CO401Memory1-M

CANopen-Bus-Memory-Module

frenzel + berg electronic

General Description

The CO401Memory1 is a memory module with CANopen bus interface. This gives the possibility to add non volatile parameter or data storage to CANopen bus applications.

CO401Memory1 provides 8 kBytes of EEPROM memory. The memory is organized in two parallel memory banks in order to give very high data reliability.
The memory is represented by multiple objects within the CANopen object dictionary.

The CO401Memory1 integrates the CANopen Draft standard DS401 (simple I/O device).

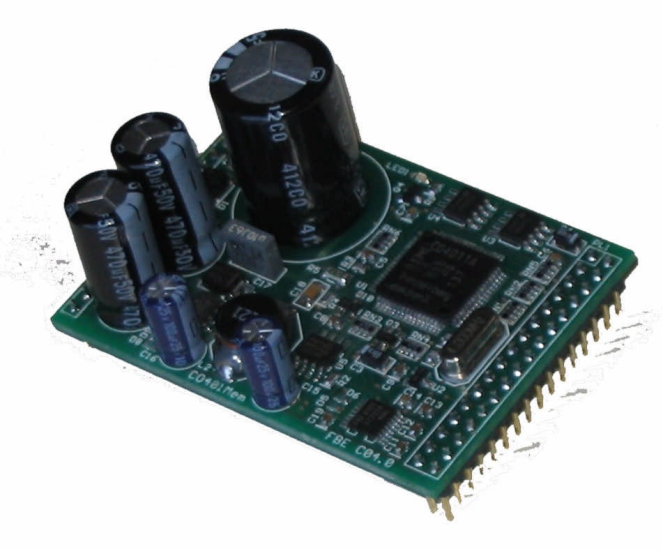
Additionally to the CANopen interface the CO401Memory1 supports a serial interface with RS232 levels. This interface also gives complete access to the memory.

In order to support CAN monitoring, the serial interface controller can receive CAN data over a predefined CAN message slot. Additionally the host can transmit CAN frames using the serial interface.

The module already has an on board CAN transceiver 82C251 and serial transceiver so only few external components are required.

Features

- **CANopen bus memory with 8 kBytes EEPROM data.**
- **High data reliability. Two parallel working memory banks.**
- **Onboard power supply monitor in order to avoid write cycles during power down**
- **According to CiA Draft Standards DS301 Version 4.0 and DS401 Version 2**
- **Serial RS232 Interface**
- **CAN-Baudrate up to 1MBit**
- **Multiple diagnostic outputs**
- **Supply voltage DC 24V (18V .. 36V)**
- **Temperature ranges up to –40 to 85 °C**
- **Compact module 62 x 44,5 mm**



Applications

- **Parameter/Data storage within the CANopen network.**
- **Backup memory**

CANopen Features

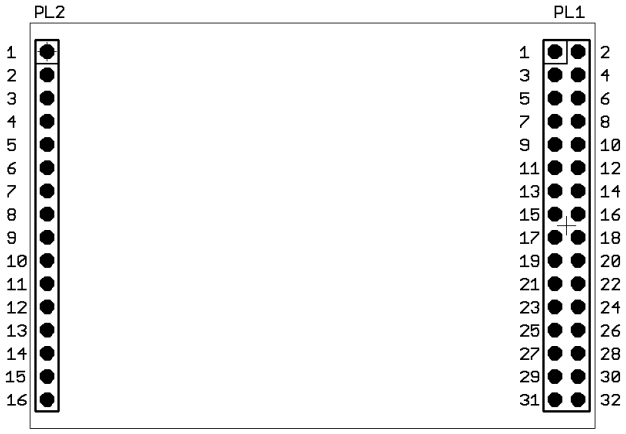
- **2 Transmit- and 2 Receive PDOs**
- **Variable PDO identifier**
- **All CANopen specific PDO transmission types supported:**
  synchronous, asynchronous, event driven, cyclic, acyclic and remote frame dependent.
- **Event timer and inhibit timer features for all transmit PDOs.**
- **Node guarding, Life guarding, Heartbeat**
- **Emergency messages**
- **Minimum boot up**

Ordering Information

CO401Memory1 (programmed, licence included)

Part	Temp. Range
CO401Memory1-M	0 °C to 70 °C
CO401Memory1E-M	-40 °C to 85 °C

Pin Assignment



Top view (component side)

Pin Listing

Pin No. PL1	Pin Name	Funktion
1	STATE6#	Status output bit 6
2	STATE7#	Status output bit 7
3	STATE4#	Status output bit 4
4	STATE5#	Status output bit 5
5	STATE2#	Status output bit 2
6	STATE3#	Status output bit 3
7	MEM1ERR#	Memory 1 error flag
8	MEM2ERR#	Memory 2 error flag
9	CANLEDR#	CANopen run LED indicates NMT state
10	CANLEDE#	CANopen error LED indicates bus errors
11..13	BD2 .. BD0	CAN baud rate bit 2 .. bit0
14..20	ID6 .. ID0	CAN node ID bit 6 .. bit0
21 .. 23	CFG0..CFG2	Configuration select bits (reserved for future use)
24 .. 26	RSBD0 .. RSBD2	Serial Baud rate select bits (reserved for future use)
27	FU#	Firmware update enable pin
28	-	reserved for future use
29	CRX	CAN receive line TTL level
30	CTX	CAN transmit line TTL level
31	GND	Ground
32	VCC	+5V output

Pin Listing continued

Pin No. PL2	Pin Name	Funktion
1,2	+24V	Power supply input DC +24V (Standard module version)
3,4, 11,12	GND	Ground
4,6,8	-	reserved for future use
7	RES#	Reset input for optional external reset bush button
9, 10	+5V	Power supply input DC +5V (5V module version only)
13	RSRX	Serial receiver line RS232 signal level
14	RSTX	Serial transmitter line RS232 signal level
15	CANL	CAN bus line Low
16	CANH	CAN bus line High

Pin Description

The CO401Memory1-M module supports on board pull up resistors for most of the interface signals, so only few external components are required.

Note:
In order to keep compatibility with future versions of the CO401Memory1-M modules unused pins should be left unconnected.

CFG0, CFG1, CFG2

The CFG pins are used to select special features of the module. The pins are active low.

CANL, CANH: CAN interface pins

This pins should be directly connected to the CAN network. Note, that there must be a resistor of 120 Ohms at each end of the CAN bus line. This resistor is not implemented on the module and must be connected externally.

CANRX, CANTX: CAN interface pins (TTL level)

The CAN interface pins may be used for direct connection to CAN transceivers like the 80C251. For longer bus length or noisy or disturbed environments it is strongly recommended to use galvanic isolation with opto couplers between bus interface and CANopen application, to improve system reliability. For the standard module the CAN transceiver is already on board, so this pins must be unconnected.

RSRX, RSTX: RS232 interface pins

Serial interface pins. This pins are driven with RS232 levels.

MEM1ERR#, MEM2ERR# Memory Error Signal

This status output pins indicate an error condition of the memory banks of the module. The output pins are active low.

STATE2..STATE7 Status output

The status output pins are active low.

STATE4# : New CAN monitoring data available. The CO401Memory1 has detected a new CAN frame that was not read through the serial interface.

STATE7# : Voltage low. The CO401Memory1 has detected a supply voltage to low. Access to non volatile data memory is denied.

All other status pins are reserved for future use.

CANLEDR# CANopen RUN-LED

This pin outputs the CANopen NMT-state of the device. The behaviour is according to CANopen draft standard DR303-3. The output pin is active low. It is recommended to connect a green LED.

CANLEDE# CANopen ERROR-LED

This pin outputs the CANopen error state of the device. The behaviour is according to CANopen draft standard DR303-3. The output pin is active low. It is recommended to connect a red LED.

RES#: Reset input pin

For a device reset, provide an active low reset signal according to recommended operation conditions to input RES#. Note there is only a reset circuit on board providing correct power on/off reset behaviour.

BD0 to BD2: CAN baud rate configuration bits

Set the baud rate for the CAN interface using this bits. The bits are active low with on board pull up. It is recommended to connect this pins to ground signal using a dip switch or jumpers.

RSBD0 to RSBD2: Serial baud rate config. bits

Set the baud rate for the serial interface using this bits. The bits are active low with on board pull up. It is recommended to connect this pins to ground signal using a dip switch or jumpers.

ID0 to ID7: CANopen identifier selection bits

Set the device identifier for the CANopen interface using this bits. The bits are active low with on board pull up. This results in an inverted reading of the TTL levels from the input pins to the selected node ID.

For example:
ID0 = Low, ID1..ID6 = High ➔ Node-ID is 1
ID1 = Low, ID0, ID2..ID6 = High ➔ Node-ID is 2

It is recommended to connect this pins to ground signal using a dip switch or jumpers.

Note:
For in circuit firmware update of the controller it is necessary to force pins ID0 and ID1 to ground.

FU#: Firmware update enable

In order to enable in circuit update of the modules firmware, this pin must be connected to ground. This pin must not be connected fpr normal operation mode. It is recommended to connect this pin to ground signal using a dip switch or jumper.

+24V: Power Supply

This pin is the input for the power supply.

GND: Ground

Ground potential for the complete system

VCC: 5V output

This signal may be used to supply an external CAN transceiver in module versions where no on board CAN transceiver is mounted, or as a supply for the LEDs connected to the module.

Device Configuration

The following sections describe the device configuration with meaning:

1: ViH logic high level
0: ViL logic low level

CAN Identifier

The CAN Identifier will be set with Pins ID0 to ID6. This configuration pins use internal inverter. The ID is set as follows:

ID6	ID5	ID4	ID3	ID2	ID1	ID0	CAN-Identifier
1	1	1	1	1	1	1	Reserved
1	1	1	1	1	1	0	1 = 0x01
1	1	1	1	1	0	1	2 = 0x02
1	1	1	1	1	0	0	3 = 0x03
1	1	1	1	0	1	1	4 = 0x04
			….				….
1	0	0	0	0	0	0	63 = 0x3F
0	1	1	1	1	1	1	64 = 0x40
0	1	1	1	1	1	0	65 = 0x41
			….				….
0	0	0	0	0	1	0	125 = 0x7C
0	0	0	0	0	0	1	126 = 0x7E
0	0	0	0	0	0	0	127 = 0x7F

All Identifiers from 1 to 127 are valid settings.

CAN baud rate

The baud rate configuration will be done with configuration inputs BD0 to BD2

BD2	BD1	BD0	CAN-Baud Rate / Bus length
1	1	1	1 Mbit/sec 25 m *1)
1	1	0	800 kbit/sec 50 m *1)
1	0	1	500 kbit/sec 100 m *2)
1	0	0	250 kbit/sec 250 m *2)
0	1	1	125 kbit/sec 500 m *3)
0	1	0	50 kbit/sec 1000 m *3)
0	0	1	20 kbit/sec 2500 m *3)
0	0	0	10 kbit/sec 5000 m *3)

*1) Calculation without optocouplers.
For optocouplers bus length is reduced for about 4m per 10 nsec propagation delay of employed optocoupler type
*2) Calculation with 40 nsec optocoupler propagation delay
*3) Calculation with 100 nsec optocoupler propagation delay

The calculation of the bus length is based on a line propagation delay of 5 nsec/m.

Serial baud rate

The serial baud rate configuration for the serial interface will be done with configuration inputs RSBD0 to RSBD2

RS BD2	RS BD1	RS BD0	Serial Interface Baud Rate	
			nominal	Exact
1	1	1	9600	9615
1	1	0	4800	4807
1	0	1	2400	2404
1	0	0	Reserved	-
0	1	1	Reserved	-
0	1	0	38400	38461
0	0	1	19200	19230
0	0	0	Reserved	-

Device Configuration Pins

With the device configuration input bits the CANopen memory module can be adapted to several application requirements.

CFG 2	CFG 1	CFG 0	Setting
1	1	1	Digital hardware inputs enabled
0	x	X	Reserved for future use
x	0	X	Reserved for future use
x	x	0	Reserved for future use

In order to keep compatibility to future versions of the CO401Memory1 controller it is recommended to leave the CFGx input pins unconnected or to place dip switches or jumpers from CFGx pins to ground.

Object Dictionary

The CO401Memory1 module keeps a complex object dictionary for CANopen.

For detailed information about CANopen objects see additional brochure "Introduction to CANopen"

For the Object tables all values are shown in hexa-decimal way.

For access types the following settings are valid
ro read only
wo write only
rw read and write access enabled

DS301: global Objects

Index	Sub-Index	Name	Acc.
0005	-	Dummy 8	ro
0006	-	Dummy 16	ro
0007	-	Dummy 32	ro
1000	-	Device Type	ro
1001	-	Error Register	ro
1002	-	Manufacturer Status Register	ro
1005	-	COB-ID Sync Identifier Sync Object	ro
1008	-	Device Name	ro
1009	-	Hardware Version	ro
100A	-	Software Version	ro
100B	-	Node Id *3)	-
100C	-	Guard Time	rw
100D	-	Life Time Factor	rw
100E	-	COB-ID Guard *3)	-
1014	-	COB ID Emergency	rw
1015	-	Inhibit Time Emergency	rw
1017	-	Producer Heartbeat Time	rw
1018	0	Identity Object	ro
	1	Vendor ID	ro
	2	Product Code	ro
	3	Revision Number	ro
	4	Serial Number	ro
1029	0	Error Behavior	ro
	1	In case of bus errors	rw
	2	In case of output errors	rw
2000	-	Device Manufacturer *2)	ro
2101	-	System Configuration	ro
2102	-	Remapping Enabled Info	ro
2103	-	Enable Guarding Warning	rw
2105	-	Api State Register	ro
2110	-	CiA Compatibility Test	rw
2180	-	CAN Restart Time	rw

Notes:

*1) This object cannot be written to in operational device state.
Only use this command in preoperational device state, otherwise the Chip will answer requests with SDO abort telegrams.

*2) This Objects shows "Frenzel + Berg" as visible string data type.

*3) This objects are implemented but not accessible from CAN bus line. Description is added in order to give an easier understanding of the functionality.

The data type entries Index 0005 to 0007 are implemented for compatibility reasons. They may be mapped to PDOs in order to define the appropriate space in the PDO.

For the read only objects following data is set:

Index	Sub.	Name	Value in Hex.
1000		Device Type	0003 0191 h
1018	0	Identity Object	03h
	1	Vendor ID	0000 0058 h
	2	Product Code	0140 1FFE h
	3	Revision Number	0 .. 0xFFFFFFFF
	4	Serial Nr.	0
2101		System Configuration	Set according to the setting of the configuration input bits.

DS301: PDO Parameter/Mapping Objects

Description of PDO Parameter objects:

These Objects enable dynamic PDO mapping, variable identifier distribution for PDOs and setting of the transmission mode, inhibit and event times.

The setting of all parameters may be done in the device state "operational" as well as in "preoperational" state.

The CANopen memory module CO401Memory1 supports 2 Receive PDOs and 2 Transmit PDOs.

Index	Sub-Index	Name	Acc.
14xx		Receive PDO Communication Parameter	
18xx		Transmit PDO Communication Parameter	
14xx 18xx	0	Communication Parameter Nr of SubIndex	ro
	1	COB-ID	rw
	2	Transmission Type	rw
	3	Inhibit Time (not used)	rw
	4	Reserved	rw
	5	Event Timer	rw
1400 1401	0 .. 5	Receive RPDO1/RPDO2 Communication Parameter	rw
1800 1801	0 .. 5	Transmit TPDO1/TPDO2 Communication Parameter	rw
16xx		Receive PDO Mapping Parameter	
1Axx		Transmit PDO Mapping Parameter	
16xx 1Axx	0	Number of Mapped Objects in this PDO	ro
	1 to n	Mapped Object *1) (max. 8 objects mappable)	ro
1600 1601		Receive RPDO1/ RPDO2 Mapping Parameter	ro
1A00 1A01		Transmit TPDO1/ TPDO2 Mapping Parameter	ro

DS401: Memory related Objects

The complete memory is arranged in 128 byte blocks. Each memory block is represented by an own object array within the object dictionary. All data storage and reading operations are always accessed on both memory banks in parallel.

In order to give additional control over the memory interface, the CANopen memory module CO401Memory1 supports one status and one command byte for each memory bank. This gives the possibility for accesses to one specific data bank. Data storage is always done to both memory banks in parallel.

The status and command bytes are mapped to the objects 6000/6200 that are usually reserved for the I/O addressing of a CANopen I/O module.

Memory Objects

Index	Sub-Index	Name	Acc.
5000 .. 503F	1 to 0x80	Memory block 0 byte access 128 Bytes addressed within this b	
	0	Nr of bytes within this block	ro
	1 .. 0x80	Memory bytes	rw
5C00	0 to 2	Memory Block Checksum	
	0	Nr of memory banks	ro
	1	Checksum memory bank 1	ro
	2	Checksum memory bank 2	ro
5E00	0 .. 8	CAN Monitoring Byte	
	0	Nr of memory banks	ro
	1 .. 8	Monitoring Byte	wo
5F00		Supply Voltage monitor	ro
6000	0 to 2	Read Memory Status (Read digital input 8 bit)	ro
	0	Nr of memory banks	ro
	1	Status memory bank 1	ro
	2	Status memory bank 2	ro
6200	0 to 2	Write Command to memory (Write Output 8 Bit)	rw
	0	Nr of memory banks	ro
	1	Command memory bank 1	rw
	2	Command memory bank 2	rw

Description of Object Dictionary

The following list gives a description of all dictionary entries.

Index 0005 / 0006 / 0007

This object are implemented to enable reservation of data space in PDOs by mapping dummy entries.

Index	0005
Name	Dummy 8
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	0

Index	0006
Name	Dummy 16
Description	-
Data Type	Unsigned 16
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	0

Index	0007
Name	Dummy 32
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	0

DS301: Global Objects

Index 1000 : Device Type

Description of the device type. The Object gives the CiA device profile number and additionally the functionality of the device.

Index	1000h
Name	Device Type
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0x00020194

Index 1001 : Error Register

This object holds an error of the device.

Index	1001h
Name	Error Register
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

The error register has the following structure

Bit	Meaning
0	Generic error. This bit is set, if any error is active
1	0
2	0
3	0
4	CAN bus or communication error
5	0
6	0
7	0

Index 1002 : Status Register

This object gives additional information for the device

Index	1002h
Name	Status Register
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

The status register bits have the following meaning

Bit	Meaning

Index 1005 : COB-ID Sync

Identifier of Can Object for the Synchronisation message. The CANopen-Chip may only operate in Sync consumer mode. Generating of Sync messages is not possible. Nevertheless is the Identifier for the Sync message programmable.

Index	1005h
Name	COB-ID Sync
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	-

Index 1008 : Device Name

This object shows the name of the device as visible string.

Index	1008h
Name	Device Name
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	CO401Memory1

Index 1009 : Hardware Version

This object shows the Hardware Version as visible string.

Index	1009h
Name	Hardware Version
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	-

Index 100A : Software Version

This object shows the Software Version as visible string.

Index	100Ah
Name	Software Version
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	-

Index 100B : Node-ID

This object keeps the actual node Id. The Object is not represented in the object dictionary because of standard conforming reasons.

Index	100Bh
Name	Node ID
Description	-
Data Type	Unsigned 8
Access modes	Not accessible
PDO Mapping	No
Value Range	1 to 127
Default Value	See below

There are several modes to select a valid node ID.

Setting the configuration input bits ID0 to ID6 to any combination other than zero will take the configuration input setting of bits ID0 to ID6 as valid Node-ID.

If setting the configuration input bits ID0 to ID6 to the combination zero (all input bits at high level) is reserved for future use.

Index 100C : Guard Time

The objects at index 100Ch (Guard Time in milli-seconds) and 100Dh (Life Time Factor) are used to implement the life guarding protocol. The Guard Time multiplied with the Life Time Factor gives the Life Time in milliseconds.

It is 0 (zero) if not used.

Index	100Ch
Name	Guard Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0

Index 100D : Life Time Factor

The objects at index 100Ch (Guard Time in milli-seconds) and 100Dh (Life Time Factor) are used to implement the life guarding protocol. The Guard Time multiplied with the Life Time Factor gives the Life Time in milliseconds.

It is 0 (zero) if not used.

Index	100Dh
Name	Life Time Factor
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0

Index 1014 : COB-ID Emergency

Identifier of Can Object for the emergency messages.

Index	1014h
Name	COB-ID Emergency
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	80h + Node-ID

Index 1015 : Inhibit Time Emergency

Inhibit Time for emergency messages. If the Inhibit Time is set to 0, inhibit delay is disabled. The Inhibit Time is a multiple of 100usec, but the CO401Memory1 offers a maximum resolution of 1 millisecond.

Index	1015h
Name	Inhibit Time Emergency
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Index 1017 : Producer Heartbeat Time

The producer heartbeat time defines the cycle time of the heartbeat. The producer heartbeat time is 0 if it not used. The time has to be a multiple of 1ms.

Index	1017h
Name	Producer Heartbeat Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Note:

Either Heartbeat or node guarding may be allowed at the same time. Do not use both protocols at the same time.

See additional brochure for further information about heartbeat protocol.

Index 1018 : Identity Object

The object at index 1018h contains general information about the device and the manufacturer frenzel + berg elektronik. It cannot be modified.

Index	1018h
Name	Identity Object
Description	-
Data Type	Structure

Index	1018h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned char
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	4

Index	1018h Subindex 1
Name	Vendor ID
Description	Registration Code of frenzel + berg elektronik at the CiA
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	58h

Index	1018h Subindex 2
Name	Product Code
Description	Internal Product Code for CO401Memory1 at frenzel + berg elektronik
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0140 1FFEh

Index	1018h Subindex 3
Name	Revision Code
Description	
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Revision of the device

Index	1018h Subindex 4
Name	Serial Number
Description	
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0

Index 1029 : Error Behaviour

With object 1029 the CANopen chip can be configured to enter alternatively the preoperational or the stopped state or remain in the current state in case of a device failure. Device failures shall include the following communication errors:

Bus-off conditions of the CAN interface, Life guarding error, Serious device errors also can be caused by device internal failures.

The value of the Error Classes is as follows:
0 = pre-operational
(only if current state is operational)
1 = no state change
2 = stopped
3 .. 127 = reserved

Index	1029h
Name	Error Behaviour Object
Description	-
Data Type	Structure

Index	1029h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned char
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2

Index	1029h Subindex 1
Name	Communication Error
Description	NMT state change in case of communication error
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	00h

Index	1029h Subindex 2
Name	Application Error
Description	NMT state change in case of pin EMY0# is at low level
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	00h

Index 2000 : Device Manufacturer

This Object shows "Frenzel + Berg" as visible string.

Index	2000h
Name	Device Manufacturer
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	"Frenzel + Berg"

Index 2101 : System Configuration

This Object returns the operation mode of the CANopen-Chip. It represents the inverted Setting of the configuration input bits CFG0 to CFG3.

Index	2101h
Name	System Configuration
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Depends on CFG0 to CFG3

Index 2102 : Remapping Enabled Info

This Object indicates whether the remapping of the PDOs is allowed or not.
0: Remapping is disabled
1..255: Remapping is enabled

Index	2102h
Name	Remapping Enabled Info
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	1 (remapping of PDOs enabled)

Index 2103 : Enabled Guarding Warning

This Object enables/disables transmission of emergency messages in case of a node guarding warning.

The condition of a guarding warning is met, if the time between two node guarding frames increases the guarding time given in object 100C independent of the setting of the life time (object 100D). The node guarding warning does not cause any NMT state change or switching the output pins to the error state. It is implemented to give the CANopen master an early information that the guarding interval has already exceeded the predefined value.
0 : Guarding Warning is disabled
1 : Guarding Warning is enabled

Index	2103h
Name	Enable Guarding Warning
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0

Index 2105 : Api State Register

This Object represents the state of the Api

Index	2105h	
Name	CiA Compatibility Test	
Description	State of the units within the CO401Memory	
	Bit0	Bank1 Error Error on Memory Bank 1
	Bit1	Bank2 Error Error on Memory Bank 2
	Bit2	-
	Bit3	-
	Bit4	New CAN monitoring data available
	Bit5	-
	Bit6	-
	Bit7	Voltage low, access to non volatile data memory denied.
Data Type	Unsigned 8	
Access modes	RO	
PDO Mapping	No	
Value Range		
Default Value		

Index 2110 : CiA Compatibility Test

This Object is implemented to solve a bug within the CANopen conformance test provided from CiA. It has no functionality

Index	2110h
Name	CiA Compatibility Test
Description	-
Data Type	Structure
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	

Index 2180 : CAN Restart Time

This Object gives the restart time out for the CAN communication layer in case of bus off errors in milliseconds.

If the restart time is set to 0 automatic restart of the device in case of bus off is prohibited.

Index	2180h
Name	CAN Restart Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	0 .. 50000
Default Value	1000 (restart after 1 second)

DS301: PDO Parameter Objects

Communication Parameter Objects

The following table shows the communication parameter objects for Index 140x (Receive PDOs) and Index 180x (Transmit PDOs). The tables show Index 1400 as an example for all PDOs

The transmission type (sub-index 2) defines the mode for transmission / reception of the PDO. See table for detailed description of this entry.

Description of transmission type:

Type	PDO transmission				
	cyclic	acyclic	Sync related	Async.	Only on remote
0		X	X		
1-240	X		X		
241-251	Reserved				
252			X		X
253				X	X
254				X	
255				X	

Synchronous (transmission types 0-240 and 252) means that the transmission of the PDO shall be related to the SYNC object. Asynchronous means that the transmission of the PDO is not related to the SYNC object.

A transmission type of zero means that the message shall be transmitted synchronously with the SYNC object but not periodically but only in case of data change.

A value between 1 and 240 means that the PDO is transferred synchronously and cyclically, the transmission type indicating the number of SYNC signals, which are necessary to trigger PDO transmissions or receptions.

The transmission types 252 and 253 mean that the PDO is only transmitted on reception of a remote frame. At transmission type 252, the data is updated (but not sent) immediately after reception of the SYNC object. At transmission type 253 the data is updated at the reception of the remote frame. These values are only possible for transmit PDOs.

Transmission type 255 means, the application event is defined in the device profile. For receive PDOs the reception of a PDO will update the mapped data (normally the analog or digital outputs).

Sub-index 3h contains the inhibit time. This time is a minimum interval for PDO transmission. The value is defined as multiple of 100ms.

Sub-index 4h is reserved.

In mode 254/255 additionally an event time can be used for TPDO. If an event timer exists for a TPDO (value not equal to 0) the elapsed timer is considered to be an event. The event time is a multiple of 1 ms. This event will cause the transmission of this TPDO in addition to otherwise defined events.

The PDO communication parameter objects have the same structure for all PDOs. The following Objects are used.

Index	PDO
1400h	Receive PDO1
1401h	Receive PDO2
1800h	Transmit PDO1
1801h	Transmit PDO2

Index	14xxh / 18xxh
Name	Receive PDO1 Communication Parameters
Description	-
Data Type	Structure

Index	14xxh / 18xxh Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	5

Index	14xxh / 18xxh Subindex 1
Name	COB-ID
Description	Identifier for CAN-Object for PDO1
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	180h + Node-Id (for Index 1800) 80000000h + Node-Id (for Index 1801) 200h + Node-Id (for Index 1400) 80000000h + Node-Id (for Index 1401)

An Identifier of 8xxxxxxxh means, that this PDO is disabled by default and must be enabled from the CANopen master by assigning a valid PDO ID.

Index	14xxh / 18xxh Subindex 2
Name	Transmission Type
Description	-
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0FFh

Index	14xxh / 18xxh Subindex 3
Name	Inhibit Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Index	14xxh / 18xxh Subindex 4
Name	Reserved
Description	-
Data Type	-
Access modes	-
PDO Mapping	No
Value Range	-
Default Value	-

Index	14xxh / 18xxh Subindex 5
Name	Event Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	1000

PDO Mapping Objects

The following table shows the PDO Mapping Objects. The principle of PDO mapping is the same for all PDOs. The PDO Mapping table is the cross reference between the Object dictionary entries (for example the data of an digital output byte) and the data field inside an PDO data field (position in the data field of a CAN message for PDO transfer).

Subindex 0 determines the valid number of objects that have been mapped. The CANopen module allows a maximum of 8 mapped objects for each PDO. For changing the PDO mapping first subindex 0 must be set to 0 (mapping is deactivated). Then the objects can be remapped. When a new object is mapped by writing a subindex between 1 and 8, the device may check whether the object specified by index /subindex exists. If the object does not exist or the object cannot be mapped, the SDO transfer will be aborted.

Subindexes 1 to 8 keep the pointers of the mapped objects as unsigned 32 values. The value is 0 if there is no mapped object. The structure for these pointers is as follows.

MSB			LSB
Byte3	Byte2	Byte1	Byte0
Mapped index		Subindex	Length

Mapped Index and Subindex together are the Pointer to the Object dictionary data to be mapped at this location.

Length gives the length of the mapped object in bits.

The following mapping object uses index 1600 as an example for all mapping objects.

Index	160xh
Name	Receive PDO1 Mapping Parameters
Description	-
Data Type	Array

Index	160xh Subindex 0
Name	Largest SubIndex supported
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	See table below

Index	160xh Subindex 1 to 8
Name	Mapped object
Description	
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	See table below

Receive PDOs

The CANopen chip CO401Memory1 uses the following default mapping entries receive PDO mapping:

Index	Entry	Explanation
Receive-PDO1		
1600.00	2	RPDO1: 2 mapped objects
1600.01	62000108h	Command Byte Memory Bank 1 Digital Output Byte0
1600.02	62000208h	Command Byte Memory Bank 2 Digital Output Byte1
Receive-PDO2		
1602.00	8	RPDO2: 8 mapped objects
1602.01	5E000108h	CAN Monitoring Byte 1
1602.02	5E000208h	CAN Monitoring Byte 2
1602.03	5E000308h	CAN Monitoring Byte 3
1602.04	5E000408h	CAN Monitoring Byte 4
1602.05	5E000508h	CAN Monitoring Byte 5
1602.06	5E000608h	CAN Monitoring Byte 6
1602.07	5E000708h	CAN Monitoring Byte 7
1602.08	5E000808h	CAN Monitoring Byte 8

Transmit PDOs

The CANopen chip CO401Memory1 uses the following default mapping entries for transmit PDO mapping:

Index	Entry	Explanation
Transmit-PDO1		
1A00.00	2	TPDO1: 2 mapped objects
1A00.01	60000108h	Status Byte Memory Bank 1 Digital Input Byte0
1A00.02	60000208h	Status Byte Memory Bank 2 Digital Input Byte1
Transmit-PDO2		
1A01.00	0	TPDO2: 0 mapped objects

DS401: Memory Bank Objects

Index 50xx : Memory Block Byte Access

These objects gain success to the memory blocks. Each memory block keeps a total of 128 bytes. Each memory block is represented by an own array object within the object dictionary.

Index	50xxh
Name	Memory Block Byte Access
Description	Memory
Data Type	Array

Index	Subindex 0
Name	Nr of Bytes within this memory block
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	128

Index	Subindex 1 .. 80h
Name	Data byte within this memory block
Description	
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	-

Index 5C00 : Memory Bank Checksum

This object shows the checksum for each memory bank. The checksum is a 32 bit sum of the complete data memory array.

Index	5C00h
Name	Memory Bank Checksum
Description	Checksum for the complete memory array
Data Type	Array

Index	Subindex 0
Name	Nr of memory banks
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2

Index	Subindex 1 / 2
Name	Checksum of memory bank 1 / 2
Description	
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	-

Index 5E00 : CAN Monitoring Byte

These objects are used in order to implement the CAN monitoring feature. The object bytes are mapped to receive PDO2, which is used as CAN monitoring PDO. All received CAN frames that are detected on the Node-ID configured for receive PDO2 are directly stored to the bytes in object 5E00 and are prepared for reporting to the host via serial interface.

Index	5E00h
Name	CAN Monitoring Byte
Description	Bytes received from CAN
Data Type	Array

Index	Subindex 0
Name	Nr of Bytes for monitoring
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	8

Index	Subindex 1 .. 8h
Name	CAN Monitoring Byte
Description	The data content scanned from the CAN bus line is stored within these bytes. From CAN bus line the bytes can only be written to. Reading is performed by the host via serial interface.
Data Type	Unsigned 8
Access modes	WO
PDO Mapping	No
Value Range	-
Default Value	-

Index 5F00 : Supply Voltage Monitor

This Object outputs the supply voltage in milli volts. The voltage is not directly the voltage that is supplied to the hardware, because there are diodes and other decoupling devices in the input circuit.

Index	5F00h
Name	Supply Voltage Monitor
Description	-
Data Type	Unsigned 16
Access modes	RO
PDO Mapping	No
Value Range	
Default Value	

Index 6000 : Read Memory Bank Status

This object represents the “digital input bytes” realized as memory status interface. The digital input bytes represent the state of the memories. There are no real hardware input pins supported.

Index	6000h
Name	Memory Bank Status Digital Input 8 Bit
Description	The digital input bytes represent the state of the memories.
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2 (Number of digital input bytes)

Index		Subindex 1
Name		Memory Hardware Error
Description		Error Situation on memory bank 1
	Bit0	Access-Time-Out Error
	Bit1	
	Bit2	
	Bit3	
	Bit4	Data Check Sum Error
	Bit5	Data was overwritten from other memory bank
	Bit6	Memory bank was cleared
	Bit7	
Data Type		Unsigned 8
Access modes		RO
PDO Mapping		Yes
Value Range		-
Default Value		-

Index		Subindex 2
Name		Memory Hardware Error
Description		Error Situation on memory bank 2
	Bit0	Access-Time-Out Error
	Bit1	
	Bit2	
	Bit3	
	Bit4	Data Check Sum Error
	Bit5	Data was overwritten from other memory bank
	Bit6	Memory bank was cleared
	Bit7	
Data Type		Unsigned 8
Access modes		RO
PDO Mapping		Yes
Value Range		-
Default Value		-

Index 6200 : Write Memory Bank Command

This object represents the "digital output bytes" realized as memory command interface. The digital input bytes represent the state of the memories. There are no real hardware input pins supported.

Index	6200h
Name	Write Memory Bank Command
Description	-
Data Type	Array

Index	Subindex 0
Name	
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	NO
Value Range	-
Default Value	2 (Number of digital output bytes)

Index		Subindex 1
Name		Memory Hardware Error
Description		Command for memory bank 1
	Bit0	Command Bit 0
	Bit1	Command Bit 1
	Bit2	Command Bit 2
	Bit3	Command Bit 3
	Bit4	1
	Bit5	0
	Bit6	0
	Bit7	1
Data Type		Unsigned 8
Access modes		RO
PDO Mapping		Yes
Value Range		-
Default Value		-

Index		Subindex 1
Name		Memory Hardware Error
Description		Command for memory bank 1
	Bit0	Command Bit 0
	Bit1	Command Bit 1
	Bit2	Command Bit 2
	Bit3	Command Bit 3
	Bit4	1
	Bit5	0
	Bit6	0
	Bit7	1
Data Type		Unsigned 8
Access modes		RO
PDO Mapping		Yes
Value Range		-
Default Value		-

The following Commands are implemented at this time:

Cmd Byte	Command
0x91	Clear all error flags and status information of the memory channel

Emergency Messages

The CO401Memory1 supports several emergency messages. For all emergencies the same structure is used:

Byte							
0	1	2	3	4	5	6	7
EMY-Code		1001	0	CO40xx-Code			

EMY-Code: Emergency-Error-Code according to DS301
1001: Content of Object 1001
CO40xx-Code: Emergency-Error-Code as unsigned 32 value

CO40xx-Code (hex)	May change		Description
	NMT	I/O	
8000 0000	X	X	CAN bus is bus off
4000 0000			CAN bus in error warning state
2000 0000			Node guarding warning
3000 0000	X	X	Life guarding error
0000 0010			Error on memory bank 1 detected
0000 0020			Error on memory bank 2 detected
0000 0040			Voltage low Writing to memory is prohibited
0000 0080			Voltage low critical Writing to memory is prohibited

Emergency 2000 0000 (Node guarding warning) must be enabled with object 2103.

If more than one error is active at the same time, the bitmap of the CO40xx-Codes for all active errors are combined with a logical or conjunction.

Some of the emergencies may cause a NMT state change and/or may force the output pins to the error state. This behaviour depends on the setting of object 1029.

The ID for emergency transmission is fixed to:

0x80 + $NodeID.

List of emergency messages:

Node-Guarding Warning							
30	81	01	00	00	00	00	20

This warning occurs, if the masters fails to transmit the guarding remote frame within the specified Guard Time object 100C and if transmission is enabled in object 2103

Life-Guarding Error							
30	81	01	00	00	00	00	30

This error occurs, if the masters fails to transmit the guarding remote frame within the specified Life Time (Guard Time object 100C multiplied with Life Time Factor object 100D)

Error on memory bank 1 detected							
00	10	01	00	10	00	00	00
Error on memory bank 2 detected							
00	10	01	00	20	00	00	00

These errors occur, if the firmware detects a checksum error or different data within the two memory banks

Supply voltage low							
00	10	01	00	40	00	00	00
Error on memory bank 2 detected							
00	10	01	00	80	00	00	00

These errors occur, if the controller detects a supply voltage less than 15V/less than 11V. Any write access to the memory will be aborted in order to protect the memory for invalid data storage.

CAN Bus in Error Warning state							
00	81	01	00	00	00	00	40

This error occurs, if the chips internal CAN module is in error warning state.

Return from CAN Bus OFF							
40	81	01	00	00	00	00	C0

This message indicates a return from Bus OFF state.

Asynchronous Serial Interface

The CANopen memory module CO401Memory1 supports an asynchronous serial interface to access the CANopen data memory objects.

Additionally there is a CAN bus monitoring feature implemented, in order to gain access to the CAN bus line over the CO401Memory1's serial interface.

A serial protocol string must be sent in a straight order without any time delay in-between the single bytes belonging to the same data record. So resynchronisation of the data stream is automatically done by inserting a pause of approx 100 msec.

Serial Protocol

The serial protocol controls the data transfer between the host controller and the CO401Memory1.

Byte 0	Byte 1	Byte 2	Byte n
Command	DataByte0	DataByte1	DataByte n

Command: The Command Byte describes the command or the content of the data bytes.

Command Byte							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CMD				Len			

CMD Command specifier for active command

Len Length information. Gives the number of data bytes transmitted within this command record

Serial Protocol Command List

The serial protocol supports the following commands.

Cmd Byte	Data Len	Telegram Data Flow	Description
0x00	-		Request: Read Status Registers from CO401Memory1
0x04	4	CO -> H	Answer: Status Registers from CO401Memory1
0x14	4	H -> CO	Command: Write Command Registers
0x11	1	CO -> H	Acknowledge: Write Command Registers
0x33	3	CO -> H	Request: Read Memory Array Data
0x32	2	H -> CO	Answer: Read Memory Array Data
0x44	4	H -> CO	Command: Write Memory array data
0x41	1	CO -> H	Acknowledge: Write Memory Array Data
0x83	3	H -> CO	Command: Setup CAN Monitoring Object
0x81	1	CO -> H	Acknowledge: Setup CAN Monitoring Object
0xC0	0	CO -> H	Request: Read Received CAN Data
0xCn	n	H -> CO	Answer: Return Received CAN Data
0xDn	n	H -> CO	Command: Write CAN data
0xD1	1	CO -> H	Acknowledge: Write CAN data

Telegram Flow:

H -> CO Data flow for this Telegram is from Host Controller to CO401Memory1.

CO -> H Data flow for this Telegram is from CO401Memory1 to Host Controller.

Read Status Register

This command is used to read the status registers of the CO401Memory1.

Request Message from host to CO401Memory1

Byte
0
0x00

Answer Message from CO401Memory1 to Host

Byte				
0	1	2	3	4
0x04	MS1	MS2	SOR	Res

MS1 Memory status of memory bank 1
CANopen dictionary object 6000.01

MS2 Memory status of memory bank 2
CANopen dictionary object 6000.02

SOR Status Output Register. Represents the system status at the status output pins.

Res Reserved for future use

Write Command Registers

With this message the Host may directly write to the command registers.

Command Message from Host to CO401Memory1

Byte		
0	1	2
0x12	ADR	VAL

ADR Address of Command Register to write to:
- 1 Command Register of memory bank 1 CANopen dictionary object 6200.01
- 2 Command Register of memory bank 2 CANopen dictionary object 6200.01

VAL Value to write to the command register

Acknowledge from CO401Memory1 to host

Byte	
0	1
0x11	Ack

ACK Acknowledge for this command
- 0 Negative acknowledge. execution of command failed
- 1 Positive acknowledge. execution of command successful completed.

Read Memory Array Data

With this message the host reads data from the non volatile data memory of the CO401Memory1

Request Message from host to CO401Memory1

Byte			
0	1	2	3
0x33	IDXL	IDXH	SUB

IDXL Index of the CANopen object low byte
IDXH Index of the CANopen object high byte
SUB Sub-Index of the CANopen object selected with IDXH/IDXL

Answer from CO401Memory1 to host

Byte		
0	1	2
0x32	ACK	DAT

ACK Acknowledge for this command
- 0 Negative acknowledge. execution of command failed DAT is not valid
- 1 Positive acknowledge. execution of command successful completed. DAT is valid

DAT Data value of the addressed memory location.

Example:

The Host wants to read object 5012.04

The required message is:

0x23 0x12 0x50 0x04

If reading was successful, the CO401Memory1 will return the data content of this object (0x23 for this example) answer with the message:

0x32 0x01 0x23

If reading failed, the CO401Memory1 will answer with a telegram that indicates the abort information within the data content. Answer message:

0x32 0x00 0xXX

***Note:* The Read Memory Array Data" command is restricted to the objects according to the non volatile data area of the CO401Memory module.**

Write Memory Array Data

With this message the host writes data to the non volatile data memory of the CO401Memory1

Command Message from host to CO401Memory1

Byte				
0	1	2	3	4
0x44	IDXL	IDXH	SUB	DAT

IDXL Index of the CANopen object low byte
IDXH Index of the CANopen object high byte
SUB Sub-Index of the CANopen object selected with IDXH/IDXL
DAT Data value of the addressed memory location.

Acknowledge from CO401Memory1 to host

Byte	
0	1
0x41	Ack

ACK Acknowledge for this command
- 0 Negative acknowledge. execution of command failed
- 1 Positive acknowledge. execution of command successful completed.

Setup CAN Monitoring Object

With this message the host initialises the CAN receive channel in order to support the CAN bus line monitoring.

Command Message from host to CO401Memory1

Byte			
0	1	2	3
0x83	Reg	VL	VH

Reg Register of the receive buffer to initialise
- 0 CAN message ID
  Identifier of the CAN message to monitor

VL/VH Value of the register indicated by Reg field.

Reg	Value
0	CAN message ID Identifier of the CAN message to monitor. Identifier = 0 will stop monitoring of the CAN bus line ***Note***: The CO401Memory1 does not check whether the ID is valid or not. The user must not set this ID to an ID used by the currently running CANopen stack of the device. This might cause the CANopen stack to crash.

Acknowledge from CO401Memory1 to host

Byte	
0	1
0x81	Ack

ACK Acknowledge for this command
- 0 Negative acknowledge.
  execution of command failed
- 1 Positive acknowledge.
  execution of command successful completed.

Example:

The Host wants to monitor the CAN bus line for message ID 0x123

The required message is:

0x83 0x00 0x23 0x01

If setting of the monitoring ID was successful, the CO401Memory1 will answer with the message:

0x81 0x01

Request Read CAN data

With this message the host reads the CAN data received by the CAN bus monitoring channel.

Request Message from host to CO401Memory1

Byte
0
0xC0

Answer from CO401Memory1 to host

Byte					
0	1	2	3	..	n
0xCx	ACK	DAT1	DAT2	..	DATn

ACK Acknowledge for this command
- 0 Negative acknowledge.
  execution of command failed
  DAT is not valid
- 1 Positive acknowledge.
  execution of command successful completed.
  DAT is valid

DAT.. Data values of the received CAN frame.
The number of data bytes is equal to the number data bytes received over the CAN bus line.

Example:

The CO401Memory1 has received the CAN frame with 5 data bytes 0xB1, 0xB2, 0xB3, 0xB4, 0xB5 during the the monitoring feature. The host wants to read this data bytes.

The required message is:

0xC0 0x00 0x23 0x01

The CO401Memory1 will answer with the message:

0xC6 0x01 0xB1 0xB2 0xB3 0xB4 0xB5

If the CO401Memory1 has not detected a valid CAN frame for monitoring it will to the request with an abort message:

0xC1 0x00

Transmit CAN data

With this message the host transmits CAN data.

Command Message from host to CO401Memory1

Byte					
0	1	2	3	..	N
0xDx	IDL	IDH	DAT1	..	DATn

IDL/IDH CAN Identifier for the transmit message.
DAT.. Data values to transmit over the CAN bus line. The CO401Memory1 will initiate transmission of a CAN frame with the

Acknowledge from CO401Memory1 to host

Byte	
0	1
0xD1	Ack

ACK Acknowledge for this command
0 Negative acknowledge.
execution of command failed
1 Positive acknowledge.
execution of command successful completed.

Example:

The host wants to create a CAN message with identifier 0x123 and the three data bytes 0xB1, 0xB2, 0xB3

The required message is:

0xD5 0x23 0x01 0xB1 0xB2 0xB3

If CAN transmission was successfully initiated, the CO401Memory1 will answer with the message:

0xD1 0x01

If the CO401Memory1 was unable to start transmission the CO401Memory1 will answer with the message:

0xD1 0x00

Absolute Maximum Ratings

Stresses greater than those listed parameters may cause permanent damage to the device. Functional operation should be restricted to recommended operation conditions. Exposure to absolute maximum rating conditions for extended times may affect reliability.

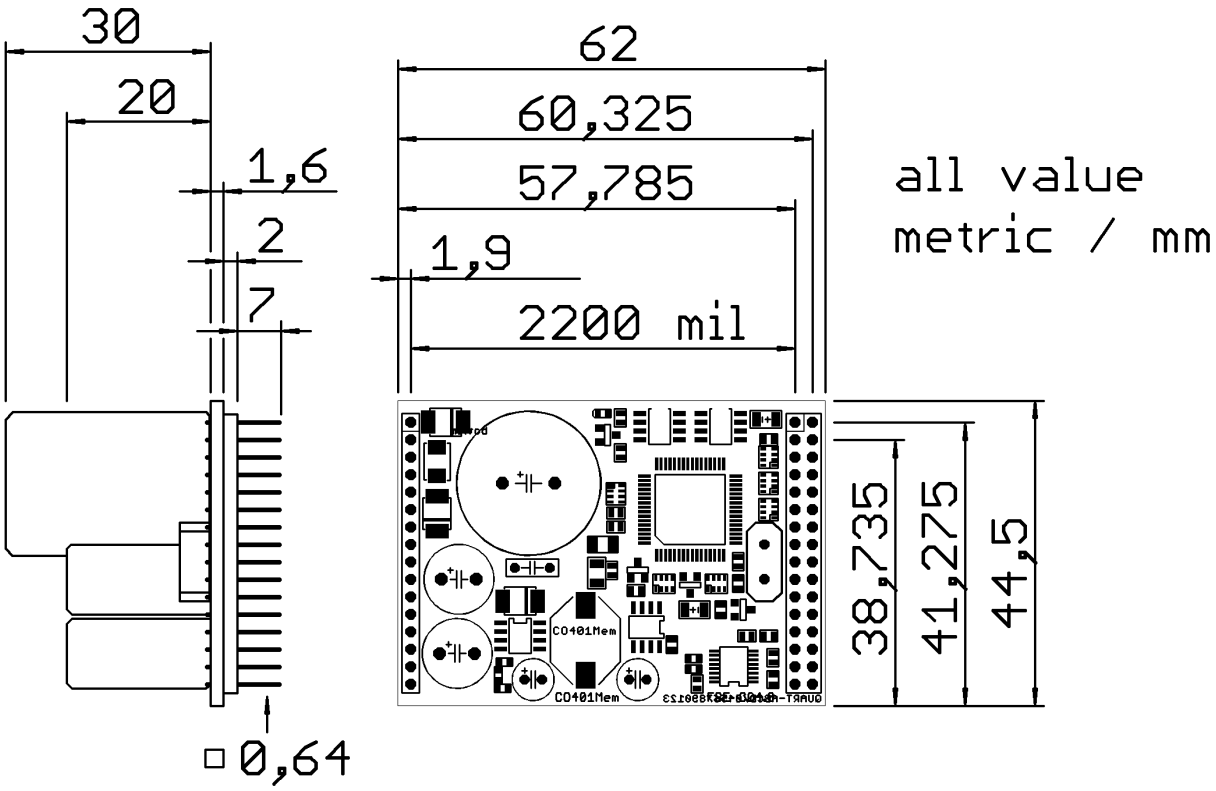
Parameter	Symbol	Rated Value		Units	Remarks
		Min.	Max.		
Power supply voltage	+24V	VSS – 0.3	VSS + 45	V	
Input voltage	Vi	VSS – 0.3	VSS + 6.0	V	Vi < VCC + 0.3V
Output voltage	Vo	VSS – 0.3	VSS + 6.0	V	Vo < VCC + 0.3V
L level maximum output current	I_{OLMAX}		15	mA	Time < 20 msec
L level maximum output current	I_{OL}		4	mA	
H level maximum output current	I_{OHMAX}		15	mA	Time < 20 msec
H level maximum output current	I_{OH}		4	mA	
Maximum VCC (+5V) output current	I_{O+5MAX}		50	mA	
Operating temperature	T_A	0	+70	^oC	CO401Memory1-M
	T_A	-40	+85	^oC	CO401Memory1E-M
Storing temperature	T_A	-55	+150	^oC	

Recommended Operation Conditions

Functional operation should be restricted to recommended operation conditions.

Parameter	Symbol	Rated Value			Units	Remarks
		Min.	Typ.	Max.		
Power supply voltage	+24V	18	24	36	V	
Power supply current	I_{CC}		25		mA	All inputs V_{IL} or V_{IH} All outputs open
VCC output	VCC		5		V	
Input H voltage	V_{IH}	0.8 * VCC		VCC + 0.3	V	
Input L voltage	V_{IL}	VSS – 0.3		0.2 * VCC	V	
Output H voltage	V_{OH}	VCC – 0.5			V	I_{OH} = -4.0 mA
Output L voltage	V_{OL}			0.4	V	I_{OL} = 4.0 mA
Input leakage current	I_{LKC}	-5		5	uA	
Operating temperature	T_A	0		+70	^oC	CO401Memory1-M
	T_A	-40		+85	^oC	CO401Memory1E-M

Board Dimension



Revision History

Version	Date of Change	Changes
1.110	Jan-24-2005	First Version : Serial command interface not supported
1.120	Feb-01-2005	Serial command interface implemented CAN monitoring feature implemented. RxPDO2 mapping changed. Several changes within object dictionary

Table of Content