

DIGITAL RESEARCH CORP.

INTRODUCTION

The 16K Static RAM you have just purchased is one of the best RAM 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 boards for S-100 systems.

FEATURES:

Full S-100 Compatible !

Uses the very popular 2114 4K Static RAM

Addressable as four separate 4K blocks.

On board bank select (Cromemco standard) is provided!

On board selectable wait states !

Board Access time under 500 NS.

PC Board is solder masked and silk screened.

Gold plated contact fingers for long life.

All address and data lines fully buffered.

Phantom is Jumperable to buss pin #67.

LOW POWER dissipation (<2 amps typical).

Kit includes ALL parts and sockets.

PDRIN strobe is used for reliable operation.

Blank PC board may be populated as any multiple of 4K

## PARTS LIST

1	4 Pin Low Profile Socket
13	14 Pin Low Profile Sockets
9	16 Pin Low Profile Sockets
32	18 Pin Low Profile Sockets
1	24 Pin Low Profile Sockets
4	Heatsinks (with hardware) for regulators.
53	Disc Bypass Capacitors
8	Tantalum Capacitors for regulators
1	1K ohm Resistor
5	2.2K ohm Resistors
4	7805 5VDC Regulators
32	2114 1K X 4 Static RAM's
5	74LS367 Buffers (8T97 or 74367)
1	74LS138 3 to 8 Decoder
1	74LS154 4 to 16 Decoder
3	74LS04 Hex Inverters
4	74LS32 Quad 2 Input OR
2	74LS05 Hex Inverter (O.C)
1	74LS10 Triple 3 Input Nand
1	74LS20 Dual 4 Input Nand
1	74LS30 8 Input Nand
1	74LS74 Dual D FF
1	74LS175 Quad D FF
1	Red LED
1	Printed Circuit Board

## GENERAL CONSTRUCTION HINTS

For soldering we recommend a 32 Watt soldering pencil . DO NOT use a soldering gun !!! Use small diameter (such as 22 ga.) rosin core 60/40 alloy solder.

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

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

Observe polarities of all tantalum caps and the LED.

If you notice any discrepancies between the parts received and those listed please notify us immediately.

## LIMITED WARRANTY

Digital Research Corp. of Texas warrants all components in this kit to be free from defects in material and workmanship for a period of 90 days. Any defective parts must be returned to us and will be replaced at no charge. Any board purchased as a kit which malfunctions during the warranty period which has not been subjected to abuse and that has been assembled with reasonable care will be repaired or replaced at no charge.

Any unassembled kit purchased from us may be returned within 14 days of receipt for a FULL "no questions asked" refund. No reason is necessary. The above warranties also apply to kits assembled by Digital Research Corp.

Any board which is not covered by the above warranty will be repaired at a cost commensurate with the work required. This charge will not exceed \$20 without prior approval.

This warranty is made in lieu of any other warranty expressed or implied and is limited in all cases to the repair or replacement of the kit involved.

## 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 ohm meter, insure that there are no shorts between buss pins 1 and 50.
- ( ) Install and solder 18 pin sockets for IC locations 1 through 32. Note that there is a notch or indentation on each of the IC sockets. This should be oriented in the same direction as the notch on the silk screened component legend for each IC location.
- ( ) Install and solder a 24 pin socket in IC location 44.
- ( ) Install and solder a 16 pin IC socket in each of the following locations: 33, 39, 40, 45, 49, 50 and 51. Also install 16 pin sockets for the "Bank Select" and "Address Select" locations.
- ( ) Install and solder 14 pin sockets in the following locations: 34, 35, 36, 37, 38, 41, 42, 43, 46, 47, 48, 52, and 53.
- ( ) Install and solder the 4 pin socket in the location marked "DCBA".
- ( ) Install and solder the 53 bypass caps in locations C1 through C53. Note that these are disc ceramic capacitors.
- ( ) Install and solder the one 1K resistor in location R4.
- ( ) Install and solder 2.2K resistors in locations R1, R2, R3, R5 and R6.
- ( ) Install and solder the four 7805 voltage regulators with heatsinks using the hardware provided.
- ( ) Install and solder the LED in the upper right hand corner of the board, near the word "ENABLED". The flat side of the LED is to the right.
- ( ) Install and solder the 8 tantalum caps as follows: C54 + down, C55 + up, C56 + down, C57 + up, C58 + down, C59 + up, C60 + down, and C61 + to the right. Note that "down" is toward the gold fingers. **WARNING** : Double check that the tantalums are installed properly.
- ( ) Using any of the regulator mounting tabs as ground, measure the output of each 7805 under power in your system. The output pin of the regulators is the uppermost pin. The measured outputs should be between 4.75 and 5.25 VDC. Any regulator not meeting these requirements must be replaced before any further steps are taken.

( ) Insert 74LS367's in the following locations: 39, 40, 49, 50, and 51. Be extremely careful to match the dot on each socket with pin 1 of each IC denoted by a small notch or indentation.

( ) Insert 74LS32 in locations 34, 35, 36, 37.

( ) Insert 74LS04 in locations 42, 47, and 48.

( ) Insert 7405's in locations 52 and 53.

( ) Insert a 74LS10 in location 41.

( ) Insert a 74LS20 in location 38.

( ) Insert a 74LS30 in location 46.

( ) Insert a 74LS74 in location 43.

( ) Insert a 74LS139 in location 33.

( ) Insert a 74LS154 in location 44.

( ) Insert a 74LS175 in location 45.

( ) Insert 2114's in locations 1 through 32. WARNING: All pin #1's are UP !!!

( ) Now that all IC's have been installed in sockets you should again check the regulators for proper operation.

## 16K SET UP AND USE

There are several options available to the user. These include "ADDRESS SELECTION", "WAIT STATES", "PHANTOM", and "BANK SELECT".

## ADDRESS SELECTION

The DIGITAL RESEARCH CORP. 16K Static RAM is configured as four independent 4K blocks. Each 4K block can be addressed on any of the sixteen available 4K areas of the S-100 buss. The four 4K blocks on the board are designated by the letters A,B,C,D. The sixteen system 4K areas are designated by 0 through 15. It is necessary to place Jumpers between each 4K block (A,B,C,D) and the desired 4K area (0 through 15). The address select area is located at the lower left-hand side of the board.

If your board is not fully populated then the pins corresponding to the unused 4K blocks should be pulled up to +5 VDC. This is accomplished as shown

4K Block not used	2.2K on back of PC (pin 1 to pin 14)
A	IC 34
B	IC 35
C	IC 36
D	IC 37

## WAIT STATES

Wait states are normally not required however they can be jumpered if your system needs them. To select wait states place a Jumper between "W" and the number desired (1 through 4). With no Jumper, no wait states are inserted.

## PHANTOM

If your computer requires PHANTOM it is easily jumperable to buss pin 67 by placing a Jumper at the location marked PHANTOM.

## BANK SELECT

This board supports CROMEMCO standard bank select which is a feature of some of their software. Bank select is a method of interchanging up to eight 64K blocks of RAM under software control. This is accomplished by outputting a byte of data to Port 40H. Each bit (when high) determines which bank is enabled. Bit 0 is Bank 1 and Bit 7 is Bank 8.

To select which bank this board is part of, place a Jumper from the left side to the right side at the point designated by the BANK # stenciled on the PC board. This socket for Jumpering is at the lower right side of the board.

Also in the lower right of the board is an area labeled RESET. A Jumper must be installed in this location such that a system reset will either enable or disable the board. Normally a Jumper is placed from the ENABLE to the RESET pads. This will enable the board after a system reset. If, for example, the board is jumpered to be Bank 5 and it is not desired that BANK 5 be enabled after a system reset then the a Jumper would placed between DISABLE and RESET. Now the only way the board could be enabled would be via software. Only one bank of upto 64K is enabled at one time.

### THEORY OF OPERATION

This 16K board can reside in any of four 16K Ram areas available on the S-100 buss. IC 44 (74LS154) is used to decode the four high order address (A12-A15) and generates the outputs (0-15) brought out to the address Jumper area. IC 33 (74LS138) is used to decode addresses A10 and A11. The outputs of IC33 and IC44 are ORed (negative logic AND) together to form the 16 Ram Chip Select signals. Addresses A0-A9 are buffered by IC's 49 and 50. The Write Enable signal required by the 2114 is generated by inverting MWRITE from the buss (pin 68). D00-D07 are buffered by IC's 50,51 which are enabled by the inverted MWRITE signal. This is data out of the CPU and in to the Ram board. D00-D07 are also inverted by IC52 and 53 the outputs of which are selected by the Bank Select Jumper area (Wired ORed) then inverted (by IC42) and fed into the Data input of FF IC43. IC's 46,47, 48, 42 and 41 decode output port 40 as the clock input of ic 43. The active high output of IC43 is the Bank Select signal and is used to enable IC 44. The active low output is used to drive the Board Enable LED. The preset and clear inputs of IC 43 are jumperable to buss pin 75 (PRESET).

IC45 is configured as a ripple counter which counts 02 and is cleared by PSYNC. IC45'S outputs are brought out to jumpers. This allows you to select how many 02's are counted before PSYNC clears the counter.

D10-D17 (data in to the CPU) are buffer by IC39 and 40. These are enabled by the output of IC38. The inputs of IC38 are comprised SMEMR, PDBIN, PHANTOM, and Board Select. Board Select is derived from the jumpered outputs of IC 44.

