

# Manual Switches

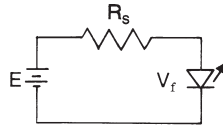
## LEDs

### 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.

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

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

### 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 86.

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.

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### 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.

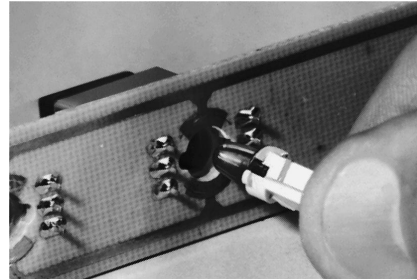
**User installed.** LEDs can also be ordered separately and installed in these products by the user, per the procedures described below.

### LED INSTALLATION

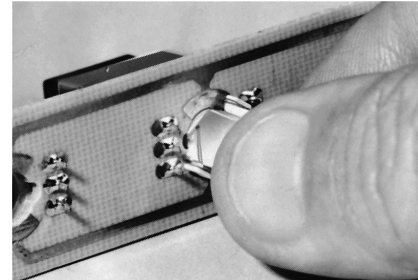
#### 1. With Printed Wiring Board Receptacle. (MML93K)

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 87.

Printed wiring boards are not supplied.



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

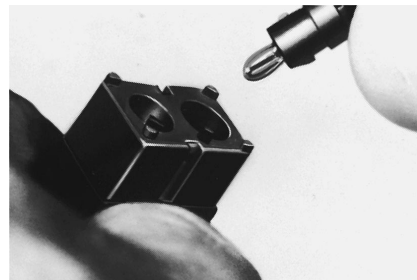


2. A 1/8-turn applied clockwise to the receptacle locks it in the printed wiring board and establishes the electrical connection.

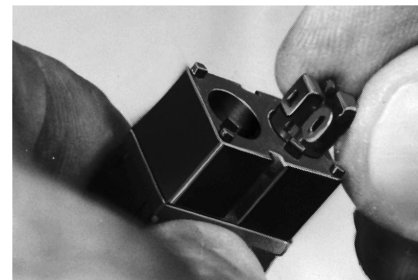
#### 2. With Solder Terminal Receptacle. (MML93J)

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.

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.

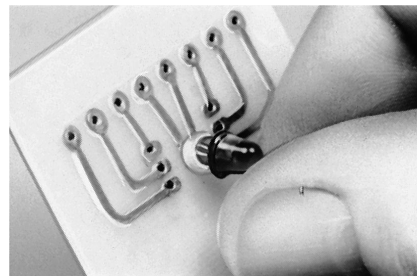


2. A 1/8-turn clockwise applied to the receptacle locks it in the base.

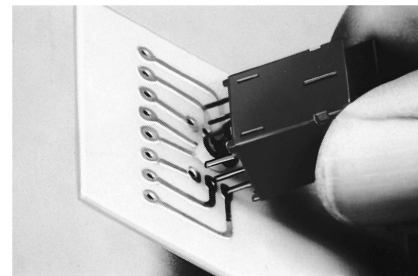
#### 3. By Soldering To Printed Wiring Board.

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

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



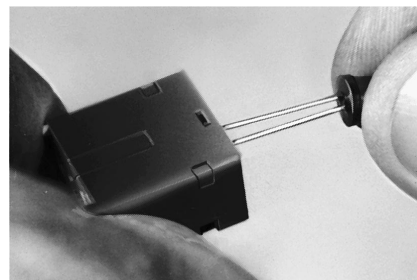
1. Assemble stand-off spacer to LED terminals and seat on printed wiring board.



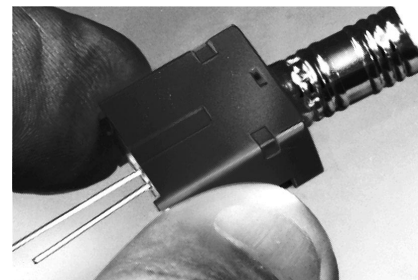
2. Seat housing on printed wiring board, with LED projecting into hole at the base of the housing.

#### 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.