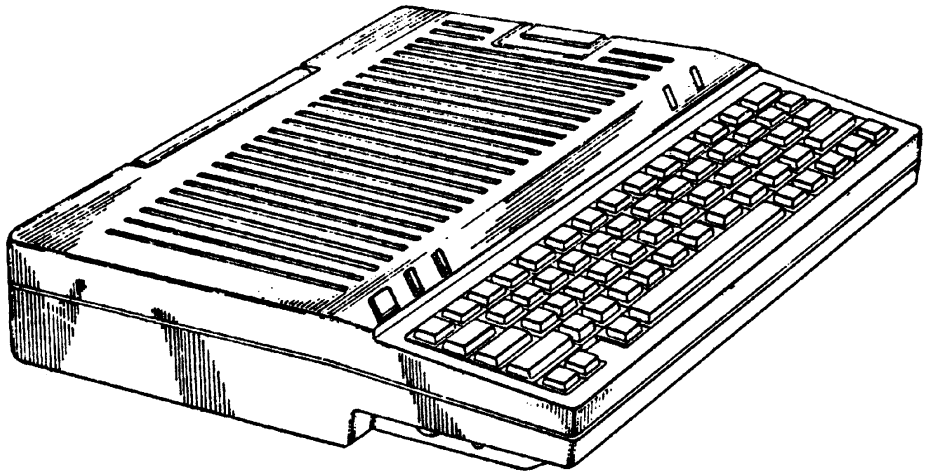

Apple IIc Computer Firmware ERS Changes

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RS-232 Printer and Mouse Port I/O

AUTHOR
Apple Computer Inc.

DOCUMENT DATES OF RECORD
September 1983

INTRODUCTION

What is this document?

The Apple IIc Computer Firmware ERS Changes: RS-232 Printer and Mouse Port I/O document describes the programming commands for controlling these ports. This document was written by Apple's internal Apple IIc computer engineering team.

This information eventually was publicly documented by Apple Computer, Inc. in the Apple IIc Reference Manual.

Firmware is the read-only (ROM) memory stored in the Apple IIc.

ERS = Engineering Reference Specification.

Chels is one of many internal Apple Computer, Inc. code names for the Apple IIc computer. Other code names were: Lolly, ET (extra terrestrial), IIb (b=book), IIp (p=portable), Pippin, VLC (very low cost), Elf, Yoda, Teddy, Jason, Sherry, Zelda.

Facts about this document

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Document dates of record:

September 1983

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Date: September 1,1983
To: Distribution
From: Rich Williams
Subject: Chels firmware ERS changes

The RS232 printer and the Mouse specifications have been changed from revision #2 of the firmware of the ERS. Since the changes to the serial printer port are large, they are being sent out in a memo. A revision #3 of the ERS will be done and will be available in fine mail slots everywhere. The changes add new functions and capabilities to the firmware.

RS232 printer

The commands to the printer driver have been changed to make them closer to the Super serial card. The old functions were:

```
nnn     ;Where nnn is the (decimal) line width.
I       ;Enable video echo
J       ;Disable LF, Enable video echo
K       ;Disable LF
L       ;Set LF
M       ;Set LF, Enable video echo
N       ;Disable video echo
^x      ;Set command chacter to ^x. ^ = control. x = character.
```

The new commands are:

```
nnnB    ;Set the baud rate to nnn.  nnn same as Super Serial card.
        1 = 50 baud
        2 = 75 baud
        3 = 109.92 baud
        4 = 134.58 baud
        5 = 150 baud
        6 = 300 baud
        7 = 600 baud
        8 = 1200 baud
        9 = 1800 baud
        10 = 2400 baud
        11 = 3600 baud
        12 = 4800 baud
        13 = 7200 baud
        14 = 9600 baud
        15 = 19200 baud
nnD     ;Set the data format.  nnn same as SS card.
        0 = 8 data, 1 stop
        1 = 7 data, 1 stop
        2 = 6 data, 1 stop
        3 = 5 data, 1 stop
        4 = 8 data, 2 stop
        5 = 7 data, 2 stop
        6 = 6 data, 2 stop
        7 = 5 data, 2 stop
I       ;Enable video echo.
K       ;Disable LF.
L       ;Enable LF.
nnnN    ;Set line width to nnn. Disable video echo.
nnnP    ;Set parity bits to nnn.  nnn same as SS card.
        0,2,4,6 = none
        1 = odd
        3 = even
```

```
        5 = mark
        7 = space
Z       ;Disable future commands.
nnn     ;Set line width to nnn.
^x      ;Set command char to ^x.
```

Special note for programs using the hardware directly

The 6502 processor does a false read before write when doing indexed write operations. When writing to the transmit register, the false read would read from the receive register causing the loss of data. This can be avoided by using a base address that is in a different page than the final address. For example, the usual way for a program to store to the transmit register is:

```
LDX     #$20    ;X = Slot 2 * 16
STA     $C088,X ;Causes false read
```

The way to avoid it is:

```
LDX     #$B0    ;X = Slot 2 * 16 + $90
STA     $BFF8,X ;On a different page
```

Mouse

The mouse now has the added feature of allowing the user to specify the bounds for the mouse. The pointer for the routine, called CLAMPMOUSE, is at $C417.

```
CLAMPMOUSE - Sets the mouse window
        Input:  A = $00 for X axis, $80 for Y axis
                X = $C4
                Y = $40
                $478 = Low byte of minimum bound
                $4F8 = High byte of minimum bound
                $578 = Low byte of maximum bound
                $5F8 = High byte of maximum bound
        Output: A,X,Y undefined
```

CLEARMOUSE will set the mouse position to the upper left corner of the window instead of 0,0.