PC20 CAN J1939 Slave

Solid State POWERCORE Management Enclosure

Features:

CAN2.0B supported

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

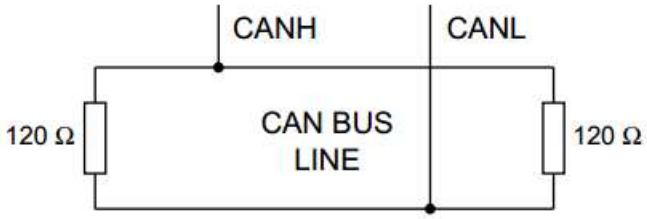
Splash proof (IP65)

Molex connectors MX150L series

Contents

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 terminating resistor between CAN-L and CAN-H.

NOTE: the PC20 PCB is set up so that it is possible to require the terminating resistor to be built in.

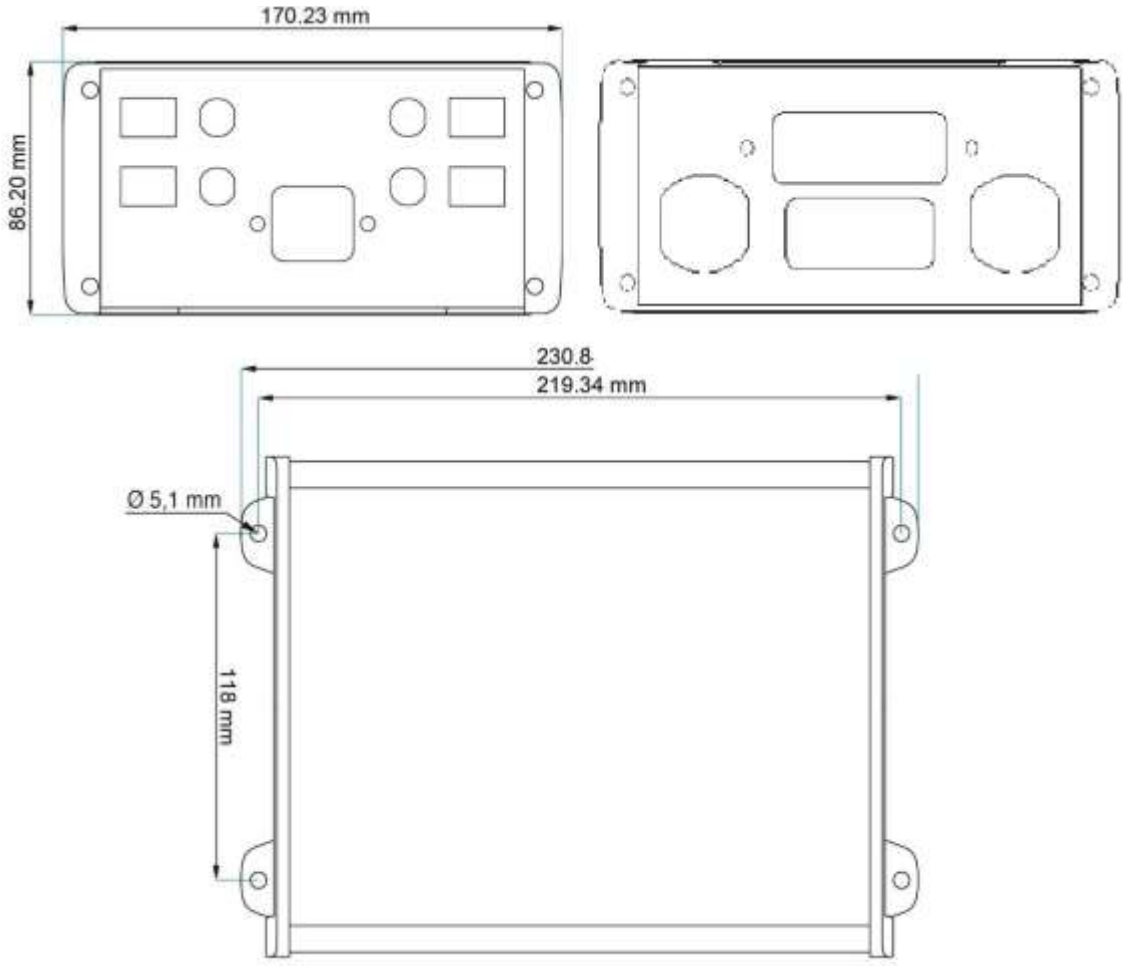
2. PC20 Technical Specifications

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.

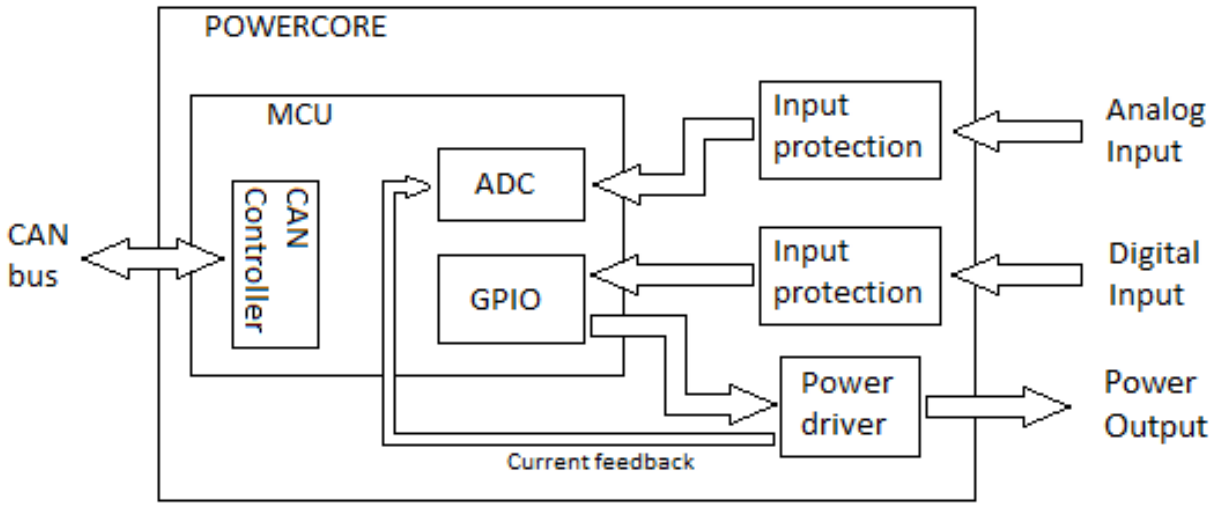
6. Pin Assignment

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	
J2	4	I/O	15					X		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								

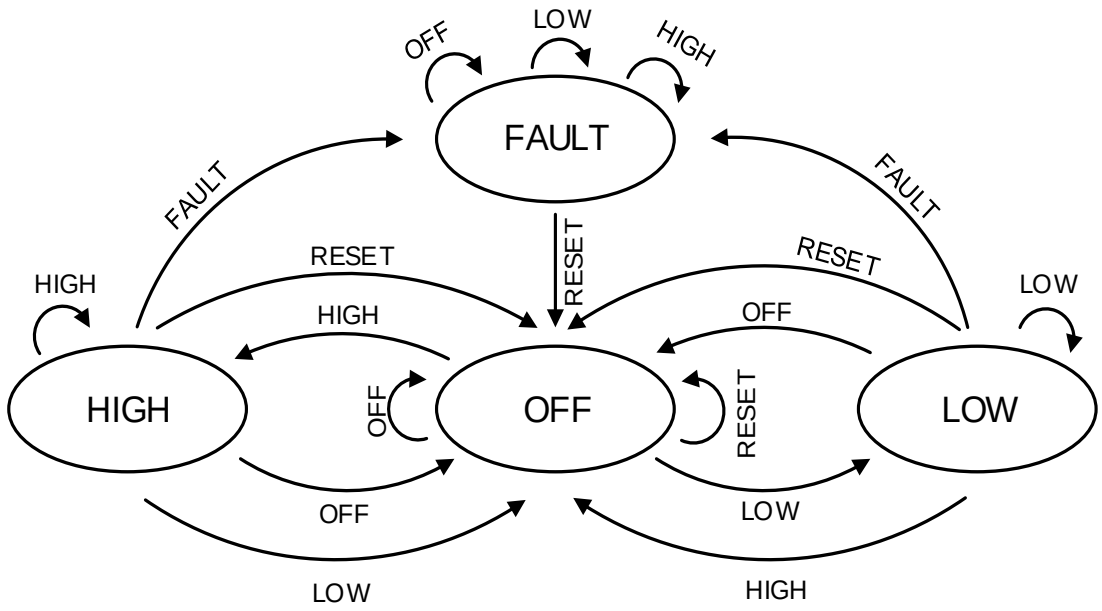
Function Summary

- **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.

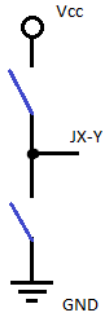
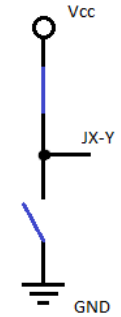
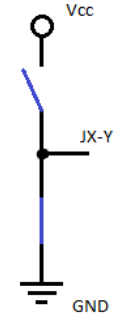
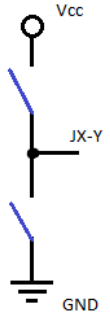
7. Hardware Block Diagram



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 active 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. Message header description

The 29-bit CAN identifier used in J1939 is structured in the following way:

Priority	Reserved	Data Page	PDU Format	PDU Specific	Source Address
3 bits	1 bit	1 bit	8 bits	8 bits	8 bits

The proprietary format used by PC20 is defined as follows:
Priority = **6**.
Reserved = **0**.
Data page = **0**.
PDU Format = EFh (the message is addressable).
PDU Specific = Destination Address.
Parameter Group Number:
61184 (EF00h) used for command type messages;
59904 (EA00h) used for request type messages.

An example of CAN identifier of messages sent to the PC20 is 18EF2100h where:
21h is the destination address (PC20)
00h is the source address.

An example of CAN identifier of messages sent by the PC20 is 18EFFF21h where:
FFh refers to broadcast messages (no specific destination address)
21h is the source address (PC20).

10. General Data Format

The proprietary protocol has defined a general format for the data fields in the PGN 61184. The format consists of:
1 header field (2 bytes)
1 command byte
8 bytes (the remaining field) are defined specifically for each command.

The data length is 8 bytes, unused bits and bytes are set to all 1's (0xFF).

Byte 0	04h
Byte 1	1Bh
Byte 2	Command
Byte 3-7	Data required for each specific command

11. Default Settings

Setting	Default status or level	How to change
Baud rate	250kbit/s	Command 6Fh
Source address	21h	Command 70h
PC20 identifier	21h	
JX-Y output current threshold	10A	Command 0Dh
J3-4 output current threshold	5A	
Periodic fault message transmission	Disabled	Command 71h
Fault-event message transmission	Enabled	Command 72h
Protection trip delay	100ms	Command 0Eh
Default tachometer counter value	0000h	Command 10h
Normal ON mode	Disabled	Command 12h
Heartbeat	Disabled	Command 75h
Periodic fault message period	1s	Command 77h

12. Set single pin state (01h)

This message is sent to the PowerCore to set the state of one single output pin.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	01h	Set single pin state
Byte 3	XXh	XX: pin number 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
Byte 4	YYh	YYh: state 00h: OFF 01h: HIGH 02h: LOW[1] 03h: TOGGLE 04h: RESET
Byte 5,6,7	FFh	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 01 01 02 FF FF FF	J1-1 LOW
To PowerCore	18EF2100h	Ext	04 1B 01 11 02 FF FF FF	J2-5 LOW
To PowerCore	18EF2100h	Ext	04 1B 01 01 00 FF FF FF	J1-1 OFF
To PowerCore	18EF2100h	Ext	04 1B 01 06 01 FF FF FF	J1-6 HIGH
To PowerCore	18EF2100h	Ext	04 1B 01 0D 01 FF FF FF	J2-1 HIGH
To PowerCore	18EF2100h	Ext	04 1B 01 06 03 FF FF FF	J1-6 TOGGLE
To PowerCore	18EF2100h	Ext	04 1B 01 0A 04 FF FF FF	J1-10 RESET
To PowerCore	18EF2100h	Ext	04 1B 01 16 00 FF FF FF	J2-12 OFF
To PowerCore	18EF2100h	Ext	04 1B 01 14 04 FF FF FF	J2-8 RESET

[1] Refer to the Pin assignment table at page 6 for the pins supporting LOW state.

13. Set multiple pin state (02h)

This message is sent to the PowerCore to set the state HIGH, LOW or OFF of more output pins at the same time.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	02h	Set multiple pin state
Byte 3	XXh	XXh: state 00h: OFF 01h: HIGH 02h: LOW
Byte 4	J1-8 J1-7 J1-6 J1-5 J1-4 J1-3 J1-2 J1-1	Each bit set a pin
Byte 5	J2-4 J2-3 J2-2 J2-1 J1-16 J1-11 J1-10 J1-9	
Byte 6	0 J3-4 J2-12 J2-11 J2-8 J2-7 J2-6 J2-5	
Byte 7	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 02 01 01 00 00 00	Set J1-1 and J1-9 HIGH
To PowerCore	18EF2100h	Ext	04 1B 02 01 00 C0 10 00	Set J2-3, J2-4 and J2-11 HIGH
To PowerCore	18EF2100h	Ext	04 1B 02 02 03 00 00 00	Set J1-1 and J1-2 LOW
To PowerCore	18EF2100h	Ext	04 1B 02 01 00 00 03 00	Set J2-5 and J2-6 HIGH
To PowerCore	18EF2100h	Ext	04 1B 02 00 00 00 00 00	Set OFF all the outputs

14. Set PWM state (03h-04h)

This command enables the PWM state on the outputs (listed in the table below) supporting this feature.

NOTE: it is possible to set this state up to a maximum of 4 outputs simultaneously and applicable to a signal whose frequency does not exceed 195Hz.

NOTE 2: for purely inductive loads (e.g.: motor, extractor fan) use J1-1 or J1-2 only.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	03h	Set PWM state
Byte 3	RRh	Duty cycle level (D) of J1-1 00h-FFh → 0%-100%
Byte 4	SSh	Duty cycle level (D) of J1-2 00h-FFh → 0%-100%
Byte 5	XXh	Duty cycle level (D) of J1-3 00h-FFh → 0%-100%
Byte 6	YYh	Duty cycle level (D) of J1-4 00h-FFh → 0%-100%
Byte 7	ZZh	Duty cycle level (D) of J1-5 00h-FFh → 0%-100%

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	04h	Set PWM state
Byte 3	XXh	Duty cycle level (D) of J1-6 00h-FFh → 0%-100%
Byte 4	YYh	Duty cycle level (D) of J1-7 00h-FFh → 0%-100%
Byte 5	ZZh	Duty cycle level (D) of J1-8 00h-FFh → 0%-100%
Byte 6,7	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 03 33 00 00 00 00	Set PWM on J1-1 with D=20%
To PowerCore	18EF2100h	Ext	04 1B 03 00 00 99 00 00	Set PWM on J1-3 with D=60%
To PowerCore	18EF2100h	Ext	04 1B 03 00 00 00 00 B3	Set PWM on J1-5 with D=70%

15. Fault-event message (01h)

This message is sent by the PowerCore when an overcurrent or a fault condition is detected.
NOTE: it might be transmitted more than one message if other fault conditions occur before this event.
NOTE 2: it is possible to disable the transmission of this message by the configuration command 72h.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	01h	Fault message
Byte 3	XXh	XX: pin number 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
Byte 4	01h	Fault condition detected
Byte 5	YYh	PC20 identifier
Byte 6,7	FFh	Not used

Examples:

Direction	Identifier	Format	Message	Data
From PowerCore	18EFFF21h	Ext	04 1B 01 01 01 21 FF FF	J1-1 fault state
From PowerCore	18EFFF21h	Ext	04 1B 01 02 01 21 FF FF	J1-2 fault state
From PowerCore	18EFFF21h	Ext	04 1B 01 03 01 21 FF FF	J1-3 fault state
From PowerCore	18EFFF21h	Ext	04 1B 01 04 01 21 FF FF	J1-4 fault state
From PowerCore	18EFFF21h	Ext	04 1B 01 0A 01 21 FF FF	J1-10 fault state
From PowerCore	18EFFF21h	Ext	04 1B 01 0B 01 21 FF FF	J1-11 fault state
From PowerCore	18EFFF21h	Ext	04 1B 01 10 01 21 FF FF	J2-4 fault state
From PowerCore	18EFFF21h	Ext	04 1B 01 14 01 21 FF FF	J2-8 fault state

Configuration commands

In this section it is shown a list of control messages to configure the PowerCore and/or modify default settings. Where applicable, changes take effect immediately and are stored in non-volatile memory address unless otherwise noted.

Note: the request-type messages have 3-bytes data length. (See ISO 11783-3 for further details)

Note 2: for some commands the set values are kept at the startup.

16. Read Digital Input 8-bit (0Ah)

The following message sent to the PowerCore allows to read the digital input value.

Note: the digital input is applicable only on output pins listed in the table below.

Identifier	18EA2100h	
Byte 0	0Ah	Read digital input 8-bit
Byte 1	00h	Single frame
Byte 2	01h	Enable reading

Answer:

Identifier	18EAFF21h	
Byte 0	0Ah	Command byte
Byte 1	00h	Single frame
Byte 2	XXh	06h: command understood 15h: command not accepted
Byte 3	J1-16 J1-9 J1-8 J1-7 J1-6 J1-5 J1-3 J1-2	'1': digital input
Byte 4,7	00h	Not used

17. Read Fault event (0Bh)

The following message sent to the PowerCore allows to read which output pins have gone into the fault condition.

Identifier	18EA2100h	
Byte 0	0Bh	Read Fault event
Byte 1	00h	Single frame
Byte 2	01h	Enable reading

Answer:

Identifier	18EAFF21h	
Byte 0	0Bh	Command byte
Byte 1	00h	Single frame
Byte 2	XXh	06h: command understood 15h: command not accepted
Byte 3	J1-8 J1-7 J1-6 J1-5 J1-4 J1-3 J1-2 J1-1	'1' = fault; '0' = not in fault
Byte 4	J2-4 J2-3 J2-2 J2-1 J1-16 J1-11 J1-10 J1-9	
Byte 5	0 J3-4 J2-12 J2-11 J2-8 J2-7 J2-6 J2-5	
Byte 6,7	00h	Not used

Examples:

Direction	**Identifier**	**Format**	**Message**	**Data**
To PowerCore	18EA2100h	Ext	0B 00 01	Read enabled
From PowerCore	18EAFF21h	Ext	0B 00 06 01 01 00 00 00	J1-1 and J1-9 in fault
To PowerCore	18EA2100h	Ext	0B 00 01	Read enabled
From PowerCore	18EAFF21h	Ext	0B 00 06 40 00 00 00 00	J1-7 in fault
To PowerCore	18EA2100h	Ext	0B 00 01	Read enabled
From PowerCore	18EAFF21h	Ext	0B 00 06 00 00 08 00 00	J2-8 in fault

18. Read PowerCore electronic values (0Ch)

The following message sent to the PowerCore allows to read the analog values of the output currents, the total current and the battery voltage.

Identifier	18EA2100h	
Byte 0	0Ch	Read PowerCore electronic values
Byte 1	00h	single frame
Byte 2	XXh	XXh: pin number 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 18h: battery voltage (32,7=FFh) 19h: total current

Answer:

Identifier	18EAFF21h	
Byte 0	0Ch	Command byte
Byte 1	00h	Single frame
Byte 2	XXh	06h: command understood 15h: command not accepted
Byte 3	YYh	Pin number
Byte 4	ZZh	ZZh: Current [A] Voltage=ZZ_d×32,7/255
Byte 5,7	00h	Not used

19. a) Set Output current threshold (0Dh)

This command sets for each output pin the current threshold. Refer to the pin assignment table to check the maximum currents of each pin. If it is set a value too high, the threshold is set at the maximum value supported for the selected pin. The default thresholds are 5A for J3-4 and 10A for the other outputs.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	0Dh	Output current threshold
Byte 3	XXh	XX: pin number 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
Byte 4	YYh	Threshold value in ampere (A)
Byte 5,7	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 0D 06 0F 00 00 00	Set J1-6 threshold current to 15A
To PowerCore	18EF2100h	Ext	04 1B 0D 08 06 00 00 00	Set J1-8 threshold current to 6A
To PowerCore	18EF2100h	Ext	04 1B 0D 0E 09 00 00 00	Set J2-2 threshold current to 9A
To PowerCore	18EF2100h	Ext	04 1B 0D 13 0B 00 00 00	Set J2-7 threshold current to 11A

b) Read Output current threshold (0Dh)

The following message sent to the device allows to require the output current threshold value set for the selected pin.

Identifier	18EA2100h	
Byte 0	0Dh	Read output current threshold
Byte 1	00h	single frame
Byte 2	XXh	Pin number

Answer:

Identifier	18EAFF21h	
Byte 0	0Dh	Command byte
Byte 1	00h	Single frame
Byte 2	XXh	06h: command understood 15h: command not accepted
Byte 3	YYh	Pin number
Byte 4	ZZh	Threshold current value [A]
Byte 5,7	00h	Not used

Examples:

Direction	**Identifier**	**Format**	**Message**	**Data**
To PowerCore	18EA2100h	Ext	0D 00 01	Read pin J1-1 threshold current
From PowerCore	18EAFF21h	Ext	0D 00 06 01 0A 00 00 00	10A
To PowerCore	18EA2100h	Ext	0D 00 17	Read pin J3-4 threshold current
From PowerCore	18EAFF21h	Ext	0D 00 06 17 05 00 00 00	5A

20. a) Protection trip delay (0Eh)

This message is used to set the protection trip delay for each output. It is possible to select a value between 100ms and 900ms.

The default value is 100ms.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	0Eh	Protection trip delay
Byte 3	XXh	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
Byte 4	YYh	XXh: Protection Trip Delay (ms) 01h=100 (default) 06h=600 02h=200 07h=700 03h=300 08h=800 04h=400 09h=900 05h=500
Byte 5,7	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 0E 05 05 00 00 00	Set protection trip delay for J1-5 to 500ms
To PowerCore	18EF2100h	Ext	04 1B 0E 0D 01 00 00 00	Set protection trip delay for J2-1 to 100ms

b) Read Protection trip delay (0Eh)

The following message sent to the device allows to require the protection trip delay value set for the selected pin.

Identifier	18EA2100h	
Byte 0	0Eh	Read Protection trip delay
Byte 1	00h	single frame
Byte 2	XXh	Pin number

Answer:

Identifier	18EAFF21h	
Byte 0	0Eh	Command byte
Byte 1	00h	Single frame
Byte 2	XXh	06h: command understood 15h: command not accepted
Byte 3	YYh	Pin number
Byte 4	ZZh	Protection trip delay [ms]
Byte 5,7	00h	Not used

Examples:

Direction	**Identifier**	**Format**	**Message**	**Data**
To PowerCore	18EA2100h	Ext	0E 00 05	Read pin J1-5 protection trip delay
From PowerCore	18EAFF21h	Ext	0E 00 06 05 05 00 00 00	500ms
To PowerCore	18EA2100h	Ext	0E 00 0D	Read pin J2-1 protection trip delay
From PowerCore	18EAFF21h	Ext	0D 00 06 0D 01 00 00 00	100ms

21. Read analog input (0Fh)

The message sent to the PowerCore allows to read the analog input values with 8-bit resolution. 32.7V=FFh.

Expected value: $(Vin \times 255/32.7)_h$

NOTE: this feature requires the installation of an additional component on the PowerCore.

Identifier	18EA2100h	
Byte 0	0Fh	Read analog input
Byte 1	00h	single frame
Byte 2	XXh	XX: pin number 01h: J1-1 02h: J1-2 03h: J1-3 04h: J1-4 05h: J1-5 06h: J1-6 07h: J1-7 08h: J1-8

Answer:

Identifier	18EAFF21h	
Byte 0	0Fh	Command byte
Byte 1	00h	Single frame
Byte 2	XXh	06h: command understood 15h: command not accepted
Byte 3	YYh	Pin number
Byte 4	ZZh	Expected value: $(Vin \times 255/32.7)_h$
Byte 5,7	00h	Not used

Examples:

Direction	**Identifier**	**Format**	**Message**	**Data**
To PowerCore	18EA2100h	Ext	0F 00 01	Read J1-1
From PowerCore	18EAFF21h	Ext	0F 00 06 01 99 00 00 00	20V
To PowerCore	18EA2100h	Ext	0F 00 07	Read J1-7
From PowerCore	18EAFF21h	Ext	0F 00 06 07 7A 00 00 00	16V

22.a) Set Tachometer counter (10h)

This message is used to set the start value of the tachometer counter available for PINs J2-4 and J2-8.

The default counter value is 0000h.

NOTE: the value set is not kept at the startup.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	10h	Set Tachometer counter
Byte 3	XXh	01h: J2-4 02h: J2-8
Byte 4	YYh	00h-FFh LSB
Byte 5	ZZh	00h-FFh MSB
Byte 6,7	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 10 01 04 00 00 00	Set start tachometer counter to 0004h for J2-4
To PowerCore	18EF2100h	Ext	04 1B 10 02 00 12 00 00	Set start tachometer counter to 1200h for J2-8

b) Read Tachometer counter value (10h)

The following message sent to the device allows to read the current tachometer counter value for PINs J2-4 and J2-8.

Identifier	18EA2100h	
Byte 0	10h	Read tachometer counter value
Byte 1	00h	single frame
Byte 2	XXh	PIN number 01h: J2-4 02h: J2-8

Answer:

Identifier	18EAFF21h		
Byte 0	10h	Command byte	
Byte 1	00h	Single frame	
Byte 2	RRh	06h: command understood 15h: command not accepted	
Byte 3	XXh	PIN number	
Byte 4	YYh	00-FFh LSB	Current tachometer Counter value
Byte 5	ZZh	00-FFh MSB	
Byte 6,7	00h	Not used	

Examples:

Direction	**Identifier**	**Format**	**Message**	**Data**
To PowerCore	18EA2100h	Ext	10 00 01	Read current tachometer counter value for J2-4
From PowerCore	18EAFF21h	Ext	10 00 06 01 01 00 00 00	0001h
To PowerCore	18EA2100h	Ext	10 00 02	Read current tachometer counter value for J2-8
From PowerCore	18EAFF21h	Ext	10 00 06 02 98 99 00 00	9998h

23.a) Normal ON mode (12h)

This command allows configuring the outputs' state in order to be already active (normal ON mode) when the PowerCore is powered on.

The setting is kept at the power on.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	12h	Normal ON mode
Byte 3	XXh	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
Byte 4	YYh	YYh: 00h: disabled (default) 01h: normal ON enabled
Byte 5,7	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 12 0C 01 00 00 00	Enable pin J1-16 for normal ON mode
To PowerCore	18EF2100h	Ext	04 1B 12 02 01 00 00 00	Enable pin J1-2 for normal ON mode

b) Read Normal ON mode (12h)

The following message sent to the device allows to require which output pins have been set for the normal ON mode.

Identifier	18EA2100h	
Byte 0	12h	Read Normal ON mode
Byte 1	00h	single frame
Byte 2	XXh	Pin number

Answer:

Identifier	18EAFF21h	
Byte 0	12h	Command byte
Byte 1	00h	Single frame
Byte 2	XXh	06h: command understood 15h: command not accepted
Byte 3	YYh	Pin number
Byte 4	ZZh	ZZh: 00h: disabled 01h: normal ON enabled
Byte 5,7	00h	Not used

Examples:

Direction	**Identifier**	**Format**	**Message**	**Data**
To PowerCore	18EA2100h	Ext	12 00 0C	Read pin J1-16 state
From PowerCore	18EAFF21h	Ext	12 00 06 0C 01 00 00 00	J1-16 in normal ON mode
To PowerCore	18EA2100h	Ext	12 00 02	Read pin J1-2 state
From PowerCore	18EAFF21h	Ext	12 00 06 02 01 00 00 00	J1-2 in normal ON mode

24. Get software revision (2Ah)

Identifier	18EA2100h	
Byte 0	2Ah	Get software revision
Byte 1	00h	single frame
Byte 2	01h	Enable reading

Answer:

Identifier	18EAFF21h	
Byte 0	2Ah	Command byte
Byte 1	00h	Single frame
Byte 2	SSh	06h: command understood 15h: command not accepted
Byte 3	XXh	SW revision ASCII
Byte 4	YYh	
Byte 5	WWh	
Byte 6	ZZh	
Byte 7	00h	

Example:

Direction	**Identifier**	**Format**	**Message**	**Data**
To PowerCore	18EA2100h	Ext	2A 00 01	Get software revision
From PowerCore	18EAFF21h	Ext	2A 00 06 56 XX 2E XX 00	VX.X

25. Baud rate setting (6Fh)

This message is used to change the baud rate of the CAN bus. Connecting only one PowerCore to the bus when changing the baud rate is recommended. If an invalid value is chosen, then no change is done to the stored value.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	6Fh	Set baud rate message
Byte 3	02h	500kbit/s
	03h	250kbit/s
Byte 4,7	FFh	Not used

Example:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 6F 02 FF FF FF FF	Set baud rate = 500kbit/s

26. Set Source address (70h)

This message is used to change the PowerCore CAN source Address and/or the PowerCore identifier.

Either or both the Source Address or PowerCore identifier may be changed independently. Connecting only one PC20 to the bus during the address change is recommended. If an invalid value is chosen, then no change is done to the stored value.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	70h	Set address message
Byte 3	XXh	XX: CAN source address From 01h to FEh FFh: no change
Byte 4	YYh	YY: PC20 identifier From 00h to FEh FFh no change
Byte 5,7	FFh	Not used

Example:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 70 05 21 FF FF FF	Set source address = 05h Set PowerCore identifier = 21h

27. Periodic fault message transmission (71h)

This command enables or disables the periodic transmission of the fault-event message.
When enabled, a message informing if the PIN has entered fault condition is periodically sent for each output of the PC20.
The period is set to 1s as default value but can be changed by command 77h (see chapter 30 for further details).

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	71h	Periodic fault event message transmission
Byte 3	XXh	XXh: 00h Disabled (default) 01h Enabled
Byte 4,7	FFh	Not used

Example:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 71 01 FF FF FF FF	Periodic fault event transmission enabled

PowerCore reply message:

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	01h	Fault message
Byte 3	XXh	Pin number (01h-17h)
Byte 4	YYh	00h: normal 01h: fault
Byte 5	21h	PowerCore identifier
Byte 6,7	FFh	Not used

Examples:

Direction	Identifier	Time [s]	Message	Data
From PowerCore	18EFFF21h	0.0406	04 1B 01 01 00 21 FF FF	J1-1 normal state
From PowerCore	18EFFF21h	0.0456	04 1B 01 02 01 21 FF FF	J1-2 fault state
From PowerCore	18EFFF21h	0.0506	04 1B 01 03 00 21 FF FF	J1-3 normal state
From PowerCore	18EFFF21h	0.0557	04 1B 01 04 01 21 FF FF	J1-4 fault state
From PowerCore	18EFFF21h	0.0607	04 1B 01 05 00 21 FF FF	J1-5 normal state
From PowerCore	18EFFF21h	0.0656	04 1B 01 06 01 21 FF FF	J1-6 fault state
From PowerCore	18EFFF21h	0.0706	04 1B 01 07 00 21 FF FF	J1-7 normal state
From PowerCore	18EFFF21h	0.0756	04 1B 01 08 01 21 FF FF	J1-8 fault state
From PowerCore	18EFFF21h	0.0806	04 1B 01 09 00 21 FF FF	J1-9 normal state
From PowerCore	18EFFF21h	0.0856	04 1B 01 0A 01 21 FF FF	J1-10 fault state
From PowerCore	18EFFF21h	0.0907	04 1B 01 0B 00 21 FF FF	J1-11 normal state
From PowerCore	18EFFF21h	0.0956	04 1B 01 0C 01 21 FF FF	J1-16 fault state
From PowerCore	18EFFF21h	0.0965	04 1B 01 0F 01 21 FF FF	J2-3 fault state
From PowerCore	18EFFF21h	0.1006	04 1B 01 17 00 21 FF FF	J3-4 normal state
From PowerCore	18EFFF21h	0.1406	04 1B 01 01 00 21 FF FF	J1-1 normal state
…	…	…	…	…
…	…	…	…	…

28. Fault-event message transmission (72h)

This command enables or disables the transmission of the fault-event message (see chapter 15 for further details). This feature is active by default, but if it is disabled when a PIN enters fault condition the PowerCore will not transmit the related message.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	72h	Fault event transmission
Byte 3	XXh	XX: 00h: Disabled 01h: Enabled (default)
Byte 4,7	FFh	Not used

Example:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 72 00 FF FF FF FF	Fault event transmission disabled

29. Heartbeat (75h)

This message enables or disables the transmission of Heartbeat message. This message is designed to indicate to other devices on the bus that this unit continues to work.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	75h	Heartbeat
Byte 3	XXh	XX: 00h Disabled (default) 01h Enabled
Byte 4	YYh	YY: Period in milliseconds ÷ 10 From 05h (50ms) to FEh (2.54 sec)
Byte 5,7	FFh	Not used

Example:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 75 01 32 FF FF FF	Set heartbeat enabled with 500ms period.

Heartbeat generated message:

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	F9h	Heartbeat message
Byte 3	XXh	XX: Message counter, incremented each message sent
Byte 4	J1-16 J1-9 J1-8 J1-7 J1-6 J1-5 J1-3 J1-2	'1': digital input
Byte 5,7	00h	Not used

Examples:

Direction	Identifier	Format	Message	Data
From PowerCore	18EFFF21h	Ext	04 1B F9 03 04 00 00 00	Heartbeat message with J1-5 detected high
From PowerCore	18EFFF21h	Ext	04 1B F9 06 02 00 00 00	Heartbeat message with J1-3 detected high

30. Periodic fault message period (77h)

This message sets the period time for the periodic fault-event message transmission (see chapter 27 for further details). This does not enable or disable the messages.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	77h	Periodic fault event message period
Byte 3	XXh	XX: Period in milliseconds ÷ 10 From 05h (50ms) to FEh (2.54 sec)
Byte 4,7	FFh	Not used

Example:

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 77 64 FF FF FF FF	Period set to 1 sec

31. Restore default parameters (81h)

The following command allows to reset the PowerCore to factory settings (see chapter 11 for further details). At the end of this procedure the default parameters will be reactivated.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	81h	Restore default parameters message
Byte 3	01h	RESET
Byte 4,7	FFh	Not used

Direction	Identifier	Format	Message	Data
To PowerCore	18EF2100h	Ext	04 1B 81 01 FF FF FF FF	Reset PowerCore to factory settings

32. Revision history

Date	Manual Revision	Comment
21/07/2023	1.0	First release