

Features

- Metal shaft and bushing
- Consistent, smooth quality feel
- Up to 4 sections available

81/82 - 5/8" Square Single-Turn Conductive Plastic

Initial Electrical Characteristics ¹	Conductive Plastic Element	Cermet Element
Standard Resistance Range		
Linear Tapers (A, B, E, & H)	(B & E) 1K ohms to 1 megohm	(A & H) 50 ohms to 1 megohm
Audio Tapers (C, D, F, G, S, & T)	(D, G, S, & T) 1K ohms to 1 megohm	(C & F) 1K ohms to 1 megohm
Resistance Tolerance	(B, D & G tapers) ±20% (E, S, & T tapers) ±10%	(A, C, & F tapers) ±10% (H taper) ±5%
Independent Linearity	(B & E tapers) ±5%	(A & H tapers) ±5%
Absolute Minimum Resistance	2 ohms maximum	2 ohms maximum
Continuity	Maintained for full mechanical angle	Maintained for full mechanical angle
Effective Electrical Angle	240° ±5%	240° ±6°
Contact Resistance Variation	±1%	±1% or 3 ohms (whichever is greater)
Theoretical Resolution	Essentially infinite	Essentially infinite
Dielectric Withstanding Voltage	MIL-STD-202, Method 301	MIL-STD-202, Method 301
Sea Level	1,500 VAC minimum	1,500 VAC minimum
70,000 Feet	500 VAC minimum	500 VAC minimum
Insulation Resistance (500 VDC)	1,000 megohms minimum	1,000 megohms minimum
Power Rating At 70°C (Voltage Limited By Power Dissipation or 350 VAC, Whichever Is Less)		
+70°C Single Section Assembly	(B & E tapers) 0.5 watt (D, G, S & T tapers) 0.25 watt	(A & H tapers) 2 watts (C & F tapers) 1 watt
+70°C Multiple Section Assembly	(B & E tapers) 0.5 watt/section (D, G, S & T tapers) 0.25 watt/section	(A & H tapers) 1 watt/section (C & F tapers) 0.5 watt/section
+125°C	0 watt	0 watt
Roll-on/Roll-off	(B & E tapers) 0.25% maximum (D & S tapers) 0.1% maximum CCW end (G & T tapers) 0.1% maximum CW end (D & S tapers) 0.5% maximum CW end (G & T tapers) 0.5% maximum CCW end	(A & H tapers) 0.5% maximum (C taper) 0.1% maximum CCW end (F taper) 0.1% maximum CW end (C taper) 1.0% maximum CW end (F taper) 1.0% maximum CCW end

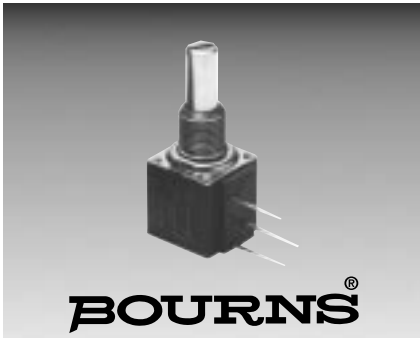
Environmental Characteristics ¹	Conductive Plastic Element	Cermet Element
Operating Temperature	+1°C to +125°C	+1°C to +125°C
Storage Temperature Range	-55°C to +125°C	-55°C to +125°C
Temperature Coefficient		
Over Storage Temperature Range	±1,000PPM/°C	±150PPM/°C
Vibration (Single Section)	15G	15G
Voltage Ratio Shift	±5% maximum	±5% maximum
Total Resistance Shift	±2% maximum	±2% maximum
Shock (Single Section)	30G	30G
Voltage Ratio Shift	±5% maximum	±5% maximum
Total Resistance Shift	±2% maximum	±2% maximum
Load Life	1,000 hours	1,000 hours
Total Resistance Shift	±10% maximum	±5% maximum
Rotational Life (No Load)	100,000 cycles	100,000 cycles
Total Resistance Shift	(B & E tapers) 10 ohms or ±12% maximum (whichever is greater) (D, G, S & T tapers) ±20% maximum	10 ohms or ±10% maximum (whichever is greater)
Moisture Resistance	MIL-STD-202, Method 103, Condition B	MIL-STD-202, Method 103, Condition B
Total Resistance Shift	(B & E tapers) ±10% maximum (D, G, S & T tapers) ±20% maximum	±5% maximum (all tapers)
Insulation Resistance (500 VDC)	100 megohms minimum	100 megohms minimum

Mechanical Characteristics ¹	Conductive Plastic Element	Cermet Element
Running Torque (Non-Locking Bushings)		
Single Section	0.2 to 1.5 oz.-in. (0.14 to 1.06 Ncm)	0.2 to 1.5 oz.-in. (0.14 to 1.06 Ncm)
Dual Section	0.2 to 1.5 oz.-in. (0.14 to 1.06 Ncm)	0.2 to 1.5 oz.-in. (0.14 to 1.06 Ncm)
Triple Section	0.5 to 2.0 oz.-in. (0.35 to 1.41 Ncm)	0.5 to 2.0 oz.-in. (0.35 to 1.41 Ncm)
Quadruple Section	0.5 to 2.0 oz.-in. (0.35 to 1.41 Ncm)	0.5 to 2.0 oz.-in. (0.35 to 1.41 Ncm)
Running Torque (Locking Bushings)	0.2 to 4.0 oz.-in. (0.14 to 2.82 Ncm)	0.2 to 4.0 oz.-in. (0.14 to 2.82 Ncm)
Shaft Locking Torque with Locknut @ 10 in.-lb. (B & E Bushings)	20 oz.-in.	20 oz.-in.
Stop Strength	1/4" (6.35mm) and 1/8" (3.18mm) shafts - 4 in.-lb. (45.19 Ncm) min. 7/8" (19.81mm) shaft -2 in.-lb. (22.6 Ncm) min.	1/4" (6.35mm) and 1/8" (3.18mm) shafts - 4 in.-lb. (45.19 Ncm) min. 7/8" (19.81mm) shaft -2 in.-lb. (22.6 Ncm) min.
Mechanical Angle	300° ±5°	300° ±5°
Weight (Single Section)	21 grams maximum	21 grams maximum
Each Additional Section	6 grams maximum	6 grams maximum
Terminals	Printed circuit terminals or J-Hooks	Printed circuit terminals or J-Hooks
Marking	Manufacturer's trademark, wiring diagram, date code and resistance, manufacturer's part number	

For dimensional drawings see page 222.
For ordering information see page 224.

NOTE: Model 81/82 performance specifications do not apply to units subjected to printed circuit board cleaning procedures.

¹At room ambient: +25°C nominal and 50% relative humidity nominal, except as noted.



Features

- Compatible with other members of the Model 80 Series
- The only 10-turn precision potentiometer in a modular panel control package
- Up to 3 sections available

83/84 - 5/8" Square 10-Turn

Initial Electrical Characteristics¹

	Wirewound Element (J Taper)	Hybriton® Element (K Taper)
Standard Resistance Range	200 to 100K ohms	1K to 100K ohms
Resistance Tolerance	±5%	±10%
Independent Linearity	±0.25%	±0.25%
Effective Electrical Angle	3600° +10°, -0°	3600° +10°, -0°
Minimum Resistance (J Taper)	1.0 ohm or 0.1% (whichever is greater)	-
End Voltage (K Taper)	-	0.2% of applied voltage
Noise (J Taper)	100 ohms ENR maximum	-
Output Smoothness (K Taper)	-	0.15% maximum
Dielectric Withstanding Voltage	MIL-STD-202, Method 301	MIL-STD-202, Method 301
Sea Level	1,500 VAC minimum	1,500 VAC minimum
Insulation Resistance (500 VDC)	1,000 megohms minimum	1,000 megohms minimum
Power Rating (Voltage Limited By Power Dissipation or 316 VAC, Whichever Is Less)		
+70°C	1 watt	1 watts
+125°C	0 watt	0 watt
Theoretical Resolution	See table	Essentially infinite

Environmental Characteristics¹

Operating Temperature	+1°C to +125°C	+1°C to +125°C
Storage Temperature Range	-55°C to +125°C	-55°C to +125°C
Temperature Coefficient		
Over Storage Temperature Range	±50PPM/°C	±100PPM/°C
Vibration	15G	15G
Wiper Bounce	0.1 millisecond maximum	0.1 millisecond maximum
Shock	50G	50G
Wiper Bounce	0.1 millisecond maximum	0.1 millisecond maximum
Load Life	1,000 hours	1,000 hours
Total Resistance Shift	±2% maximum	±5% maximum
Rotational Life (No Load)	1,000,000 shaft revolutions	4,000,000 shaft revolutions
Total Resistance Shift	±5% maximum	±5% maximum
Moisture Resistance	MIL-STD-202, Method 103, Condition B	MIL-STD-202, Method 103, Condition B
Total Resistance Shift	±2% maximum	±5% maximum
Insulation Resistance (500 VDC)	100 megohms minimum	100 megohms minimum

Mechanical Characteristics¹

Mechanical Angle	3600° +15°, -0°	3600° +15°, -0°
Shaft Runout	0.006 in. (0.15mm) T.I.R.	0.006 in. (0.15mm) T.I.R.
Shaft End Play	0.014 in. (0.36mm) T.I.R.	0.014 in. (0.36mm) T.I.R.
Shaft Radial Play	0.005 in. (0.13mm) T.I.R.	0.005 in. (0.13mm) T.I.R.
Stop Strength	48.0 oz.-in. (33.90 Ncm) minimum	48.0 oz.-in. (33.90 Ncm) minimum
Running Torque (1 or 2 Section)	0.25 to 2.0 oz.-in. (0.18 to 1.41 Ncm)	0.25 to 2.0 oz.-in. (0.18 to 1.41 Ncm)
Weight	Approximately 0.75 oz.-in. (0.53 Ncm)	Approximately 0.75 oz.-in. (0.53 Ncm)
Terminals	Printed circuit terminals or solder lugs	Printed circuit terminals or solder lugs
Marking	Manufacturer's trademark, wiring diagram, date code and resistance, manufacturer's part number	Manufacturer's trademark, wiring diagram, date code and resistance, manufacturer's part number

Wirewound Resolution Table

Resistance (Ohms)	Resolution (Nom.) (%)
200	.048
500	.037
1K	.032
2K	.031
5K	.023
10K	.020
20K	.015
50K	.012
100K	.010

For dimensional drawings see page 220 and 223.
For ordering information see page 2221

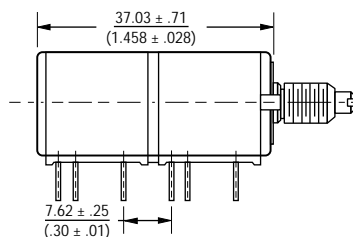
⁴NOTE: MODEL 83/84 PERFORMANCE SPECIFICATIONS DO NOT APPLY TO UNITS SUBJECTED TO PRINTED CIRCUIT BOARD CLEANING PROCEDURES.

¹AT ROOM AMBIENT: +25°C NOMINAL AND 50% RELATIVE HUMIDITY NOMINAL, EXCEPT AS NOTED.

Specifications are subject to change without notice.

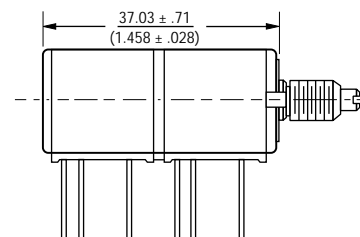
Dimensional Drawings

Dual Section Model 84 Solder Lugs



Note: The Models 83/84 dimensions for dual section assembly are for either single or dual concentric shaft styles.

Dual Section Model 83 PC Pins

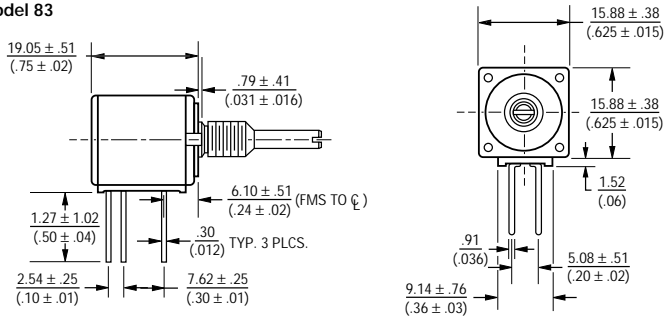


DIMENSIONS ARE: $\frac{\text{METRIC}}{\text{(INCHES)}}$

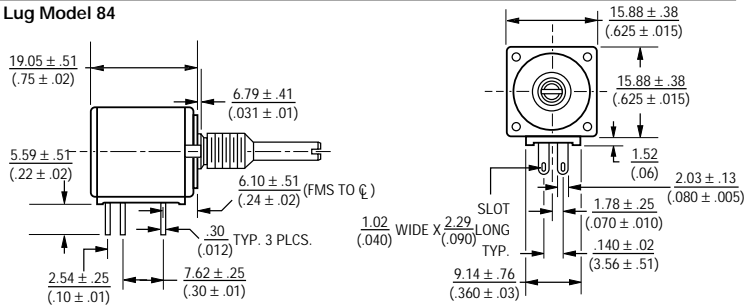
83/84 - Dimensions and Tolerances



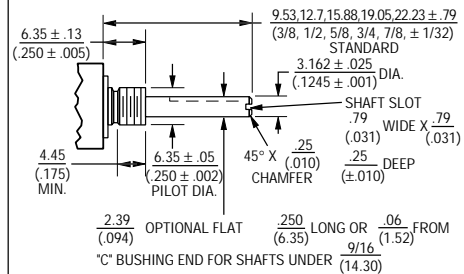
PC Pin Model 83



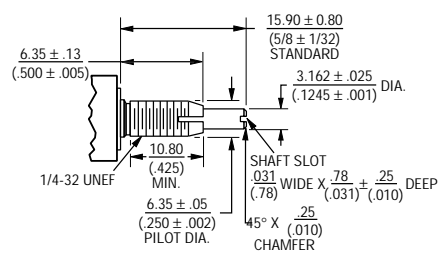
Solder Lug Model 84



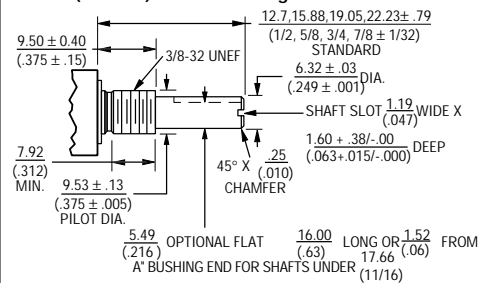
"C" Bushing 1/4" (6.35mm) Dia. Plain - Single Shaft



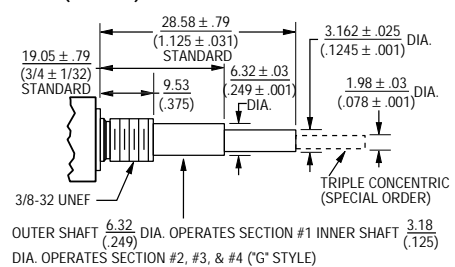
"E" Bushing 1/4" (6.35mm) Dia. Locking - Single Shaft



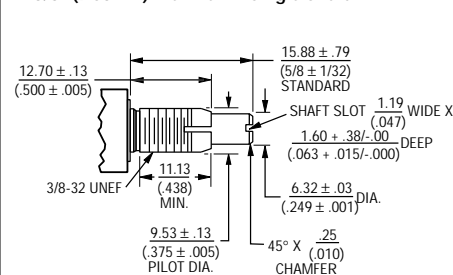
"A" Bushing 3/8" (9.53mm) Dia. Plain - Single Shaft



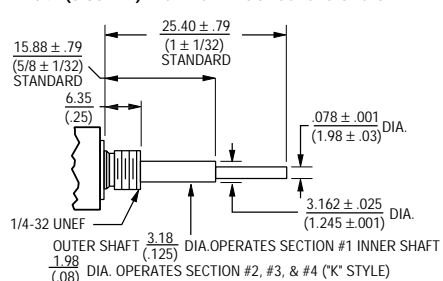
"A" Bushing 3/8" (9.53mm) Dia. Plain - Concentric Shaft



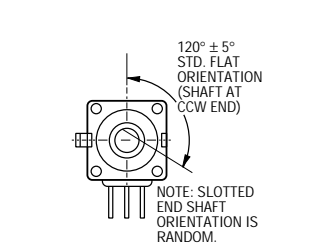
"B" Bushing 3/8" (9.53mm) Dia. Plain - Single Shaft



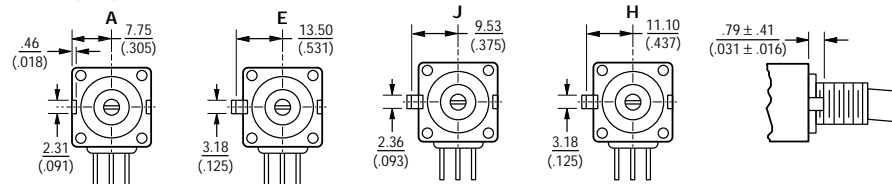
"C" Bushing 1/4" (6.35mm) Dia. Plain - Concentric Shaft



Shaft Flat Orientation



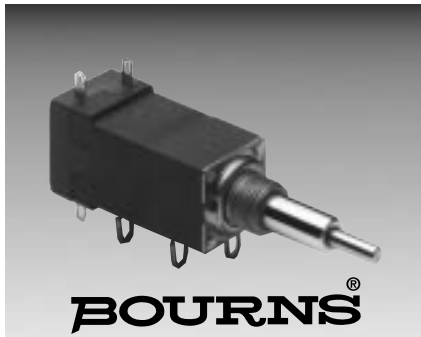
Locating Lug Options - All Model 80 Series



NOTE: "D" OPTION - NO A/R LUG. OTHER LOCATING LUG OPTIONS AVAILABLE. FOR DETAILS CONSULT FACTORY.

TOLERANCES EXCEPT AS SHOWN: DECIMALS .XXX ± .127 (.005)
 .XX ± .38 (.015)
 ANGLE ± 5°
 FRACTIONS ± 1/64

DIMENSIONS ARE: METRIC (INCHES)



Features

- Designed for “on-off” function control
- Positive action, “non-tease” detent
- Low actuation torque

85/86 - 5/8" Square Single-Turn Rotary Switch

Initial Electrical Characteristics¹

Contacts:	
DPST.....	N.O./N.O., N.C./N.C. or N.O./N.C.
DPDT.....	2 N.O./N.C. (break before make)
Power Rating (Resistive Load):	
DPST.....	2A @ 125 volts RMS-60 Hz or 2A @ 28 VDC, 1A@ 250 volts RMS-60 Hz
DPDT.....	1A @ 125 volts RMS-60 Hz or 1A @ 28 VDC
Contact Resistance (.1VDC-10mA).....	10 milliohms nominal
Contact Bounce.....	.5 milliseconds maximum
Dielectric Withstanding Voltage.....MIL-STD-202, Method 301	
Sea Level.....	1500 VAC minimum
Insulation Resistance.....	1000 megohms minimum

Environmental Characteristics¹

Operating Temperature Range.....	0°C to +70°C
Storage Temperature Range.....	-65° to +125°C
Vibration (Dual Section).....8G	
Contact Resistance.....	10 milliohms maximum
Contact Bounce.....	0.1 millisecond maximum
Shock (Dual Section).....20G	
Contact Resistance.....	10 milliohms maximum
Contact Bounce.....	0.1 millisecond maximum
Rotational Life.....	25,000 cycles
Switch Actuating Torque (50% Duty cycle @ Rated Power Load).....	2 to 7 oz.-in. (1.41 to 4.94 Ncm)
Contact Resistance.....	100 milliohms maximum
Moisture Resistance.....MIL-STD-202, Method 106, Condition B	
Contact Resistance (0.1VDC-10mA).....	10 milliohms maximum
Insulation Resistance (After 24 Hours @ Room Temperature) (500 VDC).....	100 megohms minimum
Switch Housing Material.....	High temperature, flame retardant, thermosetting plastic

Mechanical Characteristics¹

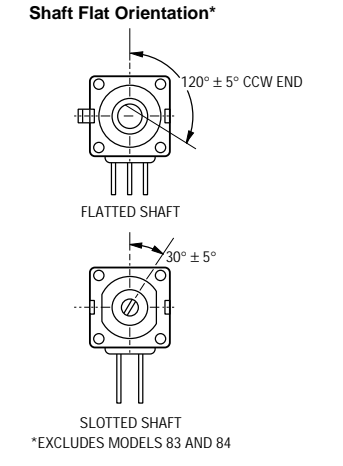
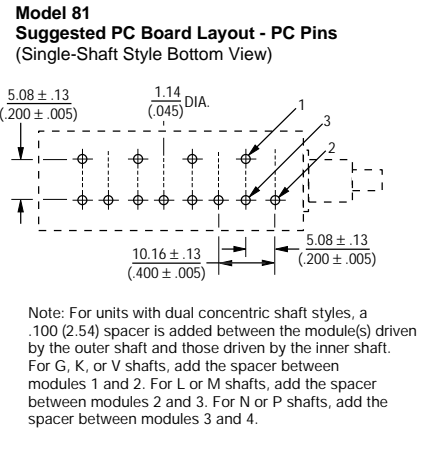
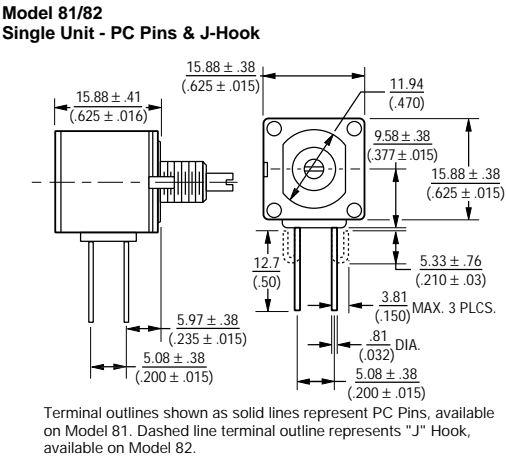
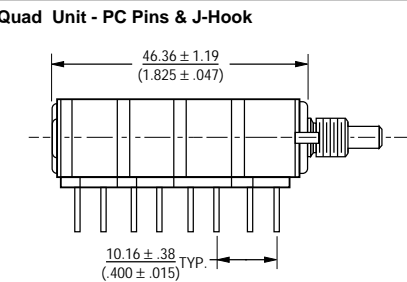
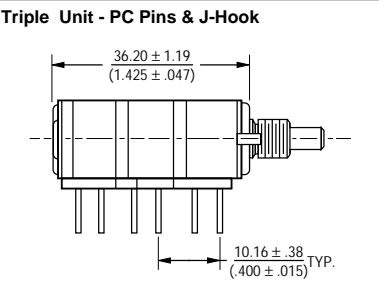
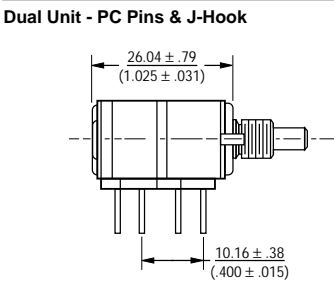
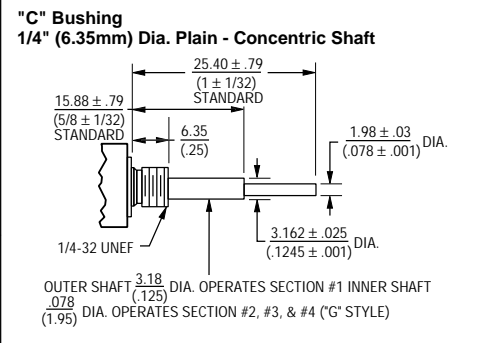
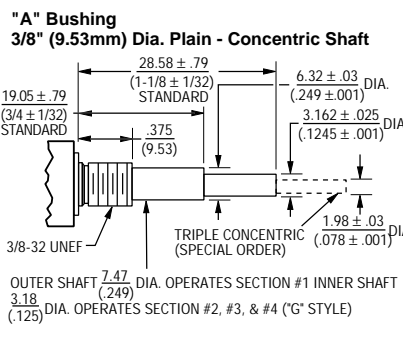
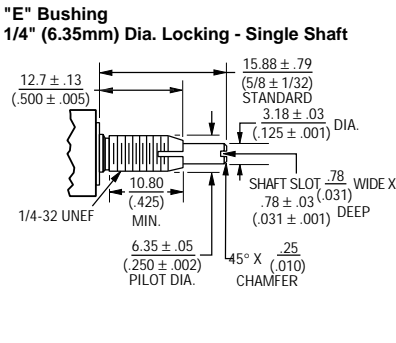
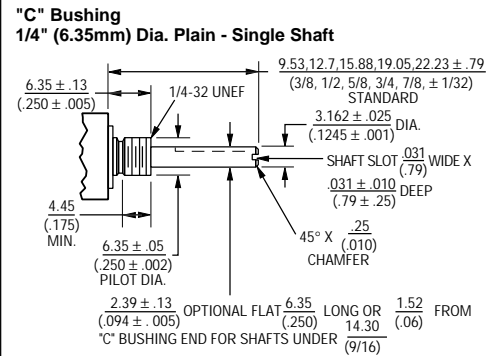
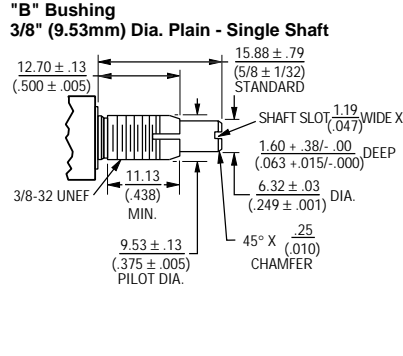
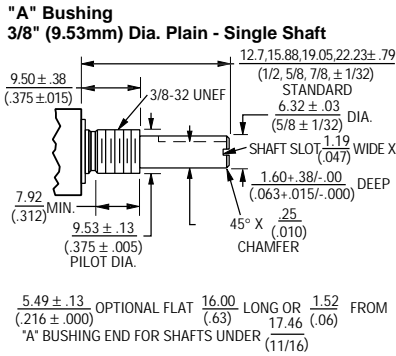
Actuating Torque (Each Section, Switch Module Only).....	.5 to 15 oz.-in. (3.53 to 10.6 Ncm)
Running Torque (Out of Detent, 2-4 Module Assembly).....	.03 to 2 oz.-in. (0.21 to 1.41 Ncm)
Detent.....	CW or CCW standard
Actuation Angle.....	.25°
Contact Materials.....Fine silver with gold overlay	
Terminal Styles.....Solder lug only	
Standard Orientation.....	In-line with control terminals
Optional.....	Rotated 90° CCW from standard
Terminal Strength (Before and After Soldering Heat Exposure).....	2 lbs. (0.9 Kg) minimum

NOTE: MODEL 85/86 PERFORMANCE SPECIFICATIONS DO NOT APPLY TO UNITS SUBJECTED TO PRINTED CIRCUIT BOARD CLEANING PROCEDURES.

¹AT ROOM AMBIENT: +25°C NOMINAL AND 50% RELATIVE HUMIDITY NOMINAL, EXCEPT AS NOTED.

For Dimensional Drawings See Page 223.
For Ordering Information See Page 224.

Model 81, 82 - Dimensions and Tolerances



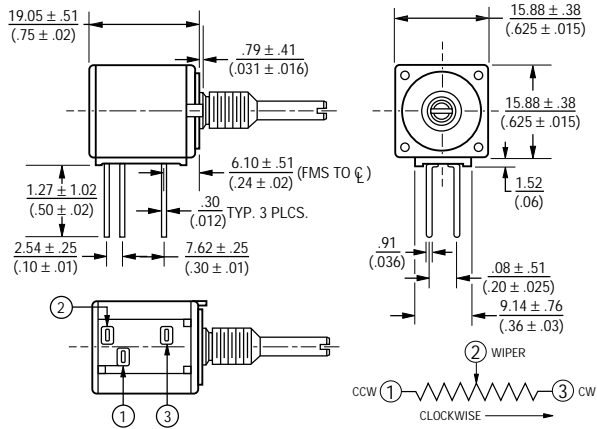
DIMENSIONS ARE: METRIC / (INCHES)

Specifications are subject to change without notice.

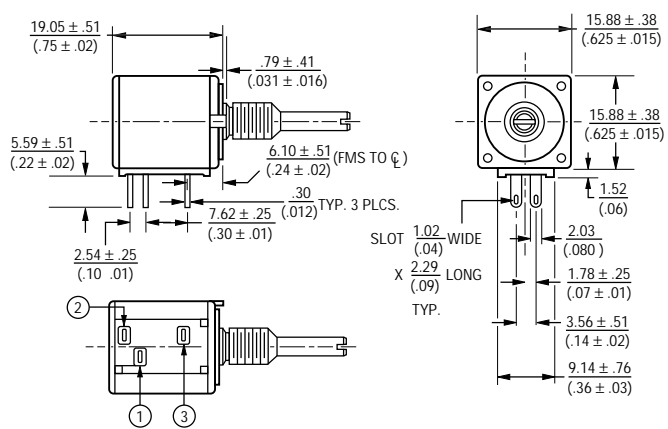
Model 83, 84, 85, 86 - Dimensions and Tolerances



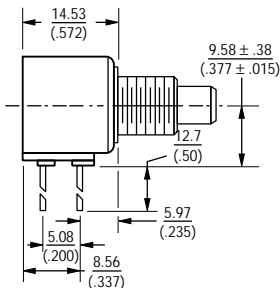
Solder Lug Model 84



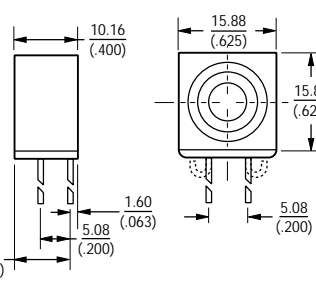
Solder Lug Model 84



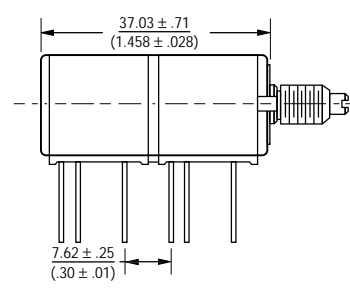
Primary Potentiometer Module Model 85/86



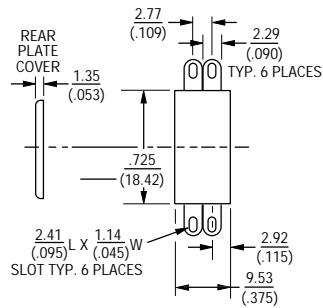
Secondary Potentiometer Module Model 85/86



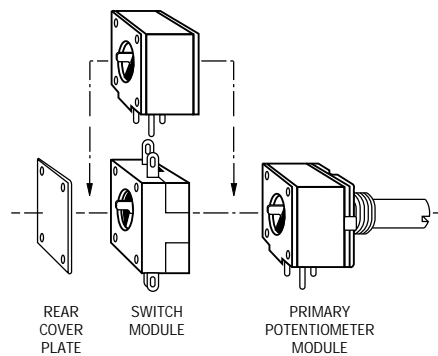
Dual Section Model 83 PC Pins



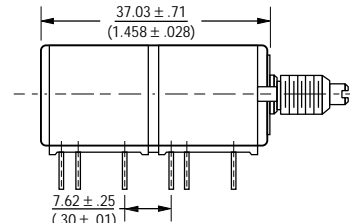
Switch Module Model 85/86



Assembly Sequence Model 85/86 Secondary Potentiometer Module



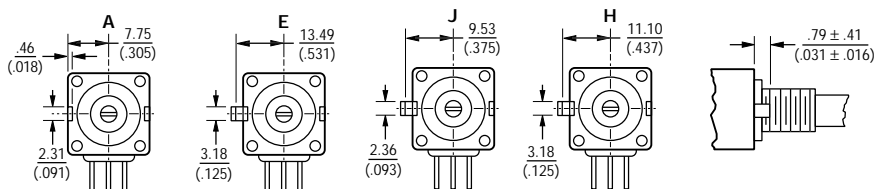
Dual Section Model 84 Solder Lugs



Note: The Models 83/84 dimensions for dual section assembly are for either single or dual concentric shaft styles.

TOLERANCES EXCEPT AS SHOWN: DECIMAL .XXX ± .127 (.005)
.XX ± .38 (.015)
ANGLE ± 5%

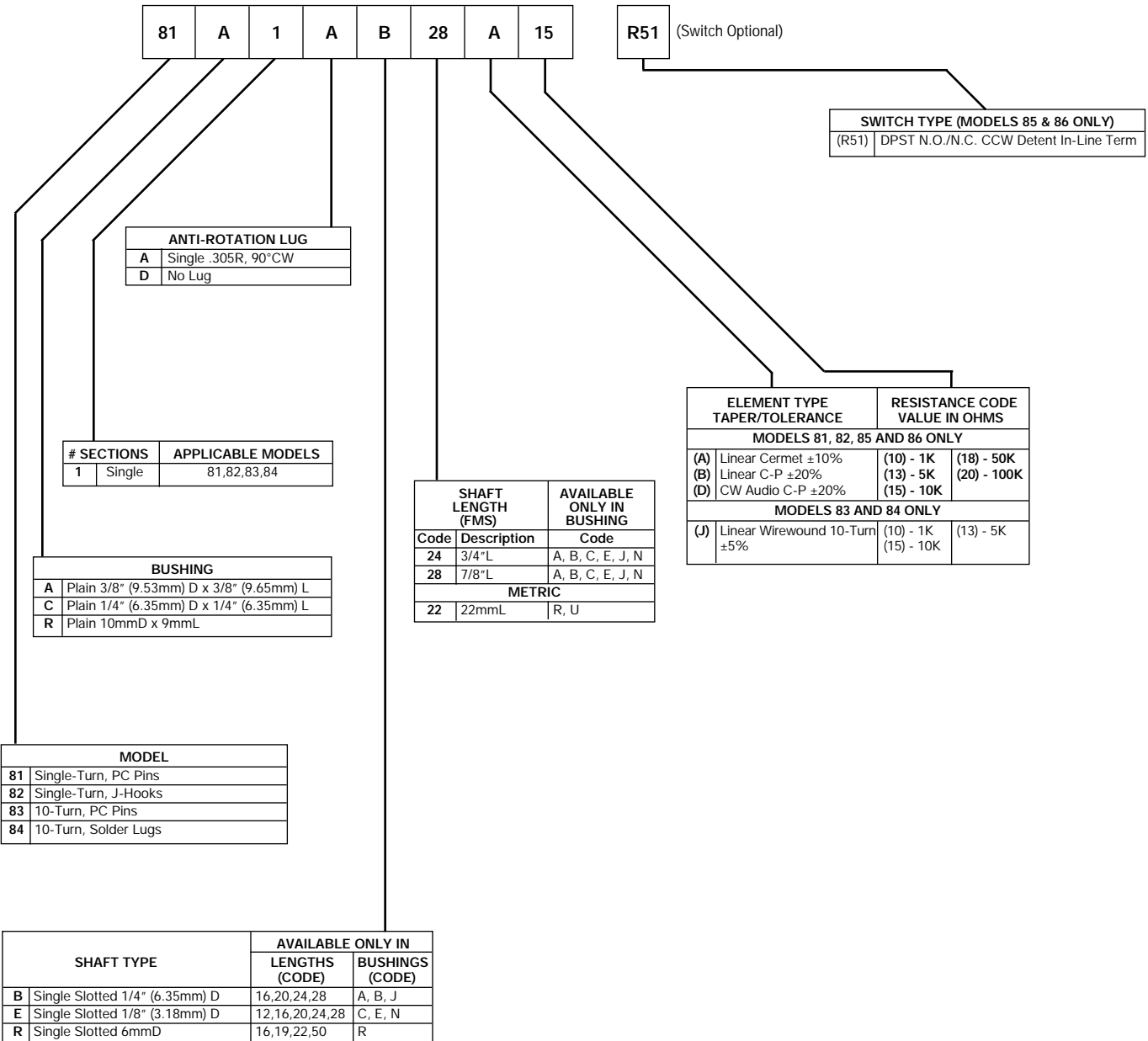
Locating Lug Options - All Model 80 Series



$$E = \frac{2.36 \pm .76}{(.093 \pm .03)} \quad H \& J = \frac{1.98 \pm .41}{(.078 \pm .016)}$$

DIMENSIONS ARE: METRIC (INCHES)

How To Order 80 Series Panel Controls



Recommended part numbers, for other options contact the factory. Boldface listings are in stock and readily available through distribution.

Specifications are subject to change without notice.