

EAT•N

AEROSPACE CONTROLS DIVISION

SERIES 951/952 SUNLIGHT READABLE LOW PROFILE MODULE

SUNLIGHT READABLE
NVIS COMPATIBLE

| | | | | | | |
|---------|-------|--------|--------|----------|-------|--------|
| LOW | LED | SERIES | INCAND | SPARE II | DRIP | 951 |
| PROFILE | ILLUM | 951 | ILLUM | ANNUN | PROOF | FAMILY |



SERIES 951/952 LOW PROFILE MODULE

Background

The Series 951/952 was designed to provide a modular low profile annunciator family of products for use in cockpit or other applications where behind panel space, low power, and sunlight readability are primary requirements.

Through our many years of experience in dealing with customer special needs, we have recognized and designed in features needed to make the Series 951/952 the most economical choice.

THE SERIES 951/952 SPECIAL FEATURES ARE:

Low Profile

The overall depth of the unit is 1.15 inches when mounted in a rack terminating in a PC board. When mounted in a rack with connector blocks, the overall depth is 1.45 inches.

Two Size Annunciators

The 951 is a single module capable of a two-line message. The 952 is a dual module capable of a four-line message. Both types can be used within the same matrix.

Mounting

The Series 951/952 has been designed to be modular, with plug-in modules in a panel mounted matrix, up to six horizontal stations by 15 vertical stations as standard. Two matrix configurations and two single mount configurations are available.

Matrix Mount Configurations

Rear mount: **RX** type
(may be used with edge lit panels).
Front mount: **RW** type.

Single Unit Mounting Configurations

Sleeve mounting: **R1** type.
Spring clip mounting: **R2** type.

Light Source

Incandescent lamps: 5 & 28 VDC
Light Emitting Diodes: 5 & 28 VDC
(28 VDC LED modules require external resistor assembly)

Sunlight Readable

The Series 951/952 is available with state-of-the-art optics including superb uniformity and off-angle legibility. Standard configuration includes sunlight readability and NVIS compatibility. The Series 951/952 is available with lenses that are legible in direct sunlight (10,000 foot candles).

NVIS Lighting

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

Drip Proof

The Series 951 low profile annunciator and mounting matrix can be supplied with drip-proof seal.

Plug In Modules

The 951/952 are modular plug-in annunciators, easily removable for replacement of light source, legends or complete modules.

Easily Maintained

The lamps or LEDs are easily replaced from the front of the panel; replaceable as individual or complete lamp circuit assemblies.

Termination

STD: Insertable snap-in socket contacts; crimp, solder, or wire wrap. (See Page 10 - Fig. 1 & 2)

MIL Qual: Insertable snap-in contact, removable, crimp, or solder, in accordance with MIL-C-39029 (See Page 10 - Fig. 3).

Environmental Specifications

The 951/952 low profile product family has been designed to meet the following specified environmental conditions. Please note that the specifications differ based on the light source.

Temperatures

| | | |
|---------------------------|-------|-------|
| Operating Temperature | | |
| a. Incandescent | -55°C | +85°C |
| b. Single Chip LED | -30°C | +65°C |
| c. Four-Chip LED | -25°C | +60°C |
| Non-Operating Temperature | -55°C | +85°C |

Vibration: Mil-Std-202

Incandescent type:
Method 204, Condition A, 10 to 500 Hz (10G)
LED type:
Method 204, Condition B, 10 to 2000 Hz (15G)

Shock: Mil-Std-202

Incandescent type: Method 202 Condition B, 30G (PK)
LED type: Method 213, Condition H, 75G (PK)

Salt Spray: Mil-Std-108

Method 101, Condition A.

Moisture Resistance: Mil-Std-202

Method 106

Mechanical Specifications

Weight: Single Annunciator Module 5 Grams
Dual Annunciator Module 10 Grams
Module extraction force:
Single Module 2.0 to 4.0 lbs.
Dual Module 4.0 to 8.0 lbs.

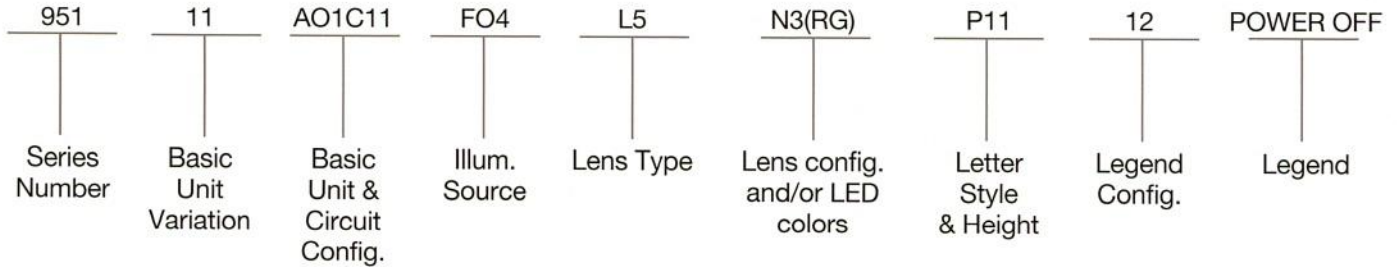
Optical Specifications

When sunlight readable lenses are specified (L5), the average contrast of each lighted legend character to the background is 0.6 minimum. The contrast of each unlighted legend character to the background is less than 0.1. The average contrast of each legend to the background is measured with incidental illumination of 10,000 foot candles directed at an angle of 45 degrees to the viewing surface.

HOW TO USE THIS CATALOG

This catalog describes each of the standard and optional elements of the Series 951 and 952 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.

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 Eaton. Consult your Eaton representative for details.



Description of Ordering Code Series Number

The first three digits of the ordering code identify the annunciator module type:

- 951 - Single Module
- 952 - Dual Module

Basic Unit Variation

Digits 4 and 5 identify variations to the basic unit. The following are available:

- 11 - Unsealed Module - terminates with .040 pins in standard connector
- 12 - Sealed Module - terminates with .040 pins in standard connector (951 only)
- 13 - Unsealed Module - terminates with .030 pins for use with Mil Qualified connector
- 14 - Sealed Module - terminates with .030 pins for use with Mil Qualified connector (951 only)

Basic Unit and Lamp Circuit Configuration

Digits 6 through 11 identify the basic unit, circuit, and termination arrangement. The circuits identified on page 3 refer to 951 modules only. Please note that the 952 will use two circuits per module.

Identification code and description of these features are as follows:

| BASIC UNIT | | CIRCUIT CONFIGURATION |
|------------|----------------------|-------------------------------|
| A01C11 | 2 Incandescent Lamps | 2 Terminal Annunciator Module |
| A01C12 | 4 Incandescent Lamps | 3 Terminal Annunciator Module |
| A01C13 | 4 Incandescent Lamps | 4 Terminal Annunciator Module |
| A02C21 | 4 Single Chip LEDs | 2 Terminal Annunciator Module |
| A02C22 | 4 Single Chip LEDs | 3 Terminal Annunciator Module |
| A02C23 | 4 Single Chip LEDs | 4 Terminal Annunciator Module |
| A03C31 | 4 Four Chip LEDs | 6 Terminal Annunciator Module |
| A03C32 | 4 Four Chip LEDs | 7 Terminal Annunciator Module |

Illumination Source F—

The Series 951 uses 4 T1 Bi-Pin 5 volt incandescent lamps or 2 T1 Bi-Pin 28 volt lamps. For LED light source, each 951 uses 4 Bi-Pin LEDs. Please note: Each 952 will require twice as many lamps as noted above for the Series 951.

Table I - Incandescent Lamps

| TYPE | VOLTAGE | CURRENT mA | MSCP ±25% |
|------|---------|---------------|--------------|
| F03 | 5 | 21 | .034 |
| F04 | 28 | 20 | .15 |
| F08 | 5 | 60 | .15 |

Table II - LED Light Source

| TYPE | MAX. VOLTS | MIN. VOLTS | CURRENT* mA |
|------|---------------|---------------|----------------|
| F11 | 5 | 4.75 | 40 |
| F42 | 28 | 12.0 | 68 |
| F44 | 28 | 22.0 | 34 |

- F11 BI-PIN SINGLE CHIP LED
- F42 BI-PIN 4 CHIP LED (2 CHIPS IN SERIES)
- F44 BI-PIN 4 CHIP LED (4 CHIPS IN SERIES)
- *TOTAL CURRENT PER 951 MODULE

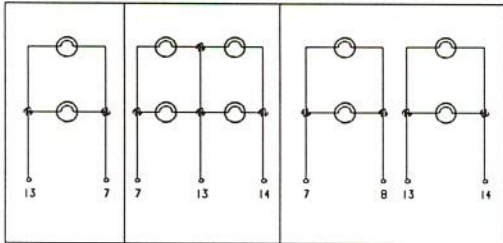
Table III - Color Designation for LED Light Source

LEDs are available in the following colors. When ordering, the color designation must be entered as a part of the lens configuration N_(*).

| COLOR DESIGNATION | NAME | PEAK WAVELENGTH (in nm) |
|-------------------|------------|----------------------------|
| U | Ultra Red | 660 |
| G | Green | 565 |
| P | Pure Green | 555 |
| A | Amber | 585 |
| O | Orange | 610 |

951 ANNUNCIATOR CIRCUIT SCHEMATICS

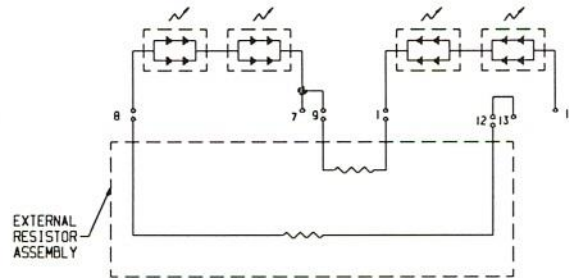
Incandescent Illuminated Annunciator Circuit Schematic:



C11F-- C12F-- C13F--

Select Lamp from Table I.

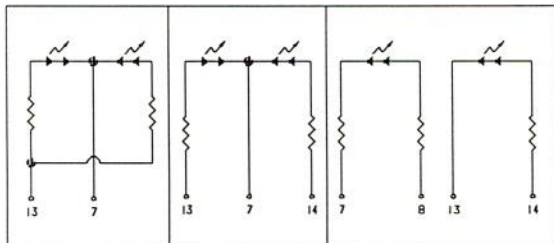
Four chip led annunciator circuit schematic: (split display)



C32F42

For LED information see Table II.

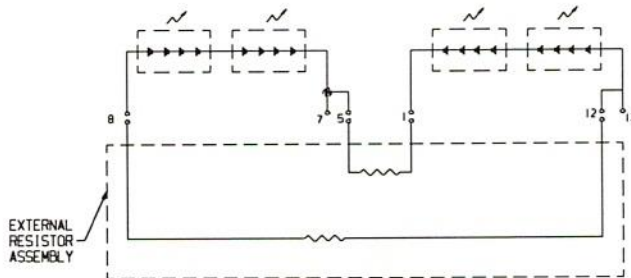
Single Chip LED Annunciator Circuit Schematics:



C21F11 C22F11 C23F11

For LED information see Table II.

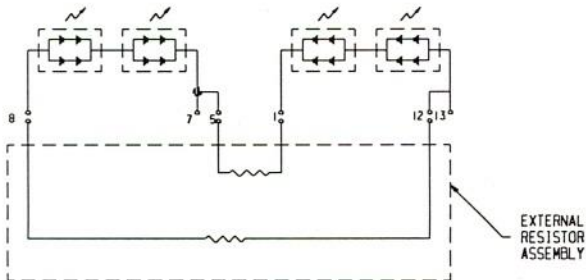
Four Chip LED Annunciator Circuit Schematic: (full display)



C31F44

For LED information see Table II.

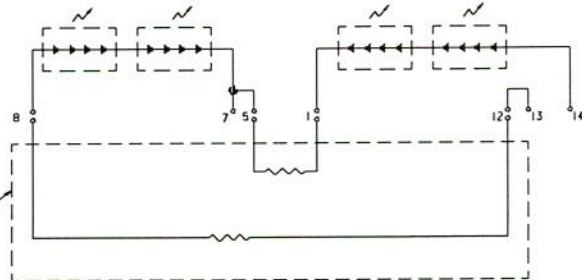
Four Chip LED Annunciator Circuit Schematic: (full display)



C31F42

For LED information see Table II.

Four Chip LED Annunciator Circuit Schematic: (split display)



C32F44

For LED information see Table II.

Lens Type

The letter L and the number immediately following it specify the lens type. The common types are listed below. For special requirements, please consult the factory. Due to the difference in illuminated characteristics of LEDs versus incandescent lamps, the lens assemblies are different; therefore, part numbers are different.

Incan. LED

- L1 L21 **Lighted letters:** Letters appear white on black background until illuminated and then letters appear in color. Background remains black.
- L2 L22 **Lighted background:** Letters appear black on a white background until illuminated and then background appears in color. Letters remain black.
- L3 L23 **Hidden Message Lighted Letters:** Letters are not legible until illuminated and then letters appear in color. Background remains black.
- L4 L24 **Hidden Message Lighted Background:** Letters are not legible until illuminated and then background appears in color. Letters remain black. Not sunlight readable.
- L5 L25* **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. Sunlight readability is achieved by using F04 or F08 incandescent lamps.
- L6 L26 **Colored Background:** Letters appear black against a colored background until illuminated and then background appears in lighted color. Letters remain black.
- L60 N/A **NVIS:** Night Vision Goggle Compatible/Sunlight Readable. Use F08 Lamps (4 each)

*Daylight readable when using F42 or F44 LED

Lens Configuration and Color Filter N-()

Select the number above the illustration below that describes the display screen arrangement desired. Use the letters in the brackets above the illustration to indicate the required color filter or LED color. The sequence in which the letters for the color must be written in the brackets is in order of viewing from left to right.

951 Module



952 Module



For LED color designation, see Table III, Page 2

Incandescent colors are:

| Color Code | Description |
|------------|-------------------------------|
| A | Aviation Yellow |
| L | Blue (Not SRL) |
| D | Lunar White |
| F | NVIS Green A per MIL-L-85762A |
| G | Green |
| H | NVIS Green B per MIL-L-85762A |
| J | NVIS Yellow per MIL-L-85762A |
| K | NVIS Red per MIL-L-85762A |
| R | Aviation Red |

Letter Style and Letter Height

The letter "P" and the number immediately following designate the letter style (font) and height to be used. The letter styles and fonts available are as follows:

| CODE | MSC FONT STYLE | CHARACTER HEIGHT | CHARACTERS PER ROW |
|------|----------------|------------------|--------------------|
| P12 | FONT I | 0.090 (STD) | 11 |
| P11 | FONT I | 0.093 | 11 |
| P12 | FONT I | 0.125 | 7 |
| P13 | FONT I | 0.156 | 6 |
| P17 | FONT III | 0.125 | 5 |

Note: Font I is similar to Helvetica Medium
Font II is similar to Futura Bold

Legend Configuration

The number following the letter style and height specifies the legend configuration. Available configurations are shown below. Please note: The configuration shown are for a .090 character height, maximum of 11 characters per row:

Legend Configuration for 951 Annunciator

FULL DISPLAY

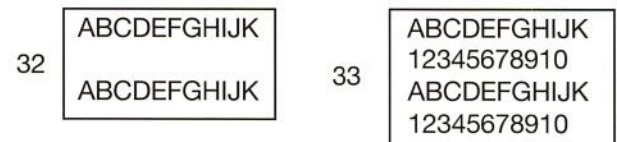


VERTICAL SPLIT

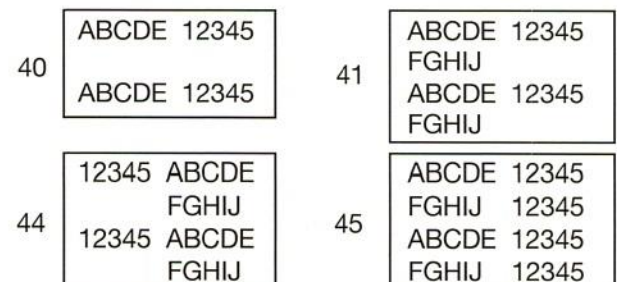


Legend Configuration for 952 Annunciator

FULL DISPLAY

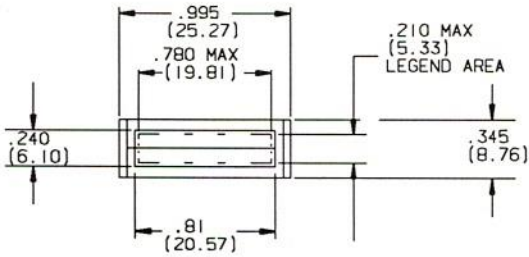
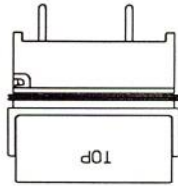


VERTICAL SPLIT

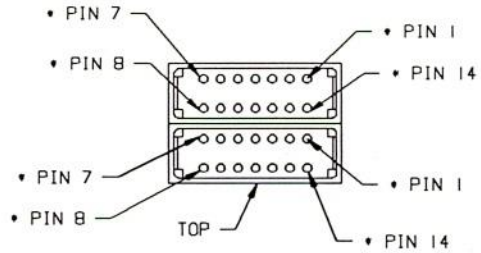
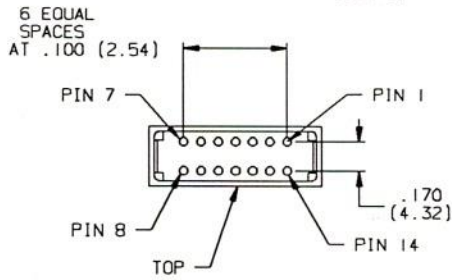
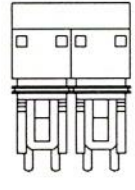
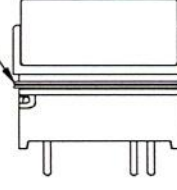
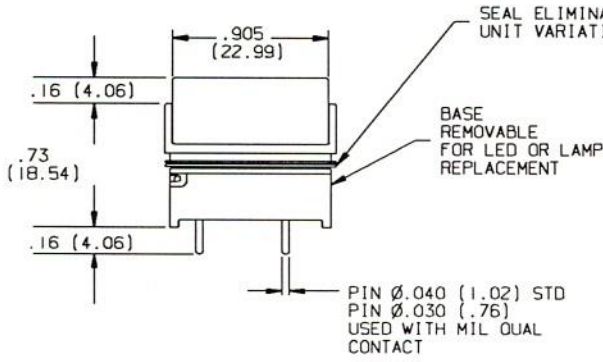
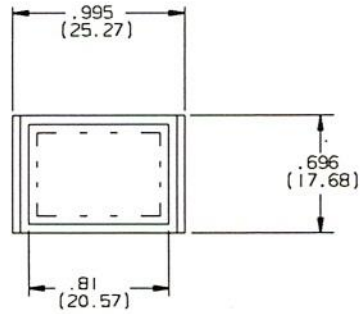
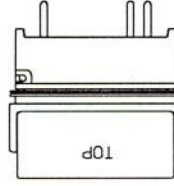


DIMENSIONAL SPECIFICATIONS

Single Module (951)



Dual Module (952)



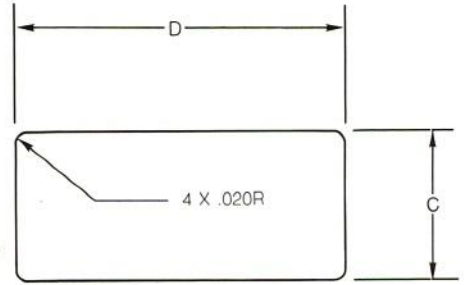
• THE 952 USES 2 CIRCUIT PER MODULE

SERIES 951 MATRICES

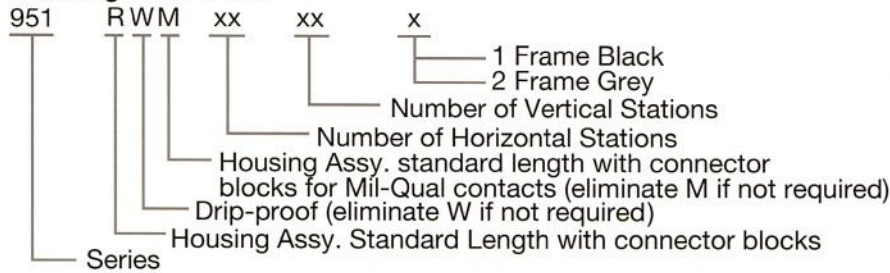
The Series 951 Matrices are modular units that can have any number of channels into which an incandescent or LED 951 or 952 annunciator can be installed. The maximum matrix is 6 horizontal stations by 15 vertical stations. Consult the factory for specific size requirements not shown.

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. Also available with moisture seal and a variety of frame colors. Consult the factory for specific frame color requirements not shown. Each frame is supplied with capsule/retention bezel. Panel thickness range is from .030" to .250"

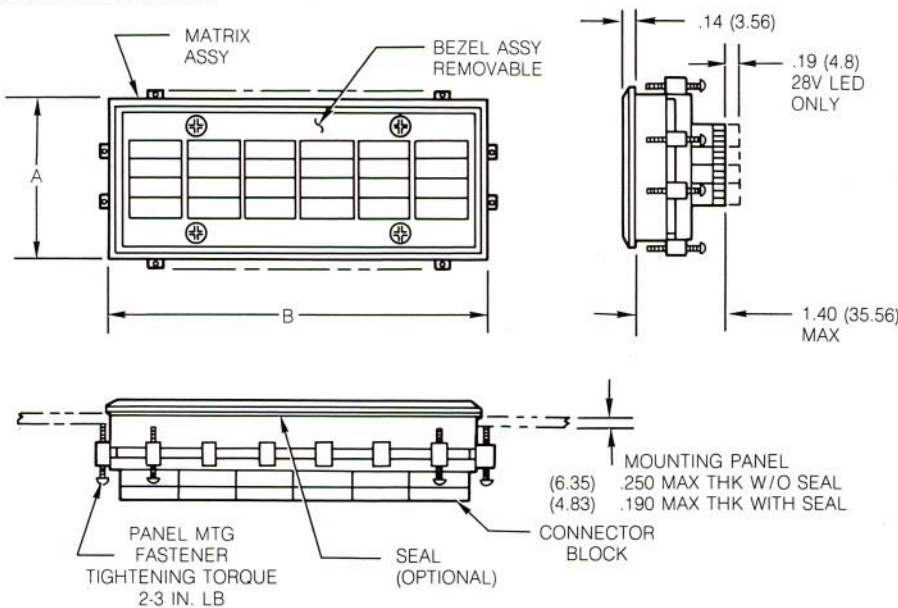


Ordering Information



| NUMBER OF STATIONS VERTICAL | DIMENSION | |
|-----------------------------|------------------|----------|
| | .030 C ± .000 | |
| 1 | 1.570 | (39.88) |
| 2 | 1.920 | (48.77) |
| 3 | 2.270 | (57.66) |
| 4 | 2.620 | (66.55) |
| 5 | 2.970 | (75.44) |
| 6 | 3.320 | (84.33) |
| 7 | 3.670 | (93.22) |
| 8 | 4.020 | (102.11) |
| 9 | 4.370 | (111.00) |
| 10 | 4.720 | (119.89) |
| 11 | 5.070 | (128.78) |
| 12 | 5.420 | (137.67) |
| 13 | 5.770 | (146.56) |
| 14 | 6.120 | (155.45) |
| 15 | 6.470 | (164.34) |

Matrix Dimensions

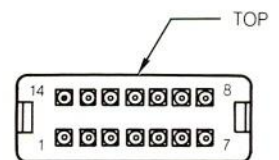


| NUMBER OF STATIONS HORIZONTAL | DIMENSION | |
|-------------------------------|------------------|----------|
| | .030 D ± .000 | |
| 1 | 1.370 | (34.80) |
| 2 | 2.370 | (60.20) |
| 3 | 3.370 | (85.60) |
| 4 | 4.370 | (111.00) |
| 5 | 5.370 | (136.40) |
| 6 | 6.370 | (161.80) |

| NUMBER OF STATIONS VERTICAL | DIMENSION | |
|-----------------------------|-----------|----------|
| | A = .015 | |
| 1 | 1.750 | (44.45) |
| 2 | 2.100 | (53.34) |
| 3 | 2.450 | (62.23) |
| 4 | 2.800 | (71.12) |
| 5 | 3.150 | (80.01) |
| 6 | 3.500 | (88.90) |
| 7 | 3.850 | (97.79) |
| 8 | 4.200 | (105.68) |
| 9 | 4.550 | (115.57) |
| 10 | 4.900 | (124.46) |
| 11 | 5.250 | (133.35) |
| 12 | 5.600 | (142.24) |
| 13 | 5.950 | (151.13) |
| 14 | 6.300 | (160.02) |
| 15 | 6.650 | (168.91) |

| NUMBER OF STATIONS HORIZONTAL | DIMENSION | |
|-------------------------------|-----------|----------|
| | B ± .015 | |
| 1 | 1.550 | (39.37) |
| 2 | 2.550 | (64.77) |
| 3 | 3.550 | (90.17) |
| 4 | 4.550 | (115.57) |
| 5 | 5.550 | (140.97) |
| 6 | 6.550 | (166.37) |

Connector Block



Rear View

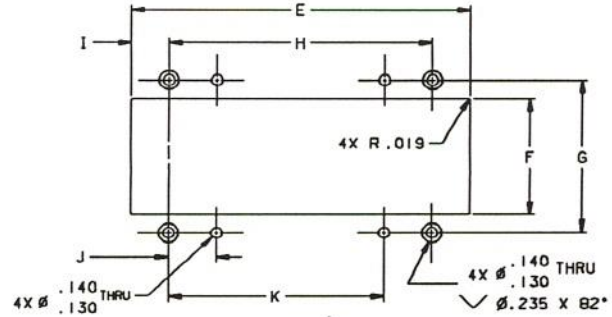
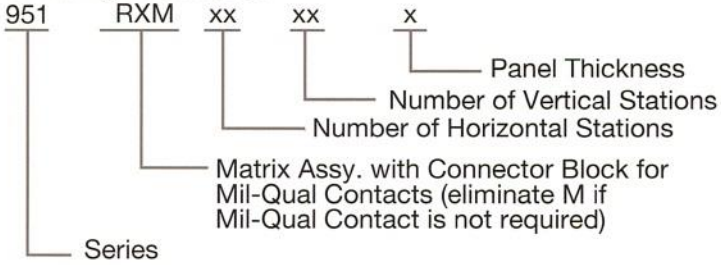
(TERMINALS MUST BE ORDERED SEPARATELY)

SERIES 951 MATRICES

Series 951 Flange Type Matrix*

The flange type matrix is a rear mount unit for applications using edge-lit panels. A variety of panel thickness are available as shown below. Consult the factory for other panel sizes.

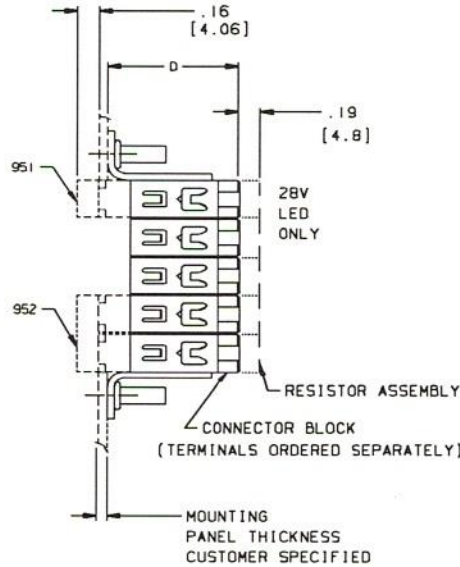
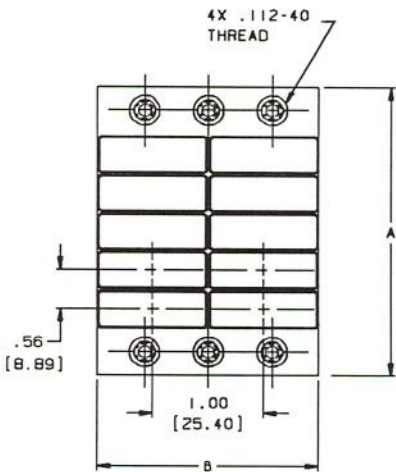
Ordering Information



Recommended Panel Cutout

ORDERING EXAMPLE FOR A 2 X 5 MATRICES AS SHOWN BELOW
951-RX-02-05-3

Matrix Dimension



| NUMBER OF VERTICAL STATIONS | PANEL CUTOUT DIMENSIONS | |
|-----------------------------|-------------------------|----------------|
| | F | G |
| 1 | .370 (9.40) | .828 (21.03) |
| 2 | .720 (18.29) | 1.178 (29.92) |
| 3 | 1.070 (27.18) | 1.528 (38.81) |
| 4 | 1.420 (36.07) | 1.878 (47.70) |
| 5 | 1.770 (44.96) | 2.228 (56.59) |
| 6 | 2.120 (53.85) | 2.578 (65.48) |
| 7 | 2.470 (62.74) | 2.928 (74.37) |
| 8 | 2.820 (71.63) | 3.278 (83.26) |
| 9 | 3.170 (80.52) | 3.628 (92.15) |
| 10 | 3.500 (89.41) | 3.978 (101.04) |
| 11 | 3.870 (98.30) | 4.328 (109.93) |
| 12 | 4.220 (107.90) | 4.678 (118.82) |
| 13 | 4.570 (116.08) | 5.028 (127.71) |
| 14 | 4.920 (124.97) | 5.378 (136.60) |
| 15 | 5.270 (133.86) | 5.728 (145.49) |

| NUMBER OF VERTICAL STATIONS | DIMENSION | |
|-----------------------------|----------------|--|
| | A ± .0-15 | |
| 1 | 1.260 (32.00) | |
| 2 | 1.610 (40.89) | |
| 3 | 1.960 (49.78) | |
| 4 | 2.310 (58.67) | |
| 5 | 2.660 (67.56) | |
| 6 | 3.010 (76.45) | |
| 7 | 3.360 (85.34) | |
| 8 | 3.710 (94.23) | |
| 9 | 4.060 (103.12) | |
| 10 | 4.410 (112.01) | |
| 11 | 4.760 (120.90) | |
| 12 | 5.110 (129.79) | |
| 13 | 5.460 (138.68) | |
| 14 | 5.810 (147.57) | |
| 15 | 6.160 (156.46) | |

| NUMBER OF HORIZONTAL STATIONS | DIMENSION | |
|-------------------------------|---------------|--|
| | B ± .0-15 | |
| 1 | 1.000 (25.4) | |
| 2 | 2.000 (50.8) | |
| 3 | 3.000 (76.2) | |
| 4 | 4.000 (101.6) | |
| 5 | 5.000 (127.0) | |
| 6 | 6.000 (152.4) | |

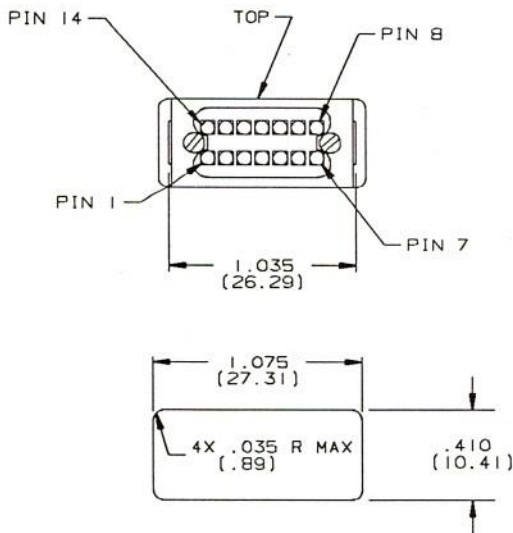
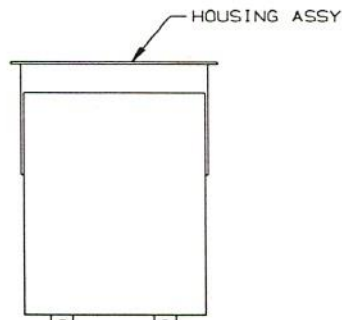
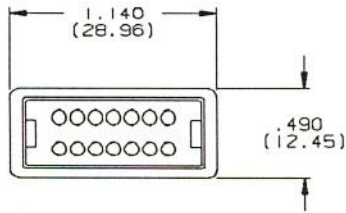
| DASH NO. | PANEL THICKNESS | DIMENSION D ± .03 |
|----------|-----------------|-------------------|
| -1 | .062 (1.57) | 1.26 (32.0) |
| -2 | .093 (2.36) | 1.23 (31.2) |
| -3 | .125 (3.18) | 1.20 (30.5) |
| -4 | .190 (4.83) | 1.14 (28.9) |
| -5 | .250 (6.35) | 1.07 (27.2) |

| NUMBER OF VERTICAL STATIONS | PANEL CUTOUT DIMENSIONS | | | | |
|-----------------------------|-------------------------|---------------|----------------|----------------|----------------|
| | I | J | K | H | E |
| 1 | .165 (4.19) | .360 (9.14) | ----- | .720 (18.29) | 1.050 (26.67) |
| 2 | .450 (11.43) | .575 (14.61) | ----- | 1.150 (29.21) | 2.050 (52.07) |
| 3 | .450 (11.43) | 1.075 (27.31) | ----- | 2.150 (54.61) | 3.050 (77.47) |
| 4 | .450 (11.43) | .575 (14.61) | 2.575 (65.40) | 3.150 (80.07) | 4.050 (102.87) |
| 5 | .450 (11.43) | .575 (14.61) | 3.575 (90.81) | 4.150 (105.41) | 5.050 (128.27) |
| 6 | .450 (11.43) | 1.075 (27.31) | 4.075 (103.51) | 5.150 (130.81) | 6.050 (153.67) |

* PLEASE NOTE: EACH 952 ANNUNCIATOR REQUIRES 2 VERTICAL MATRIX STATIONS

951 LPM HARD MOUNT

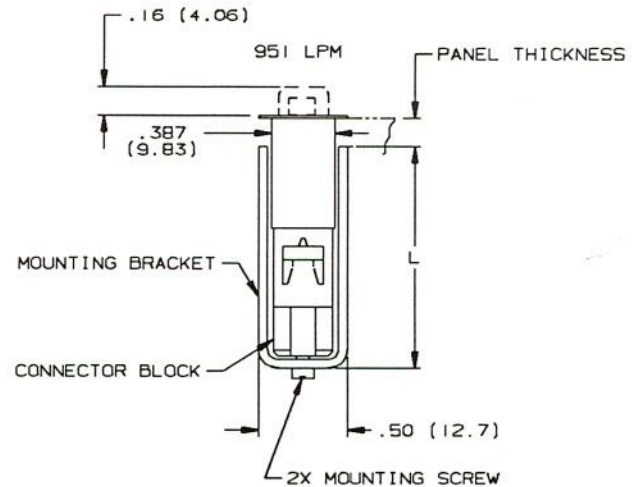
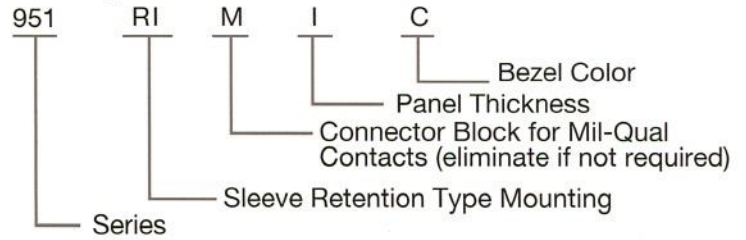
Individual Unit Sleeve Retention Type Mounting



Recommended Panel Cutout

To mount remove mounting bracket by removing the two mounting screws. Insert housing assembly into panel cutout from front. Replace the mounting bracket at the rear of the panel and tighten the two mounting screws to draw the mounting bracket up against the back of the panel and secure in place.

Ordering Information



(TERMINALS MUST BE ORDERED SEPARATELY)

Panel Thickness

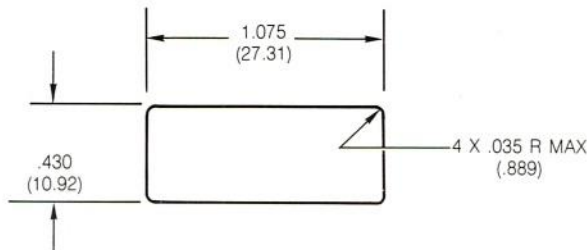
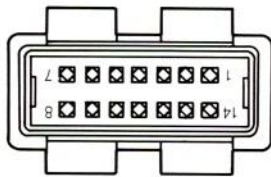
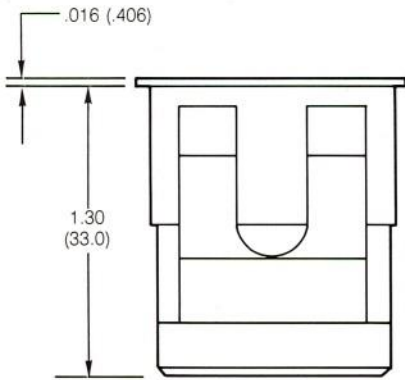
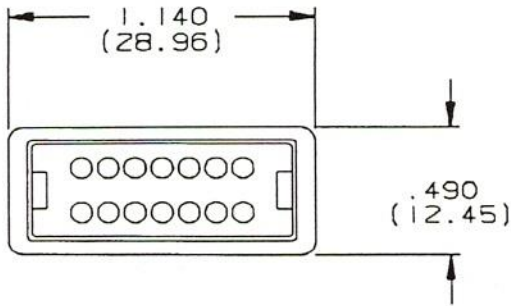
| CATALOG PART NO. | DIM L | PANEL THICKNESS |
|----------------------|------------------|-----------------|
| 951-R-1 951-RIM-1 | 1.140 (28.95) | .250 (6.35) |
| 951-R-2 951-RIM-2 | 1.200 (30.48) | .190 (4.83) |
| 951-R-3 951-RIM-3 | 1.230 (31.24) | .156 (3.96) |
| 951-R-4 951-RIM-4 | 1.260 (32.00) | .125 (3.18) |
| 951-R-5 951-RIM-5 | 1.290 (32.77) | .093 (2.36) |
| 951-R-6 951-RIM-6 | 1.325 (33.65) | .062 (1.57) |

Bezel Color

| DESIGNATION | COLOR |
|-------------|-------|
| C | CLEAR |
| B | BLACK |
| G | GRAY |

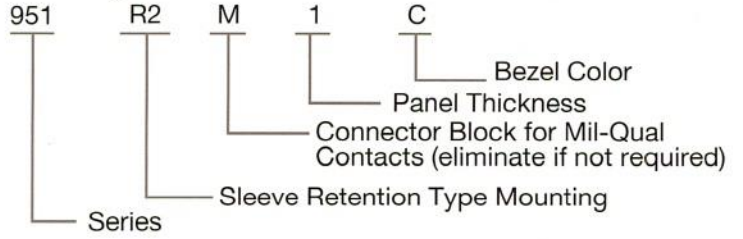
951 LPM SPRING CLIP MOUNT

Individual Unit Spring-Clip – Retention Type Mounting

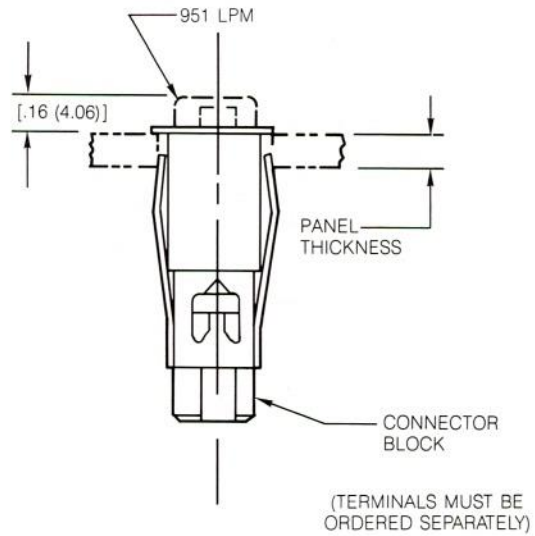


Recommended Panel Cutout

Ordering Information



| CATALOG PART NO. | | PANEL THICKNESS |
|------------------|-----------|-----------------|
| 951-R2-1 | 951-R2M-1 | .062 (1.57) |
| 951-R2-2 | 951-R2M-2 | .093 (2.36) |
| 951-R2-3 | 951-R2M-3 | .125 (3.18) |
| 951-R2-4 | 951-R2M-4 | .190 (4.83) |
| 951-R2-5 | 951-R2M-5 | .250 (6.35) |



Bezel Color

| DESIGNATION | COLOR |
|-------------|-------|
| C | CLEAR |
| B | BLACK |
| G | GRAY |

READY TO WIRE WITH CRIMP OR WIREWRAP/PCB TERMINALS

A variety of insertable terminals are available to wire the connector block at the rear of each channel in the matrix. Terminals come packaged 25 to a bag and are offered separately.

| PART NUMBER | TERMINAL TYPE | DIMENSIONS | | | MAX. NO. OF TERMINATIONS PER POST |
|-------------|---------------|------------|---------------|--------------|-----------------------------------|
| | | FIGURE | A | B | |
| 951-921 | WIREWRAP/PCB | 1 | .767 [19.48] | .257 [6.53] | 1 |
| 951-914 | WIREWRAP/PCB | 1 | .981 [24.92] | .471 [11.96] | 2 |
| 951-915 | WIREWRAP/PCB | 1 | 1.195 [30.35] | .685 [17.4] | 3 |
| 951-920 | CRIMP | 2 | | | |
| 951-930 | CRIMP/SOLDER | 3 | | | |

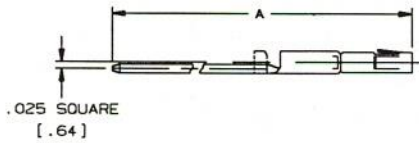
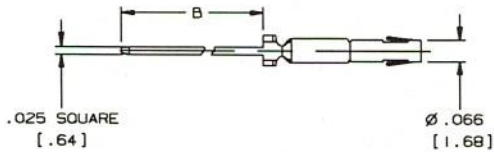


FIGURE 1 - WIREWRAP/PCB TERMINAL

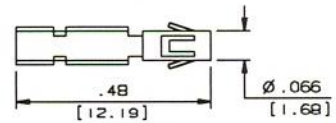


FIGURE 2 - CRIMP TERMINAL (20-24 AWG WIRE)

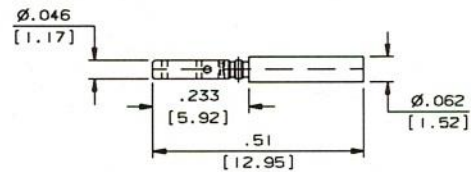
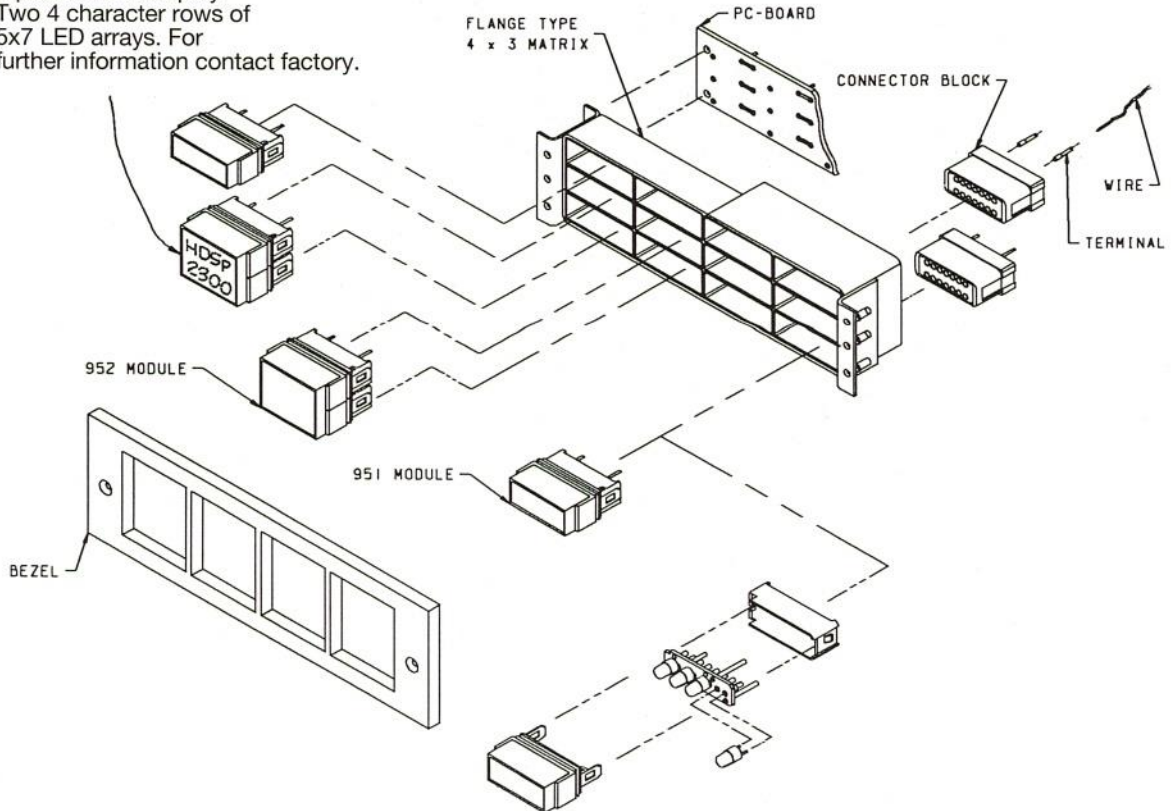


FIGURE 3 - CRIMP TERMINAL (M39029/57-354)

Programmable Multi-Legend

Alphanumeric display:
Two 4 character rows of
5x7 LED arrays. For
further information contact factory.



Typical Illustration Assembly

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