NOTES:
1. Address as wired is Binary "0". To change to address "1" cut A9 etch and add jumper along dotted path. To change to address "5" for example, change connection path of A9 and A1.
2. All IC's have pin 1 in lower left corner.
3. Power and ground connect to pins 14 and 7 unless shown otherwise.
4. Item's in ( ) not supplied.

CRT/1 LAYOUT PLAN

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Item Part Description Designation Qty
---
0 CRT/1 P.C. board X-1 x 3, X-6, X-4 1
1 DM8833 Quad 1/R E1, E2 2
2 SN7415 Quad MIX E3, E4, E5 3
3 SN7493 4 bit Eor.E N4 E6 E10 E11 3
4 SN7430 NAND Gate E7, E15 2
5 SN7431 ASC II Char.Gen E8 1
6 SN7495 4 bit Shift Reg. E9, E12 2
7 SN7402 Quad & Gate E12 1
8 SN7404 HEX Inverter E13, E17 2
9 MCM6050 128 x 9 Static RAM E14, E20, E25, E70 4
10 SN7405 HEX Inverter E16 1
11 SN7420 Dual NAND gate E18 1
12 SN7400 Quad NAND gate E24, E29 2
13 SN7490 Quad Eor.E E24, E10 2
14 SN7474 Dual D Fl/F E23 1
15 SN7408 Quad NAND gate E26, E27 2
16 SN74123 Dual monostable E31 1
17 NE555 Timer E29 1
18 SN7435 Dual to/F or gate E28 2
19 2N5299 Transistor Q1 1
20 2N918 Transistor Q2 1
21 "L" Inductive coil SEE TYPE ACRYLIC 1
22 IN914 Diode D1 - D3 4 1
23 20K Resistor, var R19 1
24 5K Resistor, var R20 1
25 50K Resistor, var R22 1
26 450uF Capacitor, 10 vdc C5 1
27 1000uF Capacitor, 10 vdc C1, C31 1
28 .1uF Capacitor C2, C14, C17, C19 1
29 C2, C22, C26-38, C90, C35, C36 1
30 .001 Capacitor C29 1
31 .001 Capacitor C20, C34, C38 1
32 .22uf Capacitor C33 1
33 .47uf Capacitor C37 1
34 .007 Capacitor C15, C24, C32 1
35 8-25uf Capacitor,VAR C25 1
36 22 Resistor R13 1
37 2K Resistor R7, R14 2
38 470 Resistor R4 1
39 1K Resistor R2, R3, R6-R1, R12 2
40 47V Resistor R13, R18, R23 2
41 100V Resistor R11 1
42 56K Resistor R8 1
43 5K Resistor R1, R5 2
44 3K Resistor R14 1
45 3.3K Resistor R21 1

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CRT/1 MODULE
Omit C6 if Class type approved and Antenna inputs used otherwise omit C8 and Q9 and Q1, and X66 composite video put to drive a video monitor. If L1 is omitted, tie the function of D4 and B2 to +5V.
THIS KEYBOARD WILL GENERATE A FULL ASCII CHARACTER SET
HOWEVER, THIS IS NOT EASY TO USE IN HEX CODING FROM THE
KEYBOARD.

BY MAKING THE JUMPERS SHOWN BELOW OR ON DRAWING A MODIFIED
ASCII VERSION OF THE KEYBOARD IS ACHIEVED. THIS VERSION IS MUCH
EASIER TO USE IN HEX CODING (THIS VERSION REQUIRES NO SHIFTING OF
ALPHA CHARACTERS)

PRINTED CIRCUIT BOARDS THAT HAVE A PART NUMBER OF 00026 WITH NO
REVISION SHOULD BE JUMPERED AS FOLLOWS:

JUMPER FOR MODIFIED ASCII

(1) 'ASCII' to E7-4 (use pin), Cut Etch E7-4 to E7-13 (under R19)

(2) 'MOD' to 'FULL'

(3) Cut Etch Between FULL & ASCII (Backside)
THIS KEYBOARD WILL GENERATE A FULL ASCII CHARACTER SET
HOWEVER, THIS IS NOT EASY TO USE IN HEX CODING FROM THE
KEYBOARD.

BY MAKING THE JUMPERS SHOWN BELOW OR ON DRAWING A MODIFIED
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PRINTED CIRCUIT BOARDS THAT HAVE A PART NUMBER OF 00026 WITH NO
REVISION SHOULD BE JUMPERED AS FOLLOWS:

JUMPER FOR MODIFIED ASCII

(1) 'ASCII' to E7-4 (use pin), Cut Etch E7-4 to E7-13 (under R19)
(2) 'MOD' to 'FULL'
(3) Cut Etch Between FULL & ASCII (Backside)
1. C1, C2, C3, C6, C8, C9, C10
   BYPASS +5V-GND

2. C7, C11, C12
   BYPASS -9V-GND
The SPHERE ROM/1 board is designed to provide up to 4K of read only memory program space using the commonly available 1702 PROM. The addressing on the board is fully selectable on 1K boundaries by the user. All four banks must be either address strapped or grounded - no banks' address select logic may be left open. If the addressing on your board will change frequently a 14 pin DIP socket may be installed at J1-J4 and 2 inch wire-wrap type wires in the adjoining connecting holes. These wires may then be pushed into the correct hole of J1-J4.

![Diagram of SPHERE ROM/1 board]

To select an address, jumper each connection hole to the appropriate address selection hole. To make a 'don't care' bit (either on or off will do) leave the jumper wire from the connection hole open (no connection). It is for this reason that unused banks must be strapped down.

To select 1000 as the starting address of bank 1 (U13 1000, U12 1100, U11 1200, U10 1300) connect
- 15 to address inverted, pin 1 of J1
- 14 to address inverted, pin 2 of J1
- 13 to address inverted, pin 3 of J1
- 12 to address true, pin 11 of J1
- 11 to address inverted, pin 5 of J1
- 10 to address inverted, pin 6 of J1

To select D000 as the starting address of bank 3 (U25 D000, U24 D100, U23 D200, U22 D300) connect
- 15 to address true, pin 14 of J3
- 14 to address true, pin 13 of J3
- 13 to address inverted, pin 3 of J3
- 12 to address true, pin 11 of J3
- 11 to address true, pin 10 of J3
- 10 to address true, pin 9 of J3

To strap a bank of ROM off, connect any (at least one) connection hole to a ground, available feed-throughs near pin 7 of U9, U15, and U21.

In selecting addresses, remember that below 1000 is dedicated to RAM and above E000 are I/O devices and system ROM's.

Good programming to you all.

Ernest Dixon
SPhēra Corporation
<table>
<thead>
<tr>
<th>QTY</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
<th>LOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7404</td>
<td>IC HEX INVERTER</td>
<td>U1, U2</td>
</tr>
<tr>
<td>2</td>
<td>7408</td>
<td>IC QUAD AND</td>
<td>U3, U4</td>
</tr>
<tr>
<td>3</td>
<td>7420</td>
<td>IC DUAL NAND</td>
<td>U5</td>
</tr>
<tr>
<td>4</td>
<td>7430</td>
<td>IC 8-INP NAND</td>
<td>U9, U15, U21, U27</td>
</tr>
<tr>
<td>5</td>
<td>7442</td>
<td>IC 4-10 DECODER</td>
<td>U8, U14, U20, U26</td>
</tr>
<tr>
<td>6</td>
<td>DM8097</td>
<td>IC HEX BUS DRIVER</td>
<td>U6, U7</td>
</tr>
<tr>
<td>7</td>
<td>1702A</td>
<td>IC 256x8 PROM</td>
<td>U(10-13), U(16-19), U(22-25), U(23-26)</td>
</tr>
<tr>
<td>9</td>
<td>1N4001</td>
<td>50V RECTIFIER DIODE</td>
<td>D1, D2, D3, D4</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>33µF/20V CAPACITOR, ELECTROLYTIC</td>
<td>C4, C5</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>0.1µF/50V CAPACITOR, CERAMIC</td>
<td>C1, C2, C3, C(6-12)</td>
</tr>
<tr>
<td>11</td>
<td>24</td>
<td>4.7K, 1/4W, 10% RESISTOR, CARBON CERM</td>
<td>R1 - 24</td>
</tr>
<tr>
<td>12</td>
<td>14</td>
<td>14-pin sockets (DIP)</td>
<td>x1, x2, x3, x6, (11, 12, 13, 14)</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>ROM/I EHD PCB</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>16</td>
<td>24-pin DIP sockets</td>
<td>U(10-13), U(16-19), U(22-25), U(23-32)</td>
</tr>
</tbody>
</table>

UNDERLINED ITEMS NOT SUPPLIED
For my bookkeeping please:
One board per order form (copy it if necessary)
One check per order
No charges or COD orders—cash with order!

Please send me ONE (1) ROM/1 board wired to the following addresses:

<table>
<thead>
<tr>
<th>BANK</th>
<th>STARTING ADDRESS</th>
<th>Hex</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Binary</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0 0 0 0 0 0 0 0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>B</td>
<td>0 0 0 0 0 0 0 0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>C</td>
<td>0 0 0 0 0 0 0 0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>D</td>
<td>0 0 0 0 0 0 0 0 0</td>
<td>0 0</td>
</tr>
</tbody>
</table>

Please remember that addresses below 1000\_x and above 8000\_x are assigned to memory and I/O devices and that SPHERE Corporation reserves the right to modify at any time or add to the addresses of the I/O devices.

Initial orders will be shipped within 10 days. Unshipped orders may be canceled after 45 days. Allow an extra 30 days for non-guaranteed checks to clear.

CORRESPONDENCE ADDRESS: ____________________________________________

________________________________________

ATTN: __________________ ZIP ___________

SHIPPING ADDRESS: ____________________________________________

________________________________________

ATTN: __________________ ZIP ___________

Send this form and $156.00 (plus 6% California sales tax if applicable) to:
Ernest Dixon
P. O. Box 3102
Culver City, Ca. 90230
* ADDRESS GIVEN AS WIRED! JUMPERS ON A4, A5, AND A6 WILL ALLOW SELECTION OF 7 ADDITIONAL PIM/J1 CARDS WITH ADDRESSES F09X, F0A2, F0B3, ... F0E8.