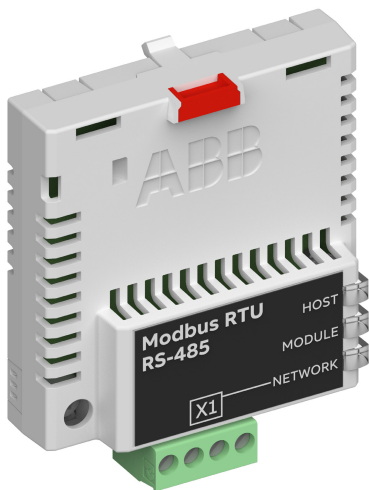


OPTION FOR ABB DRIVES, CONVERTERS AND INVERTERS

FSCA-01 RS-485 adapter module

User's manual



List of related manuals

See section *Related manuals* on page 13.

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:



FSCA-01 manual



Fieldbus connectivity webpage

User's manual

FSCA-01 RS-485 adapter module

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1

Safety instructions

What this chapter contains

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.
-



About the manual

What this chapter contains

This chapter introduces this manual.

Purpose of the manual

The manual provides information on installing, commissioning and using an FSCA-01 RS-485 adapter module.

Applicability

This manual applies to the FSCA-01 RS-485 adapter module (+K458), SW version 1.70 or later.

Compatibility

The FSCA-01 RS-485 adapter module is compatible with the following drives:

- ACS355
- ACSM1
- ACH580
- ACQ580
- ACS580
- ACS530
- ACS850
- ACS860
- ACQ810
- ACS880.

The FSCA-01 RS-485 adapter module supports the Modbus/RTU communication protocol. Support for the DCP protocol to be used with ACSM1 Lift control program is pending.

The FSCA-01 RS-485 adapter module is compatible with all Modbus/RTU masters that support *Modbus Application Protocol Specification v1.1b* and *MODBUS over Serial Line Specification and Implementation Guide v1.02*.

Note: The adapter module is compatible with more drives that may not be listed here. For details of compatibility, check the drive's firmware manual.

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.

Before you start

It is assumed that the drive is installed and ready to operate before you start the installation of the adapter module.

In addition to conventional installation tools, have the drive manuals available during the installation as they contain important information not included in this manual. The drive manuals are referred to at various points of this manual.

Related manuals

The related manuals are listed below.

Drive user's manuals	Code (English)
<i>ACS355 drives (0.37...22 kW, 0.5...30 hp) user's manual</i>	3AUA0000066143
<hr/>	
Drive hardware manuals and guides	
<i>ACSM1 manuals</i>	00578051
<i>ACQ810 manuals</i>	00598718
<i>ACS850-04 manuals</i>	00592009
<i>ACH580-01 manuals</i>	9AKK10103A0587
<i>ACH580-04 manuals</i>	9AKK106930A9059
<i>ACH580-07 manuals</i>	9AKK106930A5241
<i>ACQ580-01 manuals</i>	9AKK106713A2709
<i>ACQ580-04 manuals</i>	9AKK106930A9053
<i>ACQ580-07 manuals</i>	9AKK106930A3150
<i>ACS580-01 manuals</i>	9AKK105713A8085
<i>ACS580-04 manuals</i>	9AKK106930A9060
<i>ACS580-07 (75 to 250 kW) manuals</i>	9AKK106930A5239
<i>ACS580-07 (250 to 500 kW) manuals</i>	9AKK106713A0278
<i>ACS880-01 manuals</i>	9AKK105408A7004
<i>ACS880-04 manuals</i>	9AKK105713A4819
<i>ACS880-07 manuals</i>	9AKK105408A8149
<i>ACS880-07 (560 to 2800 kW)</i>	9AKK105713A6663
<i>ACS880-17 (132 to 355 kW)</i>	9AKK106930A3466
<i>ACS880-17 (160 to 3200 kW)</i>	9AKK106354A1499
<i>ACS880-37 (132 to 355 kW)</i>	9AKK106930A3467
<i>ACS880-37 (160 to 3200 kW)</i>	9AKK106354A1500
<i>ACS880-01 manuals</i>	9AKK105408A7004

Drive firmware manuals and guides

<i>ACSM1 motion control program FW manual</i>	3AFE68848270
<i>ACSM1 speed and torque control program FW manual</i>	3AFE68848261
<i>ACSM1 regen supply control program FW manual</i>	3AUA0000052174
<i>ACS850 standard control program FW manual</i>	3AUA0000045497
<i>ACQ810 standard pump control program FW manual</i>	3AUA0000055144
<i>ACS880 primary control program FW manual</i>	3AUA0000085967
<i>ACH580 HVAC control program FW manual</i>	3AXD50000027537
<i>ACS580 standard ctrl program FW manual</i>	3AXD50000016097

Option manuals and guides

<i>FSCA-01 RS-485 adapter module user's manual</i>	3AUA0000109533
<i>FSCA-01 RS-485 adapter module quick guide</i>	3AXD50000158546

Contents

The manual consists of the following chapters:

- [Safety instructions](#) contains the safety instructions which you must follow when installing a fieldbus adapter module.
 - [About the manual](#) introduces this manual.
 - [Overview of the RS-485 network and the FSCA-01 module](#) contains a short description of the RS-485 network and the adapter module.
 - [Mechanical installation](#) contains a delivery checklist and instructions to install the adapter module.
 - [Electrical installation](#) contains instructions on cabling, connecting the module to the RS-485 network and bus termination.
 - [Start-up](#) presents the steps to take during the start-up of the drive with the adapter module and gives information on configuring the master.
 - [Communication profiles](#) describes the communication profiles used in the communication between the master, the adapter module and the drive.
-

- *Communication protocol* describes the Modbus/RTU communication protocol for the adapter module.
- *Diagnostics* explains how to trace faults with the status LEDs on the adapter module.
- *Technical data* contains the technical data of the adapter module and the RS-485 link.

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 used in this manual

■ General terms and abbreviations

Term/abbreviation	Explanation
Communication module	Communication module is a name for a device (eg, a fieldbus adapter) through which the drive is connected to an external communication network (eg, a fieldbus). The communication with the module is activated with a drive parameter.
Command word	See <i>Control word</i> .
Control word	16-bit word from master to slave with bit-coded control signals (sometimes called the Command word).
EIA-485	Balanced (differential) serial interface standard. Also known as TIA-485 or RS-485. In this manual, term RS-485 is used.
FSCA-01 RS-485 adapter module	One of the optional fieldbus adapter modules available for ABB drives. FSCA-01 is a device through which an ABB drive is connected to an RS-485 network.
Parameter	Operating instruction for the drive. Parameters can be read and programmed with the drive control panel, drive PC tools or through the adapter module.
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 word from slave to master with bit-coded status messages
TIA/EIA	ANSI Telecommunication Industry Association/Electronic Industries Alliance

■ Modbus 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 indicates to the server what kind of action to perform.
Holding register	Holds data that will be later executed by an application program.

3

Overview of the RS-485 network and the FSCA-01 module

What this chapter contains

This chapter contains a short description of the RS-485 network and the FSCA-01 RS-485 adapter module.

RS-485 network

RS-485 (EIA-485, TIA-485) is a balanced (differential) serial interface standard for communication over a twisted-pair cable. Because the RS-485 signal transmission is differential, it provides better protection against noise and longer transmission distances than RS-232. RS-485 is a half-duplex multi-drop network, which means that multiple devices may reside on line. Only one transmitter may be active at any given time.

The RS-485 standard specifies only the electrical characteristics of the bus system. The communication protocol and communication speed depend on the application used. For example, the electrical characteristics of the Modbus protocol are based on the RS-485 standard.

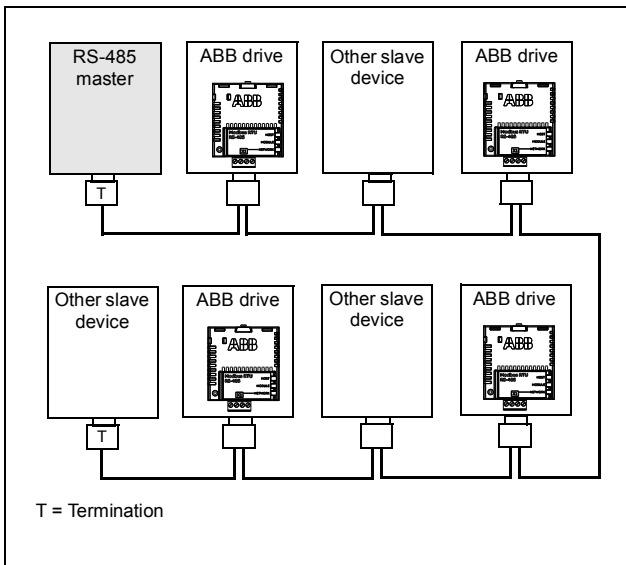
The RS-485 transmission line consists of two wires, A and B (balanced pair). The signal transmission is based on the voltage difference between the wires. The minimum detected voltage difference is 200 mV. The potential difference between the two wires determines the logic state bit: when B is at a higher voltage than A, the state is defined as bit 1 (data high) and when A is at a higher voltage than B, the state is defined as bit 0 (data low).

The maximum common mode voltage between RS-485 network devices is limited to $-7 \dots +12$ V. A ground wire and cable shield should be connected to prevent the common mode voltage between the network devices from drifting outside the allowable limits.

The RS-485 bus cable should be terminated with a 120 ohm resistor at both ends to prevent signal reflection. When no device on the network is transmitting, noise can be falsely interpreted as communication data. To avoid this, a termination can be included with a fail-safe circuit (pull-up and pull-down resistors). The circuit forces the bus into a known idle state when no device is transmitting.

■ Example topology of the RS-485 link

The figure below shows an example of an allowable topology of FSCA-01 RS-485 link.



FSCA-01 RS-485 adapter module

The FSCA-01 RS-485 adapter module is an optional device for ABB drives which enables the connection of the drive to an RS-485 network. The adapter module provides galvanic isolation between the drive and RS-485 network and converts the serial communication signals of the drive to the RS-485 signal levels.

The adapter module has a built-in bus termination with fail-safe circuitry. The termination can be activated with a jumper. For instructions, see chapter [Electrical installation](#).

Through the adapter module you can:

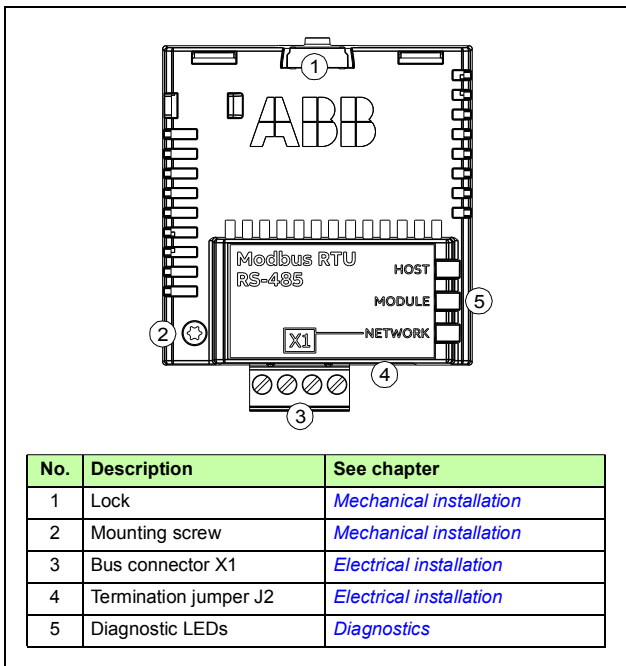
- give control commands to the drive (for example, Start, Stop, Run enable)
- feed a motor speed or torque reference to the drive
- give a process actual value or a process reference to the PID controller of the drive
- read status information and actual values from the drive
- change drive parameter values
- reset a drive fault.

The communication protocol used to access these functionalities over the RS-485 connection is described in chapter [Communication protocol](#).

The adapter module is mounted into an option slot on the motor control board of the drive. See the drive manuals for module placement options.

Layout of the adapter module

The figure below shows the layout of FSCA-01 adapter module.



4

Mechanical installation

What this chapter contains

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 FSCA 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:
 - FSCA-01 RS-485 adapter module
 - this manual.
 3. Make sure that there are no signs of damage.
-

Installing the adapter module



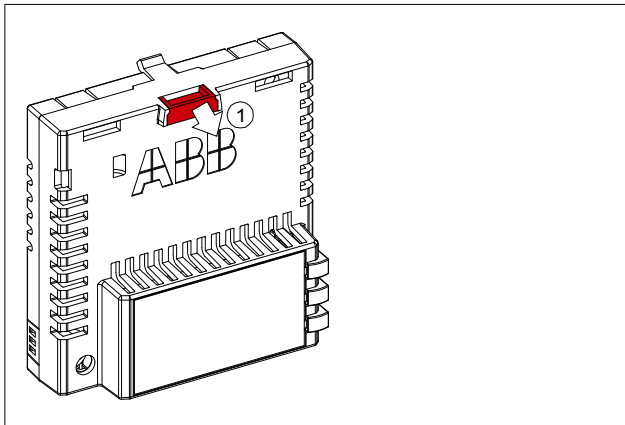
WARNING! Obey the safety instructions. See chapter [Safety instructions](#) on page 9. If you ignore the safety instructions, injury or death can occur.

The adapter module has a specific position in the drive. You can plug and unplug the adapter when the drive is power off and no external 24 voltage supplied to the control board. Plastic pins, a lock and one screw hold the adapter module in place. The screw also makes an electrical connection between the module and drive frame for cable shield termination.

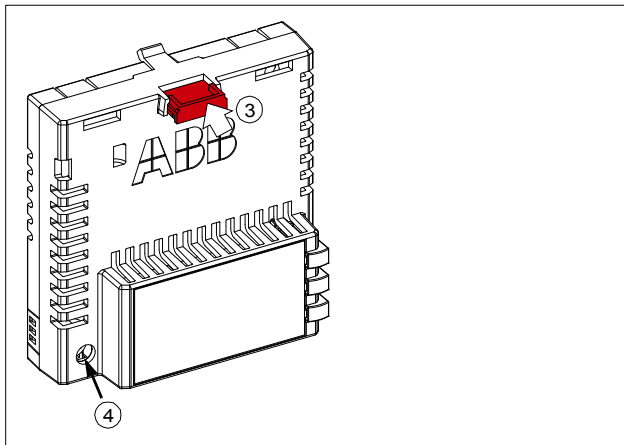
When the adapter module is installed, it makes the signal and power connection to the drive through a 20-pin connector.

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

1. Pull out the lock.



- Put the adapter module carefully into its position on the drive.
- Push in the lock.



- Tighten the screw to torque 0.8 N·m using a Torx TX10 screwdriver.

Note: A too high torque may break the screws. It is necessary to tighten the screw properly to fulfill the EMC requirements and to ensure the proper operation of the module.

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





5

Electrical installation

What this chapter contains

This chapter contains:

- general cabling instructions
- instructions on connecting the module to the RS-485 network
- instructions on switching on the bus termination.

Warnings



WARNING! Obey the safety instructions. See chapter [Safety instructions](#) on page 9. 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.



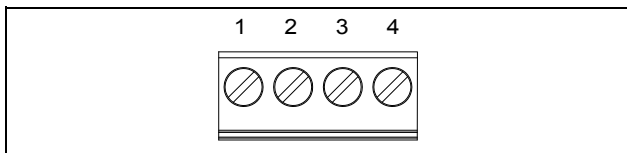
General cabling instructions

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

Connecting the module to the RS-485 network

Connect the bus cable to connector X1 on the adapter module.

The pin allocation of the X1 connector is shown below.



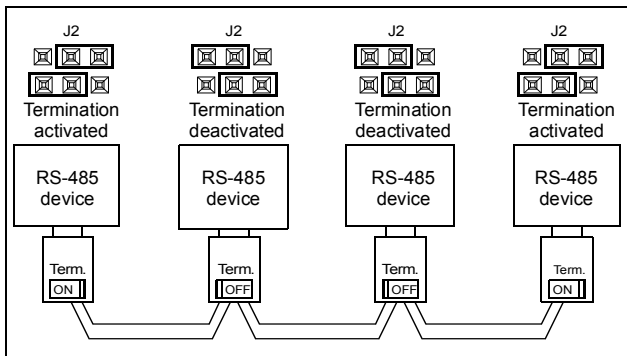
X1		Description
1	SHLD	Bus cable shield. Connected internally to GND_B and CH_GND (chassis) via RC filters.
2	DATA_B	Data positive
3	DATA_A	Data negative
4	GND_B	Isolated signal ground



Switching on the bus termination

Bus termination is required to prevent signal reflections from the bus cable ends. The adapter module is equipped with internal bus termination, which is configurable with jumper J2 pins.

Activate the termination on the devices located at the bus ends and deactivate it on the other devices. See the figure below.





6

Start-up

What this chapter contains

This chapter contains:

- information on configuring the drive for operation with the adapter module
- drive-specific instructions and examples on starting up the drive with the adapter module
- information on configuring the master station for communication with the adapter module.



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



Drive configuration

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

■ Modbus/RTU 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/RTU 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 procedures starting on page 45.

Once communication between the drive and the adapter module has been established, several configuration parameters are copied to the drive. These parameters are shown in the tables below and must be checked first and adjusted where necessary.

Note that not all drives display descriptive names for the configuration parameters. To help you identify the parameters in different drives, the names displayed by each drive are given in grey boxes in the tables.

Note: The new settings take effect only when the adapter module is powered up the next time or when the fieldbus adapter refresh parameter is activated.



FSCA-01 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, ACSM1, ACS530, ACS850 and ACQ810
- 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.	485 = RS-485
02	Profile	Selects the communication profile for the network connection. Note: The communication protocol is selected with parameter 25 Protocol .	0 = ABB Classic
	0 = ABB Classic	Modbus/RTU protocol with ABB Drives profile - Classic	
	1 = ABB Enhanced	Modbus/RTU protocol with ABB Drives profile - Enhanced	
	2 = Transp 16	Modbus/RTU protocol with Transparent 16-bit profile	
	3 = Transp 32	Modbus/RTU protocol with Transparent 32-bit profile	
03	Station ID	Defines the address of the device. Two units with the same address are not allowed on-line.	1
	1...247	Address of the device	
04	Baud rate	Selects the baud rate of the link.	0 = 9.6 kbit/s
	0 = 9.6 kbit/s	9.6 kbit/s	
	1 = 19.2 kbit/s	19.2 kbit/s	
	2 = 38.4 kbit/s	38.4 kbit/s	
	3 = 57.6 kbit/s	57.6 kbit/s	
	4 = 115.2 kbit/s	115.2 kbit/s	



No.	Name/Value	Description	Default
05	Parity	Defines the use of parity and stop bit(s) and the data length. The same settings must be used in all on-line stations.	0 = 8 None 1
	0 = 8 None 1	No parity bit, one stop bit, 8 data bits	
	1 = 8 None 2	No parity bit, two stop bits, 8 data bits	
	2 = 8 Even 1	Even parity indication bit, one stop bit, 8 data bits	
	3 = 8 Odd 1	Odd parity indication bit, one stop bit, 8 data bits	
06	Modbus timeout	<p>The Modbus/RTU protocol does not specify a timeout mechanism for the application layer. ABB Drives and the FSCA-01 module provide a Modbus timeout method as it may be desired for drive control. The timeout is:</p> <p style="text-align: center;">(MODBUS TIMEOUT value) * 100 milliseconds</p> <p>For example, a MODBUS TIMEOUT value of 22 would result in a timeout of:</p> <p style="text-align: center;">22 * 100 milliseconds = 2.2 seconds</p> <p>When a Modbus timeout occurs, the adapter module signals the drive that communication with the master has been lost. The drive configuration determines how it responds.</p> <p>Example: If you configure the MODBUS TIMEOUT as 250 ms and the drive is configured to fault on a communication failure with a delay of 500 ms, then the drive faults 750 ms after the communication is lost.</p>	0
	0...65535	Modbus timeout value	
07	Timeout mode	Selects which Modbus register accesses reset the timeout counter.	0 = None
	0 = None	Modbus timeout feature is disabled.	
	1 = Any message	Timeout counter is reset when any Modbus register of the drive is accessed.	
	2 = Ctrl write	Timeout counter is reset when the drive receives either a new Control word or new reference value (REF1 or REF2) from the Modbus master.	

No.	Name/Value	Description	Default
08	OK messages	Read-only. Shows the number of valid messages which the drive has received.	0
	0...65535	Number of valid messages	
09	CRC errors	Read-only. Shows the number of messages with a cyclic redundancy check (CRC) error which the drive has received. If the number is high, check the CRC calculation for possible errors. Note: High electromagnetic noise levels may generate errors.	0
	0...65535	Number of messages with a CRC error	
10	UART errors	Read-only. Shows the number of messages which the drive has received with other communication errors.	0
	0...65535	Number of messages with other communication errors	
11	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 last byte contains the low order byte. The covers holding register range of 1...65535.	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.	
12	Address mode	Defines the mapping between parameters and holding registers in the 0...65535 Modbus register range.	0 = Mode 0



No.	Name/Value	Description	Default
	Mode 0	<p>Used when access to parameter indexes greater than 99 is not needed. Allows 5-digit addressing¹⁾ used by legacy Modbus masters.</p> <p>16-bit access:¹⁾ Register address²⁾ = 100 * parameter group + parameter index (16-bit values, groups 1...199, indexes 1...99).</p> <p>32-bit access: Register address = 20000 + 200 * parameter group + 2 * parameter index (32-bit values, groups 1...199, indexes 1...99). Example, 5101 (0x13ED) is group 51 index.</p> <p>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 70.</p>	
	Mode 1	<p>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.</p>	
	Mode 2	<p>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.</p> <p>Used when 32-bit parameter values are needed and there is no need to access groups 128 or higher.</p>	
	Mode 3	<p>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.</p> <p>Used when 32-bit parameter values are needed and there is no need to access parameter index 128 or higher.</p>	

No.	Name/Value	Description	Default
13... 23	Reserved	These parameters are not used by the adapter module.	N/A
24	Protocol check	Read only. Shows whether the parameters of the selected communication protocol have been loaded to the module. - If the value of this parameter corresponds to the setting of par. 25 Protocol , it means that the parameters have been loaded. - If the value of this parameter differs from the setting of par. 25 , load the parameters by setting par. 27 FBA par refresh to 1 = Refresh / Configure.	1
	0...5	Communication protocol check	
25	Protocol	Selects the communication protocol for the network connection.	1 = Modbus
	0	No protocol selected	
	1 = Modbus	Modbus/RTU protocol selected	
	2 = N2	N/A	
	3 = FLN	N/A	
	4 = BACnet	N/A	
	5 = DCP	N/A	
26	Protocol sw ver	Read only. Shows the software version of the communication protocol currently selected.	N/A
		Version of the communication protocol	
27	FBA 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 / Configure	Refreshing	



No.	Name/Value	Description	Default
28	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 number z = correction number or letter.	N/A
		Parameter table revision	
29	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	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 comm sta	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
	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.	



No.	Name/Value	Description	Default
32	FBA comm SW ver	Read-only. Displays the common program of the adapter module in format axyz , where: a = major revision number xy = minor revision number z = correction number or letter.	N/A
		Common program version of the adapter module	
33	FBA appl SW ver	Read-only. Displays the application program revision of the adapter module in format axyz , where: a = major revision number xy = minor revision number z = correction number or letter.	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 70.



FSCA-01 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, ACS530, ACS850 and ACQ810
- parameter group 53 in ACS880 if the adapter is installed as fieldbus adapter A or group 56 if the adapter is installed as fieldbus adapter B

No. ¹⁾	Name/Value	Description	Default						
01	FBA data out1 (master to drive)	<p>Selects the drive parameter address into which the value of the DATA OUT 1 register is written (from the master to the server). The Modbus register address maps are explained in chapter <i>Communication protocol</i>. The content is defined by a decimal number in the range of 0 to 9999 as follows:</p> <table border="1"> <tr> <td>0</td> <td>Not used</td> </tr> <tr> <td>1...99</td> <td>Virtual address area of drive control. Not used with Modbus/RTU.</td> </tr> <tr> <td>101...9999</td> <td>Parameter area of the drive</td> </tr> </table>	0	Not used	1...99	Virtual address area of drive control. Not used with Modbus/RTU.	101...9999	Parameter area of the drive	0 = None
0	Not used								
1...99	Virtual address area of drive control. Not used with Modbus/RTU.								
101...9999	Parameter area of the drive								
	0 = None	Not used							
	101...9999	Parameter index with format xyyy , where <ul style="list-style-type: none"> • xx is the parameter group number (1...99) • yyy is the parameter number index within that group (01...99). 							
	Other	Path to parameter area selection.							
02... 12	FBA data out2... FBA data out12	See parameter <i>01 FBA data out1</i> .	0 = None						

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

FSCA-01 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, ACS530, ACS850 and ACQ810
- parameter group 52 in ACS880 if the adapter is installed as fieldbus adapter A or group 55 if the adapter is installed as fieldbus adapter B.

No. ¹⁾	Name/Value	Description	Default						
01	FBA data in1 (drive to master)	<p>Selects the drive parameter address from which the data is read to the DATA IN 1 register (from the server to the master). The Modbus register address maps are explained in chapter Communication protocol.</p> <p>The content is defined by a decimal number in the range of 0 to 9999 as follows:</p> <table border="1" data-bbox="422 666 857 831"> <tr> <td>0</td> <td>Not used</td> </tr> <tr> <td>1...99</td> <td>Virtual address area of drive control. Not used with Modbus/RTU.</td> </tr> <tr> <td>101...9999</td> <td>Parameter area of the drive</td> </tr> </table>	0	Not used	1...99	Virtual address area of drive control. Not used with Modbus/RTU.	101...9999	Parameter area of the drive	0 = None
0	Not used								
1...99	Virtual address area of drive control. Not used with Modbus/RTU.								
101...9999	Parameter area of the drive								
	0 = None	Not used							
	101...9999	Parameter index with format xxyy , where <ul style="list-style-type: none"> • xx is the parameter group number (1...99) • yy is the parameter number index within that group (01...99). 							
	Other	Path to parameter area selection.							
02... 12	FBA data in2... FBA data in12	See parameter 01 FBA 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 communication module (for example, the 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 master station the most complete control over the drive, the communication module must be selected as the source for this information. The drive-specific parameter setting examples below contain the drive control parameters needed in the examples. For a complete parameter list, see the drive documentation.



Starting up ACS355 drives

1. Power up the drive.
2. Enable the communication between the adapter module and the drive by setting parameter **9802 COMM PROT SEL** to EXT FBA.
3. Set the FSCA-01 configuration parameters in group 51.
 - Select the communication protocol with parameter 5125 and profile with parameter 5102.
 - Configure the network settings with parameters 5103...5105.
 - With parameters 5106 and 5107, 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 the FSCA-01 configuration 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 by setting parameter **5127 FBA PAR REFRESH** to 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 the state machine on page 65.

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	RS-485 ¹⁾	Displays the type of the fieldbus adapter module.

Drive parameter	Setting for ACS355 drives	Description
5102 FB PAR 2 (PROFILE)	1 (= ABB Enhanced)	Selects the ABB Drives - Enhanced profile.
5103 FB PAR 3 (STATION ID)	3 ²⁾	Defines the address of the device.
5104 FB PAR 4 (BAUD RATE)	4 (= 115.2 kbit/s) ²⁾	Selects the baud rate of the link. Note: The baud rate of the master has to be the same.
5105 FB PAR 5 (PARITY)	0 (= 8 None 1) ²⁾	Defines the use of parity and stop bit(s) and the data length. Note: The parity setting of the master has to be the same.
5106 FB PAR 6 (MODBUS TIMEOUT)	10 ²⁾	Sets the communication timeout as 1 second.
5107 FB PAR 7 (TIMEOUT MODE)	2 (=Ctrl write) 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 FSCA-01 configuration parameter settings.
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.



Drive parameter	Setting for ACS355 drives	Description
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.
1106 REF2 SELECT	8 = COMM	Selects the fieldbus reference 2 as the source for torque reference.
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 ACSM1 drives

1. Power up the drive.
2. Enable the communication between the adapter module and the drive by setting parameter **50.01 FBA ENABLE** to 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 FSCA-01 configuration parameters in group **51**.
 - Select the communication protocol with parameter **51.25** and profile with parameter **51.02**.
 - Configure the network settings with parameters **51.03...51.05**.
 - With parameters **51.06** and **51.07**, select how the adapter module detects fieldbus communication breaks.



7. Define the process data transferred to and from the drive in the FSCA-01 configuration parameter groups 52 and 53.

Note 1: 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.

Note 2: With 32-bit parameters, one can only assign process data to every second configuration parameter (eg, 52.01, 52.03, 52.05, and so on).

8. Validate the settings made in parameter groups 51, 52 and 53 by setting parameter **51.27 FBA PAR REFRESH** to 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 the state machine on page 65.

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	RS-485 COMM ¹⁾	Displays the type of the fieldbus adapter module.
51.02 FBA PAR2 (PROFILE)	1 (= ABB Enhanced)	Selects the ABB Drives - Enhanced profile.
51.03 FBA PAR3 (STATION ID)	3 ²⁾	Defines the address of the device.
51.04 FBA PAR4 (BAUD RATE)	4 (= 115.2 kbit/s) ²⁾	Selects the baud rate of the link. Note: The baud rate of the master has to be the same.



Drive parameter	Setting for ACSM1 drives	Description
51.05 FBA PAR5 (PARITY)	0 (= 8 None 1) ²⁾	Defines the use of parity and stop bit(s) and the data length. Note: The parity setting of the master has to be the same.
51.06 FBA PAR6 (MODBUS TIMEOUT)	10 ²⁾	Sets the communication timeout as 1 second.
51.07 FBA PAR7 (TIMEOUT MODE)	2 (=Ctrl write) 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 FSCA-01 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.
24.01 SPEED REF1 SEL	FBA REF1	Selects the fieldbus reference 1 as the source for speed reference 1.
32.01 TORQ REF1 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.



Drive parameter	Setting for ACSM1 drives	Description
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 ACS880 drives

1. Power up the drive.
2. Enable the communication between the adapter module and the drive by setting parameter **50.01 FBA A enable** to Enable.
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 parameters **50.04...50.11**. Examples of appropriate values are shown in the tables below.
6. Set the FSCA-01 configuration parameters in group **51**.
 - Select the communication protocol with parameter **51.25** and profile with parameter **51.02**.
 - Configure the network settings with parameters **51.03...51.05**.
 - With parameters **51.06** and **51.07**, select how the adapter module detects fieldbus communication breaks.

7. Define the process data transferred to and from the drive in FSCA-01 configuration parameter groups **52** and **53**.

Note 1: 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.



Note 2: With 32-bit parameters, one can only assign process data to every second configuration parameter (eg, 52.01, 52.03, 52.05, and so on).

8. Save the valid parameter values to permanent memory by setting parameter **96.07 Parameter save** to Save.
9. Validate the settings made in parameter groups 51, 52 and 53 by setting parameter **51.27 FBA par refresh** to Configure.
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 – 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.

The start/stop commands and reference are according to the ABB Drives profile. For more information, see the state machine on page [65](#).

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 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 ACS880 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 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.
50.04 FBA A ref1 type	4 = Speed	Selects the fieldbus A reference 1 type and scaling.
51.01 FBA type	485 = RS-485 ¹⁾	Displays the type of the fieldbus adapter module.
51.02 Profile	1 = ABB Enhanced ²⁾	Selects the ABB Drives - Enhanced profile.
51.03 Station ID	3 ²⁾	Defines the address of the device.
51.04 Baud rate	4 = 115.2 kbit/s ²⁾	Selects the baud rate of the link. Note: The baud rate of the master has to be the same.



Drive parameter	Setting for ACS880 drives	Description
51.05 Parity	0 = 8 None 1 ²⁾	Defines the use of parity and stop bit(s) and the data length. Note: The parity setting of the master has to be the same.
51.06 Modbus timeout	10 ²⁾	Sets the communication timeout as 1 second.
51.07 Timeout mode	1 = Any message ²⁾	Timeout counter is reset when any Modbus register of the drive is accessed.
52.01 FBA data in1	01.14 ²⁾	Output power
52.03 FBA data in3	01.11 ²⁾	DC voltage
53.01 FBA data out1	22.26 ²⁾	Constant speed 1
53.03 FBA data out3	22.27 ²⁾	Constant speed 2
51.27 FBA par refresh	1 = Configure	Validates the FSCA-01 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.
20.02 Ext1 start trigger	1 = Level ²⁾	Defines the start signal for external control location 1 as level-triggered.
22.11 Speed ref1 selection	4 = FB A ref1	Selects the fieldbus A 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).

Configuring the master station

After the adapter module has been initialized by the drive, the master station must be prepared for communication with the module. Refer to the documentation of your Modbus/RTU master for more information.

■ Modbus register maps

The *02 Profile* configuration parameter selects the communication profile and Modbus register map that the adapter module presents to the Modbus master.

For the Modbus register map definitions, see chapter *Communication protocol*.

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



7

Communication profiles

What this chapter contains

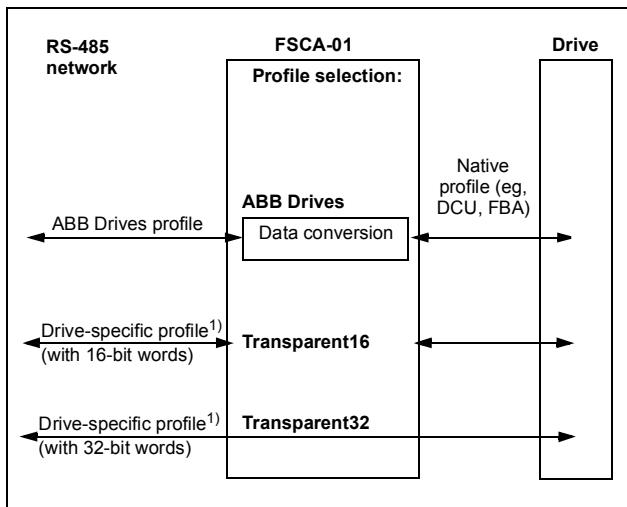
This chapter describes the communication profiles used in the communication between the Modbus/RTU master, the adapter module and the drive.

Communication profiles

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

You can configure the adapter module to provide either the ABB Drives profile or one of the two Transparent modes for 16-bit and 32-bit words respectively. For the ABB Drives profile, the adapter module converts the data to the native profile (eg, DCU or FBA). For the Transparent modes, no data conversion takes place.

The figure below illustrates the profile selection:



¹⁾ To be used if the drive does not support the speed control mode of the DCU communication profile or if the ABB Drives profile does not cover all needed functionality like the position control.

ABB Drives communication profile

■ Control word and Status word

The Control word is the principal means for controlling the drive from a fieldbus system. The fieldbus master station sends the Control word 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 65.

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 65.

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.

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	Drive-specific (For information, see the drive documentation.)		

Status word contents

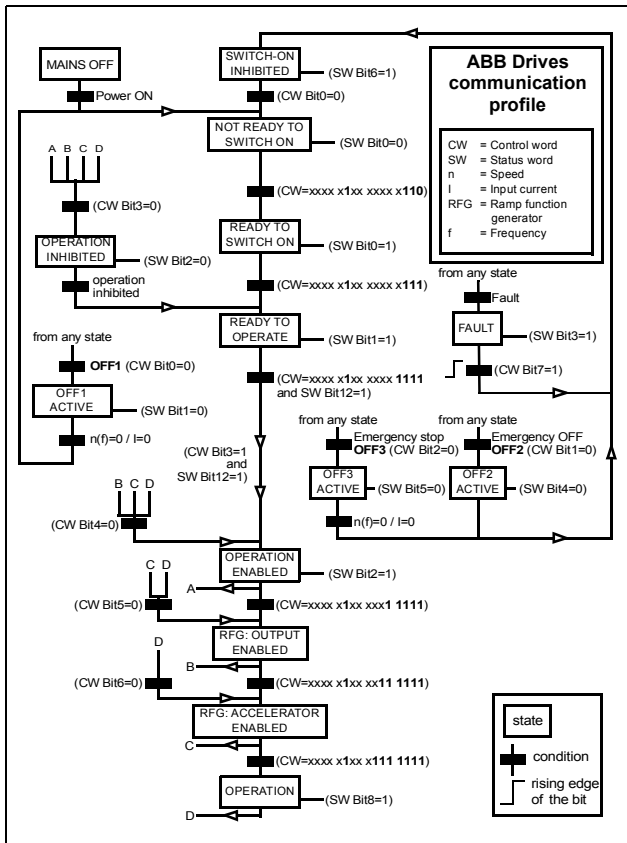
The table below shows the contents of the Status word for the ABB Drives communication profile. The upper case boldface text refers to the states shown in the state machine on page 65.

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	–

Bit	Name	Value	STATE/Description
7	ALARM	1	Warning/Alarm
		0	No warning/alarm
8	AT_ SETPPOINT	1	OPERATION. Actual value equals reference (= is within tolerance limits, ie, in speed control, speed error is 10% max. of nominal motor speed).
		0	Actual value differs from reference (= is outside tolerance limits.)
9	REMOTE	1	Drive control location: REMOTE (EXT1 or EXT2)
		0	Drive control location: LOCAL
10	ABOVE_ LIMIT	1	Actual frequency or speed equals or exceeds supervision limit (set by drive parameter). Valid in both directions of rotation.
		0	Actual frequency or speed within supervision limit
11	EXT_CTRL_ LOC	1	External Control Location EXT2 selected. Note concerning ACS880 and ACS860: 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 and ACS860: 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	Drive-specific (For information, see the drive documentation.)		
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 communication module (for example, FSCA-01). To have the drive controlled through the fieldbus, the module must be defined as the source for control information, for example, reference.

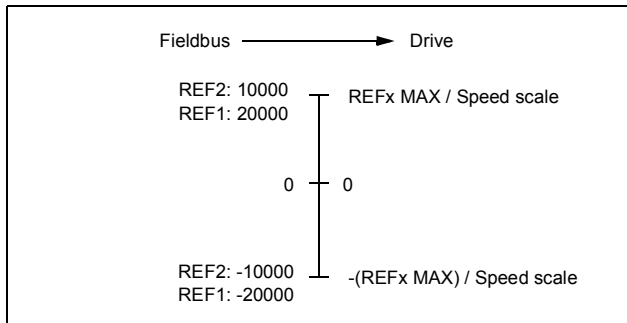
Scaling

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, ACS850, ACQ810, ACS880, ACS860 and ACS530 the speed reference (REFx) in decimal (0...20000) corresponds to 0...100% of the speed scaling value (as defined with a drive parameter, eg, ACS880 parameter 46.01 Speed scaling).

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



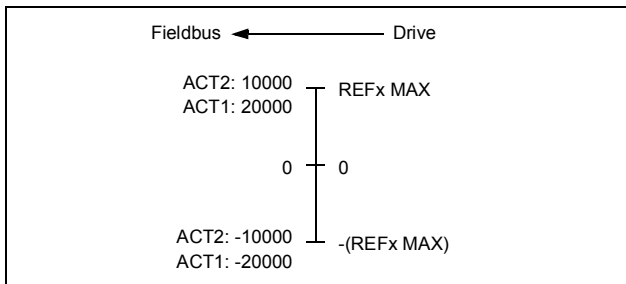
Actual values

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.





Communication protocol

What this chapter contains

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

Modbus/RTU

Modbus/RTU is a variant of the Modbus family of simple, vendor neutral communication protocols intended for supervision and control of automation equipment.

The FSCA-01 RS-485 adapter module acts as a Modbus/RTU slave with support for ABB Drives and Transparent profiles. The Modbus commands supported are listed in section *Function codes* on page 70.

You can find more information on the RTU transmission mode and cabling in *MODBUS over Serial Line Specification and Implementation Guide v1.02* 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 master 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 master 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 master 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 masters.

Note: Register addresses of the 32-bit parameters cannot be accessed by using 5-digit register numbers.

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.

Function code	Name	Description
08h	Diagnostics	<p>Provides a series of tests for checking the communication between the master and the slave devices, or for checking various internal error conditions within the slave.</p> <p>The following subcodes are supported:</p> <p>00 Return Query Data: The data passed in the request data field is to be returned in the response. The entire response message should be identical to the request.</p> <p>01 Restart Communications Option: The serial line port of the slave device must be initialized and restarted, and all of its communication event counters cleared. If the port is in the Listen Only mode, no response is returned. If the port is not in the Listen Only mode, a normal response is returned before the restart.</p> <p>04 Force Listen Only Mode: Forces the addressed slave device to the Listen Only mode. This isolates it from the other devices on the network, allowing them to continue communicating without interruption from the addressed remote device. No response is returned. The only function that will be processed after this mode is entered is the Restart Communications Option function (subcode 01).</p>

Function code	Name	Description
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 to define three access types: <ul style="list-style-type: none"> • 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

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 master 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 a master 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), 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	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)000010	DATA IN 1
(4)000011	DATA IN 2
(4)000012	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 = (4)00318 Note: Addressing depends on the address mode selected with parameter 12 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 register map. See section [Register addressing](#) on page 70 for additional information.

²⁾ Register addresses of the 32-bit parameters cannot be accessed by using 5-digit register numbers.

Register Address ^{1), 2)}	Register Data (16-bit)
(4)20000...(4)29999	Drive Parameter Access (32-bit) (not supported with ACS355) $\text{Register Address} = (4)20000 + 200 \times \text{Group} + 2 \times \text{Index}$ Example for Drive Parameter 1.27: $(4)20000 + 200 \times 1 + 2 \times 27 = (4)20254$ Note: Addressing depends on the address mode selected with parameter 12 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 register map. See section [Register addressing](#) on page 70 for additional information.

²⁾ Register addresses of the 32-bit parameters cannot be accessed by using 5-digit register numbers.

■ 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.

Note: If 32-bit parameters are mapped to DATA IN or DATA OUT, adjust the length of the request message to fit both words of the parameter.

Register Address ^{1), 2)}	Register Data (16-bit)
(4)00001	ABB Drives Profile Control
(4)00002	ABB Drives Profile Reference 1
(4)00003	ABB Drives Profile Reference 2
(4)00004	DATA OUT 1
(4)00005	DATA OUT 2
(4)00006	DATA OUT 3
(4)00007	DATA OUT 4
(4)00008	DATA OUT 5
(4)00009	DATA OUT 6
(4)00010	DATA OUT 7
(4)00011	DATA OUT 8
(4)00012	DATA OUT 9
(4)00013	DATA OUT 10
(4)00014	DATA OUT 11
(4)00015	DATA OUT 12
(4)00051	ABB Drives Profile Status
(4)00052	ABB Drive Profile Actual 1
(4)00053	ABB Drive Profile Actual 2
(4)00054	DATA IN 1
(4)00055	DATA IN 2
(4)00056	DATA IN 3

Register Address ^{1), 2)}	Register Data (16-bit)
(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	<p>Drive Parameter Access (16-bit) Register Address = (4)00000 + 100 × Group + Index Example for Drive Parameter 3.18: (4)00000 + 100 × 3 + 18 = (4)00318 Note: Addressing depends on the address mode selected with parameter 12 in group A (51/151, 54/154).</p>
(4)20000...(4)29999	<p>Drive Parameter Access (32-bit) (not supported with ACS355) Register Address = (4)20000 + 200 × Group + 2 × Index Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27 = (4)20254 Note: Addressing depends on the address mode selected with parameter 12 in group A (51/151, 54/154).</p>

¹⁾ 6-digit register addressing ([4]00001) is used instead of 5-digit register addressing ([4]0001) to describe register map. See section [Register addressing](#) on page 70 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

Register Address ^{1), 2)}	Register Data (16-bit)
(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 = (4)00318 Note: Addressing depends on the address mode selected with parameter 12 in group A (51/151, 54/154).
(4)20000...(4)29999	Drive Parameter Access (32-bit) (not supported with ACS355) Register Address = (4)20000 + 200 × Group + 2 × Index Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27 = (4)20254 Note: Addressing depends on the address mode selected with parameter 12 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 register map. See section [Register addressing](#) on page 70 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

Register Address ^{1), 2)}	Register Data (16-bit)
(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
(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

Register Address ^{1), 2)}	Register Data (16-bit)
(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	<p>Drive Parameter Access (16-bit) Register Address = (4)00000 + 100 × Group + Index Example for Drive Parameter 3.18: (4)00000 + 100 × 3 + 18 = (4)00318 Note: Addressing depends on the address mode selected with parameter 12 in group A (51/151, 54/154).</p>
(4)20000... (4)29999	<p>Drive Parameter Access (32-bit) (not supported with ACS355) Register Address = (4)20000 + 200 × Group + 2 × Index Example for Drive Parameter 1.27: (4)20000 + 200 × 1 + 2 × 27 = (4)20254 Note: Addressing depends on the address mode selected with parameter 12 in group A (51/151, 54/154).</p>

¹⁾ 6-digit register addressing ((4)00001) is used instead of 5-digit register addressing ((4)0001) to describe register map. See section [Register addressing](#) on page 70 for additional information.

²⁾ Register addresses of the 32-bit parameters cannot be accessed by using 5-digit register numbers.



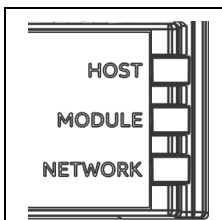
Diagnostics

What this chapter contains

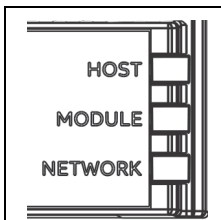
This chapter explains how to trace faults with the status LEDs on the adapter module.

LED indications

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



Name	Color	Function/state
HOST	Flashing green	Establishing communication to host
	Green	Connection to host OK
	Flashing red	Communication to host lost temporarily
	Orange	Configuration error
	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	Green	The device is operating in a normal condition.
	Off	Communication to host lost temporarily (or no power applied to the device)
	Flashing red	Start-up initialization
	Orange	Configuration error
	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.



Name	Color	Function/state
NETWORK	Off	No communication
	Flashing green	Communication activity on the interface
	Orange	Configuration error
	Flashing green, alternating with flashing orange	Parity error
	Flashing orange	Data lines DATA_B and DATA_A are connected crosswise. Swap the data lines at connector X1 or at the master station.

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 FSCA-01 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

Address	Registers (16-bit word)
(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

10

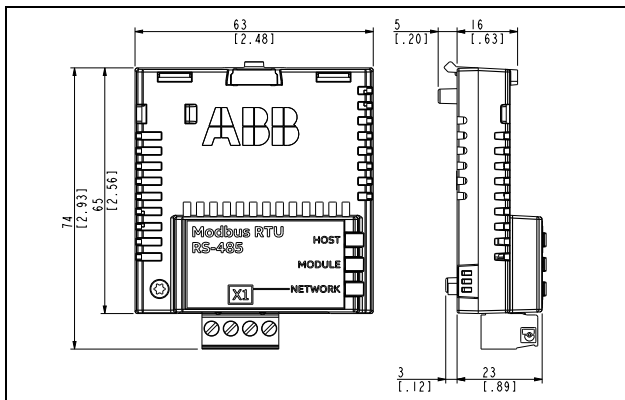
Technical data

What this chapter contains

This chapter contains the technical specifications of the adapter module and the RS-485 link.

FSCA-01

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



Mounting	Into the option slot of the drive
Degree of protection	IP20
Ambient conditions	The applicable ambient conditions specified for the drive in its manuals are in effect.
Indicators	Three LEDs (HOST, MODULE, NETWORK)
Connectors	20-pin connector to the drive 4-pin detachable screw connector to the bus 6-pin jumper block 2 for bus termination configuration
Power supply	+3.3 V \pm 5% max. 400 mA (supplied by the drive)
General	Complies with EMC standard EN 61800-3:2004 Bus interface functionally isolated from the drive Printed circuit board conformal coated

RS-485 link

Compatible devices	All RS-485 compliant devices
Medium	Shielded twisted pair cable, impedance 100...150 ohm <ul style="list-style-type: none"> Termination: 120 ohms (built in the module)
Topology	Trunk line, drop lines allowed
Transfer rate	9.6, 19.2, 38.4, 57.6, or 115.2 kbit/s
Serial communication type	Asynchronous, half-duplex RS-485
Protocol	Modbus/RTU

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 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 abb.com/drives/documents.



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