**JAY-EL MARK 11 P/N 10648
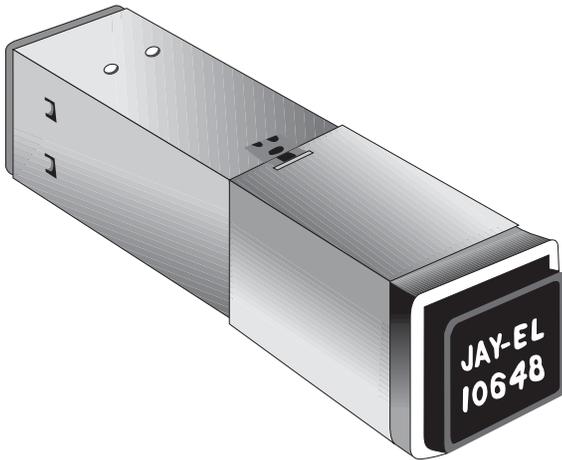ILLUMINATED PUSHBUTTON SWITCH
MIL-S-22885/77 ON THE
QUALIFIED PRODUCTS LIST**

**Ducommun
Technologies**

MARK 11 is designated as Mil-S-22885/77 on the Qualified Products List.

SUNLIGHT READABLE DISPLAYS

The Mark 11, P/N 10648 is available with a legend that is hidden before lighted and provides lighted characters readable in direct sunlight (10,000 FC). It is designated as Display Type 8. This displaytype utilizes maximum lighted contrast enhancing techniques.

Available with T-1 or T-1$\frac{3}{4}$ based lamps. Most efficient Display Type 8 is with the "T" type pushbutton using T-1 lamps. This "T" type pushbutton eliminates high legend surface temperatures and can provide power saving up to 70% with no loss of luminance. Luminances far exceed requirements of MIL-STD-411 when using .15MSCP lamps.

Details for legend information and viewing area on Page 10.

Jay-El can provide P/N 10648 switches and indicators with NVIS compatible lightning.

TABLE OF CONTENTS

MOUNTING

Three mounting types available and referred to as Type I, Type II and Type III.

Type I incorporates a mounting sleeve with rotating cams and removable spacer to allow the switch bezel to be mounted flush with a .220 thick edge lighted panel.

Type II contains no mounting hardware and is supplied with or without mounting brackets. These mounting brackets can be of practically any configuration and are to customer requirements. Both mounting methods afford secure shock and vibration proof mounting.

Type III allows switch housing to be removed from front of panel without unwiring.

ENVIRONMENTAL SEALING -MIL- STD-108

The Mark 11 can be supplied with an integral seal which has passed Splash Proof requirements to Mil-Std-108, High Shock to Mil-S-901C and Mil-S22885. This is available for push button styles B, C and D. See Page.

Also available for the standard pushbutton only is a drip proof external seal. See Page 5.

SEVERAL PUSHBUTTON STYLES AVAILABLE

From standard with .53 square legend area to the largest with .64 x .84 legend area.

SWITCHING ACTIONS

Maintained depressed alternate action. Pushbutton stays in the down position giving a visual indication of what mode switch is in when not illuminated. When pushed again the pushbutton returns to the up position.

Momentary, magnetic holding and alternate /magnetic holding actions are also available.

SOLDERLESS TERMINATION

The Mark 11 is an illuminated pushbutton switch designed to meet the exacting requirements of the aircraft ground support and/or shipboard equipment and high quality computers.

The Mark 11 eliminates soldering as it employs the Integrated Wire Termination System. This system accepts the military approved male pin to M39029/1-101.

All Information in this catalog is effective at time of publication and is subject to change without notice.

ENGINEERING SPECIFICATIONS

ELECTRICAL

Switch Contacts:

Silver alloy contacts are standard. Gold Contacts are recommended for reliable low level switching below 1.0 amperes.

Switch Ratings:

SILVER CONTACTS Maximum 2/

Load	Sea Level		50,000 FT 28VDC
	28 VDC	115VAC, 60Hz	
Resistive	7.5 Amps	5.0 Amps	4.0 Amps
Inductive	5.0 Amps	3.5 Amps	2.5 Amps
Lamp 1/	1.0 Amps	1.0 Amps	1.0 Amps

1/ Inrush, 10:1 for 20 milliseconds maximum.
2/ Minimum conditions are dependent on use and atmospheric conditions. Contact Jay-El for detailed application information.

GOLD CONTACTS

Load	Sea Level and 50.00 Feet	Maximum Contact Res. OHM
Max. Voltage	28VDC	.025
Max. Current	1 Amp.Res. .5 Amp.Ind.	.025
Min. Current	5 Microamps	50
Min Voltage	15 Millivolts	50

Contact Resistance:

25 Milliohms maximum in accordance with MIL-S-22885 for switch contacts and 1 OHM maximum in accordance with MIL-S-22885 for lamp contacts.

Holding Coil: (H & A/H actions only)
.04 + .01 Amps @ 28VDC will hold in at > 18/DC and drops out at < 14VDC. Other coil voltages available on request.

Elecrical Life:

25,000 cycles at rated loads per Para. 3.33 of MIL-S-22885C.

Lamp Type* Note
Relamp only when the maintained/depressed pushbutton is in the Off/Extended position.
T-1¾ mid get flange base in candescent is standard.

Available on special order:
 T -1¾ neon (External ballast 10K⁓ minimum)
 T -1 sub-midget flange base with special pushbutton modifications.
 T -1¾ midget flange base LED (Recommended for back lighting only)

MECHANICAL

Actuation force:

Sealed and Unsealed 2 to 5.5 pounds.
Actuation travel: .180 + .015 total travel
Pushbutton extraction force: 1.5 to 4 pounds
Mechanical life: 100,000 cycles minimum
Termination: The contact retention system and electrical contacts accept a crimp contact conforming to M39029/1-101 and Mil-T-81714.

Weight-Maximum ounces - Complete with standard pushbutton.

	Indicator	Momentary and Main. Dep. Alt.	Mag. Hold and Alt / Mag. hold
Type I	1.255 oz	1.880 oz	2.000 oz
Type II	1.035 oz	1.660 oz	1.780 oz

ENVIRONMENTAL

Temperature: High + 85 oC Low - 55oC
Explosion: Per Mil-Std.810, Method 51   1,
        Procedure 1   1
Humidity: Per Mil-Std-202, Method 106
Vibration: 10-2000Hz@ .06Da or 15 G
        (Peak) whichever is less.
Shock: 75G's, 6 milliseconds, Half sine
        & MIL-S-901C
EMI: Per Mil-Std - 285

Basic switch contacts per Mil - S -88805/101

CONTACTOR TERMINATIONS

The Mark 11 accepts the M39029/1-101 male pin. This crimp contact completely eliminates all soldering requirements allowing for ease of installation and removal. pins are not supplied with units but may be ordered separately.

Tools applicable:

Insertion/removal NAS 1664-20, M81969/14-11, -02 or equivalent.
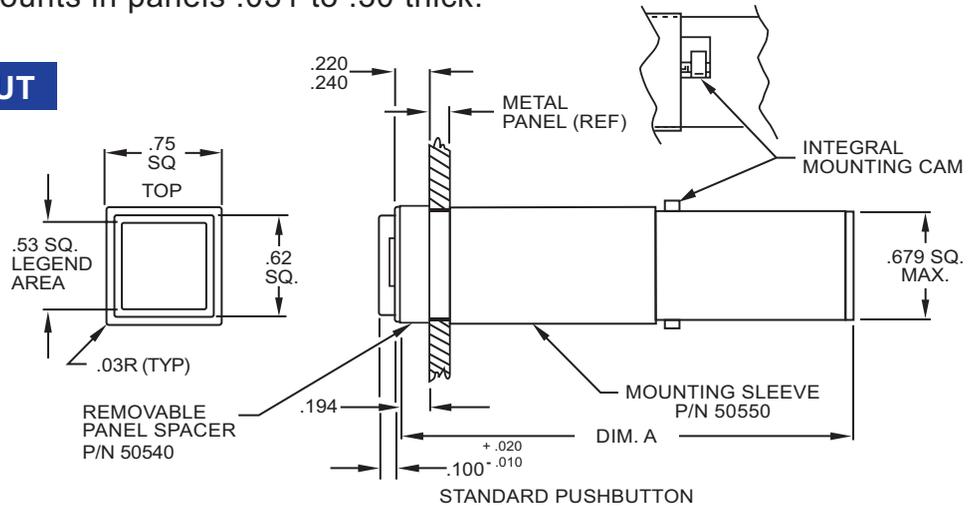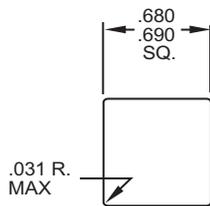Basic crimping tool M22520/1-01 & /2-01

JAY-EL **PRODUCTS**
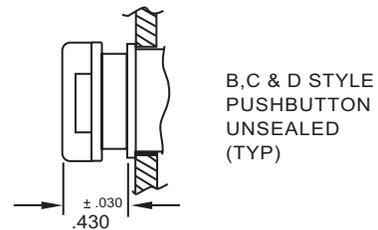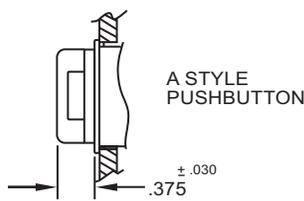
MAJOR OUTLINE DIMENSIONS

MOUNTING TYPE I

Mounting Type I switch mounts in panel .031 to .350 thick.
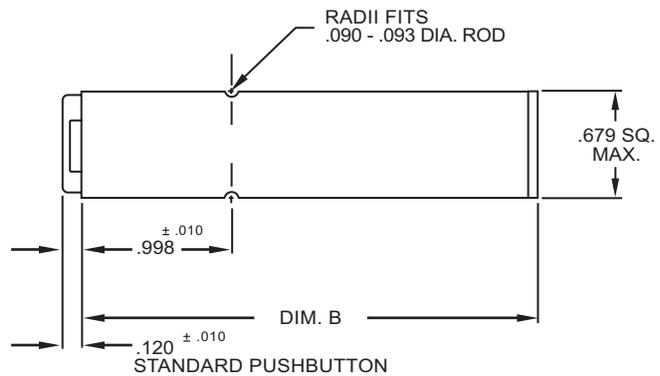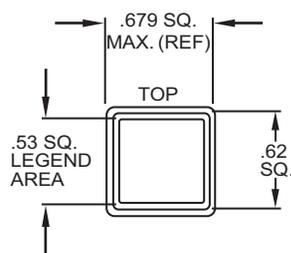Mounting Type I indicator mounts in panels .031 to .30 thick.

MOUNTING PANEL CUTOUT

.680
.690
SQ.

.031 R. MAX

.75 SQ. TOP

.53 SQ. LEGEND AREA

.62 SQ.

.03R (TYP)

.220 / .240

METAL PANEL (REF)

INTEGRAL MOUNTING CAM

.679 SQ. MAX.

MOUNTING SLEEVE P/N 50550

REMOVABLE PANEL SPACER P/N 50540

.194

DIM. A

.100 $^{+.020}_{-.010}$

STANDARD PUSHBUTTON

DIMENSION A MAXIMUM	
INDICATOR	2.26
MOMENTARY	2.95
MAINTAINED DEPRESSED	2.95
MAGNETIC HOLDING	3.56
ALTERNATE/MAGNETIC HOLDING	3.56

A STYLE PUSHBUTTON

.375 $\pm$ .030

B,C & D STYLE PUSHBUTTON UNSEALED (TYP)

.430 $\pm$ .030

MOUNTING TYPE II

.679 SQ. MAX. (REF)

TOP

.53 SQ. LEGEND AREA

.62 SQ.

RADII FITS .090 - .093 DIA. ROD

.679 SQ. MAX.

.998 $\pm$ .010

DIM. B

.120 $\pm$ .010

STANDARD PUSHBUTTON

DIMENSION B MAXIMUM	
INDICATOR	2.31
MOMENTARY	3.00
MAINTAINED DEPRESSED	3.00
MAGNETIC HOLDING	3.61
ALTERNATE/MAGNETIC HOLDING	3.61

A STYLE PUSHBUTTON

.390 $\pm$ .030
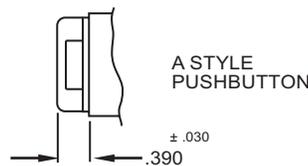
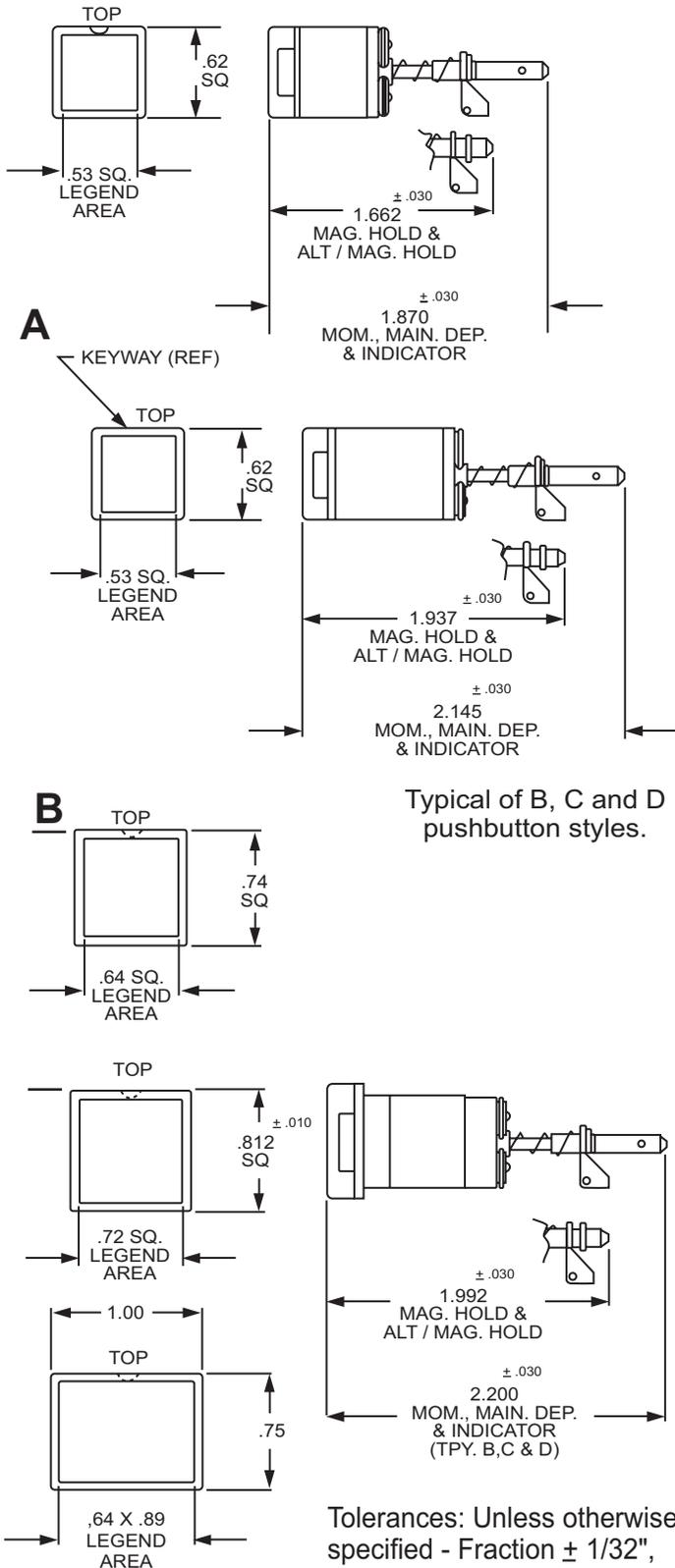Tolerances: Unless otherwise specified - Fraction ± 1/32", .XX±.01, XXX ± .005

Note: Only standard and "A" style pushbuttons may be used with Type II.

MAJOR OUTLINE DIMENSIONS

PUSHBUTTON STYLES (UNSEALED)

Standard pushbutton style will be supplied unless otherwise specified.

TOP

.62 SQ

.53 SQ. LEGEND AREA

± .030
1.662
MAG. HOLD & ALT / MAG. HOLD

± .030
1.870
MOM., MAIN. DEP. & INDICATOR

A

KEYWAY (REF)

TOP

.62 SQ

.53 SQ. LEGEND AREA

± .030
1.937
MAG. HOLD & ALT / MAG. HOLD

± .030
2.145
MOM., MAIN. DEP. & INDICATOR

Typical of B, C and D pushbutton styles.

B

TOP

.74 SQ

.64 SQ. LEGEND AREA

TOP

± .010
.812 SQ

.72 SQ. LEGEND AREA

1.00

TOP

.75

.64 X .89 LEGEND AREA

± .030
1.992
MAG. HOLD & ALT / MAG. HOLD

± .030
2.200
MOM., MAIN. DEP. & INDICATOR
(TPY. B,C & D)

Tolerances: Unless otherwise specified - Fraction ± 1/32", .XX±.01, XXX ± .005

ACCESSORIES
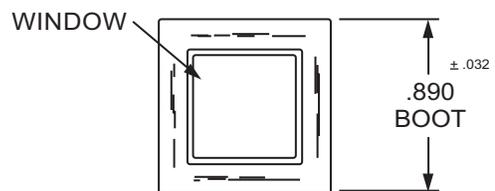
Standard pushbutton Only

SWITCH GUARD P/N 51056

Spring loaded clear polycarbonate switch guard.

± .015
.291

± .020
.785

± .02
.98
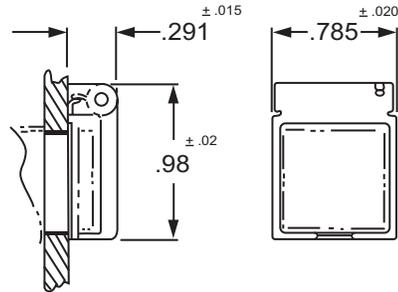
RUBBER BOOT KIT P/N 50682 -C-1 (Clear w/EMI)
-BLK-2 (w/o EMI)
-BLK-1 (w/EMI)

Flush mounted black silicone rubber boot with clear nylon window, for sand, dust and moisture protection. For standard pushbutton only.
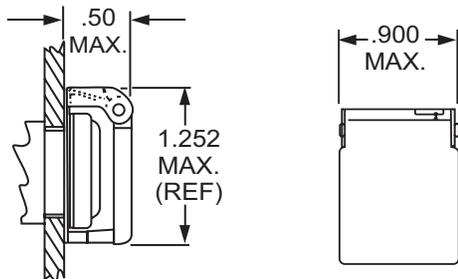
WINDOW

± .032
.890 BOOT

RUBBER BOOT KIT P/N 50680

Available for edge lit panel mounting.

SWITCH GUARD P/N 50632

Spring loaded clear polycarbonate switch guard to use with P/N 50682 boot.

.50 MAX.

.900 MAX.

1.252 MAX. (REF)

EMI SHIELDING

Welded 300 Series stainless steel grounding wipers provide chassis ground for EMI.

EMI SCREEN

PUSHBUTTON HOUSING

GROUNDING WIPERS
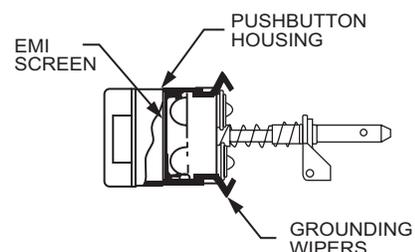
SCHEMATICS AND LAMP TERMINAL HOOK-UP

*Lamp schematics indicate lamp positions as viewed from front of unit.

For two color full face, all divided legends are supplied with lamps in all four positions.

Full face legen display is supplied with lamps in the upper left and lower right positions. Other positions supplied with Display Type 8 - Full face, lamps in all 4 positions.

MOMENTARY AND MAINTAINED DEPRESSED ALTERNATE ACTION

4 POLE
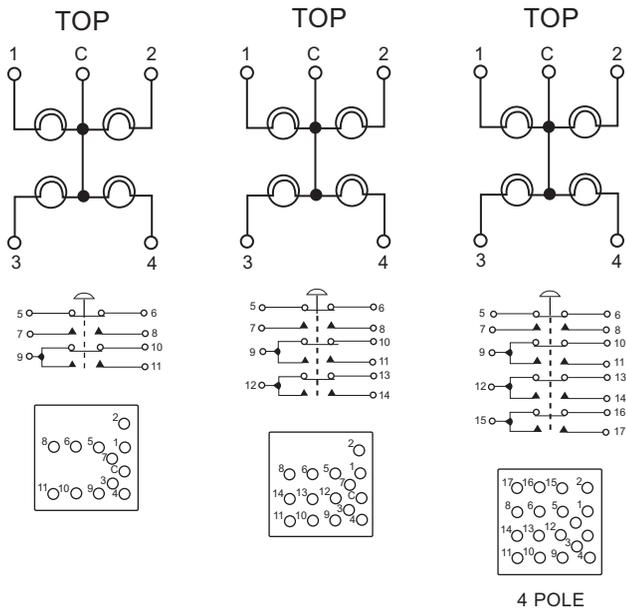
MAGNETIC HOLDING

Available for full face, horizontally or vertically divided legend display only.

Switch is rotated 90° to right for vertically divided legend display.
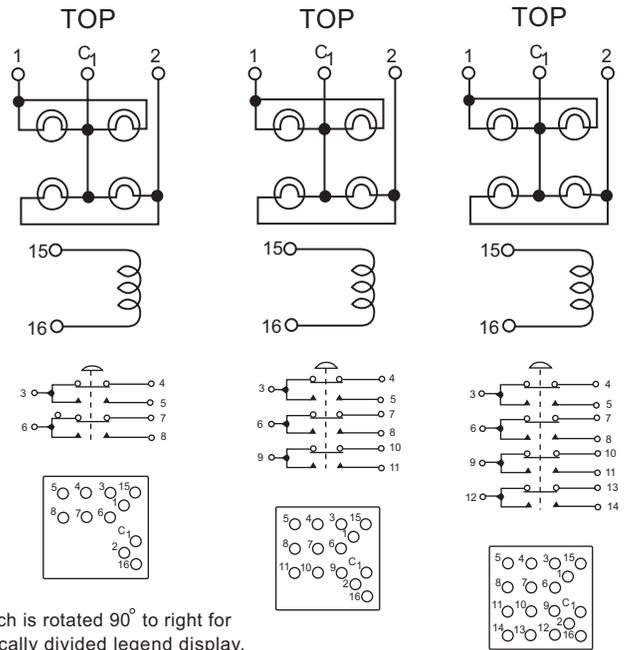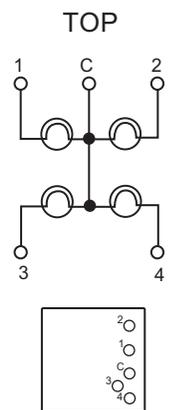
INDICATOR

SPLIT GROUND

Momentary, Maintained Depressed Alternate and Indicator

TOP
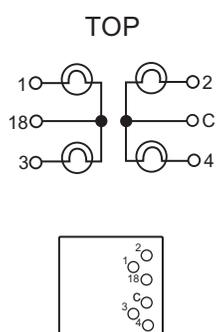
Lamp schematics only. For switch terminal numbers and positions refer to diagrams above.

Switch is rotated 90° to right to accomodate horizontally divided legend display.

ALTERNATE / MAGNETIC HOLDING

TOP
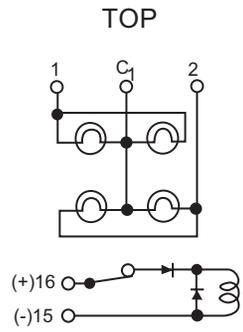
Lamp and coil schematic only. For switch terminal numbers and positions refer to standard magnetic holding diagrams above.

Switch is rotated 90° to right for vertically divided legend

SPLIT GROUND

Standard Magnetic Holding and Alternate / Magnetic Hold

TOP

Lamp schematic only. For switch and coil terminal numbers and positions refer to standard magnetic holding diagrams above.

Switch is rotated 90° to right for horizontally divided legend display.

INSTALLATION PROCEDURE TYPE I

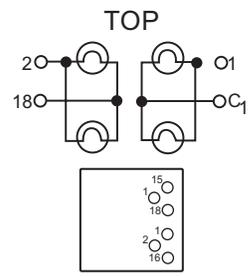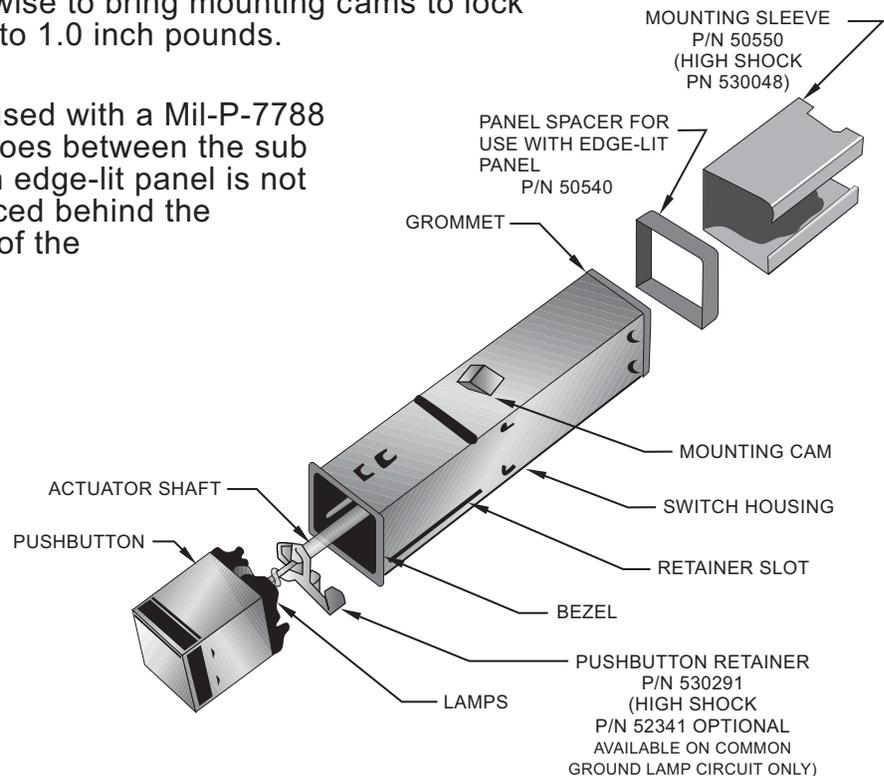1. Verify the maintained/depressed pushbuttons are in the Off/Extended position.
2. Extract pushbutton to it's full extent.
3. Rotate locking screws inside housing counter clockwise with small screw driver.
4. Slide mounting sleeve off of unit.
5. Install unit through front of panel with the word "TOP" to top of the panel.
6. Slide mounting sleeve onto unit. Place cutouts in sleeve against panel if the panel thickness is .125 or under . Reverse if panel is .125 to .240.
7. Rotate locking screws clockwise to bring mounting cams to lock position. Mounting torque is to 1.0 inch pounds.
8. Insert keyed pushbutton.
9. Panel spacer P/N 50540 is used with a Mil-P-7788 edge-lit panel. The spacer goes between the sub panel and switch bezel. If an edge-lit panel is not used the spacer may be placed behind the mounting panel and in front of the mounting sleeve.

MOUNTING SLEEVE
P/N 50550
(HIGH SHOCK
PN 530048)

PANEL SPACER FOR
USE WITH EDGE-LIT
PANEL
P/N 50540

GROMMET

MOUNTING CAM

SWITCH HOUSING

ACTUATOR SHAFT

RETAINER SLOT

PUSHBUTTON

BEZEL

LAMPS

PUSHBUTTON RETAINER
P/N 530291
(HIGH SHOCK
P/N 52341 OPTIONAL
AVAILABLE ON COMMON
GROUND LAMP CIRCUIT ONLY)

INSTALLATION PROCEDURE TYPE II

1. Matrix mounts to back of panel.

2. Studs supplied customer or countersunk screws may be used.

3. Units may be ordered as assembled matrixes or as individual switches and brackets.

MOUNTING BRACKET PER
CUST. REQUIREMENTS

THREADED STUD LOCK WASHER

SATCOM   CONTROL   VLF 1
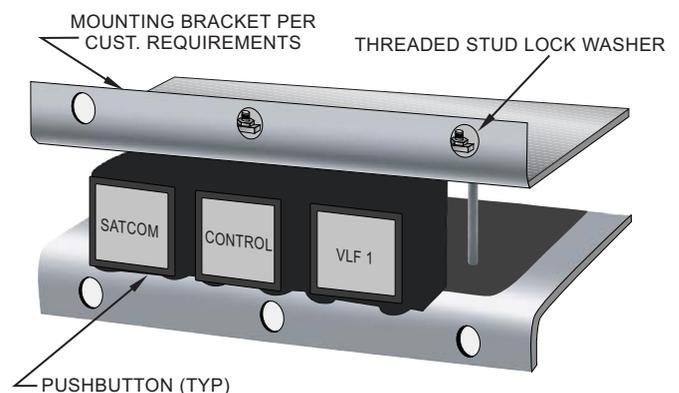
PUSHBUTTON (TYP)

MAJOR OUTLINE DIMENSIONS
INTEGRAL SEALED UNITS

Single station only

PUSHBUTTON STYLES (SEALED)

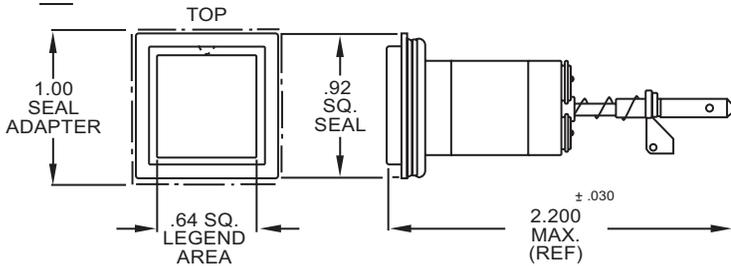Splashproof per Mil-Std-108

B

TOP

1.00
SEAL
ADAPTER

.92
SQ.
SEAL

.64 SQ.
LEGEND
AREA

± .030

2.200
MAX.
(REF)

C

TOP

1.08 SQ.
SEAL
ADAPTER

.97 SQ.
SEAL

.72 SQ.
LEGEND
AREA

D

1.25
SEAL
ADAPTER

1.17 SEAL

TOP

.64
LEGEND
AREA

.92
SEAL

1.00
SEAL
ADAPTER

.89
LEGEND
AREA
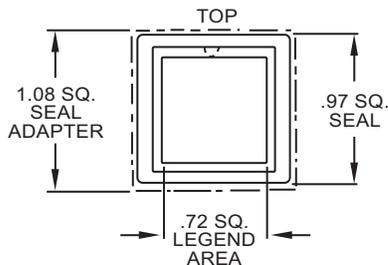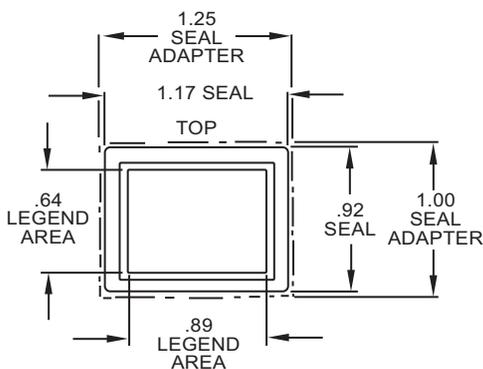
Mounting hole size (Single Unit)

"B" Style Pushbutton : .927 $^{+.010}_{-.000}$ SQ.
"C" Style Pushbutton : .990 $^{+.010}_{-.000}$ SQ.
"D" Style Pushbutton : .927 $^{+.010}_{-.000}$ X 1.180 $^{+.010}_{-.000}$

Note: All mounting hole have to have .062 corner radius. Mounting panel thickness: .31 to .187

SEAL ADAPTER CLAMP
ALUMINIUM SEAL ADAPTER
LAMPS
SWITCH HOUSING
MOUNTING SLEEVE
EMI MOISTURE GASKET
PUSHBUTTON RETAINER
INTEGRAL SILICONE RUBBER SEAL
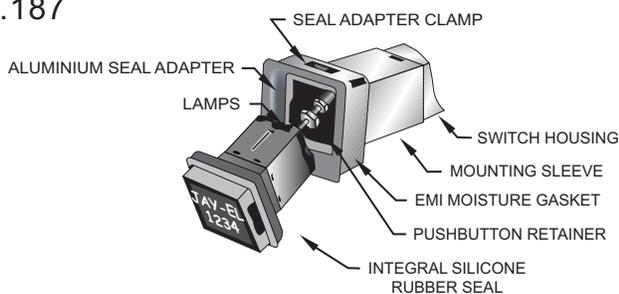
ACCESSORIES

Switch Guard P/N 51034 for use with "B" pushbutton.

±.02
.46

.75
MAX.

.53
MAX.

1.28
MAX.

1.06
MAX.
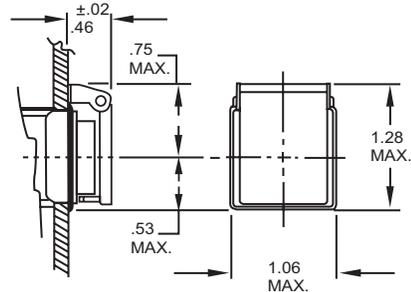
Switch Guard P/N 51059 for use with "C" pushbutton.

±.02
.57

.75
MAX.

.66
MAX.

1.41
MAX.

1.23
MAX.
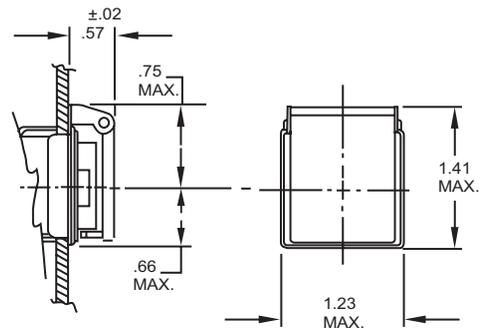
Switch Guard P/N 50937 for use with "D" pushbutton.

±.02
.46

.75
MAX.

.53
MAX.

1.28
MAX.

1.31
MAX.

Type I

SEAL ADAPTER

PUSHBUTTON ("B" REF)
INTEGRAL SILICONE RUBBER SEAL
EMI GASKET

.27

2.470 MAX INDICATOR
3.160 MAX. MOM., & MAIN. DEP.
3.770 MAX. MAG. HOLD & ALT. / MAG. HOLD

SEAL ADAPTER CLAMP

STANDARD INTEGRAL MOUNTING CAM SCREW

RESILENT RUBBER SEAL CONNECTOR BLOCK. ACCEPTS M39029/1-101 PINS
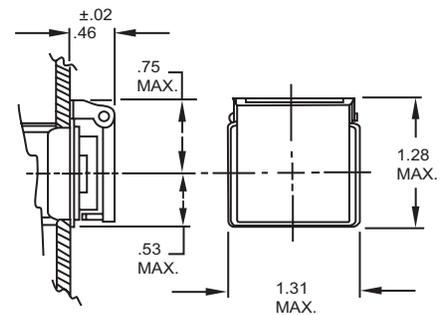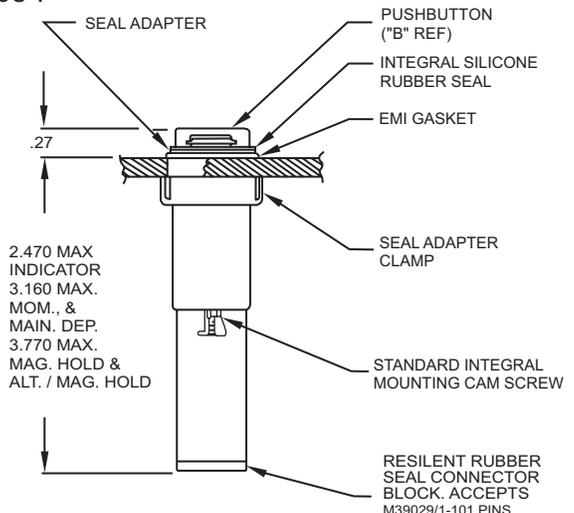
MAJOR OUTLINE DIMENSIONS, SEALED MATRIX

Matrix Mounting - Type I and Type III.Type III allows for
switch body to be removed without un-wiring. See Page 10.

Type I matrix shown.

Example: 2 x 2 "D" style, sealed pushbutton panel cutout dimension shown.
 "C" style mounting center dimensions are 1.00 typical (2 places)
 "B" style mounting center dimension is .94 typical (2 places)

Panel cutouts and mounting centers for single and matrix units.

Note: When ordering matrices, contact Jay-El for part numbers.

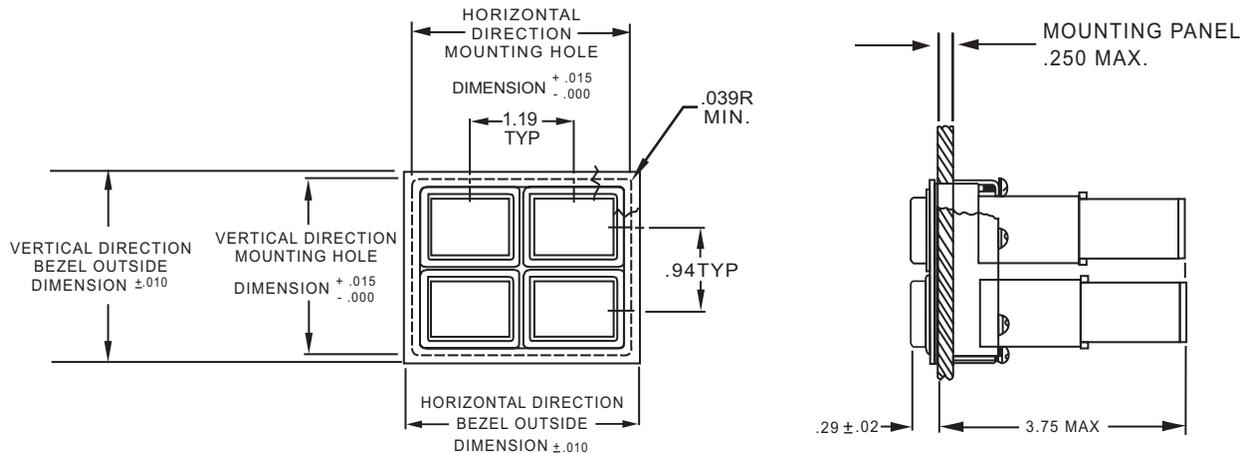| HORIZONTAL DIRECTION										
Number of Positions	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Mounting Hole Dim.										
B Style P/ B	1.062	2.002	2.942	3.882	4.882	5.762	6.702	7.642	8.582	9.522
C Style P/ B	1.122	2.122	3.122	4.122	5.122	6.122	7.122	8.122	9.122	10.122
D Style P/ B	1.312	2.502	3.692	4.882	6.072	7.626	8.452	9.642	10.322	12.022
Bezel Outline Dim.										
B Style P/ B	1.240	2.180	3.120	4.060	5.000	5.940	6.880	7.820	8.760	9.700
C Style P/ B	1.300	2.300	3.300	4.300	5.300	6.300	7.300	8.300	9.300	10.300
D Style P/ B	1.490	2.680	3.870	5.060	6.250	7.440	8.630	9.820	11.010	12.200
VERTICAL DIRECTION										
Number of Positions	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Mounting Hole Dim.										
B Style P/ B	1.062	2.002	2.942	3.882	4.822	5.762	6.702	7.642	8.582	9.522
C Style P/ B	1.122	2.122	3.122	4.122	5.122	6.122	7.122	8.122	9.122	10.122
D Style P/ B	1.062	2.002	2.942	3.882	4.822	5.762	6.702	7.642	8.582	9.522
Bezel Outline Dim.										
B Style P/ B	1.240	2.180	3.120	4.060	5.000	5.940	6.880	7.820	8.760	9.700
C Style P/ B	1.300	2.300	3.300	4.300	5.300	6.300	7.300	8.300	9.300	10.300
D Style P/ B	1.240	2.180	3.120	4.060	5.000	5.940	6.880	7.820	8.760	9.700

Tolerances: Unless otherwise specified - Fraction ± 1/32",
.XX±.01, XXX ± .005

CHARACTER INFORMATION
(HORIZONTAL DIRECTION ONLY)

** To obtain more characters per line other type fonts are available.
Contact Jay-El for further information.

PUSHBUTTON STYLE	LEGEND SEGMENTS				CHARACTERS PER LINE			NUMBER OF LINES	
	CONDENSED BLOCK	SIZE	STROKE	HEIGHT	SEGMENT -1	SEGMENT -2-3	SEGMENT -4-5-6	SEGMENT -1-4-5	SEGMENT -2-3-6
STANDARD .62 SQ. / .53 SQ. LEGEND AREA / A .62 SQ.	JAY-EL PRODUCTS INC.	-1	.010	.072	8	8	3	5	2
	JAY-EL PRODUCTS INC.	-2	.012	.087	7	7	3	4	2
	JAY-EL PRODUCTS INC.	-3	.015	.109	6	6	3	3	1
	JAY-EL PRODUCTS	-4	.018	.125	5	5	2	3	1
	JAY-EL PRODUCTS	-5	.020	.145	4	4	2	3	1
	JAY-EL PRODU	-6	.025	.175	4	4	1	2	1
	JAY-EL PRO	-7	.035	.222	3	3	1	2	0
	JAY-EL P	-8	.040	.290	2	2	0	1	0
*DISPAY TYPE 8 ONLY .48 LEGEND AREA	FUTURA MEDIUM CONDESED	SIZE	STROKE	HEIGHT					
	JAY-EL PRODUCTS INC.	-1	.012	.072	18	11	3	5	2
	JAY-EL PRODUCTS INC.	-2	.012	.087	9	9	3	4	2
	JAY-EL PRODUCTS INC.	-3	.012	.109	6	6	3	3	1
	JAY-EL PRODUCTS	-4	.012	.125	5	6	2	3	1
	JAY-EL PRODUCTS	-5	.012	.145	5	5	2	3	1
	JAY-EL PRODU	-6	.012	.175	4	4	1	2	1
	JAY-EL PRO	-7	.012	.222	3	0	1	2	0

* BASIC INFORMATION

Legend area .450 square for full face on all push button styles.

(.230 x .480 for 1/2 section (may be used with combination of other Display Types)
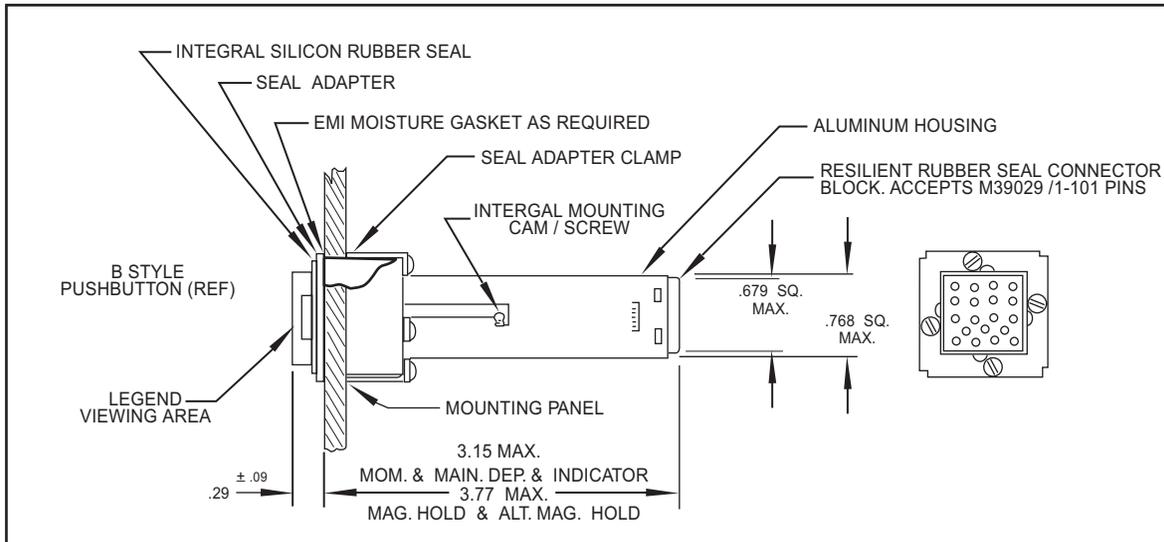
LEGEND SEGMENTS

PUSHBUTTON STYLE	CONDENSED BLOCK	SIZE	STROKE	HEIGHT	CHARACTERS PER LINE		NUMBER OF LINES	
					SEGMENT -1-2-3	SEGMENT -4-5-6	SEGMENT -1-4-5	SEGMENT -2-3-6
D — .75 x 1.00 (.64 / .89 LEGEND AREA)	JAY-EL PRODUCTS INC.	-1	.010	.072	16	8	5	2
	JAY-EL PRODUCTS INC.	-2	.012	.087	14	6	4	2
	JAY-EL PRODUCTS INC.	-3	.015	.109	11	5	4	2
	JAY-EL PRODUCTS	-4	.018	.125	9	4	3	1
	JAY-EL PRODUCTS	-5	.020	.145	8	4	3	1
	JAY-EL PRODU	-6	.025	.175	7	3	2	1
	JAY-EL PRO	-7	.035	.222	5	2	2	1
	JAY-EL P	-8	.040	.290	4	2	2	1
B — .74 SQ. (.64 SQ. LEGEND AREA)	JAY-EL PRODUCTS INC.	-1	.010	.072	10	5	5	2
	JAY-EL PRODUCTS INC.	-2	.012	.087	9	4	4	2
	JAY-EL PRODUCTS INC.	-3	.015	.109	7	3	4	2
	JAY-EL PRODUCTS	-4	.018	.125	6	3	3	1
	JAY-EL PRODUCTS	-5	.020	.145	5	2	3	1
	JAY-EL PRODU	-6	.025	.175	4	2	2	1
	JAY-EL PRO	-7	.035	.222	3	2	2	1
	JAY-EL P	-8	.040	.290	4	2	2	1
C — .812 SQ. (.72 SQ. LEGEND AREA)	JAY-EL PRODUCTS INC.	-1	.010	.072	12	6	6	3
	JAY-EL PRODUCTS INC.	-2	.012	.087	11	4	5	2
	JAY-EL PRODUCTS INC.	-3	.015	.109	8	4	5	2
	JAY-EL PRODUCTS	-4	.018	.125	7	3	4	2
	JAY-EL PRODUCTS	-5	.020	.145	5	2	3	1
	JAY-EL PRODU	-6	.025	.175	5	2	3	1
	JAY-EL PRO	-7	.035	.222	4	2	3	1
	JAY-EL P	-8	.040	.290	3	1	2	1

MAJOR OUTLINE DIMENSIONS INTEGRAL SEALED TYPE III

Single station mounting

SEALED TYPE III ASSEMBLED

INTEGRAL SILICON RUBBER SEAL
SEAL ADAPTER
EMI MOISTURE GASKET AS REQUIRED
SEAL ADAPTER CLAMP
ALUMINUM HOUSING
RESILIENT RUBBER SEAL CONNECTOR BLOCK. ACCEPTS M39029 /1-101 PINS
INTERGAL MOUNTING CAM / SCREW
B STYLE PUSHBUTTON (REF)
.679 SQ. MAX.
.768 SQ. MAX.
LEGEND VIEWING AREA
MOUNTING PANEL
± .09
.29
3.15 MAX.
MOM. & MAIN. DEP. & INDICATOR
3.77 MAX.
MAG. HOLD & ALT. MAG. HOLD

VIEW SHOWING FRONT PANEL REMOVABILITY

Switch body may be replaced from front of panel without un-wiring

EMI MOISTURE GASKET AS REQUIRED
PUSHBUTTON, INCLUDES INTEGRAL SPLASHPROOF SEAL
MODULE HOUSING
SWITCH MODULE
M39029/1-101 (REF) PINS AND WIRES MUST BE ORDERED SEPERATELY

Tolerances: Unless otherwise specified - Fraction ± 1/32",
.XX± .01, XXX ± .005

Ducommun Technologies