

# **MULTI I/O<sup>TM</sup>**

## **User's Manual**

**AST**  
**RESEARCH INC.**

**MULTI I/O™**  
**I/O EXPANSION CARD**  
**for the**  
**APPLE IIe™**

User's Manual  
Version 1.0  
November, 1984

REV. B

AST RESEARCH, INC.  
Irvine, California 92714

## MULTI I/O™ CARD

**INCLUDES:** Printer Serial Port  
Modem/Remote Terminal Serial Port  
Clock—Calendar

**AND:** Software Utilities

**FOR:** Apple IIe™ and compatible computers.

**USERS MANUAL:** Installation and Operating Guide.

Please read this manual before attempting to install the Multi I/O Card in your computer. Incorrect installation could cause permanent damage to both the Multi I/O Card and your computer.

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November, 1984

**FIRST EDITION (November, 1984)**

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## SECTION 1 GENERAL OVERVIEW

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### INTRODUCTION

This User's Manual describes the features, installation procedure, and operational information for the AST Multi I/O Card.

The Multi I/O Card is a flexible and powerful multifunction enhancement product for the Apple IIe and compatible computers. The single, self-contained printed circuit board provides three of the most popular peripheral functions for your Apple IIe. These functions include:

- Serial Printer port for use with printers such as the Apple Imagewriter™
- RS-232 asynchronous Serial Communications port for connecting to an external modem or a remote terminal.
- Real time Clock/Calendar with battery backup.

#### NOTE

Any one or more of the Multi I/O Card functions can be disabled.

In addition to the on-board firmware for operation of the above functions, your Multi I/O Card is supplied with a valuable software utilities diskette containing the following programs:

- Clock Read/Set in ProDOS™
- Clock Read "ONLY" in DOS 3.3

- Graphics output for compatible Serial printers
- Text file listing
- Phone dialer
- Modem or remote terminal print
- Screen time display

The Multi I/O Card has been designed so that it is friendly and easy to use. Single commands issued from the keyboard instruct your Apple computer to send/receive data to/from the equipment connected to the card. Simple commands will also allow you to change the characters per line and the data format parameters.

## COMPATIBILITY

Your Multi I/O Card has been designed to be compatible with a large number of popular software and hardware products that you may want to use with your computer.

The list of hardware/software products with which Multi I/O has been tested is provided separately as part of your documentation package.

## TECHNICAL SPECIFICATIONS

### Power usage:

100 milliamps typical at + 5 VDC  
10 milliamps typical at + 12 VDC  
10 milliamps typical at -12 VDC

### Temperature range:

+ 10 deg C to + 50 deg C (+ 40 deg F to + 110 deg F)

### Interface connectors:

The Multi I/O Card has 2 connectors. One of these is configured for data terminal equipment (DTE) and the other for data computer equipment (DCE). The electrical interface for both Serial ports is per EIA Standard RS-232-C.

Multi I/O Card connector P2 (DCE)	Corresponding DB25 connector (Socket)	Signal Function (Printer port)
P2-3	2	Receive data
P2-5	3	Transmit data
P2-11	6	Data Terminal Ready
P2-13	7	Signal ground
P2-14	20	Data Set Ready
Multi I/O Card connector P3 (DTE)	Corresponding DB25 connector (Pins)	Signal Function (Serial Comm port)
P3-3	2	Transmit data
P3-5	3	Receive data
P3-11	6	Data Set Ready
P3-13	7	Signal ground
P3-14	20	Data Terminal Ready

Data Transmission Parameters (both ports):

BAUD RATE: The following rates are switch selectable

Baud Rate	Characters/Second*
-----------	--------------------

50	4.17
75	6.25
110	9.17
134.5	11.21
150	12.5
300	25.0
600	50.0
1200	100.0
1800	150.0
2000	167.0
2400	200.0
3600	300.0
4800	400.0
7200	600.0
9600	800.0
19200	1600.0

\*Based on 1 start bit, 8 data bits, 1 parity bit, and 2 stop bits.

#### WORD CONFIGURATION:

1. Selectable word length 7 or 8 bits per character word length.
2. Selectable stop bits 1 or 2.
3. Parity enable or disable.
4. Parity select odd or even.

## SECTION 2 INSTALLATION PROCEDURE

### MULTI I/O PACKAGE CONTENTS

Your Multi I/O Card package contains the following items:

1. Multi I/O Printed Circuit Board
2. Adaptor cables and hardware for: (a) printer and (b) communications ports
3. Software Utilities Diskette
4. User's Manual
5. Hardware/Software Compatibility Card
6. Warranty and Extended Warranty Cards

PLEASE FILL OUT AND MAIL IN YOUR  
WARRANTY REGISTRATION CARD TO HELP  
US PROVIDE YOU WITH CONTINUOUS  
SUPPORT AND SERVICE.

### INSTALLING YOUR MULTI I/O CARD

You will need a small blade screwdriver and pair of pliers or a nut driver for a #6 screw and nut assembly.

It is also recommended that you be familiar with the Apple IIe User's Manual, Chapter 1 in particular.

Step by step installation procedure:

1. Plug in the cables marked 'PRINTER' and 'COMM' into connectors P2 and P3 respectively on the Multi I/O Card. Be sure the colored stripe is oriented towards the top of the card.
2. Check the configuration options on the Multi I/O Card to verify their settings — standard as shipped, or changed as explained in "CONFIGURATION OPTIONS."
3. Power down your Apple IIe and disconnect the power cord from the supply outlet.
4. Remove the cover from the computer top (refer to the Apple IIe Owner's Manual, Chapter 1, section on "REMOVING THE APPLE IIe COVER"). Make sure there are no other cards plugged in Slots 1, 2, or 7. Remove any cards from these slots (again, refer to the Apple IIe Owner's Manual, Chapter 1, sections on "A LOOK INSIDE" and "CONNECTING CARDS INSIDE THE COMPUTER").
5. Install Multi I/O in Slot 1 of your Apple IIe with the components facing the right hand side when viewing the computer from the front.
6. Turn towards the back panel of the computer for attaching the adaptor cable connector to the appropriate outlet.
7. Use computer back panel opening #11 for the 25-pin printer connector. Using a screw driver and pliers (or a nut driver) secure the connector in the opening with the hardware provided.
8. Follow the above procedure and fasten the second 25-pin communication connector on the back panel opening #10.

9. If more information is required regarding the cable adaptors, please refer to "Interface Connectors" under Technical Specifications in Section #1.
10. If you have problems with installation, read the directions again and refer to the Apple IIe Owner's manual as well. If you continue to have difficulties, consult your dealer.

Before you turn on the power, here is a quick review of installation steps:

- Unpack the Multi I/O Card and accessories
- Check items against the above list
- Disconnect all power from the computer
- Remove cards from expansion Slots 1, 2 & 7
- Install the Multi I/O Card and cables
- Reconnect your computer system

If all these steps have been taken you are ready to turn on the power and go!

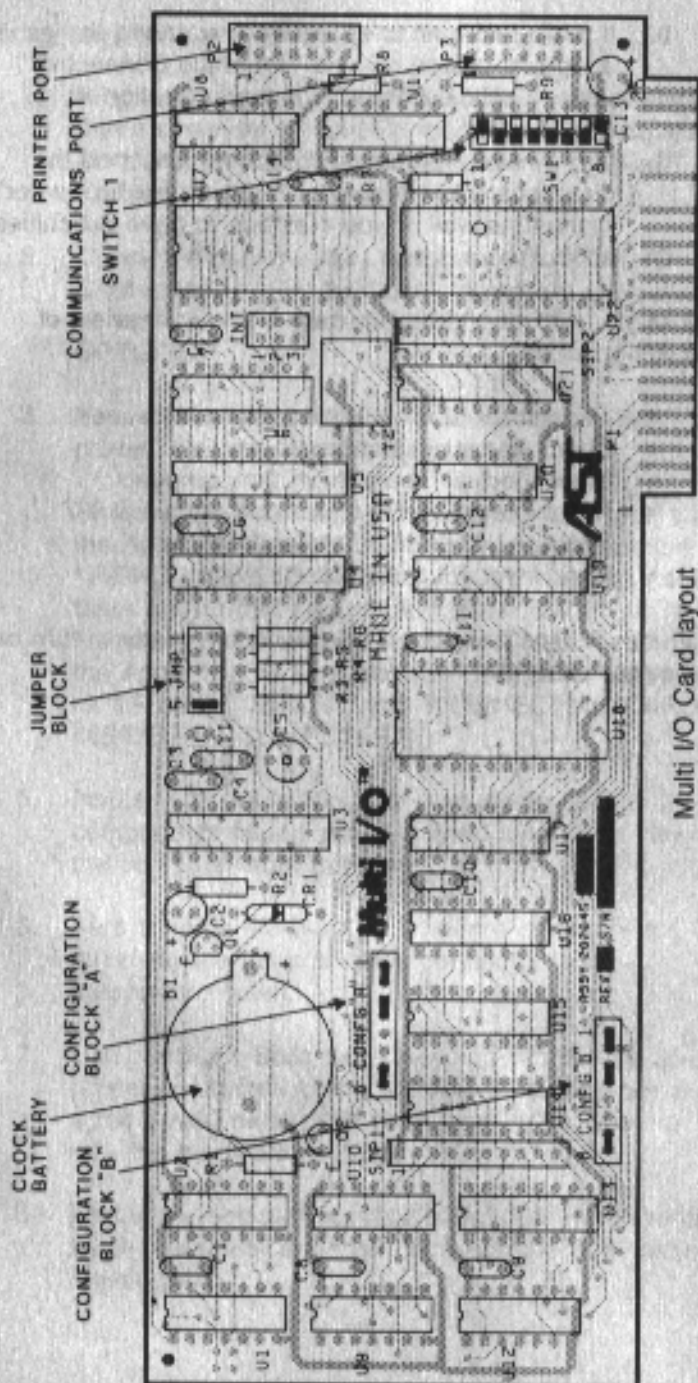


FIGURE 1

## STANDARD CONFIGURATION

There are four Switch/Jumper configuration areas on the Multi I/O Card which you may adjust. This section describes the switch and jumper settings, as shipped from the factory for the most common applications.

Refer to Figure 1, which shows the Multi I/O Card layout and will help in the following explanation.

### Switch 1

This is located in the lower right hand corner of the card and is labeled 'SW 1'. It has eight tabs and is used for setting the baud rate for the Serial Printer port and the Serial Communications port.



FIGURE 2

Tabs 1 thru 4 are for the Serial Printer Channel.  
Tabs 5 thru 8 are for the Serial Communications Channel.

The Serial Printer port is set to operate at 9600 baud, with Tab 1 in the ON position, and Tabs 2, 3, and 4 in the OFF position.

The Serial Communications port is set to operate at 1200 baud (such as for a 1200 baud modem) with Tabs 5, 6 & 7 in OFF position, and 8 in the ON position.

## Jumper Block

This is located in the center of the top edge of the card and is used for receiving real time clock interrupts from the Multi I/O Card, and for allowing you to set the Clock/Calendar.

This jumper block is labeled 'JMP' and consists of five pairs of pins, numbered 1 thru 5.

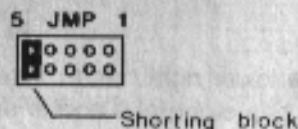


FIGURE 3

Pin pairs 1, 2, 3, and 4 are unused.

Pin pair 5 is for enabling or disabling setting the Clock/Calendar. You will see a shorting block on this pin pair which allows you to set the time and date. Removal of the shorting block will protect the settings from being changed.

## Configuration Blocks

There are two of these. The one labeled CONFIG "A" is just below the round lithium battery, and the other labeled CONFIG "B" is at the bottom edge of the card towards the left. Both of these configuration blocks are ALWAYS SET IDENTICALLY. Each consists of a single row of 8 pins.

The setting of these pins allows you the flexibility of installing your Multi I/O Card in an expansion slot other than Slot 1, also tells the Apple computer which slots the three functions are logically mapped. In addition, the configuration blocks can also be used to disable any one or more of the Multi I/O Card functions you so desire.

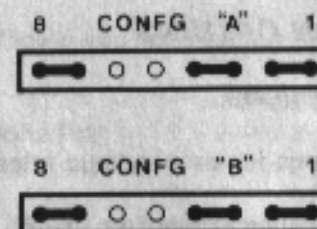


FIGURE 4

## Configuration Blocks

You will notice that each configuration block is identically shorted. The shorting blocks connect Pin 1 to Pin 2, Pin 3 to Pin 4, and Pin 7 to Pin 8.

This setting is provided for you to install Multi I/O in expansion slots 1, 2, or 7 of the Apple IIe. The settings logically map the three functions so that the Serial Printer port appears to the Apple in Slot 1, the Serial Communications port in Slot 2, and the Clock/Calendar function in Slot 7 — even though there is physically nothing in Slots 2 or 7 !

## CONFIGURATION OPTIONS

### Baud Rate Selections

Switch 1 Tab settings for various baud rates:

	5 6 7 8				Baud Rate
	5	6	7	8	
Tabs for Serial Communications Port	1	2	3	4	
Tabs for Serial Printer Port					
	0	0	0	0	50
	1	0	0	0	75
0 = ON	0	1	0	0	110
	1	1	0	0	134.5
1 = OFF	0	0	1	0	150
	1	0	1	0	300
	0	1	1	0	600
	1	1	1	0	1200
	0	0	0	1	1800
	1	0	0	1	2000
	0	1	0	1	2400
	1	1	0	1	3600
	0	0	1	1	4800
	1	0	1	1	7200
	0	1	1	1	9600
	1	1	1	1	19200

### Expansion Slot Mapping

**IMPORTANT NOTE:** Both CONFIG "A" and CONFIG "B" must be adjusted identically. The following explanation applies to both.

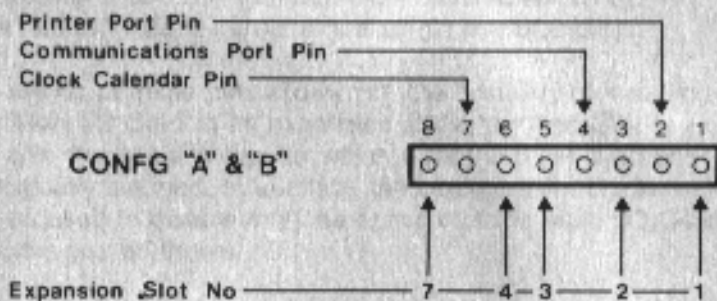


FIGURE 5

From the above Figure you will note the following:

Printer Port	=	Pin 2 of CONFIG 'A' or 'B'
Communications Port	=	Pin 4 "
Clock/Calendar Function	=	Pin 7 "
and		
Apple IIe Expansion Slot # 1	=	Pin 1 "
"	# 2	Pin 3 "
"	# 3	Pin 5 "
"	# 4	Pin 6 "
"	# 7	Pin 8 "

The three functions of Multi I/O can be mapped to an appropriate slot by shorting it's pin (connecting with the shorting block) to the corresponding function pin.

Note, that the Printer port function can be mapped only to Slots 1 or 2, Communications port function can be mapped only to Slots 2 or 3, and the Clock/Calendar function can be mapped only to Slots 4 and 7.

Examples:

- Printer port mapped to Slot 1
- Printer port mapped to Slot 2
- Comm port mapped to Slot 2
- Comm port mapped to Slot 3
- Clock mapped to Slot 4
- Clock mapped to Slot 7

The following should be noted in mapping various functions to expansion slots:

1. Serial Printer port can be mapped to Slot 1 or 2 only.
2. Comm port can be mapped to Slot 2 or 3 only.
3. Both the Serial Printer & Comm ports cannot be in Slot 2 at the same time.
4. Any function can be disabled by not mapping to a slot. (that is, remove the shorting block from the pin corresponding to that function).

Example: If you remove the shorting jumper from between Pins 1 and 2 of CONFIG 'A' & 'B', then the Serial Printer port function becomes disabled. Also note that you cannot install the Multi I/O Card in Slot 1 since that function does not exit.

5. Both, CONFIG "A" and "B" *must* be adjusted exactly the same way.
6. The Multi I/O Card can be installed in any of the slots to which its functions are mapped, and no other. Also, there should not be any other cards installed in those mapped slots.

Example: If the functions are mapped to Slots 1, 2, and 7 (per shipped configuration) the card can be installed in any of those slots, and only those. Also there should not be any other cards in those slots.

Example: If the functions are mapped to Slots 2, 3, and 4 the card can be installed in any of these slots, and no other. Again, there should not be any other cards in these slots.

7. Note, if you have selected to map communications Serial port to Slot 3 then you *cannot* use an 80 column display/text card.

## CLOCK/CALENDAR BATTERY

A lithium battery (See Figure 1) is used as backup power for the Clock/Calendar electronics on the Multi I/O Card when your computer is turned off. The Apple IIe supplies DC power under normal operation. Since the battery is used only when your computer is not operating, the actual life of your battery will be determined by how often the computer is used.

The battery is easily replaceable and should typically last for about a year. To replace the battery, slightly lift the retaining clip with your finger (or a small screwdriver) and use another screwdriver to pry up the silver battery from its holder, then slide it out sideways. Do not remove the battery socket from the card. Replacement batteries can be purchased from your dealer (AST P/N 108-BR2325).

Be sure not to damage or bend the retaining clip by lifting it too far. The clip completes an electrical circuit and must make solid contact with the positive (+) side of the battery. Whenever the battery is removed, it is a good idea to check the clip in the bottom of the battery holder; be sure that it is sticking up high enough to make good contact with the bottom of the battery. When installing a new battery make sure it is clean and dry.

NOTE: If you replace the battery, be sure to set the proper time and date.

### ERRATA FOR SECTION 3 OPERATIONS GUIDE

Page 18, line 22

Change POKE 1656 + n,c (\$5B8 + \$CN)  
to POKE 1400 + n,c (\$4B8 + \$CN)

Page 23, line 6

Change POKE 1912 + n, 0 (\$6Bg + \$cn)  
to POKE 1912 + n, 0 (\$778 + \$cn)

Page 23, line 31

Change "DT/MO/YR HR:MN:SC:  
to "DT/MO HR:MN:SC

Page 23, line 33

Delete And YR = 0 to 99.

## **SECTION 3 OPERATIONS GUIDE**

This section is optional and provides operational details. Programming information included here may be necessary if you are not using off the shelf software programs. It is assumed you are familiar with BASIC and Assembly Language.

### **SERIAL PRINTER PORT OPERATION**

#### **Data Output Operation**

To use the printer interface port of the card you will need to tell the Apple IIe where and when to send data so the printer can receive it. To establish the printer (or an equivalent device) as the destination of data from the Multi I/O Card, the following commands from the keyboard must be typed:

	PR#n	(BASIC)
OR	n^P	(Assembly Language), where n = slot number to which the port is logically mapped. This could be Slot 1 per factory setting, or 2, if you have changed the card accordingly. Remember, the card need not physically be in these slots. Refer to 'Configuration Options' for further explanation.

On typing these commands, the Apple IIe will direct its data output to the Serial Printer port.

To restore the computer screen as the output destination for the data, type in the following commands:

	PR#0	(BASIC)
OR	0^P	(Assembly Language)

## Changing Serial Printer port parameters:

There are two default parameters that can be changed after the port has been initialized once by using the PR#n/n^P or IN#n/n^K commands. These are described below.

### Changing Data Word Parameters:

To change the default operating mode, POKE the desired command (refer to Table 1 below) into location

$$49280 + 16 \cdot n \text{ ( } \$C080 + \$n0 \text{ )}$$

where  $n$  = slot number to which the port is logically mapped. Note that any subsequent IN#n or PR#n command will restore the default value.

### Changing Characters Per Line:

The Multi I/O firmware automatically initiates a CARRIAGE RETURN/LINE FEED after 255 characters have been printed on one line. If you wish to use some other number of characters per line, simply POKE the desired number into the location as noted below. Make sure the number you have selected is in the range of  $0 < \text{characters per line} < 255$ . The BASIC keyboard command sequence will be:

PR#n

POKE  $1656 + n, c \text{ ( } \$5B8 + \$CN \text{ )}$ , where  $n$  = slot to which the port is logically mapped, and  $c$  = characters per line. Any subsequent PR# will reset the next character length to 255

NOTE: Some printers will not print characters until a complete line ending with a CARRIAGE RETURN is received.

## Changing Serial Printer port parameters:

TABLE 1

### Data Word Parameter Commands

(a) with transmitting interrupts disabled

Command	Function		
	word bits	stop bits	parity
\$ 01	7	2	even
\$ 05	7	2	odd
\$ 09	7	1	even
\$ 0D	7	1	odd
\$ 11	8	2	none
\$ 15	8	1	none
\$ 19	8	1	even
\$ 1D	8	1	odd

default  
command  
is \$11  
←

(b) for transmission of a break level with transmitting interrupts disabled

Command	Function		
	word bits	stop bits	parity
\$ 61	7	2	even
\$ 65	7	2	odd
\$ 69	7	1	even
\$ 6D	7	1	odd
\$ 71	8	2	none
\$ 75	8	1	none
\$ 79	8	1	even
\$ 7D	8	1	odd

## COMMUNICATIONS PORT OPERATION

The Modem/Terminal firmware of Multi I/O Card allows your Apple IIe to function as an ordinary computer terminal when connected to either a modem, or another computer. In the Terminal mode of operation Multi I/O supports both Full and Half Duplex modes and the Break Signal. You can switch between Terminal and Non-Terminal mode with a few commands entered from the Apple keyboard, or from an external device. In the Non-Terminal mode, the Multi I/O allows the Apple to interface to peripherals such as modems and terminals. Input to the Apple Computer can be taken from the external device instead of the Apple's keyboard, and output from the Apple can be sent to the external device as well as to the Apple's display.

### Terminal Mode Operation

After the IN#n and PR#n commands, the Apple still functions as a computer: that is, its CPU is still connected. In Terminal mode the Apple simulates a computer terminal; in effect its CPU is disconnected. The Terminal mode can be entered and exited by a number of commands, either entered on your Apple's keyboard, or sent by the external device.

#### Keyboard Commands (^A):

The Modem/Terminal commands entered from the keyboard are always prefixed by ^A. They can be used only after an IN#n command, and are the only keyboard commands in addition to RESET that the Apple will recognize after IN# has been entered.

#### (a) Full—Duplex ( ^A^F )

The Full-Duplex command allows your Apple to operate as a Full-Duplex terminal. In this mode a character entered on the keyboard is sent to the external device that the terminal is communicating

with. Unless the external device sends the character back (echoes), the character does not appear on the screen. Full-Duplex mode, with echoing, is the preferred mode since it confirms the communications reliability. However, it requires that the receiving device has the capability of echoing the received character.

Enter ^A^F to enable the Full-Duplex mode.

#### (b) Half—Duplex ( ^A^H )

This command makes your Apple operate in Half-Duplex mode. Characters entered in this mode are sent to both, the Apple screen and the external device. Thus you see exactly what you entered. Note that if you use the Half-Duplex mode with an external device in Full-Duplex mode, every character on the screen will be doubled as 'ddoouubblleedd', since both the external receiving device and the Multi I/O Card will be echoing every character it receives.

Enter ^A^H to enable Half-Duplex mode.

#### (c) Exit Command ( ^A^X )

Enter ^A^X to exit from the Terminal mode. A backslash (/) will appear on the screen.

### External Commands, Remote Mode (^R)

When your Apple is operating in the Terminal mode, an external device can connect and disconnect the computer's CPU. If the Apple receives a ^R while in the Terminal mode, it operates in a remote mode to the external device. Any input coming from the external device goes to Apple's 'CPU'. In this way an external device controls the computer as though it were receiving instructions from the keyboard. If the PR#n command is in effect (where n = slot number to which the Communications port is logically mapped) your Apple will echo whatever it receives from the external device.

### Terminal Mode Operation

#### External Commands, Terminal Mode (^T):

After ^R has been issued, ^T reactivates the Apple to the Terminal mode. In effect, the command cancels the Remote mode command and returns your Apple to Half- or Full-Duplex terminal. If the Multi I/O has been accessed by an IN#n command, the Terminal mode has not yet been invoked, ^T sent by the external device will turn the Apple into a Half-Duplex terminal.

### Changing Communications Port Parameters:

As in the case of the Serial Printer port, there are also two default parameters that can be changed after the port has been initialized once by using the PR#n/n^P and/or IN#n/n^K commands.

#### Changing Data Word Parameters:

Please refer to the same section under 'Changing Serial Printer Port Parameters'. Note, however, that 'n' for Communications port will have a different value than the one used for the Serial Printer port.

### Lower Case Conversion

Apple IIe converts lower case characters to upper case when receiving them from an external device.

To allow lower/upper case characters use the following BASIC IN#n command:

POKE 1912 + n, 0 (\$6Bg + \$cn) where n = slot number to which the port is logically mapped.

To display characters in reverse video, and all upper case, the following may be used:

POKE 1912 + n, 160 where n = slot number to which the port is logically mapped.

### CLOCK/CALENDAR OPERATION

#### Reading the Time and Date

There are four mode characters that can be read in BASIC. The following lists the formats and the read mode characters:

Read Mode Mode Character	Display Format
%	AM/PM 12 hr MON DEC 31 12:59:59 PM
&	24 hr FORMAT MON DEC 31 23:59:59
#	NUMERIC FORMAT see below
" "	MOUNTAIN FORMAT see below

Format: #;MO,DA,DT,HR,MN,SC

where MO = 1 to 2 (JAN = 1, FEB = 2, etc)

DA = 0 to 6 (SUN = 0, MON = 1, etc)

DT = 1 to 31 (for days of the month)

HR = 0 to 23 (for hours: 1 = 1 AM

12 = noon, 16 = 4 PM,

00 = midnight)

MN = 0 to 59 (for minutes)

SC = 0 to 59 (for seconds)

Mountain Format: " " DT/MO/YR HR:MN:SC

where DT, MO, HR, MN, and SC are same as Numeric format above. And YR = 0 to 99.

The read mode is selected by writing one of the read mode characters to the Multi I/O Card. In BASIC this can be done as an input statement used to write the mode and read the time and date.

Example:

Suppose we wanted to read the time in 24 hour format. Assume now that the Multi I/O function is mapped to Slot 7 (physically the card could be in another slot). The following input statements show how the time can be read into the string variable TI\$.

```
10 D$ = CHR$(4): REM DS = CTRL D CHAR
20 PRINT D$: "PR#7": REM ENABLE WRITE TO SLOT 7
30 PRINT D$: "IN#7": REM ENABLE READ FROM SLOT 7
40 INPUT "&": TI$: REM GET TIME AND DATE
50 PRINT D$: "PR#0": REM RESET THE OUTPUT
60 PRINT D$: "IN#0": REM RESET THE INPUT
70 HOME : REM HOME THE CURSOR
80 PRINT TI$ : REM PRINT THE TIME AND DATE
```

### Setting the Time and Date

To set the time and date in the Multi I/O Card's Clock/Calendar feature make sure that the shorting block is in the correct position as described in "STANDARD CONFIGURATION, Jumper Block, Figure 3". Use the format described below to set the time and date:

! MO W DD HH MN (RETURN), where

MO = 2 ASCII digits, 1 to 12 (JAN = 1, FEB = 2, etc)  
W = 1 ASCII digit, 0 to 6 (SUN = 0, MON = 1, etc)  
DD = 2 ASCII digits, 0 to 31 (for days of the month)  
HH = 2 ASCII digits, for hrs. (1 = 1 AM, 12 = noon, etc)  
MN = 2 ASCII digits, 0 to 59, for minutes.

NOTE: Each character field needs to be separated by "space" characters, and the string is terminated by a "return" character.

Example:

Let's say we want to set the time and date to September 19th, 21 hours, and 54 minutes. The 19th of September is a Wednesday, and so W = 3. As in the previous example, the Clock/Calendar function is logically mapped to Slot 7. Our statements will be:

```
10 DS = CHR$(4)
20 PRINT D$: "PR#7"
30 PRINT "! 09 3 19 21 59"
40 PRINT D$: "PR#0"
```

Note: After setting the time and date you might wish to remove the shorting block from position 5 and put it in one of the unused positions 1 thru 4. Removing the jumper from 5 will protect the clock from being set.

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## SECTION 4 SOFTWARE UTILITIES

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### ***Tutorial***

A self paced tutorial is provided, to instruct the user on how to use this diskette. The disk is self booting and comes up with a menu similar to the ProDOS Start-Up Menu (on the ProDOS User's Disk). Selections may be chosen using the UP and DOWN arrow keys.

### ***Clock Utility (Multi Time/Multi Set)***

The clock utilities set and read the clock from ProDOS. These two files can be converted to run under DOS 3.3 (See ProDOS Manual) for added flexibility.

### ***Telephone Dialer (For use with Smart Modems)***

The telephone dialer allows phone numbers recorded on disk to be automatically dialed (requires Smartmodem).

### ***Text File Listing Utility (Print, Number & Date)***

The Text File Utility allows Text Files to be dated, have page numbers, and be printed.

### ***Terminal Program with Simultaneous Print Capabilities***

The Terminal Program allows the Apple to act as a terminal (compatible with most modems) while offering simultaneous printing capabilities.

### ***Graphics Printing Utility***

The Graphics Print Utility will allow the user to print out graphics screens using the Imagewriter Printer.

## NOTICE

AST Research, Inc. reserves the right to make changes in this manual and in the product(s) described herein at any time and without notice.

## LIMITED WARRANTY

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The limited warranty applies to hardware products only.

## NOTICE

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## LIMITED WARRANTY

EST. warrants the system to the original purchaser of the system for a period of 90 days from the date of purchase. This warranty is limited to the system and does not cover any accessories or optional equipment. EST. does not warrant the system for a period of 90 days from the date of purchase. EST. does not warrant the system for a period of 90 days from the date of purchase. EST. does not warrant the system for a period of 90 days from the date of purchase.

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