CAN-CBM-Clock

Real Time Clock with CAN Interface

Software Manual

to Product C.2836.03

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N O T E

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This manual contains important information and instructions on safe and efficient handling of the module. Carefully read this manual before commencing any work and follow the instructions.
The manual is a product component, please retain it for future use.

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Changes in the Chapters

The changes in the document listed below affect changes in the firmware as well as changes in the description of facts only.

Version	Chapter	Changes versus previous version
1.1	-	First English version
1.2	1.	Chapter revised and description of CANopen basic information
	1.4	Chapter moved and note inserted
	2.	New chapter: “Time Stamp Object (TIME)”
	5.2	Note inserted
	5.4.13	Note inserted

Technical details are subject to change without further notice.

Contents

1. Overview

The CAN-CBM-Clock module provides the current date and the current time as timestamp and via a TPDO. Time can be preset via RPDO.

A complete CANopen description is too extensive for the purpose of this manual. Further information can therefore be taken from the CANopen® specification CiA® 301.

1.1 Definition of Terms

COB ...	Communication Object
Emergency-Id...	Emergency Data Object
NMT...	Network Management (Master)
Rx...	receive
SDO...	Service Data Object
Sync...	Sync(frame) Telegram
Tx...	transmit

PDOs (Process Data Objects)

PDOs are used to transmit process data.
In the 'Receive'-PDO (RxPDO) process data is received by the CAN-CBM-Clock module.
In the 'Transmit'-PDO (TxPDO) the CAN-CBM-Clock module transmits data to the CANopen network.

SDOs (Service Data Objects)

SDOs are used to transmit module internal configuration- and parameter data. In contrast to the PDOs SDO-messages are confirmed. A write or read request on a data object is always answered by a response telegram.

1.2 CANopen Object Directory

The object directory is basically a (sorted) group of objects which can be accessed via the CAN network. Each object in this directory is addressed with a 16-bit index. The index in the object directories is represented in hexadecimal format.
The index can be a 16-bit parameter in accordance with the CANopen specification CiA 301 or a manufacturer-specific code. By means of the MSBs of the index the object class of the parameter is defined.

Part of the object directory are among others:

Index	Object
0001_h ... $009F_h$	definition of data types
1000_h ... $1FFF_h$	Communication Profile Area
2000_h ... $5FFF_h$	Manufacturer Specific Profile Area
6000_h ... $9FFF_h$	Standardized Device Profile Area
$A000_h$ ... $FFFF_h$	reserved

1.3 Communication Parameters of the PDOs

The communication parameters of the PDOs (according to CiA 301) are transmitted as SDO (Service Data Objects) on ID '**600_h + Node-ID**' (Request). The receiver acknowledges the parameters on ID '**580_h + Node-ID**' (Response).

The **Node-ID** (module No.) is configured via coding switches Low and High. Please refer to chapter "Coding Switches" for a detailed description of possible configurations.

1.3.1 Accessing the Communication Parameters via SDO Telegrams

The SDOs (Service Data Objects) are used to access the object directory of a device.
An SDO is therefore a 'channel' to access the parameters of the CAN-CBM-Clock-module. Access via this channel is possible in *operational* and *pre-operational* status in the CAN-CBM-Clock-module.

This chapter does not describe all possible, but only some important modes of access to the CAN-CBM-Clock- module.
Definitions for the access modes can be taken from CiA 301.

An SDO is structured as follows:

Identifier	Command code	Index		Sub-index	LSB	Data field	MSB
		(low)	(high)				

Example:

600_h+ Node-ID	23_h (write)	00	14_h (Index=1400_h) (Receive-PDO-Comm-Para)	01 (COB-def.)	$7F_h$	04_h	00	00 COB Node ID = 0000 $047F_h$

Identifier
The parameters are transmitted with ID '600_h + NodeID' (request).
The receiver acknowledges the parameters with ID '580_h + NodeID' (response).

Command code
The command code transmitted consists among other things of the Command Specifier and the length. Frequently required combinations are, for instance:

$40_h = 64_{dec}$: Read Request, i.e. a parameter is to be read
$23_h = 35_{dec}$: Write Request with 32-bit data, i.e. a parameter is to be set

The CAN-CBM-Clock-module responds to every received telegram with a response telegram. This can contain the following command codes:

$43_h = 67_{dec}$: Read Response with 32 bit data, this telegram contains the parameter requested
$60_h = 96_{dec}$: Write Response, i.e. a parameter has been set successfully
$80_h = 128_{dec}$: Error Response, i.e. the CAN-CBM-Clock-module reports a communication error

Frequently Used Command Codes
The following table summarizes frequently used command codes. The command frames must always contain 8 data bytes. Notes on the syntax and further command codes can be found in CiA 301.

Command	Number of data bytes	Command code
Write Request (Initiate Domain Download)	1 2 3 4	$2F_h$ $2B_h$ 27_h 23_h
Write Response (Initiate Domain Download)	-	60_h
Read Request (Initiate Domain Upload)	-	40_h
Read Response (Initiate Domain Upload)	1 2 3 4	$4F_h$ $4B_h$ 47_h 43_h
Error Response (Abort Domain Transfer)	-	80_h

Index, Sub-Index
Index and sub-index will be described in the chapters “Device Profile Area” and “Manufacturer Specific Objects” of this manual.

Data Field
The data field has got a size of a maximum of 4 bytes and is always structured ‘LSB first, MSB last’. The least significant byte is always in ‘Data 1’. With 16-bit values the most significant byte (bits 8...15) is always in ‘Data 2’, and with 32-bit values the MSB (bits 24...31) is always in ‘Data 4’.

Error Codes of the SDO Domain Transfer

The following error codes might occur (according to CiA 301):

Abort code	Description
0x05040001	wrong command specifier
0x06010002	wrong write access
0x06020000	wrong index
0x06040041	object can not be mapped to PDO
0x06060000	access failed due to an hardware error
0x06070010	wrong number of data bytes
0x06070012	service parameter too long
0x06070013	service parameter too small
0x06090011	wrong sub-index
0x06090030	transmitted parameter is outside the accepted value range
0x08000000	undefined cause of error
0x08000020	data cannot be transferred or stored in the application
0x08000022	data cannot be transferred or stored in the application because of the present device state
0x08000024	access to flash failed

1.4 Table of Important Identifiers and Messages for CANopen

CAN-Identifier	Name	Length	Data	Description
0	NMT	2	02 xx_h	module enters the state *stopped*
0	NMT	2	01 xx_h	Start (module enters the state *operational*)
0	NMT	2	80 xx_h	module enters the state *preoperational*
0	NMT	2	81 xx_h	Reset module
0	NMT	2	82 xx_h	Reset communication
80_h	SYNC	0	-	SYNC (Synchronization Object) broadcast
100_h	TIME	6 Bytes	user data	Time Stamp
180_h + *Node-ID*	TPDO1	6 bytes	user data	from CAN-CBM-Clock-module (Tx/transmit-PDO)
200_h + *Node-ID*	RPDO1	6 bytes	user data	to CAN-CBM-Clock-module (Rx/receive-PDO)
580_h + *Node-ID*	Tx-SDO	0...8 bytes	parameter	SDO from CAN-CBM-Clock (Tx)
600_h + *Node-ID*	Rx-SDO	0...8 bytes	parameter	SDO to CAN-CBM-Clock (Rx)
700_h + *Node-ID*	NMT	1 bytes	identifier	Node guarding

xx = *Node-ID* or xx = 00 if all CANopen nodes shall be addressed.

NOTICE
The CAN-CBM-Clock module provides the current date and the current time as time stamp and via its TPDO. Both have a different data format and they have to be configured differently.

- Time Stamp Frame (Id 100_h),
  see chapter “Time Stamp object TIME” on page 11,
  Id + Enable via object 1012_h, the Enable-Bit (bit 30) must be set!
  Interval via object 2200_h (default: 1000 ms)

- TPDO (Id 180_h + *Node-ID*),
  see chapter “Assignment of the TPDO” on page 12,
  Id fixed, interval via object 1800_h, sub-index 5 (default: 1000 ms)

The frames are cyclically sent, as soon as NMT Start has been received.

2. Time Stamp Object (TIME)

The time stamp object TIME is described in CiA 301 and is of data type TIME_OF_DAY.
The data type TIME_OF_DAY represents absolute time and consists of 6 bytes, composed of:
- 4 bytes for the time in milliseconds since midnight
  (Bit 28 ... 31 are reserved and are not evaluated)
- 2 bytes for the number of days since January 1, 1984

Identifier	Length	Data					
ID	L	ms since midnight				days since January 1, 1984	
100_h (default)	6	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5

Example:
This example shows the data structure for the following time:
Date: August 31, 2016
Time: 15.00h (15 hours, 00 minutes, 000 milliseconds)

The date is contained in days since January 1, 1984
This is 11932 days up to August 31, 2016
11932 = $2E9C_h$ (transmitted as byte 4: $9C_h$, byte 5: $2E_h$)

The time of day (15 h) is specified in milliseconds. This equals 54.000.000 ms
54.000.000 = 337 $F980_h$ (bit 28 ... 31 are reserved and thus **0** => **0**337 $F980_h$)
(Transmitted as byte 0: 80_h, byte 1: $F9_h$, byte 2: 37_h, byte 3: **0**3_h)

These data are send with the following data structure:

Structure:

Identifier	Length	Data					
ID (default)	L	ms since midnight				days since January 1, 1984	
		Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5

Data structure:

100_h	6	80_h	$F9_h$	37_h	03_h	$9C_h$	$2E_h$

Of course the time of day and the date must have been set in the CAN-CBM-Clock module (see Manufacturer- Specific Objects).

3. Assignment of the TPDOs

The module transmits only the TPDO1. The table below shows the assignment of the TPDOs:

Byte (big endian)						
0	**1**	**2**	**3**	**4**	**5**	**6, 7**
hour	*minute*	*second*	*year*	*month*	*day*	*not used*

Meaning of the values:

The time reference of the returned time value is defined in the parameter *mode* in object 2300_h (see page 34). For example the returned time value can be specified in local time (*mode* = 1)

hour... output of hours — valid range of values: $0...23_d$ $(0...17_h)$

minute... output of minutes — valid range of values: $0...59_d$ $(0...3B_h)$

second... output of seconds — valid range of values: $0...59_d$ $(0...3B_h)$

year... output of the year — valid range of values: $0...99_d$ $(0...63_h)$, given in the number of years since the year 2000

month... output of the month — valid range of values: $1...12_d$ $(1...0C_h)$

day... output of the day — valid range of values: $1...31_d$ $(1...1F_h)$

Example:

Byte-no.:	0	1	2	3	4	5
Variable:	*hour*	*minute*	*second*	*year*	*month*	*day*
Value [Hex]:	$0E_h$	$2A_h$	08_h	05_h	$0B_h$	$1C_h$
Value [Dec]:	14	42	08	05	11	28

determined time: 14:42:08 on November 28th, 2005

4. Assignment of the RPDOs

The module evaluates only the RPDO1. The following table shows the assignment of the RPDOs:

Byte (big endian)						
0	**1**	**2**	**3**	**4**	**5**	**6, 7**
hour_utc	*minute_utc*	*second_utc*	*year_utc*	*month_utc*	*day_utc*	*not used*

Meaning of the variables:

In the RPDOs the time reference for the time values is always UTC (coordinated universal time).

hour_utc...	input of hours in UTC	valid range of values: $0...23_d$ $(0...17_h)$
minute_utc...	input of minutes in UTC	valid range of values: $0...59_d$ $(0...3B_h)$
second_utc...	input of seconds in UTC	valid range of values: $0...59_d$ $(0...3B_h)$
year_utc...	input of the year in UTC	valid range of values: $0...99_d$ $(0...63_h)$, given in the number of years since 2000
month_utc...	input of the month in UTC	valid range of values: $1...12_d$ $(1...0C_h)$
day_utc...	input of the day in UTC	valid range of values: $1...31_d$ $(1...1F_h)$

5. Implemented CANopen objects

5.1 Overview of Communication Parameters

The format of the communication parameters can be taken from CiA DS-301.
The module supports only the communication parameters listed in the table below.

Index	Name	Sub-index	Type	Access	Default
1000_h	*Device Type*	-	Unsigned 32	ro	0006 0191_h
1001_h	*Error Register*	-	Unsigned 8	ro	Error-Code
1008_h	*Manufacturer Device Name*	-	Visible String	ro	CLK
1009_h	*Manufacturer Hardware Version (see: DS-301)*	-	Visible String	ro	1.0 1*)
$100A_h$	*Manufacturer Software Version*	-	Visible String	ro	1.0 1*)
$100B_h$	*Node-ID*	-	Unsigned 32	ro	Coding switch - adjustment
$100C_h$	*Guard Time*	-	Unsigned 16	rw	0 Sec.
$100D_h$	*Life Time Factor*	-	Unsigned 8	rw	0
$100E_h$	*Node Guarding ID*	-	Unsigned 32	ro	700_h +Node-ID
1012_h	*COB-ID_Time_Stamp_Object*	-	Unsigned 32	rw	0000 0100_h
1400_h	*Receive PDO Communication Parameter*	0,1,2	PDOCommPar	ro	see chapter “PDO-Mapping” on page 16 f.f.
1600_h	*Receive PDO Mapping Parameter*	0...6	PDOMapping	ro	
1800_h	*Transmit PDO Communication Parameter*	0...5	PDOCommPar	ro	
$1A00_h$	*Transmit PDO Mapping Parameter*	0...6	PDOMapping	ro	

ro - Read Only, rw - Read/Write
1*) depending on hardware/software version

5.2 Description of the Communication Parameters

5.2.1 COB-ID_Time_Stamp_Object (1012_h)

INDEX	**1012_h**
Name	*COB-ID_Time_Stamp_Object*
Data Type	unsigned 32
Access Type	rw
Default Value	$0000\ 0100_h$

Values of the parameters:

Value *COB-ID_Time_Stamp_Object*	Meaning
$0000\ 0100_h$	no time stamp producer
$4000\ 0100_h$	CAN-CBM-Clock is time stamp producer

This object defines according to CiA DS301 with bit 30, if the CAN-CBM-Clock module works as time stamp producer or not. The bits 0...29 define on which CAN identifier the time stamp will be transmitted. The reception of time stamps is not provided in this firmware implementation.

The module does not work as time stamp producer in the default-setting.

With object 2200_h it can be defined how often the time stamp can be transmitted. In the default-setting the time stamp is transmitted once per second.

INFORMATION
The identifier ID 100_h for the time stamp object cannot be changed.

5.2.2 Receive PDO Communication Parameter (1400_h)

Object 'Receive PDO Communication Parameter 1400_h' contains the communication parameters for the RPDO1.

INDEX	**1400_h**
Name	*receive PDO parameter*
Data Type	PDOCommPar

Index	Sub-index	Description	Value range	Default	Data type	Access
1400_h	0	*no_of_entries*	2	2_h	unsigned 8	ro
	1	*COB_ID used by PDO1*	1... 8000 $07FF_h$	200_h + Node-ID	unsigned 32	ro
	2	*transmission type*	0...FF_h	255_d	unsigned 8	ro

Only *transmission type* 255 is supported.

5.2.3 Receive PDO Mapping Parameter (1600_h)

Object 'Receive PDO Mapping Parameter 1600_h' contains the mapping parameters for the RPDO1 the CAN-CBM-Clock is able to receive.

INDEX	**1600_h**
Name	*receive PDO mapping*
Data Type	PDO Mapping

The following table shows the assignment of the Receive PDO Mapping Parameter in the default configuration:

Index	Sub-index	Description	Value range	Default	Data type	Access
1600_h	0	*no_of_entries*	6	6_h	unsigned 8	ro
	1	*object_1_to_be_mapped*	0...FFFF $FFFF_h$	2100 0008_h	unsigned 32	ro
	2	*object_2_to_be_mapped*	0...FFFF $FFFF_h$	2101 0008_h	unsigned 32	ro
	3	*object_3_to_be_mapped*	0...FFFF $FFFF_h$	2102 0008_h	unsigned 32	ro
	4	*object_4_to_be_mapped*	0...FFFF $FFFF_h$	2103 0008_h	unsigned 32	ro
	5	*object_5_to_be_mapped*	0...FFFF $FFFF_h$	2104 0008_h	unsigned 32	ro
	6	*object_6_to_be_mapped*	0...FFFF $FFFF_h$	2105 0008_h	unsigned 32	ro

5.2.4 Object Transmit PDO Communication Parameter (1800_h)

This object contains the communication parameters for the TPDO1.

INDEX	**1800_h**
Name	*transmit PDO parameter*
Data Type	PDOCommPar

Index	Sub-index	Description	Value range	Default	Data type	Access
1800_h	0	*number_of_entries*	0...FF_h	5	unsigned 8	ro
	1	*COB-ID used by PDO*	1...8000 07FF_h	4000 0180 $_h$ +Node-ID	unsigned 32	ro
	2	*transmission type*	0...FF_h	255_d	unsigned 8	rw
	3	*inhibit time*	0...$FFFF_h$	50_d	unsigned 16	ro
	4	*reserved*	0..FF_h	0	unsigned 8	const
	5	*event timer*	0...$FFFF_h$	1000_d	unsigned 16	rw

5.2.5 Transmit PDO Mapping Parameter ($1A00_h$)

The object 'Transmit PDO Mapping Parameter $1A00_h$' contains the mapping for the TPDO1.

INDEX	**$1A00_h$**
Name	*transmit PDO mapping*
Data Type	PDO Mapping

The following table shows the assignment of the Transmit PDO Mapping Parameters:

Index	Sub-index	Description	Value range	Default	Data type	Access
$1A00_h$	0	*number of entries*	0...FF	6_h	unsigned 8	ro
	1	*object_1_to_be_mapped*	2100 0008, 2110 0008 [1*)]	2100 0008_h	unsigned 32	ro
	2	*object_2_to_be_mapped*	2101 0008, 2111 0008 [1*)]	2101 0008_h	unsigned 32	ro
	3	*object_3_to_be_mapped*	2102 0008, 2112 0008 [1*)]	2102 0008_h	unsigned 32	ro
	4	*object_4_to_be_mapped*	2103 0008, 2113 0008 [1*)]	2103 0008_h	unsigned 32	ro
	5	*object_5_to_be_mapped*	2104 0008, 2114 0008 [1*)]	2104 0008_h	unsigned 32	ro
	6	*object_6_to_be_mapped*	2105 0008, 2115 0008 [1*)]	2105 0008_h	unsigned 32	ro

[1*)] The value of the *object_to_be_mapped* depends on the *mode* selected in object 2300_h (see page 34).
mode = 0 values 2100 0008_h - 2105 0008_h (default)
the time is given in UTC, as described in the objects 2100_h-2105_h
mode = 1,2 values 2110 0008_h - 2115 0008_h
the time is given in local time (*mode* = 1) or in DCF77-time (*mode* = 2), as described in the objects 2110_h-2115_h

5.3 Overview of the Manufacturer-Specific Objects

Index	Name	Data Type	Access
2100_h	*hour_utc*	unsigned 8	rw
2101_h	*minute_utc*	unsigned 8	rw
2102_h	*second_utc*	unsigned 8	rw
2103_h	*year_utc*	unsigned 8	rw
2104_h	*month_utc*	unsigned 8	rw
2105_h	*day_utc*	unsigned 8	rw
2110_h	*hour* [1*)]	unsigned 8	ro
2111_h	*minute* [1*)]	unsigned 8	ro
2112_h	*second* [1*)]	unsigned 8	ro
2113_h	*year* [1*)]	unsigned 8	ro
2114_h	*month* [1*)]	unsigned 8	ro
2115_h	*day* [1*)]	unsigned 8	ro
2200_h	*period_of_timestamp*	unsigned 16	rw
2300_h	*mode*	unsigned 8	rw
2301_h	*time_difference*	integer 16	rw
$2FFF_h$	*coding_switch*	unsigned 8	ro

[1*)]... The time values are given according to the time reference as specified in *modus* (object 2300_h, see page 34), e.g.: local time or DCF77-time.

5.4 Description of the Manufacturer-Specific Objects

5.4.1 *hour* in UTC (2100_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2100_h	0	*hour_utc*	$00...17_h$	-	unsigned 8	rw

Value range: $0...23_d$ ($0...17_h$)
Unit: Hours

This object holds the number of hours since midnight in UTC (coordinated universal time).

5.4.2 *minute* in UTC (2101_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2101_h	0	*minute_utc*	$00...3B_h$	-	unsigned 8	rw

Value range: $0...59_d$ ($0...3B_h$)
Unit: Minutes

This object holds the number of minutes since the last clock hour in UTC (coordinated universal time).

5.4.3 *second* in UTC (2102_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2102_h	0	*second_utc*	$00...3B_h$	-	unsigned 8	rw

Value range: $0...59_d$ ($0...3B_h$)
Unit: Seconds

This object holds the seconds since the last completed minute in UTC (coordinated universal time).

5.4.4 *year* in UTC (2103_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2103_h	0	*year_utc*	$00...63_h$	-	unsigned 8	rw

Value range: $0...99_d$ ($0...3B_h$)
Unit: Years

This object holds the number of years since the year 2000 in UTC (coordinated universal time).

5.4.5 *month* in UTC (2104_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2104_h	0	*month_utc*	$01...0C_h$	-	unsigned 8	rw

Value range: $1...12_d$ ($1...0C_h$)
Unit: Month

This object holds the current month in UTC (coordinated universal time).

5.4.6 *day* in UTC (2105_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2105_h	0	*day_utc*	$01...31_h$	-	unsigned 8	rw

Value range: $1...31_d$ ($1...1F_h$)
Unit: Day

This object holds the current day of month in UTC (coordinated universal time).

5.4.7 *hour* (2110_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2110_h	0	*hour*	$00...17_h$	-	unsigned 8	ro

Value range: $0...23_d$ ($0...17_h$)
Unit: Hour (e.g. in local time as CET)

This object provides the number of hours since midnight in the time reference as defined in *mode* in object 2300_h (see page 34), e.g. in the local time.

5.4.8 *minute* (2111_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2111_h	0	*minute*	$00...3B_h$	-	unsigned 8	ro

Value range: $0...59_d$ ($0...3B_h$)
Unit: Minute (e.g. in local time as CET)

This object provides the number of minutes since the last clock hour in the time reference as defined in *mode* in object 2300_h (see page 34), e.g. in the local time.

5.4.9 *second* (2112_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2112_h	0	*second*	$00...3B_h$	-	unsigned 8	ro

Value range: $0...59_d$ ($0...3B_h$)
Unit: Seconds (e.g. in local time as CET)

This object provides the number of seconds since the last completed minute in the time reference as defined in *mode* in object 2300_h (see page 34), e.g. in the local time.

5.4.10 *year* (2113_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2113_h	0	*year*	$00...63_h$	-	unsigned 8	ro

Value range: $0...99_d$ ($0...3B_h$)
Unit: Year (e.g. in local time as CET)

This object provides the number of years since the year 2000 in the time reference as defined in *mode* in object 2300_h (see page 34), e.g. in the local time.

5.4.11 *month* (2114_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2114_h	0	*month*	$01...0C_h$	-	unsigned 8	ro

Value range: $1...12_d$ ($1...0C_h$)
Unit: Month (e.g. in local time as CET)

This object provides the current month in the time reference as defined in *mode* in object 2300_h (see page 34), e.g. in the local time.

5.4.12 *day*(2115_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2115_h	0	*day*	$01...31_h$	-	unsigned 8	ro

Value range: $1...31_d$ ($1...1F_h$)
Unit: Day (e.g. in local time as CET)

This object provides the current month in the time reference as defined in *mode* in object 2300_h (see page 34), e.g. in the local time.

5.4.13 *period_of_timestamp* (2200_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2200_h	0	*period_of_timestamp*	$0000...FFFF_h$	1000	unsigned 16	rw

Value range: 0...65535 ms

This object contains the repetition rate of the time stamp in milliseconds as defined in CiA DS-301.

If the module transmits a time stamp and if so, on which CAN identifier the time stamp is transmitted is defined via Object 1012_h. In the default setting the module transmits the time stamp once per second on the 11-bit CAN identifier 100_h.

INFORMATION
For further information about the time stamp read chapter “Time Stamp Object TIME” on page 11.

5.4.14 *mode* (2300_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2300_h	0	*mode*	0, 1, 2	0	unsigned 8	rw

This object defines in which *mode* the time is calculated for the objects from 2110_h to 2115_h. The parameter *mode* selects the reference time.

Values of the parameters:

Value *mode*	Meaning
0	time in UTC
1	time in local time, the time zone offset to UTC has to be defined in object 2301_h.
2	DCF77 time

5.4.15 *time_difference* (2301_h)

Index	Sub-index	Description	Value range	Default	Data type	Access
2301_h	0	*time_difference*	$FD30_h$ ... 0348_h	0	integer 16	rw

Value range: -720...+840 min

In this object the time offset of the local time to the coordinated universal time (UTC) may be set.
The offset to UTC has to be specified in minutes.
The value *time_difference* is used for the calculation of the local time in the objects from 2110_h to 2115h.

Example:

The local time shall be calculated as Central European Time (CET, winter).
It is:

CET = UTC + 1 hour

The offset is +1hour or 60 minutes. Because the offset has to be specified in minutes, the entry (hexadecimal) is: *time_difference* = $3C_h$

Note that during summer the summer time is observed, and CEST is used instead.

5.4.16 *coding_switch* ($2FFF_h$)

Index	Sub-index	Description	Value range	Default	Data type	Access
$2FFF_h$	0	*coding_switch*	$00...FF_h$	-	unsigned 8	ro

This object contains the current coding switch setting:

Index: $2FFF_h$, sub-index: 0

Bit:	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Assignment:	*coding_switch SW101*				*coding_switch SW100*			