



Features

- Metal shaft and bushing
- Consistent, smooth quality feel
- Up to 4 sections available
- Rotary switch option designed for "on-off" function control
- RoHS compliant*

81/82 - 5/8" Square Single-Turn Panel Control

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

Potentiometer Specifications

| Initial Electrical Characteristics ¹ | Conductive Plastic Element | Cermet Element |
|--|--|---------------------------------------|
| Standard Resistance Range | | |
| Linear Tapers (A, B, E, & H) | (B & E) 1 K ohms to 1 megohm | (A & H) 100 ohms to 1 megohm |
| Audio Tapers (C, D, F, G, S, & T) | (D, G, S, & T) 1 K ohms to 1 megohm .. | (C & F) 1 K ohms to 1 megohm |
| Total Resistance Tolerance | ±20 % or 10 % | ±10 % or 5 % |
| Independent Linearity | ±5 % | ±5 % |
| Absolute Minimum Resistance | 2 ohms maximum | 2 ohms maximum |
| Effective Electrical Angle | (Linear tapers) 240 ° ± 5 ° | (Linear tapers) 240 ° ± 6 ° |
| | (Audio tapers) 225 ° ± 5 ° | (Audio tapers) 225 ° ± 6 ° |
| Contact Resistance Variation | ±1 % | ±1 % or 3 ohms (whichever is greater) |
| Dielectric Withstanding Voltage (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 | (Linear tapers) 1 watt | (Linear tapers) 2 watts |
| | (Audio tapers) 0.5 watt | (Audio tapers) 1 watt |
| +70 °C Multiple Section Assembly | (Linear tapers) 0.5 watt/section | (Linear tapers) 1 watt/section |
| | (Audio tapers) 0.25 watt/section | (Audio tapers) 0.5 watt/section |
| +125 °C | 0 watt | 0 watt |
| Theoretical Resolution | Essentially infinite | Essentially infinite |

Environmental Characteristics¹

| | | |
|--|---------------------------------------|-------------------------------|
| Operating Temperature Range | -40 °C to +125 °C | -40 °C to +125 °C |
| Storage Temperature Range | -55 °C to +125 °C | -55 °C to +125 °C |
| Temperature Coefficient Over Storage Temperature Range | ±1,000 ppm/°C | ±150 ppm/°C |
| Vibration (Single Section) | 15 G | 15 G |
| Total Resistance Shift | ±2 % maximum | ±2 % maximum |
| Voltage Ratio Shift | ±5 % maximum | ±5 % maximum |
| Shock (Single Section) | 30 G | 30 G |
| Total Resistance Shift | ±2 % maximum | ±2 % maximum |
| Voltage Ratio Shift | ±5 % maximum | ±5 % 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 | (Linear taper) 10 ohms or | (All tapers) ±5 % TRS maximum |
| | ±10 % TRS max. (whichever is greater) | |
| | (Audio taper) ±20 % maximum | |
| Contact Resistance Variation @ 50,000 cycles | | |
| (Audio taper) | ±3 % | ±3 % |
| (Linear taper) | ±2 % | ±2 % |
| Moisture Resistance (MIL-STD-202, Method 103, Condition B) | | |
| Total Resistance Shift | (B & E tapers) ±10 % maximum | ±5 % maximum (all tapers) |
| | (D, G, S & T tapers) ±20 % maximum | |
| Insulation Resistance (500 VDC) | 100 megohms minimum | 100 megohms minimum |
| IP Rating | IP40 | IP40 |

Mechanical Characteristics

| | |
|---|--|
| Stop Strength | |
| 1/4" and 1/8" diameter shafts | 45,19 N-cm (4 lb.-in.) |
| 7/8" length shaft | 22.6 N-cm (2 lb.-in.) |
| Mechanical Angle | 300 ° ±5 ° |
| Torque | |
| Starting and Running Torque (Non-Locking Bushings) | |
| Single Section | 0.14 to 1.06 N-cm (0.2 to 1.5 oz.-in.) |
| Dual Section | 0.14 to 1.06 N-cm (0.2 to 1.5 oz.-in.) |
| Triple Section | 0.35 to 1.41 N-cm (0.5 to 2.0 oz.-in.) |
| Quadruple Section | 0.35 to 1.41 N-cm (0.5 to 2.0 oz.-in.) |
| Starting and Running Torque (Locking Bushings) | 0.14 to 2.82 N-cm (0.2 to 4.0 oz.-in.) |
| Shaft Locking Torque with Locknut @ 10 in.-lb. (B & E Bushings) | 14 N-cm (20 oz.-in.) |
| Mounting | 1.7-2.0 N-m (15-18 lb.-in.) maximum |
| Weight (Single Section) | 21 grams maximum |
| (Each Additional Section) | 6 grams maximum |
| Terminals | Printed circuit terminals or J-Hooks |
| Soldering Condition | Recommended hand soldering using Sn95/Ag5 no clean solder, 0.025" wire diameter. Maximum temperature 399 °C (750 °F) for 3 seconds. No wash process to be used with no clean flux. |
| Marking | Manufacturer's trademark, wiring diagram, date code and resistance, manufacturer's part number |
| Ganging (multiple section potentiometers) | 4 cup maximum |
| Hardware | One lockwasher and one mounting nut is shipped with each potentiometer, except where noted in the part number. |

For dimensional drawings see pages 3 & 4.

For ordering information see page 5.

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.

*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

Specifications are subject to change without notice.

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81/82 - 5/8 " Square Single-Turn Panel Control
85/86 - 5/8 " Square Single-Turn Panel Control with Rotary Switch



Rotary Switch Specifications

Initial Electrical Characteristics¹

| | |
|---|--|
| Contacts: | N.O./N.O., N.C./N.C. or N.O./N.C. |
| DPST | 2 N.O./N.C. (break before make) |
| DPDT | |
| Power Rating (Resistive Load): | |
| DPST | 2 A @ 125 volts RMS-60 Hz or 2 A @ 28 VDC, 1 A @ 250 volts RMS-60 Hz |
| DPDT | 1 A @ 125 volts RMS-60 Hz or 1 A @ 28 VDC |
| Contact Resistance (0.1 VDC-10 mA) | 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 | -40 °C to +70 °C |
| Storage Temperature Range | -65 °C to +125 °C |
| Vibration (Dual Section) | 8 G |
| (Triple Section) | 5 G |
| (Quadruple Section) | 3 G |
| Contact Resistance | 10 milliohms maximum |
| Contact Bounce | 0.1 millisecond maximum |
| Shock (Dual Section) | 20 G |
| (Triple Section) | 15 G |
| (Quadruple Section) | 10 G |
| 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) | 1.41 to 4.94 N-cm (2 to 7 oz.-in.) |
| Contact Resistance | 100 milliohms maximum |
| Moisture Resistance (MIL-STD-202, Method 106, Condition B) | |
| Contact Resistance (0.1 VDC-10 mA) | 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) | 3.53 to 10.6 N-cm (5 to 15 oz.-in.) |
| Running Torque (Out of Detent, 2-4 Module Assembly) | 0.21 to 1.41 N-cm (0.3 to 2 oz.-in.) |
| 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) | 0.9 Kg (2 lbs.) minimum |

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.

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81/82 - 5/8 " Square Single-Turn Panel Control

BOURNS®

Product Dimensions

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



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



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



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



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



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



"S" Bushing
10 mm Dia. Locking - Single Shaft



DIMENSIONS: $\frac{\text{MM}}{(\text{INCHES})}$



81/82 - 5/8" Square Single-Turn Panel Control

BOURNS®

Product Dimensions

Dual Unit - PC Pins & J-Hook



Triple Unit - PC Pins & J-Hook



Quad Unit - PC Pins & J-Hook



**Model 81/82
Single Unit - PC Pins & J-Hook**



Terminal outlines shown as solid lines represent PC Pins, available on Model 81. Dashed line terminal outline represents "J" Hook, available on Model 82.

**Model 81
Suggested PC Board Layout - PC Pins
(Single-Shaft Style Bottom View)**



Note: For units with dual concentric shaft styles, a 2.54 (.100) spacer is added between the module(s) driven by the outer shaft and those driven by the inner shaft. For G, K, or V shafts, add the spacer between modules 1 and 2. For L or M shafts, add the spacer between modules 2 and 3. For N or P shafts, add the spacer between modules 3 and 4.

Shaft Flat Orientation*



FLATTED SHAFT



SLOTTED SHAFT

*EXCLUDES MODELS 83 AND 84

DIMENSIONS: $\frac{\text{MM}}{\text{(INCHES)}}$

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

BOURNS®

Product Dimensions

Primary Potentiometer Module Model 85/86



Secondary Potentiometer Module Model 85/86



Shaft Flat Orientation*



Switch Module Model 85/86



Assembly Sequence Model 85/86 Secondary Potentiometer Module



NOTE: Switch terminals shown in vertical position.



Switch contacts shown in detent position.

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: $\frac{\text{MM}}{(\text{INCHES})}$

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

TOLERANCES EXCEPT AS SHOWN: DECIMAL .XXX ± $\frac{.127}{(.005)}$
 .XX ± $\frac{.38}{(.015)}$
 ANGLE ± 5%

81/82 - 5/8" Square Single-Turn Panel Control 85/86 - 5/8" Square Single-Turn Panel Control with Rotary Switch

BOURNS®

How To Order

| | | | | | | | | | |
|----|---|---|---|---|---|----|---|---|----|
| 81 | A | 2 | A | - | B | 28 | - | A | 15 |
| 85 | A | 2 | A | - | B | 28 | - | A | 15 |

| | |
|-----|---|
| A15 | L |
| R51 | L |

Models 81 & 82: Part number for multiple section potentiometers must have a taper and resistance value for each section.

Models 85 & 86: Part number must contain a switch type.

| ANTI-ROTATION LUG | |
|-------------------|-------------------------------|
| A | Single .305 R, 90 °CW |
| B | Double .305 R, 90 ° & 270 °CW |
| C | Single .305 R, 270 °CW |
| D | No Lug |
| E | Single .531 R, 90 °CW |
| F | Single .305 R, 180 °CW |
| J | Single .375 R, 90 °CW |
| K | Double .375 R, 90 ° & 270 °CW |

| RoHS IDENTIFIER | |
|-----------------|-----------|
| L | Compliant |

| # SECTIONS | APPLICABLE MODELS |
|------------|--------------------|
| 1 | Single 81,82 |
| 2 | Double 81,82,85,86 |
| 3 | Triple 81,82,85,86 |
| 4 | Quad 81,82,85,86 |

| SWITCH TYPE (MODELS 85 & 86 ONLY) | |
|-----------------------------------|--|
| (R50) | DPST N.O./N.C. CW Detent In-Line Term |
| (R51) | DPST N.O./N.C. CCW Detent In-Line Term |
| (R52) | DPST N.O./N.O. CW Detent In-Line Term |
| (R53) | DPST N.O./N.O. CCW Detent In-Line Term |
| (R56) | DPST N.O./N.C. CW Detent Horz Term |
| (R57) | DPST N.O./N.C. CCW Detent Horz Term |
| (R58) | DPST N.O./N.O. CW Detent Horz Term |
| (R59) | DPST N.O./N.O. CCW Detent Horz Term |

| BUSHING | |
|---------|---|
| A | Plain 3/8" (9.53 mm) D x 3/8" (9.53 mm) L |
| B | Locking 3/8" (9.53 mm) D x 1/2" (12.7 mm) L |
| C | Plain 1/4" (6.35 mm) D x 1/4" (6.35 mm) L |
| E | Locking 1/4" (6.35 mm) D x 1/2" (12.7 mm) L |
| J | Plain 3/8" (9.53 mm) D x 1/4" (6.35 mm) L |
| N | Plain 1/4" (6.35 mm) D x 3/8" (9.53 mm) L |
| R | Plain 10 mm D x 9 mm L |
| S | Locking 10 mm D x 12.5 mm L |
| U | Plain 7 mm D x 6 mm L |

| SHAFT LENGTH (FMS) | | AVAILABLE ONLY IN BUSHING CODE |
|--------------------|-------------|--------------------------------|
| Code | Description | Code |
| 12 | 3/8" L | C, N, J |
| 16 | 1/2" L | A, C, J, N |
| 20 | 5/8" L | A, B, C, E, J, N |
| 24 | 3/4" L | A, B, C, E, J, N |
| 28 | 7/8" L | A, B, C, E, J, N |
| 32 | 1" L | A, B, C, E, J, N |
| 36 | 1-1/8" L | A, B, C, E, J, N |
| 40 | 1-1/4" L | A, B, C, E, J, N |
| Metric | | |
| 10 | 10 mm L | U |
| 13 | 13 mm L | U |
| 16 | 16 mm L | R, S |
| 19 | 19 mm L | R, S |
| 22 | 22 mm L | R, S, U |
| 30 | 30 mm L | R, S |
| 42 | 42 mm L | R, S |
| 50 | 50 mm L | R, S |

| MODEL | |
|-------|---|
| 81 | Single-Turn, PC Pins |
| 82 | Single-Turn, J-Hooks |
| 85 | Single-Turn, Pot/Rotary Switch, PC Pins |
| 86 | Single-Turn, Pot/Rotary Switch, J-Hooks |

| ELEMENT TAPER TYPE/TOLERANCE | | RESISTANCE CODE VALUE IN OHMS | |
|------------------------------|--------------------------------------|-------------------------------|--------------|
| (A) (H) | Linear Cermet ±10 % | (05) - 100 | (30) - 15 K |
| | Linear Cermet ±5 % | (28) - 150 | (16) - 20 K |
| (B) (E) | Linear C-P ±20 % Linear C-P ±10 % | (06) - 200 | (17) - 25 K |
| | | (07) - 250 | (18) - 50 K |
| | | (08) - 500 | (19) - 75 K |
| | | (09) - 750 | (20) - 100 K |
| | | (10) - 1 K | (31) - 150 K |
| | | (29) - 1.5 K | (21) - 200 K |
| | | (11) - 2 K | (22) - 250 K |
| | | (12) - 2.5 K | (23) - 500 K |
| | | (13) - 5 K | (24) - 750 K |
| | | (14) - 7.5 K | (25) - 1 M |
| (C) | CW Audio Cermet ±10 % | (10) - 1 K | (18) - 50 K |
| (D) | CW Audio C-P ±20 % | (12) - 2.5 K | (20) - 100 K |
| (F) | CCW Audio Cermet ±10 % | (22) - 250 K | (23) - 500 K |
| (G) | CCW Audio C-P ±20 % | (15) - 10 K | (24) - 750 K |
| (S) | CW Audio C-P ±10 % | (16) - 20 K | (25) - 1 M |
| (T) | CCW Audio C-P ±10 % | (17) - 25 K | (25) - 1 M |

| SHAFT TYPE | | AVAILABLE ONLY IN | |
|------------|--|-------------------|-----------------|
| | | LENGTHS (CODE) | BUSHINGS (CODE) |
| A | Single Plain 1/4" (6.35 mm) D | 16,20,24,28 | A, B, J |
| B | Single Slotted 1/4" (6.35 mm) D | 16,20,24,28 | A, B, J |
| C | Single Flatted 1/4" (6.35 mm) D | 20,24,28 | A, B, J |
| E | Single Slotted 1/8" (3.18 mm) D | 12,16,20,24,28 | C, E, N |
| F | Single Flatted 1/8" (3.18 mm) D | 24 | C, N |
| G | Dual Concentric Plain 1/4" (6.35 mm) D - 1/8" (3.18 mm) D Outer Operates Section 1 | 36,40 | A, J |
| K | Dual Concentric Plain 1/8" (3.18 mm) D - 5/64" (1.98 mm) D Outer Operates Section 1 | 32,36 | C, N |
| L | Dual Concentric Plain 1/4" (6.35 mm) D - 1/8" (3.18 mm) D Outer Operates Section 1/2 | 36,40 | A, J |
| M | Dual Concentric Plain 1/8" (3.18 mm) D - 5/64" (1.98 mm) D Outer Operates Section 1/2 | 32,36 | C, N |
| N | Dual Concentric Plain 1/4" (6.35 mm) D - 1/8" (3.18 mm) D Outer Operates Section 1/2/3 | 36,40 | A, J |
| P | Dual Concentric Plain 1/8" (3.18 mm) D - 5/64" (1.98 mm) D Outer Operates Section 1/2/3 | 32,36 | C, N |
| R | Single Slotted 6 mm D | 16,19,22,50 | R, S |
| T | Single Slotted 4 mm D | 10, 13, 22 | U |
| V | Dual Concentric Plain 6 mm D - 3 mm D Outer Operates Section 1 | 30, 42 | R |

Boldface features are Bourns standard options. All others are available with higher minimum order quantities.

REV. 03/13

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