

INCH-POUND

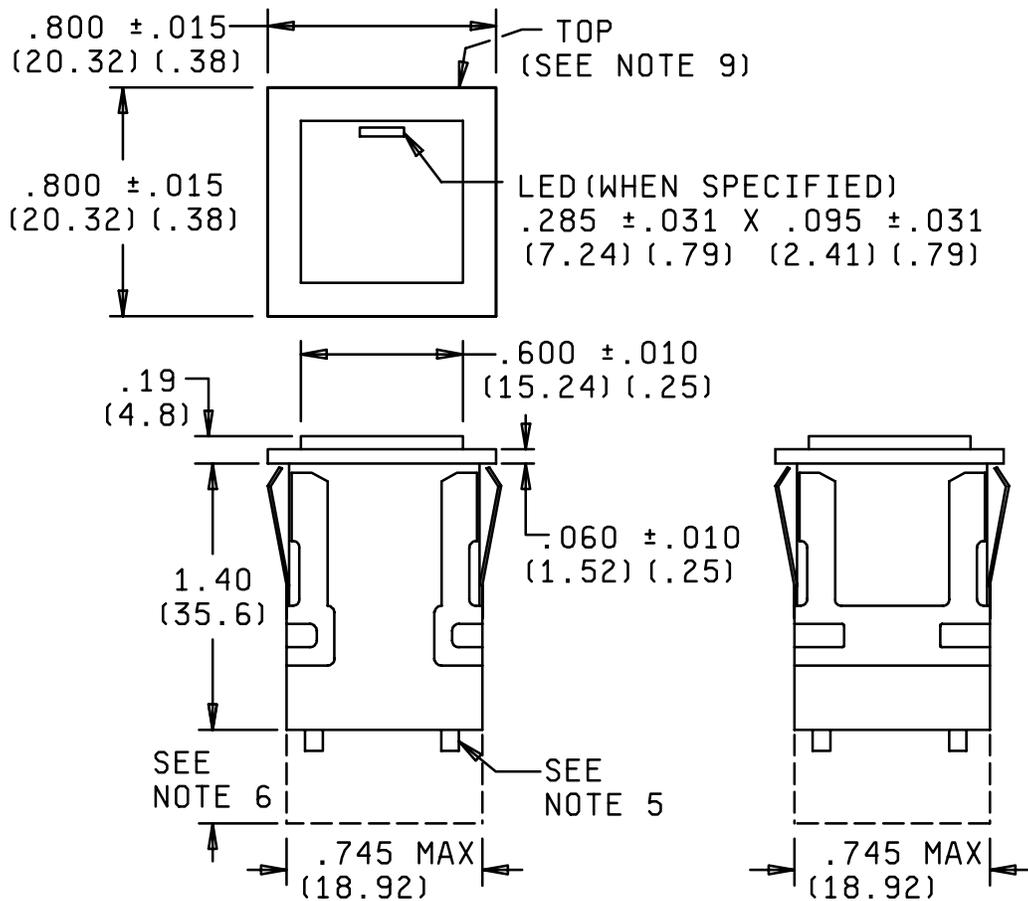
MIL-PRF-22885/93C
1 March 2001
SUPERSEDING
MIL-S-22885/93B
27 February 1985

PERFORMANCE SPECIFICATION SHEET

SWITCH, PUSHBUTTON, ILLUMINATED, ROCKER, PADDLE,
LOGIC LOAD TO 3 AMPERES, UNSEALED

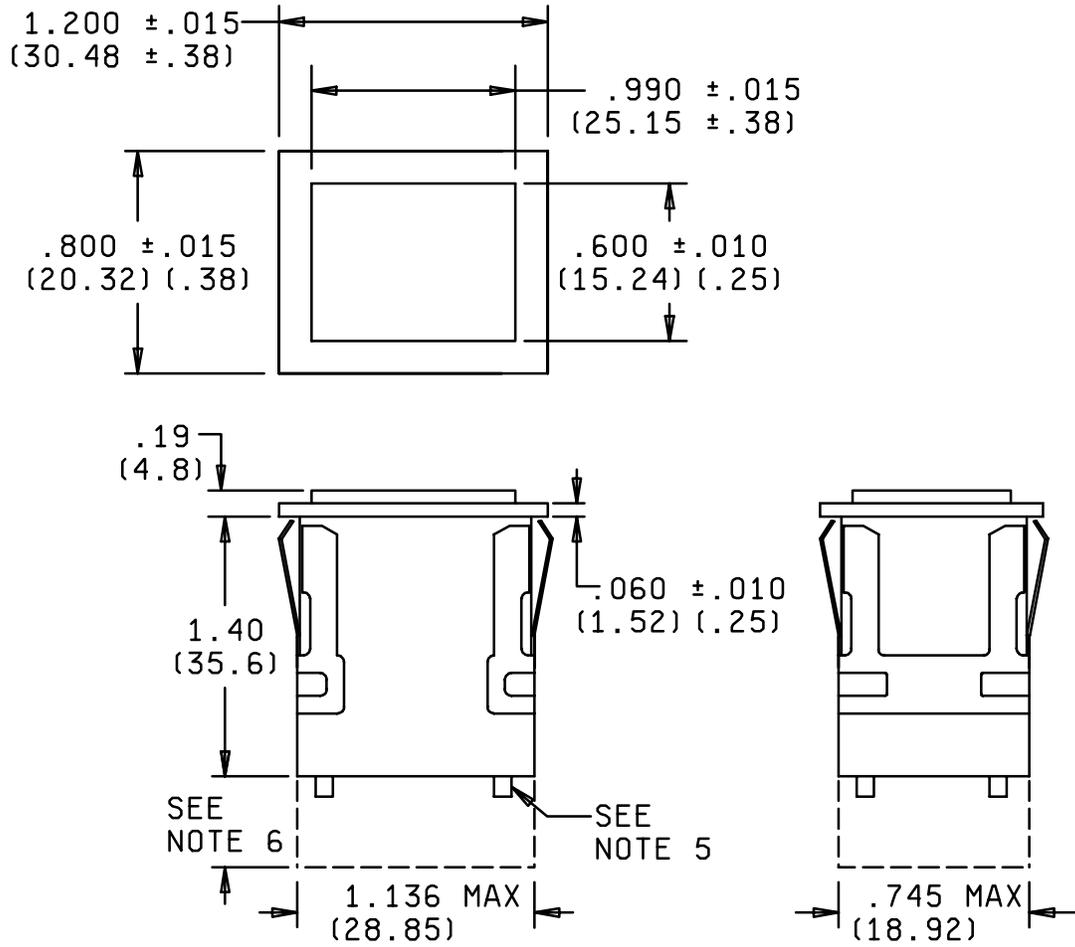
This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the switches described herein shall consist of this specification and MIL-PRF-22885.



PUSHBUTTON-SQUARE
(SWITCH AND INDICATOR)

FIGURE 1. Configurations and dimensions.



PUSHBUTTON-RECTANGULAR
(SWITCH AND INDICATOR)

FIGURE 1. Configurations and dimensions - Continued.

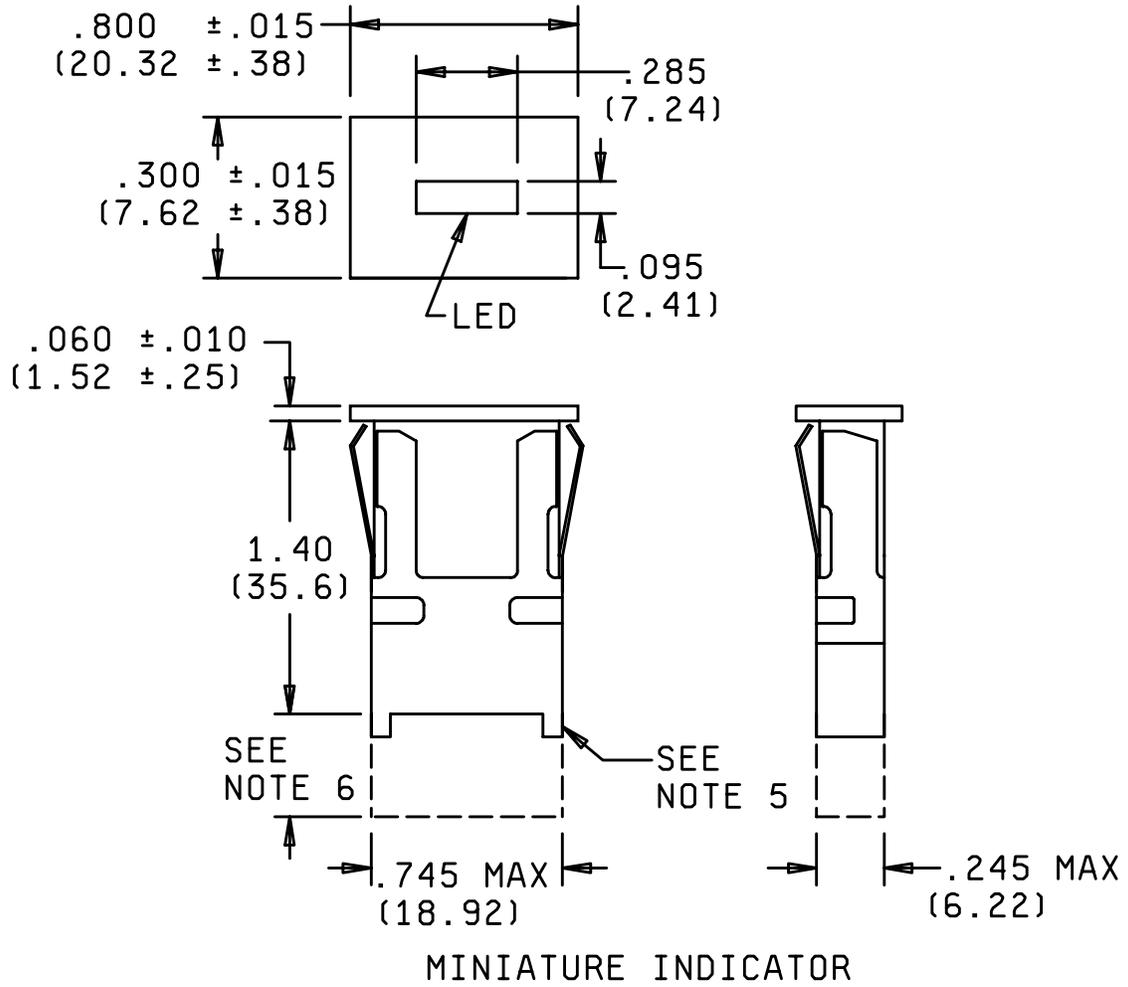


FIGURE 1. Configurations and dimensions - Continued.

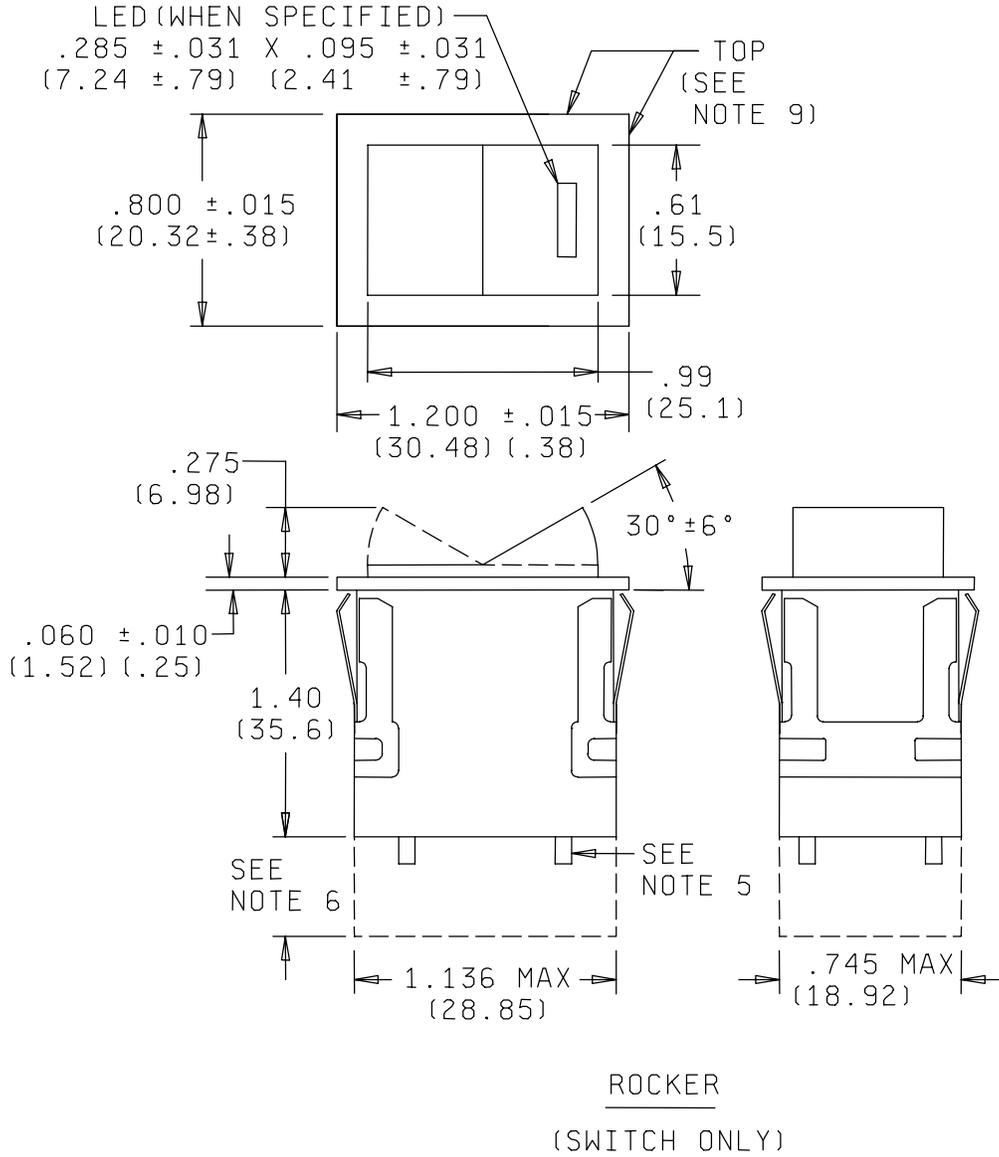
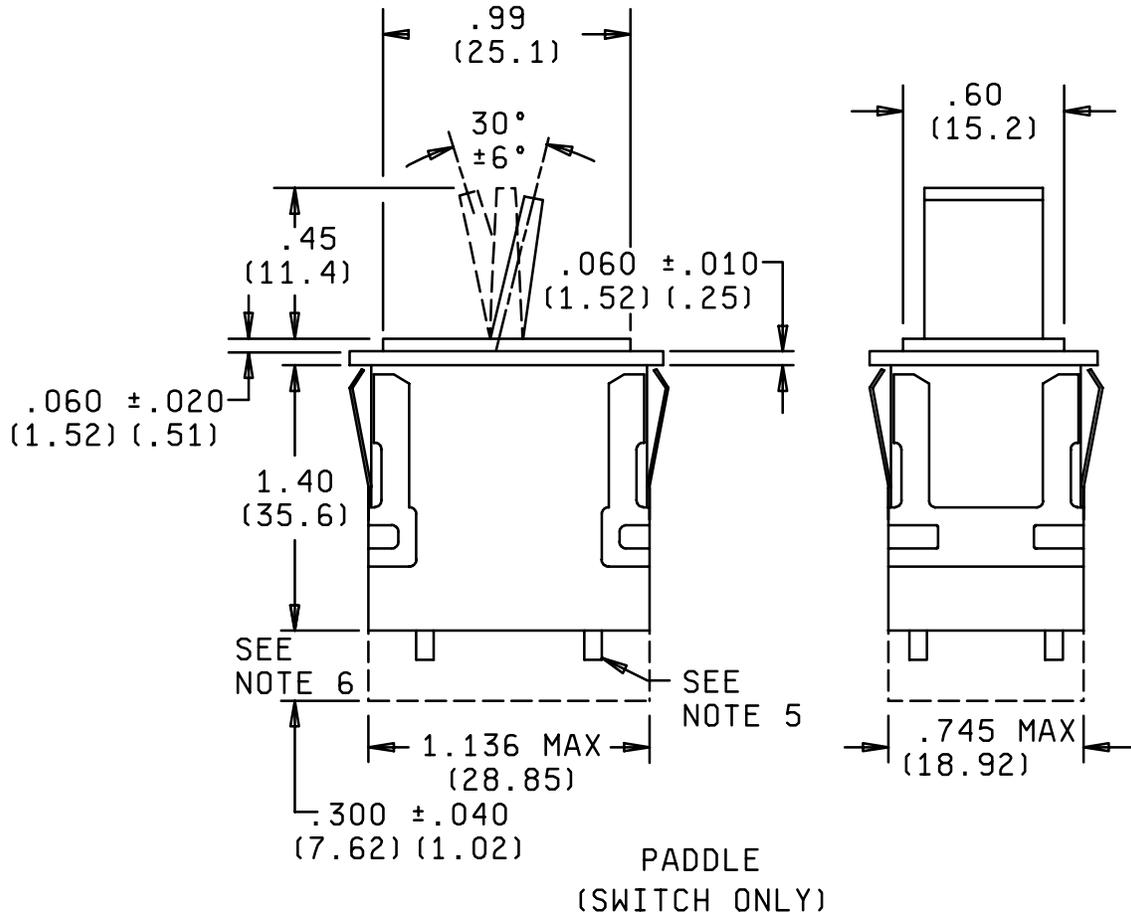


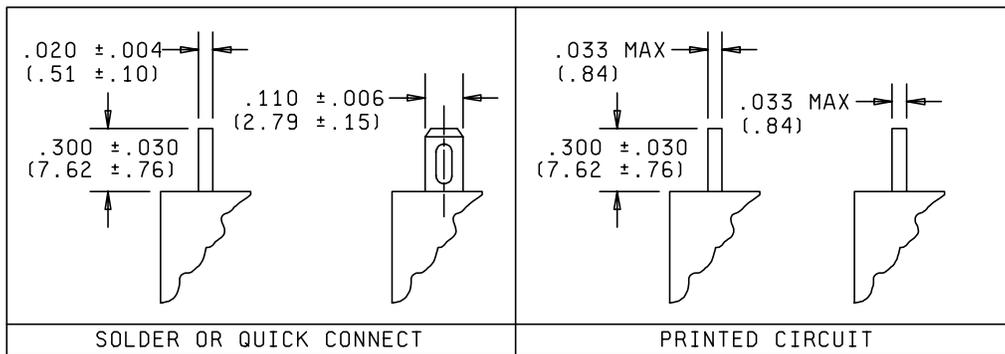
FIGURE 1. Configurations and dimensions - Continued.



NOTES

1. Dimensions are in inches.
2. Tolerances are ± .031 (±0.79 mm) unless otherwise specified.
3. Switches shall mount on .060 - .187 (1.52 - 4.75 mm) panel thickness.
4. The design configuration is optional within envelope dimensions shown.
5. .059 ± .015 (1.50 ± 0.38 mm) high x .065 ± .021 (1.65 ± 0.53 mm) diameter standoffs are provided.
6. See figures 2 through 8 for terminal size and location.
7. Metric equivalents are given for general information only.
8. Metric equivalents are in parentheses.
9. Top side(s) of switch is shown to insure proper legend orientation (see figures 3 through 8). See application information.

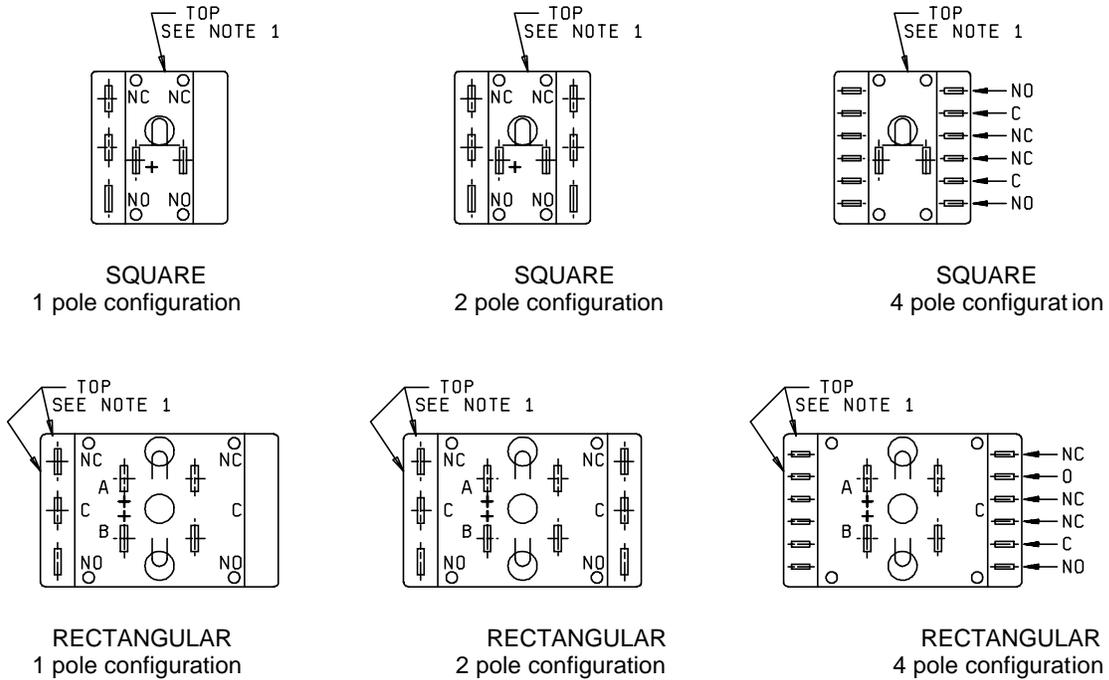
FIGURE 1. Configurations and dimensions - Continued.



Solder or quick connect - Solder hole will accept two #22 AWG standard conductor (in accordance with NEMA publication DC-2 1976).

Printed circuit - See figure 10 for printed circuit board mounting information.

FIGURE 2. Terminal types.

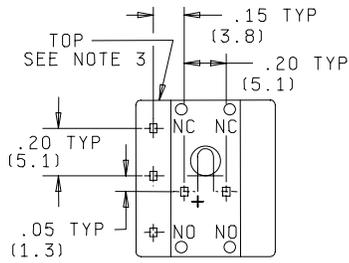


Illuminated devices shown for nonilluminated devices, lamp terminals are not provided.

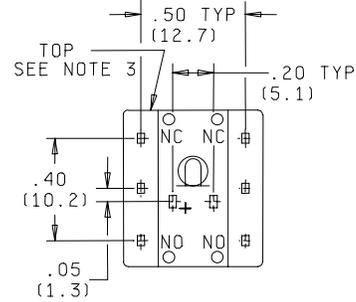
NOTES:

1. Top side of switch is shown to insure proper legend orientation. See application information.
2. Switch terminals shall be located relative to top sides of switch as shown. Orientation of switch terminals is optional.
3. Location and orientation of lamp (or LED) terminals optional.
4. Terminal identification marking shall be as shown. Terminal identification may be marked on adjacent side of housing.
5. Minimum spacing between terminals and minimum distance from terminal edge to edge of housing is .045 inch.

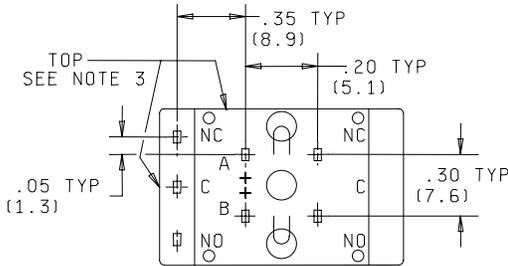
FIGURE 3. Terminal location-push buttons - solder or quick connect terminals.



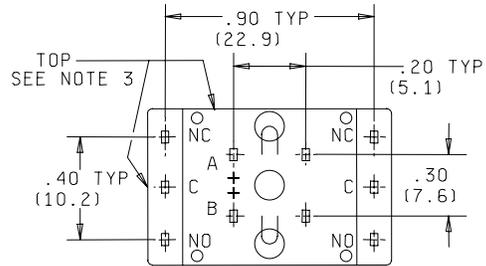
SQUARE
1 pole configuration
.033 max P. C. termination



SQUARE
2 pole configuration
.033 max P. C. termination



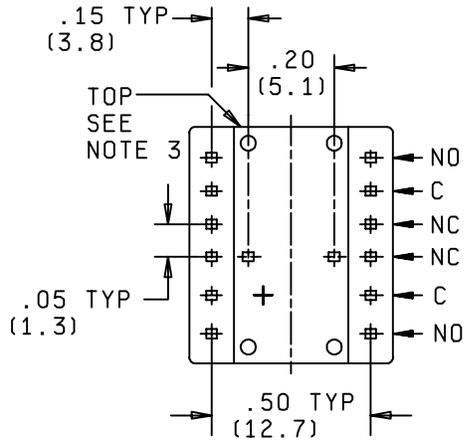
RECTANGULAR
1 pole configuration
.033 max P. C. termination



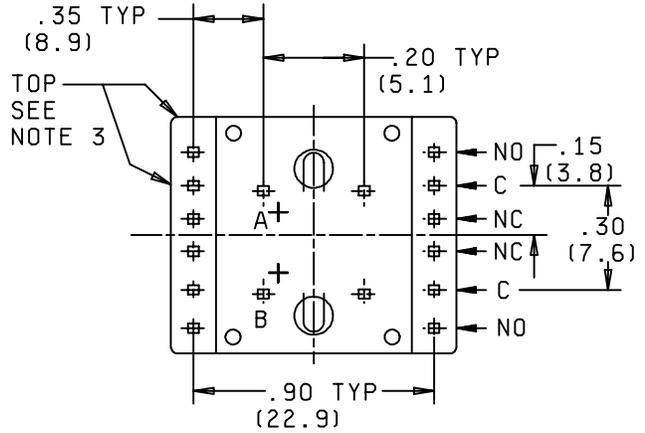
RECTANGULAR
2 pole configuration
.033 max P. C. termination

Illuminated devices shown for nonilluminated devices, lamp terminals are not provided.

FIGURE 4. Terminal location-push buttons - printed circuit terminals.



SQUARE
4 pole configuration
.033 max P. C. termination



RECTANGULAR
4 pole configuration
.033 max P. C. termination

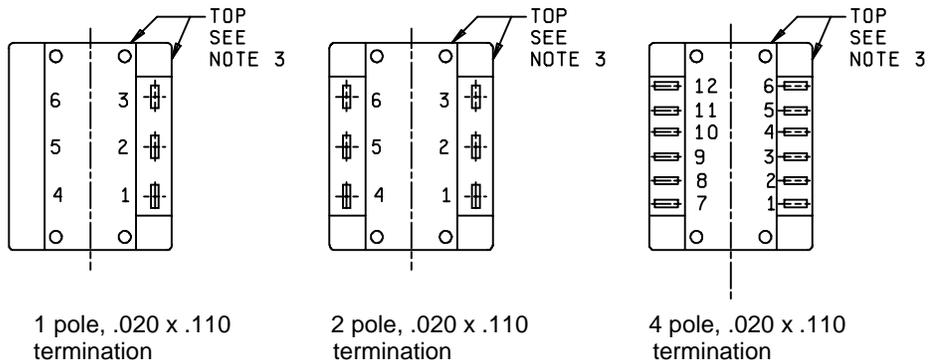
Illuminated devices shown for nonilluminated devices, lamp terminals are not provided.

NOTES:

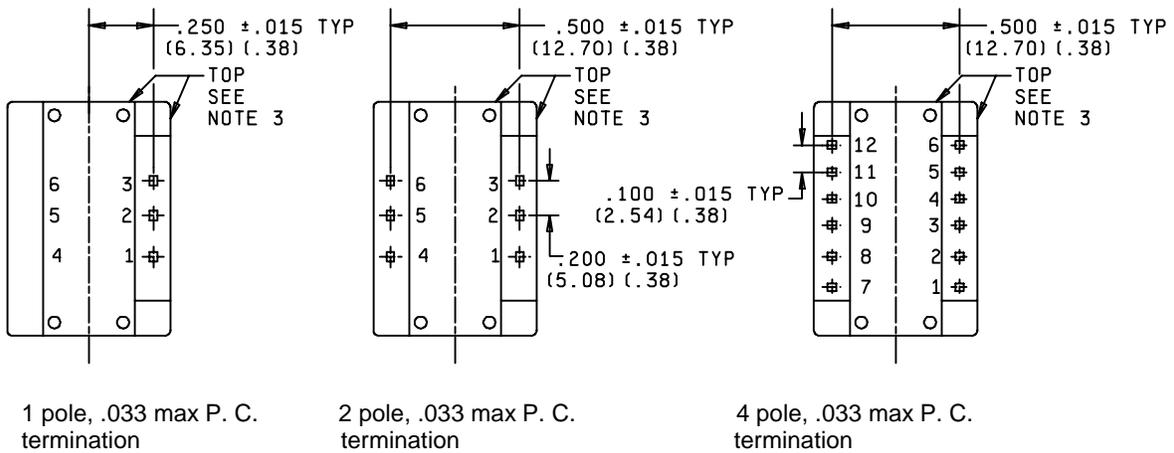
1. Dimensions are in inches.
2. Tolerances are $\pm .015$ inch (± 0.38 mm) unless otherwise specified.
3. Top side of switch is shown to insure proper legend orientation. See application information.
4. Metric equivalents are given for general information only.
5. Metric equivalents are in parentheses.

FIGURE 4. Terminal location-push button - printed circuit terminals - Continued

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Solder or quick connect terminals.

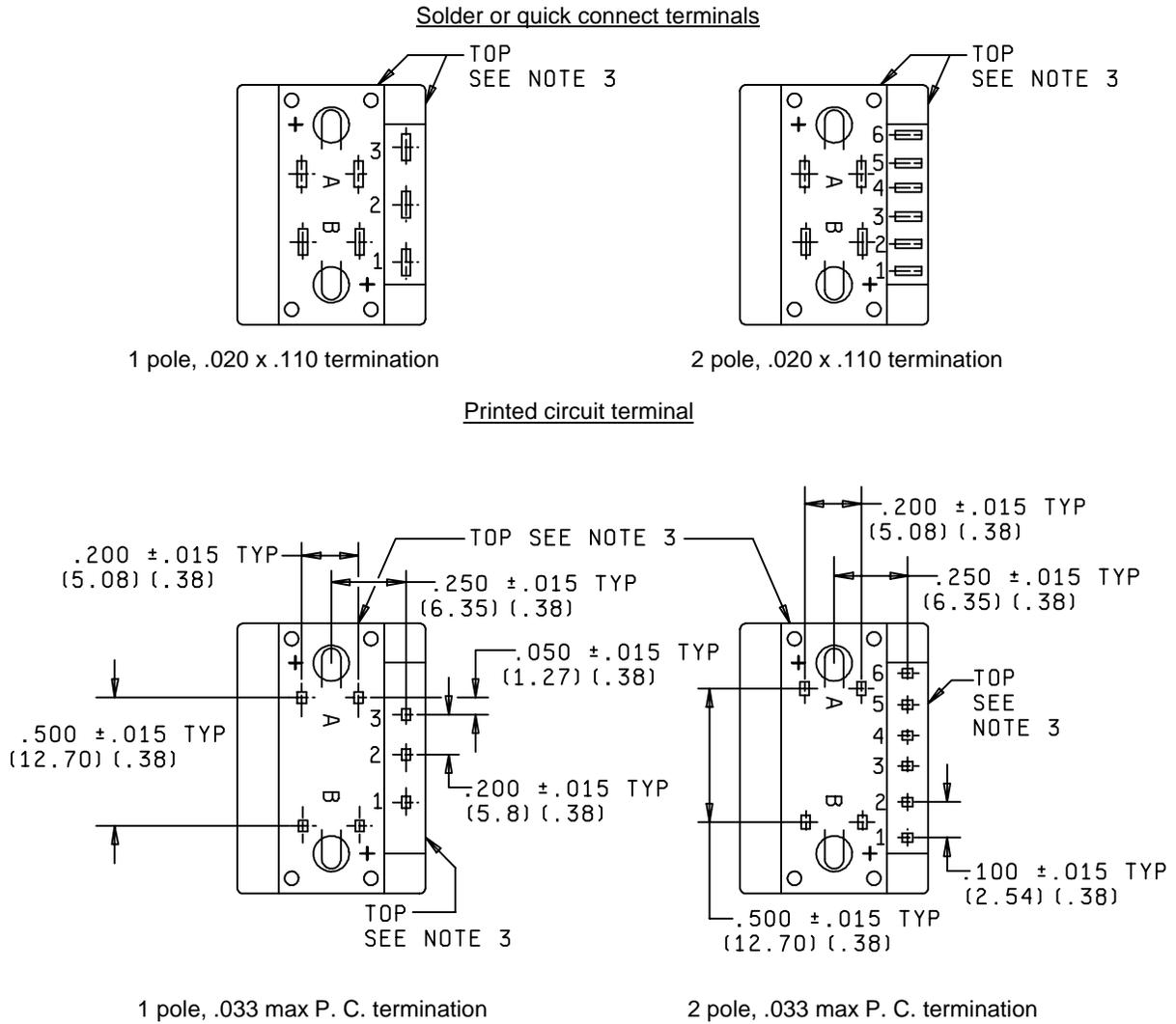


Printed circuit terminals.

NOTES:

1. Dimensions are in inches.
2. Tolerances are $\pm .031$ inch (± 0.79 mm) unless otherwise specified.
3. Top side of switch is shown to insure proper legend orientation. See application information.
4. Metric equivalents are given for general information only.
5. Metric equivalents are in parentheses.
6. Solder/quick connect terminals shall be located relative to top sides of switch as shown, and terminal orientation is optional.
7. Solder terminals. Minimum spacing between terminals, and minimum distance to edge of housing is .045 inch.

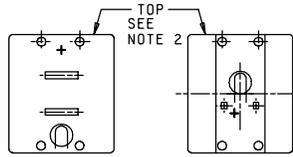
FIGURE 5. Terminal locations-rockers and paddles - nonilluminated.



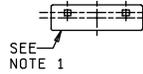
NOTES:

1. Dimensions are in inches.
2. Tolerances are $\pm .031$ inch (± 0.79 mm) unless otherwise specified.
3. Top side of switch is shown to insure proper legend orientation. See application information.
4. Metric equivalents are given for general information only.
5. Metric equivalents are in parentheses.
6. Solder/quick connect terminals: Switch terminals shall be located relative to top sides of switch as shown. Orientation of switch terminals is optional. Location and orientation of lamp terminals is optional.
7. Solder terminals. Minimum spacing between terminals, and minimum distance to edge of housing is .045 inch.

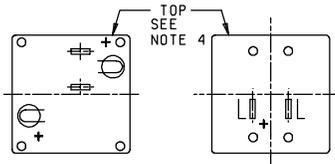
FIGURE 6. Terminal location-rockers and paddles - illuminated.



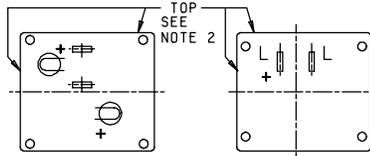
Square configuration
1 LED circuit
Either terminal
arrangement acceptable



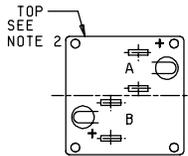
Miniature indicator configuration
1 LED circuit



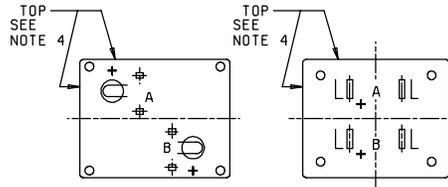
Square configuration
1 incandescent lamp circuit
either terminal arrangement acceptable.



Rectangular configuration
1 incandescent lamp circuit
either terminal arrangement acceptable.



Square configuration
2 incandescent lamp circuits

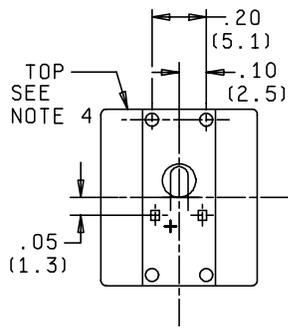


Rectangular configuration
2 incandescent lamp circuit
either terminal arrangement acceptable.

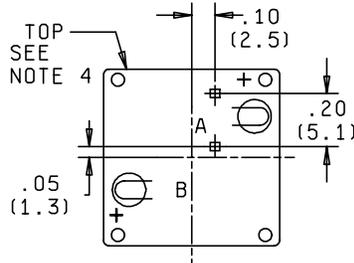
NOTES:

1. Positive terminal identification (+) marked on side of housing.
2. Top side of switch is shown to insure proper legend orientation. See application information.
3. Minimum spacing between terminals, and minimum distance from terminal edge to edge of housing is .045 inch.

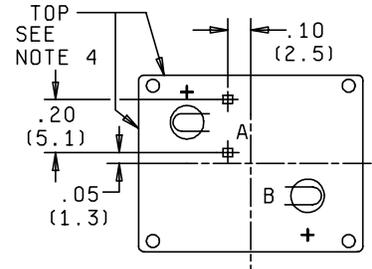
FIGURE 7. Terminal location - indicators - solder or quick connect terminals.



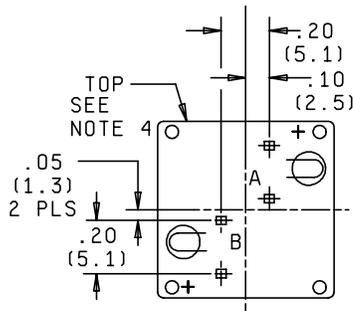
Square configuration
1 LED circuit



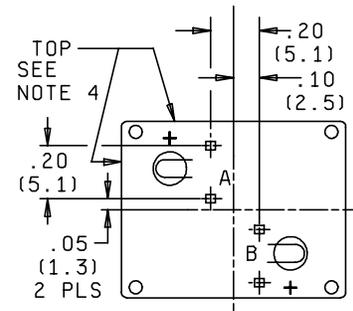
Square configuration
1 incandescent lamp circuit



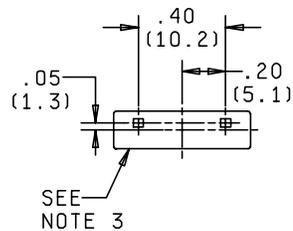
Rectangular configuration
1 incandescent lamp circuit



Square configuration
2 incandescent lamp circuits



Rectangular configuration
2 incandescent lamp circuits

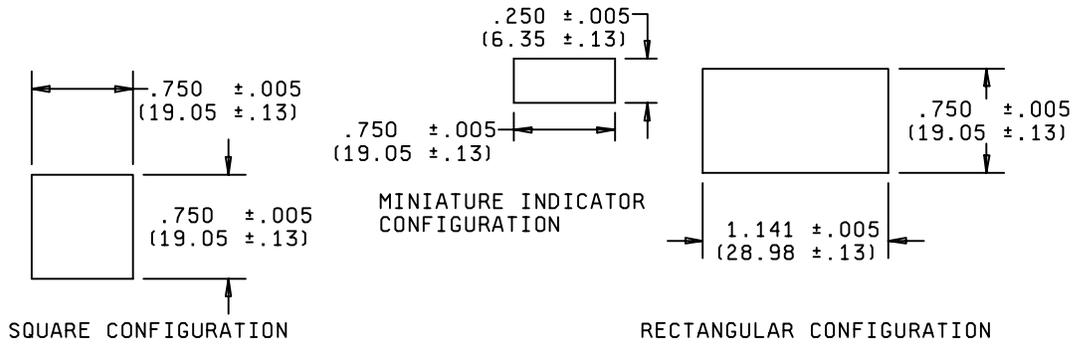


Miniature indicator configuration
1 LED circuit

NOTES:

1. Dimensions are in inches.
2. Tolerances are $\pm .015$ inch (± 0.38 mm) unless otherwise specified.
3. Positive terminal identification (+) marked on side of housing.
4. Top side of switch is shown to insure proper legend orientation. See application information.
5. Metric equivalents are given for general information only.
6. Metric equivalents are in parentheses.

FIGURE 8. Terminal locations - indicators - printed circuit terminals.



Strip mounting (see notes 4 and 5)

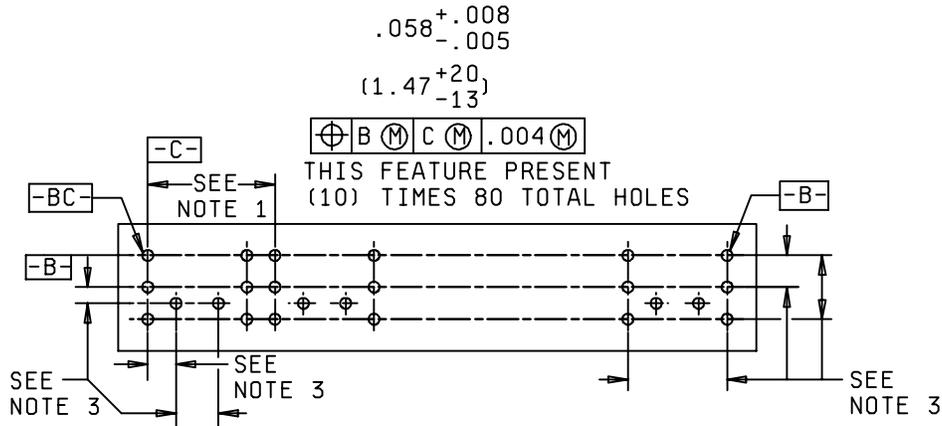
Square units	Rectangular units
(.8) (Number of units) - .045 (20,3) (Number of units) - 1,14	(1.20) (Number of units) - .045 (30,5) (Number of units) - 1,14

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Metric equivalents are in parentheses.
4. See application information for strip mounting information.
5. Miniature indicator not suitable for strip mounting.

FIGURE 9. Panel cutouts.

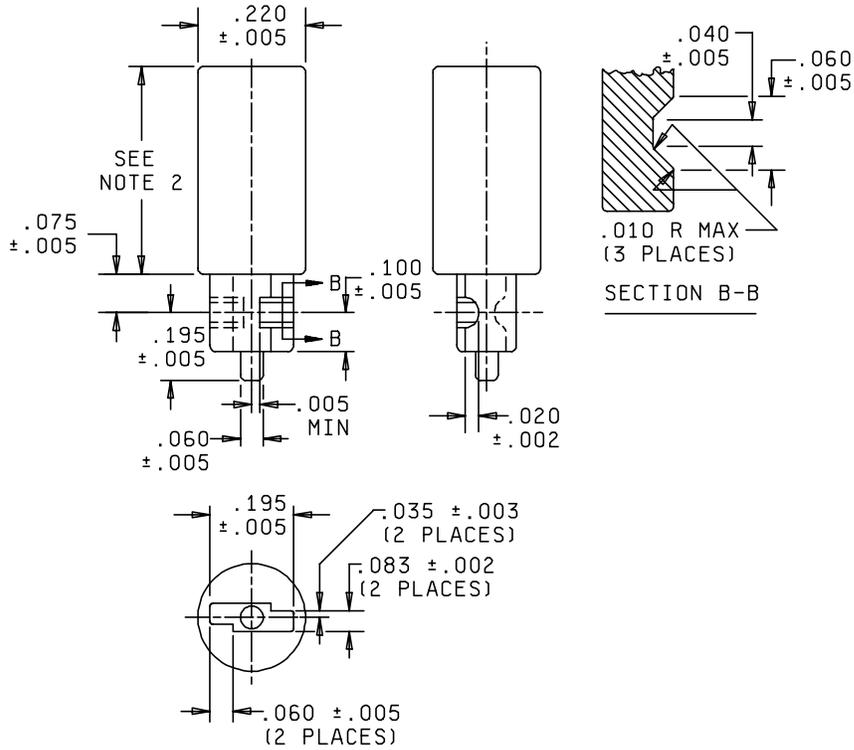
Basic dimensions for strip mounting are: .800 inch (20.32 mm) for square units. .800 inch (20.32 mm) and 1.200 inch (30.48 mm) for the rectangular units.



NOTES:

1. Dimension for square .800 (20.32 mm) typ.
Dimension for rectangular - 1.200 (30.48 mm) typ. (horizontal).
.800 (20.32 mm) typ. (vertical).
2. Component side shown.
3. Basic dimensions for each component hole pattern spacing are the nominal dimensions as shown on figures 4, 5, 6, and 8 for printed circuit terminals.
4. Dimensions are in inches.
5. Metric equivalents are given for general information only.
6. Metric equivalents are in parentheses.

FIGURE 10. Printed circuit board dimensions for strip mount.



NOTES:

1. All radii $.030 \pm .015$ inch ($.76 \pm 0.38$ mm) unless otherwise specified.
2. This dimension shall be adjusted to provide a total weight of $5 +1, -0$ gram.
3. May be of multi-piece construction.
4. May be suitably plated to resist corrosion.
5. Dimensions are in inches.
6. Metric equivalents are given for general information only.

FIGURE 11. T1 3/4 wedge base lamp retention plug.

REQUIREMENTS:

Dimensions and configuration: See figures 1 through 11.

Complete switch shall consist of:

Switch housing: The switch housing shall include mounting clips.

Actuation and display: Unassembled, when furnished.

Pushbutton actuation:

Transmitted color: (One translucent colored button is furnished when specified).

Projected color: (One white translucent cap and a transparent color insert is furnished when specified).

Hidden color: (One black appearing cap and a translucent color insert is furnished when specified).

Nonilluminated: (One translucent colored button is furnished when specified).

LED: (The rectangular LED is furnished as an integral part of the switch which extends through a window in the translucent colored button to extend flush with the top of the button surface).

Indicators: Square and rectangular indicators are furnished with the same display features as detailed for the illuminated pushbuttons. Miniature indicators are furnished with LED illumination only.

Rocker actuation: Same features as detailed for the pushbutton actuation except the rocker operator can be provided as one piece full rocker or two piece rocker for contrasting color selection.

Paddle actuation: Same features as detailed for the pushbutton actuation except paddle cover is provided as a two piece cover.

Lamps: Not furnished. Illuminated switches will accept T-1 3/4 subminiature wedge base incandescent lamps (Industry Lamp No. 73 (14 volt), No. 85 (28 volt), and No. 86 (6.3 volt)).

Enclosure design: 1 (unsealed).

Temperature characteristic: 0°C to +55°C.

Vibration grade: 2 (10-500 Hz).

Materials:

LED circuitry: Ferrous materials may be used for current carrying parts. The dissimilar metals and compatible couples requirements are not applicable.

Polycarbonate: May be used as material for light displays and actuators only providing it meets UL 94V-2 or better.

Printed circuit terminals: Printed circuit terminals shall be treated to facilitate soldering.

Weight: See table I.

TABLE I. Weight.

Configuration type	Weight
	<u>Max. grams</u>
Square pushbutton	21
Square indicator	20
Rectangular pushbutton	33
Rectangular indicator	25
Miniature indicator	8
Rocker	30
Paddle	33

Lamp contacts: Contacts for incandescent lamps shall be designed to accept T-1 3/4 wedge base lamps.

LED: Shall not be damaged by the application of reverse polarity voltage.

Lens: The lens design shall permit application of hot stamp legends.

Electrical ratings and endurance: See table II. The overload, short circuit, and electrical endurance requirements of MIL-PRF-22885 are not applicable to 10 mA switches. For 10 mA rating, switches shall be tested as follows:

The open circuit voltage shall be 5 V dc maximum. The load current shall be 10 mA maximum.

Contact load: Each set of normally open and normally closed contacts shall be connected to individual loads.

Operate cycles: 50,000 at a rate not to exceed 60 cycles per minute with "ON" and "OFF" times approximately equal.

Operating temperatures:

Twenty-five percent of the test cycles at the minimum temperature specified.

Twenty-five percent of the test cycles at room ambient temperature.

Fifty percent of the cycles at the maximum temperature specified.

During each closure, the contact potential shall be monitored for a minimum of .010 second. The contact voltage drop of any individual switch circuit shall be 50 mV or less during each contact closure.

Lamps shall be energized during test.

TABLE II. Electrical rating/life and initial contact resistance.

Rating	Cycles	Initial cycle resistance
3 amperes, 120 V ac (75 percent power factor)	25,000	.100 ohm max
2 amperes, 28 V dc (resistive)		
10 mA, 5 V dc (resistive)	50,000	.050 ohm max

Intermediate current: Not applicable.

Overload: Inductive load ac electrical endurance samples shall be subjected to a resistive overload test at 150 percent of the inductive rating.

Operating characteristics: See table III.

TABLE III. Operating characteristics. 1/

Configuration type	Characteristics	Value
Pushbutton	Total actuator travel	.180 inch minimum
Rocker		30° ±6°
Paddle		30° ±6°

1/ Operating characteristics are not applicable to indicators.

Contact resistance (switch):

Initial: See table II.

After electrical endurance: Not applicable.

Contact resistance (lamp): Not applicable to LED. Lamp circuit resistance test plug in accordance with figure 12.

Terminal strength: Direction of pull to be parallel to the long axis of the terminal only.

Strength of actuating means:

Rocker actuation: The static load shall be gradually applied to the rocker surface when that surface is parallel to the mounting surface.

Paddle actuation: With the paddle in the extreme position, a static load of 15 pounds shall be gradually applied perpendicular to the paddle axis and parallel to the direction of paddle travel.

Thermal shock: Temperature extremes shall be -40°C to +65°C.

Shock (specified pulse): MIL-STD-202, method 213, test condition A (50 G's).

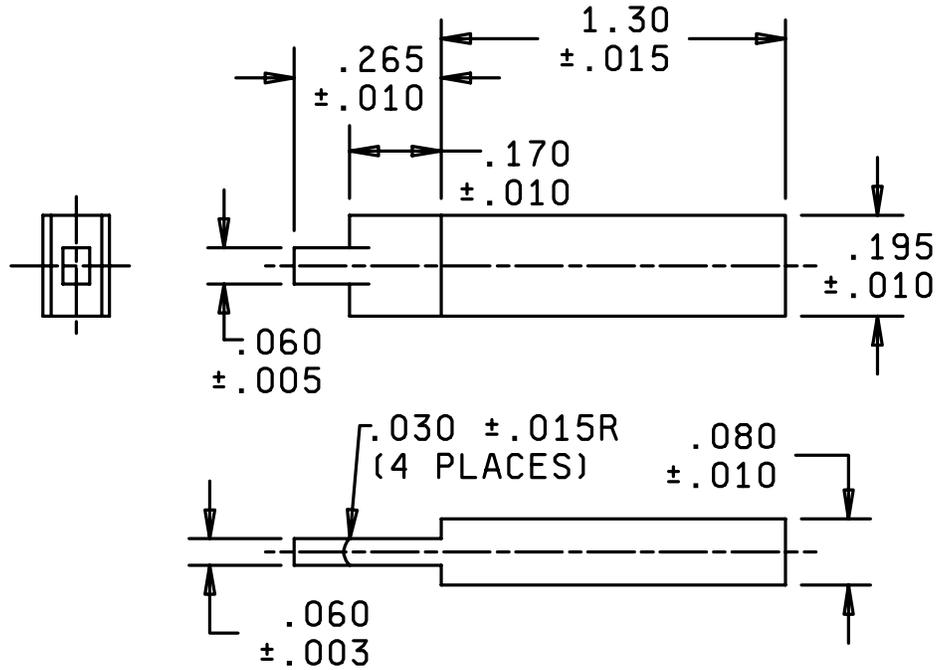
Field of view: For paddle configuration, obstruction of view by paddle shall not be cause for failure.

Color and luminance: See tables IV and V.

Group A inspection: See table VI.

Qualification inspection: See table VII.

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Inches	mm
.003	0.08
.005	0.13
.010	0.25
.015	0.38
.030	0.76
.060	1.52
.080	2.03
.170	4.32
.195	4.95
.265	6.73
1.30	33.0

NOTES:

1. Dimensions are in inches.
2. Material shall be one-half hard brass.
3. May be suitably plated to resist corrosion.
4. Metric equivalents are given for general information only.

FIGURE 12. T1 3/4 wedge base lamp circuit resistance test plug.

TABLE IV. Illuminated chromaticity limits incandescent. 1/2/

Color	Chromaticity coordinates					
	Projected color		Transmitted color		Hidden color	
	"X"	"Y"	"X"	"Y"	"X"	"Y"
Blue	.275	.525	.325	.475	.275	.475
	.275	.450	.250	.475	.225	.475
	.200	.425	.250	.400	.200	.400
	.200	.525	.325	.400	.275	.350
Green	.415	.495	.290	.610	.275	.650
	.375	.450	.255	.525	.195	.595
	.300	.525	.180	.610	.325	.500
	.355	.585	.180	.695	.375	.550
Red	.695	.285	.695	.285	.695	.285
	.710	.290	.710	.290	.710	.290
	.655	.320	.655	.320	.655	.320
	.660	.340	.660	.340	.660	.340
White	.550	.395	.475	.435	.570	.395
	.530	.435	.475	.395	.530	.435
	.460	.435	.530	.435	.460	.435
	.460	.385	.545	.395	.460	.395
Yellow	.580	.400	.580	.400	.580	.400
	.590	.410	.590	.410	.590	.410
	.515	.450	.515	.450	.515	.450
	.525	.475	.525	.475	.525	.475

1/ Measured at 2100° Kelvin using one rectangular pushbutton indicator housing plus two lens of each color.

2/ Illuminated chromaticity limits shall be established by the spectroradiometric method of incandescent lamps.

TABLE V. Brightness - incandescent switches, push-buttons, indicators, rockers, and paddles.

Brightness foot-lambert minimum average												
Color	Pushbuttons											
	Square <u>1/</u>						Rectangular <u>2/</u>					
	Projected		Transmitted		Hidden		Projected		Transmitted		Hidden	
Blue	21		18		3		32		15		2	
Green	32		16		3		60		26		4	
Red	36		28		6		68		51		11	
White	90		91		16		146		159		41	
Yellow	92		114		19		142		193		49	
Indicators												
Color	Projected		Transmitted		Hidden		Projected		Transmitted		Hidden	
	<u>1/</u>	<u>2/</u>	<u>1/</u>	<u>2/</u>	<u>1/</u>	<u>2/</u>	<u>1/</u>	<u>2/</u>	<u>1/</u>	<u>2/</u>	<u>1/</u>	<u>2/</u>
	Blue	24	30	18	39	3	6	16	20	9	18	2
Green	36	67	21	46	3	6	24	44	12	31	2	5
Red	32	78	38	65	8	15	25	51	22	55	5	12
White	115	250	141	274	24	48	75	165	56	174	16	42
Yellow	105	249	161	309	26	51	69	164	79	208	17	50
Rockers and paddles <u>3/</u>												
Color	Rocker						Paddle					
	Projected		Transmitted		Hidden		Projected		Transmitted		Hidden	
	Blue	25		14		4		25		14		4
Green	40		19		4		40		19		4	
Red	42		38		9		42		38		9	
White	108		109		19		108		109		19	
Yellow	120		136		22		120		136		22	

- 1/ Tested with one lamp using one housing plus two lens of each color.
- 2/ Tested with two lamps using one housing plus two lens of each color.
- 3/ Tested with one housing plus two lens of each color.

TABLE VI. Group A inspection.

Inspection
Visual and mechanical inspection Operating characteristics Dielectric withstanding voltage Contact resistance (switch)

1/ At the option of the contractor, in-process inspection may be used to meet the materials and design and construction requirements provided they meet the acceptable quality level and all of the contractor's in-process control data on these tests are made available to the Government upon request.

TABLE VII. Qualification (group submission).

Inspection	Samples <u>4/</u>	Ext. of approval
<u>Group I</u> Visual and mechanical <u>1/</u> Solderability <u>2/</u> Resistance to solder heat <u>2/</u> Contact resistance Operating characteristics	All	All
<u>Group II</u> Terminal strength <u>2/</u> Strength of actuation means <u>3/</u> Lamp retention Thermal shock Vibration Shock (specified pulse) Moisture resistance Dielectric withstanding voltage Operating characteristic	M22885/93-HAB06EW (4 samples) M22885/93-CEA01DW (4 samples) M22885/93-RAA83KWW (4 samples) M22885/93-PEA11JWW (4 samples)	
<u>Group III</u> Salt spray (corrosion)	M22885/93-HAB06EW (2 samples) M22885/93-PEA11JWW (2 samples) M22885/93-TEA11PWW (2 samples)	
<u>Group IV</u> Short circuit Dielectric withstanding voltage Operating characteristics	M22885/93-HAB06EW (2 samples)	
<u>Group VI</u> Overload Electrical endurance Contact resistance Dielectric withstanding voltage Operating characteristics	M22885/93-HAB06EW (4 samples) M22885/93-HAB13EW (2 samples) M22885/93-RAA83KWW (2 samples)	
<u>Group VIII</u> Color Luminance Field of view	Chromaticity and brightness samples to be tested are as determined by the applicable tables of this specification sheet. Two samples of each configuration are tested for field of view.	

1/ Two samples of each configuration type for physical dimensions.

2/ Two samples of each terminal type.

3/ Two samples of each actuator type.

4/ Samples shall have Industry Lamp No. 85 installed for those tests requiring the lamps to be energized.

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Part or Identifying Number (PIN) for indicators and pushbutton switches:

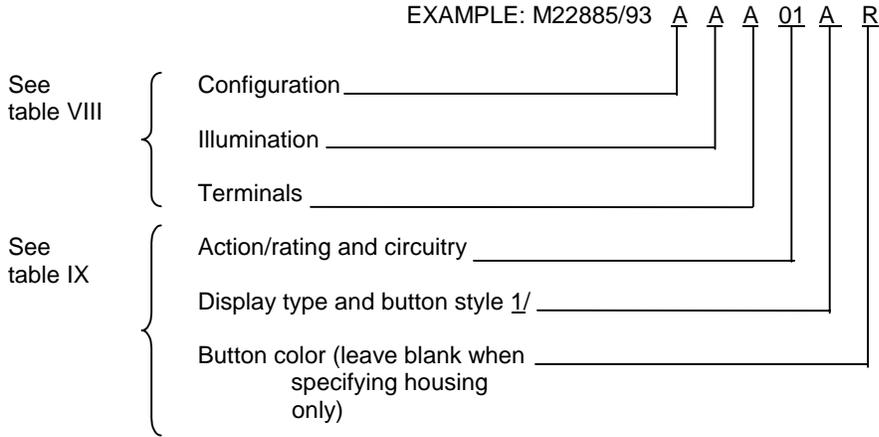


TABLE VIII. Configuration, illumination, and terminal codes for indicators and pushbutton switches.

Configuration	Illumination	Terminal
A - Square, switch, nonilluminated	A - Nonilluminated or incandescent (no lamp installed)	A - Solder or quick connect
B - Square, switch, 1 lamp circuit	B - * V Red LED	B - Printed circuit
C - Square, switch, 1 LED	C - 5.0 V Red LED	
D - Square, indicator, 1 lamp circuit	D - 10.0 V Red LED	
E - Square, indicator, 2 lamp circuits	E - 15.0 V Red LED	
F - Square, indicator, 1 LED	F - * V Yellow LED	
G - Rectangular, switch, nonilluminated	G - 5.0 V Yellow LED	
H - Rectangular, switch, 2 lamp circuits	H - 10.0 V Yellow LED	
J - Rectangular, indicator, 1 lamp circuit	J - 15.0 V Yellow LED	
K - Rectangular, indicator, 2 lamp circuits	K - * V Green LED	
L - Miniature indicator, 1 LED	L - 5.0 V Green LED	
	M - 10.0 V Green LED	
	N - 15.0 V Green LED	

* Refer to application information for nonresistor.

1/ For acquisition of Government spares, code letters H or J shall be used.

TABLE IX. Action/rating and circuitry, display and button style for indicators and pushbutton switches.

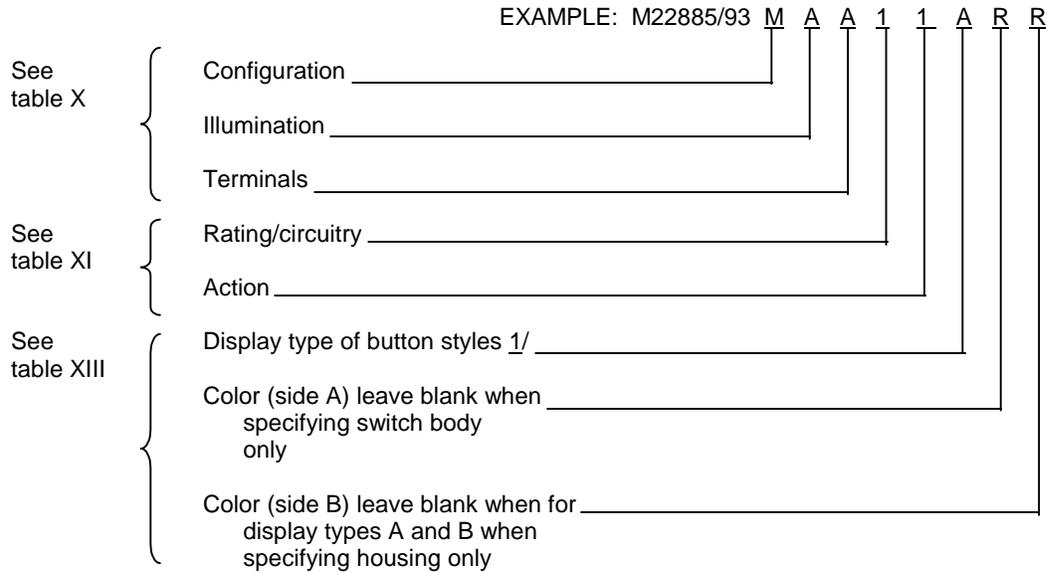
Action/rating and circuitry	Display type, button style <u>1/</u> <u>2/</u>	Button color
01 - Momentary, 1 pole, 3A, 120 V ac Ind - 2A 28 V dc, Res.	A - Transmitted color - square	R - Red
02 - Momentary, 2 pole, 3A, 120 V ac Ind - 2A, 28 V dc, Res.	B - Projected color - square	Y - Yellow
03 - Momentary, 4 pole, 3A, 120 V ac Ind - 2A, 28 V dc, Res.	C - Hidden color - square	G - Green
04 - Alternate, 1 pole, 3A, 120 V ac Ind - 2A, 28 V dc, Res.	D - LED window - square	B - Blue
05 - Alternate, 2 pole, 3A, 120 V ac Ind - 2A, 28 V dc, Res.	E - Transmitted color - rectangular	W - White
06 - Alternate, 4 pole, 3A, 120 V ac Ind - 2A, 28 V dc, Res.	F - Projected color - rectangular	A - Miniature indicator
07 - Momentary, 1 pole 10 mA, 5 V dc, Res.	G - Hidden color - rectangular	No button
08 - Momentary, 2 pole 10 mA, 5 V dc, Res.	H - Miniature indicator (No button required)	K - Black <u>3/</u>
09 - Momentary, 4 pole, 10 mA, 5 V dc, Res.	J - Housing only. No button, caps, or color inserts supplied. Acquire separately from source listed on QPL	L - Gray <u>3/</u>
11 - Alternate, 1 pole, 10 mA, 5 V dc, Res.		
12 - Alternate, 2 pole, 10 mA, 5 V dc, Res.		
13 - Alternate, 4 pole, 10 mA, 5 V dc, Res.		
14 - No action, indicator only No switching mechanism		

1/ For nonilluminated switches, use code A, E, or J as required. For LED illuminated switches, use code D or J as required.

2/ Button styles are shown as viewed from the front of the panel.

3/ For nonilluminated and LED configuration types only.

PIN for rocker and paddle switches:



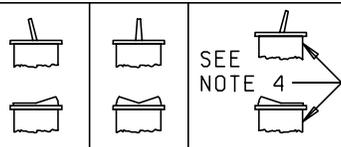
^{1/} For acquisition of Government spares, code letter R shall be used.

TABLE X. Configuration, illumination, and terminal codes for rocker and paddle switches.

Configuration	Illumination	Terminals
M - Rocker, nonilluminated N - Rocker, 2 lamp circuits P - Rocker, 1 LED (side A) R - Paddle, nonilluminated S - Paddle, 2 lamp circuits T - Paddle, 1 LED (side A)	A - Nonilluminated or incandescent (no lamp installed) B - * V Red LED C - 5.0 V Red LED D - 10.0 V Red LED E - 15.0 V Red LED F - * V Yellow LED G - 5.0 V Yellow LED H - 10.0 V Yellow LED J - 15.0 V Yellow LED K - * V Yellow LED L - 5.0 V Yellow LED M - 10.0 V Yellow LED N - 15.0 V Yellow LED	A - Solder or quick-connect B - Printed circuit

* Refer to application information for nonresistor.

TABLE XI. Rating/circuitry and action for rocker and paddle switches.

Rating/circuitry		ACTION CODE			
			2 - POSITION		
1	<u>1/</u> - 3A, 120 V ac ind. - 2 A, 28 V dc Res. 1 pole (code D circuitry - see table XII)	1	MAIN.	(NONE)	MAIN.
2	<u>2/</u> - 3A, 120 V ac ind. - 2 A, 28 V dc Res. 2 pole (code E circuitry - see table XII)		2	MOM.	(NONE)
3	<u>1/ 3/</u> 3A, 120 V ac ind. - 2 A, 28 V dc Res. 2 pole (code F circuitry - see table XII)	3	MAIN.	(NONE)	MOM.
4	<u>2/</u> - 3A, 120 V ac ind. - 2 A, 28 V dc Res. 4 pole (code G circuitry - see table XII)	3 - POSITION			
5	<u>1/</u> - 10 mA, 5 V dc Res. 1 pole (code D circuitry - see table XII)	4	MAIN.	MAIN.	MAIN.
6	<u>2/</u> - 10 mA, 5 V dc Res. 2 pole (code E circuitry - see table XII)	5	MOM.	MAIN.	MOM.
7	<u>1/ 3/</u> 10 mA, 5 V dc Res. 2 pole (code F circuitry - see table XII)	6	MAIN.	MAIN.	MOM.
8	<u>2/</u> - 10 mA, 5 V dc Res. 4 pole (code G circuitry - see table XII)	7	MOM.	MAIN.	MAIN.

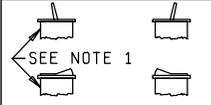
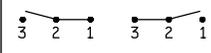
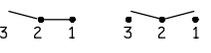
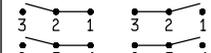
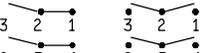
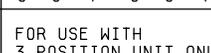
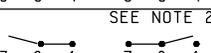
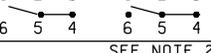
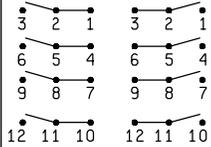
1/ LED versions available only in these circuitries.

2/ Nonilluminated switches only.

3/ For use with three position switches only.

4/ Actions are shown with the switch positioned such that the top side located on figures 5 and 6 is on this side of the switch. See application information.

TABLE XII. Paddle and rocker circuitry.

PADDLE AND CIRCUITRIES					
CODE	2 POSITION		3 POSITION		
					
D SEE NOTE 4					
E SEE NOTE 3					
F SEE NOTE 4	FOR USE WITH 3 POSITION UNIT ONLY		SEE NOTE 2		
G SEE NOTE 3			SEE NOTE 2		

NOTES:

1. Circuitries are shown with the switch positioned such that the top side located on figures 5 and 6 is on this side of the switch.
2. Refer to application information for how to wire for ON-ON-ON circuitry.
3. For nonilluminated switches only.
4. LED version available only in these circuitries.

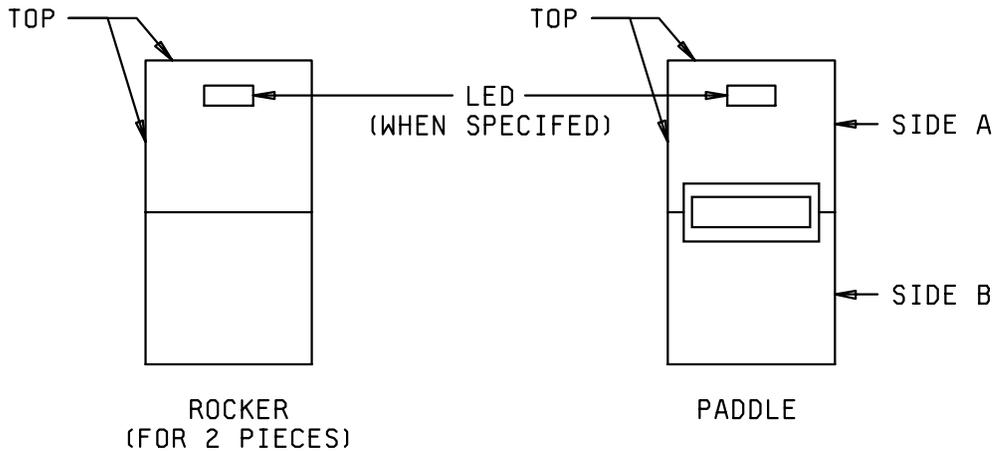
TABLE XIII. Button style/display type and color for rocker and paddle switches.

Button style/display type <u>1/</u> <u>3/</u>	Color	
A - Nonilluminated/1 piece rocker (one color selection only) B - Transmitted color/1 piece rocker (one color selection only) C - Projected color/1 piece rocker D - Hidden color/1 piece rocker E - Nonilluminated/2 piece rocker F - Transmitted color/2 piece rocker G - Projected color/2 piece rocker H - Hidden color/2 piece rocker J - 1 LED window/2 piece rocker K - Nonilluminated/2 piece paddle cover L - Transmitted color/2 piece paddle cover M - Projected color/2 piece paddle cover N - Hidden color/2 piece paddle cover P - 1 LED window/2 piece paddle cover R - Housing only. No rocker, covers, or color inserts supplied. Acquire separately from source listed on QPL.	<u>Side A</u> R - Red Y - Yellow G - Green B - Blue W - White K - Black <u>2/</u> L - Gray <u>2/</u>	<u>Side B</u> R - Red Y - Yellow G - Green B - Blue W - White K - Black <u>2/</u> L - Gray <u>2/</u>

1/ Button styles are shown below as viewed from front of the panel. Top sides of switch are shown to insure proper legend orientation (see figures 5 and 6). See application information.

2/ For nonilluminated and LED configurations only.

3/ For nonilluminated switches, use code A, E, K, or R as required. For LED illuminated switches, use code J, P, or R as required.



APPLICATION INFORMATION

LED APPLICATION INFORMATION

Internal resistors control the LED current to a nominal 20 mA on 5 V dc and 15 V dc devices.

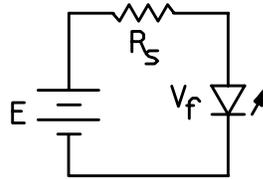
For those devices without internal current limiting resistors, suitable external control of the LED current must be provided. It is recommended that a minimum of 5 V dc open circuit voltage with an appropriate series resistance be used to drive LED devices. This minimizes the effect of temperature (current variation) on forward voltage of the LED.

The example illustrates a simple dc drive circuit and the equation used to determine the value of the series resistance.

TYPICAL LED CHARACTERISTICS

Color	Forward voltage at .020 mA, V	Intensity at 20 mA, mcd	Dominant wavelength, nm
Red	2.4	1.5	626
Yellow	2.4	1.4	585
Green	2.4	1.2	570

The reverse breakdown voltage of the LED is 5 volts minimum.



$$R_s = \frac{E - V_f}{I_f}$$

Where: R_s = Series resistance
 E = Supply voltage
 V_f = Forward voltage of LED
 I_f = Circuit current

For example: For $E = 5\text{ V}$
 $V_f = 2.4\text{ V}$
 $I_f = .020\text{ A}$ $R_s = \frac{5.0 - 2.4}{.020} = 130\Omega$

If a diode is added in series for reverse polarity protection, then:

$$R_s = \frac{E - V_f - V_{PD}}{I_f}$$

Where: V_{PD} = Forward voltage of protection diode

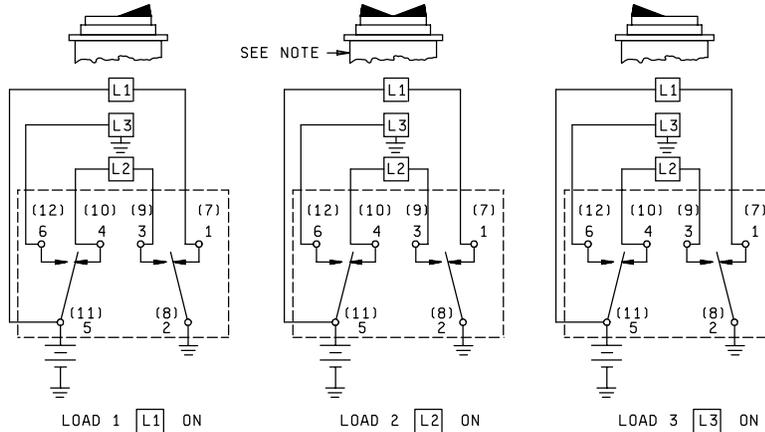
For the 5 V dc example above, the required resistance is then:

$$R_s = \frac{5 - 2.4 - 0.7}{.020} = 95\Omega$$

APPLICATION INFORMATION - Continued

How to wire for ON-ON-ON circuitry

Schematic shows wiring for code F circuitry when specified with a 3-position switch. Numbers in parentheses indicate additional circuitry available when code G is specified.



NOTE: Top side of switch as located on figures 5 and 6.

RECOMMENDED STRIP-MOUNTING ORIENTATION:

SQUARE. Square housings have "panel holding" mounting clips located on the top side and on the opposite side. These clips should be compressed against the edges of the mounting slot when strip mounting. The clips on the other two sides may have a lower profile to allow units to be horizontally strip-mounted with bezels touching. (No more than three square housings can be mounted in a vertical strip with the bezel touching.)

RECTANGULAR. "Panel holding" mounting clips are on the long sides. Only horizontal strip mounting with the long sides adjacent the panel edges is recommended. (No more than three units can be strip-mounted with the long bezel sides touching.)

ROCKERS AND PADDLES. "Panel holding" mounting clips are located on the short sides. This permits horizontal strip mounting with the long sides of the bezel touching. (No more than three rocker or paddle switches can be strip-mounted with the short sides of the bezel touching.)

Custodians:
 Army - CR
 Navy - EC
 Air Force - 11
 DLA - CC

Preparing activity:
 DLA - CC
 (Project 5930-1716-20)