Introduction

The FLEX64K board is designed for use in early S-100 systems in which memory space fragmentation can make it difficult to expand RAM and PROM as you might need. This board provides up to 64K of RAM and up to 32K of PROM. The PROM is implemented in EEPROM, however, the write enable line is normally disconnected, so you don't have to worry about accidental EEPROM write cycles.

In the top 16K of memory space (C000-FFFF), RAM and PROM can be enabled/disabled in completely independent 1K blocks. This allows working around fragmentation due to PROM, scratch pad RAM, memory mapped I/O, etc., that often breaks up this range of memory space.

From 8000-BFFF, RAM and PROM can be enabled/disabled in independent 4K blocks.

From 0000-7FFF, RAM can start on any 1K boundary and extend from that address through 7FFF. This allows keeping small RAM boards in your system (e.g, 1K, 4K) and having the FLEX64K board fill above those boards with RAM.

Phantom support includes blocking only reads during a Phantom cycle, blocking both reads and writes during Phantom, or ignoring Phantom.

Switches allow swapping the upper and lower half of the 32K EEPROM. This allows swapping between two 16K PROMs with the flip of a switch and running two completely different configurations without having to swap EPROMs or reprogram a part. Swapping halves can also solve programming issues when the address range to be programmed conflicts with PROM or hardware present in the system used for programming.

A switch connects the write line to the EEPROM to allow programming of the EEPROM. A utility for programming the EEPROM is accessible in the same folder as this manual.

Parts List

Ref	Qty	Description
C1, C2	2	10uf, >= 25v, Tantalum, 0.1" lead spacing
C3-C13	11	0.1uF (0.2" lead spacing)
R1, R2	2	1.2K
RN1	1	4.7K x 5 bussed resistor network
SW1-SW4, SW8	5	8 position DIP switch
SW5-SW7	3	4 position DIP switch
U1-U3	3	74LS156
U4	1	628128 - 128K x 8 Static RAM (see notes below)
U5	1	28C256 - 32K x 8 EEPROM
U6	1	74LS682
U7, U13	2	74LS00
U8-U11	4	74LS244
U12	1	74LS10
U14	1	74LS32
U15	1	L7805 Voltage Regulator (and heat sink)

Compatible RAM Chips (TTL Solution)

Following is a list of 128K x 8 RAM chips that are TTL compatible. These must be found on the surplus market. Make sure the part you purchase is the through-hole package (not SMT).

- BSI BS62LV1027PC or PI
- Hitachi HM628128LP
- Samsung K6T1008C2D
- Toshiba TC551001P
- NEC uPD431000CZ
- Winbond W24100

Compatible RAM Chips (CMOS Solution)

Both Mouser and DigiKey still sell the Alliance AS6C1008-55PCN (and -55PIN) 128K x 8 SRAM. These chips expect CMOS input levels, however, they operate reliably on this board due to light loading of the LS TTL outputs that drive the inputs on the SRAM chip.

Note: It is not recommended that you substitute HCT parts for the LS parts that drive the CMOS SRAM chip. The high slew rate of the HCT parts can induce signal ringing and power supply noise that may result in unreliable operation of the board.

Assembly

Assembly of the FLEX64K board is not difficult, but it is assumed you are already familiar with identifying parts, how to solder, etc. If you have any concerns about building this board, please contact me first.

Order of Assembly

Solder the board starting with lowest profile parts first, working to highest profile parts last:

1) Install all IC sockets
2) Install R1-R2
3) Install U15 leaving small gap for heat sink thickness
4) Install SIP resistor network RN1
5) Install SW1-SW8
6) Install C1, C2 noting polarity
7) Install C3-C13
9) Install heat sink with the head of the screw on the backside of the board - tighten firmly
10) Install ICs in the sockets

Using the FLEX64K RAM/PROM Board

RAM 0000-7FFF

RAM in this range is controlled by SW8. To use any of this RAM, turn switch 6 ON. To disable all RAM in this range, turn switch 6 OFF. Switches 1-5 set the address at which RAM should start in 1K increments. From the selected start address, RAM then extends up through 7FFF. The switch settings for each possible starting address are shown on the board.

RAM 8000-BFFF

RAM in this range can be enabled or disabled in 4K blocks using the four switches on SW5 (marked "RAM 4K"). Switch ON enables the block, switch OFF disables the block.

RAM C000-FFFF

RAM in this range can be enabled or disabled in 1K blocks using the 16 switches on SW1 and SW2 (marked "RAM 1K Block Enable"). Switch ON enables the block, switch OFF disables the block.

EEPROM 8000-BFFF

EEPROM in this range can be enabled or disabled in 4K blocks using the four switches on SW6 (marked "4K ROM"). Switch ON enables the block, switch OFF disables the block.

EEPROM C000-FFFF

EEPROM in this range can be enabled or disabled in 1K blocks using the 16 switches on SW3 and SW4 (marked "ROM 1K Block Enable"). Switch ON enables the block, switch OFF disables the block.

Phantom Support

Phantom is controlled with two switches on SW8. If your system does not use Phantom, switches 7 and 8 should be off. If your system does use Phantom, then switch 7 ("Phantom Reads") should be on. If your system also requires that writes are blocked during Phantom cycles, then also turn on switch 8 ("Phantom Writes"). Having only switch 8 on (just Phantom Writes) won't hurt anything, but it's probably not a useful setting.

Swapping EEPROM Halves

The two 16K halves of the EEPROM can be swapped versus normal addressing of the EEPROM. This is controlled by switches 1 and 2 on SW7. With ONLY switch 1 on, the EEPROM is addressed normally. With ONLY switch 2 on, the two halves of the EEPROM are swapped in the address space. **Switches 1 and 2 should never be ON at the same time**.

Notes

On the 1K and 4K block switches (SW1-SW6), it is important that only RAM or only PROM is enabled for a given address. If you're seeing odd behavior, you most likely have both RAM and PROM enabled for the same address.

You can change switches while the system is powered on if you follow this basic procedure: First, turn OFF any switches that are changing from ON to OFF. Second, turn ON the switches that are changing from OFF to ON. This is especially important for the "Swap EEPROM Halves" switches.