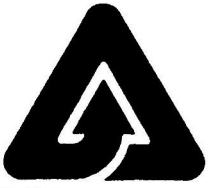
Super Serial Imager Operator's Manual



APRICORN

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Introduction

Apricorn's Super Serial Imager (tm) is a multipurpose I/O connection for the Apple // series of computers including the Apple][, the Apple][+ and the Apple //e. The Imager provides a hardware interface and a set of complex programs which make communication with a wide variety of devices relatively simple.

The Imager provides a wide variety of options that allow it to easily communicate with printers, plotters, modems, other Apples, other computers or any device which uses the RS-232C serial communications format. It is fully compatible with Apple's Super Serial Card while also providing a very powerful graphics printer interface program for support of printers such as Apple's Imagewriter and Epson's FX-80.

The Imager contains special smart handshaking circuitry to permanently end RS-232C "hookup hassle". This smart circuit will automatically find and use the correct busy line so that no buffer overflow can result. This means an end to special cables and wasted time.

In the Super Serial Card Emulation Mode the Imager supports all of Apple's Super Serial Card commands, allowing programs written for the Super Serial Card to be completely compatible with the Imager. The emulation program supports three basic modes of operation: Communications Mode, which allows you to connect your Apple to modems, or directly to other computers, Terminal Mode, which allows you to use your Apple as a terminal for use with other computers or timesharing networks, and Printer Mode, which allows you to use the standard Apple printer card commands.

The Imager GPI (Graphics Printer Interface) Mode provides a full featured graphics printer interface for use with the Apple Imagewriter, Epson, Star Micronics, C. Itoh, Okidata and all the compatibles such as Citizen and Panasonic. Any Apple screen can be transfered to paper with a simple Imager command. These screens include 40 column text, Apple //e 80 column text, Videx VideoTerm 80 column text, low resolution and high resolution graphics and the Apple //e's double resolution graphics screens. More commands are also available for formatting output of printed text.

The Imager is compatible with all Apple operating systems, such as DOS 3.3, ProDOS, Integer and Applesoft BASIC, Apple PASCAL, Apple FORTRAN, Apple PILOT, Apple LOGO, and CP/M. Compatability is also maintained with all word processing systems, spreadsheet programs, communications packages, and graphics programs. Among the programs with which the Super Serial Imager has been thoroughly tested are Mousepaint, Imagewriter Toolkit, Apple Access, and Appleworks.

Installation

Installation of the Super Serial Imager into your Apple][, Apple][+, or Apple //e involves two tasks. The first is to configure the Imager to suit your particular needs, the second is to physically install the unit.

Connecting the Cable Assembly

There are two different methods of RS-232C communications and two devices must each be of the opposite type to hook up to each other correctly. This has been simplified by the Imager's two cable connections available on the circuit board. If you are connecting the Imager to a modem then connect the cable assembly to the header labeled "MODEM". If you are connecting the Imager to a printer, plotter, terminal or other similar output device connect the cable assembly to the header labeled "PRINTER".

WARNING

Be sure to install the cable assembly with the colored wire positioned nearest the top part of the card. In this position the cable assembly should not lay over the card, but should extend past the right side of the card. Failure to position the cable assembly correctly could result in damage to your computer equipment.

Setting the DIP Switches

The Imager has two banks of "DIP switches" which it uses for hardware options and to set certain configuration options. Many of these options can be changed through software, but it is very convienient to have the unit start off in the configuration you want to use.

If you are using the Super Serial Card Emulation Mode of the Imager, then you will need to set the DIP switches as indicated below under "Super Serial Card Emulation DIP Switch Settings". If you are using the Imager as a graphics printer interface then you will need to set the DIP switches as indicated under "Imager GPI Mode DIP Switch Settings" later in this chapter.

Super Serial Card Emulation DIP Switch Settings

To select the Super Serial Card Emulation Mode SW1-8 must be set to the ON position. In this mode the Imager acts exactly like a Super Serial Card right down to the DIP switch settings. The Super Serial Card has two banks of seven position DIP switches of which only the first six are of concern (SW1-7 and SW2-7 on the Super Serial Card select one of two lines to use for Clear-To-Send, which is automatically taken care of in the Imager's smart serial circuit). These six DIP switches are setup exactly the same on the Imager so that any recommendations or chart settings concerning the Super Serial

Card can be used as such with the Imager. Remember to use only the first six DIP switch settings for these cases.

Super Serial Card Emulation: SW1-8/ON

The Imager's DIP switches as used under Super Serial Card Emulation Mode are described below:

Baud Rate Control

The Imager's baud rate is controlled by SW1-1 through SW1-4. These four switches are used to select the baud rate which the Imager will use for transmission and reception of data. The following table describes how to set the switches for the baud rate you desire, which must match the baud rate of the device with which the Imager is communicating.

Baud Rate	DIP Switch SW1 1	2	3	4
Undef.	ON	ON	ON	ON
50	ON	ON	ON	ON
75	ON	ON	OFF	ON
110	ON	ON	OFF	OFF
135	ON	OFF	ON	ON
150	ON	OFF	ON	OFF
300	ON	OFF	OFF	ON
600	ON	OFF	OFF	OFF
1200	OFF	ON	ON	ON
1800	OFF	ON	ON	OFF
2400	OFF	ON	OFF	ON
3600	OFF	ON	OFF	OFF
4800	OFF	OFF	ON	ON
7200	OFF	OFF	ON	OFF
9600	OFF	OFF	OFF	ON
19200	OFF	OFF	OFF	OFF

(note: actual baud at 110 baud is 109.92 and at 135 baud is 134.58)

Generate <LF> on <CR>

When using a printer it is usually desirable to have the printer execute a linefeed <LF> along with carriage returns <CR>. Some printers do this automatically, and most can be tol to do so by setting DIP switches on the printer. You can tell the Imager to generate <LF>s with <CR>s by setting SW2-5 ON. The Imager will not generate <LF>s with <CR>s if SW2-5 is turned OFF.

You will be able to tell if you need to turn this switch on or off by sending several lines of text to your printer. If your printer is generating <LF>s when it recieves <CR>s and you have this switch on your printout will be double spaced. If neither your printer or the Imager are generating <LF>s on <CR>s then

your printout will write over the same line again and again.

Some programs need to be able to write on the same line more than once, and send the <LF> character when it is necessary to advance the paper. In these cases, and whenever you are using the Imager in Communications or Terminal Mode, SW2-5 should be OFF.

<LF> After <CR> SW2-5

Send <LF> ON
Don't send <LF> OFF

Interrupts

The Imager has the capability to generate interrupts on the Apple bus. This capability is not used by most applications. Unless an application program specifically indicates that interrupts must be on, set SW2-6 to OFF. If your application needs interrupts supported then set SW2-6 to ON. An example of an application that will usually supports or requires interrupts are telecommunication programs such as ASCII Express Professional.

Interrupt Status SW2-6

Interrupts On ON
Interrupts Off OFF

Data Carrier Detect

The Data Carrier Detect (DCD) signal can be disconnected via SW1-7. This is useful for certain intelligent modems that do not have the capability to produce a false DCD signal. The Imager's Terminal Mode and most terminal programs will not let you send data out the serial port unless the DCD line is asserted. However, certain intelligent modems don't assert the DCD line until after they have dialed a host and established a connection. The problem is that characters have to be sent to the modem to dial the host! If your modem works in this way then turn SW1-7 OFF. For all other applications turn SW1-7 ON.

DCD Status SW1-7

Connect ON
Disconnect OFF

The rest of the DIP switch settings depend on whether you are using the Communications Mode or Printer Mode. If you are using the Imager with a modem or external terminal then Communications Mode is best suited for your device. If you are using the Imager with a printer, plotter or other output device then Printer Mode is for you.

Communication Mode DIP Switch Settings

Under Super Serial Card Emulation, SW1-5 and SW1-6 control the mode. Communications Mode is selected by setting both of these switches ON. The remainder of the DIP switches applicable to Communications Mode will be explained below.

Communications Mode: SW1-5/ON SW1-6/ON

Data Format

When transmitting data, it is very important that both the transmitter and the receiver use the same data format. The Imager always sends its data one character at a time, as a string of ones and zeros, but the interpretation of the data is by convention. Therefore you must tell the Imager which data format it is to use. transmission always begins with a "start bit", followed by 7 or 8 "data bits", an optional "parity bit" followed by one or two "stop bits".

Data Bits

The number of data bits sent or received is controlled by SW2-2. If this switch is ON then 8 data bits will be transmitted. If it is OFF then 7 data bits will be transmitted.

Data bits	SW2-2
7 Data bits	OFF
8 Data Bits	ON

Parity

Parity is a method of confirming correct data transmission. The details of this method are explained under the "Data Parity" command in the chapter "Sending Commands to Imager". SW2-3 SW2-4 are used to control the parity used by the Imager, as follows:

Parity	SW2-3	SW2-4
Odd	ON	OFF
Even	OFF	OFF
None	---	ON

Stop Bits

The number of stop bits used by the Imager is controlled by SW2-1. If this switch is ON then one stop bit will be used, if this switch is OFF then two stop bits will be used.

Stop bits	SW2-1
1 stop bit	ON
2 stop bits	OFF

Printer Mode DIP Switch Settings

Under Super Serial Card Emulation SW1-5 and SW1-6 control the mode. To select Printer Mode set SW1-5 to OFF and SW1-6 to ON. The remainder of the DIP switch settings applicable to Printer Mode will be explained below.

Printer Mode: SW1-5/OFF SW1-6/ON

Data Format

Data format DIP switch settings under Printer Mode are limited to controlling the stop bits. The Imager defaults to 1 start bit, 8 data bits and no parity. The stop bits can be set using SW2-1. To select 1 stop bit turn SW2-1 ON. To select 2 stop bits turn SW2-1 OFF. For baud rates of 110 and under, 2 stop bits is best. For baud rates over 110, 1 stop bit is prefered.

Stop bits	SW2-1
1 stop bit	ON
2 stop bits	OFF

Carriage Return Delay

Many printers need extra time to move the printhead when executing a carriage return. Printers which do not support handshaking with the Imager may lose characters after receiving a <CR>. If this occurs you can tell the Imager to wait 32 ms after sending a <CR> to allow the printhead time to position itself by turning SW2-2 ON.

<CR> Delay	SW2-2
None	OFF
32 ms	ON

The Imager can also be told to wait by using the nC command described in the chapter "Sending Commands to Imager, which will allow delay times of 0 ms, 32ms, 250 ms (1/4 second) or 2 seconds.

Line Width and Video Echo

You can control the line width and turn on or off video echo with SW2-3 and SW2-4. The following table lists the possible settings:

Line Width	Video Echo	SW2-3	SW2-4
40 Characters	Enabled	ON	ON
72 Characters	Disabled	ON	OFF
80 Characters	Disabled	OFF	ON
132 Characters	Disabled	OFF	OFF

If you intend to use the Imager with a printer then set the switches for the number of characters per line that you want on your printer. If you are using the Imager with a terminal then set the switches for the number of characters per line that the terminal can accomodate on one line.

Imager GPI Mode DIP Switch Settings

If you are using the Imager to interface to an Apple Imagewriter, Epson, Star Micronics, C. Itoh Prowriter, Okidata or Epson compatible printer, the Imager's graphics printer interface mode is the one to use. To configure the Imager as a Graphics Printer Interface (GPI) set SW1-8 to the OFF position. The Imager's use of the DIP switches under GPI Mode will be explained below.

Imager GPI Mode: SW1-8/OFF

Baud Rate Control

The Imager's baud rate is controlled by SW1-1 through SW1-4. These four switches are used to select the baud rate which the Imager will use for transmission of data. The following table describes how to set the switches for the baud rate you desire, which must match the baud rate of the printer with which the Imager is communicating. The highest common baud rate of the Imager and printer is best.

Baud	DIP Switch SW1			
Rate	1	2	3	4
Undef.	ON	ON	ON	ON
50	ON	ON	ON	ON
75	ON	ON	OFF	ON
110	ON	ON	OFF	OFF
135	ON	OFF	ON	ON
150	ON	OFF	ON	OFF
300	ON	OFF	OFF	ON
600	ON	OFF	OFF	OFF
1200	OFF	ON	ON	ON
1800	OFF	ON	ON	OFF
2400	OFF	ON	OFF	ON
3600	OFF	ON	OFF	OFF
4800	OFF	OFF	ON	ON
7200	OFF	OFF	ON	OFF
9600	OFF	OFF	OFF	ON
19200	OFF	OFF	OFF	OFF

(note: actual baud at 110 baud is 109.92 and at 135 baud is 134.58)

Printer Selection

In order for the Imager GPI to print bit image data it needs to know exactly what printer it is being used with. SW2-1 through

SW2-4 are set to indicate this. Use the chart below to set these switches.

Printer Type	SW2-1	SW2-2	SW2-3	SW2-4
ImageWriter	ON	ON	OFF	OFF
Epson	OFF	ON	OFF	OFF
Star Micronics	OFF	ON	ON	OFF
Okidata	ON	OFF	ON	OFF
C. Itoh	ON	ON	ON	OFF

Epson compatibles such as Panasonic should use the Epson setting.

Most Signifigant Bit Control

The Most Signifigant Bit (MSB) can be controlled using SW2-5. If this switch is set to the ON position, the Imager will pass the 8th bit of output data to the printer. In the OFF position the 8th bit of output data will be cleared before being sent to the printer. This setting is valid even if SW2-8, which controls transparent mode, is ON.

MSB Control	SW2-5
Clear it	OFF
Pass it	ON

Generate <LF> on <CR>

When using a printer it is usually desirable to have the printer execute a linefeed <LF> along with carriage returns <CR>. Some printers do this automatically, and most can be told to do so by setting DIP switches on the printer. You can tell the Imager to generate <LF>s with <CR>s by setting SW1-6 ON.

You will be able to tell if you need to turn this switch on or off by sending several lines of text to your printer. If your printer is generating <LF>s when it receives <CR>s and you have this switch on your printout will be double spaced. If neither your printer or the Imager are generating <LF>s on <CR>s then your printout will write over the same line again and again.

Some programs need to be able to write on the same line more than once, and send a <LF> character when it is necessary to advance the paper. In these cases SW1-6 should be OFF.

<LF> after <CR>	SW1-6
Send <LF>	ON
No <LF>	OFF

Video Echo Control

If you want the Imager to echo all of it's output to the video screen, then turn SW2-7 ON. For a silent screen turn SW2-7 OFF. The video echo will work correctly with the 80 column screen of the Apple //e.

Video Echo	SW2-7
Echo on	ON
echo off	OFF

XON/XOFF Control

The Imager supports XON/XOFF software handshaking. This can be enabled by turning SW1-5 ON and disabled by turning SW1-5 OFF.

XON/XOFF	SW1-5
Enabled	ON
Disabled	OFF

Transparent Mode

The Imager can be transformed into a fully transparent serial output port. This can be enabled by turning SW2-8 ON. In this mode no printer control commands will be acted upon by the Imager and they willbe sent directly out the serial port. The MSB control is still active under transparent mode to allow selection of a 7 bit or 8 bit transparent port.

Transparent Mode	SW2-8
Enabled	ON
Disabled	OFF

Interrupts

Interrupts are rarely used for printing and unless interrupts are specifically required turn SW2-6 OFF.

Data Carrier Detect

The Data Carrier Detect (DCD) line is controlled by SW1-7. The DCD line is normally left connected for printing so turn SW1-7 ON.

Physical Installation

The Imager can be installed in any of the Apple's internal slots except the auxiliary slot on the Apple //e. On the Apple][or Apple][+ there are 8 internal slots, numbered Ø to 7 from left to right. On the Apple //e there are 7 slots, numbered 1 to 7.

If you intend to use your Imager as a printer interface you should install it in slot number 1. If you intend to use it with a modem or as a general purpose I/O port it should be installed in slot 2. For use with an external terminal it should be installed in slot 3. To be used, the slot in which the Imager resides must be known, and these are the standard slot usages compatible with most Apple operating systems and commercial software.

The following steps should result in the correct installation of your Imager:

WARNING

Make sure the power to your Apple is off while physically installing the Imager into one of the Apple's internal slots. Failure to do so will result in damage to both your computer and the Imager.

1) Turn off the power to your Apple computer. Failure to do so will result in damage to both the Imager and your Apple. The POWER light located in the lower left hand corner of the keyboard should not be illuminated.

2) Remove the cover of your Apple][by pulling up on the rear of the cover until it just pops loose, and then slide it rearward until it is completely free of the rest of the Apple case.

3) Insert the Imager into the desired slot. Press firmly with a slight forward and backwards rocking motion (along the length of the card).

4) On the Apple][and Apple][+ the Imager cable assembly hangs out the rear of the case. The Apple //e has cutouts in the rear panel designed to accept DB-25 connectors. Using the enclosed screw-lock kit, attach the Imager's DB-25 connector to the rear panel in the desired location.

5) Replace the cover to your Apple by reversing step 2.

6) Connect your peripheral device using an appropriate cable with a male termination.

7) Recheck the installation of the Imager and cable assembly. You may want to reread the installation instructions.

In order to check the installation of your Super Serial Imager, turn on your Apple and peripheral device. To check a printer, type the command:

PR#1 <RETURN> (This selects slot 1)

This should turn the printer on. Hitting the return key a few times should cause the BASIC prompt character to be printed on the printer.

To check installation with an intelligent modem, first type

IN#2 <RETURN> (This selects slot 2)
<CTRL-A> T <RETURN> (This commands Imager into Terminal Mode)
AT <RETURN> (This is the ATtention command for the modem)

If everything is correct the modem should respond to the AT command with the characters "OK". If your modem does not accept commands then you will have to dial a test host and try to get on-line.

Selecting the Imager for I/O

Before you can use the Imager you must tell the Apple to communicate with the Imager. DOS 3.3 and ProDOS support eight different I/O devices. These are the standard Apple 40 column screen/built-in keyboard and up to seven different I/O devices that are present in the peripheral slots. The PR#s (s = slot) command is used for selecting output and the IN#s (s=slot) command is used to select input. To turn the printer on in slot 1 we would type:

```
PR#1 <RETURN>
```

This channels output to the printer attached to the Imager in slot 1. To turn the printer off type:

```
PR#0 <RETURN>
```

To select the Imager in slot 3 for input and output so that we could use an external terminal instead of the standard Apple screen and built-in keyboard we would type:

```
PR#3 <RETURN>
IN#3 <RETURN>
```

The external terminal's screen and keyboard can be used as if they were the Apple's own.

To use the Imager in slot 2 to emulate a terminal with an external modem to communicate with a remote host we would type:

```
IN#3 <RETURN>
<CTRL-A> T <RETURN>
```

The <CTRL-A> was a "Control Command" issued to the Imager to put it into Terminal Mode. This will be explained in the next chapter.

In deferred execution mode (or program mode) all "PR#s" and "IN#s" commands must actually be printed in PRINT statements and preceded by the DOS character <CTRL-D>. The following BASIC program will turn the printer on, print a short message and then turn the printer off.

```
100 D$ = CHR$(4): REM DOS CHARACTER <CTRL-D>
110 PRINT D$; "PR#1"
120 PRINT "HELLO FROM THE SUPER SERIAL IMAGER"
130 PRINT D$; "PR#0"
140 END
```

If you are using the Imager under an operating system other than DOS 3.3 or ProDOS consult your instruction manual for details on how to select I/O devices.

Sending Commands to Imager

The format of the commands used with the Imager will depend upon the language you use. However your goal will always be the same; you must send specific codes to the slot in which the Imager resides.

When you are using DOS 3.3 or ProDOS codes can be sent simply by pressing the correct sequence of keys or sending codes via simple PRINT statements. Imager commands usually start with a "control code" which is sent by first holding down the control key (like a shift key) and then pressing another key. When the Imager recieves this code it knows that a command is coming. When a complete command sequence has been recognized the Imager will execute the specified command.

For example, the key sequence:

<CTRL-I><S>

would tell the Imager to perform a text screen dump to the printer, assuming the Imager is in Printer Mode configuration and output has been redirected to the Imager. In BASIC the statement:

```
100   PRINT CHR$(9); "S"
```

would do the same thing. Notice that <CTRL-I> has an ASCII code value of 9.

Super Serial Imager Commands

The Imager supports three different sets of commands. There are two sets of commands under Super Serial Card Emulation (Communications Mode and Printer Mode) and another set for the GPI Mode. These three sets of commands will be explained in this chapter.

Commands in the Communications Mode

Before any of the commands in this section can be used the Imager must be configured and initialized as follows:

The Imager must be installed with the cable header connected to the MODEM port on the Imager circuit board, and the Dip Switches set for Communications Mode, under Super Serial Card Emulation, as described in the installation chapter of this manual.

The Imager must be initialized for input or output using the IN#s or PR#s commands, where s is the slot containing the Imager, as described in the section "Selecting the Imager for I/O" earlier in this manual.

>>>Note: all commands listed must be preceeded by the "control" character, which will always start as <CTRL-A> in Communications Mode.

The control character can be changed by first typing the current control character, and then the desired control character. For example:

<CTRL-A> <CTRL-W>

would change the control character from <CTRL-A> to <CTRL-W>.

Apple Super Serial Card Emulation Communications Mode

Command	Description	Range
nB <CR>	Set Baud Rate	0 - 15
nC <CR>	Carriage Return Delay	0 - 3
nD <CR>	Data Format	0 - 7
nF <CR>	Form Feed Delay	0 - 3
nL <CR>	Line Feed Delay	0 - 3
nP <CR>	Parity	0 - 7
nS <CR>	Specify Screen Slot	0 - 7
nT <CR>	Translate Lowercase	0 - 3
B <CR>	Transmit 233ms Break signal	
R <CR>	Reset Super Serial Imager	
T <CR>	Enter TERMINAL MODE	
Z <CR>	Transparent Mode	
En <CR>	Echo keyboard input on screen	E/D
Fn <CR>	Find Keyboard	E/D
Ln <CR>	Send <LF> with <CR>	E/D
Mn <CR>	Mask incoming <LF> w/ <CR>	E/D
Xn <CR>	XOFF detect	E/D
Hn <CR>	High bit	E/D

Set Baud Rate: <CTRL-A> (n) (B)

```
100  PRINT CHR$(1); "8B"
```

This command provides software control of the baud rate used by the Imager when communicating with external devices. The following table lists the baud rate settings assigned to different values of n:

0	use Dip Switches (p.8)	8	1200
1	50	9	1800
2	75	10	2400
3	110 (109.92)	11	3600
4	135 (134.58)	12	4800
5	150	13	7200
6	300	14	9600
7	600	15	19200

Set Time Delays: nC, nF, & nL.

These commands cause the Imager to wait after telling a printer to reposition the printhead so that data will not be lost while the printhead is in transit. For almost all communications mode applications these commands will not be necessary. See the Printer Mode section of this chapter for specifics regarding these commands.

0	None
1	32 milliseconds
2	250 milliseconds (=1/4 sec)
3	2 seconds

Data Parity: <CTRL-A> (n) (P) <CR>

```
100  PRINT CHR$(1); "1P"
```

This command is used to specify the type of parity used by the Imager when sending or receive data. The following table lists possible parity selections:

0,2,4,6	None (send bit 8 as is)
1	ODD Parity
3	EVEN Parity
5	MARK Parity (bit 8 always 1)
7	SPACE Parity (bit 8 always 0)

Parity is a method of confirming correct data tranmition. In "Odd Parity" the low 7 bits of each byte sent or recieved are checked, and if an "odd" number of them are set (1's) then the high bit of the byte (bit 8) is transmitted as a 0, otherwise it is sent as 1. Thus when examining incoming data, all bytes must contain an odd number of bits or a transmission error has been detected.

Even Parity is the same as odd parity except the total number of set bits in each byte is defined as even rather than odd.

Translate Lowercase Characters: <CTRL-A> (n) (T) <CR>

```
100  PRINT CHR$(1); "1T"
```

When recieving data the Apple][converts lowercase characters to uppercase before passing them to the screen or a BASIC program. Lowercase characters coming into the Imager can be converted as you desire with this command. Conversion options are as follows:

0 Convert lowercase characters to uppercase. Default.
1 Do not convert incoming lowercase character. Pass them along unchanged.
2 Show lowercase characters as reversed uppercase characters.
3 Send lowercase characters to programs unchanged. Send them to the screen as uppercase characters, and display uppercase characters as reversed.

Reset Imager: <CTRL-A> (R) <CR>

```
100 PRINT CHR$(9); "R"
```

This command will reset the Imager, having the same effect as pressing the "Reset" key on the apple (but only effecting the Imager). The difference between this command and issueing a PR#0 and IN#0 is that reset will re-establish the default configuration indicated by the DIP switches. This means that any changes in the configuration which have been made (such as the location of the left margin) will be lost after a system reset or reset command, but not when PR#0 and IN#0, are used.

Transparent Mode: <CTRL-A> (Z) <CR>

```
100 PRINT CHR$(1); "Z"
```

This command tells the Imager to ignore all subsequent control characters, and pass them along unaltered. Thus no further commands will be recognized by the Imager. This command is useful if the data being transmitted may contain desired control characters, which would normally be filtered out by the Imager.

>>>Note: Once you issue this command the only way to turn this option off is to clear bit 8 at location $5F8+s (s = slot).

Find Keyboard: <CTRL-A> (F) <SPACE> (E/D) <CR>

```
100 PRINT CHR$(1); "F E"
```

This command is used to disable the Apple Keyboard in order to prevent possible keystrokes from disrupting incoming data. This command would be used in a program immeadiatly preceeding the inflow of data to disable (D) the keyboard, and again after the data has been recieved to enable (E) the keyboard.

Generate <LF> with <CR>: <CTRL-A> (L) <SPACE> (E/D) <CR>

```
100 PRINT CHR$(1); "L D"
```

This command tells the Imager to send or not send a linefeed character after transmitting a carriage return. This command overrides the setting of SW2-5.

Mask Incoming Linfeeds: <CTRL-A> (M) <SPACE> (E/D) <CR>

```
100  PRINT CHR$(1); "M E"
```

This command enables/disables the removal of linefeed characters which are immediately preceeded by carriage return characters in an incoming data stream.

Terminal Mode

Terminal Mode is really a subset of Communications Mode. This mode allows your Apple to act as a terminal for use with other computers, or network timesharing services.

To use Terminal Mode you simply issue the command:

<CTRL-A> T <RETURN>

from Communications Mode. The following commands relate specifically to Terminal Mode:

>>>Note: All commands listed must be preceeded by the "control" character, which will always start as <CTRL-A> in Terminal Mode. The control character can be changed by first entering the current control character, followed by the desired control character. For example, typing:

<CTRL-A> <CTRL-W>

would change the control character from <CTRL-A> to <CTRL-W>.

Apple Super Serial Card Emulation
Terminal Mode

Command	Description	Range
T <CR>	Enter TERMINAL MODE	
B <CR>	Transmit 233ms Break signal	
nT <CR>	Translate Lowercase	0 - 3
En <CR>	Echo keyboard input on screen	E/D
Sn <CR>	Special Characters	E/D
Xn <CR>	XOFF detect	E/D
Q <CR>	Quit TERMINAL MODE	

Enter Terminal Mode: <CTRL-A> (T) <CR>

```
100  PRINT CHR$(1); "T"
```

This command is used to enter Terminal Mode from Communications Mode. Execution of this command allows your Apple to function as a full-duplex terminal with an external modem. By enabling screen echoing with "Echo keyboard input on screen" you can cause the Apple to function as a half-duplex terminal.

>>>**Note:** Unless you have enabled screen echoing with the command "<CTRL-A> (E) <SPACE> (E) <CR>", the Apple will not send characters to the screen. If you have done this and characters are still not being sent to the screen, the Imager has probably not yet established communications with your modem.

Transmit Break Signal: <CTRL-A> (B) <CR>

```
100  PRINT CHR$(1); "B"
```

This command sends a 233 millisecond break signal, which is recognized by most timesharing systems as system signoff.

Translate Lowercase Characters: <CTRL-A> (n) (T) <CR>

```
100  PRINT CHR$(1); "1T"
```

When receiving data the Apple converts lowercase characters to uppercase before passing them to the screen or a BASIC program. Lowercase characters coming into the Imager can be converted as you desire with this command. Conversion options are as follows:

0 Convert lowercase characters to uppercase. Default.
1 Do not convert incoming lowercase character. Pass them along unchanged.
2 Show lowercase characters as reversed uppercase characters.
3 Send lowercase characters to programs unchanged. Send them to the screen as uppercase characters, and display uppercase characters as reversed.

Echo Keyboard Input to Screen: <CTRL-A> (E) <SPACE> (E/D) <CR>

```
100  PRINT CHR$(1); "E E"
```

Once a character is received from the keyboard it can be "echoed" to the screen. This command will tell the Imager to echo (E) or not to echo (D) keyboard input to the screen.

Special Characters: <CTRL-A> (S) <SPACE> (E/D) <CR>

```
100  PRINT CHR$(1); "S E"
```

Unfortunately the Apple][keyboard does not support all the ASCII codes sometimes needed when using your Apple as a terminal. Normally, Apple programs simply do not use these codes, thereby avoiding any problem. To generate these special codes you must first enable special characters with this command. From then on, pressing the <ESC> key followed by another key will send one of the unsupported codes. The following table lists the keys, characters, and ASCII codes enabled by this command:

Entering <ESC> (n) will generate

n	Code Sent	Dec	Hex
1	FS	156	9C
2	US	159	9F
3	[	219	DB
4	backslash	220	DC
5	underline	223	DF
6	{	251	FB
7	vert line	252	FC
8	}	253	FD
9	tilde	254	FE
0	<ESC>	155	9B
:	RUB	255	FF

XON/OFF Detect: <CTRL-A> (X) <SPACE> (E/D) <CR>

```
100  PRINT CHR$(1); "X D"
```

Many devices use the decimal code "19" to tell other devices to wait. In this way, when the peripheral device (say a modem) is about to run out of buffer space for incoming characters, it can tell the Imager to halt transmission. When the peripheral device has proccessed the data, freeing buffer memory, it can tell the Imager to resume transmitting characters by sending it the code "17". Normally the Imager will recognize the XOFF and XON charcacters, (CHR$(19) and CHR$(17) respectively). You can tell the Imager not to recognize these codes by disabling ("D") XOFF recognition with this command.

High Bit Enable/Disable: <CTRL-A> (H) <SPACE> (E/D) <CR>

```
100  PRINT CHR$(1); "H E"
```

This command allows you to have a full 8 bit serial data port yet still control the "8th" or "high" bit of the transmitted byte. Enabling the 8th bit allows the Imager to pass along the full 8 bit byte it receives for transmission out the serial port. Disabling the 8th bit forces this bit to always be cleared before transmission out the serial port.

Uppercase/Lowercase on the Apple][and][+

Because the Apple][and][+ keyboards do not support lowercase characters, the <ESC> key is used to switch between upper and lower case output for the Imager. Here's how it works:

Assuming that you start off with uppercase output, to switch to lowercase output press the <ESC> once. To switch back to uppercase output, press the <ESC> twice in a row. To capitalize just one character while in lowercase mode press <ESC> once followed by the character you want capitalized. This will work also work on the Apple //e, but since they support upper/lowercase characters it is unnecessary.

Commands in the Printer Mode

Before any of the commands in this section can be used the Imager must be configured and initialized as follows:

- The Imager must be installed with the cable header connected to the PRINTER port on the Imager circuit board, and the DIP Switches set for Super Serial Card Emulation and Printer Mode as described in the installation chapter of this manual.

- The Imager must be initialized for output by sending a return character to the slot containing the Imager using PR#s, as described in the chapter "Selecting the Imager for I/O" earlier in this manual.

>>>Note: All commands listed must be preceeded by the "control" character, which will always start as <CTRL-I> in Printer Mode. The control character can be changed by first typing the current control character, and then the desired control character.

For example:

<CTRL-I> <CTRL-W>

changes the control character to from <CTRL-I> to <CTRL-W>.

Apple Super Serial Card Emulation
Printer Mode

Command	Description	
nB <CR>	Set Baud Rate	0 - 15
nC <CR>	Carriage Return Delay	0 - 3
nF <CR>	Form Feed Delay	0 - 3
nL <CR>	Line Feed Delay	0 - 3
nD <CR>	Data Format	0 - 7
nP <CR>	parity	0 - 7
nT <CR>	Translate Lowercase	0 - 3
C <CR>	Column Overflow	
R <CR>	Reset Super Serial Imager	
Z <CR>	Transparent Mode	
Fn <CR>	Find Keyboard	E/D
Ln <CR>	Send <LF> with <CR>	E/D
Mn <CR>	Mask <LF> preceeded by <CR>	E/D
Tn <CR>	Tab in BASIC	E/D
Xn <CR>	XOFF detect	E/D
Hn <CR>	High bit	E/D
nN	Video Echo Off & Set Line length	40 - 255
I	Video Echo On & set Line length	
K	Do not generate <LF> with <CR>	
S <CR>	Text Screen Dump	

Set Baud Rate: <CTRL-I> (n) (B) <CR>

100 PPRINT CHR$(9); "15B"

This command provides software control of the baud rate used by the Imager when transmitting data to the printer. The following table lists the baud rate settings assigned to different values of n:

0	use Dip Switches (p.8)	8	1200
1	50	9	1800
2	75	10	2400
3	110 (109.92)	11	3600
4	135 (134.58)	12	4800
5	150	13	7200
6	300	14	9600
7	600	15	19200

Set Carriage Return Delay <CTRL-I> (n) (C) <CR>

100 PRINT CHR$(9); "2C"

This command is used to tell the Imager to wait after sending a <CR> to the printer. This is necessary with some printers to allow the print head adequate time to position itself. The delay time is specified by the value of n, as follows:

0 None
1 32 milliseconds
2 250 milliseconds (=1/4 sec)
3 2 seconds

Set Form Feed Delay: <CTRL-I> (n) (F) <CR>

100 PRINT CHR$(9); "2F"

This command is the same as "Set Carriage Return Delay" above except delay is executed after transmission of a Form Feed character.

Set Line Feed Delay: <CTRL-I> (n) (L) <CR>

100 PRINT CHR$(9); "2L"

This command is the same as "Set Carriage Return Delay" above except delay is executed after transmission of a Form Feed character.

These commands are not necessary with printers capable of sending a printer busy signal to the Imager. If your printer does not do so you will have to look through its manual and find the needed delay time after carriage returns, line feeds, and form feeds.

Data Parity: <CTRL-I> (n) (P) <CR>

```
100  PRINT CHR$(9); "2P"
```

This command is used to specify the type of parity used by the Imager when sending or receive data. The following table lists possible parity selections for different values of n:

0,2,4,6	None (send bit 8 as is)
1	ODD Parity
3	EVEN Parity
5	MARK Parity (bit 8 always 1)
7	SPACE Parity (bit 8 always 0)

Parity is a method of confirming correct data tranmition. In "Odd Parity" the low 7 bits of each byte sent or received are checked, and if an "odd" number of them are set (1's) then the high bit of the byte (bit 8) is transmitted as a 0, otherwise it is sent as 1. Thus when examining incoming data, all bytes must contain an odd number of bits or a transmission error has been detected.

Even Parity is the same as odd parity except the total number of set bits in each byte is defined as even rather than odd.

Translate Lowercase Characters: <CTRL-I> (n) (T) <CR>

```
100  PRINT CHR$(9); "1T"
```

When recieving data the Apple converts lower case characters to uppercase before passing them to the screen or a BASIC program. Characters coming into the Imager can be converted as you desire with this command. Conversion options are as follows:

0	Convert lowercase characters to uppercase. Default.
1	Do not convert incoming lowercase character. Pass them along unchanged.
2	Show lowercase characters as reversed uppercase characters.
3	Send lowercase characters to programs unchanged. Send them to the screen as uppercase characters, and display uppercase characters as reversed.

Column Overflow Handling: <CTRL-I> (C) <CR>

```
100  PRINT CHR$(9); "C"
```

This command causes the Imager to send a <CR> character to the printer should the column count exceed the printer line width.

>>>Note: Once this command is issued, the only way to turn it off is by clearing the 8th bit at location $578+s (s = slot).

Reset Imager: <CTRL-I> (R) <CR>

```
100 PRINT CHR$(9); "R"
```

This command will reset the Imager, having the same effect as pressing the <RESET> key on the Apple (but only effecting the Imager). The difference between this command and issueing a PR#0 and IN#0 is that reset will re-establish the default configuration indicated by the DIP switches. This means that any changes in the configuration which have been made (such as the location of the left margin) will be lost when a system reset or reset command occurs, but not when PR#0 and IN#0, are used.

Transparent Mode: <CTRL-I> (Z) <CR>

```
100  PRINT CHR$(9); "Z"
```

This command tells the Imager to ignore all subsequent control characters, and pass them along unaltered. Thus no further commands will be recognized by the Imager. This command is useful if the data being transmitted may contain desired control characters, which would normally be filtered out by the Imager.

>>>NOTE: once you issue this command the only way to turn this option off is to clear the 8th bit at location $5F8s.

Find Keyboard: <CTRL-I> (F) <SPACE> (E/D) <CR>

```
100 PRINT CHR$(9); "F E"
```

This command is used to disable the Apple Keyboard in order to prevent possible keystrokes from disrupting incoming data. This command would be used in a program immeadiatly preceeding the inflow of data to disable (D) the keyboard, and again after the data has been recieved to enable (E) the keyboard.

Generate Linefeed with <CR>: <CTRL-I> (L) <SPACE> (E/D) <CR>

```
100 PRINT CHR$(9); "L D"
```

This command tells the Imager to send or not send a linefeed character after sending a carriage return to the printer. This command overides the setting of SW2-5.

Mask Incoming Linefeeds: <CTRL-I> (M) <SPACE> (E/D) <CR>

```
100  PRINT CHR$(9); "M E"
```

This command enables/disables the removal of linefeed characters which are immediately preceeded by carriage return characters in an incoming data stream.

Tab in BASIC: <CTRL-I> (T) <SPACE> (E/D) <CR>

```
100  PRINT CHR$(9); "T E"
```

This command enables/disables the use of the various tabbing and horizontal spacing functions used in BASIC. All tabs beyond column 40 still require a POKE to location 36.

Text Screen Dump: <CTRL-I> (S) <CR>

```
100  PRINT CHR$(9); "S"
```

This command will transfer a copy of the current text screen to the printer. On the Apple //e the screen dump will be 40 or 80 columns wide, depending upon which mode the computer is in. If the left margin is set, 40 column screen dumps will be left justified at that position 80 column screen dumps will start at the left edge of the paper.

XON/OFF Detect: <CTRL-A> (X) <SPACE> (E/D) <CR>

```
100  PRINT CHR$(1); "X D"
```

Many devices use the decimal code "19" to tell other devices to wait. In this way, when the peripheral device (say a modem) is about to run out of buffer space for incoming characters, it can tell the Imager to halt transmission. When the peripheral device has proccessed the data, freeing buffer memory, it can tell the Imager to resume transmitting characters by sending it the code "17". Normally the Imager will recognize the XOFF and XON charcacters, (CHR$(19) and CHR$(17) respectively). You can tell the Imager not to recognize these codes by disabling ("D") XOFF recognition with this command.

High Bit Enable/Disable: <CTRL-A> (H) <SPACE> (E/D) <CR>

```
100  PRINT CHR$(1); "H E"
```

This command allows you to have a full 8 bit serial data port yet still control the "8th" or "high" bit of the transmitted byte. Enabling the 8th bit allows the Imager to pass along the full 8 bit byte it receives for transmission out the serial port. Disabling the 8th bit forces this bit to always be cleared before transmission out the serial port.

Apple Parallel Card Commands

In order to support compatibility with the Apple Parallel Card the next three commands have been included.

Video Echo Off & Set Line Length: <CTRL-I> (n) (N)

```
100  PRINT CHR$(9); "80N"
```

This command turns off output to the Apple video screen and sets the line length to n. The line length will be used for automatic <CR> generation if enabled by the "Column Overflow" command listed above. The value for n must be between 40 and 255.

Video Echo On & Set Line Length to 40: <CTRL-I> (I)

```
100 PRINT CHR$(9); "I"
```

This command will turn on video echo to the Apple video screen and sets the line length value to 40.

Do not Generate Line Feed with <CR>: <CTRL-I> (K)

```
100 PRINT CHR$(9); "K"
```

This command turns off the generation of linefeed characters after carriage returns.

Imager GPI Mode Commands

The GPI (Graphics Printer Interface) Mode of the Imager is a special mode. Setting SW1-8 to the OFF position will cause the Imager to operate in the graphics mode, and will make all other modes unavailable.

In the GPI Mode you will be able to transfer both text and graphics to your printer. Of course, printers not capable of bit image will not be able to print hi-res images.

The following table lists the commands available while in the GPI Mode, and a description of the commands is presented thereafter.

>>>Note: All commands listed must be preceeded with the control character, which will always start as <CTRL-I> in the GPI Mode. The control character can be changed by first typing the current control character, and then the desired control character. For example:

<CTRL-I> <CTRL-W>

would change the control character from <CTRL-I> to <CTRL-W>.

Imager GPI Mode Commands

A	Send <LF> with <CR>	
K	No <LF> with <CR>	
F	Print Firmware version	
H	Pass MSB to printer	
X	Clear MSB from print stream	
I	Video Echo on	
nN	Video Echo off & set line length	40 - 255
nL	Set left margin	0 - 255
nP	Set page length	1 - 255
S	40 column Text Screen Dump	
2S	Side by Side 40 Colunm Text Screen Dump	
3S	Videx VideoTerm 80 Column Screen Dump	
8S	Apple //e 80 column Text Screen Dump	
sV	Chain Output to slot s	0 - 7
Z	Transparent Mode	
Q	Quit 80 Column Video	

G options <CR> Graphics Dump

GI<CR>	Inverse Image	
GE<CR>	Emphasize Image	
GD<CR>	Magnify Image x2	
R<CR>	Rotate Image	
2<CR>	Select Page 2 Image	
S<CR>	Select Both Pages	
M<CR>	Mix Graphics & Text	
L<CR>	Left Margin	
B<CR>	Low Resolution Graphics Dump	
e<CR>	Double Resolution Graphics Dump	
O<CR>	Overlay Screens	
nZ<CR>	Zoom Graphics Size	n = 2 - 8
nH<CR>	Horizontal Aspect Ratio	n = 1 - 16
nV<CR>	Verticle Aspect Ratio	n = 1 - 8
nP<CR>	Set Print Mode	n = 1 - x

Send <LF> with <CR>: <CTRL-I> (A)

```
100 PRINT CHR$(9); "A"
```

Append a linefeed to all carriage returns. ie: whenever the Apple sends a <CR> character to the Imager, it will also send a <LF> character. This tells the printer to move the print head to the beginning of the line and to advance the paper 1 line.

No <LF> with <CR>: <CTRL-I> (K)

```
100  PRINT CHR$(9); "K"
```

This command cancels the automatic linefeed function of the Imager, whether established using the Imager "DIP switches" or GPI Mode command listed above.

Print Firmware Version number: <CTRL-I> (F)

```
100  PRINT CHR$(9); "F"
```

Print the version number of the firmware (ie: ROM program code) contained in your Imager.

Pass MSB to Printer: <CTRL-I> (H)

```
100  PRINT CHR$(9); "H"
```

This command is the counterpart of the "Clear MSB from print stream" command, which is used to ensure that the high bit of each byte sent to the printer is clear. The "Pass MSB" command will send the high bit as is to the printer.

Clear MSB from print stream: <CTRL-I> (X)

```
100 PRINT CHR$(9); "X"
```

Issuing this command will tell the Imager that when the Apple sends it a byte the high bit is to be cleared before it is transmitted out the RS-232C port. This may occasionally be desirable for printers which use the MSB to indicate special functions. Consult your printer manual to see if the MSB is used for such a purpose (which is usually to change the character set).

Video Echo On: <CTRL-I> (I)

```
100 PRINT CHR$(9); "I"
```

The Imager will send a copy of all text it sends to the printer to the screen. This command will work in both 40 and 80 column mode on the Apple //e.

Video Echo Off & Set Line Length: <CTRL-I> (n) (N)

```
100  PRINT CHR$(9); "80N"
```

Set the line length to n characters per line and turn video echo off.

Set Left Margin: <CTRL-I> (n) (L)

```
100  PRINT CHR$(9); "12L"
```

This command tells the Imager to move the print head to column n after a carraige return. The default left margin is column 0, and issuing this command with n equal to 0 effectively cancels this function.

Set Page Length: <CTRL-I> (n) (P)

```
100  PRINT CHR$(9); "60P"
```

This command tells the Imager how many lines of print it is to use on a single page. After the designated number of lines have been printed the Imager will skip 6 lines. Most printer default line spacing allows 66 lines on 11 inch tall paper, so using 60 as your value for n will neatly skip over the perforations (this process is called pagination). Issuing this command using 0 as your value for n will cancel pagination.

40 column Text Screen Dump: <CTRL-I> (S)

```
100  PRINT CHR$(9); "S"
```

This sends a copy of the current 40 column text screen to the printer. The 40 column dump will be centered if the left margin is disabled, or will start at the left margin if it has been set.

Side By Side 40 Column Text Dump: <CTRL-I> (2) (S)

```
100  PRINT CHR$(9); "2S"
```

This command will send a copy of two 40 column text screens to the printer. Text screen 1 is on the left and text screen 2 is on the right.

Videx VideoTerm 80 Column Screen Dump: <CTRL-I> (3) (S)

```
100  PRINT CHR$(9); "3S"
```

This command will send a copy of the Videx VideoTerm 89 column display in slot 3 to the printer.

Apple //e 80 Column Text DUMP: <CTRL-I> (8) (S)

```
100  PRINT CHR$(9); "8S"
```

This command is the same as the "40 column Text Screen Dump" listed above, except that an 80 column dump will be executed. This command only works with the Apple //e.

Chain Output to Slot s: <CTRL-I> (s) (V)

```
100  PRINT CHR$(9); "3V"
```

This command tells the Imager to send a copy of it's output to the peripheral in slot s. Video echo to an 80 column board in slot 3 can be established with this command. A peripheral must be installed in the specified slot or the system will hang up.

Transparent Mode: <CTRL-I> (Z)

```
100  PRINT CHR$(9); "Z"
```

This command will turn the Imager into a transparent output port. No commands will be recognized. The only action performed by the Imager once this command has been used will be to send data transfer data out the serial port without modification. The MSB command is still in effect under transparent mode. This allows for a transparent 7 bit or 8 bit serial port.

Quit 80 Column Video: <CTRL-I> (Q)

```
100  PRINT CHR$(9); "Q"
```

If an 80 column board was active when the Imager was turned on by a "PR#1" command, then the "Quit 80 column Video" command is used to exit the printing mode. This command is necessary because using the command "PR#0" will cause the apple to not only exit the printing mode but also to turn off the 80 column card in the wrong manner, which will crash the Apple operating system.

Graphics Commands

One of the more powerful features of the Graphics Printer Interface is its ability to transfer low and high resolution images from your Apple's memory to graphics capable printers. To instruct the Imager to perform a "Graphics Dump", the command "G" is issued, optionally followed by any combination of graphics options.

Graphics Dump: <CTRL-I> (G) (options) <CR>

```
100 PRINT CHR$(9); "G"
```

Print Apple graphics screen command. When the "G" command is used alone it will send the Apple's high resolution screen, page 1, centered, regular size, black on white (ie:non-reversed). Sending valid option characters between the "G" and the <CR> will modify the output as described below. Any non-valid character used as an option will terminate the command without action.

Inverse Image: <CTRL-I> (G) (I) <CR>

```
100 PRINT CHR$(9); "GI"
```

Normally, the "G" command results in black dots being printed on the screen for corresponding white dots on the screen. This command will tell the Imager to reverse the image, resulting in a white on black printout.

Emphasize Image: <CTRL-I> (G) (E) <CR>

```
100  PRINT CHR$(9); "GE"
```

This command will result in denser (darker) image being printed. Some printers do not support this command.

Magnify Image X 2: <CTRL-I> (G) (D) <CR>

```
100  PRINT CHR$(9); "GD"
```

This causes the Imager to print an image which is twice as high and twice as wide as normal (ie:double size). Some printers are not sufficiently wide to perform this function without also rotating the image with the "R" option described below.

Rotate Image: <CTRL-I> (G) (R) <CR>

```
100  PRINT CHR$(9); "GR"
```

This command will rotate the image to be printed 90 degrees, turning the printout sideways.

Select Page 2 Image: <CTRL-I> (G) (2) <CR>

```
100  PRINT CHR$(9); "G2"
```

This option chooses high resolution page 2 instead of page 1.

Select Both Pages: <CTRL-I> (G) (S) <CR>

```
100  PRINT CHR$(9); "GS"
```

This command will print high resolution page 1 and 2, side by side. The "R" option may be needed on some printers to allow sufficient width for both pages.

Mix Graphics and Text: <CTRL-I> (G) (M) <CR>

```
100  PRINT CHR$(9); "GM"
```

This option prints the high resolution screen, but leaves 4 lines for text at the bottom of the page. The text characters on the bottom 4 lines of the screen will be printed at the bottom of the printout.

Left Margin: <CTRL-I> (G) (L) <CR>

```
100  PRINT CHR$(9); "GL"
```

This option forces the printed image to be left justified against the left margin as set during text mode. If this option is not used the printed image will be centered.

Low Resolution Graphics Dump: <CTRL-I> (G) (B) <CR>

```
100  PRINT CHR$(9); "GB"
```

This option will select the Apple low resolution graphics screen for printing.

Double Resolution Graphics: <CTRL-I> (G) (e) <CR>

```
100  PRINT CHR$(9); "Ge"
```

This option selects the double resolution graphics mode available on the Apple //e for printing. This capability requires an Apple //e with 128K of system RAM, a revision B motherboard, and a jumper installed on the 80 column board.

Overlay Graphics Screens: <CTRL-I> (G) (O) <CR>

```
100  PRINT CHR$(9); "GO"
```

This option causes the images contained in the Apple's "page 1" and "page 2" of graphics memory to be printed one on top of the other. Thus a background could be placed on one page, and foreground subjects could be easily printed against that background by using this option.

Zoom Graphics Size: <CTRL-I> (G) (n) (Z) <CR>

```
100  PRINT CHR$(9); "G4Z"
```

This option expands the size of the graphics image sent to the printer. The BASIC example listed would cause the printout to be four times as high and four times as wide as normal. Sending a value of "2" would duplicate the function of the "D" option listed above. If the graphics printout is wider than the printer can handle, the right edge of the printout will be cropped off.

Horizontal Aspect Ratio: <CTRL-I> (G) (n) (H) <CR>

```
100  PRINT CHR$(9); "G4H"
```

This option allows you to control the width of your graphics printout. The BASIC example listed would print an image which is normal height, but 4 times wider than normal.

Verticle Aspect Ratio: <CTRL-I> (G) (n) (V) <CR>

```
100  PRINT CHR$(9); "G5V"
```

This option allows you to control the height of your graphics printout. The BASIC example listed would print an image which is normal width, but 5 times taller than normal.

Set Print Mode: <CTRL-I> (G) (n) (P) <CR>

```
100  PRINT CHR$(9); "G2P"
```

This option allows you to select different print modes that your printer allows. The range for n depends on how many print modes your printer supports.

Any or all of the above options can be used together, and order is not important. For example, to print an image that is inverse, rotated, double size and emphasiaed, the following command would be used.

<CTRL-I> (G) (I) (R) (D) (E) <CR>

```
100 PRINT CHR$(9);  "GIRDE"
```

All command lines must end with a carriage return. NOTE that this means that BASIC program statements cannot end with a ";" (semicolon), because this is BASIC's way of suppressing carriage returns normally issued after a PRINT.

Chart Recorder Mode

In order to emulate a chart recorder a method has been provided to allow several pages of continuous graphics printouts without any intervening spaces or blank lines. This is accomplished by sending more than one graphics command without printing anything else or sending any other commands. For example, let's say your program produces a bar chart which is four graphics pages wide. Your program creates and saves the high resolution screens on the disk drive as SCREEN1, SCREEN2, SCREEN3, and SCREEN4. The following example will produce a continuous printout of these four charts.

```
10   D$ = CHR$(4):  REM DOS COMMAND <CTRL-D>
100  PRINT D$; "BLOAD SCREEN1,A$2000"
110  PRINT D$; "BLOAD SCREEN2,A$4000"
120  PRINT D$; "PR#1"
130  PRINT CHR$(9); "GR"
140  PRINT CHR$(9); "GR2"
150  PRINT D$; "BLOAD SCREEN3,A$2000"
160  PRINT D$; "BLOAD SCREEN4,A$4000"
170  PRINT CHR$(9); "GR"
180  PRINT CHR$(9); "GR2"
```

Technical Information

The information contained in this section is highly technical and is intended for the advanced Apple user. All address values are given in hexadecimal and some technical jargon is used. Proceed at your own discretion.

This chapter will describe the Imager's firmware entry points, peripheral card I/O space, and DB-25 pinouts.

Firmware Entry Points

$Cn00: I/O Initialization
$Cn05: Subsequent Input
$Cn07: Subsequent Output

All calls using these vectors should be made using the CSW and KSW zero page vectors. All registers are preserved after these calls except the A register on input, which of course will contain the fetched character from the serial port.

The Imager also supports the Firmware Protocol. The firmware supports the standard generic signature byte, device signature byte and offsets for initialization, read, write and status.

Peripheral Card I/O Space

The Imager contains a 6551 ACIA and two DIP switch registers in the I/O space which is located from $C080+s0 to C08F+s0 for each slot. A The table below charts this usage.

Address	Register
$C081+s0	DIP Switch 1
$C082+s0	DIP Switch 2
$C088+s0	6551 ACIA Transmit (Write)
	6551 ACIA Receive (Read)
$C089+s0	6551 ACIA Status
$C08A+s0	6551 ACIA Command
$C08B+s0	6551 ACIA Control

Connector Pinouts

The Imager supports two different connector pinouts dependent upon the internal cable being attached to the PRINTER header or the MODEM header. The tables below will map these pinouts.

MODEM Pinout

DB-25#	Description
1	FG: Frame Ground
2	TxD: Transmit Data (Output)
3	RxD: Receive Data (Input)
4	RTS: Request To Send (Output)
5	CTS: Clear To Send (Input)
6	DSR: Data Set Ready (Input)
7	SG: Signal Ground
8	DCD: Data Carrier Detect (Input)
11	SCTS: Secondary Clear To Send (Input)
12	HLS: High/Low Speed (Input)
19	JCTS: Jumpered Clear To Send (Input)
20	DTR: Data Terminal Ready (Output)
22	RI: Ring Indicator (Input)

PRINTER Pinout

DB-25#	Description
1	FG: Frame Ground
2	RxD: Receive Data (Input)
3	TxD: Transmit Data (Output)
4	CTS: Clear To Send (Input)
5	RTS: Request To Send (Output)
6	DTR: Data Terminal Ready (Output)
7	SG: Signal Ground
8	DCD: Data Carrier (Output)
11	SCTS: Secondary Clear To Send (Input)
12	AI1: Auxiliary Input 1 (Input)
19	JCTS: Jumpered Clear To Send (Input)
20	DSR: Data Set Ready (Input)
22	AI2: Auxiliary Input 2 (Input)

The Imager will sense a busy signal on any of it's main handshaking lines. These lines are CTS (pin 4), DTR (pin 20), SCTS (pin 11) and JCTS (pin 19 default). If your device does not connect to one of these lines the Imager ignores that line. A straight cable will work with the handshaking system of almost any device.

The JCTS (Jumpered Clear To Send) line can be moved from it's default position of pin 19 and moved to any other unnassigned DB-25 pin position. This is done by moving the mini jumper along the strip of lettered positions located at the top right corner of the Imager circuit board. The table below matches the lettered positions with it's corresponding DB-25 pin number.

A - 9	B - 10	C - 13
D - 14	E - 15	F - 16
G - 17	H - 18	I - 19
J - 21	K - 23	L - 24
M - 25		

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Apricorn warrants that its products will be free from defects in materials and workmanship for as long as the original purchaser owns the product. This warranty is extended only to the original purchaser and is not assignable.

In the event of failure the remedy will be repair or replacement of the product at no charge to the original purchaser. This warranty does not apply if the product has been damaged by accident, abuse, misuse or misapplication or has been modified in any way. This warranty does not extend to any other products used in conjunction with this product and is limited to the repair or replacement of the product.

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10670 TREENA STREET
SUITE 10
SAN DIEGO, CA 92131

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