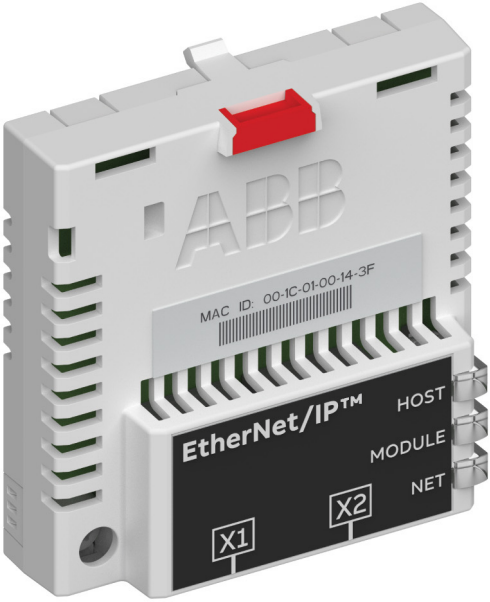
OPTIONS FOR ABB DRIVES

FEIP-21 EtherNet/IP™ fieldbus adapter module

User's manual



FEIP-21 EtherNet/IP™ fieldbus adapter module

User's manual

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3AXD50000158621 Rev E
EN
Original instructions
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1

Safety instructions

Contents of this chapter

The chapter describes the warning symbols used in this manual and refers to the safety instructions which you must obey when you install or connect an option module. If you ignore the safety instructions, injury, death or damage can occur. Read this chapter before you start the installation.

Safety messages

These safety messages help to prevent personal injury and damage to the equipment. The hazard levels comply with standard ANSI Z535.6.

The manual uses these warning symbols:



DANGER Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Is used to address practices not related to physical injury, but which can result in equipment damage.

Safety in installation and maintenance



⚠WARNING Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning, or maintenance work.



2

Introduction to the manual

Contents of this chapter

This chapter introduces this manual.

Applicability

This manual applies to the FEIP-21 fieldbus adapter module (referred to as FEIP-21 module from here on), adapter revision Q or firmware version 1.30 or later.

Compatibility

Drives

The FEIP-21 module is compatible with:

- ACS380 machinery control program version 2.02.0.1 and later
- ACS480 standard control program 2.02.0.3 and later
- ACH480 HVAC control program 2.06.0.2 and later
- ACS560 standard control program 2.08.0.0 and later
- ACS580 standard control program version 2.02.0.1 and later
- ACH580 HVAC control program 2.01.0.4 and later
- ACQ580 pump control program 2.03.0.3 and later
- ACS880 primary control program version 2.51.0.0 and later

Note: Not all compatible drives are listed here. For information on compatibility, refer to the drive firmware manual. You can check the current firmware version of the drive from parameter 07.05 Firmware version.

Protocol

The FEIP-21 module is compatible with Ethernet standards IEEE 802.3 and IEE 802.3u and it supports the EtherNet/IP protocol.

All EtherNet/IP clients that support:

- The CIP Networks Library, Volume 1, Common Industrial Protocol (CIP), Edition 3.0 May, 2006
- The CIP Networks Library, Volume 2, EtherNet/IP Adaptation of CIP, Edition 1.2 May, 2006
- Recommended Functionality for EtherNet/IP Devices Version 1.2, Feb., 2006

are compatible with the EtherNet/IP module.

The FEIP-21 module can run other protocols. You can enable and disable these protocols via web pages:

- ABB IP configuration tool
- Simple Network Time Protocol (SNTP)
- HTTPS for web page
- Open Platform Communications Unified Architecture (OPC UA)
- Multicast DNS (mDNS)
- Drive Composer software tool via HTTP(S) or EtherNet/IP (CIP)

Target audience

This manual is intended for people who plan the installation, install, start up, use and service the module. Before you do work on the module, read this manual and the applicable drive manual that contains the hardware and safety information for the product.

You are expected to know the fundamentals of electricity, wiring, electrical components, and electrical schematic symbols.

Purpose of the manual

The manual provides information on how to install, commission and use the FEIP-21 module.

Cyber security disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is the Customer's sole responsibility to provide and continuously ensure a secure connection between the product and the Customer network or any other network (as the case may be). The Customer 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 and its affiliates 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.

Terms and abbreviations

Term	Description
CIP	Common Industrial Protocol
Control word	16-bit or 32-bit word from a controller to the controlled device with bit-coded control signals (sometimes called the Command word).
DHCP	Dynamic Host Control Protocol. A protocol for automating the configuration of IP devices. DHCP can be used to automatically assign IP addresses and related network information.
DLR	Device Level Ring. DLR network is a single-fault tolerant ring network topology intended for interconnection of automation devices.
Drive	Frequency converter for controlling AC motors
EDS file	Electronic Datasheet File identifies the properties of the device to the EtherNet/IP client.
EMC	Electromagnetic compatibility
FEIP-21	Optional Ethernet adapter module for EtherNet/IP™
Fieldbus adapter module	Device through which the drive is connected to an external communication network, that is, a fieldbus
LLDP	Link Layer Discovery Protocol
MAC address	Media Access Control address
mDNS	Multicast DNS, a network protocol that resolves hostnames to IP addresses on a local network without a dedicated DNS server.
ODVA™	Open DeviceNet Vendor Association. ODVA is an independent organization that promotes interoperability between different manufacturers' EtherNet/IP products. ABB is an Associate Member at ODVA.
OPC UA	Open Platform Communications Unified Architecture
PLC	Programmable logic controller
Profile	Adaptation of a communication protocol for a certain application field (for example, drives)

Term	Description
SNTP	Simple Network Time Protocol. A protocol to synchronize drive time with the network time server.
Status word	16-bit or 32-bit word from a controlled device to the controller with bit-coded status signals

Related documents

Manual	Code
Drive hardware manuals and guides	
ACS380-04 manuals	9AAK10103A6193
ACS480 manuals	9AKK106930A8739
ACH480 manuals	9AKK107046A8101
ACS580-01 manuals	9AKK105713A8085
ACH580-01 manuals	9AKK10103A0587
ACQ580-01 manuals	9AKK106713A2709
ACS580-04 manuals	9AKK106930A9060
ACH580-04 manuals	9AKK106930A9059
ACQ580-04 manuals	9AKK106930A9053
ACS580-07 manuals	9AKK106930A5239
ACH580-07 manuals	9AKK106930A5241
ACQ580-07 manuals	9AKK106930A3150
ACS880-01 manuals	9AKK105408A7004
ACS880-04 manuals	9AKK105713A4819
ACS880-07 (45 to 710 kW) manuals	9AKK105408A8149
ACS880-07 (560 to 2800 kW) manuals	9AKK105713A6663
ACS880-07LC manuals	9AKK107680A9275
ACS880-11 manuals	9AKK106930A9565
ACS880-14 manuals	9AKK107045A8023

Manual	Code
ACS880-17 (45 to 400 kW) manuals	9AKK106930A3466
ACS880-17 (160 to 3200 kW) manuals	9AKK106354A1499
ACS880-17LC manuals	9AKK107492A4721
ACS880-31 manuals	9AKK106930A9564
ACS880-34 manuals	9AKK107045A8025
ACS880-37 (45 to 400 kW) manuals	9AKK106930A3467
ACS880-37 (160 to 3200 kW) manuals	9AKK106354A1500
ACS880-37LC manuals	9AKK107492A4722
ACS880 multidrive manuals	9AKK106103A9122
ACS880 multidrive module manuals	9AKK105713A3673
Option manuals and guides	
FEIP-21 EtherNet/IP fieldbus adapter module user's manual	3AXD50000158621
FEIP-21 EtherNet/IP fieldbus adapter module quick installation and start-up guide	3AXD50000158584

The links above contain lists of documents.

For more documentation, go to www.abb.com/drives/documents.

For manuals not available in ABB Library, contact your local ABB representative.

FEIP-21 EtherNet/IP fieldbus adapter module User's manual

Fieldbus connectivity web page

3

Overview of the Ethernet network and the FEIP-21 module

Contents of this chapter

This chapter contains a short description of the Ethernet network and the topology supported by the FEIP-21 module.

Ethernet network

Ethernet standards support a variety of physical media (coaxial cable, twisted pair, fiber optics) and topologies (bus and star).

The FEIP-21 module supports:

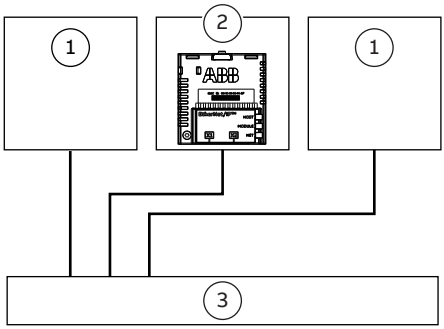
- twisted pair as the physical media
- star topology, daisy chain topology and ring topology (Device Level Ring, DLR).

The maximum length for an Ethernet segment on twisted pair media is 100 m (328 ft). All twisted pair media between the Ethernet node and the switch or router must be shorter than 100 m (328 ft), including media within patch panels.

Example topology of the Ethernet link

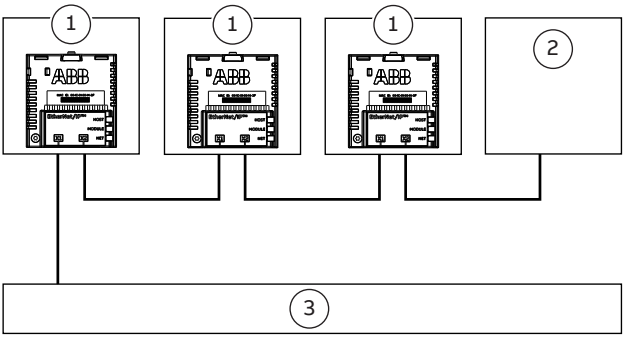
The figures below show example topologies for an Ethernet network with FEIP-21 module.

Star topology



1	Other device
2	ABB drive
3	Switch or router

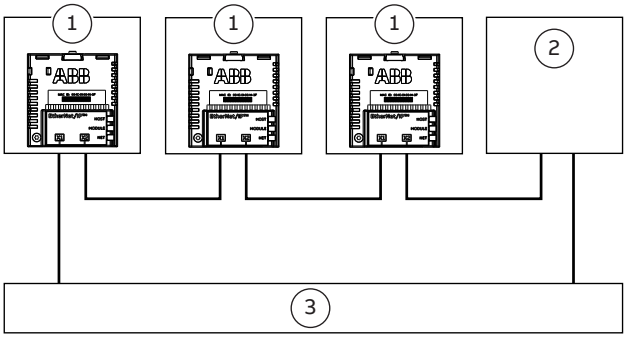
Daisy chain topology using integrated Ethernet switch



1	ABB drive
2	Other device
3	Network master device

Ring topology

For DLR configuration, refer to Configuring DLR topology for FEIP-21 module (page 69).



1	ABB drive
2	Other device
3	Network master device

FEIP-21 module overview

The FEIP-21 module is a plug-in device for ABB drives which enables the connection of the drive to an EtherNet/IP network.

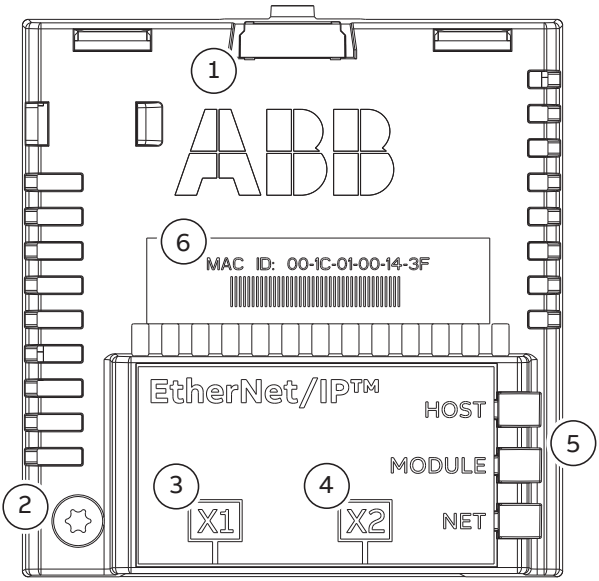
Through the FEIP-21 module you can:

- give control commands to the drive (for example, Start, Stop, Run enable)
- feed a motor speed or torque reference to the drive
- give a process actual value or a process reference to the PID controller of the drive
- read status information and actual values from the drive
- reset a drive fault
- read/write parameters of the drive
- connect to the drive via OPC UA client for monitoring and diagnostics of the drive
- connect a PC with the Drive Composer pro tool.

The adapter module supports 10 Mbit/s and 100 Mbit/s data transfer rates and automatically detects the data transfer rate of the network.

The FEIP-21 module is installed into an option slot on the drive control unit. Refer to the drive manuals for module placement options.

FEIP-21 module layout



1	Lock
2	Mounting screw (Grounding screw)
3	X1 connector to Ethernet (RJ-45)
4	X2 connector to connect to another module in the chain (RJ-45)
5	Diagnostic LEDs
6	MAC address

4

Mechanical installation

Contents of this chapter

This chapter contains a delivery checklist and instructions on installing the module.

Necessary tools and instructions

Use a Torx TX10 screwdriver to attach the FEIP-21 module to the drive. For more information, refer to the drive hardware manual.

Unpacking and examining the delivery

1. Open the option package.
2. Make sure that the package contains:
   - fieldbus module, type FEIP-21
   - quick guide.
3. Make sure that there are no signs of damage.

Before you start

Install the FEIP-21 module in a free option slot on the drive control unit. Plastic pins, a lock and one screw hold the module in place. The screw also makes an electrical connection between the FEIP-21 module and drive frame for cable shield grounding.

Do not install the FEIP-21 module on the FEA-03 F-series extension adapter.

Do not install the FEIP-21 module when the drive is powered up.

When you install the FEIP-21 module, it makes the signal and power connection to the drive through a 20-pin connector.

Installing option modules

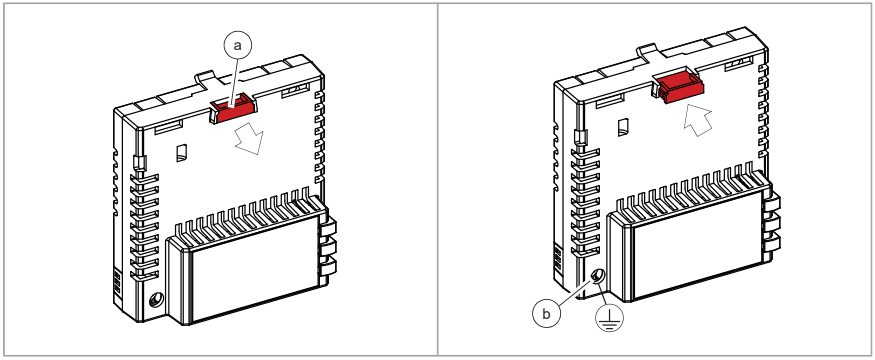
WARNING Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do electrical installation, commissioning or maintenance work.

Pay attention to the free space required by the cabling and terminals that connect to the option modules.

1. Stop the drive and do the steps in section **Electrical safety precautions** of the drive hardware manual.
2. Get access to the drive control unit. For the location of the control unit, refer to the drive hardware manual.
3. Pull out the lock on the module (a).
4. Install the module in a free option module slot on the control unit.
5. Push in the lock on the module (a).
6. Torque the grounding screw (b) to 0.8 N·m (7 lbf·in).

   Note: The screw tightens the connections and grounds the module. It is necessary for fulfilling the EMC requirements and for correct operation of the module.

   NOTICE Do not tighten the screw too much or too little. If you tighten the screw too much, damage to the threads or to the module can occur. A loose screw can cause a malfunction.



7. Connect the wiring to the module. Obey the instructions in this manual.

If you must remove the adapter module after it was installed into the drive, use a suitable tool (for example, small pliers) to carefully pull out the lock.

5

Electrical installation

Contents of this chapter

This chapter contains general cabling instructions and instructions on how to connect the FEIP-21 module to the Ethernet network and the drive.

Necessary tools and instructions

Refer to the drive hardware manual.

General cabling instructions

- Arrange the bus cables as far away from the motor cables as possible.
- Avoid parallel runs.
- Use grommets at cable entries.

Connecting the FEIP-21 module to the network



⚠WARNING Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do electrical installation, commissioning or maintenance work.

Choose correct cable for your application, CAT5e and CAT6 cables are recommended for industrial applications. ABB recommends to use double shielded twisted pair cables, eg. "SF/FTP".

6

EtherNet/IP – Start-up

Contents of this chapter

This chapter contains:

- information on configuring the drive for operation with the adapter module
- drive-specific instructions on starting up the drive with the adapter module
- examples of configuring the client for communication with the adapter module.

Warnings

⚠WARNING Obey the safety instructions given in this manual and the drive documentation.

Drive configuration

The information in this section applies to all drive types compatible with the adapter module, unless otherwise stated.

EtherNet/IP connection configuration

After the adapter module has been mechanically and electrically installed according to the instructions in chapters Mechanical installation and Electrical installation, you must prepare the drive for communication with the module.

Normally, you must adjust a parameter to activate the communication. For detailed procedure of activating the module for EtherNet/IP communication with the drive, refer to section Starting up fieldbus communication for the drive (page 52).

Once communication between the drive and the adapter module has been established, several configuration parameters are copied to the drive. These parameters are shown in the tables below and must be checked first and adjusted where necessary. You can adjust the parameters via a drive control panel or a PC tool.

Note: The new parameter settings take effect only when you power up the module the next time or when you activate the fieldbus adapter refresh parameter.

FEIP-21 configuration parameters – group A (group 1)

Note: The actual parameter group number depends on the drive type. Group A (group 1) corresponds to:

- parameter group 51 in ACS380, ACS480, ACH580, ACQ580 and ACS580
- parameter group 51/54 (or 151/154 in some variants) in ACS880 if the adapter is installed as fieldbus adapter A/B.

No.	Name/ Value	Description	Default
01	FBA type	Read-only. Shows the fieldbus adapter type as detected by the drive. The value cannot be adjusted by the user. If the value is 0 = None, the communication between the drive and the module has not been established.	2222 = Ether-Net/IP
02	Pro-tocol/Pro-file	Selects the application protocol and communication profile for the network connection. The selections available for EtherNet/IP communication are listed below.	101 = EIP ABB Pro
	100 = EIP AC/DC	EtherNet/IP protocol: ODVA AC/DC drive profile	
	101 = EIP ABB Pro	EtherNet/IP protocol: ABB Drives profile	
	102 = EIP T16	EtherNet/IP protocol: Transparent 16-bit profile	
	103 = EIP T32	EtherNet/IP protocol: Transparent 32-bit profile	
03	Commrate	Sets the bit rate for the Ethernet interface. In FEIP-21 module this parameter is used for configuring port 1. For configuring port 2, refer to parameter 14 Commrate port 2 (page 35).	0 = Auto
	0 = Auto	Autonegotiate	

No.	Name/ Value	Description	Default
	1 = 100 Mbps FD	100 Mbps, full duplex	
	2 = 100 Mbps HD	100 Mbps, half duplex	
	3 = 10 Mbps FD	10 Mbps, full duplex	
	4 = 10 Mbps HD	10 Mbps, half duplex	
04	IP configuration	Sets the method for configuring the IP address, subnet mask and gateway address for the adapter module.	1 = Dyn IP DHCP
	0 = Static IP	Configuration will be obtained from parameters 05…13.	
	1 = Dyn IP DHCP	Configuration will be obtained via DHCP.	
05	IP address 1	An IP address is assigned to each IP node on a network. An IP address is a 32-bit number that is typically represented in dotted decimal notation consisting of four decimal integers, on the range 0…255, separated by periods. Each integer represents the value of one octet (8-bits) in the IP address. Parameters 05…08 define the four octets of the IP address of the adapter module.	0
	0 … 255	IP address	
06	IP address 2	Second octet of adapter module IP address. Refer to parameter IP address 1 (page 33).	0
	0 … 255	IP address	
07	IP address 3	Third octet of adapter module IP address. Refer to parameter IP address 1 (page 33).	0
	0 … 255	IP address	
08	IP address 4	Fourth octet of adapter module IP address. Refer to parameter IP address 1 (page 33).	0
	0 … 255	IP address	

No.	Name/ Value	Description	Default
09	Subnet CIDR	Subnet masks are used for splitting networks into smaller networks called subnets. A subnet mask is a 32-bit binary number that splits the IP address into a network address and host address. Subnet masks are typically represented in dotted decimal notation or CIDR notation.	0
	31	255.255.255.254	
	30	255.255.255.252	
	29	255.255.255.248	
	28	255.255.255.240	
	27	255.255.255.224	
	26	255.255.255.192	
	25	255.255.255.128	
	24	255.255.255.0	
	23	255.255.254.0	
	22	255.255.252.0	
	21	255.255.248.0	
	20	255.255.240.0	
	19	255.255.224.0	
	18	255.255.192.0	
	17	255.255.128.0	
	16	255.255.0.0	
	15	255.254.0.0	
	14	255.252.0.0	
	13	255.248.0.0	
	12	255.240.0.0	
	11	255.224.0.0	

No.	Name/ Value	Description	Default
	10	255.192.0.0	
	9	255.128.0.0	
	8	255.0.0.0	
	7	254.0.0.0	
	6	252.0.0.0	
	5	248.0.0.0	
	4	240.0.0.0	
	3	224.0.0.0	
	2	192.0.0.0	
	1	128.0.0.0	
10	GW address 1	IP gateways connect individual physical IP subnets into a unified IP network. When an IP node needs to communicate with an IP node on another subnet, the IP node sends the data to the IP gateway for forwarding. Parameters 10…13 define the four octets of the gateway IP address.	0
	0 … 255	GW address	
11	GW address 2	Second octet of the gateway IP address. Refer to parameter GW address 1 (page 35).	0
	0 … 255	GW address	
12	GW address 3	Third octet of the gateway IP address. Refer to parameter GW address 1 (page 35).	0
	0 … 255	GW address	
13	GW address 4	Fourth octet of the gateway IP address. Refer to parameter GW address 1 (page 35).	0
	0 … 255	GW address	
14	Commrate port 2	Sets the bit rate for the Ethernet port 2. This parameter is used only with FEIP-21 module.	0 = Auto

No.	Name/ Value	Description	Default
	0 = Auto	Autonegotiate	
	1 = 100 Mbps FD	100 Mbps, full duplex	
	2 = 100 Mbps HD	100 Mbps, half duplex	
	3 = 10 Mbps FD	10 Mbps, full duplex	
	4 = 10 Mbps HD	10 Mbps, half duplex	
	5 = Disable Port	Disable Ethernet port.	
15	Service configuration	Disable services that are not required. Each service is represented by a single bit. Bit 0, Lock configuration, can be used to prevent accidental changing of this parameter. By default, all services are enabled and configuration is unlocked.	

No.	Name/ Value	Description	Default

No.	Name/ Value	Description	Default

Bit	Name	Information
0	Lock configuration	Changing this bit to one will lock service configuration and no bit can be changed. Only resetting the fieldbus configuration will unlock the parameter. To reset the fieldbus configuration, choose "Reset all fieldbus settings" or "Clear all" in parameter 96.06 Parameter restore.
1	Disable IP config tool	When this bit is set, access from ABB IP Configuration tool is prevented.
2	Disable ETH tool network	When this bit is set, access from Ethernet tool network (eg, ABB Drive Composer tool) is prevented.
3	Disable ping response	When this bit is set, response to ICMP (ping) message is prevented.
4	Unsecured ETH tool network	When this bit is set, access from Ethernet tool network is unsecured. **Note:** Drive Composer pro before V2.7 supports unsecured communication only.
5	Disable configuring web pages	When this bit is set, access to web pages is disabled.
6	Disable web-based firmware update	When this bit is set, the web-based firmware update is disabled.
7	Disable OPC UA	When this bit is set, the OPC UA server is disabled. OPC UA is not enabled by default. For more information, refer to Appendix F - OPC UA server (page 207).
8	Unencrypted OPC UA	When this bit is set, connection to the OPC UA server can be selected as unencrypted and not signed.
9	Enable mDNS	To enable mDNS, set this bit to 1. To disable, set to 0. mDNS is disabled by default.
10	Disable SNTP	To enable SNTP, set this bit to 0. To disable, set to 1. SNTP is disabled by default.
11	Disable CIP tool network	To enable CIP tool network, set this bit to 0. To disable, set to 1.

<table>
<tr><th>No.</th><th>Name/ Value</th><th>Description</th><th>Default</th></tr>
<tr><td></td><td colspan="3"><table>
<tr><th>Bit</th><th>Name</th><th>Information</th></tr>
<tr><td></td><td></td><td>CIP tool network is enabled by default.</td></tr>
</table></td></tr>
<tr><td></td><td>0000b … 1111b</td><td>Service configuration</td><td></td></tr>
<tr><td>16</td><td>Module emulation</td><td>Enables the emulation of an old EtherNet/IP module (RETA-01) and selects the emulated old drive type.
Select the emulated product code from the list below on basis of the drive and Ethernet module type to be emulated. FEIP-21 module reports the selected code to the PLC. It is also possible to use your own code.
Refer to section Emulation modes (page 49).</td><td>0</td></tr>
<tr><td></td><td>0</td><td>No emulation. The FEIP-21 module reports the actual product code to the PLC.</td><td></td></tr>
<tr><td></td><td>1</td><td>FEIP-21 version < 1.30</td><td></td></tr>
<tr><td></td><td>202</td><td>ACH550-xx with RETA-01</td><td></td></tr>
<tr><td></td><td>201</td><td>ACS550-xx with RETA-01</td><td></td></tr>
<tr><td></td><td>171</td><td>ACS800 (AMAL) with RETA-01</td><td></td></tr>
<tr><td></td><td>149</td><td>ACS800 (Braking) with RETA-01</td><td></td></tr>
<tr><td></td><td>121</td><td>ACS800 (Centrifuge) with RETA-01</td><td></td></tr>
<tr><td></td><td>111</td><td>ACS800 (Crane) with RETA-01</td><td></td></tr>
<tr><td></td><td>112</td><td>ACS800 (CraneControl) with RETA-01</td><td></td></tr>
<tr><td></td><td>141</td><td>ACS800 (FCBTemplate) with RETA-01</td><td></td></tr>
<tr><td></td><td>210</td><td>ACS800 (MotionControl) with RETA-01</td><td></td></tr>
<tr><td></td><td>191</td><td>ACS800 (MultiBlock) with RETA-01</td><td></td></tr>
<tr><td></td><td>101</td><td>ACS800 (Standard) with RETA-01</td><td></td></tr>
<tr><td></td><td>151</td><td>ACS800 (StandardPMSM) with RETA-01</td><td></td></tr>
<tr><td></td><td>105</td><td>ACS800 (System) with RETA-01</td><td></td></tr>
</table>

No.	Name/ Value	Description	Default
	156	ACS800 (SystemPMSM) with RETA-01	
	243	ACS800 (Winder) with RETA-01	
17	Revision emulation	Enables the user to define the firmware major and minor revisions that FEIP-21 module will emulate. Revision emulation can be used to pass the major/minor revision check if they are set in the Ethernet IP scanner configuration. **Note:** Emulating the revision number might affect system behavior. By changing this parameter you accept the risk. Refer to section Configuring revision emulation (page 50).	0 = Use the actual revision of FEIP-21 module
	0	Emulation is not used. Actual revision of FEIP-21 module will be used.	
	0x1-0x9999	Emulate revision in hexadecimal. High byte sets the major revision, low byte sets the minor revision.	
18	Reserved	This parameter is not used.	
	0	Reset Safety Network Number	
19	T16 scale	Defines the scaling for reference 1 and actual 1 with Transparent 16 profile. (Protocol.Profile = EIP T16) Scaling also depends on the selected Reference type on 50.04 FBA A Ref 1 type and 50.34 FBA B Ref 1 type and 50.07 and 50.37 for the actual 1. Ref type = Transparent FBA_A/B_Ref1 = Ref1_from_PLC * (T16_Scale + 1) Ref type = General FBA_A/B_Ref1 = Ref1_from_PLC * (T16_Scale + 1) / 100	99
	0 … 65535	Reference multiplier/actual value divisor	

No.	Name/ Value	Description	Default
20	Control timeout	Defines the control timeout value. The EtherNet/IP protocol specifies connection timeout for I/O messaging (Class 1) and Connected explicit messaging (Class 3), but not Unconnected explicit messaging. This parameter provides a timeout for Unconnected explicit messaging and for instances of Connected explicit messaging (Class 3), where the client breaks the connection in between requests.	0
	0	**I/O messaging (Class 1) and Connected explicit messaging (Class 3):** (Requested Packet Interval) × (Connection Timeout Multiplier) **Note:** Timeout behavior can be modified by Watchdog Timeout Action attribute of Connection object. **Unconnected explicit messaging:** Always timeout Control timeout must be greater than zero to control drive with Unconnected Explicit Messaging.	
	1 … 65534	**I/O messaging (Class 1):** (Requested Packet Interval) × (Connection Timeout Multiplier) **Note:** Timeout behavior can be modified by Watchdog Timeout Action attribute of Connection object. **Connected explicit messaging (Class 3)** and **Unconnected explicit messaging:** 100ms × (Control Timeout Value) since last Control Event	
	65535	**I/O messaging (Class 1):** (Requested Packet Interval) × (Connection Timeout Multiplier) **Note:** Timeout behavior can be modified by Watchdog Timeout Action attribute of Connection object. **Connected explicit messaging (Class 3)** and **Unconnected explicit messaging:** Never Timeout.	

No.	Name/ Value	Description	Default
		Control timeout events: • Write of an output assembly object instance • Write of control bits (Run1, Run2, NetCtrl, NetRef and FaultReset) • Write Speed Reference • Write Torque Reference • Reset Control Supervisor object • Write Force Fault via Control Supervisor object If a timeout occurs, the adapter module signals the drive that communication with the client has been lost. The drive configuration then determines how to respond. Example: If the timeout is 250 ms and the drive is configured to trip on a fault on a communication failure with a delay of 500 ms, then the drive will trip on a fault 750 ms after communications is lost.	
21	Idle action	I/O connections may include a Run/Idle notification. This parameter determines the action the drive takes in response to an Idle notification.	0 = Off-line
	0 = Off-line	In the event of an Idle notification, the adapter module signals the drive that communication with the client has been lost. The drive configuration then determines how to respond. Example: If the timeout is 250 ms and the drive is configured to trip on a fault on a communication failure with a delay of 500 ms, then the drive will trip on a fault 750 ms after communications is lost.	
	1 = On-line	In the event of an Idle notification, the drive will continue to operate using the last command and references received.	
22	Stop function	Determines how the motor is to be stopped when a stop command is received via EtherNet/IP. This parameter only applies to the ODVA AC/DC drive profile.	0 = Ramp
	0 = Ramp	The motor decelerates along the active deceleration ramp.	
	1 = Coast	The motor comes to a stop by coasting.	

No.	Name/ Value	Description	Default
23	Speed scale	This parameter only applies to the ODVA AC/DC drive profile. The units of reference and actual speeds for the ODVA AC/DC drive profile are given by the formula below. Speed unit = RPM × $2^{(-1 \times \text{ODVA speed scale value})}$ Use the speed scale value of the drive parameter when reading/writing parameter **Speed scale** through the drive control panel, Drive parameter object, class 90h and Fieldbus configuration object, class 91h. When written through these methods, the new value takes effect after the drive control unit is restarted or a "Fieldbus Adapter Parameter refresh" is given. Use the ODVA speed scale value when reading/writing parameter Speed scale via AC/DC-drive object, class 2Ah. When written via the AC/DC drive object, the new value takes effect immediately. **Note:** While a wide range of resolutions can be configured, the actual performance is limited to the performance capabilities of the drive. The rows below show how the drive ODVA speed scale parameter values correspond to the ODVA speed scale units.	128
	123	ODVA speed scale value: -5 Unit: 32 RPM	
	124	ODVA speed scale value: -4 Unit: 16 RPM	
	125	ODVA speed scale value: -3 Unit: 8 RPM	
	126	ODVA speed scale value: -2 Unit: 4 RPM	
	127	ODVA speed scale value: -1 Unit: 2 RPM	
	128	ODVA speed scale value: 0 Unit: 1 RPM	
	129	ODVA speed scale value: 1 Unit: 0.5 RPM	

No.	Name/ Value	Description	Default
	130	ODVA speed scale value: 2 Unit: 0.25 RPM	
	131	ODVA speed scale value: 3 Unit: 0.125 RPM	
	132	ODVA speed scale value: 4 Unit: 0.0625 RPM	
	133	ODVA speed scale value: 5 Unit: 0.03125 RPM	
	0 … 255	Speed scale value of drive parameter	
24	Torque scale	This parameter only applies to the ODVA AC/DC drive profile. The units of reference and actual torques for the ODVA AC/DC drive profile are given by the formula below. Torque unit = N·m × $2^{(-1 \times \text{ODVA torque scale})}$ where: (N·m = Newton × Meter) Use the torque scale value of the drive parameter when reading/writing parameter Torque scale through the drive control panel, Drive parameter object, class 90h and Fieldbus configuration object, class 91h. When written through these methods, the new value takes effect after the drive control unit is restarted or a “Fieldbus Adapter Parameter refresh” is given. Use the ODVA torque scale value when reading/writing parameter Torque scale via AC/DC-drive object, class 2Ah. When written via the AC/DC drive object, the new value takes effect immediately. **Note:** While a wide range of resolutions can be configured, the actual performance is limited to the performance capabilities of the drive. The rows below show how the drive ODVA torque scale parameter values correspond to the ODVA torque scale units.	128
	123	ODVA torque scale value: -5 Unit: 32 N·m	
	124	ODVA torque scale value: -4 Unit: 16 N·m	

No.	Name/ Value	Description	Default
	125	ODVA torque scale value: -3 Unit: 8 N·m	
	126	ODVA torque scale value: -2 Unit: 4 N·m	
	127	ODVA torque scale value: -1 Unit: 2 N·m	
	128	ODVA torque scale value: 0 Unit: 1 N·m	
	129	ODVA torque scale value: 1 Unit: 0.5 N·m	
	130	ODVA torque scale value: 2 Unit: 0.25 N·m	
	131	ODVA torque scale value: 3 Unit: 0.125 N·m	
	132	ODVA torque scale value: 4 Unit: 0.0625 N·m	
	133	ODVA torque scale value: 5 Unit: 0.03125 N·m	
	0 … 255	Torque scale value of drive parameter	
25 … 26	Reserved		
27	FBA A/B par refresh	Validates changed adapter module configuration parameter settings. After refreshing, the value reverts automatically to 0 = Done. **Note:** This parameter cannot be changed while the drive is running.	0 = Done
	0 = Done	Refreshing done	
	1 = Refresh	Refreshing	

No.	Name/ Value	Description	Default
28	FBA A/B par table ver	Read-only. Displays the parameter table revision of the fieldbus adapter module mapping file stored in the memory of the drive, in format xyz, where x = major revision number y = minor revision number z = correction number OR in format axyz, where a = major revision number xy = minor revision numbers z = correction number or letter.	N/A
		Parameter table revision	
29	FBA A/B drive type code	Read-only. Displays the drive type code of the fieldbus adapter module mapping file stored in the memory of the drive.	N/A
		Drive type code of the fieldbus adapter module mapping file	
30	FBA A/B mapping file ver	Read-only. Displays the fieldbus adapter module mapping file revision stored in the memory of the drive in decimal format.	N/A
		Mapping file revision	
31	D2FBA A/B comm status	Read-only. Displays the status of the fieldbus adapter module communication. **Note:** The value names can vary by drive.	0 = Idle or 4 = Off-line
	0 = Idle	Adapter is not configured.	
	1 = Exec.init	Adapter is initializing.	
	2 = Time out	A timeout has occurred in the communication between the adapter and the drive.	
	3 = Conf.err	Adapter configuration error: The major or minor revision code of the common program revision in the fieldbus adapter module is not the revision required by the module or mapping file upload has failed more than three times.	
	4 = Off-line	Adapter is off-line.	

No.	Name/ Value	Description	Default
	5 = On-line	Adapter is on-line.	
	6 = Reset	Adapter is performing a hardware reset.	
32	FBA A/B comm SW ver	Read-only. Displays firmware patch and build number of the adapter module in the xxyy format, where: xx = patch number yy = build number Example: If the firmware version (<major>.<minor>.<patch>.<build>) is 3.10.200.13, the value C80D is displayed. If the version is 3.10.0.0, the value 0 is displayed. Refer to also parameter 33 FBA A/B appl SW ver (page 47).	N/A
33	FBA A/B appl SW ver	Read-only. Displays firmware version of the adapter module in xxyy format, where: xx = major revision number yy = minor revision number Example: If the firmware version (<major>.<minor>.<patch>.<build>) is 3.10.200.13 or 3.10.0.0, the value 310 is displayed. Refer to also parameter 32 FBA A/B comm SW ver (page 47).	N/A

FEIP-21 configuration parameters – group B (group 2)

Note: The actual parameter group number depends on the drive type. Group B (group 2) corresponds to:

- parameter group 53 in ACS380, ACS480, ACH580, ACQ580 and ACS580
- parameter group is typically 53/56 (153/156 in some variants) in ACS880 if the adapter is installed as fieldbus adapter A/B.

No.[1)]	Name/ Value	Description	Default
01	FBA A/B data out 1 (client to drive)	In output assembly instances that include drive parameters, this parameter specifies which parameter's value will be placed in location Data out 1 value received by the drive from the EtherNet/IP client.	0 = None
	0 = None	Not used	

No.[1]	Name/ Value	Description	Default
	1 … 99	Virtual address area of drive control. Not used with the EtherNet/IP protocol.	
	101 … 9999	Parameter area of the drive. Parameter index with format xxyy, where • xx is the parameter group number (1…99) • yy is the parameter number index within that group (01…99). **Note:** In ACS480, ACS580 and ACS880, choose Other to display a list of mappable drive parameters.	
02 … 10	Data out 2 … Data out 10	Refer to parameter 01 FBA A/B data out 1 (client to drive) (page 47).	0 = None

1) The number of parameters in this group may vary by drive type and drive firmware.

FEIP-21 configuration parameters – group C (group 3)

Note: The actual parameter group number depends on the drive type. Group C (group 3) corresponds to:

- parameter group 52 in ACS380, ACS480, ACH580, ACQ580 and ACS580
- parameter group is typically 52/55 (152/155 in some variants) in ACS880 and ACS880-M04 if the adapter is installed as fieldbus adapter A/B.

No.[1]	Name/ Value	Description	Default
01	FBA A/B data in1 (drive to client)	In input assembly instances that include drive parameters, this parameter specifies which parameter's value will be placed in location Data in 1 value sent by the drive to the EtherNet/IP client.	0 = None
	0 = None	Not used	
	1 … 99	Virtual address area of drive control. Not used with the EtherNet/IP protocol.	

No.[1]	Name/ Value	Description	Default
	101 … 9999	Parameter area of the drive. Parameter index with format xxyy, where • xx is the parameter group number (1…99) • yy is the parameter number index within that group (01…99). **Note:** In ACS480, ACS580 and ACS880, choose Other to display a list of mappable drive parameters.	
02 … 10	Data in 2 … Data in 10	Refer to parameter 01 FBA A/B data in1 (drive to client) (page 48).	0 = None

[1] The number of parameters in this group may vary by drive type and drive firmware.

Control locations

ABB drives can receive control information from multiple sources including digital inputs, analog inputs, the drive control panel and a fieldbus adapter module. ABB drives allow the user to separately determine the source for each type of control information (Start, Stop, Direction, Reference, Fault reset, etc.).

To give the fieldbus client the most complete control over the drive, you must select the adapter module as the source of this information. The drive-specific parameter setting examples below contain the drive control parameters relevant in the examples. For a complete parameter list, refer to the drive documentation.

Emulation modes

You can use the emulation mode in the following cases:

- when you replace an older drive with a new drive
- where the PLC program is configured to use RETA-01 and the drive is equipped with FEIP-21 module
- where the PLC program is configured to check device firmware major and minor revisions and FEIP-21 module has different firmware revisions, but the device must still be used
- where the PLC program is configured to use old FEIP-21 EDS files (version in prior v1.30), that contain drive-specific information and old assembly instance numbers for the Transparent32 profile

FEIP-21 module supports emulation of RETA-01 module and emulation of FEIP module software revisions (major and minor). It also supports emulation of FEIP-21 versions below 1.30, to retain backwards compatibility with PLC projects designed for those versions.

RETA-01 compatibility mode changes the assembly of FEIP-21 module and emulates the product code of the selected drive, so that an old PLC configuration done for an old drive type with RETA-01 module can accept FEIP-01 module and new drive type connection without modifications.

Note: RETA-01 compatibility mode does not emulate the firmware version of RETA-01. For firmware version emulation, refer to Revision emulation (page 50).

The "FEIP-21 version < 1.30" emulation mode changes the product code and product type of FEIP-21 to match the drive. It also modifies the assembly instance numbers of the Transparent32 profile to correspond to the numbers in older FEIP-21 EDS files. If a PLC configuration uses these older EDS files, it operates with FEIP-21 version 1.30 or later without modification.

This emulation mode will be activated automatically when:

- The emulation mode is set to "None", and the drive backup contains FEIP-21 version earlier than 1.30
- The drive backup includes any version of FENA-xx.

Refer to Appendix C - Replacing FENA-xx module with FEIP-21 module (page 183) for more information about this drive backup.

Revision emulation

Revision emulation allows the user to define the firmware major and minor revisions which FEIP-21 will emulate, so that the PLC accepts the connection when replacing an ethernet adapter module (eg. FEIP-01, RETA-01 or FENA-01 or -11) with a FEIP module with different firmware revisions. If the PLC has major and minor revision checks disabled, you do not need to use revision emulation even if the replacement part revisions do not match.

Always verify correct drive operation when you use the emulation. Emulated revision might behave differently than the product used before.

Note: Revision emulation does not emulate other functions.

Configuring revision emulation

To emulate FENA-11/21 firmware revision:

1. Set parameter 51.17 Revision emulation in hexadecimal to match the FENA-11/21 label SW information or parameter 51.33 FBA A appl FW value.
   - Example: when the label states “SW: 3.25” or parameter 51.33 FBA A appl FW is set to 0x0325, set parameter 51.17 Revision emulation to 0x0325.

To emulate RETA-01 firmware revision:

1. Convert the RETA-01 label APPL information or parameter 51.33 FBA APPL FW REV value from decimal to hexadecimal separately for the major and minor revision numbers.

- Example: when the label states “APPL 2.12” or parameter 51.33 FBA APPL FW REV is set to 0x0212, convert major revision 2 to hex 0x02 and minor revision 12 to 0x0C.

2. Combine the hexadecimal values (major revision 0x02 and minor revision 0x0C = 0x020C) and set the value to parameter 51.17 Revision emulation.

RETA-01 compatible assemblies

Profile	Assembly types
ODVA	• 20 - Basic Speed Control output assembly (Control Word, Set Speed) • 70 - Basic Speed Control input assembly (Status Word, Actual Speed) • 21 - Extended Speed Control assembly output (Extended Control Word, Set Speed) • 71 - Extended Speed Control assembly input (Extended Status Word, Actual Speed) • 121 - Extended Speed Control plus Drive parameters output assembly (Extended Control Word, Set Speed, dynamic mappings) • 171 - Extended Speed Control plus Drive parameters input assembly (Extended Status Word, Actual Speed, dynamic mappings)
ABB Drives profile	• 100 - Output ABB Drive Control assembly (Control Word, Set Speed) • 101 - Input ABB Drive Control assembly (Status Word, Actual Speed) • 102 - Output User Specific Control assembly (dynamic) • 103 - Input User Specific Control assembly (dynamic)

Configuring RETA-01 emulation mode

To configure RETA-01 emulation mode, follow the below steps:

1. Select a profile based on the used assemblies with parameter 51.02 Protocol Profile.
   - Select EIP AC/DC, if assemblies 20, 70, 21, 71, 121 or 171 are used in the RETA-01.
   - Select EIP ABB Pro, if assemblies 100, 101, 102 or 103 are used in the RETA-01.
2. Select the desired product code in parameter 51.16 Module emulation.
3. Refresh the parameters to configure other parameters needed for Ethernet/IP protocol.

Configuring data in and data out mapping parameters

For assemblies 20, 70, 21, 71, 100, or 101, the order of parameters is predefined. For dynamic assemblies 102, 103, 121, or 171, the assembly content can be configured. You must refresh the parameters after the mapping parameters are ready.

For more information, refer to RETA-01 Ethernet Adapter Module User's Manual (3AFE64539736 [English]).

Note: FEIP-21 module determines the length of dynamic assemblies by refreshing the parameters. The connection from host does not succeed before the host and FEIP-21 module have matching lengths of assemblies.

Note: RETA-01 compatibility mode cannot emulate drive parameters. The compatible parameter data is required if parameters other than Control word, Status word, Speed reference, and Speed actual are needed.

Fieldbus configuration object, class 91h

The fieldbus configuration object allows you to configure Data out and Date in configuration over Ethernet/IP.

- Use instance #1 for Data out parameters
- Use instance #2 for Data in parameters.

For more information, refer to section Starting up fieldbus communication for the drive.

Starting up fieldbus communication for the drive

1. Power up the drive.
2. Enable the communication between the adapter module and the drive by selecting the correct slot number in parameter 50.01 FBA A enable.
   The selection must correspond to the slot where the adapter module is installed. For example, if the adapter module is installed in slot 2, you must select slot 2.
3. With parameter 50.02 FBA A comm loss func, select how the drive reacts to a fieldbus communication break.
   Note that this function monitors both communication between the fieldbus master and the adapter module and communication between the adapter module and the drive.
4. With parameter 50.03 FBA A comm loss t out, define the time between communication break detection and the selected action.
5. Select application-specific values for the rest of the parameters in group 50, starting from 50.04.
   Examples of appropriate values are shown in the tables below.
6. Set the module configuration parameters in group 51.
   At the minimum, select the communication protocol and profile with parameter 51.02 and configure the network settings with parameters 51.03…51.13.
7. Define the process data transferred to and from the drive in parameter groups 52 and 53.

Note: The adapter module assigns the Control word, Status word, references 1…2 and actual values 1…2 automatically to cyclical communication according to the selected assembly instances.

8. Save the valid parameter values to permanent memory with parameter 96.07 Parameter save manually.
9. Validate the settings made in parameter groups 51, 52 and 53 with parameter 51.27 FBA A par refresh.
10. Set the relevant drive control parameters to control the drive according to the application.
    Examples of appropriate values are shown in the tables below.

Parameter setting examples – ACS380, ACS480, ACS580 and ACS880

Speed control using the ODVA AC/DC drive profile, Extended speed control assembly

This example shows how to configure a speed control application that uses the ODVA AC/DC drive profile, Extended speed control assembly. In addition, some application-specific data is added to the communication.

The start/stop commands and reference scaling are according to the ODVA AC/DC drive profile. For more information, refer to section ODVA AC/DC drive profile (page 75).

When Reference 1 (REF1) is used for speed control and the value of parameter 51.23 is 128, an ODVA speed reference value of ±30000 (decimal) corresponds to an equal amount of rpm in the drive. The speed reference value sent from the PLC is limited by parameter 30.12 Maximum speed in the forward direction and 30.11 Minimum speed in the reverse direction.

The minimum and maximum 16-bit integer values that can be given through the fieldbus are -32768 and 32767 respectively.

Bytes	Instance 121	Instance 171
0…1	Control word	Status word
2…3	Speed reference	Speed actual value
4…7	Constant speed 1 [32] 1)	Output power [32] 1)
8…11	Constant speed [32] 1)	DC voltage [32] 1)

1) Example

The table below gives the recommended drive parameter settings.

Drive parameter	Setting for drives	Description
50.01 FBA A enable	1 = Option slot 1[1)]	Enables communication between the drive and the fieldbus adapter module.
50.02 FBA A comm loss func	1 = Fault[1)]	Enables fieldbus A communication fault monitoring.
50.03 FBA A comm loss t out	3.0 s[1)]	Defines the fieldbus A communication break supervision time.
50.04 FBA A ref1 type	4 = Speed	Selects the fieldbus A reference 1 type and scaling.
51.01 FBA A type	2222 = EtherNet/IP[2)]	Displays the type of the fieldbus adapter module.
51.02 Protocol/Profile	100 = EIP AC/DC	Selects the EtherNet/IP protocol and the ODVA AC/DC drive profile.
51.03 Commrate	0 = Auto[1)]	Ethernet communication rate is negotiated automatically by the device.
51.04 IP configuration	0 = Static IP[1)]	Configuration will be obtained from parameters 51.05…51.13.
51.05 IP address 1	192[1)]	First part of the IP address
51.06 IP address 2	168[1)]	Second part of the IP address
51.07 IP address 3	0[1)]	Third part of the IP address
51.08 IP address 4	16[1)]	Fourth part of the IP address
51.09 Subnet CIDR	24[1)]	Sets the network mask. In this example, the network mask is set as 255.255.255.0.
51.23 ODVA speed scale	128[1)]	Sets the scaling for the ODVA speed reference.
52.01 FBA data in1	01.14[1)]	Output power
52.03 FBA data in3	01.11[1)]	DC voltage
53.01 FBA data out1	22.26[1)]	Constant speed 1
53.03 FBA data out3	22.27[1)]	Constant speed 2

Drive parameter	Setting for drives	Description
51.27 FBA A par refresh	1 = Refresh	Validates the FEIP-21 module configuration parameter settings.
20.01 Ext1 commands	12 = Fieldbus A	Selects the fieldbus A interface as the source of the start and stop commands for external control location 1.
22.11 Speed ref1 source	4 = FB A ref1	Selects the fieldbus A reference 1 as the source for speed reference 1.

1) Example
2) Read-only or automatically detected/set

The start sequence for the parameter example above is given below.

Control word:

- Reset the fieldbus communication fault (if active).
- Enter 0h (0 decimal) → READY.
- Enter 1h (1 decimal) → ENABLED (Running forward).
- Enter 2h (2 decimal) → ENABLED (Running reverse).

Configuring the client

After the adapter module has been initialized by the drive, you must prepare the client for communication with the module. An example of an Allen-Bradley® PLC is given below. If you are using another client system, refer to its documentation for more information.

The example applies to all drive types compatible with the module.

Before you start

Decide on these points before you start the client configuration.

Select profile

The communication profile determines which I/O assemblies and objects are available. Refer to chapter EtherNet/IP – Communication profiles (page 73) for more information.

Select output and input assembly instances

EtherNet/IP devices implement multiple objects each with many attributes. While it is possible to write or read each attribute separately to control the drive, this is inefficient. Assembly object instances provide a means to group writes or reads of attributes. The selection of assembly objects is limited by the choice of the communication profile. This table gives a listing of the output and input assemblies.

Name	Output instance	Input instance	Size (bytes)	Size (16-bit words)	Profile
Basic Speed Control	20	70	4	2	ODVA AC/DC drive
Enhanced Speed Control	21	71	4	2	ODVA AC/DC drive
Basic Speed and Torque Control	22	72	6	3	ODVA AC/DC drive
Enhanced Speed and Torque Control	23	73	6	3	ODVA AC/DC drive
Basic Speed Control plus Drive Parameters	120	170	24	12	ODVA AC/DC drive
Enhanced Speed Control plus Drive Parameters	121	171	24	12	ODVA AC/DC drive
Basic Speed and Torque Control plus Drive Parameters	122	172	26	13	ODVA AC/DC drive
Enhanced Speed and Torque Control plus Drive Parameters	123	173	26	13	ODVA AC/DC drive
ABB Drives Profile w/ Set Speed	1	51	4	2	ABB Drives profile
ABB Drives Profile w/ Set Speed and Set Torque	2	52	6	3	ABB Drives profile
ABB Drives Profile w/ Set Speed plus Drive Parameters	101	151	24	12	ABB Drives profile
ABB Drives Profile w/ Set Speed and Set Torque plus Drive Parameters	102	152	26	13	ABB Drives profile
Transparent16 w/One	11	61	4	2	Transparent16 profile
Transparent16 w/Two	12	62	6	3	Transparent16 profile
Transparent16 w/One plus Drive Parameters	111	161	24	12	Transparent16 profile

Name	Output instance	Input instance	Size (bytes)	Size (16-bit words)	Profile
Transparent16 w/Two plus Drive Parameters	112	162	26	13	Transparent16 profile
Transparent32 w/One[1)]	41	91	8	4	Transparent32 profile
Transparent32 w/Two[1)]	42	92	12	6	Transparent32 profile
Transparent32 w/One plus Drive Parameters[1)]	141	191	28	14	Transparent32 profile
Transparent32 w/Two plus Drive Parameters[1)]	142	192	32	16	Transparent32 profile

1) Only for FEIP-21 firmware version 1.30 and onwards

Select connection method

EtherNet/IP provides a variety of connection methods to communicate between devices. Not all methods are supported by all devices. Refer to the client documentation to determine which method(s) are supported by the client.

Note: The choice of the connection method has a significant impact on the timeout behavior. Refer to configuration parameters 20 Control timeout and 21 Idle action for more information.

The FEIP-21 module supports the following connection methods:

Connection method	Description
I/O connections	The adapter module supports Class 1 I/O connections. I/O connections are often also referred to as “Implicit Messaging”. I/O connections are typically established by configuring an I/O scanner to write and read assembly object instances.
Connected explicit messaging	The adapter module supports Class 3 connected explicit messaging. Class 3 connected explicit messages are typically established by using a “message instruction” to write or read an attribute. **Note:** When using Class 3 explicit messaging, some EtherNet/IP clients may close the connection after the MSG instruction is done. This will cause the module to behave as if it were controlled via unconnected explicit messaging.

Connection method	Description
Unconnected explicit messaging	The adapter module supports unconnected explicit messaging. Unconnected explicit messages are typically established by using a “message instruction” to write or read an attribute. **Note:** EtherNet/IP does not provide a timeout means for unconnected explicit messaging. To use unconnected explicit messaging for control, refer to configuration parameter 20 Control timeout (page 41).

EDS files

Electronic Data Sheet (EDS) files specify the properties of the device for the EtherNet/IP client. The client identifies the device by means of the product code, device type and major revision attributes.

From v1.30 onwards, only a generic EDS file will be provided for FEIP-21 module. Instead of taking the identifying information from the drive, it uses product code 1 and device type 103, which are unique to the FEIP-21 module. This makes the generic EDS file compatible with all drive types and firmware versions supported by FEIP-21 module.

The generic EDS file supports both ODVA and ABB drives profiles. Separate EDS files for both profiles are not needed anymore.

The EDS file is available from the fieldbus module's internal webpage and the ABB Library (https://www.abb.com/drives/documents).

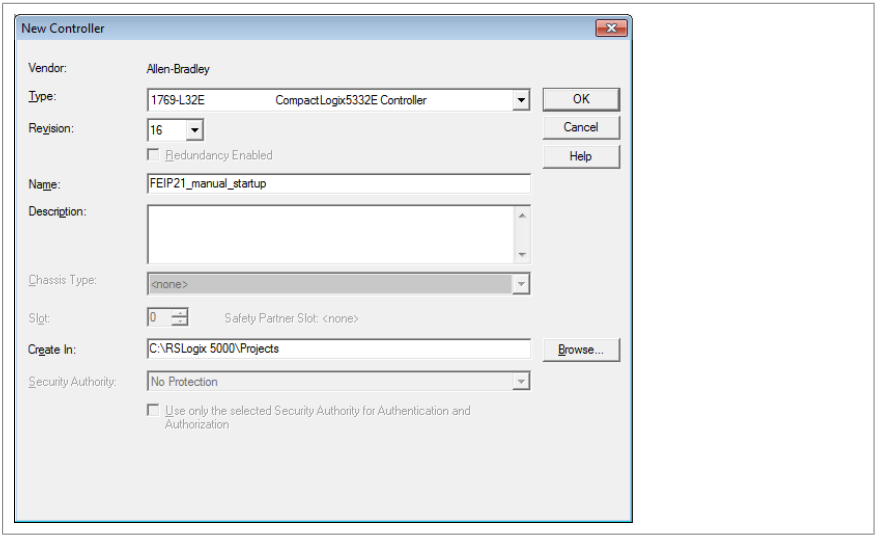
Configuring an Allen-Bradley® PLC

Example 1: RSLogix 5000

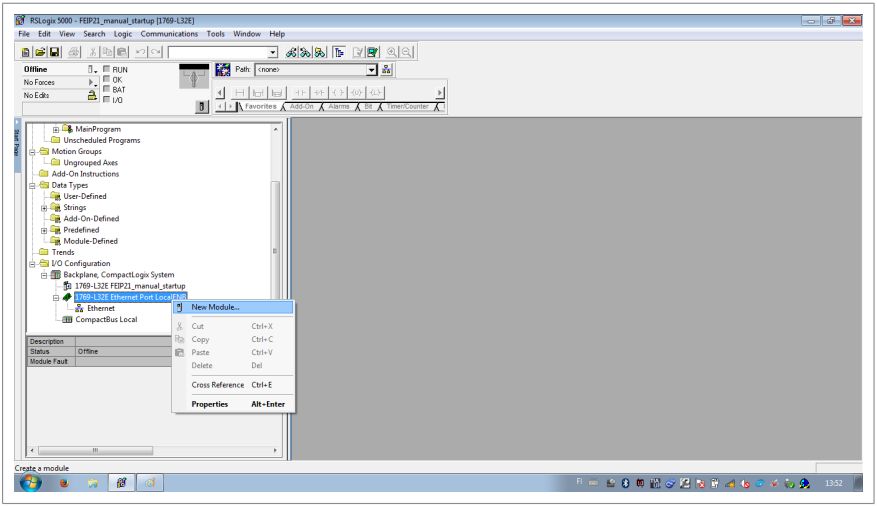
This example shows how to prepare an Allen-Bradley® Control-Logix5555™ PLC for communication with the adapter module by using the RSLogix 5000® software as the configuration tool.

1. Start the RSLogix software and open/create an RSLogix project.

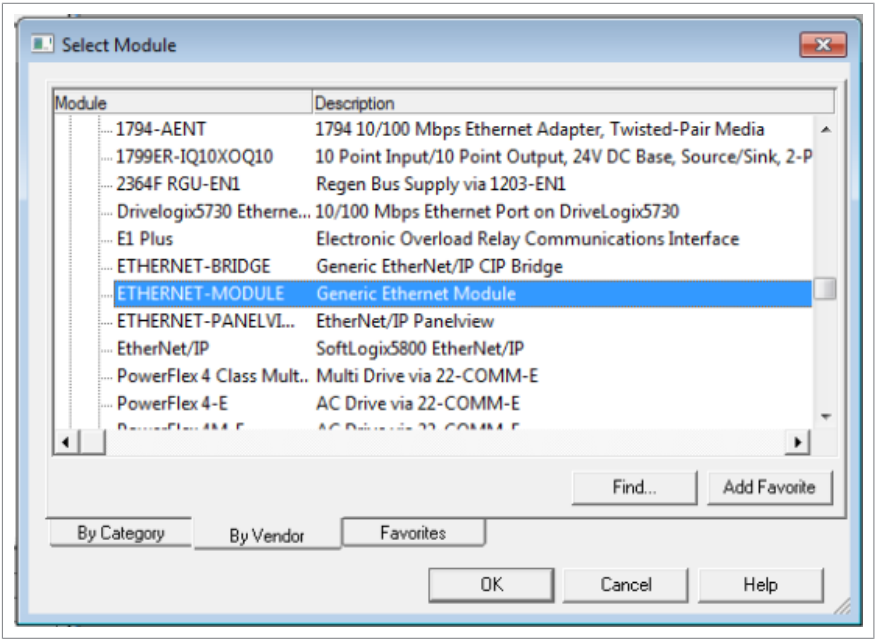
   Note: It is assumed that the PLC configuration has already been established in the RSLogix project.



2. In the RSLogix I/O, right-click the EtherNet/IP communication module and select New Module.



3. In the Select Module window, select ETHERNET-MODULE.



4. Select the input and output assembly instances and the PLC I/O memory size to be used.

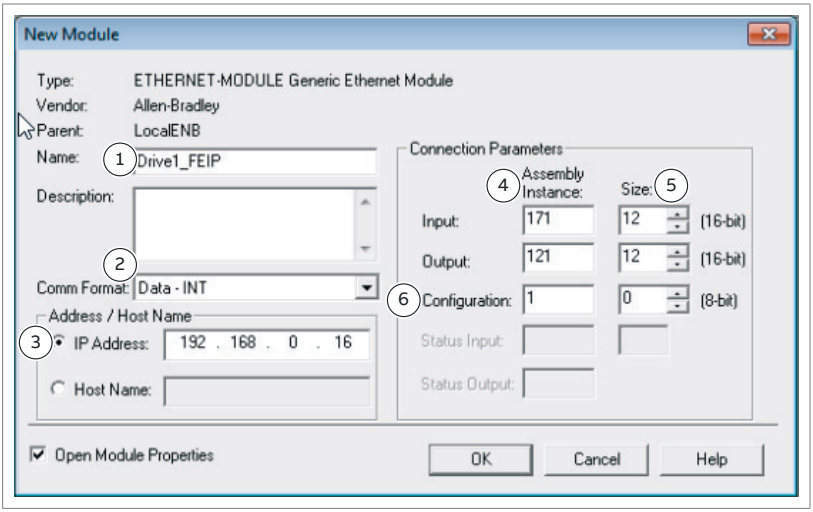
   The table below shows the available combinations. The example below uses the ODVA AC/DC assembly instances 121 and 171.

Input assembly instances	Output assembly instances	PLC word settings
70	20	2
71	21	2
72	22	3
73	23	3
91	41	4
92	42	6
170	120	12
171	121	12
172	122	13

Input assembly instances	Output assembly instances	PLC word settings
173	123	13
191	141	14
192	142	32
51	1	2
52	2	3
151	101	12
152	102	13
61	11	2
62	12	3
161	111	12
162	112	13

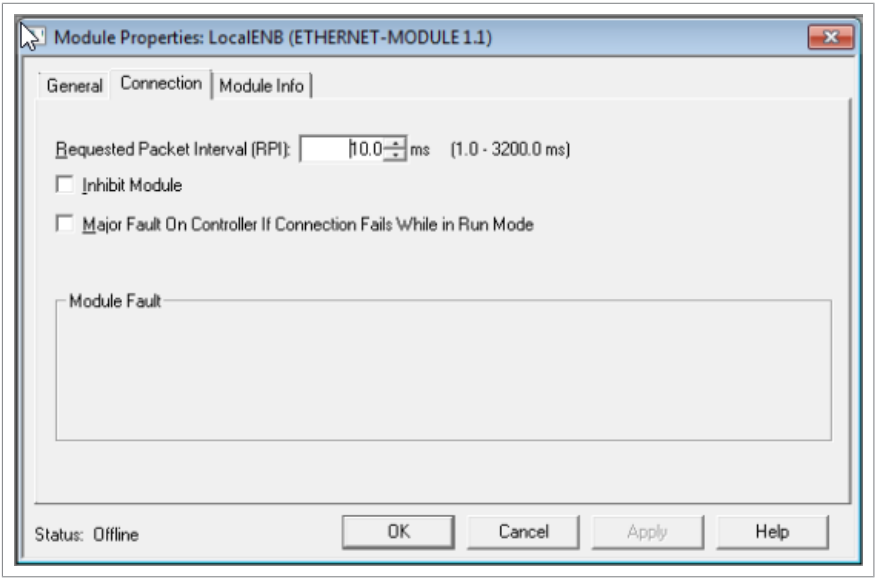
For more information on the input/output assembly instances, refer to section Select output and input assembly instances (page 55).

5. Enter the following information.
   The example below uses ODVA AC/DC assembly instances 121 and 171. The PLC will transmit and receive 12 words.



- Type a name for the adapter module. (1)
- FEIP-21 module uses 16-bit words. Change Comm Format to Data - INT (16 bits). (2)
- Type the IP address of the adapter module. (3)
- Type the Input and Output Assembly Instance numbers. (4)
- Select the sizes of the Input and Output words for the adapter module. (5)
- Set Configuration as 1 and Size as 0. (6)

6. Click OK.
   The adapter module is now added to the PLC I/O.
7. Click the FEIP-21 module to open the Module Properties window.
8. On the Connection tab, select the Requested Packet Interval (RPI) for the adapter module I/O communication.



9. Download the new configuration to the PLC.
   The PLC is now ready for communication with the adapter module.

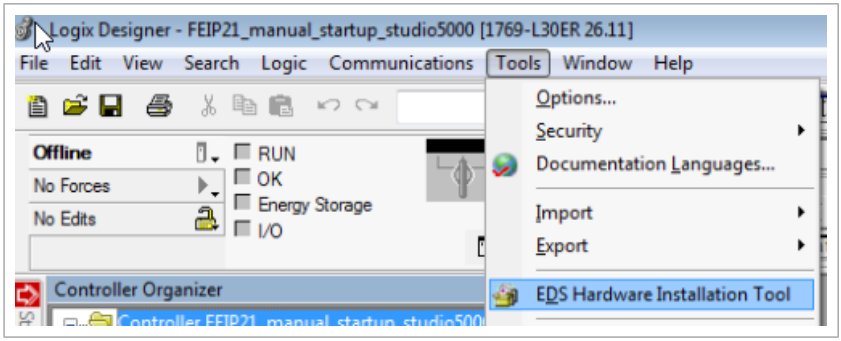
Example 2: Studio 5000

This example shows how to prepare an Allen-Bradley® CompactLogix™ PLC for communication with the adapter module using the Studio 5000® software as the configuration tool.

1. Start the RSLogix software and open/create an RSLogix project.

   Note: It is assumed that the PLC configuration was already established in the Studio 5000® project.

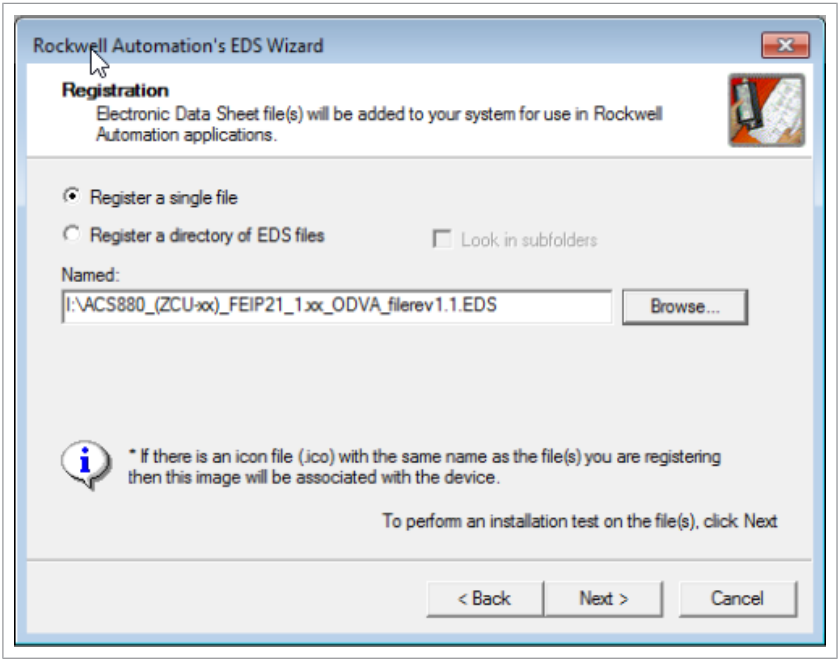
2. If EDS file for the correct device is not installed, use the EDS hardware installation tool. To register a new EDS file:
   - Select Tools → EDS Hardware Installation Tool.



   - Select the option Register an EDS file(s). Click Next.

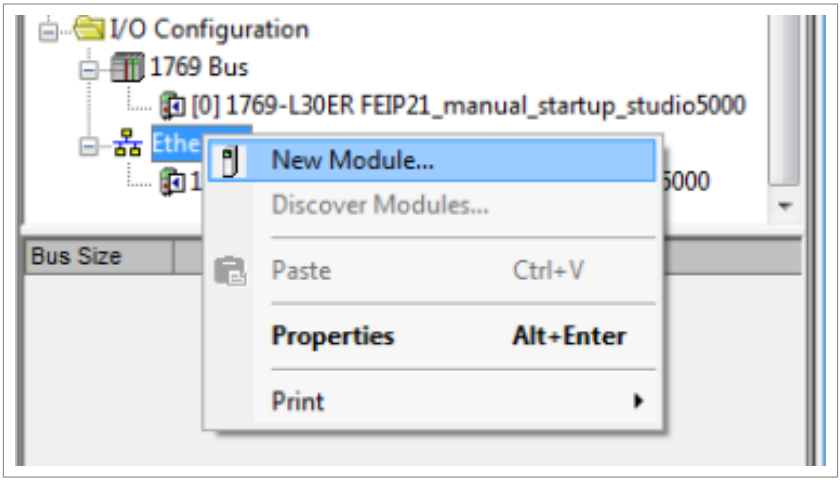


   - Browse to FEIP-21 module EDS file and select the file. Click Next to register the EDS file.

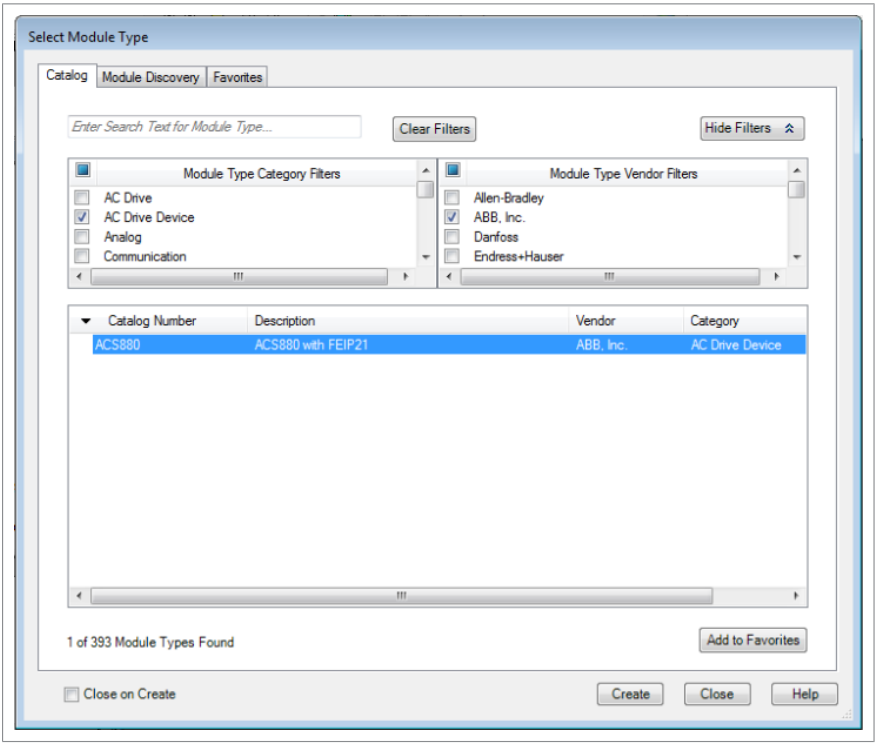


- Click Next and Finish to finalize registration. After the EDS file is successfully registered the device can be used in the PLC project.

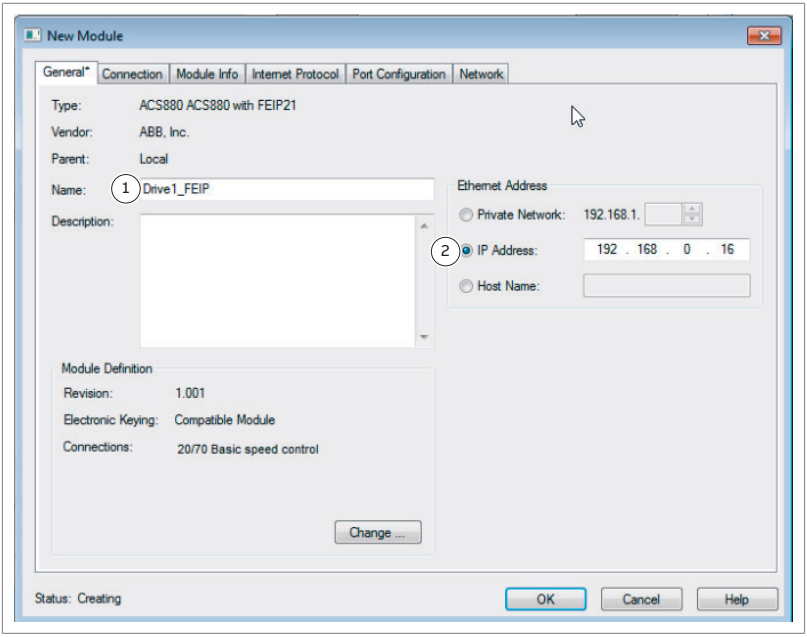
3. Add new devices to EtherNet/IP bus by right-clicking Ethernet under I/O Configuration and selecting New Module.



4. In the Select Module Type window, select ACS880 module (AC Drive Device). You can easily find the ABB devices using filters. Click Create to add a new module.



5. Enter the following information to configure the IP address and module name.



- Type a name for the adapter module. (1)
- Type the IP address of the adapter module. (2)

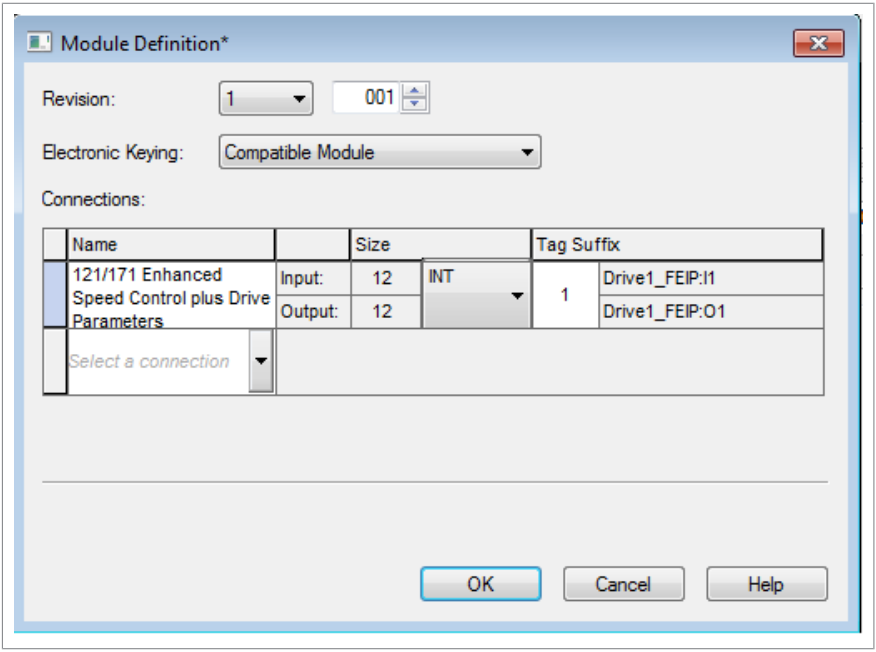
6. Click Change, to select the input and output assembly instances and the PLC I/O memory size to be used. The table below shows the available combinations.

Input assembly instances	Output assembly instances	PLC word setting
70	20	2
71	21	2
72	22	3
73	23	3
91	41	4
92	42	6
170	120	12
171	121	12
172	122	13
173	123	13

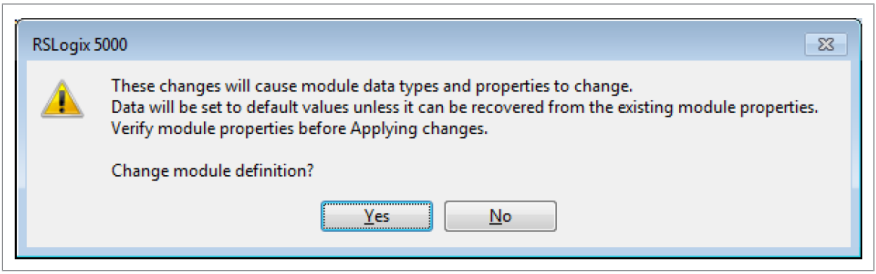
Input assembly instances	Output assembly instances	PLC word setting
191	141	14
192	142	32
51	1	2
52	2	3
151	101	12
152	102	13
61	11	2
62	12	3
161	111	12
162	112	13

For more information on the input/output assembly instances, refer to section Select output and input assembly instances (page 55).

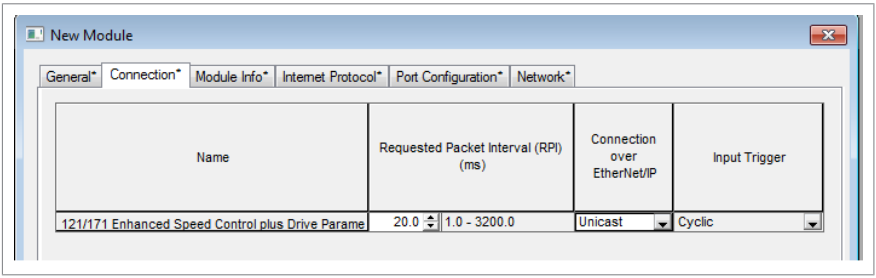
FEIP-21 module uses 16-bit words. Change the size to INT (16 bits). The example below uses ODVA AC/DC assembly instances 121 and 171. The PLC transmits and receives 12 words.



7. Click OK and confirm selection to change the module data types.



8. On the Connection tab, select the Requested Packet Interval (RPI) for the adapter module I/O communication.



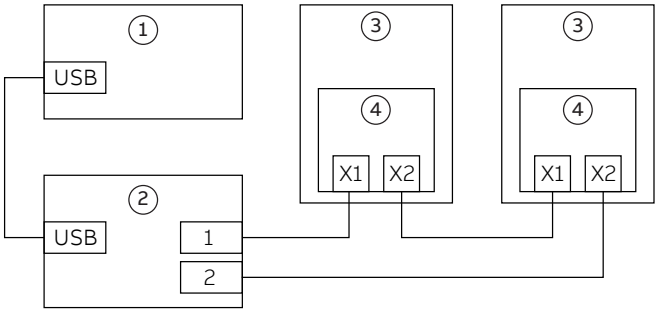
9. Click OK. The adapter module is now added to the PLC I/O. You can add more modules by choosing Create or exit the window by choosing Close.
10. Download the new configuration to the PLC. The PLC is now ready for communication with the adapter module.

Configuring DLR topology for FEIP-21 module

This example shows how to prepare an Allen-Bradley® CompactLogix™ PLC for DLR topology with FEIP-21 modules. After installing the devices on the DLR network, at least one supervisor node must be configured. Configuration can be done by using the Studio 5000® Logix Designer or RSLinx® Classic Lite software.

Setup using Logix Designer

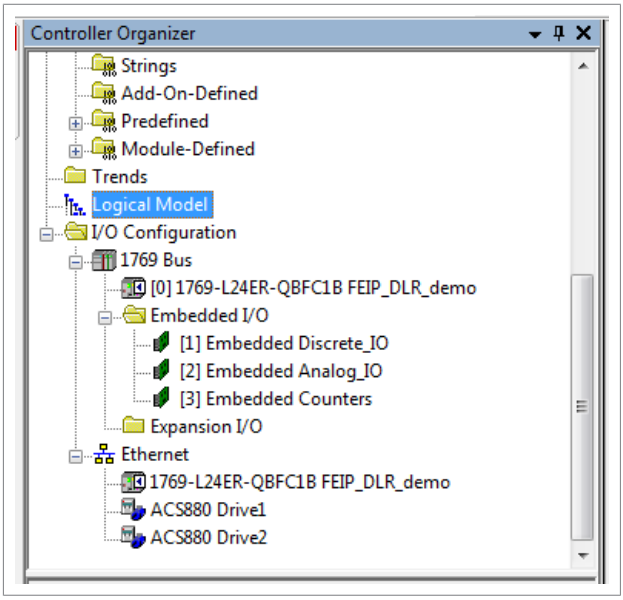
1. Open the Studio 5000® software. Test setup uses an Allen Bradley PLC connected in a ring topology with two FEIP-21 modules. The topology used in the example is shown below. More devices can be added, but the recommended maximum number of nodes on a single DLR network is 50.



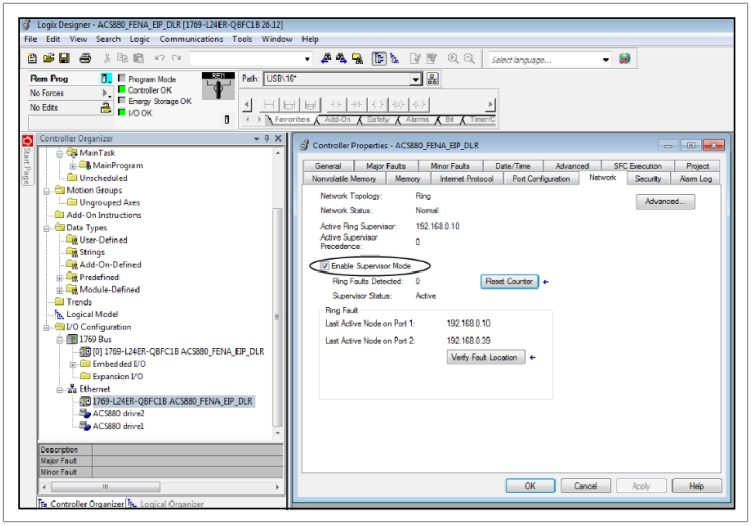
1	PC Studio 5000
2	PLC
3	Drive
4	FEIP-21 module

Note: It is assumed that the PLC configuration was already established in the Studio 5000® project and the EDS file(s) are installed and at least two FEIP-21 modules are added to the project.

For more information on adding modules to a project and installing EDS files, refer to section Configuring an Allen-Bradley® PLC (page 58).



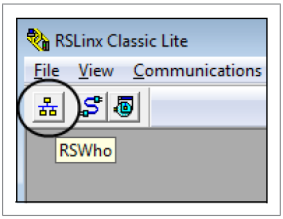
2. Download the project to the PLC.
3. Go online with the PLC and leave it in Program mode.
4. Double-click the module in the I/O Configuration. In the Controller Properties window, open Network tab and select Enable Supervisor Mode. Click OK.



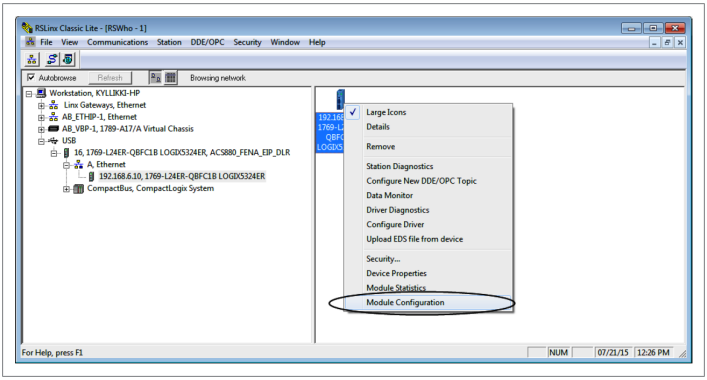
Setup using RSLinx® Classic

You can configure and enable DLR supervisor via RSLinx®Classic.

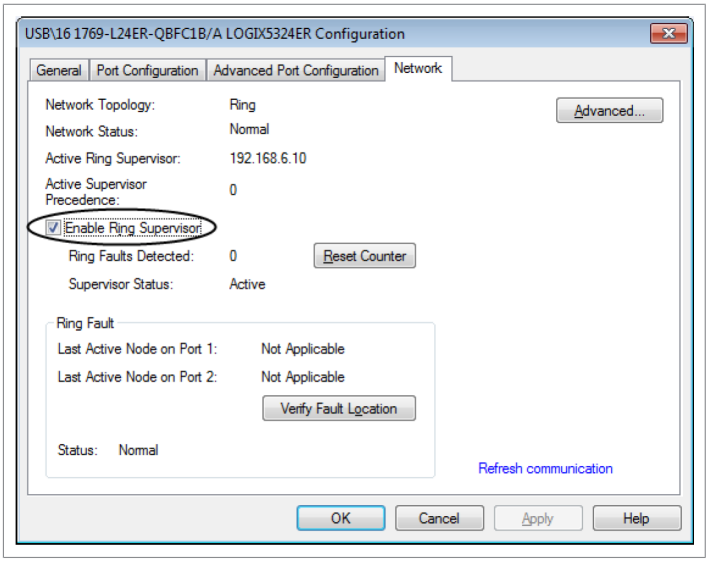
1. Open the RSLinx®Classic software.
2. Browse to the DLR network.



3. Open the Module Configuration by right-clicking on the ring supervisor in the list.



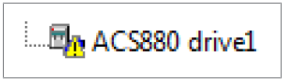
4. On the Network tab, select Enable Ring Supervisor, to enable DLR messages in the ring.



5. Click Advanced... to configure DLR parameters, such as Beacon Interval and Beacon Timeout.

   Note: It is recommended to use the default values.

6. Go back to Logix Designer and make sure that none of the FEIP-21 modules are faulted (no warning symbols are shown).



7

EtherNet/IP – Communication profiles

Contents of this chapter

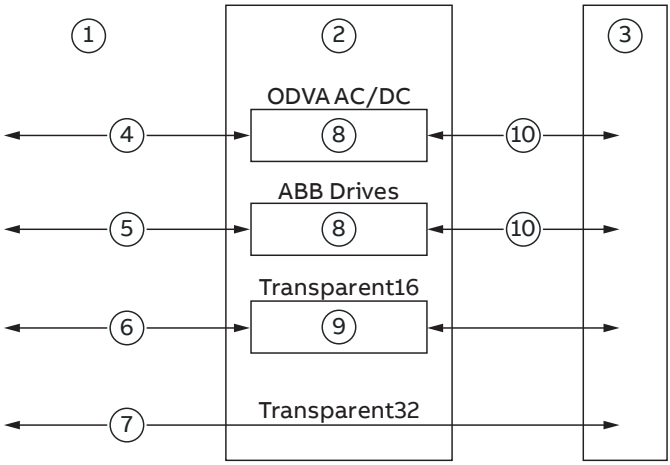
This chapter describes the communication profiles used in the communication between the EtherNet/IP client, the adapter module and the drive. It also describes the Control word, the Status word, references and actual values for the ODVA AC/DC drive and ABB Drives communication profiles. Refer to the drive manuals for details on the native profiles.

Communication profiles

Communication profiles are ways of conveying control commands (Control word, Status word, references and actual values) between the master station and the drive.

With the FEIP-21 module, the EtherNet/IP network may employ either the ODVA AC/DC drive profile or the ABB Drives profile. Both are converted to the native profile (eg, DCU or FBA) by the adapter module. In addition, two Transparent modes – for 16-bit and 32-bit words respectively – are available. With the Transparent modes, no data conversion takes place.

The figure below illustrates the profile selection:



1	EtherNet/IP network
2	FEIP-21 module
3	Drive
4	ODVA AC/DC profile
5	ABB Drives profile
6	Drive-specific profile (with 16-bit words) [1)]
7	Drive-specific profile (with 32-bit words)[1)]
8	Data conversion
9	Optional reference/actual value scaling
10	Native profile (for example, DCU, FBA)

1) Can be used if the drive supports the native profile.

ODVA AC/DC drive profile

This section briefly describes the ODVA AC/DC drive profile. Additional information is available at www.odva.org.

An EtherNet/IP node is modeled as a collection of abstract objects. Each object represents the interface to and behavior of a component within the product. The ODVA AC/DC drive profile defines a collection of objects suitable for the control of AC and DC drives. The objects supported by the adapter module are listed in section Class objects (page 125).

Objects are defined by:

- Service
- Class
- Instance
- Attribute
- Behavior.

For example, to set the drive speed reference, the Set_Attribute_Single service can be requested for the SpeedRef attribute of the AC/DC drive object class. The resulting behavior is that the reference speed of the drive is set to the requested value.

This is an example of explicit messaging, where each attribute of a class is set individually. While this is allowed, it is inefficient. Instead, implicit messaging using input and output assembly Instances is recommended. Implicit messaging allows the EtherNet/IP client to set or get predefined groups of attributes in a single message exchange. The assembly instances supported by the adapter module are listed and defined in section Assembly objects (page 90).

ODVA output attributes

This section briefly describes the instances found in the output assemblies of the ODVA AC/DC drive profile. Note that all output assembly instances do not support all attributes listed here.

In the ODVA EtherNet/IP specification the word **output** is used to describe data flow from the network into a device (such as the adapter module).

Run Forward & Run Reverse (Control supervisor object)

These attributes are used to assert run and stop commands to the Control supervisor object state machine according to the following Run/Stop event matrix. Refer to section State (Control supervisor object) (page 79).

RunFwd (Run1)	RunRev (Run2)	Trigger event	Run type
0	0	Stop	N/A
0 → 1	0	Run	RunFwd
0	0 → 1	Run	RunRev
0 → 1	0 → 1	No action	N/A
1	1	No action	N/A
0 → 1	1	Run	RunRev
1	1 → 0	Run	RunFwd

Fault Reset (Control supervisor object)

This attribute resets a drive fault on a transition from zero to one if the condition that caused the fault has been cleared.

Net Ctrl (Control supervisor object)

This attribute requests that the drive Run/Stop command be supplied locally (Net Ctrl = 0) or by the network (Net Ctrl = 1).

Net Ref (AC/DC drive object)

This attribute requests that the drive speed and torque references be supplied locally (Net Ref = 0) or by the network (Net Ref = 1).

Speed Reference (AC/DC drive object)

This attribute is the speed reference for the drive. The units are scaled by the Speed Scale attribute of the AC/DC drive object. Refer to parameter 23 Speed scale (page 43) for details.

Scalar mode

When the drive is operating in the scalar mode, the adapter module provides the drive with a frequency reference. The ODVA AC/DC drive profile uses rpm units for the speed reference. The drive frequency reference is calculated as follows:

$$Dfr = \frac{Osr \times Us \times Mf}{Mss}$$

where

Dfr = Drive Frequency Reference in Hz

Osr = ODVA Speed Reference

Us = ODVA Speed Unit (refer to parameter 23 Speed scale (page 43))

Mf = Motor Nominal Frequency in Hz

Mss = Motor Synchronous Speed in rpm (not Motor Nominal Speed).

For example, for a 4-pole 60 Hz motor (Mss = 1800 rpm) with a unit of 1 rpm and an ODVA Speed Reference of 900, the drive frequency reference is:

$$Dfr = \frac{Osr \times Us \times Mf}{Mss} = \frac{900 \times 1rpm \times 60Hz}{1800rpm} = 30Hz$$

Vector mode

When the drive is operating in the vector mode, the adapter module provides the drive with a speed reference. The ODVA AC/DC drive profile uses rpm units for the speed reference. The drive speed reference is calculated as follows:

$$Dsr = Osr \times Us$$

where

Dsr = Drive Speed Reference in rpm

Osr = ODVA Speed Reference

Us = ODVA Speed Unit (refer to parameter 23 Speed scale (page 43)).

For example, for an ODVA Speed Reference of 900 rpm with a unit of 0.5 rpm, the drive speed reference is:

$$Dsr = Osr \times Us = 900 \times 0.5rpm = 450rpm$$

Torque Reference (AC/DC drive object)

This attribute is the torque reference for the drive. The units are scaled by the Torque Scale attribute of the AC/DC drive object. Refer to parameter 24 Torque scale (page 44) for details.

The adapter module provides the drive with a torque reference in percent of the motor nominal torque. The ODVA AC/DC drive profile uses Newton-meter (N·m) units for the torque reference. The drive torque reference is calculated as follows:

$$Dtr = \frac{100 \times Otr \times Ut}{Mt}$$

where

Dtr = Drive Torque Reference in Percent of Motor Nominal Torque

Otr = ODVA Torque Reference

Ut = ODVA Torque Unit (refer to parameter 24 Torque scale Torque scale (page 44))

Mt = Motor Nominal Torque in N·m.

For example, for a 1000 N·m Motor Nominal Torque with a unit of 1 N·m and an ODVA Torque Reference of 500, the drive torque reference is:

$$Dtr = \frac{100 \times Otr \times Ut}{Mt} = \frac{100 \times 500 \times 1\,Nm}{1000\,Nm} = 50$$

ODVA input attributes

This section briefly describes the instances found in the ODVA AC/DC drive profile's input assemblies. Note that all input assembly instances do not support all attributes listed here.

In the ODVA EtherNet/IP specification the word input is used to describe data flow from a device (such as the adapter module) to the network.

Faulted (Control supervisor object)

This attribute indicates that the drive has experienced a fault. The fault code may be read from the FaultCode attribute of the Control supervisor object.

Warning (Control supervisor object)

This attribute indicates that the drive is experiencing a warning condition. The warning code may be read from the WarnCode attribute of the Control supervisor object.

Running Forward (Control supervisor object)

This attribute indicates that the drive is running in the forward direction.

Running Reverse (Control supervisor object)

This attribute indicates that the drive is running in the reverse direction.

Ready (Control supervisor object)

This attribute indicates that the Control supervisor object state machine is in the Ready, Running or Stopping state. Refer to State (Control supervisor object) (page 79).

Ctrl From Net (Control supervisor object)

This attribute indicates if the Run/Stop command is being supplied locally (Ctrl From Net = 0) or by the network (Ctrl From Net = 1).

Ref From Net (AC/DC drive object)

This attribute indicates if the speed and torque references are being supplied locally (Ref From Net = 0) or by the network (Ref From Net = 1).

At Reference (AC/DC drive object)

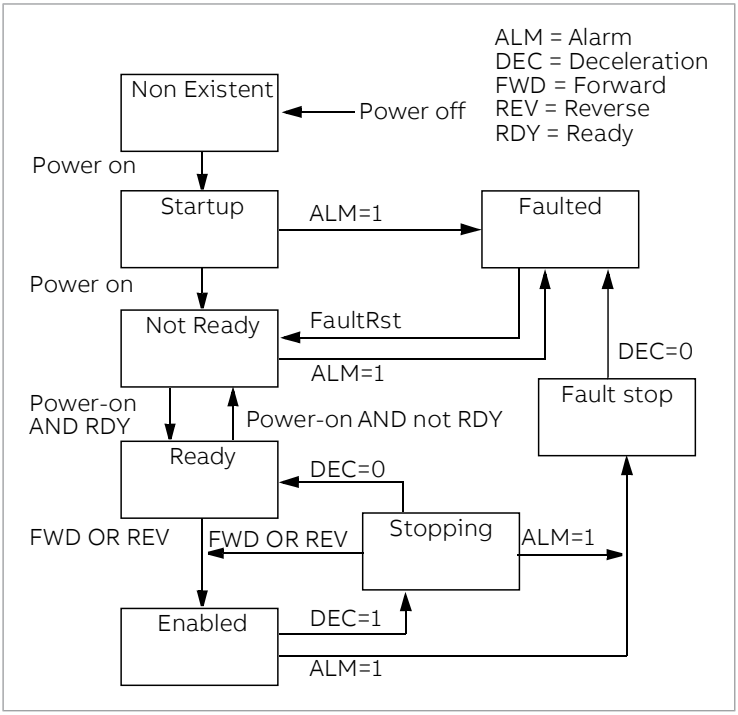
This attribute indicates that the drive is operating at the specified speed or torque reference.

State (Control supervisor object)

This attribute indicates the current state of the Control supervisor object.

State	Description	State	Description
0	Vendor-specific	4	Enabled
1	Startup	5	Stopping
2	Not ready	6	Fault stop
3	Ready	7	Faulted

The ODVA state transition diagram is shown below:



Speed Actual (AC/DC drive object)

This attribute indicates the actual speed at which the drive is operating. The units are scaled by the SpeedScale attribute of the AC/DC drive object. Refer to parameter 23 Speed scale (page 43) for details.

Scalar mode

When the drive is operating in the scalar mode, the drive provides the adapter module with a frequency actual. The ODVA AC/DC drive profile uses rpm units for the speed actual. The ODVA Speed Actual is calculated as follows:

$$Osa = \frac{Dfa \times Mss}{Mf \times Us}$$

where

Osa = ODVA Speed Actual

Dfa = Drive Frequency Actual in Hz

Us = ODVA Speed Unit (refer to parameter 23 Speed scale (page 43))

Mf = Motor Nominal Frequency in Hz

Mss = Motor Synchronous Speed in rpm (not Motor Nominal Speed).

For example, for a 4-pole 60 Hz motor (Mss = 1800 rpm) with a unit of 1 rpm and a Drive Frequency Actual of 30 Hz, the ODVA Speed Actual is:

$$Osa = \frac{Dfa \times Mss}{Mf \times Us} = \frac{30Hz \times 1800rpm}{60Hz \times 1rpm} = 900$$

Vector mode

When the drive is operating in the vector mode, the drive provides the adapter module with a speed actual. The ODVA AC/DC drive profile uses rpm units for the speed actual. The ODVA Speed Actual is calculated as follows:

$$Osa = \frac{Dsa}{Us}$$

where

Dsa = Drive Speed Actual in rpm

Osa = ODVA Speed Actual

Us = ODVA Speed Unit (refer to parameter 23 Speed scale (page 43)).

For example, for a Drive Speed Actual of 900 rpm with a unit of 0.5 rpm, the ODVA Speed Actual is:

$$Osa = \frac{Dsa}{Us} = \frac{450rpm}{0.5rpm} = 900$$

Torque Actual (AC/DC drive object)

This attribute indicates the actual torque at which the drive is operating. The units are scaled by the Torque Scale attribute of the AC/DC drive object. Refer to parameter 24 Torque scale (page 44) for details.

The drive provides the adapter module with a torque actual in percent of the Motor Nominal Torque. The ODVA AC/DC drive profile uses Newton-meter (N·m) units for the torque actual. The ODVA Torque Actual is calculated as follows:

$$Ota = \frac{Dta \times Mt}{100 \times Ut}$$

where

Dta = Drive Torque Actual in Percent of Motor Nominal Torque

Ota = ODVA Torque Actual

Ut = ODVA Torque Unit (Refer to parameter 24 Torque scale (page 44))

Mt = Motor Nominal Torque in N·m.

For example, for a 1000 N·m Motor Nominal Torque with a unit of 1 N·m and a drive torque actual of 50%, the ODVA Torque Actual is:

$$Ota = \frac{Dta \times Mt}{100 \times Ut} = \frac{50 \times 1000Nm}{100 \times 1Nm} = 500$$

ABB Drives communication profile

Control word and Status word

The Control word is the principal means for controlling the drive from a fieldbus system. It is sent by the fieldbus client station to the drive through the adapter module. The drive switches between its states according to the bit-coded instructions in the Control word and returns status information to the client in the Status word.

The contents of the Control word and the Status word are detailed below. The drive states are presented in section State machine (page 86).

Control word contents

The table below shows the contents of the Control word for the ABB Drives communication profile. The upper case boldface text refers to the states shown in section State machine (page 86).

Bit	Name	Value	STATE/Description
0	OFF1_CONTROL	1	Proceed to READY TO OPERATE.
		0	Stop along currently active deceleration ramp. Proceed to OFF1 ACTIVE; proceed to READY TO SWITCH ON unless other interlocks (OFF2, OFF3) are active.
1	OFF2_CONTROL	1	Continue operation (OFF2 inactive).
		0	Emergency OFF, coast to stop. Proceed to OFF2 ACTIVE, proceed to SWITCH-ON INHIBITED.
2	OFF3_CONTROL	1	Continue operation (OFF3 inactive).
		0	Emergency stop, stop within time defined by drive parameter. Proceed to OFF3 ACTIVE; proceed to SWITCH-ON INHIBITED. **⚠WARNING** Make sure that the motor and driven machine can be stopped using this stop mode.
3	INHIBIT_OPERATION	1	Proceed to OPERATION ENABLED. **Note:** Run enable signal must be active; refer to the drive documentation. If the drive is set to receive the Run enable signal from the fieldbus, this bit activates the signal.
		0	Inhibit operation. Proceed to OPERATION INHIBITED.
4	RAMP_OUT_ZERO	1	Normal operation. Proceed to RAMP FUNCTION GENERATOR: OUTPUT ENABLED.
		0	Force Ramp Function Generator output to zero. Drive ramps to stop (current and DC voltage limits in force).
5	RAMP_HOLD	1	Enable ramp function. Proceed to RAMP FUNCTION GENERATOR: ACCELERATOR ENABLED.
		0	Halt ramping (Ramp Function Generator output held).
6	RAMP_IN_ZERO	1	Normal operation. Proceed to OPERATION. **Note:** This bit is effective only if the fieldbus interface is set as the source for this signal by drive parameters.
		0	Force Ramp Function Generator input to zero.

Bit	Name	Value	STATE/Description
7	RESET	0 → 1	Fault reset if an active fault exists. Proceed to SWITCH-ON INHIBITED. **Note:** This bit is effective only if the fieldbus interface is set as the source for this signal by drive parameters.
		0	Continue normal operation.
8 ... 9	Drive-specific (For information, refer to the the drive documentation.)		
10	REMOTE_CMD	1	Fieldbus control enabled.
		0	Control word and reference not getting through to the drive, except for CW bits OFF1, OFF2 and OFF3.
11	EXT_CTRL_LOC	1	Select External Control Location EXT2. Effective if control location parameterized to be selected from fieldbus.
		0	Select External Control Location EXT1. Effective if control location parameterized to be selected from fieldbus.
12 ... 15	Reserved		

Status word contents

The table below shows the contents of the Status word for the ABB Drives communication profile. The upper case boldface text refers to the states shown in section State machine (page 86).

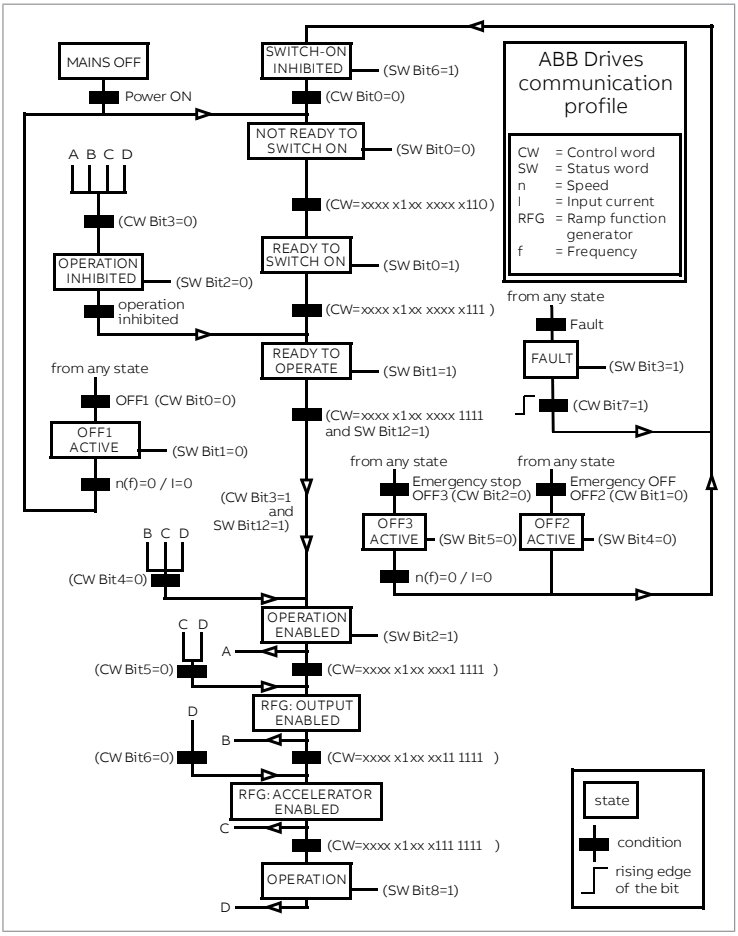
Bit	Name	Value	STATE/Description
0	RDY_ON	1	READY TO SWITCH ON
		0	NOT READY TO SWITCH ON
1	RDY_RUN	1	READY TO OPERATE
		0	OFF1 ACTIVE
2	RDY_REF	1	OPERATION ENABLED
		0	OPERATION INHIBITED

Bit	Name	Value	STATE/Description
3	TRIPPED	1	FAULT
		0	No fault
4	OFF_2_STA	1	OFF2 inactive
		0	OFF2 ACTIVE
5	OFF_3_STA	1	OFF3 inactive
		0	OFF3 ACTIVE
6	SWC_ON_INHIB	1	SWITCH-ON INHIBITED
		0	–
7	ALARM	1	Warning/Alarm
		0	No warning/alarm
8	AT_SETPOINT	1	OPERATION. Actual value equals reference (= is within tolerance limits, ie, in speed control, speed error is 10% max. of nominal motor speed).
		0	Actual value differs from reference (= is outside tolerance limits).
9	REMOTE	1	Drive control location: REMOTE (EXT1 or EXT2)
		0	Drive control location: LOCAL
10	ABOVE_LIMIT	1	Actual frequency or speed equals or exceeds supervision limit (set by drive parameter). Valid in both directions of rotation.
		0	Actual frequency or speed within supervision limit
11	EXT_CTRL_LOC	1	External Control Location EXT2 selected. **Note:** For ACS880: This bit is effective only if the fieldbus interface is set as the target for this signal by drive parameters. User bit 0 selection (06.33).
		0	External Control Location EXT1 selected

Bit	Name	Value	STATE/Description
12	EXT_RUN_ENABLE	1	External Run Enable signal received. **Note:** For ACS880: This bit is effective only if the fieldbus interface is set as the target for this signal by drive parameters. User bit 1 selection (06.34)
		0	No External Run Enable signal received
13 ... 14	Reserved		
15	FBA_ERROR	1	Communication error detected by fieldbus adapter module
		0	Fieldbus adapter communication OK

State machine

The state machine for the ABB Drives communication profile is shown below.



References

References are 16-bit words containing a sign bit and a 15-bit integer. A negative reference (indicating reversed direction of rotation) is formed by calculating the two's complement from the corresponding positive reference.

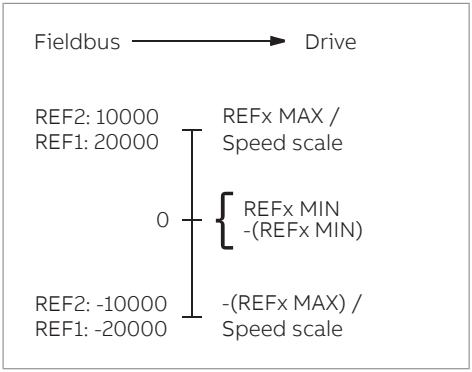
ABB drives can receive control information from multiple sources including analog and digital inputs, the drive control panel and a fieldbus adapter module (for example, FEIP-21 module). To have the drive controlled through the fieldbus, you must select the module as the source for control information, for example, reference.

Scaling

References are scaled as shown below.

Note: The values of REF1 MAX and REF2 MAX are set with drive parameters. Refer to the drive manuals for further information.

In ACS380, ACS480, ACH580, ACQ580, ACS580 and ACS880, the speed reference (REFx) in decimal (0…20000) corresponds to 0…100% of the speed scaling value (as defined with a drive parameter).



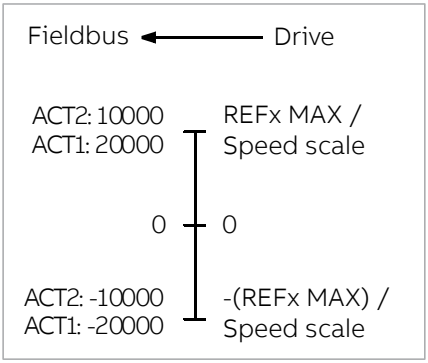
Actual values

Actual values are 16-bit words containing information on the operation of the drive. The functions to be monitored are selected with a drive parameter.

Scaling

Actual values are scaled as shown below.

Note: The values of REF1 MAX and REF2 MAX are set with drive parameters. Refer to the drive manuals for further information.



8

EtherNet/IP – Communication protocol

Contents of this chapter

This chapter describes the EtherNet/IP communication protocol for the adapter module.

EtherNet/IP

EtherNet/IP is a variant of the Common Industrial Protocol (CIP) family of communication protocols intended for supervision and control of automation equipment. Specifically, it covers the use of CIP messaging over an IP network, typically using Ethernet as the media.

The FEIP-21 module acts as a server on an EtherNet/IP network with support for the ODVA AC/DC drive, ABB Drives and Transparent profiles. Two simultaneous EtherNet/IP connections are supported, that is, two clients can be connected to the adapter module at a time.

Further information on the EtherNet/IP protocol is available at www.odva.org.

Object modeling and functional profiles

One of the main features of EtherNet/IP is object modeling. A group of objects can be described with a Functional Profile. The FEIP-21 module realizes the ODVA AC/DC drive Functional Profile with additional features.

Assembly objects

I/O assembly instances may also be referred to as Block Transfer of data. Intelligent devices realizing a Functional Profile, such as FEIP-21 module, have several objects. Since it is not possible to transmit more than one object data through a single connection, it is practical and more efficient to group attributes from different objects into a single I/O connection using the assembly object. The assembly object acts as a tool for grouping these attributes.

The assembly selections described above are, in fact, instances of the assembly object class. The adapter module uses static assemblies (in other words, fixed groupings of different object data only). The following tables describe the assembly instances supported by the adapter module.

Basic speed control assembly

The Basic speed control assembly is defined by the ODVA AC/DC drive profile. The format of the output assembly is:

Instance 20 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0						Fault Reset		Run Fwd
1								
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							

The format of the input assembly is:

Instance 70 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0						Running1 (Fwd)		Faulted
1								
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							

Basic speed control plus drive parameters assembly

The Basic speed control plus drive parameters assembly, defined by ABB, adds configurable drive parameters to the Basic speed control assembly of the ODVA AC/DC drive profile.

The format of the output assembly is:

Instance 120 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0						Fault re-set		Run Fwd
1								
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	DATA OUT 1 Value (Low Byte)							
5	DATA OUT 1 Value (High Byte)							
6	DATA OUT 2 Value (Low Byte)							
7	DATA OUT 2 Value (High Byte)							
8	DATA OUT 3 Value (Low Byte)							
9	DATA OUT 3 Value (High Byte)							
10	DATA OUT 4 Value (Low Byte)							
11	DATA OUT 4 Value (High Byte)							
12	DATA OUT 5 Value (Low Byte)							
13	DATA OUT 5 Value (High Byte)							
14	DATA OUT 6 Value (Low Byte)							
15	DATA OUT 6 Value (High Byte)							
16	DATA OUT 7 Value (Low Byte)							
17	DATA OUT 7 Value (High Byte)							
18	DATA OUT 8 Value (Low Byte)							

Instance 120 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
19	DATA OUT 8 Value (High Byte)							
20	DATA OUT 9 Value (Low Byte)							
21	DATA OUT 9 Value (High Byte)							
22	DATA OUT 10 Value (Low Byte)							
23	DATA OUT 10 Value (High Byte)							

The format of the input assembly is:

Instance 170 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0						Run-ning1 (Fwd)		Faulted
1								
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	DATA IN 1 Value (Low Byte)							
5	DATA IN 1 Value (High Byte)							
6	DATA IN 2 Value (Low Byte)							
7	DATA IN 2 Value (High Byte)							
8	DATA IN 3 Value (Low Byte)							
9	DATA IN 3 Value (High Byte)							
10	DATA IN 4 Value (Low Byte)							
11	DATA IN 4 Value (High Byte)							
12	DATA IN 5 Value (Low Byte)							
13	DATA IN 5 Value (High Byte)							
14	DATA IN 6 Value (Low Byte)							

Instance 170 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
15	DATA IN 6 Value (High Byte)							
16	DATA IN 7 Value (Low Byte)							
17	DATA IN 7 Value (High Byte)							
18	DATA IN 8 Value (Low Byte)							
19	DATA IN 8 Value (High Byte)							
20	DATA IN 9 Value (Low Byte)							
21	DATA IN 9 Value (High Byte)							
22	DATA IN 10 Value (Low Byte)							
23	DATA IN 10 Value (High Byte)							

Extended speed control assembly

The Extended speed control assembly is defined by the ODVA AC/DC drive profile. The format of the output assembly is:

Instance 21 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0		NetRef	NetCtrl			Fault Reset	Run Rev	Run Fwd
1								
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							

The format of the input assembly is:

Instance 71 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	At Reference	Ref From Net	Ctrl From Net	Ready	Running2 (Rev)	Running1 (Fwd)	Warning	Faulted

Instance 71 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
1	Drive State. Refer to section State (Control supervisor object) (page 79).							
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							

Extended speed control plus drive parameters assembly

The Extended speed control plus drive parameters assembly, defined by ABB, adds configurable drive parameters to the Extended speed control assembly of the ODVA AC/DC drive profile.

The format of the output assembly is:

Instance 121 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0		Net Ref	Net Ctrl			Fault reset	Run Rev	Run Fwd
1								
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	DATA OUT 1 Value (Low Byte)							
5	DATA OUT 1 Value (High Byte)							
6	DATA OUT 2 Value (Low Byte)							
7	DATA OUT 2 Value (High Byte)							
8	DATA OUT 3 Value (Low Byte)							
9	DATA OUT 3 Value (High Byte)							
10	DATA OUT 4 Value (Low Byte)							
11	DATA OUT 4 Value (High Byte)							
12	DATA OUT 5 Value (Low Byte)							

Instance 121 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
13	DATA OUT 5 Value (High Byte)							
14	DATA OUT 6 Value (Low Byte)							
15	DATA OUT 6 Value (High Byte)							
16	DATA OUT 7 Value (Low Byte)							
17	DATA OUT 7 Value (High Byte)							
18	DATA OUT 8 Value (Low Byte)							
19	DATA OUT 8 Value (High Byte)							
20	DATA OUT 9 Value (Low Byte)							
21	DATA OUT 9 Value (High Byte)							
22	DATA OUT 10 Value (Low Byte)							
23	DATA OUT 10 Value (High Byte)							

The format of the input assembly is:

Instance 171 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	At Reference	Ref From Net	Ctrl From Net	Ready	Running2 (Rev)	Running1 (Fwd)	Warning	Faulted
1	Drive State Refer to section State (Control supervisor object) (page 79).							
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	DATA IN 1 Value (Low Byte)							
5	DATA IN 1 Value (High Byte)							
6	DATA IN 2 Value (Low Byte)							
7	DATA IN 2 Value (High Byte)							

Instance 171 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
8	DATA IN 3 Value (Low Byte)							
9	DATA IN 3 Value (High Byte)							
10	DATA IN 4 Value (Low Byte)							
11	DATA IN 4 Value (High Byte)							
12	DATA IN 5 Value (Low Byte)							
13	DATA IN 5 Value (High Byte)							
14	DATA IN 6 Value (Low Byte)							
15	DATA IN 6 Value (High Byte)							
16	DATA IN 7 Value (Low Byte)							
17	DATA IN 7 Value (High Byte)							
18	DATA IN 8 Value (Low Byte)							
19	DATA IN 8 Value (High Byte)							
20	DATA IN 9 Value (Low Byte)							
21	DATA IN 9 Value (High Byte)							
22	DATA IN 10 Value (Low Byte)							
23	DATA IN 10 Value (High Byte)							

Basic speed and torque control assembly

The Basic speed and torque control assembly is defined by the ODVA AC/DC drive profile. The format of the output assembly is:

Instance 22 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0						Fault Reset		Run Fwd
1								

Instance 22 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							
4	Torque Reference (Low Byte)							
5	Torque Reference (High Byte)							

The format of the input assembly is:

Instance 72 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0						Run-ning1 (Fwd)		Faulted
1								
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	Torque Actual (Low Byte)							
5	Torque Actual (High Byte)							

Basic speed and torque control plus drive parameters assembly

The Basic speed and torque control plus drive parameters assembly, defined by ABB, adds configurable drive parameters to the Basic speed and torque control assembly of the ODVA AC/DC drive profile.

The format of the output assembly is:

Instance 122 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0						Fault re-set		Run Fwd
1								
2	Speed Reference (Low Byte)							

Instance 122 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
3	Speed Reference (High Byte)							
4	Torque Reference (Low Byte)							
5	Torque Reference (High Byte)							
6	DATA OUT 1 Value (Low Byte)							
7	DATA OUT 1 Value (High Byte)							
8	DATA OUT 2 Value (Low Byte)							
9	DATA OUT 2 Value (High Byte)							
10	DATA OUT 3 Value (Low Byte)							
11	DATA OUT 3 Value (High Byte)							
12	DATA OUT 4 Value (Low Byte)							
13	DATA OUT 4 Value (High Byte)							
14	DATA OUT 5 Value (Low Byte)							
15	DATA OUT 5 Value (High Byte)							
16	DATA OUT 6 Value (Low Byte)							
17	DATA OUT 6 Value (High Byte)							
18	DATA OUT 7 Value (Low Byte)							
19	DATA OUT 7 Value (High Byte)							
20	DATA OUT 8 Value (Low Byte)							
21	DATA OUT 8 Value (High Byte)							
22	DATA OUT 9 Value (Low Byte)							
23	DATA OUT 9 Value (High Byte)							
24	DATA OUT 10 Value (Low Byte)							
25	DATA OUT 10 Value (High Byte)							

The format of the input assembly is:

Instance 172 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0						Run-ning1 (Fwd)		Faulted
1								
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	Torque Actual (Low Byte)							
5	Torque Actual (High Byte)							
6	DATA IN 1 Value (Low Byte)							
7	DATA IN 1 Value (High Byte)							
8	DATA IN 2 Value (Low Byte)							
9	DATA IN 2 Value (High Byte)							
10	DATA IN 3 Value (Low Byte)							
11	DATA IN 3 Value (High Byte)							
12	DATA IN 4 Value (Low Byte)							
13	DATA IN 4 Value (High Byte)							
14	DATA IN 5 Value (Low Byte)							
15	DATA IN 5 Value (High Byte)							
16	DATA IN 6 Value (Low Byte)							
17	DATA IN 6 Value (High Byte)							
18	DATA IN 7 Value (Low Byte)							
19	DATA IN 7 Value (High Byte)							
20	DATA IN 8 Value (Low Byte)							
21	DATA IN 8 Value (High Byte)							
22	DATA IN 9 Value (Low Byte)							

Instance 172 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
23	DATA IN 9 Value (High Byte)							
24	DATA IN 10 Value (Low Byte)							
25	DATA IN 10 Value (High Byte)							

Extended speed and torque control assembly

The Extended speed and torque control assembly is defined by the ODVA AC/DC drive profile. The format of the output assembly is:

Instance 23 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0		Net Ref	Net Ctrl			Fault Reset	Run Rev	Run Fwd
1								
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							
4	Torque Reference (Low Byte)							
5	Torque Reference (High Byte)							

The format of the input assembly is:

Instance 73 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	At Reference	Ref From Net	Ctrl From Net	Ready	Running2 (Rev)	Running1 (Fwd)	Warning	Faulted
1	Drive State Refer to section State (Control supervisor object) (page 79).							
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							

Instance 73 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
4	Torque Actual (Low Byte)							
5	Torque Actual (High Byte)							

Extended speed and torque control plus drive parameters assembly

The Extended speed and torque control plus drive parameters assembly, defined by ABB, adds configurable drive parameters to the Extended speed and torque control assembly of the ODVA AC/DC drive profile.

The format of the output assembly is:

Instance 123 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0		NetRef	NetCtl			Fault reset	Run Rev	Run Fwd
1								
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							
4	Torque Reference (Low Byte)							
5	Torque Reference (High Byte)							
6	DATA OUT 1 Value (Low Byte)							
7	DATA OUT 1 Value (High Byte)							
8	DATA OUT 2 Value (Low Byte)							
9	DATA OUT 2 Value (High Byte)							
10	DATA OUT 3 Value (Low Byte)							
11	DATA OUT 3 Value (High Byte)							
12	DATA OUT 4 Value (Low Byte)							
13	DATA OUT 4 Value (High Byte)							
14	DATA OUT 5 Value (Low Byte)							

Instance 123 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
15	DATA OUT 5 Value (High Byte)							
16	DATA OUT 6 Value (Low Byte)							
17	DATA OUT 6 Value (High Byte)							
18	DATA OUT 7 Value (Low Byte)							
19	DATA OUT 7 Value (High Byte)							
20	DATA OUT 8 Value (Low Byte)							
21	DATA OUT 8 Value (High Byte)							
22	DATA OUT 9 Value (Low Byte)							
23	DATA OUT 9 Value (High Byte)							
24	DATA OUT 10 Value (Low Byte)							
25	DATA OUT 10 Value (High Byte)							

The format of the input assembly is:

Instance 173 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	At Reference	Ref From Net	Ctrl From Net	Ready	Running2 (Rev)	Running1 (Fwd)	Warning	Faulted
1	Drive State Refer to section State (Control supervisor object) (page 79).							
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	Torque Actual (Low Byte)							
5	Torque Actual (High Byte)							
6	DATA IN 1 Value (Low Byte)							
7	DATA IN 1 Value (High Byte)							

Instance 173 (ODVA AC/DC profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
8	DATA IN 2 Value (Low Byte)							
9	DATA IN 2 Value (High Byte)							
10	DATA IN 3 Value (Low Byte)							
11	DATA IN 3 Value (High Byte)							
12	DATA IN 4 Value (Low Byte)							
13	DATA IN 4 Value (High Byte)							
14	DATA IN 5 Value (Low Byte)							
15	DATA IN 5 Value (High Byte)							
16	DATA IN 6 Value (Low Byte)							
17	DATA IN 6 Value (High Byte)							
18	DATA IN 7 Value (Low Byte)							
19	DATA IN 7 Value (High Byte)							
20	DATA IN 8 Value (Low Byte)							
21	DATA IN 8 Value (High Byte)							
22	DATA IN 9 Value (Low Byte)							
23	DATA IN 9 Value (High Byte)							
24	DATA IN 10 Value (Low Byte)							
25	DATA IN 10 Value (High Byte)							

ABB Drives profile with set speed assembly

The ABB Drives profile with set speed assembly is defined by ABB. The format of the output assembly is:

Instance 1 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Reset	Ramp in Zero	Ramp Hold	Ramp Out Zero	Inhibit Operation	Off 3 Control	Off 2 Control	Off 1 Control
1					Ext Ctrl Loc	Remote Cmd		
2	Set Speed (Low Byte)							
3	Set Speed (High Byte)							

The format of the input assembly is:

Instance 51 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Alarm	Swc On Inhib	Off 3 Sta	Off 2 Sta	Tripped	Rdy Ref	Rdy Run	Rdy On
1	Fieldbus Error			Ext Run Enable	Ext Ctrl Loc	Above Limit	Remote	At Set-point
2	Actual Speed (Low Byte)							
3	Actual Speed (High Byte)							

ABB Drives profile with set speed plus drive parameters assembly

The ABB Drives profile with set speed plus drive parameters assembly, defined by ABB, adds configurable drive parameters to the ABB Drives profile with set speed of the ABB Drives profile.

The format of the output assembly is:

Instance 101 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Reset	Ramp in Zero	Ramp Hold	Ramp Out Zero	Inhibit Operation	Off 3 Control	Off 2 Control	Off 1 Control
1					Ext Ctrl Loc	Remote Cmd		

Instance 101 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
2	Set Speed (Low Byte)							
3	Set Speed (High Byte)							
4	DATA OUT 1 Value (Low Byte)							
5	DATA OUT 1 Value (High Byte)							
6	DATA OUT 2 Value (Low Byte)							
7	DATA OUT 2 Value (High Byte)							
8	DATA OUT 3 Value (Low Byte)							
9	DATA OUT 3 Value (High Byte)							
10	DATA OUT 4 Value (Low Byte)							
11	DATA OUT 4 Value (High Byte)							
12	DATA OUT 5 Value (Low Byte)							
13	DATA OUT 5 Value (High Byte)							
14	DATA OUT 6 Value (Low Byte)							
15	DATA OUT 6 Value (High Byte)							
16	DATA OUT 7 Value (Low Byte)							
17	DATA OUT 7 Value (High Byte)							
18	DATA OUT 8 Value (Low Byte)							
19	DATA OUT 8 Value (High Byte)							
20	DATA OUT 9 Value (Low Byte)							
21	DATA OUT 9 Value (High Byte)							
22	DATA OUT 10 Value (Low Byte)							
23	DATA OUT 10 Value (High Byte)							

The format of the input assembly is:

Instance 151 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Alarm	Swc On Inhib	Off 3 Sta	Off 2 Sta	Tripped	Rdy Ref	Rdy Run	Rdy On
1	Fieldbus Error			Ext Run Enable	Ext Ctrl Loc	Above Limit	Remote	At Set-point
2	Actual Speed (Low Byte)							
3	Actual Speed (High Byte)							
4	DATA IN 1 Value (Low Byte)							
5	DATA IN 1 Value (High Byte)							
6	DATA IN 2 Value (Low Byte)							
7	DATA IN 2 Value (High Byte)							
8	DATA IN 3 Value (Low Byte)							
9	DATA IN 3 Value (High Byte)							
10	DATA IN 4 Value (Low Byte)							
11	DATA IN 4 Value (High Byte)							
12	DATA IN 5 Value (Low Byte)							
13	DATA IN 5 Value (High Byte)							
14	DATA IN 6 Value (Low Byte)							
15	DATA IN 6 Value (High Byte)							
16	DATA IN 7 Value (Low Byte)							
17	DATA IN 7 Value (High Byte)							
18	DATA IN 8 Value (Low Byte)							
19	DATA IN 8 Value (High Byte)							
20	DATA IN 9 Value (Low Byte)							
21	DATA IN 9 Value (High Byte)							
22	DATA IN 10 Value (Low Byte)							

Instance 151 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
23	DATA IN 10 Value (High Byte)							

ABB Drives profile with set speed and set torque assembly

The ABB Drives profile with set speed and set torque assembly is defined by ABB. The format of the output assembly is:

Instance 2 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Reset	Ramp in Zero	Ramp Hold	Ramp Out Zero	Inhibit Opera-tion	Off 3 Control	Off 2 Control	Off 1 Control
1					Ext Ctrl Loc	Remote Cmd		
2	Set Speed (Low Byte)							
3	Set Speed (High Byte)							
4	Set Torque (Low Byte)							
5	Set Torque (High Byte)							

The format of the input assembly is:

Instance 52 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Alarm	Swc On Inhib	Off 3 Sta	Off 2 Sta	Tripped	Rdy Ref	Rdy Run	Rdy On
1	Fieldbus Error			Ext Run Enable	Ext Ctrl Loc	Above Limit	Remote	At Set-point
2	Actual Speed (Low Byte)							
3	Actual Speed (High Byte)							
4	Actual Torque (Low Byte)							
5	Actual Torque (High Byte)							

ABB Drives profile with set speed and set torque plus drive parameters assembly

The ABB Drives profile with set speed and set torque plus drive parameters assembly, defined by ABB, adds configurable drive parameters to the ABB Drives profile with set speed and set torque of the ABB Drives profile.

The format of the output assembly is:

Instance 102 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Reset	Ramp in Zero	Ramp Hold	Ramp Out Zero	Inhibit Opera-tion	Off 3 Control	Off 2 Control	Off 1 Control
1					Ext Ctrl Loc	Remote Cmd		
2	Set Speed (Low Byte)							
3	Set Speed (High Byte)							
4	Set Torque (Low Byte)							
5	Set Torque (High Byte)							
6	DATA OUT 1 Value (Low Byte)							
7	DATA OUT 1 Value (High Byte)							
8	DATA OUT 2 Value (Low Byte)							
9	DATA OUT 2 Value (High Byte)							
10	DATA OUT 3 Value (Low Byte)							
11	DATA OUT 3 Value (High Byte)							
12	DATA OUT 4 Value (Low Byte)							
13	DATA OUT 4 Value (High Byte)							
14	DATA OUT 5 Value (Low Byte)							
15	DATA OUT 5 Value (High Byte)							
16	DATA OUT 6 Value (Low Byte)							
17	DATA OUT 6 Value (High Byte)							

Instance 102 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
18	DATA OUT 7 Value (Low Byte)							
19	DATA OUT 7 Value (High Byte)							
20	DATA OUT 8 Value (Low Byte)							
21	DATA OUT 8 Value (High Byte)							
22	DATA OUT 9 Value (Low Byte)							
23	DATA OUT 9 Value (High Byte)							
24	DATA OUT 10 Value (Low Byte)							
25	DATA OUT 10 Value (High Byte)							

The format of the input assembly is:

Instance 152 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Alarm	Swc On Inhib	Off 3 Sta	Off 2 Sta	Tripped	Rdy Ref	Rdy Run	Rdy On
1	Fieldbus Error			Ext Run Enable	Ext Ctrl Loc	Above Limit	Remote	At Set-point
2	Actual Speed (Low Byte)							
3	Actual Speed (High Byte)							
4	Actual Torque (Low Byte)							
5	Actual Torque (High Byte)							
6	DATA IN 1 Value (Low Byte)							
7	DATA IN 1 Value (High Byte)							
8	DATA IN 2 Value (Low Byte)							
9	DATA IN 2 Value (High Byte)							
10	DATA IN 3 Value (Low Byte)							
11	DATA IN 3 Value (High Byte)							

Instance 152 (ABB Drives profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
12	DATA IN 4 Value (Low Byte)							
13	DATA IN 4 Value (High Byte)							
14	DATA IN 5 Value (Low Byte)							
15	DATA IN 5 Value (High Byte)							
16	DATA IN 6 Value (Low Byte)							
17	DATA IN 6 Value (High Byte)							
18	DATA IN 7 Value (Low Byte)							
19	DATA IN 7 Value (High Byte)							
20	DATA IN 8 Value (Low Byte)							
21	DATA IN 8 Value (High Byte)							
22	DATA IN 9 Value (Low Byte)							
23	DATA IN 9 Value (High Byte)							
24	DATA IN 10 Value (Low Byte)							
25	DATA IN 10 Value (High Byte)							

Transparent 16 with one assembly

The Transparent 16 with one assembly, defined by ABB, provides unaltered 16-bit access to the configured drive profile.

The format of the output assembly is:

Instance 11 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 16-bit Control Word (Low Byte)							
1	Drive Profile 16-bit Control Word (High Byte)							
2	Drive Profile 16-bit Reference 1 Word (Low Byte)							
3	Drive Profile 16-bit Reference 1 Word (High Byte)							

The format of the input assembly is:

Instance 61 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 16-bit Status Word (Low Byte)							
1	Drive Profile 16-bit Status Word (High Byte)							
2	Drive Profile 16-bit Actual 1 Word (Low Byte)							
3	Drive Profile 16-bit Actual 1 Word (High Byte)							

Transparent 16 with one assembly plus drive parameters

The Transparent 16 with one assembly plus drive parameters, defined by ABB, adds configurable drive parameters to the Transparent 16 with one assembly.

The format of the output assembly is:

Instance 111 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 16-bit Control Word (Low Byte)							
1	Drive Profile 16-bit Control Word (High Byte)							
2	Drive Profile 16-bit Reference 1 Word (Low Byte)							
3	Drive Profile 16-bit Reference 1 Word (High Byte)							
4	DATA OUT 1 Value (Low Byte)							
5	DATA OUT 1 Value (High Byte)							
6	DATA OUT 2 Value (Low Byte)							
7	DATA OUT 2 Value (High Byte)							
8	DATA OUT 3 Value (Low Byte)							
9	DATA OUT 3 Value (High Byte)							
10	DATA OUT 4 Value (Low Byte)							
11	DATA OUT 4 Value (High Byte)							
12	DATA OUT 5 Value (Low Byte)							

Instance 111 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
13	DATA OUT 5 Value (High Byte)							
14	DATA OUT 6 Value (Low Byte)							
15	DATA OUT 6 Value (High Byte)							
16	DATA OUT 7 Value (Low Byte)							
17	DATA OUT 7 Value (High Byte)							
18	DATA OUT 8 Value (Low Byte)							
19	DATA OUT 8 Value (High Byte)							
20	DATA OUT 9 Value (Low Byte)							
21	DATA OUT 9 Value (High Byte)							
22	DATA OUT 10 Value (Low Byte)							
23	DATA OUT 10 Value (High Byte)							

The format of the input assembly is:

Instance 161 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 16-bit Status Word (Low Byte)							
1	Drive Profile 16-bit Status Word (High Byte)							
2	Drive Profile 16-bit Actual 1 Word (Low Byte)							
3	Drive Profile 16-bit Actual 1 Word (High Byte)							
4	DATA IN 1 Value (Low Byte)							
5	DATA IN 1 Value (High Byte)							
6	DATA IN 2 Value (Low Byte)							
7	DATA IN 2 Value (High Byte)							
8	DATA IN 3 Value (Low Byte)							
9	DATA IN 3 Value (High Byte)							

Instance 161 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
10	DATA IN 4 Value (Low Byte)							
11	DATA IN 4 Value (High Byte)							
12	DATA IN 5 Value (Low Byte)							
13	DATA IN 5 Value (High Byte)							
14	DATA IN 6 Value (Low Byte)							
15	DATA IN 6 Value (High Byte)							
16	DATA IN 7 Value (Low Byte)							
17	DATA IN 7 Value (High Byte)							
18	DATA IN 8 Value (Low Byte)							
19	DATA IN 8 Value (High Byte)							
20	DATA IN 9 Value (Low Byte)							
21	DATA IN 9 Value (High Byte)							
22	DATA IN 10 Value (Low Byte)							
23	DATA IN 10 Value (High Byte)							

Transparent 16 with two assembly

The Transparent 16 with two assembly, defined by ABB, provides unaltered 16-bit access to the configured drive profile.

The format of the output assembly is:

Instance 12 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 16-bit Control Word (Low Byte)							
1	Drive Profile 16-bit Control Word (High Byte)							
2	Drive Profile 16-bit Reference 1 Word (Low Byte)							
3	Drive Profile 16-bit Reference 1 Word (High Byte)							

Instance 12 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
4	Drive Profile 16-bit Reference 2 Word (Low Byte)							
5	Drive Profile 16-bit Reference 2 Word (High Byte)							

The format of the input assembly is:

Instance 62 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 16-bit Status Word (Low Byte)							
1	Drive Profile 16-bit Status Word (High Byte)							
2	Drive Profile 16-bit Actual 1 Word (Low Byte)							
3	Drive Profile 16-bit Actual 1 Word (High Byte)							
4	Drive Profile16-bit Actual 2 Word (Low Byte)							
5	Drive Profile 16-bit Actual 2 Word (High Byte)							

Transparent 16 with two assembly plus drive parameters

The Transparent 16 with two assembly plus drive parameters, defined by ABB, adds configurable drive parameters to the Transparent 16 with two assembly.

The format of the output assembly is:

Instance 112 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 16-bit Control Word (Low Byte)							
1	Drive Profile 16-bit Control Word (High Byte)							
2	Drive Profile 16-bit Reference 1 Word (Low Byte)							
3	Drive Profile 16-bit Reference 1 Word (High Byte)							
4	Drive Profile 16-bit Reference 2 Word (Low Byte)							
5	Drive Profile 16-bit Reference 2 Word (High Byte)							
6	DATA OUT 1 Value (Low Byte)							

Instance 112 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
7	DATA OUT 1 Value (High Byte)							
8	DATA OUT 2 Value (Low Byte)							
9	DATA OUT 2 Value (High Byte)							
10	DATA OUT 3 Value (Low Byte)							
11	DATA OUT 3 Value (High Byte)							
12	DATA OUT 4 Value (Low Byte)							
13	DATA OUT 4 Value (High Byte)							
14	DATA OUT 5 Value (Low Byte)							
15	DATA OUT 5 Value (High Byte)							
16	DATA OUT 6 Value (Low Byte)							
17	DATA OUT 6 Value (High Byte)							
18	DATA OUT 7 Value (Low Byte)							
19	DATA OUT 7 Value (High Byte)							
20	DATA OUT 8 Value (Low Byte)							
21	DATA OUT 8 Value (High Byte)							
22	DATA OUT 9 Value (Low Byte)							
23	DATA OUT 9 Value (High Byte)							
24	DATA OUT 10 Value (Low Byte)							
25	DATA OUT 10 Value (High Byte)							

Instance 162 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 16-bit Status Word (Low Byte)							
1	Drive Profile 16-bit Status Word (High Byte)							

Instance 162 (Transparent 16 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
2	Drive Profile 16-bit Actual 1 Word (Low Byte)							
3	Drive Profile 16-bit Actual 1 Word (High Byte)							
4	Drive Profile 16-bit Actual 2 Word (Low Byte)							
5	Drive Profile 16-bit Actual 2 Word (High Byte)							
6	DATA IN 1 Value (Low Byte)							
7	DATA IN 1 Value (High Byte)							
8	DATA IN 2 Value (Low Byte)							
9	DATA IN 2 Value (High Byte)							
10	DATA IN 3 Value (Low Byte)							
11	DATA IN 3 Value (High Byte)							
12	DATA IN 4 Value (Low Byte)							
13	DATA IN 4 Value (High Byte)							
14	DATA IN 5 Value (Low Byte)							
15	DATA IN 5 Value (High Byte)							
16	DATA IN 6 Value (Low Byte)							
17	DATA IN 6 Value (High Byte)							
18	DATA IN 7 Value (Low Byte)							
19	DATA IN 7 Value (High Byte)							
20	DATA IN 8 Value (Low Byte)							
21	DATA IN 8 Value (High Byte)							
22	DATA IN 9 Value (Low Byte)							
23	DATA IN 9 Value (High Byte)							
24	DATA IN 10 Value (Low Byte)							
25	DATA IN 10 Value (High Byte)							

Transparent 32 with one assembly

The Transparent 32 with one assembly, defined by ABB, provides unaltered 32-bit access to the configured drive profile.

The format of the output assembly is:

Instance 41 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 32-bit Control Word (Low Byte)							
1	Drive Profile 32-bit Control Word							
2	Drive Profile 32-bit Control Word							
3	Drive Profile 32-bit Control Word (High Byte)							
4	Drive Profile 32-bit Reference 1 Word (Low Byte)							
5	Drive Profile 32-bit Reference 1 Word							
6	Drive Profile 32-bit Reference 1 Word							
7	Drive Profile 32-bit Reference 1 Word (High Byte)							

The format of the input assembly is:

Instance 91 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 32-bit Status Word (Low Byte)							
1	Drive Profile 32-bit Status Word							
2	Drive Profile 32-bit Status Word							
3	Drive Profile 32-bit Status Word (High Byte)							
4	Drive Profile 32-bit Actual 1 Word (Low Byte)							
5	Drive Profile 32-bit Actual 1 Word							
6	Drive Profile 32-bit Actual 1 Word							
7	Drive Profile 32-bit Actual 1 Word (High Byte)							

Transparent 32 with one assembly plus drive parameters

The Transparent 32 with one assembly plus drive parameters, defined by ABB, adds configurable drive parameters to the Transparent 32 with one assembly.

The format of the output assembly is:

Instance 141 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 32-bit Control Word (Low Byte)							
1	Drive Profile 32-bit Control Word							
2	Drive Profile 32-bit Control Word							
3	Drive Profile 32-bit Control Word (High Byte)							
4	Drive Profile 32-bit Reference 1 Word (Low Byte)							
5	Drive Profile 32-bit Reference 1 Word							
6	Drive Profile 32-bit Reference 1 Word							
7	Drive Profile 32-bit Reference 1 Word (High Byte)							
8	DATA OUT 1 Value (Low Byte)							
9	DATA OUT 1 Value (High Byte)							
10	DATA OUT 2 Value (Low Byte)							
11	DATA OUT 2 Value (High Byte)							
12	DATA OUT 3 Value (Low Byte)							
13	DATA OUT 3 Value (High Byte)							
14	DATA OUT 4 Value (Low Byte)							
15	DATA OUT 4 Value (High Byte)							
16	DATA OUT 5 Value (Low Byte)							
17	DATA OUT 5 Value (High Byte)							
18	DATA OUT 6 Value (Low Byte)							
19	DATA OUT 6 Value (High Byte)							
20	DATA OUT 7 Value (Low Byte)							

Instance 141 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
21	DATA OUT 7 Value (High Byte)							
22	DATA OUT 8 Value (Low Byte)							
23	DATA OUT 8 Value (High Byte)							
24	DATA OUT 9 Value (Low Byte)							
25	DATA OUT 9 Value (High Byte)							
26	DATA OUT 10 Value (Low Byte)							
27	DATA OUT 10 Value (High Byte)							

The format of the input assembly is:

Instance 191 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 32-bit Status Word (Low Byte)							
1	Drive Profile 32-bit Status Word							
2	Drive Profile 32-bit Status Word							
3	Drive Profile 32-bit Status Word (High Byte)							
4	Drive Profile 32-bit Actual 1 Word (Low Byte)							
5	Drive Profile 32-bit Actual 1 Word (High Byte)							
6	Drive Profile 32-bit Actual 1 Word							
7	Drive Profile 32-bit Actual 1 Word (High Byte)							
8	DATA IN 1 Value (Low Byte)							
9	DATA IN 1 Value (High Byte)							
10	DATA IN 2 Value (Low Byte)							
11	DATA IN 2 Value (High Byte)							
12	DATA IN 3 Value (Low Byte)							
13	DATA IN 3 Value (High Byte)							

Instance 191 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
14	DATA IN 4 Value (Low Byte)							
15	DATA IN 4 Value (High Byte)							
16	DATA IN 5 Value (Low Byte)							
17	DATA IN 5 Value (High Byte)							
18	DATA IN 6 Value (Low Byte)							
19	DATA IN 6 Value (High Byte)							
20	DATA IN 7 Value (Low Byte)							
21	DATA IN 7 Value (High Byte)							
22	DATA IN 8 Value (Low Byte)							
23	DATA IN 8 Value (High Byte)							
24	DATA IN 9 Value (Low Byte)							
25	DATA IN 9 Value (High Byte)							
26	DATA IN 10 Value (Low Byte)							
27	DATA IN 10 Value (High Byte)							

Transparent 32 with two assembly

The Transparent 32 with two assembly, defined by ABB, provides unaltered 32-bit access to the configured drive profile.

The format of the output assembly is:

Instance 42 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 32-bit Control Word (Low Byte)							
1	Drive Profile 32-bit Control Word							
2	Drive Profile 32-bit Control Word							
3	Drive Profile 32-bit Control Word (High Byte)							

Instance 42 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
4	Drive Profile 32-bit Reference 1 Word (Low Byte)							
5	Drive Profile 32-bit Reference 1 Word							
6	Drive Profile 32-bit Reference 1 Word							
7	Drive Profile 32-bit Reference 1 Word (High Byte)							
8	Drive Profile 32-bit Reference 2 Word (Low Byte)							
9	Drive Profile 32-bit Reference 2 Word							
10	Drive Profile 32-bit Reference 2 Word							
11	Drive Profile 32-bit Reference 2 Word (High Byte)							

The format of the input assembly is:

Instance 92 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 32-bit Status Word (Low Byte)							
1	Drive Profile 32-bit Status Word							
2	Drive Profile 32-bit Status Word							
3	Drive Profile 32-bit Status Word (High Byte)							
4	Drive Profile 32-bit Actual 1 Word (Low Byte)							
5	Drive Profile 32-bit Actual 1 Word							
6	Drive Profile 32-bit Actual 1 Word							
7	Drive Profile 32-bit Actual 1 Word (High Byte)							
8	Drive Profile 32-bit Actual 2 Word (Low Byte)							
9	Drive Profile 32-bit Actual 2 Word							
10	Drive Profile 32-bit Actual 2 Word							
11	Drive Profile 32-bit Actual 2 Word (High Byte)							

Transparent 32 with two assembly plus drive parameters

The Transparent 32 with two assembly plus drive parameters, defined by ABB, adds configurable drive parameters to the Transparent 32 with two assembly.

The format of the output assembly is:

Instance 142 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 32-bit Control Word (Low Byte)							
1	Drive Profile 32-bit Control Word							
2	Drive Profile 32-bit Control Word							
3	Drive Profile 32-bit Control Word (High Byte)							
4	Drive Profile 32-bit Reference 1 Word (Low Byte)							
5	Drive Profile 32-bit Reference 1 Word							
6	Drive Profile 32-bit Reference 1 Word							
7	Drive Profile 32-bit Reference 1 Word (High Byte)							
8	Drive Profile 32-bit Reference 2 Word (Low Byte)							
9	Drive Profile 32-bit Reference 2 Word							
10	Drive Profile 32-bit Reference 2 Word							
11	Drive Profile 32-bit Reference 2 Word (High Byte)							
12	DATA OUT 1 Value (Low Byte)							
13	DATA OUT 1 Value (High Byte)							
14	DATA OUT 2 Value (Low Byte)							
15	DATA OUT 2 Value (High Byte)							
16	DATA OUT 3 Value (Low Byte)							
17	DATA OUT 3 Value (High Byte)							
18	DATA OUT 4 Value (Low Byte)							
19	DATA OUT 4 Value (High Byte)							
20	DATA OUT 5 Value (Low Byte)							

Instance 142 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
21	DATA OUT 5 Value (High Byte)							
22	DATA OUT 6 Value (Low Byte)							
23	DATA OUT 6 Value (High Byte)							
24	DATA OUT 7 Value (Low Byte)							
25	DATA OUT 7 Value (High Byte)							
26	DATA OUT 8 Value (Low Byte)							
27	DATA OUT 8 Value (High Byte)							
28	DATA OUT 9 Value (Low Byte)							
29	DATA OUT 9 Value (High Byte)							
30	DATA OUT 10 Value (Low Byte)							
31	DATA OUT 10 Value (High Byte)							

The format of the input assembly is:

Instance 192 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Drive Profile 32-bit Status Word (Low Byte)							
1	Drive Profile 32-bit Status Word							
2	Drive Profile 32-bit Status Word							
3	Drive Profile 32-bit Status Word (High Byte)							
4	Drive Profile 32-bit Actual 1 Word (Low Byte)							
5	Drive Profile 32-bit Actual 1 Word							
6	Drive Profile 32-bit Actual 1 Word							
7	Drive Profile 32-bit Actual 1 Word (High Byte)							
8	Drive Profile 32-bit Actual 2 Word (Low Byte)							
9	Drive Profile 32-bit Actual 2 Word							

Instance 192 (Transparent 32 profile)								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
10	Drive Profile 32-bit Actual 2 Word							
11	Drive Profile 32-bit Actual 2 Word (High Byte)							
12	DATA IN 1 Value (Low Byte)							
13	DATA IN 1 Value (High Byte)							
14	DATA IN 2 Value (Low Byte)							
15	DATA IN 2 Value (High Byte)							
16	DATA IN 3 Value (Low Byte)							
17	DATA IN 3 Value (High Byte)							
18	DATA IN 4 Value (Low Byte)							
19	DATA IN 4 Value (High Byte)							
20	DATA IN 5 Value (Low Byte)							
21	DATA IN 5 Value (High Byte)							
22	DATA IN 6 Value (Low Byte)							
23	DATA IN 6 Value (High Byte)							
24	DATA IN 7 Value (Low Byte)							
25	DATA IN 7 Value (High Byte)							
26	DATA IN 8 Value (Low Byte)							
27	DATA IN 8 Value (High Byte)							
28	DATA IN 9 Value (Low Byte)							
29	DATA IN 9 Value (High Byte)							
30	DATA IN 10 Value (Low Byte)							
31	DATA IN 10 Value (High Byte)							

Class objects

The following table lists the data types used in the class object descriptions of this manual.

Legend	Data type
UINT8	Unsigned Integer 8 bit
UINT16	Unsigned Integer 16 bit
SINT16	Signed Integer 16 bit
UINT32	Unsigned Integer 32 bit
BOOL	Boolean value
BYTE	Bit String 8 bit
WORD	Bit String 16 bit
DWORD	Bit String 32 bit

Note: The adapter module is designed to provide EtherNet/IP communications for a variety of drives with different capabilities. Default, minimum and maximum values for attributes necessarily vary based upon the capabilities of the drive to which the module is attached and are not documented herein. Default, minimum and maximum values for attributes may be found in the:

- drive manuals

Note that the units of the attributes may differ from those of the parameters documented elsewhere, and those differences must be considered when interfacing to the drive via the module.

The table below shows the service names of the class objects.

Service	Name
GET	0x0E Get_Attribute_Single
SET	0x10 Set_Attribute_Single
SET ALL	0x02 Set_Attribute_All
GET ALL	0x01 Get_Attribute_All

Identity object, class 01h

This object provides identification of and general information about the device.

Class attributes (Instance #0)

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of the identity object	Array of UINT8

Instance attributes (Instance #1)

#	Attribute name	Services	Description	Data type
1	Vendor ID	Get	Identification of the device vendor	UINT16
2	Device Type	Get	Identification of the general product type	UINT16
3	Product Code	Get	Assigned vendor code to describe the device	UINT16
4	Revision	Get	Revision of the item the identity object represents	Array [UINT8 UINT8]
5	Status	Get	Summary status of the device	UINT16
6	ODVA Serial Number	Get	Serial number of the EtherNet/IP module	UINT32
7	Product Name	Get	Product identification. Max 32 characters.	Short String

Reset service (Service code 05h)

Value (reset type)	Type of reset
0	Power cycle

Attribute explanations

Vendor ID

Vendor IDs are managed by the Open DeviceNet Vendor Association, Inc. (ODVA). The ABB Vendor ID is 46.

Device Type

The list of device types is managed by ODVA. It is used to identify the device profile that a particular product is using.

Drive Type	Profile	Device Type	Value
AC	ODVA AC/DC Drive	ODVA AC Drive	02h
	ABB Drives Profile	ABB AC Drive	64h
	Transparent 16	ABB AC Drive	64h
	Transparent 32	ABB AC Drive	64h
DC	ODVA AC/DC Drive	ODVA DC Drive	13h
	ABB Drives Profile	ABB DC Drive	65h
	Transparent 16	ABB DC Drive	65h
	Transparent 32	ABB DC Drive	65h

Product Code

Every ABB drive type or application of the drive has a dedicated product code. The product code is 100 + the value of parameter 29 FBA A/B drive type code (page 46).

Revision

Revision attribute, which consists of Major and Minor Revisions, identifies the revision of the item the identity object represents.

Status

This attribute represents the current status of the entire device. Its value changes as the state of the device changes. The Status attribute is a WORD, with the following bit definitions:

Bit(s)	Type/ Name	Definition
0	Owned	TRUE indicates the device (or an object within the device) has an owner. Within the Master/Slave paradigm the setting of this bit means that the Predefined Master/Slave Connection Set has been allocated to a master. Outside the Master/Slave paradigm the meaning of this bit is to be defined.

Bit(s)	Type/ Name	Definition
1		Reserved, set to 0
2	Configured	TRUE indicates that the application of the device has been configured to do something that differs from the “out–of–box” default. This does not include configuration of the communications.
3		Reserved, set to 0
4 … 7		Vendor-specific
8	Minor Recoverable Fault	TRUE indicates the device detected a recoverable problem. The problem does not cause the device fault state.
9	Minor Unrecoverable Fault	TRUE indicates the device detected a unrecoverable problem. The problem does not cause the device fault state.
10	Major Recoverable Fault	TRUE indicates the device detected a problem which caused the device to transfer into the “Major Recoverable Fault” state.
11	Major Unrecoverable Fault	TRUE indicates the device detected a problem which caused the device to transfer into the “Major Unrecoverable Fault” state.
12 … 15		Reserved, set to 0

ODVA Serial Number

This attribute is a number used in conjunction with the Vendor ID to form a unique identifier for each device on EtherNet/IP. The value of this attribute is 02000000h plus the SERNO value from the device label.

Product Name

This text string should represent a short description of the product/product family represented by the product code in attribute 3.

Motor data object, class 28h

The Motor data object can only be used if the ODVA AC/DC drive profile is in use.

The object serves as a database for motor parameters.

Class attributes (Instance #0)

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of the CIP Object Class Definition upon which the implementation is based	Array of UINT8

Instance attributes (Instance #1)

Different motor types require different data. The table below shows the data applicable to different motor types.

#	Attribute name	Services	Description	Motor type	Data type
3	Motor type	Get	Refer to section Attribute explanations (page 130).	AC or DC	UINT8
6	Rated Current	Get, Set	Rated Stator Current from motor name plate Units: [100mA]	AC or DC	UINT16
7	Rated Voltage	Get, Set	Rated Base Voltage from motor name plate Units: [V]	AC or DC	UINT16
8	Rated Power	Get, Set	Rated Power at Rated Frequency Units: [W]	AC or DC	UINT32
9	Rated frequency	Get, Set	Rated Electrical Frequency Units: [Hz]	AC	UINT16
12	Pole Count	Get	Number of poles in the motor	AC	UINT16
15	Base Speed	Get, Set	Nominal speed at rated frequency from nameplate Units [RPM]	AC or DC	UINT16

Attribute explanations

Attribute	Value	Definition
Motor type	1	Permanent magnet DC motor
	2	FC DC motor
	3	Permanent magnet synchronous AC motor
	6	Wound rotor induction AC motor
	7	Squirrel cage induction AC motor

Control supervisor object, class 29h

The Control supervisor object can only be used if the ODVA AC/DC drive profile is in use.

The object models all the management functions for devices within the 'Hierarchy of Motor Control Devices'. The behavior of motor control devices is described by:

- AC/DC-drive object, class 2Ah (page 132) and
- Run/Stop event matrix under Run Forward & Run Reverse (Control supervisor object) (page 75).

Refer to section State (Control supervisor object) (page 79).

Note: If assembly instances are used, they override this object, for example, upon drive power-up.

Class attributes (Instance #0)

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of the CIP Object Class Definition upon which the implementation is based	Array of UINT8

Instance attributes (Instance #1)

#	Attribute name	Services	Description	Data type
3	Run 1 (Run-Fwd)	Get, Set	0 = Stop 1 = Run Refer to Run Forward & Run Reverse (Control supervisor object) (page 75).	BOOL

#	Attribute name	Services	Description	Data type
4	Run 2 (Run-Rev)	Get, Set	0 = Stop 1 = Run Refer to Run Forward & Run Reverse (Control supervisor object) (page 75).	BOOL
5	Net Control	Get, Set	0 = Local Control 1 = Network Control	BOOL
6	State	Get	State of Object. Refer to section State (Control supervisor object) (page 79).	UINT8
7	Running 1 (Fwd)	Get	0 = Stopped 1 = Running	BOOL
8	Running 2 (Rev)	Get	0 = Stopped 1 = Running	BOOL
9	Ready	Get	1 = Ready, Enabled or Stopping 0 = Other state	BOOL
10	Faulted	Get	0 = Not faulted 1 = Fault occurred	BOOL
11	Warning	Get	0 = No Warnings present 1 = Warning	BOOL
12	FaultRst	Get, Set	0 → 1 Fault Reset	BOOL
13	Fault Code	Get	The fault that caused the last transition to the Faulted state. DRIVECOMM codes are reported. Refer to the drive manual for further information on DRIVECOMM codes.	UINT16
14	Warning Code	Get	Code word indicating the warning present. If multiple warnings are present, the lowest code value is displayed. DRIVECOMM codes are reported. Refer to the drive manual for further information on DRIVECOMM codes.	UINT16
15	CtlFrom-Net	Get	0 = NetControl disabled 1 = NetControl enabled	BOOL
17	ForceFault	Get, Set	0 → 1 forces the drive to fault	BOOL

#	Attribute name	Services	Description	Data type
18	ForceStatus	Get	0 = No fault 1 = Fault active	BOOL

AC/DC-drive object, class 2Ah

The AC/DC-drive object can only be used if the ODVA AC/DC drive profile is in use.

The object models the functions specific to an AC or DC Drive.

Class attributes (Instance #0)

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of the CIP Object Class Definition upon which the implementation is based	Array of UINT8

Instance attributes (Instance #1)

#	Attribute name	Services	Description	Data type
3	At Reference	Get	Frequency arrival	BOOL
4	NetRef	Get, Set	Requests torque or speed reference to be local or from the network. 0 = Set Reference not DN Control 1 = Set Reference at DN Control Note that the actual status of torque or speed reference is reflected in attribute 29, RefFromNet.	BOOL
6	Drive mode	Get, Set	0 = Vendor-specific	UINT8
7	Speed Actual	Get	Units = Refer to parameter 23 Speed scale (page 43).	SINT16
8	SpeedRef	Get, Set	Units = Refer to parameter 23 Speed scale (page 43).	SINT16
11	Torque Actual	Get	Units = Refer to parameter 24 Torque scale (page 44).	SINT16

#	Attribute name	Services	Description	Data type
12	TorqueRef	Get, Set	Units = Refer to parameter 24 Torque scale (page 44).	SINT16
18	AccelTime	Get, Set	Units = milliseconds	UINT16
19	DecelTime	Get, Set	Units = milliseconds	UINT16
22	Speed Scale	Get, Set	Speed scaling factor. Refer to parameter 23 Speed scale (page 43).	UINT8
24	Torque Scale	Get, Set	Torque scaling factor. Refer to parameter 24 Torque scale (page 44).	UINT8
29	Ref From Net	Get	Reflecting attribute 4	BOOL

Drive parameter object, class 90h

With the FEIP-21 module, drive parameters can also be accessed via Explicit Messaging. Explicit Messaging makes use of objects consisting of three parts: class, instance and attribute.

Note: When you use the drive parameter object to update the fieldbus configuration groups, changes to the fieldbus configuration will only take effect when the module is powered up the next time or when a 'Fieldbus Adapter parameter refresh' is given.

Class is always 144 (90h). Instance and attribute correspond to the drive parameter group and index in the following way:

- Instance = Parameter group (0…99) (ACS880/ACx580: 0...255)
- Attribute = Parameter index (01…99) (ACS880/ACx580: 0...255)

For example, parameter 99.01 is accessed as follows:

- Class = 144 = 90h
- Instance = 99 = 63h
- Attribute = 1 = 01h

Fieldbus configuration object, class 91h

The fieldbus configuration object allows you to configure the fieldbus configuration groups without the need to know the drive-specific groups associated with the configuration groups.

Note: When you use the fieldbus configuration object to update the fieldbus configuration groups, changes to the fieldbus configuration will only take effect when a reset service is requested of the Identity Object, the module is powered up the next time or when a 'Fieldbus Adapter parameter refresh' is given.

Class attributes

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of the Configuration Object	Array of UINT8

Instance #1: FEIP-21 configuration parameters group A (group 1)

The actual parameter group number depends on the drive type. Group A (group 1) corresponds to:

- parameter group 51 in ACS380, ACS480, ACH580, ACQ580 and ACS580
- parameter group is typically 51/54 (group 151/154 in some variants) in ACS880 if the adapter is installed as fieldbus adapter A/B.

#	Attribute name	Services	Description	Data type
1	Configuration Group A (Group 1) - Parameter 1	Get	Refer to FBA type (page 32) .	UINT16
2	Configuration Group A (Group 1) - Parameter 2	Get, Set	Refer to Protocol/Profile (page 32).	UINT16
3	Configuration Group A (Group 1) - Parameter 3	Get, Set	Refer to Comm-rate (page 32).	UINT16
4	Configuration Group A (Group 1) - Parameter 4	Get, Set	Refer to IP configuration (page 33).	UINT16
5	Configuration Group A (Group 1) - Parameter 5	Get, Set	Refer to IP address 1 (page 33).	UINT16
6	Configuration Group A (Group 1) - Parameter 6	Get, Set	Refer to IP address 1 (page 33).	UINT16
7	Configuration Group A (Group 1) - Parameter 7	Get, Set	Refer to IP address 1 (page 33).	UINT16
8	Configuration Group A (Group 1) - Parameter 8	Get, Set	Refer to IP address 1 (page 33).	UINT16

#	Attribute name	Services	Description	Data type
9	Configuration Group A (Group 1) - Parameter 9	Get, Set	Refer to Subnet CIDR (page 34).	UINT16
10	Configuration Group A (Group 1) - Parameter 10	Get, Set	Refer to GW address 1 (page 35).	UINT16
11	Configuration Group A (Group 1) - Parameter 11	Get, Set	Refer to GW address 1 (page 35).	UINT16
12	Configuration Group A (Group 1) - Parameter 12	Get, Set	Refer to GW address 1 (page 35).	UINT16
13	Configuration Group A (Group 1) - Parameter 13	Get, Set	Refer to GW address 1 (page 35).	UINT16
14	Configuration Group A (Group 1) - Parameter 14	Get, Set	Refer to Commrate port 2 (page 35).	UINT16
15	Configuration Group A (Group 1) - Parameter 15	Get, Set	Refer to Service configuration (page 36).	UINT16
16	Configuration Group A (Group 1) - Parameter 16	Get, Set	Refer to Reserved (page 40).	UINT16
17	Configuration Group A (Group 1) - Parameter 17	Get, Set	Refer to Reserved (page 40).	UINT16
18	Configuration Group A (Group 1) - Parameter 18	Get, Set	Refer to Reserved (page 40).	UINT16
19	Configuration Group A (Group 1) - Parameter 19	Get, Set	Refer to T16 scale (page 40).	UINT16
20	Configuration Group A (Group 1) - Parameter 20	Get, Set	Refer to Control timeout (page 41).	UINT16
21	Configuration Group A (Group 1) - Parameter 21	Get, Set	Refer to Idle action (page 42).	UINT16
22	Configuration Group A (Group 1) - Parameter 22	Get, Set	Refer to Stop function (page 42).	UINT16
23	Configuration Group A (Group 1) - Parameter 23	Get, Set	Refer to Speed scale (page 43).	UINT16

#	Attribute name	Services	Description	Data type
24	Configuration Group A (Group 1) - Parameter 24	Get, Set	Refer to Torque scale (page 44).	UINT16
25	Configuration Group A (Group 1) - Parameter 25	Get, Set	Refer to Reserved (page 45).	UINT16
26	Configuration Group A (Group 1) - Parameter 26	Get, Set	Refer to Reserved (page 45).	UINT16
27	Configuration Group A (Group 1) - Parameter 27	Get, Set	Refer to FBA A/B par refresh (page 45).	UINT16
28	Configuration Group A (Group 1) - Parameter 28	Get	Refer to FBA A/B par table ver (page 46).	UINT16
29	Configuration Group A (Group 1) - Parameter 29	Get	Refer to FBA A/B drive type code (page 46).	UINT16
30	Configuration Group A (Group 1) - Parameter 30	Get	Refer to FBA A/B mapping file ver (page 46).	UINT16
31	Configuration Group A (Group 1) - Parameter 31	Get	Refer to D2FBA A/B comm status (page 46).	UINT16
32	Configuration Group A (Group 1) - Parameter 32	Get	Refer to FBA A/B comm SW ver (page 47).	UINT16
33	Configuration Group A (Group 1) - Parameter 33	Get	Refer to FBA A/B appl SW ver (page 47).	UINT16

Instance #2: FEIP-21 configuration parameters group B (group 2)

The actual parameter group number depends on the drive type. Group B (group 2) corresponds to:

- parameter group 53 in ACS380, ACS480, ACH580, ACQ580 and ACS580
- parameter group is typically 53/56 (group 153/156 in some variants) in ACS880 if the adapter is installed as fieldbus adapter A/B.

#	Attribute name	Services	Description	Data type
1	Configuration Group B (Group 2) - Parameter 1	Get, Set	Refer to FBA A/B data out 1 (client to drive) (page 47).	UINT16 / UINT32 ACS880 / ACx580
2	Configuration Group B (Group 2) - Parameter 2	Get, Set	Refer to FBA A/B data out 1 (client to drive) (page 47).	UINT16 / UINT32 ACS880 / ACx580
3	Configuration Group B (Group 2) - Parameter 3	Get, Set	Refer to FBA A/B data out 1 (client to drive) (page 47).	UINT16 / UINT32 ACS880 / ACx580
4	Configuration Group B (Group 2) - Parameter 4	Get, Set	Refer to FBA A/B data out 1 (client to drive) (page 47).	UINT16 / UINT32 ACS880 / ACx580
5	Configuration Group B (Group 2) - Parameter 5	Get, Set	Refer to FBA A/B data out 1 (client to drive) (page 47).	UINT16 / UINT32 ACS880 / ACx580
6	Configuration Group B (Group 2) - Parameter 6	Get, Set	Refer to FBA A/B data out 1 (client to drive) (page 47).	UINT16 / UINT32 ACS880 / ACx580
7	Configuration Group B (Group 2) - Parameter 7	Get, Set	Refer to FBA A/B data out 1 (client to drive) (page 47).	UINT16 / UINT32 ACS880 / ACx580
8	Configuration Group B (Group 2) - Parameter 8	Get, Set	Refer to FBA A/B data out 1 (client to drive) (page 47).	UINT16 / UINT32 ACS880 / ACx580
9	Configuration Group B (Group 2) - Parameter 9	Get, Set	Refer to FBA A/B data out 1 (client to drive) (page 47).	UINT16 / UINT32 ACS880 / ACx580
10	Configuration Group B (Group 2) - Parameter 10	Get, Set	Refer to FBA A/B data out 1 (client to drive) (page 47).	UINT16 / UINT32 ACS880 / ACx580

Instance #3: FEIP-21 configuration parameters group C (group 3)

The actual parameter group number depends on the drive type. Group C (group 3) corresponds to:

- parameter group 52 in ACS380, ACS480, ACH580, ACQ580 and ACS580

- parameter group is typically 52/55 (group 152/155 in some variants) in ACS880 if the adapter is installed as fieldbus adapter A/B.

#	Attribute name	Services	Description	Data type
1	Configuration Group C (Group 3) - Parameter 1	Get, Set	Refer to FBA A/B data in1 (drive to client) (page 48).	UINT16 / UINT32 ACS880 / ACx580
2	Configuration Group C (Group 3) - Parameter 2	Get, Set	Refer to FBA A/B data in1 (drive to client) (page 48).	UINT16 / UINT32 ACS880 / ACx580
3	Configuration Group C (Group 3) - Parameter 3	Get, Set	Refer to FBA A/B data in1 (drive to client) (page 48).	UINT16 / UINT32 ACS880 / ACx580
4	Configuration Group C (Group 3) - Parameter 4	Get, Set	Refer to FBA A/B data in1 (drive to client) (page 48).	UINT16 / UINT32 ACS880 / ACx580
5	Configuration Group C (Group 3) - Parameter 5	Get, Set	Refer to FBA A/B data in1 (drive to client) (page 48).	UINT16 / UINT32 ACS880 / ACx580
6	Configuration Group C (Group 3) - Parameter 6	Get, Set	Refer to FBA A/B data in1 (drive to client) (page 48).	UINT16 / UINT32 ACS880 / ACx580
7	Configuration Group C (Group 3) - Parameter 7	Get, Set	Refer to FBA A/B data in1 (drive to client) (page 48).	UINT16 / UINT32 ACS880 / ACx580
8	Configuration Group C (Group 3) - Parameter 8	Get, Set	Refer to FBA A/B data in1 (drive to client) (page 48).	UINT16 / UINT32 ACS880 / ACx580
9	Configuration Group C (Group 3) - Parameter 9	Get, Set	Refer to FBA A/B data in1 (drive to client) (page 48).	UINT16 / UINT32 ACS880 / ACx580
10	Configuration Group C (Group 3) - Parameter 10	Get, Set	REfer to FBA A/B data in1 (drive to client) (page 48).	UINT16 / UINT32 ACS880 / ACx580

Instance #10: SNTP configuration

#	Attribute name	Services	Description	Data type
1	UTC time offset	Get, Set	SNTP time offset to UTC time. Value in minutes [-1440, 1440] to offset the UTC time received from SNTP.	SINT16

TCP/IP interface object, class F5h

This object provides the mechanism to configure the TCP/IP network interface of the device.

Class attributes (Instance #0)

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of the TCP/IP Interface Object Class Definition upon which the implementation is based	Array of UINT8

Instance attributes (Instance #1)

#	Attribute name	Services	Description	Data type
1	Interface status	Get	Refer to section Attribute explanations (page 141).	DWORD
2	Configuration Capability	Get	Refer to section Attribute explanations (page 141).	DWORD
3	Configuration Control	Get	Refer to section Attribute explanations (page 141).	DWORD
4	Physical Link Object	Get	Path to physical link object	STRUCT of:
	Path Size		Path size	UINT
	Path		Logical segments identifying the physical link object	Padded EPATH

#	Attribute name	Services	Description	Data type
5	Interface Configuration	Get		STRUCT of:
	IP Address		IP Address	UINT32
	Network Mask		Network Mask	UINT32
	Gateway Address		Gateway Address	UINT32
	Unused			UINT32
	Unused			UINT32
	Default Domain Name		Default Domain Name for unqualified host names.	STRING
6	Host Name	Get / Set	Host name	STRING
8	TTL Value	Get / Set	TTL value for EtherNet/IP multi cast packets	UINT8 1 … 255
13	NV Encapsulation Inactivity	Get / Set	Encapsulation inactivity timeout	UINT16 0 = disabled 1 … 3600 timeout in seconds

Attribute explanations

Interface Status attribute (#1) bits			
Bit	**Name**	**Value**	**Description**
0 … 3	Interface configuration status	0	The Interface Configuration attribute has not been configured.
		1	The Interface Configuration attribute contains valid configuration obtained from BOOTP, DHCP or non-volatile storage.
		2	The IP address member of the Interface Configuration attribute contains valid configuration obtained from hardware settings (e.g., push-wheel, thumbwheel).
		3 … 15	Reserved

Interface Status attribute (#1) bits		
Bit	**Name**	**Description**
4	Mcast pending	Indicates a pending configuration change in the TTL Value and/or Mcast Config attributes. This bit is set when either the TTL Value or Mcast Config attribute is set, and cleared the next time the device starts.
5 … 31		Reserved, set to 0

Configuration Capability attribute (#2) bits		
Bit	**Name**	**Description**
0	BOOTP client	1 (True) = The device is capable of obtaining its network configuration via BOOTP.
1	DNS client	1 (True) = The device is capable of resolving host names by querying a DNS server.
2	DHCP client	1 (True) = The device is capable of obtaining its network configuration via DHCP.
3	DCHP-DNS update	1 (True) = The device is capable of sending its host name in the DHCP request as documented in Internet draft <draft-ietf-dhc-dhcp-dnc-12.txt>

Configuration Capability attribute (#2) bits		
Bit	**Name**	**Description**
4	Configuration settable	1 (True) = The Interface Configuration attribute is settable. Some devices, e.g., a PC or workstation, may not allow interface configuration to be set via the TCP/IP interface object.
5	Hardware configurable	1 (True) = The IP address member of the Interface Configuration attribute can be obtained from hardware settings (eg, push-wheel, thumb-wheel).
		0 (False) = The Status instance attribute (1) Interface configuration status field value shall never be 2. (The Interface configuration attribute contains valid configuration obtained from hardware settings.)
6 … 31		Reserved, set to 0

Configuration Control attribute (#3) bits			
Bit	**Name**	**Value**	**Description**
0 … 3	Start-up configuration	0	The device uses the interface configuration values previously stored (eg, in non-volatile memory or via hardware switches).
		1	The device obtains its interface configuration values via BOOTP.
		2	The device obtains its interface configuration values via DHCP upon startup.
		3 … 15	Reserved

Configuration Control attribute (#3) bits		
Bit	**Name**	**Description**
4	DNS enable	1 (True) = The device resolves host names by querying a DNS server.
5 … 31		Reserved, set to 0.

Ethernet link object, class F6h

This object maintains link-specific counters and status information for the Ethernet communication interface.

Class attributes (Instance #0)

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of the Ethernet Link Object Class Definition upon which the implementation is based	Array of UINT8

Instance attributes (Instance #1)

#	Attribute name	Services	Description	Data type
1	Interface Speed	Get, Set	10 or 100 Mbps	UDINT
2	Interface Flags	Get, Set	Interface status flags. For details, refer to section Attribute explanations.	DWORD
3	Physical Address	Get	Ethernet MAC address of the module	ARRAY of 6 UINT8s

Attribute explanations

Attribute	Description	Bit	Definition
Interface Flags	Interface status flags	0	Link status
		1	Half/Full duplex
		2 … 4	Negotiation status
		5	Manual setting requires reset
		6	Local hardware fault
		7 … 31	Reserved

Connection object, class 05h

Do not modify this object. This object is only used while establishing the connection between the adapter module and the PLC.

The connection class allocates and manages the internal resources associated with both I/O and explicit messaging connections. The specific instance generated by the connection class is referred to as connection instance or connection object.

Connection object states			
State	**Description**	**State**	**Description**
00	Non-Existent	03	Established
01	Configuring	04	Timed Out
02	Waiting for Connection ID	05	Deferred Delete

Class attributes

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of the connection object	Array of UINT8

Instance attributes

Instance number	Description
1	Explicit messaging connection
2	Polled I/O connection
4	Change-of-State / Cyclic I/O connection

#	Attribute name	Services	Description	Data type
1	State	Get	State of the object. Refer to the Connection object states (page 144).	UINT8
2	Instance Type	Get	Indicates either I/O (1) or messaging connection (0).	UINT8
3	Transport Class Trigger	Get	Defines the behavior of the connection.	UINT8
4	Produced Cnxn Id	Get	Placed in CAN Identifier Field when the connection transmits.	UINT16
5	Consumed Cnxn Id	Get	CAN Identifier Field value that denotes the message to be received	UINT16

#	Attribute name	Services	Description	Data type
6	Comm Character-istics	Get	Defines the Message Group(s) across which productions and consumptions are associated in this connection.	UINT8
7	Produced Connection Size	Get	Maximum number of bytes transmitted across this connection	UINT16
8	Consumed Connection size	Get	Maximum number of bytes received across this connection	UINT16
9	Expected Packet Rate	Get, Set	Defines the timing associated with this connection in milliseconds. A value of 0 deactivates the associated timers.	UINT16
12	Watchdog Timeout Ac-tion	Get, Set	Defines how to handle Inactivity/Watch-dog timeouts.	UINT8
13	Produced Connection Path Length	Get	Number of bytes in the produced_con-nection_path length attribute	UINT16
14	Produced Connection Path	Get	Application object producing data on this connection	Array of UINT8
15	Consumed Connection Path Length	Get	Number of bytes in the consumed_con-nection_path length attribute	UINT16
16	Consumed Connection Path	Get	Specifies the application object(s) that are to receive the data consumed by this connection object.	Array of UINT8
17	Production Inhibit Time	Get	Defines the minimum time between new data production in milliseconds.	UINT16

Acknowledge handler object, class 2Bh

The acknowledge handler object is used to manage the reception of message acknowledgements. This object communicates with a message producing application object within the device. The acknowledge handler object notifies the producing application of acknowledge reception, acknowledge timeouts and production retry limit.

Class attributes (Instance #0)

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of the CIP Object Class Definition upon which the implementation is based	Array of UINT8

Instance attributes (Instance #1)

#	Attribute name	Services	Description	Data type
1	Acknowledge Timer	Get, Set	Time in milliseconds to wait for acknowledge before resending	UINT16
2	Retry Limit	Get, Set	Number of Acknowledge Timeouts to wait before informing the producing application of a Retry-Limit_Reached event	UINT8
3	COS Producing Connection Instance	Get	Connection Instance Id which contains the path of the producing I/O application object which will be notified of Acknowledge Handler events	UINT16

QoS object, class 48h

Quality of Service (QoS) is a general term that is applied to mechanisms used to treat traffic streams with different relative priorities or other delivery characteristics. Standard QoS mechanisms include IEEE 802.1D/Q (Ethernet frame priority) and Differentiated Services (DiffServ) in the TCP/IP protocol suite.

The QoS Object provides a means to configure certain QoS-related behaviors in EtherNet/IP devices.

Class attributes (Instance #0)

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of this object	UINT16

Instance attributes (Instance #1)

#	Attribute name	Services	Description	Data type
1	802.1Q Tag Enable	Get, Set	Enables or disables sending 802.1Q frames on CIP and IEEE 1588 messages	UINT8
2	DSCP PTP Event	Get, Set	DSCP value for PTP (IEEE 1588) event messages	UINT8
3	DSCP PTP General	Get, Set	DSCP value for PTP (IEEE 1588) general messages	UINT8
4	DSCP Urgent	Get, Set	DSCP value for CIP transport class 0/1 Urgent priority messages	UINT8
5	DSCP Scheduled	Get, Set	DSCP value for CIP transport class 0/1 Scheduled priority messages	UINT8
6	DSCP High	Get, Set	DSCP value for CIP transport class 0/1 High priority messages	UINT8
7	DSCP Low	Get, Set	DSCP value for CIP transport class 0/1 Low priority messages	UINT8
8	DSCP Explicit	Get, Set	DSCP value for CIP explicit messages (transport class 2/3 and UCMM) and all other EtherNet/IP encapsulation messages	UINT8

Attribute explanations

Attribute	Description	Value	Definition
802.1Q Tag Enable	The 802.1Q Tag Enable attribute enables or disables sending 802.1Q frames on CIP and IEEE 1588 messages. When the attribute is enabled, the device sends 802.1Q frames for all CIP and IEEE 1588 messages. A change to the value of the attribute takes effect the next time the device restarts.	0	Disabled (default)
		1	Enabled

Attribute	Description
DSCP Value Attributes	Attributes 2…8 contain the DSCP values that must be used for the different types of EtherNet/IP traffic.

LLDP Management object, class 109h

The LLDP Management object contains administrative information for the LLDP protocol.

Class attributes (Instance #0)

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of this object	UINT16

Instance attributes (Instance #1)

#	Attribute name	Services	Description	Data type
1	LLDP Enable	Get, Set	Enable generation of LLDP Frames both Globally and per Port and the processing of received LLDP frames globally	Struct of: UINT16 – array length ARRAY of BYTE
2	msgTxInterval	Get, Set	From 802.1AB-2016. The interval in seconds at which LLDP frames are transmitted from this device.	UINT16
3	msgTxHold	Get, Set	From 802.1AB-2016. A multiplier of msgTxInterval to determine the value of the TTL TLV sent to neighboring devices.	UINT8
4	LLDP Datastore	Get	An indication of the retrieval methods for the LLDP database supported by the device	WORD
5	Last Change	Get	The value of sysUpTime taken the last time any entry in the local LLDP database (ignoring TTL) changed	UINT32

Attribute explanations

Attribute	Description	Bit	Name	Values	Description
LLDP Enable	Enable generation of LLDP Frames both Globally and per Port and the processing of received LLDP frames globally. The bit definitions of the LLDP Enable Array are shown on the right.	0	Global Enable	0 = LLDP Tx & Rx Disabled 1 = LLDP Tx & Rx Enabled (default)	If Global Enable (Bit 0) is set to 0, transmitting will be stopped for all ports (other bits must be ignored) and received LLDP frames will be ignored. When Global Enable (Bit 0) is set from 1 to 0, all existing table entries are removed.
		1…N	Port Tx Enable	0 = LLDP Tx Disabled 1 = LLDP Tx Enabled (default)	The values of elements corresponding to non-existent Ethernet Link instances or instances (eg, internal) that do not support LLDP must be set to 0 and are ignored
		>N	Reserved	Must be 0 and are ignored	Pad bits included as necessary to fill the last BYTE

Attribute	Description	Value	Definition
msgTxInterval	From 802.1AB-2016. The interval in seconds at which LLDP frames are transmitted from this device. The recommended default value is 30.	0	Reserved
		1…3600	Message Transmission Interval for LLDP frames
		3601… 65535	Reserved

Attribute	Description	Value	Definition
msgTxHold	From 802.1AB-2016. A multiplier of msgTxInterval to determine the value of the TTL TLV sent to neighboring devices. The recommended default value is 4.	0	Reserved
		1…100	Message Transmission Multiplier for LLDP Frames
		101…255	Reserved

Attribute	Description	Bit	Definition
LLDP Datastore	An indication of the retrieval methods for the LLDP database supported by the device.	0	LLDP Data Table Object
		1	SNMP
		2	NETCONF YANG
		3	RESTCONF YANG
		4…15	Reserved

LLDP Data Table Object, class 10Ah

The LLDP Data Table object displays a record of all adjacent LLDP implementing devices that are currently active according to the receive state machine of the LLDP protocol. If neighboring devices have not been detected, only class attributes may be reachable.

One instance of the LLDP Data Table object is implemented for each adjacent device detected. Only 8 instances are supported. Instances are created and removed as neighboring devices change. The same instance number is maintained for each neighboring device until the next power cycle of the device implementing this object.

Class attributes (Instance #0)

#	Attribute name	Services	Description	Data type
1	Revision	Get	Revision of this object	UINT16
2	Max Instance	Get	Maximum instance number of an object currently created in this class level of the device.	UINT16

#	Attribute name	Services	Description	Data type
3	Number of Instances	Get	Number of object instances currently created at this class level of the device.	UINT16

Instance attributes (Instance #1)

#	Attribute name	Services	Description	Data type
1	Ethernet Link Instance Number	Get	The local instance number of the Ethernet Link Object that matches the physical Ethernet port the LLDP frame populating this instance was received on, if known.	UINT16
2	MAC Address	Get	The neighboring MAC Address received from the CIP MAC Address, Chassis ID, or Port ID TLV	ETH_MAC_ADDR
3	Interface Label	Get	The neighboring Interface Label received from the CIP Interface Label, Chassis ID or Port ID TLV	SHORT_STRING
4	Time to Live	Get	The number of seconds the neighboring information is to be considered valid	UINT16
5	System Capabilities TLV	Get	The capabilities which the neighboring device supports based on currently loaded firmware.	STRUCT of: WORD – System Cap WORD – Enabled Cap
6	IPv4 Management Addresses	Get	A list of IPv4 encoded management addresses as defined by one or more received Management Address TLVs (TLV Type = 8)	STRUCT of: UINT8 – num of addr ARRAY of UINT32

#	Attribute name	Services	Description	Data type
7	CIP Identification	Get	The CIP Identification TLV of the neighboring device, if present.	STRUCT of: UINT16 – Vendor ID UINT16 – DevType UINT16 – ProductCode BYTE – Major Rev UINT8 – Minor Rev UINT32 – CIP Ser Num
8	Additional Ethernet Capabilities	Get	A TLV for Ethernet Preemption Support from the neighboring device	STRUCT of: BOOL – Preemption support BOOL – Preemption status BOOL – Preemption active
9	Last Change	Get	The value of sysUpTime taken the last time an attribute in this instance changed.	UINT32

Attribute explanations

Attribute	Description	Value	Definition
Ethernet Link Instance Number	The local instance number of the Ethernet Link Object that matches the physical Ethernet port the LLDP frame populating this instance was received on, if known.	0	Unknown
		1… 65535	Ethernet Link Object (0xF6) Instance Number

Attribute	Description	Value	Definition
Time to Live	The number of seconds the neighboring information is to be considered valid. **Note:** A received TTL TLV value of 0 means that the table entry must be removed according to IEEE 802.1AB-2016.	0	Reserved
		1… 65535	Time To Live (in seconds)

Attribute	Description	Bit	Definition
System Capabilities TLV	The system capabilities TLV is a structure that contains bitmaps of both the supported and enabled capabilities of the neighboring device.	0	Other
		1	Repeater
		2	Bridge
		3	Access Point
		4	Router
		5	Telephone
		6	DOCSIS Cable Device
		7	End Station
		8	C-VLAN component
		9	S-VLAN component
		10	Two-port MAC relay component
		11…15	Reserved by IEEE

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EtherNet/IP – Diagnostics

Contents of this chapter

This chapter explains how to trace faults with a PLC software, and with the status LEDs on the adapter module when the module is used for EtherNet/IP communication.

Fault and warning messages

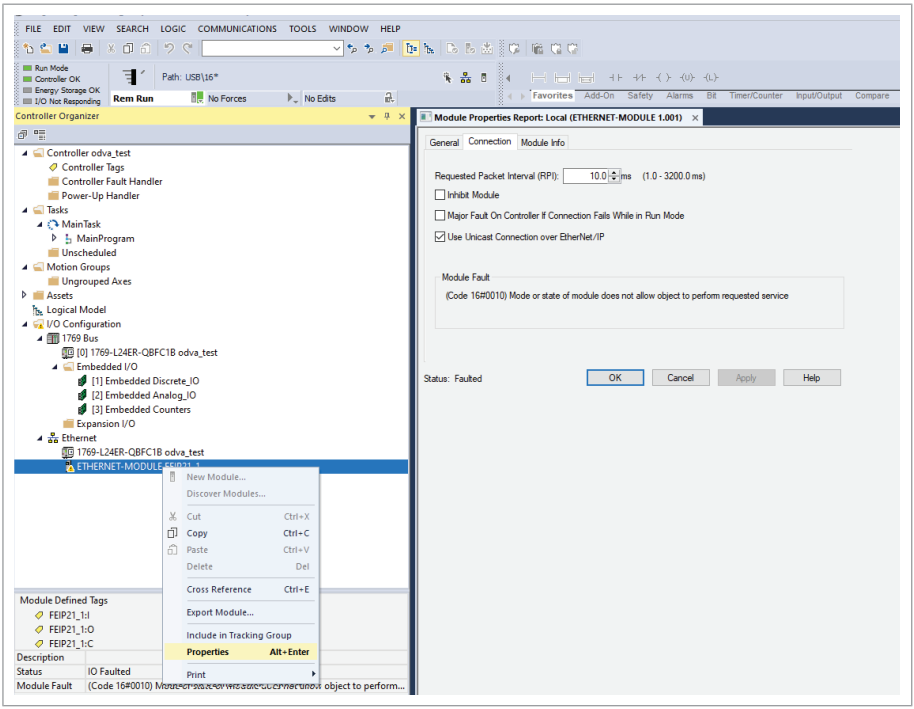
For the fault and warning messages displayed in the drive control panel or in Drive Composer software concerning the adapter module, refer to the drive firmware manual.

You can diagnose EtherNet/IP communication errors between the fieldbus adapter and the PLC by using the PLC software, as explained in the following chapters. The most common errors occur due to misconfigured drive and fieldbus settings.

If a communication error occurs, check the drive control mode (19.12) and profile (51.2) parameters. Verify that they match the PLC control settings.

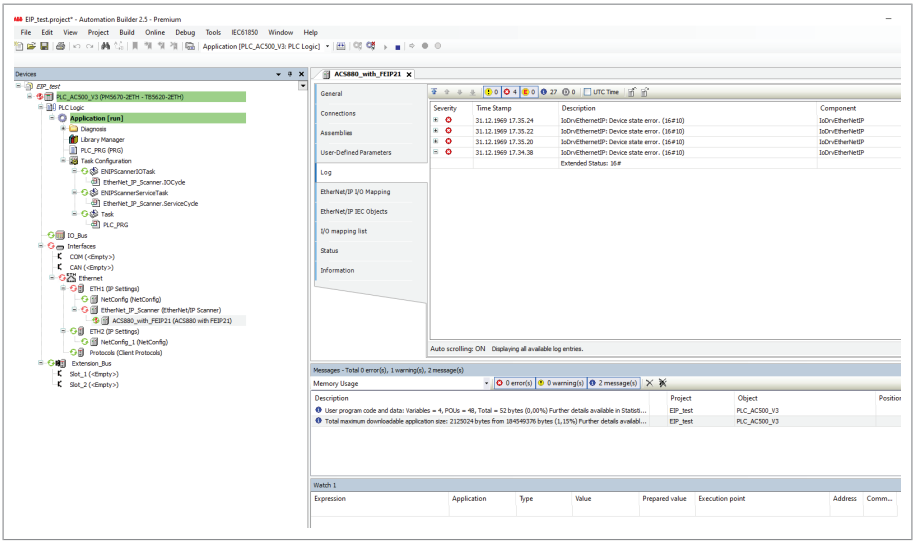
Fault messages in Allen-Bradley® PLC

If a fault occurs in the EtherNet/IP communication between fieldbus adapter and Allen-Bradley® PLC, use Studio 5000® software to check the error codes and descriptions. You can find the fault code and message in the properties of the faulty EtherNet/IP module. Refer to the image below.



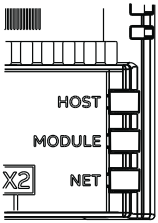
Fault messages in ABB AC500 PLC

If a fault occurs in the EtherNet/IP communication between fieldbus adapter and ABB AC500 PLC, use Automation builder to check the error codes and descriptions. You can find the fault code and message in the log of the faulty EtherNet/IP module. Refer to the image below.

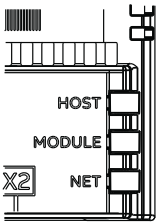


LEDs

The adapter module is equipped with three bicolor diagnostic LEDs. The LEDs are described below.



Name	Color	Function
HOST	Flashing green	Establishing communication to host
	Green	Connection to host OK
	Flashing red	Communication to host lost temporarily
	Flashing orange, alternating with the MODULE flashing orange	Internal file system error. Cycle the drive power off and on. If the error persists, contact your local ABB representative.
MODULE	Off	The device does not have power.
	Green	Device is operating in a normal condition.
	Flashing green	Device needs commissioning due to configuration missing, incomplete or incorrect. The device may be in the Standby state. This may be caused by the adapter waiting for a response from a DHCP server or Duplicate Address Detection to complete.
	Flashing red	Ethernet interface is disabled. Duplicate Address Detection may have detected a duplicate address. Check the IP configuration and either initiate a Fieldbus Adapter parameter refresh or cycle power to the drive.
	Flashing red-green	Device is in Self Test.
	Flashing orange, alternating with the HOST flashing orange	Internal file system error. Cycle the drive power off and on. If the error persists, contact your local ABB representative.



Name	Color	Function
NETWORK / NET	Off	The device is powered off, or is powered on but with no IP address configured.
	Flashing green	An IP address is configured, but no CIP connections are established, and an exclusive owner connection has not timed out.
	Green	An IP address is configured and at least one CIP connection is established, and an exclusive owner connection has not timed out.
	Flashing red	An IP address is configured, and an exclusive owner connection for which this device is the target has timed out.

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NONE – Start-up

Contents of this chapter

This chapter contains:

- information on how to configure the drive for operation with the adapter module
- drive-specific instructions on how to start-up the drive with the adapter module
- information on how to configure the client for communication with the adapter module.

Warnings



⚠WARNING Obey the safety instructions given in this manual and the drive documentation.

Drive configuration

This information applies to all drive types that are compatible with the adapter module, unless it is otherwise stated.

Connection configuration for the NONE protocol

After the adapter module is mechanically and electrically installed according to the instructions in chapters Mechanical installation and Electrical installation, set the drive for communication with the module.

The detailed procedure of activating the module using the NONE protocol with the drive depends on the drive type. Normally, you must adjust a parameter to activate the communication. Refer to the the drive-specific start-up sections Starting up fieldbus communication (page 170).

When communication between the drive and the adapter module is established, several configuration parameters are copied to the drive. These parameters are shown in the tables below and must be checked first and adjusted if it is necessary. You can adjust the parameters via a drive control panel or a PC tool.

Note:

- Not all drives show the descriptive names for the configuration parameters.
- The new parameter settings take effect only when you power up the module the next time or when you activate the fieldbus adapter refresh parameter.
- Use the NONE protocol selection when no fieldbus protocol is required. For example, when only the Ethernet tool network is used or to synchronize time.

FEIP-21 configuration parameters – group A (group 1)

Note: The actual parameter group number depends on the drive type. Group A (group 1) corresponds to:

- parameter group 51 in ACS380, ACS480, ACH480, ACS580, ACH580 and ACQ580.
- parameter group 51 in ACS880 if the adapter is installed as fieldbus adapter A or group 54 if the adapter is installed as fieldbus adapter B.

No.	Name/Value	Description	Default
01	FBA TYPE	**Read-only.** Shows the fieldbus adapter type as detected by the drive. The value cannot be adjusted by the user. If the value is **0** = None, the communication between the drive and the module has not been established.	**2222** = EtherNet/IP
02	Protocol/Profile	Select NONE to disable the EtherNet/IP protocol. Other services (ABB IP Configuration tool, Ethernet tool network, etc.) are still available, refer to Service configuration (page 166).	**2222** = EtherNet/IP
	200 = NONE	NONE protocol	

No.	Name/Value	Description	Default
03	Commrate	Sets the bit rate for the Ethernet interface.	**0** = Auto
	0 = Auto	Autonegotiate	
	1 = 100 Mbps FD	100 Mbps, full-duplex	
	2 = 100 Mbps HD	100 Mbps, half-duplex	
	3 = 10 Mbps FD	10 Mbps, full-duplex	
	4 = 10 Mbps HD	10 Mbps, half-duplex	
04	IP configuration	Sets the method for configuring the IP address, subnet mask and gateway address for the module.	**0** = Static IP
	0 = Static IP	Configuration is obtained from parameters 05…13.	
	1 = Dyn IP DHCP	Configuration is obtained via DHCP.	
05 … 08	IP address 1	An IP address is assigned to each IP node on a network. An IP address is a 32-bit number that is typically represented in “dotted decimal” notation consisting of four decimal integers, on the range 0…255, separated by periods. Each integer represents the value of one octet (8-bits) in the IP address. Parameters define the four octets of the IP address.	0
	0...255	IP address	
	...	...	...
	IP address 4	Refer to parameter 05 IP address 1	0
	0...255	IP address	

No.	Name/Value	Description	Default
09	Subnet CIDR	Subnet masks are used for splitting networks into smaller networks called subnets. A subnet mask is a 32-bit binary number that splits the IP address into a network address and host address. Subnet masks are typically represented in either dotted decimal notation or the more compact CIDR notation, as shown in the table below.	0

CIDR	Dotted decimal	CIDR	Dotted decimal
31	255.255.255.254	15	255.254.0.0
30	255.255.255.252	14	255.252.0.0
29	255.255.255.248	13	255.248.0.0
28	255.255.255.240	12	255.240.0.0
27	255.255.255.224	11	255.224.0.0
26	255.255.255.192	10	255.192.0.0
25	255.255.255.128	9	255.128.0.0
24	255.255.255.0	8	255.0.0.0
23	255.255.254.0	7	254.0.0.0
22	255.255.252.0	6	252.0.0.0
21	255.255.248.0	5	248.0.0.0
20	255.255.240.0	4	240.0.0.0
19	255.255.224.0	3	224.0.0.0
18	255.255.192.0	2	192.0.0.0
17	255.255.128.0	1	128.0.0.0
16	255.255.0.0		

1...31	Subnet mask in CIDR notation	

No.	Name/Value	Description	Default
10 … 13	GW address 1	IP gateways connect individual physical IP subnets into a unified IP network. When an IP node needs to communicate with an IP node on another subnet, the IP node sends the data to the IP gateway for forwarding. Parameters define the four octets of the gateway address.	0
	0...255	GW address	
	...	...	...
	GW address 4	Refer to parameter 10 GW address 1.	0
	0.255	GW address	
14	Commrate port 2	Sets the bit rate for the Ethernet port 2.	**0** = Auto
	0 = Auto	Autonegotiate	
	1 = 100 Mbps FD	100 Mbps, full-duplex	
	2 = 100 Mbps HD	100 Mbps, half-duplex	
	3 = 10 Mbps FD	10 Mbps, full-duplex	
	4 = 10 Mbps HD	10 Mbps, half-duplex	
	5 = Disable Port	Disable Ethernet port. ABB recommends to disable the second port if it is not in use.	

No.	Name/Value	Description	Default
15	Service configuration	Disable services that are not required. Each service is represented by a single bit. Bit 0, Lock configuration, can be used to prevent accidental changing of this parameter. By default, all services are enabled and configuration is unlocked. ABB recommends to disable all services that are not used after commissioning.	

No.	Name/Value	Description	Default

Bit	Name	Information
0	Lock configuration	Changing this bit to one will lock service configuration and no bit can be changed. Only resetting the fieldbus configuration will unlock the parameter. To reset the fieldbus configuration, choose "Reset all fieldbus settings" or "Clear all" in parameter 96.06 Parameter restore.
1	Disable IP config tool	When this bit is set, access from ABB IP Configuration tool is prevented.
2	Disable ETH tool network	When this bit is set, access from Ethernet tool network (eg, ABB Drive Composer tool) is prevented.
3	Disable ping response	When this bit is set, response to ICMP (ping) message is prevented.
4	Unsecured ETH tool network	When this bit is set, access from Ethernet tool network is unsecured. **Note:** Drive Composer pro before V2.7 supports unsecured communication only.
5	Disable configuring web pages	When this bit is set, access to web pages is disabled.
6	Web-based firmware update	When this bit is set, the web-based firmware update is disabled. The update is enabled as a default.
7	Disable OPC UA	When this bit is set, the OPC UA server is disabled. By default, OPC UA is disabled. For more information, refer to Appendix F - OPC UA server (page 207).
8	Unencrypted OPC UA	When this bit is set, connection to the OPC UA server can be selected as unencrypted and not signed.
9	Enable mDNS	To enable mDNS, set this bit to 1. To disable, set to 0. mDNS is disabled by default.
10	Disable SNTP	To enable SNTP, set this bit to 0. To disable, set to 1. SNTP is disabled by default.

000000b…111111b	Service configuration	

No.	Name/Value	Description	Default
16 … 26	Reserved	These parameters are not used by the adapter module when using the NONE protocol.	N/A
27	FBA A/B par refresh	Validates any changed adapter module configuration parameter settings. After refreshing, the value reverts automatically to **0** = Done. **Note:** This parameter cannot be changed while the drive is running.	**0** = Done
	0 = Done	Refreshing done	
	1 = Refresh	Refreshing	
28	FBA A/B par table ver	**Read-only.** Displays the parameter table revision of the fieldbus adapter module mapping file stored in the memory of the drive. In format **xyz**, where **x** = major revision number **y** = minor revision number **z** = correction number OR in format **axyz**, where **a** = major revision number **xy** = minor revision numbers **z** = correction number or letter.	N/A
		Parameter table revision	
29	FBA A/B drive type code	**Read-only**. Displays the drive type code of the fieldbus adapter module mapping file stored in the memory of the drive.	N/A
		Drive type code of the fieldbus adapter module mapping file	
30	FBA A/B mapping file ver	**Read-only.** Displays the fieldbus adapter module mapping file revision stored in the memory of the drive in decimal format.	N/A
		Mapping file revision	

No.	Name/Value	Description	Default
31	D2FBA A/B comm status	**Read-only.** Displays the status of the fieldbus adapter module communication. **Note:** The value names may vary by drive.	**0** = Idle or **4** = Offline or **2** = Time out
	0 = Idle	Adapter is not configured.	
	1 = Exec.init	Adapter is initializing.	
	2= Time out	A timeout has occurred in the communication between the adapter and the drive.	
	3= Conf.err	There is an internal error in the communication between the adapter and the drive. Contact your local ABB representative.	
	4 = Off-line	Adapter is off-line.	
	5 = On-line	Adapter is on-line.	
	6 = Reset	Adapter is performing a hardware reset.	
32	FBA A/B comm SW ver	**Read-only.** Displays patch and build numbers of the adapter module's firmware version in **xxyy** format, where: **xx** = patch number **yy** = build number. Example: If the firmware version (<major>.<minor>.<patch>.<build>) is 3.10.200.13, the value C80D is displayed. If the version is 3.10.0.0, the value 0 is displayed. Refer to parameter 33.	N/A
33	FBA A/B appl SW ver	**Read-only.** Displays major and minor revision numbers of the adapter module's firmware version in **xxyy** format, where: **xx** = major revision number **yy** = minor revision number Example: If the firmware version (<major>.<minor>.<patch>.<build>) is 3.10.200.13 or 3.10.0.0, the value 310 is displayed. Refer to parameter 32.	N/A

Starting up fieldbus communication

1. Power up the drive.
2. To enable communication between the adapter module and the drive, select the correct slot number in parameter 50.01 FBA A enable.

   The selection must correspond to the slot where the adapter module is installed. For example, if the adapter module is installed in slot 1, you must select slot 1.
3. Set the module configuration parameters in group 51.
   - select the communication protocol as NONE (parameter 51.02 = NONE),
   - configure the network settings with parameters 51.03…51.13, and
   - deactivate all services that are not used in the installation with parameter 51.15 Service configuration.
4. Save the valid parameter values to permanent memory with parameter 96.07 Parameter save manually.
5. Validate the settings made in parameter groups 51 with parameter 51.27 FBA A par refresh.

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NONE – Diagnostics

Contents of this chapter

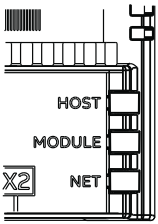
This chapter explains how to trace faults with the status LEDs on the adapter module using the NONE protocol.

Fault and warning messages

For the fault and warning messages concerning the adapter module, refer to the drive firmware manual.

LEDs

The adapter module has three bicolor diagnostic LEDs. The LEDs are described below.



Name	Color	Function
HOST	Flashes green	Establishing communication to the drive
	Green	The connection to the drive operates
	Flashes red	The connection to the drive is temporarily lost
	Flashes orange, alternating with the MODULE flashing orange	Internal file system error. Cycle the drive power off and on. If the error persists, contact your local ABB representative.
MODULE	Off	There is no PC tool connected to the device.
	Flashes orange	The device is attempting to obtain IP configuration from the DHCP server.
	Orange	The device is executing duplicate address detection.
	Green	The PC tool is connected to the device.
	Flashes red	The Ethernet link is down.
	Red	Ethernet interface is disabled. Duplicate address detection may have detected a duplicate address. Examine the IP configuration and either initiate a Fieldbus Adapter parameter refresh or cycle the drive power off and on.
	Flashes orange, alternating with the HOST flashing orange	Internal file system error. Cycle the drive power off and on. If the error persists, contact your local ABB representative.
NETWORK / NET	Off	The Ethernet link is down.
	Flashes green	The Ethernet link is up at 100 Mbps. Flashes to show activity on the interface.
	Flashes orange	The Ethernet link is up at 10 Mbps. Flashes to show activity on the interface.

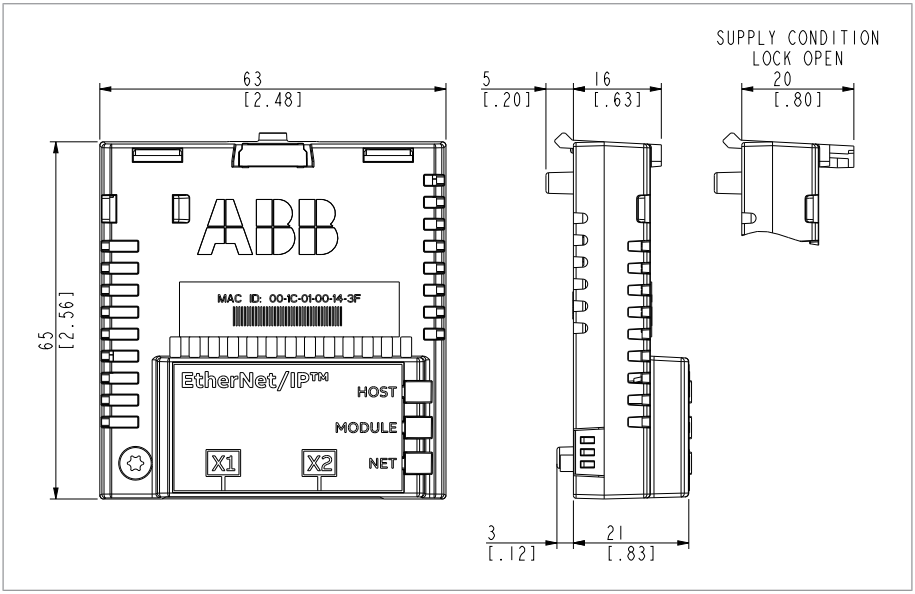
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Technical data

Contents of this chapter

This chapter contains the technical specifications of the FEIP-21 module.

Dimension drawing



General data

Installation	Into an option slot on the drive control unit
Degree of protection	IP20
Ambient conditions	The applicable ambient conditions specified for the drive in its manuals are in effect.
Package	Cardboard. Plastic wrapping: Antistatic air bubble sheet (PE).
Indicators	Three bicolor LEDs (HOST, MODULE, NETWORK/NET)
Connectors	A 20-pin connector to the drive RJ-45 connector to Ethernet (X1) RJ-45 connector for chaining another adapter module (X2)
Power supply	+3.3 V ±5% max. 400 mA (supplied by the drive)
General	Complies with EMC standard EN 61800-3:2004 Printed circuit board conformal coated

Ethernet link

Compatible devices	Ethernet Standard IEEE 802.3 and IEEE 802.3u devices.
Medium	10BASE-TX or 100Base-TX with Auto-negotiation and Auto-MDIX (Auto-crossover) • Wiring: CAT5e/6 S/FTP, CAT5e/6 S/STP, CAT5e/6 SF/FTP • Connector: RJ-45 • Termination: Internal • Maximum segment length: 100 m (328 ft)
Topology	Bus, star or ring. A maximum of 50 nodes is permitted for FEIP-21 module in a ring topology. In a chain the maximum recommended number of nodes is 50.
Transfer rate	10 Mbit/s or 100 Mbit/s **Note:** PROFINET IO uses only 100 Mbit/s in the full-duplex mode.
Minimum RPI	1 ms

Serial communication type	Half-duplex or full-duplex communication
Protocol	EtherNet/IP
Number of connections	Three

TCP and UDP service ports

There are multiple in-bound and out-bound network services running on the module. Some ports are protocol-specific and are not used when other protocols are selected.

Port	Service	Purpose
80 (TCP)	HTTP	HTTP protocol, used for Ethernet tool Network (like Drive composer pro). To disable, go to Service Configuration parameter **51.15**.
68 (UDP)	DHCP	DHCP client **Note:** Used only when IP configuration method is selected as "Dyn IP DHCP".
24576 (UDP)	ABB Netconfig	• Auto discovery protocol • Used by ControlBuilder plus (IP Configuration tool) and Drive Composer pro tools • Discovers ABB-specific Ethernet devices in a local network segment, by listening to and responding to UDP broadcasts. To disable, go to **Service Configuration parameter 51.15** or to Service configuration web page.
44818 (TCP)	EtherNet/IP	EtherNet/IP, explicit messaging. **Note:** Used only when EtherNet/IP protocol is selected
2222 (UDP)	EtherNet/IP	EtherNet/IP, implicit messaging. **Note:** Used only when EtherNet/IP protocol is selected
4840 (TCP)	OPC UA	OPC UA server.
443 (TCP)	HTTPS	HTTPS protocol, used for access to FEIP-21 module's web page and for Ethernet tool Network (like Drive Composer pro).
5353 (UDP)	mDNS	Multicast DNS, used for discovery service.

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Appendix A - ABB IP configuration tool

Contents of this chapter

This chapter shows how to use the ABB IP configuration tool to:

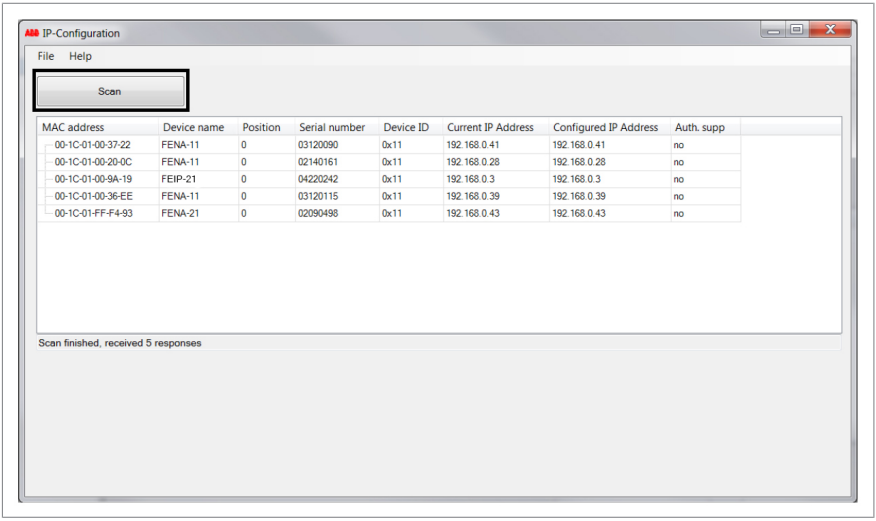
- find configured and unconfigured FEIP-21 modules in the network
- rewrite the IP configuration of the adapter modules.

Installation

The ABB IP configuration tool is part of the ABB Automation Builder software. No separate installation is needed.

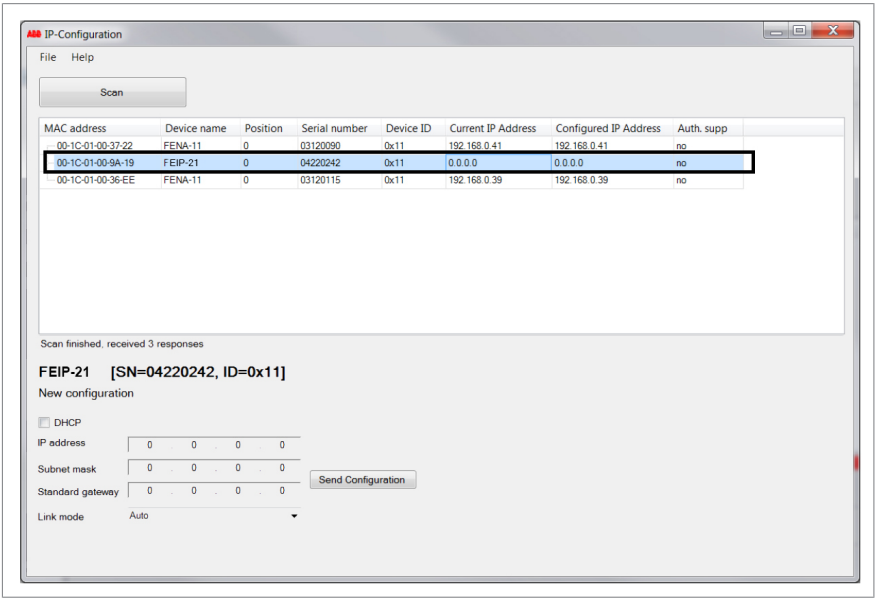
Finding adapter modules in the network

1. Open the ABB IP configuration tool.
2. Click the **Scan** button.
   The FEIP-21 modules in the network are shown in the results list.

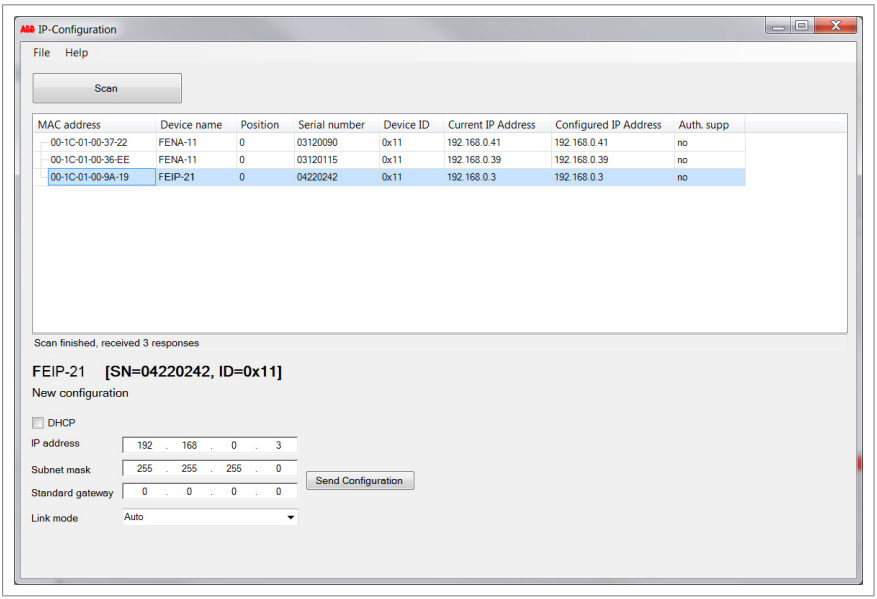


Rewriting the IP configuration of adapter modules

1. Scan the network for adapter modules.
   For instructions, refer to section Finding adapter modules in the network (page 177).
2. In the results list, select the adapter module.



3. Below **New configuration**, define the IP configuration settings according to your network configuration. If you want the adapter module to use DHCP for the IP configuration, tick the **DHCP** checkbox. If you want the adapter module to use a static IP address, clear the **DHCP** checkbox and set the IP configuration manually.
4. To apply the new settings, click the **Send Configuration** button.
   The new current IP address and configured IP address appear on the results list.



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Appendix B - Module configuration backup

Contents of this chapter

This chapter presents the settings for FEIP-21 module configuration backup.

Compatibility

FEIP-21 module settings are stored in the drive parameters and also in the configuration files. FEIP-21 module supports backup of all settings to the drive. These settings are now also included in any backups made of the drive using the Drive composer PC tool or the control panel.

Settings for backup

Consider these points:

- Backup is not slot-specific. For example, backup of FEIP-21 in FBA A, slot 1 can be restored to FEIP-21 FBA A, slot 2.
- Backup depends on the fieldbus channel. For example, backup of FEIP-21 in FBA A is not restored to FEIP-21 in FBA B.
- FEIP-21 module configuration parameters are included in the backup when drive parameters are saved.

Configuration backup for all protocols in FEIP-21

The settings are saved to the drive after 10 seconds. If a Refresh command is given to FEIP-21 module using parameter 51.27, the pending backup is transferred to drive immediately and FEIP-21 module is refreshed after the transfer is completed.

Note: The new setting is not saved to drive if the drive was powered off or the adapter was disconnected from the drive within 10 seconds of changing a setting.

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Appendix C - Replacing FENA-xx module with FEIP-21 module

Contents of this chapter

This chapter shows the configurations to replace FENA-xx with FEIP-21 module.

Compatibility

FEIP-21 module supports automatic configuration of fieldbus settings and service configuration. The automatic configuration can be performed when FENA-xx is replaced with FEIP-21 module and it is configured to use an Ethernet/IP profile. In case of other profiles (for example, Modbus), a manual configuration is needed.

Automatic configuration process

FEIP-21 module reads the fieldbus configuration parameters from the drive (group A) during the first initialization. When FEIP-21 module detects a FENA-xx or Ethernet usage, FEIP-21 module accepts the configuration settings read from the drive and overwrites the configuration back to the drive.

The configuration for FENA-xx (v3.10 or later) is stored in a backup file on the drive, for example, ACS880, v2.6 or later, ACS380/ACS580, v2.04 or later.

During the first initialization, FEIP-21 module checks the backup configuration of module type and protocol from the drive. When FEIP-21 module detects that a FENA-xx or Ethernet/IP was used, FEIP-21 module reads the backup file from the

drive and extracts the service configuration parameters configured through FENA-xx web page. The parameters recognized by FEIP-21 module (for example, ping response, IP config tool, ETH tool network) are applied and the unrecognized parameters are ignored.

After replacing FENA-xx with FEIP-21 module, FEIP-21 module automatically enables the configuration lock to prevent unwanted modifications to the service configuration.

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Appendix D - FEIP-21 module configuration web pages

Contents of this chapter

This chapter presents the FEIP-21 module configuration web pages.

Note: ABB recommends to disable the web pages after the commissioning to reduce cyber security risks. Refer to Service configuration page (page 190).

Browser requirements

You can use any web browser.

Compatibility

The web pages support all drives compatible with the FEIP-21 module.

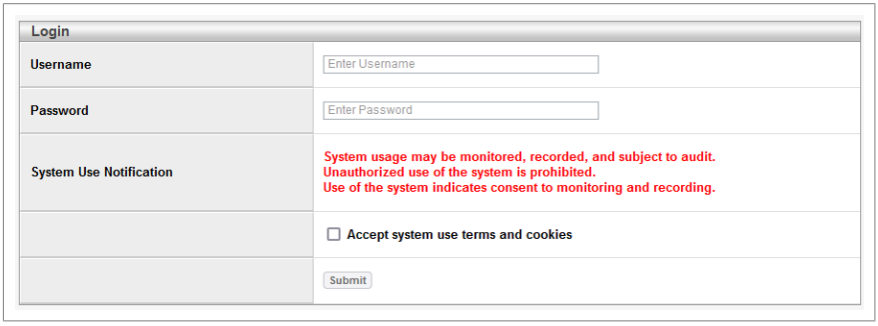
For the compatibility table, refer to Drives (page 15).

Logging in

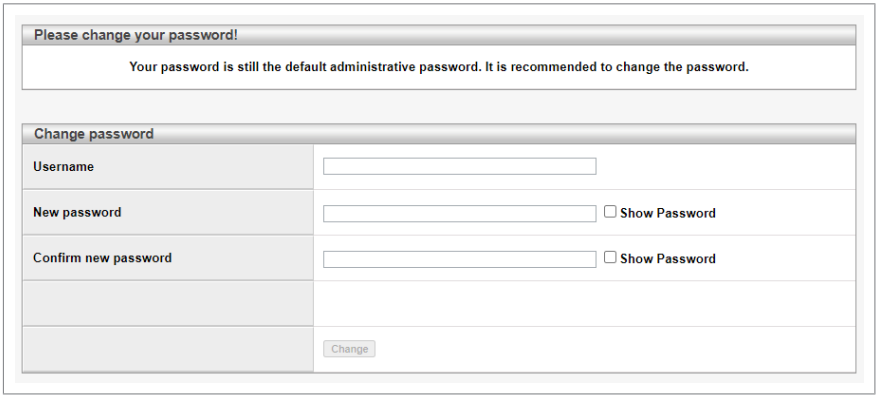
1. Open a web browser and type the IP address of the adapter module in the address field. The IP address is visible in the FEIP-21 configuration parameters, group A, parameter 5...8.

   Example: https://192.168.0.100/

2. Log in with a user name and a password.
   Default user name: admin
   Password: The last six digits of the MAC address of the adapter module, in upper case, without hyphens.
   The MAC ID is visible on the cover of the adapter module and in the ABB IP configuration tool, refer to Appendix A - ABB IP configuration tool (page 177).
   Example: If the MAC address of the adapter module is 00-1C-01-00-2F-73, the password is 002F73.
   The browser opens the user interface.



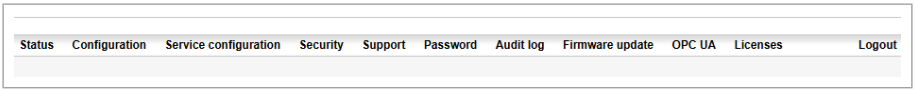
3. After successful login, you are prompted to change the default password for security reasons. ABB recommends that you change the default password. For the password restrictions, refer to Password page (page 196).



Menu overview

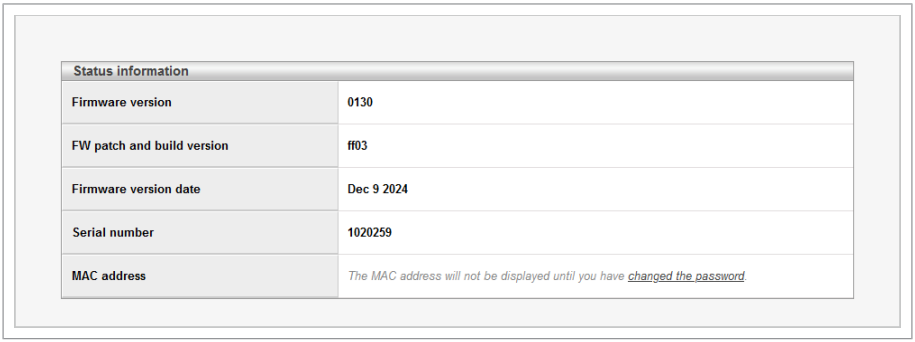
To navigate on the web pages, use the menu items available:

- Status
- Configuration
- Service configuration
- Security
- Support
- Password
- Audit log
- Firmware update
- OPC UA
- Licenses



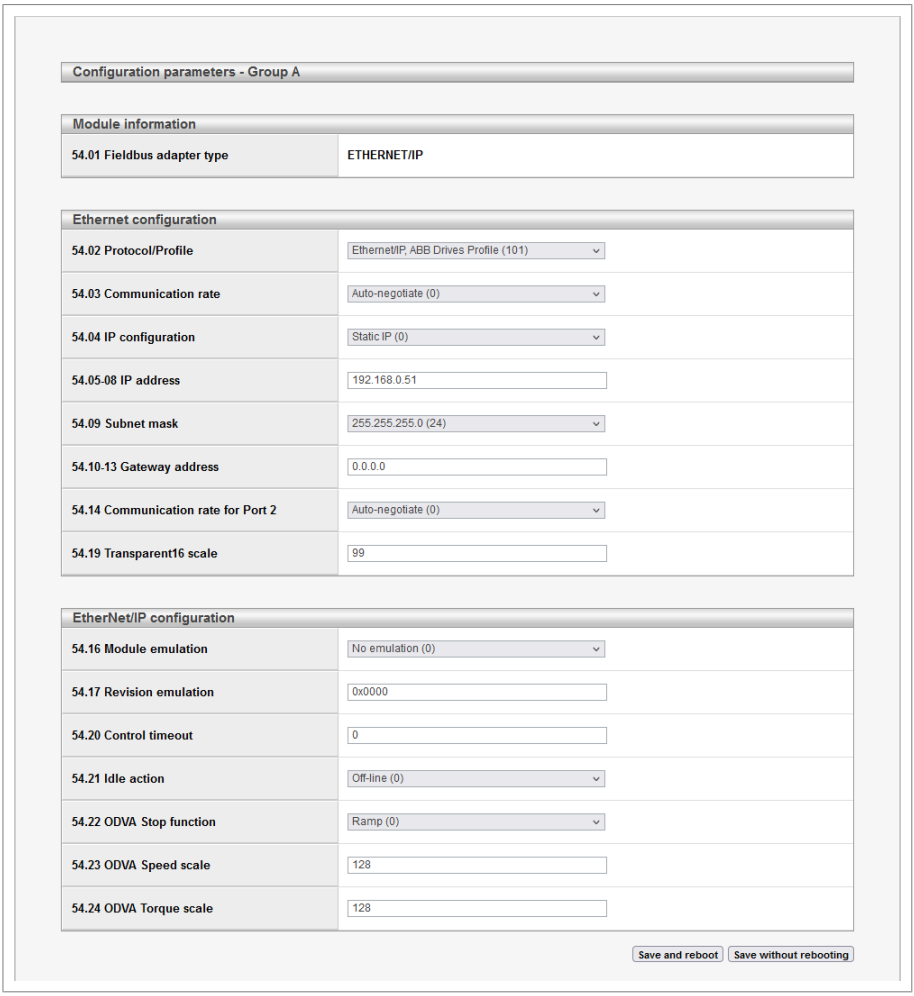
Status page

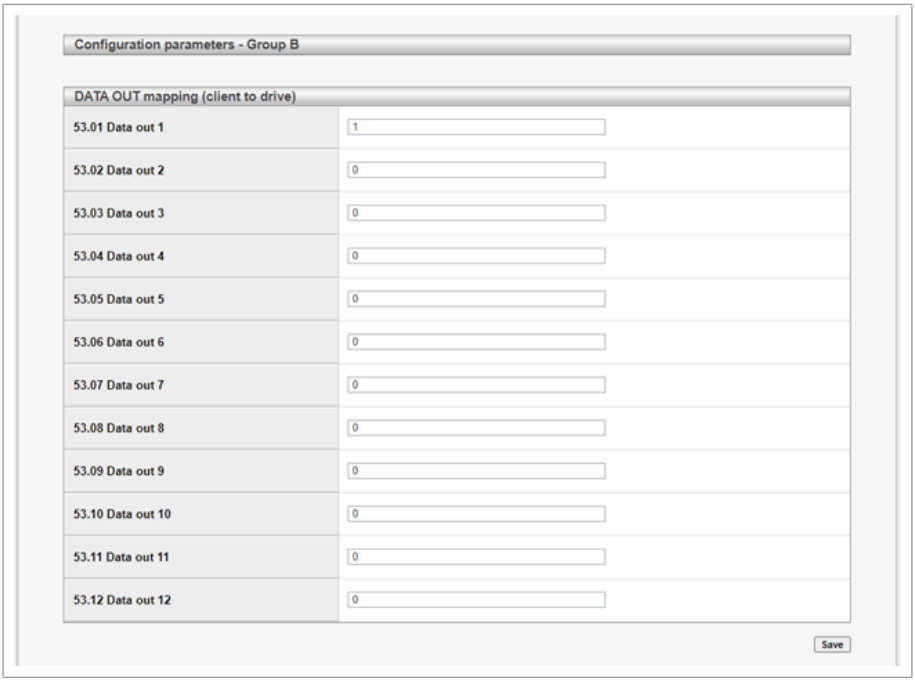
The Status page shows version information, as well as the serial number and MAC address (MAC ID) of the adapter module.



Configuration page

On the Configuration page, you can modify parameter settings in the configuration parameter groups A (1), B (2) and C (3).

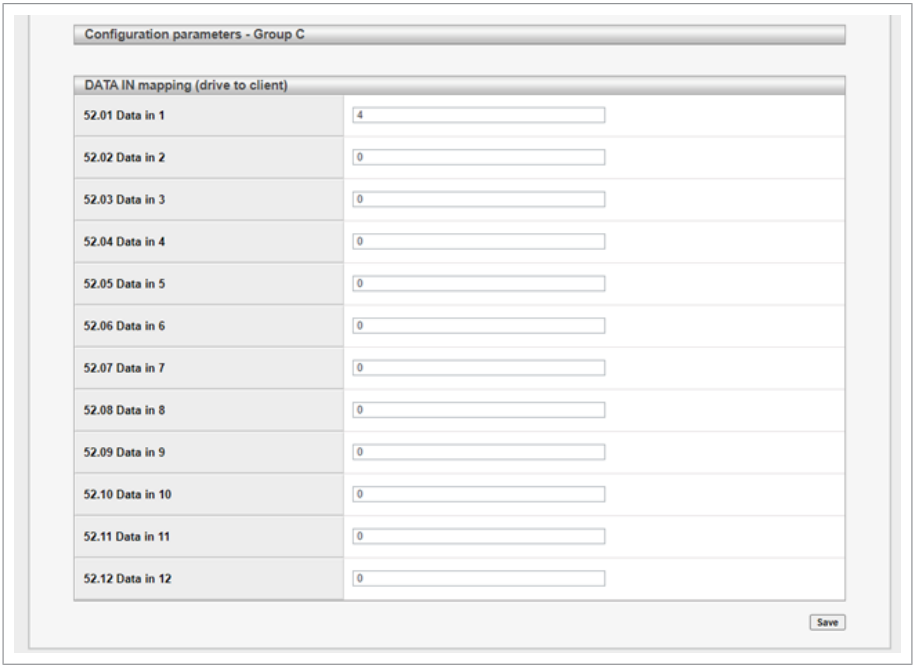




Configuration parameters - Group B

DATA OUT mapping (client to drive)	
53.01 Data out 1	1
53.02 Data out 2	0
53.03 Data out 3	0
53.04 Data out 4	0
53.05 Data out 5	0
53.06 Data out 6	0
53.07 Data out 7	0
53.08 Data out 8	0
53.09 Data out 9	0
53.10 Data out 10	0
53.11 Data out 11	0
53.12 Data out 12	0

Save



Configuration parameters - Group C

DATA IN mapping (drive to client)	
52.01 Data in 1	4
52.02 Data in 2	0
52.03 Data in 3	0
52.04 Data in 4	0
52.05 Data in 5	0
52.06 Data in 6	0
52.07 Data in 7	0
52.08 Data in 8	0
52.09 Data in 9	0
52.10 Data in 10	0
52.11 Data in 11	0
52.12 Data in 12	0

Save

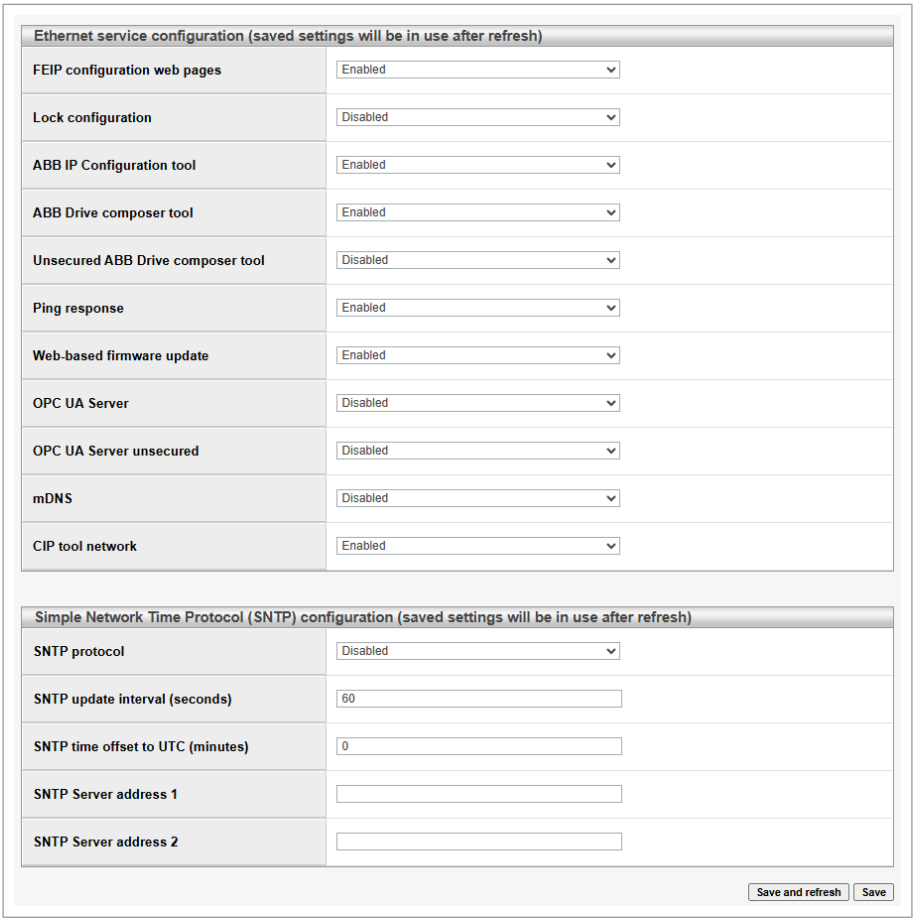
After you change any setting in any of the groups, click Save and refresh at the bottom of Group A to validate the settings.

Service configuration page

On the Service configuration page, you can enable, disable, or configure following Ethernet services:

- access to FEIP-21 module configuration web page
- allow changing IP settings remotely via ABB IP configuration tool
- remote access drive with Drive composer tool via Ethernet tool network
- Ping response
- web-based firmware update
- OPC UA server
- mDNS
- configure SNTP

The new settings take effect after refresh of the module. You can click Save and refresh, to validate the new settings immediately or click Save if you want to do other settings also and refresh after all the changes are done.



Note: These settings are available only through web pages. When you select to disable the web page, a warning appears to confirm before you can save the selection.

To enable the web page again, refer to Enable web page access if it is disabled (page 202).

ABB recommends that you disable all services that are not used after commissioning.

Configuring SNTP

You can use the Simple Network Time Protocol (SNTP) to synchronize drive time with a network time server. When SNTP is enabled, FEIP-21 module requests the time from the configured server at a given interval. To receive this time

synchronization, set parameter 96.20 Time sync primary source to Fieldbus A. The table shows the settings for SNTP:

Settings	Description	Value
SNTP update interval	Interval to request time from server.	Default: 60 seconds Minimum: 1 second
SNTP time offset to UTC	Time offset to the time received from SNTP. This value can also be set over Ethernet/IP Class 91h, Instance 10, attribute 1. **Note:** SNTP time offset change does not need a device refresh.	-1440…1440 minutes
SNTP server address 1	Primary server address for requesting time. Format: IP address followed by optional port number, eg: 192.168.0.1:123 **Note:** If port number is missing, the default NTP port number "123" is used.	-
SNTP server address 2	Secondary server address used if the request to server 1 fails.	-

Security page

On the Security page, you can upload a private key and certificates for FEIP-21 module to use instead of the self-signed certificate that FEIP-21 module uses as a default. You can upload and manage Drive Composer certificate files on Security page under "Drive Composer certificate settings". Up to four certificates are supported at a time.

FEIP-21 module uses secure HTTPS (TLS 1.2) communication for the web page server. By default, FEIP-21 module does not require client authentication for the PC tool communication. You can use client authentication to improve the system security.

If unsecured communication is required, you can enable it from Service configuration page or by setting bit 4 of parameter 51.15 Service configuration. When unsecured communication is enabled, the PC tool communication is not encrypted or authenticated.

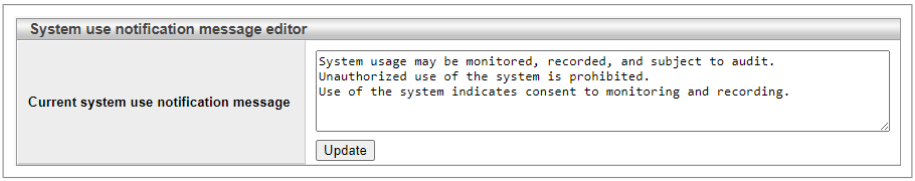
For more details, refer to Drive Composer start-up and maintenance PC tool user's manual (3AUA0000094606 [English]).

Note: Secure PC tool communication is possible with Drive Composer Pro version 2.7 or later.

Note: The uploaded certificates and keys take effect after you refresh the adapter.

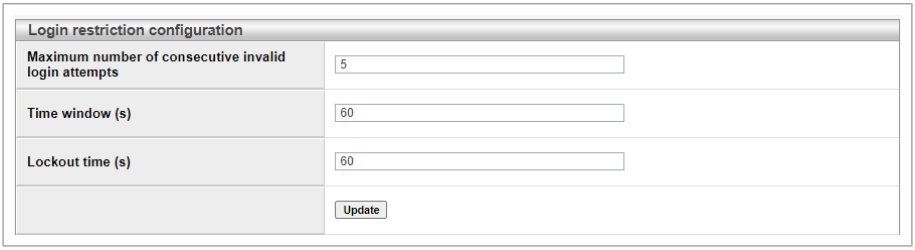
System use notification message editor

A system use notification message is displayed on the login page. On the security page, you can edit the system use message notification. Updates to the message will appear the next time a user visits the login page.



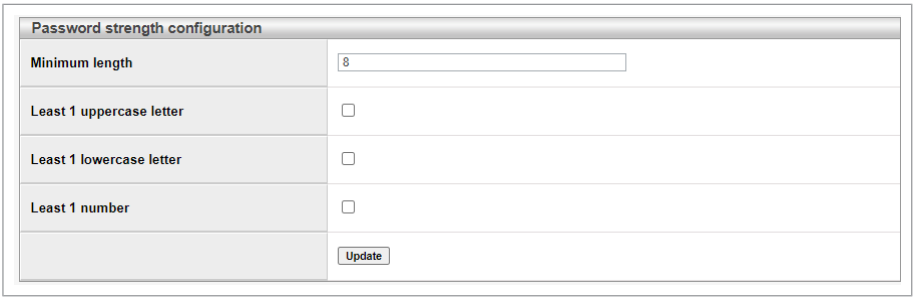
Configuring login restrictions

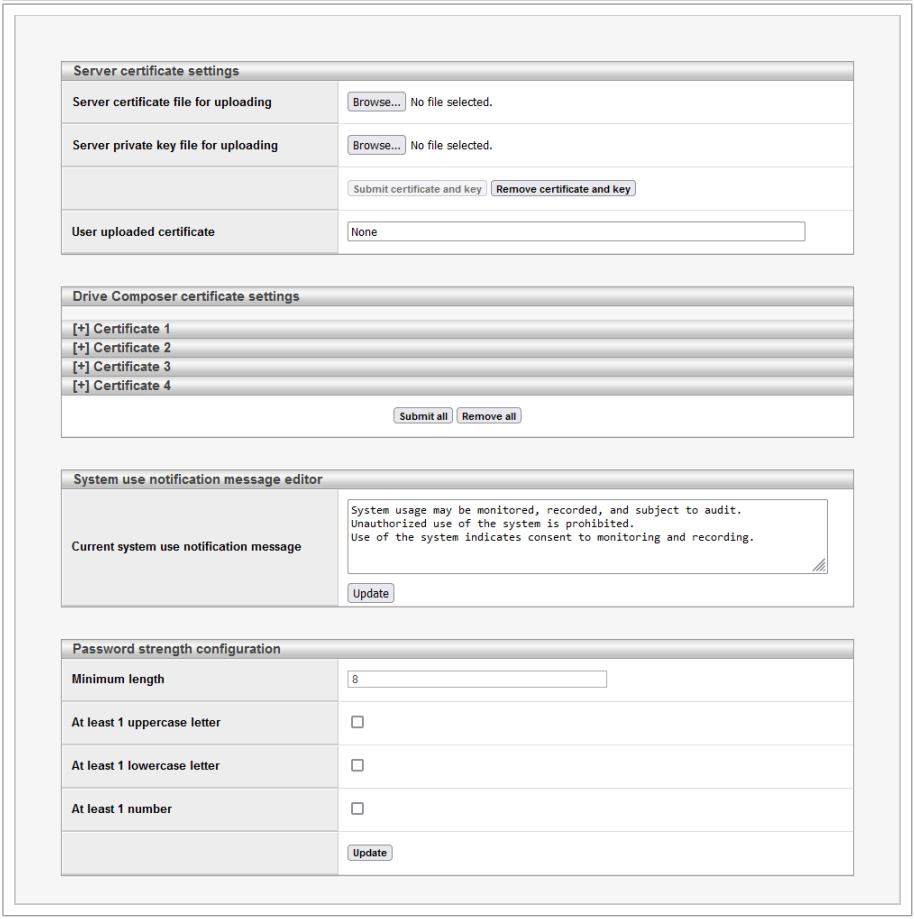
By default, the Login page allows up to 5 consecutive invalid login attempts in 1 minute. When the limit is reached, the page locks for 1 minute. It unlocks automatically at the end of the lockout period, and the user can try again. Use the Login restriction configuration to change these settings.



Password strength configuration

On the security page, you can use the password strength editor to enforce requirements for the password. You can set minimum password length and the requirement for at least one uppercase letter, lowercase letter and number. Any changes on the restrictions are applied next time when the password is changed on the Password page.

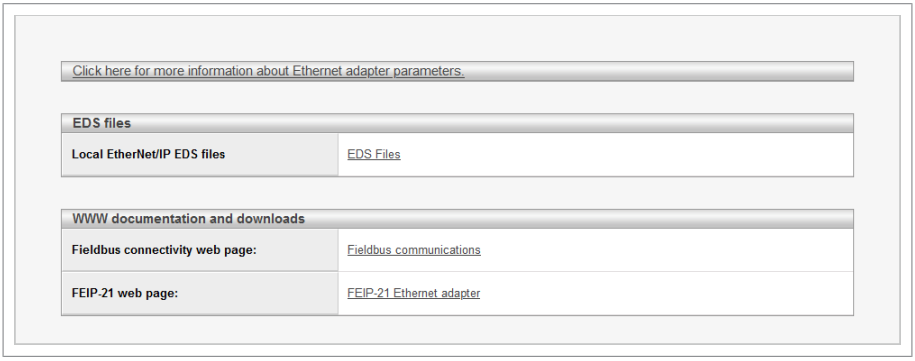




Support page

On the Support page, you can access documentation related to the adapter module and the EDS file.

The latest files corresponding to the drive firmware are available through the hyperlinks listed under "WWW documentation and downloads". You can find more information about each parameter under "Click here for more information about fieldbus parameters".



Password page

NOTICE ABB recommends that you change the default password and username as soon as possible.

On the Password page, you can change your password and username.

FEIP-21 module supports only one user access level.

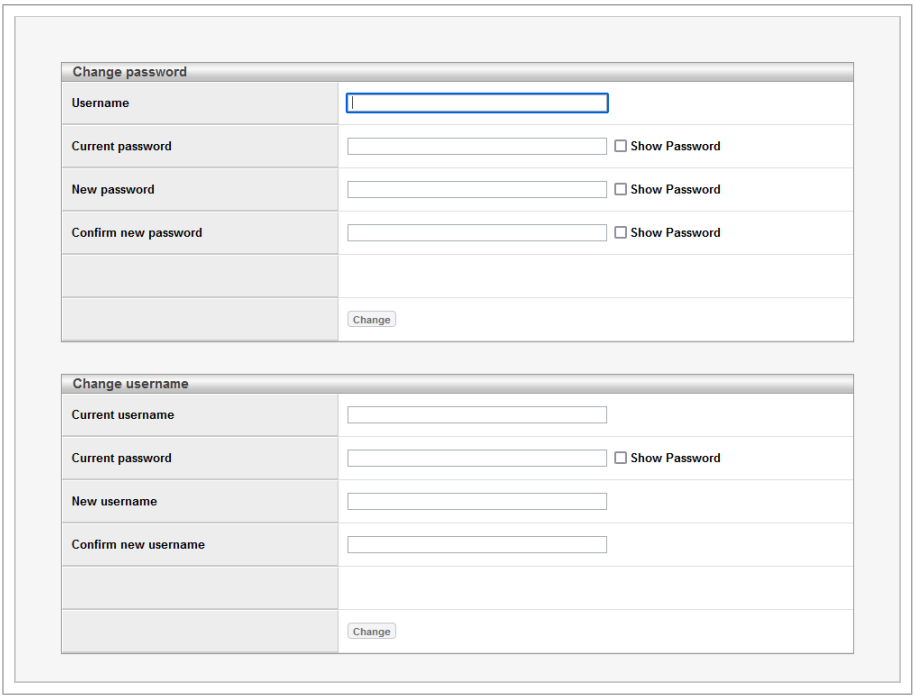
By default, the password must contain:

- 8 to 64 characters.

You can adjust the password strength settings on the Security page with the Password strength configuration, refer to Password strength configuration (page 193).

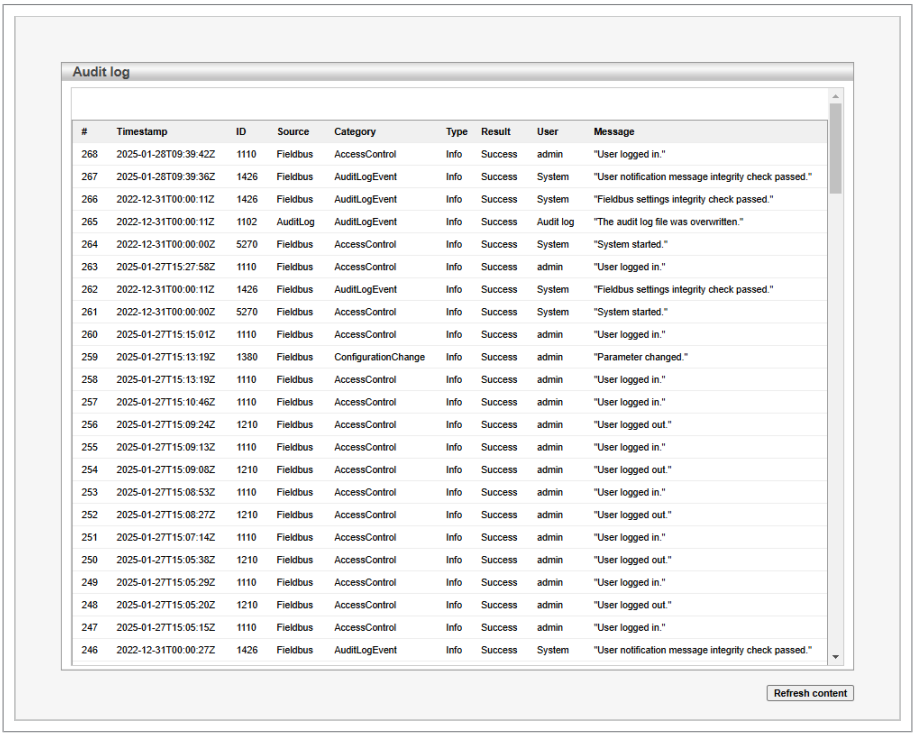
The username must contain:

- 5 to 20 characters
- no special characters or spaces (only uppercase letters, lowercase letters and numbers are allowed).



Audit log page

On the Audit log page, you can view recent events. Administrator rights are required. To update the event list, select **Refresh content** or reload the page.



#	Timestamp	ID	Source	Category	Type	Result	User	Message
268	2025-01-28T09:39:42Z	1110	Fieldbus	AccessControl	Info	Success	admin	"User logged in."
267	2025-01-28T09:39:36Z	1426	Fieldbus	AuditLogEvent	Info	Success	System	"User notification message integrity check passed."
266	2022-12-31T00:00:11Z	1426	Fieldbus	AuditLogEvent	Info	Success	System	"Fieldbus settings integrity check passed."
265	2022-12-31T00:00:11Z	1102	AuditLog	AuditLogEvent	Info	Success	Audit log	"The audit log file was overwritten."
264	2022-12-31T00:00:00Z	5270	Fieldbus	AccessControl	Info	Success	System	"System started."
263	2025-01-27T15:27:58Z	1110	Fieldbus	AccessControl	Info	Success	admin	"User logged in."
262	2022-12-31T00:00:11Z	1426	Fieldbus	AuditLogEvent	Info	Success	System	"Fieldbus settings integrity check passed."
261	2022-12-31T00:00:00Z	5270	Fieldbus	AccessControl	Info	Success	System	"System started."
260	2025-01-27T15:15:01Z	1110	Fieldbus	AccessControl	Info	Success	admin	"User logged in."
259	2025-01-27T15:13:19Z	1380	Fieldbus	ConfigurationChange	Info	Success	admin	"Parameter changed."
258	2025-01-27T15:13:19Z	1110	Fieldbus	AccessControl	Info	Success	admin	"User logged in."
257	2025-01-27T15:10:46Z	1110	Fieldbus	AccessControl	Info	Success	admin	"User logged in."
256	2025-01-27T15:09:24Z	1210	Fieldbus	AccessControl	Info	Success	admin	"User logged out."
255	2025-01-27T15:09:13Z	1110	Fieldbus	AccessControl	Info	Success	admin	"User logged in."
254	2025-01-27T15:09:08Z	1210	Fieldbus	AccessControl	Info	Success	admin	"User logged out."
253	2025-01-27T15:08:53Z	1110	Fieldbus	AccessControl	Info	Success	admin	"User logged in."
252	2025-01-27T15:08:27Z	1210	Fieldbus	AccessControl	Info	Success	admin	"User logged out."
251	2025-01-27T15:07:14Z	1110	Fieldbus	AccessControl	Info	Success	admin	"User logged in."
250	2025-01-27T15:05:38Z	1210	Fieldbus	AccessControl	Info	Success	admin	"User logged out."
249	2025-01-27T15:05:29Z	1110	Fieldbus	AccessControl	Info	Success	admin	"User logged in."
248	2025-01-27T15:05:20Z	1210	Fieldbus	AccessControl	Info	Success	admin	"User logged out."
247	2025-01-27T15:05:15Z	1110	Fieldbus	AccessControl	Info	Success	admin	"User logged in."
246	2022-12-31T00:00:27Z	1426	Fieldbus	AuditLogEvent	Info	Success	System	"User notification message integrity check passed."

Firmware update page

On the Firmware update page, you can view the current firmware version of the adapter module and update the firmware. The firmware update requires adapter restart, so you cannot start the firmware update if the drive is currently controlled by the fieldbus adapter. All Ethernet communication to the drive (including Drive composer and OPC UA) will be lost during the firmware update.

NOTICE ABB recommends that you update the FEIP-21 module only when the drive is in local mode and not operational.

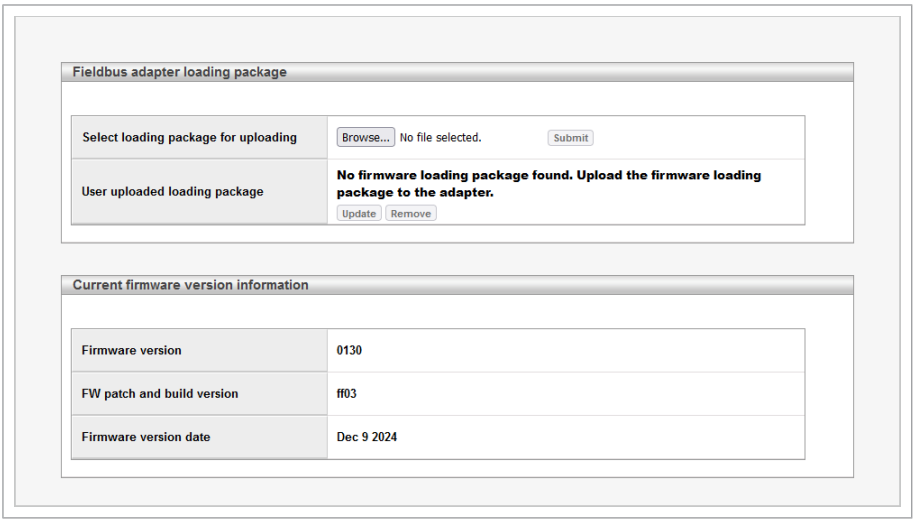
To update the adapter firmware, first upload the firmware loading package:

Note: Contact ABB to get the firmware loading package

- Click Browse.
- Select the correct firmware loading package (.lpe).

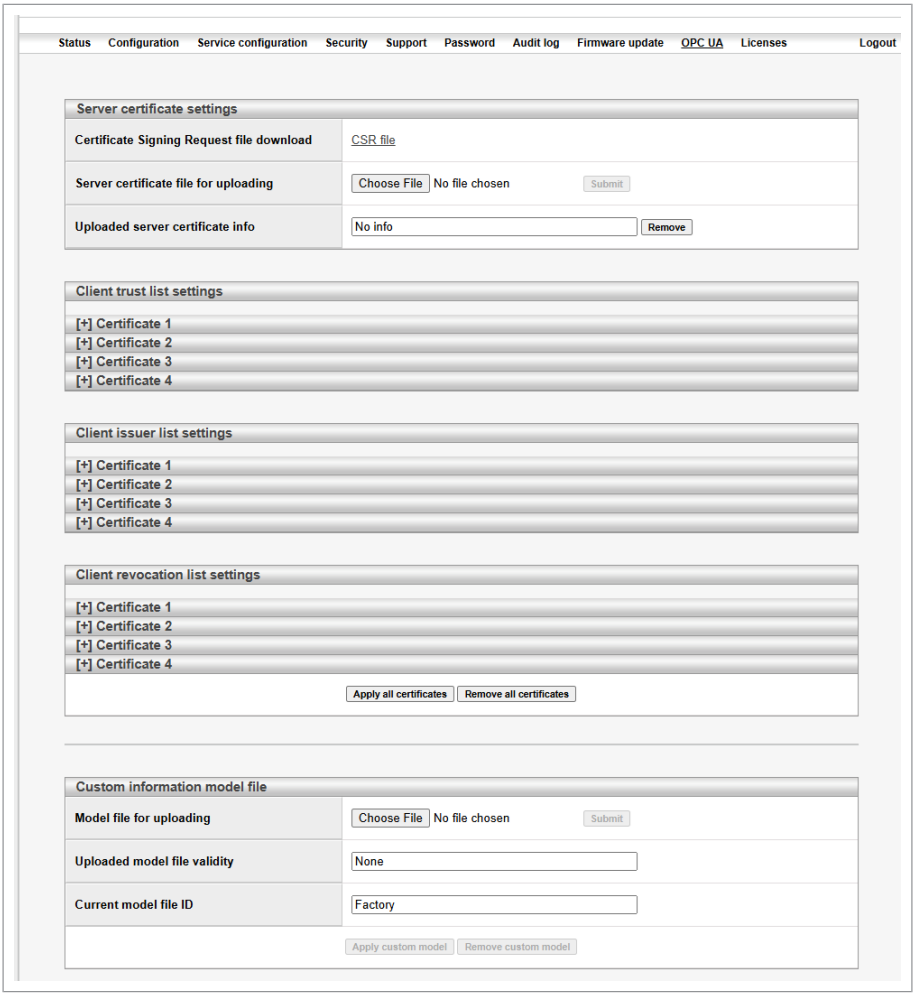
- Click Submit.

After uploading the firmware loading package, click Update to start the firmware update. The adapter restarts to complete the firmware installation.



OPC UA configuration page

On the OPC UA configuration page you can upload server certificates, maintain client trust, issuer and revocation lists, and install custom information models.



OPC UA server certificate settings

To upload an OPC UA server certificate to the FEIP-21 module:

1. Download the Certificate Signing Request file (CSR) from section Certificate Signing Request file download.
2. Have the CSR file signed by your Certificate Authority (CA).
3. Select **Choose file** and browse for the signed certificate file you want to upload.
4. Select **Submit**.
5. The Uploaded server certificate info shows ValidNotApplied.

6. Select **Apply all certificates**. The server will restart. After the restart, wait until the module becomes available before reconnecting via OPC UA.

Managing client certificate lists

The FEIP-21 module supports three client certificate management lists that can be configured in OPC UA configuration page:

- **Client Trust List**: Contains trusted client certificates
- **Client Issuer List**: Contains Certificate Authority (CA) certificates for validating certificate chains
- **Client Revocation List**: Contains revoked certificates

Note: If all these lists are empty, no validation policy is used.

To upload a certificate to the FEIP-21 module:

1. Select **Choose file** and browse for the certificate file you want to upload.
2. Select **Submit**.
3. The **Uploaded trust list info** shows ValidNotApplied.

   Note: If you upload an issuer (CA) certificate or a revocation list (CRL), the text is **Uploaded issuer list validity**.

4. Select **Apply all certificates**. The server will restart. After the restart, wait until the module becomes available before reconnecting via OPC UA.

Certificate chain validation requirements

The FEIP-21 module requires explicit management of both trust and issuer lists for CA-signed certificates.

1. **Self-signed certificates**: Must be in the Client trust list
2. **CA-signed certificates**: Require both the client certificate in the Client trust list and the issuing CA in the Client issuer list.

The table shows connection requirements by certificate type.

Certificate type	Trust list requirement	Issuer list requirement	Connection result
Self-signed	Client certificate must be uploaded	Not required	Connection allowed
CA-signed	Client certificate must be uploaded	Issuing CA must be uploaded	Connection allowed
CA-signed	Client certificate is missing	Issuing CA must be uploaded	Connection denied

Certificate type	Trust list requirement	Issuer list requirement	Connection result
CA-signed	Client certificate is missing	Issuing CA must be uploaded	Connection denied

Using custom information model with OPC UA

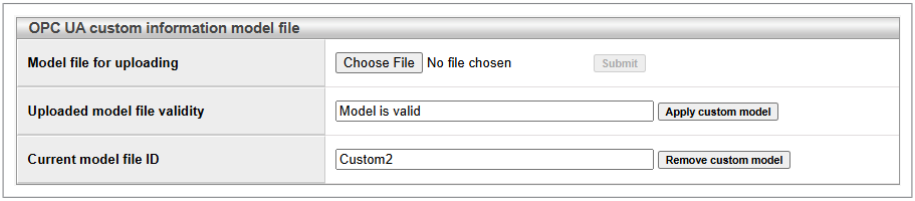
You can install a custom OPC UA information model on the adapter. The custom model replaces the default information model.

Note: Contact ABB if you want your model to have access to other parameters and signals, including writing values.

Select **Choose file**. In the file dialog, select the .sqlite model file to apply and select **Submit**. The adapter uploads the file and runs a validity check. When the check completes, the page shows a status message. If the file is valid, select **Apply custom model** to activate it. If the file is not valid, the adapter deletes the file.

When you apply a valid model, the OPC UA server restarts and uses the custom model instead of the default model. The page shows the model file ID after upload or activation.

To return to the factory model, select **Remove custom model**. The OPC UA server restarts and starts to use the default model.



Licenses page

The License page shows a list of open-source licenses used in the adapter. Click the plus sign to expand a license and view its agreement.



Reset FEIP-21 module web page password to default

You can reset the FEIP-21 module web page password to factory default.

Note: The password can be reset only with local access to the drive.

1. Disconnect all cable connections to FEIP-21 module.
   The NET led should switch off.
2. Write 0 (zero) to the parameter 26 under Group A (for example, 51.26).
3. Refresh the settings by selecting Refresh in parameter 27 (for example, 51.27).
4. Write 17989 to parameter 26 under Group A.
5. Refresh the settings by selecting Refresh in parameter 27.
6. Write 20033 to parameter 26 under Group A.
7. Refresh the settings by selecting Refresh in parameter 27.
8. Write 0 to parameter 26 under Group A.

FEIP-21 module password is now reset to the default password. For information of default password, refer to Logging in (page 186).

Enable web page access if it is disabled

You can enable the access to web pages with drive parameters.

1. Disconnect all cable connections to FEIP-21 module.
   The NET led should switch off.
2. Write 0 (zero) to the parameter 26 under Group A (for example, 51.26).
3. Refresh the settings by selecting Refresh in parameter 27 (for example, 51.27).
4. Write 87 to parameter 26 under Group A.
5. Refresh the settings by selecting Refresh in parameter 27.
6. Write 17730 to parameter 26 under Group A.
7. Refresh the settings by selecting Refresh in parameter 27.
8. Write 0 to parameter 26 under Group A.

Access to web pages is now enabled.

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Appendix E - Firmware update using the Drive Composer

Contents of this chapter

This chapter provides instructions on how to update FEIP-21 module using the Drive Composer.

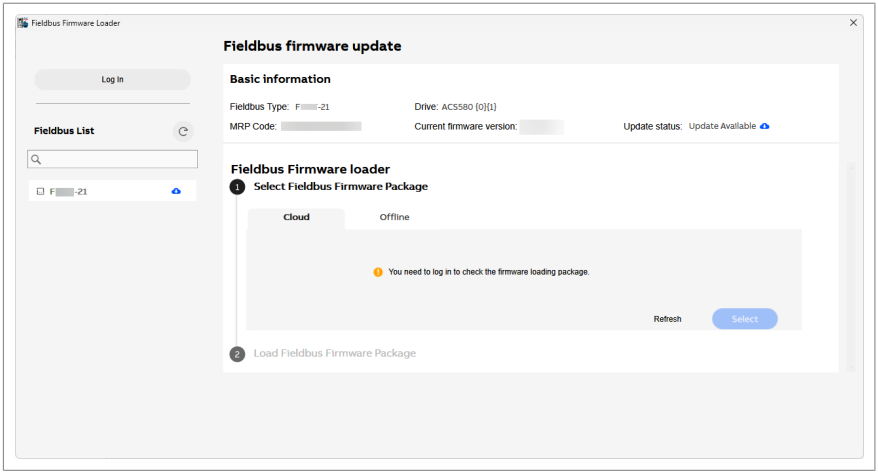
Note: To update the firmware using the Configuration web pages of the module, refer to Firmware update page (page 197).

How to update firmware using the Drive Composer

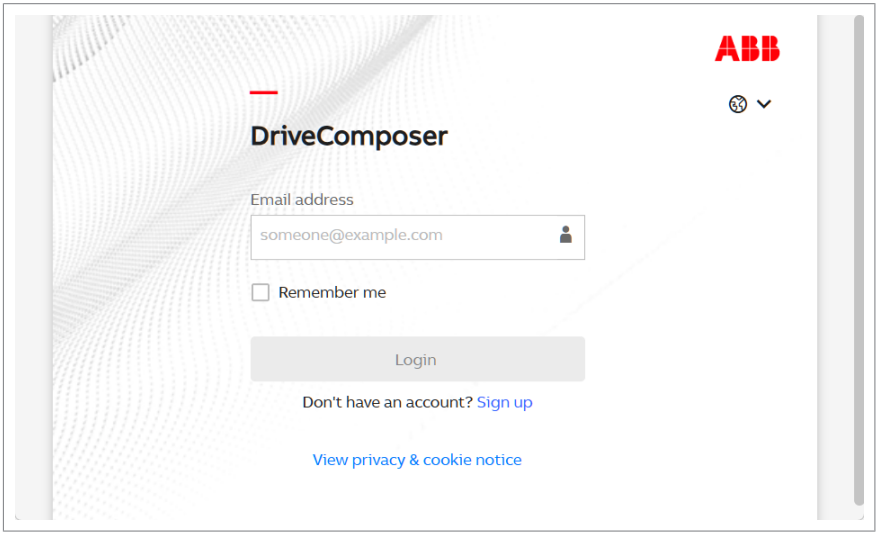
To update the FEIP-21 module firmware using the Drive Composer, follow these steps:

- Connect the Drive Composer to a drive via Ethernet tool network using FEIP-21 module
- In Drive Composer, select **Tools > Fieldbus adapter loader** option from the menu bar

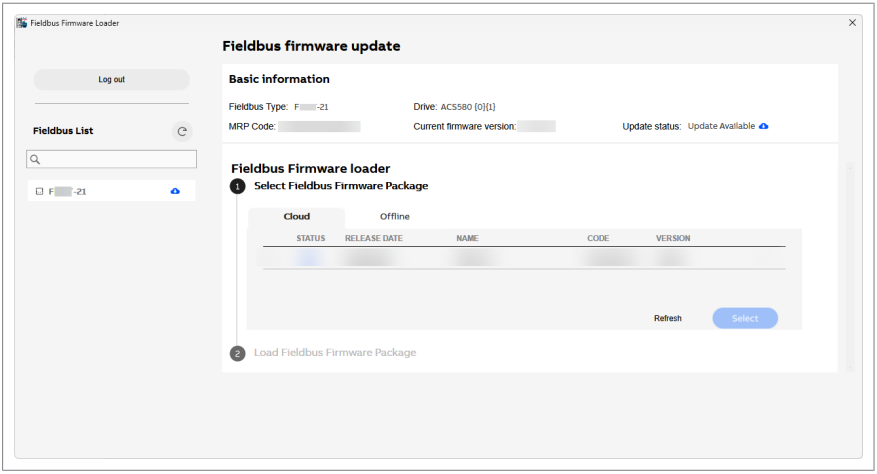
- You need to log in to portal to be able to continue



- Log in to portal



- After logging in, select the firmware version you want to update.



- Current firmware version and the firmware version to be updated are shown. Make sure they are relevant. Click the **Next** button.
- Connection refresh is required during the update. When the dialogue window opens click the **Refresh** button to continue.
- Wait for the update to complete. Click **Close**.
- Make sure the current firmware version shows the updated firmware version number.

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Appendix F - OPC UA server

Contents of this chapter

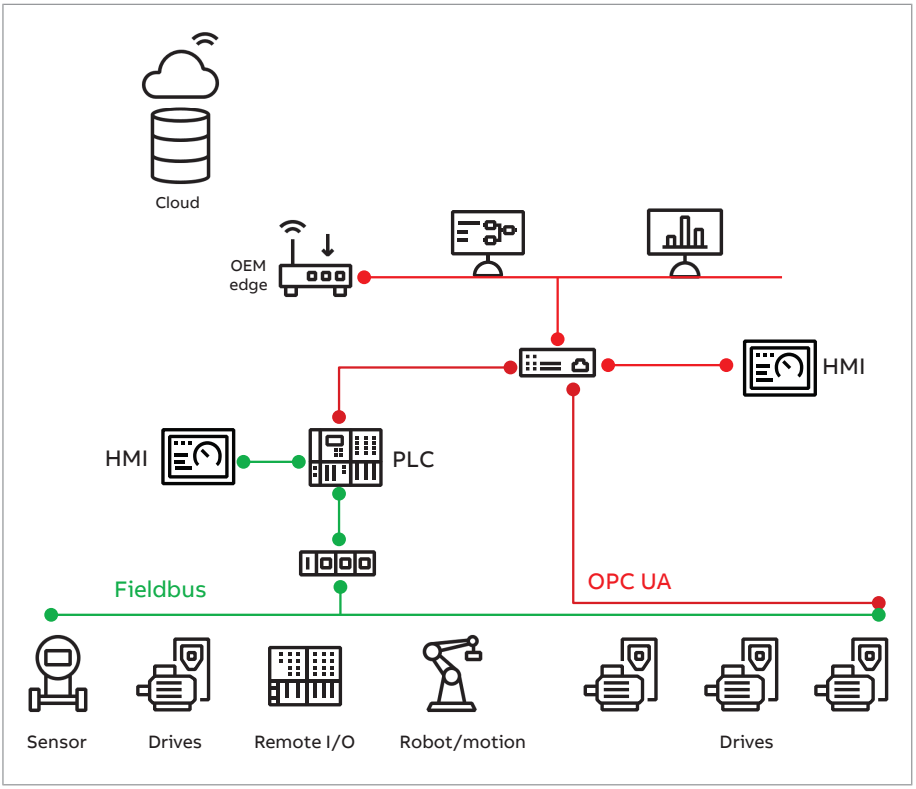
This chapter provides instructions on how to enable, configure, and use the OPC UA server and client.

OPC UA

OPC UA is a communication protocol for interoperability and data exchange between different devices, systems and applications. OPC UA stands for Open Platform Communications Unified Architecture, and it is based on open standards and technologies.

OPC UA provides a secure, reliable and scalable way to access data from drives and other sources. OPC UA supports different transport protocols, data formats and encryption methods. OPC UA supports strong authentication methods that differentiate the client and user with fine granular role-based access rights.

With OPC UA, users can access real-time and historical data and events from drives, such as speed, torque, current, voltage, temperature, alarms, faults and diagnostic codes. OPC UA allows users to create custom views and dashboards of the drive data, as well as to integrate the drive data with other systems and applications, such as SCADA, HMI, MES, ERP and cloud services. OPC UA enables data collection parallel to various protocols and networks, such as EtherNet/IP.



Compatibility

OPC UA server enables ABB drives to operate with any OPC UA compliant client. OPC UA requires FEIP-21 version 1.30 or later.

Supported drives:

- ACS380 machinery control program version 2.20.0.13 and later
- ACS480 standard control program version 2.20.0.13 and later
- ACH480 standard control program version 2.20.0.13 and later
- ACS580 standard control program version 2.20.0.13 and later
- ACH580 HVAC control program version 2.20.0.13 and later
- ACQ580 pump control program version 2.20.0.13 and later
- ACS880 primary control program version 2.90.0.0 and later

Note: The previous software version is also fully compatible with OPC UA, but it does not support access to drive events.

Supported services and features

The OPC UA server supports these OPC UA services and features:

- Read and write service: Read and write OPC UA node data.
- Browse service: Examine the OPC UA server address space and read the OPC UA nodes and their attributes.
- Supported endpoints: For secure and encrypted communication between the OPC UA server and the client. Support for None, Sign and Sign & Encrypt security modes. Support for None, Basic128RSA15 and Basic 256 security policies. For more information, refer to Encrypted Communication.
- Subscription and monitored item service: Subscribe to OPC UA node data and notifications when the data changes.
- Event service: Subscribe to Drives events, warnings, faults and receiving notifications when events occur. Historical event access is available.
- Information model: OPC UA Device Integration (DI) information model for asset and actual value monitoring. OPC UA FX (Field eXchange) information model to represent assets information for drives, motors and interface adapters.
- Anonymous user authentication modes
- Accessible to multiple OPC UA clients at the same time.

Discovery service

The Discovery Service enables OPC UA clients to automatically detect devices running an OPC UA server on the local network by using mDNS for service advertisement.

Enabling and Disabling the Discovery service

Set the Discovery service in parameter 51.15 bit 9. The default is disabled. To enable the Discovery service, set the bit to 1. To disable it, set the bit to 0.

Availability

The Discovery service works only if the OPC UA server is enabled and running.

mDNS query

To discover the OPC UA service, use query:

_opcua-tcp._tcp.local.

This query lists the devices that have the Discovery service enabled.

Device hostnames

If the device does not have a predefined hostname, the default hostname format is:

<DriveType>-<SerialNumber>-<SlotNumber>

Enabling OPC UA server on an ABB drive

The OPC UA server on the ABB drive is not enabled by default. You can enable the OPC UA server with parameter 15 Service configuration, bit 7.

Note: After you enable the OPC UA server for the first time or if the IP address changes, the OPC UA server creates a self-signed certificate. This can take up to 60 seconds.

Note: For the OPC UA timestamps to function properly, the drive time must be synchronized with the universal coordinated time (UTC). Set the drive time to UTC before establishing the OPC UA connection. You can use the drive control panel or drive composer tool to adjust the drive time. ABB recommends SNTP (Simple Network Time Protocol) server to synchronize the time of all drives to same source. Refer to Configuring SNTP (page 191).

Encrypted Communication

The OPC UA server supports encrypted communication with different security policies. The OPC UA server provides the following endpoints for encrypted communication:

- **None:** No encryption or signing. It is deactivated by default. Use this only for testing or in trusted networks. To enable it, refer to parameter 15 Service configuration, bit 8.

  NOTICE ABB recommends that you do not use None in unprotected networks to reduce cyber security risks.

- **Sign with Basic256Sha256:** This endpoint uses SHA-256 as the hash algorithm and RSA as the signature algorithm with 256-bit keys. It signs the messages but does not encrypt them. It is deactivated by default. Use this only when encryption is not required or supported by the client. To enable it, refer to parameter 15 Service configuration, bit 8.
- **SignAndEncrypt with Basic256Sha256:** This endpoint uses SHA-256 as the hash algorithm, RSA as the signature algorithm with 256-bit keys, and AES as the encryption algorithm with 256-bit keys. It signs and encrypts the messages. This is the recommended endpoint for most applications.
- **Sign with Aes128_Sha256_RsaOaep:** This endpoint uses SHA-256 as the hash algorithm, RSA with OAEP padding as the signature algorithm with 2048-bit keys, and AES as the encryption algorithm with 128-bit keys. It signs the

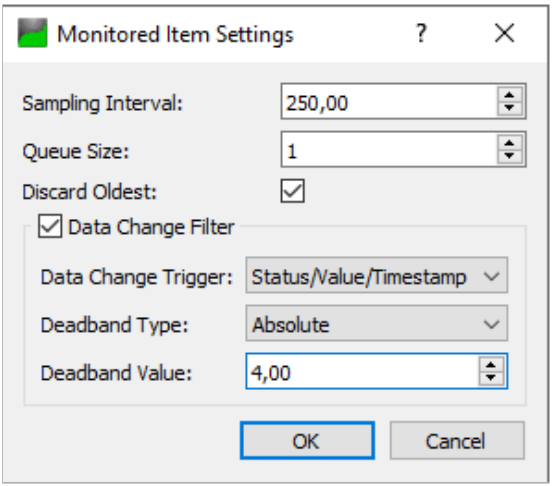
messages but does not encrypt them. It is deactivated by default. Use this only when the client does not support Basic256Sha256. To enable it, refer to parameter 15 Service configuration, bit 8.

- **SignAndEncrypt with Aes128_Sha256_RsaOaep:** This endpoint uses SHA-256 as the hash algorithm, RSA with OAEP padding as the signature algorithm with 2048-bit keys, and AES as the encryption algorithm with 128-bit keys. It signs and encrypts the messages. This endpoint offers a higher level of security than Basic256Sha256. Use this endpoint when the client supports it.

To use an encrypted endpoint, the OPC UA client software must provide a valid certificate and trust the certificate of the OPC UA server. The certificates are used to authenticate the identity of the OPC UA server and the client and to exchange the encryption keys. The certificates can be self-signed or issued by a trusted authority. The OPC UA server and the client must also have the same security policy and security mode selected for the encrypted communication to work. The OPC UA client software can display the available endpoints of the OPC UA server and allow the user to choose the preferred one.

OPC UA subscription

The OPC UA server supports up to 50 subscriptions. An OPC UA subscription lets an OPC UA client software get data changes and events from the OPC UA server. The OPC UA client sets the monitored items, the sampling interval, the publishing interval, and other parameters for the subscription. The publishing interval is the time between notification messages from the OPC UA server. The monitored items are the variables or events that the OPC UA client software wants to get updates on. Each monitored item has a sampling interval, which is the frequency with which the OPC UA server checks its value or status. The OPC UA server sends notification messages with the data changes or events to the OPC UA client software at the publishing interval. The OPC UA client software can create, modify, or delete subscriptions as needed.


Monitored Item Settings
?
Sampling Interval:
250,00
Queue Size:
1
Discard Oldest:
Data Change Filter
Data Change Trigger:
Status/Value/Timestamp
Deadband Type:
Absolute
Deadband Value:
4,00
OK
Cancel

Accessing drive events and event log with OPC UA

The OPC UA server can send OPC UA Events to inform an OPC UA client about drive events, such as warnings and faults.

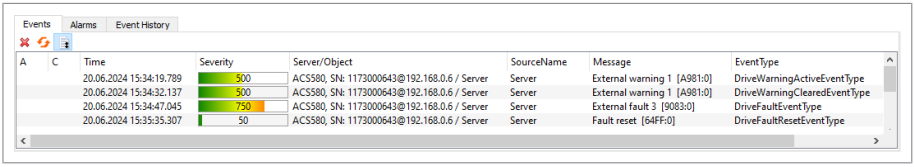
Drive events use specific event types derived from 1:DriveEventType.

<table>
<tr><th>Property Browse-Name</th><th>Data type</th><th>Description</th></tr>
<tr><td>EventId</td><td>NodeId</td><td>A unique identifier for the event. This identifier can be used to distinguish between different events.</td></tr>
<tr><td>EventType</td><td>NodeId</td><td>Identifies the type of the event. It specifies the event type that is instantiated.
The following event types are supported:
<table><tr><th>EventType</th><th>Description</th></tr><tr><td>1:DriveFaultEventType</td><td>Generate on fault</td></tr><tr><td>1:DriveWarningActiveEventType</td><td>Generate when warning activates</td></tr><tr><td>1:DriveWarningClearedEventType</td><td>Generate when warning is cleared</td></tr><tr><td>1:DrivePureEventType</td><td>Generate on general notification</td></tr><tr><td>1:DriveFaultResetEventType</td><td>Generate on fault reset</td></tr></table></td></tr>
<tr><td>SourceNode</td><td>NodeId</td><td>Node that caused the event. SourceNode is always "i=2253".</td></tr>
<tr><td>Message</td><td>LocalizedText</td><td>A human-readable description of the event. It shows the drive event name including fault code and aux code in HEX format.</td></tr>
<tr><td>Severity</td><td>UInt16</td><td>Represents the severity of the event. It provides an indication of the urgency or importance of the event.
50: Fault reset
100: Event
500: Warning
750: Fault</td></tr>
</table>

Property Browse-Name	Data type	Description
SourceName	String	DisplayName of the object node (SourceNode) that caused the event. = "Server"
Time	UtcTime	Indicates the time the event occurred. This is the time the event is generated.
ReceiveTime	UtcTime	Indicates the time the server received the event over drive back end (option card interface)
1:BasicCode	UInt16	The drive event code
1:AuxCode	UInt32	Auxiliary code of the drive event code

Note: ns=1: http://www.abb.com/Motion.

Example of the event notification:

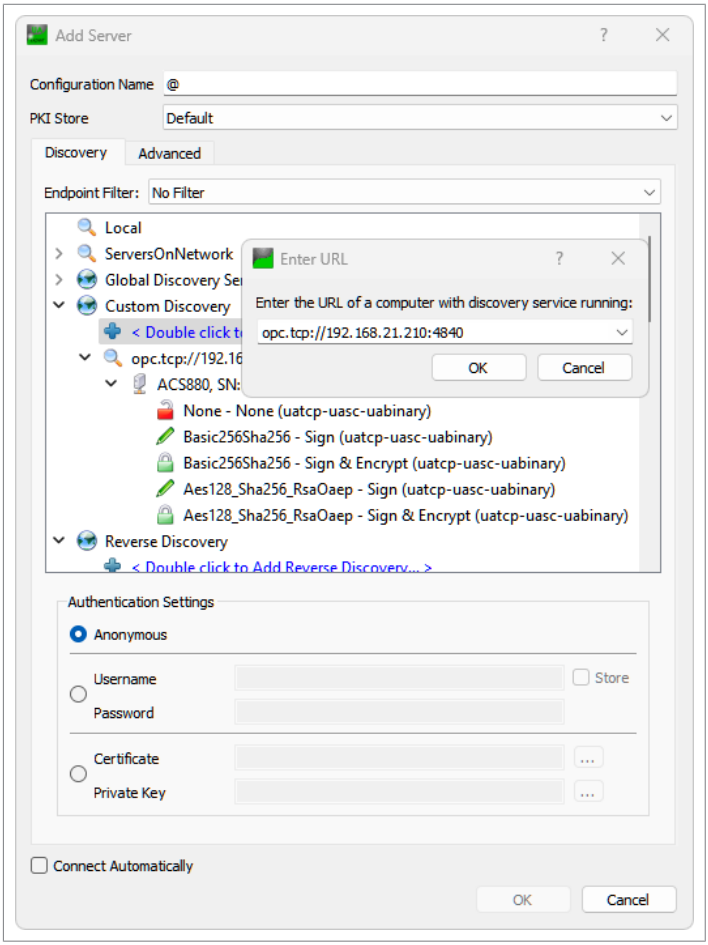


Connection example

The OPC UA client software in this example is UaExpert® v1.7. from Unified Automation GmbH. For more information, refer to https://www.unified-automation.com/products/development-tools/uaexpert.html.

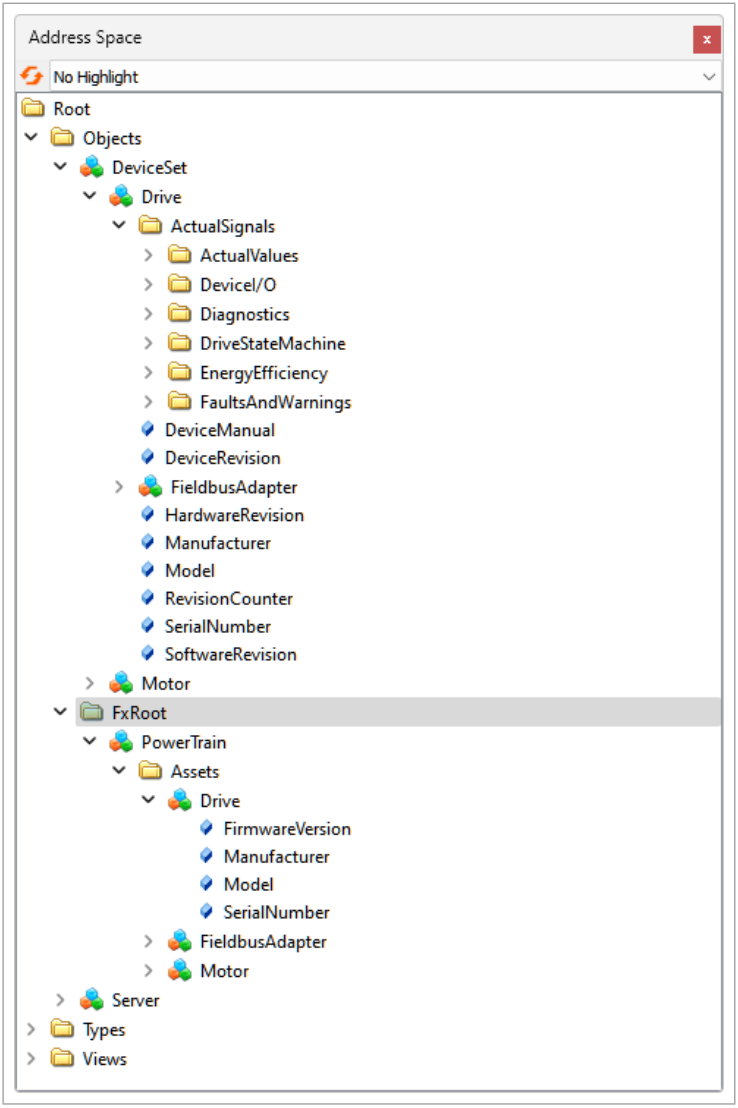
To connect the OPC UA client to an OPC UA server on an ABB drive:

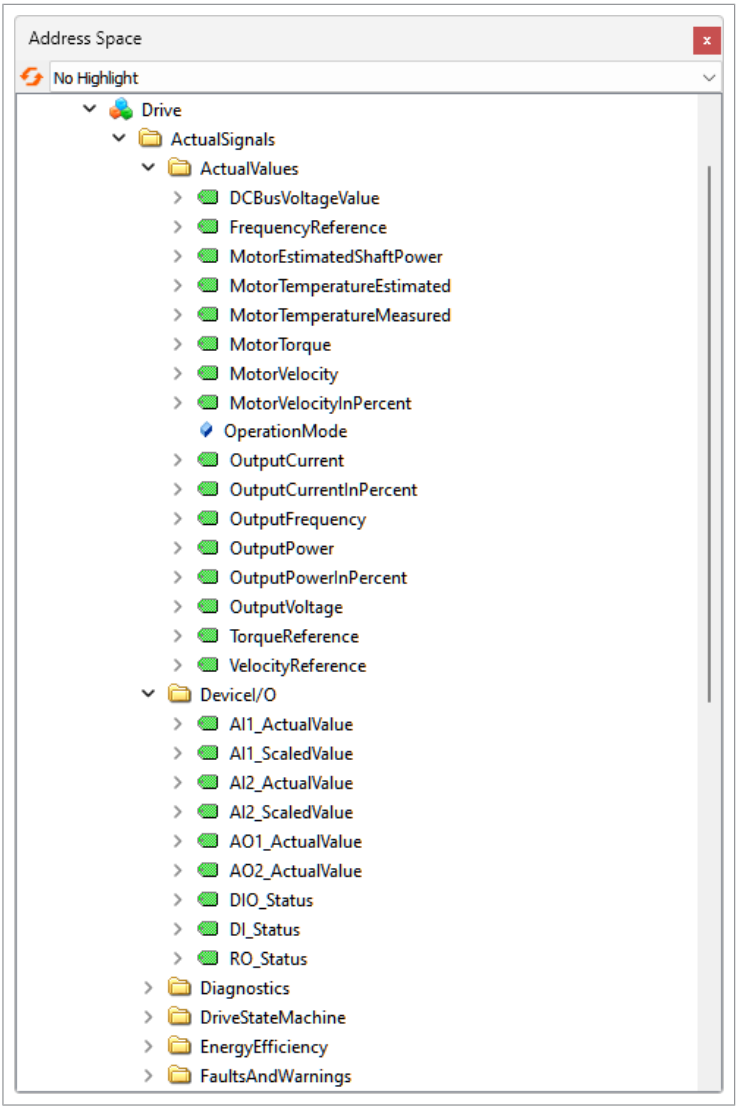
1. Start the OPC UA client software and open the project that was created or configured previously.
2. Discover the OPC UA server.
   Enter the endpoint URL of the OPC UA server in the format "opc.tcp://<ip_address>:4840". The <ip_address> refers to the IP address of the Ethernet connection on the ABB drive. The default port number of the OPC UA server is 4840. Example: opc.tcp://192.168.21.210:4840.
   Alternatively you can select the OPC UA server from the list of available servers and click Connect.
3. Select the security mode and the security policy for the OPC UA connection. The security mode can be none, sign, or sign and encrypt.
4. Select the Anonymous Authentication method.



5. Accept the certificate of the OPC UA server.
6. Wait for the OPC UA connection to be established and verified. The OPC UA client software should show a message that the connection is successful and show the status and the details of the connection.

Example of the information model:




Address Space
No Highlight
Drive
ActualSignals
ActualValues
DCBusVoltageValue
FrequencyReference
MotorEstimatedShaftPower
MotorTemperatureEstimated
MotorTemperatureMeasured
MotorTorque
MotorVelocity
MotorVelocityInPercent
OperationMode
OutputCurrent
OutputCurrentInPercent
OutputFrequency
OutputPower
OutputPowerInPercent
OutputVoltage
TorqueReference
VelocityReference
DeviceI/O
AI1_ActualValue
AI1_ScaledValue
AI2_ActualValue
AI2_ScaledValue
AO1_ActualValue
AO2_ActualValue
DIO_Status
DI_Status
RO_Status
Diagnostics
DriveStateMachine
EnergyEfficiency
FaultsAndWarnings

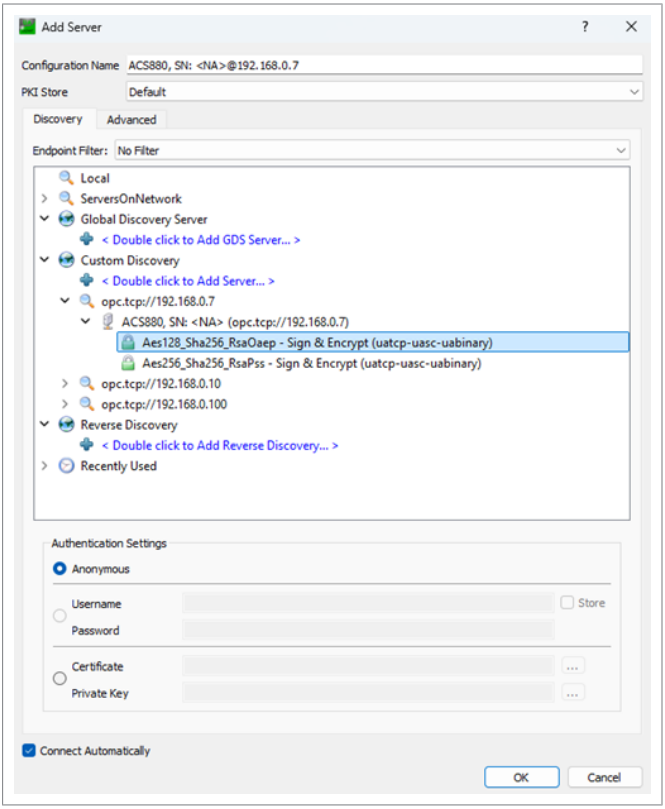
FEIP-21 adapter firmware update over OPC UA

OPC UA server supports firmware update of the FEIP-21 adapter. The implementation is based on OPC 10000-100, Device Model v1.05.0 specification.

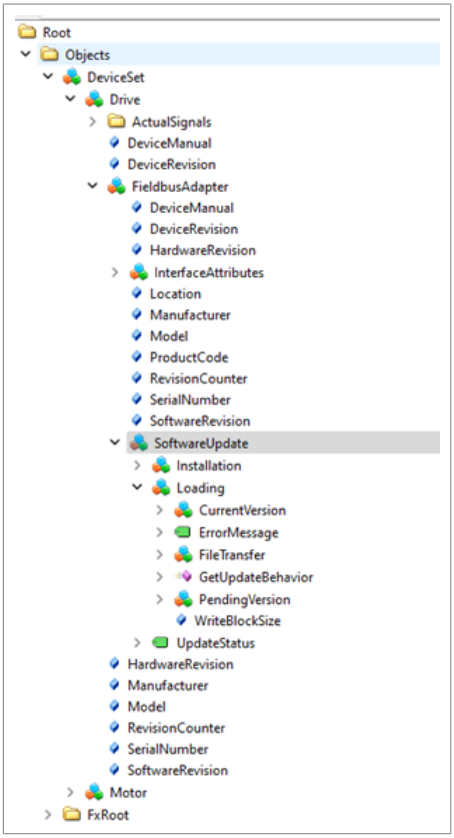
The OPC UA client software in this example is UaExpert® v1.7. from Unified Automation GmbH. For more information, refer to https://www.unified-automation.com/products/development-tools/uaexpert.html.

To update the FEIP-21 firmware using UaExpert®:

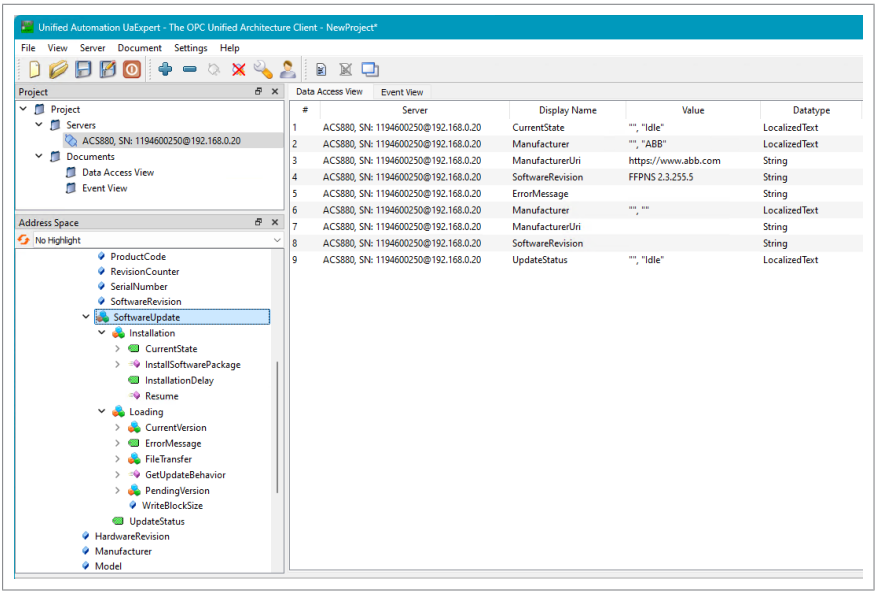
1. Connect to the OPC UA server.



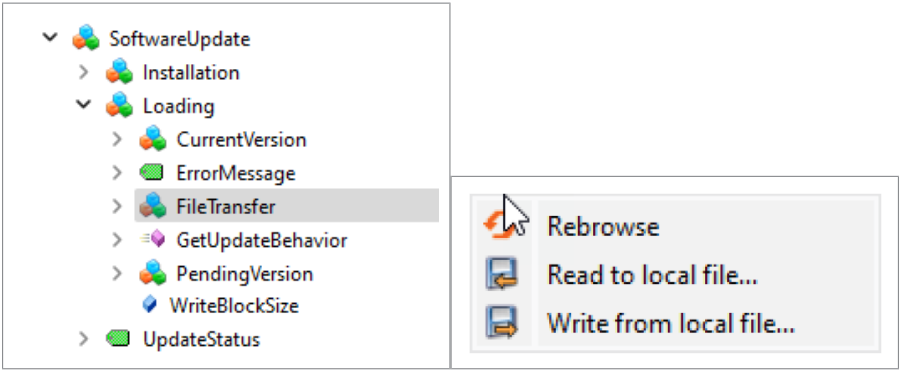
2. Go to Root > Objects > DeviceSet > Drive > FieldbusAdapter and select SoftwareUpdate.



3. Add these variable nodes as monitored items to the subscription Root/Objects/CurrentState/DeviceSet/Drive/FieldbusAdapter/...
   - SoftwareUpdate/Installation/CurrentState
   - SoftwareUpdate/Loading/CurrentVersion/Manufacturer
   - SoftwareUpdate/Loading/CurrentVersion/SoftwareRevision
   - SoftwareUpdate/Loading/ErrorMessage
   - SoftwareUpdate/Loading/PendingVersion/Manufacturer
   - SoftwareUpdate/Loading/PendingVersion/ManufacturerUri
   - SoftwareUpdate/Loading/PendingVersion/SoftwareRevision
   - SoftwareUpdate/UpdateStatus

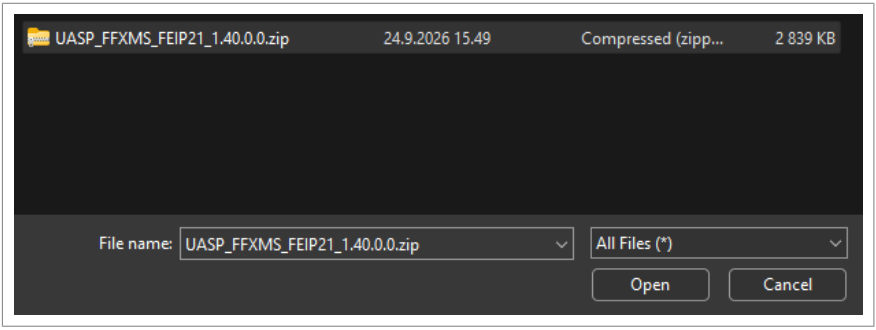


4. Go to SoftwareUpdate > Loading and right-click FileTransfer. From the context menu, select Write from local file...

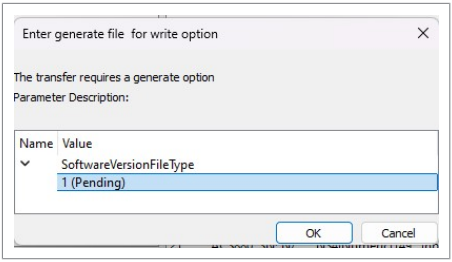


5. In the file browser, select the OpcUa software package for FEIP-21.

   Note: Contact ABB for FEIP-21 OPC UA specific software package.

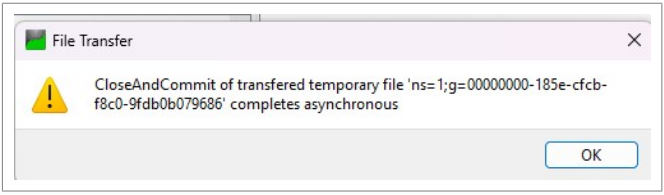


6. Double-click "0 (Current)" to open the selection list. From the list, select 1 (Pending) and then select OK.

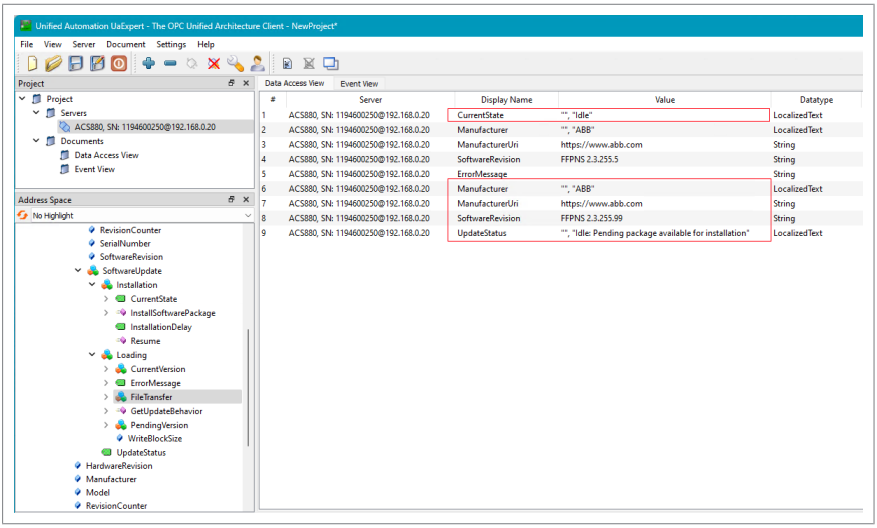


A status bar shows the file transfer progress. Wait until the transfer finishes. It can take several minutes.

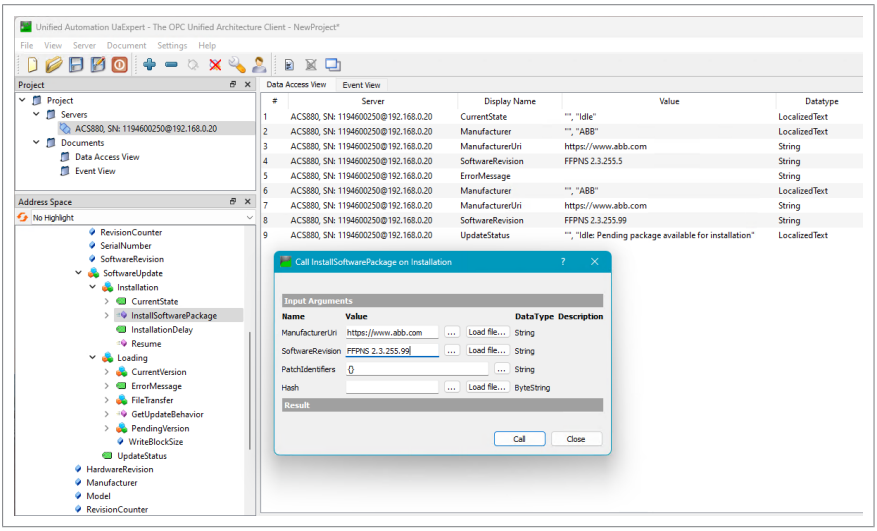
7. When the transfer completes, a dialogue box opens with the text "CloseAndCommit will complete asynchronous". Select OK and monitor CurrentState in the FileTransfer > <TransferState> object.



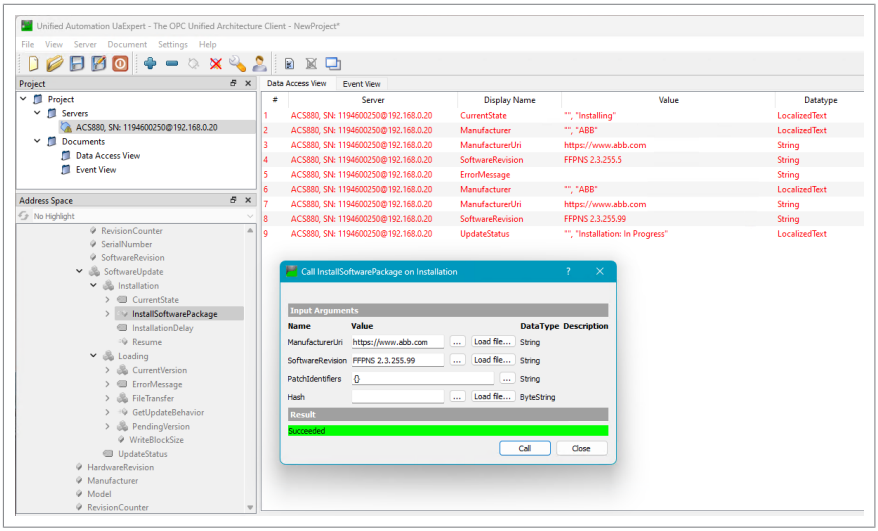
8. After a succesful file transfer the metadata of the pending version becomes available. UpdateStatus shows that a pending version is available for installation. CurrentState changes from ApplyWrite to Idle.



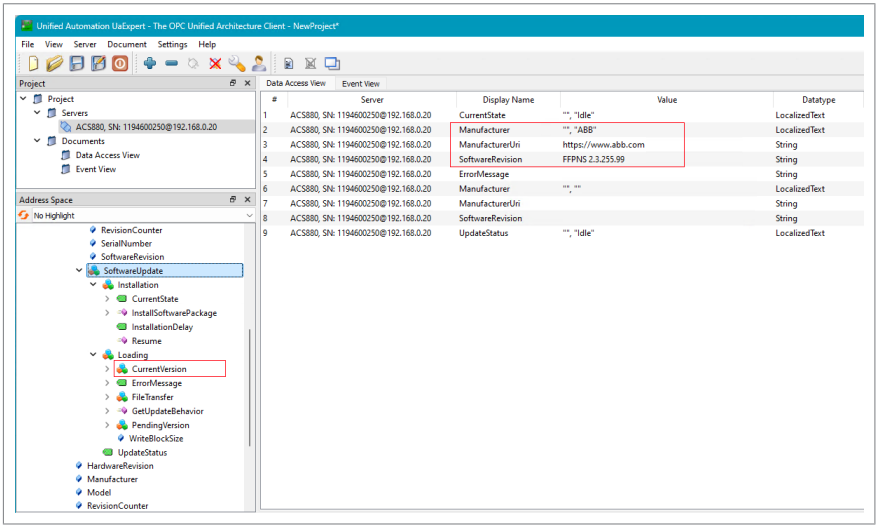
9. Double-click the InstallSoftwarePackage method under SoftwareUpdate > Installation. Update the ManufacturerUri and SoftwareVersion fields with the data in the PendingVersion object, and call the method.



10. The method call succeeds, and after a few seconds the connection to the server is lost. At this point, the FEIP-21 restarts to apply the firmware update.



11. Wait until the OPCUA server restarts and reconnects to the client. This can take several minutes. Once connected, verify that the new software is applied: check that the SoftwareRevision under Loading > CurrentVersion has the new software revision. The values of CurrentState and UpdateStatus return to "Idle".



Technical data

The default OPC UA Application name is <Drive type>, SN: <drive serial number>. Example: ACS880, SN 1234567890.

The implementation of the OPC UA server is based on these specifications:

- OPC UA v1.05.02 (released 2022)
- OPC 10000-100, Device Model v1.04 (released 2022)
- OPC UA Field eXchange with:
  -OPC 10000-80, Overview and Concepts v1.00 (released 2022)
  -OPC 10000-81, Connecting Devices and Information Model v1.00.02 (released 2022)
- OPC 40400-1: OPC UA for Powertrain
  -Part 1: Asset Management

Maximum number of connections	5
Maximum number of subscription	50
Maximum number of monitored items (over all clients)	50
Maximum monitored items per subscription	50
Minimum sample rate	100 ms

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Appendix G - Drive Composer tool communication over EtherNet/IP (CIP)

Contents of this chapter

This chapter provides instructions on how to make a communication between the Drive Composer tool and the FEIP-21 module over EtherNet/IP (CIP).

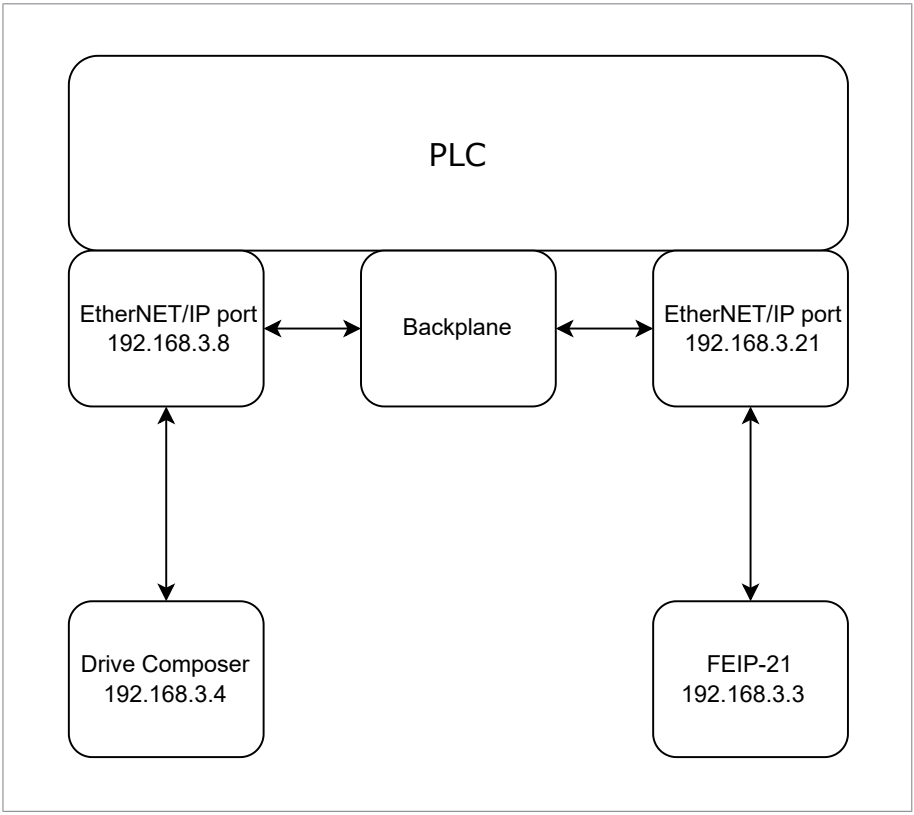
Compatibility

This feature requires:

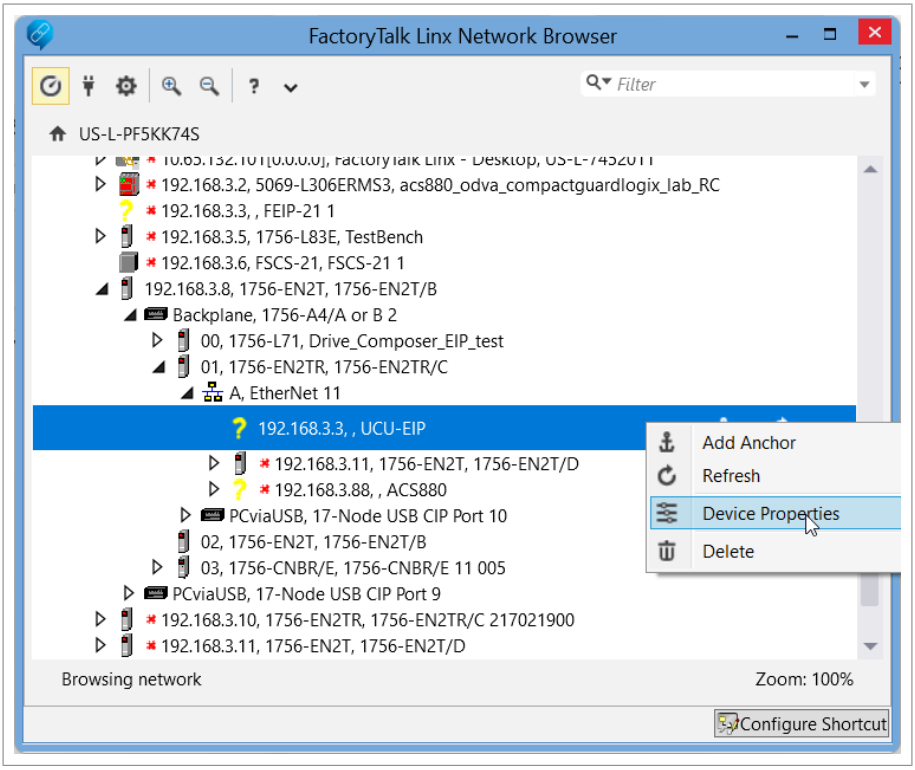
- FEIP-21 module version 1.40 or later, and
- Drive Composer PC tool version 3.7 or later.

How to set up communication over EtherNet/IP (CIP) in Drive Composer

To make a connection between the Drive Composer PC Tool and the FEIP-21 module, first identify the network path between the devices. The figure that follows shows an example network topology.



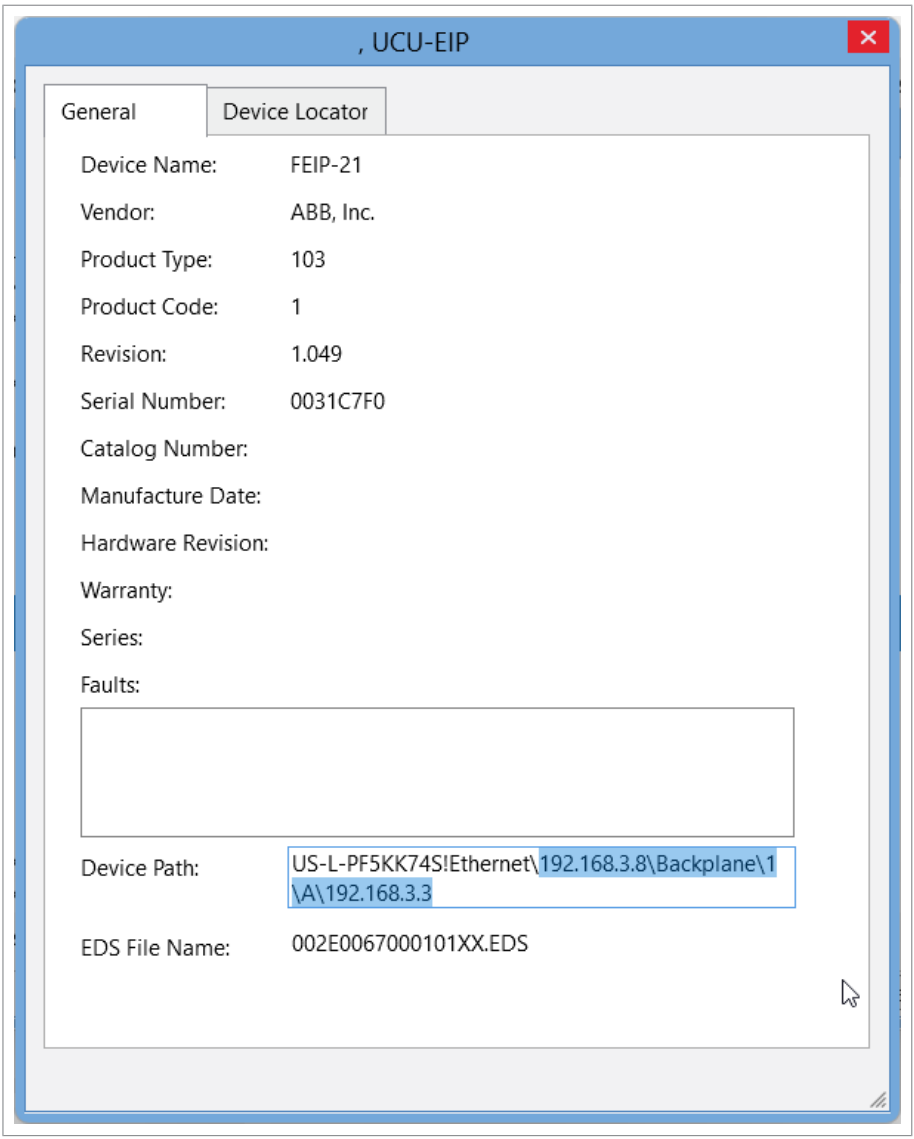
You can use a tool such as FactoryTalk® Linx to identify the network path. Right-click on the drive in the list and select **Device Properties**. See the image that follows.



In the window that opens, you can see the network path under **Device Path**. The path has this format:

- 192.168.3.8 - the IP address of the scanner that is connected to the PC
- Backplane - the PLC backplane
- 1 - the slot number of the scanner that is connected to the drive
- A - the port that the drive is connected to
- 192.168.3.3 - the IP address of the drive that is connected to that port.

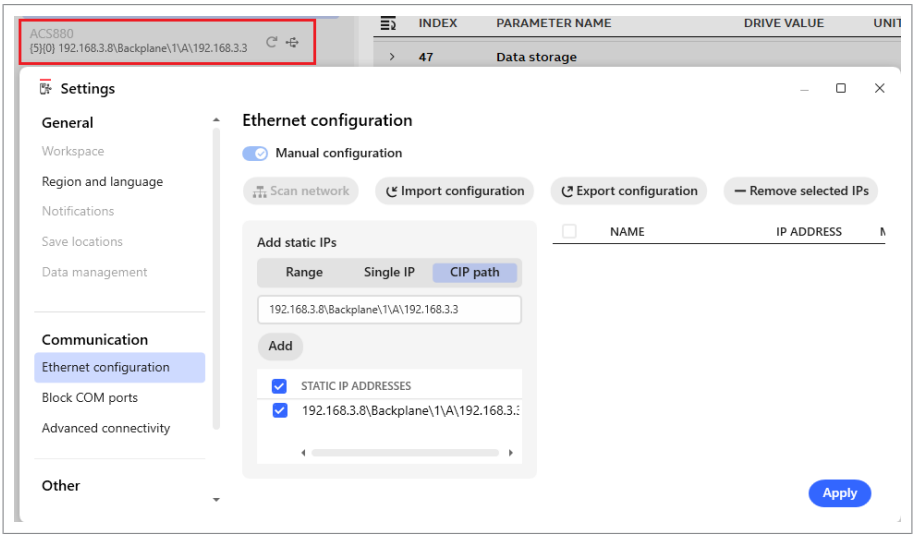
Copy the end of the path string. See the image that follows.



To make the connection in the Drive Composer PC tool:

- Open **Settings**.
- Under **Communication**, select **Ethernet configuration**.
- Under **CIP path**, paste the path string and select **Apply**.

After you apply the settings, Drive Composer makes a connection to the FEIP-21 module. In the image that follows, Drive Composer shows a successful connection in the upper-left corner.



Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to new.abb.com/contact-centers.

Product training

For information on ABB product training, navigate to new.abb.com/service/training.

Providing feedback on ABB manuals

Your comments on our manuals are welcome. Navigate to forms.abb.com/form-26567.

Document library on the Internet

You can find manuals and other product documents in PDF format on the Internet at www.abb.com/drives/documents.

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