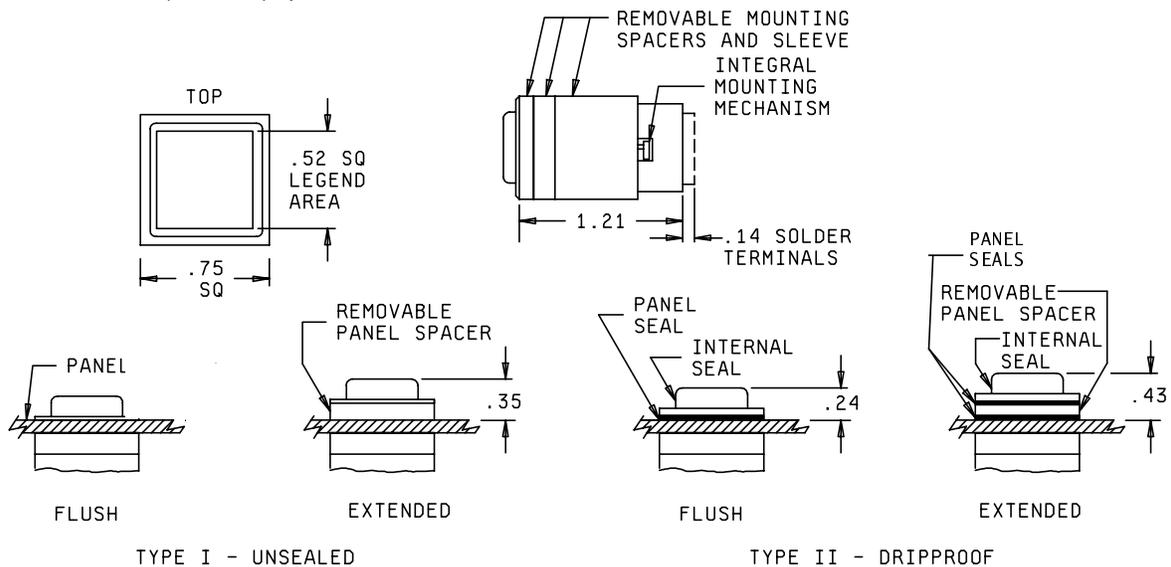


PERFORMANCE SPECIFICATION SHEET

SWITCHES, PUSHBUTTON, LIGHT EMITTING DIODE (LED) ILLUMINATED, STANDARD, NIGHT VISION IMAGING SYSTEM (NVIS) AND SUNLIGHT READABLE DISPLAYS, SPDT AND DPDT, LOW LEVEL TO 7 AMPERES, SEALED AND UNSEALED, SOLDER AND COMMON TERMINATION SYSTEM (CTS) TERMINATIONS

This specification is approved for use within the Space and Naval Warfare Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification sheet and the latest issue of the following specification listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation: MIL-PRF-22885.

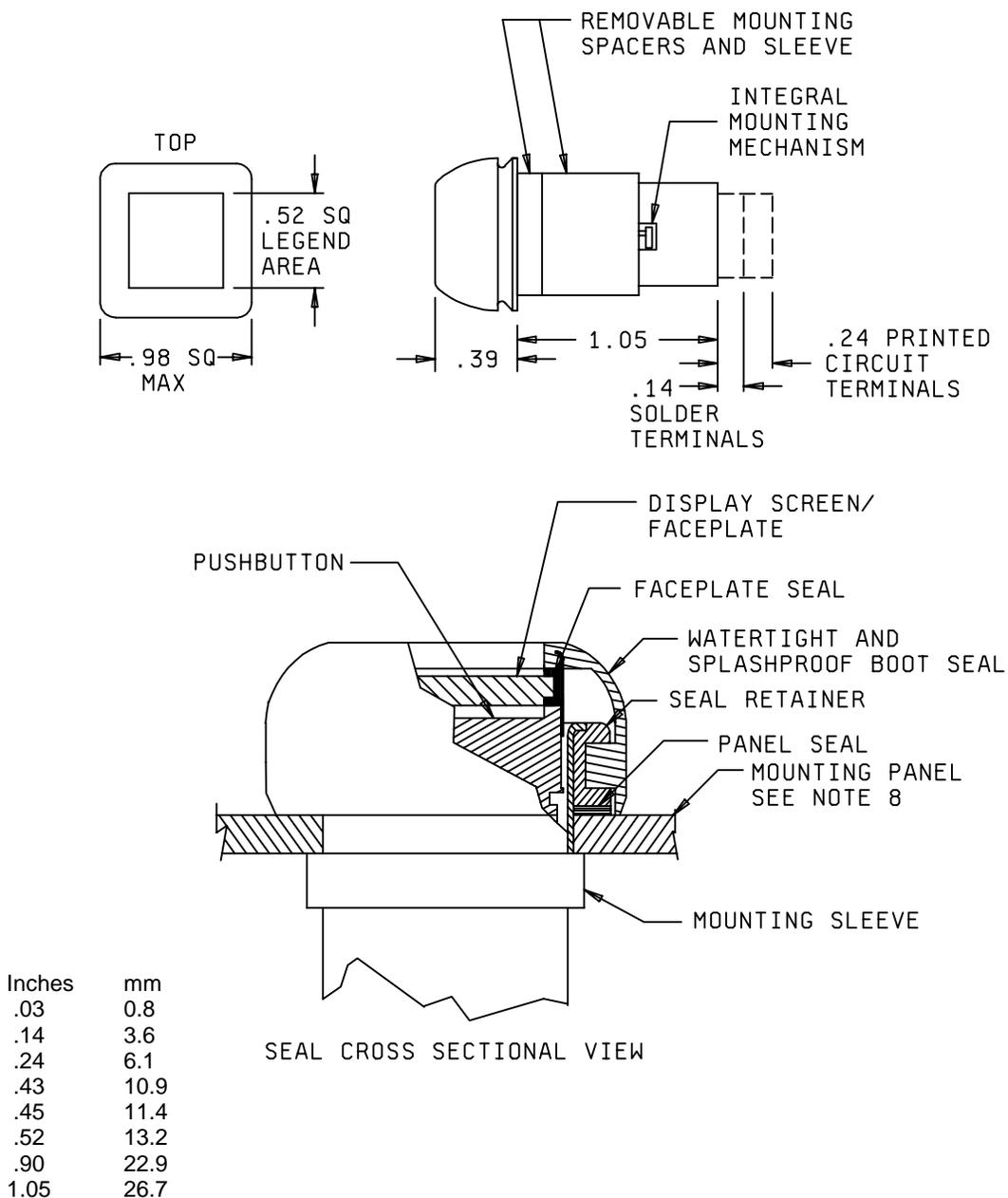


NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ± 0.03 .
4. Pushbutton design shall provide a means to prevent incorrect installation and a means of retention with switch body during service.
5. See figure 8 for recommended mounting panel cutouts and thickness ranges.

Inches	mm
.03	0.8
.14	3.6
.20	5.1
.24	6.1
.35	8.9
.39	9.9
.52	13.2
.75	19.1
1.21	30.7

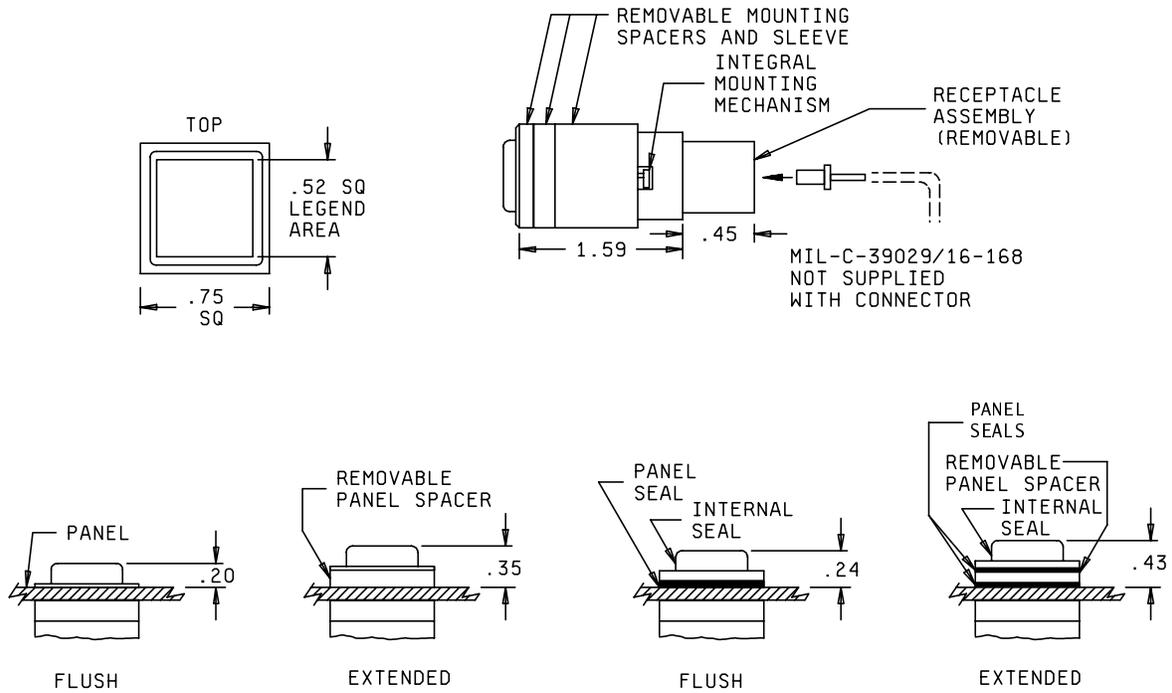
FIGURE 1. Switches - type I (unsealed, solder terminals) and type II (drip-proof seal(s), solder terminals).



NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerances is ± 0.03 .
4. Pushbutton design shall provide a means to prevent incorrect installation and a means of retention with switch body during service.
5. See figure 8 for recommended mounting panel cutouts and thickness ranges.

FIGURE 2. Switches - type III (watertight and splashproof sealed, solder terminals).



TYPE IV - UNSEALED

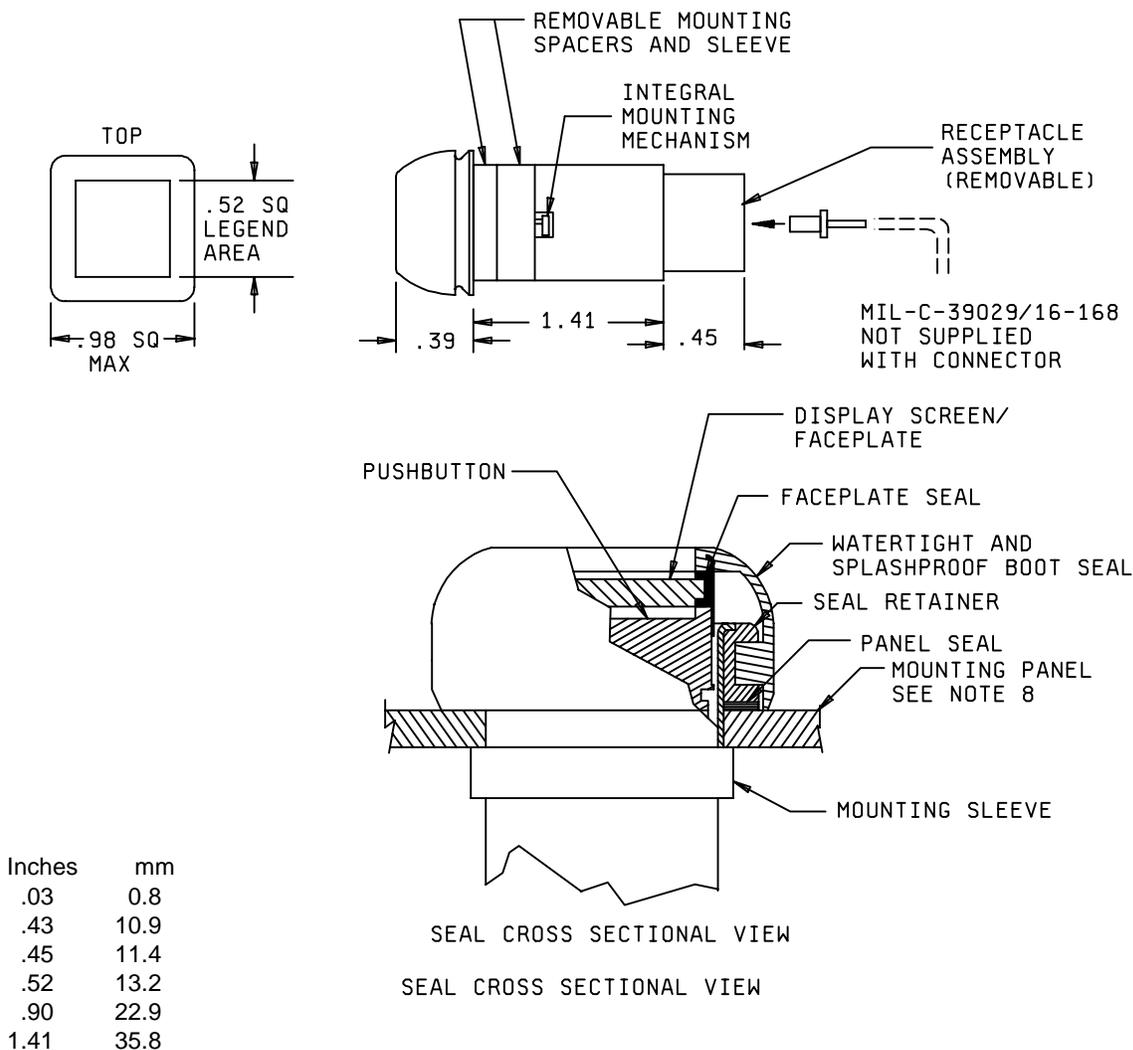
TYPE V - DRIPPROOF

Inches	mm
.03	0.8
.20	5.1
.24	6.1
.35	8.9
.39	9.9
.45	11.4
.52	13.2
.75	19.1
1.59	40.4

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ± 0.03 .
4. Pushbutton design shall provide a means to prevent incorrect installation and a means of retention with switch body during service.
5. The CTS receptacle assembly shall be removable from switch module and switch housing unit assembly.
6. The switch module is an integral part of the switch housings and CTS unit assembly.
7. The CTS pins shall be M39029/16-168 and shall be removable from the CTS module assembly. The CTS pins accept 20, 22, or 24 gauge wire.
8. See figure 8 for recommended mounting panel cutouts and thickness ranges.

FIGURE 3. Switches, common termination system - type IV (unsealed) and type V (drip-proof seal(s)).



NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is $\pm .03$.
4. Pushbutton design shall provide a means to prevent incorrect installation and a means of retention with switch body during service.
5. The CTS receptacle assembly shall be removable from switch module and switch housing unit assembly.
6. The switch module is an integral part of the switch housings and CTS unit assembly.
7. The CTS pins shall be M39029/16-168 and shall be removable from the CTS module assembly. The CTS pins accept 20, 22, or 24 gauge wire.
8. See figure 8 for recommended mounting panel cutouts and thickness ranges.

FIGURE 4. Switch - type VI (watertight and splashproof seal, common termination system).

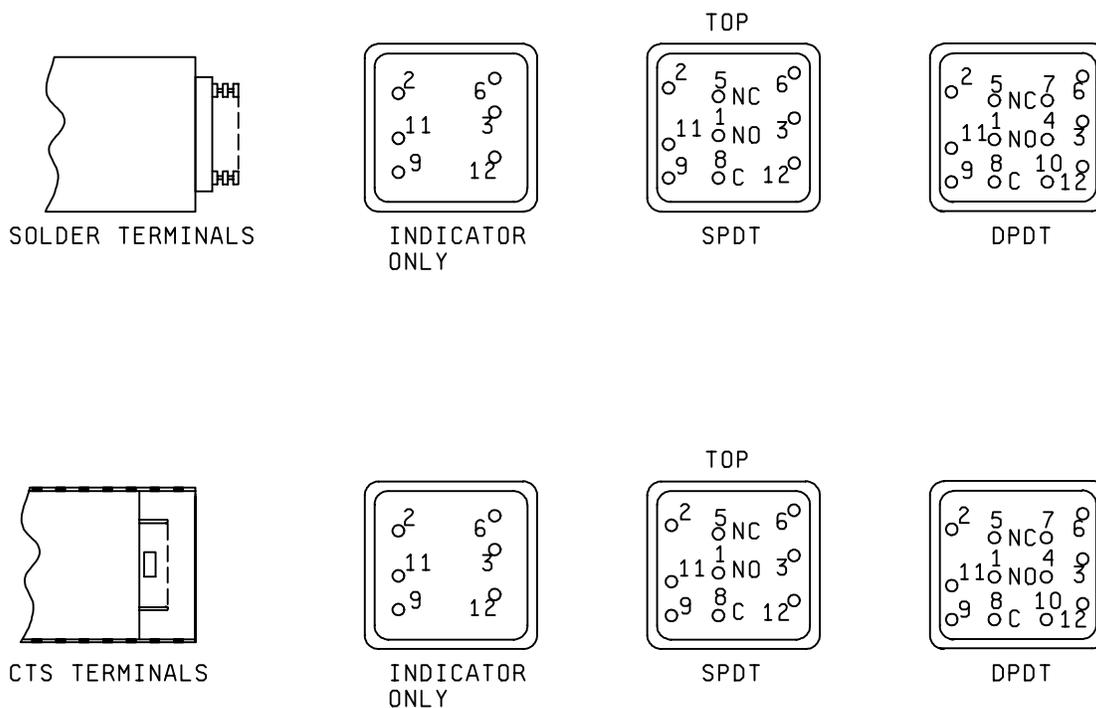
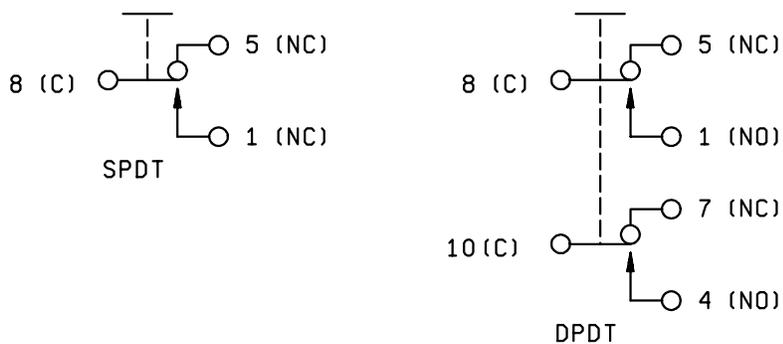


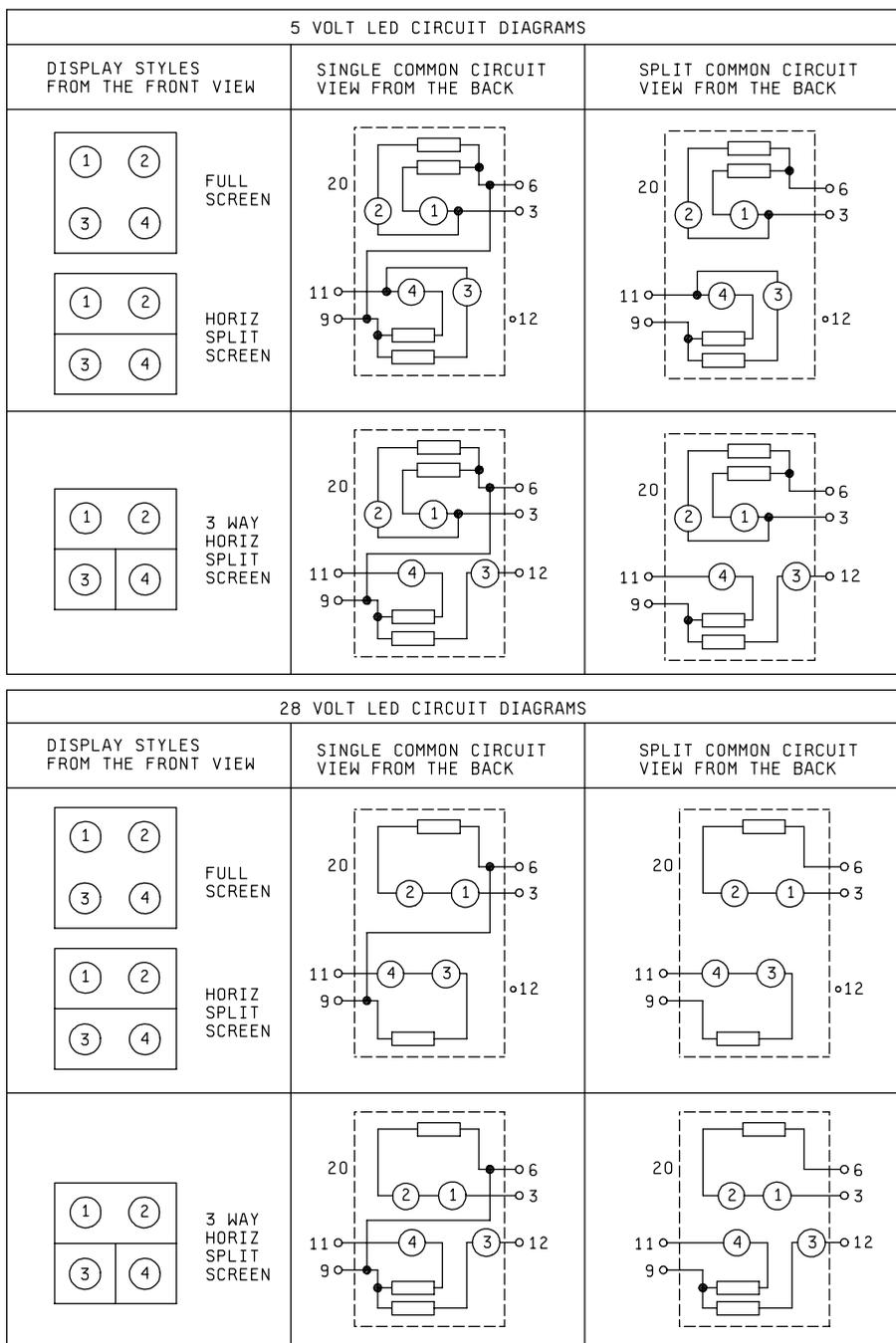
FIGURE 5. Terminal location and identification.



NOTES:

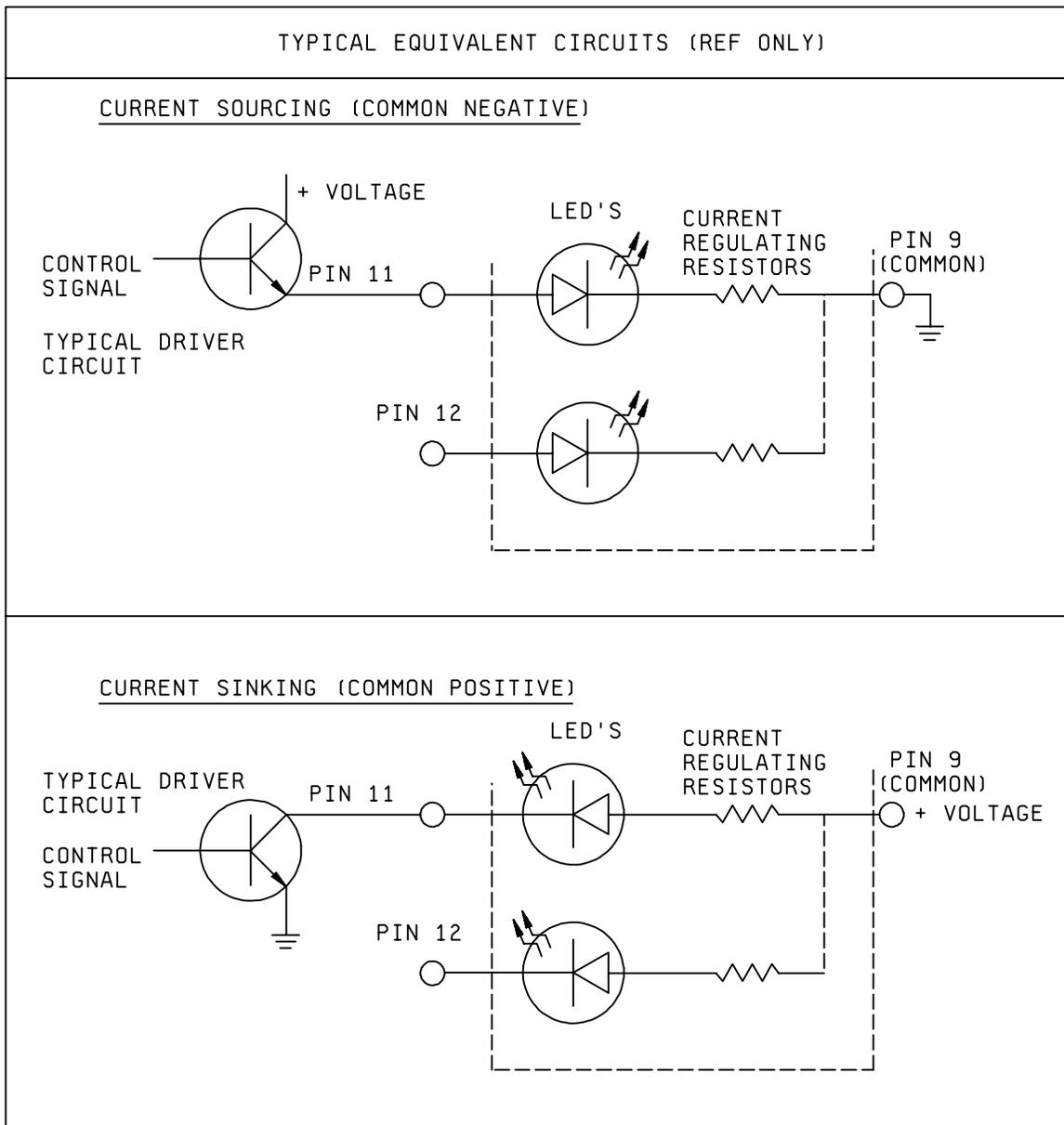
1. Terminals five and seven are normally closed (NC).
2. Terminals one and four are normally open (NO).
3. Terminals eight and ten are common (C).
4. For indicator only, terminals one, four, five, seven, eight, and ten are omitted.
5. For SPDT switch, terminals four, seven, and ten are omitted.

FIGURE 6. Switch circuits.



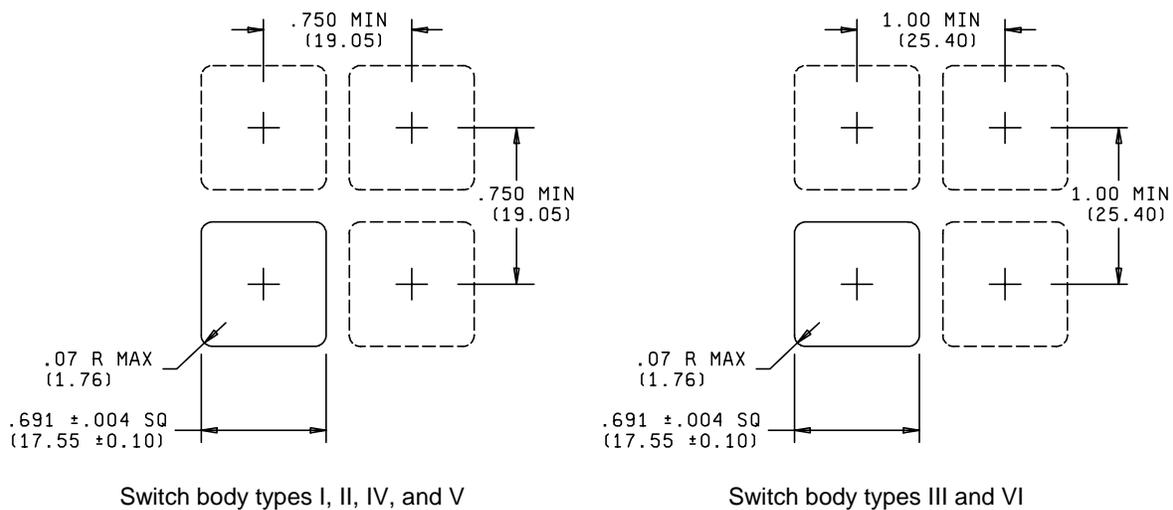
- NOTES:
1.  - Multi-chip LED's with position number.
 2.  - Current regulating resistor.

FIGURE 7. Light emitting diode circuit schematics.



NOTE: All 5 V and 28 V LED circuits are available in either the current sourcing or current sinking configuration.

FIGURE 7. Light emitting diode circuit schematics - Continued.



Mounting panel thickness	
Switch body types	Panel thickness ranges
I and IV flush	.00 to .92 (0.0 to 23.4)
I and IV extended	.00 to .77 (0.0 to 19.6)
II and V flush	.00 to .88 (0.0 to 22.4)
II and V extended	.00 to .73 (0.0 to 18.5)
III and VI	.00 to .77 (0.0 to 19.6)

- NOTES:
1. Dimensions are in inches.
 2. Metric equivalents are given for general information only.

FIGURE 8. Recommended mounting panel cutouts and thickness ranges.

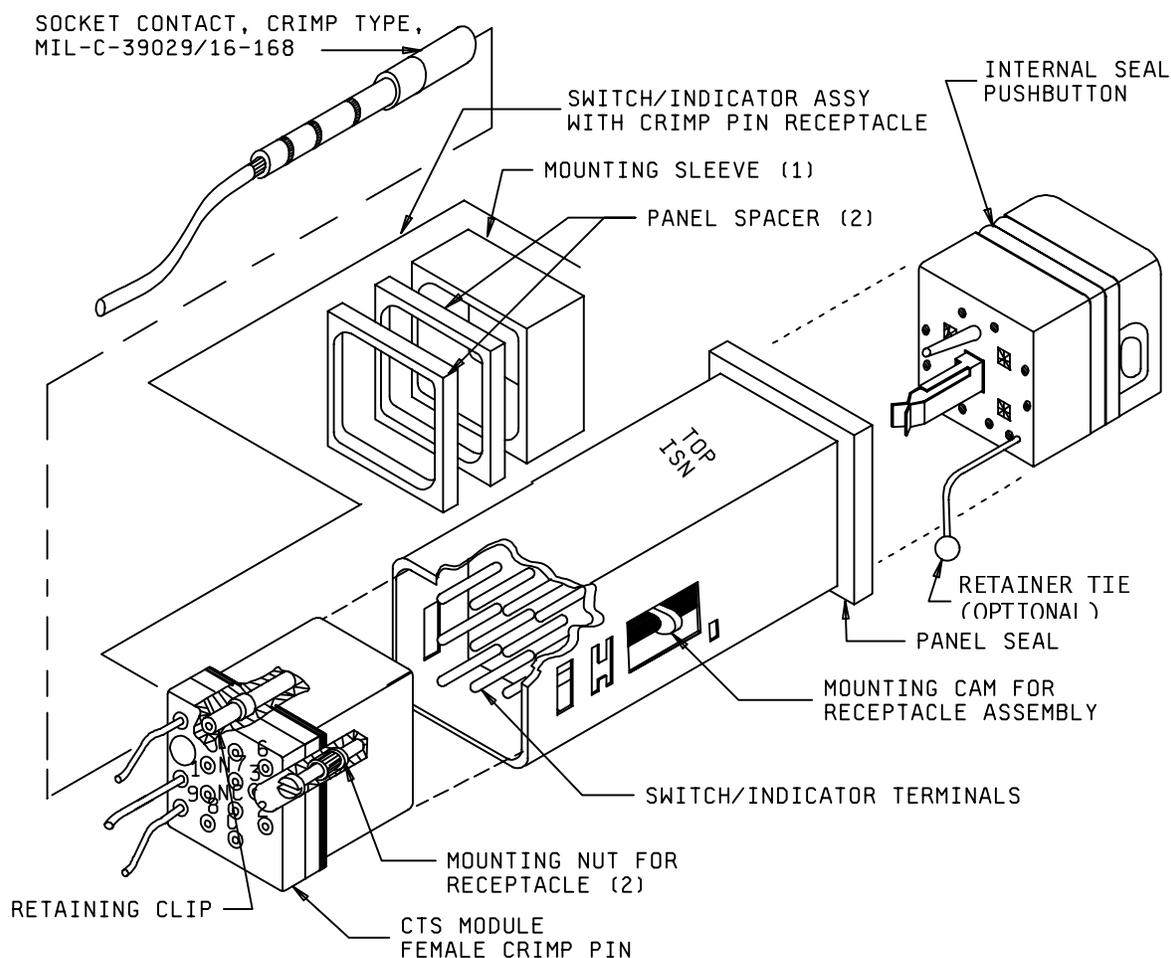


FIGURE 9. Common termination system mechanical details.

REQUIREMENTS:

Design and construction: See figures 1 through 9.

Complete switch and pushbutton assembly includes the following:

Switch body:

Type I switch bodies include a mounting sleeve and two panel mounting spacers. See figure 1.

Type II switch bodies include a mounting sleeve, two panel mounting spacers, and dripproof panel seals. See figure 1.

Type III switch bodies include a mounting sleeve, panel mounting spacer, splashproof/watertight seal, seal retainer, and gasket. See figure 2.

Type IV switch bodies include a mounting sleeve, two panel mounting spacers, and CTS module/receptacle. See figure 3.

Type V switch bodies include a mounting sleeve, two panel mounting spacers, dripproof panel seal, and CTS module/receptacle. See figure 3.

Type VI switch bodies include a mounting sleeve, panel mounting spacer, splashproof/watertight seal, seal retainer, gasket, and CTS module/receptacle. See figure 4.

Pushbutton: All pushbutton assemblies include a display faceplate and legend assembly, display segment divider, nonreplaceable LED lamps, lamp contact board assembly, pushbutton faceplate seal, retainer/bezel, and optional captive pushbutton retainer.

Other parts, when applicable, are NVIS compatible lighting, EMI/RFI shielding, and dripproof or splashproof/watertight seals.

Enclosure designs:

<u>Symbol</u>	<u>Switch type</u>
1 (unsealed).....	I and IV
2 (dripproof).....	II and V
3 (watertight) and 4 (splashproof).....	III and VI

Temperature characteristic: Symbol 1 (-55°C to +85°C).

Vibration grade: Symbol 3 (10 to 2,000 Hz, 15 g peak).

Operation:

- Symbol A (momentary action).
- Symbol B (alternate action).
- Symbol H (indicator light).

Display types:

N (Legend is white on nonreflective matte black background when LED light is not lighted. Legend is colored on black background when LED is lighted).

W (Legend is opaque black on white background when LED lamp is not lighted. Legend is opaque black on colored background when LED is lighted).

S (Sunlight readable contrast requirements apply. Background is nonreflective matte black. Legend is not visible when LED is not lighted. Legend appears in color on black background when LED is lighted).

H (Hidden legend. Same as display type S except contrast requirements do not apply).

Material:

Finish: When used, shall be selected to enable the switch to meet performance requirements of this specification. It may be Aluminum alloy black anodized per MIL-A-8625, Type II, Class 2.

Operating characteristics:

Actuating force: 5 pounds max.

Plunger travel: .130 ±.030.

Pushbutton removal force: 2 to 5 pounds. Not applicable to type III or type VI (sealed) switches.

Shock:

All switch types: Method I (75 g).

Switch types III and VI (sealed switches): High impact shock in accordance with MIL-S-901, grade A, class II (for deck-mounted equipment) when attached to the anvil plate of the shock machine by means of standard mounting figure 11-C with simulated console, which provides resilient mounting typical of in-service use within "deck-mounted" electronic cabinets or panels. These units are not recommended for direct "hull mounted" applications.

Salt spray: Test condition A (96 hours).

Sand and dust: Applicable.

Terminal strength:

Solder terminals, applied force and direction of force: 3 pounds perpendicular to the long axis, and 5 pounds parallel to the long axis.

Electrical endurance: 25,000 cycles at the following electrical ratings:

Silver contacts: Sea level 50,000 feet

28 V dc:

Resistive	7.0 A	4.0 A
Inductive	4.0 A	2.5 A
Lamp	2.5 A	2.5 A

115 V ac, 60 Hz:

Resistive	7.0 A
Inductive	7.0 A
Lamp	2.0 A

Gold plated contacts:

28 V dc:

Resistive	1.0 A
Inductive	0.5 A

Low-level life: Applicable to switches with gold plated contacts.

Intermediate current: Applicable to switches with silver contacts.

Mechanical endurance: 100,000 cycles consisting of 5,000 cycles of operation at $-55^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 10,000 cycles of operation at $+85^{\circ}\text{C} \pm 2^{\circ}\text{C}$, and 85,000 cycles of operation at room temperature.

Illuminated color and luminance: See table I.

TABLE I. Illuminated color and luminance limits.

Color	Color code	Nominal peak wave length (nm)	Color limits <u>1/</u>		Minimum average luminance (100 percent duty cycle) <u>2/</u>
			x	y	
Red	RD	630	.668 .682 .705 .719	.304 .318 .267 .281	60 foot-lamberts
Amber yellow	AY	585	.465 .479 .589 .603	.506 .520 .382 .396	70 foot-lamberts
Lime green	LG	565	.324 .338 .499 .513	.644 .659 .472 .485	150 foot-lamberts
Green	GR	555	.252 .266 .395 .409	.710 .724 .575 .589	45 foot-lamberts
Orange	OR	610	.613 .627 .678 .692	.358 .372 .294 .308	70 foot-lamberts
Ultra red	UR	660	.700 .714 .713 .733	.272 .286 .258 .267	400 foot-lamberts
NVIS green B	JJ	553	In accordance with MIL-L-85762 <u>3/</u>		40 foot-lamberts
NVIS yellow	KK	580			50 foot-lamberts
NVIS red	LL	607			8 foot-lamberts

1/ Corners of the x and y envelope limits from the CIE chromaticity diagram.

2/ With or without EMI/RFI shielding.

3/ Appropriate power modulation required to regulate LED illumination output.

EMI/RFI shielding: When applicable, the shielding efficiency test of MIL-PRF-22885 shall be conducted at the frequencies and with the minimum attenuation requirements as specified below:

<u>Electric field</u>	<u>Minimum attenuation</u>	<u>Plane wave</u>	<u>Minimum attenuation</u>
150 kHz	60 dB	400 MHz	39 dB
500 kHz	60 dB	1 GHz	33 dB
1 MHz	60 dB	2.5 GHz	28 dB
10 MHz	60 dB	10 GHz	20 dB

Sunlight readability: Applicable to display type S switches. Units shall be tested for $\varnothing_1 = 45^\circ\text{C}$ and $\varnothing_2 = 0^\circ\text{C}$ only. This procedure does not test readability in direct reflected specular sunlight (glare). The average contrast ratio of each lighted legend character to the background shall be as specified in table II. In the unlighted legend condition, the average contrast ratio of each legend character to the background shall have an absolute value ≤ 0.1 . The legend used for testing shall have a character height of approximately 0.09 to 0.1 inch. The stroke width shall be characteristic of each manufacturer's standard military product.

TABLE II. Contrast ratio requirements for sunlight readable displays.

Color code	Legend/LED color	Contrast ratio <u>1/</u>	
		Minimum lighted	Maximum unlighted
UR	Ultra red	.90	.1
LG	Lime green	.60	.1

1/ With and without EMI/RFI shielding.

NVIS compatibility: When switches are tested as specified below, the chromaticity, luminance and spectral radiance output of the illuminated display shall be NVIS compatible as specified in MIL-L-85762. The following equipment requirements apply:

NVIS green B: Shall meet all class A and class B equipment requirements of MIL-L-85762 for illuminated controls.

NVIS yellow: Shall meet type I class A, type II class A, and type II class B equipment requirements of MIL-L-85762 for caution signals.

NVIS red: Shall meet type I class B, and type II class B equipment requirements of MIL-L-85762 for warning signals.

The test procedure for measuring NVIS luminance, chromaticity, and spectral radiance shall be in accordance with MIL-L-85762 for illuminated displays (for NVIS green B), caution signals (for NVIS yellow), and warning signals (for NVIS red).

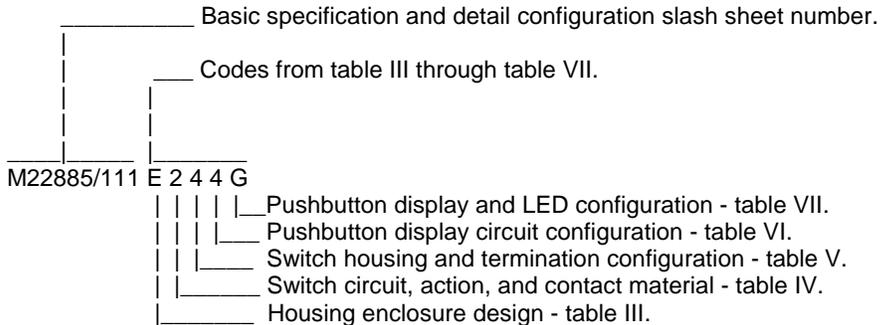
Touch temperature: Applicable to all body types of LED illuminated switches.

Requirements: When switches are tested as specified below, the maximum difference between the stabilized lens face temperature and the ambient temperature shall not exceed +25°C.

Test method: The test method shall be in accordance with EIA-448-20 using the recommended panel cutout (see figure 8). The test shall be performed with each of the standard LED voltages at full rated current and at 100 percent duty cycle.

Marking: All required marking shall be permanent. Pushbuttons shall indicate the applicable nominal voltage (5 V or 28 V). LED printed circuit boards shall be blue for current sinking configurations and natural or green for current sourcing configurations. NVIS type and class marking are not required. The word "TOP" shall be marked on switching housings and pushbuttons, excluding splashproof/watertight sealed units, to indicate proper orientation.

Part or Identifying Number (PIN): The PIN shall be constructed as illustrated in the following example:



Legend details and display screen colors are not defined by the PIN. These details are specified by user's acquisition documents in accordance with the acquisition requirements for category II switches, see

section 6 of MIL-PRF-22885. For the convenience of users, an extension to the PIN may be utilized on the acquisition document to define the legend details and colors. The method of constructing this extension is illustrated below. The extension is for convenience only, and is not a part of the PIN.

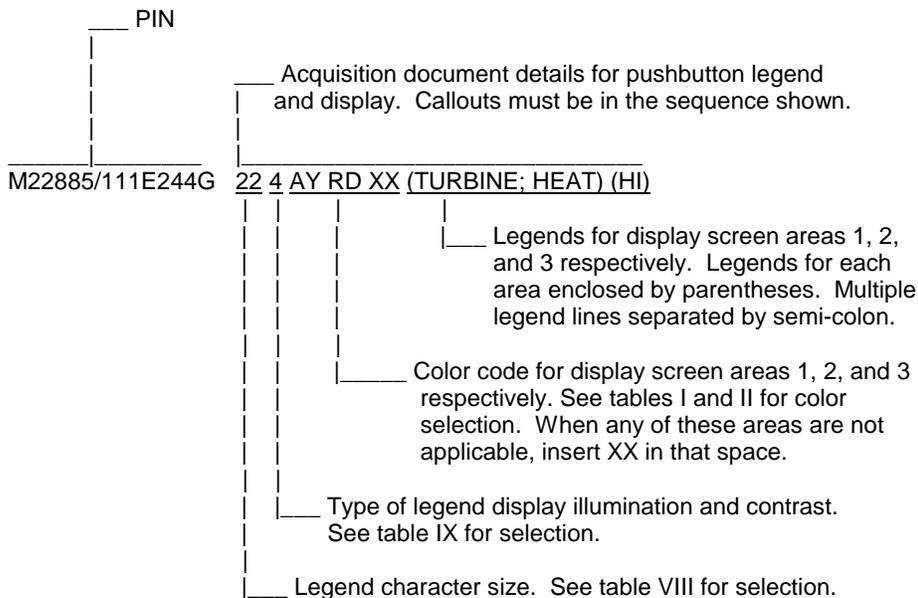


TABLE III. Codes for housing enclosure design.

Enclosure design	Without EMI/RFI shielding		With EMI/RFI shielding	
	75 G shock	Hi-impact shock	75 G shock	Hi-impact shock
With solder terminations:				
Unsealed	A	---	J	---
Dripproof	B	---	K	---
Watertight/splashproof	C	S	L	W
With CTS terminations:				
Unsealed	E	---	N	---
Dripproof	F	---	O	---
Watertight/splashproof	G	U	P	Y

TABLE IV. Codes for switch circuit, action, and contact material.

Switch circuit	Contact material	
	Silver	Gold
Momentary action:		
Single pole, double throw (SPDT)	1	5
Double pole, double throw (DPDT)	2	6
Alternate action:		
Single pole, double throw (SPDT)	3	7
Double pole, double throw (DPDT)	4	8
Indicator:	---	0

TABLE V. Codes for termination type.

Termination type	Code
Turret, solder	1
Common termination system (CTS):	
Without termination module <u>1/</u>	3
With termination module <u>2/</u>	4

1/ Designates CTS switch housing without connector module. Connector modules may be supplied pre-wired to wire harness assembly.

2/ Designates CTS switch housing with connector module installed. Sealing plugs and termination pins not included.

TABLE VI. Pushbutton display module LED circuit configuration.

Load circuit configuration	Code	
	Single common	Split common
Current sourcing	1	3
Current sinking	2	4

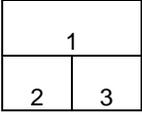
TABLE VII. Pushbutton display screen and LED design.

LED voltage	LED light type	Display screen design code					
		1	<table border="1"> <tr><td>1</td></tr> <tr><td>2</td></tr> </table>	1	2	<table border="1"> <tr><td>1</td></tr> <tr><td>2</td><td>3</td></tr> </table>	1
1							
2							
1							
2	3						
5 V dc	Standard	A	G	N			
	Sunlight readable <u>1/</u>	B	H	P			
	NVIS compatible <u>2/</u>	C	J	R			
28 V dc	Standard	D	K	S			
	Sunlight readable <u>1/</u>	E	L	T			
	NVIS compatible <u>2/</u>	F	M	U			

1/ Available in ultra red and lime green only. See application information for contrast ratio data on hidden legend displays in other colors.

2/ Available in display type H only (hidden legend), see table IX.

TABLE VIII. Legend character size. 1/ 2/ 3/ 4/

Size code	Character size (inches)	Display screen area	Number of characters per legend area		
			1	2	3
10	None		None	x	x
11	.072		5 x 12	x	x
12	.087		4 x 10	x	x
13	.100		3 x 9	x	x
14	.125		3 x 7	x	x
15	.145	2 x 6	2 x 6	x	x
20	None		None	None	x
21	.072		2 x 12	2 x 12	x
22	.087		2 x 10	2 x 10	x
23	.100		1 x 9	1 x 9	x
24	.125		1 x 7	1 x 7	x
25	.145	1 x 6	1 x 6	x	
30	None		None	None	None
31	.072		5 x 12	2 x 6	2 x 6
32	.087		4 x 10	2 x 5	2 x 5
33	.100		3 x 9	1 x 4	1 x 4
34	.125		3 x 7	1 x 3	1 x 3
35	.145		2 x 6	1 x 2	1 x 2

1/ Alpha-numeric character format is alternate gothic number 2, Sans-serif.

2/ Number of characters shown above is number of lines times number of characters per line. For example, 5 x 12 is 5 lines of 12 characters each.

3/ Maximum number of characters per line shown above is an approximate value. The actual number of characters may be more or less, depending on characters used.

4/ Size codes 10, 20, and 30 are not applicable to legend codes 6 and 7 of table IX.

TABLE IX. Legend display and illumination details.

Code	Nonilluminated		LED illuminated		MIL-PRF-22885 display type
	Legend	Background	Legend	Background	
4 <u>1/</u>	White	Black	LED color	Black	N
5 <u>1/</u>	Black	White	Black	Lamp color	W
6 <u>2/</u>	Hidden	Black	LED color	Black	S
7 <u>3/</u>	Hidden	Black	NVIS or LED color <u>3/</u>	Black	H

1/ Not available in NVIS compatible colors.

2/ Sunlight readable. Available in colors ultra red and lime green only. Not NVIS compatible.

3/ Hidden legend. Available in NVIS colors or standard color codes OR, AY, RD, and GR. See application information for approximate contrast ratios of standard colors. Not sunlight readable.

Inspections:

LED failure: LED failure during any inspection shall constitute a test failure.

Qualification:

Group submission: Table X applies, provided that the switching elements used are qualified MIL-PRF-8805 category I or II basic sensitive switches and the endurance and electrical ratings are compatible. Captive pushbutton retainers are not required on assemblies used for qualification and retention testing.

TABLE X. Qualification inspection - group submission.

Test samples	Qualification inspection table of MIL-PRF-22885		Extent of approval
	Group	Number of samples	
M22885/111B213D	I	10	All PINs
	II <u>1/</u>	2 from group I	
	III	2 from group I	
	VI <u>2/</u>	2 from group I	
	VII	4 from group I	
M22885/111A812A	I <u>3/</u>	4	
	II <u>1/</u>	2 from group I	
	VII <u>4/</u>	2 from group I	
M22885/111Y241K	I	12	
	II <u>5/ 6/</u>	4 from group I	
	III	2 from group I	
	V <u>6/</u>	2 from group I	
	VI <u>7/</u>	2 from group I	
	VII <u>6/ 8/</u>	2 from group I	
M22885/111B213D	VIII <u>9/</u>	42 <u>10/</u>	

- 1/ Shock: Method I.
- 2/ Electrical endurance: Sea level, inductive dc load only.
- 3/ Test current and voltage for contact resistance and operating characteristics tests shall not exceed 10 mA and 30 mV dc on all gold plated contact switches subject to low level life test. Low level life contact resistance requirements apply.
- 4/ Mechanical endurance test not required.
- 5/ Shock: High impact shock in accordance with MIL-S-901, grade A, class II.
- 6/ Sealing shall be verified by the watertight and splashproof tests only.
- 7/ Electrical endurance: Sea level, resistive dc load only.
- 8/ Intermediate current test not required.
- 9/ NVIS color and radiance measurements shall be made, as applicable, during group VIII inspections.
- 10/ In combination with the test sample specified in the first column, 42 pushbutton display screen assemblies shall be tested: Two each of six colors for each standard display type, N and W; two each of two colors for display type S; and 2 each of three NVIS colors and four standard colors for display type H. One of the pushbutton samples for each color/display type combination shall have 5 volt LED's, and the other shall have 28 volt LED's. Test legend characters and display screen design shall be as follows:

LEG	END
ALT	LOW

TABLE XI. Group A inspection.

Seal (when applicable) 1/
 Visual and mechanical examination
 Operating characteristics
 Dielectric withstanding voltage
 Contact resistance 2/
 Sunlight readability (when applicable)
 NVIS compatibility (when applicable)

- 1/ Visual in-process inspection of seal with high intensity light source may be used.
- 2/ Low level test current and voltage may be used for contact resistance tests on gold contact switches: The test current and voltage shall not exceed 10 mA and 30 mV dc. The maximum contact resistance under this condition is 3 ohms.

APPLICATION INFORMATION:

Storage temperature: -65°C to +100°C.

U.L. listing: 250 V ac, 60 Hz, 7 amperes, listing L7 (21 SK83-H j40).

Recommended substitute for color white is LG. Best color separation is obtained with combinations of LG, OR, and UR; or with GR, AY, and RD.

Category II product offerings:

Printed circuit terminals (switches with terminals designed for direct insertion into printed circuit boards).

Display screens with four-way splits are available.

Oil, fuel, and solvent resistant seals are available. (A listing of specific types of chemicals recommended and not recommended, may be obtained from the switch manufacturer.)

Contrast ratios for hidden legend displays: See table XII. Contrast ratios specified in table XII are calculated using the sunlight readability test procedure but do not meet minimum contrast ratio requirements to be considered sunlight readable.

TABLE XII. Average contrast ratios for hidden legend displays (not sunlight readable).

Color code	Legend/LED color	Contrast ratio	
		Minimum lighted	Maximum unlighted
OR	Orange	.40	.1
AY	Amber yellow	.30	.1
RD	Red	.25	.1
GR	Green	.30	.1

Custodian:
 DLA - CC
 Navy - EC

Preparing activity:
 DLA - CC

(Project 5930-1705)