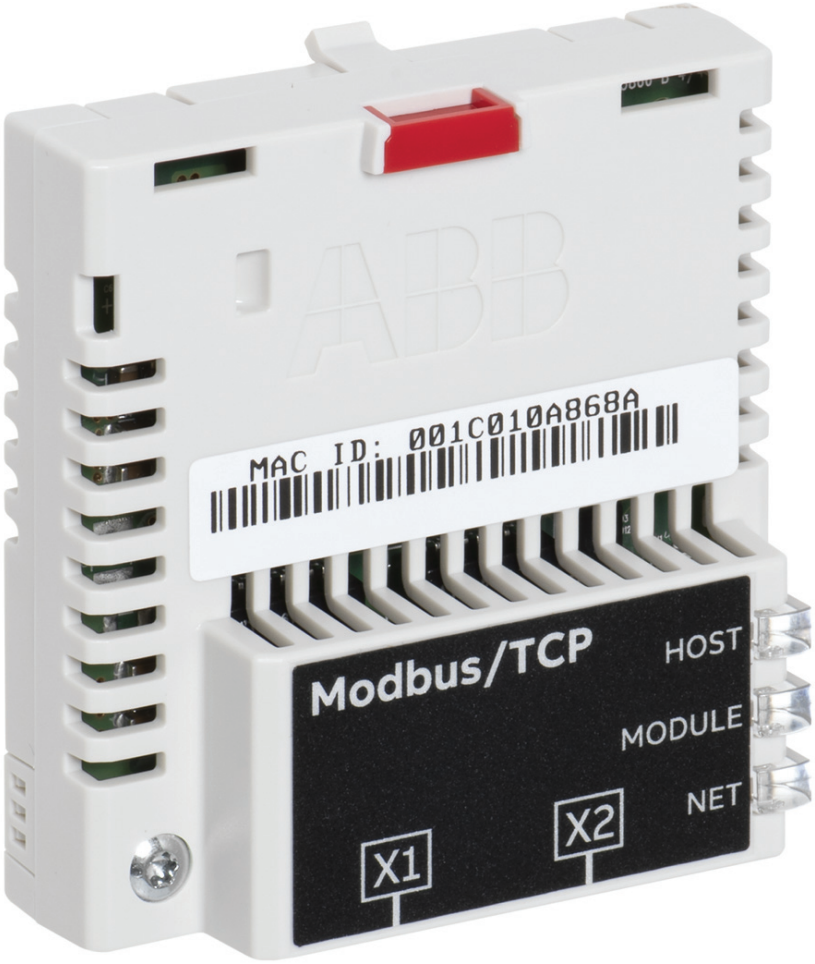
OPTIONS FOR ABB DRIVES

# FMBT-21 Modbus/TCP adapter module

User’s manual



# FMBT-21 Modbus/TCP adapter module

## User’s manual




3AXD50000158607 Rev C
EN
Original instructions
EFFECTIVE: 2025-03-11

# Table of contents

**17 Appendix E - OPC UA server**



**Further information**

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# 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.

## Use of warnings and notes

Warnings tell you about conditions which can cause injury or death, or damage to the equipment. They also tell you how to prevent the danger. Notes show a particular condition or fact, or give information.

The manual uses these warning symbols:

**WARNING!**
Electricity warning tells about hazards from electricity which can cause injury or death, or damage to the equipment.

**WARNING!**
General warning tells about conditions other than those caused by electricity, which can cause injury or death, or damage to the equipment.

## Safety in installation and maintenance

These instructions are for all who install or connect an optional module to a drive, converter or inverter and need to open its front cover or door to do the work.

**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.

- Disconnect the drive, converter or inverter from all possible power sources. After you have disconnected the drive, converter or inverter, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue. Lock out and tag out.
- Disconnect all dangerous voltages connected to other control signal connectors in reach. For example, it is possible that 230 V AC is connected from outside to a relay output of the drive, converter or inverter.
- Always use a voltage tester to make sure that there are no parts under voltage in reach. The impedance of the voltage tester must be at least 1 Mohm.

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# Introduction to the manual

## Contents of this chapter

This chapter introduces this manual.

## Purpose of the manual

The manual provides information on installing, commissioning and using the FMBT-21 Modbus/TCP adapter module.

## Applicability

This manual applies to the FMBT-21 Modbus/TCP Ethernet adapter module, revision E or software version 2.03 and later.

## Compatibility

### Drives

The FMBT-21 adapter module is compatible with:

- ACS355 drive firmware version 5.090 and later
- 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.

## Protocols

The FMBT-21 adapter module is compatible with Ethernet standards IEEE 802.3 and IEEE 802.3u.

The FMBT-21 adapter module supports these protocols:

- Modbus/TCP
- Modbus over UDP

The FMBT-21 adapter 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)
- Drive composer tool via Ethernet tool network.

In addition to these protocols, it is possible to have the no communication protocol running on the FMBT-21 adapter module. This configuration is called NONE protocol. In this setup, the FMBT-21 adapter module is used only for running Ethernet services which can be enabled/disabled via parameter **51.15 Service configuration.**

This table specifies the clients/masters that are compatible with the Modbus/TCP protocol.

| Protocol | Compatible client/master |
|---|---|
| Modbus/TCP | All Modbus/TCP clients that support:<br>• Modbus Application Protocol Specification v1.1b<br>• Modbus Messaging on TCP/IP Implementation Guide v1.0b |

## Tools

The FMBT-21 adapter module can be used in the Ethernet tool network. The Ethernet tool network enables commissioning and monitoring several single drives, or inverter and supply units of a multi-drive from a single location by using the Drive composer pro PC tool.

**Note:** When the FMBT-21 adapter module is used only in the Ethernet tool network, the recommended setting for parameters **50.21 FBA A timelevel sel** and **50.51 FBA B timelevel sel** is *Slow* or *Monitoring.*

For more information on the Ethernet tool network, refer to:

- Ethernet tool network for ACS880 drives application guide (3AUA0000125635 [English])
- Drive composer user's manual (3AUA0000094606 [English]).

## 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.

The manual is written for readers worldwide. Both SI and imperial units are shown.

## Cyber security disclaimer

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

### General terms and abbreviations

| Term | Description |
|---|---|
| Command word | See Control word. |
| 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. |
| Drive | Frequency converter for controlling AC motors |
| EMC | Electromagnetic compatibility |
| FBA | Fieldbus adapter |
| Fieldbus adapter module | Device through which the drive is connected to an external communication network, that is, a fieldbus |
| FMBT-21 adapter module | One of the optional fieldbus adapter modules available for ABB drives. FMBT-21 is a device through which an ABB drive is connected to an Ethernet network. |
| LSB | Least significant bit |
| LSC | Least significant character |
| MAC address | Media Access Control address |

| Term | Description |
|---|---|
| MSB | Most significant bit |
| MSC | Most significant character |
| 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) |
| 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 |

### Modbus/TCP terms and abbreviations

| Term | Explanation |
|---|---|
| Exception code | If an error related to the requested Modbus function occurs, the data field contains an exception code that the server application can use to determine the next action to be taken. |
| Function code | The second byte sent by the client. The function tells the server what kind of action to perform. |
| Holding register | Holds data that will be later executed by an application program. |

## 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 |
| ACS880-17 (45 to 400 kW) manuals | 9AKK106930A3466 |

| Manual | Code |
|---|---|
| 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** | |
| FMBT-21 Modbus/TCP adapter module user's manual | 3AXD50000158607 |
| FMBT-21 Modbus/TCP adapter module quick guide | 3AXD50000158560 |

The links above contain lists of documents.

You can find manuals on the Internet. See below for the relevant code/link. For more documentation, go to www.abb.com/drives/documents.

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

FMBT-21 manual

Fieldbus connectivity web page

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# Overview of the Ethernet network and the FMBT-21 module

## Contents of this chapter

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

## Ethernet network

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

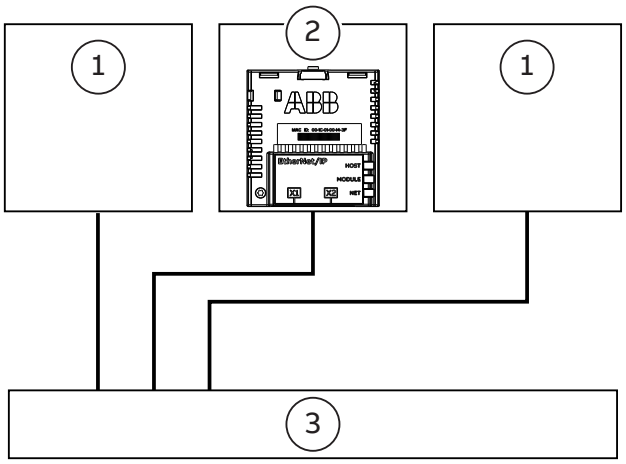
The FMBT-21 module supports twisted pair as the physical media in a star topology.

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

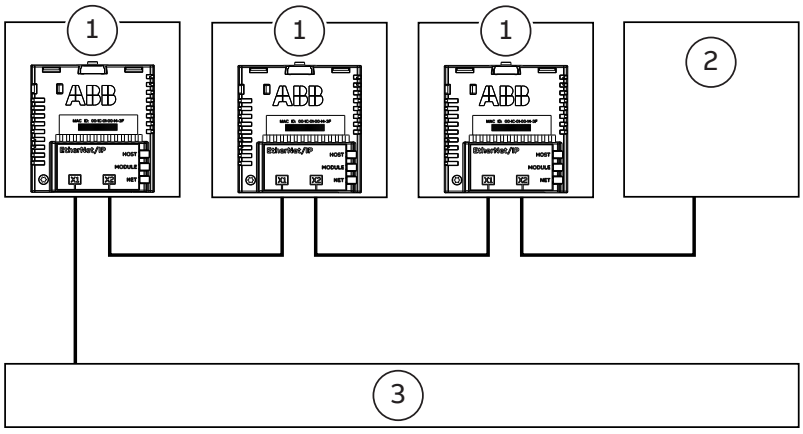
The figures below show example topologies for an Ethernet network with FMBT-21 module.

Star topology




| | |
|---|---|
| 1 | Other device |
| 2 | ABB drive |
| 3 | Switch or router |

Daisy chain topology




| | |
|---|---|
| 1 | ABB drive |
| 2 | Other device |
| 3 | Network master device |

# FMBT-21 module overview

The FMBT-21 Modbus/TCP adapter module is an optional device for ABB drives which enables the connection of the drive to an Ethernet network.

Through the FMBT-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

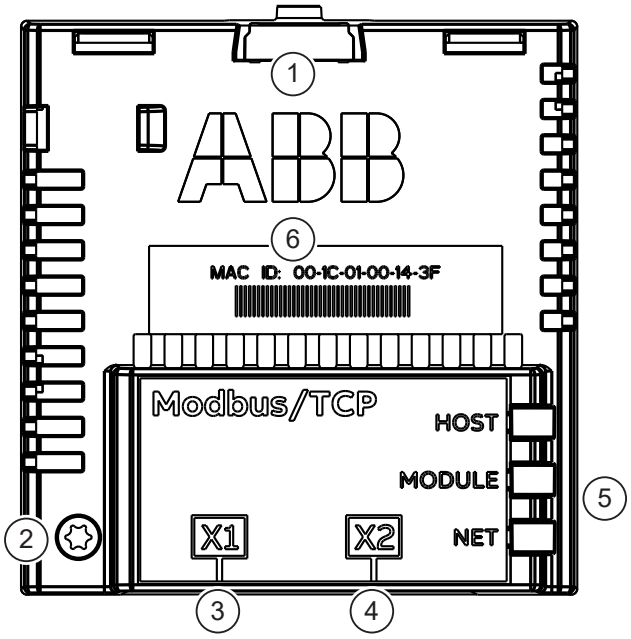
- read status information and actual values from the drive
- reset a drive fault
- read/write parameters of the drive
- connect to the drive via OPC UA client for monitoring and diagnostics of the drive
- connect a PC with the Drive Composer pro tool.

The protocol used to access these functionalities over Ethernet is described in chapter Modbus/TCP – Communication protocol.

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

## FMBT-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 |

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# 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 FMBT-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:
   - Modbus/TCP adapter module, type FMBT-21
   - quick guide.
3. Make sure that there are no signs of damage.

## Before you start

The adapter module has a specific position in the drive. Plastic pins, a lock and one screw hold the module in place. The screw also makes an electrical connection between the FMBT-21 module and drive frame for cable shield grounding.

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

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

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

# Installing option modules

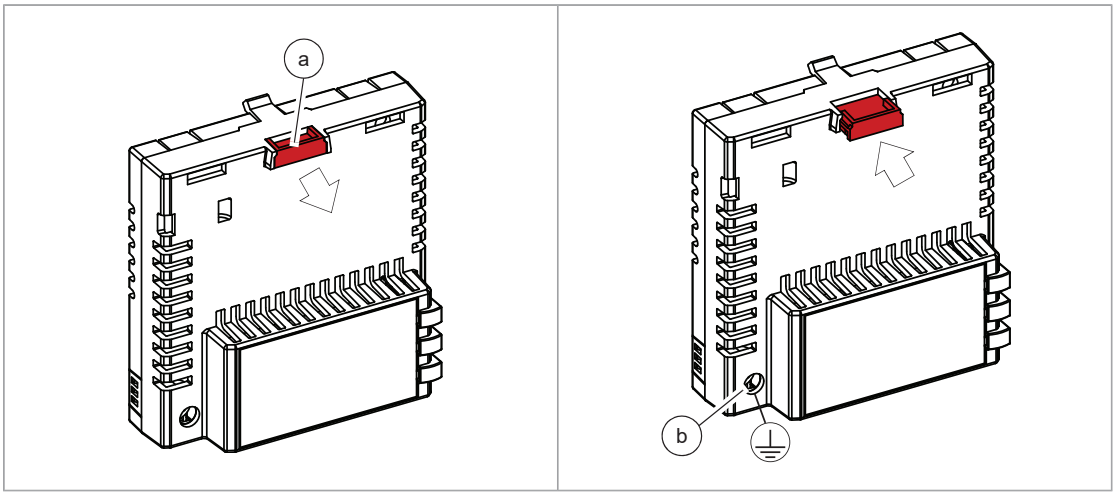
**WARNING!**
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

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.

**WARNING!**
Do not use excessive force, or leave the screw too loose. Over-tightening can cause damage to the screw or module. A loose screw can cause an operation failure.




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.

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# Electrical installation

## Contents of this chapter

This chapter contains general cabling instructions and instructions on how to connect the FMBT-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 FMBT-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.

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

## Connection procedure

1. Make a hole to a grommet at the drive cable entry, and pull the cable through the grommet inside the drive enclosure.
2. Connect the network cable to the RJ-45 connector (X1) on the adapter module.
3. If you want to create a daisy chain with FMBT-21 adapter modules, connect the X2 connector of the first adapter module to X1 on the next adapter module, and so on.
4. Mechanically attach the cables on the outside of the drive for strain relief.

**Note:** If a device in the daisy chain is powered off or fails, the rest of the chain is disconnected from the network. If the drive power supply is not on and you want to keep the control unit energized, you must supply an external 24 V to the control unit. For ACH480 you need a BAPO-01 option module and for ACH580 a CMOD-01 or CMOD-02 option module. For more information, refer to the drive hardware manual.

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# Modbus/TCP – 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
- information on 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.

### Modbus/TCP 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.

The detailed procedure of activating the module for Modbus/TCP communication with the drive depends on the drive type. Normally, you must adjust a parameter to activate the communication. See the drive-specific start-up sections.

Once 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 where necessary. You can adjust the parameters via a drive control panel, a PC tool or a web user interface.

**Note:**

- Not all drives display 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 **51.27 FBA A par refresh**.

### FMBT-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 is typically 51/54 (group 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.<br>If the value is **0** = None, the communication between the drive and the module has not been established. | Mod-bus/TCP |
| 02 | Protocol/profile | Selects the application protocol and communication profile for the network connection.<br>The selections available for Modbus communication are listed below. | 0 = MB/TCP ABB C |
| | 0 = MB/TCP ABB C | Modbus/TCP: ABB Drives profile - Classic | |
| | 1 = MB/TCP ABB E | Modbus/TCP: ABB Drives profile - Enhanced | |
| | 2 = MB/TCP T16 | Modbus/TCP: Transparent 16-bit profile | |
| | 3 = MB/TCP T32 | Modbus/TCP: Transparent 32-bit profile | |
| | 4 = MB/UDP ABB C | Modbus over UDP: ABB Drives profile - Classic | |
| | 5 = MB/UDP ABB E | Modbus over UDP: ABB Drives profile - Enhanced | |
| | 6 = MB/UDP T16 | Modbus over UDP: Transparent 16-bit profile | |
| | 7 = MB/UDP T32 | Modbus over UDP: Transparent 32-bit profile | |
| 03 | Commrate | Sets the bit rate for the Ethernet interface. | 0 = Auto |
| | 0 = Auto | Auto-negotiate | |
| | 1 = 100 Mbps FD | 100 Mbps, full-duplex | |
| | 2 = 100 Mbps HD | 100 Mbps, half-duplex | |

| No. | Name/Value | Description | Default |
|---|---|---|---|
| | 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. | 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. | 0 |
| | 0…255 | IP address | |
| ... | ... | ... | |
| 08 | IP address 4 | See parameter 05 IP address 1. | 0 |
| | 0…255 | IP address | |

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Default</th></tr>
<tr><td>09</td><td>Subnet CIDR</td><td>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.<br>Subnet masks are typically represented in either dotted decimal notation or the more compact CIDR notation, as shown in the table below.
<table>
<tr><th>Dotted decimal</th><th>CIDR</th><th>Dotted decimal</th><th>CIDR</th></tr>
<tr><td>255.255.255.254</td><td>31</td><td>255.254.0.0</td><td>15</td></tr>
<tr><td>255.255.255.252</td><td>30</td><td>255.252.0.0</td><td>14</td></tr>
<tr><td>255.255.255.248</td><td>29</td><td>255.248.0.0</td><td>13</td></tr>
<tr><td>255.255.255.240</td><td>28</td><td>255.240.0.0</td><td>12</td></tr>
<tr><td>255.255.255.224</td><td>27</td><td>255.224.0.0</td><td>11</td></tr>
<tr><td>255.255.255.192</td><td>26</td><td>255.224.0.0</td><td>10</td></tr>
<tr><td>255.255.255.128</td><td>25</td><td>255.128.0.0</td><td>9</td></tr>
<tr><td>255.255.255.0</td><td>24</td><td>255.0.0.0.0</td><td>8</td></tr>
<tr><td>255.255.254.0</td><td>23</td><td>254.0.0.0.0</td><td>7</td></tr>
<tr><td>255.255.252.0</td><td>22</td><td>252.0.0.0.0</td><td>6</td></tr>
<tr><td>255.255.248.0</td><td>21</td><td>248.0.0.0.0</td><td>5</td></tr>
<tr><td>255.255.240.0</td><td>20</td><td>240.0.0.0.0</td><td>4</td></tr>
<tr><td>255.255.224.0</td><td>19</td><td>224.0.0.0.0</td><td>3</td></tr>
<tr><td>255.255.192.0</td><td>18</td><td>192.0.0.0.0</td><td>2</td></tr>
<tr><td>255.255.128.0</td><td>17</td><td>128.0.0.0.0</td><td>1</td></tr>
<tr><td>255.255.0.0</td><td>16</td><td></td><td></td></tr>
</table></td><td>0</td></tr>
<tr><td></td><td>1...31</td><td>Subnet mask in CIDR notation</td><td></td></tr>
<tr><td>10</td><td>GW address 1</td><td>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 address.</td><td>0</td></tr>
<tr><td></td><td>0...255</td><td>GW address</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td></tr>
<tr><td>13</td><td>GW address 4</td><td>See parameter 10 GW address 1.</td><td>0</td></tr>
<tr><td></td><td>0…255</td><td>GW address</td><td></td></tr>
<tr><td>14</td><td>Commrate port 2</td><td>Sets the bit rate for the Ethernet port 2.</td><td>0 = Auto</td></tr>
<tr><td></td><td>0 = Auto</td><td>Auto-negotiate</td><td></td></tr>
<tr><td></td><td>1 = 100 Mbps FD</td><td>100 Mbps, full-duplex</td><td></td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Default</th></tr>
<tr><td></td><td>2 = 100 Mbps HD</td><td>100 Mbps, half-duplex</td><td></td></tr>
<tr><td></td><td>3 = 10 Mbps FD</td><td>10 Mbps, full-duplex</td><td></td></tr>
<tr><td></td><td>4 = 10 Mbps HD</td><td>10 Mbps, half-duplex</td><td></td></tr>
<tr><td></td><td>5 = Disable Port</td><td>Disable Ethernet Port.</td><td></td></tr>
<tr><td>15</td><td>Service configuration</td><td>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.</td><td></td></tr>
<tr><td></td><td colspan="3">
<table>
<tr><th>Bit</th><th>Name</th><th>Information</th></tr>
<tr><td>0</td><td>Lock configuration</td><td>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.</td></tr>
<tr><td>1</td><td>Disable IP config tool</td><td>When this bit is set, access from ABB IP Configuration tool is prevented.</td></tr>
<tr><td>2</td><td>Disable ETH tool network</td><td>When this bit is set, access from Ethernet tool network (eg, ABB Drive Composer tool) is prevented.</td></tr>
<tr><td>3</td><td>Disable ping response</td><td>When this bit is set, response to ICMP (ping) message is prevented.</td></tr>
<tr><td>4</td><td>Unsecured ETH tool network</td><td>When this bit is set, access from Ethernet tool network is unsecured.<br>Note: Drive Composer pro before V2.7 supports unsecured communication only.</td></tr>
<tr><td>5</td><td>Disable configuring web pages</td><td>When this bit is set, access to web pages is disabled.</td></tr>
<tr><td>6</td><td>Web-based firmware update</td><td>When this bit is set, the web-based firmware update is disabled.</td></tr>
<tr><td>7</td><td>Disable OPC UA</td><td>When this bit is set, the OPC UA server is disabled. OPC UA is not enabled by default. For more information, refer to Appendix E - OPC UA server (page 99).</td></tr>
<tr><td>8</td><td>Unencrypted OPC UA</td><td>When this bit is set, connection to the OPC UA server can be selected as unenrcrypted and not signed.</td></tr>
</table>
</td></tr>
<tr><td></td><td>0000b… 1111b</td><td>Service configuration</td><td></td></tr>
<tr><td>16 … 17</td><td>Reserved</td><td>These parameters are not used by the adapter module when the module is configured for Modbus/TCP</td><td>N/A</td></tr>
<tr><td>18</td><td>DHCP hostname index</td><td>Allows to use pre-defined format of the DHCP hostname. By default, this value is 0, and if the hostname is not configured from the web page, the default hostname is used. Default hostname is in the format of "drive type-drive serial number". When the parameter value is set to other than 0, the DHCP hostname is overwritten in the format “abbdrive-x”, where "x" is the value of the parameter name index. Example: Setting this value to 12 results in the name of “abbdrive-12”.</td><td>0</td></tr>
</table>

| No. | Name/Value | Description | Default |
|---|---|---|---|
| 19 | T16 scale | Defines the reference multiplier/actual value divisor for the adapter module.<br>**Note:** The parameter is effective only when the following conditions are satisfied:<br>• transparent 16 profile is selected<br>• drive is using the native communication profile (e.g, DCU or FBA)<br>• drive is using a 16-bit transparent reference 1/actual value 1.<br>Reference 1 is multiplied by the value of this plus one and the actual value 1 is divided by the value of this plus one. With value 0, the reference 1/actual value 1 scale in the adapter module is 1 = 1.<br>With ACS380, ACS480, ACH480, ACS580, ACH580, ACQ580 and ACS880: Generic reference type:<br>1 = (T16 scale + 1)/100 -> T16 scale = 99,<br>1 = 1. | 99 |
| | 0…65535 | Reference multiplier/actual value divisor | |
| 20 | Timeout time | Defines the Modbus/TCP timeout value. The Modbus protocol does not specify a timeout mechanism for the application layer. A timeout mechanism may be desired when controlling a drive, so the adapter module provides a method for this purpose.<br>• If the parameter value is zero, this feature is disabled.<br>• If the parameter value is non-zero, the timeout is:<br>• (Modbus/TCP timeout value) * 100 milliseconds<br>For example, a value of 22 results in a timeout of:<br>22 * 100 milliseconds = 2.2 seconds<br>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.<br>**Example**: If the Modbus/TCP timeout is 300 ms and the drive is configured to fault on a communication failure with a delay of 500 ms, the drive will fault 800 ms after communications is lost. | 20 |
| | 0…65535 | Modbus/TCP timeout value | |
| 21 | Timeout mode | Selects which Modbus/TCP register accesses reset the timeout counter. | 2 = Control WR |
| | 0 = None | The Modbus/TCP timeout feature is disabled. | |
| | 1 = Any message | The timeout counter is reset when any Modbus register of the drive is accessed. | |
| | 2 = Control RW | The timeout counter is reset when the drive receives either a new Control word or new reference value (REF1 or REF2) from the Modbus/TCP client. | |
| 22 | Word order | Selects in which order the 16-bit registers of 32-bit parameters are transferred. For each register (16-bit), the first byte contains the high order byte and the second byte contains the low order byte. | 1 = HILO |
| | 0 = LoHi | The first register contains the low order word and the second register contains the high order word. | |
| | 1 = HiLo | The first register contains the high order word and the second register contains the low order word. | |
| 23 | Address mode | Defines the mapping between parameters and holding registers in the 0…65535 Modbus register range. | 0 = Mode 0 |

| No. | Name/Value | Description | Default |
|---|---|---|---|
| | 0 = Mode 0 | Used when access to parameter indexes greater than 99 is not needed. Allows 5-digit addressing[1] used by legacy Modbus masters.<br>16-bit access:[1]<br>Register address[2] = 100 * parameter group + parameter index (16-bit values, groups 1...199, indexes 1...99)<br>32-bit access:<br>Register address = 20000 + 200 * parameter group + 2 * parameter index (32-bit values, groups 1...199, indexes 1...99) | |
| | 1 = Mode 1 | 16-bit access:<br>Register address = 256 * parameter group + parameter index<br>(16-bit values, groups 1...255, indexes 1...255)<br>Example: 13057 (0x3301) is group 51 index 1<br>No access to 32-bit parameter values. | |
| | 2 = Mode 2 | 32-bit access:<br>Register address = 512 * parameter group + 2<br>* parameter index<br>(32-bit values, groups 1...127, indexes 1...255).<br>Example: 26114 (0x6602) is group 51 index 1 Used when 32-bit parameter values are needed and there is no need to access groups 128 or higher. | |
| | 3 = Mode 3 | 32-bit access:<br>Register address = 256 * parameter group + 2<br>* parameter index<br>(32-bit values, groups 1...255, indexes 1...127).<br>Example: 13058 (0x3302) is group 51 index 1 Used when 32-bit parameter values are needed and there is no need to access parameter index 128 or higher. | |
| 24 ... 26 | Reserved | These parameters are not used by the adapter module when the module is configured for Modbus/TCP. | 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.<br>**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.<br>In format **xyz**, where<br>**x** = major revision number<br>**y** = minor revision number<br>**z** = correction number<br>OR<br>in format **axyz**, where<br>**a** = major revision number<br>**xy** = minor revision numbers<br>**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.<br>**Note:** The value names may vary by drive. | |
| | 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. | |
| | 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:<br>**xx** = patch number<br>**yy** = build number<br>Example: C80D ≥ 200.13<br>or 0 ≥ 0.0 | N/A |
| | | Common program version of the adapter module | |

| No. | Name/Value | Description | Default |
|---|---|---|---|
| 33 | FBA A/B appl SW ver | Read-only. Displays firmware version of the adapter module in xxyy format, where:<br>**xx** = major revision number<br>**yy** = minor revision number<br>Example: 310 = 3.10<br>Version number is the form:<br><major>.<minor>.<patch>.<build><br>Example: 3.10.200.13 or 3.10.0.0 | N/A |
| | | Application program revision of the adapter module | |

1) 6-digit register addressing (400001) is used instead of 5-digit register addressing (40001) to describe register map.
2) Register address = Register address + 40000 (0) if holding register area indication should be used.

For more information, see Register addressing (page 49)

### FMBT-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, ACH480, ACS580, ACH580, and ACQ580
- parameter group is typically 53/56 (group 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 out1 (client to drive) | Selects the drive parameter address into which the value of the Data out 1 register is written (from the client to the server). The Modbus register address maps are explained in chapter Modbus/TCP – Communication protocolThe content is defined by a decimal number in the range of 0 to 9999 as follows:<br>0 – Not used<br>1...99 – Virtual address area of drive control. Not used when the Modbus/TCP protocol is used.<br>101...9999 – Parameter area of the drive | 0 = None |
| | 0 = None | Not used | |
| | 101…9999 | Parameter index with format xxyy, where<br>• xx is the parameter group number (1…99)<br>• yy is the parameter number index within<br>that group (01…99).<br>**Note:** In ACS380, ACS480, ACH480, ACS580, ACH580, ACQ580 and ACS880, choose **Other** to display a list of mappable drive parameters. | |
| 02 ... 12 | Data out 2 …12 | See parameter 01 FBA A/B data out1. | 0 = None |

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

**FMBT-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, ACH480, ACS580, ACH580 and ACQ580.
- parameter group is typically 52/55 (group 152/155 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 in1 (drive to client) | Selects the drive parameter address from which the data is read to the Data in 1 register is written (from the server to the client). The Modbus register address maps are explained in chapter Modbus/TCP – Communication protocol The content is defined by a decimal number in the range of 0 to 9999 as follows:<br>0 – Not used<br>1...99 – Virtual address area of drive control. Not used when the Modbus/TCP protocol is used.<br>101...9999 – Parameter area of the drive | 0 = None |
| | 0 = None | Not used | |
| | 101…9999 | Parameter index with format **xxyy**, where<br>• **xx** is the parameter group number (1…99)<br>• **yy** is the parameter number index within that group (01…99).<br>**Note:** In ACS380, ACS480, ACH480, ACS580, ACH580, ACQ580 and ACS880, choose **Other** to display a list of mappable drive parameters. | |
| 02…12 | Data in 2 … Data in 12 | See parameter *01 FBA A/B data in 1.* | 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.

## Starting up fieldbus communication for ACS380, ACS480, ACH480, ACS580, ACH580, ACQ580 and ACS880 drives

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 1, you must select slot 1.

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.
   - Select the communication protocol and profile with parameter **51.02** and configure the network settings with parameters **51.03...51.13**.
   - With parameters **51.20** and **51.21**, select how the adapter module detects fieldbus communication breaks.
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 Modbus registers. Process data groups are not available in the ABB Drives - Classic communication profile.
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, ACH480, ACS580, ACSH580 and ACQ580 drives

### Frequency control using the ABB Drives – Enhanced communication profile

This example shows how to configure a frequency control application that uses the ABB Drives - Enhanced profile. In addition, some application-specific data is added to the communication.

The start/stop commands and reference are according to the ABB Drives profile. For more information, see section ABB Drives communication profile (page 42).

In the frequency control mode, when Reference 1 (REF1) is used, a reference value of ±20000 (4E20h) corresponds to the reference set with parameter **46.02 Frequency scaling** in the forward and reverse directions.

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

| Output data | Modbus register | Input data | Modbus register |
|---|---|---|---|
| Control word | (4)00001 | Status word | (4)00051 |

| Output data | Modbus register | Input data | Modbus register |
|---|---|---|---|
| Frequency reference | (4)00002 | Frequency actual value | (4)00052 |
| Reference 2 (Not used) | (4)00003 | Actual value 2 (Not used) | (4)00053 |
| Constant frequency 1 [1)] | (4)00004<br>(4)00005 | Power [1)] | (4)00054<br>(4)00055 |
| Constant frequency 2 [1)] | (4)00006<br>(4)00007 | DC bus voltage [1)] | (4)00056<br>(4)00057 |

1) Example

The table below gives the recommended drive parameter settings.

| Drive parameter | Setting | Description |
|---|---|---|
| 50.01 FBA A enable | 1 = Enable | 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 | 0 = Speed or frequency | Selects the fieldbus A reference 1 type and scaling. |
| 51.01 FBA A type | Modbus/TCP [2)] | Displays the type of the fieldbus adapter module. |
| 51.02 Protocol/Profile | 1 = MB/TCP ABB E | Selects the Modbus/TCP protocol and the ABB Drives - Enhanced 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 05…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)] | Last part of the IP address |
| 51.09 Subnet CIDR | 24 [1)] | Sets the network mask as 255.255.255.0, allowing access only to the last subnet. |
| 51.20 Timeout time | 10 [1)] | Sets the communication timeout as 1 second. |
| 51.21 Timeout mode | 2 = Control RW [1)] | The timeout feature monitors the updating of the Control word and Reference 1. |
| 52.01 FBA A data in1 | 01.14 [1)] | Output power |

| Drive parameter | Setting | Description |
|---|---|---|
| 52.03 FBA a data in3 | 01.11 [1] | DC voltage |
| 53.01 FBA A data out1 | 28.26 [1] | Constant frequency 1 |
| 53.03 FBA A data out3 | 28.27 [1] | Constant frequency 2 |
| 51.27 FBA A par refresh | 1 = Refresh | Validates the FMBT-21 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. |
| 31.11 Fault reset selection | 06.1.7 | Selects the fieldbus interface as the source for the fault reset signal. |

[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 47Eh (1150 decimal) -> READY TO SWITCH ON.
- Enter 47Fh (1151 decimal) -> OPERATING (Scalar motor control mode).

## Parameter setting examples – ACS880

### Speed control using the ABB Drives – Enhanced communication profile

This example shows how to configure a speed control application that uses the ABB Drives - Enhanced profile. In addition, some application-specific data is added to the communication.

The start/stop commands and reference are according to the ABB Drives profile. For more information, see section ABB Drives communication profile (page 42).

When Reference 1 (REF1) is used, a reference value of ±20000 (4E20h) corresponds to the reference set with parameter **46.01 Speed scaling** in the forward and reverse directions.

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

| Output data | Modbus register | Input data | Modbus register |
|---|---|---|---|
| Control word | (4)00001 | Status word | (4)00051 |
| Speed reference | (4)00002 | Speed actual value | (4)00052 |
| Reference 2 (Not used) | (4)00003 | Actual value 2 (Not used) | (4)00053 |
| Constant speed 1 [32] [1] | (4)00004<br>(4)00005 | Output power [32] [1] | (4)00054<br>(4)00055 |

| Output data | Modbus register | Input data | Modbus register |
|---|---|---|---|
| Constant speed 2 [32] 1) | (4)00006<br>(4)00007 | DC voltage [32] 1) | (4)00056<br>(4)00057 |

1) Example

The table below gives the recommended drive parameter settings.

| Drive parameter | Setting for ACS880 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 | Modbus/TCP 2) | Displays the type of the fieldbus adapter module. |
| 51.02 Protocol/Profile | 1 = MB/TCP ABB E | Selects the Modbus/TCP protocol and the ABB Drives - Enhanced 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 05…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) | Last part of the IP address |
| 51.09 Subnet CIDR | 24 | Sets the network mask as 255.255.255.0, allowing access only to the last subnet. |
| 51.20 Timeout time | 10 | Sets the communication timeout as 1 second. |
| 51.21 Timeout mode | 2 = Control RW | The timeout feature monitors the updating of the Control word and Reference 1. |
| 52.01 FBA A data in1 | 01.14 | Output power |
| 52.03 FBA a data in3 | 01.11 | DC voltage |
| 53.01 FBA A data out1 | 22.26 | Constant speed 1 |
| 53.03 FBA A data out3 | 22.27 | Constant speed 2 |

| Drive parameter | Setting for ACS880 drives | Description |
|---|---|---|
| 51.27 FBA A par refresh | 1 = Refresh | Validates the FMBT-21 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. |
| 31.11 Fault reset selection | 30 = FBA A MCW bit 7 | Selects the fieldbus interface as the source for the fault reset signal. |

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 47Eh (1150 decimal) -> READY TO SWITCH ON.
- Enter 47Fh (1151 decimal) -> OPERATING (Speed mode).

# Client configuration

After the adapter module has been initialized by the drive, you must prepare the client for communication with the module. Due to the large number of different Modbus clients, specific instructions cannot be provided here. Refer to the documentation of your client for more information.

## Modbus register maps

The Modbus register map which the adapter module presents to the Modbus client is selected with parameter *02 Protocol/Profile.*

For Modbus register map definitions, see chapter Modbus/TCP – Communication protocol.

For definitions of the Control word, Status word, references and actual values for a given communication profile, see chapter Modbus/TCP – Communication profiles.

7

# Modbus/TCP – Communication profiles

## Contents of this chapter

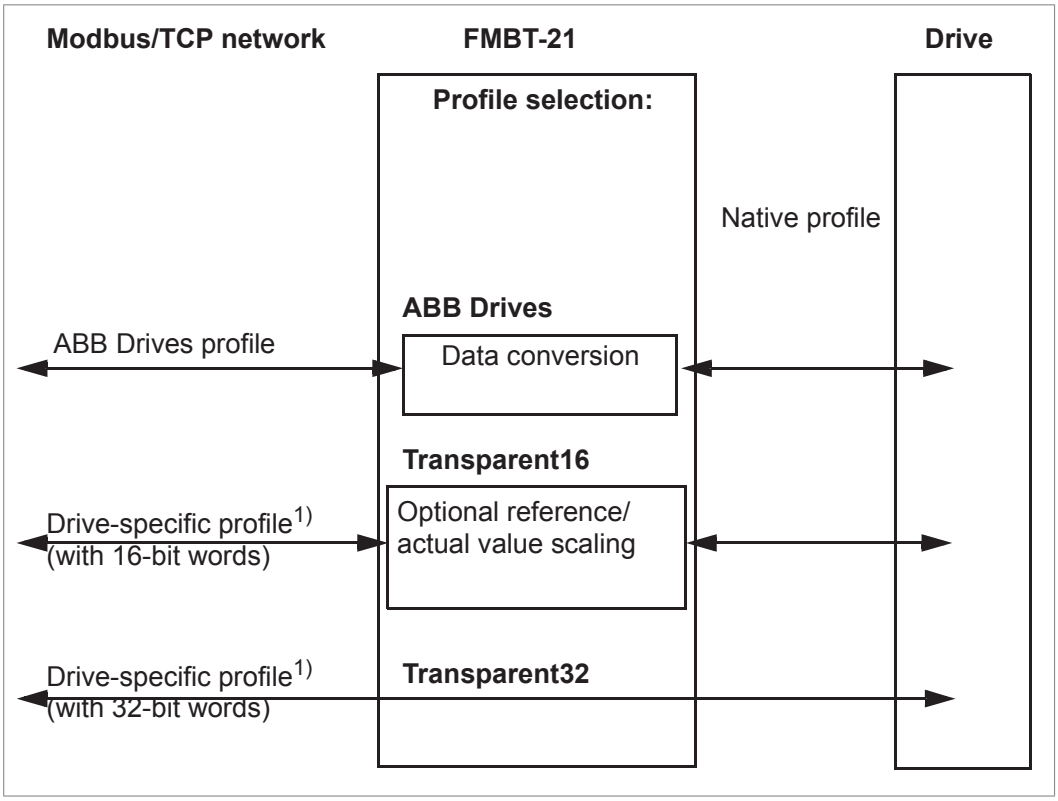
This chapter describes the communication profiles used in the communication between the Modbus/TCP client, the adapter module and the drive.

## Communication profiles

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

With the FMBT-21 adapter module, the Modbus/TCP network may employ either the ABB Drives profile or one of two Transparent modes for 16-bit and 32-bit words respectively. For the ABB Drives profile, data is converted by the adapter module into the native profile (eg, DCU or FBA). For the Transparent modes, no data conversion takes place.

The figure below illustrates the profile selection:




1) Can be used if the native profile is supported by the drive

The following sections describe the Control word, the Status word, references and actual values for the ABB Drives communication profile. Refer to the drive manuals for details on the native profiles.

# 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 master in the Status word.

The contents of the Control word and the Status word are detailed below. The drive states are presented on page 46.

### 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 on page 46.

| 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. |

| Bit | Name | Value | STATE/Description |
|---|---|---|---|
| 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**.<br>**Warning:** Ensure that motor and driven machine can be stopped using this stop mode. |
| 3 | INHIBIT_ OPERATION | 1 | Proceed to **OPERATION ENABLED.**<br>**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.<br>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.**<br>**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. |
| 7 | RESET | 0 → 1 | Fault reset if an active fault exists. Proceed to **SWITCH-ON INHIBITED**.<br>**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 | Reserved | | |
| 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 or freely programmable control bits | | |

### Status word contents

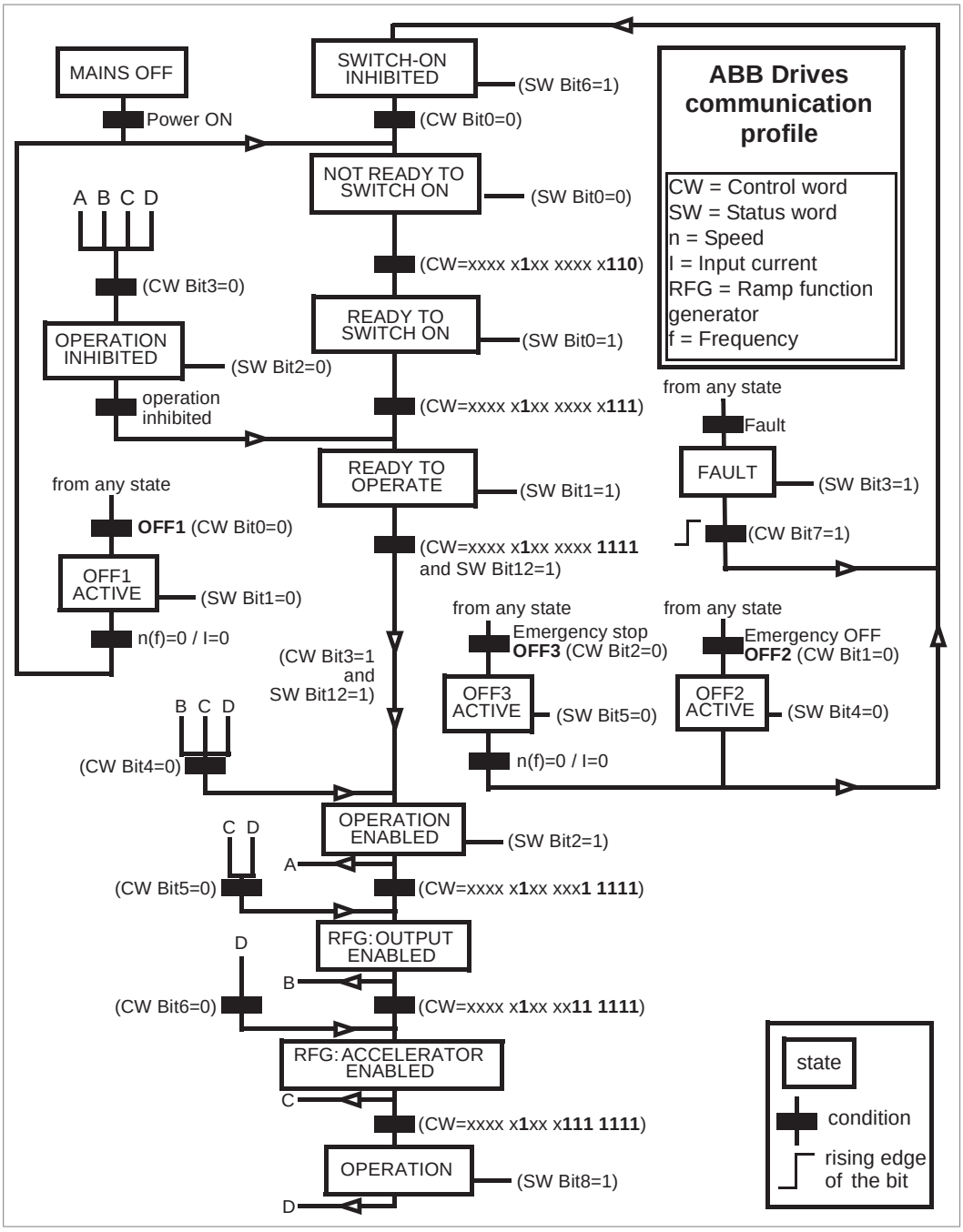
The table below shows the contents of the Status word for the ABB Drives communication profile. The upper case boldface text refers to the states shown on page 46.

| 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** |
| 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, i.e., 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 concerning 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.<br>**Note concerning 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 or freely programmable control bits | | |
| 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.

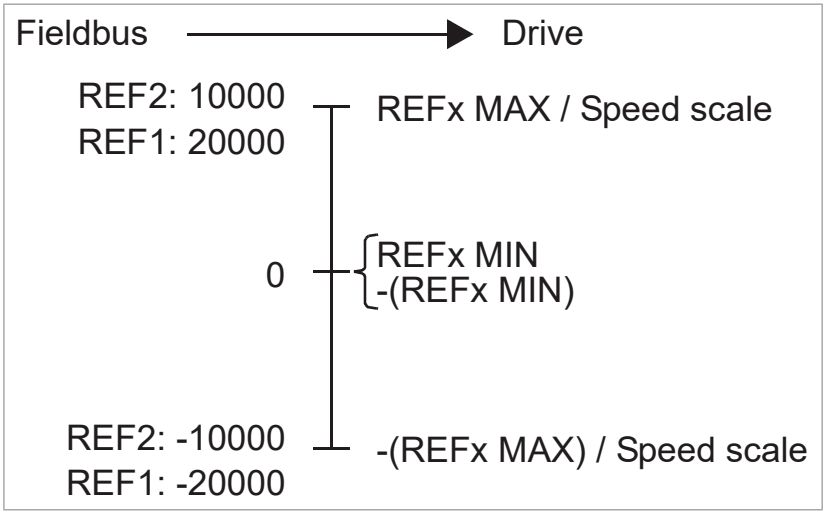
ABB drives can receive control information from multiple sources including analog and digital inputs, the drive control panel and a fieldbus adapter module (for example, FMBT-21). To have the drive controlled through the fieldbus, you must select the module as the source for control information, for 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 ACH480, ACS580, ACH580, ACQ580 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).



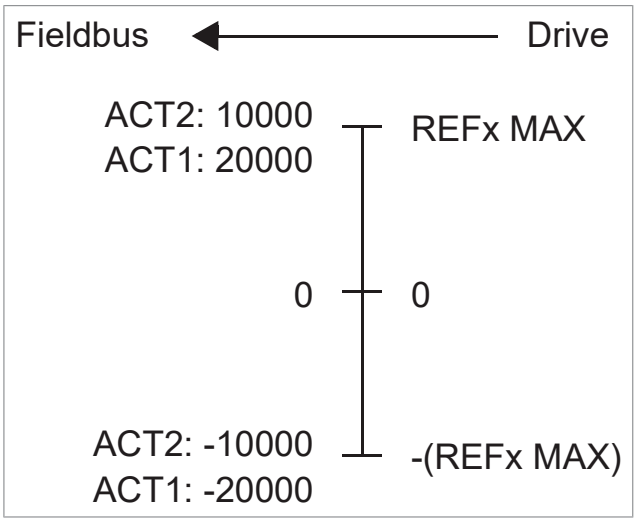

## Actual values

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

# Modbus/TCP – Communication protocol

## Contents of this chapter

This chapter describes the Modbus/TCP communication protocol for the adapter module.

## Modbus/TCP

Modbus/TCP is a variant of the Modbus family of simple, vendor neutral communication protocols intended for supervision and control of automation equipment. Specifically, it covers the use of Modbus messaging over TCP connection on an IP network.

The FMBT-21 adapter module acts as a Modbus/TCP server with support for the ABB Drives and Transparent profiles. The adapter module also supports Modbus over UDP. The only difference between Modbus/TCP and Modbus/UDP is that in Modbus/UDP the transport layer protocol is UDP instead of TCP.

The supported Modbus commands are listed in section Function codes (page 50). Two simultaneous Modbus/TCP connections are supported, that is, two clients can be connected to the adapter module at a time.

For information of the port used with Modbus/TCP or Modbus/UDP, see TCP and UDP service ports (page 74).

Further information on the Modbus/TCP protocol is available at www.modbus.org.

## Register addressing

The address field of Modbus Requests for accessing Holding registers is 16 bits. This allows the Modbus protocol to support addressing of 65536 Holding registers.

Historically, Modbus client devices used 5-digit decimal addresses from 40001 to 49999 to represent Holding register addresses. 5-digit decimal addressing limited to 9999 the number of holding registers that could be addressed.

Modern Modbus client devices typically provide a means to access the full range of 65536 Modbus Holding registers. One of these methods is to use 6-digit decimal addresses from 400001 to 465536. This manual uses 6-digit decimal addressing to represent Modbus Holding register addresses.

Modbus client devices that are limited to 5-digit decimal addressing may still access registers 400001 to 409999 by using 5-digit decimal addresses 40001 to 49999. Registers 410000-465536 are inaccessible to these clients.

## Function codes

The adapter module supports the Modbus function codes shown below.

| Function code | Name | Description |
|---|---|---|
| 03h | Read Holding Registers | Reads the contents of a contiguous block of holding registers in a server device. |
| 06h | Write Single Register | Writes a single holding register in a server device. |
| 10h | Write Multiple Registers | Writes the contents of a contiguous block of holding registers in a server device. |
| 17h | Read/Write Multiple Registers | Writes the contents of a contiguous block of holding registers in a server device, then reads the contents of a contiguous block of holding registers (same or different than those written) in a server device. |
| 2Bh/0Eh | Encapsulated Interface Transport / Read Device Identification | Allows reading identification and other information of the server.<br>Parameter "Read Device ID code" allows one to define three access types:<br>• 01: Request to get the basic device identification (stream access)<br>• 02: Request to get the regular device identification (stream access)<br>• 04: Request to get one specific identification object (individual access). |

## Encapsulated Interface Transport / Read Device Identification

The adapter module supports the Modbus EIT/RDI objects shown below.

| Object ID | Name |
|---|---|
| 00h | Vendor Name |
| 01h | Product Code |
| 02h | Major/Minor Revision |
| 03h | Vendor URL |
| 04h | Product Name |

| Object ID | Name |
|---|---|
| 80h | Drive electronic serial number |

## SNTP time offset to UTC time

| Register address | Description | Value |
|---|---|---|
| (4)00084 | Time in minutes to offset the UTC time received from the SNTP. | -1440...1440 minutes |

## Drive local time read write via Modbus address

| Register address | Description |
|---|---|
| (4)00085 | Year in format 0xYYYY, for example: 0x2025 |
| (4)00086 | Date in format 0xMMDD, where MM is month and DD is day. For example: 0x0127 |
| (4)00087 | Time in format 0xHHMM, where HH is hours in 24h format and MM is minutes. For example: 0x1917 |
| (4)00088 | Seconds in format 0xSS, for example: 0x42 |
| (4)00089 | Value 1 to write local time to the drive. Value 2 to read local time from the drive. |

## Drive electronic serial number

| Register address | Description |
|---|---|
| (4)60000...(4)60039 | (4)60000 Drive electrical serial number, most significant character<br>...<br>(4)60039 Drive electrical serial number, least significant character |

## Exception codes

The adapter module supports the Modbus exception codes shown below.

| Exception Code | Name | Description |
|---|---|---|
| 01h | ILLEGAL FUNCTION | The function code received in the query is not an allowable action for the server. |
| 02h | ILLEGAL DATA ADDRESS | The data address received in the query is to an allowable address for the server. |
| 03h | ILLEGAL DATA VALUE | A value contained in the query data field is not an allowable value for the server. |
| 04h | SLAVE DEVICE FAILURE | An unrecoverable error occurred while the server was attempting to perform the requested action. |

| Exception Code | Name | Description |
|---|---|---|
| 06h | SLAVE DEVICE BUSY | The server is engaged in processing a long-duration command. The client should re-transmit the message later when the server is free. |

# Communication profiles

Modbus is an application layer messaging protocol. It describes how data is transferred between the client and a server, but not the meaning of that data. Communication profiles are used to define the meaning of the data.

## ABB Drives profile - Classic

The ABB Drives profile - Classic communication profile provides register mapped access to the control, status, reference and actual values of the ABB Drives profile in the classic format for backward compatibility.

| Register Address [1] | Register Data (16-bit) |
|---|---|
| (4)00001 | ABB Drives Profile Control |
| (4)00002 | ABB Drives Profile Reference 1 |
| (4)00003 | ABB Drives Profile Reference 2 |
| (4)00004 | ABB Drives Profile Status |
| (4)00005 | ABB Drive Profile Actual 1 |
| (4)00006 | ABB Drive Profile Actual 2 |
| (4)00007 | DATA OUT 1 |
| (4)00008 | DATA OUT 2 |
| (4)00009 | DATA OUT 3 |
| (4)00010 | DATA IN 1 |
| (4)00011 | DATA IN 2 |
| (4)00012 | DATA IN 3 |
| (4)00101… (4)09999 | Drive Parameter Access (16-bit): Register Address = (4)00000 + 100 × Group + Index<br>Example for Drive Parameter 3.18: (4)00000 + 100 × 3 + 18 = 400318<br>**Note:** Addressing depends on the address mode selected with parameter group 23 in group A (51/151, 54/154). |
| (4)20000… (4)29999 | Drive Parameter Access (32-bit): Register Address = (4)20000 + 200 × Group + 2 × Index<br>Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27 = 420254<br>**Note:** Addressing depends on the address mode selected with parameter group 23 in group A (51/151, 54/154). |

[1] 6-digit register addressing ([4]00001) is used instead of 5-digit register addressing ([4]0001) to describe the register map. See section Register addressing (page 49) for additional information.

## ABB Drives profile - Enhanced

The ABB Drives profile - Enhanced communication profile provides register mapped access to the control, status, reference and actual values of the ABB Drives profile. The mapping of the registers has been enhanced to allow writing of control and reading of status in a single Read/Write Multiple Register request.

| Register Address [1) 2)] | Register Data (16-bit) |
|---|---|
| (4)00001 | ABB Drives Profile Control |
| (4)00002 | ABB Drives Profile Reference 1 |
| (4)00003 | ABB Drives Profile Reference 2 |
| (4)00004 | DATA OUT 1 |
| (4)00005 | DATA OUT 2 |
| (4)00006 | DATA OUT 3 |
| (4)00007 | DATA OUT 4 |
| (4)00008 | DATA OUT 5 |
| (4)00009 | DATA OUT 6 |
| (4)00010 | DATA OUT 7 |
| (4)00011 | DATA OUT 8 |
| (4)00012 | DATA OUT 9 |
| (4)00013 | DATA OUT 10 |
| (4)00014 | DATA OUT 11 |
| (4)00015 | DATA OUT 12 |
| (4)00051 | ABB Drives Profile Status |
| (4)00052 | ABB Drive Profile Actual 1 |
| (4)00053 | ABB Drive Profile Actual 2 |
| (4)00054 | DATA IN 1 |
| (4)00055 | DATA IN 2 |
| (4)00056 | DATA IN 3 |
| (4)00057 | DATA IN 4 |
| (4)00058 | DATA IN 5 |
| (4)00059 | DATA IN 6 |
| (4)00060 | DATA IN 7 |
| (4)00061 | DATA IN 8 |
| (4)00062 | DATA IN 9 |
| (4)00063 | DATA IN 10 |
| (4)00064 | DATA IN 11 |

| Register Address [1) 2)] | Register Data (16-bit) |
|---|---|
| (4)00065 | DATA IN 12 |
| (4)00101… (4)09999 | Drive Parameter Access (16-bit): Register Address = (4)00000 + 100 × Group + Index<br>Example for Drive Parameter 3.18: (4)00000 + 100 × 3 + 18 = 400318<br>**Note:** Addressing depends on the address mode selected with parameter group 23 in group A (51/151, 54/154). |
| (4)20000… (4)29999 | Drive Parameter Access (32-bit): Register Address = (4)20000 + 200 × Group + 2 × Index<br>Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27= 420254<br>**Note:** Addressing depends on the address mode selected with parameter group 23 in group A (51/151, 54/154). |

1) 6-digit register addressing ([4]00001) is used instead of 5-digit register addressing ([4]0001) to describe the register map. See section Register addressing (page 49) for additional information.
2) Register addresses of the 32-bit parameters cannot be accessed by using 5-digit register numbers.

## Transparent 16-bit

The Transparent 16-bit communication profile provides unaltered 16-bit access to the configured drive profile.

| Register Address [1) 2)] | Register Data (16-bit) |
|---|---|
| (4)00001 | Native Drive Profile Control |
| (4)00002 | Native Drive Profile Reference 1 |
| (4)00003 | Native Drive Profile Reference 2 |
| (4)00004 | DATA OUT 1 |
| (4)00005 | DATA OUT 2 |
| (4)00006 | DATA OUT 3 |
| (4)00007 | DATA OUT 4 |
| (4)00008 | DATA OUT 5 |
| (4)00009 | DATA OUT 6 |
| (4)00010 | DATA OUT 7 |
| (4)00011 | DATA OUT 8 |
| (4)00012 | DATA OUT 9 |
| (4)00013 | DATA OUT 10 |
| (4)00014 | DATA OUT 11 |
| (4)00015 | DATA OUT 12 |
| (4)00051 | Native Drive Profile Status |
| (4)00052 | Native Drive Profile Actual 1 |
| (4)00053 | Native Drive Profile Actual 2 |
| (4)00054 | DATA IN 1 |

| Register Address [1) 2)] | Register Data (16-bit) |
|---|---|
| (4)00055 | DATA IN 2 |
| (4)00056 | DATA IN 3 |
| (4)00057 | DATA IN 4 |
| (4)00058 | DATA IN 5 |
| (4)00059 | DATA IN 6 |
| (4)00060 | DATA IN 7 |
| (4)00061 | DATA IN 8 |
| (4)00062 | DATA IN 9 |
| (4)00063 | DATA IN 10 |
| (4)00064 | DATA IN 11 |
| (4)00065 | DATA IN 12 |
| (4)00101… (4)09999 | Drive Parameter Access (16-bit): Register Address = 400000 + 100 × Group + Index<br>Example for Drive Parameter 3.18: (4)00000 + 100 × 3 + 18 = 400318<br>**Note:** Addressing depends on the address mode selected with parameter group 23 in group A (51/151, 54/154). |
| (4)20000… (4)29999 | Drive Parameter Access (32-bit): Register Address = (4)20000 + 200 × Group + 2 × Index<br>Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27= 420254<br>**Note:** Addressing depends on the address mode selected with parameter group 23 in group A (51/151, 54/154). |

1) 6-digit register addressing ([4]00001) is used instead of 5-digit register addressing ([4]0001) to describe the register map. See section Register addressing (page 49) for additional information.
2) Register addresses of the 32-bit parameters cannot be accessed by using 5-digit register numbers.

## Transparent 32-bit

The Transparent 32-bit communication profile provides unaltered 32-bit access to the configured drive profile.

| Register Address [1) 2)] | Register Data (16-bit) |
|---|---|
| (4)00001 | Native Drive Profile Control - Least Significant 16-bits |
| (4)00002 | Native Drive Profile Control - Most Significant 16-bits |
| (4)00003 | Native Drive Profile Reference 1 - Least Significant 16-bits |
| (4)00004 | Native Drive Profile Reference 1 - Most Significant 16-bits |
| (4)00005 | Native Drive Profile Reference 2 - Least Significant 16-bits |
| (4)00006 | Native Drive Profile Reference 2 - Most Significant 16-bits |
| (4)00007 | DATA OUT 1 |
| (4)00008 | DATA OUT 2 |
| (4)00009 | DATA OUT 3 |

| Register Address [1) 2)] | Register Data (16-bit) |
|---|---|
| (4)00010 | DATA OUT 4 |
| (4)00011 | DATA OUT 5 |
| (4)00012 | DATA OUT 6 |
| (4)00013 | DATA OUT 7 |
| (4)00014 | DATA OUT 8 |
| (4)00015 | DATA OUT 9 |
| (4)00016 | DATA OUT 10 |
| (4)00017 | DATA OUT 11 |
| (4)00018 | DATA OUT 12 |
| (4)00051 | Native Drive Profile Status - Least Significant 16-bits |
| (4)00052 | Native Drive Profile Status - Most Significant 16-bits |
| (4)00053 | Native Drive Profile Actual 1 - Least Significant 16-bits |
| (4)00054 | Native Drive Profile Actual 1 - Most Significant 16-bits |
| (4)00055 | Native Drive Profile Actual 2 - Least Significant 16-bits |
| (4)00056 | Native Drive Profile Actual 2 - Most Significant 16-bits |
| (4)00057 | DATA IN 1 |
| (4)00058 | DATA IN 2 |
| (4)00059 | DATA IN 3 |
| (4)00060 | DATA IN 4 |
| (4)00061 | DATA IN 5 |
| (4)00062 | DATA IN 6 |
| (4)00063 | DATA IN 7 |
| (4)00064 | DATA IN 8 |
| (4)00065 | DATA IN 9 |
| (4)00066 | DATA IN 10 |
| (4)00067 | DATA IN 11 |
| (4)00068 | DATA IN 12 |
| (4)00101… (4)09999 | Drive Parameter Access (16-bit): Register Address = 400000 + 100 × Group + Index<br>Example for Drive Parameter 3.18: (4)00000 + 100 × 3 + 18 = 400318<br>**Note:** Addressing depends on the address mode selected with parameter group 23 in group A (51/151, 54/154). |

| Register Address [1) 2)] | Register Data (16-bit) |
|---|---|
| (4)20000… (4)29999 | Drive Parameter Access (32-bit): Register Address = (4)20000 + 200 × Group + 2 × Index<br>Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27= 420254<br>**Note:** Addressing depends on the address mode selected with parameter group 23 in group A (51/151, 54/154). |

1) 6-digit register addressing ([4]00001) is used instead of 5-digit register addressing ([4]0001) to describe the register map. See section Register addressing (page 49) for additional information.
2) Register addresses of the 32-bit parameters cannot be accessed by using 5-digit register numbers.

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# Modbus/TCP – Diagnostics

## Contents of this chapter

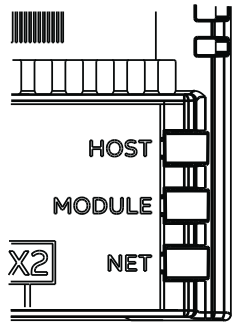
This chapter explains how to trace faults with the status LEDs on the adapter module when the module is used for Modbus/TCP communication.

## Fault and warning messages

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

## 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 drive |
| | Green | Connection to drive OK |
| | Flashing red | Communication to drive lost temporarily |
| | Flashing orange, alternating with the MODULE flashing orange | Internal file system error. The error may be cleared by cycling drive power. If the error persists, contact your local ABB representative. |
| MODULE | Off | There is no power applied to the device. |
| | Flashing orange | Device is attempting to obtain IP configuration from the DHCP server. |
| | Orange | Device is executing Duplicate Address Detection. |
| | Flashing green | Device is waiting for a Modbus request. |
| | Green | Device has received a Modbus request within the Modbus/TCP Timeout period. |
| | Flashing red | Ethernet link is down. |
| | 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 orange, alternating with the HOST flashing orange | Internal file system error. The error may be cleared by cycling drive power. If the error persists, contact your local ABB representative. |
| NETWORK / NET | Off | Ethernet link is down. |
| | Flashing green | Ethernet link is up at 100 Mbps.<br>Flashing indicates activity on interface. |
| | Flashing orange | Ethernet link is up at 10 Mbps.<br>Flashing indicates activity on interface. |

## Internal error code registers

A Modbus query can fail in many ways in the drive. The Modbus standard does not specify detailed error descriptions. In addition to the standard error codes, the FMBT-21 adapter module provides an internal error register area for more detailed diagnostics.

The internal error register area is used if Modbus error code 0x04 occurs. The registers contain information about the last query. You can figure out the reason of the failure by reading the registers. The internal error register is cleared when a query has finished successfully.

| Address | Registers (16-bit word) |
|---|---|
| (4)00090 | Reset internal error registers (0 = Do nothing, 1 = Reset) |
| (4)00091 | Function code of the failed query |
| (4)00092 | Internal error code; see the error number. |
| (4)00093 | Failed register |
| (4)00094 | Last register that was written successfully |
| (4)00095 | Last register that was read successfully |

| Error code | Description | Situation |
|---|---|---|
| 0x00 | No error | Used when a Modbus query was successful |
| 0x02 | Low or high limit exceeded | Change access with a value outside the value limits |
| 0x03 | Faulty subindex | Access to an unavailable subindex of an array parameter |
| 0x05 | Incorrect data type | Change access with a value that does not match the data type of the parameter |
| 0x65 | General error in drive communication | Undefined error when handling a Modbus query |
| 0x66 | Timeout | Timeout in drive communication when handling a Modbus query |
| 0x70 | Read-only | An attempt to write a non-zero value to a read-only drive parameter |
| 0x71 | Parameter group ended | An attempt to write to multiple parameter groups |
| 0x72 | MSB is not zero | An attempt to write a 16-bit parameter with a 32-register address and the MSB bytes are not zero |
| 0x73 | LSB query start | An attempt to access only the LSB register of the 32-bit parameter |
| 0x74 | MSB query end | An attempt to access only the MSB register of the 32-bit parameter |

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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 70).

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.

### FMBT-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.<br>If the value is **0** = None, the communication between the drive and the module has not been established. | Modbus/TCP |
| 02 | Protocol/Profile | Selects the application protocol and communication profile for the network connection.<br>The selections available for NONE protocol are listed below. | **0**=Modbus/TCP |
| | **0** = Modbus/TCP | ABB Drives profile - Classic | |
| | **200** = NONE | NONE protocol | |
| 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. | |

| No. | Name/Value | Description | Default |
|---|---|---|---|
| 05<br>…<br>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 | See parameter 05 IP address 1 | 0 |
| | 0...255 | IP address | |
| 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.<br>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<br>…<br>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 | See 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. | |

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Default</th></tr>
<tr><td>15</td><td>Service configuration</td><td>Disable services that are not required.<br>Each service is represented by a single bit. Bit 0, Lock configuration, can be used to prevent accidental changing of this parameter.<br>By default, all services are enabled and configuration is unlocked.<br>ABB recommends to disable all services that are not used after commissioning.</td><td></td></tr>
<tr><td></td><td colspan="3"><table>
<tr><th>Bit</th><th>Name</th><th>Information</th></tr>
<tr><td>0</td><td>Lock configuration</td><td>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.</td></tr>
<tr><td>1</td><td>Disable IP config tool</td><td>When this bit is set, access from ABB IP Configuration tool is prevented.</td></tr>
<tr><td>2</td><td>Disable ETH tool network</td><td>When this bit is set, access from Ethernet tool network (eg, ABB Drive Composer tool) is prevented.</td></tr>
<tr><td>3</td><td>Disable ping response</td><td>When this bit is set, response to ICMP (ping) message is prevented.</td></tr>
<tr><td>4</td><td>Unsecured ETH tool network</td><td>When this bit is set, access from Ethernet tool network is unsecured.<br>Note: Drive Composer pro before V2.7 supports unsecured communication only.</td></tr>
<tr><td>5</td><td>Disable configuring web pages</td><td>When this bit is set, access to web pages is disabled.</td></tr>
<tr><td>6</td><td>Web-based firmware update</td><td>When this bit is set, the web-based firmware update is disabled. The update is enabled as a default.</td></tr>
<tr><td>7</td><td>Disable OPC UA</td><td>When this bit is set, the OPC UA server is disabled. OPC UA is not enabled by default. For more information, refer to Appendix E - OPC UA server (page 99).</td></tr>
<tr><td>8</td><td>Unencrypted OPC UA</td><td>When this bit is set, connection to the OPC UA server can be selected as unenrcrypted and not signed.</td></tr>
</table></td></tr>
<tr><td></td><td>000000b…111111b</td><td>Service configuration</td><td></td></tr>
<tr><td>16<br>…<br>17</td><td>Reserved</td><td>These parameters are not used by the adapter module when using the NONE protocol.</td><td>N/A</td></tr>
<tr><td>18</td><td>DHCP hostname index</td><td>Allows to use pre-defined format of the DHCP hostname. By default, this value is 0, and if the hostname is not configured from the web page, the default hostname is used. Default hostname is in the format of "drive type-drive serial number". When the parameter value is set to other than 0, the DHCP hostname is overwritten in the format “abbdrive-x”, where "x" is the value of the parameter name index. Example: Setting this value to 12 results in the name of “abbdrive-12”.</td><td>0</td></tr>
</table>

| No. | Name/Value | Description | Default |
|---|---|---|---|
| 19<br>…<br>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.<br><br>**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<br>**x** = major revision number<br>**y** = minor revision number<br>**z** = correction number<br>OR<br>in format **axyz**, where<br>**a** = major revision number<br>**xy** = minor revision numbers<br>**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.<br>**Note:** The value names may vary by drive. | **0** = Idle<br>or<br>**4** = Offline<br>or<br>**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 | 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. | |
| | **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:<br>**xx** = patch number<br>**yy** = build number.<br>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.<br>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:<br>**xx** = major revision number<br>**yy** = minor revision number<br>Example: If the firmware version (<major>.<minor>.<patch>.<build>) is 3.10.200.13 or 3.10.0.0, the value 310 is displayed.<br>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

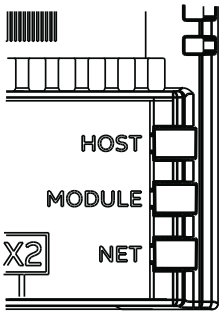
This chapter explains how to trace faults with the status LEDs on the adapter module using the NONE protocol.

## 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.<br>Flashes to show activity on the interface. |
| | Flashes orange | The Ethernet link is up at 10 Mbps.<br>Flashes to show activity on the interface. |

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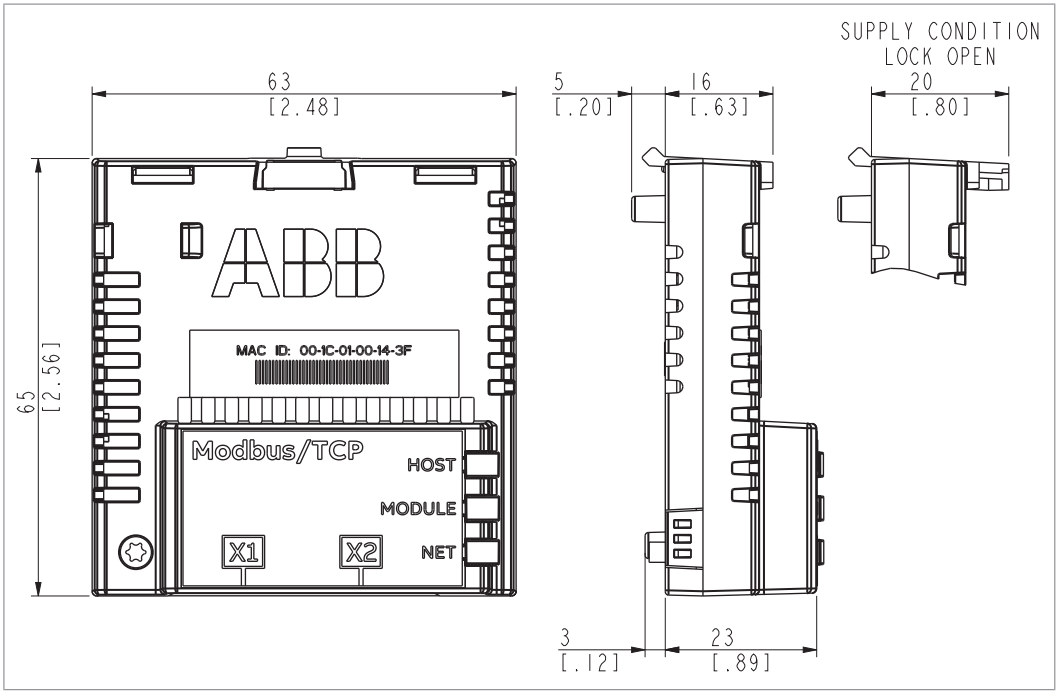
# Technical data

## Contents of this chapter

This chapter contains the technical specifications of the adapter module and the Ethernet link.

## FMBT-21

The figure below shows the enclosure of the adapter module from the front and side.




| | |
|---|---|
| **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<br>RJ-45 connector to Ethernet (X1)<br>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<br>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)<br>• Wiring: CAT5e/6 S/FTP, CAT5e/6 S/STP, CAT5e/6 SF/FTP<br>• Connector: RJ-45<br>• Termination: Internal<br>• Maximum segment length: 100 m (328 ft) |
| **Topology** | Bus or star.<br>In a chain maximum recommended amount of nodes is 50. |
| **Transfer rate** | 10 Mbps or 100 Mbps |
| **Serial communication type** | Half-duplex or full-duplex communication |
| **Protocol** | Modbus/TCP |
| **Number of connections** | Two |

# 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 | Used for Ethernet tool communication. To disable, go to Service configuration page (page 90) via web interface. |
| 502 (TCP/UDP) | Modbus/TCP | Communication between the drive and a PLC.<br>**Note:** Used only when Modbus/TCP protocol is selected |
| 68 (UDP) | DHCP | DHCP client<br>**Note:** Used only when IP configuration method is selected as "Dyn IP DHCP". |

| Port | Service | Purpose |
|---|---|---|
| 24576 (UDP) | ABB Netconfig | • Auto discovery protocol<br>• Used by ControlBuilder plus (IP Configuration tool) and Drive Composer pro and DriveWindow 2.40 PC tools<br>• Discovers ABB-specific Ethernet devices in a local network segment, by listening to and responding to UDP broadcasts.<br>To disable, go to **Service Configuration parameter 51.15** or to Service configuration web page. |
| 123 (UDP) | SNTP | Simple Network Time Protocol. This service is disabled by default. To enable the service, go to Service configuration page (page 90) via web interface. |
| 4840 (TCP) | OPC UA | OPC UA server. |
| 443 (TCP) | HTTPS | HTTPS protocol, used for access to FMBT-21's web page and for Ethernet tool Network (like Drive Composer pro). |

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# Appendix A – ABB IP configuration tool for FMBT-21

## Contents of this chapter

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

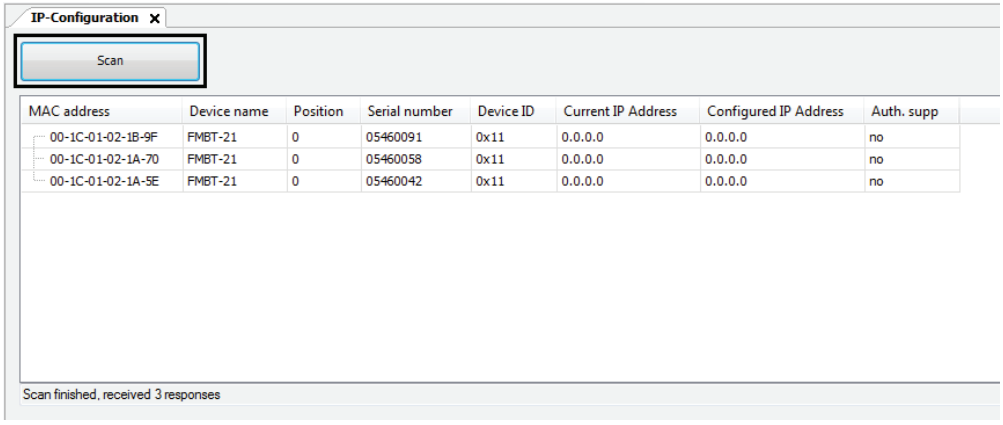
- find configured and unconfigured FMBT-21 adapter modules in the network
- rewrite the IP configuration of the adapter modules.

## Installation

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

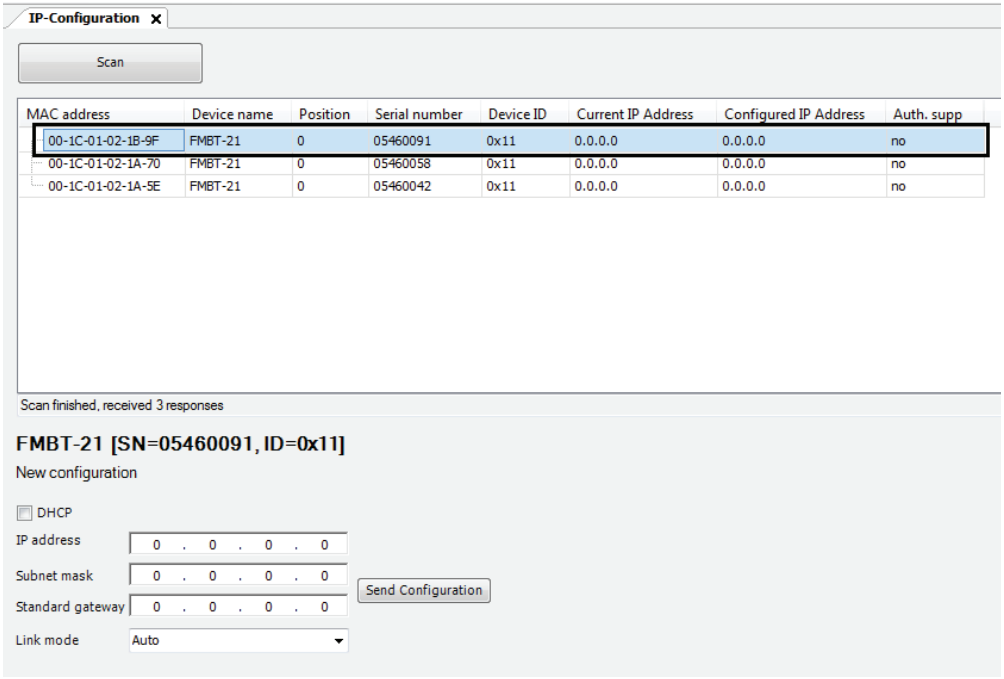
## Finding adapter modules in the network

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

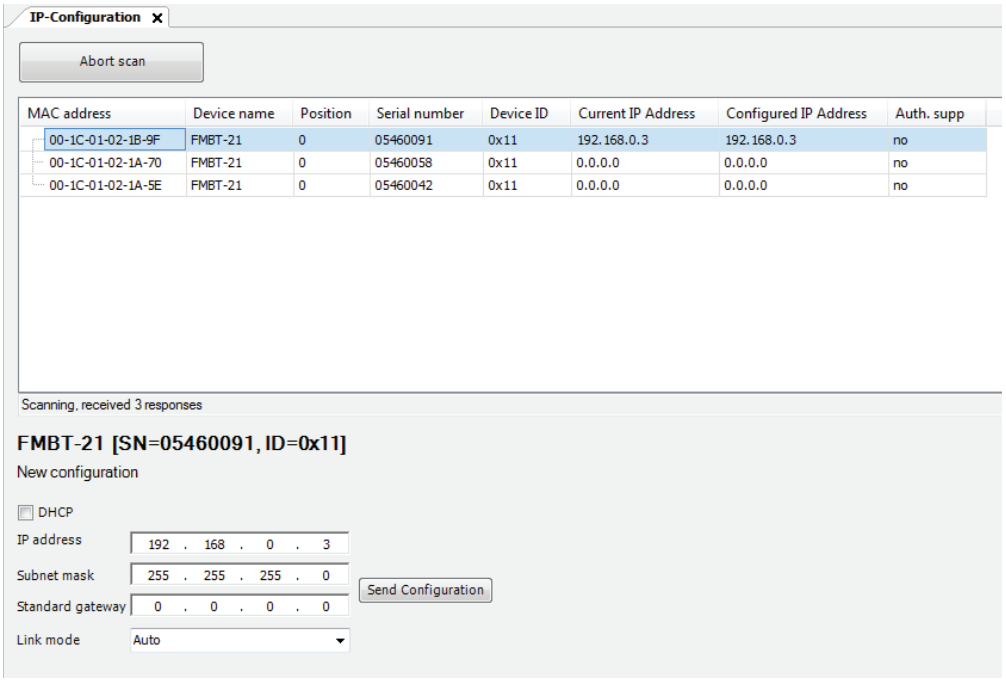



# Rewriting the IP configuration of adapter modules

1. Scan the network for adapter modules.
   For instructions, refer to section Finding adapter modules in the network (page 77).
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.


IP-Configuration
Abort scan
MAC address
Device name
Position
Serial number
Device ID
Current IP Address
Configured IP Address
Auth. supp
00-1C-01-02-1B-9F
FMBT-21
0
05460091
0x11
192.168.0.3
192.168.0.3
no
00-1C-01-02-1A-70
FMBT-21
0
05460058
0x11
0.0.0.0
0.0.0.0
no
00-1C-01-02-1A-5E
FMBT-21
0
05460042
0x11
0.0.0.0
0.0.0.0
no
Scanning, received 3 responses
FMBT-21 [SN=05460091, ID=0x11]
New configuration
DHCP
IP address
192 . 168 . 0 . 3
Subnet mask
255 . 255 . 255 . 0
Standard gateway
0 . 0 . 0 . 0
Send Configuration
Link mode
Auto

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# Appendix B - Module configuration backup

## Contents of this chapter

This chapter presents the settings for FMBT-21 configuration backup.

## Compatibility

FMBT-21 settings are stored in the drive parameters and also in the configuration files. FMBT-21 adapter 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 FMBT-21 in FBA A, slot 1 can be restored to FMBT-21 FBA A, slot 2.
- Backup depends on the fieldbus channel. For example, backup of FMBT-21 in FBA A is not restored to FMBT-21 in FBA B.
- FMBT-21 configuration parameters are included in the backup when drive parameters are saved.

### Configuration backup for all protocols in FMBT-21

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

## Contents of this chapter

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

## Compatibility

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

## Automatic configuration process

FMBT-21 reads the fieldbus configuration parameters from the drive (group A) during the first initialization. When FMBT-21 detects a FENA-xx or Ethernet usage, FMBT-21 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, FMBT-21 checks the backup configuration of module type and protocol from the drive. When FMBT-21 detects that a FENA-xx or Modbus/TCP (UDP) was used, FMBT-21 reads the backup file from the drive and extracts the service configuration parameters configured through FENA-xx web page. The parameters recognized by FMBT-21 (for example, ping response, IP config tool, ETH tool network) are applied and the unrecognized parameters are ignored.

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

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# Appendix D - FMBT-21 configuration web pages

## Contents of this chapter

This chapter presents the FMBT-21 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 90).

## Browser requirements

You can use any web browser.

## Compatibility

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

For the compatibility table, see section Drives (page 11).

# 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 FMBT-21 configuration parameters, group A, parameter 5...8.

   Example: https://192.168.0.100/

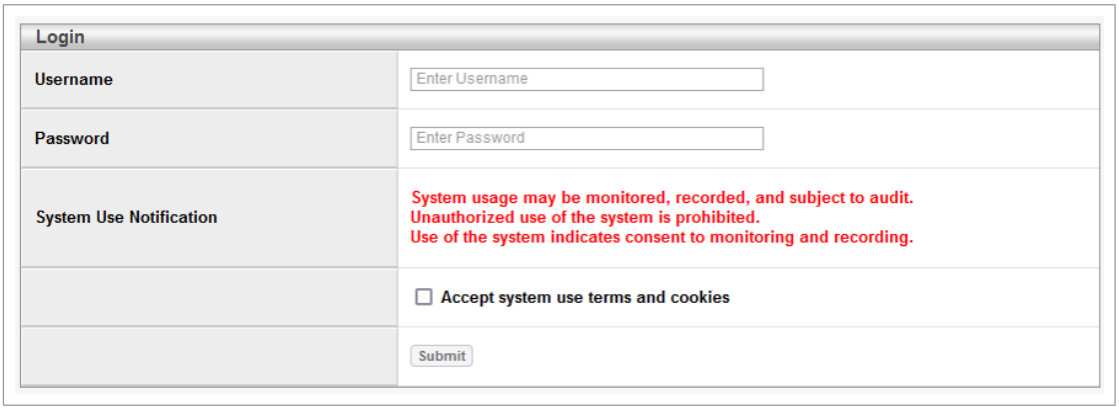
2. Log in with a user name and a password.

   Default user name: admin

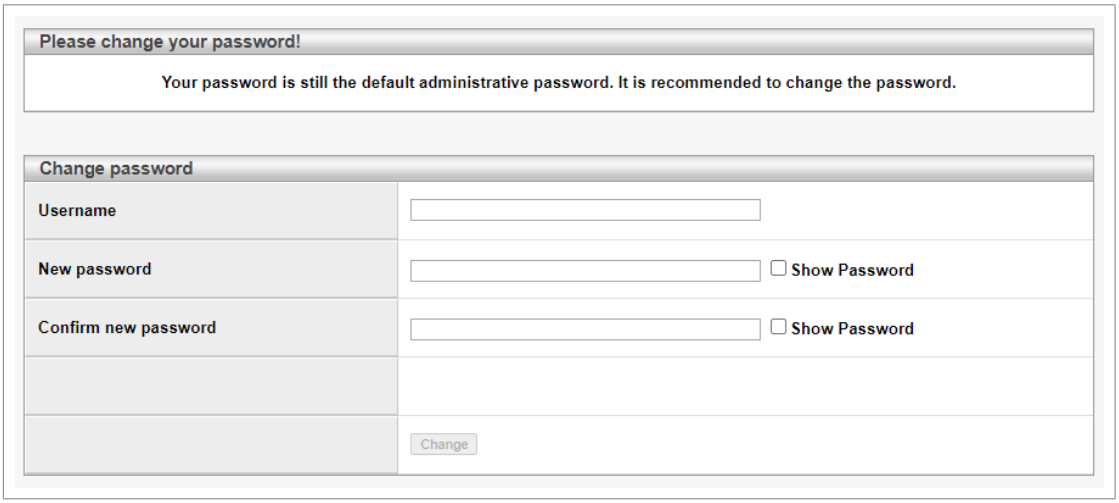
   Password: The last six digits of the MAC address of the adapter module, in upper case, without hyphens.

   The MAC ID is visible on the cover of the adapter module and in the ABB IP configuration tool, see Appendix A – ABB IP configuration tool for FMBT-21 (page 77).

   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.



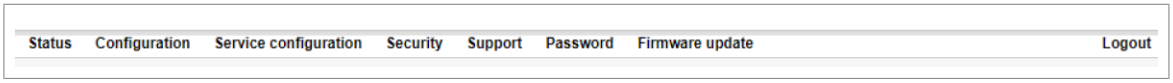

3. After successful login, you are prompted to change the default password for security reasons. ABB recommends that you change the default password. For the password restrictions, refer to Password page (page 94).



# Menu overview

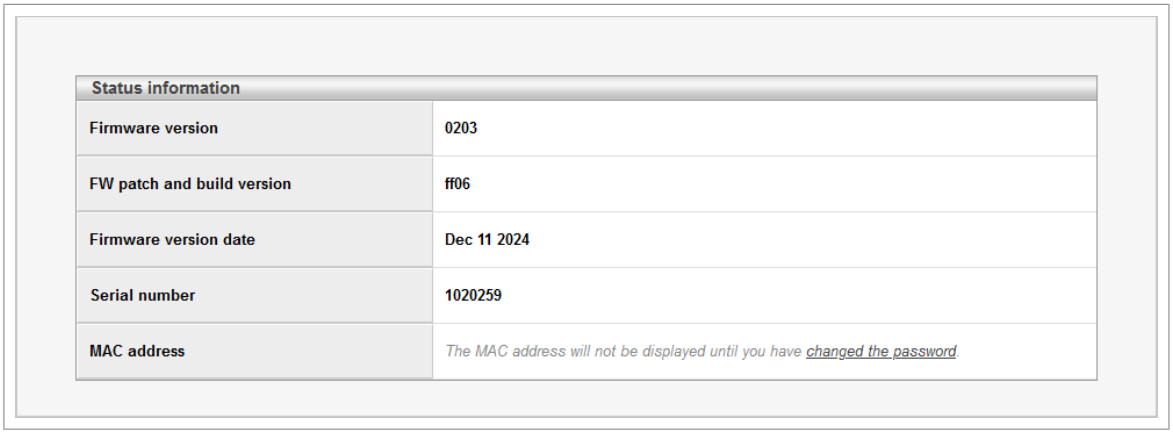
To navigate on the web pages, use the menu items available:

- Status
- Configuration
- Service configuration
- Security
- Support
- Password
- Firmware update



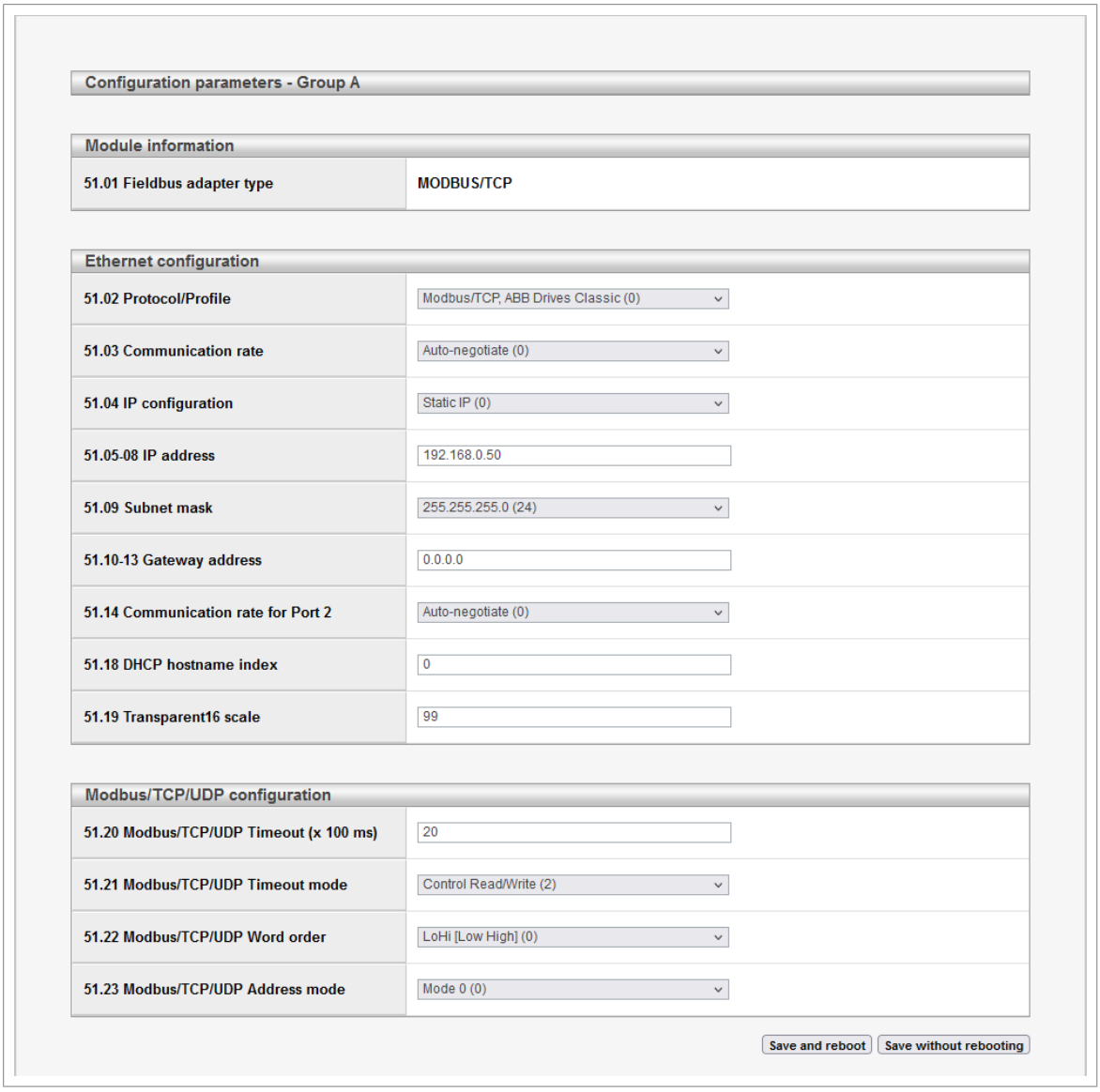

## Status page

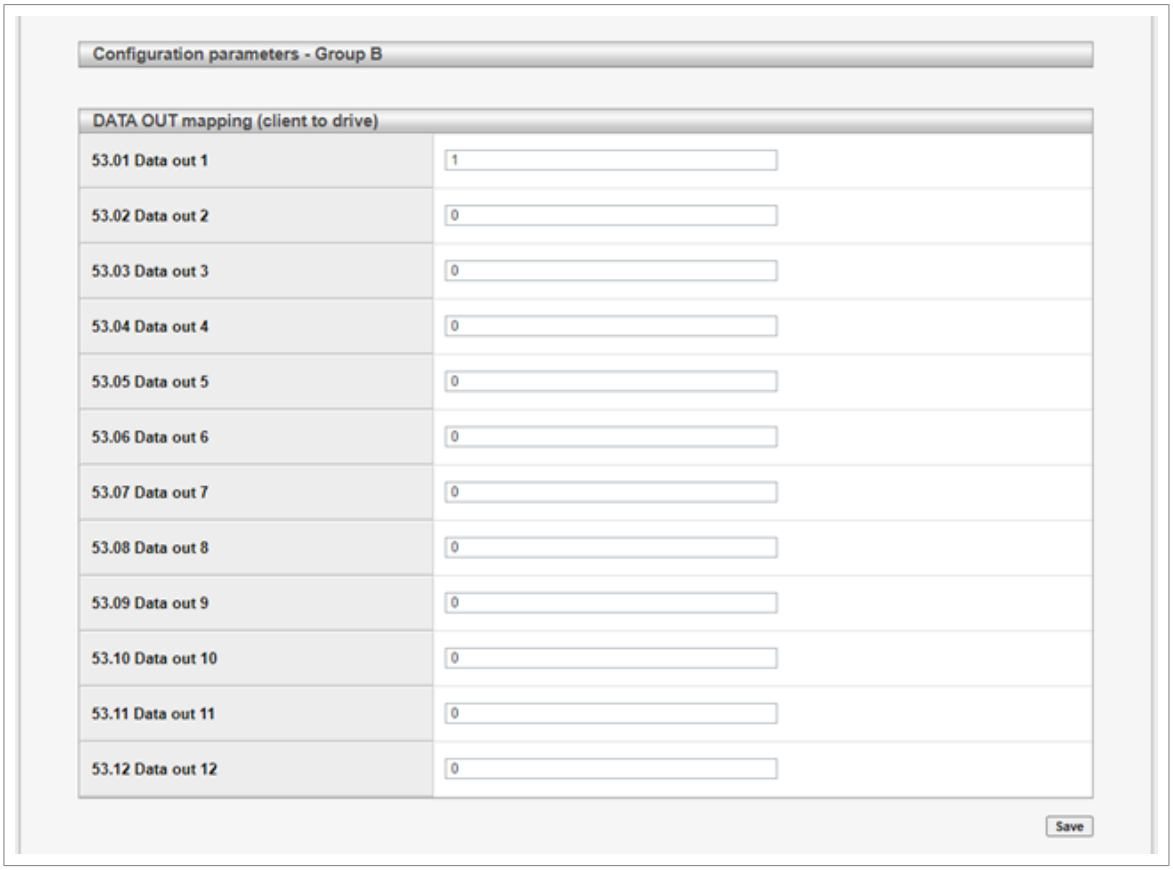
The Status page shows version information, as well as the serial number and MAC address (MAC ID) of the adapter module.

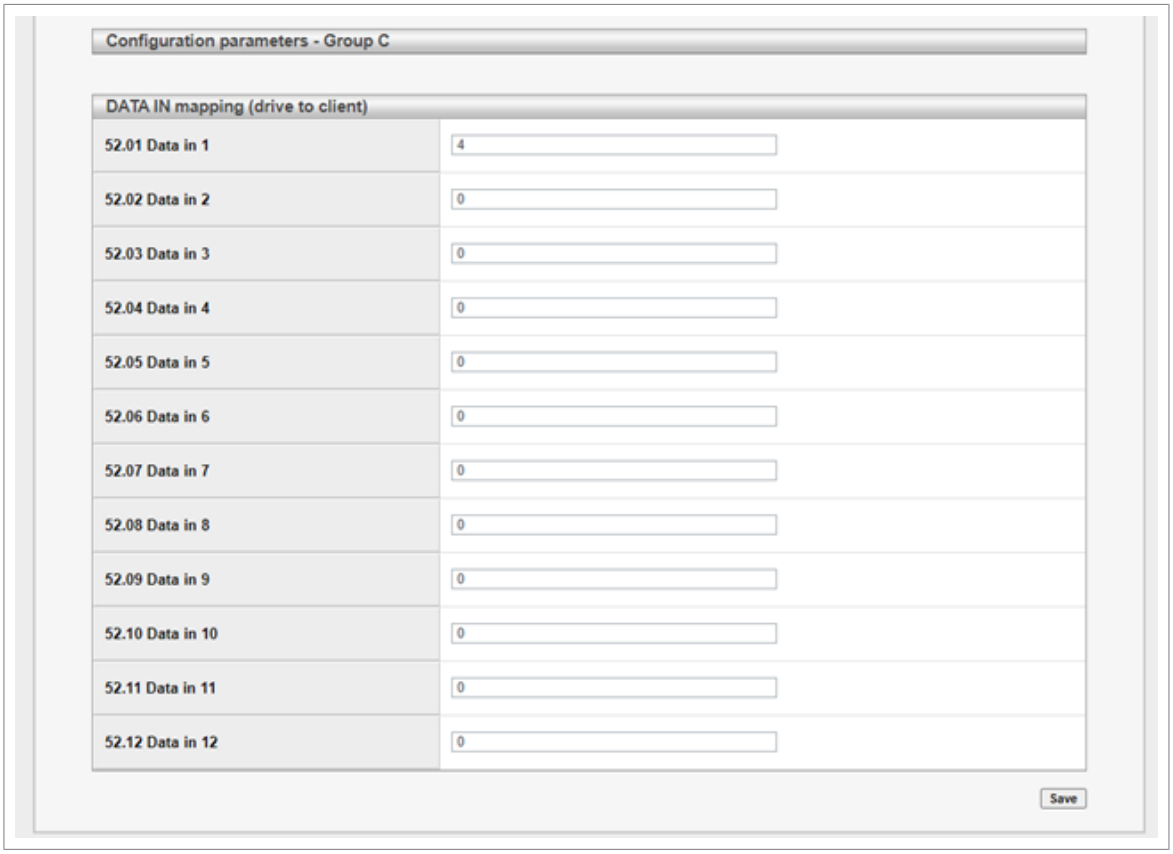



## Configuration page

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


Configuration parameters - Group A
Module information
51.01 Fieldbus adapter type
MODBUS/TCP
Ethernet configuration
51.02 Protocol/Profile
Modbus/TCP, ABB Drives Classic (0)
51.03 Communication rate
Auto-negotiate (0)
51.04 IP configuration
Static IP (0)
51.05-08 IP address
192.168.0.50
51.09 Subnet mask
255.255.255.0 (24)
51.10-13 Gateway address
0.0.0.0
51.14 Communication rate for Port 2
Auto-negotiate (0)
51.18 DHCP hostname index
0
51.19 Transparent16 scale
99
Modbus/TCP/UDP configuration
51.20 Modbus/TCP/UDP Timeout (x 100 ms)
20
51.21 Modbus/TCP/UDP Timeout mode
Control Read/Write (2)
51.22 Modbus/TCP/UDP Word order
LoHi [Low High] (0)
51.23 Modbus/TCP/UDP Address mode
Mode 0 (0)
Save and reboot
Save without rebooting



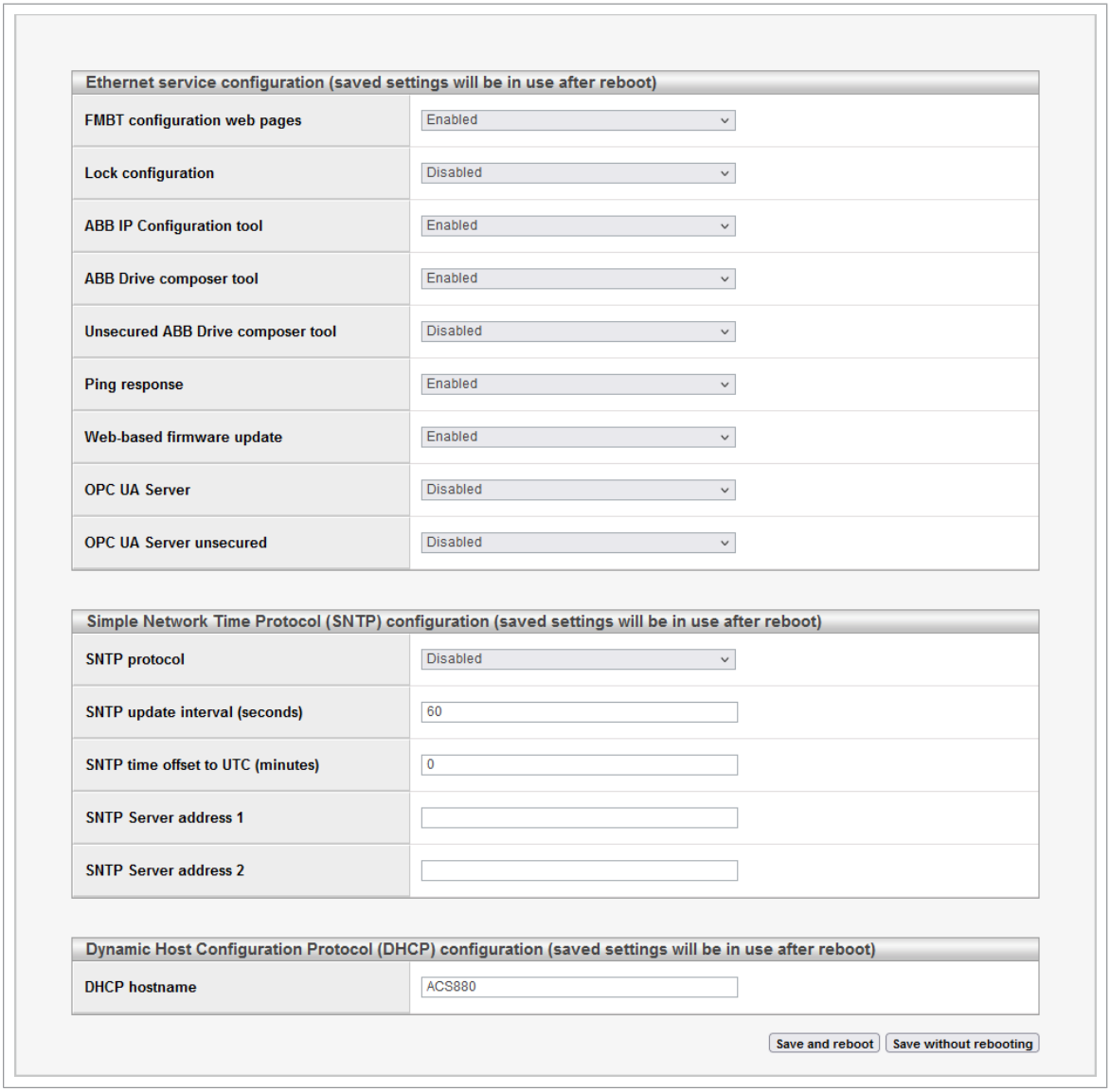

After you change any setting in any of the groups, click **Save** and reboot at the bottom of Group A to validate the settings.

## Service configuration page

On the Service configuration page, you can enable or disable certain Ethernet services. All services except Simple Network Time Protocol (SNTP) and OPC UA server are enabled by default. You can disable or enable the following services on this page:

- access to FMBT-21 configuration web page
- allow to change 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
- configure SNTP
- configure DHCP hostname.

The new settings take effect after reboot of the module. You can click Save and reboot, to validate the new settings immediately or click Save without rebooting if you want to do other settings also and then reboot.



**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 98).

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

### Configuring SNTP

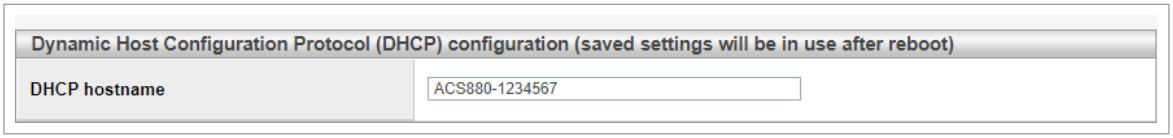
You can use the Simple Network Time Protocol (SNTP) to synchronize drive time with a network time server. When SNTP is enabled, FMBT-21 requests the time from the configured server at a given interval. To receive this time synchronization, set parameter 96.20 Time sync primary source to Fieldbus A. The table shows the settings for SNTP:

| Settings | Description | Value |
|---|---|---|
| SNTP update interval | Interval to request time from server. | Default: 30 seconds<br>Minimum: 30 seconds |
| SNTP time offset to UTC | Time offset to the time received from SNTP.<br>This value can also be set over Modbus register (4)00084.<br>**Note:** SNTP time offset change does not need a reboot. | -1440…1440 minutes |
| SNTP server address 1 | Primary server address for requesting time.<br>Format: IP address followed by optional port number, eg:<br>192.168.0.1:123<br>**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. | - |

### Configuring DHCP hostname

Dynamic Host Configuration Protocol (DHCP) is a network management protocol used to automate the process of configuring devices on IP networks. A DHCP hostname is the name assigned to a device on the network by the DHCP server. This hostname helps to identify the device within the network, making it easier for network administrators to manage and for other devices to locate it.

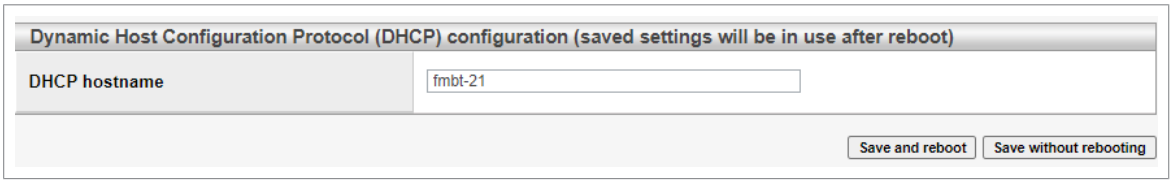
The DHCP hostname field displays the current DHCP hostname set for the FMBT-21 and can also be used to assign a custom hostname to the module. By default, the default hostname is configured to the FMBT-21 which is in format <drive type>-<drive serial number>. If default hostname is in use and drive type is unavailable, the hostname will default to "ABBDrive" for the drive type portion. Should the drive's serial number be missing, the default hostname will consist only of the drive type.



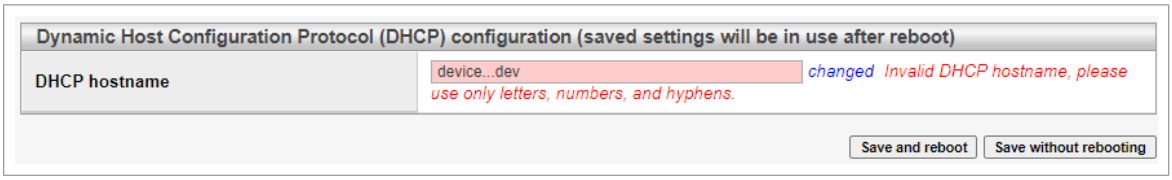
To set a new name, type the name in the DHCP hostname field. Click Save and reboot to save the hostname and to reboot the FMBT-21. The new name is effective only after the FMBT-21 reboot.

**Note:** The value in parameter 51.18 DHCP hostname index must be 0 to use the set hostname. Otherwise the name generated by the DHCP hostname index overrides it.

Example: the DHCP hostname is set as fmbt-21. After you click Save and reboot, the new hostname is shown on the refreshed web page after the reboot.

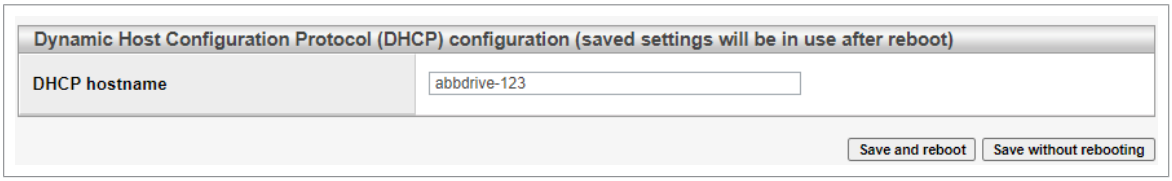



The web page validates the DHCP hostname format and displays possible corrections needed to the new name.




You can also set the DHCP hostname using the DHCP hostname index.


After you click Save and reboot, and the reboot is completed, the DHCP hostname field shows the new generated name.




## Security page

On the Security page, you can upload a private key and certificates for FMBT-21 to use instead of the self-signed certificate that FMBT-21 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.

FMBT-21 uses secure HTTPS (TLS 1.2) communication for the web page server. By default, FMBT-21 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.

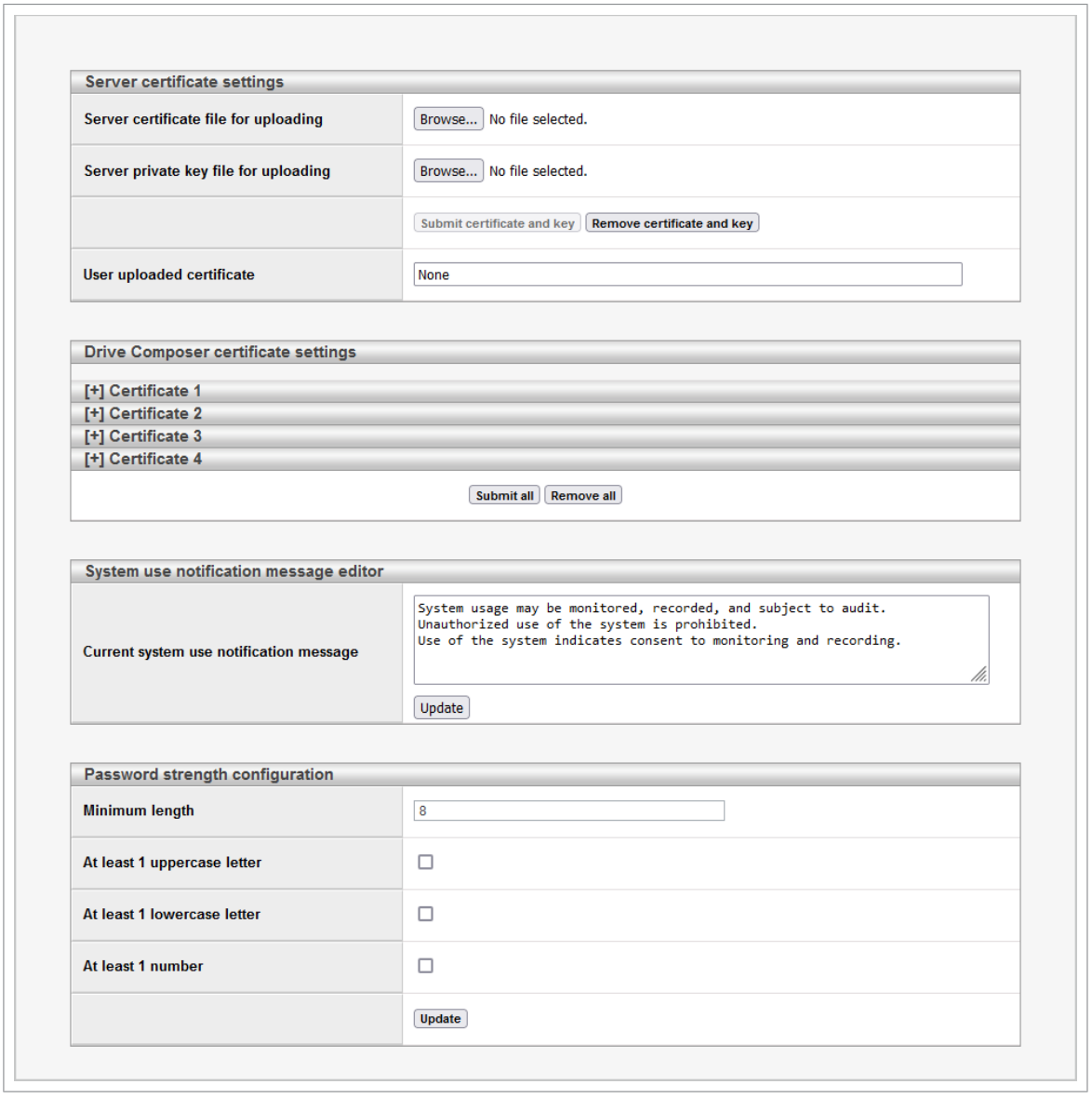
A system use notification message is displayed on the login page. On the security page, you can edit the system use message notification. Updates to the message will appear the next time a user visits the login page.

### 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.

### Password strength configuration

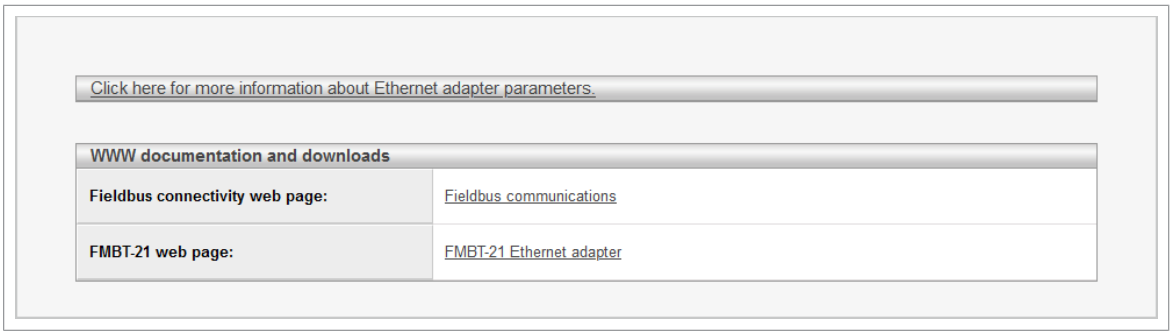
On the security page, you can use the password strength editor to enforce requirements for the password. You can set minimum password length and the requirement for at least one uppercase letter, lowercase letter and number. Any changes on the restrictions are applied next time when the password is changed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



## Support page

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

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

**WARNING!** 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.

FMBT-21 supports only one user access level.

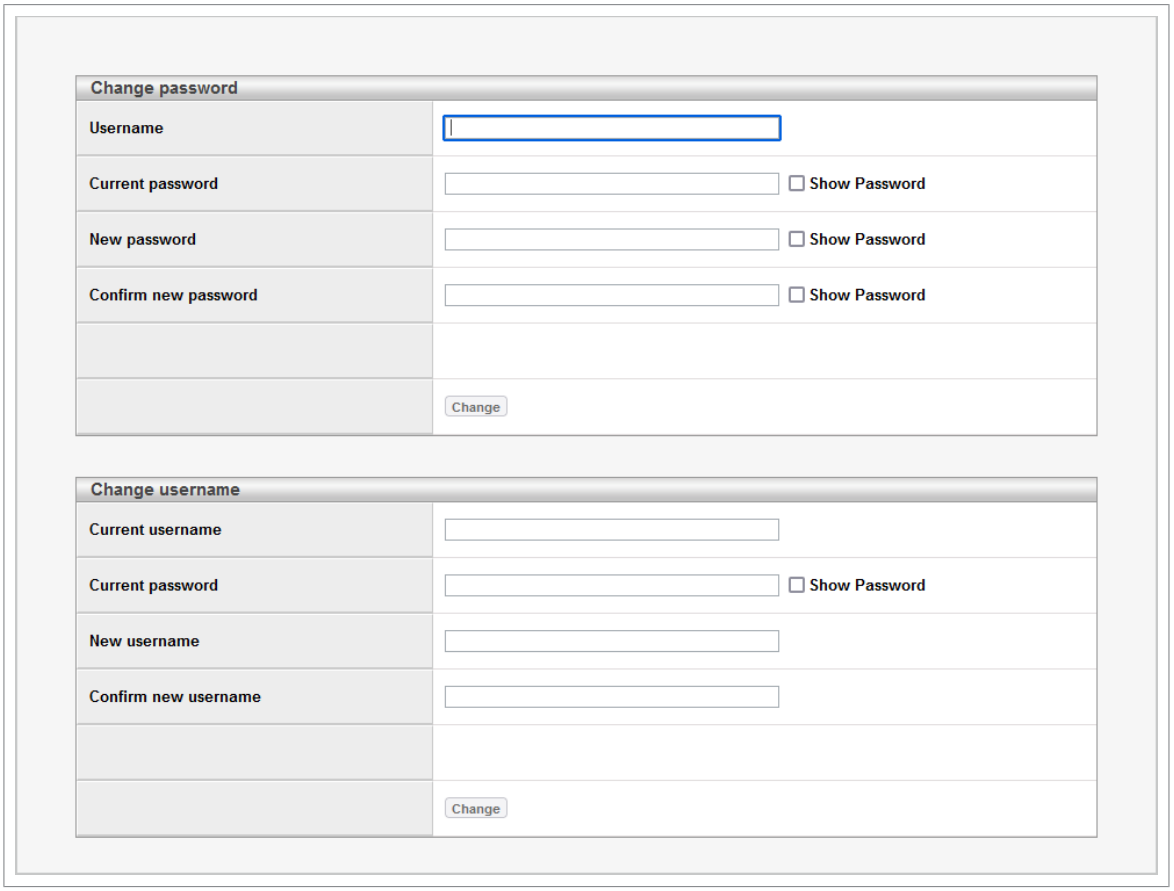
By default, the password must contain:

- 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 93).

The username must contain:

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




## 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 Modbus, Drive composer and OPC UA) will be lost during the firmware update.

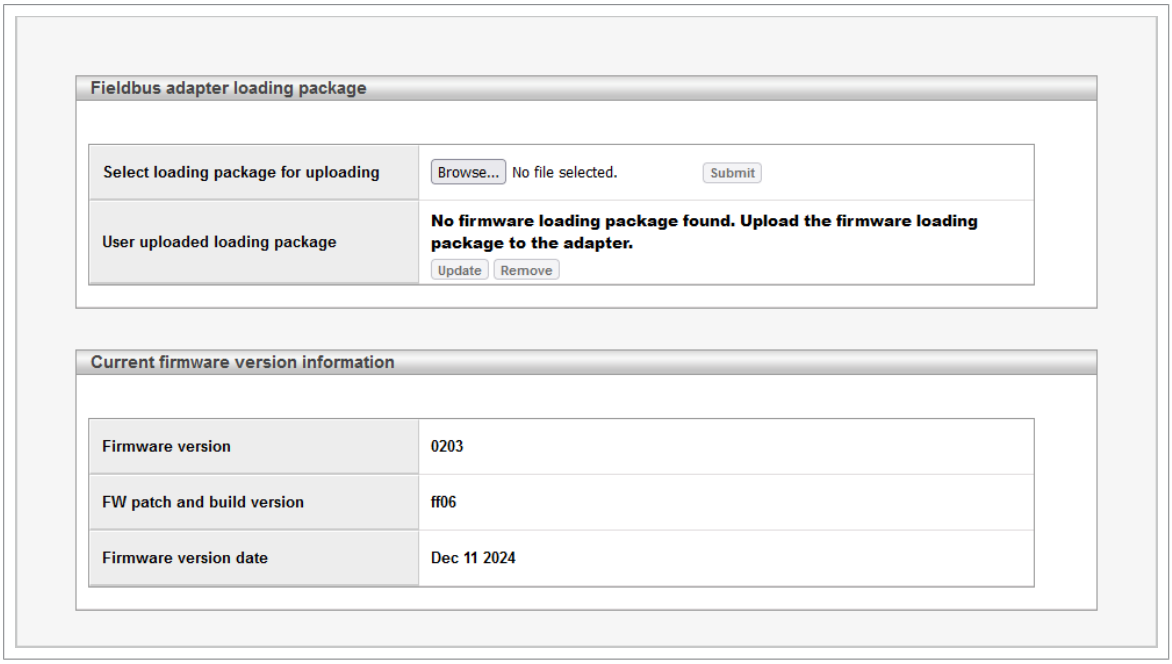
**WARNING!** ABB recommends that you update the FMBT-21 module only when the drive is in local mode and not operational.

To update the adapter firmware, first upload 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.

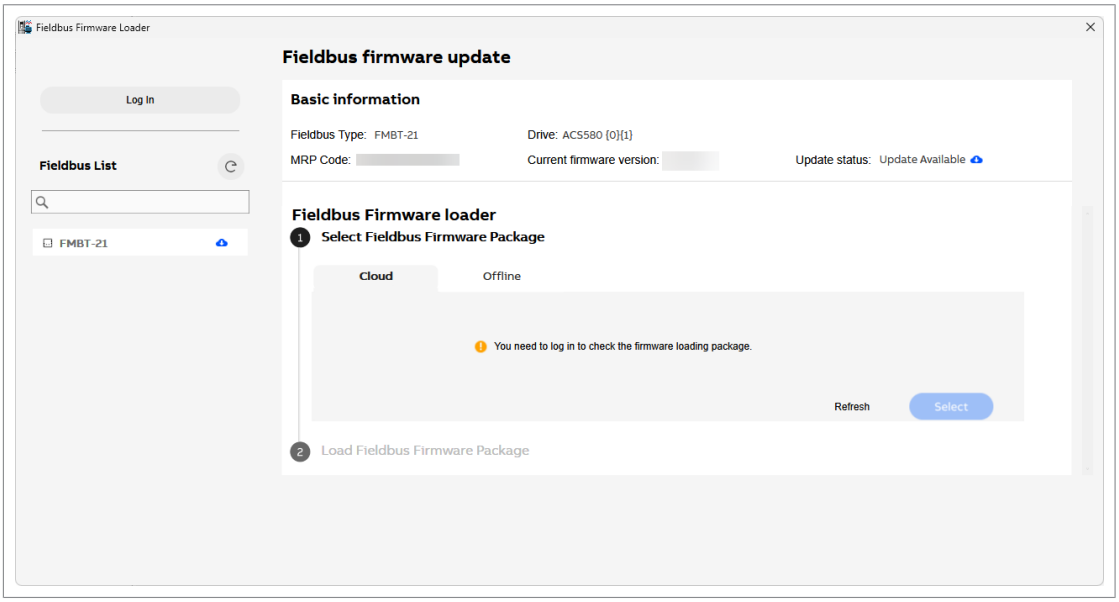
*For the firmware loading package, contact ABB.



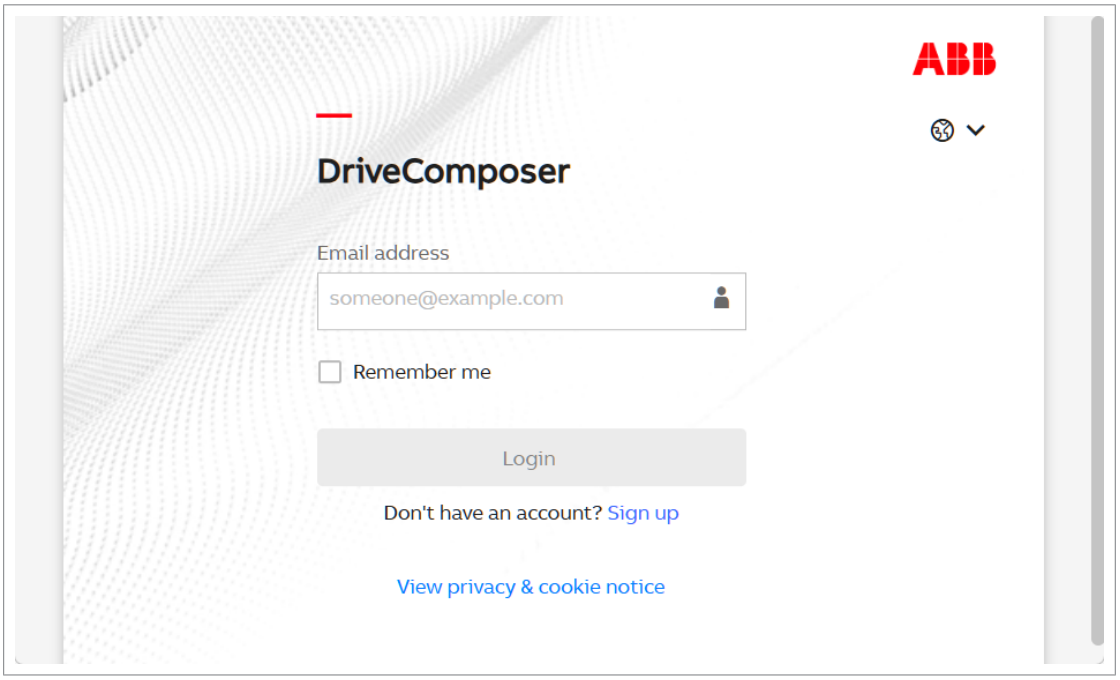

## Firmware update using the Drive Composer

You can update FMBT-21 using the Drive Composer PC tool. To update the firmware, follow these steps:

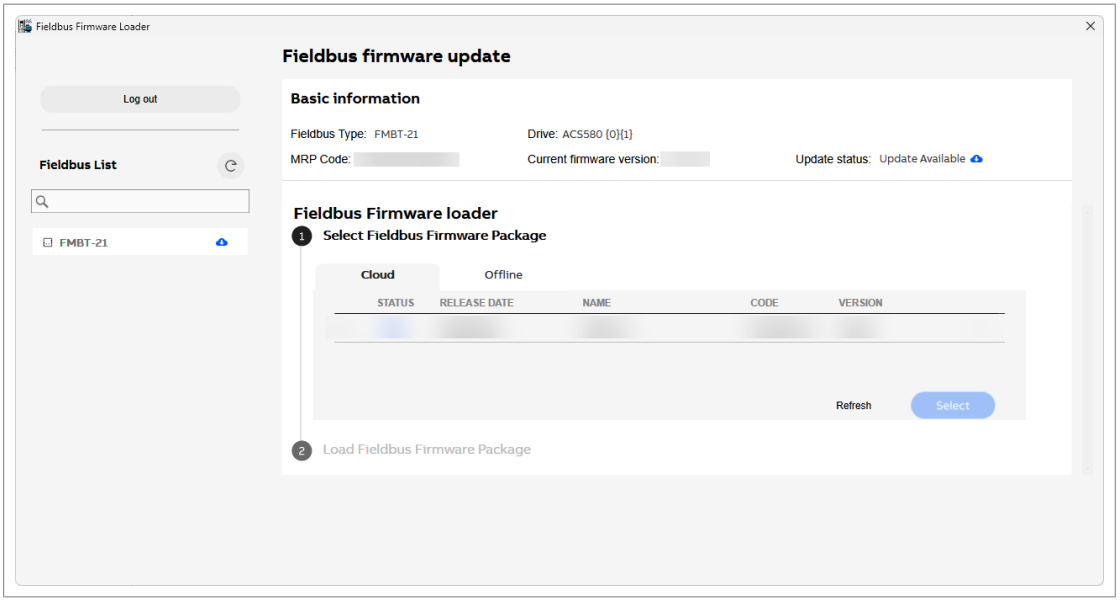
- Connect the Drive Composer to a drive via Ethernet tool network using FMBT-21
- In Drive Composer, select **Tools > Fieldbus adapter loader** option from the menu bar
- You need to log in to portal to be able to continue



- 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.

## Reset FMBT-21 web page password to default

You can reset the FMBT-21 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 FMBT-21.
   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.

FMBT-21 password is now reset to the default password. For information of default password, refer to Logging in (page 86).

## 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 FMBT-21.
   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 - OPC UA server

## Contents of this chapter

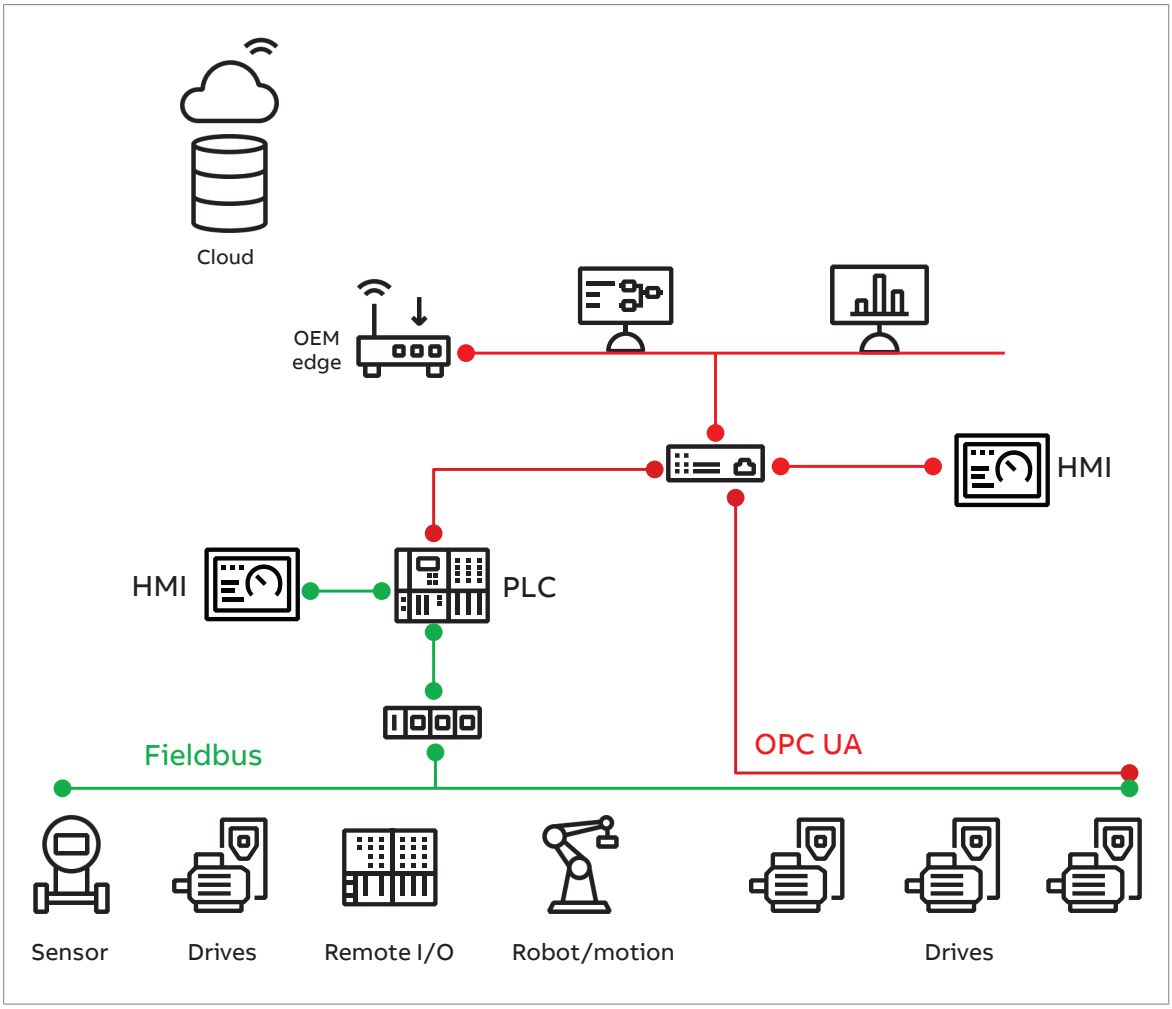
This chapter provides instructions on how to enable, configure, and use the OPC UA server and client.

## 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 Modbus.




## Compatibility

OPC UA server enables ABB drives to operate with any OPC UA compliant client. OPC UA requires FMBT-21 version 2.03 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.

## 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 91).

### 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.

  **WARNING!** 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.

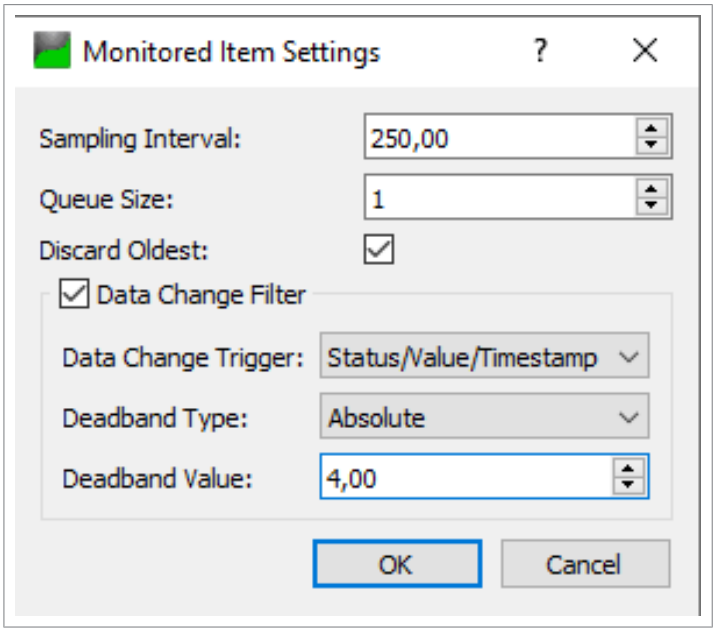
- **Sign with Aes128_Sha256_RsaOaep:** This endpoint uses SHA-256 as the hash algorithm, RSA with OAEP padding as the signature algorithm with 2048-bit keys, and AES as the encryption algorithm with 128-bit keys. It signs the messages but does not encrypt them. It is deactivated by default. Use this 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.

**Note:** Only a self-signed certificate is supported by FMBT-21 V2.03 OPC UA server.

## 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.




## 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.

| Property BrowseName | Data type | Description |
|---|---|---|
| EventId | NodeId | A unique identifier for the event. This identifier can be used to distinguish between different events. |
| EventType | NodeId | Identifies the type of the event. It specifies the event type that is instantiated.<br>The following event types are supported: |

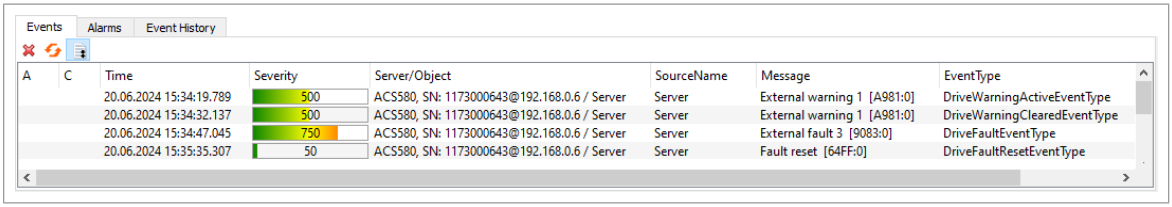
| EventType | Description |
|---|---|
| 1:DriveFaultEventType | Generate on fault |
| 1:DriveWarningActiveEvent-Type | Generate when warning activates |
| 1:DriveWarningCleare-dEventType | Generate when warning is cleared |
| 1:DrivePureEventType | Generate on general notific-ation |
| 1:DriveFaultResetEvent-Type | Generate on fault reset |

| | | |
|---|---|---|
| SourceNode | NodeId | Node that caused the event. SourceNode is always "i=2253". |
| Message | LocalizedText | A human-readable description of the event. It shows the drive event name including fault code and aux code in HEX format. |

| Property BrowseName | Data type | Description |
|---|---|---|
| Severity | UInt16 | Represents the severity of the event. It provides an indication of the urgency or importance of the event.<br>50: Fault reset<br>100: Event<br>500: Warning<br>750: Fault |
| 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:

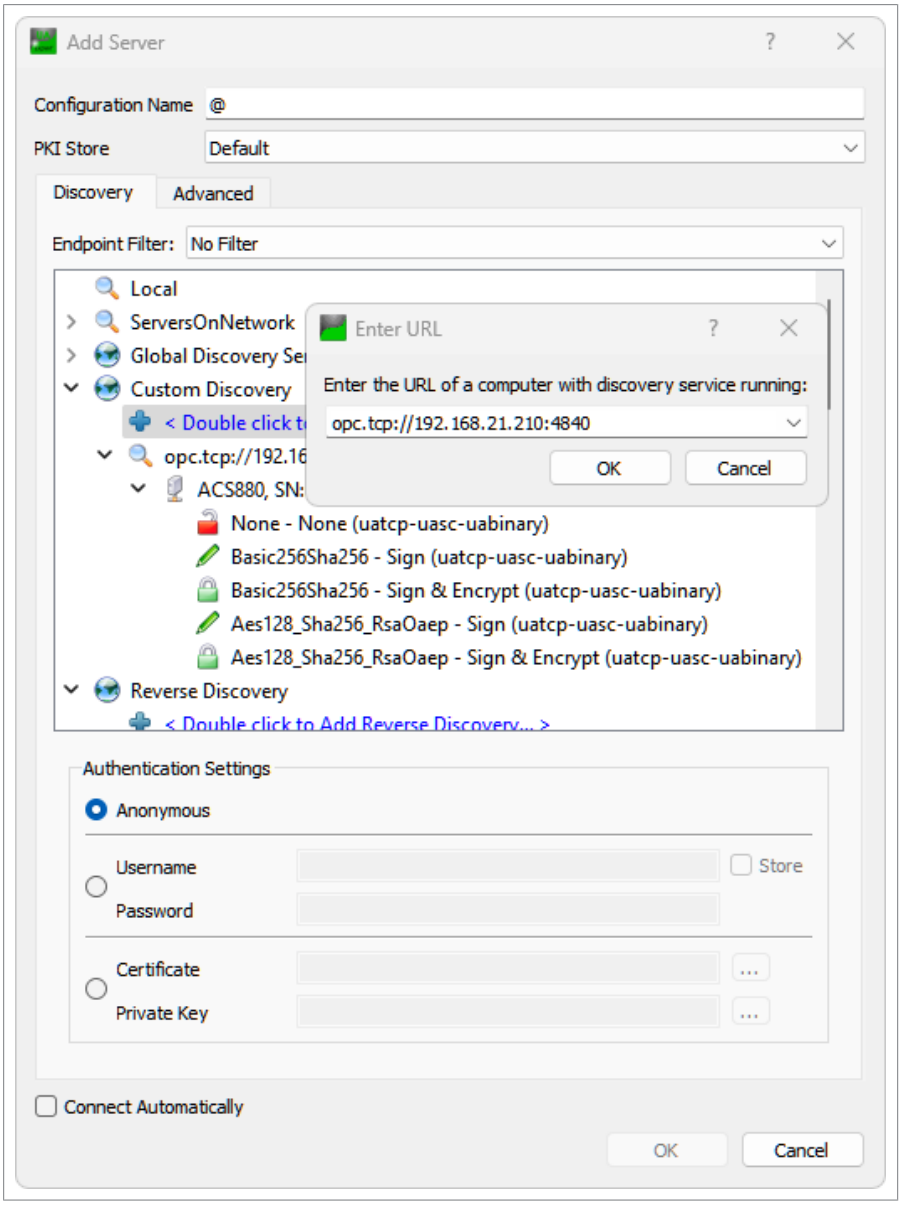



## Connection example

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.

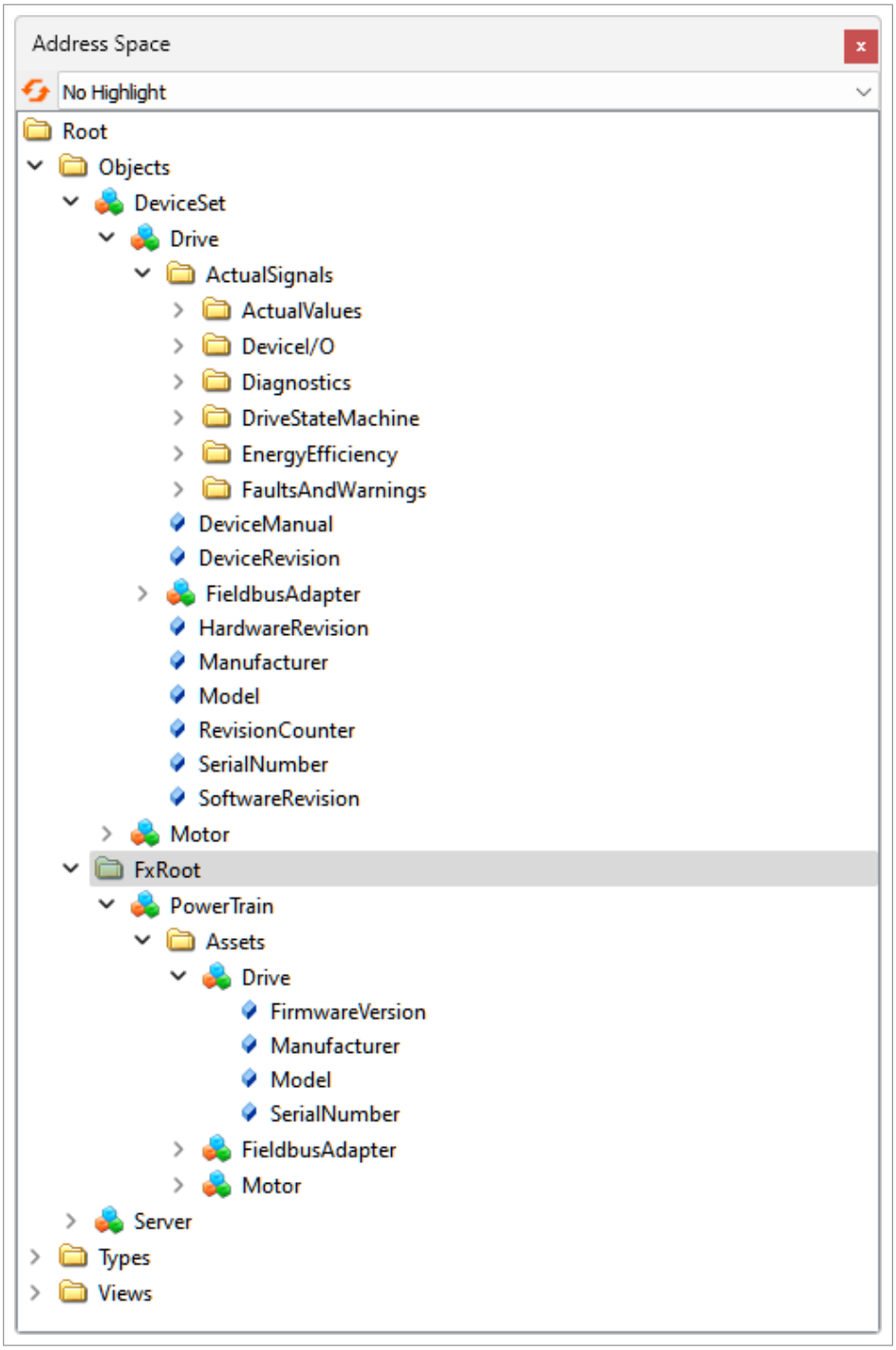
To connect the OPC UA client to an OPC UA server on an ABB drive:

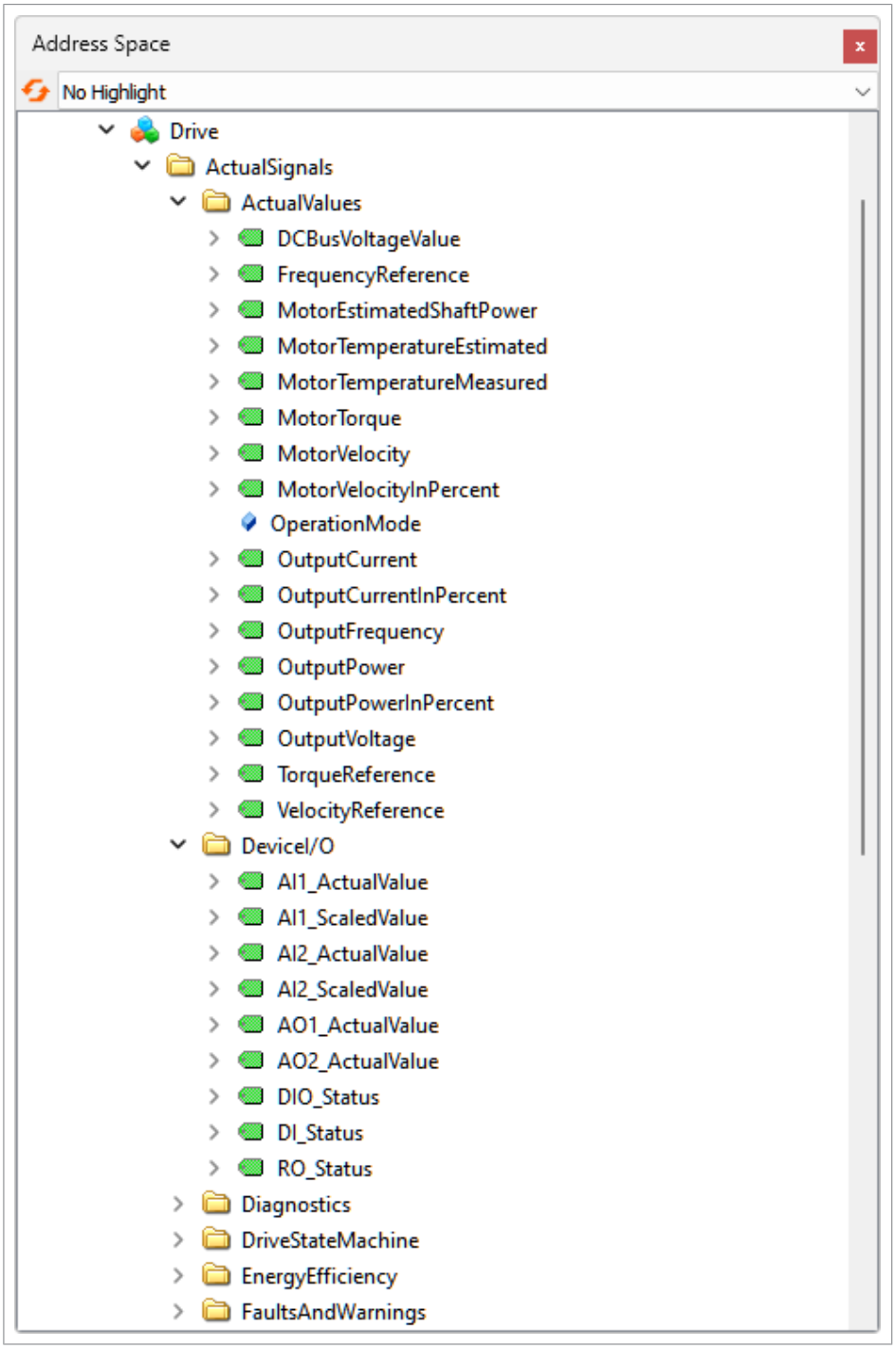
1. Enable the OPC UA server with parameter 15 Service configuration, bit 7.
2. Start the OPC UA client software and open the project that was created or configured previously.
3. Discover the OPC UA server.
   Enter the endpoint URL of the OPC UA server in the format "opc.tcp://<ip_address>:4840". The <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.
4. Select the security mode and the security policy for the OPC UA connection. The security mode can be none, sign, or sign and encrypt.
5. Select the Anonymous Authentication method.




6. Accept the certificate of the OPC UA server.
7. 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

# 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)
- VDMA 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 |

# 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 www.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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PDF-A4
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**www.abb.com/drives**

3AXD50000158607C



3AXD50000158607 Rev C (EN) 2025-02-1