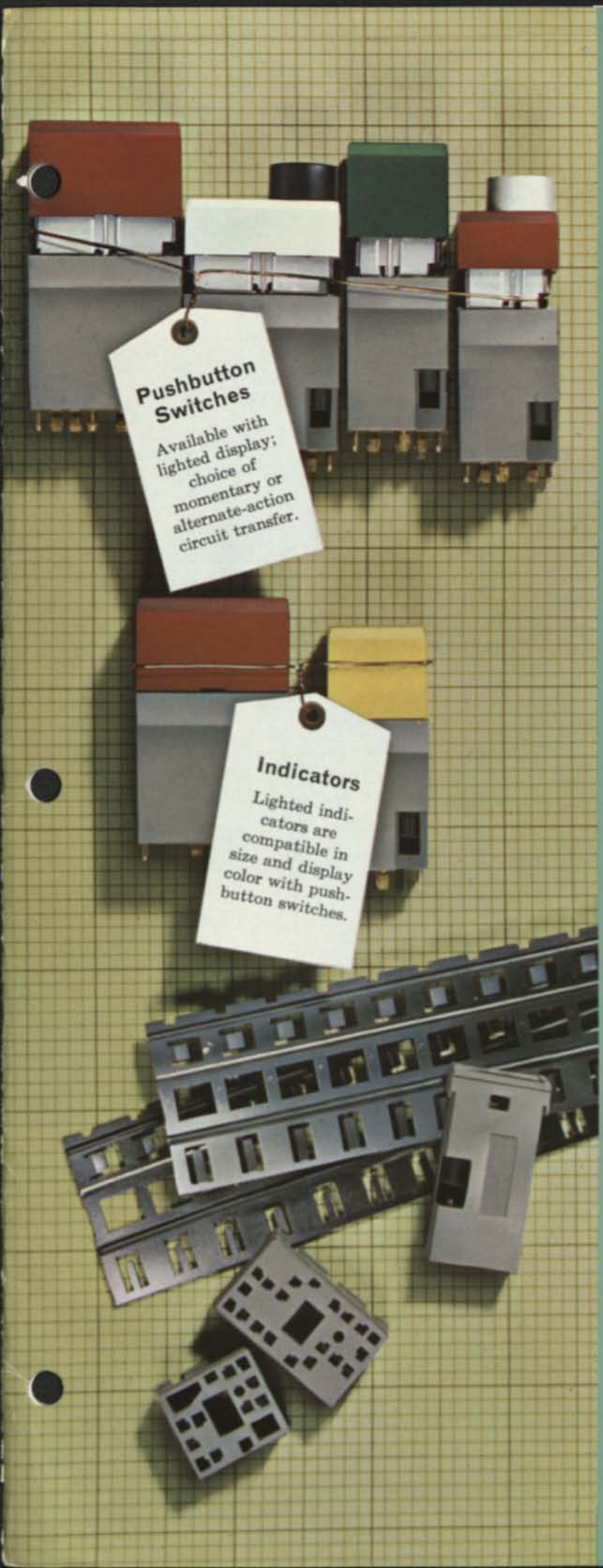
MICRO SWITCH
BULLETIN 70a

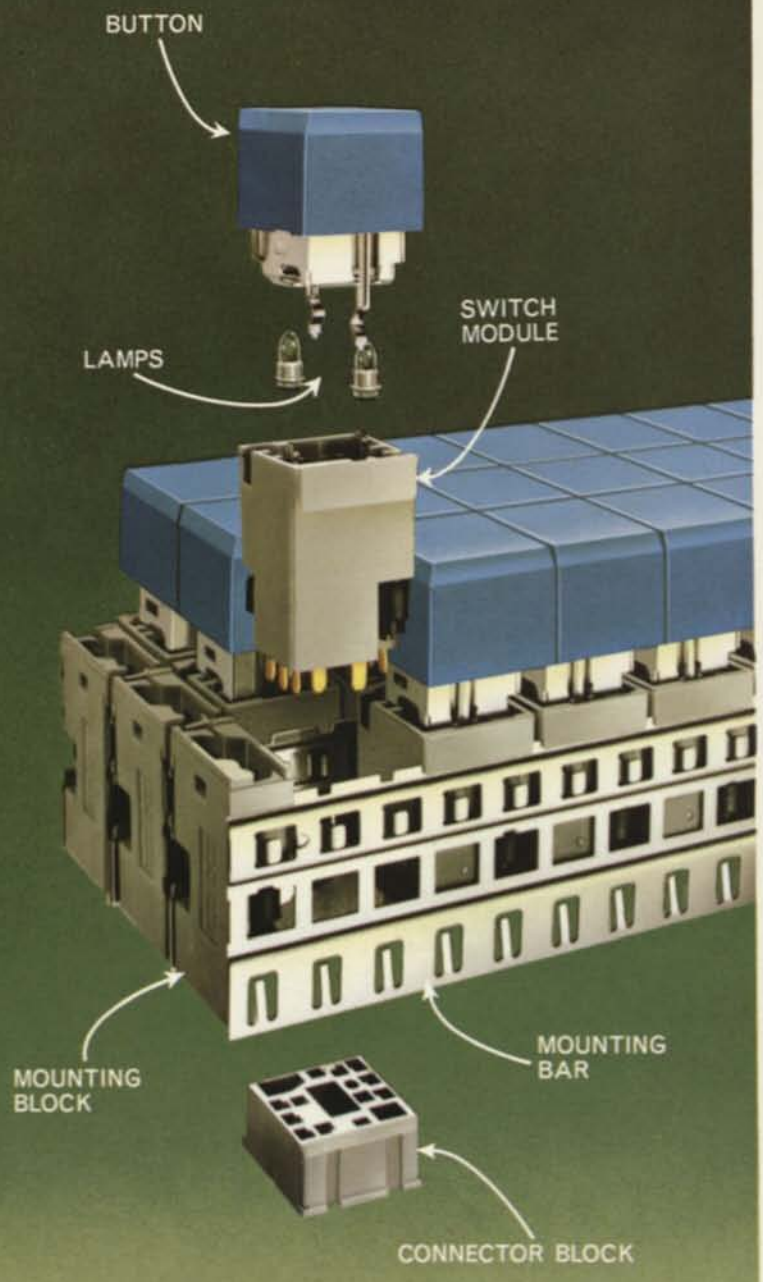


Lighted pushbutton switches

and matching indicators

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

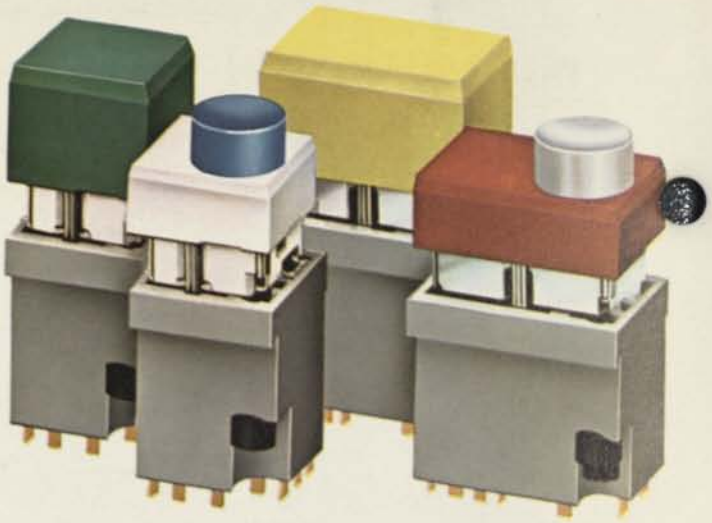
- Complete flexibility in display and arrangement.
- Plug-in elements for fast assembly and easy field changes.
- Variety of display colors and 2-color combinations.



Modular Mounting System

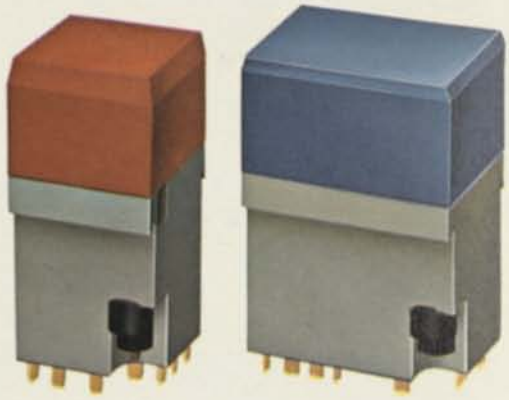
Mounting bars are the basic support structure of the versatile KB mounting concept. They are joined together to form a "box-girder" framework that adds strength to the panel. Switches and indicators can be mounted in compact arrays, up to 256 units per square foot, all in a single panel cutout.

MICRO SWITCH
FREEPORT, ILLINOIS 61033
A DIVISION OF HONEYWELL
IN CANADA: HONEYWELL CONTROLS LIMITED, TORONTO 17, ONTARIO

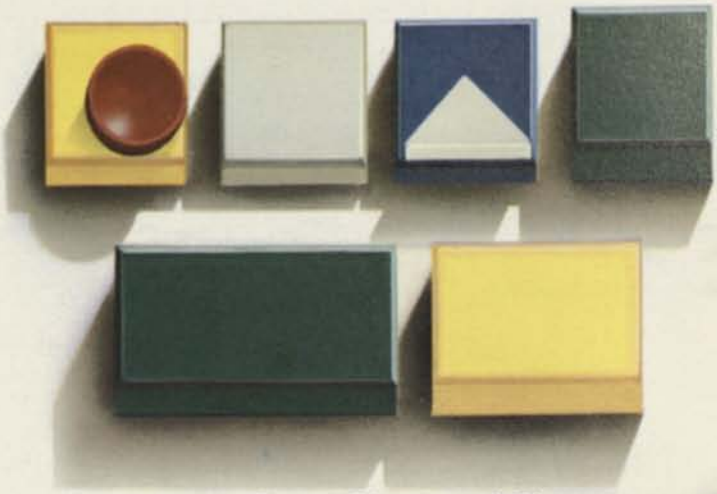


Pushbutton Switches have 2 or 4-pole double-throw double-break circuitry, momentary or alternate action, with lighted display option.

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.



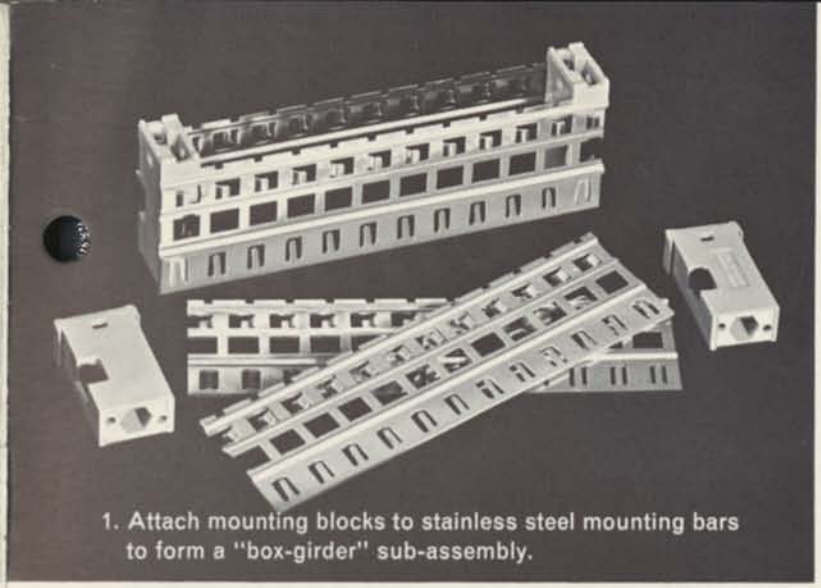
Flexibility in Color, Shape and Size

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.

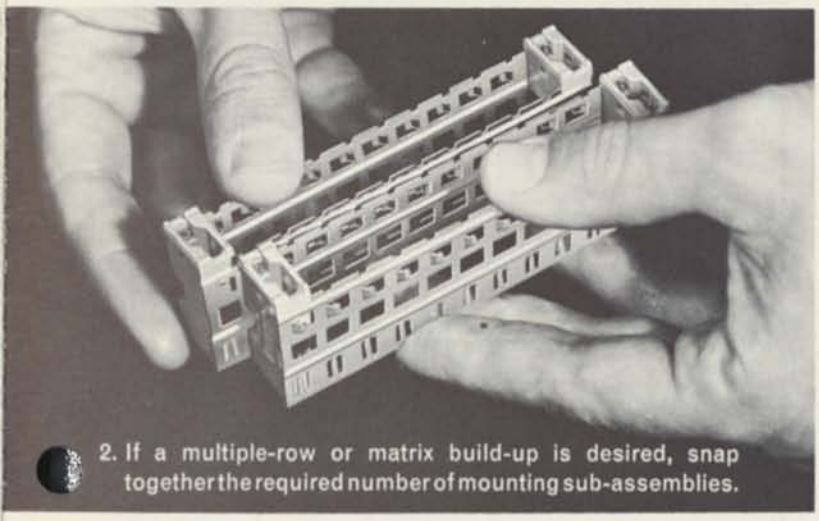
Quick and Easy to Assemble

Lighted pushbutton switches

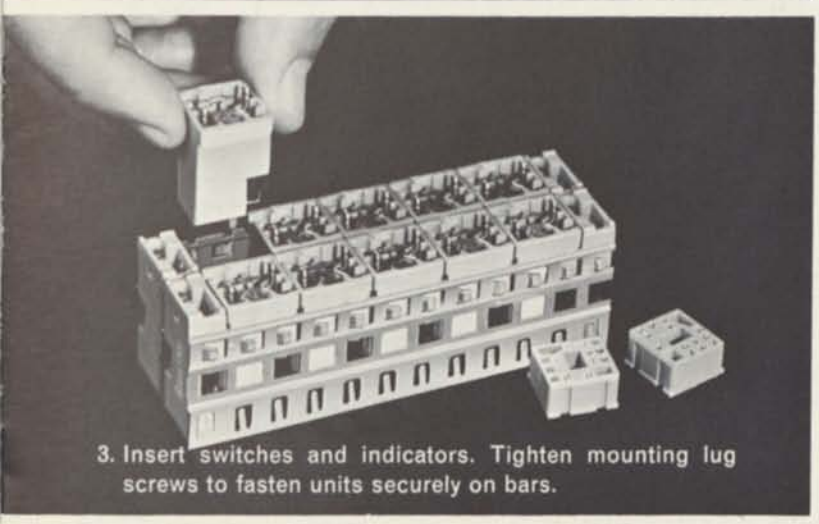
and matching indicators



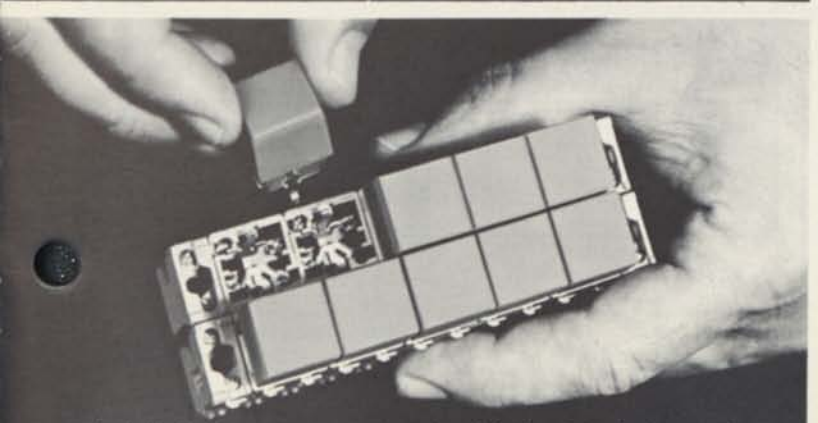
1. Attach mounting blocks to stainless steel mounting bars to form a "box-girder" sub-assembly.



2. If a multiple-row or matrix build-up is desired, snap together the required number of mounting sub-assemblies.



3. Insert switches and indicators. Tighten mounting lug screws to fasten units securely on bars.



4. Add buttons, snap connector blocks into bottom of assembly, wire and install.

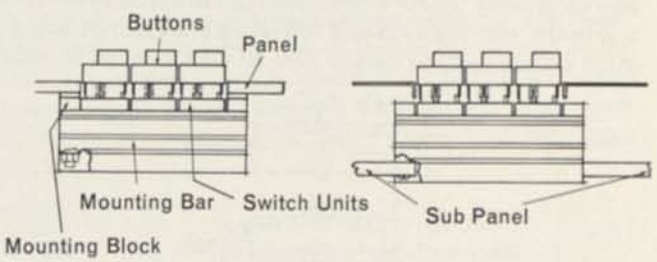
Standard Building Block Units

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

1/2-UNIT.....3/8" x 3/4"	1 1/2-UNIT....1 1/8" x 3/4"
1-UNIT.....3/4" x 3/4"	2-UNIT.....1 1/2" x 3/4"



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.

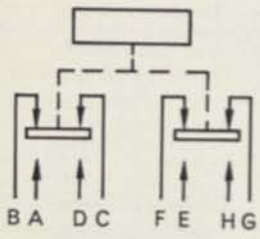
Switch Modules

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.

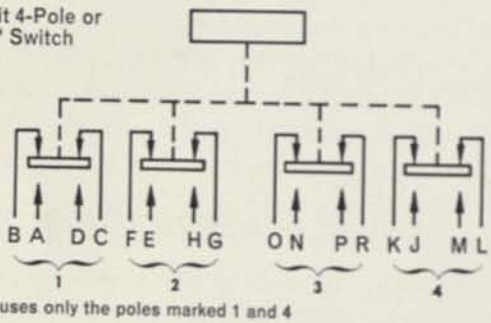
Alternate-action (push-on push-off) switches transfer and maintain circuit transfer between operations. When the button is pushed and released, it remains visibly below the level of other unoperated switches (approx. 3/16"). Circuit transfer is maintained until the button is pushed a second time to return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

SWITCH CIRCUITS

1-Unit 2-Pole Switch



1½-Unit 4-Pole or 2-Pole* Switch

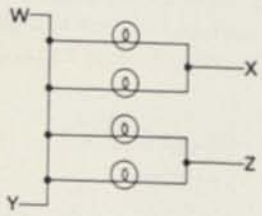


*2-Pole uses only the poles marked 1 and 4

LAMP CIRCUIT

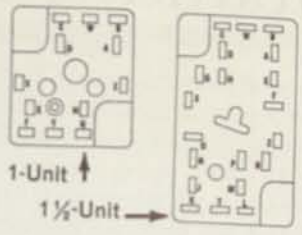
Terminals "W" and "Y" are common. Series wiring (connection of "X" and "Z" for 4-lamp hook-up) is not recommended.

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



TERMINAL LOCATIONS

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.

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.	 2-Pole 1-Unit
7A1CC	Alternate Action (tactile feedback)	Terminals A, B, C, D, E, F, G, H.	
7A1CE	Momentary Action (tactile feedback)	Has Extended Plunger for Momentary Lockout 7F1AA* Only. Terminals A, B, C, D, E, F, G, H.	 2-Pole 1-Unit
7A1CG	Momentary Action (no tactile feedback)	Has Extended Plunger for Bail and Lockout 7F1AC* Only. Terminals A, B, C, D, E, F, G, H.	
7A1CJ	Alternate Action (tactile feedback)	Has extended plunger for Momentary Lockout 7F1AA* Only. Terminals A, B, C, D, E, F, G, H.	
7A1GA	Momentary Action (tactile feedback)	Terminals A, B, C, D, J, K, L, M.	 2-Pole 1½-Unit
7A1GC	Alternate Action (tactile feedback)	Terminals A, B, C, D, J, K, L, M.	
7A1EA	Momentary 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
7A1EC	Alternate Action (tactile feedback)	Terminals A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, R.	

*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 1½-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	
7C1	1-Unit	Single Level 1 or 2-Unit Button	
7C2	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

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

*A Spirol Pin (7G3GF) is included with each 2nd level bar ordered.

**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.

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**	

*Refer to Page 6, Table 1, footnote 3.

**Refer to Page 6, Table 1, footnote 4.

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	
7D3	1-Unit	Terminal Housing	
7D7	1-Unit	Connector Block (terminal housing with 12 terminals inserted)	
7D4	1½-Unit	Terminal Housing	
7D8	1½-Unit	Connector Block (Terminal housing with 20 terminals inserted)	
7D6	—	Quick-Connect Terminal (Sold only in multiples of 50)	

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 

Color	Catalog Listing		
	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

Buttons for Switches and Indicators

EASY TO ADD LAMPS

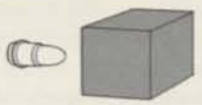
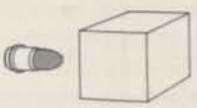
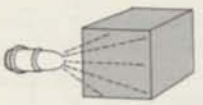
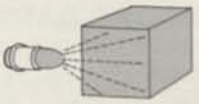
Addition or removal of the T-1 type lamps can be accomplished easily from front of panel after removing the button. No tools are required.

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). →

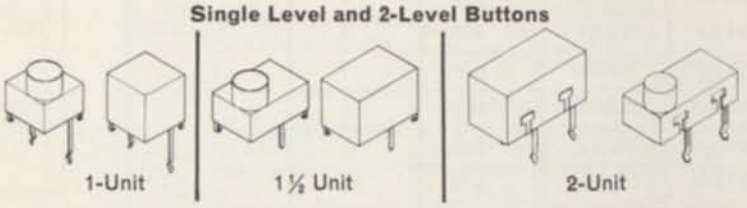
Buttons are available in red, yellow, green, blue, white, gray and black in the one-color single-level type and in one-color and 2-color combination in the 2-level style.

	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.

Single Level and 2-Level Buttons



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	03	C

TABLE 1 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.

3) As a lighted pushbar, with one 1-unit switch and a pushbar mounting block with lighted capability (Catalog Listing 7E3BA).

4) As an unlighted pushbar, with one 1-unit switch and a pushbar mounting block without lighted capability (Catalog Listing 7E3BB).

TABLE 2 BUTTON CONSTRUCTION

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

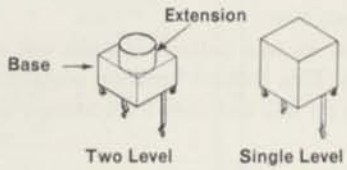
*Oriented for applications with Mounting Bars horizontal.

**Oriented for applications with Mounting Bars vertical.

TABLE 3 BUTTON COLORS

Color	Portion of Catalog Listing		
	Two Level Button		Single Level Button
	Base	Extension	Single Color
Red	R	R	RR
Blue	B	B	BB
Green	G	G	GG
Yellow	Y	Y	YY
White	W	W	WW
*Black	K	K	KK
*Gray	A	A	AA

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



Notes for Table 3

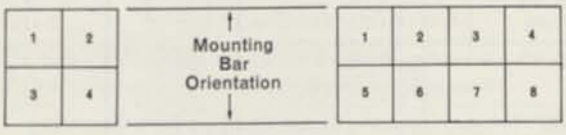
1. All listings require two (2) letters.
2. For two level, two color buttons the first letter indicates base color and the second letter indicates extension color.
   Example: White Base with Red Extension would be WR.
3. A single color button requires a double letter of color desired.
   Example: A 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 and 1½ 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 Catalog Listing		Projected Colors	
Colored Lamps	Colored Filters	Circuit X	Circuit Z
CA	AA	Red	None
CB	AB	Blue	None
CC	AC	Green	None
CD	AD	Yellow	None
CE	AE	White	None
CF	AF	Red	Blue
CG	AG	Red	Green
CH	AH	Red	Yellow
CJ	AJ	Red	White
CK	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	Type
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 Catalog Listing	1 or 1½ Unit Button		2-Unit Button/Pushbar	
	No. of Lamps	Lamp Positions	No. of Lamps	Lamp Positions
A	0	—	0	—
B	1	2	2	4 & 5
C	2	1 & 2	3	1, 2 & 4
D	4*	1, 2, 3 & 4	4**	2, 4, 5 & 7
E	—	—	6**	1, 2, 4, 5, 7 & 8

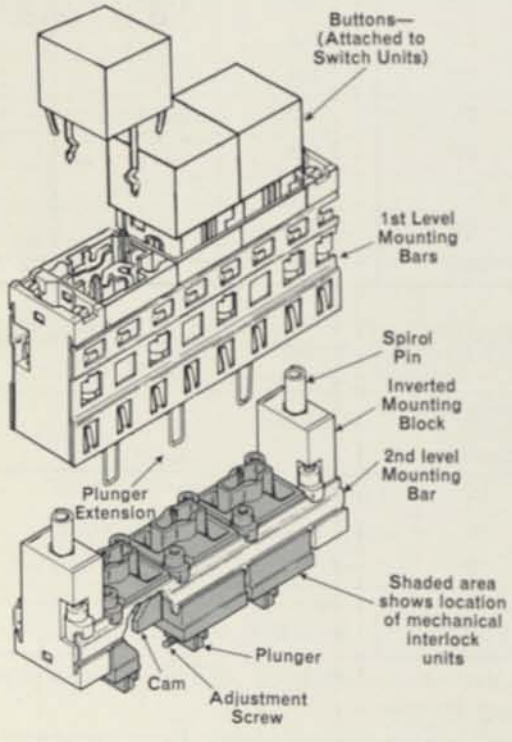
*2.3 (max.) total wattage
**2.5 (max.) total wattage

Mechanical Interlock "Add-On" Devices

Mechanical interlock units can be added under a row of push-button 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

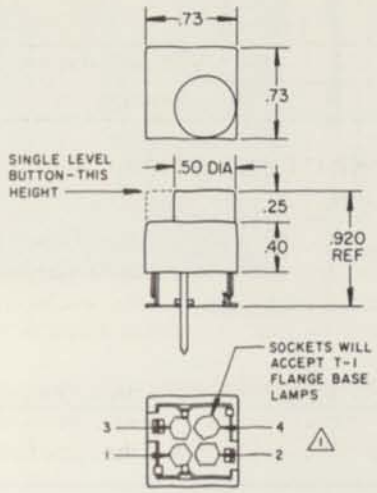
Catalog Listing	Description
7G3GA*	Mounting Screw and Lug for Switch, Indicator and Spacer Mounting Block (Sold only in multiples of 10.)
7G3GE**	Long Mounting Screw For Two Level Mounting (Sold only in multiples of 50.)
7G3GF*	Spirol Pin For Two Level Mounting (Sold only in multiples of 10.)
7G3GH*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

*These items are replacement parts and need not be ordered initially.

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

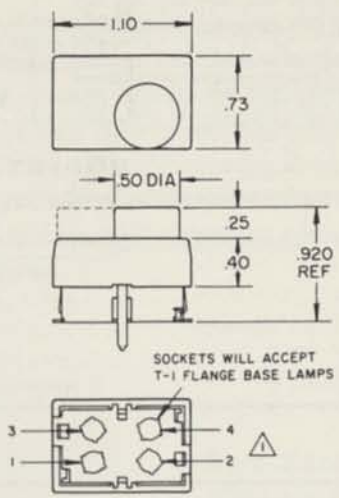
MOUNTING DIMENSIONS

1-UNIT BUTTON



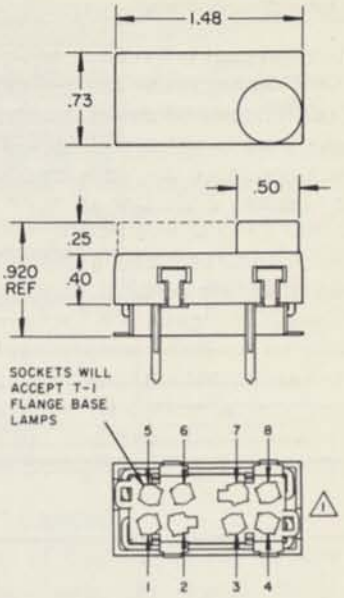
1 Lamp positions 1 and 2 are lighted by Terminal "X" (Circuit "X"), while 3 and 4 are lighted by Terminal "Z" (Circuit "Z").

1½-UNIT BUTTON



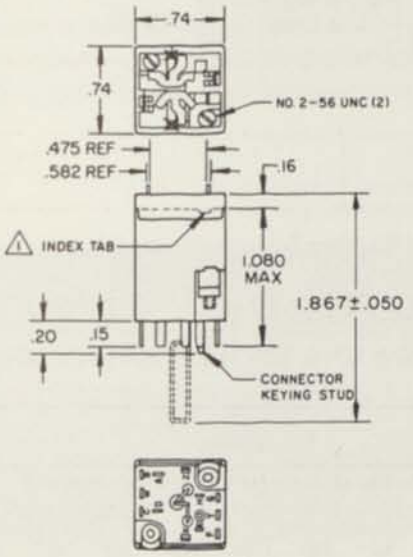
1 Lamp positions 1 and 2 are lighted by Terminal "X" (Circuit "X"), while 3 and 4 are lighted by Terminal "Z" (Circuit "Z").

2-UNIT BUTTON/PUSHBAR



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

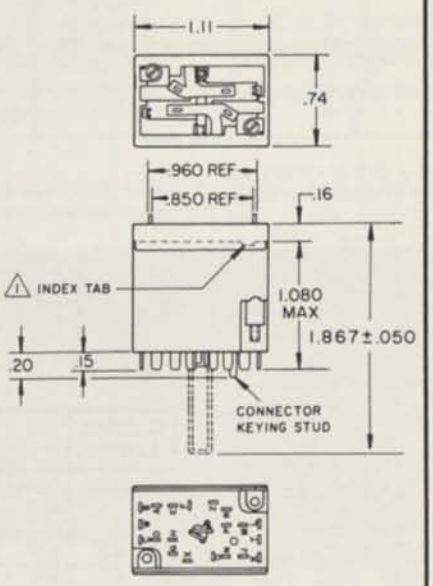
1-UNIT SWITCH*



X Button plungers plug into switch plungers at these points. Switch plunger surface is color coded.

1 For recommended panel orientation, tab should be facing forward (or toward operator) for horizontal mount and to left for vertical mount arrangements.

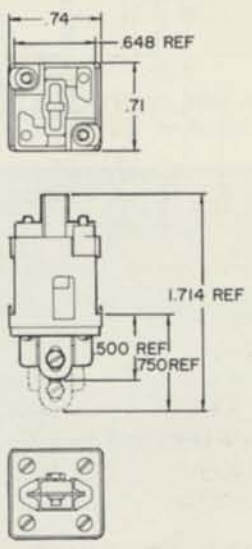
1½-UNIT SWITCH*



X Color Coded: Straight leg of button plugs in at this point.

1 For recommended panel orientation, tab should be facing forward (or toward operator) for horizontal mount and to left for vertical mount arrangements.

MECHANICAL INTERLOCK MODULE

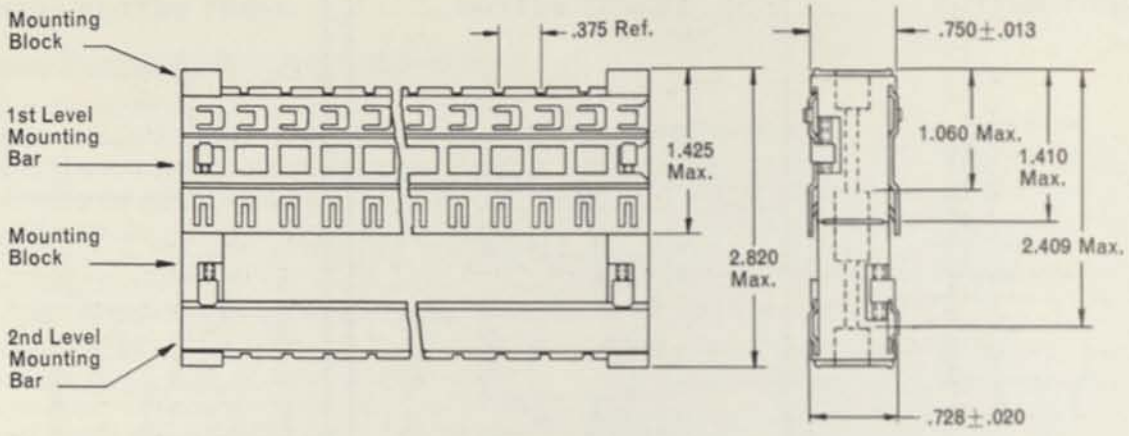


Total depth from top of first level mounting block to bottom of fully depressed plunger is 3.4 in. max.

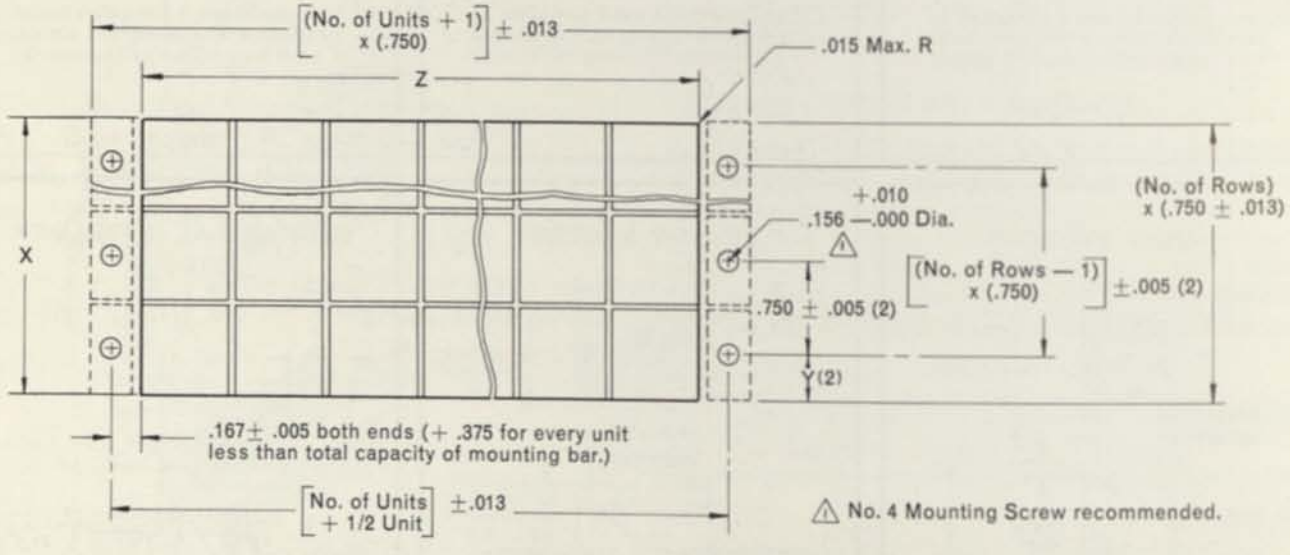
*Dimensions are identical to indicator module, but has no switch terminals

MOUNTING DIMENSIONS

BEHIND PANEL



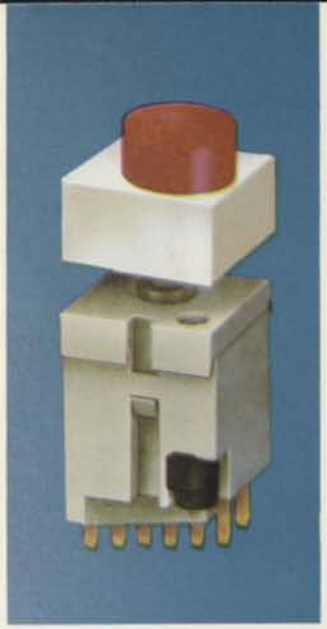
CUT-OUT



Dimensions "X" and "Z" Refer to Panel Cutout

No. of Rows	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
"X" Dimension ± .010 (except where noted)	.765±.005	1.540	2.305	3.055	3.815	4.565	5.315	6.065	6.815	7.575	8.325	9.075	9.825	10.575	11.325	12.075
"Y" Dimension ± .005	.380	.395	.400	.400	.408	.408	.408	.408	.408	.414	.414	.414	.414	.414	.414	.414

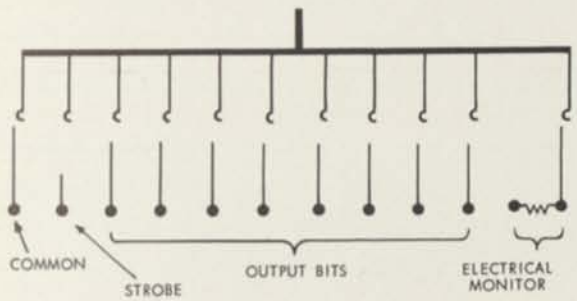
No. of Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
"Z" Dimension ±.010	.760	1.540	2.290	3.040	3.790	4.540	5.290	6.040	6.790	7.540	8.290	9.040	9.790	10.540	11.290	12.040



Encoding Switch for data entry

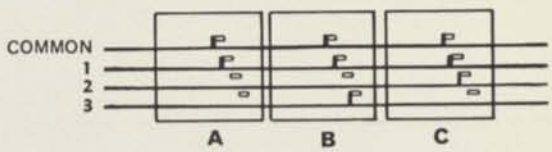
- Up to eight output bits
- 256 possible code combinations
- Momentary action

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.)



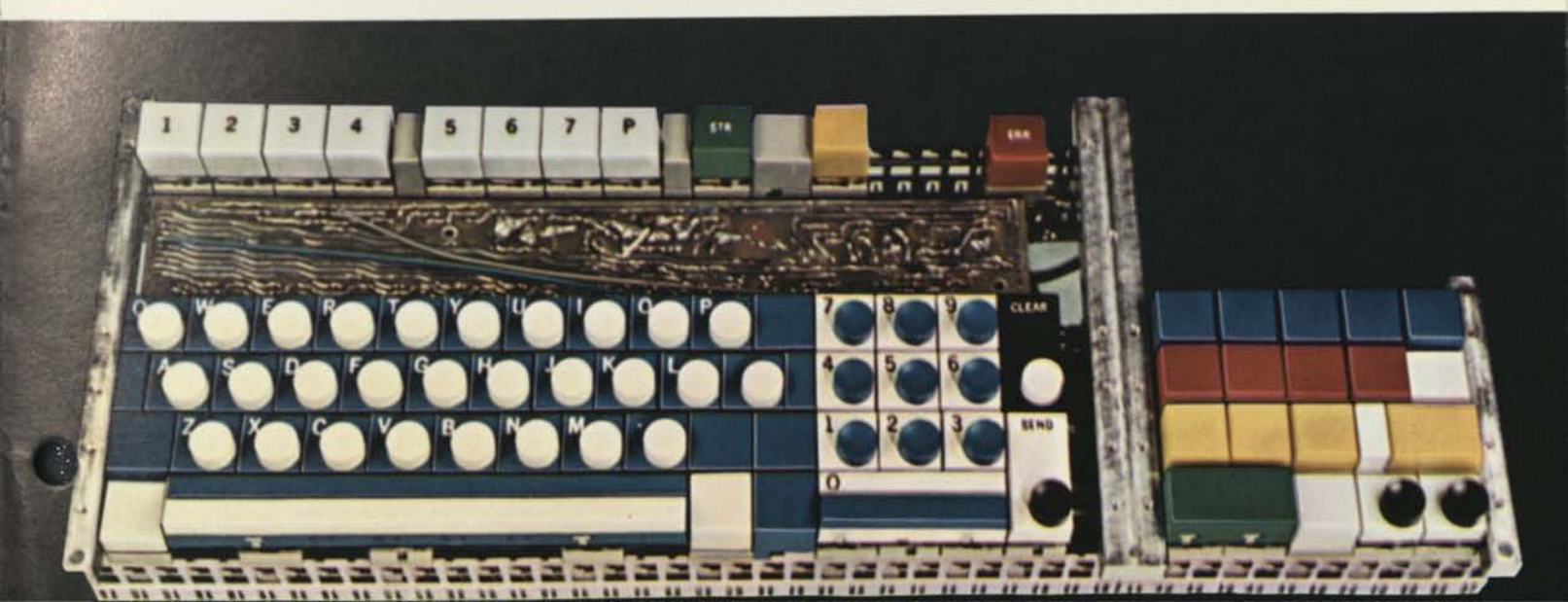
"Auto-Encoding" Feature

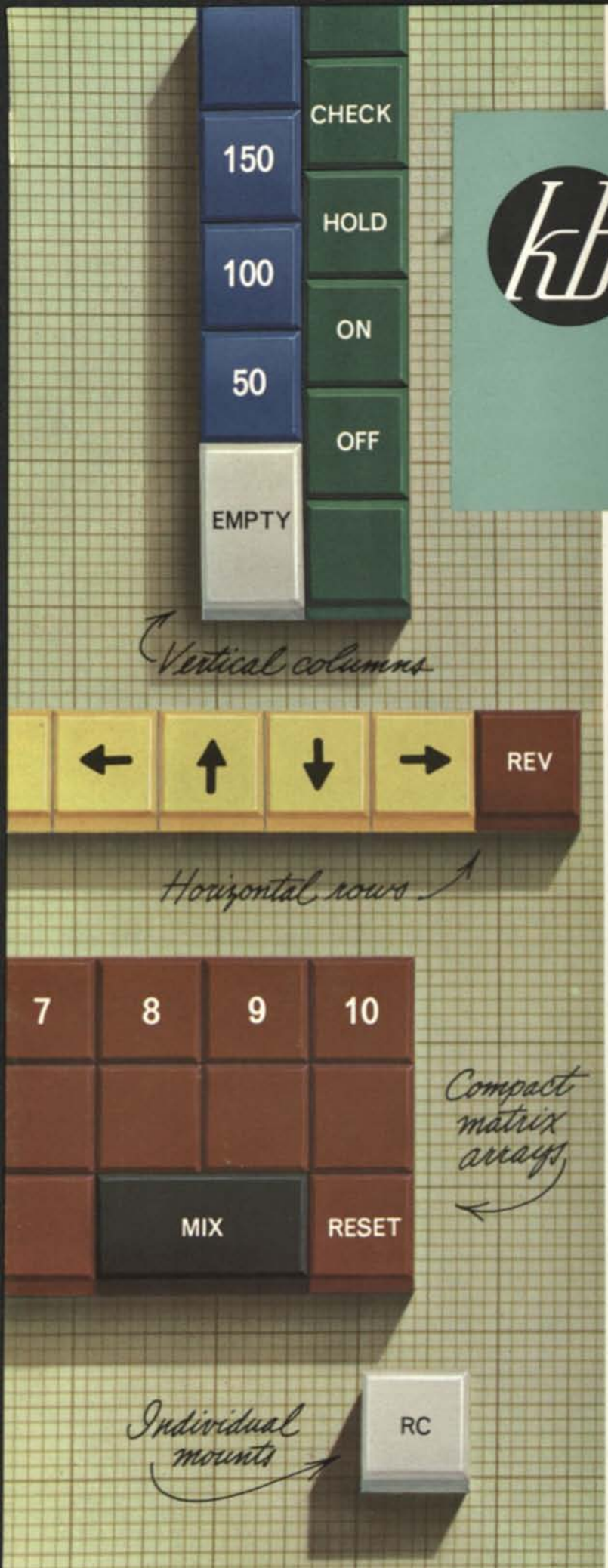
This graphic view of the wiring shows how the encoding switch terminals are bussed in a row using the encoding strips.

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.





Lighted pushbutton switches

For More Information
Call the nearest MICRO SWITCH Authorized Distributor or Branch Office for further details on KB.

MICRO SWITCH

FREEPORT, ILLINOIS 61033

A DIVISION OF HONEYWELL

IN CANADA: HONEYWELL CONTROLS LIMITED, TORONTO 17, ONTARIO

Form No. 84-769A W-2-6

Printed in U.S.A.

Covering MICRO SWITCH Products in "KB" Bulletin 70

TERMS AND CONDITIONS OF SALE

Effective January 1, 1967

A) **DATA** – All the data published in this schedule is effective as of the above date and is subject to change without notice.

B) **ERRORS** – All stenographic and clerical errors are subject to correction.

C) **DISCOUNTS AND PRODUCT CLASSES** –
(1) Discounts are based on quantity ordered on one purchase order.
(a) Multiple shipments of the same listing are allowable to the extent each shipment meets the level set forth as the "QUANTITY" adjacent product class in the headings below.
(b) Various listings of the same product class may be combined for discount to the extent each shipment of each listing meets the level set forth as the "QUANTITY" adjacent the product class in the headings below.
(2) Listings of different product classes can not be combined for discount.
(3) Listings which are unclassified (UNC) can not be combined for discount.

D) **SHIPMENTS** – All prices are F.O.B. Freeport, Illinois.

E) **TAXES** – The amount of any and all taxes shall be added to the price and be paid by the purchaser because of transaction under effective statute, or in lieu thereof, the purchaser shall furnish the seller with tax exempt certificates acceptable to the taxing authorities.

F) **TERMS OF PAYMENT** – Net thirty (30) days.

G) **WARRANTY** – Seller warrants its products to be free from defects in material and workmanship under normal use and service and seller will repair or replace without charge any such product it finds to be so defective on its return to seller within one year of date of shipment to the original purchaser. The foregoing is in lieu of all other expressed or implied warranties (except of title), guarantees, obligations, or liabilities on seller's part.

H) **MINIMUM ORDER** – A minimum charge of $15.00 will apply on all orders. It is recommended that smaller orders be placed through your nearest MICRO SWITCH Authorized Distributor.

DISCOUNT "R"

Except for legending, Discount "R" applies to all products in this schedule.

1-24 – None
25-99 – 10%
100-499 – 18%

"Products in these quantities can be purchased through our Authorized Distributors (see the Yellow Pages)."

SWITCH MODULES

Product Class 136. Quantity 50. See Page 4 of Bulletin 70.

TYPE	ACTION	CATALOG LISTINGS	LIST PRICE
2 Pole 1 Unit	Momentary Action	7A1CA	$4.90
	Alternate Action	7A1CC	5.25
	Momentary Action Extended Plunger	7A1CE	5.20
	Momentary Action No Tactile Feedback Extended Plunger	7A1CG	4.90
	Alternate-Action Extended Plunger	7A1CJ	5.55
2 Pole 1½ Unit	Momentary Action	7A1GA	5.50
	Alternate Action	7A1GC	5.85
4 Pole 1½ Unit	Momentary Action	7A1EA	7.50
	Alternate Action	7A1EC	7.85

INDICATORS

Product Class 136. Quantity 50. See Page 4 of Bulletin 70.

SIZE	CATALOG LISTING	LIST PRICE
1 Unit	7C1	$1.75
1½ Unit	7C2	1.90

SPACERS

Product Class 141. Quantity 50. See Page 5 of Bulletin 70.

SIZE	PORTION OF CATALOG LISTING	LIST PRICE
½ Unit, Low Level	7G1A-	$0.45
½ Unit, High Level	7G1B-	0.45
1 Unit, Low Level	7G1C-	0.50

Prices for Spacers (above) are for basic unit sizes. Only portion of catalog listing affecting price is shown. The balance of the catalog listing determined by the colors selected as shown under "Spacers".

MOUNTING BARS

Product Class 139. Quantity 50. See Page 5 of Bulletin 70.

SIZE (UNITS)**	CATALOG LISTING		LIST PRICE
	1st LEVEL	2nd LEVEL*	
1	7E1AA	7E2AA	$0.25
2	7E1AB	7E2AB	0.25
3	7E1AC	7E2AC	0.30
4	7E1AD	7E2AD	0.30
5	7E1AE	7E2AE	0.35
6	7E1AF	7E2AF	0.35
7	7E1AG	7E2AG	0.40
8	7E1AH	7E2AH	0.45
9	7E1AJ	7E2AJ	0.50
10	7E1AK	7E2AK	0.55
11	7E1AL	7E2AL	0.60
12	7E1AM	7E2AM	0.65
13	7E1AN	7E2AN	0.70
14	7E1AP	7E2AP	0.75
15	7E1AR	7E2AR	0.80
16	7E1AS	7E2AS	0.85

*A Spirol Pin (7G3GF) is included with each 2nd level bar ordered.
**Mounting bar sizes are based on the number of 1-unit controls they will accept. Thus, a "1-unit" mounting bar is actually 2-units or 1-½" long, since it includes the space for a mounting block (½-unit) at each end; a "2-unit" mounting bar is 3-units or 2¼" long, etc.

MOUNTING BLOCKS

Product Class 139. Quantity 50. See Page 5 of Bulletin 70.

ITEM	CATALOG LISTING	NET PRICE
Pushbar Mounting Block (With lighted capability)	7E3BA	$1.85
Pushbar Mounting Block (Without lighted capability)	7E3BB	1.35
End Mounting Block	7E3CA	0.50
Spacer Mounting Block	7E3CB	0.50

MECHANICAL INTERLOCK

Product Class 140. Quantity 50. See Page 8 of Bulletin 70.

MODULE	CATALOG LISTING	LIST PRICE
Momentary Lockout	7F1AA	$1.80
Bail & Lockout	7F1AC	2.10

BUTTONS FOR SWITCHES AND INDICATORS

Product Class 137. Quantity 50. See Pages 6 & 7 of Bulletin 70.

Prices shown in the table below are for basic units.
These additional costs must be added as required:

(1) **Lamps** ($0.95 net each for clear lamps, $1.25 net each for colored lamps.) See Table 7 on page 7 of Bulletin 70. (Refer to "Lamp Policy".)

(2) **Color Filters** (Add $0.15 per filter to the list price of the button.) For projected color using filters, each lamp requires one filter. Two lamps minimum are recommended for each projected color.

(3) **Legending** – See price schedule.

BUTTON SIZE	LEVELS	PORTION OF CATALOG LISTING	LIST PRICE (SEE ABOVE)
1 Unit	Single Level	7B1C- 7B1D-	$0.95 0.95
	2 Level	7B1C- 7B1D-	1.10 1.10
1½ Unit	Single Level	7B1E- 7B1F-	1.10 1.10
	2 Level	7B1E- 7B1F-	1.25 1.25
2 Unit	Single Level	7B2A- 7B2B-	2.10 2.10
	2 Level	7B2A- 7B2B-	2.25 2.25

WIRING HARDWARE

Product Class 138, Quantity 50, except Quick-Connect Terminals, which are Unclassified. See Page 5 in Bulletin 70.

ITEM	CATALOG LISTING	LIST PRICE
Quick Connect Terminal (Sold only in multiples of 50)	7D6	$0.09 (net ea.)
Connector Block for 1 Unit Switch or Indicator Module. (12 Terminals)	7D7	2.00
Connector Block for 1½ Unit Switch or Indicator Module. (20 Terminals)	7D8	3.00
Terminal Housing for 1 Unit Switch or Indicator Module.	7D3	0.45
Terminal Housing for 1½ Unit Switch or Indictaor Module.	7D4	0.50

LAMP POLICY

As a convenience to customers using T-1 type lamps with 7B1 Buttons and 7B2 (2 unit) pushbars, MICRO SWITCH offers such lamps subject to the following provisions.

a. A customer may buy up to four lamps for each 7B1 lighted button ordered on a single purchase order, or up to eight lamps for each 7B2 2-unit lighted pushbar on a single purchase order.
   1. Unless otherwise specified, lamps will be assembled into buttons or pushbars.
   2. If order calls for providing lamps unassembled, the number of lamps customer is entitled to buy is still covered by (a) above. All lamps furnished unassembled will bear a 7G2 designation and will carry a higher price to cover cost of handling and packaging. Unassembled prices are $1.10 net each for clear lamps and $1.40 net each for colored lamps.
   3. The button catalog listing will be determined by the actual number of lamps assembled into the button, without regard to lamps (purchased on the same order) to be furnished unassembled.
   4. Additional orders for lamps referencing earlier p.o. under which lamps were ordered in numbers less than specified in (a) above must be dated within 3 months after original order is shipped.

b. Customers requiring more than the number of lamps provided in (a) above should purchase them from one of the lamp manufacturers or their agents.

c. No warranty is offered or implied hereby, the service being one of convenience to MICRO SWITCH customers, MICRO SWITCH will supply lamps of commercial quality from manufacturers of good repute. MICRO SWITCH cannot guarantee to provide lamps from specific manufacturers. Any technical or quality questions regarding such lamps should be directed to the lamp manufacturer.

d. Lamps may not be ordered for buttons which are nonlighted types (7B1A, 7B1B, 7B1D, 7B2B, C, D, E).

COLORED LAMPS

As stated in paragraph (b), above, replacement lamps are to be purchased from the manufacturer or their agents. At present, colored lamps for KB are manufactured to MICRO SWITCH color specifications only by: Chicago Miniature Lamp Works, 4433 North Ravenswood, Chicago, Illinois. Their part numbers are:

CM8-718-801 – Red Lamp, CM8-718-802 – Yellow Lamp,
CM8-718-803 – Green Lamp, CM8-718-804 – Blue Lamp,
CM8-718-805 – White Lamp.

REPLACEMENT PARTS

Product Class – Unclassified. See page 8 of Bulletin 70.

ITEM		CATALOG LISTING	NET PRICE
Mounting Screw & Lug for Switch, Indicator, and Spacer Mounting Block (Sold only in multiples of 10)		7G3GA	$0.20
Long Mounting Screw for 2-Level Mounting (Sold only in multiples of 50)		7G3GE	0.10
Spirol Pin for 2-Level Mounting (Sold only in multiples of 10)		7G3GF	0.20
Mechanical Interlock Mounting Screw & Lug (Sold only in multiples of 10)		7G3GH	0.20
T-1 Type #718 Lamps (Furnished unassembled. See "Lamp Policy")	Clear	7G2LA	1.10
	Red	7G2AR	1.40
	Green	7G2AG	
	Blue	7G2AB	
	Yellow	7G2AY	
	White	7G2AW	

NET PRICES FOR LEGENDING *

(NET PRICES ARE PER SCHEDULED SHIPMENT OF IDENTICAL LEGENDS.)

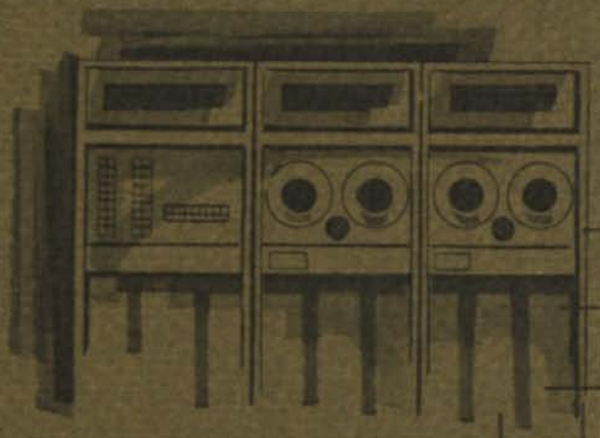
	1	2	3	4	5	6	7	8	9	10	15	25	50	100	250
1 Line	3.48	1.77	1.20	.91	.75	.64	.55	.50	.44	.41	.30	.20	.13	.10	.08
2 Lines	4.62	2.34	1.58	1.21	.98	.83	.72	.64	.57	.52	.37	.25	.15	.11	.08
3 Lines	5.65	2.86.	1.93	1.46	1.20	1.00	.87	.77	.68	.63	.44	.29	.17	.12	.09
4 Lines	5.97	3.00	2.04	1.55	1.25	1.06	.91	.81	.73	.66	.46	.31	.19	.13	.09

To specify desired legend information, use Legend Order Sheet , Form No. FO-62302

*Net prices indicated are for identical legends based on the quantities shown for a specific button, pushbar or spacer Catalog listing. All legend service prices are in addition to the price of the specific button, pushbar or spacer.

MICRO SWITCH
FREEPORT, ILLINOIS, U.S.A.
A DIVISION OF HONEYWELL
IN CANADA: HONEYWELL CONTROLS LIMITED, TORONTO 17, ONTARIO

FORM 84-774D MS-1-67 PRINTED IN U.S.A.



Introducing the
MICRO SWITCH *kb*

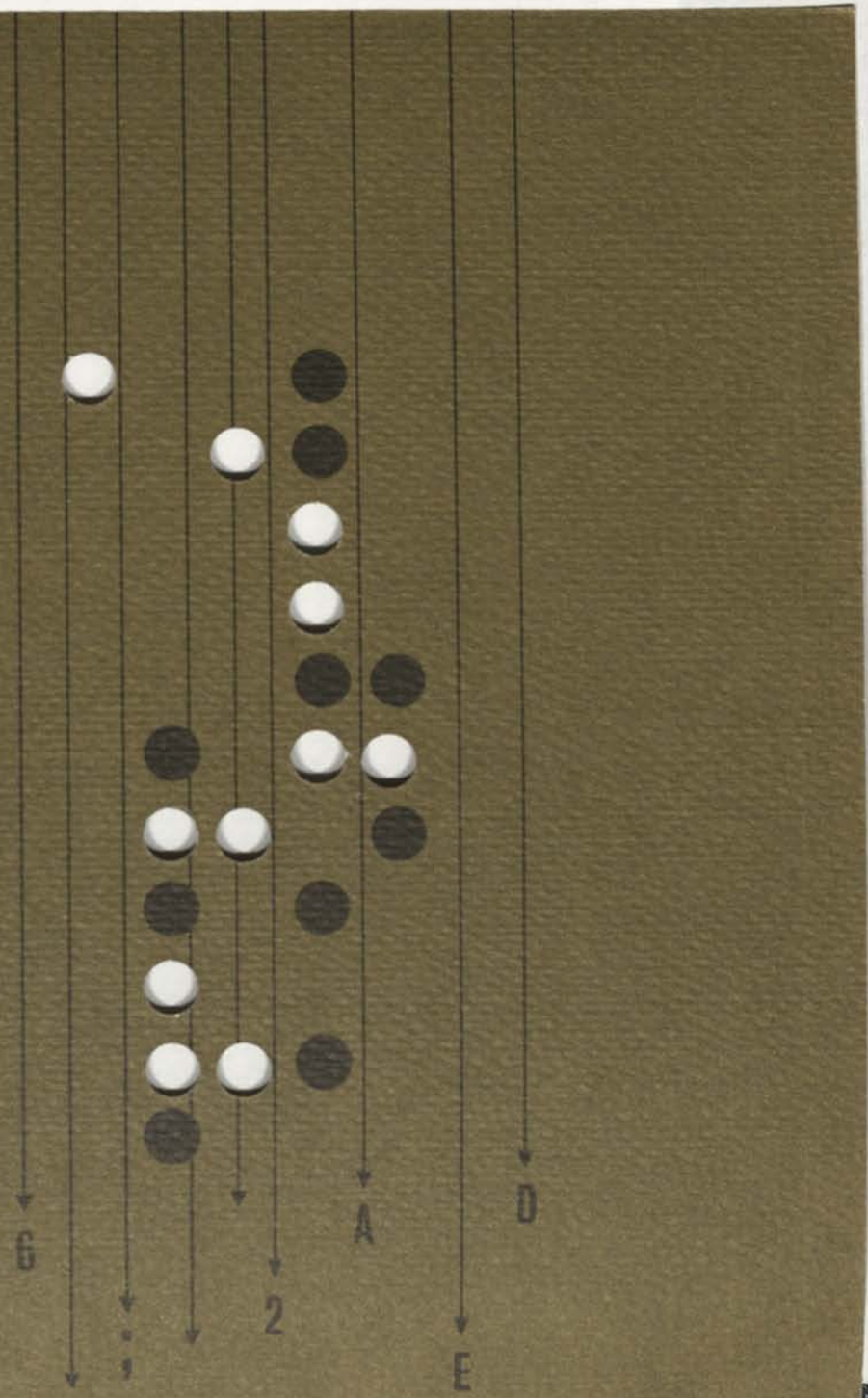
SWITCH/DISPLAY MATRIX

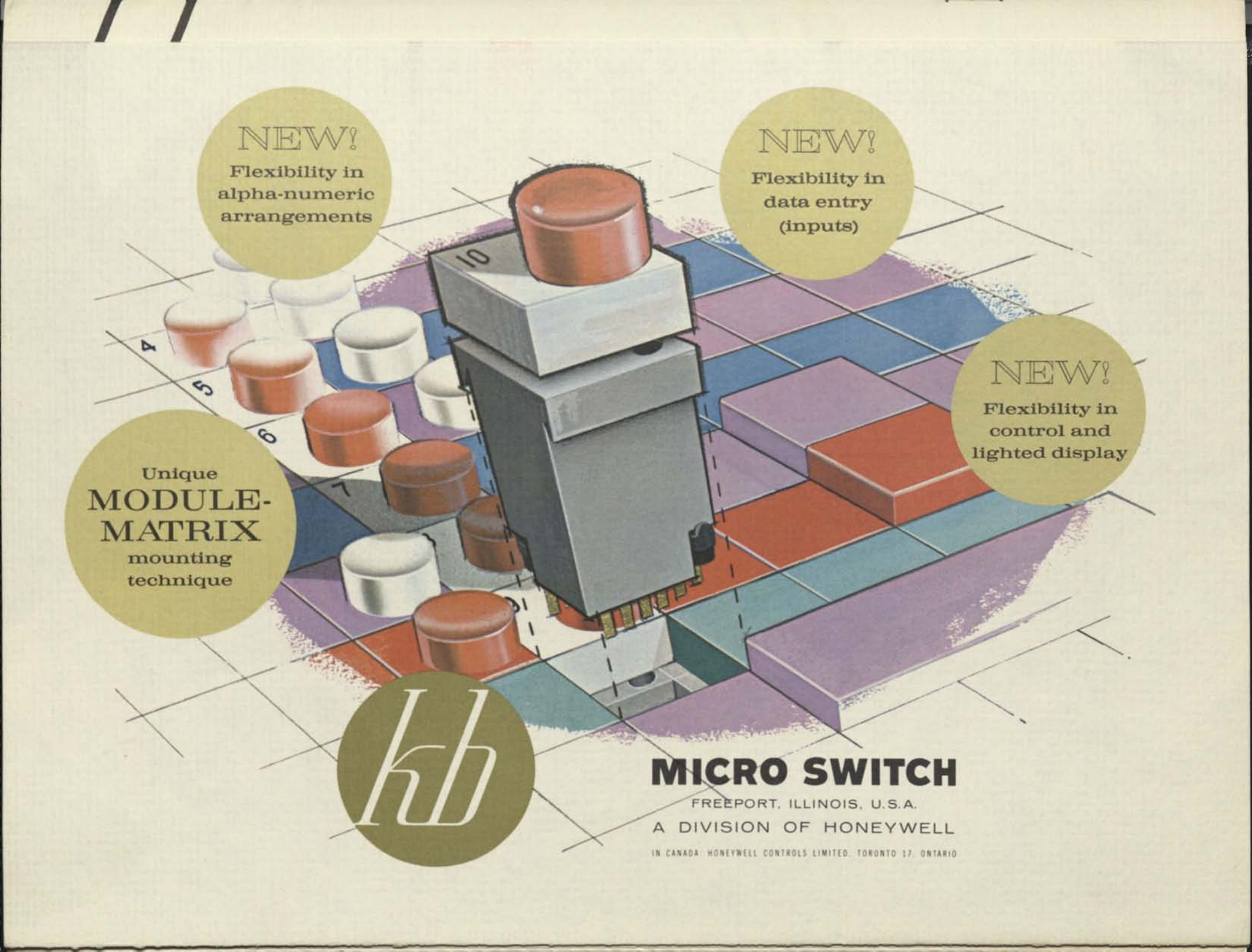
kb

SWITCH/DISPLAY MATRIX

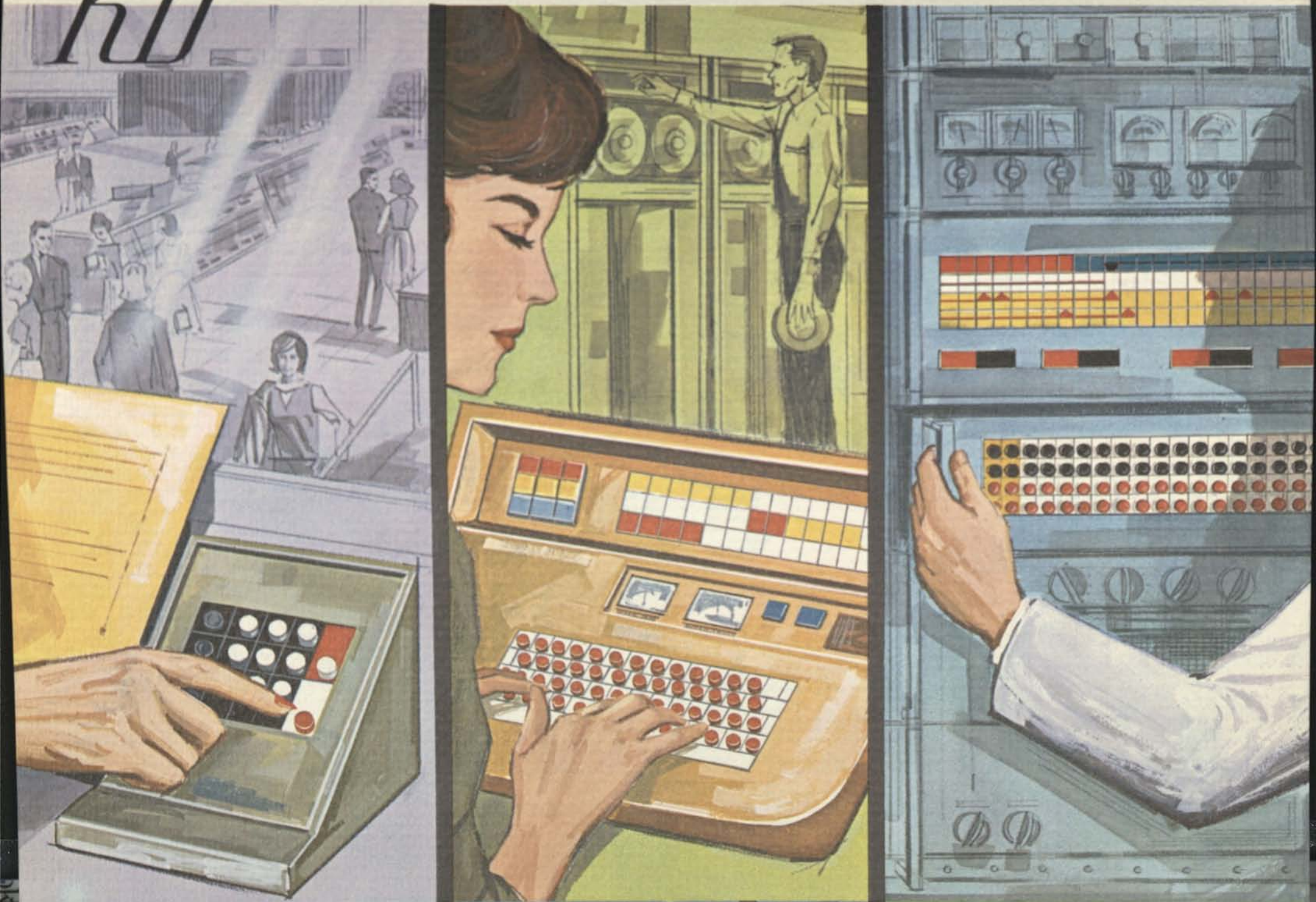
with a major new keyboard control concept:

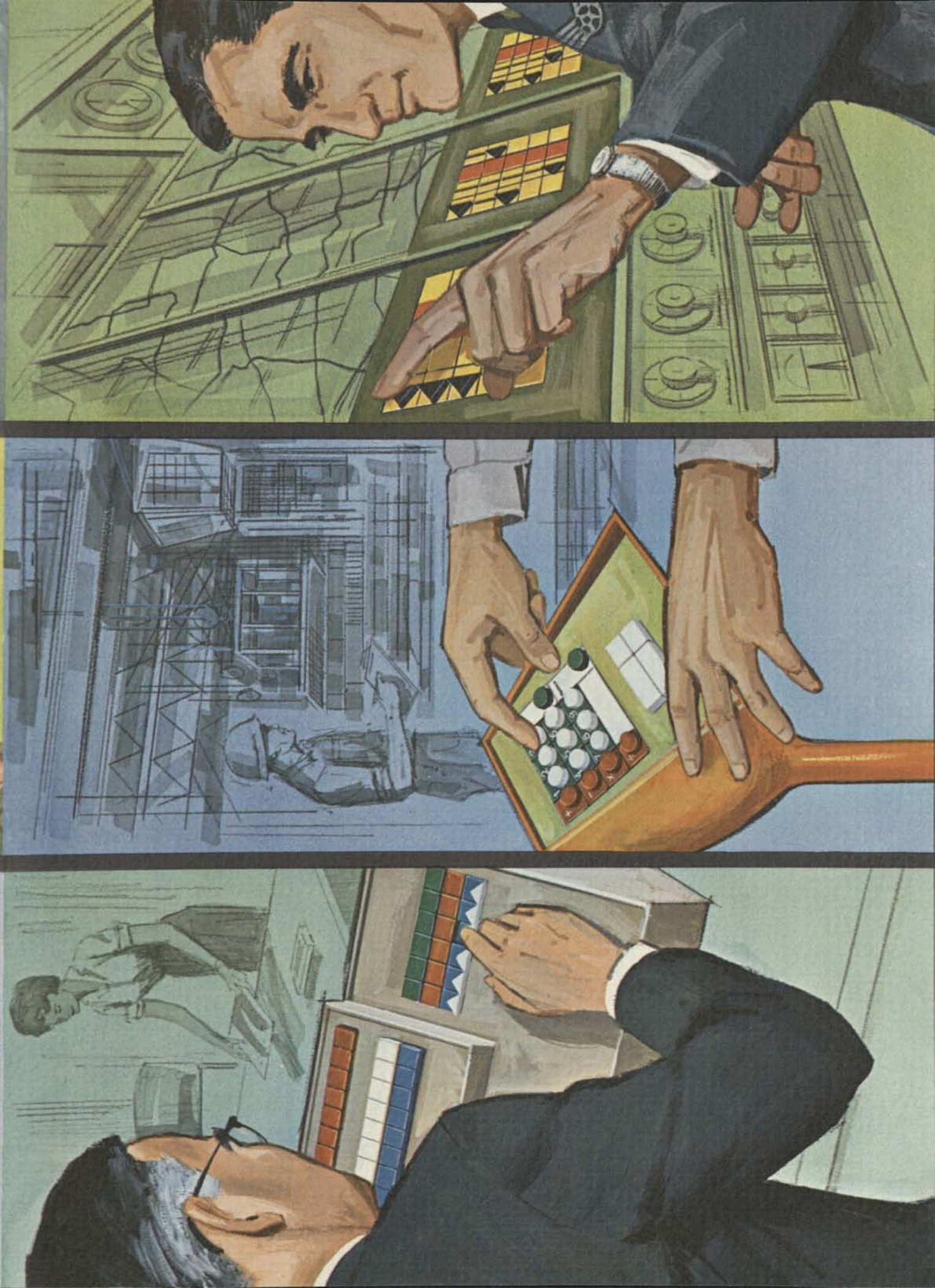
Flexibility!




NEW!
Flexibility in alpha-numeric arrangements
NEW!
Flexibility in data entry (inputs)
NEW!
Flexibility in control and lighted display
Unique
MODULE-MATRIX
mounting technique
MICRO SWITCH
FREEPORT, ILLINOIS, U.S.A.
A DIVISION OF HONEYWELL
IN CANADA: HONEYWELL CONTROLS LIMITED, TORONTO 17, ONTARIO

kb ...freedom for designers of man/machine interface

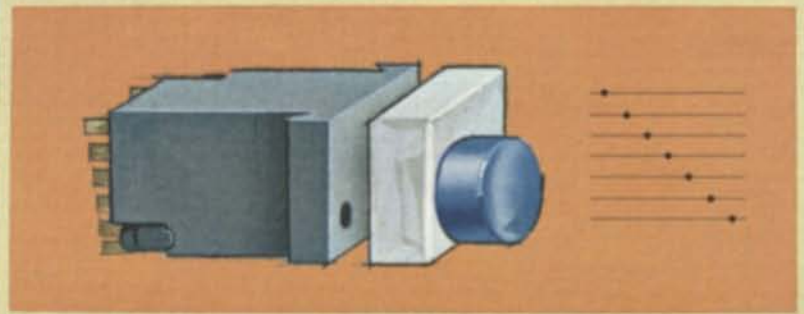




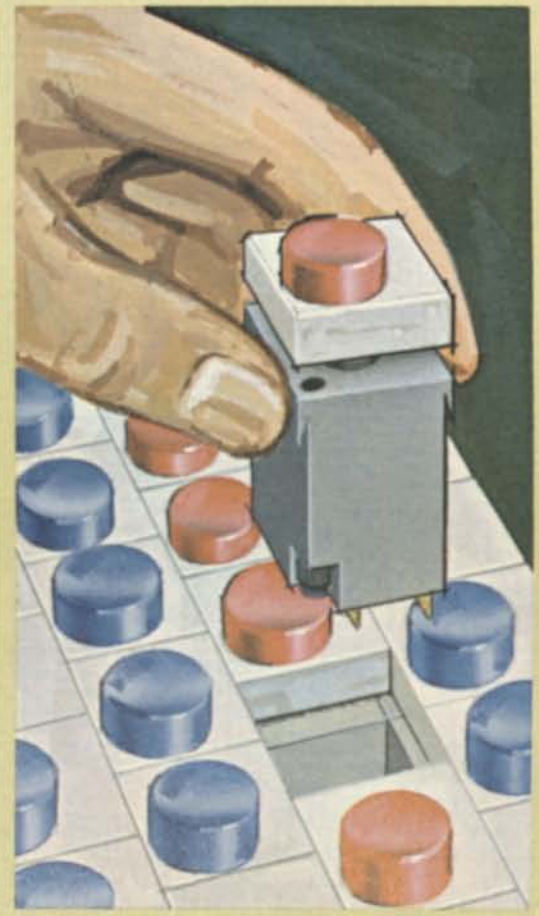
MICRO SWITCH "KB" offers a fresh approach to design and building of keyboards and control panels

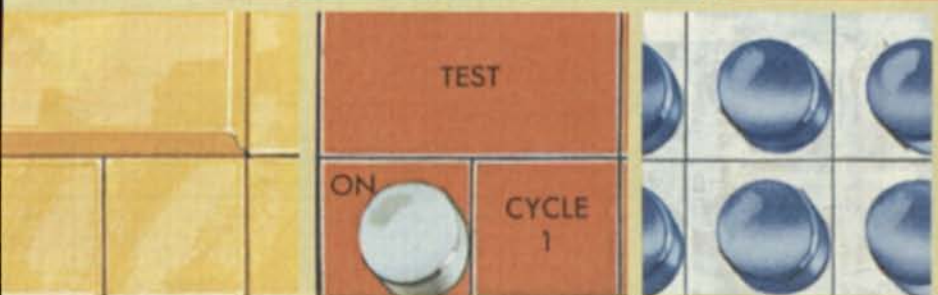
LIGHTED DISPLAY—in pushbutton switch modules and indicators; never before available in matrixed controls.

"AUTO ENCODING"—encoding switches enable encoding-by-connection; eliminates diode matrices, and associated cables and connections.

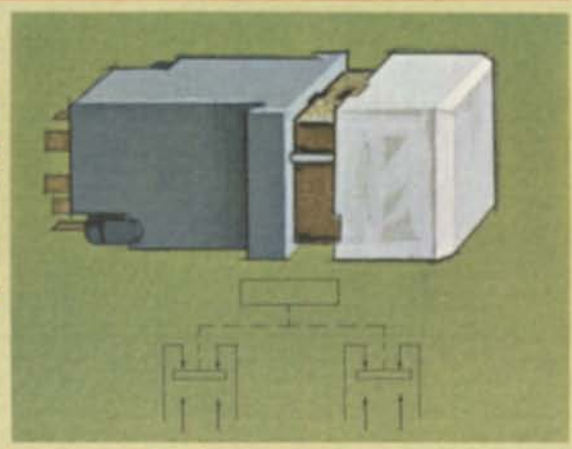


NEW TECHNIQUES—individual plug-in mount allows pre-wired switches to be inserted or removed from front of panel.

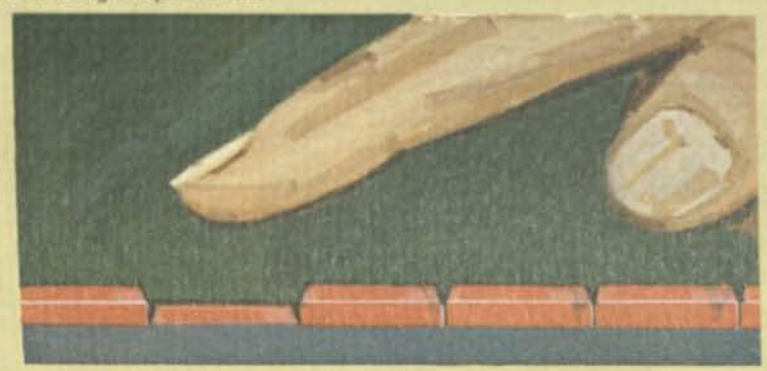




CUSTOMIZED APPEARANCE—vivid colors and different shapes to solve your own interface problems or design requirements.



FUNCTION CONTROL—power switches in choice of momentary or alternate-action. Has lighted display option.



MECHANICAL INTERLOCK—for bailing or lockout functions; one-by-one actuation, "key-down memory" feature.

MICRO SWITCH *kb* SWITCH/DISPLAY MATRIX

What is the "KB" Switch/Display Matrix?

The revolutionary new "KB" Switch/Display Matrix signals an advance in the state-of-the-art that offers a fresh approach to the design and construction of keyboards and control panels. The "KB" introduces a unique modular mounting technique which enables the entire matrix to be bench assembled! Vivid colored pushbuttons assemble into compact matrix and offer lighted display options.

Data entry, control, and indicating elements can be placed in the best positions and arrays without tooling or custom engineering. The compatible and unrestricted intermix of all components permits the human factors engineer and industrial designer to use the optimum configuration to solve his specific man/machine interface problem.

Two switch types are available—the encoding switch—and the power switch module.

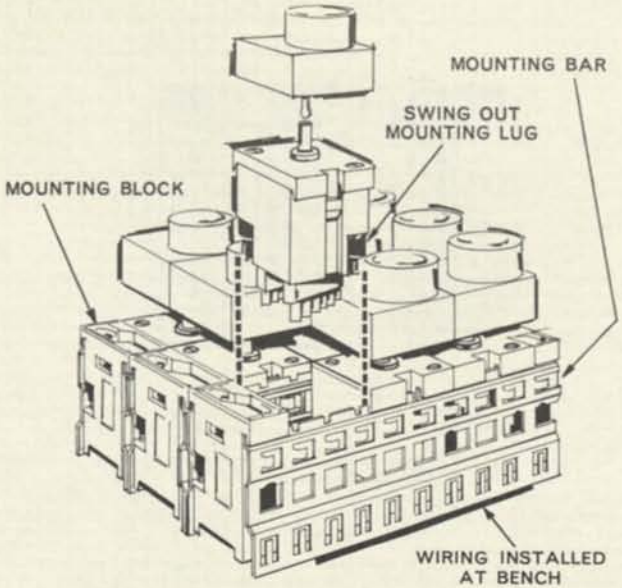
"Auto Encoding"—a MICRO SWITCH exclusive—enables encoding-by-connection. The encoding switch produces an 8-bit binary output which is field variable. This provides a completely modular data entry element without the usual diode matrix and cabling, thus eliminating the high cost of encoding the raw keyboard contact closures.

Typical "KB" uses include general business machines, scientific and military computer directed equipment, commercial control panels, stock market inquiry stations, cash registers, tape and card perforators, scientific panels, inventory systems, airline traffic control and reservation equipment, computer programmed (or directed) machine tools, calculators, and other data input and control applications that demand vivid color display and flexibility of mounting.

Versatile Modular Mounting System

A "KB" matrix can have an unlimited number of switches (up to 256 units per square foot).

Compactness of "KB" design is illustrated in this typical matrix. Nine pushbutton switches can be fitted in a 2-1/4 inch square panel opening. Entire matrix is bench assembled from interchangeable modules. Individual switches can be easily installed or removed without demounting matrix or disturbing adjacent switches.

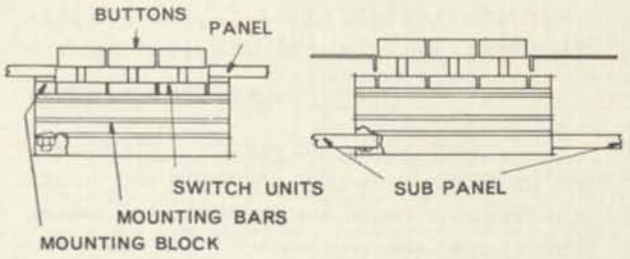


MOUNTING BARS are the basic support structure in the "KB" mounting assembly concept. They provide the backbone for the other "building block" elements in the matrix.

MOUNTING LUGS on the switch hold it secure in the matrix. By turning a screw on the top surface, these lugs (see illustration) are engaged or disengaged from slots in the mounting bars to enable easy installation or removal from front of panel.

Individual row subassemblies locked together in matrix have a high degree of panel strength. A 16 x 16 unit matrix will support itself in the cutout, without additional bars or strengthening members. The matrix actually adds strength to the panel.

MOUNTING SCHEMES—Panel installation of the "KB" matrix is quick and easy. It can be bolted to the back of the front panel or mounted on a subpanel. Only a single hole cutout is necessary. Switch unit can be mounted individually, where required.



PANEL MOUNTING **SUB PANEL MOUNTING**

Panel Display Flexibility

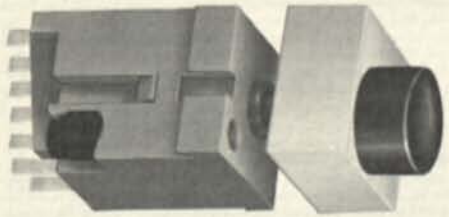
In addition to conventional single-level rectangular and square button shapes, "KB" has a new 2-level button design that offers four important user benefits: (1) raised operator knob is inset on button base to provide an attractive, interesting panel look, (2) human factored display shapes tell at a glance the difference between pushbutton and indicator only, (3) use of separate colors for button extension and base permits wide range of color adaptability—by merely varying color combinations, the complete appearance of the panel can be altered, (4) legend on pushbutton base is on lower level, protected against wear and visible during operation. Standard buttons are 1/2″ round cylinders on a 3/4″ x 3/4″, 3/4″ x 1-1/8″ or 3/4″ x 1-1/2″ base. Other shapes could be used.

PUSHBARS in various lengths can be used with an individual switch module or group of switch modules. Pushing the bar at any point along its surface will actuate the switch module(s) mounted underneath.

SPACER hardware in high and low level heights is available to complete the matrix or allow for future expansion. The high level type can be used as barriers against accidental operation.

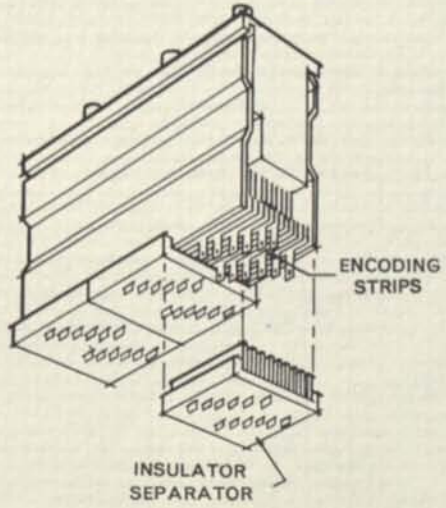
LIGHTED DISPLAY is offered in a wide choice of colors and color-combinations. Miniature T-1 long life lamps provide illumination. Lamps can be installed or removed quickly without tools.

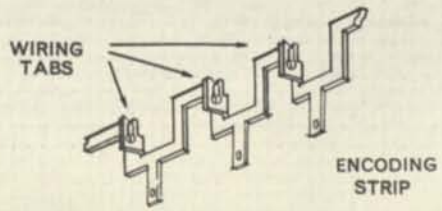
Unique Encoding Switch Design



- Provision for up to eight output bits
- 256 possible code combinations
- Delayed strobe eliminates contact bounce on output bits
- Momentary-action
- Eliminates need for separate encoding function

Momentary-action encoding switch modules are primarily for use as a data entry device. They will directly provide a field variable 8-bit output code. Encoding switches also have an electrical monitor which can electrically indicate if two switches have been operated at the same time by mistake.

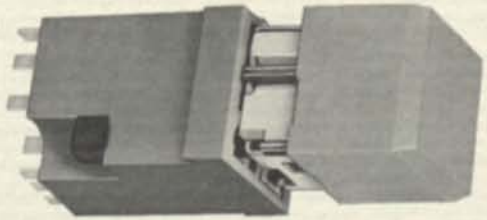




Power Switch for Function Control

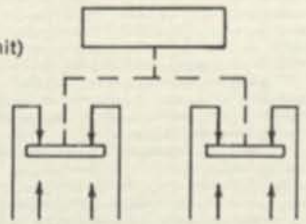
- Also available with lighted display
- Momentary or maintained contacts
- 2-pole or 4-pole circuitry

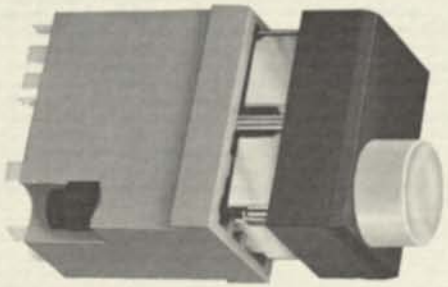
Designed for use as a function control ("on-off", "total", "cancel", etc.), the power switch modules are size compatible with the encoding switch units and can be combined with them in a common matrix.



1-UNIT

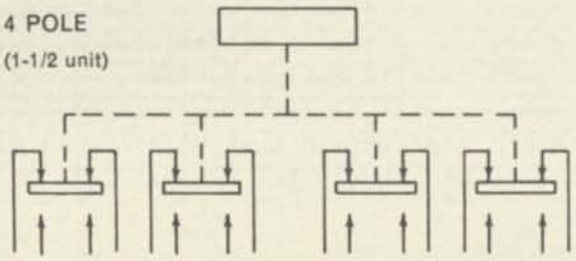
2 POLE
(1 or 1-1/2 unit)





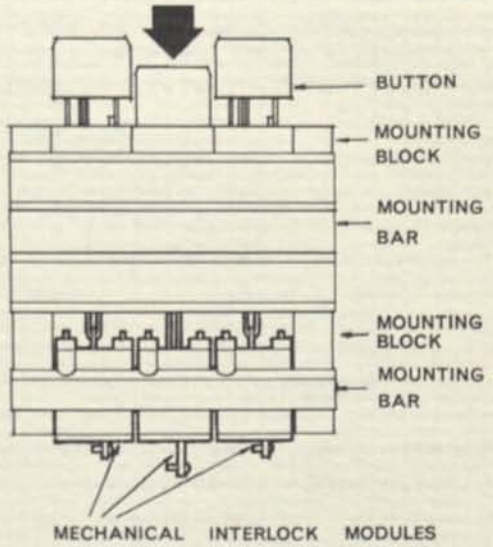
1-1/2-UNIT

4 POLE
(1-1/2 unit)



Mechanical Interlock provides "Key-down memory"

An add-on feature of the "KB" series is the mechanical interlock module. It attaches to an encoding or 1-unit power switch to provide bailing and "no-two-operate" functions (drawing shows its location in modular stack).

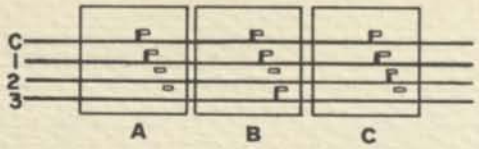


BAILING SYSTEM

Up to 16 switch modules attached to the same mounting bars can be actuated in a one-by-one sequence. With the bailing feature, the pressing of any button in a row will actuate the switch module below, while releasing any button previously held down. This "key-down memory" arrangement tells the operator which unit was last operated.

LOCKOUT SYSTEM

In this no-two-operate arrangement, the operator cannot actuate two or more units simultaneously if they are attached to the same mounting bars. The lockout can function on switch modules in a row of 16 units or less.



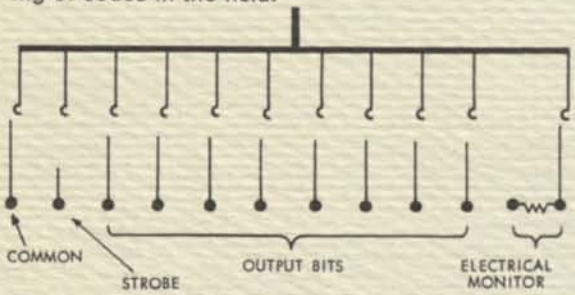
"AUTO ENCODING" FEATURE

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 strip picks up only terminals designated 1 and 3 which give switch module "B" a code value of "4", as in the "BCD" code.

Should a switch module in the matrix become damaged, a new unit can be plugged in its place, bussed automatically to the proper encoding strip connections.

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



ELECTRICAL OUTPUT

All moving contacts are trifurcated (three surfaces) to insure reliability. As the switch module is operated, the common and electrical monitor circuit is made first, followed by up to 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 is available for a "repeat" or sequence action control.)

ELECTRICAL RATING

Up to 60 milliamps at 2-10 vdc (over 10 million operations).

MOMENTARY-ACTION

Momentary-action switch modules transfer the circuit only while the button is manually held depressed. When the finger is removed, the button and contacts return to their unoperated position.

ALTERNATE-ACTION

Alternate-action (push-push) switches transfer and maintain the contact position between operations, in the following cycle: (1) when the button is pushed and released, it remains visibly below the level of other unoperated switches (approx. 3/16") and maintains circuit transfer, (2) when the button is pushed again, both button and contacts return to their original position.

LIGHTED POWER SWITCH

Power switch modules can be supplied with or without lighted display pushbuttons. Illumination is provided by two or four miniature long-life T-1 lamps. Lamps can be easily installed or removed from front of panel without tools.

LIGHTED INDICATOR

Indicator modules, identical in appearance to the power switches but without provision for switching, can be supplied for use as a lighted display unit only.

Lamps used in the lighted power switches and indicators are miniature high reliability (16,000-hour life) #718 (MS24515-718) T-1 type.

ELECTRICAL RATING

28 vdc	3 amps, inductive; 5 amps, resistive.
115 vac	5 amps, resistive or inductive.

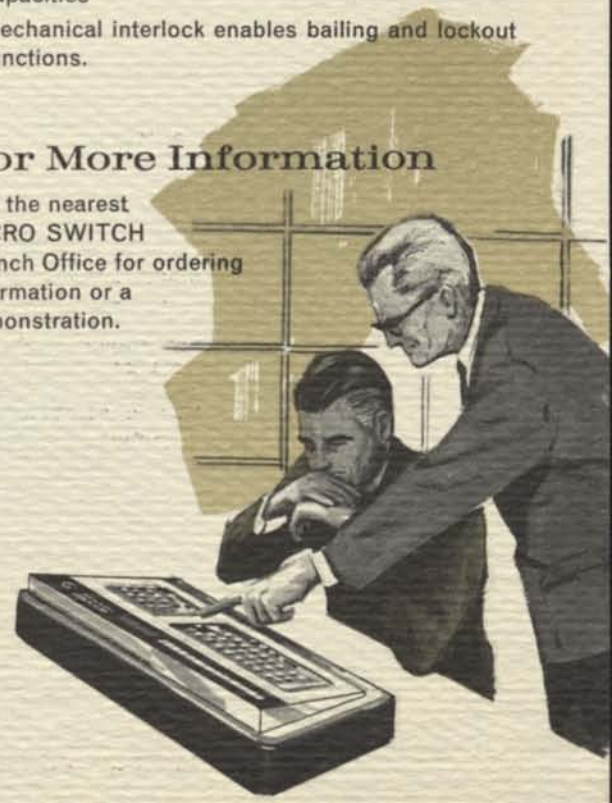
MICRO SWITCH

Resume of "KB" Features

- Dynamic answer to man-machine interface problem
- Vivid color display in a compact control package
- Individual plug-in mount switch modules simplify installation and maintenance.
- Gives equipment panels an exciting look of tomorrow—today
- Designed with close attention to good human factors principles
- Reliable long-life switching
- Provides designer with wide choice of color, shapes and switching combinations
- Meets the need for a versatile numeric or alpha numeric keyboard and control panel from interchangeable bench assembled modules.
- Encoding switch provides up to 8-bit field variable output.
- Simplified wiring cuts installation time
- Available with or without lighted display feature
- Choice of low energy or medium duty electrical capacities
- Mechanical interlock enables bailing and lockout functions.

For More Information

Call the nearest MICRO SWITCH Branch Office for ordering information or a demonstration.



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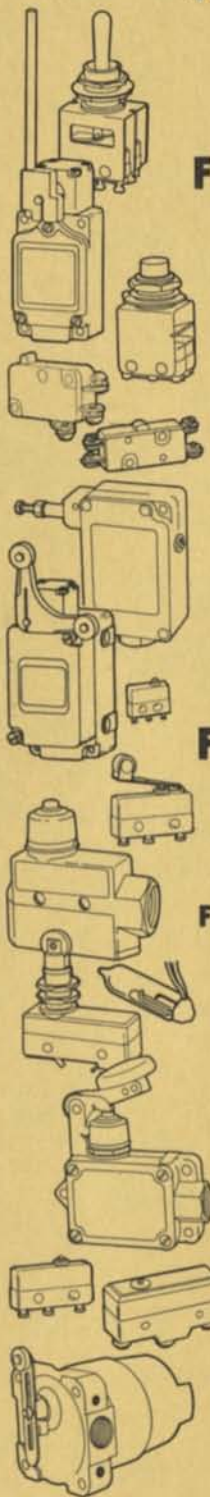

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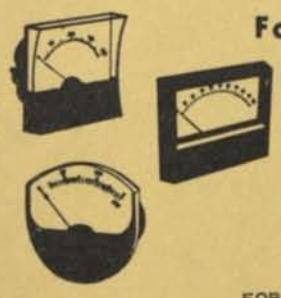

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