

# MEDIUM HALL EFFECT JOYSTICK

JHM  
MEDIUM  
JOYSTICK

UP TO 10 MILLION OPERATIONAL CYCLES IN ALL DIRECTIONS



Handle Style 32 with  
2 Pushbuttons



Handle Style 61  
with Rocker and  
5 Switches

The JHM is a medium, bottom mount, full-function joystick that fits in an armrest, on a panel or other locations with a shallow behind-panel depth. It utilizes Hall effect technology for long life and reliability. Electronics are sealed up to IP68S with an operational life of 10 million cycles in all directions.

The standard JHM offers 19 handle styles such as a ball handle, a lockout handle, a G3-D Control Grip and handles with pushbuttons, rockers and 5-button keypads. It can also be paired with any OTTO Universal Series grip.

Output options include CANopen, J1939, PWM, USB, analog and digital control outputs, and redundant sensors.

Gating options include single axis, dual axis, friction y-axis, and various omnidirectional selections that include omnidirectional round smooth feel, omnidirectional on-axis and off-axis guided feel and omnidirectional square on-axis guided feel.

## Features:

- **Designed for armrest and panel mounting**
- **Shorter behind panel depth, bottom mount**
- **Contactless analog output Hall effect technology**
- **Electronics sealed up to IP68S**
- **Up to 10 million operational cycles in all directions**
- **Available with a variety of grip and switch options**
- **Redundant sensors available**
- **Various output configurations include:**
  - CANopen
  - J1939
  - USB
  - PWM
  - Serial
  - Analog
- **Variety of gating options**
- **RoHS compliant**

### Standard Characteristics/Ratings:

**Sensor Type:** Hall effect analog, factory programmed with temperature compensation, ground and supply line break detection, and over voltage and reverse voltage protection options.

**Design:** Contactless sensing using dual bar permanent magnet

#### ELECTRICAL RATINGS: Joystick Rated at 5V @ 20°C, Load = 1mA (4.7kΩ)

Electrical	Units	Min	Typ	Max
Supply Voltage, Vcc	VDC	4.5	5.0	5.5
Output Voltage Tolerance at Center AA, BB, CC, DD, EE, FF, GG & HH	5V Vcc	-0.25	N/A	+0.25
Output Voltage Tolerance at Center AT, BT, CT, DT, ET & FT	5V Vcc	-0.15	N/A	+0.15
Output Voltage Tolerance Full Travel	5V Vcc	-0.25	N/A	+0.25
Supply Current Per Sensor	mA	N/A	N/A	10.00
Output Source Current Limit	mA	-1.00	N/A	1.00

#### ELECTRICAL RATINGS: U2 Rated at Vcc = 5V @ 25°C, Load = 1mA (4.7kΩ)

Electrical	Units	Min	Typ	Max
Supply Voltage, Vcc	VDC	4.5	5.0	5.5
Output Voltage +, - 0° Deflection	5V Vcc	2.25	2.50	2.75
Output at Full Travel Direction -Z	5V Vcc	0.45	0.50	0.75
Output at Full Travel Direction +Z	5V Vcc	4.25	4.50	4.55
Supply Current B-0, Vcc=5V, 1o=0	mA	N/A	N/A	10.00

#### ELECTRICAL RATINGS: P9 Switches Rated at 10mA Resistive Load at 5VDC

Electrical Life: 1,000,000 cycles

### MECHANICAL (JOYSTICK):

**Mechanical Life:** 5 Million Cycles, High Force  
10 Million Cycles, Low Force  
2.5 Million Cycles, Outputs JJ, KK, MM, NN, Rear Mount  
250,000 Cycles, Friction Held, High Force  
Boot Life up to 1 Million Cycles

Mechanical (Operating Force w/Boot)	Units	Min	Typ	Max
Travel Angle	Degrees	18°	20°	22°
High Force @ 2° GRP (Return to Center)	Lbs.	0.5	1.25	2.0
Low Force @ 2° GRP (Return to Center)	Lbs.	0.5	1.0	1.5
High Force @ 3° GRP (Return to Center)	Lbs.	0.5	1.0	1.5
Low Force @ 3° GRP (Return to Center)	Lbs.	0.4	0.7	1.0
High Force @ 4° GRP (Return to Center)	Lbs.	1.2	2.5	3.8
Handle Styles 51, 52, 53				
Low Force @ 4° GRP (Return to Center)	Lbs.	0.4	0.8	1.2
Handle Styles 51, 52, 53				
High Force (w/Boot) Y Direction @ 2° GRP (Friction)	Lbs.	1.5	4.5	7.5
High Force (w/Boot) Friction @ 3° GRP, Y Direction	Lbs.	1.0	3.5	6.0
High Force (w/Boot) Friction @ 4° GRP (Handle Styles 51, 52, 53), Y Direction	Lbs.	0.8	2.4	4.0

#### MECHANICAL (U2 SWITCH): 2,500,000 Cycle Mechanical Life

Mechanical	Units	Min	Typ	Max
Operating Force	Oz.	3.5	6.5	9.5

#### MECHANICAL (P9 SWITCH): 1,250,000 Cycle Mechanical Life

Mechanical	Units	Min	Typ	Max
Operating Force	Oz.	8	12	16

#### MECHANICAL (KEYPAD PUSHBUTTONS): 3,000,000 Cycle Mechanical Life

Mechanical	Units	Min	Typ	Max
Operating Force	Oz.	2	8	10

### ENVIRONMENTAL

Operating Temperature (except below)	°C	-40	20	85
Operating Temperature (Handles 61, 62)	°C	-25	20	70
Storage Temperature (Handles 61, 62)	°C	-40	20	85
Electronics (Handles 11, 12, 21, 35, 41, 53, 71, 72)		IP68S		
Seal		Handle styles 34 and 35 panel sealed to IP68S		
RFI / EMI		Withstand per SAE J1113		

## HALL EFFECT TECHNOLOGY JOYSTICK

### JHM PART NUMBER CODE

<b>JHM</b> – <b>XX</b>	<b>X</b>	<b>X</b>	<b>XX</b>	<b>X</b>
<b>Handle Style*</b>				
11. No Handle ①	1. Gated; Single axis – Return to Center	1. Low ④	AA. 2.5 +/- 2.0VDC	NONE
12. Standard - Blank ①	2. Gated; Dual axis – Return to Center	2. High	BB. 2.5 +/- 2.0VDC	2.5 +/- 2.0VDC
21. With Hall effect Rocker	3. Omni-directional; Round Smooth Feel		CC. 2.5 +/- 2.0VDC	2.5 +/- 2.0VDC
31. With Pushbutton-Top Handle, Half Boot	4. Omni-directional; On-Axis and Off-Axis Guided Feel		DD. 2.5 +/- 1.5VDC	NONE
32. With 2 Pushbuttons - Handle	5. Omni-directional; Round On-Axis Guided Feel		EE. 2.5 +/- 1.5VDC	2.5 +/- 1.5VDC
33. With 3 Pushbuttons	6. Friction - Single axis ①④		FF. 2.5 +/- 1.5VDC	2.5 +/- 1.5VDC
34. With Pushbutton - Top Handle, Full Boot ②	7. Friction Y-axis; Return to Center X-axis ①④		GG. 0.5 - 4.5VDC	0.5 - 4.5VDC
35. No Pushbutton - Top Handle, Full Boot ①②	8. Omni-directional; Square Smooth Feel		HH. 1.0 - 4.0VDC	1.0 - 4.0VDC
41. Lockout ①⑥	9. Omni-directional; Square On-axis Guided Feel		AT. 2.5 +/- 2.0VDC	NONE
51. G3-D, Rocker and Operator Presence ②			BT. 2.5 +/- 2.0VDC	2.5 +/- 2.0VDC
52. G3-D, Rocker ③			CT. 2.5 +/- 2.0VDC	2.5 +/- 2.0VDC
53. G3-D, Blank ①③			DT. 2.5 +/- 1.5VDC	NONE
54. G3-D, Operator Presence			ET. 2.5 +/- 1.5VDC	2.5 +/- 1.5VDC
61. 5-Button Keypad & Hall Rocker Right ③⑤			FT. 2.5 +/- 1.5VDC	2.5 +/- 1.5VDC
62. 5-Button Keypad & Hall Rocker Left ③⑤			JJ. CANbus J1939 ⑤	NONE
63. 7-Button Keypad & Hall Rocker Right ⑤			KK. CANopen ⑤	NONE
64. 7-Button Keypad & Hall Rocker Left ⑤			LL. PWM	NONE
71. Ball Handle, Large, Thermoset ①			MM. USB, Inverted Y ⑤⑦	NONE
72. Ball Handle, Small, Rubber ①			NN. USB, Standard Y ⑦	NONE

\* Wire loop not in handle style 11, 12, 35, 41, 53 and 71.

\*\*Outputs are from the center to the full travel position in each direction. Options "AA", "BB", "CC", "DD", "EE", "FF", "AT", "BT", "CT", "DT", "ET" and "FT" provide increased voltage in +x, +y; and decreasing voltage in -x, -y for output 1. Options "GG" and "HH" provide increasing voltages in all directions (+x, +y, -x, -y) for output 1 and output 2.

Options "BB", "EE", "BT", "ET" provide redundant output 2 which duplicates output 1.

Options "CC", "FF", "CT", "FT" provide redundant output 2 which is inverse of output 1.

Options "AT", "BT", "CT", "DT", "ET" and "FT" are identical to options "AA", "BB", "CC", "DD", "EE", and "FF" respectively except with a tighter center tolerance.

For pricing on PWM output, please contact factory at 847-428-7171.

\*\*\*Outputs "AA" through "FT" and "LL" utilize termination 1, outputs "JJ" and "KK" utilize termination 2, and outputs "MM" and "NN" utilize termination 3.

① Friction hold only available with handle styles 11, 12, 35, 41, 53, 71 and 72.

② Watertight panel seal applies to handle style 34 and 35.

③ Handle styles 61, 62 have the following wires for the 5-button switch array: 26 AWG, MIL-W-22759/33.  
Handle styles 52, 53 have the following wires for the handle wires: 22 AWG, UL1569.

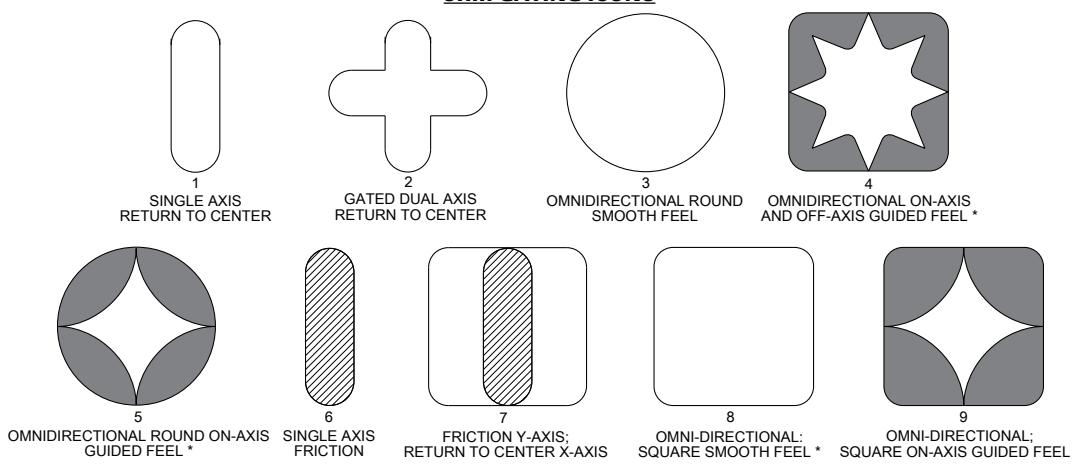
④ Low force not available with gating options 6 and 7.

⑤ Outputs "JJ", "KK", "MM" not available with handle styles 61, 62, 63, 64.

⑥ Only available with gating options 1, 3 and 6.

⑦ For outputs MM and NN, the reported values for the x direction increase as the joystick moves from left to right. For option MM (inverted y), the reported values for the y direction decrease as the joystick moves from far to near. For output NN (standard y), the reported values for the y-direction increase as the joystick moves from far to near.

### JHM GATING ICONS



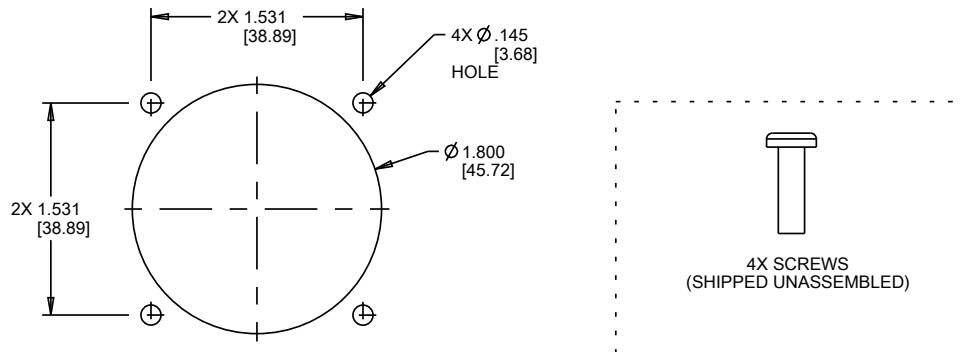
\* FEEL DEFINED BY SHADING

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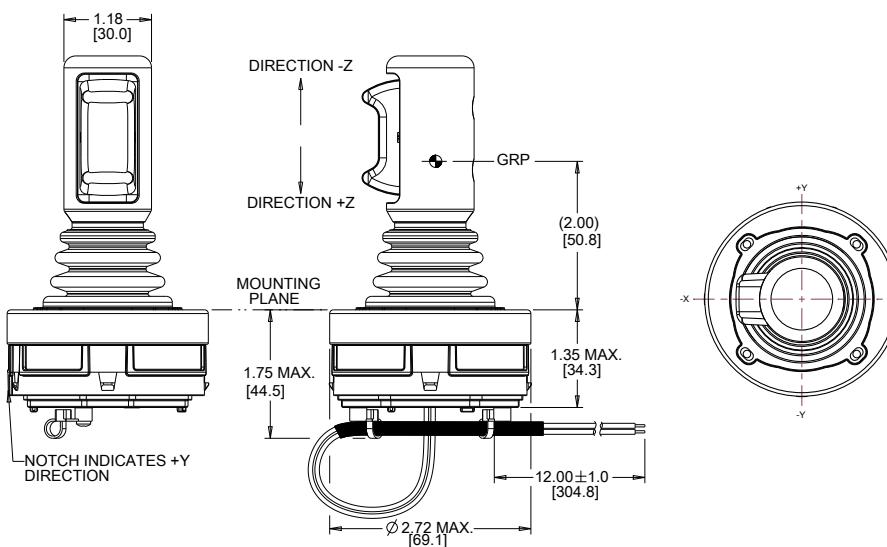
## JHM Suggested Panel Opening



SUGGESTED PANEL OPENING  
REAR MOUNT  
(ALL HANDLE STYLES EXCEPT HANDLE 51)  
PANEL THICKNESS .06

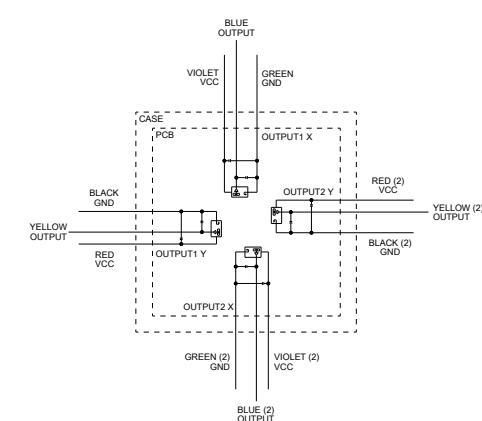
## Mounting Hardware Information

MATERIAL:	
MOUNTING HARDWARE (EXCEPT HANDLE STYLE 51)	4X M3X0.5X14MM



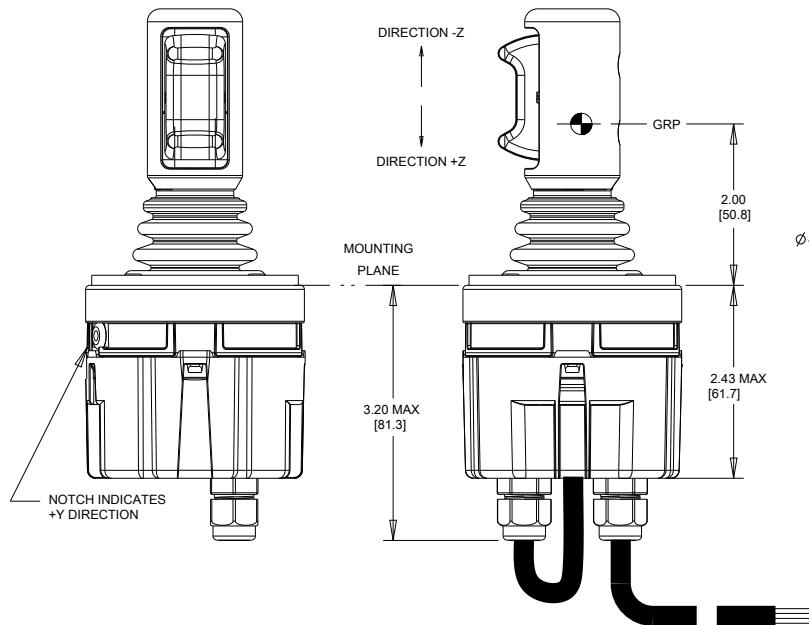
## JHM Outputs AA-FT and LL (Output Graph at end of JHM section)

PWM PRODUCT SPECIFICATIONS				
ELECTRICAL:				
PWM INTERFACE				
SUPPLY VOLTAGE, Vcc	VDC	4.5	N/A	18.0
OUTPUT FREQUENCY	Hz	460	500	540
AMPLITUDE LOW	A	0.0	N/A	.020
AMPLITUDE HIGH PULLUP REQUIRED	VDC	3.0	N/A	12.0
PWM OUTPUT @ +X AND +Y FULL TRAVEL	%	80.0	90.0	92.0
PWM OUTPUT @ ZERO TRAVEL	%	42.0	50.0	58.0
PWM OUTPUT @ -X AND -Y FULL TRAVEL	%	8.0	10.0	20.0



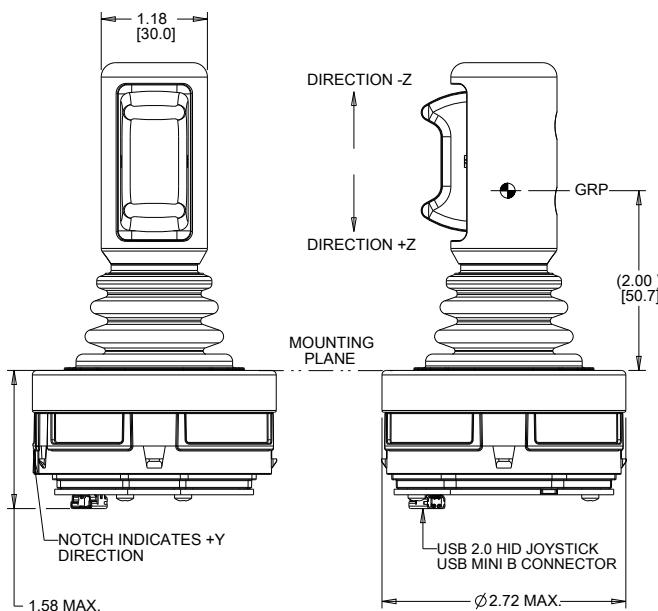
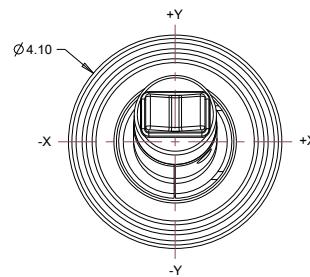
## HALL EFFECT TECHNOLOGY JOYSTICK

### Rear Mount Style



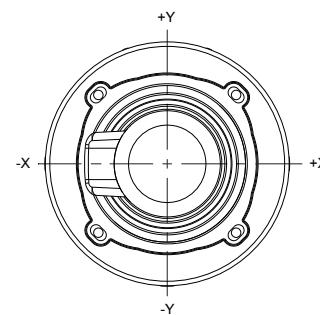
### JHM Outputs JJ and KK

FUNCTION	COLOR	PRODUCT SPECIFICATIONS			
CAN HIGH	YELLOW	ELECTRICAL:			
-SUPPLY	BLACK	JOYSTICK CAN OPEN			
+SUPPLY	RED				
CAN LOW	GREEN	SUPPLY VOLTAGE	UNITS	MIN	TYP
SHIELD	DRAIN	VDC		9	N/A
		NODE IDENTIFIER		10	DECIMAL
		BAUD RATE		125K	bits/s
		TRANSMISSION REPETITION RATE		100	ms
		JOYSTICK J1939			
		SUPPLY VOLTAGE	UNITS	MIN	TYP
		VDC		9	N/A
		SOURCE ADDRESS		51	DECIMAL
		BAUD RATE		250K	bits/s
		TRANSMISSION REPETITION RATE		100	ms



### JHM Outputs MM and NN

PRODUCT SPECIFICATIONS	
ELECTRICAL:	JOYSTICK POWERED BY STANDARD USB INTERFACE



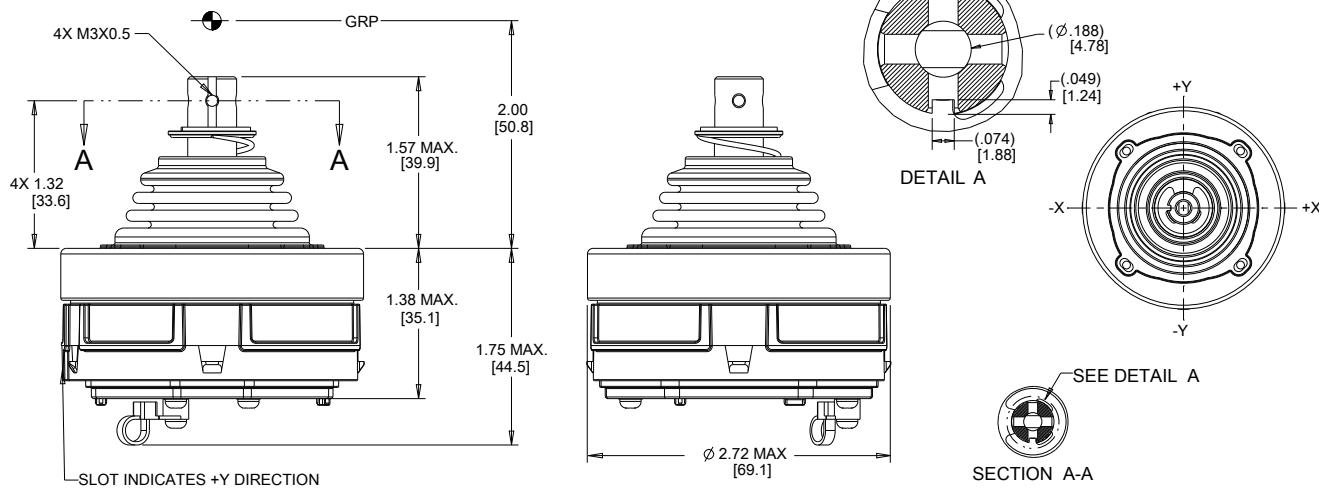
Wires and Strain Relief not shown in all views for clarity.

# MEDIUM HALL EFFECT JOYSTICK

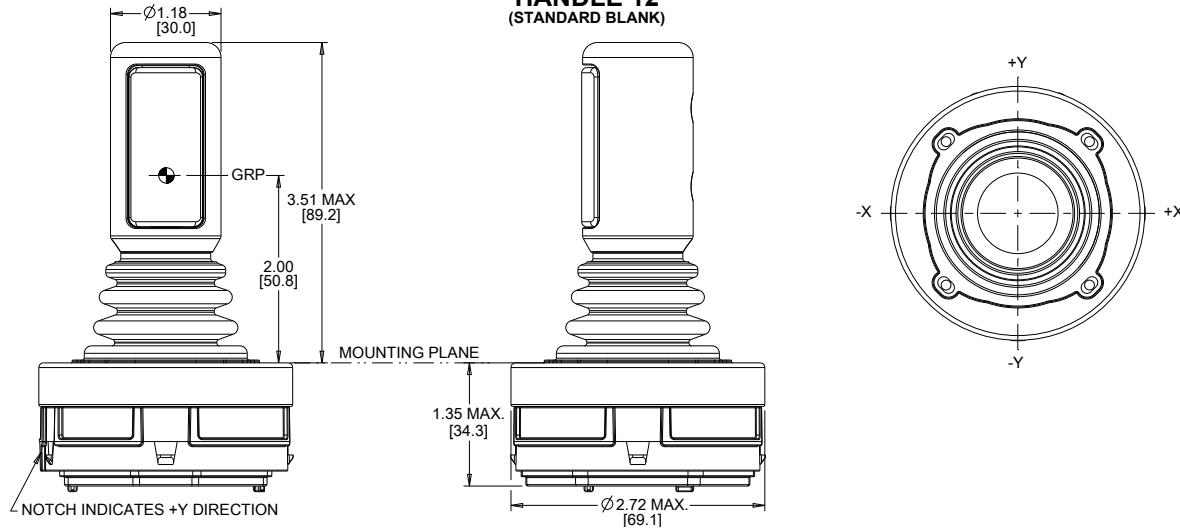
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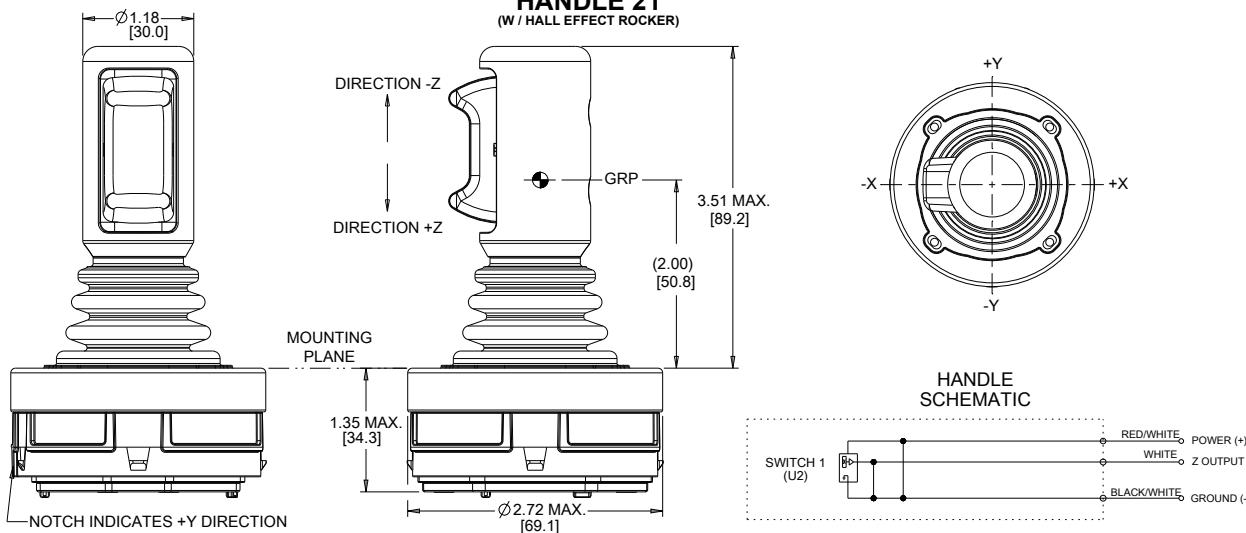
## HANDLE 11 (No Handle)



## HANDLE 12 (STANDARD BLANK)



## HANDLE 21 (W/ HALL EFFECT ROCKER)

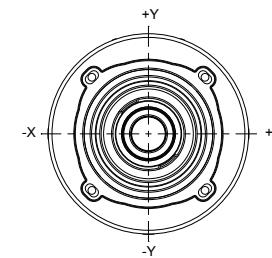
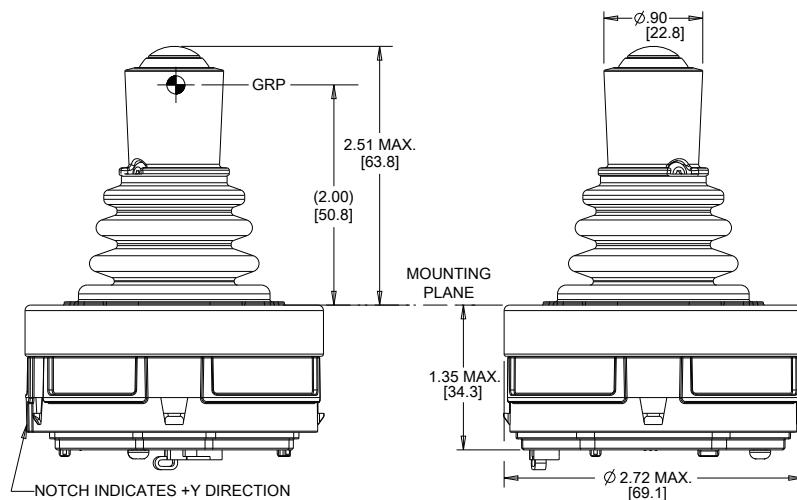


Wires and Strain Relief not shown in all views for clarity.

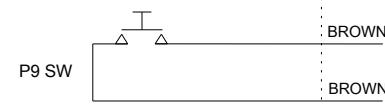
## HALL EFFECT TECHNOLOGY JOYSTICK

### HANDLE 31

(W / PUSHBUTTON, TOP HANDLE, HALF BOOT)

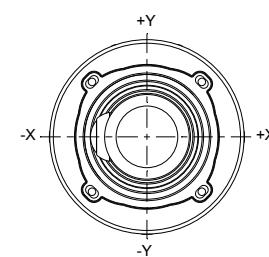
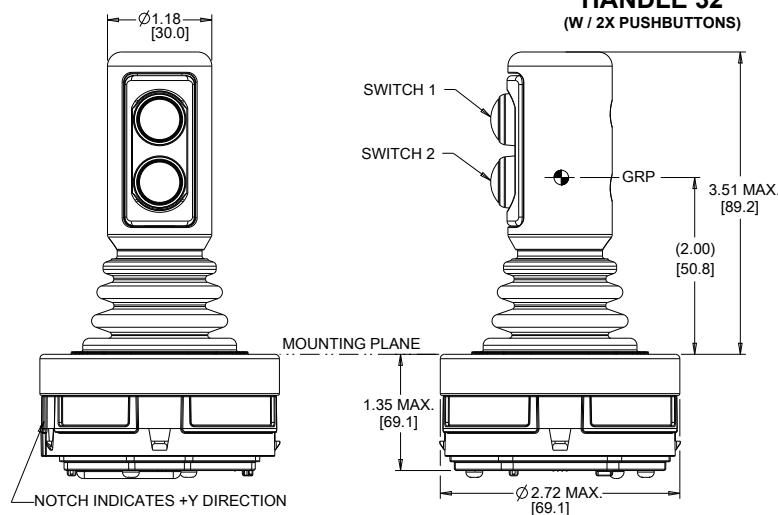


HANDLE SCHEMATIC

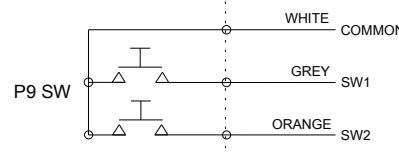


### HANDLE 32

(W / 2X PUSHBUTTONS)

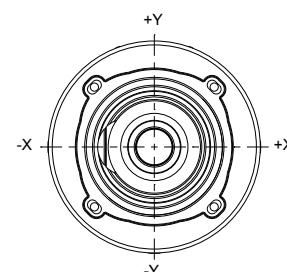
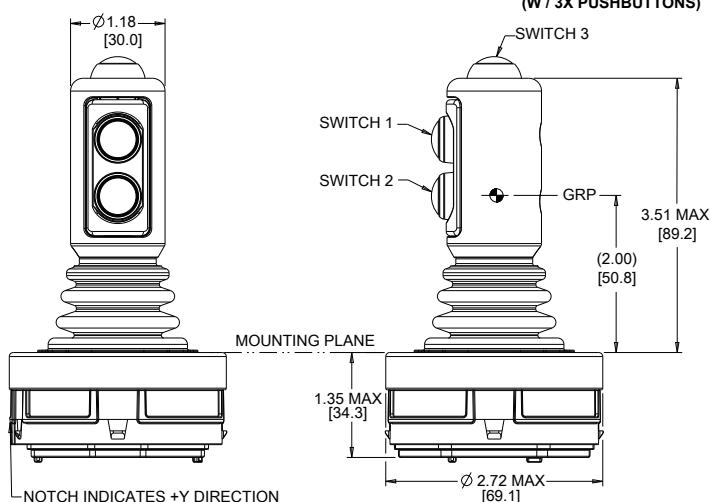


HANDLE SCHEMATIC

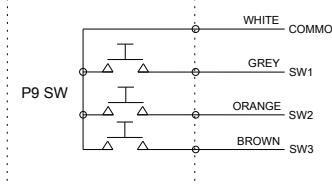


### HANDLE 33

(W / 3X PUSHBUTTONS)



HANDLE SCHEMATIC



Wires and Strain Relief not shown in all views for clarity.

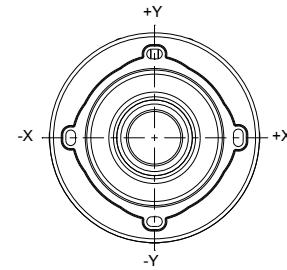
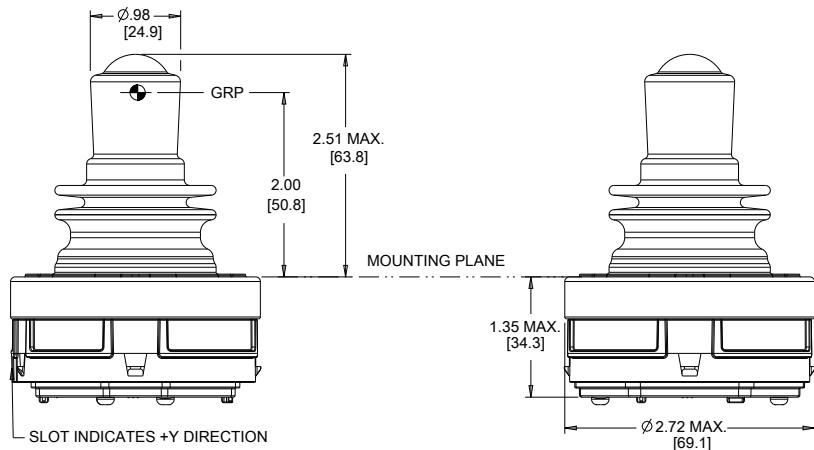
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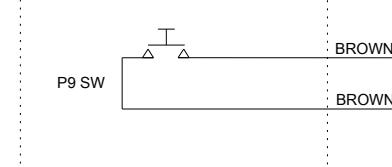
UP TO 10 MILLION OPERATIONAL CYCLES IN ALL DIRECTIONS

## HANDLE 34

(W / PUSHBUTTON, TOP HANDLE, FULL BOOT)

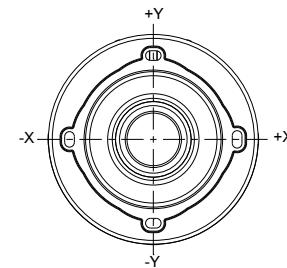
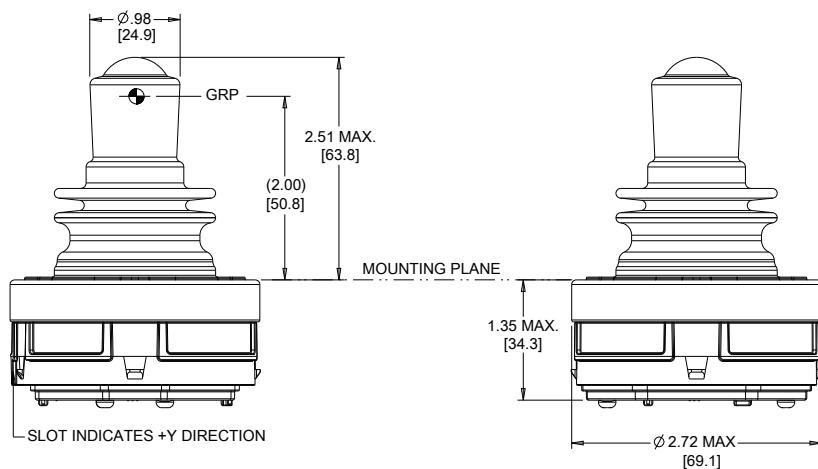


HANDLE SCHEMATIC

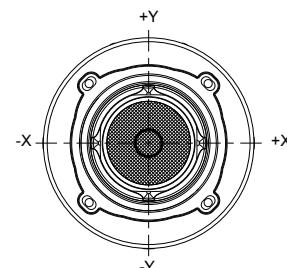
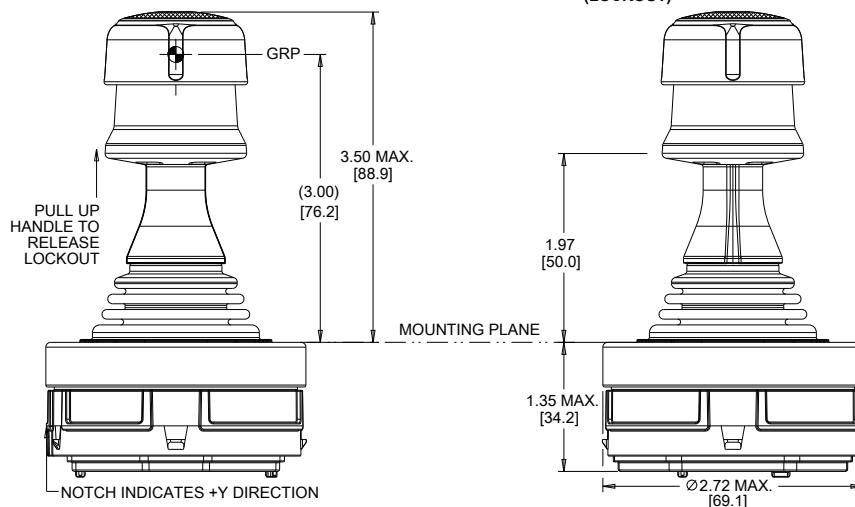


## HANDLE 35

(NO PUSHBUTTON, TOP HANDLE, FULL BOOT)



## HANDLE 41 (LOCKOUT)



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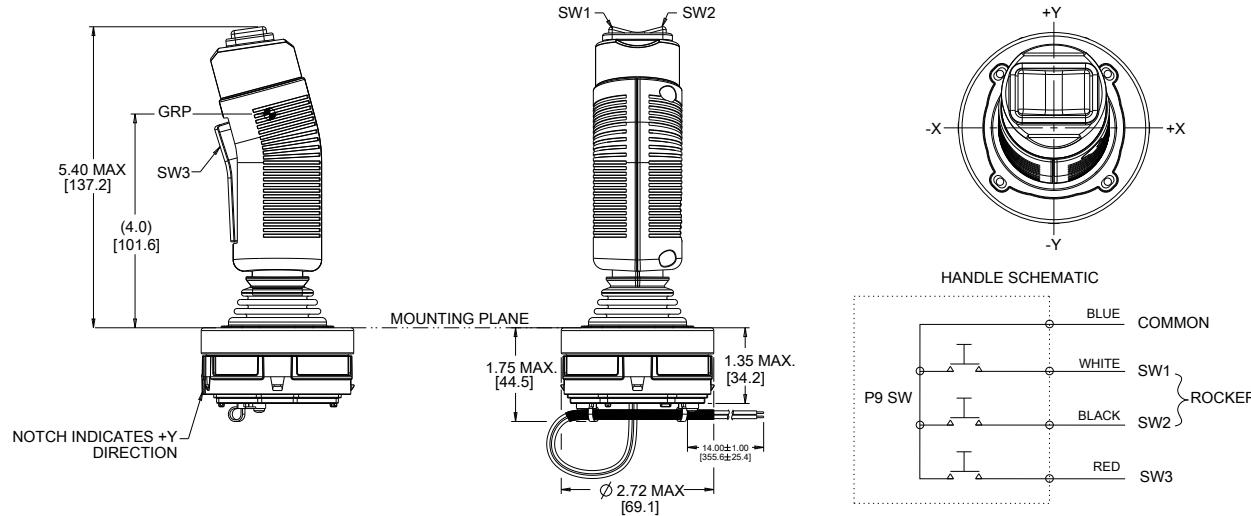
Specifications Subject To Change Without Notice

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## HALL EFFECT TECHNOLOGY JOYSTICK

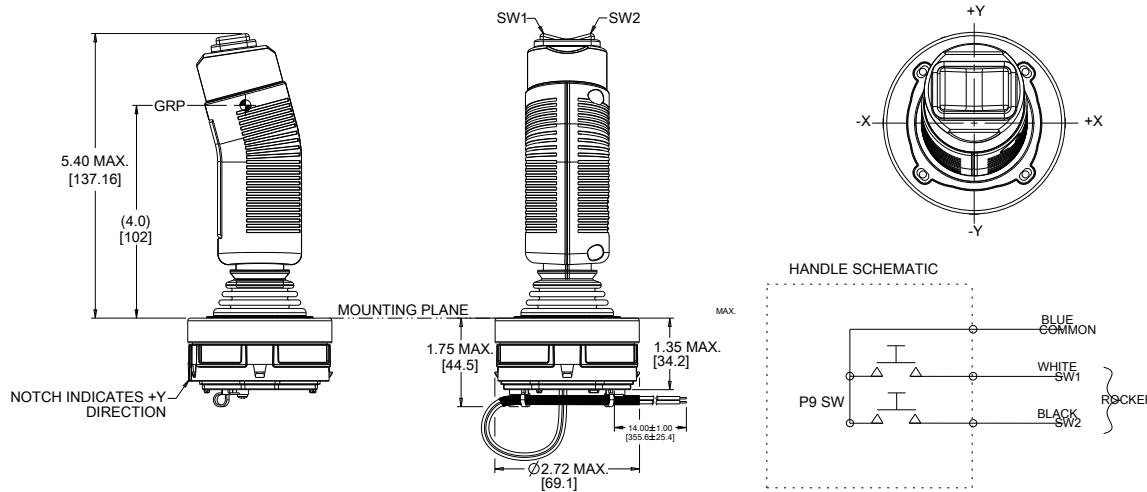
### HANDLE 51

(G3-D WITH ROCKER AND OPERATOR PRESENCE)



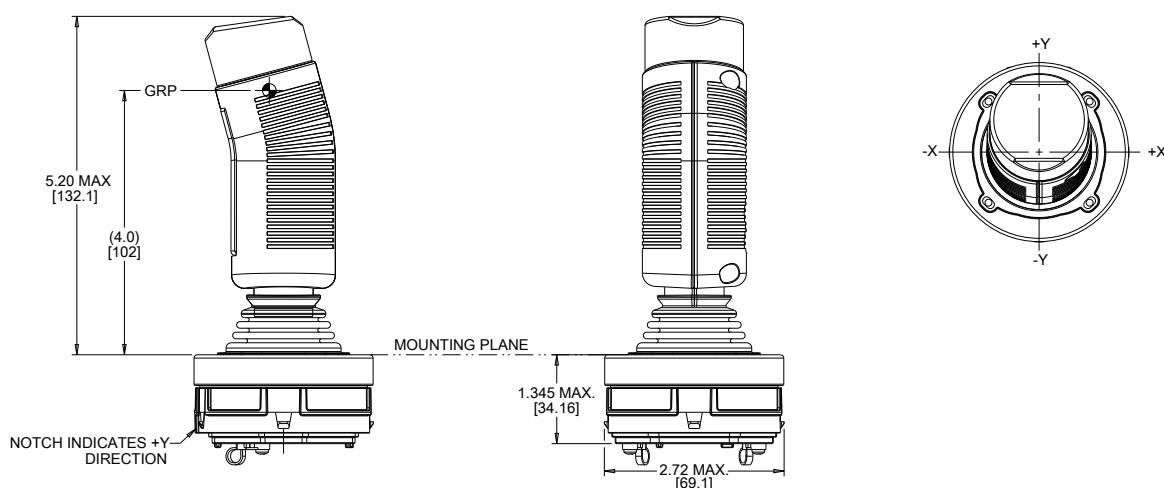
### HANDLE 52

(G3-D WITH ROCKER)



### HANDLE 53

(G3-D)



**Wires and Strain Relief not shown in all views for clarity.**

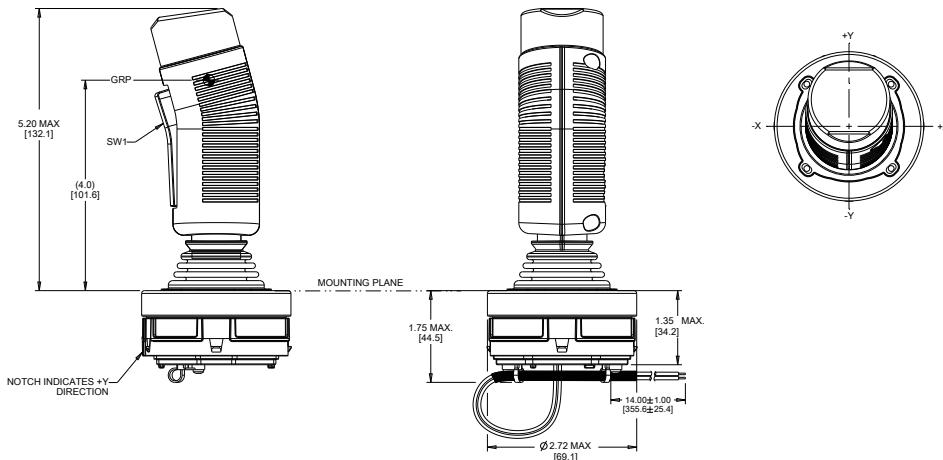
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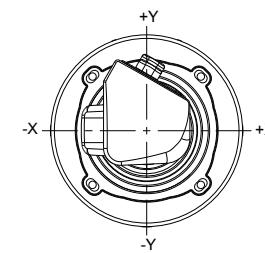
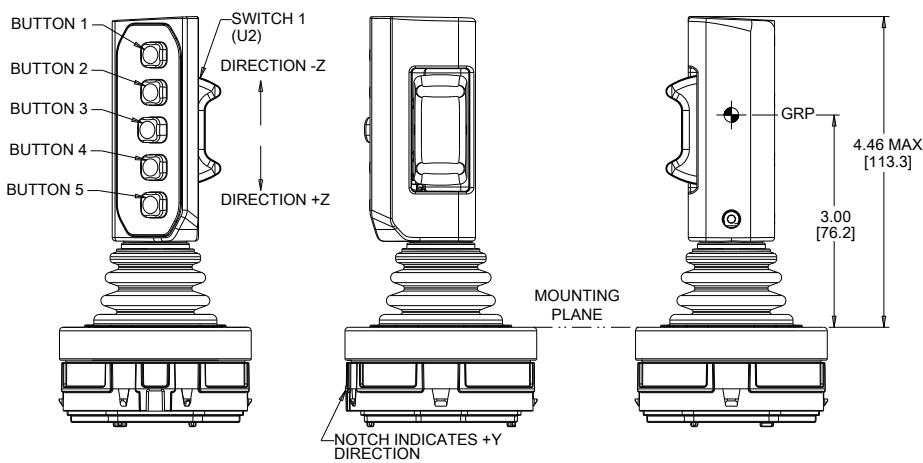
### HANDLE 54

(G3-D WITH OPERATOR PRESENCE)



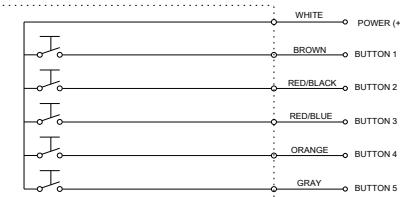
### HANDLE 61

(5-BUTTON KEYPAD & HALL ROCKER RIGHT)



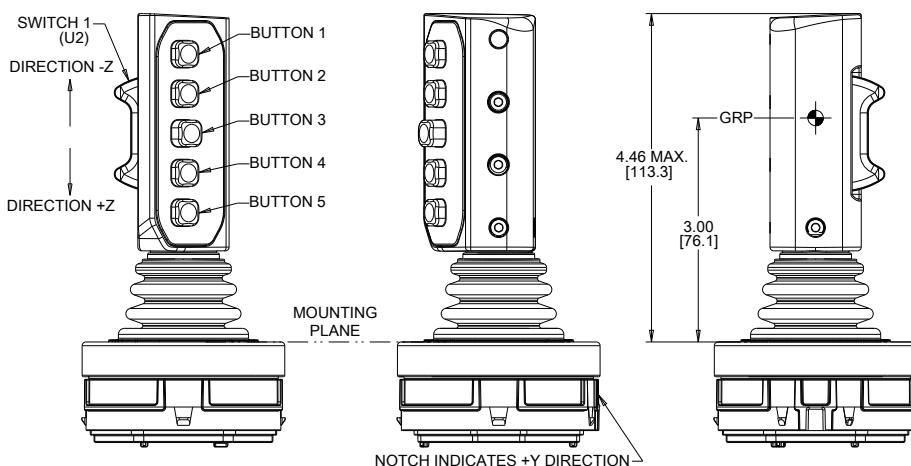
Right-Handed Version

#### BUTTON SCHEMATIC

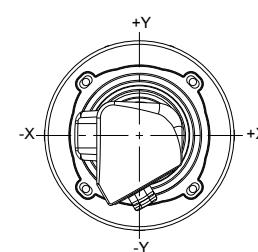
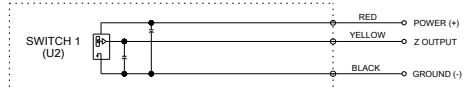


### HANDLE 62

(5-BUTTON KEYPAD & HALL ROCKER LEFT)



#### HANDLE SCHEMATIC



Left-Handed Version

Wires and Strain Relief not shown in all views for clarity.

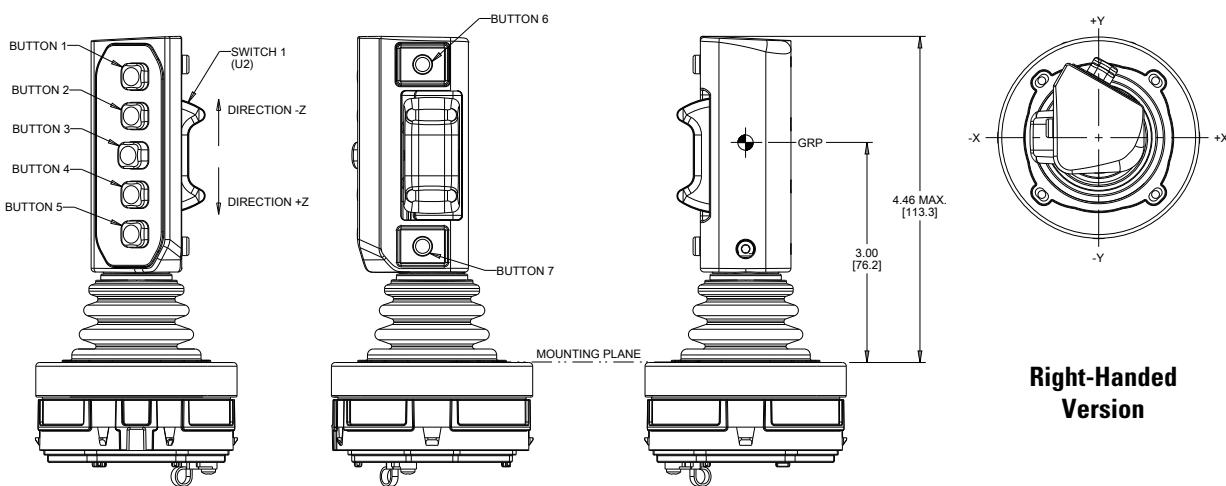
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UP TO 10 MILLION OPERATIONAL CYCLES IN ALL DIRECTIONS

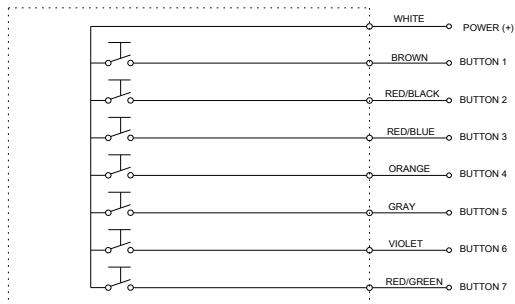
## HANDLE 63

(7-BUTTON KEYPAD & HALL ROCKER RIGHT)

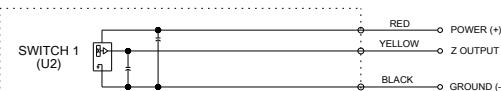


Right-Handed  
Version

### BUTTON SCHEMATIC

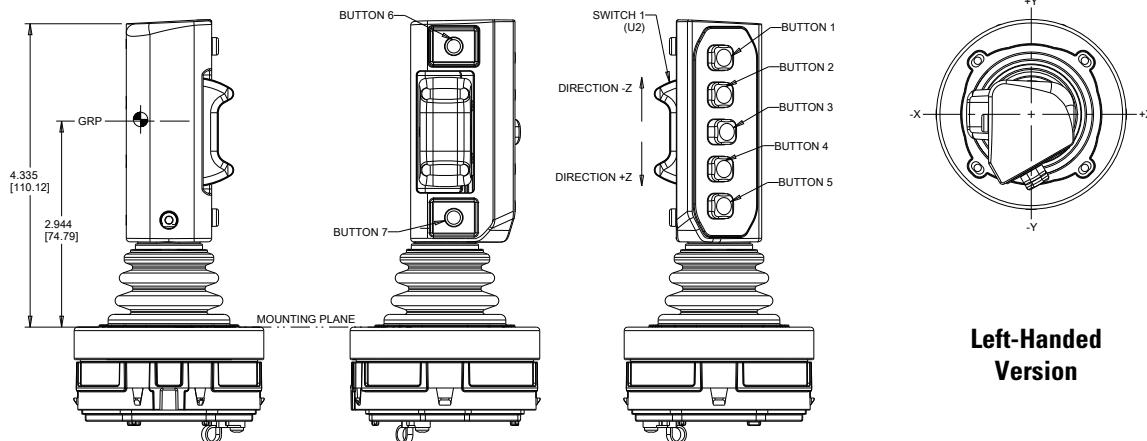


### HANDLE SCHEMATIC



## HANDLE 64

(7-BUTTON KEYPAD & HALL ROCKER LEFT)



Left-Handed  
Version

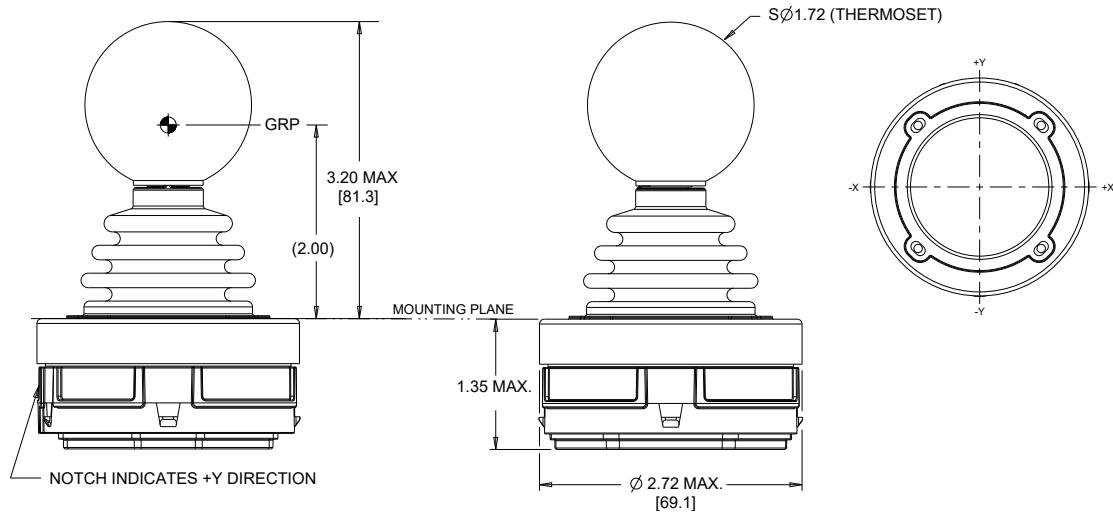
Wires and Strain Relief not shown in all views for clarity.

# MEDIUM HALL EFFECT JOYSTICK

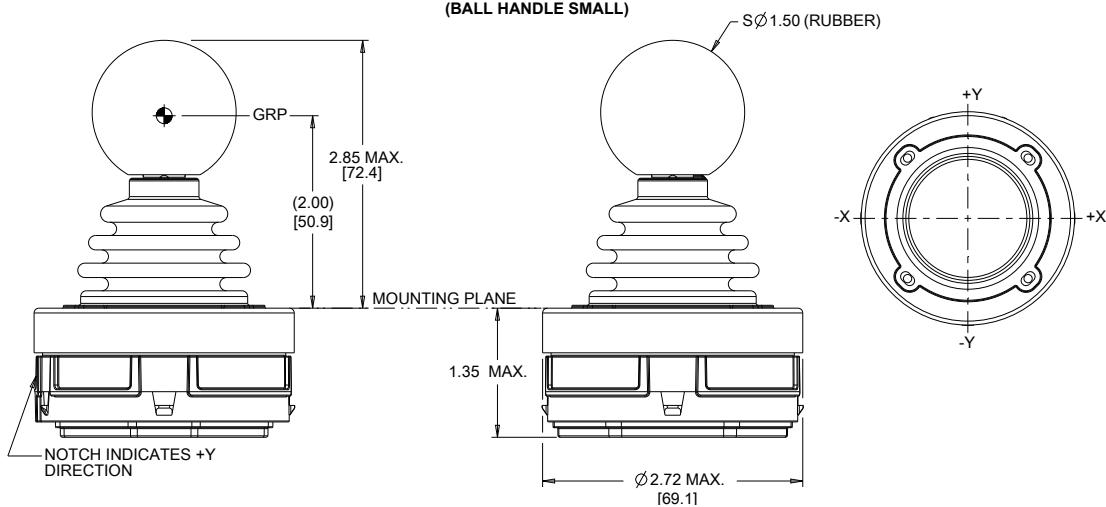
JHM  
MEDIUM  
JOYSTICK

UP TO 10 MILLION OPERATIONAL CYCLES IN ALL DIRECTIONS

**HANDLE 71**  
(BALL HANDLE LARGE)



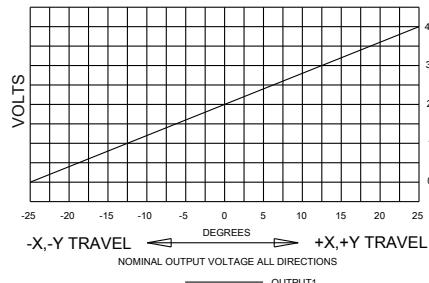
**HANDLE 72**  
(BALL HANDLE SMALL)



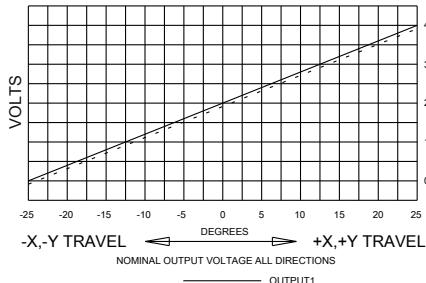
UP TO 10 MILLION OPERATIONAL CYCLES IN ALL DIRECTIONS

## JHM OUTPUTS

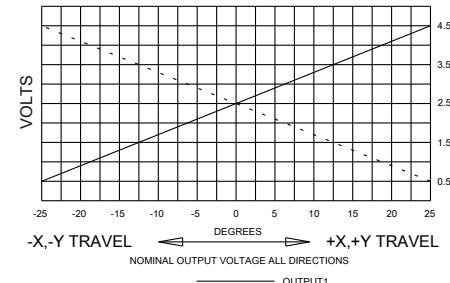
OPTION AA & AT



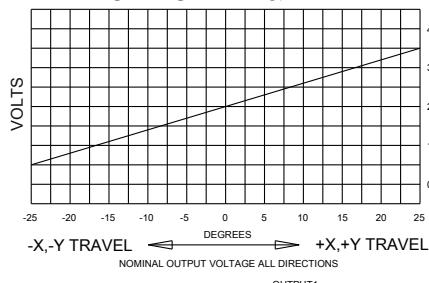
OPTION BB & BT



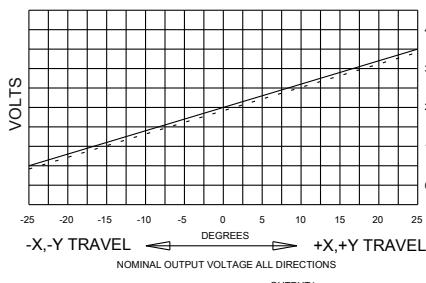
OPTION CC & CT



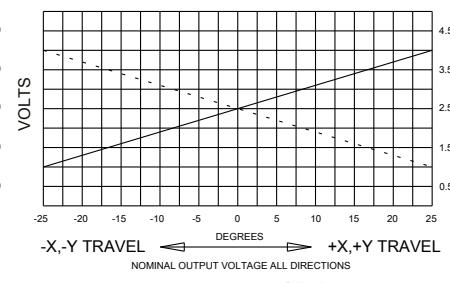
OPTION DD & DT



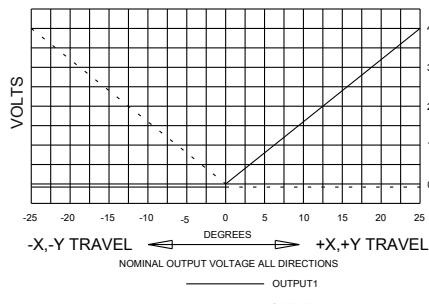
OPTION EE & ET



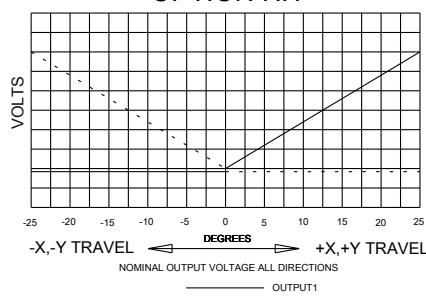
OPTION FF & FT



OPTION GG



OPTION HH



OPTION LL

