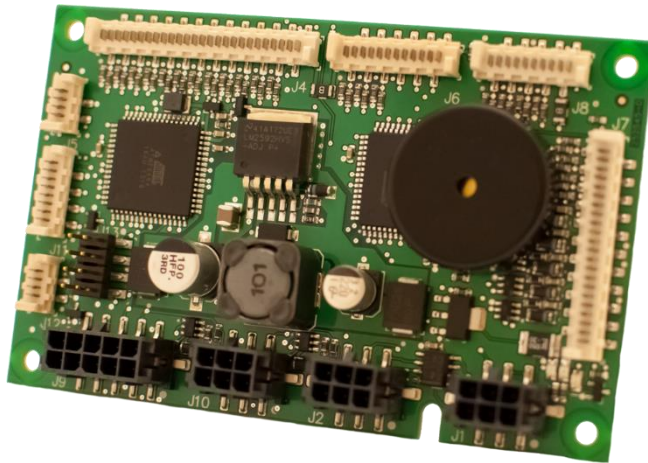


# CCM FULL MANUAL

*Introduction* | **CAN Cabin Module** for connection of operators steering commands and display indication LEDs. To be placed in driver cabin or a control panel.



## Product Overview

### Technical data

- Can be driven from 9-32Vdc power supply
- Designed for use in vehicles and mobile machinery
- 44 digital inputs(Positive signals)
- 8 analog inputs 10bit (0-5V)
- 1 unfiltered analog input 10bit (0-5V)
- 10 digital PNP outputs (5V) max 100mA
- 5 PWM outputs (Negative switching) Max 500mA
- Internal buzzer and status LEDs
- 2 Atmel processors, possibility to implement internal monitoring

### Mechanical data

- Dimensions: 95x60x11mm
- Mounting hole diameter: 3.2mm
- Connectors: Molex Microfit and Picoflex®

### Communication

- Supports CAN 2.0A and 2.0B with bus speed up to 1Mbit/s
- Electrum Automation AB is a member of *CAN in Automation* and supports the CANopen protocol
- Customized protocol is available



### Test standards

- Immunity conducted interference ISO7637-2, pulse 1, 2a, 2b, 3a, 3b, 4
- Immunity conducted interference ISO7637-2, pulse 5: +100V
- Immunity to interfering fields ISO11452 20-1000MHz 30V/m
- Current injection ISO11452 120mA
- Transient emission ISO7637
- Interference emission CISPR 25
- ESD ISO10605, class C

## Table of content

1	Electrical characteristics .....	4
2	Absolute maximum ratings .....	4
3	I/O characteristics .....	5
4	Connectors .....	6
5	CANopen protocol .....	8
6	Status LEDs .....	10
7	CANopen object dictionary .....	11
8	Document history .....	16
9	Contact us .....	17

## 1 Electrical characteristics

Parameter	Condition	Min.	Typ.	Max.	Units
Operational voltage		9		32	V <sub>DC</sub>
Power consumption (no outputs sourcing current)	32V < V <sub>IN</sub> > 9V	0.6	0.8	1.0	W
CAN termination	CAN <sub>termination</sub> = On	118	120	122	Ω
Operating temperature		-40		85	°C
Analog Input voltage		0		5	V <sub>DC</sub>
Digital input high voltage level <sup>(1)</sup>		3			V <sub>DC</sub>
Digital input low voltage level <sup>(2)</sup>				1	V <sub>DC</sub>
Analog voltage input impedance	Fixed pull-down		100k		Ω
Unfiltered analog voltage input impedance	Fixed pull-down		200k		Ω
Digital input impedance	Fixed pull-down		5.6k		Ω
+5V supply output voltage		4.950	5.000	5.050	V
+5V supply output current <sup>(3)</sup>		100			mA
Digital output current source <sup>(3)</sup>		100			mA
PWM1-4 current sink <sup>(3)</sup>		125			mA
PWM5 current sink <sup>(3)</sup>		500			mA

- Note:
1. "Min" means the lowest value where the pin is guaranteed to be read as high
  2. "Max" means the highest value where the pin is guaranteed to be read as low
  3. "Min" means the lowest value guaranteed not to trigger the over current protection

## 2 Absolute maximum ratings

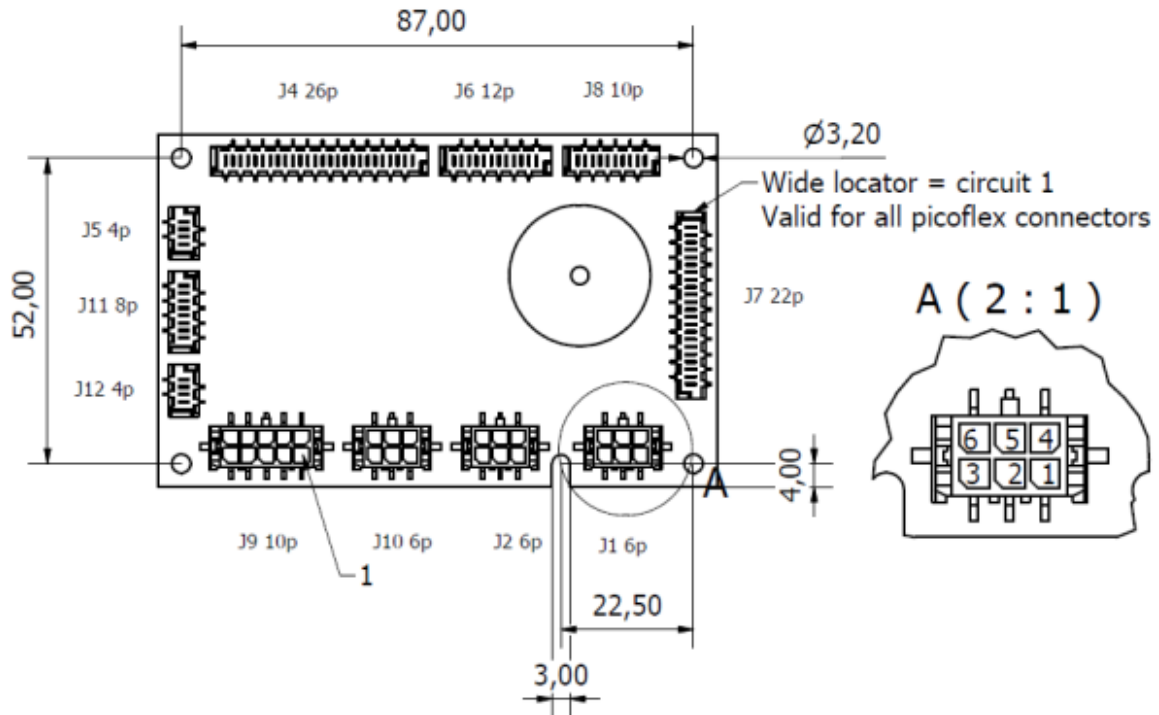
Parameter	Condition	Min.	Typ.	Max.	Units
Input voltage <sup>(1)</sup>		-60		100	V <sub>DC</sub>
Input voltage CAN <sub>L</sub> & CAN <sub>H</sub> <sup>(1)</sup>		-36		36V	V <sub>DC</sub>
Storage temperature <sup>(1)</sup>		-40		85	°C
Input voltage on +5V output pin <sup>(1)(2)</sup>		0		25	V <sub>DC</sub>
Input voltage on digital output pin <sup>(1)(2)</sup>		0		25	V <sub>DC</sub>

- Note:
1. Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
  2. Output is short-circuit protected against GND.

### 3 I/O characteristics

Parameter	Function
Digital input	Positive logic. Fixed internal pull-down.
Digital output	<b>High:</b> +5V (Refer to Electrical Characteristics, Max digital output current). <b>Low:</b> Fixed internal pull-down. All outputs are short circuit and over-temperature protected.
Analog voltage input	0-5V, 10bit resolution. Overvoltage protected.
Constant voltage +5V	Always high. Short circuit and over-temperature protected.

## 4 Connectors



J1 Power supply & CAN bus		J2 Power supply & CAN bus	
1	VBB	1	VBB
2	GND	2	GND
3	CANH	3	CANH
4	CANL	4	CANL
5	Termination Jumper	5	-
6	Termination Jumper	6	-

J4 Digital inputs & PWM			
1	Digital in 1	14	Digital in 14
2	Digital in 2	15	Digital in 15
3	Digital in 3	16	Digital in 16
4	Digital in 4	17	Digital in 17
5	Digital in 5	18	Digital in 18
6	Digital in 6	19	Digital in 19
7	Digital in 7	20	Digital in 20
8	Digital in 8	21	Digital in 21
9	Digital in 9	22	Digital in 22
10	Digital in 10	23	Digital in 23
11	Digital in 11	24	+SYS
12	Digital in 12	25	+5V supply out
13	Digital in 13	26	PWM4 Out

J5 Digital out			
1	Digital out 9	3	GND
2	Digital out 10	4	GND

J6 Digital inputs & PWM			
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1	Digital in 24	7	Digital out 10
2	Digital in 25	8	+5V supply out
3	Digital in 26	9	<i>Sensor return, unfiltered analog input 9</i>
4	Digital in 27	10	PWM1 out
5	Digital in 28	11	+SYS
6	Digital in 29	12	GND

#### J7 Digital inputs & PWM

1	Digital in 30	12	Digital out 4
2	Digital in 31	13	Digital out 5
3	Digital in 32	14	Digital out 6
4	Digital in 33	15	Digital out 7
5	Digital in 34	16	Digital out 8
6	Digital in 35	17	+5V supply
7	Digital in 36	18	+5V supply
8	Digital in 37	19	PWM2 out
9	Digital out 1	20	+SYS
10	Digital out 2	21	PWM5 out
11	Digital out 3	22	GND

#### J8 Digital inputs & PWM

1	Digital in 38	6	Digital in 43
2	Digital in 39	7	Digital in 44
3	Digital in 40	8	+5V supply
4	Digital in 41	9	PWM3 out
5	Digital in 42	10	+SYS

#### J9 Analog inputs

1	+5V supply	6	GND
2	Analog in 1	7	+5V supply
3	GND	8	Analog in 3
4	+5V supply	9	GND
5	Analog in 2	10	-

#### J10 Analog inputs

1	+5V supply	4	+5V supply
2	Analog in 4	5	Analog in 5
3	GND	6	GND

#### J11 Analog inputs

1	+5V supply	1	+5V supply
2	Analog in 6	2	Analog in 8
3	GND	3	GND
4	+5V supply	4	NC
5	Analog in 7		
6	GND		
7	-		
8	-		

#### J12 Analog inputs

1	+5V supply	1	+5V supply
2	Analog in 6	2	Analog in 8
3	GND	3	GND
4	+5V supply	4	NC
5	Analog in 7		
6	GND		
7	-		
8	-		

## 5 CANopen protocol

TxPDO1: 0x180+NodID, Digital Inputs								
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte0	Di8	Di7	Di6	Di5	Di4	Di3	Di2	Di1
Byte1	Di16	Di15	Di14	Di13	Di12	Di11	Di10	Di9
Byte2	Di24	Di23	Di22	Di21	Di20	Di19	Di18	Di17
Byte3	Di32	Di31	Di30	Di29	Di28	Di27	Di26	Di25
Byte4	Di40	Di39	Di38	Di37	Di36	Di35	Di34	Di33
Byte5	-	-	-	-	Di44	Di43	Di42	Di41
Byte6	-	-	-	-	-	-	-	-
Byte7	-	-	-	-	CAN Error	Short Circuit +5V	Short circuit DO	Internal error

TxPDO2: 0x280+NodID, Analog Inputs 1-4			
Byte0	LSB	Analog In 1	10 bit
Byte1	MSB	Analog in 1	0-1023 = 0-5V
Byte2	LSB	Analog In 2	10 bit
Byte3	MSB	Analog In 2	0-1023 = 0-5V
Byte4	LSB	Analog In 3	10 bit
Byte5	MSB	Analog In 3	0-1023 = 0-5V
Byte6	LSB	Analog In 4	10 bit
Byte7	MSB	Analog In 4	0-1023 = 0-5V




TxPDO3: 0x380+NodID, Analog Inputs 5-8			
Byte0	LSB	Analog In 5	10 bit
Byte1	MSB	Analog in 5	0-1023 = 0-5V
Byte2	LSB	Analog In 6	10 bit
Byte3	MSB	Analog In 6	0-1023 = 0-5V
Byte4	LSB	Analog In 7	10 bit
Byte5	MSB	Analog In 7	0-1023 = 0-5V
Byte6	LSB	Analog In 8	10 bit
Byte7	MSB	Analog In 8	0-1023 = 0-5V

TxPDO4: 0x480+NodID, Unfiltered analog Input 9			
Byte0	LSB	Analog In 9	10 bit
Byte1	MSB	Analog in 9	0-1023 = 0-5V

RxPDO1: 0x200+NodID, Outputs								
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte0	DO8	DO7	DO6	DO5	DO4	DO3	DO2	DO1
Byte1	-	-	-	-	-	-	DO10	DO9
Byte2	PWM OUT1, Value 0-127 equals 0-100% PWM							
Byte3	PWM OUT2, Value 0-127 equals 0-100% PWM							
Byte4	PWM OUT3, Value 0-127 equals 0-100% PWM							
Byte5	PWM OUT4, Value 0-127 equals 0-100% PWM							
Byte6	PWM OUT5, Value 0-127 equals 0-100% PWM							
Byte7	Buzzer, Value 0-127 equals 0-100% PWM							

Baudrate & Nod ID		
Index	3000	
Subindex	1	Nod ID, 1-127, Default 127
	2	Baudrate, Default 250 kbaud

## 6 Status LEDs

-  Green LED indicates that the modules power supply is OK
-  Red LED lights up to signal error states
-  Yellow LED is used for CAN status. Toggles when a CAN message is received

## 7 CANopen object dictionary

Index	S-idx	Name	Type	Default	Description	Saveable
0x1000	0x00	Moduletype	ro u32	0x00000000	Nonstandard description of CCM module.	
0x1001	0x00	Error register	ro u8	0x00		
0x1005	0x00	COB ID SYNC	rw u32	0x00000080		x
0x1008	0x00	Module name	ro str	Electrum CCM		
0x1009	0x00	Revision HW	ro str	REV X	Starting at char "A".	
0x100A	0x00	Revision SW	ro str	REV X	Starting at char "A".	
0x100C	0x00	Guard time	rw u16	0x0000	Time in ms. Within this time the module expects a "node guarding" of the network master. 0 = Node guarding deactivated.	x
0x100D	0x00	Life time factor	rw u8	0x00	If no "node guarding" is received for "guard time" x "life time", the module generates an EMCY. The result of "guard time" x "life time" must be between 0 and 65535.	x
0x1010	0x00	Number of save options	ro u8	0x01		
	0x01	Save parameter	rw u32	0x00000002	0x00000000 = No save. 0x00000001 = Saving all parameters after string "save" is written to this entry. 0x00000002 = Auto store.	x
0x1011	0x00	Number of restore options	ro u8	0x01		
	0x01	Restore default parameters	rw u32	0x00000001	Restores all parameters to default values if string 'load' is written to this entry.	
0x1014	0x00	COB ID EMCY	rw u32	0x00000080 +\$NODEID	Module generates EMCY messages (bit 31=0)	x
0x1016	0x00	Number of monitored devices	ro u8	0x01		
	0x01	Consumer heartbeat time	rw u32	0x00000000	Heartbeat monitoring time for node n monitoring only one node is supported. 0x00nnnttt = monitoring time (ms) 0x00nnnttt = node number (If nn or tttt = 0, no monitoring is carried out.)	x
0x1017	0x00	Producer heartbeat time	rw u16	0x00FA	Time interval (ms) where the module generates a producer heartbeat.	x
0x1018	0x00	Number of identity objects	ro u8	0x04		
	0x01	Vendor ID	ro u32	0x00000356		
	0x02	Product code	ro u32	0x00000000		
	0x03	Revision number	ro u32	0x00000000		
	0x04	Unique serial nr	ro u32	0x00000000		

Index	S-idx	Name	Type		Default	Description	Saveable
<b>0x1400</b>	0x00	Number of entries	ro	u8	0x05	RPDO1 communication parameter	
	0x01	COB-ID used by RPDO1	rw	u32	0x00000200 +\$NODEID		x
	0x02	Transmission type	rw	u8	0x01	0x01-0xF0	x
	0x03	Inhibit time	rw	u16	0x0000		x
	0x05	Event-timer	rw	u16	0x0000		x
<b>0x1600</b>	0x00	Number of entries	ro	u8	0x08	RPDO1 mapping parameter	
	0x01	PDO Mapping Entry 1	ro	u32	0x62000108		
	0x02	PDO Mapping Entry 2	ro	u32	0x62000208		
	0x03	PDO Mapping Entry 3	ro	u32	0x64140108		
	0x04	PDO Mapping Entry 4	ro	u32	0x64140208		
	0x05	PDO Mapping Entry 5	ro	u32	0x64140308		
	0x06	PDO Mapping Entry 6	ro	u32	0x64140408		
	0x07	PDO Mapping Entry 7	ro	u32	0x64140508		
	0x08	PDO Mapping Entry 8	ro	u32	0x64140608		

Index	S-idx	Name	Type	Default	Description	Saveable
<b>0x1800</b>	0x00	Number of entries	ro u8	0x05	TPDO1 communication parameter	
	0x01	COB-ID used by TPDO1	rw u32	0x00000180 +\$NODEID		x
	0x02	Transmission type	rw u8	0x01	0x01-0xF0	x
	0x03	Inhibit time	rw u16	0x0000		x
	0x05	Event-timer	rw u16	0x0000		x
<b>0x1801</b>	0x00	Number of entries	ro u8	0x05	TPDO2 communication parameter	
	0x01	COB-ID used by TPDO2	rw u32	0x00000280 +\$NODEID		x
	0x02	Transmission type	rw u8	0x01	0x01-0xF0	x
	0x03	Inhibit time	rw u16	0x0000		x
	0x05	Event-timer	rw u16	0x0000		x
<b>0x1802</b>	0x00	Number of entries	ro u8	0x05	TPDO3 communication parameter	
	0x01	COB-ID used by TPDO3	rw u32	0x00000380 +\$NODEID		x
	0x02	Transmission type	rw u8	0x01	0x01-0xF0	x
	0x03	Inhibit time	rw u16	0x0000		x
	0x05	Event-timer	rw u16	0x0000		x
<b>0x1803</b>	0x00	Number of entries	ro u8	0x05	TPDO4 communication parameter	
	0x01	COB-ID used by TPDO4	rw u32	0x00000480 +\$NODEID		x
	0x02	Transmission type	rw u8	0x01	0x01-0xF0	x
	0x03	Inhibit time	rw u16	0x0000		x
	0x05	Event-timer	rw u16	0x0000		x

Index	S-idx	Name	Type	Default	Description	Saveable
<b>0x1A00</b>	0x00	Number of entries	ro u8	0x08	TPDO1 mapping parameter	
	0x01	PDO Mapping Entry 1	ro u32	0x60000108		
	0x02	PDO Mapping Entry 2	ro u32	0x60000208		
	0x03	PDO Mapping Entry 3	ro u32	0x60000308		
	0x04	PDO Mapping Entry 4	ro u32	0x60000408		
	0x05	PDO Mapping Entry 5	ro u32	0x60000508		
	0x06	PDO Mapping Entry 6	ro u32	0x60000608		
	0x07	PDO Mapping Entry 7	ro u32	0x43210008		
	0x08	PDO Mapping Entry 8	ro u32	0x40000008		
<b>0x1A01</b>	0x00	Number of entries	ro u8	0x04	TPDO2 mapping parameter	
	0x01	PDO Mapping Entry 1	ro u32	0x64040110		
	0x02	PDO Mapping Entry 2	ro u32	0x64040210		
	0x03	PDO Mapping Entry 3	ro u32	0x64040310		
	0x04	PDO Mapping Entry 4	ro u32	0x64040410		
<b>0x1A02</b>	0x00	Number of entries	ro u8	0x04	TPDO3 mapping parameter	
	0x01	PDO Mapping Entry 1	ro u32	0x64040510		
	0x02	PDO Mapping Entry 2	ro u32	0x64040610		
	0x03	PDO Mapping Entry 3	ro u32	0x64040710		
	0x04	PDO Mapping Entry 4	ro u32	0x64040810		
<b>0x1A03</b>	0x00	Number of entries	ro u8	0x01	TPDO4 mapping parameter	
	0x01	PDO Mapping Entry 1	ro u32	0x64040910		

Index	S-idx	Name	Type	Default	Description	Saveable
<b>0x20F2</b>	0x00	CAN baudrate	rw u8	0x00	0=125kbit/s, 1=250kbit/s, 2=500kbit/s, 3=1Mbit/s	x
<b>0x20F3</b>	0x00	CAN baudrate	rw u8	0x00	Baudrate must be written to both index 20F2 and 20F3.	x
<b>0x3000</b>	0x00	Node ID	rw u8	0x7F		x
<b>0x4000</b>	0x00	CCM status	ro u8	-	mappable	
<b>0x6000</b>	0x00	Read Binary inputs	ro u8	0x06	Number of entries	
	0x01	binary inputs 1-8	ro u8		Mappable	
	0x02	binary inputs 9-16	ro u8		Mappable	
	0x03	binary inputs 17-24	ro u8		Mappable	
	0x04	binary inputs 25-32	ro u8		Mappable	
	0x05	binary inputs 33-40	ro u8		Mappable	
	0x06	binary inputs 41-44	ro u8		Mappable	
<b>0x6200</b>	0x00	Write Binary outputs	ro u8	0x02	Number of entries	
	0x01	binary outputs 1-8	wo u8		Mappable	
	0x02	binary outputs 9-10	wo u8		Mappable	
<b>0x6404</b>	0x00	Manufacturer-specific analog input	ro u8	0x08	Number of entries	
	0x01	analog input 1	ro u16		Mappable	
	0x02	analog input 2	ro u16		Mappable	
	0x03	analog input 3	ro u16		Mappable	
	0x04	analog input 4	ro u16		Mappable	
	0x05	analog input 5	ro u16		Mappable	
	0x06	analog input 6	ro u16		Mappable	
	0x07	analog input 7	ro u16		Mappable	
	0x08	analog input 8	ro u16		Mappable	
	0x09	Unfiltered analog input 9	ro u16		Mappable	
<b>0x6414</b>	0x00	Manufacturer Specific Analog Output	ro u8	0x06	Number of entries	
	0x01	PWM OUT1	wo u8		Mappable	
	0x02	PWM OUT2	wo u8		Mappable	
	0x03	PWM OUT3	wo u8		Mappable	
	0x04	PWM OUT4	wo u8		Mappable	
	0x05	PWM OUT5	wo u8		Mappable	
	0x06	Buzzer	wo u8		Mappable	

## 8 Document history

Document revision	Description	Release date
A	Initial release	2013-05-07
B	Added usage examples	2013-06-26
C	Fixed table TxPDO1.	2013-10-23
D	<ul style="list-style-type: none"><li>• Added CANopen Object Dictionary</li><li>• Changed footer logo</li><li>• Updated electrical characteristics</li><li>• Changed document layout</li></ul>	2014-11-19
E	<ul style="list-style-type: none"><li>• Added unfiltered analog input 9</li></ul>	2015-11-26

For latest revision of this document please visit [www.electrumab.se](http://www.electrumab.se)

## 9 Contact us

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