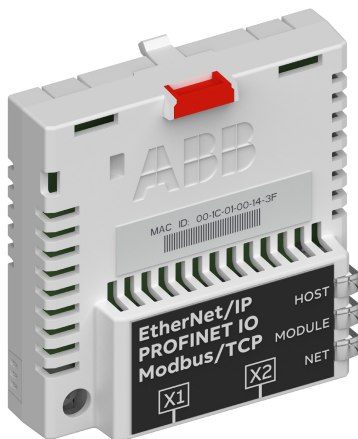**ABB**

OPTIONS FOR ABB DRIVES, CONVERTERS AND INVERTERS

FENA-01/-11/-21 Ethernet adapter module

User's manual

List of related manuals

See section *Related manuals* on page *27*.

You can find manuals and other product documents in PDF format on the Internet. See section Document library on the Internet on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

The code below opens an online listing of the manuals applicable to the product:

FENA-01/-11/-21 manual

Fieldbus connectivity webpage

User's manual

FENA-01/-11/-21 Ethernet adapter module

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Further information

1

Safety instructions

Contents of this chapter

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

Use of warnings

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. The manual uses these warning symbols:

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

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

Safety in installation

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 these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

• 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 FENA-01/-11/-21 Ethernet adapter module.

Applicability

This manual applies to the FENA-01/-11/-21 Ethernet adapter module, software version 3.20 and later.

Compatibility

The FENA-01/-11/-21 Ethernet adapter module is compatible with different ABB drives and solar inverters.

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

■ **Drives**

The table below shows the compatibility of FENA adapter module with different ABB drives.

Drives	FENA-01	FENA-11	FENA-21
ACS355	x	x	x
ACS380		x	x
ACSM1		x	x
ACS480		x	x
ACH580		x	x
ACQ580		x	x
ACS530*)		x	x
ACS560*)		x	x
ACS580		x	x
ACS850		x	x
ACS860*)		x	x
ACQ810		x	x
ACS880		x	x
ACS880-M04		x	x

*) check the compatibility in drive's release note

■ **Protocols**

The FENA adapter module is compatible with Ethernet standards IEEE 802.3 and IEEE 802.3u.

This table shows the protocols supported by the FENA adapter module from SW version 3.11 onwards.

	Modbus/TCP[1]	EtherNet/IP™	PROFINET IO
FENA-01	x	x	x
FENA-11	x	x	x
FENA-21	x	x	x

[1] In addition to Modbus/TCP, FENA-01/-11/-21 supports Modbus over UDP.

[2] In addition to these protocol, it is possible to have the no communication protocol running on FENA adapter module. This configuration is called NONE protocol. In this setup, FENA adapter module is used only for running Ethernet services which can be enabled/disabled via Web pages. See *Appendix C – FENA configuration web pages* on page *435*. Also SNTP is available with NONE protocol).

The below table specifies the clients/masters that are compatible with the supported protocols.

Protocol	Compatible client/master
Modbus/TCP[1]	All Modbus/TCP clients that support: • Modbus Application Protocol Specification v1.1b • Modbus Messaging on TCP/IP Implementation Guide v1.0b
EtherNet/IP	All EtherNet/IP clients that support: • The CIP Networks Library, Volume 1, Common Industrial Protocol (CIP), Edition 3.0 May, 2006 • The CIP Networks Library, Volume 2, EtherNet/IP Adaptation of CIP, Edition 1.2 May, 2006 • Recommended Functionality for EtherNet/IP Devices Version 1.2, Feb., 2006
PROFINET IO	All PROFINET IO masters that support: • GSDML file version 2.31 • PROFINET IO protocol according IEC standards 61158 and 61784 • PROFINET-IO conformance class B

■ **Tools**

The FENA-11/-21 adapter module can be used in the Ethernet tool network for ACS880. 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 FENA-11/-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 adapter module. Before you do work on the module, read this manual and the applicable drive manual that contains the hardware and safety instructions 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.

Related manuals

Drive manuals and guides	Code (EN/Multilingual)
ACS355 drives (0.37…22 kW, 0.5…30 hp) user's manual	*3AUA0000066143*
ACSM1 manuals	*00578051*
ACS380-04 manuals	*9AAK10103A6193*
ACS480 manuals	*9AKK106930A8739*
ACH580-01 manuals	*9AKK10103A0587*
ACH580-04 manuals	*9AKK106930A9059*
ACH580-07 manuals	*9AKK106930A5241*
ACH580-31 manuals	
ACQ580-01 manuals	*9AKK106713A2709*
ACQ580-04 manuals	*9AKK106930A9053*
ACQ580-07 manuals	*9AKK106930A3150*
ACQ580-31 manuals	
ACS580-01 manuals	*9AKK105713A8085*
ACS580-04 manuals	*9AKK106930A9060*
ACS580-07 (75 to 250 kW) manuals	*9AKK106930A5239*
ACS580-07 (250 to 500 kW)	*9AKK106713A0278*
ACS850-04 manuals	*00592009*
ACS880-01 manuals	*9AKK105408A7004*
ACS880-04 manuals	*9AKK105713A4819*
ACS880-07 manuals	*9AKK105408A8149*
ACS880-07 (560 to 2800 kW)	*9AKK105713A6663*
ACS880-17 (132 to 355 kW)	*9AKK106930A3466*
ACS880-17 (160 to 3200 kW)	*9AKK106354A1499*
ACS880-11 manuals	
ACS880-31 manuals	
ACS880-37 (132 to 355 kW)	*9AKK106930A3467*
ACS880-37 (160 to 3200 kW)	*9AKK106354A1500*
ACS880-M04 manuals	*9AKK106930A7550*
ACQ810 manuals	*00598718*

Option manuals and guides	
FENA-01/-11/-21 Ethernet adapter module user's manual	*3AUA0000093568*

Contents

The manual consists of the following chapters:

- *Safety instructions* gives the safety instructions which you must obey when you install a fieldbus adapter module.

- *Overview of the Ethernet network and the FENA-01/-11/-21 module* contains a short description of the Ethernet network and the adapter module.

- *Mechanical installation* contains a delivery checklist and instructions on installing the adapter module.

- *Electrical installation* contains instructions on cabling and connecting the adapter module to the Ethernet network.

- *Technical data* contains the technical data of the adapter module and the Ethernet link.

- *Appendix A – PROFIdrive parameters and I&M records of PROFINET IO* contains the PROFIdrive profile parameters and telegram and response structures for the I&M records of the PROFINET IO protocol.

- *Appendix B – ABB IP configuration tool for FENA* shows how to use the APP IP configuration tool for FENA.

- *Appendix C – FENA configuration web pages* presents the FENA configuration web pages.

- *Appendix D – FENA configuration backup* presents the FENA configuration backup.

Modbus/TCP protocol

- *Modbus/TCP – Start-up* presents the steps to take during the start-up of the drive with the adapter module and gives information on configuring the Modbus/TCP client.

- *Modbus/TCP – Communication profiles* describes the communication profiles used in the communication between the client, the adapter module and the drive.

- *Modbus/TCP – Communication protocol* describes the Modbus/TCP communication protocol for the adapter module.

- *Modbus/TCP – Diagnostics* explains how to trace faults with the status LEDs on the adapter module.

EtherNet/IP protocol

- *EtherNet/IP – Start-up* presents the steps to take during the start-up of the drive with the adapter module and gives examples of configuring the EtherNet/IP client.

- *EtherNet/IP – Communication profiles* describes the communication profiles used in the communication between the client, the adapter module and the drive.

- *EtherNet/IP – Communication protocol* describes the EtherNet/IP communication protocol for the adapter module.

- *EtherNet/IP – Diagnostics* explains how to trace faults with the status LEDs on the adapter module.

PROFINET IO protocol

- *PROFINET IO – Start-up* presents the steps to take during the start-up of the drive with the adapter module and gives examples of configuring the PROFINET master.

- *PROFINET IO – Communication profiles* describes the communication profiles used in the communication between the master, the adapter module and the drive.

- *PROFINET IO – Communication protocol* describes the PROFINET IO communication protocol for the adapter module.

- *PROFINET IO – Diagnostics* explains how to trace faults with the status LEDs on the adapter module.

NONE protocol selection

- *NONE – Start-up* presents the steps to take during the start-up of the drive with the adapter module and gives examples of configuring the NONE protocol.
- *NONE - Diagnostics* explains how to trace faults with the status LEDs on the adapter module.

Cybersecurity disclaimer

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

Note: The web pages are meant only for configuring the device during commissioning. For security reasons, it is recommended to disable the web pages after commissioning.

Terms and abbreviations

■ General terms

Term	Definition
Command word	See Control word.
Control word	16-bit or 32-bit word from master to slave with bit-coded control signals (sometimes called the Command word).
Drive	Frequency converter for controlling AC motors. The drive consists of a rectifier and an inverter connected together by the DC link. In drives up to approximately 500 kW, these are integrated into a single module (drive module). Larger drives typically consist of separate supply and inverter units. This manual uses the term drive to refer converters and inverter as well.
FENA-01/-11/-21 Ethernet adapter module	One of the optional fieldbus adapter modules available for ABB drives. FENA-01/-11/-21 is a device through which an ABB drive is connected to an Ethernet network.
Fieldbus adapter module	Device through which the drive is connected to an external communication network, that is, a fieldbus. The communication with the module is activated with a drive parameter.
MAC address	Media Access Control address. A unique factory-programmed identifier used to address a node in an Ethernet network.
Profile	Adaptation of the protocol for certain application field, for example, drives. In this manual, drive-internal profiles (eg, DCU or FBA) are called native profiles.
Status word	16-bit or 32-bit word from slave to master with bit-coded status messages.

■ Abbreviations

Abbreviation	Explanation
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.
EMC	Electromagnetic compatibility
FBA	Fieldbus adapter
LSB	Least significant bit
MSB	Most significant bit
PLC	Programmable logic controller
SNTP	Simple Network Time Protocol. A protocol to synchronize drive time with the network time server.
SNMP	Simple Network Management Protocol.

■ 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.

■ EtherNet/IP terms and abbreviations

Term	Explanation
DLR	Device Level Ring. DLR network is a single-fault tolerant ring network topology intended for interconnection of automation devices. FENA-21 supports DLR.
EDS file	The Electronic Data Sheet (EDS) file identifies the properties of the device to the EtherNet/IP client. Each type of drive and application program requires its own EDS file.
Input	In the ODVA EtherNet/IP specification the word 'input' is used to describe data flow from a device (such as the adapter module) to the network.
I/O Assembly selection	Smart networked devices (like FENA) can produce and/or consume more than one I/O value. Typically, they will produce and/or consume one or more I/O value, as well as status and diagnostic information. Each piece of data communicated by a device is represented by an attribute of one of the device's internal objects. Communicating multiple pieces of data (attributes) across a single I/O connection requires that the attributes be grouped or assembled together into a single block.
ODVA™	ODVA stands for Open DeviceNet Vendor Association. ODVA is an independent organization that promotes interoperability between different manufacturers' EtherNet/IP products. ABB is an Associate Member at ODVA.
Output	In the ODVA EtherNet/IP specification the word 'output' is used to describe data flow from the network into a device (such as the adapter module).

■ PROFINET IO terms and abbreviations

Term	Explanation
Acyclic communication	Communication in which messages are sent only once on request
Array	Parameter consisting of data fields of equal data type
Cyclic communication	Communication in which parameter/process data objects are sent cyclically at pre-defined intervals
DCP	Discovery Control Protocol. A protocol that allows the master controller to find every PROFINET IO device on a subnet.
Fault	Event that leads to tripping of the device
GSD file	ASCII-format device description file in a specified form. Each different slave type on the PROFINET IO network needs to have its own GSD file. GSD files in PROFINET IO are written in GSDML.
Index	Access reference for objects in PROFINET IO
I/O controller	Control system with bus initiative. In PROFINET IO terminology, I/O controllers are also called master stations.
Master	Control system with bus initiative. In PROFINET IO terminology, master stations are also called active stations.
Name	Symbolic name of a parameter
Parameter	Value that can be accessed as an object, eg, variable, constant, signal
Parameter number	Parameter address
Parameter/Process	Special object that contains parameter and process
Data object	Special object that contains parameter and process data
Process data	Data that contains Control word and reference value or Status word and actual value. May also contain other (user-definable) control information.

Term	Explanation
Slave	Passive bus participant. In PROFINET IO terminology, slave stations (or slaves) are also called passive stations. Also referred to as node.
Warning	Signal caused by an existing alarm which does not lead to tripping of the device

The text in *italics* is the original German term.

Abbreviation	Explanation
ACT	Actual value *Istwert*
DAP	Device access point
DP	Decentralised Periphery *Dezentrale Periphere*
DP-V0	PROFINET IO extension to the EN 50170 standard, providing the basic functionality of DP, including cyclic data exchange
DP-V1	PROFINET IO extension to the EN 50170 standard, including, eg, acyclic data exchange
GSDML	General Station Description Markup Language
ISW	See ACT.
MAP	Module access point
MRC	Media Redundancy Client
MRM	Media Redundancy Manager
MRP	Media Redundancy Protocol
PAP	Parameter access point
PD	Process data *Prozessdaten*
PKE	Parameter identification *Parameter-Kennung*
PKW	Parameter identification value *Parameter-Kennung-Wert*

Abbreviation	Explanation
PNU	Parameter number *Parameternummer*
PPO	Parameter/Process data object *Parameter-/Prozessdaten-Objekt*
PWE	Parameter value *Parameter-Wert*
PZD	See PD.
PZDO	Process data object *Prozessdatenobjekt*
SAP	Service access point
SOW	Reference *Sollwert*
STW	Control word *Steuerwort*
ZSW	Status word *Zustandswort*

3

Overview of the Ethernet network and the FENA-01/-11/-21 module

Contents of this chapter

This chapter contains a short description of the Ethernet network and the FENA adapter module.

Ethernet network

Ethernet standards support a variety of physical media (coaxial cable, twisted pair, fiber optics) and topologies (bus and star). The FENA-01/-11/-21 adapter module supports twisted pair as the physical media in a star topology. In addition, FENA-21 supports a daisy chain topology with all protocols and DLR with EtherNet/IP and Media Redundancy Protocol (MRP) with PROFINET IO protocol.

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. For more information, see chapter *Technical data*.

■ Example topology of the Ethernet link

This figure shows an example of an allowable topology for an
Ethernet network with FENA-01/-11/-21.
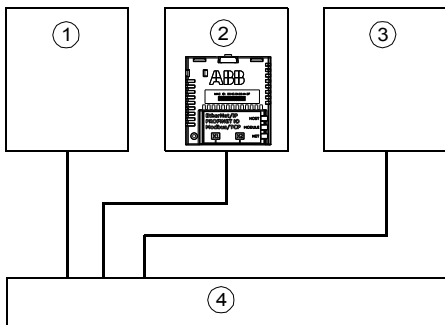
No.	Description
1	Other slave device
2	ABB drive
3	Other slave device
4	Switch or router

This figure shows an example of an allowable topology for an Ethernet network with FENA-21.

No.	Description
1...3	ABB drive
4	Other slave device
5	Network master device
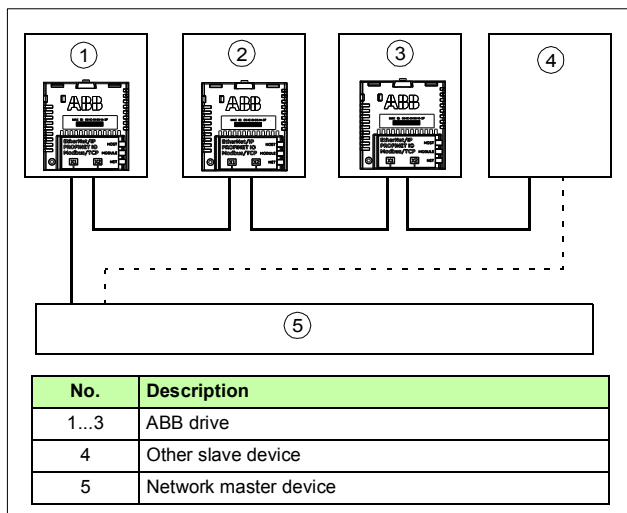
FENA-01/-11/-21 Ethernet adapter module

The FENA-01/-11/-21 Ethernet 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.

The protocols used to access these functionalities over Ethernet are described in chapters:

- *Modbus/TCP – Communication protocol*
- *EtherNet/IP – Communication protocol*
- *PROFINET IO – 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.

Note: PROFINET IO uses only 100 Mbit/s in the Full duplex mode.

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

■ Layout of the adapter module

This figure shows the layout of FENA-01/-11.

No.	Description	See chapter
1	Lock	*Mechanical installation*
2	Mounting and grounding screw	*Mechanical installation*
3	Connector X1 to Ethernet	*Electrical installation*
4	Diagnostic LEDs	*Modbus/TCP – Diagnostics* *EtherNet/IP – Diagnostics* *PROFINET IO – Diagnostics* *NONE - Diagnostics*
5	MAC address	-

This figure shows the layout of FENA-21.

No.	Description	See chapter
1	Lock	*Mechanical installation*
2	Mounting screw	*Mechanical installation*
3	RJ-45 connector [X1] to Ethernet	*Electrical installation*
4	RJ-45 connector [X2] for chaining another module	*Electrical installation*
5	Diagnostic LEDs	*Modbus/TCP – Diagnostics* *EtherNet/IP – Diagnostics* *PROFINET IO – Diagnostics* *NONE - Diagnostics*
6	MAC address	-

4

Mechanical installation

Contents of this chapter

This chapter contains a delivery checklist and instructions to install the adapter module.

Necessary tools and instructions

You will need a Torx TX10 screwdriver to secure the FENA adapter module to the drive. See also, the applicable drive hardware manual.

Unpacking and examining the delivery

1. Open the option package.

2. Make sure that the package contains:
   - Ethernet adapter module, type FENA-01/-11/-21
   - this manual.

3. Make sure that there are no signs of damage.

Installing the adapter module

⚠ **WARNING!** Obey the safety instructions. See chapter
Safety instructions on page *19*. If you ignore the safety
instructions, injury or death can occur.

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

When the adapter module is installed, it makes the signal and
power connection to the drive through a 20-pin connector.

When you install or remove the adapter module from the control
unit:

1. Pull out the lock.
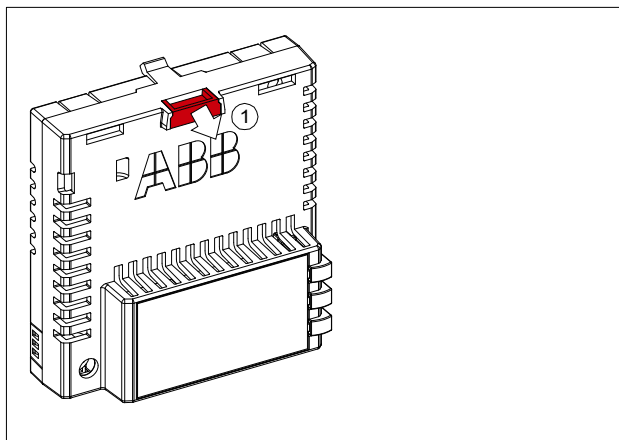
2. Put the adapter module carefully into its position on the drive.

3. Push in the lock.
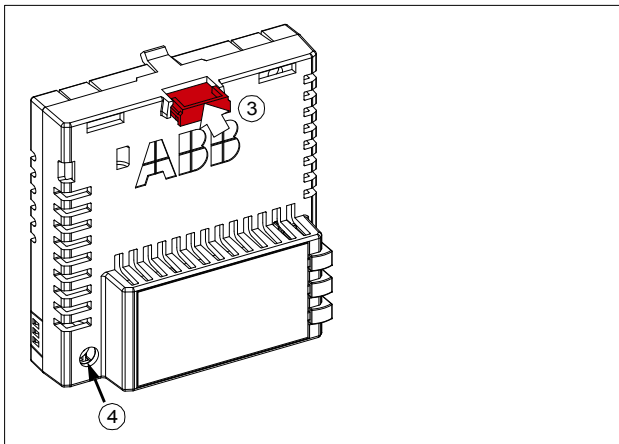
4. Tighten the screw to torque 0.8 N·m using a Torx TX10 screwdriver.

> **WARNING!** Do not use excessive force, or leave the screw too loose. Over-tightening can damage the screw or module. A loose screw decreases the EMC performance, and can even cause an operation failure.

See the applicable drive manual for further instructions on how to install the adapter module to the drive.

5

Electrical installation

Contents of this chapter

This chapter contains:
- general cabling instructions
- instructions on connecting the adapter module to the Ethernet network.

Warnings

WARNING! Obey the safety instructions. See chapter *Safety instructions* on page *19*. If you ignore the safety instructions, injury or death can occur. If you are not a qualified electrician, do not do electrical work.

Necessary tools and instructions

See the applicable drive hardware manual.

General cabling instructions

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

Connecting the adapter module to the Ethernet network

The network cable can be CAT5 or higher, and type UTP, FTP or STP.

When CAT5 FTP or STP is used, the cable shield is connected to the drive frame through an RC network. In FENA-01, it is possible to change this connection by using jumper J1 located next to the X1 connector.

- Position 1-2 connects the cable shield directly to the drive frame.
- Position 2-3 connects the cable shield to the drive frame through an RC network. This is the default setting of the jumper.

The figure below shows the location of jumper pin 1 on the FENA-01 adapter module.
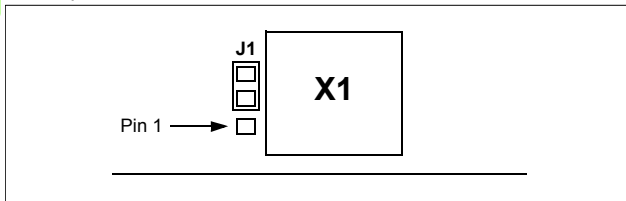
■ **Connection procedure**

1. Connect the network cable to the RJ-45 connector (X1) on the adapter module.

2. If you want to create a daisy chain with FENA-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. In applications where this is not acceptable, consider using the ring topology instead.

Modbus/TCP protocol

M

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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 starting on page *67*.

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. For more information on the web user interface, see *Appendix C – FENA configuration web pages*.

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.

FENA-01/-11-/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 ACS355, ACS380, ACSM1, ACS480, ACS580, ACS850 and ACQ810.
- parameter group is typically 51/54 (group 151/154 in some variants) in ACS880 and ACS880-M04 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.	**128** = ETHER-NET
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	

◇

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

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	8
255.255.254.0	23	254.0.0.0	7
255.255.252.0	22	252.0.0.0	6
255.255.248.0	21	248.0.0.0	5
255.255.240.0	20	240.0.0.0	4
255.255.224.0	19	224.0.0.0	3
255.255.192.0	18	192.0.0.0	2
255.255.128.0	17	128.0.0.0	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	

No.	Name/Value	Description	Default
14	Commrate port 2	Sets the bit rate for the Ethernet port 2. This parameter is used only with FENA-21.	**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 … 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 an ACS355 drive: For example, if the parameter has a value 99 and the reference of 1000 is given by the master, the reference is multiplied by 100 (i.e. 99 + 1) and forwarded to the drive as 100000. According to the DCU profile, speed scale is 1000 = 1 rpm. This value is interpreted as a reference of 100 rpm in the drive. With ACSM1, ACS850 and ACQ810, the DCU profile speed scale is approximately 65535 = 1 rpm. With ACS380, ACS580 and ACS880: Generic reference type: *1 = (T16 scale + 1)/100 -> T16 scale = 99, 1 = 1.*	99
	0…65535	Reference multiplier/actual value divisor	

No.	Name/Value	Description	Default
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.	

No.	Name/Value	Description	Default
	1 = HiLo	The first register contains the high order word and the second register contains the low order word.	
23	Address mode	Defines the mapping between parameters and holding registers in the 0...65535 Modbus register range.	**0** = Mode 0
	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. Mode is backward compatibility with old firmware versions of FENA-xx and with, for example, ACx550. 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.	

No.	Name/Value	Description	Default
24 … 26	Reserved for web page functionality. For more information, see *Appendix C – FENA configuration web pages*.	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	
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** = Off-line 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 firmware patch and build number of the adapter module in the **xxyy** format, where: **xx** = patch number **yy** = build number Example: C80D $\geq$ 200.13 or 0 $\geq$ 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* on page *100*.

FENA-01/-11/-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 55 in ACS355
- parameter group 53 in ACSM1, ACS380, ACS480, ACS580, ACS850 and ACQ810.
- parameter group is typically 53/56 (group 153/156 in some variants) in ACS880 and ACS880-M04 if the adapter is installed as fieldbus adapter A/B.

No.[1]	Name/Value	Description	Default
01	FBA A/B data 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 protocol*. The content is defined by a decimal number in the range of 0 to 9999 as follows:	**0** = None
		<table><tr><td>0</td><td>Not used</td></tr><tr><td>1…99</td><td>Virtual address area of drive control. Not used when the Modbus/TCP protocol is used.</td></tr><tr><td>101… 9999</td><td>Parameter area of the drive</td></tr></table>	
	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 … Data out 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.

FENA-01/-11/-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 54 in ACS355
- parameter group 52 in ACSM1, ACS480, ACS580, ACS850 and ACQ810
- parameter group is typically 52/55 (group 152/155 in some variants) in ACS880 and ACS880-M04 if the adapter is installed as fieldbus adapter A/B.

No.[1)	Name/Value	Description	Default
01	FBA A/B data in1 (drive to client)	Selects the drive parameter address from which the data is read to the Data in 1 register (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** = None
		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	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 in1*.	**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 ACS355 drives

1. Power up the drive.

2. Enable the communication between the adapter module and the drive with parameter **9802 COMM PROT SEL**.

3. Set the module configuration parameters in group 51.

    • Select the communication protocol and profile with parameter **5102** and configure the network settings with parameters **5103**…**5113**.

    • With parameters **5120** and **5121**, select how the adapter module detects fieldbus communication breaks.

4. With parameter **3018 COMM FAULT FUNC**, select how the drive reacts to a fieldbus communication break.

5. With parameter **3019 COMM FAULT TIME**, define the time between communication break detection and the selected action.

6. Define the process data transferred to and from the drive in parameter groups 54 and 55.

    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 for the ABB Drives - Classic communication profile.

7. Validate the settings made in parameter groups 51, 54 and 55 with parameter **5127 FBA PAR REFRESH**.

8. 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 – ACS355

Speed and torque control using the ABB Drives – Enhanced communication profile

This example shows how to configure a speed and torque 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* on page *91*.

When Reference 1 (REF1) is used, a reference value of ±20000 (decimal) corresponds to the reference set with parameter **1105 REF1 MAX** in the forward and reverse directions.

When Reference 2 (REF2) is used, a reference value of ±10000 (decimal) corresponds to the reference set with parameter **1108 REF2 MAX** 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
Torque reference	(4)00003	Torque actual value	(4)00053
Constant speed 1[1]	(4)00004	Power[1]	(4)00054
Constant speed 2[1]	(4)00005	DC bus voltage[1]	(4)00055

[1] Example

The table below gives the recommended drive parameter settings.

Drive parameter	Setting for ACS355 drives	Description
9802 COMM PROT SEL	**4** = EXT FBA	Enables communication between the drive and the fieldbus adapter module.
5101 FBA TYPE	ETHERNET[1]	Displays the type of the fieldbus adapter module.

Drive parameter	Setting for ACS355 drives	Description
5102 FB PAR 2 (PROTOCOL/PROFILE)	**1** (= MB/TCP ABB E)	Selects the Modbus/TCP protocol and the ABB Drives - Enhanced profile.
5103 FB PAR 3 (COMMRATE)	**0** (= Auto)[2]	Ethernet communication rate is negotiated automatically by the device.
5104 FB PAR 4 (IP CONFIGURATION)	**0** (= Static IP)	Configuration will be obtained from parameters *05…13*.
5105 FB PAR 5 (IP ADDRESS 1)	192[2]	First part of the IP address
5106 FB PAR 6 (IP ADDRESS 2)	168[2]	Second part of the IP address
5107 FB PAR 7 (IP ADDRESS 3)	0[2]	Third part of the IP address
5108 FB PAR 8 (IP ADDRESS 4)	16[2]	Last part of the IP address
5109 FBA PAR 9 (SUBNET CIDR)	24[2]	Sets the network mask as 255.255.255.0, allowing access only to the last subnet.
5120 FB PAR 20 (MODBUS/TCP TIMEOUT)	10[2]	Sets the communication timeout as 1 second.
5121 FB PAR 21 (TIMEOUT MODE)	**2** (= Control RW)[2]	The timeout feature monitors the updating of the Control word and Reference 1.
3018 COMM FAULT FUNC	**1** = FAULT[2]	Enables fieldbus communication fault monitoring.
3019 COMM FAULT TIME	3.0 s[2]	Defines the fieldbus communication break supervision time.
5401 FBA DATA IN 1	106[2]	Power
5402 FBA DATA IN 2	107[2]	DC bus voltage
5501 FBA DATA OUT 1	1202[2]	Constant speed 1
5502 FBA DATA OUT 2	1203[2]	Constant speed 2
5127 FBA PAR REFRESH	**1** = REFRESH	Validates the FENA-01/-11/-21 configuration parameter settings.

Drive parameter	Setting for ACS355 drives	Description
9904 MOTOR CTRL MODE	**2** = VECTOR: TORQ	Selects the vector control mode as the motor control mode.
1001 EXT1 COMMANDS	**10** = COMM	Selects the fieldbus interface as the source of the start and stop commands for external control location 1.
1002 EXT2 COMMANDS	**10** = COMM	Selects the fieldbus interface as the source of the start and stop commands for external control location 2.
1102 EXT1/EXT2 SEL	**8** = COMM	Enables external control location 1/2 selection through the fieldbus.
1103 REF1 SELECT	**8** = COMM	Selects the fieldbus reference 1 as the source for speed reference 1.
1106 REF2 SELECT	**8** = COMM	Selects the fieldbus reference 2 as the source for speed reference 1.
1601 RUN ENABLE	**7** = COMM	Selects the fieldbus interface as the source for the inverted Run enable signal (Run disable).
1604 FAULT RESET SEL	**8** = COMM	Selects the fieldbus interface as the source for the fault reset signal.

[1] Read-only or automatically detected/set

[2] Example

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)

  or

  C7Fh (3199 decimal) → OPERATING (Torque mode).

Starting up fieldbus communication for ACSM1 drives

1. Power up the drive.

2. Enable the communication between the adapter module and the drive with parameter **50.01 FBA ENABLE**.

3. With parameter **50.02 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 COMM LOSS T OUT**, define the time between communication break detection and the selected action.

5. Select application-specific values for parameters **50.04**…**50.11**.

   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. Validate the settings made in parameter groups 51, 52 and 53 with parameter **51.27 FBA PAR REFRESH**.

9. 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 – ACSM1

Speed and torque control using the ABB Drives – Enhanced communication profile

This example shows how to configure a speed and torque 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* on page *91*.

When Reference 1 (REF1) is used, a reference value of ±20000 (4E20h) corresponds to the reference set with parameter **25.02 SPEED SCALING** in the forward and reverse directions.

When Reference 2 (REF2) is used, a reference value of ±10000 (2710h) corresponds to the reference set with parameter **32.04 TORQUE REF 1 MAX** 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
Torque reference	(4)00003	Torque actual value	(4)00053
Constant speed[1]	(4)00004 (4)00005	Power[1]	(4)00054 (4)00055
Speed reference for jogging function 1[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 ACSM1 drives	Description
50.01 FBA ENABLE	Enable	Enables communication between the drive and the fieldbus adapter module.
50.02 COMM LOSS FUNC	Fault[2]	Enables fieldbus communication fault monitoring.
50.03 COMM LOSS T OUT	3.0 s[2]	Defines the fieldbus communication break supervision time.
50.04 FBA REF1 MODESEL	Speed	Selects the fieldbus reference 1 scaling.
50.05 FBA REF2 MODESEL	Torque	Selects the fieldbus reference 2 scaling.
51.01 FBA TYPE	ETHERNET[1]	Displays the type of the fieldbus adapter module.
51.02 FBA PAR2 (PROTOCOL/PROFILE)	**1** (= MB/TCP ABB E)	Selects the Modbus/TCP protocol and the ABB Drives - Enhanced profile.
51.03 FBA PAR3 (COMMRATE)	**0** (= Auto)[2]	Ethernet communication rate is negotiated automatically by the device.
51.04 FBA PAR4 (IP CONFIGURATION)	**0** (= Static IP)[2]	Configuration will be obtained from parameters *05…13*.

Drive parameter	Setting for ACSM1 drives	Description
51.05 FBA PAR5 (IP ADDRESS 1)	192[2)]	First part of the IP address
51.06 FBA PAR6 (IP ADDRESS 2)	168[2)]	Second part of the IP address
51.07 FBA PAR7 (IP ADDRESS 3)	0[2)]	Third part of the IP address
51.08 FBA PAR8 (IP ADDRESS 4)	16[2)]	Last part of the IP address
51.09 FBA PAR9 (SUBNET CIDR)	24[2)]	Sets the network mask as 255.255.255.0, allowing access only to the last subnet.
51.20 FBA PAR20 (MODBUS/TCP TIMEOUT)	10[2)]	Sets the communication timeout as 1 second.
51.21 FBA PAR21 TIMEOUT MODE)	**2** (= Control RW)[2)]	The timeout feature monitors the updating of the Control word and Reference 1.
52.01 FBA DATA IN1	122[2)]	Power
52.03 FBA DATA IN3	107[2)]	DC bus voltage
53.01 FBA DATA OUT1	2408[2)]	Constant speed
53.03 FBA DATA OUT3	2410[2)]	Speed reference for jogging function 1
51.27 FBA PAR REFRESH	REFRESH	Validates the FENA-11/-21 configuration parameter settings.
10.01 EXT1 START FUNC	FBA	Selects the fieldbus interface as the source of the start and stop commands for external control location 1.
10.04 EXT2 START FUNC	FBA	Selects the fieldbus interface as the source of the start and stop commands for external control location 2.
10.08 FAULT RESET SEL	P.FBA MAIN CW.8	Selects the fieldbus interface as the source for the fault reset signal.
24.01 SPEED REF1 SEL	FBA REF1	Selects the fieldbus reference 1 as the source for speed reference 1.

Drive parameter	Setting for ACSM1 drives	Description
32.02 TORQ REF ADD SEL	FBA REF2	Selects the fieldbus reference 2 as the source for torque reference 1.
34.01 EXT1/EXT2 SEL	P.FBA MAIN CW.15	Enables external control location 1/2 selection through the fieldbus only (bit 15 in the fieldbus Control word).
34.03 EXT1 CTRL MODE1	Speed	Selects speed control as the control mode 1 for external control location 1.
34.05 EXT2 CTRL MODE1	Torque	Selects torque control as the control mode 1 for external control location 2.

[1] Read-only or automatically detected/set

[2] Example

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)

   or

   C7Fh (3199 decimal) → OPERATING (Torque mode).

Starting up fieldbus communication for ACS850 and ACQ810 drives

1. Power up the drive.

2. Enable the communication between the adapter module and the drive with parameter **50.01 FBA enable**.

3. With parameter **50.02 Comm loss func**, select how the drive reacts to a fieldbus communication break.

   Notes:

   - This function monitors both communication between the fieldbus master and the adapter module and communication between the adapter module and the drive.

   - In ACQ810, you can select the control locations to be monitored with parameter **50.21 Comm loss enable**. By default, the monitoring is enabled in both control locations (EXT1 and EXT2).

4. With parameter **50.03 Comm loss t out**, define the time between communication break detection and the selected action.

5. Select application-specific values for parameters **50.04**…**50.11**.

   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. Validate the settings made in parameter groups 51, 52 and 53 with parameter **51.27 FBA par refresh**.

9. 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 – ACS850 and ACQ810

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* on page *91*.

When Reference 1 (REF1) is used, a reference value of ±20000 (4E20h) corresponds to the reference set with parameter **19.01 Speed scaling** in the forward and reverse directions.

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

Output data	Modbus register	Input data	Modbus register
Control word	(4)00001	Status word	(4)00051
Speed reference	(4)00002	Speed actual value	(4)00052
Reference 2 (Not used)	(4)00003	Actual value 2 (Not used)	(4)00053
Constant speed 1[1)	(4)00004 (4)00005	Power[1)	(4)00054 (4)00055
Constant speed 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 ACS850/ACQ810 drives	Description
50.01 Fba enable	Enable	Enables communication between the drive and the fieldbus adapter module.
50.02 Comm loss func	Fault[2)	Enables fieldbus communication fault monitoring.
50.03 Comm loss t out	3.0 s[2)	Defines the fieldbus communication break supervision time.
50.04 Fb ref1 modesel	Speed	Selects the fieldbus reference 1 scaling.

51.01 FBA type	Ethernet[1)	Displays the type of the fieldbus adapter module.
51.02 FBA par2 (PROTOCOL/ PROFILE)	**1** (= MB/TCP ABB E)	Selects the Modbus/TCP protocol and the ABB Drives - Enhanced profile.
51.03 FBA par3 (COMMRATE)	**0** (= Auto)[2)	Ethernet communication rate is negotiated automatically by the device.
51.04 FBA par4 (IP CONFIGURATION)	**0** (= Static IP)[2)	Configuration will be obtained from parameters *05…13*.

Drive parameter	Setting for ACS850/ACQ810 drives	Description
51.05 FBA par5 (IP ADDRESS 1)	192[2]	First part of the IP address
51.06 FBA par6 (IP ADDRESS 2)	168[2]	Second part of the IP address
51.07 FBA par7 (IP ADDRESS 3)	0[2]	Third part of the IP address
51.08 FBA par8 (IP ADDRESS 4)	16[2]	Last part of the IP address
51.09 FBA par9 (SUBNET CIDR)	24[2]	Sets the network mask as 255.255.255.0, allowing access only to the last subnet.
51.20 FBA par20 (MODBUS/TCP TIME-OUT)	10[2]	Sets the communication timeout as 1 second.
51.21 FBA par21 (TIMEOUT MODE)	**2** (= Control RW)[2]	The timeout feature monitors the updating of the Control word and Reference 1.
52.01 FBA data in1	122[2]	Power
52.03 FBA data in3	107[2]	DC bus voltage
53.01 FBA data out1	2606[2]	Constant speed 1
53.03 FBA data out3	2607[2]	Constant speed 2
51.27 FBA par refresh	Refresh	Validates the FENA-11/-21 configuration parameter settings.
10.01 Ext1 start func	FB	Selects the fieldbus interface as the source of the start and stop commands for external control location 1.
10.10 Fault reset sel	P.FBA main cw.8	Selects the fieldbus interface as the source for the fault reset signal.
21.01 Speed ref1 sel (ACS850) 21.01 Speed ref sel (ACQ810)	FBA ref1 FBA ref1	Selects the fieldbus reference 1 as the source for speed reference 1.

[1] Read-only or automatically detected/set

[2] Example

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).

Starting up fieldbus communication for ACS480, ACS580 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 ACS580 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* on page *91*.

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
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** = Option slot 1[2]	Enables communication between the drive and the fieldbus adapter module.
50.02 FBA A comm loss func	**1** = Fault[2]	Enables fieldbus A communication fault monitoring.

Drive parameter	Setting for ACS480 and ACS580 drives	Description
50.03 FBA A comm loss t out	3.0 s[2]	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	**128** = ETHERNET[1]	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[2]	Ethernet communication rate is negotiated automatically by the device.
51.04 IP configuration	**0** = Static IP[2]	Configuration will be obtained from parameters *05…13*.
51.05 IP address 1	192[2]	First part of the IP address
51.06 IP address 2	168[2]	Second part of the IP address
51.07 IP address 3	0[2]	Third part of the IP address
51.08 IP address 4	16[2]	Last part of the IP address
51.09 Subnet CIDR	24[2]	Sets the network mask as 255.255.255.0, allowing access only to the last subnet.
51.20 Timeout time	10[2]	Sets the communication timeout as 1 second.
51.21 Timeout mode	**2** = Control RW[2]	The timeout feature monitors the updating of the Control word and Reference 1.
52.01 FBA A data in1	01.14[2]	Output power
52.03 FBA a data in3	01.11[2]	DC voltage
53.01 FBA A data out1	28.26[2]	Constant frequency 1
53.03 FBA A data out3	28.27[2]	Constant frequency 2
51.27 FBA A par refresh	**1** = Refresh	Validates the FENA-11/-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.

Drive parameter	Setting for ACS480 and ACS580 drives	Description
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] Read-only or automatically detected/set

[2] Example

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* on page *91*.

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

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

Output data	Modbus register	Input data	Modbus register
Control word	(4)00001	Status word	(4)00051
Speed reference	(4)00002	Speed actual value	(4)00052
Reference 2 (Not used)	(4)00003	Actual value 2 (Not used)	(4)00053
Constant speed 1 [32][1]	(4)00004 (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[2]	Enables communication between the drive and the fieldbus adapter module.
50.02 FBA A comm loss func	**1** = Fault[2]	Enables fieldbus A communication fault monitoring.
50.03 FBA A comm loss t out	3.0 s[2]	Defines the fieldbus A communication break supervision time.

Drive parameter	Setting for ACS880 drives	Description
50.04 FBA A ref1 type	**4** = Speed	Selects the fieldbus A reference 1 type and scaling.
51.01 FBA A type	**128** = ETHERNET[1)]	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[2)]	Ethernet communication rate is negotiated automatically by the device.
51.04 IP configuration	**0** = Static IP[2)]	Configuration will be obtained from parameters *05…13*.
51.05 IP address 1	192[2)]	First part of the IP address
51.06 IP address 2	168[2)]	Second part of the IP address
51.07 IP address 3	0[2)]	Third part of the IP address
51.08 IP address 4	16[2)]	Last part of the IP address
51.09 Subnet CIDR	24[2)]	Sets the network mask as 255.255.255.0, allowing access only to the last subnet.
51.20 Timeout time	10[2)]	Sets the communication timeout as 1 second.
51.21 Timeout mode	**2** = Control RW[2)]	The timeout feature monitors the updating of the Control word and Reference 1.
52.01 FBA A data in1	01.14[2)]	Output power
52.03 FBA a data in3	01.11[2)]	DC voltage
53.01 FBA A data out1	22.26[2)]	Constant speed 1
53.03 FBA A data out3	22.27[2)]	Constant speed 2
51.27 FBA A par refresh	**1** = Refresh	Validates the FENA-11/-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.

Drive parameter	Setting for ACS880 drives	Description
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] Read-only or automatically detected/set

[2] Example

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* (see page *55*).

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*.

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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 FENA 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 (e.g., DCU or FBA). For the Transparent modes, no data conversion takes place.

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The figure below illustrates the profile selection:

$^{1)}$ Can be used if the native profile is supported by the drive.
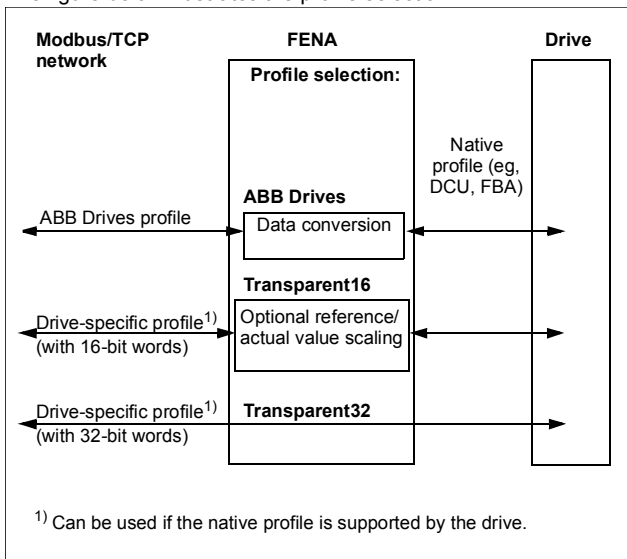
The following sections describe the Control word, the Status word, references and actual values for the ABB Drives communication profile. Refer to the drive manuals for details on the native profiles.

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ABB Drives communication profile

■ Control word and Status word

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

The contents of the Control word and the Status word are detailed below. The drive states are presented on page *95*.

Control word contents

The table below shows the contents of the Control word for the ABB Drives communication profile. The upper case boldface text refers to the states shown in the state machine on page *95*.

Bit	Name	Value	STATE/Description
0	OFF1_CONTROL	1	Proceed to **READY TO OPERATE**.
		0	Stop along currently active deceleration ramp. Proceed to **OFF1 ACTIVE**; proceed to **READY TO SWITCH ON** unless other interlocks (OFF2, OFF3) are active.
1	OFF2_CONTROL	1	Continue operation (OFF2 inactive).
		0	Emergency OFF, coast to stop. Proceed to **OFF2 ACTIVE**, proceed to **SWITCH-ON INHIBITED**.
2	OFF3_CONTROL	1	Continue operation (OFF3 inactive).
		0	Emergency stop, stop within time defined by drive parameter. Proceed to **OFF3 ACTIVE**; proceed to **SWITCH-ON INHIBITED**. **Warning:** Ensure that motor and driven machine can be stopped using this stop mode.

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Bit	Name	Value	STATE/Description
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.		

Bit	Name	Value	STATE/Description
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 (Not supported with ACS355)		

Status word contents

The table below shows the contents of the Status word for the ABB Drives communication profile. The upper case boldface text refers to the states shown in the state machine on page *95*.

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	–

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Bit	Name	Value	STATE/Description
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
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 status bits (Not supported with ACS355)		
15	FBA_ERROR	1	Communication error detected by fieldbus adapter module
		0	Fieldbus adapter communication OK

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State machine

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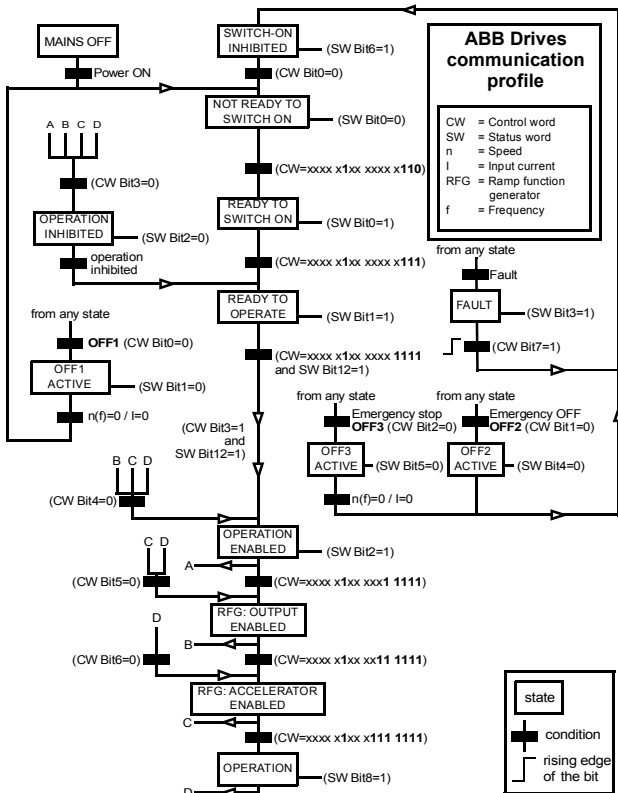
■ **References**

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, FENA). To have the drive controlled through the fieldbus, you must select the module as the source for control information, for example, reference.
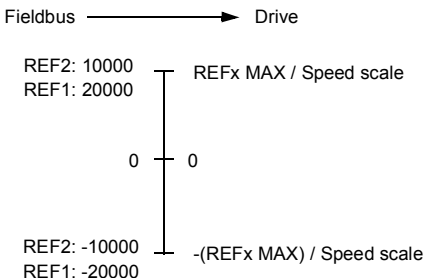
Scaling

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 ACSM1, ACS480, ACS580, ACS850, ACQ810 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).

In ACS355, drive parameter REFx MIN may limit the actual minimum reference.
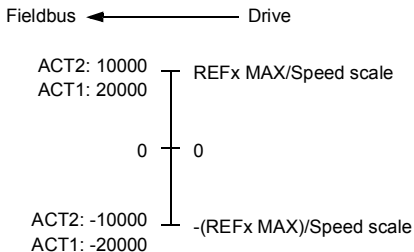
■ Actual values

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.

```
        Fieldbus ◄──────────── Drive

ACT2: 10000  ┬  REFx MAX/Speed scale
ACT1: 20000  │

          0  ┼  0

ACT2: -10000 ┴  -(REFx MAX)/Speed scale
ACT1: -20000
```

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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 FENA 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.

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The supported Modbus commands are listed in section *Function codes* on page *100*. 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* on page *417*.

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.

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