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CAGE CODE: **12522**

Part of the M7 Family of MET Data Entry Products

Series M716

PC-COMPATIBLE KEYBOARDS

Panel Mount

104-Key with Encoder,
Built-in Cursor Control,
LED Lighting and NEMA 4 Sealing

SERIES M716 CODED

Revision Log

Rev.	E. R. No.	Revised By	Checked By	Approved By	Rel. Date
NC	02-35751	A. KERTATAMA		P. H.	11/27/00
A	02-37749	A. KERTATAMA		[illegible]	11-9-01

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PRODUCT LINE SPECIFICATION

SERIES M716

PC-COMPATIBLE KEYBOARDS

Panel Mount

1.0 SCOPE

This Specification Control Document (SCD) describes the detailed characteristics of one of the M7 Family of data entry devices utilizing Molded Elastomer Technology (MET). The products emanating from this SCD are designated as product series M716.

Specifically, the M716 includes a Qwerty panel mount keypad and built-in pressure sensitive cursor control. LED lighting of the panel mount keyboard is also available as an option. The keyboard has 104 physical keys to be equivalent to a 104-key PC-compatible keyboard. Incorporated into the keyboard is an encoder to translate key strokes into standard PS/2 codes through the commonly used PS/2 connector. The cursor control has two control buttons and interfaces through the PS/2 connector. The keyboard and cursor control are PS/2 compatible. The keyboard is also PC/AT compatible with the optional PC/AT keyboard adapter. The surface mounted panel mount keyboard meets NEMA 4 requirements.

Accessory items for the panel mount keyboard are rear panel mounting bracket, mating connector kit, crimping tool, extraction tool, power supplies for the lighted keyboards, cables for the 104 key keyboards, and PC/AT keyboard adapter.

2.0 SERIES M716 PC-COMPATIBLE PANEL MOUNT KEYBOARDS

2.1 Product Features/Options

The PC-compatible panel mount keyboard is designed to be rugged and durable, yet provide modern styling. It is available in a choice of three colors with coordinated contrasting or matching colors for the laser-etched keycaps. Backlighting with green LEDs is available as an option.

2.2 Panel Mount Keyboard

The panel mount keyboard has 104 physical keys as shown in Figure 2.1. The keyboard has a built-in encoder that allows the keyboard to be connected directly to an IBM PC PS/2 connector. The keyboard has plastic keycaps with laser engraved legends. The keyboard is a plug and play device.

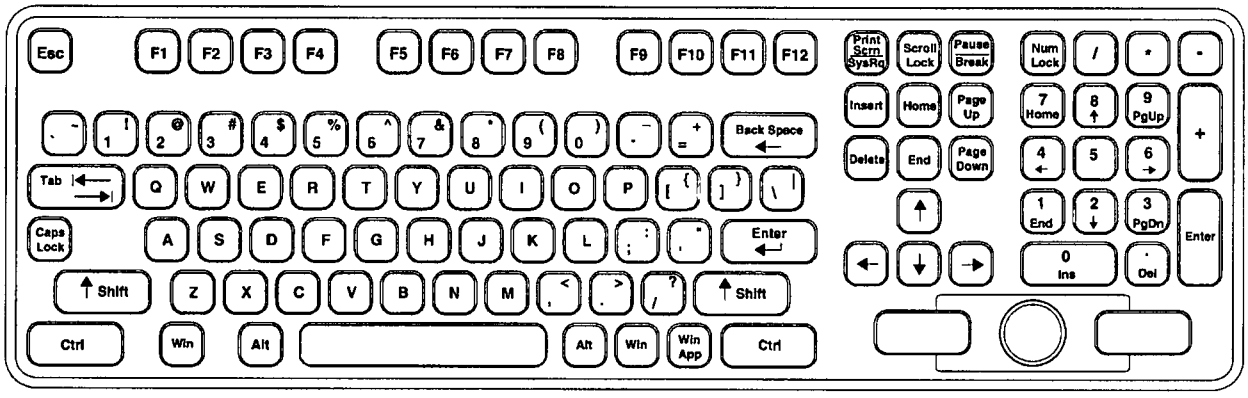


Figure 2.1
Panel Mount Keyboard

2.3 Color

The alpha-numeric keycaps in the center of the keyboard and the control (peripheral) keys on the left and right edges of the keyboard are of the contrasting colors. Three contrasting color combinations are available. The space bar color matches the alpha-numeric keys color and the key legend color is white. The cursor control button keys color matches the control keys color. Three keyboard colors are available.

2.4 Cursor Control

The cursor control is a pressure sensitive cursor steering button with left and right cursor control buttons as shown in Figure 2.1. It is similar in function to a two button mouse. Each button has a plastic keycap without legends.

2.5 Lighting

2.5.1 Backlighting Option

When the option is specified, the lighted keyboard is equipped with green LEDs under each key for background lighting.

2.5.2 Status Indicators

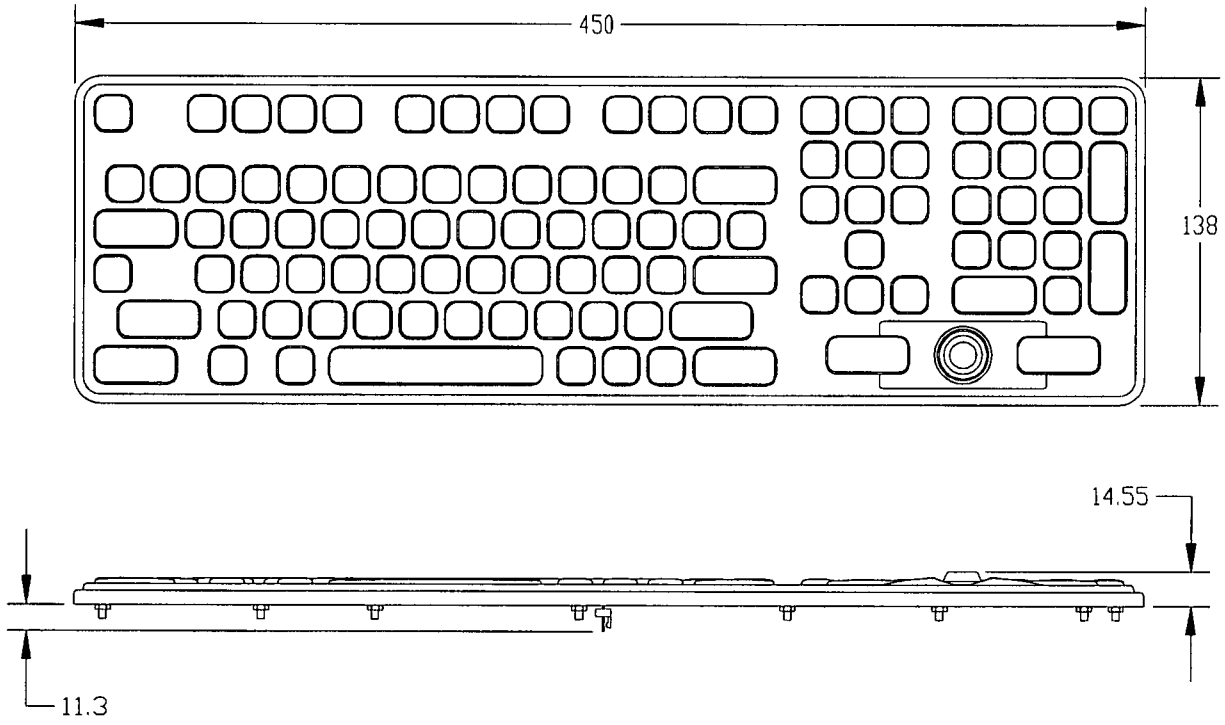
All keyboards are equipped with Caps Lock, Num Lock and Scroll Lock red indicators.

3.0 REQUIREMENTS

This specification defines the detailed requirements for the M716 panel mount keyboard. The test sample shall be mounted in such a manner as to simulate in-service use for all tests specified in this document, unless the specific test method precludes such mounting.

3.1 Dimensions

The panel mount keyboard outline dimensions are shown in Figure 3.1.



DIMENSIONS ARE IN MILLIMETERS.

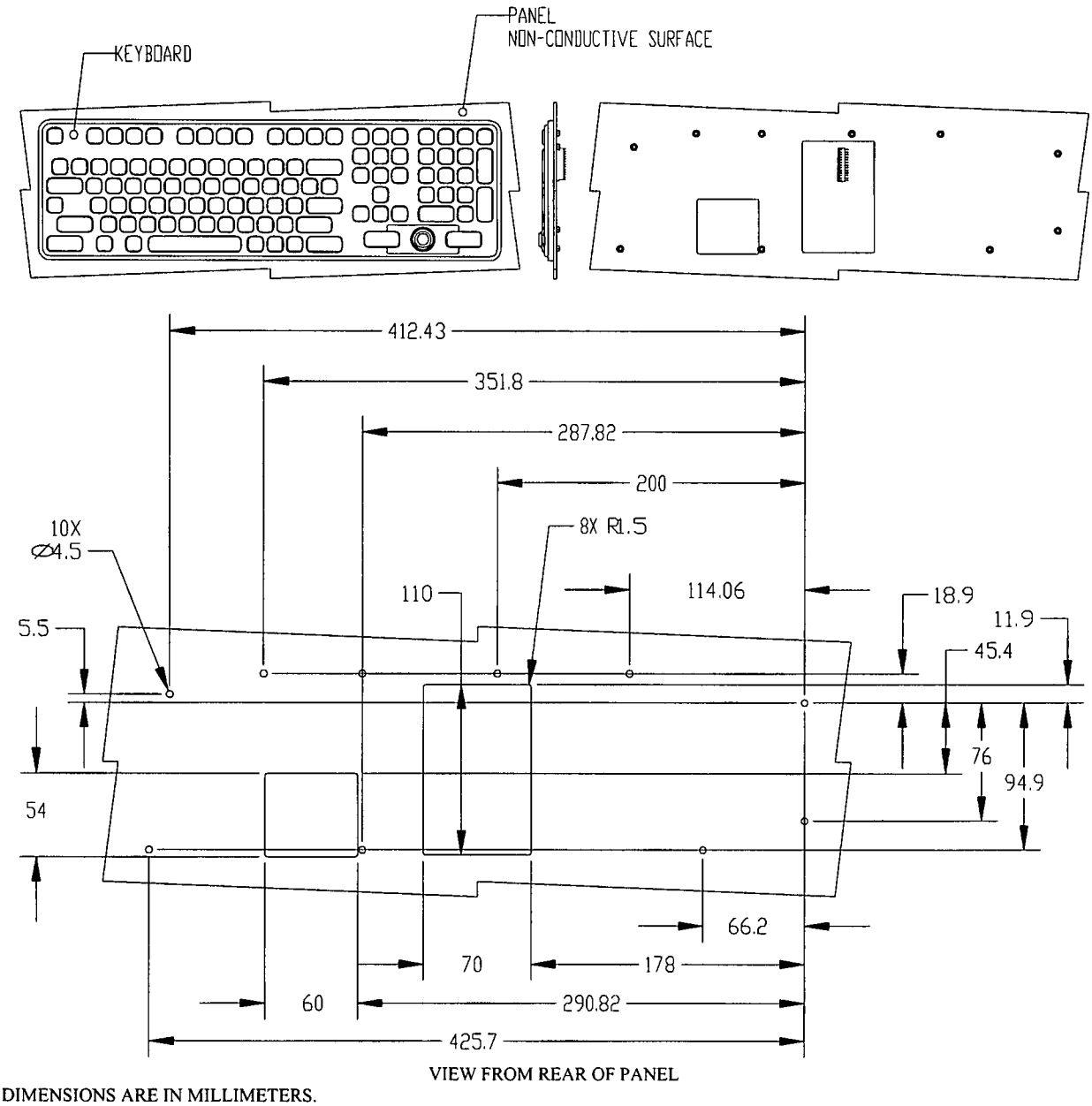
Figure 3.1
Panel Mount Keyboard Outline Dimensions

3.1.1 Panel Cutouts and Mounting

The panel mount keyboard is designed for either surface mount application or rear mount application.

3.1.1.1 Surface Mount Application

Figure 3.2 shows panel cutout recommendation for surface mounting a panel mount keyboard.



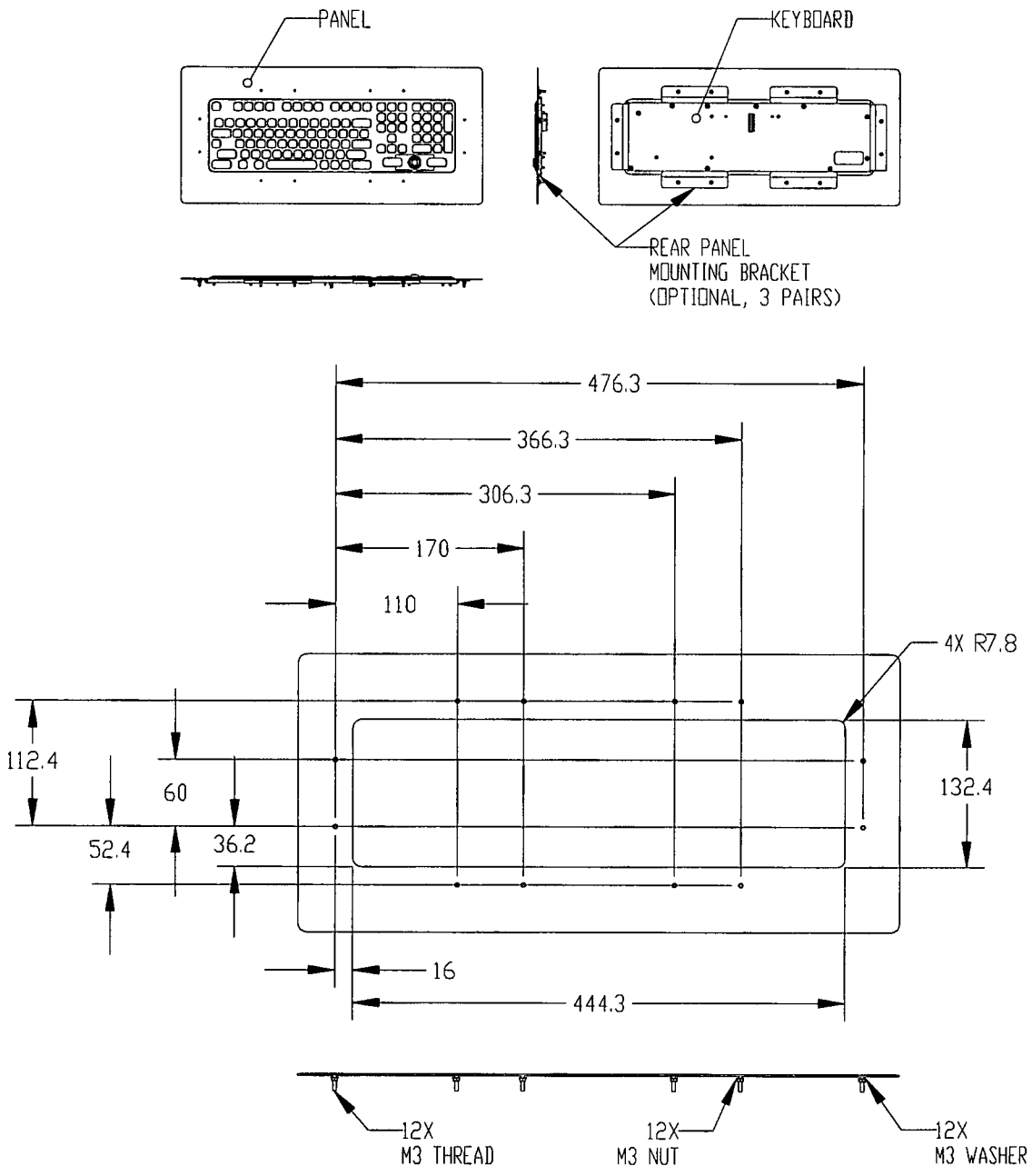
DIMENSIONS ARE IN MILLIMETERS.

Figure 3.2

Panel Cutout Recommendation for Surface Mounting a Panel Mount Keyboard

3.1.1.2 Rear Mount Application

Figure 3.3 shows the panel cutout and hardware recommendation for rear mounting a panel mount keyboard.



DIMENSIONS ARE IN MILLIMETERS

Figure 3.3
Panel Cutout and Hardware Recommendation for Rear Mounting a Panel Mount Keyboard

3.1.2 Mounting Torque

The recommended torque to be applied to the nuts during installation is 0.60 ± 0.02 Nm (5.31 ± 0.18 lbf in).

3.2 Pressure Relief

The NEMA 4 enclosure that is furnished by the user should have a pressure relief feature. The pressure relief feature is required to equalize the air pressure inside the enclosure to the surrounding atmosphere.

3.3 Interface Connection

The connection to the panel mount keyboard is through a standard .100 inches (2.54 mm) pitch centerline connector. The keyboard has a .025 inches (0.64 mm) square pin friction lock header for keyboard, cursor control and lighting connections. The connector is shown on Figure 3.4. The .100 inches (2.54 mm) center header pins are gold plated.

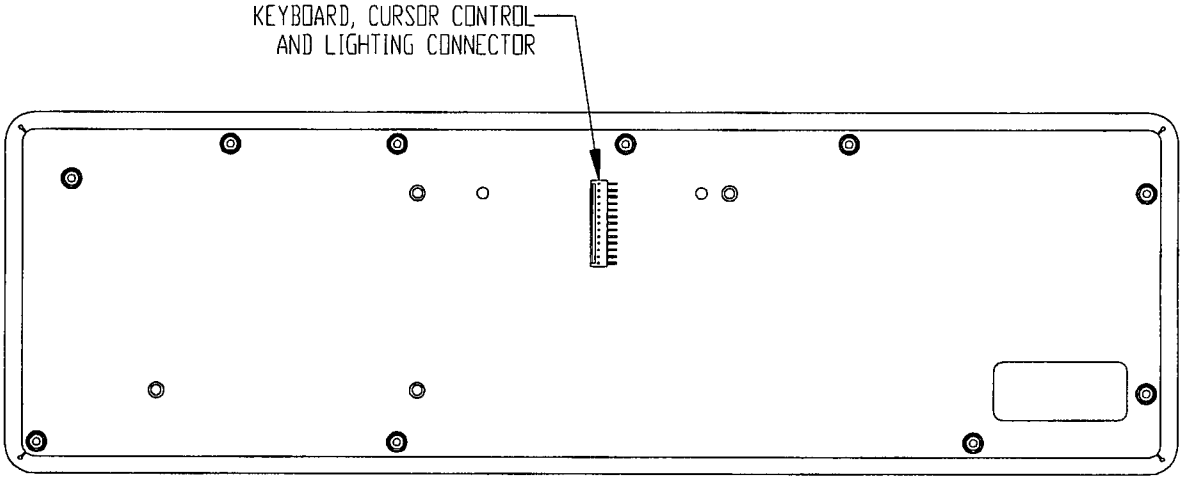


Figure 3.4
Connector

The mating connector of the keyboard 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 keyboard can work with 24 AWG cable up to 75 ft (22.86 m) long. A mating connector kit and other accessories are available in Section 4.2. Users must provide their own strain relief for severe vibration requirements.

3.3.1 Keyboard Connection

Figure 3.5 shows the pin numbers of a keyboard connector, and Table 3.1 shows the pin assignment of the keyboard connector. Keyboard cables with PS/2 connectors, and a PC/AT keyboard adapter are available, as described in section 4.2, to conveniently connect a panel mount keyboard to an IBM PC computer.

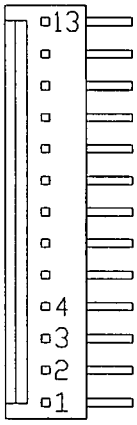


Figure 3.5
Keyboard Connector Pin Number

Table 3.1
Keyboard Connector Pin Number/Assignment and Description

Pin Number	Description
1	+5 VDC
2	GND
3	Keyboard Data
4	Keyboard Clock
13	PCB Shield (optional)

The pin numbers/assignments of unlighted and lighted panel mount keyboards are the same.

3.3.2 Cursor Control Connection

Figure 3.6 shows the pin numbers of a cursor control connector, and Table 3.2 shows the pin assignment of the keyboard connector. Keyboard cables are available, as described in section 4.2, to conveniently connect a panel mount cursor control to an IBM PC computer PS/2 port.

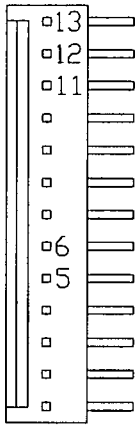


Figure 3.6
Cursor Control Connector Pin Number

Table 3.2
Cursor Control Connector Pin Number/Assignment and Description

Pin Number	Description
5	Cursor Control Data
6	Cursor Control Clock
11	GND
12	+5 VDC
13	PCB Shield (optional)

The pin numbers/assignments of unlighted and lighted panel mount keyboards are the same.

3.3.3 LED Electrical Connection and Power Requirements

The connection to the panel mount keyboard LEDs is shown on Figure 3.7. The keyboard has 132 LEDs connected in parallel through a 4-pin connector. Pins 7 and 10, which are tied

together, supply the anodes of the LEDs. The cathodes are connected to pins 8 and 9 as shown in Table 3.3. The user is to supply the current limiting circuit.

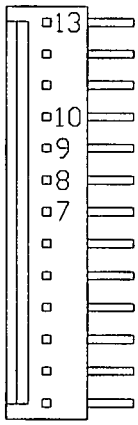


Figure 3.7
Lighting Connector

Table 3.3
Lighting Pin Number/Assignment and Description

Pin Number	Description
7	Anode
8	Cathode
9	Cathode
10	Anode
13	PCB Shield (optional)

Power required to light the keyboard is 2.64 A at 2.1 VDC for a total power usage of 5.54 W at full brightness. Two AC power converters are available to conveniently and efficiently meet the lighting power requirements of 2.64 Amps at 2.1 VDC. See section 4.2 for keyboard panel mount lighting power supplies and cabling.

The keyboard may be lighted using various voltage sources as long as a current limiting circuit is provided. The recommended current limiting circuit includes user-supplied resistor as shown on Figure 3.8. The V_S is the voltage source, and pin 7 through pin 10 are the keyboard lighting connector.

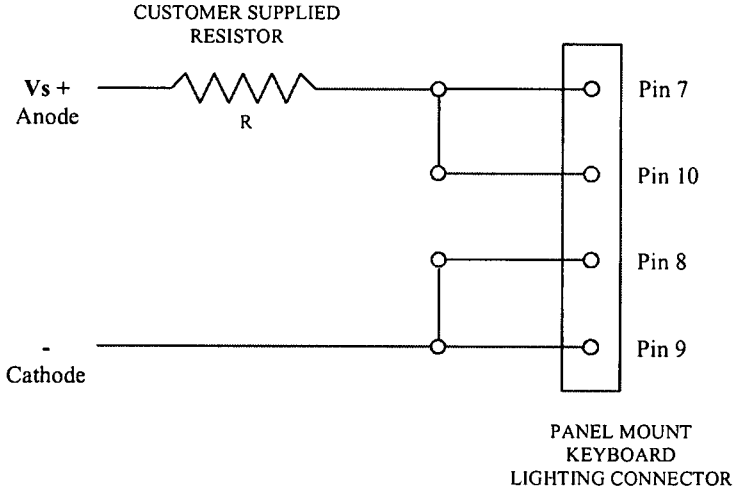


Figure 3.8
Keyboard User Supplied Resistor for Lighting

The recommended resistor value (R) and minimum resistor power rating (P_R) for a given power supply voltage source (V_S) are shown in Table 3.4. Also shown are the minimum power supply power ratings (P_S).

Table 3.4
Recommended Resistor for Keyboard LEDs

DC Power Supply		Resistor		Keyboard	LED
V_S (V)	P_S min (W)	R (Ω)	P_R min (W)	i (A)	V_L (V)
2	5.3	0.000	0.0	2.64	2.0
5	13.3	1.136	8.0	2.64	2.0
12	31.7	3.788	26.5	2.64	2.0
14	37.0	4.545	31.7	2.64	2.0
28	74.0	9.848	68.7	2.64	2.0

If the voltage source is not listed in Table 3.4, the minimum power supply power rating, resistor value, and the minimum resistor power rating are determined by evaluating the equations that follow. The following equations are derived for a panel mount keyboard LEDs that requires 2.64 A typical current (i), and 2.0 V LED forward voltage (V_L). The maximum green LED voltage is 2.6 V.

$$R = \frac{V_S - V_L}{i}$$

$$P_R = I^2R$$

$$P_S = IV_S$$

3.4 Electrical Performance Requirements

Electrical Life 1,000,000 Actuations minimum.

3.5 Mechanical Performance

3.5.1 Weight

The typical weight of a panel mount keyboard and the rear panel mounting bracket is given in Table 3.5.

Table 3.5
M716 Keyboard Weight

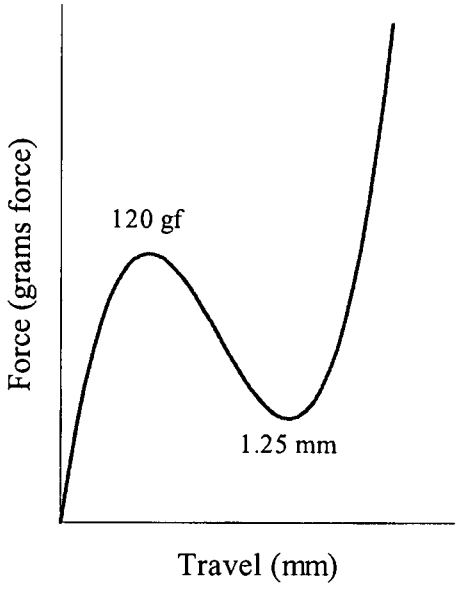
Data Entry	Weight, Not to Exceed	
	Grams	Ounces
Panel Mount Keyboard	660	23.3
Rear Panel Mounting Bracket (3 pairs)	300	10.6

3.5.2 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.

3.5.3 Force Travel Curve

Force vs Travel



Nominal Key Travel	1.25 mm (.050 in).
Nominal Actuation Force	120 grams force (4.23 ounces force).

3.6 Environmental Requirements

3.6.1 Temperature Range

The operating and storage temperature ranges of the panel mount keyboard with built-in cursor control shall be as shown in Table 3.6.

Table 3.6
Keyboard with Cursor Control Temperature Range

Condition	° Celsius	° Fahrenheit
Operating	-20 to 60	-4 to 140
Storage	-20 to 60	-4 to 140

3.6.2 Thermal Shock

Thermal Shock Test: -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).

3.6.3 Vibration

Vibration Test: 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 60 minutes. This cycle shall be performed once in each of three mutually perpendicular directions (total of 3 times), so that the motion shall be applied for a total period of approximately 3 hours.

3.6.4 Shock

Three shocks shall be applied in each direction of the three mutually perpendicular axes of the panel mount keyboard (total of 9 shocks). Each shock pulse shall have 100 G peak value, 11 ms duration, half-sine waveform and 12.3 ft/s velocity change.

3.6.5 Moisture Resistance

Use MIL-STD-202, method 106 as guideline to perform the moisture resistance test by setting the relative humidity between 90 and 98%, temperature cycling between 65 °C (149 °F) and 25 °C (77 °F), for 10 cycles (240 hours) and for 10 days cycling period providing that the keyboard is installed and sealed in a moisture resistance enclosure. The user is to provide installation provisions to prevent the exposure of the rear of the keyboard to moisture.

3.6.6 NEMA 4

Apply a continous coat of appropriate sealing compound (GE Silicon Adhesive, RTV 108, or equivalent) between the matting surfaces of the keyboard and the panel prior to NEMA 4 test. The surface mounted panel mount keyboard 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) of water per minute. The water shall be directed at all joints from all angles and from a distance of 3.05 to 3.65 meters (10 to 12 feet) for a minimum of 5 minutes providing that the keyboard is installed and sealed in a moisture resistance enclosure. NEMA 4 requirements is not applicable to rear mounted keyboards. The user is to provide installation and sealing provisions to prevent the penetration of the water to the rear of the keyboard.

3.6.7 Salt Spray

No functional damage will result from a test wherein the panel mount keyboard is subjected to the spray of a 5% salt and water solution at 35 °C (95 °F) for 96 hours providing that the keyboard is installed and sealed in a salt solution resistance enclosure. The user is to provide installation provisions to prevent the exposures of the rear of the keyboard to salt spray and associated contamination.

3.6.8 Sand and Dust

Apply a continous coat of appropriate sealing compound (GE Silicon Adhesive, RTV 108, or equivalent) between the matting surfaces of the keyboard and the panel prior sand and dust test. The panel mount keyboard shall be exposed to 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. The dust shall be mixed with different air velocity, temperature and relative humidity as described in Table 3.7 providing that the keyboard is installed and sealed in a solid enclosure. Also specified is the duration of each test. The user to provide installation provisions to protect the rear of the keyboard against sand and dust test.

Table 3.7
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

3.6.9 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 above tests.

3.6.10 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.

The characters and symbols shall remain readable after completion of the above tests.

3.6.11 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.

The characters and symbols shall remain readable after completion of the above test.

3.6.12 Finger Print Resistance

Two tests are required to verify 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).

The characters and symbols shall remain readable after completion of the above tests.

3.7 Material Requirement

3.7.1 Corrosion Resistance

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

3.7.2 Fungus

The panel mount keyboard shall be constructed of fungus inert materials.

3.7.3 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.

3.8 Other Requirements

3.8.1 Marking

Data entry product package shall be legibly marked as follows:

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

3.8.2 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.

3.8.3 Quality

The keyboard 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.

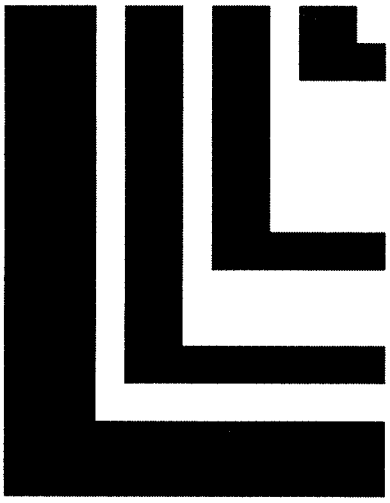
3.8.4 Changes In Specification

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.

4.0 PART NUMBER INFORMATION

This section contains the information necessary to order each of the standard and optional features of the Series M716 panel mount keyboard products described in this specification. Rear panel mounting bracket, mating connector kit, crimping tool, extraction tool, power supplies for the lighted keyboards, cables for the 104 key keyboards, and PC/AT keyboard adapter are covered in Section 4.2.

4.1 M716 Panel Mount Keyboards



M716	X	X	X		Code	
				Color Combination	1	Black A
					2	Gray A
					5	Blue A
					6	Black B
				Lighting	0	Unlighted
					1	Lighted
				Sealing	1	Sealed to NEMA 4
				Type M716		104 Key Keyboard, Panel Mount w/ Encoder and Cursor Control

Table 4.1 gives the definition of the color combination codes.

Table 4.1
Color Combination Codes

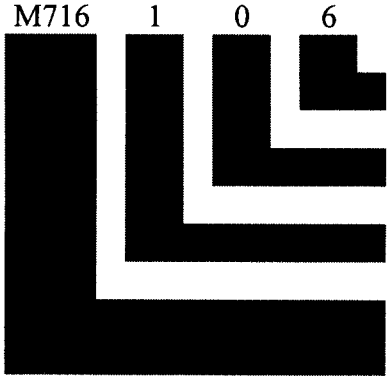
Color Combination Code	Keyboard	Alpha Numeric Key Color	Control Key Color
Black A	Black	Gray	Black
Gray A	Gray	Gray	Black
Blue A	Blue	Blue-Gray	Blue
Black B	Black	Black	Gray

Table 4.2 gives the relationship between color description and Pantone number. Other colors are available by special order.

Table 4.2
Color Description

Data Entry	Color	Pantone Number
Keyboard	Black	Pantone # 433 U
	Gray	Pantone # Cool Gray 9 U
	Blue	Pantone # 286 U
Key Color	Black	Pantone # 433 U
	Blue-Gray	Pantone # 5483 U
	Gray	Pantone # 429 U
	Blue	Pantone # 285 U

Typical panel mount keyboard part number is M716106. It is a 104 key panel mount keyboard with built-in cursor control that is sealed and unlighted. The keyboard alpha numeric keycap color is black, and the control keycap color is gray. The keyboard legend color is white. The keyboard color is black.



M716	1	0	6		Code	
				Color Combination	6	Black B
				Lighting	0	Unlighted
				Sealing	1	Sealed
				Type M716		104 Key Keyboard, Panel Mount w/ Encoder and Cursor Control

4.2 Accessories

4.2.1 Rear Panel Mounting Brackets

Rear panel mounting brackets are required for rear mounting a panel mount keyboard. Three pairs are required to rear mount a panel mount keyboard. The part number is 15264. A bag of 15264 contains three pairs of rear panel mounting brackets.

4.2.2 Mating Connector Kit

A mating connector kit that is compatible with the lighted and unlighted panel mount keyboards is available for customer convenience. The kit contains a connector housing of the proper size needed to interface to the keyboard and the quantity of crimping terminals (+10%). The matting connector kit part number is 15229-009.

4.2.3 Crimping Tool

The crimping tool part number is 15232. The crimping tool is compatible with the terminals supplied in the 15229-009 kit.

4.2.4 Extractor Tool

An extractor tool is available for use in removing crimped terminals from the connector housings used in keyboard mating connector kit. The extractor tool part number is 15233.

4.2.5 Keyboard Lighting Power Supplies

Two optional power supplies are available to light the panel mount keyboard. The power supplies convert 110 VAC to 2.1 VDC with a constant current rating of 2.64 A. Each power supply has a five-pin DIN female connector that mates with the lighting cable (part number 15257) connector. One of the power supplies is a wall mount version, while the other one is table mount version.

4.2.5.1 Wall Mount Power Supply

The part number of the wall mount power supply is 15256. 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 cable (part number 15257) connector. The power supply dimension is TBD x TBD x TBD mm (L x W x H) or approximately TBD x TBD x TBD inches. The wall mount power supply weighs approximately 450 gm (15.9 oz). The above AC adapter converts 120 VAC, 47 to 62 Hz, TBD A to 2.1 VDC, 2.64 A, constant current.

4.2.5.2 Desktop Power Supply

The desktop power supply part number is 15259. This power supply 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 cable (part number 15257) connector. The power supply dimension is TBD x TBD x TBD mm (L x W x H) or approximately TBD x TBD x TBD inches. The desktop power supply weighs approximately 795 gm (28.0 oz).

4.2.6 104 Key Keyboard Cables

Two optional 104 key keyboard cable assemblies are available to connect a keyboard to a computer. One of the cable assemblies is for the 104 key unlighted keyboard, and the other one is for the 104 key lighted keyboard.

4.2.6.1 104 Key Unlighted Keyboard Cable

The 104 key unlighted keyboard cable assembly part number is 15258. It is a cable assembly with three connectors. One end of the cable has a connector that mates with a panel mount keyboard connector. The other end of the cable has two connectors that mate with IBM PC PS/2 keyboard and mouse connectors. The PS/2 keyboard connector allows the keyboard to be connected directly to a female IBM PC PS/2 keyboard connector. The PS/2 keyboard connector may be connected to an IBM PC/AT keyboard connector by using a PC/AT keyboard adapter (part number 15260).

The PS/2 cursor control connector with "CURSOR CONTROL" mark allows the keyboard to be connected directly to a female IBM PC PS/2 mouse connector. The cable length is about 1.8 m (5.9 ft).

4.2.6.2 104 Key Lighted Keyboard Cable

The 104 key lighted keyboard cable assembly part number is 15257. It is a cable assembly with four connectors. One end of the cable has a connector that mates with a panel mount keyboard connector. The other end of the cable has three connectors that mate with IBM PC PS/2 keyboard and mouse connectors, and a power supply connector. The PS/2 keyboard connector allows the keyboard to be connected directly to a female IBM PC PS/2 keyboard connector. The PS/2 keyboard connector may be connected to an IBM PC/AT keyboard connector by using a PC/AT keyboard adapter (part number 15260).

The PS/2 cursor control connector with "CURSOR CONTROL" mark allows the keyboard to be connected directly to a female IBM PC PS/2 mouse connector. The five-pin DIN connector allows the keyboard to be connected directly to either desktop or wall mount power supply. The cable length is about 1.8 m (5.9 ft).

4.2.7 PC/AT Keyboard Adapter

The PC/AT keyboard adapter part number is 15260. It facilitates the panel mount keyboard with its keyboard cable to be connected directly to an IBM PC/AT standard 5-pin DIN keyboard connector. The PS/2 side of the adapter is female, and the AT side is male. The PC/AT keyboard adapter weighs approximately 18.5 gm (0.66 oz). The adapter diameter is about 20.3 mm (.80 in) and the length is about 56 mm (2.20 in).