

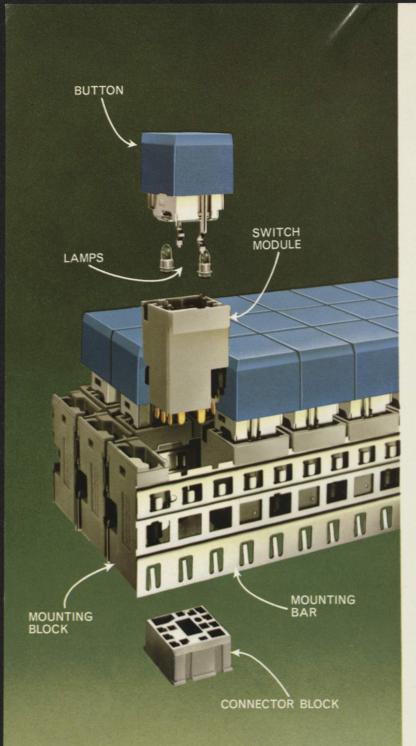


# Lighted pushbutton switches

and matching indicators

"KB" provides new freedom in the design and building of your panels:

- Complete flexibility in display and arrangement.
- Plug-in elements for fast assembly and easy field changes.
- Variety of display colors and 2-color combinations.



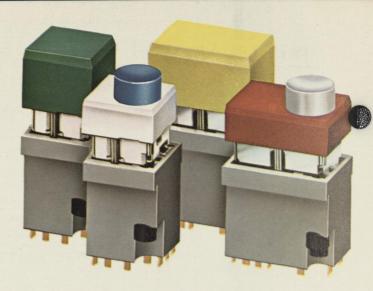
#### Modular Mounting System

Mounting bars are the basic support structure of the versatile KB mounting concept. They are joined together to form a "box-girder" framework that adds strength to the panel. Switches and indicators can be mounted in compact arrays, up to 256 units per square foot, all in a single panel cutout.

# **MICRO SWITCH**

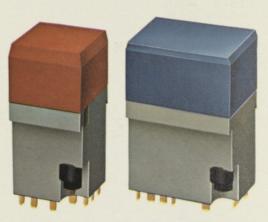
FREEPORT, ILLINOIS 61033

A DIVISION OF HONEYWELL
IN CANADA: HONEYWELL CONTROLS LIMITED, TORONTO 17 ONTARIO

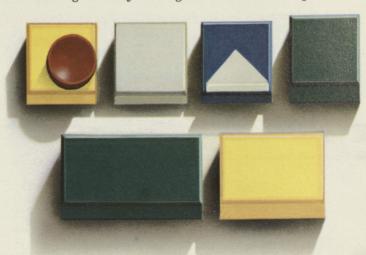


**Pushbutton Switches** have 2 or 4-pole double-throw double-break circuitry, momentary or alternate action, with lighted display option.

Electrical Rating: 28 vdc—3 amps inductive, 5 amps resistive; 115 vac—5 amps resistive or inductive.

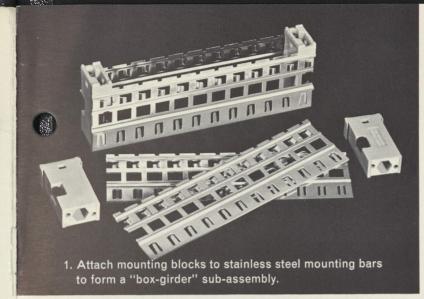


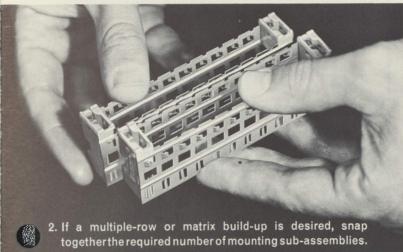
Indicators are similar in appearance to the switches, except the button is on a lower level, making it easily distinguished in a mixed panel.

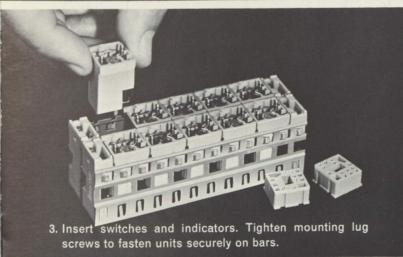


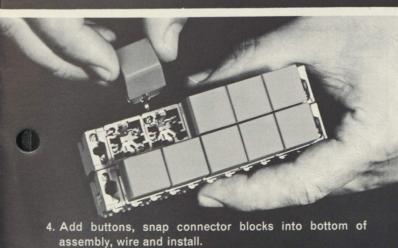
#### Flexibility in Color, Shape and Size

In addition to square and rectangular display forms, KB has a new 2-level button with raised operator knob inset on a flat base. Mixing of base and extension colors gives a wide selection of 2-color combinations.









#### Quick and Easy to Assemble



# Lighted pushbutton switches

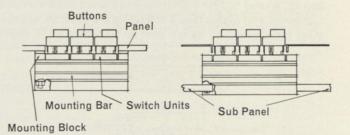
and matching indicators

#### Standard Building Block Units

The basic "KB" unit measure is 3/4" square—any device that will mount in that panel area is considered one unit in size.

For example, buttons are available in 1, 1-1/2 and 2-unit; switches and indicators, 1 and 1-1/2-unit; and spacers, 1/2 and 1-unit sizes. (Spacers can be used to fill openings in rows and provide expansion space.) This building block principle greatly simplifies the design and alteration of panel layouts.

#### **Unit Sizes**



PANEL MOUNTING

SUB PANEL MOUNTING

#### Flexibility in Mounting Schemes

"KB" can be bolted to the back of the front panel or mounted on a subpanel. Only a single-hole panel cutout is necessary.

The entire "KB" assembly can be put together, wired and checked out at the bench prior to installation

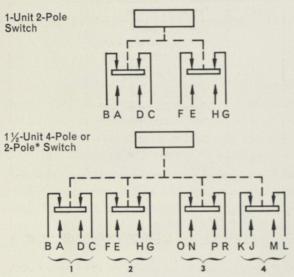
All "KB" modules have individual catalog listings to enable them to be ordered as separate items. Catalog Listings and their descriptions are shown on Pages 4 through 8.

# Switch Modules

Momentary-action (Push-on release-off) switch modules maintain circuit transfer from the normally-closed to the normally-open contacts only while the button is manually held depressed. When the finger is removed, the button and switch contacts return to their original position.

Alternate-action (push-on push-off) switches transfer and maintain circuit transfer between operations. When the button is pushed and released, it remains visibly below the level of other unoperated switches (approx. 3/16"). Circuit transfer is maintained until the button is pushed a second time to return button and contacts to their original position.

#### SWITCH CIRCUITS



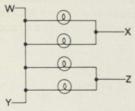
\*2-Pole uses only the poles marked 1 and 4

#### LAMP CIRCUIT

Terminals "W" and "Y" are common. Series wiring (connection of "X" and "Z" for 4-lamp hook-up) is not recommended.

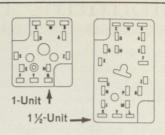
If lamps with higher than 6 volt rating are used, UL require-

If lamps with higher than 6 volt rating are used, UL requirement for approval of device over 30 volts may be in effect.



# TERMINAL

Switch and lamp terminal designations are clearly marked on the bottom of switches and connector blocks.



Switch modules listed below have a .250" operating stroke.

Switte	n modules listed be	low have a .250 operating	g stroke.
Catalog Listing	Switch Action	Special Features (all switches have lamp terminals W, X, Y, Z)	Poles & Size
7A1CA	Momentary Action (tactile feedback)	Terminals A, B, C, D, E, F, G, H.	
7A1CC	Alternate Action (tactile feedback)	Terminals A, B, C, D, E, F, G, H.	2-Pole 1-Unit
7A1CE	Momentary Action (tactile feedback)	Has Extended Plunger for Momentary Lockout 7F1AA* Only. Terminals A, B, C, D, E, F, G, H.	
7A1CG	Momentary Action (no tactile feedback)	Has Extended Plunger for Bail and Lockout 7F1 AC* Only. Terminals A, B, C, D, E, F, G, H.	0.001
7A1CJ	Alternate Action (tactile feedback)	Has extended plunger for Momentary Lockout 7F1AA* Only. Terminals A, B, C, D, E, F, G, H.	2-Pole 1-Unit
7A1GA	Momentary Action (tactile feedback)	Terminals A, B, C, D, J, K, L, M.	
7A1GC	Alternate Action (tactile feedback)	Terminals A, B, C, D, J, K, L, M.	2-Pole 1½-Unit
7A1EA	Momentary Action (tactile feedback)	Terminals A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, R.	
7A1EC	Alternate Action (tactile feedback)	Terminals A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, R.	4-Pole 1½-Unit

<sup>\*</sup>Refer to Page 8 for details on these mechanical interlock "add-on" modules.

### **Indicator Modules**

Indicators show circuit status by lighted display. They are similar in appearance to the 1 and  $1\frac{1}{2}$ -unit pushbutton switches, except that indicators hold the button continually depressed, and have no switching function.

If a larger display area is desired, a 2-unit button can be attached to a pair of 1-unit indicator modules. The lamp circuit is the same as shown above for the switches.

Catalog Listing	Indicator Size	Use With Button Type	
7 <b>C</b> 1	1-Unit	Single Level 1 or 2-Unit Button	
7 <b>C</b> 2	1½-Unit	Single Level 1½-Unit Button Only	

# Mounting Hardware

Each row of switches and indicators requires two 1st level mounting bars and two end mounting blocks. Each mechanical interlock "add-on" row (see page 8) uses two 2nd level mounting bars, two spirol pins and two end mounting blocks.

The spirol pin aligns the 1st and 2nd level mounting blocks until they are fastened together by long mounting screws. One spirol pin is supplied with each 2nd level mounting bar.

#### MOUNTING BARS

1st Level	g Listing 2nd* Level	Nominal Length (inches)	To Mount No. of Unit(s)**	
7E1AA	7E2AA	1.50	1	75
7E1AB	7E2AB	2.25	2	33305
7E1AC	7E2AC	3.00	3	
7E1AD	7E2AD	3.75	4	N N N O
7E1AE	7E2AE	4.50	5	1st Level Mounting
7E1AF	7E2AF	5.25	6	Bar
7E1AG	7E2AG	6.00	7	
7E1AH	7E2AH	6.75	8	
7E1AJ	7E2AJ	7.50	9	
7E1AK	7E2AK	8.25	10	A CONTRACTOR OF THE PARTY OF TH
7E1AL	7E2AL	9.00	11	
7E1AM	7E2AM	9.75	12	2nd Level
7E1AN	7E2AN	10.50	13	Mounting Bar
7E1AP	7E2AP	11.25	14	Dai
7E1AR	7E2AR	12.00	15	
7E1AS	7E2AS	12.75	16	

<sup>\*</sup>A Spirol Pin (7G3GF) is included with each 2nd level

#### MOUNTING BLOCKS

Catalog Listing	Description		
7E3CA	End Block—For Mounting 1st and 2nd Level Mounting Bars		
7E3CB	Spacer Mounting Block		
7E3BA	Pushbar Block—Lighted Capability*		
7E3BB	Pushbar Block—Without Lighted Capability**		

<sup>\*</sup>Refer to Page 6, Table 1, footnote 3.

## Wiring Hardware

Connector blocks plug-in at the base of switches and indicators to provide means of attaching leadwires. Terminal locations are marked for easy identification. A connector block consists of a terminal housing with quick-connect terminals inserted in all positions.

Terminal housings and quick-connect terminals are also sold as separate items. However, the quick-connect terminals cannot be used by themselves; they must be mounted in a terminal housing to assure proper alignment with the tabs at the base of the switches and indicators.

Catalog Listing	Size	Description	
7 <b>D</b> 3	1-Unit	Terminal Housing	of the teated have
7 <b>D</b> 7	1-Unit	Connector Block (terminal housing with 12 terminals inserted)	
7 <b>D</b> 4	1½-Unit	Terminal Housing	
7D8	1½-Unit	Connector Block (Terminal housing with 20 terminals inserted)	
7 <b>D</b> 6		Quick-Connect Terminal (Sold only in multiples of 50)	Ō

## Spacers

"Low-level" spacers are used to fill out rows in a matrix where there is no switch to close separations between modules or to fill out the corners of a matrix. "High-level" spacers can be used as an added precaution against accidental operation of adjacent pushbuttons.

½-unit spacers are available in two heights—"low level" (flush with the base of a 2-level button) and "high level" (flush with the tops of single level buttons and extensions on 2-level buttons). 1-unit spacers are available in "low level" only. All spacers are mounted over a spacer mounting block (7E3CB).

½-Unit Low Level



½-Unit High Level



1-Unit Low Level



	Catalog Listing			
Color	½-Unit Low Level	½-Unit High Level	1-Unit Low Level	
Red	7G1AR	7G1BR	7G1CR	
Blue	7G1AB	7G1BB	7G1CB	
Green	7G1AG	7G1BG	7G1CG	
Yellow	7G1AY	7G1BY	7G1CY	
White	7G1AW	7G1BW	7G1CW	
Black	7G1AK	7G1BK	7G1CK	
Gray	7G1AA	7G1BA	7G1CA	

<sup>\*\*</sup>Mounting bar sizes include the space required for a mounting block (1/2-unit) at each end. Thus, a "1-unit" mounting bar is actually 2 units or 1-1/2" long; a "2-unit" mounting bar, 3 units or 2-1/4" long, etc.

<sup>\*\*</sup>Refer to Page 6, Table 1, footnote 4.

# Buttons for Switches and Indicators

#### EASY TO ADD LAMPS

Addition or removal of the T-1 type lamps can be accomplished easily from front of panel after removing the button. No tools are required.

#### DISPLAY COLOR OPTIONS

TRANSMITTED COLOR refers to the use of clear lamps and colored buttons in applications which require the color to be distinguished when the display is unlighted.

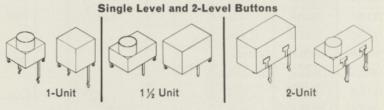
PROJECTED COLOR is a technique that uses white buttons and colored lamps or clear lamps with color filters. When the lamps are lighted, the white button takes on the color imparted by the colored lamps or filters (see chart).

Buttons are available in red, yellow, green, blue, white, gray and black in the one-color single-level type and in one-color and 2-color combination in the 2-level style.

	Transmitted Color	Projected Color
Lamps Off		
Lamps On		
Display Effect	Button is same color whether lighted or unlighted.	When lighted, white button takes on color of colored lamp or filter.

#### **HOW TO ORDER BUTTONS**

Complete catalog listings for buttons are made up from selections from the tables. However, if the button is to be unlighted, the information in Tables 5, 6 and 7 is *not* necessary.



**Sample** of Button Catalog Listing: Description of 7B1C-01WW3-CA03C, as shown below: Lighted button for 1-unit switch, single level construction, white button, with legend, red projected color and two colored lamps. When lamps (and filters) are specified, they are supplied ready-installed in button.

From TABLE	1	2	3	4	5	6	7
Feature	Type of Button	Button Construction	Button Color	Legend	Type of Display Color	Type of Lamp	No. of Lamps
Catalog Listing	7B1C -	01	ww	3 .	CA CA	03	С

TABLE 1	TYPE	TYPE OF BUTTON			
Portion of Catalog Listing	Size	Lighted or Non-Lighted	Use With Switch or Indicator Type		
7B1C	1 Unit	Lighted	1-Unit		
7B1D*	1 Unit	Non-Lighted	1-Unit		
7B1E	1½ Unit	Lighted	1½-Unit		
7B1F*	1½ Unit	Non-Lighted	1½-Unit		
7B2A	2 Unit**	Lighted	(see below)		
7B2B*	2 Unit**	Non-Lighted	(see below)		

- \*Buttons are opaque and cannot be used for lighted display.
- \*\*This 2-unit module can be utilized the following ways:
- 1) As a lighted indicator, with two 1-unit indicator modules.
- 2). As a lighted pushbar, with two 1-unit switch modules.
- As a lighted pushbar, with one 1-unit switch and a pushbar mounting block with lighted capability (Catalog Listing 7E3BA).
- As an unlighted pushbar, with one 1-unit switch and a pushbar mounting block without lighted capability (Catalog Listing 7E3BB).

TABLE 2	<b>BUTTON CONSTRUCTION</b>

Portion of Catalog Listing	Button Construction	Extension Orientation	Use With Button Type
01	Single Level	Single Level None	
02	*Two Level Round Extension	===	1, 1½ and 2-Unit
03	**Two Level Round Extension		1, 1½ and 2-Unit
04	*Two Level with Bump on Extension for Finger Orientation	1 and 1½-U Only	
05	**Two Level with Bump on Extension for Finger Orientation	H	1 and 1½ Unit Only

- \*Oriented for applications with Mounting Bars horizontal.
- \*\*Oriented for applications with Mounting Bars vertical.

#### TABLE 3

**BUTTON COLORS** 

orange of	Portion of Catalog Listing				
Color	Two L	evel Button	Single Level Button		
	Base	Extension	Single Color		
Red	R	R	RR		
Blue	В	В	ВВ		
Green	G	G	GG		
Yellow	Υ	Υ	YY		
White	W	W	ww		
*Black	К	K	KK		
*Gray	A	A	AA		

\*Gray and black buttons are opaque and cannot be used for lighted display.



Notes for Table 3

- Single Level
- 1. All listings require two (2) letters.
- For two level, two color buttons the first letter indicates base color and the second letter indicates extension color.Example: White Base with Red Extension would be WR.

Two Level

A single color button requires a double letter of color desired. Example: A yellow button would by YY.

TABLE 4		LEGENDING	
Portion of Catalog Listing	Description		
1	No Legending—With Lusterless Coating		
2	No Legending—Lusterless Coating Omitted		
3	Legend—With Lusterless Coating, Use Legend Order Sheet—Form No. FO-62302		

A clear lusterless coating is applied to buttons after legending (No. 3, above). This coating helps protect the legend from wear and gives the button a matte finish. Buttons without legends can also be furnished with the lusterless coating (No. 1, above). However, if you wish to do your own legending, please specify that the coating be omitted (No. 2, above), since previously coated buttons will not readily accept hot stamping.

#### LAMP POSITIONS (view from top of button)

1	2	† Mounting Bar	1	2	3	4
3	4	Orientation	5	6	7	8

1 and 11/2 Unit\*

2-Unit\*\*

- \*Lamp positions 1 and 2 are lighted by Terminal "X" (circuit X), while positions 3 and 4 are lighted by Terminal "Z" (circuit Z).
- \*\*Lamp positions 1, 2, 3 and 4 are lighted by Terminal "X" (circuit X), while positions 5, 6, 7 and 8 are lighted by Terminal "Z" (circuit Z).

Refer to Page 4 for schematic of lamp circuits.

# IF BUTTON IS NON-LIGHTED INFORMATION IN TABLES 5, 6 AND 7 IS NOT REQUIRED:

#### TABLE 5 TYPE OF DISPLAY COLOR

If TRANSMITTED COLOR is to be used, insert "XX" in catalog listing. For PROJECTED COLOR, select the color combinations from the table below. Colored lamps or clear lamps with color filters (when specified) are provided installed in the button, if projected color is desired.

Portion of Ca	atalog Listing	Projected Colors	
Colored Lamps	Colored Filters	Circuit X	Circuit Z
CA	AA	Red	None
СВ	AB	Blue	None
CC	AC	Green	None
CD	AD	Yellow	None
CE	AE	White	None
CF	AF	Red	Blue
CG	AG	Red	Green
СН	AH	Red	Yellow
CJ	AJ	Red	White
СК	AK	Blue	Green
CL	AL	Blue	Yellow
CM	AM	Blue	White
CN	AN	Green	Yellow
CP	AP	Green	White
CR	AR	Yellow	White

TABLE	6 TYPE OF LAMP	
Portion of Catalog Listing	Туре	
01	No Lamps	
02	Clear T-1 Type, 5 Volt .115 Amp, #718	
03	Colored T-1 Type, 5 Volt .115 Amp, #718	

#### TABLE 7 NUMBER OF LAMPS

If projected color display is used, there should be two lamps minimum for each color.

Portion of	1 or 1½ Unit Button		2-Unit Button/Pushbar	
Catalog Listing	No. of Lamps	Lamp Positions	No. of Lamps	Lamp Positions
А	0	Hanca —	0	6189 <b>—</b> 617
В	1	2	2	4 & 5
С	2	1 & 2	3	1, 2 & 4
D	4*	1, 2, 3 & 4	4**	2, 4, 5 & 7
E		10 10 10 10 10 10 10 10 10 10 10 10 10 1	6**	1, 2, 4, 5, 7 & 8

\*2.3 (max.) total wattage

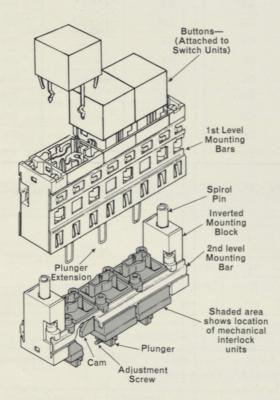
\*\*2.5 (max.) total wattage

# Mechanical Interlock "Add-On" Devices

Mechanical interlock units can be added under a row of pushbutton switches to provide a variety of sequential functions.

A pair of 2nd level mounting bars and inverted end mounting blocks provide the mounting means for the "add on" mechanical interlock row, as shown in the drawing. Spirol pins align the two levels. One spirol pin is supplied with each 2nd level bar. Long screws for attaching the assembly to the panel can be ordered (Catalog Listing 7G3GE), unless other mounting means are used.

Mechanical interlock units are actuated by through-plunger extensions on specially equipped switch modules. These extensions are linked to the plungers on the mechanical interlock units which move inter-acting cams. These cams, supplied with the mechanical interlock units, transmit motion along the row to provide the desired operating function.



Three ways the mechanical interlock modules can be utilized are described below. Additional information can be supplied by your MICRO SWITCH branch office or Authorized Distributor.

# BAIL AND LOCKOUT FUNCTION (With Key-Down Memory)

Operation of a switch button will bail (release) any previously operated button within the row. Buttons are to be operated in one-by-one sequence, with one button always being held down by a mechanical detent. This provides a "key-down

memory" arrangement which tells the operator which button was last depressed.

When two buttons are pushed at once their downward stroke is stopped after 1/10-inch (approx.) travel. This lockout function prevents the normally-open contacts on two switches from being made at the same time.

#### Modules Required

Switch Module	Bail and Lockout Module
7A1CG	7F1AC

# MOMENTARY LOCKOUT FUNCTION (With "No-Two-Operate")

Only one button can be operated at one time. Circuit transfer in the switch is maintained only while the button is manually held depressed. When the finger is removed, the button and switch contacts return to their original position. There is no bailing function.

A push on two buttons at once will move them 3/64-inch (approx.). This lockout function prevents the normally-open contacts on two switches from being made at the same time.

#### **Modules Required**

Switch Module	Momentary Lockout Module
7A1CE	7F1AA

#### **CLEARING STATION FUNCTION**

In a bail and lockout function row, it may be desirable to include a provision for returning any previously operated button to the free position (all buttons "up"). This can be accomplished by adding a clearing station(s) to the row. To set up the clearing station, a bail and lockout cam is substituted for the cam in a momentary lockout module. (Each bail and lockout row will have one bail and lockout cam left over.)

#### Modules Required

Switch Module	Momentary Lockout Module
7A1CE	7F1AA

# Replacement Parts

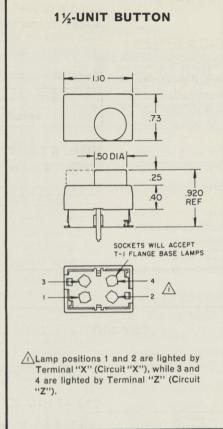
Catalog Listing	Description
7G3GA*	Mounting Screw and Lug for Switch, Indicator and Spacer Mounting Block (Sold only in multiples of 10.)
7G3GE**	Long Mounting Screw For Two Level Mounting (Sold only in multiples of 50.)
7G3GF*	Spirol Pin For Two Level Mounting (Sold only in multiples of 10.)
7G3GH*	Mechanical Interlock Mounting Screw and mounting lug (Sold only in multiples of 10.)

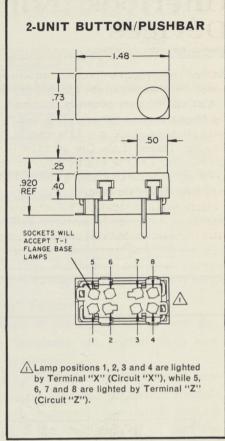
<sup>\*</sup>These items are replacement parts and need not be ordered initially.

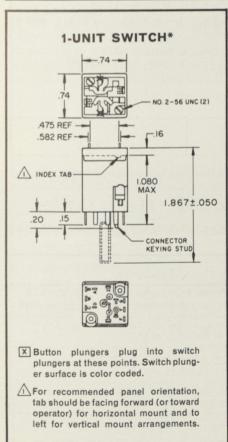
<sup>\*\*</sup>Two long mounting screws are required for each row of 2nd level (mechanical interlock) modules, unless other mounting means are used.

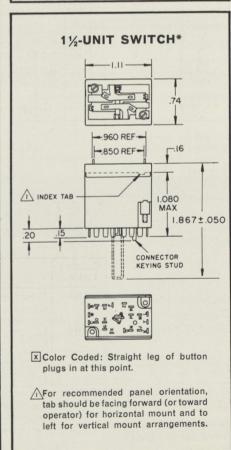
#### MOUNTING DIMENSIONS

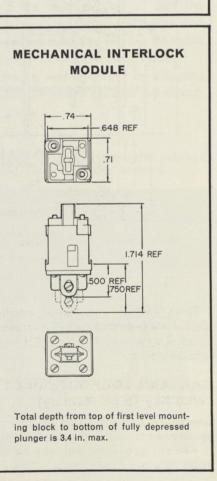
# SINGLE LEVEL BUTTON-THIS HEIGHT SOCKETS WILL ACCEPT T-I FLANGE BASE LAMPS Lamp positions 1 and 2 are lighted by Terminal "X" (Circuit "X"), while 3 and 4 are lighted by Terminal "Z" (Circuit





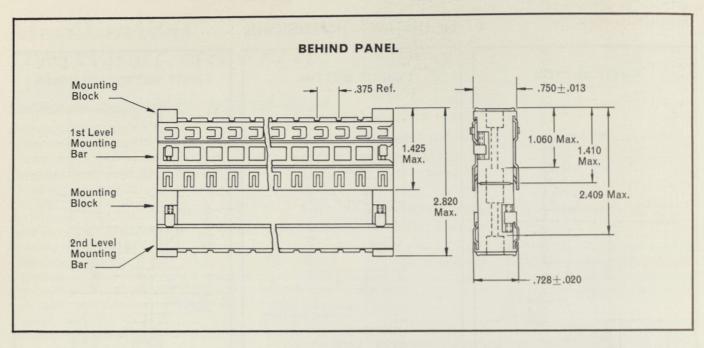


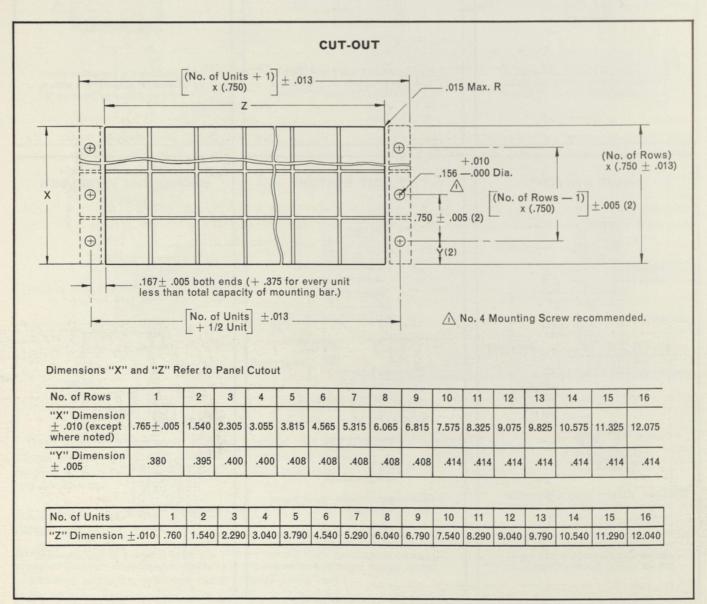


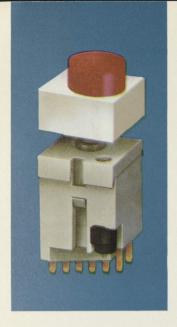


<sup>\*</sup>Dimensions are identical to indicator module, but has no switch terminals

#### MOUNTING DIMENSIONS



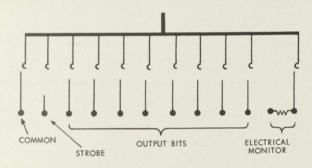






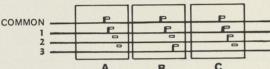
- Up to eight output bits
- 256 possible code combinations
- Momentary action

This unique pushbutton switch design enables encoding-by-connection, eliminating the cost and installation of diode matrices to encode the raw keyboard contact closures. "KB" encoding switches also have an electrical monitor circuit which can electrically indicate if two buttons have been pushed by mistake. All moving contacts are trifurcated (3-surface) for high reliability. Gold plated copper-alloy strips are used to wire a row of switches together and provide means of encoding. Ordering information is available upon request.



#### Contact Arrangement

As the switch module is operated, the common and electrical monitor circuit is made first, followed by the eight output bit circuits and, lastly, the strobe circuit which is intentionally delayed to allow a stable output from the output bit contacts. (A special contact below the strobe is available for a "repeat" or sequence action control.)



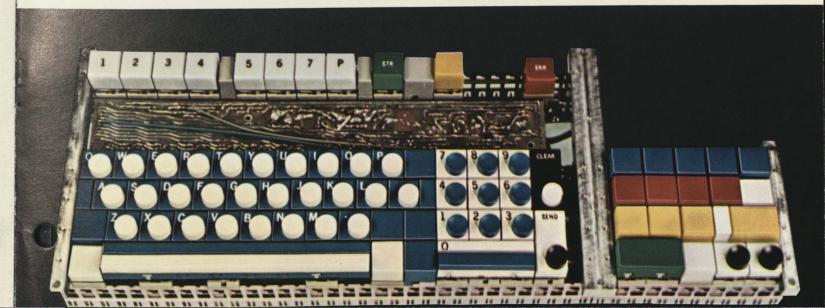
#### "Auto-Encoding" Feature

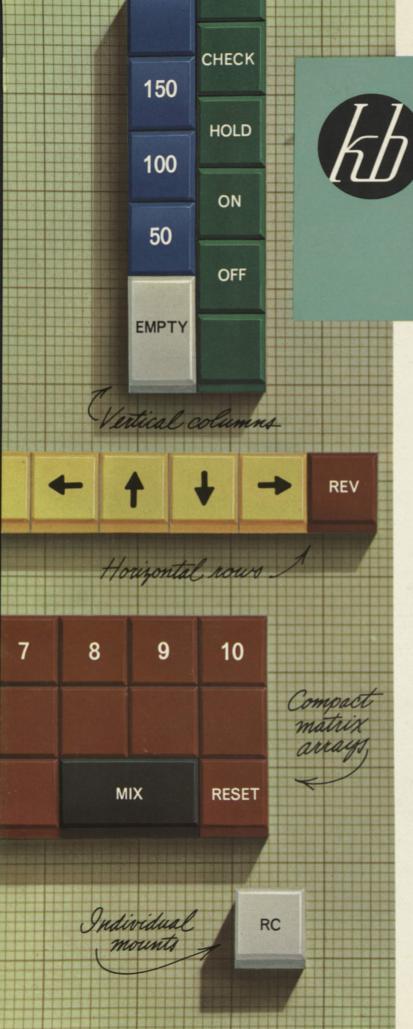
This graphic view of the wiring shows how the encoding switch terminals are bussed in a row using the encoding strips.

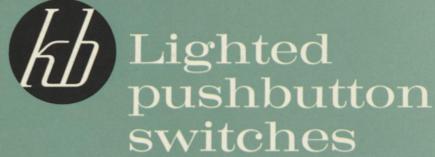
As supplied, the encoding strip tabs would contact all terminals. In the case of switch module "B", above, the tab that would have made contact with terminal No. 2 has been clipped so that the encoding strips pick up only terminals designated 1 and 3 which give switch module "B" a code value of "4", as in the Binary Coded Decimal Code.

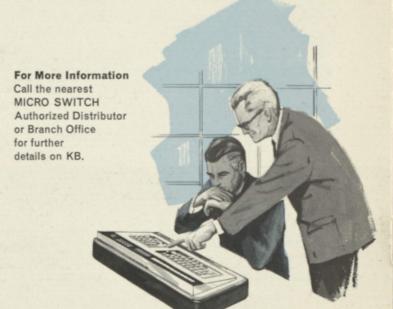
Encoding can also be accomplished by clipping switch terminals. This procedure enables the changing of codes in the field.

You can bench assemble a matrixed array of KB encoding pushbutton switches, lighted pushbutton switches and lighted indicators. Encoding switches are used in the alpha-numeric portions of this keyboard.









# **MICRO SWITCH**

FREEPORT, ILLINOIS 61033

A DIVISION OF HONEYWELL

IN CANADA: HONEYWELL CONTROLS LIMITED, TORONTO 17. ONTARIO