

# PC20 CANOPEN SLAVE

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MARINE



## Features

- CANopen BUS
- 12V and 24V power supply supported
- Electronic protection from short circuit
- 4 bypass circuits for emergency
- Up to 22 power outputs with current sense
- 5 high current outputs
- Up to 8 digital inputs
- Up to 8 analog inputs
- Up to 9 low side outputs
- Operating temperature range: -20 to +85°C
- Splash proof (IP65)
- Molex connectors MX150L series

THE PRESENT MANUAL IS FOR REFERENCE ONLY AND MIGHT BE NOT UP TO DATE TO THE LATEST VERSION. PLEASE CONTACT US FOR GETTING THE MOST UPDATED FILE

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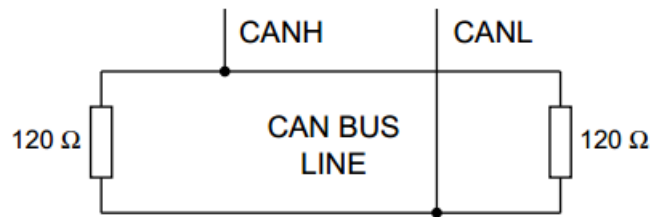
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## 1. How to Connect CAN bus:

J3 PIN	FUNCTION
1	CAN L
2	CAN H
3	Negative Battery (GND)
4	J3 Power Output (May be set as bus power)



Each end of the CAN bus is terminated with 120Ω resistors in compliance with the standard to minimize signal reflections on the bus. You may need to place a 120Ω resistor between CAN-L and CAN-H.

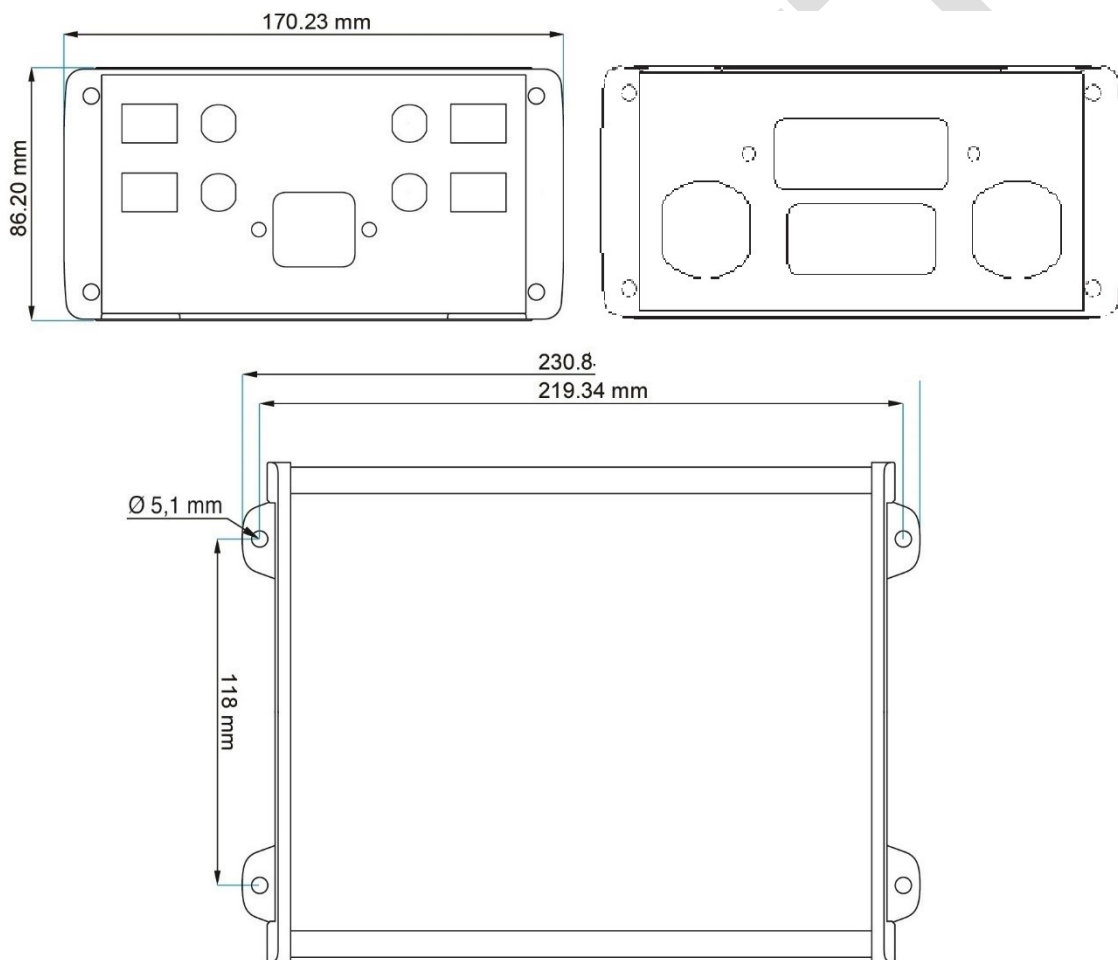
## 2. PC20 Technical Specifications

Electrical	Value	Unit
Supply Voltage (Battery Voltage)	8-32	V
Maximum input current	150	A
Maximum current single pin high side	20 or 15 see pin assignment table	A
Maximum current single pin low side	20 or 15 see pin assignment table	A
Maximum Digital input voltage	Battery Voltage	V
Digital input low voltage max	5,5	V
Analog input voltage	0-14	V
Inverse supply polarity protection	Not protected	N/A
Environmental	Value	Unit
Storage temperature range	-40 to +85	°C
Operating temperature range	-20 to +85	°C
Humidity	0 to 98	%

### 3. Mechanical Features

- Extruded aluminum housing
- End-panel power and I/O connections 2 x 5,7mm power lugs Amphenol SurLok Plus™ with sealed plug.
- 16 pin Molex MX150L connectors (Molex part # 19427-0049). Mates with 16 pin receptacle (Molex part # 19418-0030) using 14-16 gauge contact (Molex part #19420-0009)
- One 4 pin can bus connector Molex MX150L (Molex #19427-0032). Mates with 4pin receptacle (Molex part # 19418-0004) using 14-16 gauge contact (Molex #19420-0009)

#### Mechanical Dimension



## 4. Electrical Loads Connection

### HIGH side switch:

The electrical device is connected between an output pin of the PowerCore and ground.

The output pin state can be HIGH (pin voltage at battery voltage) or OFF (pin floating).

The ground can be connected either to one of the ground pins of the PowerCore or directly to the battery's negative pole.

The electrical device is ON when the pin state is HIGH and the current consumption of the electrical device is read by the PowerCore.

### LOW side switch:

The electrical device is connected between an output pin of the PowerCore with Low Side Drive feature and the positive battery pole.

The output pin state can be LOW (pin voltage at ground) or OFF (pin floating).

The current flowing in the low side switch is not read by the PowerCore. A 25A fuse protects the circuit, but a lower current threshold is needed, the connection to the battery's positive pole should be made through a fuse.

The electrical device is ON when the pin state is LOW.

### H-Bridge connection:

The electrical device is connected between two output pins of the PowerCore.

The state of each output pin can be HIGH (pin voltage at battery voltage), LOW (pin voltage at ground) or OFF (pin floating).

This connection is common for DC motor to invert the power supply polarity to change the direction of the motor's rotation.

## 5. Bypasses

The bypasses are intended as backup for the system, in the unlikely case of a system failure. Every load controller is equipped with 4 ON/OFF rocker switches which, when set to ON position, bypasses the electronic circuitry, to guarantee that said channel will be able to operate even in the remote case of a general failure of the electronic board.

The 4 bypass switches are wired to 4 of these outputs: J1-3 J1-5 J1-9 J1-16 J2-2 J2-4 J2-11 J2-12. The default configuration is the one in the table here below but with no fuses in fuse holders.

<Bypass 1	Bypass 2	Bypass 3	Bypass 4
J1-3	J1-5	J1-9	J1-16

Bypass circuits are protected by cartridge fuses 6,3 x 32 mm, 32V from 1 to 20A.

## 6. Pin Assignment

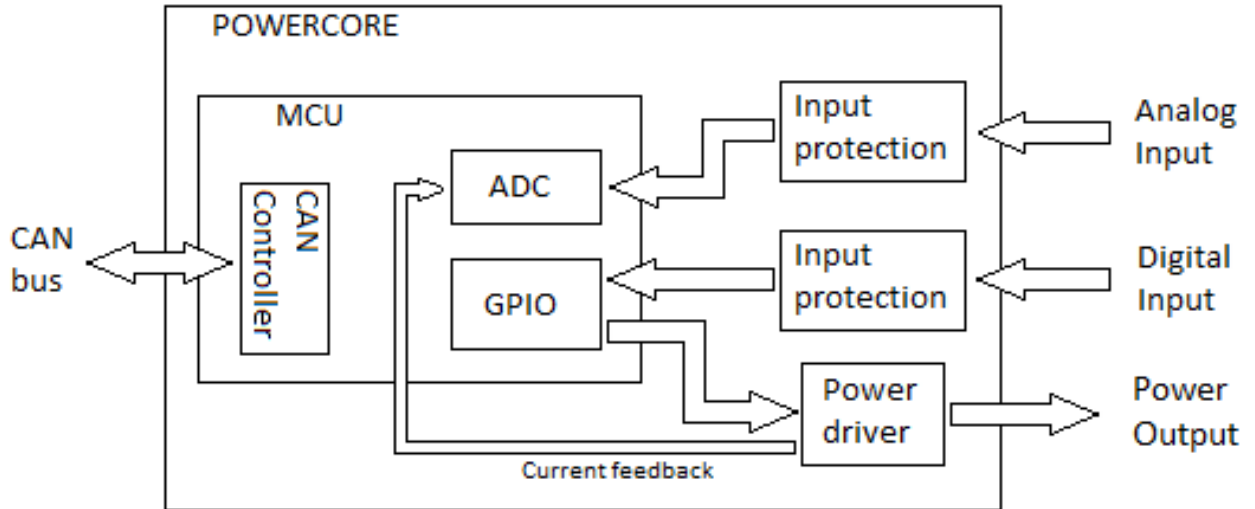
Connector	Pin	Function	Rating	High Current Driver	Low Side Driver	Level Sense	Analog Sense	Tach Sense	Optional Relè Contacts	Optional Diode Protection	By-Pass
J1	1	I/O	15		X		X			X	
J1	2	I/O	15		X	X	X			X	
J1	3	I/O	20	X		X	X			X	X
J1	4	I/O	15				X			X	
J1	5	I/O	15			X	X			X	X
J1	6	I/O	15			X	X			X	
J1	7	I/O	15			X	X			X	
J1	8	I/O	15			X	X			X	
J1	9	I/O	20	X	X	X				X	X
J1	10	O	15						X	X	
J1	11	O	15						X	X	
J1	12	GND	NA								
J1	13	GND	NA								
J1	14	GND	NA								
J1	15	GND	NA								
J1	16	I/O	20	X	X	X				X	X
J2	1	I/O	15						X	X	
J2	2	I/O	15						X	X	X
J2	3	I/O	15					X		X	
J2	4	I/O	15							X	X
J2	5	I/O	15		X					X	
J2	6	I/O	15		X					X	
J2	7	I/O	15		X					X	
J2	8	I/O	15					X		X	
J2	9	GND	NA								
J2	10	GND	NA								
J2	11	I/O	20	X	X					X	X
J2	12	I/O	20	X	X					X	X
J3	1	CAN L	NA								
J3	2	CAN H	NA								
J3	3	GND	NA								
J3	4	BUS PWR	15								

### Function Summary

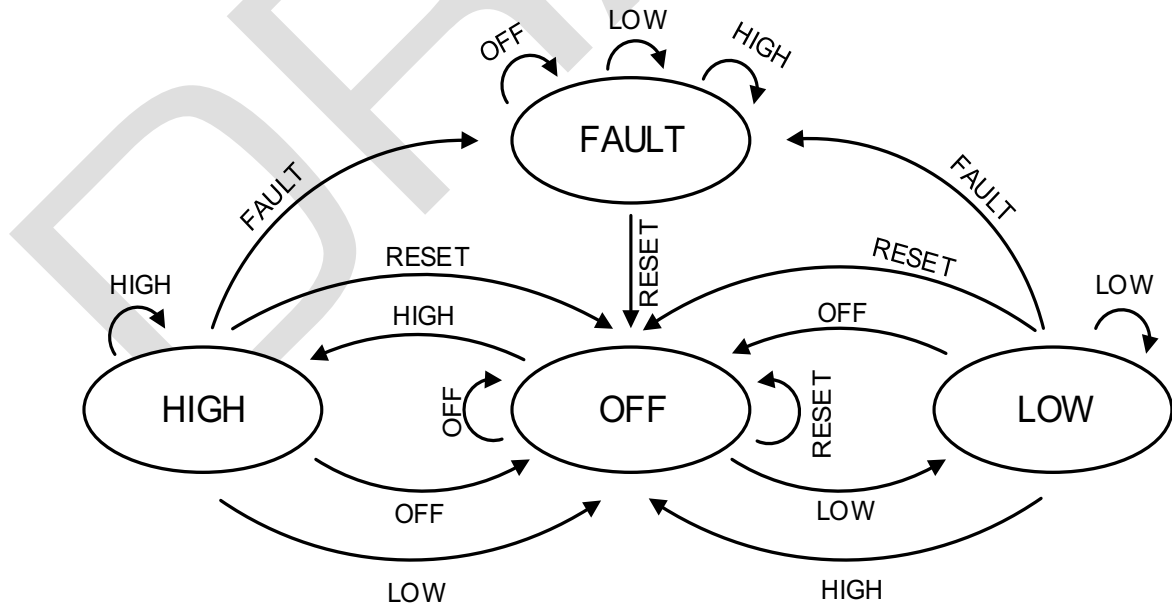
- **O:** Output high side pin
- **I/O:** Input / output high side pin
- **GND:** Internally connected to Negative terminal of the batteries

- **BUS PWR:** Power supply for the bus
- **CAN-L, CAN-H:** CAN bus signals.

## 7. Hardware Block Diagram

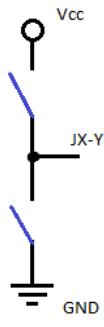
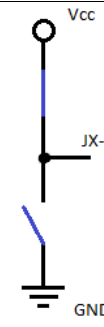
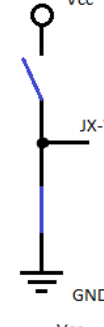
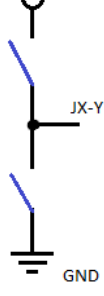


## 8. Output State Machine Diagram





The output pin can be set to one of the 4 states available:

Output state	Pin voltage	Equivalent Circuit
OFF	Floating	
HIGH	Battery Voltage	
LOW	Ground Voltage	
FAULT	Floating	

To avoid cross conduction, the system does not allow to change the state of an output pin from HIGH to LOW and from LOW to HIGH. The pins must be always set to OFF for at least 300 milliseconds before the polarity can be changed.

As a measure of protection when using inductive loads, longer delays are added so a current peak during the transient period does not activate the system's protection against overcurrent.

Each output circuit is protected against short circuits and overcurrent. If a failure event occurs, the pin goes into the FAULT state. To exit the FAULT state, a reset command is needed to return the pin to its initial OFF state.

The LOW state is applicable only on the output pins that have a low side driver (refer to the pin assignment table).

## 9. CANopen Messages Structure

All the data type used are unsigned integer and the syntax is specified in the following table:

octet number	1.	2.	3.	4.	5.	6.	7.	8.
UNSIGNED8	b7..b0							
UNSIGNED16	b7..b0	b15..b8						
UNSIGNED24	b7..b0	b15..b8	b23..b16					
UNSIGNED32	b7..b0	b15..b8	b23..b16	b31..b24				
UNSIGNED40	b7..b0	b15..b8	b23..b16	b31..b24	b39..b32			
UNSIGNED48	b7..b0	b15..b8	b23..b16	b31..b24	b39..b32	b47..b40		
UNSIGNED56	b7..b0	b15..b8	b23..b16	b31..b24	b39..b32	b47..b40	b55..b48	
UNSIGNED64	b7..b0	b15..b8	b23..b16	b31..b24	b39..b32	b47..b40	b55..b48	b63..b56

### NMT MESSAGES

The Network Management messages follow a master-slave structure. Through NMT services, CANopen devices are initialized, started, reset, or stopped. All CANopen devices are regarded as NMT slaves.

NMT messages have CAN-ID always equal to 00h.

00h	1-byte command specifier	1-byte NODE-ID	6 bytes not used
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### PDO MESSAGES

PDO are fast telegram messages that can simply manage the most important functions. All PDOs have an equivalent SDO message. There are no answers for this type of messages. PDO messages have identifiers from 180h to 57Fh.

Identifier	8-byte data
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### SDO MESSAGES

SDO are more complex messages that completely manage all the functions of the PowerCore.

SDO messages have identifiers from 580h to 67Fh and always expect an answer or an acknowledge reply.

Identifier	Command byte	2-byte index	1-byte sub index	4-byte data
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**Identifier:** The messages to the PowerCore shall have 600h+current CAN ID identifier.

The messages from the PowerCore have 580h+ current CAN ID identifier.

**Command byte:** 40h: request to read a register      60h: write acknowledge  
 43h: response with 4-byte data      23h: request to write 4-byte data  
 4Fh: response with 1-byte data      2Fh: request to write 1-byte data  
 80h: error response

Every answer has index and sub index echo.

The error responses have the byte data containing the abort codes.

**Abort codes implemented:**

0602 0000h: Object does not exist in the object dictionary  
 0609 0011h: Sub-index does not exist  
 0609 0030h: Invalid value for parameter  
 0601 0002h: Attempt to write a read only object

## 10. CAN Messages for Managing Output Pins

Output state	Direction	Can message
HIGH	Write	<a href="#">PDO 300h + node-ID</a>
	Read/Write	<a href="#">SDO Object 2001h</a>
	Read/Write	<a href="#">SDO Object 2008h sub-index 02h</a>
LOW	Read/Write	<a href="#">SDO Object 2001h</a>
	Read/Write	<a href="#">SDO Object 2008h sub-index 03h</a>
OFF	Write	<a href="#">PDO 200h + node-ID</a>
	Read/Write	<a href="#">SDO Object 2001h</a>
	Read/Write	<a href="#">SDO Object 2008h sub-index 05h</a>
FAULT	Read when occur	<a href="#">PDO 180h + node-ID</a>
	Read	<a href="#">SDO Object 2001h</a>
	Read	<a href="#">SDO Object 2008h sub-index 06h</a>
RESET	Write	<a href="#">SDO Object 2001h</a>
	Write	<a href="#">SDO Object 2008h sub-index 07h</a>

## 11. CAN bus Default Settings

Setting	Default State or Level	How to Change
Baud rate	125 kbit/s	<a href="#">Object 2010h</a>
CANopen Node ID	15h	<a href="#">Object 2011h</a>
CANopen Node State	Pre-operational	NMT Message Start CANopen node <a href="#">Object 2013h</a> Device active on startup
J3-4 CAN bus power	ON	<a href="#">Object 2001h</a> and <a href="#">2014h</a>
J3-4 CAN bus current threshold	5A	<a href="#">Object 2002h</a>
JX-Y output current threshold	10A	<a href="#">Object 2002h</a>
Periodic Message Transmission	Disabled	<a href="#">Object 2012h</a>
Heartbeat Message	Disabled	<a href="#">Object 1017h</a>
Boot-up service	Active	<a href="#">Object 2015h</a>

## NMT MESSAGES

The Network Management Messages follow a master-slave structure. Through NMT services, CANOpen devices are initialized, started, reset, or stopped. All CANOpen devices are regarded as NMT slaves.

NMT messages have CAN-ID always equal to 00h.

### 12. Start CANOpen Node

<b>Identifier</b>	00h	
<b>Byte 0</b>	01h	Start CANOpen node
<b>Byte 1</b>	XXh	PowerCore CAN ID 00h: start all the devices 15h: start the PowerCore with CAN ID = 15h.
<b>Byte 2, 7</b>	00h	Not used

Example:

<b>Direction</b>	<b>Identifier</b>	<b>Format</b>	<b>Message</b>
To PowerCore	0	Std	01 15

### 13. Enter Pre-operational

<b>Identifier</b>	00h	
<b>Byte 0</b>	80h	Enter pre-operational
<b>Byte 1</b>	XXh	PowerCore CAN ID 00h: start all the devices 15h: start the PowerCore with CAN ID = 15h.
<b>Byte 2, 7</b>	00h	Not used

Example:

<b>Direction</b>	<b>Identifier</b>	<b>Format</b>	<b>Message</b>
To PowerCore	0	Std	80 15

### 14. Reset CANOpen Node

<b>Identifier</b>	00h	
<b>Byte 0</b>	81h	Reset CANOpen node
<b>Byte 1</b>	XXh	PowerCore CAN ID 00h: start all the devices 15h: start the PowerCore with CAN ID = 15h.
<b>Byte 2, 7</b>	00h	Not used

Example:

<b>Direction</b>	<b>Identifier</b>	<b>Format</b>	<b>Message</b>
To PowerCore	0	Std	81 15

## 15. Stop CANopen Node

<b>Identifier</b>	00h	
<b>Byte 0</b>	XXh	02h: Stop CANopen node 00h: Stop CANopen node (old SW compatibility)
<b>Byte 1</b>	YYh	PowerCore CAN ID 00h: Stop all the devices 15h: Stop the PowerCore with CAN ID = 15h.
<b>Byte 2, 7</b>	00h	Not used

Example:

Direction	Identifier	Format	Message
To PowerCore	0	Std	02 15

## 16. Boot-up Service

This service is used to signal that a NMT slave has entered the NMT Pre-operational state.

<b>Identifier</b>	700h + current CAN ID	Default 715h
<b>Byte 0</b>	00h	One data byte is transmitted with value 0.

Example:

Direction	Identifier	Format	Message
From PowerCore	715h	Std	00h

The PowerCore with CAN ID 15h has entered the NMT state Pre-operational.

## 17. Heartbeat Message

The heartbeat mechanism for a CANopen device is established by configuring the heartbeat producer to cyclically transmitting the heartbeat message. One or more CANopen devices in the network should be aware of this message. If by any chance the heartbeat producer fails to send the heartbeat message, the local application on the heartbeat consumer will be notified.

In the case the CANopen device starts with a heartbeat producer time different from 0, then the boot-up message is regarded as the first heartbeat message.

<b>Identifier</b>	700h + current CAN ID	Default 715h
<b>Byte 0</b>	XXh	XXh: State of heartbeat producer 00h: Boot-up 04h: Stopped 05h: Operational 7Fh: Pre-operational

Example:

Direction	Identifier	Format	Message	Data
From PowerCore	715h	Std	00h	Boot up
From PowerCore	715h	Std	7Fh	Pre-operational
To PowerCore	00h	Std	01h 15h	Start PowerCore with CAN id =15h
From PowerCore	715h	Std	05h	Operational

## PDO Messages

### 18. Set Output HIGH

Identifier	300h + current CAN ID	Default 315h
Byte 0	J1-8 J1-7 J1-6 J1-5 J1-4 J1-3 J1-2 J1-1	'1' = set HIGH '0' = do nothing
Byte 1	J2-4 J2-3 J2-2 J2-1 J1-16 J1-11 J1-10 J1-9	'1' = set HIGH '0' = do nothing
Byte 2	0 J3-4 J2-12 J2-11 J2-8 J2-7 J2-6 J2-5	'1' = set HIGH '0' = do nothing
Byte 3,7	00h	Not used

Example

Direction	Identifier	Format	Message	Data
To PowerCore	315	Std	40 00 00 00 00 00 00 00	Set J1-7 HIGH
To PowerCore	315	Std	00 03 00 00 00 00 00 00	Set J1-9 and J1-10 HIGH

### 19. Set Output OFF

Identifier	200h + current CAN ID	Default 215h
Byte 0	J1-8 J1-7 J1-6 J1-5 J1-4 J1-3 J1-2 J1-1	'1' = turn OFF '0' = do nothing
Byte 1	J2-4 J2-3 J2-2 J2-1 J1-16 J1-11 J1-10 J1-9	'1' = turn OFF '0' = do nothing
Byte 2	0 J3-4 J2-12 J2-11 J2-8 J2-7 J2-6 J2-5	'1' = turn OFF '0' = do nothing
Byte 3,7	00h	Not used

Example

Direction	Identifier	Format	Message	Data
To PowerCore	215	Std	04 00 00 00 00 00 00 00	Turn OFF J1-3
To PowerCore	215	Std	02 01 00 00 00 00 00 00	Turn OFF J1-2 and J1-9

### 20. Fault Message

This message is sent by the PowerCore when an overcurrent is detected.

Identifier	180h + current CAN ID	Default 195h
Byte 0	J1-8 J1-7 J1-6 J1-5 J1-4 J1-3 J1-2 J1-1	'1' = fault '0' = not fault
Byte 1	J2-4 J2-3 J2-2 J2-1 J1-16 J1-11 J1-10 J1-9	'1' = fault '0' = not fault
Byte 2	0 J3-4 J2-12 J2-11 J2-8 J2-7 J2-6 J2-5	'1' = fault '0' = not fault
Byte 3,7	00h	Not used

Example

Direction	Identifier	Format	Message	Data
From PowerCore	195	Std	03 00 00 00 00 00 00 00	J1-1 and J1-2 Fault
From PowerCore	195	Std	00 10 00 00 00 00 00 00	J2-1 Fault state

## 21. Object 2001h: Single Pin State

This object sets and reads the state of each output pins.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
	2Fh	Write 1-byte data
<b>Byte 1</b>	01h	CAN Object 2001h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	Highest sub-index supported (read only)
	01h	J1-1
	02h	J1-2
	03h	J1-3
	04h	J1-4
	05h	J1-5
	06h	J1-6
	07h	J1-7
	08h	J1-8
	09h	J1-9
	0Ah	J1-10
	0Bh	J1-11
	0Ch	J1-16
	0Dh	J2-1
	0Eh	J2-2
	0Fh	J2-3
	10h	J2-4
11h	J2-5	
12h	J2-6	
13h	J2-7	
14h	J2-8	
15h	J2-11	
16h	J2-12	
17h	J3-4 Can bus power	
<b>Byte 4</b>	00h	OFF
	01h	HIGH
	02h	LOW (on supported pins)
	03h	FAULT (read only)
	04h	RESET
<b>Byte 5,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 01 20 00 00 00 00 00	Read highest sub-index supported
PowerCore reply	595	Std	4F 01 20 00 17 00 00 00	17h is the highest sub-index supported
To PowerCore	615	Std	40 01 20 0A 00 00 00 00	Read state J1-10
PowerCore reply	595	Std	4F 01 20 0A 01 00 00 00	Pin J1-10 HIGH
To PowerCore	615	Std	40 01 20 0D 00 00 00 00	Read state J2-1

<b>PowerCore reply</b>	595	Std	40 01 20 0D 03 00 00 00	Pin J2-1 FAULT
<b>To PowerCore</b>	615	Std	2F 01 20 17 04 00 00 00	RESET pin J3-4
<b>PowerCore reply</b>	595	Std	60 01 20 05 00 00 00 00	ACK
<b>To PowerCore</b>	615	Std	2F 01 20 13 00 00 00 00	Set J2-7 to OFF
<b>PowerCore reply</b>	595	Std	60 01 20 07 00 00 00 00	ACK

## 22. Object 2002h: Output Current Threshold

This object sets and reads for each output pins the current thresholds. Refer to the pin assignment table to check the maximum currents of each pin. If you set a too high value a response error occurs, and the value is set to the maximum. The default thresholds are 5 A for J3-4 and 10 A for other outputs.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
	2Fh	Write 1-byte data
<b>Byte 1</b>	02h	CAN Object 2002h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	Highest sub-index supported (read only)
	01h	J1-1
	02h	J1-2
	03h	J1-3
	04h	J1-4
	05h	J1-5
	06h	J1-6
	07h	J1-7
	08h	J1-8
	09h	J1-9
	0Ah	J1-10
	0Bh	J1-11
	0Ch	J1-16
	0Dh	J2-1
	0Eh	J2-2
	0Fh	J2-3
	10h	J2-4
11h	J2-5	
12h	J2-6	
13h	J2-7	
14h	J2-8	
15h	J2-11	
16h	J2-12	
17h	J3-4 Can bus power	
<b>Byte 4</b>	XXh	XXh: Threshold value in ampere [A]
<b>Byte 5,7</b>	00h	Not used



Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 02 20 00 00 00	Read highest sub-index supported
PowerCore reply	595	Std	4F 02 20 00 17 00	17h is the highest sub-index supported
To PowerCore	615	Std	40 02 20 01 00 00	Read pin J1-1 threshold
PowerCore reply	595	Std	4F 02 20 01 0F 00	15A
To PowerCore	615	Std	40 02 20 09 00 00	Read pin J1-9 threshold
PowerCore reply	595	Std	4F 02 20 09 14 00	20A
To PowerCore	615	Std	2F 02 20 06 0F 00	Set pin J1-6 current to 15A
PowerCore reply	595	Std	60 02 20 06 00 00	ACK
To PowerCore	615	Std	2F 02 20 08 06 00	Set pin J1-8 current to 6A.
PowerCore reply	595	Std	60 02 20 08 00 00	ACK

### 23. Object 2003h: Read Digital Input 8-bit

This object reads digital input values. The digital input is applicable only on some pins (refer to the pin assignment table). The unsupported pins have always the value '0'.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	03h	CAN Object 2003h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	Highest sub-index supported
	01h	Read input J1-1 to J1-8
	02h	Read input J1-9 to J1-16
<b>Byte 4,7</b>	00h	Not used

PowerCore reply:

<b>Identifier</b>	595h (580h + current CAN ID)	
<b>Byte 0</b>	4Fh	Response length 1-byte
<b>Byte 1</b>	03h	CAN Object 2003h
<b>Byte 2</b>	20h	

<b>Byte 3</b>	00h	sub-index
<b>Byte 4</b>	02h	Highest sub-index supported
<b>Byte 5,7</b>	00h	Not used

<b>Byte 3</b>	01h	sub-index
<b>Byte 4</b>	J1-8 J1-7 J1-6 J1-5 0 J1-3 J1-2 0	Digital input
<b>Byte 5,7</b>	00h	Not used

<b>Byte 3</b>	02h	sub-index
<b>Byte 4</b>	0 0 0 0 0 0 J1-16 J1-9	Digital input
<b>Byte 5,7</b>	00h	Not used

## 24. Object 2004h: Read Analog Input

This object reads analog input values with 8-bit resolution. 14V=FFh.

Expected value:  $(V_{in} \cdot 255/14)_h$

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	04h	CAN Object 2004h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	Highest sub-index supported
	01h	Input J1-1
	02h	Input J1-2
	03h	Input J1-3
	04h	Input J1-4
	05h	Input J1-5
	06h	Input J1-6
	07h	Input J1-7
<b>Byte 4</b>	$(V_{in} \cdot 255/14)_h$	Expected value
<b>Byte 5,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 04 20 00 00 00 00 00	Read highest sub-index supported
PowerCore reply	595	Std	4F 04 20 00 08 00 00 00	08h is the highest sub-index supported
To PowerCore	615	Std	40 04 20 01 00 00 00 00	Read J1-1
PowerCore reply	595	Std	4F 04 20 01 FF 00 00 00	14V
To PowerCore	615	Std	40 04 20 07 00 00 00 00	Read J1-7
PowerCore reply	595	Std	4F 04 20 07 B6 00 00 00	10V
To PowerCore	615	Std	40 04 20 08 00 00 00 00	Read J1-8
PowerCore reply	595	Std	4F 04 20 08 5B 00 00 00	5V

## 25. Object 2007h: Read PowerCore Electronic Values

This object reads the analog values of the output currents, the total current and the battery voltage.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	07h	CAN Object 2007h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	Highest sub-index supported (read only)
	01h	J1-1 current Amp
	02h	J1-2 current Amp
	03h	J1-3 current Amp
	04h	J1-4 current Amp
	05h	J1-5 current Amp
	06h	J1-6 current Amp
	07h	J1-7 current Amp
	08h	J1-8 current Amp
	09h	J1-9 current Amp
	0Ah	J1-10 current Amp
	0Bh	J1-11 current Amp
	0Ch	J1-16 current Amp
	0Dh	J2-1 current Amp
	0Eh	J2-2 current Amp
	0Fh	J2-3 current Amp
	10h	J2-4 current Amp
	11h	J2-5 current Amp
	12h	J2-6 current Amp
13h	J2-7 current Amp	
14h	J2-8 current Amp	
15h	J2-11 current Amp	
16h	J2-12 current Amp	
17h	J3-4 Can bus power current Amp	
18h	Battery voltage: 35,5V = FFh	
19h	Total current	
<b>Byte 4,7</b>	00h	Not used

Answer:

<b>Identifier</b>	595h (580h + current CAN ID)	
<b>Byte 0</b>	4Fh	1-byte response
<b>Byte 1</b>	07h	CAN Object 2007h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	XXh	XXh: Sub index echo
<b>Byte 4</b>	YYh	YYh: Current [A] Voltage= YYd · 35,5/255
<b>Byte 5,7</b>	00h	Not used

## 26. Object 2008h: Output State

This object sets and reads the state of each output pin.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
	23h	Write 4-byte data
<b>Byte 1</b>	08h	CAN Object 2008h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	Highest sub-index supported (read only)
	01h	Output OFF
	02h	Output HIGH
	03h	Output LOW
	06h	Output FAULT
	07h	Output RESET (write only)
<b>Byte 4</b>	J1-8 J1-7 J1-6 J1-5 J1-4 J1-3 J1-2 J1-1	Each bit sets a pin
<b>Byte 5</b>	J2-4 J2-3 J2-2 J2-1 J1-16 J1-11 J1-10 J1-9	Each bit sets a pin
<b>Byte 6</b>	0 J3-4 J2-12 J2-11 J2-8 J2-7 J2-6 J2-5	Each bit sets a pin
<b>Byte 7</b>	00h	Always '0'

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	23 08 20 02 08 00 00 00	Set J1-4 HIGH
PowerCore reply	595	Std	60 08 20 02 00 00 00 00	ACK
To PowerCore	615	Std	40 08 20 03 00 00 00 00	Who is LOW?
PowerCore reply	595	Std	43 08 20 03 00 40 01 00	J2-4 and J2-5 low
To PowerCore	615	Std	40 08 20 01 00 00 00 00	Who is OFF?
PowerCore reply	595	Std	43 08 20 01 01 00 00 00	Only J1-1 OFF

## 27. Object 2010h: Baud rate settings

This object sets and reads the baud rate.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
	2Fh	Write 1-byte data
<b>Byte 1</b>	10h	CAN Object 2010h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	
<b>Byte 4</b>	XXh	Sub index XXh: 00h: 125k 01h: 250k 02h: 500k
<b>Byte 5,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 10 20 00 00 00 00 00	Read baud rate
PowerCore reply	595	Std	4F 10 20 00 01 00 00 00	01h = 250k
To PowerCore	615	Std	2F 10 20 00 02 00 00 00	Set 02h = 500k
PowerCore reply	595	Std	60 10 20 00 00 00 00 00	ACK
To PowerCore	615	Std	2F 10 20 00 00 00 00 00	Set 00h = 125k
PowerCore reply	595	Std	60 10 20 00 00 00 00 00	ACK

## 28. Object 2011h: Set node ID

This object sets and reads the CANopen node-id.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
	2Fh	Write 1-byte data
<b>Byte 1</b>	11h	CAN Object 2011h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	
<b>Byte 4</b>	XXh	Sub index New node id: (00h – 7Fh)
<b>Byte 5,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 11 20 00 00 00 00 00	Read Node ID
PowerCore reply	595	Std	4F 11 20 00 15 00 00 00	ID = 15h
To PowerCore	615	Std	2F 11 20 00 16 00 00 00	Set ID = 16h
PowerCore reply	595	Std	60 11 20 00 00 00 00 00	ACK

## 29. Object 2012h: Set Periodic Messages

This object sets the periodic transmission of TPDO 180h (Fault message).

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
	2Fh	Write 1-byte data
<b>Byte 1</b>	12h	CAN Object 2012h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	Sub index
<b>Byte 4</b>	XXh	XXh: Period in milliseconds * 10 (00h = OFF, maximum FEh)
<b>Byte 5,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 12 20 00 00 00 00 00	Read register
PowerCore reply	595	Std	4F 12 20 00 0A 00 00 00	Period = 100ms
To PowerCore	615	Std	2F 12 20 00 32 00 00 00	Set period = 500ms
PowerCore reply	595	Std	60 12 20 00 00 00 00 00	ACK

## 30. Object 2013h: Set Device Active on Startup

If device is active on startup don't need start command from master.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
	2Fh	Write 1-byte data
<b>Byte 1</b>	13h	CAN Object 2013h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	Sub index
<b>Byte 4</b>	XXh	00h: OFF 01h: ACTIVE
<b>Byte 5,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 13 20 00 00 00 00 00	Read register
PowerCore reply	595	Std	4F 13 20 00 00 00 00 00	Not active at start
To PowerCore	615	Std	2F 13 20 00 01 00 00 00	Set active on start
PowerCore reply	595	Std	60 13 20 00 00 00 00 00	ACK

### 31. Object 2014h: Set CAN Bus Power Supply Active on Startup

This object sets and reads the pin J3-4 state at startup.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
	2Fh	Write 1-byte data
<b>Byte 1</b>	14h	CAN Object 2014h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	Sub index
<b>Byte 4</b>	XXh	00h: NOT ACTIVE 01h: ACTIVE
<b>Byte 5,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 14 20 00 00 00 00 00	Read register
PowerCore reply	595	Std	4F 14 20 00 00 00 00 00	Not active at start
To PowerCore	615	Std	2F 14 20 00 01 00 00 00	Set active on start
PowerCore reply	595	Std	60 14 20 00 00 00 00 00	ACK

### 32. Object 2015h: Set Boot-up Service

This object enables and disables the boot-up message.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
	2Fh	Write 1-byte data
<b>Byte 1</b>	15h	CAN Object 2015h
<b>Byte 2</b>	20h	
<b>Byte 3</b>	00h	Sub index
<b>Byte 4</b>	XXh	00h: NOT ACTIVE 01h: ACTIVE
<b>Byte 5,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 15 20 00 00 00 00 00	Read register
PowerCore reply	595	Std	4F 15 20 00 00 00 00 00	Not active at start
To PowerCore	615	Std	2F 15 20 00 01 00 00 00	Set active on start
PowerCore reply	595	Std	60 15 20 00 00 00 00 00	ACK
To PowerCore	615	Std	2F 15 20 00 00 00 00 00	Set not active at start
PowerCore reply	595	Std	60 15 20 00 00 00 00 00	ACK

### 33. Object 1017h: Producer Heartbeat Time

The producer heartbeat time shall indicate the configured cycle time of the heartbeat.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
	2Bh	Set device register
<b>Byte 1</b>	17h	CAN Object 1017h
<b>Byte 2</b>	10h	
<b>Byte 3</b>	00h	Sub index
<b>Byte 4</b>	YYh	YYh: Heartbeat time in milliseconds
<b>Byte 5</b>	XXh	XXh: Heartbeat time in milliseconds
<b>Byte 6, 7</b>	00h	Not used

Heartbeat time: XYYh (from 000Ah to FFFFh: 10ms to 65535 milliseconds).

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 17 10 00 00 00 00 00	Read heartbeat time
PowerCore reply	595	Std	4B 17 10 00 64 00 00 00	Heartbeat time = 100ms
To PowerCore	615	Std	2B 17 10 00 00 00 00 00	Switch off the heartbeat
PowerCore reply	595	Std	60 17 10 00 00 00 00 00	
To PowerCore	615	Std	2B 17 10 00 32 00 00 00	Heartbeat time = 50ms
PowerCore reply	595	Std	60 17 10 00 00 00 00 00	
To PowerCore	615	Std	2B 17 10 00 F4 01 00 00	Heartbeat time = 500ms
PowerCore reply	595	Std	60 17 10 00 00 00 00 00	

### 34. Object 1000h: Device Type

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	00h	CAN Object 1000h
<b>Byte 2</b>	10h	
<b>Byte 3</b>	00h	Sub Index
<b>Byte 4, 7</b>	00h	Not used

Example:

Direction	Identifier	Format	Message
To PowerCore	615	Std	40 00 10 00 00 00 00 00
PowerCore reply	595	Std	43 00 10 00 91 01 87 00

Device profile number: 870191h generic I/O module.

I/O Functionality: digital I/O, analog Input.

Mapping PDOs: Device specific PDO supported.



### 35. Object 1404h: Receive PDO 4 Communication Parameter

Describes the RPDO parameters for turning OFF the outputs.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	04h	CAN Object 1404h
<b>Byte 2</b>	14h	
<b>Byte 3</b>	00h	Highest sub-index supported
	01h	COB-ID used by RPDO
	02h	Transmission type
<b>Byte 4,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 04 14 00 00 00 00 00	
PowerCore reply	595	Std	4F 04 14 00 02 00 00 00	02
To PowerCore	615	Std	40 04 14 01 00 00 00 00	
PowerCore reply	595	Std	43 04 14 01 15 02 00 00	0000 0215h
To PowerCore	615	Std	40 04 14 02 00 00 00 00	
PowerCore reply	595	Std	4F 04 14 02 FE 00 00 00	FEh

Highest sub-index supported: 02h;

COB-ID used by RPDO: 0000 0215h; 0000 0200h + Node-ID;

Transmission type: event-driven (manufacturer-specific).

### 36. Object 1405h: Receive PDO 5 Communication Parameter

Describes the RPDO parameters for turning HIGH the outputs.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	05h	CAN Object 1405h
<b>Byte 2</b>	14h	
<b>Byte 3</b>	00h	Highest sub-index supported
	01h	COB-ID used by RPDO
	02h	Transmission type
<b>Byte 4,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 05 14 00 00 00 00 00	
PowerCore reply	595	Std	4F 05 14 00 02 00 00 00	02
To PowerCore	615	Std	40 05 14 01 00 00 00 00	
PowerCore reply	595	Std	43 05 14 01 15 03 00 00	0000 0315h
To PowerCore	615	Std	40 05 14 02 00 00 00 00	
PowerCore reply	595	Std	4F 05 14 02 FE 00 00 00	FEh

Highest sub-index supported: 02h;

COB-ID used by RPDO: 0000 0315h; 0000 0300h + Node-ID.

Transmission type: event-driven (manufacturer-specific).

### 37. Object 1600h: Receive PDO 0 Mapping Parameter

Describes the RPDO 0 mapping parameters for setting single pin state OUTPUT PDO message.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	00h	CAN Object 1600h
<b>Byte 2</b>	16h	
<b>Byte 3</b>	XXh	00h: Number of mapped objects
		01h: 1 <sup>st</sup> application object
		02h: 2 <sup>nd</sup> application object
		03h: 3 <sup>rd</sup> application object
		04h: 4 <sup>th</sup> application object
		05h: 5 <sup>th</sup> application object
		06h: 6 <sup>th</sup> application object
		07h: 7 <sup>th</sup> application object
		08h: 8 <sup>th</sup> application object
		09h: 9 <sup>th</sup> application object
		0Ah: 10 <sup>th</sup> application object
		0Bh: 11 <sup>th</sup> application object
		0Ch: 12 <sup>th</sup> application object
		0Dh: 13 <sup>th</sup> application object
		0Eh: 14 <sup>th</sup> application object
0Fh: 15 <sup>th</sup> application object		
10h: 16 <sup>th</sup> application object		
11h: 17 <sup>th</sup> application object		
12h: 18 <sup>th</sup> application object		
13h: 19 <sup>th</sup> application object		
14h: 20 <sup>th</sup> application object		
15h: 21 <sup>st</sup> application object		
16h: 22 <sup>nd</sup> application object		
17h: 23 <sup>rd</sup> application object		
<b>Byte 4,7</b>	00h	Not used

Example:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 00 16 00 00 00 00 00	
PowerCore reply	595	Std	4F 00 16 00 17 00 00 00	17
To PowerCore	615	Std	40 00 16 01 00 00 00 00	
PowerCore reply	595	Std	43 00 16 01 08 01 01 20	2001 01 08
To PowerCore	615	Std	40 00 16 02 00 00 00 00	
PowerCore reply	595	Std	43 00 16 02 08 02 01 20	2001 02 08
To PowerCore	615	Std	40 00 16 03 00 00 00 00	
PowerCore reply	595	Std	43 00 16 03 08 03 01 20	2001 03 08
To PowerCore	615	Std	40 00 16 04 00 00 00 00	
PowerCore reply	595	Std	43 00 16 04 08 04 01 20	2001 04 08
To PowerCore	615	Std	40 00 16 05 00 00 00 00	
PowerCore reply	595	Std	43 00 16 05 08 05 01 20	2001 05 08
To PowerCore	615	Std	40 00 16 06 00 00 00 00	
PowerCore reply	595	Std	43 00 16 06 08 06 01 20	2001 06 08
To PowerCore	615	Std	40 00 16 07 00 00 00 00	

PowerCore reply	595	Std	43 00 16 07 08 07 01 20	2001 07 08
To PowerCore	615	Std	40 00 16 08 00 00 00 00	
PowerCore reply	595	Std	43 00 16 08 08 08 01 20	2001 08 08
To Powercore	615	Std	40 00 16 09 00 00 00 00	
PowerCore reply	595	Std	43 00 16 09 08 09 01 20	2001 09 08
To PowerCore	615	Std	40 00 16 0A 00 00 00 00	
PowerCore reply	595	Std	43 00 16 0A 08 0A 01 20	2001 0A 08
To PowerCore	615	Std	40 00 16 0B 00 00 00 00	
PowerCore reply	595	Std	43 00 16 0B 08 0B 01 20	2001 0B 08
To PowerCore	615	Std	40 00 16 0C 00 00 00 00	
PowerCore reply	595	Std	43 00 16 0C 08 0C 01 20	2001 0C 08
To PowerCore	615	Std	40 00 16 0D 00 00 00 00	
PowerCore reply	595	Std	43 00 16 0D 08 0D 01 20	2001 0D 08
To PowerCore	615	Std	40 00 16 0E 00 00 00 00	
PowerCore reply	595	Std	43 00 16 0E 08 0E 01 20	2001 0E 08
To PowerCore	615	Std	40 00 16 0F 00 00 00 00	
PowerCore reply	595	Std	43 00 16 0F 08 0F 01 20	2001 0F 08
To PowerCore	615	Std	40 00 16 10 00 00 00 00	
PowerCore reply	595	Std	43 00 16 10 08 10 01 20	2001 10 08
To PowerCore	615	Std	40 00 16 11 00 00 00 00	
PowerCore reply	595	Std	43 00 16 11 08 11 01 20	2001 11 08
To PowerCore	615	Std	40 00 16 12 00 00 00 00	
PowerCore reply	595	Std	43 00 16 12 08 12 01 20	2001 12 08
To PowerCore	615	Std	40 00 16 13 00 00 00 00	
PowerCore reply	595	Std	43 00 16 13 08 13 01 20	2001 13 08
To PowerCore	615	Std	40 00 16 14 00 00 00 00	
PowerCore reply	595	Std	43 00 16 14 08 14 01 20	2001 14 08
To PowerCore	615	Std	40 00 16 15 00 00 00 00	
PowerCore reply	595	Std	43 00 16 15 08 15 01 20	2001 15 08
To PowerCore	615	Std	40 00 16 16 00 00 00 00	
PowerCore reply	595	Std	43 00 16 16 08 16 01 20	2001 16 08
To PowerCore	615	Std	40 00 16 17 00 00 00 00	
PowerCore reply	595	Std	43 00 16 17 08 17 01 20	2001 17 08

Number of mapped objects: 23;

Application object: set single pin state output

Index 2001h, sub-index 01h, length 08h;

Index 2001h, sub-index 02h, length 08h;

Index 2001h, sub-index 03h, length 08h;

Index 2001h, sub-index 04h, length 08h;

Index 2001h, sub-index 05h, length 08h;

Index 2001h, sub-index 06h, length 08h;

Index 2001h, sub-index 07h, length 08h;

Index 2001h, sub-index 09h, length 08h;

Index 2001h, sub-index 0Ah, length 08h;

Index 2001h, sub-index 0Bh, length 08h;  
 Index 2001h, sub-index 0Ch, length 08h;  
 Index 2001h, sub-index 0Dh, length 08h;  
 Index 2001h, sub-index 0Eh, length 08h;  
 Index 2001h, sub-index 0Fh, length 08h;  
 Index 2001h, sub-index 10h, length 08h;  
 Index 2001h, sub-index 11h, length 08h;  
 Index 2001h, sub-index 12h, length 08h;  
 Index 2001h, sub-index 13h, length 08h;  
 Index 2001h, sub-index 14h, length 08h;  
 Index 2001h, sub-index 15h, length 08h;  
 Index 2001h, sub-index 16h, length 08h;  
 Index 2001h, sub-index 17h, length 08h.

### 38. Object 1601h: Receive PDO 2 Mapping Parameter

Describes the RPDO 1 mapping parameters for setting OUTPUT CURRENT THRESHOLD PDO message.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	01h	CAN Object 1601h
<b>Byte 2</b>	16h	
<b>Byte 3</b>	XXh	00h: Number of mapped objects
		01h: 1 <sup>st</sup> application object
		02h: 2 <sup>nd</sup> application object
		03h: 3 <sup>rd</sup> application object
		04h: 4 <sup>th</sup> application object
		05h: 5 <sup>th</sup> application object
		06h: 6 <sup>th</sup> application object
		07h: 7 <sup>th</sup> application object
		08h: 8 <sup>th</sup> application object
		09h: 9 <sup>th</sup> application object
		0Ah: 10 <sup>th</sup> application object
		0Bh: 11 <sup>th</sup> application object
		0Ch: 12 <sup>th</sup> application object
		0Dh: 13 <sup>th</sup> application object
		0Eh: 14 <sup>th</sup> application object
0Fh: 15 <sup>th</sup> application object		
10h: 16 <sup>th</sup> application object		
11h: 17 <sup>th</sup> application object		
12h: 18 <sup>th</sup> application object		
13h: 19 <sup>th</sup> application object		
14h: 20 <sup>th</sup> application object		
15h: 21 <sup>st</sup> application object		
16h: 22 <sup>nd</sup> application object		
17h: 23 <sup>rd</sup> application object		
<b>Byte 4,7</b>	00h	Not used

Example:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 01 16 00 00 00 00 00	
PowerCore reply	595	Std	4F 01 16 00 17 00 00 00	17
To PowerCore	615	Std	40 01 16 01 00 00 00 00	
PowerCore reply	595	Std	43 01 16 01 08 01 02 20	2002 01 08
To PowerCore	615	Std	40 01 16 02 00 00 00 00	
PowerCore reply	595	Std	43 01 16 02 08 02 02 20	2002 02 08
To PowerCore	615	Std	40 01 16 03 00 00 00 00	
PowerCore reply	595	Std	43 01 16 03 08 03 02 20	2002 03 08
To PowerCore	615	Std	40 01 16 04 00 00 00 00	
PowerCore reply	595	Std	43 01 16 04 08 04 02 20	2002 04 08
To PowerCore	615	Std	40 01 16 05 00 00 00 00	
PowerCore reply	595	Std	43 01 16 05 08 05 02 20	2002 05 08
To PowerCore	615	Std	40 01 16 06 00 00 00 00	
PowerCore reply	595	Std	43 01 16 06 08 06 02 20	2002 06 08
To PowerCore	615	Std	40 01 16 07 00 00 00 00	
PowerCore reply	595	Std	43 01 16 07 08 07 02 20	2002 07 08
To PowerCore	615	Std	40 01 16 08 00 00 00 00	
PowerCore reply	595	Std	43 01 16 08 08 08 02 20	2002 08 08
To PowerCore	615	Std	40 01 16 09 00 00 00 00	
PowerCore reply	595	Std	43 01 16 09 08 09 02 20	2002 09 08
To PowerCore	615	Std	40 01 16 0A 00 00 00 00	
PowerCore reply	595	Std	43 01 16 0A 08 0A 02 20	2002 0A 08
To PowerCore	615	Std	40 01 16 0B 00 00 00 00	
PowerCore reply	595	Std	43 01 16 0B 08 0B 02 20	2002 0B 08
To PowerCore	615	Std	40 01 16 0C 00 00 00 00	
PowerCore reply	595	Std	43 01 16 0C 08 0C 02 20	2002 0C 08
To PowerCore	615	Std	40 01 16 0D 00 00 00 00	
PowerCore reply	595	Std	43 01 16 0D 08 0D 02 20	2002 0D 08
To PowerCore	615	Std	40 01 16 0E 00 00 00 00	
PowerCore reply	595	Std	43 01 16 0E 08 0E 02 20	2002 0E 08
To PowerCore	615	Std	40 01 16 0F 00 00 00 00	
PowerCore reply	595	Std	43 01 16 0F 08 0F 02 20	2002 0F 08
To PowerCore	615	Std	40 01 16 10 00 00 00 00	
PowerCore reply	595	Std	43 01 16 10 08 10 02 20	2002 10 08
To PowerCore	615	Std	40 01 16 11 00 00 00 00	
PowerCore reply	595	Std	43 01 16 11 08 11 02 20	2002 11 08
To PowerCore	615	Std	40 01 16 12 00 00 00 00	
PowerCore reply	595	Std	43 01 16 12 08 12 02 20	2002 12 08
To PowerCore	615	Std	40 01 16 13 00 00 00 00	
PowerCore reply	595	Std	43 01 16 13 08 13 02 20	2002 13 08

<b>To PowerCore</b>	615	Std	40 01 16 14 00 00 00 00	
<b>PowerCore reply</b>	595	Std	43 01 16 14 08 14 02 20	2002 14 08
<b>To PowerCore</b>	615	Std	40 01 16 15 00 00 00 00	
<b>PowerCore reply</b>	595	Std	43 01 16 15 08 15 02 20	2002 15 08
<b>To PowerCore</b>	615	Std	40 01 16 16 00 00 00 00	
<b>PowerCore reply</b>	595	Std	43 01 16 16 08 16 02 20	2002 16 08
<b>To PowerCore</b>	615	Std	40 01 16 17 00 00 00 00	
<b>PowerCore reply</b>	595	Std	43 01 16 17 08 17 02 20	2002 17 08

Number of mapped objects: 23;

Application object: set output current threshold;

Index 2002h, sub-index 01h, length 08h;

Index 2002h, sub-index 02h, length 08h;

;

Index 2002h, sub-index 03h, length 08h;

Index 2002h, sub-index 04h, length 08h;

Index 2002h, sub-index 05h, length 08h;

Index 2002h, sub-index 06h, length 08h;

Index 2002h, sub-index 07h, length 08h;

Index 2002h, sub-index 08h, length 08h;

Index 2002h, sub-index 09h, length 08h;

Index 2002h, sub-index 0Ah, length 08h;

Index 2002h, sub-index 0Bh, length 08h;

Index 2002h, sub-index 0Ch, length 08h;

Index 2002h, sub-index 0Dh, length 08h;

Index 2002h, sub-index 0Eh, length 08h;

Index 2002h, sub-index 0Fh, length 08h;

Index 2002h, sub-index 10h, length 08h;

Index 2002h, sub-index 11h, length 08h;

Index 2002h, sub-index 12h, length 08h;

Index 2002h, sub-index 13h, length 08h;

Index 2002h, sub-index 14h, length 08h;

Index 2002h, sub-index 15h, length 08h;

Index 2002h, sub-index 16h, length 08h

Index 2002h, sub-index 17h, length 08h.

### 39. Object 1604h: Receive PDO 4 Mapping Parameter

Describes the RPDO 4 mapping parameters for turning OFF the outputs.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	04h	CAN Object 1604h
<b>Byte 2</b>	16h	
<b>Byte 3</b>	00h	Highest sub-index supported
	01h	Application object: Set Output OFF
<b>Byte 4,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
<b>To PowerCore</b>	615	Std	40 04 16 00 00 00 00 00	
<b>PowerCore reply</b>	595	Std	4F 04 16 00 01 00 00 00	01
<b>To PowerCore</b>	615	Std	40 04 16 01 00 00 00 00	
<b>PowerCore reply</b>	595	Std	43 04 16 01 18 01 08 20	2008 01 18

Highest sub-index supported: 01h;

Application object: set output OFF, index 2008h, sub-index 01h, length 18h.

### 40. Object 1605h: Receive PDO 5 Mapping Parameter

Describes the RPDO 5 mapping parameters for turning HIGH the outputs.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	05h	CAN Object 1605h
<b>Byte 2</b>	16h	
<b>Byte 3</b>	00h	Highest sub-index supported
	01h	Application object: Set Output HIGH
<b>Byte 4,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
<b>To PowerCore</b>	615	Std	40 05 16 00 00 00 00 00	
<b>PowerCore reply</b>	595	Std	4F 05 16 00 01 00 00 00	01
<b>To PowerCore</b>	615	Std	40 05 16 01 00 00 00 00	
<b>PowerCore reply</b>	595	Std	43 05 16 01 18 02 08 20	2008 02 18

Highest sub-index supported: 01h;

Application object: set output HIGH, index 2008h, sub-index 02h, length 18h.

## 41. Object 1804h: Transmit PDO 4 Communication Parameter

Describes the TPDO communication parameters for outputs FAULT state.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	04h	CAN Object 1804h
<b>Byte 2</b>	18h	
<b>Byte 3</b>	00h	
	01h	Highest sub-index supported
	02h	COB-ID used by TPDO
<b>Byte 4,7</b>	00h	Transmission type
		Not used

Examples:

Direction	Identifier	Format	Message	Data
<b>To PowerCore</b>	615	Std	40 04 18 00 00 00 00 00	
<b>PowerCore reply</b>	595	Std	4F 04 18 00 02 00 00 00	02
<b>To PowerCore</b>	615	Std	40 04 18 01 00 00 00 00	
<b>PowerCore reply</b>	595	Std	43 04 18 01 95 01 00 00	0000 0195h
<b>To PowerCore</b>	615	Std	40 04 18 02 00 00 00 00	
<b>PowerCore reply</b>	595	Std	4F 04 18 02 FE 00 00 00	FEh

Highest sub-index supported: 02h;

COB-ID used by TPDO: 0000 0195h; 0000 0180h + Node-ID;

Transmission type: event-driven (manufacturer-specific).

## 42. Object 1A00h: Transmit PDO 0 Mapping Parameter

Describes the TPDO 0 communication parameters for read digital input 8 bit.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	00h	CAN Object 1A00h
<b>Byte 2</b>	1Ah	
<b>Byte 3</b>	00h	
	01h	Number of mapped objects
	02h	1 <sup>st</sup> application object
		2 <sup>nd</sup> application object
<b>Byte 4,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
<b>To PowerCore</b>	615	Std	40 00 1A 00 00 00 00 00	
<b>PowerCore reply</b>	595	Std	4F 00 1A 00 02 00 00 00	02
<b>To PowerCore</b>	615	Std	40 00 1A 01 00 00 00 00	
<b>PowerCore reply</b>	595	Std	43 00 1A 01 08 01 03 20	2003 01 08
<b>To PowerCore</b>	615	Std	40 00 1A 02 00 00 00 00	
<b>PowerCore reply</b>	595	Std	43 00 1A 02 08 02 03 20	2003 02 08

Number of mapped objects: 2;

Application object: Read digital input 8 bit;

Index 2003h; sub-index 01h; length 08h;

Index 2003h; sub-index 02h; length 08h.



### 43. Object 1A04h: Transmit PDO 4 Mapping Parameter

Describes the TPDO 4 communication parameters for reading output FAULT states.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	04h	CAN Object 1A04h
<b>Byte 2</b>	1Ah	
<b>Byte 3</b>	00h	Number of mapped objects
	01h	1 <sup>st</sup> application object
<b>Byte 4,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
<b>To PowerCore</b>	615	Std	40 04 1A 00 00 00 00 00	
<b>PowerCore reply</b>	595	Std	4F 04 1A 00 01 00 00 00	01
<b>To PowerCore</b>	615	Std	40 04 1A 01 00 00 00 00	
<b>PowerCore reply</b>	595	Std	43 04 1A 01 18 06 08 20	2008 06 18

Number of mapped objects: 1;

Application object: Read output FAULT state;  
Index 2008h; sub-index 06h; length 18h.

### 44. Object 1A05h: Transmit PDO 5 Mapping Parameter

Describes the TPDO 5 communication parameters for reading analog inputs.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	05h	CAN Object 1A05h
<b>Byte 2</b>	1Ah	
<b>Byte 3</b>	00h	Number of mapped objects
	01h	1 <sup>st</sup> application object: read analog input J1-1
	02h	2 <sup>nd</sup> application object: read analog input J1-2
	03h	3 <sup>rd</sup> application object: read analog input J1-3
	04h	4 <sup>th</sup> application object: read analog input J1-4
	05h	5 <sup>th</sup> application object: read analog input J1-5
	06h	6 <sup>th</sup> application object: read analog input J1-6
	07h	7 <sup>th</sup> application object: read analog input J1-7
	08h	8 <sup>th</sup> application object: read analog input J1-8
<b>Byte 4,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 05 1A 00 00 00 00 00	
PowerCore reply	595	Std	4F 05 1A 00 08 00 00 00	08
To PowerCore	615	Std	40 05 1A 01 00 00 00 00	
PowerCore reply	595	Std	43 05 1A 01 08 01 04 20	2004 01 08
To PowerCore	615	Std	40 05 1A 02 00 00 00 00	
PowerCore reply	595	Std	43 05 1A 02 08 02 04 20	2004 02 08
To PowerCore	615	Std	40 05 1A 03 00 00 00 00	
PowerCore reply	595	Std	43 05 1A 03 08 03 04 20	2004 03 08
To PowerCore	615	Std	40 05 1A 04 00 00 00 00	
PowerCore reply	595	Std	43 05 1A 04 08 04 04 20	2004 04 08
To PowerCore	615	Std	40 05 1A 05 00 00 00 00	
PowerCore reply	595	Std	43 05 1A 05 08 05 04 20	2004 05 08
To PowerCore	615	Std	40 05 1A 06 00 00 00 00	
PowerCore reply	595	Std	43 05 1A 06 08 06 04 20	2004 06 08
To PowerCore	615	Std	40 05 1A 07 00 00 00 00	
PowerCore reply	595	Std	43 05 1A 07 08 07 04 20	2004 07 08
To PowerCore	615	Std	40 05 1A 08 00 00 00 00	
PowerCore reply	595	Std	43 05 1A 08 08 08 04 20	2004 08 08

Number of mapped objects: 8;

Application object: Read analog input;  
 J1-1: Index 2004h; sub-index 01h; length 08h;  
 J1-2: Index 2004h; sub-index 02h; length 08h;  
 J1-3: Index 2004h; sub-index 03h; length 08h;  
 J1-4: Index 2004h; sub-index 04h; length 08h;  
 J1-5: Index 2004h; sub-index 05h; length 08h;  
 J1-6: Index 2004h; sub-index 06h; length 08h;  
 J1-7: Index 2004h; sub-index 07h; length 08h;  
 J1-8: Index 2004h; sub-index 08h; length 08h.

## 45. Object 1A06h: Transmit PDO 6 Mapping Parameter

Describes the TPDO 6 communication parameters for reading output currents.

<b>Identifier</b>	600h + current CAN ID	Default 615h
<b>Byte 0</b>	40h	Read Device Register
<b>Byte 1</b>	06h	CAN Object 1A06h
<b>Byte 2</b>	1Ah	
<b>Byte 3</b>	00h	Number of mapped objects
	01h	1 <sup>st</sup> application object: read output current J1-1
	02h	2 <sup>nd</sup> application object: read output current J1-2
	03h	3 <sup>rd</sup> application object: read output current J1-3
	04h	4 <sup>th</sup> application object: read output current J1-4
	05h	5 <sup>th</sup> application object: read output current J1-5
	06h	6 <sup>th</sup> application object: read output current J1-6
	07h	7 <sup>th</sup> application object: read output current J1-7
	08h	8 <sup>th</sup> application object: read output current J1-8
	09h	9 <sup>th</sup> application object: read output current J1-9
	0Ah	10 <sup>th</sup> application object: read output current J1-10
	0Bh	11 <sup>th</sup> application object: read output current J1-11
	0Ch	12 <sup>th</sup> application object: read output current J1-16
	0Dh	13 <sup>th</sup> application object: read output current J2-1
	0Eh	14 <sup>th</sup> application object: read output current J2-2
	0Fh	15 <sup>th</sup> application object: read output current J2-3
	10h	16 <sup>th</sup> application object: read output current J2-4
	11h	17 <sup>th</sup> application object: read output current J2-5
	12h	18 <sup>th</sup> application object: read output current J2-6
	13h	19 <sup>th</sup> application object: read output current J2-7
	14h	20 <sup>th</sup> application object: read output current J2-8
	15h	21 <sup>st</sup> application object: read output current J2-11
	16h	22 <sup>nd</sup> application object: read output current J2-12
	17h	23 <sup>rd</sup> application object: read output current J3-4
	18h	24 <sup>th</sup> application object: read battery voltage
	19h	25 <sup>th</sup> application object: read total current
<b>Byte 4,7</b>	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	615	Std	40 06 1A 00 00 00 00 00	
PowerCore reply	595	Std	4F 06 1A 00 19 00 00 00	19
To PowerCore	615	Std	40 06 1A 01 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 01 08 01 07 20	2007 01 08
To PowerCore	615	Std	40 06 1A 02 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 02 08 02 07 20	2007 02 08
To PowerCore	615	Std	40 06 1A 03 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 03 08 03 07 20	2007 03 08
To PowerCore	615	Std	40 06 1A 04 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 04 08 04 07 20	2007 04 08
To PowerCore	615	Std	40 06 1A 05 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 05 08 05 07 20	2007 05 08
To PowerCore	615	Std	40 06 1A 06 00 00 00 00	

PowerCore reply	595	Std	43 06 1A 06 08 06 07 20	2007 06 08
To PowerCore	615	Std	40 06 1A 07 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 07 08 07 07 20	2007 07 08
To PowerCore	615	Std	40 06 1A 08 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 08 08 08 07 20	2007 08 08
To PowerCore	615	Std	40 06 1A 09 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 09 08 09 07 20	2007 09 08
To PowerCore	615	Std	40 06 1A 0A 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 0A 08 0A 07 20	2007 0A 08
To PowerCore	615	Std	40 06 1A 0B 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 0B 08 0B 07 20	2007 0B 08
To PowerCore	615	Std	40 06 1A 0C 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 0C 08 0C 07 20	2007 0C 08
To PowerCore	615	Std	40 06 1A 0D 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 0D 08 0D 07 20	2007 0D 08
To PowerCore	615	Std	40 06 1A 0E 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 0E 08 0E 07 20	2007 0E 08
To PowerCore	615	Std	40 06 1A 0F 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 0F 08 0F 07 20	2007 0F 08
To PowerCore	615	Std	40 06 1A 10 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 10 08 10 07 20	2007 10 08
To PowerCore	615	Std	40 06 1A 11 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 11 08 11 07 20	2007 11 08
To PowerCore	615	Std	40 06 1A 12 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 12 08 12 07 20	2007 12 08
To PowerCore	615	Std	40 06 1A 13 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 13 08 13 07 20	2007 13 08
To PowerCore	615	Std	40 06 1A 14 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 14 08 14 07 20	2007 14 08
To PowerCore	615	Std	40 06 1A 15 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 15 08 15 07 20	2007 15 08
To PowerCore	615	Std	40 06 1A 16 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 16 08 16 07 20	2007 16 08
To PowerCore	615	Std	40 06 1A 17 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 17 08 17 07 20	2007 17 08
To PowerCore	615	Std	40 06 1A 18 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 18 08 18 07 20	2007 18 08
To PowerCore	615	Std	40 06 1A 19 00 00 00 00	
PowerCore reply	595	Std	43 06 1A 19 08 19 07 20	2007 19 08

Number of mapped objects: 25;

Application object:

Read output current;

J1-1: Index 2007h; sub-index 01h; length 08h;  
 J1-2: Index 2007h; sub-index 02h; length 08h;  
 J1-3: Index 2007h; sub-index 03h; length 08h;  
 J1-4: Index 2007h; sub-index 04h; length 08h;  
 J1-5: Index 2007h; sub-index 05h; length 08h;  
 J1-6: Index 2007h; sub-index 06h; length 08h;  
 J1-7: Index 2007h; sub-index 07h; length 08h;  
 J1-8: Index 2007h; sub-index 08h; length 08h;  
 J1-9: Index 2007h; sub-index 09h; length 08h;  
 J1-10: Index 2007h; sub-index 0Ah; length 08h;  
 length 08h;  
 J1-11: Index 2007h; sub-index 0Bh; length 08h;  
 08h.  
 J1-16: Index 2007h; sub-index 0Ch; length 08h;  
 J2-1: Index 2007h; sub-index 0Dh; length 08h;  
 J2-2: Index 2007h; sub-index 0Eh; length 08h;

J2-3: Index 2007h; sub-index 0Fh; length 08h;  
 J2-4: Index 2007h; sub-index 10h; length 08h;  
 J2-5: Index 2007h; sub-index 11h; length 08h;  
 J2-6: Index 2007h; sub-index 12h; length 08h;  
 J2-7: Index 2007h; sub-index 13h; length 08h;  
 J2-8: Index 2007h; sub-index 14h; length 08h;  
 J2-11: Index 2007h; sub-index 15h; length 08h;  
 J2-12: Index 2007h; sub-index 16h; length 08h;  
 J3-4: Index 2007h; sub-index 17h; length 08h;  
 Battery voltage: Index 2007h; sub-index 18h;

Total current: Index 2007h; sub-index 19h; length

## 46. Revision history

Date	Manual Revision	Comment	Related SW version
07/09/2018	1.0	First release	x.x