

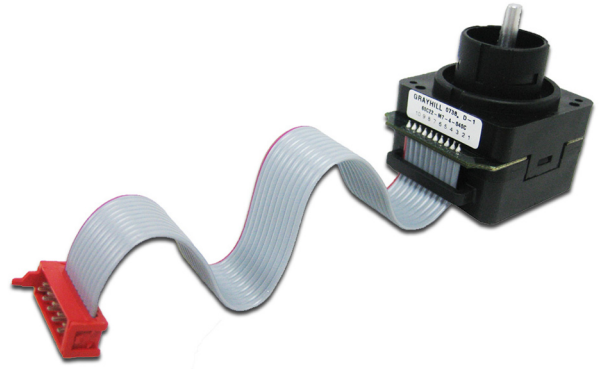
# SERIES 60C Multi-Function Joystick

## FEATURES

- Three-in-One Joystick, Optical Encoder and Pushbutton
- Compact Packaging
- Choices of Cable Length and Termination
- Customized Solutions Available

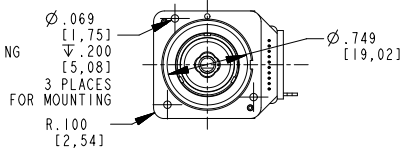
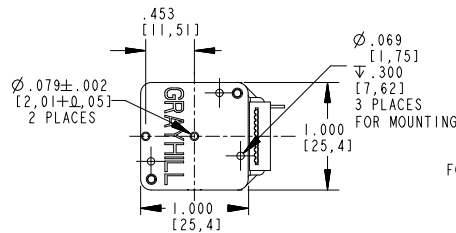
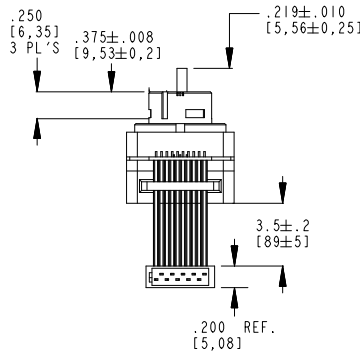
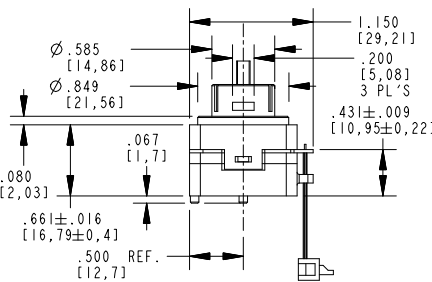
## APPLICATIONS

- Avionics
- Medical Equipment
- Automotive Navigation, Information & Entertainment Equipment

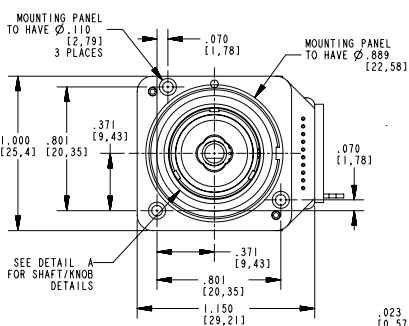


## DIMENSIONS in inches (and millimeters)

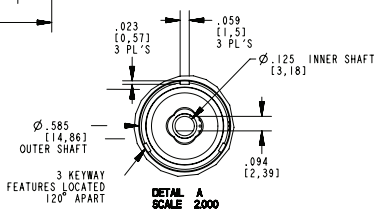
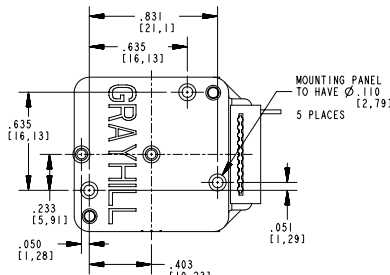
Unless otherwise specified, standard tolerance are:  
 Linear ± .025  
 Diameter ± .010  
 Angle ± 2.0°



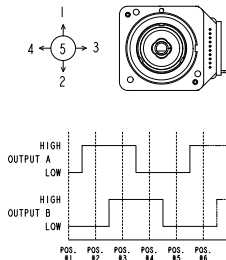
### FRONT MOUNTING



### REAR MOUNTING



## JOYSTICK OPERATION ENCODER WAVEFORM



## TRUTH TABLE Standard Quadrature 2-Bit Code

○ INDICATES LOGIC HIGH  
 ○ INDICATES LOGIC LOW

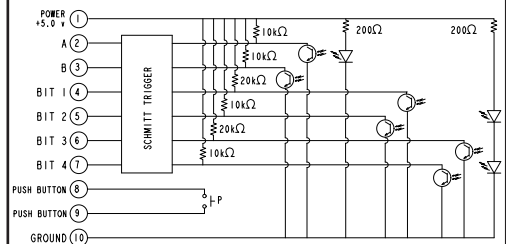
### JOYSTICK

POSITION	BIT 1	BIT 2	BIT 3	BIT 4
1	○	○	○	○
2	○	○	○	○
3	○	○	○	○
4	○	○	○	○
5	○	○	○	○

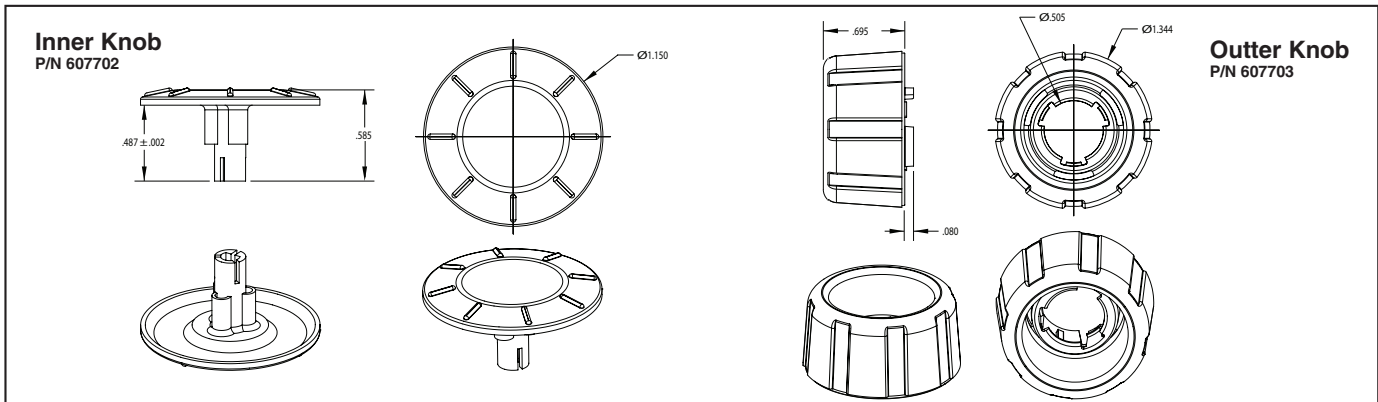
### ENCODER

POSITION	OUTPUT A	OUTPUT B
#1	○	○
#2	○	○
#3	○	○
#4	○	○

## SWITCH SCHEMATIC



## CONTROL KNOBS



## SPECIFICATIONS

## Rotary

## Electrical and Mechanical Ratings

**Operating Voltage:** 5.00 ± 0.25 Vdc

**Supply Current:** 35mA TYP at 5 Vdc

**Power Consumption:** 175mW TYP at 5Vdc

**Output:** Direct output from inverting Schmitt trigger

**Output Code:** 2-Bit quadrature, channel A leads channel B by 90° in cw rotation

## Logic Output Characteristics:

High: No less than 3.5 Vdc

Low: No greater than 1.0 Vdc

**Mechanical Life:** 500K rotational cycles (through all positions and a full return)

**Rotational Torque:** medium torque option 3.00±2.00 in-oz, torque shall be within 50% of initial value throughout life

**Mounting Torque:** 15 in-lbs. maximum

**Shaft Push/Pull Out Force:** 25 lbs minimum

**Terminal Strength:** 15 lbs terminal minimum

## Joystick

## Electrical and Mechanical Ratings

**Operating Voltage:** 5.00 ± 0.25 Vdc

**Supply Current:** 35mA at TYP at 5 Vdc

**Power Consumption:** 175mW TYP at 5Vdc

**Output:** Direct output from inverting Schmitt trigger

## Logic Output Characteristics:

High: No less than 3.5 Vdc

Low: No greater than 1.0 Vdc

**Mechanical Life:** 500K cycles

(through all positions and a full return)

**Angle of Throw:** 8° max. in all directions

## Pushbutton

## Electrical and Mechanical Ratings

**Rating:** 10 mA at 5 Vdc resistive

**Contact Resistance:** less than 10 ohms

**Contact Bounce:** < 4ms make, 10 ms break

**Mechanical Life:** 500K actuations minimum

**Actuation Force:** option 7 = 485 ± 115grams

**Pushbutton Travel:** 0.033 ± 0.015 inches to contact; 0.075 inches maximum

## Environmental Ratings

**Operating Temperature Range:** -40°C to 85°C

**Storage Temperature Range:** -55°C to 100°C

**Relative Humidity:** 96 hours at 90-95% humidity at 40°C

**Vibration:** Harmonic motion with amplitude of 15g, within a varied 10 to 2000 Hz

## Mechanical Shock:

Test 1: 100g for 6ms half-sine wave with a velocity change of 12.3 ft/s

Test 2: 100g for 6ms sawtooth wave with a velocity change of 9.7 ft/s

**Thermocycle:** 4 hours cycling between -40°C to 85°C

## Materials and Finishes

**Bushing:** Thermoplastic

**Shaft Outer:** Thermoplastic

**Upper Housing:** Thermoplastic

**Pushbutton Rocker:** Thermoplastic

**Pushbutton Actuator:** Thermoplastic

**Inner Shaft Slide:** Thermoplastic

## Slider Plate: Thermoplastic

**Backplate:** Thermoplastic

**Lightpipe, Joystick:** Thermoplastic

**Lightpipe, 16 pos:** Thermoplastic

**Centering Profile:** Thermoplastic

**Shaft Inner:** Aluminum

**Pins:** Stainless steel

**Barbed Rivet:** Stainless steel

**Detent Balls:** Carbon steel 100 with nickel finish

**Centering Balls:** Carbon steel 100 with nickel finish

**Detent Springs:** Tinned music wire

**Centering Springs:** Tinned music wire

**Cable ASM:** .050 round conductor flat cable, PVC coated. Conductors are stranded, top-coated wire

**Solder:** 95.5% SN, 4% AG, 0.5% CU

**Dome:** Stainless steel

**PCB 16 Pos:** NEMA grade FR-4. Plating is gold or palladium over nickel

**Infrared Emitter:** Gallium aluminum arsenide

**Phototransistor:** Planar silicon

**Resistor:** Carbon film

**Schmitt Trigger:** RoHS Compliant TSSOP, 14 pin

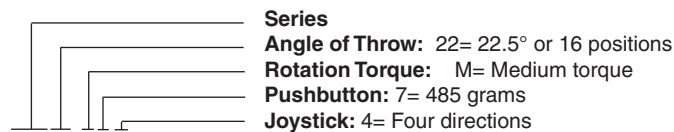
**Lubricating Grease:** Nyogel 774L

**Label:** TT406 Thermal transfer cast film

## OPTIONS

Contact Grayhill for custom terminations, rotational torque, number of positions, shaft configurations, and resolutions. Control knobs are also available.

## ORDERING INFORMATION



60C22-M7-4-060S

**Termination:** 0.050" center ribbon cable with; C= Connector; S= 0.1" stripped end  
**Cable Length:** 025 thru 250 in 1/2 inch increments, 060= 6.0 inch cable

Available from your local Grayhill Distributor. For prices and discounts, contact a local sales office, an authorized distributor, or Grayhill.