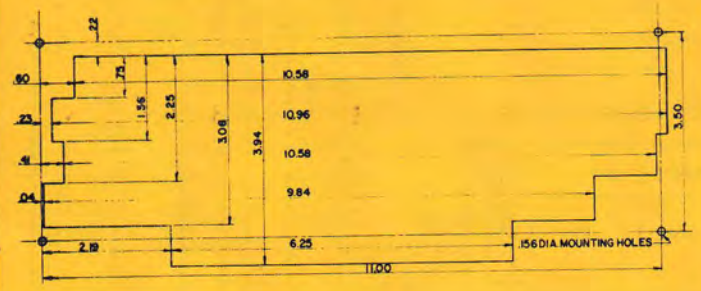
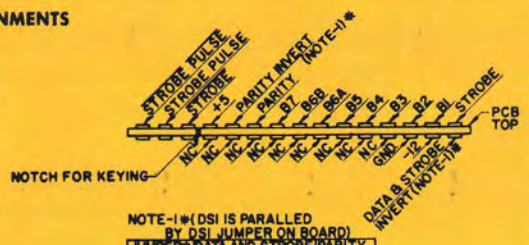
GEORGE RISK INDUSTRIES, INC.
TECHNICAL DATA

SUGGESTED PANEL CUTOUT



PIN ASSIGNMENTS



NOTE-1*(DSI IS PARALLED BY DSI JUMPER ON BOARD)

JUMPER*	DATA AND STROBE OUTPUTS	PARITY OUTPUT
+5	NEG. LOGIC	EVEN
GND.	POS. LOGIC	ODD

2-B6A PROVIDES BOTH UPPER AND LOWER CASE OPTION
B6B PROVIDES UPPER CASE ONLY
DRIVE CAPABILITY IS ONE TTL UNIT LOAD.
TYP. CONNECTOR CINCH*251-15-30(NOT INCL.)
3-STROBE PULSE WIDTH 1 MS WITH STD. VALUES

AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE (ASCII)

b7 b6 b5 / Bits b4 b3 b2 b1 / Row ↓ Column →	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
	0	1	2	3	4	5	6	7
0 0 0 0 0	NUL	DLE	SP	0	@	P	`	p
0 0 0 1 1	SOH	DC1	!	1	A	Q	a	q
0 0 1 0 2	STX	DC2	"	2	B	R	b	r
0 0 1 1 3	ETX	DC3	#	3	C	S	c	s
0 1 0 0 4	EOT	DC4	$	4	D	T	d	t
0 1 0 1 5	ENQ	NAK	%	5	E	U	e	u
0 1 1 0 6	ACK	SYN	&	6	F	V	f	v
0 1 1 1 7	BEL	ETB	'	7	G	W	g	w
1 0 0 0 8	BS	CAN	(	8	H	X	h	x
1 0 0 1 9	HT	EM	)	9	I	Y	i	y
1 0 1 0 10	LF	SUB	*	:	J	Z	j	z
1 0 1 1 11	VT	ESC	+	;	K	[	k	{
1 1 0 0 12	FF	FS	,	<	L	/	l	|
1 1 0 1 13	CR	GS	—	=	M	]	m	}
1 1 1 0 14	SO	RS	.	>	N	^	n	~
1 1 1 1 15	SI	US	/	?	O	—	o	DEL

2376 KEYBOARD ENCODER PIN ASSIGNMENTS

1	Vcc (+5v)	21	Y 10
2	Freq. Control	22	Y 9
3	Freq. Control	23	Y 8
4	Shift input	24	Y 7
5	Control Input	25	Y 6
6	Parity Invert	26	Y 5
7	Parity Output	27	Y 4
8	Data Output B7 (MSB)	28	Y 3
9	Data Output B6B (UC)	29	Y 2
10	Data Output B6A (UC/LC)	30	Y 1
11	Data Output B5	31	Y Ø
12	Data Output B4	32	X 7
13	Data Output B3	33	X 6
14	Data Output B2	34	X 5
15	Data Output B1 (LSB)	35	X 4
16	Strobe Output (level)	36	X 3
17	Vss (ground)	37	X 2
18	Vgg (-12v)	38	X 1
19	Strobe Control	39	X Ø
20	DSI (Data and Strobe Invert)	40	Freq. Control

NOTE: G.R.I. Keyboards use a custom-programmed ROM, designed especially for your keyboard. Order replacements ONLY direct from G.R.I. Specify p/n 2376-012 Encoder, $7.50 ea.

George Risk Industries, Inc., is a leading manufacturer of high reliability switch and keyboard products. Write or call for full information. Or contact one of our nationwide representatives for immediate applications assistance.

OTHER PRODUCTS OF INTEREST BY G.R.I.

. . . . Model 753 low-cost TTY style keyboard kit!
. . . . Model 716 Hexadecimal keyboard!
. . . . Custom keycaps and engraving services!
. . . . Magnetic burglar alarm door and window contacts!
. . . . and the only complete line of hermetically-sealed hi-rel reed type panel mount and pushbutton switches!

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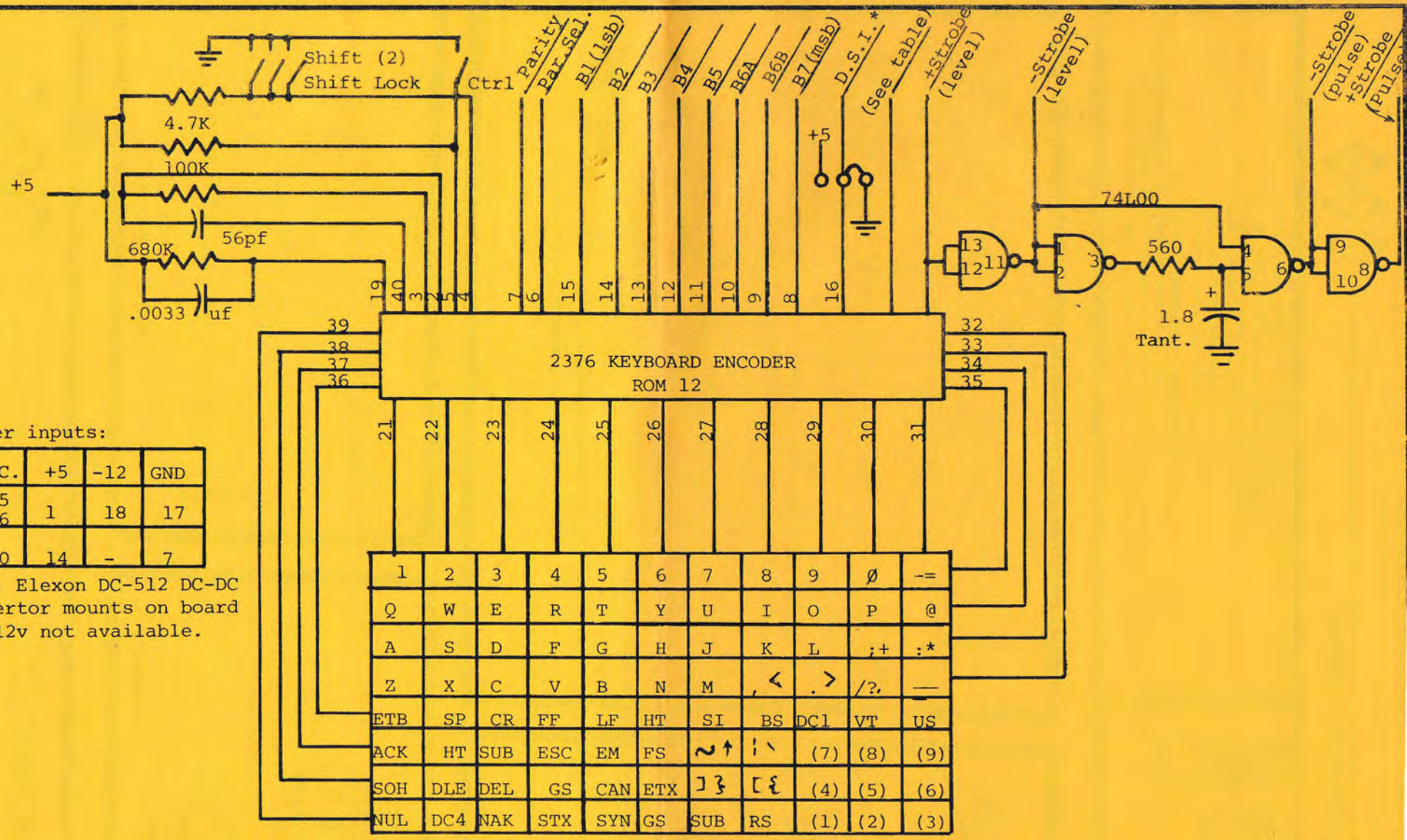
TELEPHONE (308) 235-4645 TWX 910-620-940



Power inputs:

I.C.	+5	-12	GND
AY-5 2376	1	18	17
74L00	14	-	7

Note: Elexon DC-512 DC-DC convertor mounts on board if -12v not available.

7. Numbers in boxes are ASCII keycodes.
6. Strobe pulse width 1ms with std. values.
5. Output drive capacity 1 std. TTL load.
4. All outputs TTL-CMOS compatible.
3. ( ) indicates optional numeric pad.
2. Capacitors disc ceramic except as noted.
1. All Resistors 1/4 watt, carbon comp.

NOTES:

DASH NO.	NEXT ASSY	FINAL ASSY	NEXT ASSY	FINAL ASSY
APPLICATION			QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES TOLERANCES ON
FRACTIONS ± 1/64 DECIMALS XX ± .01 XXX ± .005 ANGLES ± 0°30'

MATERIAL | FINISH

GEORGE RISK INDUSTRIES, INC.
KIMBALL, NEBRASKA

SCALE: NONE | APPROVED BY: | DRAWN BY hs
DATE: 11-11-77 | REVISED

ELECTRICAL SCHEMATIC - 756 KEYBOARD

SIZE A | DRAWING NUMBER 2-756-003

INTERFACING AND USING THE G.R.I. MODEL 756 KEYBOARD

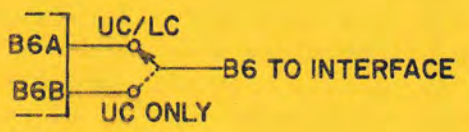
READ CAREFULLY BEFORE ASSEMBLING OR USING YOUR KEYBOARD!

1. The Model 756 Full ASCII Keyboard is designed to be used with almost any available microcomputer-related product which requires alphanumeric data input. Because of the lack of standardization among manufacturers of input-output boards, video display boards, TVT boards, etc., it is impossible to furnish step-by-step instructions for using our keyboards with a particular unit. What we will attempt to do, however, is to outline the basic procedure for interfacing keyboards, so that you will have a minimum of difficulty. We believe the 756 will work directly with most interfaces available today, but like any rule, there will almost surely be exceptions!

2. To begin with, get out your manuals, and study up on the keyboard input structure of your interfacing equipment. Pay close attention to the logic requirements of the "Strobe," "Data Ready," or "Key-pressed" inputs, since several options are available on the 756, and this area seems to be the most troublesome of all. A sketch, with the input port on one side and the keyboard output connector on the other is the best way to keep things straight.

3. Most interfaces use a keyboard strobe signal to indicate that keyboard data is ready. The 756 provides the following strobe signals:
   Positive Strobe Level (goes high with any key depression)
   Negative Strobe Level (" low " " " ")
   Positive Strobe Pulse (a 1 ms. pulse following key depression, going high)
   Negative Strobe Pulse (" " " " " " " " " low)
   Determine the correct strobe signal for interfacing with your equipment, and connect the keyboard connector pin associated with this signal to your interface.

4. Next, select the appropriate data signals. The connector pins marked "B1" through "B7" correspond to the LSB through MSB of the ASCII Code outputs. You will notice, though, that there are two outputs for bit 6. This is for the purpose of selecting between upper and lower case alpha characters, or upper-case-only. An SPDT switch (included with our Model 702 enclosures) is the easiest way of choosing between these two outputs. Wire the switch as shown:



(In either position, the shift and control keys still select punctuation and control.) You will also notice there are only seven of the eight ASCII bits connected up at this point. The reason is the most significant bit (B8) is Parity, used mainly in telecommunications for error checking. Since most input

routines don't bother to check parity, you may just want to tie the bit 8 line of your port high, or let it float. The parity sense, if used, can be selected by connecting the parity invert pin either high (even) or low (odd). You are on your own here. Good luck. (If you're confused, maybe a hardware-oriented friend can shed light on the darkness!)

5. The final step is to supply power to the keyboard. Two different voltages are needed, and since currents are very small (< 20 ma.) they can be "stolen" from almost anywhere. S-100 buss users will have to tap off a board regulator, while others simply connect to the main power supply. Three wires are needed, for +5v, -12v., and ground. Above all, double check your wiring to be sure you have the right voltages on the keyboard before powering up. Encoder ROM's are an expensive way to check polarity!!! Once you are satisfied, apply power. The keyboard should be operational.

T R O U B L E S H O O T I N G

Because the keyboard is based upon a LSI MOS encoder (2376 type by General Instruments or S.M.C.) troubleshooting is largely a matter of checking parts placement, wiring, connector insertion, etc. Before blaming the keyboard, be sure to check out all other elements of the system. (One fellow swore his keyboard was bad, only to find his keyboard routine had been garbled during loading!)
Here are some (helpful?) hints, should you find your ASCII in a jam:

1. The designers of the 2376 saw fit to allow data to fluctuate during the interval between key depressions. Some systems latch onto this stuff, and GIGO prevails. Two remedies suggest themselves. One, use AND gates gated by a buffered strobe signal (+ level) to gate data onto the interface only after a key has been depressed. Two, rewrite the keyboard routine to eliminate this messy problem. The choice is yours. It's one of those things.

2. Aforementioned designers, limited by the PMOS structure, made the 2376 TTL compatible, but just barely. Do not connect more than ONE standard TTL unit load to any keyboard pin. Buffers must be used if more than one load is needed (it usually isn't).

3. Long cables may cause erratic operation. Use line drivers, or a shorter cable. Five or six feet works fine.

4. If the keyboard still isn't working, you have reason to suspect the encoder. All GRI keyboard encoders are 100% tested for function and parameters just before packaging. Typical problems are: shorted traces causing various codes for a particular key, no operation at all, one row or column of keys dead, etc. Using a scope, check the clock to be sure it is running (pin2). Check to make sure that each row and column is being scanned (ac waveforms- 12 v p-p) Check the strobe, and the strobe one-shot. If the one-shot is bad, use only 74L00 (or LS). Check pulse width (should be 1 ms). See schematic for help.

5. Perhaps your interface just doesn't like a 1 ms. pulse at its strobe input. Vary pulse width as needed by substituting values for the 1.8 uf tantalum cap.

6. If all else fails, you probably have a bad encoder, which is bad news. The good news is, you finally can stop worrying about "it" happening to you. Yes, you most likely blew it away with a nasty little bit of static, the kind your mother always warned you about. Seriously, you need a new encoder (order from G.R.I. only, due to the custom ROM) and we need $15.00. Our condolences, but believe us, it happens to everyone (at least once)!