μU•REm

MICRO UNIVERSAL ROM/RAM EMULATION SYSTEM

USER'S GUIDE AND
REFERENCE MANUAL

Rev. 11/99

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PERTAINING TO HARDWARE

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Manufacturer warrants that the Products sold hereunder will be free from defects in material and workmanship for a period of ONE (1) YEAR from the date of purchase. If the Products do not conform to this Limited Warranty during the warranty period (as herein above specified), Buyer shall notify Manufacturer in writing of the claimed defects and demonstrate to Manufacturer satisfaction that said defects are covered by this Limited Warranty. If the defects are properly reported to Manufacturer within the warranty period, and the defects are of such type and nature as to be covered by this warranty, Manufacturer shall, at its own expense, furnish, replacement Products or, at Manufacturer's option, replacement parts for the defective Products. Manufacturer may use remanufactured, refurbished, or used parts and modules in making warranty repairs. Shipping and installation of the replacement Products or replacement parts shall be at Buyer's expense.

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Manufacturer has tested the software and reviewed the accuracy of this documentation. Manufacturer makes no warranty or representation, either expressed or implied, with respect to its software and documentation. As a result, this software and documentation are sold "as is", and you, the Buyer, are assuming the entire risk as to their quality and performance.

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ABI products are sold with a 30-day money-back guarantee. If you are not completely satisfied with the product, return the entire package to the place of original purchase within 30 days of receipt for a full refund of your purchase price (excluding any shipping, handling, or transportation charges).

Contents

INTRODUCTION

OVERVIEW

ABI's µU•REm hardware and software combination provide an affordable ROM/ RAM emulation system for the PC Compatible family of computers.

The µU•REm system allows you to quickly download and test your code: from 2 Kbyte to 8 Mbyte in 8 bit or 16 bit width. Your code can be viewed and easily edited to see the results of your changes instantly.

The µU•REm system is expandable. The emulation memory space can be easily increased by simply adding additional SRAM or by adding another memory card.

The µU•REm system is flexible. The available standard target adapters (for all common EPROMs and PROMs) and custom adapters for specific systems will meet the needs for a wide range of requirements.

Whether your code is large or small, the advantages µU•REm system offers will greatly reduce your development time.

FEATURES

The µU•REm hardware and software offer a range of features:

- Emulates 8 or 16 bit data width (2716, 27C512, 27C800, ...) up to 8M-bytes per unit
- Combine up to four units for 64 bit emulation
- Two proprietary slots for multiple memory cards and future expansion
- Separate 8 and 8/16 bit target interface connectors
- Both TTL and CMOS input/output compatible
- No external power needed (powered by host)
- Easily expandable by simply adding additional SRAM
- 3V lithium battery backup

- High speed data transfer: downloads 1M-byte in under 2 seconds (hard drive to emulator)
- Access time: approx. 30 ns plus SRAM speed
- Target controlled data width (on 8/16 bit connector)
- I/O lines: 2 (1 RESET) open-collector outputs, and 1 bidirectional
- Target write access to emulation memory or secondary space using additional memory card
- View and edit any address range or individual bytes instantly
- Monitor and modify I/O lines
- Download and upload with verify
- Control multiple emulators seamlessly under one environment with intelligent 16/32/64 bit file splits
- Automatically sets RESET line HIGH, LOW, or no-action on host access with adjustable delay

SYSTEM REQUIREMENTS

The µU•REm system requires the following:

- PC Compatible with a free expansion slot
- 512 Kbyte of RAM
- MS-DOS, Version 3.3 or greater
- One floppy disk drive

µU•REm PACKAGE

The µU•REm package contains:

- the Host Interface Card
- the Desktop Unit
- the Memory Card
- two 40-pin ribbon cables
- one 50-pin ribbon cable
- the URE-40A Target Adapter
- the URE-51A Target Adapter
- DIP headers (one of each): assorted sizes
- one RED Test Lead
- the µU•REm Program disk
- the µU•REm User's Guide and Reference Manual
- the Registration Card

HARDWARE SETUP

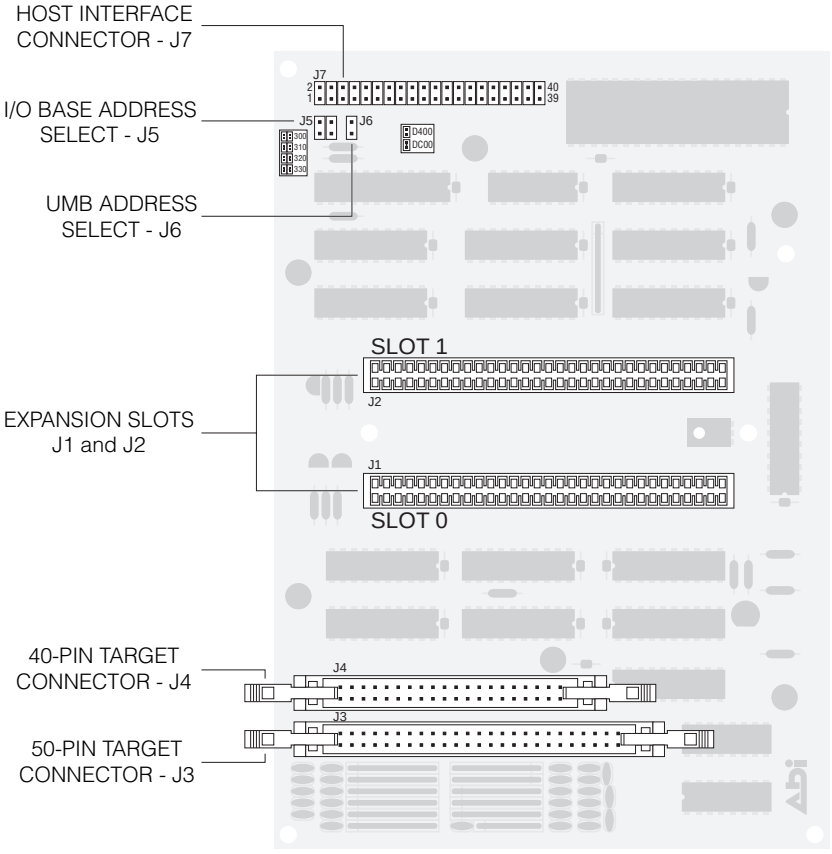


FIGURE 2-1. DESKTOP UNIT CONNECTOR LOCATIONS

HARDWARE INSTALLATION

Refer to Fig. 2-1 and Fig. 2-2 during installation.

Install the Host Interface Card.

1. Turn OFF your computer.
2. Remove the cover from your computer.
3. Touch the chassis of the computer to discharge any static charges.
4. Firmly press the Host Interface Card into an available slot and secure to chassis.
5. Replace the computer cover.

Next, connect the Host Interface Card to the Desktop Unit.

6. Connect the 40-pin ribbon cable to the Host Interface Connector on the Desktop Unit Desktop Unit (J7 in Fig. 2-1). Pin 1 is marked red or blue strip on the ribbon cable.
7. Connect the other end of the 40-pin ribbon cable to the Host Interface Card with pin 1 toward the top edge of the card.

Then, insert the Memory Card.

8. Insert the Memory Card into Expansion SLOT 0 (J1 in Fig. 2-1) with the front facing the Target Connectors J3 and J4. The front side of the Memory Card is the side with the 3V lithium battery.

Finally, connect the Target Adapter.

9. Connect the appropriate Target Adapter to the Target Connector (J3 or J4 in Fig. 2-1) on the Desktop Unit with the corresponding ribbon cable. See Appendix B for information on Target Adapters pinouts.
10. Insert the DIP header with the same pin count as the target into the Target Adapter. If an exact matching DIP header is not available, use the next larger header.
11. Carefully insert the Target Adapter into the target unit.
12. Clip one end of the supplied red test lead to the pin labeled **IN**

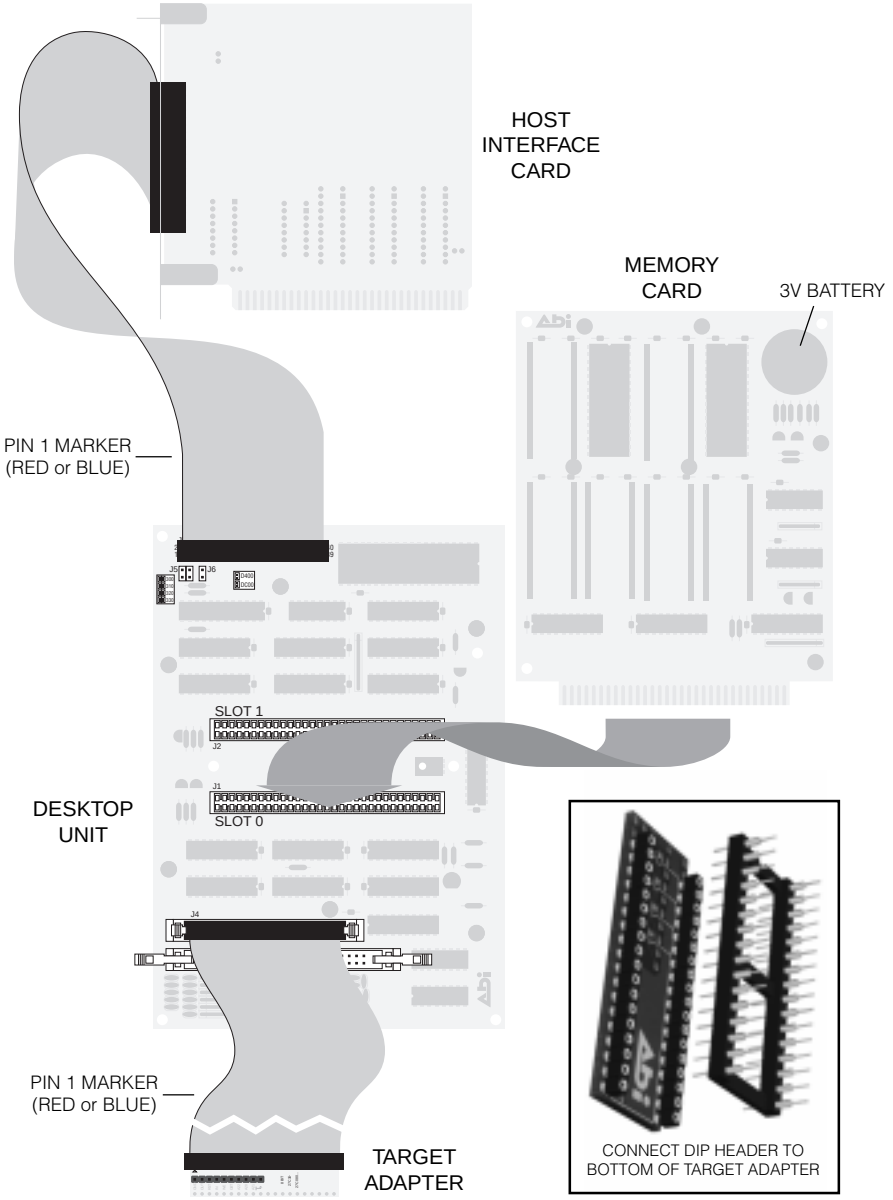


FIGURE 2-2. CABLE CONNECTIONS

on the Target Adapter (see Fig. 2-3).

⚠ 13. Clip the free end of the red test lead to the target's VCC at an easily accessible area on the target unit. The state of target's VCC is displayed in the 'IN: User' field on the application main screen. IMPORTANT: emulator will ***not*** function if the red test lead is not connected to target's VCC.

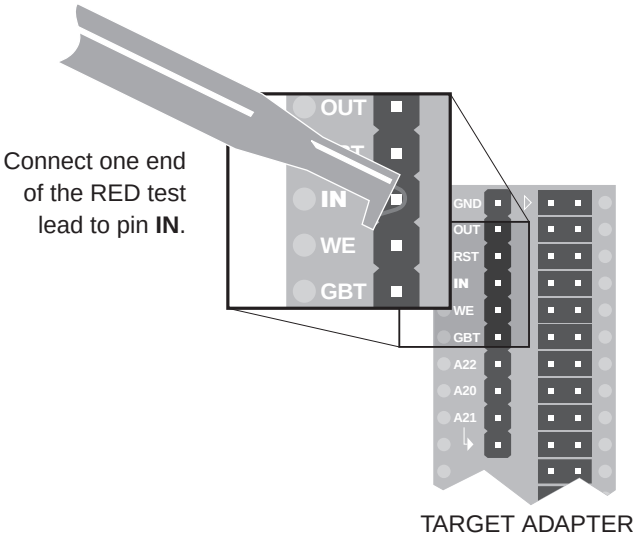


FIGURE 2-3. RED TEST LEAD CONNECTION

HARDWARE CONFIGURATION

The µU•REm hardware occupies 16 consecutive addresses starting at the base I/O address of 300h (default), 310h, 320h, or 330h. In addition to the I/O address, 16 Kbytes of memory space in the Upper Memory Block (UMB) region starting at D400:0000 or DC00:0000 (default) is used for data transfer. To prevent DOS and WINDOWS operating systems from attempting to use this UMB range, add the following to exclude the UMB range.

For **DOS** or **Win3.x**:

Add the following statement to the EMM386.EXE device driver line in the CONFIG.SYS file:

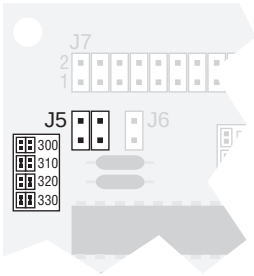
X=DC00-DFFF
or
X=D400-D7FF

For **Win9x**:

Open *Control Panel->System->Device Manager->Computer->Reserve Resources->Memory* and add range **DC000 to DFFFF** (or **D4000 to D7FFF**), note the extra '0' and 'F'; open *Control Panel->System->Device Manager->Computer->Reserve Resources->Input/Output (I/O)* and add range **300 to 30F** (or appropriate range). ⚠ Remove any EMM386.EXE call from the CONFIG.SYS file.

For more information about excluding memory ranges, refer to your Operating System manual.

To change the I/O base address, set the jumpers at J5 as shown in Fig. 2-4.

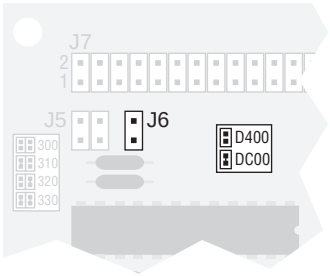


I/O BASE	J5
300h-30Fh*	
310h-31Fh	
320h-32Fh	
330h-33Fh	

**DEFAULT*

FIGURE 2-4. I/O BASE ADDRESS JUMPERS

To change the UMB address, set the jumper at J6 as shown in Fig. 2-5.



UMB ADDRESS	J6
D400-D7FF	
DC00-DFFF*	

**DEFAULT*

FIGURE 2-5. UMB ADDRESS JUMPER

⚠ In multiple emulation systems installation, each unit must have a unique I/O base address but ***all*** units must share a common UMB address.

SOFTWARE SETUP

SOFTWARE INSTALLATION

For **DOS** or **Win3.x**:

The µU•REm software may be installed in any directory or in its own directory. To install the software, enter the following at the DOS prompt:

```
C:\>md uurem  <Enter>
C:\>cd uurem  <Enter>
C:\UUREM>copy a:\DOS_Win3x\*.*  <Enter>
```

The name of the directory in which the software was installed may be added to the PATH statement in the AUTOEXEC.BAT file to simplify program execution:

```
PATH=C:\DOS;C:\WINDOWS;C:\UUREM;
```

For **Win9x** or **WinNT**:

To install the software, RUN the following:

```
A:\Win9x_NT\SETUP.EXE  <Enter>
```

⚠ Installation requires user to be logged in with FULL Administrator privileges. System must also be rebooted after installation is complete.

SOFTWARE CONFIGURATION

From the appropriate directory, enter the following to run the µU•REm software:

```
uurem
```

If the default I/O base address (300h) was unchanged during Hardware Configuration, the program will begin initialization. Otherwise, an error message will appear and you will have a chance to enter the new I/O base address.

FIGURE 3-1. EMULATOR NOT FOUND

Selecting OK will bring up the I/O base address setup window.

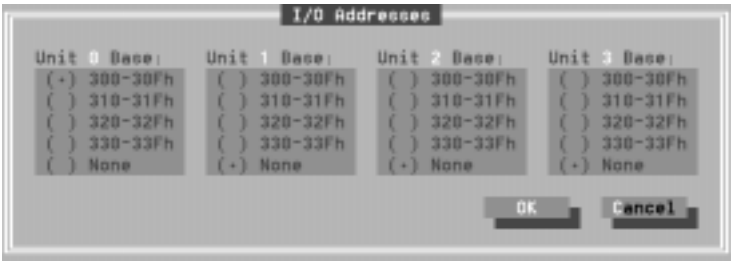


FIGURE 3-2. I/O ADDRESS SETUP WINDOW

Select the correct address for each installed unit. The UMB address is automatically detected when the correct I/O base address is set.

MULTIPLE EMULATION SYSTEMS INSTALLATION

Define I/O base address for each additional Emulator in “Options - I/O Port...” menu.

USING μU•REm

After starting the μU•REm software, the Main Screen will be shown:

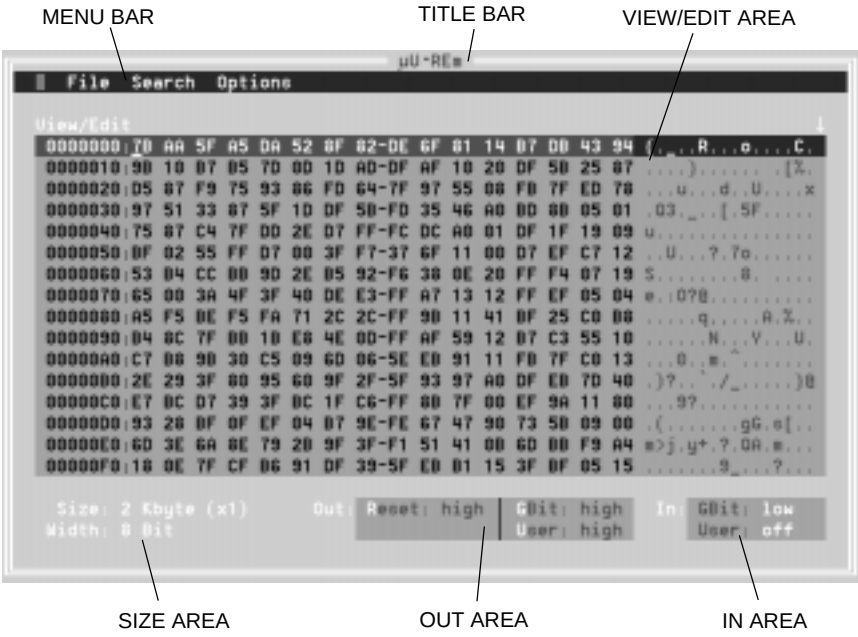


FIGURE 5-1. MAIN SCREEN

Menu Bar	The Menu Bar shows the available menus.
Title Bar	The Title Bar shows the name of the current file.
View/Edit Area	The View/Edit Area is for viewing and editing of the emulation memory contents.
Size Area	The Size Area shows the current size and width of the emulator.
Out Area	The Out Area shows the current state of each user output line.
In Area	The In Area shows the current state of each user input line.

MOVING AROUND

Use the following keys to move between each screen area:

Tab/Shift-Tab	Use the Tab/Shift-Tab keys to select between each group of items on the screen.
Arrow	Use the Arrow keys to select items within a group.
Enter	Use the Enter key to confirm a selection or to toggle the state of an item.
Space-bar	Use the Space-bar to toggle the state of an item.
Alt + <key>	Use the Alt + highlighted letter of an item to select that item.

SELECTING EMULATION SIZE

Select Size from the Options menu and the Size Setup window will appear.

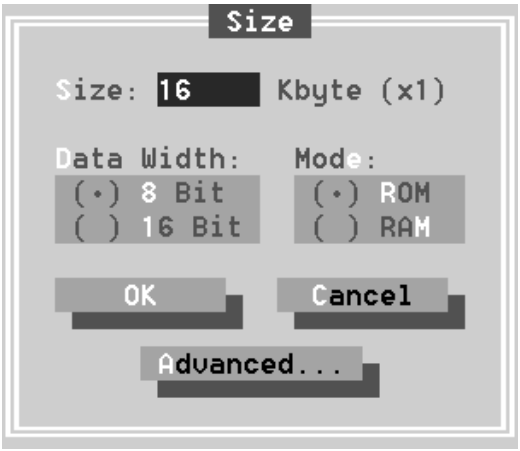


FIGURE 4-2. SIZE SETUP WINDOW

Enter the new size in the Size field: size must be in kilobyte units. If the entered size is unavailable, the next available larger size will be selected. Next, select the Data Width and Mode. In the 8 Bit emulation mode, the 40-Pin Target Connector is used; in the 16 Bit mode, the 50-Pin Target Connector is used. It is important to note that the target adapter be connected to the correct connector.

The Advanced button provides more flexibility in setting up the emulation memory.

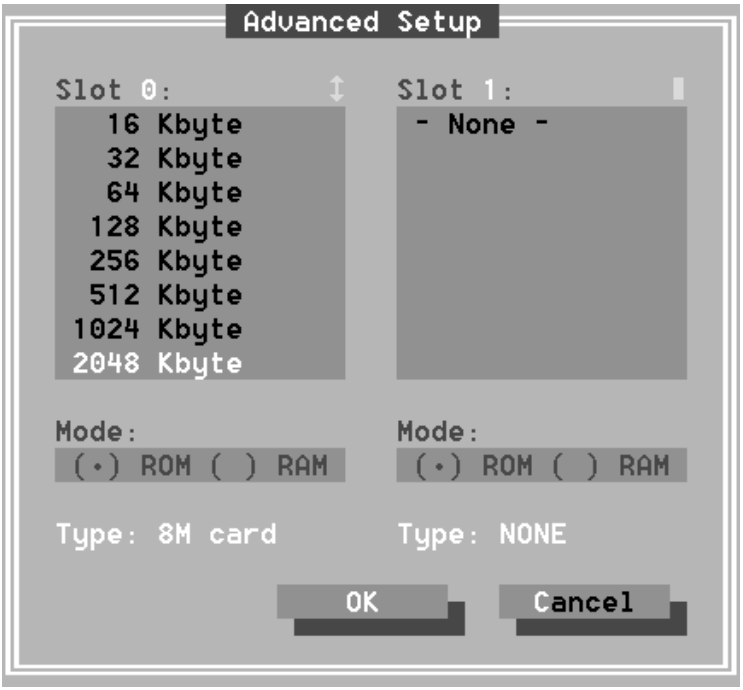


FIGURE 4-3. ADVANCED SETUP WINDOW

The emulation memory can be configured as ROM or RAM—in systems with two memory cards, the second card can be used as a "scratch-pad" RAM area.

The list of choices for the second memory card only becomes available when a valid size is selected for the first card. If the second memory card size list is empty, scroll down the list of sizes for the first card until sizes for the second card appears. The Advanced button is disabled in systems with multiple emulators.

SETTING THE ENVIRONMENT

Selecting Environment from the Options menu will bring up the Environment window.

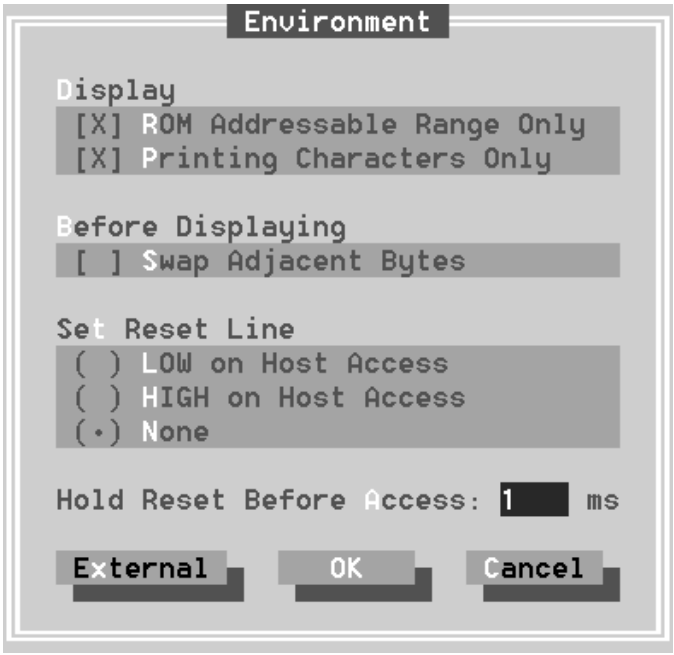


FIGURE 4-4. ENVIRONMENT WINDOW

ROM Addressable Range Only

The ROM Addressable Range Only option limits the View/Edit range to that of the emulation memory size.

Printing Characters Only

The Printing Characters Only option limits display of printing characters in the ASCII portion of the View/Edit area. All graphic characters are suppressed.

Swap Adjacent Bytes

The Swap Adjacent Bytes option makes data more easily readable. This option ***does not*** affect how data is loaded.

Set Reset Line	The Set Reset Line group establishes the link between the Reset line and host access to emulation memory.
Hold Reset Before Access	The Hold Reset Before Access field defines how long , in 1ms increments, the Reset line should be held before host initiates access to emulation memory.
External	The External provides definition of call to external applications for pre/post processing of data.

EDITING DATA

To edit data, select the View/Edit area and move the cursor to the desired location. Type in the changes and press Enter to update the emulation memory. Use the following keys while in the View/Edit area:

F2	Switch between Hex and ASCII areas.
Shift-F2	Toggle ASCII display filter.
Home	Moves cursor to beginning of current line.
End	Moves cursor to end of current line.
PgUp	Move to previous page.
PgDn	Move to next page.
Ctrl-Home	Moves cursor to beginning of current page.
Ctrl-End	Moves cursor to end of current page.
Ctrl-PgUp	Moves cursor to address: 000000.
Ctrl-PgDn	Moves cursor to end of addressable range.

LOADING FILES

Select Load from the File menu and the Load Setup window appears.

FIGURE 4-5. LOAD SETUP WINDOW

Start Load — The Start Load field defines the address in the emulation memory space at which loading begins.

Blank Fill — The Blank Fill option, when enabled, fills unloaded area of the emulation memory with the value in the text box.

Swap Adjacent Bytes — The Swap Adjacent Bytes option, when enabled, will physically swap adjacent bytes before loading.

File Format — The File Format specifies the format of the data file: Binary, Intel-hex, Motorola S-record, or External call for data pre-processing.

Split — The Split list lists the available split formats. Auto-Split is only available when two or four emulators are in use at once.

Select OK after setup is complete and a window for selecting a file to load will appear.

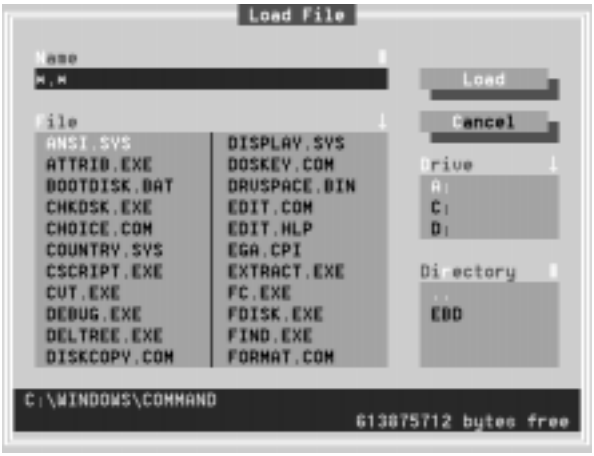


FIGURE 4-6. LOAD FILE WINDOW

The following figures show how Auto-Split splits and loads data into each emulator. When None is selected in Split list when multiple units are used, emulation memory in all attached units are treated as one contiguous space: data is loaded in a continuous stream..

DATA FILE				
0000:	AB	96	2C	1D
0004:	05	20	E3	A1
0008:	17	34	FF	8C
000C:	00	6B	DC	55
…	…			

	UNIT 0	UNIT 1
0000:	AB	96
0001:	2C	1D
0002:	05	20
0003:	E3	A1
…	…	…

FIGURE 4-7. DATA SPLIT FOR SYSTEM WITH TWO EMULATORS IN 8 BIT MODE

DATA FILE				
0000:	AB	96	2C	1D
0004:	05	20	E3	A1
0008:	17	34	FF	8C
000C:	00	6B	DC	55
…	…			

	UNIT 0	UNIT 1	UNIT 2	UNIT 3
0000:	AB	96	2C	1D
0001:	05	20	E3	A1
0002:	17	34	FF	8C
0003:	00	6B	DC	55
…	…	…	…	…

FIGURE 4-8. DATA SPLIT FOR SYSTEM WITH FOUR EMULATORS IN 8 BIT MODE

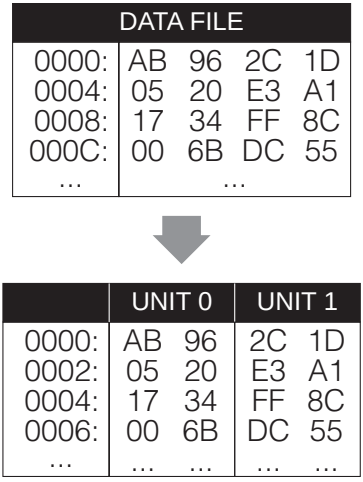


FIGURE 4-9. DATA SPLIT FOR SYSTEM WITH TWO EMULATORS IN 16 BIT MODE

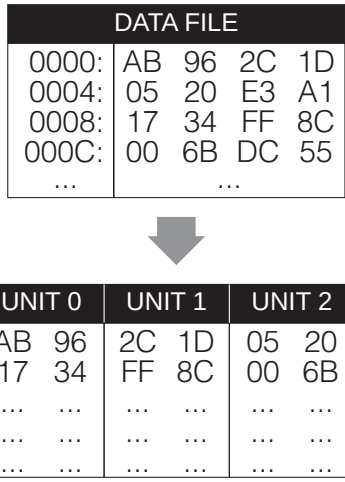


FIGURE 4-10. DATA SPLIT FOR SYSTEM WITH FOUR EMULATORS IN 16 BIT MODE

Data in the View/Edit area appears as in the original data file. All data splits occur transparently.

CONTROLLING USER I/O LINES

State of two (Reset and User) open-collector output lines and one (GBit) bidirectional line can be manually toggled by selecting the desired line and pressing Enter or the space-bar in the Out area.

FIGURE 4-11. USER OUT LINES

The state of the Reset line may change if the Set Reset Line option in the Environment window is set.

The state of the user input lines are monitored and updated approximately every 100ms in the In area (User: field reflects the power state of the Target System).

FIGURE 4-12a. USER IN LINES

It is important to note that for any input to register on the GBit input line, its output control must be set high (or open state). The status of the GBit input will show LOCK whenever the GBit output is set LOW as a reminder.

FIGURE 4-12b. USER IN LINES

SAVING FILES

Select Save As from the File menu and the Save Setup window will appear.

FIGURE 4-13. SAVE SETUP WINDOW

Enter the From and the To address range of the desired emulation memory space in their respective fields, select File Format, then select OK. Next, enter the new file name, drive, and directory in the Save File window.

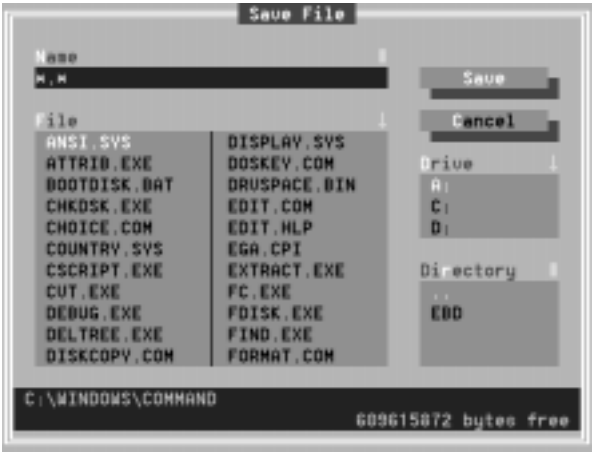


FIGURE 4-14. SAVE FILE WINDOW

IMPORTANT NOTE:

Under certain condition, scrolling up or down in the VIEW/EDIT area while emulating will cause the target unit to reset (when RESET line is connected) or freeze. This is a normal occurrence resulting from the *host PC* temporarily taking control of the shared emulation memory space from the *target unit* to read additional data when a 16 Kbyte boundary is crossed.

COMMAND REFERENCE

ABOUT MENU COMMANDS

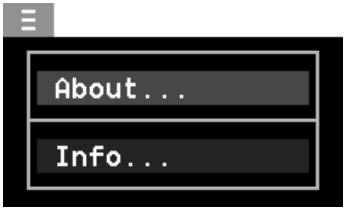


FIGURE A-1. ABOUT MENU

About	The About command gives the current software version.
Info	The Info command gives the current configuration and system addresses of the emulation system.

FILE MENU COMMANDS

FIGURE A-2. FILE MENU

New — The New command prepares the emulation memory for data.

Load — The Load command loads an existing file. When Load is chosen, the Load Setup window with options for specifying load address, blank fill, file format, and split format appears.

Auto Load *Win9x/NT version ONLY* — The Auto Load command monitors a data file for change and automatically load when change is detected. When Auto Load is chosen, the Load Setup window with options for specifying load address, blank fill, file format, and split format appears.

Save — The Save command saves the content of the emulation memory to disk, replacing the most recent version of file with the same name.

Save As — The Save As command saves the content of the emulation memory to disk under a new name. When Save As is chosen, the Save Setup window with options for specifying From and To addresses and file format appears.

DOS Shell — The DOS Shell command temporarily leaves the µU•REm software and exits to the DOS prompt. Enter EXIT from the DOS prompt to continue.

Quit — The Quit command ends the program and returns to the operating system. If any unsaved changes remain, a window will appear to ask if changes need to be saved.

SEARCH MENU COMMANDS

FIGURE A-3. SEARCH MENU

Find Hex The Find Hex command searches the emulation memory for a matching hexadecimal sequence. Find Hex will search to the end of the View/Edit addressable range.

Find ASCII The Find ASCII command searches the emulation memory for a matching text string. Find ASCII will search to the end of the View/Edit addressable range.

Search Again The Search Again command repeats the last successful search of the emulation memory for the next occurrence.

Go To The Go To command moves the cursor in the View/Edit area to the specified address.

OPTIONS MENU COMMANDS

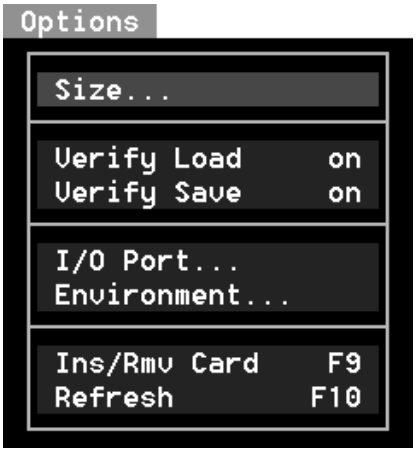


FIGURE A-4. OPTIONS MENU

Size The Size command presents a window for specifying size and width of the emulation memory.

Verify Load The Verify Load command verifies the integrity of the data during load operations.

Verify Save The Verify Save command verifies the integrity of the data during save operations.

I/O Port The I/O Port command presents a window for defining I/O base address for each attached emulator.

Environment The Environment command presents a window for specifying range and appearance of the View/Edit area and Reset link to host access.

Ins/Rmv Card The Ins/Rmv Card command removes power to the emulator expansion slots to allow insertion or removal of cards.

Refresh The Refresh command updates the display in the View/Edit area with the content of the emulation memory.

PINOUTS

40-PIN TARGET CONNECTOR

The 40-Pin Target Connector (J4) is located on the desktop unit, shown in Fig. B-1. Attach the appropriate target adapter to this connector when emulation system is in 8 bit mode.

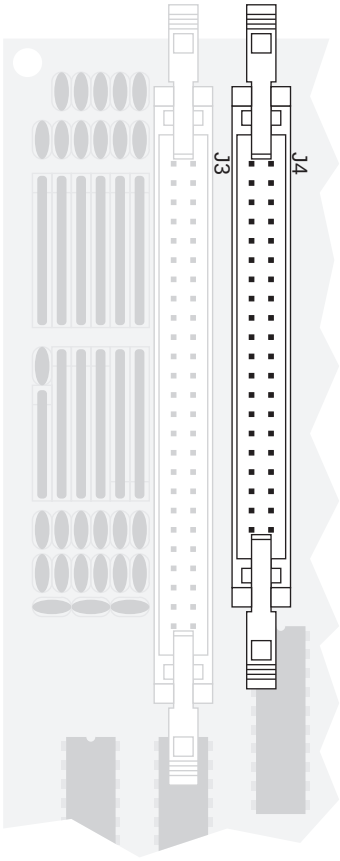


FIGURE B-1. 40-PIN CONNECTOR LOCATION

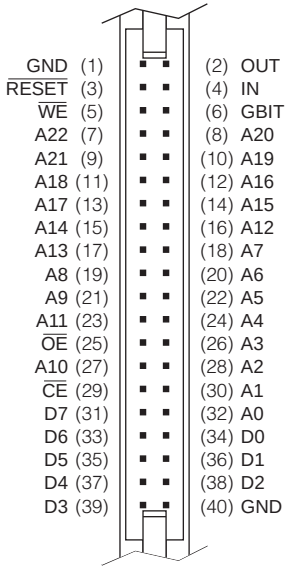


FIGURE B-2. 40-PIN CONNECTOR PINOUT

50-PIN TARGET CONNECTOR

The 50-Pin Target Connector (J3) is located on the desktop unit, shown in Fig. B-3. Attach the appropriate target adapter to this connector when emulation system is in 16 bit mode. Signal A0 (pin 3) is used to select HIGH/LOW byte when signal BHE (pin 29) is LOW. An alternate pin designation of address lines are shown in italic; this may be more helpful if the manufacturer of the target device uses a different method of designating address lines.

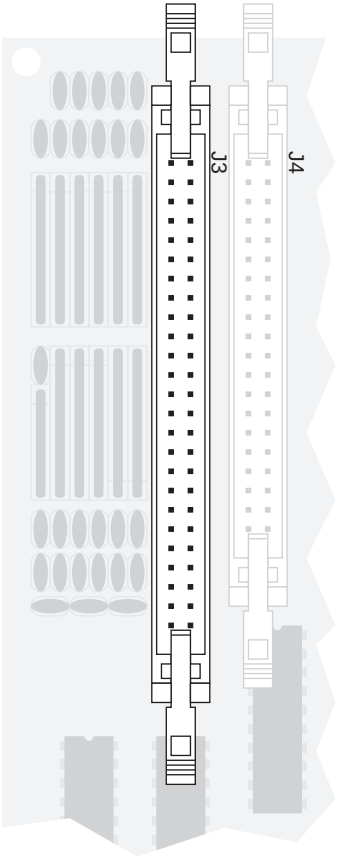


FIGURE B-3. 50-PIN CONNECTOR LOCATION

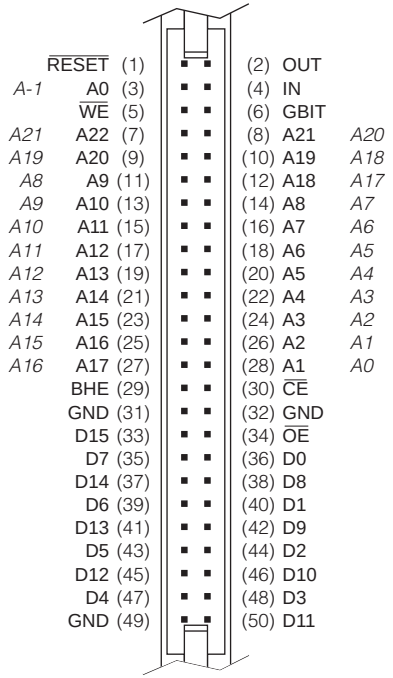


FIGURE B-4. 50-PIN CONNECTOR PINOUT

TARGET ADAPTERS

The URE-40A adapter conforms to JEDEC standard for 8 bit EPROM. This adapter is pin compatible with common 8 bit wide EPROMs (27C16, 27C64, ... , 27C080) and other devices with the same pin configuration. Connect this adapter to the 40-Pin Target Connector with a 40-pin ribbon cable and set the µU•REm program in 8 bit mode.

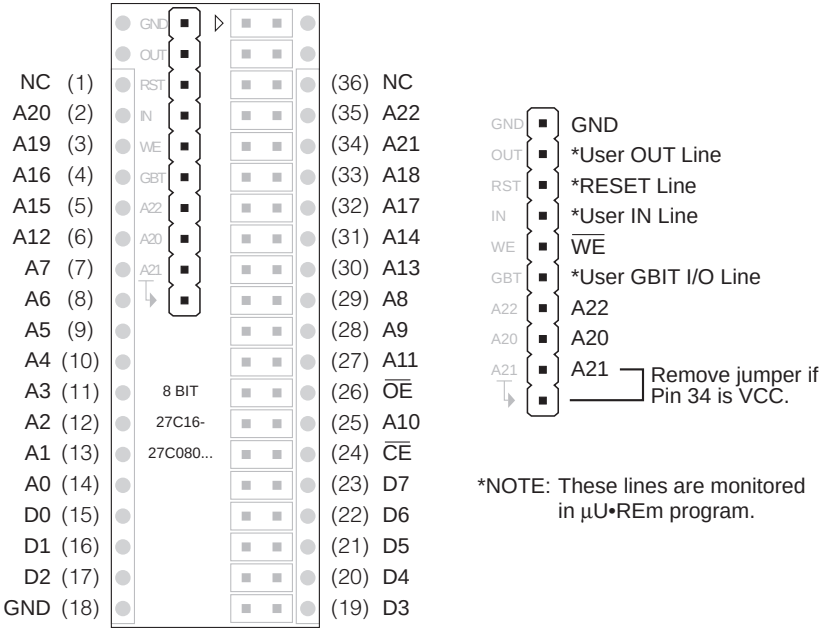


FIGURE B-5. URE-40A TARGET ADAPTER

The URE-50A adapter conforms to JEDEC standard for 16 bit EPROM. This adapter is pin compatible with common 8/16 bit wide EPROMs (27C400, 27C800, ...) and other devices with the same pin configuration. The BHE (Byte High Enable) pin is used to select between 8 and 16 bit modes. Connect this adapter to the 50-Pin Target Connector with a 50-pin ribbon cable and set the µU•REm program in 16 bit mode. An alternate pin designation of address lines are shown in italic; this may be more helpful if the manufacturer of the target device uses a different method of designating address lines.

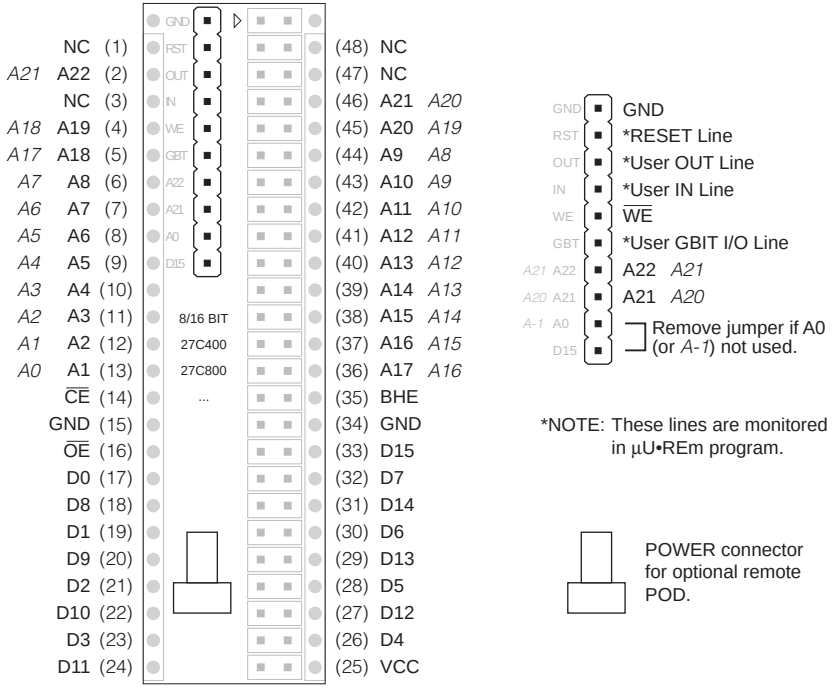


FIGURE B-6. URE-50A TARGET ADAPTER

The URE-51A adapter conforms to JEDEC standard for 16 bit EPROM. This adapter is pin compatible with common 16 bit wide EPROMs (27C1024, 27C4096) and other devices with the same pin configuration. Connect this adapter to the 50-Pin Target Connector with a 50-pin ribbon cable and set the µU•REm program in 16 bit mode. An alternate pin designation of address lines are shown in italic; this may be more helpful if the manufacturer of the target device uses a different method of designating address lines.

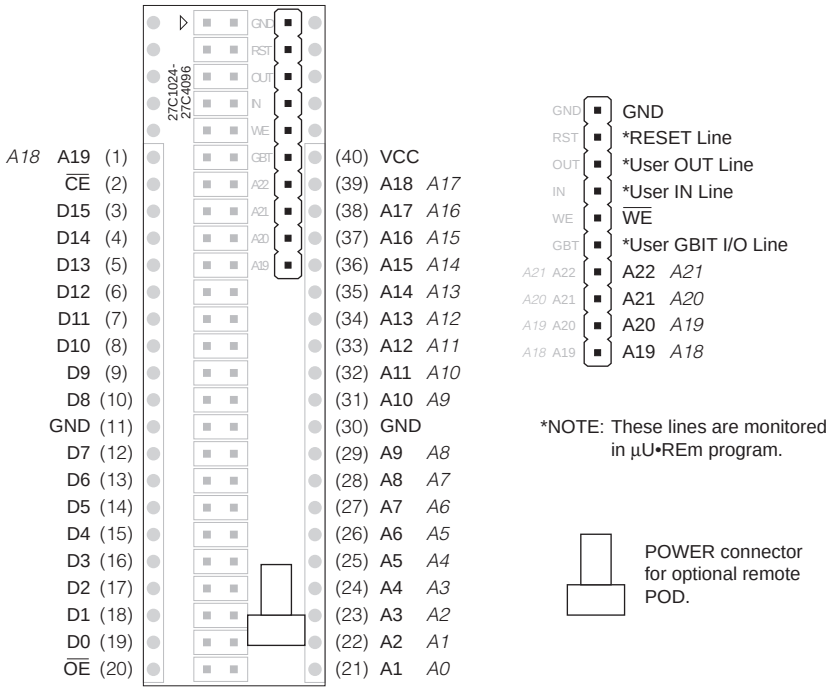


FIGURE B-7. URE-51A TARGET ADAPTER

APPENDIX B

MEMORY MAPS

Three types of memory cards are available: 2M-byte (Group 1) memory card, 2M-byte (Group 2) memory card, and 8M-byte memory card. The following diagrams show the memory maps for possible combinations of memory cards installed in the system; diagrams for one installed memory card also apply to systems with two installed memory cards with one disabled.

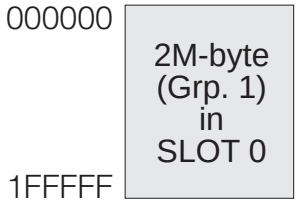


FIGURE C-1. ONE 2M-BYTE (GRP.1) CARD

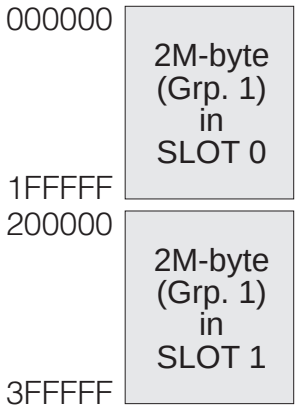


FIGURE C-2. TWO 2M-BYTE(GRP.1) CARDS

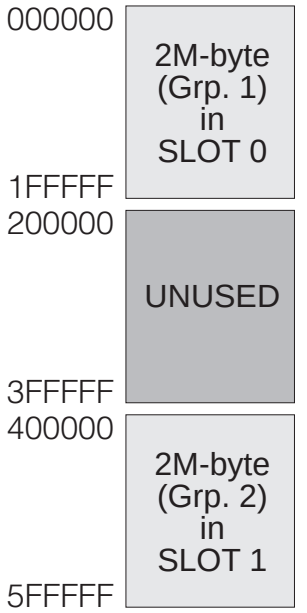


FIGURE C-3. ONE 2M-BYTE (GRP.1) & ONE 2M-BYTE (GRP.2) CARDS

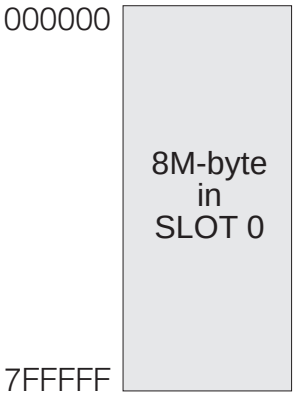


FIGURE C-4. ONE 8M-BYTE CARD

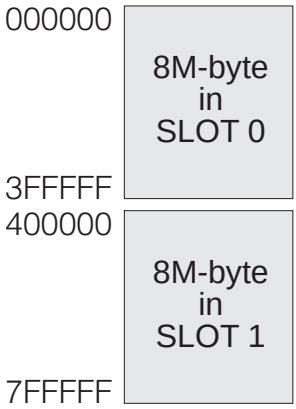


FIGURE C-5. TWO 8M-BYTE CARDS

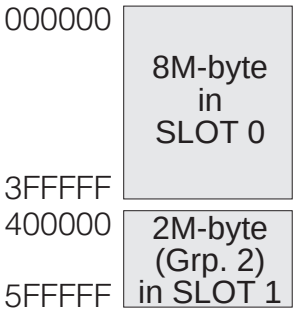


FIGURE C-6. ONE 8M-BYTE & ONE 2M-BYTE (GRP.2) CARDS

ADDING MEMORY

The emulation memory space can be easily increased by adding additional SRAMs. The 2M-byte (Grp. 1 & 2) cards require 128K x 8 SRAM: SAMSUNG KM681000BLP or equivalent. The 8M-byte card requires 512K x 8 SRAM: SAMSUNG KM684000LP or equivalent. All memory MUST have the same access time. The shaded area in Figure D-1 is for parts located on the backside of the memory card. Memory is added in sets of twos as shown in the following table:

2M CARD	8M CARD	ADD SET	
256KB	1MB	U4	U9
512KB	2MB	U3	U8
768KB	3MB	U2	U7
1024KB	4MB	U1	U6
1280KB	5MB	U14	U18
1536KB	6MB	U13	U17
1792KB	7MB	U12	U16
2048KB	8MB	U11	U15

FIGURE D-1. ADDING MEMORY SEQUENCE

APPENDIX D