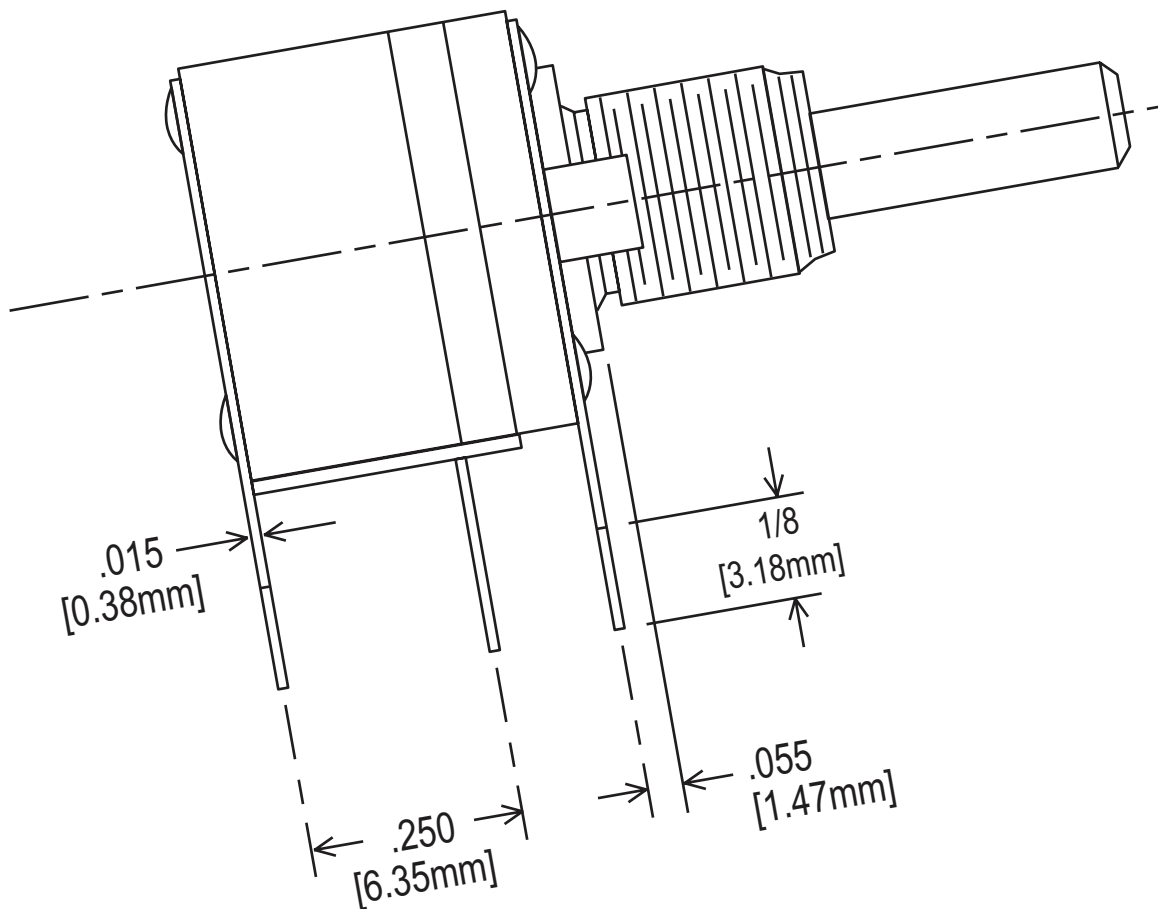


STATE ELECTRONICS

Series 388/389 Custom Potentiometer Designer Guide

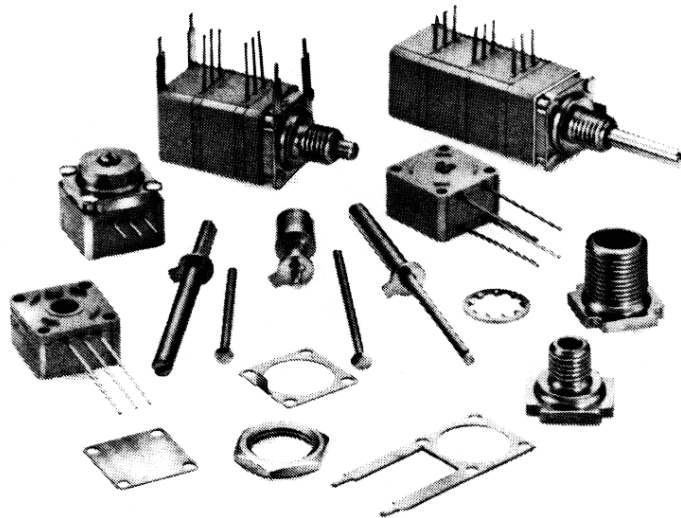


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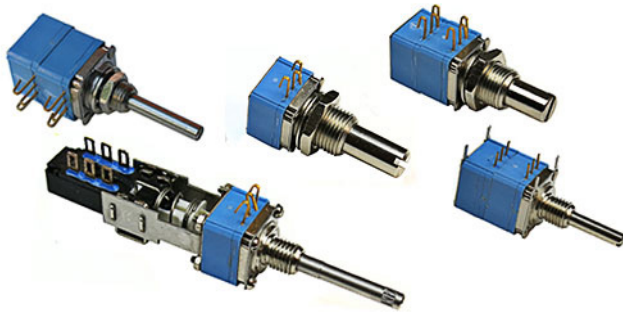
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Series 388 Potentiometer

Conductive Plastic - 1/2 inch square; .5 Watt

Series 389 Potentiometer

Cermet - 1/2 inch square; 1 Watt



Description

The 388 and 389 series are 1/2 in. square, modular, stackable potentiometers. The basic construction suits the series for countless design options.

The 388 and 389 series can be found in a wide range of sophisticated systems in a broad scope of industries.

Features

- **Small size** - 1/2 in. square
- **Stackable** - up to 8 modules
- **Switches** - rotary, push-pull, push-momentary, and shadow.
- **Versatility** - various shaft, bushings, terminal styles, resistance values, tapers and tolerances. Available in Conductive Plastic or Thick Film Cermet
- **RoHS Compliant**

Special Features

- **Detents** - Center detent and 11 position detents available
- **Seals** - mounting and shaft seals
- **Medium torque** - 1 to 6 oz. in.

	Operational Specifications Series 388	Operational Specifications Series 389
Resistance Range	Linear: 100 ohms to 5 Megohms Tapered: 500 ohms to 2 Megohms	Linear: 5 ohms to 5 Megohms Tapered: 100 ohms to 2 Megohms
Resistance Tolerance	Linear: thru 500K ohms , ±10%; above 500K ohms , ±20%. Tapered: thru 100K ohms , ±10%; above 100K ohms ±20%	Linear: ±10%; ±20% special Tapered: ±10% Under 20 ohms ±20%
Taper	<i>See Charts A and B, page 6 for standard and special tapers available</i>	<i>See Charts A and B, page 6 for standard and special tapers available</i>
Taper Tolerance	±20% of nominal resistance at 50% ±3% mechanical rotation	±20% of nominal resistance at 50% mechanical rotation
Independent Linearity	±5% standard with specials available	±5% standard with specials available
End Resistance	4 ohms max. each end linear and low side of taper. 1% of total R high side of taper.	2 ohms max. each end (5 ohms - 2.5K ohms) 4 ohms max. each end (above 2.5K)
Dynamic Noise (C.R.V.)	1.5% of total R, standard linear; 1.0% of total R, special linear; 2.2% of total R, tapered.	3.0% of total R, standard linear; 1.5% of total R, special linear (500 ohms and above); 6.0% of total R, tapered.
Static Noise	Up to 30K ohms - 20db; 100K ohms - 12 db; 1 Megohms +3db	Up to 100 ohms - 25db; 10K ohms - 15 db; 100K ohms -10db.

Electrical Specifications continued, next page

	Operational Specifications Series 388	Operational Specifications Series 389
Power Rating	0.5 Watt @ 70°C bushing mounting 0.25 Watt @ 70°C PC mounting. Derate to 0 watts at 120°C. derate 50% for non-linear tapers and derate multiple sections 1/2 wattage of panel unit.	1.0 Watt @ 85°C bushing mounting 0.5 Watt @ 85°C PC mounting. Derate to 0 watts at 150°C. derate 50% for non-linear tapers and derate multiple sections 1/2 wattage of panel unit.
Working Voltage	350 Vdc across end terminals, but power not to exceed rating.	350 Vdc across end terminals, but power not to exceed rating.
Dielectric Withstanding Voltage	750 Vac @ ATM pressure. 350 Vac @ 3.4 in. (86.36mm) Mercury.	900 Vac single standard module and 750 Vac all non-standard constructions @ ATM pressure; 350 Vac @ 3.4 in. (86.36mm) Mercury.
Insulation Resistance	1000 Megohms minimum for dry, clean conditions @ 25°C	1000 Megohms minimum for dry, clean conditions @ 25°C
Temperature Coefficient	<i>See Chart C, page 7</i>	15 ohms to 100 ohms 250 ppm/°C. 100 ohms to 5 Megohms 150 ppm/°C Temperature range -55°C to 150°C.
Tracking	10% voltage ratio tracking between sections standard. Specials available.	10% voltage ratio tracking between sections standard. Specials available.
Electrical Rotation	295° ±5°	295° ±5°
Effective Rotation	265° ±5° without switch; 240° ±5° with switch.	250° +10° -5° without switch; 225° +10° -5° with switch.
Load Life	10% maximum change in resistance and within end resistance limits with rated power across element, at 70°C ambient temperature. Power applied 1.5 hours "on" 0.5 hours "off" for 1000 hours.	5% maximum change in resistance and within end resistance limits with rated power across element, at 85°C ambient temperature. Power applied 1.5 hours "on" 0.5 hours "off" for 1000 hours.
Rotational Life	10% maximum resistance change up to 50,000 cycles under load. Trimmer version 5000 cycles.	25,000 cycles under load. Trimmer version 5000 cycles.
Low Temperature Operation	Less than 3% change in total R. Operating torque at -40°C is 30 oz. in.	Less than 2% change in total R. Operating torque at -40°C is 30 oz. in.

**Environmental Specifications
Series 388**

**Environmental Specifications
Series 389**

MIL-R-94 Standard	Series 388 is designed to meet MIL-R-94 performance characteristics where applicable	Series 389 is designed to meet MIL-R-94 and MIL-R-22097 performance characteristics where applicable
Low Temperature Storage	Less than 2% change in total resistance	Less than 2% change in total resistance
Thermal Cycling	Less than 4% total R change as a result of 5 cycles @ -55°C to +120°C	Less than 3% total R change as a result of 5 cycles @ -55°C to +150°C
Moisture Resistance	10% maximum total R change when tested per method 103 of MIL-STD-202	5% maximum total R change when tested per method 103 of MIL-STD-202
Shock	The total resistance setting change is 2% maximum between left and right terminals and 5% maximum between CCW terminal and center terminal when tested per method 213 condition I of MIL-STD-202.	The total resistance setting change is 2% maximum between left and right terminals and 5% maximum between CCW terminal and center terminal when tested per method 213 condition I of MIL-STD-202.
Vibration, High Frequency	No intermittent contacts or open circuits when tested per method 204 Condition C of MIL-STD-202. Resistance setting change is 5% maximum between left (CCW) terminal and center terminal. The total resistance change is 2% maximum between left and right terminals.	No intermittent contacts or open circuits when tested per method 204 Condition C of MIL-STD-202. Resistance setting change is 5% maximum between left (CCW) terminal and center terminal. The total resistance change is 2% maximum between left and right terminals.
Washability	Units may be adversely affected if subjected to conventional after-solder board-wash	Units may be adversely affected if subjected to conventional after-solder board-wash

**Mechanical Specifications
Series 388 & Series 389**

Body Size

(Single module) .5 in. (12.70mm) square ±.047 in. (1.19mm), except at standoffs

Terminals

Printed circuit style on 0.100 in. (2.54mm) grid in line, 0.250 in. (6.35mm) long. Spacing between terminals in multiple section controls 0.300 in. (7.54mm). Solder lugs formed from PC pins to accept three #22 AWG wires. Maximum PC terminal length .875 in. (22.23mm).

Housing

Molded thermoplastic

Anti-turn Device

Location 1 supplied unless otherwise specified. See Chart D Anti-turn Device radius is (6.35mm).

Shafts

1/8 in. (3.18mm) diameter & 1/4 in. (6.35mm) diameter are standard for single shaft. Concentric shafts 1/8 in. (3.18mm) outer shaft and 0.078 in. (1.98mm) inner shaft. Shafts are nickel-plated brass.

Seals

Mounting seal and shaft seal available for single shafts only. Caution: These units not designed to meet boardwashing requirements.

Medium Torque

Medium torque option available, single shaft controls. 1 oz. in. minimum to 6.0 oz. in.

Mechanical Rotation

With or without switch, 295° ±5°. With push-pull or momentary switch, 310° (inc. 10° backlash). Rotary switch with push-pull or momentary switch, 42° maximum. (Plus 30° for added detents). Push-pull or momentary switch, 12° maximum.

Shaft Pull Force

.125 in. (3.18mm) diameter shaft: 18 lbs.
.250in. (6.35mm) diameter shaft: 10 lbs.
Pot BJ or BJM: 7.5 lbs.
Pot AJ/BJ: 10 lbs.
Clutch: 20 lbs.
Concentric Rear Shaft: 7.5 lbs.

**Mechanical Specifications
continued, next page**

Shaft End Play

.020 in. (0.51mm) maximum

Shaft Radial Play

.028 in. (0.71 mm) maximum 1 in. (25.4mm) from mounting surface with .250 in (6.35mm) diameter bushing

Actuating Forces

Pot/BJ: 10-22 oz.; Dual Pot/BJ: 10-25 oz.;
Pot/BJM: 25-40 oz.; Pot/Pot/BJM: 25-43 oz.;

Tap Terminal Strength

18 lbs. maximum pull

Bushing Diameter

1/4 in. (6.35mm) x 32NEF-2A standard 3/8 in. (9.53mm) x 32NEF-2A optional. When using 3/8 in. diameter bushing, distance from mounting surface to PC terminals is .170 in. (4.32mm) See page 8.

Bushing Length

Plain: 1/4 in. (6.35mm), 3/8 in. (9.53mm), or 1/2 in (12.7mm)
Split-locking style: 3/8 in. (9.35mm)

Operating Torque

0.2 to 3.0 oz. in. for single and dual concentric controls.
Duals: 0.3 to 3.5 oz. in.
Triples: 0.5 to 4.5 oz. in.
Quads: 0.5 to 5.5 oz. in.
Medium Torque: 1 to 6 oz. in.
Variation within a control 1 oz. in. maximum.

Stop Torque

3 lb. in. single shaft - Standard
8 lb. in. - Available

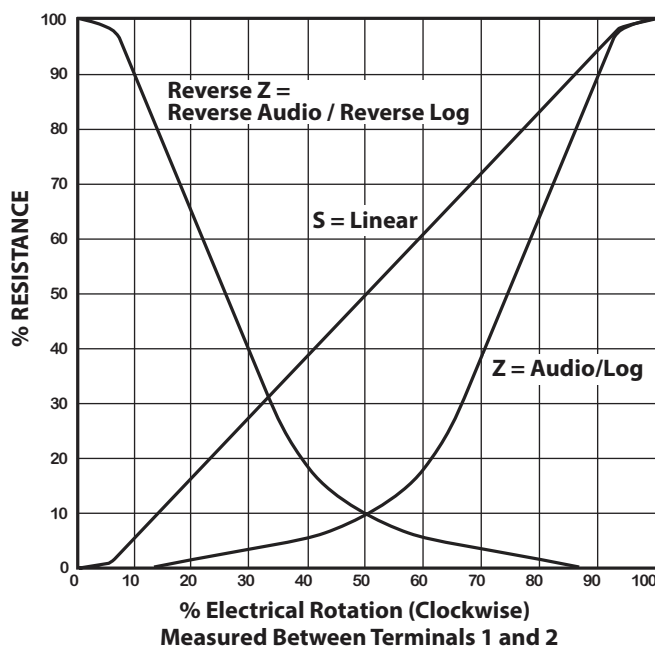
Hardware

- Mounting Hardware available
- a. Hex mounting nut 1/4 in. (6.35mm) x 32 thread, 5/16 in. (7.94mm) across flats, 1/16 in. (1.59mm) thick.
 - b. Internal tooth lockwasher 13/32 in. (10.32mm) OD x .025 in. (0.64mm) thick.
 - c. Jam hex nut 5/16 in. (7.94mm) across flats, 5/32 in. (3.97mm) thick supplied with locking type bushings.

Marking

Consisting of State Electronics part number.
Customer part number optional.

Chart A - Standard Taper Curves



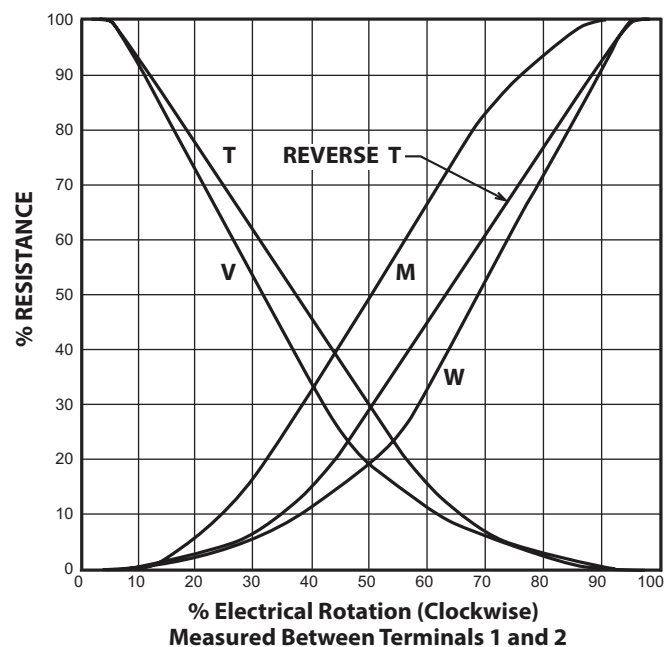
The "S" taper is linear, the change in resistance value being directly proportional to the degree of rotation. It can be used either as right-hand or left-hand taper.

The "Z" taper attains 10% resistance value at 50% of clockwise rotation (left hand).

The "Reverse Z" taper attains 10% resistance value at 50% of counter-clockwise rotation (right hand).

For conformity and special output curves, consult State Electronics.

Chart B - Special Taper Curves



The "W" taper attains 20% resistance value at 50% of clockwise rotation (left-hand).

The "V" taper attains 20% resistance value at 50% of counterclockwise rotation (right-handed).

The "T" taper attains 30% resistance value at 50% of clockwise rotation (left-hand).

The reverse "T" taper attains 30% resistance value at 50% of counterclockwise rotation (right hand).

The "M" taper is such that a "W" taper is attained from either the 1 or 3 terminal to the center of the element.

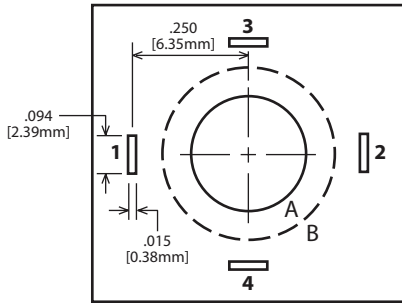
Chart C - TEMPERATURE RESISTANCE CHANGE

Nominal Resistance	Maximum Percent Temporary Resistance Change From 25°						
	-55°C	-40°C	0°C	+25°C	+85°C	+105°C	+120°C
100 Ohms	±5.0	±4.0	±1.5	0	±1.5	±2.0	±3.5
10K Ohms	+7.0	+5.5	+2.0	0	±1.5	±2.5	±5.5
100K Ohms	+8.0	+6.0	+2.5	0	±2.0	±3.5	±6.0
1 Megohm	+10.0	+8.0	+3.0	0	±2.5	±4.0	±7.5

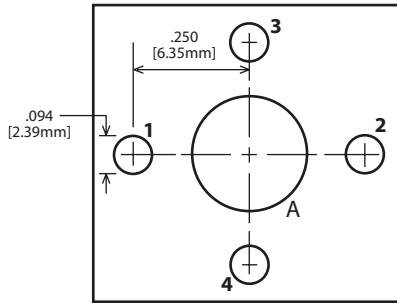
Note: For non-linear tapers, multiply chart values by 1.25

Chart D - LOCATING TAB OPTIONS

P.C. Board & Panel Mounting Dimensions
Using Slots for Locating Tab(s)



P.C. Board & Panel Mounting Dimensions
Using Holes for Locating Tab(s)



Ref	Bushing	Mounting Panel Hole
A	1/4 - 32-NEF Max Dia. (0.249 [6,32mm])	0.265" [6,76mm]
B	3/8 - 32-NEF Max Dia. (0.375" [9,53mm])	0.390" [9,91mm]

Series 388 Locating Lug Style:

Tab width: .091"
Tab Height: .041±.005" FMS
Spacing: .250"

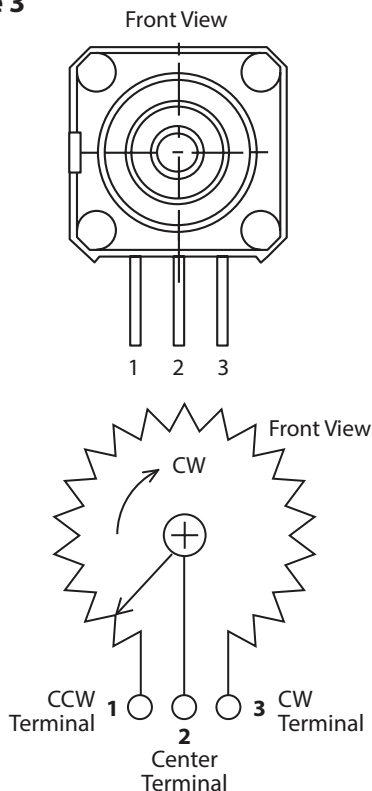
Option Number

- 1 = one tab - at 9 o'clock (standard)
- 2 = one tab - at 3 o'clock
- 3 = one tab - at 12 o'clock
- 4 = one tab - at 6 o'clock
- 5 = two tabs - at 3 and 9 o'clock
- 6 = two tabs - at 6 and 12 o'clock
- 7 = No Locating Lug

NOTE: Slots are recommended for the locating tab(s) when using 3/8" diameter bushings because of clearance issues,

Potentiometer Schematic

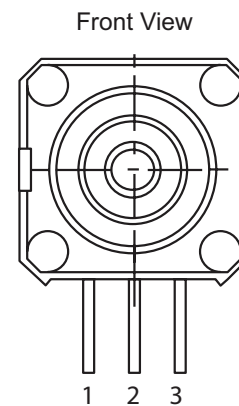
Figure 3



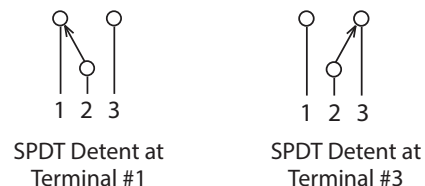
Switch Modules

Figure 4

Series AJ Switch: Rotary Style



Series AJ - SPDT Rotary
125MA 28VDC



Series 388/389 Bushings

Figure 6
 .250 (6.35mm) Diameter Bushing, Plain Shaft

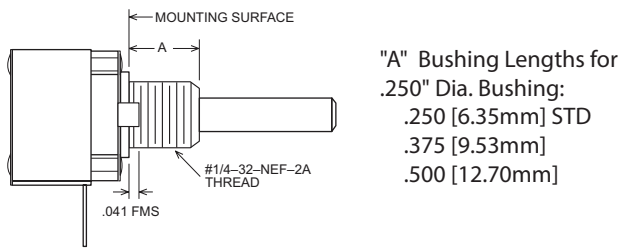


Figure 8
 .250 (6.35mm) Diameter, Locking Bushing

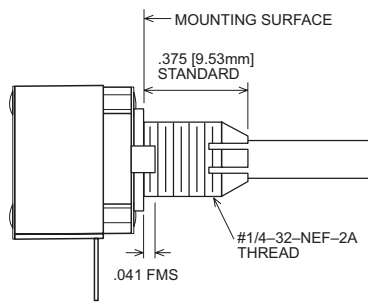


Figure 7
 .375 (9.53mm) Diameter Bushing, Plain Shaft

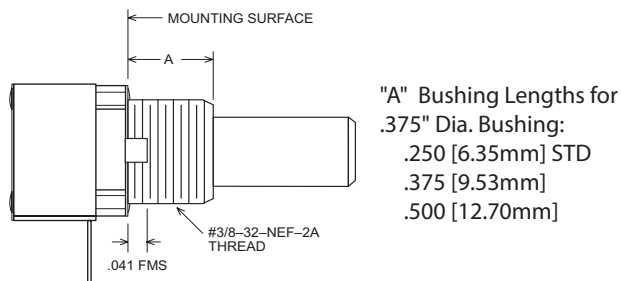
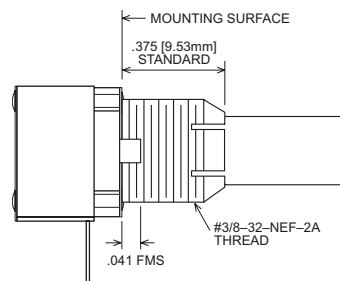


Figure 9
 .375 (9.53mm) Diameter, Locking Bushing



Series 388/389 Shafts

Figure 10
.125 (3.18mm) Diameter - Slotted Shaft

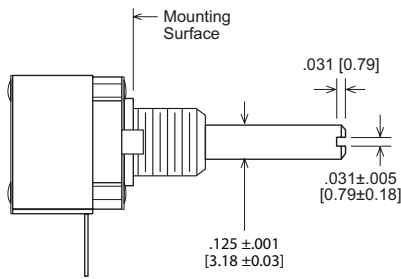


Figure 11
.250 (6.35mm) Diameter - Slotted Shaft

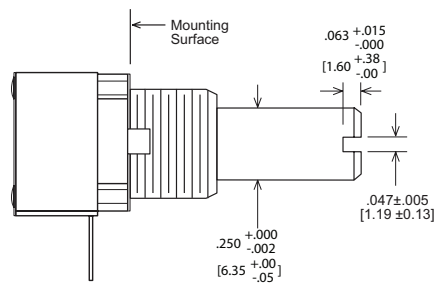
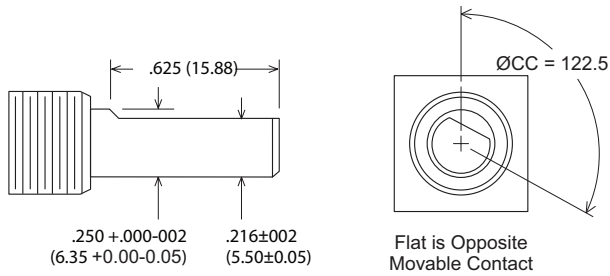
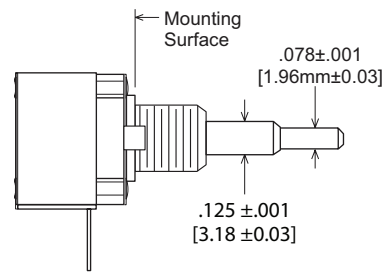


Figure 12
.250 (6.35mm) Diameter, Flatted Shaft



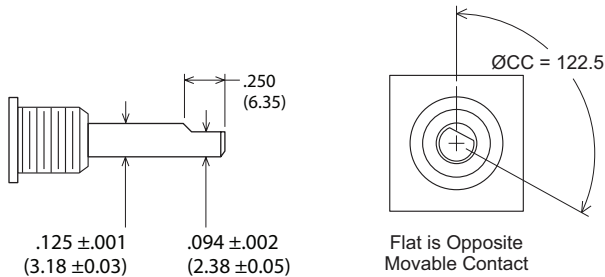
Flat can extend to within .031 (0,79) of mounting bushing where shaft length will not permit standard flat.

Figure 13
.125 (3.18mm) Diameter - Concentric Shafts



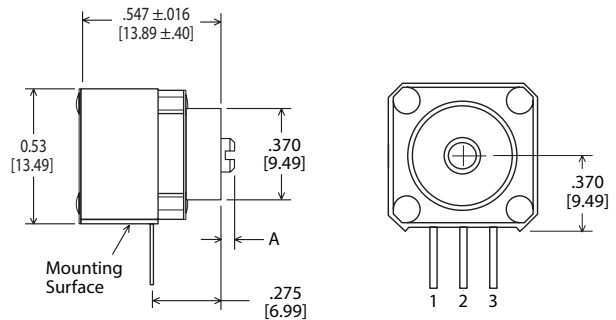
Note: Only Plain Ends are Available for Concentric Shaftz

Figure 14
.125 (3.18mm) Diameter, Flatted Shaft



Flat will extend to within .031 (0,79) of mounting bushing where shaft length will not permit standard flat.

Figure 15
Trimmer



Dimension A: .025 (0.64) Standard
Other lengths available to .50 (12.70) Maximum

Series 388 & 389 controls are assembled from 1/2" square, stackable potentiometer and switch modules. Combine up to 8 modules, with single or concentric metal shafts. Series 388 potentiometer modules have conductive plastic resistive elements, and Series 389 potentiometer modules have cermet resistive elements.

The most common configurations are listed below. Contact your State Electronics sales representative for your custom requirements.

Series 388/389 - Horizontal Mounting Styles

B-22: Single, Dual, Triple, Quad Potentiometer or Rotary Switch, PC Pin Terminals	11
B-22: Dual, Triple Potentiometer or Rotary Switch, PC Pin Terminals, Concentric Shafts	11C
B-24: Single, Dual, Triple, Quad Potentiometer or Rotary Switch, PC Pin Terminals, Support Plates	12
B-22: Dual, Triple Potentiometer or Rotary Switch, PC Pin Terminals, Concentric Shafts, Support Plates....	12C
B-22: Single, Dual, Triple, Quad Potentiometer or Rotary Switch, Solder Hook Terminals	13
B-22: Dual, Triple Potentiometer or Rotary Switch, Solder Hook Terminals, Concentric Shafts	13C
B-22: Single, Dual Potentiometer or Rotary Switch, plus Push-Pull/Momentary Switch, PC Pin Terminals ..	14
B-22: Single, Dual Pot or Rotary Switch, plus Push-Pull/Momentary Switch, Solder Hook Terminals	14C
B-28: Dual Potentiometer/Rotary switch with (BJ) Push-Pull/(BJM) Momentary Switch; PC Pin Terminals ...	15

Detent

B-22: Single, Dual Potentiometer with Detent, Valley Style, PC Pin Terminals, Solder Hook Terminals	16
B-24: Single, Dual Potentiometer with Detent, Valley Style, PC Pin Terminals, Support Plates.....	17

Schadow Switch

Single, Dual Potentiometer with DPDT Schadow Switch, PC Pin Terminals	18
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Series 388/389 - Vertical Mounting Styles

C-8: Single Potentiometer or Rotary Switch, PC Pin Terminals	19
A-18: Single Potentiometer or Rotary Switch, PC Pin Terminals.....	19
C-15: BBJ Single Push-Pull / BBJM Momentary Switch, PC Pin Terminals	20
A-19, A-20: Dual Potentiometer or Rotary Switch, PC Pin Terminals.....	20
C-14, A-21, C-9, C-10: Dual Potentiometer or Rotary Switch, PC Pin Terminals	21
A-22, C-15: BBJ Momentary/ BBJM Push-Pull Switch, PC Pin Terminals	21
C-11: Single Potentiometer and BBJ/BBJM Switch, PC Pin Terminals	22

Concentric Shafts

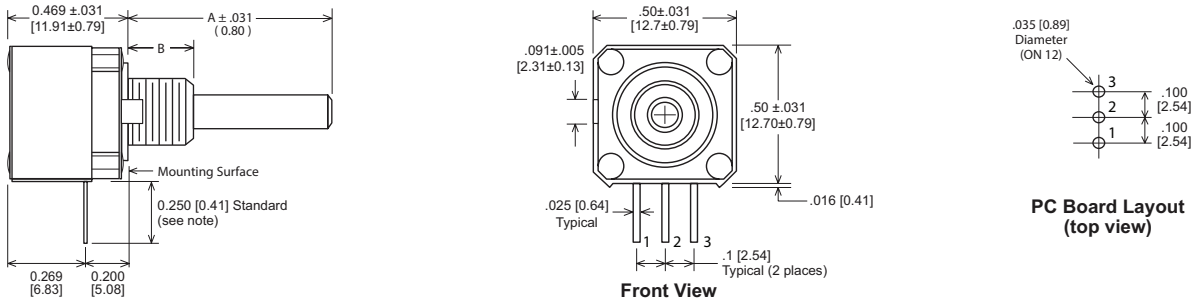
C-9, C-10: Dual Potentiometer, Concentric Shaft, PC Pin Terminals	22
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Detent

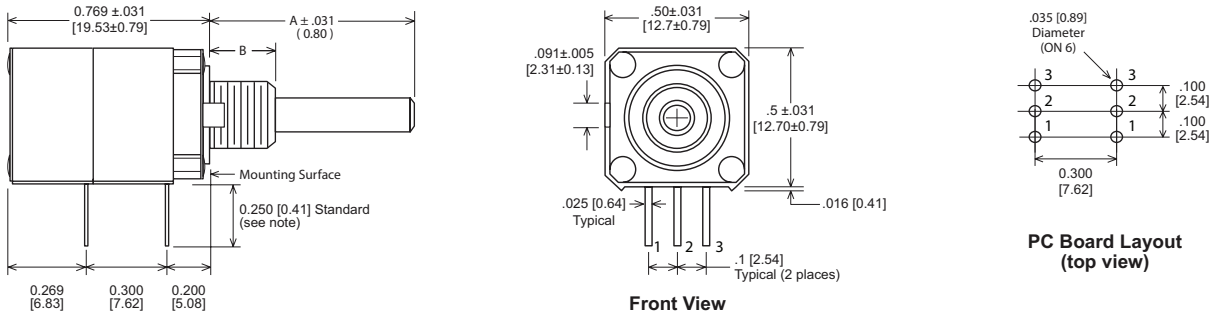
C-8, A-18, C10, A20: Single, Dual Potentiometer with Detent, Valley Style, PC Pin Terminals	23
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Series 388/389 - Horizontal Mounting Styles

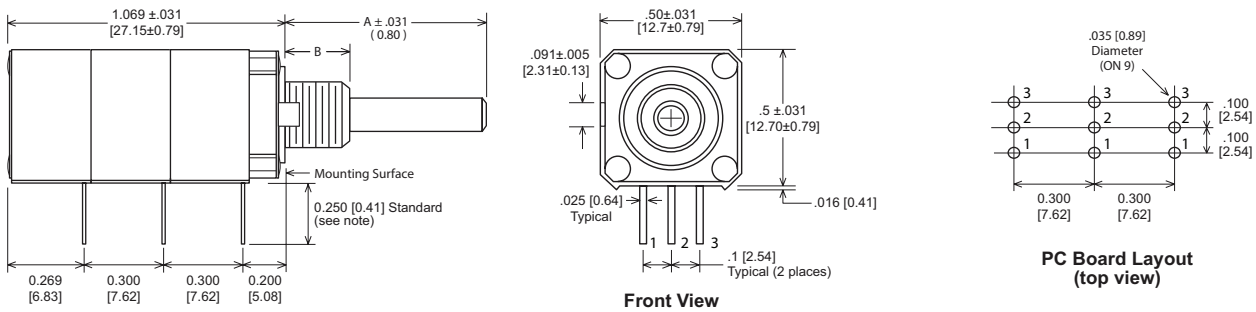
Dwg 11-1: B-22 Single Potentiometer or Rotary Switch, PC Pin Terminals



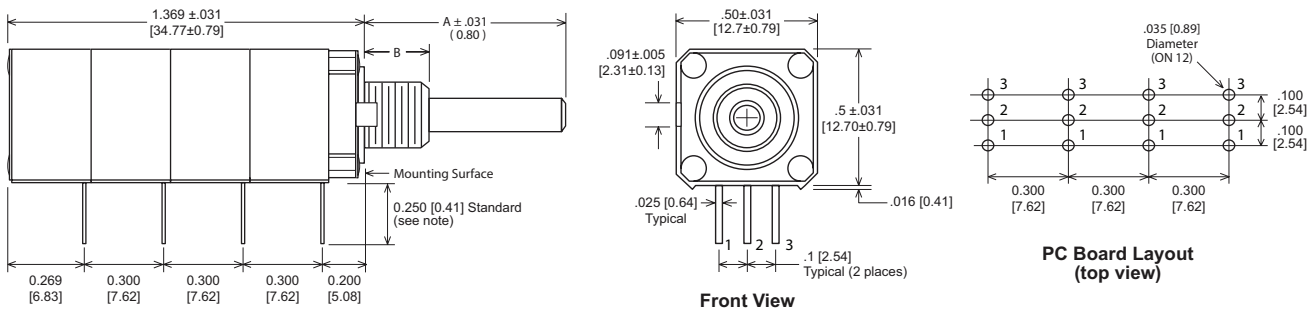
Dwg 11-2: B-22 Dual Potentiometer or Rotary Switch, PC Pin Terminals



Dwg 11-3: B-22 Triple Potentiometer or Rotary Switch, PC Pin Terminals



Dwg 11-4: B-22 Quad Potentiometer or Rotary Switch, PC Pin Terminals

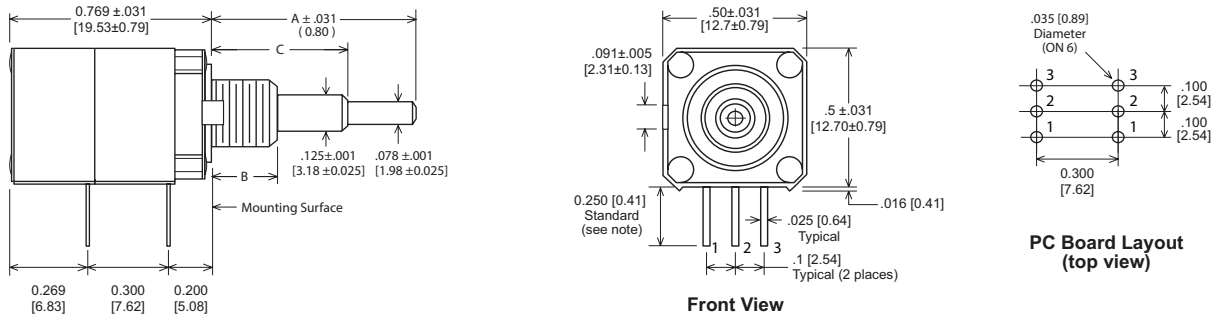


Notes:

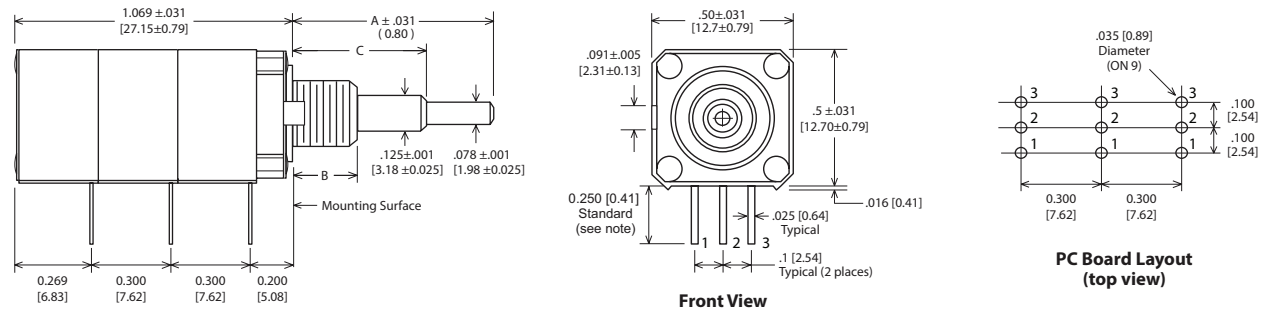
1. Basic dimensions are in inches.
Dimensions in brackets are in millimeters.
Dimensional Tolerance ± 0.016 [0.40], except as specified.
2. B-22 PC pin length standard is 0.250 ". Maximum 0.875 ".
3. Drawings are not to scale.

Series 388/389 - Horizontal Mounting Styles (continued)

Dwg 11C-1: B-22 Dual Potentiometer or Rotary Switch, Concentric Shaft, PC Pin Terminals



Dwg 11C-2: B-22 Triple Potentiometer or Rotary Switch, Concentric Shaft, PC Pin Terminals

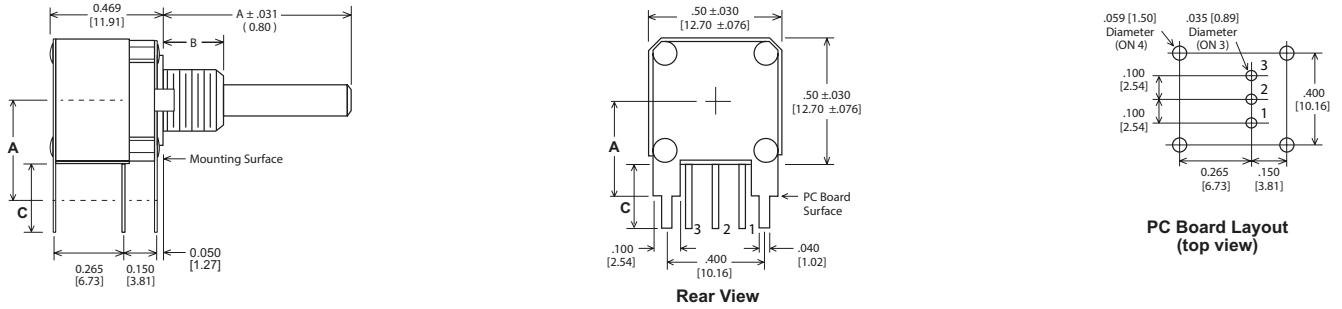


Notes:

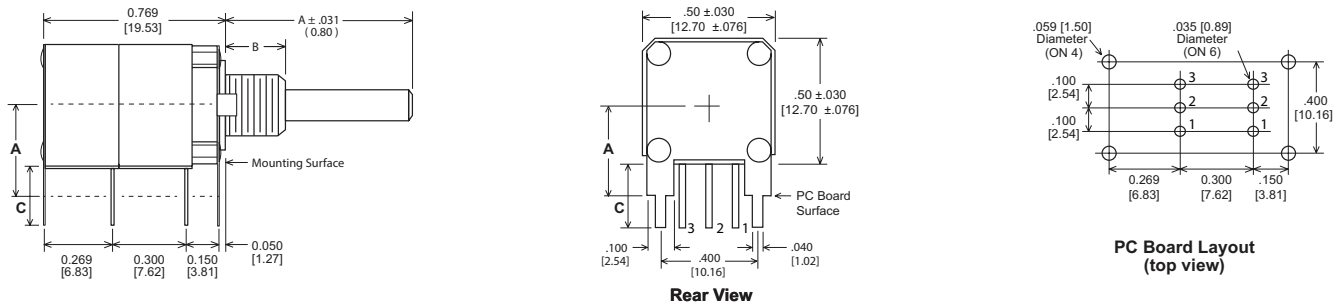
1. Basic dimensions are in inches.
Dimensions in brackets are in millimeters.
Dimensional Tolerance ± 0.016 [0.40], except as specified.
2. B-22 PC pins length standard is 0.250". Maximum 0.875"
3. Drawings are not to scale.

Series 388/389 - Horizontal Mounting Styles (continued)

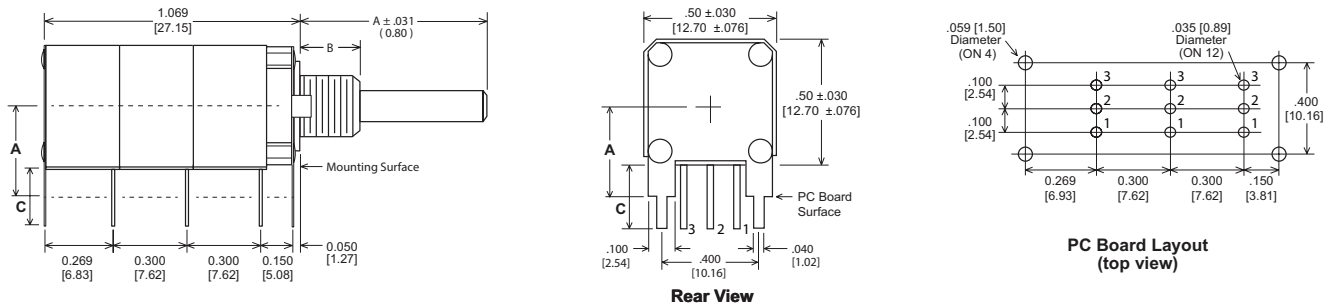
Dwg 12-1: B-24 Single Potentiometer or Rotary Switch, Support Plates



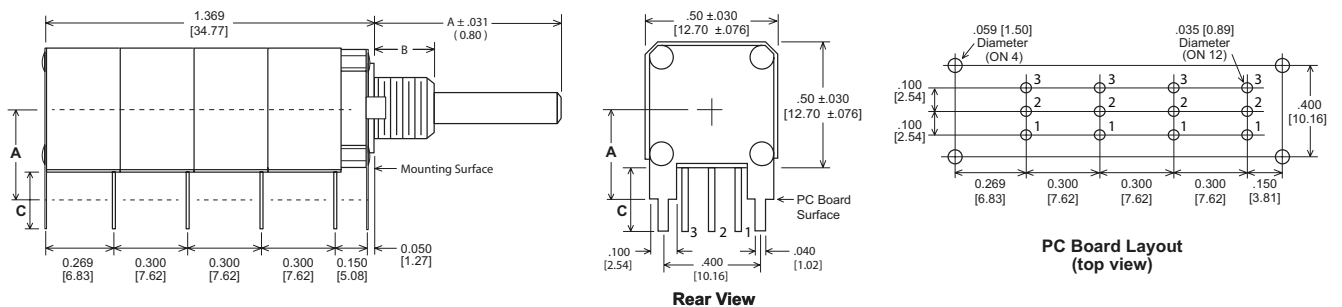
Dwg 12-2: B-24 Dual Potentiometer or Rotary Switch, Support Plates



Dwg 12-3: B-24 Triple Potentiometer or Rotary Switch, Support Plates



Dwg 12-4: B-24 Quad Potentiometer or Rotary Switch, Support Plates



Support Plate Dimensions:

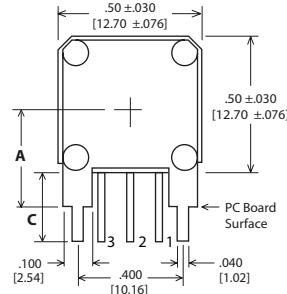
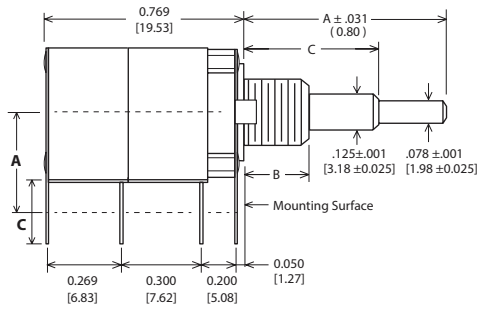
Type	"A" Support Plate	"C" Terminal Length
B-24-1	.375 [6.35]	.250 [6.35] STANDARD
B-24-2	.500 [12.70]	.375 [9.53]
B-24-3	.625 [15.88]	.500 [12.70]
B-24-4	.750 [19.05]	.625 [15.88]
B-24-5	.275 [6.98]	.125 [3.18]

Notes:

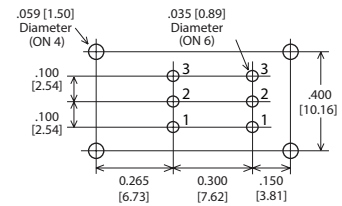
- Basic dimensions are in inches. Dimensions in brackets are in millimeters. Dimensional Tolerance ± 0.016 [0.40], except as specified.
- B-24 PC pins length standard is 0.250". Maximum 0.875"
- Drawings are not to scale.

Series 388/389 - Horizontal Mounting Styles (continued)

Dwg 12C-1: B-24 Dual Potentiometer or Rotary Switch, Concentric Shaft, PC Pin Terminals, Support Plates

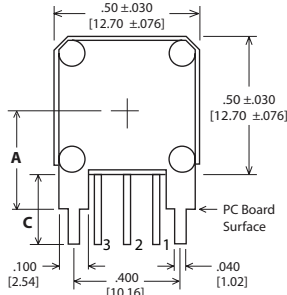
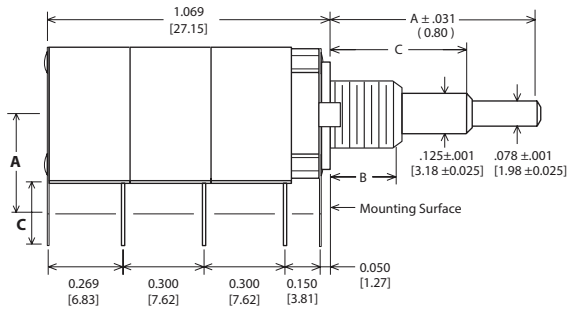


Rear View

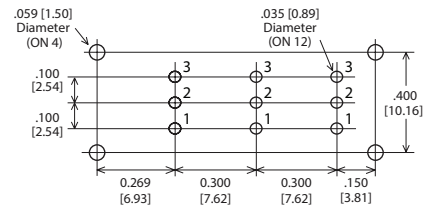


PC Board Layout (top view)

Dwg 12C-2: B-24 Triple Potentiometer or Rotary Switch, Concentric Shaft, PC Pin Terminals, Support Plates



Rear View



PC Board Layout (top view)

Notes:

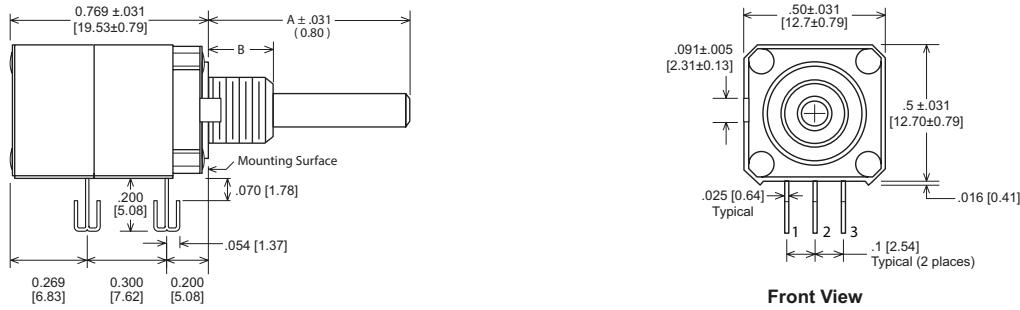
1. Basic dimensions are in inches.
Dimensions in brackets are in millimeters.
Dimensional Tolerance ± 0.016 [0.40], except as specified.
2. B-22 PC pins length standard is 0.250". Maximum 0.875"
3. Drawings are not to scale.

Series 388/389 - Horizontal Mounting Styles (continued)

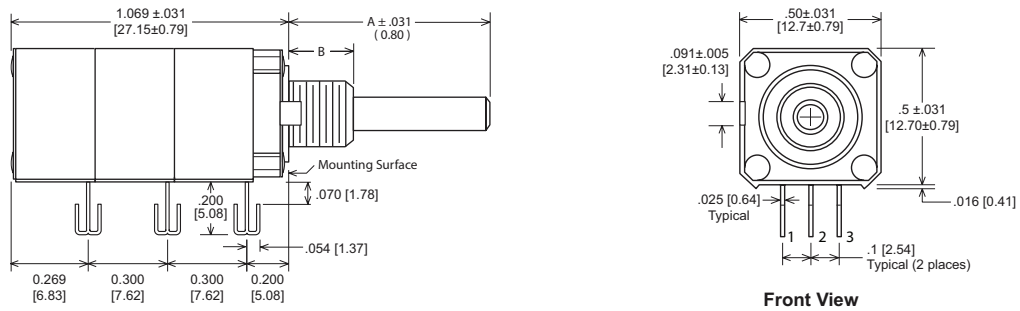
Dwg 13-1: B-22 Single Potentiometer or Rotary Switch, Solder Hook Terminals



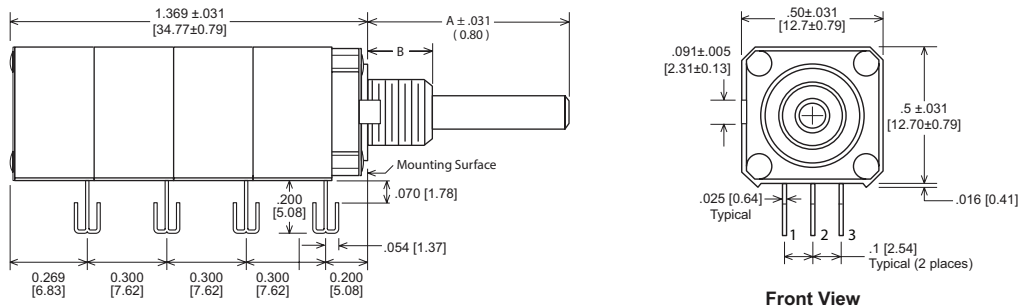
Dwg 13-2: B-22 Dual Potentiometer or Rotary Switch, Solder Hook Terminals



Dwg 13-3: B-22 Triple Potentiometer or Rotary Switch, Solder Hook Terminals



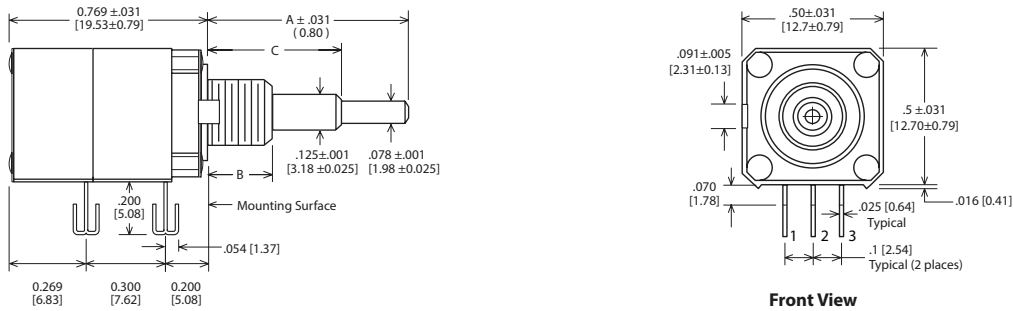
Dwg 13-4: B-22 Quad Potentiometer or Rotary Switch, Solder Hook Terminals



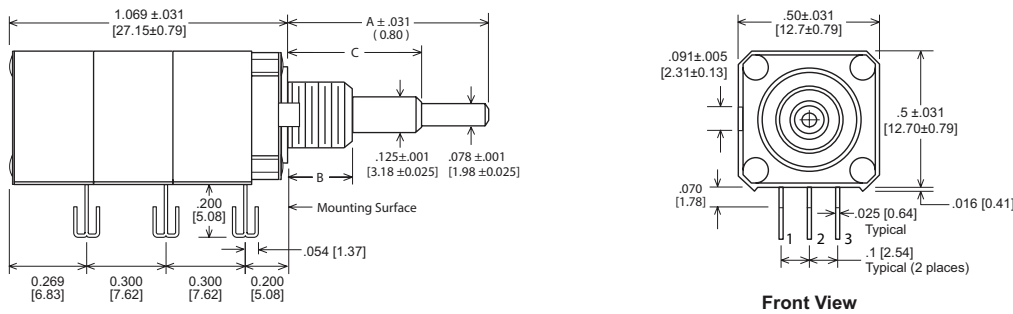
NOTE: Solder Hook Terminal receives (3) NO. 22 AWG .025 (0.64mm) solid wires

Series 388/389 - Horizontal Mounting Styles (continued)

Dwg 13C-1: B-22 Dual Potentiometer or Rotary Switch, Concentric Shaft, Solder Hook Terminals



Dwg 13C-2: B-22 Triple Potentiometer or Rotary Switch, Concentric Shaft, Solder Hook Terminals

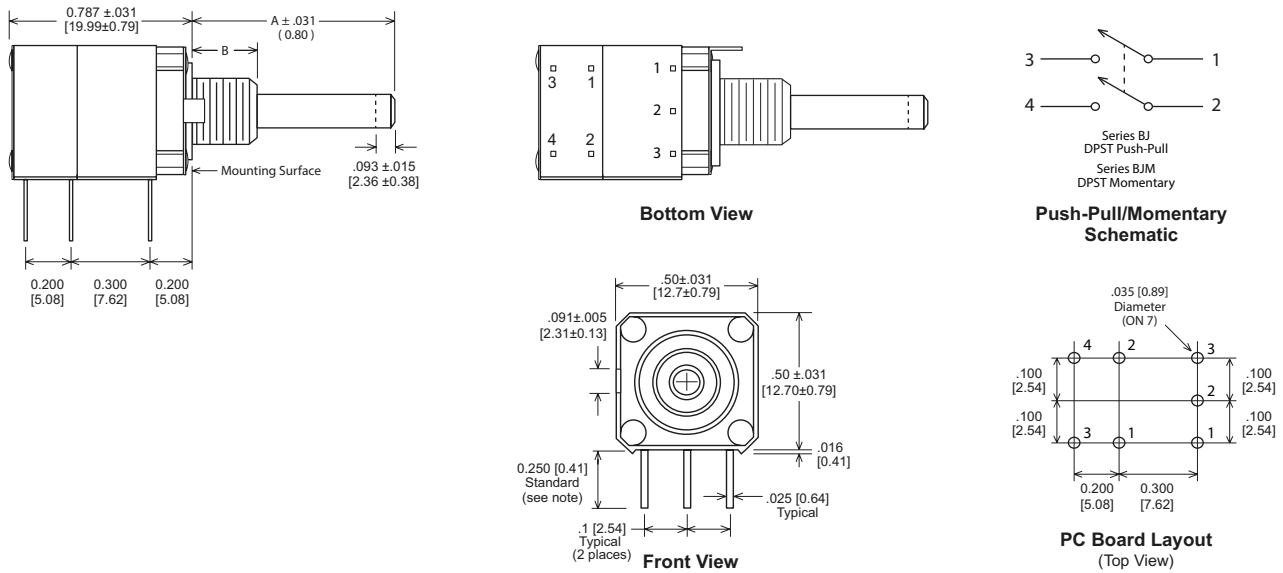


Notes:

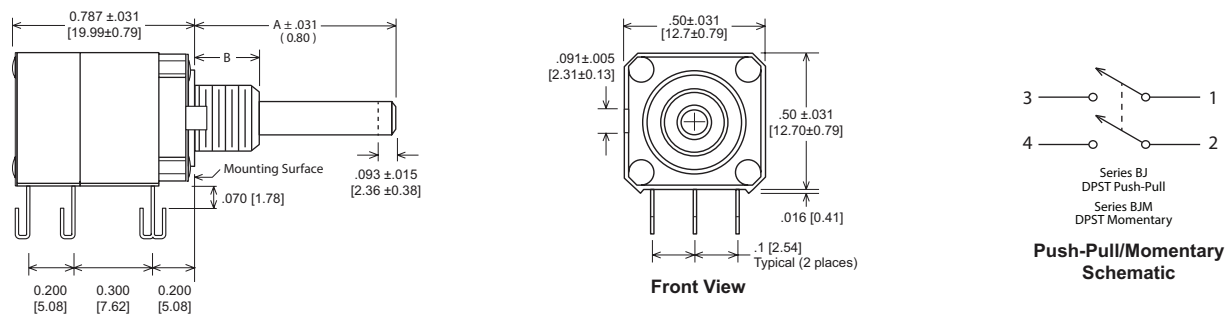
1. Basic dimensions are in inches.
Dimensions in brackets are in millimeters.
Dimensional Tolerance ± 0.016 [0.40], except as specified.
2. B-22 PC pins length standard is 0.250". Maximum 0.875"
3. Drawings are not to scale.

Series 388/389 - Horizontal Mounting Styles (continued)

Dwg 14-1: B-22 Single Potentiometer or Rotary Switch, plus Push-Pull/Momentary Switch, PC Pin Terminals



Dwg 14-1A: B-22 Single Pot or Rotary Switch, plus Push-Pull/Momentary Switch, Solder Hook Terminals

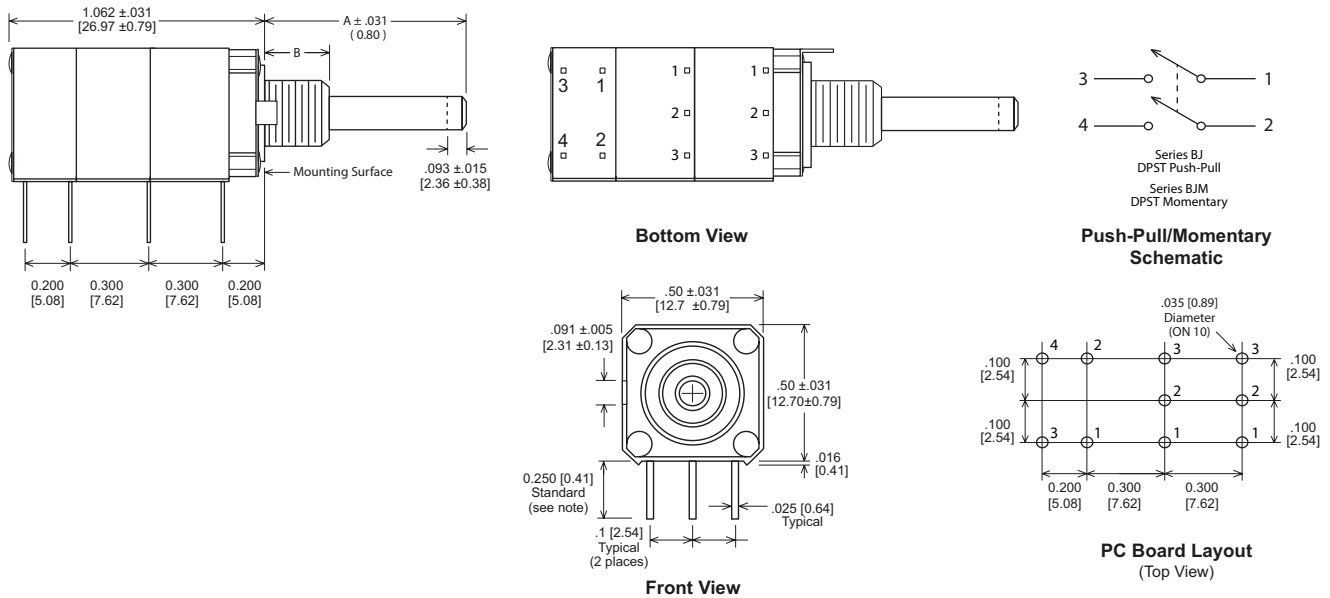


Notes:

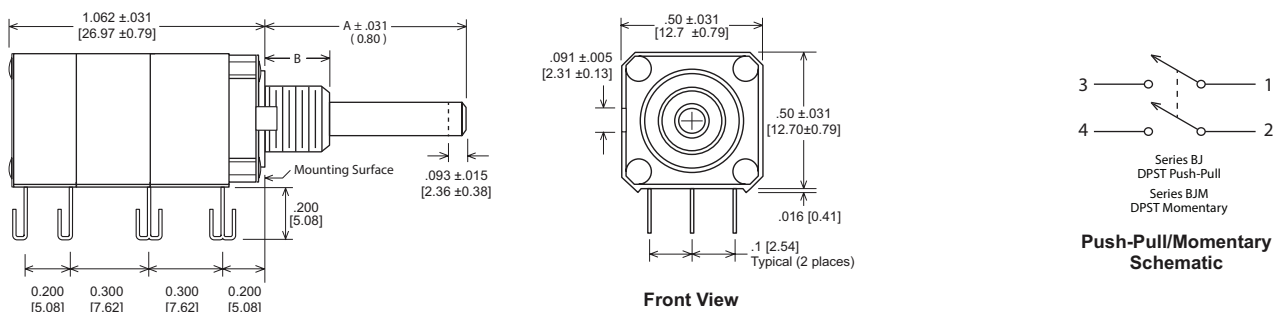
1. Basic dimensions are in inches.
Dimensions in brackets are in millimeters.
Dimensional Tolerance ± 0.016 [0,40], except as specified.
2. B-22 PC pins length standard is 0.250". Maximum 0.875"
3. Drawings are not to scale.

Series 388/389 - Horizontal Mounting Styles (continued)

Dwg 14-2: B-22 Dual Potentiometer or Rotary Switch, plus Push-Pull/Momentary Switch, PC Pin Terminals



Dwg 14-2A: B-22 Dual Pot or Rotary Switch, plus Push-Pull/Momentary Switch, Solder Hook Terminals

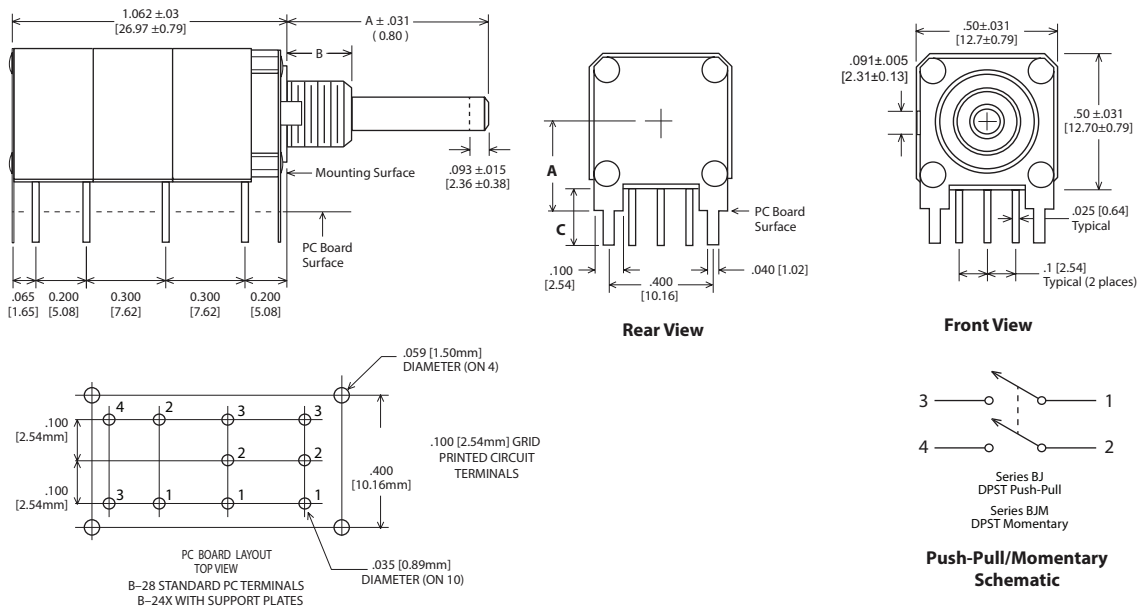


Notes:

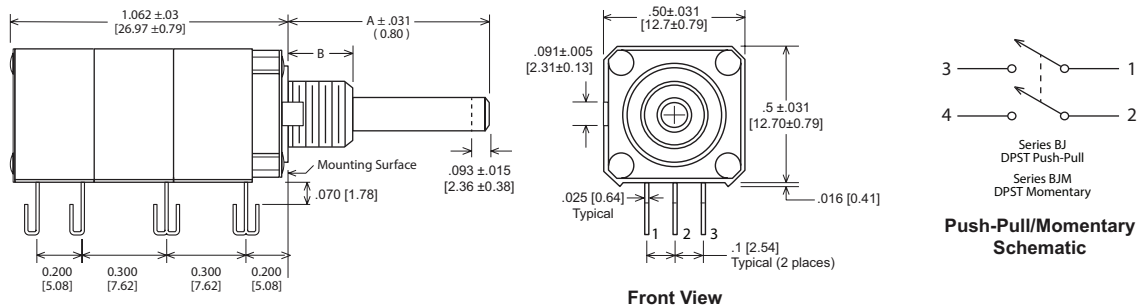
1. Basic dimensions are in inches.
Dimensions in brackets are in millimeters.
Dimensional Tolerance ± 0.016 [0,40], except as specified.
2. B-22 PC pins length standard is 0.250". Maximum 0.875"
3. Drawings are not to scale.

Series 388/389 - Horizontal Mounting Styles (continued)

Dwg 15-1: Dual Potentiometer/Rotary switch with (BJ) Push-Pull/(BJM) Momentary Switch; PC Pin Terminals (Support Plates optional)



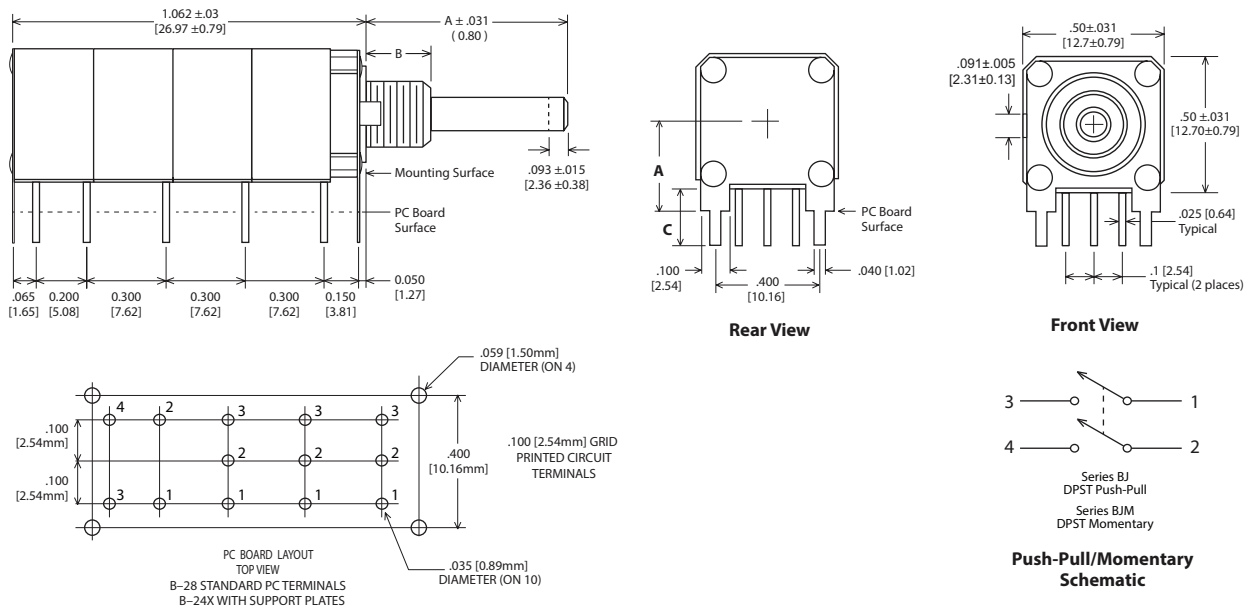
Dwg 15-2: Dual Potentiometer/Rotary switch with (BJ) Push-Pull/(BJM) Momentary Switch; Solder Hook Terminals.



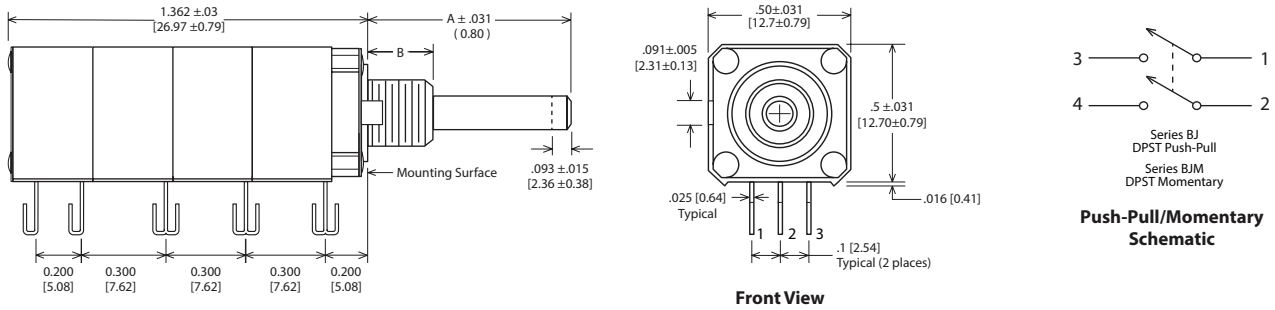
1. Basic dimensions are in inches.
Dimensions in brackets are in millimeters.
Dimensional Tolerance ± 0.016 [0,40], except as specified.
2. B-22 PC pins length standard is 0.250". Maximum 0.875"
3. Drawings are not to scale.

Series 388/389 - Horizontal Mounting Styles (continued)

Dwg 15-3: Triple Potentiometer/Rotary switch with (BJ) Push-Pull/(BJM) Momentary Switch; PC Pin Terminals (Support Plates optional)



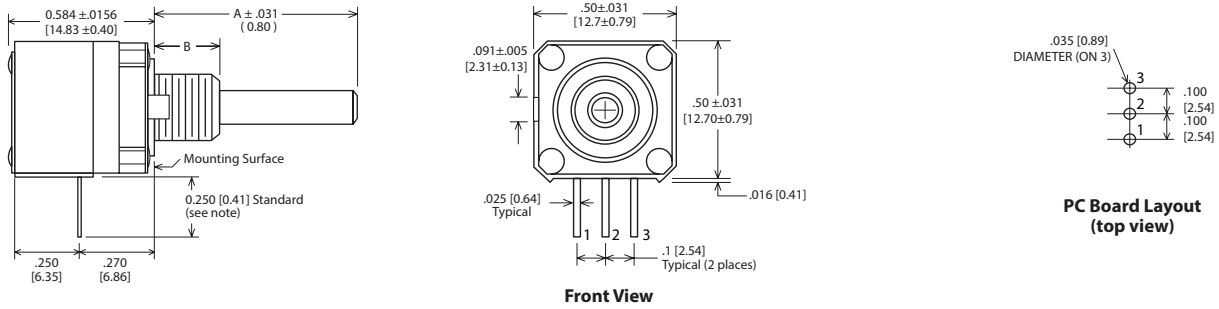
Dwg 15-4: Triple Potentiometer/Rotary switch with (BJ) Push-Pull/(BJM) Momentary Switch; Solder Hook Terminals.



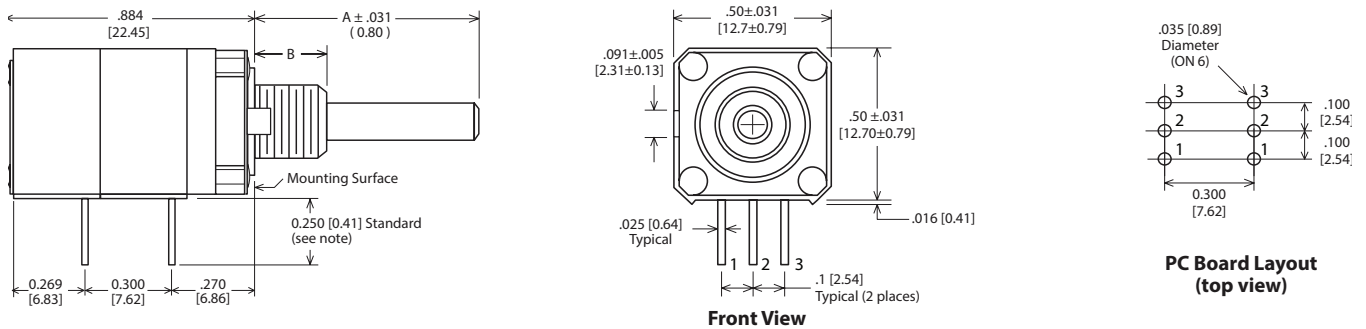
1. Basic dimensions are in inches.
Dimensions in brackets are in millimeters.
Dimensional Tolerance ± 0.016 [0,40], except as specified.
2. B-22 PC pins length standard is 0.250". Maximum 0.875"
3. Drawings are not to scale.

Series 388/389 - Horizontal Mounting Styles (continued)

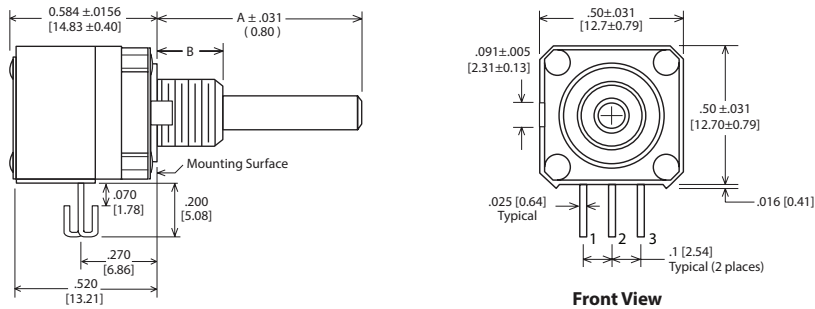
Dwg 16-1: B-22 Single Potentiometer with detent, Valley Style, PC Pin Terminals



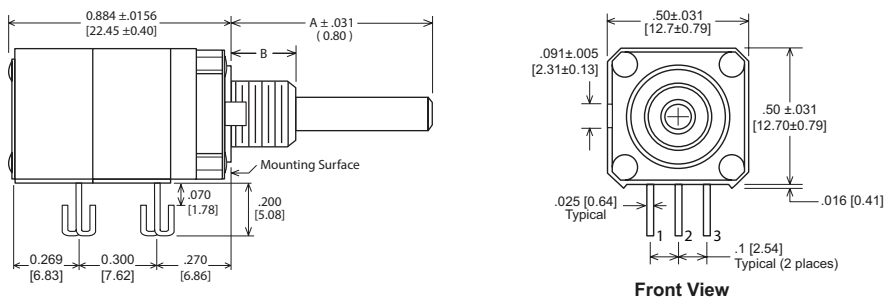
Dwg 16-2: B-22 Dual Potentiometer with detent, Valley Style, PC Pin Terminals



Dwg 16-3: B-22 Single Potentiometer with detent, Valley Style, Solder Hook Terminals

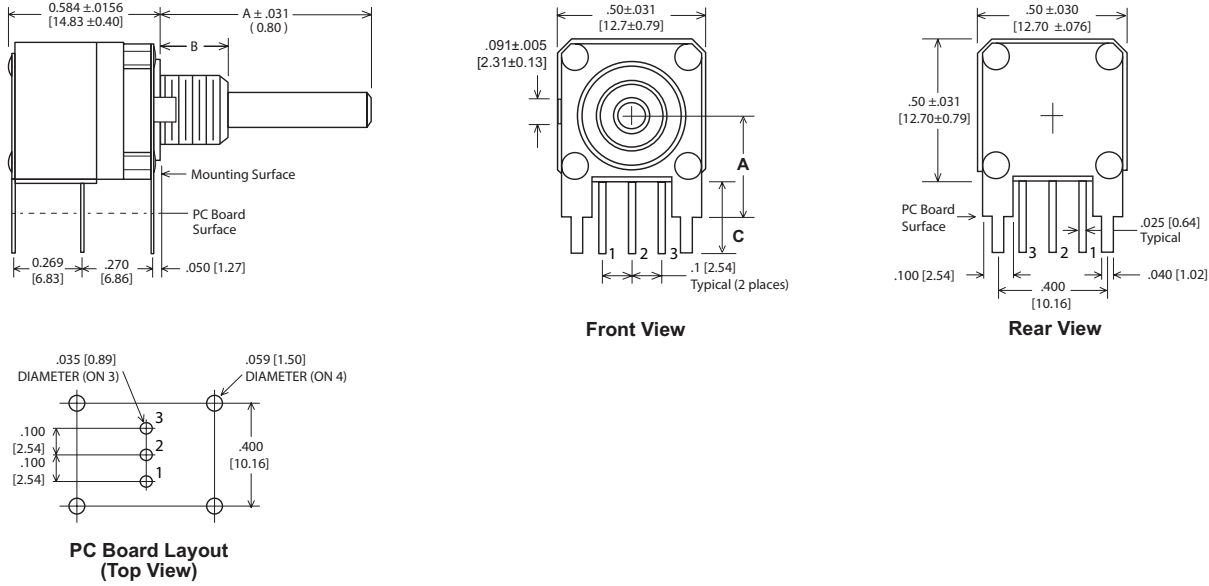


Dwg 16-4: B-22 Dual Potentiometer with detent, Valley Style, Solder Hook Terminals

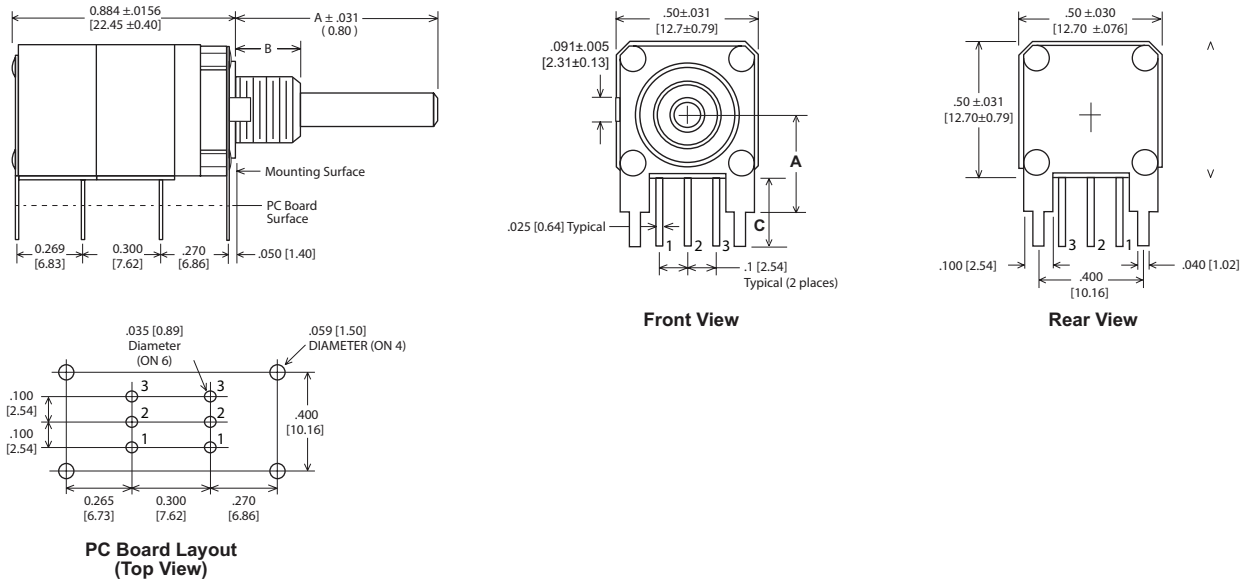


Series 388/389 - Horizontal Mounting Styles (continued)

Dwg 17-1: B-24 Single Potentiometer with detent, Valley Style, PC Pin Terminals, Support Plates

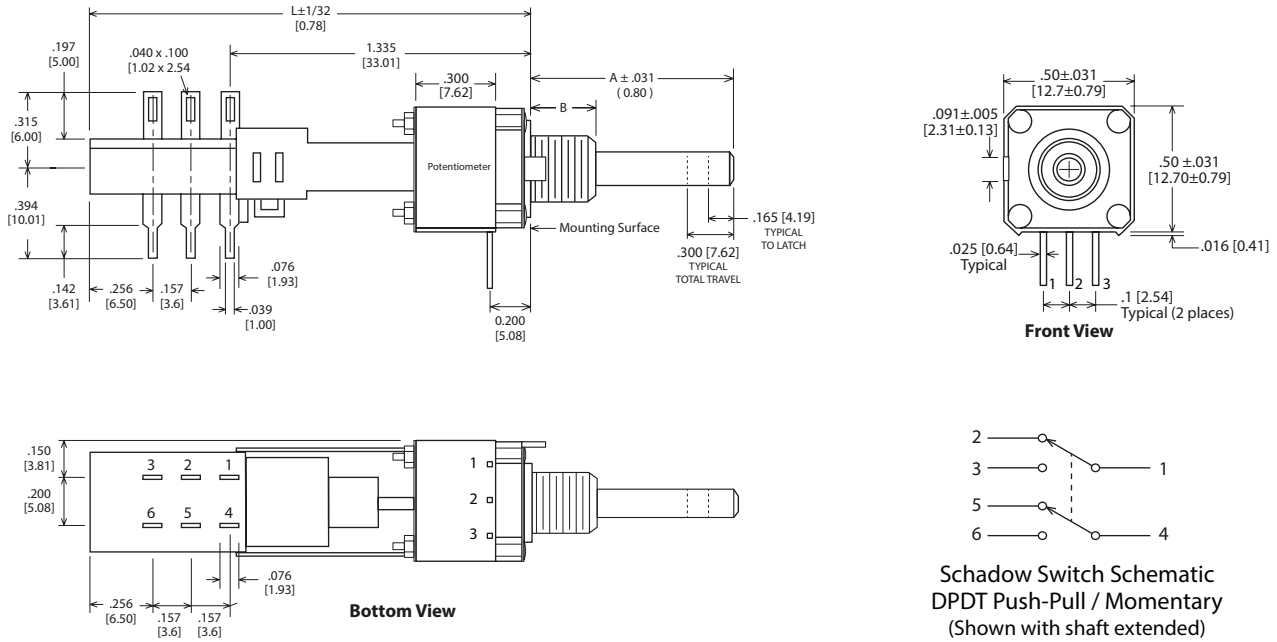


Dwg 17-2: B-24 Dual Potentiometer with detent, Valley Style, PC Pin Terminals, Support Plates

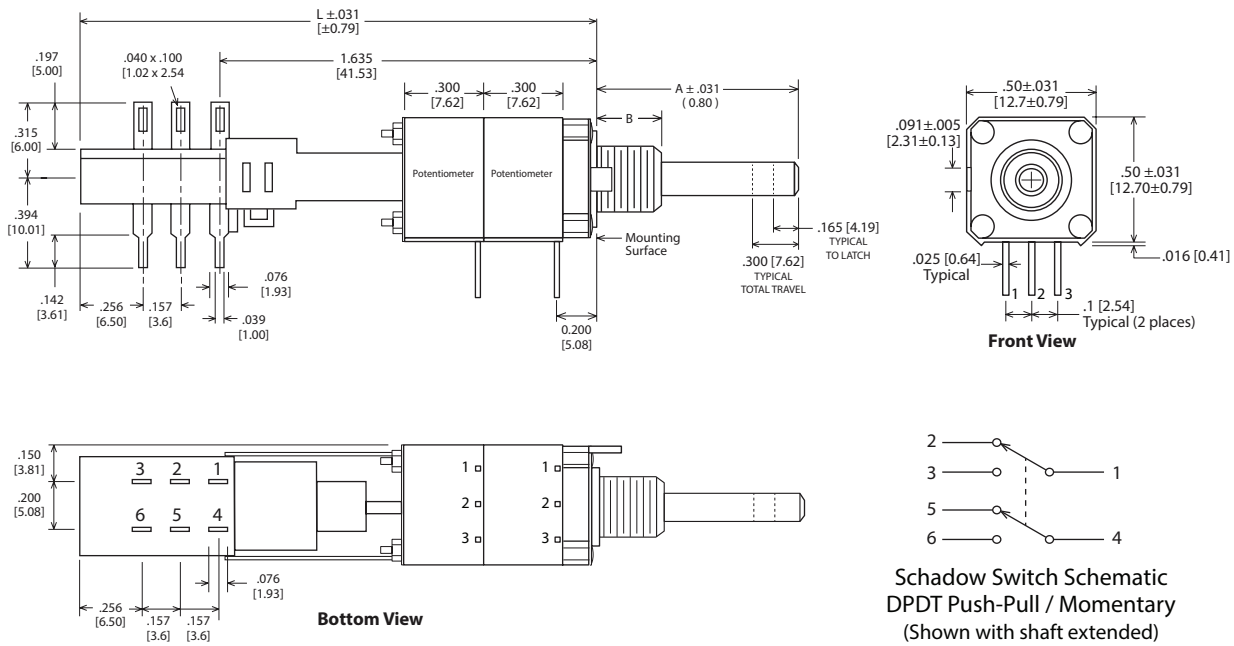


Series 388/389 - Horizontal Mounting Styles (continued)

Dwg 18-1: Single Potentiometer with DPDT Schadow Switch: Momentary Push or Push On / Push Off.

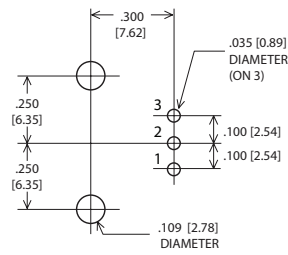
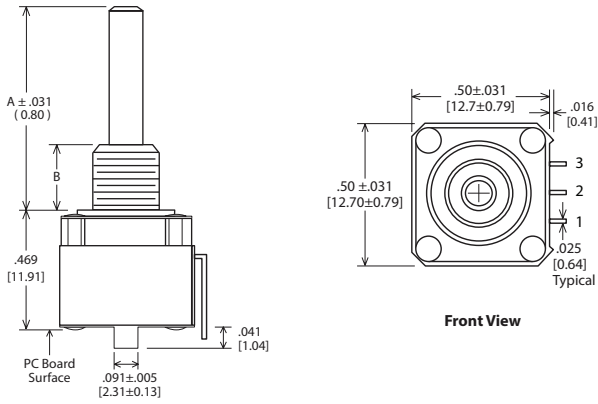


Dwg 18-2: Dual Potentiometer with DPDT Schadow Switch: Momentary Push or Push On / Push Off.



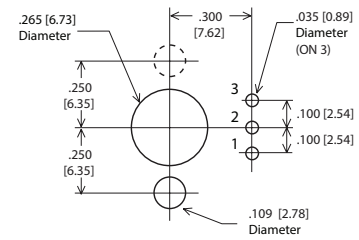
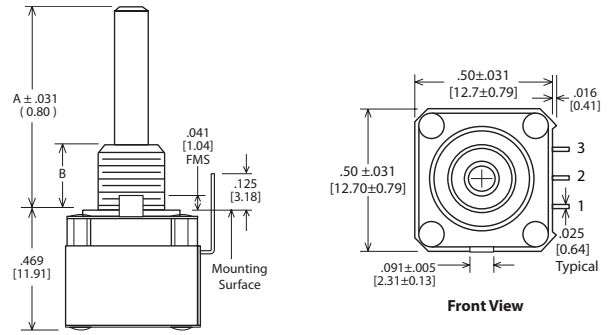
Series 388/389 - Vertical Mounting Styles

Dwg 19-1: C-8 Single Potentiometer or Rotary Switch, PC Pin Terminals



PC Board Layout (top view)
Type C-8

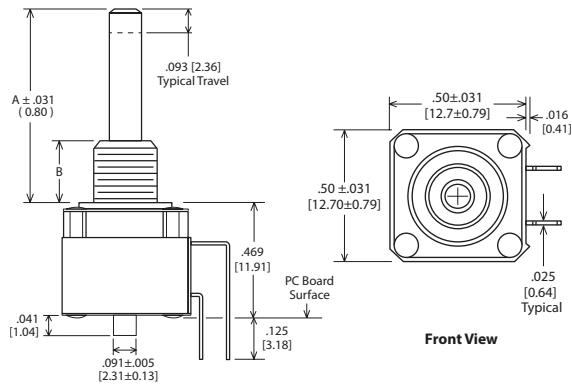
Dwg 19-2: A-18 Single Potentiometer or Rotary Switch, PC Pin Terminals



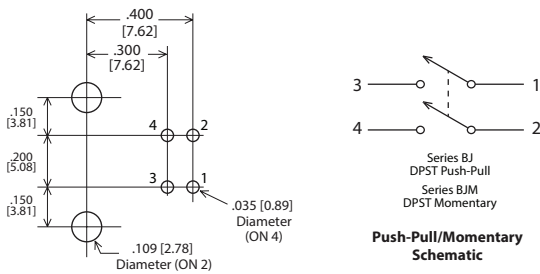
PC Board Layout (top view)
Type A-18

Series 388/389 - Vertical Mounting Styles (continued)

Dwg 20-1: C-15 Single BBJ Push-Pull / BBJM Momentary Switch, PC Pin Terminals



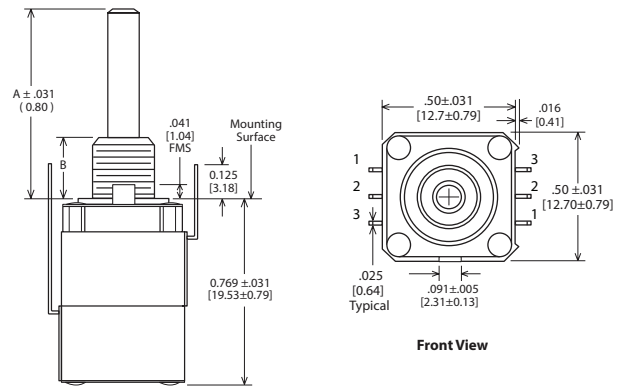
Front View



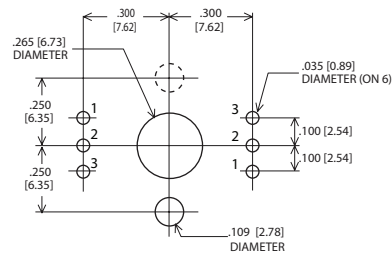
PC Board Layout (top view)
Type C-15

Push-Pull/Momentary Schematic

Dwg 20-2: A-19 Dual Potentiometer or Rotary Switch, PC Pin Terminals

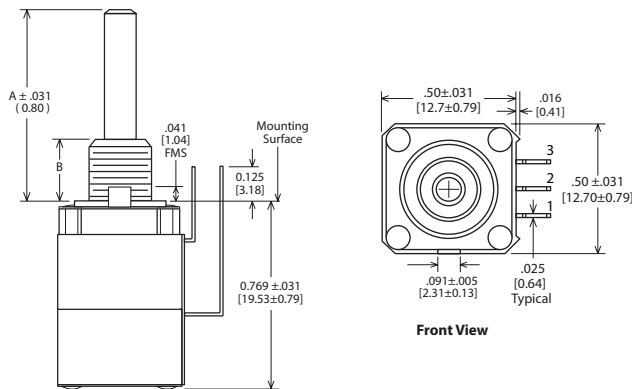


Front View

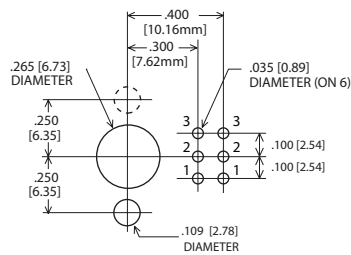


PC BOARD LAYOUT (top view)
Type A-19

Dwg 20-3: A-20 Dual Potentiometer or Rotary Switch, PC Pin Terminals



Front View



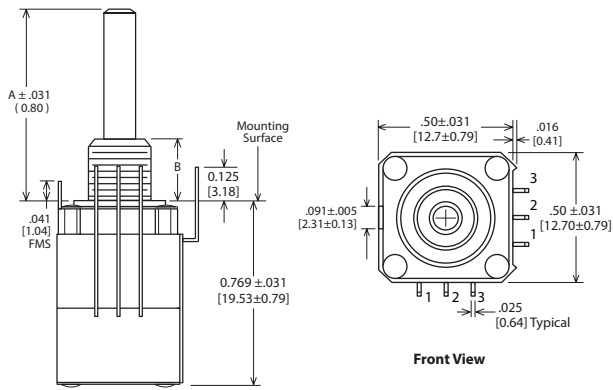
PC BOARD LAYOUT (top view)
Type A-20

Notes:

1. Basic dimensions are in inches.
Dimensions in brackets are in millimeters.
Dimensional Tolerance $\pm .016$ [0.40], except as specified.
2. Drawings are not to scale.

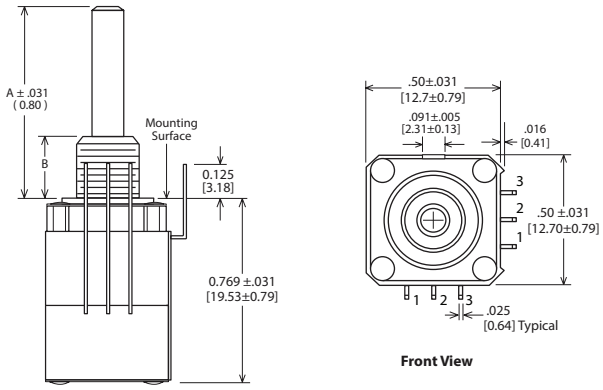
Series 388/389 - Vertical Mounting Styles (continued)

Dwg 21-1: A-21 Dual Potentiometer or Rotary Switch, PC Pin Terminals



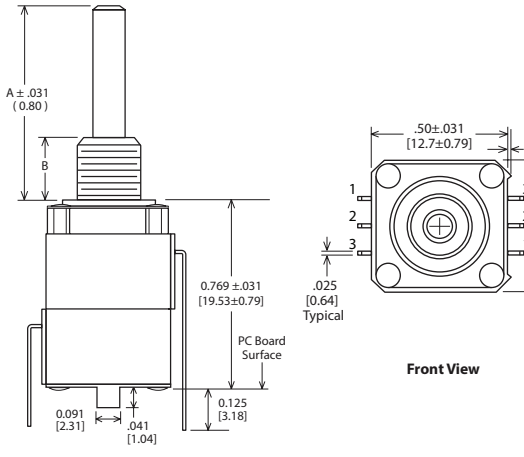
PC BOARD LAYOUT (top view)
Type A-21

Dwg 21-2: A-20 Dual Potentiometer or Rotary Switch, PC Pin Terminals



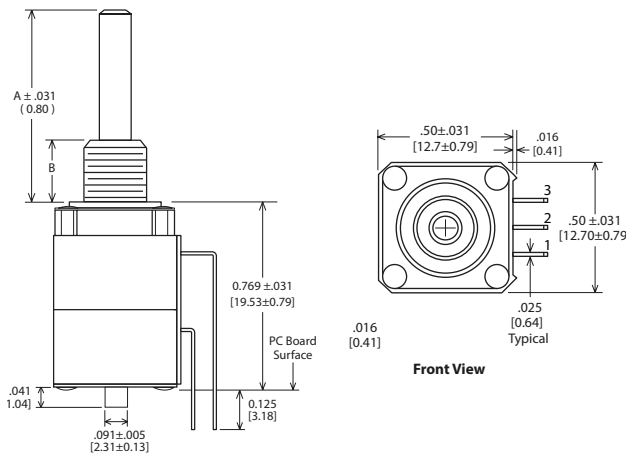
PC BOARD LAYOUT (top view)
Type A-20

Dwg 21-3: C-9 Dual Potentiometer or Rotary Switch, PC Pin Terminals



PC BOARD LAYOUT (top view)
Type C-9

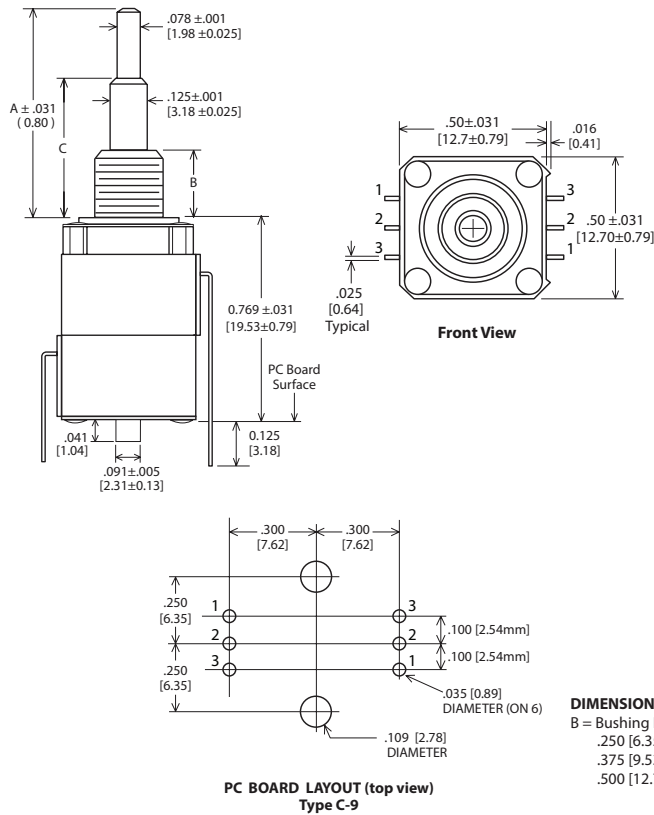
Dwg 21-4: C-10 Dual Potentiometer or Rotary Switch, PC Pin Terminals



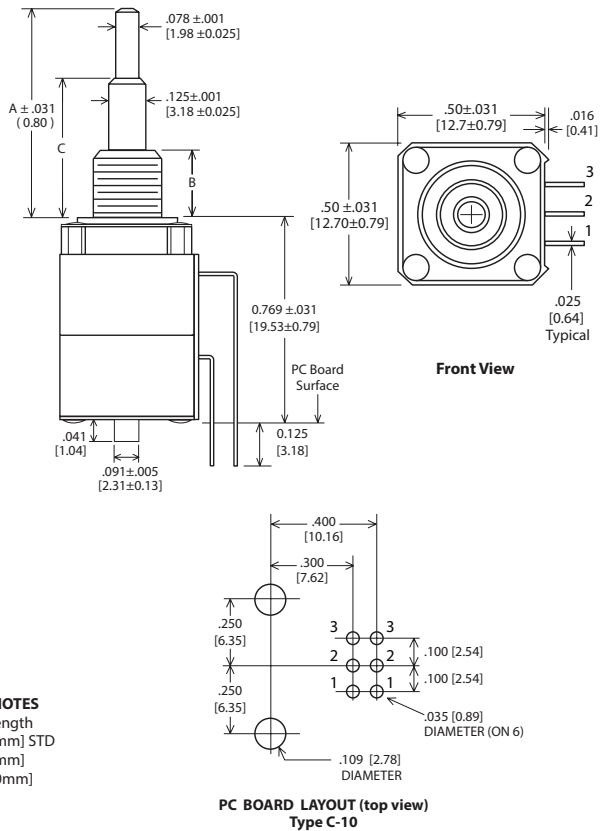
PC BOARD LAYOUT (top view)
Type C-10

Series 388/389 - Vertical Mounting Styles (continued)

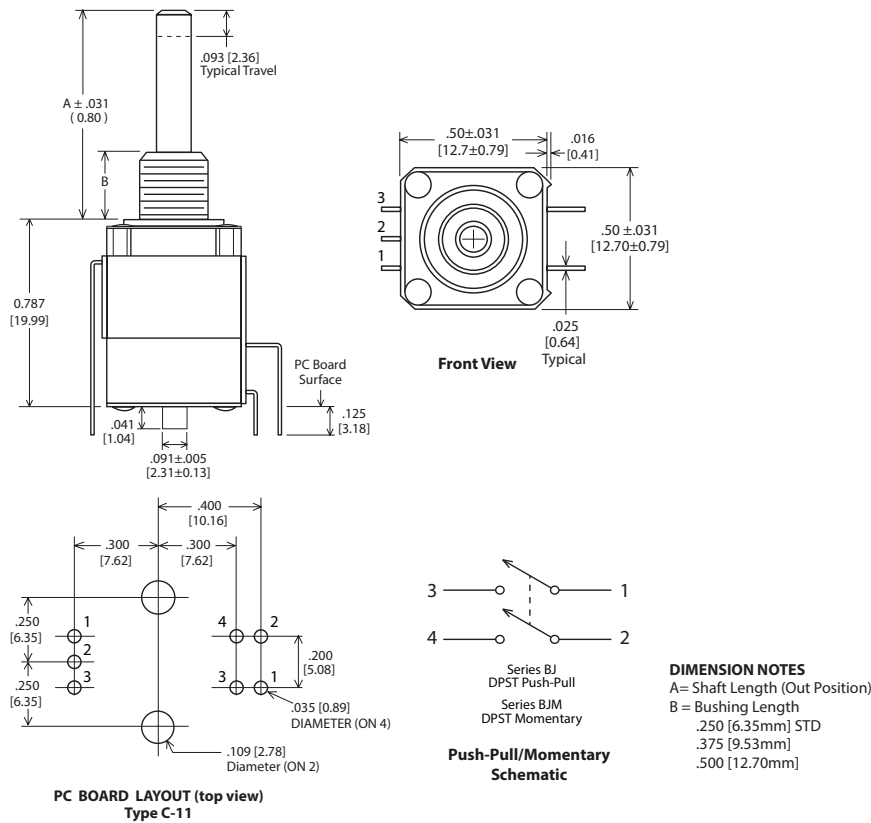
Dwg 22-1: C-9 Dual Potentiometer, Concentric Shaft, PC Pin Terminals



Dwg 22-2: C-10 Dual Potentiometer, Concentric Shaft, PC Pin Terminals

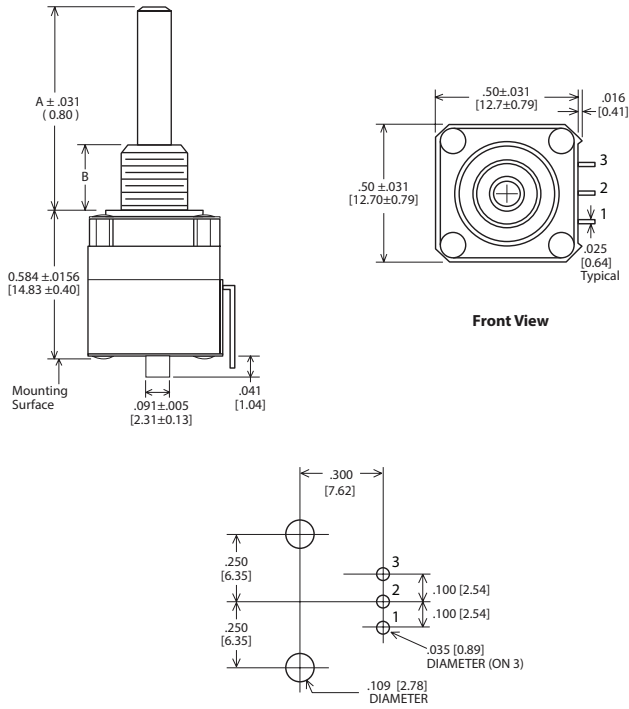


Dwg 22-3: C-11 Single Potentiometer and BBJ Momentary/BBJM Push-Pull Switch, PC Pin Terminals



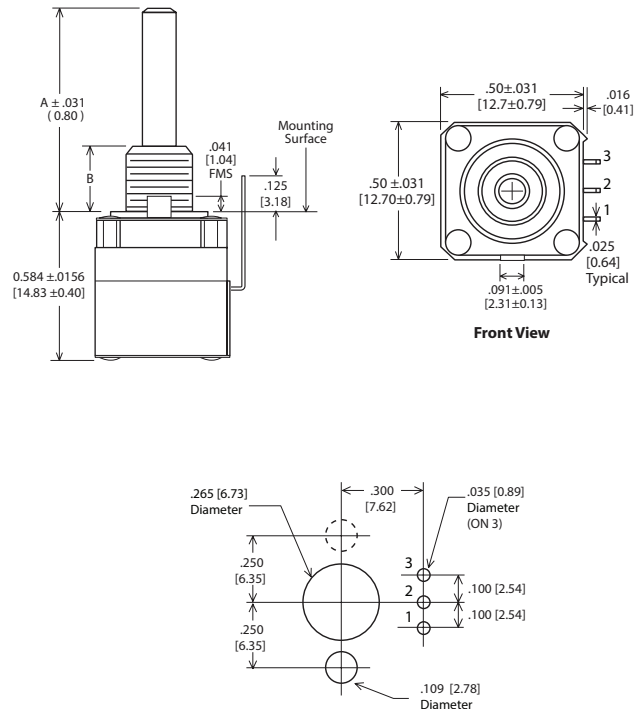
Series 388/389 - Vertical Mounting Styles (continued)

Dwg 23-1: C-8 Single Potentiometer with Detent, PC Pin Terminals



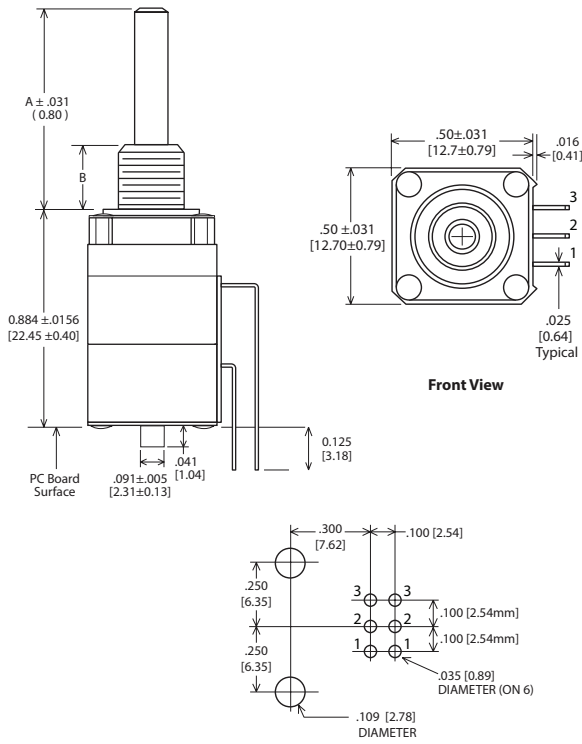
PC Board Layout (top view)
Type C-8

Dwg 23-2: A-18 Single Potentiometer with Detent, PC Pin Terminals



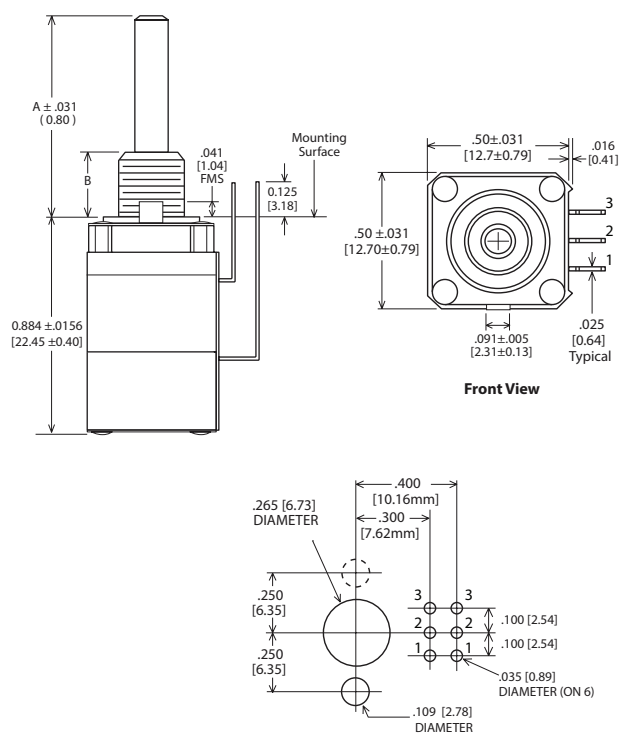
PC Board Layout (top view)
Type A-18

Dwg 23-3: C-10 Dual Potentiometer with Detent, PC Pin Terminals



PC BOARD LAYOUT (top view)
Type C-10

Dwg 23-4: A-20 Dual Potentiometer with Detent, PC Pin Terminals



PC BOARD LAYOUT (top view)
Type A-20

CLAROSYSTEM

Series 388/389

Request For Quotation
Single Page Form

1/2" Square Modular Potentiometer
Conductive Plastic - 1/2 Watt
Cermet - 1 Watt



36 ROUTE 10 EAST HANOVER, N.J. 07936
TEL. 973-887-2550 Toll Free 800-631-8083

[Request Quotation Online at Potentiometer.com](http://Potentiometer.com)

Customer Name _____ Address _____

City, State, Zip, Country _____ Customer Part Number/When Specified _____

SEE DATA SHEETS FOR ASSEMBLED DIMENSIONS & DETAILED DESCRIPTION OF THE FOLLOWING OPTIONS:

FOLLOW STEPS TO DESCRIBE CONTROL

STEP 1	RESISTANCE ELEMENT (Select One)	<input type="checkbox"/> Conductive Plastic Series 388	<input type="checkbox"/> Cermet Series 389	LOCATING LUG OPTIONS Dimension A → Dimension B → Modules 1 2 3 4 B22 Style Terminal	Printed Circuit Terminal Styles (Check One) C8 <input type="checkbox"/> A18 <input type="checkbox"/>		
STEP 2	TERMINALS (Select One)	B22 P.C. Pin Style Terminals (See Other Options At Right) <input type="checkbox"/> .350" length <input type="checkbox"/> .875" length			C10 <input type="checkbox"/> A20 <input type="checkbox"/>		
STEP 3	TAPER (Insert Taper Designation Letter for Each Resistance Module)	Cermet: S, Z Conductive Plastic: S, Z, RZ (See Graph Below)		Module 1	Module 2	Module 3	Module 4
STEP 4	RESISTANCE VALUE (Insert for Each Resistance Module)	Nominal Resistance Values in Ohms 100 1K 10K 100K 1.0 Meg 250 2.5K 25K 250K 2.5 Meg 500 5K 50K 500K 5 Meg Other Values Available on Special Order Standard Tolerance: 10%					
STEP 5	SWITCH MODULES (Insert for Each Switch Module)	AJ Rotary SPDT CW or CCW detent BJ Push-Pull SPDT (last section only) BJM Momentary SPDT (last section only) Schadow DPDT Momentary (last section only) Schadow DPDT Push-Push (last section only)		Optional B-24 Mounting Plate "A" Dimension <input type="checkbox"/> B-24-1 .375 <input type="checkbox"/> B-24-2 .500 <input type="checkbox"/> B-24-3 .625 <input type="checkbox"/> B-24-4 .750 <input type="checkbox"/> B-24-5 .275			
STEP 6	BUSHING (Select Length and Diameter)	Length (Dim "A") <input type="checkbox"/> 1/4" <input type="checkbox"/> 3/8" <input type="checkbox"/> Locking 3/8" Bushing Diameter <input type="checkbox"/> 1/4" <input type="checkbox"/> 3/8"		Length (Dim "B" Inches): From Mounting Surface (FMS) 1/8" Diameter <input type="checkbox"/> 5/16 <input type="checkbox"/> 3/8 <input type="checkbox"/> 7/16 <input type="checkbox"/> 1/2 <input type="checkbox"/> 5/8 <input type="checkbox"/> 3/4 <input type="checkbox"/> 7/8 <input type="checkbox"/> 1" <input type="checkbox"/> 2" <input type="checkbox"/> Other _____ 1/4" Diameter <input type="checkbox"/> 1/2 <input type="checkbox"/> 3/4 <input type="checkbox"/> 7/8 <input type="checkbox"/> Other _____			
STEP 7	SHAFT (Select Diameter and Length)	Concentric Combinations (Up to 3 modules. Panel module controlled by outer shaft.) Concentric Shaft Diameter: .125" Outer Diameter .078" Inner Diameter		Outer Shaft Length - Specify <input type="checkbox"/> 7/8" <input type="checkbox"/> 1 1/2" Other _____ Inner Shaft Length - Specify <input type="checkbox"/> 1 1/8" <input type="checkbox"/> 1 3/4" Other _____			
STEP 8	LOCATING LUG OPTIONS (Select One)	<input type="checkbox"/> 1 = tab at 9 o'clock (std) <input type="checkbox"/> 2 = tab at 3 o'clock <input type="checkbox"/> 3 = tab at 12 o'clock <input type="checkbox"/> 4 = tab at 6 o'clock <input type="checkbox"/> 5 = tabs at 3 and 9 o'clock <input type="checkbox"/> 6 = tabs at 6 and 12 o'clock <input type="checkbox"/> 7 = No Locating Lug					
STEP 9	MOUNTING HARDWARE (Select One)	<input type="checkbox"/> STANDARD <input type="checkbox"/> NONE					
STEP 10	MARKING (Select One)	<input type="checkbox"/> STANDARD <input type="checkbox"/> OTHER					
STEP 11	KNOB	Indicate Manufacturer and Part Number _____					
STEP 12	QUANTITY	Purchase Order No. _____					

NOTE: SELECT THE DIMENSIONS WHICH ARE REQUIRED AND FILL IN ALL APPROPRIATE BOXES

REMARKS AND/OR SPECIAL FEATURES: _____

Date: _____ Issued By: _____ Title: _____ Phone: _____

Fax completed form to: STATE ELECTRONICS, 36 Route 10, East Hanover, NJ 07936 • FAX 973-887-1940

For Assistance Contact Clarosystem Product Manager Toll Free – 800-631-8083

CLAROSYSTEM

Series 388/389

Request For Quotation
Page 1 of 3

1/2" Square Modular Potentiometer

Conductive Plastic - 1/2 Watt
Cermet - 1 Watt



36 ROUTE 10 EAST HANOVER, N.J. 07936
TEL. 973-887-2550 Toll Free 800-631-8083

[Request Quotation Online at Potentiometer.com](http://Potentiometer.com)

Series 388/389 Custom Ordering Information – Follow Steps to Describe Control

1 Resistance Element (choose one) Series 388 Conductive Plastic Series 389 Cermet

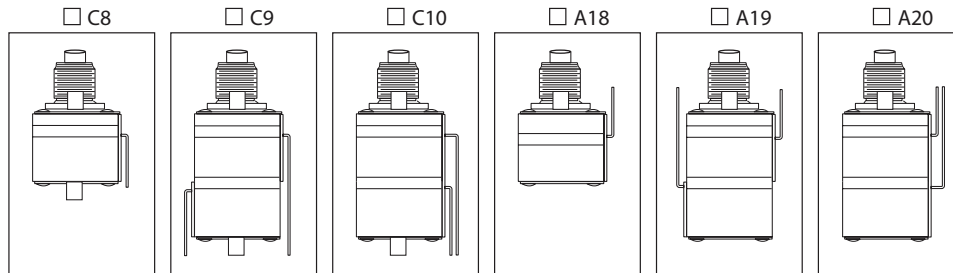
2 Terminals OR Support Plates (choose one)

Terminals (choose style)

Solder Hook

- PC Pin Style B22 (specify length)
- .250 in. (6.35mm)
 - .350 in. (8.89mm)
 - .750 in. (19.05mm)
 - .500 in. (12.7mm)
 - .625 in. (15.875mm)
 - .875 in. (22.225mm) Standard

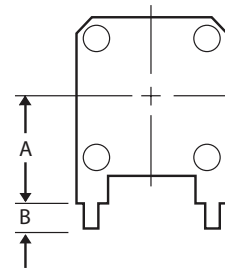
PC Pin Style special configuration (specify)



Optional Support Plates (choose one type)

Type	"A" Support Plate		"B" Terminal	
	in.	(mm)	in.	(mm)
<input type="checkbox"/> B-24-1	.375	(9.53)	.250	(6.35)
<input type="checkbox"/> B-24-2	.500	(12.53)	.375	(9.35)
<input type="checkbox"/> B-24-3	.625	(15.88)	.500	(12.70)
<input type="checkbox"/> B-24-4	.750	(19.05)	.625	(15.88)
<input type="checkbox"/> B-24-5	.275	(6.98)	.125	(3.18)
* B-24-6	.2969	(7.54)	.175	(4.45)
* B-24-7	.4375	(11.11)	.315	(8.00)
* B-24-8	.5625	(14.28)	.425	(10.8)

* (Discontinued - For Reference Only)



CLAROSYSTEM

Series 388/389

Request For Quotation
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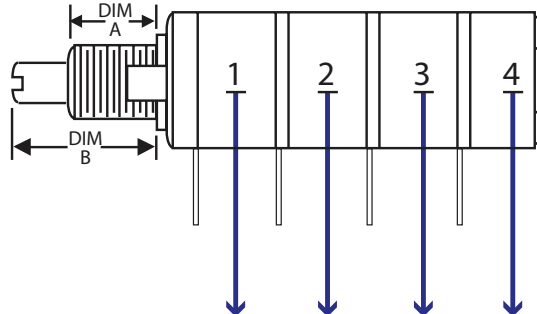
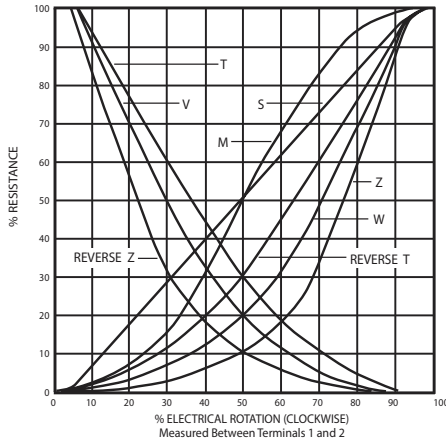
1/2" Square Modular Potentiometer

Conductive Plastic - 1/2 Watt

Cermet - 1 Watt



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TEL. 973-887-2550 Toll Free 800-631-8083



3 Taper (Insert taper designation letter below module or modules)

Cermet or Conductive Plastic	Taper Design
Linear	S
Clockwise Modified Log	Z
Counter Clockwise Modified Log	RZ
Modified Linear	M*
Counter Clockwise Modified Log	V*
Modified Log	W*
Counter Clockwise Modified Log	T*
Modified Log	RT* *(special order)

4 Tolerance (Insert tolerance for each resistance module)

Cermet: 10% standard; 5% special
Conductive Plastic: 10% standard; 5% special

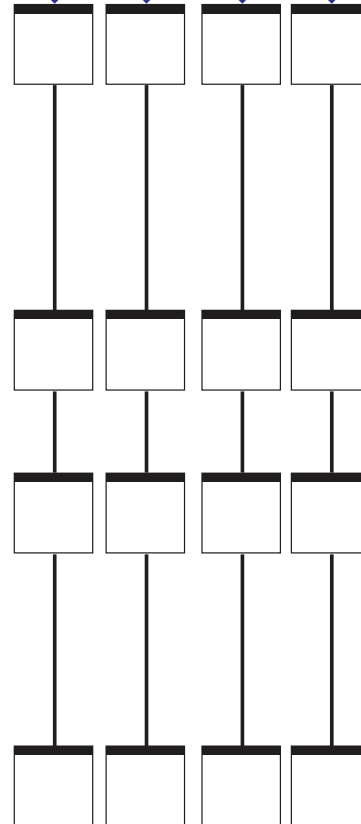
5 Resistance Value (Insert for each resistance module)

Nominal Resistance Values in Ohms				
100	1K	10K	100K	1.0 Meg
250	2.5K	25K	250K	2.5 Meg
500	5K	50K	500K	

Other Values Available
on Special Order

6 Switch Modules (Insert designation in proper module box)

- AJ SPDT Rotary - CCW detent
- AJ SPDT Rotary - CW detent
- BJ SPDT Push-Pull (last section only)
- BJM SPDT Push Momentary (last section only)
- Schadow DPDT Push-Push (single shaft, last section only)
- Schadow DPDT Momentary (single shaft, last section only)



CLAROSYSTEM

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Request For Quotation
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1/2" Square Modular Potentiometer
Conductive Plastic - 1/2 Watt
Cermet - 1 Watt



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7 Special Options (Specify if required)

8 lb. Stop Torque

8 Bushing (Choose length and diameter)

Length (Dim "A")	<input type="checkbox"/> Plain .250 in. (6.35mm)	Diameter	<input type="checkbox"/> Plain .250 in. (6.35mm)
	<input type="checkbox"/> Plain .375 in. (9.53mm)		<input type="checkbox"/> Plain .375 in. (9.53mm)
	<input type="checkbox"/> Plain .500 in (12.70mm)		
	<input type="checkbox"/> Locking .375 in (9.53mm)		

9 Shaft

Diameter (Choose one) .125 in. (3.18mm) (with .250 in. (6.35mm) Dia. bushing)
 .250 in. (6.35mm) (with .375 in. (9.53mm) Dia. bushing)

Length (Dim "B") from mounting surface (FMS) (specify) _____

Concentric Shafts (available for Up to 3 modules. Module closest to Panel is controlled by outer shaft.)

.125 in. (3.18mm) Outer Diameter; .078 in. (1.98mm) Inner Diameter

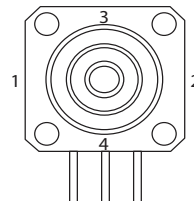
Length FMS (specify) Outer _____ Inner _____

10 Shaft Ending (Select one)

Plain Flatted (specify length & thickness) _____
 Slotted Special (specify) _____

11 Locating Lug Options (Select one)

- 1 = one tab - at 9 o'clock (standard)
- 2 = one tab - at 3 o'clock
- 3 = one tab - at 12 o'clock
- 4 = one tab - at 6 o'clock
- 5 = two tabs - at 3 and 9 o'clock
- 6 = two tabs - at 6 and 12 o'clock
- 7 = No Locating Lug



12 Mounting Hardware (Specify)

Standard IP66 Hardware None

13 Marking (Specify)

Standard Other _____

Mod-Pot™ SERIES OPTIONS



	70	72 - Plastic Bushing / Shaft Non-Magnetic Construction			388	389	S127
Technology	Conductive Plastic	Cermet	Conductive Plastic	Cermet	Conductive Plastic	Cermet	Conductive Plastic
Max Wattage Rating	1-Watt	2-Watt	1/2-Watt	1-Watt	1/2-Watt	1	1/2-Watt
Operating Temperature (°C)	-55° to 120°	-55° to 150°	-55° to 120°	-55° to 150°	-55° to 120°	-55° to 150°	-55° to 125°
Temperature Coefficient (TC)	+/-5% (Typical)	150 PPM °C	+/-5% (Typical)	150 PPM °C	+/-5% (Typical)	150 PPM °C	+/-5% (Typical)
Rotational Life		100,000			50,000	25,000	1,000,000
Sections		6			8		4

Center Detent				Center or 11 Detents Only			Optional
11 - Detents							
21 - Detents				21 Detents Not Available			

Rotary Switch - Counter Clockwise Detent		2A @125VAC			125 MA @ 28VDC SPDT		0.5A @ 30VDC SPDT
		1 SPST, N.O. + 1 SPST N.C. OR					No CW Detent
Rotary Switch - Clockwise Detent		2A @125VAC					
		1 SPST, N.O. + 1 SPST N.O					
Push-Pull Switch (1/8" or 1/4" Dia. Shaft)		Optional			250 MA @ 30 VDC		
		2A @125VAC					Not Available
Push-Momentary - 1/8" Dia. Shaft					1/8" Only 1 SPST N.O. + 1 SPST N.C.		
Push-Momentary - 1/4" Dia. Shaft		2 SPST N.O. + 2 SPST N.C					
Push-On / Push-Off - 1/8" Dia. Shaft		Not Available			1/4" Shaft - Not Available		
					Optional 500 MA @ 30V/DC DPDT		

Max Shaft Single Length - 1/8 Dia.		Metal Shaft 2.5"	Plastic Shaft - 3/4"			2"	2"
Max Shaft Single Length - 1/4 Dia.		Metal Shaft 2.5"	Plastic Shaft - 7/8"				
Concentric Shafts .078 / .125			6-Sections		Maximum 3-Sections.		
					Outer shaft - Panel Pot Only		Not Available
Concentric Shafts .125 / .250					.125 / .250 Combination Not Available		

Vernier Drive		Optional		No		No	No
Internal Shaft Seal		Optional		Optional		Optional	Standard
IP 66 Rated		No		No		No	Standard

Stop Torque		4 in / pd			3 in / pd		2.5 in / pd
High Stop Torque		Not Available			8 in / pd		Not Available
Rotational Torque Standard (Min / Max)			0.3 / 3.0 (In-Oz)		0.2 / 3.0 (In-Oz)		1.5 Max (In-Oz)
Rotational Torque, Medium Torque Option (Min / Max)				Not Available		1 - 6 (In-Oz)	Not Available
Non-Magnetic			N/A	Yes - with Plastic shaft and Bushing & Solder Lug Terminals		N/A	N/A
Rotary Switch Actuating Torque			20 (In-Oz)		3.3 - 10.5 (In-Oz)		2 (In-Oz)

Note: Most parameters (wattage rating, rotational torque, etc.) are affected by the total number of sections. Download full specifications for further details.

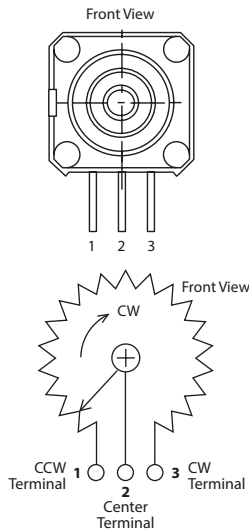
GLOSSARY OF TERMS

Input and Output Terms

Output Voltage

(e) The voltage between the wiper terminal and the designated reference point. Unless otherwise specified, the designated reference point is the CCW terminal (See 3.1).

Figure 1
Circuit and Travel
Diagram



Output Ratio

(e/E) The ratio of the output voltage to the designated input reference voltage. Unless otherwise specified, the reference voltage is the total applied voltage.

Rotation and Translation

Total Mechanical Travel

The total travel of the shaft between integral stops, under the specified stop load. In potentiometers without stops, the mechanical travel is continuous.

Mechanical Overtravel - Wirewound

The shaft travel between each End Point (or Theoretical End Point for Absolute Conformity or Linearity units) and its adjacent corresponding limit of Total Mechanical Travel.

Mechanical Overtravel

The shaft travel between each Theoretical End Point and its adjacent corresponding limit of Total Mechanical Travel.

Backlash

The maximum difference in shaft position that occurs when the shaft is moved to the same actual Output Ratio point from opposite directions.

Theoretical Electrical Travel

The specified shaft travel over which the theoretical function characteristic extends between defined Output Ratio limits, as determined from the Index Point.

Electrical Overtravel - Nonwirewound

The shaft travel over which there is continuity between the wiper terminal and the resistance element beyond each end of the Theoretical Electrical Travel.

Electrical Continuity Travel

The total travel of the shaft over which electrical continuity is maintained between the wiper and the resistance element.

Tap Location

The position of a tap relative to some reference. This is commonly expressed in terms of an Output Ratio and/or a shaft position. When a shaft position is specified, the Tap Location is the center of the Effective Tap Width.

Resistance

End Resistance

The resistance measured between the wiper terminal and an end terminal with the shaft positioned at the corresponding End Point.

Temperature Coefficient Of Resistance

The unit change in resistance per degree celsius change from a reference temperature, expressed in parts per million per degree celsius as follows:

$$T.C. = \frac{R_2 - R_1}{R_1(T_2 - T_1)} \times 10^6$$

Where:

R1 = Resistance at reference temperature in ohms.

R2 = Resistance at test temperature in ohms

T1 = Reference temperature in degrees celsius.

T2 = Test temperature in degrees celsius.

Conformity and Linearity

Linearity

A specific type of conformity where the theoretical function characteristic is a straight line.

Mathematically:

$$\frac{e}{E} = f(W) \pm C = A(W) + B \pm C$$

Where:

A is the given slope; B is given intercept at W=0.

W = Angle or slope

Absolute Linearity

The maximum deviation of the actual function characteristic from a fully defined straight reference line. It is expressed as a percentage of the Total Applied Voltage and measured over the Theoretical Electrical Travel. An Index Point on the actual output is required.

The straight reference line may be fully defined by specifying the low and high theoretical end Output Ratios separated by the Theoretical Electrical Travel. Unless otherwise specified, these end Output Ratios are 0.0 and 1.0 respectively.

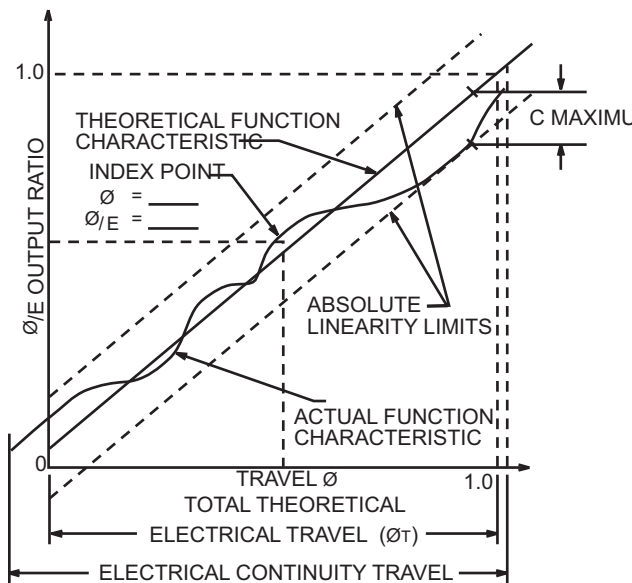
Mathematically:

$$\frac{e}{E} = A(W/W_T) + B \pm C$$

Where:

A is the given slope; B is given intercept at W=0. Unless otherwise specified: A=1; B=0

Figure 2



Independent Linearity

The maximum deviation, expressed as a percent of the Total Applied Voltage, of the actual function characteristic from a straight reference line with its slope and position chosen to minimize deviations over the Actual Electrical Travel, or any specified portion thereof.

Note: End Voltage requirements, when specified, will limit the slope and position of the reference line.

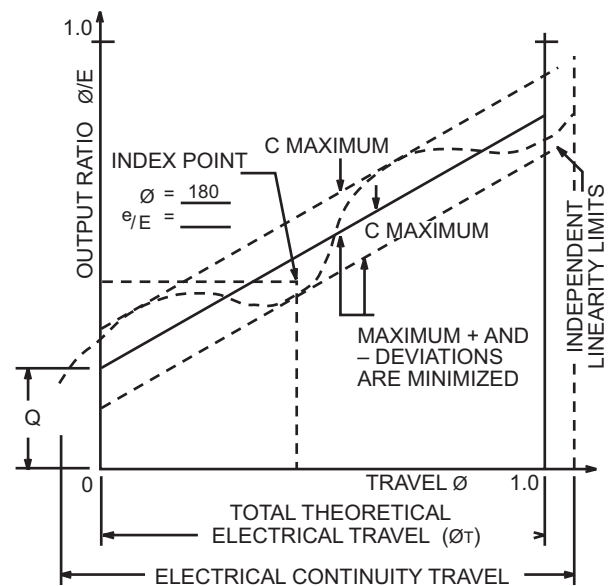
Mathematically:

$$\frac{e}{E} = P(W/W_A) + Q \pm C$$

Where:

P is unspecified slope; Q is unspecified intercept at W=0. And both are chosen to minimize C but are limited by the End Voltage requirements.

Figure 3
Independent Linearity



Electrical Characteristics

Noise

Any spurious variation in the electrical output not present in the input, defined quantitatively in terms of an equivalent parasitic, transient resistance in ohms, appearing between the contact and the resistance element when the shaft is rotated or translated. The Equivalent Noise Resistance is defined independently of the resolution, the functional characteristics, and the total travel. The magnitude of the Equivalent Noise Resistance is the maximum departure from a specified reference line. The wiper of the potentiometer is required to be excited by a specified current and moved at a specified speed.

Output Smoothness (Non-wirewound Potentiometers Only)

Output Smoothness is a measurement of any spurious variation in the electrical output not present in the input. It is expressed as a percentage of the Total Applied Voltage and measured for specified travel increments over the Theoretical Electrical Travel. Output Smoothness includes effects of contact resistance variations, resolution, and other micrononlinearities in the output.

Resolution

A measure of the sensitivity to which the Output Ratio of the potentiometer may be set.

Dielectric Strength

Ability to withstand under prescribed conditions, a specified potential of a given characteristic between the terminals of each cup and the exposed conducting surfaces of the potentiometer, or between the terminals of each cup and the terminals of every other cup in the gang without exceeding a specified leakage current value.

Insulation Resistance

The resistance to a specified impressed DC voltage between the terminals of each cup and the exposed conducting surfaces of the potentiometer, or between the terminals of each cup and the terminals of every other cup in the gang, under prescribed conditions.

Power Rating

The maximum power that a potentiometer can dissipate under specified conditions while meeting specified performance requirements.

Power Derating

The modification of the nominal power rating for various considerations such as Load Resistance, Output Slopes, Ganging, nonstandard environmental conditions and other factors.

Life

The number of shaft revolutions or translations obtainable under specific operating conditions and within specified allowable degradations of specific characteristics.

Mechanical Characteristics

Shaft Runout

The eccentricity of the shaft diameter with respect to the rotational axis of the shaft, measured at a specified distance from the end of the shaft. The body of the potentiometer is held fixed and the shaft is rotated with a specified load applied radially to the shaft. The eccentricity is expressed in inches, TIR.

Lateral Runout

The perpendicularity of the mounting surface with respect to the rotational axis of the shaft, measured on the mounting surface at a specified distance from the outside edge of the mounting surface. The shaft is held fixed and the body of the potentiometer is rotated with specified loads applied radially and axially to the body of the pot. The Lateral Runout is expressed in inches.

Shaft Radial Play

The total radial excursion of the shaft, measured at a specified distance from the front surface of the unit. A specified radial load is applied alternately in opposite directions at a specified point. Shaft Radial Play is expressed in inches.

Shaft End Play

The total axial excursion of the shaft, measured at the end of the shaft with a specified axial load supplied alternately in opposite directions. Shaft End Play is expressed in inches.

Starting Torque

The maximum moment in the clockwise and counterclockwise directions required to initiate shaft rotation anywhere in the Total Mechanical Travel.

Running Torque

The maximum moment in the clockwise and counterclockwise directions required to sustain uniform shaft rotation at a specified speed throughout the Total Mechanical Travel.

Moment of Inertia

The mass moment of inertia of the rotating elements of the potentiometer about their rotational axis.

Stop Strength

Static Stop Strength

The maximum static load that can be applied to the shaft at each mechanical stop for a specified period of time without permanent change of the stop positions greater than specified.

Dynamic Stop Strength

The inertia load, at a specified shaft velocity and a specified number of impacts, that can be applied to the shaft at each stop without a permanent change of the stop position greater than specified.

General Terms and Conditions of Sale

Orders

All orders are subject to acceptance by State Electronics, E. Hanover, NJ. No order or contract shall be deemed accepted unless and until such acceptance is made in writing by State Electronics.

All agreements are more contingent upon strikes, accidents or causes of delay beyond our control

Prices and Specifications

Prices, quotations, specifications and other terms and all statements appearing in the Company's catalogs and advertisements, and otherwise made by the Company, are subject to change without notice. State Electronics reserves the right to make changes in design at any time without incurring any obligation to provide same units previously purchased or to continue to supply discontinued items. The specifications shown in the sales literature are not always the latest version. Certified current specification prints are available upon request.

Unless specifically provided in writing, prices quoted are based upon manufacture of quantities and types originally specified and are subject to revision when interpretation or engineering changes are initiated by the customer. Quoted prices are based upon present cost of materials and labor and are subject to change without notice.

We are not responsible for typographical errors made in any of our publications or for stenographic or clerical errors made in preparations of quotations, all such errors are subject to correction.

Delivery

Delivery promise is based on our best estimate of the date material will be shipped from our factory and we assume no responsibility for losses, damage or consequential damages due to delays.

Terms of Payment

On approved orders, terms are net thirty (30) days from the date of invoice. The Company may at any time, when in its opinion the financial condition of the customer warrants it, either hold or suspend credit. In cases where credit is not established or satisfactory financial information is not available, the terms are cash with order or C.O.D. at the option of the Company. Each shipment will be considered a separate and independent transaction and payment should be made accordingly.

Shipments

All shipments are made F.O.B. shipping point (unless otherwise specified) and packaging for domestic shipment is included in the quoted price. When special domestic or export packaging is specified involving greater expense than is customary, a charge will be made to cover such extra expense. Unless otherwise specified, we will normally use the best, least expensive surface transportation. Reasonable care is exercised in packaging our products for shipment and no responsibility is assumed by the Company for delay, breakage or damage after having made delivery in good order to the carrier. All claims for breakage or damage should be made to the carrier, but will be glad to render all possible assistance in securing satisfactory adjustment of such claims.

Claims and Rejected Material

Claims for defective material must be made within 30-days of the customer's receipt of shipment. No products may be returned without a return authorization (RMA).

Country of Origin

The 388 / 389 and 70 series Mod-Pot products are assembled in the United States at our facility located in East Hanover, New Jersey, USA, using components parts manufactured by the Sensing and Control Division of Honeywell International headquartered in Morris Township, New Jersey, USA.

Export Information

HARMONIZED TARIFF SCHEDULE (HTS #) - 8533.31.0000

EXPORT CONTROL CLASSIFICATION # (ECCN #) - EAR99



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