# SERIES 60AR

## Rugged and Sealed Joystick

### FEATURES

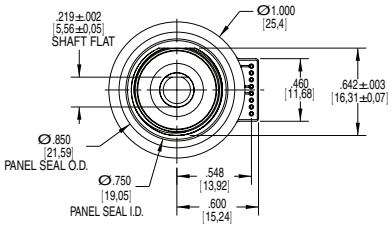
- Three-in-One Joystick, Optical Encoder and Pushbutton
- Shaft and panel sealed to IP67 against liquids and particulates
- Choices of knobs, cable length and termination
- Customized solutions available

### APPLICATIONS

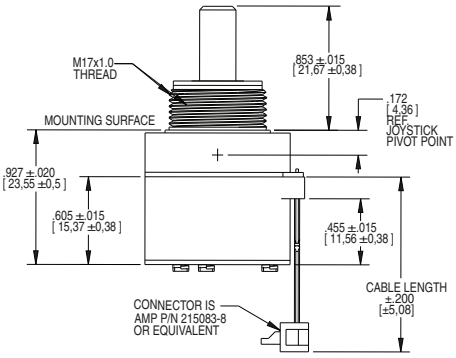
- Aerospace
- Military vehicles and devices
- Mobile electronics for outdoor use

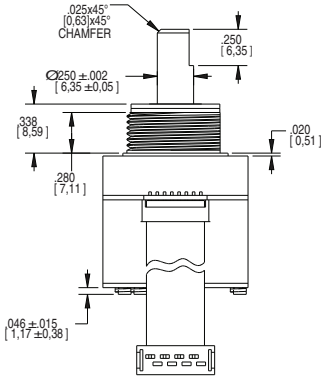
### DIMENSIONS in inches (and millimeters)

Unless otherwise specified, standard tolerance are:
Linear ± .025
Diameter ± .010
Angle ± 2.0°



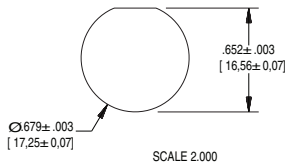

### Cable Connector Version



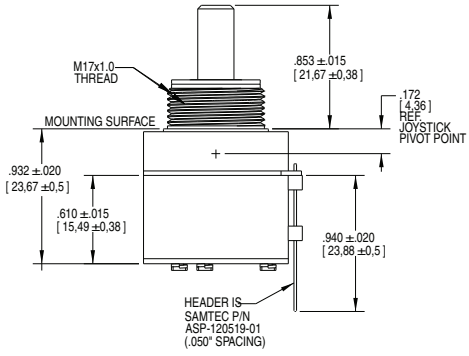



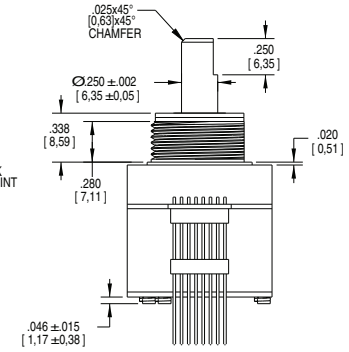

PANEL SEAL GASKET NOT SHOWN TO ILLUSTRATE MOUNTING SURFACE

### Recommended Panel Cut Out




### Pin Version




PANEL SEAL GASKET NOT SHOWN IN LOWER VIEWS TO ILLUSTRATE MOUNTING SURFACE

### ORDERING INFORMATION

**60AR18-4-060S**

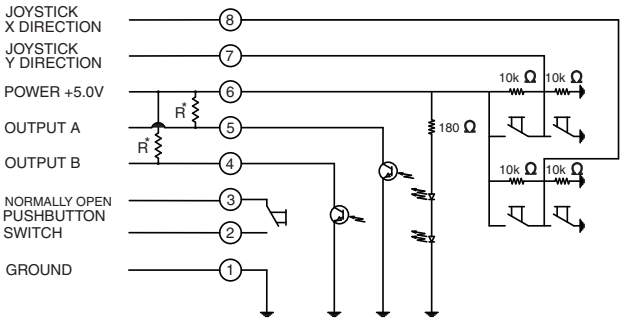
**Angle of Throw:** 18= 18° or 20 positions, 08= Non-detent or 20 positions, 00= Non-turn
**Joystick:** 4= Four contacts & four directions; 8= Four contacts & eight directions

**Termination:** 0.050" center P= pin header; C= connector; S= stripped cable
**Cable Length:** 020 thru 250 in 1/2 inch increments, 060= 6.0 inch cable, leave blank if pinned

For prices and custom configurations, contact a local sales office, an authorized distributor, or Grayhill's sales department.

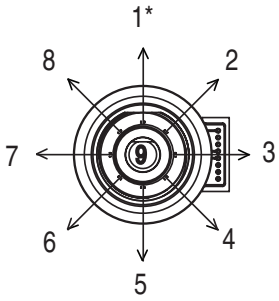
## JOYSTICK OPERATION + ENCODER WAVEFORM AND TRUTH TABLE Standard Quadrature 2-Bit Code

SWITCH SCHEMATIC

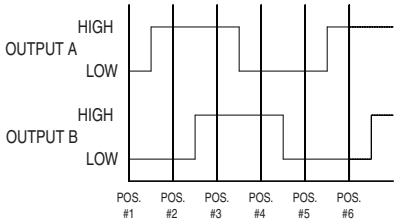



*EXTERNAL PULL-UP RESISTORS REQUIRED FOR OPERATION (2.2k Ω).

JOYSTICK POSITION DIAGRAM
* INDICATES DIRECTION OF D-FLAT ON BUSHING




ENCODER WAVEFORM (C.W. ROTATION)




ENCODER TRUTH TABLE (C.W. ROTATION)

| POSITION | OUTPUT A | OUTPUT B |
|---|---|---|
| #1 | ○ | ○ |
| #2 | ◯ | ○ |
| #3 | ◯ | ◯ |
| #4 | ○ | ◯ |

◯ INDICATES LOGIC-HIGH
○ INDICATES LOGIC-LOW
CODE REPEATS EVERY FOUR POSITIONS

JOYSTICK TRUTH TABLE

| POSITION | X OUTPUT | Y OUTPUT |
|---|---|---|
| 1 | 2.5 | HIGH |
| 2 | HIGH | HIGH |
| 3 | HIGH | 2.5 |
| 4 | HIGH | LOW |
| 5 | 2.5 | LOW |
| 6 | LOW | LOW |
| 7 | LOW | 2.5 |
| 8 | LOW | HIGH |
| 9 | 2.5 | 2.5 |



## SPECIFICATIONS

### Environmental Specifications

**Operating Temperature Range:** -40°C to 85°C
**Storage Temperature Range:** -40°C to 100°C
**Humidity:** 96 hours at 90-95% humidity at 40°C
**Mechanical Vibration:** Harmonic motion with amplitude of 15g, within a varied 10 to 2000 Hz frequency for 12 hours
**Mechanical shock:**
Test 1: 100g for 6Ms half sine wave with velocity change of 12.3 ft/s.
Test 2: 100g for 6 Ms sawtooth wave with velocity change of 9.7 ft/s.
**Shaft and panel Seal:** IP67, 1 meter submersion for 30 minutes

### Joystick Electrical & Mechanical Specifications

**Supply Current:** 5 Ma, maxium
**Output Code:** 2-bit
**Logic Output Characteristics:** Neutral Position: 2.5±0.5 Vdc, High-state Position: >4.5 Vdc, Low-state Position: <0.5 Vdc
**Mechanical Life (Joystick):** 500k actuations, minimum in each direction
**Actuation Force (Joystick):** 1500±300g (X&Y directions only)
**Angle of Throw:** 3.5°+2/1° (X&Y directions only, at electrical contact)

### Pushbutton Electrical & Mechanical Specifications

**Rating:** 10 Ma at 5 Vdc, resistive
**Contact Resistance:** Less than 10 Ω
**Contact Bounce:** <4 Ms make, <10 Ms break
**Mechanical Life (Pushbutton):** 1 million actuations, minimum
**Actuation Force (Pushbutton):** 1600±400g
**Pushbutton Travel:** .015±.005 in

### Rotary Electrical & Mechanical Specifications

**Operating Voltage:** 5.00±25 Vdc
**Supply Current:** 20 Ma, maximum at 5 Vdc
**Minimum Sink Current:** 2.0 Ma for 5 Vdc
**Output:** Open collector phototransister, external pull-up resistors are required
**Output Code:** 2-bit quadrature, channel "A" leads channel "B" by 90° electrically during clockwise rotation of the shaft
**Logic Output Characteristics:** Logic-high shall be no less than 3.5 Vdc, Logic-low shall be no greater than 1.0 Vdc
**Optical Rise Time:** 30 µs, maximum
**Optical Fall Time:** 30 µs, maximum
**Mechanical Life (Rotational):** 1 million cycles, minimum (1 cycle is a rotation through all positions and a full return)
**Average Rotational Torque:** 8.0±30% in-oz, initial
**Shaft Push-out Force:** 60 lbs, minimum before failure
**Shaft Side-load Force:** 25 lbs, minimum before failure
**Terminal Strength:** 15 lbs pull-out force, minimum for cable or header termination
**Solderability:** 95% free of pin holes or voids
**Maximum Rotational Speed:** 100 Rpm
**Mounting Torque:** 15 in-lbs maximum

***Specifications are subject to change***