stacosystems
One Step Ahead

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Data Entry Solutions (D.E.S.) Products

PRODUCT LINE SPECIFICATION

SERIES M2 AND M15

STANDARD MOLDED ELASTOMER KEYPADS

M2 KEYPADS
M15 KEYCAPS
M2-M15 ASSEMBLIES

SERIES M2 AND M15 CODED

Revision Log

Rev.	E. R. No.	Revised By	Checked By	Approved By	Rel. Date
NC	02-31534	/s/ E.Ogle	/s/ A.Kertatama	/s/ T.L.Nichols	7-17-95
A	02-32505	/s/ E.Ogle	/s/ A.Kertatama	/s/ T.L.Nichols	10-2-96
B	02-32892	/s/ E.Ogle	/s/ A.Kertatama	/s/ T.L.Nichols	4-10-97
C	02-33110	/s/ A.Kertatama	/s/ J.W.B.	/s/ T.L.Nichols	7-15-97
D	02-34048	/s/ A.Kertatama	/s/ J.W.B.	/s/ T.L.Nichols	7-7-98
E	02-37233	/s/ A.Kertatama	/s/ J.W.B.	/s/ P.H.	3-14-01
F	02-38177	/s/ A.Kertatama	/s/ P.H.	/s/ P.H.	3-22-02
G	02-38432	/s/ A.Kertatama	/s/ P.H.	/s/ P.H.	7-12-02
H	02-38862	/s/ A.Kertatama	/s/ P.H.	/s/ P.H.	6-5-03
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1.1	42092	F.Tu	Dora Wang Digitally signed by Dora Wang DN: cn=Dora Wang, o=Slaco Systems, ou=DES, email=dwang@slacosystems.com, c=US Date: 2011.03.16 15:26:31 -07'00'	James Yeh Digitally signed by James Yeh DN: cn=James Yeh, o=Slaco Systems, ou=Data Entry Solutions, email=jyeh@slacosystems.com, c=US Date: 2011.03.15 21:28:17 -07'00'	03/15/11

Table of Contents

1.0 SCOPE

This Specification Control Document (SCD) describes 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 is 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 detail of which, are beyond the scope of this document. Contact StacoSystems 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 application.

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.

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

Legends 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.

3.0 REQUIREMENTS

This specification defines the detailed requirements for 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.

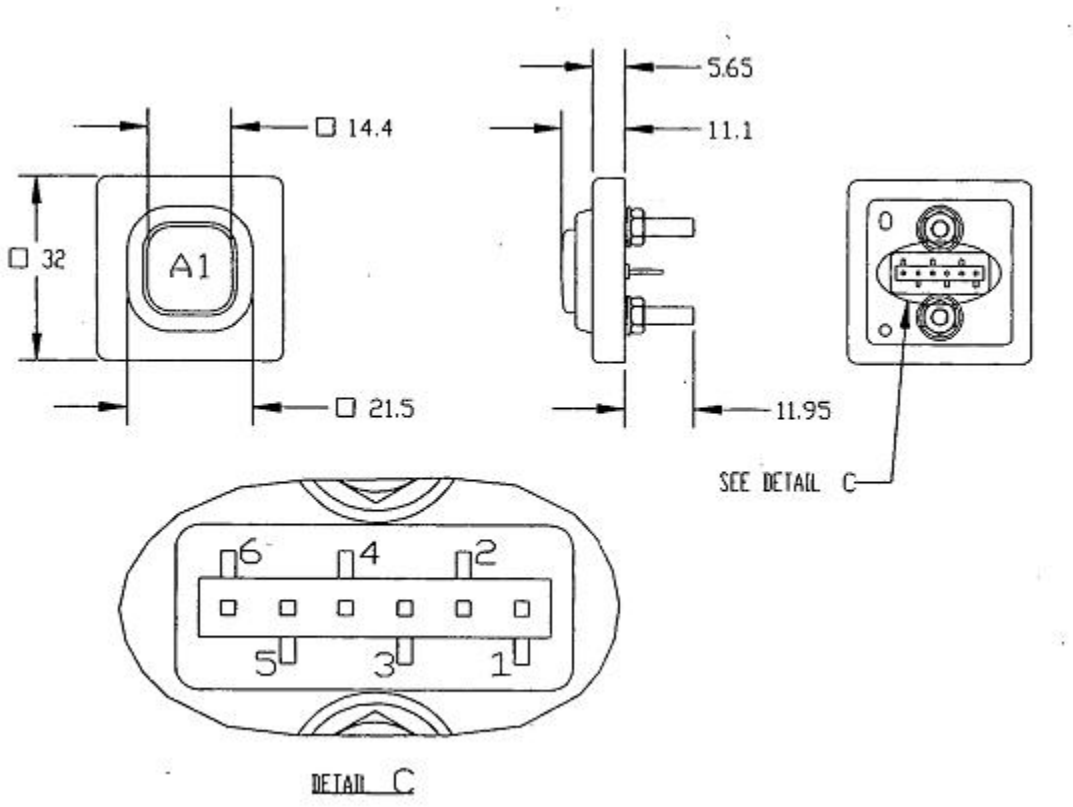
3.1 Dimensional Requirements

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



SWITCHING CONTACTS

CONNECTOR PIN NO.	PUSHBUTTON LOCATION
1	COMMON
6	A1

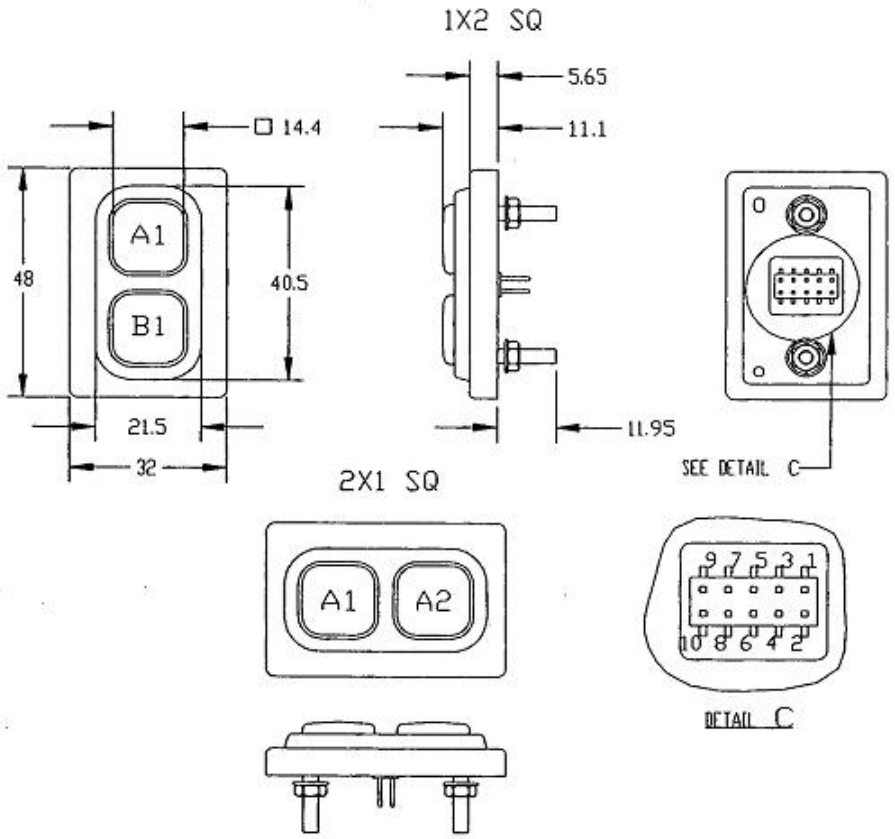
LIGHTING CONTACTS

CONNECTOR PIN NO.	RED LED LOCCATION	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 KEPADS.
DIMENSIONS ARE IN MILIMETERS.



SWITCHING CONTACTS

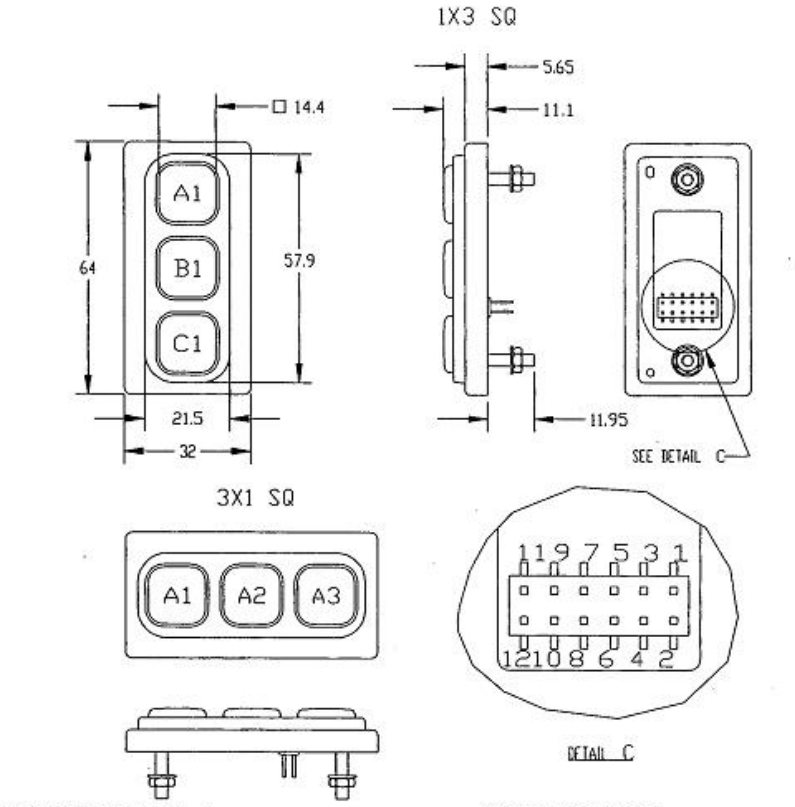
Connector Pin No.	1X2 Pushbutton Location	2X1 Pushbutton Location
1	Common	Common
2	B1	A2
3	A1	A1

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 KEPADS.
DIMENSIONS ARE IN MILIMETERS.



SWITCHING CONTACTS

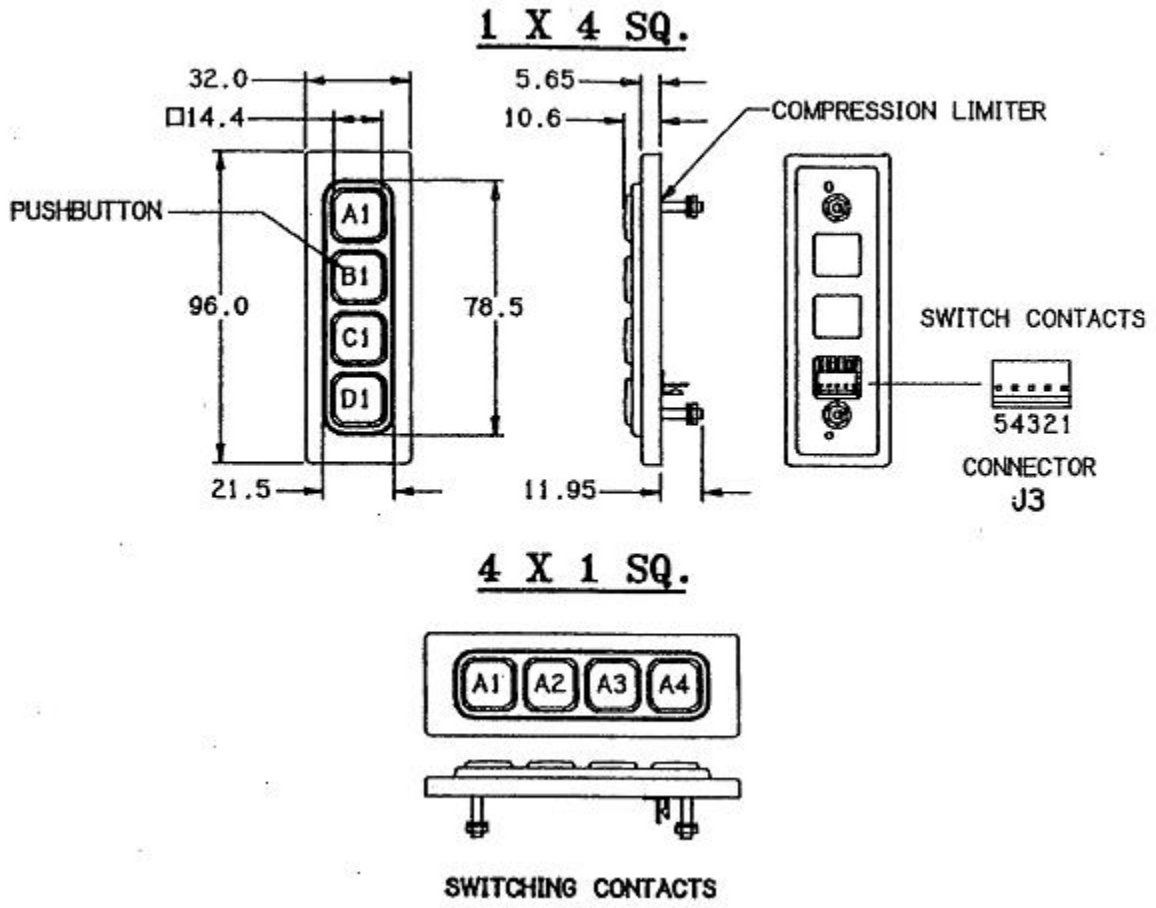
Connector Pin No.	1X3 Pushbutton Location	3X1 Pushbutton Location
1	Common	Common
2	C1	A3
3	B1	A2
4	A1	A1

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 KEPADS.
DIMENSIONS ARE IN MILIMETERS.

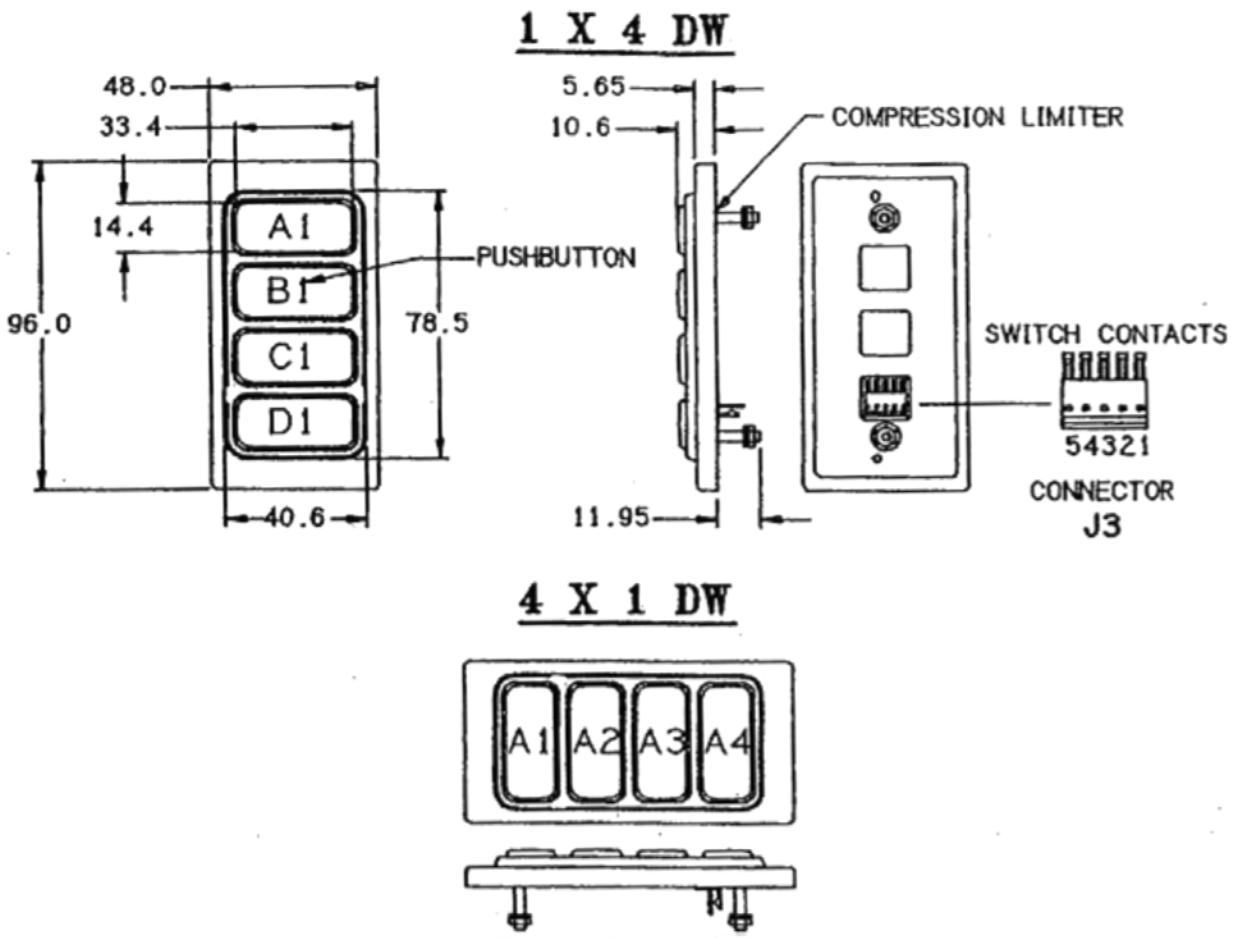


SWITCHING CONTACTS

SWITCH CONTACT	PUSHBUTTON LOCATION	
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 MILIMETERS.

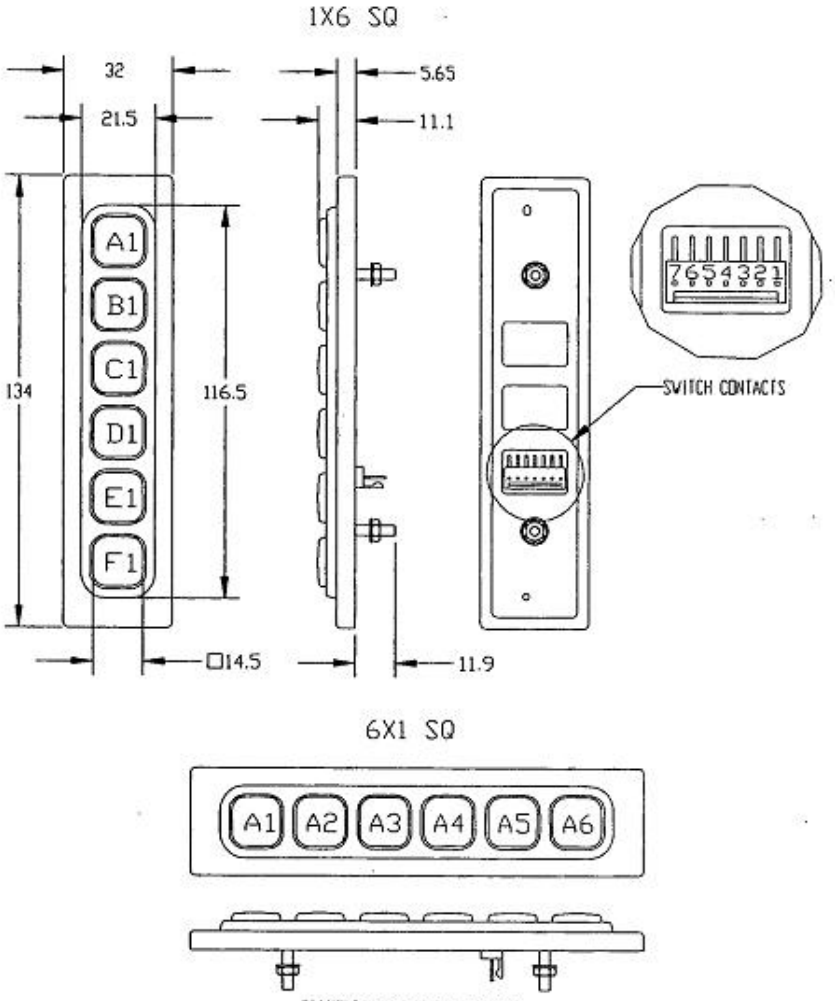


SWITCHING CONTACTS

SWITCH CONTACT	PUSHBUTTON LOCATION	
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 MILIMETERS.

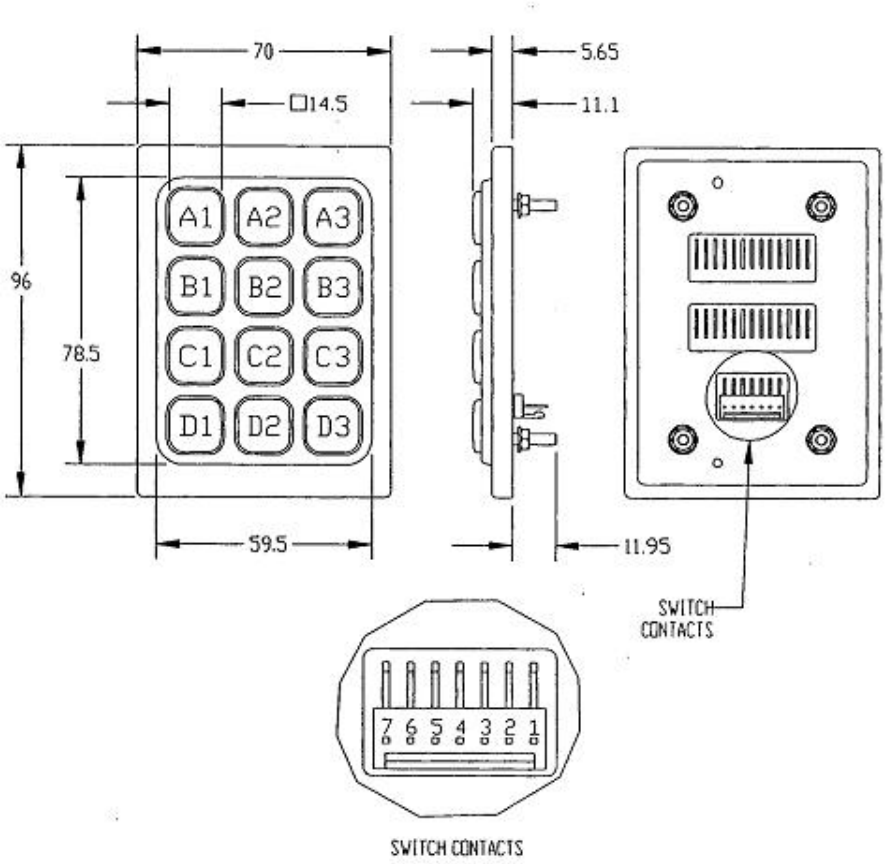


SWITCHING CONTACTS

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 MILIMETERS.

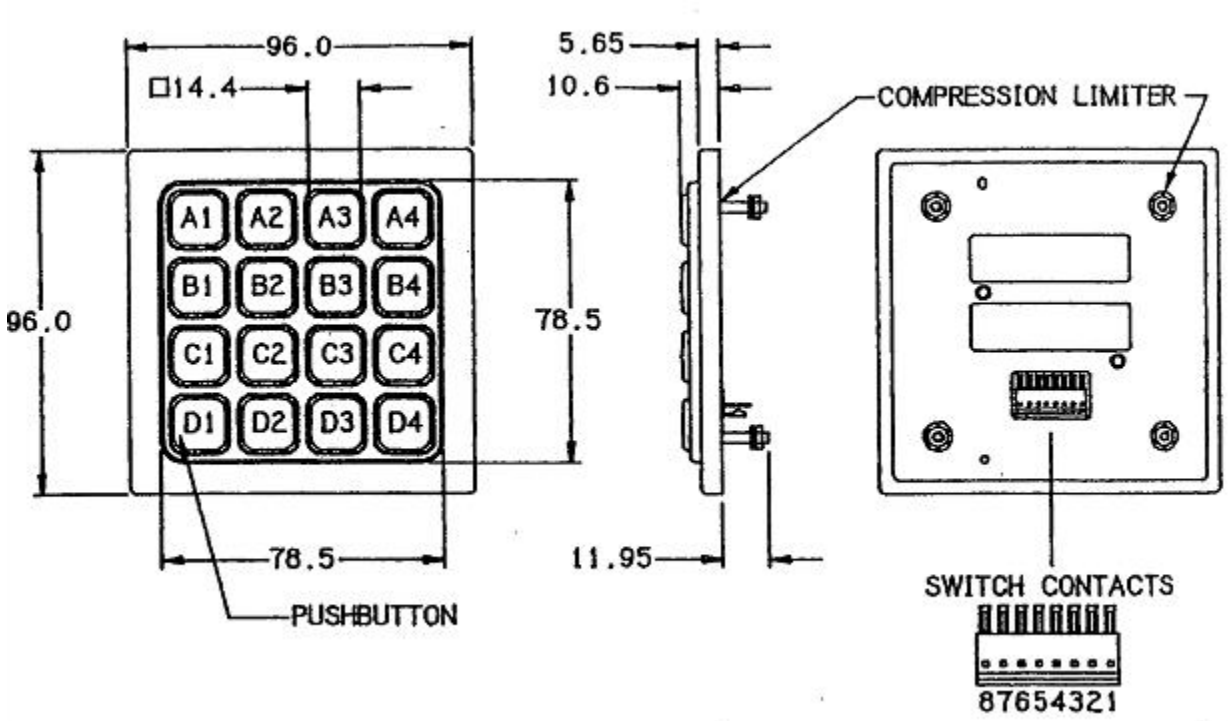


SWITCHING CONTACTS

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 MILIMETERS.



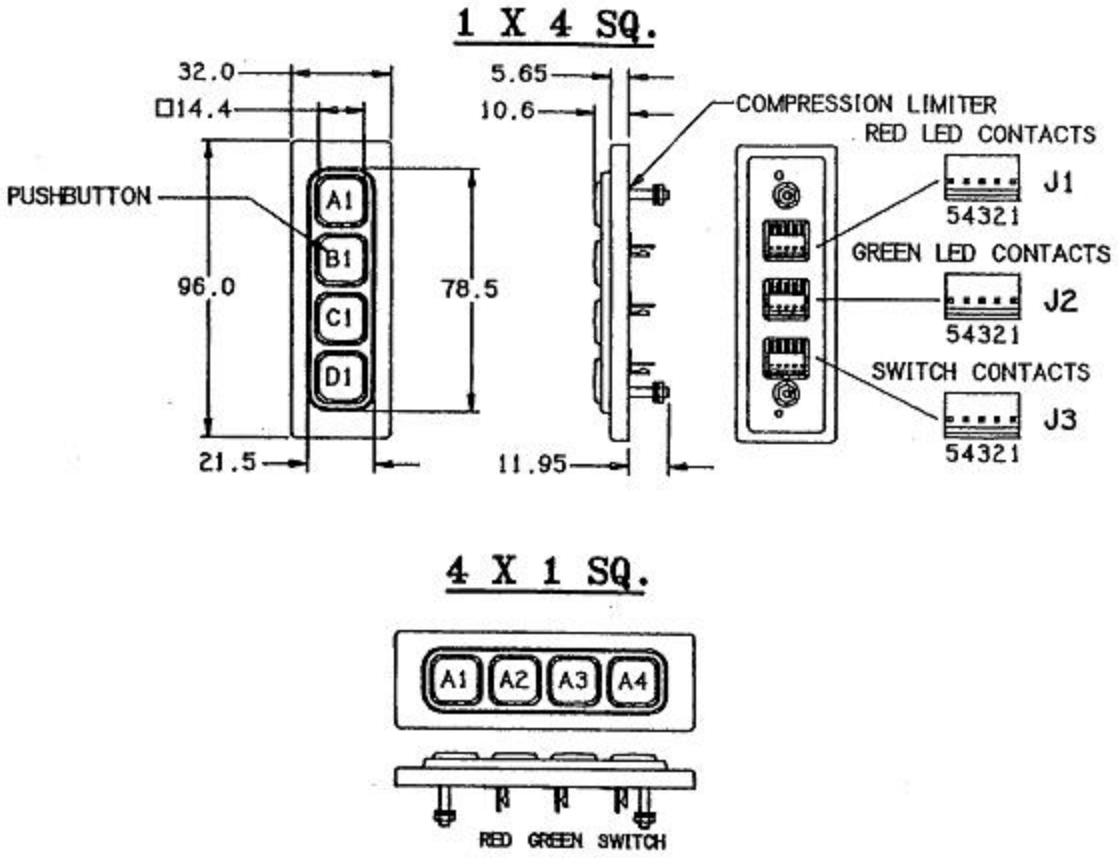
CONNECTOR J3

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 MILIMETERS.



LIGHTING CONTACTS

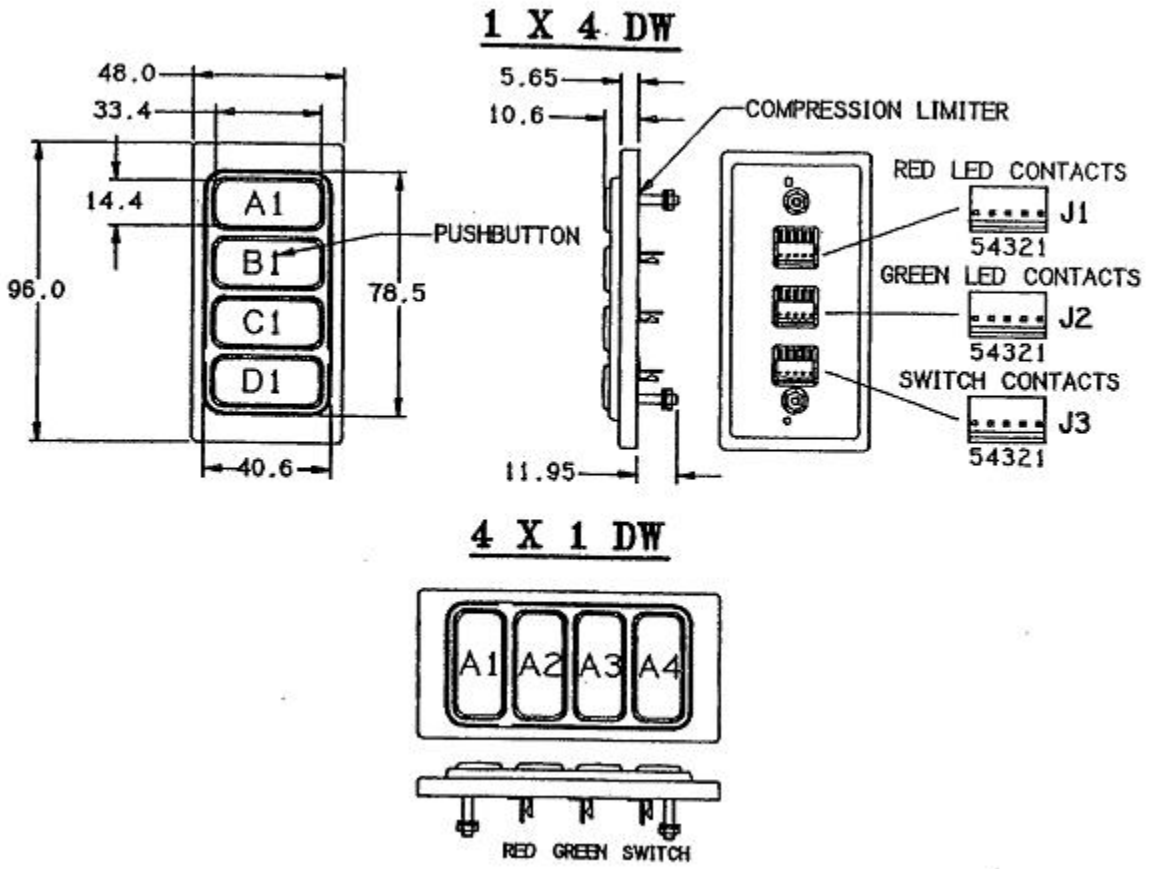
LED CONTACT	RED LED LOCATION		GREEN LED LOCATION	
1	COMMON	COMMON	COMMON	COMMON
2	A1	A1	A1	A1
3	B1	A2	B1	A2
4	C1	A3	C1	A3
5	D1	A4	D1	A4

SWITCHING CONTACTS

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

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

DIMENSIONS ARE IN MILIMETERS.



LIGHTING CONTACTS

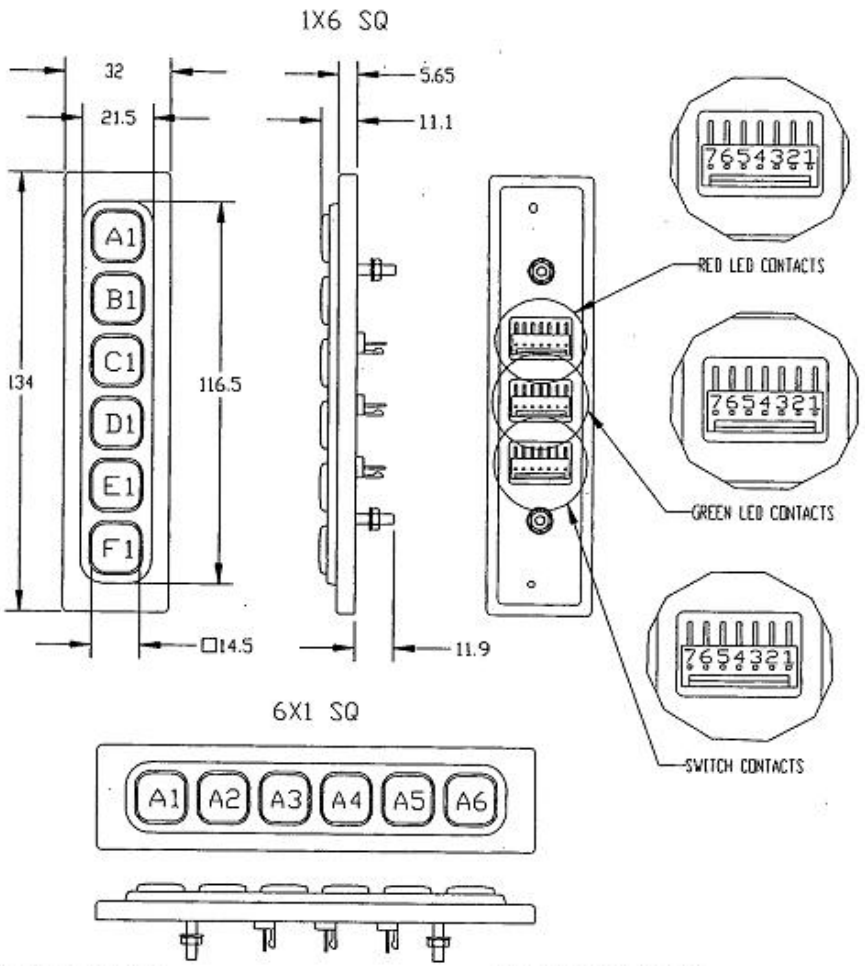
LED CONTACT	RED LED LOCATION		GREEN LED LOCATION	
1	COMMON	COMMON	COMMON	COMMON
2	A1	A1	A1	A1
3	B1	A2	B1	A2
4	C1	A3	C1	A3
5	D1	A4	D1	A4

SWITCHING CONTACTS

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

FIG. 10
1X4 AND 4X1 DW LIGHTED OUTLINE DIMENSIONS AND CONNECTOR IDENTIFICATIONS

DIMENSIONS ARE IN MILIMETERS.



SWITCHING CONTACTS

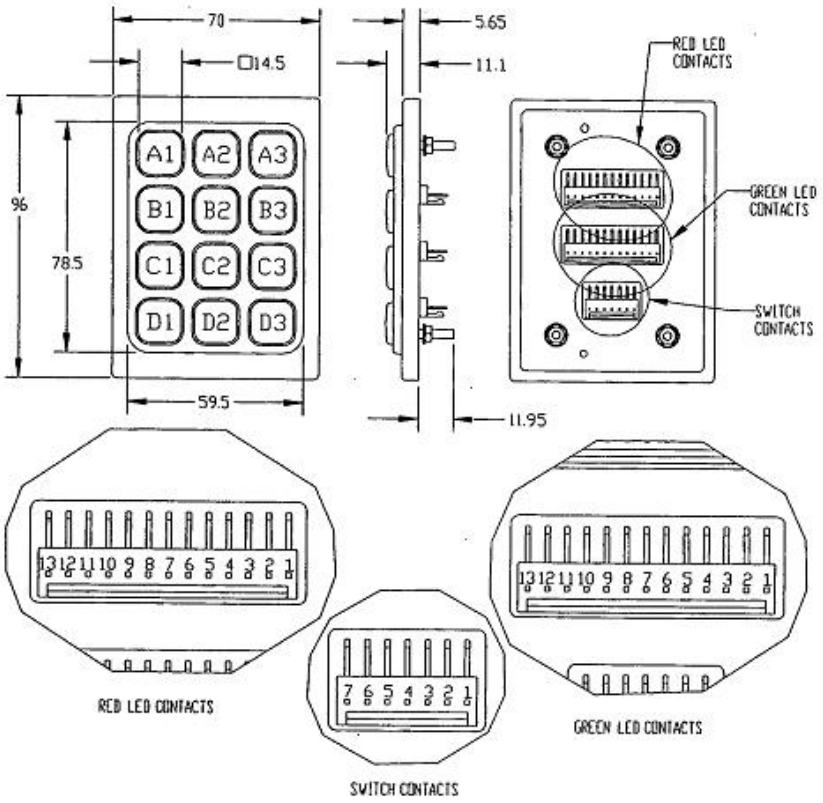
Connector Pin No.	1X6 Pushbutton Location	6X1 Pushbutton Location
1	Common	Common
2	F1	A6
3	E1	A5
4	D1	A4
5	C1	A3
6	B1	A2
7	A1	A1

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 MILIMETERS.



SWITCHING CONTACTS

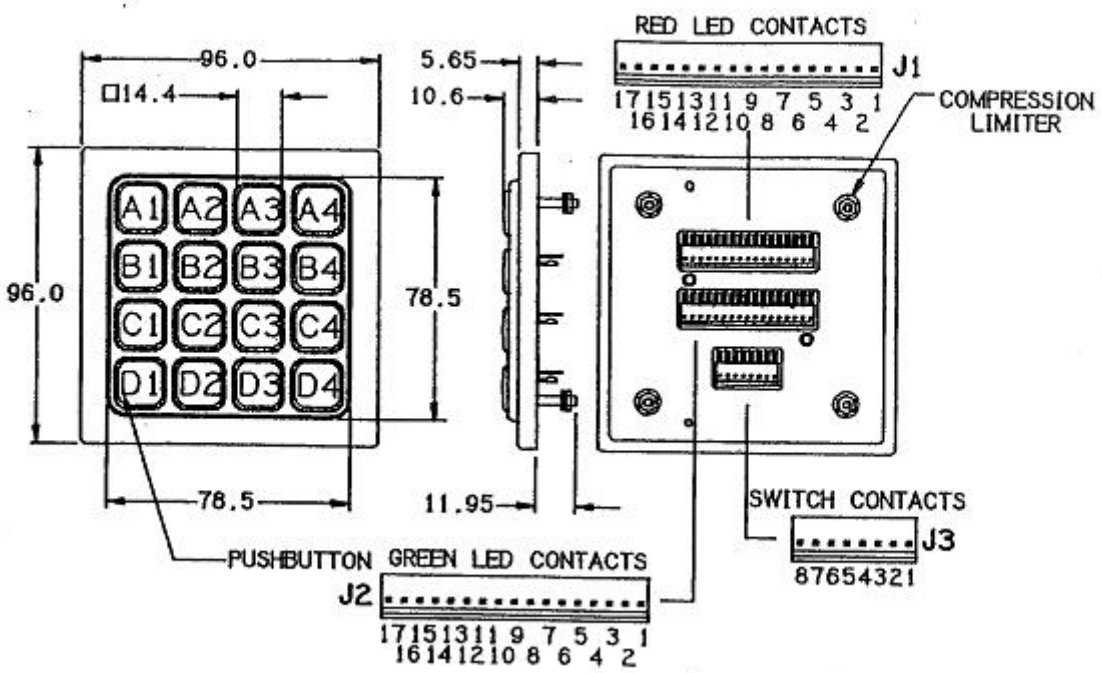
Connector Pin No.	ROW / COLUMN
1	A
2	B
3	C
4	D
5	1
6	2
7	3

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 MILIMETERS.



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

SWICHING 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 MILIMETERS.

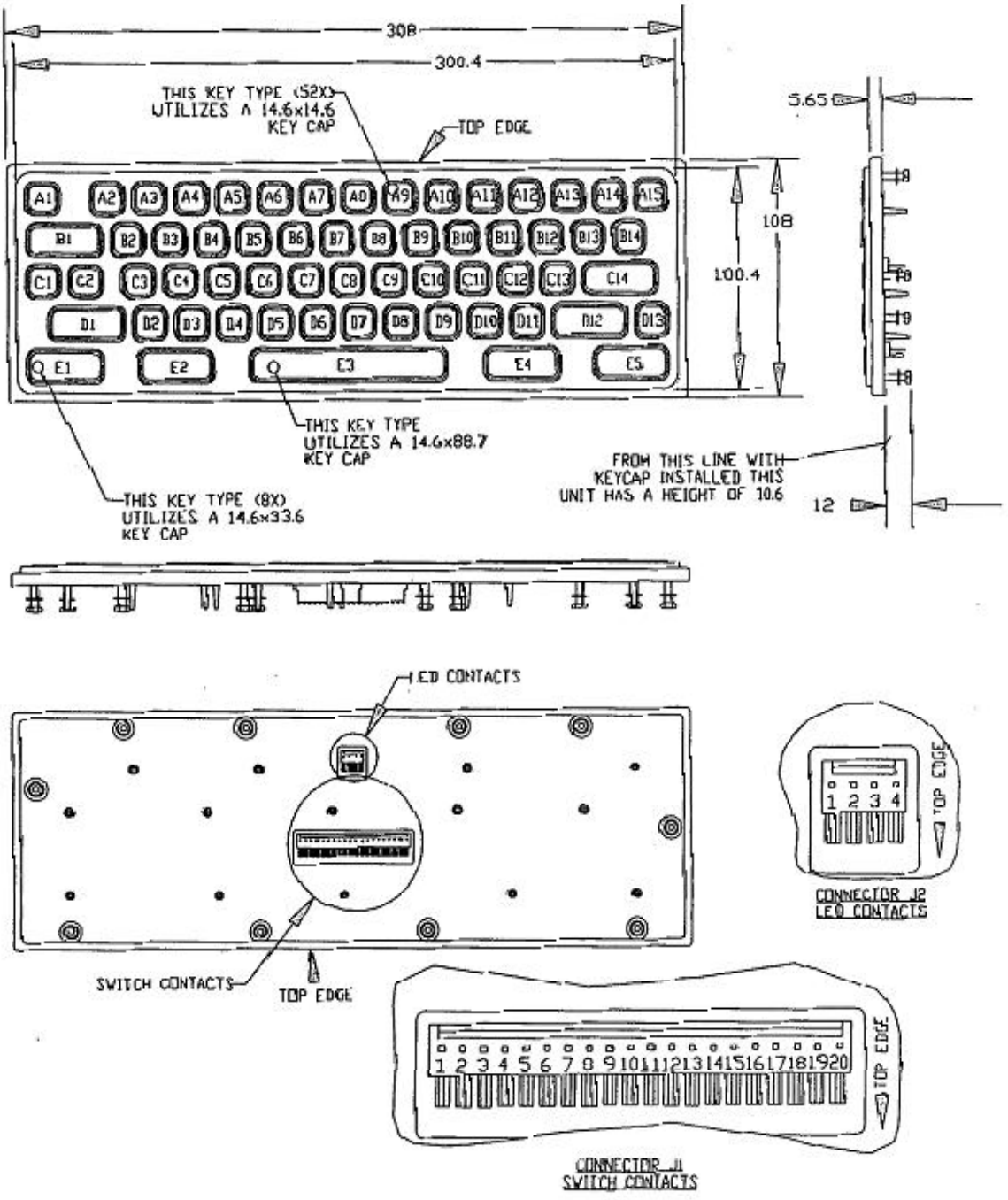


FIG.14
QWERTY UNLIGHTED AND LIGHTED OUTLINE DIMENSIONS AND CONNECTOR IDENTIFICATIONS

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

3.1.1 Panel Cutouts and Mounting

The keypads are designed for either surface mount application or rear 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

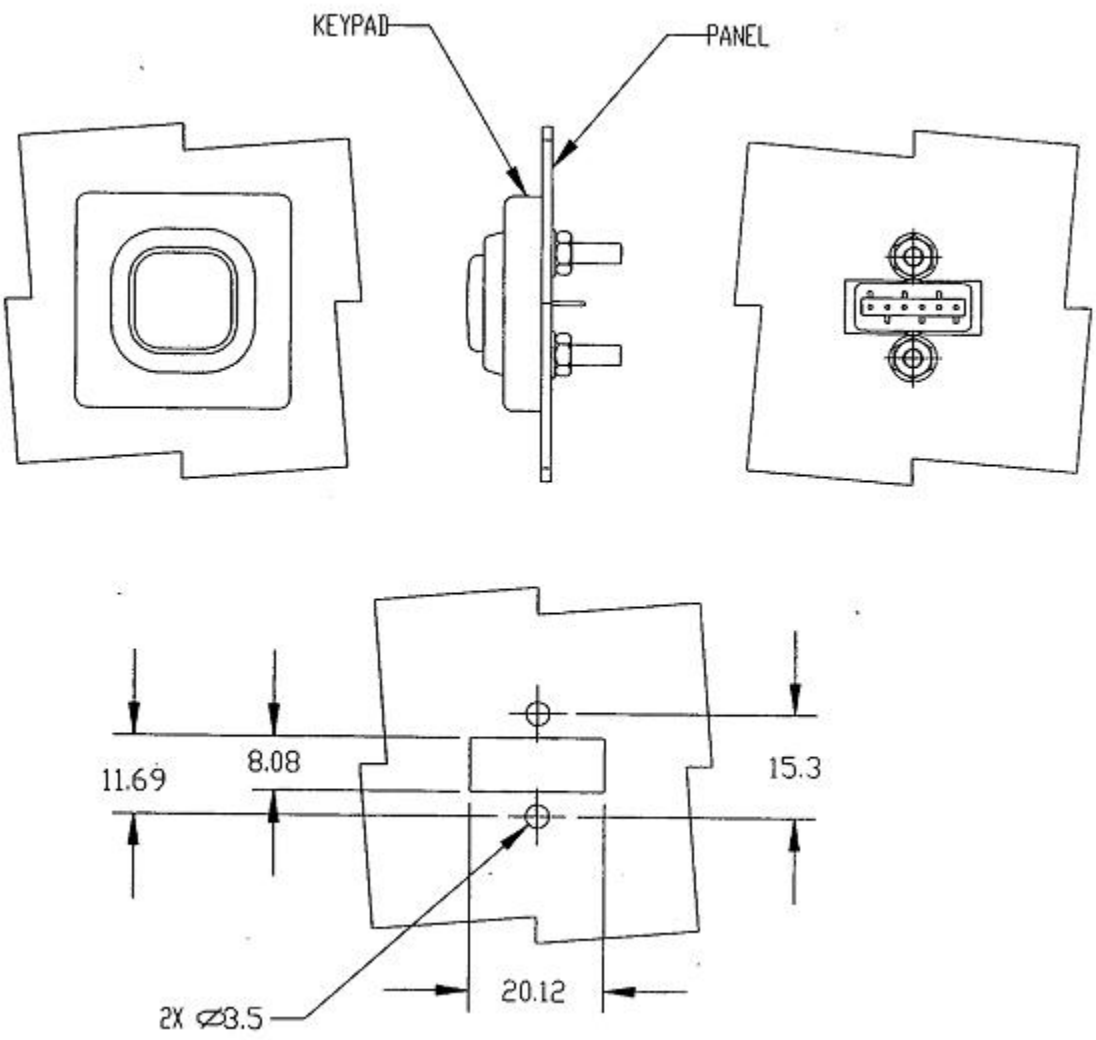
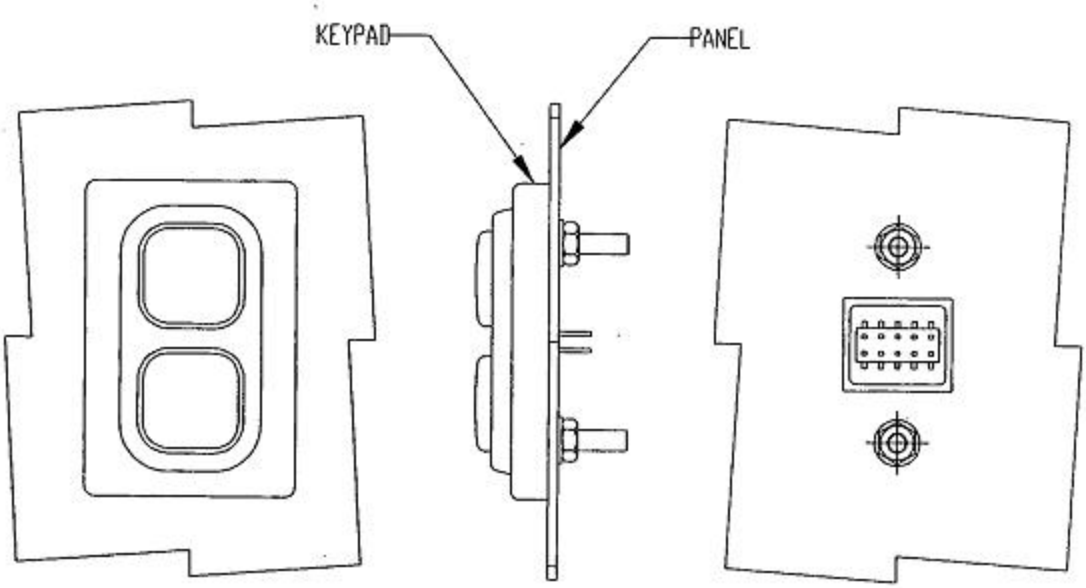


FIG.15
1X1 UNLIGHTED AND LIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.



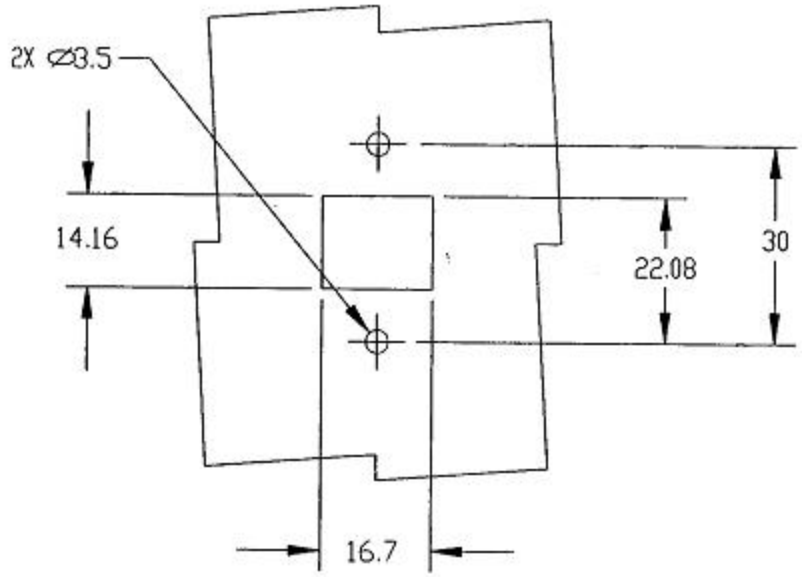


FIG.16
1X2 UNLIGHTED AND LIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.

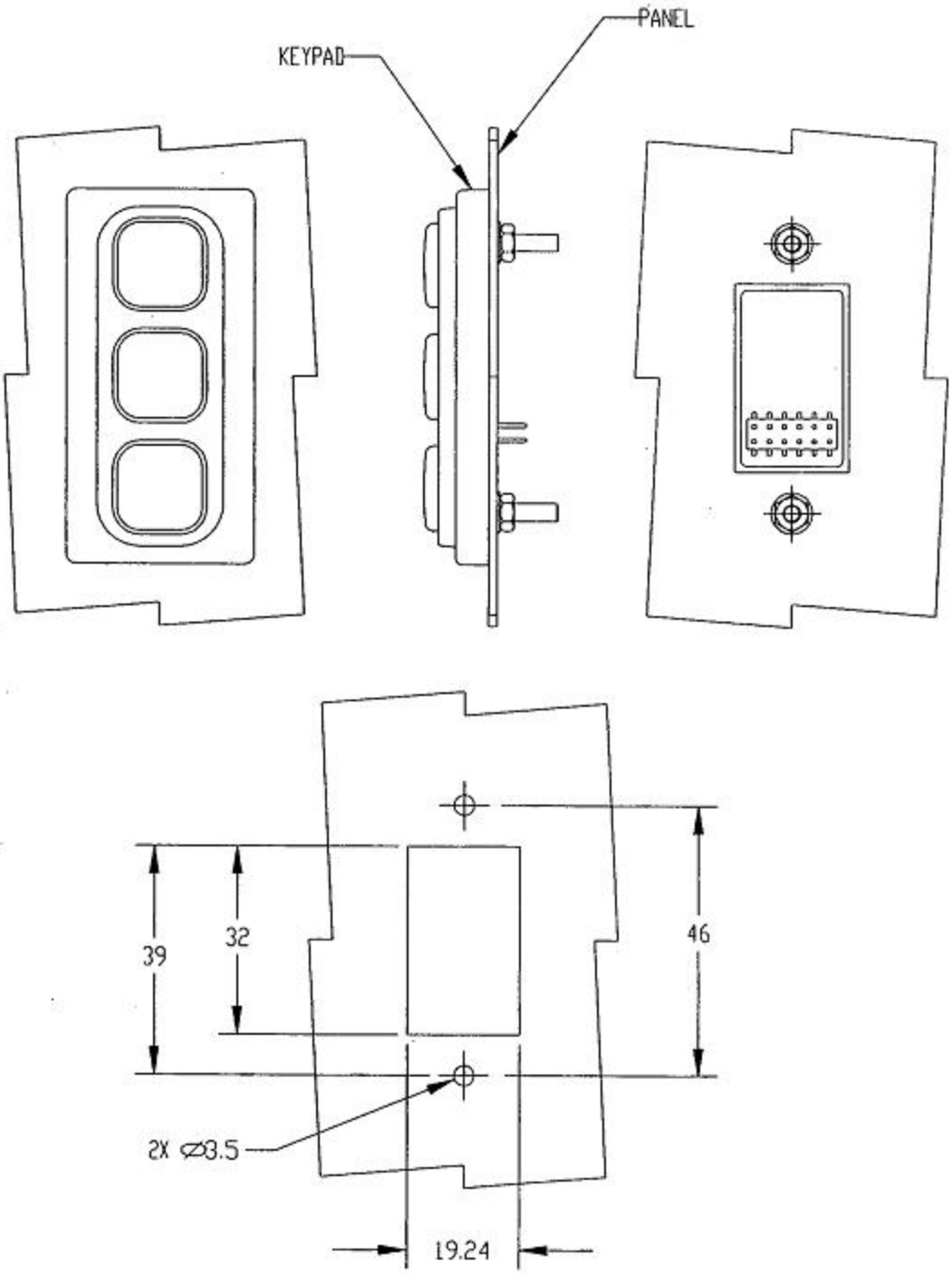
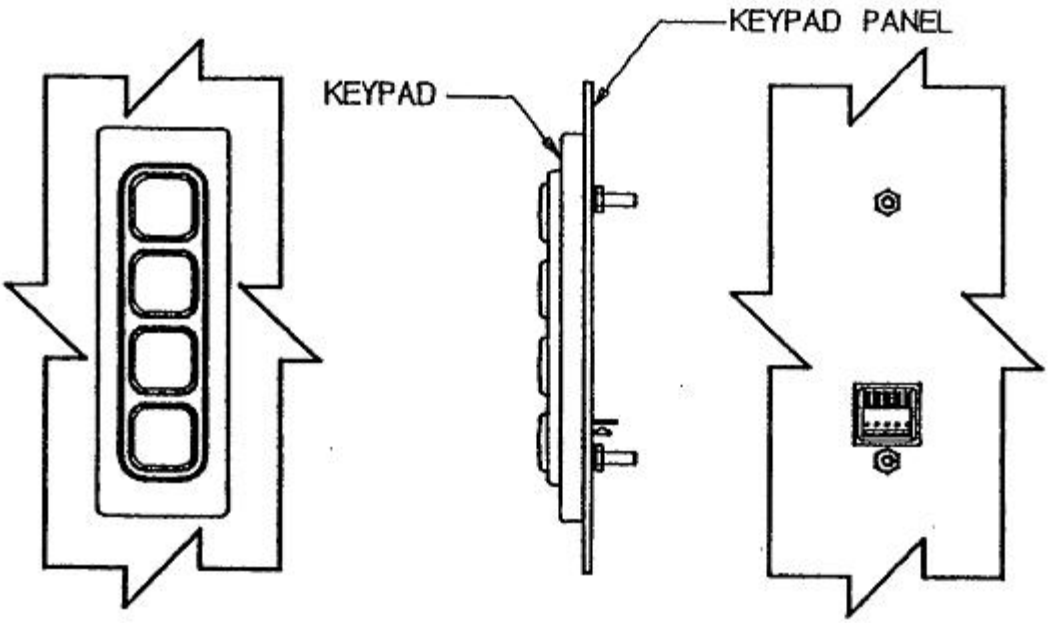


FIG.17
1X3 UNLIGHTED AND LIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.



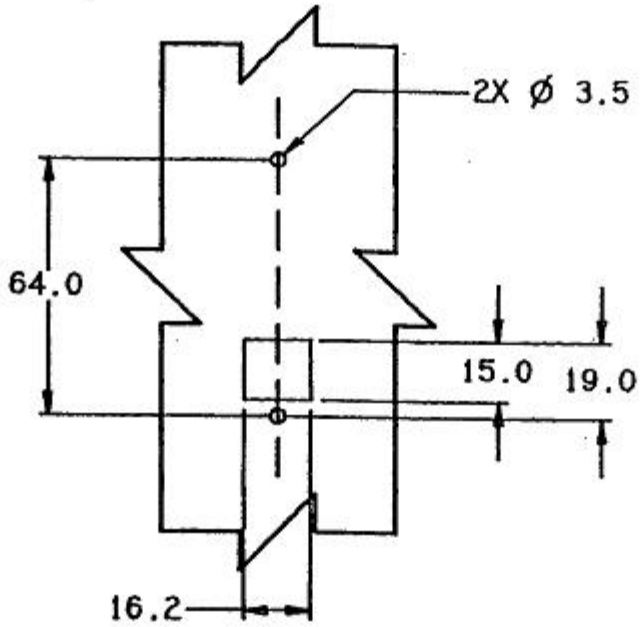
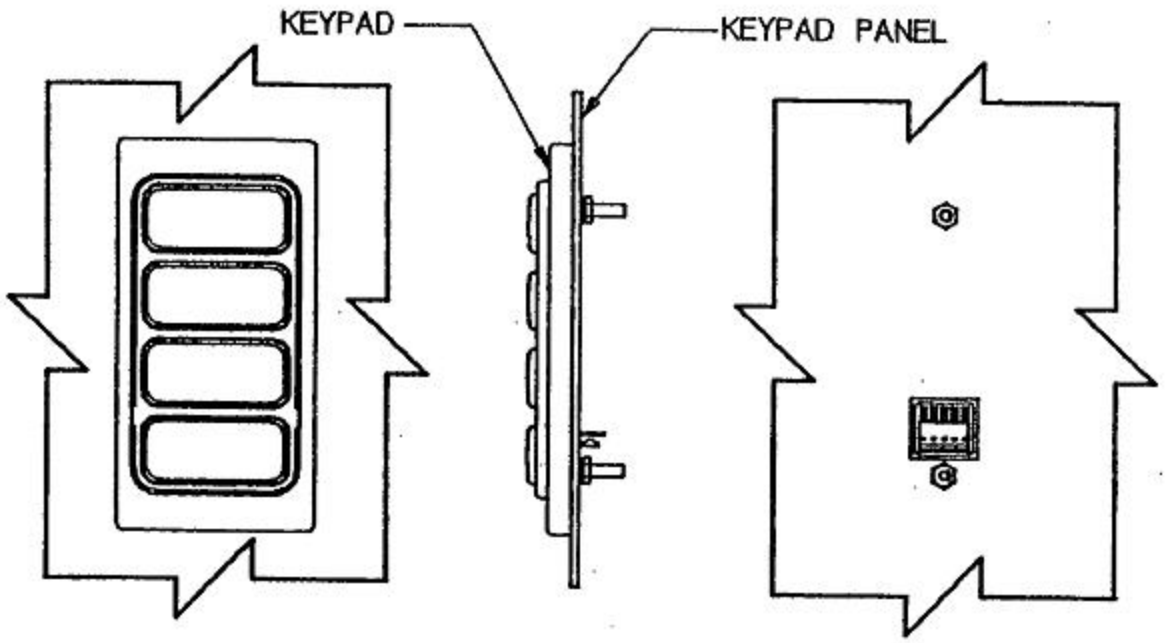


FIG.18
1X4 UNLIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.



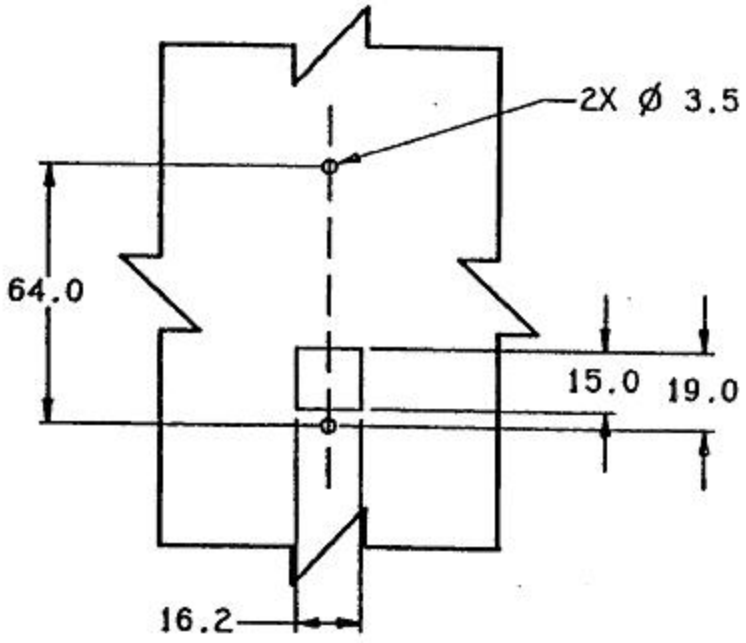


FIG.19
1X4 DW UNLIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.

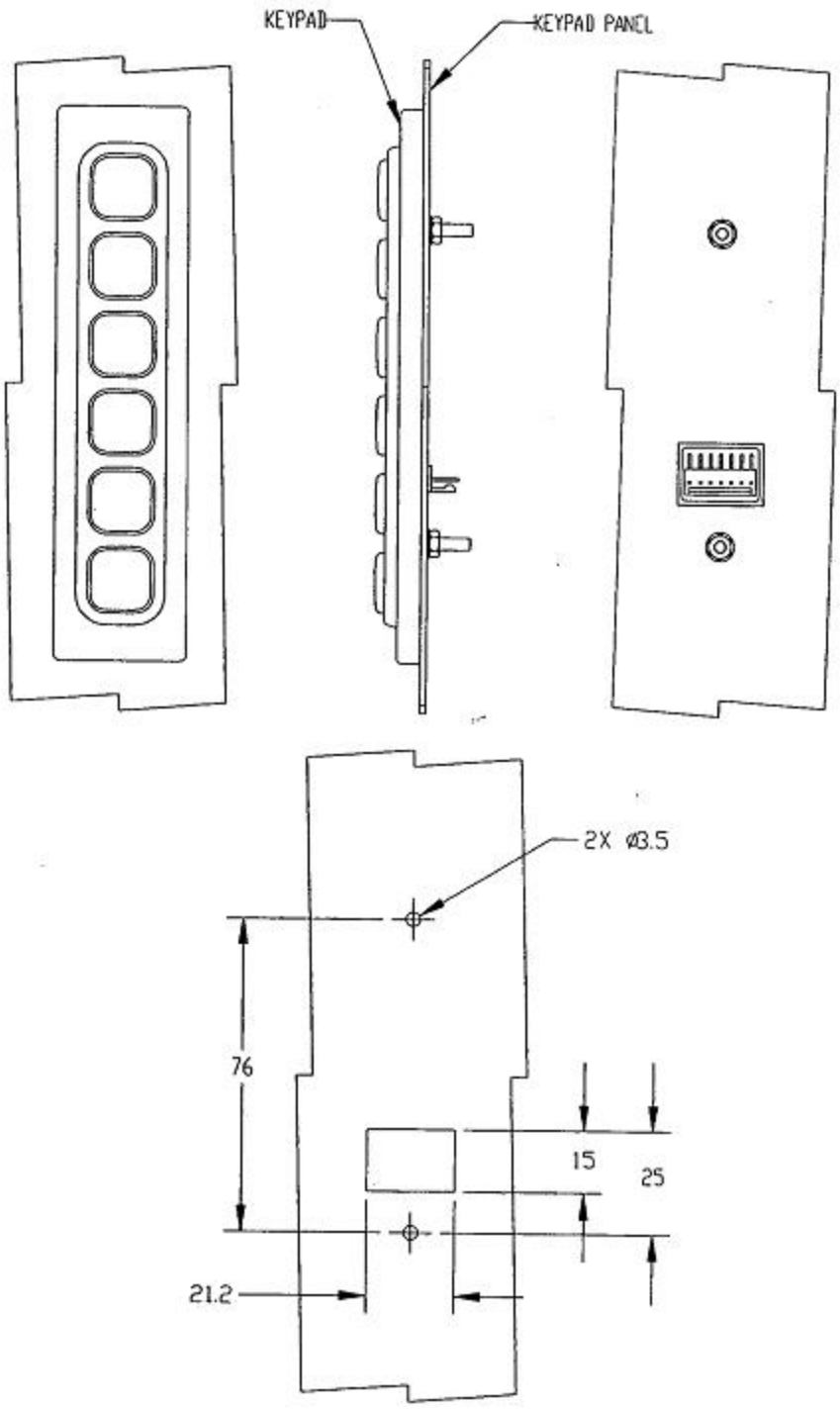


FIG.20
1X6 UNLIGHTED SURFACE MOUNT RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.

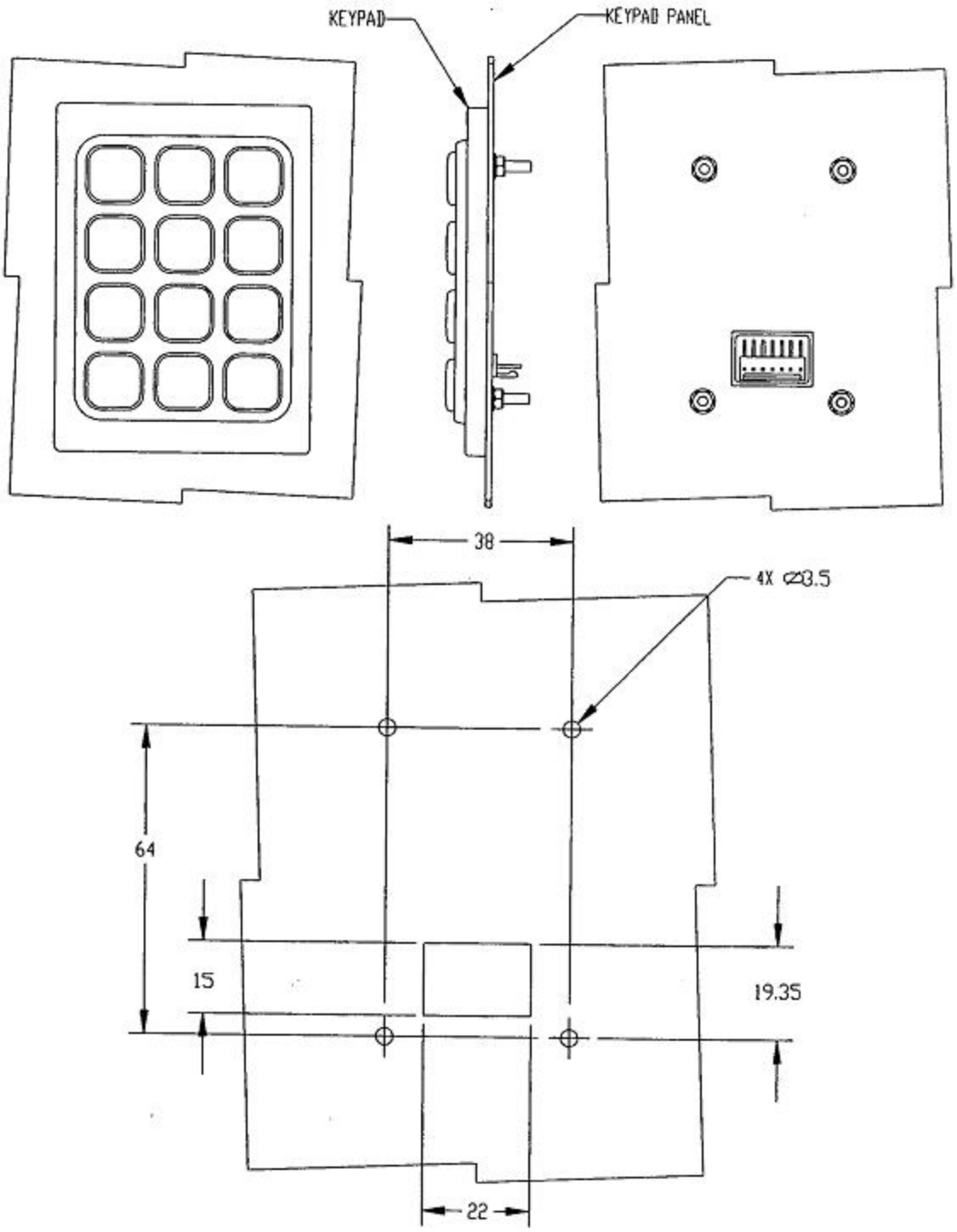


FIG.21
3X4 UNLIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.

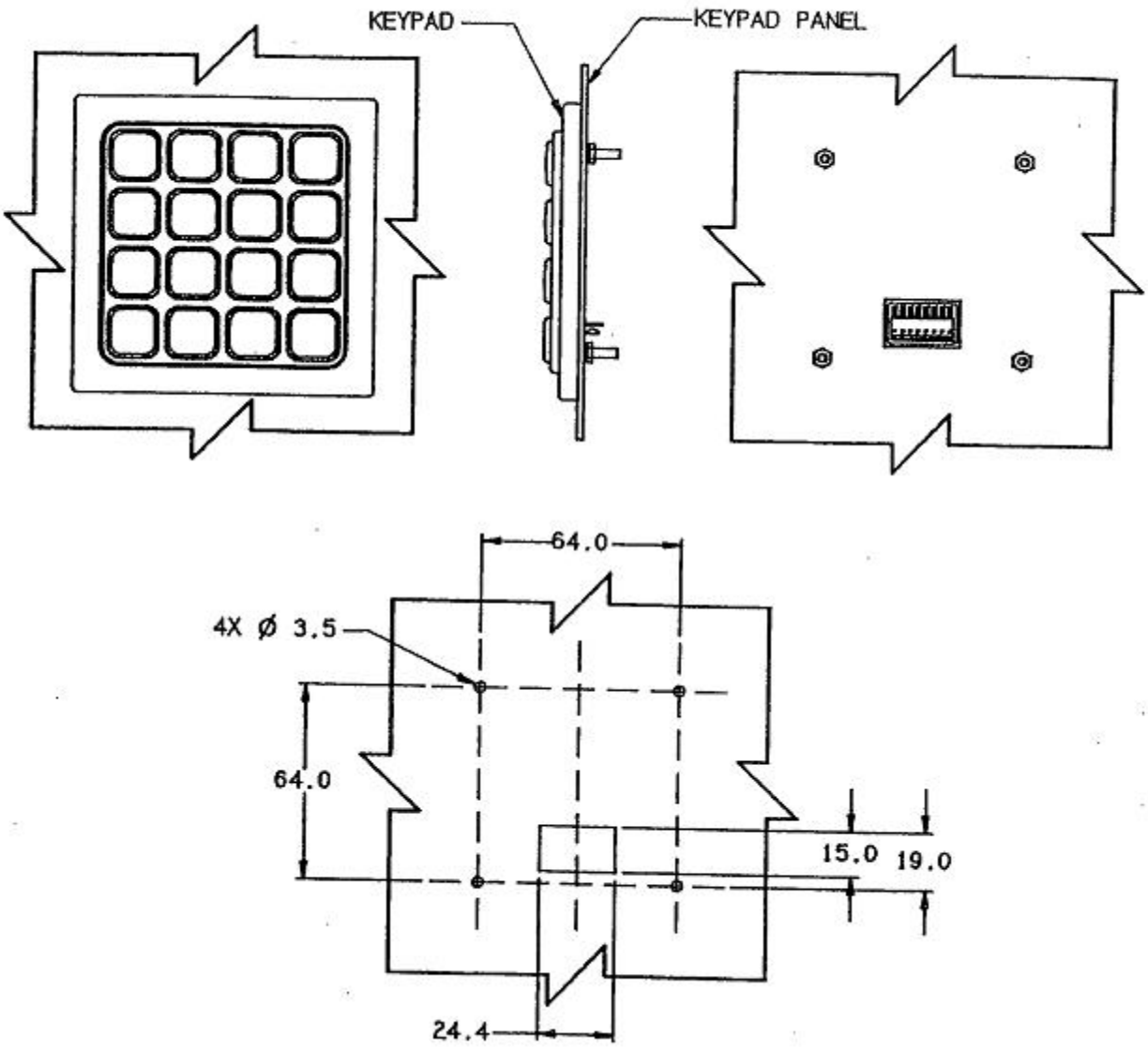
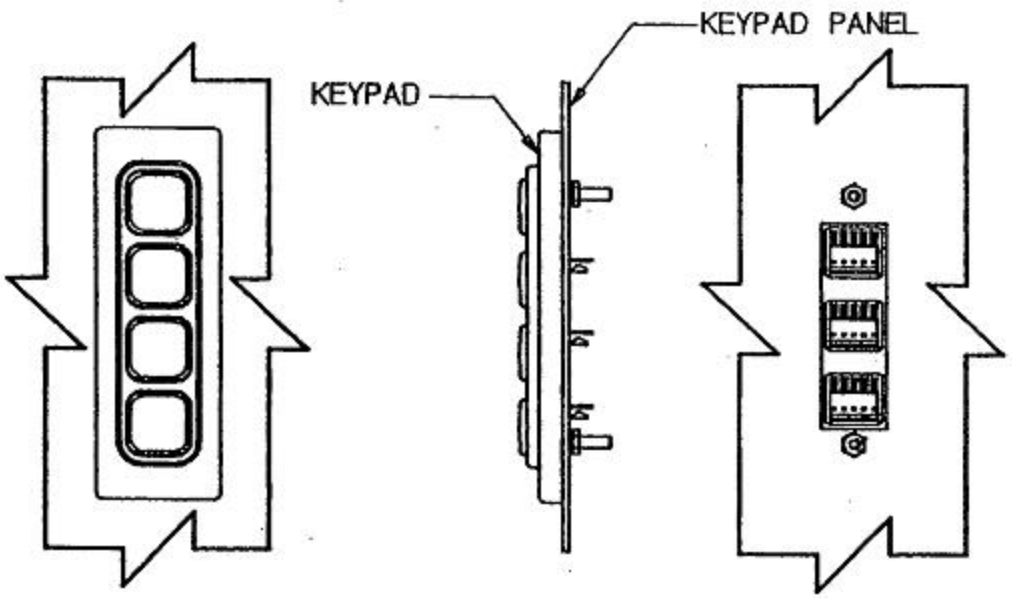


FIG.22
4X4 UNLIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.



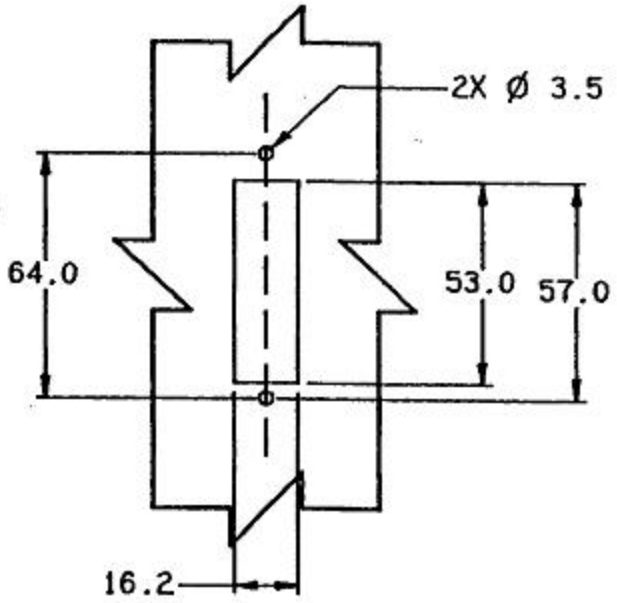


FIG.23
1X4 LIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.

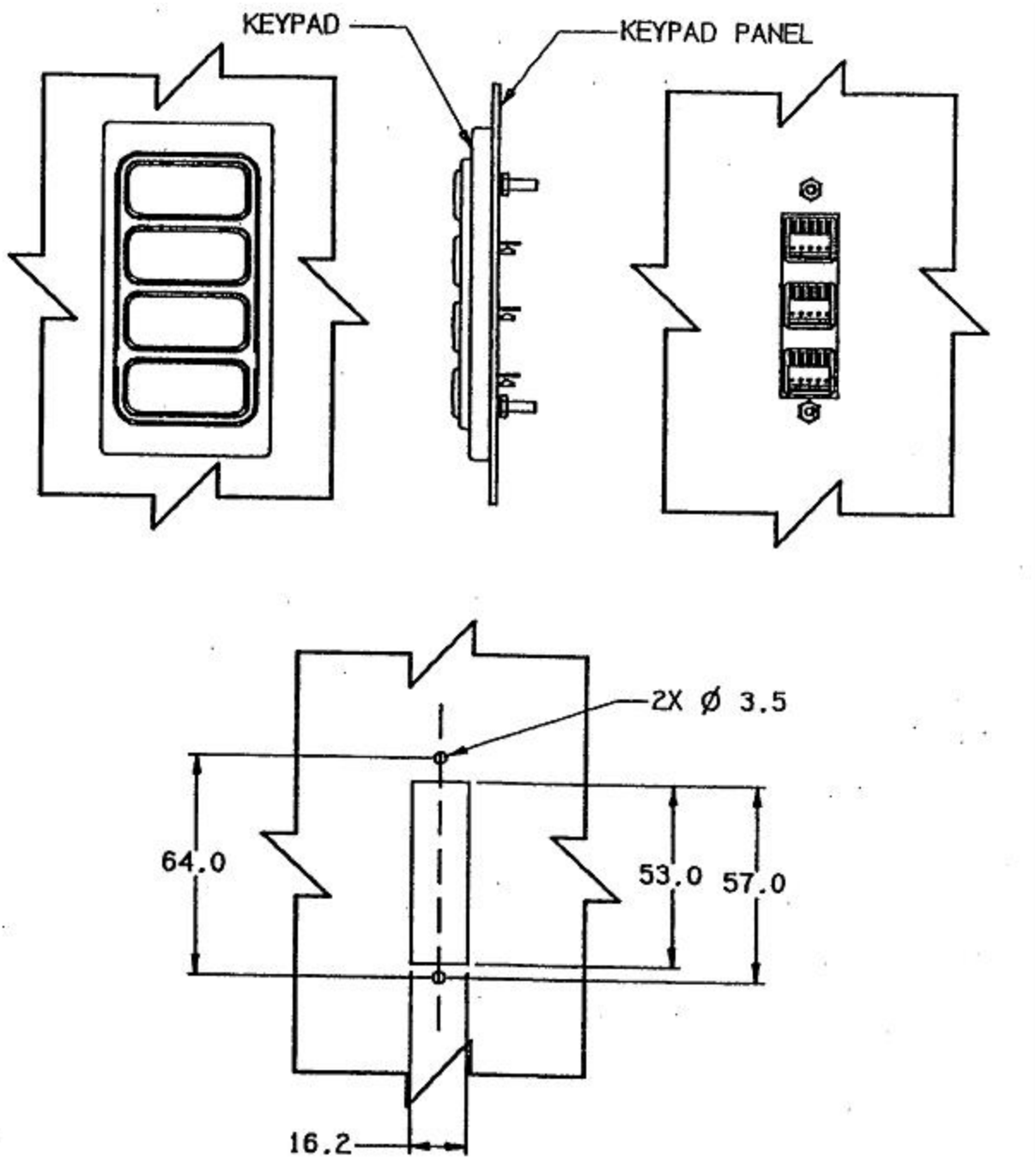


FIG.24
1X4 DW LIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.

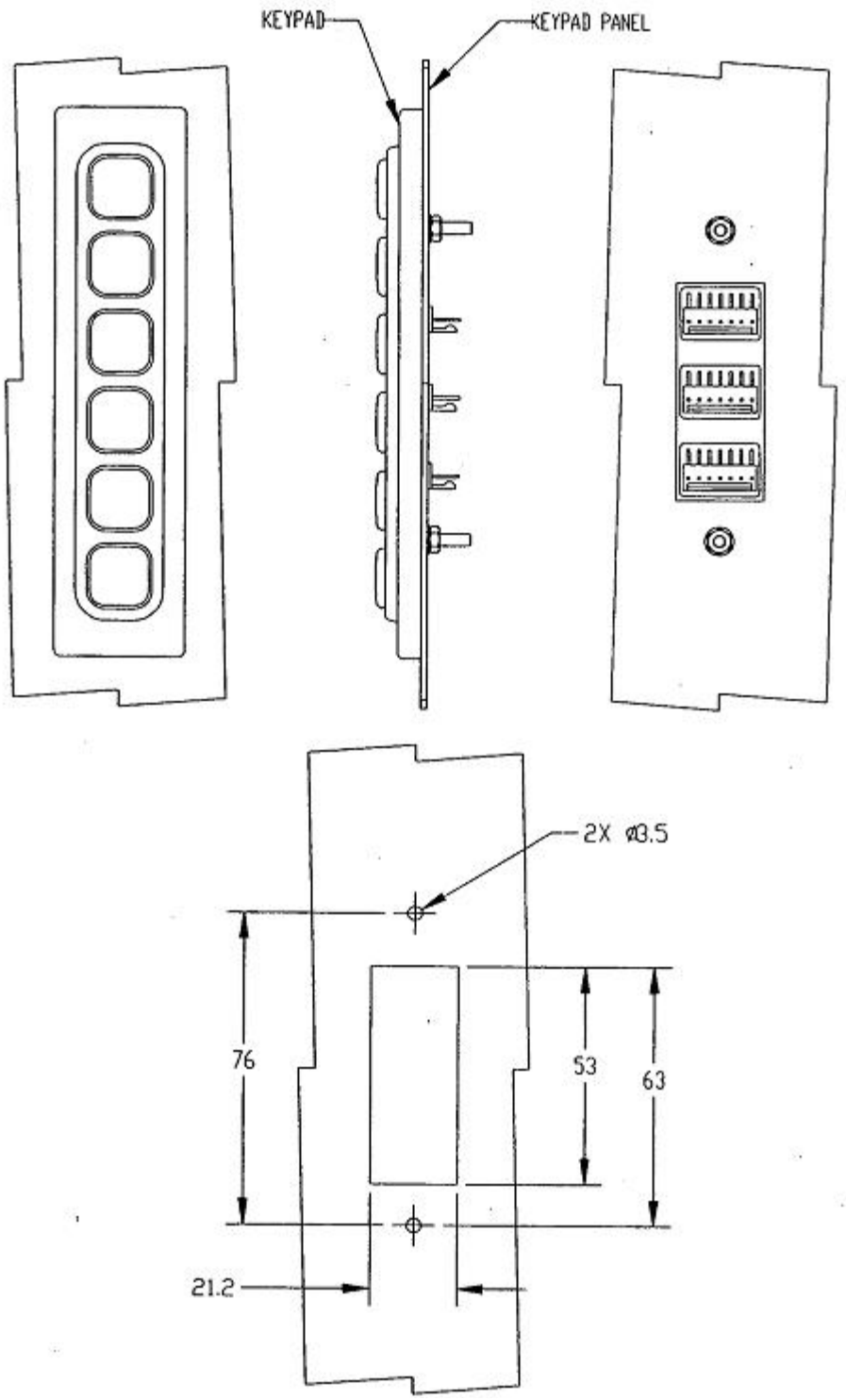


FIG.25

1X6 LIGHTED SURFACE MOUNT RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.

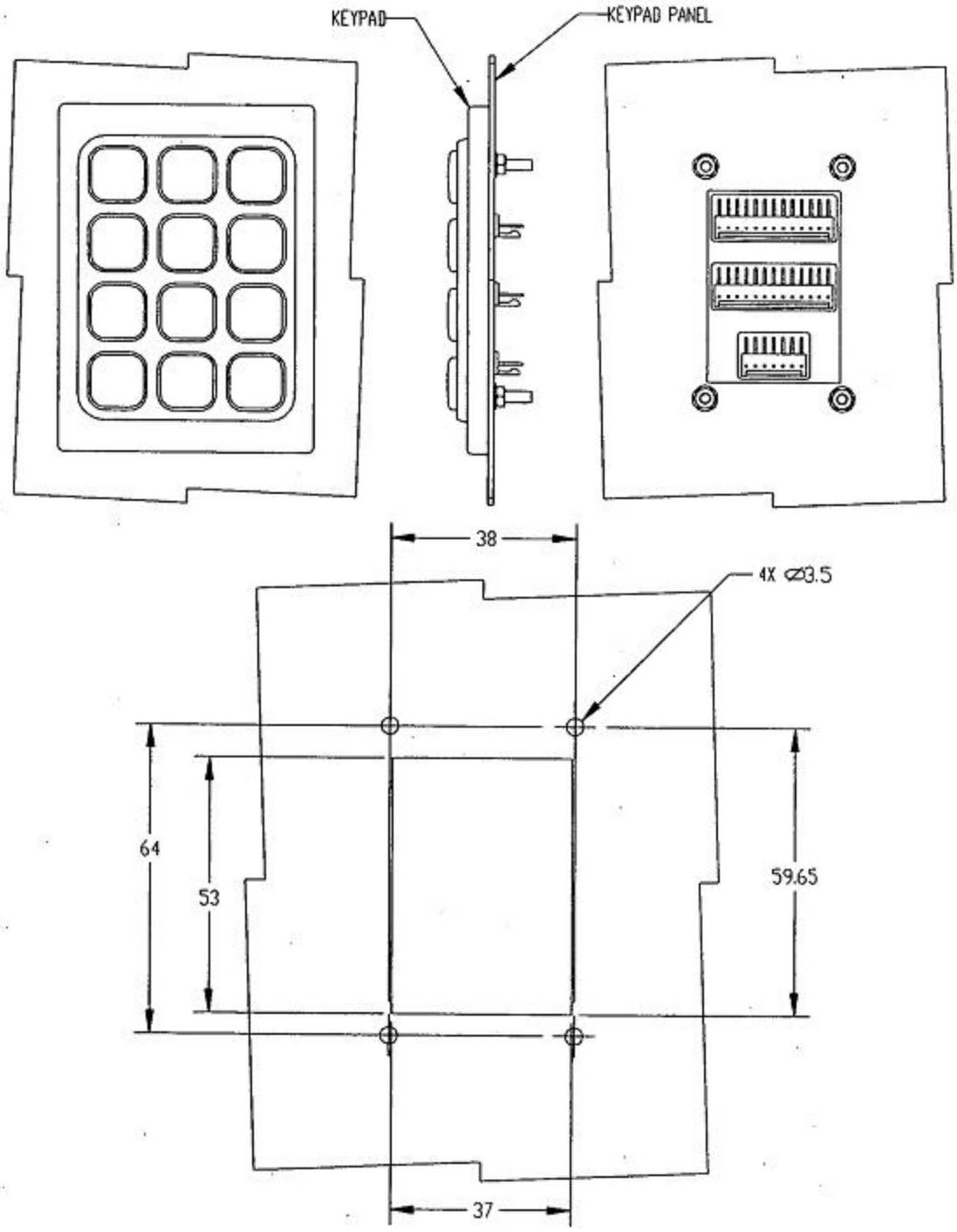


FIG.26
3X4 LIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.

CAGE CODE:	DRAWING NO.	REV.	SHT.
12522	SERIES M2 AND M15 CODED	1.1	35

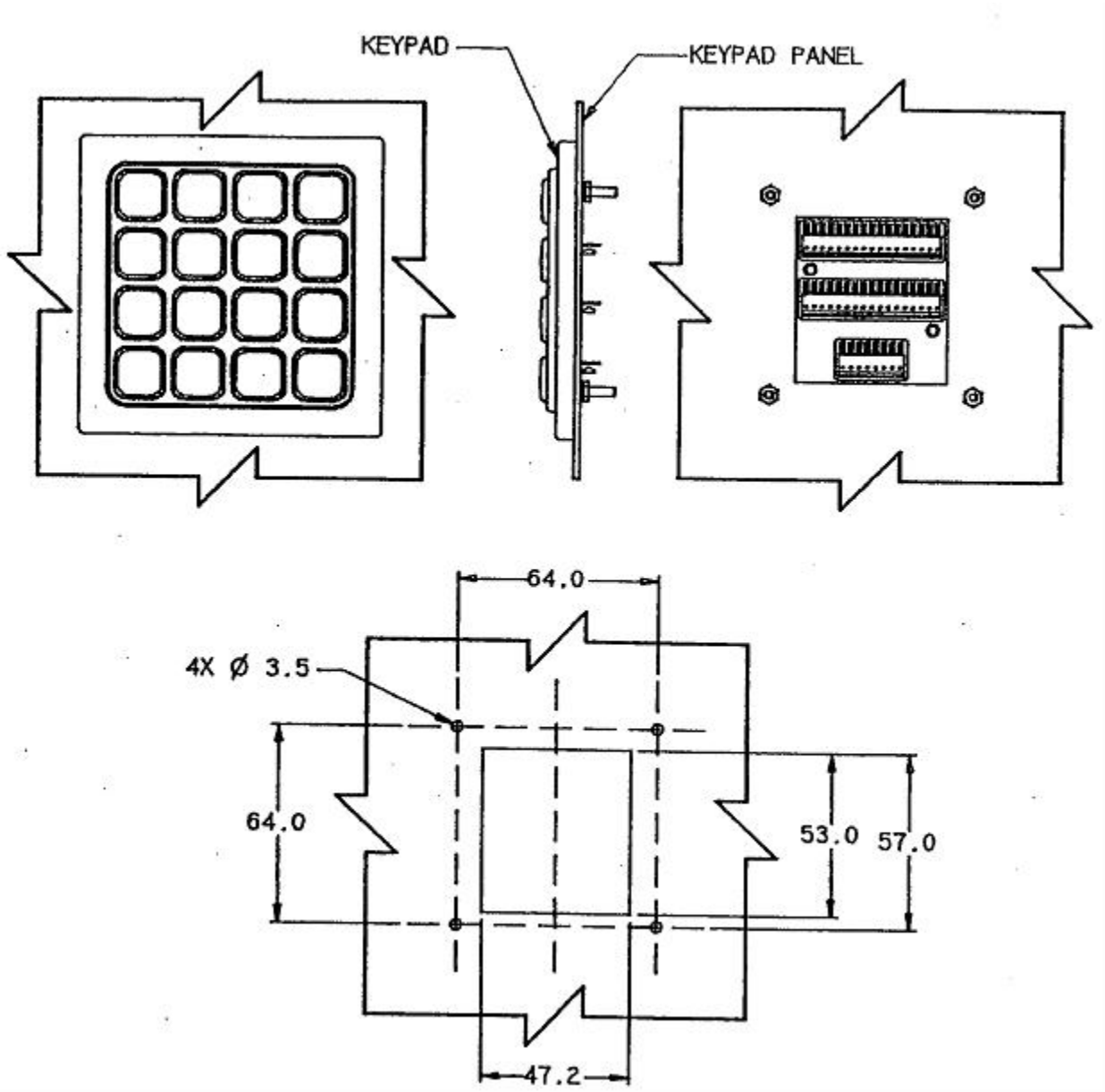


FIG.27
4X4 LIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.

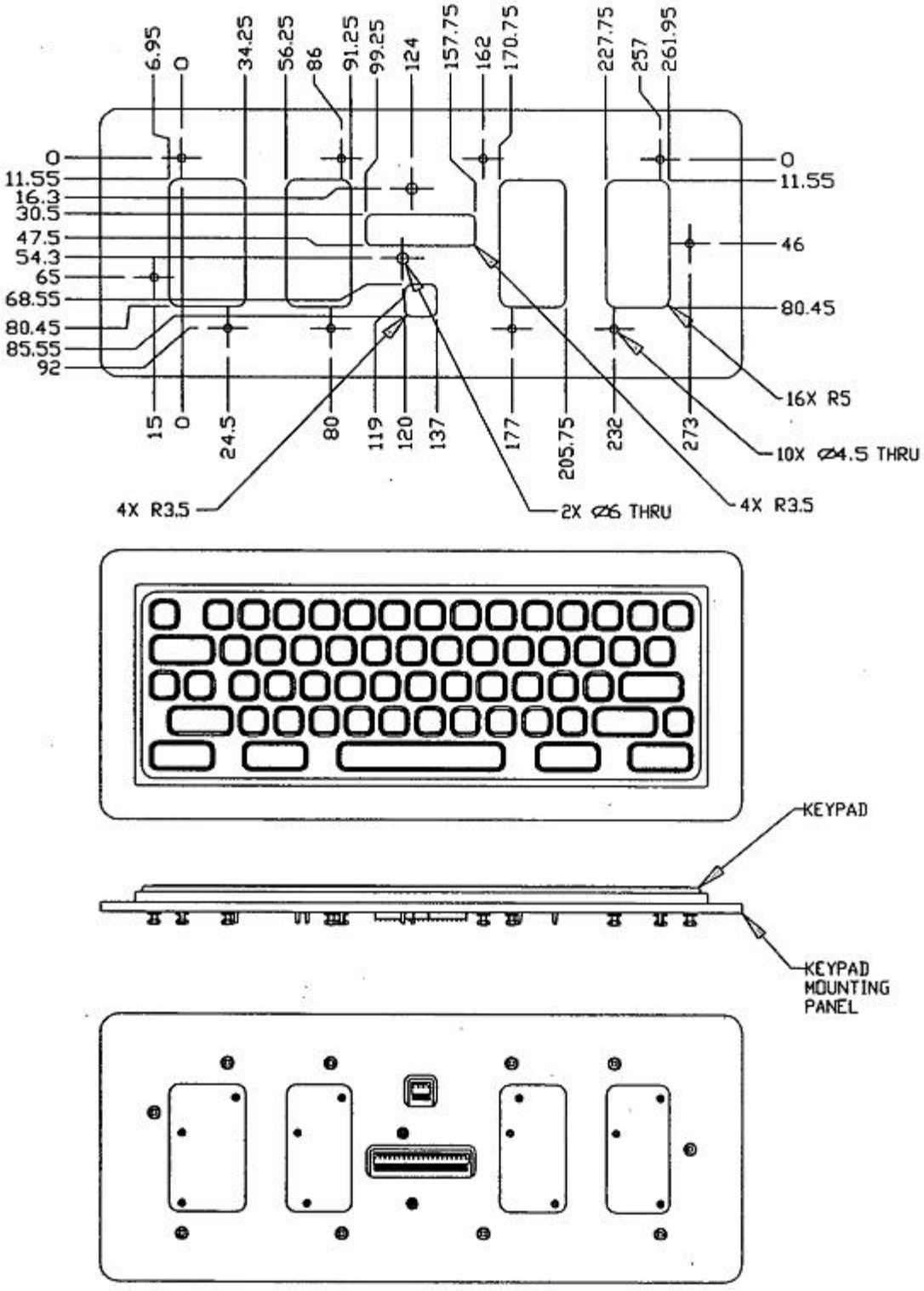


FIG.28
QWERTY UNLIGHTED AND LIGHTED SURFACE MOUNT
RECOMMENDED PANEL CUTOUT AND HOLES

DIMENSIONS ARE IN MILIMETERS.

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

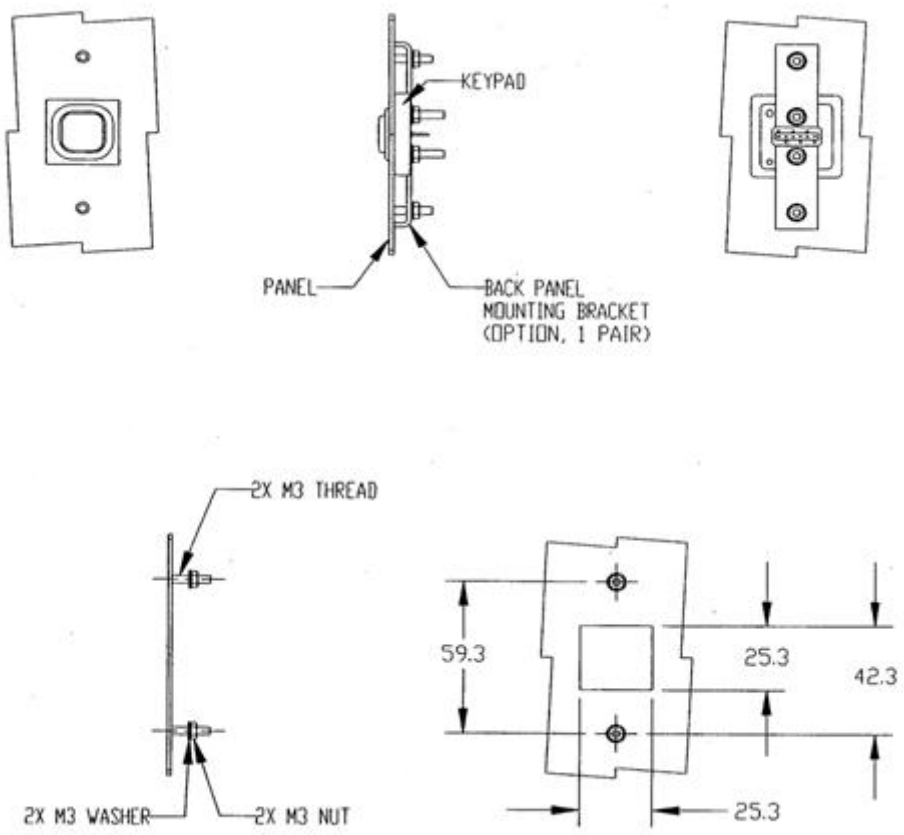


FIG. 29
1X1 UNLIGHTED AND LIGHTED REAR MOUNT
RECOMMENDED PANEL CUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

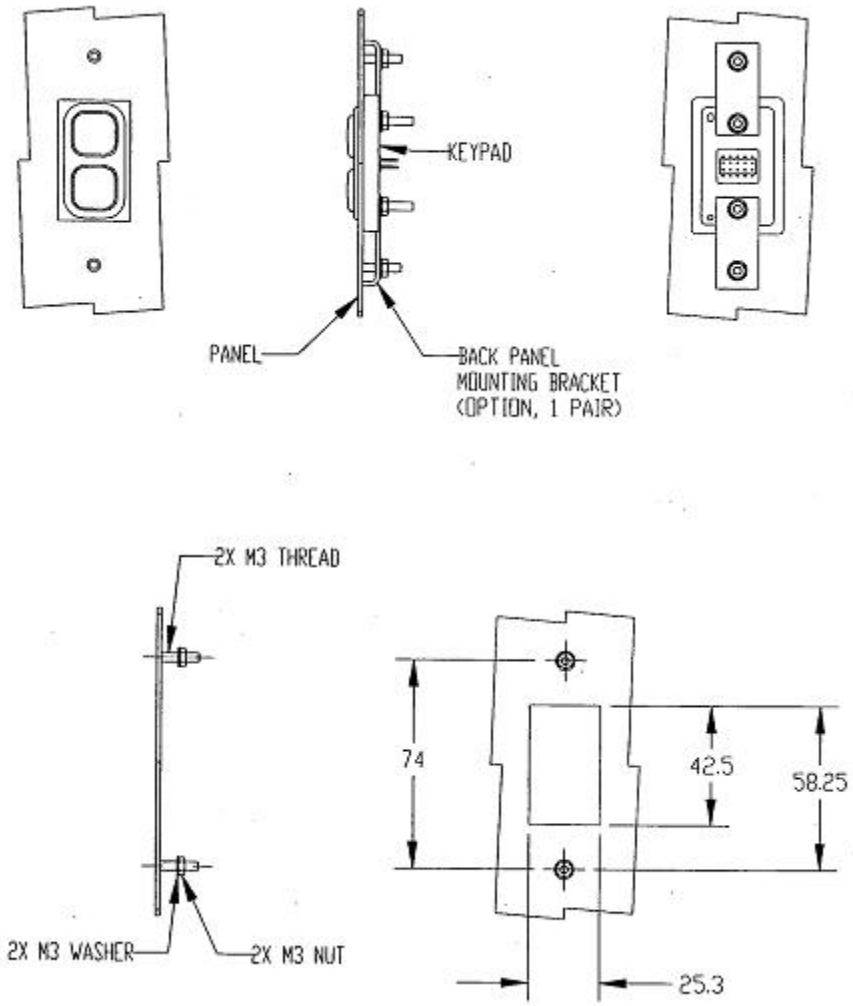


FIG. 30
1X2 UNLIGHTED AND LIGHTED REAR MOUNT
RECOMMENDED PANEL CUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

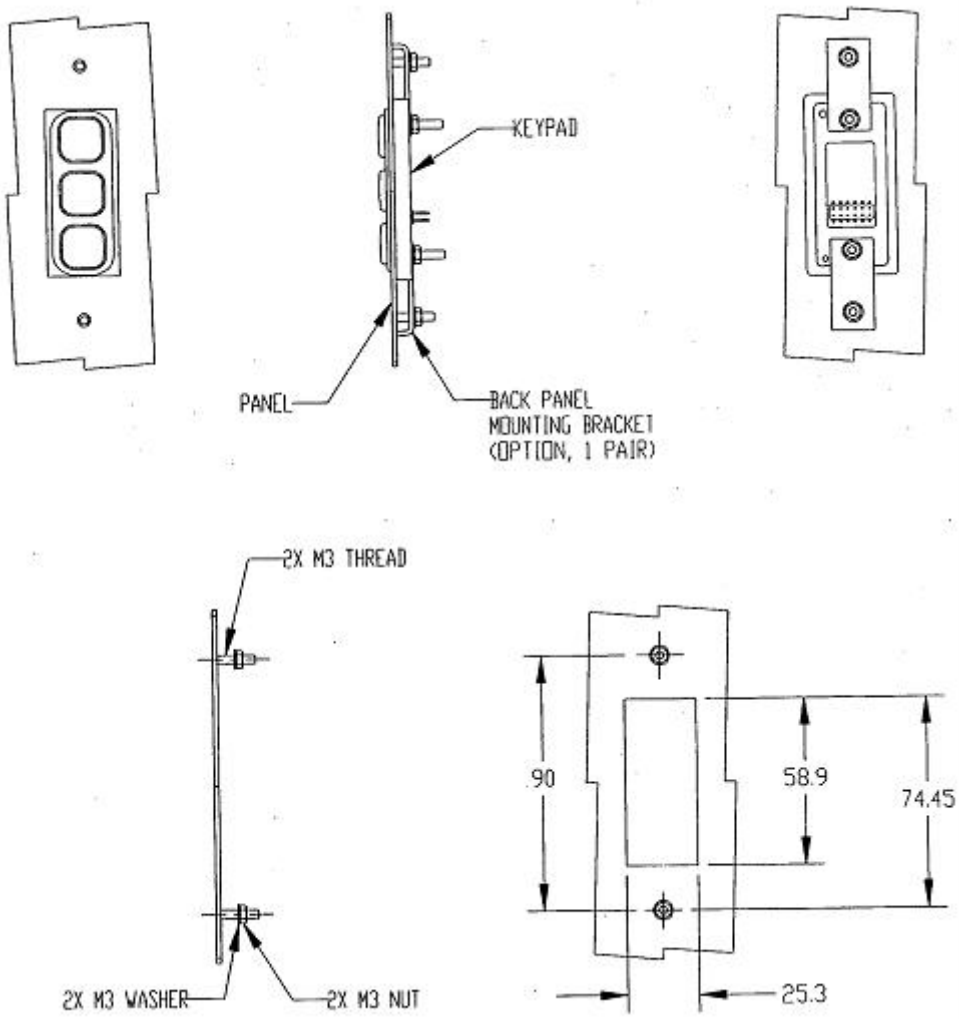


FIG. 31
1X3 UNLIGHTED AND LIGHTED REAR MOUNT
RECOMMENDED PANEL CUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

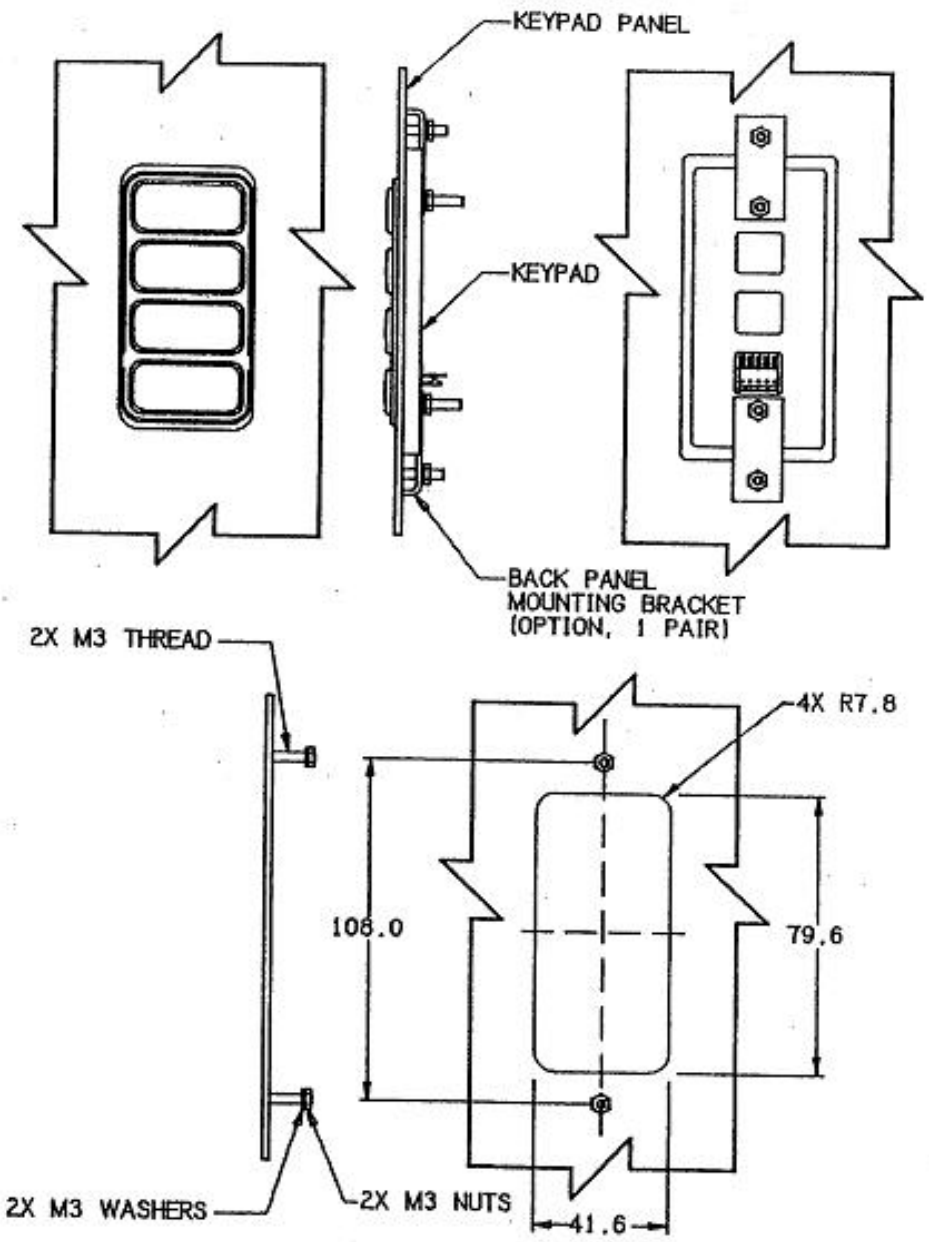


FIG. 33
1X4 DW UNLIGHTED REAR MOUNT
RECOMMENDED PANEL CUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

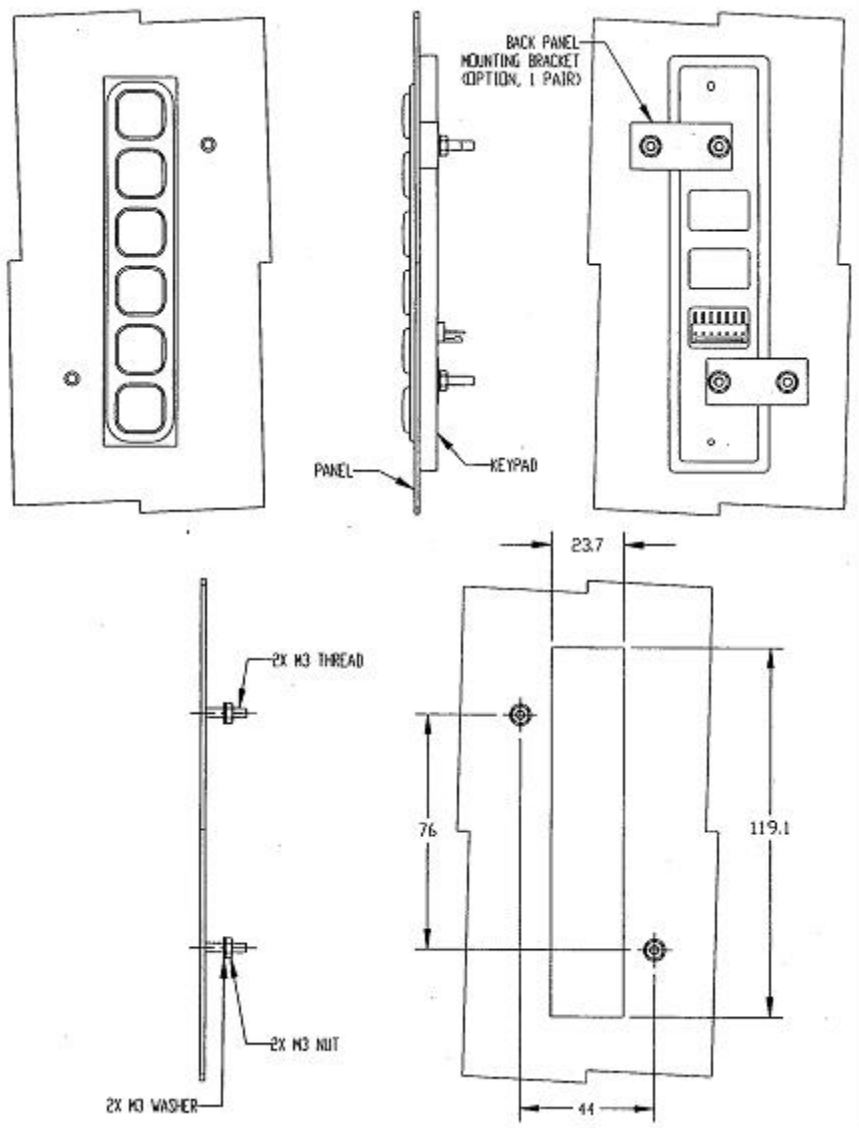


FIG. 34
1X6 UNLIGHTED REAR MOUNT RECOMMENDED PANEL CUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

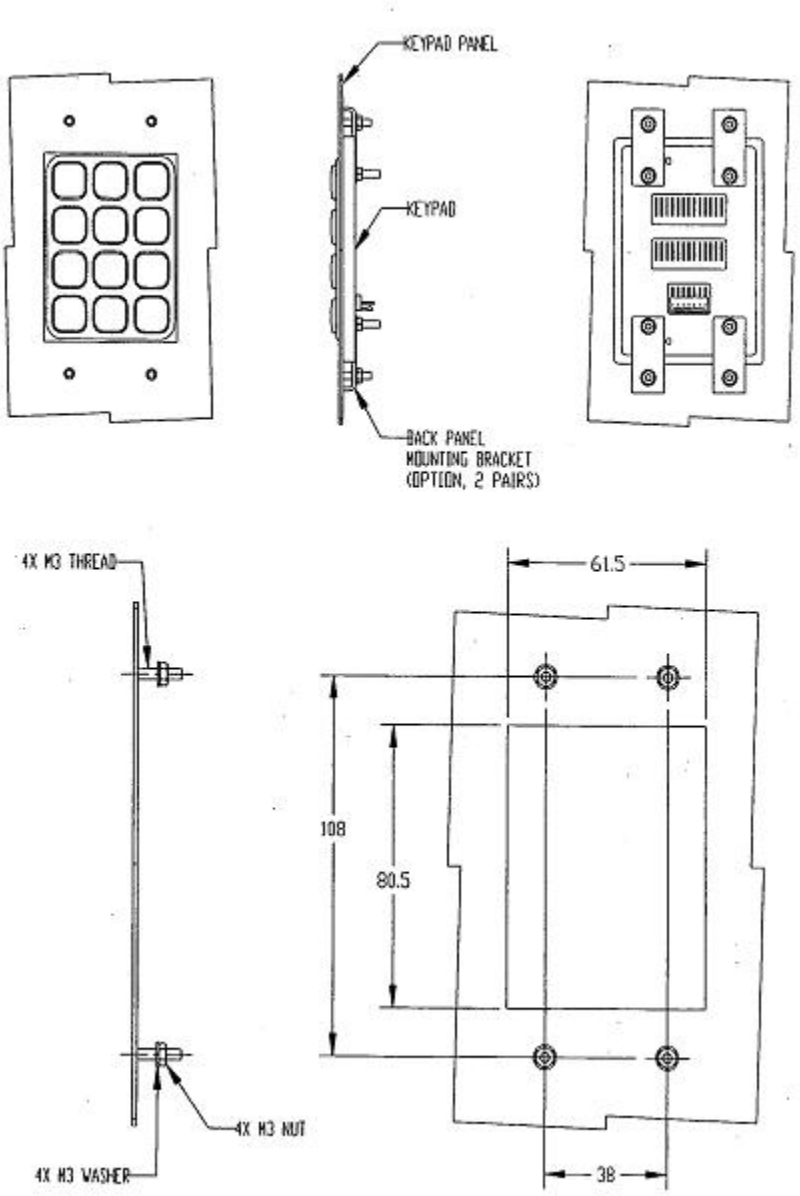


FIG. 35
3X4 UNLIGHTED REAR MOUNT
RECOMMENDED PANEL COUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

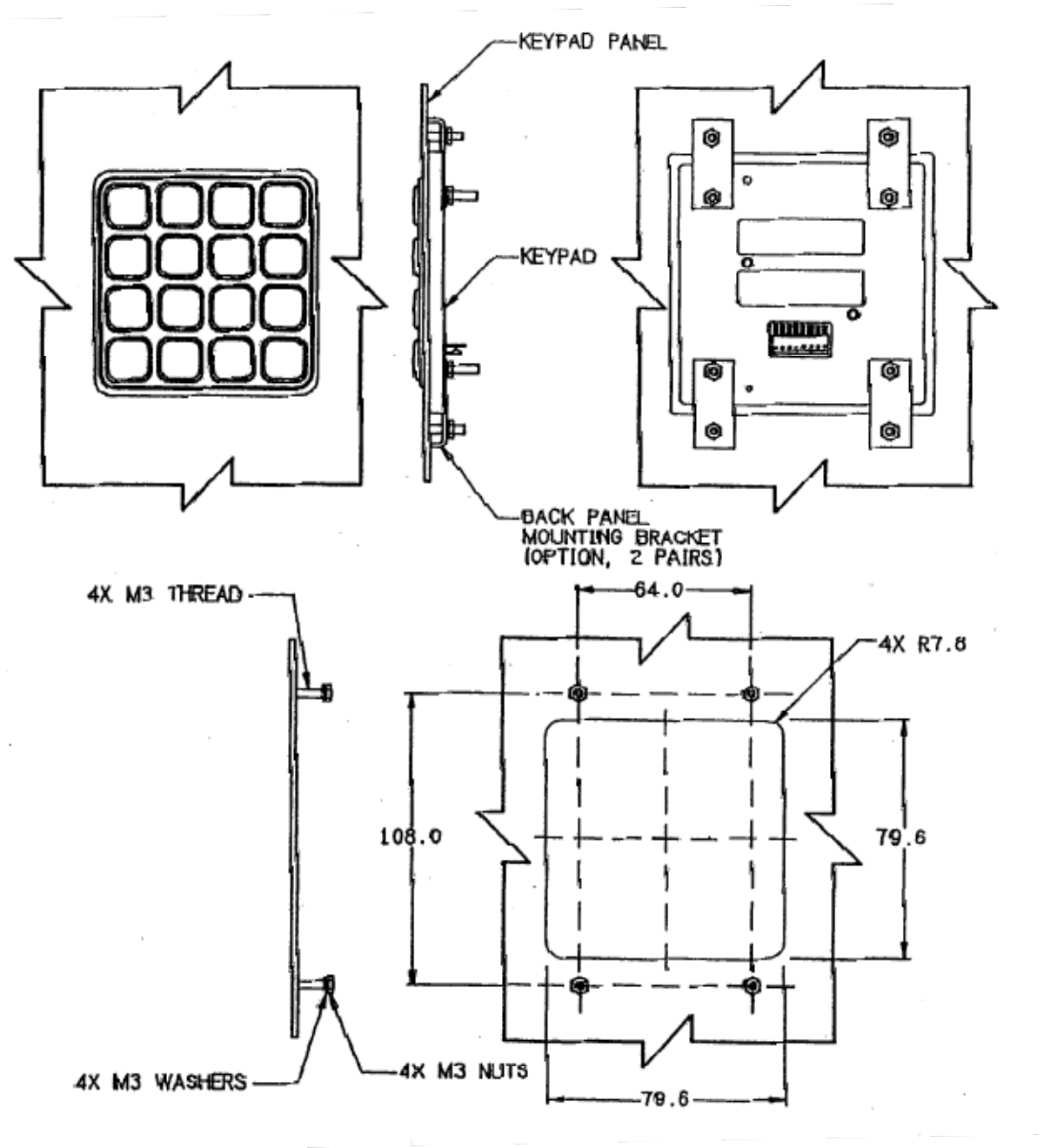


FIG. 36
4X4 UNLIGHTED REAR MOUNT
RECOMMENDED PANEL CUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

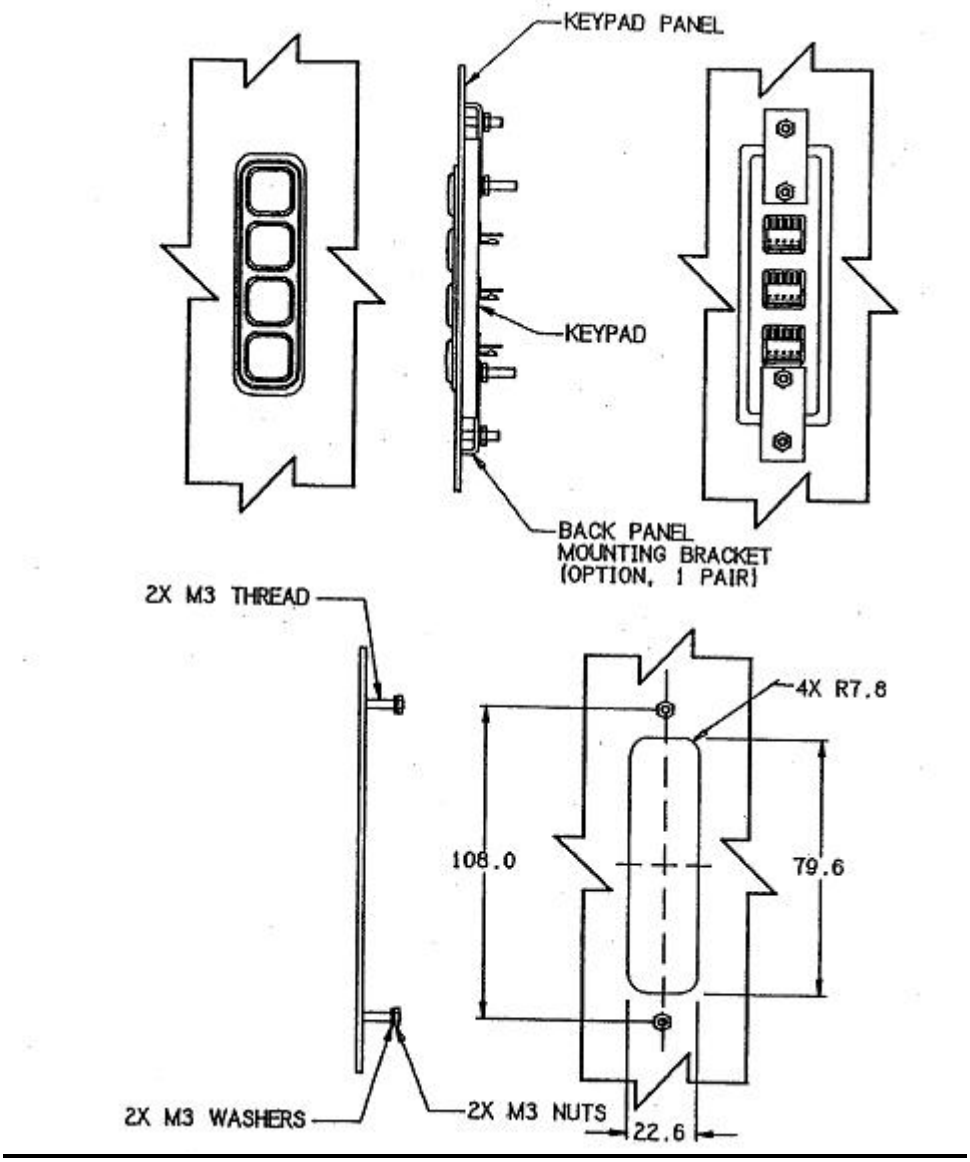


FIG. 37
1X4 LIGHTED REAR MOUNT
RECOMMENDED PANEL CUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

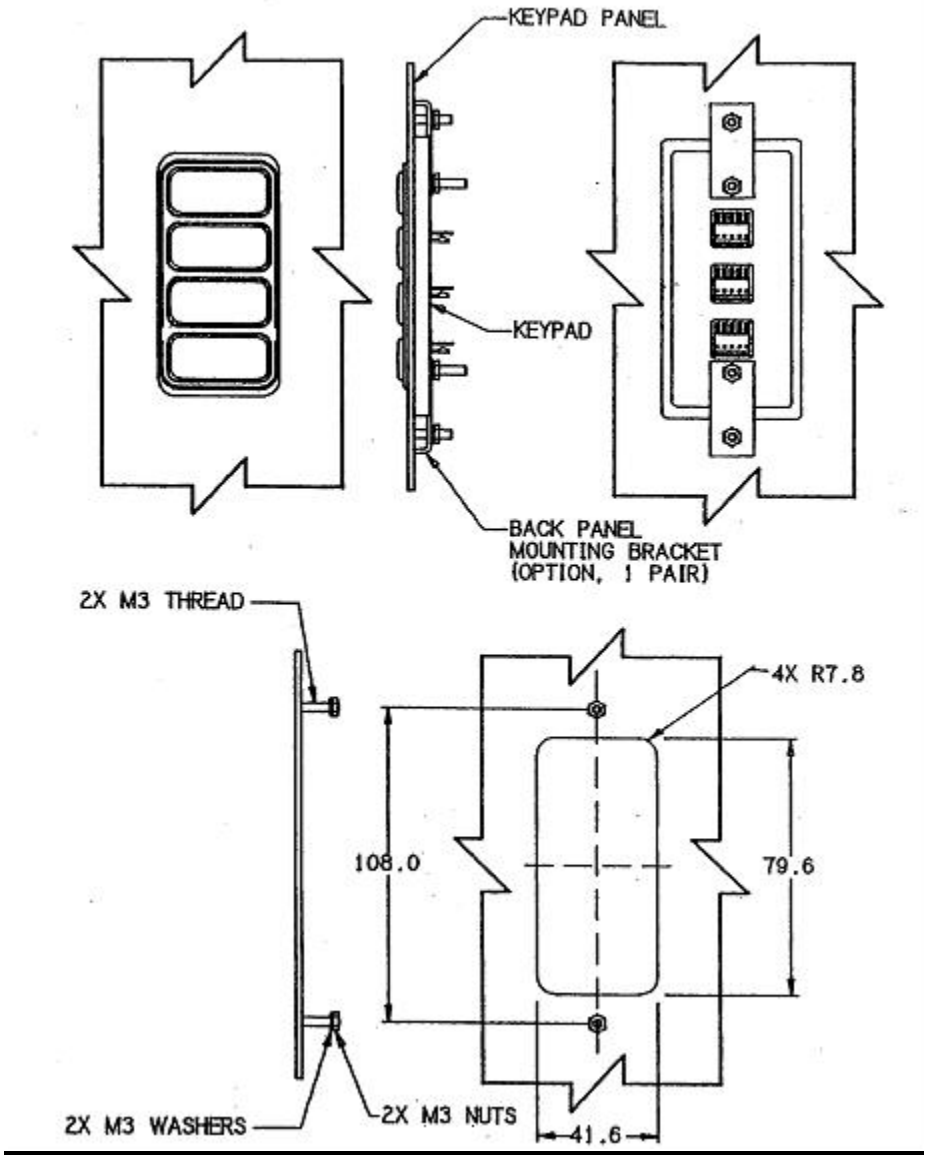


FIG. 38
1X4 DW LIGHTED REAR MOUNT
RECOMMENDED PANEL CUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

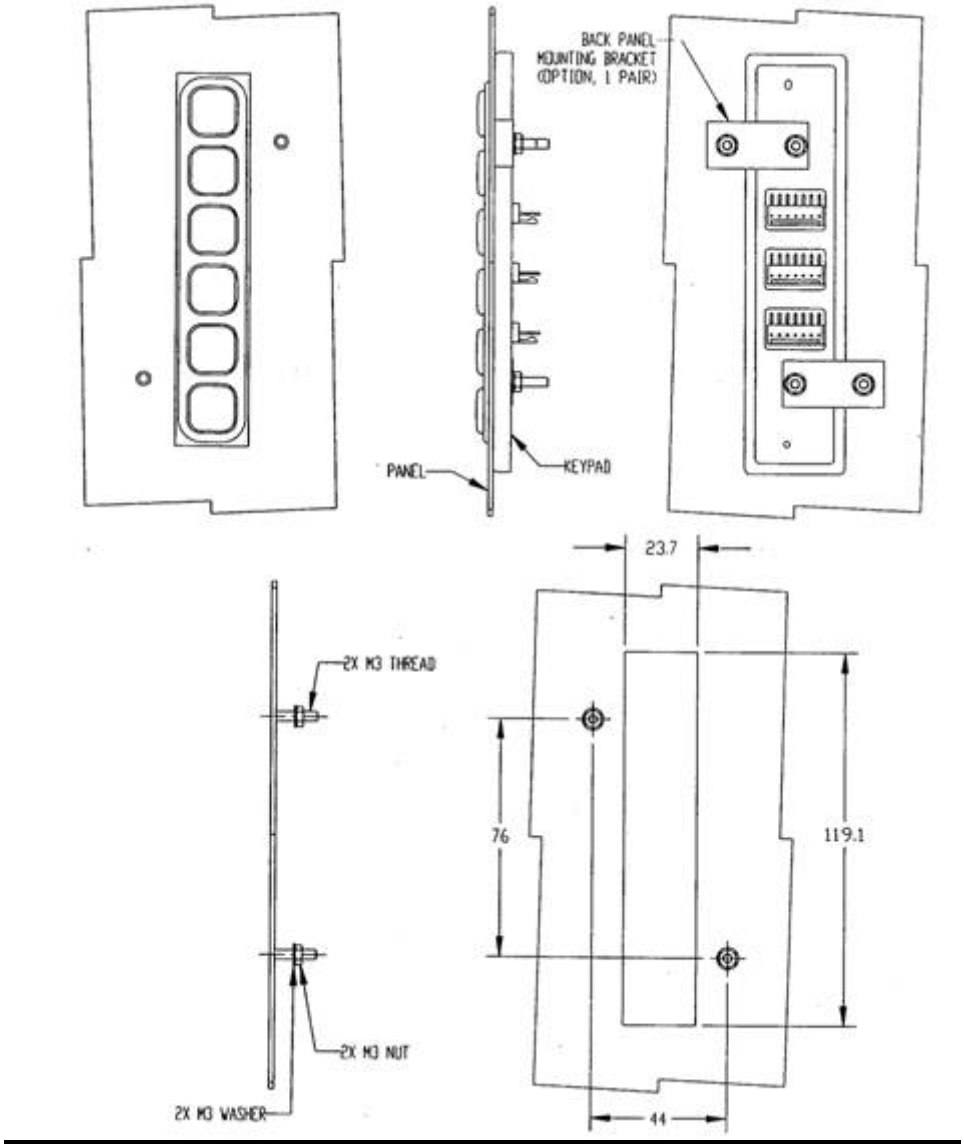


FIG. 39
1X6 LIGHTED REAR MOUNT RECOMMENDED PANEL CUTOUT AND HARDWARE

DIMENSIONS ARE IN MILLIMETERS.

3.1.2 Mounting Torque

The recommended torque to be applied to the nuts during installation is 0.34±0.02 Nm (3.00±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.

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
4X4	Unlighted	Refer to Figure 8 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 and Table E
4X4	Lighted	Refer to Figure 13 and Table F
Qwerty, 61 - key	Unlighted or Lighted	Refer to Figure 14 and Tables G and H

The 1X1, 1X2, 1X3, 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.

Table E

3X4 Pushbutton Location and Switch Contact Chart

Button 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 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 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.

Table H

Qwerty Key Locations and Connector Pin Chart

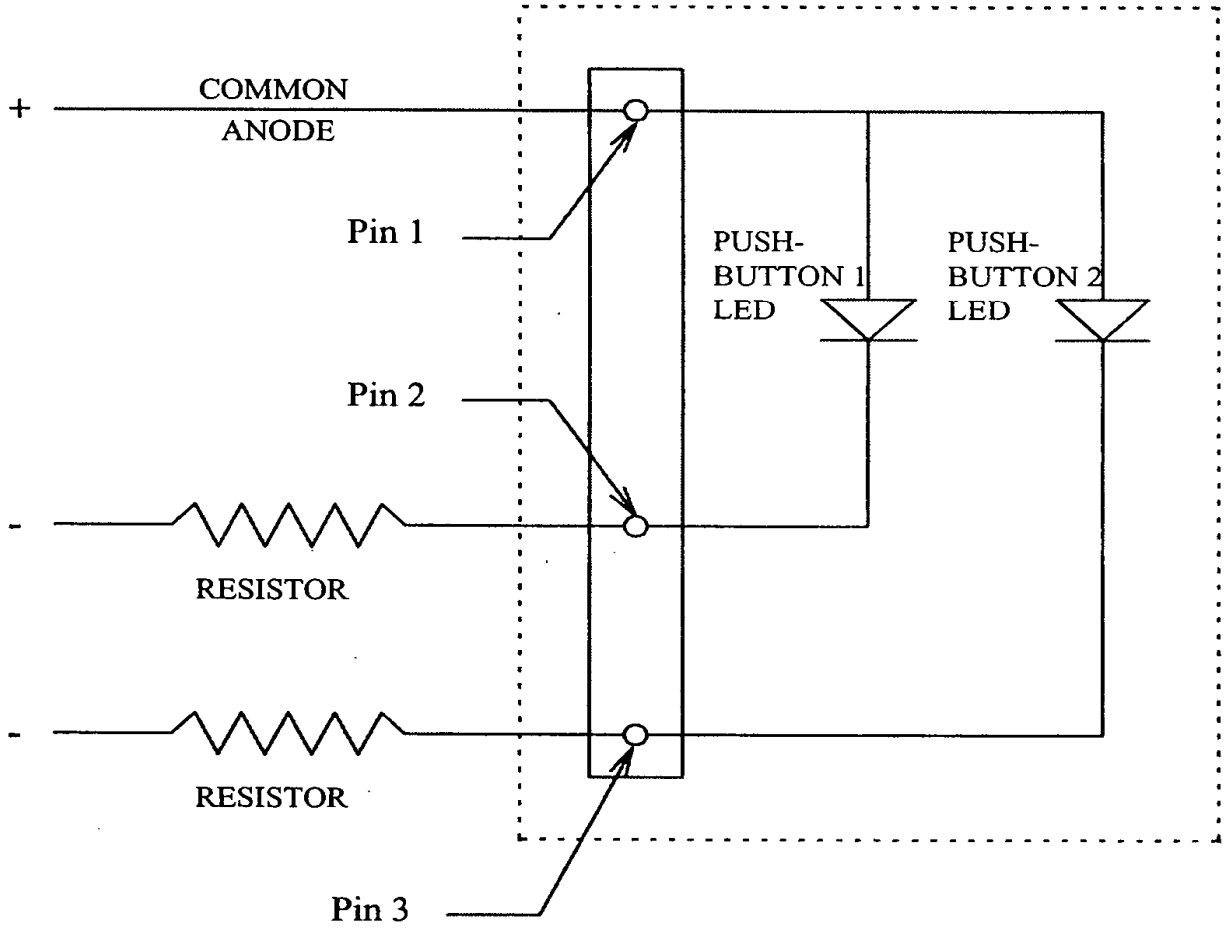
Key Location	Key without Shift	Key with Shift	Key with Fn	Connector J1 Pin Number																			
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A1	Esc			X					X														
A2	1	!	F1	X						X													
A3	2	@	F2	X							X												
A4	3	#	F3	X								X											
A5	4	$	F4	X									X										
A6	5	%	F5	X										X									
A7	6	^	F6	X											X								
A8	7	&	F7	X												X							
A9	8	*	F8	X													X						
A10	9	(	F9	X														X					
A11	0	)	F10	X															X				
A12	-	_		X																X			
A13	=	+	Scroll Lock	X																	X		
A14	\	|	Print Scrn	X																		X	
A15	⇦		Break	X																			X
B1	Tab				X				X														
B2	q	Q			X					X													
B3	w	W			X						X												
B4	e	E			X							X											
B5	r	R			X								X										
B6	t	T			X									X									
B7	y	Y			X										X								
B8	u	U	Home		X											X							
B9	i	I	⇧		X												X						
B10	o	O	Page Up		X													X					
B11	p	P			X														X				
B12	[	{			X															X			
B13	]	}			X																X		
B14	`	~			X																	X	

CONTINUED NEXT SHEET . . .

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	20
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 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.

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) 10mA maximum, 3 to 18 VDC.

3.3.2 Keypad Contact Resistance

Contact Resistance 200 Ohms maximum.

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 is the rear panel mounting brackets that are required to rear-mount the keypad.

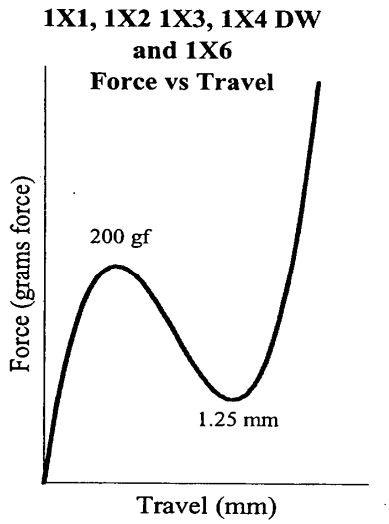
Table K
Keypad and Keycap Weight

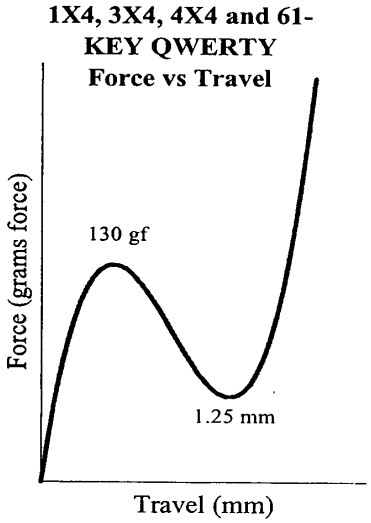
Keypad with Keycaps	Weight	
	Ounces	Grams
Unlighted 1X1	0.6	16
Unlighted 1X2	0.9	25
Unlighted 1X3	1.1	30
Unlighted 1X4	1.5	44
Unlighted 1X4 DW	2.6	73
Unlighted 1X6	TBD	TBD
Unlighted 3X4	TBD	TBD
Unlighted 4X4	5.1	145
Unlighted Qwerty, 61-key	19.3	547
Lighted 1X1	0.6	16
Lighted 1X2	0.9	25
Lighted 1X3	1.1	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 (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.

3.4.3 Force Travel Curve





Nominal Pushbutton Travel	1.25 mm (.050 in).
1X1, 1X2, 1X3, 1X4 DW and 1X6 Nominal Actuation Force	200 grams force (7.05 ounces force).
1X4, 3X4, 4X4 and 61-key Qwerty Actuation Force	130 grams force (4.59 ounces force).

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 following 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 85	-13 to 149
Storage	-30 to 75	-22 to 167

3.5.2 Thermal Shock

Thermal Shock	-30 ˚C (-22˚F) for ½ hour, +75˚C (167˚F) for ½ 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-since 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.

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.

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 Requirements

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.

3.7 Other Requirements

3.7.1 Marking

Keypad and keycap package shall be legibly marked as follows:

a) StacoSystems name and (optional) logo.
b) StacoSystems 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

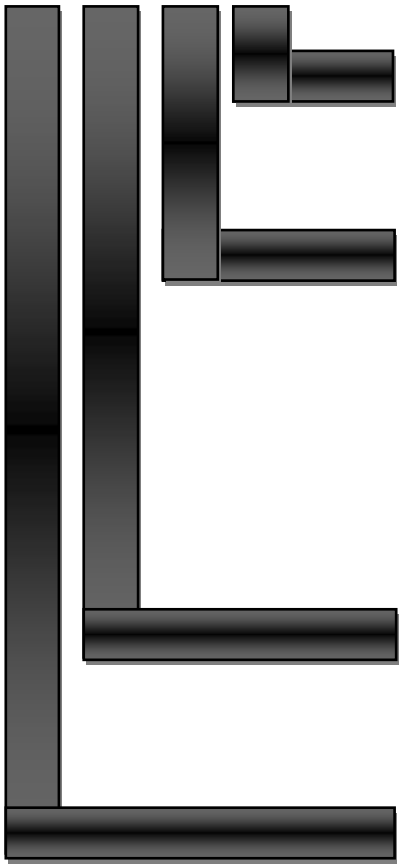
Specifications defined herein are accurate at the time of release and publication of this document. StacoSystems reserves the right to make changes without prior notice.

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 orders 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

M2 X XX XX



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

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

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.

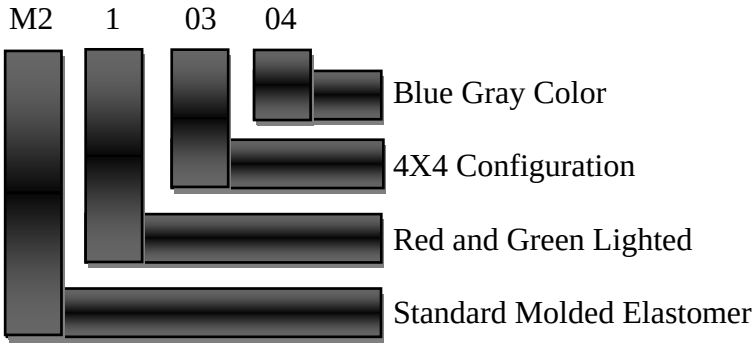
Table 3 shows the required keycap shape for each keypad configuration. Keycap shape information is required when ordering keycap.

Table 3

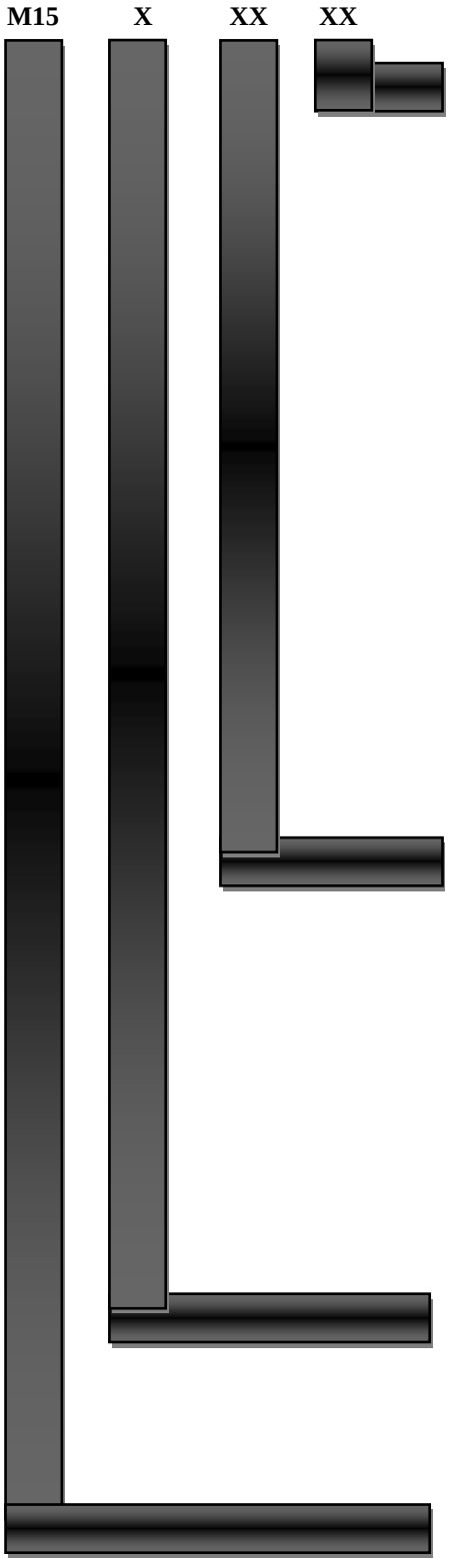
Keypad Configuration and Required Keycap Shape

Keypad Configuration	Keycap Shape
1X1 1X2 or 2X1 1X3 or 3X1 1X4 or 4X1 1X6 or 6X1 3X4 And 4X4	Square (M15 1 XX XX)
1X4 DW OR 4X1 DW	Rectangular (M15 2 XX XX)
Qwerty	Square, Combination and Space Bar (M15 1 XX XX, M15 3 XX XX, and M15 5 XX XX), 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).



4.2 M15 Keycaps



Legend Set

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

Color
(Background/Cap & Legend)

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)

Keycap Shape

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

Basic Keycap Part Number, M15

(L) = Configuration suitable for lighted operation.

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 (Legend Set Code)	Keycap Shape	Keycap Shape Code	Quantity In Set
Blank (00)	Square, Rectangular, Combination, and Space Bar	1, 2, 3, and 5	16, 8, *See note 1* 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	*See note 1*
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 Rectangular	1 and 2	16 and 8
F12 Qwerty Number Set (18)	Square	1	16
Pause Qwerty Navigation Set (19)	Square	1	16
F12 61 – Key Set (97) *see note 4*	Square and Combo	1 and 3	61
Fn 61 – Key Set (98) *see note 3*	Square and Combo	1 and 3	61
Standard 61 – Key Set (99) *see note 2*	Square and Combo	1and 3	61

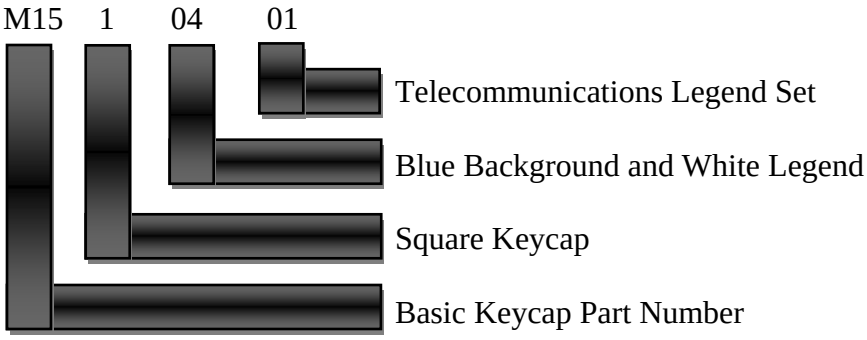
Note 1: Combinations sets have 8 rectangular, and 4 square keycaps.
Note 2: Standard 61-key sets have a blank key for the “Fn” position. All other keys are the normal PC-AT style. Legend set 99 is composed of legend sets number 09, 10, 12, 13, and 16.
Note 3: Fn 61-key sets have the “Fn” key and contain 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.

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.



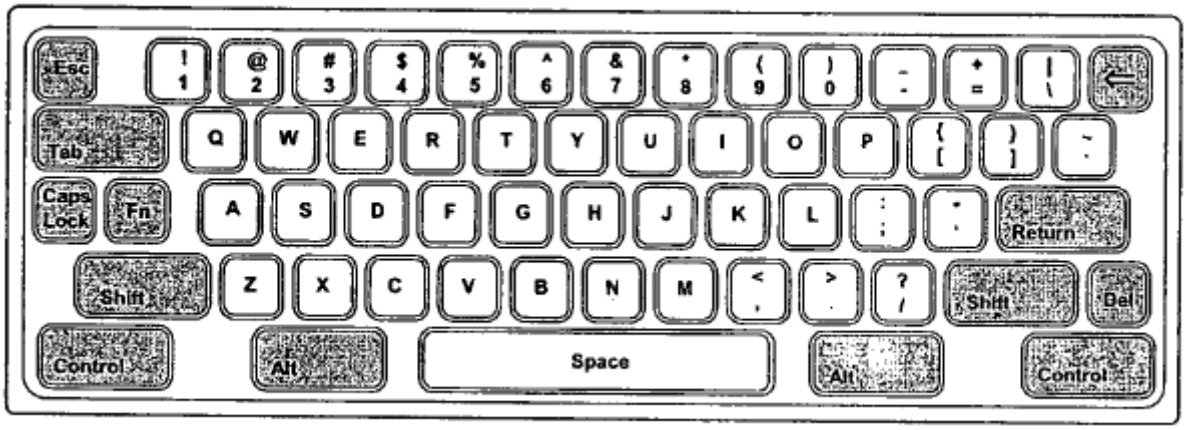
For QWERTY keyboards, a full set of keycaps may be ordered. This is indicated with a 4 in the Key Shape code, i.e., M154XXXX. If it is desired that all of the 61 keys be the same color, the normal two-digit code may be used, such as M15408XX for black background with white (translucent) legend. However, 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.

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.

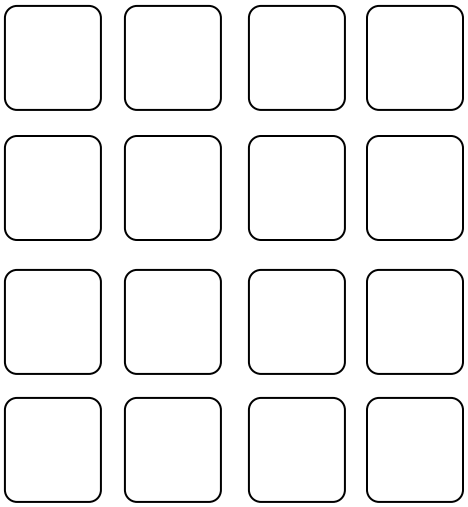


Note 1: The location of the Fn key is shown for references only; it is a blank key in the standard (Non-Fn) key sets

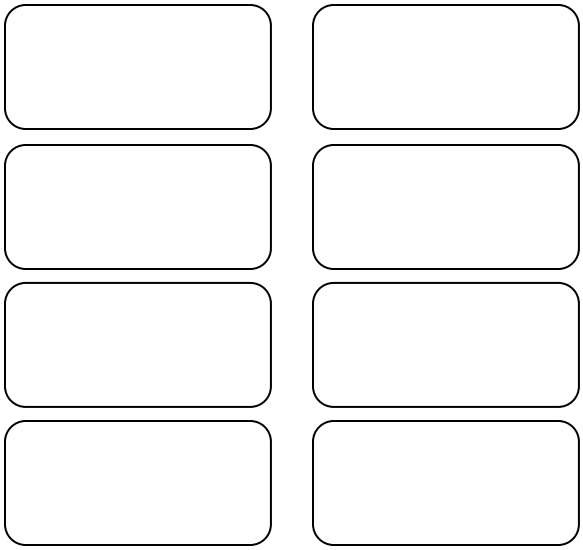
Note 2: Refer to legend sets codes 14 and 15 for the alternate configuration for navigation and numeric keypad legends.

Note 3: For “Color Coordinated Qwerty Sets” refer to legend set code 10 for keycaps in the “Peripheral/Control Field”

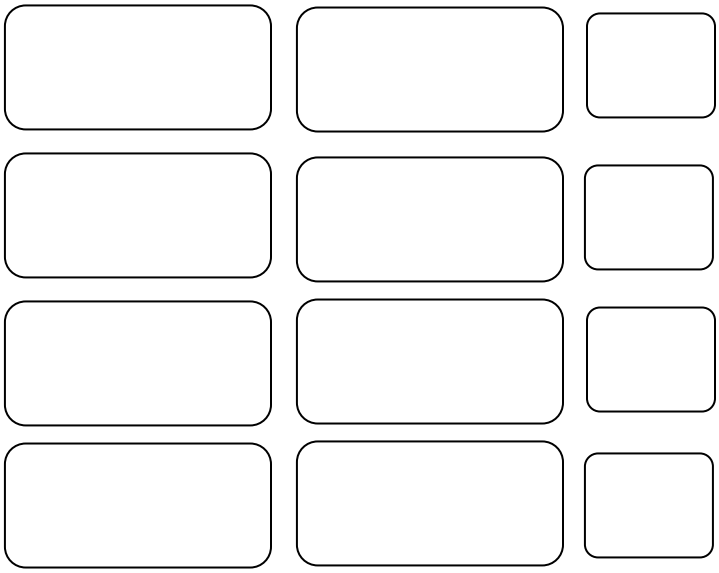
4.2.1 Blank Legend Sets Code 00



Blank Square Keycap Set (M15 1 XX 00)



Blank Rectangular Keycap Set (M15 2 XX 00)



Combination Blank Keycap Set (M15 3 XX 00)

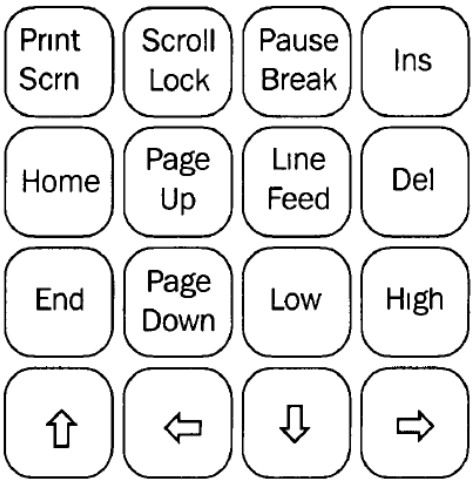
Space Bar Blank Keycap Set (M15 5 XX 00)

4.2.2 Telecommunications Legend Set Code 01

M15 1 XX 01
For legend layout information, see STACO drawing 140002

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

4.2.3 Computer Legend and Arrows Legend Set Code 02



M15 1 XX 02

For legend layout information, see STACO drawing 140002

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

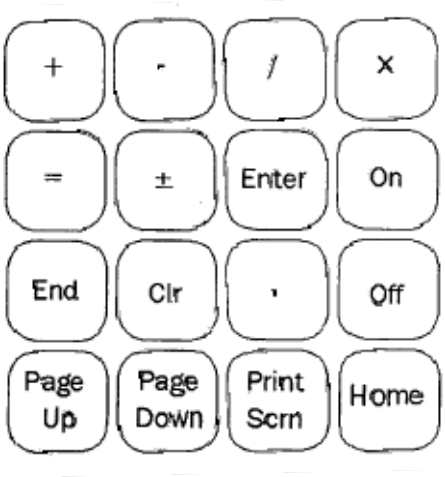
4.2.4 Numerical Pad Legend Set Code 03

M15 1 XX 03

For legend layout information, see STACO drawing 140002

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

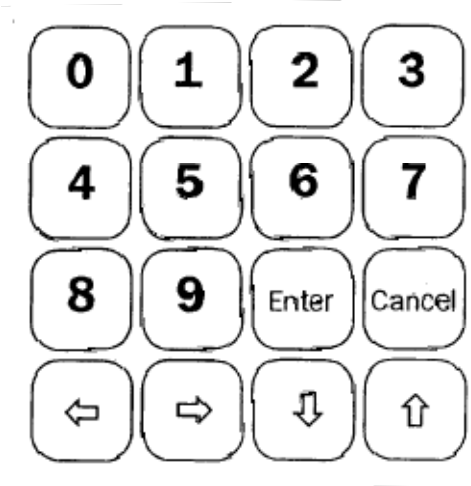
4.2.5 Math Functions Legend Set Code 04



M15 1 XX 04
For legend layout information, see STACO drawing 140002

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

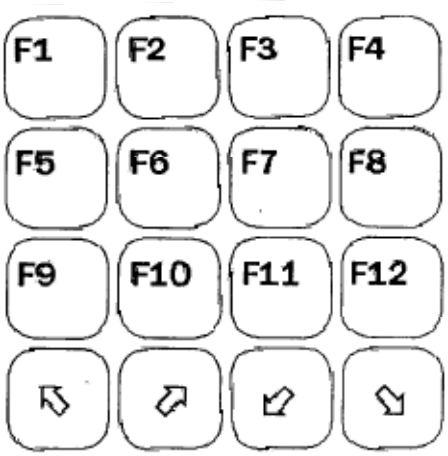
4.2.6 Numerals and Arrows Legend Set Code 05



M15 1 XX 05
For legend layout information, see STACO drawing 140002

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

4.2.7 Function Keys Legend Set Code 06



M15 1 XX 06
For legend layout information, see STACO drawing 140002

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
For legend layout information, see STACO drawing 140002

The legend font of “Alpha A – P Legend Set” is Franklin Gothic Demi (Frankfurt Gothic Demi).

4.2.9 Alpha Q-Z and Bracket Legend Set Code 08

M15 1 XX 08
For legend layout information, see STACO drawing 140002

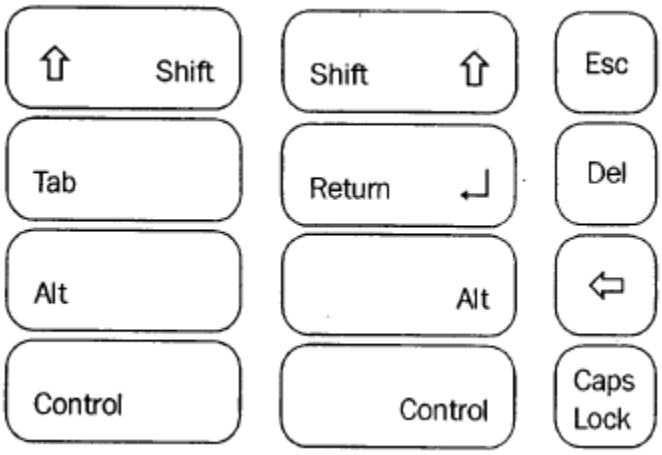
The legend font of “Alpha Q-Z Legend Set” is Franklin Gothic Demi, and Franklin Gothic Book.

4.2.10 Qwerty 0-9 and Brackets Legend Set Code 09

M15 1 XX 07
For legend layout information, see STACO drawing 140002

The legend font of “Qwerty 0-9 and Brackets Legend Set” is Franklin Gothic Demi.

4.2.11 Qwerty Peripheral Control Keys Legend Set Code 10

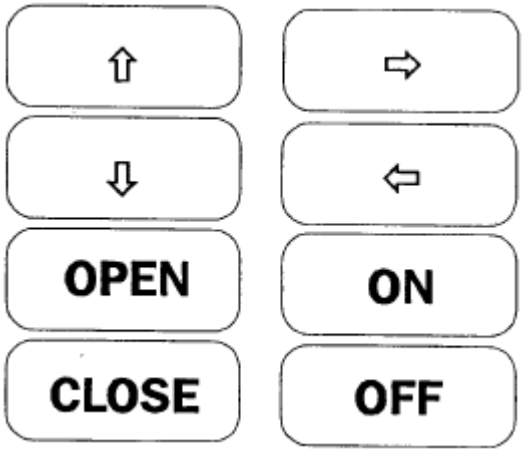


M15 3 XX 10

For legend layout information, see STACO drawing 140002

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

For legend layout information, see STACO drawing 140002

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

4.2.13 Qwerty Set 1, Q – H Legend Set Code 12

M15 1 XX 12
For legend layout information, see STACO drawing 140002

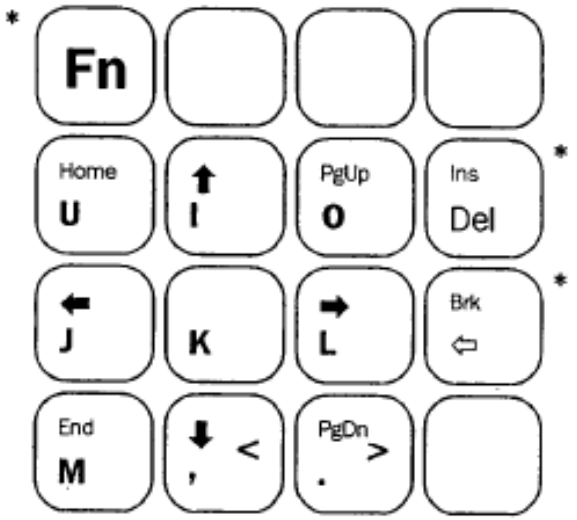
The legend font of "Qwerty Set 1, Q – H Legend Set" is Franklin Gothic Demi (Frankfurt Gothic Demi)

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

M15 1 XX 13
For legend layout information, see STACO drawing 140002

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

4.2.15 Fn Qwerty Navigation Legend Set Code 14



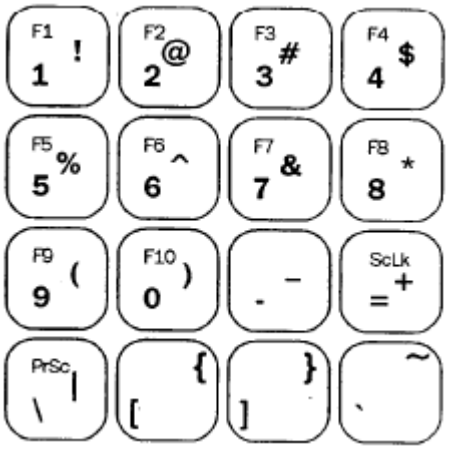
* For color coordinated Qwerty Keyboards, these three keys are the contrasting color of the remainder of this set.
(Refer to Table 6 and Qwerty Keyboard layout.)

M15 1 XX 14

For legend layout information, see STACO drawing 140002

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

For legend layout information, see STACO drawing 140002

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

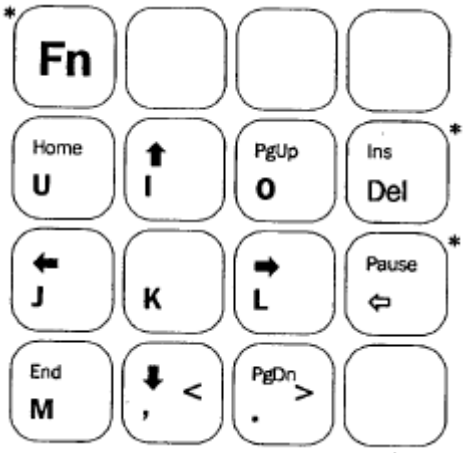
4.2.17 F12 Qwerty Number Legend Set Code 18

M15 1 XX 18

For legend layout information, see STACO drawing 140002

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

For legend layout information, see STACO drawing 140002

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

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 M1510404). 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 configuration 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.

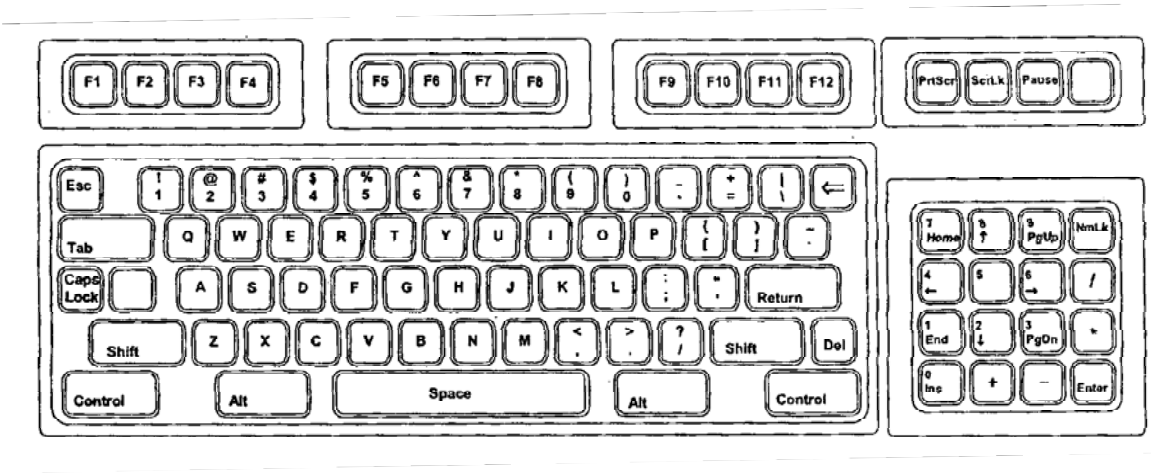
15230-001 Standard PC AT/386/486-compatible output for each of 60 keys. (One key is blank and not programmed; it is the Fn key of the -002 configuration.)

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**".

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.

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 2m (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 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 is required for each keypad configuration.

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

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.