

Interactive Catalog Supplements Catalog PDFs

If you need detailed product information, or help choosing the right product for your application, see our **Interactive Catalog**. Use the **Interactive Catalog** to access the most complete and up-to-date information available.

The **Interactive Catalog** provides an extensive collection of product specifications, application data, and technical literature that can be searched based on criteria you select.

This PDF catalog information was published in November 2000.



Sensing and Control
**Interactive
Catalog...**

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Sensing and Control

Honeywell Inc.

11 West Spring Street

Freeport, IL 61032

www.honeywell.com/sensing

Manual Switches

Miniature Manual Line

MML Series



FEATURES

- Breadth of line offers complete selection of pushbuttons, rockers, and indicators to accommodate different functions and promote operator efficiency.
- Printed wiring board (PWB) or panel mounted switches, plus multi-unit strip mounting, and single level termination for cost-effective installation.
- Tactile feedback imparts a definite feel of switching action.
- Coordinated appearance enhances panel harmony.
- Illumination by long-life LEDs and incandescent lamps—for lighted display versatility.
- Solid state, electronic control and power duty switching—for electrical versatility.
- Temperature range: -18° to 65°C (0° to 149°F).

DESIGN FREEDOM

Rocker switches are available in the MICRO SWITCH MML Miniature Manual Line. They complement AML pushbuttons and indicators, providing you flexibility and design freedom to answer all your miniature manual control requirements. You can choose the actuator option that matches the switch function and natural habit pattern reflex of the operator. You no longer need to compromise quality, appearance, or human factors considerations, because of size constraints.

The MML pushbutton and indicator offering has also been expanded to include new square forms which are small enough to fit in the tightest places.

MOUNTING FLEXIBILITY

Printed wiring board (PWB) mounted switches can be arranged in individual panel openings or multi-unit strips, in a common panel cutout. Optional support brackets provide added rigidity for stand-alone PWB mounted devices. Units with bezels and mounting clips can be snap-in mounted from the panel front.

Single level PWB or solder/quick-connect termination throughout makes wiring faster, easier, and more economical. Housings are designed to accommodate washing, before and after wave soldering, to help prevent contamination during printed wiring board installation.

LIGHTED DISPLAY OPTIONS

Pushbuttons and indicators can be full-face illuminated by LEDs or incandescent lamps for high visibility of colors and legends. Inherently rugged, long-life LEDs reduce service and maintenance costs. Also, their low drive and inrush current (30 mA or less) reduces costs of drive circuitry.

Rockers can be furnished with colored lenses for illumination by LEDs or incandescent lamps.

CONTROL VERSATILITY

Solid state pushbutton switches with Hall effect integrated circuits interface directly with microprocessors and other logic level devices. Time-proven for billions of cycles, Hall effect ICs provide the ultimate in reliability.

Electronic control pushbutton or rocker switches, with gold or silver contacts, handle up to 1 amp; power duty switches, up to 6 amps.

Manual Switches

Miniature Manual Line

MML Series

MML ENHANCES PANEL HARMONY

The attractive clean line design of the total MML offering is coordinated to work in harmony and enhance the visual qualities of your product. MML will help make a good first impression with your customers by blending with other panel components. And also work hard over the long run to maintain operator satisfaction.

HOW TO ORDER

To specify MML catalog listings, refer to the order guides. They are based on a modular cataloging system which gives you the flexibility to choose the combination of feature options that best answers the requirements of your application.

ORDER GUIDES

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MML medical application. Intranavenous fluid flow controller automatically dispenses fluids for medications, therapy, and nutrition.



MML communications application. Mobile radio control keeps businesses in touch with employees on the road.



Manual Switches

Miniature Manual Line

MML Series

MML CHARACTERISTICS

	MML 10 Series	MML 20 Series	MML 30 Series	MML 40 Series
Mechanical Lifetime*				N/A
Pushbuttons–Momentary	1,000,000	250,000	100,000	---
Pushbuttons–Alternate	100,000	100,000	100,000	---
Rockers	100,000	250,000	100,000	---
Electrical Lifetime***				N/A
Pushbuttons–Momentary	1,000,000	25,000	25,000	---
Pushbuttons–Alternate	100,000	25,000	25,000	---
Rockers	100,000	25,000	25,000	---
Agency Ratings				
UL	File E53576	File E12252	File E12252	File E58932
CSA	File L R4442	File LR4442	File LR4442	File LR4442

*95% Survival
** Lifetime at Full Rated Load

MML ELECTRICAL DATA

MML10 SERIES

Electrical Characteristics	Integrated Circuit Function	5-24 VDC Sinking
	Supply Current (Max.)	7 mA (Released) 8 mA (Operated no load)
	Output Voltage (Operated)	0.3 Volt (Sinking 10 mA)
	Output Leakage Current Max. (Released)	5.0 µA
	Switching Time Max.	
	Rise 10% to 90%	1.5 µ sec (Sinking 10 mA)
	Fall 90% to 10%	0.5 µ sec (Sinking 10 mA)
	Rated Output Current	10 mA Sinking
	Supply Voltage (V _s)	–28 to +28 VDC
	Voltage Externally Applied to Output	–0.5 Volt min. +28 Volts max. (Off condition)
Absolute Maximum Ratings	Loads to Output	20 mA (Sinking)
	Storage Temperature	–40° to +85°C (–40° to +185°F)
	Operating Temperature	–18° to +65°C (0° to +149°F) and supply voltage of 4.5 to 5.5 VDC

As with all solid state components, performance can be expected to deteriorate as rating limits are approached; however, they will not be damaged unless the limits are exceeded.

Manual Switches

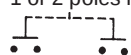
Miniature Manual Line

MML Series

MML20 SERIES

Electrical Rating (silver contacts)	Standard buttons Up to 1 amp, 125 VAC
	1 piece plunger/lens cap buttons: Black—Up to 1 amp, 125 VAC All others—Up to 0.5 amp, 125 VAC
Electrical Rating Gold Contacts	All button styles: Up to 0.25 amp, 30 VDC UL rating—0.10 amp, 30 VDC
	One pole Form C 

MML30 SERIES

MML31:	
Electrical Rating	6A @ 125 VAC, 250 VAC; 2A @ 30 VDC;
Silver Contacts	1A @ 125 VDC "L"; 1/10 hp @ 125 VAC
Contact Arrangement	1 or 2 poles Form X 

Manuals

LED, INCANDESCENT, OR NON-LIGHTED DISPLAY



PWB Mount

FEATURES

- Hall effect reliability
- Provides low voltage signals that interface with nearly all DC logic
- Accepts one LED or incandescent lamp
- Printed wiring board mounting
- UL recognized, CSA certified
- Bezels and mounting clips, LEDs and legended lenses can be furnished installed or ordered separately

Example: MML11KK3AAKRSDR

Furnished with black bezel; mounting clips (long sides); red LED, and red lens installed.

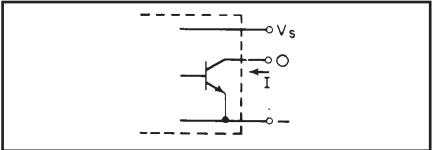
MML11 ORDER GUIDE

Catalog listing codes for switch, less assembled display options

MML11K			
A			
3			
AA			
Housing Type (Rectangular)	Mounting	Terminals	Circuitry/Action
MML11K Black housing	K Black bezel, mtg. clip/long sides	3 Printed wiring board	AA 5-24 VDC sinking mom. action

Electrical Data	page 56
Strip and matrix mounting	page 71
Mounting dimensions	page 79
PWB pin locations	page 79
LED/receptacle	pages 73/74
Lamp/LED/Lens	pages 75/76

Current Sinking Output
A permanent magnet plunger moves adjacent to the Hall effect integrated circuit to give a digital, current sinking (normally high and normally low) output.



Order display options assembled to switch by adding codes below

K	RS	DR	Leave this space blank,
Plunger	LED (Stanley Type)	Lens	Legend
K Black	XX No LED RS Red* YS Yellow* GS Green*	For LED display: DR Red DY Yellow DG Green For incandescent or non-lighted display: LR Red LY Yellow LG Green LW White LK Black	20 With Legend Use Legend Order Sheet FO-74024 to cover each catalog listing (see page 69).

* Permanently installed.

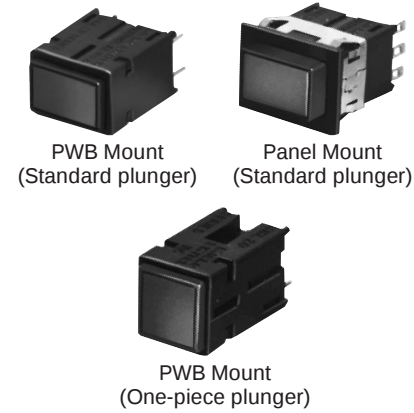
CUSTOMER INSTALLATION:
LED
1. Order LED and receptacle, page 73.
2. Installation instructions, page 74/76.
Incandescent Lamp
1. Order lamp/PWB receptacle or lamp/solder receptacle, page 75.
2. Installation instructions, page 76.

Manual Switches

Electronic Control Pushbutton

MML21 Series

LED, INCANDESCENT, OR NON-LIGHTED DISPLAY



- FEATURES**
- Silver or gold contacts
 - Choice of rectangular or square housings
 - Accepts one LED or incandescent lamp
 - Printed wiring board or snap-in panel mounting
 - Bezels and mounting clips, LEDs and legended lenses can be furnished installed or ordered separately
 - UL recognized, CSA certified

Example: MML21KK3AAK
Electronic control pushbutton switch with standard plunger; rectangular housing (black); bezel (black); mounting clips on long sides, PWB terminals; 1-pole, momentary action, silver contacts, black plunger.

Example: MML21KK3AAKRSDR
As above, except furnished with red LED and red lens installed.

MML21KK3AAHRSXX20 as above, legended.

MML21 STANDARD PLUNGER SWITCHES ORDER GUIDE

Catalog listing codes for switch, less assembled display options

MML21K		K		3		AA	
Housing Type		Mounting		Terminals		Circuitry/Action (Each pole is double throw)	
		Rectangular	Square			Rectangular	Square
MML21K Rectangular Black Housing		A No bezel (PWB mounting)	A No bezel (PWB mounting)	3 Printed Wiring Board		Silver Contacts:	Silver contacts:
MML21H Square Black Housing		K Black bezel, mtg. clip/long sides	R Black bezel & mtg. clip	2 Solder		AA 1 pole, mom. action	AA 1-pole, mom. action
						AB 1 pole, alt. action	AB 1-pole, alt. action
						AC 2 pole, mom. action	
						AD 2 pole, alt. action	
						Gold Contacts:	Gold contacts
						BA 1 pole, mom. action	BA 1-pole, mom. action
						BB 1 pole, alt. action	BB 1-pole, alt. action
						BC 2 pole, mom. action	
						BD 2 pole, alt. action	

MML21 ONE PIECE LENS/PLUNGER SWITCHES ORDER GUIDE

Catalog listing codes for switch, less assembled display options

MML21H		K		3		AA	
Housing Type		Mounting		Terminals		Circuitry/Action (Each pole is double throw)	
		Rectangular	Square			Rectangular	Square
MML21K Rectangular Black Housing		A No bezel (PWB mounting)	A No bezel (PWB Mounting)	3 Printed Wiring Board		Silver Contacts:	Silver contacts:
MML21H Square Black Housing		K Black bezel, mtg. clip/long sides	R Black bezel & mtg. clip	2 Solder		AA 1 pole, mom. action	AA 1-pole, mom. action
						AB 1 pole, alt. action	AB 1-pole, alt. action
						AC 2 pole, mom. action	
						AD 2 pole, alt. action	
						Gold Contacts:	Gold contacts
						BA 1 pole, mom. action	BA 1-pole, mom. action
						BB 1 pole, alt. action	BB 1-pole, alt. action
						BC 2 pole, mom. action	
						BD 2 pole, alt. action	

Electrical Data page 57
Bezels page 72
Strip and matrix mounting page 71
PWB pin locations page 79

Order display options assembled to switch by adding codes below³

Diagram showing three main options: Plunger Type (K, W), LED* (XX, RS, YS, GS), and Lens (DR, DY, DG, LR, LY, LG, LW, LK). Includes a Legend section and a CUSTOMER INSTALLATION section with instructions for LED and Incandescent Lamp.

Order display options assembled to switch by adding codes below

Diagram showing two main options: Button Color (One Piece Plunger) (H, L, N, R, Y, G, Z) and LED* (XX, RS, YS, GS). Includes a Legend section with instructions for legend order sheet.

- *Notes:
1. When an LED is specified in a rectangular MML21 listing, MICRO SWITCH will permanently install it in the housing.
2. MICRO SWITCH does not permanently install an LED in a square MML21 listing. To install an LED in a square housing, order a MML93L or MML93G receptacle and a MML92 LED (see pages 86 and 88).
3. Include four digits (XXXX or XX DR) when a legend is required.
4. For square or rectangular only.
5. For rectangular only.

Manuals

Manual Switches

Electronic Control Rocker Switches

MML24 Series

LED, INCANDESCENT, OR NON-LIGHTED DISPLAY



PWB Mount



Panel Mount



PWB Mount
(Lighted rocker)

FEATURES

- Accepts one or two LEDs or incandescent lamps which are ordered separately
- Printed wiring board mounting or snap-in panel mounting
- Bezels and mounting clips can be furnished installed or ordered separately
- UL recognized, CSA certified

MML24 ORDER GUIDE (Catalog listing for switch, less assembled display options)

MML24K			
A			
3			
AA			
Housing Type	Mounting	Terminals	Circuitry
MML24K Black housing	A No bezel (PWB mounting) K Black bezel, mtg. clip/long sides	3 Printed wiring board 2 Solder	Insert code letters from Circuitry Chart

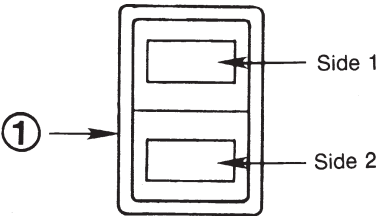
Electrical Data page 57
Bezels page 72
Strip and matrix mounting page 71
Mounting dimensions pages 85/86
PWB pin locations page 85
Rockers are permanently installed.

CIRCUITRY

Table with 4 columns: Silver Contacts, Gold Contacts, 2-Position, 3-Position. Rows include AA BA, AC BC with circuit diagrams.

Example: MML24KA3AA01HDRXX
Electronic control rocker switch with black housing, printed wiring board terminals; 1 pole, silver contacts; 2-position, maintained action; one circuit ON in each position; black rocker, red lens for LED display in Side 1 and no lens in Side 2.

The "MICRO SWITCH" identification is shown on this side of the switch housings.



OPERATING ACTION

Table with 4 columns: 2-Position, 3-Position, and two unlabeled columns. Rows 01-07 show action types like Maint., Mom., None.

Order display options assembled to switch by adding codes below.

01 Action: Insert code numbers from Operating Action Chart
H Rocker: K Black rocker, non-lighted; H Black rocker, one lens*; F White rocker, one lens*
DRXX Lens: Side 1 (LED display: DR Red, DY Yellow, DG Green; Incand. display: LR Red, LY Yellow, LG Green, LW White); Side 2 (LED display: DR Red, DY Yellow, DG Green; Incand. display: LR Red, LY Yellow, LG Green, LW White)
Leave blank, if legend not desired
Legend: 20 With legend. Use legend order sheet FO-74193 to cover each catalog listing (see page 70).

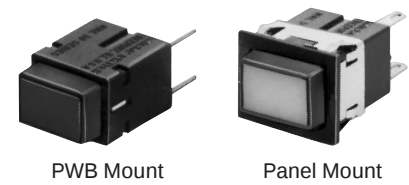
CUSTOMER INSTALLATION:
LED
1. Order LED and receptacle, page 73.
2. Installation instructions, pages 74/76.
Incandescent Lamp
1. Order lamp/PWB receptacle or lamp/solder receptacle, page 75.
2. Installation instructions, page 76.

Manual Switches

Power Duty Pushbutton

MML31 Series

NON-LIGHTED DISPLAY



- FEATURES**
- Printed circuit board or snap-in panel mounting
 - Bezels and mounting clips, and legended lenses can be furnished installed or ordered separately
 - UL recognized, CSA certified.

Example: MML31KK2AAK
Power duty pushbutton switch housing (black); bezel (black) and mounting clips; solder terminals; 1 pole, momentary action; black plunger.

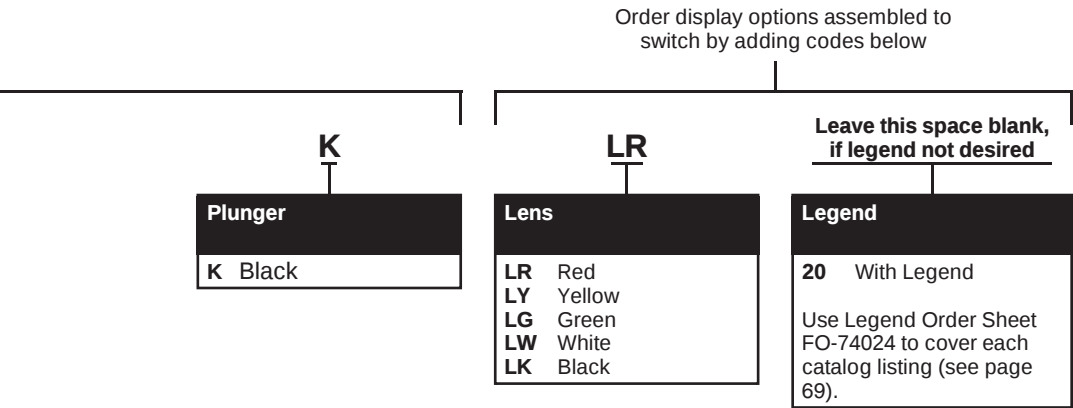
Example: MML31KK2AAKLR
As above, except furnished with red lens.

MML31 ORDER GUIDE

Catalog listing codes for switch, less assembled display options

MML31K	K	2	AA
Housing Type (Rectangular)	Mounting	Terminals	Circuitry/Action (Each pole is single-throw, normally open)
MML31K Black housing, non-lighted	A No bezel (PWB mounting) K Black bezel, mtg. clip/long sides	3 Printed wiring board 2 Solder/Quick-connect	AA 1 pole, mom. action AB 1 pole, alt. action AC 2 poles, mom. action AD 2 poles, alt. action

Electrical Data	page 57
Bezels	page 72
Strip and matrix mounting	page 71
Mounting dimensions	pages 85/86
PWB pin locations	page 85



Manual Switches

Indicators/Pushbutton Style

MML41/46 Series

LED OR INCANDESCENT DISPLAY



PWB Mount



Panel Mount

FEATURES

- Accepts one LED or incandescent lamp

MML41 indicators resemble a pushbutton switch with the button in the “down” position.

MML41 ORDER GUIDE

Catalog listing codes for indicator, less assembled display options

MML41K			
Housing Type (Rectangular)		Mounting	Support Posts/Terminals
MML41K		A	3
Black housing		K	0
			For panel mount and strip/matrix mount

Indicators/Flush Mount MML46

LED OR INCANDESCENT DISPLAY



PWB Mount



Panel Mount



PWB Mount



Panel Mount

FEATURES

- Accepts one or two LEDs or incandescent lamps
- Bezels and mounting clips, LEDs and legended lenses can be furnished installed or ordered separately

MML46 ORDER GUIDE

Catalog listing codes for indicator, less assembled display options

MML46K			
Housing Type		Mounting	Support Posts
Rectangular* (1 or 2 LEDs or incand. lamps)	Square* (1 LED or incand. lamp)	Rectangular:	Square:
MML46K	MML46H	A	A
Black housing	Black housing	K	R

** Rectangular housings only.
*** No LEDs allowed.

- * Notes:**
1. When an LED is specified in a **rectangular** MML46 listing, MICRO SWITCH will permanently install it in the housing.
 2. MICRO SWITCH does **not** permanently install an LED in a **square** MML46 listing. To install an LED in a square housing, order a MML93L or MML93G receptacle and a MML92 LED (see pages 74 and 76).

Manual Switches

Indicators/Pushbutton Style

MML41/46 Series

Example: MML41KA3K
Pushbutton style indicator housing (black); no bezel; support posts; black plunger.

Example: MML41KA3KRSDR
As above, except furnished with one red LED and red lens.

Electrical Data	page 57
Lenses	page 68
Bezels	page 72
LEDs/Lamps	pages 73/75
Strip and matrix mounting	page 71
Mounting dimensions	pages 80/82/83
PWB pin locations	pages 80/84

Order display options assembled to indicator by adding codes below

RS

LED (Stanley type)

XX	None
RS	Red
YS	Yellow
GS	Green

DR

Lens

For LED display:	For incandescent or non-lighted display:*
DR Red	LR Red
DY Yellow	LY Yellow
DG Green	LG Green
	LW White
	LK Black

20

Legend

20 With legend

Use Legend Order Sheet FO-74024 to cover each catalog listing (see page 69).
Note: If legend is not desired, leave this space blank.

Example: MML46KA3
Indicator housing, rectangular (black); no bezel; support terminals.

Example: MML46KA3RSXXDR20
As above, except furnished with red LED and red lens, with legend.

CUSTOMER INSTALLATION:

LED

- Order LED and receptacle, page 73.
- Installation instructions, pages 74/76.

Incandescent Lamp

- Order lamp/PWB receptacle or lamp/solder receptacle, page 75.
- Installation instructions, page 76.

LED TERMINATION

If LEDs are to be permanently installed by MICRO SWITCH, please indicate by either a **2** (solder) or a **3** (PWB) for the Support Posts listing code. With MICRO SWITCH identification to the rear, the longest lead (+) anode will be to the left, closest to the double-pole circuit or support terminals.



Style 2**Style 3**

Order display options assembled to indicator by adding codes below

RSXX

LED (Stanley type)

Available in rectangular housings only.

XXXX	No LED	
One LED*:		Two LEDs:
RSXX	Red	RSRS Red
YSXX	Yellow	YSYS Yellow
GSXX	Green	GSYS Green

DR

Lens

For LED display:	For incandescent or non-lighted display:*
DR Red	LR Red
DY Yellow	LY Yellow
DG Green	LG Green
	LW White
	LK Black

20

Legend

20 With legend

Use Legend Order Sheet FO-74024 to cover each catalog listing.

Square housings accept only one LED. Only a two-character LED code is necessary.
Example: MML46HR0XXDY.

* When ordering incandescent or non-lighted display, LED field must be **XXXX**.

Manuals

Manual Switches

Button Lenses/Incandescent or Non-lighted Display

MML51 Series

MML51 ORDER GUIDE
For standard plunger MML pushbuttons.

MML51E

Lens Type
Rectangular Lenses:
MML51E
Switch lens*
MML51G
Indicator lens
Square Lenses:
MML51C
Switch lens
MML51D**
Indicator lens

20

Display/Legend Type
Transmitted Color:
10 No legend
20 With legend

R

Color
R Red
Y Yellow
G Green
W White
K Black
(Opaque)

Example: MML51E20R
Incandescent or non-lighted display switch lens; red transmitted color, with legend.

LEGENDING
Use the MML Legend Order Sheets on pages 81 and 82 to specify legending.

* Use MML51E with MML41 rectangular pushbutton style indicators.
** MML51D for use with MML41 square.

Button Lenses/LED

MML52

MML52 ORDER GUIDE
For standard plunger MML pushbuttons.

MML52G

Lens Type
Rectangular Lenses:
MML52E
Switch lens, LED display
MML52G*
Indicator lens
LED display
Square Lenses:
MML52C
Switch lens, LED display
MML52D**
Indicator lens, LED display

10

Display/Legend Type
Transmitted Color:
10 No legend
20 With legend

Y

Color/Illumination
LED Display:
R Red
Y Yellow
G Green
C Clear

Example: MML52G10Y
LED display indicator lens; yellow transmitted color, no legend.

Square lenses have tabs on two sides. Before snapping in place, the tabs should be at right angles to the housing side with the MICRO SWITCH logo. (See below.)

MICRO SWITCH logo on housing



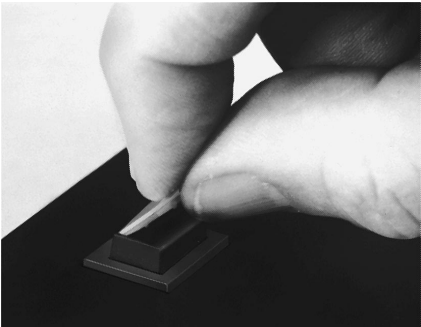
← Lens key tab

* Use MML52E with MML41 rectangular pushbutton style indicators.
** Use MML52D with MML41 square.

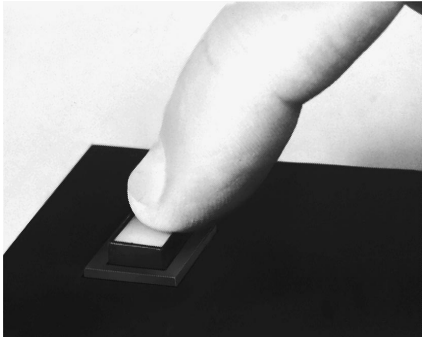
HOW TO INSTALL LENSES
Keytabs on two sides of the lenses mate with matching button slots.

Rectangular lenses have tabs on the long sides. Seat a long side before snapping in place.

HOW TO INSTALL LENSES



1. Seat lens.



2. Snap in place.

Legend Order Guide/Product Specification (PG ____ of ____)

Note

1. For Proper Legend Orientation, MML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented "UP"
2. All legends will be centered within Legend Area.
3. Please use black ink in filling out this form to help us process your order.

[illegible]

(Signature) _____ (Date)

Instructions

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, Type color.
3. Fill in quantity required.
4. Indicate legends desired — Do not exceed maximums shown in Legend Order Guide.

Modified Gothic lettering (A thru Z), numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, and 13/64.	A3 Modified Gothic											
STANDARD SYMBOLS AVAILABLE												
.	,	:	;	!	?	'	"	/	(	)	*	&
\$	¢	#	%	°	+	-	±	÷	x	=	≠	>
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞	∞

NOTE: Use this area to show special Legend Locations or Configurations NOT shown above. NON-STANDARD legends will involve additional charges and increased delivery time.

Fig. "A"	Fig. "B"
----------	----------

Catalog Listing MML	
Customer P.O. No.	Customer Dwg. No.
MICRO SWITCH Sales Order	Schedule No.

Customer: _____

Address: _____

_____ (city) _____ (state)

1. Fill in appropriate catalog listing - one listing/sheet.
2. Check proper figure #. Type size, Type color.
3. Fill in quantity required.

1. For Proper Legend Orientation, MML housings (when viewed from front of panel) should have "MICRO SWITCH" logo oriented to the left. For other Orientation, indicate the Housing Logo Location in Special Legend Area.
2. All legends will be centered within Legend Area.

3. Please use black ink in filling out this form to help us process your order.

[illegible]

(Signature)

Modified Gothic lettering (A thru Z), numerals (0 thru 9) and Symbols below available in 5/64, 7/64, 9/64, and 13/64.	A3 Modified Gothic											
STANDARD SYMBOLS AVAILABLE												
.	,	:	;	!	?	'	"	/	(	)	*	&
\$	¢	#	%	°	+	-	±	×	=	≠	>	<
→	↑	↓	←	CR	1/4	1/2	3/4	1/3	2/3	@	∞	

NOTE: Use this area to show special Legend Locations or Configurations NOT shown above. NON-STANDARD legends will involve additional charges and increased delivery time.

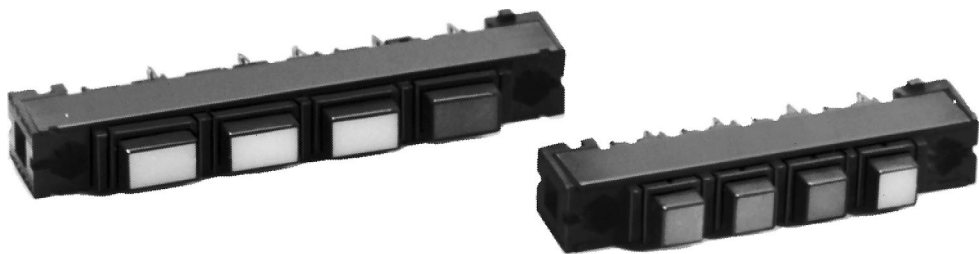
Fig. "B"

Fig. 1A"

Manual Switches

Strip Mounting Frames

MML61 Series



MML61 ORDER GUIDE

MML61K	5
Orientation/Color	No. of Stations
For Rectangular* Housings:	1 One
MML61K	2 Two
Horizontal strip, black	3 Three
MML61G	4 Four
Vertical strip, black	5 Five
For Square Housings	6 Six
MML61J	7 Seven
Black	8 Eight
	9 Nine
	10 Ten

* *.4" x .6" housings only.

Note: Switches and indicators are ordered as separate items.

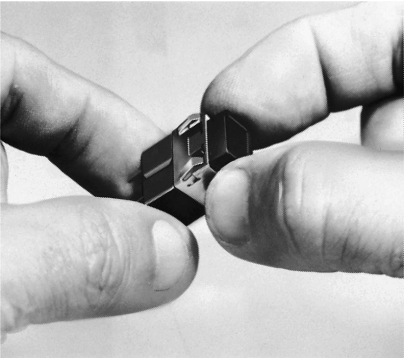
FEATURES

- Provides back of panel or printed wiring board mounting in a multi-unit strip of switches/indicators.
- Devices can be pre-wired prior to installation.
- Holes at each end of frame will accept No. 4 screws.
- Can be used for pushbutton or rocker type switches.

Example: MML61K5

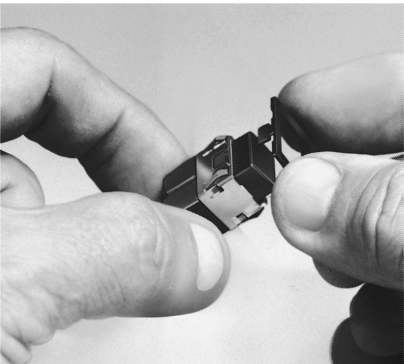
Black 5-station strip mounting frame, horizontal orientation.

Manuals



MML72EEK
(Black switch bezel, mounting clips on long sides)

1. Slip mounting clip over top of switch/
indicator housing.



2. Snap bezel onto mounting clip.

Recommended panel thickness for
panel mounted units is .050 to .094 in.
(1,27 to 2,39 mm).

**TO ORDER MOUNTING CLIPS
SEPARATELY**

For Rectangular Housings:	
MML73EA	(long sides)
MML73EB	(short sides)

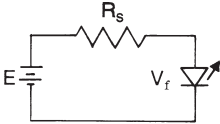
LED APPLICATION INFORMATION

To insure stable conditions, suitable external control of the LED current must be provided. It is recommended that a minimum of 5 VDC open circuit voltage with an appropriate series resistance be used to drive LED devices. This minimizes current variation and its effect on temperature and forward voltage of the LED.

Maximum drive current is 30 mA. Reverse voltage breakdown of the LED's is 4 volts (min.).

Resistor values can be determined by supply voltage or current for LED:

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



WHERE: R_s = Series Resistance
 E = Supply Voltage
 V_f = Forward Voltage of LED
 I_f = Circuit Current

MML92 ORDER GUIDE

LEDs should be the same color as the lenses they illuminate. They are packed 10 per listing, including stand-off spacers for use when solder terminating to a printed wiring board, per procedure 3 on page 74.

LED Type	Use To Illuminate	Catalog Listing	LED Color	Forward Characteristics Typ. @ 20mA	Max.	LED Manufacturers' Part Numbers
T-1¾	Rectangular button lens	MML92ERS MML92EGS MML92EYS	Red Green Yellow	1.7 V 2.1 V 2.1 V	Stanley: 2.0 V 2.5 V 2.5 V	ESBR5633 ESBG5633 ESAY5633
		MML92ERH MML92EGH MML92EYH	Red Green Yellow	2.2 V 2.3 V 2.2 V	Hewlett Packard: 3.0 V 3.0 V 3.0 V	HLMP-3366 HLMP-3568 HLMP-3466
T-1	Square button lens, MML24 rocker lens rectangular button lens	MML92HRS MML92HGS MML92HYS	Red Green Yellow	1.7 V 2.1 V 2.2 V	Stanley: 2.0 V 2.5 V 2.5 V	ESBR3901 ESPY3901 ESAY3901
		MML92HRH MML92HGH MML92HYH	Red Green Yellow	2.2 V* 2.3 V* 2.2 V	Hewlett Packard: 3.0 V 3.0 V 3.0 V	HLMP-1340 HLMP-1540 HLMP-1440

Long lead: Anode (+). Short lead: Cathode (-).
* @ 25 mA.

Manuals

MML93 LED PWB RECEPTACLE ORDER GUIDE

LED Type	Use to Illuminate	Catalog Listing
T-1¾	Rectangular button lens or umbrella button lens	MML93K
T-1	Square button lens or MML24 rocker lens	MML93G

MML93 LED SOLDER TERMINAL ORDER GUIDE

LED Type	Use to Illuminate	Catalog Listing
T-1	Square button (base only)	MML93L
T-1	MML24 rocker lens (base only)	MML93R
T-1	Rectangular button (base and terminal)	MML93J

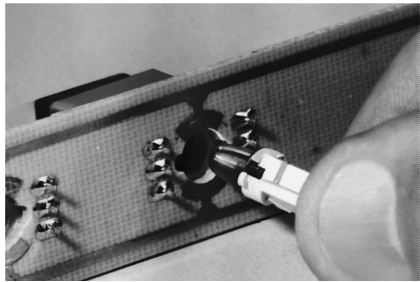
Factory installed. Certain MML switches and indicators can be furnished with LEDs **permanently** factory installed, where specified in the order guides.

User installed. LEDs can also be ordered separately and installed in these products by the user, per the procedures described below.

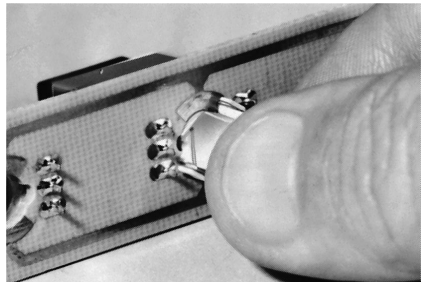
LED INSTALLATION

1. With Printed Wiring Board Receptacle. (MML93K)

PWB receptacle enables T-1 3/4 or T-1 LEDs to be added or replaced from behind the printed wiring board, without soldering. LEDs and receptacles are ordered separately. See page 75.



1. Insert the LED/PWB receptacle assembly through a hole in the printed wiring board.

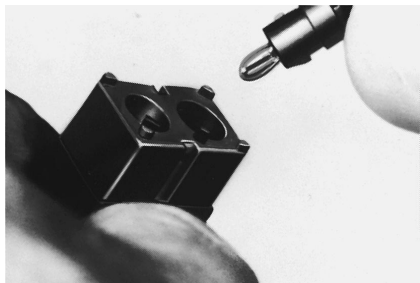


2. A 1/8-turn applied clockwise to the receptacle locks it in the printed wiring board and establishes the electrical connection.

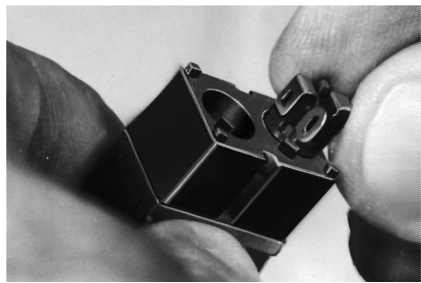
Printed wiring boards are not supplied.

2. With Solder Terminal Receptacle. (MML93J)

This receptacle attaches directly to the rear of panel-mounted units. It enables incandescent lamps to be added or replaced without rewiring. LEDs and receptacles are ordered separately.



1. Insert solder terminal receptacle into hole in base of panel mount unit.

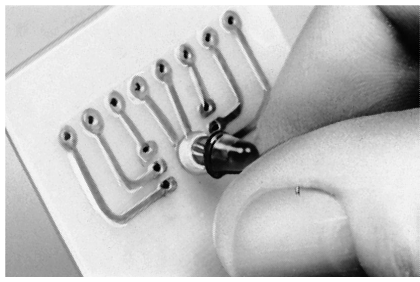


2. A 1/8-turn clockwise applied to the receptacle locks it in the base.

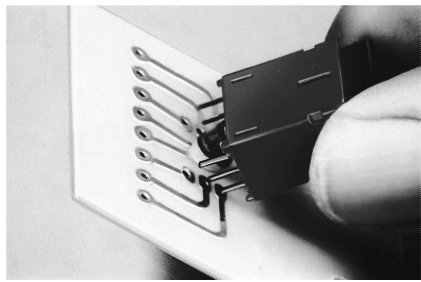
This receptacle is for use with all rectangular pushbuttons and MML41 or MML46 rectangular indicators only.

3. By Soldering To Printed Wiring Board.

In this procedure, the housing is mounted on the printed wiring board after the T-1 3/4 LED has been seated.



1. Assemble stand-off spacer to LED terminals and seat on printed wiring board.

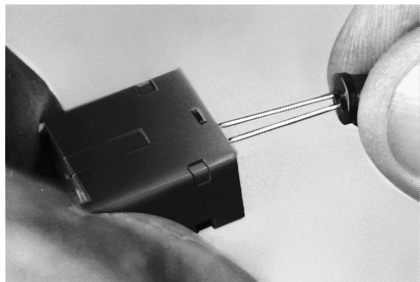


2. Seat housing on printed wiring board, with LED projecting into hole at the base of the housing.

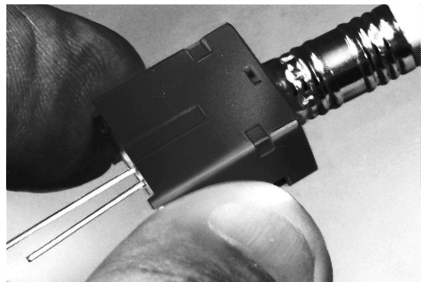
This procedure can be used with any MML having PWB terminals.

4. By Soldering to Printed Wiring Board or Leadwire (MML44 indicators only).

T-1 3/4 LEDs are added to MML44 indicators via a procedure which is unique to this product. The LED is inserted from the top of the housing with the leadwires protruding through the housing base.



1. Assemble LED to MML44 indicator, with the LED terminals protruding through assembly slot in the middle of housing base.



2. Use pencil eraser to snap LED securely in place.

Manual Switches

Incandescent Lamp Assemblies

MML91/93 Series

MML91 LAMP/PWB RECEPTACLE ORDER GUIDE

Lamp Type	Use To Illuminate	Voltage	Catalog Listing Incl. Lamp & PWB Receptacle	Industry Lamp No.
T-1 ① (unbased)	Rectangular button lens	5 28	MML91C MML91DC	715 6838
T-1 ② (bi-pin)	Square button lens and MML24 rocker lens	5 28	MML91E MML91DE	7715 7839

Notes:
① To order PWB receptacle separately, specify **MML93H**.
② To order PWB receptacle separately, specify **MML93G**.

MML91 LAMP/SOLDER RECEPTACLE ORDER GUIDE

Lamp Type	Use To Illuminate	Voltage	Catalog Listing Incl. Lamp & Solder Receptacle	Industry Lamp No.
T-1 ③ (bi-pin)	Rectangular button lens	5 28	MML91D MML91DD	7715 7839

Lamp Type	Use To Illuminate	Voltage	Catalog Listing ④ Solder Receptacle	T-1 (Unbased) Lamp Only	Industry Lamp No.
T-1 (unbased)	Square button lens	5 28	MML93L MML93L	MML91A MML91DA	715 6838
T-1 (unbased)	MML24 rocker lens	5 28	MML93R MML93R	MML91A MML91DA	715 6838

Notes:
③ To order solder receptacles separately, specify **MML93J**.
④ Order solder receptacles and T-1 lamp listings for complete assembly.

Manuals

Manual Switches

LED/Incandescent Lamp Receptacles

MML93 Series

User installed. Certain MML switches and indicators will accept incandescent lamps, where specified in the order guides.

These lamps are ordered separately and installed by the user, per the procedures described below.

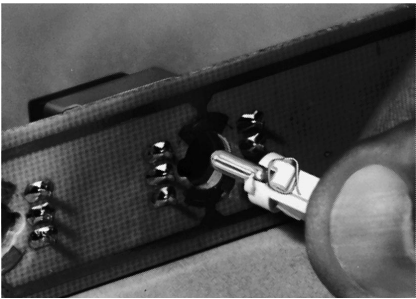
LAMP INSTALLATION

1. With Printed Wiring Board Receptacle for MML93G and MML93H only.

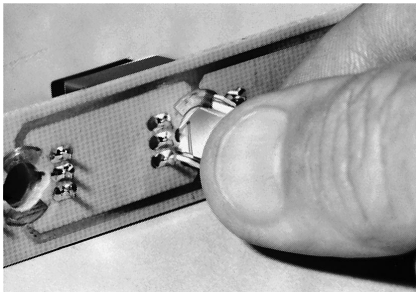
Use PWB receptacles to permit lamps to be added or replaced from behind the printed wiring board, without soldering.

These receptacles are for use with rectangular pushbuttons, square pushbuttons and MML24 rocker lens only.

Printed wiring boards are not supplied.



1. Insert the PWB receptacle/incandescent lamp assembly through a hole in the printed wiring board.

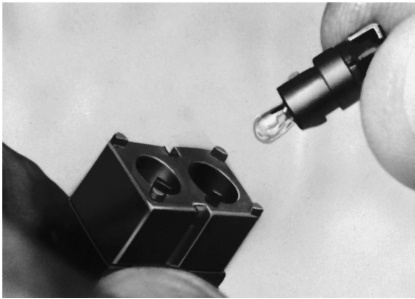


2. A 1/8-turn applied clockwise to the receptacle locks it in the printed wiring board and establishes the electrical connection.

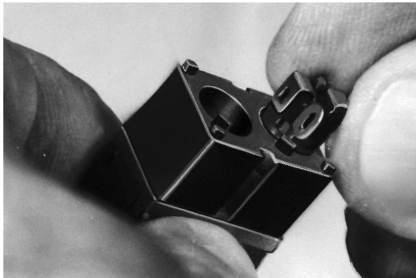
2. With Solder Terminal Receptacle for MML93J bi-pin only

This receptacle attaches directly to the rear of panel-mounted units. It enables lamps to be added or replaced without rewiring.

This receptacle is for use with all rectangular pushbuttons and MML41 or MML46 rectangular indicators only.



1. Insert solder terminal receptacle into hole in base of panel mount unit.



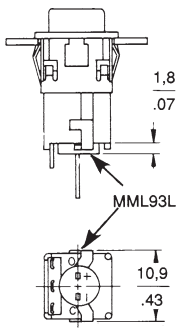
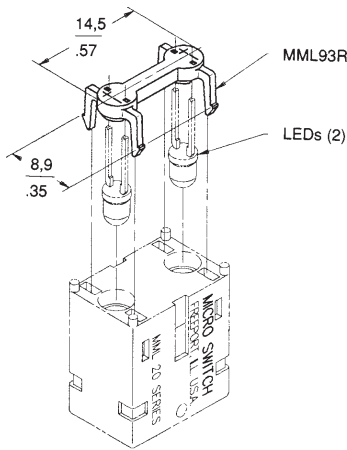
2. A 1/8-turn clockwise applied to the receptacle locks it in the base.

3. With Solder Terminal Receptacles for MML93L/93R Unbased Only or T-1 LED.

Use the receptacles shown at right to install T-1 LEDs or T-1 unbased lamps in panel-mounted MML21 square pushbutton switches and MML24 rocker switches.

Procedure:

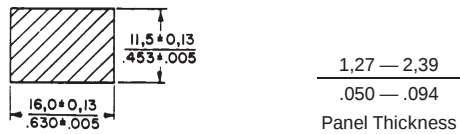
1. Assemble LEDs or lamps to receptacles (leads first).
2. Snap receptacle into slots in housing base.
3. Solder directly to leads.



MOUNTING DIMENSIONS (For reference only)

PANEL CUTOUTS FOR PUSHBUTTON SWITCHES AND INDICATORS/RECTANGULAR TYPE

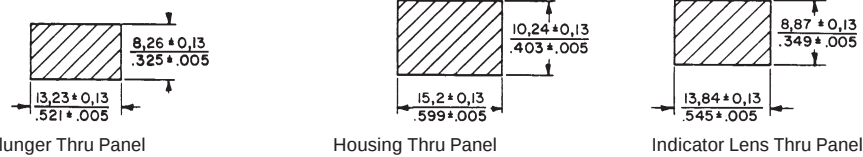
INDIVIDUAL SNAP-IN PANEL MOUNT



PANEL PUNCH FOR MML SERIES

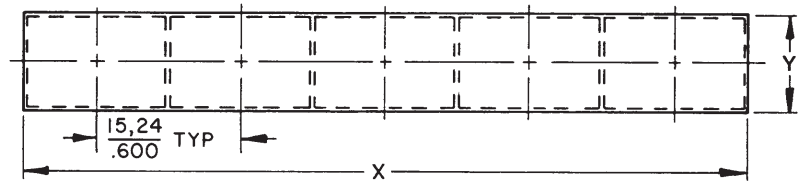
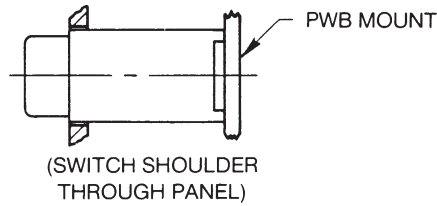
A panel punch is manufactured by Greenlee-Textron Tool Co., Rockford, IL (815-926-3011).

INDIVIDUAL PRINTED WIRING BOARD (PWB) MOUNT



MULTI-UNIT PRINTED WIRING BOARD (PWB) MOUNT

Horizontal Mount



Establish tooling holes on X coordinate and use these holes to establish relationship between PWB and Panel

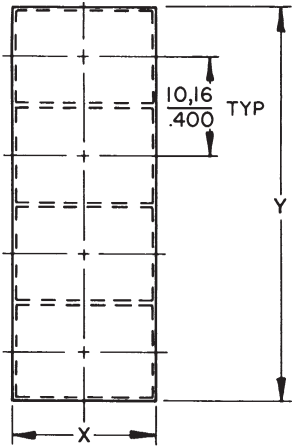
Terminals $\frac{0.20}{.008} \times \frac{0.76}{.030}$

Recommended hole size in PWB $\frac{1.17}{.046}$

N = Number of switches
 $X = N-1 \times \frac{15.24}{.600} + \frac{15.11}{.595}$
 $Y = \frac{10.16}{.400}$

Example: N = 5 Switches
 $X = 5-1 \times \frac{15.24}{.600} + \frac{15.11}{.595}$
 $X = \frac{76.07}{2.995}$

Vertical Mount



N = Number of Switches
 $Y = N \times \frac{10.16}{.400}$
 $X = \frac{15.11}{.595}$

Example: N = 4
 $Y = 4 \times \frac{10.16}{.400}$
 $Y = \frac{40.64}{1.600}$

Manual Switches

Miniature Manual Line

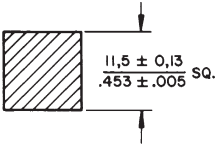
MML Series

MOUNTING DIMENSIONS (For reference only)

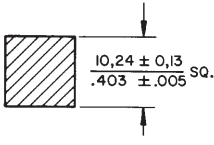
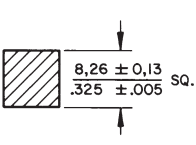
PANEL CUTOUTS FOR PUSHBUTTON SWITCHES AND INDICATORS/SQUARE TYPE

Individual Snap-in Panel Mount

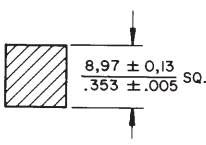
Individual Printed Wiring Board PWB Mount



Pushbutton Plunger Thru Panel



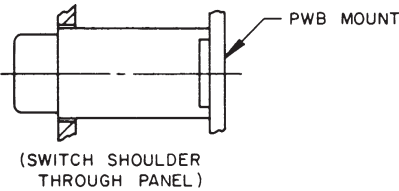
Housing Thru Panel



Indicator Lens Thru Panel

See page 77 for panel punch manufacturer.

MULTI-UNIT PRINTED WIRING BOARD (PWB) MOUNT

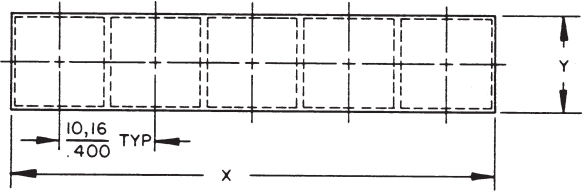


Establish tooling holes on X coordinate and use these holes to establish relationship between PWB and Panel

Terminals $\frac{0,20}{.008} \times \frac{0,76}{.030}$

Recommended hole size in PWB $\frac{1,17}{.046}$

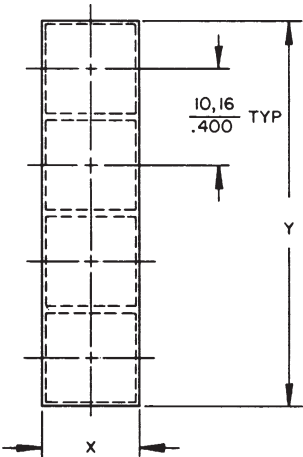
Horizontal Mounting



Formula:
N = Number of switches
 $X = N \times \frac{10,16}{.400}$
 $Y = \frac{10,16}{.400}$

Example: N = 5 Switches
 $X = 5 \times \frac{10,16}{.400}$
 $X = \frac{50,80}{2.00}$

Vertical Mounting



N = Number of Switches
Formula: $Y = N \times \frac{10,16}{.400}$
 $X = \frac{10,16}{.400}$

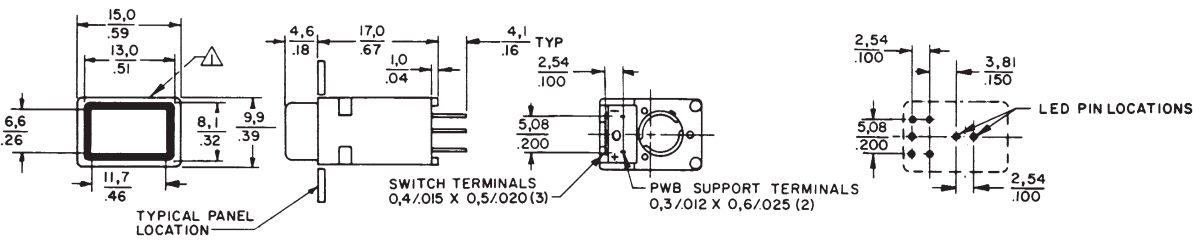
Example: N = 4
 $Y = 4 \times \frac{10,16}{.400}$
 $Y = \frac{40,64}{1.600}$

Manual Switches
Miniature Manual Line

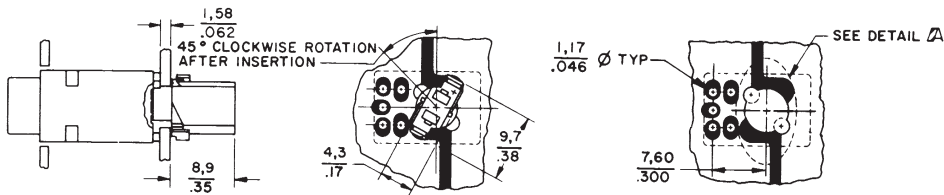
MML Series

MOUNTING DIMENSIONS (For reference only)

PRINTED WIRING BOARD MOUNT PUSHBUTTON SWITCHES/RECTANGULAR TYPE
MML11 Switches PWB Pin Locations

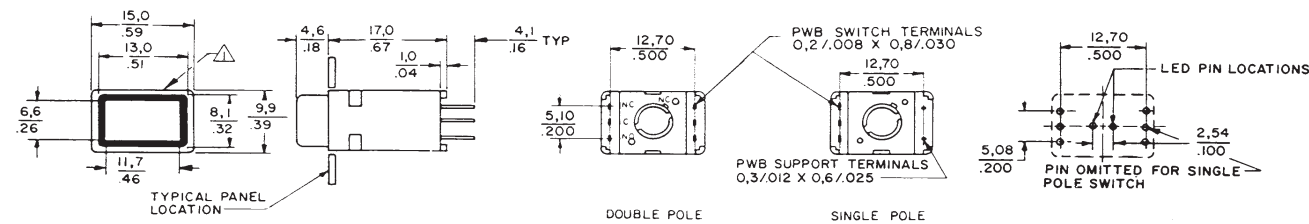


PWB Receptacle Installed (LED or Incandescent Lamp)

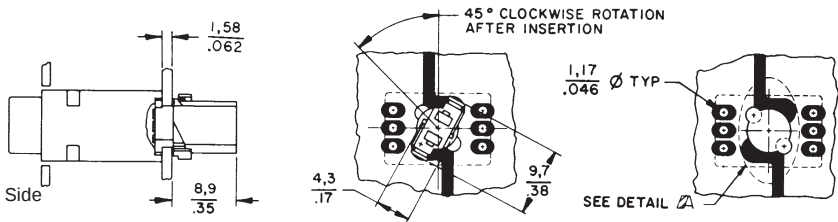


MML21 Switches

PWB Pin Locations

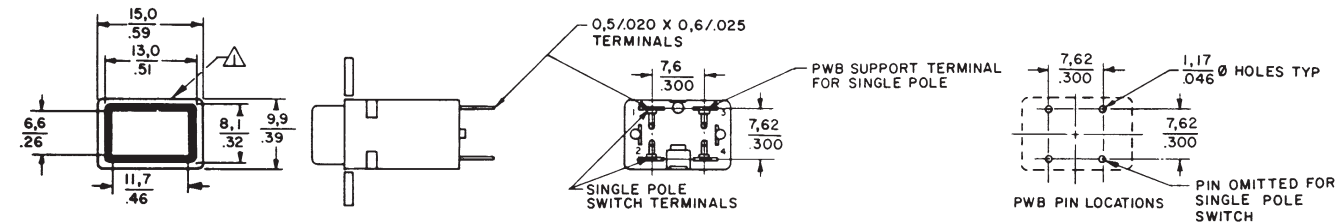


PWB Receptacle Installed (LED or Incandescent Lamp)



Notes:
△ MICRO SWITCH Identification This Side
2 – Linear measure mm/IN. or mm/IN.

MML31 Switches



Manuals

Manual Switches

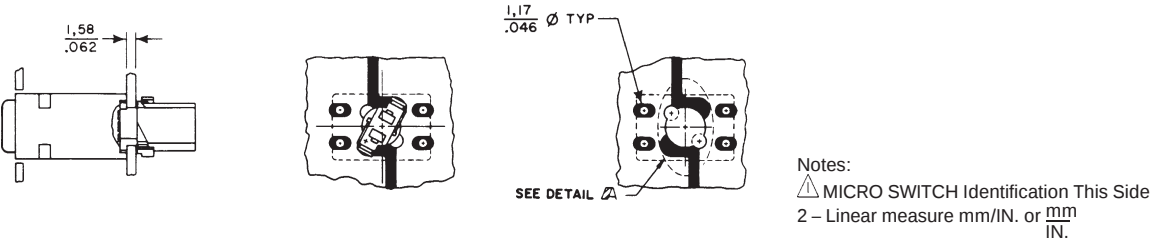
Miniature Manual Line

MML Series

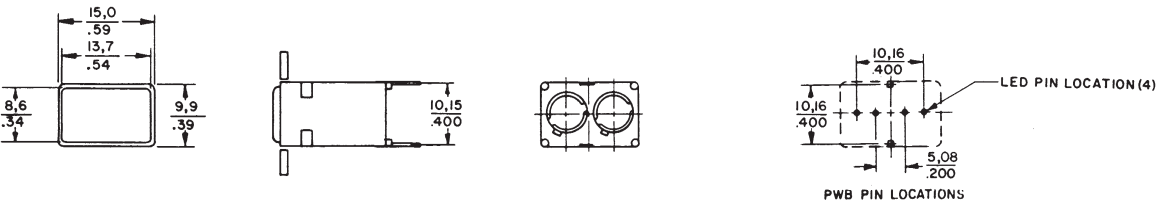
MOUNTING DIMENSIONS (For reference only)
PRINTED WIRING BOARD MOUNT INDICATORS/RECTANGULAR TYPE
MML41 Indicators



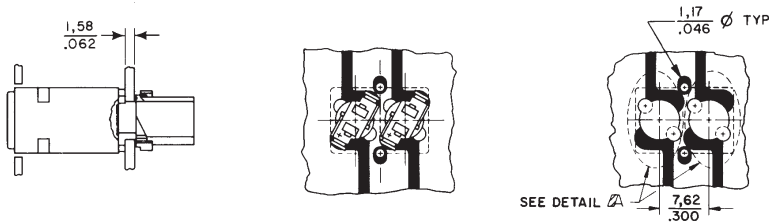
PWB Receptacle Installed (LED or Incandescent Lamp)



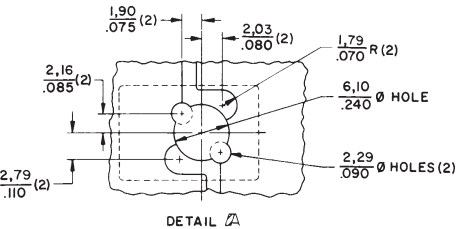
MML46 Indicators



PWB Receptacle Installed (LED or Incandescent Lamp)

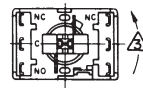


PWB Pad Location For Receptacle (LED or Incandescent Lamp)



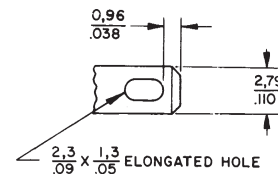
MML Series

MML21 Switches



③ Rotate 45° counter clockwise for removal from switch or indicator

Terminal Detail



Manual Switches

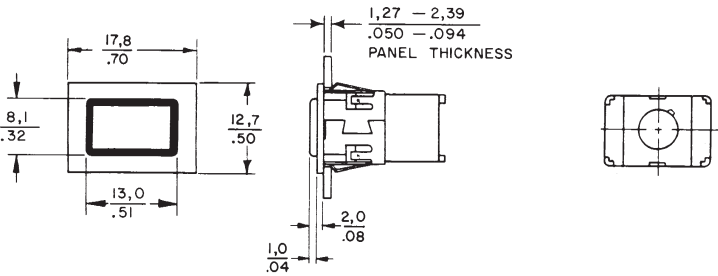
Miniature Manual Line

MML Series

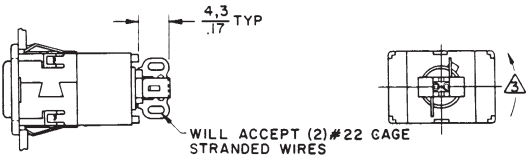
MOUNTING DIMENSIONS (For reference only)

PANEL MOUNT INDICATORS/RECTANGULAR TYPE

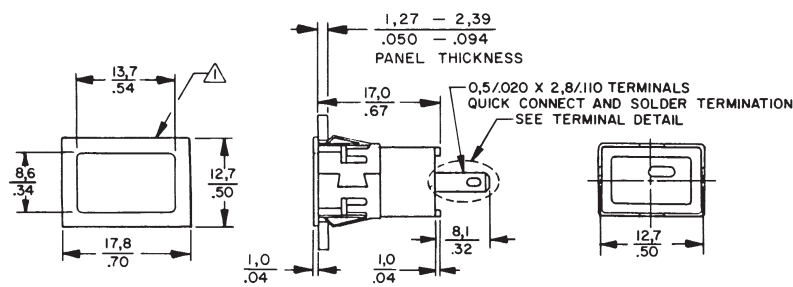
MML41 Indicators



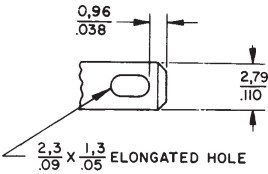
Solder Receptacle Installed (LED or Incandescent Lamp)



MML43 Indicators

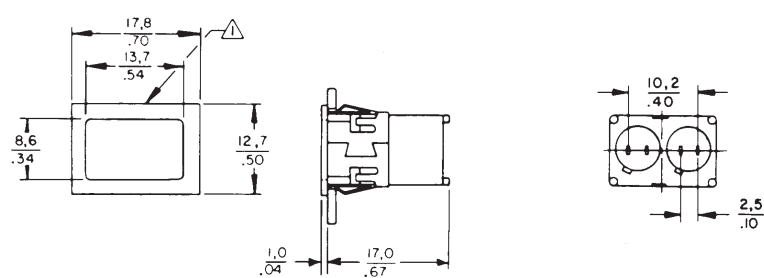


Terminal Detail

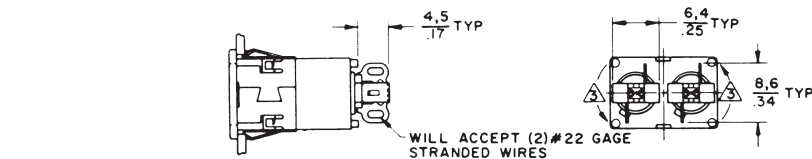


Notes:
△ MICRO SWITCH Identification This Side
2 - Linear measure mm/IN. or mm/IN.

MML46 Indicators



Solder Receptacle Installed (LED or Incandescent Lamp)



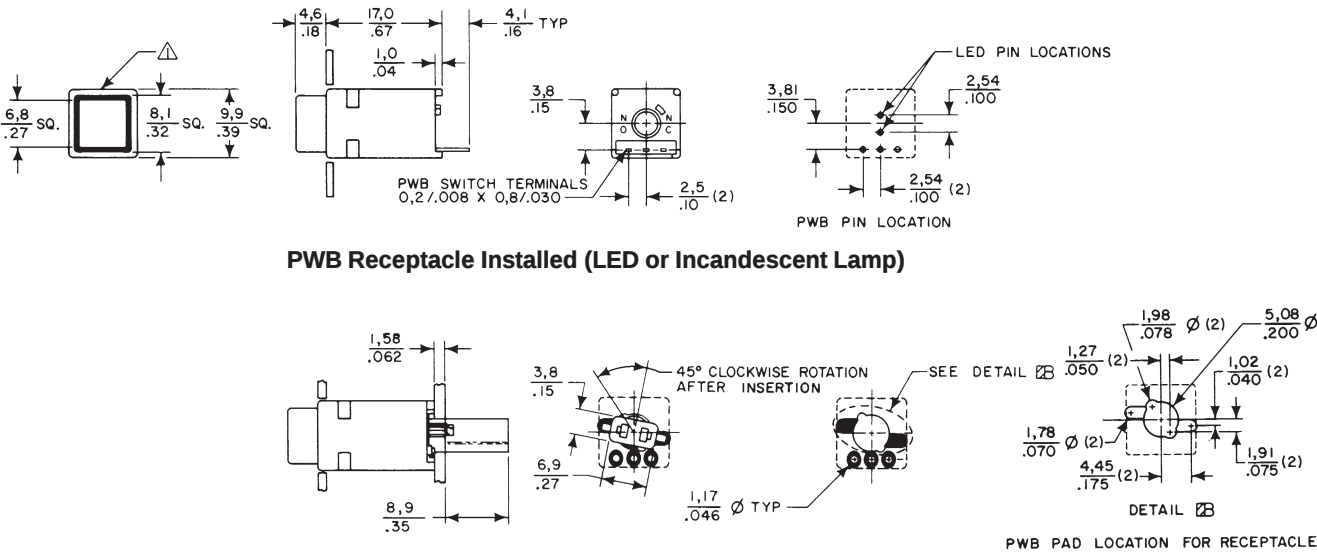
Manual Switches
Miniature Manual Line

MML Series

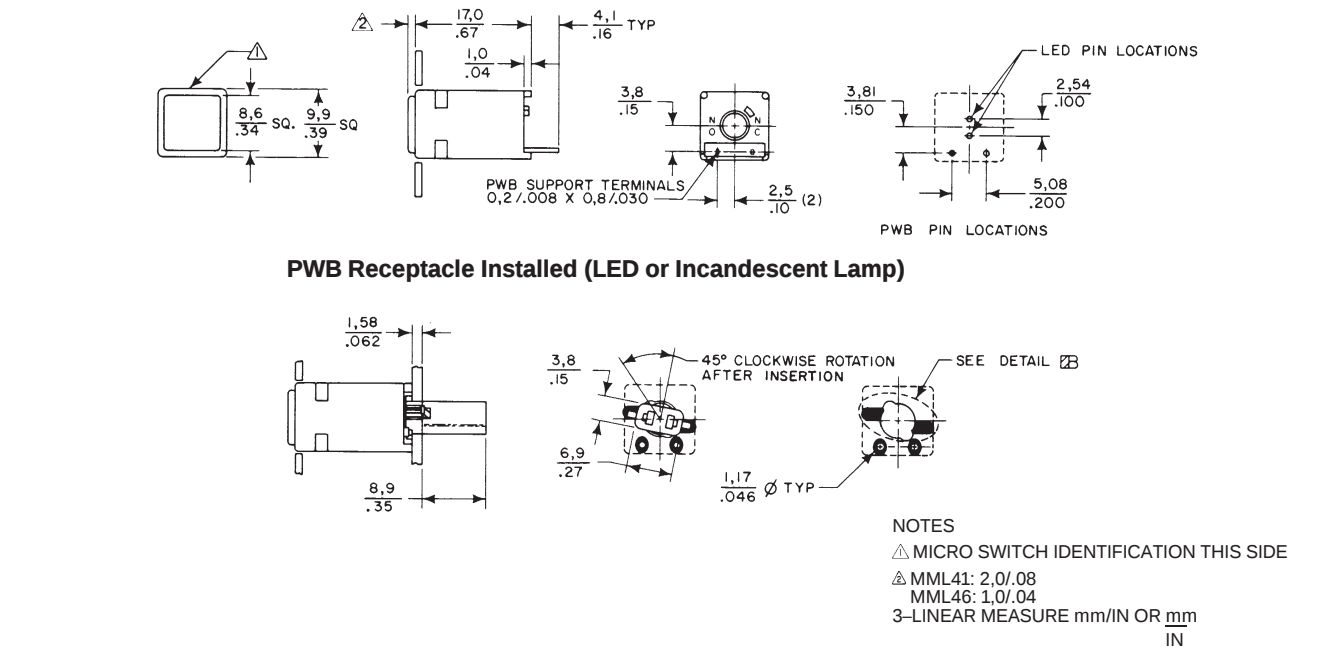
MOUNTING DIMENSIONS (For reference only)

PRINTED WIRING BOARD MOUNT PUSHBUTTON SWITCHES AND INDICATORS/SQUARE TYPE

MML21 Switches

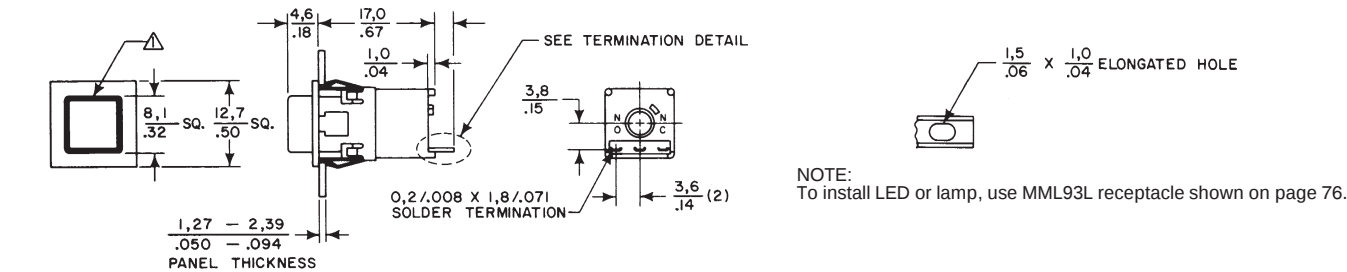


MML46 Indicators



PANEL MOUNT PUSHBUTTON SWITCHES/SQUARE TYPE

MML21 Switches



Manual Switches

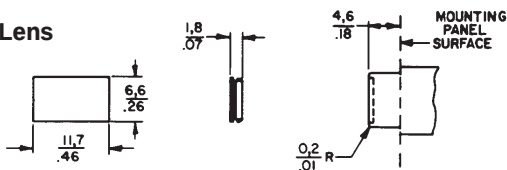
Miniature Manual Line

MML Series

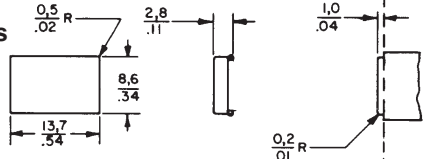
MOUNTING DIMENSIONS (For reference only)

LENSES

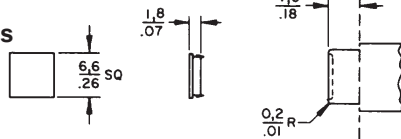
Rectangular Pushbutton Lens



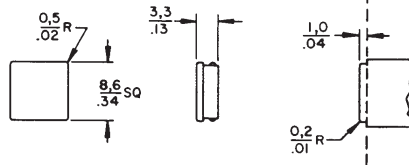
Rectangular Indicator Lens



Square Pushbutton Lens

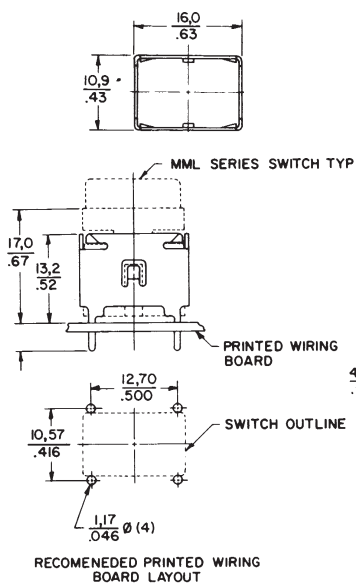


Square Indicator Lens

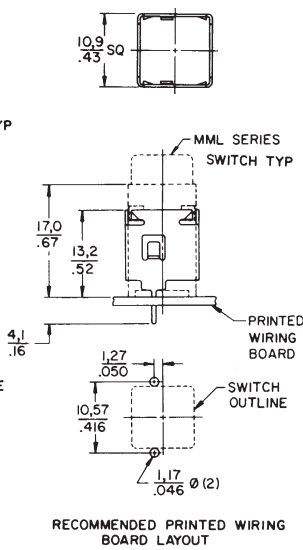


PWB SUPPORT BRACKETS

Rectangular



Square

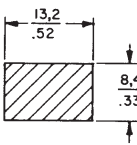


Manual Switches
Miniature Manual Line

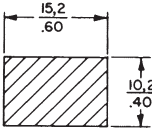
MML Series

MOUNTING DIMENSIONS (For reference only)

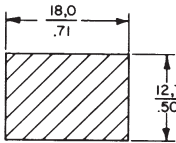
PANEL CUTOUTS FOR PWB MOUNT PADDLE AND ROCKER SWITCHES



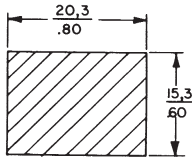
Actuator
Thru Panel



Housing
Thru Panel



2-Pole
MML33, 34 Actuator

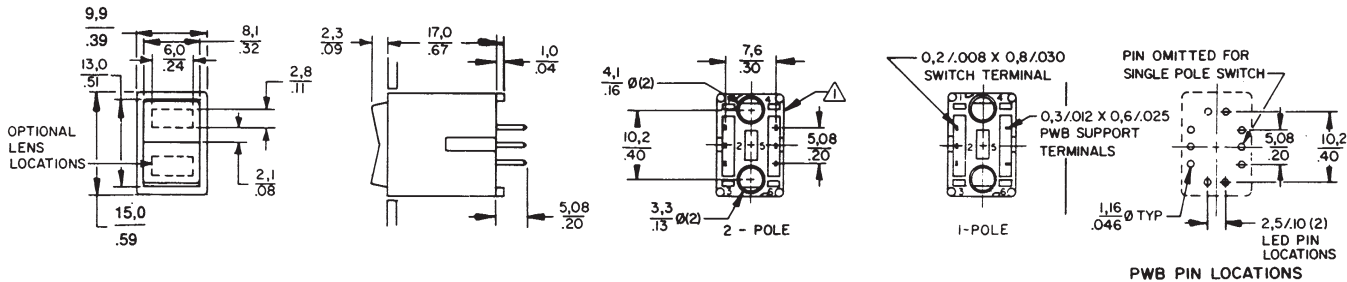


2-Pole
MML33, 34
Thru Panel

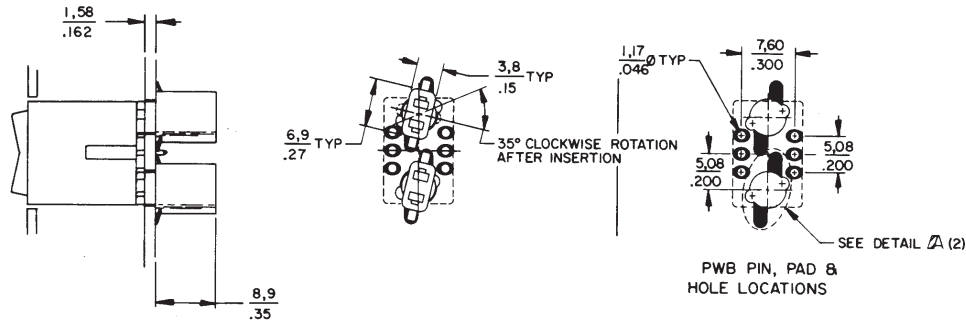
Housing Thru Panel

See page 77 for panel punch manufacturer.

MML24 Rocker Switches

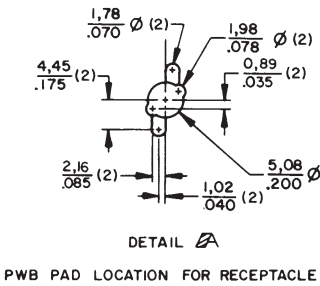


With PWB Receptacle Installed (LED or Incandescent Lamp)



Notes:
△ MICRO SWITCH Identification
This Side
2 – Linear measure mm/IN. or $\frac{\text{mm}}{\text{IN.}}$

Manuals



Manual Switches

Miniature Manual Line

PANEL MOUNT ROCKER SWITCHES

Figure 1 shows the mechanical drawing of the 16-pin DIP package. The drawing includes three views: a top view, a side view, and a bottom view. The top view shows the pin locations and dimensions: 17.8, 12.7, 6.1, 2.8, 1.3, 1.0, 5.1, 1.0, 17.0, 13.0, 8.1, 2.0, 15.0, 9.9, 3.3. The side view shows the package profile. The bottom view shows the solder termination dimensions: 0.2 x 1.8, 15.0, 9.9, 3.3. The text "OPTIONAL LENS LOCATIONS" is present on the top view.

Notes:

 MICRO SWITCH Identification This Side

2 – Linear measure mm/IN. or $\frac{\text{mm}}{\text{IN.}}$

NOTE:

To install LED or lamp, use MML93R receptacle shown on page 75.