



## 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 <sup>1</sup>  | 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 Characteristics<sup>1</sup>

|  |                                       |                               |
|--|---------------------------------------|-------------------------------|
| 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.

<sup>1</sup>At 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 Characteristics<sup>1</sup>**

|   |  |
|---|--|
| 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 Characteristics<sup>1</sup>**

|   |  |
|---|--|
| 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 Characteristics<sup>1</sup>**

|  |                                      |
|--|--------------------------------------|
| 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.

<sup>1</sup>At 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



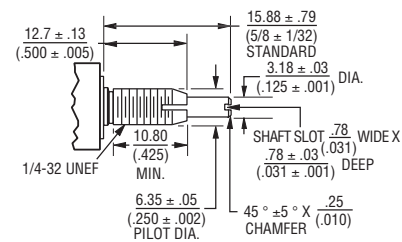
**"B" Bushing**  
3/8 " (9.53 mm) Dia. Plain - Single Shaft



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



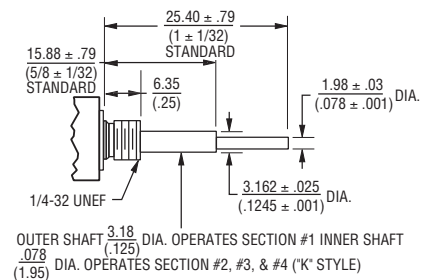
**"E" Bushing**  
1/4 " (6.35 mm) Dia. Locking - Single Shaft



**"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**



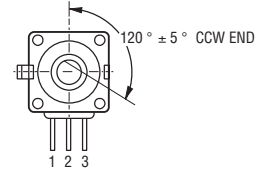
Terminal outlines shown as solid lines represent PC Pins, available on Model 81. Dashed line terminal outline represents "J" Hook, available on Model 82.

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

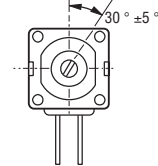


Note: For units with dual concentric shaft styles, a 2.54 (.100) spacer is added between the module(s) driven by the outer shaft and those driven by the inner shaft. For G, K, or V shafts, add the spacer between modules 1 and 2. For L or M shafts, add the spacer between modules 2 and 3. For N or P shafts,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

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## 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   |

| 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                       |

| 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 |

| 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                           |

| 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    |

| ELEMENT TAPER TYPE/TOLERANCE |                                      | RESISTANCE CODE VALUE IN OHMS |              |
|------------------------------|--------------------------------------|-------------------------------|--------------|
| (A)<br>(H)                   | Linear Cermet ±10 %                  | (05) - 100                    | (30) - 15 K  |
|                              | Linear Cermet ±5 %                   | (28) - 150                    | (16) - 20 K  |
| (B)<br>(E)                   | Linear C-P ±20 %<br>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)                          | CCW Audio Cermet ±10 %               | (12) - 2.5 K                  | (20) - 100 K |
| (F)                          | CCW Audio C-P ±10 %                  | (22) - 250 K                  | (23) - 500 K |
| (G)                          | CCW Audio C-P ±20 %                  | (15) - 10 K                   | (24) - 750 K |
| (S)                          | CCW 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<br>Outer Operates Section 1      | 36,40             | A, J            |
| K          | Dual Concentric Plain 1/8" (3.18 mm) D - 5/64" (1.98 mm) D<br>Outer Operates Section 1     | 32,36             | C, N            |
| L          | Dual Concentric Plain 1/4" (6.35 mm) D - 1/8" (3.18 mm) D<br>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<br>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<br>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<br>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<br>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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**Стандарт  
Электрон  
Связь**

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С нами вы становитесь еще успешнее!

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