ABB Drives

User's Manual
Modbus Adapter Module
FMBA-01



Modbus Adapter Module
FMBA-01

User's Manual

3AFE68586704 REV A EN

EFFECTIVE: 27.06.2005

© 2005 ABB Oy. All Rights Reserved.

Safety instructions

Overview

This chapter states the general safety instructions that must be followed when installing and operating the FMBA-01 Modbus Adapter module.

The material in this chapter must be studied before attempting any work on, or with, the unit.

In addition to the safety instructions given below, read the complete safety instructions of the specific drive you are working on.

General safety instructions

WARNING! All electrical installation and maintenance work on the drive should be carried out by qualified electricians.



The drive and adjoining equipment must be properly earthed.

Do not attempt any work on a powered drive. After switching off the mains, always allow the intermediate circuit capacitors 5 minutes to discharge before working on the frequency converter, the motor or the motor cable. It is good practice to check (with a voltage indicating instrument) that the drive is in fact discharged before beginning work.

The motor cable terminals of the drive are at a dangerously high voltage when mains power is applied, regardless of motor operation.

There can be dangerous voltages inside the drive from external control circuits even when the drive mains power is shut off. Exercise appropriate care when working on the unit. Neglecting these instructions can cause physical injury or death.

Table of contents

Safety instructions 5

Overview 5
General safety instructions 5

Table of contents 7

Introduction 9

Intended audience 9
Before you start 9
What this manual contains 9
Terms used in this manual 10

Overview 11

Overview 11
RS-485 standard 11
The FMBA-01 Modbus Adapter module 12
Compatibility 13
Delivery check 13

Mechanical installation 15

Mounting 15

Electrical installation 17

Overview 17
General cabling instructions 17
RS-485 connection 17
Bus termination 18

Technical data and diagnostics 19

FMBA-01 Modbus Adapter module 19
RS-485 link 20
LED indications 20

Introduction

Intended audience

The manual is intended for the people who are responsible for commissioning and using an FMBA-01 Modbus Adapter module. The reader is expected to have a basic knowledge of electrical fundamentals, electrical wiring practices and how to operate the drive.

Before you start

It is assumed that the drive is installed and ready to operate before starting the installation of the extension 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 document.

What this manual contains

This manual contains information on the wiring, configuration and use of the FMBA-01 Modbus Adapter module.

Safety instructions are featured on the first few pages of this manual.

Overview contains a short description of the RS-485 standard and the FMBA-01 Modbus Adapter module and a delivery checklist.

Mechanical installation contains placing and mounting instructions for the module.

Electrical installation contains wiring, bus termination and earthing instructions.

Technical data and diagnostics contains information on physical dimensions and connectors of the module and the specification of the RS-485 link. It also explains how to trace faults with the status LEDs on the FMBA-01 Modbus Adapter module.

Terms used in this manual

Communication Module

Communication Module is a name for a device (e.g. a fieldbus adapter) through which the drive is connected to an external communication network (e.g. a fieldbus). The communication with the module is activated with a drive parameter.

FMBA-01 Modbus Adapter module

The FMBA-01 Modbus Adapter module is one of the optional fieldbus adapter modules available for ABB drives. The FMBA-01 is a device through which an ABB drive is connected to a RS-485 network.

Overview

Overview

This chapter contains a short description of the RS-485 standard and the FMBA-01 Modbus Adapter module, and a delivery checklist.

RS-485 standard

RS-485 is a 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 the 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 used application. For example the electrical characteristics of the PROFIBUS and MODBUS are based on the RS-485 standard.

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

The common mode voltage between RS-485 network devices is limited to -5...+12 V. Ground wire and cable shield should be connected to prevent common mode voltage between the network devices from drifting outside the allowable limits.

RS-485 bus cable should be terminated with a 120 ohm resistor on 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, 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.

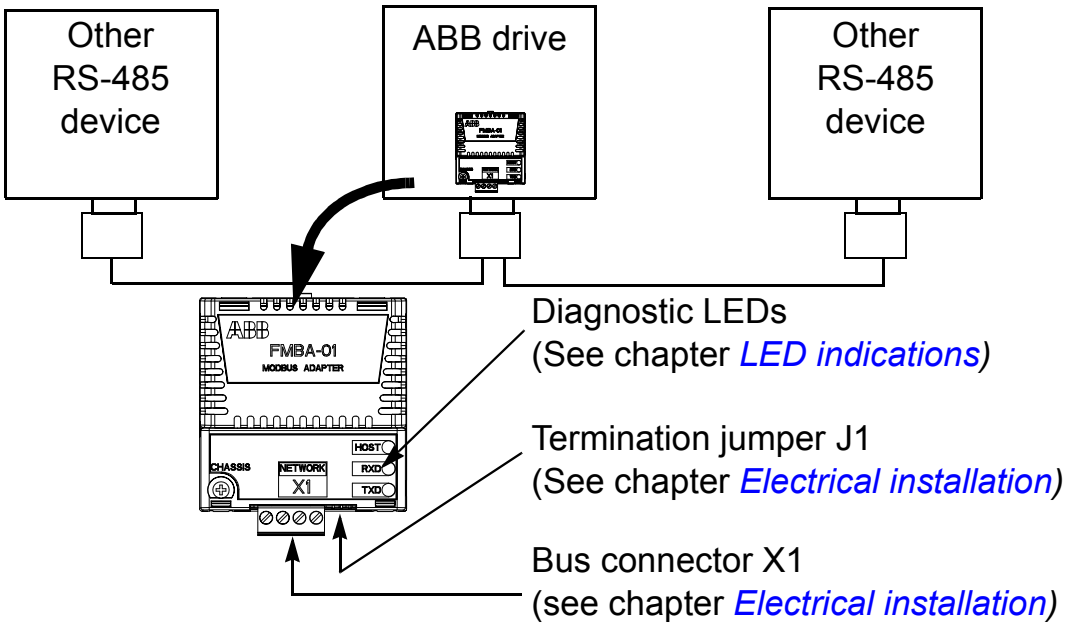
The FMBA-01 Modbus Adapter module

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

The FMBA-01 has a built-in bus termination with fail-safe circuitry. The termination can be activated with a jumper.

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

Construction of the RS-485 network and the FMBA-01



Compatibility

The FMBA-01 Modbus Adapter module is compatible with all stations that comply with RS-485.

Delivery check

The option package for the FMBA-01 Modbus Adapter module contains:

- Modbus Adapter module, type FMBA-01
- this manual.

Mechanical installation



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

Mounting

The FMBA-01 Modbus Adapter module is to be inserted into its specific position in the drive. The module is held in place with plastic pins and one screw. The screw also provides the earthing of the fieldbus cable shield connected to the module.

On installation of the module, the signal and power connection to the drive is automatically made through a 20-pin connector. (All drives do not use all the available signals so the connector on the drive may have fewer pins.)

Mounting procedure:

- Insert the module carefully into its position on the drive.
- Fasten the screw.

Note: Correct installation of the screw is essential for fulfilling the EMC requirements and for proper operation of the module.

Electrical installation

Overview

This chapter contains:

- general cabling instructions
- instructions for setting the bus termination
- instructions for connecting the module to the RS-485 network.



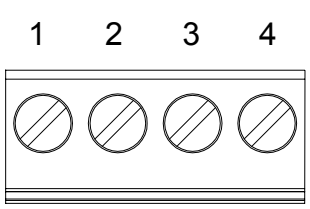
WARNING! Before installation, switch off the drive power supply. Wait five minutes to ensure that the capacitor bank of the drive is discharged. Switch off all dangerous voltages connected from external control circuits to the inputs and outputs of the drive.

General cabling instructions

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

RS-485 connection

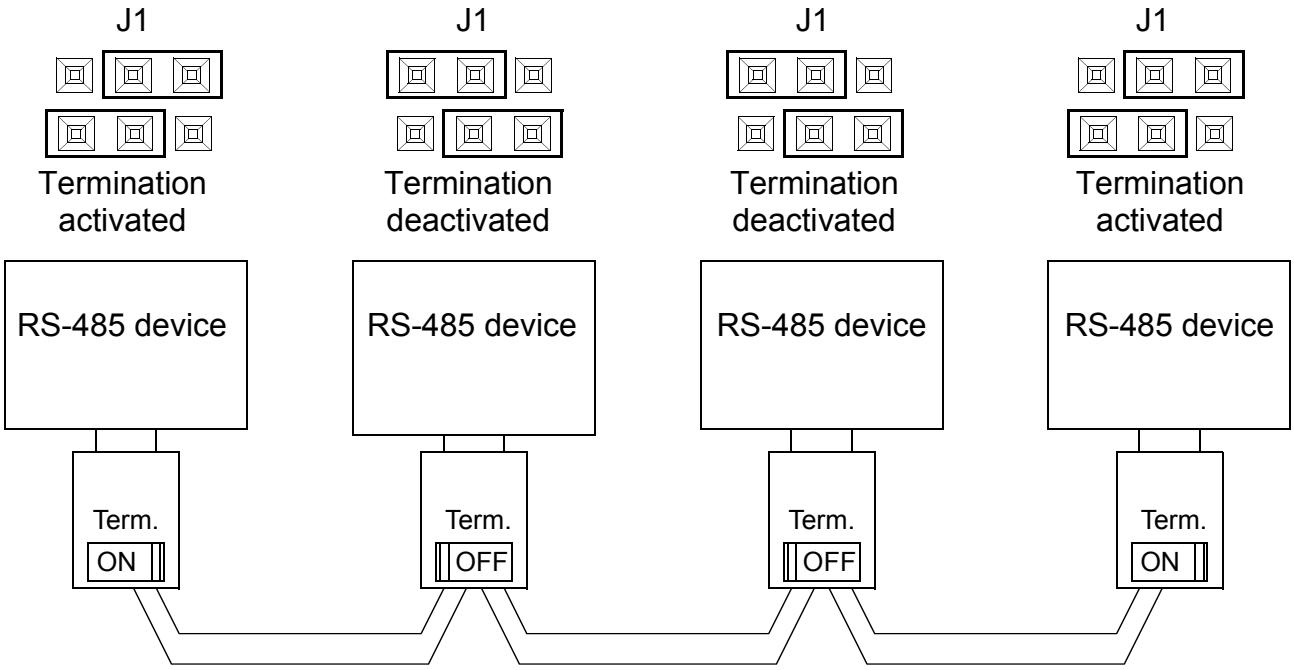
RS-485 cable is connected to connector X1 on the FMBA-01 Modbus Adapter module.

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

Bus termination

Bus termination is required to prevent signal reflections from the bus cable ends. The FMBA-01 Modbus Adapter module is equipped with internal bus termination, which is configurable with jumper J1 pins. Termination should be activated on devices located at bus ends and deactivated on other devices. See the figure below.

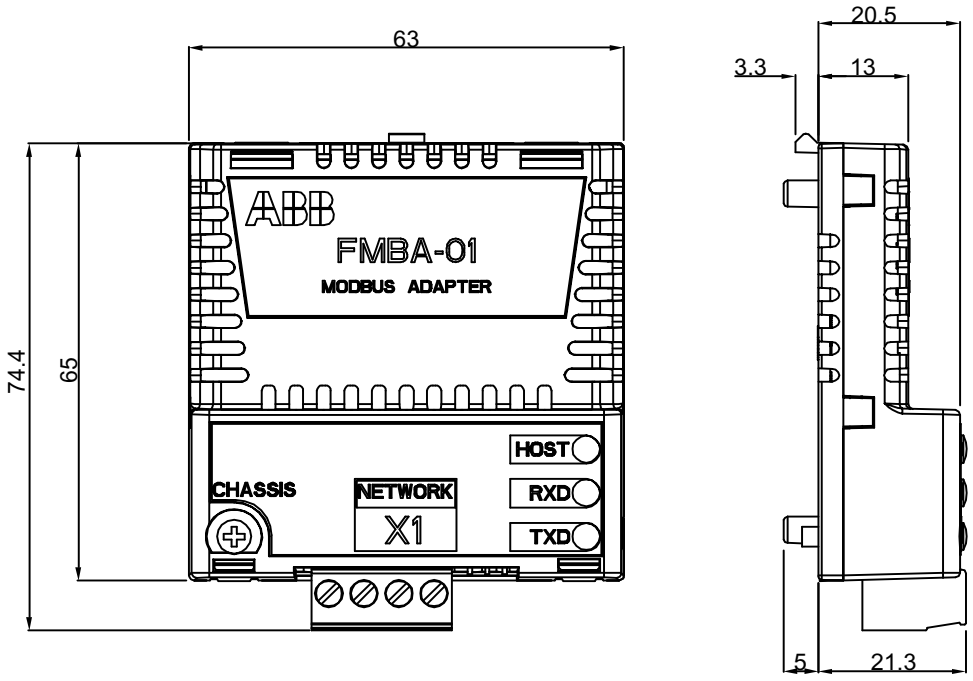
RS-485 bus termination



Technical data and diagnostics

FMBA-01 Modbus Adapter module

Enclosure:



Mounting: Into the option slot on 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, RXD, TXD)

Connectors:

- 20-pin connector to drive (X2)
- 4-pin detachable screw connector to bus (X1)
- 6-pin jumper block for bus termination configuration (J1)

Power supply:

- +3.3 V ±5% max. 150 mA (supplied by the drive)

General:

- Estimated min. lifetime: 100 000 h
- All materials UL/CSA-approved
- Complies with EMC standards EN 50081-2 and EN 50082-2
- Bus interface functionally isolated from drive

RS-485 link

Compatible devices: All RS-485 compliant devices

Medium: Shielded twisted pair cable, impedance 100 to 150 ohm

- Termination: 120 ohms (built in the FMBA-01 Modbus Adapter module)

Topology: Trunk line, drop lines allowed

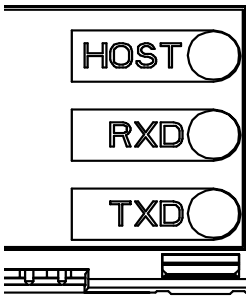
Transfer rate: 5 Mb/s max.

Serial communication type: Asynchronous, half-duplex RS-485

Protocol: Depends on the used application. Typically Modbus.

LED indications

The FMBA-01 Modbus Adapter module is equipped with three green diagnostic LEDs. The LEDs are described below.

	Name	Colour	Function
	HOST	Green	The module is powered up.
	RXD	Blinking	The module receives data from the bus. The LED blinks whether the received data is address to the unit or not.
	TXD	Blinking	The module sends data to the bus.

3AFE68586704 REV A EN
EFFECTIVE: 27.06.2005

ABB Oy
AC Drives
P.O. Box 184
FI-00381 HELSINKI
FINLAND
Telephone +358 10 22 11
Fax +358 10 22 22681
Internet http://www.abb.com

ABB Inc.
Automation Technologies
Drives & Motors
16250 West Glendale Drive
New Berlin, WI 53151
USA
Telephone 262 785-3200
800-HELP-365
Fax 262 780-5135