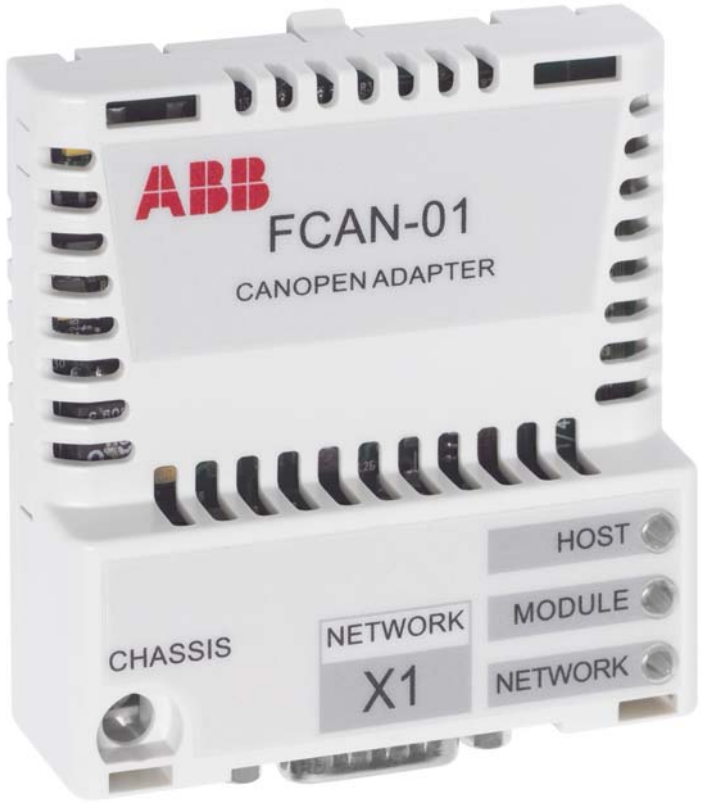
ABB Drives

User’s Manual
CANopen Adapter Module
FCAN-01



CANopen Adapter Module
FCAN-01

User's Manual

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Safety instructions

What this chapter contains

This chapter states the general safety instructions that must be followed when installing and operating the FCAN-01 CANopen 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 main power, 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 main power is applied, regardless of motor operation.

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

Table of contents

Introduction

What this chapter contains

This chapter includes a description of the contents of the manual.

Intended audience

The manual is intended for the people who are responsible for commissioning and using an FCAN-01 CANopen 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 manual.

What this manual contains

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

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

Overview contains a short description of the CANopen protocol and the FCAN-01 CANopen Adapter module, and a delivery checklist.

Quick start-up guide contains a short description of how to set up the FCAN-01 CANopen Adapter module.

Mechanical installation contains placing and mounting instructions for the module.

Electrical installation contains wiring and bus termination instructions.

Drive configuration explains how to program the drive before the communication through the adapter module can be started.

Master configuration explains how to program the CANopen master before the communication through the adapter module can be started.

Communication profiles describes the communication profiles used in the communication between the CANopen network, the FCAN-01 module, and the drive.

Communication contains a description of how data is transmitted through the FCAN-01 module.

Diagnostics explains how to trace faults with the status LEDs on the FCAN-01 module.

Dictionary structure and entries contains information about PDO transmission and mapping.

CANopen error codes contains reference tables for decoding CANopen error messages.

Definitions and abbreviations explains definitions and abbreviations concerning the CANopen protocol family.

Technical data contains information on physical dimensions, configurable settings and connectors of the module and the specification of the CANopen link.

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.

Virtual data words

The Control Word (sometimes called the Command Word) and the Status Word, references and actual values (see chapter *Drive configuration* on page *41*) are types of virtual data words.

FCAN-01 CANopen Adapter module

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

Parameter

A parameter is an operating instruction for the drive. Parameters can be read and programmed with the drive control panel, or through the FCAN-01 module.

Further information

Further information is available on the World Wide Web from www.can-cia.org.

Overview

What this chapter contains

This chapter contains a short description of the CANopen protocol and the FCAN-01 CANopen Adapter module, a delivery checklist and warranty information.

CANopen

CANopen is a higher layer protocol based on the CAN (Control Area Network) serial bus system and the CAL (CAN Application Layer). CANopen assumes that the hardware of the connected device has a CAN transceiver and a CAN controller as specified in ISO 11898.

The CANopen Communication Profile, CiA DS 301, includes both cyclic and event driven communication, which makes it possible to reduce the bus load to minimum while still maintaining extremely short reaction times. High communication performance can be achieved at relatively low baud rates, thus reducing EMC problems and cable costs.

CANopen device profiles define both direct access to drive parameter and time critical process data communication. The FCAN-01 module fulfils CiA (CAN in Automation) standard DSP 402 (Device Profile Drives and Motion Control).

The physical medium of CANopen is a differentially driven two wire bus line with common return according to ISO 11898. The maximum length of the bus is limited by the communication speed as follows:

Bit rate	Max. bus length
1 Mbit/s	25 m
800 kbit/s *	50 m
500 kbit/s	100 m
250 kbit/s	250 m

Bit rate	Max. bus length
125 kbit/s	500 m
50 kbit/s	1000 m
20 kbit/s *	2500 m
10 kbit/s *	5000 m

* Not supported by FCAN-01

The maximum theoretical number of nodes is 127. However, in practice, the maximum number depends on the capabilities of the used CAN transceivers.

Further information is available from the CAN in Automation International Users and Manufacturers Group (www.can-cia.org).

FCAN-01 CANopen Adapter module

The FCAN-01 CANopen Adapter module is an optional device for ABB drives which enables the connection of the drive to a CANopen network. The drive is considered as a slave (server) on the CANopen network. Through the FCAN-01 CANopen Adapter module, it is possible to:

- give control commands to the drive (Start, Stop, Run enable, etc.)
- feed a motor speed, torque or position 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 CANopen commands and services supported by the FCAN-01 CANopen Adapter module are discussed in chapter *Communication* on page *79*. Please refer to the drive manuals as to which commands are supported by the drive.

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.

EDS (Electronic Data Sheet) configuration files for ABB Drives are available through your local ABB representative and the ABB Library (www.abb.com).

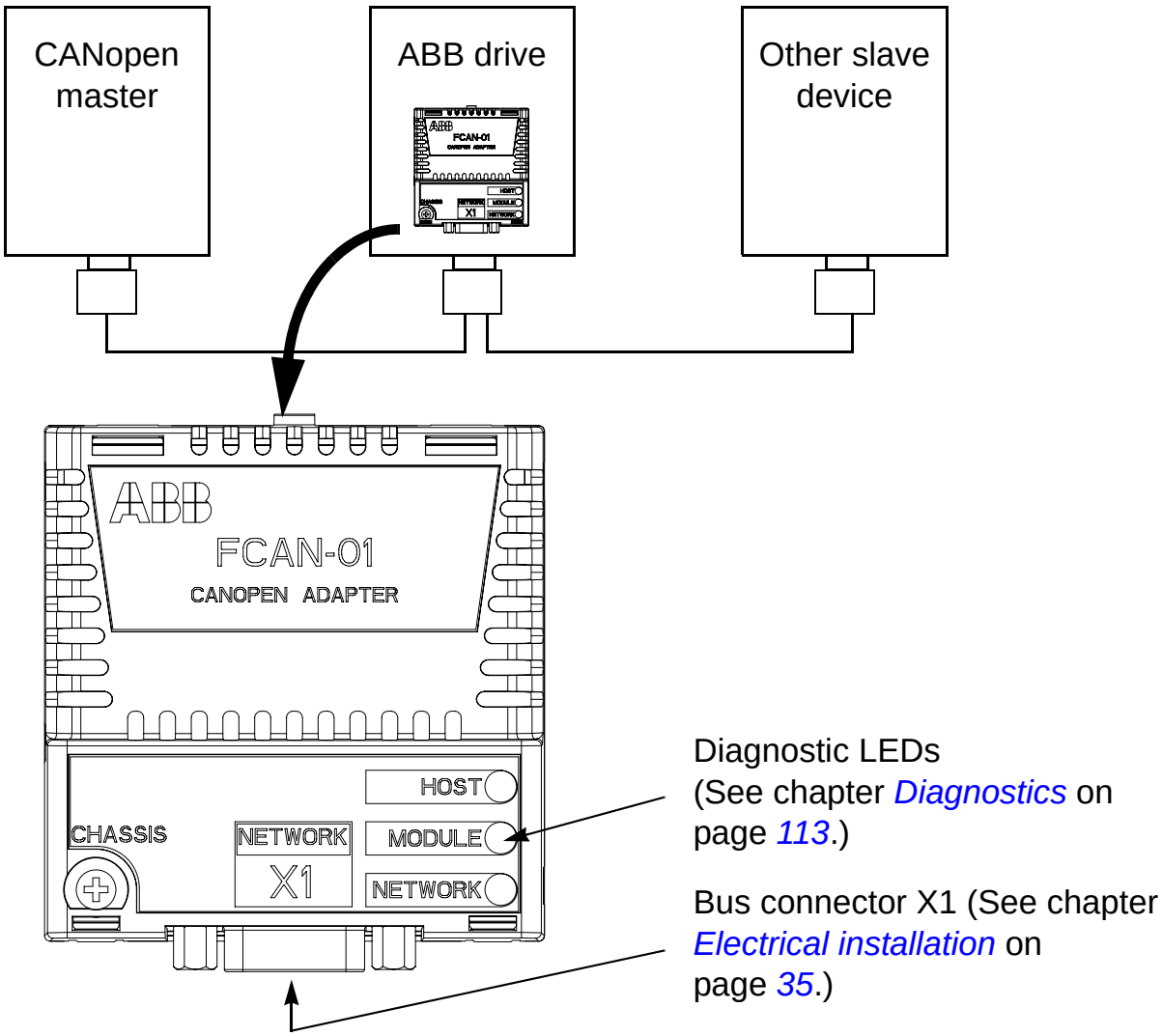


Figure 1. Construction of the CANopen link and the FCAN-01 Adapter module

Compatibility

The FCAN-01 module is compatible with all master (client) stations that support the CANopen protocol.

Delivery check

The option package for the FCAN-01 CANopen Adapter module contains:

- CANopen Adapter module, type FCAN-01
- this manual.

Warranty and liability information

The manufacturer warrants the equipment supplied against defects in design, materials and workmanship for a period of twelve (12) months after installation or twenty-four (24) months from date of manufacturing, whichever first occurs. The local ABB office or distributor may grant a warranty period different to the above and refer to local terms of liability as defined in the supply contract.

The manufacturer is not responsible for

- any costs resulting from a failure if the installation, commissioning, repair, alternation, or ambient conditions of the unit do not fulfil the requirements specified in the documentation delivered with the unit and other relevant documentation
- units subjected to misuse, negligence or accident
- units comprised of materials provided or designs stipulated by the purchaser.

In no event shall the manufacturer, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, losses or penalties.

This is the sole and exclusive warranty given by the manufacturer with respect to the equipment and is in lieu of and excludes all other warranties, express or implied, arising by operation of law or otherwise, including, but not limited to, any implied warranties of merchantability or fitness for a particular purpose.

If you have any questions concerning your ABB drive, please contact the local distributor or ABB office. The technical data, information and specifications are valid at the time of printing. The manufacturer reserves the right to modifications without prior notice.

Quick start-up guide

What this chapter contains

This chapter presents the steps to take during the start-up of the FCAN-01 CANopen Adapter Module with an ACS350 or ACSM1 drive. For more detailed information, see chapters *Mechanical installation* on page *33*, *Electrical installation* on page *35* and *Drive configuration* on page *41*.

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

Mechanical and electrical installation

- Insert the FCAN-01 into its specified slot in the drive.
- Fasten the screw.
- Plug the fieldbus connector to the module and fasten the connection screws. See section *Bus termination* on page *37*.

Drive configuration

- Power up the drive.
- The detailed procedure of activating the drive for communication with the module is dependent on the drive type. Normally, a parameter must be adjusted to activate the communication. Refer to the drive documentation for information on the communication settings. With an ACS350 drive, set parameter 9802 COMM PROT SEL to EXT FBA; with an ACSM1 drive, set parameter 5001 FBA ENABLE to ENABLE.
- Parameter group 51 shows the status of the FPBA configuration parameters.
- At minimum, set the required node address at parameter 5102 NODE ADDRESS, the required bit rate at 5103 BIT RATE and

the communication profile at 5105 PROFILE. Finally, validate the settings with 5127 FBA PAR REFRESH.

Parameter setting examples - ACS 350

DSP 402 Velocity mode with default mapping

ACS350 parameters and recommended parameter settings for the CANopen fieldbus communication are listed in the following table.

Drive parameter	Recommended setting for ACS350	Description
9802 COMM PROT SEL	EXT FBA	Communication (fieldbus) module activation
1001 EXT1 COMMANDS	COMM	Communication module as the source for the start, stop and direction commands
1103 REF1 SELECT	AI1	Analogue input as the source for reference 1
1601 RUN ENABLE	COMM	Communication module as the source for the run enable signal
1604 FAULT RESET SEL	COMM	Communication module as the source for the fault reset signal
5101 FBA TYPE	CANopen (1	Communication module type
5102 NODE ID (FBA PAR 2)	3 (2	FCAN-01 module node ID
5103 BIT RATE (FBA PAR 3)	3 (2	Bit rate used on the CANopen network. (3 = 125 kbit/s)
5104 CONF LOC (FBA PAR 4)	0	CANopen objects (14xxh, 16xxh, 18xxh and 1Axxh) as the source for the PDO settings
5105 PROFILE (FBA PAR 5)	0	DSP 402 Velocity mode communication profile (i.e. communication profile used by the module)
• • •		
5127 FBA PAR REFRESH	REFRESH	Fieldbus configuration parameter settings activation

(1 Automatically detected
(2 Example

With default mapping only PDO1 Rx and PDO1 Tx are used in the cyclical communication.

PDO	Control Word *	PDO length
PDO1 Rx	6040h	16 bits

PDO	Status Word *	
PDO1 Tx	6041h	16 bits
* According to the DSP 402 Velocity mode		

Note: PDO1 Tx default transmission type is 255 (acyclic) and event time is 0. The event time should be changed with CANopen object 1800h05 if the default transmission type is used.

ABB Drives profile mode with parameter mapping

ACS350 parameters and recommended parameter settings for the CANopen fieldbus communication are listed in the following table:

Drive parameter	Recommended setting for ACS350	Description
9802 COMM PROT SEL	EXT FBA	Communication (fieldbus) module activation
1001 EXT1 COMMANDS	COMM	Communication module as the source for the start, stop and direction commands
1103 REF1 SELECT	COMM	Communication module as the source for reference 1
1601 RUN ENABLE	COMM	Communication module as the source for the Run enable signal
1604 FAULT RESET SEL	COMM	Communication module as the source for the fault reset signal
5101 FBA TYPE	CANopen (1	Communication module type
5102 NODE ID (FBA PAR 2)	3 (2	FCAN-01 module node ID
5103 BIT RATE (FBA PAR 3)	2 (2	Bit rate used on the CANopen network (2 = 250 kbit/s)
5104 CONF LOC (FBA PAR 4)	1	Fieldbus configuration parameters as the source for the PDO settings
5105 PROFILE (FBA PAR 5)	1	ABB Drives profile mode (i.e. communication profile used by the module)
5107 RPDO1-COB-ID TYPE (FBA PAR 7)	1	RPDO1 is enabled and configured to use the default COB-ID.
5108 RPDO1-TR TYPE (FBA PAR 8)	255 (2	Asynchronous transmission mode is used by PDO1 Rx.

5110 TPDO1-COB-ID (FBA PAR 10)	1	TPDO1 is enabled and configured to use the default COB-ID.
5111 TPDO1-TR TYPE (FBA PAR 11)	255	Asynchronous transmission mode is used by PDO1 Tx. Transmission is triggered by the event time.
5112 TPDO1-EV TIME (FBA PAR 12)	100 (2	Event time, i.e. event time elapses every 100 ms.
• • •		

5401 DATA IN 1	5 (2	Actual value 1 as mapping entry 2 in PDO1 Tx
5402 DATA IN 2	6 (2	Actual value 2 as mapping entry 3 in PDO1 Tx
5403 DATA IN 3	106 (2	Signal 106 POWER as mapping entry 4 in PDO1 Tx
• • •		
5501 DATA OUT 1	2 (2	Reference 1 as mapping entry 2 in PDO1 Rx
5502 DATA OUT 2	3 (2	Reference 2 as mapping entry 3 in PDO1 Rx
5503 DATA OUT 3	135 (2	Signal 135 COMM VALUE 1 as mapping entry 4 in PDO1 Rx
• • •		

5127 FBA PAR REFRESH	REFRESH	Fieldbus configuration parameter settings activation

(1 Automatically detected
(2 Example

With parameter mapping only PDO1 Rx and PDO1 Tx are used in the cyclical communication.

PDO	Control Word *	Target velocity *	Reference 2 *	Signal 135 COMM VALUE 1	PDO length
PDO1 Rx	6040h	6042h	2000h03	4001h23	64 bits

PDO	Status Word *	Velocity control effort *	Actual value 2 *	Signal 106 POWER	PDO length
PDO1 Tx	6041h	6044h	2000h06	4001h26	64 bits

* According to the ABB Drives profile mode

Note: The settings of the PDOs can be changed with CANopen objects 14xxh, 16xxh, 18xxh and 1Axxh. Communication parameter settings (if not stored to the non-volatile memory) of the CANopen objects 14xxh and 18xxh are valid only to next boot-up.

The start/stop commands and reference are according to the ABB DRIVES profile. (For more information, see section *The ABB Drives communication profile* on page *71*.)

When reference 1 (REF1) is used, a reference value of ±20000 (decimal) corresponds to the reference set by 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 by 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.

Parameter setting examples - ACSM1

DSP 402 Profile Position mode
(requires ACSM1 Motion Control Program)

The ACSM1 parameters and recommended parameter settings for the CANopen fieldbus communication are listed in the following table:

Drive parameter	Recommended setting for ACSM1	Description
50.01 FBA ENABLE	(1) ENABLE	Communication (fieldbus) module activation
50.04 FBA REF1 MODESEL	(3) POSITION	Defines the fieldbus reference scaling
10.01 EXT1 START FUNC	(3) FBA	Communication module as the source for the start, stop and direction commands
34.03 EXT1 CTRL MODE 1	(6) POSITION	Selects the position control mode for external control location EXT1
65.01 POS REFSOURCE	(0) REF TABLE	Reference and other positioning parameters are read from reference set 1/2
65.04 POS REF 1 SEL	(3) FBUS REF1	Fieldbus reference 1 is the source for the position reference when reference set 1 is used
51.01 FBA TYPE	CANopen (1	Communication module type
51.02 NODE ID (FBA PAR 2)	3 (2	FCAN-01 module node ID
51.03 BIT RATE (FBA PAR 3)	3 (2	Bit rate used on the CANopen network. (3 = 125 kbit/s)

51.04 CONF LOC (FBA PAR 4)	1	PDO1 configuration is done via FCAN-01 configuration parameter groups 1, 2 and 3 (i.e. ACSM1 parameter groups 51, 52 and 53)
51.05 PROFILE (FBA PAR 5)	0	DSP 402 communication profile (i.e. communication profile used by the module)
...		
5108 RPDO1-TR TYPE (FBA PAR 8)	255 (2	Asynchronous transmission mode is used by PDO1 Rx.

52.01	4	Status Word (16-bit)
52.02	15	Position Actual Value (32-bit)
52.03	0 (reserved)	Parameters in groups 52 and 53 are 16-bit parameters. Mapping of 32-bit parameters automatically reserves also the following cell (i.e. mapping of 15 to parameter 52.02 reserves also the parameter 52.03)

53.01	1	Control Word (16-bit)
53.02	12	Position Reference (32-bit)
53.03	0 (reserved)	Parameters in groups 52 and 53 are 16-bit parameters. Mapping of 32-bit parameters automatically reserves also the following cell (i.e. mapping of 12 to parameter 53.02 reserves also the parameter 53.03)

51.27 FBA PAR REFRESH	REFRESH	Fieldbus configuration parameter settings activation

PDO1 Rx and PDO1 Tx are used in the cyclical communication.

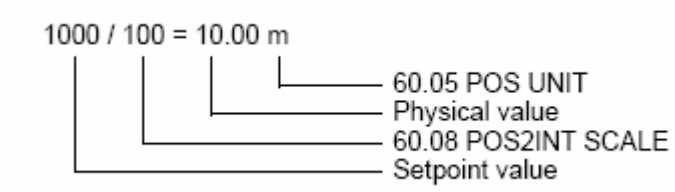
PDO	Control Word *	Position Reference	PDO length
PDO1 Rx	6040h	607Ah	48 bits

PDO	Status Word *	Position Actual Value	PDO length
PDO1 Tx	6041h	6064h	48 bits

* According to the DSP 402 Profile Position mode

The position setpoint (reference) and the position actual value are scaled as follows:

Drive parameter	Setting
60.05 POS UNIT (Position unit)	m**
60.08 POS2INT SCALE	100**
** Example	



Mechanical installation

What this chapter contains

This chapter contains placing and mounting instructions for the module.

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

Mounting

The FCAN-01 CANopen 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 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

What this chapter contains

This chapter contains:

- general cabling instructions
- bus termination instructions
- instructions for connecting the module to the CANopen 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.

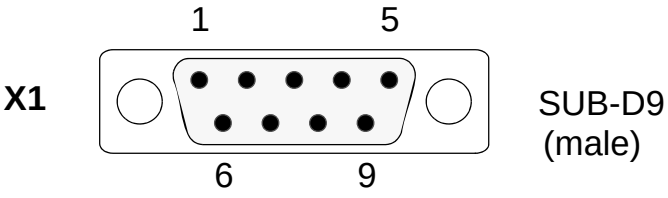
General cabling instructions

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

CANopen connection

The bus cable is connected to connector X1 on the FCAN-01.

The connector pin allocation described below follows the CANopen Communication Profile, CiA DS 301.

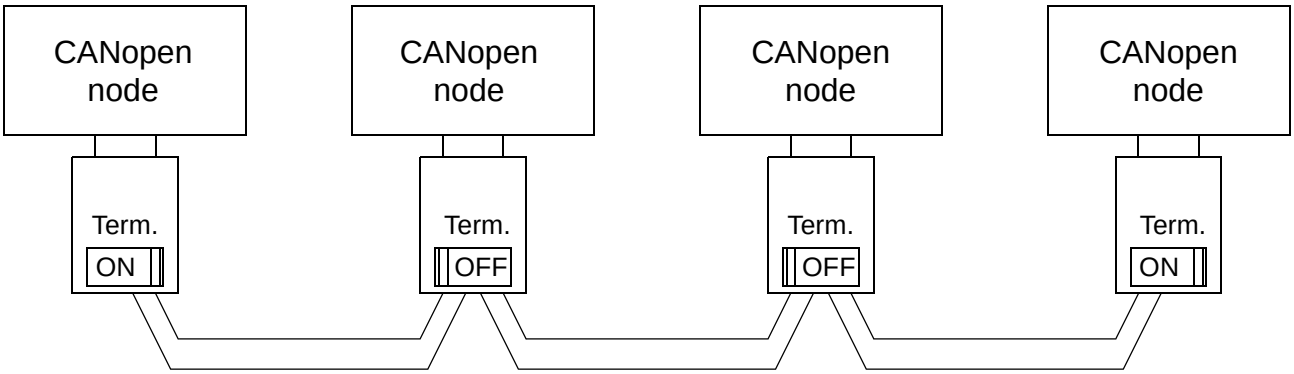


X1		Description
1	-	Not in use
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	CAN ground
4	-	Not in use
5	CAN_SHLD	Optional CAN shield
6	GND	Optional ground
7	CAN_H	CAN_H bus line (dominant high)
8	-	Not in use
9	CAN_V+	Optional CAN external power supply. Not supported by FCAN-01.

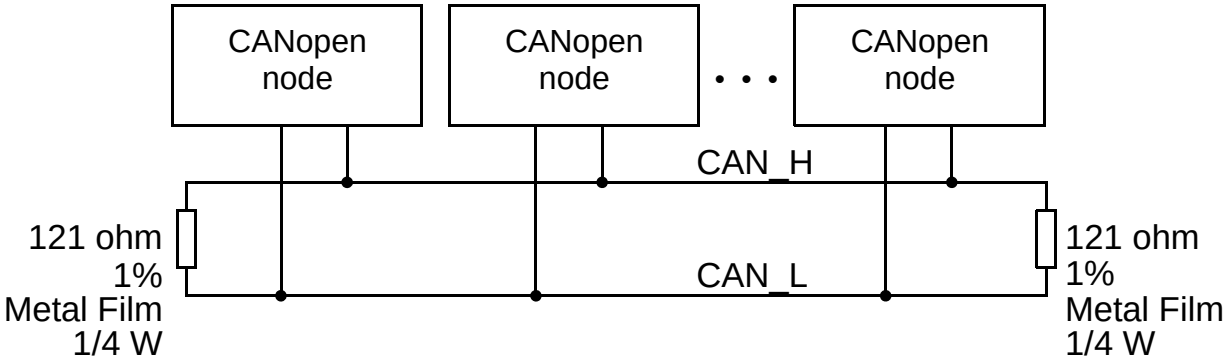
Bus termination

Bus termination is required to prevent signal reflections from the bus cable ends. The FCAN-01 module is not equipped with internal bus termination. Therefore the first and last nodes of the bus must be included with bus termination. Termination is done by connecting one resistor between the CAN_H and CAN_L signals. The resistors can be connected between the CAN_H and CAN_L wires or a D-SUB connector with a built-on termination can be used.

In the following diagram, the built-on terminations of the D-SUB connectors at the first and last nodes are switched on.



In the following diagram, the bus line is terminated with 121 ohm resistors connected between the CAN_L and CAN_H wires at each end.



Note: Further information on CANopen wiring is available from www.can-cia.org.

AC and DC parameters for the CANopen network

Bus cable and termination resistors

The cables, connectors, and termination resistors used in CANopen networks must meet the requirements specified in ISO 11898.

The table below lists the standard values for DC parameters for CANopen networks with less than 64 nodes:

Bus length [m]	Bus cable (1		Termination resistance [ohm]	Baudrate [kbit/s]
	Length-related resistance [mohm/m]	Cross-section [mm^2]		
0...40	70	0.25...0.34	124	1000 at 40 m
40...300	< 60	0.34...0.6	150...300	> 500 at 100 m
300...600	< 40	0.5...0.6	150...300	> 100 at 500 m
600...1000	< 26	0.75...0.8	150...300	> 50 at 1 km
(1 Recommended cable for AC parameters: 120 ohm impedance and 5 ns/m line delay.				

With drop cables the recommended cable cross-section is 0.25...0.34 mm^2.

In addition to the cable resistance, the real resistance of the connectors should be taken into account in voltage drop calculation. The transmission resistance of one connector should be 2.5...10 mohm.

The following table lists the maximum bus cable length for different node numbers (n), when

minimum dominant value $V_{diff.out.min}$ = 1.5 V
minimum differential input resistance $R_{diff.min}$ = 20 kohm
requested differential input voltage $V_{th.max}$ = 1.0 V
minimum termination resistance $R_{T.min}$ = 118 ohm.

Wire cross-section [mm²]	**Maximum length [m] (1**			**Maximum length [m] (2**		
	n = 32	**n = 64**	**n = 100**	**n = 32**	**n = 64**	**n = 100**
0.25	200	170	150	230	200	170
0.5	360	310	270	420	360	320
0.75	550	470	410	640	550	480

(1 Safety margin of 0.2
(2 Safety margin of 0.1

Drive configuration

What this chapter contains

This chapter gives information on configuring the drive for communication through the FCAN-01 CANopen Adapter module.

CANopen connection configuration

After the FCAN-01 CANopen Adapter module has been mechanically and electrically installed according to the instructions in previous chapters, the drive must be prepared for communication with the module.

The detailed procedure of activating the module for CANopen communication with the drive is dependent on the drive type. Normally, a parameter must be adjusted to activate the communication (see the drive manuals).

As communication between the drive and the FCAN-01 is established, several configuration parameters are copied to the drive. These parameters – shown below in Tables 2 to 4 – must be checked first and adjusted when necessary. The alternative selections for these parameters are discussed in more detail below the tables.

Note: The new settings take effect only when the module is powered up the next time or when a ‘Fieldbus Adapter parameter refresh’ command is given (see the drive manuals).

Data transfer rates supported

The FCAN-01 supports the following CANopen communication speeds: 50 kbit/s, 100 kbit/s *, 125 kbit/s, 250 kbit/s, 500 kbit/s and 1 Mbit/s.

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* **Note:** Not recommended for a new installation.

FCAN-01 configuration parameters - group 1

Table 2. FCAN-01 configuration parameters – group 1 (1

Par. no.	Parameter name	Parameter name in drive	Alternative settings	Default setting
1	FBA TYPE	FBA TYPE	(Read-only)	CANopen
2	NODE ID	FBA PAR 2	1 to 127	3
3	BIT RATE	FBA PAR 3	**(0)** 1 Mbit/s; **(1)** 500 kbit/s; **(2)** 250 kbit/s; **(3)** 125 kbit/s; **(4)** 100 kbit/s; **(5)** 50 kbit/s	3
4	CONF LOC	FBA PAR 4	**(0)** PDO configuration from CANopen objects (NETWORK); **(1)** PDO configuration from configuration parameters (PARAMETERS)	0
5	PROFILE	FBA PAR 5	**(0)** DSP 402; **(1)** ABB Drives; **(2)** Transparent 16; **(3)** Transparent 32	1
6	T16 SCALE	FBA PAR 6	1 to 65535	100
7	RPDO1-COB-ID	FBA PAR 7	0 = Not valid; 1 = Valid, default COB ID; (3 358 to 1407 (dec) = Valid, custom COB ID	1
8	RPDO1-TR TYPE	FBA PAR 8	0 to 255 (dec) (2	255
9	RPDO1-EV TIME	FBA PAR 9	0 to 65535 (ms) 0 = Not used	0

10	TPDO1-COB-ID	FBA PAR 10	0 = Not valid; 1 = Valid, default COB; (3 ID358 to 1407 (dec) = Valid, custom COB ID	1
11	TPDO1-TR TYPE	FBA PAR 11	0 to 255 (dec) (2	255
12	TPDO1-EV TIME	FBA PAR 12	0 to 65535 (ms) 0 = Not used	0
13	RPDO6-COB-ID	FBA PAR 13	0 = Not valid; 1 = Valid, default COB ID; (3 358 to 1407 (dec) = Valid, custom COB ID	0
14	RPDO6-TR TYPE	FBA PAR 14	0 to 255 (dec) (2	255
15	RPDO6-EV TIME	FBA PAR 15	0 to 65535 (ms) 0 = Not used	255
16	TPDO6- COB-ID	FBA PAR 16	0 = Not valid; 1 = Valid, default COB ID; (3 358 to 1407 (dec) = Valid, custom COB ID	0
17	TPDO6-TR TYPE	FBA PAR 17	0 to 255 (dec) (2	255
18	TPDO6-EV TIME	FBA PAR 18	0 to 65535 (ms) 0 = Not used.	0
19	RPDO21- COB-ID	FBA PAR 19	0 = Not valid;1 = Valid, default COB ID; (3 358 to 1407 (dec) = Valid, custom COB ID	0
20	RPDO21-TR TYPE	FBA PAR 20	0 to 255 (dec) (2	255
21	RPDO21-EV TIME	FBA PAR 21	0 to 65535 (ms) 0 = Not used.	0

22	TPDO21- COB-ID	FBA PAR 22	0 = Not valid; 1 = Valid, default COB ID; (3 358 to 1407 (dec) = Valid, custom COB ID	0

(1 Actual parameter group number in the drive depends on the drive type. E.g. for ACS350 and ACSM1 group 1 is parameter group 51 of the drive.

(2 See section *Description of transmission type* on page *115*.

(3 Valid with the default value (e.g. RxPDO1 0x200 + Node ID)

01 FBA TYPE

Shows the fieldbus adapter type as detected by the drive. The value cannot be adjusted by the user.

If this parameter is undefined, the communication between the drive and the module has not been established.

02 NODE ID

Selects the node address of the module.

1...127

Each device on the CANopen network must have a unique node identifier. This parameter is used to define a node identifier for the drive it is connected to.

03 BIT RATE

Sets the bit rate for the CANopen interface. This is user selectable, but must be the same on every node on the CANopen network.

1 Mbit/s **(0)**, 500 kbit/s **(1)**, 250 kbit/s **(2)**, 125 kbit/s **(3)**, 100 kbit/s **(4)** and 50 kbit/s **(5).**

Note: 100kbit/s is not recommended for a new installation.

---

04 CONF LOC

Selects the source of the PDO configuration. PDOs can be configured either via CANopen objects or via FCAN-01 module configuration parameter groups 1, 2 and 3.

0 = Configuration via CANopen objects 1400h, 1600h, 1405h, 1605h, 1414h, 1614h, 1800h, 1A00h, 1805h, 1A05h, 1814h and 1A14h only.

1 = Configuration via FCAN-01 module configuration parameter groups 1, 2 and 3 (default values).

Note: The first mapping entries of the Tx/RxPDO1 and Tx/RxPDO6 is fixed in the ACS350.

Note: Make sure that the PLC does not overwrite the selected configuration during the initialization phase when the configuration is taken from the configuration parameter groups.

---

05 PROFILE

Selects the used communication profile by the FCAN-01. CANopen device profile DSP 402 (0), ABB Drives (1), Transparent 16 (2) and Transparent 32 (3) profiles. For more information on the communication profiles, see chapter *Communication profiles* on page *59*.

06 T16 SCALE

Defines the reference multiplier / actual value divisor for the FCAN-01. The parameter is effective only when Transparent 16 profile is selected and the drive is using the DCU communication profile.

For example, if T16 SCALE has a value of 100 and a reference of 1,000 given by the PLC, the reference will be multiplied by 100 and forwarded to the drive as 100,000. According to the DCU profile, this value is interpreted as a reference of 100 rpm in the ACS350.

07 RPDO1-COB-ID

Defines the COB-ID for RxPDO1.

0 = RxPDO1 is not valid (disabled). The COB-ID is 80000200h+Node-ID.

1 = RxPDO1 is valid and configured to use the default COB-ID (200h+Node-ID).

358…1407 (181h…57Fh) = RxPDO1 is valid and configured to use a custom COB-ID defined with this parameter. The COB-ID must be within the allowed PDO COB-ID range (181h - 57Fh).

Note: It is recommended to use the default COB-ID.

---

08 RPDO1-TR TYPE

Defines the RxPDO1 transmission type. See chapter *Dictionary structure and entries* on page *115*.

09 RPDO1-EV TIME

Defines the event time (timeout time) for the RxPDO1 in the asynchronous transmission mode. In the case when the RxPDO1 communication between the FCAN-01 and the bus master fails the FCAN-01 sets the communication between the module and the drive to OFF-LINE mode.

0 = timeout supervision is disabled.

1...65535 ms

The event timer (timeout timer) elapses as a multiple of 1 ms of the entry of this parameter.

Note: Timeout supervision is activated upon a successful reception of an RxPDO1.

---

10 TPDO1-COB-ID

Defines the COB-ID for TxPDO1.

0 = TxPDO1 is not valid (disabled). The COB-ID is 80000180h+Node-ID.

1 = TxPDO1 is valid and configured to use the default COB-ID (180h+Node-ID).

358…1407 (181h…57Fh) = TxPDO1 is valid and configured to use a custom COB-ID defined with this parameter. The COB-ID must be within the allowed PDO COB-ID range (181h - 57Fh).

Note: It is recommended to use the default COB-ID.

---

11 TPDO1-TR TYPE

Defines the PDO1 transmission type. See chapter *Dictionary structure and entries* on page *115*.

12 TPDO1-EV TIME

Defines the event time for the TxPDO1 asynchronous transmission mode.

0 = Not used.

1...65535 ms

The event timer elapses as a multiple of 1 ms of the entry of this parameter.

13 RPDO6-COB-ID

Defines the COB-ID for RxPDO6.

0 = RxPDO6 is not valid (disabled). The COB-ID is 80000300h+Node-ID.

1 = RxPDO6 is valid and configured to use the default COB-ID (300h+Node-ID).

358…1407 (181h…57Fh) = RxPDO6 is valid and configured to use a custom COB-ID defined with this parameter. The COB-ID must be within the allowed PDO COB-ID range (181h - 57Fh).

Note: It is recommended to use the default COB-ID.

---

14 RPDO6-TR TYPE

Defines the RxPDO6 transmission type. See chapter *Dictionary structure and entries* on page *115*.

15 RPDO6-EV TIME

Defines the event time (timeout time) for the RxPDO6 in the asynchronous transmission mode. In the case when the RxPDO6 communication between the FCAN-01 and the bus master fails the FCAN-01 sets the communication between the module and the drive to OFF-LINE mode.

0 = timeout supervision is disabled.

1...65535 ms

The event timer (timeout timer) elapses as a multiple of 1 ms of the entry of this parameter.

Note: Timeout supervision is activated upon a successful reception of an RxPDO6.

---

16 TPDO6-COB-ID

Defines the COB-ID for TxPDO6.

0 = TxPDO6 is not valid (disabled). The COB-ID is 80000280h+Node-ID.

1 = TxPDO6 is valid and configured to use the default COB-ID (280h+Node-ID).

358…1407 (181h…57Fh) = TxPDO6 is valid and configured to use a custom COB-ID defined with this parameter. The COB-ID must be within the allowed PDO COB-ID range (181h - 57Fh).

Note: It is recommended to use the default COB-ID.

---

17 TPDO6-TR TYPE

Defines the TxPDO6 transmission type. See chapter *Dictionary structure and entries* on page *115*.

18 TPDO6-EV TIME

Defines the event time for the TxPDO6 asynchronous transmission mode.

0 = Not used.

1...65535 ms

The event timer elapses as a multiple of 1 ms of the entry of this parameter.

19 RPDO21-COB-ID

Defines the COB-ID for RxPDO21.

0 = RxPDO21 is not valid (disabled). The COB-ID is 80000400h+Node-ID.

1 = RxPDO21 is valid and configured to use the default COB-ID (400h+Node-ID).

358…1407 (181h…57Fh) = RxPDO21 is valid and configured to use a custom COB-ID defined with this parameter. The COB-ID must be within the allowed PDO COB-ID range (181h - 57Fh).

Note: It is recommended to use the default COB-ID.

---

20 RPDO21-TR TYPE

Defines the RxPDO21 transmission type. See chapter *Dictionary structure and entries* on page *115*.

21 RPDO21-EV TIME

Defines the event time (timeout time) for the RxPDO21 in the asynchronous transmission mode. In the case when the RxPDO21 communication between the FCAN-01 and the bus master fails the FCAN-01 sets the communication between the module and the drive to OFF-LINE mode

0 = timeout supervision is disabled.

1...65535 ms

The event timer (timeout timer) elapses as a multiple of 1 ms of the entry of this parameter.

Note: Timeout supervision is activated upon a successful reception of an RxPDO21.

---

22 TPDO21-COB-ID

Defines the COB-ID for TxPDO21.

0 = TxPDO21 is not valid (disabled). The COB-ID is 80000380h+Node-ID.

1 = TxPDO21 is valid and configured to use the default COB-ID (380h+Node-ID).

358…1407 (181h…57Fh) = TxPDO21 is valid and configured to use a custom COB-ID defined with this parameter. The COB-ID must be within the allowed PDO COB-ID range (181h - 57Fh).

Note: It is recommended to use the default COB-ID.

---

23 TPDO21-TR TYPE

Defines the TxPDO21 transmission type. See chapter *Dictionary structure and entries* on page *115*.

24 TPDO21-EV TIME

Defines the event time for the TxPDO21 asynchronous transmission mode.

0 = Not used.

1...65535 ms

The event timer elapses as a multiple of 1 ms of the entry of this parameter.

FCAN-01 configuration parameters - group 2

Table 3. FCAN-01 configuration parameters – group 2 (1

Par. no.	Parameter name (2		Parameter name in drive (2	Alternative settings	Default setting
	ACS350	ACSM1			
1	PDO1 Rx WORD 2	PDO1 Rx WORD 1	FBA DATA OUT 1 (master to drive)	0 to 9999 Format: **xxyy**, where **xx** = parameter group and **yy** = parameter index.	0
2	PDO1 Rx WORD 3	PDO1 Rx WORD 2	FBA DATA OUT 2	See FBA DATA OUT 1 above.	0
3	PDO1 Rx WORD 4	PDO1 Rx WORD 3	FBA DATA OUT 3	See FBA DATA OUT 1 above.	0
4	PDO6 Rx WORD 2	PDO1 Rx WORD 4	FBA DATA OUT 4	See FBA DATA OUT 1 above.	0
5	PDO6 Rx WORD 3	PDO6 Rx WORD 1	FBA DATA OUT 5	See FBA DATA OUT 1 above.	0
6	PDO6 Rx WORD 4	PDO6 Rx WORD 2	FBA DATA OUT 6	See FBA DATA OUT 1 above.	0
7	PDO21 Rx WORD 1	PDO6 Rx WORD 3	FBA DATA OUT 7	See FBA DATA OUT 1 above.	0
8	PDO21 Rx WORD 2	PDO6 Rx WORD 4	FBA DATA OUT 8	See FBA DATA OUT 1 above.	0
9	PDO21 Rx WORD 3	PD21 Rx WORD 1	FBA DATA OUT 9	See FBA DATA OUT 1 above.	0
10	PDO21 Rx WORD 4	PD21 Rx WORD 2	FBA DATA OUT 10	See FBA DATA OUT 1 above.	0
11		PD21 Rx WORD 3	FBA DATA OUT 11	See FBA DATA OUT 1 above.	0
12		PD21 Rx WORD 4	FBA DATA OUT 12	See FBA DATA OUT 1 above.	0

(1 Actual parameter group number in the drive depends on the drive type. E.g., for ACS350 group 2 is the parameter group 55 of the drive and for the ACSM1 group 2 is parameter group 53 of the drive.

(2 For more information, see chapter *Communication* on page *79*.

Note: the FCAN-01 configuration parameters are 16-bit parameters. If the mapped parameter is a 32-bit parameter, it automatically reserves two consecutive parameters. E.g. mapping of a 32-bit parameter to Par. no. 1 also reserves Par. no. 2.

1 FBA DATA OUT 1

This parameter represents data word 1 received by the drive over the CANopen network. The content is defined by a decimal number in the range of 0 to 9999 as follows:

0	Not used
1...99	Virtual address area of the drive control
101...9999	Parameter area of the drive

The virtual address area of the drive control is allocated as follows:

Virtual address	Description	Data length	Profile								
			DSP 402						ABB Drives	Transparent 16	Transparent 32
			hm	pp	ip	pv	pt	vl			
1	Control Word	16-bit	6040h	6040h		6040h	6040h	6040h	6040h	6040h	-
2	Reference 1	16-bit	-	-		-	6071h	6042h	6042h	6042h	-
3	Reference 2	16-bit	-	-		-	-	-	2000h03	2000h03	-
4	Status Word	16-bit	6041h	6041h		6041h	6041h	6041h	6041h	6041h	-
5	Actual Value 1	16-bit	-	-		-	6077h	6044h	6044h	6044h	-
6	Actual Value 2	16-bit	-	-		-	-	-	2000h06	2000h06	-
7...10	Reserved	n/a	-	-		-	-	-	-	-	-
11	Control Word	32-bit	-	-		-	-	-	-	-	2001h
12	Reference 1	32-bit	-	607Ah		60FF	-	-	-	-	2002h
13	Reference 2	32-bit	-	-		-	-	-	-	-	2003h
14	Status Word	32-bit	-	-		-	-	-	-	-	2004h
15	Actual Value 1	32-bit	-	6064h		606C	-	-	-	-	2005h
16	Actual Value 2	32-bit	-	-		-	-	-	-	-	2006h
	Reserved	n/a	-	-		-	-	-	-	-	-

hm homing mode
pp profile position mode
ip inter-polated position mode
pv profile velocity mode
pt profile torque mode
vl velocity mode

The parameter area is allocated as follows:

Parameter number with format xxyy, where xx is the parameter group number (1 to 99) and yy is the parameter number index within that group (01 to 99).

2 FBA DATA OUT 2 to 10 FBA DATA OUT 10

See section *1 FBA DATA OUT 1* above.

FCAN-01 configuration parameters - group 3

Table 4. FCAN-01 configuration parameters – group 3 (1

Par. no.	Parameter name (2		Parameter name in the drive (2	Alternative settings	Default setting
	ACS350	ACSM1			
1	PDO1 Tx WORD 2	PDO1 Tx WORD 1	FBA DATA IN 1 (drive to master)	0 to 9999 Format: **xxyy**, where **xx** = parameter group and **yy** = parameter index.	0
2	PDO1 Tx WORD 3	PDO1 Tx WORD 2	FBA DATA IN 2	See FBA DATA IN 1 above.	0
3	PDO1 Tx WORD 4	PDO1 Tx WORD 3	FBA DATA IN 3	See FBA DATA IN 1 above.	0
4	PDO6 Tx WORD 2	PDO1 Tx WORD 4	FBA DATA IN 4	See FBA DATA IN 1 above.	0
5	PDO6 Tx WORD 3	PDO6 Tx WORD 1	FBA DATA IN 5	See FBA DATA IN 1 above.	0
6	PDO6 Tx WORD 4	PDO6 Tx WORD 2	FBA DATA IN 6	See FBA DATA IN 1 above.	0
7	PDO21 Tx WORD 1	PDO6 Tx WORD 3	FBA DATA IN 7	See FBA DATA IN 1 above.	0
8	PDO21 Tx WORD 2	PDO6 Tx WORD 4	FBA DATA IN 8	See FBA DATA IN 1 above.	0
9	PDO21 Tx WORD 3	PDO21 Tx WORD 1	FBA DATA IN 9	See FBA DATA IN 1 above.	0
10	PDO21 Tx WORD 4	PDO21 Tx WORD 2	FBA DATA IN 10	See FBA DATA IN 1 above.	0
11	-	PDO21 Tx WORD 3	FBA DATA IN 11	See FBA DATA IN 1 above.	0
12	-	PDO21 Tx WORD 4	FBA DATA IN 12	See FBA DATA IN 1 above.	0

(1 Actual parameter group number in the drive depends on the drive type. E.g. for ACS350 group 3 is parameter group 54 of the drive and for ACSM1 group is parameter group 52 of the drive.
(2 For more information, see chapter *Communication* on page *79*.

1 FBA DATA IN 1

This parameter represents data word 1 sent by the drive over the CANopen network. For the contents, see configuration parameter group 2, parameter 1 (FBA DATA OUT 1) on page 52.

2 FBA DATA IN 2 to 10 FBA DATA IN 10

See section *1 FBA DATA IN 1* above.

Control locations

ABB drives can receive control information from multiple sources including digital inputs, analogue inputs, the drive control panel and a communication module (e.g. FCAN-01). ABB drives allow the user to separately determine the source for each type of control information (Start, Stop, Direction, Reference, Fault Reset, etc.). In order to give the fieldbus master station the most complete control over the drive, the communication module must be selected as source for this information. See the drive manuals for information on the selection parameters.

Master configuration

What this chapter contains

This chapter gives information on configuring the CANopen master station for communication through the FCAN-01 CANopen Adapter module.

Configuring the system

After the FCAN-01 CANopen Adapter module has been mechanically and electrically installed according to the instructions in previous chapters, and has been initialised by the drive, the master station must be prepared for communication with the module.

Please refer to the master station documentation for more information.

EDS files

Electronic Data Sheet (EDS) files specify the device properties for the CANopen master (client). EDS files for the FCAN-01 CANopen Adapter module contain information on the supported communication objects. EDS files for ABB Drives are available through your local ABB representative.

Communication profiles

What this chapter contains

This chapter describes the communication profiles used in the communication between the CANopen network, the FCAN-01 module, and the drive.

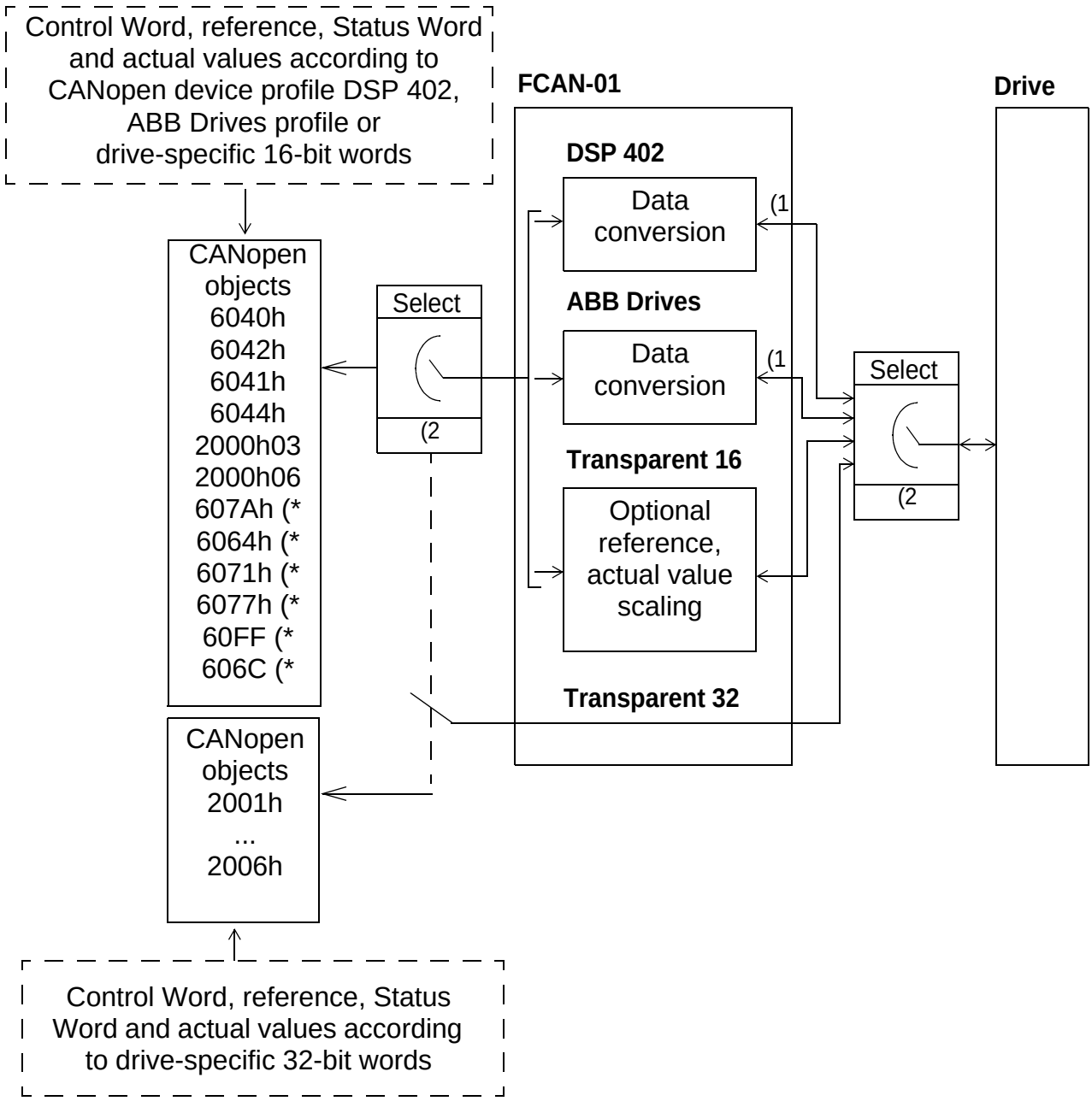
Communication profiles

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

With the FCAN-01 module, the CANopen network may employ DSP 402 (Device Profile Drives and Motion Control) profile or the ABB Drives profile. Both are converted to the DCU profile (detailed in the drive manuals) by the FCAN-01 module. In addition, two Transparent profiles – for 16-bit and 32-bit words respectively – are available. With the Transparent modes, no data conversion takes place.

Note: The DSP 402 operation mode support is drive-specific. See *The CANopen device profile DSP 402* on page *62* for more details.

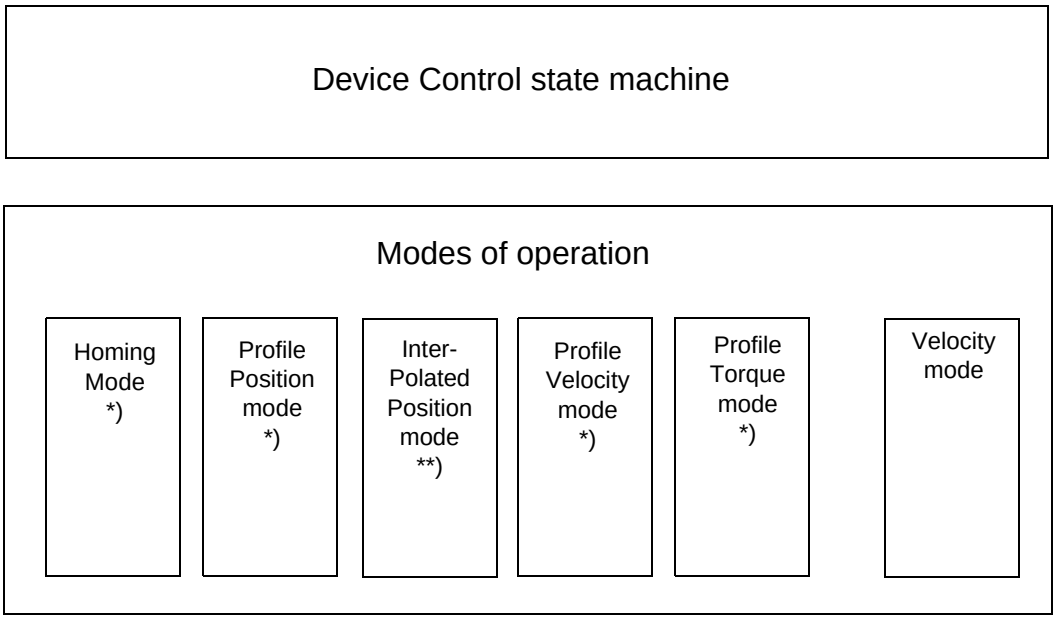
The profile is selected from the drive with parameter 5 PROFILE of the fieldbus configuration group 1. E.g. if parameter 5 PROFILE is set to 0, the Control Word of the drive is set according to the DSP 402 Standard (Device Profile Drives and Motion Control).



(1 DCU profile
(2 Selection via FCAN-01 configuration parameters (par. 5 PROFILE of group 1)
(* Only with ACSM1

The following sections describe the Control Word, the Status Word, references and actual values for the CANopen device profile DSP 402 and ABB Drives communication profiles. See the drive manuals for details on the DCU communication profile.

The CANopen device profile DSP 402



*) Supported with ACSM1 only
**) Not supported

Device Control state machine

The start and stop of the drive and several mode specific commands are executed by the Device Control state machine. This is described in *Figure 5.*

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

The contents of the Control Word and the Status Word are detailed section *Control Word and Status Word of the DSP 402 profile* on page *67*.

Modes of operation

The operation mode defines the behavior of the drive. DSP 402 defines following operation modes:

- *Homing mode*
- *Profile position mode*
- *Interpolated position mode*
- *Profile velocity mode*
- *Profile torque mode*
- *Velocity mode*

FCAN-01 supports minimal implementation of the operation modes. Operation mode support is drive-specific (see figure 1). Interpolated position mode is not supported.

In this chapter scalings of the reference and actual values are described for each operation mode. Operation mode specific objects are defined in the *CANopen Object Dictionary* on page *98*.

In ACSM1, the mode of operation is automatically selected according to the control mode configured with parameter 3403 EXT1 CTRL MODE, 3404 EXT1 CTRL MODE2 or 3405 EXT2 CTRL MODE1 (depending on the current control location). The correct reference scaling must be selected with par. 5004 FBA REF1 MODESEL.

Homing mode

Homing mode describes various methods of finding a home position, or zero point. Either limit switches at the ends of travel or a home switch in mid travel are used. Most of the methods also use the index (zero) pulse from an incremental encoder. For more information on the homing mode and descriptions of the various homing methods, see the drive manual.

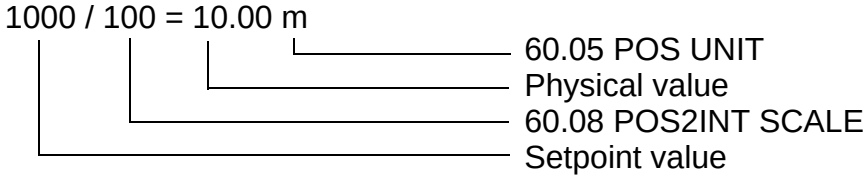
Profile position mode

This mode enables the positioning of the drive to be controlled.

Position demand value

Position demand value defines the position setpoint. The position setpoint is scaled as follows:

Drive parameter	Setting
60.05 POS UNIT (Position unit)	m**
60.08 POS2INT SCALE	100**
**Example	



Position actual value

Position actual value defines the actual position of the application. Position actual value is scaled as position demand value (see above).

Interpolated position mode

Not supported with FCAN-01 CANopen adapter.

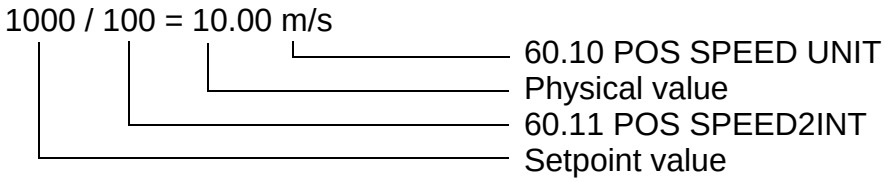
Profile velocity mode

The profile velocity mode is used to control the velocity of the drive with no special regard of the position.

Target velocity

Target velocity is the required velocity of the application. The target velocity is scaled as follows:

Drive parameter	Example setting
60.05 POS UNIT (Position unit)	**m**
60.10 POS SPEED UNIT	**unit/s**
60.11 POS SPEED2INT	**100**



Velocity actual value

Velocity actual value defines the actual velocity of the application. Velocity actual value is scaled as target velocity (see above).

Profile torque mode

Profile torque mode enables the drive torque to be controlled directly.

Target torque

Target torque is the required torque of the application. The value is given per thousand of the rated torque, i.e. 10 = 1 %.

Torque actual value

Torque actual value corresponds to the instantaneous torque in the drive motor. The value is given per thousand of the rated torque, i.e. 10 = 1 %.

Velocity mode

Basic mode to control the velocity of the drive with limits and ramp functions.

Target velocity of DSP 402 Velocity mode

Target velocity is the required velocity of the application. The unit of the target velocity is interpreted as rpm. 1 = 1 rpm.

Control effort of DSP 402 Velocity mode

Control effort is the actual velocity of the application. The unit of the control effort is interpreted as rpm. 1 = 1 rpm.

Control Word and Status Word of the DSP 402 profile

Control Word of DSP 402

Bit	Description
0	Switch on.
1	Enable voltage.
2	Quick stop
3	Enable operation.
4...6	Operation mode specific
7	Fault reset
8	Halt (not used).
9...10	Reserved
11...15	Drive-specific bit

Operation mode specific bits

Bit	Velocity mode	Profile position mode*	Profile velocity mode*	Profile torque mode*	Homing mode*	Interpolation position mode**
4	rfg enable	New setpoint	Reserved	Reserved	Homing operation start	Enable ipmode
5	rfg unlock	Change set immediately	Reserved	Reserved	Reserved	Reserved
6	rfg use ref	abs / rel	Reserved	Reserved	Reserved	Reserved

* Supported with ACSM1 only

** Not supported

Status Word of DSP 402

Bit	Description
0	Ready to switch on
1	Switched on
2	Operation enabled
3	Fault
4	Voltage disabled
5	Quick stop
6	Switch on disabled
7	Warning
8	Drive-specific bit
9	Remote
10	Target reached
11	Internal limit active
12...13	Operation mode specific
14...15	Drive-specific bit

Operation mode specific bits

Bit	Velocity mode	Profile position mode*	Profile velocity mode*	Profile torque mode*	Homing mode*	Interpolation position mode**
12	Reserved	Setpoint acknowledge	Speed	Reserved	Homing attained	IP mode active
13	Reserved	Following error	Max slippage error	Reserved	Homing error	Reserved

* Supported with ACSM1 only
**Not supported

Device control commands are triggered by the Control Word bits as follows:

Device control commands

Command	Control Word bit					
	Fault reset, bit 7	**Enable operation, bit 3**	**Quick stop, bit 2**	**Enable voltage, bit 1**	**Switch on, bit 0**	**State transitions * (See *Figure 5.*)**
Shut down	0	x	1	1	0	2, 6, 8
Switch on	0	0	1	1	1	3 *
Switch on	0	1	1	1	1	3 *
Disable voltage	0	x	x	0	x	7, 9, 10, 12
Quick stop	0	x	0	1	x	7, 10, 11
Disable operation	0	0	1	1	1	5
Enable operation	0	1	1	1	1	4, 1
Fault reset		x	x	x	x	15

x: Bits marked with x are irrelevant
* When Control Word bit 3 (Enable operation) is 1, the drive does not do perform any tasks in the SWITCHED ON state. When bit 3 is 0, state SWITCHED ON tasks are performed.

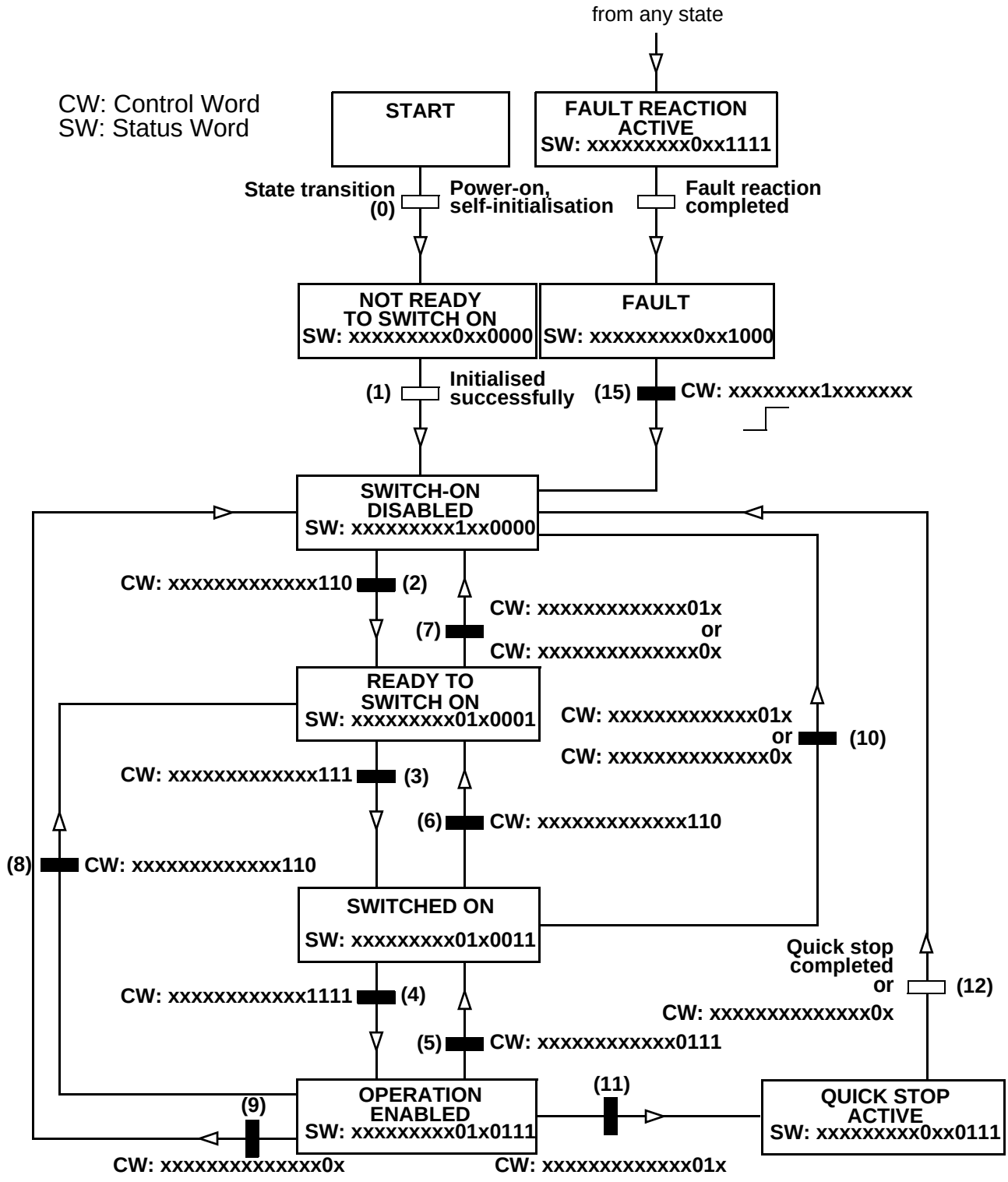


Figure 5. The CANopen state machine

The ABB Drives communication profile

The Control Word and the Status Word

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

The contents of the Control Word and the Status Word are detailed section *Control Word and Status Word of the ABB Drives profile* on page *74*. The drive states are presented in the ABB Drives profile state machine, Figure 6.

References

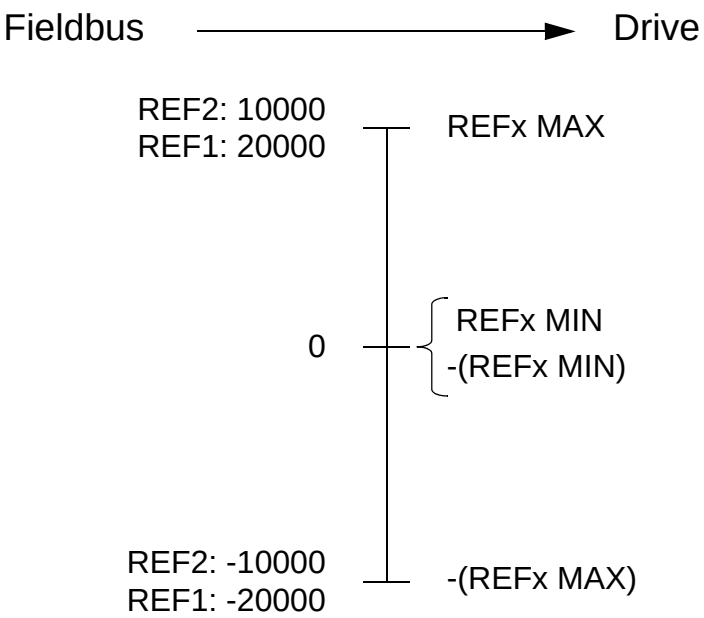
References are 16-bit words containing a sign bit and a 15-bit integer. A negative reference (indicating reversed direction of rotation) is formed by calculating the two’s complement from the corresponding positive reference.

ABB drives can receive control information from multiple sources including analogue and digital inputs, the drive control panel and a communication module (e.g. FCAN-01). In order to have the drive controlled through the fieldbus, the module must be defined as the source for control information, e.g. reference.

Scaling

References are scaled as shown below.

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



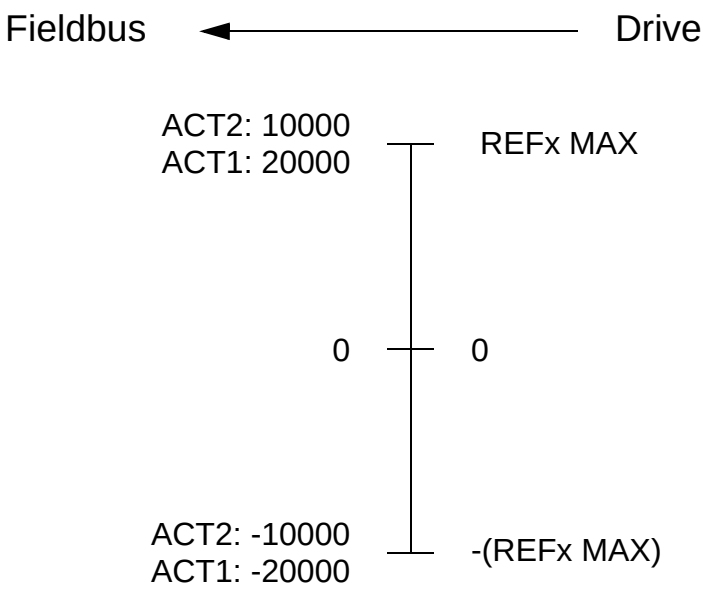
Actual values

Actual values are 16-bit words containing information on the operation of the drive. The functions to be monitored are selected by a drive parameter.

Scaling

Actual values are scaled as shown below.

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



Control Word and Status Word of the ABB Drives profile

The following table presents the Control Word of the ABB Drives communication profile. The upper case boldface text refers to the states shown in Figure 6.

Control Word of ABB Drives profile

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 motor and driven machine can be stopped using this stop mode.
3	INHIBIT_ OPERATION	1	Proceed to **OPERATION ENABLED**. **Note:** Run enable signal must be active; see the drive manuals. 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).

Control Word of ABB Drives profile

Bit	Name	Value	STATE/Description
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 **OPERATING**. **Note:** 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:** Effective only if the fieldbus interface is set as the source for this signal by drive parameters.
		0	Continue normal operation.
8 to 9	Reserved.		
10	REMOTE_ CMD	1	Fieldbus control enabled
		0	Control Word <> 0 or Reference <> 0: Retain last Control Word and Reference. Control Word = 0 and Reference = 0: Fieldbus control enabled. Reference and deceleration/ acceleration ramp are locked.
11	EXT_CTRL_ LOC	1	Select External Control Location EXT2. Effective if control location is parameterised to be selected from fieldbus.
		0	Select External Control Location EXT1. Effective if control location is parameterised to be selected from fieldbus.
12 to 15	Reserved		

The following table presents the Status Word of the ABB Drives communication profile. The upper case boldface text refers to the states shown in Figure 6.

Status Word of the ABB Drives profile

Bit	Name	Value	STATE/Description
0	RDY_ON	1	**READY TO SWITCH ON**
		0	**NOT READY TO SWITCH ON**
1	RDY_RUN	1	**READY TO OPERATE**
		0	**OFF1 ACTIVE**
2	RDY_REF	1	**OPERATION ENABLED**
		0	**OPERATION INHIBITED**
3	TRIPPED	1	**FAULT**
		0	No fault
4	OFF_2_STA	1	OFF2 inactive
		0	**OFF2 ACTIVE**
5	OFF_3_STA	1	OFF3 inactive
		0	**OFF3 ACTIVE**
6	SWC_ON_ INHIB	1	**SWITCH-ON INHIBITED**
		0	–
7	ALARM	1	Warning/Alarm
		0	No warning/alarm
8	AT_ SETPOINT	1	**OPERATING**. Actual value equals reference = is within tolerance limits, i.e. in speed control, speed error is 10% max. of the 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

Status Word of the ABB Drives profile

Bit	Name	Value	STATE/Description
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
		0	External Control Location EXT1 selected
12	EXT_RUN_E NABLE	1	External Run Enable signal received
		0	No External Run Enable signal received
13 to 14	Reserved		
15		1	Communication error detected by fieldbus adapter module
		0	Fieldbus adapter communication OK

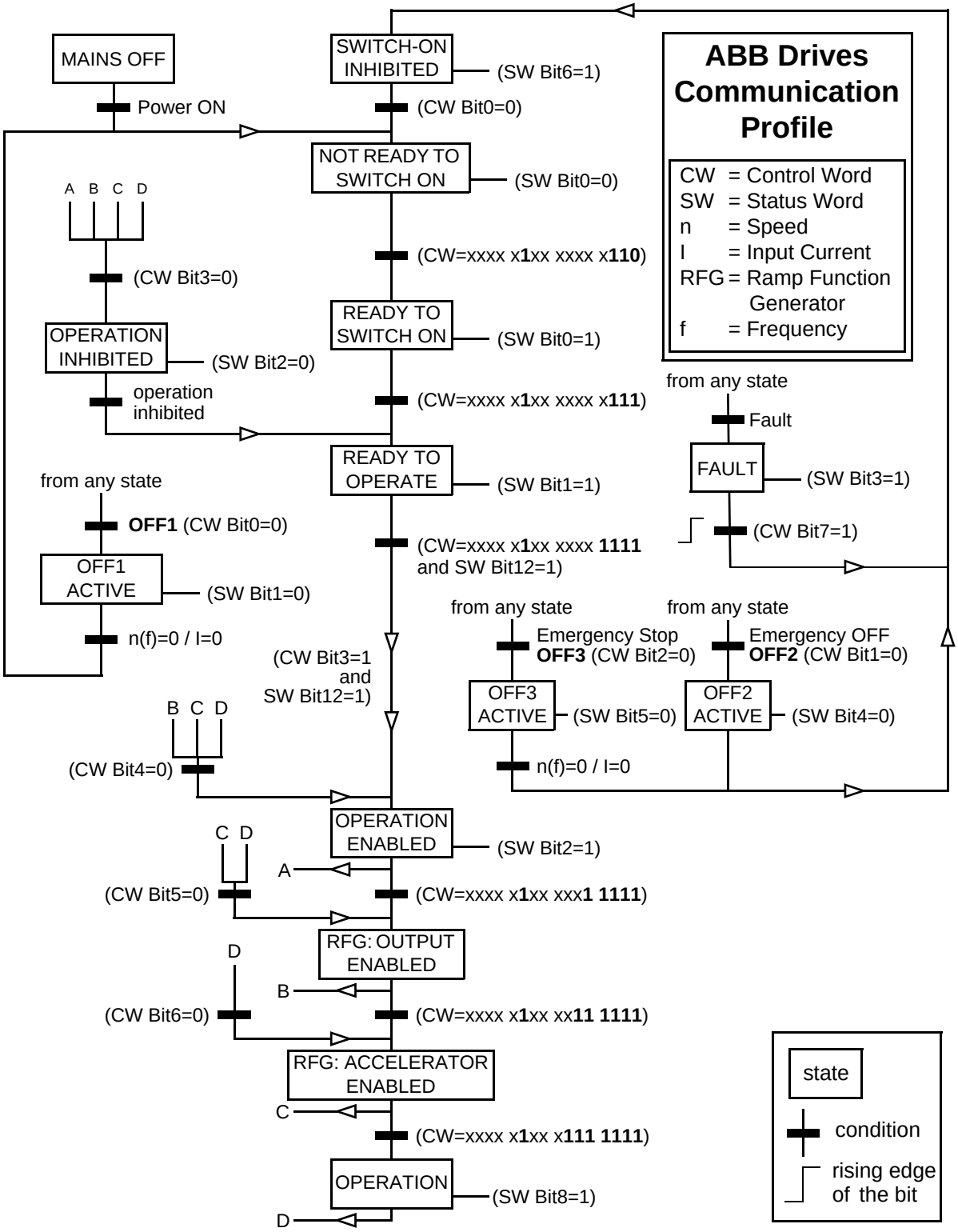


Figure 6. State machine, ABB Drives communication profile

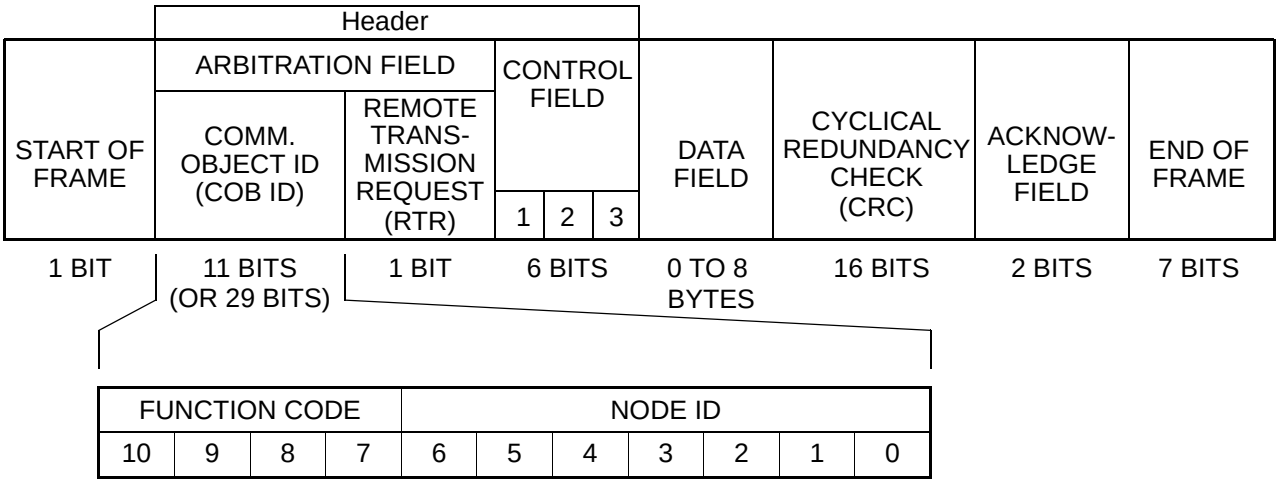
Communication

What this chapter contains

This chapter describes the communication on a CANopen network.

CAN data frame

CAN employs data frames for transferring data between the host (controller) and the nodes on the bus. The following figure presents the structure of the data frame.



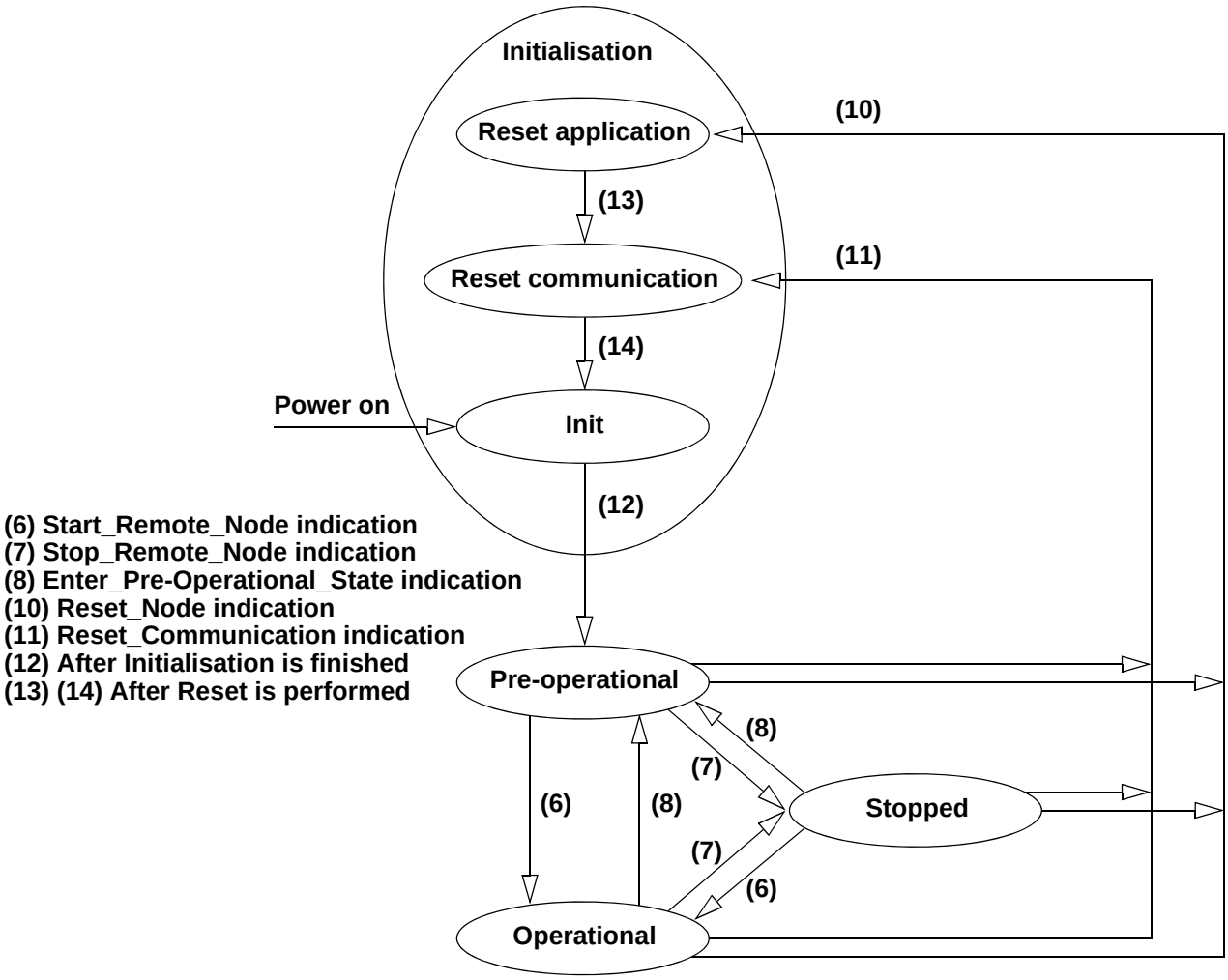
Communication object	Function code (Binary)	COB ID (Hex)	COB ID (Dec)
NMT	0000	00h	0
SYNC	0001	80h	128
TIME STAMP	0010	100h	256
EMERGENCY	0001	81h…FFh	129…255
PDO1 (Tx)	0011	181h...1FFh	385...511
PDO1 (Rx)	0100	201h...27Fh	513...639
PDO6 (Tx)	0101	281h...2FFh	641...767
PDO6 (Rx)	0110	301h...37Fh	769...895
PDO21 (Tx)	0111	381h...3FFh	897...1023
PDO21 (Rx)	1000	401h...47Fh	1025...1151
SDO (Tx)	1011	581h…5FFh	1409…1535
SDO (Rx)	1100	601h…67Fh	1537…1663
NODEGUARD	1110	701h…77Fh	1793…1919

1 = IDE bit = Extended format / standard format (1 bit)
2 = ro = reserved (1 bit)
3 = DLC = Data Length Code (4 bits)

Inside the CANopen data frame, different types of Communication Objects are used to convey the data. Process Data Objects (PDO) are used for transmitting time critical process data (references, control commands, status information); Service Data Objects (SDO) are used for less time critical data, e.g. parameters.
In addition, there are Special Function Objects and Network Management Objects.

FCAN-01 boot-up sequence and Network Management (NMT)

The FCAN-01 supports the boot-up sequence of a “Minimum Capability Device”, as defined by the CANopen Communication Profile. The boot-up state diagram of the FCAN-01 is shown below.



The NMT (Network Management) message is mapped to a single CAN frame with data length of 2 bytes. Its identifier is 0. The first byte contains the command specifier and the second contains the Node ID of the device, which must perform the command (if the node ID is 0, all nodes must perform the command). The NMT message transmitted by the NMT master forces the nodes to transit to another NMT state. The CANopen state machine specifies states: Initialisation, Pre-Operational, Operational and Stopped. After power-on, each CANopen device is first in the Initialization state and then the state transits automatically to the Pre-Operational state.

The NMT commands used for controlling the node are:

Command	Name
001	Start_Remote_Node
002	Stop_Remote_Node
128	Enter_Pre-Operational_State
129	Reset_Node
130	Reset_Communication

Header	Byte	
	1	2
00000000000000010	NMT Command	Node ID

Note: If Node ID is 0, all NMT slaves are addressed.

The node state indications are as follows:

Indication	State
0	Boot-up
4	Stopped
5	Operational
127	Pre-operational

Process Data Objects (PDO)

Process Data Object (PDO) is used for time critical process data exchange. PDO transmissions can be controlled by an internal timer, by remote requests or by the received Sync message. For each PDO the transmission mode of the PDO as well as the default mappings of the application objects are described in the Object Dictionary. FCAN-01 supports also configuration of the PDOs via drive parameters.

FCAN-01 supports maximum of three PDOs in both directions. By default only PDO1 Tx and PDO1 Rx are enabled (valid) and PDO6 Tx/Rx and PDO21 Tx/Rx are disabled (not valid).

PDO mapping defines which application objects (parameters) are transmitted within a PDO. PDO mappings of the FCAN-01 can be changed in the Pre-operational state (variable objects). Transmission of the enabled (valid) PDOs is possible only in the Operational state.

Each PDO can support up to 8 bytes of process data. In ACS350, the first mapping entry of PDO1 Tx/Rx and PDO6 Tx/Rx is fixed and it cannot be changed. The length of the PDOs and other mapping entries of the PDOs are configurable.

The mapping entries of the PDOs can be configured through CANopen objects or from the drive through fieldbus configuration parameters. The configuration location is selected from the drive with parameter 4 CONF LOC of the fieldbus configuration group 1 (par. 5104 in ACS350 and ACSM1).

When mapping through CANopen objects, the PDO length must be set to zero before the mapping entries can be changed.

PDO1 Rx

		Mapped obj 1		Mapped obj 2		Mapped obj 3		Mapped obj 4	
Byte		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Object		6040h (Control Word) Fixed *		-		-		-	
CANopen Object for Mapping		1600h01		1600h02		1600h03		1600h04	
Mapping parameter **	**ACS350**	Not used		FBA DATA OUT 1		FBA DATA OUT 2		FBA DATA OUT 3	
	ACSM1	FBA DATA OUT 1		FBA DATA OUT 2		FBA DATA OUT 3		FBA DATA OUT 4	

* With the ACS350, the first mapping entry is fixed and the others are configurable. With the ACSM1 all mapping entries are configurable.
** Configuration group 2

Note: The mapping entries of the PDO1 Rx can be configured through CANopen object 1600h or from the drive through fieldbus configuration parameter group 2.
The default COB ID for PDO1 Rx is 200h + Node ID, the default transmission type is 255 and the event time is 0. These values can be changed only with CANopen object 1400h or from the drive with parameters 7, 8 and 9 of the fieldbus configuration group 1.

PDO1 Tx

		Mapped obj 1		Mapped obj 2		Mapped obj 3		Mapped obj 4	
Byte		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Object		6041h (Status Word) Fixed*		-		-		-	
CANopen Object for Mapping		1A00h01		1A00h02		1A00h03		1A00h04	
Mapping parameter **	**ACS350**	Not used		FBA DATA IN 1		FBA DATA IN 2		FBA DATA IN 3	
	ACSM1	FBA DATA IN 1		FBA DATA IN 2		FBA DATA IN 3		FBA DATA IN 4	

* With the ACS350, the first mapping entry is fixed and the others are configurable. With the ACSM1 all mapping entries are configurable.
** Configuration group 3

Note: The mapping entries of the PDO1 Tx can be configured through CANopen object 1A00h or from the drive through fieldbus configuration parameter group 3.
The default COB ID for PDO1 Tx is 180h + Node ID, the default transmission type is 255 and the event time is 0. These values can be changed with CANopen object 1600h or from the drive with parameters 10, 11 and 12 of the fieldbus configuration group 1.

PDO6 Rx

		Mapped obj 1		Mapped obj 2		Mapped obj 3		Mapped obj 4	
Byte		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Object		6040h (Control Word) Fixed *		-		-		-	
CANopen Object for Mapping		1605h01		1605h02		1605h03		1605h04	
Mapping parameter **	**ACS350**	Not used		FBA DATA OUT 4		FBA DATA OUT 5		FBA DATA OUT 6	
	ACSM1	FBA DATA OUT 5		FBA DATA OUT 6		FBA DATA OUT 7		FBA DATA OUT 8	

* With the ACS350, the first mapping entry is fixed and the others are configurable. With the ACSM1 all mapping entries are configurable.
** Configuration group 2

Note: The mapping entries of the PDO6 Rx can be configured through CANopen object 1605h or from the drive through fieldbus configuration parameter group 2.
The default COB ID for PDO6 Rx is 80000300h + Node ID, the default transmission type is 255 and the event time is 0. These values can be changed with CANopen object 1405h or from the drive with parameters 13, 14 and 15 of the fieldbus configuration group 1.

PDO6 Tx

		Mapped obj 1		Mapped obj 2		Mapped obj 3		Mapped obj 4	
Byte		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Object		6041h (Status Word) Fixed *		-		-		-	
CANopen Object for Mapping		1A05h01		1A05h02		1A05h03		1A05h04	
Mapping parameter **	**ACS350**	Not used		FBA DATA IN 4		FBA DATA IN 5		FBA DATA IN 6	
	ACSM1	FBA DATA IN 5		FBA DATA IN 6		FBA DATA IN 7		FBA DATA IN 8	

* With the ACS350, the first mapping entry is fixed and the others are configurable. With the ACSM1 all mapping entries are configurable.
** Configuration group 3

Note: The mapping entries of the PDO6 Tx can be configured through CANopen object 1A05h or from the drive through fieldbus configuration parameter group 3.
The default COB ID for PDO6 Tx is 80000280h + Node ID, the default transmission type is 255 and the event time is 0. These values can be changed with CANopen object 1605h or from the drive with parameters 16, 17 and 18 of the fieldbus configuration group 1.

PDO21 Rx

		Mapped obj 1		Mapped obj 2		Mapped obj 3		Mapped obj 4	
Byte		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Object		-		-		-		-	
CANopen Object for Mapping		1614h01		1614h02		1614h03		1614h04	
Mapping parameter **	**ACS350**	FBA DATA OUT 7		FBA DATA OUT 8		FBA DATA OUT 9		FBA DATA OUT 10	
	ACSM1	FBA DATA OUT 9		FBA DATA OUT 10		FBA DATA OUT 11		FBA DATA OUT 12	

** Configuration group 2

Note: The mapping entries of the PDO21 Rx can be configured through CANopen object 1614h or from the drive through fieldbus configuration parameter group 2.
The default COB ID for PDO21 Rx is 80000400h + Node ID, the default transmission type is 255 and the event time is 0. These values can be changed with CANopen object 1414h or from the drive with parameters 19, 20 and 21 of the fieldbus configuration group 1.

PDO21 Tx

		Mapped obj 1		Mapped obj 2		Mapped obj 3		Mapped obj 4	
Byte		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Object		-		-		-		-	
CANopen Object for Mapping		1A14h01		1A14h02		1A14h03		1A14h04	
Mapping parameter **	**ACS350**	FBA DATA IN 7		FBA DATA IN 8		FBA DATA IN 9		FBA DATA IN 10	
	ACSM1	FBA DATA IN 9		FBA DATA IN 10		FBA DATA IN 11		FBA DATA IN 12	

** Configuration group 3

Note: The mapping entries of the PDO21 Tx can be configured through CANopen object 1A14h or from the drive through fieldbus configuration parameter group 3.
The default COB ID for PDO21 Tx is 80000380h + Node ID and the default transmission type is 255 and the event time is 0. These values can be changed with CANopen object 1614h or from the drive with parameters 22, 23 and 24 of the fieldbus configuration group 1.

Mapping format

Note: Subindex 0h contains the number of valid entries within the mapping record. This number is also the number of the application variables (parameters), which shall be transmitted/received with the corresponding PDO. The subindexes from 1h to the number of objects contain information about the mapped application variables.

The mapping values in the CANopen object are hexadecimal coded. The following table presents an example of the PDO mapping entry structure:

Type	**MSB**		**LSB**
UINT32	31 16	15 8	7 0
Description	Index e.g. 1400h ≙ drive par.12.02 (16 bits)	Subindex e.g. 02 (8 bits)	Object length in bits e.g. 10h = 16 bits (8 bits)

If the PDO mappings are configured through fieldbus configuration parameters groups 2 and 3, only objects belonging to the virtual address area of the drive control and to the drive parameter area can be mapped, i.e. objects 6040h, 6042h, 6041h, 6044h, 6064h 60FF, 606C, 607Ah, 6077h, 6071h, 2001h, 2002h, 2003h, 2004h, 2005h, 2006h, 2000h03, 2000h06 and objects 4000h…4063h. The mapping values are in decimal format and only virtual addresses of the drive control (1...6 and 11...16) or drive parameter numbers (101...9999) can be set. FCAN-01 converts the values to CANopen objects. The length of the object is detected automatically.

Note: The PDO mappings should be started from subindex 1h. If a PDO mapping entry is zero, the mapping for that subindex and from that subindex onwards is neglected. I.e. if there are zeros in the PDO mapping, only objects from subindex 1h to the first zero are taken into account.

Service Data Objects (SDO)

Service Data Objects are mainly used for transferring non-time critical data, e.g. parameter values. SDOs provide access to the entries in the device Object Dictionary.

If 4 bytes (or less) of data is to be transmitted, an Expedited transfer SDO message can be used. Larger quantities of data can be segmented, i.e. split between several CAN messages.

The following services can be applied to SDO depending on the service requirements:

- **SDO Upload**, which can be divided into

- Initiate SDO Upload

- Upload SDO Segment.

- **SDO Download**, which can be divided into

- Initiate SDO Download

- Download SDO Segment.

- **Abort SDO Transfer**

With expedited transfer all data is transferred during the initialisation phase (Initiate SDO Upload/Download). With segmented transfer only part of the data is transferred during the initialisation phase and the rest of the data is transferred during the Upload/Download SDO Segment phase.

The COB IDs for the SDO communication are:

- Client to Server (Master to Slave): 600h + Node ID
- Server to Client (Slave to Master): 580h + Node ID.

SDO Download

Through this service the client of an SDO downloads data to the server (owner of the Object Dictionary).

The data, the multiplexor (index and subindex) of the data set that is downloaded and the data size are indicated to the server. The service is confirmed. The remote result parameter will indicate the success or failure of the request. In case of a failure, an Abort SDO Transfer request has to be executed.

SDO Upload

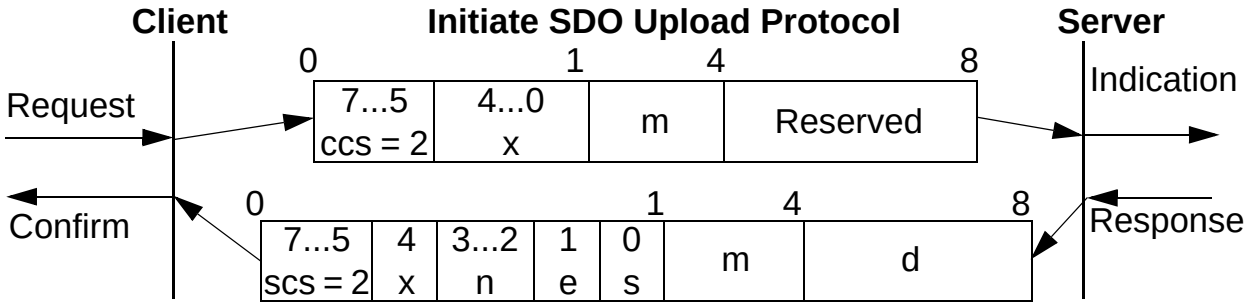
Through this service the client of an SDO requests the server to prepare to upload data to the client.

The multiplexor (index and subindex) of the data set to be uploaded is indicated to the server. The service is confirmed. The remote result parameter will indicate the success of the request. In case of a failure, an Abort SDO Transfer request has to be executed. In case of success, the size of the data to be uploaded is confirmed. In case of successful expedited upload, this service concludes the upload of the data set (identified by the multiplexor) and confirms the corresponding data.

Read Service (SDO Upload)

Initiate SDO Upload Protocol

This protocol is used to implement the Initiate SDO Upload service.

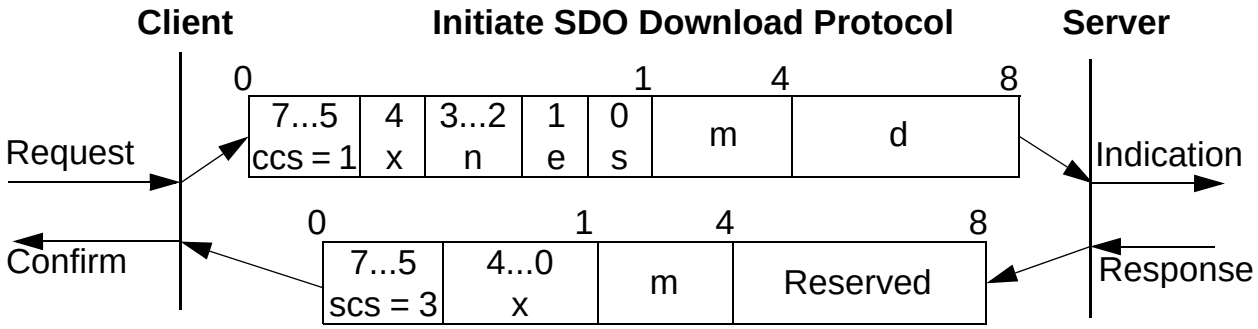


ccs	Client command specifier. ccs = 2: Initiate upload request.
scs	Server command specifier. scs = 2: Initiate upload response.
n	Number of data bytes (in d) which do not contain data. Bytes [8-n, 7] do not contain segment data. Valid only if e = 1 and s = 1 (otherwise n = 0).
e	Transfer type. e = 0: Normal transfer. e = 1: Expedited transfer.
s	Size indicator. s = 0: No data set size indication. s = 1: Data set size indication.
m	Multiplexor. Represents the index/subindex of the data to be transfer by the SDO.
d	Data. e = 0, s = 0: Reserved for further use. e = 0, s = 1: Contains the number of bytes to be uploaded. Byte 4 contains the LSB and byte 7 contains the MSB. e = 1, s = 1: Contains the data of length 4-n to be uploaded. The encoding depends on the type of the data referenced by index and subindex e = 1, s = 0: Contains unspecified number of bytes to be uploaded.
x	Not used. Value is always 0.
Reserved	Reserved for further use. Value is always 0.

Write Service (SDO Download)

Initiate SDO Download Protocol

This protocol is used to implement the Initiate SDO Download service.

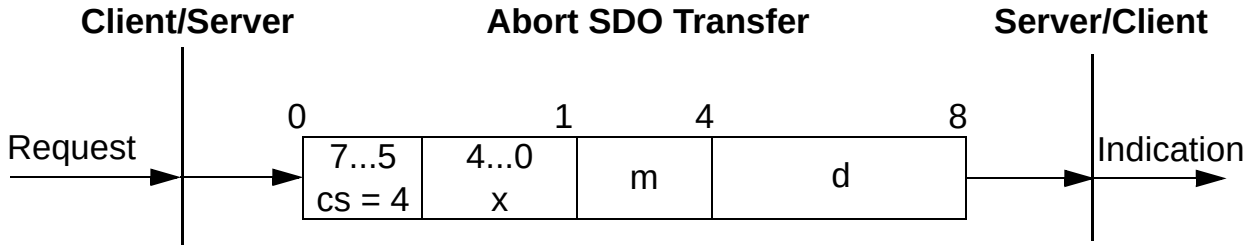


ccs	Client command specifier. ccs = 1: Initiate download request.
scs	Server command specifier. scs = 3: Initiate download response.
n	Number of data bytes (in d) which do not contain data. Bytes [8-n, 7] do not contain segment data. Valid only if e = 1 and s = 1 (otherwise n = 0).
e	Transfer type. e = 0: Normal transfer. e = 1: Expedited transfer.
s	Size indicator. s = 0: No data set size indication. s = 1: Data set size indication
m	Multiplexor. Represents the index/subindex of the data to be transfer by the SDO.
d	Data. e = 0, s = 0: Reserved for further use. e = 0, s = 1: Contains the number of bytes to be downloaded. Byte 4 contains the LSB and byte 7 contains the MSB. e = 1, s = 1: Contains the data of length 4-n to be downloaded. The encoding depends on the type of the data referenced by index and subindex e = 1, s = 0: Contains unspecified number of bytes to be downloaded
X	Not used. Value is always 0
Reserved	Reserved for further use. Value is always 0.

Abort SDO Transfer

Abort SDO Transfer Protocol

This protocol is used to implement the Abort SDO Transfer Service.



cs	Command specifier. cs = 4: Abort transfer request.
x	Not used. Value is always 0.
m	Multiplexor. Represents the index and subindex of the SDO.
d	Contains a 4 byte abort code which includes the reason for the abort.

Abort code description

Error class	Error code	Additional code	Description
05	**03**	0000h	Toggle bit not alternated
	04	0000h	SDO protocol timeout
		0001h	Client/Server command specifier not valid or unknown
		0002h	Invalid block size (block mode only)
		0003h	Invalid sequence number (block mode only)
		0004h	CRC error (block mode only)
		0005h	Out of memory
06	**01**	0000h	Unsupported access to an object
		0001h	Attempt to read a write-only object.
		0002h	Attempt to write a read-only object.
	02	0000h	Object does not exist in the Object Dictionary.
	04	0041h	Object cannot be mapped to the PDO.
		0042h	The number and length of the objects to be mapped would exceed the PDO length.
		0043h	General parameter incompatibility
		0047h	General internal incompatibility in the device
	06	0000h	Access failed because of hardware error
	07	0010h	Data type does not match. Length of service parameter does not match.
		0012h	Data type does not match. Length of service parameter is too long.
		0013h	Data type does not match. Length of service parameter is too short.

Error class	Error code	Additional code	Description
	09	0011h	Subindex does not exist.
		0030h	Parameter value range is exceeded (for write access parameters).
		0031h	Value of written parameter is too high.
		0032h	Value of written parameter is too low.
		0036h	Maximum value is less than minimum value.
08	**00**	0000h	General error
		0020h	Data cannot be transferred or stored to the application.
		0021h	Data cannot be transferred or stored to the application because of local control.
		0022h	Data cannot be transferred or stored to the application because of the active device state.
		0023h	Object Dictionary dynamic generation fails or no Object Dictionary is present (e.g. object dictionary is generated from a file and generation fails because of file error).

The abort codes not listed here are reserved.

CANopen Object Dictionary

Each object within the dictionary is addressed using a 16-bit index.

Object Dictionary Structure

The overall layout of the standard Object Dictionary:

Index (hex)	Object
0000	Not used
0001...001F	Static Data Types
0020...003F	Complex Data Types
0040...005F	Manufacturer Specific Complex Data Types
0060...007F	Device Profile Specific Static Data Types
0080...009F	Device Profile Specific Complex Data Types
00A0...0FFF	Reserved for further use
1000...1FFF	Communication Profile Area
2000...5FFF	Manufacturer Specific Profile Area 2000...2006 virtual Control/Status Words 4001...4063 drive parameter area
6000...9FFF	Standardised Device Profile Area
A000...BFFF	Standardised Interface Profile area
C000...FFFF	Reserved for further use

The serial communication properties of the drive, as well as drive parameters, are detailed further in the appropriate drive firmware manual.

Communication profile area (1000...1FFF)

<table>
<tr><th>Index (hex)</th><th>Sub-index</th><th>Name</th><th>Type</th><th>Attri-bute</th><th>Information</th></tr>
<tr><td>1000</td><td>0</td><td>Device Type</td><td>U32</td><td>RO</td><td>Describes the type of the device. Composed of two 16-bit fields (one for device profile, the other for additional information). The object value of the FCAN-01 is 01192h, which corresponds to drive profile DSP 402 (192h), and to additional information Frequency Converter (01h).</td></tr>
<tr><td>1001</td><td>0</td><td>Error Register</td><td>U8</td><td>RO</td><td>Error register for the FCAN-01. Bit encoded according to DS 301/401. Bit value 1 = error occurred.
<table>
<tr><th>Bit</th><th>Description</th></tr>
<tr><td>0</td><td>Generic error</td></tr>
<tr><td>1</td><td>Current</td></tr>
<tr><td>2</td><td>Voltage</td></tr>
<tr><td>3</td><td>Temperature</td></tr>
<tr><td>4</td><td>Communication error</td></tr>
<tr><td>5</td><td>Device profile specific</td></tr>
<tr><td>6</td><td>Reserved</td></tr>
<tr><td>7</td><td>Manufacturer specific</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Index (hex)</th><th>Sub-index</th><th>Name</th><th>Type</th><th>Attri-bute</th><th>Information</th></tr>
<tr><td rowspan="4">1003</td><td>0</td><td>Pre-defined Error Field</td><td>U8</td><td>RW</td><td>Number of errors occurred and listed at subindexes 1 to 5. Writing a zero here deletes the list.</td></tr>
<tr><td>1</td><td>Pre-defined Error Field</td><td>U32</td><td>RO</td><td rowspan="3">List of errors. The most recent error is at subindex 1. When a new error occurs, previous errors move down the list. Error numbers comprise a 16-bit error code (see the appropriate drive firmware manual and chapter CANopen error codes on page 117) and a 16-bit additional information field (0 with FCAN-01). The error code is contained in the lower 2 bytes (LSB), the additional information in the upper 2 bytes (MSB).
Slave to master
<table>
<tr><th rowspan="2">Header</th><th colspan="2">Byte</th></tr>
<tr><th>1...2</th><th>3</th></tr>
<tr><td rowspan="3">0001xxxxxx01000</td><td>Error code</td><td>Error register</td></tr>
<tr><th>4...7</th><th>8</th></tr>
<tr><td>Additional error info</td><td>Unused</td></tr>
</table></td></tr>
<tr><td>• • •</td><td>• • •</td><td>• • •</td><td>• • •</td></tr>
<tr><td>5</td><td>Pre-defined Error Field</td><td>U32</td><td>RO</td></tr>
<tr><td>1005</td><td>0</td><td>COB ID SYNC Message</td><td>U32</td><td>RW</td><td>Identifier of the SYNC message. The SYNC message controls the actions of PDOs that have the transmission type Synchronous.</td></tr>
<tr><td>1008</td><td>0</td><td>Manufacturer Device Name</td><td>Visible string</td><td>RO</td><td>Module name. The constant string is FCAN-01 and ACxxxx.</td></tr>
<tr><td>1009</td><td>0</td><td>Manufacturer Hardware Version</td><td>Visible string</td><td>RO</td><td>Version of the module hardware.
The constant string is xx.xxy, e.g. v.01.00A.</td></tr>
</table>

Index (hex)	Sub-index	Name	Type	Attri-bute	Information
100A	0	Manufacturer Software Version	Visible string	RO	Version of the FCAN-01 module software. The constant string is x.x where x.x = version number, e.g. *2.0*.
100C	0	Guard Time	U16	RW	Guard Time (ms) × Life Time Factor = Life time for the Node Guarding Protocol
100D	0	Life Time Factor	U8	RW	
1010	0	Store Parameters	U32	RO	Largest supported subindex
	1		U32	RW	Saves all parameters (and provides information about the saving capabilities). Bit 0 value 1 indicates that the device saves parameters on command. 65766173h (evas). (1
	2		U32	RW	Saves communication parameters (1000h...1FFFh).
	3		U32	RW	Saves application parameters (6000h...9FFFh).
	4		U32	RW	Saves drive parameters (4001h...4063h).
1011	0	Restore Default Parameters	U32	RO	Largest supported subindex
	1		U32	RW	Restore all default parameters. 64616F6Ch (daol) (1
	2		U32	RW	Restore communication default parameters (1000h...1FFFh).
	3		U32	RW	Restore application default parameters (6000h...9FFFh).
	4		U32	RW	Restore drive default parameters (4001h...4063h). (1

Index (hex)	Sub-index	Name	Type	Attri-bute	Information
1014	0	COB ID Emergency Message	U32	RW	Defines the COB ID of the Emergency Object (EMCY). Default: 80h + Node ID
1017		Producer Heartbeat Time	U16	RW	Defines the cycle time of the heartbeat (multiple of 1 ms). 0 = Not used.
1018	0	Identity Object	U8	RO	Number of entries
	1		U32	RO	Vendor ID. Default: B7h = ABB (Oy)
	2		U32	RO	Product code. E.g. 1F600h = ACS350
	3		U32	RO	Module revision
	4		U32	RO	Serial number
1400	0	Receive PDO1 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 200h + Node ID
	2	Transmission Type	U8	RW	Default: 255 = FFh (asynchronous transmission) (2
	3	Inhibit time	U16	RW	
	5	Event timer	U16	RW	0...65535 ms 0 = not used Default: 0

Index (hex)	Sub-index	Name	Type	Attri-bute	Information
1600	0	Receive PDO1 Mapping	U8	RO	Number of mapped objects Default: 1 (high limit 4) Determines which mapped objects 1...4 are visible/used. Subindexes 0...4 are freely programmable. *
	1	Mapped Obj 1	U32	RW	6040h (60400010h) Control Word (fixed with ACS350)
	2	Mapped Obj 2	U32	RW	
	3	Mapped Obj 3	U32	RW	
	4	Mapped Obj 4	U32	RW	
1405	0	Receive PDO6 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 80000300h + Node ID ≙ PDO not valid, MSB set (2
	2	Transmission Type	U8	RW	Default: 255 asynchronous (2
	3	Inhibit time	U16	RW	
	5	Event timer	U16	RW	0...65535 ms 0 = not used Default: 0

Index (hex)	Sub-index	Name	Type	Attri-bute	Information
1605	0	Receive PDO6 Mapping	U8	RO	Number of mapped objects Default: 1 (high limit 4) Determines which mapped objects 1...4 are visible/used. Subindexes 0...4 are freely programmable. *
	1	Mapped Obj 1	U32	RW	6040h (60400010h) Control Word (fixed with ACS350)
	2	Mapped Obj 2	U32	RW	
	3	Mapped Obj 3	U32	RW	
	4	Mapped Obj 4	U32	RW	
1414	0	Receive PDO21 Parameter	U8	RO	Number of entries
	1	COB-ID	U32	RW	Default: 80000400h + NODE ID (≙ PDO not valid) (2
	2	Transmission Type	U8	RW	Default: 255 (2
	3	Inhibit time	U16	RW	
	5	Event timer	U16	RW	0...65535 ms 0 = not used Default: 0

Index (hex)	Sub-index	Name	Type	Attri-bute	Information
1614	0	Receive PDO21 Mapping	U8	RW	Number of mapped objects Default: 0 (high limit 4) Determines which mapped objects 1...4 are visible/used. Subindexes 0...4 are freely programmable.
	1	Mapped Obj 1	U32	RW	E.g. 20060210h = Const speed 1 with ACS350. See section *PDO21 Rx* on page *88*. (2
	2	Mapped Obj 2	U32	RW	
	3	Mapped Obj 3	U32	RW	
	4	Mapped Obj 4	U32	RW	
1800	0	Transmit PDO1 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 180h + Node ID
	2	Transmission Type	U8	RW	Default: 255 (asynchronous transmission) (2
	3	Inhibit Time	U16	RW	
	5	Event Timer	U16	RW	0...65535 ms. 0 = Not used. Default: 0
1A00	0	Transmit PDO1 Mapping	U32	RO	Number of mapped objects Default: 1 (high limit 4) Determines which mapped objects 1...4 are visible/used. Subindexes 0...4 are freely programmable.*
	1	Mapped Obj 1	U32	RW	6041h (60410010h) Status Word (fixed with ACS350)
	2	Mapped Obj 2	U32	RW	
	3	Mapped Obj 3	U32	RW	
	4	Mapped Obj 4	U32	RW	

Index (hex)	Sub-index	Name	Type	Attri-bute	Information
1805	0	Transmit PDO6 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 80000280h + NODE ID (= PDO not valid) (2
	2	Transmission Type	U8	RW	Default: 255 (asynchronous transmission) (2
	3	Inhibit Time	U16	RW	
	5	Event Timer	U16	RW	0...65535 ms. 0 = Not used. Default: 0
1A05	0	Transmit PDO6 Mapping	U8	RO	Number of mapped objects Default: 1 (high limit 4) Determines which mapped objects 1...4 are visible/used. Subindexes 0...4 are freely programmable.*
	1	Mapped Obj 1	U32	RW	6041h (60410010h) Status Word (fixed with ACS350)
	2	Mapped Obj 2	U32	RW	
	3	Mapped Obj 3	U32	RW	
	4	Mapped Obj 4	U32	RW	

Index (hex)	Sub-index	Name	Type	Attri-bute	Information
1814	0	Transmit PDO21 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 80000380h + NODE ID (= not valid) (2
	2	Transmission Type	U8	RW	(2
	3	Inhibit Time	U16	RW	
	5	Event Timer	U16	RW	0...65535 ms. 0 = Not used. Default: 0
1A14	0	Transmit PDO21 Mapping	U8	RW	Number of mapped objects Default: 0 (high limit 4) Determines which mapped objects 1...4 are visible/used. Subindexes 0...4 are freely programmable.
	1	Mapped Obj 1	U32	RW	
	2	Mapped Obj 2	U32	RW	
	3	Mapped Obj 3	U32	RW	
	4	Mapped Obj 4	U32	RW	

(1 **WARNING**: Drive default values are set immediately after the restore command. Without discrete reset command or power cycle, FCAN-01 loses connection to the drive.
(2 See chapter *Dictionary structure and entries* on page *115*.
* With ACS350 subindex 1 is fixed

Uxx = unsigned xx
INT = signed xx

Manufacturer specific profile area (2000...5FFF)

Manufacturer specific profile objects

Index (hex)	Sub-index	Name	Type	Attri-bute	Information
2000	0	Virtual Address of the drive control	U8	RO	Number of entries
	3	REF2	INT16	RW	Reference 2
	6	ACT2	INT16	RO	Actual value 2
2001	0	Transparent 32 Control Word	U32	RW	32-bit Transparent Control Word
2002	0	Transparent 32 Reference 1	INT32	RW	32-bit Transparent Reference 1
2003	0	Transparent 32 Reference 2	INT32	RW	32-bit Transparent Reference 2
2004	0	Transparent 32 Status Word	U32	RO	32-bit Transparent Status Word
2005	0	Transparent 32 Actual 1	INT32	RO	32-bit Transparent Actual 1
2006	0	Transparent 32 Actual 2	INT32	RO	32-bit Transparent Actual 2
2100	0	Number of entries	U8	RO	
	1	Alarm code 1 (latest)	U16	RO	
	2	Alarm code 2	U16	RO	
	3	Alarm code 3	U16	RO	
	4	Alarm code 4	U16	RO	
	5	Alarm code 5 (oldest)	U16	RO	

Drive actual signals and parameters

The actual signals and parameters available depend on the drive type. See the appropriate drive firmware manual for signal and parameter listings.

The Read service is used for reading actual signals and parameters from the drive. The Write service is used for writing parameter values to the drive. Both the Read and Write services use the same parameter mapping system. CANopen Index equals drive parameter group in hexadecimal format + 4000h and subindex is parameter index. For example, the index for drive parameter 30.19 equals 1Eh + 4000h = 401Eh and subindex = 19 (dec) = 13h.

Index (hex)	Subindex	Name	Type	Attribute	Information
4001	1	Drive signal 1.01	(1	(2	(3
	2	Drive signal 1.02	(1	(2	(3
• • •	• • •	• • •	• • •	• • •	• • •
4002	1	Drive signal 2.01	(1	(2	(3
• • •	• • •	• • •	• • •	• • •	• • •
4003	1	Drive signal 3.01	(1	(2	(3
• • •	• • •	• • •	• • •	• • •	• • •
400A	1	Drive par. 10.01	(1	(2	(3
	2	Drive par. 10.02	(1	(2	(3
• • •	• • •	• • •	• • •	• • •	• • •
400B	1	Drive par. 11.01	(1	(2	(3
• • •	• • •	• • •	• • •	• • •	• • •
4063	1	Drive par. 99.01	(1	(2	(3
• • •	• • •	• • •	• • •	• • •	• • •

Subindex 0 = number of mapped objects.
(1 U16, INT16, U32 or INT32
(2 Depends on parameter type of the drive.
(3 See the appropriate drive firmware manual.

Standardised device profile area DSP 402 (6000...9FFF)

Index	Sub	Access	Type	Name	Information	Support						
						all	hm	pp	ip	pv	pt	vl
603Fh		RO	U16	Error code	See chapter *CANopen error codes* on page *117*.	x						
6040h		RW	U16	Control word	See chapter *Communication profiles* on page *59*.	x						
6041h		RO	U16	Status word		x						
6042h		RW	INT16	Target velocity								x
6043h		RO	INT16	Vl velocity demand	Instantaneous velocity provided by the ramp function. Scaled to the unit of the vl target velocity.							x
6044h		RO	INT16	Vl control effort	See chapter *Communication profiles* on page *59*.							x
6046h				Vl velocity min max amount	Vl velocity min max amount							x
	0	RO	U8	Number of entries	Default: 2							x
	1	RW	U32	Vl velocity min amount	Mapped internally to vl velocity min pos and vl velocity max neg values							x
	2	RW	U32	Vl velocity max amount	Mapped internally to vl velocity max pos and vl velocity max neg values							x
6048h				Vl velocity acceleration	Slope of the acceleration ramp = delta speed / delta time. If delta time = 0, function follows the setpoint (=target velocity) value							x
	0	RO	U8	Number of entries	Default: 2							x
	1	RW	U32	Delta speed	[rpm]							x
	2	RW	U16	Delta time	0...65536 [sec]							x
6049h				Vl velocity decelera-tion	Slope of the deceleration ramp = delta speed / delta time. If delta time = 0, function follows the setpoint (=target velocity) value							x
	0	RO	U8	Number of entries	Default: 2							x
	1	RW	U32	Delta speed	[rpm]							x
	2	RW	U16	Delta time	0...65536 [sec]							x

6060h		W	INT8	Modes of operation	-128...-1 M*anufacturer specific* *0 Reserved* *1 Profile position* *2 Velocity mode* *3 Profile velocity* *4 Torque profile* *5 Reserved* 6 Homing 7 Interpolated position 8...127 Reserved **Note:** the mode of operation cannot be changed with this object. See section *Modes of operation* on page *63*.	x						
6061h		RO	INT8	Modes of operation display	See index 6060h	x						
6064h		RO	INT32	Position actual value	See chapter *Communication profiles* on page *59*.			x				
6069b		RO	INT32	Velocity sensor actual value	Value read from a velocity encoder.					x		
606Bh		RO	INT32	Velcoty demand value	Demand value from the velocity controller.					x		
606Ch		RO	INT32	Velocity actual value	See chapter *Communication profiles* on page *59*.					x		
6071h		RW	INT16	Target torque							x	
6077h		RW	INT16	Torque actual value							x	
607Ah		RW	INT32	Target position				x				
6081h		RW	INT32	Profile velocity	The velocity attained at the end of the acceleration ramp during a profiled move.			x			x	
6083h		RW	U32	Profile acceleration	The acceleration during a profiled move.			x			x	
6084h		RW	U32	Profile decelaration	The deceleration during a profiled move.			x			x	
6098h		RW	INT8	Homing method	0 = No homing method required 1...35 = Methods 1...35 See drive's firmware manual for description of the methods		x					
6099h				Homing speeds			x					
	0	RO	U8	Number of entries	Default: 2		x					
	1	RO	U32	Speed during search for switch			x					
	2	RO	U32	Speed during search for zero			x					

60FF		RW	INT32	Target velocity	See chapter *Communication profiles* on page *59*.					x		
6402h		RW	U16	Motor type	0000h Non-standard motor 0001h Phase-modulated DC motor 0002h Frequency-controlled DC motor 0003h PM synchronous motor 0004h FC synchronous motor 0005h Switched reluctance motor 0006h Wound rotor induction motor 0007h Squirrel cage induction motor 0008h Stepper motor 0009h Micro-step stepper motor 000Ah Sinusoidal PM BL motor 000Bh Trapezoidal PM BL motor 000Ch Reserved ... 7FFFh Reserved 8000h Manufacturer-specific ... FFFFh Manufacturer-specific	x						
6502h		RO	U32	Supported drive modes	Bit 31...16 Manufacturer-specific Bit 15...7 Reserved Bit 6 Inter-polated position mode Bit 5 Homing mode Bit 4 Reserved Bit 3 Profile torque mode Bit 2 Profile velocity mode Bit 1 Velocity mode Bit 0 Profile position mode	x						
6504		RO	Visi-ble string	Drive manufacturer	Drive manufacturer name. The constant string is ABB Drives.							
6505b		RO	Visi-ble string	http drive catalog address	Constant string: www.abb.com							
* Not supported												

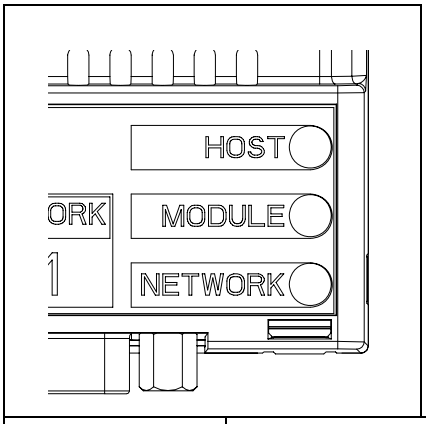
Diagnostics

What this chapter contains

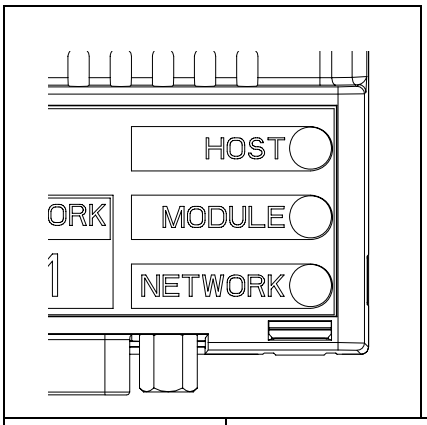
This chapter explains how to trace faults with the status LEDs on the FCAN-01 module.

LED indications

The FCAN-01 module is equipped with three bicolour diagnostic LEDs. The LEDs are described below.



Name	Colour	Function
HOST	Blinking green	Establishing communication to host
	Green	Connection to host OK
	Blinking red	Communication to host lost
MODULE (CANopen ERROR)	Off	Module status OK
	Red single flash	CANopen controller error counters have reached the warning limit (i.e. too many error frames).
	Red double flash	A guard event or a receive heartbeat timeout has occurred.
	Red	CANopen controller is in bus off state.



Name	Colour	Function
NETWORK (CANopen RUN)	Green single flash	Module is in stopped state.
	Blinking green	Module is in pre-operational state.
	Green	Module is in operational state.

Dictionary structure and entries

What this chapter contains

This chapter contains information about PDO transmission and mapping.

Description of transmission type

Transmission type	PDO transmission				
	Cyclic	Acyclic	Synchronous	Asynchronous	RTR only
0		+	+		
1...240	+		+		
241...251	Reserved				
252			+		+
253				+	+
254 (1				+	
255 (2				+	

(1 The transmission of this PDO is initiated by an event device. The event is manufacturer specific.
(2 The transmission of this PDO is initiated by an event on the device. This event must be defined in the device profile.

Description of PDO COB-ID entry

Bit	Value	Description
31	0	PDO valid
	1	PDO not valid
30	0	RTR allowed on this PDO
	1	No RTR allowed on this PDO
29	0	11 bit ID is used (CAN 2.0A). (1
	1	29 bit ID is used (CAN 2.0B). (2
28...11	0	If 11 bit ID is used, bit 28...11 = 0.
	x	If 29 bit ID is used, bit 28...0 = COB ID.
10...0	x	COB ID

(1 Recommended
(2 Not supported

PDO mapping entry structure - example

Type	MSB		LSB
UINT32	31 16	15 8	7 0
Description	Index e.g. 1400h ≙ drive par.12.02 (16 bits)	Subindex e.g. 02 (8 bits)	Object length in bits e.g. 10h = 16 bits (8 bits)

CANopen error codes

What this chapter contains

This chapter contains the CANopen error codes.

Error codes

Error codes can be read from objects 1003h, 200Bh and 603Fh. Error codes between xx80h...xxFFh and between FF00h...FFFFh are manufacturer specific. Description for these error codes can be found from the appropriate drive firmware manual and/or from the drive fault code parameter.

Error code (hex)	Meaning
0000	No error
1000	Generic error
2000	Current
2100	Current on device input side
2110	Short circuit / Earth leakage
2120	Earth leakage
2121	Earth leakage phase L1
2122	Earth leakage phase L2
2123	Earth leakage phase L3
2130	Short circuit
2131	Short circuit phases L1-L2
2132	Short circuit phases L2-L3
2133	Short circuit phases L3-L1
2200	Internal current
2211	Internal current No. 1
2212	Internal current No. 2
2213	Overcurrent in ramp function
2214	Overcurrent in sequence

Error code (hex)	Meaning
2220	Continuous overcurrent
2221	Continuous overcurrent No. 1
2222	Continuous overcurrent No. 2
2230	Short circuit / Earth leakage
2240	Earth leakage
2250	Short circuit
2300	Current on device output side
2310	Continuous overcurrent
2311	Continuous overcurrent No. 1
2312	Continuous overcurrent No. 2
2320	Short circuit / Earth leakage
2330	Earth leakage
2331	Earth leakage phase U
2332	Earth leakage phase V
2333	Earth leakage phase W
2340	Short circuit
2341	Short circuit phases U-V
2342	Short circuit phases V-W
2343	Short circuit phases W-U
3000	Voltage
3100	Mains voltage
3110	Mains overvoltage
3111	Mains overvoltage phase L1
3112	Mains overvoltage phase L2
3113	Mains overvoltage phase L3
3120	Mains undervoltage
3121	Mains undervoltage phase L1
3122	Mains undervoltage phase L2
3123	Mains undervoltage phase L3
3130	Phase failure
3131	Phase failure L1

Error code (hex)	Meaning
3132	Phase failure L2
3133	Phase failure L3
3134	Phase sequence
3140	Mains frequency
3141	Mains frequency too great
3142	Mains frequency too small
3200	DC link voltage
3210	DC link overvoltage
3211	Overvoltage No. 1
3212	Overvoltage No. 2
3220	DC link undervoltage
3221	Undervoltage No. 1
3222	Undervoltage No. 2
3230	Load error
3300	Output voltage
3310	Output overvoltage
3311	Output overvoltage phase U
3312	Output overvoltage phase V
3313	Output overvoltage phase W
3320	Armature circuit
3321	Armature circuit interrupted
3330	Field circuit
3331	Field circuit interrupted
4000	Temperature
4100	Ambient temperature
4110	Excess ambient temperature
4120	Too low ambient temperature
4130	Temperature supply air
4140	Temperature air outlet
4200	Temperature device
4210	Excess temperature device

Error code (hex)	Meaning
4220	Too low temperature device
4300	Temperature drive
4310	Excess temperature drive
4320	Too low temperature drive
4400	Temperature supply
4410	Excess temperature supply
4420	Too low temperature supply
5000	Device hardware
5100	Supply
5110	Supply low voltage
5111	U1 = supply +/-15 V
5112	U2 = supply +24 V
5113	U3 = supply +5 V
5114	U4 = manufacturer specific
5115	U5 = manufacturer specific
5116	U6 = manufacturer specific
5117	U7 = manufacturer specific
5118	U8 = manufacturer specific
5119	U9 = manufacturer specific
5120	Supply intermediate circuit
5200	Control
5210	Measurement circuit
5220	Computing circuit
5300	Operating unit
5400	Power section
5410	Output stages
5420	Chopper
5430	Input stages
5440	Contactors
5441	Contactor 1 = manufacturer specific
5442	Contactor 2 = manufacturer specific

Error code (hex)	Meaning
5443	Contactor 3 = manufacturer specific
5444	Contactor 4 = manufacturer specific
5445	Contactor 5 = manufacturer specific
5450	Fuses
5451	S1 = L1
5452	S2 = L2
5453	S3 = L3
5454	S4 = manufacturer specific
5455	S5 = manufacturer specific
5456	S6 = manufacturer specific
5457	S7 = manufacturer specific
5458	S8 = manufacturer specific
5459	S9 = manufacturer specific
5500	Data storage
5510	Working memory
5520	Program memory
5530	Non-volatile data memory
6000	Device software
6010	Software reset (Watchdog)
6100	Internal software
6200	User software
6300	Data record
6301	Data record No. 1
...	...
6314	Data record No. 14
630F	Data record No. 15
6310	Loss of parameters
6320	Parameter error
7000	Additional modules
7100	Power
7110	Brake chopper

Error code (hex)	Meaning
7111	Failure brake chopper
7112	Overcurrent brake chopper
7113	Protective circuit brake chopper
7120	Motor
7121	Motor blocked
7122	Motor error or communication malfunc.
7123	Motor tilted
7200	Measurement circuit
7300	Sensor
7301	Tacho fault
7302	Tacho wrong polarity
7303	Resolver 1 fault
7304	Resolver 2 fault
7305	Incremental sensor 1 fault
7306	Incremental sensor 2 fault
7307	Incremental sensor 3 fault
7310	Speed
7320	Position
7400	Computation circuit
7500	Communication
7510	Serial interface No. 1
7520	Serial interface No. 2
7600	Data storage
8000	Monitoring
8100	Communication
8110	CAN overrun (objects lost)
8120	CAN in Error Passive Mode
8130	Life guard error or heartbeat error
8140	Recovered from bus-off
8150	Transmit COB-ID
8200	Protocol error

Error code (hex)	Meaning
8210	PDO not processed due to length error
8220	PDO length exceeded
8300	Torque control
8311	Excess torque
8312	Difficult start up
8313	Standstill torque
8321	Insufficient torque
8331	Torque fault
8400	Velocity speed controller
8500	Position controller
8600	Positioning controller
8611	Following error
8612	Reference limit
8700	Sync controller
8800	Winding controller
8900	Process data monitoring
8A00	Control
9000	External error
F000	Additional functions
F001	Deceleration
F002	Sub-synchronous run
F003	Stroke operation
F004	Control
FF00	Manufacturer specific
...	...
FFFF	Manufacturer specific

Definitions and abbreviations

What this chapter contains

This chapter explains definitions and abbreviations concerning the CANopen protocol family.

CANopen definitions

CAN

Controller Area Network

CiA

CAN in Automation International User’s and Manufacturer’s Group

CMS

CAN Message Specification; one of the service elements of the CAN Application Layer in the CAN Reference Model

COB

Communication Object; a unit of transportation on a CAN network. Data is sent across a network inside a COB. The COB itself is part of the CAN message frame.

DBT

Distributor; one of the service elements of the CAN Application Layer in the CAN Reference Model. It is the responsibility of the Distributor to distribute COB IDs to the COBs that are used by a CMS.

EDS

Electronic Data Sheet; a node-specific ASCII-format file required when configuring the CAN network. The EDS file contains general information on the node and its dictionary objects (parameters). EDS files for ABB Drives are available through your local ABB representative.

LMT

Layer Management; one of the service elements of the CAN Application Layer in the CAN Reference Model. It serves to configure parameters for each layer in the CAN Reference Model.

NMT

Network Management; one of the service elements of the CAN Application Layer in the CAN Reference Model. It performs initialisation, configuration and error handling on a CAN network.

Object dictionary

A local storage of all Communication Objects (COB) recognised by a device

OSI

Open Systems Interconnection

PDO

Process Data Object; a type of COB. Used for transmitting time critical data, such as control commands, references and actual values.

RO

Denotes read-only access.

RW

Denotes read/write access.

SDO

Service Data Object; a type of COB. Used for transmitting non time critical data, such as parameters.

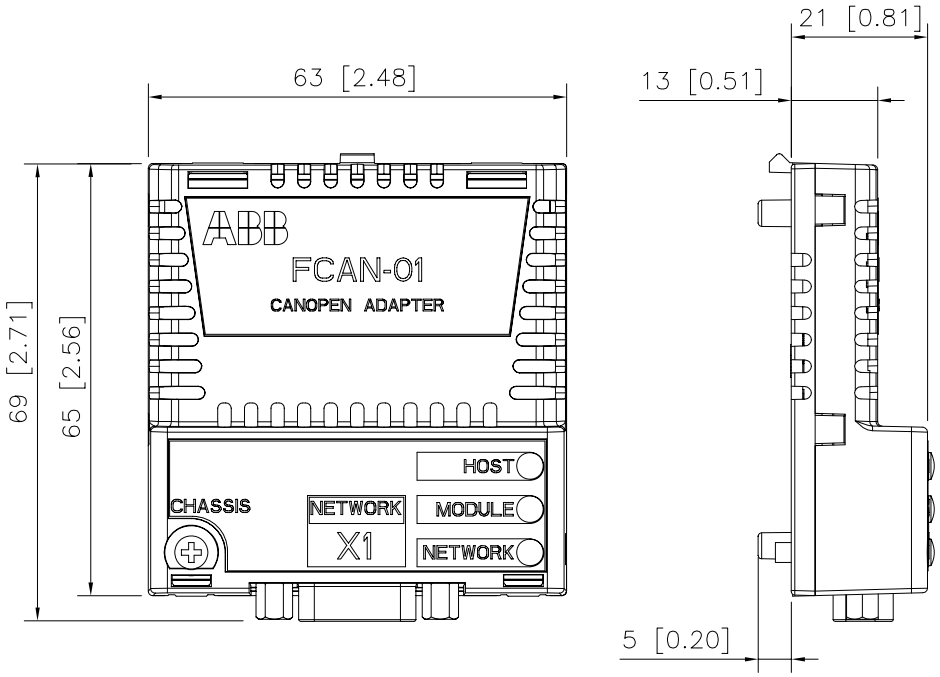
Technical data

What this chapter contains

This chapter contains the technical specifications of the FCAN-01 module.

FCAN-01

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 bicolour LEDs (HOST, MODULE, NETWORK)

Settings:

- Through drive parameters

Connectors:

- 20-pin connector to drive (X2)
- 9-pin male D-SUB connector to bus (X1)

Power supply:

- +3.3 V ±5% max. 300 mA (supplied by the drive)

General:

- Estimated minimum lifetime: 100 000 h
- All materials UL/CSA-approved
- Complies with EMC standards EN 61000-6-2: 2001 and EN 61000-6-4: 2001.
- Bus interface functionally isolated from drive

CANopen link

Compatible devices: All CANopen-compliant devices

Medium: Shielded twisted pair with nominal impedance of 120 ohms (CANopen-approved cable recommended)

- Termination: 120 ohms, or active termination circuitry at each end of trunk cable (termination not built in the FCAN-01 module)

Transfer rate: 1 Mb/s max. (1 Mbit/s; 500 kbit/s; 250 kbit/s; 125 kbit/s; 100 kbit/s; 50 kbit/s)

Serial communication type: Asynchronous, half-duplex, CAN

Protocol: CANopen

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