

# ES-043 UTS-ID Engineering CAN Message Specification

**1) PURPOSE**

Define the J1939 CAN messages supported by the UTS-ID product and provide a guide for the use of those messages.

**2) J1939 CAN MESSAGE SPECIFICATION TABLES**

The following tables define the CAN messages supported by the UTS-ID:

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# Control Area Network (CAN) Structure

The UTS-ID uses the SAE J1939 standard messaging protocol to communicate on a CAN network. The J1939 standard uses a 29-bit identifier. The 29-bits are visualized in Table i and categorized as follows:

- Bits 1-8: Source Address (**SA**)
- Bits 9-24: Parameter Group Number (**PGN**)
- Bit 25: Data Page (**DP**)
- Bit 26: Reserved (**R**)
- Bit 27-29: Priority (**P**)

Table i: J1939 Extended Frame 29-bit identifier

		29-bit IDENTIFIER																																	
		Priority			R	DP	Parameter Group Number																Source Address												
		PDU Format																PDU Specific (Destinatino Address)																	
CAN 29 Bit ID Position		29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1					

Between 0 and 8 bytes of data follow the identifier called the Data Field. The Data Field is structured as little endian format. Reference Table ii and Table iii.

Table ii: J1939 Data Field Structure


DATA FIELD																															
BYTE 1								BYTE 2								BYTE 3-7								BYTE 8							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	...	1	0	7	6	5	4	3	2	1	0			

In Parker’s use of the Data Field the smallest byte number acts as the LSB. An example segment of data looks like Table iii.

Table iii: J1939 Data Field Breakdown Example

DATA FIELD															
BYTE 5				BYTE 6				BYTE 7				BYTE 8			
0xAA				0xFF				0x00				0x00			

The content of this data is read as 0x0000 FFAA, numerically represented as 65,450. The bits are in order, but bytes may need to be rearranged for processing.

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# TABLE 1- Data Broadcast Messages - Impact

Impact Event Notification							Default Status: Enabled
Default PGN <b>0xFFAA (65450)</b>		SA <b>0xE4 (default)</b>	Parameter Group Definition <b>Proprietary B</b>	Default Priority <b>6</b>		Broadcast Interval <b>On impact <sup>(1)</sup></b>	
Data Byte	Length	Parameter Name	Format	Resolution	Offset	Description	
1	2 bytes	Impact Magnitude	Unsigned 16-bit Int	2.44244e-4 g/bit	0	Maximum Magnitude Detected	
3	2 bytes	Direction X (Unit Vector)	Unsigned 16-bit Int	3.05180e-5 unit/bit	-1	Normalized Direction x-axis	
5	2 bytes	Direction Y (Unit Vector)	Unsigned 16-bit Int	3.05180e-5 unit/bit	-1	Normalized Direction y-axis	
7	2 bytes	Direction Z (Unit Vector)	Unsigned 16-bit Int	3.05180e-5 unit/bit	-1	Normalized Direction z-axis	

Debounce Stopped							Default Status: Enabled
Default PGN <b>0xFFAA (65450)</b>		SA <b>0xE4 (default)</b>	Parameter Group Definition <b>Proprietary B</b>	Default Priority <b>6</b>		Default Broadcast Interval <b>2.000 s after impact event</b>	
Data Byte	Length	Parameter Name	Format	Resolution		Value	
1	2 bytes	Impact Magnitude	Unsigned 16-bit Int	3.05180e-5 unit/bit	0	0	
3	2 bytes	Direction X (Unit Vector)	Unsigned 16-bit Int	3.05180e-5 unit/bit	-1	0x7FFF	
5	2 bytes	Direction Y (Unit Vector)	Unsigned 16-bit Int	3.05180e-5 unit/bit	-1	0x7FFF	
7	2 bytes	Direction Z (Unit Vector)	Unsigned 16-bit Int	3.05180e-5 unit/bit	-1	0x7FFF	

1) After an impact event a cooldown timer is started to prevent multiple messages during the same impact event. The timer is 2 seconds by default and is configurable. After the debounce period then a new Impact Event Notification will be sent if an impact is detected.



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# TABLE 1 - Data Broadcast Message - Orientation and Acceleration

Sensor Orientation							Default Status: Enabled
Default PGN <b>0xFFAB (65451)</b>		SA <b>0xE4 (default)</b>	Parameter Group Definition <b>Proprietary B</b>	Default Priority <b>6</b>		Default Broadcast Interval <b>10.000 s</b>	
Data Byte	Length	Parameter Name	Format	Resolution	Offset	Description	
1	2 bytes	Direction X (Unit Vector)	Unsigned 16-bit Int	3.05180e-5 unit/bit	-1	Gravity unit vector for the x-axis	
3	2 bytes	Direction Y (Unit Vector)	Unsigned 16-bit Int	3.05180e-5 unit/bit	-1	Gravity unit vector for the y-axis	
5	2 bytes	Direction Z (Unit Vector)	Unsigned 16-bit Int	3.05180e-5 unit/bit	-1	Gravity unit vector for the z-axis	
Net Acceleration							Default Status: Enabled
Default PGN <b>0xFFAC (65452)</b>		SA <b>0xE4 (default)</b>	Parameter Group Definition <b>Proprietary B</b>	Default Priority <b>6</b>		Default Broadcast Interval <b>10.000 s</b>	
Data Byte	Length	Parameter Name	Format	Resolution	Offset	Description	
1	2 bytes	Magnitude	Unsigned 16-bit Int	2.44144e-4 g/bit	0	Three axis Magnitude vector	
3	2 bytes	Acceleration X	Unsigned 16-bit Int	4.88289e-4 g/bit	-16	Measured x-axis acceleration	
5	2 bytes	Acceleration Y	Unsigned 16-bit Int	4.88289e-4 g/bit	-16	Measured y-axis acceleration	
7	2 bytes	Acceleration Z	Unsigned 16-bit Int	4.88289e-4 g/bit	-16	Measured z-axis acceleration	



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# TABLE 2 – SAE J1939 Standard Messages – Address Claim

Request Message (PGN 59904) for Address Claimed (PGN 60928 - AC)					
PGN		PF	PS	SA	Parameter Group Definition
<b>0xEA00</b> (59904)		<b>234</b>	<b>DA</b>	<b>SA</b>	<b>PDU1 Format</b>
Data Byte	Length	Parameter Name		Format	
1	1 byte	PGN (PS)		0x00	
2	1 byte	PGN (PF)		0xEE	
3	1 byte	PGN (MSB)		0x00	
Commanded Address – CA					
PGN		PF	PS	SA	Parameter Group Definition
<b>0xFED8</b> (65240)		<b>254</b>	<b>216</b>	<b>SA</b>	<b>PDU2 Format</b>
Data Byte	Length	Parameter Name		Format	
1	8 bytes	NAME		SPN 2849, NAME of component to receive the CA message	
9	1 byte	Address Assignment		SPN 2847, valid range: 0 to 253, new Source Address of the component receiving the CA message	

- The request message may be sent to a specific address (0-253) or the global destination address (255)
- The UTS-ID will respond to a request message for Address Claimed (directed to its Source Address or the global address) with a successful Address Claimed (AC) message before resuming other transmissions; otherwise, the Cannot Claim Address message will be sent and the UTS-ID will remain silent
- The Commanded Address message is sent using the transport protocol BAM
- The UTS-ID will respond to a Commanded Address message containing its NAME with a successful Address Claimed (AC) message before resuming other transmissions; otherwise, the UTS-ID will retain its previous Source Address



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TABLE 3 – SAE J1939 Standard Messages – Address Claimed (NAME)

Address Claimed – AC					
PGN		PF	PS	SA	Parameter Group Definition
<b>0xEE00 (60928)</b>		<b>238</b>	<b>255</b>	<b>SA</b>	<b>PDU1 Format</b>
Data Byte	Length	Parameter Name		Format	
1	21 bits	Identity Number		SPN 2837, Manufacturer serial number, set in Group 0 parameter number 18 in Table 5	
3.6	11 bits	Manufacturer Code		SPN 2838, 71 – Vansco, cannot be changed	
5.1	3 bits	ECU Instance		SPN 2840, set in Group 0, parameter number 19 in Table 5	
5.4	5 bits	Function Instance		SPN 2839, set in Group 0, parameter number 20 in Table 5	
6	1 byte	Function		SPN 2841, UTS-ID function for industry group and vehicle system set in Group 0 parameter number 21 in Table 5	
7.1	1 bit	Reserved			
7.2	7 bits	Vehicle System		SPN 2842, set in Group 0, parameter number 22 in Table 5	
8.1	4 bits	Vehicle System Instance		SPN 2843, set in Group 0, parameter number 23 in Table 5	
8.5	3 bits	Industry Group		SPN 2846, set in Group 0, parameter number 24 in Table 5	
8.8	1 bit	Arbitrary Address Capable		SPN 2844, 0 – UTS-ID is not set to perform Address Arbitration, cannot be changed	



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# TABLE 3 – SAE J1939 Standard Messages – Cannot Claim Address

Cannot Claim Address					
PGN		PF	PS	SA	Parameter Group Definition
<b>0xEE00 (60928)</b>		<b>238</b>	<b>255</b>	<b>254</b>	<b>PDU1 Format</b>
Data Byte	Length	Parameter Name		Format	
1	21 bits	Identity Number		SPN 2837, Manufacturer serial number, set in Group 0 parameter number 18 in Table 5	
3.6	11 bits	Manufacturer Code		SPN 2838, 71 – Vansco, cannot be changed	
5.1	3 bits	ECU Instance		SPN 2840, set in Group 0, parameter number 19 in Table 5	
5.4	5 bits	Function Instance		SPN 2839, set in Group 0, parameter number 20 in Table 5	
6	1 byte	Function		SPN 2841, UTS-ID function for industry group and vehicle system set in Group 0 parameter number 21 in Table 5	
7.1	1 bit	Reserved			
7.2	7 bits	Vehicle System		SPN 2842, set in Group 0, parameter number 22 in Table 5	
8.1	4 bits	Vehicle System Instance		SPN 2843, set in Group 0, parameter number 23 in Table 5	
8.5	3 bits	Industry Group		SPN 2846, set in Group 0, parameter number 24 in Table 5	
8.8	1 bit	Arbitrary Address Capable		SPN 2844, 0 – UTS-ID is not set to perform Address Arbitration, cannot be changed	

- 6. Upon power-up, only the Cannot Claim Address message can be transmitted until an address is successfully claimed with the Address Claimed message
- 7. Transmitted once at startup.
- 8. Transmitted once at boot up and on request.



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# TABLE 4 – Configuration Messages - Parameter Change

Configuration Request Message <sup>(10)</sup>					
PGN		PF	PS	SA	Parameter Group Definition
<b>0xEF00 (61184)</b>		<b>239</b>	<b>0</b>	<b>SA</b>	<b>PDU2 Format</b>
Data Byte	Length	Parameter Name		Valid Range	
1	1 byte	Command Byte		<b>0xC0</b>	
2	1 byte	Read or Write		<b>0 = Read, 1 = Write</b>	
3	1 byte	Parameter Group Number		0-255	
4	1 byte	Parameter ID Number		0-255	
5	4 bytes	Parameter Value		32-bits, byte 5 is the LSB, byte 8 is the MSB	
Configuration Response Message <sup>(11)</sup>					
PGN		PF	PS	SA	Parameter Group Definition
<b>0xEF00 (61184)</b>		<b>239</b>	<b>0</b>	<b>SA</b>	<b>PDU2 Format</b>
Data Byte	Length	Parameter Name		Format	
1	1 byte	Command Byte		<b>0xC0</b>	
2	1 byte	Read/write/invalid response		<b>2 = Read response, 3 = Write response, 255 = invalid request</b>	
3	1 byte	Parameter Group Number		0-255	
4	1 byte	Parameter ID Number		0-255	
5	4 bytes	Parameter Value		32-bits, byte 5 is the LSB, byte 8 is the MSB	

9. Received by the UTS-ID Application for reading and changing configuration parameters.

10. Transmitted by the UTS-ID Application in response to a read/write request.

11. After receiving a valid read message, the UTS-ID will send a response message with the Destination Address (DA) set to the Source Address of the requestor

Example (read Impact Threshold):

Requestor (SA = 0xF9):

18EFE4F9 C0 00 02 05 00 00 00 00

UTS-ID (SA = 0xE4):

18EFF9E4 C0 02 02 05 07 00 00 00



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# TABLE 4 – Configuration Messages - Save and Calibration

Save Configuration Changes Message				
PGN	PF	PS	SA	Parameter Group Definition
<b>0xEF00</b> (61184)	<b>239</b>	<b>0</b>	<b>SA</b>	<b>PDU2 Format</b>
Data Byte	Length	Parameter Name	Format	
1	1 byte	Command Byte	<b>0xC1</b>	
2	7 bytes	Unused Bytes	0xFF FFFF FFFF FFFF	
Calibration Request Message				
PGN	PF	PS	SA	Parameter Group Definition
<b>0xEF00</b> (61184)	<b>239</b>	<b>0</b>	<b>SA</b>	<b>PDU2 Format</b>
Data Byte	Length	Parameter Name	Value	
1	1 byte	Command byte	0xB2 (178)	
2	1 byte	Calibration Requested	0 to 3 <sup>12</sup>	
3	5 bytes	Not used / reserved	0xFF FFFF FFFF	

- 12. 0 = None – will stop a calibration that has been started
- 1 = 6-point accelerometer calibration procedure
- 2 = Temperature compensation – start room temperature data collection (208 samples, 1 second)
- 3 = Temperature compensation – start high temperature data collection (208 samples, 1 second)



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# TABLE 5 – Configuration Parameter Numbers - Group 0

General Parameters – Group 0						
Group Number	Parameter Number	UTS-ID Configuration Parameter	R/W Capable <sup>15</sup>	Length	Format	Default
0	00 (0x00)	Revision Number	R	4 bytes	Unsigned Integer	4
0	01 (0x01)	Platform Software Number	R	4 bytes	Unsigned Integer	953610
0	02 (0x02)	Platform Software Version	R	4 bytes	Unsigned Integer	215
0	03 (0x03)	Platform Software Build Number	R	4 bytes	Unsigned Integer	28
0	04 (0x04)	SAP Part Number	R	4 bytes	Unsigned Integer	0xFFFF FFFF
0	05 (0x05)	Serial Number	R	4 bytes	Unsigned Integer	0xFFFF FFFF
0	16 (0x10)	CAN Bit Rate	R/W	4 bytes	Unsigned Integer, valid range: [250, 500]	250 kbps (0xFA)
0	17 (0x11)	J1939 Source Address	R/W	1 byte	Unsigned integer valid range: 0 to 253 (0x00 – 0xFD) 254 = NULL (0xFE) 255 = global (0xFF)	228 (0xE4)
0	18 (0x12)	J1939 Manufacturer Code	R/W	21 bits	Unsigned Long	0
0	19 (0x13)	J1939 ECU Instance	R/W	3 bits	Unsigned Long	0
0	20 (0x14)	J1939 Function Instance	R/W	5 bits	Unsigned Long	0
0	21 (0x15)	J1939 Function	R/W	8 bits	Unsigned Long – do not change	136 (0x88)
0	22 (0x16)	J1939 Vehicle System	R/W	7 bits	Unsigned Long	0
0	23 (0x17)	J1939 Vehicle System Instance	R/W	4 bits	Unsigned Long	0
0	24 (0x18)	J1939 Industry Group	R/W	3 bits	Unsigned Long – do not change	3 (0x03)
0	25 (0x19)	J1939 Manufacturer Code	R/W	11 bits	Unsigned Long – do not change	71 (0x47)
0	32 (0x20)	CANopen Status	R/W	4 bytes	Unsigned Integer, valid range 1 to 3. 1 = J1939 Mode 2 = CANopen Mode 3 = J1939 and CANopen mode	1 (0x01)
0	33 (0x21)	CANopen Node ID	R/W	1 byte	Unsigned Integer	10 (0x0A)

13. If the Source Address is changed with a write message, the UTS-ID must respond with a successful Address Claimed (AC) message before resuming other transmissions; otherwise, the Cannot Claim Address message must be sent and the UTS-ID must remain silent
14. The Source Address can only be written in broadcast mode by using the J1939 Commanded Address (CA) message
15. Access levels vary from Read Only (R), Read and Write Once (R/Wo), and Read and Write Many (R/W)



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TABLE 5 – Configuration Parameter Numbers - Group 0 (continued)

IMU Parameters – Group 0						
Group Number	Parameter Number	UTS-ID Configuration Parameter	R/W Capable <sup>15</sup>	Length	Format	Default
0	48 (0x30)	Sample Rate (1 to 8)	R/W	4 bytes	1 = 13 Hz 2 = 26 Hz 3 = 52 Hz 4 = 104 Hz 5 = 208 Hz 6 = 416 Hz 7 = 833 Hz 8 = 1660 Hz (default)	5
0	49 (0x31)	Accelerometer Full Scale (0 to 3)	R/W	4 bytes	0 = +/- 2G (default) 1 = +/- 4 G 2 = +/- 8 G 3 = +/- 16 G	0
0	50 (0x32)	Gyro Full Scale (0 to 3)	R/W	4 bytes	0 = +/- 250 dps 1 = +/- 500 dps 2 = +/- 1000 dps 3 = +/- 2000 dps	3



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# TABLE 5 – Configuration Parameter Numbers - Group 1

General Parameters – Group 1						
Group Number	Parameter Number	UTS-ID Configuration Parameter	R/W Capable <sup>15</sup>	Length	Format	Default
1	00 (0x00)	Revision	R	4 bytes	Unsigned Long	1
1	01 (0x01)	Accelerometer Cal Quality	R/W	4 bytes	Unsigned Long	3 after Cal.
1	02 (0x02)	Accelerometer Temp Comp	R/W	4 bytes	Unsigned Long: 0 = no Cal., 1 = Good	1 after Cal.
1	03 (0x03)	Realign Matrix State	R/W	4 bytes	Unsigned Long: 0 = no Cal., 1 = Enabled	1 after Cal.

1	16 (0x10)	Accelerometer Bias 0	R/W	4 bytes	Unsigned Long	-
1	17 (0x11)	Accelerometer Bias 1	R/W	4 bytes	Unsigned Long	-
1	18 (0x12)	Accelerometer Bias 2	R/W	4 bytes	Unsigned Long	-
1	19 (0x13)	Accelerometer SF00	R/W	4 bytes	Unsigned Long	-
1	20 (0x14)	Accelerometer SF01	R/W	4 bytes	Unsigned Long	-
1	21 (0x15)	Accelerometer SF02	R/W	4 bytes	Unsigned Long	-
1	22 (0x16)	Accelerometer SF10	R/W	4 bytes	Unsigned Long	-
1	23 (0x17)	Accelerometer SF11	R/W	4 bytes	Unsigned Long	-
1	24 (0x18)	Accelerometer SF12	R/W	4 bytes	Unsigned Long	-
1	25 (0x19)	Accelerometer SF20	R/W	4 bytes	Unsigned Long	-
1	26 (0x1A)	Accelerometer SF21	R/W	4 bytes	Unsigned Long	-
1	27 (0x1B)	Accelerometer SF22	R/W	4 bytes	Unsigned Long	-
1	28 (0x1C)	Temperature Comp Reference	R/W	4 bytes	Unsigned Long	-
1	29 (0x1D)	Temperature Comp Offset Ax	R/W	4 bytes	Unsigned Long	-
1	30 (0x1E)	Temperature Comp Offset Ay	R/W	4 bytes	Unsigned Long	-
1	31 (0x1F)	Temperature Comp Offset Az	R/W	4 bytes	Unsigned Long	-



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TABLE 5 – Configuration Parameter Numbers - Group 1 (continued)

General Parameters – Group 1						
Group Number	Parameter Number	UTS-ID Configuration Parameter	R/W Capable	Length	Format	Default
1	32 (0x20)	Realign Matrix 00	R/W	4 bytes	Unsigned Long	-
1	33 (0x21)	Realign Matrix 01	R/W	4 bytes	Unsigned Long	-
1	34 (0x22)	Realign Matrix 02	R/W	4 bytes	Unsigned Long	-
1	35 (0x23)	Realign Matrix 10	R/W	4 bytes	Unsigned Long	-
1	36 (0x24)	Realign Matrix 11	R/W	4 bytes	Unsigned Long	-
1	37 (0x25)	Realign Matrix 12	R/W	4 bytes	Unsigned Long	-
1	38 (0x26)	Realign Matrix 20	R/W	4 bytes	Unsigned Long	-
1	39 (0x27)	Realign Matrix 21	R/W	4 bytes	Unsigned Long	-
1	40 (0x28)	Realign Matrix 22	R/W	4 bytes	Unsigned Long	-
1	41 (0x29)	Temp Comp Cold Offset X	R/W	4 bytes	Unsigned Long	-
1	42 (0x30)	Temp Comp Cold Offset Y	R/W	4 bytes	Unsigned Long	-
1	43 (0x31)	Temp Comp Cold Offset Z	R/W	4 bytes	Unsigned Long	-



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# TABLE 5 – Configuration Parameter Numbers - Group 2

General Parameters – Group 2						
Group Number	Parameter Number	UTS-ID Configuration Parameter	R/W Capable	Length	Format	Default
2	00 (0x00)	Revision	R	4 bytes	Unsigned Long	1
2	01 (0x01)	Calibrated Accel PGN	R/W	4 bytes	Unsigned Long	0xFFAC
2	02 (0x02)	Calibrated Accel Transmission Interval	R/W	4 bytes	Unsigned Long	10,000,000 (10 s)
2	03 (0x03)	Impact Debounce Time	R/W	4 bytes	Unsigned Long	2,000,000 (2 s)
2	04 (0x04)	Event Timeout	R/W	4 bytes	Unsigned Long	1,000,000 (1 s)
2	05 (0x05)	Impact Threshold	R/W	4 bytes	Unsigned Long	7 (0.1 g/bit)
2	06 (0x06)	Impact PGN	R/W	4 bytes	Unsigned Long	0xFFAA
2	07 (0x07)	Low Pass Filter Decay Rate	R/W	4 bytes	Unsigned Long	1000 (0.01 / bit)
2	08 (0x08)	Orientation PGN	R/W	2 bytes	Unsigned Long	0xFFAB
2	09 (0x09)	Orientation Transmission Interval	R/W	4 bytes	Unsigned Long	10,000,000 (10 s)
2	10 (0x0A)	Transmit Debounce end	R/W	4 bytes	Unsigned Long	1 (TRUE)
2	11 (0x0B)	Variance Threshold	R/W	4 bytes	Unsigned Long	70 (0.001 g/bit)
2	12 (0x0C)	Gyros PGN	R/W	4 bytes	Unsigned Long	0xFFAD
2	13 (0x0D)	Gyros Transmission Interval	R/W	4 bytes	Unsigned Long	0xFFFF FFFF
2	14 (0x0E)	Raw Accel PGN	R/W	2 bytes	Unsigned Long	0xFFAE
2	15 (0x0F)	Raw Accel Transmission Interval	R/W	4 bytes	Unsigned Long	0xFFFF FFFF



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3) REVISION TABLE

REVISION	REVISION DATE	DESCRIPTION OF CHANGE
A	05/12/2021	Initial document creation



**Electronic Controls Division  
Sensor Business Unit**

5000 MFG. FACILITY:	DATE: 5/14/2021	BY: Dan V.	CH: -----
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