

POWERTRACK J1939 USER MANUAL



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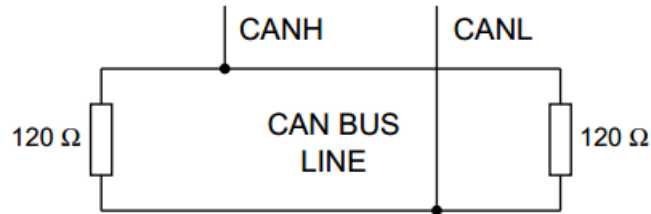
Table of contents

| | | |
|-----|---|----|
| 1. | How to connect CAN bus:..... | 3 |
| 2. | Reference | 3 |
| 3. | Message header description | 4 |
| 4. | General Data Format..... | 4 |
| 5. | Default Settings | 5 |
| 6. | Key Contact state (01h)..... | 6 |
| 7. | LED command (01h)..... | 7 |
| 8. | Set LED brightness level (02h)..... | 8 |
| 9. | Set backlight green level (03h)..... | 8 |
| 10. | Set backlight red level (04h)..... | 8 |
| 11. | Set backlight blue level (05h)..... | 9 |
| 12. | Set startup keys message(28h)..... | 9 |
| 13. | Get software revision (2Ah)..... | 9 |
| 14. | Encoder state message (0Ah)..... | 10 |
| 15. | Set startup LED show (34h)..... | 10 |
| 16. | Baud rate setting (6Fh)..... | 11 |
| 17. | Set Source Address (70h)..... | 11 |
| 18. | Periodic state transmission (71h)..... | 12 |
| 19. | Event state transmission (72h)..... | 12 |
| 20. | LED Acknowledgment (73h)..... | 13 |
| 21. | Address Claim at boot (74h)..... | 13 |
| 22. | Heartbeat (75h)..... | 15 |
| 23. | Periodic Key message period (77h)..... | 16 |
| 24. | Start Demo mode(7Ah)..... | 16 |
| 25. | LED dim at startup (7Bh)..... | 17 |
| 26. | Set backlight green level at startup (7Ch)..... | 17 |
| 27. | Set backlight red level at startup (7Dh)..... | 17 |
| 28. | Set backlight blue level at startup (7Eh)..... | 18 |
| 29. | Set CANopen protocol..... | 18 |
| | APPENDIX: DEMO Mode instructions | 19 |
| 30. | Revision history | 20 |

1. How to connect CAN bus:

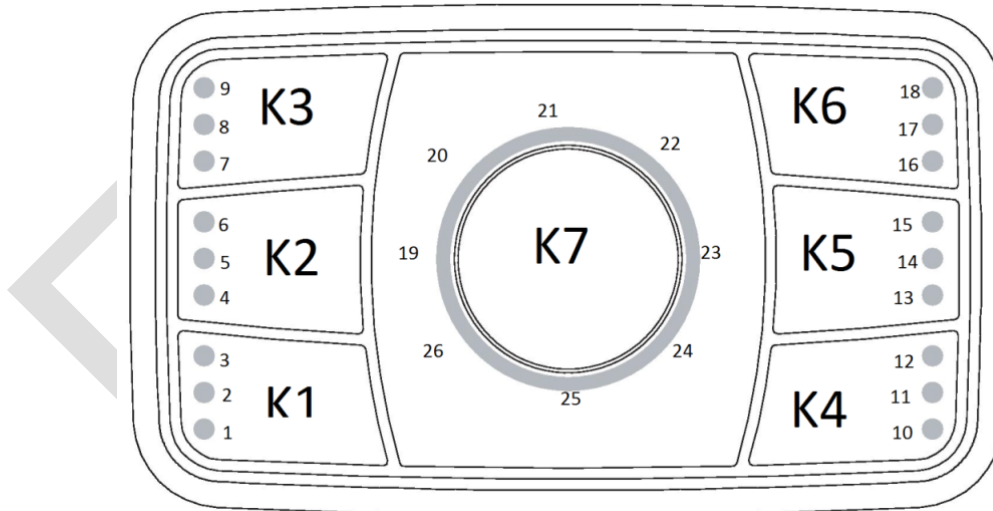


| PIN | COLOUR | FUNCTION |
|-----|--------|------------------|
| 1 | Blue | CAN L |
| 2 | White | CAN H |
| 3 | Black | Negative battery |
| 4 | Red | Vbatt. (12-24V) |



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. Reference



3. 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 PowerTrack keypad 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 (PGN) = 61184 (EFO0h).

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

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

4. 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

5 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 |

5. Default Settings

| Setting | Default state or level | How to change |
|------------------------------|------------------------|-----------------|
| CAN bus Baud Rate | 250 kbit/s | Command 6Fh |
| Source Address | 21h | Command 70h |
| Keypad Identifier | 21h | Command 70h |
| Heartbeat Message | Disable | Command 75h |
| Periodic state transmission | Disable | Command 71h |
| Periodic transmission period | 100ms | Command 77h |
| Event state transmission | Enable | Command 72h |
| Address claim | Disable | Command 74h |
| LED brightness level | 3Fh | Command 7Bh |
| Startup backlight | OFF | Command 7C/D/Eh |
| Startup LED show | Complete LED Sequence | Command 34h |
| LED acknowledgment | Disable | Command 73h |

6. Key Contact state (01h)

This message is sent by the PowerTrack to indicate the state of the contacts. The destination address is set to FFh: broadcast message. See chapter 2 for Key number reference.

| | | |
|-----------------|-----|---|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 01h | Contact state message |
| Byte 3 | XXh | XX: Key number |
| Byte 4 | YYh | Contact State 00: Switch OFF [Key released] 01: Switch ON [Key pressed] |
| Byte 5 | ZZh | Keypad Identifier (default 21h) |
| Byte 6,7 | FFh | Not used |

Example

| Direction | Identifier | Format | Message | Data |
|-------------|------------|--------|----------------------------|-----------|
| From Keypad | 18EFFF21h | Ext | 04 1B 01 01 01 21 FF FF | Key 1 ON |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 01 00 21 FF FF | Key 1 OFF |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 02 01 21 FF FF | Key 2 ON |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 02 00 21 FF FF | Key 2 OFF |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 03 01 21 FF FF | Key 3 ON |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 03 00 21 FF FF | Key 3 OFF |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 04 01 21 FF FF | Key 4 ON |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 04 00 21 FF FF | Key 4 OFF |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 05 01 21 FF FF | Key 5 ON |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 05 00 21 FF FF | Key 5 OFF |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 06 01 21 FF FF | Key 6 ON |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 06 00 21 FF FF | Key 6 OFF |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 07 01 21 FF FF | Key 7 ON |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 07 00 21 FF FF | Key 7 OFF |

If the Event state transmission is enabled, the Key Contact state message is sent when a key is switched.

If the Periodic state transmission is enabled, every Periodic transmission period a Key Contact state message is sent for each button of the PowerTrack.

7. LED command (01h)

This message is sent to the PowerTrack to set the state of the LED indicators. See chapter 2 for Key and LED number reference.

| | | |
|---------------------|-----|---|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 01h | LED command message |
| Byte 3 | XXh | XX: LED number |
| Byte 4 | YYh | LED State and Color 00h: green off 01h: green on 02h: green blink 03h: green alt blink 04h: red off 05h: red on 06h: red blink 07h: red alt blink 08h: amber ¹ off 09h: amber ¹ on 0Ah: amber ¹ blink 0Bh: amber ¹ alt blink 0Ch: blue off (only for LED from 19 to 26) 0Dh: blue on (only for LED from 19 to 26) 0Eh: blue blink (only for LED from 19 to 26) 0Fh: blue alt blink (only for LED from 19 to 26) |
| Byte 5, 6, 7 | FFh | Not used |

Examples:

| Direction | Identifier | Format | Message | Data |
|-----------|------------|--------|--|--|
| To Keypad | 18EF2100h | Ext | 04 1B 01 01 05 FF FF FF | LED 1 red on |
| To Keypad | 18EF2100h | Ext | 04 1B 01 01 04 FF FF FF | LED 1 red off |
| To Keypad | 18EF2100h | Ext | 04 1B 01 0A 01 FF FF FF | LED 10 green on |
| To Keypad | 18EF2100h | Ext | 04 1B 01 0C 02 FF FF FF | LED 12 green blinks |
| To Keypad | 18EF2100h | Ext | 04 1B 01 0F 03 FF FF FF 04 1B 01 0F 0A FF FF FF | LED 15 blinks green and amber ¹ in alternate mode |
| To Keypad | 18EF2100h | Ext | 04 1B 01 14 0D FF FF FF | LED 20 blue on |
| To Keypad | 18EF2100h | Ext | 04 1B 01 1A 0F FF FF FF 04 1B 01 1A 06 FF FF FF | LED 26 blinks red and blue in alternate mode |
| To Keypad | 18EF2100h | Ext | 04 1B 01 19 0E FF FF FF | LED 25 blue blinks |

¹ Obtained by mixing red at 100% and green at 100%

8. Set LED brightness level (02h)

This message sets the value of the indicator LED brightness. The value can be set from 0 to 3Fh from min to 100% of the LED dimming range.

| | | |
|-----------------|-----|---|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 02h | LED brightness level message |
| Byte 3 | XXh | XX: Dim Value (default 3Fh) From 00h (min) to 3Fh (100%) |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|-----------|------------|--------|----------------------------|-----------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 02 20 FF FF FF FF | Brightness level set to 50% |

9. Set backlight green level (03h)

This message sets the value of the backlight green LED brightness. The value can be set from 0 to 3Fh for 0 to 100% of the brightness range.

| | | |
|-----------------|-----|--|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 03h | Backlight green brightness level message |
| Byte 3 | XXh | XX: Value (default 00h) From 00h (0%) to 3Fh (100%) |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|-----------|------------|--------|----------------------------|----------------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 03 10 FF FF FF FF | Backlight green level set to 25% |

10. Set backlight red level (04h)

This message sets the value of the backlight red LED brightness. The value can be set from 0 to 3Fh from 0 to 100% of the brightness range.

| | | |
|-----------------|-----|--|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 04h | Backlight red brightness level message |
| Byte 3 | XXh | XX: Value (default 00h) From 00h (0%) to 3Fh (100%) |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|-----------|------------|--------|----------------------------|--------------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 03 30 FF FF FF FF | Backlight red level set to 75% |

11. Set backlight blue level (05h)

This message sets the value of the backlight blue LED brightness. The value can be set from 0 to 3Fh from 0 to 100% of the brightness range.

| | | |
|-----------------|-----|---|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 05h | Backlight blue brightness level message XX: Value (default 00h) From 00h (0%) to 3Fh (100%) |
| Byte 3 | XXh | |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|--------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 03 00 FF FF FF FF | Backlight blue OFF |

12. Set startup keys message(28h)

This command enables the transmission during power up of the state of the keys.

| | | |
|-----------------|-----|--|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 28h | Startup keys message XX: 00h Disabled (default) 01h Enabled |
| Byte 3 | XXh | |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|-----------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 28 01 FF FF FF FF | Enable startup keys message |

13. Get software revision (2Ah)

| | | |
|-----------------|-----|-----------------------|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 2Ah | Get software revision |
| Byte 3,7 | FFh | |

Answer:

| | | |
|-----------------|-----------------|--|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 2Ah | Get software revision SW revision ASCII |
| Byte 3,6 | XXh XXh XXh XXh | |
| Byte 7 | 00h | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|--------------------|------------|--------|----------------------------|-----------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 2A FF FF FF FF FF | Get software revision |
| From Keypad | 18EFFF21h | Ext | 04 1B 2A 56 32 2E 33 00 | V2.3 |

14. Encoder state message (0Ah)

This message is sent by the PowerTrack to indicate the state of the encoder. The destination address is set to FFh: broadcast message.

The state of the encoder is represented by 2 counter fields:

- The Direction counter (Byte 1) transmit the number of ticks and the direction of the encoder rotation since the last message sent. The MSB of the counter defines the direction.
- The Tick counter (Byte 2 and 3) is a two bytes counter incremented each clockwise tick and decremented each counterclockwise tick.

| | | |
|------------------|--|---------------------------------|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 0Ah | Encoder state message |
| Byte 3 | Encoder Direction counter X Y Y Y - Y Y Y Y b | |
| Byte 4, 5 | Encoder Tick counter Z Z Z Zh | Keypad Identifier (default 21h) |
| Byte 6 | Z Zh | |
| Byte 7 | 00h | Not used |

Examples:

| Direction | Identifier | Format | Message | Data |
|--------------------|------------|--------|----------------------------|------------|
| From Keypad | 18EFFF21h | Ext | 04 1B 0A 01 00 01 21 00 | 1 Tick CW |
| From Keypad | 18EFFF21h | Ext | 04 1B 01 81 FF FF 21 00 | 1 Tick CCW |

If the Event state transmission is enabled, the Encoder state message is sent when the knob is rotated for 1 or more ticks.

15. Set startup LED show (34h)

| | | |
|-----------------|-----|------------------|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 34h | Startup LED show |
| Byte 3 | XXh | |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|--------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 34 00 FF FF FF FF | Set startup LED show OFF |

16. Baud rate setting (6Fh)

This message is used to change the baud rate of the CAN bus. Connecting only one PowerTrack 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 Keypad | 18EF2100h | Ext | 04 1B 6F 02 FF FF FF FF | Set baud rate = 500kbit/s |

17. Set Source Address (70h)

This message is used to change the keypad CAN Source Address and/or the Keypad Identifier. Either or both the Source Address or Keypad Identifier may be changed independently. Connecting only one PowerTrack to the bus when changing the keypad address 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 00h to FEh FFh No change |
| | | Byte 4 |
| Byte 5,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|-----------|------------|--------|----------------------------|---|
| To Keypad | 18EF2100h | Ext | 04 1B 70 05 21 FF FF FF | Set source address = 05h, Set keypad identifier = 21h. |

18. Periodic state transmission (71h)

This message enables or disables the periodic transmission of the Key state. When enabled, one contact state message is periodically sent for each button of the PowerTrack.

The period is set to 100ms as default value but can be changed by command 77h.

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

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|-------------------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 71 01 FF FF FF FF | Enable periodic state transmission. |

19. Event state transmission (72h)

This message enables or disables event driven key state transmissions. When this feature is enabled, the PowerTrack transmits the state of a contact at the time that the contact changes state [pressed or released].

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

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|----------------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 72 00 FF FF FF FF | Disable event state transmission |

20. LED Acknowledgment (73h)

This message enables or disables the transmission of the LED Acknowledgement message. When this feature is enabled the PowerTrack transmits an acknowledgement message each time a LED Command is received.

| | | |
|-----------------|-----|---|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 73h | LED Acknowledgement XX: 00h Disabled (default) 01h Enabled |
| Byte 3 | XXh | |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|--------------------|------------|--------|----------------------------|-------------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 73 01 FF FF FF FF | Enable LED acknowledgement |
| To Keypad | 18EF2100h | Ext | 04 1B 01 01 01 FF FF FF | LED Command |
| From Keypad | 18EFFF21h | Ext | 00 01 01 FF FF FF FF FF | LED Ack message |

LED Acknowledgement message:

| | | |
|-----------------|-----|----------------|
| Byte 0 | 00h | |
| Byte 1 | XXh | XX: LED number |
| Byte 2 | YYh | YY: LED state |
| Byte 3,7 | FFh | |

21. Address Claim at boot (74h)

This message enables or disables the address claim procedure.

| | | |
|-----------------|-----|---|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 74h | Address claim at boot XX: 00h Disabled (default) 01h Enabled |
| Byte 3 | XXh | |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|-------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 74 01 FF FF FF FF | Enable address claim |

Address claiming procedure:

Under normal operation, the PowerTrack application sends an Address Claim parameter group at start up and waits up to 250 ms for the other devices connected to the same network to send a message containing the device's address and name. The PowerTrack checks every response and compares the names to see who has the highest priority. If a device is already using the address and has a higher priority, then a new address is selected and the process starts over. If the PowerTrack has a higher priority than the device in use then it waits for other systems to reply, while the responding device will have to change its address and send an address claim itself. If no message is received after the time (250ms) is up, then the device has claimed the address.

Address claim parameter group:

Priority = 6.

Destination Address should always be the Global Address FFh

Parameter Group Number (PGN) = 60928(EE00h).

Data Length = 8

Data = NAME field

Example:

| Direction | Identifier | Format | Message | Data |
|--------------------|------------|--------|----------------------------|------|
| From Keypad | 18EEFF21h | Ext | 3F 42 6F 1A 00 82 3C CO | |

22. 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 function.

| | | |
|-----------------|-----|---|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 75h | Heartbeat |
| Byte 3 | XXh | |
| Byte 4 | YYh | YY: Heartbeat Period [ms] ÷ 10 From 05h (50ms) to FEh (2.54 sec) |
| Byte 5,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|---|
| To Keypad | 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 | |
| Byte 4 | 00 K7 K6 K5 K4 K3 K2 K1 | Button state indicators Each bit represents a button state 0: OFF 1: ON |
| Byte 5 | 00 00 00 00 00 00 00 00 | |
| Byte 6 | ZZh | Keypad Identifier (default 21h) |
| Byte 7 | FFh | |

Example:

| Direction | Identifier | Format | Message | Data |
|--------------------|------------|--------|----------------------------|---|
| From Keypad | 18EFFF21h | Ext | 04 1B F9 03 02 21 00 00 | Heartbeat message with button 2 pressed |

23. Periodic Key message period (77h)

This message sets the period time for the Key state messages [71h]. This does not enable or disable the messages.

| | | |
|-----------------|-----|--|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 77h | Periodic key 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 Keypad | 18EF2100h | Ext | 04 1B 77 0A FF FF FF FF | Period set to 100ms |

24. Start Demo mode(7Ah)

This message enables the Demo mode function. Demo mode is a special feature that consists in different LED states for button pressing. Refer to the paragraph "Demo mode instructions" to try these special features. Disconnect and reconnect the PowerTrack after the enable message to enter this mode.

To exit the Demo mode, send the Disable Demo mode command or another command message.

| | | |
|-----------------|-----|--|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 7Ah | Demo mode |
| Byte 3 | XXh | XX: 00h Disabled (Default) 01h Enabled |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|-------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 7A 01 FF FF FF FF | Demo mode enabled |

25. LED dim at startup (7Bh)

This message sets the value of the indicator LED brightness at PowerTrack power up. The value can be set from 0 to 3Fh from min to max of the LED dimming range.

| | | |
|-----------------|-----|---|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 7Bh | LED dim at startup |
| Byte 3 | XXh | XX: Value From 00h (min) to 3Fh (100%) |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|-----------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 7B 10 FF FF FF FF | LED dim set to 25% |

26. Set backlight green level at startup (7Ch)

This message sets the value of the backlight green color at PowerTrack power up. The value can be set from 0 to 3Fh for 0 to 100% of the brightness range.

| | | |
|-----------------|-----|--|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 7Ch | Set backlight green at startup |
| Byte 3 | XXh | XX: Value From 00h (0%) to 3Fh (100%) |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|-----------------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 7C 20 FF FF FF FF | Backlight green at startup 50% |

27. Set backlight red level at startup (7Dh)

This message sets the value of the backlight red at PowerTrack power up. The value can be set from 0 to 3Fh for 0 to 100% of the brightness range.

| | | |
|-----------------|-----|---|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 7Dh | Set backlight at startup |
| Byte 3 | XXh | XX: Value From 00h (0%) to 3Fh (100%) |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|---------------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 7D 30 FF FF FF FF | Backlight red at startup 75% |

28. Set backlight blue level at startup (7Eh)

This message sets the value of the backlight blue at PowerTrack power up. The value can be set from 0 to 3Fh for 0 to 100% of the brightness range.

| | | |
|-----------------|-----|--|
| Byte 0 | 04h | Header bytes |
| Byte 1 | 1Bh | |
| Byte 2 | 7Eh | Set backlight at startup |
| Byte 3 | XXh | XX: Value From 00h (0%) to 3Fh (100%) |
| Byte 4,7 | FFh | Not used |

Example:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|-------------------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 7E 10 FF FF FF FF | Backlight blue at startup 25% |

29. Set CANopen protocol

This set of messages are used to change to the desired CANbus protocol.

- Change from J1939 to CANopen:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------------------|-------------------|
| To Keypad | 18EF2100h | Ext | 04 1B 80 00 FF FF FF FF | Change to CANopen |

- Change from CANopen to J1939:

| Direction | Identifier | Format | Message | Data |
|------------------|------------|--------|----------------|-----------------|
| To Keypad | 615h | Std | 2F FF 20 01 01 | Change to J1939 |

APPENDIX: DEMO Mode instructions

In DEMO Mode you can try these functions by pressing buttons on the PowerTrack.

For the Key 1, each time that you press the button, there are different steps in this sequence:

- 1) No LEDs on and no backlight;
- 2) All LEDs green on and backlight red;
- 3) All LEDs red on and backlight green;
- 4) Keys LEDs amber² on, keys backlight blue on and encoder ring backlight red-green on
- 5) Return in step 1.

Pressing Key 2 you can see backlight white color on, while keys LEDs and encoder/ring backlight blink in alternate mode red-green.

For the Key 3, each time that you press the button, you can change backlight in this sequence:

- 1) Red;
- 2) Green;
- 3) Blue, red cursor on the encoder ring;
- 4) Amber/orange and encoder yellow/green, red cursor on the encoder ring;
- 5) Cyan, red cursor on the encoder ring;
- 6) Magenta, red cursor on the encoder ring;
- 7) White/light blue, red cursor on the encoder ring;
- 8) Return in step 1.

Pressing Key 4 you can see backlight blue.

In the case that you press key 5, 6 and 7 and/or rotate the encoder (clockwise or counterclockwise) there are no events.

² Obtained by mixing red at 100% and green at 100%

30. Revision history

| Date | Manual Revision | Comment | Related SW version |
|------------|-----------------|--|--------------------|
| 06/06/2017 | 1.0 | First Release PowerTrack J1939 | SW2.0 |
| 20/02/2018 | 1.1 | Second Release <ul style="list-style-type: none">Corrected the values of byte 2 in the commands for backlight red and blue brightness level messagesReplaced the symbol 'h' (hexadecimal) with the correct one 'b' (binary) in the encoder state message table.Added appendix "DEMO mode instructions" | x.x |
| 20/03/2018 | 1.2 | Third release: <ul style="list-style-type: none">Added a note in the "LED COMMAND" to explain how the color amber is obtainedCorrected some default states and commands in the "DEFAULT SETTINGS" table | x.x |

31. Cinch Connector 30 pin:

| Output | Pin |
|--------|-----|
|--------|-----|