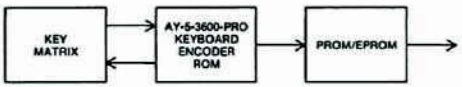
Keyboard Encoder and PROM/EPROM Application

The AY-5-3600-PRO is pre-programmed during manufacture to provide specific yet simple binary coded outputs thus allowing the purchase of off-the-shelf devices (distributors, etc.). To enhance the device flexibility, the binary outputs have been organized to provide direct interface with a PROM/EPROM.



The PROM (Programmable Read Only Memory) permits the programming of the required output code in the factory or the field within minutes, thus making it extremely suitable for small quantity, fast turnaround keyboard requirements. The EPROM (Erasable Programmable Read Only Memory) is ideally suited for prototyping, where patterns are quite variable, allowing the EPROM to be erased and reprogrammed repeatedly. Similar advantages are realized in the field where pattern changes are necessary in order to respond to redefined requirements or to subtle system peculiarities not previously encountered.

Technical Description

The AY-5-3600-PRO is a binary coded MOS-LSI device programmed to furnish 360 unique 9-bit codes (90 keys × 4 modes × 9 bits). Option selections include such popular functions as Internal Oscillator, Lockout/Rollover and an Any Key Down output. For further, more explicit device characteristics refer to the preceding pages. The internal oscillator is a self contained (on-chip) circuit option which eliminates the need for any external clock source. For applications necessitating an external clock source the internal oscillator input pins may be utilized to function in the slave mode of operation. Lockout or Rollover is selectable via an input pin, thus allowing the versatility required on various keyboard applications. The Any Key Down output performs the function of a gating signal by acknowledging both a key depression and release, making it a convenient signal for use in a repeat application.

For ease of translation, each key is assigned an X-Y coordinate and, in turn, each X-Y coordinate has been identified with a specific yet simple binary coded output. Two formats are described: the first for application with a 64 key 4 mode keyboard and the second for a 90 key 4 mode keyboard.

The 64 key 4 mode application as illustrated in Fig. 8 utilized keyboard encoder addresses X0 Y0 thru X6 Y3. A unique combination of one input (Y) and one output (X) is assigned to each key, for a total coverage of 64 keys. Binary coded outputs B2-B9 have been arranged to provide the necessary 8-bit address inputs to the PROM/EPROM, with B2 and B3 representing the variable mode identification and B4-B9 each specific key closure.

When a key is depressed a path is completed between one X line and one Y line thus addressing that specific X-Y ROM coordinate in the AY-5-3600-PRO. The 8-bit binary code for that X-Y location (ref. Truth Table page 14-15) is transferred into a one character 8-bit output latch (B2-B9) thus providing the appropriate 8-bit address to the 256 x 8 PROM/EPROM.

Expansion to a 90 key 4 mode operation (see Fig. 9) is identical to the 64 key 4 mode except: the 90 key 4 mode version utilizes the full complement of addresses X0 Y0 thru X8 Y9 (90 keys). The 8-bit binary code (B2-B9) previously produced to address the 256 x 8 PROM/EPROM is now expanded to a 9-bit binary code (B1-B9) for addressing to a 512 x 8 PROM/EPROM. With expansion to a 90 key 4 mode application outputs B1-B3 now serve as the variable mode identification.

The interface to a PROM/EPROM enables the custom programming of the required output data in the PROM/EPROM to directly coincide to the specific address inputs from the AY-5-3600-PRO. Any PROM whether it be bipolar, ultraviolet erasable or electrically alterable, may be employed to provide a wide variety of "off-the-shelf" keyboards. Once the keyboard assembly has gone beyond the prototyping stage, and assuming the quantity/cost permit, the PROM/EPROM data can be converted to the standard AY-5-3600 data format (ref. AY-5-3600 Custom Coding Information sheet) and produced in production quantities. This eliminates the PROM/EPROM expense while assuring the absence of undefined coding changes.

Summary of Important Features

- Ability to deliver complete keyboard assemblies within days without sacrificing the features offered in the AY-5-3600 Keyboard Encoder
- Ability to buy off-the-shelf devices (distributor, etc.)
- Ability to verify the specific pattern format using a PROM/EPROM prior to a 'custom' encoder commitment

NORMAL

X	Y	B_1	B_2	B_3	B_4	B_5	B_6	B_7	B_8	B_9
0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	1
0	2	0	0	0	0	0	0	0	1	0
0	3	0	0	0	0	0	0	0	1	1
0	4	0	0	0	0	0	0	1	0	0
6	3	0	0	0	1	1	1	1	1	1

6 OF 8 Bit ADDRESS

MODE IDENT. ILLUSTRATED USING NORMAL MODE ONLY, FOR REMAINING MODES REFER TO TRUTH TABLE

64 x 4 BLOCK DIAGRAM

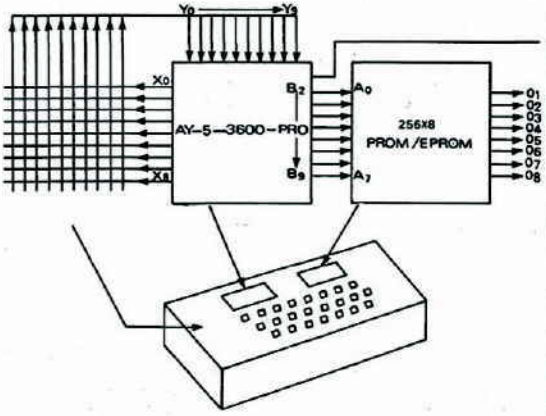


Fig.8 64 KEY 4 MODE KEYBOARD APPLICATION

NORMAL

X	Y	B_1	B_2	B_3	B_4	B_5	B_6	B_7	B_8	B_9
0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	1
0	2	0	0	0	0	0	0	0	1	0
0	3	0	0	0	0	0	0	0	1	1
0	4	0	0	0	0	0	0	1	0	0
8	9	1	0	0	0	1	1	0	0	1

6 OF 9 Bit ADDRESS

MODE IDENT. ILLUSTRATED USING NORMAL MODE ONLY, FOR REMAINING MODES REFER TO TRUTH TABLE

90 x 4 BLOCK DIAGRAM

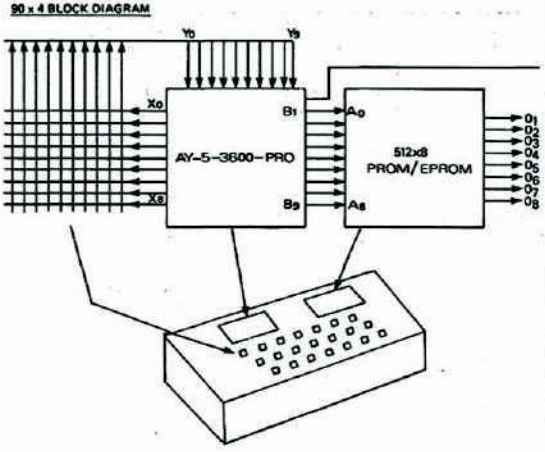


Fig.9 90 KEY 4 MODE KEYBOARD APPLICATION

OPTIONS

- Device Marking: AY-5-3600-PRO
- Internal Oscillator on Pin Nos. 1, 2, 3
- Lockout/Rollover on Pin No. 4
  Internal Resistor to V_{DD} on Lockout/Rollover Pin
- True Outputs Only
- Any Key Output on Pin No. 5.
  Any Key Output True (Logic 1) During Key Depression
- Pulse Data Ready Signal
- Plastic Package
- Internal Resistor to V_{DD} on Shift/Control Pin

XY	NORMAL	SHIFT	CONTROL	SHFT/CTR	XY	NORMAL	SHIFT	CONTROL	SHFT/CTR
0	000000000	001000000	010000000	011000000	45	000101101	001101101	010101101	011101101
1	000000001	001000001	010000001	011000001	46	000101110	001101110	010101110	011101110
2	000000010	001000010	010000010	011000010	47	000101111	001101111	010101111	011101111
3	000000011	001000011	010000011	011000011	48	000110000	001110000	010110000	011110000
4	000000100	001000100	010000100	011000100	49	000110001	001110001	010110001	011110001
5	000000101	001000101	010000101	011000101	50	000110010	001110010	010110010	011110010
6	000000110	001000110	010000110	011000110	51	000110011	001110011	010110011	011110011
7	000000111	001000111	010000111	011000111	52	000110100	001110100	010110100	011110100
8	000001000	001001000	010001000	011001000	53	000110101	001110101	010110101	011110101
9	000001001	001001001	010001001	011001001	54	000110110	001110110	010110110	011110110
10	000001010	001001010	010001010	011001010	55	000110111	001110111	010110111	011110111
11	000001011	001001011	010001011	011001011	56	000111000	001111000	010111000	011111000
12	000001100	001001100	010001100	011001100	57	000111001	001111001	010111001	011111001
13	000001101	001001101	010001101	011001101	58	000111010	001111010	010111010	011111010
14	000001110	001001110	010001110	011001110	59	000111011	001111011	010111011	011111011
15	000001111	001001111	010001111	011001111	60	000111100	001111100	010111100	011111100
16	000010000	001010000	010010000	011010000	61	000111101	001111101	010111101	011111101
17	000010001	001010001	010010001	011010001	62	000111110	001111110	010111110	011111110
18	000010010	001010010	010010010	011010010	63	000111111	001111111	010111111	011111111
19	000010011	001010011	010010011	011010011	64	100000000	101000000	110000000	111000000
20	000010100	001010100	010010100	011010100	65	100000001	101000001	110000001	111000001
21	000010101	001010101	010010101	011010101	66	100000010	101000010	110000010	111000010
22	000010110	001010110	010010110	011010110	67	100000011	101000011	110000011	111000011
23	000010111	001010111	010010111	011010111	68	100000100	101000100	110000100	111000100
24	000011000	001011000	010011000	011011000	69	100000101	101000101	110000101	111000101
25	000011001	001011001	010011001	011011001	70	100000110	101000110	110000110	111000110
26	000011010	001011010	010011010	011011010	71	100000111	101000111	110000111	111000111
27	000011011	001011011	010011011	011011011	72	100001000	101001000	110001000	111001000
28	000011100	001011100	010011100	011011100	73	100001001	101001001	110001001	111001001
29	000011101	001011101	010011101	011011101	74	100001010	101001010	110001010	111001010
30	000011110	001011110	010011110	011011110	75	100001011	101001011	110001011	111001011
31	000011111	001011111	010011111	011011111	76	100001100	101001100	110001100	111001100
32	000100000	001100000	010100000	011100000	77	100001101	101001101	110001101	111001101
33	000100001	001100001	010100001	011100001	78	100001110	101001110	110001110	111001110
34	000100010	001100010	010100010	011100010	79	100001111	101001111	110001111	111001111
35	000100011	001100011	010100011	011100011	80	100010000	101010000	110010000	111010000
36	000100100	001100100	010100100	011100100	81	100010001	101010001	110010001	111010001
37	000100101	001100101	010100101	011100101	82	100010010	101010010	110010010	111010010
38	000100110	001100110	010100110	011100110	83	100010011	101010011	110010011	111010011
39	000100111	001100111	010100111	011100111	84	100010100	101010100	110010100	111010100
40	000101000	001101000	010101000	011101000	85	100010101	101010101	110010101	111010101
41	000101001	001101001	010101001	011101001	86	100010110	101010110	110010110	111010110
42	000101010	001101010	010101010	011101010	87	100010111	101010111	110010111	111010111
43	000101011	001101011	010101011	011101011	88	100011000	101011000	110011000	111011000
44	000101100	001101100	010101100	011101100	89	100011001	101011001	110011001	111011001