Operating Manual

safety - control - motion - interface

CI800

CANopen Interface Module for MC800 Motion Controller

Product features:

- CANopen Slave compliant to CiA DS301 V 4.02
- Process data communication with 4 Receive-PDOs and 4 Transmit-PDOs
- Galvanically isolated bus electronics
- Supports all standard baud rates
- Easy plug-in mounting

motrona GmbH, Zeppelinstraße 16, DE - 78244 Gottmadingen, Tel. +49 (0) 7731 9332-0, Fax +49 (0) 7731 9332-30, info@motrona.com, www.motrona.com

Version:	Description:
Ci800_01a_oi_e / TJ / Jul 17	First edition

Legal notices:
All contents included in this manual are protected by the terms of use and copyrights of motrona GmbH. Any reproduction, modification, usage or publication in other electronic and printed media as well as in the internet requires prior written authorization by motrona GmbH.

Table of contents

1. Safety Instructions and Responsibility

1.1 General Safety Instructions

This operation manual is a significant component of the unit and includes important rules and hints about the installation, function and usage. Non-observance can result in damage and/or impairment of the functions to the unit or the machine or even in injury to persons using the equipment!

Please read the following instructions carefully before operating the device and observe all safety and warning instructions! Keep the manual for later use.

A pertinent qualification of the respective staff is a fundamental requirement in order to use these manual. The unit must be installed, configured, commissioned and serviced by a qualified electrician.

Liability exclusion: The manufacturer is not liable for personal injury and/or damage to property and for consequential damage, due to incorrect handling, installation, operation and maintaining. Further claims, due to errors in the operation manual as well as misinterpretations are excluded from liability. In addition the manufacturer reserves the right to modify the hardware, software or operation manual at any time and without prior notice. Therefore, there might be minor differences between the unit and the descriptions in operation manual.

The raiser is exclusively responsible for the safety of the system and equipment where the unit will be integrated.

During installation, operation or maintenance all general and also all country- and application-specific safety rules and standards must be observed.

If the device is used in processes, where a failure or faulty operation could damage the system or injure persons, appropriate precautions to avoid such consequences must be taken.

1.2 Use according to the intended purpose

The unit is intended exclusively for use in industrial machines, constructions and systems. Non-conforming usage does not correspond to the provisions and lies within the sole responsibility of the user. The manufacturer is not liable for damages which have arisen through unsuitable and improper use.

Please note that device may only be installed in proper form and used in a technically perfect condition in accordance to the “Technical Specifications”. The device is not suitable for operation in explosion-proof areas or areas which are excluded by the EN 61010-1 standard.

1.3 Installation

The device is only allowed to be installed and operated within the permissible temperature range. Please ensure an adequate ventilation and avoid all direct contact between the device and hot or aggressive gases and liquids.

Before installation or maintenance, the unit must be disconnected from all voltage-sources. Further it must be ensured that no danger can arise by touching the disconnected voltage-sources.

Devices which are supplied by AC voltages must be connected exclusively by switches, respectively circuit-breakers with the low voltage network. The switch or circuit-breaker must be placed as near as possible to the device and further indicated as separator.

Incoming as well as outgoing wires and wires for extra low voltages (ELV) must be separated from dangerous electrical cables (SELV circuits) by using a double resp. increased isolation.

All selected wires and isolations must be compliant to the provided voltage- and temperature-ranges. Further all country- and application-specific standards, which are relevant for structure, form and quality of the wires, must be ensured. Indications about the permissible wire cross-sections for wiring are described in the "Technical Specifications" chapter.

Before first start-up it must be ensured that all connections and wires are firmly seated and secured in the screw terminals. All (inclusively unused) terminals must be fastened by turning the relevant screws clockwise up to the stop.

Overvoltage at the connections must be limited to values in accordance to the overvoltage category II.

For placement, wiring, environmental conditions as well as shielding and earthing/grounding of the supply lines the general standards of industrial automation industry and the specific shielding instructions of the manufacturer are valid. Please find all respective hints and rules on www.motrona.com/download.html --> "[General EMC Rules for Wiring, Screening and Earthing]".

1.4 Cleaning, Maintenance and Service Notes

To clean the front of the unit please use only a slightly damp (not wet!), soft cloth. For the rear no cleaning is necessary. For an unscheduled, individual cleaning of the rear the maintenance staff or assembler is self-responsible.

During normal operation no maintenance is necessary. In case of unexpected problems, failures or malfunctions the device must be shipped for back to the manufacturer for checking, adjustment and reparation (if necessary). Unauthorized opening and repairing can have negative effects or failures to the protection-measures of the unit.

2. General

The CI800 interface module provides instant CANopen connectivity of the MC800 universal motion controller.
It is a standard CANopen Slave compliant to CiA DS301 V 4.02.
The CAN bus connection is galvanically isolated and supports all standard baud rates as well as auto baudrate detection.
The interface module allows easy parameter access via SDO communication and process data transfer with 4 Receive-PDOs and 4 Transmit-PDOs.

For the operation of the interface module and the understanding of this manual basic knowledge in CANopen communication is presupposed.

3. Connections and LEDs

Front view:

LED "RUN": Indicates the actual CANopen state

LED state	Indication	Description
Off	–	No power
Green	Operational	The Module is in the CANopen state "Operational"
Green blinking	Pre-operational	The Module is in the CANopen state "Pre-Operational"
Green single flash	Stopped	The Module is in the CANopen state "Stopped"
Green flickering	Autobaud	Baud rate detection in progress
Red	Exception state	Fatal error

LED "ERR": Indicates bus errors

LED state	Indication	Description
Off	–	No power or device is in working condition
Red single flash	Warning limit reached	A bus error counter has reached or exceeded its warning level
Red double flash	Error Control Event	A guard event (NMT-Slave or NMT-Master) or heartbeat event (Heartbeat consumer) has occurred
Red	Bus off	Bus off

CAN connector (D-Sub 9-pin male):

Pin	Signal	Comments
1, 4, 6, 8, 9	–	Unused
2	CAN_L	CAN_L bus line
3	CAN_GND	CAN ground
5	CAN_SHLD	CAN shield
7	CAN_H	CAN_H bus line
Housing	CAN_SHLD	CAN shield

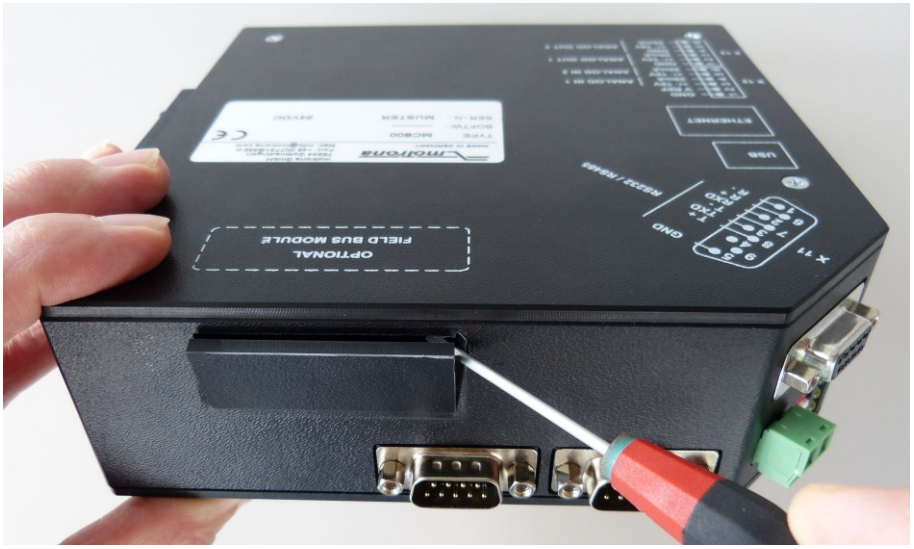
4. Mounting

If you want to mount the interface module for the very first time in your MC800 (cut-out at housing still closed) please follow the steps below.
However, if the slot for the interface module is already available in your MC800's housing, please go on with step 6.

1. Press slightly with your thumbs to the housing as shown in the picture until you can see the predetermined breaking edges of the cut-out

2. Carefully press to the upper side of the predetermined cut-out until the edge breaks

3. Flap the cut-out piece to the exterior with a small screw driver.



4. Dismantle the cut-out piece

5. The mounting slot for the interface module is now ready for use

6. Insert the interface module carefully.
   Please make sure that the module properly fits to the sliding bars in the slot, otherwise the connector pins can be damaged!

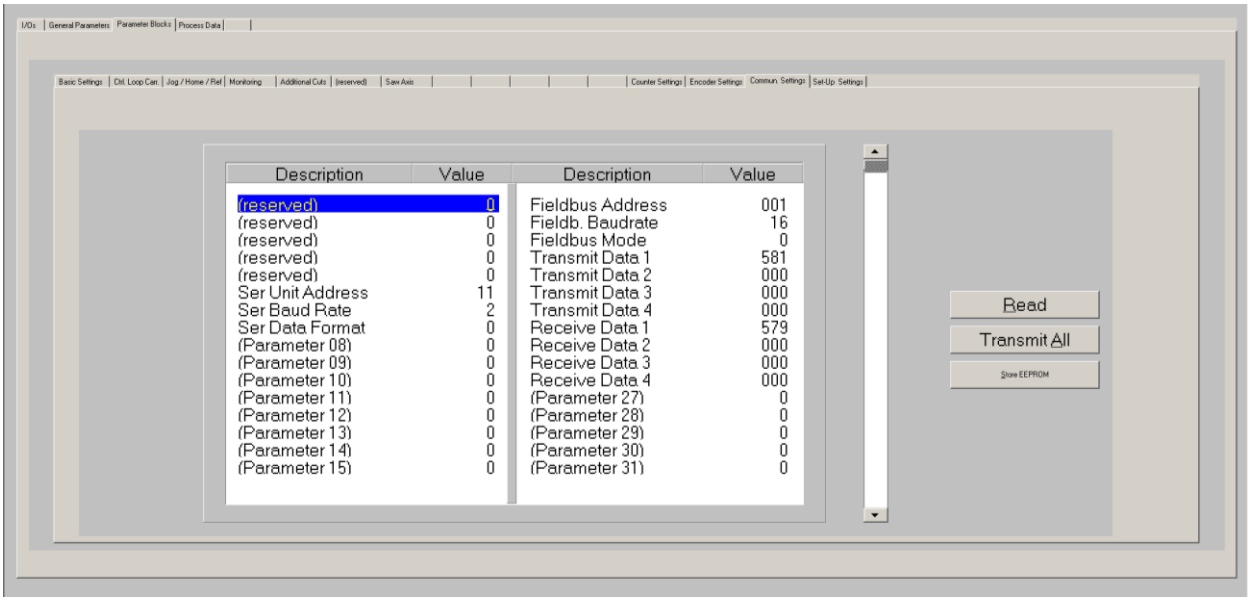
7. Tighten the two locking screws with a TORX 8 screwdriver

8. If you remove the interface module and leave the mounting slot empty, please cover the slot.
   A suitable cover is available on request (motrona part no. 42160).

5. Operation

5.1 Parameter setting in the MC800 firmware

In the MC800 firmware you will find the parameters for the interface module in parameter block "Communication settings" on the right hand side of the according register card:



Fieldbus address	CANopen Node Address Setting range 1…127
Fieldb. Baudrate	CAN transmission rate: 0: 10 kbps 1: 20 kbps 2: 50 kbps 3: 100 kbps 4: 125 kbps 5: 250 kbps 6: 500 kbps 7: 800 kbps 8: 1000 kbps 9: Auto (Automatic baud rate detection)
Fieldbus Mode	Not in use
Transmit Data 1	Mapping of the TPDO 1 (Transmit Process Data Object 1): Register number of the MC800 parameter that is transmitted by TPDO 1. See column "#" in MC800 firmware manual parameter tables for the required number. Example: With Transmit Data 1 = 581 the Output Status is transmitted by TPDO 1 Please see below for details of the PDO communication.

Transmit Data 2	As above, but for TPDO 2 (Transmit Process Data Object 2)
Transmit Data 3	As above, but for TPDO 3 (Transmit Process Data Object 3)
Transmit Data 4	As above, but for TPDO 4 (Transmit Process Data Object 4)
Receive Data 1	Mapping of the RPDO 1 (Receive Process Data Object 1): Register number of the MC800 parameter that is received by TPDO 1. See column "#" in MC800 firmware manual parameter tables for the required number. For unused PDOs please set the value to 0. Example: With Receive Data 1 = 579 the Bus Command Status (setting of commands via fieldbus) is received by RPDO 1 Please see below for details of the PDO communication.
Receive Data 2	As above, but for RPDO 2 (Receive Process Data Object 2)
Receive Data 3	As above, but for RPDO 3 (Receive Process Data Object 3)
Receive Data 4	As above, but for RPDO 4 (Receive Process Data Object 4)
(Parameter 27…31)	Not in use

5.2 SDO communication

All parameters are accessible by SDO (Service Data Object) communication.
The Identifier for the SDOs are CANopen default:

Identifier of Receive SDO = 1536 (600 hex) + Node Address
Identifier of Transmit SDO = 1408 (580 hex) + Node Address

5.3 PDO communication

For fast process data exchange the interface module provides 4 Transmit PDOs (Process Data Objects) and 4 Receive PDOs. The PDOs consist of 4 data byte and use the predefined CANopen default identifiers. You can map one MC800 parameter to each PDO, therefore you can read up to 4 parameter values and write up to 4 parameter values by fast PDO transmission.

PDO	Identifier	Data Byte 0 … 3
Transmit PDO 1	180 hex + Node Address	Value of parameter defined in "Transmit Data 1"
Transmit PDO 2	280 hex + Node Address	Value of parameter defined in "Transmit Data 2"
Transmit PDO 3	380 hex + Node Address	Value of parameter defined in "Transmit Data 3"
Transmit PDO 4	480 hex + Node Address	Value of parameter defined in "Transmit Data 4"
Receive PDO 1	200 hex + Node Address	Value of parameter defined in "Receive Data 1"
Receive PDO 1	300 hex + Node Address	Value of parameter defined in "Receive Data 2"
Receive PDO 1	400 hex + Node Address	Value of parameter defined in "Receive Data 3"
Receive PDO 1	500 hex + Node Address	Value of parameter defined in "Receive Data 4"

The PDO mapping can only be changed by MC800 parameters “Transmit Data 1” to “Receive Data 4”. Change of the mapping via CANopen is not supported, i. e. the corresponding CANopen Objects (1600 … 1603 hex and 1A00 … 1A03 hex) are read only.

The default transmission type for the PDOs is asynchronous (event driven), i. e. the corresponding Transmit PDO is sent whenever the value of the mapped MC800 parameter changes. Values received by a Receive PDO are transferred immediately to the register of the mapped MC800 parameter. However, the transmission type of each PDO can be changed by the CANopen Master in the corresponding CANopen Objects (1400 … 1403 hex and 1800 … 1803 hex) if required.

PDO transmission is only possible when the interface module is in the CANopen state “Operational”. To start the PDO communication, the CANopen master device must send the NMT (Network Management) message “Start Remote Node”.

5.4 Emergency Message

When an error occurs in the MC800 firmware and MC800 output “Error” is set, the interface module transmits a CANopen EMCY Message (identifier 80 hex + Node Address) with the Error Code “Generic Error”.
After all pending errors of the MC800 firmware have been cleared and MC800 output “Error” is reset, an EMCY message with all data bytes set to 0 is sent.

5.5 Node Guarding

The interface module supports the standard CANopen node guarding function for supervision by the CANopen master.

5.6 EDS

The corresponding CANopen EDS file (Electronic Data Sheet) “CI800.eds” is available for download on the motrona homepage.

6. Object Dictionary

6.1 CANopen Standard Objects (Communication Objects

Index (hex)	Object Type	Object Name	Data Type	Access*	Remarks
1000	VAR	Device Type	Unsigned32	RO	0000 0000 h (No profile)
1001	VAR	Error Register	Unsigned8	RO	
1003	ARRAY	Pre-defined error field	Unsigned32	RO	
1005	VAR	COB-ID Sync	Unsigned32	RW	Default: 0000 0080 h
1008	VAR	Manufacturer device name	Vis-String	Const	
100A	VAR	Manufacturer softw. version	Vis-String	Const	
100C	VAR	Guard time	Unsigned16	RW	
100D	VAR	Life time factor	Unsigned8	RW	
1010	ARRAY	Store parameters	Unsigned32	RW	For communication parameters only
1011	ARRAY	Restore default parameters	Unsigned32	RW	
1014	VAR	COB-ID EMCY	Unsigned32	RO	
1015	VAR	Inhibit time EMCY	Unsigned16	RW	Default: 0000 h
1016	ARRAY	Consumer heartbeat time	Unsigned32	RW	
1017	VAR	Producer heartbeat time	Unsigned16	RW	
1018	RECORD	Identity object	Identity	RO	
1400	RECORD	1. Receive PDO Parameter	PDO CommPar	RW	
1401	RECORD	2. Receive PDO Parameter	PDO CommPar	RW	
1402	RECORD	3. Receive PDO Parameter	PDO CommPar	RW	
1403	RECORD	4. Receive PDO Parameter	PDO CommPar	RW	
1600	RECORD	1. Receive PDO Mapping	PDO Mapping	RO	
1601	RECORD	2. Receive PDO Mapping	PDO Mapping	RO	
1602	RECORD	3. Receive PDO Mapping	PDO Mapping	RO	
1603	RECORD	4. Receive PDO Mapping	PDO Mapping	RO	
1800	RECORD	1. Transmit PDO Parameter	PDO CommPar	RW	
1801	RECORD	2. Transmit PDO Parameter	PDO CommPar	RW	
1802	RECORD	3. Transmit PDO Parameter	PDO CommPar	RW	
1803	RECORD	4. Transmit PDO Parameter	PDO CommPar	RW	
1A00	RECORD	1. Transmit PDO Mapping	PDO Mapping	RO	
1A01	RECORD	2. Transmit PDO Mapping	PDO Mapping	RO	
1A02	RECORD	3. Transmit PDO Mapping	PDO Mapping	RO	
1A03	RECORD	4. Transmit PDO Mapping	PDO Mapping	RO	

*) RO = Read only, RW = Read and write

6.2 Manufacturer Specific Objects (MC800 firmware parameters)

Index = 2000 hex + MC800 register number (marked with "#" in MC800 parameter tables)

Object name (= Parameter name) is firmware specific, please refer to corresponding MC800 firmware manual parameter tables

Index (hex)	Object Name	MC800 Register # (dec.)	Data Type	Access	Remarks
2001	General Parameter 00	1	Integer32	RW	
…	…	…	…	…	
2020	General Parameter 31	32	Integer32	RW	
2021	Block01 Parameter 00	33	Integer32	RW	
…	…	…	…	…	
2040	Block01 Parameter 31	64	Integer32	RW	
2041	Block02 Parameter 00	65	Integer32	RW	
…	…	…	…	…	
2060	Block02 Parameter 31	96	Integer32	RW	
2061	Block03 Parameter 00	97	Integer32	RW	
…	…	…	…	…	
2080	Block03 Parameter 31	128	Integer32	RW	
2081	Block04 Parameter 00	129	Integer32	RW	
…	…	…	…	…	
20A0	Block04 Parameter 31	160	Integer32	RW	
20A1	Block05 Parameter 00	161	Integer32	RW	
…	…	…	…	…	
20C0	Block05 Parameter 31	192	Integer32	RW	
20C1	Block06 Parameter 00	193	Integer32	RW	
…	…	…	…	…	
20E0	Block06 Parameter 31	224	Integer32	RW	
20E1	Block07 Parameter 00	225	Integer32	RW	
…	…	…	…	…	
2100	Block07 Parameter 31	256	Integer32	RW	
2101	Block08 Parameter 00	257	Integer32	RW	
…	…	…	…	…	
2120	Block08 Parameter 31	288	Integer32	RW	
2121	Block09 Parameter 00	289	Integer32	RW	
…	…	…	…	…	
2140	Block09 Parameter 31	320	Integer32	RW	

Index (hex)	Object Name	MC800 Register # (dec.)	Data type	Access	Remarks
2141	Block10 Parameter 00	321	Integer32	RW	
…	…	…	…	…	
2160	Block10 Parameter 31	352	Integer32	RW	
2161	Block11 Parameter 00	353	Integer32	RW	
…	…	…	…	…	
2180	Block11 Parameter 31	384	Integer32	RW	
2181	Block12 Parameter 00	385	Integer32	RW	
…	…	…	…	…	
21A0	Block12 Parameter 31	416	Integer32	RW	
21A1	Counter Settings Par. 00	417	Integer32	RW	
…	…	…	…	…	
21C0	Counter Settings Par. 31	448	Integer32	RW	
21C1	Encoder Settings Par. 00	449	Integer32	RW	
…	…	…	…	…	
21E0	Encoder Settings Par. 31	480	Integer32	RW	
21E1	Communication Par. 00	481	Integer32	RW	
…	…	…	…	…	
2200	Communication Par. 31	512	Integer32	RW	
2201	Set-up Settings Par. 00	513	Integer32	RW	
…	…	…	…	…	
2220	Set-up Settings Par. 31	544	Integer32	RW	
2221	Actual Value 00	545	Integer32	RO	
…	…	…	…	…	
2240	Actual Value 31	576	Integer32	RO	
2241	Status of Hardware Inputs	577	Unsigned32	RO	
2242	Status of Serial Commands	578	Unsigned32	RO	
2243	Status of Bus Commands	579	Unsigned32	RW	Use this register to set commands via fieldbus
2244	Status of all Commands	580	Unsigned32	RO	
2245	Status of Outputs	581	Unsigned32	RO	
2246	Error Status	582	Unsigned32	RO	
2247	Status 06 (reserved)	583	Unsigned32	RO	
…	…	…	…	…	
2250	Status 15 (reserved)	592	Unsigned32	RO	
2251	MC800 firmware version	593	Unsigned32	RO	
2252	MC800 serial number	594	Unsigned32	RO	

Object type of all manufacturer specific objects is VAR

7. Technical Data

Power supply:	Internal Power supply 3.3 V by MC800, no external power supply via fieldbus required
Ambient Temperature:	Operating: 0 … +60 °C / 32 … 140 °F (not condensing) Storage: -40 … +70 °C / -40 … 158 °F (not condensing)
Dimensions:	52 x 50 x 22 mm
Operating mode:	Designed for integration to MC800 motion controller (no stand-alone operation possible)
CANopen function:	CANopen Slave compliant to CiA DS301 V 4.02 Acyclic communication with SDOs Cyclic process data communication with 4 RPDOs and 4 TPDOs
CAN baud rates:	10, 20, 50, 100, 125, 250, 500, 800 and 1000 kbps
CAN connector:	D-Sub 9-pin male, galvanically isolated