



CKJ-Series

Interface Specification

Revision History

Revision	Description
01	Initial Release
02	Changed the picture of Figure 1. Add the button setting item.
03	Modified PS of description of PGN EA00. Added the configuration item in catalog.
04	Changed the description of "I-DRIVE" to CKJ-series module.
05	Added the configuration item of software version.
06	Added the configuration item of backlight brightness. Added the configuration item of baud rate.

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1. Overview

This document describes the functionality and communication of the CKJ-Series.

2. Functionality

The CKJ-Series has 5 buttons and one encoder. The encoder can be pushed left, right, up, down by the joystick.

There are 14 backlight LED illuminations. When the encoder or button status change, the CKJ-Series will send out the CAN message right away. When there is no any status change, the CKJ-Series will send the CAN message every 500ms(default).



2.1 Power Up Sequence

Upon first power up, the CKJ-Series sends out an Address Claimed message. If there is a Name contention and the CKJ-Series loses arbitration, it will send out the Cannot Claim Address message with all LEDs flashing(2Hz) and will not enter Run Mode (it will not transmit or act upon any messages), but it still can send the "Cannot Claim Address" message upon the request for Address Claimed.

2.2 Run Mode

2.2.1 Button or encoder Pressing Data - Transmit

The CKJ-Series buttons and encoder status information is sent on a single message every 500ms(default) or upon a change in status with a minimum period of 100ms. The PGN, priority and transmission period can be configurable at runtime.

2.2.2 Backlights - Received

The CKJ-Series will receive the backlight message sent by CAB illumination control Unit and adjusts the brightness accordingly.

2.3 Sleep Mode

In running mode, if CKJ-Series doesn't receive any message and the switch has not been pressed during 1 minute, it will enter sleep mode, and all LEDs will be turned off to conserve energy. In sleep mode, CKJ-Series will not send out the message of buttons and encoder status every 500ms(default), but once it receives any CAN message, or the buttons/encoder is pressed/pushed, it will exit sleep mode and enter run-mode.

2.4 Configuration Mode

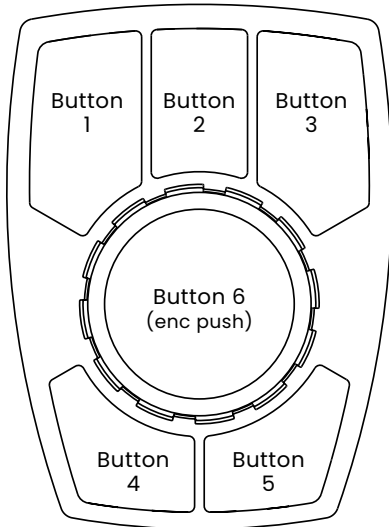
CKJ-Series only can be configured in configuration mode, which need Mode Command message to switch the mode. In configuration mode CKJ-Series will not send out the buttons and encoder status message every 500ms(default) until it exits the mode by Mode Command message.

3. Communications

3.1 Standard Message

3.1.1 Transmission of CKJ-Series Button and encoder Status			
Description	Transmission of CKJ-Series Logical channel Status		
PF	252		
PS	8		
PGN	64520(0xFC08)		
Default Priority	6		
DLC	8		
Update Rate	250ms or upon switch status change		
Direction	CKJ-Series -> CA		
Start	Length	Name	Notes
1.1	2 bits	Joystick 1 X-Axis Right	00 - Not Pushed Right 01 - Pushed Right 10 - Unused 11 - Not Available
1.3	2 bits	Joystick 1 X-Axis left	
1.5	2 bits	Joystick 1 Y-Axis Up	
1.7	2 bits	Joystick 1 Y-Axis Down	
2.1	2 bytes	Encoder data	Value between 0 and TOP. See the Encoder Configuration in Sec 4.6 for definition of TOP. 65535 - Not available
4.1	2 bits	Button 1 Status	00 - Not Pushed Right 01 - Pushed Right 10 - Unused 11 - Not Available
4.3	2 bits	Button 2 Status	
4.5	2 bits	Button 3 Status	
4.7	2 bits	Button 4 Status	
5.1	2 bits	Button 5 Status	
5.3	2 bits	Button 6 Status	
5.5	4 bits	Unused	All bits set
6.1	3 bytes	Unused	All bytes set to 255

The CA will parse status sent by CKJ-Series to get the buttons and encoder status. The buttons sequence number:



3.1.2 Reception of the backlight percentage command				
Description	Reception of the backlight percentage command, J1939-71, Cab Illumination Message			
PF	208			
PS	DA, The source address of CKJ-Series.			
PGN	53248(0xD000)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 bits	Backlight percentage value	1487	0-250, Percentage, 0.4%/bit, data range 0-100%. If this value >250, it will be regarded as 250.
2.1	7 bits	unused		All bytes set to 255

The default brightness is 0, and will not be saved in EEPROM.

3.1.3 Mode Change Command				
Description	Reception of the command to change the mode of CKJ-Series			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 bits	Backlight percentage value		0 – Boot Mode 1 – Run Mode 2 – Sleep Mode 3 – Diagnostic Test Mode 5 – Configuration Mode
2.1	7 bits	unused		All bytes set to 255

When the mode is changed by CA, the CKJ-Series cannot recover the previous mode until to get the mode changed command again from CA or re-power.

3.1.4 Transmission of CKJ-Series Status

Description	Response to query of CKJ-Series Status			
PF	252			
PS	7			
PGN	64519(0xFC07)			
Default Priority	6			
DLC	8			
Update Rate	upon request			
Direction	CJK-CA			
Start	Length	Description	SPN	Valves
1.1	1 bits	Mode Type		0 – Boot Mode 1 – Run Mode 2 – Sleep Mode 3 – Diagnostic Test Mode 5 – Configuration Mode
2.1	2 bits	Joystick 1 X-Axis Right Status		00- Not pushed right 01- Pushed right 10- Unused 11- Not available
2.3	2 bits	Joystick 1 X-Axis Left Status		
2.5	2 bits	Joystick 1 Y-Axis Up Status		
2.7	2 bits	Joystick 1 Y-Axis Down Status		
3.1	2 bytes	Encoder data		Value between 0 and TOP. 65525 – Not available.
5.1	2 bits	Button 1 Status		00 – Button not pressed 01 – Button pressed 10 – Unused 11 – Not available
5.3	2 bits	Button 2 Status		
5.5	2 bits	Button 3 Status		
5.7	2 bits	Button 4 Status		
6.1	2 bits	Button 5 Status		
6.3	2 bits	Button 6 Status		
6.5	4 bits	Unused		All bits set
7.1	1 byte	Backlight percentage value		0-250, Percentage, 0.4%/bit, data range 0-100%. Value >250 will be regarded as 250.
8.1	1 byte	Unused		FF

The CA use the PGN request message (PGN 59904) with the first three data byte the same as the PGN number 64519 to get the CKJ-Series status.

3.2 J1939 Message

3.2.1 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	CKJ-CA			
Start	Length	Description	SPN	Valves
1.1	21 bits	Identity Number		0 to 2 ²¹ -1
3.6	11 bits	Manufacturer Code		2005(default)
5.1	3 bytes	ECU Instance		0(Default)
5.4	5 bits	Function Instance		0(Default)
6.1	8 bits	Function		37(Default)
7.1	1 bites	Reserved		0 (Defined by SAE)
7.2	7 bits	Vehicle System		0(Default)
8.1	4 bits	Vehicle System Instance		0(Default)
8.5	3 bits	Industry Group		0 - Global (Default) * 1 - On-Highway Equipment 2 - Agricultural and Forestry Equipment 3 - Construction Equipment 4 - Marine 5 - Industrial-Process Control-Stationary 6 & 7 - Reserved
8.8	1 bits	Arbitrary Address Capable		0 - Not Capable 1 - Capable (Default)

3.2.2 PGN Request				
Description	PGN request, J1939-81			
PF	234			
PS	DA, global address(255) or the source address of CKJ-Series			
PGN	59904(0xEA00)			
Default Priority	6			
DLC	3			
Update Rate	Upon initialization or requested			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 bytes	Byte 1 of PGN being requested (LSB)		0-255
2.1	1 bytes	Byte 2 of PGN being requested		0-255
3.1	1 bytes	Byte 3 of PGN being requested (MSB)		0-255

This is a standard request message, and the following are the supported PGNs that can be requested from the CKJ-Series.

- CKJ-Series buttons and encoder status(PGN 64520)
- CKJ-Series global status(PGN 64519)
- Address Claimed(PGN 60928)
- ECU Identification Information(PGN 64965)
- Software Identification Information(PGN 65242)

If the requested PGN is unsupported, or the DLC is not 3, the CKJ-Series shall respond with a NACK.

Description	PGN request, J1939-81			
PF	234			
PS	DA, global address(255) or the source address of CKJ-Series			
PGN	59904(0xEA00)			
Default Priority	6			
DLC	4			
Update Rate	Upon initialization or requested			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 Bytes	Byte 1 of PGN being requested (LSB)		0-255
2.1	1 Bytes	Byte 2 of PGN being requested		0-255
3.1	1 Bytes	Byte 3 of PGN being requested (MSB)		0-255
4.1	1 Bytes	Control Byte		

Notes:

This is not a standard request message, and it only be used in requesting for CKJ-Series configured information. Byte 4 is the control byte, and it indicates which message will be requested, and its value is the same as the Control Byte in configuration message in chapter 4.

3.2.3 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	CKJ-CA			
Start	Length	Description	SPN	Valves
1.1	1 bytes	Control Byte		0 - Positive Acknowledgement 1 - Negative Acknowledgement 2 - Access Denied 3 - Cannot Respond
2.1	1 bytes	Group Function		Refer to SAE-J1939-21. 0(Default)
3.1	1 bytes	Reserved by SAE		255(Default)
4.1	1 bytes	Reserved by SAE		255(Default)
5.1	1 bytes	Reserved by SAE		255(Default)
6.1	1 bytes	Byte 1 of PGN being requested (LSB)		
7.1	1 bytes	Byte 2 of PGN being requested		
8.1	1 bytes	Byte 3 of PGN being requested (MSB)		

3.2.4 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	CKJ-CA			
Start	Length	Description	SPN	Valves
A	a<=110 characters	ECU Part Number	2901	Ex. "17000-08312"
B	<=110 characters	ECU Serial Number	2902	Ex. "000001"
C	<=110 characters	ECU Location	2903	Ex. "CAB"
D	<=110 characters	ECU Type	2904	Ex. "CKJ-24-00000002"

The length of the whole ECU ID should be not more than 120 bytes.

3.2.5 Software Identification Information				
Description	Software Identification Information, J1939-71			
PF	236			
PS	DA, global address, 255			
PGN	60416(0xEC00)			
Default Priority	7			
DLC	8			
Update Rate	Upon requested			
Direction	CKJ-CA			
Start	Length	Description	SPN	Valves
1	1 byte	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.

3.2.6 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 request			
Direction	CKJ-CA			
Start	Length	Description	SPN	Valves
1.1	1 bytes	Control Byte		32-Broadcast Announce Message
2.1	2 bytes	Message length		9-1785
4.1	1 bytes	Total number of packets		2-255
5.1	1 bytes	Reserved by SAE		255
6.1	3 bytes	Parameter Group Number of the packet message		LSB at sixth byte, MSB at eighth byte.

3.2.7 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 request			
Direction	CKJ-CA			
Start	Length	Description	SPN	Valves
1.1	1 bytes	Sequence Number:		1-255
2.1	7 bytes	Related PGN data		Packetized Data

4. Configuration

Changing the configuration can meet some of the variation of the application requirement without changing the source code. The first byte serves as the control byte. Where applicable, changes take effect immediately and are stored in non-volatile memory. The configuration PGN is 61184 for all configuration options.

Use Mode Change Command to change current mode to configuration mode.

4.1 Configuration Enter				
Description	Reception of the command to change the mode of CKJ-Series			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 bytes	Value of changing the mode.		0 – Boot Mode 1 – Run Mode 2 – Sleep Mode 3 – Diagnostic Test Mode 5 – Configuration Mode
2.1	7 bytes	unused		All bytes set to 255

Note: Now Boot Mode and Diagnostic Test Mode are

4.2 Set New Source Address				
Description	Set CKJ-Series New Source Address			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 bytes	Control Byte		225-Set CKJ-Series source address
2.1	1 bytes	New source address		0-248, otherwise the CKJ will send NACK message.
3.1	6 bytes	NOT USED		0xFFFFFFFF

4.3 Set New Priority				
Description	Set CKJ-Series New Priority			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 bytes	Control Byte		226-Set CKJ-Series new priority
2.1	1 bytes	New Priority		0-7, otherwise the CKJ-Series will send the NACK message.
3.1	6 bytes	unused		0xFFFFFFFF

4.4 Set New Transmit Rate				
Description	Set CKJ-Series New Transmit Rate			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 bytes	Control Byte		227-Set CKJ-Series New Transmit Rate
2.1	1 bytes	New Transmit Rate		10-250(The value multiplied by 10ms, range from 100ms to 2.5s). If the value <10,it will be regarded as 10,and if the value >250,it will be regarded as 250.
3.1	6 bytes	Not used		0xFFFFFFFF

4.5 Set Backlight Brightness				
Description	Set CKJ-Series New Transmit Rate			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 bytes	Control Byte		129-Set backlight brightness.
2.1	1 bytes	New Transmit Rate		0-250. It will be rejected if the value >250.
3.1	6 bytes	Not used		0xFFFFFFFF

4.6 Set New Name Field

Description	Set CKJ-Series New Name Field			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 byte	Control Byte		228-Set CKJ-Series New Name Field
2.1	1 byte	Sub-Control Byte		0-ID; 1-Manufacturer Code 2-ECU Instance 3-Function Instance 4- Function 5-Vehicle System 6-Vehicle System Instance 7-Industry Group 8-Arbitrary Address Capable
3.1	1 byte	Data0		0-255
4.1	1 byte	Data1		0-255
5.1	1 byte	Data2		0-255
6.1	3 byte	Not used		0xFFFFFFFF

4.7 Set New PGN

Description	Set New PGN			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 byte	Control Byte		204- Set New PGN
2.1	1 byte	Sub-control Byte		0 - Set PGN of Transmission of CKJ Buttons and encoder Status. 1 - Set PGN of Transmission of response to query of CKJ global status.
3.1	3 bytes	New PGN		Variable. It should not be the same as all other valid PGN, otherwise the CKJ-Series will send NACK message.
6.1	3 bytes	Not used		0xFFFFFFFF

4.8 Set Encoder

Description	Set Encoder			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 byte	Control Byte		206 - Set Encoder
2.1	1 byte	PARAM		0 - Manually sets the encoder value to the value in DATA 1 - Set TOP, which is the maximum value the encoder will count up to. Values range from 4 to 65534 with the default=255. 2 - Set the initial value, which stored in non-volatile memory, and does not manually change the encoder's value.
3.1	1 bytes	ROLL OVR		A non-zero value, with the exception of FFh, causes the value to roll over back to zero when incremented passed TOP or from zero to TOP when decremented below zero, otherwise the count remains at zero or TOP.
4.1	1 byte	Not used		0xFF
5.1	2 bytes	DATA		Input data used in setting of the parameters
7.1	2 bytes	Not used		0xFFFF

4.9 Set Buttons

Description	Set Buttons			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 byte	Control Byte		207- Set Buttons
2.1	2 bits	Joystick Right Set Status		00: Not used 01: Useful Others: Don't care
2.3	2 bits	Joystick Left Set Status		
2.5	2 bits	Joystick Up Set Status		
2.7	2 bits	Joystick Down Set Status		
3.1	2 bits	Button 1 Set status		
3.3	2 bits	Button 2 Set status		
3.5	2 bits	Button 3 Set status		
3.7	2 bits	Button 4 Set status		
4.1	2 bits	Button 5 Set status		
4.3	2 bits	Button 6 Set status		
4.5	36 bits	Not used		0xFFFFFFFF

4.10 Set Software Version				
Description	Set software version: standard or customized version			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 byte	Control byte for setting software version		231-Set software version
2.1	1 byte	Software version selection		0 – Standard version 1 – Customized version Others: Don't care
3.1	6 bytes	unused		All bytes set to 255

If customized version was selected, the source address and all PGN will be particular, and the details were specified in <CKJ-0000003(6) communication programming manual_R01>.

4.11 Set Baud Rate				
Description	Set software version: standard or customized version			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 byte	Control byte for setting baud rate		234 - Set baud rate
2.1	1 byte	Baud rate selection		0 – 250K 1 – 500K Others: Don't care
2.1	6 bytes	unused		All bytes set to 255

Except selecting customized version, use Mode change Command to change current mode to run mode or sleep mode to exit the configuration mode.

4.12 Configuration Exit				
Description	Reception of the command to change the mode of CKJ-Series			
PF	239			
PS	DA, The source address of CKJ-Series.			
PGN	61184(0xEF00)			
Default Priority	6			
DLC	8			
Update Rate	upon commanded			
Direction	CA-CKJ			
Start	Length	Description	SPN	Valves
1.1	1 byte	Value of changing the mode.		0 – Boot Mode 1 – Run Mode 2 – Sleep Mode 3 – Diagnostic Test Mode 5 – Configuration Mode
2.1	7 bytes	unused		All bytes set to 255