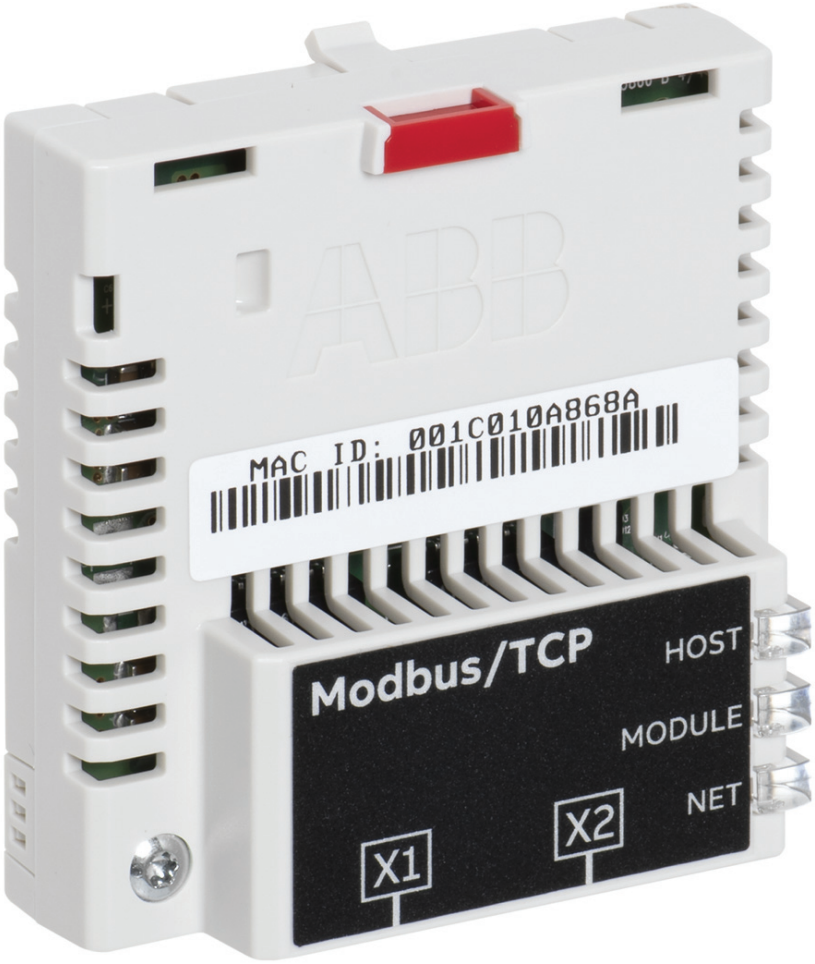
OPTIONS FOR ABB DRIVES, CONVERTERS AND INVERTERS

FMBT-21 Modbus/TCP adapter module

User's manual



FMBT-21 Modbus/TCP adapter module

User’s manual

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3AXD50000158607 Rev B
EN
Original instructions
EFFECTIVE: 2022-06-29

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1

Safety instructions

Contents of this chapter

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

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 draw attention to a particular condition or fact, or give information on a subject.

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.

- If you are not a qualified electrician, do not do installation 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.
- 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 multimeter to make sure that there are no parts under voltage in reach. The impedance of the multimeter must be at least 1 Mohm.

2

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 2.00 and later.

Compatibilty

The FMBT-21 Modbus/TCP adapter module is compatible with different ABB drives and wind turbine converters.

Note: Later in this manual, the term drive is used to refer to converters as well.

Drives

The FMBT-21 adapter module is compatible with:

- ACS880 primary control program version 2.51.0.0 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
- ACS380 machinery control program version 2.02.0.1 and later

- ACS480 standard control program 2.02.0.3 and later
- ACS355 drive firmware version 5.090 and later
- ACH480 HVAC control program 2.06.0.2 and later
- ACS560 standard control program 2.08.0.0 and later

Note: Not all compatible firmwares are listed here. For details of compatibility, check the drive's firmware manual. You can check the current firmware version of the drive with 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 from SW version 1.00 onwards:

- Modbus/TCP
- Modbus over UDP

In addition to these protocol, 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: • Modbus Application Protocol Specification v1.1b • 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, see:

- 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 in question. 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.

Cybersecurity disclaimer

This product can be connected to and communicate information and data via a network interface. The HTTP protocol, which is used between the commissioning tool (Drive Composer) and the product, is an unsecured protocol. For independent and continuous operation of product such connection via network to commissioning tool is not necessary. However 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, prevention of physical access, 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.

Notwithstanding any other provision to the contrary and regardless of whether the contract is terminated or not, ABB and its affiliates are under no circumstances 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
ACx580	ACS580, ACH580 or ACQ580
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

Term	Description
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
MSB	Most significant bit
MSC	Most significant character
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
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

Manual	Code
ACS880-14 manuals	9AKK107045A8023
ACS880-17 (45 to 400 kW) manuals	9AKK106930A3466
ACS880-17 (160 to 3200 kW) manuals	9AKK106354A1499
ACS880-17LC manuals	9AKK107492A4721
ACS880-31 manuals	9AKK106930A9564
ACS880-34 manuals	9AKK107045A8025
ACS880-37 (45 to 400 kW) manuals	9AKK106930A3467
ACS880-37 (160 to 3200 kW) manuals	9AKK106354A1500
ACS880-37LC manuals	9AKK107492A4722
ACS880 multidrive manuals	9AKK106103A9122
ACS880 multidrive module manuals	9AKK105713A3673
Option manuals and guides	
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 and other product documents in PDF format on the Internet at www.abb.com/drives/documents.

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

FMBT-21 manual

Fieldbus connectivity web page

3

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 adapter module.

Ethernet network

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

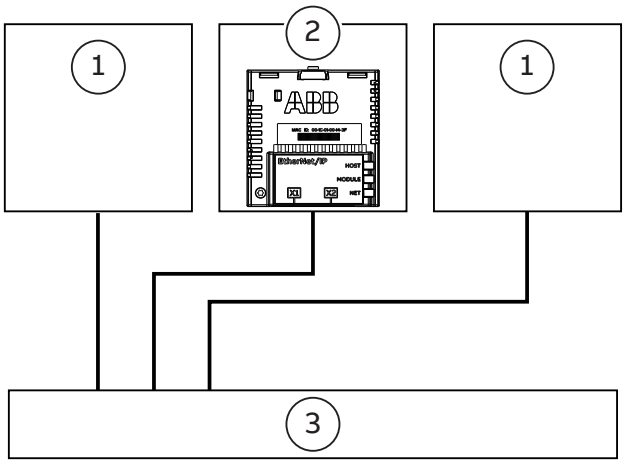
The FMBT-21 module supports twisted pair as the physical media in a star topology.

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

Example topology of the Ethernet link

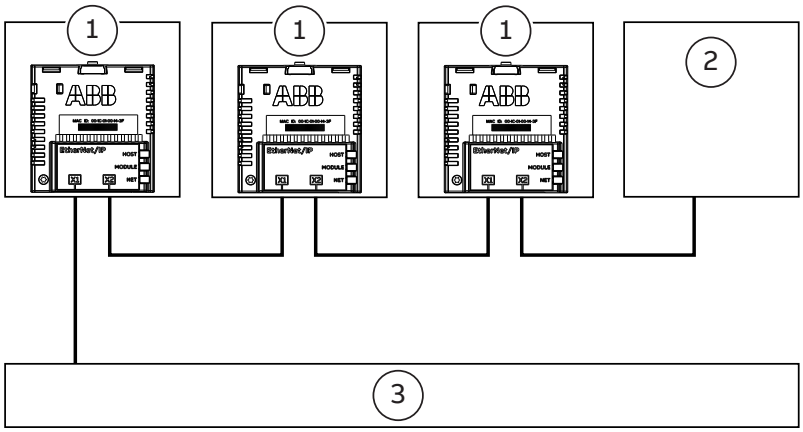
The figures below show example topologies for an Ethernet network with FMBT-21.

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 adapter 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

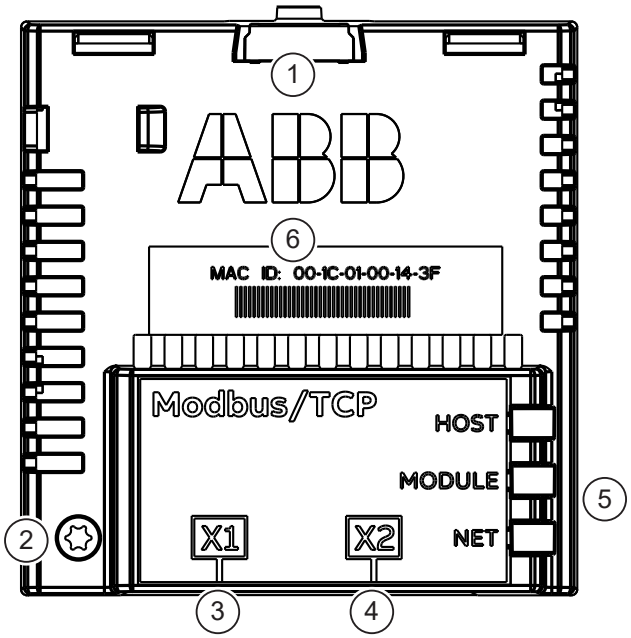
- read status information and actual values from the drive
- reset a drive fault
- read/write parameters of the drive
- connect Drive composer pro tool.

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 used in the network.

The adapter module is installed into an option slot on the drive control unit. See the drive manuals for module placement options.

FMBT-21 layout



No.	Description
1	Lock
2	Mounting screw (Grounding screw)
3	X1 connector to Ethernet (RJ-45)
4	X2 connector for chaining another module (RJ-45)
5	Diagnostic LEDs
6	MAC address

4

Mechanical installation

Contents of this chapter

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

Necessary tools and instructions

You will need a Torx TX10 screwdriver to secure the FMBT-21 adapter module to the drive. See also 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 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 the module is installed, it makes the signal and power connection to the drive through a 20-pin connector.

Installing option modules

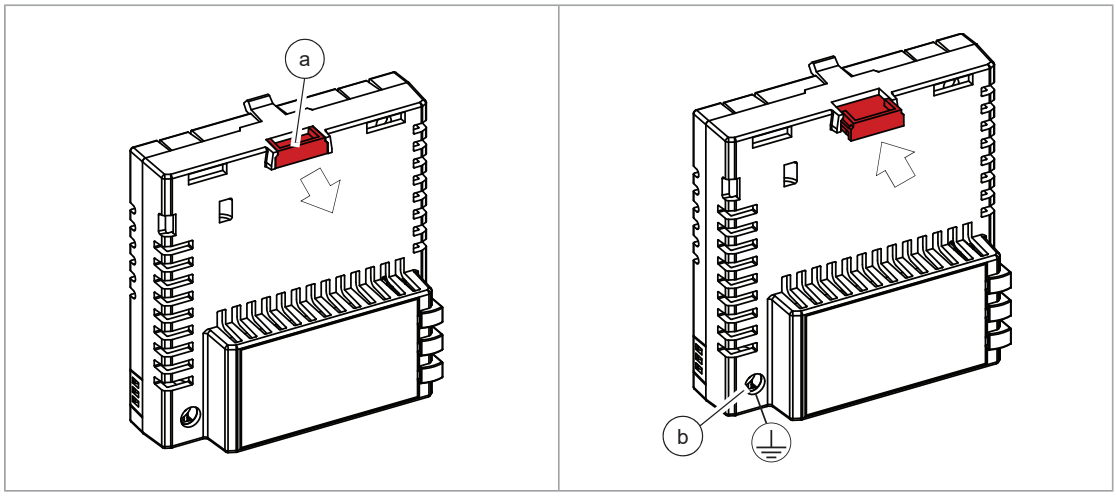
WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

Pay attention to the free space required by the cabling or terminals coming to the option modules.

1. Repeat the steps described in the electrical safety precautions of the drive.
2. Pull out the lock (a).
3. Install the module to a free option module slot on the control unit.
4. Push in the lock (a).
5. Tighten the grounding screw (b) to a torque of 0.8 N·m (7 lbf·in).

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

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



6. Connect the wiring to the module. Obey the instructions given in this manual.

5

Electrical installation

Contents of this chapter

This chapter contains general cabling instructions and instructions on connecting the FMBT-21 module to the Ethernet network and the drive.

Necessary tools and instructions

See 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 to the Ethernet 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 for industrial applications. 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.

Note: If a device in the daisy chain is powered off or fails, the rest of the chain is disconnected from the network.

6

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, 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. 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. 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	
	3 = 10 Mbps FD	10 Mbps, full duplex	
	4 = 10 Mbps HD	10 Mbps, half duplex	

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

Dotted decimal	CIDR	Dotted decimal	CIDR
255.255.255.254	31	255.254.0.0	15
255.255.255.252	30	255.252.0.0	14
255.255.255.248	29	255.248.0.0	13
255.255.255.240	28	255.240.0.0	12
255.255.255.224	27	255.224.0.0	11
255.255.255.192	26	255.224.0.0	10
255.255.255.128	25	255.128.0.0	9
255.255.255.0	24	255.0.0.0.0	8
255.255.254.0	23	254.0.0.0.0	7
255.255.252.0	22	252.0.0.0.0	6
255.255.248.0	21	248.0.0.0.0	5
255.255.240.0	20	240.0.0.0.0	4
255.255.224.0	19	224.0.0.0.0	3
255.255.192.0	18	192.0.0.0.0	2
255.255.128.0	17	128.0.0.0.0	1
255.255.0.0	16		

No.	Name/Value	Description	Default
	1...31	Subnet mask in CIDR notation	
10	GW address 1	IP gateways connect individual physical IP subnets into a unified IP network. When an IP node needs to communicate with an IP node on another subnet, the IP node sends the data to the IP gateway for forwarding. Parameters 10…13 define the four octets of the gateway address.	0
	0...255	GW address	
...	...	...	...
13	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	Auto-negotiate	
	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	
15	Service configuration	Disable services that are not required. Each service is represented by a single bit. Bit 0, Lock configuration, can be used to prevent accidental changing of this parameter. By default, all services are enabled and configuration is unlocked.	

Bit	Name	Information
0	Lock configuration	Changing this bit to one will lock service configuration and no bit can be changed. Only resetting the fieldbus configuration will unlock the parameter. To reset the fieldbus configuration, choose "Reset all fieldbus settings" or "Clear all" in parameter 96.06 Parameter restore.
1	Disable IP config tool	When this bit is set, access from ABB IP Configuration tool is prevented.
2	Disable ETH tool network	When this bit is set, access from Ethernet tool network (eg, ABB Drive Composer tool) is prevented.
3	Disable ping response	When this bit is set, response to ICMP (ping) message is prevented.
4	Unsecured ETH tool network	When this bit is set, access from Ethernet tool network is unsecured. **Note:** Drive Composer pro before V2.7 supports unsecured communication only.
5	Disable configuring web pages	When this bit is set, access to web pages is disabled.

	0000b… 1111b	Service configuration	

No.	Name/Value	Description	Default
16 … 18	Reserved	These parameters are not used by the adapter module when the module is configured for Modbus/TCP	N/A
19	T16 scale	Defines the reference multiplier/actual value divisor for the adapter module. **Note:** The parameter is effective only when the following conditions are satisfied: • transparent 16 profile is selected • drive is using the native communication profile (e.g, DCU or FBA) • drive is using a 16-bit transparent reference 1/actual value 1. 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. With ACS380, ACx580 and ACS880: Generic reference type: 1 = (T16 scale + 1)/100 -> T16 scale = 99, 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. • If the parameter value is zero, this feature is disabled. • If the parameter value is non-zero, the timeout is: • (Modbus/TCP timeout value) * 100 milliseconds For example, a value of 22 results in a timeout of: 22 * 100 milliseconds = 2.2 seconds If a timeout occurs, the adapter module signals the drive that communication with the client has been lost. The drive configuration then determines how to respond. **Example**: If the 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.	

No.	Name/Value	Description	Default
23	Address mode	Defines the mapping between parameters and holding registers in the 0 65535 Modbus register range.	0 = Mode 0
	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. 16-bit access:[1] Register address[2] = 100 * parameter group + parameter index (16-bit values, groups 1...199, indexes 1...99) 32-bit access: Register address = 20000 + 200 * parameter group + 2 * parameter index (32-bit values, groups 1...199, indexes 1...99)	
	1 = Mode 1	16-bit access: Register address = 256 * parameter group + parameter index (16-bit values, groups 1...255, indexes 1...255) Example: 13057 (0x3301) is group 51 index 1 No access to 32-bit parameter values.	
	2 = Mode 2	32-bit access: Register address = 512 * parameter group + 2 * parameter index (32-bit values, groups 1...127, indexes 1...255). 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: Register address = 256 * parameter group + 2 * parameter index (32-bit values, groups 1...255, indexes 1...127). 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. **Note:** This parameter cannot be changed while the drive is running.	0 = Done
	0 = Done	Refreshing done	
	1 = Refresh	Refreshing	

No.	Name/Value	Description	Default
28	FBA A/B par table ver	Read-only. Displays the parameter table revision of the fieldbus adapter module mapping file stored in the memory of the drive. In format **xyz**, where **x** = major revision number **y** = minor revision number **z** = correction number OR in format **axyz**, where **a** = major revision number **xy** = minor revision numbers **z** = correction number or letter.	N/A
		Parameter table revision	
29	FBA A/B drive type code	Read-only. Displays the drive type code of the fieldbus adapter module mapping file stored in the memory of the drive.	N/A
		Drive type code of the fieldbus adapter module mapping file	
30	FBA A/B mapping file ver	Read-only. Displays the fieldbus adapter module mapping file revision stored in the memory of the drive in decimal format.	N/A
		Mapping file revision	
31	D2FBA A/B comm status	Read-only. Displays the status of the fieldbus adapter module communication. **Note:** The value names 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: **xx** = patch number **yy** = build number Example: C80D ≥ 200.13 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: **xx** = major revision number **yy** = minor revision number Example: 310 = 3.10 Version number is the form: <major>.<minor>.<patch>.<build> 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 47)

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, 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: 0 – Not used 1...99 – Virtual address area of drive control. Not used when the Modbus/TCP protocol is used. 101...9999 – Parameter area of the drive	0 = None
	0 = None	Not used	
	101…9999	Parameter index with format xxyy, where • xx is the parameter group number (1…99) • yy is the parameter number index within that group (01…99). **Note:** In ACS480, ACS580 and ACS880, choose **Other** to display a list of mappable drive parameters.	
02 … 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 ACS480, 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: 0 – Not used 1...99 – Virtual address area of drive control. Not used when the Modbus/TCP protocol is used. 101...9999 – Parameter area of the drive	0 = None
	0 = None	Not used	
	101…9999	Parameter index with format **xxyy**, where • **xx** is the parameter group number (1…99) • **yy** is the parameter number index within that group (01…99). **Note:** In ACS480, ACS580 and ACS880, choose **Other** to display a list of mappable drive parameters.	
02 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, see the drive documentation.

Starting up fieldbus communication for ACS480, ACx580 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 – ACS480 and ACx580 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 40).

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
Frequency reference	(4)00002	Frequency actual value	(4)00052

Output data	Modbus register	Input data	Modbus register
Reference 2 (Not used)	(4)00003	Actual value 2 (Not used)	(4)00053
Constant frequency 1 [1)]	(4)00004 (4)00005	Power [1)]	(4)00054 (4)00055
Constant frequency 2 [1)]	(4)00006 (4)00007	DC bus voltage [1)]	(4)00056 (4)00057

[1)] Example

The table below gives the recommended drive parameter settings.

Drive parameter)	Setting for ACS480 and ACS580 drives	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 for ACS480 and ACS580 drives	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 40).

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

Output data	Modbus register	Input data	Modbus register
Constant speed 1 [32] [1)]	(4)00004 (4)00005	Output power [32] [1)]	(4)00054 (4)00055
Constant speed 2 [32] [1)]	(4)00006 (4)00007	DC voltage [32] [1)]	(4)00056 (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

Drive parameter	Setting for ACS880 drives	Description
53.03 FBA A data out3	22.27	Constant speed 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	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

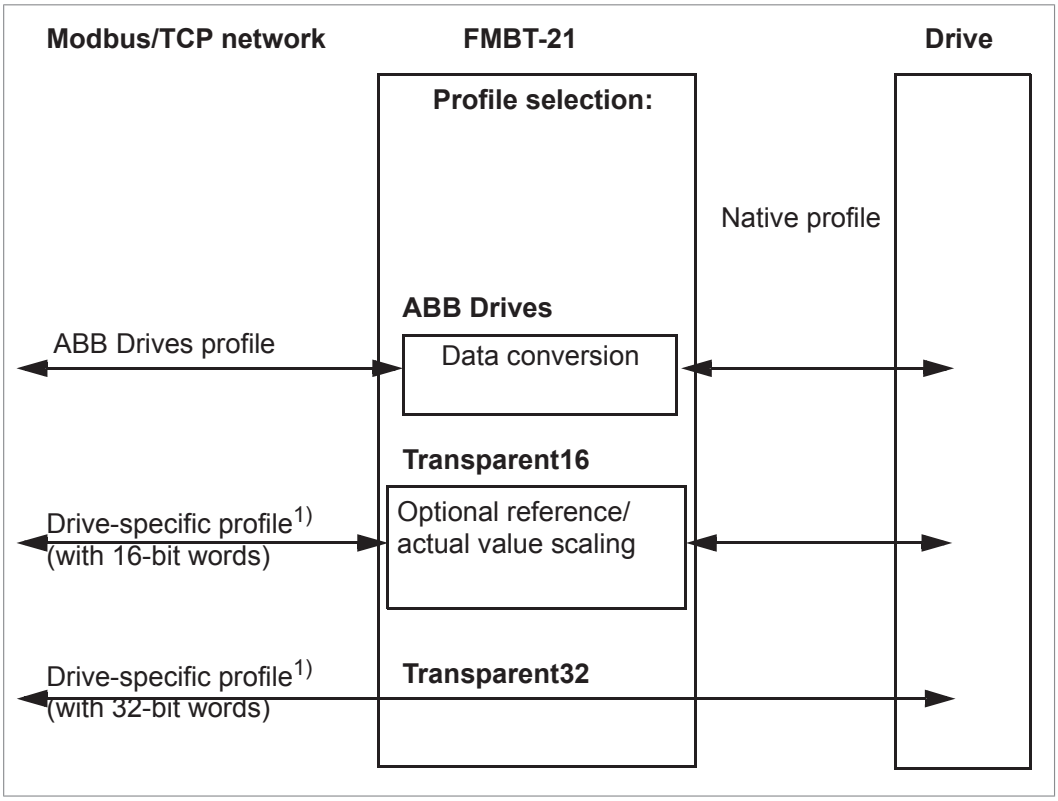
This chapter describes the communication profiles used in the communication between the Modbus/TCP client, the adapter module and the drive.

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 44.

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 44.

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**. **Warning:** Ensure that motor and driven machine can be stopped using this stop mode.
3	INHIBIT_ OPERATION	1	Proceed to **OPERATION ENABLED.** **Note:** Run enable signal must be active; see drive documentation. If the drive is set to receive the Run enable signal from the fieldbus, this bit activates the signal.
		0	Inhibit operation. Proceed to **OPERATION INHIBITED**.
4	RAMP_OUT_ ZERO	1	Normal operation. Proceed to **RAMP FUNCTION GENERATOR: OUTPUT ENABLED.**
		0	Force Ramp Function Generator output to zero. Drive ramps to stop (current and DC voltage limits in force).
5	RAMP_HOLD	1	Enable ramp function. Proceed to **RAMP FUNCTION GENERATOR: ACCELERATOR ENABLED.**
		0	Halt ramping (Ramp Function Generator output held).
6	RAMP_IN_ ZERO	1	Normal operation. Proceed to **OPERATION.** **Note:** This bit is effective only if the fieldbus interface is set as the source for this signal by drive parameters.
		0	Force Ramp Function Generator input to zero.
7	RESET	0 → 1	Fault reset if an active fault exists. Proceed to **SWITCH-ON INHIBITED**. **Note:** This bit is effective only if the fieldbus interface is set as the source for this signal by drive parameters.
		0	Continue normal operation.
8 … 9	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

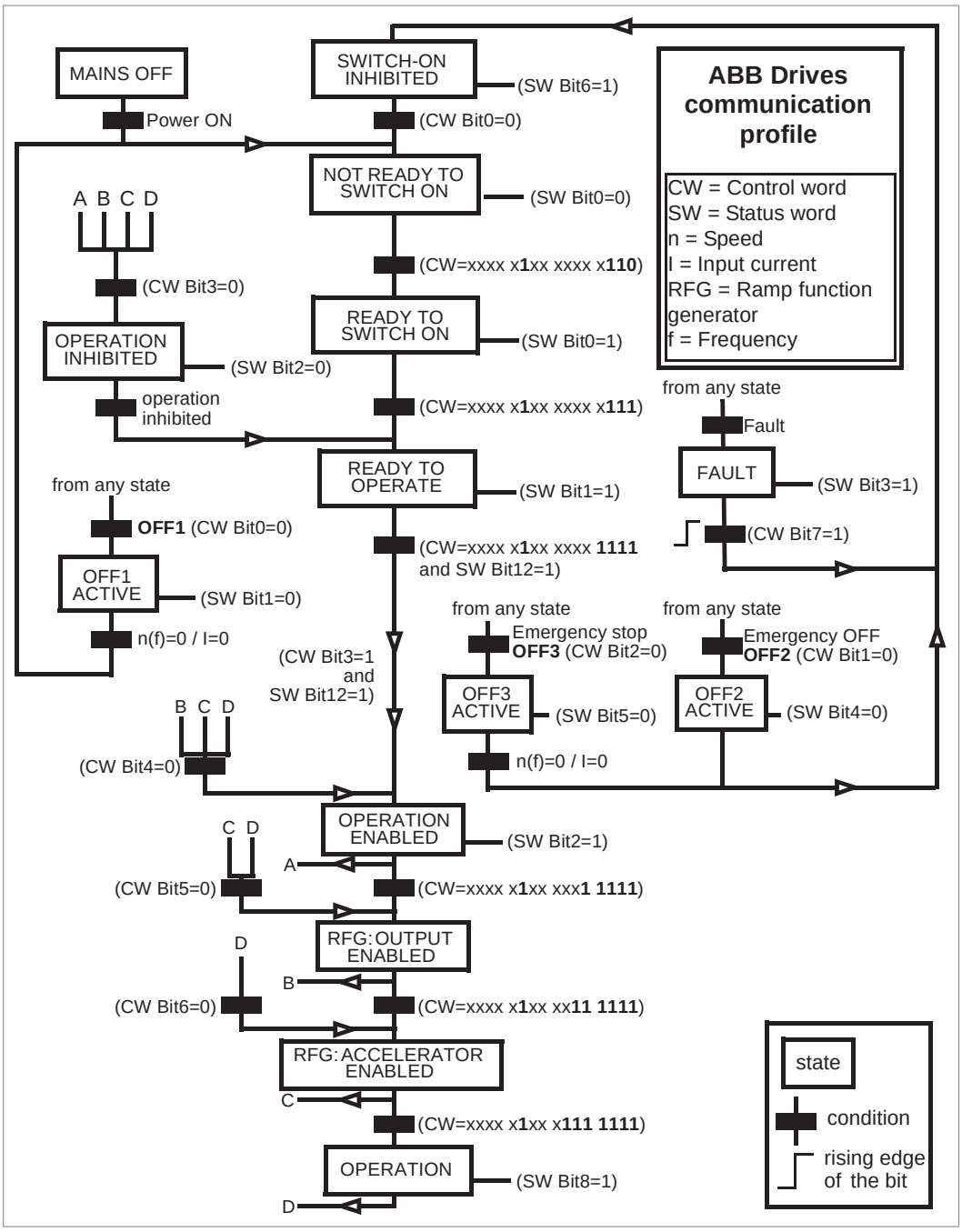
The table below shows the contents of the Status word for the ABB Drives communication profile. The upper case boldface text refers to the states shown on page 44.

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. **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.

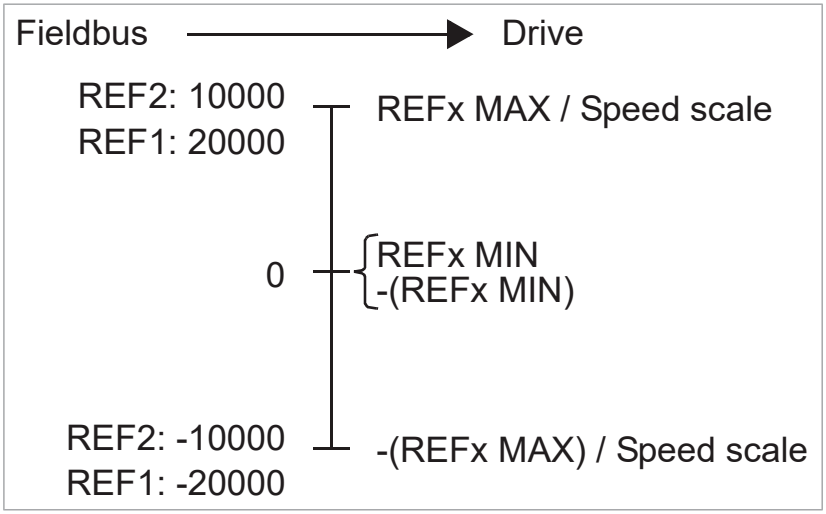
ABB drives can receive control information from multiple sources including analog and digital inputs, the drive control panel and a fieldbus adapter module (for example, FMBT-21). To have the drive controlled through the fieldbus, you must select the module as the source for control information, for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

Scaling

References are scaled as shown below.

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

In ACS480, ACH580, ACQ580ACS580 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).



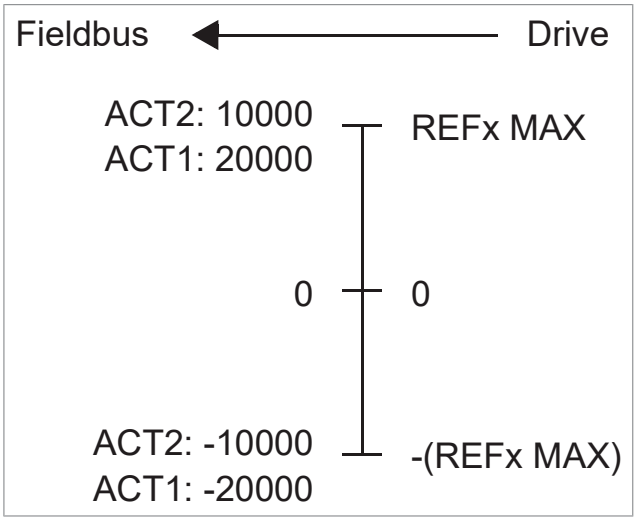
Actual values

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. See 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 48). 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 70).

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. Parameter "Read Device ID code" allows one to define three access types: • 01: Request to get the basic device identification (stream access) • 02: Request to get the regular device identification (stream access) • 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 electronic serial number

Register address	Description
(4)60000…(4)60039	(4)60000 Drive electrical serial number, most significant character ... (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.
06h	SLAVE DEVICE BUSY	The server is engaged in processing a long-duration command. The client should retransmit 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 Example for Drive Parameter 3.18: (4)00000 + 100 × 3 + 18 = 400318 **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 Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27 = 420254 **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 47) 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

Register Address [1] [2]	Register Data (16-bit)
(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
(4)00065	DATA IN 12
(4)00101… (4)09999	Drive Parameter Access (16-bit): Register Address = (4)00000 + 100 × Group + Index Example for Drive Parameter 3.18: (4)00000 + 100 × 3 + 18 = 400318 **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 Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27= 420254 **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 47) 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
(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

Register Address [1) 2)]	Register Data (16-bit)
(4)00101… (4)09999	Drive Parameter Access (16-bit): Register Address = 400000 + 100 × Group + Index Example for Drive Parameter 3.18: (4)00000 + 100 × 3 + 18 = 400318 **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 Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27= 420254 **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 47) 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
(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

Register Address [1] [2]	Register Data (16-bit)
(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 Example for Drive Parameter 3.18: (4)00000 + 100 × 3 + 18 = 400318 **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 Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27= 420254 **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 47) 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

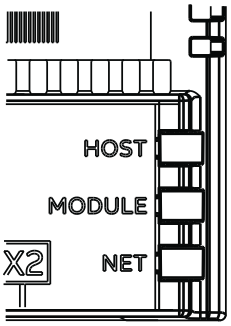
This chapter explains how to trace faults with the status LEDs on the adapter module when the module is used for Modbus/TCP communication.

Fault and warning messages

For the fault and warning messages concerning the adapter module, see 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. Flashing indicates activity on interface.
	Flashing orange	Ethernet link is up at 10 Mbps. 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 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.

Connection configuration using NONE protocol

After the adapter module is 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 using the NONE protocol 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 Starting up fieldbus communication (page 64).

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 or a PC tool.

Note:

- Not all drives will display 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 for synchronizing 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, ACH580, ACQ580 and ACS580.
- parameter group 51 in ACS880 if the adapter is installed as fieldbus adapter A or group 54 if the adapter is installed as fieldbus adapter B.

No.	Name/Value	Description	Default
01	FBA TYPE	**Read-only.** Shows the fieldbus adapter type as detected by the drive. The value cannot be adjusted by the user. If the value is **0** = None, the communication between the drive and the module has not been established.	Modbus/TCP
02	Protocol/Profile	Selects the application protocol and communication profile for the network connection. 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.	**1** = Dyn IP DHCP
	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 … 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. Subnet masks are typically represented in either dotted decimal notation or the more compact CIDR notation, as shown in the table below.	0

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

	1...31	Subnet mask in CIDR notation	

No.	Name/Value	Description	Default
10 … 13	GW address 1	IP gateways connect individual physical IP subnets into a unified IP network. When an IP node needs to communicate with an IP node on another subnet, the IP node sends the data to the IP gateway for forwarding. Parameters define the four octets of the gateway address.	0
	0...255	GW address	
	...	...	...
	GW address 4	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	
15	Service configuration	Disable services that are not required. Each service is represented by a single bit. Bit 0, Lock configuration, can be used to prevent accidental changing of this parameter. By default, all services are enabled and configuration is unlocked.	

Bit	Name	Information
0	Lock configuration	Changing this bit to one will lock service configuration and no bit can be changed. Only resetting the fieldbus configuration will unlock the parameter. To reset the fieldbus configuration, choose "Reset all fieldbus settings" or "Clear all" in parameter 96.06 Parameter restore.
1	Disable IP config tool	When this bit is set, access from ABB IP Configuration tool is prevented.
2	Disable ETH tool network	When this bit is set, access from Ethernet tool network (eg, ABB Drive Composer tool) is prevented.
3	Disable ping response	When this bit is set, response to ICMP (ping) message is prevented.
4	Unsecured ETH tool network	When this bit is set, access from Ethernet tool network is unsecured. **Note:** Drive Composer pro before V2.7 supports unsecured communication only.
5	Disable configuring web pages	When this bit is set, access to web pages is disabled.

0000b…1111b	Service configuration	

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

No.	Name/Value	Description	Default
31	D2FBA A/B comm status	**Read-only.** Displays the status of the fieldbus adapter module communication. **Note:** The value names may vary by drive.	**0** = Idle or **4** = Offline or **2** = Time out
	0 = Idle	Adapter is not configured.	
	1 = Exec.init	Adapter is initializing.	
	2= Time out	A timeout has occurred in the communication between the adapter and the drive.	
	3= Conf.err	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: **xx** = patch number **yy** = build number. Example: If the firmware version (<major>.<minor>.<patch>.<build>) is 3.10.200.13, the value C80D is displayed. If the version is 3.10.0.0, the value 0 is displayed. See also parameter 33.	N/A
33	FBA A/B appl SW ver	**Read-only.** Displays major and minor revision numbers of the adapter module's firmware version in **xxyy** format, where: **xx** = major revision number **yy** = minor revision number Example: If the firmware version (<major>.<minor>.<patch>.<build>) is 3.10.200.13 or 3.10.0.0, the value 310 is displayed. See also parameter 32.	N/A

Starting up fieldbus communication

1. Power up the drive.
2. Enable 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. 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.

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

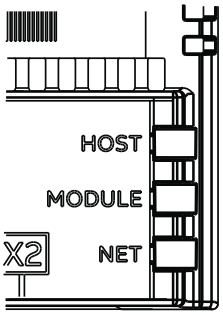
This chapter explains how to trace faults with the status LEDs on the adapter module using the NONE protocol.

Fault and warning messages

For the fault and warning messages concerning the adapter module, see 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 PC tool connected to the device.
	Flashing orange	Device is attempting to obtain IP configuration from the DHCP server.
	Orange	Device is executing Duplicate Address Detection.
	Green	PC tool is connected to the device.
	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. Flashing indicates activity on interface.
	Flashing orange	Ethernet link is up at 10 Mbps. Flashing indicates activity on interface.

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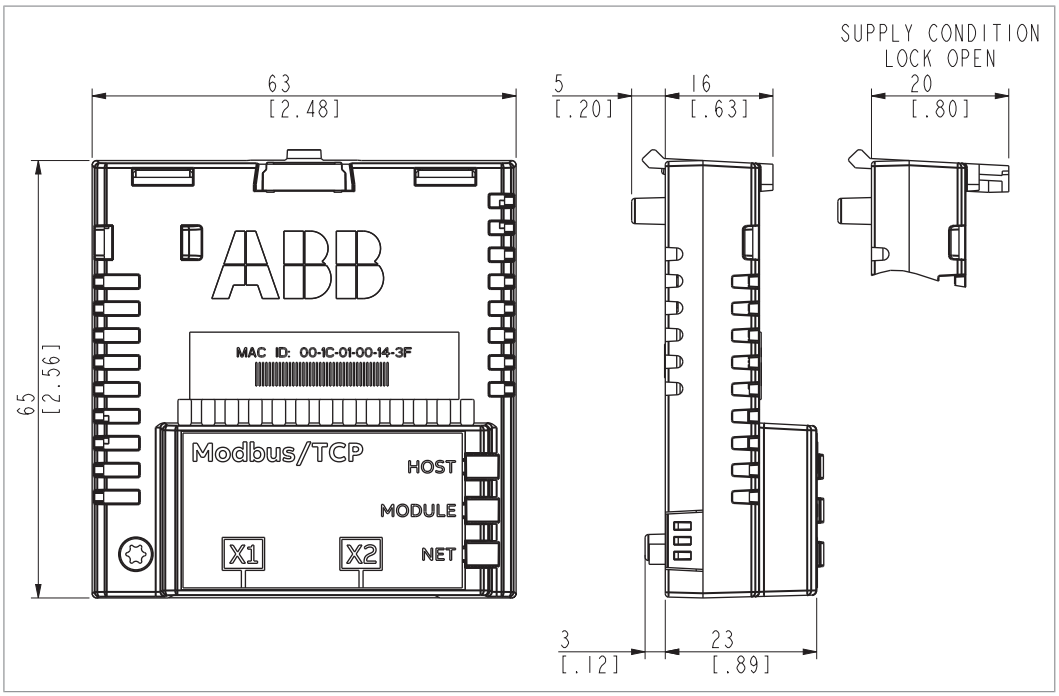
Technical data

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 RJ-45 connector to Ethernet (X1) RJ-45 connector for chaining another adapter module (X2)
Power supply	+3.3 V ±5% max. 400 mA (supplied by the drive)
General	Complies with EMC standard EN 61800-3:2004 Printed circuit board conformal coated

Ethernet link

Compatible devices	Ethernet Standard IEEE 802.3 and IEEE 802.3u devices.
Medium	10BASE-TX or 100Base-TX with Auto-negotiation and Auto-MDIX (Auto-crossover) • Wiring: CAT5e/6 S/FTP, CAT5e/6 S/STP, CAT5e/6 SF/FTP • Connector: RJ-45 • Termination: Internal • Maximum segment length: 100 m / 328 ft
Topology	Bus or star. In a chain maximum recommended amount of nodes is 50.
Transfer rate	10 Mbps or 100 Mbps
Serial communication type	Half or full duplex
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 86) via web interface.
502 (TCP/UDP)	Modbus/TCP	Communication between the drive and a PLC. **Note:** Used only when Modbus/TCP protocol is selected
68 (UDP)	DHCP	DHCP client **Note:** Used only when IP configuration method is selected as "Dyn IP DHCP".

Port	Service	Purpose
24576 (UDP)	ABB Netconfig	• Auto discovery protocol • Used by ControlBuilder plus (IP Configuration tool) and Drive composer pro and DriveWindow 2.40 PC tools • Discovers ABB-specific Ethernet devices in a local network segment, by listening to and responding to UDP broadcasts. To disable, go to **Service Configuration parameter 51.15** or to Service configuration web page.
123 (UDP)	SNTP	Simple Network Time Protocol. This service is disabled by default. To enable the service, go to Service configuration page (page 86) via web interface.
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:

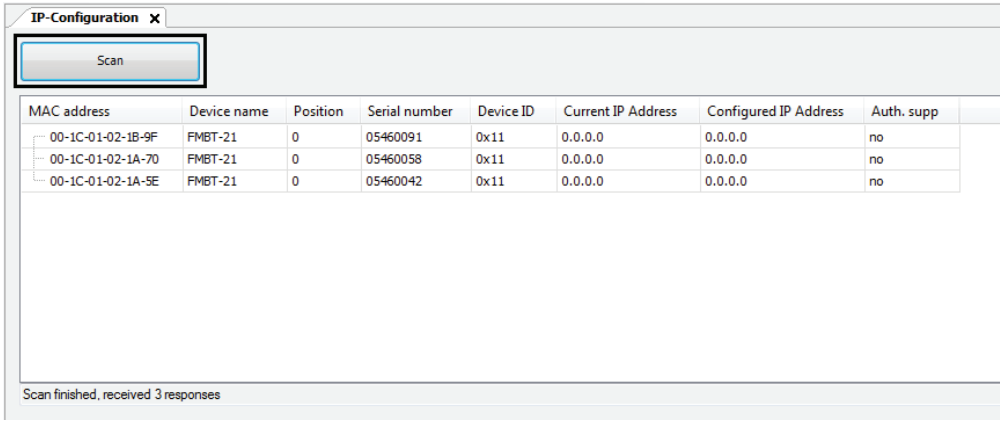
- find configured and unconfigured **FMBT-21** adapter modules in the network
- rewrite the IP configuration of the adapter modules.

Installation

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

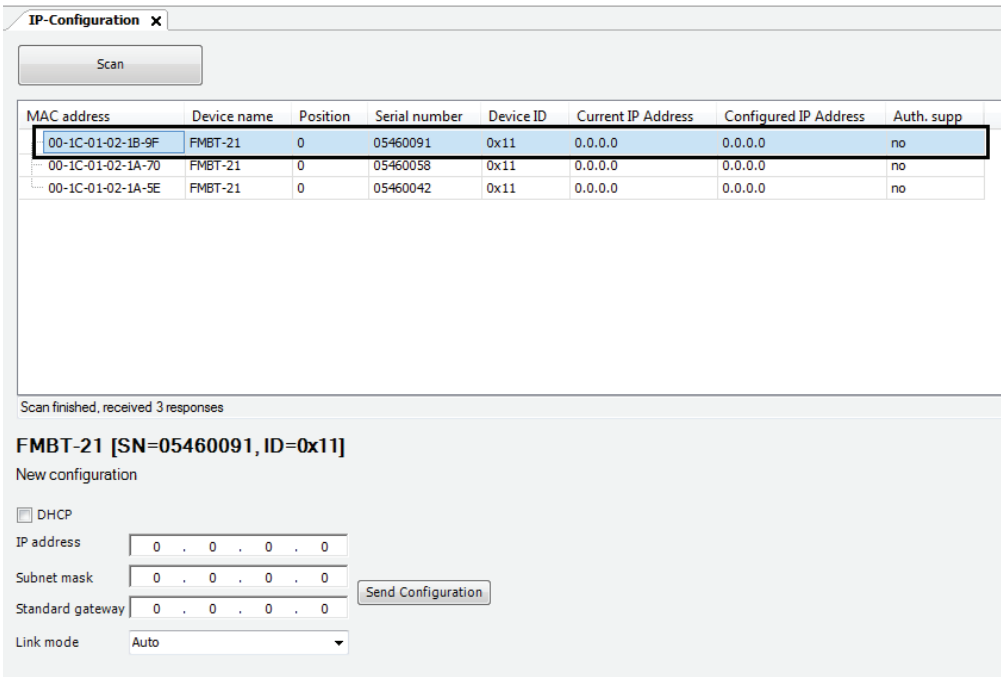
Finding adapter modules in the network

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

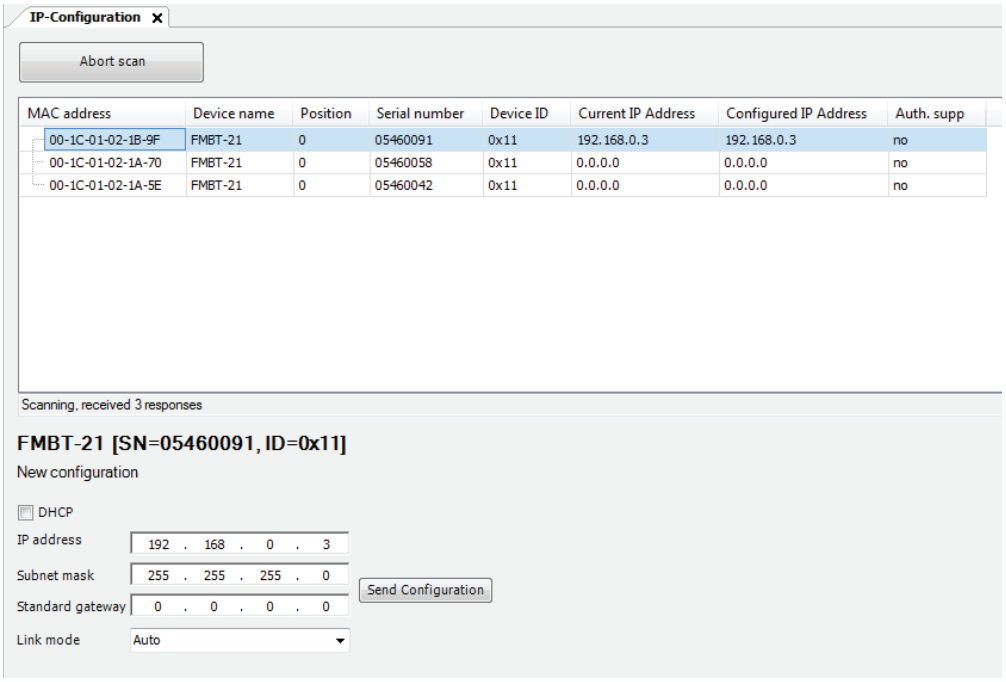


Rewriting the IP configuration of adapter modules

1. Scan the network for adapter modules.
   For instructions, see section Finding adapter modules in the network (page 73).
2. On the results list, click to select the adapter module whose IP configuration you want to modify.



3. Below **New configuration**, define the IP configuration settings according to your network configuration.
4. If you want the adapter module to use a static IP address instead of **DHCP**, clear the DHCP check box.
5. 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
Link mode Auto
Send Configuration

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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 the following 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. See the Service configuration page (page 86).

Browser requirements

Any web browser can be used.

Compatibility

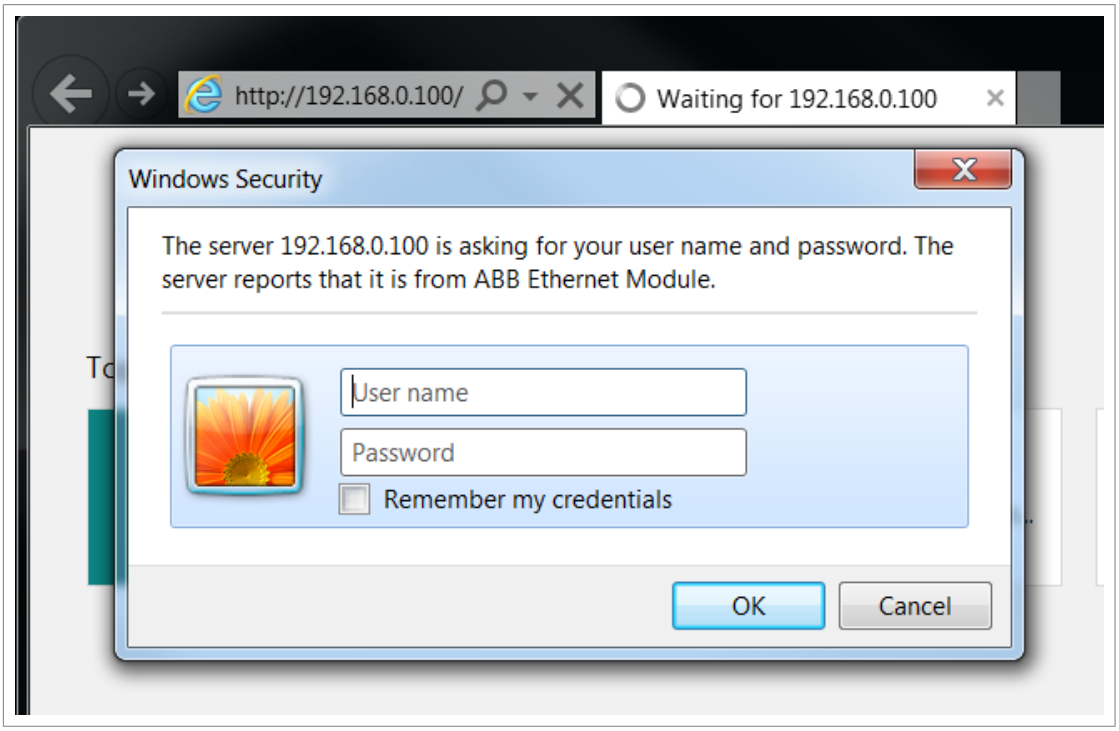
The web pages support all drives compatible with the FMBT-21 adapter module.

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

Logging in

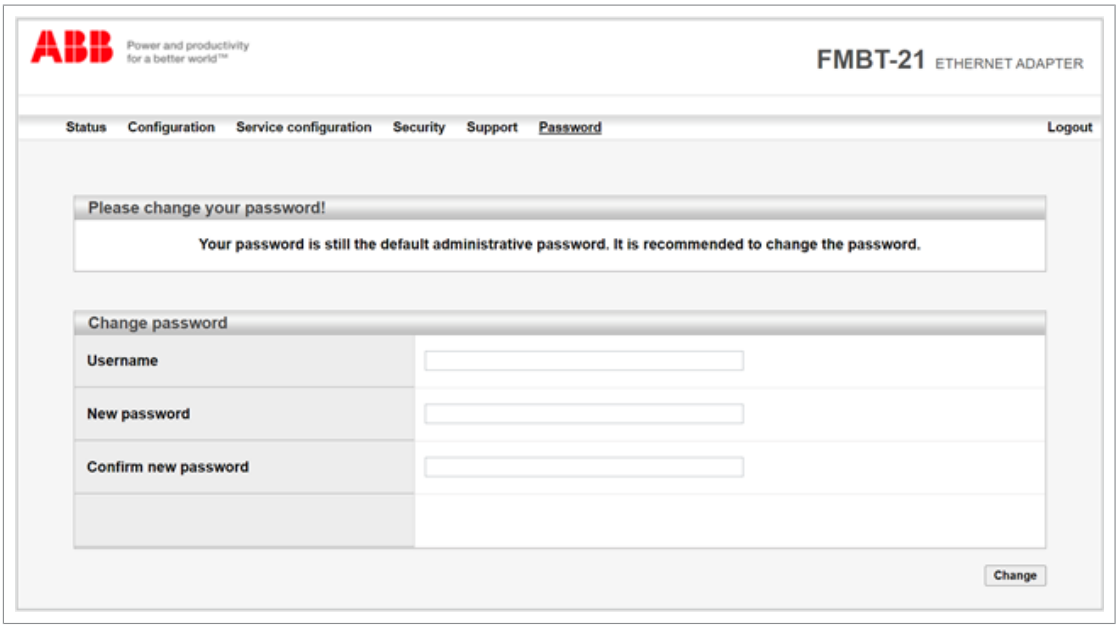
1. Open a web browser and type the IP address of the adapter module in the address field. The IP address is visible in the FMBT-21 configuration parameters, group A, parameter 5...8.

   Example: http://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 73).

   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 will be prompted to change the password for security reasons. It is recommended to change the default password.



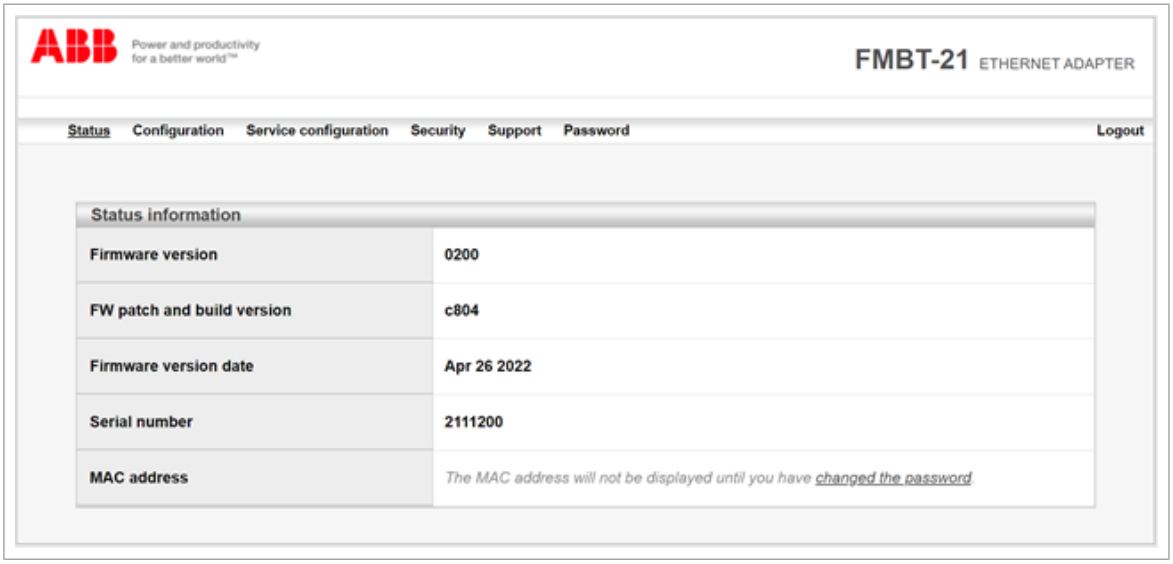
Menu overview

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

- Status
- Configuration
- Service configuration
- Security
- Support
- Password.

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).

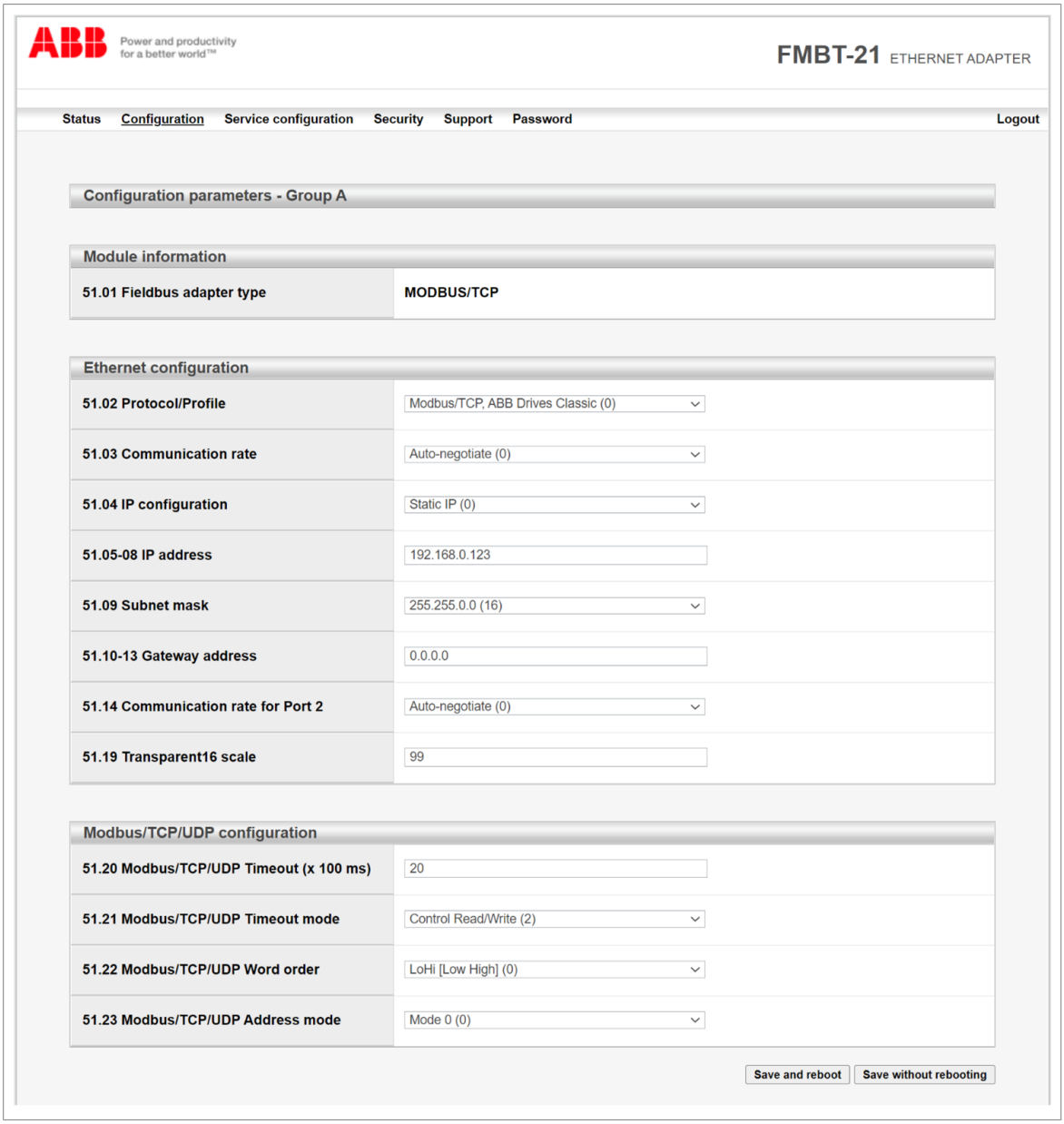
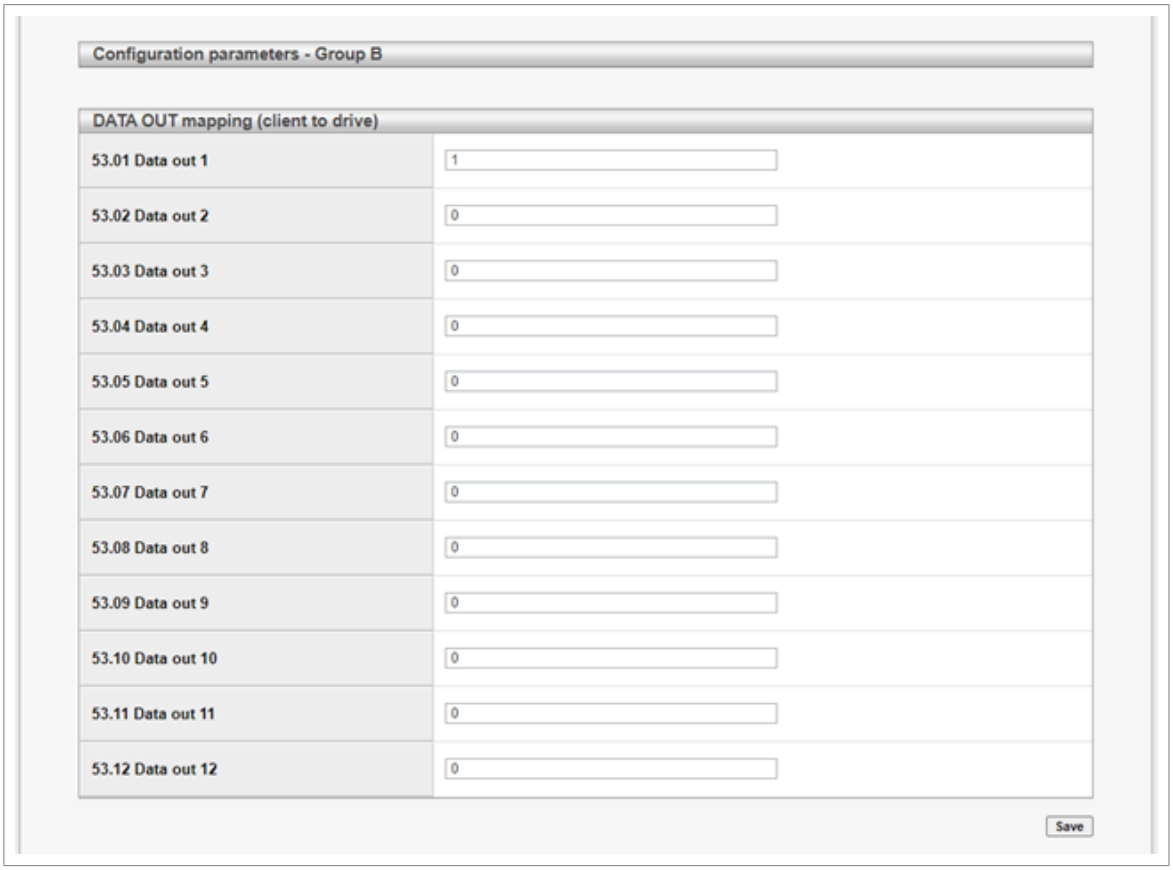


ABB
Power and productivity for a better world™
FMBT-21 ETHERNET ADAPTER
Status
Configuration
Service configuration
Security
Support
Password
Logout
Configuration parameters - Group A
Module information
51.01 Fieldbus adapter type
MODBUS/TCP
Ethernet configuration
51.02 Protocol/Profile
Modbus/TCP, ABB Drives Classic (0)
51.03 Communication rate
Auto-negotiate (0)
51.04 IP configuration
Static IP (0)
51.05-08 IP address
192.168.0.123
51.09 Subnet mask
255.255.0.0 (16)
51.10-13 Gateway address
0.0.0.0
51.14 Communication rate for Port 2
Auto-negotiate (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

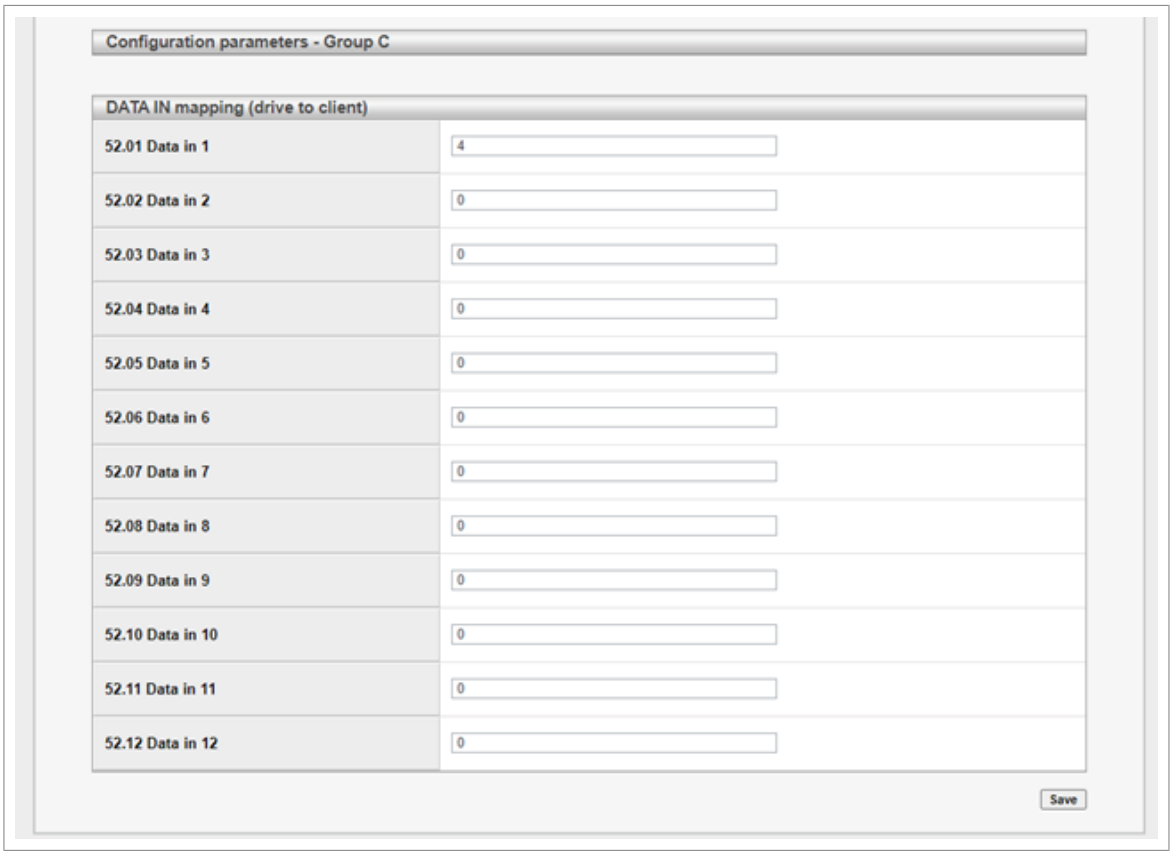


Configuration parameters - Group B

DATA OUT mapping (client to drive)

53.01 Data out 1	1
53.02 Data out 2	0
53.03 Data out 3	0
53.04 Data out 4	0
53.05 Data out 5	0
53.06 Data out 6	0
53.07 Data out 7	0
53.08 Data out 8	0
53.09 Data out 9	0
53.10 Data out 10	0
53.11 Data out 11	0
53.12 Data out 12	0

Save



Configuration parameters - Group C

DATA IN mapping (drive to client)

52.01 Data in 1	4
52.02 Data in 2	0
52.03 Data in 3	0
52.04 Data in 4	0
52.05 Data in 5	0
52.06 Data in 6	0
52.07 Data in 7	0
52.08 Data in 8	0
52.09 Data in 9	0
52.10 Data in 10	0
52.11 Data in 11	0
52.12 Data in 12	0

Save

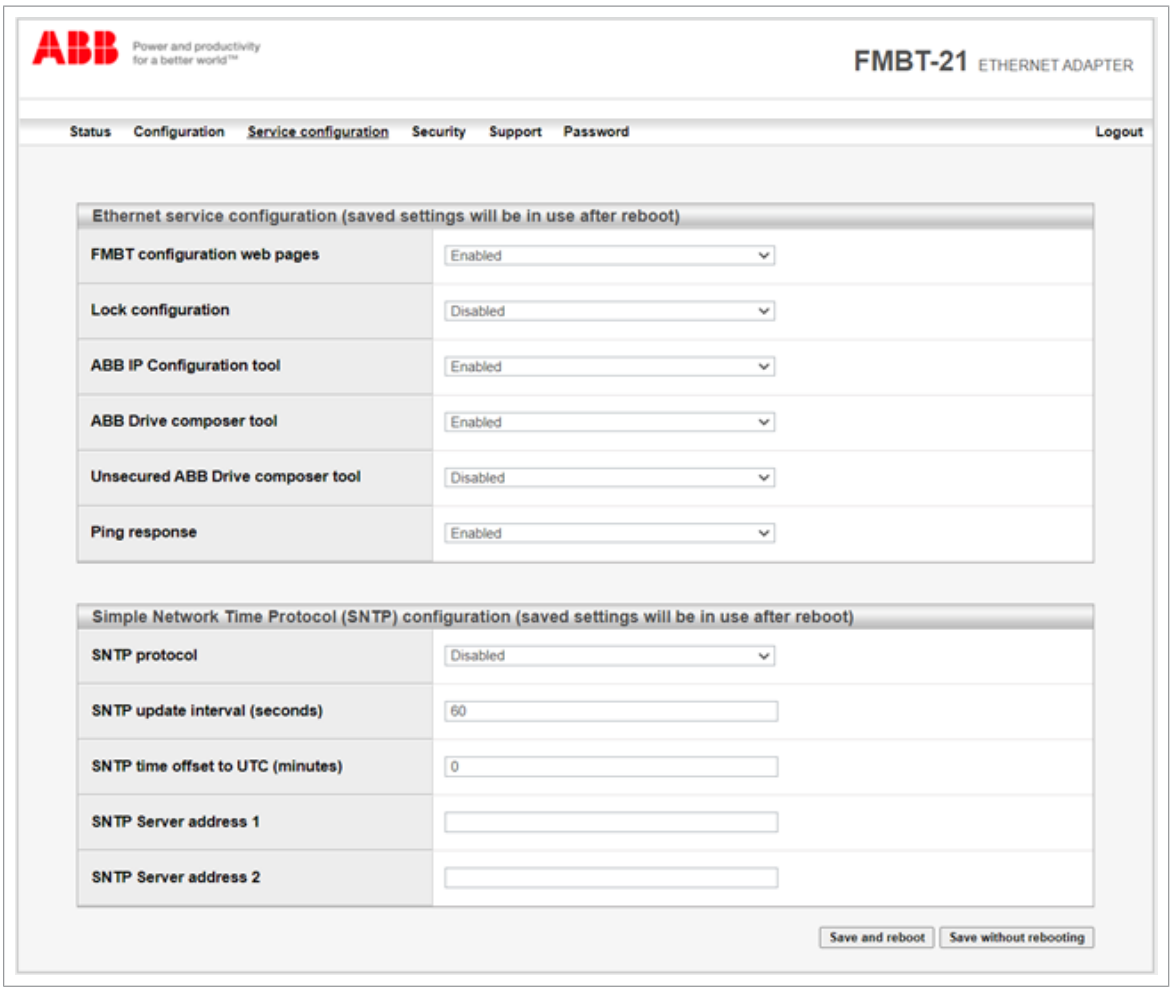
After you have changed any setting in any of the groups, you must click Save and reboot at the bottom of Group A to validate the settings.

Service configuration page

On the Service configuration page, you can enable or disable certain Ethernet services. All services except Simple Network Time Protocol (SNTP) are enabled by default. You can disable 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
- configure SNTP.

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.

Or, you can use the web page password. See Enable web page access after it was disabled (page 89).

It is recommended to disable all services that are not used after commissioning.

Configuring SNTP

Simple Network Time Protocol (SNTP) can be used to synchronize drive time with a network time server. When SNTP is enabled, FMBT-21 will request the time from configured server at a given interval. To receive this time synchronization, you must configure the drive with parameter 96.20 time sync primary source. The table below shows the settings for SNTP:

Settings	Description	Value
SNTP update interval	Interval to request time from server.	Default: 30 seconds Minimum: 30 seconds
SNTP time offset to UTC	Time offset to the time received from SNTP. This value can also be set over Modbus register (4)00084. **Note:** SNTP time offset change does not need a reboot.	-1440...1440 minutes
SNTP server address 1	Primary server address for requesting time. Format: IP address followed by optional port number, eg: 192.168.0.1:123 **Note:** If port number is missing, the default NTP port number "123" is used.	-
SNTP server address 2	Secondary server address used if the request to server 1 fails.	-

Security page

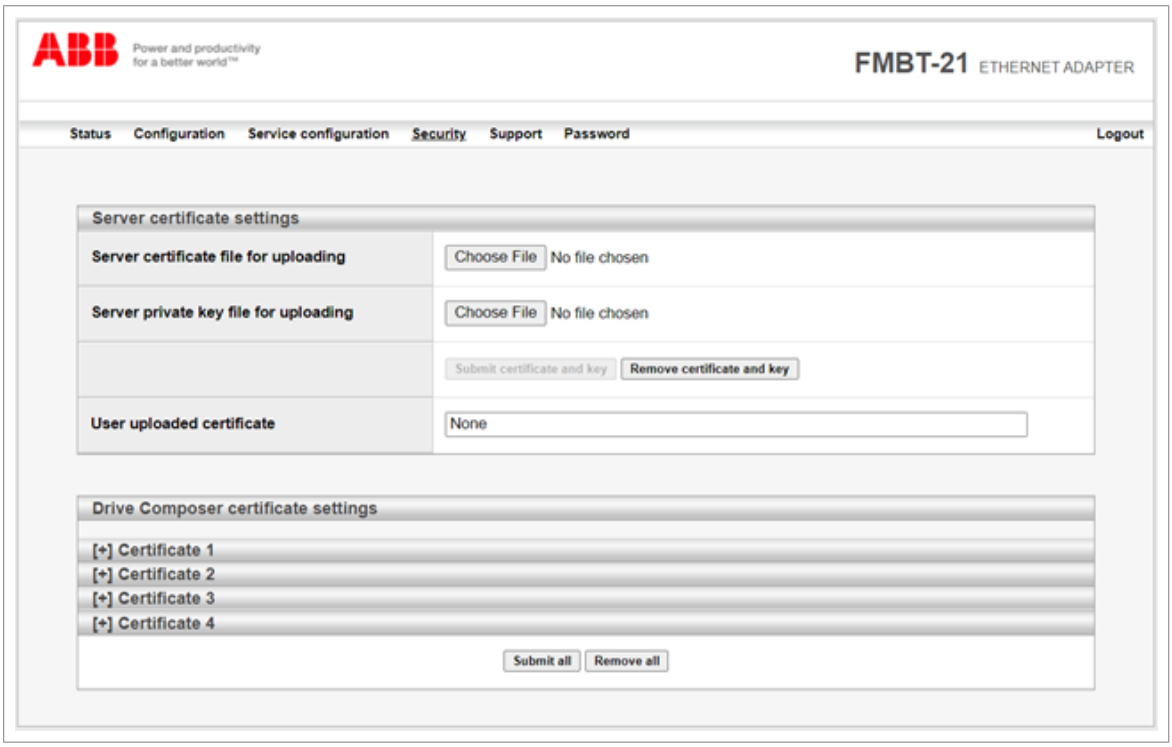
On the Security page, you can upload a private key and certificates for FMBT-21 to use instead of the self-signed certificate that FMBT-21 uses as a default. You can upload and manage Drive Composer certificate files on Security page under "Drive Composer certificate settings". Up to four certificates 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 parameter 51.15 Service configuration bit 4. 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]).

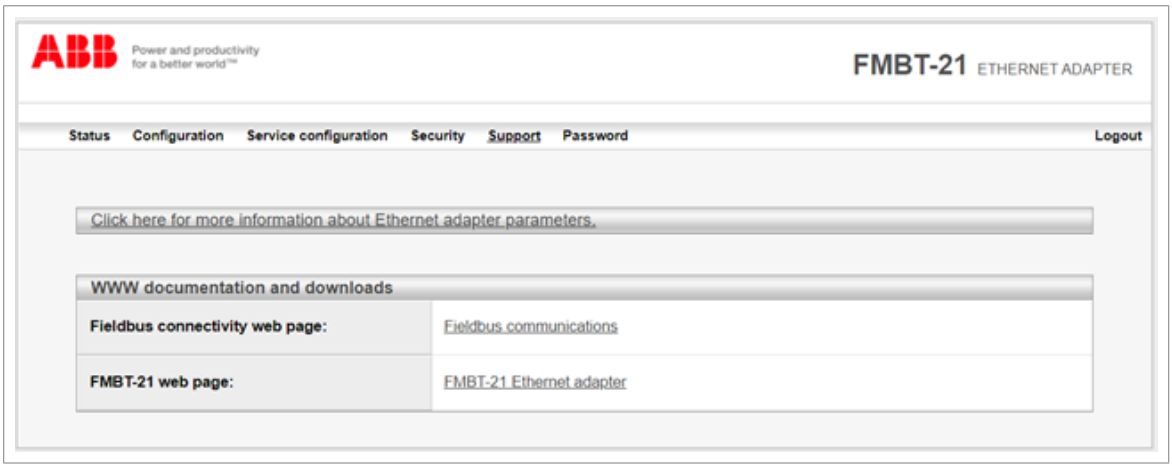
Note: Secure PC tool communication is possible with Drive Composer Pro version 2.7 or later.



Support page

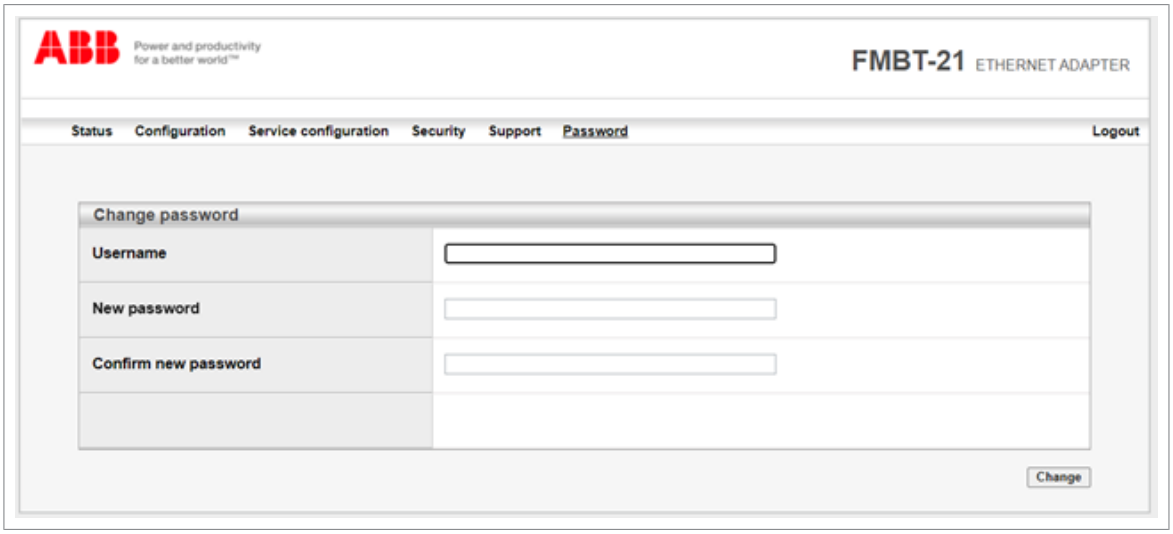
On the Support page, you can access documentation related to the adapter module.

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

On the Password page, you can change password. FMBT-21 supports only one user access level.



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 (e.g. 51.26).
3. Refresh the settings by selecting Refresh in parameter 27 (e.g. 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, see section Logging in (page 81).

Enable web page access after it was 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 (e.g. 51.26).
3. Refresh the settings by selecting Refresh in parameter 27 (e.g. 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.

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/searchchannels.

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 new.abb.com/drives/manuals-feedback-form.

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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www.abb.com/drives

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