AP-64e

EPROM Programmer

User's Manual

for the Apple II, Apple II Plus, Apple IIe & Apple III

document information

Original:
Document Size: US Letter single faced (5 pages)
Font: Epson Standard 9-pin dot matrix Elite 12cpi, 6lpi.

Re-Worked:
Document Size: Half Letter double faced
Paper Weight: 80-135gsm
Front & Back Covers: Light Grey 200gsm
Created on Windows Word 97 & Adobe PDF Writer v3.02
Fonts: Garamond, Courier New, Andale Mono, Script 12BT, Geneva
Color added for clarity.
Spelling errors corrected for clarity.
Style copied from Applied Engineering documents

Editor: Mark Cummings (figjams@primus.com.au)
Additions, comments or corrections welcome.

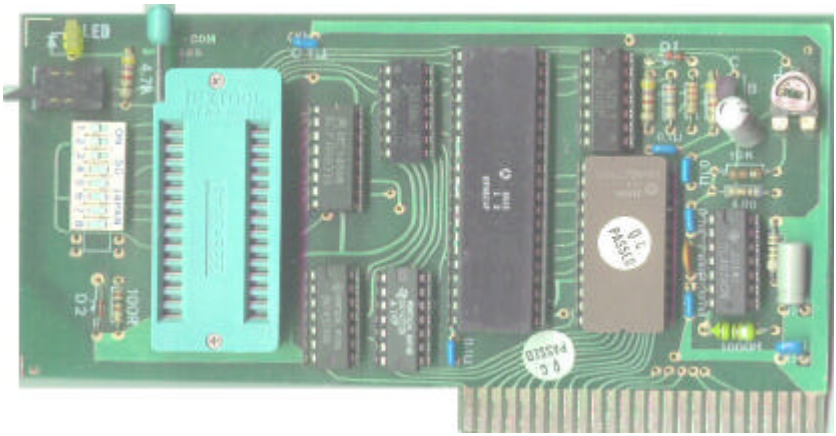
NOTE:
1. The 27128 modification has been tested and works however if you install it you do so at your own risk. I would be happy to provide answer to any questions you may have on the programmer or the modification. Please note that the modification will not allow you to WRITE to a 27128 EPROM. Doing will most likely damage the EPROM.

2. The Specifications page, Cover, EPROM pinout and 27128 mod is additional to the original document. There is also a separate document showing the circuit diagram for the Programmer. I recommend you print that too and include it in this manual.

u-com AP-64e

EPROM Programmer

User's Manual



for Apple II, Apple II Plus, Apple IIe & Apple III

CONTENTS **PAGE**

INTRODUCTION 3

INSTALLATION AND FUNCTIONS 3

-Installation 3

-Functions 4

USING THE AP-64e 5

-WRITE 6

-READ 8

-COPY 8

-COMPARE 9

-BLANKCHECK 10

-MONITOR 10

PROBLEMS AND SOLUTIONS 11

SPECIFICATIONS 12

MODIFICATION FOR 27128 EPROMs 13

INTRODUCTION

The AP-64e is an EPROM programmer for the Apple II, Apple II Plus, Apple IIe and Apple III computers. It offers very fast and easy programming through its built-in firmware.

INSTALLATION AND FUNCTIONS

Installation: To install the AP-64e EPROM Writer, simply plug it into any slot inside the Apple (except slot 0) as follows:

1. Turn off the power to the Apple. This is very important to prevent damage to the computer and the AP-64e.

2. The DIP switch an the board will define what EPROM you are writing into. The following chart shows the proper settings for the DIP switch:

	DIP switch position							
	1	2	3	4	5	6	7	8
EPROM 2716	o	o	o	x	x	x	x	x
2732	x	x	x	o	o	o	x	x
2764	x	x	x	x	o	o	o	o

note:

o = on (closed)
x = off (open)

Make sure that that the DIP switch is set properly for the type of EPROM you are writing into. If it is not, your EPROM could be damaged.

3. Remove the cover from your Apple. Inside, along the rear edge of the circuit board, is a series of eight long, narrow sockets called "slots". Now with a gentle rocking motion, plug the AP-64e into any slot except the leftmost one until it is firmly seated.

4. Now turn your Apple on and type PR#n, where n is the number of the slot the AP-64e is in. In Integer BASIC, type IN#n. From the Monitor (the prompt for which is *) type Cs00G, or s and then CTRL-P (where s is the slot the AP-64e is in).

Functions: The AP-64e has six functions:

1. WRITE: Programs the contents of any given block of memory into your EPROM.

2. READ: Loads the contents of an EPROM into a location in RAM.

3. COPY: Duplicates the contents of a master ROM into slave EPROMs.

4. COMPARE: Determines whether the contents of a master ROM and a particular blocks of memory, or the contents of two ROMS, are identical.

5. BLANKCHECK: Tests whether your EPROM is blank.

6. MONITOR: For entering the Apple's machine language. Allows you to examine, change, move, compare and run the contents of the memory in the machine language of the 6502 CPU.

USING THE AP-64e

Once you have installed and booted the AP-64e EPROM Writer, this is what will appear an your screen:

```
            AP-64 EPROM PROGRAMMER

      ENHANCED VELCOM WRITTEN BY CARL

2) 2716
4) 2732
8) 2764

?_
```

You now must key in a number - either 2, 4 or 8 - to specify how many bytes you want to program into your EPROM. The number 2 represents 2K bytes (0000-07FF), 4 represents 4K bytes (0000-0FFF), and 8 represents 8K bytes (0000-1FFF). Check again to see whether the DIP switch has been set properly before you key in a number, as errors may occur in the following steps if the setting is wrong. If you have done everything correctly the following lines will appear on the screen:

```
1) WRITE
2) READ
3) COPY
4) COMPARE
5) BLANKCHECK
6) MONITOR

?_
```

Before you proceed further, you must learn how to insert the EPROM into the Textool:

1. Pull up on the stick of the Textool. This will release any ROM or EPROM that is presently installed in the Textool.
2. Insert the correct EPROM into the Textool. The Textool has a 28-pin socket to enable it to accommodate 2764 EPROMS; if you are installing a 2716 or 2732 EPROM, insert it so that the top two pins of the Textool

socket are empty. It is extremely important that you insert your EPROM properly. It may be damaged if you do not.

3. Push the stick of the Textool down to the PCB side to secure the EPROM firmly in place.

Now you may key in a number from 1 to 6 to choose any one of the functions being displayed on the screen. The steps for carrying out each of these functions are described below.

1) WRITE: When you type in 1, it tells the system that you wish to program the contents of a particular block of memory into an EPROM. The next line that will come to the screen is:

```
START ADDRESS ? $_
```

Using hex code, key in the starting address of the block of memory the contents of which you wish to write into your EPROM, then hit RETURN. You will then see:

```
BLANK ? (Y/N)  _
```

A. At this point, if you wish to "burn" a blank EPROM, insert the EPROM and type 'Y'. This will automatically initiate a test to determine whether the EPROM is blank. If it is, you will see the following message:

```
ROM CHECK  OK !

SW ON _
```

If the EPROM is not blank - which means it cannot be written on - the screen will read:

```
ROM CHECK  ERR !!

BLANK ? (Y/N)  _
```

and you will have to try again with another EPROM.

B. If you only wish to correct data already written onto your EPROM, simply type 'N'. The BLANKCHECK procedure will be skipped and you will receive the following message:

SW ON _

The next step is to turn on the switch (up) on the front edge of the AP-64e. The LED will light, then hit RETURN. The writing process will begin and the hex code address will appear in the lower right-hand corner of the screen as follows:

WRITE ####

A 2716 will take 95 seconds to program fully. When the "burning" is complete the screen will display:

COMPARE OK !

SW OFF _

Turn the switch off (down) and remove the EPROM from the Textool. You now have a newly programmed EPROM. If the speaker beeps and the screen shows:

COMPARE ERR !!

SW OFF _

it means that your EPROM has not been programmed as you wished it to be. You will now have to turn off the switch (down) and try again with another EPROM until you get a good copy.

2) READ: When you type 2 after installing the EPROM in the Textool, the following message will appear on the screen:

```
START ADDRESS ? $_
```

Key in the hex code address to which you wish to read the contents of the EPROM, and hit RETURN. The READ operation takes about one second, after which the screen will show:

```
READ

1) WRITE
2) READ
3) COPY
4) COMPARE
5) BLANKCHECK
6) MONITOR

?_
```

You may now key in 4 or 6 to check what you have read from the EPROM using procedures that will be described below.

3) COPY: Keying in 3 enables you to burn the contents of a master ROM into a slave EPROM. The screen will display:

```
SET MASTER ROM _
```

Carefully insert your master ROM into the Textool and hit RETURN.

```
READ

SET BLANK ROM _
```

Take the master ROM out, replace it with a blank EPROM, and press RETURN.

```
BLANK ? (Y/N) _
```

The rest of the process is identical to that for WRITE and will produce for you a newly programmed EPROM.

4) COMPARE: Allows you to compare the contents of a block of memory and a master EPROM. When you type 4, you will see on the screen:

START ADDRESS ? $_

Key in the starting address of the memory block you wish to compare against the EPROM you have installed in the Textool and hit RETURN.

SET MASTER ROM _

Insert your master ROM, or if you have already done so just hit RETURN. You will now see:

COMPARE OK !

CONTINUE ? (Y/N) _

or

COMPARE ERR !!

CONTINUE ? (Y/N) _

Key in 'Y' to continue or 'N' to exit.

If you want to compare two or more EPROMS, first use the READ function to duplicate the contents of one EPROM into the memory block you choose and then insert another EPROM as master ROM and carry out COMPARE.

5) BLANKCHECK: Tests whether an EPROM is blank or not. When you hit 5 you will see:

```
SET BLANK ROM _
```

Insert the EPROM you wish to test and press RETURN.

```
ROM CHECK  OK !
```

tells you that the EPROM is blank;

```
ROM CHECK  ERR !!
```

means that it is not.

6) MONITOR: Typing in 6 lets you enter the machine language of the Apple and examine, change, move, compare and run the contents of the memory in machine language. Please refer to your Apple Reference Manual for more details.

PROBLEMS AND SOLUTIONS

Once you start using your AP-64e you will discover that it offers many advantages, among them speed, reliability and portability. You may encounter some problems too, though. Following are some of the difficulties you might have and ways to solve them:

1. Your EPROM cannot he programmed: If there already is a program stored in an EPROM you will not be able to write anything else into it. It will have to be erased before it can be reprogrammed.
2. Errors occur when you try to use the WRITE, READ or COPY function: Errors can occur in these functions if you forget to key in ROM size (2 for 2K, 4 for 4K or 8 for 8K) when you start. The only solution is to reset your computer and boot the AP-64e again.
3. Always remember to switch off the AP-64e before you do a cold boot or when the message SW OFF is displayed.
4. AP-64e will not boot with PR#n: The AP-64e may conflict with some cards, for example the Apple High Speed SCSI card will prevent the AP-64e from booting. If you cannot boot the AP-64e switch your Apple off and remove all other card from your Apple (except the Disk][Controller) and reboot. By replacing one card at a time you can work out which card conflicts with the AP-64e. Make sure you switch the Apple off before you remove or install any cards or you may damage the Apple or the card.
5. After selecting the EPROM size, the program crashes into the AppleSoft prompt and the cursor is in the middle of the screen: The AP-64e will not run when in 80-column mode. Quit to the 40-column mode by typing ESC Ctrl-Q, or simply do not boot your 80-column card.

HAPPY PROGRAMMING!

SPECIFICATIONS

The AP-64e can program EPROMs with the following specifications:

2716, 2732 & 2764 types
21-25V Programming voltage (Vpp)
45-55uS Programming pulse width.

EPROM PINOUTS

2716 pin=func	2732 pin=func	2764 pin=func	27128 pin=func
		1=Vpp	1=Vpp
		2=A12	2=A12
1=A7	1=A7	3=A7	3=A7
2=A6	2=A6	4=A6	4=A6
3=A5	3=A5	5=A5	5=A5
4=A4	4=A4	6=A4	6=A4
5=A3	5=A3	7=A3	7=A3
6=A2	6=A2	8=A2	8=A2
7=A1	7=A1	9=A1	9=A1
8=A0	8=A0	10=A0	10=A0
9=D0	9=D0	11=D0	11=D0
10=D1	10=D1	12=D1	12=D1
11=D2	11=D2	13=D2	13=D2
12=GND	12=GND	14=GND	14=GND
13=D3	13=D3	15=D3	15=D3
14=D4	14=D4	16=D4	16=D4
15=D5	15=D5	17=D5	17=D5
16=D6	16=D6	18=D6	18=D6
17=D7	17=D7	19=D7	19=D7
18=-CS/PGM	18=-CS/PGM	20=-CE	20=-CE
19=A10	19=A10	21=A10	21=A10
20=-OE	20=-OE/V	22=-OE	22=-OE
21=Vpp	21=A11	23=A11	23=A11
22=A9	22=A9	24=A9	24=A9
23=A8	23=A8	25=A8	25=A8
24=Vcc	24=Vcc	26=NC	26=A13
		27=-PGM	27=-PGM
		28=Vcc	28=Vcc

MODIFICATIONS FOR 27128 EPROMs

The following modification will allow reading of 27128 EPROMs in two passes. It will NOT allow you to write to any 27128 EPROMs, attempting to do so could damage the 27128 EPROM because the programming voltage and programming pulse width is different.

If your AP-64e has an 8-way DIP switch, remove it and install a 10-way DIP switch in the same location. Cut the track on the rear side of the board between pin 26 and pin 28 of the Textool socket. On the rear of the board connect a 4K7 1/4W resistor between pin 26 of the Textool and the GND track on the top of the board. Now connect a thin wire (ie wire-wrap wire) between pin 26 of the Textool and DIP switch 9 (pin nearest to the Textool). Then connect another wire between pin 28 of the Textool and DIP switch 9 (pin farthest from the Textool).

DIP Switch 9 now supplies 5V when using 2716s and 2732s, therefore is ON for those EPROMs. For 2764 EPROMs, DIP switch 9 has no function as pin 26 is not connected. For 27128s DIP switch 9 supplies a logic level of 0V or 5V to select the upper or lower half of the EPROM. To read the lower half DIP switch 9 is OFF, and to read the upper half DIP switch 9 is ON.

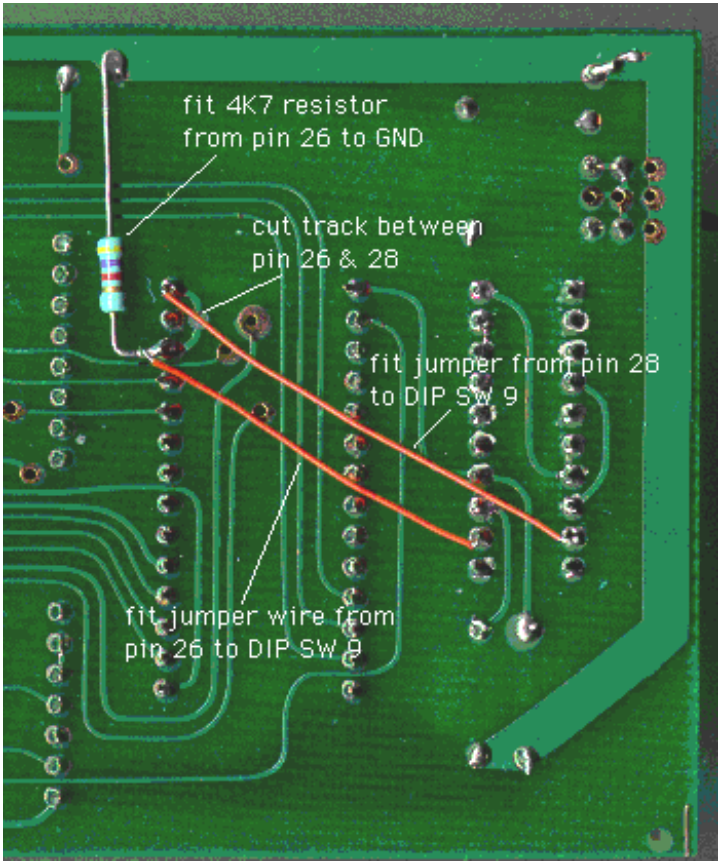
After the modification is installed, when using 27128s, use the 2764 selection in the software. Use the DIP Switch table below for each type of EPROM:

	DIP switch position									
	1	2	3	4	5	6	7	8	9	10
EPROM 2716	o	o	o	x	x	x	x	x	o	-
2732	x	x	x	o	o	o	x	x	o	-
2764	x	x	x	x	o	o	o	o	-	-
lo 27128	x	x	x	x	o	o	o	o	x	-
hi 27128	x	x	x	x	o	o	o	o	o	-

note:

o = on (closed)
x = off (open)
- = don't care (open or closed)

The diagram below shows the finished modification for reading 27128 EPROMs. Note that the modification is installed completely on the rear of the circuit board. Make sure you cut the track between pin 26 and pin 28 first before fitting the resistor or jumpers.



Should you wish to remove the modification simply remove the resistor and the jumpers and install a new jumper between pin 26 and pin 28 of the Textool instead of repairing the cut track.