BIT PAD TWO DATA TABLET USER'S GUIDE

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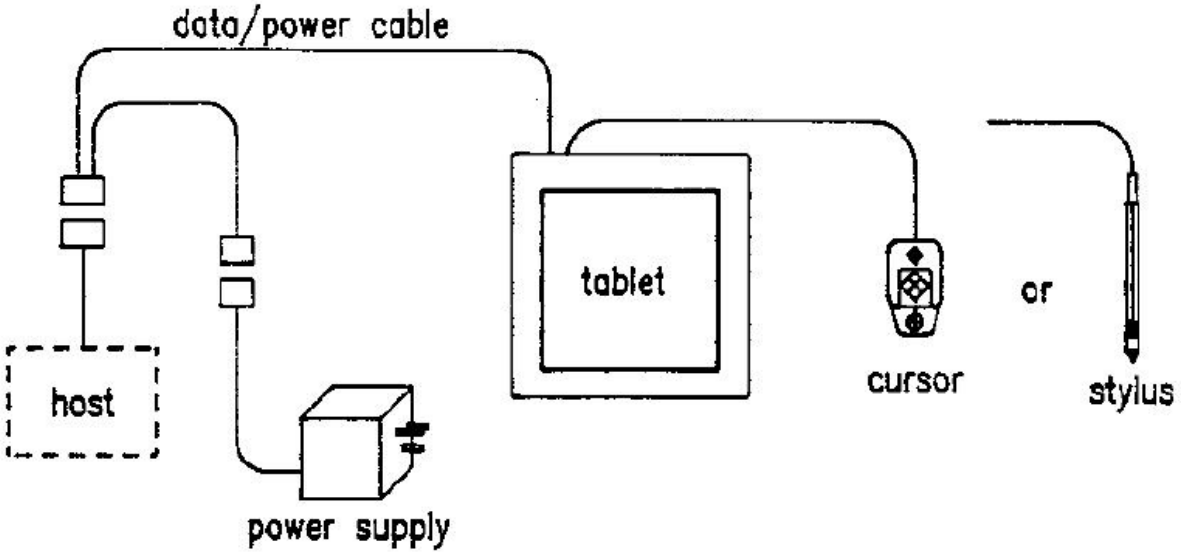
Chapter 1: Operation Overview

The Bit Pad Two is a data tablet that acts as an input device. It allows for the translation of graphic information into digital, suitable for a digital device such as a computer.

The Bit Pad Two is valuable in many applications, including:

- Steering a cursor on a computer terminal.
- Picking locations on a menu
- Digitizing maps, drawings, etc.

The parts of a standard Bit Pad Two are the tablet, cursor or stylus, data/power cable and power supply.



Tablet: Table-like surface. The tablet can tilt or lie flat.

Cursor: Handheld device that's used with the tablet to locate points. A cursor has a crosshair for precisely sighting the points. They are available with three or four buttons.

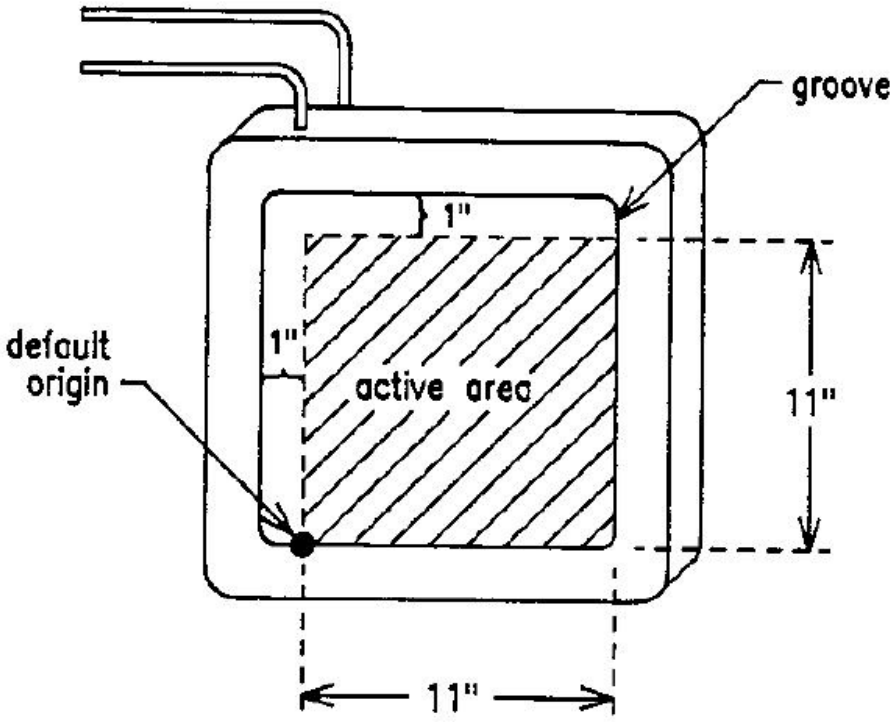
Stylus: Pen-like, handheld device. Use it with the tablet to locate points. The stylus has two buttons; one on the outside of the barrel and another inside the barrel, activated by pressing the refill tip. Refills are available in marking and non-marking,

Data/Power Cable: Cable and connector assembly that interfaces the data tablet to the host and power supply.

Power Supply: Source of power for the Bit Pad Two. It attaches to the data/power cable and the power line.

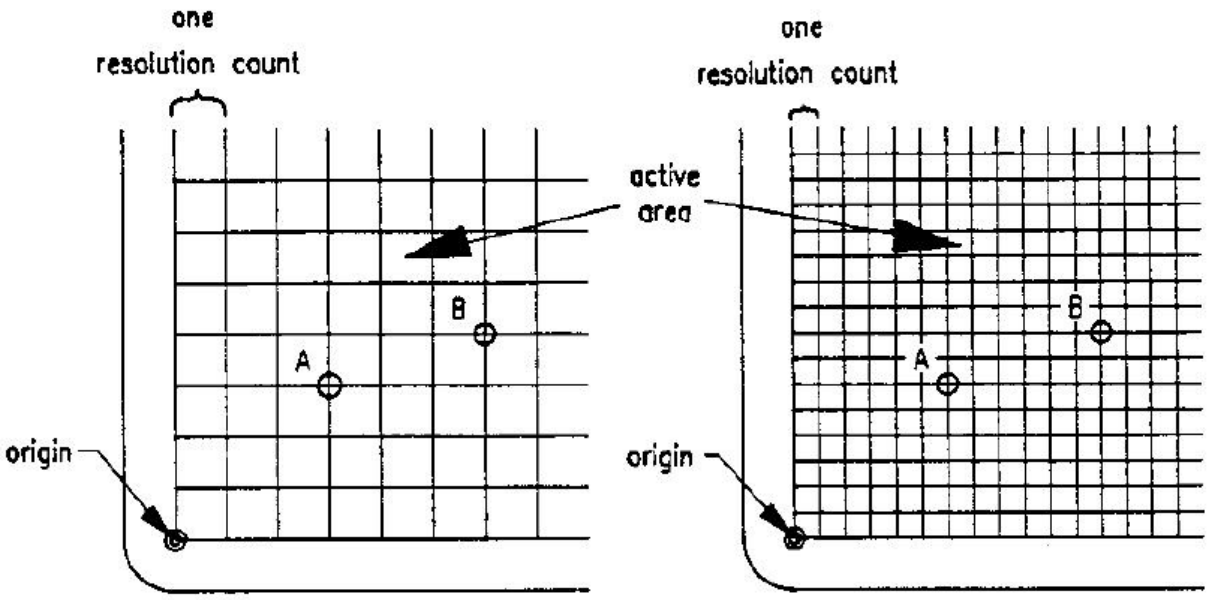
Adapter Cables: Cable assemblies that can change the gender of the data/power cable connector; reverse the communication lines or convert the power supply plug to the international standards.

The Bit Pad Two translates the position of the stylus or cursor on the tablet into digital information and communicates it to the host. The host is represented by a computer. The stylus or cursor position is expressed as an X, Y coordinate pair. One coordinate pair is called a ***report***. Reports can only be collected when the stylus or cursor is in the tablet's ***active area*** and is in ***proximity***.



Proximity is the maximum distance above the active area that the cursor or stylus can be held and report a valid position. This, in effect, establishes a three-dimensional volume, within which the cursor or stylus can issue valid reports. Reports issued from outside of this volume are ***out of proximity*** (out-of-prox) and therefore, do not represent the current position of the stylus or cursor.

Reports are in counts of resolution, expressed as absolute coordinates or relative coordinates.



points	absolute coordinates	relative coordinates
A	(3,3)	(3,3)
B	(6,4)	(3,1)

Part I

points	absolute coordinates	relative coordinates
A	(6,6)	(6,6)
B	(12,8)	(6,2)

Part II

Resolution: Smallest distance or movement that the data tablet can distinguish. Resolution is a measure of precision and is expressed in lines per inch (lpi) or lines per millimeter (lpmm).

Counts of Resolution: Unit of measure: one count is the distance between two lines of resolution.

Absolute coordinates are measured from the tablet's origin (0, 0). ***Relative coordinates*** are measured relative to the last report location. Reports are in absolute coordinates when the

data tablet is in ***Absolute Mode***. Reports are in relative coordinates when the data tablet is in ***Relative Mode***.

Absolute and Relative modes are two of the Bit Pad Two's many operating characteristics. Other operating characteristics govern when reports are issued; how fast they are issued and the tablet resolution.

The operating characteristics can be set by commands from the host or by switches. The switches, slide or rocker, are grouped in banks of eight per DIP switch. The DIP switches are located on the printed circuit board inside the tablet.

Also, established by switch are the data tablet's configuration parameters. These parameters specify the data communications, such as CTS handshaking and baud rate, and the data format.

Chapter 2: Configuration Parameters

For successful communication between a Bit Pad Two and its host, the hardware interface and configuration parameters must be compatible. The hardware interface is RS-232C. The configuration parameters are:

- Proximity transmission
- Remote control
- Baud rate
- CTS handshaking
- Report format and cursor output codes

This chapter describes the alternatives available for each of the configuration parameters. The parameters are switch-selective. ***Appendix D Quick Reference Sheet of Commands and Switch Settings*** summarize the switch settings and defaults that the factory normally uses.

Section A: Proximity Transmission

The data tablet can be configured to:

- Transmit reports only when the cursor or stylus is in proximity.
- Transmit reports regardless of whether the cursor or stylus is in or out of proximity.

If the data tablet is configured the second way, reports issued from out-of-prox will reflect that state with a special bit or character. Reports in the binary format have a bit assigned

to report the proximity status. Reports in the ASCII BCD format use the cursor/stylus flag character to identify an out-of-prox report.

Section B: Remote Control

The data tablet can be configured to accept or reject commands from the host. When the remote control is enabled, the data tablet is receptive to commands from the host.

When the remote control is disabled, the data tablet only responds to the following commands:

ASCII Command	Function
T	remote request trigger
NUL	Reset
XOFF	Stop Transmission
XON	Start Transmission
ENQ	Send Configuration
SP (space)	no operation
CR	no operation

Section C: Baud Rate

Baud rate is the number of bits transmitted each second between host and peripheral (Bit Pad Two) or peripheral and host. The available baud rates are 110, 150, 300, 1200, 2400, 4800, 9600 and 19200.

Section D: CTS Handshaking

The Bit Pad Two supports CTS (Clear to Send) handshaking, hardware governed method of communications control. The Bit Pad Two is configured as a DTE (Data Terminal Equipment). Therefore, RTS (Request to Send) and DTR (Data Terminal Ready) are always asserted.

If the switch is set to enable CTS handshaking, the data tablet awaits CTS from the host before it can issue reports. If CTS is not asserted, the data tablet is inhibited from sending reports. If the switch is set to disable CTS handshaking, the data tablet ignores the CTS line.

Section E: Hardware Interface

The Bit Pad Two has an RS-232C interface. It is full duplex, asynchronous and serial. View the sections below for the pin assignments and signal levels.

Connector Pin Assignments

The data/power cable is a single, shielded cable terminated with a 25-pin female D connector and a 4-pin male in-line connector. The D connector plugs into the host and the in-line connector attaches into the power supply. The pin assignments appear below:

RS-232C Data/Power Cable – Pin Assignments for the 25-Pin D Connector

Pin	Wire Name	Description
1	shield	protective, frame ground
2	TXD	transmit data from Bit Pad Two to host
3	RXD	receive commands from host to Bit Pad Two
4	RTS	Request To Send
5	CTS	Clear To Send
7	signal ground	return for serial data
20	DTR	Data Terminal Ready

Pins 1 and 7 are jumpered together.

RS-232C Data/Power Cable – Pin Assignments for the 4-Pin In-Line Connector

Pin	Wire Name	Description
1	shield	protective, frame ground
2	-12V supply	power: 100 mA at +/-5%
3	+12V supply	power: 300 mA at +/-.5% regulation or better
4	signal ground	return for power

An adapter cable is available to change the connector gender from female to male. Also, a reversing cable is available to reverse the communications lines; its pin assignments appear below:

RS-232C Reversing Cable – Pin Assignments for the 25-Pin D Connector

Pin	Wire Name	Description
1	shield	protective, frame ground
2	RXD	receive commands from host to Bit Pad Two
3	TXD	transmit data from Bit Pad Two to host
4	RTS	Request To Send
5	CTS	Clear To Send
7	signal ground	return for serial data
20	DTR	Data Terminal Ready

Pins 1 and 7 are jumpered together.

Signal Levels

The table below specifies the signal levels for data transmissions:

RS-232C Signal Levels

RS-232-C Interface	Interchange Voltage -3V to -12V	Interchange Voltage +3V to +12V
Binary states	1	0
Signal condition	Mark	Space

The source of the above tablet is the ***EIA Standard RS-232C: Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange*** by the Engineering Department of the Electronic Industries Association (Washington, D.C.: EIA, 1969).

Section F: Report Format and Cursor Output Codes

Two report formats are available: packed binary and ASCII BCD.

NOTE: To users of other Summagraphics data tablets or digitizers: the formats described here are specific to the Bit Pad Two and Bit Pad One. Other Summagraphics products have similarly named formats, but their content may be different. Regardless of format, reports are in counts of resolution, not in inches or millimeters.

Within the report format:

- You can opt to have parity enabled or not.
- If parity is enabled, it can be even or odd.
- Select the number of stop bits to be one or two.
- You have two cursor output codes to choose from.

The Bit Pad Two is normally configured at the factory in the ASCII BCD report format with parity enabled (set for even parity), two stop bits and cursor output.

Bit Pad Two Packed Binary Format

The packed binary formats are different for reports issued when the data tablet is in Absolute Mode vs. Relative Mode. Absolute Mode has 12 bits per coordinate while Relative Mode has 11 bits and one sign bit per coordinate.

Bit Pad Two Packed Binary Report Format

Stop Bits	MSB 7	6	5	4	3	2	1	LSB 0	Start Bit	Transmission Sequence
SB	P	PH	Fd	Fc	Fb	Fa	0	PR	0	1st byte
SB	P	0	X5	X4	X3	X2	X1	X0	0	2nd byte
SB	P	0	X11	X10	X9	X8	X7	X6	0	3rd byte
SB	P	0	Y5	Y4	Y3	Y2	Y1	Y0	0	4th byte
SB	P	0	Y11	Y10	Y9	Y8	Y7	Y6	0	5th byte

LSB Least significant bit

MSB Most significant bit

PR Proximity, 0 when in proximity and 1 when out-of-prox

F Flag bit, identifying the stylus or cursor buttons being pressed. The cursor output codes are switch selective:

Stylus Buttons	Output Code Fd	Fc	Fb	Fa
none	0	0	0	0
tip	0	0	0	1
barrel	0	0	1	0
tip & barrel	0	0	1	1

3-button Cursor Buttons*	4-button Cursor Buttons	Output A Code Fd	Fc	Fb	Fa	Output B Code Fd	Fc	Fb	Fa
none	none	0	0	0	0	0	0	0	0
1	1	0	0	0	1	0	0	0	1
2	2	0	0	1	0	0	0	1	0
—	3	0	1	0	0	0	0	1	1
3	4	1	0	0	0	0	1	0	0

*On the 3-button cursor, the buttons are distinguished by raised dimples, rather than by numbered labels. In the table above, 1 corresponds to one dimple; 2 to two dimples, etc.

PH Phasing bit, which is always 1

P Parity bit

SB One or two stop bits

X0 to X11 and Y0 to Y11 X and Y coordinate bits.

NOTE: In Relative Mode, X11 and Y11 are the sign bits. The bit is 0 for a positive coordinate and 1 for a negative coordinate. Furthermore, the remaining bits for a negative coordinate are in the two's complement form.

Bit Pad Two ASCII BCD Format

When the data tablet is in Absolute Mode, the ASCII BCD report format is:

XXXX,YYYY, F<CR> or XXXX,YYYY,F<CR><LF>

When the data tablet is in Relative Mode, the ASCII BCD report format is:

SXXX,SYYY,F<CR> or SXXX,SYYYY,F<CR><LF>

As shown in the above formats, the terminator can be a carriage return (<CR>) or a carriage return and a line feed (<LF>). This is switch-selective.

NOTE: The character 9 is in the cursor/stylus flag position when a report is issued from out-of-prox.

Key:

S Coordinate sign, in Relative Mode only. For a positive coordinate, the character can be 0 through 9. For a negative coordinate, the character is a minus sign (-).

X A digit of the X coordinate; each digit is an ASCII character, 0 through 9.

, The delineator character, an ASCII comma.

Y A digit of the Y coordinate; each digit is an ASCII character, 0 through 9.

F Flag character identifying the stylus or cursor buttons being pressed. The cursor output codes are switch-selective:

Stylus Buttons	Output Code
none	0
tip	1
barrel	2
tip & barrel	3
out-of-prox	9

3-button Cursor Buttons*	4-button Cursor Buttons	Output Code A	Output Code B
none	none	0	0
1	1	1	1
2	2	2	2
—	3	4	3
3	4	8	4
out-of-prox		9	9

*On the 3-button cursor, the buttons are distinguished by raised dimples, rather than by numbered labels. In the table above, 1 corresponds to one dimple, 2 to two dimples and etc.

<CR>	ASCII carriage return
<LF>	ASCII line feed

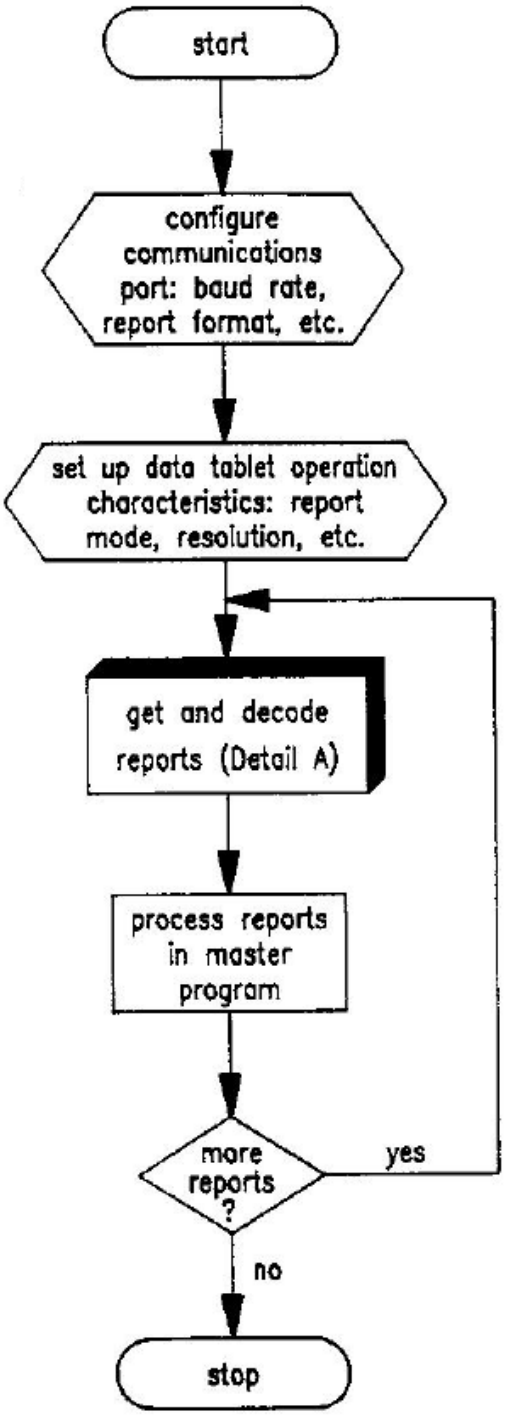
Chapter 3: Guidelines for Writing a Software Driver

A computer must have a driver in order for the Bit Pad Two to be connected. The driver is a software subroutine that collets and decodes Bit Pad Two reports for use by another (master) program. This section provides some guidelines, in the form of flowcharts, for writing a driver.

The flowcharts are for a Bit Pad Two using the packed binary report format. The steps are general for any set of operating characteristics.

NOTE: In the context of these charts, ***normalize*** means to combine the two coordinate bytes into the format required by your master program.

General Flowchart for Master Program to Read and Process Data Tablet Reports



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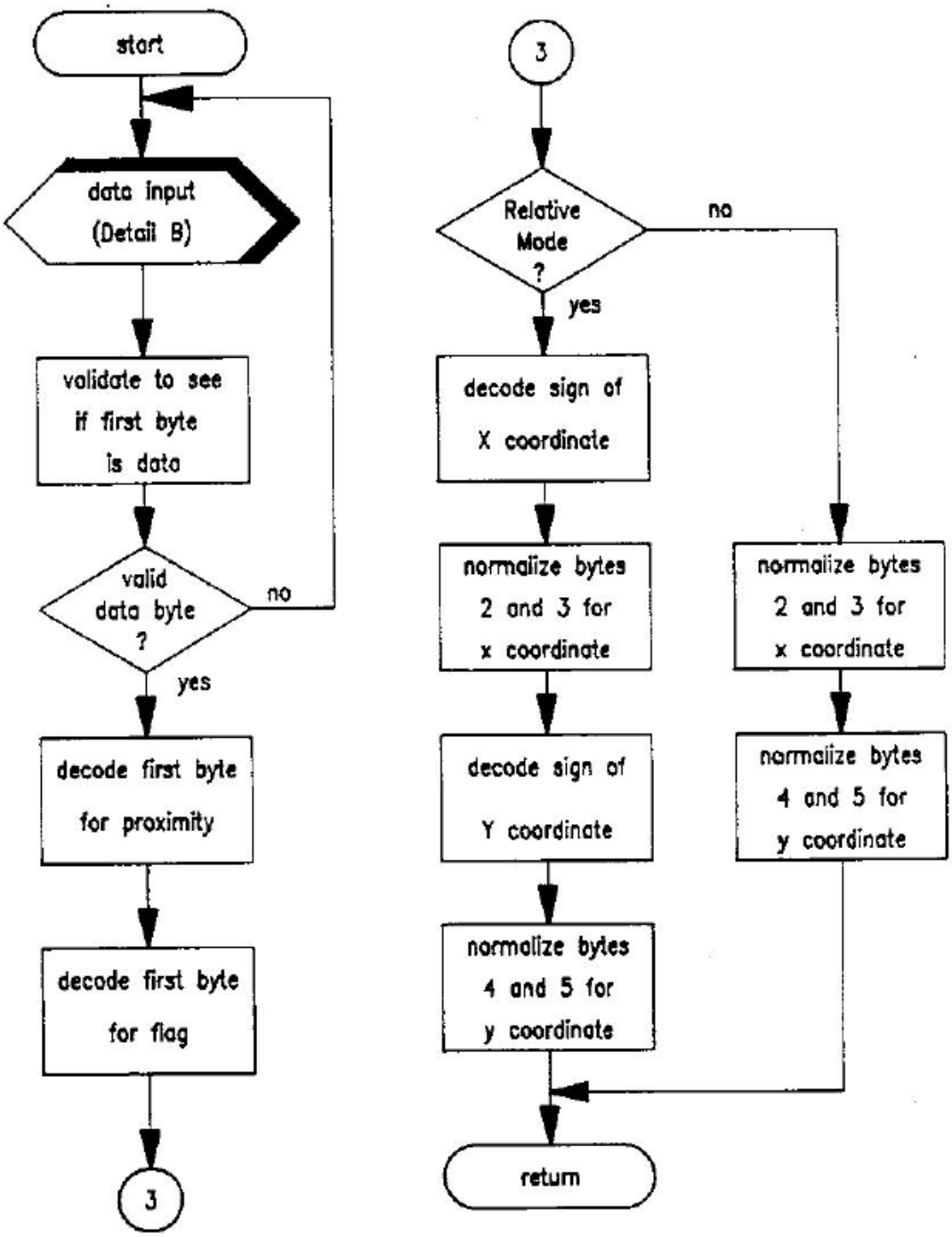
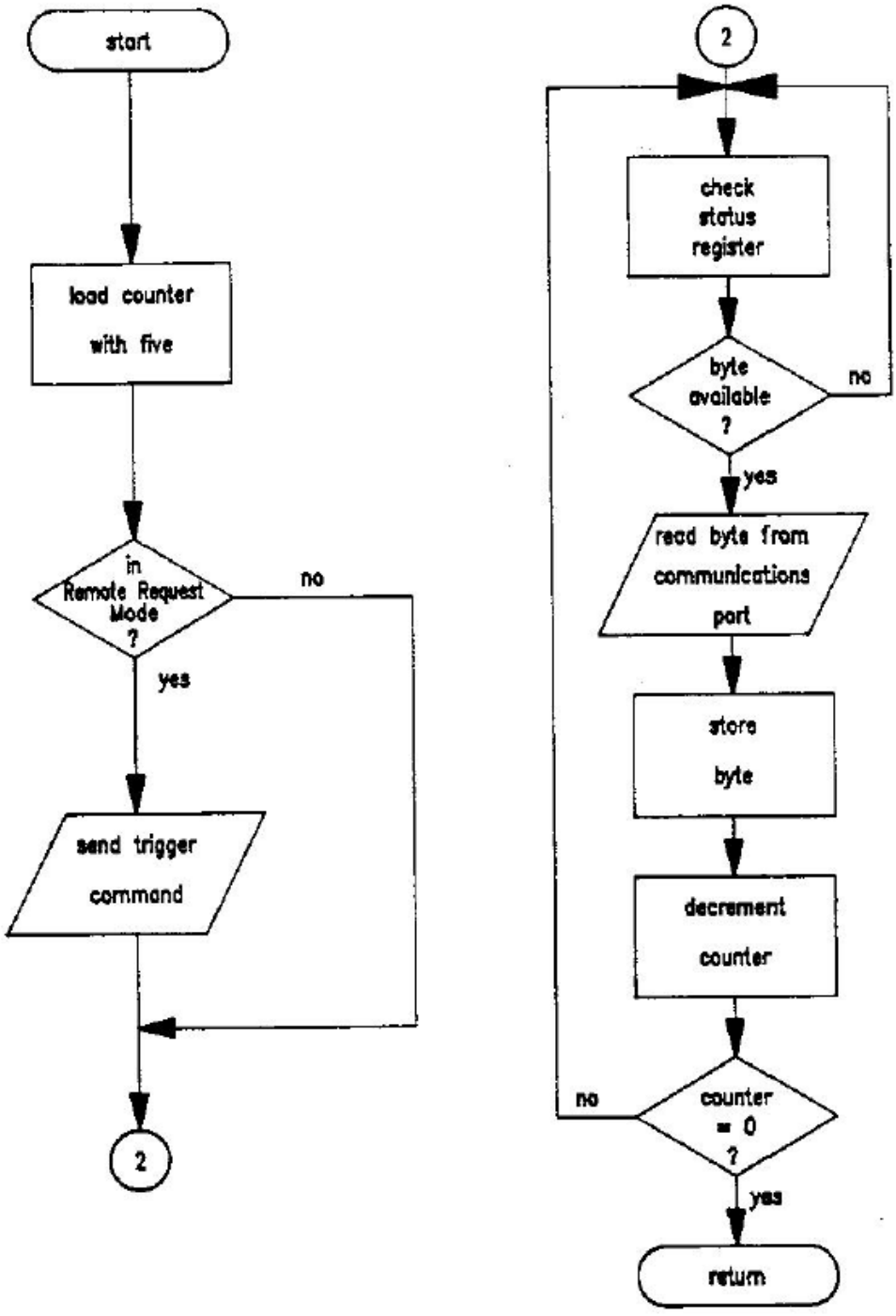
Detail A: Get and Decode Reports Subroutine



Detail B: Data Input Subroutine



Chapter 4: Operating Characteristics and Commands

Bit Pad Two has a variety of operating characteristics and functions. The operating characteristics control the report flow, report content and tablet resolution.

Set the Bit Pad Two's operating characteristics or initiate the functions with commands from the host or with the switches inside the tablet. The table below identifies the selector methods available:

Methods of Operating Characteristic and Function Control

Operating Characteristics and Functions	Controlled by Switch	Command
Stream Mode	yes	yes
Switch Stream Mode	yes	yes
Stream/Switched Stream Report Rate	yes	yes
resolution	yes	yes
Increment Mode and value	yes	yes
Remote Request Mode	yes	yes
Point Mode	yes	yes
Absolute/Relative Mode	yes	yes
Send Configuration	no	yes
Self Test	no	yes
Start/Stop Transmission	no	yes
Rest	yes	yes
NOP (no operation)	no	yes

Commands override switch settings.

NOTE: The operating characteristics revert to the switch settings, however, each time you power up the data tablet or issue the Reset command.

Each characteristic or function and its commands are defined. For easy reference, the commands appear in ASCII and hexadecimal. ***Appendix B ASCII Conversion Chart*** also provides the binary, decimal and octal conversions. A summary of the commands and switch settings appears in ***Appendix D Quick Reference Sheet***.

The command byte format uses the same conventions as those used in the report formats: one start bit, seven data bits, an optional parity bit and one or two stop bits.

Commands are one byte long. The Bit Pad Two command buffer can hold ten bytes; therefore, up to ten bytes can be sent to the Bit Pad Two in quick succession.

Section A: Controlling the Report Flow and Content

Use the operating characteristics described in the section to control when reports are issued, how fast they are issued and coordinate content. Furthermore, reports can be gated (allowed to flow or not) with the ***Start*** and ***Stop Transmission*** commands.

Some characteristics are called ***modifiers*** because they can be combined with ***primary modes***. The primary modes are Stream, Switch Stream, Point and Remote Request modes. The modifiers are Absolute, Relative and Increment modes, as well as Report Rate.

Primary Modes: Stream, Switch Stream Modes and Report Rate

Command

Mode and Rate	ASCII	Hex
Switch Stream at 2 rps	@	40
Switch Stream at 4 rps	A	41
Switch Stream at 10 rps	B	42
Switch Stream at 20 rps	C	43
Switch Stream at 40 rps	D	44
Switch Stream at 70 rps	E	45
Switch Stream at 100 rps	F	46
Switch Stream at maximum rps	G	47
Stream at 2 rps	H	48
Stream at 4 rps	I	49
Stream at 10	J	4A
Stream at 20	K	4B
Stream at 40	L	4C
Stream at 70	M	4D
Stream at 100	N	4E
Stream at maximum rps	O	4F

Switch Setting:

Stream Mode:

DIP #	Switch	Setting
1	3	on
	4	off

Switch Stream Mode:

DIP #	Switch	Setting
1	3	on
	4	on

Report Rate: DIP #1

Report Rate	Switch Settings 6	7	8
2 rps	off	off	off
4 rps	off	off	on
10 rps	off	on	off
20 rps	off	on	on
40 rps	on	off	off
70 rps	on	off	on
100 rps	on	on	off
maximum rps	on	on	on

Please note that one command sets both the mode and Report Rate. However, five switches must be set to accomplish the same setting, two for the mode and three for the Report Rate.

Stream Mode

Bit Pad Two continuously issues reports. It is not necessary to press a cursor or stylus button.

NOTE: To eliminate redundant reports from being issued when the cursor or stylus is stationary, use Stream Mode together with Increment Mode.

Switch Stream Mode

Bit Pad Two continuously issues reports when a cursor or stylus button is pressed.

Report Rate

The Report Rate is the number of reports the data tablet issues each second. Use it with Stream or Switch Stream modes. Note that the Report Rate settings, such as 2 rps or 70 rps, are approximations. The rate at which the data tablet actually sends reports depends on the baud rate and the report format. The following tables identify the rates you can expect.

Report Rates Relative to Baud Rates for Reports in Binary Format

Baud Rate	Actual Report Rate (approximate)							
	2 rps setting	4 rps setting	10 rps setting	20 rps setting	40 rps setting	70 rps setting	100 rps setting	maximum setting
1200	2	4	10	20	22	22	22	22
2400	2	4	10	21	37	40	40	40
4800	2	4	10	21	38	62	72	72
9600	2	4	10	21	38	69	95	119
19200	2	4	10	21	38	69	96	154

Report Rates Relative to Baud Rates for Reports in ASCII BCD Format

Baud Rate	Actual Report Rate (approximate)							
	2 rps setting	4 rps setting	10 rps setting	20 rps setting	40 rps setting	70 rps setting	100 rps setting	maximum setting
1200	2	3	6	8	8	8	8	8
2400	2	4	8	13	16	16	16	16
4800	2	4	9	16	25	31	31	31
9600	2	4.5	9	18	30	46	53	57
19200	2	5	9.5	19	34	54	68	90

The Report Rates at 110, 150 and 300 baud are slower.

Point Mode

Command:

	ASCII	Hex
command	P	50

Switch Setting:

DIP #	Switch	Setting
1	3	off
	4	on

In Point Mode, the Bit Pad Two issues one report each time a cursor or stylus button is pressed. Reports can be issued up to the maximum Report Rate available for the set baud rate.

Remote Request Mode

Command:

	ASCII	Hex
mode command	S	53
trigger command	T	54

Switch Setting:

DIP #	Switch	Setting
1	3	off
	4	off

In Remote Request Mode, the Bit Pad Two issues one report each time the host sends a trigger command. Issue the mode command once. Thereafter, send only a trigger command for each report.

After Remote Request Mode is initiated, the Bit Pad Two takes between two and ten milliseconds to issue the report resulting from the first trigger command. Subsequent reports can be issued up to the maximum Report Rate available for the set baud rate.

Modifiers

Absolute Mode

Command:

	ASCII	Hex
command	Q	51

Switch Setting:

DIP #	Switch	Setting
1	5	off

In Absolute Mode, the Bit Pad Two issues reports as absolute coordinates. Absolute coordinates are measured relative to the tablet origin. Reports issued from out-of-prox are repeats of the last valid coordinate pair.

NOTE: When reports are in binary format and the data tablet is in Absolute Mode, the maximum reportable value is 4095. (Reports in ASCII BCD format have no restrictions.) Reports larger than this are detailed as the maximum value (4095). This, in effect, restricts the resolution setting to 254 lpi if you want the entire Bit Pad Two active area (11" x 11") available for digitizing. Higher resolutions can be used; however, the active area shrinks accordingly. The following table specifies the maximum length of each active area's axis from the tablet origin for resolutions higher than 254 lpi:

Resolution Setting	Maximum Axis Length (binary format only)
400	10.24 inches
500	8.19 inches
508	8.06 inches

Relative Mode

Command:

	ASCII	Hex
command	R	52

Switch Setting:

DIP #	Switch	Setting
1	5	on

In Relative Mode, the Bit Pad Two issues reports as relative coordinates. Relative coordinates are measured relative to the last issued report, not the tablet origin.

In Relative Mode, reports can have positive or negative values. Reports issued while the cursor or stylus is out-of-prox are zero.

NOTE: When the data tablet is in Relative Mode, the maximum negative coordinate that can be reported is restricted. In the binary format, the maximum reportable value is 2047. In the ASCII BCD format, the maximum reportable value is 999. Reports larger than these values are detailed as the maximum value. (Positive coordinates are not restricted.)

The effect is a restriction of the maximum ***delta*** between reported points. The delta is the distance from the last report to the current one. The maximum delta varies, depending on the tablet's resolution setting. This relationship is quantified in the table below:

Resolution Setting	Max. Negative Delta ASCII BCD Format (in inches)	Max. Negative Delta Binary Format (in inches)
100	9.99	no restriction
127	7.87	no restriction
200	4.99	no restriction
254	3.93	8.06
400	2.5	5.12
500	1.99	4.09
508	1.97	4.03

Increment Mode

Command:

	ASCII	Hex
Increment equals:		
0 (disable)	a	61
1	b	62
2	c	63
3	d	64
4	e	65
5	f	66
10	g	67
20	h	68

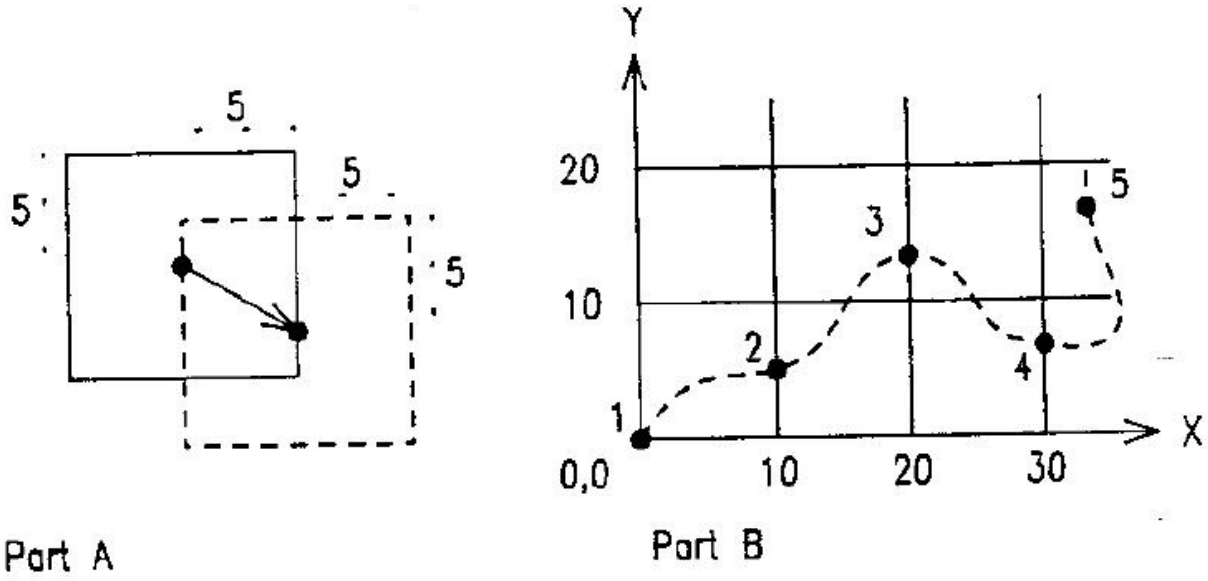
Switch Setting:

Increment Mode and Value: DIP #2			
	Switch Setting 3	4	5
0	off	off	off
1	off	off	on
2	off	on	off
3	off	on	on
4	on	off	off
5	on	off	on
10	on	on	off
20	on	on	on

In Increment Mode, the Bit Pad Two sends a report only when the cursor or stylus has traveled a minimum distance in the X or Y direction. This minimum distance is the increment. The increment is defined by you and applies to both axes. Because redundant reports are not sent to the host, Increment Mode is useful in reducing data output.

Here's a description of how Increment Mode works: last report issued becomes the center of an imaginary square whose sides are twice the increment value. The cursor can move anywhere inside the imaginary square without a report being issued. As soon as the increment is satisfied along either axis, the Bit Pad Two transmits the actual X and Y coordinates of the point. The new point becomes the center of a new, imaginary square.

Example: Part A shows the imaginary square created around each report point; the increment is five. Part B shows the reports issued as the cursor or stylus travels across the tablet; the increment is 10.



The five points issued in Part B are numbered in order.

Point	Report	Description
1	(0,0)	
2	(10,5)	Only X is satisfied. The actual value of Y is transmitted. No point is transmitted between points 2 and 3 because the cursor or stylus did not move ten resolution counts in either the X or Y directions.
3	(20,13)	The increment is satisfied from the last point along the X axis only; the Bit Pad Two issues the new report.

4	(30,7)	The increment is satisfied from the last point along the X axis only; the Bit Pad Two issues the new report.
5	(32,17)	The increment is satisfied from the last point along the Y axis only; the Bit Pad Two issues the new report.

Section B: Combining Characteristics

This section describes some of the nuances of combining primary modes and modifiers.

- Reports are not issued in response to buttons being pressed when the data tablet is in Remote Request Mode.
- Reports are issued in response to either buttons being pressed or remote requests when the data tablet is in Point, Stream or Switch Stream Mode.
- When the data tablet is in Stream, Switch Stream or Point Mode together with Increment Mode and a button is pressed, the last coordinate pair that satisfies the increment is reported.
- When the data tablet is in Stream Mode and Increment Mode or Switch Stream Mode and Increment Mode, reports are issued as follows:
    - A report cannot be issued until the increment has been satisfied.
    - If the increment has been exceeded and the Report Rate mandates that a report be issued, the last coordinate pair that satisfies the increment is reported.
- When the data tablet is in Point and Increment modes, reports are issued as follows:
    - If a button is pressed, but the increment has not been met, the last coordinate pair that satisfies the increment is reported.
    - If the increment has been exceeded and a button is pressed, the actual stylus or cursor position is reported.

- When the data tablet is in Remote Request and Increment modes, regardless of whether the increment has been satisfied or not, the actual position where the stylus or cursor is when the data tablet receives the remote trigger is reported position.

- If Point or Remote Request modes are set by switch rather than by command, the Report Rate, also set by switch, is valid. Consequently, the Report Rate has priority over buttons or remote triggers.

Section C: Other Commands

Resolution

Command:

	ASCII	Hex
Resolution of:		
100 lpi	i	69
127 lpi (5 lpmm)	j	6A
200 lpi	k	6B
254 lpi (10 lpmm)	l	6C
400 lpi	m	6D
500 lpi	n	6E
508 lpi (20 lpmm)	o	6F

Switch Setting:

Resolution: DIP #2			
	Switch Setting 6	7	8
100 lpi	off	off	off
127 lpi (5 lpmm)	off	off	on
200 lpi	off	on	off
254 lpi (10 lpmm)	off	on	on
400 lpi	on	off	off
500 lpi	on	off	on
508 lpi (20 lpmm)	on	on	off

Resolution is the smallest distance or movement that the data tablet can distinguish. It's a measure of precision and is expressed in lines per inch (lpi) or lines per millimeter (lpmm).

NOTE: The data format and coordinate mode both play a role in which resolutions are valid for the entire tablet.

Send Configuration

Command:

		ASCII	Hex
command		s	73
	or	ENQ	05

Switch Setting:

DIP #	Switch	Setting
none		

Use the Send Configuration command to send a report to the host that identifies the data tablet model and its version of software. The output looks like this:

MM1103_BIT_PAD_II_by_Summagraphics_Version_n.n<CR><LF>

The underlines are spaces; n.n is the version number and the line feed is switch-selective.

Transmission Control

Command:

	ASCII	Hex
Stop Transmission	XOFF	13
Start Transmission	XON	11

Switch Setting:

DIP #	Switch	Setting
none		

The Start Transmission and Stop Transmission commands act as gates, allowing reports to be sent or not sent from the Bit Pad Two to the host. These commands control data flow, regardless of the report mode. (Stop Transmission and Start Transmission are equivalents of the transmission protocols XOFF and XON.)

Stop Transmission places the data tablet on standby. It is useful for systems that do not constantly use the data tablet. End the standby state by sending the Start Transmission command.

If a report is interrupted by Stop Transmission, no data is lost. The report is severed at the end of the byte. When the Start Transmission command is issued, the next byte in that report is sent, intact. To avoid corrupted data, the host software should not look for a phasing bit at the beginning of resumed transmission.

The data tablet will respond to other commands, such as a command to change the resolution, while it is on standby. If the Reset command is issued while the data tablet is on standby, the data tablet honors the Reset command, but does not retract the XOFF state.

Reset

Command:

	ASCII	Hex
command	NUL	00

Switch Setting:

DIP #	Switch	Setting
A Reset switch is located inside the tablet on the printed circuit board. It is square and close to switch #3.		

Use the Reset command to return the operating characteristics to their current switch settings.

The factory-set defaults are:

Report Mode = Stream
Coordinate System = Absolute
Report Rate = 100 rps
Increment = 0
Resolution = 200 lpi

After a Reset is issued, there is a 10 millisecond delay before the Bit Pad Two is ready to receive information from the host.

NOP (No Operation)

Command:

		ASCII	Hex
command		SP	20
	or	CR	0D

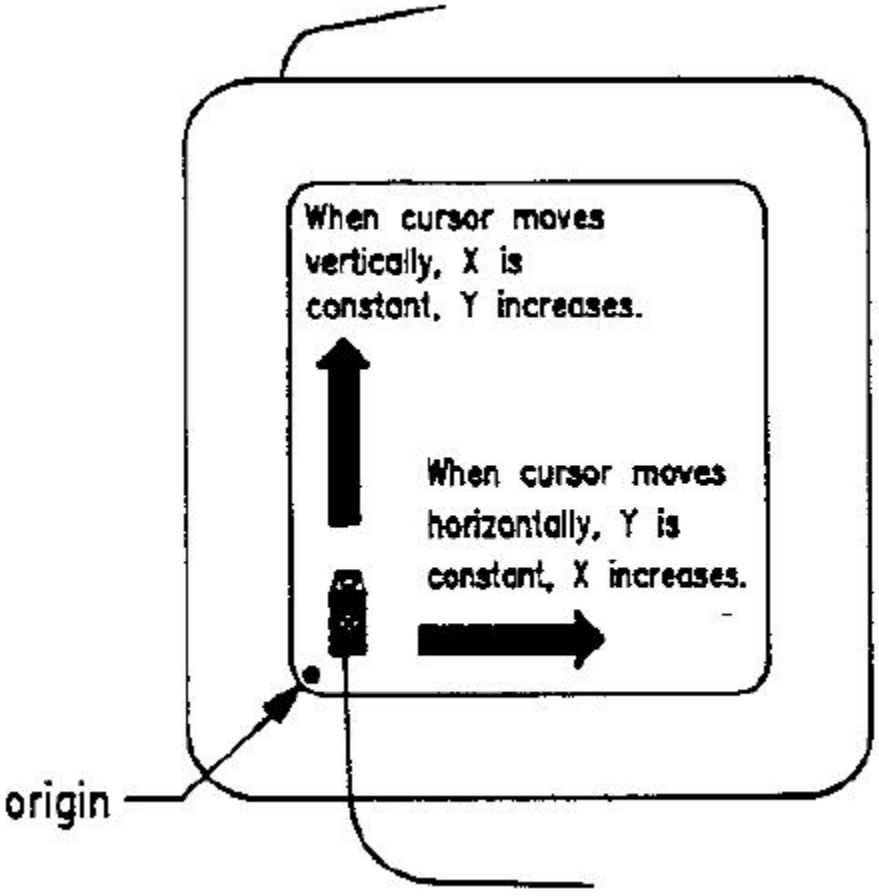
Switch Setting:

DIP #	Switch	Setting
none		

The data tablet performs no operation (NOP) when one of these commands is issued to it. This function can be used as a pad between command sequences, e.g. between XON and XOFF.

Chapter 5: Checking the Data Tablet

A convenient functional check of the data tablet can be performed by connecting Bit Pad Two to a terminal and moving the cursor or stylus across the tablet's active area. (The output is easier to interpret if you have the report format set for ASCII BCD.) The X and Y values should increase as the cursor or stylus slides from the tablet origin toward the end of the axis. This is depicted in the following illustration:



Another mechanism for checking a Bit Pad Two is the Self-Test diagnostic function.

Section A: Self-Test Diagnostic Function

Command:

	ASCII	Hex
command	t	74

Switch Setting:

DIP #	Switch	Setting
none		

Use the Self-Test command to perform tests on the tablet and cursor or stylus. Self-Test checks:

- Analog circuitry
- Cursor or stylus connection, operation and location
- Digital circuitry

After the test is performed, the results are sent to the host. The results are transmitted in one byte in the following format:

Stop Bits	MSB 7	6	5	4	3	2	1	LSB 0	Start Bit
SB	P	T	0	0	PR	D	C	A	0

A	analog circuitry test	pass = 1 fail = 0
C	cursor/stylus connection and cursor/stylus coil operation test	pass = 1 fail = 0
D	digital circuitry test	pass = 1 fail = 0
PR	cursor/stylus on/off tablet	on = 1 off = 0
T	total test result (This result is based only on the results of tests A, C, and D.)	pass = 1 fail = 0
P	parity	n/a
SB	stop bit or bits	n/a

If the Self-Test output byte is an ASCII O or G, the data tablet passed the diagnostic tests. (An ***O*** simply indicates that the stylus/cursor is in proximity. A ***G*** indicates that it is out-of-prox.)

Section B: In Case of Failure

If the Bit Pad Two does not operate or fails the Self-Test, follow these steps:

1. Power down the Bit Pad Two.
2. Check that cables are firmly attached.
3. Ensure that the host is working properly.
4. If possible, issue each diagnostic command and review the results.

Chapter 6: Operating Environment, Installation, Care and Service

Section A: Operating Environment

Temperature and Humidity

Operate Bit Pad Two within these temperature and humidity ranges:

+45 degrees to +110 degrees Fahrenheit
+7 degrees to +43 degrees Celsius
8% to 80% relative humidity, non-condensing

Acceptable non-operating conditions are:

-45 degrees to +145 degrees Fahrenheit
-43 degrees to +63 degrees Celsius
8% to 80% relative humidity, non-condensing

Extremes in environment can cause degradation of operation.

Power

The power supply shipped with Bit Pad Two provides the proper power: 300mA at +12VDC with +/-.5% regulation or better and 100 mA at -12VDC with +/-5% regulation or better.

Section B: Unpacking and Installation

Unpacking

Immediately upon receipt, inspect the package for damage. If damage exists:

1. Open the package and inspect the damage.
2. Report the damage to the carrier as soon as possible, preferably within 72 hours or receipt.
3. Record the damaged items on the freight bill.
4. Write to the carrier: state that the shipment was damaged, when it was received and request an inspection.
5. Keep the shipment in its original container until an inspection is made by the carrier.
6. Notify GTCO CalComp by Turning Technologies at 1.866.746.3015 or email us at gtco.support@gtcocalcomp.com.

Otherwise, unpack the Bit Pad Two. The package should include:

- Tablet with data/power cable attached
- Four rubber feet
- Bit Pad Two Data Tablet Technical Reference
- Power supply

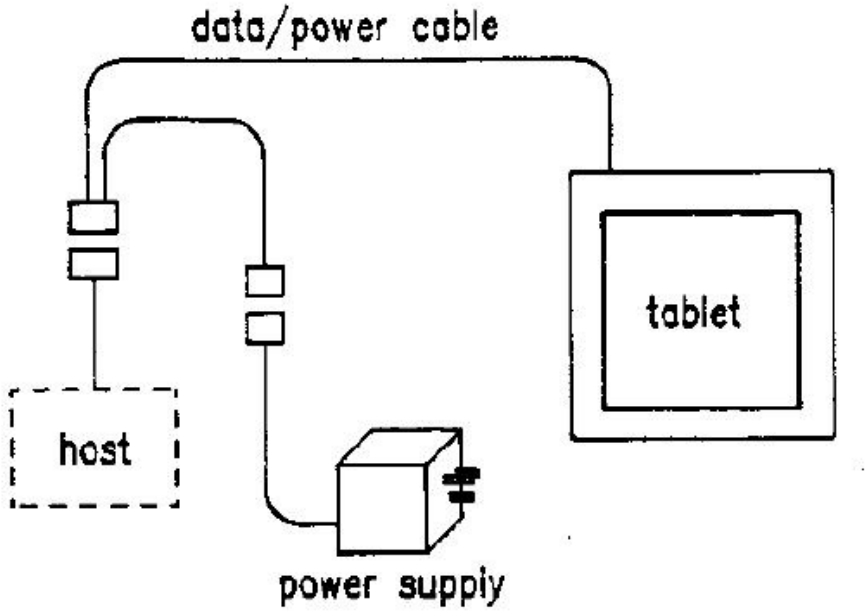
Purchasable options include:

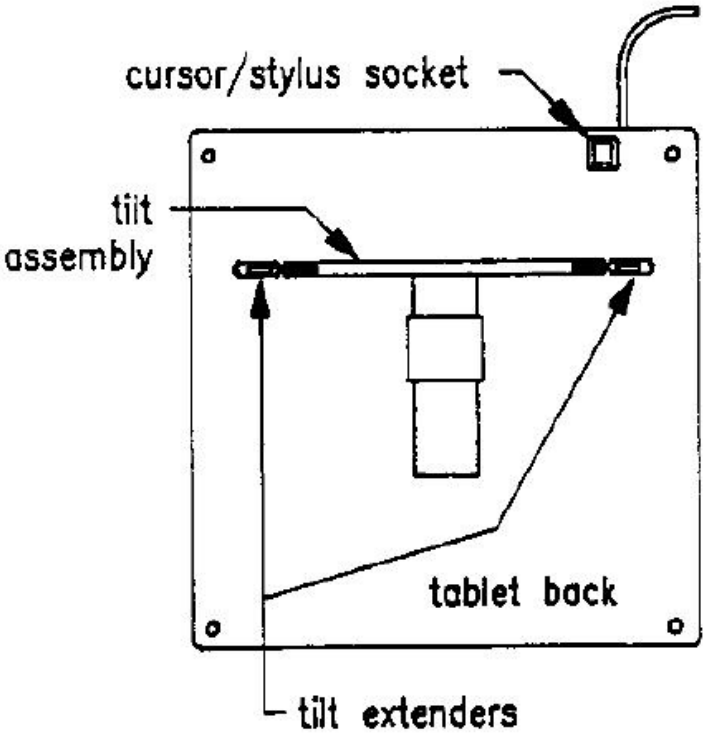
- Cursor/Stylus
- Gender changer or reversing cable
- Power cable (for international power supply)

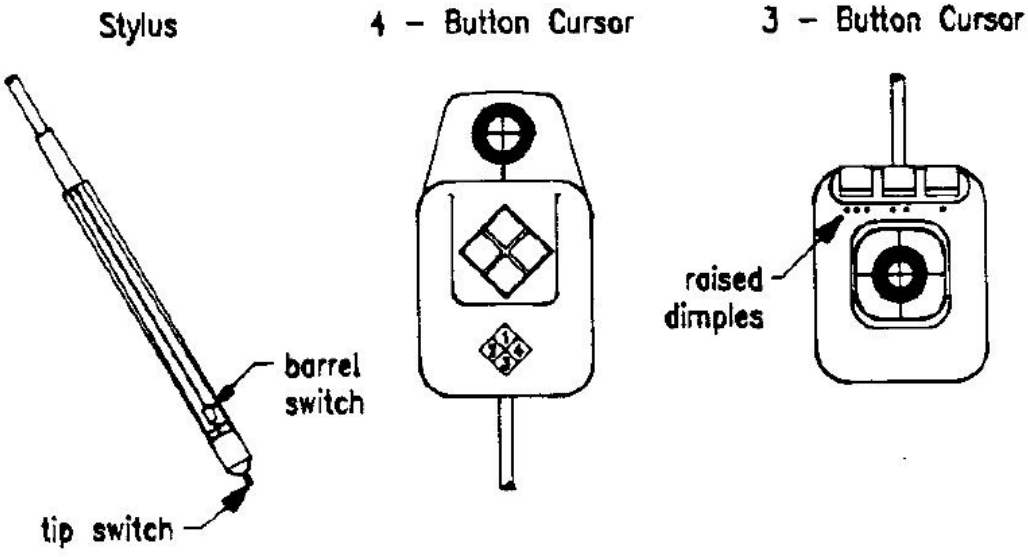
Installation

A brief summary of the steps for assembling and installing a Bit Pad Two is as follows:

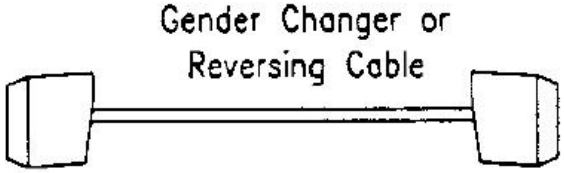
1. Configure Bit Pad Two data tablet.
2. Adjust the tilt or use flat
3. Attach stylus holder, if applicable.
4. Connect the stylus or cursor to the tablet.
5. Attach the tablet to the host.
6. Connect the tablet to the power source.

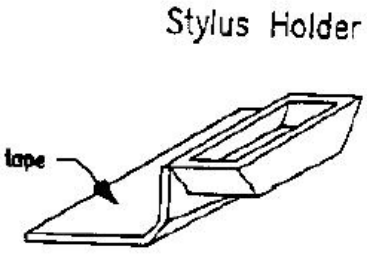






14557 N. 82nd St.
Scottsdale, AZ 85260
www.gtcocalcomp.com
866.746.3015 toll free
480.998.1751 fax





1. *Configure Bit Pad Two Data Tablet*

The Bit Pad Two's configuration parameters are set at the factory to your specifications. If however, you want to adjust the configuration, you can do so by setting the switches inside the tablet. It is advantageous to do this step before connecting the unit with the host since it requires disassembling the tablet.

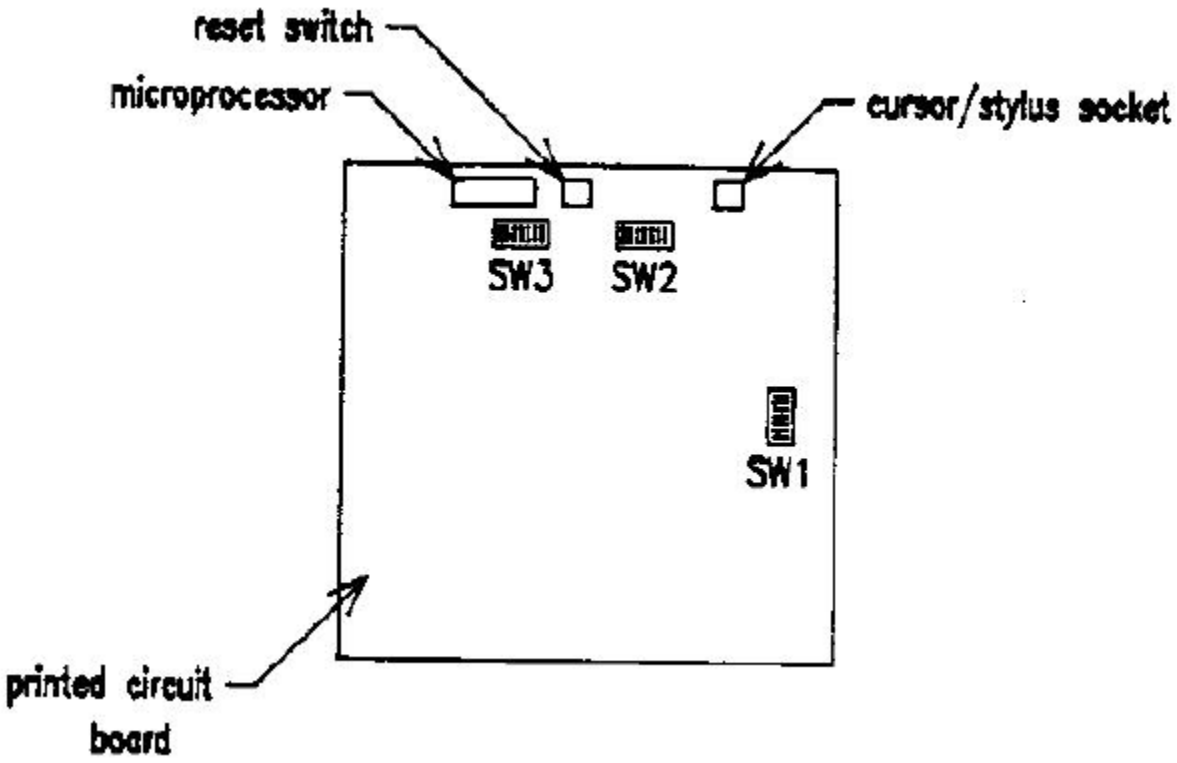
NOTE: Every time you open the tablet cabinetry, observe the following instructions:

Discount the tablet from its power source before opening the case. Special care must be taken when the tablet case is open. Components on the printed circuit board, especially the microprocessor, can be damaged or destroyed by electrostatic discharges. This can be avoided by preventing static electricity from building up.

- Have an antistatic floor covering under you and the tablet.
- Use a conductive, grounded work surface.
- Keep yourself at ground potential with conductive wrist bands and a 1 megohm resistor to ground.
- Do not wear clothes or shoes made of materials that promote static electricity, e.g. nylon, polyester or wool.

To access the board, lay the tablet upside down on a table. Remove the Phillip head screws along the outer edge. Gently remove the tablet back.

The switches are slide or rocker switches, grouped in banks of eight switches per DIP switch. The DIP switches are labeled SW1, SW2, and SW3 and are located along the periphery of the printed circuit board.



The ON and OFF positions are labeled on each switch. Set a slide switch by sliding it to the desired position. Set a rocker switch by pressing down on the side next to the desired position. Use a pointed instrument. Do NOT, however, use a pencil or another instrument that could deposit residue, e.g. graphite or ink, on the switch. This could cause the switch to malfunction.

2. *Adjust the Tilt or Use Flat*

Bit Pad Two can tilt or lie flat. The tilt mounting is already attached to the back of the tablet when shipped. It tilts four to six degrees or ten to 14 degrees, depending on the position of the extenders.

For the tablet to lie flat, the tilt mounting must be removed and the four rubber feet attached to the tablet bottom:

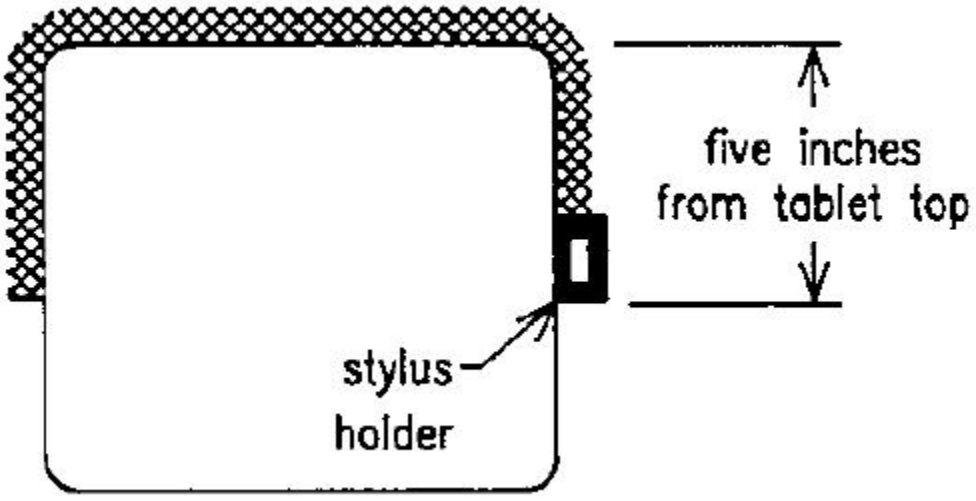
- Slide the tilt mounting toward the edge of the tablet where the data/power cable protrudes.

- Lift the tilt mounting gently to clear the cursor/stylus socket. Remove the tilt assembly.

- Remove the paper backing from the rubber feet. Stick the feet on the tablet back, approximately one inch from each corner.

3. *Attach Stylus Holder (if applicable)*

Attach the stylus holder anywhere along the tablet edge within five inches from the tablet top. Refer to the illustration below:



Remove the protective paper from the adhesive tape. Attach the taped side to the back of the tablet.

4. *Connect the Stylus or Cursor to the Tablet*

The stylus or cursor plugs into a phone jack on the underside of the tablet. Cursors and stylus are interchangeable. Upon changing from a stylus to a cursor or from a cursor to a stylus, reset the tablet by powering it down or by issuing the Reset command.

NOTE: When the tablet is powered and the stylus is plugged in, but not in use, store the stylus in the stylus holder. This allows air to freely circulate around the tip. Not providing air circulation could damage the stylus from overheating.

5. ***Connect the Tablet to the Host***

   The RS-232C cable is equipped with a 25-pin female D connector with a jack screw. The host must have a 25-pin male D connector (AMP P/N 205208-1). To lock the connectors together, the host connector must have a screw lock (AMP P/N 205817-1).

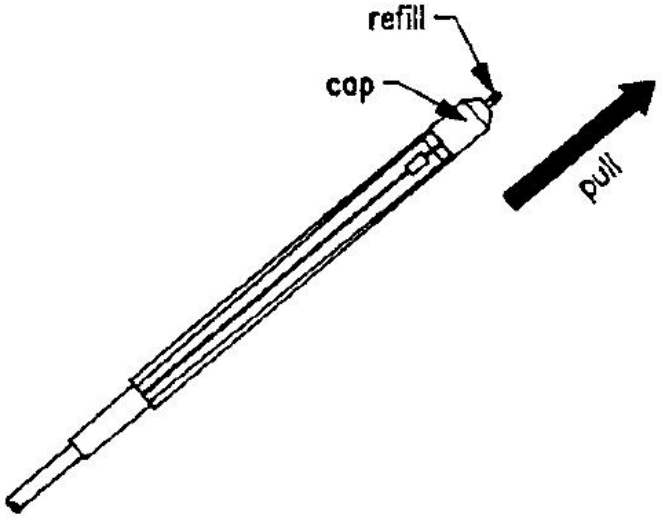
   If the system requires them, adapter cables are available to change the connector gender from female to male; or to reverse communication lines. Install an adapter cable between Bit Pad Two data/power cable and the host.

6. ***Connect the Tablet to the Power Source***

   Plug the four-pin connector of the pigtail cable into the power supply. In turn, plug the power supply into the wall outlet. For international power supplies, a plug adapter cable must be connected between the power supply and the wall outlet.

Changing the Stylus Refill

As depicted in the illustration below, to change the stylus refill, pull the cap straight out; likewise, the refill. Replace the refill and cap.



NOTE: Do not remove the metal guide-ring in the cap. It keeps the refill in place.

Section C: FCC Considerations

As stated by FCC rules and regulations, Bit Pad Two must be installed and operated in accordance with the procedures appearing in this manual. In addition, to ensure that EMI shielding requirements are met, the host's interface cabling connector must have a metal shroud, grounded to the host chassis.

Section D: Care and Cleaning

Avoid sharply banging or dropping the tablet, cursor or stylus.

Never immerse any part in fluid.

Disconnect the tablet from its power source before cleaning it.

The Bit Pad Two tablet surface is made of plastic. To clean, use only a cotton flannel cloth with mild detergent and water. Never use a hydrocarbon cleaner such as acetone or an abrasive cloth. These mar the tablet finish.

Section E: Service

For technical support and service, contact your local GTCO CalComp by Turning Technologies representative or GTCO CalComp by Turning Technologies at:

GTCO CalComp by Turning Technologies
14557 N. 82nd Street
Scottsdale, AZ 85260

Toll Free: 866.746.3015
Fax: 480.998.1751

If you return a Bit Pad Two for repair, a Return Authorization Number must be on the outside of the package and on all accompanying paperwork. Obtain a Return Authorization Number from GTCO CalComp by Turning Technologies Customer Support. When contacting Customer Support, please have ready the tablet serial number purchase order number.

NOTE: Do not ship any equipment to GTCO CalComp by Turning Technologies without a Return Authorization Number.

Appendix A: Specifications

Physical Description

Overall Dimensions	**Active Area (nominal)**	**Weight**
16.0" x 16.2" x 0.80"	11" x 11"	Maximum: 7 pounds
406mm x 412mm x 20mm	280mm x 280mm	3.2kg

Power Requirements

300 mA at +12VDC with +/-.5% regulation or better and 100 mA at -12VDC with +/-5% regulation or better.

Optional Power Supplies

U.S.A.	102V to 132V; 58Hz to 62Hz; NEMA 5-15P plug
International	197V to 264V; 48Hz to 52Hz; I.E.C. Universal power receptacle
Japan	90V to 110V; 42Hz to 62Hz; NEMA 1-15P plug

Material and Cosmetics

Color: Pearl white
Finish: Matte (silk-like)
Material: Cycolac KJW flame-retardant ABS plastic

Operating Specifications

A Bit Pad Two performs to the specifications listed below. The word ***typical*** is used to describe accuracy and proximity. Typical means the unit performs to that specification of more than 90% of the active area at 25 degrees Celsius. A slight degradation occurs at the extreme edges and corners of the active area.

The following specifications are provided to aid in the understanding and use of the product.

Accuracy
The similarity of a distance measured by the tablet with the actual distance.

Cursor Eccentricity
How much the electrical center varies from the crosshair center as the cursor is rotated through 360 degrees.

Jitter
Repeatability error of short duration caused by electrical noise.

Proximity
Greatest distance above the drawing area that the pointing tool can be raised and still be sensed by the tablet.

Repeatability
How closely you receive the same coordinates from the repeatedly locating the point. Repeatability takes temperature range and jitter into consideration.

Appendix B: ASCII Conversion Chart

Decimal	Binary 7 6 5 4 3 2 1 0	Octal	Hex	ASCII Character	Control Function or Character Description
0	0 0 0 0 0 0 0 0	000	00	NUL	Null
1	0 0 0 0 0 0 0 1	001	01	SOH	Start of Heading
2	0 0 0 0 0 0 1 0	002	02	STX	Start of Text
3	0 0 0 0 0 0 1 1	003	03	ETX	End of Text
4	0 0 0 0 0 1 0 0	004	04	EOT	End of Transmission
5	0 0 0 0 0 1 0 1	005	05	ENQ	Enquiry
6	0 0 0 0 0 1 1 0	006	06	ACK	Acknowledge
7	0 0 0 0 0 1 1 1	007	07	BEL	Bell
8	0 0 0 0 1 0 0 0	010	08	BS	Backspace
9	0 0 0 0 1 0 0 1	011	09	HT	Horizontal Tab
10	0 0 0 0 1 0 1 0	012	0A	LF or NL	Line Feed or New Line
11	0 0 0 0 1 0 1 1	013	0B	VT	Vertical Tab
12	0 0 0 0 1 1 0 0	014	0C	FF	Form Feed
13	0 0 0 0 1 1 0 1	015	0D	CR or RT	Carriage Return
14	0 0 0 0 1 1 1 0	016	0E	SO	Shift Out
15	0 0 0 0 1 1 1 1	017	0F	SI	Shift In
16	0 0 0 1 0 0 0 0	020	10	DLE	Data Link Escape
17	0 0 0 1 0 0 0 1	021	11	DC1	Device Control 1
18	0 0 0 1 0 0 1 0	022	12	DC2	Device Control 2
19	0 0 0 1 0 0 1 1	023	13	DC3	Device Control 3
20	0 0 0 1 0 1 0 0	024	14	DC4	Device Control 4
21	0 0 0 1 0 1 0 1	025	15	NAK	Negative Acknowledge
22	0 0 0 1 0 1 1 0	026	16	SYN	Synchronous Idle
23	0 0 0 1 0 1 1 1	027	17	ETB	End Transmission Block
24	0 0 0 1 1 0 0 0	030	18	CAN	Cancel
25	0 0 0 1 1 0 0 1	031	19	EM	End of Medium
26	0 0 0 1 1 0 1 0	032	1A	SUB	Substitute
27	0 0 0 1 1 0 1 1	033	1B	ESC	Escape
28	0 0 0 1 1 1 0 0	034	1C	FS	File Separator
29	0 0 0 1 1 1 0 1	035	1D	GS	Group Separator
30	0 0 0 1 1 1 1 0	036	1E	RS	Record Separator
31	0 0 0 1 1 1 1 1	037	1F	US	Unit Separator
32	0 0 1 0 0 0 0 0	040	20	SP	Space
33	0 0 1 0 0 0 0 1	041	21	!	Exclamation Point
34	0 0 1 0 0 0 1 0	042	22	"	Double Quote
35	0 0 1 0 0 0 1 1	043	23	#	Number or Pound
36	0 0 1 0 0 1 0 0	044	24	$	Dollar
37	0 0 1 0 0 1 0 1	045	25	%	Percent
38	0 0 1 0 0 1 1 0	046	26	&	Ampersand
39	0 0 1 0 0 1 1 1	047	27	'	Apostrophe, Right Single Quote
40	0 0 1 0 1 0 0 0	050	28	(	Left Parenthesis
41	0 0 1 0 1 0 0 1	051	29	)	Right Parenthesis
42	0 0 1 0 1 0 1 0	052	2A	*	Asterisk
43	0 0 1 0 1 0 1 1	053	2B	+	Plus or Addition
44	0 0 1 0 1 1 0 0	054	2C	,	Comma
45	0 0 1 0 1 1 0 1	055	2D	-	Hyphen

cont.

Decimal	Binary 7 6 5 4 3 2 1 0	Octal	Hex	ASCII Character	Control Function or Character Description
46	0 0 1 0 1 1 1 0	056	2E	.	Period
47	0 0 1 0 1 1 1 1	057	2F	/	Slash
48	0 0 1 1 0 0 0 0	060	30	0	
49	0 0 1 1 0 0 0 1	061	31	1	
50	0 0 1 1 0 0 1 0	062	32	2	
51	0 0 1 1 0 0 1 1	063	33	3	
52	0 0 1 1 0 1 0 0	064	34	4	
53	0 0 1 1 0 1 0 1	065	35	5	
54	0 0 1 1 0 1 1 0	066	36	6	
55	0 0 1 1 0 1 1 1	067	37	7	
56	0 0 1 1 1 0 0 0	070	38	8	
57	0 0 1 1 1 0 0 1	071	39	9	
58	0 0 1 1 1 0 1 0	072	3A	:	Colon
59	0 0 1 1 1 0 1 1	073	3B	;	Semicolon
60	0 0 1 1 1 1 0 0	074	3C	<	Less Than
61	0 0 1 1 1 1 0 1	075	3D	=	Equals
62	0 0 1 1 1 1 1 0	076	3E	>	Greater Than
63	0 0 1 1 1 1 1 1	077	3F	?	Question Mark
64	0 1 0 0 0 0 0 0	100	40	@	Commercial At
65	0 1 0 0 0 0 0 1	101	41	A	
66	0 1 0 0 0 0 1 0	102	42	B	
67	0 1 0 0 0 0 1 1	103	43	C	
68	0 1 0 0 0 1 0 0	104	44	D	
69	0 1 0 0 0 1 0 1	105	45	E	
70	0 1 0 0 0 1 1 0	106	46	F	
71	0 1 0 0 0 1 1 1	107	47	G	
72	0 1 0 0 1 0 0 0	110	48	H	
73	0 1 0 0 1 0 0 1	111	49	I	
74	0 1 0 0 1 0 1 0	112	4A	J	
75	0 1 0 0 1 0 1 1	113	4B	K	
76	0 1 0 0 1 1 0 0	114	4C	L	
77	0 1 0 0 1 1 0 1	115	4D	M	
78	0 1 0 0 1 1 1 0	116	4E	N	
79	0 1 0 0 1 1 1 1	117	4F	O	
80	0 1 0 1 0 0 0 0	120	50	P	
81	0 1 0 1 0 0 0 1	121	51	Q	
82	0 1 0 1 0 0 1 0	122	52	R	
83	0 1 0 1 0 0 1 1	123	53	S	
84	0 1 0 1 0 1 0 0	124	54	T	
85	0 1 0 1 0 1 0 1	125	55	U	
86	0 1 0 1 0 1 1 0	126	56	V	
87	0 1 0 1 0 1 1 1	127	57	W	
88	0 1 0 1 1 0 0 0	130	58	X	
89	0 1 0 1 1 0 0 1	131	59	Y	
90	0 1 0 1 1 0 1 0	132	5A	Z	
91	0 1 0 1 1 0 1 1	133	5B	[	Left Square Bracket
92	0 1 0 1 1 1 0 0	134	5C	\	Back Slash
93	0 1 0 1 1 1 0 1	135	5D	]	Right Square Bracket

cont.

Decimal	Binary 7 6 5 4 3 2 1 0	Octal	Hex	ASCII Character	Control Function or Character Description
94	0 1 0 1 1 1 1 0	136	5E	^	Circumflex
95	0 1 0 1 1 1 1 1	137	5F	_	Underscore
96	0 1 1 0 0 0 0 0	140	60	`	Left Single Quote
97	0 1 1 0 0 0 0 1	141	61	a	
98	0 1 1 0 0 0 1 0	142	62	b	
99	0 1 1 0 0 0 1 1	143	63	c	
100	0 1 1 0 0 1 0 0	144	64	d	
101	0 1 1 0 0 1 0 1	145	65	e	
102	0 1 1 0 0 1 1 0	146	66	f	
103	0 1 1 0 0 1 1 1	147	67	g	
104	0 1 1 0 1 0 0 0	150	68	h	
105	0 1 1 0 1 0 0 1	151	69	i	
106	0 1 1 0 1 0 1 0	152	6A	j	
107	0 1 1 0 1 0 1 1	153	6B	k	
108	0 1 1 0 1 1 0 0	154	6C	l	
109	0 1 1 0 1 1 0 1	155	6D	m	
110	0 1 1 0 1 1 1 0	156	6E	n	
111	0 1 1 0 1 1 1 1	157	6F	o	
112	0 1 1 1 0 0 0 0	160	70	p	
113	0 1 1 1 0 0 0 1	161	71	q	
114	0 1 1 1 0 0 1 0	162	72	r	
115	0 1 1 1 0 0 1 1	163	73	s	
116	0 1 1 1 0 1 0 0	164	74	t	
117	0 1 1 1 0 1 0 1	165	75	u	
118	0 1 1 1 0 1 1 0	166	76	v	
119	0 1 1 1 0 1 1 1	167	77	w	
120	0 1 1 1 1 0 0 0	170	78	x	
121	0 1 1 1 1 0 0 1	171	79	y	
122	0 1 1 1 1 0 1 0	172	7A	z	
123	0 1 1 1 1 0 1 1	173	7B	{	Left Curved Bracket
124	0 1 1 1 1 1 0 0	174	7C	|	Vertical Line
125	0 1 1 1 1 1 0 1	175	7D	}	Right Curved Bracket
126	0 1 1 1 1 1 1 0	176	7E	~	Tilde
127	0 1 1 1 1 1 1 1	177	7F	DEL	Delete (rubout)

Appendix C: How the Bit Pad Two is Different from Bit Pad One

Bit Pad Two is a second generation data tablet. It is, with some minor exceptions, a plug replacement for Bit Pad One. As an improved version of its predecessor, dissimilarities do exist. For example, the Bit Pad Two uses more advanced hardware and different technology.

Some noteworthy exceptions regarding Bit Pad Two:

- Does not require biasing: pulling a magnet over the tablet.
- Report formats, binary and ASCII BCD, include a bit or character identifying whether the stylus/cursor is in or out of proximity.
- Offers more operating characteristics to choose from, such as Relative Mode.
- Maximum baud rate is 19.2K.
- Hardware interface is RS-232C.
- Does not have a Stop Mode, as such. Instead, it offers two alternatives, XOFF and Remote Mode. Note that the command previously used by Bit Pad One to initiate Stop Mode is now the command for Remote Request Mode.

Switch Settings: DIP Switch 1

Operating Characteristics and Configuration Parameters	Factory Setting	Switches and Settings 1	2	3	4	5	6	7	8
remote control									
enable		on							
disable	√	off							
proximity transmission									
always transmit			on						
only when in proximity	√		off						
stream									
enable	√			on					
disable				off					
switch									
enable					on				
disable	√				off				
coordinate content									
Absolute Mode	√					off			
Relative Mode						on			
Report Rate of									
2 rps							off	off	off
4 rps							off	off	on
10 rps							off	on	off
20 rps							off	on	on
40 rps							on	off	off
70 rps							on	off	on
100 rps	√						on	on	off
maximum							on	on	on

Switch Settings: DIP Switch 3

Operating Characteristics and Configuration Parameters	Factory Setting	Switches and Settings 1	2	3	4	5	6	7	8
parity									
enable	√	on							
disable		off							
enabled parity setting									
odd			on						
even	√		off						
number of stop bits									
two	√			on					
one				off					
CTS handshake									
enable	√				on				
disable					off				
cursor output code									
output A	√					on			
output B						off			
baud rate									
110							off	off	off
150							off	off	on
300							off	on	off
1200							off	on	on
2400							on	off	off
4800							on	off	on
9600	√						on	on	off
19200							on	on	on

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Bit Pad Two

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