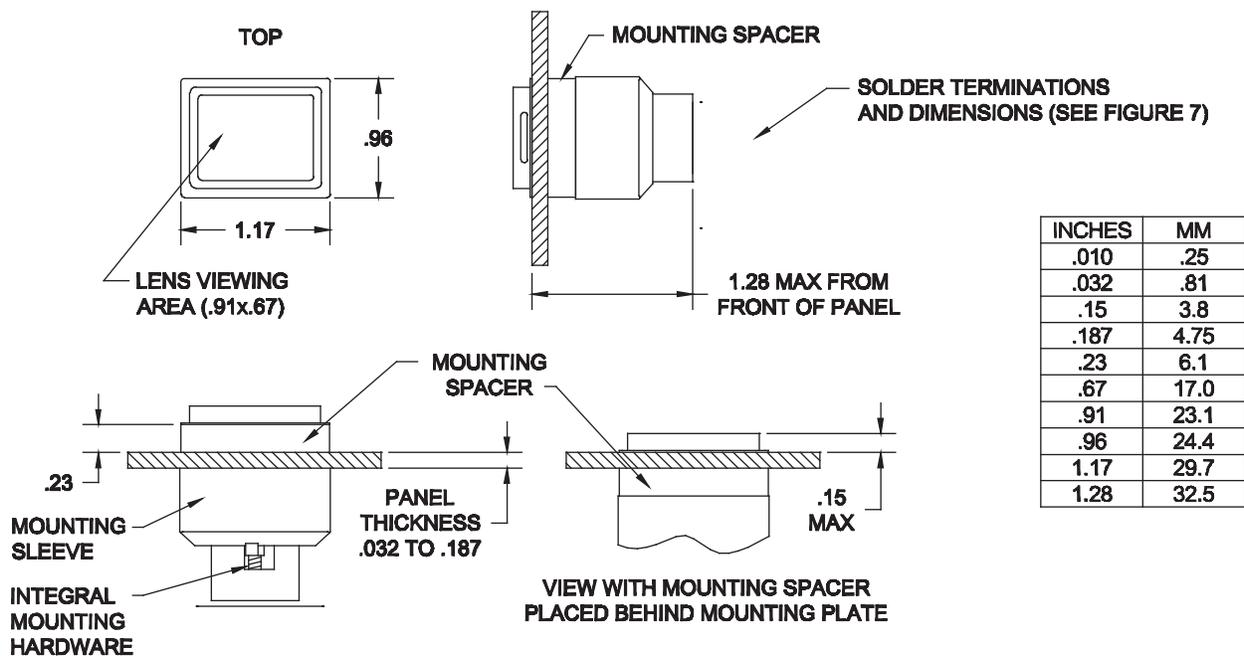


PERFORMANCE SPECIFICATION SHEET

SWITCHES, PUSHBUTTON, ILLUMINATED, 1.17 BY .96, LIGHT EMITTING DIODE (LED), SUNLIGHT READABLE, VOLTAGE DIMMABLE, NIGHT VISION GOGGLE COMPATIBLE, EMC COMPLIANT, COMMON TERMINATION SYSTEM (CTS), SPDT, DPDT, 4PDT, LOGIC LEVEL TO 7.5 AMPERES, DRIPPROOF, WATERTIGHT, SPLASHPROOF, HIGH IMPACT SHOCK RESISTANT

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

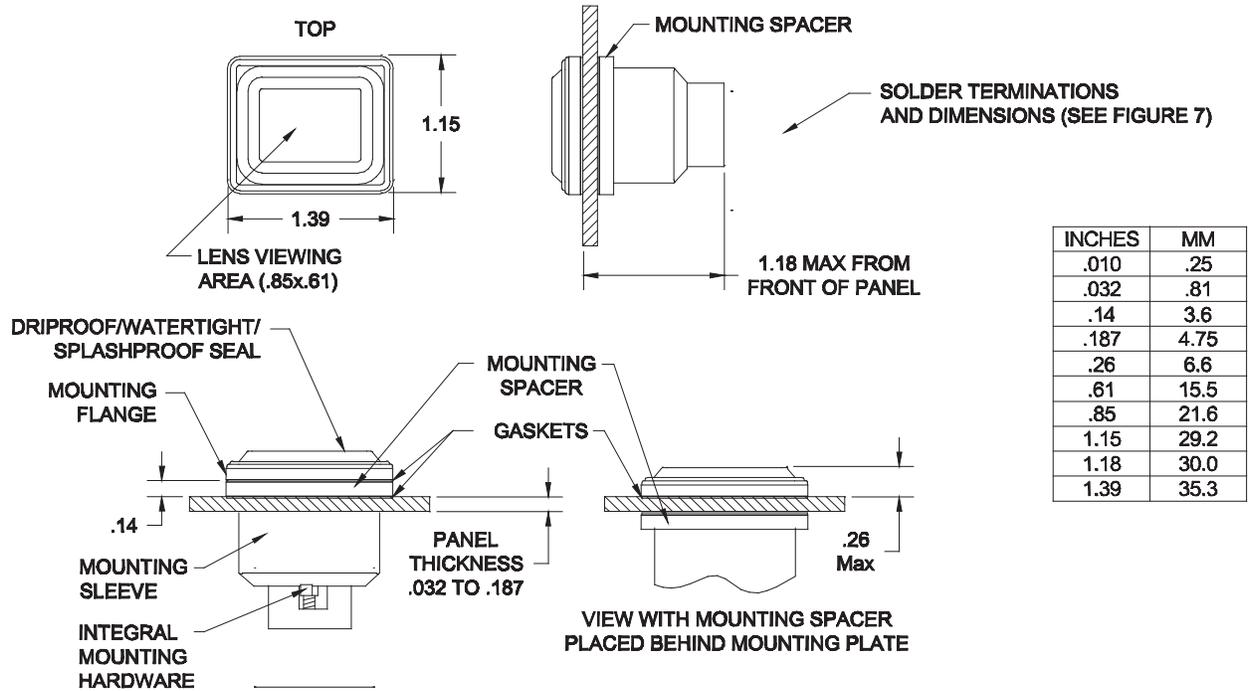
The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-PRF-22885.



NOTES:

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Unless otherwise specified, tolerances are  $\pm 0.010$  for three place decimals and  $\pm 0.03$  for two place decimals.
3. The switch shall accommodate mounting to panels from .032 to .187 thick.
4. A mounting spacer is supplied with each switch unit for SAE-AS7788 panel requirements and places the mounting flange flush with the top of a .235 thick edge lighted panel when used in front of the panel. Otherwise, the spacer is used behind the panel.
5. Pushbutton cap shall be designed to prevent incorrect insertion into switch housing.
6. Pushbutton cap shall be held captive to switch body by retaining element to prevent accidental interchange.
7. Exact shape of switch is optional provided dimensions specified are not exceeded.
8. Terminals and basic switch identification shall be permanently marked as shown on figure 12.

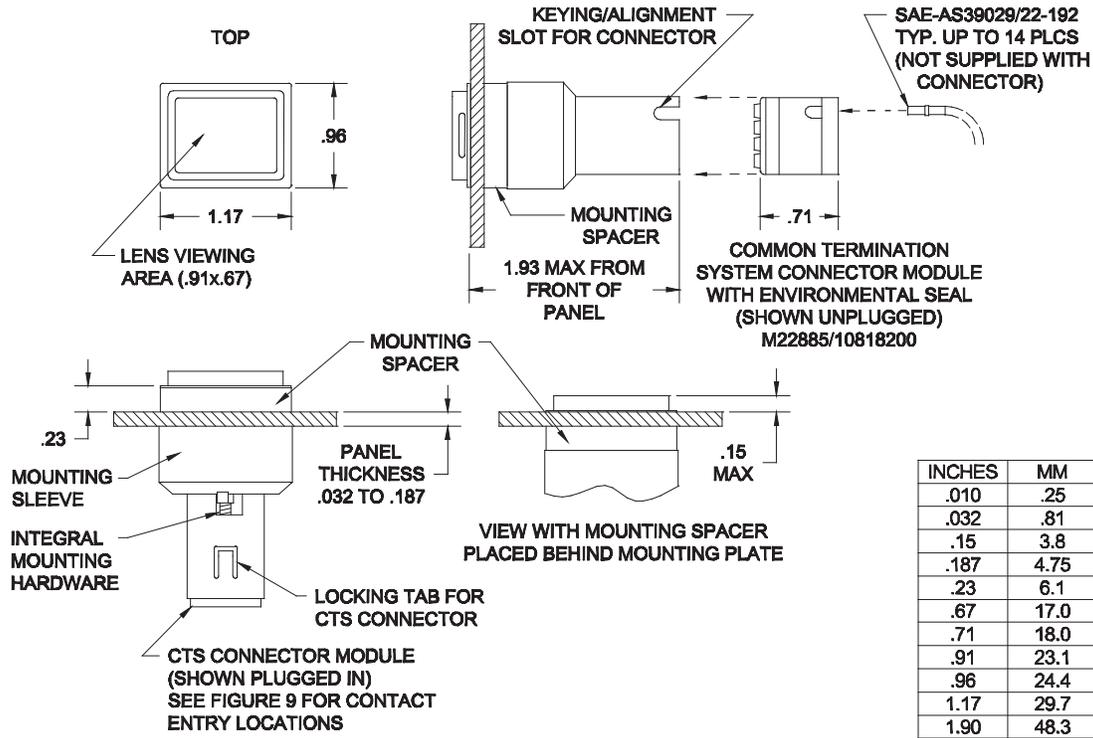
FIGURE 1. Switch - type I, 2 pole (enclosure design 1, unsealed with solder terminals).



NOTES:

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Unless otherwise specified, tolerances are  $\pm .010$  for three place decimals and  $\pm .03$  for two place decimals.
3. The switch shall accommodate mounting to panels from  $.032$  to  $.187$  thick.
4. A mounting spacer is supplied with each switch unit for SAE-AS7788 panel requirements and places the mounting flange flush with the top of a  $.235$  thick edge lighted panel when used in front of the panel. Otherwise, the spacer is used behind the panel.
5. Pushbutton cap shall be designed to prevent incorrect insertion into switch housing.
6. Pushbutton cap shall be held captive to switch body by retaining element to prevent accidental interchange.
7. Exact shape of switch is optional provided dimensions specified are not exceeded.
8. Terminals and basic switch identification shall be permanently marked as shown on figure 12.

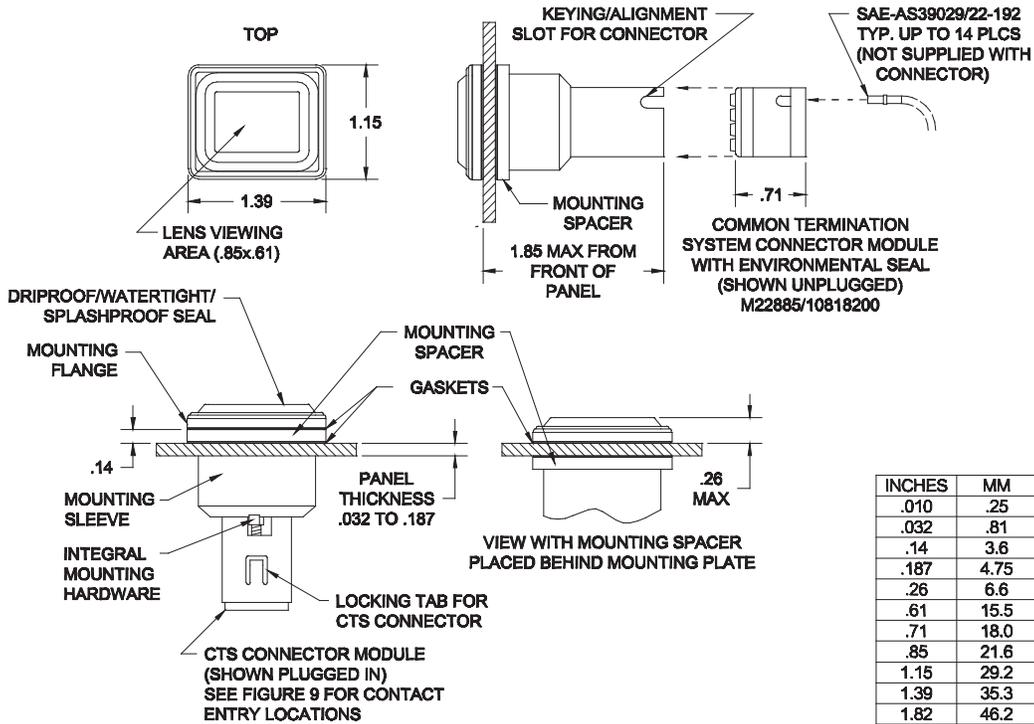
FIGURE 2. Switch - type II, 2 pole (enclosure design 2, 3, and 4; dripproof, watertight, and splashproof with solder terminals).



NOTES:

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Unless otherwise specified, tolerances are  $\pm 0.10$  for three place decimals and  $\pm 0.03$  for two place decimals.
3. The switch shall accommodate mounting to panels from .032 to .187 thick.
4. A mounting spacer is supplied with each switch unit for SAE-AS7788 panel requirements and places the mounting flange flush with the top of a .235 thick edge lighted panel when used in front of the panel. Otherwise, the spacer is used behind the panel.
5. Pushbutton cap shall be designed to prevent incorrect insertion into switch housing.
6. Pushbutton cap shall be held captive to switch body by retaining element to prevent accidental interchange.
7. The Common Termination System (CTS) connector shall be designed and constructed to meet the performance requirements of this document. This item, M22885/108-18200 for 2 pole switches, shall be acquired from a source listed on QPL-22885.
8. The CTS connector shall be removable from the switch housing to allow the housing to be mounted separately. The connector may be wired during harnessing operations, allowing bench testing without the need of the switch housing
9. The CTS connector shall be considered as a connector plug that may be separated from the switch housing for the convenience of installation.
10. The CTS connector shall be removable from the switch body by use of a M22885/108-T8234 CTS module extraction tool. Refer to MIL-PRF-22885/108 for details. This item shall be acquired from a source listed on QPL-22885.
11. The CTS connector shall be capable of receiving SAE-AS39029/22-192 socket contacts crimped to a 20, 22, or 24 gauge wire.
12. The CTS connector shall be capable of having the socket contacts inserted or removed using an M81969/14-10 contact insertion/removal tool.
13. Exact shape of switch is optional provided dimensions specified are not exceeded.
14. Terminals and basic switch identification shall be permanently marked as shown on figure 12.

FIGURE 3. Switch - type III (enclosure design 1; unsealed with 2 pole common termination system).

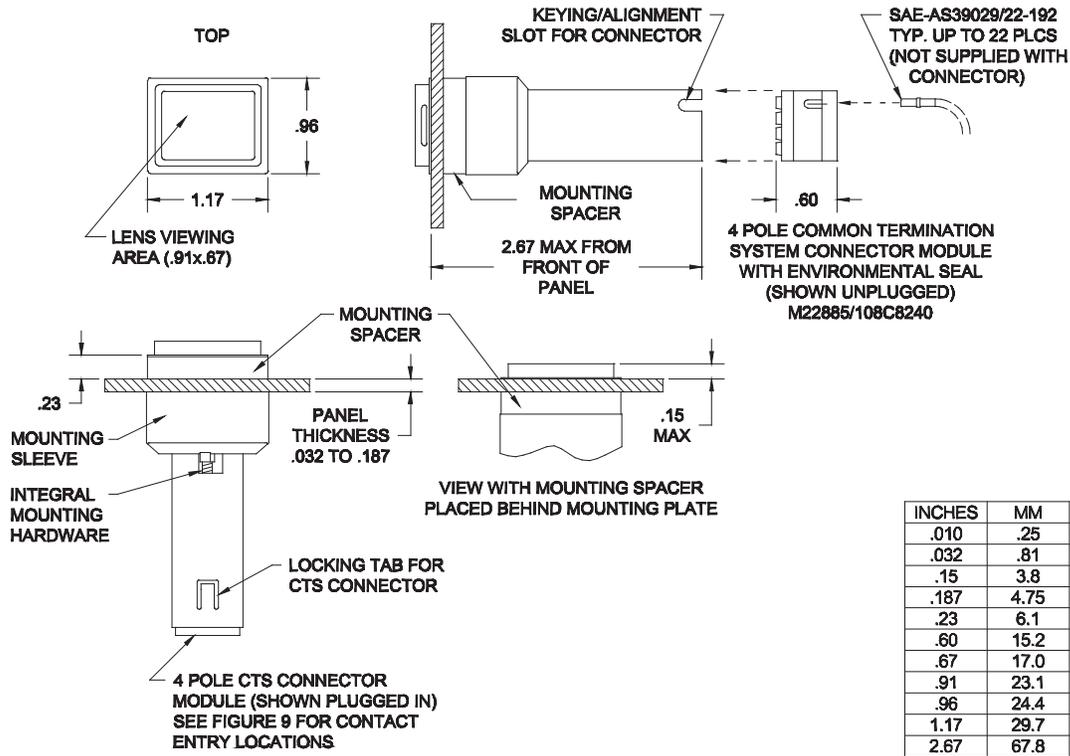


Notes

- Dimensions are in inches. Metric equivalents are given for general information only.
- Unless otherwise specified, tolerances are  $\pm 0.10$  for three place decimals and  $\pm 0.03$  for two place decimals.
- The switch shall accommodate mounting to panels from .032 to .187 thick.
- A mounting spacer is supplied with each switch unit for SAE-AS7788 panel requirements and places the mounting flange flush with the top of a .235 thick edge lighted panel when used in front of the panel. Otherwise, the spacer is used behind the panel.
- Pushbutton cap shall be designed to prevent incorrect insertion into switch housing.
- Pushbutton cap shall be held captive to switch body by retaining element to prevent accidental interchange.
- The Common Termination System (CTS) connector shall be designed and constructed to meet the performance requirements of this document. This item, M22885/108-18200 for 2 pole switches, shall be acquired from a source listed on QPL-22885.
- The CTS connector shall be removable from the switch housing to allow the housing to be mounted separately. The connector may be wired during harnessing operations, allowing bench testing without the need of the switch housing
- The CTS connector shall be considered as a connector plug that may be separated from the switch housing for the convenience of installation.
- The CTS connector shall be removable from the switch body by use of a M22885/108-T8234 CTS module extraction tool. Refer to MIL-PRF-22885/108 for details. This item shall be acquired from a source listed on QPL-22885.
- The CTS connector shall be capable of receiving SAE-AS39029/22-192 socket contacts crimped to a 20, 22, or 24 gauge wire.
- The CTS connector shall be capable of having the socket contacts inserted or removed using an M81969/14-10 contact insertion/removal tool.
- Exact shape of switch is optional provided dimensions specified are not exceeded.
- Terminals and basic switch identification shall be permanently marked as shown on figure 12.

FIGURE 4. Switch - type IV (enclosure design 2, 3, and 4; dripproof, watertight and splashproof with 2 pole common termination system)

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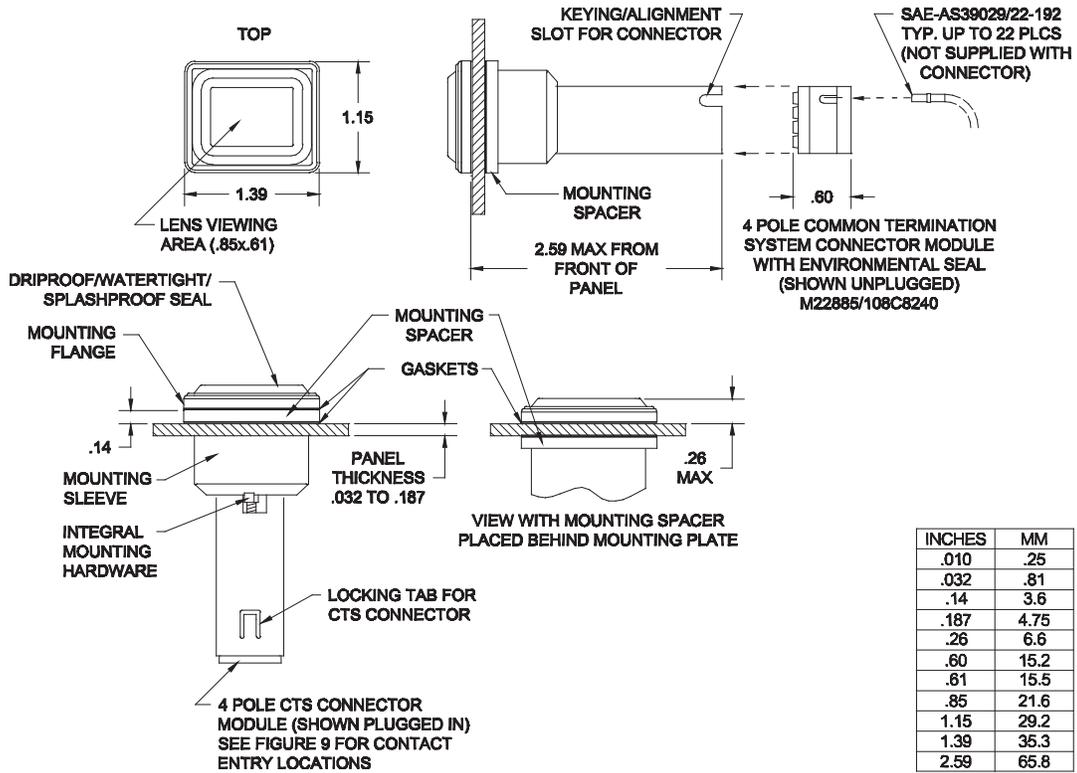


NOTES:

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Unless otherwise specified, tolerances are  $\pm 0.010$  for three place decimals and  $\pm 0.03$  for two place decimals.
3. The switch shall accommodate mounting to panels from .032 to .187 thick.
4. A mounting spacer is supplied with each switch unit for SAE-AS7788 panel requirements and places the mounting flange flush with the top of a .235 thick edgelight panel when used in front of the panel. Otherwise, the spacer is used behind the panel.
5. Pushbutton cap shall be designed to prevent incorrect insertion into switch housing.
6. Pushbutton cap shall be held captive to switch body by retaining element to prevent accidental interchange.
7. The Common Termination System (CTS) connector shall be designed and constructed to meet the performance requirements of this document. This item, M22885/108-C8240 for 4 pole switches, shall be acquired from a source listed on QPL-22885.
8. The CTS connector shall be removable from the switch housing to allow the housing to be mounted separately. The connector may be wired during harnessing operations, allowing bench testing without the need of the switch housing.
9. The CTS connector shall be considered as a connector plug that may be separated from the switch housing for the convenience of installation.
10. The CTS connector shall be removable from the switch body by use of a M22885/108-T8234 CTS module extraction tool. Refer to MIL-PRF-22885/108 for details. This item shall be acquired from a source listed on QPL-22885.
11. The CTS connector shall be capable of receiving SAE-AS39029/22-192 socket contacts crimped to a 20, 22, or 24 gauge wire.
12. The CTS connector shall be capable of having the socket contacts inserted or removed using an M81969/14-10 contact insertion/removal tool.
13. Exact shape of switch is optional provided dimensions specified are not exceeded.
14. Terminals and basic switch identification shall be permanently marked as shown on figure 12.

FIGURE 5. Switch - type V (enclosure design 1: unsealed with 4 pole common termination system)

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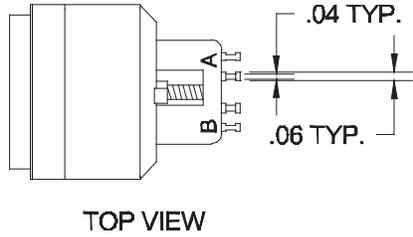


NOTES:

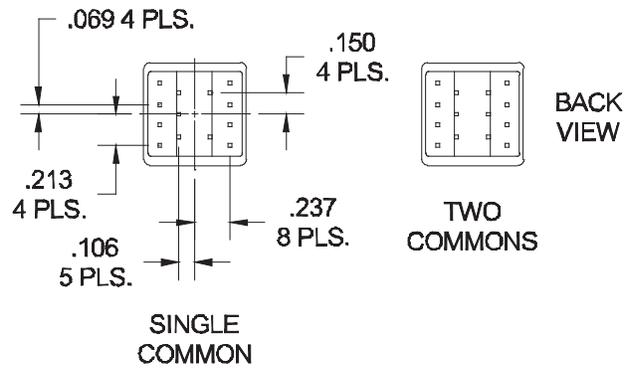
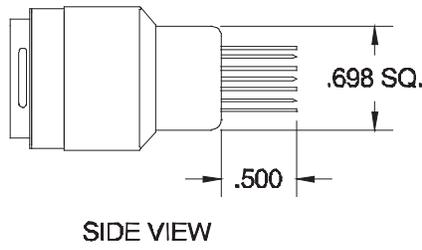
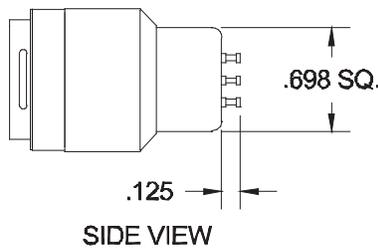
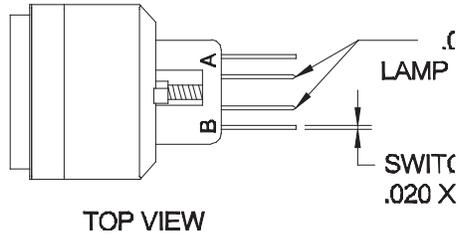
1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Unless otherwise specified, tolerances are  $\pm 0.010$  for three place decimals and  $\pm 0.03$  for two place decimals.
3. The switch shall accommodate mounting to panels from .032 to .187 thick.
4. A mounting spacer is supplied with each switch unit for SAE-AS7788 panel requirements and places the mounting flange flush with the top of a .235 thick edgelighted panel when used in front of the panel. Otherwise, the spacer is used behind the panel.
5. Pushbutton cap shall be designed to prevent incorrect insertion into switch housing.
6. Pushbutton cap shall be held captive to switch body by retaining element to prevent accidental interchange.
7. The Common Termination System (CTS) connector shall be designed and constructed to meet the performance requirements of this document. This item, M22885/108-C8240 for 4 pole switches, shall be acquired from a source listed on QPL-22885.
8. The CTS connector shall be removable from the switch housing to allow the housing to be mounted separately. The connector may be wired during harnessing operations, allowing bench testing without the need of the switch housing
9. The CTS connector shall be considered as a connector plug that may be separated from the switch housing for the convenience of installation.
10. The CTS connector shall be removable from the switch body by use of a M22885/108-T8234 CTS module extraction tool. Refer to MIL-PRF-22885/108 for details. This item shall be acquired from a source listed on QPL-22885.
11. The CTS connector shall be capable of receiving SAE-AS39029/22-192 socket contacts crimped to a 20, 22, or 24 gauge wire.
12. The CTS connector shall be capable of having the socket contacts inserted or removed using an M81969/14-10 contact insertion/removal tool.
13. Exact shape of switch is optional provided dimensions specified are not exceeded.
14. Terminals and basic switch identification shall be permanently marked as shown on figure 12.

FIGURE 6. Switch- type VI (enclosure design 2, 3, and 4: dripproof, watertight, and splashproof with 4 pole common termination system).

TURRET TERMINALS



WIREWRAP/PCB TERMINALS



Inches	mm
.003	0.08
.010	0.25
.020	0.51
.030	0.76
.04	1.0
.06	1.5
.069	1.75
.106	2.69
.125	3.18
.150	3.81
.213	5.41
.237	6.02
.500	12.70
.698	17.73

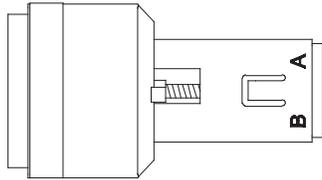
NOTES:

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Unless otherwise specified, tolerances are  $\pm .010$  for three place decimals and  $\pm .03$  for two place decimals.

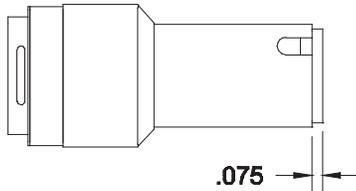
FIGURE 7. Switch and lighting circuit terminations, Type I and II, dimensions and center location.

**COMMON TERMINATION  
SYSTEM**

**2 POLE**

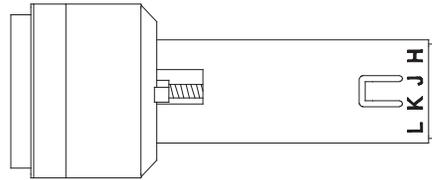


**TOP VIEW**

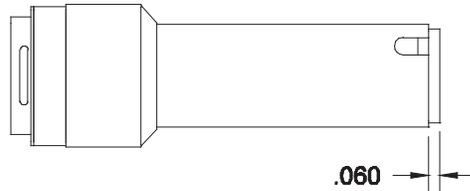


**SIDE VIEW**

**4 POLE**



**TOP VIEW**



**SIDE VIEW**

INCHES	MM
.010	.25
.03	.8
.060	1.52
.075	1.91

**NOTES:**

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Unless otherwise specified, tolerances are  $\pm .010$  for three place decimals and  $\pm .03$  for two place decimals.

**FIGURE 8. Switch and lighting circuit terminations, Common Termination System (CTS), interface.**

SWITCH CIRCUIT SCHEMATIC

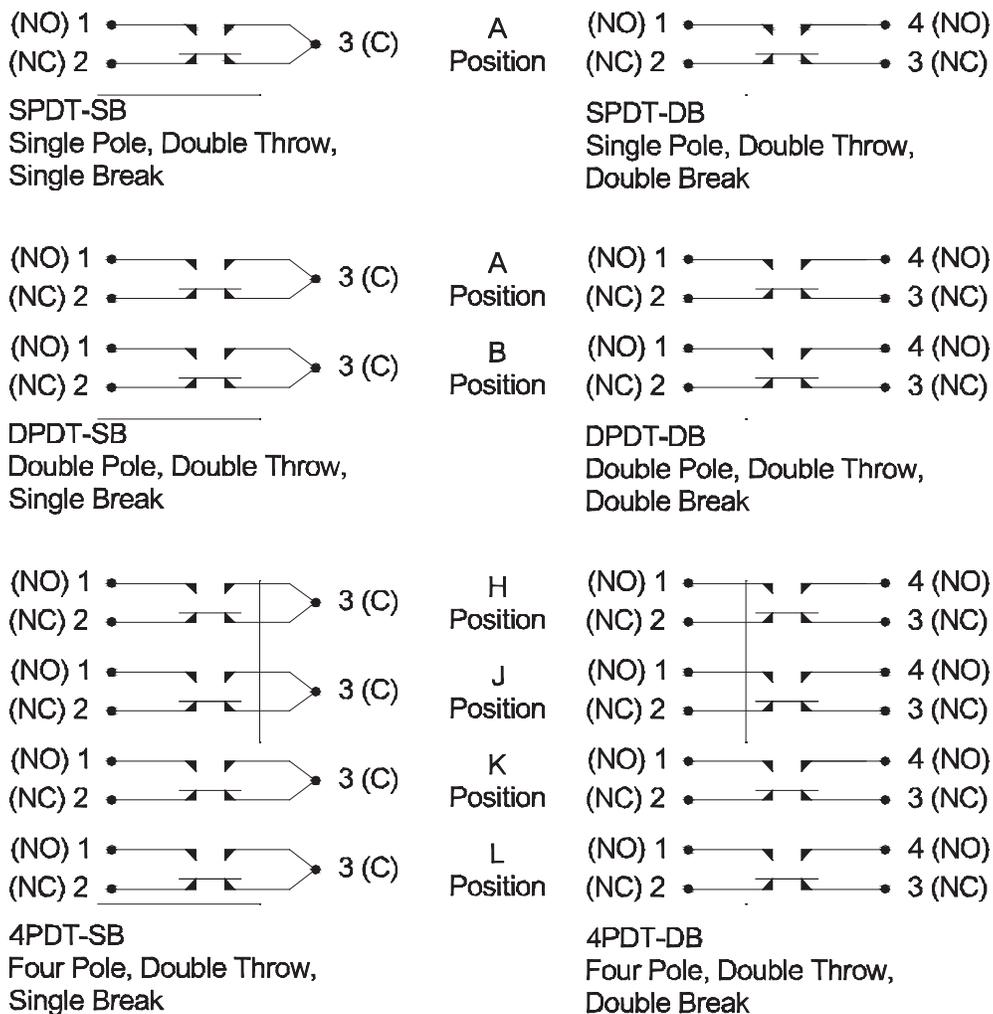
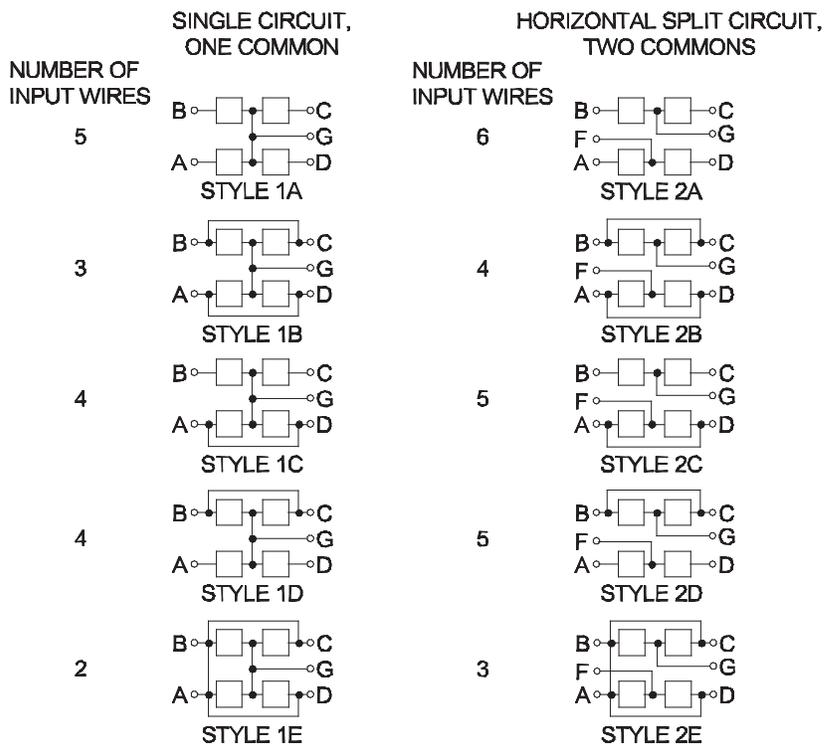


FIGURE 9. Switch circuit configurations, schematics.

LED CIRCUIT SCHEMATIC BLOCK DIAGRAMS

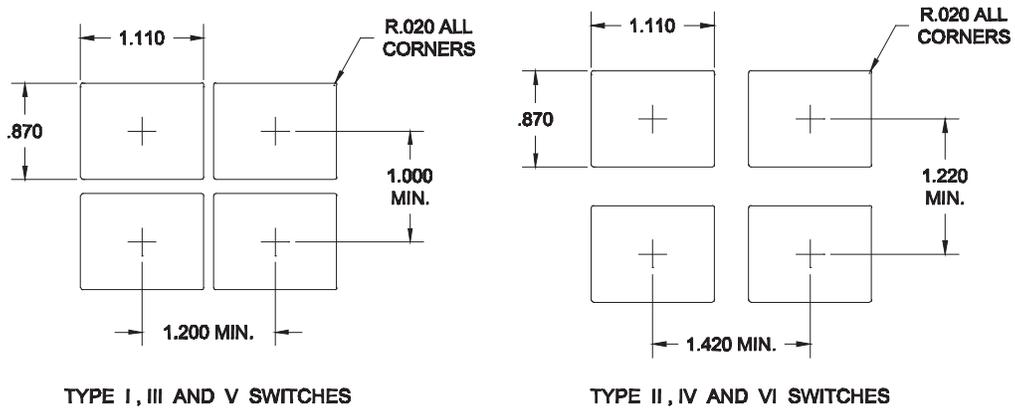
28 VDC OR 28 VAC



THE SYMBOL REPRESENTS AN ENTIRE QUADRANT'S ELECTRONIC CIRCUIT INCLUDING 4 LED'S AND THE DRIVER, DIMMING AND PROTECTION CIRCUIT (DDPC). DIAGRAMS ARE AS VIEWED FROM THE FRONT OF THE DISPLAY.

FIGURE 10. LED circuit configurations, schematics.

RECOMMENDED PANEL CUTOUTS



INCHES	MM
.010	.25
.020	.51
.870	22.10
1.000	25.40
1.110	28.19
1.200	30.48
1.220	30.99
1.420	36.07

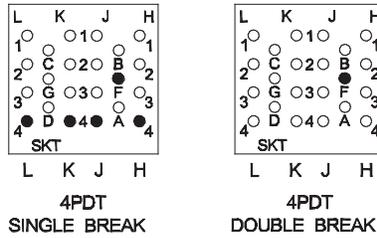
NOTES:

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Unless otherwise specified, tolerances are  $\pm .010$  for three place decimals and  $\pm .03$  for two place decimals.

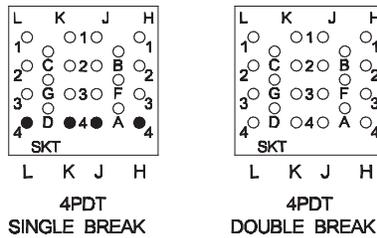
FIGURE 11. Recommended panel cutouts.



**SINGLE COMMON, 4 POLE CTS  
TYPE V AND VI**



**SPLIT COMMON, 4 POLE CTS  
TYPE V AND VI**



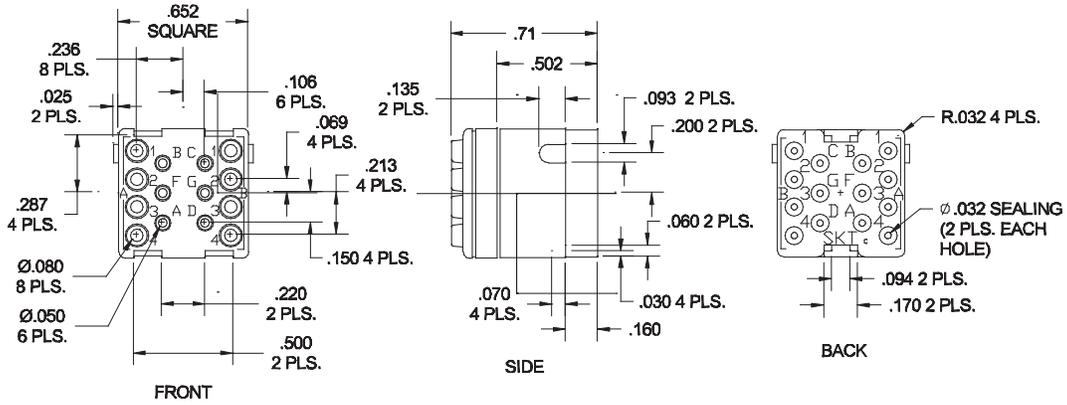
**NOTES:**

1. All 2 pole common termination system (CTS) switches have identical switch and lighting circuit terminal arrangement identification. All 4 pole CTS switches have identical switch and lighting circuit terminal arrangement identification.
2. To make the various CTS combinations, an MS27488-20 sealing plug is placed in the locations not to be used. In the above identifications, blackened circles indicate where the sealing plugs shall be located to form the described variation.
3. "SKT" identifies the socket side.
4. A and B or H, J, K and L identify each switch pole.
5. C, B, G, F, D, and A identify the lighting circuit terminations.
6. 1, 2, 3, and 4 identify the switch contact termination.

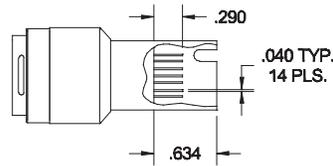
FIGURE 12. Switch poles and lighting circuit terminal arrangements and identification -  
Continued.

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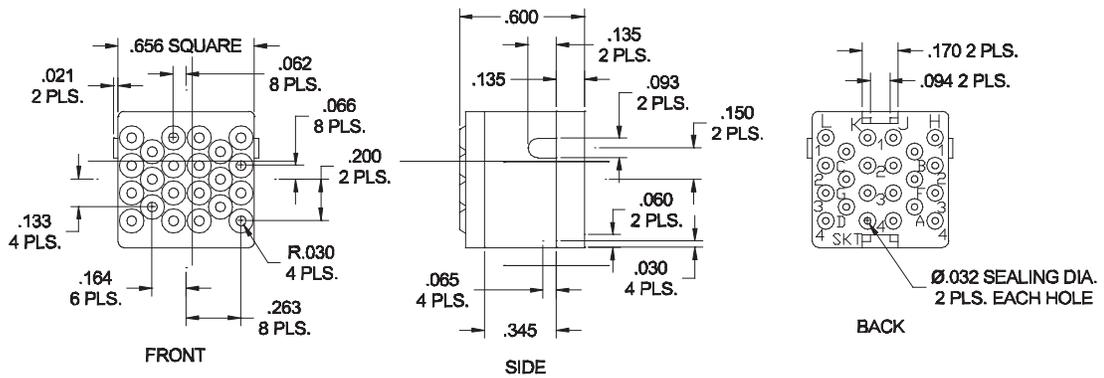
2 POLE  
CTS MODULE  
(MS22885/108-18200)  
FOR TYPE III AND IV SWITCHES



2 POLE CTS MATING PINS



4 POLE  
CTS MODULE  
(M22885/108-C8240)  
FOR TYPE V AND VI SWITCHES



4 POLE CTS MATING PINS

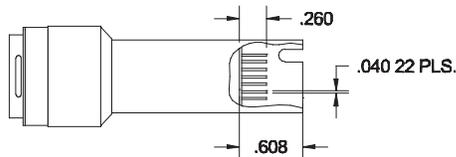


FIGURE 13. CTS modules

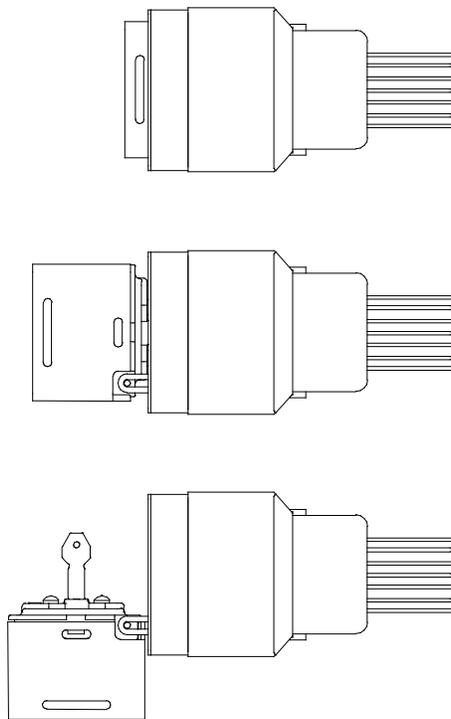
MIL-PRF-22885/113A

INCHES	MM	INCHES	MM
.010	.25	.160	4.06
.021	.53	.164	4.17
.025	.64	.170	4.32
.030	.76	.200	5.08
.032	.81	.213	5.41
.040	1.02	.220	5.59
.050	1.27	.236	5.99
.060	1.52	.260	6.60
.062	1.58	.263	6.68
.065	1.65	.287	7.29
.066	1.68	.290	7.37
.069	1.75	.345	8.76
.070	1.78	.500	12.70
.080	2.03	.502	12.75
.093	2.36	.600	15.20
.094	2.39	.608	15.44
.106	2.69	.634	16.10
.133	3.38	.652	16.56
.135	3.43	.656	16.66
.150	3.81	.71	18.0

NOTES:

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Unless otherwise specified, tolerances are  $\pm .010$  for three place decimals and  $\pm .03$  for two place decimals.

FIGURE 13\_ CTS modules - Continued



NOTES:

1. Retaining element shall be permanently attached to switch housing.
2. Retaining element shall allow pushbutton cap to be pulled fully out of switch housing and dropped down 90 degrees. (Pushbutton cap must still be retained.)
3. Pushbutton cap shall be removable from the retaining element to allow caps to be changed if necessary.

FIGURE 14. Pushbutton cap retaining element.

REQUIREMENTS:

Design and construction: See figures 1 through 14.

Complete switch shall consist of:

One switch body, mounting sleeve, a spacer, and an LED lens module pushbutton cap. Type II, IV and VI switch bodies also include a splashproof mounting flange. When specified, type III, IV, V, and VI switch bodies also include an environmentally sealed plug-on connector, common termination system (CTS) designed in accordance with the Terminal Junction System (TJS) of SAE-AS81714.

LED lens module pushbutton cap includes non-replaceable LED lamps, LED circuit assembly with LED driver, dimming and electrical protection circuitry, night vision goggle compatibility when specified, EMI/RFI shielding efficiency when specified, and an integral dripproof, watertight and splashproof seal when specified.

Material:

Housing: Corrosion-resistant steel or other material that when selected will allow the switch to meet the performance requirements of this specification sheet and MIL-PRF-22885.

Mounting sleeve: Thermoplastic, black or other material that when selected will allow the switch to meet the performance requirements of this specification sheet and MIL-PRF-22885.

Panel mounting spacer: Thermoplastic, black, or aluminum, black corrosion resistant steel, black or other material that when selected will allow the switch to meet the performance requirements of this specification sheet and MIL-PRF-22885.

Front lens material: High temperature heat-resistant thermoplastic or other material that when selected will allow the switch to meet the performance requirements of this specification sheet and MIL-PRF-22885.

Enclosure design:

Symbol 1 (unsealed) for type I, type III, and type V.

Symbol 2 (dripproof) for type II, type IV, and type VI.

Symbol 3 (watertight) for type II, type IV, and type VI.

Symbol 4 (splashproof) for type II, type IV, and type VI.

Temperature characteristic: -55°C to +71°C with lighting circuit energized, -55°C to +85°C with lighting circuit unenergized.

Vibration grade: 3 (10 to 2,000 Hz).

Operating characteristics:

Actuation force: 2 to 5 pounds.

Actuation travel: 0.150 ±0.030 inch, except 0.100 ±0.030 inch for high impact shock units.

Lens module extraction force: 2 to 5 pounds, except 2 to 8 pounds for high impact shock units.

Strength of actuator: 25 pounds.

Sand and dust: Applicable to type II, type IV, and type VI.

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Shock: 75 g (MIL-STD-202, method 213, test condition B).

High impact shock: MIL-STD-202, method 207, when specified. Applicable to indicator and momentary action type II, type IV, and type VI only.

Weight:

Connector (CTS): 6 grams maximum.

4 pole connector (CTS): 6 grams maximum.

Type I (solder terminations): 32 grams maximum.

Type II (solder terminations): 34 grams maximum.

Type III (CTS): 35 grams maximum.

Type IV (CTS): 39 grams maximum.

Type V (4 pole CTS): 45 grams maximum.

Type VI (4 pole CTS): 50 grams maximum.

Seal:

Watertight test: When specified, test in accordance with MIL-PRF-22885 and MIL-STD-108. There shall be no leakage of water through the panel and pushbutton seals as determined by visual examination and the dielectric withstanding voltage test.

Splashproof test: When specified, test in accordance with MIL-PRF-22885 and MIL-STD-108. There shall be no leakage of water through the panel and pushbutton seals as determined by visual examination and the dielectric withstanding voltage test.

Mechanical endurance: 100,000 cycles.

10,000 cycles of operation at  $-55^{\circ}\text{C} \pm 2^{\circ}\text{C}$  (cycling rate shall not exceed 18 cpm during the low temperature portion of this test for sealed switches), 20,000 cycles of operation at  $+85^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and 70,000 cycles of operation at room temperature.

Electrical endurance: 50,000 cycles.

Intermediate current: Applicable, 50,000 cycles.

Logic Level Switching: Applicable to gold-plated contacts, 100,000 cycles.

Electrical ratings: See table I.

Color and luminance: See table II and table III.

Sunlight readability: Applicable to Display Type S

Display Types: See table II and table III for specific colors.

Display Type S:

Requirements: All legends shall be capable of being read in direct sunlight and at any glare-producing, specularly reflective angles up to 15 degrees  $\pm$ 2 degrees to the normal of the display viewing surface. The legend background shall illuminate in color with an average display luminance in excess of 300 foot-lamberts when energized at full rated voltage. The average luminance contrast ratio of each lighted legend character to background shall be 0.6 minimum. The average luminance contrast ratio of each unlighted legend character to background shall have an absolute value equal to or less than 0.1. The average luminance contrast ratio for each color shall not be less than the values listed in table IV for the respective glare-producing angle.

Test method: The test procedure for measuring the average luminance contrast ratios for sunlight readability shall be the specular reflectance test in accordance with MIL-PRF-22885.

Display type N:

Requirements: All legends shall be visible white with an opaque black background. The legend characters shall always be visible in any light ambience except in darkened conditions. In darkened conditions, the legend characters shall illuminate in color with an average luminance of 0.5 to 3.0 foot-lamberts when energized at full rated voltage.

Test method: The test procedure for measuring the average luminance and color of the illuminated visible white legend characters shall be in accordance with MIL-PRF-22885.

Display type D:

Requirements: All legends shall be visible white with an opaque black background. The legend characters shall illuminate in color with an average display luminance in excess of 100 foot-lamberts when energized at full rated voltage.

Test method: The test procedure for measuring the average luminance and color of the illuminated visible white legend characters shall be in accordance with MIL-PRF-22885.

Display type A:

Requirements: All legends shall be visible white on an obscure black background. The legend background shall illuminate in color with an average display luminance in excess of 200 foot-lamberts when energized at full rated voltage.

Test method: The test procedure for measuring the average luminance and color of the illuminated display background shall be in accordance with MIL-PRF-22885.

Display type B:

Requirements: All legends shall be opaque black on an obscure black background. The legend characters shall remain black and the legend background shall illuminate in color with an average display luminance in excess of 200 foot-lamberts when energized at full rated voltage.

Test method: The test procedure for measuring the average luminance and color of the illuminated display background shall be in accordance with MIL-PRF-22885.

Display type W:

Requirements: All legends shall be opaque black on a visible white background. The legend characters shall remain black and the legend background shall illuminate in color with an average display luminance in excess of 100 foot-lamberts when energized at full rated voltage.

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Test method: The test procedure for measuring the average luminance and color of the illuminated display background shall be in accordance with MIL-PRF-22885.

Display type X:

Requirements: All legends shall be visible only in ambient light as white lettering on black background. Legends do not illuminate and the lens module does not contain internal electronics.

Test method: The test procedure shall be by visual inspection of the legend only.

Display type Ø:

No display is visible, only a matte black background. The lens module does not illuminate and does not contain internal electronics.

Night vision imaging system (NVIS) compatibility:

NVIS Green A: Shall meet all MIL-STD-3009 and MIL-L-85762 requirements for illuminated controls for type I, class A and type II, class B equipment.

NVIS Green B: Shall meet all MIL-STD-3009 and MIL-L-85762 requirements for illuminated controls for type I, class A and type II, class B equipment.

NVIS Blue: Shall meet all MIL-STD-3009 and MIL-L-85762 NVIS radiance requirements for illuminated controls and advisory lights for type I, Class A and type II, Class B equipment. The color shall meet the requirements as specified herein.

NVIS White: Shall meet all MIL-STD-3009 requirements for utility lighting (white) for type I, class A and type II, class B equipment.

NVIS Yellow Class A: Shall meet all MIL-STD-3009 and MIL-L-85762 requirements for caution signals for type I, class A and type II, class B equipment.

NVIS Yellow Class B: Shall meet all MIL-STD-3009 and MIL-L-85762 requirements for caution signals for type I, class B and type II, class B equipment.

NVIS Red: Shall meet all MIL-STD-3009 and MIL-L-85762 requirements for warning signals for type I, Class B and type II, class B equipment.

Test methods: The test procedure for measuring luminance, chromaticity and spectral radiance shall be in accordance with MIL-STD-3009 and MIL-L-85762 for illuminated controls (for NVIS green A and NVIS green B), illuminated controls and advisory lights (for NVIS blue), caution signals (for NVIS yellow) and warning signals (for NVIS red).

The night vision goggle compatible feature, when specified, is in addition to the sunlight readable feature and all minimum sunlight readable requirements shall be maintained on all type S displays along with the unique requirements for night vision goggle compatibility. When night vision goggle compatibility is specified for type N displays (visible legend), all the requirements for color and NVIS radiance in accordance with MIL-STD-3009 shall be satisfied when display is operated at the specified luminance level (see table III).

Lens module pushbutton caps containing NVIS compatible displays are marked with NVIS Type ( ), Class ( ), in accordance with MIL-STD-3009 and MIL-L-85762.

Electrical environment requirements:

The LED illuminated display and related circuitry shall not be adversely affected when subjected to the following electrical environmental conditions specified in the noted standards:

**Abnormal Power Surge:** A minimum of 10 voltage surges of 80 VDC, 100 ms. are applied directly to the lighting circuits at a rate of 10 per minute. This test meets or exceeds the abnormal DC power surge requirements of RTCA/DO-160E, Section 16, Category Z; and MIL-STD-704F, 28 VDC Abnormal Power Operation.

**Voltage Spike:** A minimum of 60 pulses in each polarity with 600 volt amplitude, 10  $\mu$ s duration and source impedance of less than 0.5 ohms are applied directly to the lighting circuits at a rate of approximately one pulse per second. This test meets or exceeds the voltage spike requirements of RTCA/DO-160E, Section 17, Category A and MIL-STD-461C, CS06, Spike 1.

**Audio Frequency Conducted Susceptibility:** A 10 Hz to 150 kHz sine wave signal source of 7 VAC RMS is superimposed directly onto the 28 VDC power supplying the lighting circuits. This test meets or exceeds the requirements of RTCA/DO-160E, Section 18, Category Z; and MIL-STD-461E, CS101, Curve 1.

**Induced Signal Susceptibility:** An electric field strength test of 10,000 volts per meter from 350 to 800 Hz thereafter reducing to a minimum field strength of 1000 volts per meter at 32 kHz and a separate magnetic field strength test of 120 amperes per meter from 350 to 800 Hz thereafter reducing to a minimum field strength of 2 amperes per meter at 32 kHz is coupled to the test article lighting circuit interconnection cable while the display is visually monitored for readability. This test meets or exceeds the test levels specified in RTCA/DO-160E, Section 19, Category CW.

**Radio Frequency Conducted Susceptibility:** A 10 kHz to 400 MHz radio frequency continuous wave (CW) signal source of (7.5 V, 150 mA, 50 ohm) is superimposed directly onto the 28 VDC power supplying the lighting circuits. This test meets or exceeds the injected signal requirements of RTCA/DO-160E, Section 20, Category W and MIL-STD-461E, CS114, Curve 4.

**Radio Frequency Radiated Susceptibility:** The test article with unshielded cables is mounted to a composite mounting plate and placed in a transverse electromagnetic (TEM) cell where it is subjected to a continuous wave (CW) field strength of 200 V/m from 2 MHz to 1 GHz as verified by an isotropic field probe located adjacent to the test article. This test meets or exceeds the field strength requirements of RTCA/DO-160E, Section 20, Category Y and MIL-STD-461E, RS103, for the specified test frequency range.

**Radio Frequency Emissions:** The test article design incorporates only passive electronic circuitry, producing no radio frequency emissions. It meets or exceeds the requirements of RTCA/DO-160E, Section 21 and MIL-STD-461E, CE101, CE102, RE101 and RE102.

**Damped Sinusoidal Transient:** A minimum of 300 damped sinusoidal transient events with 600 volt amplitude and 1 MHz fundamental frequency are applied directly to the lighting circuits at a rate of one per second. This test meets or exceeds the damped sinusoidal waveform requirements of RTCA/DO-160E, Section 22, Waveform 3, Category A3XXX; and the test levels of MIL-STD-461E, CS116 at 1 MHz, 5 ampere, 100 ohm.

**Lightning Induced Transient:** A voltage source of 1500 VDC is applied between the lighting circuits and case ground for a minimum of one minute. Ten additional groups of fourteen Multiple Burst Ground Injection test pulses at an amplitude of 750 V and duration of 120  $\mu$ s are separately applied between the lamp circuits and case ground. These tests meet or exceed the Pin Injection lightning requirements of RTCA/DO-160E, Section 22, Category A4XXX; and the dielectric withstanding test of MIL-PRF-22885.

**Electrostatic Discharge:** A minimum of 10 pulses in each polarity at 15,000 volts, 150 pF and 330 ohms are applied to operator accessible areas of the test article in both a powered and un-powered state. This test meets or exceeds the ESD requirements of RTCA/DO-160E, Section 25.

EMI/RFI shielding:

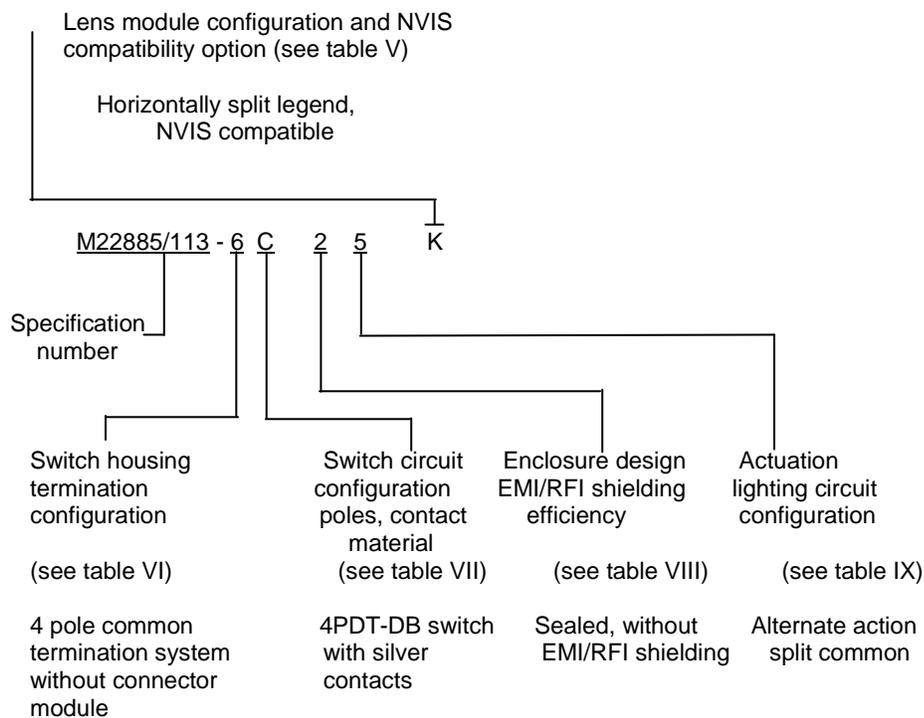
Requirement: When specified, the EMI/RFI shielding attenuation shall be not less than 60 dB over the frequency range from 100 to 1,000 MHz.

Test method: Switches shall be tested to determine the shielding effectiveness in accordance with MIL-PRF-22885, for shielding efficiency.

Measurements are to be performed at the following frequencies:

<u>Frequency</u>	<u>Minimum attenuation</u>
100 MHz	60 dB
200 MHz	60 dB
400 MHz	60 dB
600 MHz	60 dB
800 MHz	60 dB
1,000 MHz	60 dB

Part or Identifying Numbers (PIN): PINs are assigned as follows:



PINs generated do not include display type (N, S, D, A, B or W), segment color (see table XIV), or legends. Manufactures may add an additional suffix from the "designation codes" in Table XI to the military PIN for reference only. Acquisition documents shall be prepared in accordance with ordering data in section 6 of MIL-PRF-22885 for category II switches.

Lens module legend positions: Table X is shown for information only.

Table XI is shown for information only. The bottom of each LED lens module pushbutton cap shall be marked with the appropriate circuit diagram from Table XII showing whether it is a single common circuit or a horizontal split circuit and also showing the voltage, and any internal quadrant interconnections.

Qualification inspection: All applicants for qualification approval shall demonstrate that each of their items conform to all the requirements specified in the applicable documents singularly and in combination with all other previously qualified items, regardless of manufacturer. Table XIII is based on the use of MIL-PRF-8805 category I or category II basic switches listed on QPL-8805.

Group submission: See table XIII.

Group A inspection: See table XIV.

Group B inspection: See table XV.

TABLE I. Electrical ratings.

Contact material	Load	Sea level			50,000 feet	
		28 V dc		115 V ac, 60 Hz	28 V dc	
		NO or NC (amperes max)	2 circuit (amperes max)	NO or NC (amperes max)	NO or NC (amperes max)	2 circuit (amperes max)
Silver (gold finish)	Resistive	7.5	5.0	7.5	4.0	3.0
	Inductive	4.0	2.0	4.0	2.5	1.0
	Motor	4.0	---	---	---	---
	Lamp	1.0	---	---	---	---
Gold plated	Resistive	1.0	---	---	1.0	---
	Inductive	0.5	---	---	0.5	---
Logic level life applicable: 5 volts maximum or peak ac at 10 milliamperes maximum.						

TABLE II. Illuminated chromaticity limits.

Color	Color code	x <u>1/ 3/</u>	y <u>1/ 3/</u>
Red	R	.695	.285
		.710	SL <u>2/</u>
		.655	.325
		.660	SL <u>2/</u>
Green	G	.300	SL <u>2/</u>
		.300	.600
		.380	.600
		.380	SL <u>2/</u>
Yellow	Y	.562	.415
		.570	SL <u>2/</u>
		.596	.382
		.605	SL <u>2/</u>
Blue	T	.100	.145
		.180	.145
		.180	.250
		.100	.250
White	A	.330	.330
		.350	.330
		.400	.380
		.400	.420
		.380	.420
		.330	.370

- 1/ Chromaticity is expressed as x and y on the CIE chromaticity diagram. Values shown are corners of the limiting envelope.
- 2/ SL - spectrum locus (where intersected by other coordinate pair).
- 3/ Chromaticity limits and luminance levels apply when the displays are energized at full rated voltage.

TABLE III. Illuminated chromaticity limits for NVIS night vision goggle compatible displays.

Color	Color code	u' <u>1/</u>	v' <u>1/</u>	r <u>1/</u>	Foot-lamberts <u>3/</u>
NVIS Green A	H	.088	.543	.037	0.1
NVIS Green B <u>2/</u>	J	.131	.623	.057	0.1
NVIS Blue	E	.082	.390	.037	0.1
NVIS White	Q	.190	.490	.040	0.1
NVIS Yellow Class A <u>2/</u>	K	.274	.622	.083	15.0
NVIS Yellow Class B <u>2/</u>	U	.274	.622	.083	15.0
NVIS Red <u>2/</u>	S	.450	.550	.060	15.0

- 1/ Chromaticity is expressed as u' and v' coordinates of the 1976 UCS diagram. The values shown describe a circle whose center is at u', v', and of radius r.
- 2/ The area enclosed by the described circle intersecting the spectral locus is the envelope limiting the acceptable color space.
- 3/ Chromaticity limits must be met when the display voltage is set to produce 0.1 foot-lamberts for NVIS green A, NVIS green B and NVIS blue and 15 foot-lamberts (or maximum rated voltage for type N displays) for NVIS yellow Class A, NVIS yellow Class B and NVIS red.

TABLE IV Minimum contrast ratios for sunlight readable displays (type S) with or without EMI/RFI shielding.

Color	Color code	Condition 1 ( $\phi_1 = \phi_2 = 15^\circ$ )	Condition 2 ( $\phi_1 = \phi_2 = 30^\circ$ )
		Contrast ratio	Contrast ratio
Red	R	0.6	0.3
Green	G	0.6	0.3
Yellow	Y	0.6	0.4
Blue	T	0.6	0.3
White	A	0.6	0.4
NVIS Green A	H	0.6	1/
NVIS Green B	J	0.6	1/
NVIS Blue	E	0.6	1/
NVIS White	Q	0.6	1/
NVIS Yellow Class A	K	0.6	1/
NVIS Yellow Class B	U	0.6	1/
NVIS Red	S	0.6	1/

1/ Condition 2 is not applicable to NVIS compatible colors.

TABLE V. Lens module configurations.

		CONFIGURATIONS							
									
STANDARD LIGHTING DESIGNATIONS		B	C	D	E	F	J	G	H
NVIS COMPATIBLE DESIGNATIONS		K	L	M	N	P	R	Q	S

TABLE VI. Switch housing termination configuration.

Termination type	Designation
Turret terminals	1
Wire wrap/PCB terminals	3
CTS (SPDT, DPDT, and indicator light)	
Without connector module <u>1/</u>	4
With connector module <u>2/</u>	5
CTS (4PDT only)	
Without connector module <u>1/</u>	6
With connector module <u>2/</u>	7

- 1/ The common termination system designation 4 or 6 is for the CTS switch housing excluding the connector module. The connector module is provided separately so wiring and harnessing can be accomplished independent of the switch housing.
- 2/ The common termination system designation 5 or 7 is for the CTS switch housing including the connector module. The connector module is provided plugged into the switch housing (sealing plugs are in their appropriate positions).

TABLE VII. Switch circuit configuration, poles and contact material.

Switch poles <u>1/</u> and circuit configuration	Contact material	
	Silver with gold finish	Gold plated
SPDT-SB	1	5
DPDT-SB	2	6
SPDT-DB	3	7
DPDT-DB	4	8
4PDT-SB	A	F
4PDT-DB	C	H
Indicator light	O	O

- 1/ SPDT - Single pole, double throw.  
 SB - Single break.  
 DPDT - Double pole, double throw.  
 DB - Double break.  
 4PDT - Four pole, double throw.

TABLE VIII. Enclosure design and EMI/RFI shielding efficiency.

Enclosure design	Without EMI/RFI shielding	With EMI/RFI shielding
1-unsealed	1	4
2-Dripproof 3-Watertight 4-Splashproof	2	5
High impact shock resistant 1/ 2-Dripproof 3-Watertight 4-Splashproof	3	6

1/ Not available in alternate action.

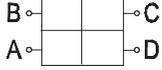
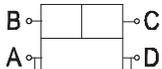
TABLE IX. Lighting circuit configuration and actuation.

LED circuit configuration	Actuation		
	Momentary	Alternate	Indicator
Single circuit, one common	1	4	7
Horizontal split circuit two commons	2	5	8

TABLE X. Lens module legend positions.

DISPLAY TYPE LIGHTING	LEGEND POSITIONS							
TYPE S TYPE N TYPE B TYPE A TYPE D TYPE W TYPE X	1	2 3	4 5 3	4 5 6 7	2 6 7	8 9	4 9 6	8 5 7
	A	B C	D E C	D E F G	B F G	H J	H E G	D J F
TYPE 0	1							
	A							

TABLE XI. Voltage, lighting circuit and quadrant interconnection styles. 1/ 2/

QUADRANT INTERCONNECTIONS		VOLTAGE AND DESIGNATION CODE
BLOCK DIAGRAM	DESCRIPTION	28VDC OR 28VAC
	FOUR INPUTS, ALL FOUR QUADRANTS INDEPENDENT	A
	TWO INPUTS, TOP QUADRANTS COUPLED AND BOTTOM QUADRANTS COUPLED	B
	THREE INPUTS, ONLY BOTTOM TWO QUADRANTS COUPLED	C
	THREE INPUTS, ONLY TOP TWO QUADRANTS COUPLED	D
	ONE INPUT, ALL FOUR QUADRANTS COUPLED	E

1/ Display quadrant power inputs are labeled A, B, C and D as viewed from the front of the display.

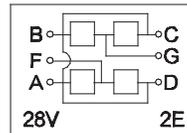
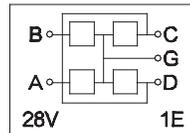
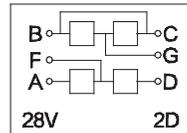
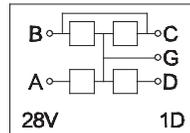
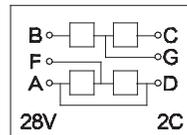
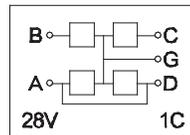
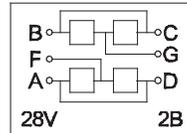
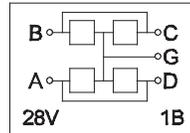
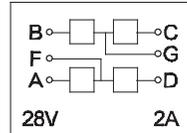
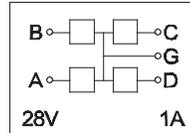
2/ The LED circuit is available with the quadrants A, B, C and D internally connected in various styles so one input wire can activate one or more quadrants thereby reducing the number of input wires necessary to illuminate the display.

TABLE XII LED lens module pushbutton cap circuit diagrams. 1/ 2/ 3/

28 VDC OR 28 VAC

SINGLE CIRCUIT,  
ONE COMMON

HORIZONTAL SPLIT CIRCUIT,  
TWO COMMONS



- 1/ The appropriate circuit diagram must be marked in white lettering on the bottom of the LED lens module pushbutton cap.
- 2/ The circuit diagrams are as viewed from the front of the display.
- 3/ The two character identifiers 1A, 1B, etc. are for reference only.

TABLE XIII. Qualification inspection, group submission.

Test sample	Inspection table X of MIL-PRF-22885		Extent of approval <u>1/</u>
	Group	Number of samples	
M22885/113-1444ED <u>2/</u>	I	12	All
	II	4 (from group I) <u>3/ 4/</u>	
	III	2 (from group I)	
	IV	2 (from group I)	
	VI	4 (from group I) <u>5/</u>	
	VIII	24 <u>8/</u>	
M22883/113-3414ED <u>2/</u>	I	2	
	II	2 (from group I) <u>13/</u>	
M22885/113-1844ED <u>2/</u>	I	2	
	VII	2 (from group I) <u>4/ 9/</u>	
M22885/113-1252ED <u>2/</u>	I	4	
	II	4 (from group I) <u>4/ 10/ 11/</u>	
M22885/113-5344ED <u>2/</u>	I	4	
	VII	4 (from group I) <u>4/ 6/ 7/</u>	
M22885/113-5431ED <u>2/</u>	I	6	
	II	4 (from group I) <u>4/ 10/ 11/</u>	
	V	2 (from group I)	
M22885/113-7C15ED <u>2/</u>	I	2	
	EMC	2 (from group I) <u>12/</u>	
M22885/113-7C61ED <u>2/</u>	I	6	
	II	4 (from group I) <u>4/ 10/ 11/</u>	
	III	2 (from group I)	

1/ Includes single break, silver contacts, gold contacts, and wire wrap termination when the basic switches are qualified to MIL-PRF-8805/101 category I or category II.

2/ Lens module configuration shall be "E" for non-NVIS legends and "N" for NVIS legends (3-way split) in accordance with table V.

Test legend:

DEVICE TEST	
234	567

3/ Shock method I.

4/ During tests requiring switch to be mounted, one-half of the sample units shall be mounted utilizing the mounting spacer in front of the panel, the remainder behind the panel.

5/ Inductive DC Two units, NO-NC only, sea level. Resistive DC: Two units, two circuit only, sea level.

6/ Two units shall be subjected to the mechanical endurance test:

7/ Two units shall be tested for intermediate current.

8/ 24 lens modules, two for each color from type S, shall be tested for color, luminance, NVIS compatibility, and sunlight readability where applicable. A single separate switch body shall be provided to energize lens modules.

9/ Two units shall be tested for Logic Level Circuit only.

10/ Shock method II.

11/ Sealing shall be verified by performing the watertight test and the splashproof test only.

12/ Electrical environment test in accordance with the test methods described in RTCA/DO-160E Sections 16 through 22 and Section 25 for compliance with the equipment categories as listed in the electrical environment requirements section

13/ Solderability and Terminal Strength

MIL-PRF-22885/113A

TABLE XIV. Group A inspection.

Inspection
Seal (when applicable) (external inspection only)
Visual and mechanical examination
Operating characteristics
Dielectric withstanding voltage
Contact resistance <u>1/</u>
Sunlight readability <u>2/</u>
NVIS compatibility <u>3/</u>

- 1/ Contact resistance measurements for gold contact switches shall be measured in accordance with switch contact resistance paragraph of MIL-PRF-22885, except the test current shall not exceed 10 milliamperes and the open-circuit test voltage shall not exceed 5.5 volts DC. Contact resistance shall not exceed 210 ohms.
- 2/ Maintain a visual standard of like color producing technique per each color and use these as visual standards. Visually inspect all switches in each lot against the appropriately colored standard. The visual standards shall be certified annually by performing the sunlight readability test.
- 3/ Maintain a standard of like color producing technique for each NVIS color in production. Visually inspect all NVIS compatible switches in each lot with an image intensifier against the appropriate standard. The visual standards shall be certified annually by performing the NVIS compatibility test.

TABLE XV Group B inspection.

Inspection <u>1/</u>	Test sample PIN's and sample numbers																
	M22885/ 113-5445ED								M22885/ 113-5861ED				M22885/ 113-3444ED		MS22885/ 113-7C41ED		<u>2/</u>
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Visual and mechanical	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Solderability													X	X			
Shock I	X	X															
Shock II									X	X							
Moisture resistance	X	X							X	X							
Salt spray			X	X													
Overload cycling					X	X									X	X	
Electrical endurance-inductive dc															X	X	
Electrical endurance resistance dc					X	X											
Mechanical endurance							X	X									
Logic Level Circuit											X	X					
Color																	X
Luminance																	X
Sunlight readability																	X
NVIS compatibility																	X
Dielectric withstanding voltage					X	X									X	X	
Operating characteristics	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Seal									X	X							
Marking visibility	X	X	X	X					X	X							

1/ All tests shall be performed as required by MIL-PRF-22885, Table XII.

2/ Two sample lens cap assemblies of each color for type S.

The margins of this specification are marked with vertical lines to indicate where modifications from this revision were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

Referenced Documents

MIL-PRF-8805	MIL-PRF-8805/101
MIL-PRF-22885	MIL-PRF-22885/108
MIL-STD-108	MIL-STD-202
MIL-STD-461	MIL-STD-704
MIL-STD-3009	RTCA DO-160
SAE-AS7788	SAE-AS81714
MIL-L-85762	

Custodians:

Army - CR  
Navy - EC  
Air Force -85  
DLA - CC

Preparing activity:  
DLA - CC

(Project 5930-2010-021)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.daps.dla.mil/>.