CJ series

Proportional, multi-function hand grip controllers • non-contacting Hall effect technology

DISTINCTIVE FEATURES

One and two axis control

Analog outputs

Rated for 5 million lifecycles

CAN bus and USB output options

Redundant output available

ENVIRONMENTAL SPECIFICATIONS

- Operating Temperature: -40 °C to +85 °C (-40 °F to +185 °F)
- Storage Temperature: -40 °C to +85 °C (-40 °F to +185 °F)
- Above Panel Sealing: Up to IP67 (subject to handle configuration)
- EMC Immunity Level: EN61000-4-3: 2006
- EMC Emissions Level: EN61000-4-8: 2009
- ESD: EN61000-4-2: 2008

ELECTRICAL SPECIFICATIONS

- Supply voltage range: 5.00 VDC ±0.01 VDC
- Reverse polarity Max: -10 VDC
- Ratiometric Output Voltage: See options
- Transient overvoltage max: 16 V
- Output Impedance: 2 Ω
- Return to Center Voltage Tolerance: ±200 mV initial
- Supply Current: 13 mA per sensor

MECHANICAL SPECIFICATIONS

- Operating Force: 7.6 N (1.70 lbf)
- Maximum Vertical Load: 444.8 N (100 lbf)
- Maximum Horizontal Load: 649.4 N (146 lbf)
- Mechanical Angle of Movement: 40° (±20°)
- Expected Life: 10 million lifecycles
- Mass /weight: 544.3 g (19.2 oz)
- Lever Action (centering): Spring

* Operating force: configuration option «L»

The company reserves the right to change specifications without notice.

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MATERIALS

• Body: Glass Filled Nylon

• Handles: Glass Filled Nylon

TERMINATION

The CJ series is fitted with a 18" ±0.5" AWG22 wire harness. Further non-standard connectors and cable options are available upon request.

WIRE COLOR	SIGNAL
RED	5 VDC for analog outputs within voltage range 0 VDC to 5 VDC 7 VDC to 35 VDC for voltage regulator options
BLACK	Ground
BLUE	X axis data
YELLOW	Y axis data
GREEN	Z axis data
BLUE / WHITE	Redundant X axis
YELLOW / BLACK	Redundant Y axis
GREEN / BLACK	Redundant Z axis
ORANGE	Button 1
VIOLET	Button 2
GREY	Button 3
BROWN	Button 4
GRAY / BLACK	Button 5
BLUE / WHITE	Button 6
YELLOW / BLACK	Button 7
GREEN / BLACK	Button 8
VIOLET / WHITE	Button 9
WHITE	Common

PANEL CUT-OUT

30.48 (1.20)
Ø57.15 (2.25)
60.96 (2.40)
30.48 (1.20)
60.96 (2.40)
R 6.35 (0.25) 4 plcs
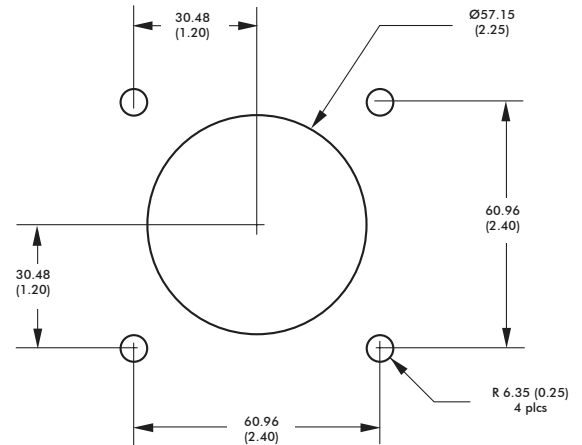
CAN J1939 INTERFACE SPECIFICATION

The CJ Series utilizes redundant Hall effect sensors to measure the primary X and Y axis. The CAN controller support various button configurations as well as proportional thumbwheels and mini-joysticks for additional axis data.
All axis and button data are delivered on a CAN 2.0B compliant physical interface. Two additional signals allow configuration of the controller Source Address. Controller messages are delivered per the SAE J1939-71 message protocol.

CAN 2.0B INTERFACE PARAMETERS

• Baud rate: 250 KHz

• Transmission repetition rate: 50ms

• BJMl/EJMl interval time: 20ms

• Terminating resistor: No (available by special request to factory)

• Connection to Deutsch DTM04-6P connector:

Pin	Color	Function
1	White	CAN Lo
2	Green	CAN Hi
3	Blue	Source Address SEL 1
4	Orange	Source Address SEL 0
5	Black	Ground
6	Red	6 - 35 VDC

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CAN J1939 INTERFACE SPECIFICATION
(CONTINUED)

CAN MESSAGE PROTOCOL

- Primary Axis and button data on Basic Joystick
  Message 1 (BJM1):
  - Priority: 3
  - Base PGN: 0xFDD6
  - Source address: 0x10[1]
  - Data field: 8 bytes
- Redundant Axis data on Extended Joystick Message 1
  (EJMl):
  - Priority: 3
  - Base PGN: 0xFDD7
  - Source address: 0x10[1]
  - Data field: 8 bytes
- Additional thumbwheels and mini-joysticks data on
  Extended Joystick Message 2 (EJM2):
  - Priority: 3
  - Base PGN: 0xFDD9
  - Source address: 0x10[1]
  - Data field : 8 bytes

Note 1: Alternate source addresses can be configured by groun-
ding of the blue and/or orange wires.
- Source address= Ox10: ORANGE= floating , BLUE= floating (default)
- Source address= Ox20: ORANGE= floating, BLUE= grounded
- Source address= Ox30: ORANGE= grounded, BLUE= floating
- Source address= Ox40: ORANGE= grounded, BLUE= grounded

BJM1 DATA FIELD STRUCTURE:

START POSITION (BYTE/BIT)	LENGTH (BITS)	FUNCTION
1/1	2	Primary X-axis neutral position status
1/3	2	Primary X-axis left position status
1/5	2	Primary X-axis right position status
1/7 to 2/8	10	Primary X-axis position data
3/1	2	Primary Y-axis neutral position status
3/3	2	Primary Y-axis down position status
3/5	2	Primary Y-axis up position status
3/7 to 4/8	10	Primary Y-axis position data
6/1	2	Button 4 status
6/3	2	Button 3 status
6/5	2	Button 2 status
6/7	2	Button 1 status
7/1	2	Button 8 status (Paddle if 6 button configuration)[2]
7/3	2	Button 7 status (Trigger if 6 button configurat ion)[2]
7/5	2	Button 6 status
7/7	2	Button 5 status
8/5	2	Button 10 status (Paddle if 8 button configuration)[2]
8/7	2	Button 9 status (Trigger if 8 button configuration)[2]

Note 2: If configured with no buttons, trigger and/or paddle would be positioned
in Button n+1 and Button n+2.

EJM1 DATA FIELD STRUCTURE:

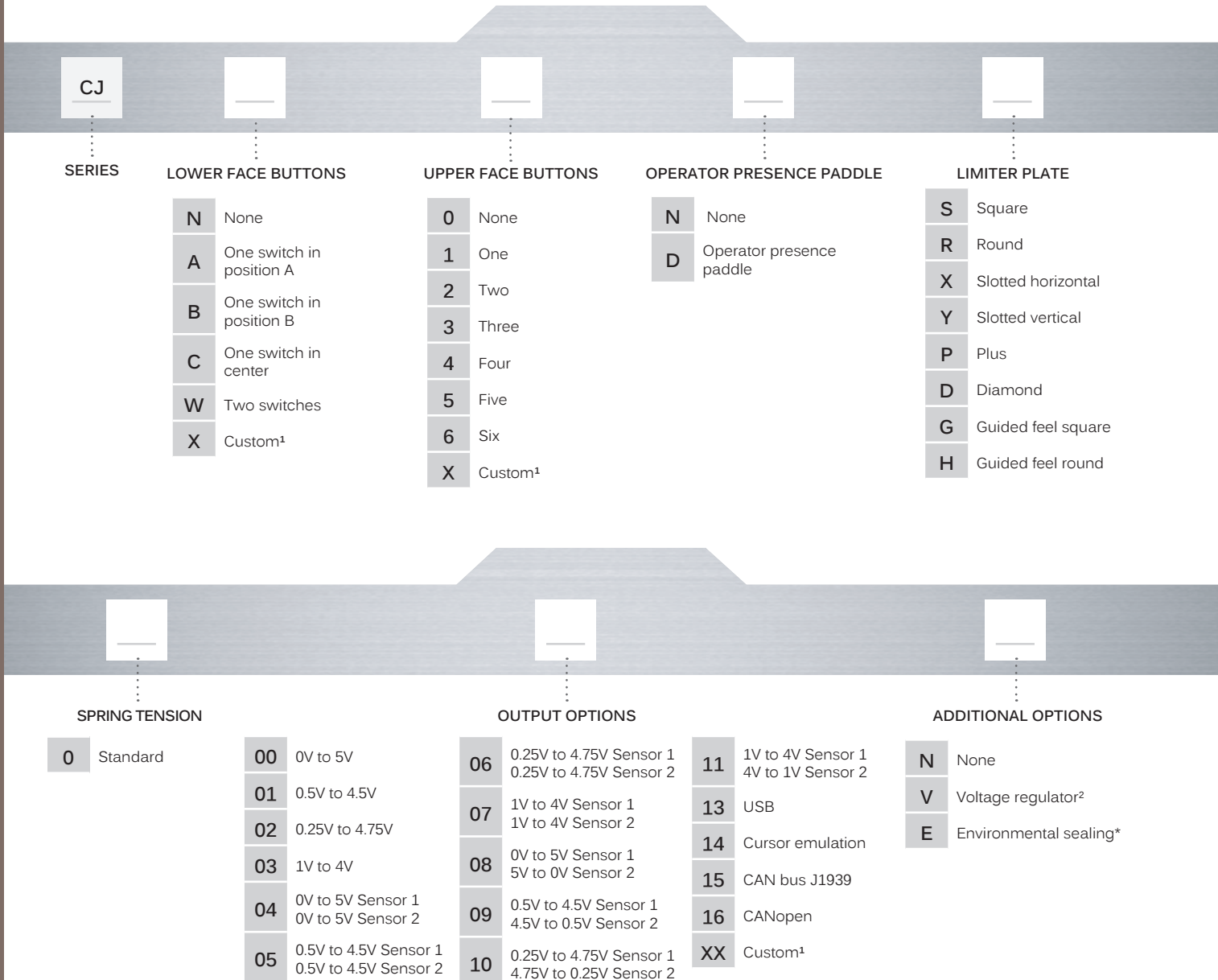| START POSITION (BYTE/BIT)	LENGTH (BITS)	FUNCTION
1/1	2	Redundant X-axis neutral position status
1/3	2	Redundant X-axis left position status
1/5	2	Redundant X-axis right position status
1/7 to 2/8	10	Redundant X-axis position data
3/1	2	Redundant Y-axis neutral position status
3/3	2	Redundant Y-axis down position status
3/5	2	Redundant Y-axis up position status
3/7 to 4/8	10	Redundant Y-axis position data

EJM2 DATA FIELD STRUCTURE:

START POSITION (BYTE/BIT)	LENGTH (BITS)	FUNCTION
1/1	2	A-axis neutral position status
1/3	2	A-axis left position status
1/5	2	A-axis right position status
1/7 to 2/8	10	A-axis position data
3/1	2	B-axis neutral position status
3/3	2	B-axis left position status
3/5	2	B-axis right position status
3/7 to 4/8	10	B-axis position data
5/1	2	C-axis neutral position status
5/3	2	C-axis left position status
5/5	2	C-axis right position status
5/7 to 6/8	10	C-axis position data

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🧩 BUILD YOUR PART NUMBER

| CJ | ___ | ___ | ___ | ___ |

SERIES

LOWER FACE BUTTONS

N	None
A	One switch in position A
B	One switch in position B
C	One switch in center
W	Two switches
X	Custom[1]

UPPER FACE BUTTONS

0	None
1	One
2	Two
3	Three
4	Four
5	Five
6	Six
X	Custom[1]

OPERATOR PRESENCE PADDLE

N	None
D	Operator presence paddle

LIMITER PLATE

S	Square
R	Round
X	Slotted horizontal
Y	Slotted vertical
P	Plus
D	Diamond
G	Guided feel square
H	Guided feel round

SPRING TENSION

0	Standard

OUTPUT OPTIONS

00	0V to 5V
01	0.5V to 4.5V
02	0.25V to 4.75V
03	1V to 4V
04	0V to 5V Sensor 1 / 0V to 5V Sensor 2
05	0.5V to 4.5V Sensor 1 / 0.5V to 4.5V Sensor 2

06	0.25V to 4.75V Sensor 1 / 0.25V to 4.75V Sensor 2
07	1V to 4V Sensor 1 / 1V to 4V Sensor 2
08	0V to 5V Sensor 1 / 5V to 0V Sensor 2
09	0.5V to 4.5V Sensor 1 / 4.5V to 0.5V Sensor 2
10	0.25V to 4.75V Sensor 1 / 4.75V to 0.25V Sensor 2

11	1V to 4V Sensor 1 / 4V to 1V Sensor 2
13	USB
14	Cursor emulation
15	CAN bus J1939
16	CANopen
XX	Custom[1]

ADDITIONAL OPTIONS

N	None
V	Voltage regulator[2]
E	Environmental sealing*

NOTES
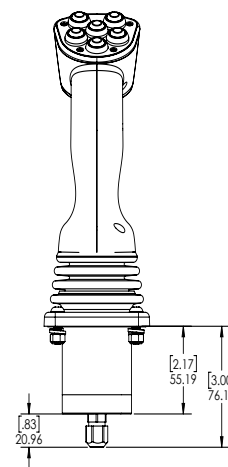[1] Contact Technical Sales for custom options
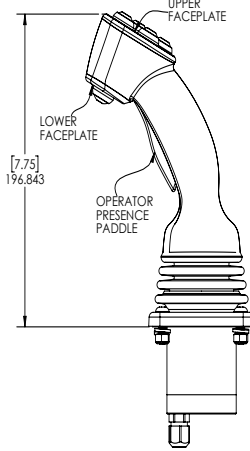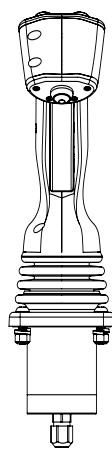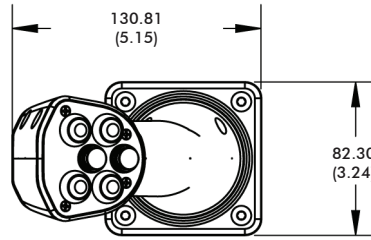[2] Not available on dual output
[3] Environmental sealing dependent on specific configuration. Please consult factory for additional information.
* Mounting accessories: standard hardware includes 4 Phil. screws (6-32x7/8) .
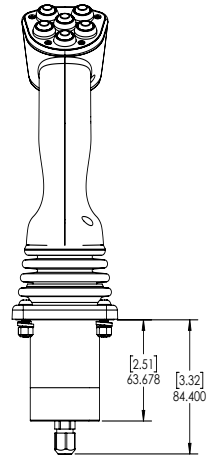
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DIMENSIONS

130.81
(5.15)

82.30
(3.24)

UPPER
FACEPLATE

LOWER
FACEPLATE

OPERATOR
PRESENCE
PADDLE

[7.75]
196.843

[2.17]
55.19

[3.00]
76.15

[.83]
20.96

[2.51]
63.678

[3.32]
84.400

Analog & USB

CAN

LOWER FACE BUTTONS

N   A   B   C   W

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⤬ USB SPECIFICATIONS

- Supply Voltage Range: 5.00 VDC
- Maximum current: 70 mA
- USB version: 2.0

USB GAME CONTROLLER
Featuring USB 2.0 HID compliant interface, APEM's USB joysticks are recognized as standard HID "game controller" devices. Adhering to the HID specification, APEM's USB joysticks are plug-and-play with most versions of Windows. Joystick button and axis assignments are dependent upon the controlled application.

Features

- USB 2.0 HID compliant "game controller" device
- Easy to install and operate
- Functions determined by controlled application
- 12-bit (0 to 4095) axis resolution

Termination (supplied cable)

- USB Male Type A Connector (198 cm)
  - (84" +/-1") - overmolded cable - Male Type A USB connector (Output option 13)

USB CURSOR EMULATION
The Cursor Emulation option converts multi-axis joystick output into a mouse or cursor control device. The Cursor Emulation option is ideal for vehicle applications subjected to dirt and high vibration which makes operating a traditional cursor control device difficult. Cursor simulation is only compatible with Window OS.

Features

- HID compliant "mouse" device

Button Function

- B1: Left Mouse Click
- B2: Right Mouse Click

Termination (supplied cable)

- USB Male Type A Connector (185 cm):
  - (72" +/-1") - overmolded cabled - Mini B to Male Type A USB connector (option 0U)

SUPPORTED OPERATING SYSTEMS: USB GAME CONTROLLER AND CURSOR EMULATION

Windows Operating System

- Windows 7
- Windows 8.1
- Windows 10

Linux Operating System
APEM's USB joysticks are compatible with Linux, although system compatibility is not guaranteed. The user is responsible for verifying specific Linux OS compatibility.

Custom Firmware
Custom configurations and firmware is availableupon request. Available options include:

- 8-bit axis resolution
- 10-bit axis resolution
- Signed bit axis resolution
- Custom USB product name

⤬ VOLTAGE REGULATOR SPECIFICATIONS

The Voltage Regulator allows APEM's Hall effect joysticks to operate with a range of supply voltages..

Voltage Regulator - Unipolar

- Supply Voltage Range: 8-35 VDC
- Output Voltage Range: see output options
- Maximum Current: 90 mA

Voltage Regulator - Bipolar

- Supply Voltage Range: 11-35 VDC
- Output Voltage Range: ±10 VDC
- Maximum Current: 90 mA

Termination (flying leads)

- 28 AWG 20.32 cm (8.0") ±1.54 cm (1") PTFE