



UKP-Series

Interface Specification

Revision History

Revision	Description
01	Initial Release
02	Added CAN bus baud rate description
03	Bug fix
04	Added some configurations

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UKP-Series: J1939 Interface Specification

This document contains the message format details required for communication between the ECU and the UKP-Series under the J1939 protocol.

1.0 Quick Start Guide

1. Connect the UKP harness to a power supply and a PC-based CAN tool (such as CANalyzer) with the proper terminating resistor (120 ohm) across CAN-L and CAN-H.
2. Once input power has been applied, observe the live CAN traffic on the PC - a J1939 Address Claim (ACL) message should be immediately visible, followed by sequential transmission of the J1939 Aux I/O and DMI messages.
3. It is critical to understand that the backlight and function LEDs will not illuminate on their own, as the UKP is a passive device that requires interaction with other ECUs to fully integrate into a CAN-based network. To illuminate the backlights, the UKP needs to receive the J1939 standard Cab Illumination (CL) message - see section 1.4 for a definition of this message.
4. Use the PC-based CAN tool to transmit the CL message onto the CAN network - once the CL message has been received by the UKP with a non-zero value for the Switch Backlight Illumination Brightness percentage, the backlights should immediately illuminate.

2. Functionality

2.1 Power Up Sequence

Upon first power up, the UKP module sends out an Address Claimed message. If there is an address confliction and the module loses arbitration, it will send out the Cannot Claim Address message. And it will not transmit or act upon any messages, but still can send the "Cannot Claim Address" message upon the request for Address Claimed.

2.2 Normal Mode

Button Pressing Data - Transmit

The UKP button status message is sent every 500ms(configurable) or upon a change in status with a minimum period of 25ms.

Backlights and Function Lights Brightness - Received

The UKP module monitors the backlights and function Lights brightness message sent by CAB illumination control Unit and adjusts the brightness accordingly.

Function Lights Status - Received

The UKP module monitors the function lights message sent by CAB illumination control Unit and adjusts the brightness accordingly. The function lights can be activated or deactivated by related control unit.

Button mode Setting - Received

Set the button as normal, long press or double press mode.

Normal mode: The button status becomes ON immediately after being pressed.

Long press: The button status becomes ON after keeping pressed for a given time.

Double press mode: The button status becomes ON after being double pressed.

No matter what mode, the button status becomes OFF immediately after being released.

Diagnostic Reporting - Transmit

Diagnostic message is broadcast from the UKP and contains details of any problems within the unit. If more than one problem exists, it will be transmitted using the multi-packet protocol

2.3 Sleep Mode

In normal mode, if the CAN bus is quiet (There is no message from other node no matter the receiver is UKP or not) and no button is pressed over a span of seconds(configurable), it will enter sleep mode, and all LEDs will be turned off to conserve energy. In sleep mode, UKP will not send any message, but once it detects any CAN message, or any button is pressed, it will exit sleep mode and enter normal mode.

3. Communications

The default communication baud rate is 250kbps. However, it can be customized when customer places order.

3.1 Standard Message

Transmission of UKP Button Status			
PF	254		
PS	8		
PGN	65241 (0xFED9)		
Default Priority	6		
DLC	8		
Update Rate	500ms or upon button status change		
Direction	UKP → CA		
Start	Bits	Description	Notes
1.1	2	Auxiliary I/O 4 Status	00 - Off 01 - On 10 - Error (Stuck) 11 - Not available
1.3	2	Auxiliary I/O 3 Status	
1.5	2	Auxiliary I/O 2 Status	
1.7	2	Auxiliary I/O 1 Status	
2.1	2	Auxiliary I/O 8 Status	
2.3	2	Auxiliary I/O 7 Status	
2.5	2	Auxiliary I/O 6 Status	
2.7	2	Auxiliary I/O 5 Status	
3.1	4	Unused	All bits set to 1
3.5	2	Auxiliary I/O 10 Status	00 - Off 01 - On 10 - Error (Stuck) 11 - Not available
3.7	2	Auxiliary I/O 9 Status	
4.1	5	Unused	All bytes set to 255

Note: Some buttons are unavailable according to the type. For instance, Aux I/O 11 is unavailable for 2x5 and 5x2 UKP

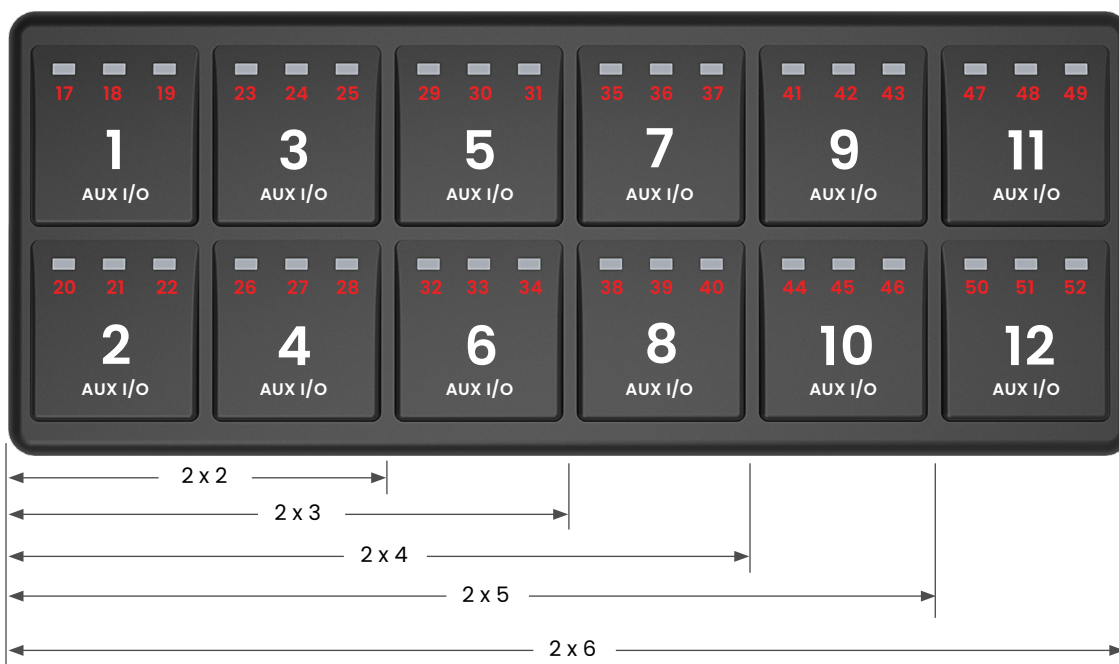


Figure 1: Buttons and LEDs mapping for 2x2 2x3 2x4 2x5, 2x6 UKPs

LED Brightness Setting			
Description	Adjust the indicator and backlight brightness based on the standard J1939 Cab Illumination Message.		
PF	208		
PS	DA, The address of UKP		
PGN	53248 (0xD000)		
Default Priority	6		
DLC	8		
Update Rate	Upon commanded		
Direction	CA -> UKP		
Start	Bits	Description	Notes
1.1	1	Function lights brightness percentage	0.4%/bit 0-250: normal >250: invalid value
2.1	1	Back lights brightness percentage	
3.1	1	LED Blinking period Effective when LED status is Blink	10ms/bit 5-250: normal others: invalid value
4.1	5	Unused	All bytes set to 255

LED Function Lights Status			
Description	Control the state of indicators.		
PF	167		
PS	DA, The address of UKP		
PGN	42752 (0xA700)		
Default Priority	6		
DLC	8		
Update Rate	Upon commanded		
Direction	CA -> UKP		
Start	Bits	Description	Notes
1.1	2	Auxiliary I/O 20 Status	00 - Off 01 - On 10 - Blink 11 - invalid value
1.3	2	Auxiliary I/O 19 Status	
1.5	2	Auxiliary I/O 18 Status	
1.7	2	Auxiliary I/O 17 Status	
2.1	2	Auxiliary I/O 24 Status	
2.3	2	Auxiliary I/O 23 Status	
2.5	2	Auxiliary I/O 22 Status	
2.7	2	Auxiliary I/O 21 Status	
3.1	2	Auxiliary I/O 28 Status	
3.3	2	Auxiliary I/O 27 Status	
3.5	2	Auxiliary I/O 26 Status	
3.7	2	Auxiliary I/O 25 Status	
4.1	2	Auxiliary I/O 32 Status	
4.3	2	Auxiliary I/O 31 Status	
4.5	2	Auxiliary I/O 30 Status	
4.7	2	Auxiliary I/O 29 Status	
5.1	2	Auxiliary I/O 36 Status	
5.3	2	Auxiliary I/O 35 Status	
5.5	2	Auxiliary I/O 34 Status	
5.7	2	Auxiliary I/O 33 Status	
6.1	2	Auxiliary I/O 40 Status	
6.3	2	Auxiliary I/O 39 Status	
6.5	2	Auxiliary I/O 38 Status	
6.7	2	Auxiliary I/O 37 Status	
7.1	2	Auxiliary I/O 44 Status	
7.3	2	Auxiliary I/O 43 Status	
7.5	2	Auxiliary I/O 42 Status	
7.7	2	Auxiliary I/O 41 Status	
8.1	2	Auxiliary I/O 48 Status	
8.3	2	Auxiliary I/O 47 Status	
8.5	2	Auxiliary I/O 46 Status	
8.7	2	Auxiliary I/O 45 Status	

4. Note: Some LEDs are unavailable according to the type. For instance, Aux I/O 47 is unavailable for 2x5 and 5x2 UKP.

LED Function Lights Status			
Description	Control the state of indicators. Available only for 12 button UKP.		
PF	166		
PS	DA, The address of UKP		
PGN	42496 (0x A600)		
Default Priority	6		
DLC	8		
Update Rate	Upon commanded		
Direction	CA → UKP		
Start	Bits	Description	Notes
1.1	2	Auxiliary I/O 52 Status	00 - Off 01 - On 10 - Blink 11 - invalid value
1.3	2	Auxiliary I/O 51 Status	
1.5	2	Auxiliary I/O 50 Status	
1.7	2	Auxiliary I/O 49 Status	
2.1	7	Unused	All bytes set to 255

Diagnostic Reporting – DMI			
Description	Transmission of UKP Diagnostic Information		
PF	245		
PS	202		
PGN	65226 (0xFECA)		
Default Priority	6		
DLC	8		
Update Rate	1000ms periodically		
Direction	UKP → CA		
Start	Bits	Description	Notes
1.1	2	Protect Lamp	00 - Off 01 - On 10 - Error 11 - Not available
1.3	2	Amber Warning Lamp	
1.5	2	Red Stop Lamp	
1.7	2	Malfunction Indicator Lamp	
2.1	1	For future use	255
3.1	24	SPN and FMI	
6.1	7	Occurrence Count	
6.8	1	SPN Conversion Method	
7.1	2	unused	All bytes set to 255

If more than one problem exists it will be transmitted using the multi packet protocol.

Trouble Code List:			
Diagnostic Trouble Code Name	SPN	FMI	Lamp
Button 1 Stuck	516252	7	Amber
Button 2 Stuck	516253		
Button 3 Stuck	516254		
Button 4 Stuck	516255		
Button 5 Stuck	516256		
Button 6 Stuck	516257		
Button 7 Stuck	516258		
Button 8 Stuck	516259		
Button 9 Stuck	516260		
Button 10 Stuck	516261		
Button 11 Stuck	516262		
Button 12 Stuck	516263		

Address Claimed			
Description	Address Claimed, J1939-81		
PF	238		
PS	DA, global address, 255		
PGN	60928 (0xEE00)		
Default Priority	6		
DLC	8		
Update Rate	Upon initialization or requested		
Direction	UKP → CA		
Start	Bits	Description	Notes
1.1	16	Identity Number	2018 (Default)
3.1	5	Identity Number	12 (Default)
3.6	11	Manufacturer Code	2005 (Default)
5.1	3	ECU Instance	0 (Default)
5.4	5	Function Instance	0 (Default)
6.1	8	Function	37 (Default)
7.1	1	Reserved	0 (Default by SAE)
7.2	7	Vehicle System	0 (Default)
8.1	4	Vehicle System Instance	0 (Default)
8.5	3	Industry Group	0 - Global 1 - On-Highway Equipment 2 - Agricultural and Forestry Equipment 3 - Construction Equipment (Default) 4 - Marine 5 - Industrial-Process Control-Stationary 6 & 7 - Reserved
8.8	1	Arbitrary Address Capable	0 - Not Capable 1 - Capable (Default)

PGN Request				
Description	PGN request, J1939-81			
PF	234			
PS	DA, global address, 255			
PGN	59904(0xEA00)			
Default Priority	6			
DLC	3			
Update Rate	Upon initialization or requested			
Direction	CA → UKP			
Start	Bits	Description	SPN	Value
1.1	1	Byte 1 of PGN being requested (LSB)		0-255
2.1	1	Byte 2 of PGN being requested		
8.8	1	Byte 3 of PGN being requested (MSB)		

This is a standard request message, and the following are the supported PGNs that can be requested from the UKP module.

- UKP Status PGN 65241
- Address Claimed PGN 60928)
- ECU Identification Information PGN 64965)
- Software Identification Information PGN 65242)

If the requested PGN is unsupported, the UKP module shall respond with a NACK.

Acknowledgment Message				
Description	Acknowledgment Message, J1939-81			
PF	238			
PS	DA, global address, 255			
PGN	59392(0xE800)			
Default Priority	6			
DLC	8			
Update Rate	Upon reception of a PGN that requires this form of acknowledgment			
Direction	UKP → CA			
Start	Bits	Description	Notes	
1.1	1	Control Byte	0 - Positive Acknowledgment 1 - Negative Acknowledgment 2 - Access Denied 3 - Cannot Respond	
2.1	1	Group Function	Refer to SAE-J1939-21. 0(Default)	
3.1	1	Reserved by SAE	255 (Default)	
4.1	1	Reserved by SAE	255 (Default)	
5.1	1	Reserved by SAE	255 (Default)	
6.1	1	Byte 1 of PGN being requested (LSB)		
7.1	1	Byte 2 of PGN being requested		
8.1	1	Byte 3 of PGN being requested (MSB)		

ECU Identification Information				
Description	ECU Identification Information, J1939-71			
PF	253			
PS	197			
PGN	64965(0xFDC5)			
Default Priority	6			
DLC	variable			
Update Rate	Upon request			
Direction	UKP → CA			
Start	Length	Description	SPN	Notes
A	<=110 characters	ECU Part Number	2901	
B		ECU Serial Number	2902	
C		ECU Location	2903	
D		ECU Type	2904	

The length of the whole ECU ID should be not more than 110 bytes.

Software Identification Information				
Description	Software Identification Information, J1939-71			
PF	254			
PS	218			
PGN	65242(0xFEDA)			
Default Priority	6			
DLC	variable			
Update Rate	Upon request			
Direction	UKP → CA			
Start	Bits	Description	SPN	Notes
1	1	Number of Software Identification Fields	965	0-125
2-N	Variable	ECU Serial Number	234	ASCII characters. Each field delimited with an "*" and up to 200 characters.

Transport Protocol Connection Management BAM			
Description	Transport Protocol Connection Management BAM, J1939-21		
PF	236		
PS	DA, global address, 255		
PGN	60416 (0xEC00)		
Default Priority	7		
DLC	8		
Update Rate	Upon requested		
Direction	UKP → CA		
Start	Bits	Description	Notes
1.1	1	Control Byte	32-Broadcast Announce Message
2.1	2	Message length	9-1785
4.1	1	Total number of packets	2-255
5.1	1	Reserved by SAE	255
6.1	3	Parameter Group Number of the packeted message	LSB at sixth byte, MSB at eighth byte.

Transport Protocol Data Transfer			
Description	Transport Protocol Data Transfer, J1939-21		
PF	235		
PS	DA, global address, 255		
PGN	60160 (0xEB00)		
Default Priority	7		
DLC	8		
Update Rate	Upon requested		
Direction	UKP → CA		
Start	Bits	Description	Notes
1.1	1	Sequence Number	1-255
2.1	7	Related PGN data	Packetized Data

4. Configuration

Configurations remains in the flash memory after setting. They will still be effective after power up again . When a configuration is successful, UKP will reply an ACK message, otherwise UKP will reply a NACK message.

Set New Source Address				
PF	239			
PS	DA, The source address of UKP			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	Upon commanded			
Direction	CA → UKP			
Start	Bits	Description	SPN	Value
1.1	1	Control Byte		0xE1-Set UKP source address
2.1	1	New Source Address		
3.1	6	Not Used		OXFFFFFFFF

Set New Priority				
PF	239			
PS	DA, The source address of UKP			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	Upon commanded			
Direction	CA -> UKP			
Start	Bits	Description	SPN	Value
1.1	1	Control Byte		0xE4-Set UKP new priority
2.1	1	New Priority		0-7, otherwise the UKP will send the NACK message
3.1	6	Not Used		0xFFFFFFFF

Set New Field Name				
PF	239			
PS	DA, The source address of UKP			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	Upon commanded			
Direction	CA -> UKP			
Start	Bits	Description	SPN	Value
1.1	1	Control Byte		0xE2 - Set UKP New Name Field Part 1
2.1	4	New Name Field Part 1 (Byte1 Byte4)		
6.1	3	Not Used		0xFFFFFFFF

Set New Field Name				
PF	239			
PS	DA, The source address of UKP			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	Upon commanded			
Direction	CA -> UKP			
Start	Bits	Description	SPN	Value
1.1	1	Control Byte		0xE3 - Set UKP New Name Field Part 2
2.1	4	New Name Field Part 2 (Byte5 Byte8)		
6.1	3	Not Used		0xFFFFFFFF

Set Button Mode			
Description	Set the button as normal long press or double press mode		
PF	239		
PS	DA, The address of UKP		
PGN	61184(0x EF00)		
Default Priority	6		
DLC	8		
Update Rate	Upon commanded		
Direction	CA → UKP		
Start	Bits	Description	Notes
1.1	8	Control byte	0x81
2.1	2	Auxiliary I/O 4 Status	00 - Normal Mode (default) 01 - Long Press Mode 10 - Double Press Mode 11 - Invalid Value
2.3	2	Auxiliary I/O 3 Status	
2.5	2	Auxiliary I/O 2 Status	
2.7	2	Auxiliary I/O 1 Status	
3.1	2	Auxiliary I/O 8 Status	
3.3	2	Auxiliary I/O 7 Status	
3.5	2	Auxiliary I/O 6 Status	
3.7	2	Auxiliary I/O 5 Status	
4.1	4	Unused	All bits set to 1
4.5	2	Auxiliary I/O 10 Status	00 - Normal Mode (default) 01 - Long Press Mode 10 - Double Press Mode 11 - Invalid Value
4.7	2	Auxiliary I/O 9 Status	
5.1	3	Unused	All bits set to 255
8.1	1	Button long push time. Effective only for Long press mode	100ms/bit 5-250: Normal Others: Invalid Value

Note: Some buttons are unavailable according to the type. For instance, Aux I/O 11 is unavailable for 2x5 and 5x2 UKP

Set Sleep Time			
Description	Set UKP Sleep Time		
PF	239		
PS	DA, The address of UKP		
PGN	61184(0x EF00)		
Default Priority	6		
DLC	8		
Update Rate	Upon commanded		
Direction	CA → UKP		
Start	Bits	Description	Notes
1.1	1	Control byte	0x82
2.1	2	Auxiliary I/O 4 Status	0 - Never Sleep 1-250 : 1s/bit others: unused
3.1	6	Not used	0xFFFFFFFF

Set PGN of Button Status			
Description	Set UKP PGN of Button Status		
PF	239		
PS	DA, The address of UKP		
PGN	61184(0x EF00)		
Default Priority	6		
DLC	8		
Update Rate	Upon commanded		
Direction	CA → UKP		
Start	Bits	Description	Notes
1.1	1	Control byte	0x85
2.1	1	Byte 1 of PGN being requested (LSB)	0~255
3.1	1	Byte 2 of PGN being requested	240~255
4.1	1	Byte 3 of PGN being requested (MSB)	Must be 0
5.1	4	Not Used	0xFFFFFFFF

Set Button Status Transmission Rate			
Description	Set UKP Button Status Transmission Rate		
PF	239		
PS	DA, The address of UKP		
PGN	61184(0x EF00)		
Default Priority	6		
DLC	8		
Update Rate	Upon commanded		
Direction	CA → UKP		
Start	Bits	Description	Notes
1.1	1	Control byte	0x86
2.1	1	Transmission Rate	10ms/bit 5-250: normal others: unused
3.1	6	Not Used	0xFFFFFFFFFFFF