DIGITAL RESEARCH COMPUTERS

(214) 225-2309

INTRODUCTION

The 128K S-100 Static Ram/Eprom Board you have just purchased is one of the best Ram/Eprom bargains on the market today. We have gone to great lengths to combine the right mix of features that are most often required on high density Ram/Eprom boards for S-100(IEEE-696) systems.

FEATURES:

FULL STATIC OPERATION!

FULL S-100 IEEE-696 COMPATIBLE!

USES POPULAR 28 PIN "2764" STYLE 8K X 8 DEVICES

EACH LOCATION MAY BE DISABLED

16 BIT AUTOMATIC MODE (8 OR 16 BIT OPERATION)

8 BIT SEQUENTIAL MODE (8 BIT ONLY OPERATION)

ZERO TO SEVEN WAIT STATES

BYTE LOW OR BYTE HIGH MODE

24 BIT EXTENDED ADDRESSING BUT WILL WORK IN OLDER 8 BIT SYSTEMS

FRONT PANEL OPERATION

FAST ACCESS TIMES (50NS PLUS MEMORY ACCESS TIME)

PC BOARD IS SOLDER MASKED AND SILK SCREENED

GOLD PLATED CONTACT FINGERS FOR LONG LIFE

ALL DATA, ADDRESS AND CONTROL LINES FULLY BUFFERED

PHANTOM AVAILABLE

LOW POWER OPERATION (<600 MA. TYP.)

PARTS LIST:

7	14 PIN SOCKETS
7	16 PIN SOCKETS
11	20 PIN SOCKETS
16	28 PIN SOCKETS
16	SHORTING BLOCKS
16	3 PIN JUMPER POST
2	HEATSINKS (THM 6106-14) WITH #6 HARDWARE
28	.1 MFD BYPASS CAPS (VALUE MAY VARY)
4	1 MFD 16 VOLT OR GREATER TANTALUM CAPACITORS
5	2.2K TO 5.6K 10 PIN RESISTOR PACKS(PIN 1 COMMON)
1	220 OHM 1/4 WATT RESISTOR
1	2.2K TO 5.6K 1/4 WATT RESISTOR
2	7805 VOLTAGE REGULATOR
1	74LS00
1	7406
1	74LS10
1	74LS14
2	74LS30
1	74LS86
2	74LS138
4	74LS157
1	74LS165
9	74LS244
1	PAL 16L8
1	25LS2521
4	8 POSITION DIP SWITCHES
1	LED

GENERAL CONSTRUCTION HINTS

For soldering we recomend a 32 watt soldering pencil. Do not use a soldering gun!!! Use a quality grade small diameter (such as 22 gauge) rosin core 60/40 alloy solder.

Keep the soldering pencil clean with a wet sponge or cloth.

After soldering such components as resistors or capacitors, use a small pair of diagonal cutters to remove the excess lead length.

Observe polarities on all tantalum caps, resistor packs, ICs and LEDs.

If any discrepancies between the parts received and those listed are noticed please notify us.

LIMITED WARRANTY

Read the enclosed yellow sheet for a statement of our limited warranty as relates to this kit.

Also note that when this product is purchased as a blank board, all that is covered by the limited warranty is the PC Board itself.

ASSEMBLY INSTRUCTIONS

[] Give the PC Board a good visual inspection for any obvious shorts or opens. There should be none, but a few minutes spent here could save hours later.

[] Using an Ohmmeter, insure that there are no shorts between buss pins 1 and 50.

[] Install and solder the 28 pin sockets for IC locations Y1 through Y8 and X1 through X8. Note that pin #1 on all ICs is oriented to the top of the board.

[] Install and solder the 11 20 pin sockets at locations U11-U15, U20, U23 and U26-U29.

[] Install and solder the 7 16 pin sockets at locations U3, U5, U8, U21-U22 and U24-U25.

[] Install and solder the 7 14 pin sockets at locations U1, U6, U9-U10, U16 and U30-U31.

[] Install and solder the 4 8-position dip switches at locations S1-S4.

[] Install and solder 4 resistor packs at locations U2, U4, U7 and U19. NOTE PIN #1 IS TOWARDS THE TOP OF THE BOARD.

[] Install and solder the remaining resistor pack in location U32. NOTE PIN #1 IS TOWARDS THE LEFT EDGE OF THE BOARD, DENOTED BY THE DOT.

[] Install and solder the 16 3-pin jumper posts near locations Y1-Y8 and X1-X8 labeled ROMRAM.

[] Install and solder the bypass caps in locations C1-C23 and C28-C32.

[] Install and solder the 2.2K to 5.6K OHM resistor at location R1.

[] Install and solder the 220 OHM resistor in location R2.

[] Install and solder the LED at location DS1. The cathode (denoted by the flat side) goes towards the bottom of the board.

[] Install and solder the 4 Tantalum caps at locations C24-C27. Please observe the proper polarity when installing the parts.

[] Using the heatsinks and hardware, install and solder the 2 7805 voltage regulators at locations U17-U18.

[] Using any of the regulator mounting tabs as ground, measure the output of each 7805 under power in your system. The output is

measured on the right most pin of the 7805. The measured voltage should be between 4.75 and 5.25 VDC. Any regulator out of spec. must be replaced.

[] Install a 74LS00 in socket location U30. Pin #1 is to the top.

[] Install a 7406 in location U10.

[] Install a 74LS10 in location U31.

[] Install a 74LS14 in location U16.

[] Install two 74LS30s in locations U1 and U6.

[] Install a 74LS86 in location U9.

[] Install two 74LS138s in locations U3 and U8.

[] Install four 74LS157s in locations U21-U22 and U24-U25.

[] Install a 74LS165 in location U5.

[] Install nine 74LS244s in locations U11-U14, U23 and U26-U29.

[] Install a PAL 16L8 in location U15.

[] Install a 25LS2521 in location U20.

[] Remeasure the voltage outputs on the 7805s now to insure proper operation.

[] Install shorting blocks in ROMRAM locations as per your application. See Setup and Use for information.

SETUP AND USE

Determine which locations you need to be RAM and which need to be EPROM. Using the shorting blocks provided jumper the center pin at each location to either RAM (right pin) or ROM (left pin).

Switches S1 and S3 enable memory locations when the switch is on. The location is disabled when the switch is off.

16 BIT MODE

SWITCH S1(first byte)

POSITION	MEMORY LOCATION
1(Y1)	00000-03FFF
2(Y2)	04000-07FFF
3(Y3)	08000-0BFFF
4(Y4)	0C000-0FFFF
5(Y5)	10000-13FFF
6(Y6)	14000-17FFF
7(Y7)	18000-1BFFF
8(Y8)	1C000-1FFFF

SWITCH S3(second byte)

POSITION	MEMORY LOCATION
1(X1)	00000-03FFF
2(X2)	04000-07FFF
3(X3)	08000-0BFFF
4(X4)	0C000-0FFFF
5(X5)	10000-13FFF
6(X6)	14000-17FFF
7(X7)	18000-1BFFF
8(X8)	1C000-1FFFF

8-BIT MODE

SWITCH S1

POSITION	MEMORY LOCATION
1(Y1)	00000-01FFF
2(Y2)	04000-05FFF
3(Y3)	08000-09FFF
4(Y4)	0C000-0DFFF
5(Y5)	10000-11FFF
6(Y6)	14000-15FFF
7(Y7)	18000-19FFF
8(Y8)	1C000-1DFFF

SWITCH S3

POSTION	MEMORY LOCATION
1(X1)	02000-03FFF
2(X2)	06000-07FFF
3(X3)	0A000-0BFFF
4(X4)	0E000-0FFFF
5(X5)	12000-13FFF
6(X6)	16000-17FFF
7(X7)	1A000-1BFFF
8(X8)	1E000-1FFFF

Switch S2 positions 1 through 7 enable wait states. Zero wait states are all positions off. One wait state is position 1 on. Two wait states are positions 1 and 2 on. Three wait states are positions 1, 2 and 3 on. And so on till seven wait states are positions 1 to 7 all on.

Switch S2 position 7 reverses the order in which 8 bit bytes are transfered during a double byte transfer(16 bit mode without STXRQ). Normally this switch is on.

Switch S4 position 1 is the MODE switch. Off is 16 BIT MODE, ON is 8 BIT (only) MODE.

Switch S4 positions 2 through 8 correspond to address bits A23 through A17 respectively. OFF equals a high bit and ON equals a low bit.

NOTES ON OLD 8 BIT SYSTEMS

This board will work in older systems such as an IMSAI or ALTAIR. To do so requires some unique switch settings and memory chip placement. Remember that these are 64k systems so only 1/2 of the board will be used. Install memory devices in locations Y5-Y8 and X5-X8.

SWITCH S1

POSITION	SETTING	EXPLAINATION
1(Y1)	OFF	NOT USED
2(Y2)	OFF	NOT USED
3(Y3)	OFF	NOT USED
4(Y4)	OFF	NOT USED
5(Y5)	ON	0000-1FFF
6(Y6)	ON	4000-5FFF
7(Y7)	ON	8000-9FFF
8(Y8)	ON	C000-DFFF

SWITCH S3

POSITION	SETTING	EXPLAINATION
1(X1)	OFF	NOT USED
2(X2)	OFF	NOT USED
3(X3)	OFF	NOT USED
4(X4)	OFF	NOT USED
5(X5)	ON	2000-3FFF
6(X6)	ON	6000-7FFF
7(X7)	ON	A000-BFFF
8(X8)	ON	E000-FFFF

SWITCH S2

POSITION	SETTING	EXPLAINATION
1	OFF	NEW CHIPS PLENTY FAST ENOUGH
2	OFF	"
3	OFF	"
4	OFF	"
5	OFF	"
6	OFF	"
7	OFF	"
8	ON	NORMAL POSITION

SWITCH S4

POSITION	SETTING	EXPLAINATION
1	ON	8 BIT (only) MODE
2	OFF	NO EXTENDED ADDRESS LINES ON BUSS
3	OFF	BUSS LINES PULLED UP ON BOARD
4	OFF	TO HIGH STATE BY RESISTOR PACK
5	OFF	"
6	OFF	"
7	OFF	"
8	OFF	"

Of course if your system uses extended addressing then this section does not apply, you must use the first section.

THEORY OF OPERATION

Lower order address lines are buffered by U23 and U26. After passing through the 74LS157 multiplexers U21, U22, U24 and U25, they enter the memory chips. The multiplexers are controlled by S4 position 1. When on the memory chips see the normal address lines. This is the normal 8 bit method. When off they see address lines shifted by one, i.e. Buss line A1 goes to memory chip A0. This is the normal 16 bit method.

The output of U21 Pin 12 may be inverted by U9 and Switch S2 position 8 in order to reverse the order of the double fetch done when making 8 bit transfers in the 16 bit mode.

A14 through A16 are buffered by U11 and decoded by U3 and U8 to provide chip selects for the memory chips.

A17 through A23 are compared with Switch S4 positions 2 through 8 by U20 to generate a board select.

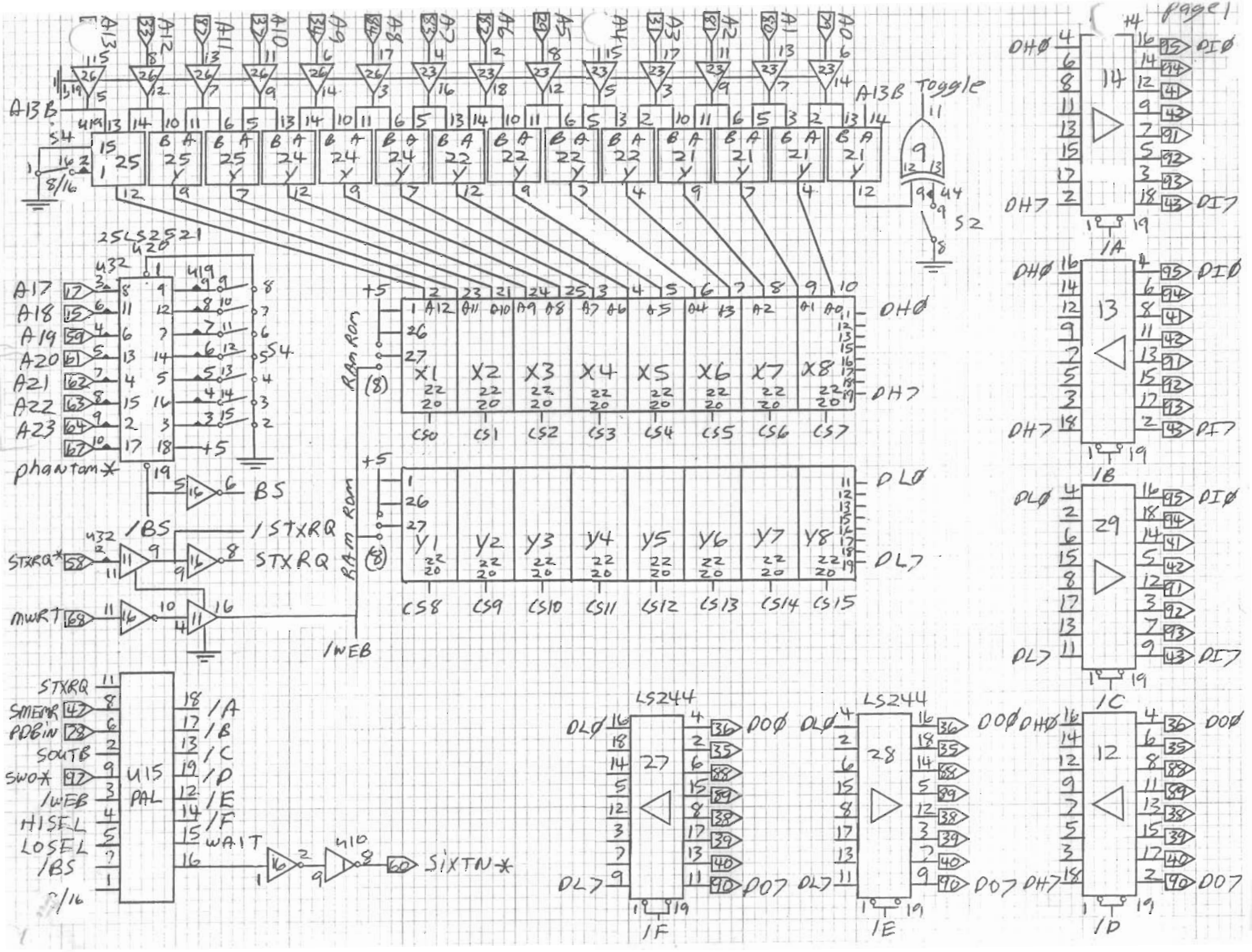
Phantom is also an input to U20.

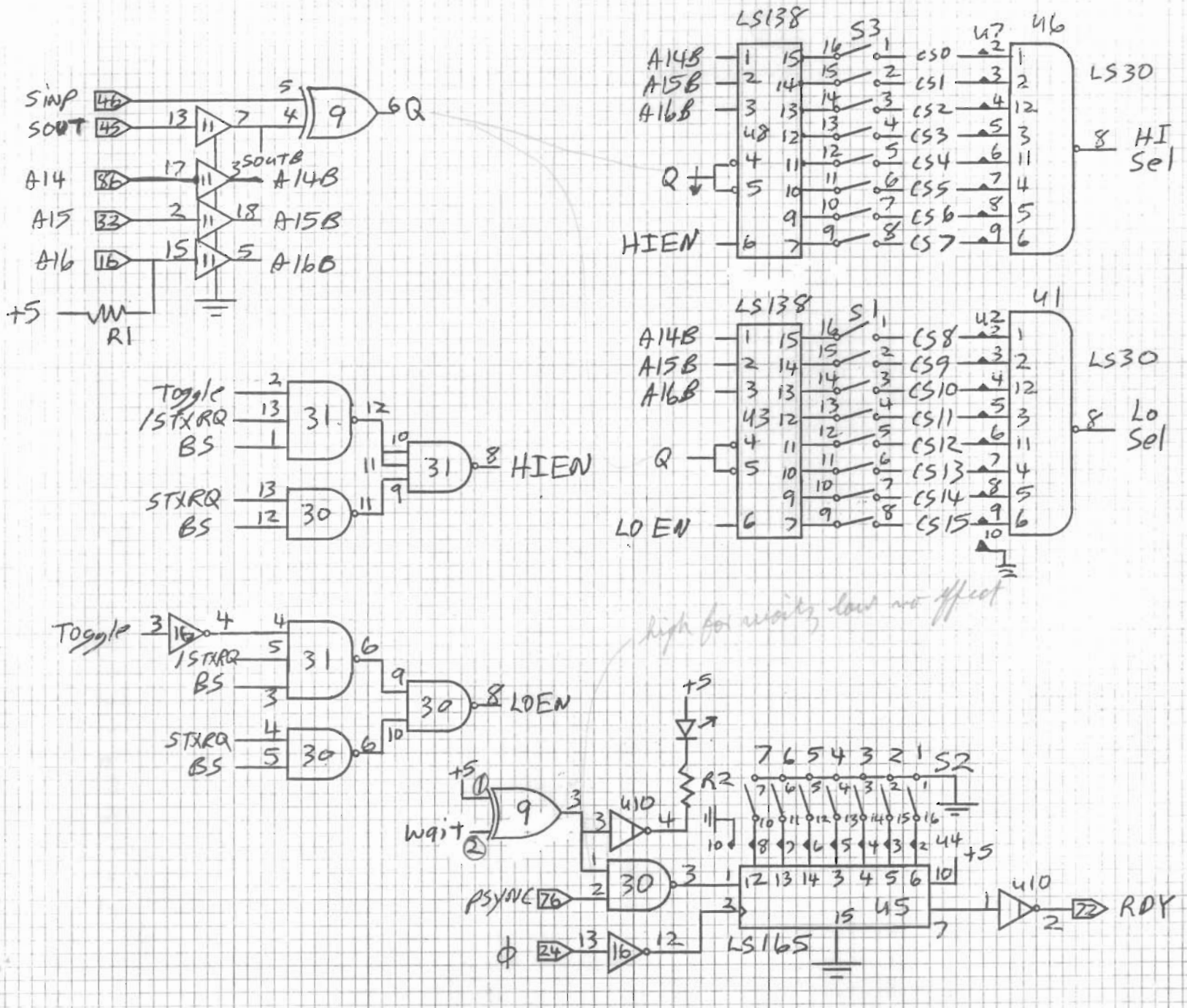
U15 is a 16L8 PAL and is used to generate enables for the data buffers (U12, U13, U14, U27, U28 and U29). It also enables the wait state generator and provides SIXTN*. While the enables meet the IEEE standard, the internal code of the PAL is proprietary.

U9 pins 4, 5 and 6 inhibit operation during I/O operations.

U30 and U31 provide seperate enables during 8 bit transfers and provide simultaneous enables during 16 bit transfers.

U1 and U6 provide signals to the PAL that a valid chip select has taken place so buffers may be enabled.


A13
A12
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
A13B
Toggle
S4
8/16
S2
25LS25221
U32
U20
U19
A17
A18
A19
A20
A21
A22
A23
phantom*
+5
BS
/BS
/STXRQ
STXRQ
STXRQ*
MWRT
/WEB
RAM ROM
(8)
X1 X2 X3 X4 X5 X6 X7 X8
CS0 CS1 CS2 CS3 CS4 CS5 CS6 CS7
Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8
CS8 CS9 CS10 CS11 CS12 CS13 CS14 CS15
D0H
D0L
D7H
D7L
U15
PAL
STXRQ
SMEMR
PDBIN
SOUTB
SWO*
/WEB
HISEL
LOSEL
/BS
/16
/A
/B
/C
/D
/E
/F
WAIT
U10
SIXTN*
LS244
U14
U13
U29
U27
U28
U12
/A
/B
/C
/D
/E
/F
DI0
DI7
DO0
DO7


SINP
SOUT
A14
A15
A16
+5
R1
3SOUTB
A14B
A15B
A16B
Toggle
ISTXRQ
BS
STXRQ
HIEN
LOEN
Wait
PSYNC
Φ
R2
S2
S3
S1
LS138
LS30
LS165
HI Sel
LO Sel
HIEN
LO EN
RDY
high for waits, low no effect