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Sensing and Control
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Sensing and Control

Honeywell Inc.

11 West Spring Street

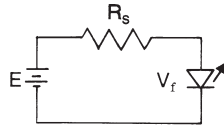
Freeport, IL 61032

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 74.

LED Type	Use To Illuminate	Catalog Listing	LED Color	Forward Characteristics Typ. @ 20mA	Max.	LED Manufacturers' Part Numbers
T-1 $\frac{3}{4}$	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-1 $\frac{3}{4}$	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.

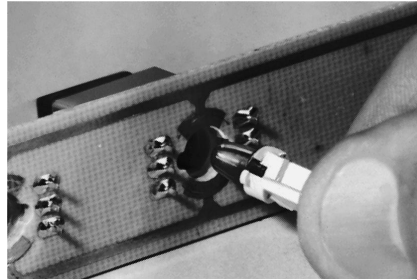
User installed. LEDs can also be ordered separately and installed in these products by the user, per the procedures described below.

LED INSTALLATION

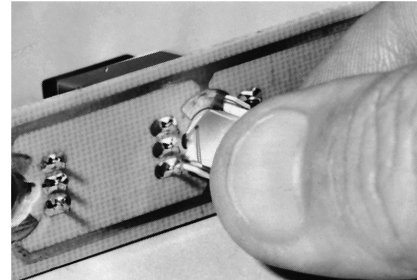
1. With Printed Wiring Board Receptacle. (MML93K)

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

Printed wiring boards are not supplied.



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

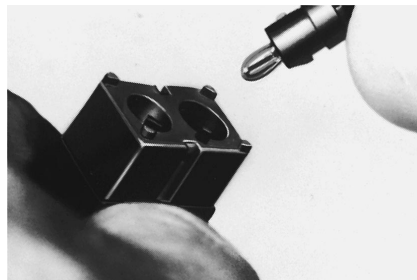


2. A $\frac{1}{8}$ -turn applied clockwise to the receptacle locks it in the printed wiring board and establishes the electrical connection.

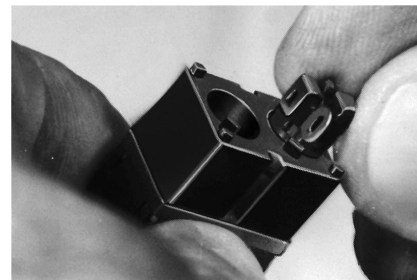
2. With Solder Terminal Receptacle. (MML93J)

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.

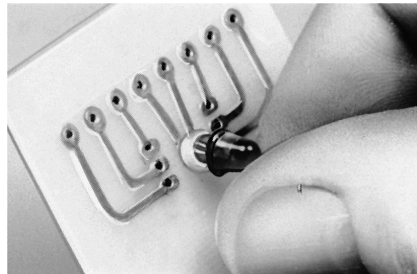


2. A $\frac{1}{8}$ -turn clockwise applied to the receptacle locks it in the base.

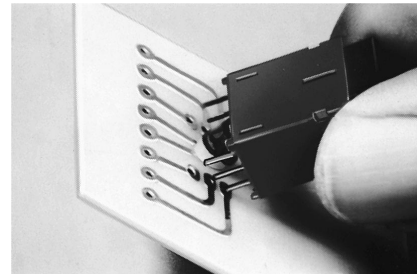
3. By Soldering To Printed Wiring Board.

In this procedure, the housing is mounted on the printed wiring board after the T-1 $\frac{3}{4}$ LED has been seated.

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



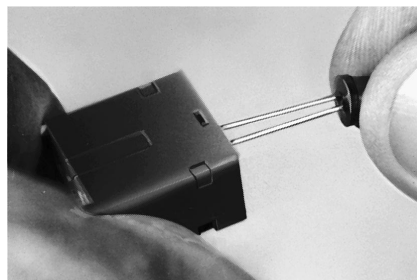
1. Assemble stand-off spacer to LED terminals and seat on printed wiring board.



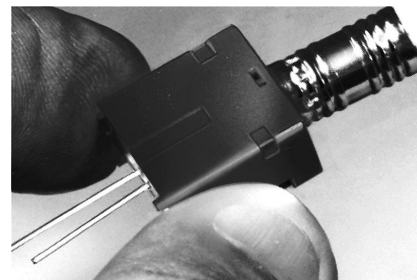
2. Seat housing on printed wiring board, with LED projecting into hole at the base of the housing.

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

T-1 $\frac{3}{4}$ 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 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		Industry Lamp No.
			Solder Receptacle	T-1 (Unbased) Lamp Only	
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

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.

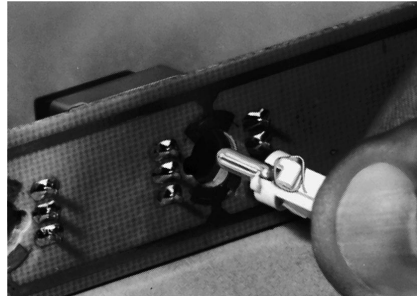
LAMP INSTALLATION

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

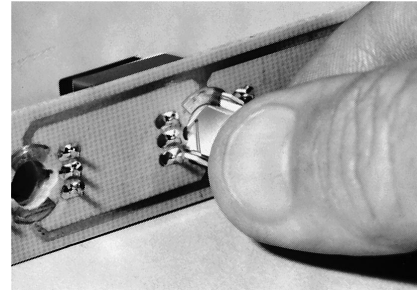
Use PWB receptacles to permit lamps to be added or replaced from behind the printed wiring board, without soldering.

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.

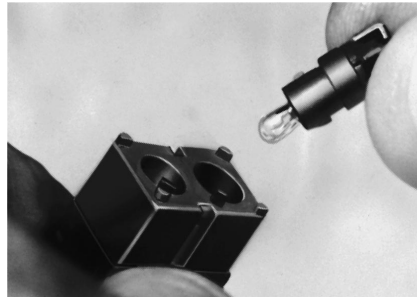


2. A 1/8-turn applied clockwise to the receptacle locks it in the printed wiring board and establishes the electrical connection.

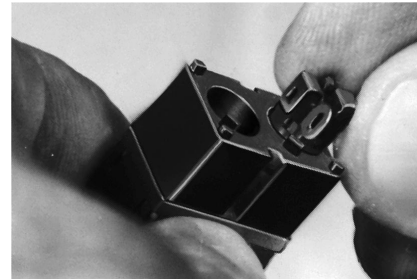
2. With Solder Terminal Receptacle for MML93J bi-pin only

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.

