

Summary:

1.	How to connect the wires:	3
2.	Reference	4
3.	Message header description	6
4.	General Data Format	6
5.	Default Settings	7
6.	Key Contact state (01h)	8
7.	Encoder state message (02h/0Ah)	9
8.	Joystick state message (03h) (if available)	10
9.	LED command (01h)	11
10.	Set LED brightness level (02h)	12
11.	Set backlight level (03h)	12
12.	Set startup encoder tick counter value (0Ah)	13
13.	Set startup keys message(28h)	14
14.	Set encoder state message mode (29h)	14
15.	Get software revision (2Ah)	15
16.	Set TOP position encoder (6Bh)	16
17.	Set startup LED show (34h)	16
18.	Set Destination Address (6Eh)	17
19.	Baud rate setting (6Fh)	17
20.	Set Source Address (70h)	18
21.	Periodic state transmission (71h)	19
22.	Event state transmission (72h)	19
23.	LED Acknowledgment (73h)	20
24.	Address Claim at boot (74h)	21
25.	Heartbeat (75h)	22
26.	Periodic Key message period (77h)	23
27.	Start Demo mode(7Ah)	23
28.	Default backlight brightness level (7Bh)	24
29.	Default LED indicators brightness level (7Ch)	24
30.	Default backlight color(7Dh)	25
31.	Set CAN protocol	25

APPENDIX: DEMO Mode instructions 26

32. Revision history 27

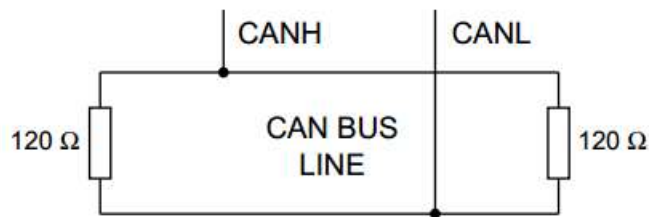
NB: Please contact APEM for User Manual latest version

1. How to connect the wires:



Power Supply Connector		
Manufacturer	TE Connectivity / Deutsch	Amphenol
Connector p/n	DT04-4P	AT04-4P
Mating Connector		
Connector p/n	DT06-4S	AT06-4S
Wedgelock p/n	W4S	AW4S
Terminals p/n	0462-201-16141	AT62-201-16141

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



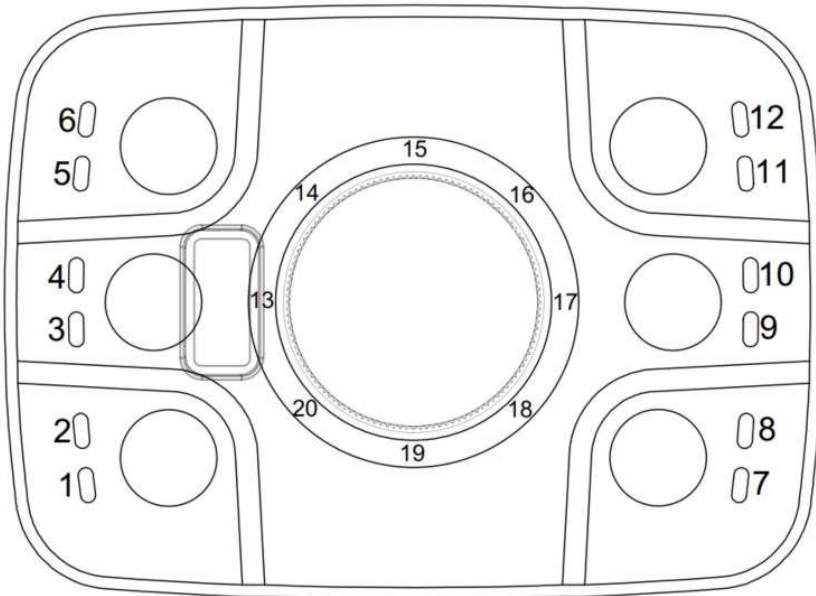
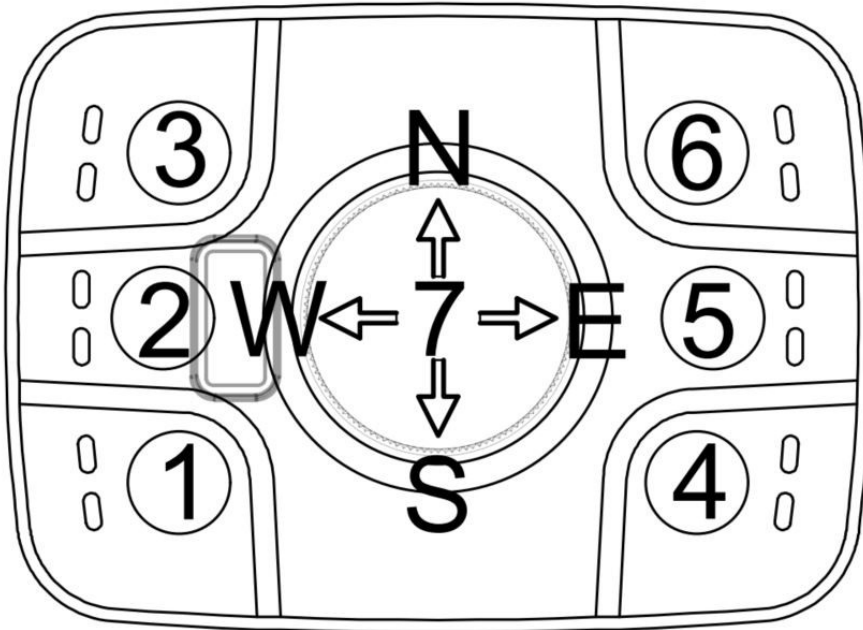
Each end of the CAN bus is terminated with 120Ω resistors in compliance with the standard to minimize signal reflections on the bus. You may need to place a 120Ω resistor between CAN-L and CAN-H.



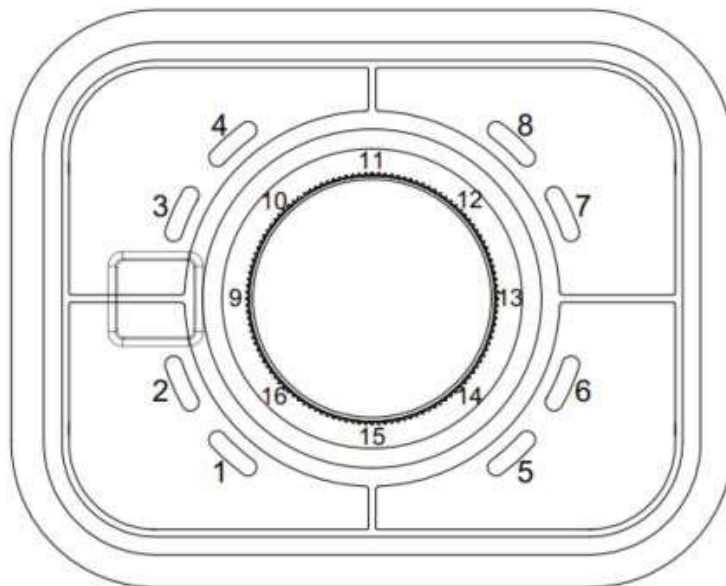
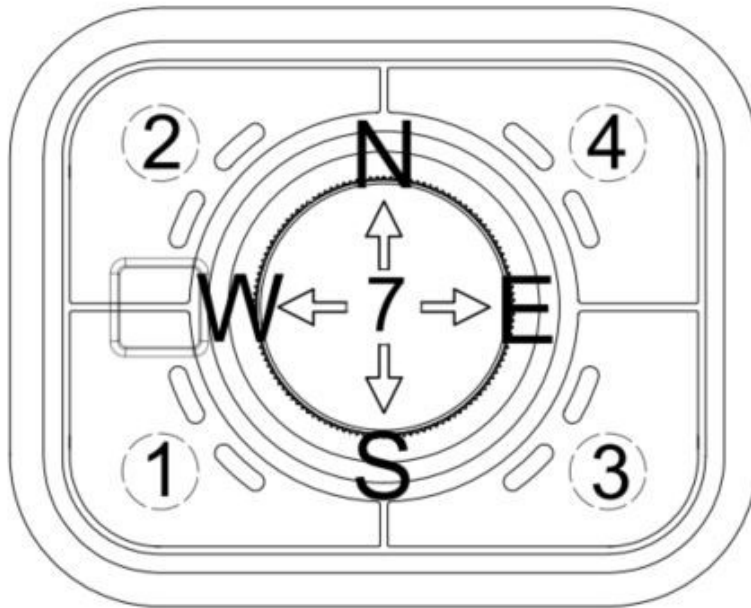
Warning: to avoid breakage do not tighten the backshell nuts with a torque exceeding 1.8 Nm (16 lbf-in)!

2. Reference

PKD6J



PKD4J



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 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 (EF00h).

An example of CAN identifier of messages sent to the Keypad is 18EF2100h where:

21h is the destination address (Keypad)

00h is the source address.

An example of CAN identifier of messages sent by the Keypad is 18EFFF21h where:

FFh refers to broadcast messages (no specific destination address)

21h is the source address (Keypad).

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
Destination address	FFh	Command 6Eh
Encoder state message	Standard	Command 29h
Heartbeat	Disabled	Command 75h
Periodic key-state message transmission	Disabled	Command 71h
Key-state message period	100ms	Command 77h
Event state transmission	Enabled	Command 72h
Address claim at boot	Disabled	Command 74h
Default LED indicators brightness level	3Fh	Command 7Ch
Default backlight brightness level	OFF	Command 7Bh
Startup LED show	Complete LED Sequence	Command 34h
Startup encoder tick counter value	0000h	Command 0Ah
Default backlight color	Amber	Command 7Dh
TOP position	Disabled	Command 6Bh
LED acknowledgment	Disable	Command 73h

6. Key Contact state (01h)

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

NOTE: based on the version used, some keys might not be available.

NOTE 2: the key 7 identifies the central key (encoder).

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

Examples:

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

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 Keypad.

7. Encoder state message (02h/0Ah)

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

Note: the message can be transmitted in standard or alternative mode as shown in the following tables. The standard mode is active by default; the alternative mode can be enabled by the [configuration message 29h](#).

Note: the encoder is identified with the key number 7. See [chapter 2](#) for further details.

The state of the encoder is represented by 3 counter fields:

- The Direction counter (Byte 3) transmits the direction of the encoder rotation.
- The Tick counter (Byte 4 and 5) is a two bytes counter incremented each clockwise tick and decremented each counterclockwise tick.
- The TOP position (Byte 6): when is different from 00h, it is the maximum value the encoder tick counter will count up to. In this case, with each clockwise tick the counter increases until the TOP position is reached; once reached this value, each further tick in this direction does not increase the counter. On the contrary, with each counterclockwise tick the counter decreases from the current value to zero; once reached zero, each further tick in this direction does not change the counter value.

NOTE: the default TOP position value can be set by using the configuration command [Set TOP position encoder \(6Bh\)](#). In case it is selected the value 00h the maximum encoder tick counter value is 65535. Not available for the alternative mode.

Standard mode:

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	02h	Encoder state message
Byte 3	XXh	Encoder direction 01h: clockwise 81h: counterclockwise
Byte 4, 5	YY YYh	Encoder Tick counter
Byte 6	00h or ZZh	TOP position encoder
Byte 7	ZZh	Keypad Identifier (default 21h)

Alternative mode:

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	0Ah	Encoder state message
Byte 3	XXh	Encoder direction 01h: clockwise 81h: counterclockwise
Byte 4, 5	Encoder Tick counter ZZ ZZh	
Byte 6	ZZh	Keypad Identifier (default 21h)
Byte 7	FFh	Not used

Examples for the standard mode:

Direction	Identifier	Format	Message	Data
From Keypad	18EFFF21h	Ext	04 1B 02 01 00 01 04 21	1 Tick CW with 04h as TOP position
From Keypad	18EFFF21h	Ext	04 1B 02 81 FF FF 00 21	1 Tick CCW

8. Joystick state message (03h) (if available)

This message transmits the cardinal direction of the joystick incline. The default destination address is set to FFh: broadcast message.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	03h	Joystick state message
Byte 3	XXh	Joystick direction: 00h: NEUTRAL 01h: NORTH 02h: NORTH-EAST 04h: EAST 08h: SOUTH-EAST 10h: SOUTH 20h: SOUTH-WEST 40h: WEST 80h: NORTH-WEST
Byte 4	YYh	Keypad identifier (default 21h)
Byte 5,7	FFh	Not used

Examples:

Direction	Identifier	Format	Message	Data
From Keypad	18EFFF21h	Ext	04 1B 03 00 21 FF FF FF	Joystick in neutral position
From Keypad	18EFFF21h	Ext	04 1B 03 01 21 FF FF FF	North direction detected
From Keypad	18EFFF21h	Ext	04 1B 03 02 21 FF FF FF	North-east direction detected
From Keypad	18EFFF21h	Ext	04 1B 03 10 21 FF FF FF	South direction detected
From Keypad	18EFFF21h	Ext	04 1B 03 40 21 FF FF FF	West direction detected

9. LED command (01h)

This message is sent to the Keypad to set the state of the Key-LED and or encoder LED indicators. See chapter 2 LED number reference.

NOTE: in case the message is transmitted periodically to the keypad, to ensure correct processing of the command the period used must be higher than 50ms; a value equal to 100ms is fairly good for most applications.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	01h	LED command message
Byte 3	XXh	XX: Key/encoder LED number
		01h-0Ch: key-LED indicators 0Dh-14h: encoder LED indicators
Byte 4	YYh	LED Color 00h: off 01h: red 02h: green 03h: blue 04h: yellow 05h: cyan 06h: magenta 07h: white/light blue 08h: amber/orange 09h: yellow/green
Byte 5	ZZh	LED state 00h: off 01h: on 02h: blink 03h: alternate blink
Byte 6	WWh	LED Secondary color (for alt blink only) 00h: off 01h: red 02h: green 03h: blue 04h: yellow 05h: cyan 06h: magenta 07h: white/light blue 08h: amber/orange 09h: yellow/green
Byte 7	FFh	Not used

Examples:

Direction	Identifier	Format	Message	Data
To Keypad	18EF2100h	Ext	04 1B 01 01 01 00 00 FF	Key-LED #1 red ON
To Keypad	18EF2100h	Ext	04 1B 01 08 04 03 05 FF	Key-LED #8 alt blinks yellow and magenta
To Keypad	18EF2100h	Ext	04 1B 01 03 02 02 00 FF	Key-LED #3 green blinks
To Keypad	18EF2100h	Ext	04 1B 01 05 07 01 00 FF	Key-LED #5 white ON
To Keypad	18EF2100h	Ext	04 1B 01 14 02 01 00 FF	Encoder-LED #20 red ON

10. 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.

NOTE: this setting has temporary effect and at the startup comes back to the default value. If the default value is desired to change, please refer to the [Command 7Ch](#).

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%

11. Set backlight level (03h)

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

NOTE: this setting has temporary effect and at the startup comes back to the default value. If the default value is desired to change, please refer to the [Command 7Bh](#).

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	03h	Set backlight level
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 20 FF FF FF FF	Backlight level set to 50%

12. Set startup encoder tick counter value (0Ah)

The following command allows to set the desired encoder tick counter value at the startup.

NOTE: in case the TOP position has been set, if it is selected a startup counter value higher than the TOP position, the counter starts from the TOP position.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	0Ah	Startup encoder tick counter value
Byte 3	YYh	Tick counter value LSByte
Byte 4	XXh	Tick counter value MSByte
Byte 5,7	FFh	Not used

Encoder tick counter value: XXYYh (from 0000h to FFFFh: from 0 to 65535)

Examples:

Direction	Identifier	Format	Message	Data
To Keypad	18EF2100h	Ext	04 1B 0A 0F 00 FF FF FF	Encoder tick counter value set to 15
From Keypad	18EFFF21h	Ext	04 1B 0A 01 10 00 00 21	1 Tick CW
From Keypad	18EFFF21h	Ext	04 1B 0A 81 0E 00 00 21	1 Tick CCW

13. 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
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 28 01 FF FF FF FF	Startup keys message enabled

14. Set encoder state message mode (29h)

This command allows to set the standard or alternative mode for the encoder state message transmission. For further details please refer to [chapter 7](#).

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	29h	Set encoder state message mode
Byte 3	XXh	XX: 00h Standard 01h Alternative
Byte 4,7	FFh	Not used

Example:

Direction	Identifier	Format	Message	Data
To Keypad	18EF2100h	Ext	04 1B 29 01 FF FF FF FF	Encoder state alternative message enabled

15. Get software revision (2Ah)

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	2Ah	Get software revision
Byte 3,7	FFh	Not used

Answer:

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	2Ah	Get software revision
Byte 3,6	XXh XXh XXh XXh	SW revision ASCII
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 31 2E 30 30 00	1.00

16. Set TOP position encoder (6Bh)

The following command allows to set the TOP position value for the tick counter of the encoder.

Note: if the value 00h is selected the maximum tick counter value achievable is 65535.

Note 2: the encoder is identified with the key number 7. See chapter 2 for further details.

Note 3: the feature is not available for the alternative encoder state message. See [chapter 7](#) for further details.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	6Bh	Set TOP position encoder
Byte 3	XXh	XXh: 00h: Disabled From 01h (1) to 14h (20)
Byte 4,7	FFh	Not used

Example:

Direction	Identifier	Format	Message	Data
To Keypad	18EF2100h	Ext	04 1B 6B 01 FF FF FF FF	TOP position set to 1

17. Set startup LED show (34h)

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	34h	Startup LED show
Byte 3	XXh	XX: 00h OFF 01h Complete LED show (default)
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

18. Set Destination Address (6Eh)

This message is used to set the addressee node of the Key Contact state transmitted by the keypad. The default destination address is FFh (broadcast).

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	6Eh	Set Destination Address
Byte 3	XXh	XX: CAN Destination Address From 00h to FFh FEh: reserved
Byte 4,7	FFh	Not used

Example:

Direction	Identifier	Format	Message	Data
To Keypad	18EF2100h	Ext	04 1B 6E 00 FF FF FF FF	CAN destination address set to 00h

19. Baud rate setting (6Fh)

This message is used to change the baud rate of the CAN bus. Connecting only one Keypad 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

20. 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 Keypad 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 FDh FEh: reserved FFh: no change
Byte 4	YYh	YY: Keypad Identifier From 00h to FDh FEh: reserved FFh: no change
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.

21. Periodic state transmission (71h)

This message enables or disables the periodic transmission of the keys, encoder and joystick state.

When enabled, one contact state message is periodically sent for each button of the Keypad. 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	Periodic state transmission enabled

22. Event state transmission (72h)

This message enables or disables event driven key state transmissions. When this feature is enabled, the Keypad 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	Event state transmission disabled

23. LED Acknowledgment (73h)

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

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	73h	LED Acknowledgement
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 73 01 FF FF FF FF	LED acknowledgement enabled
To Keypad	18EF2100h	Ext	04 1B 01 01 01 FF FF FF	LED Command
From Keypad	18EFFF21h	Ext	00 03 01 04 05 FF FF FF	LED Ack message

LED Acknowledgement message:

Byte 0	00h	
Byte 1	XXh	XX: LED state
Byte 2	YYh	YY: LED number
Byte 3	PPh	PP: Primary color
Byte 4	ZZh	ZZ: Secondary color
Byte 5,7	FFh	Not used

24. 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
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 74 01 FF FF FF FF	Address claim enabled

Address claiming procedure:

Under normal operation, the Keypad 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 Keypad 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 Keypad 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 C0	

25. 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	XX: 00h Disabled (default) 01h Enabled
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	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	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	FFh	Not used
Byte 7	ZZh	Keypad Identifier (default 21h)

Example:

Direction	Identifier	Format	Message	Data
From Keypad	18EFFF21h	Ext	04 1B F9 03 04 00 FF 21	Heartbeat message with button 3 pressed

26. 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

27. 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 Keypad 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

28. Default backlight brightness level (7Bh)

This message sets the default value of the backlight brightness level. The value can be set from 0 to 3Fh (0-100%) of the brightness range.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	7Bh	Default backlight brightness level
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	Default backlight level set to 25%

29. Default LED indicators brightness level (7Ch)

This message sets the default value of the LED indicators brightness level. The value can be set from 0 to 3Fh (min-100%) of the LED dimming range.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	7Ch	Default LED indicators brightness level
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 2F FF FF FF FF	Default LED indicators brightness level set to 75%

30. Default backlight color(7Dh)

This message sets the default color of the backlight.

Byte 0	04h	Header bytes
Byte 1	1Bh	
Byte 2	7Dh	Default backlight color
Byte 3	XXh	XX: Color 01: red 02: green 03: blue 04: yellow 05: cyan 06: magenta 07: white/light blue 08: amber/orange 09: yellow/green
Byte 4,7	FFh	Not used

Example:

Direction	Identifier	Format	Message	Data
To Keypad	18EF2100h	Ext	04 1B 7D 02 FF FF FF FF	Default backlight color set to green

31. Set CAN protocol

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

- Change from CANopen to J1939:

Direction	Identifier	Format	Message	Data
To Keypad	600h + current CAN ID (default 615h)	Std	2B FF 20 01 01	Change to J1939

- Change from J1939 to CANopen:

Direction	Identifier	Format	Message	Data
To Keypad	18EFXX00h where XXh is the current CAN source address (default 18EF2100h)	Ext	04 1B 80 00 FF FF FF FF	Change to CANopen

APPENDIX: DEMO Mode instructions

In DEMO Mode you can try the following functions by pressing buttons on the PKD.

Entering this mode, you turn on the key and encoder LED indicators with red color; for the key 1 each time you press this button you can change the color of the indicators with this sequence:

1. Red;
2. Green;
3. Blue;
4. Yellow;
5. Cyan;
6. Magenta;
7. White/light blue;
8. Amber;
9. Yellow/green;
10. OFF.

Once reached step 10 of the sequence, if the knob is rotated in the clockwise direction the LED indicators turn on sequentially according to the order reported in the LED reference in chapter 2.

Once all the LED indicators are on, a further tick in the same direction makes them turn them off.

NOTE: if during this phase the knob is rotated in the counterclockwise direction, the LED indicators already on change color sequentially.

NOTE 2: in case this feature is carried out when the LED indicators are already on before step 10, the rotation changes sequentially their color.

NOTE 3: the press of key 1, when the knob is rotated, makes change the color of the next LED indicators; the sequence of the colors is listed above.

Pressing key 2, you can increase key and encoder LED indicators brightness.

Pressing key 4, you can decrease key and encoder LED indicators brightness.

For the key 3, each time that you press the button, there are different steps in this sequence:

1. Complete LED show of all colors;
2. Backlight active with LED indicators on in sequence (it is possible to change the color of the indicators by pressing key 1);
3. Encoder and key-LED indicators blink with different colors.

In the case you press the other keys there are no events.

Only for the models supporting the joystick feature: inclining the joystick in one of the eight cardinal directions, the matching LED indicator on the encoder turns on or changes its color (if already on).

32. Revision history

Date	Manual Revision	Comment
25/09/2023	1.0	First release
31/10/2023	1.1	Second release: • Updated Appendix DEMO MODE instructions
07/02/2024	1.2	Third release: • Added note on chapter 9 • Updated chapters 1 and 20
14/03/2024	1.3	Fourth release: • Added images on chapter 2
17/04/2024	1.4	Fourth release: • Corrected <i>heartbeat message</i> on chapter 24
29/10/2024	1.5	Fifth release: • Added <i>Set encoder state message mode (29h)</i> command