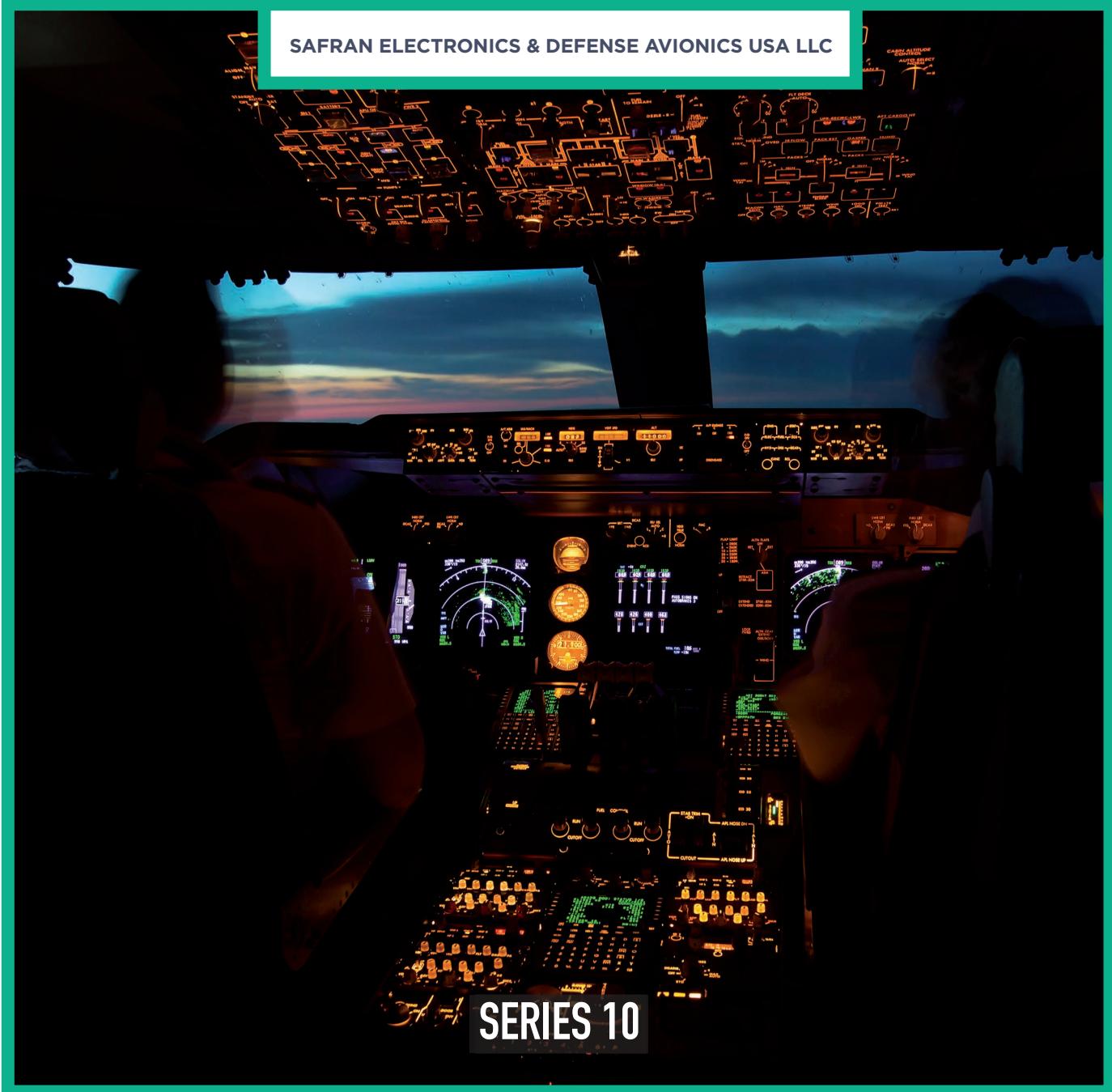


SAFRAN ELECTRONICS & DEFENSE AVIONICS USA LLC



 **SAFRAN**

SERIES 10 FEATURES

FEATURING A FOUR LAMP DESIGN, POSITIVE HARD MOUNTING SLEEVE, INDIVIDUAL LAMP COLOR CONTROL, UP TO 4-WAY SPLIT DISPLAY FACE.

The Series **10E** Twist-Lite® is a 4-lamp indicator unit with a modular design that permits it to be used as a lighted pushbutton switch or as a word indicator light for design compatibility. Inclusion of a magnetic holding coil for numerous electrical interlock, lock-in, and lock-out circuits gives the switch light complete capability. The 4-lamp design combined with a choice of divided screens offers many display possibilities. Depression of the front lens actuates the switch module which is available in momentary or alternate action in snap-on assemblies. Legends may be reverse engraved on the front lens at the factory for uniform readability and long wear. The special slip-on mounting sleeve provides a positive hard mount particularly useful in equipment designed for extreme measures of shock and vibration. Flush mounting is easily achieved in horizontal or vertical rows, as well as matrix configurations.

The Series **10H** Twist-lite is basically the same as the Series **10E**, except it has been qualified to meet the requirements of **MIL-PRF-22885**.

EASY FRONT OF PANEL RELAMPING

Lamp replacement is accomplished from the panel front without the use of tools and may easily be done without fear of accidental switch actuation. Simply PULL, TWIST, and REMOVE for complete access to the lamps.

POSITIVE INDEXING

During relamping, the front end assembly remains connected to the unit's housing by two sides. This important feature precludes the possibility of inadvertently transposing the front end assembly with adjacent units. (Series **10E** only).

For positive indexing on Series 10H military version, order by part number **10H7**.



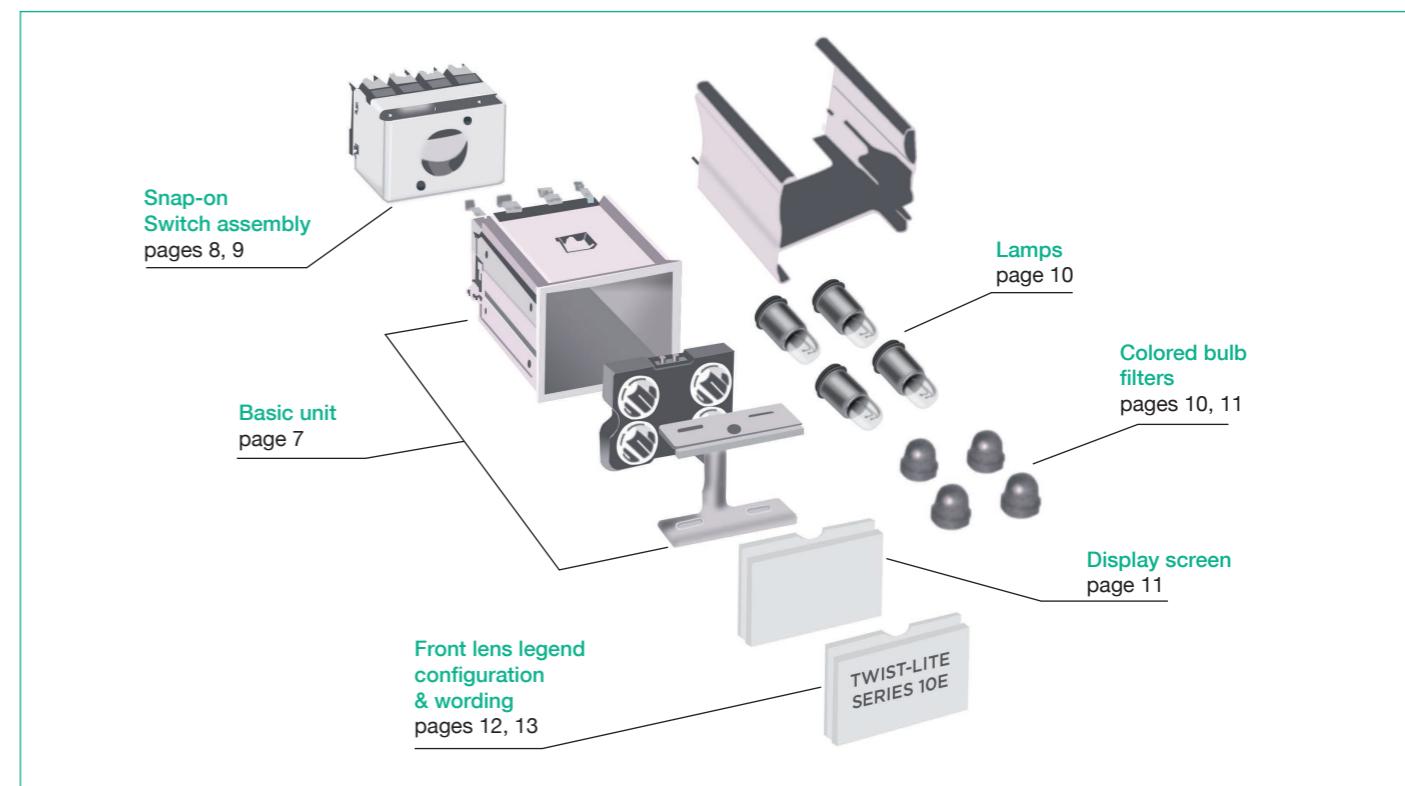
HOW TO USE THIS CATALOG

The pages of this catalog describe the component parts that make up a Series 10 Switch-Lite or Indicator-Lite unit. To define the units you want, simply select the code that identifies your choice of each required element. The selected codes, when written together become the part number you will use to order the units. A typical part number is illustrated as below.

10E1	O	A1C2	F2	J3	L(AABB)	N2	R1,V16	ON/OFF
SERIES NUMBER, PAGES 4 & 5	VARIATIONS OF BASIC UNIT, PAGES 14 & 15	BASIC UNIT, PAGE 7	SWITCH ASSEMBLY, PAGES 8 & 9	LAMPS, PAGE 10	COLORED BULB FILTERS, PAGES 10 & 11	DISPLAY SCREENS, PAGE 11	LEGEND CONFIGURATION, PAGES 12 & 13	LEGEND WORDING, PAGES 12 & 13

A sample part number appears at the top of each of the following pages emphasizing the code you are selecting from that page.

The exploded view below illustrates the elements of a typical Series 10 Switch-Lite or Indicator-Lite unit and the pages of this catalog that describe each element.

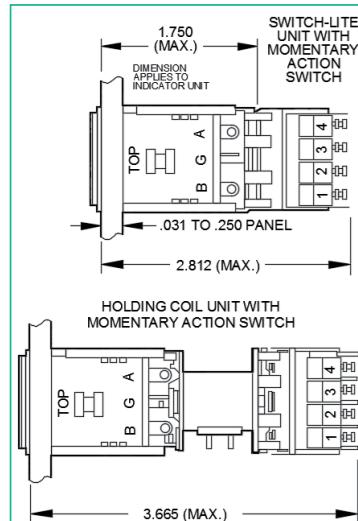


SERIES NUMBER - 10E

10E1C2F2J3L(AABB)N2R1,V16 ON/OFF

COMPLETED UNIT OUTLINE DIMENSIONS

The first three digits of the part number are the Series Number, which identify the unit. In this case the Series Number is «10E», which identifies it as a 4-lamp indicator unit with snap-on switch capability. The unit's physical size, panel cutout dimension requirements, and mounting arrangement capabilities are described and illustrated on the following pages.

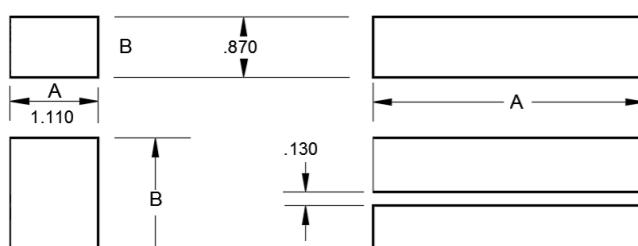


NOTES :

1. Terminals will accept two #20 (AWG) wire leads.
2. Holding Coil Power Requirements: 3 watts (MAX).
3. For mounting on panels 0.000-0.150 inch thick, the notch on the side of the mounting sleeve should be toward the front of the unit. For mounting on panels 0.150-0.280 inch thick, the sleeve should be turned around so that the notch is toward the back of the unit.
4. When the mounting unit is 90° from normal, the top of the unit shall appear on right side as viewed from the panel front.

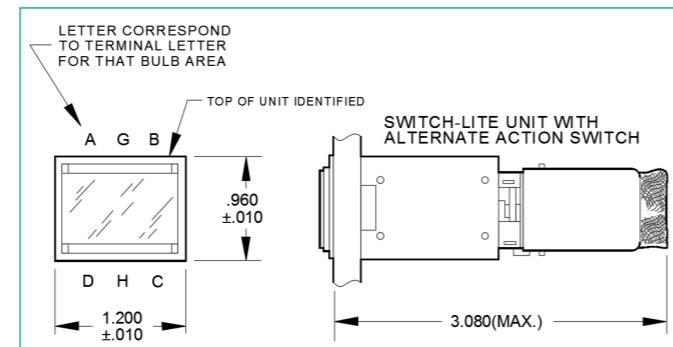


PANEL CUTOUT DIMENSIONS FOR SERIES 10E



NO. OF UNITS	A	B	NO. OF UNITS	A	B
1	1.110	.870	6	7.160	5.720
2	2.320	1.840	7	8.370	6.690
3	3.530	2.810	8	9.580	7.660
4	4.740	3.780	9	10.790	8.630
5	5.950	4.750	10	12.000	9.600

NOTE: Series 10H panel cutout dimensions are shown on page 5.



SERIES NUMBER - 10H

10H1C3F2J3L(GGRR)N3R1,V16 ON/OFF

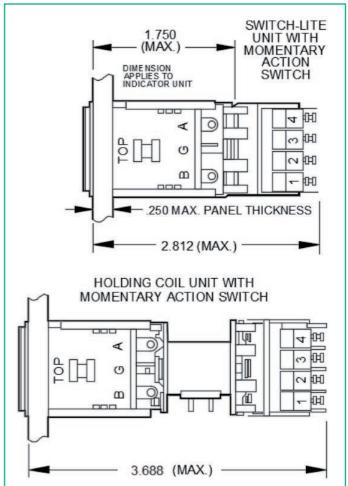
COMPLETED UNIT OUTLINE DIMENSIONS

The Series **10H** is basically the same as the Series **10E**, except it has been qualified to meet the requirements of MIL-PRF-22885. Its outline dimensions are slightly different and are shown on the following diagrams.

The following is a cross reference of the MIL-PRF-22885 part numbers to the Safran Series **10H** part numbers. Part numbers shown are for units without lamps or color filters. When color filters are required, add color symbols within (). For lamp ordering information see page 12.

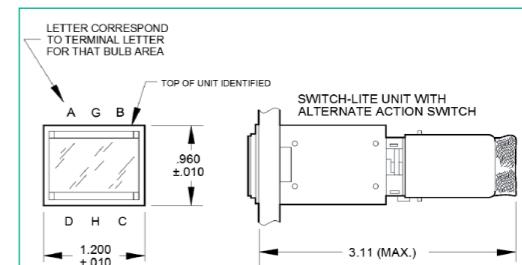
MILITARY PART NUMBER	SAFRAN PART NUMBER	TYPE
M22885/9-01 (XXXX)	10H1C1F1L()N1R1	
M22885/9-02 (XXXX)	10H1C1F2L()N1R1	
M22885/9-03 (XXXX)	10H1C1F3L()N1R1	
M22885/9-04 (XXXX)	10H1C1F4L()N1R1	
M22885/9-05 (XXXX)		
M22885/9-06 (XXXX)		
M22885/9-07 (XXXX)		
M22885/9-08 (XXXX)		
M22885/9-09 (XXXX)	10H1C1F1L()N2R1	
M22885/9-10 (XXXX)	10H1C1F2L()N2R1	
M22885/9-11 (XXXX)	10H1C1F3L()N2R1	
M22885/9-12 (XXXX)	10H1C1F4L()N2R1	
M22885/9-13 (XXXX)	10H1C2F1L()N2R1	
M22885/9-14 (XXXX)	10H1C2F2L()N2R1	
M22885/9-15 (XXXX)	10H1C2F3L()N2R1	
M22885/9-16 (XXXX)	10H1C2F4L()N2R1	
M22885/9-17 (XXXX)	10H1C1F1L()N3R1	
M22885/9-18 (XXXX)	10H1C1F2L()N3R1	
M22885/9-19 (XXXX)	10H1C1F3L()N3R1	
M22885/9-20 (XXXX)	10H1C1F4L()N3R1	
M22885/9-21 (XXXX)	10H1C3F1L()N3R1	
M22885/9-22 (XXXX)	10H1C3F2L()N3R1	
M22885/9-23 (XXXX)	10H1C3F3L()N3R1	
M22885/9-24 (XXXX)	10H1C3F4L()N3R1	
M22885/9-25 (XXXX)	10H1C3F1L()N1R1	
M22885/9-26 (XXXX)	10H1C3F2L()N1R1	
M22885/9-27 (XXXX)	10H1C3F3L()N1R1	
M22885/9-28 (XXXX)	10H1C3F4L()N1R1	
M22885/10-01 (XXXX)	10H2C1L()N1R1	
M22885/10-03 (XXXX)	10H2C1L()N2R1	
M22885/10-04 (XXXX)	10H2C2L()N2R1	
M22885/10-05 (XXXX)	10H2C1L()N3R1	
M22885/10-06 (XXXX)	10H2C3L()N3R1	
M22885/10-07 (XXXX)	10H2C3L()N1R1	

Additional mil-spec listings available on request.



NOTES :

1. Terminals will accept two #20 (AWG) wire leads.
2. Holding Coil Power Requirements: 3 watts (MAX).
3. For mounting on panels 0.000-0.150 inch thick, the notch on the side of the mounting sleeve should be toward the front of the unit. For mounting on panels 0.150-0.280 inch thick, the sleeve should be turned around so that the notch is toward the back of the unit.
4. When the mounting unit is 90° from normal, the top of the unit shall appear on right side as viewed from the panel front.



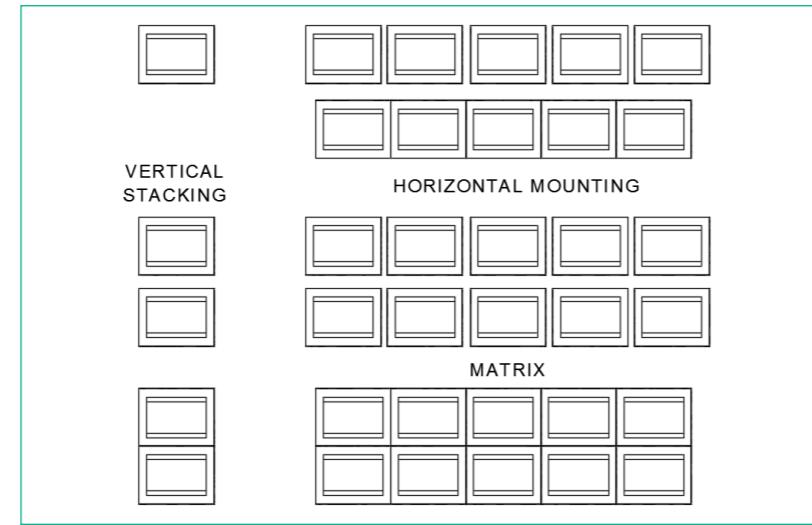
NO. OF UNITS	A	B	NO. OF UNITS	A	B
1	1.115	.875	6	7.165	5.725
2	2.325	1.845	7	8.375	6.695
3	3.535	2.815	8	9.585	7.665
4	4.745	3.785	9	10.795	8.635
5	5.955	4.755	10	12.005	9.605

NOTE: Series 10E panel cutout dimensions are shown on page 4.

MOUNTING 10E & 10H

EASY PANEL MOUNTING

The unit is easily mounted to the panel by installing it from the front of the panel and sliding the mounting sleeve over the rear of the unit. The two captive mounting screws - accessible from the panel front when the front end assembly is removed - are then tightened with a standard screwdriver, pulling the sleeve tight against the back of the panel.

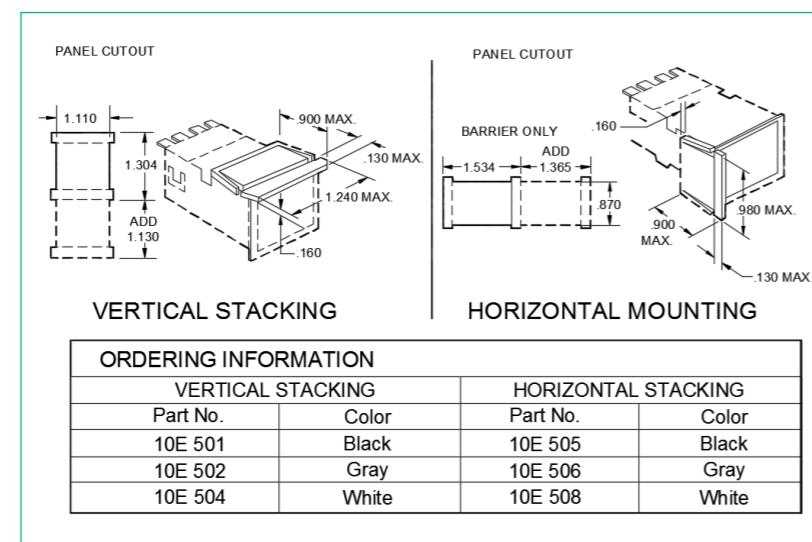


UNLIMITED MOUNTING ARRANGEMENTS

Designers are afforded infinite flexibility in panel layout. Units may be mounted individually with no restrictions as to the space allowed between associated equipments. Vertical and horizontal rows can be mounted in elongated cutouts rather than in individual cutouts. Units may be removed or installed without disturbing adjacent units. Matrix mountings are available.

SPACER BARRIERS

These spacer barriers provide additional separation between units, and are available in several different colors. Styles for vertical stacks or horizontal rows are offered. Barriers are ordered separately from unit.



ORDERING INFORMATION

VERTICAL STACKING		HORIZONTAL STACKING	
Part No.	Color	Part No.	Color
10E 501	Black	10E 505	Black
10E 502	Gray	10E 506	Gray
10E 504	White	10E 508	White

BASIC UNITS - SERIES 10

10E A1C2F2J3L(AABB)N2R1,V16 ON/OFF & 10H A1C2F2J3L(GGRR)N3R1,V16 ON/OFF

SWITCH-LITE UNITS

Combined capability of both indication and switching are available in this unit. Depression of the front lens actuates the switch contacts, which are completely isolated from the lamp circuit, allowing independent control of illumination. Switches are available in momentary or alternate action, 2PDT or 4PDT.

INDICATOR UNITS

Applications requiring indication only are easily accomplished by the indicator unit, which has a limiting clip installed to prevent the front lens from being depressed. This unit is readily converted to a Switch-Lite by removal of the clip and installation of the desired switch assembly.

HOLDING COIL UNITS

Numerous electrical interlock, lock-in, and lock-out circuits are made possible by including a magnetic holding coil with the Switch-Lite unit. Depressing the front lens after the coil has been energized causes the switch contacts to remain actuated until the coil voltage is removed.

INTERNALLY BUSSSED LAMP CIRCUITS REDUCE SOLDERING, SAVE INSTALLATION TIME AND COST

The various lamp circuits for versatile display use are internally bussed to eliminate several soldering operations and provide additional flexibility in design.

Typical lamp circuits are shown in the following table.

Series 10E

BASIC UNIT ORDERING CODE

LAMP CIRCUIT	SWITCH-LITE UNIT	INDICATOR UNIT	HOLDING COIL UNIT		
			6 VOLT	12 VOLT	28 VOLT
1 COMMON GROUND SEPARATE INPUT		A1C1	A2C1	A4C1	A5C1
2 HORIZONTAL SPLIT GRD. SEPARATE INPUT		A1C2	A2C2	A4C2	A5C2
3 VERTICAL SPLIT GRD. SEPARATE INPUT		A1C3	A2C3	A4C3	A5C3
4 SEPARATE GROUND SEPARATE INPUT		A1C4	A2C4	A4C4	A5C4
5 COMMON GROUND COMMON INPUT		A1C5	A2C5	A4C5	A5C5
6 COMMON GROUND HORIZONTAL SPLIT INPUT		A1C6	A2C6	A4C6	A5C6
7 COMMON GROUND VERTICAL SPLIT INPUT		A1C7	A2C7	A4C7	A5C7
8 HORIZONTAL SPLIT GRD. HORIZONTAL SPLIT INPUT		A1C8	A2C8	A4C8	A5C8
9 VERTICAL SPLIT GRD. VERTICAL SPLIT INPUT		A1C9	A2C9	A4C9	A5C9

Series 10H

BASIC UNIT ORDERING CODE

LAMP CIRCUIT	SWITCH-LITE UNIT	INDICATOR UNIT	HOLDING COIL UNIT		
			6 VOLT	12 VOLT	28 VOLT
1 COMMON GROUND SEPARATE INPUT		A1C1	A2C1	A4C1	A5C1
2 VERTICAL SPLIT GRD. SEPARATE INPUT		A1C2	A2C2	A4C2	A5C2
3 HORIZONTAL SPLIT GRD. SEPARATE INPUT		A1C3	A2C3	A4C3	A5C3
4 SEPARATE GROUND SEPARATE INPUT		A1C4	A2C4	A4C4	A5C4
5 COMMON GROUND COMMON INPUT		A1C5	A2C5	A4C5	A5C5
6 COMMON GROUND HORIZONTAL SPLIT INPUT		A1C6	A2C6	A4C6	A5C6
7 COMMON GROUND VERTICAL SPLIT INPUT		A1C7	A2C7	A4C7	A5C7
8 HORIZONTAL SPLIT GRD. HORIZONTAL SPLIT INPUT		A1C8	A2C8	A4C8	A5C8
9 VERTICAL SPLIT GRD. VERTICAL SPLIT INPUT		A1C9	A2C9	A4C9	A5C9

SWITCH ASSEMBLIES - SERIES 10E

10EA1C2F2J3L(AABB)N2R1,V16 ON/OFF

SNAP-ACTION CONTACTS

Switch assemblies feature a positive snap-action design that assures instantaneous contact transfer, which is perceptible to the touch at the instant of actuation. The force required to switch is sufficient to prevent accidental switching.

BIFURCATED CONTACTS

Bifurcated contacts multiply reliability up to 40 times compared with single-point contacts. This feature uses two parallel contact points, either of which can handle the rated load, insuring against effects of particulate contamination. Offers more reliable dry circuit switching.

SWITCH RATINGS

SNAP-ACTION CONTACTS

SILVER: Rated for 5 amps at 125 or 250 volts A.C. The 30-volt D.C. rating is: Inductive, 3 amps; Resistive, 5 amps.

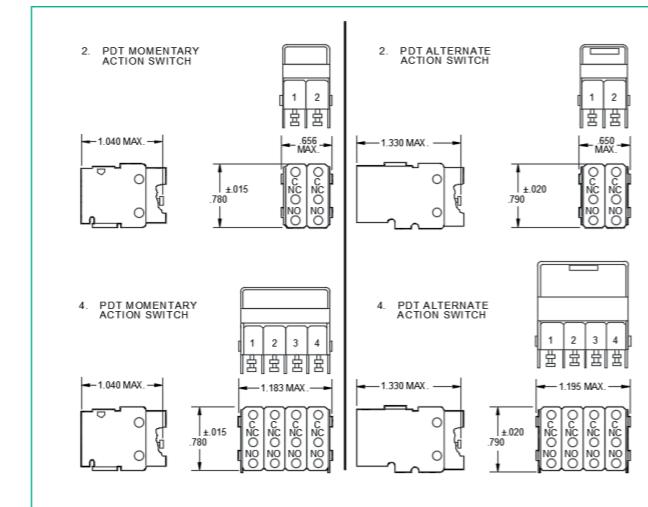
GOLD: The 30-volt D.C. rating is: Inductive, $\frac{1}{2}$ amp, Resistive 1 amp.

BIFURCATED CONTACTS

GOLD: The 30-volt D.C. rating is: Inductive $\frac{1}{2}$ amp, Resistive 1 amp.

BASIC UNIT TYPE	MOMENTARY ACTION		ALTERNATE ACTION	
	2PDT	4PDT	2PDT	4PDT
Snap-action silver	F1	F2	F3	F4
Snap-action gold	F10	F11	F12	F13
Sliding-bifurcated gold	F38	F39	F40	F41

NOTE: For Series 10H Switch Assembly ordering code see Page 9.



SWITCH ASSEMBLIES - SERIES 10H

10HA1C3F2J3L(GGRR)N3R1,V16 ON/OFF

SNAP-ACTION CONTACTS

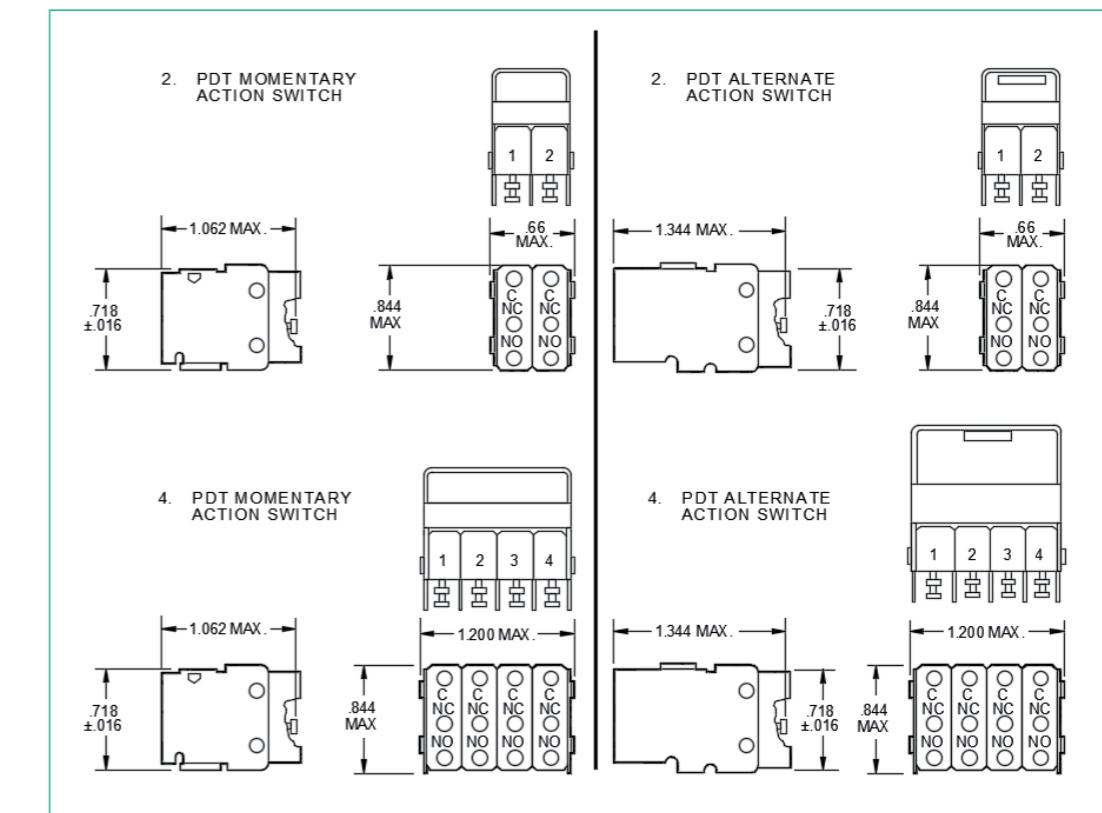
Switch assemblies feature a positive snap-action design that assures instantaneous contact transfer, which is perceptible to the touch at the instant of actuation. The force required to switch is sufficient to prevent accidental switching.

SWITCH RATINGS (AT SEA LEVEL)

SNAP-ACTION CONTACTS

SILVER: Rated for 5 amps at 115 volts A.C. for both inductive and resistive loads. The 28-volt D.C. rating is: Inductive, 3 amps; Resistive, 5 amps.

SWITCH CONTACTS	MOMENTARY ACTION		ALTERNATE ACTION	
	2PDT	4PDT	2PDT	4PDT
SNAP-ACTION SILVER	F1	F2	F3	F4
MILITARY PART NUMBER	M22885/11-01	M22885/11-02	M22885/11-03	M22885/11-04



LAMPS & COLORED LAMP FILTERS SERIES 10E OR 10H

10EA1C2F2J3L(AABB)N2R1,V16 ON/OFF

LAMP TYPES

T-1½ midget flange base incandescent lamps are available in 6, 12, and 28 volts. A special neon lamp with or without a built-in current limiting resistor is also available for 115VAC applications, but is only recommended for use with red or amber colors. See the accompanying table for part number ordering codes.

Note: Neon lamps without built-in resistor require external current limiting resistance.

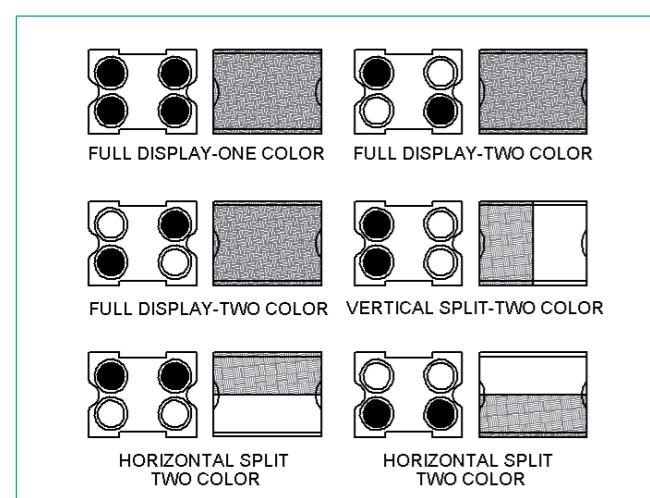
When ordering as a separate item, precede the above code number by basic «10E» or «10H» to make part number.

COLORED LAMP FILTERS

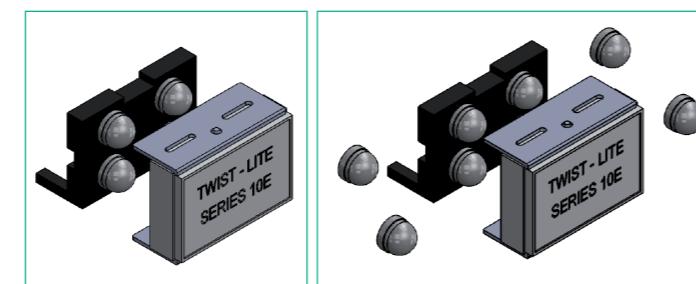
Individual lamp color control is provided by silicone rubber filters, which fit over each lamp socket. These high efficiency filters are available in amber, blue, green, red, white, and yellow. The chromaticity of each color has been carefully selected to insure maximum operator response and discernibility between colors.

PROJECTED COLOR

Prior to illumination the black letters engraved on the clear front lens are easily read against the white translucent display screen background. When energized, the background illuminates in color. Projected color also provides for full display, two color indication as well as two color split screen indications.



6 VOLT LAMPS	12 VOLT LAMPS	28 VOLT LAMPS	115 VAC NEON LAMPS WITH RESISTORS	115 VAC NEON LAMPS WITHOUT RESISTORS
J1	J2	J3	J4	J10



COLORED LAMP FILTER ORDERING CODES

All colors apply to Series 10E. All colors, except amber (A), apply to Series 10H, military version.

COLOR	CODE NUMBER	MILITARY PART NUMBER
AMBER	L(A)	
BLUE	L(B)	M22885/12-001
GREEN	L(G)	M22885/12-002
RED	L(R)	M22885/12-003
WHITE (see NOTE 2)	L(W)	M22885/12-004
YELLOW	L(Y)	M22885/12-005

NOTES:

1. Where more than one color is desired within the same unit, denote by including within the parenthesis, (), all colors desired. Priority for actual location in the unit when viewed from the front of the panel is: upper left, upper right, lower left, lower right.

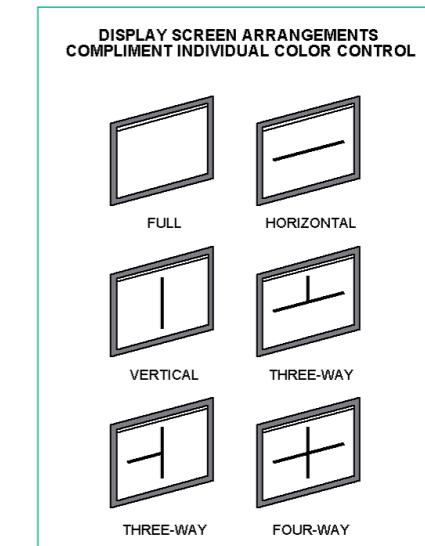
Where two colors are indicated, and the display screen callout is for a full display, the first color will be upper left, lower right and the second color will be upper right, lower left.

2. White color is produced by a light blue bulb filter.

DISPLAY SCREENS FOR SERIES 10

10EA1C2F2J3L(AABB)N2R1,V16 ON/OFF or 10HA1C3F2J3L(GGRR)N3R1,V16 ON/OFF

The advantages of individual lamp color control and projected color is further enhanced by the display screen which is available in all possible display arrangements. This combined capability provides an unlimited number of indication arrangements.



WHITE TRANSLUCENT DISPLAY SCREENS

The translucent display screen evenly diffuses the light across the entire front lens. Variations in background color are effected through the use of color lamp filters. Where horizontally or vertically-split displays are desired, color lamp filters can provide a different color in each part of the display with no light leakage between displays because of a unique divider arrangement. Screen appears white until illuminated and then appears in color.

Series 10E

TRANSLUCENT WHITE DISPLAY SCREEN CODE NUMBERS			
FULL N1	HORIZONTAL SPLIT N2	VERTICAL SPLIT N3	FOUR-WAY SPLIT N15
THREE-WAY SPLIT N11	THREE-WAY SPLIT N12	THREE-WAY SPLIT N13	THREE-WAY SPLIT N14

Series 10H

TRANSLUCENT WHITE DISPLAY SCREEN CODE NUMBERS			
FULL N1	HORIZONTAL SPLIT N3	VERTICAL SPLIT N2	FOUR-WAY SPLIT N15
THREE-WAY SPLIT N11	THREE-WAY SPLIT N12	THREE-WAY SPLIT N13	THREE-WAY SPLIT N14

COLORED DISPLAY SCREENS

The normally translucent white display screens are also available in translucent colors. All standard colors are available in any combination of colors for split display. Colored lamp filters are not required when using colored display screens. Screen appears in color when not illuminated and glows brightly in color when illuminated.

COLOR DISPLAY SCREEN CODE NUMBERS			
N4(X)	N5(XX)	N6(XX)	N20(XXX)
N16(XXX)	N17(XXX)	N18(XXX)	N19(XXX)

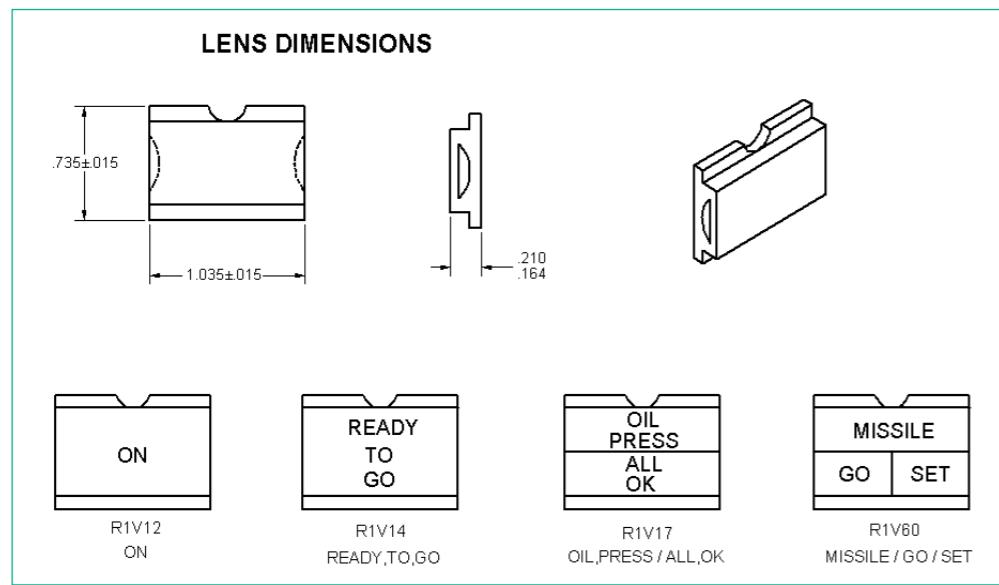
LEGENDS - SERIES 10E & 10H

10EA1C2F2J3L(AABB)N2R1,V16 ON/OFF

TRANSMITTED COLOR (SLAB FILTERS)

The front lens with required engraving is ordered by following the callout «R1V» with the engraving configuration number as selected from those below.

After this, the actual wording is added, using commas between rows of lettering and a straight vertical line between splits. Priority for segments of split displays when viewed from the front of the panel is upper left, upper right, lower left, lower right. Examples are shown at the right.



BLANK FRONT LENS

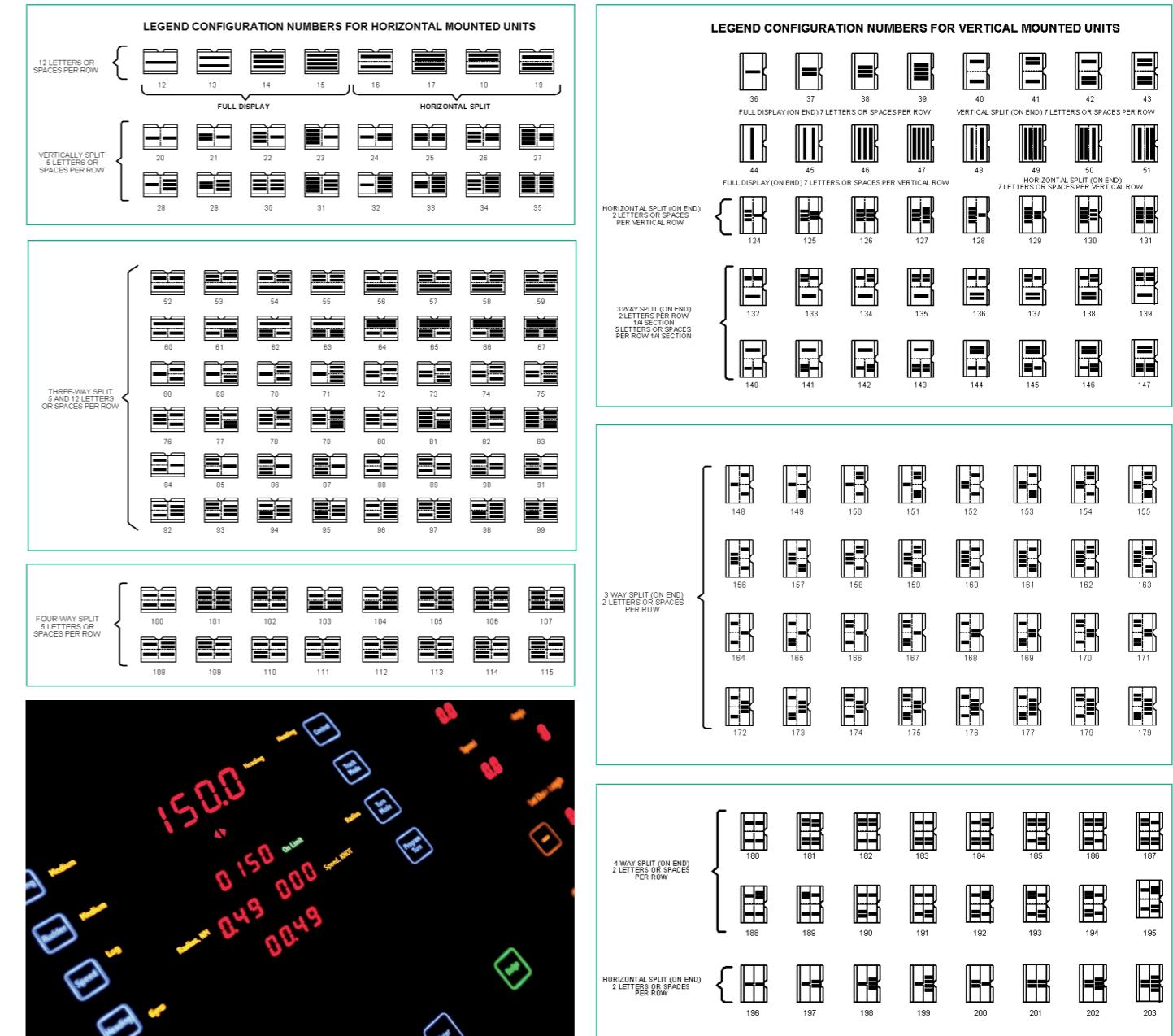
When a non-engraved front lens is required, the code number «R1» is used, eliminating the remaining part of the engraved front lens callout.

SEPARATE ENGRAVED LENS

Where separate engraved lenses are required, precede the complete engraved front lens callout with the basic «10E» or «10H».

ENGRAVING SPECIFICATIONS

Front lens is reverse engraved 0.120 inch high with 0.020 inch stroke and filled with a special black filler. The engraving is done on the back face of the lens for appearance and long life.



FOUR COLOR DISPLAY FOR SERIES 10E OR 10H

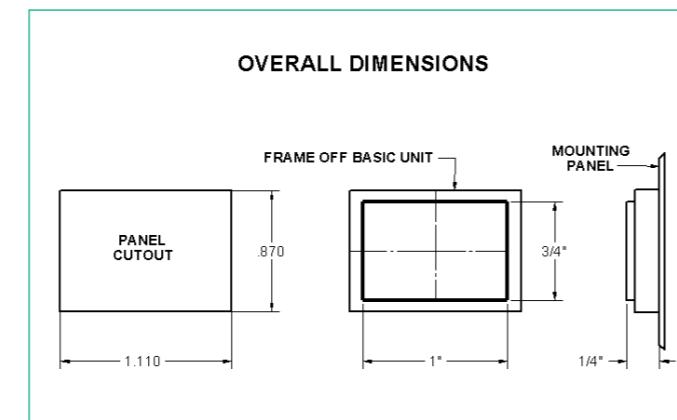
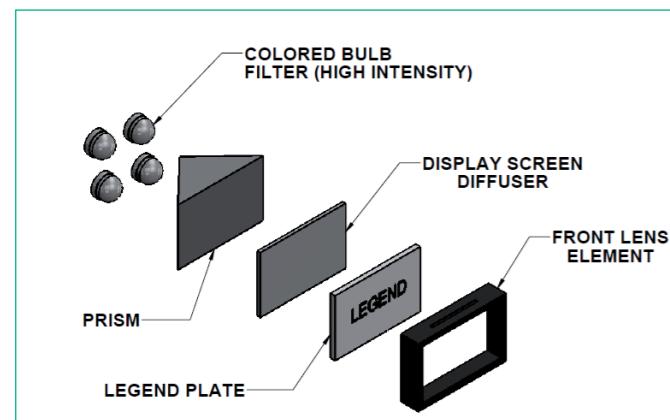
10E10A1C1F1J3L1(ARGW)N10R10, V12 LAUNCH

The four-color Twist-Lite is a unique indicating light offering four separate color indications on the full display screen of each unit. The different colors are obtained by four individual lamp circuits in the same Twist-Lite unit. Each lamp is furnished with a colored bulb filter to produce the desired indicating color. A prismatic lens arrangement is placed between the indicating lamp and legend plate. The design of the prism has been made to offer maximum uniform light intensity integrated across the full display face with only one lamp illuminated. In this manner, as each of the four lamps is illuminated singly, the legend face is completely flooded with the indicating color as determined by the color of the bulb filter over the energized lamp.

This unit incorporates several special features in addition to those of the Safran standard Twist-Lite. These special items include a high reflective white coating to the housing interior surfaces as well as a white nylon bulb board on the front end assembly.

The use of white reflecting surfaces offers maximum light reflectance for overall intensity on the legend face.

A unique front element is provided on the prismatic lens assembly. This front element has been molded with a clear viewing area surrounded by a black integrally mounted frame. With this arrangement all extraneous light leakage is eliminated from the sides of the lens assembly.



WHEN ORDERED AS A PART OF A COMPLETE UNIT.	10E 10 A1C1 F1 J3 L1(A) N10 R10, V13 MISSILE, AWAY <small>HIGH INTENSITY COLORED BULB FILTERS</small> <small>LEGEND ARRANGEMENT AND WORDING REQ'D.</small> <small>FOR 4-COLOR TWIST-LITE WITH BRIGHT FINISH HOUSING. ADD (12) FOR 4-COLOR TWIST-LITE WITH BLACK FINISH HOUSING.</small>	
WHEN ORDERED AS A SEPARATE ASSEMBLY.	10E N10 R10 <small>FRONT LENS ASSEMBLY (4 PIECE)</small> <small>4-COLOR LENS ASSEMBLY</small> <small>NOTE: THIS ORDER NUMBER CONSISTS OF ONE EACH; PRISM, DIFFUSER, LEGEND PLATE, AND FRONT ELEMENT.</small>	
WHEN ORDERED AS REPLACEMENT PARTS.	<small>FRONT LENS ELEMENT</small> 10E 535 <small>DISPLAY SCREEN DIFFUSER</small> 10E 536 <small>PRISM</small> 10E 537 <small>LEGEND PLATE</small> 10E 539 <small>NOTE: LEGEND PLATE NOT ENGRAVED</small> <small>COLORED BULB FILTER (HIGH INTENSITY)</small> 10E L1() <small>ADD COLOR LETTER FOR COLOR REQUIRED</small>	
ENGRAVED LEGEND ORDERED AS REPLACEMENT PARTS.	10E R10, V13 MISSILE, AWAY <small>LEGEND ARRANGEMENT AND WORDING REQUIRED.</small> <small>LEGEND PLATE FOR 4-COLOR</small> <small>*MAXIMUM OF THREE LINES OF ENGRAVING ON LEGEND PLATE OF 4 COLOR TWIST-LITE ONLY.</small>	

SWITCH GUARD & RF1 SCREEN SERIES 10E & 10H

10EA1C2F2J3L1(AABB)M1N2R1,V16 ON/OFF

SWITCH GUARD

Full protection against inadvertent switch actuation is provided by a clear plastic cover hinged at the top and spring loaded to the closed position. The attachment may be easily installed in the field on any Twist-Lite. To install, pull out the front end assembly and loosen the housing mounting screws to provide sufficient clearance between the Twist-Lite frame and panel. When properly aligned, the Switch Guard retainer is slipped onto the frame. The order number for the Twist-Lite Switch Guard is **10E534** or **10H534**.

RF1 SCREEN

Added protection against unwanted radiated and conducted RFI passage through the Twist-Lite panel cut-out is attained through the use of a fine-mesh metal screen attached to the lens retainer behind the display screen. The silver-plated beryllium copper screen makes contact with the stainless steel housing in four separate areas. The RFI Screen is available for full, vertical, horizontal, three, or four-way split displays. The RFI Screen and the display screen are installed as an integral part of the front-end assembly during the manufacturing. The Screen may be included as part of either a completed Twist-Lite assembly or a front-end assembly with display screen.

SPARE PART NUMBERS*

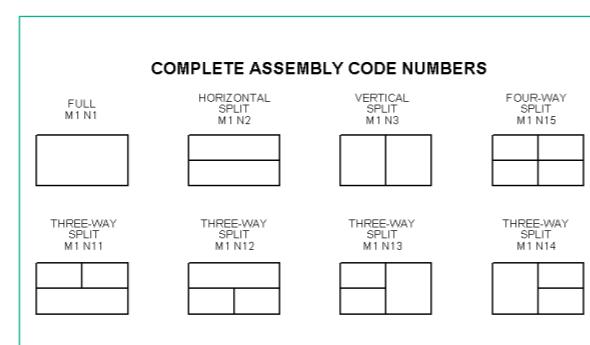
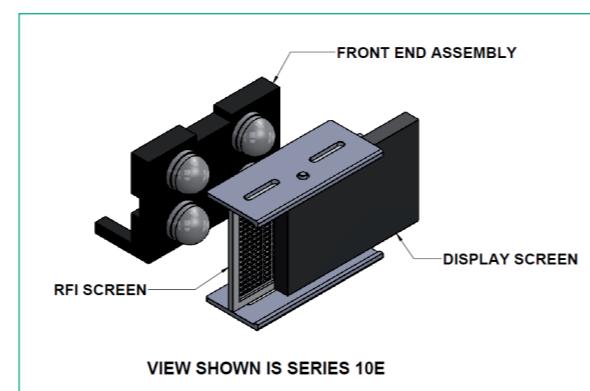
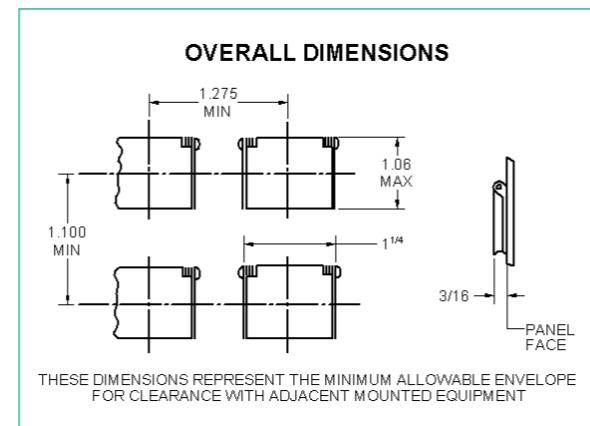
(Front end assembly with RFI Screen and white Display Screen)

TYPE OF UNIT			
DISPLAY SCREEN	INDICATOR	SWITCH	HOLDING COIL
FULL DISPLAY	10E or 10H 557	10E or 10H 613	10E or 10H 647
HORIZONTAL SPLIT	10E or 10H 558	10E or 10H 614	10E or 10H 648
VERTICAL SPLIT	10E or 10H 559	10E or 10H 615	10E or 10H 649
3-WAY SPLIT	10E or 10H 560	10E or 10H 616	10E or 10H 650
3-WAY SPLIT	10E or 10H 561	10E or 10H 617	10E or 10H 651
3-WAY SPLIT	10E or 10H 562	10E or 10H 618	10E or 10H 652
3-WAY SPLIT	10E or 10H 563	10E or 10H 619	10E or 10H 653
4-WAY SPLIT	10E or 10H 564	10E or 10H 620	10E or 10H 654

*Add «H», «V» or «S» to the end of the Unit Part Number when Split Ground for Lamp Circuit shown on Page 7 is required. No letter designation is required for common ground.

Example:

10E 558 H
HORIZONTAL SPLIT GROUND
LAMP CIRCUIT
FRONT END ASSEMBLY,
WITH RFI SCREEN
AND WHITE DISPLAY SCREEN.
BASIC CODE NO. (10H FOR SERIES 10H)



EFFECTIVE, SIMPLIFIED 2-PART ASSEMBLY

The Drip-Proof Seal is an effective accessory to the basic Series 10 Twist-Lite unit for applications where adverse environmental conditions could prove destructive to equipment in which push-button switching devices are employed. Comprised of two parts, this assembly provides a more effective seal than other available types. The two parts are (1) a flexible transparent plastic front covered seal and (2) a plastic retainer.

QUICKLY, EASILY INSTALLED

Installation of the Drip-Proof Seal is easily accomplished during the mounting of the Twist-Lite unit. Before the switch assembly is snapped onto the indicator unit, the retainer is slipped over the indicator unit from the back. It is slid forward as far as it will go to frame the flange of the unit housing.

The Twist-Lite unit is then mounted in the normal manner. After the Twist-Lite has been mounted to the panel, the front seal can be simply pressed into place over the flange of the retainer.

NO HINDRANCE OF LEGEND READABILITY OR SWITCH ACTUATION

The properties of the front seal yield a virtually transparent, flexible cover that permits free movement of the switching mechanism with the application of normal pressure. Legends can be easily read before or during illumination.

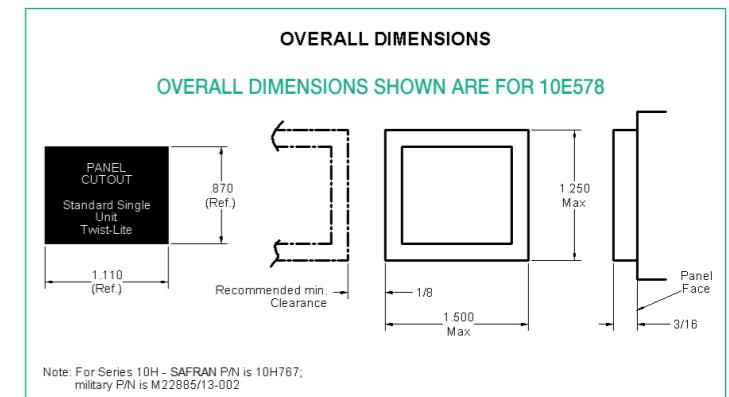
QUICK ACCESS TO FRONT END ASSEMBLIES

The front seal can be simply removed at any time by snapping it off from the retainer, permitting removal of the front end assembly of the indicator unit for relamping, change of colored lamp filters or for front lens legend replacement. No tools are required for any of the changes.

NO SPECIAL LEGEND PLATES REQUIRED

Since it is made from clear plastic material, the Drip-Proof Seal can be used with standard Series **10E** Twist-Lite reverse engraved front lenses.

DRIP PROOF SEAL SERIES 10E & 10H



WHEN ORDERED AS AN INDIVIDUAL PART	10E 578 Drip-Proof Seal - (2 piece: RETAINER AND FRONT SEAL). BASIC CODE NUMBER
WHEN ORDERING FRONT LENS ENGRAVED SEPARATELY	10E R1, V13 MISSILE, AWAY LEGEND ARRANGEMENT AND WORDING (TYPICAL) STANDARD LENS BASIC CODE NUMBER





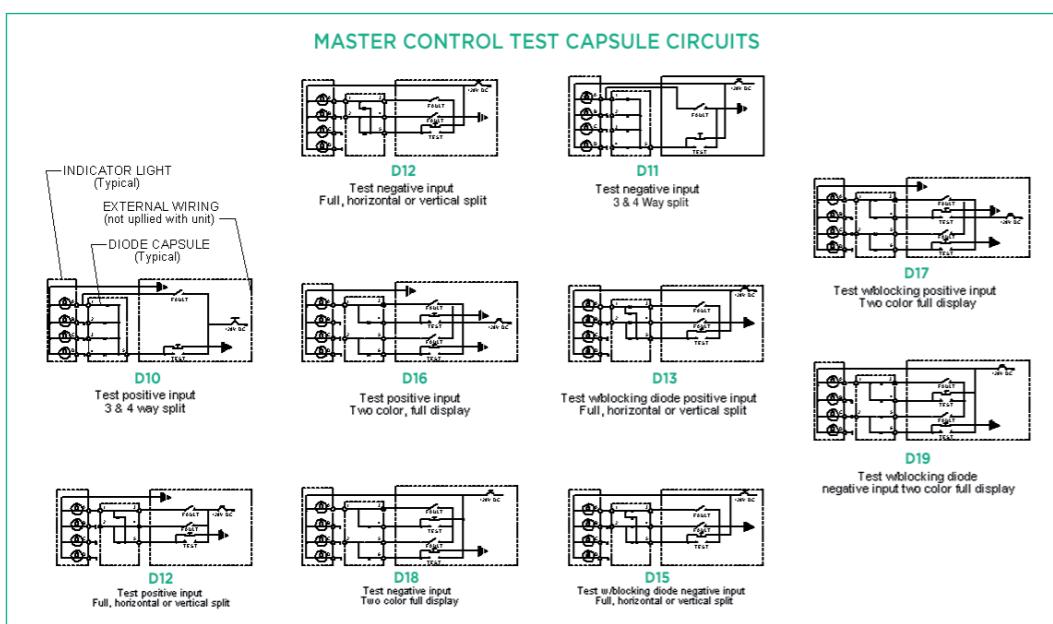
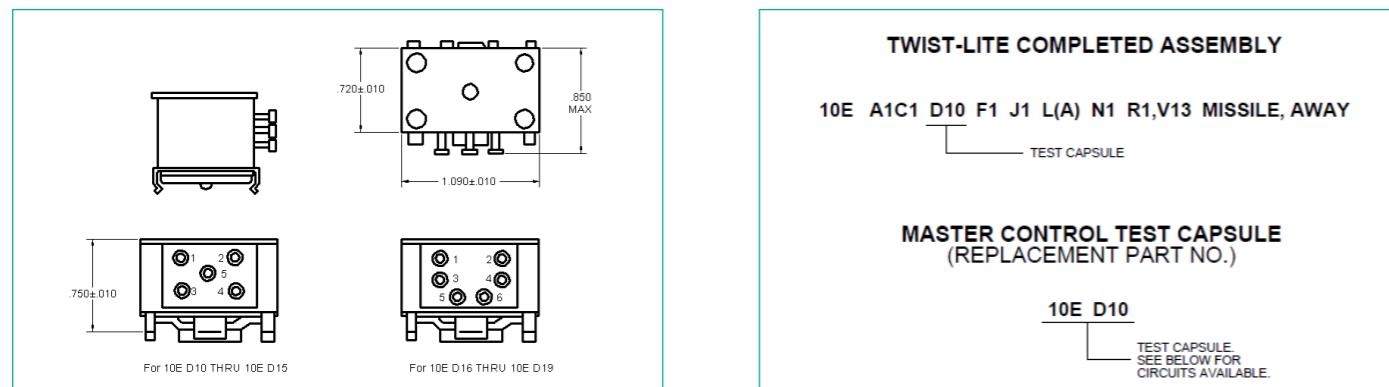
MASTER CONTROL TEST CAPSULES SERIES 10E & 10H

10EA1C1D10F1J1L(AAAA)N1R1,V12 LAUNCH

Components required for Master Lamp Verification are encapsulated in a test control capsule which mounts on spring clips, located on the back of the Series **10E** Twist-Lite unit. This capsule eliminates the need for external circuitry and is available in a wide range of circuits, providing negative and positive test inputs for all available display screen styles. Spring clips are also provided on the back of the capsule, to allow attachment of switch assemblies.

ORDERING INFORMATION

The Twist-Lite series **10E** Diode Test Capsule may be ordered as part of a completed assembly or as a replacement part. Both methods of ordering are shown below.



QUALIFICATION TO MIL-PRF-22885

The Series 10 Twist-Lite Switches have been granted qualification approval to MIL-PRF-22885. To order MIL-PRF-22885 qualified units, the part number should include the letter "H" after the series number 10.

The list of Safran military specification part numbers for the Series 10H Switches is listed on page 5 of this catalog. Additional military specification part numbers for these switches are available upon request. Should you have a need for more information on these Military Qualified Products and its components, please consult your Safran representative or call the factory.

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BY TRUST**

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SAFRAN ELECTRONICS & DEFENSE AVIONICS USA LLC



 **SAFRAN**

SERIES 90E FEATURES

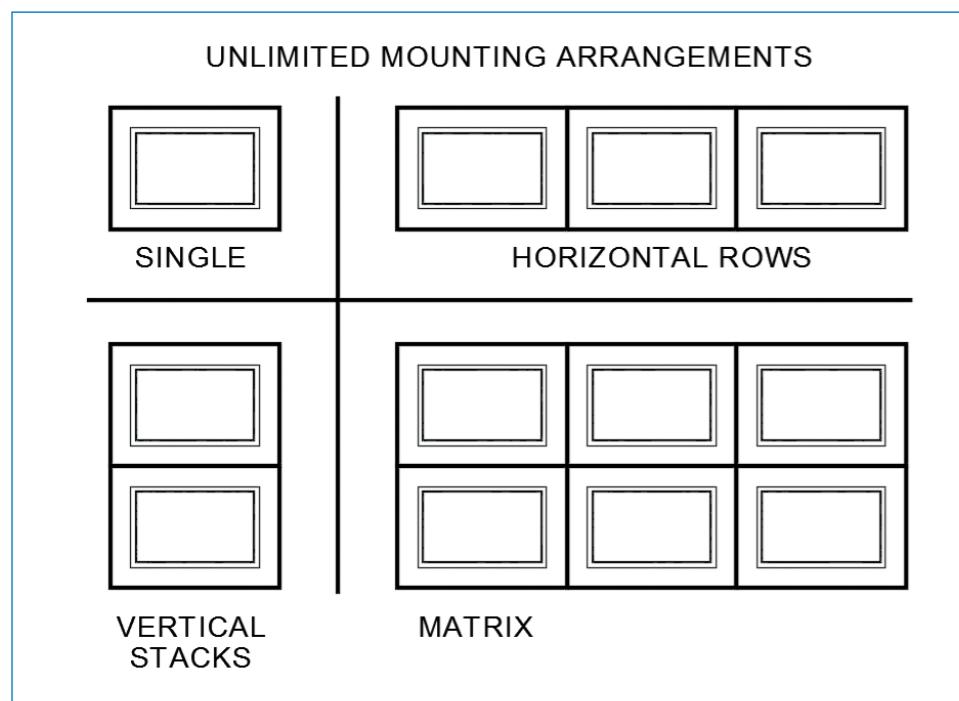
The Series 90 Tellite units are miniature, two-lamp lighted push-button switches and/or word indicator lights with capacity for up to three lines of legend in a compact area. They feature flush-to-the-panel mounting and rectangular lens configuration with word indication by means of two separate standard lamps. The lamps and/or lens assembly may be installed or removed from the panel front without the use of any tools.

Units are available from 2PDT in some versions to 4PDT, in either momentary or alternate switch action. Holding coil units are also available for electrical interlock.



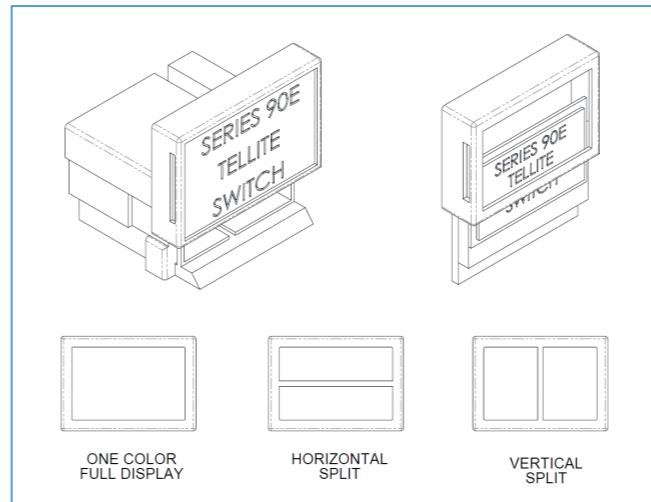
UNIQUE MOUNTING HAS NO LOOSE HARDWARE

The mounting is designed as an integral part of the main housing and consists of special mounting sleeves located in opposite corners. Removing the front-end assembly gives access to the screw heads which cam the mounting sleeves in position to contact the rear of the panel. Hard mounting is attained, yet no screw heads show from the panel front; there is no loose or special mounting hardware; and the mounting is completely contained within the outline dimensions of the unit's front face.



NO TOOLS REQUIRED FOR LAMP REPLACEMENT

Lamp replacement is accomplished from the panel front without the use of any tools. The light capsule, which holds the lamps and front lens, is held to the unit housing by spring clips which allow it to be removed for quick and easy lamp replacement



indications in the same unit. Colored display is achieved through the use of color filters. Color coded indication - two separate colors illuminating the full display screen - is available. A process in which SAFRAN Electronics & Defense pioneered is that of engraving on the reverse side of the lens. This avoids the usual problem of legends being effaced through normal wear.

SERIES 90H

The Series 90H Tellite Switch is **the military version of the Series 90E**, and it meets the requirements of MIL-PRF-22885/58. The package size, mounting method, and wire terminations are the same as the Series 90E. The following is a cross reference of the Mil-Spec part numbers and the 90H part numbers. Refer to subsequent pages for further definition of part number designations.

REMOVABLE LENS ASSEMBLY

Once the light capsule has been disengaged from the housing, the lens assembly is readily removed. This permits easy changing of display arrangement, color filter, or legend configuration. Simply slide the holder up, which frees the lens, diffuser, and color filter.

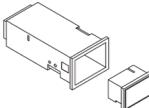
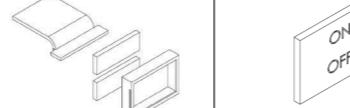
VERSATILE DISPLAY ARRANGEMENT

Word indication may be presented on a full, horizontally, or vertically split display screen. The full display one-color has the added feature of two-lamp reliability. The horizontal or vertical split is made possible by the unique design of the light capsule wherein one lamp illuminates each half of the display, thus providing two

MIL-SPEC Part No.	SAFRAN Part No.
M22885/58-01 (X)	90HA1C2J1 () L1N1
M22885/58-02 (XX)	90HA1C2J2 () L2N1
M22885/58-03 (XX)	90HA1C2J3 () L3N1
M22885/58-04 (X)	90HA1C3J1 () L1N1
M22885/58-05 (XX)	90HA1C3J2 () L2N1
M22885/58-06 (XX)	90HA1C3J3 () L3N1
M22885/58-07 (X)	90HA1C4J1 () L1N1
M22885/58-08 (XX)	90HA1C4J2 () L2N1
M22885/58-09 (XX)	90HA1C4J3 () L3N1
M22885/58-10 (X)	90HA1C5J1 () L1N1
M22885/58-11 (XX)	90HA1C5J2 () L2N1
M22885/58-12 (XX)	90HA1C5J3 () L3N1

SERIES 90E ORDERING INFORMATION

90EA1C2F3J2(AB)L2N1R16 ON/OFF

SERIES	BASIC UNITS	LAMPS	COLOR FILTERS	DISPLAY SCREEN	FRONT LENS AND ENGRAVING
90E	A1C2	F3	J2(AB)	L2	N1R16 ON/OFF
TELLITE SWITCH		2 EA. 28 VOLT LAMPS	1 EA. AMBER 1 EA. BLUE	 HORIZONTAL SPLIT	

CODED CALL-OUT PROVIDES EASY ORDERING

The completed unit, including the engraved inscription, may be ordered by a single coded call-out. This system eliminates the need for individually ordering each item required for a completed unit, which in turn would necessitate the customer having to assemble the items once received. The engraving service eliminates the customer's need for in-house engraving equipment or additional sub-contracting.

CODED CALL-OUT SYSTEM

Each item required for a completed unit is assigned a code number. By selecting the code number call-out for each item required and then placing these in alphabetical sequence following the series number «90E» a completed unit call-out is derived.

ELIMINATION OF ITEMS

Where one or more items comprising a completed unit are not required, omit the call-out for that item.

ORDERING SEPARATE ITEMS

Where separate items are required, precede an item's call-out with the basic «90E» to obtain the correct order number for that item. Lamps, when ordered separately, are always considered 1 each rather than the 2.

BASIC UNITS CODE NUMBERS

SWITCH CHARACTERISTICS	SWITCH UNIT	HOLDING COIL UNIT			
		6 Volt	12 Volt	28 Volt	48 Volt
2PDT Momentary	A1C2	A3C2	A4C2	A2C2	A5C2
4PDT Momentary	A1C3	A3C3	A4C3	A2C3	A5C3
2PDT Alternate	A1C4	-----	-----	-----	-----
4PDT Alternate	A1C5	-----	-----	-----	-----

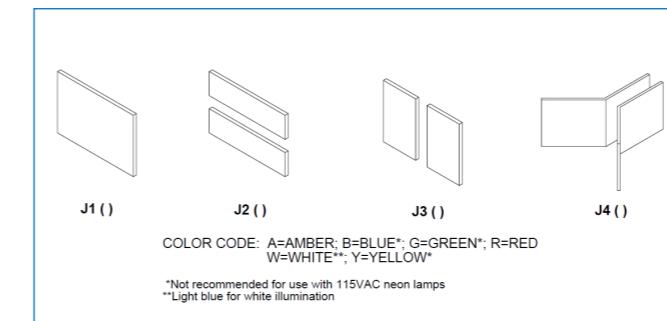
LAMP CODE NUMBERS

6 Volt	12 Volt	28 Volt	28 Volt Long Life	115 Volt Neon W/ Resistor	115 Volt Neon No Resistor
F1	F2	F3	F14	F4	F10

Lamp size: T-1 3/4 midget flanged base

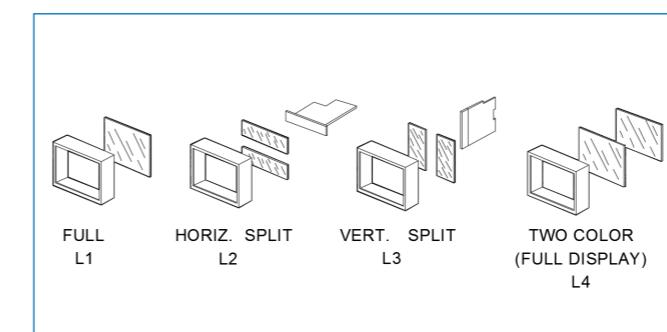
COLOR FILTER CODE NUMBER

To order a color filter for a specific display arrangement, use the code numbers shown for that display, followed by the color code letter desired in parentheses. In a horizontal split, the first color code denotes the top half of the display; the second color denotes the bottom half. In a vertical split, the first color code denotes the color for the left half of the display; the second color code denotes the color for the right half. For the 2-color full display, the first color code denotes the color to be used with the left lamp; the second color code denotes the color for the right lamp, as viewed from the panel front.



DISPLAY SCREEN CODE NUMBER

The code number includes the holder and dividers, where applicable. Full displays or horizontally or vertically split displays are available. The coded part number, «L1» etc., also includes the holder for the lens assembly.



NON-ENGRAVED LENS

When a non-engraved lens is required, the code number «N1» is used, eliminating the remaining part of the engraved lens call-out.

SEPARATE ENGRAVED LENSES

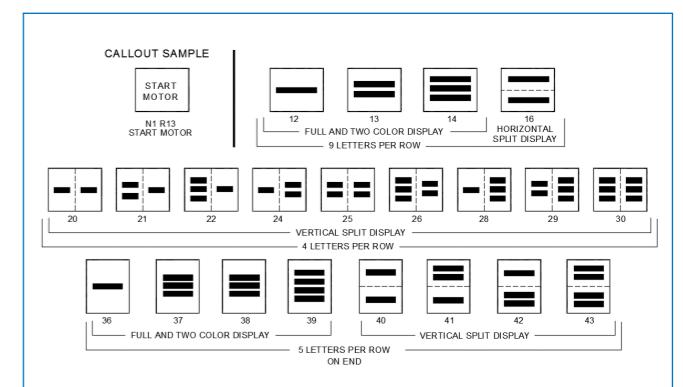
Where separate engraved lenses are required, precede the front lens and engraving code number call-out with the basic «90E».

ENGRAVING SPECIFICATIONS

Engraving of the 90E Series lens produces letters 0.110 inch in height, with a 0.017 inch stroke. Letters are filled with special black filler.

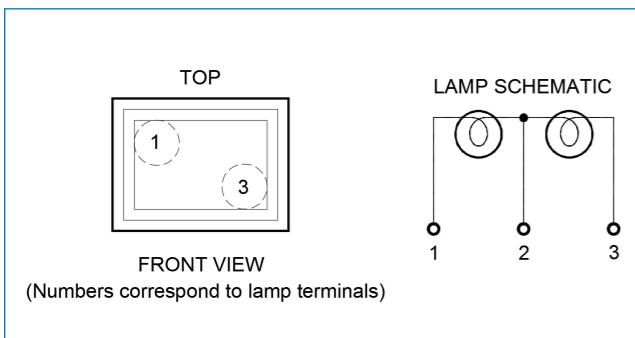
FRONT LENS AND ENGRAVING CODE NUMBER

The front lens with required engraving is ordered by following the call-out «N1R» with the engraving configuration number as selected below. After this, the actual wording is added, using commas between rows of wording and a straight vertical line between splits.



SERIES 90E TERMINAL I.D. & PANEL CUTOUT

LAMP LOCATION AND LAMP TERMINAL IDENTIFICATION

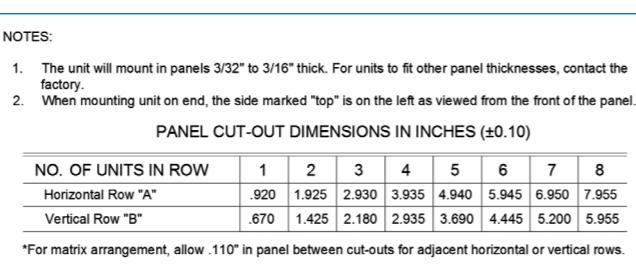
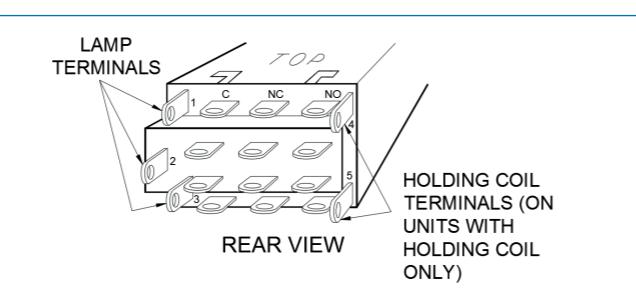
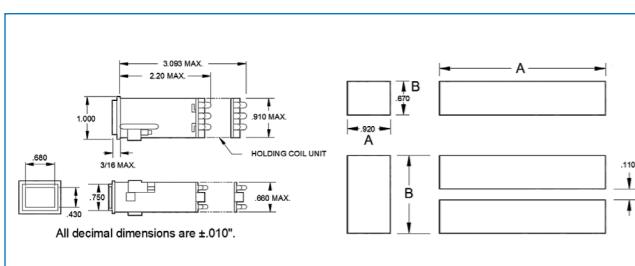


SWITCH TERMINAL IDENTIFICATION

NOTES:

1. On 2 PDT switches, switch terminals are furnished in center only.
2. Terminals will accept two No. 20 AWG wire leads.
3. Electrical ratings: 3 amps resistive, 1 1/2 amps inductive, 1 amp lamp load.
4. Holding coil power requirement: Maximum 3 watts.

Outline Dimensions and Panel Cutout



SERIES 90K FEATURES

SERIES 90K

The Series 90K Tellite units are available in three versions as an indicator-lite only, switch-lite, or switch-lite with holding coil. Package sizes of each version are shown in the dimensional drawings on page 8. Units are available with a choice of wiring terminals. All units may be specified with solder lugs or plug-in connector pins. In addition, indicator-lite only units may be specified with screw-type terminals. Each unit incorporates mounting tabs that provide a positive hard mount after inserting the unit through the panel cutout from the panel front. Captive mounting screws inside the unit cam out these mounting tabs and tighten them up against the back of the panel.

No external hardware required.



GENERAL

Basic Unit Types Available

Indicator-Lite, Switch-Lite, Switch-Lite with Holding Coil. Press to test indicator.

Switch Configurations and Actions

2PDT or 4PDT, momentary or alternate action

Lamp Types/Number of Lamps/

Voltage
Two T-1 3/4 incandescent 6, 12, or 28 volt based lamps (115 VAC neon lamps available)

Lamp Circuits Available

Common ground

Display Screen Arrangements

Full display, two-way vertical or horizontal split, two-color full display

Color Control Method

Slab filter in yellow, amber, red, green, blue, and white. Projected color (silicone rubber bulb boots) also available

Lens Types Available

Lighted letters or lighted background, letters either legible or not when unit is unlighted

Engraving Size

0.110" high with .017" stroke (standard)

Relamping

Front of panel without tools

Mounting Panel Thickness

1/32" to 3/16"

Mounting Method

Hard mount from front of panel with integral mounting nuts

Wiring Terminations

Switch: double turret, connector pins. Indicator: solder lugs, connector pins, screw type

Wire Sizes

Screw type and solder lug terminals accept up to #20 gauge wires. Connector pin type terminals accept #20 through 28 gauge wires

Optional Features Available

Control Circuits, Drip Proof Seal, RFI Screen, Spacer Barriers, Switch Guard, Panel Plug, Crimp Tool, Locator, Removal Tool

ELECTRICAL AND MECHANICAL CHARACTERISTICS

Operation

Momentary or Alternate

Action

Snap-action

Contacts

2PDT or 4PDT

Contact Ratings

3 amps resistive @115 to 250 VAC: 3 amps resistive, 1.5 amps inductive (minimum - 10mA @ 5V)

Mounting Panel Thickness

50 Milliohms @ 6 VDC and 100 ma

Operation Force

64 oz. max

Feel

Tactile

Mechanical Life

100,000 cycles (on and off = 1 cycle)

Electrical life

100,000 cycles

Stroke

0.125" nominal

Tease proof

Yes, 100%

Holding Coil Nominal Voltage

6, 12, 28 and 48 VDC

Holding Coil, Min. Hold-In Voltage

50% of nominal rating

Holding Coil, Max. Drop-Out Voltage

40% of nominal rating

Holding Coil Power

3 watts, max.

ENVIRONMENTAL

Operating Temperature Range

-55°C to +85°C

Terminal Strength

5 lbs. parallel and perpendicular per MIL-STD-202, Method 211, Cond. A

Actuator and Stop Strength

25 lbs. for 1 minute

Thermal Shock

-55°C to +85°C per MIL-STD-202, Method 107B, Cond. A

Dielectric Strength

1000 volts, per MIL-STD-202, Method 301

Insulation Resistance

500VDC for 1 minute, 1000 megohms minimum per MIL-STD-202, Method 302, Cond. B

Shock

50 G's, per MIL-STD-202, Method 202B

Vibration

10 G's of 10 to 500Hz, per MIL-STD-202, Method 204A, Cond. A

Salt Spray

48 hours, per MIL-STD-202, Method 101B, Cond. B

Moisture Resistance

10 cycles at 90% to 98% relative humidity, per MIL-STD-202, Method 106B

Sand and Dust

6 hours, per MIL-STD-202, Method 110, Cond. B

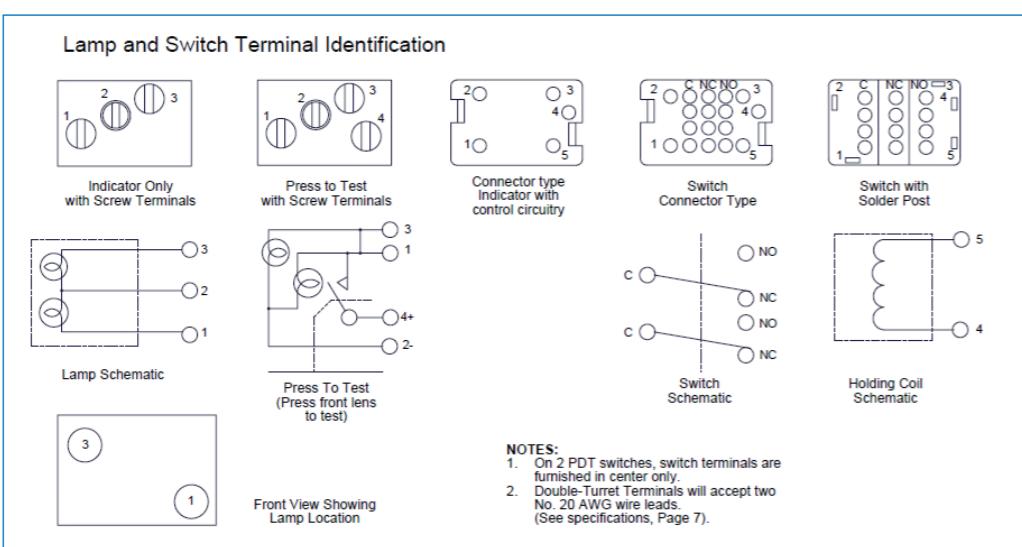
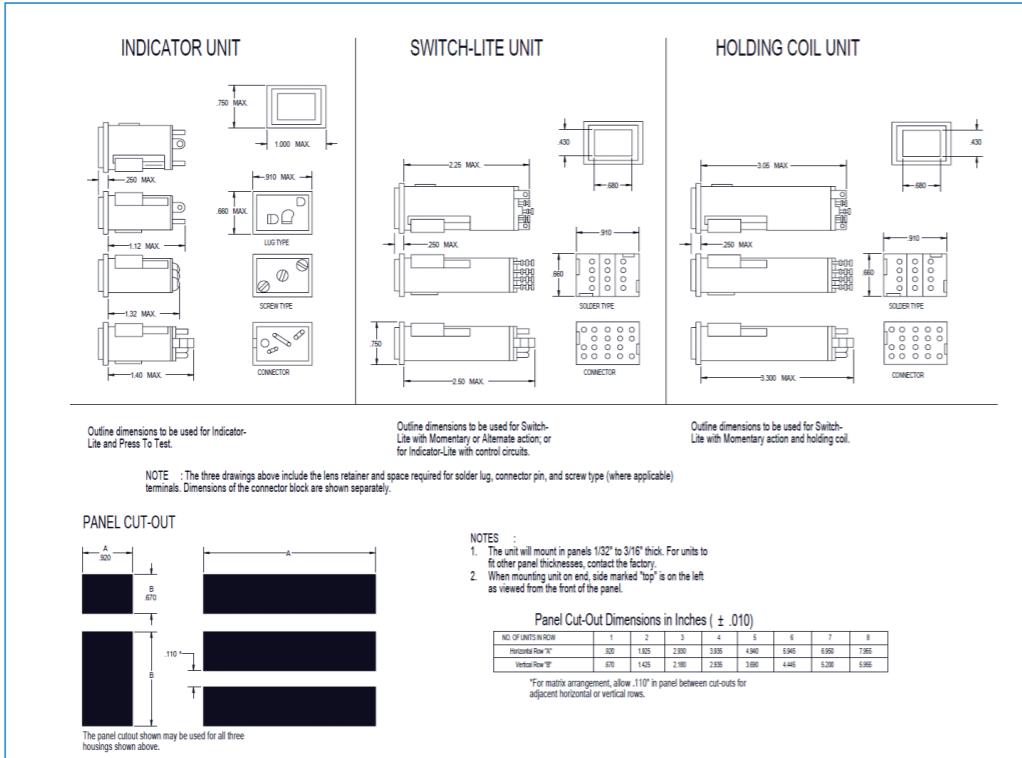
Overload

50 cycles at 6 amps, 28 VDC

RFI, EMI

70 DB minimum relative attenuation in the frequency range of 10K Hz to 10,000 MHz, per MIL-STD-285.

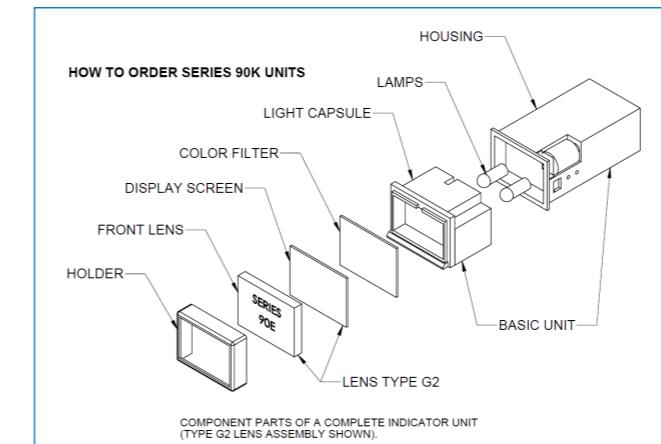
SERIES 90K FEATURES



SERIES 90K ORDERING INFORMATION

90KA1C2D1F1G2H1J1(R)L1N1R120FF

90K	<input type="checkbox"/>	A1C2	D1	E1	F1	G1	H1	J1()	L1	N1	R1	ON OFF
Series Number	Basic Unit Variation	Basic Unit	Terminals	Control Circuits	Lamps	Lens Type	RFI Screen	Color Filters	Display Screen	Front Lens	Legend Configuration	Legend Wording



ELIMINATION OF ITEMS

Where one or more items comprising a complete unit are not required, omit the code number for that item.

ORDERING SEPARATE ITEMS

When separate items are required, precede an item's code number with the basic «90K» to obtain the correct order number for that item. Lamps, when ordered separately, are always considered 1 each rather than 2.

BASIC UNIT VARIATIONS

Variations of the basic unit, such as units with connector pins, may be specified in this space. Future expansions of the line, which will be described in Supplement Sheets to this Catalog, may also be specified here, if applicable.

Complete Switch-Lite and Indicator-Lite assemblies may be ordered using a single coded part number. Each item required for a complete assembly has been assigned a code number and is described on the following pages. By selecting the part number code for each item desired, and then placing these numbers in alphabetical sequence immediately following the series number «90K», a complete part number is formulated. Above is the code number sequence to be used in ordering.



BASIC UNIT CODE NUMBERS

Basic Unit Type	Indicator or SwitchLite Code	Holding Coil Unit Order Code			
		6 Volt	12 Volt	28 Volt	48 Volt
Indicator Only (U.L.approved)	A1				
2PDT Momentary Switch	A1C2	A3C2	A4C2	A2C2	A5C2
Momentary 4PDT Alternate	A1C3	A3C3	A4C3	A2C3	A5C3
2PDT Alternate Switch	A1C4				
4PDT Alternate Switch	A1C5				
Press to Test (Indicator Only)	A6D2				

SERIES 90K TERMINALS, CONTROL CIRCUITS & LAMPS

90KA1D1E1F1G2H1J1(R)L1N1R120FF



TERMINALS

Series 90K units are available with a choice of wiring terminals. All units may be specified with solder lugs or plug-in connector pins. In addition, Indicator-Lites may be specified with screw-type terminals. To specify the proper terminals, insert the appropriate code number in the basic ordering sequence.

CODE	TERMINAL
D1	Solder Lug
D2	Screw Type (Indicator Only)
D3	Connector Pin

CONTROL CIRCUITS (INDICATORS ONLY)

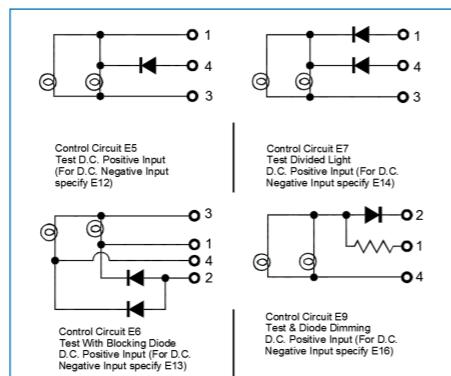
Special circuits which provide master lamp test and dimming capabilities are available as an integral part of the basic unit. These circuits eliminate the need for external circuitry and are available in four standard circuits which provide positive and negative test inputs for all full display screen styles. Other control circuits are available on request.

NOTE: The indicator only units with control circuits are the same package size as switch-lite units.

LAMPS

Series 90K units accept two T-1 3/4 midget flanged base lamps. To specify, insert the appropriate code number in the basic ordering sequence.

*NOTE: LED's are available upon request.
Please contact a Safran representative.*



CODE	LAMP
F1	6 Volt Incandescent
F2	12 Volt Incandescent
F3	28 Volt Incandescent
F14	28 Volt Long Life Incandescent
F4	115 Volt Neon With Resistor (*)
F10	115 Volt Neon Without Resistor (for use with external resistor)*

**Recommended for use with red or amber color filters only.*

SERIES 90K LENS TYPE & RFI SCREEN

90KA1C2F1G1H1J1(R)L1N1R120FF



LENS TYPE

Series 90K units are available with four types of lenses, each producing a different type of legend display. To order, use the appropriate «G» code number from those described below.

LENS TYPE CODE	DESCRIPTION
G1	Lighted Letters: Letters appear white on a black background until illuminated, and then letters appear in color, background remains black.
G2 (*)	Lighted Background: Letters appear black on a white background until illuminated and then background appears in color, letters remain black.
G3	Lighted Letters: Letters are not legible until illuminated and then letters appears in color, background is black.
G4	Lighted Background: Letters are not legible until illuminated, then background appears in color, letters are black.

**This is the most commonly used and preferred type of lens for most applications.*

RFI SCREENS

The passage of radiated and/or conducted RFI through panel cutouts can be reduced by the fine mesh, metal RFI screen, which is mounted between the lamps and display screen of the light capsule. RFI is grounded by electrical contact from the screen to the unit housing to the panel.

Available for full, horizontal and vertical split displays. To order RFI screens for complete units, insert the code number shown below, according to the screen configuration, into the basic ordering sequence.

CODE NUMBER	DESCRIPTION
H1	Full Display RFI Screen
H2	Horizontal Split Display RFI Screen
H3	Vertical Split Display RFI Screen

To order RFI screens as separate parts, consult factor for ordering information.



SERIES 90K COLOR FILTERS

90KA1C2D1E1F1G1H1J1(R)L1N1R120FF

TRANSMITTED COLOR (SLAB FILTERS)

To order a color slab filter for a Series 90K unit for a specific display arrangement, use the code numbers shown at the right for the desired display, followed by the color code letter desired in parenthesis. In a horizontal split, the first color code denotes the top half of the display; the second color denotes the bottom half. In a vertical split, the first color code denotes the color for the left half of the display; the second color code denotes the color for the right half, as viewed from the front.

The code number includes the holder and dividers, and spacers where applicable. Full displays or horizontally or vertically split displays, and two color full displays, are available. The coded part number, «L1», etc., also includes the holder for the lens assembly.

Note: The display screen illustration at the right is provided as an example only. It illustrates the Series 90K; the series 90E and 90H use slightly different parts, but the part number codes are the same.

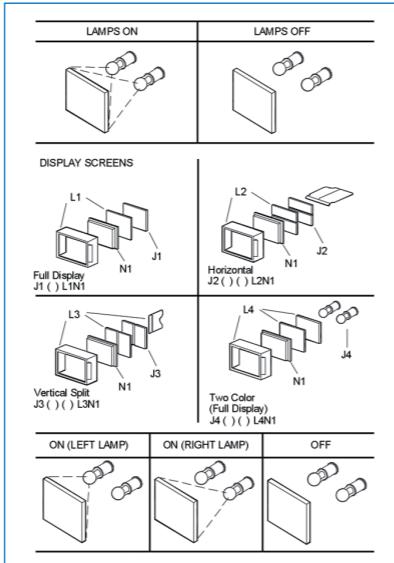
PROJECTED COLOR (TWO COLOR FULL DISPLAY)

Two colored lamp filters (silicone rubber bulb boots) are required for each unit. Use the color code described in this sequence: the first color code denotes the color to be used with the left lamp; the second color code denotes the color for the right lamp, as viewed from the panel front. These codes should be preceded by the code «J4».

Example: J4 (RG) would produce a red and green indication in a full two-color display.

LENS FRAME

Select the lens most suited to your application and add the appropriate order code, N1 or N2, to the part number in the proper sequence. When ordering N2 lens for the Series 90K, omit the «G» lens type code and the «L» display screen code, since the N2 lens is available only in the G2 type lens. The standard color for the frame on the N1 lens is gray. Other frame colors such as black, red, white, etc., are available on special order. The standard color for the N2 lens is white, which is used with color filters. Other colors for the lens itself, for use without color filters, are available, such as red, yellow, green, etc. on special order. Also white and colored lenses with concave front surfaces are available on special order. Consult the factory for ordering information on special front lens colors and shapes.



Color Code	Description
(A)	Amber
*(B)	Blue
*(G)	Green
(R)	Red
*(W)	White +
*(Y)	Yellow

*Not recommended for use with 115 VAC neon lamps.
+Light blue bulb is used for white illumination.



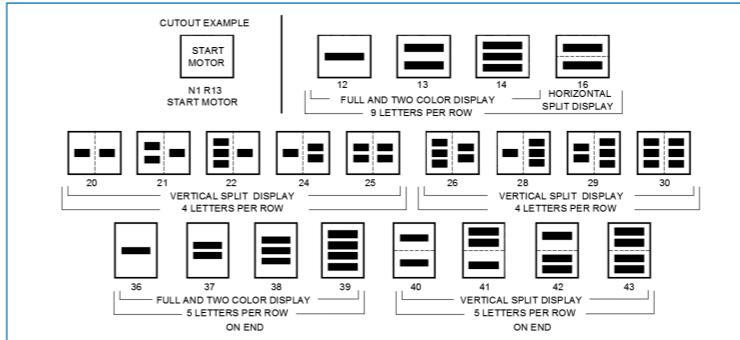
For representation only

SERIES 90K LEGEND CONFIGURATIONS & CRIMP-TYPE TERMINALS

90KA1C2D1E1F1G1H1J1(R)L1N1R120FF

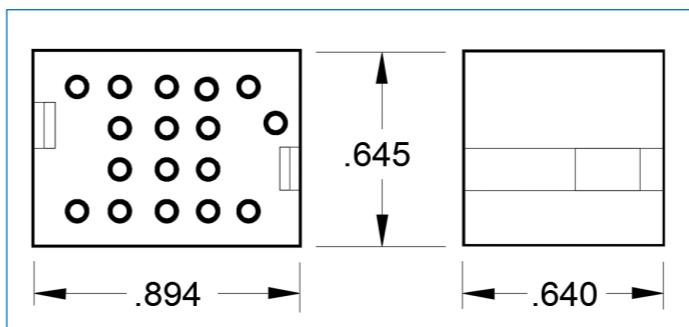
LEGEND CONFIGURATION

Engraving of the Series 90 unit lenses produces letters 0.110 ± 0.010 inch in height, with a 0.017 ± 0.005 inch stroke. Letters are filled with special black filler. To specify the engraving, add the letter «R» to the part number following the front lens code. The «R» code is then followed by the number or the engraving configuration desired, as shown in the illustration to the left. Use commas to separate rows of wording and a straight vertical line to separate splits.



CRIMP-TYPE TERMINALS

A standard connector block, which accepts crimp-type terminals is available for Series 90K units. This connector quickly snaps over the Series 90K connector pin terminals and offers the advantages of fast installation and replacement, as well as simplified wiring. To order the connector block, specify Safran Electronics & Defense part number **901K-600**.



CRIMP-TYPE TERMINALS

The crimp-type terminals used to wire the terminal blocks are also ordered as a separate item. These terminals are packaged in plastic bags, 25 terminals to the bag. Each bag of 25 terminals may be ordered by using the part number **800-CT20**. (Takes on #20, 22, or 24 gauge wire or two #24 gauge wires.) Part Number **800-CT20-2** takes one #26 or #28 gauge wire.

Terminals can be shipped from stock prior to shipment of the units. This permits advance attachment of the terminals to the wires and speeds installation when units arrive.

REMOVAL TOOL

Crimp terminals may be quickly removed from the connector block by using the Safran Electronics & Defense Removal Tool. To order, specify Safran Electronics & Defense part number **800-P2**.

SERIES 90C FEATURES

The Series 90C Tellite Switch units are ruggedly packaged in stainless-steel housings to assure long-term wearability and resistance to environmental extremes. Their double-turrent, hot-tin dipped switch terminals provide for fast and reliable wiring. They mount firm and flush-to-the-panel by means of an integral flange and a pressure spring-clip arrangement. No external mounting hardware is required. Installation is through the panel cutout from the panel front. Package size is shown in the dimensional drawings below.



SPECIFICATIONS

SWITCH MODULE (SPST or 2PST and SPDT or 2PDT, with momentary or alternate action).

Electrical :

- 5.0 amps @ 125 VAC or 250 VAC
- 5.0 amps @ Resistive Loads of 30 Vdc
- (@sea-level and 50,000 feet)
- Inductive Loads
 - 3.0 amps @ sea level
 - 2.5 amps @ 50,000 feet
- Inrush Loads - 24 amps (max)

Terminals :

- Double-Turrent, Hot-Tin Dipped.

Character Size :

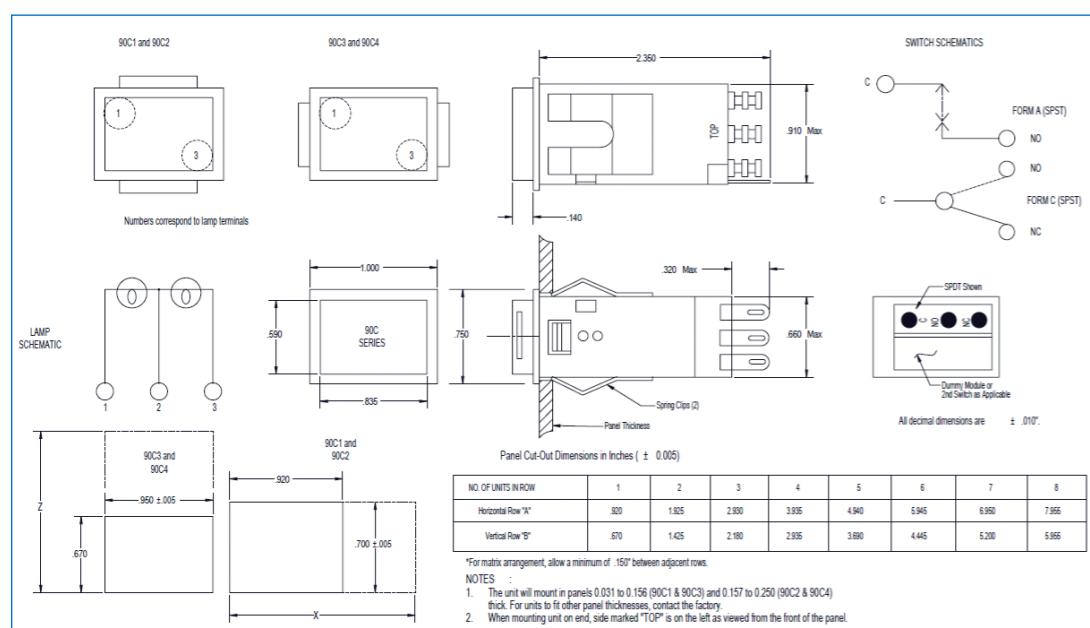
- 0.110 inch high with a 0.017 inch stroke. Units mount flush with the panel.

Mounting :

- No special brackets required

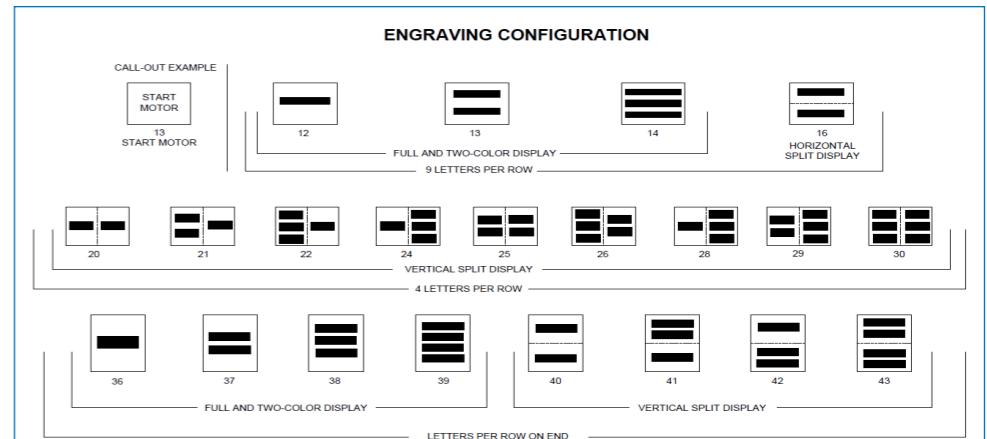
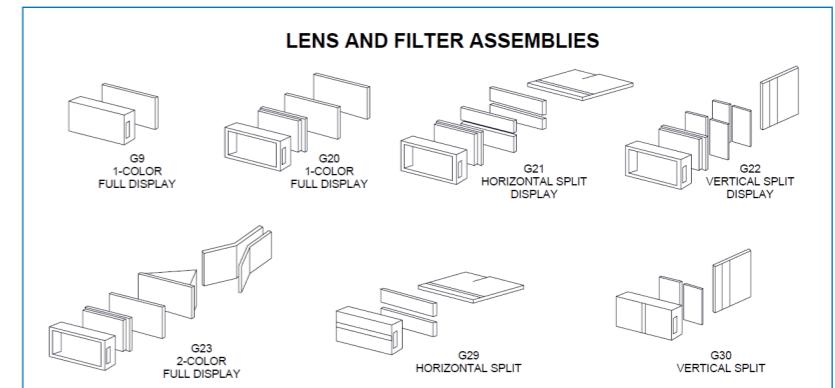
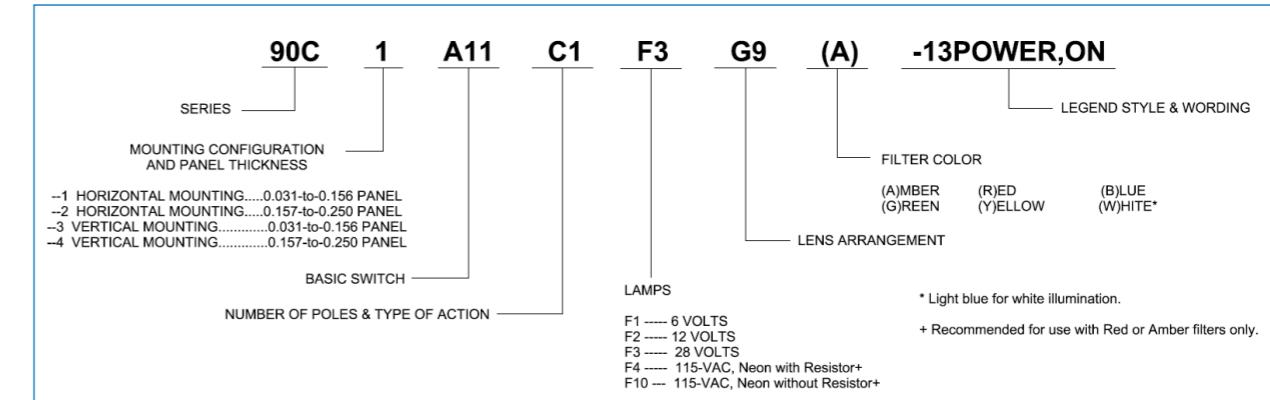
Lamps :

- Two T-1 3/4 inch midget flanged base.



SERIES 90C ORDERING INFORMATION

90C1A11C1F3G9(A)13POWER,ON



OPTICAL ACCESSORIES FOR SERIES 90E, 90H, 90K & 90C

DRIP-PROOF SEAL

An easily installed, effective barrier that prohibits the entrance of liquids, or foreign matter through panel openings, without affecting visibility of legends or ease of switching. Assembly consists of a diaphragm, which slips over the basic unit from the back, and a seal that fits over the front of the unit to provide an effective seal.

Order as part number **90□-502**.

NOTE: Insert the letter in place of the box to indicate the proper Series for the part ordered.

SPACER BARRIERS

Spacer Barriers are available for vertical mounting with basic 90 units. As a safety precaution, the barriers preclude the possibility of inadvertently switching two adjacent units at the same time. For design purposes, barriers are available in a variety of colors as listed.

How to Order: Select vertical (short) barriers from the tables below, according to the desired colors. Two are required for one unit (and one for each additional unit if rows are used).

Vertical Barriers for Horizontal Rows (Mount on Sides)	
Part Number	Color
90□535G	Gray
90□535B	Black
90□535W	White
90□535R	Red

NOTE: Barriers are 0.125 inch thick. The added space required for barriers must be allowed for in the preparation of panel cutouts. Allow 0.340 inch for the first unit and 0.125 inch for each additional unit in a matrix.

SWITCH GUARD

Positive protection against accidental switch actuation is provided by this spring-loaded, clear plastic cover. The spring holds the cover over the switch face at all times. To gain access to the switch face to actuate the switch, the cover must be raised by deliberate action.

How to Order: Switch Guards may be ordered separately by specifying Part Number **90K-19**.

How to install: The installation of a Switch Guard can be quickly accomplished in the field. To install, remove the unit light capsule, loosen the mounting screws sufficiently to provide space between the frame of the switch unit and the panel front. Slip the Switch Guard onto the frame from the bottom of the frame. Tighten mounting screws securely and replace the light capsule.

PANEL PLUGS

Panel plugs may be used to cover panel cutouts for Series 90 units, attractively covering cutouts which have been provided for future expansion, or which have been created by design changes. Each plug will fit any single cutout measuring 0.920x0.670 inch. Plugs may also be inserted into vertical or horizontal rows of units to cover spaces allotted for one or several units. Dimensions of plug face are 0.75x1.00 inch.

How to Order: Panel plugs may be ordered in various colors by using the part numbers shown below.

Safran Part Number	Color
90□542-1	Black
90□542-2	Red
90□542-3	Gray
90□542-4	White
90□542-5	Blue
90□542-6	Yellow
90□542-7	Green



Qualification to MIL-PRF-22885/58

The Series 90 Tellite Switches have been granted qualification approval to MIL-PRF-22885/58. To order MIL-PRF-22885/58 qualified units, the part number should include the letter "H" after the series number 90.

The list of Safran military specification part numbers for the 90H series is listed on page 3 of this catalog. Should you have a need for more information on these Military Qualified Products, please consult your Safran representative or call the factory.

OUR PRESENCE IN THE



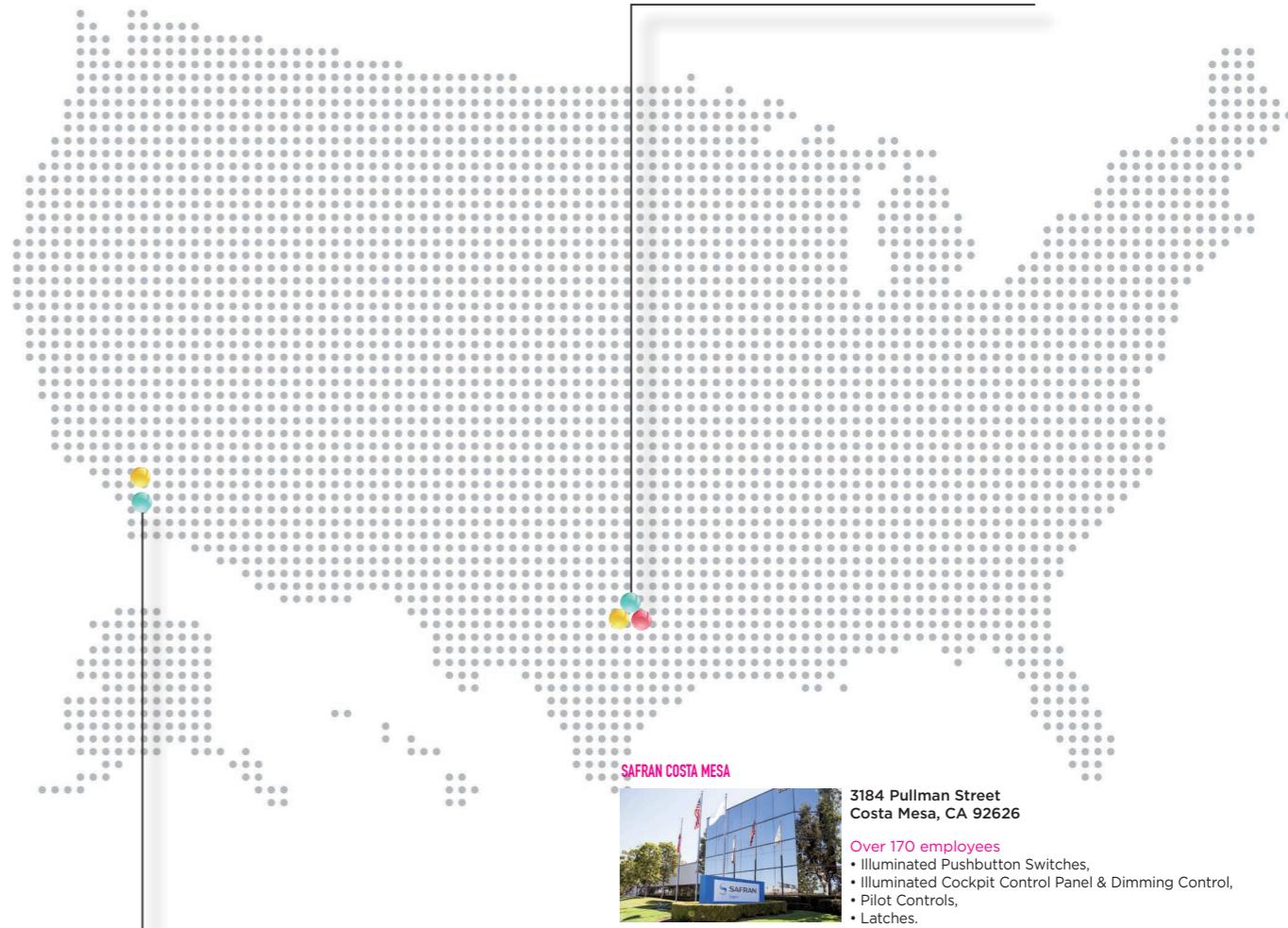
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- Integrated Cockpit Display,
- System Design & Manufacturing,
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Costa Mesa, CA 92626

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- Illuminated Pushbutton Switches,
- Illuminated Cockpit Control Panel & Dimming Control,
- Pilot Controls,
- Latches.

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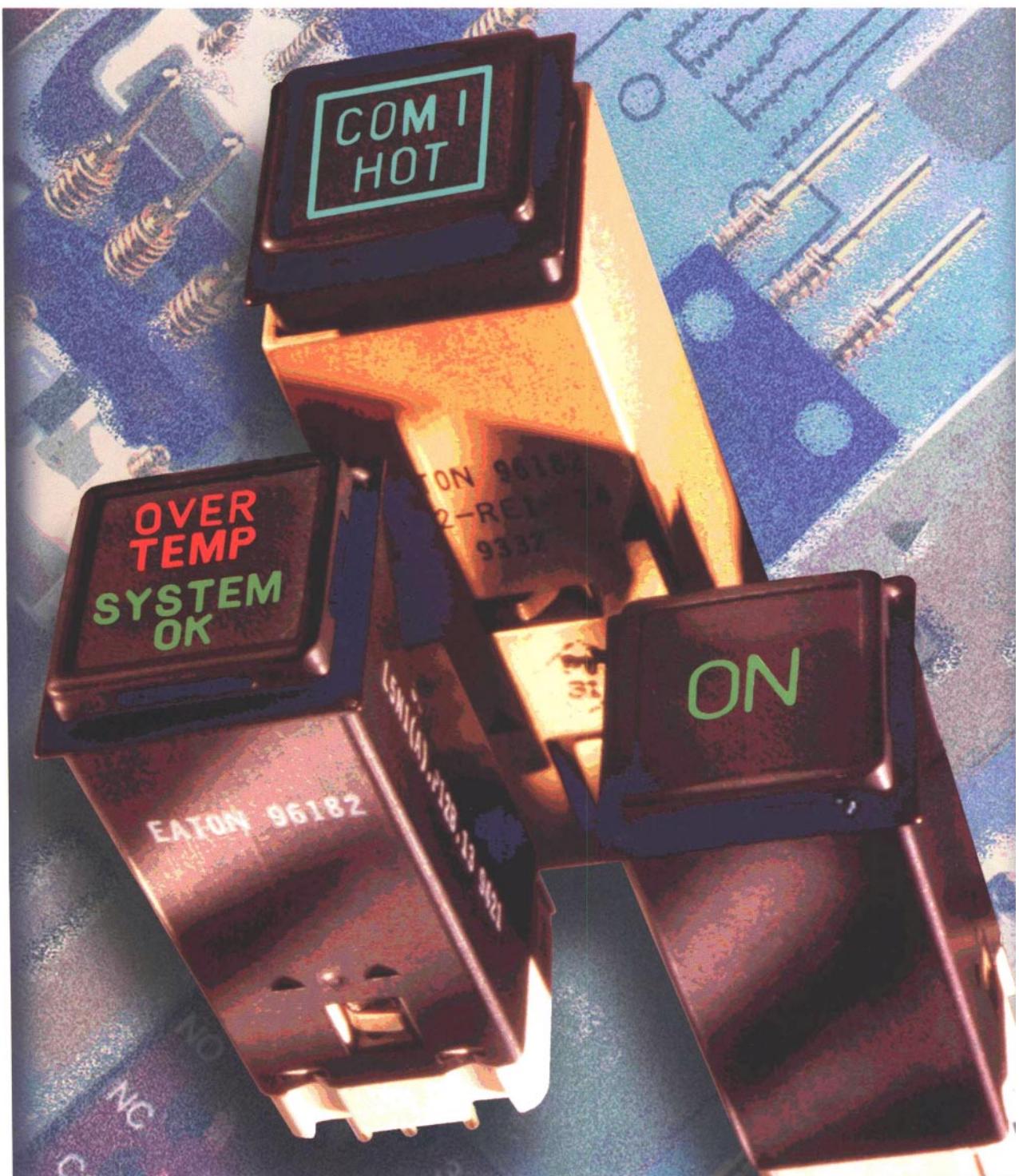


Series 582

Two Pole Lighted Pushbutton Switches



EATON

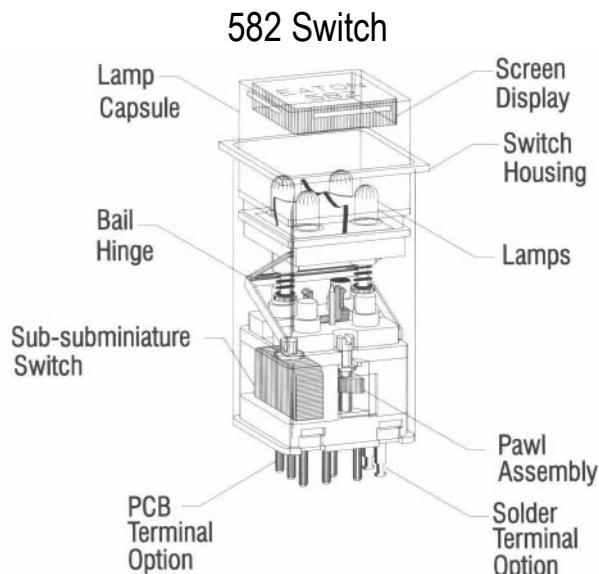


582 Two Pole Lighted Pushbutton Switches

Development

The Series 582 is designed for use in the crew stations of commercial and military aircraft, shipboard systems, off road vehicles and commercial applications requiring a high reliability switch with superior lighting. The 582 is a Series 581 switch mechanism with upgraded lighting capabilities and more options. The Series 581 is qualified to **MIL-S-22885/101**.

The switch design has evolved from specific customer requirements. We asked the people who manufacture avionic, vetronic and shipboard equipment what was needed in a two pole, lighted pushbutton switch. The answers that came back included reliability, light weight, short behind panel depth, sunlight readability, night vision imaging system compatibility, LED illumination, spray-tight sealing and plug-in mounting. The Series 582 provides these capabilities.



Since 1942, our lighted indicators and pushbutton switches have proven to be the best in the industry at meeting customer requirements for quality, reliability, variety of options and technical performance.

Your program needs will be supported by a committed team of people at Eaton. Eaton wants to be your long-term partner in product innovation, just-in-time delivery, electronic data interchange, quality improvement and responsiveness to changing design needs. A tour of our factory will prove our commitment to continuous improvement, quality control and responsiveness.

Switch Design

The Series 582 is a one or two pole, Form C switch available in momentary and indicating alternate configurations. It is also available in a simple indicator configuration. The Series 582 is supplied with gold-plated terminals and has a lamp capsule retention system that prevents the accidental interchange of capsules during relamping, maintaining the orientation of the capsule in relation to the switch body.

Lamp Capsule Replaceability and Retention

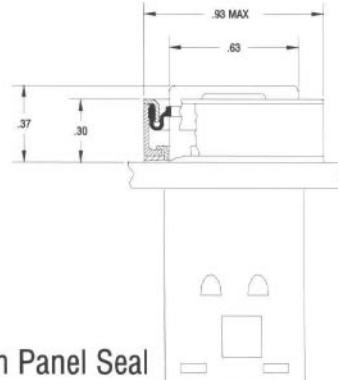
The lamp capsule retention system allows the removal and replacement of the lamp capsule, without requiring the replacement of the switch body, providing the lowest spares costs to the equipment operator. It also prevents the accidental interchange of capsules during relamping, maintaining the orientation of the capsule in relation to the switch body. This prevents accidental mis-orientation of the lamp capsule with the switch body during lamp replacement.

Dual Mounting Pawls

In order to ensure switch mounting integrity, two mounting pawls are supplied in the 582 which ensure balanced engagement force with the panel. Two pawls provide balanced clamping forces with the panel for superior performance under shock and vibration, and offer added safety in the event of a pawl failure or damage.

Sealing Capabilities

The Series 582 has three levels of sealing available; unsealed, drip-proof internal seal and spray-tight diaphragm seal. The unsealed version does not have provisions to prevent water or dust from entering the unit. The drip-proof version is sealed from the inside of the lamp capsule to prevent the entry of water or dust and includes a lamp capsule seal to protect the opening between the lamp capsule and switch housing. Also included with the drip-proof unit is an o-ring and retainer that mounts between the housing flange and panel to prevent water from penetrating through the panel cut out. The spray-tight version uses an external seal to cover the opening between the capsule and housing and a flat panel seal to prevent water from leaking through the panel cut out.



Diaphragm Panel Seal

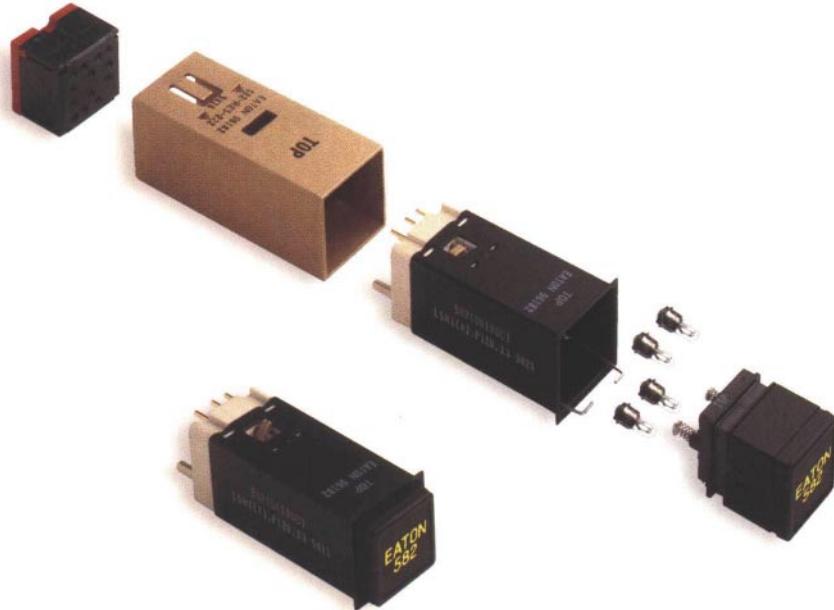
RFI/EMI Protection

The primary ground path for RFI/EMI protection runs from the RFI screen, mounted in the lamp capsule behind the display screen, to the switch housing. Contact to the panel is made with the housing flange. A redundant ground path also runs through the mounting sleeve to the panel. To maintain the ground circuit, RFI versions are provided with a gold chemical film coated housing instead of the standard black anodized housing.

Termination and Mounting Systems

Termination systems for the 582 include solder, PCB and plug-in interfaces. A rod mount system is also available. In the rod mount version, the front housing flange is eliminated and a semi-circular relief is provided in the switch body. These alterations allow the units to be stacked together and configured within the smallest space possible. The units are assembled together by fastening rods through the hole formed by aligning the two semi-circular features on adjoining switches to end plates located on either end of the switch stack.

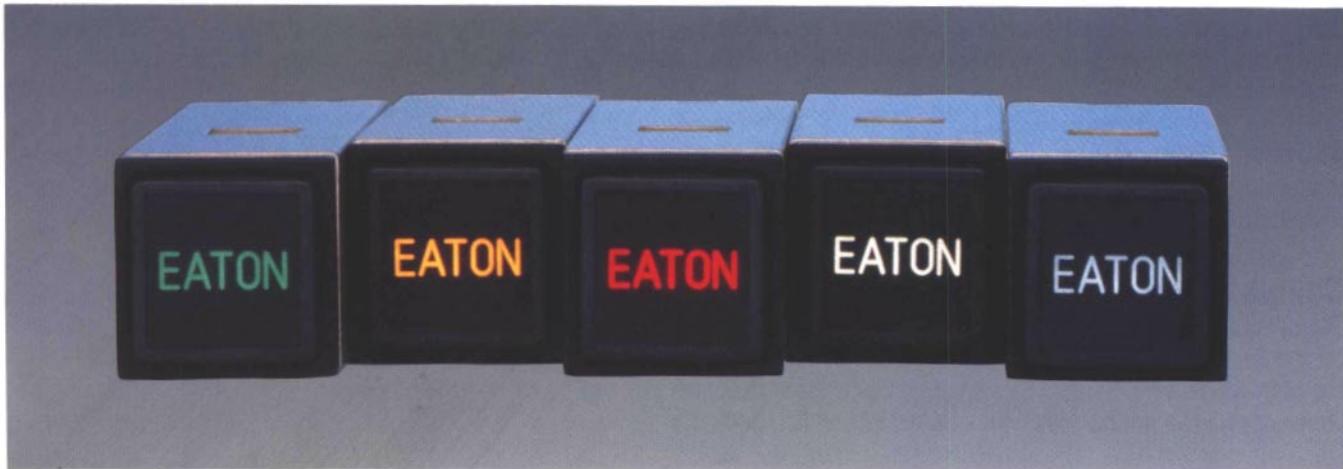
Panel spacers are used to adjust the exposure of the switch in front of the panel and to reduce the extension of the switch behind panel. When a light plate is used, it is common for a spacer to be used above panel to mount the housing flange flush with the light plate. In situations where behind panel depth is an issue, a panel spacer can be used to make the unit fit the space available. Custom switches with a shorter switch housing that expose more of the button can be designed for your specific application, if desired.



Optics

The 582 is available with state-of-the-art optics that provide superb uniformity and off angle legibility. Luminance has been increased 50 percent above the Series 581. Standard configurations include sunlight readable, lightplate white and NVIS compatible displays. Different colors are available; complying with MIL-S-22885/101, MIL-S-22885/110, MIL-C-25050 and MIL-L-85762. Custom lighting packages are available upon request.

The Eaton optics laboratory features state-of-the-art equipment necessary to design and measure displays in both sunlight readable and NVIS configurations. One highly sensitive spectroradiometer is equipped with an external detector cooled to -30°C that eliminates electronic noise. By eliminating low level noise, the spectroradiometer responds to 10E-15 watts/(cm²*steradian) for NVIS measurements and the resulting data gives Eaton the information to advance the boundaries of NVIS filter design. In addition, a computerized library of filter materials is used to model new designs before they are prototyped, shortening the development cycle for all display types.



NVIS Lighting

The 582 is one platform for Eaton's NVIS technology. The NVIS system uses a combination of low pass and band pass filters to screen out unwanted near-infrared light from cockpit displays. NVIS displays are replaceable as a capsule only. More information on NVIS displays is contained in Eaton's "Crew Station Lighting for Night Operation" brochure.

LED Lighting

Eaton offers two styles of light-emitting diode light sources (LEDs), replaceable flange based T-1 LEDs and capsule replaceable sunlight readable LEDs, in green, yellow, amber and red colors. T-1 flange based LEDs are available in two and four chip configurations, offering the benefits of redundancy and ease of relamping. The sunlight readable system is replaceable as a capsule only. Contact the factory customer service center for information on specific requirements for split display sunlight readable LEDs. LED light sources have a rated life of 100,000 hours. New colors and more efficient LEDs will also be made available as LED technology matures.

The LED option offers the advantage of increased life with lower energy consumption. In the temperature range from -20°C to + 50°C, the reliability of LEDs over incandescent light sources is expected to be greater than ten to one. And, unlike incandescent light sources, the display brightness remains relatively stable with variations in applied voltage because LEDs are current dependent devices. However, voltage stability does limit the ability to adjust crew station displays to the different light environments of day, dusk and night.

The trade-offs for using a LED light source include lower light output and limited color offerings. Also, the actual life and luminance of LEDs is temperature dependent with a 10 percent reduction in display luminance expected after 10,000 hours of operation.

Dual Color Displays

The Series 582 is also offered with two options allowing the same legend to illuminate in two different colors. In the incandescent version, this is accomplished by assembling a prism into the lamp capsule that directs the light from one side of the display through one color filter and the lamps from the second side of the display through a second color filter. In the LED version, the color is provided by the T-1 lamps. For example, in a full display, the legend can be made to light in red when the top two lamps are energized and light in green when the bottom two lamps are energized. Full displays and two-way split displays can be supplied with the dual color feature.

Low Power Full Display

With this patent pending option, a full display unit can be operated with two lamps and maintain sunlight readability, brightness and uniformity comparable to four lamp systems. It also delivers lower power consumption and touch temperature. Originally developed for military applications, the low power full display is now available to the commercial market. The minimum oncontrast is 1.0 for green, red, amber and white and 0.8 for blue when subjected to 6500 fc of incident light.

Test Facilities

Eaton has made long-term investments in testing equipment to ensure the continuing quality of each product line and speed the design process. Our capabilities include environmental testing, functional testing and calibration of all in-house measuring equipment.

As a U.S. Government approved laboratory, the majority of testing for military and customer qualification tests is completed at the factory. This testing includes mechanical life, electrical life, sinusoidal and random vibration, half sine and sawtooth shock, temperature, humidity, salt spray, altitude, sealing, tensile strength and lighting.

Compatibility with the Series 581

The panel opening for the Series 582 requires a 0.031 maximum radius instead of the original 0.070 maximum radius required for the Series 581. Series 581 dripproof switch bodies can not be used in the Series 582 panel cut out without risking the failure of the panel seal. Series 581 switch bodies without the panel seal can be used in the 582 panel cutout. Also, the Series 582 lamp capsule can not be used with a Series 581 switch body.

Warranties

The Series 582 carries a two-year warranty for defects in materials and workmanship from the date of manufacture.

Mechanical Specifications

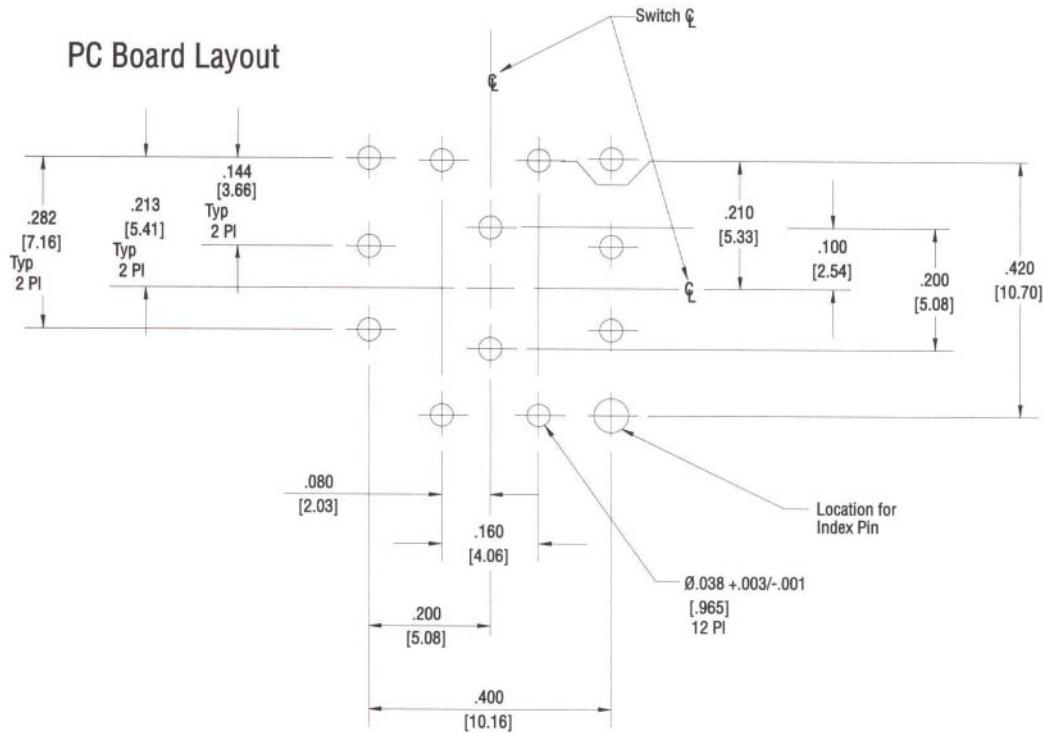
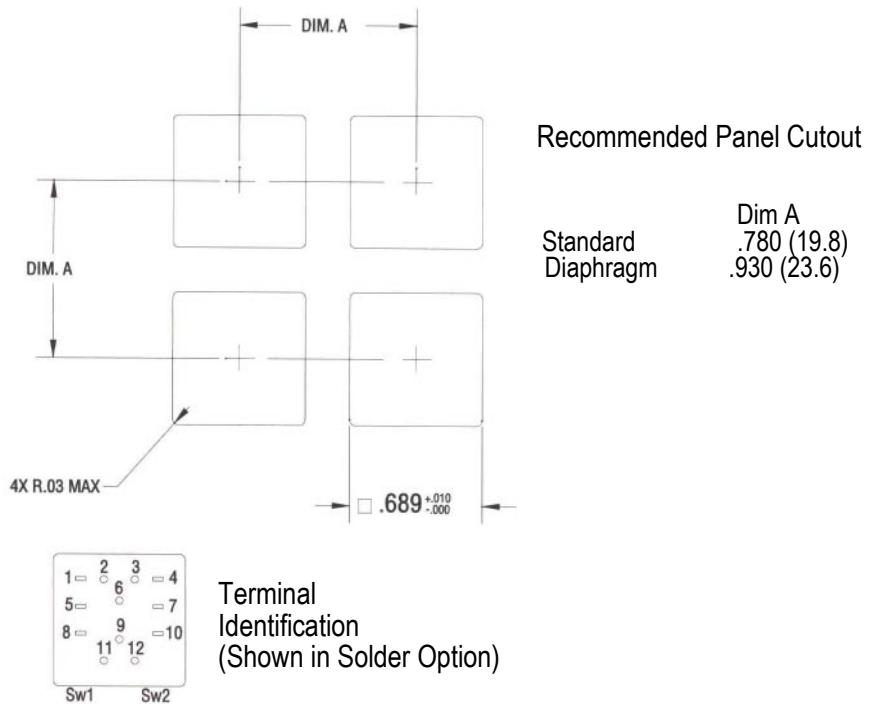
The length of each unit is specified from the rear of the housing flange to the end of the switch body, not including terminals. Terminal length is 0.15 inches (3.8 mm) for solder and PCB units, except alternate switches with a split ground, plug-in and rod mount units, which have a 0.20 inch (5.1 mm) terminal.

To calculate the actual behind panel depth for your application, subtract the thickness of the panel, the thickness of spacers used above panel and 0.030 inches for the drip-proof panel seal, if required, from the length of unit listed below. Weights listed are for switches with T-1 lamps.

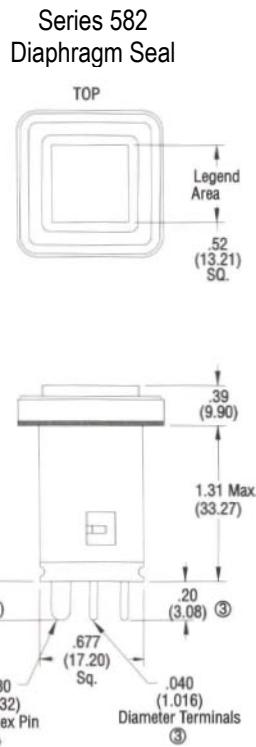
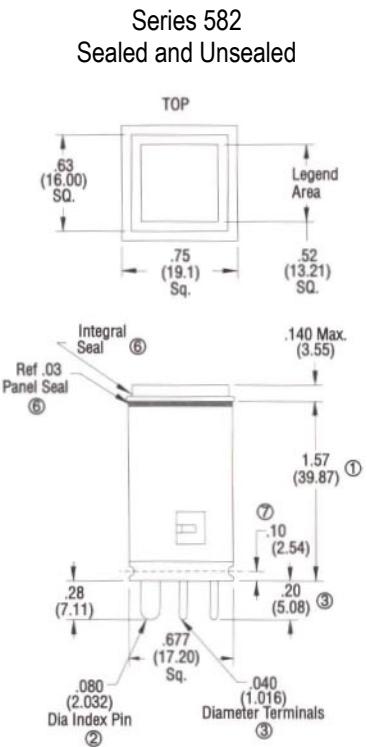
The difference between the basic and short lengths is due to the size of the lamp capsule. The basic unit has better lighting uniformity, lower touch temperature and can provide for lighting options such as the NVIS compatible display and the sunlight readable LED display.

	Maximum Length Behind Housing Flange	Maximum Weight
Short Length, Solder & PCB termination	1.19 inches (30.2 mm)	18 grams
Short Length, Rod Mount & Plug-in termination	1.36 inches (34.5 mm)	21 grams
Basic Length, Solder & PCB termination	1.40 inches (35.6 mm)	21 grams
Basic Length, Rod Mount & Plug-in termination	1.57 inches (39.9 mm)	24 grams
Basic Length, Solder & PCB termination, Diaphragm Seal	1.16 inches (29.5 mm)	26 grams
Basic Length, Plug-in termination, Diaphragm Seal	1.33 inches (33.8 mm)	29 grams
582-81/582-RE1 Plug-in Mount	See 582-R1/RE1	14 grams
Switch Mechanism	MIL-S-8805/101, silver contacts with gold plating	
Switch Form	Form C	
Actuation Travel	0.125 \pm 0.025 inches (3.2 \pm 0.6 mm)	
Actuation Force	1 to 5 lbs (4.5 to 22.3 N)	
Extraction Force	2 to 5 lbs (8.9 to 22.3 N)	
Mounting Torque	16 \pm 4 inch-oz. (0.113 \pm 0.028 J)	
Internal Seal	Drip-proof per MIL-STD-108	
Diaphragm Seal	Spraytight MIL-STD-108	
Mechanical Life	100,000 cycles	
EMI/RFI Shielding	When specified, resistance between the mounting panel and EMI/RFI screen shall be measured in accordance with MIL-STD-202, Method 307 and shall not exceed 3 ohms.	
Marking	MIL-STD-130	
Light Sources	Both incandescent and LED light sources are considered expendable parts and do not have a warranted life. Light sources are rated under ideal conditions and vary considerably in service. MTBF and life data presented in this catalog are for comparison purposes only.	

Mechanical Specifications



Dimensional Specifications



① For short unit subtract .210" from dimension shown.

② Included on plugin/crimp type termination units.

③ For PCB shall be .030 diameter. For solder shall be single turret .050 diameter.

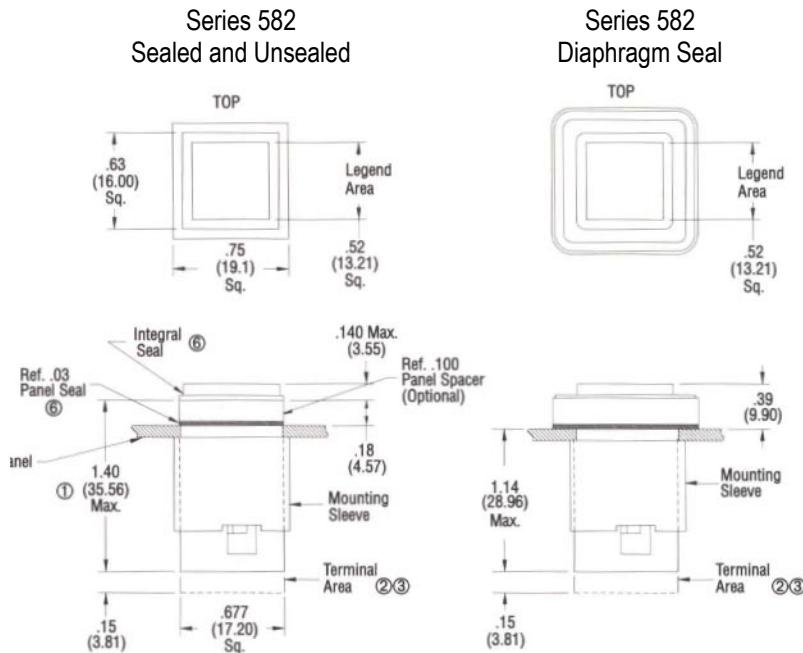
4. Dimensions are in inches. Unless otherwise specified, tolerances are $\pm .010$ for three place decimals and $\pm .03$ for two place decimals.

5. Mounting screw torque 16 ± 4 in-oz.

⑥ For sealed units only.

⑦ Required for rodmount. Optional for other types.

Rod Mount and Plug-in/Crimp Type Terminations



① For short unit subtract 0.210" from dimension shown.

② Terminals for printed circuit board shall be .030 diameter for lamp circuit and .030 x .020 for switch.

③ Terminals for solder shall be single turret, .050 diameter for lamp circuit and .05 x .02 for switch.

4. Dimensions are in inches. Unless otherwise specified, tolerances are $\pm .010$ for three place decimals and $\pm .03$ for two place decimals.

5. Mounting screw torque 16 ± 4 in-oz.

⑥ For sealed units only.

7. Alternate with split ground lamp circuit is provided the plug-in length.

8. Mounting sleeve & spacer is included on solder and PCB type units.

Solder and PCB Termination

Environmental Specifications

Operating Temperature	-55°C to + 71 °C -20°C to + 50°C for T-1 LED light sources -25°C to + 75°C for SLR LED light sources
Storage Temperatures	-55°C to + 85°C -64°C to + 95°C for 24 hours excluding LED light sources -30°C to + 86°C for LED light sources
Thermal Shock	MIL-STD-202, Method 107, Condition A
Moisture	MIL-STD-202, Method 106
Salt Spray	MIL-STD-202, Method 101, Condition A, 96 hours
Sand and Dust	MIL-STD-202, Method 110
Fungus	MIL-STD-810, Method 508, All materials used are non-nutritive to fungus
Vibration	MIL-STD-202, Method 204, Condition B, for single channel mount. For multiple channel matrix mount, contact the factory for information.
Shock	MIL-STD-202, Method 213, Condition B
Explosion	MIL-STD-202, Method 109

Electrical Specifications

High Current Rating

Load	Sea Level 28 VDC max	Sea Level 115 VAC max	50 000 ft 28 VDC max	50 000 ft 115 VAC max	Life
Resistive	7.5 A	7.5 A	5.0 A	5.0 A	50 000 cycles
Inductive	4.0 A	4.0 A	2.0 A	2.0 A	50 000 cycles
Lamp	1.0A	1.0A	-	-	-

Low Current Rating

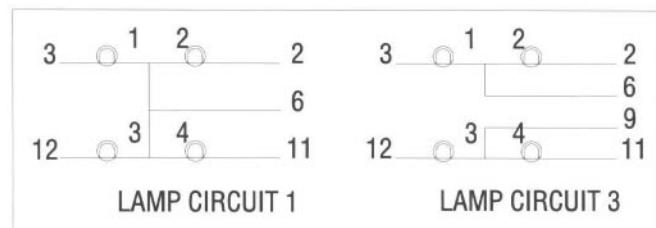
Load	Sea Level 28 VDC max	Sea Level 115 VAC max	50 000 ft 28 VDC max	50 000 ft 115 VAC max	Life
Resistive	1.0 A	1.0 A	0.5 A	0.5 A	50 000 cycles
Inductive	0.5 A	0.5 A	0.5 A	0.5 A	50 000 cycles
Low Level	0.03 VDC max	Life			
Resistive	0.01 A	50 000 cycles			

1. Contacts subjected to currents over 100 mA are no longer usable for low current applications.

2. Contact Resistance: Initial contact resistance at 6 VDC, 100 mA is 25 mΩ maximum. Post application resistance is 1 l of the electrical circuit when measured during the operation of that circuit. The switch contacts are not hermetically sealed. Actual contact resistance will vary based upon the cleanliness of the operating environment.



Form "C" Switch Circuits



Lamp Circuits

Display Type Specifications

The Series 582 is available with a variety of display screens. The most common types are listed below, for special requirements, contact the factory service center.

Display Type	With light source not energized		With light source energized		Description
	Legend	Background	Legend	Background	
1	White	Black	Color	Black	White legend lights in color when energized.
2	Black	White	Black	Color	White background lights in color when energized.
5	Black	Black	Color	Black	Hidden legend lights in sunlight readable color when energized.
6	Black	Color	Black	Color	Colored background lights in color when energized.
8	Black	Black	Black	Color	Hidden background lights in sunlight readable color when energized.
9	White	Black	White	Color	Hidden background lights in sunlight readable color when energized. Legend is white at all times.
12	White	Black	Color	Black	Top Half: White legend lights in color when energized and is specifically designed for low ambient light conditions.
	Black	Black	Color	Black	Bottom half: Hidden legend lights in sunlight readable color when energized.
35	Gray	Black	Color	Black	Slightly visible gray legend lights in sunlight readable color when energized.
36	Black	Black	Color	Black	Top half: Hidden legend lights in sunlight readable color when energized.
	White	Black	Color	Black	Bottom Half: White legend lights in color when energized and is specifically designed for low ambient light conditions.
40	White	Black	Color	Black	White legend lights in color when energized. Designed for low ambient light conditions.
48	Black	Black	Black	Color	Top half: Hidden background lights in sunlight readable color when energized. Color may be visible in the unenergized condition.
	Black	Black	Color	Black	Bottom half: Hidden legend lights in sunlight readable color when energized.
72	Black	Black	Color	Black	Top half: Hidden legend lights in sunlight readable color when energized.
	Black	Black	Black	Color	Bottom half: Hidden background lights in sunlight readable color when energized. Some color may be visible in the unenergized condition.

Optical Specifications

Sunlight Readable Display Types & NVIS Displays in Sunlight Readable mode

On Contrast	> 0.6
Off Contrast	< 0.1
Character-to-Character Brightness Uniformity	< 2.0:1 Basic Length (Except NVIS Red and Green A Displays)
Character-to-Character Brightness Uniformity	< 3.0:1 Short Length
Luminance (without RFI)	185 fL minimum
Luminance (with RFI)	150 fL minimum

All SRL displays meet or exceed the requirements of MIL-S-22885/101 when used with a 0.15 MSCP lamp. See the military specification for more detailed information on the color coordinates and luminance of individual colors.

Non-Sunlight Readable Displays

For applications that do not have sunlight readability requirements, a line of commercial display screens is available. These displays meet the requirements listed below when used with a 0.15 MSCP lamp. Values are in fL.

	Display Type 1		Display Type 2 & 6		Display Type 40 ¹	
Color	STD	RFI	STD	RFI	STD	RFI
White	300	150	350	175	3.0 ± 1.0	1.5 ± 1.0
Blue	25	12	30	12	3.0 ± 1.0	1.5 ± 1.0
Yellow	200	100	350	175	3.0 ± 1.0	1.5 ± 1.0
Green	40	20	50	25	3.0 ± 1.0	1.5 ± 1.0
Red	50	25	70	35	3.0 ± 1.0	1.5 ± 1.0

1. When used with a 5V, 0.15 MSCP lamp operated at 4.5 ± 0.5 V, luminance will be 1.0 ± 0.5 fL per MIL-L-27160, section 3.3.5.a.

NVIS Display Types in NVIS mode

	NRa maximum	NRb maximum
Green A, Green B @ 0.1 fL	8.0×10^{-11}	7.0×10^{-11}
Yellow, Class A C 15.0 fL	5.0×10^{-8}	N/A
Yellow, Class B @ 15.0 fL	N/A	4.7×10^{-8}
Red @ 15.0 fL	N/A	1.4×10^{-7}
White @ 10.0fL	1.0×10^{-7}	6.0×10^{-8}

NVIS displays meet the compatibility requirements of MIL-L-85762 at derated voltage and the sunlight readability requirements of MIL-S-22885/101 when energized at full rated voltage with a 0.15 MSCP lamp. With 28 VDC lamps, Green A, green B and white comply with the MIL-L-85762 luminance requirement when energized at approximately 6 VDC, yellow complies at approximately 12 VDC and red complies at approximately 14 VDC.

LED Displays

Approximate values of display luminance for a hidden message, lighted letter display type 5 are listed below. Values are in fL.

LED Color	Peak Wavelength	2 Chip	4 Chip	Sunlight Readable	SLR RFI
Pure Green	555 nm	20	40	100	80
Green	565 nm	40	80	200	160
Amber	585 nm	35	70	150	120
Orange	610 nm	45	90	200	160
Ultra Red	660 nm	45	90	200	160

1. Lighting values assume the use of four LED lamps in a full display. Splitting the display will nominally reduce luminance values.
2. Pure green is not sunlight readable.

How to Use this Catalog

This catalog describes the standard and optional features of the Series 582. To determine the correct part number, refer to the following pages or use the Quick Reference Specification Tables in the inside back cover. Samples of a typical part number are shown on pages 7-13 and a Part Number Specification Sheet is provided on page 21 to aid your selection.

582	11	A4	B21	C1	D2 ¹	F4	L5	N2	(GR)	,P12	,16	ON/OFF
Series Number	Basic Unit	-	Lamp Circuit	Lamp Type	Panel Thickness	Display Screen	Display Configuration	Display Color	Character Font/Height	Legend Configuration	Legend	Legend
Unit Options	Termination											

1. The panel thickness call-out is only required for solder and PCB part numbers where mounting hardware is supplied. Plug-in termination mounting hardware is identified by separate part numbers listed in the rear of the catalog.

Series and Option Codes

58211 A4B21 C1 D2F4L5N2(GR),P12,16 ON/OFF

The Series number and unit options are identified by the first five digits of the part number. The first three digits identify the unit as a Series 582. The fourth and fifth digits identify product options.

Lighting Option	Behind Flange Length Solder/PCB ^{1,2}	Behind Flange Length Plug-in/ Rod Mount	Fourth Digit
T-1 Lamp, Short Capsule	1.19 inches (30.2 mm)	1.36 inches (34.5 mm)	0
T-1 Lamp, Basic Capsule	1.40 inches (35.6 mm)	1.57 inches (39.9 mm)	1
LED	1.40 inches (35.6 mm)	1.57 inches (39.9 mm)	2
Dual Color	1.40 inches (35.6 mm)	1.57 inches (39.9 mm)	3
NVIS	1.40 inches (35.6 mm)	1.57 inches (39.9 mm)	4
Low Power Full Display ³	1.40 inches (35.6 mm)	1.57 inches (39.9 mm)	5
Dual Color, T1 LED	1.40 inches (35.6 mm)	1.57 inches (39.9 mm)	6

1. Alternate switches requiring a split ground circuit (C3) will be the plug-in length.
2. Units specified with the rod mount feature will be the plug-in length.
3. Patent Pending. Only uses two T-1 lamps mounted diagonally from each other.

Seal and RFI Option	Fifth Digit
Unsealed	0
Drip-proof, w/ Panel Seal	1
Spraytight, w/ Diaphragm Seal	2
Unsealed, w/ RFI	3
Drip-proof, w/ Panel Seal & RFI	4
Spraytight, w/ Diaph. Seal & RFI	5

1. RFI not available with SLR LED.

Switch Action Codes

58211 A4 B21 C1 D2F4L5N2(GR),P12,16 ON/OFF

The letter "A" and the digit immediately following it identify the switch action and number of poles.

Basic Unit	Code
Indicator	A0
1 PDT Momentary switch	A1
2PDT Momentary switch	A2
1 PDT Alternate switch	A3
2PDT Alternate switch	A4

Termination and Mounting Codes

58211A4 **B2** 1C1D2F4L5N2(GR),P12,16 ON/OFF

The letter "B" and the digit following it identify the termination and mounting method.

Termination	Code
Plug-in	B0
Single Turret Solder	B21
Single Turret Solder, Tin Dipped	B22
PCB	B31
PCB, Tin Dipped	B32
Single Turret Solder w/ Rod Mount	B41
Single Turret Solder w/ Rod Mount, Tin Dipped	B42
PCB w/ Rod Mount	B51
PCB w/ Rod Mount, Tin Dipped	B52

Lamp Circuit Codes

58211A4B21 **C1** D2F4L5N2(GR),P12,16 ON/OFF

The letter "C" and the digit following it designate the lamp circuit. For information on custom circuits, contact the factory customer service center.

Lamp Circuit	Code
Common Ground	C1
Horizontal Split, Dual Ground ¹	C3

t. When specified with the B2X or B3X terminations and alternate action, the basic and short length switches will be 1.57 (39.9 mm) and 1.36 (34.5mm) inches respectively.

Mounting Hardware Codes

58211 A4B21 C1 **D2** F4L5N2(GR),P12.16 ON/OFF

The letter "D" and the digit following it identify the mounting hardware requirements for solder and PCB units. This code is omitted if a plug-in mount unit is specified. Plug-in hardware is specified by separate part numbers listed later in this catalog.

Gold colored parts are chemical film coated to maintain EMI/RFI compatibility. Custom hardware for panel thicknesses outside the listed range is available. Contact the factory customer service center.

Spacer Color	Spacer Height	Panel Thickness Range	Code
No Spacer	-	0.030 - 0.250 (0.76 - 6.35 mm)	D1
Black	0.100 (2.5 mm)	0.030 - 0.250 (0.76 - 6.35 mm)	D2
Gold (EMI/RFI)	0.100 (2.5 mm)	0.030 - 0.250 (0.76 - 6.35 mm)	D3

Light Source Codes

58211 A4B21 C1D2 **F4** L5N2(GR),P12,16 ON/OFF

The letter "F" and the digits immediately following it identify the light source supplied with the unit.

The Series 582 uses four T-1, midget flange, based lamps for a light source, except for the sunlight readable LED light source which uses integrally mounted LEDs in the capsule. T-1 lamps are the lowest replaceable unit when specified and are available in incandescent, 2 chip LED and 4 chip LED configurations.

Light Source Codes continued

T-1 Incandescent Lamps

Lamp Type	Design Volts	Design Amps	Design Watts	Avg MSCP ¹	Design Life (hrs)	Lamp Code
Incandescent 2,4	5.0	0.06	0.30	0.15	6,500	F8
Incandescent 2,3,4	5.0	0.115	0.58	0.15	40,000	F2
Incandescent	6.0	0.06	0.36	0.13	3,000	F13
Incandescent 3	12.0	0.04	0.48	0.15	16,000	F18
Incandescent 3	14.0	0.04	0.56	0.15	16,000	F6
Incandescent 3	18.0	0.026	0.47	0.15	10,000	F10
Incandescent 3,5	28.0	0.024	0.67	0.13	16,000	F4
Incandescent 3,10	28.0	0.026	0.73	0.23	16,000	F29
Low Power Display 6	5.0	0.115	0.58	0.15	40,000	F46
Dummy lamp	-	-	-	-	-	F11

1. MSCP is defined as Mean Spherical Candle Power and is an indication of the total light emitted by the lamp. Lamps are aged and selected to a $\pm 15^\circ$ tolerance.
2. 5 volt lamps have nickel plated bases to eliminate the effect of fretting corrosion in lead based lamps. Over time, the voltage seen by lamp will drop about 1.5 VDC due to the increased resistance caused by fretting corrosion.
3. When using lamps above 0.45 design watts, only the basic length versions can be used. Additional heat sinking and air flow is recommended. Matrix mounting is not recommended.
4. MS-24515
5. MS-3338
6. Two F2 lamps and two dummy plugs provided. Lamps are assembled in diagonally opposite positions.
7. Under mechanical stress, incandescent lamps will operate for approximately 20%-40% of their rated life before failure.
8. Series 582 units are designed for use with lamps installed. For proper operation of the switch, all four locations must have a lamp or dummy plug installed.
9. The lamps listed above will work with all display types. Other lamps with lower current and MSCP are available by request. Contact the factory customer service center for additional information.
10. Required for NVIS red compliance to MIL-L-85762. Minimizes radiance output of all NVIS colors at specified luminance.

T-1 Light Emitting Diode Lamps with Internal Resistors¹

LED Type	Peak Wavelength	Design Voltage	Design Amperage	Design Watts	Average Brightness (mcd)	Code
2 Chip LED, Pure Grn	555 nm	5.0	0.040	0.20	4	F40
2 Chip LED, Green	565 nm	5.0	0.040	0.20	13	F40
2 Chip LED, Amber	585 nm	5.0	0.040	0.20	11	F40
2 Chip LED, Orange	610 nm	5.0	0.040	0.20	11	F40
2 Chip LED, Ultra Red	660 nm	5.0	0.040	0.20	25	F40
4 Chip LED, Pure Grn	555 nm	28.0	0.020	0.56	10	F43
4 Chip LED, Green	565 nm	28.0	0.020	0.56	20	F43
4 Chip LED, Amber	585 nm	28.0	0.020	0.56	10	F43
4 Chip LED, Orange	610 nm	28.0	0.020	0.56	14	F43
4 Chip LED, Ultra Red	660 nm	28.0	0.020	0.56	30	F43

Sunlight Readable Light Emitting Diode Capsule^{2,3}

LED Type	Peak Wavelength	LED V Forward	Design	Code
LED Type	Wavelength	Voltage	Amperage	
SR LED, Green	565 nm	7.5 min.	.040 max	F45
SR LED, Amber	585 nm	7.5 min.	.040 max	F45
SR LED, Orange	606 nm	7.5 min.	.040 max	F45
SR LED, Red	639 nm	6.5 min.	.040 max	F45

1. T-1 LEDs are not recommended for high ambient light levels due to their low light output.
2. Lowest replaceable unit is the lamp capsule.
3. Application notes on resistor sizing, dimming and pulse width modulation available from the factory.
4. For all LED light sources, PIN#6 or/and 9 are ground (-).
5. RFI not available with SLR LED

Display Screen Codes

58211A4B21C1D2F4 **L5** N2(GR),P12,16 ON/OFF

The letter "L" and the digits immediately following it identify the display screen. Display screens vary by the light source specified. To select the proper display screen code, identify the display type listed in the left column and the light source listed across the top row. Display screen types were specified in the Optical section, see page 6 .

Display Screen Codes

Display Type	Incandescent	NVIS	SLR LED & T-1 LED	Dual Color	Low Power	LED Dual Color
1	L301		L401	L501	L601	L701
2	L302		L402	L502	L602	L702
5	L5	L60	L405	L503	L605	L703 ²
6	L306					
7	L7				L607	
8	L8 ¹	L61	L408	L508	L608	L708 ²
9	L9 ¹		L409		L609	
12	L12	L62	L412		L612	
35	L35	L64	L435		L635	
36	L36	L65	L436			
40	L40	L66	L440		L640	
48	L48	L63	L448			
72	L72 ¹	L67	L472			

1. Color may be discernible in off condition in the short length version.
2. Not sunlight readable.

Display Configuration Codes

58211A4B21 C1 D2F4L5N2(GR).P12,16 ON/OFF

The letter "N" and the number immediately following it designate the lens configuration as follows. Color callouts are shown for orientation.



Color Codes

58211A4B21C1D2F4L5N2 **(GR)**, P12,16 ON/OFF

The letters in parentheses following the lens configuration identify the lighted colors of the unit. In split displays, multiple letters are used to designate the colors of individual sections, in order from left to right and top to bottom. For example, in a four way split device, the designation (RDLG) would identify a red upper left quadrant, white upper right, blue lower left and green lower right. Note: for dual color displays, two color codes are required where one is used in the standard part number. For example, 58231 A2BOC1 F4LJ05N1(RG),P12,12 READY.

Color Codes continued

Incandescent Display Color Codes

The colors listed below have improved color discrimination throughout the dimming range when compared to the original 581 colors. Please note that the Series 581 MIL-S-22885/101 display screen designs for blue and white are no longer available. Each color is defined by color coordinates published in the referenced military specification.

Color	Dominant Wavelength	M22885/101	M22885/110	MIL-C-25050	Code
Blue ¹	530 nm	No	Yes	No	L
Green ¹	543 nm	Yes	No	No	G
Green	553 nm	No	Yes	Yes	M
White ¹	565 nm	No	Yes	No	D
Amber ¹	592 nm	Yes	Yes	Yes	A
Red ¹	621 nm	Yes	Yes	Yes	R

1. Meets M22885/90 and M22885/109 color and luminance specifications.
2. Color coordinates are published in MIL-S-22885/101 and MIL-S-22885/110.
3. Aviation blue per MIL-C-25050 is not suitable for lighted pushbuttons because it can not be made sunlight readable.
4. Eaton's white color "D" supersedes the use of aviation white. It overlaps part of the MIL-C-25050 white specification, but eliminates the undesired yellow and pink variations inherent with aviation white's location on the CIE 1931 color chart.

NVIS Display Color Codes

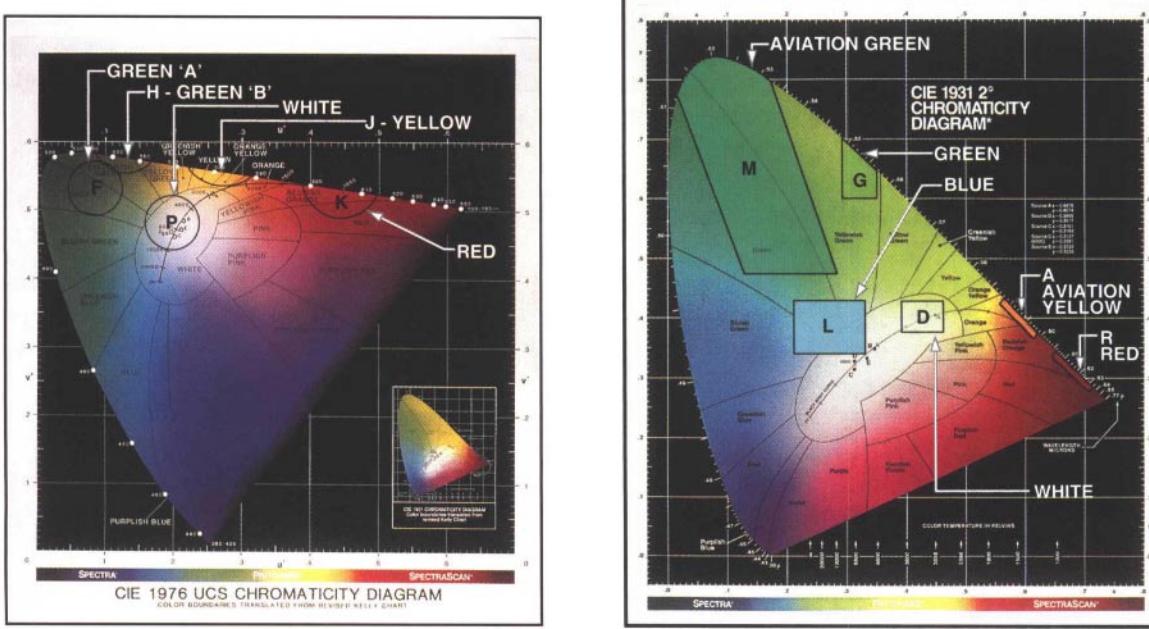
Color ²	u'	v'	r'	NVIS Luminance	Fast Jet G/R	Helo G/R	Fast Jet NVGGain	Sunlight Readable Luminance	Code
Green A	.088	.543	.037	0.1	230	1600	.387	>200 fL	F
Green B	.131	.623	.057	0.1	230	2600	.618	>200 fL	H
Yellow, Class A	.274	.622	.083	15.0	N/A	N/A	N/A	>150 fL	T
Yellow, Class B	.274	.622	.083	15.0	180	80	.910	>200 fL	J
Red	.450	.550	.060	15.0	120	25	.634	>160 fL	K
White	.195	.505	.037	10.0	330	210	.478	>200 fL	P

1. All NVIS colors meet the requirements of MIL-L-85762 and current UK military specifications. NVIS white was developed for the UK market. The U.S. military specification does not have a white requirement at this time.
2. Luminance values are for full and half displays. Quarter displays have a 110 fL minimum.
3. G/R and NVG Gain are the measurements for NVIS compatibility in the UK. The values listed are specified at 14 VDC with 28V, 0.15 MSCP lamps. Tests at the Defense Research Agency-Farnborough confirm these results.

LED Display Color Codes

Color	Dominant Wavelength	Code
Pure Grn	555 nm	P (T-1 only)
Green	565 nm	G
Amber	585 nm	A
Orange	606 nm	O
Red	639 nm	R
Ultra Red	660 nm	U (T-1 only)

Color Codes continued



CIE Diagrams provided courtesy Photo Research.

Character Font and Height Codes

58211A4B21C1D2F4L5N2(GR), P12,16 ON/OFF

The letter "P" and the digits following it identify the font style and character height to be used for the legend nomenclature.

Letter Style	Font#	Character Height	Letters per Full row ²	Letters per Half Row ³	Code
Helvetica Medium ¹	1	0.093 (2.4 mm)t	7	3	P11
Helvetica Medium	1	0.125 (3.2 mm)	5	2	P12
Helvetica Medium Bold ⁴	1	0.125 (3.2 mm)	5	2	P12B
Helvetica Medium Condensed	2	0.093 (2.4 mm)	8	3	P14
Helvetica Medium Condensed	2	0.125 (3.2 mm)	6	2	P16
Helvetica Med Condensed Bold ⁴	2	0.125 (3.2 mm)	6	2	P16B
DIN 1451/17	4	0.125 (3.2 mm)	4	2	P18
DIN 1451/17 Bold ⁴	4	0.125 (3.2 mm)	4	2	Pi
813					
DIN 1451/17 Condensed	5	0.125 (3.2 mm)	6	2	P19
DIN 1451/17 Condensed Bald	5	0.125 (3.2 mm)	6	2	P19B
Futura Medium	7	0.125 (3.2 mm)	5	2	P20
Futura Medium Bold ⁴	7	0.125 (3.2 mm)	5	2	P20B
Futura Medium Condensed	8	0.125 (3.2 mm)	6	2	P21
Futura Med Condensed Bold ⁴	8	0.125 (3.2 mm)	6	2	P21 B

1. Default letter style and height. Allows two rows of text per half (N2) display, larger heights only allow one row of text.

2. Average for a full width N1 or N2 display. Each legend will vary based on the actual letters used.

3. Average for a half width N3, N11, N12, N13, N14 or N15 display. Each legend will vary based on the actual letters used.

4. 15% wider character stroke width. Recommended for better off-angle viewing and lighted background displays.

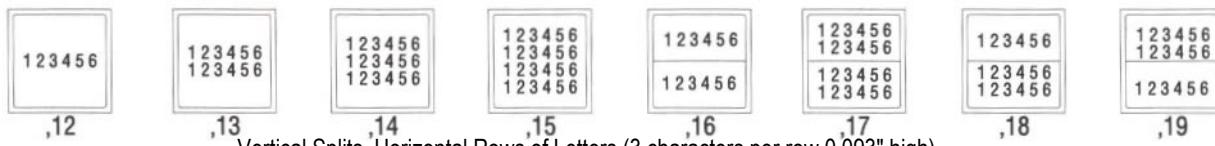
Legend Configuration Codes

58211A4B21 C1 D2F4L5N2(GR),P12,16 ON/OFF

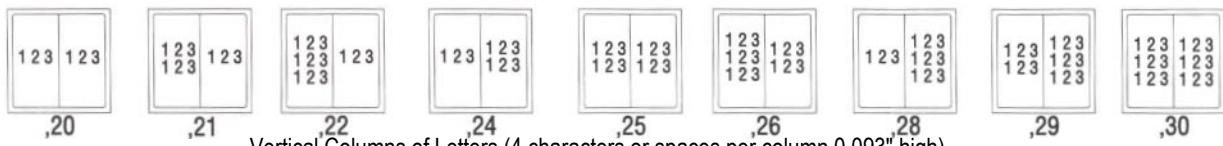
The two digits following the second comma identify the legend configuration. Legend configurations are listed below. The .093 inch (2.4 mm) character height is shown.

The legend itself must be written out as part of the catalog number when ordering a switch or indicator. The legend information required is added to the catalog number after the legend configuration, using commas between rows of characters and a diagonal slash to indicate where the split is. When specifying a split, the order in which the nomenclature is written is upper left, upper right, lower left, and lower right (the same convention as used in the color designation). See examples below.

Horizontal Rows of Letters (6 characters or spaces per row 0.093" high)



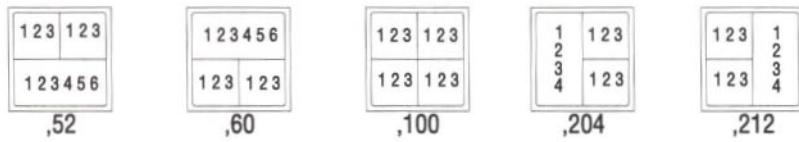
Vertical Splits, Horizontal Rows of Letters (3 characters per row 0.093" high)



Vertical Columns of Letters (4 characters or spaces per column 0.093" high)



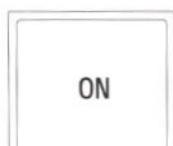
Three-Way Splits and Four-Way Splits (0.093")



Legend Nomenclature

58211A4B21 C1 D2F4L5N2(GR),P12.16 ON/OFF

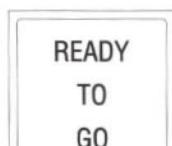
The legend nomenclature must be written out as part of the catalog part number when ordering a switch or indicator. The legend is appended to the catalog part number after the legend configuration code. Commas are used between rows of characters and a slash is used to identify legend splits. When specifying a legend with a split, the order for the nomenclature is upper left, upper right, lower left and lower right. Examples are listed below.



,12 ON



,16 ON/OFF



,14 READY,TO,GO



,204 1/2/3

Series 582 Plug-In Mounting Sleeves with Connector Block

After the switch has been inserted in the panel, this sleeve slides over the behind panel portion of the switch and is secured by tightening the pawl. When switch removal is necessary, access to both the front and rear of the panel is required.

582 RE1 for M24317/11 Connector Pins

Switch Length	Code	Panel Spacer	Panel Thickness (± 0.010 inches (0.3 mm))											
			0.032 (0.8)	DIM A	0.063 (1.6)	DIM A	0.090 (2.3)	DIM A	0.125 (3.2)	DIM A	0.190 (4.8)	DIM A	0.250 (6.4)	DIM A
Short	582-R1	None	-011	1.911	-012	1.880	-013	1.853	-014	1.818	-015	1.753	-016	1.693
Basic	582-RE1	None	-021	2.121	-022	2.090	-023	2.063	-024	2.028	-025	1.963	-026	1.903
Diaphragm	582-RD1	None	-031	1.866	-032	1.835	-033	1.808	-034	1.773	-035	1.708	-036	1.648
Short	582-R1	0.100 (2.5 mm) Gold*	-111	1.811	-112	1.780	-113	1.753	-114	1.718	-115	1.653	-116	1.593
Basic	582-RE1	0.100 (2.5 mm) Gold*	-121	2.021	-122	1.990	-123	1.963	-124	1.928	-125	1.863	-126	1.803
Short	582-R1	0.100 (2.5 mm) Black*	-211	1.811	-212	1.780	-213	1.753	-214	1.718	-215	1.653	-216	1.593
Basic	582-RE1	0.100 (2.5 mm) Black*	-221	2.021	-222	1.990	-223	1.963	-224	1.928	-225	1.863	-226	1.803

*Gold = Gold chemical film for RFI applications

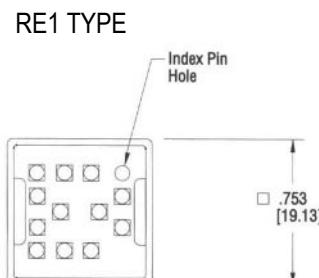
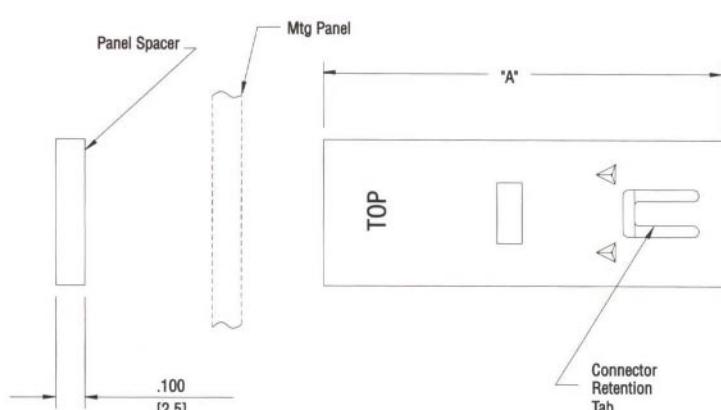
*Black = Black anodize

582 RE5 for M39029/22-192 Connector Pins

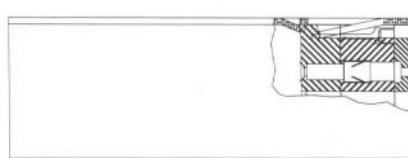
Switch Length	Code	Panel Spacer	Panel Thickness (± 0.010 inches (0.3 mm))											
			0.032 (0.8)	DIM A	0.063 (1.6)	DIM A	0.090 (2.3)	DIM A	0.125 (3.2)	DIM A	0.190 (4.8)	DIM A	0.250 (6.4)	DIM A
Short	582-135	None	-011	1.911	-012	1.880	-013	1.853	-014	1.818	-015	1.753	-016	1.693
Basic	582-RE5	None	-021	2.121	-022	2.090	-023	2.063	-024	2.028	-025	1.963	-026	1.903
Diaphragm	582-RD5	None	-031	1.866	-032	1.835	-033	1.808	-034	1.773	-035	1.708	-036	1.648
Short	582-1115	0.100 (2.5 mm) Gold*	-111	1.811	-112	1.780	-113	1.753	-114	1.718	-115	1.653	-116	1.593
Basic	582-RE5	0.100 (2.5 mm) Gold*	-121	2.021	-122	1.990	-123	1.963	-124	1.928	-125	1.863	-126	1.803
Short	582-1115	0.100 (2.5 mm) Black*	-211	1.811	-212	1.780	-213	1.753	-214	1.718	-215	1.653	-216	1.593
Basic	582-RE5	0.100 (2.5 mm) Black*	-221	2.021	-222	1.990	-223	1.963	-224	1.928	-225	1.863	-226	1.803

*Gold = Gold chemical film for RFI applications

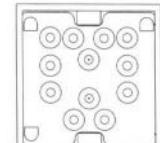
*Black = Black anodize



RE1 TYPE



TOP



Series 582 Snap-On Mounting Sleeves with Connector Block

Snap-On Mounting Sleeve 582-R6-# and 582-RE6-# for M39029/22-192 Connector Pin

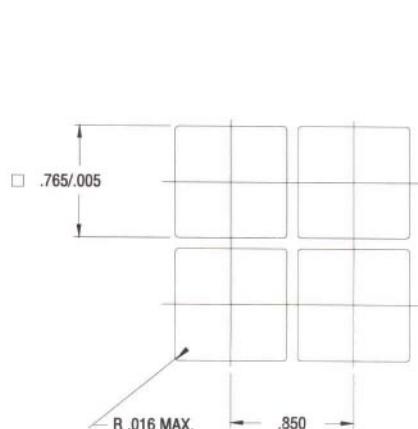
In the snap-on version, the 582-RE5 sleeve is modified to provide a positive stop above panel, leaving part of the sleeve protruding above the panel. Two versions are available, one with a 0.125 inch protrusion above panel and one with a flush mount. The sleeve is installed and retained by a snap-on clip assembled from the rear of the panel. The sleeve assembly remains loosely attached to the panel until the switch is inserted and tightened, creating a rigid mounting. The switch is removable from the front of the panel, rear access is not required. Not available for use with the EMI/RFI option or drip-proof seal and spray-tight seal switches. Contact the factory customer service center for additional information.

582 RE3 for M24317/11 Connector Pins

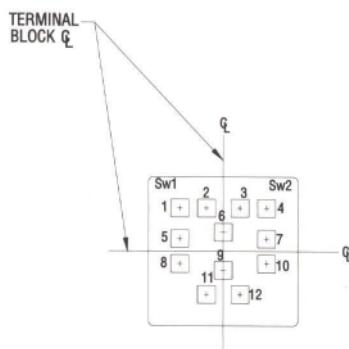
Length	Height Above Panel	Dim "L" Code	Panel Thickness (± 0.010 inches (0.3 mm))					
			0.032 (0.8)	0.063 (1.6)	0.090 (2.3)	0.125 (3.2)	0.190 (4.8)	0.250 (6.4)
Short	0.125	2.02	582-R6	N/A	N/A	-003	-004	N/A
Basic	0.125	2.32	582-RE6	N/A	N/A	-003	-004	N/A
Short	0.040	2.02	582-R6	N/A	N/A	-103	-104	N/A
Basic	0.040	2.32	582-RE6	N/A	N/A	-103	-104	N/A

582 RE6 for M39029-192/11 Connector Pins

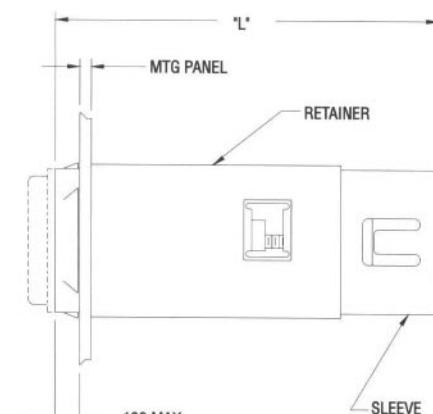
Length	Height Above Panel	Dim "L" Code	Panel Thickness (± 0.010 inches (0.3 mm))					
			0.032 (0.8)	0.063 (1.6)	0.090 (2.3)	0.125 (3.2)	0.190 (4.8)	0.250 (6.4)
Short	0.125	2.02	582-R6	N/A	N/A	-003	-004	N/A
Basic	0.125	2.32	582-RE6	N/A	N/A	-003	-004	N/A
Short	0.040	2.02	582-R6	N/A	N/A	-103	-104	N/A
Basic	0.040	2.32	582-RE6	N/A	N/A	-103	-104	N/A



Snap-On Panel Cutout



Terminal Block



TOL: .XXX = $\pm .010$
.XX = $\pm .03$

Snap-On Mounting Sleeve

Series 582 Matrices

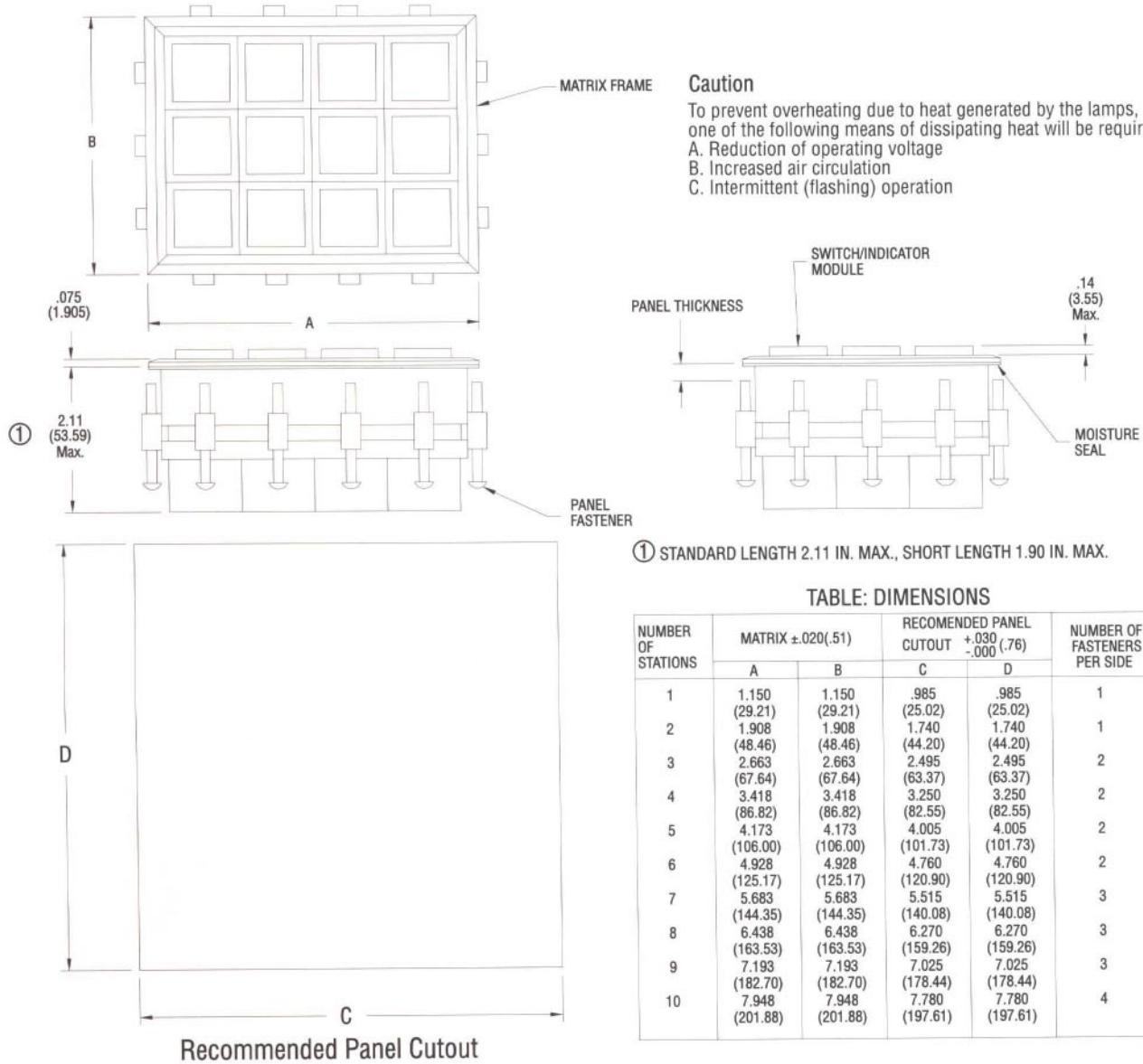
Series 582 matrices are modular units in which switches and indicators can be mounted. The maximum square matrix is 5 X 5 and the maximum rectangular matrix is 5 X 10. Contact the factory service center for information on other configurations. Wire terminals and installation tools are listed on page 19.

Bezel Matrix 582-REWYxxxx

The bezel matrix has a black colored bezel and is inserted through the front of the panel. Matrix selection must be coordinated with switch length. Fasteners are inserted into slots in the matrix after the matrix has been inserted into the panel and are tightened to secure the unit. Once mounted, the switches are removable from the front of the panel. Rear access is not required. Not available with the diaphragm seal version.

Code	Identifies	Codes
582-REWY0203	Matrix length	Use REWY for basic units, RWY for short
582-REWY0203	No. of units per horizontal row	Two digits
582-REWY0203	No. of units per vertical column	Two digits

Bezel Matrix Dimensions



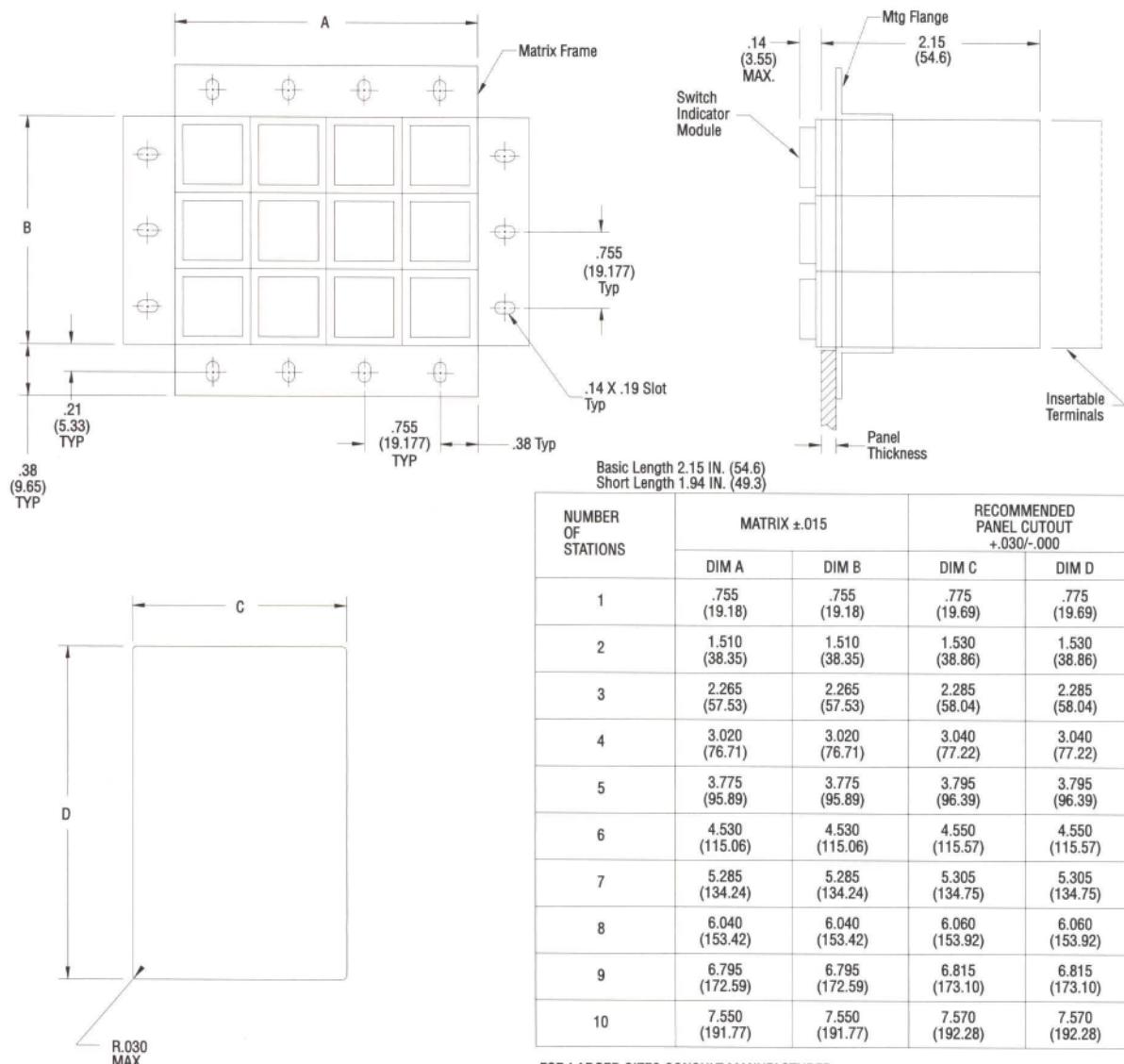
Series 582 Matrices continued

Flange Matrix 582-REXxxxx-.xxx

The flange matrix mounts from the rear of the panel and is secured with screws (not included). Flange mount matrices are RFI compatible, but are not supplied in a drip-proof or diaphragm seal versions. Matrix selection must be coordinated with switch length. Letters in the part number are omitted if the feature is not required. Switches are removable from the front of the panel, rear access is not required.

Code	Identifies	Codes
582-REX0203-.125	Matrix length	Use REX for basic units, RX - for short units
582-REX0203-.125	No. of units per horizontal row	Two digits
582-REX0203-.125	No. of units per vertical column	Two digits
582-REX0203-.125	Panel thickness	Std thicknesses: 0.063 (1.6), 0.090 (2.3), 0.125 (3.2) 0.190 (4.8)

Flange Matrix Dimensions



NUMBER OF STATIONS	MATRIX $\pm .015$		RECOMMENDED PANEL CUTOUT $+.030/-0.00$	
	DIM A	DIM B	DIM C	DIM D
1	.755 (19.18)	.755 (19.18)	.775 (19.69)	.775 (19.69)
2	1.510 (38.35)	1.510 (38.35)	1.530 (38.86)	1.530 (38.86)
3	2.265 (57.53)	2.265 (57.53)	2.285 (58.04)	2.285 (58.04)
4	3.020 (76.71)	3.020 (76.71)	3.040 (77.22)	3.040 (77.22)
5	3.775 (95.89)	3.775 (95.89)	3.795 (96.39)	3.795 (96.39)
6	4.530 (115.06)	4.530 (115.06)	4.550 (115.57)	4.550 (115.57)
7	5.285 (134.24)	5.285 (134.24)	5.305 (134.75)	5.305 (134.75)
8	6.040 (153.42)	6.040 (153.42)	6.060 (153.92)	6.060 (153.92)
9	6.795 (172.59)	6.795 (172.59)	6.815 (173.10)	6.815 (173.10)
10	7.550 (191.77)	7.550 (191.77)	7.570 (192.28)	7.570 (192.28)

FOR LARGER SIZES CONSULT MANUFACTURER

TOL: XXX = $\pm .010$
.XX = $\pm .03$

Caution: To prevent overheating due to heat generated by the lamps, one of the following means of dissipating heat will be required:
A. Reduction of operating voltage
B. Increased air circulation
C. Intermittent (flashing) operation

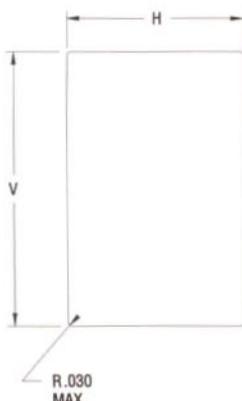
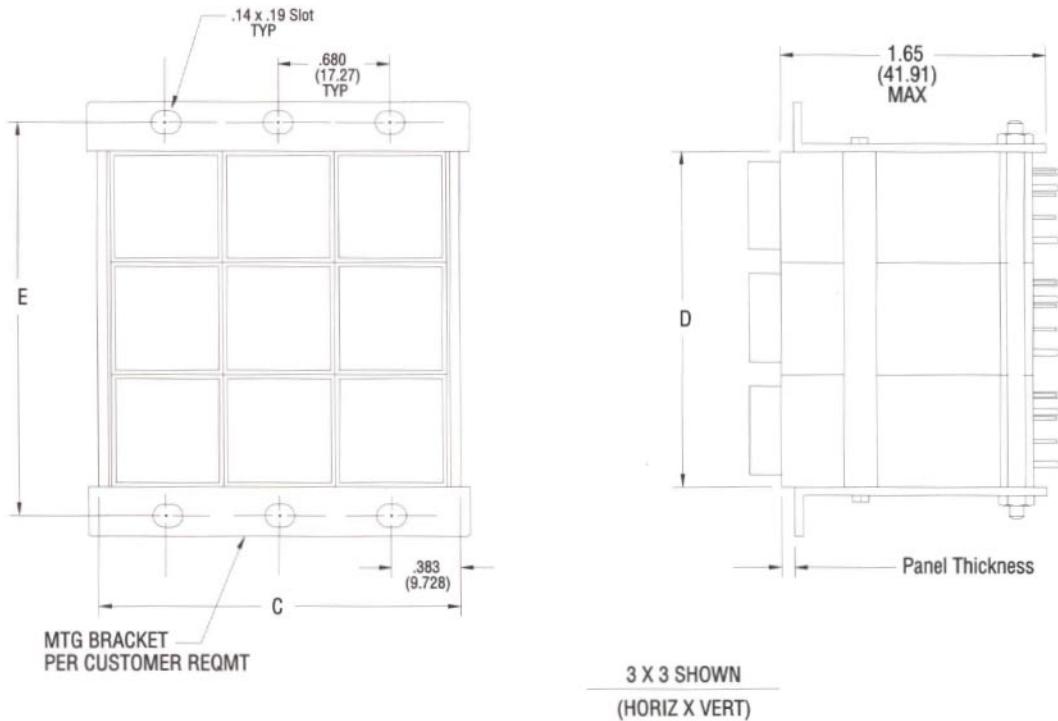
Recommended Panel Cutout

Series 582 Rod Mount Hardware

The rod mount system allows for units to be mounted in the smallest allowable space by using a system of rods and plates to hold the switch/indicator units together and fasten them to the mounting panel. Not released for production at time of publication. Contact the factory customer service center for information.

582-REMxxxx-.xxx

Code	Identifies	Codes
582-REM0303-.125	Matrix length	Use REM for basic units, RM for short units
582-REM0303-.125	No. of units per horizontal row	Two digits
582-REM0303-.125	No. of units per vertical column	Two digits
582-REM0303-.125	Panel thickness	Std sizes: 0.063 (1.6), 0.090 (2.3), 0.125 (3.2)



Recommended Panel Cutout

NUMBER OF STATIONS	RECOMMENDED PANEL CUTOUT +.030/-0.000		MATRIX ±.025		
	DIM H	DIM V	DIM C	DIM D	DIM E
1	.700	.700	.766	.680	1.104
2	1.380	1.380	1.446	1.360	1.784
3	2.060	2.060	2.126	2.040	2.464
4	2.740	2.740	2.806	2.720	3.144
5	3.420	3.420	3.486	3.400	3.824
6	4.100	4.100	4.166	4.080	4.504

FOR LARGER SIZES CONSULT MANUFACTURER

TOL: XXX = ±.010
XX = ±.03

Caution: To prevent overheating due to heat generated by the lamps, one of the following means of dissipating heat will be required:
A. Reduction of operating voltage
B. Increased air circulation
C. Intermittent (flashing) operation

Spare Parts

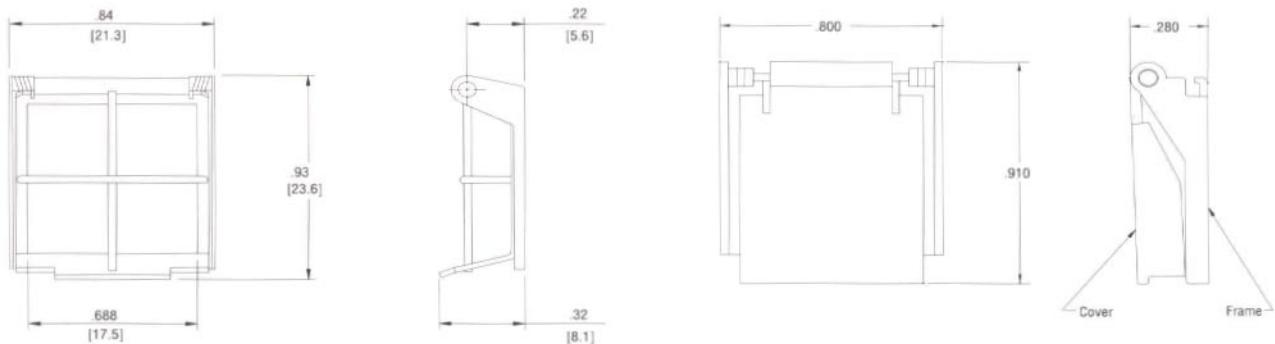
Lamps	582-F#	(See Pages 11, 12)
Capsule	582-##C#F#L#N#(#,P##,##	(See Pages 9 thru 15)
Body	582-##A#B#C#	(See Pages 9, 10)
Mounting Hardware	582-##D##	(See Page 10)
Panel Seal and Retainer, Black	582-515-1	
Panel Seal and Retainer, Stainless Steel	582-515-2	
Capsule Seal	582-507	
Frame Matrix Fastener	582-526	
Connector Block	582-504	

Accessories

Molycote 33 Lubricant, Light Grade, 1 gram tube	58A-101
Connector Pin, M24317/11, Crimp Style, 1 ea, 20-24 AWG	58A-102-1
Connector Pin, M24317/11-905, 25 ct, 20-24 AWG	58A-102-2
Connector Pin, M24317/11, Wire Wrap, 1 ea, 20-24 AWG	58A-103-1
Connector Pin, M24317/11-901, 25 ct, 20-24 AWG	58A-103-2
Connector Pin, M39029/22-192, Crimp Style, 1 ea, 20-24 AWG	58A-111-1
Connector Pin, M39029/22-192, Crimp Style, 25 ct, 20-24 AWG	58A-111-2
Clear Plastic Switchguard	58A-104
Wire Switchguard, Black	58A-105-1
Wire Switchguard, Red	58A-105-2

Installation and Removal Tools

Lamp Capsule Removal Tool	58T-101
Connector Pin Crimp Tool	58T-103
Connector Pin Removal Tool	58T-104
Connector Pin Removal Tool Tip for 58T-105-1	58T-105-2
Connector Pin Removal Tool, Extended	58T-105-1
Torque Screwdriver	58T-106
Connector Block Removal Tool	58T-107



Wire Switch Guard
Not For Use With Matrices
Individual Mount Only

Clear Plastic Switch Guard
Not For Use With Matrices
Individual Mount Only

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Part Number Specification Sheet

The Part Number Specification Sheet and accompanying Quick Reference Specification Tables have been created to streamline your selection of standards and features for the Series 582. For an in-depth description of this material, refer to pages 7-13.

Project

Customer

Submitted By

Customer Code

Notes/Comments

SERIES 584

ILLUMINATED PUSHBUTTON SWITCHES
& INDICATORS WITH LED LIGHTING



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Headquartered in the metro area of Dallas, Texas, with factories in Grand Prairie, TX and Costa Mesa, CA, Sagem Avionics, LLC offers a comprehensive range of Part 21 products and Part 145 services touching most civil and military aircraft. As a subsidiary of Sagem, part of the worldwide corporation of Safran, Sagem Avionics, LLC is able to draw on a vast range of resources covering nearly every aspect of aviation. With our collective experience in this highly dynamic industry, our Customers are delighted with the tailor-made, innovative and reliable solutions provided.

Specializations

MRO, Flight Controls, Flight Operations Quality Assurance, Auto Pilot Systems, Aircraft Condition Monitoring, Integrated Cockpit Display Systems, Avionics Illuminated Pushbutton Switches.

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Sagem Avionics, LLC. has field proven capability and pedigree of development and manufacturing of illuminated pushbutton switches and control panel products. This development covers a wide array of applications for civil and military platforms.

At Sagem Avionics Costa Mesa Facility we manufacture pushbutton switches, illuminated panels, pilot controls and cockpit control panels at the site in Costa Mesa, California. The co-location of Sagem Avionics design and manufacturing enables superior Control and delivery of Quality product. Everyone at Sagem Avionics take great pride in their work and the Quality of the product being shipped to the customer. Additionally, the Sagem Avionics switches, pilot control products and cockpit control panels have demonstrated superior performance and reliability in the field.

584 PBA LED PRESENTATION

INTRODUCTION

The Series 584 PBA LED Lighted Avionics Pushbutton Switch is designed for life-of-the-aircraft service. It features five aviation and five NVIS (Night Vision Imaging System) compatible colors. The Series 584 PBA is available in momentary action, alternate action, alternate action holding coil and indicator only configurations. Three termination systems are available: Plug-in, Solder turret and IWTS (Integrated Wire Termination System).

PEDIGREE

The Series 584 LED switch uses the proven four-pole switch contact pushbutton mechanism and qualified to MIL-PRF-22885/110. The switch display is illuminated by surface mount Light Emitting Diodes (LEDs) located within the lamp capsule.

Series 584 PBA switches, the LED version provides high reliability product in a lightweight, sunlight readable package with options of night vision compatibility, spray-tight sealing, and plug-in mounting.

SWITCH DESIGN

The Series 584 LED pushbutton switch is a four pole, snap action, Form C device available in momentary, indicating alternate, and indicator configurations. Sagem Avionics use of its proprietary bi-stable switch contact system differentiates the Series 584 switch from all other four pole pushbutton switches. This bi-stable design ensures contact reliability and speed by enabling four switch contacts to be equally stable in both C-NC and C-NO states, unlike sub-miniature switches which require a balanced spring system to maintain them in an activated mode. The switch actuation mechanism is a unique over-center snap actuator which precludes contact tease and inadvertent switch transfer by operators. The Series 584 PBAs deliver fast and simultaneous switch contact transfer based on the bi-stable and switch actuation mechanism..

Standard Series 584 LED pushbutton switch delivers 200,000 cycles. While the «Millennium» version delivers in excess of 1,000,000 cycles.

LED LIGHTING

The Series 584 LED PBA functions with 28-Volt aircraft DC power supply systems. Additionally, the LED PBA Lighting is available linear or step function. The linear dimming is proportional to the external current or voltage input while the step dimming is defined by the desired daytime and night mode voltage levels. Series 584 PBA illumination life exceeds 100,000 continuous hours due to optimized Electro-Opto-Mechanical design.



1. RELIABILITY

Switch life is based on three factors:

- Mechanical life,
- Electrical life of the switch contacts
- Electrical life of the lighting circuitry.

Mechanical Life

The 584 switch is rated for 1,000,000 actuations.

Switch Electrical Life

1,000,000 actuation cycle at 0.01 to 0.1 amperes resistive

Lighting Circuitry Life

100,000 continuous hours based on when the illumination degradation reaches 50% of its initial brightness value.

Reliability Prediction

The MTBF for the Series 584 LED pushbutton switch is predicted to be greater than 500,000 hours based on MIL-HDBK-217F and the Non-Electronic Parts Reliability Data (NPRD) and the assumption of one operation cycle per flight. However the MTBF computation is performed based on each application pending the environmental conditions. Sagem Avionics can determine the MTBF for a given requirements.

2. PERFORMANCE CHARACTERISTICS

Polarity

LED's are polarity sensitive devices therefore Sagem Avionics provides polarity definition as part of the electronic circuit information marked on the side of the 584 LED switches. Additionally, the polarity can be marked on the connector to prevent incorrect wiring. The electronic circuit is protected from accidental application of power with the wrong polarity.

Chromaticity and Luminance

Sagem Avionics LED illuminated switches are manufactured with true color LED's to meet specific chromaticity values. The LED luminance or brightness can be tailored to specific customer requirements if the application necessitates a deviation from the performance of the standard product provided here. Luminance levels for all LED capsule colors and legend configurations are derived for the specified bright and dim operating voltages. The selected voltage or current has minimal impact on legend colors. The LED color and luminance will operate consistently at the specified input voltages set for the bright and dim control voltages.

Low Power Consumption

The nominal power consumption for the Series 584 LED pushbutton switch is 1.5 Watts for the 28-Volt system. This represents a power savings of greater than 50% over a typical 28-Volt incandescent system.

Low Touch Temperature

The touch temperature at the face of the Series 584 LED pushbutton switch operated at 28 volts in an ambient temperature of 24 degrees Celsius has been tested at 38 degrees Celsius. This temperature rise of 14 degrees Celsius is as much as 40 degrees Celsius cooler than an equivalent 28 volt incandescent light source.

LED Design Redundancy

The Series 584 LED PBA design utilizes eight LED's. A full display is made up of 8 LED's, while a half display would have 4 LED's per each half. Given the long life of the individual LED's, LED replacement is highly unlikely during the life of an aircraft; however premature loss of one or two LED's in a full display capsule would not result in a non-legible capsule legend. A half display will remain legible with one failed LED.

Qualification Data

The Series 584 LED pushbutton switch is qualified to MIL-PRF-22885/110. The LED upgrade to the 584 product is based on incandescent series 584 PBA and does not impact the structural integrity of the switch, and the basic switch operating mechanism remains the same.

PERFORMANCE AND RELIABILITY

As an electronic component, the series 584 LED pushbutton switch is designed to meet the demanding environmental conditions for airborne equipment of RTCA/DO-160. The specific test methods used are listed under the detailed environmental specification in this catalog.

3. DESIGN AND PRODUCT FLEXIBILITY

Dimming Methods

Sagem Avionics offers «linear dimming» and «step dimming» capabilities for the Series 584 LED PBA switch.

Linear dimming uses external voltage input for providing the dimming control. In this method, the voltage input to the switch is varied from full rated voltage (bright mode) to a desired dim voltage level (dim mode). In this configuration, the LED current limiting resistors are located inside the switch body which control the current and subsequently tune the luminance value of the LED's.

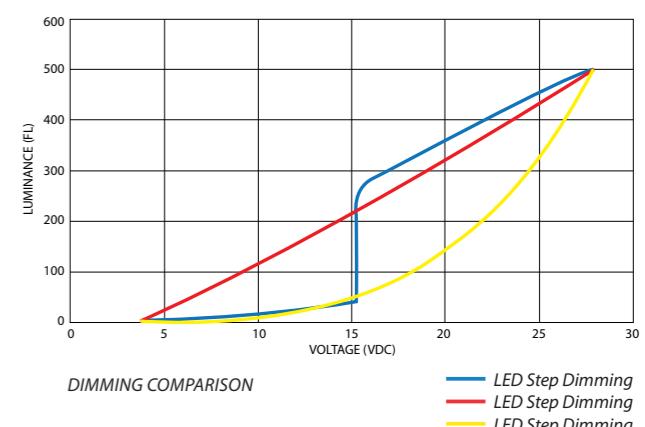
Step dimming provides dimming control internal to the switch and is generally designed to provide a «stair-step» response to bright and dim mode voltage inputs to achieve desired levels of luminance for day and night operation.

In a 28-Volt system, an electrical circuit within the switch housing provides the voltage reduction and dimming circuitry to provide the desired bright mode and dim mode luminance at the desired voltages. The dimming circuit is attached to the switch body to remove heat away from the LED capsule and thereby increase their operating life.

The graph shown compares the luminance versus voltage curve for a standard 28-Volt LED PBA switch with step dimming to that of a 28-Volt LED PBA switch with linear dimming and a typical 28-Volt incandescent switch. For custom applications the range of the dimming step can be pre-specified within 22 to 12 Volt for a 28-Volt system.

Legends

The legend and character sizes specified for the Series 584 LED are provided in the Character Font and Height Codes section of this catalog. Sagem Avionics can provide legends to various standard fonts as well as custom legends and sizes.



4. HANDLING

Due to sensitivity of electronics and Electro-Optics component to ESD the series 584 LED PBAs shipped with ESD protection packaging. Sagem Avionics strongly recommends that proper ESD handling procedures are used when working with the series 584 LED pushbutton switches.

MECHANICAL SPECIFICATION

The length of each unit is specified from the rear of the housing flange to the end of the switch body, not including terminals. Terminal length is 0.2 inches (5.1 mm) for solder and PCB units.

To calculate the actual behind panel depth for your application, subtract the thickness of the panel, the thickness of spacers used above panel and 0.030 inches for the drip-proof panel seal, if required, from the length of unit listed below.



	Maximum Length Behind Switch Housing Flange	Maximum Weight
Basic Length, Solder & PCB Termination	2.27 inches (35.0mm)	26 grams
Basic Length, Plug-in Termination	2.56 inches (52.3mm)	27 grams
Basic Length, Solder & PCB Termination, Diaphragm Seal	2.00 inches (37.3mm)	29 grams
Basic Length, Plug-in Termination, Diaphragm Seal	2.29 inches (46.2mm)	30 grams
584-REL5 Plug-in Mount	See 584-REL5	14 grams
584 Switch Contacts	Fine Silver Plated with 50 million th inches gold	
584 Millennium Switch Contacts	Fine Silver Plated with 100 million th inches gold	

Switch Form	Form C single break
Actuation Travel	0.135 ± 0.010 inches (3.43 ± 0.25 mm).
Actuation Force	2 to 5 lbs (8.9 to 22.3 N)
Extraction Force	3 to 5 lbs ((8.9 to 22.3 N)
Mounting Torque	18 ± 2 inch-oz. (0.127 ± 0.014 N-m)
Internal Seal	Drip-proof per MIL-S-22885
Diaphragm Seal	Spray-tight per MIL-STD-108
Mechanical Life	584: 200 000 cycles 584 Millennium: 1 000 000 cycles
Marking	MIL-STD-130

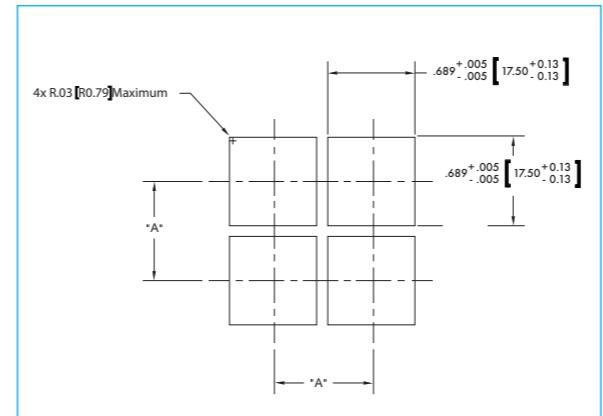


Figure 1. Recommended Panel Cutout

TYPE	DIMENSION "A"
Unsealed Switch	.780 [19.8]
Switch with Spray Tight Boot	.930 [23.62]

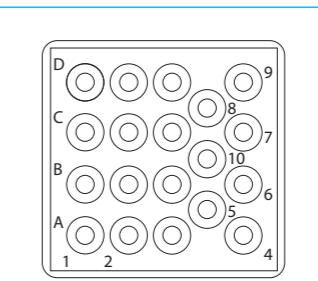


Figure 2. 8 Amp IWTS Terminations

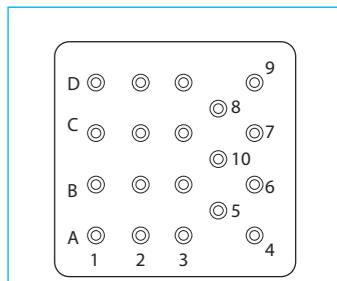
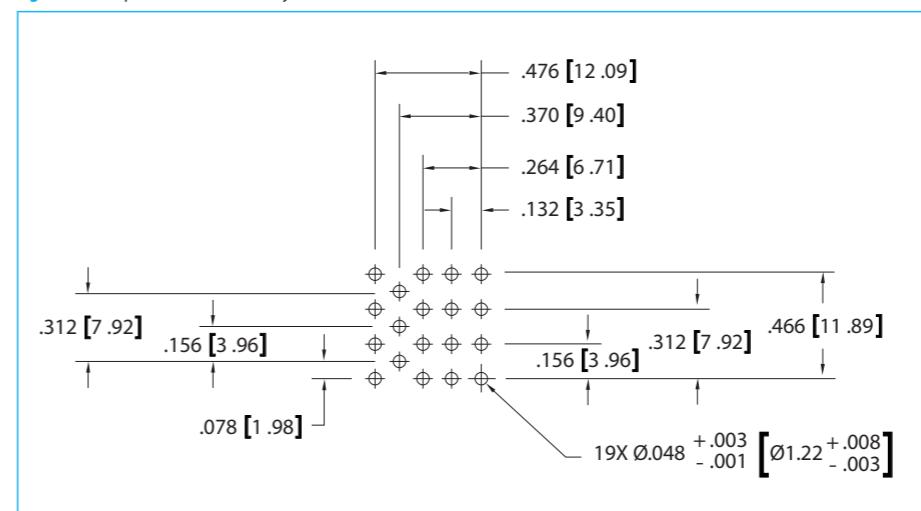


Figure 3. 8 Amp Terminations
Styles: Solder, Plug-in, PCB (shown)

Figure 4. 8 Amp Termination PCB Layout



DIMENSIONAL SPECIFICATIONS

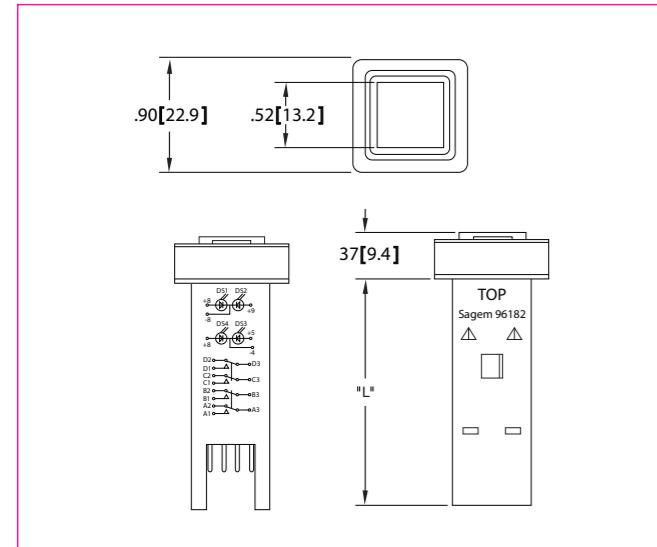


Figure 5. Spray tight Seal

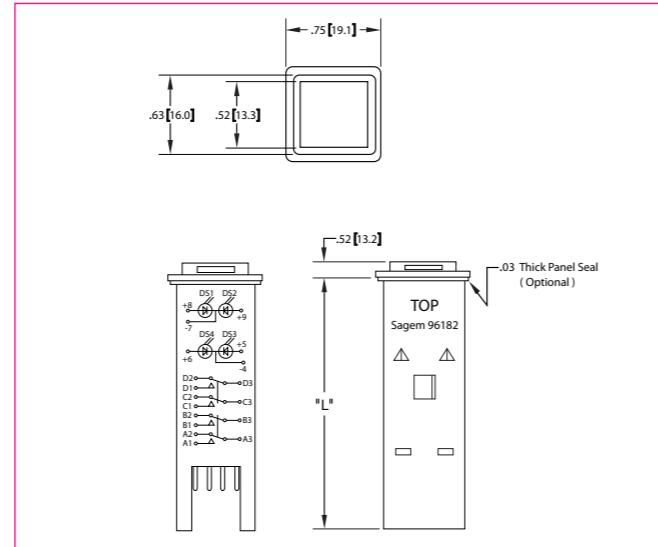


Figure 6. Dust Resistant or Driproof Seal

PLUG-IN TERMINATION

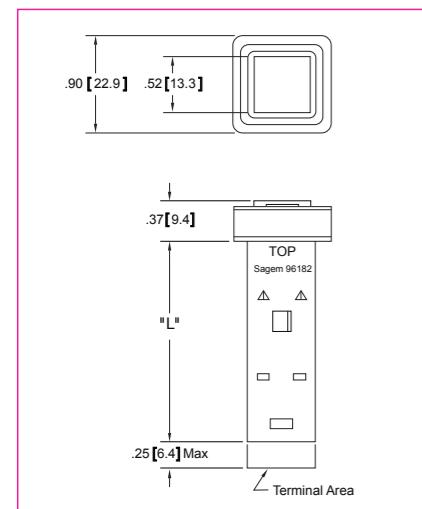


Figure 7. Spray Tight Seal

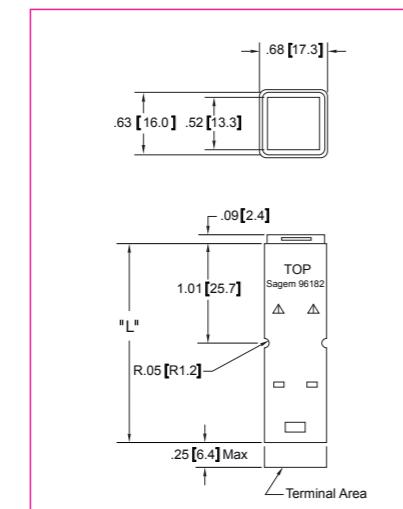


Figure 8. Dust Resistant or Driproof Seal

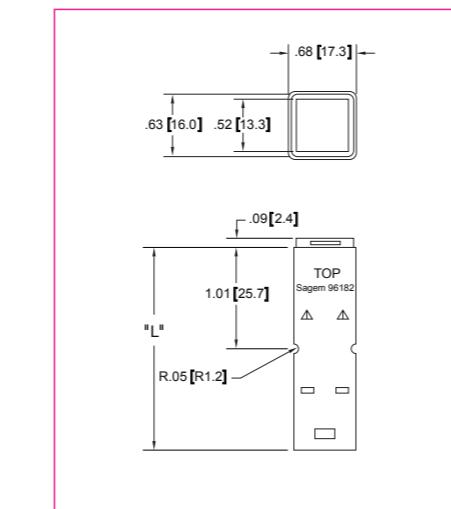
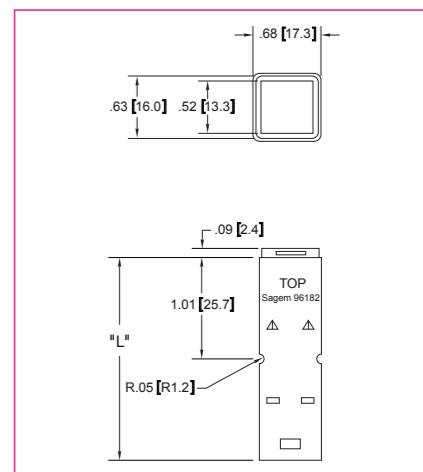
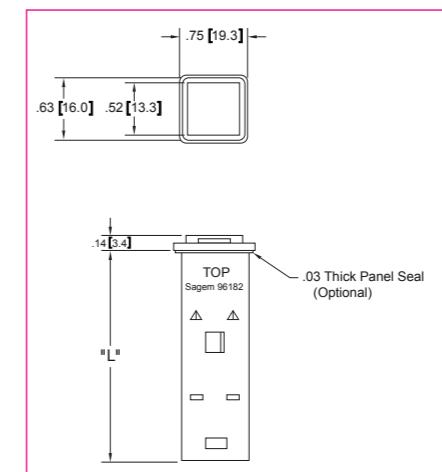
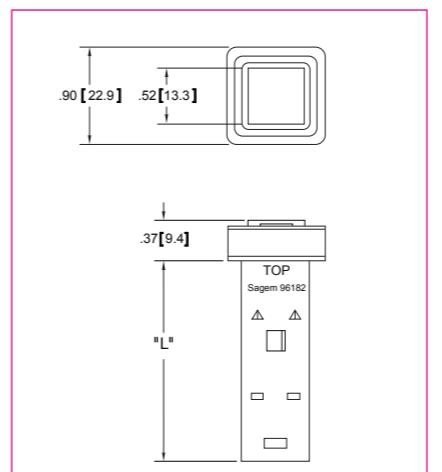


Figure 9. Rod Mount

TURRET TERMINAL OR PCB TERMINATION

DIM «L»			
Termination Type	Device Description	Unsealed Or Driproof	Spray Tight
Plug-in	Basic, Switch	2.56 [65.0]	2.29 [58.2]
	Basic, Holding Coil	3.10 [78.7]	2.83 [71.9]
Solder	Basic, Switch	2.27 [57.6]	2.00 [50.8]
Turret	Basic, Holding Coil	2.81 [71.4]	2.54 [64.5]
or PCB	Basic, Holding Coil, Rod Mtg.	2.85 [72.4]	not available

Table 1. 8Amp Plug-in, Turret and PCB Terminations



IWTS TERMINATION

DIM «L»			
Spray Tight	Termination Type	Device Description	Unsealed Or Driproof
IWTS	Basic, Switch	2.74 [69.6]	2.47 [62.7]
	Holding Coil, Basic	3.28 [83.3]	3.01 [76.4]
	Holding Coil, Basic, Rod Mtg.	3.32 [84.3]	not available

Table 2. 8 Amp IWTS

ENVIRONMENTAL SPECIFICATIONS

Operating Temperatures	-40°C to +71°C
Storage Temperatures	-55°C to +85°C
Thermal Shock	MIL-STD-202, Method 107, Condition A
Moisture	MIL-STD-202, Method 106
Salt Spray	MIL-STD-202, Method 101, Condition A, 96hours
Sand and Dust	MIL-STD-202, Method 110
Fungus	MIL-STD-810, Method 508, All Materials used are non-nutrient to fungus
Vibration	MIL-STD-202, Method 204m Condition B, for single channel mount. For multiple channel matrix mount, contact the factory for information
Shock	MIL-STD-202, Method 213, Condition B
Explosion	MIL-STD-202, Method 109
Magnet Effect	RTCA/DO-160, Section 15, Class Z
Power Input	RTCA/DO-160, Section 16, Category Z
Voltage Spike	RTCA/DO-160, Section 17, Category B
Audio Frequency Conducted Susceptibility	RTCA/DO-160, Section 18, Category Z
Induced Signal Susceptibility	RTCA/DO-160, Section 19, Category Z
Emission of Radio Frequency Energy	RTCA/DO-160, Section 21, Category M

ELECTRICAL SPECIFICATIONS

584 and 584 Millenium Current Ratings¹

Load	Sea level 28 vdc Max	Sea level 115 vac Max	50 000 Ft 28 vdc Max	50 000 Ft 115 vac Max	Life
Resistive	8.0 A	8.0 A	5.0 A	5.0 A	25 000 cycles
Resistive	5.0 A	5.0 A	3.0 A	3.0 A	100 000 cycles
Inductive	4.0 A	4.0 A	2.5 A	2.5 A	25 000 cycles
Inductive	0.5 A	0.5 A	0.3 A	0.3 A	100 000 cycles
Lamp	1.0 A	1.0 A	-	-	50 000 cycles

Table 3. Other application values can be identified on the switch life graph shown in figure 13.

584 and 584 Millenium Current Ratings¹

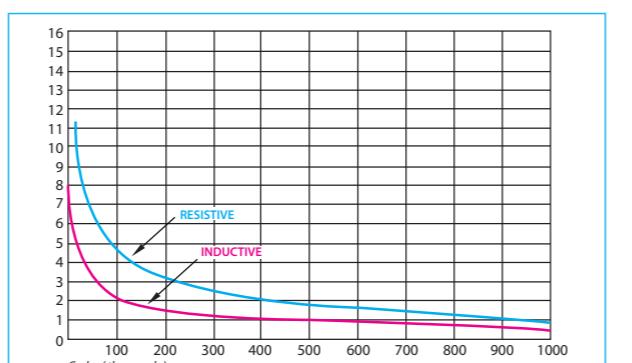
Logic Level	Sea Level 5 vdc Max	Life
Resistive	0.01 A	50 000 cycles

584 Low Level Rating¹

Low Level	Sea Level 0.03 vdc Max	Life
Resistive	0.01 A	200 000 cycles

584 Millenium Low Level Rating¹

Low Level	Sea Level 0.01 vdc Max	Life
Resistive	0.003 A	1 000 000 cycles



Note 1 Contacts subjected to currents over 100 mA are no longer useable for low current applications. Contact Resistance: Initial contact resistance at 6 VDC, 100 mA is 25 mΩ maximum. Post application resistance is 1% of the electrical circuit when measured during the operation of that circuit. Since the switch contacts are not hermetically sealed, actual contact resistance will vary based upon the cleanliness of the operating environment.

Note: Lamp positions are as viewed from the front of the display.

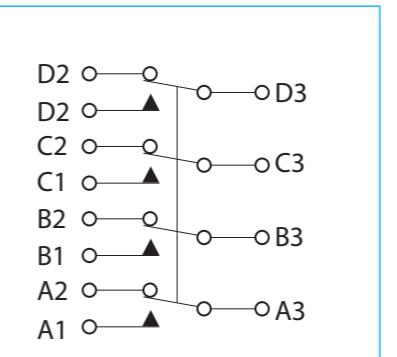


Figure 14.
4PDPT Switch

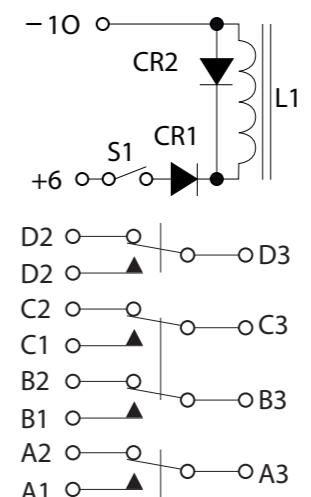


Figure 15.
4PDPT Switch with Alternate Holding Coil

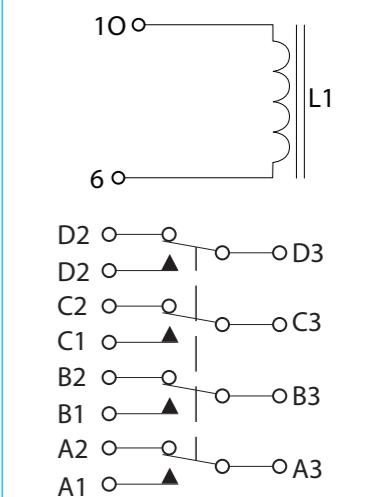


Figure 16.
4PDPT Switch with Momentary Holding Coil

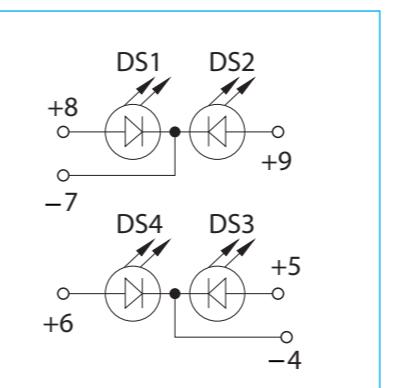


Figure 17.
C1 Four Lamp Separate Power & Ground not available with holding coil devices (see C2 or C3).

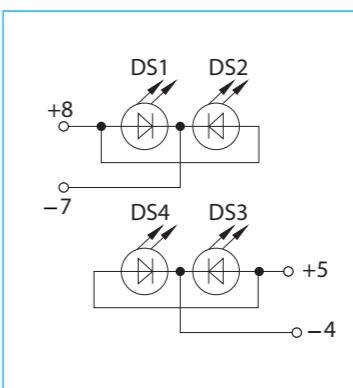


Figure 18.
C2 Two Lamp Common Power & Ground

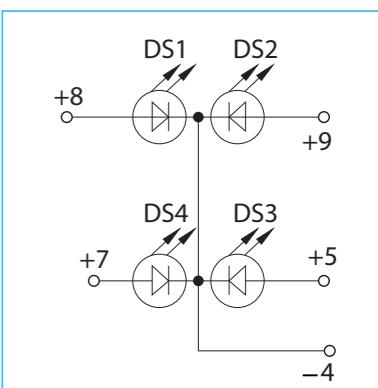


Figure 19.
C3 Four Lamp Separate Power & Common Ground

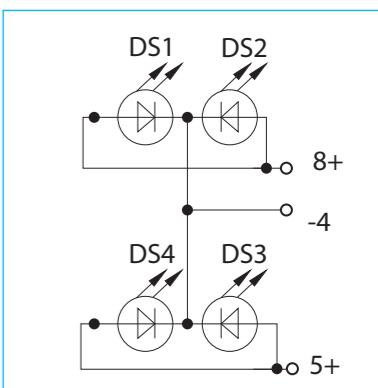
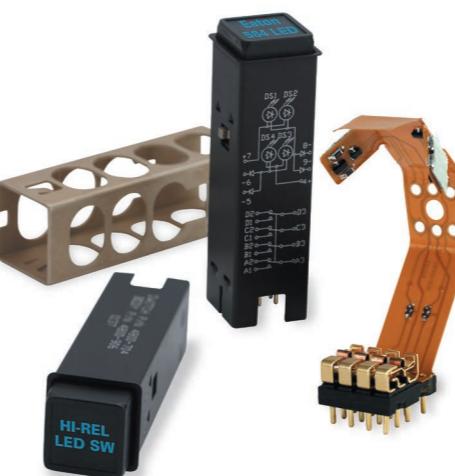


Figure 20.
C5 Two Lamp Common Power & Four Lamp Common Ground

DISPLAY SPECIFICATIONS

The Series 584 is available with a variety of display screens. The most common types are listed below. For special requirements, contact the factory customer service center.

DISPLAY TYPE DESIGNATION		WITH LIGHT SOURCE NOT ENERGIZED				WITH LIGHT SOURCE ENERGIZED			
MIL-PRF-22885	SAGEM	LEGEND	BACKGROUND	APPEARANCE/DESCRIPTIONS		LEGEND	BACKGROUND	APPEARANCE/DESCRIPTIONS	
N	1	White	Black		White characters on opaque black background	Color	Black		Color characters on black background
W	2	Black	White		Opaque black characters on white background	Black	Color		Black characters on color background
S	5	Not visible	Black		Hidden characters on black background	Color	Black		Color characters on black background. Sunlight Readable
C	6	Black	Color		Opaque black characters on color background	Black	Color		Black characters on color background
B	8	Not visible	Black		Hidden characters on black background	Black	Color		Black characters on color background
Special	9	White	Black		Opaque white characters on opaque black background	White	Color		White characters on color background
special	40	White	Black		White characters on black background for low ambient light	Color	Black		Color characters on black background for low ambient light
special	12	White	Black		White characters on black background	Color	Black		Color characters on black background.
		Black	Black		Hidden characters on black background	Color	Black		Color characters on black background.

OPTICAL SPECIFICATIONS

All sunlight readable displays meet or exceed the requirements of MIL-PRF-22885/110

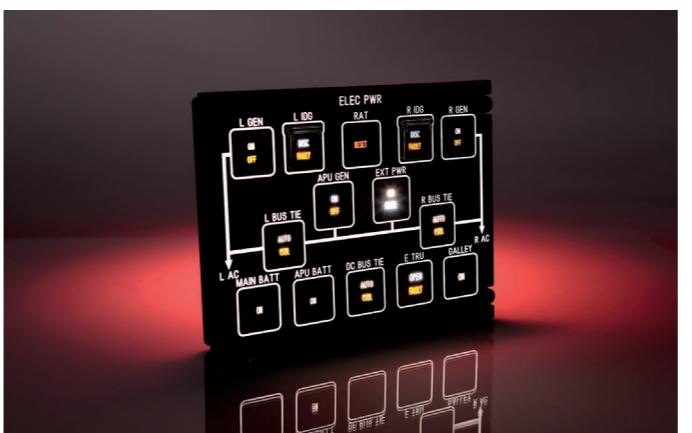
Luminance

The below table specifies the Luminance of PBAs at bright mode and dim mode. Bright mode luminance values are provided when the input voltage is 28V. Dim mode luminance values are provided when the input voltage is 14V. However, customers can specify non-standard dim voltage within the range of 12V to 22V.

Aviation Color	Luminance (fL) Bright mode at 28V	Luminance (fL) Dim mode at 14V
RED	≥ 250	15±5
AMBER	≥ 250	15±5
GREEN	≥ 250	15±5
WHITE	≥ 250	15±5
BLUE	≥ 200	10±5

Chromaticity

The typical color coordinates of illuminated characters and background shall be within the area defined by the following color coordinates based on the CIE 1931 Chromaticity diagram.



Control Panel with illuminated pushbutton switches

Contrast

The below table specifies the sunlight readability by contrast values between legend and background for sunlight readable display types. The measurements shall be performed at the following illumination conditions: 10,000 fC of 3000K to 5000K light source incidents to the measured surface at $45^\circ \pm 2^\circ$. The photometer is positioned perpendicular to the measured surface.

Aviation Color	On-Contrast (C_L)	Off-Contrast (C_{UL})
RED	≥ 0.6	≤ 0.1
AMBER	≥ 0.6	≤ 0.1
GREEN	≥ 0.6	≤ 0.1
WHITE	≥ 0.6	≤ 0.1
BLUE	≥ 0.6	≤ 0.1

Color	Chromaticity Coordinates based on CIE 1931	
	x	y
RED	0.665	0.335
	0.665	0.320
	0.695	0.290
	0.710	0.290
AMBER	0.540	0.459
	0.540	0.445
	0.610	0.375
	0.625	0.375
GREEN	0.150	0.808
	0.150	0.640
	0.300	0.640
	0.300	0.694
WHITE	0.290	0.315
	0.330	0.285
	0.400	0.390
	0.360	0.420
BLUE	0.175	0.005
	0.175	0.175
	-	-

NVIS Compatible Display

Sagem NVIS compatible displays meet the requirements of MIL-L-85762A and MIL-STD-3009.

The typical sunlight readable NVIS displays are shown in the following table.

WITH LIGHT SOURCE NOT ENERGIZED			WITH LIGHT SOURCE ENERGIZED		
LEGEND	BACKGROUND	APPEARANCE/DESCRIPTIONS	LEGEND	BACKGROUND	APPEARANCE/DESCRIPTIONS
Not visible	Black	Hidden characters on black background	Red	Black	 Red characters on black background
			Yellow	Black	 Yellow characters on color background
			White	Black	 White characters on black background. Sunlight Readable
			Green B	Black	 Green B characters on color background
			Green A	Black	 Green A characters on color background

NVIS Color and Radiance

The center chromaticity coordinates and its radius of a circle for each NVIS compatible color is specified in the table. At the luminance level specified in the following table, the u' and v' chromaticity coordinate values for Green A and White shall be within the areas by the defined circles; the u' and v' chromaticity coordinate values for Green B, Yellow, and Red shall be within the area by the defined circles and CIE 1976 diagram boundary.

The NVIS radiance for each NVIS compatible color shall meet the requirements in the table at the specified luminance level.

NVIS-Compatible Color	Class	Chromaticity Coordinates Based on CIE 1976				NVIS RADIANCE (NRa or NRB) (W/cm ² · sr)
		u'	v'	r	Luminance (fL)	
RED	B	0.450	0.550	0.060	15	$4.7 \times 10^{-8} < NRB < 1.4 \times 10^{-7}$
YELLOW	B	0.274	0.622	0.083	15	$4.7 \times 10^{-8} < NRB < 1.4 \times 10^{-7}$
YELLOW	A	0.274	0.622	0.083	15	$5.0 \times 10^{-8} < NRa < 1.5 \times 10^{-7}$
GREEN B	A and B	0.131	0.623	0.057	0.1	$NRa, NRB < 1.7 \times 10^{-10}$
GREEN A	A and B	0.088	0.543	0.037	0.1	$NRa, NRB < 1.7 \times 10^{-10}$
WHITE	A and B	0.190	0.490	0.040	0.1	$NRa, NRB < 1.0 \times 10^{-9}$

Luminance - NVIS Compatible Display

NVIS-Compatible Color	Class	Luminance (fL) Bright mode at 28V	Luminance (fL) Dim mode at 14V
RED	B	≥ 200	15±5
¹ YELLOW	A and B	≥ 200	15±5
¹ WHITE	A and B	≥ 200	15±5
¹ GREEN B	A and B	≥ 200	15±5
^{1&2} GREEN A	A and B	≥ 200	15±5

Note 1: PBAs of Yellow Class A, White, Green A, and Green B are able dimmable continuously to less than 0.1fL.

Note 2: Legends with Green A applications appear the same as the markings of the illuminated panels.

Contrast – NVIS Compatible Display

The below table specifies the sunlight readability by contrast values between legend and background for sunlight readable display types. The measurements for NVIS Red, NVIS Yellow, and NVIS Green B shall be performed at the following illumination conditions: 10,000 fC of 3000K to 5000K light source incidents to the measured surface at $45^\circ \pm 2^\circ$. The photometer is positioned perpendicular to the measured surface. The measurements for NVIS Green A shall be performed at the following illumination conditions: 50 fC of cool light source F2 incidents to the measured surface at $45^\circ \pm 2^\circ$. The photometer is positioned perpendicular to the measured surface.

NVIS-Compatible Color	Class	On-Contrast (C_{OL})	Off-Contrast (C_{UL})
RED	B	≥ 0.6	≤ 0.1
YELLOW	A and B	≥ 0.6	≤ 0.1
WHITE	A and B	≥ 0.6	≤ 0.1
GREEN B	A and B	≥ 0.6	≤ 0.1
GREEN A	A and B	≥ 0.6	≤ 0.1

CREATE YOUR OWN REFERENCE

This catalog describes the standard and optional features of the Series 584. To determine the correct part number, refer to the following pages. Samples of the typical part number are shown on each page to aid your selection.

584	71	A4	B5	C1	D2	G28	L5000	N2	GR	P12	16	ON/OFF
Series No.	Unit Options	Switch Action	Termination	Lamp Circuit	Panel Thickness	Voltage	Display Screen	Display configuration	Display color	Character Front/Height	Legend Configuration	Legend

1 Series Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The series number is identified by the first three or four digits of the part number.

Series	Code
584	584
584 with QA per M22885/110	584H
584 Millenium	584M

2 Option Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

Several products options are identified by the next two digits of the part number. Use the table below to select the lighting option, sealing level.

Lighting Option	Fourth Digit
LED with Step Dimming	7
LED with Linear Dimming	8
LED-NVIS with Step Dimming	9

Seal Options	Fifth Digit
Dust Resistant	0
Drip-proof, with Panel Seal	1
Spraytight, With Diaphragm Seal	2

3 Switch Action Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The letter "A" and the digit immediately following it identify the switch action

Basic Unit	Code
Indicator	A0
4PDT Monetary Switch	A1
4PDT Alternate Switch	A2
4PDT Momentary Holding Coil Switch	A3
4PDT Alternate Holding Coil Switch	A4

4 Termination and Mounting

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The letter "B" and the digit following it identify the termination and mounting method.

Termination	Maximum Current Carrying Capacity	Compatible Connector Pins	Wire Size	Code
Plug-in	8A	M39029/22-192	20-24 AWG	B5
solder Turret	8A	N/A	20-24 AWG	B2
PCB	8A	N/A	20-24 AWG	B3
IWTS	8A	M39029/1-100	22-26 AWG	B4
		M39029/1-100	22-24 AWG	B4
Solder Turret w/Rod Mount	8A	N/A		B7
PCB w/Rod Mount	8A	N/A		B8
IWTS w/Rod Mount	8A	M39029/1-100	22-26 AWG	B9
		M39029/1-101	22-24 AWG	

5 Lamp Circuit Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The letter "C" and the digit following it designate the lamp circuit. For information on custom circuits, contact the factory customer service center.

Lamp Circuit	Code
Dual Ground, 4 Way Split	C1
Dual Ground, 2 Way Split	C2
Common Ground, 4 Way Split	C3
Common Ground, 2 Way Split	C5

6 Mounting Hardware Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The letter "D" and the digit following it identify the mounting hardware requirements for IWTS, solder and PCB units. This code is omitted if a plug-in mount unit is specified. Plug-in hardware is specified by separate part numbers listed later in this catalog. Custom mounting hardware is available by request. Contact the factory customer service center for information.

Spacer	Spacer Height	Panel Thickness Range	Code
No Spacer	-	0.030-0.149(0.76-3.79 mm)	D25
Black	0.100(2.5mm)	0.030-0.149(0.76-3.79 mm)	D1
No Spacer	-	.150-0.269 (3.80-6.83 mm)	D26
Black	0.100 (2.5mm)	.150-0.269 (3.80-6.83 mm)	D2

7 Voltage Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The letter "G" and the digit(s) following identify the lighting system input voltage.

Voltage Type	Code
5-VDC	G5
28-VDC	G28

Note: 5-VDC is available with linear dimming only

8 Display Screen Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

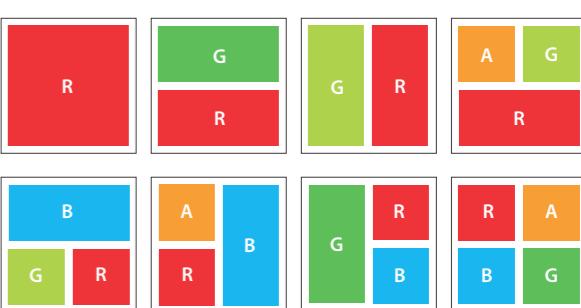
The letter "L" and the digits immediately following it identify the display screen. Display screens vary by the light source specified. To select the proper display screen code, identify the display type listed in the left column and the light source listed across the top row. Display screen types are described in the Optical Specification section.

Display Type	NVIS	Non-NVIS
1		L5001
2		L5002
5	L5060	L5000
6		L5006
7		L5007
8	L5061	L5008
9		L5009
12	L5062	L5012
40	L5066	L5040

9 Display Configuration Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The letter "N" and the number following it designate the lens configuration as follows: Full display and Split displays.



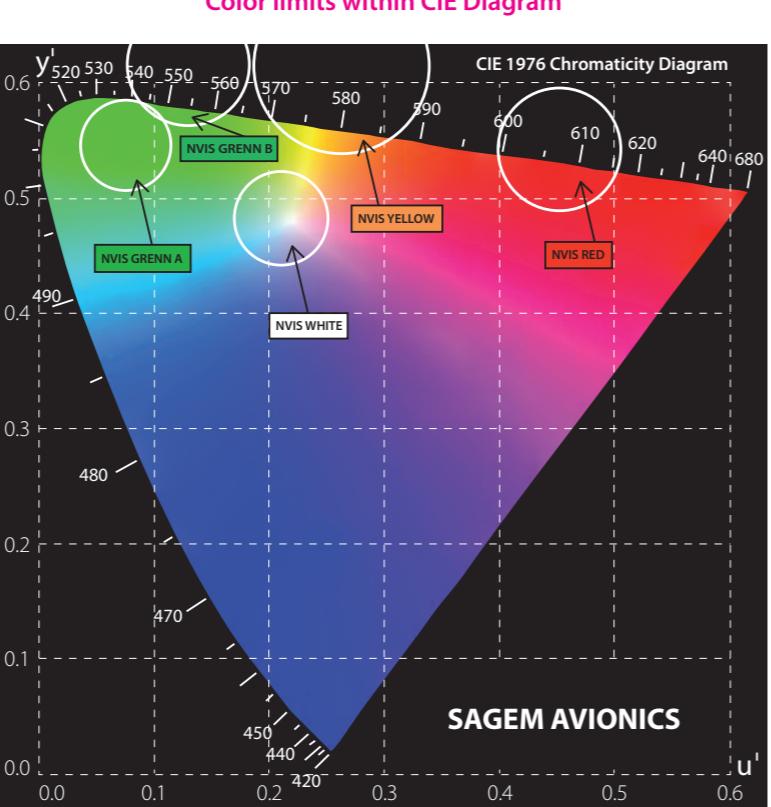
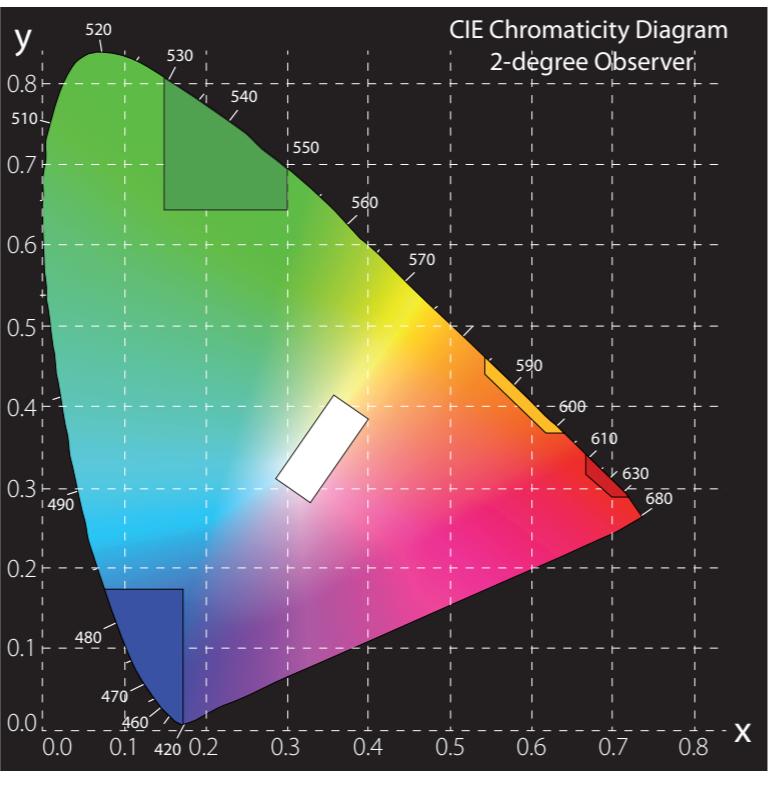
10 Color Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The Letters in parentheses following the lens configuration identify the lighted colors of the unit. In split displays, multiple letters are used to designate the colors of individual sections, in order from left to right and top to bottom. For example, in a four way split device, the designation (RWBG) would identify a red upper left quadrant, white upper right, blue lower left and green lower right.

Aviation Color	Display Code
RED	R
AMBER	A
GREEN	G
WHITE	W
BLUE	B

NVIS-Compatible Color	Class	NVIS-Compatible Display Code
RED	B	K
YELLOW	B	J
YELLOW	A	T
WHITE	A&B	V
GREEN B	A&B	H
GREEN A	A&B	F



11 Character Font and Height Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The Letter "P" and the digits following it identify the font style and character height to be used for the legend nomenclature

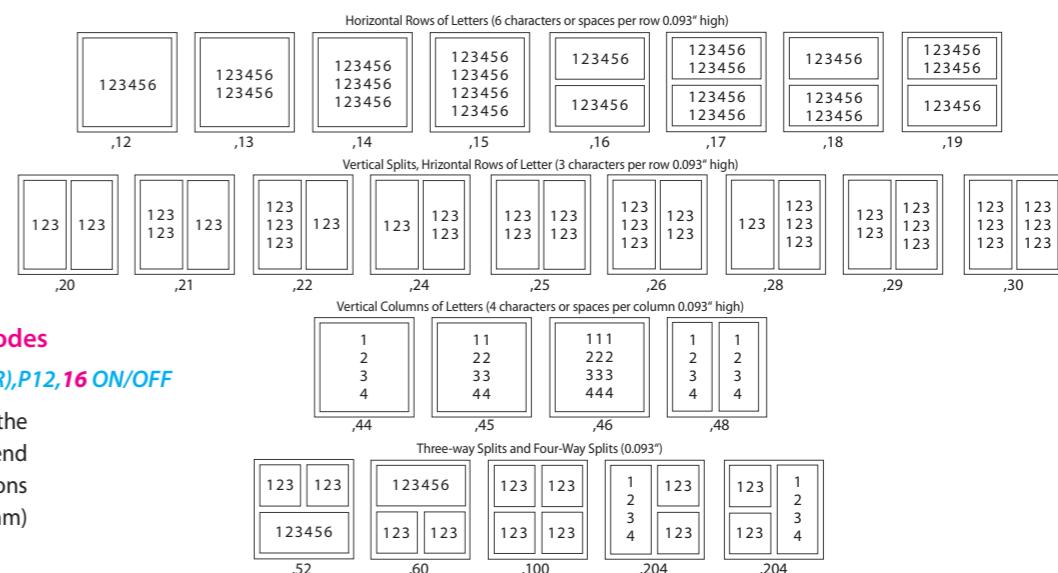
Letter Style	Font	Character Height	Letters Per Full Row ²	Letters Per Half Row ³	Code
Helvetica Medium ¹	1	0.093 (2.4 mm) ¹	7	3	P11
Helvetica Medium	1	0.125 (3.2 mm)	5	2	P12
Helvetica Medium Bold ⁴	1	0.125 (3.2 mm)	5	2	P12B
Helvetica Medium Condensed	2	0.093 (2.4 mm)	8	3	P14
Helvetica Medium Condensed	2	0.125 (3.2 mm)	6	2	P16
Helvetica Med Condensed Bold ⁴	2	0.125 (3.2 mm)	6	2	P16
DIN 1451/17	4	0.125 (3.2 mm)	4	2	P18
DIN 1451/17 Bold ⁴	4	0.125 (3.2 mm)	4	2	P18B
DIN 1451/17 Condensed	5	0.125 (3.2 mm)	6	2	P19
DIN 1451/17 Condensed	5	0.125 (3.2 mm)	6	2	P19B
Futura Medium	7	0.125 (3.2 mm)	5	2	P20
Futura Medium Bold ⁴	7	0.125 (3.2 mm)	5	2	P20B
Futura Medium Condensed	8	0.125 (3.2 mm)	6	2	P21
Futura Med Bold ⁴	8	0.125 (3.2 mm)	6	2	P21B

Note 1: Default letter style and height. Allows two rows of text per half (N2) display, larger heights only allow one row of text.

Note 1: Average for a full width N1 or N2 display. Each legend will vary based on the actual letters used.

Note 1: Average for a half width N3,N11,N12,N13,N14 or N15 display. Each legend will vary based on the actual letters used.

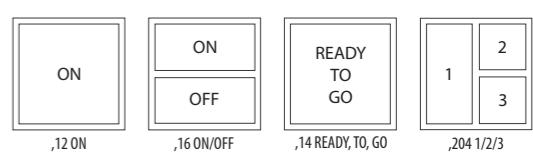
Note 1: 15% wider character stroke width. Recommended for better off-angle viewing.



12 Legend Configuration Codes

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The two digits following the second comma identify the legend configuration. Legend configurations are listed below. The .093 inch (2.4mm) Character height is shown.



13 Legend Nomenclature

58471A4B5C1D2G28L5000N2(GR),P12,16 ON/OFF

The legend nomenclature must be written out as part of the catalog part number when ordering a switch or indicator. The legend is appended to the catalog part number after the legend configuration code. Commas are used between rows of characters and a slash is used to identify legend splits. When specifying a legend with a split, the order for the nomenclature is upper left, upper right, lower left and lower right. Examples are listed below.

SERIES 584 PLUG-IN MOUNTING SLEEVES

WITH CONNECTOR BLOCK

Basic Mounting Sleeve 584-RDL5-XXX, 584-REL5 for M39029/22-192 Connector Pins

After the switch has been inserted in the panel, this sleeve slides over the behind panel portion of the switch and is secured by tightening the pawl. When switch removal is necessary, access to both the front and rear of the panel is required.

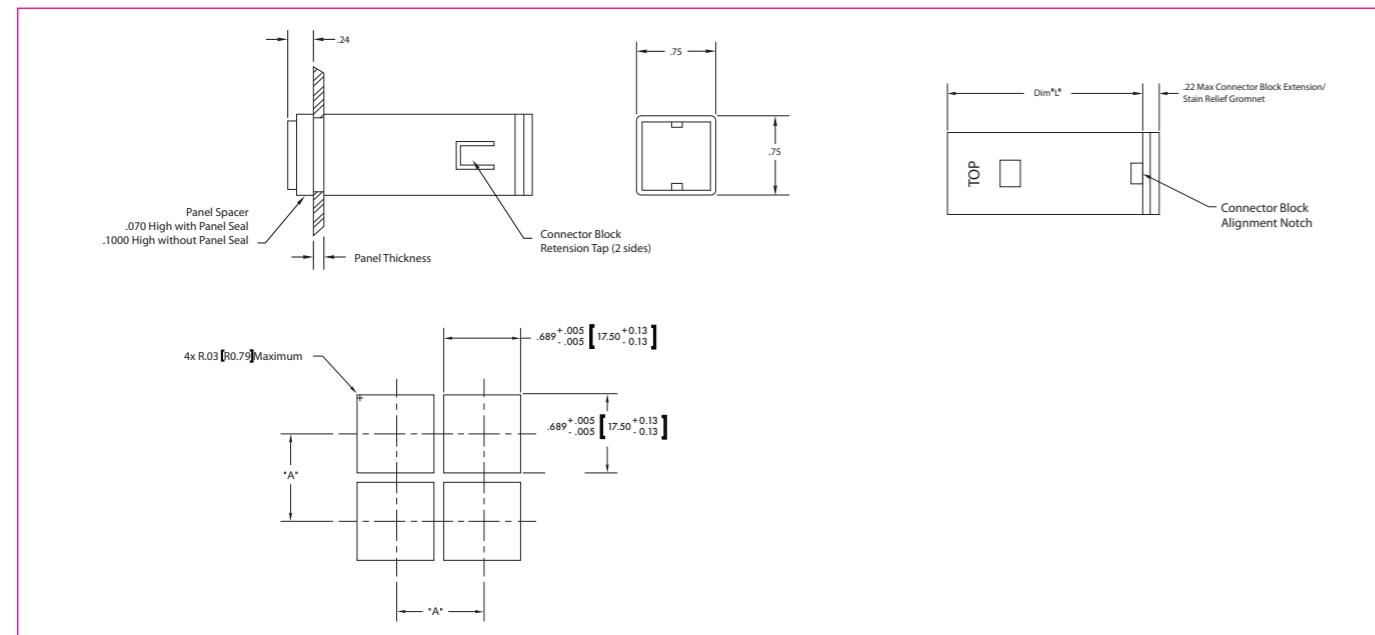
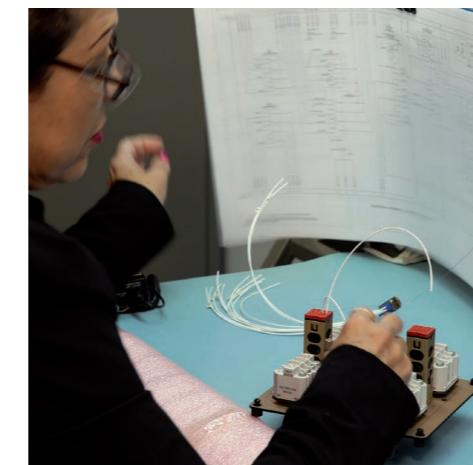


Figure 23.
Plug-In Mounting Sleeve with Connector and Plug-In Mounting Sleeve



Mounting Sleeve Dash Numbers for Dust Resistant, Spraytight & Driproof 8 Amp Devices

Device Description	Code	Code Dash Numbers (-XXX)							
		.032 [.813]	.063 [1.59]	.094 [2.39]	.125 [3.17]	.157 [3.99]	.188 [4.78]	.219 [5.56]	.250 [6.35]
Basic, Switch	584-REL5	-1	-2	-3	-4	-5	-6	-7	-8
Basic, Holding Coil	584-REHLS	-1	-2	-3	-4	-5	-6	-7	-8
Basic, Switch	584-REL5	-201	-202	-203	-204	-205	-206	-207	-208
Basic, Holding Coil	584-REHLS	-201	-202	-203	-204	-205	-206	-207	-208
Basic, Switch, Driproof	584-REL5	-301	-302	-303	-304	-305	-306	-307	-308
Basic, Switch, Driproof	584-REL5	-101	-102	-103	-104	-105	-106	-107	-108
Basic, H.C., Driproof	584-REHLS	-101	-102	-103	-104	-105	-106	-107	-108
Basic, H.C., Driproof	584-REHLS	-301	-302	-303	-304	-305	-306	-307	-308
Basic, Spray Tight	584-RDL5	-201	-202	-203	-204	-205	-206	-207	-208
Basic, H.C., Spray Tight	584-RDHL5	-201	-202	-203	-204	-205	-206	-207	-208

Note: The dash numbers shown are for applications without switch guards. For applications employing switch guards, please consult customer service.
Table 8

Basic Mounting Sleeve 584-RDL5-XXX, 584-REL5 for M39029/22-192 Connector Pins (cont'd)

Mounting Sleeve Lengths For Dust Resistant, Spraytight & Driproof 8 Amp Devices

	Dim L			
	rdL5	rdhL5	reL5	rehL5
-1 or -101	-	-	2.52	3.06
-2 or -102	-	-	2.49	3.03
-3 or -103	-	-	2.47	3.01
-4 or -104	-	-	2.43	2.97
-5 or -105	-	-	2.40	2.94
-6 or -106	-	-	2.37	2.91
-7 or -107	-	-	2.34	2.88
-8 or -108	-	-	2.31	2.85
-201	2.36	2.90	2.63	3.17
-202	2.32	2.86	2.59	3.13
-203	2.30	2.84	2.57	3.10
-204	2.25	2.80	2.53	3.07
-205	2.23	2.77	2.50	3.04
-206	2.20	2.74	2.47	3.01
-207	2.17	2.71	2.44	2.98
-208	2.14	2.68	2.41	2.95
-301	-	-	2.59	3.13
-302	-	-	2.57	3.10
-303	-	-	2.53	3.07
-304	-	-	2.50	3.04
-305	-	-	2.47	3.01
-306	-	-	2.44	2.98
-307	-	-	2.41	2.95
-308	-	-	2.38	2.92

Table 9

SERIES 584 SNAP-ON MOUNTING

SLEEVES WITH CONNECTOR BLOCK

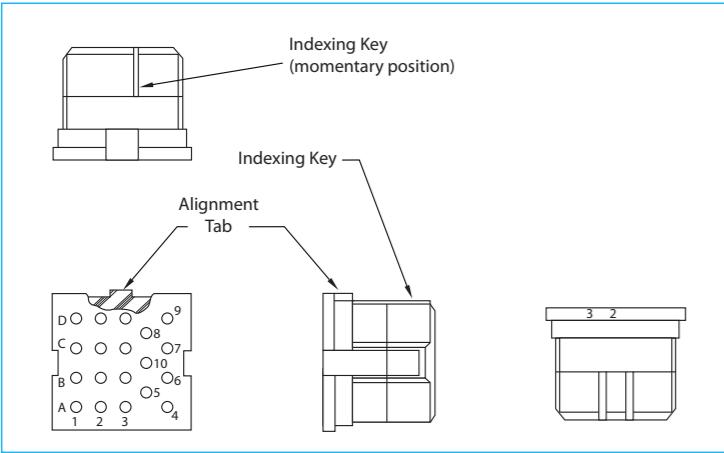
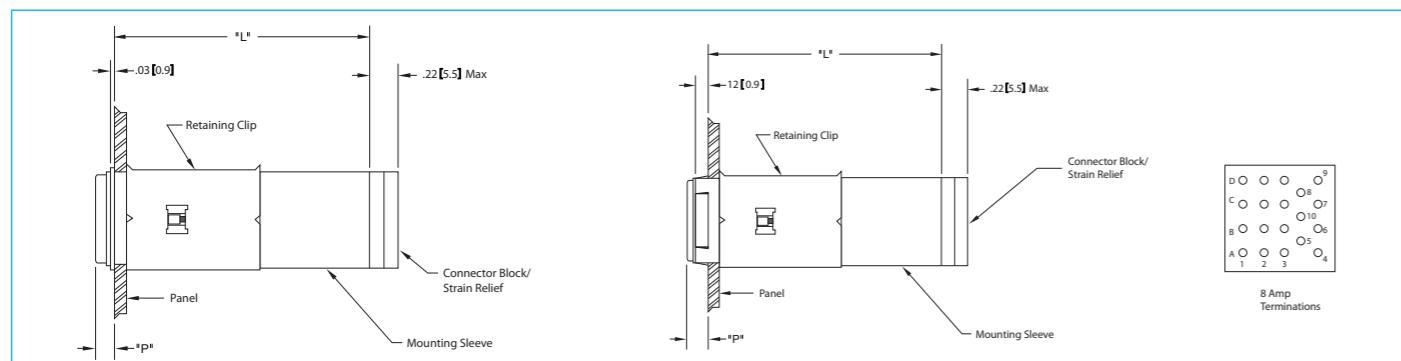


Figure 24.
Plug-In Mounting Sleeve Connector Block
Note: Polarity markings available upon request.

Figure 25.
Panel Cutout Snap-On Mounting Sleeve
Flush Mount (left) and Panel Mount (right)



Panel Cutout Snap-on Mounting Sleeve

Description	Dim "P"	Dim "L"	Code	-001	-002	-003	-004
Flush Mt., Basic	.269 [4.29]	2.64 [53.7]	584-REL6				
Flush Mt., Basic, w/HC	.169 [4.29]	3.18 [67.4]	584-REHL6	-001	-002	-003	-004
Panel Mt., Basic	.253 [6.43]	2.34 [51.6]	584-REL6	-101	-102	-103	-104
Panel Mt., Basic, with HC	.253 [6.43]	3.08 [65.3]	584-REHL6	-101	-102	-103	-104

SERIES 584 MATRICES

Series 584 matrices are modular units in which switches and indicators can be mounted. The maximum square matrix is 5 x 5 and the maximum rectangular matrix is 5 x 10. Contact factory customer service center for information on other configurations. Wire terminals and installation tools are listed on page 24.

Bezel Matrix 584-RELWY xxxx-1

The bezel matrix has a black colored bezel and is inserted through the front of the panel. Matrix selection must be coordinated with switch length. Fasteners are inserted into slots in the matrix after the matrix has been inserted into the panel and are tightened to secure the unit. Switches are removable from the front of the panel, rear access is not required after being mounted in the panel. Not available with the diaphragm seal version.

Bezel Matrix Dimensions

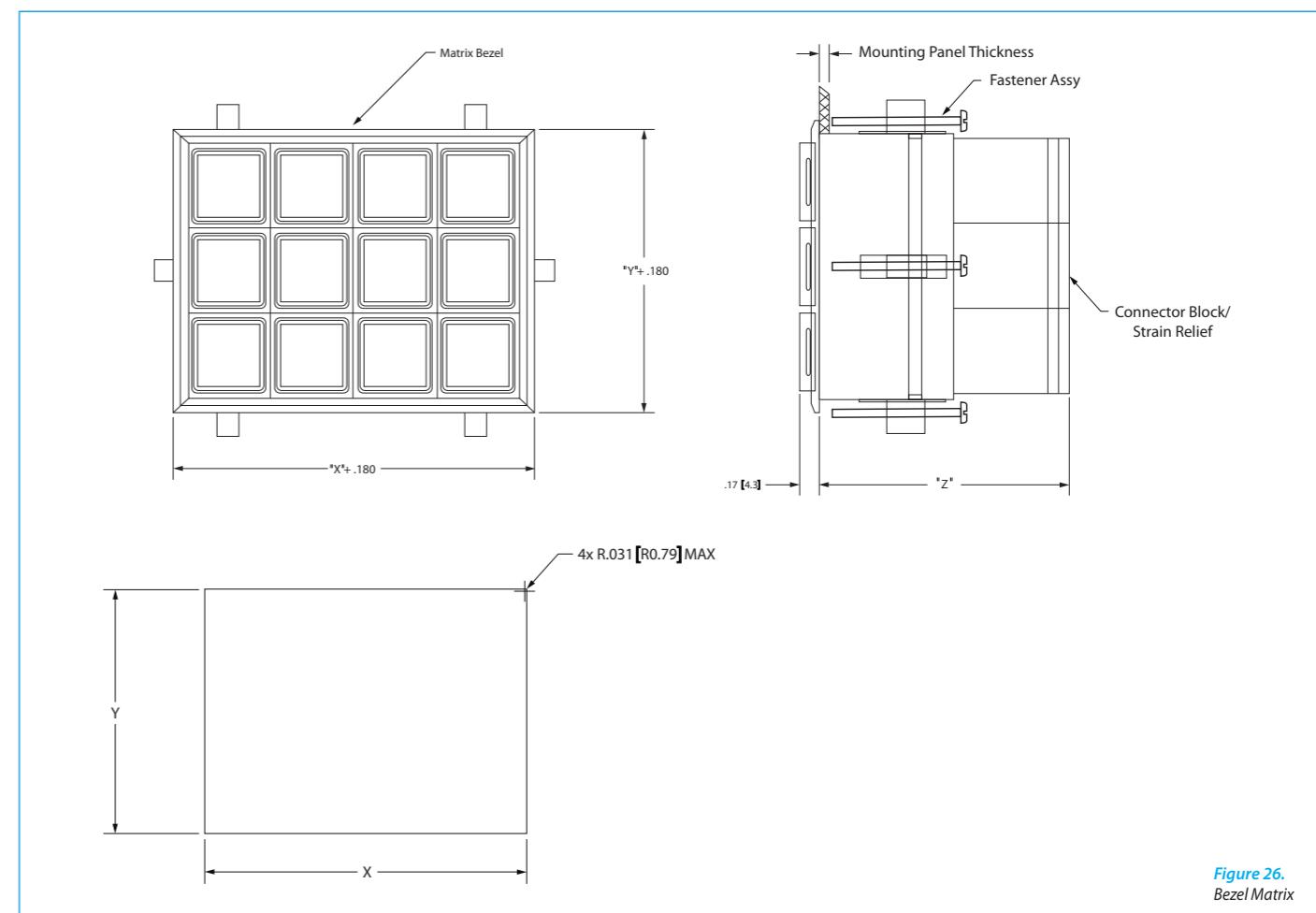


Figure 26.
Bezel Matrix

BEZEL MATRIX PANEL CUTOUT SIZES

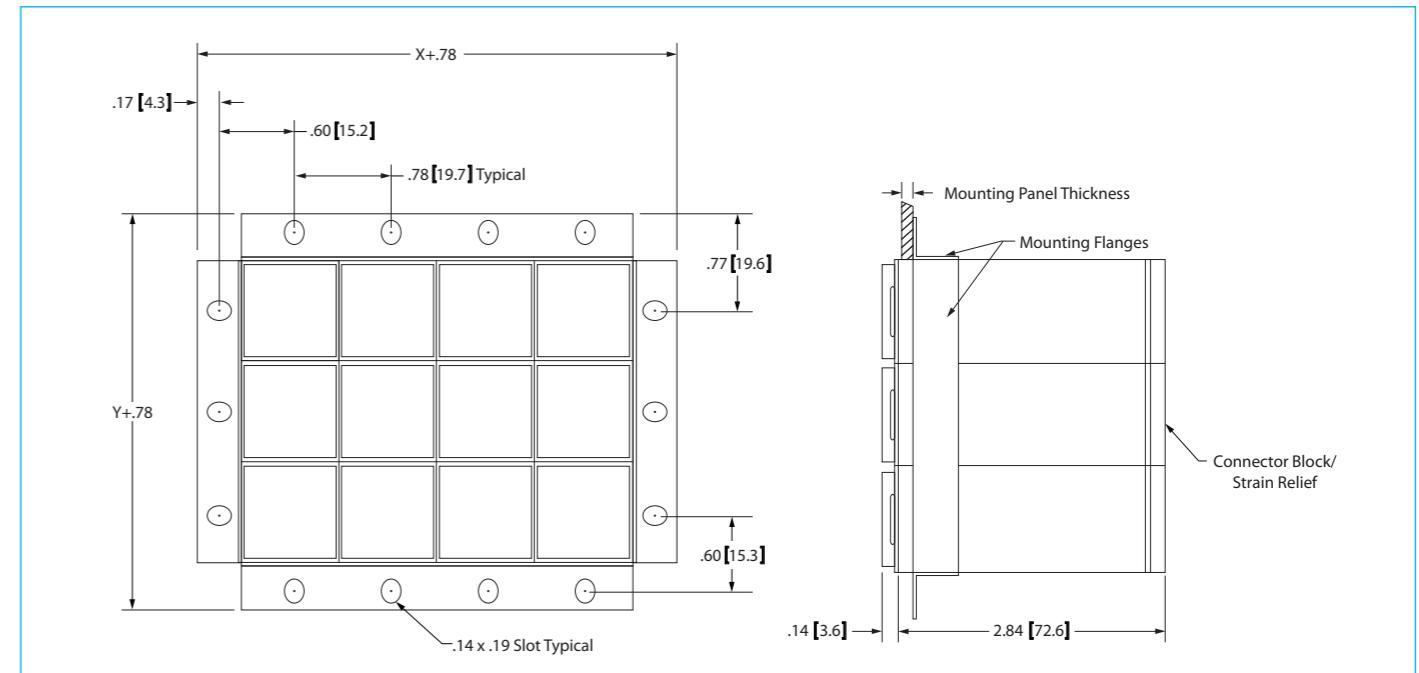
X (HORIZ) ▷	1	2	3	4	5	6	7	8	9	10
NO. OF STATIONS	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT
Y (VERT) ▽	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y
1	.985 .985	1.740 .985	2.495 .985	3.250 .985	4.005 .985	4.760 .985	5.515 .985	6.270 .985	7.025 .985	7.780 .985
	[25.02] [25.02]	[44.19] [25.02]	[63.37] [25.02]	[82.55] [25.02]	[101.73] [25.02]	[120.90] [25.02]	[140.08] [25.02]	[159.26] [25.02]	[178.43] [25.02]	[197.61] [25.02]
2	.985 1.740	1.740 1.740	2.495 1.740	3.250 1.740	4.005 1.740	4.760 1.740	5.515 1.740	6.270 1.740	7.025 1.740	7.780 1.740
	[25.02] [44.19]	[44.19] [44.19]	[63.37] [44.19]	[82.55] [44.19]	[101.73] [44.19]	[120.90] [44.19]	[140.08] [44.19]	[159.26] [44.19]	[178.43] [44.19]	[197.61] [44.19]
3	.985 2.495	1.740 2.495	2.495 2.495	3.250 2.495	4.005 2.495	4.760 2.495	5.515 2.495	6.270 2.495	7.025 2.495	7.780 2.495
	[25.02] [63.37]	[44.19] [63.37]	[63.37] [63.37]	[82.55] [63.37]	[101.73] [63.37]	[120.90] [63.37]	[140.08] [63.37]	[159.26] [63.37]	[178.43] [63.37]	[197.61] [63.37]
4	.985 3.250	1.740 3.250	2.495 3.250	3.250 3.250	4.005 3.250	4.760 3.250	5.515 3.250	6.270 3.250	7.025 3.250	7.780 3.250
	[25.02] [82.55]	[44.19] [82.55]	[63.37] [82.55]	[82.55] [82.55]	[101.73] [82.55]	[120.90] [82.55]	[140.08] [82.55]	[159.26] [82.55]	[178.43] [82.55]	[197.61] [82.55]
5	.985 4.005	1.740 4.005	2.495 4.005	3.250 4.005	4.005 4.005	4.760 4.005	5.515 4.005	6.270 4.005	7.025 4.005	7.780 4.005
	[25.02] [101.73]	[44.19] [101.73]	[63.37] [101.73]	[82.55] [101.73]	[101.73] [101.73]	[120.90] [101.73]	[140.08] [101.73]	[159.26] [101.73]	[178.43] [101.73]	[197.61] [101.73]
6	.985 4.760	1.740 4.760	2.495 4.760	3.250 4.760	4.005 4.760	4.760 4.760	5.515 4.760	6.270 4.760	7.025 4.760	7.780 4.760
	[25.02] [120.90]	[44.19] [120.90]	[63.37] [120.90]	[82.55] [120.90]	[101.73] [120.90]	[120.90] [120.90]	[140.08] [120.90]	[159.26] [120.90]	[178.43] [120.90]	[197.61] [120.90]
7	.985 5.515	1.740 5.515	2.495 5.515	3.250 5.515	4.005 5.515	4.760 5.515	5.515 5.515	6.270 5.515	7.025 5.515	7.780 5.515
	[25.02] [140.08]	[44.19] [140.08]	[63.37] [140.08]	[82.55] [140.08]	[101.73] [140.08]	[120.90] [140.08]	[140.08] [140.08]	[159.26] [140.08]	[178.43] [140.08]	[197.61] [140.08]
8	.985 6.270	1.740 6.270	2.495 6.270	3.250 6.270	4.005 6.270	4.760 6.270	5.515 6.270	6.270 6.270	7.025 6.270	7.780 6.270
	[25.02] [159.26]	[44.19] [159.26]	[63.37] [159.26]	[82.55] [159.26]	[101.73] [159.26]	[120.90] [159.26]	[140.08] [159.26]	[159.26] [159.26]	[178.43] [159.26]	[197.61] [159.26]
9	.985 7.025	1.740 7.025	2.495 7.025	3.250 7.025	4.005 7.025	4.760 7.025	5.515 7.025	6.270 7.025	7.025 7.025	7.780 7.025
	[25.02] [178.43]	[44.19] [178.43]	[63.37] [178.43]	[82.55] [178.43]	[101.73] [178.43]	[120.90] [178.43]	[140.08] [178.43]	[159.26] [178.43]	[178.43] [178.43]	[197.61] [178.43]
10	.985 7.780	1.740 7.780	2.495 7.780	3.250 7.780	4.005 7.780	4.760 7.780	5.515 7.780	6.270 7.780	7.025 7.780	7.780 7.780
	[25.02] [197.61]	[44.19] [197.61]	[63.37] [197.61]	[82.55] [197.61]	[101.73] [197.61]	[120.90] [197.61]	[140.08] [197.61]	[159.26] [197.61]	[178.43] [197.61]	[197.61] [197.61]

Table 12.

Snap-On Mounting Sleeves 584-REL6-XXX, for M39029/22-192 Connector Pins

In the snap-on version, the 584-REL5 sleeve is modified to provide a positive stop above panel, leaving part of the sleeve protruding above the panel. The sleeve is installed and retained by a snap-on clip assembled from the rear of the panel. The sleeve assembly remains loosely attached to the panel until the switch is inserted and tightened, creating a rigid mounting. The switch is removable from the front of the panel, rear access is not required. Not available for use with the diaphragm seal switches.

Code	Identifies	Codes
584-RELX0203-1-125	Matrix length	Use RELX for basic units
584-RELX0203-1-125	No. of units per horizontal row	Two digits
584-RELX0203-1-125	No. of units per vertical column	Two digits
584-RELX0203-1-125	Connector M39029/22-192	One digit
584-RELX0203-1-125	Panel thickness	Std thicknesses: 0.063 (1.6), 0.090 (2.3), 0.125 (3.2), 0.190 (4.8)



FLANGE MATRIX PANEL CUTOUT SIZES

X (HORIZ) ▷	1	2	3	4	5	6	7	8	9	10
NO. OF STATIONS	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT
Y (VERT) ▽	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y
1	.775 .775	1.530 .775	2.285 .775	3.040 .775	3.795 .775	4.550 .775	5.305 .775	6.060 .775	6.815 .775	7.570 .775
	[19.68] [19.68]	[38.86] [19.68]	[58.04] [19.68]	[77.22] [19.68]	[96.39] [19.68]	[115.57] [19.68]	[134.75] [19.68]	[153.92] [19.68]	[173.10] [19.68]	[192.28] [19.68]
2	.775 1.530	1.530 1.530	2.285 1.530	3.040 1.530	3.795 1.530	4.550 1.530	5.305 1.530	6.060 1.530	6.815 1.530	7.570 1.530
	[19.68] [38.86]	[38.86] [38.86]	[58.04] [38.86]	[77.22] [38.86]	[96.39] [38.86]	[115.57] [38.86]	[134.75] [38.86]	[153.92] [38.86]	[173.10] [38.86]	[192.28] [38.86]
3	.775 2.285	1.530 2.285	2.285 2.285	3.040 2.285	3.795 2.285	4.550 2.285	5.305 2.285	6.060 2.285	6.815 2.285	7.570 2.285
	[19.68] [58.04]	[38.86] [58.04]	[58.04] [58.04]	[77.22] [58.04]	[96.39] [58.04]	[115.57] [58.04]	[134.75] [58.04]	[153.92] [58.04]	[173.10] [58.04]	[192.28] [58.04]
4	.775 3.040	1.530 3.040	2.285 3.040	3.040 3.040	3.795 3.040	4.550 3.040	5.305 3.040	6.060 3.040	6.815 3.040	7.570 3.040
	[19.68] [77.22]	[38.86] [77.22]	[58.04] [77.22]	[77.22] [77.22]	[96.39] [77.22]	[115.57] [77.22]	[134.75] [77.22]	[153.92] [77.22]	[173.10] [77.22]	[192.28] [77.22]
5	.775 3.795	1.530 3.795	2.285 3.795	3.040 3.795	3.795 3.795	4.550 3.795	5.305 3.795	6.060 3.795	6.815 3.795	7.570 3.795
	[19.68] [96.39]	[38.86] [96.39]	[58.04] [96.39]	[77.22] [96.39]	[96.39] [96.39]	[115.57] [96.39]	[134.75] [96.39]	[153.92] [96.39]	[173.10] [96.39]	[192.28] [96.39]
6	.775 4.550	1.530 4.550	2.285 4.550							

SERIES 584 ROD MOUNT HARDWARE

The rod mount system allows for units to be mounted in the smallest allowable space by using a system of rods and plates to hold the switch/indicator units together and fasten them to the mounting panel.

584-RELMxxxx-.xxx

Codes		
584-RELM0303-125	Matrix length	Use RELM for basic units
584-RELM0303-125	No. of units per horizontal row	Two digits
584-RELM0303-125	No. of units per vertical row	Two digits
584-RELM0303-125	Panel thickness	Std sizes: 0.063 (1.6), 0.090 (2.3), 0.125 (3.2)

584-RELMxxxx-.xxx Dimensions

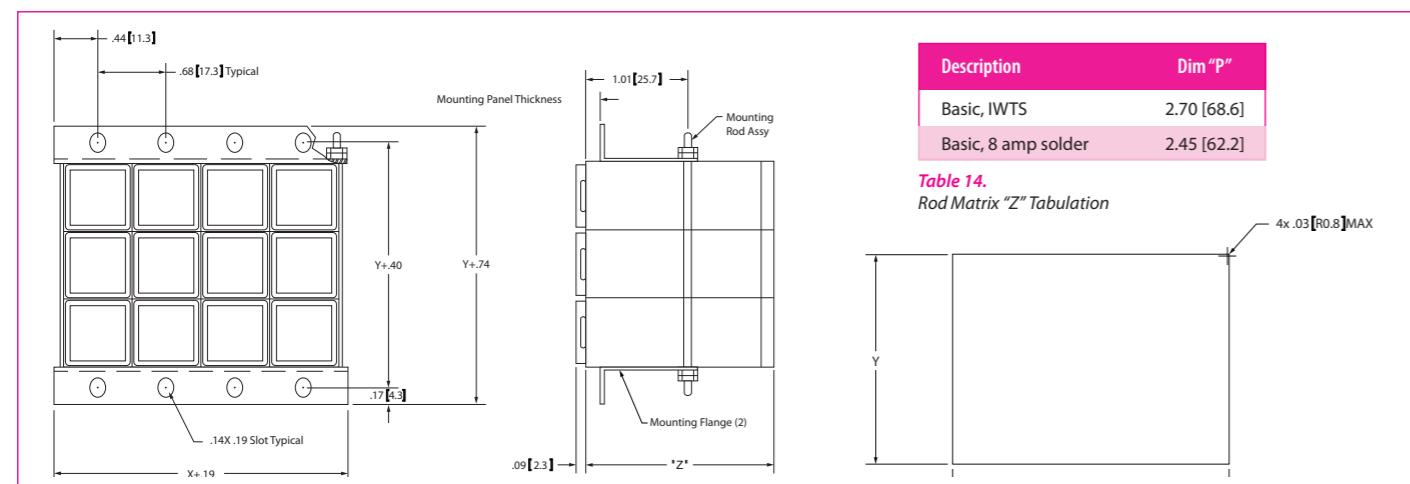


Figure 28
Rod Mount Matrix

ROD MOUNT MATRIX PANL CUTOUT SIZES

X (HORIZ) ▷	1	2	3	4	5	6
NO. OF STATIONS	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT	PANEL CUTOUT
Y (VERT) ▽	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y	DIM X DIM Y
1	.700 .700	1.380 .700	2.060 .700	2.740 .700	3.420 .700	4.100 .700
	[17.78] [17.78]	[35.05] [17.78]	[52.32] [17.78]	[69.60] [17.78]	[86.87] [17.78]	[104.14] [17.78]
2	.700 1.380	1.380 1.380	2.060 1.380	2.740 1.380	3.420 1.380	4.100 1.380
	[17.78] [35.05]	[35.05] [35.05]	[52.32] [35.05]	[69.60] [35.05]	[86.87] [35.05]	[104.14] [35.05]
3	.700 2.060	1.380 2.060	2.060 2.060	2.740 2.060	3.420 2.060	4.100 2.060
	[17.78] [52.32]	[35.05] [52.32]	[52.32] [52.32]	[69.60] [52.32]	[86.87] [52.32]	[104.14] [52.32]
4	.700 2.740	1.380 2.740	2.060 2.740	2.740 2.740	3.420 2.740	4.100 2.740
	[17.78] [69.60]	[35.05] [69.60]	[52.32] [69.60]	[69.60] [69.60]	[86.87] [69.60]	[104.14] [69.60]
5	.700 3.420	1.380 3.420	2.060 3.420	2.740 3.420	3.420 3.420	4.100 3.420
	[17.78] [86.87]	[35.05] [86.87]	[52.32] [86.87]	[69.60] [86.87]	[86.87] [86.87]	[104.14] [86.87]
6	.700 4.100	1.380 4.100	2.060 4.100	2.740 4.100	3.420 4.100	4.100 4.100
	[17.78] [104.14]	[35.05] [104.14]	[52.32] [104.14]	[69.60] [104.14]	[86.87] [104.14]	[104.14] [104.14]

Table 15

Spare Parts

Capsule	584 (See Pages 13-16)
Body	584 (See Pages 12-16)
Mounting Hardware	584 (See Page 13)
Panel Seal and Retainer, Black	584-515-1
Panel Seal and Retainer, Stainless Steel	584-515-2
Frame Matrix Fastener	584-526
8 amp, M39029/22-192 Connector Block w/ Strain Relief	584-527

Accessories

Connector Pin, 8A, M39029/22-192, Crimp Style, 1 ea.	58A-111-1
Connector Pin, 8A, M39029/22, 25 ct	58A-111-2
Connector Pin, 8A, M39029/1-100, Crimp Style, 1 ea.	58A-110-1
Connector Pin, 8A, M39029/1-100, 25 ct	58A-110-2
Connector Pin, 8A, M39029/1-101, Crimp Style, 1 ea.	58A-110-3
Connector Pin, 8A, M39029/1-101, 25 ct	58A-110-4
Clear Plastic Switchguard	58A-104
Wire Switchguard, Black	58A-105-1
Wire Switchguard, Red	58A-105-2

Installation and Removal Tools

Lamp Capsule Removal Tool	58T-101
Connector Pin Crimp Tool, for M39029/1	58T-109-1
Connector Pin Crimp Tool, for M39029/22	58T-109-2
Connector Pin Removal Tool	58T-104
Connector Block Removal Tool	58T-107
Torque Screwdriver	58T-106

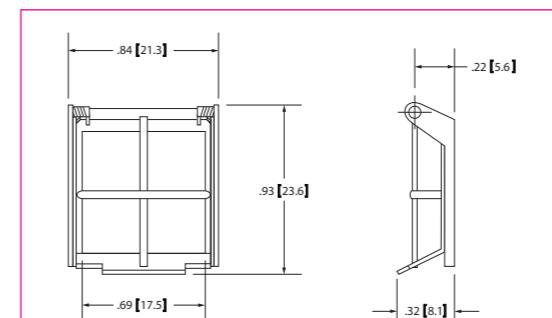


Figure 29
Wire Switch Guard
Not for use with Matrices

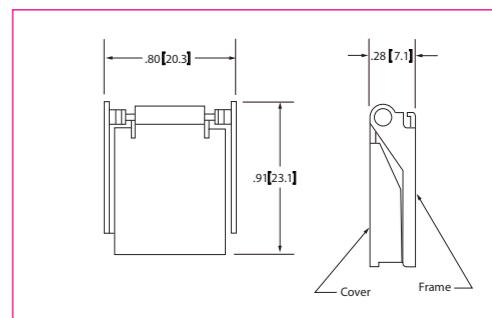
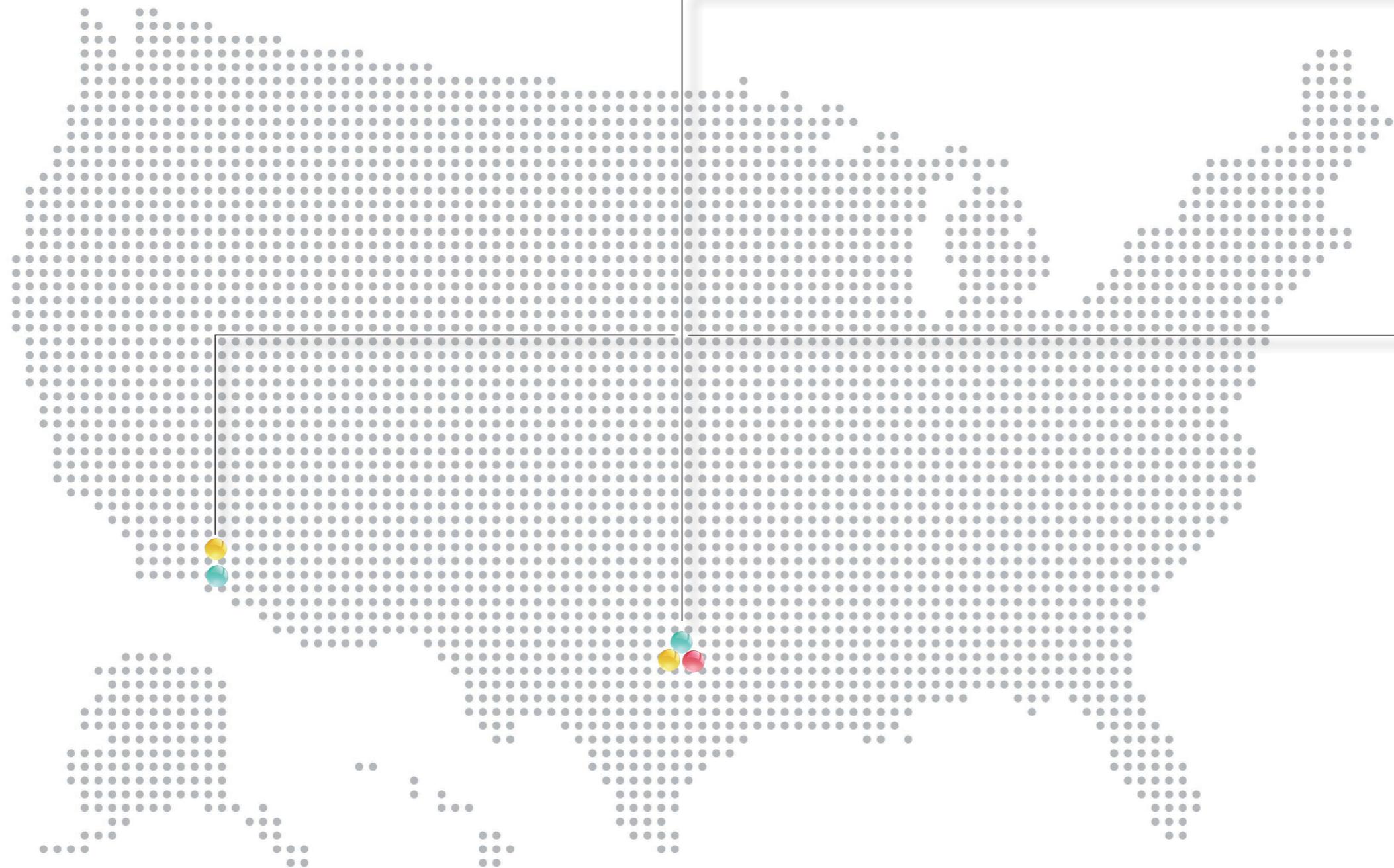


Figure 30
Clear Plastic Switch Guard
Not for use with Matrices

OUR PRESENCE IN THE



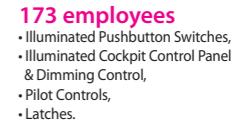
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Grand Prairie, TX 75052



SAGEM AVIONICS COSTA MESA

3184 Pullman Street
Costa Mesa, CA 92626



173 employees

- Illuminated Pushbutton Switches,
- Illuminated Cockpit Control Panel & Dimming Control,
- Pilot Controls,
- Latches.

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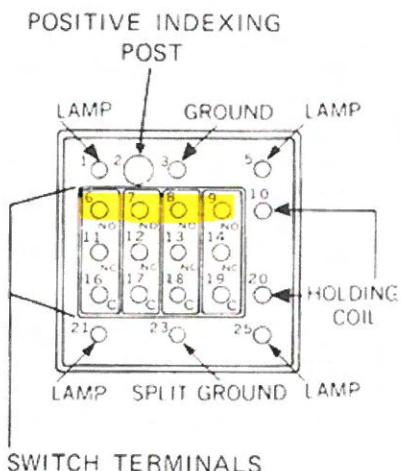
February 9, 2018

Dear Ed,

It has been brought to my attention that an error exists in our current 800 & 820 Series Catalog that was released in September, 2016. The error is repeated on Pages 4 and 5 of the catalog and pertains to the marking for the switch terminals.

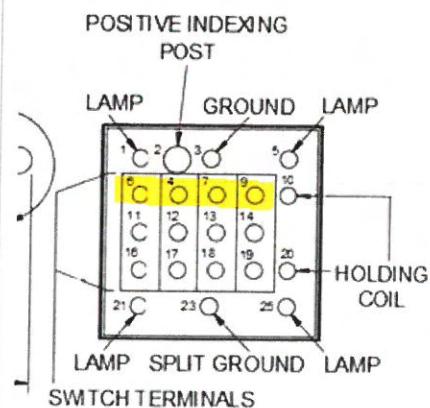
The **correct** marking for the switch terminals is highlighted below :

6-7-8-9 Old Catalog Pg. 4



The **incorrect** marking which is shown in our current catalog is highlighted below:

Safran's one: 6-4-7-9 (New Catalog Pg. 4)





We regret any inconvenience this may have caused and we are in the process of making the correction and preparing a bulletin that will alert our customers of this issue.

Please let me know if you have any additional questions.

Best Regards,

A handwritten signature in blue ink that reads "Sheri Jones".

Sheri Jones
Manager | Customer Service
Safran Electronics & Defense, Avionics USA, LLC

P +1 (657) 247-4027 • M +1 (949) 294-8597

SAFRAN ELECTRONICS & DEFENSE AVIONICS USA LLC

800 & 820 SERIES

 **SAFRAN**

Series 800 & 820 features

The SAFFRAN Series 800 & 820 are rack mounted, plug-in type, 4-lamp lighted pushbutton switch or indicator light assemblies with display face for up to four lines of legend. Both series meet the requirements of MIL-S-22885 and offer a completely modular approach to developing modern human-engineered, lighted-switch/indicator panel layouts for commercial, industrial, military, and aerospace applications.

The Series 800 offers a 3/4 inch square display face and the Series 820 offers a 3/4 inch high by one inch wide display face. All other features of both the switch-lite and indicator-lite units in each series are identical. The versatility afforded by their small size, close center-to-center spacing, 4-lamp illumination, and plug-in connectors make them ideal for almost any requirement from a single-unit mounting all the way up to multi-matrix configurations. You can procure a complete system, tailored to your needs, and ready to wire with crimp-type insertable terminals.

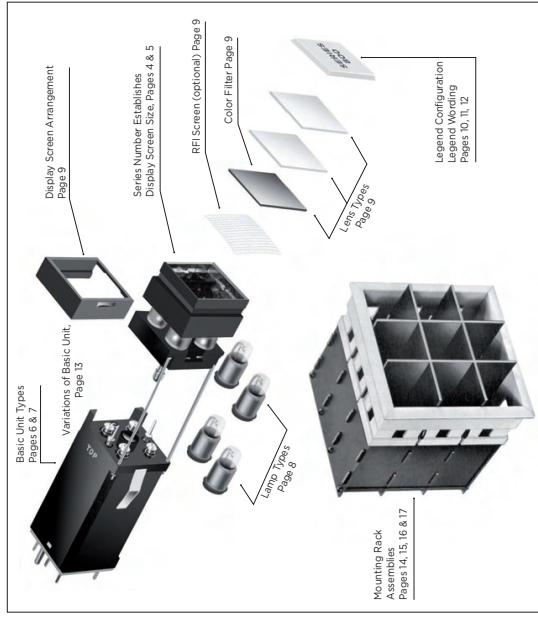
The switch-lite units are available with alternate or momentary action in 2PDT or 4PDT. A choice of holding coils (momentary action) is available to provide electrical interlock. The front lens is available as a full display or as a split display for more than one message indication. Each of the four lamps may be individually controlled to provide selected illumination and the use of different colors.

Each switch-lite or indicator-lite unit plugs into a prewired terminal block in the back of each channel in the mounting rack. The mounting rack itself is a modular assembly that can be made to accommodate anything from single unit to multiple unit matrices. Each rack assembly mounts through a single panel cutout for a simple and economical installation.

How to use this catalog

800 series No	A1C1E2	J3	L2	M1	N2	(R6)	16	ON/OFF
(800 or 820) Pages 4 & 5	Basic Unit Type Pages 6 & 7	Lamp Type Page 8	Lens Type Page 9	RFI Screen (Optional) Page 9	Display Screen Arrangement Page 9	Color Filter Page 9	Legend Configuration Page 10	Legend Wording Page 10

The pages of this catalog describe each element of the Series 800 or 820 switch-lite or indicator-lite units and mounting rack assemblies. To determine the units you need, simply select the codes that define your choice of each element. The selected codes, written together (without dashes; dashes are only shown in examples for clarity), become the part number you will use for ordering. A sample of a typical part number is shown on the left with callouts identifying what each of the codes mean.



A sample part number appears at the top of each page describing the code you are selecting from that page.

The illustrations aside identify the elements you can specify and the pages of the catalog that describes each element. An alternate ordering method is available; wherein items required for a complete switch-lite, or indicator-lite unit, or even an assembly of units in a mounting rack are defined in a Specification Sheet maintained for the specific customer by Safran. Consult your Safran representative for details.

SERIES NUMBER

800A1C1E2J3L2M1N2(RG)16 ON/OFF

SERIES 800

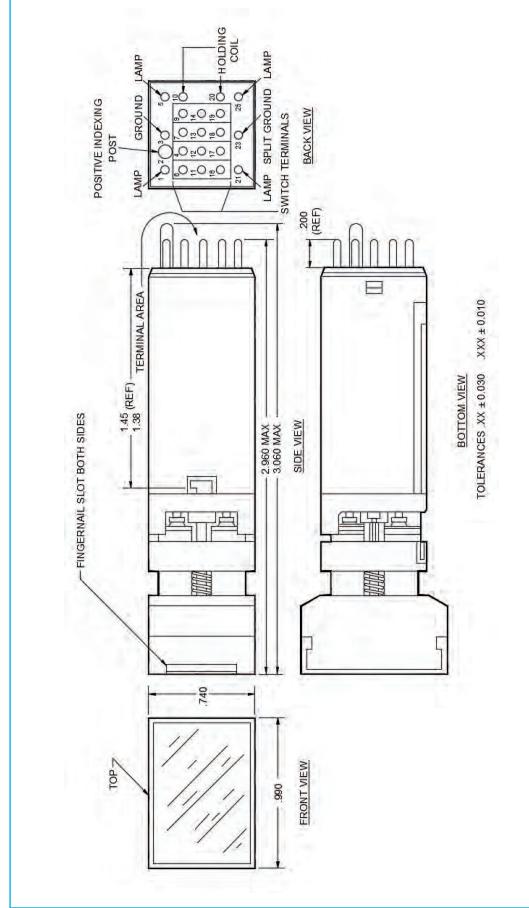
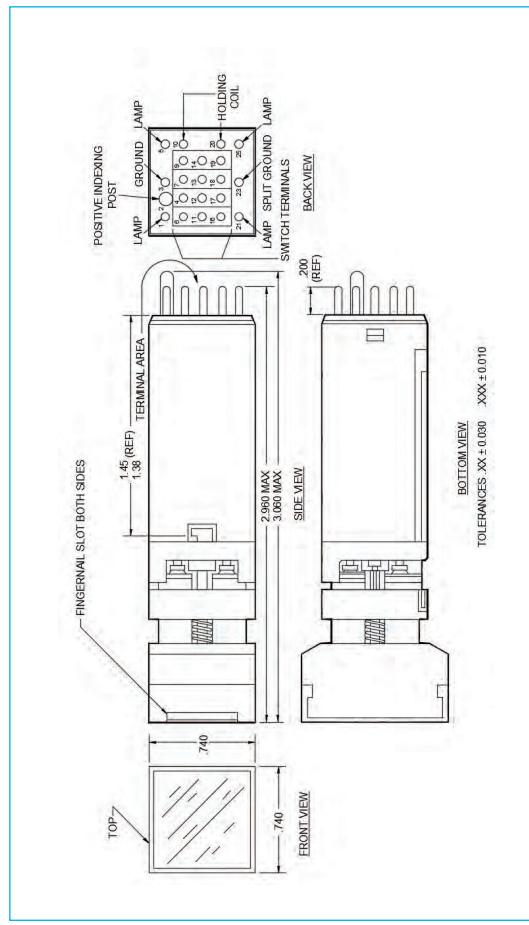
The Series Number for this particular product line establishes the display screen size. The Series 800 provides a 3/4 inch square display screen face. All other elements of the unit are identical to the Series 820, which provides a 3/4 inch high by one inch wide display screen face. Both units are available as either a switch-lite or indicator-lite. The drawings below show the overall outline dimensions for the Series 800.



820A1C1E2J3L2M1N2(RG)16 ON/OFF

SERIES 820

The Series Number for this particular product line establishes the display screen size. The Series 820 provides a 3/4 inch high by one inch wide display screen face. All other elements of the unit are identical to the Series 800, which provides a 3/4 inch square display face. Both units are available as either a switch-lite or indicator-lite. Although the sample codes at the top of the following pages reference the Series 800, all elements are also applicable to the Series 820. The drawings below show the overall outline dimensions for the Series 820.



LAMP TYPES

8000A1C1E2J3L2M1N2(RG)16 ON/OFF

EASY LAMP REPLACEMENT FROM PANEL FRONT WITHOUT TOOLS

Replace lamps quickly without having to remove the unit from its mounting. Slots on the sides of the display housing allow lamp-carrier assembly to be easily pulled out and swung to the side, exposing the back of the housing for complete access to the lamps. This is accomplished from the panel front without the use of any tools.

ATTACHED LAMP CAPSULES PREVENT TRANPOSITION

The display screen/lamp-capsule assembly is permanently connected to the basic unit by two stainless steel wires. This prevents the capsule from being accidentally transposed into an adjacent switch unit when relamping, or replacing legend lenses and color filters.



LAMPS REMAIN STATIONARY; AVOID SHOCK; LAST LONGER

When the switch-lite display face is depressed during switch actuation, it travels back over the lamp barrels, so that the lamps remain stationary at all times. This feature helps to extend lamp life by eliminating any shock the lamps might otherwise receive during switch actuation.

PART NUMBER CODE FOR TYPE OF LAMP	
6 Volt Lamps	12 Volt Lamps
J1	J2

*Recommended for use with red or amber colors only

8000A1C1E2J3L2M1N2(RG)16 ON/OFF

EASY LEGEND/COLOR FILTER REPLACEMENT FROM PANEL FRONT WITHOUT TOOLS

You can replace legend/color filters easily from the panel-front without tools allowing easy cleaning and/or changes. After pulling out the display screen lamp capsule assembly, a simple upward sliding motion frees the lens retainer housing, permitting the removal of the lens and filters.

LENS TYPES

There are four types of lenses available, each producing a different type of legend display, as described below. The numbers preceding each lens type are the part number codes.

L1-LENS TYPE 1-LIGHTED LETTERS:

Letters appear white on a black background until illuminated and then letters appear in color, background remains black.

L2-LENS TYPE 2-LIGHTED BACKGROUND:

Letters appear black on a white background until illuminated and then background appears in color, letters remain black.

L3-LENS TYPE 3-LIGHTED LETTERS:

Letters are not legible until illuminated and then letters appear in color, background is black.

L4-LENS TYPE 4-LIGHTED BACKGROUND:

Letters are not legible until illuminated then background appears in color, letters are black.

*This is the most commonly used and preferred type of lens for most applications.



DISPLAY SCREEN

RFI SCREEN

An RFI Screen may be specified by using the code «N1». This is an optional item and should only be specified in applications where radio frequency interference is a problem. The screen will minimize RFI entrance through panel cutout.

DISPLAY SCREEN/COLOR FILTER ARRANGEMENT

Select the number above the illustrations below that describes the display screen arrangement you desire. Use the letters in brackets below the illustrations to indicate the required color filters. The sequence in which the letters for the color filters must be written in the brackets is in order of viewing from upper left, upper right, lower left, lower right, as shown in the diagrams.

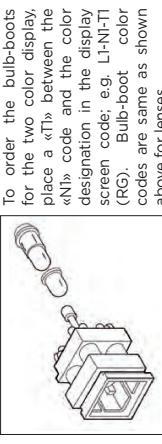
N1	N2	N3	N4	N5
R	R	G	Y	A
R	G	R	G	R
(RG)	(RG)	(AGR)	(YGR)	(ARB)

The letter codes for colors are: (A)umber (B)lue (R)ed (W)hite (Y)ellow
NOTE: **W** is produced by a light blue colored filter

TWO-COLOR FULL DISPLAY

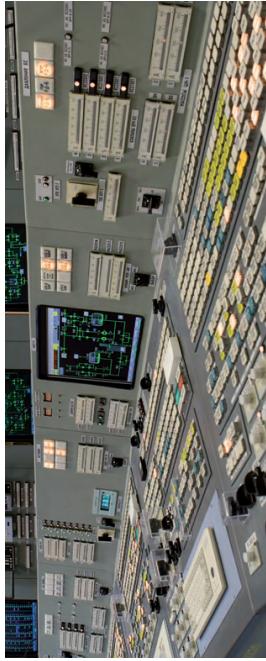
Colored silicone bulb-boots that are mounted over the lamps may be specified for use when two colors are required for a full-display (N1). This makes it possible to project one color over the full display for one condition and then a second color over the full display for a different condition.

To order a basic unit for two-color full-display, replace the «A» in the basic unit code, shown on page 7, with «B»; e.g., 800-B1C1.





800A1C1E2J3L2M1N2(RG)16 0N/0FF



The part number code for the legend should always follow the Display Screen Arrangement code, since it indicates the legend configuration and the actual

Priority for legend wording for segments of split legend wording, which goes on the lens. The legend is ordered by using the legend configuration number and following it with the actual wording, using commas between rows of letters and a diagonal slash line between splits.

Note: Display screen will accept up to four rows of .093" high letters

READY TO GO	14 READY TO GO	15 GO SET	204 PUMP/SET
ON	12 ON	16 PRESSURE OK	17 10 PRESSURE OK

HORIZONTAL ROWS OF LETTERS	FULL DISPLAY	HORIZONTAL SPLIT				
7 LETTERS OR SPACES PER ROW						
	12	13	14	15	16	17
VERTICAL SPLIT HORIZONTAL ROWS OF LETTERS						
3 LETTERS OR SPACES PER ROW						
	20	21	22	23	24	25

<p>3 WAY SPLITS HORIZONTAL ROWS OF LETTERS 3 AND 7 LETTERS OR SPACES PER ROW</p>	<p>52 53 54 55 56 57 58 59</p>	<p>60 61 62 63 64 65 66 67</p>	<p>68 69 70 71 72 73 74 75</p>	<p>76 77 78 79 80 81 82 83</p>	<p>84 85 86 87 88 89 90 91</p>	<p>92 93 94 95 96 97 98 99</p>
<p>4 WAY SPLITS HORIZONTAL ROWS OF LETTERS 3 LETTERS OR SPACES PER ROW</p>	<p>100 101 102 103 104 105 106 107</p>	<p>110 111 112 113 114 115 116</p>	<p>109 110 111 112 113 114 115 116</p>	<p>109 110 111 112 113 114 115 116</p>	<p>109 110 111 112 113 114 115 116</p>	<p>109 110 111 112 113 114 115 116</p>

LEGENDS

NOTE: For Series 820 the same code numbers for legends apply, however, you can use more letters and spaces across the display face due to the wider width of the display face.

The following number of letters and spaces can be used for the Series 820:

HORIZONTAL ROWS OF LETTERS

Full Display & Horizontal Split Display: 10 letters or spaces per row

3-Way Splits:

• 5 letters or spaces per row vertically,
• 4 letters or spaces per row horizontally.

SERIES 820	FULL DISPLAY	AVW COLOR
HORZ.	V E S	3 WAY SPLIT
SPLIT	R T	
1 2	2PDT OR 4PDT	MATRIX MOUNT
3 4		

VERTICAL ROWS OF LETTERS

Full Display & Vertical Split Display: 5 letters or spaces per row vertically

3-Way Splits:

• 4 letters or spaces in segments using 1/2 screen width
• 10 letters or spaces in segments using full screen width

4-Way Splits:

• 4 letters or spaces per row

800 □ A1C1E2J3L2M1N2(RG)16 ON/OFF

VARIATIONS OF BASIC UNIT

To order units with this capability, insert the number «10» as the part number code between the Series Number and the Basic Unit Number (e.g. 800-10-A1C1E2 ... (without dashes; dashes only used in example for clarity.) These units must be used with appropriate moisture-proof mounting racks (see page 15).

LOW ACTUATION FORCE (A12)

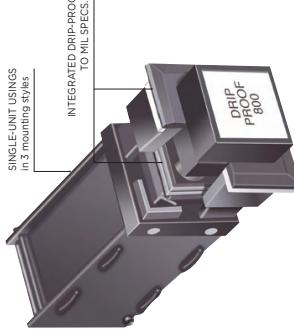
The standard actuation force for Series 800 and Series 820 switch-lite units is 4.0 lbs. maximum. Units may also be ordered with a low force actuation of less than 16 oz.

This is ideal for keyboard type arrangements or other applications where light-pressure actuation is desired. To order low force actuation units, change the «A1» in the basic unit code to «A12»; e.g. A12C1E2.

Note: these units are standard with moisture-proof requirement, as described below, but are not available with high-shock requirement or as alternate action or holding coil units.

MOISTURE PROOF REQUIREMENT (10)

The Series 800 and Series 820 units can be modified to meet the special moisture-proof requirements of MIL-S-22885C Paragraph 4.8.17.2, seal (drip-proof); and MIL-STD-108E, Paragraph 4.3, seal (drip-proof).



The following are descriptions of variations of the basic unit that offer particular capabilities for special requirements.

Code numbers for most of these items are to be written into the part number following the Series Number and preceding the Basic Unit Code.

HIGH-SHOCK & MOISTURE-PROOF (8)

The Series 800 and Series 820 units can be modified to meet both the special high-shock and moisture-proof requirements detailed above.

To order units with both of these capabilities, insert the number «8» as the part number code between the Series Number and the Basic Unit Number (e.g. 800-8-A1C1E2 ... (Without dashes; dashes only used in example for clarity). These units must be used with the appropriate high-shock and moisture-proof mounting racks (see page 15). Note: These units are not available as alternate action, holding coil, or low-force actuation units.

DUMMY UNITS

Dummy units are available to fill empty mounting rack channels reserved for future use. The part number for the standard black dummy unit is **800-G**.

SWITCH GUARD

A special switch-guard accessory is available to protect the face of switch-lite units against accidental actuation. To order the switch guard accessory, use the part number **800-508**. This accessory is only available on switch-lite units used in single-unit mounting cans 800-R1 and 800-R2 (see page 15). Other switch-guard accessories for use with the aluminum mounting rack assembly are available upon special request to the factory.



PRE-ASSEMBLED, MODULAR ALUMINIUM MOUNTING RACKS

800-R0803-1 / 820-R0803-1

The mounting rack and terminal block assembly is a modular unit that can have any number of desired channels in to which the switch-lite or indicator-lite assemblies are inserted for plug-in installation. Maximum square matrix is 12 x 12; maximum rectangular matrix is 5 x 20. Mounted in the panel through a single panel cutout, this assembly provides significant advances in mounting style, wiring, maintainability and building block capability. Complete mounting hardware is supplied with each assembly. The customer can purchase the mounting rack in advance of the switch-lite units to expedite the panel installation and inter-wiring of assemblies. These racks are available with moisture-proof and high-shock requirements. This type of rack is available for both Series 800 and 820 units.

READY TO WIRE WITH CRIMP-TYPE INSERTABLE TERMINALS

Crimp-type, solderless, insertable terminals are used to wire the terminal blocks located at the rear of each channel in the mounting rack. This type of terminal is crimped onto the end of each wire using a M22520/1-01 crimping tool with M22520/1-02 head or a standard NS3191 crimp tool and the Safran locator, that fits in this tool.

Three type of terminals are available that will accommodate AWG stranded wire, sizes #18 thru #28. The terminals are then inserted into the proper holes in the terminal block and held firmly in place by integral locking tabs.

CHANNEL DIVIDERS FORM BARRIERS TO PREVENT INADVERTENT ACTUATION
Dividers in the mounting rack extend out slightly beyond the face of the mounting rack itself to form a natural barrier between units. To actuate a particular switch-lite, the display face must be depressed below the level of the barrier. If two adjacent units are accidentally depressed simultaneously with one finger, the barrier will prevent actuation.

POSITIVE MOUNTING TO PANEL; NO SCREW HOLES REQUIRED
Once the mounting rack has been inserted through the panel cutout from the front, mounting fasteners

800	R	H	W	08	03	1
Series No.	Indicates Aluminum Rack with Terminal Blocks	Includes Moisture Proof High-Shock Requirement	Number of Units in the Vertical Axis	Number of Units in the Horizontal Axis	Number of Units in the Vertical Axis	
800						

Mounting racks are ordered separately from the switch-lite or indicator-lite units. To order, specify 800-R followed by two digits to identify the number of units in the horizontal axis and then two more digits for the number of units in the vertical axis. Finally, a dash and number, which gives the bezel finish desired, is added at the end. Special capabilities for high-shock and moisture-proof may be added to the rack by adding the appropriate code designation after the <R> and before the two digits indicating the horizontal number of units. A typical part number is illustrated at the left, including these special capabilities.

HIGH-SHOCK REQUIREMENTS (H1)

This type of mounting rack can be modified to meet the special high-shock requirements of MIL-S-22885 C, Method II, Paragraph 4.8.13.2, MIL-STD-2020, Method 207A; and MIL-S-901C, Amendment 1, Grade A, deck mounted sub-assembly, Class I, lightweight, Type C. To order racks with this capability, insert the letter <H> after the <R> and before the two digits indicating the horizontal number of units, e.g. **800-RH0803-1**. Maximum size matrix is 2 x 10 or 10 x 2.

MOISTURE-PROOF (W)

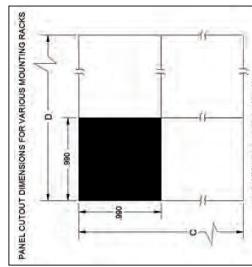
This type of mounting rack can be modified to meet the special moisture-proof requirements of MIL-S-22885C, Paragraph 4.8.17.2, seal (drip-proof); and MIL-STD-108E, Paragraph 4.3, seal (drip-proof). To order racks with this capability, insert the letter <W> after the <R> and before the two digits indicating the horizontal number of units, e.g. **800-RW0803-1**.



CAUTION	Before installing units into housing, a light coating of Dow Corning FS 3451 lubricant or equivalent, must be applied to the mounting fasteners and into each rack or housing opening for a distance of approx. 1/2 inch. Note: For RFI applications <4> must be used. Rack is supplied with special RFI gasket.					
Dash No.	Bezel Finish					

MOUNTING FASTENERS

The recommended number of special mounting fasteners are included with shipment of the rack. If additional fasteners are desired or for replacement, they can be ordered by using the part number **800-H1**.



PANEL CUTOUT DIMENSIONS FOR VARIOUS MOUNTING RACKS						
Series 820	Series 800	Series 820	Series 800	Series 820	Series 800	Series 820
High-Side Mounting	Standard	High-Side Mounting	Standard	High-Side Mounting	Standard	High-Side Mounting
No. of Fastener Per Side	No. of Fastener Per Side	No. of Fastener Per Side	No. of Fastener Per Side	No. of Fastener Per Side	No. of Fastener Per Side	No. of Fastener Per Side
Modules	Modules	Modules	Modules	Modules	Modules	Modules
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	2	1	2	1	2
4	2	3	2	3	2	3
5	2	4	3	4	3	4
6	2	5	4	5	4	5
7	3	6	5	6	5	6
8	3	4	8	4	8	4
9	3	4	9	4	9	4
10	4	5	10	8	10	8
11	4	5	11	9	11	9
12	4	5	12	9	12	9
13	5	5	13	10	13	10
14	5	6	14	11	14	11
15	5	6	12	13	12	13
16	6	6	13	15	13	15
17	6	6	13	15	13	15
18	6	7	14	17	14	17
19	7	7	15	18	15	18
20	7	7	16	19	16	19

*Recommended * Minimum
No. of Fastener Per Side

Standard Modules

High-Side Mounting

WELDED MATRIX, STAINLESS-STEEL, MOUNTING RACKS

800-RX0302-1

800	RX	03	02	1
Series Number	Indicates Stainless Steel Matrix with Terminal Blocks	Number of Units in Horizontal Axis	Number of Units in Vertical Axis	Panel Thickness

Welded matrix, stainless-steel mounting racks are available for Series 800 units only. These assemblies are available in preassembled matrices in sizes up to 6 x 6 modules as standard. Larger modules and/or other matrices can be fabricated to customer specification. Individual unit mountings are also available in either spring-clip retainer or sleeve-mount versions. All types are supplied with integral plug-in terminal blocks at the base of each individual unit channel, ready for quick, easy wiring.

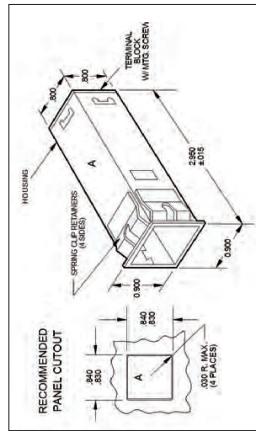
DASH NO.	PANEL THICKNESS	DASH NO.	PANEL THICKNESS
-1	1/32"	-5	5/32"
-2	1/16"	-6	3/16"
-3	3/32"	-7	7/32"
-4	1/8"	-8	1/4"



SPRING-CLIP-RETENTION TYPE MOUNTING

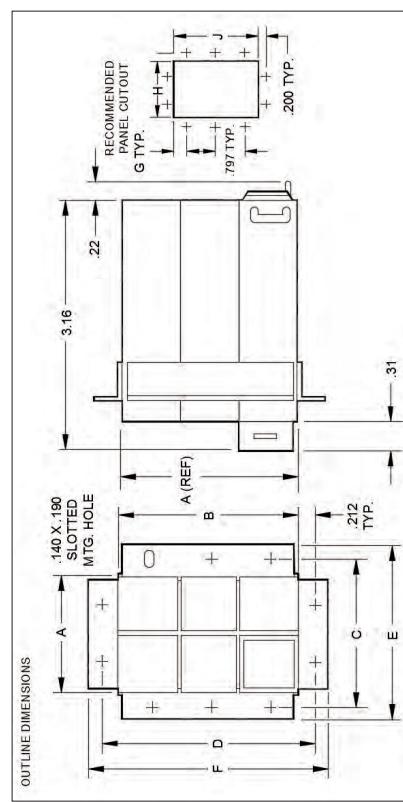
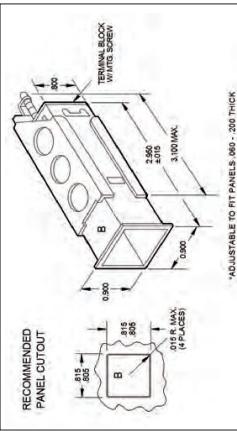
Features spring clip retainers on all four sides of the stainless steel frame, which can be specified to fit panel thicknesses from 0.100" to 0.250". To properly order this unit, use **800-R1** followed by a dash number denoting the proper placement of springs for required panel thickness:

- 1 for panel thickness from 0.100 to 0.150
- 2 for panel thickness from 0.150 to 0.200
- 3 for panel thickness from 0.200 to 0.250



SLEEVE-RETENTION TYPE MOUNTING

Fits any panel thickness requirement from 0.060" to 0.200". To mount, first remove sleeve and insert unit into panel cutout from front. Replace the sleeve at the rear of the panel and tighten the integral mounting screw to draw sleeve up against back of panel and secure unit in place. To order, simply use code number **800-R2-1**.



NUMBER OF UNITS ON A SIDE	DIM. A	DIM. E	DIM. F	DIM. G	DIM. H
1	.804	1.508	.126	1.240	.413
2	1.610	2.985	2.015	2.035	.413
3	2.415	3.940	2.815	2.940	.413
4	3.220	3.945	3.615	3.945	.405
5	4.025	4.995	4.410	4.650	.405
6	4.825	5.900	5.210	5.250	.425



OUR PRESENCE IN THE

Qualification to MIL-S-22885/80 & /74

The Series 800 and 820 have been granted qualification approval to MIL-S-22885/80 and /74. To order MIL-S-22885/80 or /74 qualified units, the part number should include the letter «H», after the series number 800 or 820.

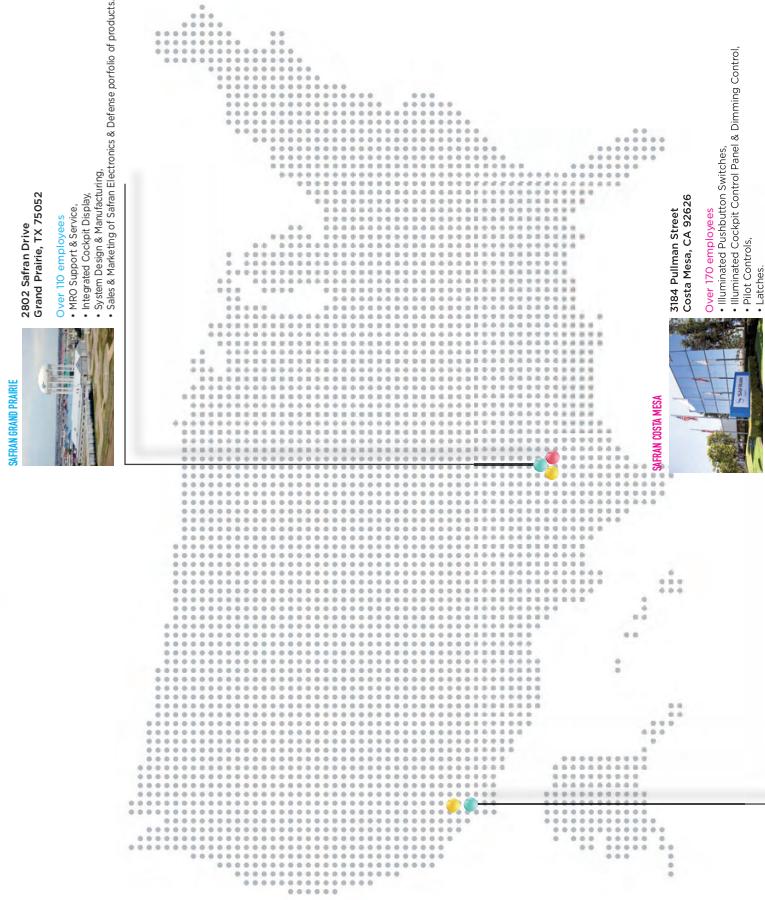
The list of Safran military specification part numbers for the 800H and 820H series is very extensive and cannot be listed due to space constraints. Should you have a need to order a Military Qualified Products List Part Number, please consult your Safran representative or call the factory.

MIL-S-22885/80 RHW 1x1 Mounting Rack plus Switch

MIL-S-22885/74 800-R2-1 Mounting Can plus Switch

MIL-S-22885/8 RHW Racks up to 1 Oxx size

MIL-S-22885/82 Lens arrangement



**POWERED
BY TRUST**

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EATON

AEROSPACE & COMMERCIAL CONTROLS DIVISION

SERIES 580 & 581 SUNLIGHT READABLE AVIONICS SWITCHES



MSC SERIES 580 & 581 Born to be Airborne

The MSC Series 580 Family was created specifically for use in the cockpits of military and commercial aircraft.

Since our goal was to supply a lighted pushbutton switch that would be more than merely suitable for airborne applications, we came to you for advice.

Designed by a Panel of Panel Experts

We asked you, the people who manufacture avionics and other aircraft panel equipment, to advise us on the problems and needs in the cockpit regarding lighted pushbutton switches.

Our extensive survey was illuminating.

And the end result is a product that probably couldn't be better if you designed it yourself. Because you did, in a sense.

A Weighty Problem Resolved

It was no surprise to learn that weight was a chief concern among airborne equipment suppliers.

But the degree of our success in solving the problem might surprise you.

The maximum weight of the Series 580 switch is just 0.565 ounces (16 grams).

This is by far the lowest weight of any two pole double throw lighted pushbutton switch with four lamps.

Ahead with Room to Spare

Our survey confirmed that panel space is expensive real estate.

And the space behind the front panel isn't exactly low rent either.

That's why the Series 580 and 581 is so small.

At 0.75-inches square, no other 4-lamp pushbutton switch takes up less panel area.

And at less than 1 inch in depth, not including terminals, the Series 580 is less than half as deep as comparable units.

In short, it cuts your space problems in half and leaves twice as much room for the behind-the-scenes components of your system.

Take data storage components, for instance. Think how many bytes of information you could fit into the space each Series 580 or 581 switch saves.

How to use this Catalog

This catalog describes each of the standard and optional elements of the Series 580 and 581 switches and indicators. To determine the type of unit you need, simply select the codes that define your choice of each element. The selected codes, written together, become the part number you will use when ordering. A sample of a typical part number is shown with callouts identifying what each code means and a page number

(581)	(32)	(A1)	(B1)	(C1)
580	22	A1	B1	C1
Model Number				
Basic Unit Variations				
580—Page 4				
581—Page 8				
Basic Unit				
580—Page 5				
581—Page 9				
Terminals				
580—Page 4				
581—Page 8				
Lamp Circuit				
580—Page 4				
581—Page 8				

Outshines the Sun

Direct sunlight has been known to cause two kinds of problems with lighted displays and pushbutton switches.

It can make lighted displays unreadable, and unlighted displays readable.

In other words, direct sunlight can cause an energized display to appear blank, and it can cause a false image to be reflected from an unenergized display.

The Series 580 and 581 overcome both serious problems. Characters on their face are easily readable in direct sunlight, regardless of display color—red, amber, white, green or blue. And no disturbing false images are reflected; a dead face is maintained at all times until the unit is energized.

The sunlight readability and non-ghosting characteristics of the Series 580 and 581 can be demonstrated in both the cockpit and the laboratory.

The conditions encountered in the cockpit when direct sunlight strikes the panel are simulated on the ground in the following manner.

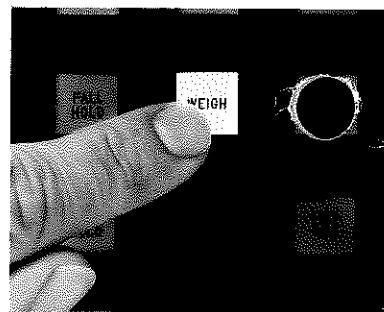
Intense light is directed at a reflective standard and adjusted until the reflected light equals 10,000 foot candles as measured by a calibrated photometer.

Then the reflective standard is replaced by the switch, and photometer measurements are taken at points in the legend area and background area. Measurements within the legend area are taken during both the energized and unenergized models.

In order to be truly sunlight readable, the legend energized contrast ratio Con and the legend unenergized contrast ratio Coff must meet the specifications stated in Mil-S-22885 using the following formula:

$$Con = \frac{\text{legend} - \text{background}}{\text{background}}$$

$$Coff = \frac{\text{legend} - \text{background}}{\text{background}}$$



in this catalog that describes the element.

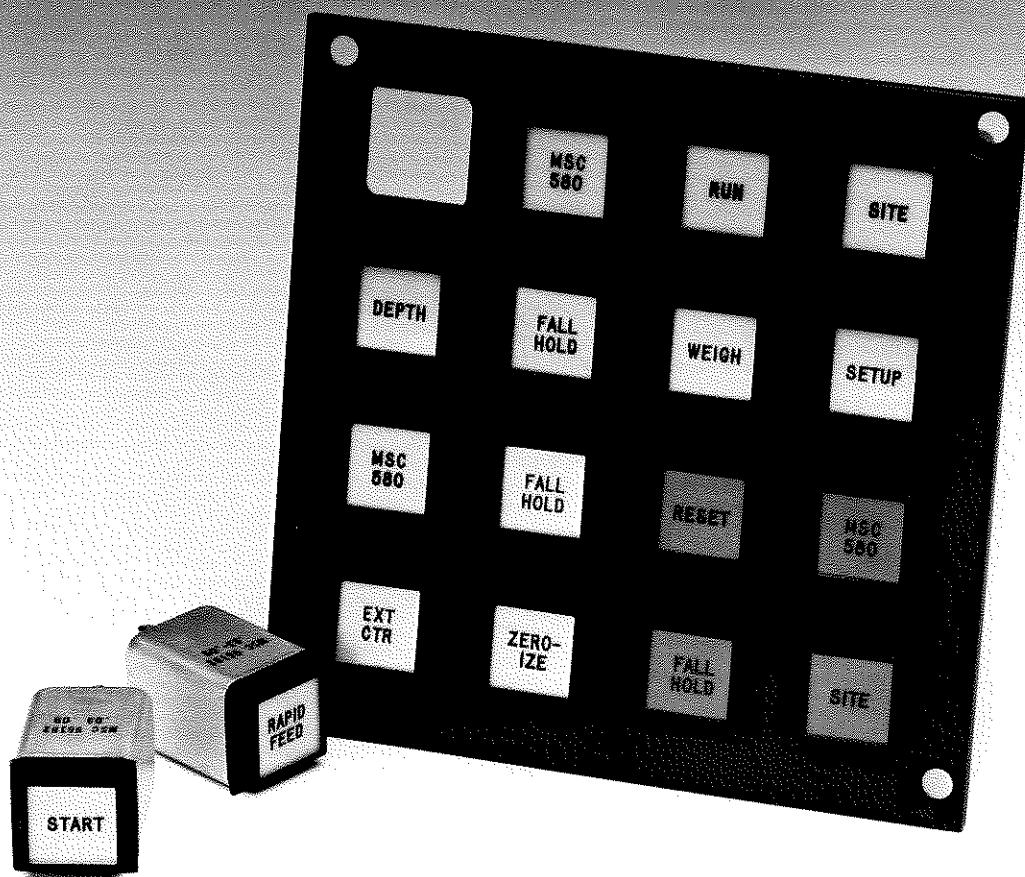
An alternate simplified method of ordering is available where you can order a complete unit using only a four digit Specification Sheet number. This number is assigned to a specific customer and maintained by Master Specialties Company. Consult your MSC representative for details.

(F4)	(L5)	(N2)	(RG),	16	ON/OFF
F4	L5	N2	(RG),	16	ON/OFF
Legend Configurations 580 & 581—Page 5					
Lens Configurations 580 & 581—Page 5					
Lens Type 580 & 581—Page 5					
Lamps 580 & 581—Page 4					

SERIES 580

QPL
MIL-S-22885/100

- Sunlight Readable
- Short Length
- Low Weight
- Variety of Terminations
- Variety of Lens Styles
- Drip Proof
- RFI
- Indicating Alternate Action
- Momentary Action
- Indicator Only
- Front Relampable



580 22 A1B1C1 F8 L5 N2 (RG), 16 ON/OFF

Basic Unit and Variations

The ordering code identifying the basic unit and its variations consists of a five digit number. The first three digits merely denote that it is a Series 580 unit. The next two digits specify the panel thickness range, sealed or unsealed with positive index pin or positive retention hinge.

Panel thickness from .030" to .093"

- 01 Positive indexing pin
- 02 Positive retention hinge
- 03 Positive indexing pin with drip proof seals
- 04 Positive retention hinge with drip proof seals

Panel thickness from .094" to .124"

- 11 Positive indexing pin
- 12 Positive retention hinge
- 13 Positive indexing pin with drip proof seals
- 14 Positive retention hinge with drip proof seals

Panel thickness .125" to .187"

- 21 Positive indexing pin
- 22 Positive retention hinge
- 23 Positive indexing pin with drip proof seals
- 24 Positive retention hinge with drip proof seals

Panel thickness from .188" to .250"

- 31 Positive indexing pin
- 32 Positive retention hinge
- 33 Positive indexing pin with drip proof seals
- 34 Positive retention hinge with drip proof seals

Mounting

The basic unit is supplied with an anodized housing and single mounting sleeve for panel thicknesses from .032" to .250". Consult factory for additional panel thicknesses.

Drip Proof Seals

The Series 580 is offered with an integral silicon rubber capsule seal and a neoprene rubber coated metal panel seal.

Positive Indexing Pin and Positive Retention

The Series 580 is available with a positive indexing pin which ensures the proper placement of the lamp capsule during relamping. Also available is a positive retention hinge which prevents the complete removal of the lamp capsule.

580 22 A1B1C1 F8 L5 N2 (RG), 16 ON/OFF

Basic Unit, Terminals, Lamp Circuit

The Series 580 is available in one and two pole momentary or alternate action units, or as an indicator only. See Table 1 for ordering codes.

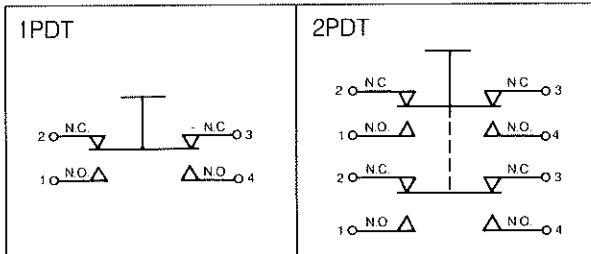
Momentary Action Switch 1 PDT or 2 PDT

Depressing front lens transfers switch contacts so long as the front lens is held down. Removing actuating force returns switch contacts to their normal position and front lens returns to its retracted position.

Alternate Action Switch 1 PDT or 2 PDT

Combines capability of both indication and switching. Depressing front lens transfers switch contacts, and they remain transferred even after the actuating force is removed. The front lens remains in the down position. Depressing the front lens again returns the switch contacts to their normal position.

Form Z Switch Action



Indicator

The basic unit may be ordered without a switch mechanism for applications requiring indication only.

580 22 A1B1C1 F8 L5 N2 (RG), 16 ON/OFF

Lamp Types

The Series 580 uses four T-1" midget flange based incandescent lamps which are available in 5, 12, 14, and 28 volts.

DESIGN VOLTS	DESIGN AMPS	MSCP ± 15%	DESIGN WATTS
F1 ^{3,6}	.06	.05	.30
F3 ^{3,6}	.021	.034	.11
F4 ^{1,5}	.024	.15	.67
F5	.03	.10	.36
F6 ^{1,5}	.04	.15	.56
F8 ^{2,6}	.06	.15	.30
F9 ⁵	.016	.072 ± 25%	.45

1 CAUTION: When using high wattage lamps, additional heat sinking and air flow must be provided. Also matrix mounting is not recommended.

2 Recommended lamp for L5 lens configuration (SRL).

3 Not recommended for high ambient light levels.

4 U.S. MIL STD: MS24515.

5 Only for use with extended 581 version.

6 All 5 volt lamps have nickel-plated bases.

580 22 A1B1C1 F8 H1 L5 N2 (RG), 16 ON/OFF

The Series 580 is available with an RFI screen. To order the 580 with RFI, merely add an "H1" after the lamp callout.

580 22 A1B1C1 F8 L5 N2 (RG), 16 ON/OFF

Lens Types

L1—Lens Type 1—Lighted Letters: Engraved letters appear white on a black background until illuminated and then letters appear in color, background remains black.

L2—Lens Type 2—Lighted Background: Engraved letters appear black on a white background until illuminated and then background appears in color, letters remain black.

L3—Lens Type 3—Hidden Message Lighted Letters:

Engraved letters are not legible until illuminated and then letters appear in color, background remains black.

L4—Lens Type 4—Hidden Message Lighted Background: Engraved letters are not legible until illuminated and then background appears in color, letters remain black.

L5—Lens Type 5—Sunlight Readable: Letters are not legible until illuminated and then letters appear in color, background remains black. When illuminated, lighted letters are readable in direct sunlight.

L6—Lens Type 6—Colored Background: Engraved letters appear black against a colored background until illuminated and then background appears in lighted color, letters remain black.

Lens or Color Filter Removal

The display lens and associated color filter assembly can be removed which allows for easy changing or cleaning. After freeing the lamp capsule assembly, and the metal lens retainer, the display lens and color filter can be removed. Field replacement of the color filter assembly can only be made on an unsealed unit.

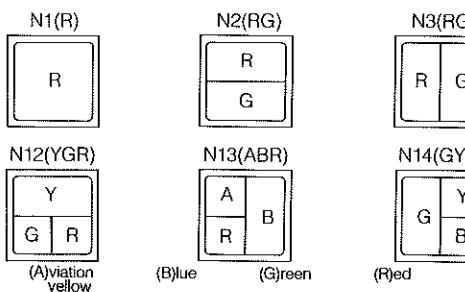
Table I 580 Series basic units

TYPE OF BASIC UNIT	PART NUMBER BY LAMP CIRCUIT		
	LAMP CIRCUIT 1 (C1)	LAMP CIRCUIT 2 (C2)	LAMP CIRCUIT (C3)
INDICATOR WITH P.C.B. TERMINALS WITH SOLDER TERMINALS	A0B5C1 A0B6C1	A0B5C2 A0B6C2	A0B5C3 A0B6C3
HIGH CURRENT SWITCHES			
1PDT MOM P.C.B. TERM.	A1B1C1	A1B1C2	A1B1C3
1PDT MOM SOLDER TERM.	A1B3C1	A1B3C2	A1B3C3
2PDT MOM P.C.B. TERM.	A2B1C1	N/A	A2B1C3
2PDT MOM SOLDER TERM.	A2B3C1	N/A	A2B3C3
1PDT ALT P.C.B. TERM.	A3B1C1	N/A	N/A
1PDT ALT SOLDER TERM.	A3B3C1	N/A	N/A
2PDT ALT P.C.B. TERM.	A4B1C1	N/A	N/A
2PDT ALT SOLDER TERM.	A4B3C1	N/A	N/A
LOW CURRENT SWITCHES			
1PDT MOM P.C.B. TERM.	A1B2C1	A1B2C2	A1B2C3
1PDT MOM SOLDER TERM.	A1B4C1	A1B4C2	A1B4C3
2PDT MOM P.C.B. TERM.	A2B2C1	N/A	A2B2C3
2PDT MOM SOLDER TERM.	A2B4C1	N/A	A2B4C3
1PDT ALT P.C.B. TERM.	A3B2C1	N/A	N/A
1PDT ALT SOLDER TERM.	A3B4C1	N/A	N/A
2PDT ALT P.C.B. TERM.	A4B2C1	N/A	N/A
2PDT ALT SOLDER TERM.	A4B4C1	N/A	N/A

580 22 A1B1C1 F8 L5 N2(RG), 16 ON/OFF

Lens Configuration

From the illustrations below select the lens configuration you need (Example N2). The letters in brackets indicate what color filters are necessary and their position when a multiple split lens is ordered.



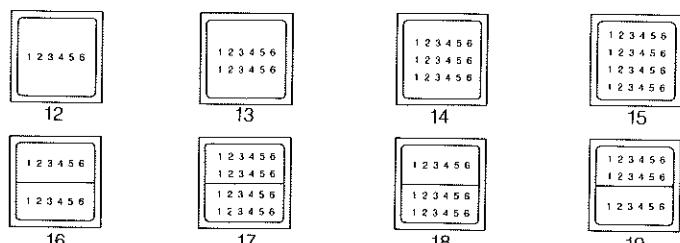
580 22 A1B1C1 F8 L5 N2(RG), 16 ON/OFF

Legend Configuration

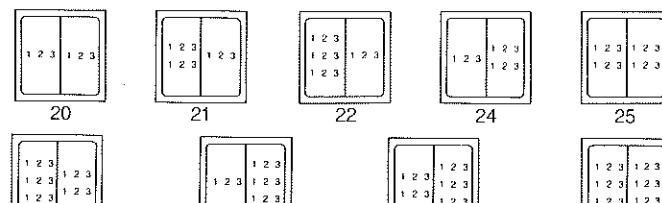
The part number code for a legend, when required, should follow the display lens code, since it indicates the legend configuration and legend wording.

To order a legend first choose the appropriate legend configuration number.

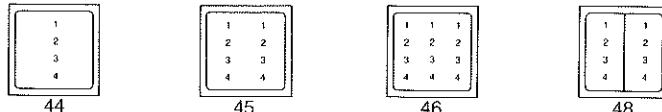
Horizontal Rows of Letters (6 characters or spaces per row .093" high)



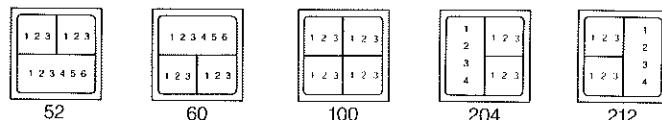
Vertical Splits, Horizontal Rows of Letters (3 characters per row .093" high)



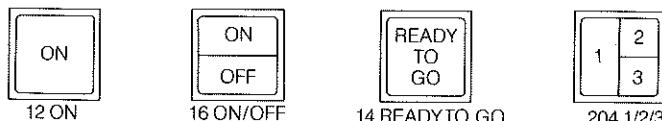
Vertical Rows of Letters (4 characters or spaces per row .093" high)



Three Way Splits and Four Way Split (.093" high)



Once the legend configuration has been specified it will be necessary to write out the actual legend information required, using commas between rows of characters and a diagonal slash to indicate where a split is. When specifying a split the order to which the words would be written is upper left, upper right, lower left, and lower right as viewed from the front panel.



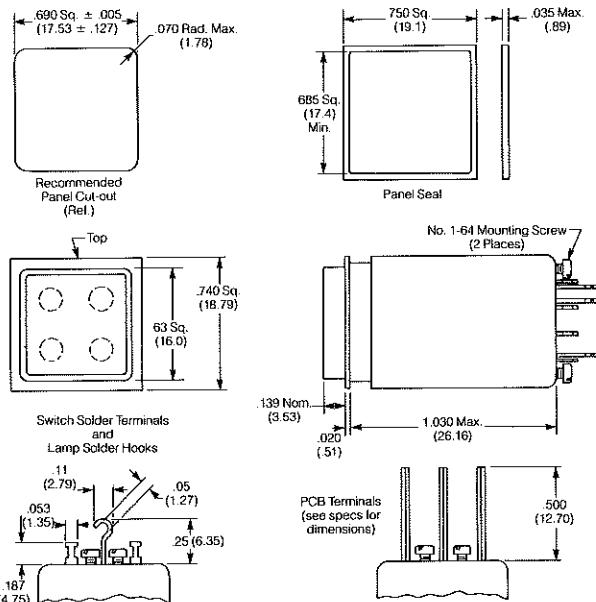
Specifications

Environmental

Vibration:	15 G's at 10 to 2000Hz (per Mil-Std-202, method 204, Cond B)
Shock:	75 G's (per Mil-Std-202, Method 213, Cond B)
Salt Spray:	(per Mil-Std-202, Method 101, Cond A)
Operating Temperature Range:	-55 °C to + 85 °C
Non-Operating Temperature Range:	-55°C to + 85°C
Drip Proof:	Per Mil-Std-108

Mechanical

Weight:	16 grams maximum
Mounting:	Panel thickness from .030" to .250" using an anodized mounting sleeve. Contact factory for additional panel thicknesses.
Switch Terminals:	PCB: .020" x .030" gold plated (B1 and B2) Solder Terminal: single turret gold plated (B3 and B4)
Lamp Terminals:	PCB: .025" x .025" gold plated (B1, B2, B5) Solder Terminal: solder hook gold plated (B6)
Actuation Force:	2.0 lbs to 5.0 lbs (unsealed unit)
Actuation Travel:	.125" ± .025
Switch Contacts:	Movable and stationary: Silver, gold plated, or gold flashed
Mechanical Life:	100,000 cycles
Electrical Life:	50,000 cycles
Switch Configuration:	Form Z



Electrical Switch Contact Ratings

B1 & B3 Silver (High Current)

28 VDC at Sea Level	NO or NC
RESISTIVE load	8 amperes
INDUCTIVE load	5 amperes
MOTOR load	5 amperes
LAMP load	1 ampere
28 VDC at 80,000 feet	NO or NC
RESISTIVE load	8 amperes
INDUCTIVE load	5 amperes
LAMP load	0.5 amperes
110 VAC at Sea Level	NO or NC
RESISTIVE load	7 amperes
INDUCTIVE load	4 amperes
LAMP load	2 amperes

B2 & B4 Gold (Low Current)

28 VDC at Sea Level	NO or NC
RESISTIVE load	5 amperes
INDUCTIVE load	3 amperes
28 VDC at 80,000 ft	NO or NC
RESISTIVE load	5 amperes
INDUCTIVE load	3 amperes

Low level rating: .01A @ .03 VDC or A.C. peak

Dielectric—1000 VRMs min at Sea Level

Insulation Resistance—1000 megohms, min.

Dimensions

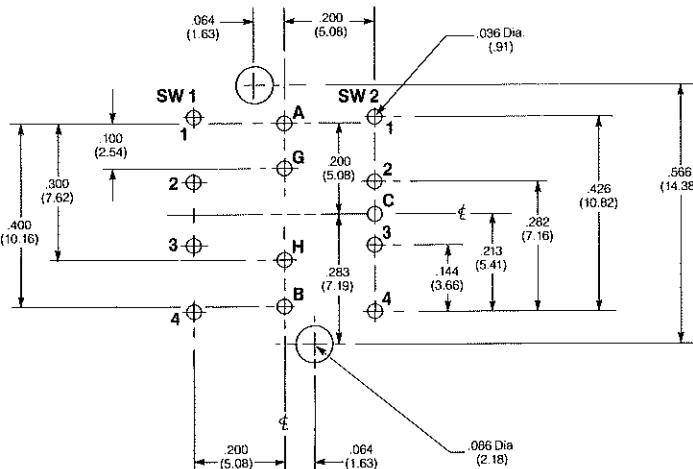
Dimensions are in inches.

Tolerances on decimals: $X \pm .1$ (.254)

$XX \pm .03$ (.76)

$XXX \pm .010$ (.25)

() = millimeters



Circuit Number	SW1				A	G	H	B	C	SW2			
	1	2	3	4						1	2	3	4
A0B5C1					•	•	•	•	•				
A1B1C1					•	•	•	•	•				
A1B2C1					•	•	•	•	•				
A2B1C1					•	•	•	•	•				
A2B2C1					•	•	•	•	•				
A0B5C2					•	•	•	•	•				
A1B1C2	•	•	•	•	•	•	•	•	•				
A1B2C2	•	•	•	•	•	•	•	•	•				
A0B5C3					•	•	•	•	•				
A1B1C3	•	•	•	•	•	•	•	•	•				
A1B2C3	•	•	•	•	•	•	•	•	•				
A2B1C3	•	•	•	•	•	•	•	•	•	•	•	•	•
A2B2C3	•	•	•	•	•	•	•	•	•	•	•	•	•

SERIES 581

QPL
MIL-S-22885/101A



Matrix Mountable
Low Weight & Short Length
Sunlight Readable
Extended Lamp Capsule Unit
28 Volt Lamp Applications
Night Vision Compatible Lenses
LED Lighting
Two Color Full Display
Drip Proof
RFI
Variety of Terminations
Form C Switch Arrangement
Variety of Lens Styles
Indicating Alternate Action
Momentary Action
Indicator Only
Front Relampable

Series 581 Features

The Series 581 was designed to provide "true" matrix mounting. Switches can be mounted in a variety of matrix types and sizes and can be removed without disturbing behind panel wiring.

The Series 581 has other features that enhance its basic design. The following describes the various types of 581s and their major added features.

581 Standard Length Type I

Length = 1.03" behind panel depth
Solder or PCB Terminations
Form C switch action

581 Standard Length Type II

Length = 1.20" behind panel depth
Solder, PCB, or Matrix Terminations
Form C switch action

581 Extended Length Type I

Length = 1.33" behind panel depth
Solder or PCB Terminations
Use with 28 volt lamps
Night Vision Lens System (consult factory)
LED lamp capsule (consult factory)
Two Color full display lamp capsule (consult factory)
Form C switch action

581 Extended Length Type II

Length = 1.50" behind panel
Solder, PCB, or Matrix Terminations
Use with 28 volt lamps
Night Vision Lens System (consult factory)
LED lamp capsule (consult factory)
Two Color Full display lamp capsule (consult factory)
Expanded lamp terminal capability
Form C switch action

581 32 A1B1C1 F4 L5 N2 (RG), 16 ON/OFF

Basic Unit and Variations

The ordering code identifying the basic unit and variations of the Series 581 consists of the first five digits. As with the 580 the first three digits indicate the model number. The next two digits indicate whether the unit is either an extended length or standard length. Also, the RFI callout is included in these two numbers. In the Series 581 one sleeve is used for all panel thickness and all 581s are included with positive retention hinges for lamp capsule retention.

581 Standard Length Type I

- 11 unsealed
- 12 sealed
- 13 unsealed with RFI
- 14 sealed with RFI

581 Standard Length Type II

- 21 unsealed
- 22 sealed
- 23 unsealed with RFI
- 24 sealed with RFI

581 Extended Length Type I

- 31 unsealed
- 32 sealed
- 33 unsealed with RFI
- 34 sealed with RFI

581 Extended Length Type II

- 41 unsealed
- 42 sealed
- 43 unsealed with RFI
- 44 sealed with RFI

Mounting

The Series 581 is supplied with a mounting sleeve that is capable of fitting panel thickness from .030 to .250.

Drip Proof Seals

Since the basic difference between the 580 and 581 is in the housing, the same Drip Proof seals are used.

Positive Retention Hinge

The Series 581 comes standard with a positive retention hinge which prevents the complete removal of the lamp capsule during relamping.

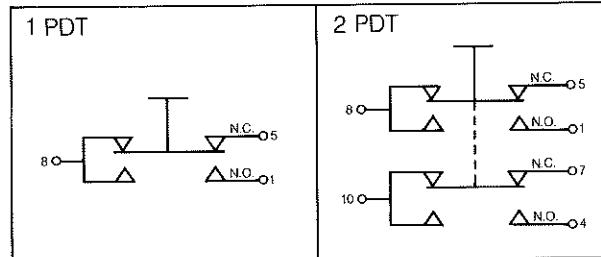
581 32 A1B1C1 F4 L5 N2 (RG), 16 ON/OFF

Basic Unit, Terminals, Lamp Circuit

The 581 is available in one and two pole momentary or indicating alternate switch actions. See Table 2 for ordering codes.

The 581 differs from the 580 in that the switch action for the 581 is a Form C configuration.

Form C Switch



581 32 A1B1C1 F4 L5 N2 (RG), 16 ON/OFF

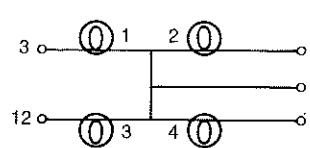
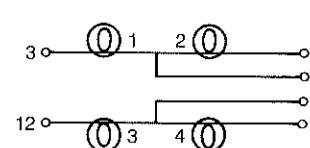
Lamp, Lens Type, Legend Configuration

Because of the similarities to the Series 580, the ordering codes for lamps, legend type, and legend configurations can be derived from the Series 580. See Pages 4 and 5.

QPL

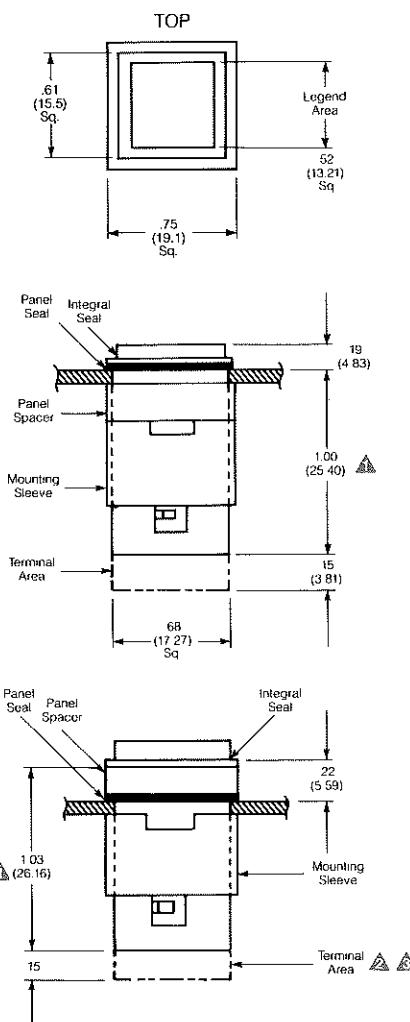
The Series 581 can be ordered per MIL-S-22885/101 and /102. To order a QPL Switch, insert an "H" in the part number between the Model Number (581) and the basic unit variation, for example 581H32A1B1C1F4L5. Not all 581 Part Numbers are available as QPL items.

Table 2 581 Series basic units

TYPE OF BASIC UNIT		PART NUMBER BY LAMP CIRCUIT			
					
					
LENGTH AVAIL.	STD or EXT	TYPE I 1.03" or 1.33"	TYPE II 1.20" or 1.50"	TYPE I 1.03" or 1.33"	TYPE II 1.20" or 1.50"
INDICATOR		A0B5C1 A0B6C1 N/A	A0B12C1 A0B15C1 A0B9C1	A0B5C3 A0B6C3 N/A	A0B12C3 A0B15C3 A0B9C3
HIGH CURRENT (SILVER)		A1B1C1 A1B3C1 N/A A2B1C1 A2B3C1 N/A A3B1C1 A3B3C1 N/A A4B1C1 A4B3C1 N/A	A1B10C1 A1B13C1 A1B7C1 A2B10C1 A2B13C1 A2B7C1 A3B10C1 A3B13C1 A3B7C1 A4B10C1 A4B13C1 A4B7C1	A1B1C3 A1B3C3 N/A A2B1C3 A2B3C3 N/A N/A N/A N/A N/A N/A N/A	A1B10C3 A1B13C3 A1B7C3 A2B10C3 A2B13C3 A2B7C3 A3B10C3 A3B13C3 A3B7C3 A4B10C3 A4B13C3 A4B7C3
LOW CURRENT (GOLD)		A1B2C1 A1B4C1 N/A A2B2C1 A2B4C1 N/A A3B2C1 A3B4C1 N/A A4B2C1 A4B4C1 N/A	A1B11C1 A1B14C1 A1B8C1 A2B11C1 A2B14C1 A2B8C1 A3B11C1 A3B14C1 A3B8C1 A4B11C1 A4B14C1 A4B8C1	A1B2C3 A1B4C3 N/A A2B2C3 A2B4C3 N/A N/A N/A N/A N/A N/A N/A	A1B11C3 A1B14C3 A1B8C3 A2B11C3 A2B14C3 A2B8C3 A3B11C3 A3B14C3 A3B8C3 A4B11C3 A4B14C3 A4B8C3

Dimensional Specifications Type I

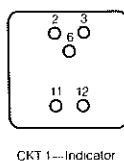
Series 581 Type I Sealed



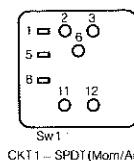
Notes:

- ▲ For extended unit add 0.300" to dimension shown.
- ▲ Terminals for printed circuit board shall be .030 diameter for lamp circuit and .030 x .020 blade for switch.
- ▲ Terminals for solder shall be single turret, .050 diameter for lamp circuit and .05 x .02 blade for switch.

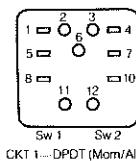
Terminal Identification—Type I (Rear View)



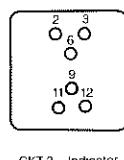
CKT 1—Indicator



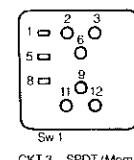
CKT 1—SPDT (Mom/Alt)



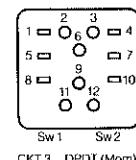
CKT 1—DPOT (Mom/Alt)



CKT 3—Indicator

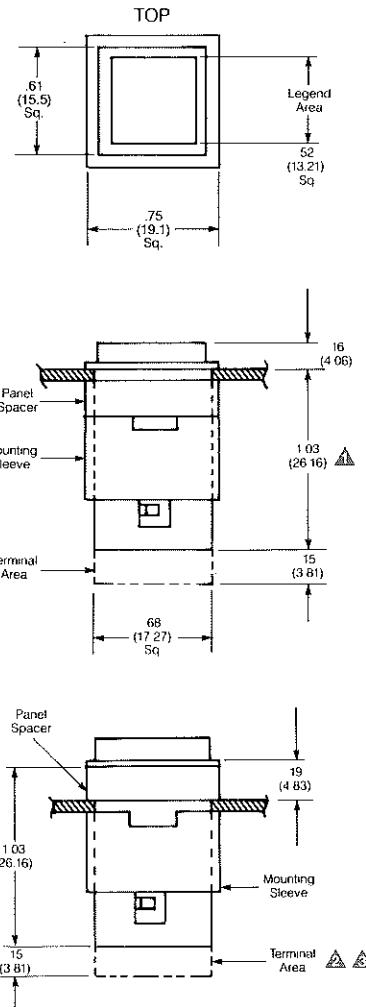


CKT 3—SPDT (Mom)



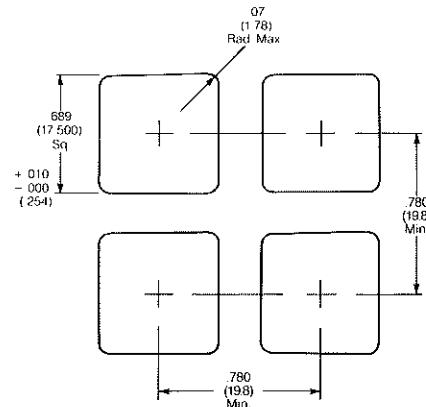
CKT 3—DPDT (Mom)

Series 581 Type I Unsealed



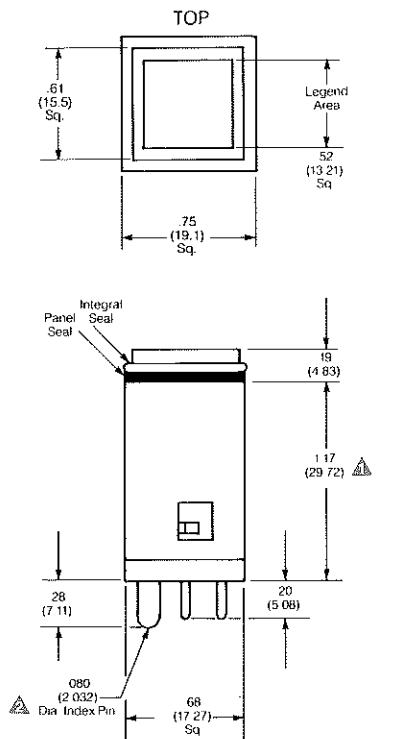
- ▲ Dimensions are in inches. Unless otherwise specified, tolerances are $\pm .010$ for three place decimals and $\pm .03$ for two place decimals.

Recommended Panel Cutout for Individual Mount—Type I & Type II Solder and PCB Terminations.

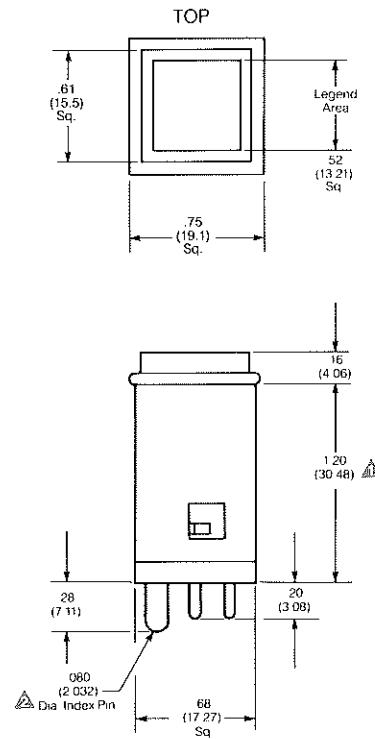


Dimensional Specifications Type II

Series 581 Type II Sealed



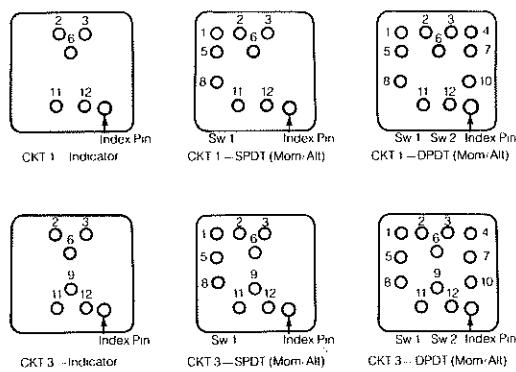
Series 581 Type II Unsealed



Notes:

- ▲ For extended unit add 0.300" to dimension shown
- ▲ Not included on Type II solder terminal units
- ▲ Terminals for printed circuit board shall be .030 diameter.
- ▲ Terminals for solder shall be single turret .050 diameter.
- ▲ Terminals for matrix plug-in shall be .040 diameter.

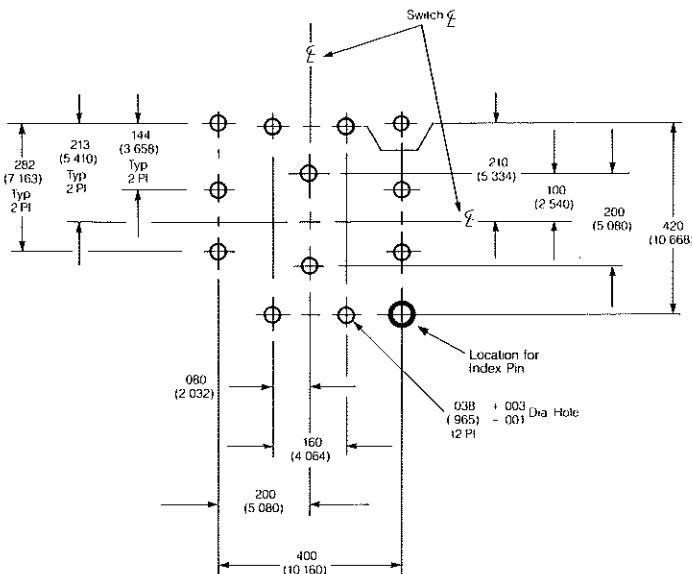
Terminal Identification—Type II (Rear View),



- ▲ Mounting Sleeve and Spacer is included on solder and PCB type units

Recommended Printed Circuit Board Layout

Rear View



Notes:

- 1 Dimensions are in inches.
- 2 Unless otherwise specified, tolerances are $\pm .010$ for three place decimals and $\pm .03$ for two place decimals.

Specifications

Housing:	Aluminum Alloy
Finish:	Chemical Film, per MIL-C-5541.
Mounting Sleeve:	Aluminum Alloy 5052-0.
Finish:	Chemical Film, per MIL-C-5541.
Weight:	Type I: 18 grams maximum (standard) 21 grams maximum (extended). Type II: 21 grams maximum (standard) 24 grams maximum (extended).
Temperature Characteristic:	- 55°C to + 85°C operating - 55°C to + 85°C nonoperating
Vibration Grade:	3 Axes (10-2000Hz). 15g per MIL-STD-202 Method 204 Condition B
Operating Characteristics:	Actuation force: 1 to 5 pounds. Actuation travel: .125 ± .025.
Pushbutton Extraction Force:	2 to 5 pounds.
Shock:	75 G (MIL-STD-202, Method 213, Test Condition B).
Thermal Shock: per MIL-STD-202 Method 107 Condition A	During high temperature portion of thermal shock test, all four lamps shall be energized with full rated voltage. Total lamp wattage shall not exceed 1.2 watts.
Driproof Test: per MIL-STD-108	When specified, test in accordance with MIL-S-22885. There shall be no leakage of water through the panel and pushbutton seals as determined by visual examination and the dielectric withstand voltage test.
Electrical Ratings: per MIL-S-22885 / 101	See Table Below. Following electrical endurance switches which are tested at the rated inductive load shall only be required to operate the circuit.
Low Level Life:	Applicable for gold contact switches. 50,000 cycles.
Marking:	Per MIL-STD-130.
Mounting Torque:	16 inch oz. ± 4 inch oz.

RFI Shielding: per MIL-S-22885 Para 4.8.32.1

When specified switches shall be equipped with an RFI screen, Resistance between the mounting sleeve and the RFI screen shall be measured in accordance with Method 307 of MIL-STD-202 and shall not exceed 1 ohm.

ELECTRICAL RATINGS—SILVER CONTACTS (HIGH CURRENT)

LOAD	Sea Level, 28 Vdc		70,000 Feet, 28 Vdc	
	NO or NC		NO or NC	
RESISTIVE	(Amperes, max.)	5.0	(Amperes, max.)	5.0
INDUCTIVE		3.0		2.0
LAMP		1.0		—

ELECTRICAL RATINGS—GOLD CONTACTS (LOW CURRENT)

LOAD	Sea Level, 28 Vdc		70,000 Feet, 28 Vdc	
	(Amperes, max.)		(Amperes, max.)	
RESISTIVE	1		1	
INDUCTIVE	0.5		0.5	

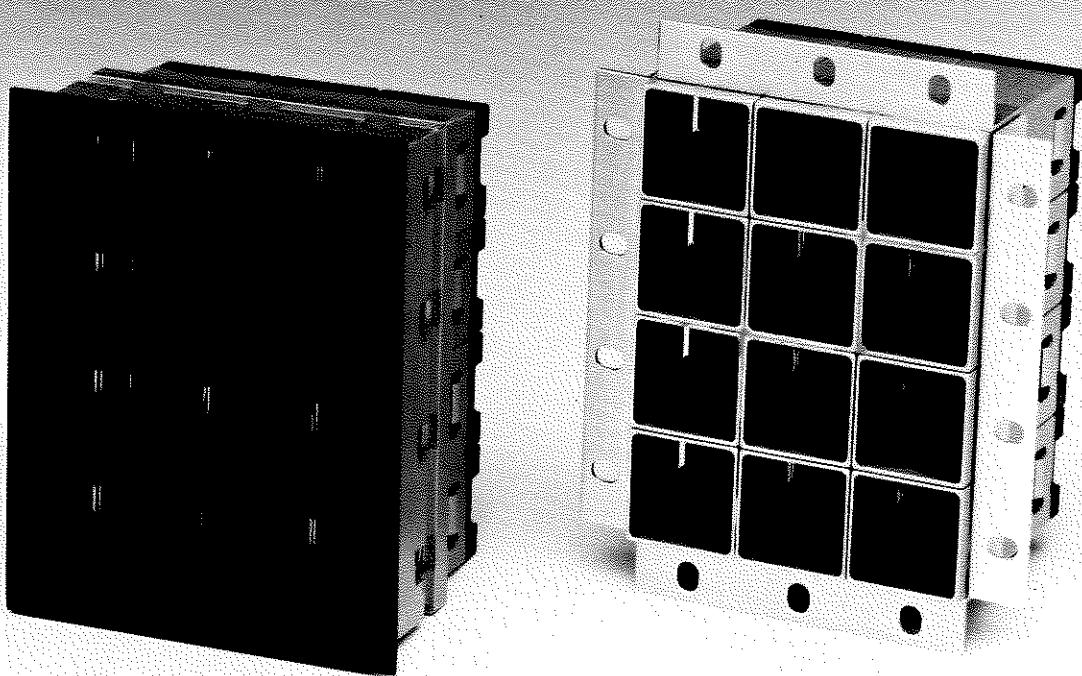
▲ Contacts are silver, gold flash for solderability and to prevent silver tarnish.

▲ Contacts are silver, gold plated for low current applications.

581 MATRICES

QPL
MIL-S-24317/11A

Frame Type
Flange Type
RFI
Moisture Proof
Variety of Sizes
Low Weight



Series 581 Matrices

The Series 581 Matrices are modular units that can have any number of channels into which a Series 581 Type II units with connector terminals can be plugged in. The maximum square matrix is 5×5 ; maximum rectangular matrix is 5×10 . Consult the factory for specific size requirements not shown.

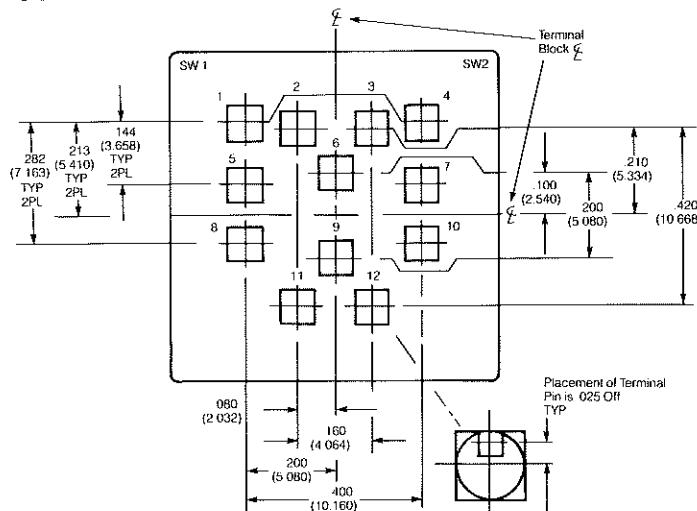
Ready to Wire with Crimp-Type PCB, or Wire Wrap Terminals

A variety of insertable terminals are available to wire the connector block at the rear of each channel in the matrix.

PART NUMBER	TERMINAL TYPE
581-921	Wire Wrap/PCB
581-914	Wire Wrap
581-915	Wire Wrap
581-920	Crimp

Once a terminal has been installed it is easily removed by using a removal tool. Removal tool part number is 581-922 for terminal type 581-921, -914, and -915.

Connector Block Rear View



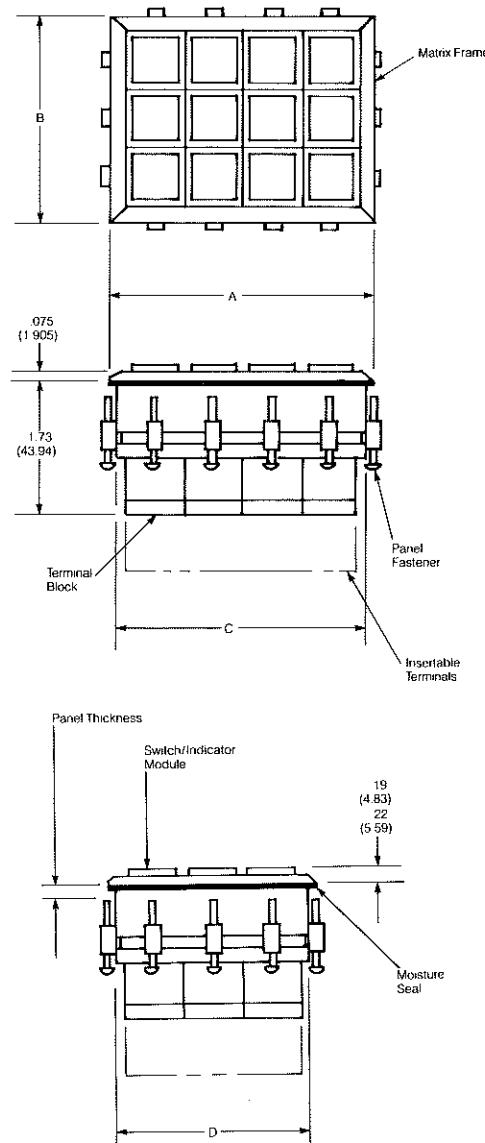
Series 581 Frame Type Matrix

The Frame Type Matrix is a front mount type which uses fasteners that are slipped into the slots on the matrix frame. They are available for either the standard or extended length 581 Type II units and are available with RFI shielding, moisture seal and a variety of frame colors. Consult factory for specific frame color requirements not shown.

Panel thickness range is from .030" to .250".

Ordering Information

581 - R W Y	XX	XX - X	1 Frame Black 2 Frame Grey
RFI Drip-proof Housing Assy, Standard Length			
581 - R E W Y	XX	XX - X	1 Frame Black 2 Frame Grey
RFI Drip-proof Housing Assy, Extended Length			



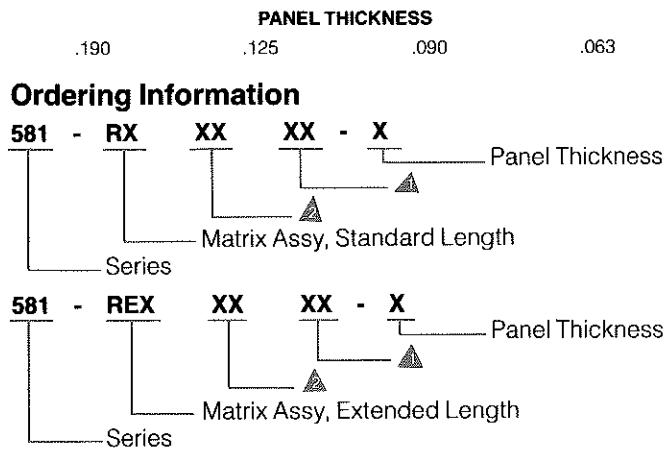
NUMBER OF STATIONS	DIMENSIONS				NUMBER OF FASTENERS PER SIDE
	A	B	C	D	
1	1.150 (29.21)	1.150 (29.21)	.985 (25.02)	.985 (25.02)	1
2	1.908 (48.46)	1.908 (48.46)	1.740 (44.20)	1.740 (44.20)	2
3	2.663 (67.64)	2.663 (67.64)	2.495 (63.37)	2.495 (63.37)	3
4	3.418 (86.82)	3.418 (86.82)	3.250 (82.55)	3.250 (82.55)	4
5	4.173 (106.00)	4.173 (106.00)	4.005 (101.73)	4.005 (101.73)	5
6	4.928 (125.17)	4.928 (125.17)	4.760 (120.90)	4.760 (120.90)	6
7	5.683 (144.35)	5.683 (144.35)	5.515 (140.08)	5.515 (140.08)	7
8	6.438 (163.53)	6.438 (163.53)	6.270 (159.26)	6.270 (159.26)	8
9	7.193 (182.70)	7.193 (182.70)	7.025 (178.44)	7.025 (178.44)	9
10	7.948 (201.88)	7.948 (201.88)	7.780 (197.61)	7.780 (197.61)	10

▲ Number of units in a vertical row (2 digits).

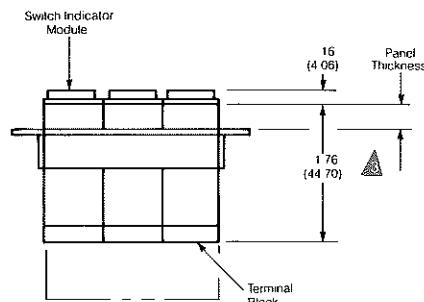
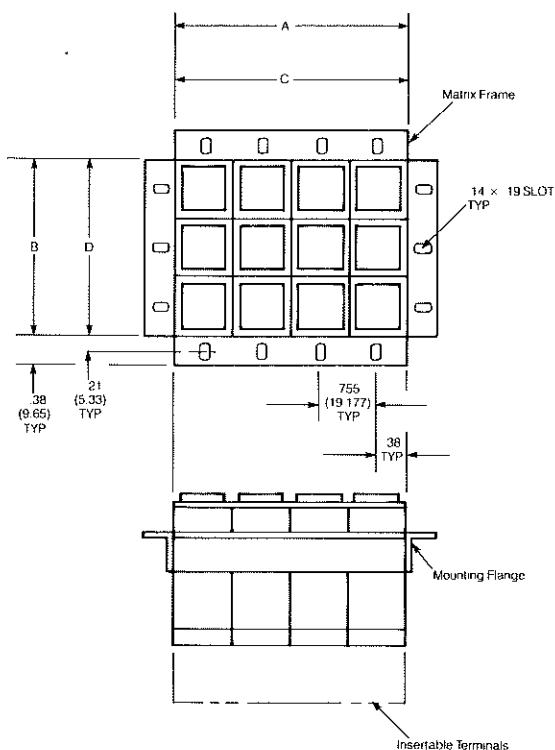
▲ Number of units in a horizontal row (2 digits).

Series 581 Flange Type Matrix

The Flange Type Matrix is a rear mount unit for applications using edge-lit panels. A variety of panel thicknesses are available as shown below. Consult factory for other panel sizes.



▲ Number of units in a vertical row (must be 2 digits).
 ▲ Number of units in a horizontal row (must be 2 digits).



▲ Standard length 1.76"; Extended length 2.06"

NUMBER OF STATIONS	DIMENSIONS			
	MATRIX ±.015 (.38)		RECOMMENDED PANEL CUTOUT +.030 -.000 (.76)	
	A	B	C	D
1	.755 (19.18)	.755 (19.18)	.775 (19.69)	.775 (19.69)
2	1.510 (38.35)	1.510 (38.35)	1.530 (38.86)	1.530 (38.86)
3	2.265 (57.53)	2.265 (57.53)	2.285 (58.04)	2.285 (58.04)
4	3.020 (76.71)	3.020 (76.71)	3.040 (77.22)	3.040 (77.22)
5	3.775 (95.89)	3.775 (95.89)	3.795 (96.39)	3.795 (96.39)
6	4.530 (115.06)	4.530 (115.06)	4.550 (115.57)	4.550 (115.57)
7	5.285 (134.24)	5.285 (134.24)	5.305 (134.75)	5.305 (134.75)
8	6.040 (153.42)	6.040 (153.42)	6.060 (153.92)	6.060 (153.92)
9	6.795 (172.59)	6.795 (172.59)	6.815 (173.10)	6.815 (173.10)
10	7.55 (191.77)	7.550 (191.77)	7.570 (192.28)	7.570 (192.28)

ROTO-TELLITE
SERIES

NO TOOLS FOR
RELAMPING

FLUSH
MOUNT

POSITIVE
INDEX

MASTER TEST
CIRCUITS

FULL
DISPLAY

FULL
DISPLAY

ON || OFF

TWO
COLOR

TWO
COLOR

VERTICAL
STACKING

MATRIX

HORIZONTAL
STACKING

FRONT
MOUNTING

100 &
100

WORD INDICATOR
LIGHT

M-E PRODUCES

ROTO-TELLITE

ROTO-TELLITE
SERIES 101

MARINE AIR SUPPLY CO., INC.

YOUR FULL LINE DISTRIBUTOR

5330 SPECTRUM DRIVE

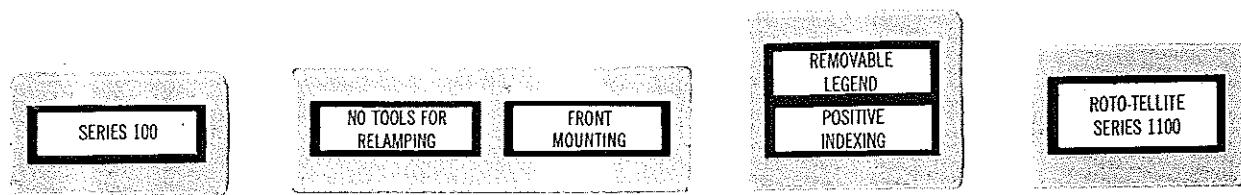
FREDERICK, MD 21703-7361

(301) 631-8400 FAX (301) 631-8425

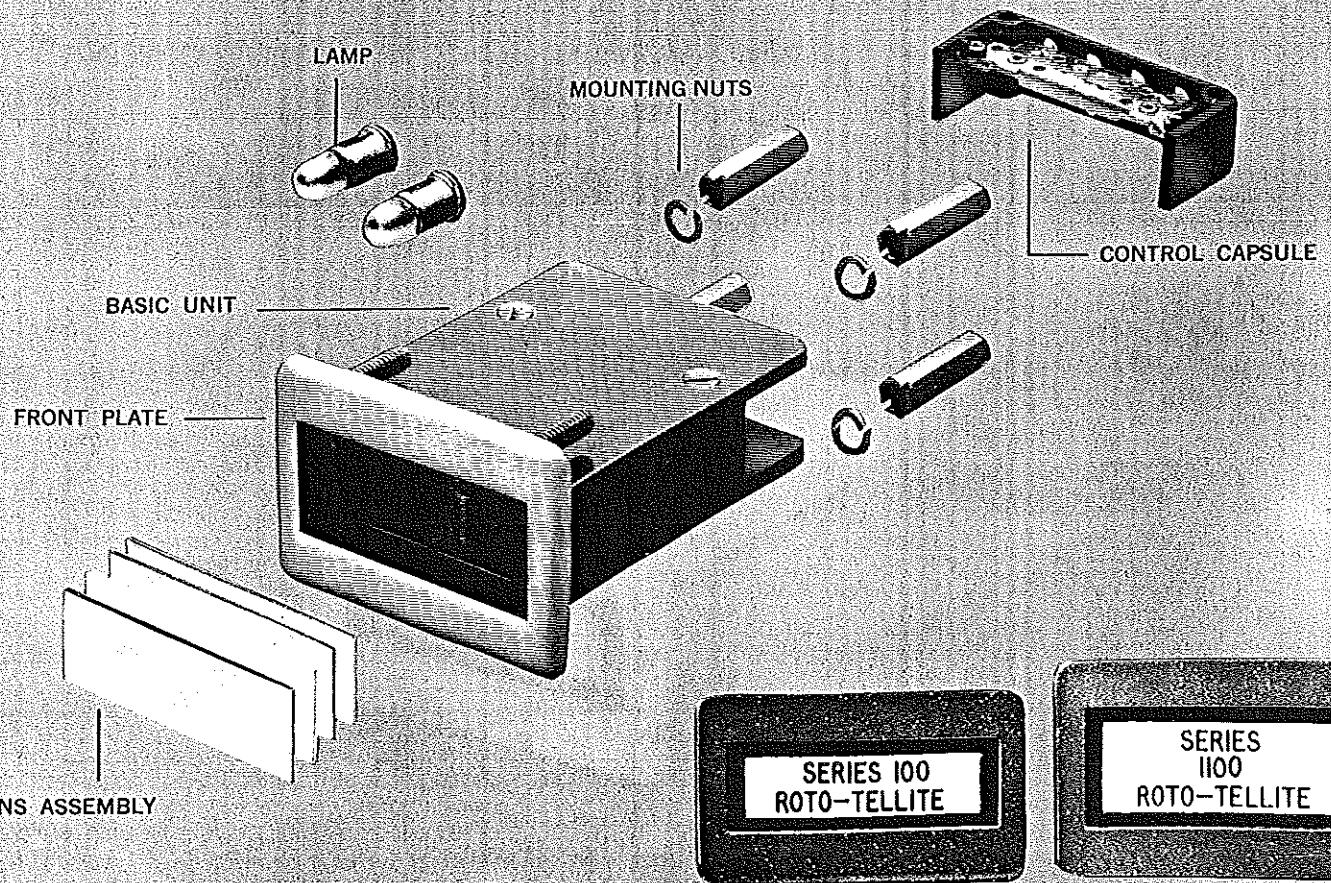
ROTO-TELLITE®

WORD INDICATOR LIGHT

SERIES 100 and 1100



The Series 100 and 1100 Roto-Tellite are flush mounted two lamp word indicator lites. The rectangular front lens and lamps are contained in a rotatable lite capsule which allows front of panel lamping and lens installation. Basic units are available in numerous different configurations providing vertical stacks, horizontal rows or matrices. The Series 1100 is slightly larger than the Series 100 and thereby provides additional area for the engraved lens inscription. The basic unit is mounted from the front of the panel by means of a front plate with mounting studs which also covers the panel cutout.



Basic Unit

MOUNTING

The basic unit consists of the lite capsule and terminal base connected to a common mounting bracket. Furnished separately with each basic unit is necessary mounting hardware and a cover plate with studs spot welded to its back face. The basic unit is installed from the front of the panel. The cover plate, which is installed from the front of the panel, covers the mounting studs as well as the panel cutout providing a finished appearance. Units are designed for mounting in panels 0" to $\frac{3}{8}$ " thick. The top of all units is permanently identified. See Fig. 1.

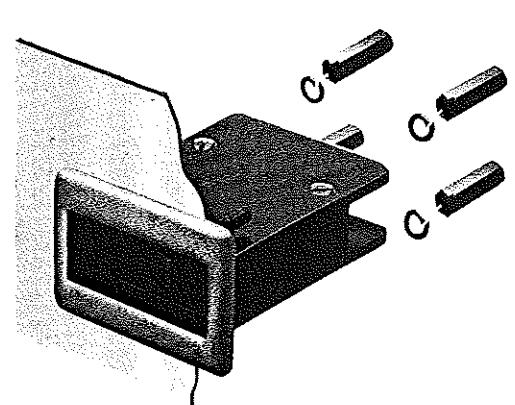


Fig. 1
MOUNTING

RELAMPING AND POSITIVE INDEXING

Relamping is accomplished without the use of tools, by depressing either side of the lense face which causes the lite capsule to rotate. Continuing to rotate the capsule 180° exposes the lamps for replacement. The capsule is permanently connected to the basic unit, therefore nothing becomes detached during the operation except the lamp. This provides protection against inadvertently exchanging capsules of adjacent units. See Fig 2 above.

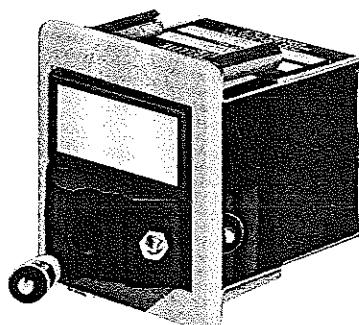


Fig. 2
RELAMPING

LAMPS

Each lamp capsule accepts two MS25237 or equivalent lamps. The lamps are connected in parallel which eliminates need for external bussing. Lamp circuit terminals are solder type and will accept two No. 20 (AWG) wire leads.

ORDER CODE NUMBER FOR LAMP TYPES				
6 Volt	12 Volt	28 Volt	*115 Volt Neon with Resistor	*115 Volt Neon without Resistor
D1	D2	D3	D4	D10

*Used only with circuits Nos. 1 and 2. Recommended for use with red or amber color filters only.

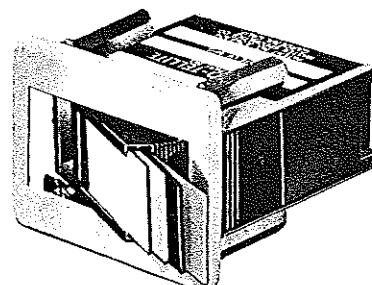


Fig. 3
LEGEND REMOVAL

FRONT LENS

The front lens assembly is held captive within the lite capsule by a nylon gate which may be opened when the lite capsule is rotated, as in relamping. This operation is accomplished from the front of the panel and requires no tools. See Fig. 3.

FRONT LENS AND ENGRAVING INFORMATION**ORDER CODE NUMBERS FOR TYPE OF LENS****LENS TYPE**

The following are standard type lenses:

L1—Lighted Letters, letters appear white on a black background until illuminated and then letters appear in color.

L2—Lighted Background, letters appear black on a white background until illuminated and then the background appears in color.

L3—Lighted Letters, letters are not legible until illuminated and then letters appear in color.

L4—Lighted Background, letters are not legible until illuminated and then background appears in color.

LEGEND AREA AND LETTERING**Series 100****FULL DISPLAY****Series 100**

The visible legend area is $5/16''$ x $1\frac{1}{4}''$, and will accommodate the following types of lettering:

OUT OF ACTION

ONE ROW OF $.125''$ HIGH CHARACTERS, 14 MAX.

2ND STAGE

ONE ROW OF $.188''$ HIGH CHARACTERS, 10 MAX.

**EMERGENCY
DESTRUCTOR
READY**

ONE, TWO, OR THREE ROWS OF $.125''$ HIGH CHARACTERS, 14 PER ROW MAX.

DISARM

ONE ROW OF $.250''$ HIGH CHARACTERS, 7 MAX.

**ENGINE FUEL
PUMP FAILURE**

TWO ROWS OF $.125''$ HIGH CHARACTERS, 14 PER ROW MAX.

SURFACE

ONE ROW OF $.250''$ HIGH CHARACTERS, 7 MAX.

**TOWER
UNSAFE**

ONE OR TWO ROWS OF $.188''$ HIGH CHARACTERS, 10 PER ROW MAX.

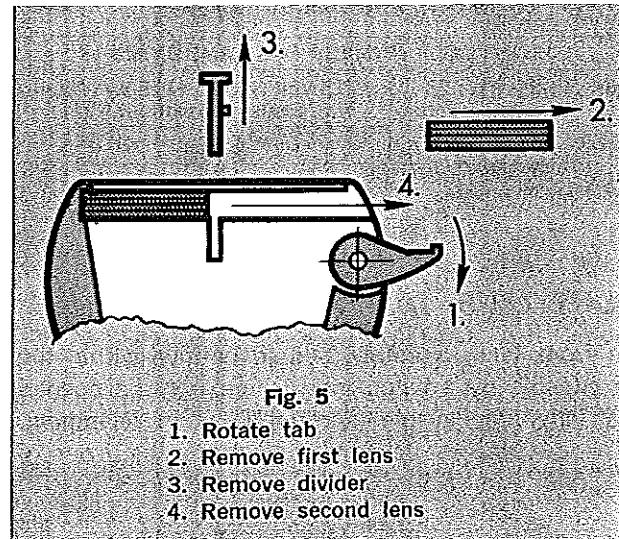
FIRE

ONE ROW OF $.375''$ HIGH CHARACTERS, 4 MAX.

DIVIDED LIGHT

The primary purpose of the divided light is to provide two indications in the space normally required for one. A divider is added, forming two distinct engraved legends, and two separate color indications. Each half has its own independent lamp. This divided lens feature is available for all Roto-Tellite units. The 100 Series divided Roto-Tellite gives a visible legend area of $5/16''$ x $9/16''$ for each half. The 1100 Series divided Roto-Tellite gives a visible legend of $15/32''$ x $9/16''$ for each half.

Divided lights are available with circuits #2, 7, 8, 14, or 15 (as shown on pages 6 & 7).



ORDER CODE NUMBER FOR LEGEND CONFIGURATION

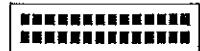
When ordering legends for the Series 100 and 1100 Roto-Tellite word indicator lights, specify the desired legend configuration number, as illustrated below. After the legend

SERIES 100

FULL DISPLAY



R1
1 row .125" high;
14 letters or spaces
max.



R2
2 rows .125" high;
14 letters or spaces
per row max.



R4
1 row .188" high;
10 letters or spaces
max.



R6
1 row .250" high;
7 letters or spaces
max.

DIVIDED DISPLAY



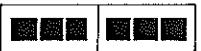
R21
1 row .125" high;
6 letters or spaces
max. each half



R22
2 rows .125" high;
6 letters or spaces
per row max. each half



R24
1 row .188" high;
4 letters or spaces
max. each half



R26
1 row .250" high;
3 letters or spaces
max. each half

SERIES 1100

FULL DISPLAY



R1
1 row .125" high;
14 letters or spaces
max.



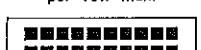
R6
1 row .250" high;
7 letters or spaces
max.



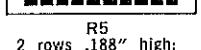
R2
2 rows .125" high;
14 letters or spaces
per row max.



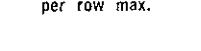
R3
3 rows .125" high;
14 letters or spaces
per row max.



R4
1 row .188" high;
10 letters or spaces
per row max.



R21
1 row .125" high
6 letters or spaces
max. each half



R22
2 rows .125" high
6 letters or spaces
per row max. each half

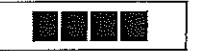


R5
2 rows .188" high;
10 letters or spaces
per row max.

DIVIDED DISPLAY



R6
1 row .250" high;
7 letters or spaces
max.



R7
1 row .375" high;
4 letters or spaces max.



R21
1 row .125" high
6 letters or spaces
max. each half



R24
1 row .188" high;
4 letters or spaces
per row max. each half



R25
2 rows .188" high;
4 letters or spaces
per row max. each half



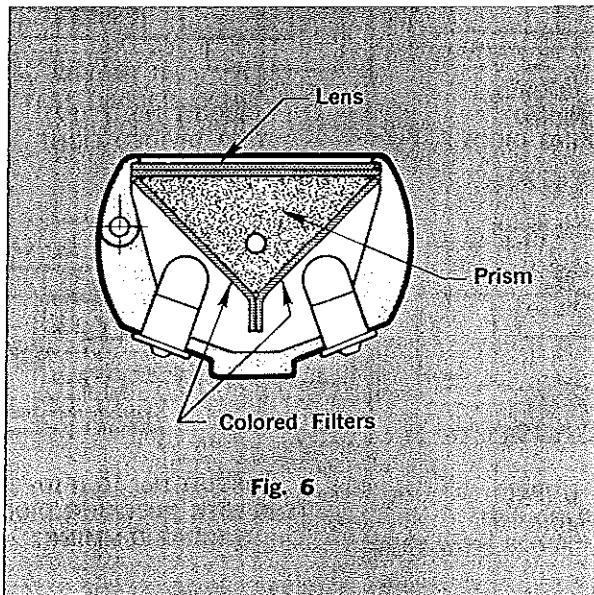
R26
1 row .250" high;
3 letters or spaces
max. each half



R27
1 row .375" high;
2 letters or spaces
max. each half

TWO COLOR LIGHT

The primary purpose of the two-color light is to provide two different colored indications where the legend or function is common to both colors. Such as a legend reading "FUEL MIXTURE" which illuminates green when operation is correct, and will illuminate red or amber when a malfunction occurs. This is accomplished by incorporation of a very simple prism, shaped to produce an even, uniform light dispersion over the entire legend area. This feature is available in the standard 100 Series, and in the 1100 wide legend Series.

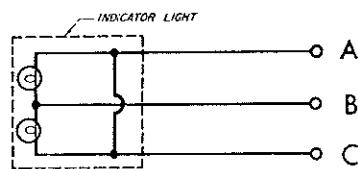


SPECIAL CIRCUIT NUMBERS are used to designate a two-color light. These circuits are similar and operate in the same manners as Circuit #8, the only exception being an additional terminal to allow testing of one bulb at a time. Circuit #20 (similar to #8) for Test with blocking diodes, positive input. Circuit #21 (like #7) for Test, positive input. Circuit #22 (like #15) Test with blocking diode, negative input. Circuit #23 (like #14) for Test, negative input. For a two-color light with the base circuit, order Circuit #2.

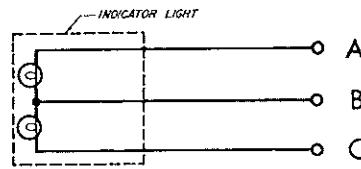
Two-color lights are available only with Lens Type 2, i.e. lighted background: letters appear black on a white background until illuminated, and then the background appears in color. Colors available are red, green, amber, and white.

BASIC CONTROL CIRCUIT

Basic Circuits



CIRCUIT No. 1 (F1)
PARALLELED LAMPS



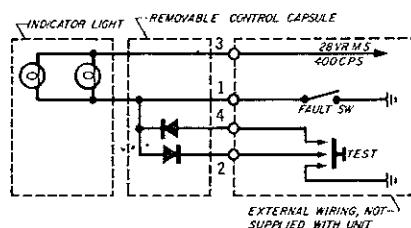
CIRCUIT No. 2 (F2)
SEPARATE LAMPS

OPTIONAL CONTROL CAPSULES

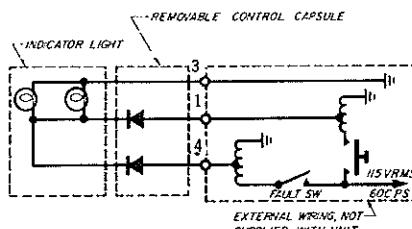
Removable control capsules, which are integral with the basic unit may be ordered as an optional feature to provide master lamp test and/or diode dimming capabilities. These control capsules are modular in design and may be changed or replaced without disassembling the indicator unit itself, providing ease of maintenance and flexibility of design.

Master lamp test circuits permit testing of all lights on a panel with the use of one switch. Diodes may also be provided to prevent current feed-back when required. Circuits for both positive and negative D.C. inputs are available. Standard circuits are illustrated below and should be specified when ordering unit with control capsules.

Basic A.C. Circuit

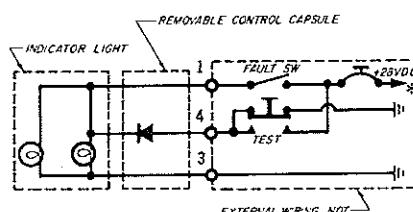


CIRCUIT No. 3 (F3)
A.C. TEST

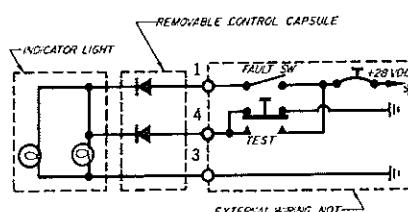


CIRCUIT No. 4 (F4)
A.C. TEST WITH BLOCKING DIODE

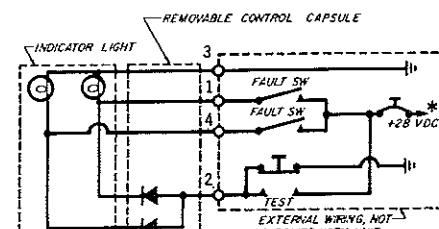
D.C. CIRCUIT POSITIVE INPUT



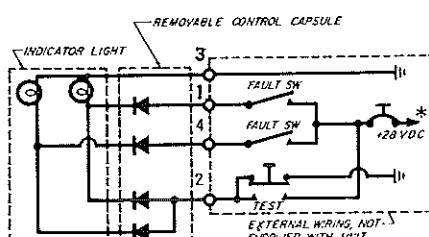
CIRCUIT No. 5 (F5)
TEST



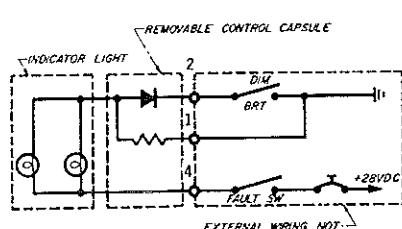
CIRCUIT No. 6 (F6)
TEST WITH BLOCKING DIODE



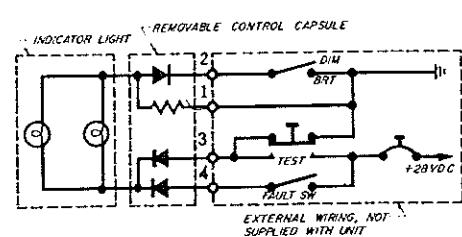
CIRCUIT No. 7 (F7)
TEST DIVIDED LIGHT



CIRCUIT No. 8 (F8)
TEST DIVIDED LIGHT
WITH
BLOCKING
DIODE



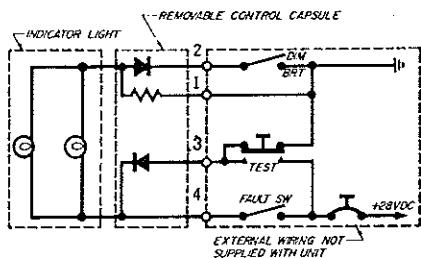
CIRCUIT No. 9 (F9)
DIODE DIMMING



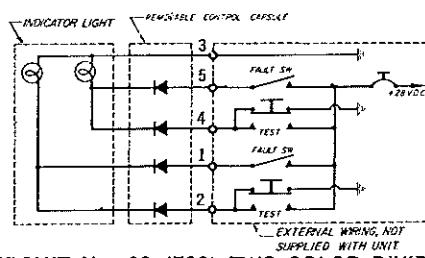
CIRCUIT No. 10 (F10)
TEST WITH BLOCKING DIODE
& DIODE DIMMING

Basic Control Circuit (cont.)

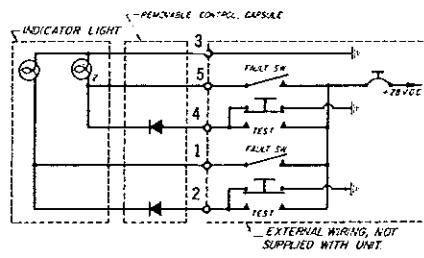
CONTINUATION OF D.C. CIRCUITS — POSITIVE INPUT



CIRCUIT No. 11 (F11)
TEST & DIODE DIMMING

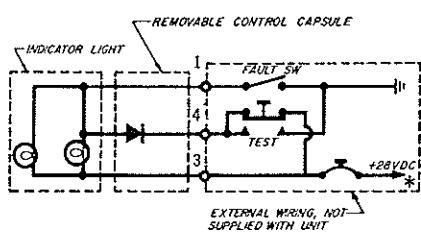


CIRCUIT No. 20 (F20) TWO COLOR DIVIDED
(POS. INPUT)
TEST WITH BLOCKING DIODE

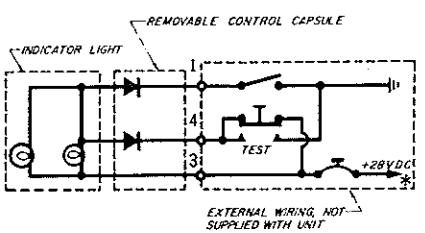


CIRCUIT No. 21 (F21)
POS. INPUT TWO COLOR TEST

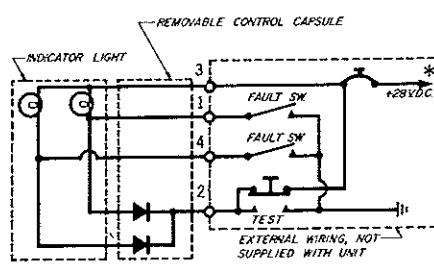
D.C. CIRCUIT NEGATIVE INPUT



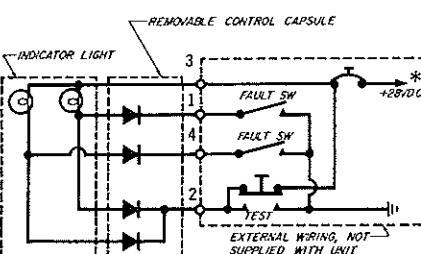
CIRCUIT No. 12 (F12)
TEST



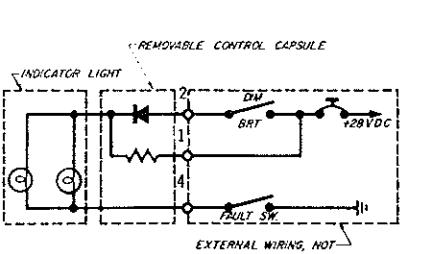
CIRCUIT No. 13 (F13)
TEST WITH BLOCKING DIODE



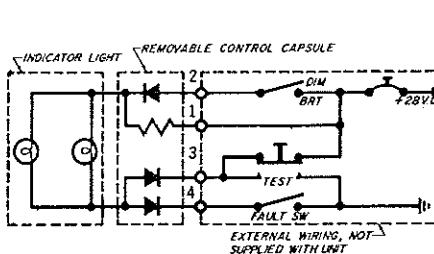
CIRCUIT No. 14 (F14)
TEST DIVIDED LIGHT



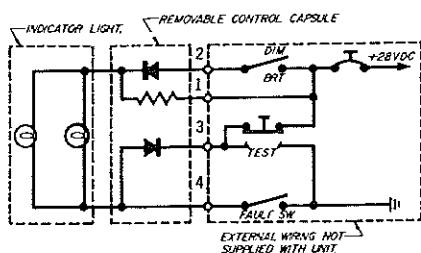
CIRCUIT No. 15 (F15)
TEST DIVIDED LIGHT WITH
BLOCKING DIODE



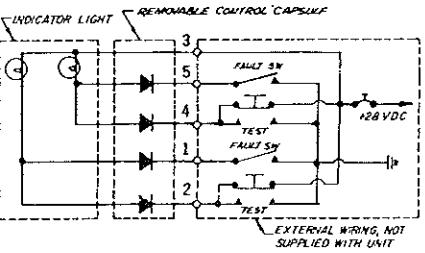
CIRCUIT No. 16 (F16)
DIODE DIMMING



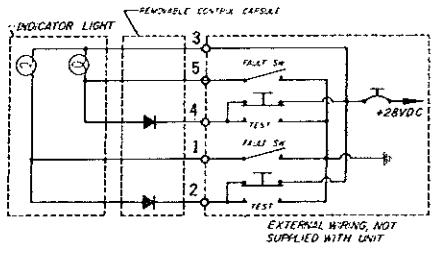
CIRCUIT No. 17 (F17)
TEST WITH BLOCKING DIODE
& DIODE DIMMING



CIRCUIT No. 18 (F18)
TEST & DIODE DIMMING



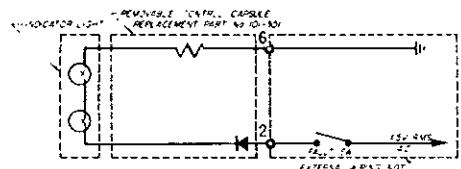
CIRCUIT No. 22 (F22)
TWO COLOR OR DIVIDED
TEST WITH BLOCKING DIODE (NEG. INPUT)



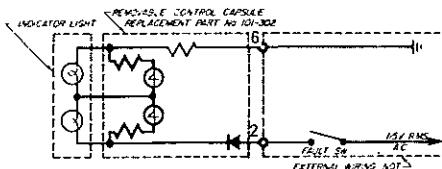
CIRCUIT No. 23 (F23)
NEG. INPUT
TWO COLOR TEST

*Also available for 6 and 12 volt.

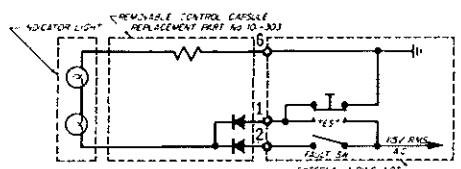
Basic Control Circuit (cont.)



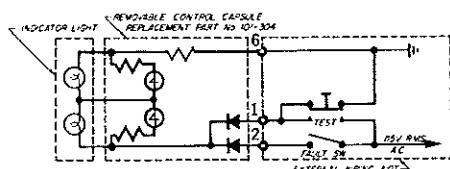
CIRCUIT No. 301 (F301)
115V.A.C.



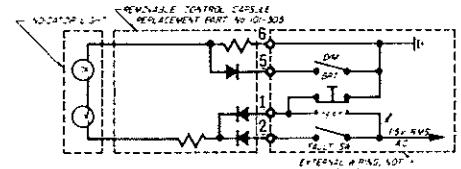
CIRCUIT No. 302 (F302)
115V.A.C. TWO BULB RELIABILITY



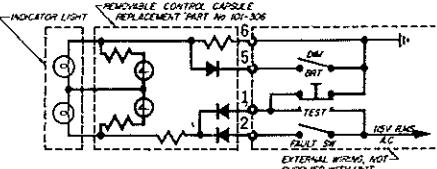
CIRCUIT No. 303 (F303)
115V.A.C. TEST



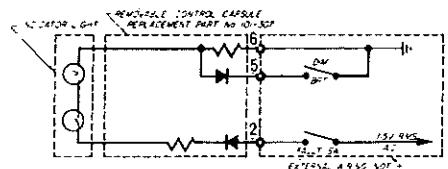
CIRCUIT No. 304 (F304)
115V.A.C. TEST WITH
TWO BULB RELIABILITY



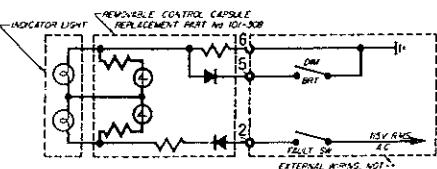
CIRCUIT No. 305 (F305)
115V.A.C. TEST & DIM



CIRCUIT No. 306 (F306)
115V.A.C. TEST & DIM WITH
TWO BULB RELIABILITY



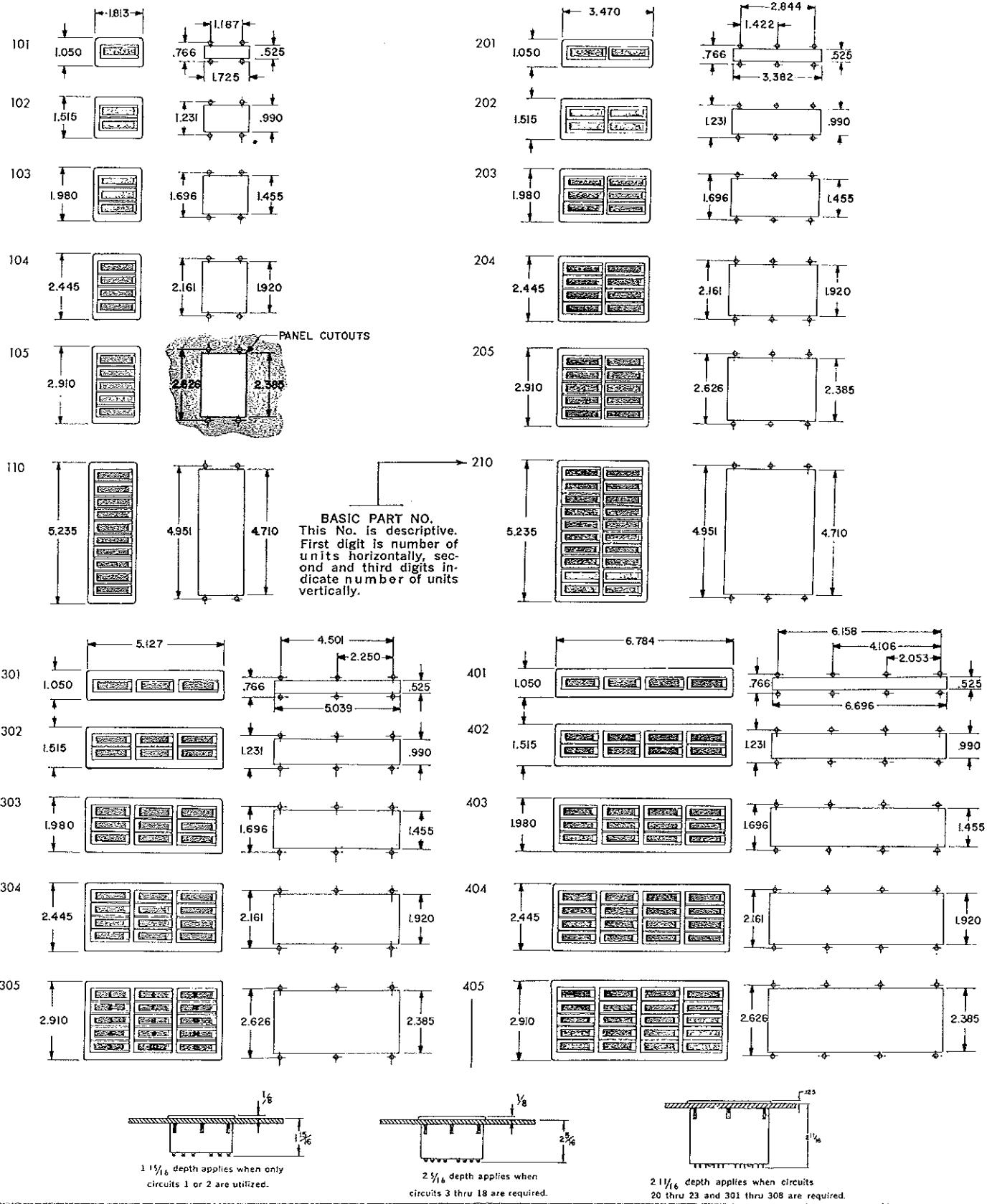
CIRCUIT No. 307 (F307)
115V.A.C. DIM



CIRCUIT No. 308 (F308)
115V.A.C. DIM WITH
TWO BULB RELIABILITY

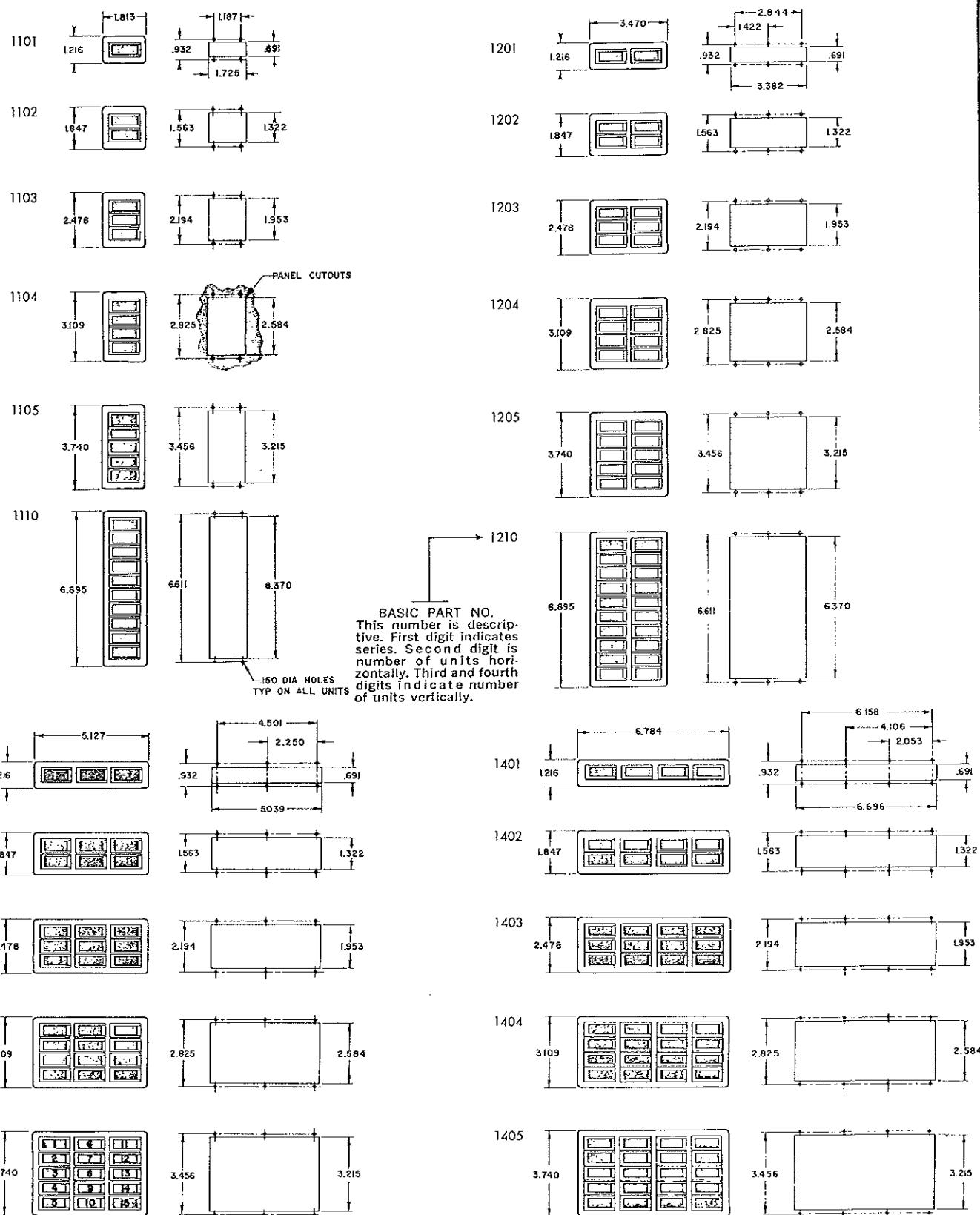
Outline and Mounting Dimensions

Series 100



Outline and Mounting Dimensions

Series 1100



ALL DIMS. $\pm .010$

ORDERING INFORMATION

A complete Series 100 or 1100 single or multi-unit assembly may be ordered by using a coded number callout that identifies the number of units in the matrix, the color of the front plate, the lamps required, the circuit desired, lens type, display screen arrangement, and the legend for each capsule. A SEPARATE LINE IN THE CALLOUT IS USED TO DESCRIBE EACH CAPSULE IN A MULTI-UNIT ASSEMBLY, AS SHOWN BELOW. A single channel unit may be ordered by using the descriptive callout number as a part number.

On all multi-unit assemblies (2 or more channels), the coded callout number, as shown below, is for descriptive purposes only and will be transferred to a Specification Sheet by Master Specialties Company and a Specification Sheet number will be issued to cover the entire assembly. This Specification Sheet number is then used for ordering purposes. A Specification Sheet number may be obtained from the MSC factory.

TYPICAL DESCRIPTIVE CALLOUT NUMBER

(A Specification Sheet Number will be assigned for all multi-unit assemblies for ordering purposes).

BASIC UNIT		LIGHT CAPSULE DESCRIPTION						
BASIC PART NUMBER	COLOR OF FRONT PLATE	LIGHT CAPSULE NUMBER	TYPE OF LAMP	CIRCUIT NUMBER	LENS TYPE	DISPLAY SCREEN	LEGEND CONFIGURATION	LEGEND WORDING
202	A1	C1	D3	F10	L2	N1 (R)	R2	ENGINE PUMP FAILURE
Indicates Series No. & number of units in matrix configuration. (See pgs. 9 & 10).	A-1—Black (MIL-TT-L-20 FED. STD. 595 color No. 27038	C2	D3	F2X*	L2	N3 (RG)	R6	POWER
	A2—Gray (MIL-TT-L-20 FED. STD. 595 color No. 36492)	C3	D3	F10	L2	N2 (AB)	R24	HOT/COLD
	A3—Gray (MIL-TT-L-20 FED. STD. 595 color No. 36118)	C4	D3	F2X*	L2	N3 (RG)	R4	VALVE #3
	Individual Units or light capsules within the matrix are numbered (for identification purposes only) numerically top to bottom, left to right. See examples on pgs. 9 & 10, numbers 305 & 1305. The "C" is the identifying letter for the light capsule & the number following it is the number of the capsule in the matrix.	"D" is the identifying letter for the lamps and the number following it is the number of the lamp desired for that capsule (See pg. 3) (2 lamps required per lamp capsule.)	"F" is the identifying letter for the circuit and the number following it is the number of the circuit for that light capsule. (See pgs. 6, 7, & 8).	"L" is the identifying letter for lens types and the number following it is the number of the lens type used in that light capsule. (See pg. 4) Type L2 is the most commonly used.	N1—Full Display N2—Divided Display N3—Two Color Full Display. Letter(s) in () indicates color unit is to display when lighted. Priority is left to right for divided display & 2 color R—Red, G—Green, A—Amber, B—Blue, W—White (White color is produced by a light blue color filter).	See Page 4	Actual wording as it will appear on face of unit. Commas used to separate rows of letters; Slash (/) indicates other side of split. (See Page 4).	

FOR SPECIAL REQUIREMENTS NOT COVERED BY THIS DESCRIPTIVE NUMBERING SYSTEM . . . CONSULT FACTORY

*When an F1 or F2 circuit is called out (which does not use a control capsule), you may specify a dummy control capsule by adding an "X" after the callout. The dummy control capsule will bring the lamp terminals out flush with the back of the other units containing control capsules, so that these lamp terminals will be easier to reach.

ELIMINATION OF ITEMS

Units may be ordered without lamps, control capsules or any other item by simply eliminating the callouts for that item from the total callout.

REPLACEMENT LENSES may be ordered by using the part numbers shown below:

LENS TYPE	SERIES 100		SERIES 1101		
	FULL DISPLAY	DIVIDED DISPLAY	FULL DISPLAY	DIVIDED DISPLAY	
1	FRONT LENS DISPERSER COLOR FILTER DIFFUSER	101-0536-1 101-0536-7-4 101-0536-□ 101-0536-97	101-0535-1 101-0535-7-4 101-0535-□ 101-0535-97	1101-0410-1 1101-0410-7-4 1101-0410-□ 1101-0410-97	1101-0411-1 1101-0411-7-4 1101-0411-□ 1101-0411-97
2	FRONT LENS DISPERSER COLOR FILTER DIFFUSER	101-0536-1 101-0536-7 101-0536-□ 101-0536-97	101-0535-1 101-0535-7 101-0535-□ 101-0535-97	1101-0410-1 1101-0410-7 1101-0410-□ 1101-0410-97	1101-0411-1 1101-0411-7 1101-0411-□ 1101-0411-97
3	FRONT LENS COLOR FILTER DISPERSER DIFFUSER	101-0536-3-1 101-0536-□-4 101-0536-94 101-0536-97	101-0535-3-1 101-0535-□-4 101-0535-94 101-0535-97	1101-0410-3-1 1101-0410-□-4 1101-0410-94 1101-0410-97	1101-0411-3-1 1101-0411-□-4 1101-0411-94 1101-0411-97
4	FRONT LENS COLOR FILTER DISPERSER DIFFUSER	101-0536-3-1 101-0536-□ 101-0536-94 101-0536-97	101-0535-3-1 101-0535-□ 101-0535-94 101-0535-97	1101-0410-3-1 1101-0410-□ 1101-0410-94 1101-0410-97	1101-0411-3-1 1101-0411-□ 1101-0411-94 1101-0411-97

Add color required R—Red; G—Green; A—Amber; B—Blue; W—White. (White color produced by light blue color filter).

REPLACEMENT CONTROL CAPSULES

In ordering replacement control capsules, add the circuit number found on pages 6, 7, and 8 to the Basic Part No. 101 or 1101.

2100 Series

First with the finest
in illuminated
switching/indicating devices

Products

- ILLUMINATED PUSHBUTTON SWITCHES
- PILOT LIGHTS
- WORD INDICATORS
- UNLIGHTED SWITCH ASSEMBLIES
- FIBER-OPTIC READOUTS
- INFORMATION DISPLAYS
- CONTROL DEVICES
- AUDIO/VISUAL ANNUNCIATORS
- WARNING SYSTEMS

Applications

- AEROSPACE
- INDUSTRIAL CONTROLS
- COMPUTERS
- DATA PROCESSING



MSC[®] MASTER SPECIALTIES COMPANY

General Offices and Manufacturing Facilities: 1640 Monrovia, Costa Mesa, California 92627 • Phone (Area Code 714) 642-2427 • TELEX 678-433

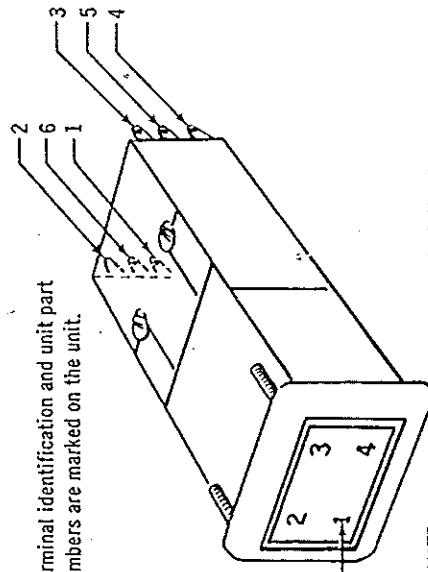
MSC MASTER SPECIALTIES COMPANY

PHOTO-VELLITE SWITCH

(ILLUMINATED PUSH BUTTON SWITCH)
SERIES 2100

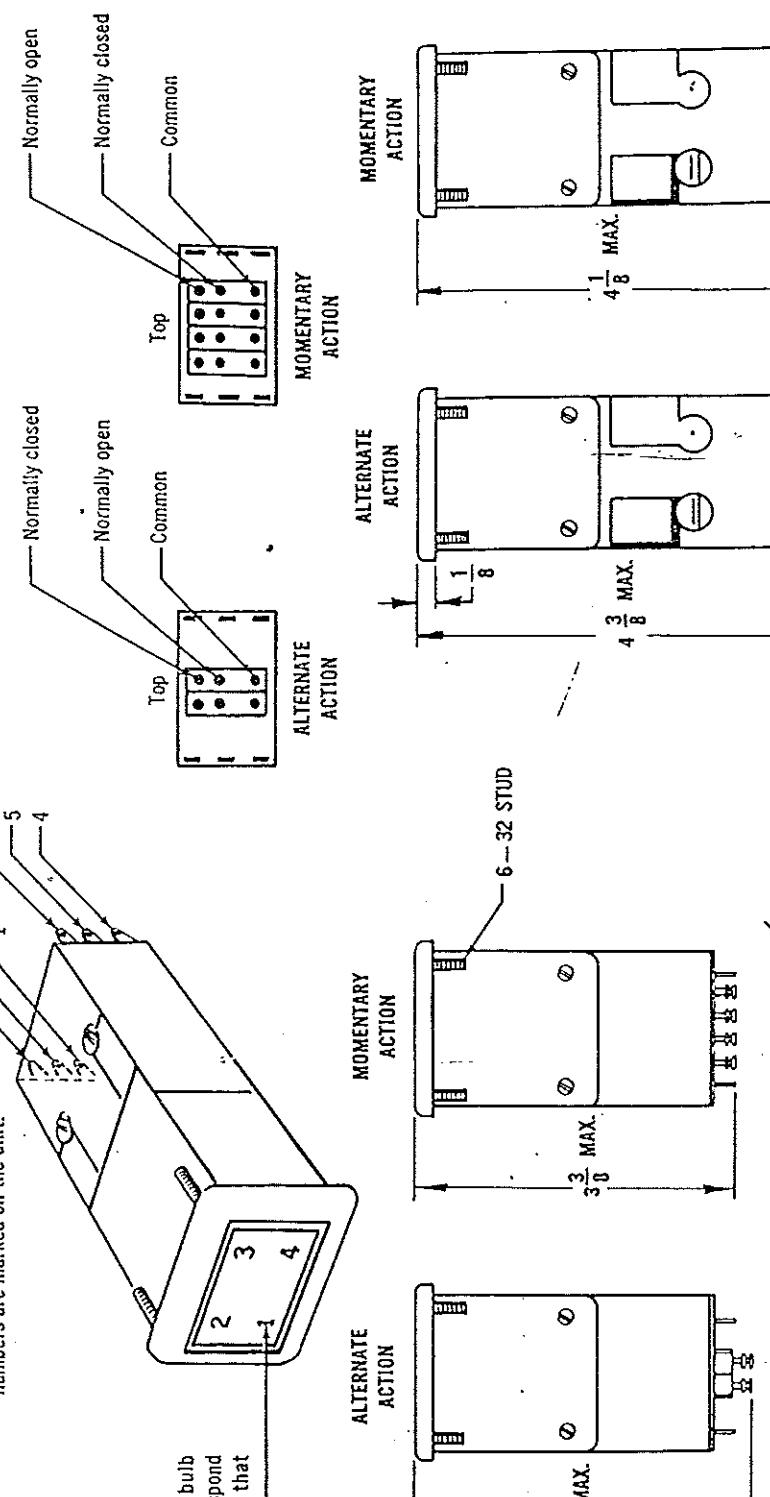
MASTER SPECIALTIES COMPANY

CATALOG NO. 2100
REVISION A



Terminal identification and unit part numbers are marked on the unit.

Numbers represent bulb positions and correspond to the terminal for that bulb area



SHORT VERSION

Accommodates circuits 201,
218, 219, & 220 only

7. SWITCH RATING: (5 AMPS 125 or 250 volts A.C.) (30 volts D.C. inductive
3 AMPS at sea level and 2.5 AMPS at 25,000 ft.)

6. VIBRATION: 5 G's to 500 C.P.S.

5. SHOCK: 20 G's for 10 Milliseconds in all three planes.

4. HIGH TEMPERATURE: Unit will withstand 48 hours in 71°C ambient
with all 4 lamps illuminated at rated voltage.

3. MECHANICAL LIFE: 100,000 operations minimum.

2. INSULATION RESISTANCE: 100 Megohms minimum.

1. DIELECTRIC STRENGTH: 1000 V.R.M.S. minimum at sea level.
NOTES:

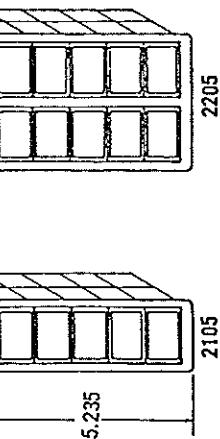
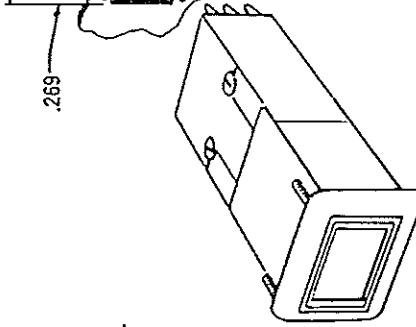
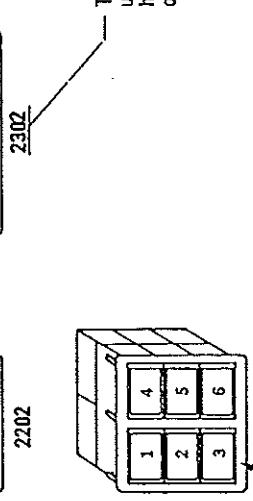
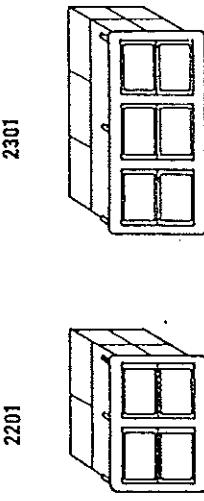
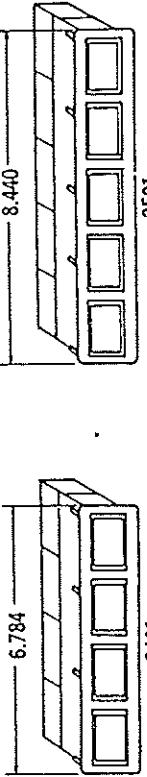
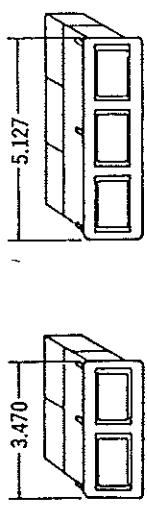
- Mounting lock washers & nuts are furnished with the unit.
- Unit will mount in panels of .020 to .375 thick.
- Terminals will accommodate two (2) number 20 gage leads.
- All current carrying parts are silver plated per QQ-S-35a.

STANDARD VERSION
Accommodates any circuit
and holding coil

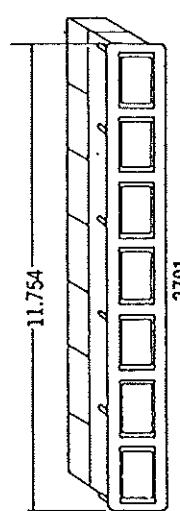
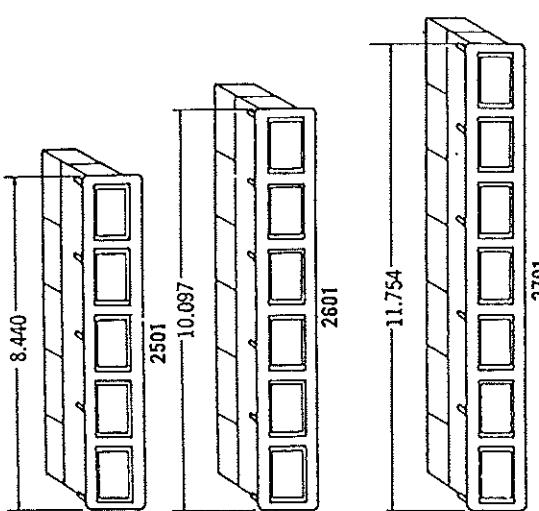
Master Specialties Company
General Offices and Manufacturing Facilities:
1640 Monrovia, Costa Mesa, California 92627

OUTLINE & MOUNTING DIMENSIONS

CHANNELS MAY BE GROUPED IN ANY OF THESE COMBINATIONS



This P/N is descriptive: the first digit is the actual unit, the second digit is the number of channels horizontally and the last two digits are the number of channels vertically.

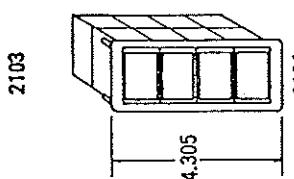


2601

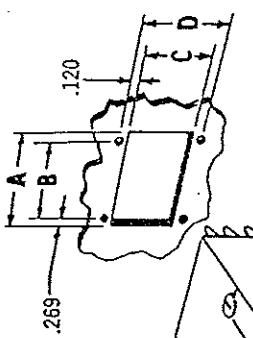
2701

Typ. channel identification
for print requisition use only.

2103



2105



BASIC UNIT NUMBER	A	B
2101	2102	2103
2201	2202	2203
2301	2302	
2401	2402	
2501		
2601		
2701		

BASIC UNIT NUMBER	C	D
2101	2201	2301
2102	2202	2302
2103	2203	
2104		
2105	2205	

FEATURES

EACH OF THESE FEATURES TO BE SELECTED (OR OMITTED) PER
THE CUSTOMER'S INDIVIDUAL REQUIREMENTS.

OPTIONAL FEATURES WHICH ARE SELECTED FOR
EACH BASIC UNIT ONLY.

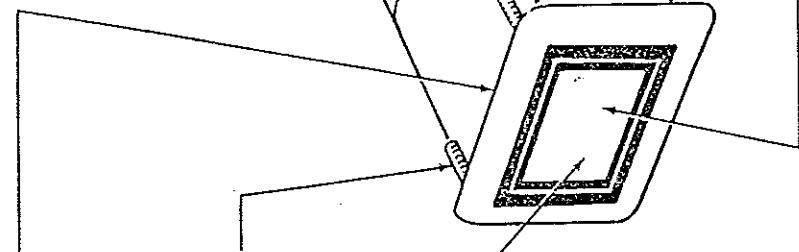
1. FRONT PLATE COLOR

- BLACK (FED STD 595 COLOR No. 27038).
- GRAY (LIGHT) (FED STD 595 COLOR No. 36492).
- GRAY (DARK) (FED STD 595 COLOR No. 36118).
- OTHER

2. STUD LENGTH TO ACCOMMODATE MOUNTING PANEL THICKNESS OF:

.020 to .375

3. BULB VOLTAGE (4 BULBS REQUIRED PER CHANNEL)

- 28 VOLTS (MS 25237-327)
- 12 VOLTS (330)
- 6 VOLTS (MS 25237-328)
- BULBS NOT FURNISHED


SWITCH CONFIGURATION

- 2 SPDT MOMENTARY ACTION
- 4 SPDT MOMENTARY ACTION
- 2 SPDT MOMENTARY ACTION WITH 28 V.D.C. HOLDING COIL
- 4 SPDT MOMENTARY ACTION WITH 28 V.D.C. HOLDING COIL
- 2 SPDT ALTERNATE ACTION
- 4 SPDT ALTERNATE ACTION

Short version provides minimized assembly length (see page 11). Optional with 201, 218, 219, 220 circuits and switch configurations 1, 2, and 5 only.

Display available in full display and seven styles of divided display. (See page 10.)

Each division available in any of 5 colors or full display in any 2 of 4 colors. (See page 10.)

Lens type available in four styles. (See page 11.)

Engraved wording available in three character heights. (See page 12.)

HOLDING COIL SCHEMATIC

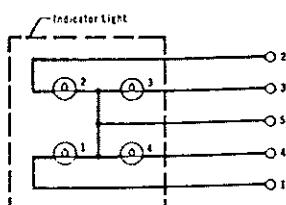
5 inch and 6 inch 20 AWG wire leads
coming out beside terminal No. 6

X 4 copies

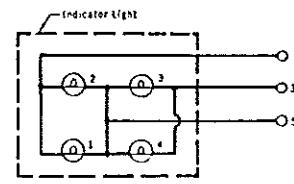
OPTIONAL FEATURES WHICH ARE SELECTED FOR
EACH CHANNEL.

CONTROL CIRCUITS

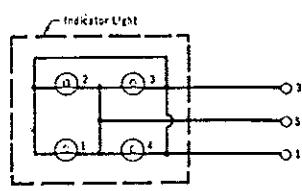
NO TEST



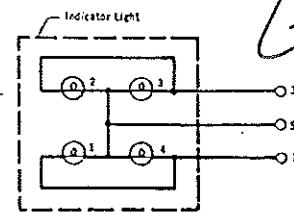
CIRCUIT NO. 201
THREE OR FOUR WAY SPLIT



CIRCUIT NO. 219
VERTICALLY SPLIT DISPLAY



CIRCUIT NO. 220
FULL DISPLAY

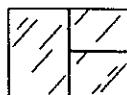


CIRCUIT NO. 218
HORIZONTALLY SPLIT AND
TWO-COLOR DISPLAY

~~THIS~~
THIS
IS THE
CLAMP CIRCUIT

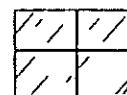
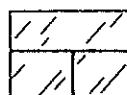
4. These circuits are recommended for use with 28 or 12 VDC only.
 3. Circuits shown may be used in lieu of circuits shown on pages 4 thru 7
 however, customer is then required to provide external bussing.
 2. Diode used in fault line is 1N2069 or T.I. 1N645 or equiv.
 1. Diode used in test line is PS010 or P.S.I. 1N645 or equiv.

NOTES:

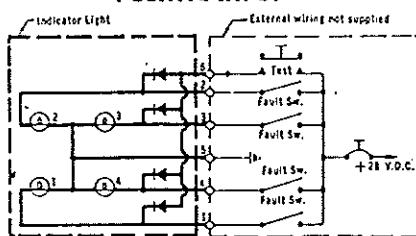


CONTROL CIRCUITS

THREE OR FOUR WAY SPLIT

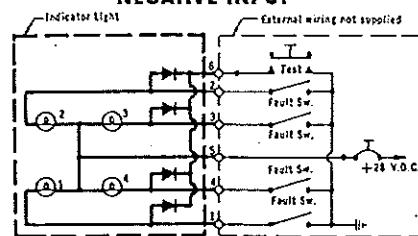


POSITIVE INPUT

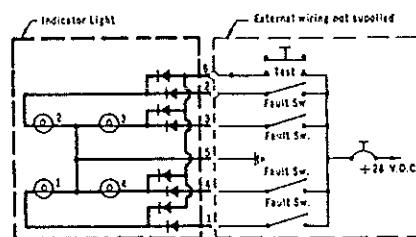


CIRCUIT NO. 202
COMMON TEST

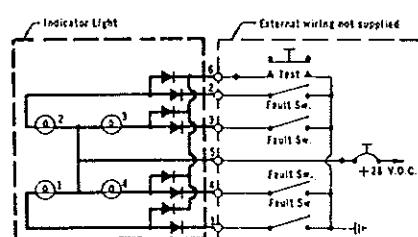
NEGATIVE INPUT



CIRCUIT NO. 204
COMMON TEST



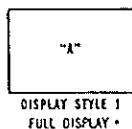
CIRCUIT NO. 203
COMMON TEST AND
BLOCKING DIODE



CIRCUIT NO. 205
COMMON TEST AND
BLOCKING DIODE

DISPLAY STYLES

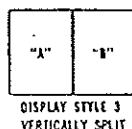
Each division is referred to as "Div. A", "Div. B" etc., according to its respective position within a given Display Style as indicated below:



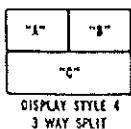
DISPLAY STYLE 1
FULL DISPLAY



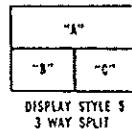
DISPLAY STYLE 2
HORIZONTALLY SPLIT



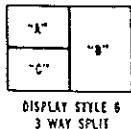
DISPLAY STYLE 3
VERTICALLY SPLIT



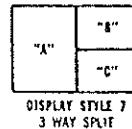
DISPLAY STYLE 4
3 WAY SPLIT



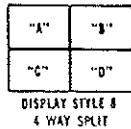
DISPLAY STYLE 5
3 WAY SPLIT



DISPLAY STYLE 6
3 WAY SPLIT



DISPLAY STYLE 7
3 WAY SPLIT



DISPLAY STYLE 8
4 WAY SPLIT

DISPLAY COLORS AND COLOR CODE

Display may be illuminated in the following colors:

COLOR CODE	R = RED
	W = WHITE
	G = GREEN
	B = BLUE
	A = AMBER

*Full Display is available in Two-Colors (Display Style is referred to as "T/C"). Entire display will illuminate in one color and change to a second color. Any two of the available colors, except BLUE, may be selected.

ENGRAVED WORDING ARRANGEMENTS

STYLE 1



FULL DISPLAY

The visible legend area is 1 x 11/16 and will accommodate the following sized lettering:

- Type 1: One, two, three, or four rows of .125 high characters twelve characters and/or spaces per row.
- Type 2: One, two, or three rows of .188 high characters, eight characters and/or spaces per row.
- Type 3: One or two rows of .250 high characters, six characters and/or spaces per row.

STYLE 3

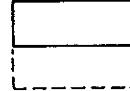


VERTICALLY SPLIT DISPLAY

Each half is 31/64 x 11/16 and will accommodate the following sized lettering:

- Type 1: One, two, three, or four rows of .125 high characters five characters and/or spaces per row.
- Type 2: One, two, or three rows of .188 high characters, three characters and/or spaces per row.
- Type 3: One or two rows of .250 high characters, two characters per row.

STYLE 2



HORIZONTALLY SPLIT DISPLAY

Each half is 1 x 5/16 and will accommodate the following sized lettering:

- Type 1: One or two rows of .125 high characters, twelve characters and/or spaces per row.
- Type 2: One row of .188 high characters, eight characters and/or spaces per row.
- Type 3: One row of .250 high characters, six characters and/or spaces per row.

STYLE 4 thru 8



THREE OR FOUR WAY SPLIT

Each quarter is 31/64 x 5/16 and will accommodate the following sized lettering:

- Type 1: One or two rows of .125 high characters, five characters and/or spaces per row.
- Type 2: One row of .188 high characters, three characters maximum.
- Type 3: One row of .250 high characters, two characters maximum.

LENS TYPES

TYPE II

Lighted background, letters appear black on a white background until illuminated and then the background appears in color.

TYPE I

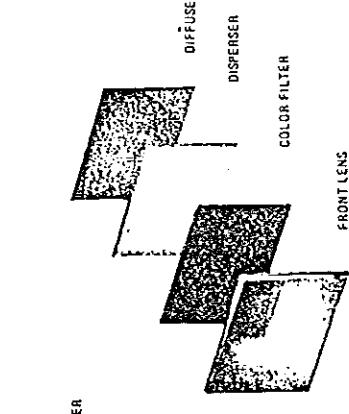
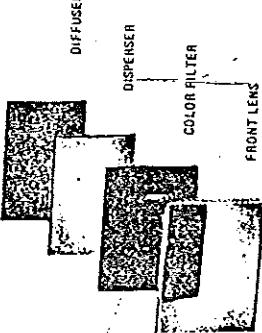
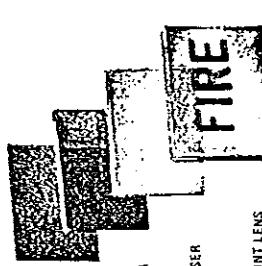
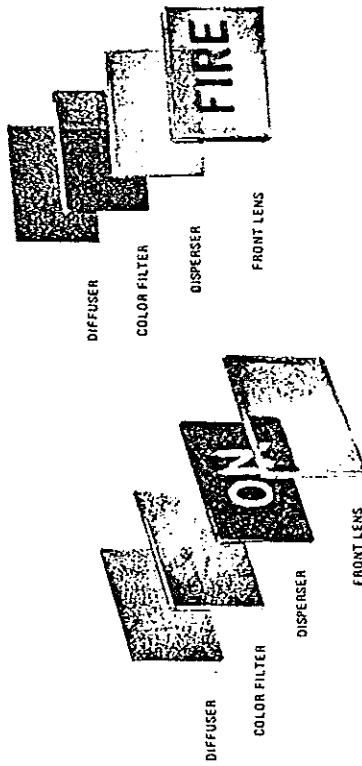
Lighted letters, letters appear white on a black background until illuminated and then letters appear in color.

TYPE III

Lighted letters, letters are not legible until illuminated and then letters appear in color.

TYPE IV

Lighted background, letters are not legible until illuminated and then background appears in color.



These Lens Types may be combined in one channel

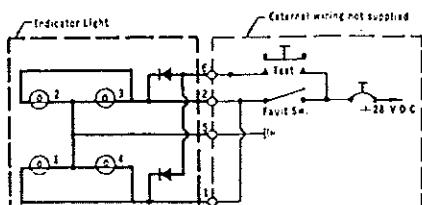
These Lens Types may be combined in one channel

*Engraved element is coated with an opaque black so that the legend appears on a black background. Nylon diffuser is .015 inches in thickness. All elements except the Nylon diffuser are .032 inches in thickness.
NOTES:

CONTROL CIRCUITS

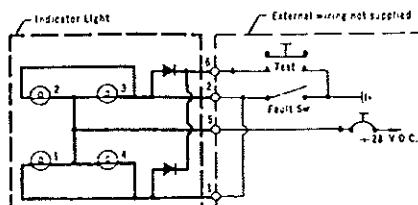
FULL DISPLAY SINGLE COLOR

POSITIVE INPUT

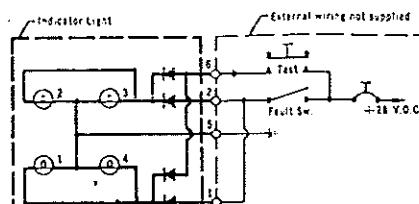


CIRCUIT NO. 222
COMMON TEST

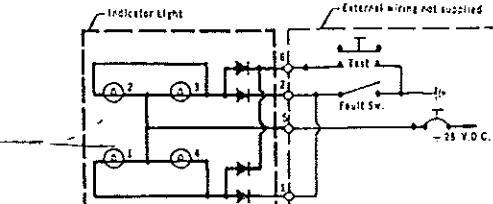
NEGATIVE INPUT



CIRCUIT NO. 223
COMMON TEST



CIRCUIT NO. 224
COMMON TEST AND
BLOCKING DIODE



CIRCUIT NO. 225
COMMON TEST AND
BLOCKING DIODE

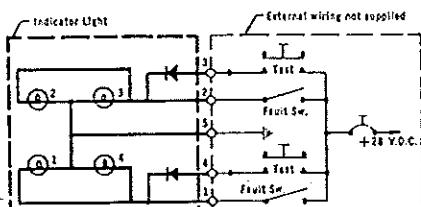
3. These circuits are recommended for use with 28 V.D.C. only.
 2. Diode used in fault line is 1N2069 or T.I. 1N645 or equiv.
 1. Diode used in test line is PS010 or P.S.I. 1N645 or equiv.

NOTES:

CONTROL CIRCUITS

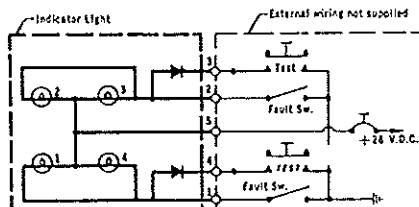
FULL DISPLAY TWO COLOR

POSITIVE INPUT

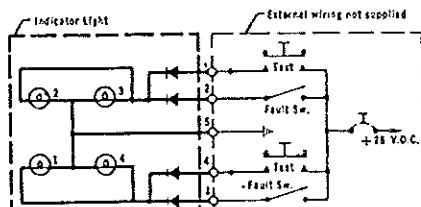


CIRCUIT NO. 210
SEPARATE TEST
(for each color)

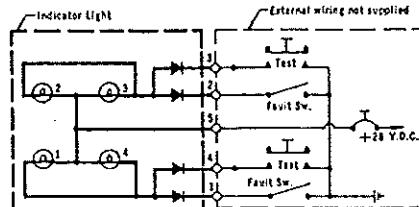
NEGATIVE INPUT



CIRCUIT NO. 212
SEPARATE TEST
(for each color)



CIRCUIT NO. 211
SEPARATE TEST AND
BLOCKING DIODE



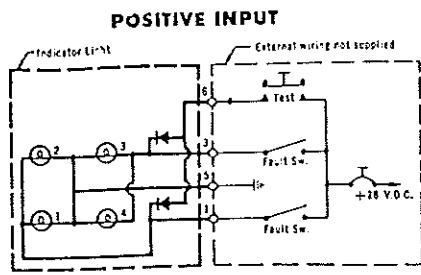
CIRCUIT NO. 213
SEPARATE TEST AND
BLOCKING DIODE

5. These circuits are recommended for use with 28 V.D.C. only.
 4. Lamps 2 & 3 will cause entire display to illuminate in color.
 Lamps 1 & 4 will cause entire display to illuminate a different color.
 3. Diode used in fault line is 1N2069 or T.I. 1N645 or equiv.
 2. Diode used in test line is PS010 or P.S.I. 1N645 or equiv.
 1. Effective testing requires each set of bulbs to be tested individually.

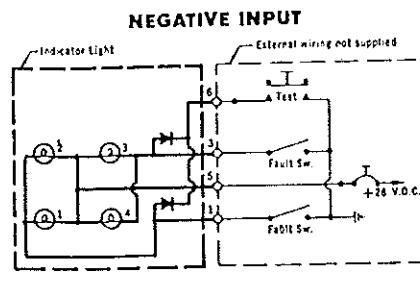
NOTES:

CONTROL CIRCUITS

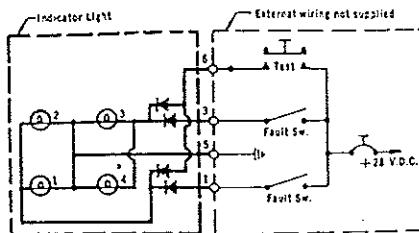
VERTICALLY SPLIT DISPLAY



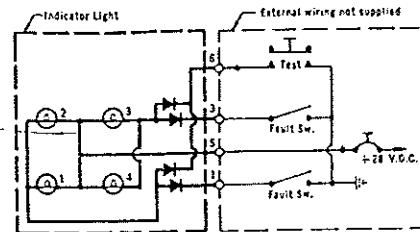
CIRCUIT NO. 221
COMMON TEST



CIRCUIT NO. 226
COMMON TEST



CIRCUIT NO. 227
COMMON TEST AND
BLOCKING DIODE



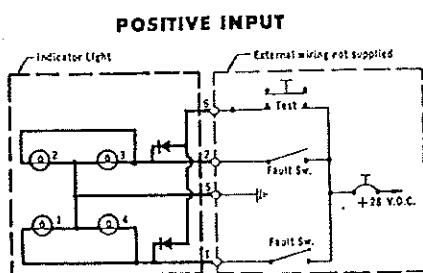
CIRCUIT NO. 228
COMMON TEST AND
BLOCKING DIODE

3. These circuits are recommended for use with 28 VDC only.
 2. Diode used in fault line is 1N2059 or T.I. 1N645 or equiv.
 1. Diode used in test line is PS010 or P.S.I. 1N645 or equiv.

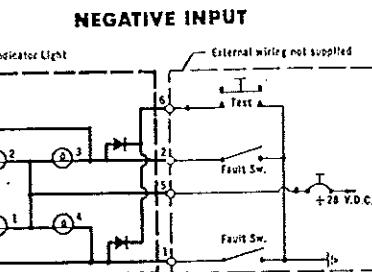
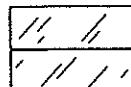
NOTES:

CONTROL CIRCUITS

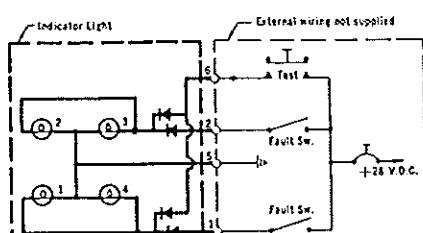
HORIZONTALLY SPLIT DISPLAY



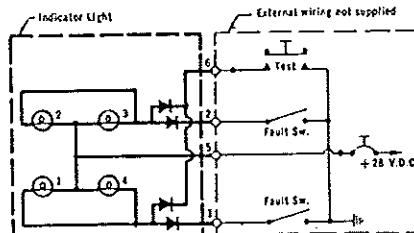
CIRCUIT NO. 206
COMMON TEST



CIRCUIT NO. 208
COMMON TEST



CIRCUIT NO. 207
COMMON TEST AND
BLOCKING DIODE



CIRCUIT NO. 209
COMMON TEST AND
BLOCKING DIODE

3. These circuits are recommended for use with 28 VDC only.
 2. Diode used in fault line is 1N2059 or T.I. 1N645 or equiv.
 1. Diode used in test line is PS010 or P.S.I. 1N645 or equiv.

NOTES:

CHANNEL NUMBER*	CIRCUIT NUMBER	SWITCH NUMBER	DISPLAY STYLE	DIV.	LENS TYPE	DISPLAY COLOR	CHAR. HEIGHT
-----------------	----------------	---------------	---------------	------	-----------	---------------	--------------

LEGEND

Make dotted lines solid where divisions are desired.

				A			
				B			
				C			
				D			

				A			
				B			
				C			
				D			

				A			
				B			
				C			
				D			

				A			
				B			
				C			
				D			

				A			
				B			
				C			
				D			

				A			
				B			
				C			
				D			

				A			
				B			
				C			
				D			

				A			
				B			
				C			
				D			

				A			
				B			
				C			
				D			

				A			
				B			
				C			
				D			

* Channels in multi-channel units are numbered top to bottom, left to right.
Add "S" after channel number when short version is desired.

X 4 - copies

LENS ELEMENTS

Dash Nos. listed in these tables apply
to the following Basic Part Nos.:

Add "L" after Dash No. when one side
is to be painted black

REPLACEMENT PARTS

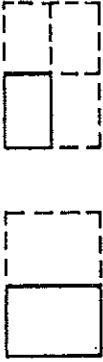
Set 2593xx

LENS DIVIDERS

		COLOR	THICKNESS	MATERIAL
BASIC P/N's 2101-508, 2101-509, 2101-510 and 2101-511	INACTIVE FOR DESIGN	ACTIVE		
-1		CLEAR	.032	ACRYLIC
-2, 4, 5, 6	-3	GREY	.032	ACRYLIC
-15	-7.7L	WHITE	.032	ACRYLIC
	-8.8L	GREEN	.032	ACRYLIC
	-9.9L	RED	.032	ACRYLIC
	10.10L	AMBER	.032	ACRYLIC
	12.12L	L.T. BLUE	.032	ACRYLIC
	13.13L	BLUE	.032	ACRYLIC
-16		RED	.062	ACRYLIC
-17		BLUE	.062	ACRYLIC
-18		L.T. BLUE	.062	ACRYLIC
-19		GREEN	.062	ACRYLIC
-20		AMBER	.062	ACRYLIC
-21		CLEAR	.062	ACRYLIC
-22		NATURAL	.010	NYLON
	-23	NATURAL	.015	NYLON
-24		NATURAL	.020	NYLON
-25		NATURAL	.025	NYLON
-26		NATURAL	.032	NYLON
-27, 28, 29, 30, 31		GREY	.020	DYED NYLON
-32		WHITE	.062	LAMACOID
-33		RED	.062	LAMACOID
-34		GREEN	.062	LAMACOID
-35		AMBER	.062	LAMACOID
-36		BLUE	.062	LAMACOID
-37		RED	.075	ACRYLIC
-38		GREEN	.032	ACRYLIC
-39		CLEAR	.032	ACRYLIC
-51		GREEN	.032	ACRYLIC



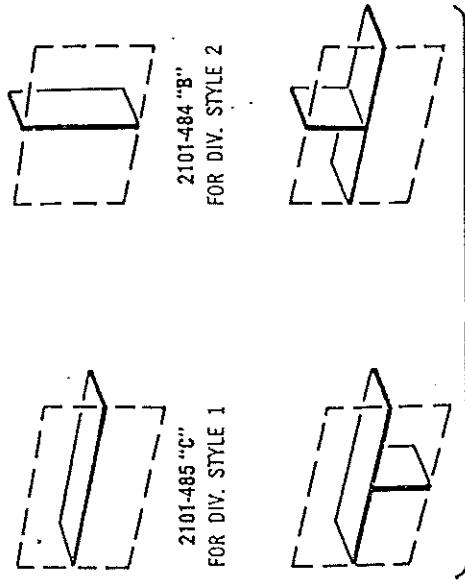
2101-510



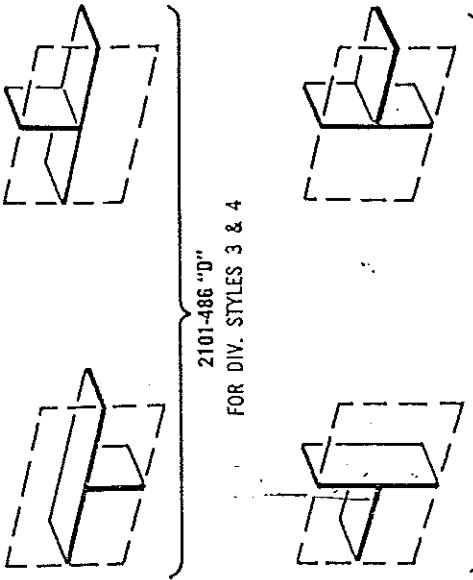
2101-509.



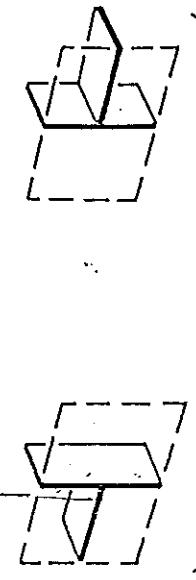
2101-508.



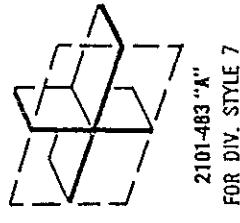
2101-484 "B"
FOR DIV. STYLE 2



2101-485 "C"
FOR DIV. STYLE 1



2101-486 "D"
FOR DIV. STYLES 3 & 4



2101-483 "A"
FOR DIV. STYLE 7



2101-487 "E"
FOR DIV. STYLES 5 & 6

MSC™

1640 MONROVIA, COSTA MESA, CALIFORNIA 92627 • PHONE (AREA CODE 714) 642-2427

PRINT REQUISITION

COMPLETE BOTH SIDES OF THIS FORM ADDING ANY
SPECIAL REQUIREMENTS IN THE "NOTES" COLUMN
BELOW. UPON RECEIPT OF THIS REQUISITION MASTER
SPECIALTIES CO. WILL TRANSFER THE INFORMATION TO
A DRAWING AND SEND YOU TWO PRINTS AT NO COST

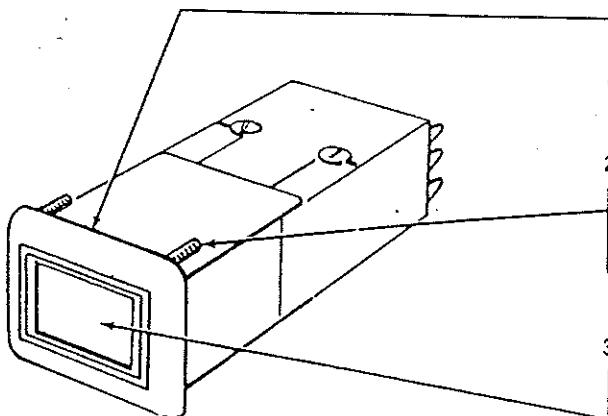
COMPANY _____

ADDRESS _____

CITY AND STATE _____

ATTENTION: _____

BASIC UNIT NUMBER _____



1. FRONT PLATE COLOR

<input type="checkbox"/> BLACK	(FED STD 595 COLOR No. 27038).
<input type="checkbox"/> GRAY (LIGHT)	(FED STD 595 COLOR No. 36492).
<input type="checkbox"/> GRAY (DARK)	(FED STD 595 COLOR No. 36118).
<input type="checkbox"/> OTHER	_____

2. STUD LENGTH TO ACCOMMODATE MOUNTING PANEL THICKNESS OF:

.020 to .375

3. BULB VOLTAGE (4 BULBS REQUIRED PER CHANNEL)

<input type="checkbox"/> 28 VOLTS (MS 25237-327)
<input type="checkbox"/> 12 VOLTS (330)
<input type="checkbox"/> 6 VOLTS (MS 25237-328)
<input type="checkbox"/> BULBS NOT FURNISHED

NOTES: _____

