

MERRITT EVOLVE

CAN SPECIFICATIONS

J.R. MERRITT
CONTROLS 

JRMERRITT.COM | 1-800-333-5762



TABLE OF CONTENTS

- 1.** Overall Specifications
- 2.** J1939
- 5.** CANOpen

OVERALL SPECIFICATIONS

Electrical Details

Supply Voltage(Vcc)

9 to 36 Volts DC

Absolute Maximum

36 Volts

Supply Current

50 - 100 mA (typ.) 200 mA (max.)

Supply Input

Reverse Polarity Protected

Analog / Digital Inputs

-0.5 mA (10K resistor, 5V source)

Maximum Baud Rate

1Mbps (250kbps default)

Environmental

Operating Temperature

-40° to +140° F [-40° to +60° C]

Storage Temperature

-40° to +176° F [-40° to +80° C]

Sealing

Silicone conformal coating

Diagnostics

Diagnostic LEDs

One (1) Power LED and One (1) Status LED

Normal Operation

Power LED lit indicates 5V power
Status LED blink once per second

Error

Status LED will blink ten times per second

Connection

Connector

Standard 22 AWG harness 18" with
Deutsch DTMO4-6P connector
Other connectors available upon request

J1939

Generic Interface

SAE J1939 71 Standard for joystick
Source Addresses: 0x01 - 0xFE (1 to 254 decimal)
Priority: 3

Basic Joystick Message 1 (BJM1)

Base PGN: 0xFDD6
X - 3D Hall Analog
Y - 3D Hall Analog

Extended Joystick Message 1 (EJM1)

Base PGN: 0xFDD7
3 Analog Inputs (Thumbwheels)

Lamp Command

4 low-power outputs

Inputs / Outputs

Standard 2 analog joystick inputs (X/Y)
Up to 14 digital inputs
Up to 4 digital outputs*
Up to 8 additional analog inputs*
* Replacing digital inputs

CANopen

CANopen Device Profile

DS301, DS401, V3.0 6/08

Terminal Resistance

120R Removable

Basic messaging

X - 3D Hall Analog
Y - 3D Hall Analog
8 Digital Inputs

Extended messaging

8 Analog Inputs

Lamp command

4 low-power outputs

Inputs / Outputs

Standard 2 analog joystick inputs (X/Y)
Up to 14 digital inputs
Up to 4 digital outputs*
Up to 8 additional analog inputs*
* Replacing digital inputs

Node ID

0x01- 0x7F

Axis & Digital Inputs

181h (180h + Node ID)

Analog Inputs

281h (280h + Node ID)

Digital Outputs

201h (200h + Node ID)

Heartbeat (500ms):

720h (700h + Node ID)

Analog Resolution

8-bit

Network Management

Auto start enabled

J1939 SPECIFICATIONS

J1939 Generic

CAN Messages

Presuming the PDO COB-ID's are assigned to 29-bit addresses:

TxPDO1 maps to J1939 address 0x0CFDD6xx,
TxPDO2 maps to J1939 address 0x0CFDD7xx,
RxPDO1 maps to J1939 address 0x0C9900xx.

Then the following example for TxPDO1 would be:

CAN-ID: 0x0CFDD6xx
PDU Format (PF): 253 (0xFD)
PDU Specific (PS): 214-218 (0xD6 – 0xDA, 0xD6 begins J1939 joystick messages)
Source Address: xx (TBD)
PGN: 64982-64985

Address	Description	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x0CFDD6xx TxPDO1	XY POS, DIGITAL INPUTS	X LSByte	X MSByte	Y LSByte	Y MSByte	0	SW1-4	SW5-8	SW9-12
0x0CFDD7xx TxPDO2	ANALOG INPUTS	Thumb-X LSByte	Thumb-X MSByte	Thumb-Y LSByte	Thumb-Y MSByte	Thumb-Z LSByte	Thumb-Z MSByte	Detent Status	0
0x0C9900xx RxPDO1	DIGITAL OUTPUTS	OUT1-4							
0x18EEFFxx	ADDRESS CLAIM	Serial Number LSByte	Serial Number MSByte	Manuf Code LSByte	Manuf Code MSByte	0	Function Code	0	0 = Fixed Address
0x18EEFFxx	REQUEST ADDRESS CLAIM	0x00	0xEE	0x00					

Digital Outputs

Address	Byte 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0C9900xx RxPDO1	DIGITAL OUTPUTS	OUT 4 MSB	OUT 4 LSB	OUT 3 MSB	OUT 3 LSB	OUT 2 MSB	OUT 2 LSB	OUT 1 MSB	OUT 1 LSB

RxPDO1 output states are presented as two bits: '0x01' for on, '0x00' for off, '0x10' for blink, and '0x11' for not available.

Digital Inputs

Address	Byte 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0C9900xx RxPDO1	DIGITAL OUTPUTS	OUT 4 MSB	OUT 4 LSB	OUT 3 MSB	OUT 3 LSB	OUT 2 MSB	OUT 2 LSB	OUT 1 MSB	OUT 1 LSB

TxPDO1 digital input states for each switch are presented as two bits: '0x01' for on, '0x00' for off, '0x11' for not available. Digital inputs are presented similarly for bytes 6, 7 and 8 of TxPDO1.

Analog Inputs

Address	Byte 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0C9900xx RxPDO1	DIGITAL OUTPUTS	OUT 4 MSB	OUT 4 LSB	OUT 3 MSB	OUT 3 LSB	OUT 2 MSB	OUT 2 LSB	OUT 1 MSB	OUT 1 LSB

Analog inputs are presented as two bytes each, with the analog value represented as -1000 to +1000. The same bit- and byte-mapping is applied to each input of Joystick X/Y, Thumb X/Y/Z.

TxPDO1 and TxPDO2 status states are presented as two bits: '0x01' for "in position", '0x00' for "not in position", '0x10' for "error", and '0x11' for not available.

TxPDO2 also presents "Detent Status" bits as '0x11' meaning not available.

J1939 SPECIFICATIONS

J1939 Generic

Basic Joystick Message 1

Start Position (byte/bit)	Length (bits)	Parameter Description	Pin
1/1	2	Joystick X-axis neutral position status	3D Hall
1/3	2	Joystick X-axis lever left negative position status	3D Hall
1/5	2	Joystick X-axis lever right positive position status	3D Hall
1/7 through 2/1-8	10	Joystick X-axis position (Byte 1 Bit 7 is LSB. Byte 2 Bit 8 is MSB)	3D Hall
3/1	2	Joystick Y-axis neutral position status	3D Hall
3/3	2	Joystick Y-axis lever back negative position	3D Hall
3/5	2	Joystick Y-axis lever forward positive position	3D Hall
3/7 through 4/1-8	10	Joystick Y-axis position (Byte 3 Bit 7 is LSB. Byte 4 Bit 8 is MSB)	3D Hall
5/5	2	Joystick Y-axis detent position status	3D Hall
5/7	2	Joystick X-axis detent position status	3D Hall
6/1	2	Grip button 4 pressed status	J3-7
6/3	2	Grip button 3 pressed status	J3-5
6/5	2	Grip button 2 pressed status	J3-3
6/7	2	Grip button 1 pressed status	J3-1
7/1	2	Grip button 8 pressed status	J3-14
7/3	2	Grip button 7 pressed status	J3-13
7/5	2	Grip button 6 pressed status	J3-11
7/7	2	Grip button 5 pressed status	J3-9
8/1	2	Not used	
8/3	2	Grip button 11 pressed status	J3-4
8/5	2	Grip button 10 presses status	J3-6
8/7	2	Grip button 9 pressed status	J3-10

J1939 SPECIFICATIONS

J1939 Generic

Extended Joystick Message 1

Start Position (byte/bit)	Length (bits)	Parameter Description	Pin
1/1	2	Grip X-axis neutral position status	J3-2
1/3	2	Grip X-axis negative position status	J3-2
1/5	2	Grip X-axis positive position status	J3-2
1/7 through 2/1-8	10	Grip X-axis position	J3-2
3/1	2	Grip Y-axis neutral position status	J3-8
3/3	2	Grip Y-axis negative position status	J3-8
3/5	2	Grip Y-axis positive position status	J3-8
3/7 through 4/1-8	10	Grip Y-axis position	J3-8
5/1	2	Grip Z-axis neutral position status	J3-12
5/3	2	Grip Z-axis negative position status	J3-12
5/5	2	Grip Z-axis position status	J3-12
5/7 through 6/1-8	10	Grip Z-axis position	J3-12
7/3	2	Not used (not available)	
7/5	2	Not used (not available)	
7/7	2	Not used (not available)	

Lamp Command Message

Start Position (byte/bit)	Length (bits)	Parameter Description	Pin
1/1	2	Button 1 lamp command	J3-1
1/3	2	Button 2 lamp command	J3-3
1/5	2	Button 3 lamp command	J3-5
1/7	2	Button 4 lamp command	J3-7

CANOPEN SPECIFICATIONS

CANOpen Interface

CAN Messages

Presuming the PDO COB-ID's are assigned to 11-bit addresses:

TxPDO1 maps to CANopen address 0x18x,
TxPDO2 maps to CANopen address 0x28x,
RxPDO1 maps to CANopen address 0x20x.

Then the following example for TxPDO1 would be:

CAN-ID: 0x18x

Source Address: x (TBD)

Address	Description	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x18x	XY POS	X LSBByte	X MSByte	Y LSBByte	Y MSByte			SW9 – SW11	SW1 – SW8
0x28x	ANALOG INPUTS	Analog In #1	Analog In #2	Analog In #3	Analog In #4	Analog In #5	Analog In #6	Analog In #7	Analog In #8
0x20x	DIGITAL OUTPUTS	OUT1-4							

Digital Inputs

Address	Byte 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x18x	DIGITAL INPUTS	SW8	SW7	SW6	SW5	SW4	SW3	SW2	SW1
	BYTE 7								
	DIGITAL INPUTS						SW11	SW10	SW9

Input states are presented as '1' for on, '0' for off.available.

Analog Inputs

Analog inputs are presented as one byte each (for 10-bit ADC, shifted right 2 bits).

CANOPEN SPECIFICATIONS

CANOpen Interface

Basic Joystick Message TxPD01

Parameters and data field locations

Start Position (byte/bit)	Length (bits)	Parameter Description	Pin
1/1 through 2/8	16	Joystick X-axis position (Byte 1 Bit 1 is LSB. Byte 2 Bit 8 is MSB)	3D Hall
3/1 through 4/8	16	Joystick Y-axis position (Byte 3 Bit 1 is LSB. Byte 4 Bit 8 is MSB)	3D Hall
5/1 – 5/8	8	N/A	
6/1 – 6/8	8	N/A	
7/1	1	Grip button 9 pressed status	J3-10
7/2	1	Grip button 10 pressed status	J3-6
7/3	1	Grip button 11 pressed status	J3-4
8/1	2	Grip button 1 pressed status	J3-1
8/2	2	Grip button 2 pressed status	J3-3
8/3	2	Grip button 3 pressed status	J3-5
8/4	2	Grip button 4 pressed status	J3-7
8/5	2	Grip button 5 pressed status	J3-9
8/6	2	Grip button 6 pressed status	J3-11
8/7	2	Grip button 7 pressed status	J3-13
8/8	2	Grip button 8 presses status	J3-14

Extended Joystick Message TxPD02

Start Position (byte/bit)	Length (bits)	Parameter Description	Pin
1/1 through 1/8	8	Grip X-axis position, Analog input #1	J3-2
2/1 through 2/8	8	Analog input #2	J3-4
3/1 through 3/8	8	Analog input #3	J3-6
4/1 through 4/8	8	Grip Y-axis position, Analog input #4	J3-8
5/1 through 5/8	8	Analog input #5	J3-10
6/1 through 6/8	8	Grip Z-axis position, Analog input #6	J3-12
7/1 through 7/8	8	Analog input #7	J3-14
8/1 through 8/8	8	Analog input #8	J3-13

Lamp Command Message

Start Position (byte/bit)	Length (bits)	Parameter Description	Pin
1/1	2	Grip Button 1, low-power LED	J3-1
1/3	2	Grip Button 2, low-power LED	J3-3
1/5	2	Grip Button 3, low-power LED	J3-5
1/7	2	Grip Button 4, low-power LED	J3-7