

SPECIFICATIONS

Rating Criteria

Rating at 24 Vdc: 10 milliamps, resistive
Contact Resistance: Compatible with MOS, TTL and DTL (10 ohms maximum)
Voltage Breakdown: 250 Vac between mutually insulated parts
Life Expectancy: 3,000,000 operations per button

Contact Bounce: Less than 4 milliseconds at make, 10 milliseconds at break
Temperature: -40°C to +80°C

Operating Features

Button Travel: 0.015"(0,38 mm) nominal total travel
Typical Operating Force: 350 grams

Materials and Finishes

Housing: ABS polycarbonate, black
Graphic Overlay: Polyester
Contact Dome: Stainless steel, selectively gold-plated
Terminals: Phosphor bronze

STANDARD LEGENDS

Colorful graphic overlays are polyester with a tough acrylic bond to provide maximum protection against dirt and moisture. Second surface printed, the overlay wipes clean and

continues to look bright and bold throughout the keyboard life. Available through distributors. For instant custom legends, order separate blank keyboards as indicated in the Ordering

Information section and choose one of the clear window overlays below; then order a sheet of legend inserts. Or, if you prefer, order the keyboard custom printed by Grayhill; see Ordering Information.



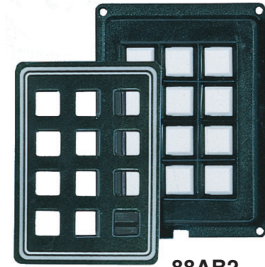
-143



-152



-172



88-101 88AB2, 88AC2



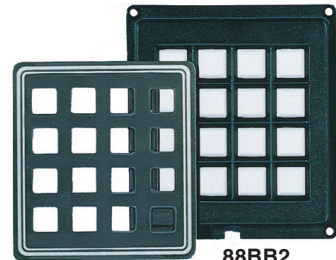
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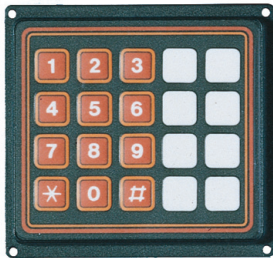
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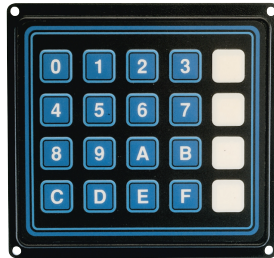
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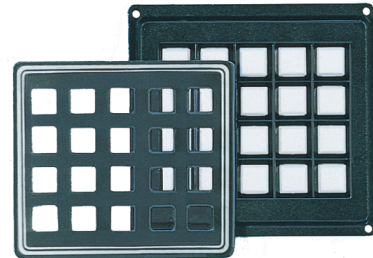
88-001 88BB2, 88BC2



-252



-262



88-201 88JB2, 88JC2

SEALING OF KEYBOARDS

The graphic legend is silk-screen printed on the second surface of a clear polyester film, providing maximum legend protection. It withstands high humidity, and it is resistant to scratching, marring, and dulling of the surface caused by fingernails, wiping cloths, and cleaning materials. It has excellent solvent resistance to water, petroleum oil, alcohols and aliphatic hydrocarbons.

These common liquids do not attack the overlay: 5% acetic acid, 5% citric acid, 2%

detergent solution, soapy water, 30% hydrogen peroxide, wine, beer, whiskey, coffee, cocoa, milk, tomato juice, lemon juice, etc. Hydrocarbons, ketones and freon do not affect the overlay. But, we recommend that you do not subject the keyboard to these chemicals, since they may affect the switch housing, which is ABS plastic. To discuss a particular solvent, contact Grayhill.

Protect your equipment in outdoor or harsh environmental conditions by sealing the

keyboard to the equipment panel. Use an optional gasket with the keyboard. There are two types of gaskets: one for mounting the keyboard beneath the panel, and one for mounting it above the equipment panel. See Panel Seal Gaskets.

The contact system is internally sealed by a special adhesive backed sheet that holds the domes in position on the PC board.

INSERTABLE LEGEND SHEETS

For use with -101 or -001 legend option. Legends are die cut to fit button surface when cap is removed. Dry transfer legends offer some flexibility to customize the blank inserts included on the sheet of popular legend letters, words and symbols provided or on the insertable legends sheet.

Description	Part Number
Sheet of Legend Inserts Dry Transfer Lettering, Small Dry Transfer Lettering, Medium Dry Transfer Lettering, Large	87AC2046 87-DT-2096-088 87-DT-2096-125 87-DT-2096-187

For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill.

PRINTED LEGENDS

For Maximum Versatility

Printing allows you the flexibility to create your own legend using whole words and symbols with various type styles. Durable epoxy ink printing bonds to the button cap surface. There are two types of button cap printing:

Top Surface Printing: Legend is applied directly to the top of the button. Button is recessed slightly below the keyboard housing.

Sub-Surface Printing: For insertable legend models. Provides maximum wear for printed surfaces. Printed internal button cap is protected by clear snap-on cap.

Printed Typestyles: The typestyle chart illustrates type style, size and approximate character limits for button caps. Grayhill's library of typefaces includes most popular legends.

Type No. and Typical Height	Sample Style and Typical Sizes	Sub Surface Character and Line Limitations	Top Surface Character and Line Limitations
4GH088 .083"	ABCDEFGH	4 Characters 2 Lines 	4 Characters 2 Lines
1GH125 .138"	ABCDE	3 Characters 1 Line 	3 Characters 1 Line
3GH187 .207"	ABCD	2 Characters 1 Line 	2 Characters 1 Line
2GH250 .276"	ABC	N/A	2 Characters 1 Line

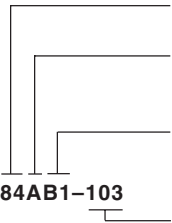
ORDERING INFORMATION:

Special Legends

Follow this procedure:

- 1. Basic Keyboard.** Formulate the part number with the exception of the legend suffix.
- 2. Mounting.** Standard mounting is shown in our dimensional drawings. These drawings relate the terminal location to the button legend orientation. It is possible to rotate the button legends by 90°, changing the orientation. When mounting the keypad, it would be rotated 90° to have the legends appear upright. A 3x4 keypad thus becomes a 4x3.
- 3. Color.** Many colors, other than our standard black housing, are available. Buttons can be made from equivalent plastic in black, red, green, blue and yellow. White legends are used with dark color buttons, black with light ones. Other colors available on special order.
- 4. Buttons.** Legends can be printed on button surface and protected by a snap-on cap in a similar fashion to our insertable legend types. A second option is printing a 'blank' button. (One that has the same dimensions as a molded-in legend button with a flat top surface.) Disadvantage is legend wear over time. A third option is molded-in legends, usually requiring tooling. Molded buttons are available with a flat or concave top surface.
- 5. Legends.** Specify the legend requirements for each button. Identify buttons per our dimensional drawings. Caution if keypad has been rotated.

ORDERING INFORMATION



Grayhill Series Number
Size Option
A = 3x4
B = 4x4
Circuitry Option
B1 = Matrix code
C1 = Single pole/common bus

Standard Legend Choices
3x4 Size: -101, -102 or -103
4x4 Size: -001, -002, -003, -004, -005 or -006

Available from your local Grayhill Distributor. For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

STANDARD LEGENDS

Insertable Style Modules

For prototypes and small quantities

Standard insertable legend modules are an economical way to create your own keyboard legend. Just remove the clear button cap, add any legend, and replace the snap-on cap.

Legend Inserts

For insertable legend modules

Give your keyboard modules the appearance of being printed without the cost. Self-adhesive, printed legend inserts are die cut to fit the buttons. Legend sheet includes commonly used symbols, terms, alpha characters A-Z, and numeric characters 0-99 in News Gothic Condensed typestyle, printed in black on clear backing. Legend sheets also include blank inserts for dry transfer lettering.

87 Series Legend Sheet **Part No. 87AC2046**

Dry Transfer Legends

For additional legend inserts

Sheets include A thru Z in upper and lower case, the numeric characters 0 thru 9, as well as commonly used symbols. The typestyle and size are similar to the chart for printed legends shown below.

Small Print

Part No. 87-DT-2096-088

Medium Print

Part No. 87-DT-2096-125

Large Print

Part No. 87-DT-2096-187

SPECIAL LEGENDS

Printed Legends

For medium volume or short runs

Virtually any character, symbol or pattern which can be photographed can be printed on the button. Grayhill uses epoxy ink which bonds to the surface of the button.

The legend can be printed on either of two

surfaces: the top surface of a one-piece button, or the internal surface on the snap-on cap style for maximum wear.

The typestyle chart shows the style and the approximate limitations of Grayhill's standard type. However, limitations differ with the surface to be printed and the actual characters to be used. If your legend exceeds the chart limits, contact Grayhill for more information. Unless specified, black legends are printed on white buttons.

Additional Ink Color: White ink is stocked for use on dark colored buttons.

Additional Button Colors: For a molding charge, we can provide buttons from other colors which we may have in stock, such as black, red, green, blue, or yellow. Non-stock button/ink colors may require minimum material purchase. To order, or to check currently stocked colors, contact Grayhill.

Molded-in Legends

For high volume production

For legends that will stand up to abuse and constant wear for the life of your keyboard, use molded-in legends. The two-shot molding process molds the legend and button together. Your special legend can be made from existing Grayhill molds or we can tool special ones.

Buttons are available with black legends molded in white or other light backgrounds, or with white legends molded into dark backgrounds. See Printed Buttons, Additional Button Colors. To order, contact Grayhill.

Type No. and Typical Height	Sample Style and Typical Sizes	Sub Surface Character and Line Limitations	Top Surface Character and Line Limitations
4GH088 .083"	ABCDEFGH	4 Characters 2 Lines 	4 Characters 2 Lines
1GH125 .138"	ABCDE	3 Characters 1 Line 	3 Characters 1 Line
3GH187 .207"	ABCD	2 Characters 1 Line 	2 Characters 1 Line
2GH250 .276"	ABC	N/A N/A	2 Characters 1 Line

ORDERING INFORMATION

Type of Module or Legend	Part Number	Special Legends
1 Button	87CC3-201	<p>To order non-standard modules, information is required for the areas listed below.</p> <p>Your special order will be assigned a part number for future identification. This number is sequentially assigned and is non-descriptive.</p> <p>1. Type of Module. 1, 2, 3, 4, 5, 6, 12 or 16 button.</p> <p>2. Mounting Orientation. Horizontal or vertical.</p> <p>3. Circuitry. Single pole/common bus is standard for all single row modules. For 12 or 16 button keyboard, specify single pole/common bus or matrix.</p> <p>4. Housing Color. Standard housing is black. Optional stock colors include beige and gray.</p> <p>5. Button Types. Flat or concave buttons are available for molded legends; flat, concave, and snap-on cap styles are available for printed legends.</p> <p>6. Button Color. Standard buttons for molded and printed legends are white with black legend. Other colors available include white legends with red, green, dark blue, dark gray and black buttons, or black legends with yellow, blue, light gray, beige and white buttons. Additional legend colors such as red are also available.</p> <p>7. Legend Style. Two-shot molded or printed. Printed legends may be top or sub-surface printed.</p> <p>8. Actual Legend. Specify for each button using the button identification on drawings. Price—Contact Grayhill.</p>
2 Button	87DC3-201	
3 Button	87EC3-201	
4 Button	87FC3-201	
5 Button	87GC3-201	
6 Button	87HC3-201	
12 Button—Matrix	87AB3-201	
12 Button—SP/Com Bus	87AC3-201	
16 Button—Matrix	87BB3-201	
16 Button—SP/Com Bus	87BC3-201	
Insertable Legend Card	87AC2046	
Dry Transfer—Small	87-DT-2096-088	
Dry Transfer—Medium	87-DT-2096-125	
Dry Transfer—Large	87-DT-2096-187	



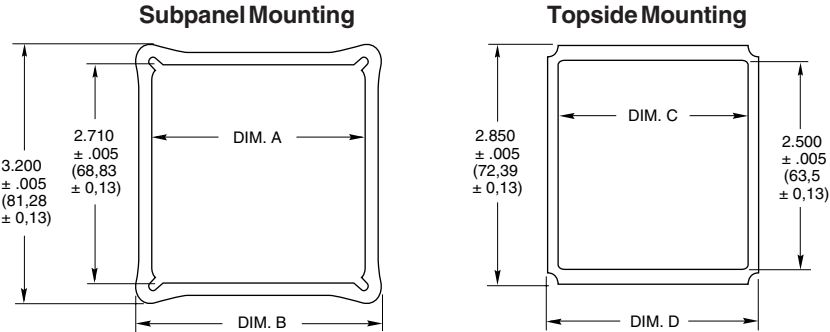
Available from your local Grayhill Distributor. For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

PANEL SEAL GASKETS

Weatherproof and waterproof your subpanel and topside mounted keyboards with optional panel seal gaskets.

Subpanel keyboard gasket is .062" (1,57 mm) thick; topside keyboard gasket is .094" (2,39 mm).

Material is cellulose fiber, foam, nitrile rubber. Order gaskets separately from keyboard.



- Subpanel 3x4 **Part No. 88M2001-2**
- Subpanel 4x4 **Part No. 88M2009-2**
- Subpanel 5x4 **Part No. 88M2019-1**

- Topside 3x4 **Part No. 88M2012-1**
- Topside 4x4 **Part No. 88M2015-1**
- Topside 5x4 **Part No. 88M2018-1**

Size of Keyboard	Subpanel Mount		Topside Mount	
	Dim. A	Dim. B	Dim. C	Dim. D
3x4	2.010 ± .005 (51,05 ± 0,13)	2.400 ± .005 (60,96 ± 0,13)	1.800 ± .005 (45,72 ± 0,13)	2.040 ± .005 (51,82 ± 0,13)
4x4	2.510 ± .005 (63,75 ± 0,13)	2.900 ± .005 (73,66 ± 0,13)	2.300 ± .005 (58,42 ± 0,13)	2.540 ± .005 (64,52 ± 0,13)
5x4	3.010 ± .005 (76,45 ± 0,13)	3.400 ± .005 (86,36 ± 0,13)	2.800 ± .005 (71,12 ± 0,13)	3.040 ± .005 (77,22 ± 0,13)

INSTANT CUSTOM LEGENDS

Available through Distributors
Create your own legends using these 3 items: 1) a blank keyboard, 2) the clear window overlays shown on Standard Legend page and 3) a sheet of legend inserts.

Blank Keyboards
The numbers below order blank keyboards for the user to legend. For description, refer to the part numbering scheme below. The keyboards and overlays are ordered separately.

- 3x4 Matrix **Part No. 88AB2**
- 3x4 SP/Com Bus **Part No. 88AC2**
- 4x4 Matrix **Part No. 88BB2**
- 4x4 SP/Com Bus **Part No. 88BC2**
- 5x4 Matrix **Part No. 88JB2**
- 5x4 SP/Com Bus **Part No. 88JC2**

Legend Insert Sheet and Dry Transfers
Self-adhesive inserts are die-cut to fit the

button. Legends are printed in black on clear film in News Gothic Condensed type style. They include letters A through Z, numbers 0-69, telephone legends, commonly used words, symbols and blanks.
Part No. 87AC2046

Use matching dry transfer lettering on blank inserts of legend sheet: upper and lower case letters, 0-9, and common symbols.

- Small Print **Part No. 87-DT-2096-088**
- Medium Print **Part No. 87-DT-2096-125**
- Large Print **Part No. 87-DT-2096-187**

Clear Window Overlays
Order separately from keyboards. See also ordering information.

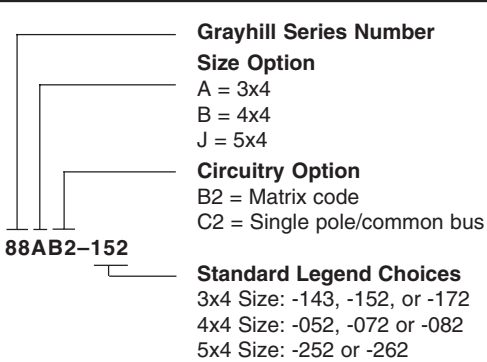
- 3x4 Overlay **Part No. 88-101**
- 4x4 Overlay **Part No. 88-001**
- 5x4 Overlay **Part No. 88-201**

PRINTED LEGENDS

Not available through Distributors. For medium volume applications, or where legends cannot be produced by the self legend method, you can order epoxy ink printed legends. Virtually anything which can be photographed can be printed. Grayhill will print your legend and then add the clear window overlay.

Type I.D. No.	Simulated Style & Size	Character & Line Limitations *
4GH088	ABCDEFGH	END DATA
1GH125	ABCDE	LAD
3GH187	ABCD	ON
2GH250	ABC	15

ORDERING INFORMATION



Available from your local Grayhill Distributor. For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

Keyboards and Key pads