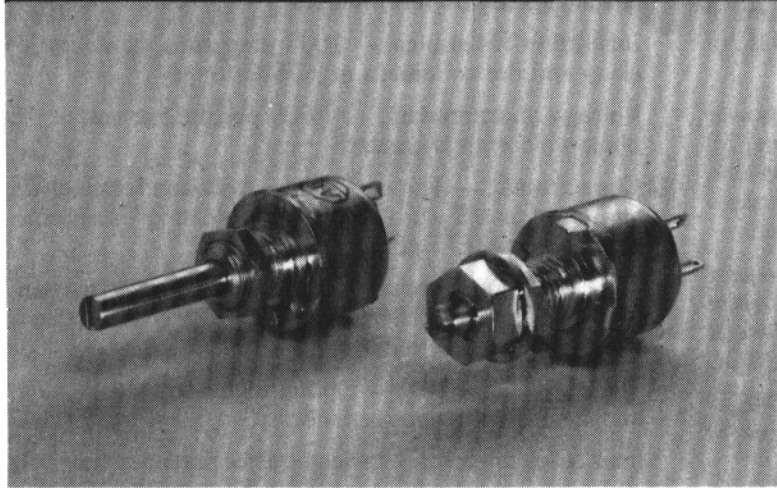


Type W
**Hot-Molded
 Panel Potentiometers**



Features

- Immersion Sealed
- Linear and Non-Linear Tapers
- Style RV6
- All-Plastic Construction

Benefits

- Washable
- Versatility
- Meets MIL-R-94 Requirements
- Cost Effective

AVAILABILITY

Groupings

The Type W Hot-Molded Panel Potentiometers are divided into two groups.

OEM standard components—These OEM components (Bushing/Resistance/Taper Combinations and Bushing/Shaft/Taper Combinations, listed in the table on Page 220) are stocked as components at our manufacturing facilities. They offer a wider range of possible

combinations than the distributor stocked potentiometers but do require assembly.

All custom components—All other components listed are available. Since they are not stocked, they require **both** fabrication and assembly. Contact factory for information.

SPECIFICATIONS

General

Temperature range — -55°C to $+120^{\circ}\text{C}$.

Total resistance values — 100 ohms to 5.0 megohms.

Total resistance tolerances — $\pm 10\%$ or $\pm 20\%$.

Tapers — Available in the following resistance ranges:

| TAPER | TOTAL RESISTANCE RANGE |
|--------------|-------------------------|
| U | 100 Ohms to 5.0 Megohms |
| A, B, S & DB | 500 Ohms to 2.5 Megohms |

General (continued)

See chart on following pages for explanation of tapers. Special tapers, where practical, can be supplied.

End Resistance — See chart on Page 218.

Electrical

Power — metal housing — 0.5 watt (with plastic shaft 0.25 watt) maximum at +70°C for “U” linear taper provided voltage rating is not exceeded.

Power — plastic housing — 0.25 watt maximum at +70°C for “U” linear taper provided voltage rating is not exceeded.

Power derating — metal housing — Derate power linearly from +70° to zero at +120°C. Derate power 50 percent for non-metallic mounting and for resistors with “A,” “B,” “S,” and “DB” tapers. For rheostat applications, derate power directly with shaft or actuator position.

Power derating — plastic housing — Derate power linearly from +70°C wattage to zero at +120°C. Derate 50 percent for “A,” “B,” “S,” or “DB” tapers. For rheostat applications, derate directly with shaft or actuator position.

Voltage — 350 volts maximum working voltage (RMS or DC), or as determined by $E_{\max} = \sqrt{PR}$, whichever is less (at sea level).

Dielectric withstanding voltage — Maximum continuous voltage 350 volts (RMS or DC) at sea level. Metal housing will withstand a one second test of 750 volts (RMS) at

Applicable military specification — Many of the variable resistors without switches may be ordered as Style RV6 of MIL-R-94.

sea level or 350 volts (RMS) at 3.4 inches (86,36 mm) mercury. Plastic housing will withstand a one second test of 1000 volts (RMS) at sea level or 500 volts (RMS) at 3.4 inches (86,36 mm) mercury.

Insulation resistance — 1000 megohms minimum for clean and dry conditions at +25°C.

Voltage characteristic — 0.005 percent per volt or 0.5 ohm, whichever is greater.

- 2 **Capacitance** — The capacitance between terminal #1 and terminal #3 with terminal #2 “floating” is approximately 0.5 to 0.75 pF at 1 KHz.

The capacitance between terminal #1 (grounded to bushing) and terminal #3 (shaft in extreme clockwise position) approximately 3.0 to 3.7 pF at 1 KHz.

The capacitance between all terminals shorted together and the bushing is approximately 5.5 to 6.5 pF at 1 KHz.

In all cases capacitance indicated is for potentiometer only and does not include capacitance of connecting wires.

- 2 Applicable to metal housing construction only.

Operational

Contact resistance variation — linear taper — Maximum value is 2.0% of nominal resistance value or 3.0 ohms whichever is greater.

Load life — 10 percent maximum change in total resistance as a result of a 1000 hour test at rated power

across entire element in still air at +70°C (1.5 hours “ON”, 0.5 hour “OFF”).

Rotational life — 10 percent maximum change in total resistance as a result of a 50,000 mechanical cycle life test without load.

Mechanical

Shafts — Metal shafts are available in 1/64 inch (0,40 mm) increments from minimum length .125 inch (3,18 mm) to maximum length 2.500 inches (63,50 mm) with plain, screwdriver slotted or flatted shaft endings. Slotted shafts can be flush with the bushing end or recessed on resistors with plain bushings.

Plastic shafts are available as specified on page 219.

All shaft lengths are measured from the mounting face of the resistor to the free end of the shaft.

Plastic housing — Bushing threadless .250 inch (6,35 mm) in diameter and .250 inch (6,35 mm) long.

Bushings — Metal bushings have a 32-NEF-2A thread and are .250 inch (6,35 mm) in diameter.

After lock nuts on locking bushings are tightened with a torque of 8 inch-pounds (9,22 kfg-cm) shafts will not turn with torques up to 20 inch-ounces (1,44 kfg-cm).

Hardware — Resistors are normally supplied with mounting nut, M-4721, and one internal tooth lock washer, M-4748. Resistors with shaft lock bushings are supplied with one lock nut, M-4761, in addition to the

above. Unless otherwise specified, all hardware shipped in bulk.

Locating lugs — Four locating lug options are available so resistors may be indexed with respect to the surface on which they are mounted. Unless otherwise specified, Type WA, WB, or WP resistors are supplied in accordance with Option No. 2. Type WC always supplied with a special lug option. See specifications on Page 222.

Turning torque — 0.5 to 3 inch-ounces (0,036 to 0,22 kgf-cm) at +25°C and 13 inch-ounces (0,94 kgf-cm) maximum at -55°C.

Stop torque — 4 inch-pounds (4,61 kgf-cm) minimum metal shaft, 2 inch-pounds (2,30 kgf-cm) minimum for flatted plastic shaft and 10 inch-ounces (0,72 kgf-cm) minimum for slotted plastic shaft.

Weight — The exact weight of individual resistors depends on the precise mechanical specifications involved. An approximate net weight of a typical resistor including hardware normally specified would be 0.24 ounce (6,8 gms) for Types WA, WB, or WP and 0.07 ounce (2,0 gms) for Type WC.

Mechanical (continued)

Immersion — No continuous stream of bubbles (4 or more) emanating from the resistor as a result of the immersion test (1 minute in water at +85°C).

Rotation — Mechanical rotation is 295° ±5°. Electrical rotation is 270° nominal.

Backlash — 3° maximum.

Construction — Materials are corrosion resistant and essentially non-magnetic; terminals are treated for easy soldering.

The resistor incorporates an internal "O" ring between the shaft and bushing. External surfaces are given special treatment so that the entire resistor is immersion sealed.

Environmental

Vibration — 2 percent maximum change in total resistance, 5 percent maximum change in resistance setting. (Tested per method 204, condition "C" of MIL-STD-202.)

Shock — 2 percent maximum change in total resistance, 5 percent maximum change in resistance setting. (Tested per method 213, condition "I" of MIL-STD-202.)

Moisture resistance — 10 percent maximum change in total resistance. (Method 106 of MIL-STD-202.)

Corrosion resistance — Materials show no corrosion after a 200 hour salt spray test. (Method 101 of MIL-STD-202.)

Effect of soldering — 2 percent maximum change in total resistance as a result of immersing the terminals in +350°C solder to within .125 inch (3,18 mm) of the resistor body for 5 seconds.

Washability — Capable of withstanding typical after-solder boardwash processes using approved detergent or solvent solutions.

Temperature cycling — 3 percent maximum change in

A panel "watertight" bushing is available. This bushing is provided with an external "O" ring in addition to the internal "O" ring supplied as standard.

Terminals — These resistors are supplied with solder lug terminals (Type WA) or printed circuit pin terminals (Type WC and WP). Terminals are treated for easy soldering.

Marking — Clarostat part number and nominal total resistance are marked in two lines. Other marking possible, limited to maximum of 16 characters in each of "Type W" always included.

total resistance as a result of the temperature cycling test (five cycles -55°C to +120°C).

Low temperature operation — 2 percent maximum change in total resistance as a result of the low temperature operation test (-55°C for two hours without load and 45 minutes with rated load.).

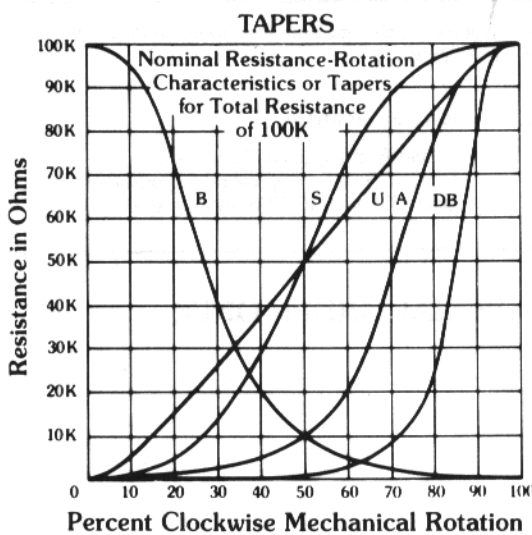
Low temperature storage — 2 percent maximum change in total resistance as a result of the storage test (24 hours at -63°C).

Temperature characteristics — Maximum percent temporary total resistance change from the +25°C value. See table below.

| Nominal Resistance | Degrees Celsius — "U" Linear Taper | | | | | | |
|--------------------|------------------------------------|------|------|------|------|------|-------|
| | -55° | -25° | 0° | +25° | +55° | +85° | +120° |
| 100 Ohms | + 4.5 | +2.5 | +1.5 | 0 | ±1.0 | ±1.5 | +3.5 |
| 1,000 Ohms | + 5.5 | +3.0 | +1.5 | 0 | ±1.0 | ±2.0 | +4.5 |
| 10,000 Ohms | + 7.0 | +3.5 | +2.0 | 0 | ±1.0 | ±2.5 | +5.5 |
| 100,000 Ohms | + 8.0 | +4.0 | +2.0 | 0 | ±1.5 | ±3.0 | +6.0 |
| 1 Megohm | +10.0 | +5.0 | +2.5 | 0 | ±1.5 | ±3.5 | +7.5 |

For "S", "A", "B" and "DB" tapers multiply percentage figures shown above by 1.25.

Taper Data



Tapers A, DB, S and U are measured between the wiper and the counter-clockwise terminals; taper B is measured between the wiper and the clockwise terminals.

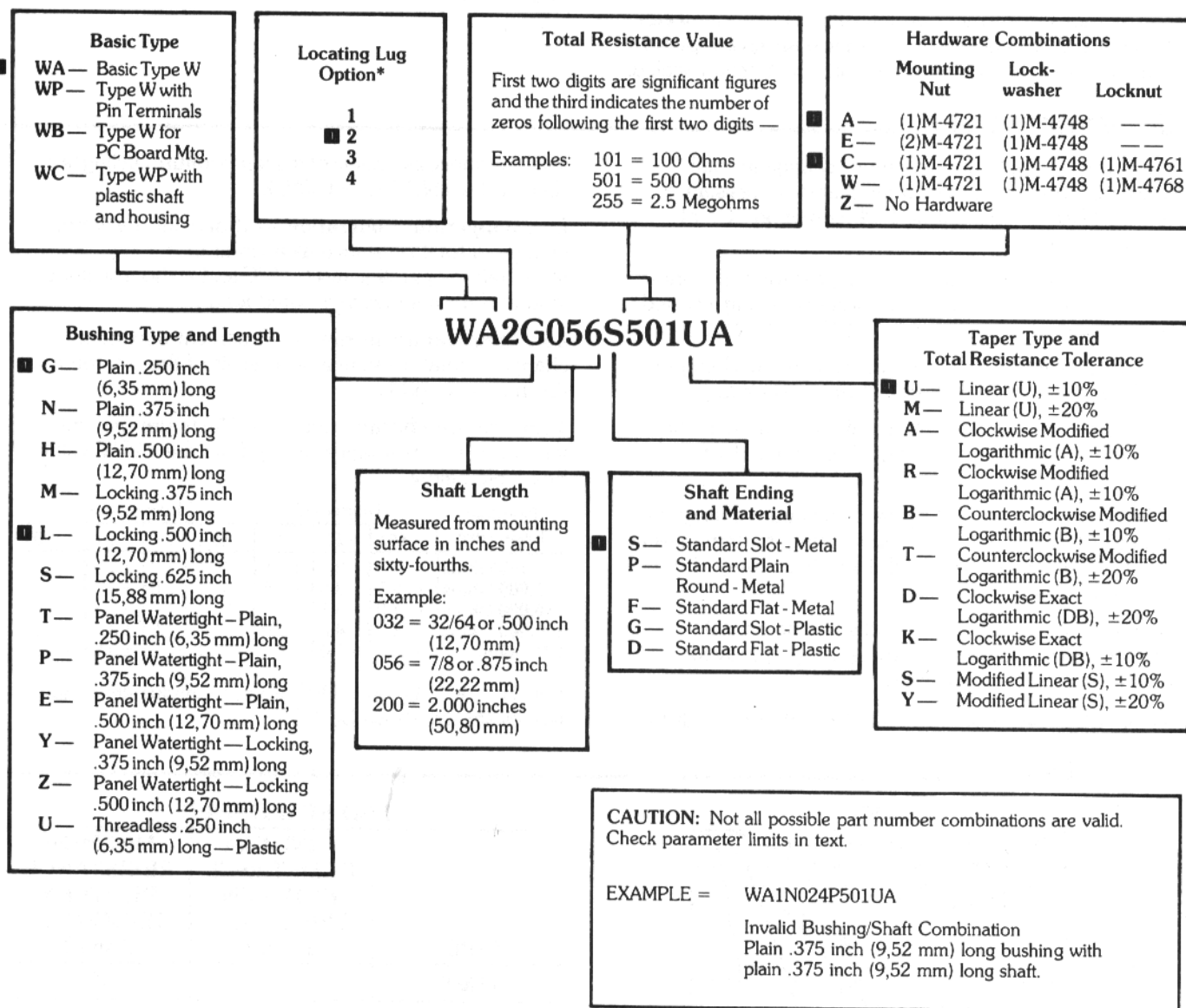
END RESISTANCE

| TAPER | MINIMUM RESISTANCE BETWEEN TERMINALS 1 and 2 | MINIMUM RESISTANCE BETWEEN TERMINALS 2 and 3 |
|-------|--|--|
| U & S | 1 | 1 |
| A | 1 | 2 |
| B | 2 | 1 |
| DB | 3 | 2 |

- 1 Less than .004% of total resistance, or less than 15 ohms, whichever is greater.
- 2 Less than 1% of total resistance, or less than 15 ohms, whichever is greater.
- 3 Less than 15 ohms.

Hot-Molded Panel Potentiometers

Explanation of Part Numbers



■ THESE CONFIGURATIONS ARE AVAILABLE AS A SPECIAL ORDER ONLY.

* Type WB available with locating lug Option 2 only.
Type WC available with locating lug Option 1 only.

Available Catalog Order Number Values

Available Special Order Number Values

| Basic Type | | W | |
|-------------------|------|----------------|-----------|
| Resistance (ohms) | Code | "U" Taper Only | |
| | | WA2G 056S | WA2L 040S |
| 100 | 101 | — | — |
| 1000 | 102 | — | — |
| 10000 | 103 | — | — |
| 100000 | 104 | — | — |
| 1000000 | 105 | — | — |
| 150 | 151 | — | — |
| 1500 | 152 | — | — |
| 15000 | 153 | — | — |
| 150000 | 154 | — | — |
| 200 | 201 | — | — |
| 2000 | 202 | — | — |
| 20000 | 203 | — | — |
| 200000 | 204 | — | — |
| 2000000 | 205 | — | — |
| 250 | 251 | — | — |
| 2500 | 252 | — | — |
| 25000 | 253 | — | — |
| 250000 | 254 | — | — |
| 2500000 | 255 | — | — |
| 500 | 501 | — | — |
| 5000 | 502 | — | — |
| 50000 | 503 | — | — |
| 500000 | 504 | — | — |
| 5000000 | 505 | — | — |

| Basic Type | | W | | |
|------------------------|------|---|-----|-----|
| Bushing Length, Inches | | 1/4 | | |
| Bushing Type | | Plain | | |
| Shaft Length, Inches | | Plain Ending Slotted Ending Flatted Ending | | |
| | | 1/2, 5/8, 3/4, 7/8 3/8, 7/16, 1/2, 5/8, 3/4, 7/8 Non-Standard | | |
| Resistance (ohms) | Code | Taper | | |
| | | "U" | "A" | "B" |
| 100 | 101 | — | * | * |
| 1000 | 102 | — | — | — |
| 10000 | 103 | — | — | — |
| 100000 | 104 | — | — | — |
| 1000000 | 105 | — | — | — |
| 150 | 151 | — | * | * |
| 1500 | 152 | — | — | — |
| 15000 | 153 | — | — | — |
| 150000 | 154 | — | — | — |
| 200 | 201 | — | * | * |
| 2000 | 202 | — | — | — |
| 20000 | 203 | — | — | — |
| 200000 | 204 | — | — | — |
| 2000000 | 205 | — | — | — |
| 250 | 251 | — | * | * |
| 2500 | 252 | — | — | — |
| 25000 | 253 | — | — | — |
| 250000 | 254 | — | — | — |
| 2500000 | 255 | — | — | — |
| 500 | 501 | — | — | — |
| 5000 | 502 | — | — | — |
| 50000 | 503 | — | — | — |
| 500000 | 504 | — | — | — |
| 5000000 | 505 | — | * | * |

— = Available as a Special Order only. Contact factory for information.

— = Available as a Special Order only. Contact factory for information.
* = Not Available.

NOTE: For MIL-R-94 Specifications, reference pages 231-232.

■ Plastic Shaft available with: Slotted Ending — 3/8, 7/16, 1/2, 5/8, 3/4, 7/8, 1.0
Flatted Ending — 1/2, 5/8, 3/4, 7/8, 1.0

Ordering Information

1. Type (WA, WB, WC, or WP).
2. Taper.
3. Total resistance value in ohms.
4. Bushing type (plain, locking, shaft watertight, or panel and shaft watertight).
5. Bushing length in inches.
6. Shaft ending (plain, slotted or flatted).
7. Shaft length from mounting surface in inches.
8. Locating lug option (1,2,3 or 4).
9. Mounting hardware (A-B Standard or Other).
10. Part number you have assigned, if any.
11. Marking required on the part.
12. Special features.*

*Forward complete detailed specifications to the factory.

Cross Reference Guide

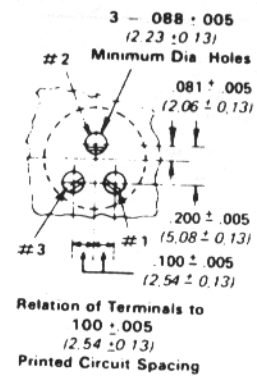
| Description | A-B Type W | Clarostat | | PEC Type S | Bourns Type 3862 | Tokyo-Cosmos Type RV12Y |
|-------------------------------|------------|-----------|----------|------------|------------------|-------------------------|
| | | Type 382 | Type 392 | | | |
| Single/Lug Terminal | ■ | ■ | | ■ | ■ | ■ |
| Single/Pin Terminal | ■ | ■ | | ■ | ■ | ■ |
| Single/Side Adj. Pin Terminal | ■ | ■ | | | | |
| Single/All Plastic | ■ | | ■ | | | |
| MIL RV6 | ■ | ■ | | | | |

■ = Available.

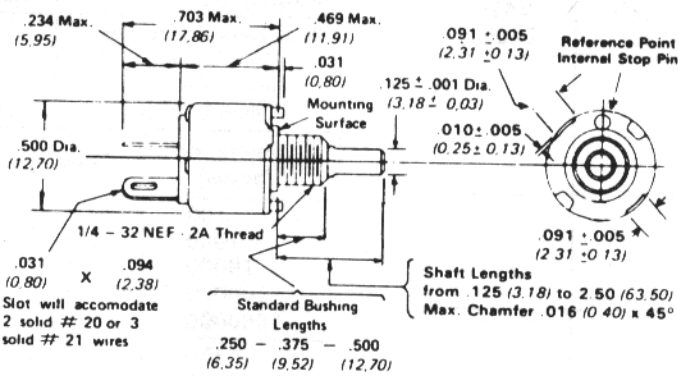
DIMENSIONS

Type WA

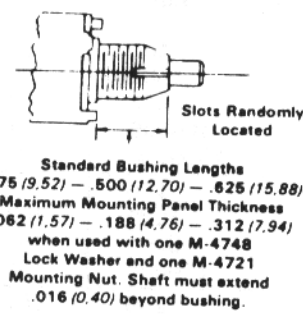
Location of Terminals



Plain Bushing

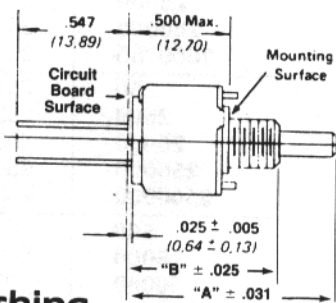
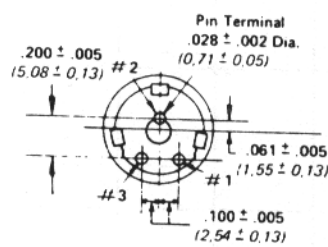


Shaft Locking Bushing



Type WP

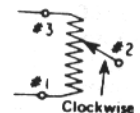
Location of Terminals



| DIMENSION "A" | |
|--------------------------------|---------------|
| Shaft Length from Mtg. Surface | Dimension "A" |
| .500 | .965 |
| .625 | 1.090 |
| .750 | 1.215 |
| .875 | 1.340 |
| 1.000 | 1.465 |

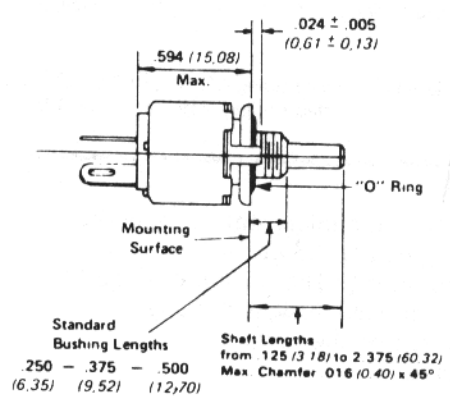
| DIMENSION "B" | |
|----------------|---------------|
| Bushing Length | Dimension "B" |
| .250 | .715 |
| .375 | .890 |
| .500 | .965 |

Resistor Connections

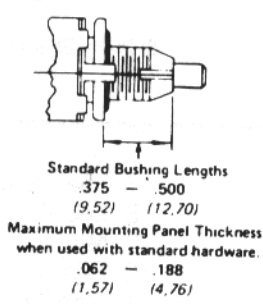


Panel Watertight Bushing

Plain

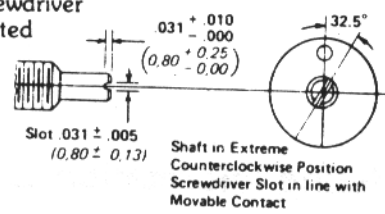


Locking

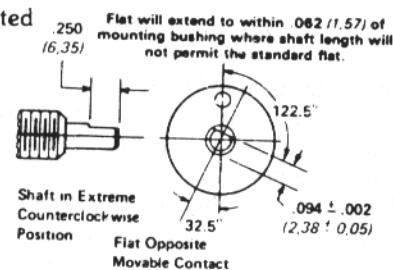


Shaft Ending

Screwdriver Slotted

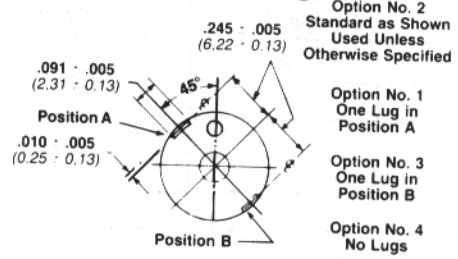


Flatted

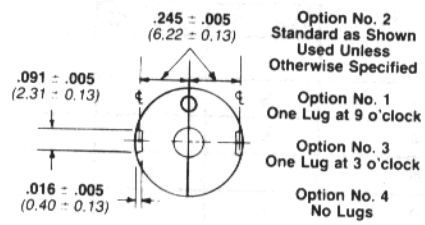


Lug Options

Plain and Locking Bushing



Panel Watertight Bushing

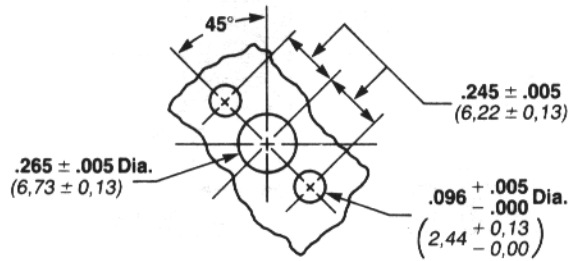


Basic dimensions in inches.
Dimensions shown in parentheses are in millimeters.
TOLERANCES
Dimensional tolerance ±.016 (0.40)
Angular tolerance ±5°
Except as specified.
NOT TO SCALE

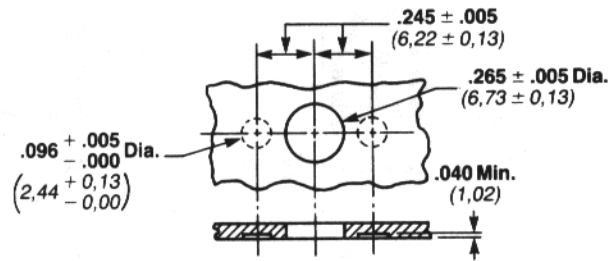
DIMENSIONS

Mounting Holes

TYPE WA or WP
Standard Potentiometer

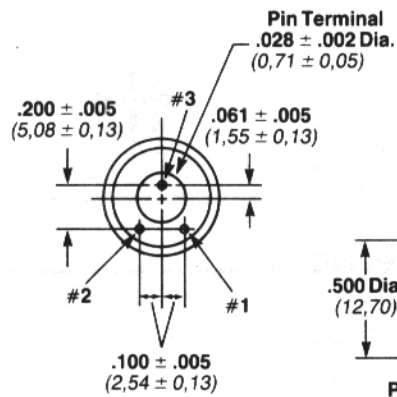


Panel Watertight Potentiometer

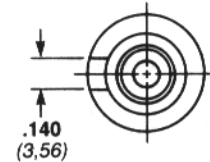
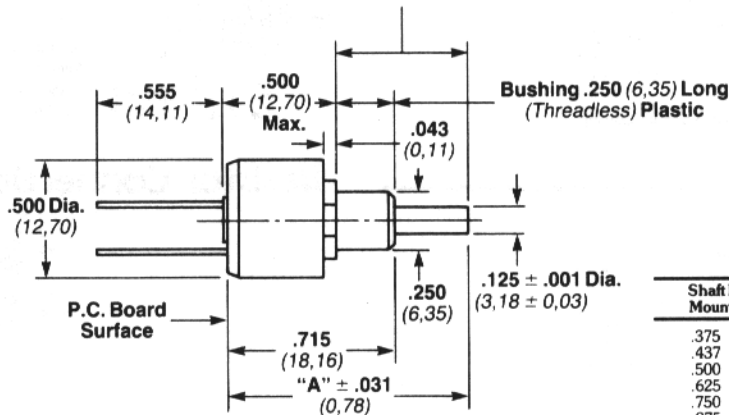


Type WC

Location of Terminals



| | | | | | | | |
|---------------|---------|---------|---------|---------|---------|---------|---------|
| Slotted Shaft | .375 | .437 | .500 | .625 | .750 | .875 | 1.000 |
| | (9,53) | (11,11) | (12,70) | (15,88) | (19,05) | (22,22) | (25,40) |
| Flatted Shaft | .500 | .625 | .750 | .875 | 1.000 | | |
| | (12,70) | (15,88) | (19,05) | (22,22) | (25,40) | | |

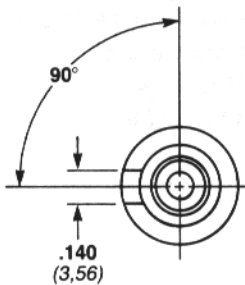


DIMENSION "A"

| Shaft Length from Mounting Surface | "A" | "A" | "A" |
|------------------------------------|-------|-------|-------|
| .375 | 9,53 | .840 | 21,33 |
| .437 | 11,09 | .902 | 22,91 |
| .500 | 12,70 | .965 | 24,51 |
| .625 | 15,87 | 1,090 | 27,69 |
| .750 | 19,05 | 1,215 | 30,86 |
| .875 | 22,22 | 1,340 | 34,03 |
| 1.000 | 25,40 | 1,465 | 37,21 |

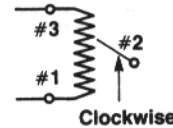
Relation of Terminals to
.100 ± .005
(2,54 ± 0,13)
Printed Circuit Spacing

Lug Option



Option No. 1
Standard as Shown

Resistor Connections



Basic dimensions in inches.
Dimensions shown in parentheses are in millimeters.

TOLERANCES

Dimensional tolerance ±.016 (0,40)

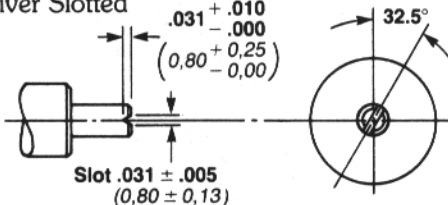
Angular tolerance ±5°

Except as specified.

NOT TO SCALE

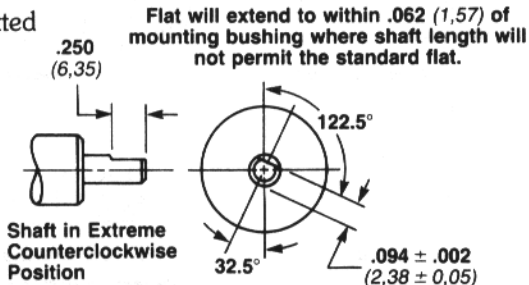
Shaft Endings

Screwdriver Slotted



Shaft in Extreme
Counterclockwise Position
Screwdriver Slot in Line with
Movable Contact

Flatted



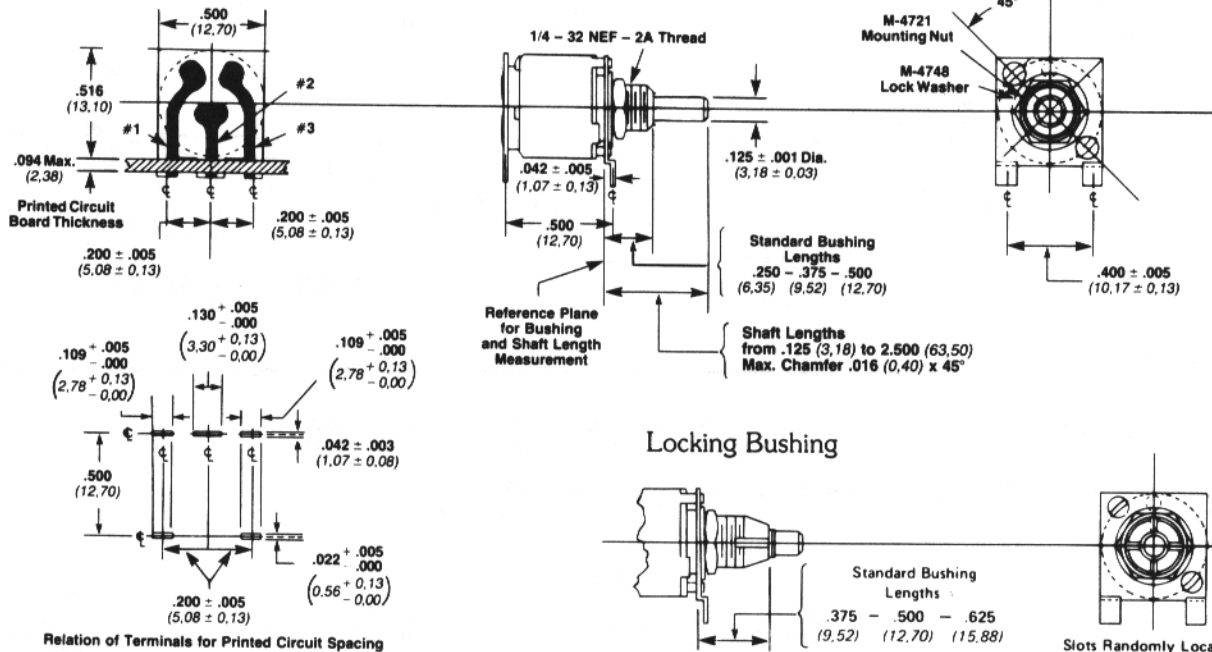
Shaft in Extreme
Counterclockwise
Position

Flat Opposite
Movable Contact

DIMENSIONS

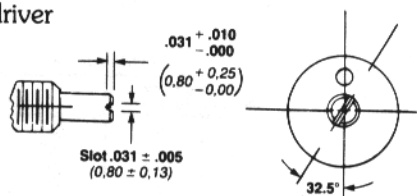
Type WB Resistor for Printed Circuit Board Mounting

Plain Bushing



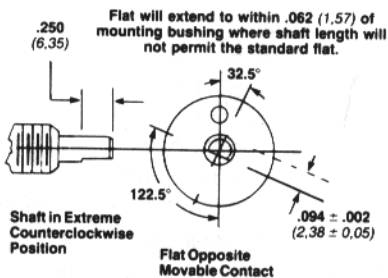
Shaft Endings

Screwdriver Slotted



Shaft in Extreme Counterclockwise Position
Screwdriver Slot in Line with Movable Contact

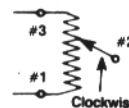
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Shaft in Extreme Counterclockwise Position

Flat Opposite Movable Contact

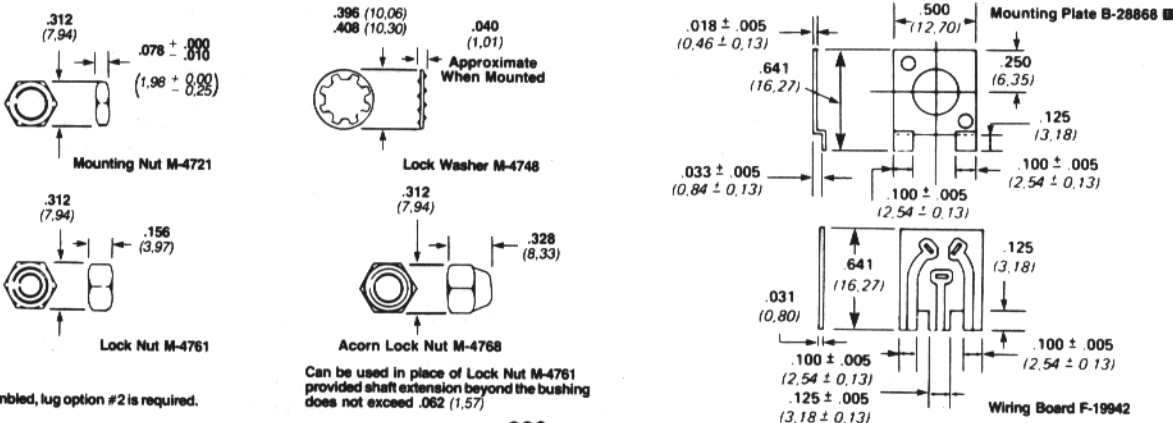
Resistor Connections



Basic dimensions in inches.
Dimensions shown in parentheses are in millimeters.

TOLERANCES
Dimensional tolerance $\pm .016$ (0,40)
Angular tolerance $\pm 5^\circ$
Except as specified.
NOT TO SCALE

Hardware



■ If field assembled, lug option #2 is required.