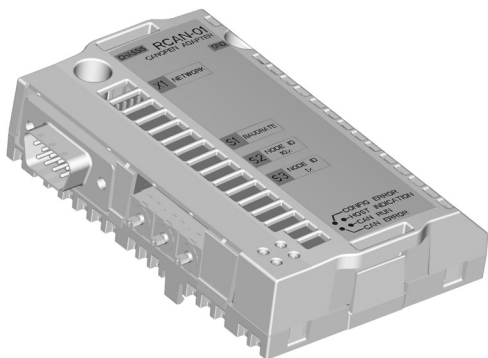


User's Manual CANopen Adapter Module RCAN-01



CANopen Adapter Module RCAN-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 RCAN-01 CANopen Adapter module.

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

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

General safety instructions



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

The drive and adjoining equipment must be properly earthed.

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

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

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

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Introduction

What this chapter contains

This chapter contains a description of the User's manual for the RCAN-01 CANopen Adapter module.

Intended audience

The manual is intended for people responsible for installing, commissioning and using the RCAN-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.

What this manual contains

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

It is assumed that the drive is installed and ready to operate before starting the installation of the adapter module. For more information on the installation and start-up procedures of the drive, see the appropriate drive manuals.

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

Overview contains a short description of the CANopen protocol and the RCAN-01 module, a delivery checklist, and information on the manufacturer's warranty.

Mechanical installation contains placing and mounting instructions for the module.

Electrical installation contains wiring, bus termination and earthing instructions.

Programming explains how to program the master station and the drive before the communication through the RCAN-01 module can be started.

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

Fault tracing explains how to trace faults with the status LED indications of the RCAN-01 module.

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

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

Technical data contains information on physical dimensions, configurable settings and connectors and CANopen network.

Dictionary structure and entries contains PDO transmission and mapping tables.

Terms used in this manual

Communication module

Communication module (often abbreviated COMM. MODULE or COMM.) is a parameter name / parameter selection name for a device (e.g. a fieldbus adapter) through which the drive is connected to an external serial communication network.

The communication with the communication module is activated with a drive parameter (see the appropriate drive firmware manual).

Data sets and data words

Each data set consists of three 16-bit words, i.e. data words.

The Control Word (sometimes called the Command Word) and the Status Word, References and Actual Values (see chapter *Communication*) are types of data words; the contents of some data words are user-definable.

Parameter

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

RCAN-01 CANopen Adapter module

The RCAN-01 CANopen Adapter module is one of the optional fieldbus adapter modules available for ABB drives. The RCAN-01 module is a device through which the drive is connected to a CANopen serial communication bus.

Overview

What this chapter contains

This chapter contains a short description of the CANopen protocol and the RCAN-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 RCAN-01 module fulfils CiA (CAN in Automation) standard DSP 402 (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:

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

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

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

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

RCAN-01 CANopen Adapter module

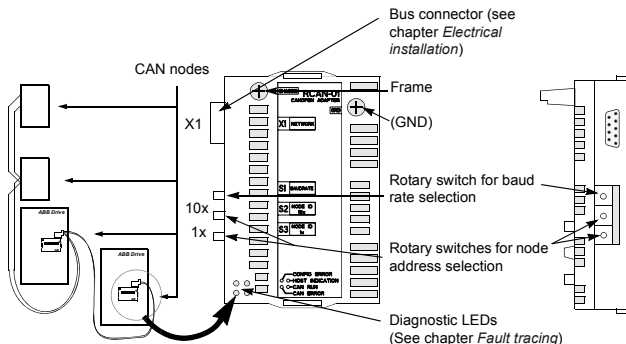
The RCAN-01 CANopen Adapter module is an optional device for ABB drives which enables the connection of the drive to a CANopen system. Through the RCAN-01 module it is possible to

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

The communication objects and functions supported by the RCAN-01 module are discussed in chapter *Communication*.

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

The construction of the CANopen network and the layout of the RCAN-01 module is presented in the following figure:



Compatibility

The RCAN-01 module is compatible with all master stations that support the CANopen protocol.

Delivery check

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

- CANopen Adapter module, type RCAN-01
- two screws (M3x10)
- 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.

Electrical installation

What this chapter contains

This chapter contains

- general cabling instructions
- instructions for setting the module node address number and communication speed (baud rate)
- instructions for connecting the module to the CANopen network.



WARNING! Before installation, switch off the drive power supply. Wait 5 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.

Baud rate selection

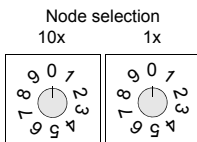
The baud rate is selected with the rotary switch next to the bus connector. The table below shows the meaning of switch the positions.

Switch setting	Baud rate
0	Baud rate is defined by parameter 3 in the fieldbus parameter group of the drive.
1	10 kbit/s
2	20 kbit/s
3	50 kbit/s
4	125 kbit/s
5	250 kbit/s
6	500 kbit/s
7	800 kbit/s
8	1 Mbit/s
9	N/A

Note: Changing the baud rate selection during operation has no effect. New settings take effect only after a re-initialisation of the module.

Node address selection

Use the rotary node address selection switches on the module to choose the node address number. The node address number is a decimal number ranging from 00 to 99. The left switch represents the first digit and the right switch the second digit. The node address can be changed during operation, but the module must be re-initialised for the changes to take effect.



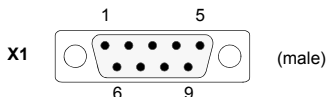
Note: When 00 is selected the node address is defined by parameter 2 in the fieldbus parameter group of the drive.

Note: Node address numbers from 100 to 127 can only be set with parameter 2 in the fieldbus parameter group of the drive.

CANopen connection

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

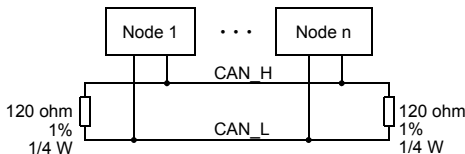
The connector pin allocation described below follows the CANopen Communication Profile, CiA DS 301.



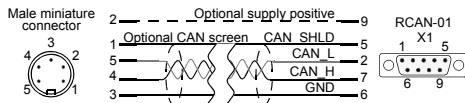
X1		Description
1	-	Not in use
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	CAN ground
4	-	Not in use
5	CAN_SHLD	Optional CAN shield
6	GND	Optional ground
7	CAN_H	CAN_H bus line (dominant high)
8	-	Not in use
9	CAN_V+	Optional CAN external power supply. Not supported by the module.

CANopen bus termination

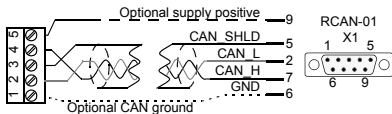
The CANopen bus line must be terminated with 120 ohm resistors connected between the CAN_L and CAN_H wires at each end as shown below.



Standard 5 pin miniature connector



Standard open style connector



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 in the appropriate drive hardware manual.

Mounting

The RCAN-01 module is to be inserted into its specific position in the drive. The module is held in place with plastic retaining clips and two screws. The screws also provide the earthing of the I/O cable shield connected to the module, and interconnect the GND signals of the module and the control board of the drive.

On installation of the module, the signal and power connection to the drive is automatically made through a 34-pin connector.

Mounting procedure:

- Insert the module carefully into its position inside the drive until the retaining clips lock the module into position.
- Fasten the two screws (included) to the stand-offs.

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

Programming

What this chapter contains

This chapter gives information on configuring the drive for operation with the RCAN-01 CANopen Adapter module.

Configuring the CAN controller and network

After the RCAN-01 module has been mechanically and electrically installed according to the instructions in the previous chapters, the CAN network and the drive must be prepared for communication and operation with the RCAN-01 module.

The RCAN-01 module cannot communicate with the CANopen controller before it is configured for the CAN network. The CAN network is configured using a network installation tool. See the installation tool manual.

EDS Files

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

Configuring the drive

The detailed procedure of activating the module for communication with the drive is dependent on the drive type. (Normally, a parameter must be adjusted to activate the communication. See the appropriate drive firmware manual.)

As communication between the drive and the RCAN-01 module is established, several configuration parameters are copied to the drive. These parameters – shown below – must be checked first and adjusted if necessary. The alternative selections for these parameters are discussed in more detail below the table.

Note: The new settings take effect only when the module is powered up the next time or when the module receives a 'Fieldbus Adapter parameter refresh' (typically fieldbus parameter no. 27) command from the drive.

The RCAN-01 module configuration parameters are listed in the following table:

Fieldbus par. no.	Parameter name	Alternative settings	Default settings
1	MODULE TYPE	Read-only	CANopen
2	Node ID	1 to 127	1
3	Baudrate	(1) 10 kbit/s (2) 20 kbit/s (3) 50 kbit/s (4) 125 kbit/s (5) 250 kbit/s (6) 500 kbit/s (7) 800 kbit/s (8) 1 Mbit/s	8
4	PDO21 Cfg. Loc.	(0) Configuration from fieldbus (1) Configuration from bus configuration parameters	0
5	RX-PDO21-Enable	0 to 1	0
6	RX-PDO21-TxType	0 to 255 (dec)	0
7	RX-PDO21-1stObj	0 to 32767 (dec)	0
8	RX-PDO21-1stSub	0 to 255 (dec)	0
9	RX-PDO21-2ndObj	0 to 32767 (dec)	0
10	RX-PDO21-2ndSub	0 to 255 (dec)	0
11	RX-PDO21-3rdObj	0 to 32767 (dec)	0
12	RX-PDO21-3rdSub	0 to 255 (dec)	0
13	RX-PDO21-4thObj	0 to 32767 (dec)	0

14	RX-PDO21-4thSub	0 to 255 (dec)	0
15	TX-PDO21-Enable	0 to 1	0
16	TX-PDO21-TxType	0 to 255 (dec)	0
17	TX-PDO21-EvTime	0 to 32767 (dec)	0
18	TX-PDO21-1stObj	0 to 32767 (dec)	0
19	TX-PDO21-1stSub	0 to 255 (dec)	0
20	TX-PDO21-2ndObj	0 to 32767 (dec)	0
21	TX-PDO21-2ndSub	0 to 255 (dec)	0
22	TX-PDO21-3rdObj	0 to 32767 (dec)	0
23	TX-PDO21-3rdSub	0 to 255 (dec)	0
24	TX-PDO21-4thObj	0 to 32767 (dec)	0
25	TX-PDO21-4thSub	0 to 255 (dec)	0
26	Transparent/Profi	(0) Profile mode DSP 402 (1) Transparent (2) Selection via CANopen object	2

01 MODULE TYPE

Shows the connected communication option module type.

02 Node ID

Selects the node address of the module.

0...127

Each device on the CAN link must have a unique node number (Node ID). This parameter is used for defining a station number for the drive it is connected to.

Note: If the node address is set via rotary switches, this parameter is read-only. See chapter *Electrical installation*.

03 BAUD RATE

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

10 kbit/s; 20 kbit/s; 50 kbit/s; 125 kbit/s; 250 kbit/s; 500 kbit/s; 800 kbit/s; 1 Mbit/s

Note: If the baud rate is set via rotary switch, this parameter is read-only. See chapter *Electrical installation*.

04 PDO21 Configuration Location

PDO21 can be configured either via CANopen objects or via RCAN-01 module configuration parameters.

0 = Configuration via CANopen objects 1414h, 1614h, 1814h and 1A14h

1 = Configuration via RCAN-01 module configuration parameters. If PDO21 is configured via RCAN-01 parameters, PDO21 configuration is read from the configuration parameters 5...25 during the power up and parameter refresh.

Note: If Rx-PDO21 and Tx-PDO21 are set through drive parameters:

Rx-PDO21 default COB-ID is set to 500h + Node ID.

Tx-PDO21 default COB-ID is set to 480h + Node ID.

05 RX-PDO21-COB-ID

Enables the PDO21 Rx and sets the PDO21 Rx COB-ID.

0 = PDO21 Rx is disabled.

1 = PDO21 Rx is enabled and the default COB-ID (480h + Node ID) is used.

As of RCAN-01 revision C (software version 1.09), if this parameter is set to a value other than those given above, the PDO21 Rx is enabled and the value is used as its COB-ID.

06 RX-PDO21-TxType

Defines the PDO21 transmission type. See chapter *Dictionary structure and entries* on page 85.

07 RX-PDO21-1stObj

Defines the index of the CANopen object, which is transferred as the first word of the PDO21. If the transferred data is written to a drive parameter, index value is drive parameter group index no. + 16384 (4000h).

See example in section 08 RX-PDO21-1stSub.

08 RX-PDO21-1stSub

Defines the subindex of the CANopen object, which is transferred as the first word of the PDO21. If transferred data is written to a drive parameter, subindex value is drive parameter index no.

Example: PDO21 data is written to drive parameter 30.19 (group 30, index 19).

Group 30 $\hat{=}$ 30 (dec) + 16384 (dec) = 16414 (dec) (401Eh)

Index 19 $\hat{=}$ 19 (dec) (13h)

09 RX-PDO21-2ndObj

See section 07 RX-PDO21-1stObj.

10 RX-PDO21-2ndSub

See section 08 RX-PDO21-1stSub.

11 RX-PDO21-3rdObj

See section 07 RX-PDO21-1stObj.

12 RX-PDO21-3rdSub

See section 08 RX-PDO21-1stSub.

13 RX-PDO21-4thObj

See section 07 RX-PDO21-1stObj.

14 RX-PDO21-4thSub

See section 08 RX-PDO21-1stSub.

15 TX-PDO21-COB-ID

Enables the PDO21 Tx and sets the PDO21 Tx COB-ID.

0 = PDO21 Tx is disabled.

1 = PDO21 Tx is enabled and the default COB-ID (500h + Node ID) is used.

As of RCAN-01 revision C (software version 1.09), if this parameter is set to other values than those given above, the PDO21 Tx is enabled and the value is used as its COB-ID.

16 TX-PDO21-TxType

Defines the PDO21 transmission type. See chapter *Dictionary structure and entries* on page 85.

17 TX-PDO21-EvTime

In transmission type 254/255 an event time can be used for PDO21 Tx.

If an event timer exists (value is $\neq 0$) the elapsed timer is considered to be an event. The event timer elapses as a multiple of 1 ms of the entry of this parameter.

18 TX-PDO21-1stObj

Defines the index of the CANopen object, which is transferred as the first word of the PDO21. If the transferred data is read from a drive parameter, index value is drive parameter group index no. + 16384 (4000h).

See example in section 19 TX-PDO21-1stSub.

19 TX-PDO21-1stSub

Defines the subindex of the CANopen object, which is transferred as the first word of the PDO21. If transferred data is read from a drive parameter, subindex value is drive parameter index no.

Example: PDO21 data is read from drive parameter 30.19 (group 30, index 19).

Group 30 $\hat{=}$ 30 (dec) + 16384 (dec) = 16414 (dec) (401Eh)

Index 19 $\hat{=}$ 19 (dec) (13h)

20 TX-PDO21-2ndObj

See section 18 TX-PDO21-1stObj.

21 TX-PDO21-2ndSub

See section 19 TX-PDO21-1stSub.

22 TX-PDO21-3rdObj

See section 18 TX-PDO21-1stObj.

23 TX-PDO21-3rdSub

See section 19 TX-PDO21-1stSub.

24 TX-PDO21-4thObj

See section 18 TX-PDO21-1stObj.

25 TX-PDO21-4thSub

See section 19 TX-PDO21-1stSub.

26 Transparent/Profi

Selects the communication profile used between the RCAN-01 module and the drive.

0 = DS 402

1 = Transparent

2 = Selection via CANopen objects

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. RCAN-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 appropriate drive firmware manual for information on the selection parameters.

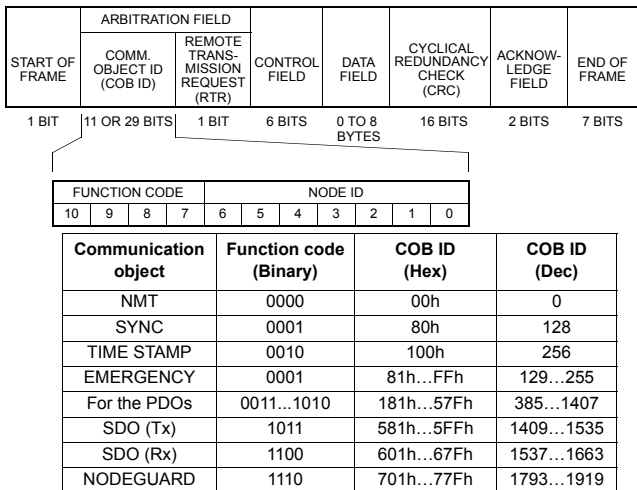
Communication

What this chapter contains

This chapter describes the communication on a CANopen network.

CAN data frame

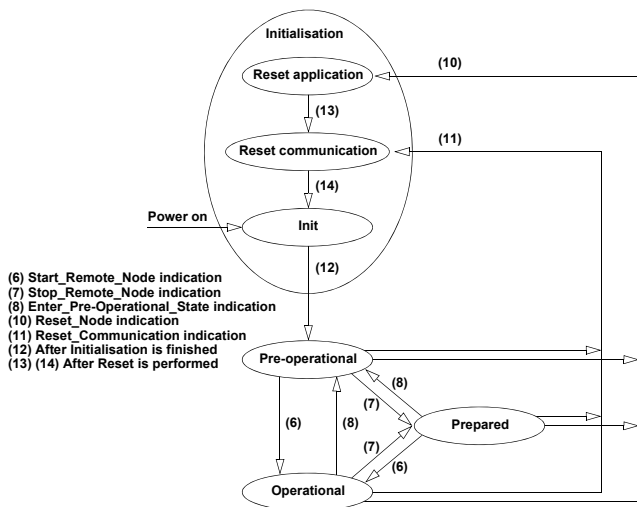
CAN employs data frames for transferring data between the host (controller) and the nodes on the bus. The following figure presents the structure of the data frame.



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.

RCAN-01 boot-up sequence

The RCAN-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 RCAN-01 is shown below.



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
0000000000000010	NMT Command	Node ID

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

The node state indications are as follows:

Indication	State
4	Prepared
5	Operational
127	Pre-operational

Process Data Objects (PDO)

Process Data Objects contain time critical process data. RCAN-01 supports PDO1, PDO6, PDO21, PDO22 and PDO23. As of RCAN-01 revision C (software version 1.09) all the PDOs can be used regardless of the operating mode (Transparent mode/DSP 402 Profile mode), and the length (0...4) and the mappings of the PDOs can be freely changed.

The recommended COB IDs for PDO1 are:

- PDO1 Rx (Master to Slave): 200h + Node ID
- PDO1 Tx (Slave to Master): 180h + Node ID.

Note: As default these COB IDs are reserved for PDO1. PDO1 must be disabled if these COB IDs are used for another PDO.

If PDO21 is configured via RCAN-01 module configuration parameters, the default COB IDs for PDO21 are:

- PDO21 Rx (Master to Slave): 500h + Node ID
- PDO21 Tx (Slave to Master): 480h + Node ID.

PDO mapping change is possible only in the Pre-operational state.

See chapter *Dictionary structure and entries* on page 85.

PDO1 Rx

The default contents of PDO1 Rx is as follows:

Master to slave

Header	Byte							
	1	2	3	4	5	6	7	8
zzzzxxxxxxryyyy	Control Word (6040h)							

zzzz = COB ID Function code

xxxxxxx = Node ID

r = RTR (Remote Transmit Request) bit

yyyy = Data length

Note: If the Transparent mode is selected with fieldbus parameter 26 (Transparent/Profi) or CANopen object 2004h, the object 2005h (Transparent control word) is mapped to PDO1 Rx by default instead. See the appropriate drive firmware manual for how to select the drive control mode. Some drives recognize the control mode used automatically (for example, ACS550).

Control Word of DSP 402

Bit	Description
0	Switch on
1	Enable voltage
2	Quick stop (active low)
3	Enable operation
4	Ramp function generator enable
5	Ramp function generator unlock
6	Ramp function generator use ref
7	Reset fault
8	Halt (not used)
9	(reserved)
10	(reserved)
11...15	-

PDO1 Tx

The default contents of PDO1 Tx are as follows:

Slave to master

Header	Byte							
	1	2	3	4	5	6	7	8
zzzzxxxxxxxxyyyy	Control Word (6041h)							

zzzz = COB ID Function code

xxxxxxx = Node ID

r = RTR (Remote Transmit Request) bit

yyyy = Data length

Note: If Transparent mode is selected with fieldbus parameter 26 (Transparent/Profi) or CANopen object 2004h, the object 2007h (Transparent Status Word) is mapped to PDO1 Tx by default instead. See the appropriate firmware manual for how to select the drive control mode. Some drives recognize the control mode used automatically (for example, ACS550).

Status Word of DSP 402

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

* See the appropriate drive firmware manual.

PDO6 Rx

The default contents of PDO6 Rx are as follows:

Master to slave

Header	Byte							
	1	2	3	4	5	6	7	8
zzzzxxxxxxxxyyyy	Control Word (6040h)		Target Velocity in RPM (6044h)					

zzzz = COB ID Function code

xxxxxxx = Node ID

r = RTR (Remote Transmit Request) bit

yyyy = Data length

Note: In the Transparent mode, the objects 2005h (Transparent Control Word) and 2006h (Transparent Reference Speed) are mapped to PDO6 Rx by default instead.

PDO6 Tx

The default contents of PDO6 Tx are as follows:

Slave to master

Header	Byte							
	1	2	3	4	5	6	7	8
zzzzxxxxxxxxyyyy	DS 402 Status Word (6041h)		Control Effort in RPM (6044h)					

zzzz = COB ID Function code

xxxxxxx = Node ID

r = RTR (Remote Transmit Request) bit

yyyy = Data length

Note: In the Transparent mode, the objects 2007h (Transparent Status Word) and 2008h (Transparent Actual Speed) are mapped to PDO6 Tx by default instead.

PDO21 Rx

The contents of PDO21 Rx is as follows:

Master to Slave

Header	Byte							
	1	2	3	4	5	6	7	8
zzzzxxxxxxxxyyyy	Mapped obj1 (1614h, 1) E.g. Transparent Control Word (2005h)		Mapped obj2 (1614h, 2) E.g. Transparent reference speed (2006h)		Mapped obj3 (1614h, 3) E.g. Const speed 1 (400Ch, 2)		Mapped obj4 (1614h, 4)	

zzzz = COB ID Function code

xxxxxx = Node ID

r = RTR bit

yyyy = Data length

Length of the PDO21 Rx depends on the settings of the fieldbus parameters or CANopen object 1614h.

PDO21 Tx

The contents of PDO21 Tx is as follows:

Master to Slave

Header	Byte							
	1	2	3	4	5	6	7	8
zzzzxxxxxxxxyyyy	Mapped obj1 (1A14h, 1) E.g. Transparent Status Word (2007h)		Mapped obj2 (1A14h, 2) E.g. Transparent actual speed (2008h)		Mapped obj3 (1A14h, 3) E.g. Frequency (4001h, 3)		Mapped obj4 (1A14h, 4) E.g. Current (4001h, 4)	

zzzz = COB ID Function code

xxxxxxx = Node ID

r = RTR bit

yyyy = Data length

Length of the PDO21 Tx depends on the settings of the fieldbus parameters or CANopen object 1A14h.

PDO22 Rx

The contents of PDO22 Rx is as follows:

Master to Slave

Header	Byte							
	1	2	3	4	5	6	7	8
zzzzxxxxxxxxxyyyy	Mapped obj1 (1615h, 1)		Mapped obj2 (1615h, 2)		Mapped obj3 (1615h, 3)		Mapped obj4 (1615h, 4)	

zzzz = COB ID Function code

xxxxxxx = Node ID

r = RTR bit

yyyy = Data length

Length of the PDO22 Rx depends on the settings of the fieldbus parameters or CANopen object 1615h.

PDO22 Tx

The contents of PDO22 Tx is as follows:

Master to Slave

Header	Byte							
	1	2	3	4	5	6	7	8
zzzzxxxxxxxxxyyyy	Mapped obj1 (1A15h, 1)		Mapped obj2 (1A15h, 2)		Mapped obj3 (1A15h, 3)		Mapped obj4 (1A15h, 4)	

zzzz = COB ID Function code

xxxxxxx = Node ID

r = RTR bit

yyyy = Data length

Length of the PDO22 Tx depends on the settings of the fieldbus parameters or CANopen object 1A15h.

PDO23 Rx

The contents of PDO23 Rx is as follows:

Master to Slave

Header	Byte							
	1	2	3	4	5	6	7	8
zzzzxxxxxxxxryyyy	Mapped obj1 (1616h, 1)		Mapped obj2 (1616h, 2)		Mapped obj3 (1616h, 3)		Mapped obj4 (1616h, 4)	

zzzz = COB ID Function code

xxxxxxx = Node ID

r = RTR bit

yyyy = Data length

Length of the PDO23 Rx depends on the settings of the fieldbus parameters or CANopen object 1616h.

PDO23 Tx

The contents of PDO23 Tx is as follows:

Master to Slave

Header	Byte							
	1	2	3	4	5	6	7	8
zzzzxxxxxxxxryyyy	Mapped obj1 (1A16h, 1)		Mapped obj2 (1A16h, 2)		Mapped obj3 (1A16h, 3)		Mapped obj4 (1A16h, 4)	

zzzz = COB ID Function code

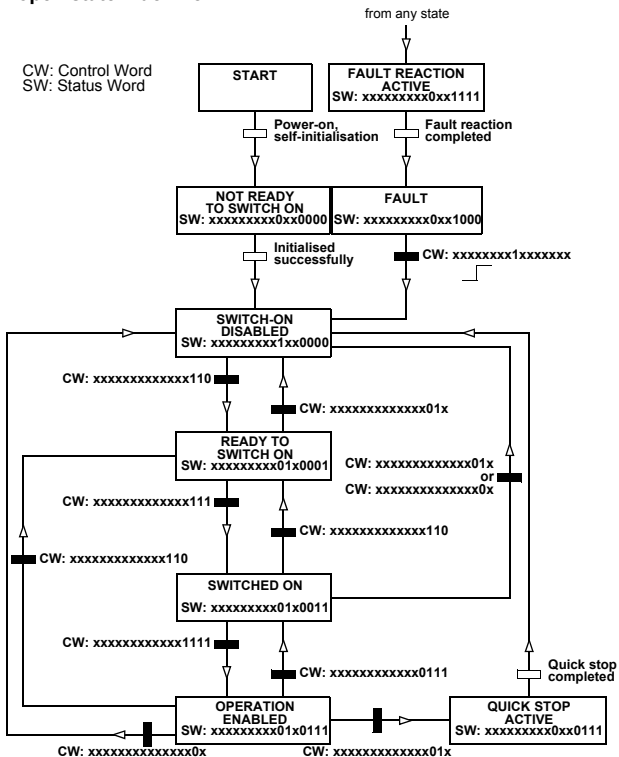
xxxxxxx = Node ID

r = RTR bit

yyyy = Data length

Length of the PDO23 Tx depends on the settings of the fieldbus parameters or CANopen object 1A16h.

CANopen state machine



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 data is to be transmitted, an 'expedited' SDO message can be used. Larger quantities of data can be segmented, i.e. split between several CAN messages.

The COB IDs for SDO communication are:

- Master to Slave: 600h + Node ID
- Slave to Master: 580h + Node ID.

Read:

Master to Slave

Header	Byte							
	1	2	3	4	5	6	7	8
1100xxxxxxryyyy	Command	Object index		Sub-index	Reserved			

xxxxxxx = Node ID

r = RTR bit

yyyy = Data length

Write:**Master to Slave** ('Expedited' message with max. 4 bytes of data)

Header	Byte							
	1	2	3	4	5	6	7	8
1100xxxxxxryyyy	Command		Object index	Sub-index	Data			

xxxxxxx = Node ID

r = RTR bit

yyyy = Data length

Master to Slave (Segmented message with over 4 bytes of data)
1st Frame

Header	Byte							
	1	2	3	4	5	6	7	8
1100xxxxxxryyyy	Command		Object index	Sub-index	Length			

xxxxxxx = Node ID

r = RTR bit

yyyy = Data length

All subsequent frames

Header	Byte							
	1	2	3	4	5	6	7	8
1100xxxxxxryyyy	Command		Data					

xxxxxxx = Node ID

r = RTR bit

yyyy = Data length

CANopen Object Dictionary

The RCAN Object Dictionary contains all Communication Objects. A listing of the Object Dictionary is given below.

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

Communication profile area

Index (hex)	Sub-index	Name	Type	Attribute	Information																		
1000	0	Device Type	U32	RO	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 RCAN-01 is 01192h, which corresponds to drive profile DSP 402 (192h), and to additional information <i>Frequency Converter</i> (01h).																		
1001	0	Error Register	U8	RO	Error register for the RCAN-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>	Bit	Description	0	Generic error	1	Current	2	Voltage	3	Temperature	4	Communication error	5	Device profile specific	6	Reserved	7	Manufacturer specific
Bit	Description																						
0	Generic error																						
1	Current																						
2	Voltage																						
3	Temperature																						
4	Communication error																						
5	Device profile specific																						
6	Reserved																						
7	Manufacturer specific																						

Index (hex)	Sub-index	Name	Type	Attribute	Information												
1003	0	Pre-defined Error Field	U8	RW	Number of errors occurred and listed at subindexes 1 to 5. Writing a zero here deletes the list.												
	1	Pre-defined Error Field	U32	RO	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 a 16 bit additional information field (0 with RCAN-01). The error code is contained in the lower 2 bytes (LSB), the additional information in the upper 2 bytes (MSB).												
													
	5	Pre-defined Error Field	U32	RO	<div>Slave to Master</div> <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="2">0001xxxxxx01000</td><td>Error code</td><td>Error register</td></tr><tr><td>4-7</td><td>8</td></tr><tr><td></td><td>Additional error info</td><td>Unused</td></tr></table>	Header	Byte		1-2	3	0001xxxxxx01000	Error code	Error register	4-7	8		Additional error info
Header	Byte																
	1-2	3															
0001xxxxxx01000	Error code	Error register															
	4-7	8															
	Additional error info	Unused															
1005	0	COB ID SYNC Message	U32	RW	Identifier of the SYNC message. The SYNC message controls the actions of PDOs that have the transmission type <i>Synchronous</i> .												
1008	0	Manufacturer Device Name	Visible string	RO	Module name. The constant string is RCAN-01 and ACxxxx.												
1009	0	Manufacturer Hardware Version	Visible string	RO	Version of module hardware. The constant string is x.xx, e.g. 1.00.												

Index (hex)	Sub-index	Name	Type	Attribute	Information
100A	0	Manufacturer Software Version	Visible string	RO	Version of the RCAN-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		U32	RO	Largest supported subindex
	1	Store Parameters	U32	RW	Saves all parameters. (65766173h) EVAS
	2		U32	RW	Saves communication parameters.
	3		U32	RW	Saves application parameters.
	4		U32	RW	Saves drive parameters.
1011	0	Restore Default Parameters	U32	RO	Largest supported subindex
	1		U32	RW	Restore all default parameters. 64616F6Ch (DAOL)
	2		U32	RW	Restore communication default parameters.
	3		U32	RW	Restore application default parameters.
	4		U32	RW	Restore drive default parameters.
1014	0	COB ID Emergency Message	U32	RW	Defines the COB ID of the Emergency Object (EMCY). Default: 80h + Node ID
1016	0	Consumer Heartbeat Time	U32	RO	Number of entries
	1		U32	RW	Consumer heartbeat time

Index (hex)	Sub-index	Name	Type	Attribute	Information
1017		Producer Heartbeat Time	U16	RW	
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. 0101h ACS800 std application, 0201h ACS550
1400	0	Receive PDO1 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 200h + Node ID
	2	Transmission Type	U8	RW	255 = FFh (asynchronous transmission)
	3	Inhibit Time	U16	RW	
	5	Event Timer	U16	RW	
1600	0	Receive PDO1 Mapping	U8	RO	Number of mapped application objects. Default: 1 = only control word mapping
	1	PDO Mapping Entry	U32	RO	6040h DS 402 Control Word

Index (hex)	Sub-index	Name	Type	Attribute	Information
1405	0	Receive PDO6 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 800006E0h \neq PDO not valid, MSB set. See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Transmission Type	U8	RW	Default: 255 asynchronous. See chapter <i>Dictionary structure and entries</i> on page 85.
	3	Inhibit Time	U16	RW	Default: 0
	5	Event Timer	U16	RW	Default: 0
1605	0	Receive PDO6 Mapping	U8	RO	Number of entries. Default: 2 = DS 402 Control Word and Target velocity mapping
	1	Mapping Entry 1	U32	RO	Constant: 6040h DS 402 Control Word
	2	Mapping Entry 2	U32	RO	Constant: 6042h DS 402 Target velocity

Index (hex)	Sub-index	Name	Type	Attribute	Information
1414	0	Receive PDO21 Parameter	U8	RO	Number of entries \neq PDO not valid
	1	COB-ID	U32	RW	Default: 800006E0h. See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Transmission Type	U8	RW	Default: FEh. See chapter <i>Dictionary structure and entries</i> on page 85.
	3	Inhibit Time	U16	RW	Default: 0
	5	Event Timer	U16	RW	Default: 0
1614	0	Receive PDO21 Mapping	U8	RW	Number of entries Default: 0 (high limit 4) Determines which mapped objects 1...4 are visible. Subindexes 0...4 are freely programmable.
	1	Mapped Obj 1	U32	RW	E.g. 20050010h = Transparent Control Word. See section <i>PDO21 Rx</i> . See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Mapped Obj 2	U32	RW	
	3	Mapped Obj 3	U32	RW	
	4	Mapped Obj 4	U32	RW	

Index (hex)	Sub-index	Name	Type	Attribute	Information
1415	0	Receive PDO22 Parameter	U8	RO	Number of entries
	1	COB-ID	U32	RW	Default: 800006E0h. See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Transmission Type	U8	RW	Default: FEh. See chapter <i>Dictionary structure and entries</i> on page 85.
	3	Inhibit Time	U16	RW	Default: 0
	5	Event Timer	U16	RW	Default: 0
1615	0	Receive PDO22 Mapping	U8	RW	Number of entries Default: 0 (high limit 4) Determines which mapped objects 1...4 are visible. Subindexes 0...4 are freely programmable.
	1	Mapped Obj 1	U32	RW	E.g. 20050010h = Transparent Control Word. See section <i>PDO21 Rx</i> . See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Mapped Obj 2	U32	RW	
	3	Mapped Obj 3	U32	RW	
	4	Mapped Obj 4	U32	RW	

Index (hex)	Sub-index	Name	Type	Attribute	Information
1416	0	Receive PDO23 Parameter	U8	RO	Number of entries
	1	COB-ID	U32	RW	Default: 800006E0h = disabled. See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Transmission Type	U8	RW	Default: FEh. See chapter <i>Dictionary structure and entries</i> on page 85.
	3	Inhibit Time	U16	RW	Default: 0
	5	Event Timer	U16	RW	Default: 0
1616	0	Receive PDO23 Mapping	U8	RW	Number of entries Default: 0 (high limit 4) Determines which mapped objects 1...4 are visible. Subindexes 0...4 are freely programmable.
	1	Mapped Obj 1	U32	RW	E.g. 20050010h = Transparent Control Word. See section <i>PDO21 Rx</i> . See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Mapped Obj 2	U32	RW	
	3	Mapped Obj 3	U32	RW	
	4	Mapped Obj 4	U32	RW	

Index (hex)	Sub-index	Name	Type	Attribute	Information
1800	0	Transmit PDO1 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 180h + Node ID
	2	Transmission Type	U8	RW	255 (asynchronous transmission). See chapter <i>Dictionary structure and entries</i> on page 85.
	3	Inhibit Time	U16	RW	
	5	Event Timer	U16	RW	
1A00	0	Transmit PDO1 Mapping	U32	RO	Number of entries
	1	1st Mapping Object	U32	RO	6041h DS 402 status word
1805	0	Transmit PDO6 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 800006E0h (= PDO not valid) See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Transmission Type	U8	RW	
	3	Inhibit Time	U16	RW	
	5	Event Timer	U16	RW	
1A05	0	Transmit PDO6 Mapping	U8	RO	Number of entries Default: 2 = DS 204 status word and control effort
	1	Mapping Entry 1	U32	RO	Default: 6041h DS 402 status word
	2	Mapping Entry 2	U32	RO	Default: 6044h DS 402 control effort

Index (hex)	Sub-index	Name	Type	Attribute	Information
1814	0	Transmit PDO21 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 800006E0h (= not valid). See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Transmission Type	U8	RW	
	3	Inhibit Time	U16	RW	
	5	Event Timer	U16	RW	
1A14	0	Transmit PDO21 Mapping	U8	RW	Number of entries. Default: 0 (High limit 4) Determines which mapped objects 1...4 are visible. Subindexes 1...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	

Index (hex)	Sub-index	Name	Type	Attribute	Information
1815	0	Transmit PDO22 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 800006E0h. See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Transmission Type	U8	RW	
	3	Inhibit Time	U16	RW	
	5	Event Timer	U16	RW	
1A15	0	Transmit PDO22 Mapping	U8	RW	Number of entries Default: 0 (High limit 4) Determines which mapped objects 1...4 are visible. Subindexes 1...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	

Index (hex)	Sub-index	Name	Type	Attribute	Information
1816	0	Transmit PDO23 Parameter	U8	RO	Number of entries
	1	COB ID	U32	RW	Default: 800006E0h. See chapter <i>Dictionary structure and entries</i> on page 86.
	2	Transmission Type	U8	RW	
	3	Inhibit Time	U16	RW	
	5	Event Timer	U16	RW	
1A16	0	Transmit PDO23 Mapping	U8	RW	Number of entries Default: 0 (High limit 4) Determines which mapped objects 1...4 are visible. Subindexes 1...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	

Uxx = unsigned xx

INT = signed xx

Manufacturer specific profile objects

Index (hex)	Sub-index	Name	Type	Attribute
2001	0	Number of entries	U8	RO
	1	Gain	U16	RW
	2	Integration time constant	U16	RW
	3	Derivation time constant	U16	RW
	4	PID actual value (in %)	INT32	RO
2003		Drive temperature	U32	RO
2004		Transparent/Profile mode (0) DSP 402, (1) Transparent	U8	RW
2005		Transparent Control Word	U16	RW
2006		Transparent Reference Speed	INT16	RW
2007		Transparent Status Word	U16	RO
2008		Transparent Actual Speed	INT16	RO
200A	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
200B	0	Number of entries	U8	RO
	1	Fault code 1 (latest)	U16	RO
	2	Fault code 2	U16	RO
	3	Fault code 3	U16	RO
	4	Fault code 4	U16	RO
	5	Fault code 5 (oldest)	U16	RO

Manufacturer specific profile area

Data sets

Note: The total number of data sets and data words supported depends on drive type and application program.

Index (hex)	Sub-index	Name	Type	Attribute	Information
4000	0	Number of entries		RO	Number of supported data sets depends on the application software of the drive.
	1	Control Word *	U16	RO	Data set 1 Word 1
	2	Reference 1 *	INT16	RO	Data set 1 Word 2
	3	Reference 2 **	INT16	RW	Data set 1 Word 3
	4	Status Word	U16	RO	Data set 2 Word 1
	5	Actual Value 1	INT16	RO	Data set 2 Word 2
	6	Actual Value 2	INT16	RO	Data set 2 Word 3
	7	Reference 3	INT16	RW	Data set 3 Word 1
	8	Reference 4	INT16	RW	Data set 3 Word 2
	9	Reference 5	INT16	RW	Data set 3 Word 3
	A	Actual Value 3	INT16	RO	Data set 4 Word 1
	B	Actual Value 4	INT16	RO	Data set 4 Word 2
	C	Actual Value 5	INT16	RO	Data set 4 Word 3

	62	Reference 49	INT16	RW	Data set 32 Word 2
	63	Reference 50	INT16	RW	Data set 32 Word 3

* Objects 4000h, 1 and 4000h, 2 cannot be written to directly. When using the Transparent mode, use objects 2005h and 2006h to write to the Control Word and Reference 1.

** When using the Transparent mode, use this object to write to Reference 2.

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.

Drive par. / signal no.	Index (hex)	Sub- index	Type depends on parameter type of the drive	Attribute
Actual signals				
1.01	4001	1	U16 or INT16	RO
1.02	4001	2	U16 or INT16	RO
...
2.01	4002	1	U16 or INT16	RO
...
3.01	4003	1	U16 or INT16	RO
...
Parameters				
10.01	400A	1	U16 or INT16	RW
10.02	400A	2	U16 or INT16	RW
...
11.01	400B	1	U16 or INT16	RW
...
99.01	4063	1	U16 or INT16	RW
...

The application error codes are a small subset of the error classes of the PROFIBUS specification (EN 50170). The codes are 4 byte values containing the Error Class, Error Code, and Additional Code fields.

Slave to Master

Header	Byte							
	1	2	3	4	5	6	7	8
1101xxxxxx01000	Command	Object index		Sub-index	Additional code		Error code	Error class

Error class	Error code	Example
5 Service error	3 Parameter inconsistent	Toggle bit not alternated
	4 Illegal parameter	Timeout value reached
6 Access error	1 Object access unsupported	Attempt to write to a read-only parameter, or to read a write-only parameter
	2 Object non-existent	Object does not exist in Object Dictionary.
	6 Hardware fault	Access failed because of a hardware error
	7 Type conflict	Data type does not match.
	9 Object attribute inconsistent	The subindex does not exist.
8 Other error	0	User aborted transfer

Additional code	Meaning
0	No precise details for the reason for the error
10h	Service parameter with an invalid value
11h	Sub-index does not exist.
12h	Service parameter too long
13h	Service parameter too short
20h	Service cannot currently be executed
21h	...because of local control.
22h	...because of present device state.
30h	Value range of parameter exceeded
31h	Value of parameter too high
32h	Value of parameter too low
36h	Maximum value smaller than minimum value
40h	Incompatibility with other values
41h	Data cannot be mapped to the PDO.
42h	PDO length exceeded
43h	General parameter incompatibility
47h	General internal incompatibility in the device

Standardised device profile area DSP 402

Index (hex)	Sub-index	Name	Type	Attribute
603F		Error code	U16	RO
6040		Controlword	U16	RW
6041		Statusword	U16	RO
6042		Target velocity	INT16	RW
6043		VI velocity demand	INT16	RO
6044		VI control effort	INT16	RO
6046		VI velocity min max amount		
	0	Number of entries	U8	RO
	1	VI velocity min amount	U32	RW
	2	VI velocity max amount	U32	RW
6047		VI velocity min max		
	0	Number of entries	U8	RO
	1	VI velocity min pos	U32	RW
	2	VI velocity max pos	U32	RW
	3	VI velocity min neg	U32	RW
	4	VI velocity max neg	U32	RW
6048		VI velocity acceleration		
	0	Number of entries	U8	RO
	1	Delta speed	U32	RW
	2	Delta time	U16	RW
6049		VI velocity deceleration		
	0	Number of entries	U8	RO
	1	Delta speed	U32	RW
	2	Delta time	U16	RW

Index (hex)	Sub-index	Name	Type	Attribute
604A		VI velocity quick stop		
	0	Number of entries	U8	RO
	1	Delta speed	U32	RW
	2	Delta time	U16	RW
604C		VI dimension factor		
	0	Number of entries	U8	RO
	1	VI dimension factor numerator	INT32	RW
	2	VI dimension factor denominator	INT32	RW
604D		VI pole number	U8	RO
60FD		Digital inputs	U32	RO
6510		Drive data		RO
		Number of entries	U8	RO
		Inverter type code	U32	RO





Fault tracing





What this chapter contains

This chapter explains how to trace faults with the status LED indications of the RCAN-01 module.

LED indications

The RCAN-01 module is equipped with four diagnostic LEDs. The description of the LEDs is presented below.

		<div> <div>CAN error</div> <div>CAN run</div> <div>   <div>Config error</div> </div> <div>   <div>Host* indication</div> </div> </div>
Name	Colour	Function
CAN run	Green	Single flash: Module is in stopped state. Single flash = one short flash (approx. 200 ms) followed by a long off phase (approx. 1000 ms)
		Flashing 2.5 Hz: Module is in pre-operational state.
		Lit: Module is in operational state.

		<div> <div>CAN error</div> <div>   Config error </div> </div> <div> <div>CAN run</div> <div>   Host* indication </div> </div>
CAN error	Red	Off: No error
		Single flash: At least one of the module error counters has reached or exceeded the warning error limit. Single flash = one short flash (approx. 200 ms) followed by a long off phase (approx. 1000 ms)
		Double flash: A guard event or a receive heartbeat timeout has occurred. Double flash = two short flashes (approx. 200 ms each) separated by an off phase (approx. 200 ms) and followed by a long off phase (approx. 1000 ms)
		Lit: CANopen controller is in bus off state.
Config error	Red	Off: Normal configuration
		Double flash: Error in parameter data: The content of the parameter data set during configuration is illegal. A re-configuration followed by a new power cycle is needed to reset CONFIG ERROR.
Host* indication	Green	Lit: Link is functional.
	Red	Lit: Link is lost permanently. Flashing: Link is lost temporarily. Off: Module is not initialised.

* Host = drive

CANopen error codes

What this chapter contains

This chapter contains CANopen error codes.

Error codes

Error codes can be read from the 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 the 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

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.

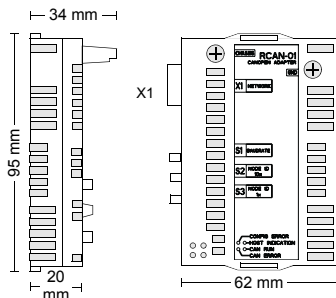
Technical data

What this chapter contains

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

RCAN-01

Enclosure:



Mounting: Into an option slot inside the drive

Degree of protection: IP20

Ambient conditions: The applicable ambient conditions specified for the drive hardware manual are in effect.

Settings:

- Through drive parameters
- Rotary switches for node address selection (address range 00...99)
- Rotary switch for baud rate selection

Connectors:

- 34-pin parallel bus connector
- 9-pin male DSUB connector (X1)

Current consumption:

- 250 mA max. (5 V), supplied by the drive control board.

General:

- Estimated min. lifetime: 100 000 h
- All materials are UL/CSA approved.
- Complies with EMC Standards EN 50081-2 and EN 50082-2.

CANopen network

Serial Communication Type: Asynchronous, half duplex

Transfer Rate: 1 Mbit/s, 500 kbit/s, 250 kbit/s, 125 kbit/s, 100kbit/s, 50 kbit/s, 20 kbit/s or 10 kbit/s

Protocol: CANopen

Topology: Multi-drop

Size of network: Max. 128 nodes, depends on the used CAN controller.

Termination: 121 ohm, 1%, Metal Film, 1/4 W

Medium: Screened, twisted pair RS-485 cable

Dictionary structure and entries

Description of transmission type

Transmission type	PDO transmission				
	Cyclic	Acyclic	Synchronous	Asynchronous	RTR only
0		+	+		
1...240 *	+		+		
241...251	Reserved				
252			+		+
253				+	
254 **				+	
255 ***				+	
<p>* For Transmit PDOs, the value in range 1...240 defines how many SYNC messages are received before the PDO is sent. For example, if the transmission type is set to 5, the PDO is sent on every fifth SYNC message.</p> <p>** The transmission of this PDO is initiated by an event device. The event is manufacturer specific.</p> <p>*** The transmission of this PDO is initiated by an event on the device. This event must be defined in the device profile.</p>					

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	29 bit ID is used (CAN 2.0B)
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

* Recommended

Structure of PDO mapping entry

	Object	Subindex	Length in bits
Bits	31...16	15...8	7...0
E.g.	2005h	00	10h (10h = 16 bit)



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