

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° ($\pm 20^\circ$)
- 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



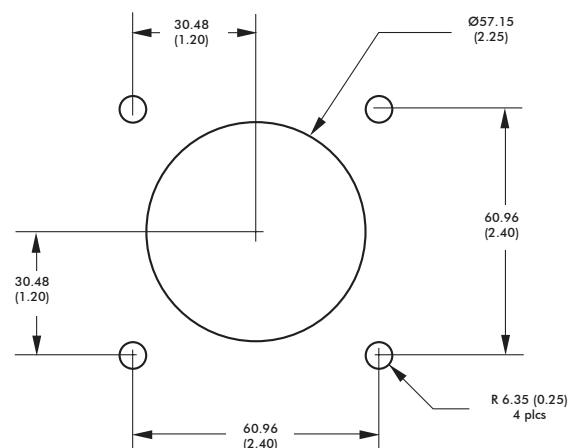
TERMINATION

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



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
- BJMI/EJMI 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: 0x10¹
 - Data field: 8 bytes
- Redundant Axis data on Extended Joystick Message 1 (EJM1):
 - Priority: 3
 - Base PGN: 0xFDD7
 - Source address: 0x10¹
 - Data field: 8 bytes
- Additional thumbwheels and mini-joysticks data on Extended Joystick Message 2 (EJM2):
 - Priority: 3
 - Base PGN: 0xFDD9
 - Source address: 0x10¹
 - Data field : 8 bytes

Note 1: Alternate source addresses can be configured by grounding of the blue and/or orange wires.

- Source address= 0x10: ORANGE= floating , BLUE= floating (default)
- Source address= 0x20: ORANGE= floating, BLUE= grounded
- Source address= 0x30: ORANGE= grounded, BLUE= floating
- Source address= 0x40: 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 configuration)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

SERIES	LOWER FACE BUTTONS	UPPER FACE BUTTONS	OPERATOR PRESENCE PADDLE	LIMITER PLATE
CJ	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	0 None 1 One 2 Two 3 Three 4 Four 5 Five 6 Six X Custom ¹	N None D Operator presence paddle	S Square R Round X Slotted horizontal Y Slotted vertical P Plus D Diamond G Guided feel square H Guided feel round
SPRING TENSION	OUTPUT OPTIONS		ADDITIONAL OPTIONS	
0 Standard	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 Game controller 14 USB cursor emulation 15 CAN bus J1939 16 CANopen XX Custom ¹	N None V Voltage regulator ² E Environmental sealing*

NOTES

¹ Contact Technical Sales for custom options

² Not available on dual output

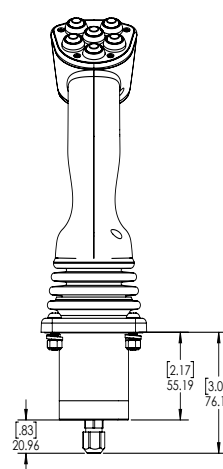
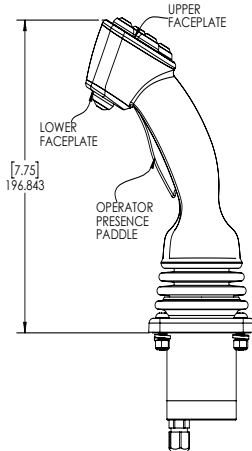
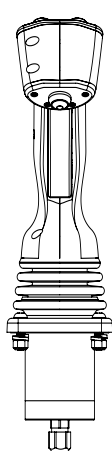
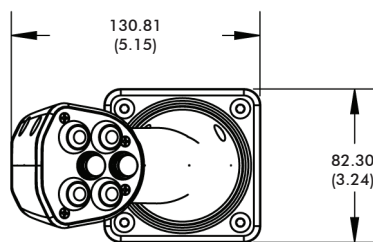
³ Environmental sealing dependent on specific configuration. Please consult factory for additional information.

* Mounting accessories: standard hardware includes 4 Phil. screws (6-32x7/8).

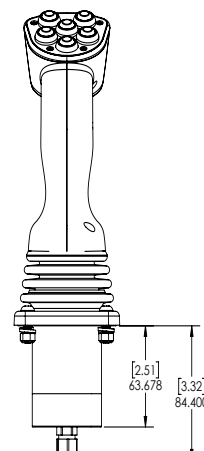
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DIMENSIONS



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 13 and 14)

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 available upon 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: 12-35 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