

PHONE:  
(714)549-3041

FAX:  
(714)549-0930



1139 BAKER ST.  
COSTA MESA, CA.  
92626

A Components Corporation of America Company

© Copyright StacoSwitch  
Inc., 2003

CAGE CODE: **12522**

|            | NAME                | DATE     |
|------------|---------------------|----------|
| ORIGINATOR | A. KERTATAMA        | 28MY03   |
| APPROVED   | <i>[Signature]</i>  | 6-2-03   |
| APPROVED   | <i>Phil Handman</i> | 6/2/2003 |

PRODUCT LINE SPECIFICATION

SERIES M2 AND M15

STANDARD MOLDED ELASTOMER KEYPADS

M2 KEYPADS  
M15 KEYCAPS  
M2-M15 ASSEMBLIES

SERIES M2 AND M15 CODED

The information and design disclosed herein was originated by and is the property of STACOSWITCH, INC. STACOSWITCH, INC. reserves all patent, proprietary, design, manufacturing, reproduction, use and sale rights thereto, and to any article disclosed therein, except to the extent rights are expressly granted to others. The foregoing does not apply to vendor proprietary parts.

SERIES M2 AND M15 CODED

SHEET 1 OF 91

H



## TABLE OF CONTENTS

|   |    |
|---|----|
| 1.0 SCOPE.....  | 6  |
| 2.0 M2 AND M15 PRODUCT LINE .....                             | 7  |
| 2.1 PRODUCT LINE FEATURES/OPTIONS .....                       | 7  |
| 2.2 KEYPAD CONFIGURATIONS .....                               | 7  |
| 2.3 LIGHTED KEYPAD .....                                      | 7  |
| 2.4 KEYCAP SHAPE.....   | 8  |
| 2.5 LEGEND SET .....  | 8  |
| 2.6 LEGEND FILM .....   | 8  |
| 3.0 REQUIREMENTS.....   | 9  |
| 3.1 DIMENSIONAL REQUIREMENTS.....                             | 9  |
| 3.1.1 Panel Cutouts and Mounting.....                         | 24 |
| 3.1.1.1 Surface Mount Application.....                        | 24 |
| 3.1.1.2 Rear Mount Application .....                          | 39 |
| 3.1.2 Mounting Torque.....                                    | 54 |
| 3.2 INTERFACE CONNECTIONS .....                               | 54 |
| 3.2.1 Keypad Switching and Lighting Connections.....          | 54 |
| 3.2.2 Qwerty Keyboard Lighting and Switching Connections..... | 57 |
| 3.2.3 LED Electrical Characteristics .....                    | 60 |
| 3.3 ELECTRICAL PERFORMANCE REQUIREMENTS .....                 | 61 |
| 3.3.1 Keypad Contact Rating.....                              | 61 |
| 3.3.2 Keypad Contact Resistance.....                          | 61 |
| 3.3.3 Electrical Life .....                                   | 62 |
| 3.3.4 Contact Bounce .....                                    | 62 |
| 3.3.5 Dielectric Strength.....                                | 62 |
| 3.3.6 Insulation Resistance.....                              | 62 |
| 3.4 MECHANICAL PERFORMANCE .....                              | 62 |
| 3.4.1 Weight.....   | 62 |
| 3.4.2 Mechanical Life .....                                   | 63 |
| 3.4.3 Force Travel Curve.....                                 | 64 |
| 3.4.4 Connector Removal/Retention Force.....                  | 65 |
| 3.5 ENVIRONMENTAL REQUIREMENTS .....                          | 65 |
| 3.5.1 Temperature Range.....                                  | 65 |
| 3.5.2 Thermal Shock.....                                      | 66 |
| 3.5.3 Vibration .....   | 66 |
| 3.5.4 Shock .....   | 66 |
| 3.5.5 Moisture Resistance.....                                | 66 |
| 3.5.6 NEMA 4.....   | 66 |
| 3.5.7 Salt Spray .....  | 66 |
| 3.5.8 Sand and Dust .....                                     | 67 |

|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 3    |

|  |    |
|--|----|
| 3.5.9 EMI/RFI Shielding.....   | 67 |
| 3.5.10 Legend Chemical Resistance .....                                  | 67 |
| 3.5.11 Legend Wear .....   | 67 |
| 3.5.12 Legend Adhesion .....   | 68 |
| 3.5.13 Finger Print Resistance.....                                      | 68 |
| 3.6 MATERIAL REQUIREMENT.....  | 68 |
| 3.6.1 Corrosion Resistance .....   | 68 |
| 3.6.2 Fungus.....  | 68 |
| 3.6.3 Finish.....  | 68 |
| 3.6.4 Terminal Plating.....  | 68 |
| 3.7 OTHER REQUIREMENTS.....  | 69 |
| 3.7.1 Marking.....   | 69 |
| 3.7.2 Workmanship.....   | 69 |
| 3.7.3 Quality.....   | 69 |
| 3.7.4 Changes In Specification.....                                      | 69 |
| <br>   |    |
| 4.0 PART NUMBER INFORMATION.....   | 70 |
| 4.1 M2 KEYPADS .....   | 70 |
| 4.2 M15 KEYCAPS.....   | 73 |
| 4.2.1 Blank Legend Sets Code 00.....                                     | 77 |
| 4.2.2 Telecommunications Legend Set Code 01 .....                        | 78 |
| 4.2.3 Computer Legend and Arrows Legend Set Code 02.....                 | 79 |
| 4.2.4 Numerical Pad Legend Set Code 03.....                              | 79 |
| 4.2.5 Math Functions Legend Set Code 04 .....                            | 80 |
| 4.2.6 Numerals and Arrows Legend Set Code 05.....                        | 80 |
| 4.2.7 Function Keys Legend Set Code 06 .....                             | 81 |
| 4.2.8 Alpha A - P Legend Set Code 07.....                                | 81 |
| 4.2.9 Alpha Q - Z and Punctuations Legend Set Code 08.....               | 82 |
| 4.2.10 Qwerty 0 - 9 and Brackets Legend Set Code 09 .....                | 82 |
| 4.2.11 Qwerty Peripheral Control Keys Legend Set Code 10 .....           | 83 |
| 4.2.12 Rectangular On, Off and Arrows Legend Set Code 11 .....           | 83 |
| 4.2.13 Qwerty Set 1, Q - H Legend Set Code 12 .....                      | 84 |
| 4.2.14 Qwerty Set 2, J - M and Punctuations Legend Set Code 13.....      | 84 |
| 4.2.15 Fn Qwerty Navigation Legend Set Code 14 .....                     | 85 |
| 4.2.16 Fn Qwerty Number Legend Set Code 15.....                          | 85 |
| 4.2.17 F12 Qwerty Number Legend Set Code 18.....                         | 86 |
| 4.2.18 Pause Qwerty Navigation Legend Set Code 19 .....                  | 86 |
| 4.3 M2-M15 ASSEMBLIES .....  | 87 |
| 4.4 QWERTY KEYBOARD ENCODERS, CABLES AND LIGHTING POWER.....             | 87 |
| 4.4.1 Qwerty Encoders .....  | 87 |
| 4.4.1.1 61-key Qwerty Encoders -- Part Number 15230-tab .....            | 87 |
| 4.4.1.2 Extended Qwerty Encoder -- Part Number 15231-tab.....            | 88 |
| 4.4.2 Encoder Cables -- Part Numbers 15234-tab, 15235 and 15236-tab..... | 88 |

|              |                                |          |          |
|--------------|--------------------------------|----------|----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.     |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>4</b> |

|   |    |
|---|----|
| 4.4.3 Qwerty Lighting Power Supplies and Cabling.....     | 88 |
| 4.4.3.1 Wall Mount Power Supply -- Part Number 15239..... | 89 |
| 4.4.3.2 Desktop Power Supply -- Part Number 15241.....    | 89 |
| 4.4.3.3 Lighting Adapter Cable -- Part Number 15240.....  | 89 |
| 4.5 ACCESSORIES .....                                     | 89 |
| 4.5.1 Rear Panel Mounting Brackets.....                   | 89 |
| 4.5.2 Mating Connector Kits and Cable Assemblies .....    | 90 |
| 4.5.3 Crimping Tools.....                                 | 91 |
| 4.5.4 Extractor Tools.....                                | 91 |

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 5    |

# STANDARD MOLDED ELASTOMER KEYPADS

## **1.0 SCOPE**

This Specification Control Document (SCD) describes the detailed characteristics of a range of keypad switch assemblies utilizing Molded Elastomer Technology (MET). The products emanating from this SCD are designated as product series M2 and M15.

The M2 family of keypads is based on a complete elastomeric switch, with conductive contacts against a switch board, or Printed Switch Board (PSB), and also includes a metal backing plate, connectors, compression limiters, and mounting studs. All switches are normally open (NO) momentary (MOM) single pole single throw (SPST). LED-lighted keyboards and keypads are available as options.

The M15 family of keycaps are molded plastic that complements M2 keypads. The keycaps fit on the top of the keypad pushbuttons. They are available in a variety of colors and provide laser engraved legends. Predefined keycap sets are available using part numbers defined in this document.

Complete M2-M15 assemblies are also available from the factory and may be ordered as described in this document.

Custom legends and artwork for keycaps are available by special order. Documentation for non-standard legends or artwork is accomplished through an M2 slash number system, the details of which, are beyond the scope of this document. Contact StacoSwitch Sales for assistance.

Accessory items for MET products are identified herein. These include mounting brackets, mating connector kits, cable assemblies, a crimping tool and an extraction tool.

Qwerty keyboard encoders and power supplies are also available along with interconnecting cables for PC-compatible applications.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 6    |

## 2.0 M2 AND M15 PRODUCT LINE

This section provides an overview of the products available and how they are identified.

### 2.1 Product Line Features/Options

The M2 product line is designed to be rugged and durable. Keyboards may be configured to be lighted or unlighted. Among the standard features are front panel or rear mounting, NEMA 4/dust sealing for surface mounting, and locking connectors. The following is a summary of the standard features and options that may be specified:

- Keypad configurations;
- Lighted/unlighted keypads;
- Keypad color;
- Keycap shape;
- Keycap color;
- Legend set;
- Legend film;
- Rear panel mounting brackets;
- Qwerty Encoders and power supplies;
- Mating connector kits and cables;
- Crimping and extractor tools.

### 2.2 Keypad Configurations

The keypad configurations are 1X1 square, 1X2 square, 1X3 square, 1X4 square, 1X4 double wide, 1X6 square, 3X4 square, 4X4 square and Qwerty. The 1X2, 1X3 and 1X6 keypad configurations have two, three and six pushbuttons (switches) respectively in a vertical orientation. Each of the 1X4 and 1X4 DW keypad configuration has four pushbuttons (switches) in a vertical orientation. These may be rotated 90° CCW to become 4X1 keypads, i.e., horizontal orientation. The 1X1 has one pushbutton (switch). The 3X4 has twelve pushbuttons (switches), 4X4 has sixteen pushbuttons (switches), and the Qwerty has sixty-one pushbuttons (switches).

### 2.3 Lighted Keypad

The lighted keypad has LED(s) located under each pushbutton. The lighted 1X1, 1X2, 1X3, 1X4, 1X4 DW, 1X6, 3X4 and 4X4 keypads have individually addressable dual chip dual color LED's. They can provide either function identification lighting or status lighting. Standard laser-etched legends provide lighted characters and symbols with opaque background. Optional special film legends allow for legends to have the background lighted using opaque characters/symbols. The lighted Qwerty keypads use a single color of LED throughout the keypad and can also provide background lighting by special order.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 7    |

## 2.4 Keycap Shape

The 1X1, 1X2, 1X3, 1X4, 1X6, 3X4 and 4X4 keypad configurations have square pushbuttons, therefore square keycaps are utilized. The 1X4 DW has rectangular pushbuttons, accordingly rectangular keycaps are necessary. The Qwerty has square, rectangular and space bar pushbuttons, thus corresponding square, rectangular and space bar keycaps are used. All keycap tops are slightly convex or domed (pillow) and the corners are rounded.

## 2.5 Legend Set

Standard keycaps are painted and the legends are laser engraved. Blank, telecommunications, arrows, math functions, numerals, function keys, and qwerty alpha-numeric keypad legends are available. Custom legends are available by special order.

## 2.6 Legend Film

Legend films can be placed under the clear keycap. The legend sets may include characters, words, symbols or artwork. Available by special order only. Documentation is with M2 slash sheet.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 8    |

### 3.0 REQUIREMENTS

This specification defines the detailed requirements for the M2 keypads and M15 keycaps. For all tests specified in this document, the test sample shall be mounted in such a manner as to simulate in-service use unless the specific test method precludes such mounting.

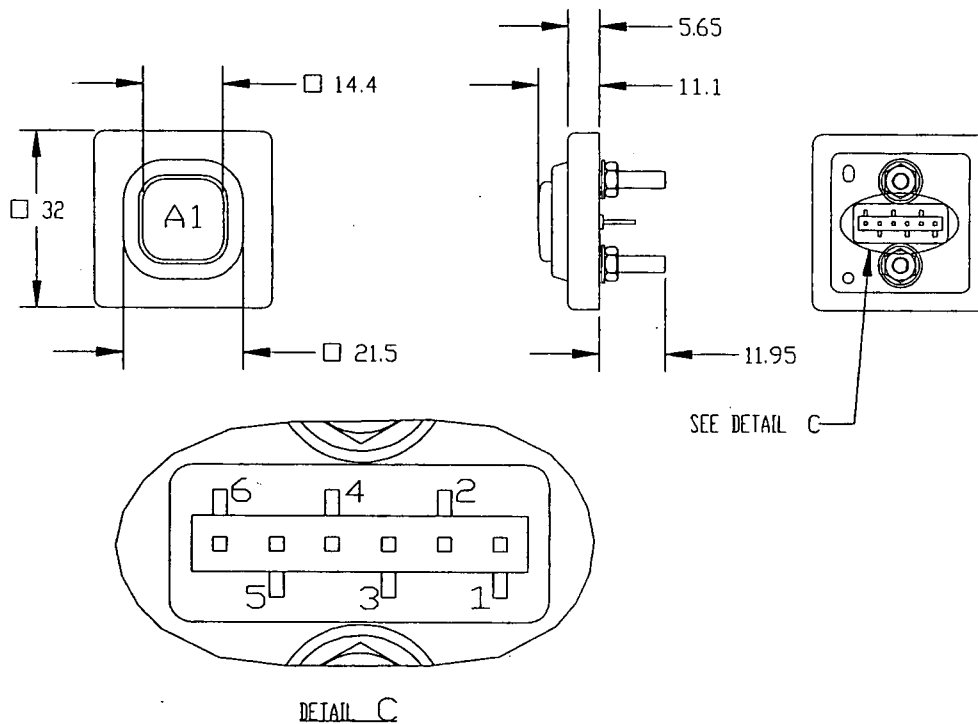
### 3.1 Dimensional Requirements

Table A references keypad and outline dimension information.

Table A  
Keypad and Outline Dimension

| Keypad Configuration | Lighting             | Dimension          |
|----------------------|----------------------|--------------------|
| 1X1                  | Unlighted or Lighted | Refer to Figure 1  |
| 1X2 or 2X1           | Unlighted or Lighted | Refer to Figure 2  |
| 1X3 or 3X1           | Unlighted or Lighted | Refer to Figure 3  |
| 1X4 or 4X1           | Unlighted            | Refer to Figure 4  |
| 1X4 DW or 4X1 DW     | Unlighted            | Refer to Figure 5  |
| 1X6 or 6X1           | Unlighted            | Refer to Figure 6  |
| 3X4                  | Unlighted            | Refer to Figure 7  |
| 4X4                  | Unlighted            | Refer to Figure 8  |
| 1X4 or 4X1           | Lighted              | Refer to Figure 9  |
| 1X4 DW or 4X1 DW     | Lighted              | Refer to Figure 10 |
| 1X6 or 6X1           | Lighted              | Refer to Figure 11 |
| 3X4                  | Lighted              | Refer to Figure 12 |
| 4X4                  | Lighted              | Refer to Figure 13 |
| Qwerty, 61-key       | Unlighted or Lighted | Refer to Figure 14 |

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 9    |



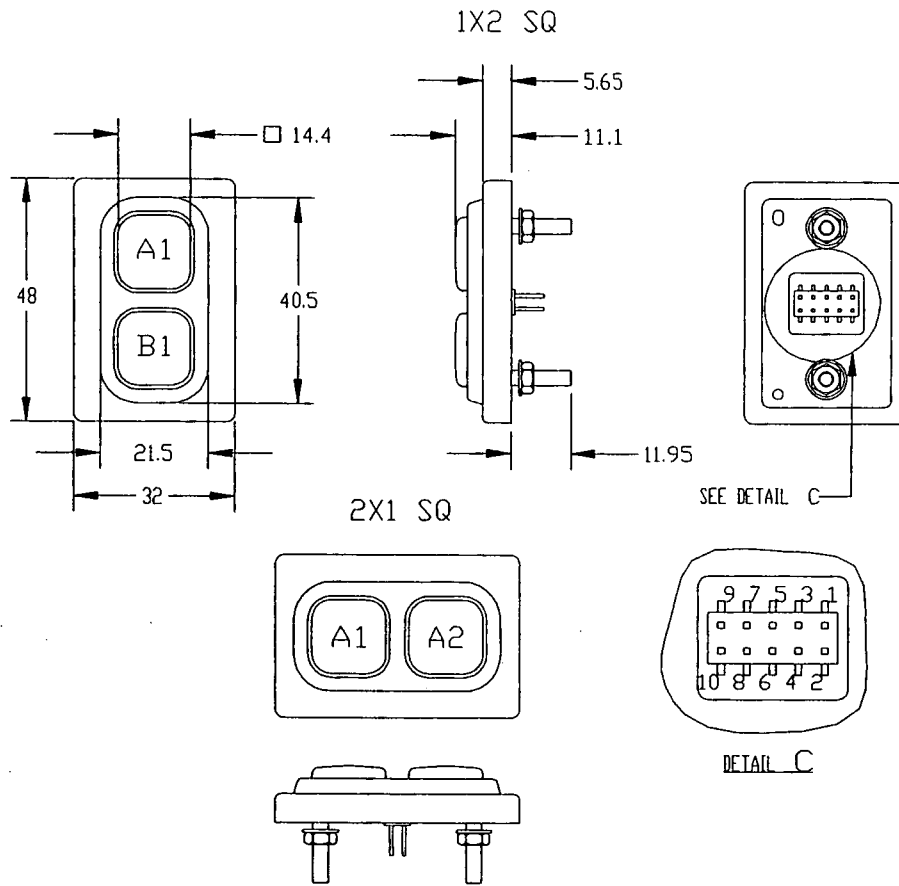
| SWITCHING CONTACTS |                     |
|--------------------|---------------------|
| CONNECTOR PIN NO.  | PUSHBUTTON LOCATION |
| 1                  | COMMON              |
| 6                  | A1                  |

| LIGHTING CONTACTS |                  |                    |
|-------------------|------------------|--------------------|
| CONNECTOR PIN NO. | RED LED LOCATION | GREEN LED LOCATION |
| 2                 |                  | A1 ANODE           |
| 3                 | A1 ANODE         |                    |
| 4                 |                  | A1 CATHODE         |
| 5                 | A1 CATHODE       |                    |

**FIG. 1**  
**1X1 UNLIGHTED AND LIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

THE LIGHTING CONTACTS TABLE IS NOT APPLICABLE TO THE UNLIGHTED KEYPADS.  
 DIMENSIONS ARE IN MILLIMETERS.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>10</b> |



**SWITCHING CONTACTS**

| Connector Pin No. | 1X2 Pushbutton Location | 2X1 Pushbutton Location |
|-------------------|-------------------------|-------------------------|
| 1                 | Common                  | Common                  |
| 2                 | B1                      | A2                      |
| 3                 | A1                      | A1                      |

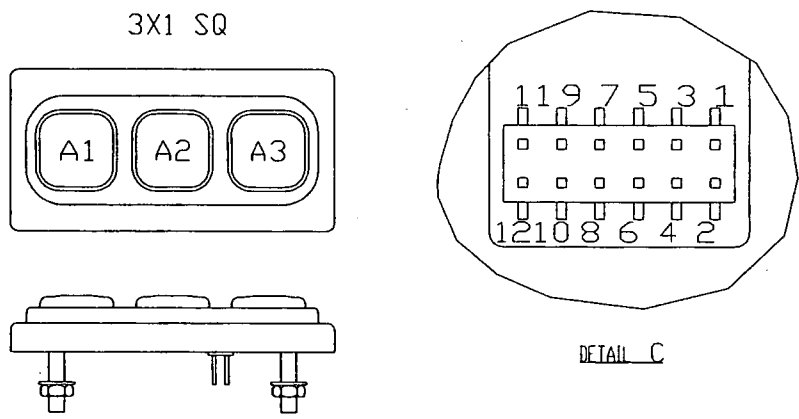
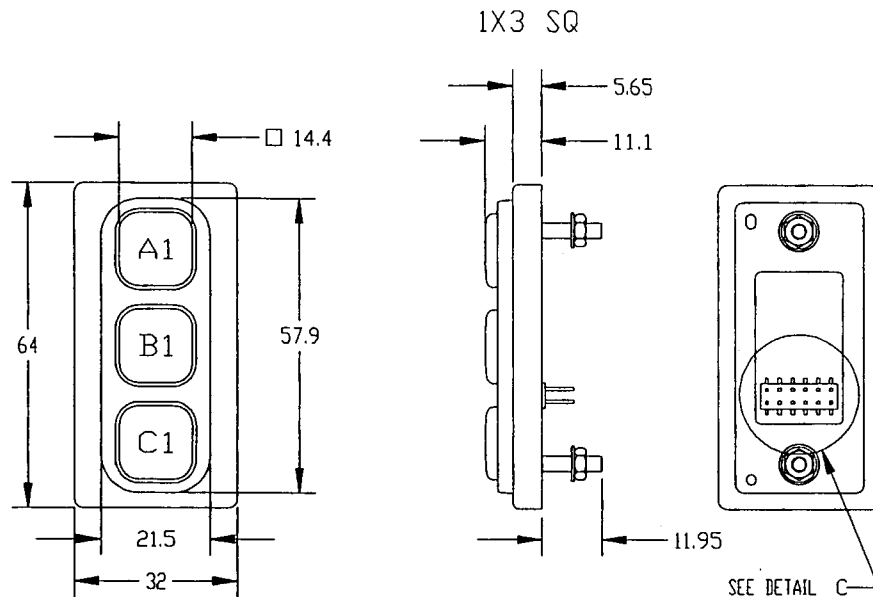
**LIGHTING CONTACTS**

| Connector Pin No. | 1X2              |                    | 2X1              |                    |
|-------------------|------------------|--------------------|------------------|--------------------|
|                   | Red LED Location | Green LED Location | Red LED Location | Green LED Location |
| 4                 | Common Anode     |                    | Common Anode     |                    |
| 5                 | A1 Cathode       |                    | A1 Cathode       |                    |
| 6                 | B1 Cathode       |                    | A2 Cathode       |                    |
| 7                 |                  | A1 Cathode         |                  | A1 Cathode         |
| 8                 |                  | B1 Cathode         |                  | A2 Cathode         |
| 9                 |                  | Common Anode       |                  | Common Anode       |
| 10                | Not Used         |                    | Not Used         |                    |

**FIG. 2**  
**1X2 UNLIGHTED AND LIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

THE LIGHTING CONTACTS TABLE IS NOT APPLICABLE TO THE UNLIGHTED KEYPADS.  
 DIMENSIONS ARE IN MILLIMETERS.

| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
|--------------|--------------------------------|----------|-----------|
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>11</b> |



**SWITCHING CONTACTS**

| Connector Pin No. | 1X3 Pushbutton Location | 3X1 Pushbutton Location |
|-------------------|-------------------------|-------------------------|
| 1                 | Common                  | Common                  |
| 2                 | C1                      | A3                      |
| 3                 | B1                      | A2                      |
| 4                 | A1                      | A1                      |

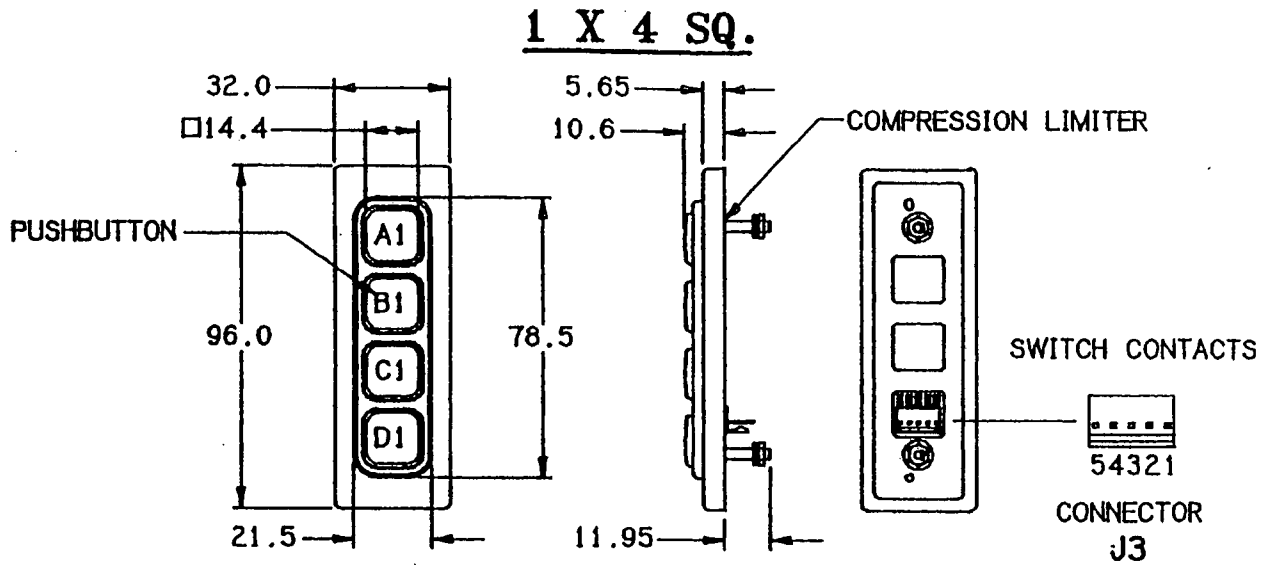
**LIGHTING CONTACTS**

| Connector Pin No. | 1X3              |                    | 3X1              |                    |
|-------------------|------------------|--------------------|------------------|--------------------|
|                   | Red LED Location | Green LED Location | Red LED Location | Green LED Location |
| 5                 |                  | Common Anode       |                  | Common Anode       |
| 6                 |                  | A1 Cathode         |                  | A1 Cathode         |
| 7                 |                  | B1 Cathode         |                  | A2 Cathode         |
| 8                 |                  | C1 Cathode         |                  | A3 Cathode         |
| 9                 | C1 Cathode       |                    | A3 Cathode       |                    |
| 10                | B1 Cathode       |                    | A2 Cathode       |                    |
| 11                | A1 Cathode       |                    | A1 Cathode       |                    |
| 12                | Common Anode     |                    | Common Anode     |                    |

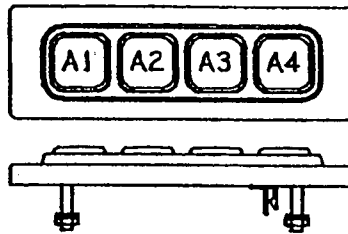
**FIG. 3**  
**1X3 UNLIGHTED AND LIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

THE LIGHTING CONTACTS TABLE IS NOT APPLICABLE TO THE UNLIGHTED KEYPADS.  
 DIMENSIONS ARE IN MILLIMETERS.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 12   |



**4 X 1 SQ.**



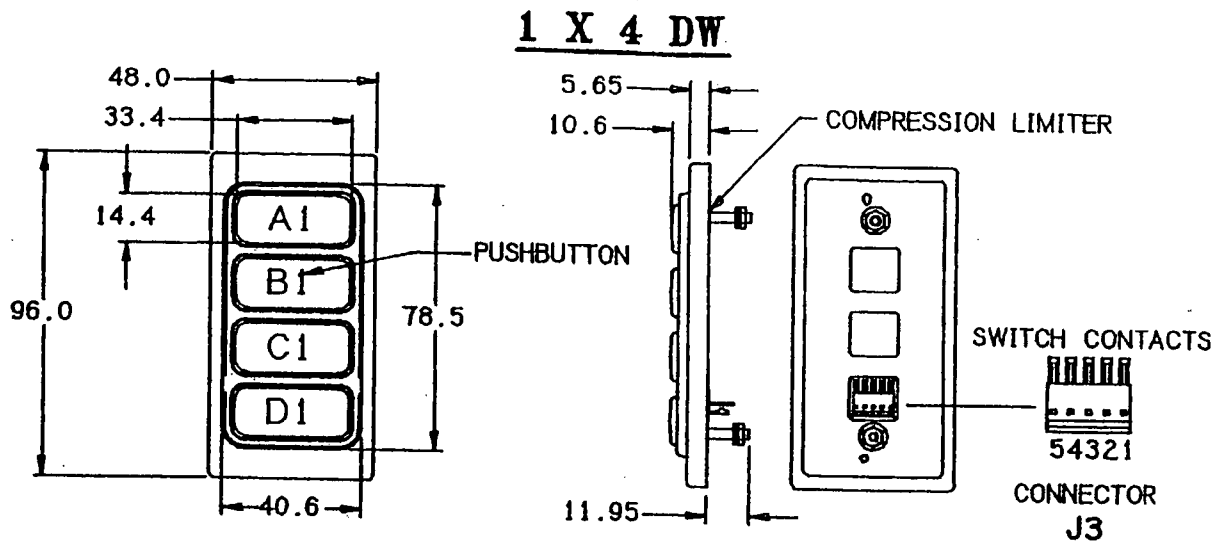
**SWITCHING CONTACTS**

| SWITCH CONTACT | PUSHBUTTON LOCATION |        |
|----------------|---------------------|--------|
|                | COMMON              | COMMON |
| 1              | COMMON              | COMMON |
| 2              | D1                  | A4     |
| 3              | C1                  | A3     |
| 4              | B1                  | A2     |
| 5              | A1                  | A1     |

**FIG. 4**  
**1X4 AND 4X1 UNLIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

DIMENSIONS ARE IN MILLIMETERS.

|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 13   |



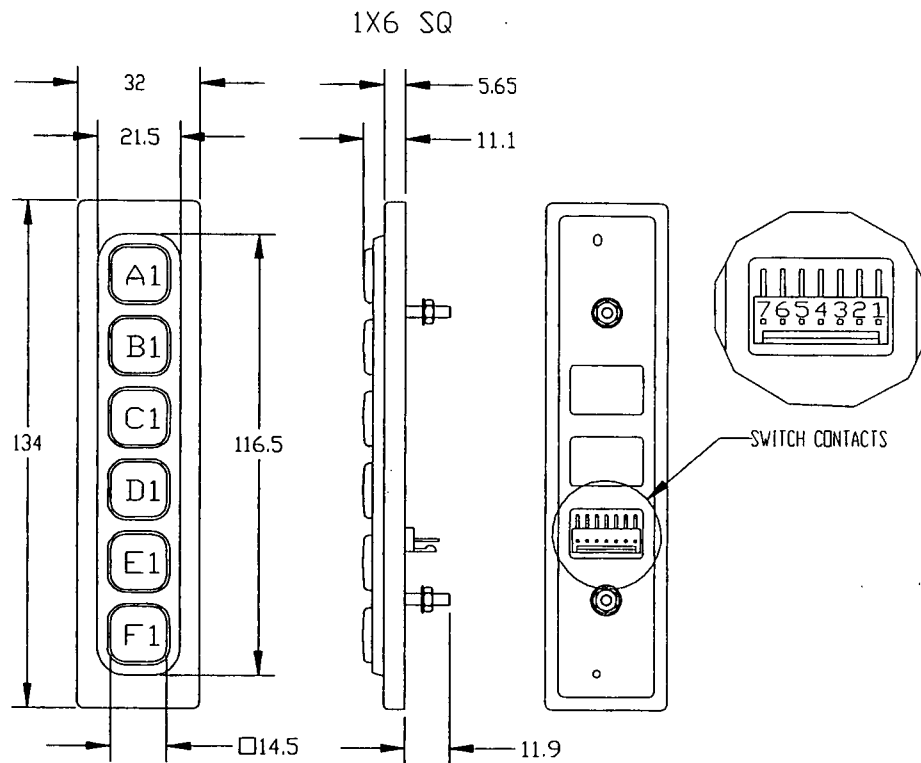
**SWITCHING CONTACTS**

| SWITCH CONTACT | PUSHBUTTON LOCATION |        |
|----------------|---------------------|--------|
|                | COMMON              | COMMON |
| 1              | COMMON              | COMMON |
| 2              | D1                  | A4     |
| 3              | C1                  | A3     |
| 4              | B1                  | A2     |
| 5              | A1                  | A1     |

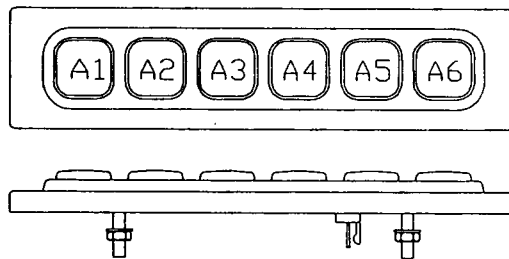
**FIG. 5**  
**1X4 AND 4X1 DW UNLIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

DIMENSIONS ARE IN MILLIMETERS.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>14</b> |



6X1 SQ



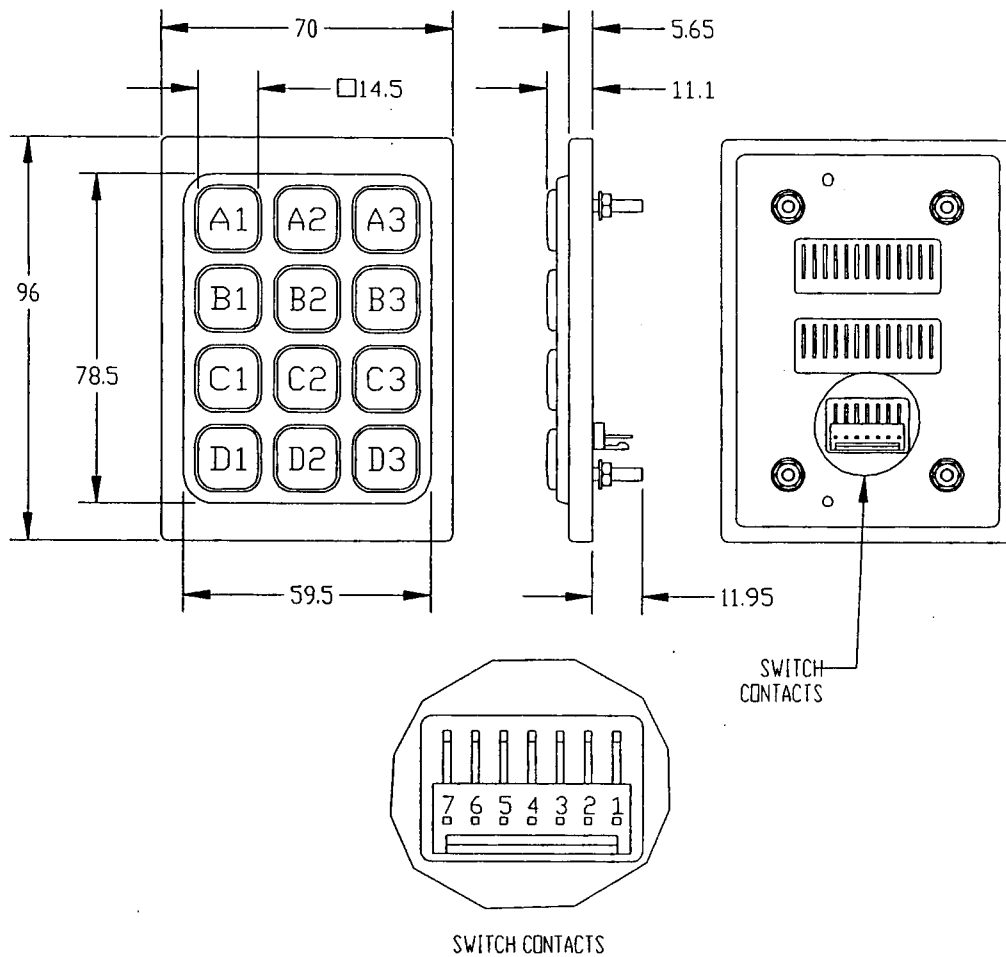
SWITCHING CONTACTS

| Connector Pin No. | 1X6 Pushbutton Location | 6X1 Pushbutton Location |
|-------------------|-------------------------|-------------------------|
| 1                 | Common                  | Common                  |
| 2                 | F1                      | A6                      |
| 3                 | E1                      | A5                      |
| 4                 | D1                      | A4                      |
| 5                 | C1                      | A3                      |
| 6                 | B1                      | A2                      |
| 7                 | A1                      | A1                      |

**FIG. 6**  
**1X6 AND 6X1 UNLIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

DIMENSIONS ARE IN MILLIMETERS.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>15</b> |



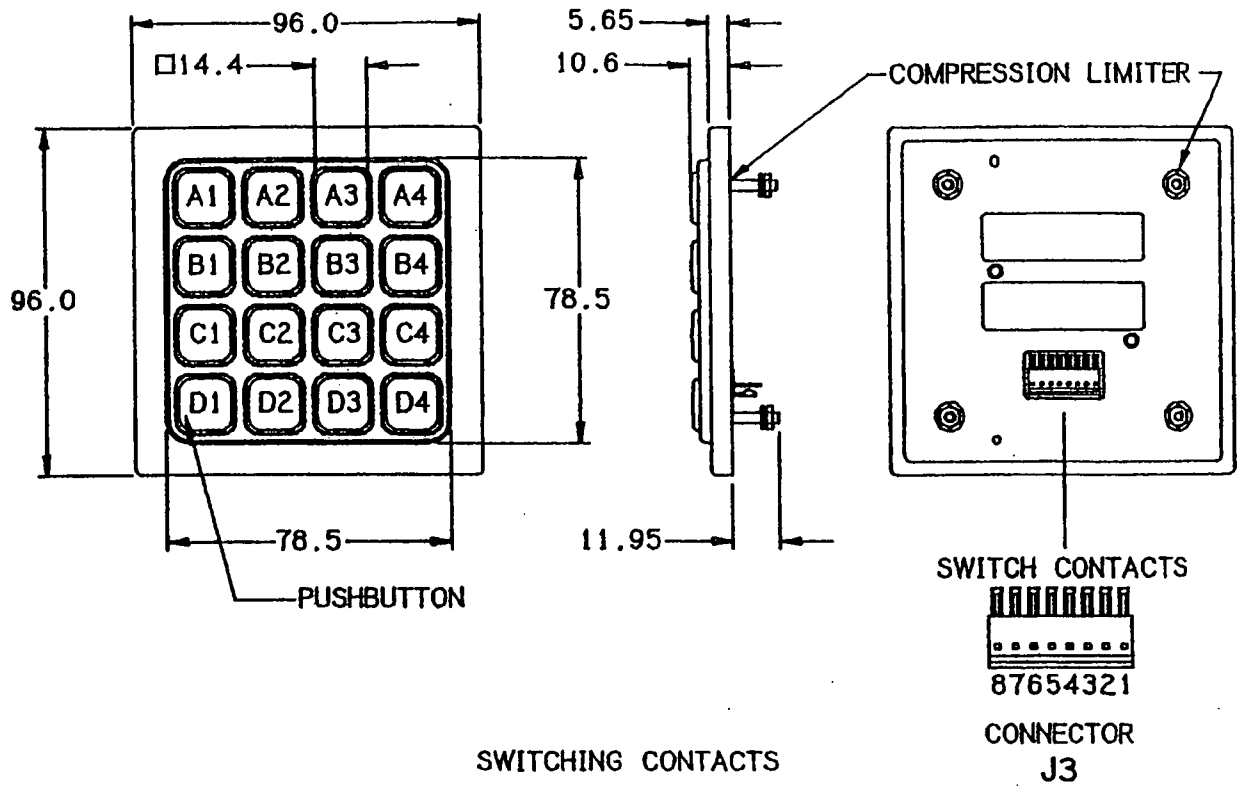
SWITCHING CONTACTS

| Connector Pin No. | ROW / COLUMN |
|-------------------|--------------|
| 1                 | A            |
| 2                 | B            |
| 3                 | C            |
| 4                 | D            |
| 5                 | 1            |
| 6                 | 2            |
| 7                 | 3            |

**FIG. 7**  
**3X4 UNLIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

DIMENSIONS ARE IN MILLIMETERS.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 16   |



SWITCHING CONTACTS

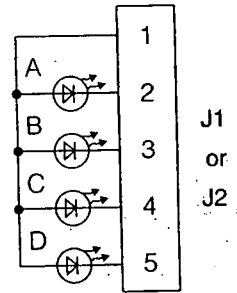
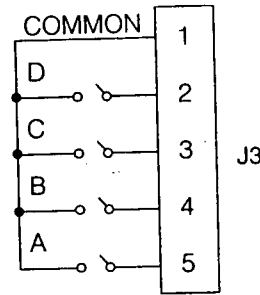
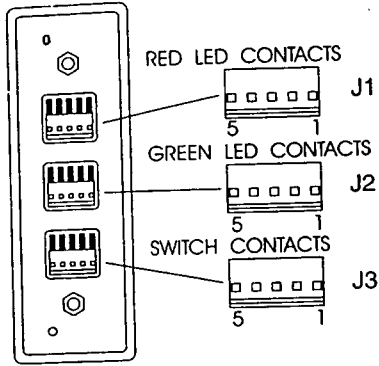
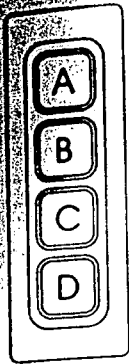
| SWITCH CONTACT | ROW / COLUMN |
|----------------|--------------|
| 1              | A            |
| 2              | B            |
| 3              | 1            |
| 4              | 2            |
| 5              | 3            |
| 6              | 4            |
| 7              | D            |
| 8              | C            |

**FIG. 8**  
4X4 UNLIGHTED OUTLINE DIMENSIONS  
AND CONNECTOR IDENTIFICATIONS

DIMENSIONS ARE IN MILLIMETERS.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 17   |

Standard 1X4



Switching Schematic

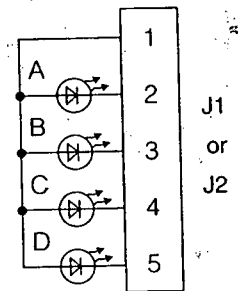
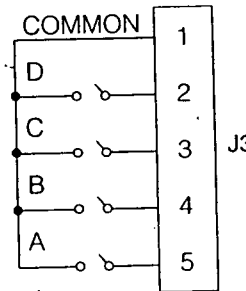
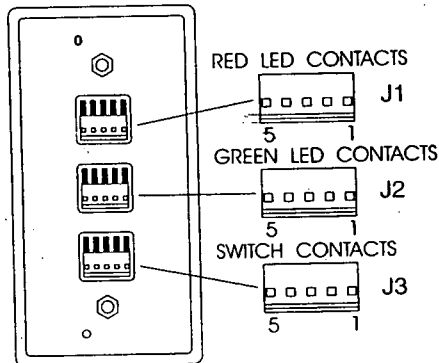
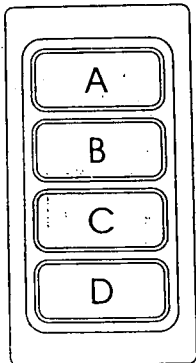
Lighting Schematic applicable to both Red and Green LEDs

| SWITCHING CONTACTS |                     |
|--------------------|---------------------|
| SWITCH CONTACT     | PUSHBUTTON LOCATION |
| 1                  | COMMON              |
| 2                  | D                   |
| 3                  | C                   |
| 4                  | B                   |
| 5                  | A                   |

| LIGHTING CONTACTS |                  |                    |
|-------------------|------------------|--------------------|
| LED CONTACT       | RED LED LOCATION | GREEN LED LOCATION |
| 1                 | COMMON ANODE     |                    |
| 2                 | A                | A                  |
| 3                 | B                | B                  |
| 4                 | C                | C                  |
| 5                 | D                | D                  |

LIGHTING AND SWITCHING DATA

Standard 1X4 Double Wide

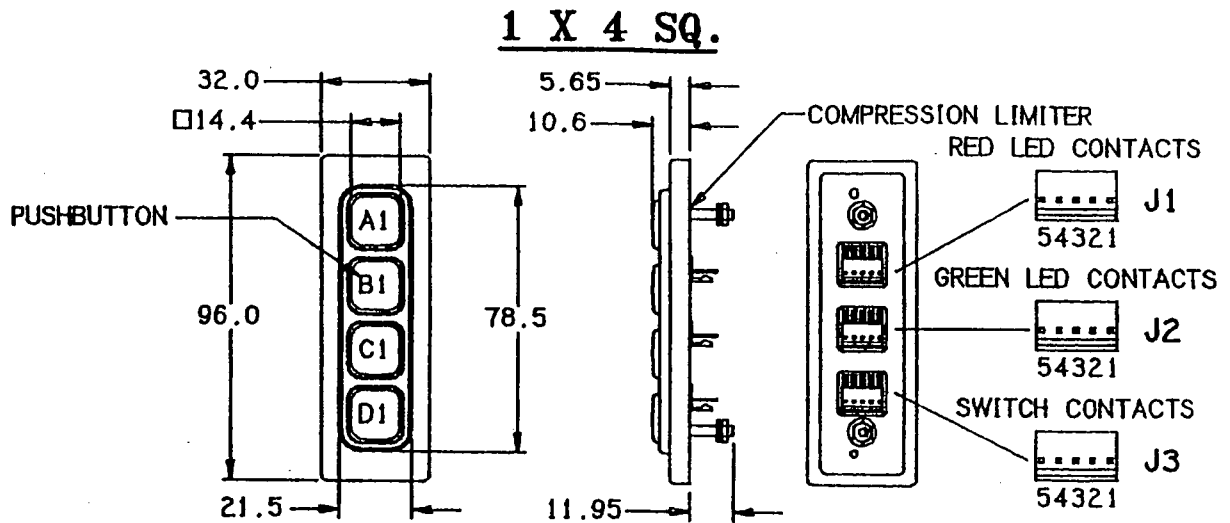


Switching Schematic

Lighting Schematic applicable to both Red and Green LEDs; Each LED here represents three in parallel

| SWITCHING CONTACTS |                     |
|--------------------|---------------------|
| SWITCH CONTACT     | PUSHBUTTON LOCATION |
| 1                  | COMMON              |
| 2                  | D                   |
| 3                  | C                   |
| 4                  | B                   |
| 5                  | A                   |

| LIGHTING CONTACTS |                  |                    |
|-------------------|------------------|--------------------|
| LED CONTACT       | RED LED LOCATION | GREEN LED LOCATION |
| 1                 | COMMON ANODE     |                    |
| 2                 | A                | A                  |
| 3                 | B                | B                  |
| 4                 | C                | C                  |
| 5                 | D                | D                  |



**LIGHTING CONTACTS**

| LED CONTACT | RED LED LOCATION |    | GREEN LED LOCATION |    |
|-------------|------------------|----|--------------------|----|
| 1           | COMMON           |    | COMMON             |    |
| 2           | A1               | A1 | A1                 | A1 |
| 3           | B1               | A2 | B1                 | A2 |
| 4           | C1               | A3 | C1                 | A3 |
| 5           | D1               | A4 | D1                 | A4 |

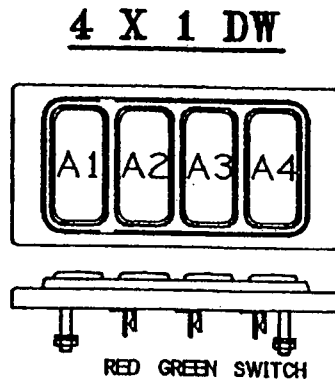
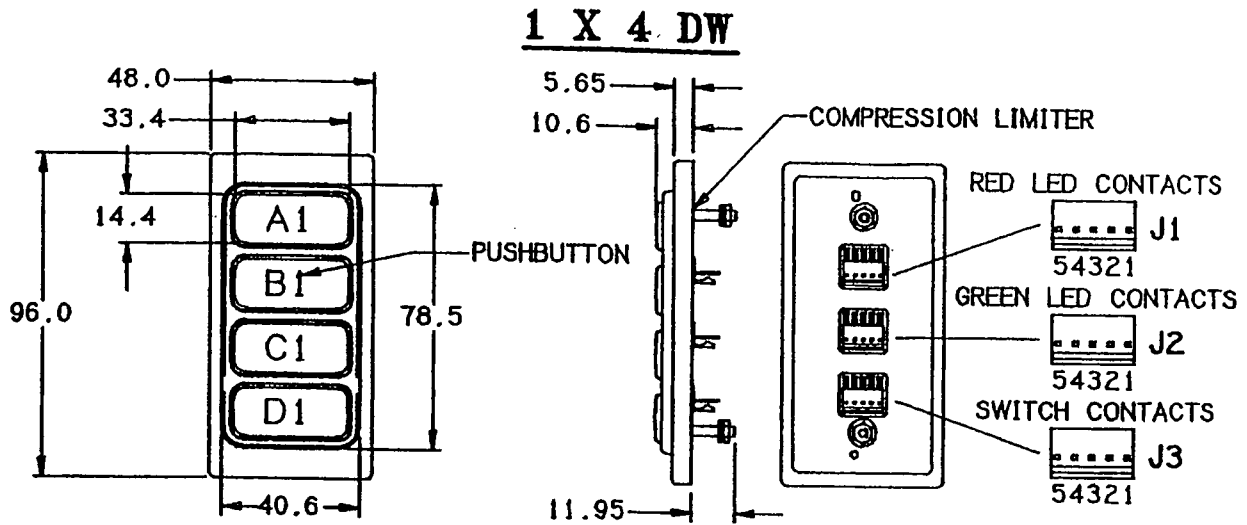
**SWITCHING CONTACTS**

| SWITCH CONTACT | PUSHBUTTON LOCATION |        |
|----------------|---------------------|--------|
|                | COMMON              | COMMON |
| 1              | COMMON              | COMMON |
| 2              | D1                  | A4     |
| 3              | C1                  | A3     |
| 4              | B1                  | A2     |
| 5              | A1                  | A1     |

**FIG. 9**  
**1X4 AND 4X1 LIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

DIMENSIONS ARE IN MILLIMETERS.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>18</b> |



**LIGHTING CONTACTS**

| LED CONTACT | RED LED LOCATION |    | GREEN LED LOCATION |    |
|-------------|------------------|----|--------------------|----|
| 1           | COMMON           |    | COMMON             |    |
| 2           | A1               | A1 | A1                 | A1 |
| 3           | B1               | A2 | B1                 | A2 |
| 4           | C1               | A3 | C1                 | A3 |
| 5           | D1               | A4 | D1                 | A4 |

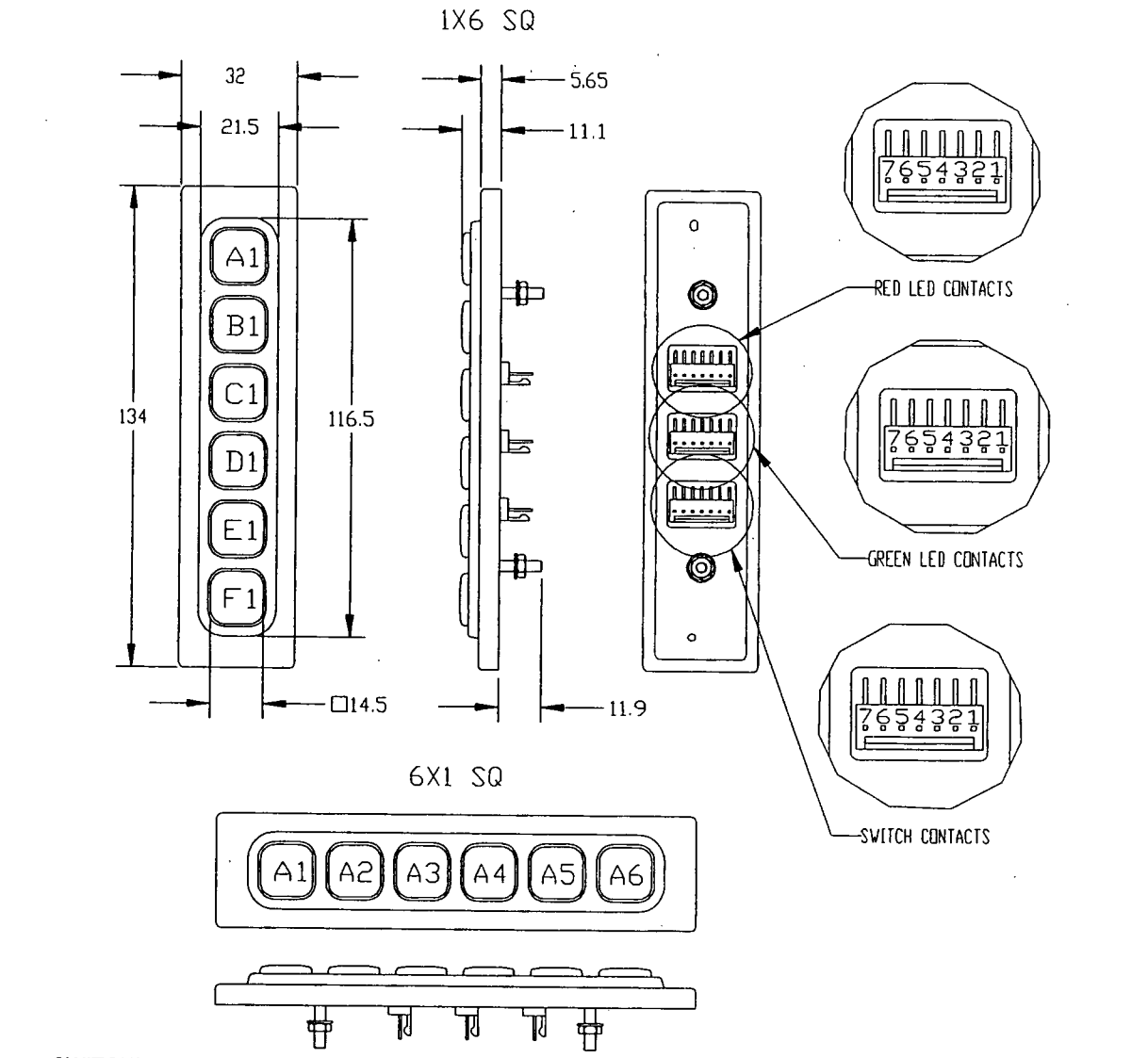
**SWITCHING CONTACTS**

| SWITCH CONTACT | PUSHBUTTON LOCATION |        |
|----------------|---------------------|--------|
| 1              | COMMON              | COMMON |
| 2              | D1                  | A4     |
| 3              | C1                  | A3     |
| 4              | B1                  | A2     |
| 5              | A1                  | A1     |

**FIG. 10**  
**1X4 DW LIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

DIMENSIONS ARE IN MILLIMETERS.

|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 19   |



**SWITCHING CONTACTS**

| Connector Pin No. | 1X6 Pushbutton Location | 6X1 Pushbutton Location |
|-------------------|-------------------------|-------------------------|
| 1                 | Common                  | Common                  |
| 2                 | F1                      | A6                      |
| 3                 | E1                      | A5                      |
| 4                 | D1                      | A4                      |
| 5                 | C1                      | A3                      |
| 6                 | B1                      | A2                      |
| 7                 | A1                      | A1                      |

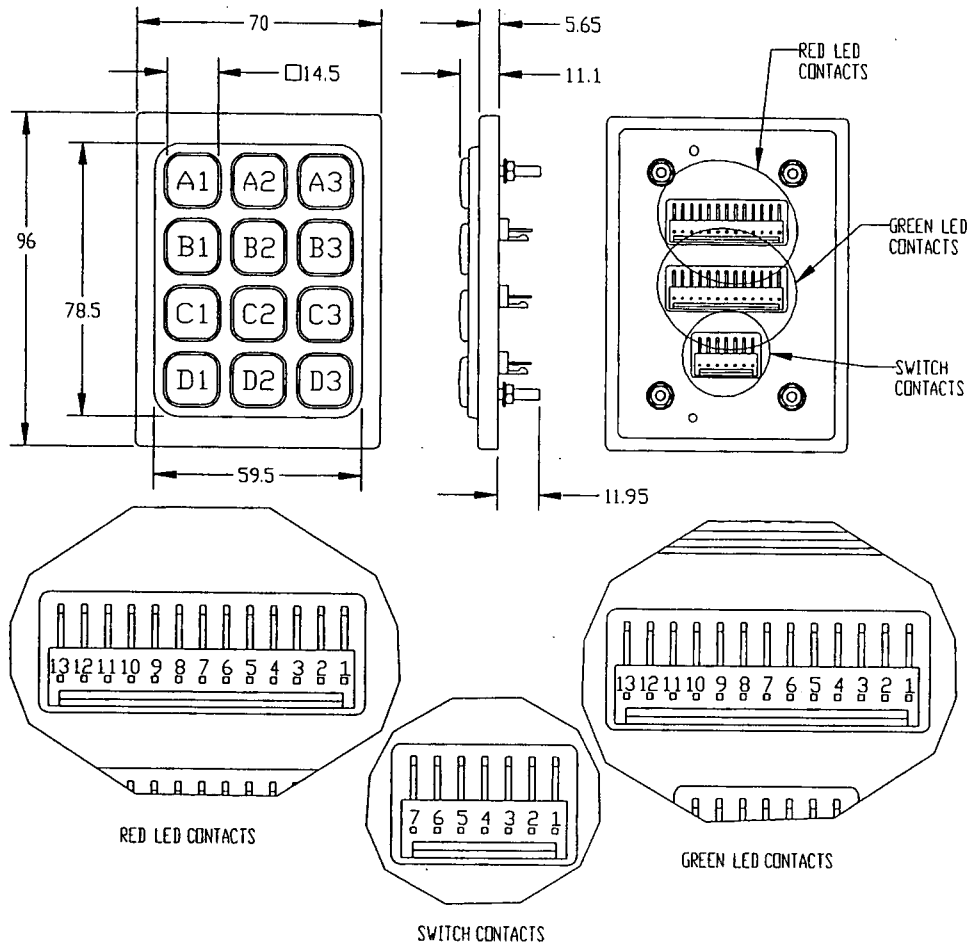
**LIGHTING CONTACTS**

| Connector Pin No. | 1X6              |                    | 6X1              |                    |
|-------------------|------------------|--------------------|------------------|--------------------|
|                   | Red LED Location | Green LED Location | Red LED Location | Green LED Location |
| 1                 | Common Anode     | Common Anode       | Common Anode     | Common Anode       |
| 2                 | A1 Cathode       | A1 Cathode         | A1 Cathode       | A1 Cathode         |
| 3                 | B1 Cathode       | B1 Cathode         | A2 Cathode       | A2 Cathode         |
| 4                 | C1 Cathode       | C1 Cathode         | A3 Cathode       | A3 Cathode         |
| 5                 | D1 Cathode       | D1 Cathode         | A4 Cathode       | A4 Cathode         |
| 6                 | E1 Cathode       | E1 Cathode         | A5 Cathode       | A5 Cathode         |
| 7                 | F1 Cathode       | F1 Cathode         | A6 Cathode       | A6 Cathode         |

**FIG. 11**  
**1X6 AND 6X1 LIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

DIMENSIONS ARE IN MILLIMETERS.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>20</b> |



**SWITCHING CONTACTS**

| Connector Pin No. | ROW / COLUMN |
|-------------------|--------------|
| 1                 | A            |
| 2                 | B            |
| 3                 | C            |
| 4                 | D            |
| 5                 | 1            |
| 6                 | 2            |
| 7                 | 3            |

**LIGHTING CONTACTS**

| Connector Pin No. | 3X4              |                    |
|-------------------|------------------|--------------------|
|                   | Red LED Location | Green LED Location |
| 1                 | Common Anode     |                    |
| 2                 | A1 Cathode       | A1 Cathode         |
| 3                 | B1 Cathode       | B1 Cathode         |
| 4                 | C1 Cathode       | C1 Cathode         |
| 5                 | D1 Cathode       | D1 Cathode         |
| 6                 | A2 Cathode       | A2 Cathode         |
| 7                 | B2 Cathode       | B2 Cathode         |
| 8                 | C2 Cathode       | C2 Cathode         |
| 9                 | D2 Cathode       | D2 Cathode         |
| 10                | A3 Cathode       | A3 Cathode         |
| 11                | B3 Cathode       | B3 Cathode         |
| 12                | C3 Cathode       | C3 Cathode         |
| 13                | D3 Cathode       | D3 Cathode         |

**FIG. 12**  
**3X4 LIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

DIMENSIONS ARE IN MILLIMETERS.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>21</b> |

Table E  
**4X4 Pushbutton Location and Switch Contact Chart**

| Button Location | Switch Contact |   |   |   |   |   |   |   |
|-----------------|----------------|---|---|---|---|---|---|---|
|                 | 1              | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| A1              | X              |   | X |   |   |   |   |   |
| A2              | X              |   |   | X |   |   |   |   |
| A3              | X              |   |   |   | X |   |   |   |
| A4              | X              |   |   |   |   | X |   |   |
| B1              |                | X | X |   |   |   |   |   |
| B2              |                | X |   | X |   |   |   |   |
| B3              |                | X |   |   | X |   |   |   |
| B4              |                | X |   |   |   | X |   |   |
| C1              |                |   | X |   |   |   |   | X |
| C2              |                |   |   | X |   |   |   | X |
| C3              |                |   |   |   | X |   |   | X |
| C4              |                |   |   |   |   | X |   | X |
| D1              |                |   | X |   |   |   | X |   |
| D2              |                |   |   | X |   |   | X |   |
| D3              |                |   |   |   | X |   | X |   |
| D4              |                |   |   |   |   | X | X |   |

**3.2.2 Qwerty Keyboard Lighting and Switching Connections**

For the 61-key Qwerty keyboard, there are 79 LEDs connected in parallel through a 4-pin connector, J2. Approximately 2.1 VDC is applied to pins 1 and 2, which are tied together on the switch board, and supply the anodes of the LEDs. The cathodes are connected to pins 3 and 4 for the return to common as shown on Table F. The current required is approximately 1.6 Amps.

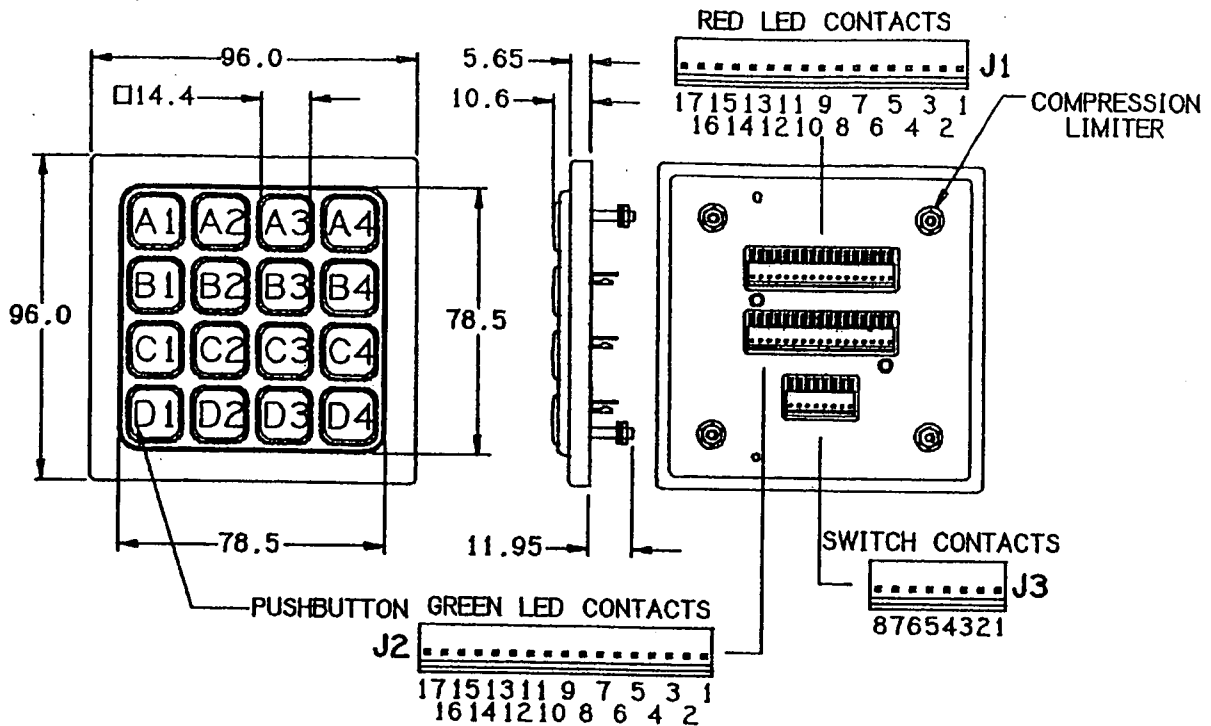
To conveniently and efficiently meet the lighting power requirements of 1.6 Amps at 2.1 VDC, a choice of two AC power converters are available. See section 4.4.3 for Qwerty lighting power supplies and cabling.

Table F  
**Qwerty LED Connector Pin Chart**

| All LEDs | Connector J2 Pin Number |   |   |   |
|----------|-------------------------|---|---|---|
|          | 1                       | 2 | 3 | 4 |
| Anode    | X                       | X |   |   |
| Cathode  |                         |   | X | X |

The 61-key Qwerty configuration uses matrix array switching connections. This basic keyboard provides switch closure information through a 20-pin data connector. Each key position has been assigned an alpha numeric location number, which is identified in Figure 10 of Section 5.

|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | E    | 12   |



LIGHTING CONTACTS

| LED CONTACT | RED LED LOCATION | GRN LED LOCATION |
|-------------|------------------|------------------|
| 1           | COMMON ANODE     |                  |
| 2           | A1               | A1               |
| 3           | B1               | B1               |
| 4           | C1               | C1               |
| 5           | D1               | D1               |
| 6           | A2               | A2               |
| 7           | B2               | B2               |
| 8           | C2               | C2               |
| 9           | D2               | D2               |
| 10          | A3               | A3               |
| 11          | B3               | B3               |
| 12          | C3               | C3               |
| 13          | D3               | D3               |
| 14          | A4               | A4               |
| 15          | B4               | B4               |
| 16          | C4               | C4               |
| 17          | D4               | D4               |

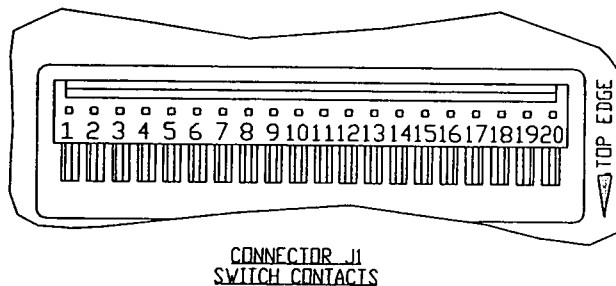
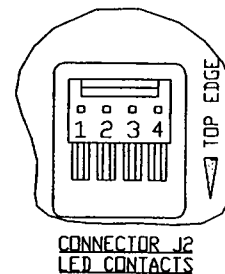
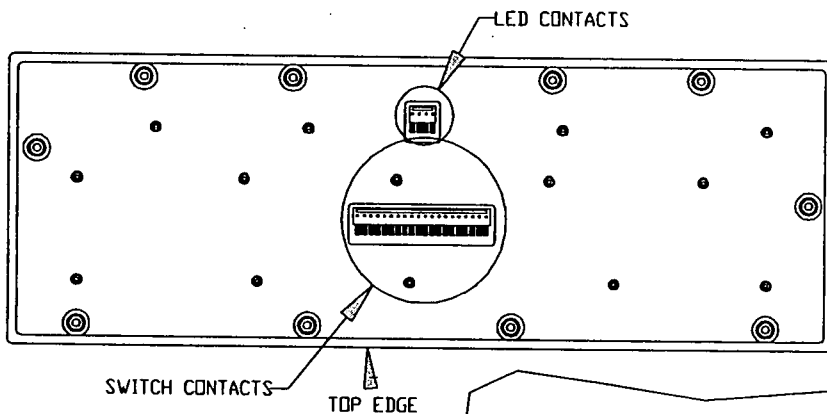
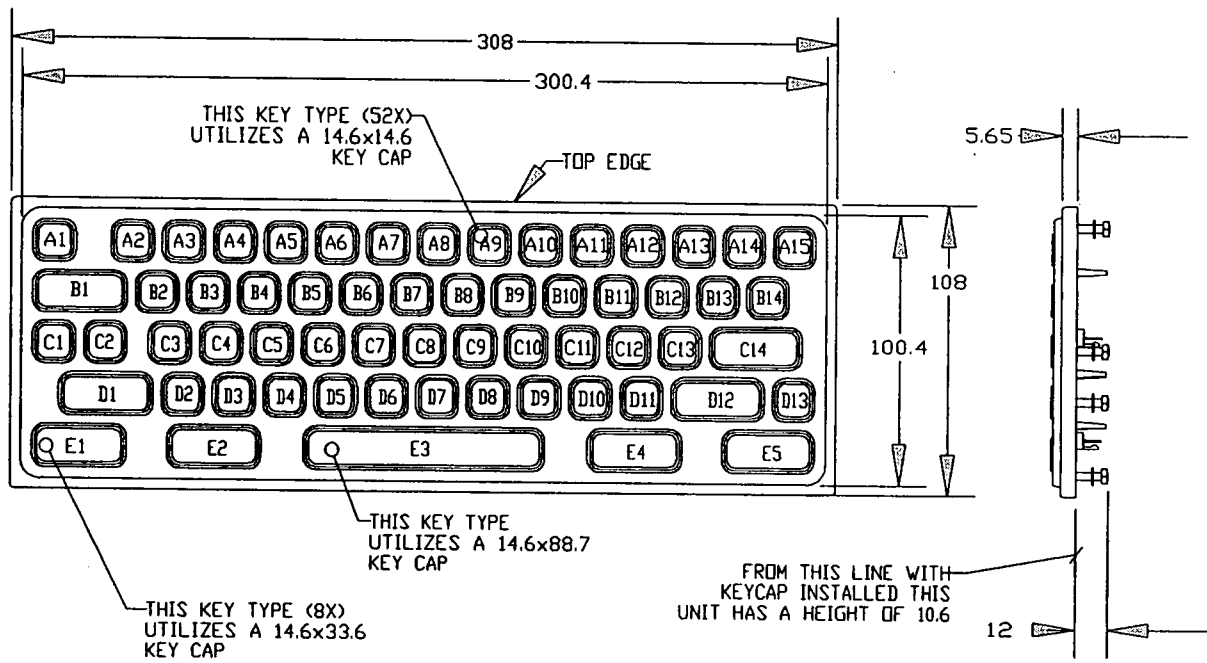
SWITCHING CONTACTS

| SWITCH CONTACT | ROW / COLUMN |
|----------------|--------------|
| 1              | A            |
| 2              | B            |
| 3              | 1            |
| 4              | 2            |
| 5              | 3            |
| 6              | 4            |
| 7              | D            |
| 8              | C            |

FIG. 13  
4X4 LIGHTED OUTLINE DIMENSIONS  
AND CONNECTOR IDENTIFICATIONS

DIMENSIONS ARE IN MILLIMETERS.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 22   |



**FIG. 14**  
**QWERTY UNLIGHTED AND LIGHTED OUTLINE DIMENSIONS**  
**AND CONNECTOR IDENTIFICATIONS**

THE QWERTY UNLIGHTED DOES NOT HAVE LED CONTACTS.  
DIMENSIONS ARE IN MILLIMETERS.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 23   |

### 3.1.1 Panel Cutouts and Mounting

The keypads are designed for either surface mount application or rear mount application.

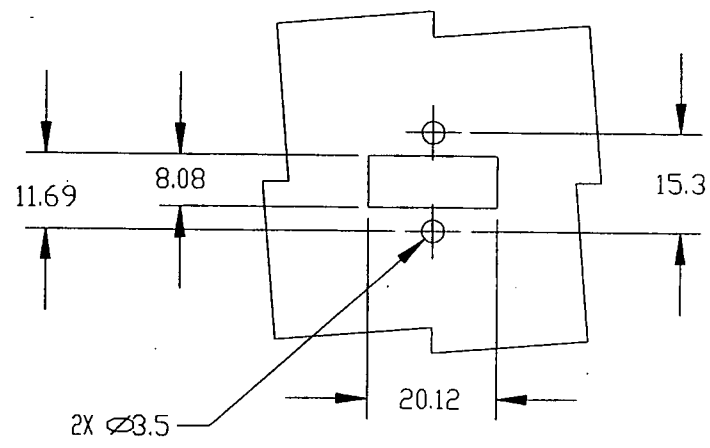
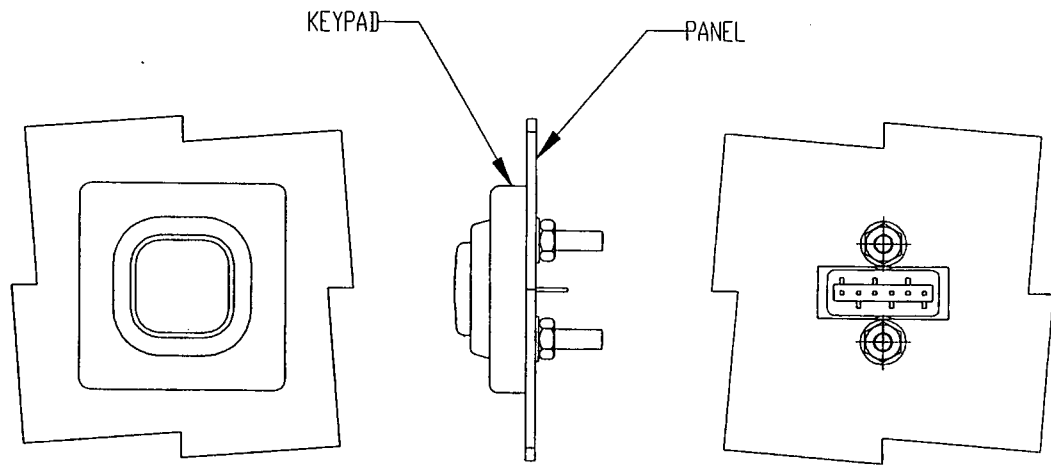
#### 3.1.1.1 Surface Mount Application

Table B references keypad and panel cutout recommendation for surface mount application.

Table B  
**Keypad and Panel Cutout for Surface Mount**

| Keypad Configuration | Lighting             | Panel Cutout       |
|----------------------|----------------------|--------------------|
| 1X1                  | Unlighted or Lighted | Refer to Figure 15 |
| 1X2                  | Unlighted or Lighted | Refer to Figure 16 |
| 1X3                  | Unlighted or Lighted | Refer to Figure 17 |
| 1X4                  | Unlighted            | Refer to Figure 18 |
| 1X4 DW               | Unlighted            | Refer to Figure 19 |
| 1X6                  | Unlighted            | Refer to Figure 20 |
| 3X4                  | Unlighted            | Refer to Figure 21 |
| 4X4                  | Unlighted            | Refer to Figure 22 |
| 1X4                  | Lighted              | Refer to Figure 23 |
| 1X4 DW               | Lighted              | Refer to Figure 24 |
| 1X6                  | Lighted              | Refer to Figure 25 |
| 3X4                  | Lighted              | Refer to Figure 26 |
| 4X4                  | Lighted              | Refer to Figure 27 |
| Qwerty 61-key        | Unlighted or Lighted | Refer to Figure 28 |

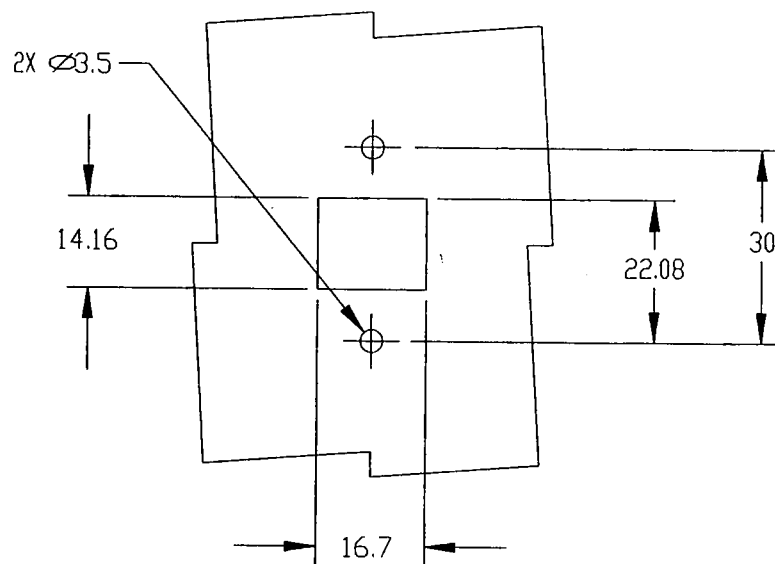
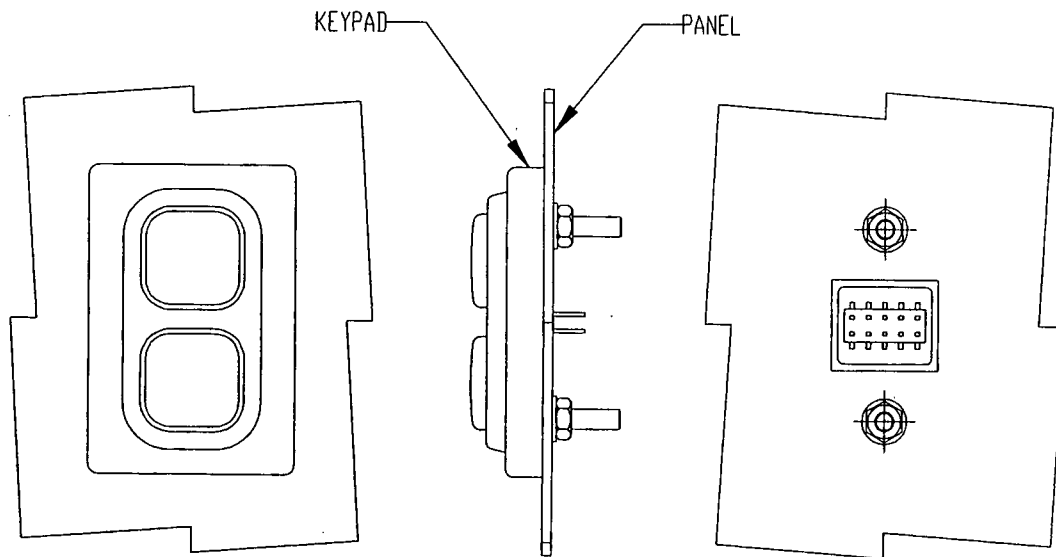
|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 24   |



**FIG. 15**  
**1X1 UNLIGHTED AND LIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

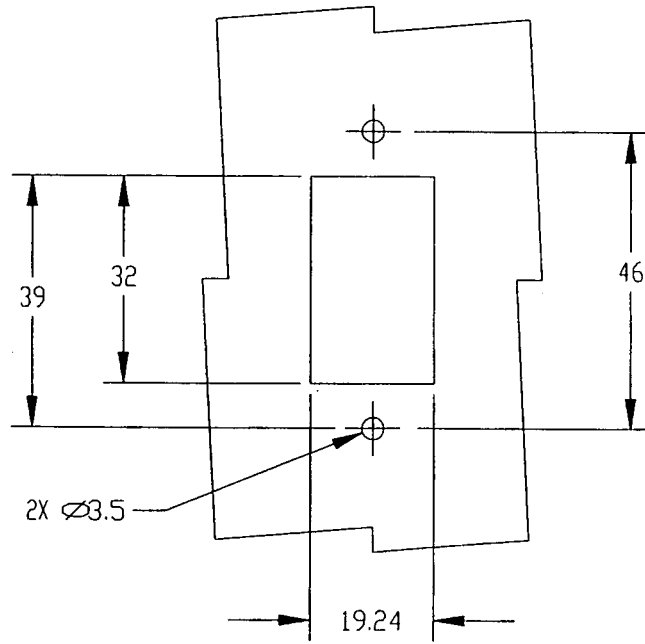
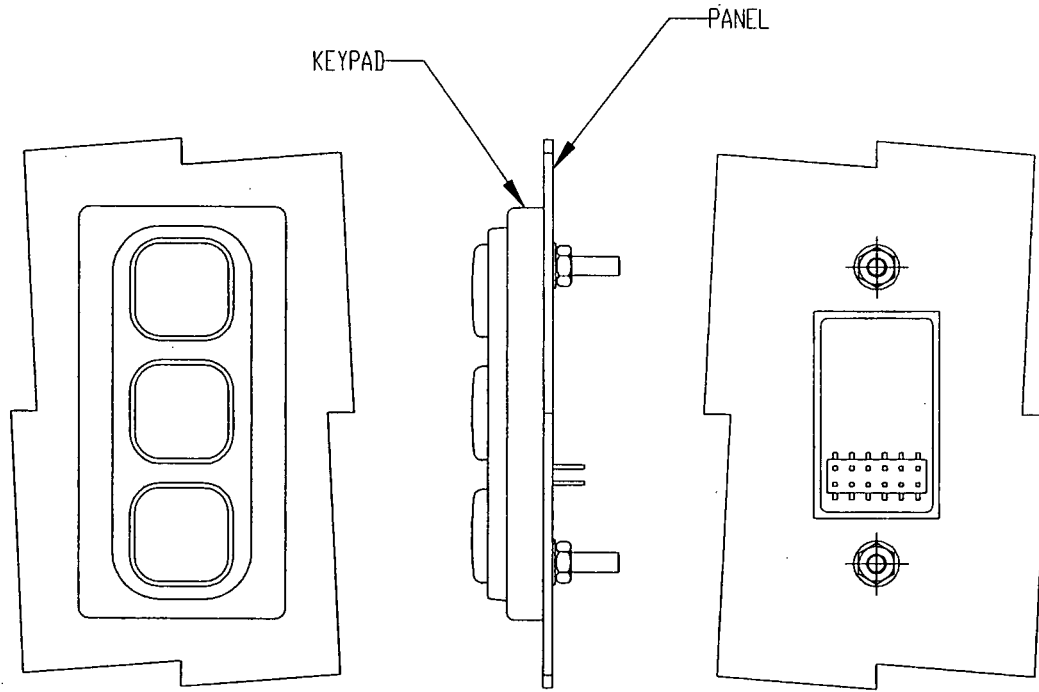
|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>25</b> |



**FIG. 16**  
**1X2 UNLIGHTED AND LIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

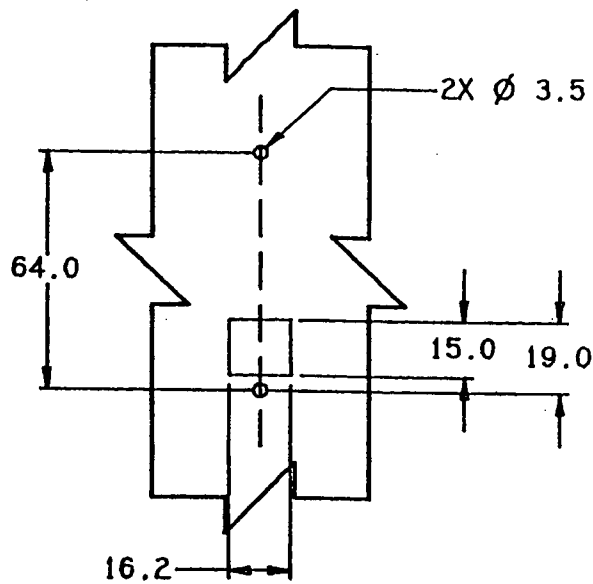
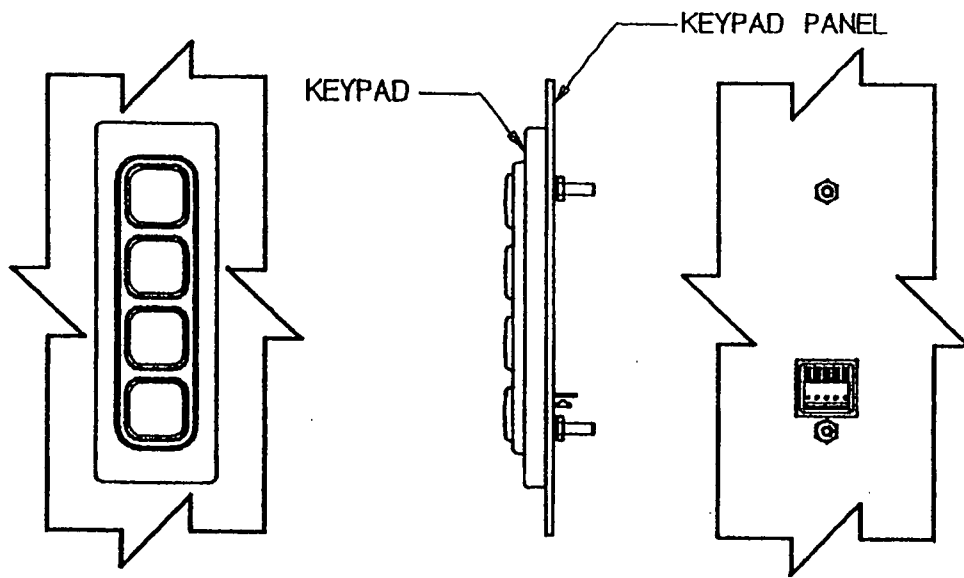
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 26   |



**FIG. 17**  
**1X3 UNLIGHTED AND LIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

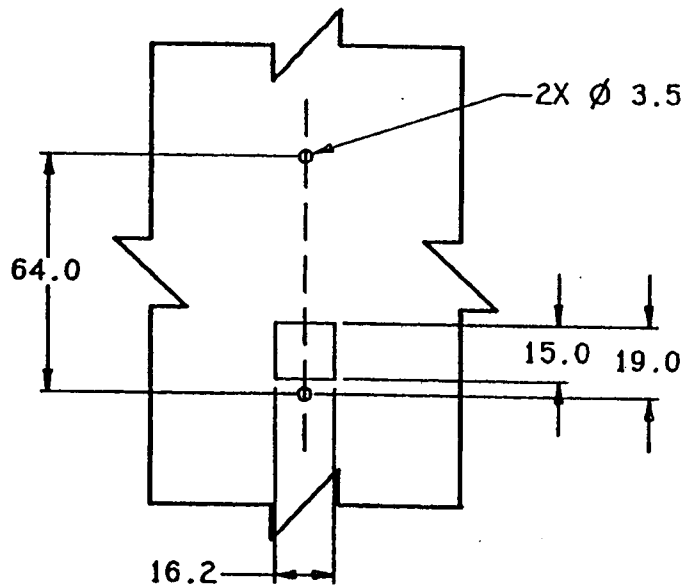
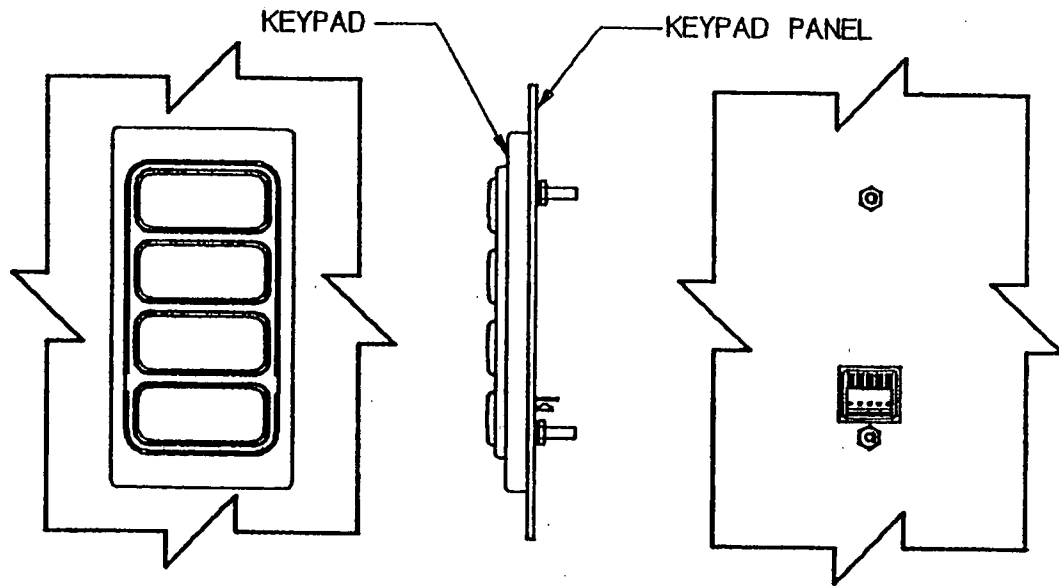
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 27   |



**FIG. 18**  
**1X4 UNLIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

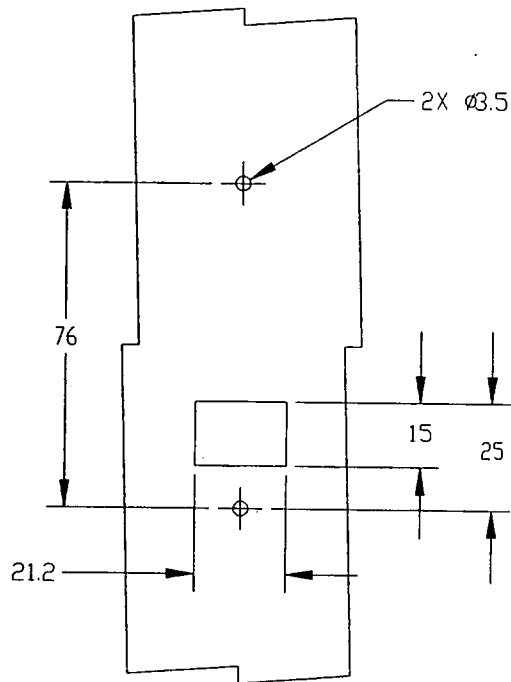
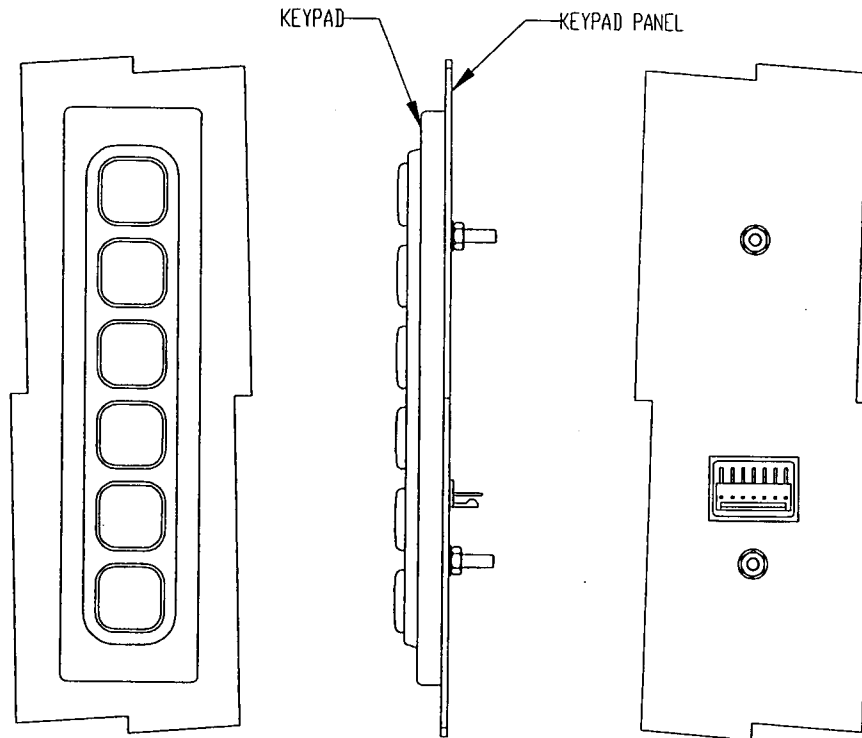
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 28   |



**FIG. 19**  
**1X4 DW UNLIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

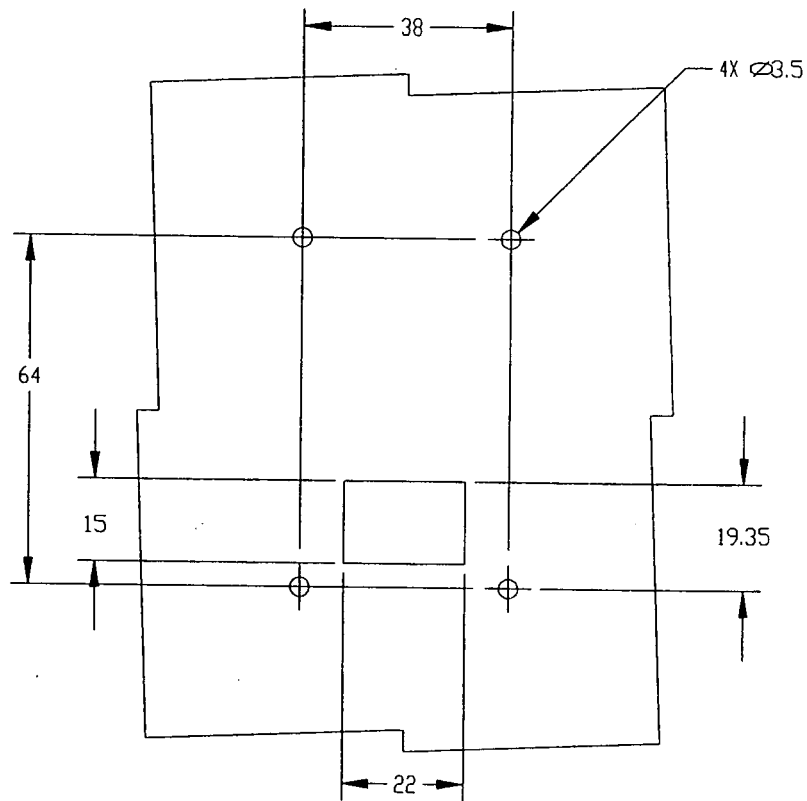
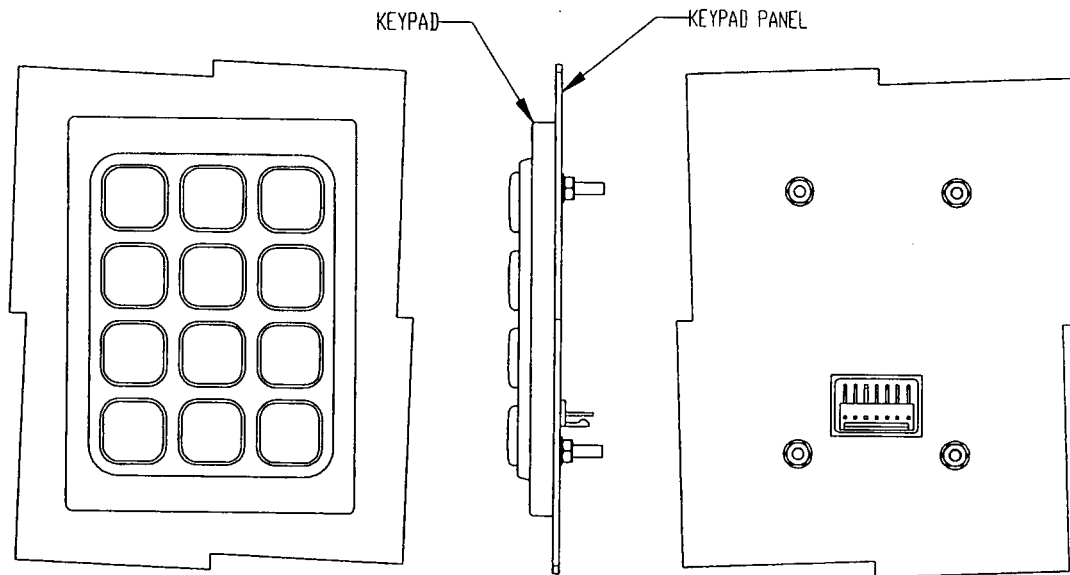
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 29   |



**FIG. 20**  
**1X6 UNLIGHTED SURFACE MOUNT RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

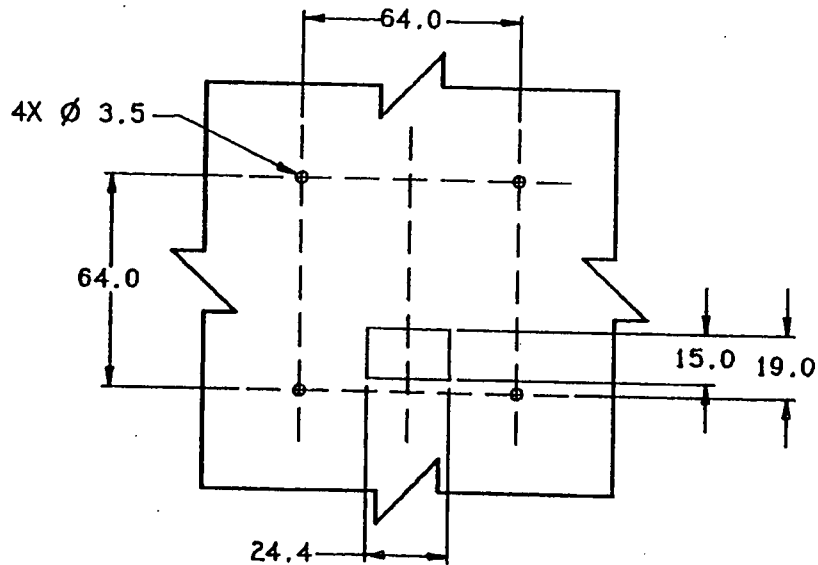
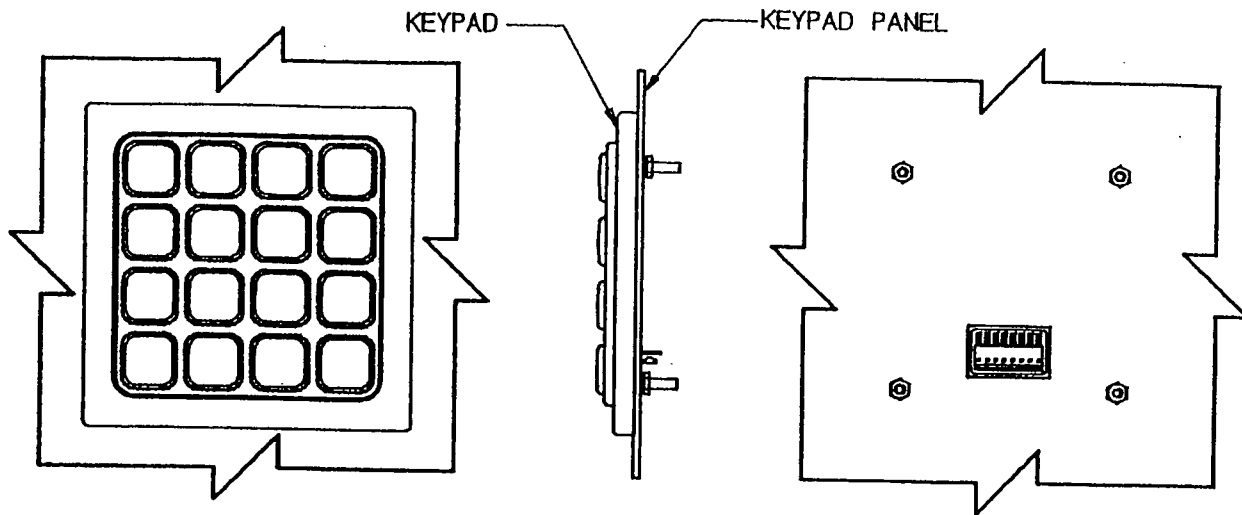
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
|--------------|-------------------------|------|------|
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 30   |



**FIG. 21**  
**3X4 UNLIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

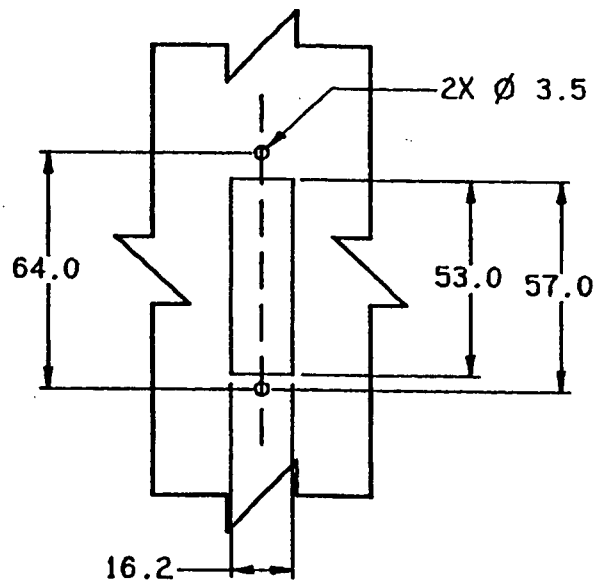
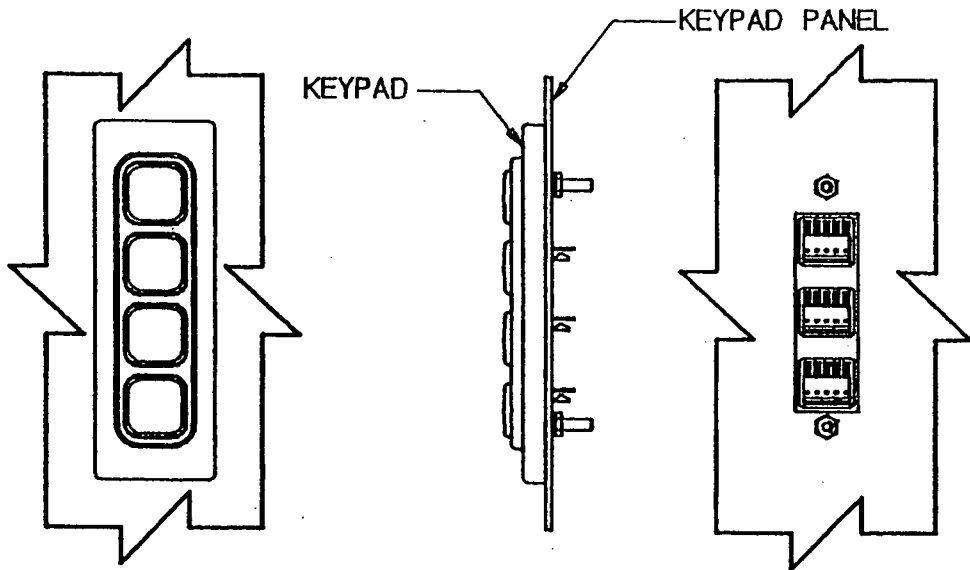
|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>31</b> |



**FIG. 22**  
**4X4 UNLIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

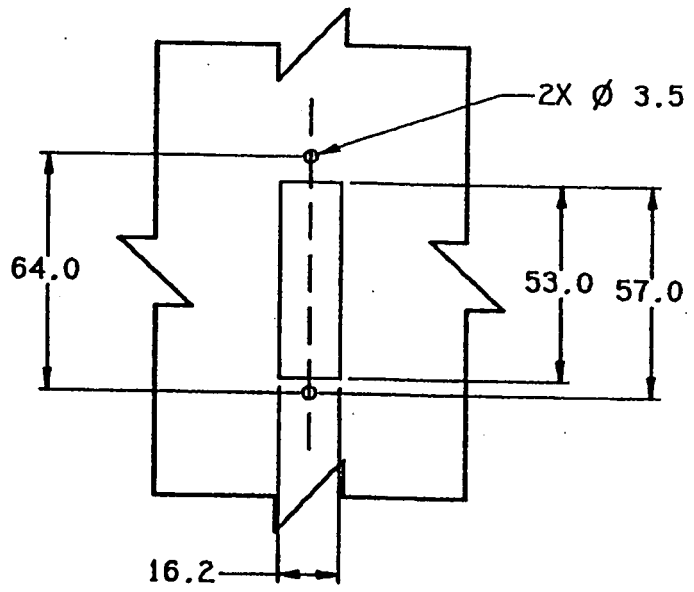
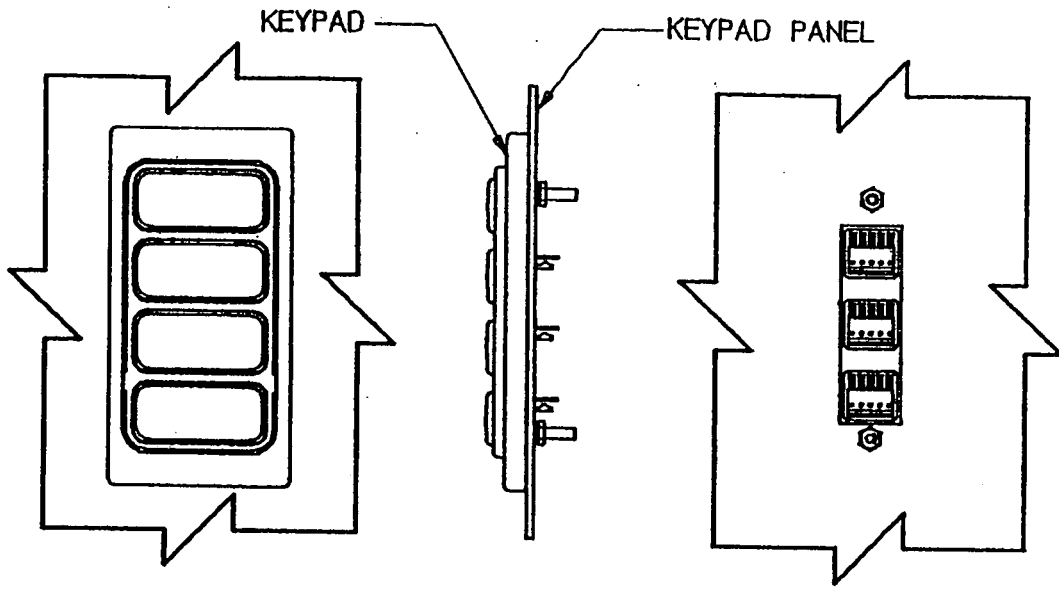
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 32   |



**FIG. 23**  
**1X4 LIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

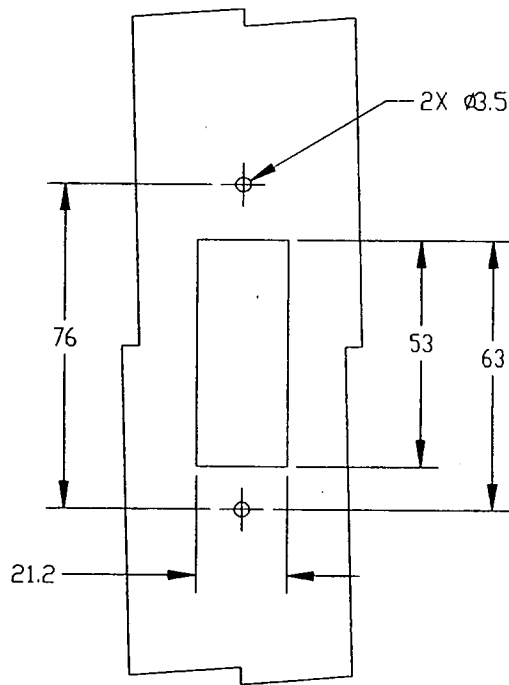
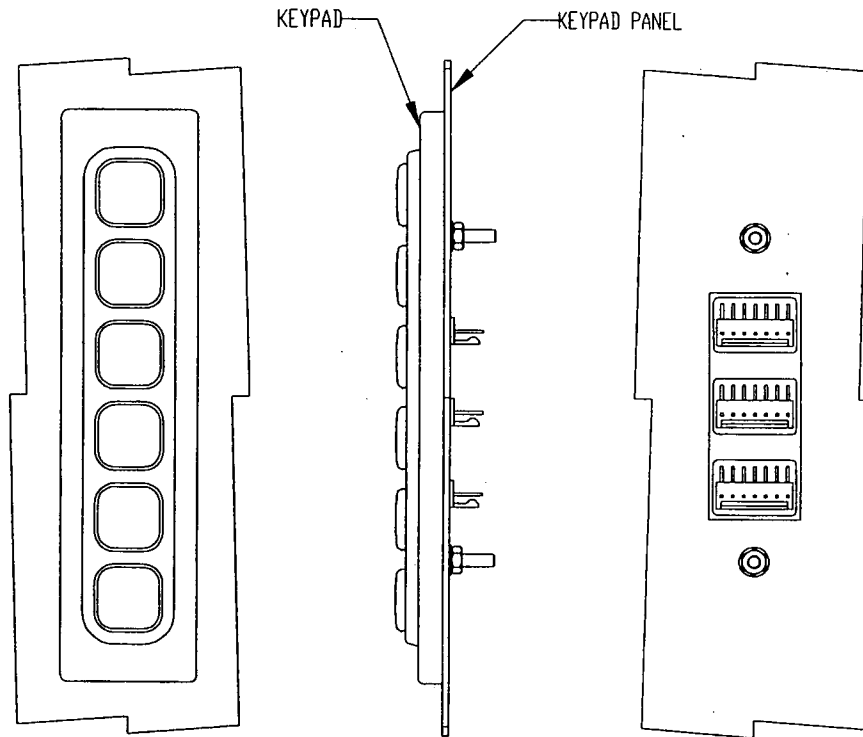
|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 33   |



**FIG. 24**  
**1X4 DW LIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

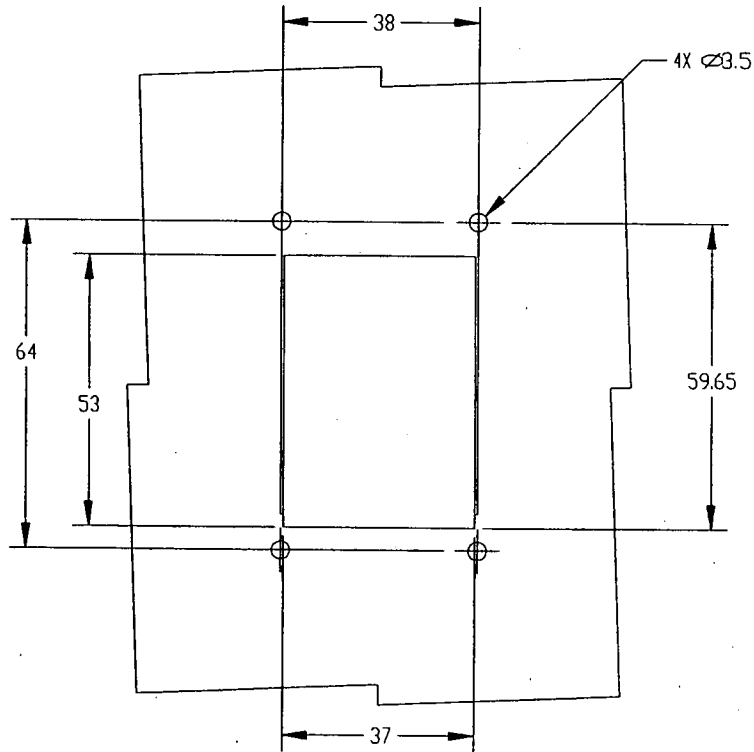
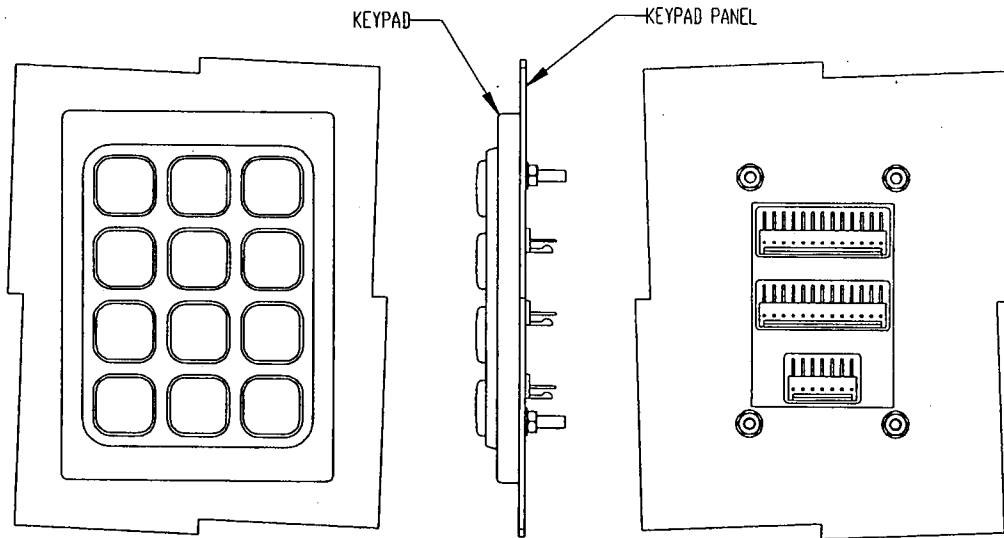
|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>34</b> |



**FIG. 25**  
**1X6 LIGHTED SURFACE MOUNT RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

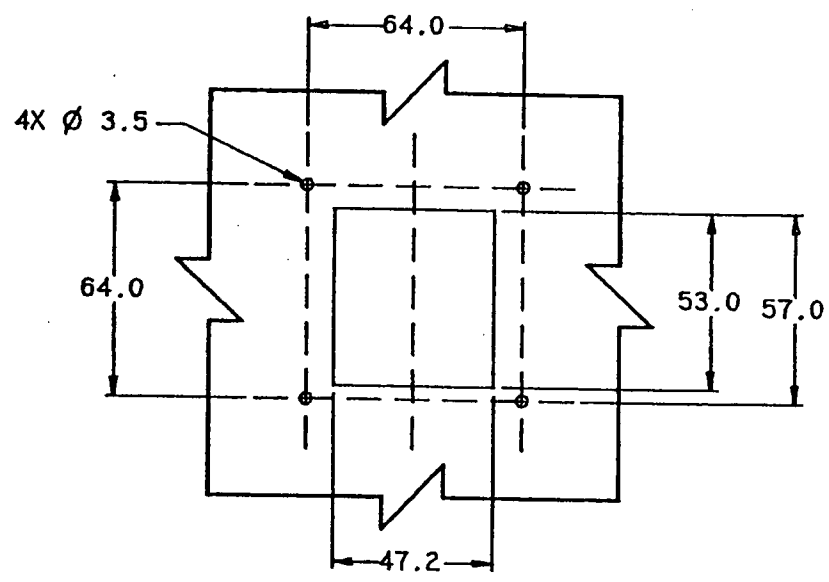
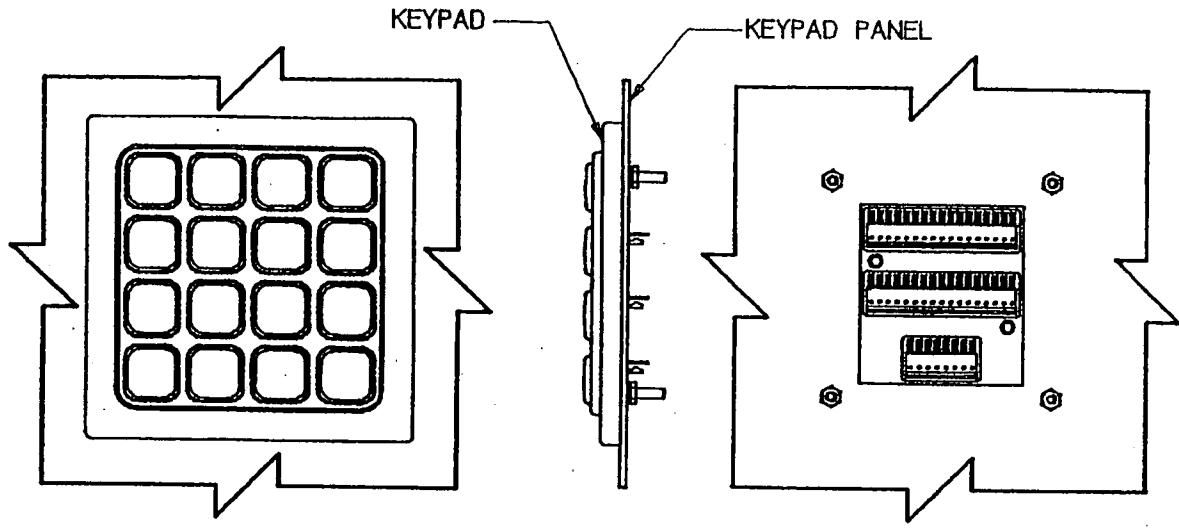
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
|--------------|-------------------------|------|------|
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 35   |



**FIG. 26**  
**3X4 LIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

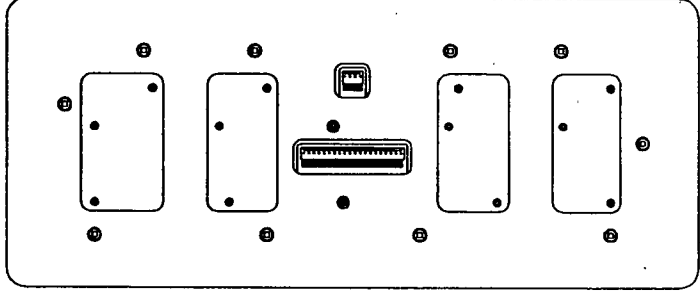
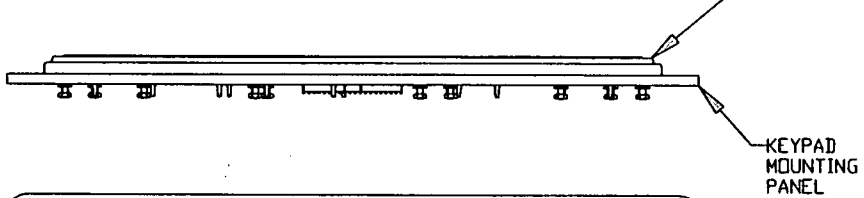
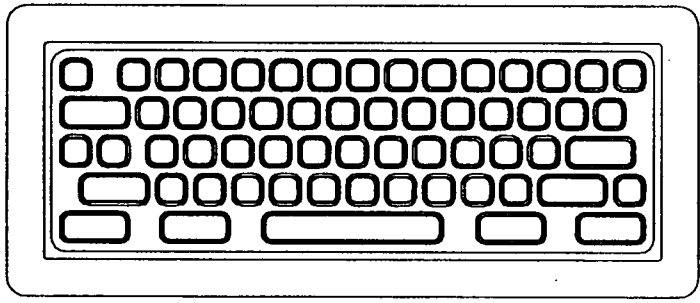
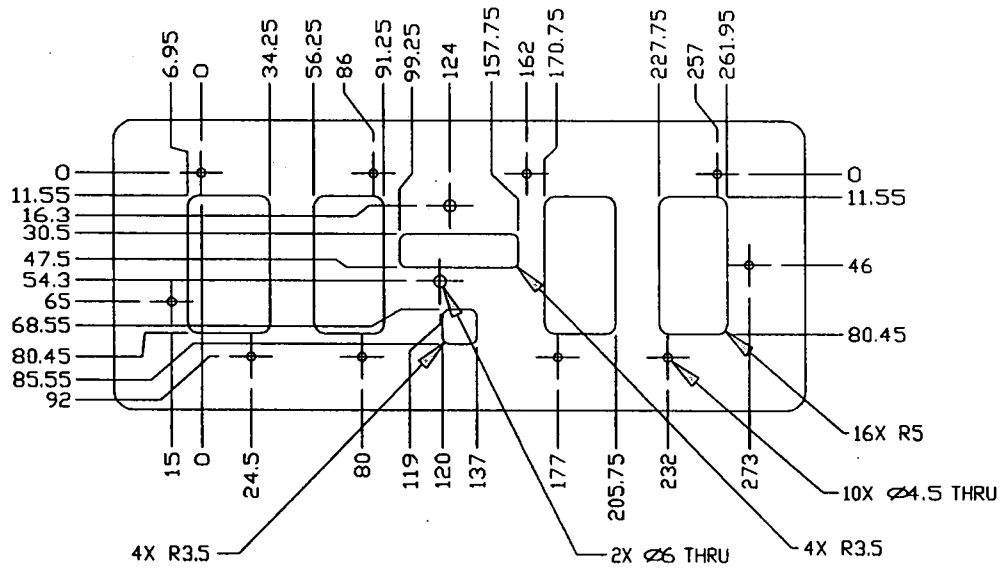
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
|--------------|-------------------------|------|------|
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 36   |



**FIG. 27**  
**4X4 LIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 37   |



**FIG. 28**  
**QWERTY UNLIGHTED AND LIGHTED SURFACE MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HOLES**

DIMENSIONS ARE IN MILLIMETERS.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>38</b> |

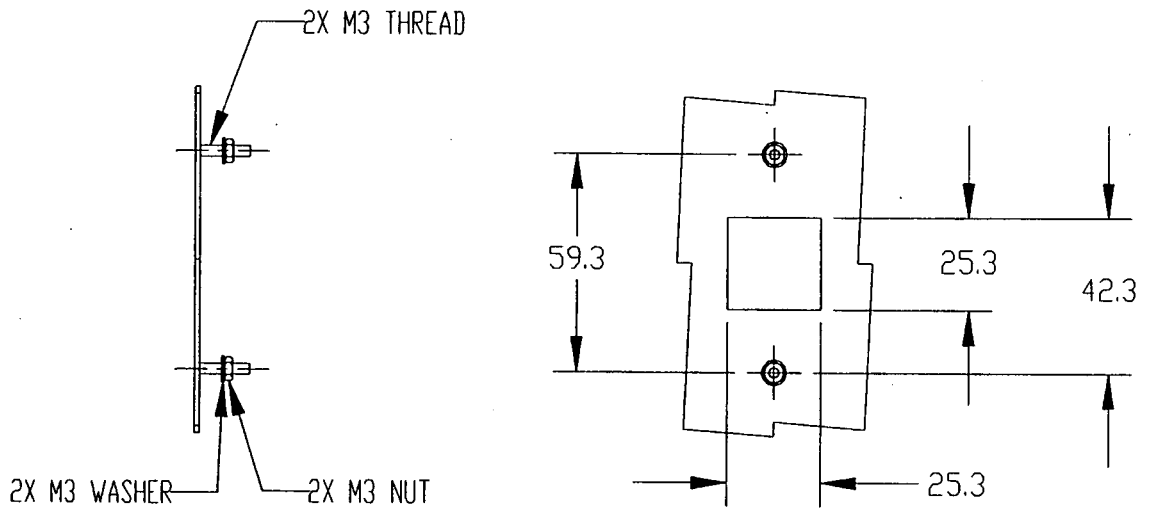
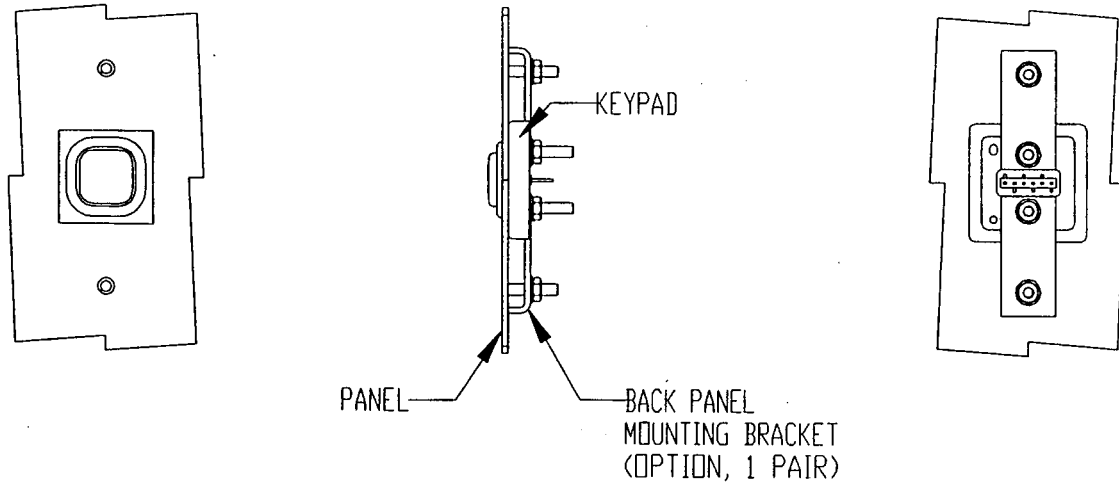
### 3.1.1.2 Rear Mount Application

Table C references keypad and panel cutout recommendation for rear mount application.

Table C  
**Keypad and Panel Cutout for Rear Mount**

| Keypad Configuration | Lighting             | Panel Cutout       |
|----------------------|----------------------|--------------------|
| 1X1                  | Unlighted or Lighted | Refer to Figure 29 |
| 1X2                  | Unlighted or Lighted | Refer to Figure 30 |
| 1X3                  | Unlighted or Lighted | Refer to Figure 31 |
| 1X4                  | Unlighted            | Refer to Figure 32 |
| 1X4 DW               | Unlighted            | Refer to Figure 33 |
| 1X6                  | Unlighted            | Refer to Figure 34 |
| 3X4                  | Unlighted            | Refer to Figure 35 |
| 4X4                  | Unlighted            | Refer to Figure 36 |
| 1X4                  | Lighted              | Refer to Figure 37 |
| 1X4 DW               | Lighted              | Refer to Figure 38 |
| 1X6                  | Lighted              | Refer to Figure 39 |
| 3X4                  | Lighted              | Refer to Figure 40 |
| 4X4                  | Lighted              | Refer to Figure 41 |
| Qwerty, 61 key       | Unlighted or Lighted | Refer to Figure 42 |

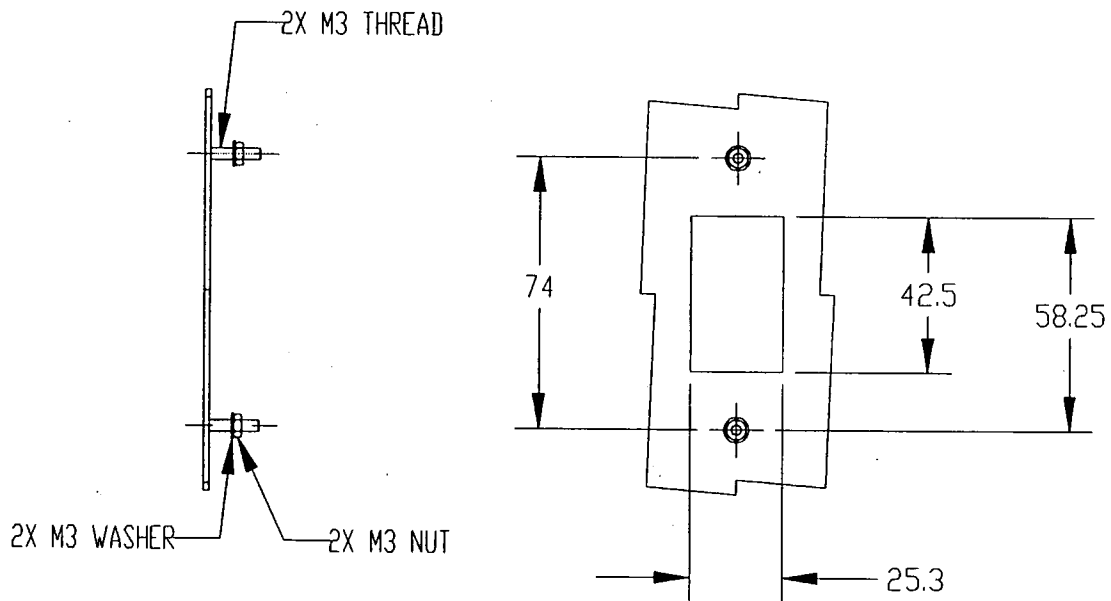
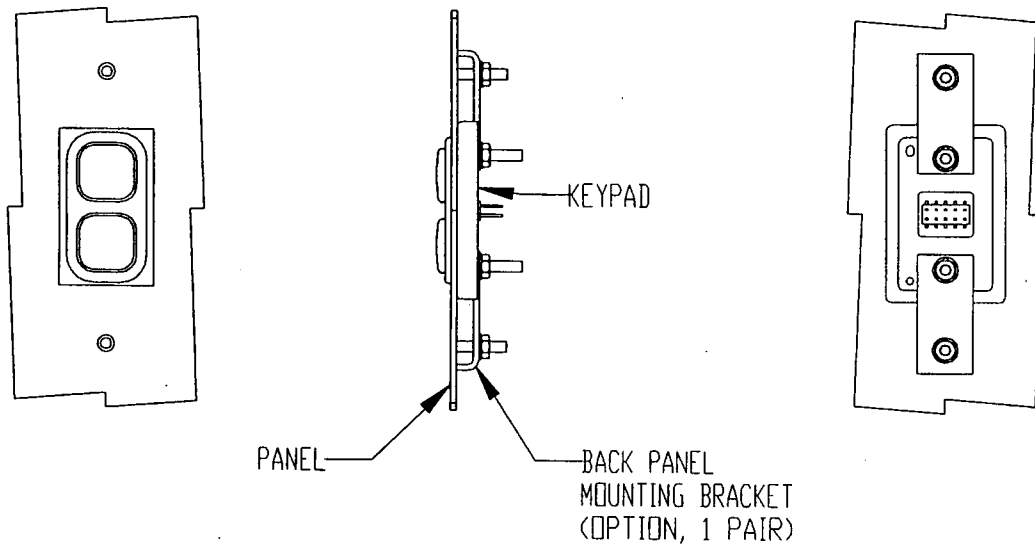
|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 39   |



**FIG. 29**  
**1X1 UNLIGHTED AND LIGHTED REAR MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HARDWARE**

DIMENSIONS ARE IN MILLIMETERS.

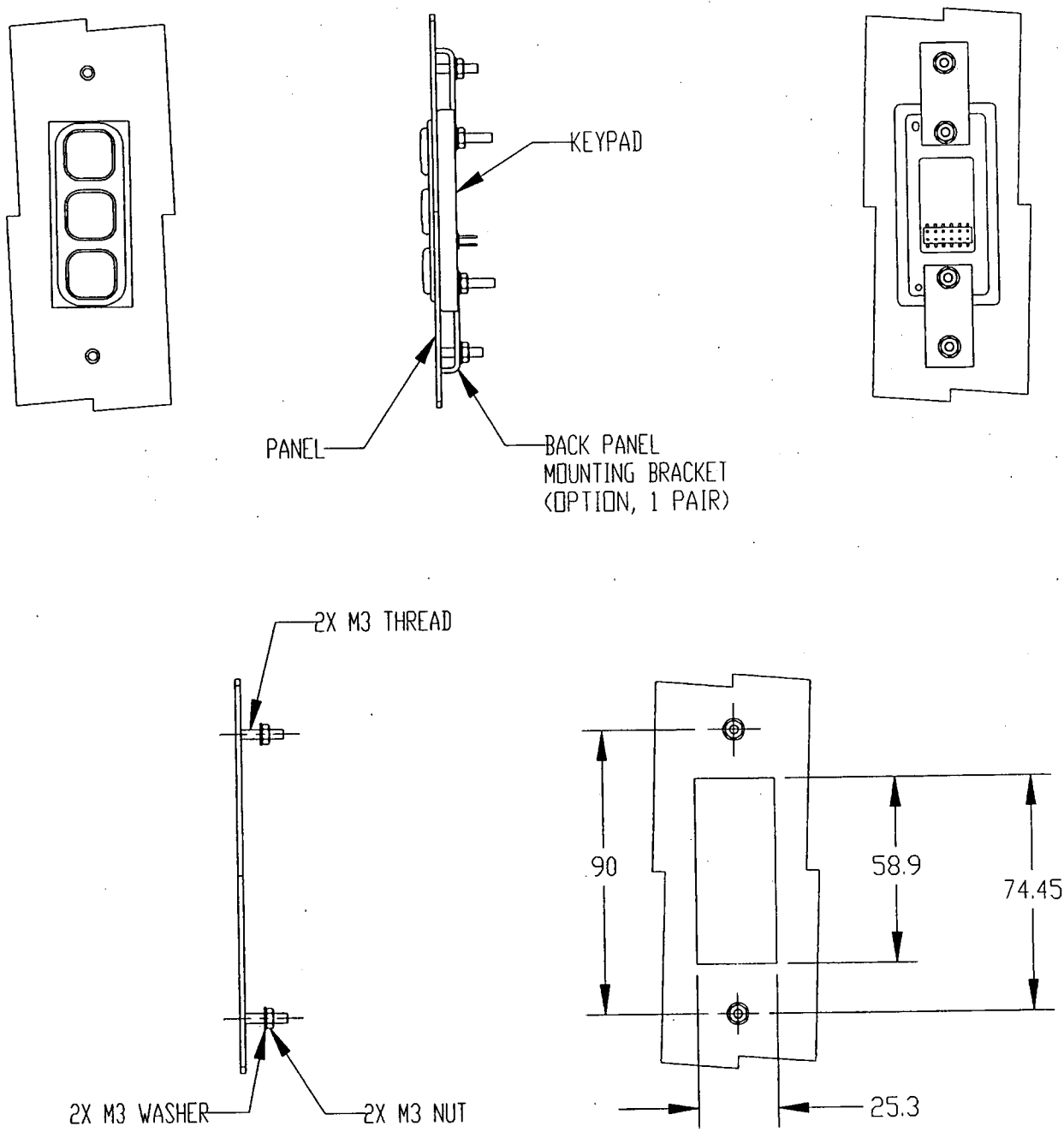
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
|--------------|-------------------------|------|------|
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 40   |



**FIG. 30**  
**1X2 UNLIGHTED AND LIGHTED REAR MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HARDWARE**

DIMENSIONS ARE IN MILLIMETERS.

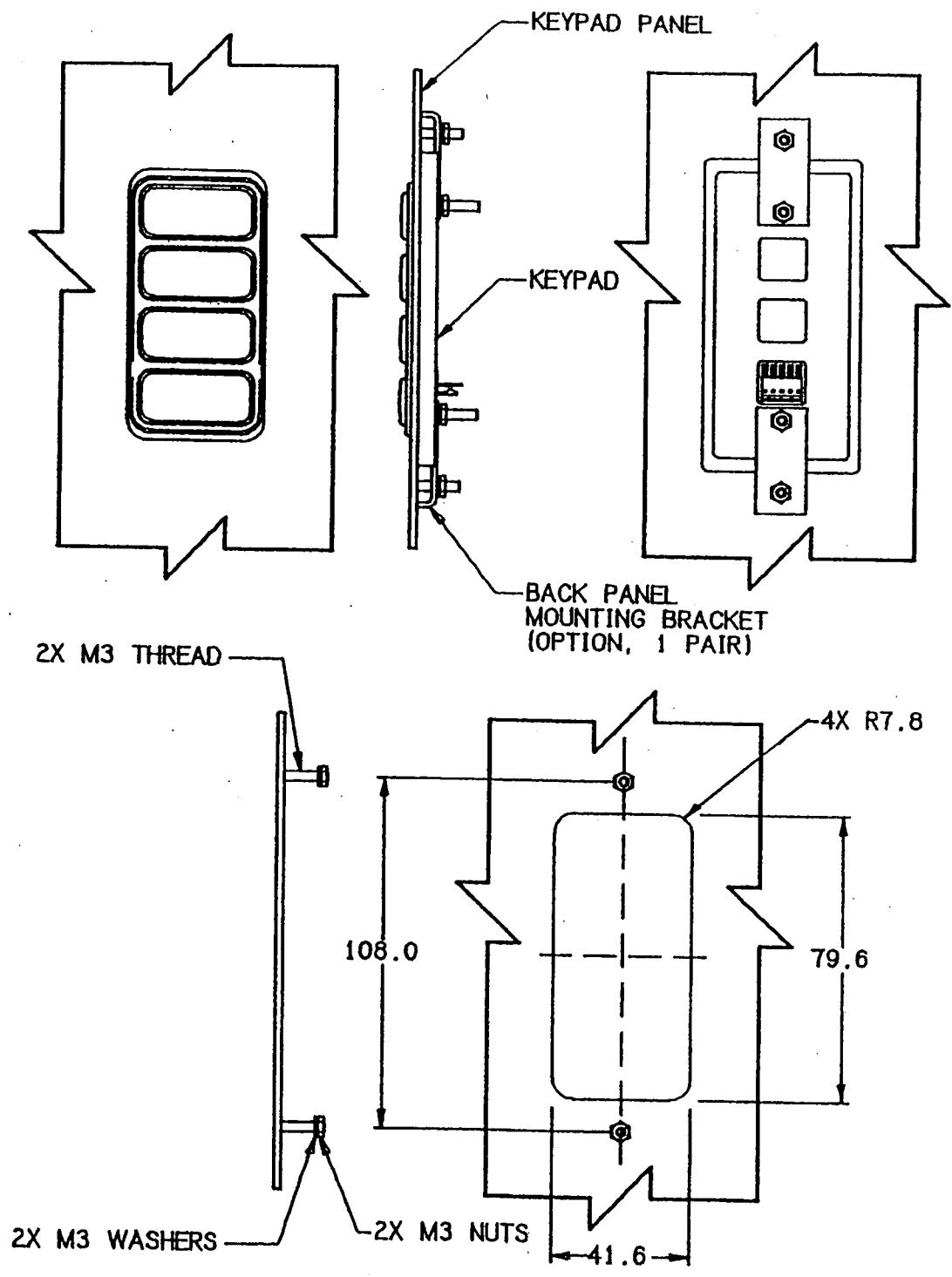
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 41   |



**FIG. 31**  
**1X3 UNLIGHTED AND LIGHTED REAR MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HARDWARE**

DIMENSIONS ARE IN MILLIMETERS.

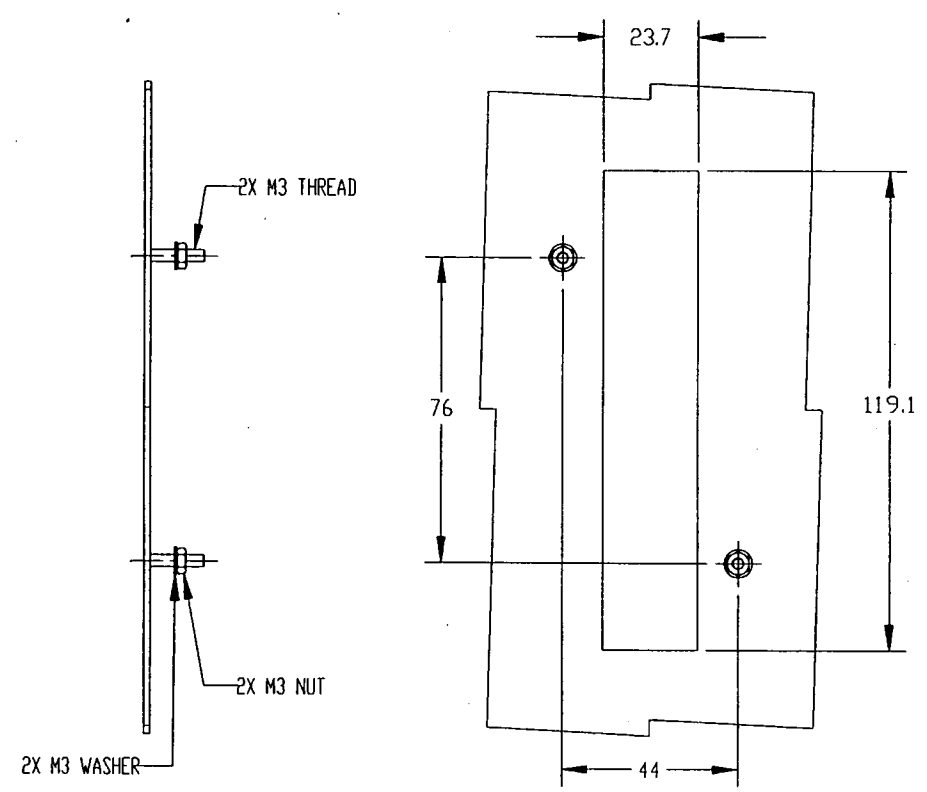
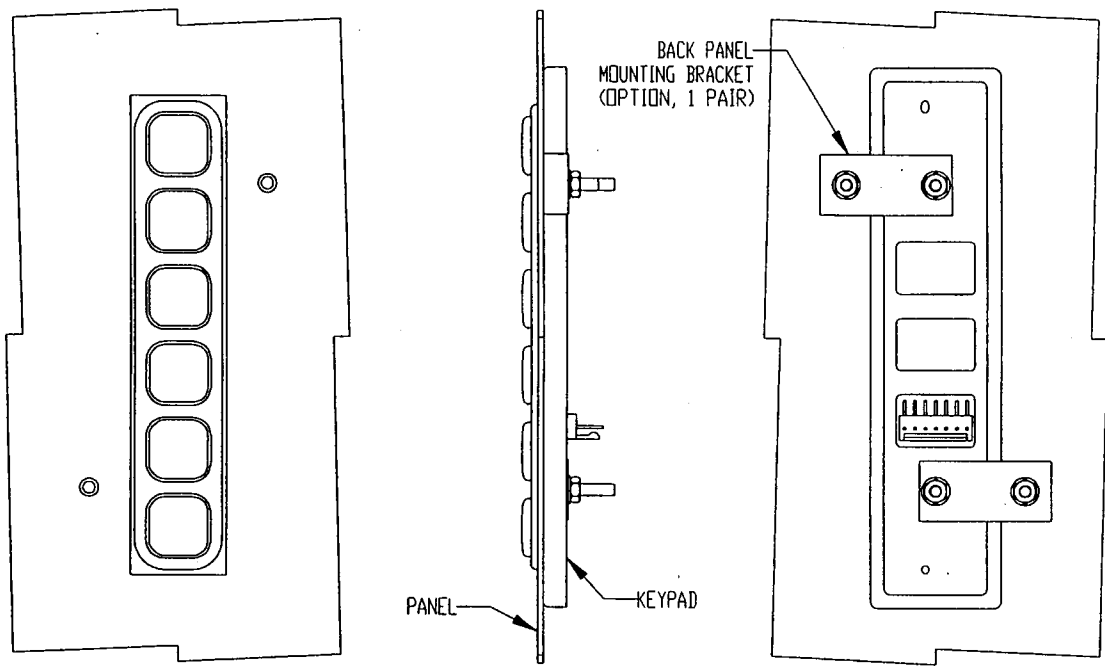
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 42   |



**FIG. 33**  
**1X4 DW UNLIGHTED REAR MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HARDWARE**

DIMENSIONS ARE IN MILLIMETERS.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 44   |

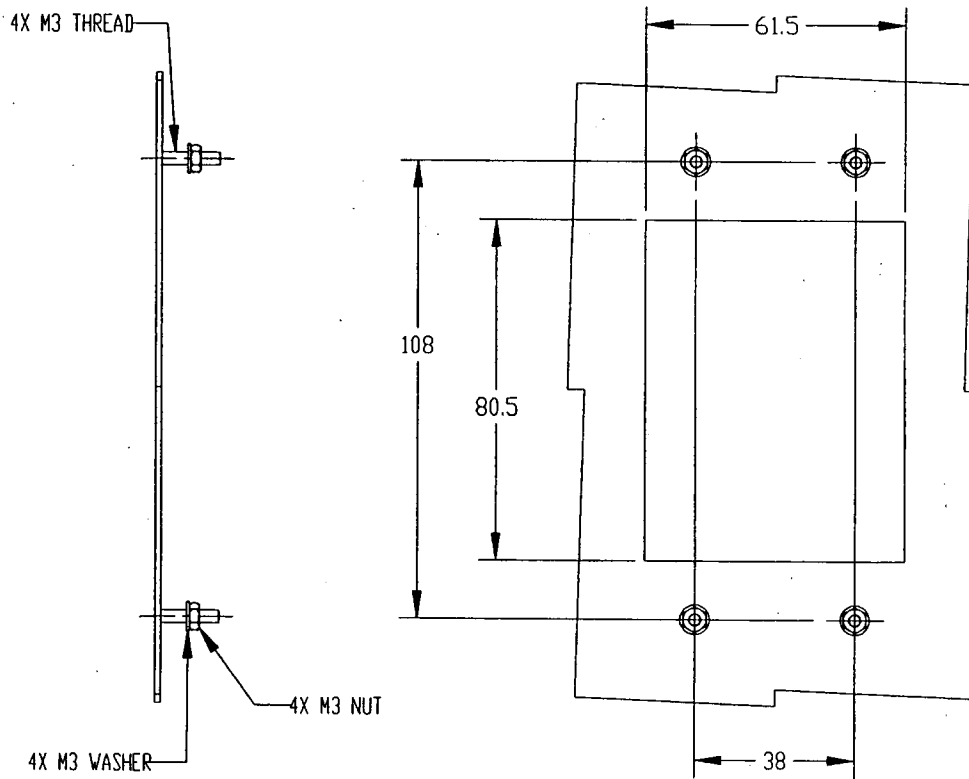
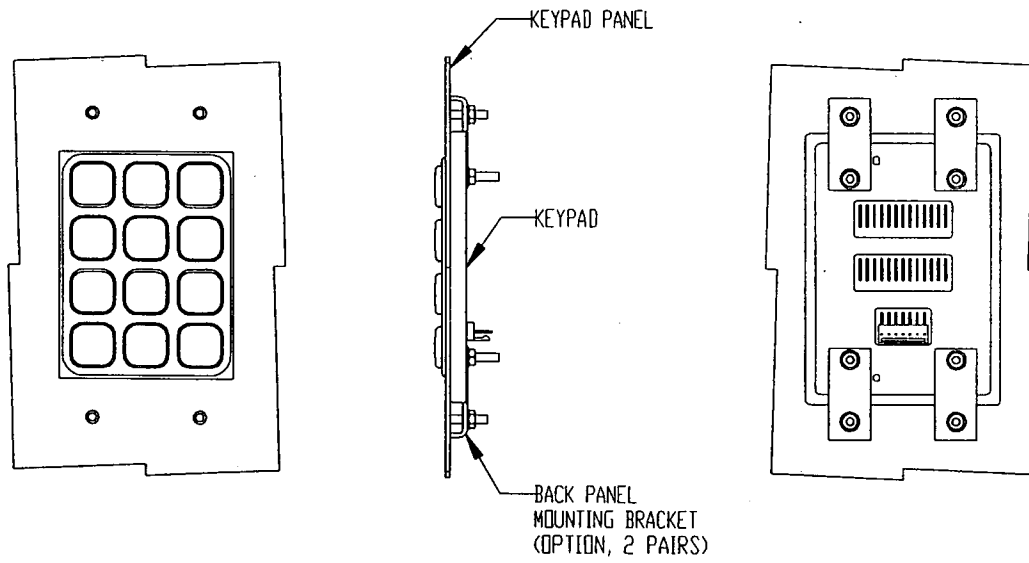


**FIG. 34**

**1X6 UNLIGHTED REAR MOUNT RECOMMENDED PANEL CUTOUT AND HARDWARE**

DIMENSIONS ARE IN MILLIMETERS.

| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
|--------------|--------------------------------|----------|-----------|
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>45</b> |



**FIG. 35**  
**3X4 UNLIGHTED REAR MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HARDWARE**

DIMENSIONS ARE IN MILLIMETERS.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 46   |

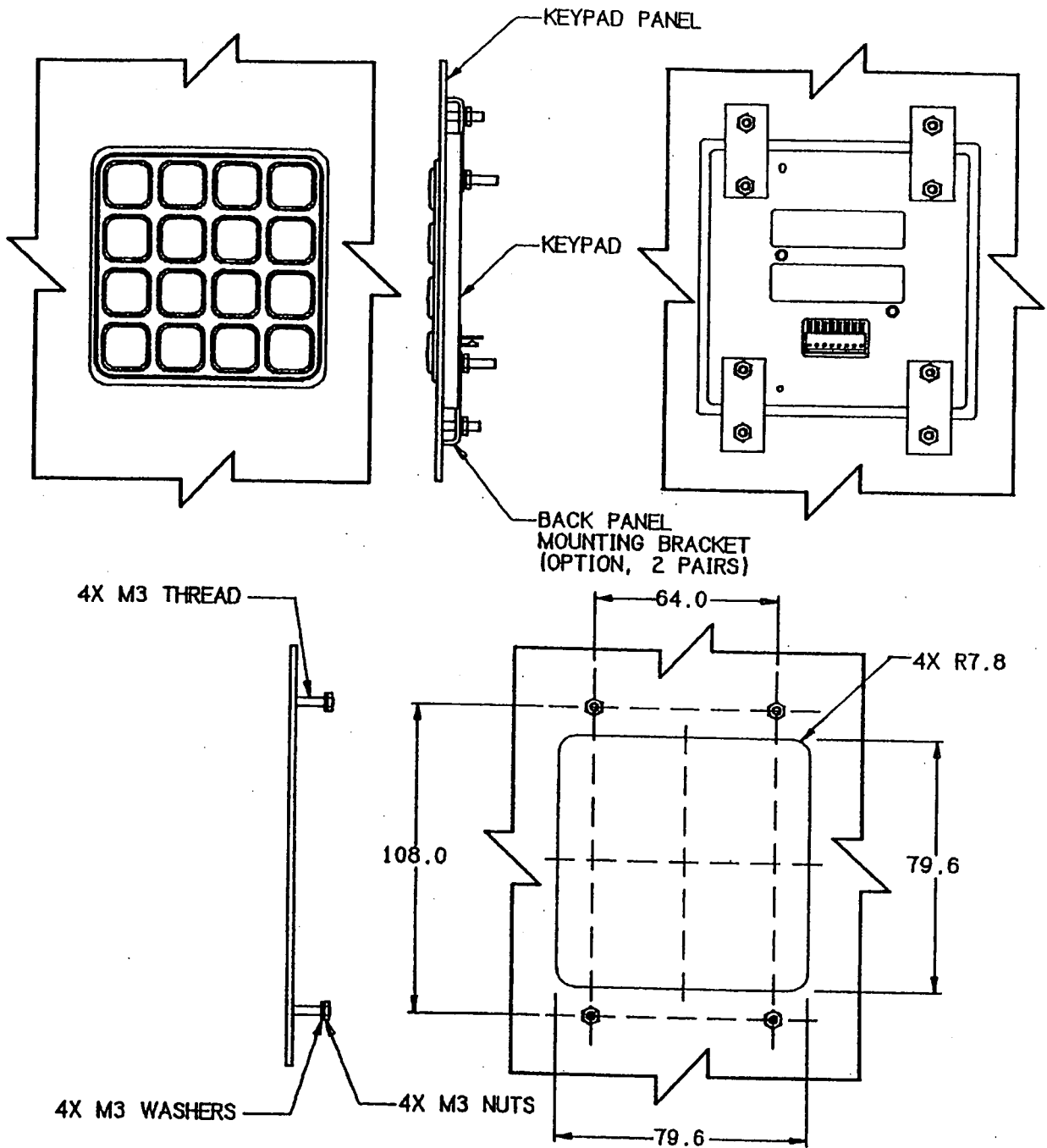
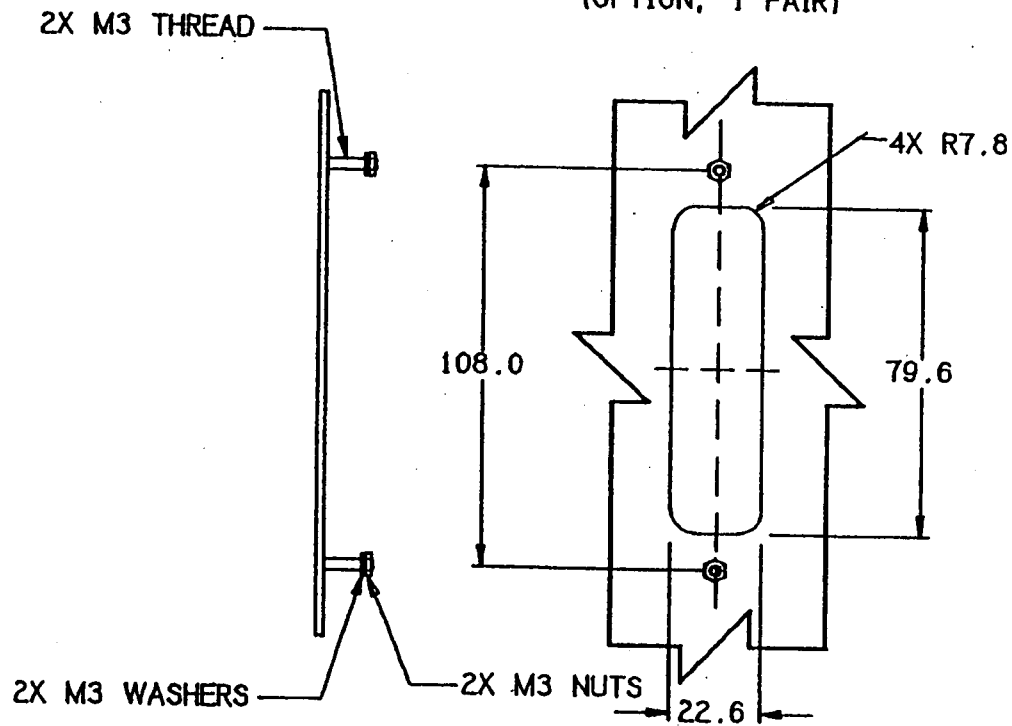
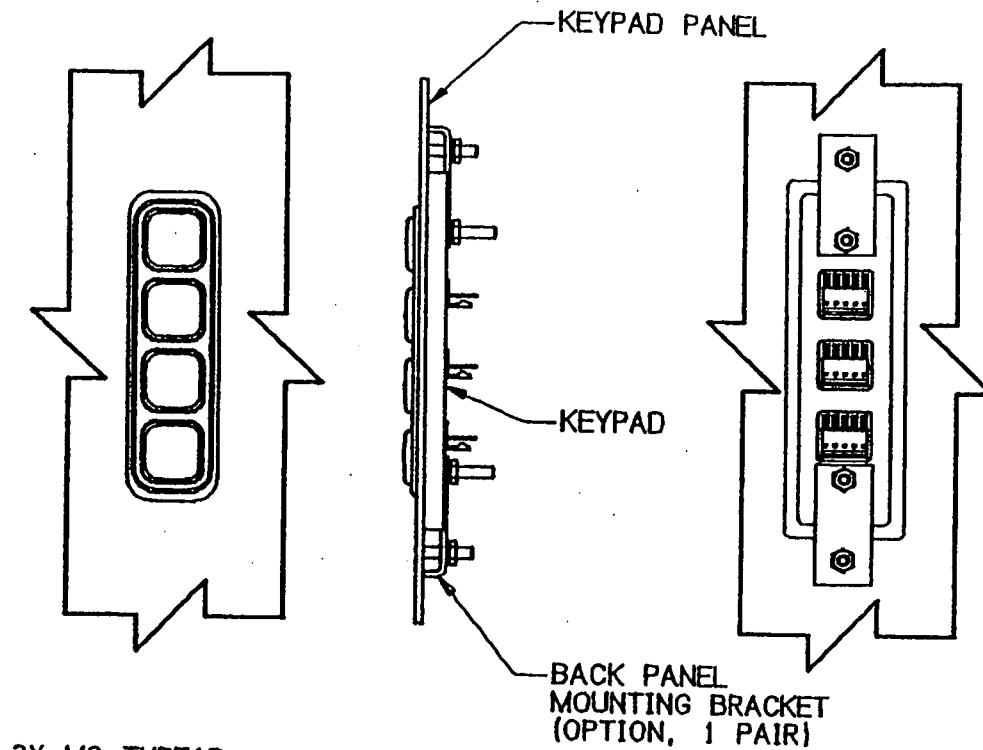


FIG. 36  
4X4 UNLIGHTED REAR MOUNT  
RECOMMENDED PANEL CUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

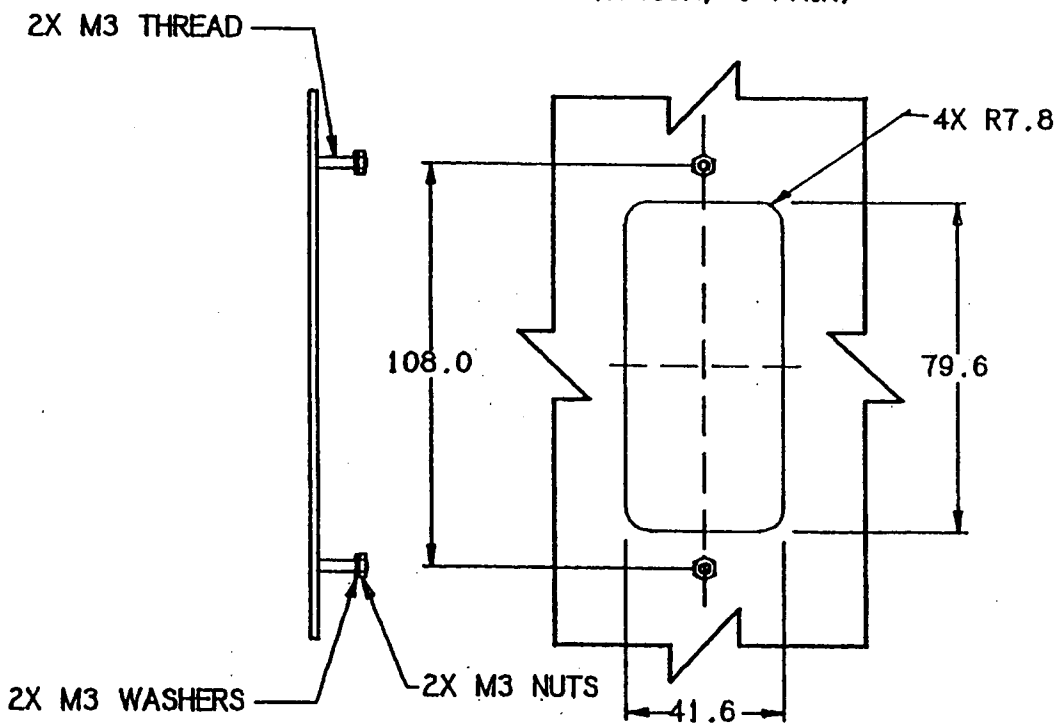
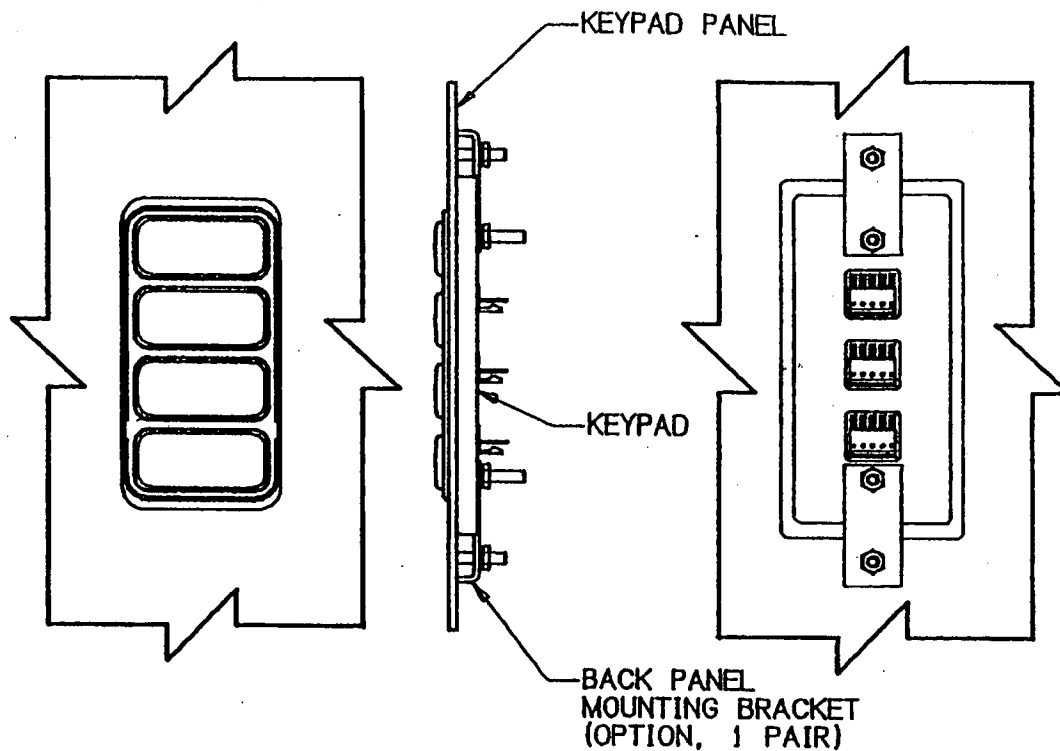
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 47   |



**FIG. 37**  
**1X4 LIGHTED REAR MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HARDWARE**

DIMENSIONS ARE IN MILLIMETERS.

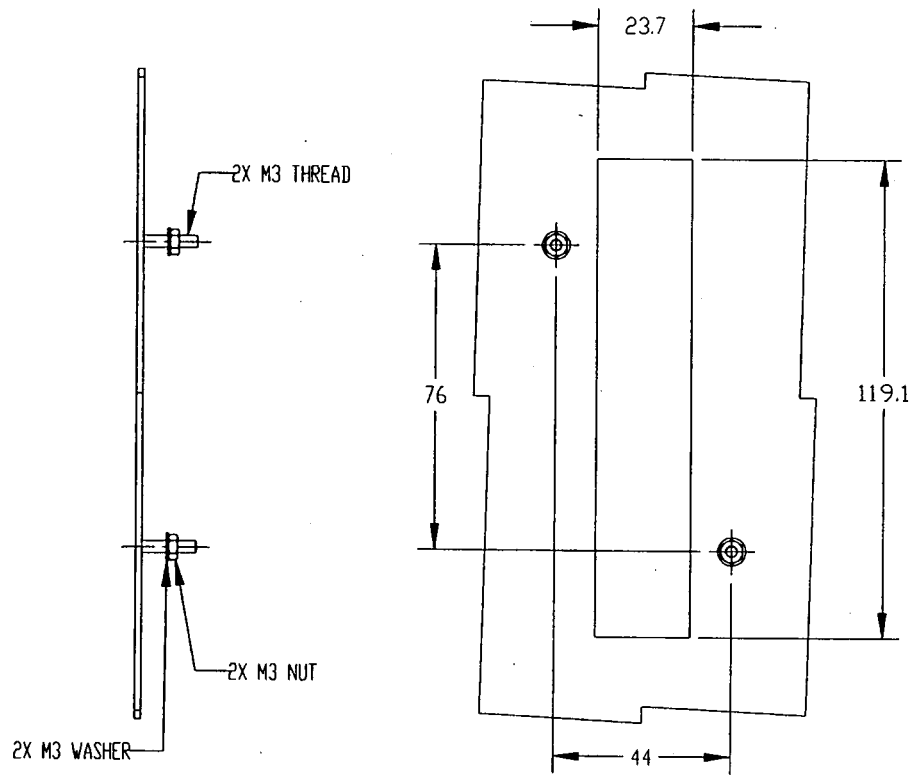
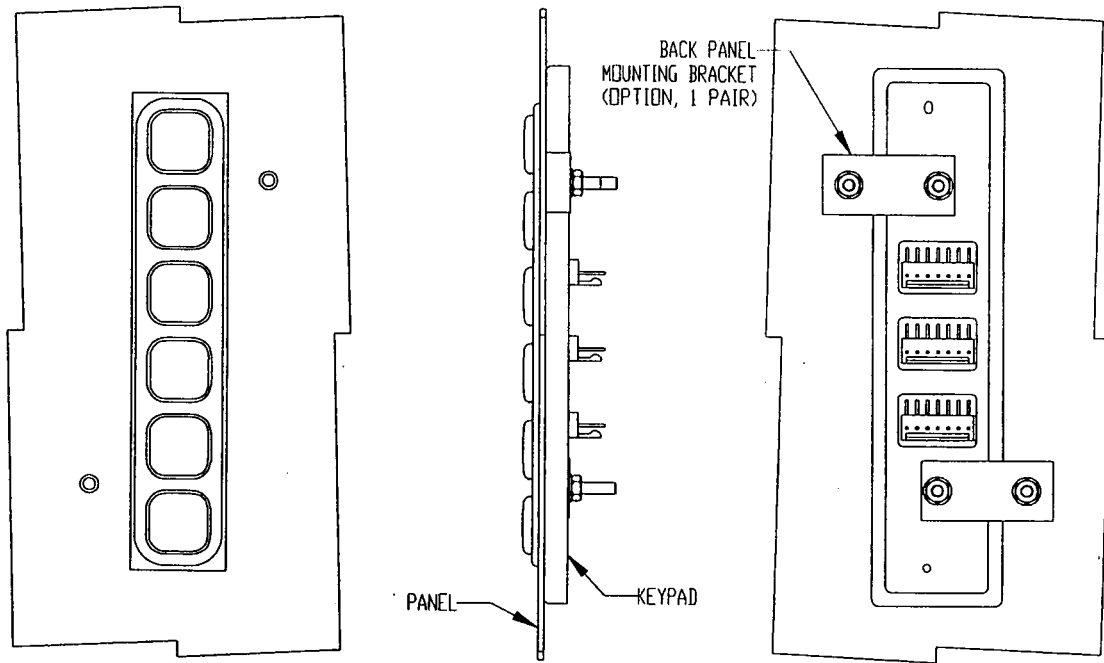
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 48   |



**FIG. 38**  
**1X4 DW LIGHTED REAR MOUNT**  
**RECOMMENDED PANEL CUTOUT AND HARDWARE**

DIMENSIONS ARE IN MILLIMETERS.

| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
|--------------|-------------------------|------|------|
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 49   |



**FIG. 39**

**1X6 LIGHTED REAR MOUNT RECOMMENDED PANEL CUTOUT AND HARDWARE**

DIMENSIONS ARE IN MILLIMETERS.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 50   |

### 3.1.2 Mounting Torque

The recommended torque to be applied to the nuts during installation is  $0.34 \pm 0.02$  Nm ( $3.00 \pm 0.18$  lbf in).

## 3.2 Interface Connections

### 3.2.1 Keypad Switching and Lighting Connections

The connection to keypad is through a standard .100 inches (2.54 mm) pitch centerline connector system. The keypad has .025 inches (0.64 mm) square pin friction lock headers for switching and lighting connections. The 1X1, 1X2 and 1X3 keypads do not have friction lock headers. The .100 inches (2.54 mm) center header pins are gold plated.

The mating connector of the 1X4, 1X4 DW, 1X6, 3X4, 4X4 and Qwerty keypads should have a .100 inches (2.54 mm) center crimp terminal housing. It is recommended that the crimp housing has polarizing ribs and locking ramp.

The mating cable assembly of the 1X1, 1X2 and 1X3 keypads should have a .100 inches (2.54 mm) center. Mating connector kits and cable assemblies are available; see Section 4.5 for these and other accessories. Users must provide their own strain relief for severe vibration requirements.

Pushbutton location charts are provided in Figures 1 through 14. Each switch location is identified by a letter for the row (from top to bottom) and a sequence number (from left to right). This key location is utilized when determining associated interface connector pin numbers, keycap and legend locations.

Table D references keypad and switching and lighting connections. The switching connections of an unlighted keypad and a lighted keypad are exactly the same.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 54   |

Table D  
Keypad Switching and Lighting Connection

| Keypad Configuration | Lighting             | Switch Contacts                          |
|----------------------|----------------------|--|
| 1X1                  | Unlighted or Lighted | Refer to Figure 1                        |
| 1X2                  | Unlighted or Lighted | Refer to Figure 2                        |
| 1X3                  | Unlighted or Lighted | Refer to Figure 3                        |
| 1X4                  | Unlighted            | Refer to Figure 4                        |
| 1X4 DW               | Unlighted            | Refer to Figure 5                        |
| 1X6                  | Unlighted            | Refer to Figure 6                        |
| 3X4                  | Unlighted            | Refer to Figure 7<br>and Table E         |
| 4X4                  | Unlighted            | Refer to Figure 8<br>and Table F         |
| 1X4                  | Lighted              | Refer to Figure 9                        |
| 1X4 DW               | Lighted              | Refer to Figure 10                       |
| 1X6                  | Lighted              | Refer to Figure 11                       |
| 3X4                  | Lighted              | Refer to Figure 12<br>and Table E        |
| 4X4                  | Lighted              | Refer to Figure 13<br>and Table F        |
| Qwerty, 61-key       | Unlighted or Lighted | Refer to Figure 14<br>and Tables G and H |

The 1X1, 1X2, 1X3, 1X4, 1X6 and 1X4 DW configurations have common ground type switching connections.

The 3X4 and 4X4 configurations have matrix array type switching connections. The Xs in Tables E and F show connected contacts when the pushbutton is actuated. Figures 7, 8, 12 and 13 show the pushbutton location and the switch contact.

|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 55   |

Table E

**3X4 Pushbutton Location and Switch Contact Chart**

| Button<br>Location | Switch Contact |   |   |   |   |   |   |
|--------------------|----------------|---|---|---|---|---|---|
|                    | 1              | 2 | 3 | 4 | 5 | 6 | 7 |
| A1                 | X              |   |   |   | X |   |   |
| A2                 | X              |   |   |   |   | X |   |
| A3                 | X              |   |   |   |   |   | X |
| B1                 |                | X |   |   | X |   |   |
| B2                 |                | X |   |   |   | X |   |
| B3                 |                | X |   |   |   |   | X |
| C1                 |                |   | X |   | X |   |   |
| C2                 |                |   | X |   |   | X |   |
| C3                 |                |   | X |   |   |   | X |
| D1                 |                |   |   | X | X |   |   |
| D2                 |                |   |   | X |   | X |   |
| D3                 |                |   |   | X |   |   | X |

Table F

**4X4 Pushbutton Location and Switch Contact Chart**

| Button<br>Location | Switch Contact |   |   |   |   |   |   |   |
|--------------------|----------------|---|---|---|---|---|---|---|
|                    | 1              | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| A1                 | X              |   | X |   |   |   |   |   |
| A2                 | X              |   |   | X |   |   |   |   |
| A3                 | X              |   |   |   | X |   |   |   |
| A4                 | X              |   |   |   |   | X |   |   |
| B1                 |                | X | X |   |   |   |   |   |
| B2                 |                | X |   | X |   |   |   |   |
| B3                 |                | X |   |   | X |   |   |   |
| B4                 |                | X |   |   |   | X |   |   |
| C1                 |                |   | X |   |   |   |   | X |
| C2                 |                |   |   | X |   |   |   | X |
| C3                 |                |   |   |   | X |   |   | X |
| C4                 |                |   |   |   |   | X |   | X |
| D1                 |                |   | X |   |   |   | X |   |
| D2                 |                |   |   | X |   |   | X |   |
| D3                 |                |   |   |   | X |   | X |   |
| D4                 |                |   |   |   |   | X | X |   |

|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 56   |

### 3.2.2 Qwerty Keyboard Lighting and Switching Connections

For the 61-key Qwerty keyboard, there are 79 LEDs connected in parallel through a 4-pin connector, J2. Approximately 2.1 VDC is applied to pins 1 and 2, which are tied together on the switch board, and supply the anodes of the LEDs. The cathodes are connected to pins 3 and 4 for the return to common as shown on Table G. The current required is approximately 1.6 Amps.

To conveniently and efficiently meet the lighting power requirements of 1.6 Amps at 2.1 VDC, a choice of two AC power converters are available. See section 4.4.3 for Qwerty lighting power supplies and cabling.

Table G  
**Qwerty LED Connector Pin Chart**

| All LEDs | Connector J2 Pin Number |   |   |   |
|----------|-------------------------|---|---|---|
|          | 1                       | 2 | 3 | 4 |
| Anode    | X                       | X |   |   |
| Cathode  |                         |   | X | X |

The 61-key Qwerty configuration uses matrix array switching connections. This basic keyboard provides switch closure information through a 20-pin data connector. Each key position has been assigned an alpha numeric location number, which is identified in Figure 14.

Table H, which follows, identifies which pair of the 20 data lines are connected by each specific key switch closure. It also identifies the alpha-numeric characters and control functions that are normally assigned to each key location.

Encoders are available that convert the output of the 20 data lines into PC-compatible serial data. See Section 4.4.1.

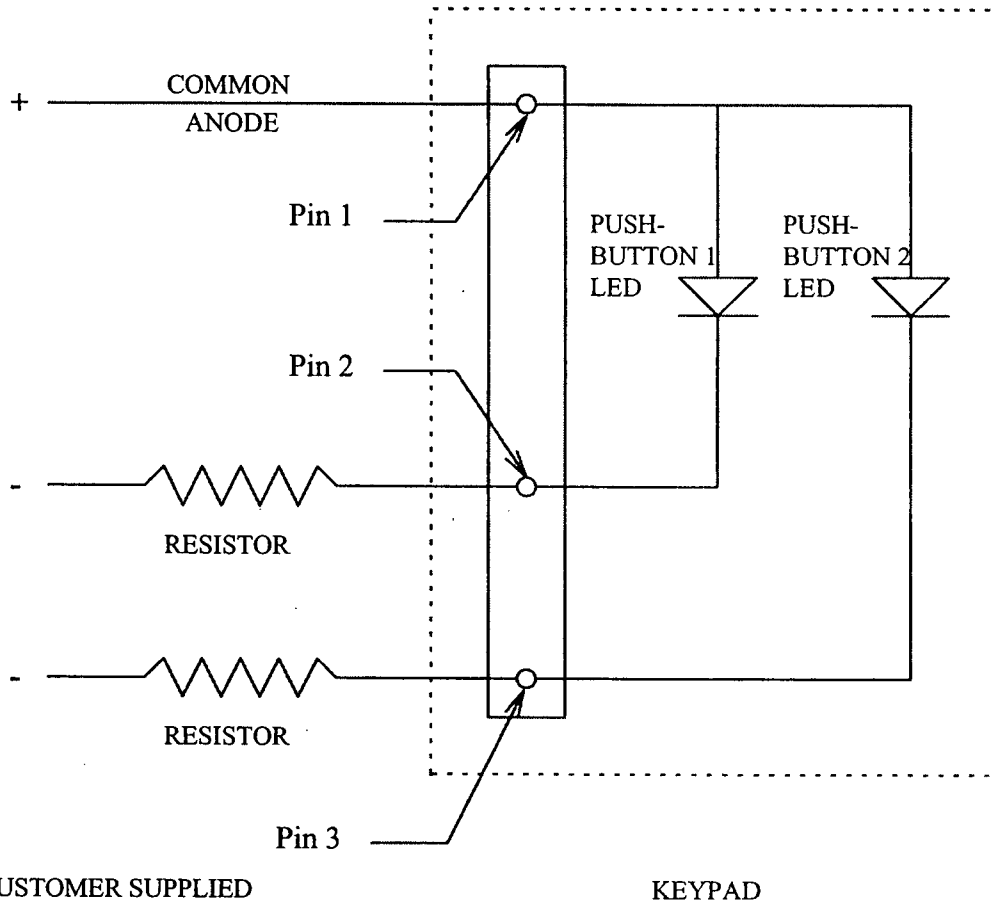
|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>57</b> |



**Qwerty Key Locations and Connector Pin Chart**  
(continued)

| Key Location | Key without Shift | Key with Shift | Key with Fn | Connector J1 Pin Number |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
|--------------|-------------------|----------------|-------------|-------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|
|              |                   |                |             | 1                       | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| C1           | Caps Lock         |                |             |                         |   | X |   |   | X |   |   |   |    |    |    |    |    |    |    |    |    |    |
| C2           | Fn                |                |             |                         |   | X |   |   | X |   |   |   |    |    |    |    |    |    |    |    |    |    |
| C3           | a                 | A              |             |                         |   | X |   |   |   | X |   |   |    |    |    |    |    |    |    |    |    |    |
| C4           | s                 | S              |             |                         |   | X |   |   |   |   | X |   |    |    |    |    |    |    |    |    |    |    |
| C5           | d                 | D              |             |                         |   | X |   |   |   |   |   | X |    |    |    |    |    |    |    |    |    |    |
| C6           | f                 | F              |             |                         |   | X |   |   |   |   |   |   | X  |    |    |    |    |    |    |    |    |    |
| C7           | g                 | G              |             |                         |   | X |   |   |   |   |   |   |    | X  |    |    |    |    |    |    |    |    |
| C8           | h                 | H              |             |                         |   | X |   |   |   |   |   |   |    |    | X  |    |    |    |    |    |    |    |
| C9           | j                 | J              | ⇐           |                         |   | X |   |   |   |   |   |   |    |    |    | X  |    |    |    |    |    |    |
| C10          | k                 | K              |             |                         |   | X |   |   |   |   |   |   |    |    |    |    | X  |    |    |    |    |    |
| C11          | l                 | L              | ⇒           |                         |   | X |   |   |   |   |   |   |    |    |    |    |    | X  |    |    |    |    |
| C12          | ;                 | :              |             |                         |   | X |   |   |   |   |   |   |    |    |    |    |    |    | X  |    |    |    |
| C13          | '                 | "              |             |                         |   | X |   |   |   |   |   |   |    |    |    |    |    |    |    | X  |    |    |
| C14          | Return            |                |             |                         |   | X |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    | X  |
| D1           | ⇧ Shift           |                |             |                         |   |   | X | X |   |   |   |   |    |    |    |    |    |    |    |    |    |    |
| D2           | z                 | Z              |             |                         |   |   | X |   | X |   |   |   |    |    |    |    |    |    |    |    |    |    |
| D3           | x                 | X              |             |                         |   |   | X |   |   | X |   |   |    |    |    |    |    |    |    |    |    |    |
| D4           | c                 | C              |             |                         |   |   | X |   |   |   | X |   |    |    |    |    |    |    |    |    |    |    |
| D5           | v                 | V              |             |                         |   |   | X |   |   |   |   | X |    |    |    |    |    |    |    |    |    |    |
| D6           | b                 | B              |             |                         |   |   | X |   |   |   |   |   | X  |    |    |    |    |    |    |    |    |    |
| D7           | n                 | N              |             |                         |   |   | X |   |   |   |   |   |    | X  |    |    |    |    |    |    |    |    |
| D8           | m                 | M              | End         |                         |   |   | X |   |   |   |   |   |    |    | X  |    |    |    |    |    |    |    |
| D9           | ,                 | <              | ⇩           |                         |   |   | X |   |   |   |   |   |    |    |    | X  |    |    |    |    |    |    |
| D10          | .                 | >              | Page Down   |                         |   |   | X |   |   |   |   |   |    |    |    |    | X  |    |    |    |    |    |
| D11          | /                 | ?              |             |                         |   |   | X |   |   |   |   |   |    |    |    |    |    | X  |    |    |    |    |
| D12          | ⇧ Shift           |                |             |                         |   |   | X |   |   |   |   |   |    |    |    |    |    |    | X  |    |    |    |
| D13          | Del               |                | Ins         |                         |   |   | X |   |   |   |   |   |    |    |    |    |    |    |    | X  |    |    |
| E1           | Control           |                |             |                         |   |   |   | X | X |   |   |   |    |    |    |    |    |    |    |    |    |    |
| E2           | Alt               |                |             |                         |   |   |   | X |   | X |   |   |    |    |    |    |    |    |    |    |    |    |
| E3           | Space Bar         |                |             |                         |   |   |   | X |   |   |   | X |    |    |    |    |    |    |    |    |    |    |
| E4           | Alt               |                |             |                         |   |   |   | X |   |   |   |   |    |    |    |    |    |    |    | X  |    |    |
| E5           | Control           |                |             |                         |   |   |   | X |   |   |   |   |    |    |    |    |    |    |    |    | X  |    |

### 3.2.3 LED Electrical Characteristics



#### **Lighting Circuit for 1X1, 1X2, 1X3, 1X4, 1X4 DW, 1X6, 3X4 and 4X4 LED's**

Table I shows the current and voltage to be applied to each contact to light the green LED under a pushbutton. For the 1X1, 1X2, 1X3, 1X4, 1X4 DW, 1X6, 3X4 and 4X4, each line controls a single LED at one pushbutton location. The 1X4 DW has three LED's for each pushbutton location. The Qwerty configuration has 61 key positions with a total of 79 LED's to be lighted. Note: Current limiting resistors are to be supplied by the user as shown on the figure above.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>60</b> |

Table I  
**Green LED Current and Voltage for Each Contact**

| Keypad Configuration | Current (mA) | Typ. Voltage (V) | Max. Voltage (V) |
|----------------------|--------------|------------------|------------------|
| Lighted 1X1          | 20           | 2.0              | 2.6              |
| Lighted 1X2          | 20           | 2.0              | 2.6              |
| Lighted 1X3          | 20           | 2.0              | 2.6              |
| Lighted 1X4          | 20           | 2.0              | 2.6              |
| Lighted 1X4 DW       | 60           | 2.0              | 2.6              |
| Lighted 1X6          | 20           | 2.0              | 2.6              |
| Lighted 3X4          | 20           | 2.0              | 2.6              |
| Lighted 4X4          | 20           | 2.0              | 2.6              |
| Lighted Qwerty       | 1580         | 2.0              | 2.6              |

The following table shows the current and voltage to be applied to each contact to light the red LED under a pushbutton. Note: Current limiting resistors are to be supplied by the user.

Table J  
**Red LED Current and Voltage for Each Contact**

| Keypad Configuration | Current (mA) | Typ. Voltage (V) | Max. Voltage (V) |
|----------------------|--------------|------------------|------------------|
| Lighted 1X1          | 20           | 1.7              | 2.6              |
| Lighted 1X2          | 20           | 1.7              | 2.6              |
| Lighted 1X3          | 20           | 1.7              | 2.6              |
| Lighted 1X4          | 20           | 1.7              | 2.6              |
| Lighted 1X4 DW       | 60           | 1.7              | 2.6              |
| Lighted 1X6          | 20           | 1.7              | 2.6              |
| Lighted 3X4          | 20           | 1.7              | 2.6              |
| Lighted 4X4          | 20           | 1.7              | 2.6              |

### 3.3 Electrical Performance Requirements

#### 3.3.1 Keypad Contact Rating

Electrical Load (resistive)      10 mA maximum, 3 to 18 VDC.

#### 3.3.2 Keypad Contact Resistance

Contact Resistance                      200 Ohms maximum.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>61</b> |

### 3.3.3 Electrical Life

Electrical Life                      1,000,000 Actuations minimum at rated load.

### 3.3.4 Contact Bounce

Contact Bounce                      10 ms maximum.

### 3.3.5 Dielectric Strength

During qualification, dielectric strength is performed after each of the following tests: electrical life, vibration, shock, moisture resistance, and salt spray. Tests are performed at sea level.

- a) Test potential 500 VAC;
- b) Duration of 1 minute maximum;
- c) Points of application:
  - 1) between open circuits of the same polarity;
  - 2) between adjacent circuits of different polarity;
  - 3) between all current carrying parts and non-current carrying parts.

### 3.3.6 Insulation Resistance

Insulation Resistance                      100 M Ohms (min) at 480 VDC.

## 3.4 Mechanical Performance

### 3.4.1 Weight

The typical weights of keypads and keycaps are given in Table K. Also shown are the rear panel mounting brackets that are required to rear-mount the keypad.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 62   |

Table K  
Keypad and Keycap Weight

| Keypad with Keycaps                     | Weight |       |
|---|--------|-------|
|   | Ounces | Grams |
| Unlighted 1X1                           | 0.6    | 16    |
| Unlighted 1X2                           | 0.9    | 25    |
| Unlighted 1X3                           | 1.1    | 30    |
| Unlighted 1X4                           | 1.5    | 44    |
| Unlighted 1X4 DW                        | 2.6    | 73    |
| Unlighted 1X6                           | TBD    | TBD   |
| Unlighted 3X4                           | TBD    | TBD   |
| Unlighted 4X4                           | 5.1    | 145   |
| Unlighted Qwerty, 61-key                | 19.3   | 547   |
| Lighted 1X1                             | 0.6    | 16    |
| Lighted 1X2                             | 0.9    | 25    |
| Lighted 1X3                             | 1.1    | 30    |
| Lighted 1X4                             | 1.6    | 46    |
| Lighted 1X4 DW                          | 2.6    | 75    |
| Lighted 1X6                             | TBD    | TBD   |
| Lighted 3X4                             | TBD    | TBD   |
| Lighted 4X4                             | 5.3    | 150   |
| Lighted Qwerty, 61-key                  | 20.3   | 576   |
| Rear Panel Mounting Bracket<br>(1 pair) | 0.4    | 12    |

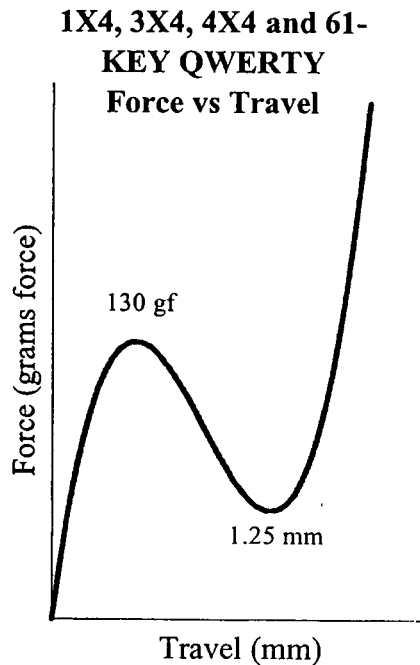
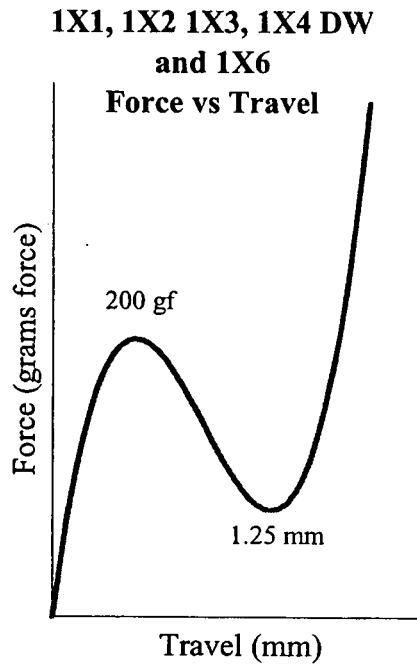
### 3.4.2 Mechanical Life

Mechanical Life

1,000,000 cycles of operation at 25 °C ambient temperature. The cycling rate is between 10 to 1000 cycles of operation per minute.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 63   |

### 3.4.3 Force Travel Curve



Nominal Pushbutton Travel

1X1, 1X2, 1X3, 1X4 DW and 1X6 Nominal Actuation Force

1X4, 3X4, 4X4 and 61-key Qwerty Actuation Force

1.25 mm (.050 in).

200 grams force  
(7.05 ounces force).

130 grams force  
(4.59 ounces force).

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>64</b> |

### 3.4.4 Connector Removal/Retention Force

The nominal connector retention and removal force for each keypad configuration are provided in the following table.

Table L  
Nominal Keypad Connector Retention/Removal Force

| Keypad Configuration | Connector            | Nominal Retention/Removal Force |              |
|----------------------|----------------------|---------------------------------|--------------|
|                      |                      | grams force                     | ounces force |
| 1X1                  | Switching & Lighting | TBD                             | TBD          |
| 1X2                  | Switching & Lighting | TBD                             | TBD          |
| 1X3                  | Switching & Lighting | TBD                             | TBD          |
| 1X4                  | Switching            | 1360                            | 48           |
|                      | Lighting             | 1360                            | 48           |
| 1X4 DW               | Switching            | 1360                            | 48           |
|                      | Lighting             | 1360                            | 48           |
| 1X6                  | Switching            | TBD                             | TBD          |
|                      | Lighting             | TBD                             | TBD          |
| 3X4                  | Switching            | TBD                             | TBD          |
|                      | Lighting             | TBD                             | TBD          |
| 4X4                  | Switching            | 2500                            | 90           |
|                      | Lighting             | 3000                            | 105          |
| Qwerty, 61-key       | Switching            | 3200                            | 115          |
|                      | Lighting             | 1100                            | 40           |

### 3.5 Environmental Requirements

#### 3.5.1 Temperature Range

The operating and storage temperature range of the Series M2 product line shall be as shown in the follows two tables:

Table M  
Unlighted Keypad Temperature Range

| Condition | ° Celsius | ° Fahrenheit |
|-----------|-----------|--------------|
| Operating | -30 to 85 | -22 to 185   |
| Storage   | -30 to 85 | -22 to 185   |

Table N  
Lighted Keypad Temperature Range

| Condition | ° Celsius | ° Fahrenheit |
|-----------|-----------|--------------|
| Operating | -25 to 65 | -13 to 149   |
| Storage   | -30 to 75 | -22 to 167   |

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 65   |

### 3.5.2 Thermal Shock

Thermal Shock      -30 °C (-22 °F) for 1/2 hour,  
                             +75 °C (167 °F) for 1/2 hour  
                             for 5 cycles with recovery time and temperature  
                             of 5 minutes at 25 °C (77 °F).

### 3.5.3 Vibration

Vibration              15 G peak or .06 inches double amplitude, 10 to 2000 Hz.

The entire frequency range of 10 to 2000 Hz and return to 10 Hz shall be traversed in 20 minutes. This cycle shall be performed 12 times in each of three mutually perpendicular directions (total of 36 times), so that the motion shall be applied for a total period of approximately 12 hours.

### 3.5.4 Shock

Three shocks shall be applied in each direction of the three mutually perpendicular axes of the keypad (total of 18 shocks). Each shock pulse shall have 100 G peak value, 11 ms duration, half-sine waveform and 12.3 ft/s velocity change.

### 3.5.5 Moisture Resistance

Moisture Resistance      With the relative humidity between 90 and 98%  
                                     cycle between 65 °C (149 °F) and 25 °C (77 °F)  
                                     for 10 cycles (240 hours), following the 10-day cycle  
                                     profile of MIL-STD-202, method 106.

### 3.5.6 NEMA 4

When surface-mounted on a smooth panel, the keypad shall be subjected to a stream of water from a hose that has a 25.4 mm (1 in) nozzle and delivers at least 246 liters (65 gallons) per minute. The water shall be directed at all joints from all angles from a distance of 3.05 to 3.65 meters (10 to 12 feet) for a minimum of 5 minutes. Rear-mounted keypads are not sealed to NEMA 4 requirements.

### 3.5.7 Salt Spray

No functional damage will result from a test wherein the keypad shall be sprayed with a 5% salt and water solution at 35 °C (95 °F) for 96 hours.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>66</b> |

### 3.5.8 Sand and Dust

For this test the keypad shall be front panel mounted and exposed to the three dust tests in succession. The dust shall be fine sand, and shall pass through a 140-mesh screen. The dust concentration shall be 0.3 grams (0.01 oz) per cubic foot. For each test, the dust shall be mixed with different air velocity, temperature and relative humidity as described in the following table. Also specified is the duration of each test.

Table O  
Air Characteristic and Test Duration

| Dust Test # | Velocity (ft/minute) | Temperature (°C) | Relative Humidity % | Test Duration (hours) |
|-------------|----------------------|------------------|---------------------|-----------------------|
| 1           | 1750                 | 23               | < 22                | 6                     |
| 2           | 300                  | 63               | < 10                | 16                    |
| 3           | 1750                 | 63               | < 10                | 6                     |

### 3.5.9 EMI/RFI Shielding

Keypad shall meet requirements of FCC level A.

### 3.5.10 Legend Chemical Resistance

The legend shall be insecticide, glass cleaner, and hand cream resistant. Two tests shall be performed to test the legend chemical resistance.

Test one requires that the legend shall be coated with each chemical, allowed to dry, and rubbed 25 times under a load of 500 grams per square centimeter (7.1 psi).

Test two requires that the legend shall be coated with each chemical, allowed to dry, wiped away, and left for 60 hours at 60 °C (140 °F) and 95% RH.

The legend shall be readable after completion of the tests.

### 3.5.11 Legend Wear

Two tests shall be performed to test the legend wear.

Test one requires that a rubber eraser shall be dragged across the legend under a 500 gram (17.6 oz) load for 1,000 cycles at a rate of 30 cycles per minute.

Test two requires that a rubber eraser shall be dragged across the legend under a 1,000 gram (35.3 oz) load for 500 cycles at a rate of 30 cycles per minute.

After testing, the characters and symbols shall remain readable.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 67   |

### 3.5.12 Legend Adhesion

A one mm interval grid pattern shall be cut on the legend. An adhesive tape shall be applied to the surface, and rapidly peeled away.

After testing, the characters and symbols shall remain readable.

### 3.5.13 Finger Print Resistance

Two tests are required to test the fingerprint resistance. Test one requires that the legend shall be coated with a synthetic finger print solution, and left at 60 °C (140 °F) and 95% RH for 240 hours.

Test two requires that the legend shall be dipped in a synthetic fingerprint solution and rubbed 50 times with a cotton applicator saturated with synthetic fingerprint solution under a load of 500 grams per square centimeter (7.1 psi).

After testing, the characters and symbols shall remain readable.

## 3.6 Material Requirement

### 3.6.1 Corrosion Resistance

All metal parts shall be corrosion-resistant material, or shall be suitably protected to resist corrosion.

### 3.6.2 Fungus

The keypad shall be constructed of fungus inert materials.

### 3.6.3 Finish

Zinc and chromate plating shall have a minimum thickness of .0002 inches (0.0051 mm). The minimum zinc plating thickness shall be .0002 inches (0.0051 mm).

### 3.6.4 Terminal Plating

Printed switch board shall be plated with .00005 inches (0.0013 mm) thick 99% gold (130-200 Knoop hardness). Connector terminals (header pins) shall be gold plated 20 micro inch thick.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 68   |

### 3.7 Other Requirements

#### 3.7.1 Marking

Keypad and keycap package shall be legibly marked as follows:

- a) StacoSwitch name and (optional) logo.
- b) StacoSwitch Manufacturer's Cage Code Identification No. 12522.
- c) Part Number.
- d) Manufacturing Date Code.

#### 3.7.2 Workmanship

Products shall be manufactured in such a manner as to be uniform in quality and free from cracked or displaced parts, sharp edges, burrs and other defects that would be detrimental to their serviceability or performance.

#### 3.7.3 Quality

Keypads shall be inspected and tested as necessary to substantiate product conformance to drawings and specifications. Inspection and test records shall be documented and shall be available for review.

#### 3.7.4 Changes In Specification

Specifications defined herein are accurate at the time of release and publication of this document. StacoSwitch reserves the right to make changes without prior notice.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 69   |

## 4.0 PART NUMBER INFORMATION

This section contains the information necessary to order each of the standard and optional features of the Series M2 keypads and M15 keycaps described in this specification. Assemblies of standard keypads and keycap sets may be ordered as completed assemblies by combining the M2 model number with the M15 model number as described in section 4.3. Accessories are covered in Section 4.5.

### 4.1 M2 Keypads





|  |   |   |   |                                      |  |
|--|---|---|---|--------------------------------------|--|
| <p>M2</p>  | <p>X</p>  | <p>XX</p>  | <p>XX</p>  | <p>Color</p>                         | <p>Code</p> <p>00 Translucent</p> <p>01 Black</p> <p>02 Light Gray</p> <p>03 Violet</p> <p>04 Blue Gray</p> <p>05 Blue</p>   |
|  |   |   |   | <p>Configuration</p>                 | <p>01 1X4 SQ, 4X1 SQ</p> <p>02 1X4 DW, 4X1 DW</p> <p>03 4X4 SQ</p> <p>04 Qwerty, 61-key</p> <p>05 1X3 SQ, 3X1 SQ</p> <p>06 1X2 SQ, 2X1 SQ</p> <p>07 1X1 SQ</p> <p>08 1X6 SQ, 6X1 SQ</p> <p>09 3X4 SQ</p> |
|  |   |   |   | <p>Lighting</p>                      | <p>0 Unlighted</p> <p>1 Red and green lighted</p> <p>2 Green lighted</p> <p><i>(Qwerty only)</i></p>   |
|  |   |   |   | <p>Standard Molded Elastomer, M2</p> |  |

Table 1 gives the relationship between color description and Pantone number. Other keypad colors are available by special order.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 70   |

**Table 1  
Color Description**

| Color      | Pantone Number         |
|------------|------------------------|
| Black      | Pantone # 433 U        |
| Light Gray | Pantone # Cool Gray 9U |
| Violet     | Pantone # 5275 U       |
| Blue Gray  | Pantone # 5483 U       |
| Blue       | Pantone # 286 U        |

The following table shows the available lighted colors along with the lighting code for lighted keypad configuration. Other lighting colors are available by special order.

**Table 2  
Keypad Configuration and Lighting**

| Keypad Configuration | Lighted Color | Lighting Code |
|----------------------|---------------|---------------|
| 1X1                  | Red and green | 1             |
| 1X2 or 2X1           | Red and green | 1             |
| 1X3 or 3X1           | Red and green | 1             |
| 1X4 or 4X1           | Red and green | 1             |
| 1X4 DW or 4X1 DW     | Red and green | 1             |
| 1X6 or 6X1           | Red and green | 1             |
| 3X4                  | Red and green | 1             |
| 4X4                  | Red and green | 1             |
| Qwerty               | Green only    | 2             |

The keycaps for lighted keypads have translucent white legend. The legend color changes to red or green depending on the illuminated LED. If the red LED is illuminated, the legend color will be red, and if the green LED is illuminated, the legend color will be green.

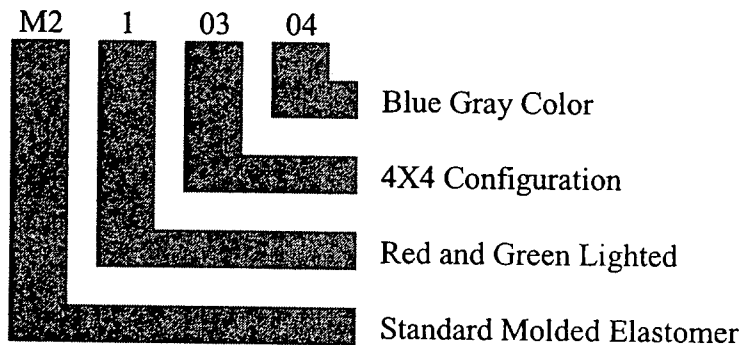
Table 3 shows the required keycap shape for each keypad configuration. Keycap shape information is required when ordering keycap.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 71   |

Table 3  
**Keypad Configuration and Required Keypad Shape**

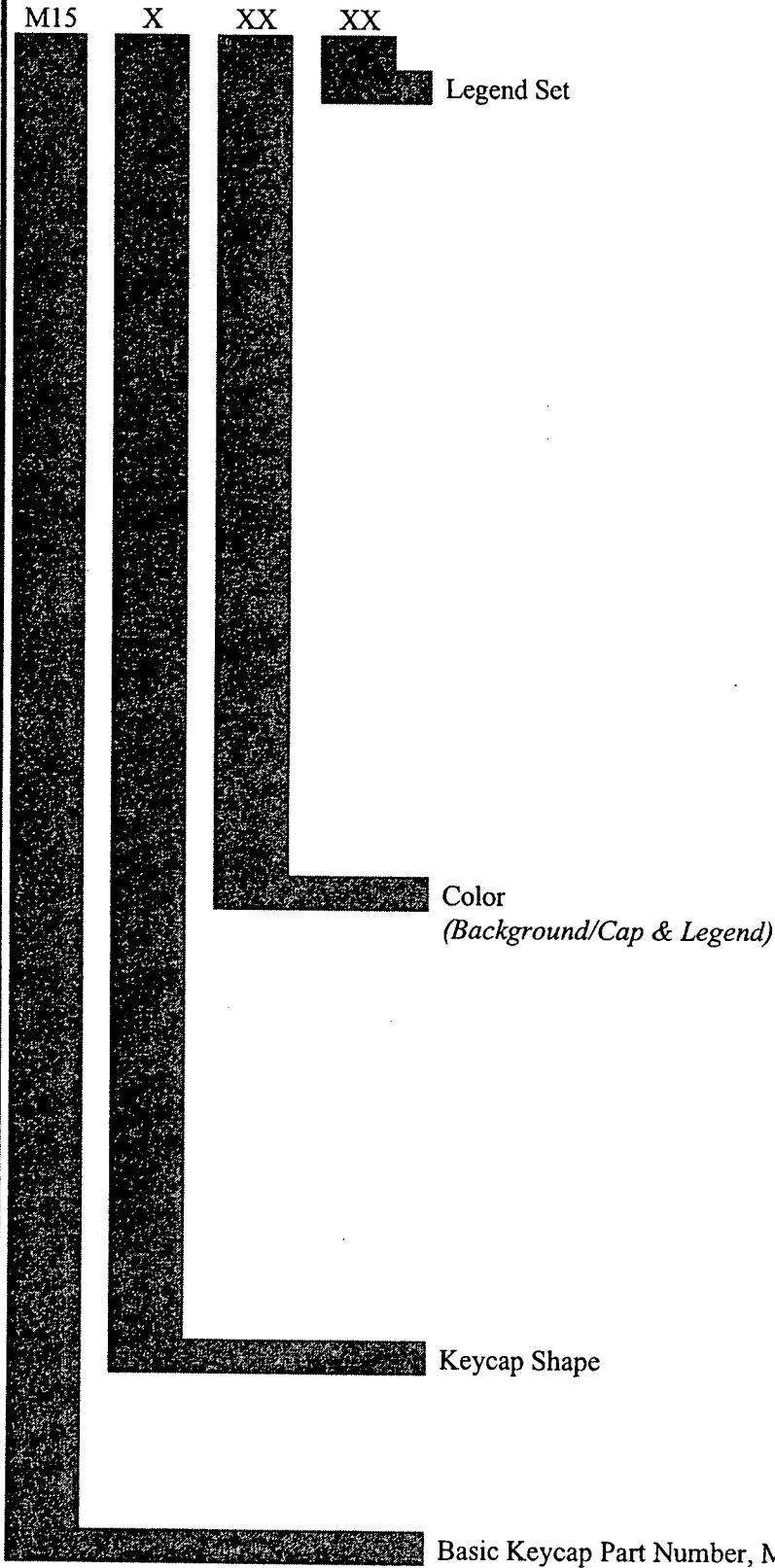
| Keypad Configuration  | Keypad Shape  |
|---|---|
| 1X1<br>1X2 or 2X1<br>1X3 or 3X1<br>1X4 or 4X1<br>1X6 or 6X1<br>3X4<br>and 4X4 | Square<br>(M15 1 XX XX)   |
| 1X4 DW or 4X1 DW  | Rectangular<br>(M15 2 XX XX)  |
| Qwerty  | Square, Combination and Space Bar<br>(M15 1 XX XX, M15 3 XX XX, and M15 5 XX XX),<br>or Qwerty Key Sets (M15 4 XX XX) |

Typical keypad part number is M210304. This is a molded elastomer keypad with red/green LED lighting, is a 4X4 configuration in blue-gray, and is uses square keycaps (M15 1 XX XX).



|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 72   |

## 4.2 M15 Keycaps



### Code

- 00 Blank
- 01 Telecommunications
- 02 Computer Legend and Arrows
- 03 Numerical Pad
- 04 Math Functions
- 05 Numerals and Arrows
- 06 Function Keys
- 07 Alpha Set A - P
- 08 Alpha Set Q - Z and Punctuations
- 09 Qwerty 0 - 9 and Brackets
- 10 Qwerty Peripheral Control Keys
- 11 Rectangular On, Off and Arrows
- 12 Qwerty Set 1, Q - H
- 13 Qwerty Set 2, J - M, Punctuations
- 14 Fn Qwerty Navigation Set
- 15 Fn Qwerty Number Set
- 16 Space Bar
- 17 Blank with Over Spray
- 18 F12 Qwerty Number Set
- 19 Pause Qwerty Navigation Set
- 97 F12 61-key Entire Set
- 98 Fn 61-key Entire Set
- 99 Standard 61-key Entire Set

- 00 Clear keycap
- 01 Light Violet and Yellow
- 02 Light Violet and White (L)
- 03 Blue and Warm Yellow
- 04 Blue and White (L)
- 05 Light Gray and Green
- 06 Light Gray and White (L)
- 07 Black and Light Green
- 08 Black and White (L)
- 09 Blue Gray and Black
- 10 Blue Gray and White (L)
- 9X Coordinated Qwerty Sets  
(See Table 6)

- 1 Square
- 2 Rectangular
- 3 Combination
- 4 Qwerty Key Sets, Complete
- 5 Space Bar

(L) = Configuration suitable for lighted operation.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 73   |

Legend keycap sets are marked with legends described in section 4.2.1 to 4.2.18. Legend sets are available for square, rectangular, combination and space bar keycap shapes as shown in the following table. Other legends may be specially ordered.

Table 4  
Legend Set and Keycap Shape

| Legend Set<br>(Legend Set Code)            | Keycap Shape   | Keycap<br>Shape Code    | Quantity<br>in Set                  |
|--|--|-------------------------|-------------------------------------|
| Blank (00)                                 | Square,<br>Rectangular,<br>Combination, and<br>Space Bar | 1,<br>2,<br>3, and<br>5 | 16,<br>8,<br><i>see note 1</i><br>1 |
| Telecommunications (01)                    | Square   | 1                       | 16                                  |
| Computer Legend and Arrows (02)            | Square   | 1                       | 16                                  |
| Numerical Pad (03)                         | Square   | 1                       | 16                                  |
| Math Functions (04)                        | Square   | 1                       | 16                                  |
| Numerals and Arrows (05)                   | Square   | 1                       | 16                                  |
| Function Keys (06)                         | Square   | 1                       | 16                                  |
| Alpha Set A - P (07)                       | Square   | 1                       | 16                                  |
| Alpha Set Q - Z and Punctuations (08)      | Square   | 1                       | 16                                  |
| Qwerty 0 - 9 and Brackets (09)             | Square   | 1                       | 16                                  |
| Qwerty Peripheral Control. Keys (10)       | Combination  | 3                       | <i>see note 1</i>                   |
| Rectangular On, Off and Arrows (11)        | Rectangular  | 2                       | 8                                   |
| Qwerty Set Q1 Q - H (12)                   | Square   | 1                       | 16                                  |
| Qwerty Set Q2 J - M, Punctuations (13)     | Square   | 1                       | 16                                  |
| Fn Qwerty Navigation Set (14)              | Square   | 1                       | 16                                  |
| Fn Qwerty Number Set (15)                  | Square   | 1                       | 16                                  |
| Space Bar (16)                             | Space Bar  | 5                       | 1                                   |
| Blank with Over Spray (17)                 | Square and<br>Rectangular                                | 1 and<br>2              | 16 and<br>8                         |
| F12 Qwerty Number Set (18)                 | Square   | 1                       | 16                                  |
| Pause Qwerty Navigation Set (19)           | Square   | 1                       | 16                                  |
| F12 61-Key Set (97) <i>see note 4</i>      | Square and Combo   | 1 and 3                 | 61                                  |
| Fn 61-Key Set (98) <i>see note 3</i>       | Square and Combo   | 1 and 3                 | 61                                  |
| Standard 61-Key Set (99) <i>see note 2</i> | Square and Combo   | 1 and 3                 | 61                                  |

*Note 1:* Combinations sets have 8 rectangular, and 4 square keycaps.

*Note 2:* Standard 61-key sets have a blank key for the "Fn" position. All other keys are the normal PC-AT style. Legend set 99 is composed of legend sets number 09, 10, 12, 13, and 16.

*Note 3:* Fn 61-key sets have the "Fn" key and contain the navigation legends on the U-I-O, J-K-L, and M-<-> keys and well as the alternate Fn Qwerty Number Set. Legend set 98 is comprised of legend sets number 10, 12, 13, 14, 15 and 16.

*Note 4:* F12 61-key sets have the "F11", "F12" and "Pause" keys in addition to the Fn 61-Key Set. Legend set 97 is comprised of legend sets number 10, 12, 13, 16, 18 and 19.

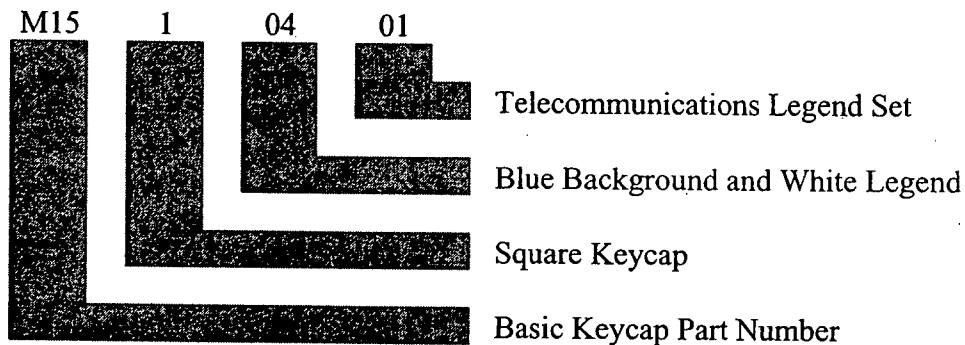
|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 74   |

Table 5 gives the relationship between color description and Pantone number. Other keycap and legend colors may be specially ordered. Clear keycaps with film legend are available by special order.

Table 5  
Color Description

| Color               | Color Code            |
|---------------------|-----------------------|
| Light Violet        | Pantone # 5295U       |
| Yellow              | Pantone # 108U        |
| Blue                | Pantone # 301U        |
| Warm Yellow         | Pantone # 135U        |
| Light Gray          | Pantone # 431U        |
| Green               | Pantone # 322U        |
| Black               | Pantone # 433U        |
| Light Green         | Pantone # 3385U       |
| Blue Gray           | Pantone # 5483U       |
| Black               | Pantone # Black U     |
| White (translucent) | Fed. Std. 595 # 37925 |

Typical keycap part number is M1510401. This is a square, blue background and white legend keycap tree with telecommunication legends. There are sixteen keycaps. The first keycap is marked "1"; second keycap is marked "2" and "ABC" below it; etc., as shown in section 4.2.2. The square keycaps are applicable to 4X4, 1X4 and Qwerty keypad configurations. The white legends are suitable for lighted keypads.



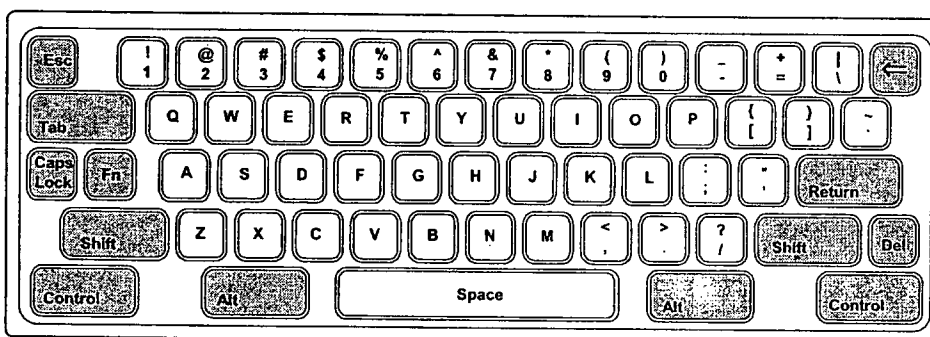
For Qwerty keyboards, a full set of keycaps may be ordered. This is indicated with a 4 in the Key Shape code, i.e., M154XXXX. If it is desired that all of the 61 keys be the same color, the normal two-digit code may be used, such as M15408XX for black background with white (translucent) legend. However, if it is desired to have only the alpha-numeric keys be this color, and the control keys around the periphery be a contrasting color, combination color code shown on the following table will provide the contrasting color sets. Unless otherwise specified in these contrasting color sets, the space bar will match the key color of the alpha-numeric field.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 75   |

Table 6  
Color Coordinated Qwerty Sets

| Color Set Code | Alpha-Numeric Field Key Color | Peripheral/Control Field Key Color | Character Color     |
|----------------|-------------------------------|------------------------------------|---------------------|
| 99             | Black                         | Light Gray                         | White (Translucent) |
| 98             | Light Gray                    | Black                              | White (Translucent) |
| 97             | Blue                          | Blue Gray                          | White (Translucent) |
| 96             | Blue Gray                     | Blue                               | White (Translucent) |
| 95             | Blue                          | Blue Gray                          | Warm Yellow         |
| 94             | Blue Gray                     | Blue                               | Warm Yellow         |

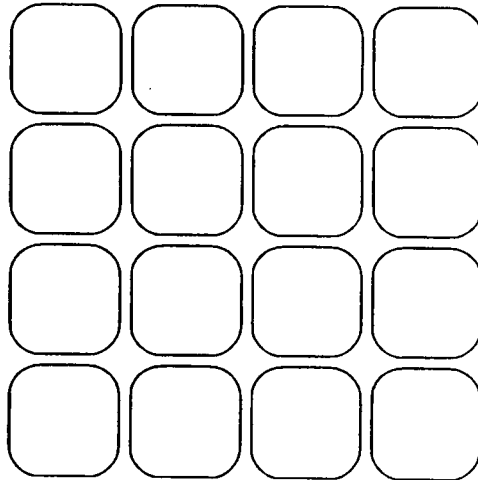
Below is the standard layout of the 61 key Qwerty keyboard. The shaded keys are the peripheral (control field) keys, and the unshaded keys are the alpha-numeric field keys.



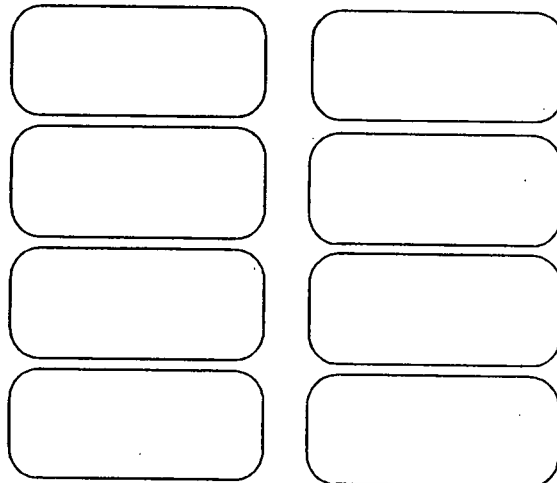
- Note 1:** The location of the Fn key is shown for reference only; it is a blank key in the standard (Non-Fn) key sets
- Note 2:** Refer to legend sets codes 14 and 15 for the alternate configuration for navigation and numeric keypad legends.
- Note 3:** For “Color Coordinated Qwerty Sets” refer to legend set code 10 for keycaps in the “Peripheral/Control Field”

|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 76   |

4.2.1 Blank Legend Sets Code 00

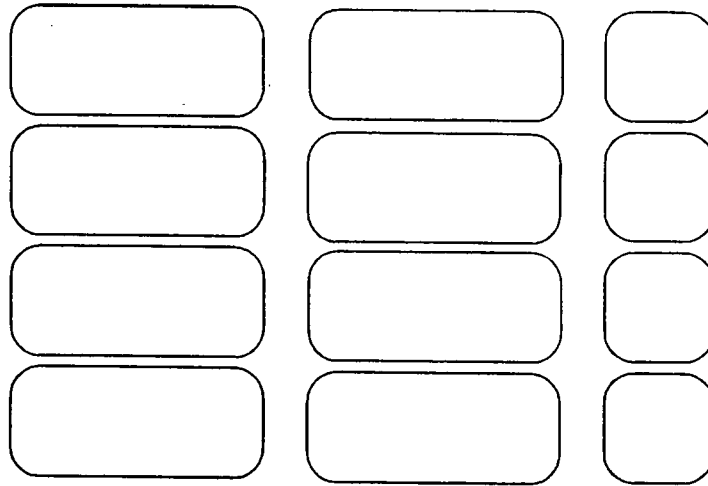


**Blank Square Keycap Set (M15 1 XX 00)**



**Blank Rectangular Keycap Set (M15 2 XX 00)**

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 77   |



**Combination Blank Keycap Set (M15 3 XX 00)**



**Space Bar Blank Keycap Set (M15 5 XX 00)**

**4.2.2 Telecommunications Legend Set Code 01**

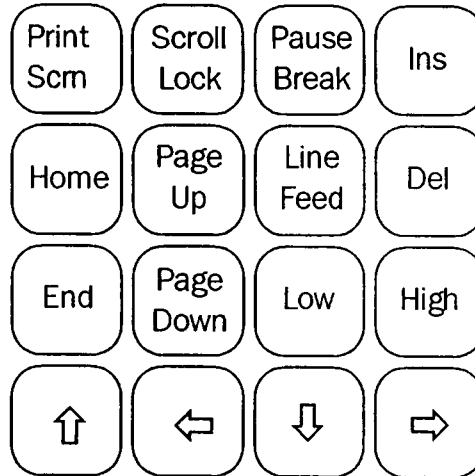


**M15 1 XX 01**

The legend font of "Telecommunications Legend Set" is Frutiger Bold and Roman (Humanist 777 Bold and BT Roman).

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 78   |

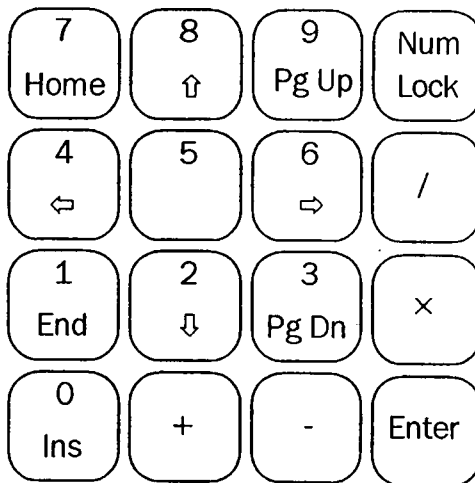
4.2.3 Computer Legend and Arrows Legend Set Code 02



**M15 1 XX 02**

The legend font of “Computer Legend and Arrows Legend Set” is Franklin Gothic Book (Frankfurt Gothic Book) and Wingdings.

4.2.4 Numerical Pad Legend Set Code 03

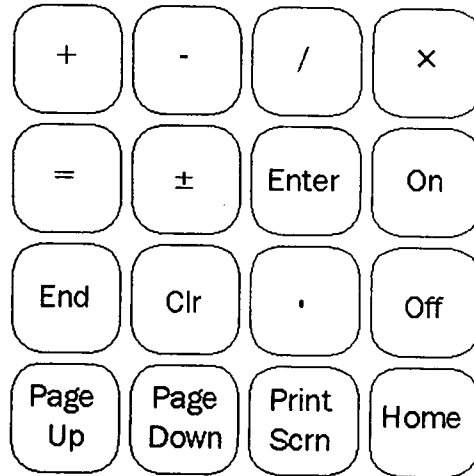


**M15 1 XX 03**

The legend font of “Numerical Pad Legend Set” is Franklin Gothic Book (Frankfurt Gothic Book) and Wingdings.

|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 79   |

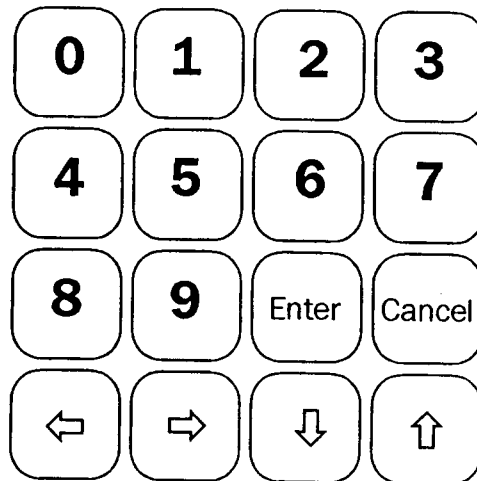
**4.2.5 Math Functions Legend Set Code 04**



**M15 1 XX 04**

The legend font of "Math Functions Legend Set" is Franklin Gothic Book (Frankfurt Gothic Book).

**4.2.6 Numerals and Arrows Legend Set Code 05**

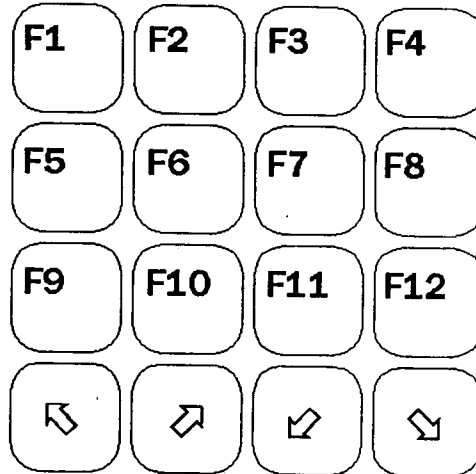


**M15 1 XX 05**

The legend font of "Numerals and Arrows Legend Set" is Franklin Gothic Demi and Book (Frankfurt Gothic Demi and Book) and Wingdings.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 80   |

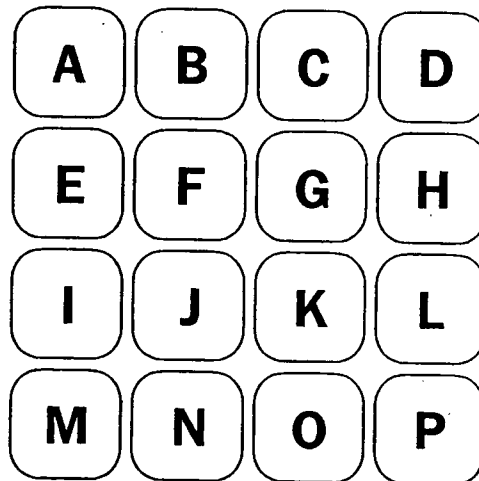
**4.2.7 Function Keys Legend Set Code 06**



**M15 1 XX 06**

The legend font of "Function Keys Legend Set" is Franklin Gothic Demi (Frankfurt Gothic Demi) and Wingdings.

**4.2.8 Alpha A - P Legend Set Code 07**

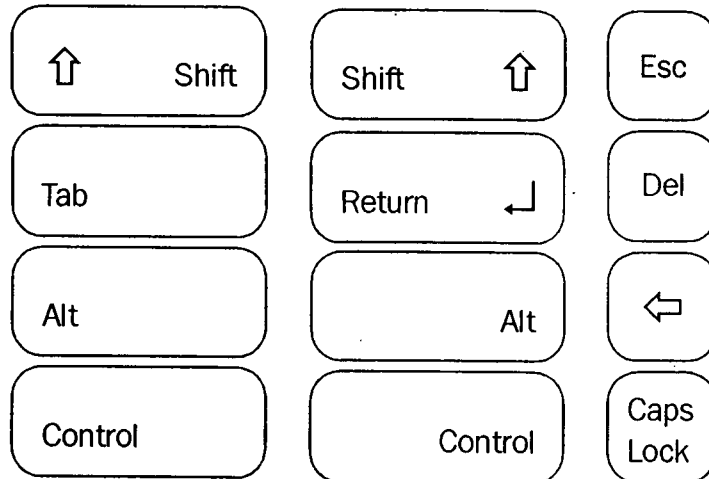


**M15 1 XX 07**

The legend font of "Alpha A - P Legend Set" is Franklin Gothic Demi (Frankfurt Gothic Demi).

|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 81   |

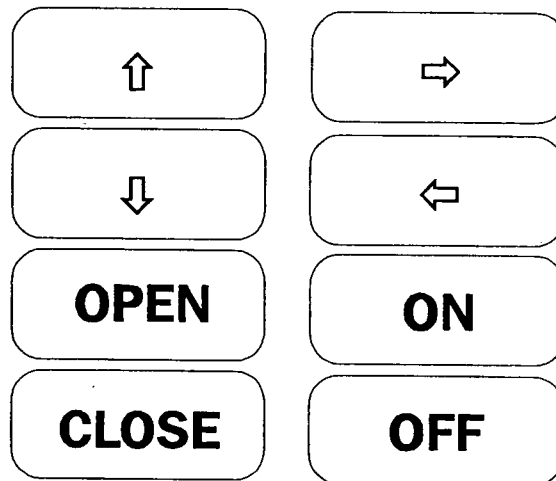
**4.2.11 Qwerty Peripheral Control Keys Legend Set Code 10**



**M15 3 XX 10**

The legend font of "Qwerty Peripheral Control Keys Legend Set" is Franklin Gothic Book (Frankfurt Gothic Book), Wingdings and Symbol.

**4.2.12 Rectangular On, Off and Arrows Legend Set Code 11**

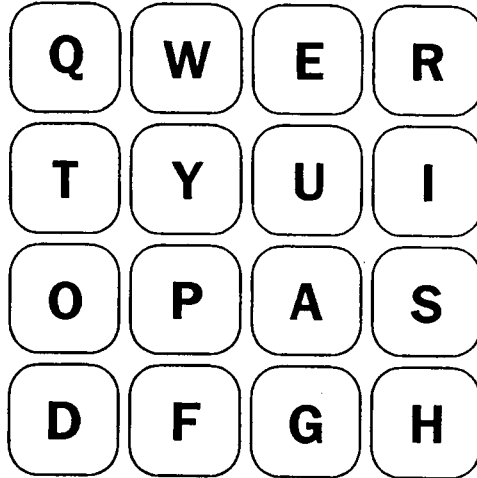


**M15 2 XX 11**

The legend font of "Rectangular On, Off and Arrows Legend Set" is Franklin Gothic Demi (Frankfurt Gothic Demi) and Wingdings.

| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
|--------------|-------------------------|------|------|
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 83   |

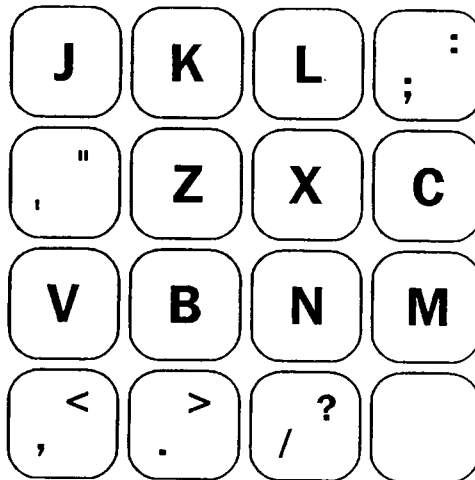
**4.2.13 Qwerty Set 1, Q - H Legend Set Code 12**



**M15 1 XX 12**

The legend font of "Qwerty Set 1, Q - H Legend Set" is Franklin Gothic Demi (Frankfurt Gothic Demi).

**4.2.14 Qwerty Set 2, J - M and Punctuations Legend Set Code 13**

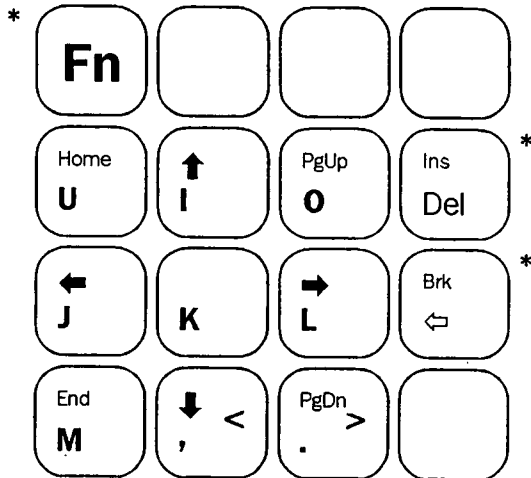


**M15 1 XX 13**

The legend font of "Qwerty Set 2, J - M and Punctuations Legend Set" is Franklin Gothic Demi (Frankfurt Gothic Demi).

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 84   |

**4.2.15 Fn Qwerty Navigation Legend Set Code 14**

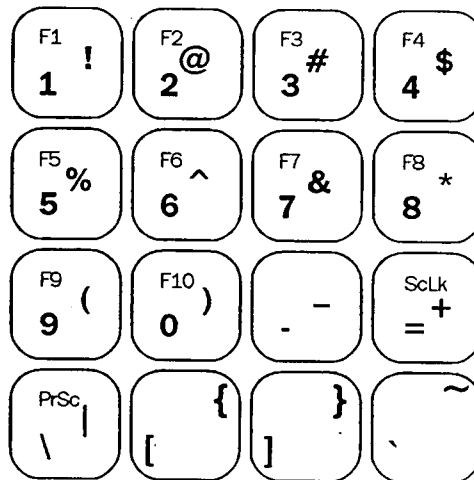


\* For color coordinated Qwerty keyboards, these three keys are the contrasting color of the remainder of this set.  
 (Refer to Table 6 and Qwerty keyboard layout.)

**M15 1 XX 14**

The legend font of “Fn Qwerty Navigation Legend Set” is Franklin Gothic Demi and Book (Frankfurt Gothic Demi and Book) and Wingdings.

**4.2.16 Fn Qwerty Number Legend Set Code 15**

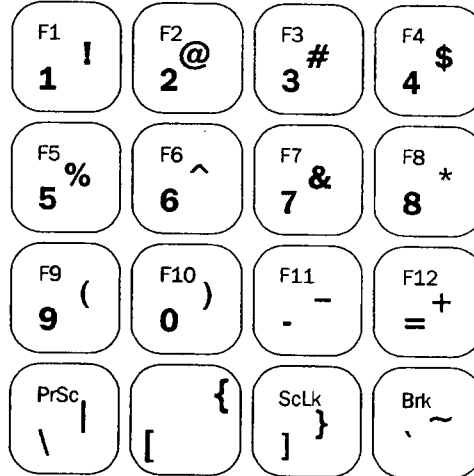


**M15 1 XX 15**

The legend font of “Fn Qwerty Number Legend Set” is Franklin Gothic Book and Demi (Frankfurt Gothic Book and Demi).

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 85   |

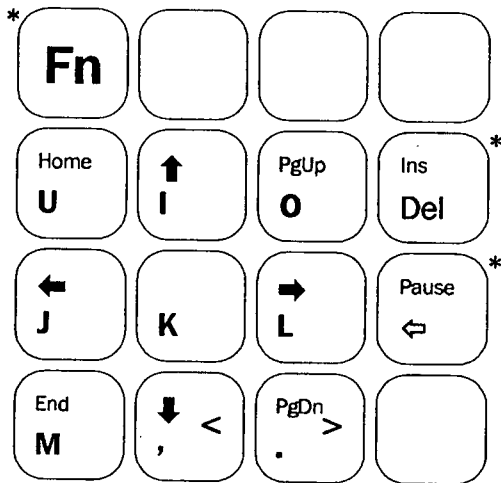
**4.2.17 F12 Qwerty Number Legend Set Code 18**



**M15 1 XX 18**

The legend font of “F12 Qwerty Number Legend Set” is Franklin Gothic Book and Demi (Frankfurt Gothic Book and Demi).

**4.2.18 Pause Qwerty Navigation Legend Set Code 19**



\* For color coordinated Qwerty keyboards, these three keys are the contrasting color of the remainder of this set.  
(Refer to Table 6 and Qwerty keyboard layout.)

**M15 1 XX 19**

The legend font of “Pause Qwerty Navigation Legend Set” is Franklin Gothic Demi and Book (Frankfurt Gothic Demi and Book) and Wingdings.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 86   |

### 4.3 M2-M15 Assemblies

Factory assembled keypad and keycaps may be ordered by combining the M2 part number with the desired M15 part number; the entire M2 number is used, then a hyphen, followed by the M15 part number without the "M15."

The M2 keypad given as an example following Table 3 was lighted 4X4 molded in a blue gray color (keypad coded part number M210304). The M15 example following Table 5 was a set of 16 square keycaps, with a blue background and laser etched white symbols, forming the standard telecommunications legend set (keycap coded part number M1510401). To order these as factory-built assemblies, the five-digit code following the "M15" is appended to the M2 number, to become:

M210304-10401.

An example of a complete Qwerty keyboard might use an unlighted 61-key configuration molded in blue, an M200405 from the keypad configurator of Section 4.1. To this could be added a complete Qwerty keycap set, an M1549499, from Section 4.2 and Table 6. This would provide blue gray keys in the alpha-numeric field and blue keys in the peripheral/control field, each set laser engraved with warm yellow characters and symbols.

For this keyboard to be entirely assembled in the factory, the part number would be:

M200405-49499.

## 4.4 Qwerty Keyboard Encoders, Cables and Lighting Power

### 4.4.1 Qwerty Encoders

Encoders provide conversion for the matrix array of the key closures on the keypad(s) to a code that is compatible with the computer interface. The encoder is on a printed circuit board that is approximately 63.5 mm (2.5 in) by 91.4 (3.6 in). It provides a 5-pin DIN serial output for IBM PC compatible applications.

#### 4.4.1.1 61-key Qwerty Encoders -- Part Number 15230-tab

Encoders are available to support the 61-key Qwerty keyboard.

**15230-001** Standard PC AT/386/486-compatible output for each of 60 keys. (One key is blank and not programmed; it is the Fn key of the -002 configuration.)

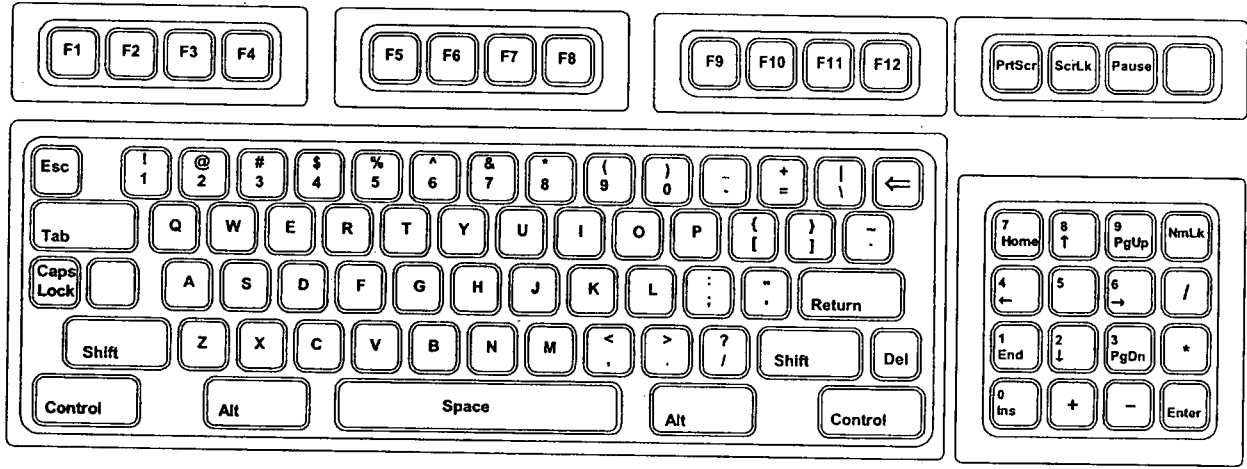
**15230-002** Same as -001 except Fn key support is provided for cursor navigation keys, F1-F10, and other functions within the 61-key configuration. This provides the equivalent capability of the IBM 84-key AT keyboard. The function key is marked with the legend "Fn".

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 87   |

**4.4.1.2 Extended Qwerty Encoder – Part Number 15231-tab**

An encoder is available to support the 61-key Qwerty keyboard combined with 4X4 keypad and 1X4 keypads.

**15231-001** This encoder supports 91 keys as standard (two keys are blank but may be custom programmed). The 91 keys consist of six keypads arranged on the following figure. Please contact the factory for custom programmed keys.



**4.4.2 Encoder Cables – Part Numbers 15234-tab, 15235 and 15236-tab**

Cabling between keypad(s) and the encoder as well as between the encoder and the IBM PC compatible computer are available.

**15234-tab** Provides 20-conductor interconnection between the keyboard and the 61-key Qwerty encoder. The tab number provides coding for cable length. Please contact the factory for the cable length.

**15235** Cable provides connection between the encoder and an IBM PC compatible computer. Connectors are 5-pin DIN.

**15236-tab** Provides interconnection between the keypads arranged on the previous figure and the Extended Qwerty encoder. The tab number provides coding for cable length. Please contact the factory for the cable length.

**4.4.3 Qwerty Lighting Power Supplies and Cabling**

For customer convenience, two power supplies are available to light the Qwerty keyboard. The power supplies convert 110 VAC to 2.1 VDC with a constant current rating of 1.6 A. The power supply has a five-pin DIN female connector that mates with the lighting adapter cable (part number 15240) connector. Two power supplies are available. One is a wall mount version, and the second one is table mount version.

|            |                         |      |      |
|------------|-------------------------|------|------|
| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
| 12522      | SERIES M2 AND M15 CODED | H    | 88   |

#### **4.4.3.1 Wall Mount Power Supply -- Part Number 15239**

The part number of the wall mount power supply is 15239. The wall mount power supply plugs directly into an AC power source and provides the power output through a six foot long cord with a connector that mates with the lighting adapter cable (part number 15240) connector. The power supply dimension is 81 x 55 x 49 mm (L x W x H) or approximately 3.2 x 2.2 x 1.9 inches. The wall mount power supply weighs approximately 300 gm (10.6 oz). This AC adapter converts 120 VAC, 47 to 62 Hz, 0.4 A to 2.1 VDC, 2.1 A, constant current.

#### **4.4.3.2 Desktop Power Supply -- Part Number 15241**

The desktop power supply, part number 15241, has two cords. One cord is approximately 2 m (6 ft) long and has a plug that plugs into an AC power source. The second cord is approximately the same length and has a five-pin male connector that mates with lighting adapter cable (part number 15240) connector. The power supply dimension is 105 x 63.5 x 38.1 mm (L x W x H) or approximately 4.1 x 2.5 x 1.5 inches. The desktop power supply weighs approximately 530 gm (18.7 oz).

#### **4.4.3.3 Lighting Adapter Cable -- Part Number 15240**

The Lighting Adapter Cable, part number 15240, provides a standard cable connection from either the 15239 or the 15241 power supply to lighting circuits of a Panel Mounted 61-Key Qwerty Keyboard.

### **4.5 Accessories**

#### **4.5.1 Rear Panel Mounting Brackets**

Rear panel mounting brackets are required for rear mounting. The brackets are packaged in pairs. The bracket part number is 15216-001. The following table specifies the number of bracket pairs are required for each keypad configuration.

| CAGE CODE: | DRAWING NO.             | REV. | SHT. |
|------------|-------------------------|------|------|
| 12522      | SERIES M2 AND M15 CODED | H    | 89   |

Table 7  
**Keypad Configuration and Required Rear Panel Mounting Bracket Quantity**

| Keypad | Rear Panel Mounting Bracket |
|--------|-----------------------------|
| 1X1    | 1 pair                      |
| 1X2    | 1 pair                      |
| 1X3    | 1 pair                      |
| 1X4    | 1 pair                      |
| 1X4 DW | 1 pair                      |
| 1X6    | 1 pair                      |
| 3X4    | 2 pairs                     |
| 4X4    | 2 pairs                     |
| Qwerty | 5 pairs                     |

**4.5.2 Mating Connector Kits and Cable Assemblies**

For customer convenience, mating connector kits and cable assemblies are available for MET keypads. The kits contain the number of connectors of the proper size needed to interface to each keypad and the quantity of crimping terminals (+10%) appropriate to the configuration.

The mating connector cable assembly is an assembly of a connector that mates with the 1X1, 1X2 or 1X3 keypad connector, and 6.35 mm stripped and tinned cable. The cable assembly length is one meter.

Use the following tables to determine the proper ordering part number.

Table 8  
**Kit Keypad Cross Reference**

| Keypad                   | Kit Part Number |
|--------------------------|-----------------|
| 1X4, Lighted             | 15229-001       |
| 1X4, Unlighted           | 15229-002       |
| 1X4 DW, Lighted          | 15229-001       |
| 1X4 DW, Unlighted        | 15229-002       |
| 1X6, Lighted             | TBD             |
| 1X6, Unlighted           | TBD             |
| 3X4, Lighted             | TBD             |
| 3X4, Unlighted           | TBD             |
| 4X4, Lighted             | 15229-003       |
| 4X4, Unlighted           | 15229-004       |
| 61-key Qwerty, Lighted   | 15229-005       |
| 61-key Qwerty, Unlighted | 15229-006       |

|              |                         |      |      |
|--------------|-------------------------|------|------|
| CAGE CODE:   | DRAWING NO.             | REV. | SHT. |
| <b>12522</b> | SERIES M2 AND M15 CODED | H    | 90   |

Table 9  
**Mating Connector Cable Assembly Keypad Cross Reference**

| Keypad                | Cable Assembly Part Number |
|-----------------------|----------------------------|
| 1X1 Lighted/Unlighted | 15245-001                  |
| 1X2 Lighted/Unlighted | 15245-002                  |
| 1X3 Lighted/Unlighted | 15245-003                  |

**4.5.3 Crimping Tools**

Order part number 15232 for a crimping tool that is compatible with the terminals supplied in the 15229-XXX kits.

**4.5.4 Extractor Tools**

An extractor tool is available for use in removing crimped terminals from connector housings used with MET keypad mating connector kits. Order part number 15233.

|              |                                |          |           |
|--------------|--------------------------------|----------|-----------|
| CAGE CODE:   | DRAWING NO.                    | REV.     | SHT.      |
| <b>12522</b> | <b>SERIES M2 AND M15 CODED</b> | <b>H</b> | <b>91</b> |