

9100 SERIES

USING THIS MANUAL

The 9100 tablet may be used as an input device under the control of graphics software. It may also be operated as an interactive, intelligent digitizer, under operator or host control.

There are four parts to this manual:

Part One explains the installation procedure, basic tablet operation, maintenance and troubleshooting.

Part Two explains how to use the 9100 standard commands. A table summarizing all the commands is located at the end of this section.

Part Three explains the optional firmware commands - SMART, Universal Formatter and Data Queue.

Part Four contains communication protocols, part numbers and other details.

To help you locate information, the page tabs identify Parts One, Two, Three and Four. An index to the manual starts on page 171.

WARNINGS, CAUTIONS AND NOTES

WARNING

A warning indicates conditions, practices or procedures which must be followed to avoid injury or loss of life.

CAUTION

A caution indicates conditions, practices or procedures which must be followed to avoid damage or destruction of equipment or data.

NOTE

A note highlights information of special importance or interest to the user.

TERMS USED

The **TOP** of the tablet is the frame edge with the CALCOMP logo. The **BOTTOM** is the edge opposite the logo.

UNDER refers to the side opposite the working surface. An object under the top of the tablet would be on the opposite side from the CALCOMP logo.

RIGHT, LEFT, UP, and DOWN are with respect to the tablet surface as you would see it during normal operation.

The tablet may be producing data for a personal computer, an engineering or drafting mini- computer workstation or a remote main-frame computer with multiple terminals. The computing device is referred to as the **HOST**, or the **COMPUTER**.

DIGITIZE is reserved for the act of using the cursor or stylus to convert graphic information into digital information.

PICK is reserved for the act of placing the cursor or stylus on a menu choice and pressing a button or clicking the stylus to activate that command. **PICK** is also used when a point on the tablet surface must be designated as part of a command sequence.

I, 1, l and 0 or O

The type style used in this manual makes these letters difficult to distinguish at times.

In tables and command listings, the letter assignments are:

I	Uppercase i
1	Numeral one
l	Lowercase L
O	Uppercase o
Ø	Numeral zero

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INSTALLATION

SPACE REQUIREMENTS

A digitizer requires enough room for its depth and width plus its accessories and working room for the operator. As an estimate, allow approximately 1 foot (300 mm) extra for each side of the tablet and 3 feet (1 M) in front of it for the minimum working room.

All cables supplied by Calcomp are designed to arc upward from the tablet to avoid kinking. A space of 3 inches (75 mm) or more behind the top of the unit is required to allow the cables to arc if it is on a pedestal.

ENVIRONMENTAL REQUIREMENTS

Refer to the specifications on page 162 for the operating conditions. If you plan to use the tablet in other than a typical office environment, please contact your CalComp representative.

CAUTION:

These precautions should be followed at all times to avoid damage to the tablet:

1. Avoid discharging static charges on the tablet surface.
2. Do not place heavy objects on the digitizing surface.
3. Do not use sharp objects, like compasses or knives, on the tablet surface.
4. Do not use the tablet surface for any purpose other than digitizing.
5. Although the surface is waterproof, spilled liquids may leak between the frame and surface. This could damage the circuit boards inside the frame. Do not use excessive amounts of cleaning fluids. Do not use the tablet or frame as a support for coffee cups.

USING THE 9100 ON A TABLE

The four feet included with every digitizer elevate it to provide clearance for the cables. The feet fit through spacers and screw into the tablet support straps as shown in Figure 1. It is easiest to turn the tablet upside down on the table while you install the feet. Be sure that the table is clean or it may scratch the digitizing surface.

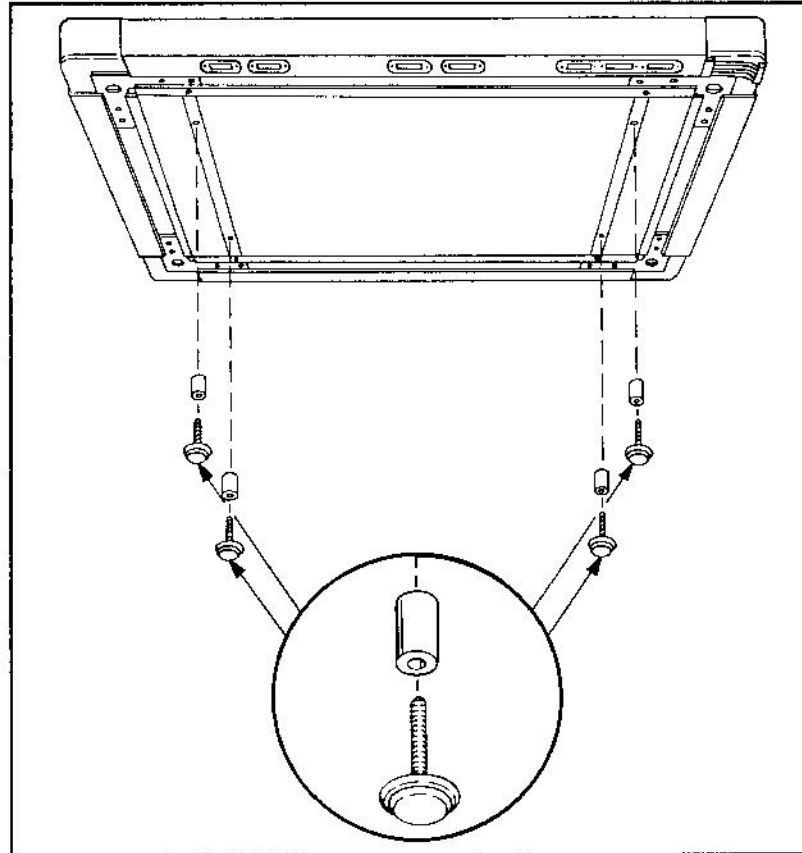


Fig 1. Attaching the Feet

Go to page 12 to continue the installation instructions.

MOUNTING TABLET TO A PEDESTAL

1

The optional Mayline[®] pedestal, which may be ordered from CalComp, will support the 24" x 36", 36" x 48", and 48" x 60" tablets. The following assembly and adjustment procedures are for the Mayline[®] brand base only. If you are mounting your 9100 Digitizer tablet to a brand of pedestal other than Mayline[®], please refer to that brand's assembly instructions.

HARDWARE AND TOOLS

Inside the Mayline[®] pedestal box are hardware and tools for assembling the pedestal.

Quantity	Item
3	Allen wrenches
1	7/16" hex wrench (for tightening leg bolts)
3	Cable clamps (discard)
5	#12 Threadform screws (discard)
4	1/4" Cap screws (on the pedestal tilt brackets)
8	1/4" x 1/2" Bolts (on chrome legs)

An accessory box inside the 9100 tablet crate contains the following hardware for attaching the tablet to the pedestal:

Quantity	Item
10	#10 Flat washers (tablet mounting)
10	10-32 x 1/2" Pan head screws (tablet mounting)
2	10-32 x 1 1/4" Pan head screws
6	10-32 x 1 1/2" Pan head screws
4	Rubber feet (for table-top tablets)
8	Spacers (for 91360 tablet)
2	8-32 x 1/4" Pan head screws (for lift switch)

A 3/16" flat blade screwdriver is also needed to mount the tablet to the pedestal.

WARNING

THE TABLET AND PEDESTAL ARE HEAVY. This assembly and mounting procedure is to be performed by a **minimum** of two persons.

CAUTION

Do not push on or activate the pedestal's tilt brake handle before reading the instructions provided by the pedestal's manufacturer. A small brochure is wrapped with packing material around the lift switch box (at the end of electrical cable). All warnings and cautionary recommendations are to be followed carefully, as CalComp is not liable for any damages incurred from misuse of manufacturer's pedestal equipment.

ASSEMBLING THE PEDESTAL

1. Remove the steel banding from around the top and base of the pedestal carton.
2. Open the reinforcing flaps from around the base of the carton and lift carton top straight up and off of the bottom skid. This will expose the pedestal, accessories and packing material.
3. Remove all inside packing and parts from ends and top of pedestal. **Do not remove the pad taped to the top of central column.** Allow the power cord and lift switch box to rest on the ribbed rubber pad.
4. Remove the packing material, instruction brochures, and small bag of tools and hardware that are taped to the lift switch box.
5. **With another person's help,** carefully rotate the pedestal until it rests on its cap.

NOTE

It may be necessary to put some packing corrugate under the cap or tilt brackets to keep the pedestal from tipping.

6. Remove the legs from the shipping box and remove the 4 (four) 1/4" bolts from each leg.

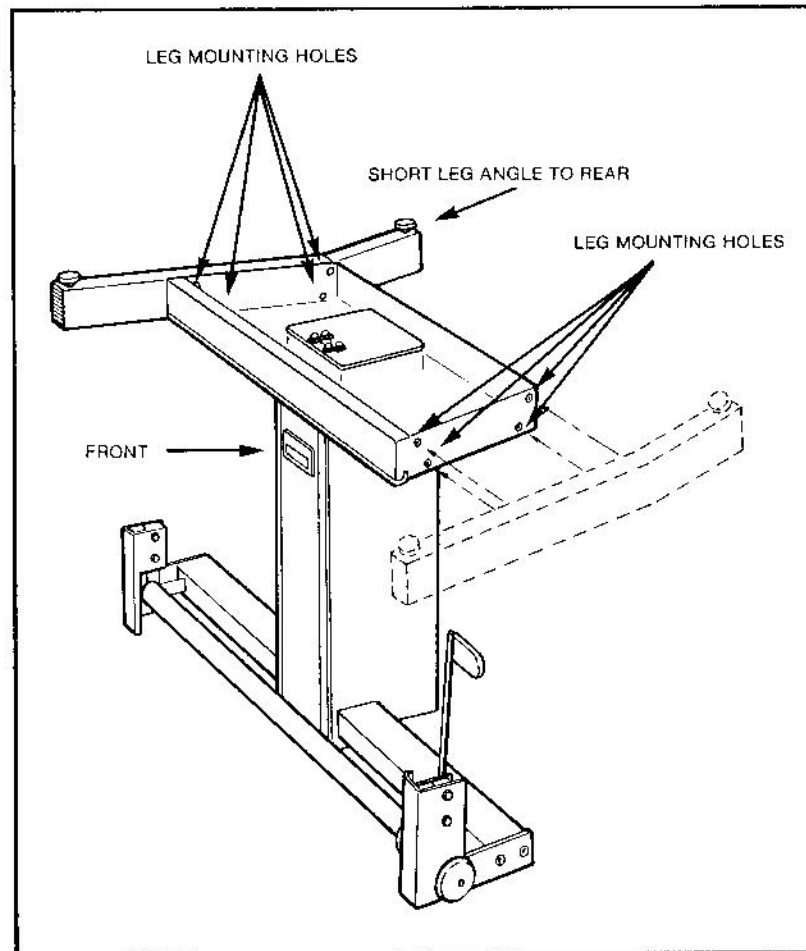


Fig 2. Attaching the Legs

7. Fasten the legs to the pedestal with the 1/4" bolts. Legs and pedestal are marked to indicate "front". The short leg angle goes to the rear (see Figure 2). Tighten the bolts with the hex wrench from the pedestal hardware bag.
8. **With another person's help**, carefully rotate the pedestal until it rests on its legs.

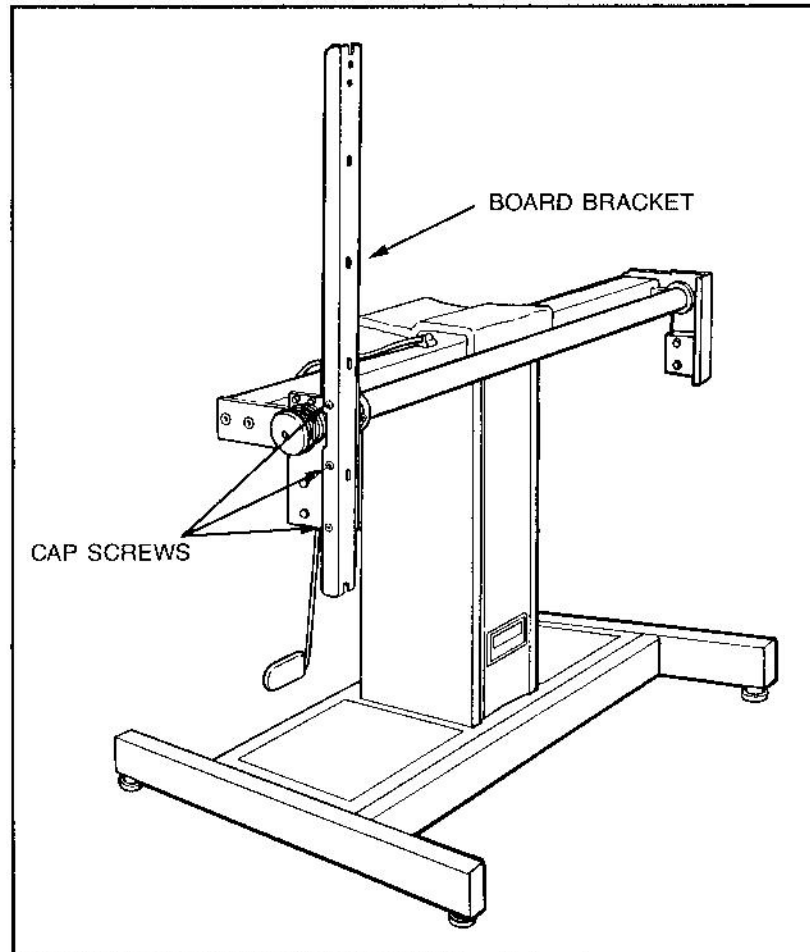
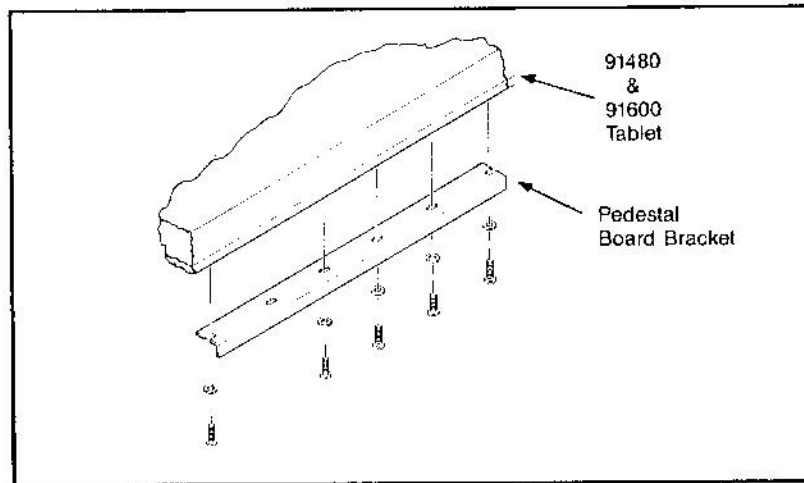


Fig 3. Attaching the Board Brackets

9. Remove the two (or three) 1/4" diameter cap screws from each side of the tilt bracket. For 36" and 48" backlit tablets, go to page 170 for instructions.
For other tablets, attach the board bracket as shown in Figure 3. The caution labels on the brackets should be visible, positioned beside the tilt pivot.
10. Remove all tape and pads from the pedestal.
11. Drape the switch box electric cord over the tubular member toward the front of the pedestal. This must be done before the tablet is mounted. For 60" backlit tablets, go to page 9 now.
12. Leave the board brackets in the vertical position until the tablet has been installed.



1

Fig 4. 91480 and 91600 Tablets

MOUNTING STANDARD TABLETS

1. Balance the tablet on its bottom edge (the top edge has the power pushbutton and cable ports). Locate the two vertical tablet mounting bars, with threaded holes, on the back of the tablet.
2. Start one #10 x 1/2" pan head screw, with washer, in the top threaded hole of each tablet mounting bar. The two screws should be screwed in about half the total screw length.

NOTE

The 91360 tablet requires spacers. See Figure 5, below. The counter-bored spacer is attached to the **BOTTOM** hole of the mounting bars **before** the tablet is attached to the pedestal.

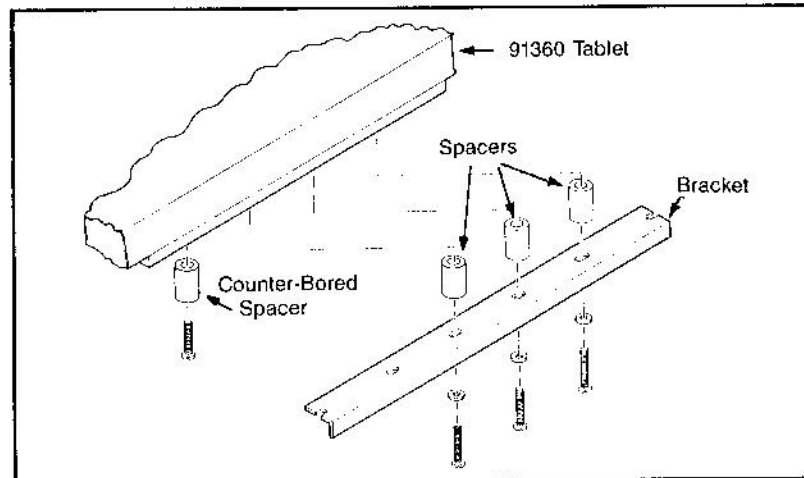


Fig 5. Spacers for 91360 Tablet

3. With another person's help, lift the tablet and "hang" it on the board brackets by sliding the projecting screws into the top slots of the brackets. Install the remaining 8 screws with washers and tighten all screws.
4. Fasten the lift switch box onto the back of the tablet, left side frame, near the bottom (see Figure 6). Two threaded holes are provided that position the switch button approximately even with the left edge of the tablet. Use two #8 x 1/4" screws from the hardware bag.

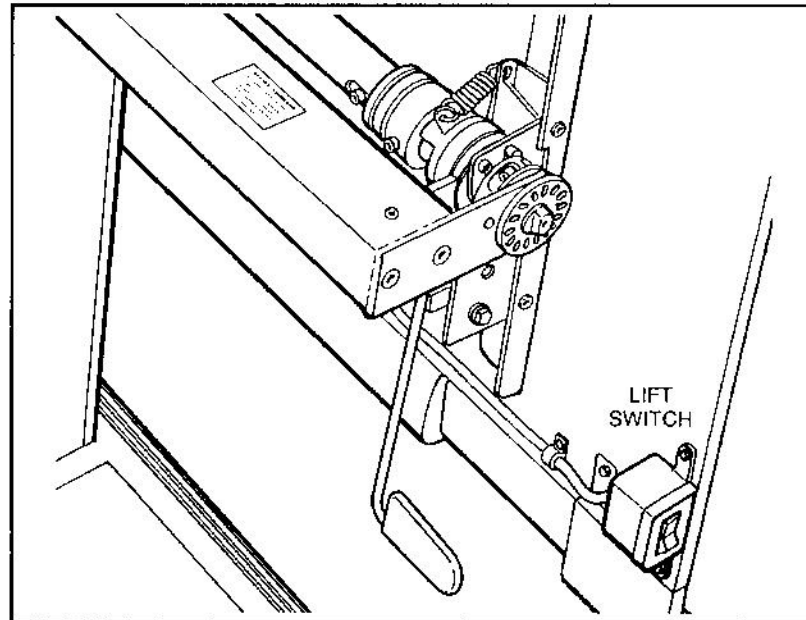


Fig 6. Attaching the Lift Switch

5. Level the pedestal base now, if necessary, using the leveler feet. The tilt brake may now be lifted up and the tablet tilted to any position.
6. Plug in the pedestal power cord.
7. Raise or lower the 9100 by pressing the rocker switch. Movement will continue only while the switch is depressed. The drive mechanism will go into neutral (or the clutch will chatter) when the upper or lower maximum height is reached.
8. The tilt of the tablet is controlled by the hand lever. Lift up on the handle and tilt the tablet to the desired angle. Releasing the handle locks the tablet in place. The tension on the tilt lever may be adjusted to make it easier or harder to tilt the 9100. See page 10 for instructions.

60" BACKLIT DIGITIZER MOUNTING PROCEDURE

Additional support brackets are used on 60" backlit tablets. The pedestal has been omitted from the sketch for clarity. It must be assembled before you mount the tablet!

1. Tilt the pedestal brackets to **horizontal**.
2. Place the tablet on the brackets, lining up the holes in the brackets with the holes in the light pan. **DO NOT** start the screws yet.
3. Brace the tablet on one side, lift the other side slightly and slide the support bracket between the pan and the pedestal, aligning the screw holes in all three. Start, but do not tighten the screws. One of the center screws will not be accessible at this time.
4. Repeat step 3 on the opposite side of the tablet.
5. Tighten the screws snugly against the bottom of the bracket.

CAUTION

The threaded inserts will break if you over-tighten the screws. Hand-tight is sufficient. If you use a power screwdriver, use it to start the screws and finish the tightening by hand.

6. Tilt the tablet to vertical and install the remaining two screws and the lift switch.

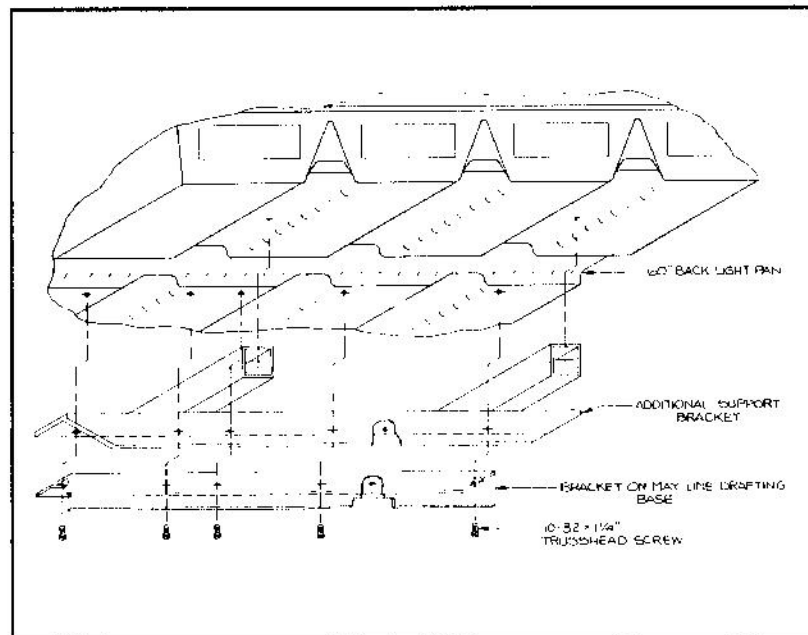


Fig 7. Backlit Mounting Procedure

ADJUSTING TILTING MECHANISM

WARNING

The tilt mechanism is under tension. When the locking bolt "A" is removed, the tension is released. Hold the wrench **firmly** as you loosen "A" to prevent the wrench from being dislodged. A closed-end wrench with a long handle gives the best leverage for the adjustments.

Always disconnect the pedestal power cord before making adjustments.

1. Before tilting the digitizer tablet, lower the tablet as far as possible (until you hear the clutch chatter). Tilt the digitizer tablet to vertical.
2. Remove the conical housings, from both ends of the tilt mechanism. See figure 8.
3. Fasten wrench to hub "B". With an allen wrench, remove locking bolt "A". Using the wrench, turn perforated disc one hole and replace locking bolt. (To increase tension always turn top edge of disc towards underside of the tablet.)

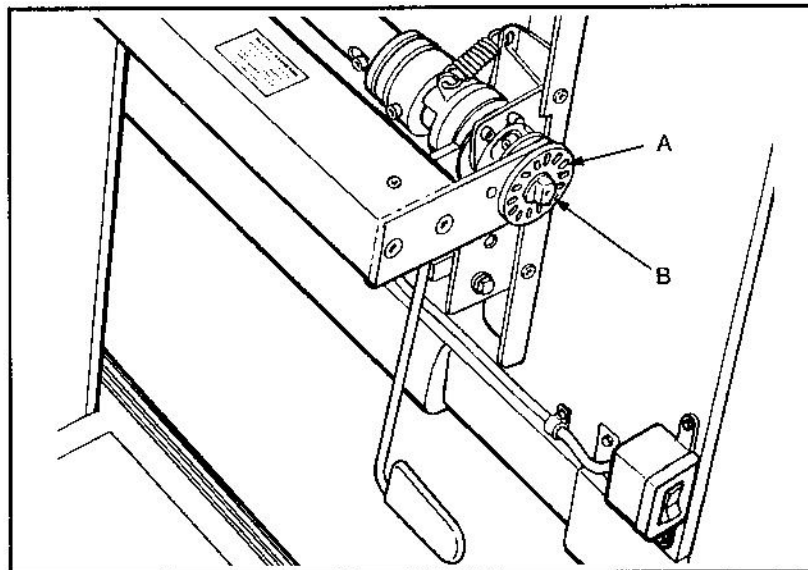


Fig 8. Adjusting the Tilt Mechanism

4. Check operation of the tilt lever. If additional adjustment is required, repeat step 3 at the other end of the tablet. Continue adjusting the tension, one hole at a time, alternating ends, until proper balance is achieved. Replace the conical housings.

5. To prevent a full vertical tilt position (recommended on the larger tablets) adjust the eccentric stop "C" on the tablet base. Eccentric stop "C", (See Figure 9) can be adjusted by loosening the cap screw from the other side of the bracket support, rotating the stop and retightening the cap screw. The widest part of the stop should be toward the protruding nut on the pivot.

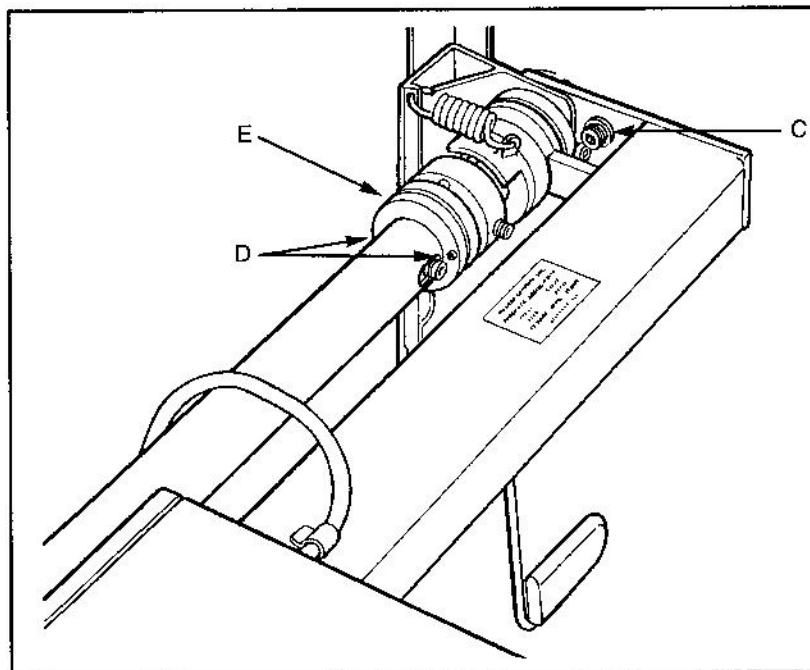


Fig 9. Adjusting the Tilt, cont.

TILT LEVER CLEARANCE

The clearance between the tilt lever and the tablet frame may be adjusted. Decreasing the clearance so that the lever and frame may be grasped at the same time allows you to use both hands to tilt the tablet. As the clearance is decreased the braking effect of the tilt mechanism is also increased, giving better control over large tablets.

1. Adjust allen screws "D" in collar "E", above, if you desire a change in the clearance. Push the tilt lever against the underside of the tablet while you turn set screws "D". The collar, "E" may be rotated for access to the screws. After adjustment, rotate collar "E" back to the position shown above.

SETTING THE INTERNAL SWITCHES

The tablet's default operating conditions are controlled by the settings of three switch banks inside the tablet. You will remove the upper left corner of the tablet frame, remove the circuit boards and set the switches.

TABLET DISASSEMBLY

The internal switches are on two printed circuit boards (the board train) housed inside the tablet frame.

CAUTION:

Disconnect all cables from the tablet and remove all covers from the port access holes before trying to remove the board train.

Support the board train as you withdraw it, especially if the SMART option is installed.

The components on the boards are susceptible to damage from static electricity. Touch the aluminum frame before you touch the boards.

To expose the internal switches:

1. If the tablet is on a table, move it until the upper left corner of the frame overhangs the table edge. If the tablet is on a pedestal, tilt it to vertical.
2. With a Phillips screwdriver, remove the two-piece cover from the upper left corner. This cover is held by two screws recessed into the underside of the cover.
The board train is suspended in a slot in the upper frame piece. (See Figure 10 on opposite page.)
3. Remove the lock screw next to the POWER button.
4. Depress the power switch, grasp the ribbon cable and partially pull the board train out of the slot. **Hold the power switch down until it slides behind the frame.**
5. Place a thumb on each release tab of the ribbon cable connector as in Figure 11 on the opposite page. Using firm pressure, push the tabs out and toward the board edge. Remove the cable from the connector.

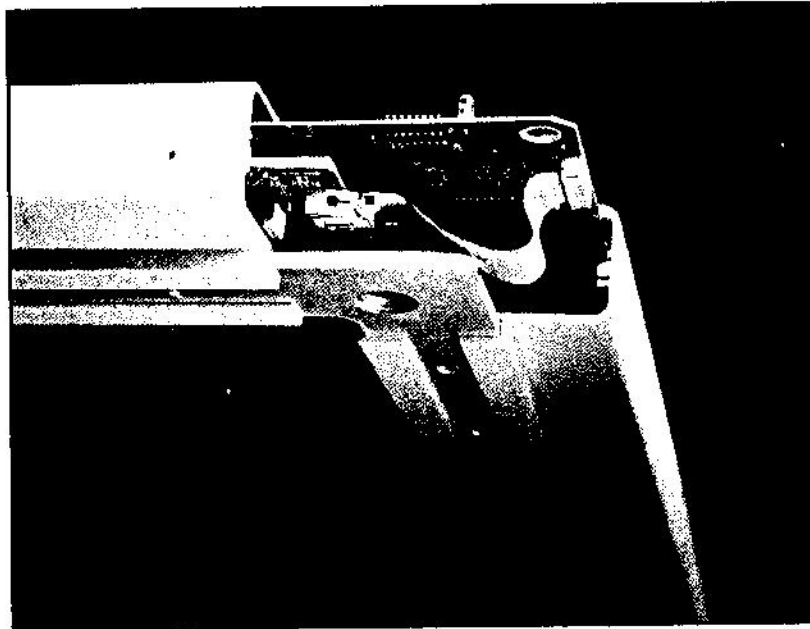


Fig 10. Board Train Inside the Frame

1



Fig 11. Releasing the Ribbon Cable

6. Using the cable connector as a grip, pull the board train straight out of its slot as in Figure 12, below.

CAUTION

Hold the ribbon cable away from the board train to prevent its being damaged by the rough surface of the board train.

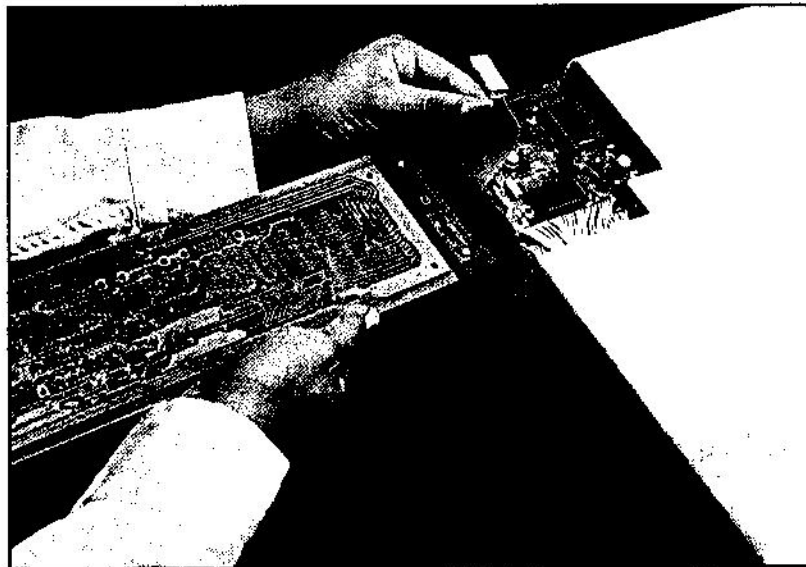
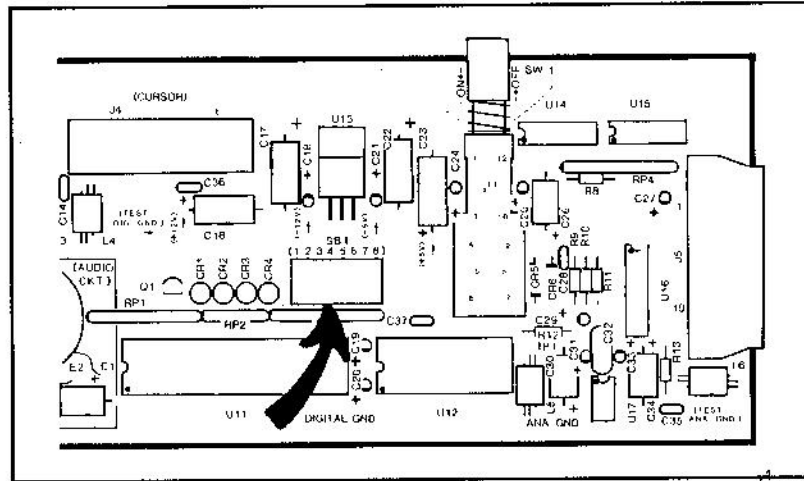


Fig 12. Removing the Board Train

7. The first board in the train is the Digitizing Processor Board. One of the three banks of switches is on this board.
8. If the SMART option is installed, its board is the middle one. There are no switches on this board.
9. The Communications Interface board, with two switch banks, is the last board in the train.
10. Place the board train on the digitizing surface or a table.
11. Referring to the diagram and tables, set the switches to the default operating parameters you need. Your software's user manual should list the operating parameters it needs.



1

Fig 13. Switch Location
Digitizing Processor Board

7004/7004A

NOTE

The switch bank is labelled SB1 on the Digitizing Processor board. On the Communication Interface board they are labelled SW1 and SW2.

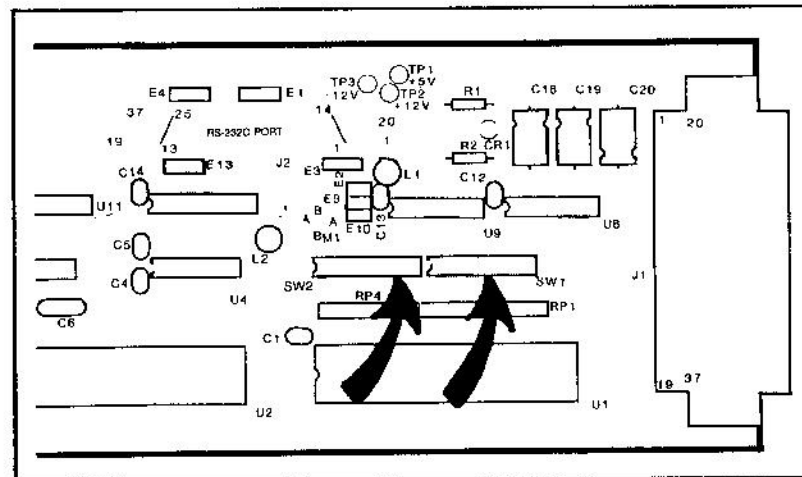


Fig 14. Switch Locations
Communication Interface Board

SWITCH SETTINGS

NOTES

"F" Indicates the factory settings.

The switches are marked Closed and Open, corresponding to C and O in these tables. An "X" means the switch may be open or closed.

The settings for SWITCH BANK TWO on the Communication Interface Board vary with the type of board. GPIB boards have different settings on SWITCH BANK TWO than RS-232 or RS-449 boards.

DIGITIZING PROCESSOR BOARD (SB1)

SWITCH	1	2	3	4	5	6	7	8
--------	---	---	---	---	---	---	---	---

OPERATING MODE

Halt	C	C	—	—	—	—	—	—
Point	C	O	—	—	—	—	—	F
Track	O	C	—	—	—	—	—	—
Run	O	O	—	—	—	—	—	—

OUTPUT FORMAT

Format 1	—	—	C	C	—	—	—	—
Format 2	—	—	O	O	—	—	—	—
Format 3	—	—	O	C	—	—	—	F
Format 4	—	—	O	O	—	—	—	—
Format 5 (16-button)	—	—	C	O	O	O	—	—
Format 5 (4-button)	—	—	O	C	O	O	—	—

(The default resolution for format 5 is 1000 LPI unless it is changed by a command. Format 5 cannot be used with SMART units.)

RESOLUTION

1000 LPI	—	—	—	—	C	C	—	F
40 LPmm	—	—	—	—	C	O	—	—
100 LPmm *	—	—	—	—	O	C	—	—
Reserved	—	—	—	—	O	O	—	—
*(50 LPmm x 2)	—	—	—	—	—	—	—	—

TABLET SIZE

91140*	—	—	—	—	—	C	O
91170*	—	—	—	—	—	C	C
91250*	—	—	—	—	—	O	C
91240	—	—	—	—	—	C	C
91360	—	—	—	—	—	C	O
91480	—	—	—	—	—	O	C
91600	—	—	—	—	—	O	O

*Jumper Installed

INTERFACE BOARD SETTINGS, SWITCH BANK ONE (SW1)

SWITCH	1	2	3	4	5	6	7	8
PARITY								
Odd	C	C	O	—	—	—	—	F
Even	C	O	O	—	—	—	—	—
Mark	O	C	O	—	—	—	—	—
Space	O	O	O	—	—	—	—	—
Disabled	X	X	C	—	—	—	—	—
FRAMING								
2 Stop Bits	—	—	—	O	—	—	—	—
1 Stop Bit	—	—	—	C	—	—	—	F
8 Data Bits	—	—	—	—	O	—	—	—
7 Data Bits	—	—	—	—	C	—	—	F
BAUD RATE								
19200	—	—	—	—	—	C	C	C
9600	—	—	—	—	—	C	O	O
4800	—	—	—	—	—	C	O	O
2400	—	—	—	—	—	O	C	C
1200	—	—	—	—	—	O	O	O
600	—	—	—	—	—	O	O	O
300	—	—	—	—	—	O	O	O
Reserved	—	—	—	—	—	O	O	O

RS-232/RS449 SETTINGS FOR SWITCH BANK TWO (SW2)

SWITCH	1	2	3	4	5	6	7	8
Port B/D ON	O	—	—	—	—	—	—	—
Port B/D OFF	C	—	—	—	—	—	—	F
LF Port A/C ON	—	—	O	—	—	—	—	—
LF Port A/C OFF	—	—	C	—	—	—	—	F
Port A/C ON	—	—	—	O	—	—	—	F
Port A/C OFF	—	—	—	C	—	—	—	—
Small Menu ON	—	—	—	—	O	—	—	—
Small Menu OFF	—	—	—	—	C	—	—	—
Cursor ON	—	—	—	—	—	O	—	—
Cursor OFF	—	—	—	—	—	C	—	F
Echo B/D ON	—	—	—	—	—	—	O	—
Echo B/D OFF	—	—	—	—	—	—	C	F
LF B/D ON	—	—	—	—	—	—	—	O
LF B/D OFF	—	—	—	—	—	—	—	C

GPIB BOARD SETTINGS FOR SWITCH BANK TWO (SW2)

Enable Port B/D	O	—	—	—	—	—	—	—
Disable Port B/D	C	—	—	—	—	—	—	F
Serial Poll ON	—	O	—	—	—	—	—	—
Serial Poll OFF	—	C	—	—	—	—	—	F
CR LF	—	—	O	—	—	—	—	F
CR	—	—	C	—	—	—	—	—
GPIB Address	—	—	—	MSB	—	—	—	LSB



CABLE CONNECTIONS

All cable connections are made under the top edge of the 9100. The cables and receptacles are marked.

Before beginning the installation, check the voltage indicator pin located on the power supply (if you are using the large, black, 2 Amp power supply). The pin should appear in the 125 V position for areas with 100-125 VAC, and the 240 V position for areas with 200-250 VAC. If the voltage is incorrect for your area, go to page 158 for instructions on changing the operating voltage of the power supply.

CAUTION

Once the connections are made, do not use the screws in the cable connectors to secure the cables to the tablet receptacles. The receptacles are soldered to the circuit boards. At best, the screws are a nuisance that must be removed each time the cables are disconnected. At worst, the strain of supporting the weight of the cables may crack the solder and damage the boards. There is also the possibility that the operator may step on, trip over or yank the cables and pull the receptacle off the board.

Use the cable retainer plates from the hardware bag to support the cables. These plates lock into the metal frame of the tablet instead of into the circuit boards.

The installation shown in the drawings is typical of drafting workstations. This procedure will vary depending on your host system. If the tablet has a SMART board installed, the communication receptacles are displaced to ports C and D. We use A/C and B/D as port designators. Only the location of the port is different.

The ports are shown in Figure 15, below.

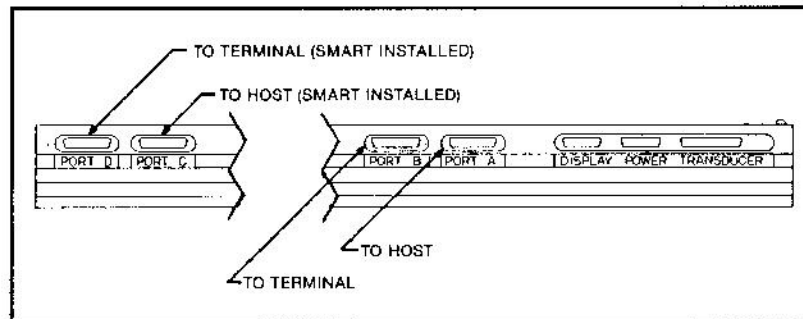


Fig 15. Tablet Ports

USING A "PC"

If, like the IBM PC/AT, your computer receives information on Pin 2 of its RS-232C port (the serial port), the tablet must be sending data from pin 2. Use the DTE port (port A/C) of the tablet.

If your computer receives information on Pin 3 of its RS-232C port, like IBM PC/XTs and most clones, the tablet must be sending data from Pin 3. Use the DCE port (port B/D) of the tablet. Check the computer's user manual for details.

If you have a single-port tablet and the tablet is transmitting on the wrong pins, you may either use a "null modem" or change the jumpers on the communication board to swap the transmit and receive lines. See page 148 for more information about the jumpers.

If the cable connectors don't fit your computer's receptacles, see your computer dealer for adapters.

AUTOCAD SETUP

Please see page 168 for directions on setting the tablet for AutoCad[®]

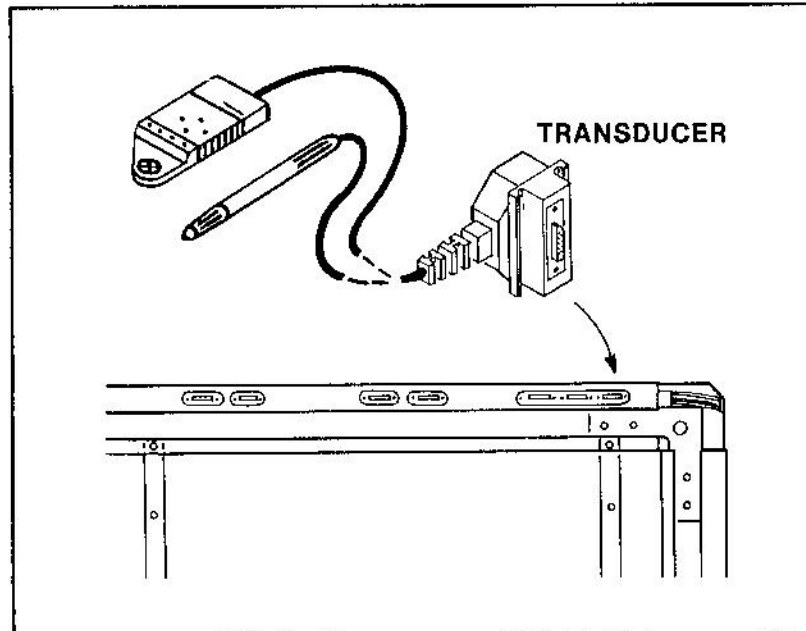


Fig 16. Connect Transducer To Tablet

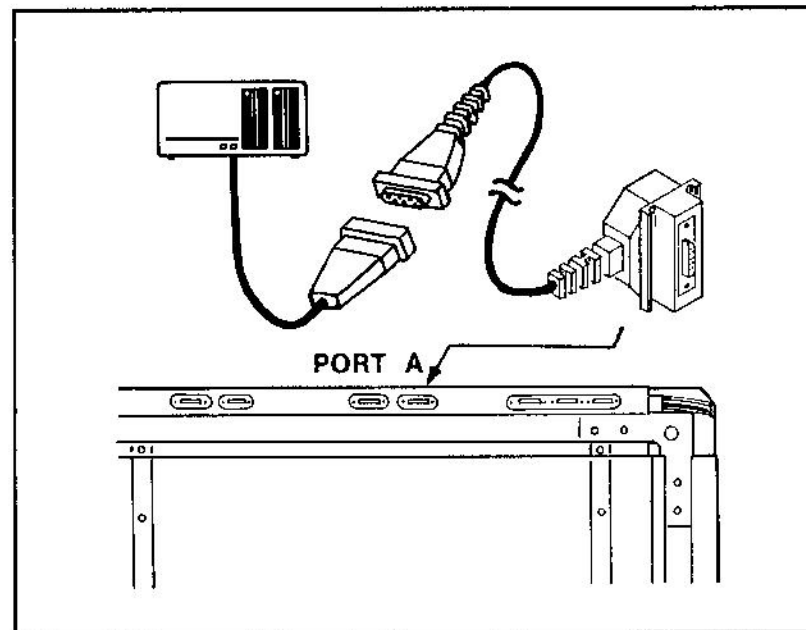
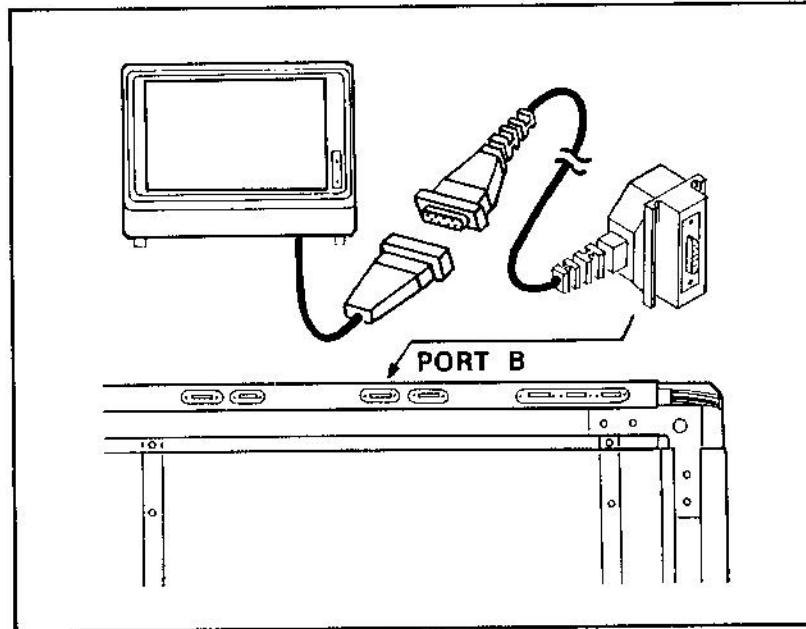


Fig 17. Connect Host To Tablet



1

Fig 18. Connect Terminal To Tablet

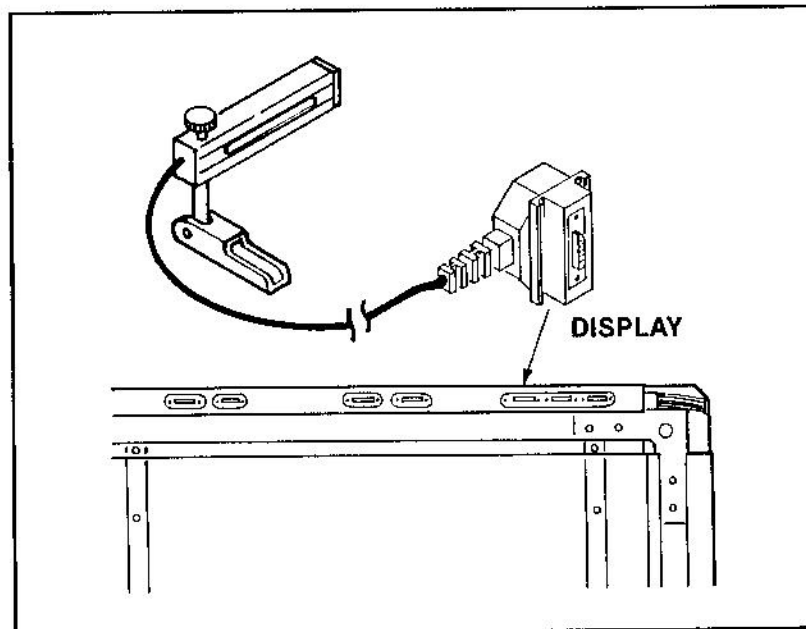


Fig 19. Connect Optional Display

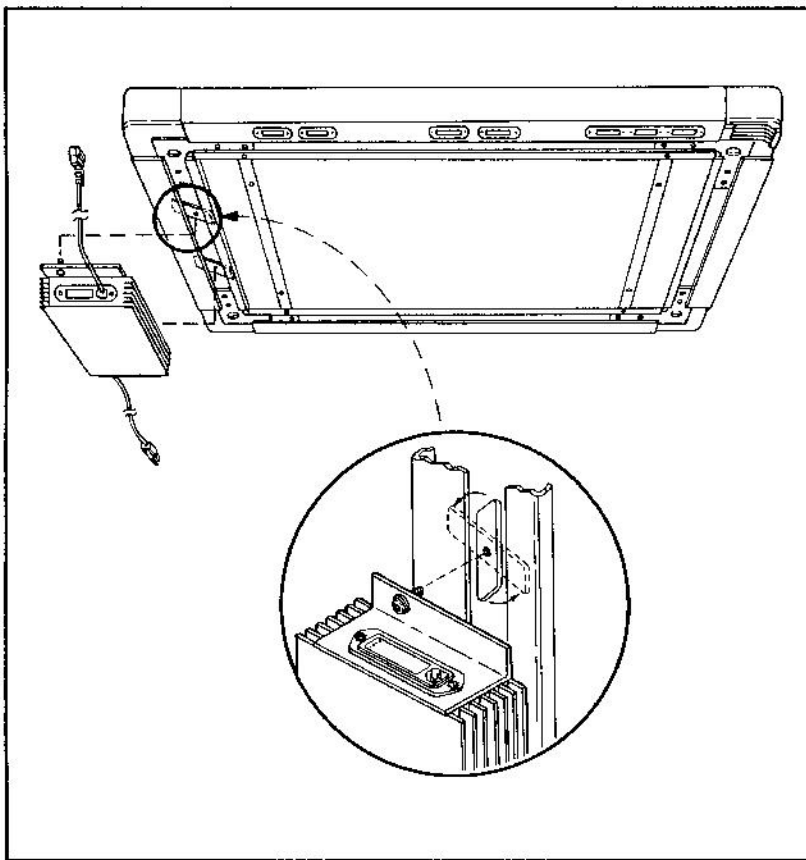


Fig 20. Attach Power Supply To Tablet

ATTACHING THE POWER SUPPLY

The power supply may also be mounted under the tablet if the tablet is on a pedestal. Make sure it doesn't interfere with the lift and tilt controls.

The power supply will not mount to the side of a 91360 tablet. It interferes with the pedestal operation. You may mount the power supply on the top rail, being careful not to obstruct the output ports. The power supply may also be mounted on the right side of the bottom rail provided it is far enough to the right to not interfere with the tilt lever.

1

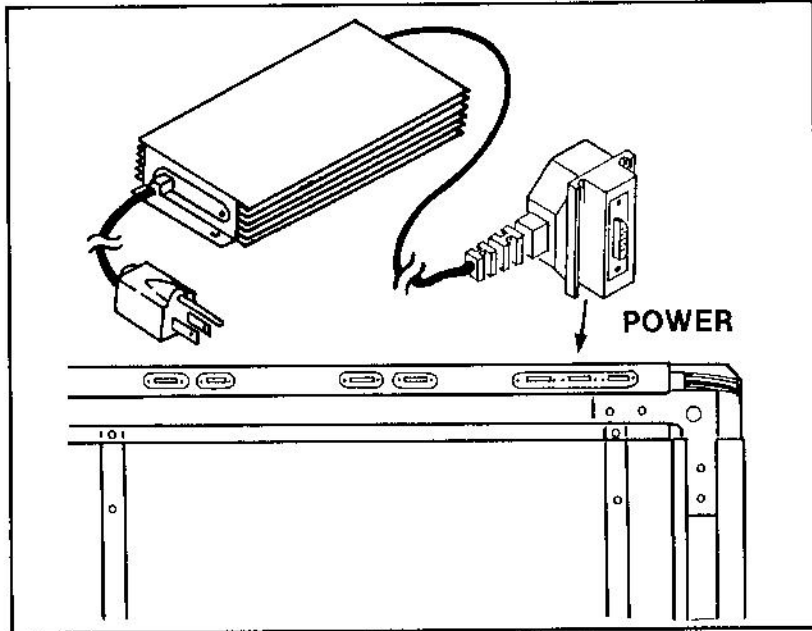


Fig 21. Connect Power Supply

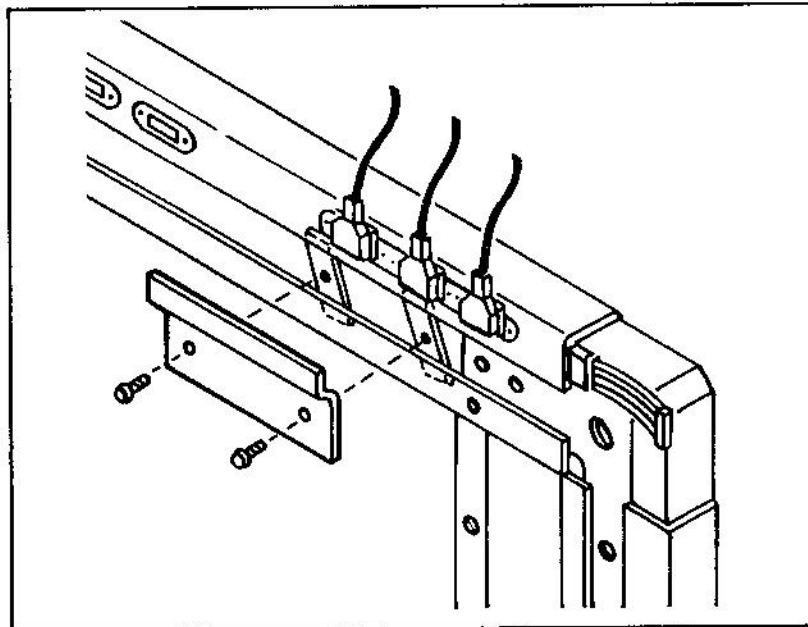


Fig 22. Install Cable Retainer Plates

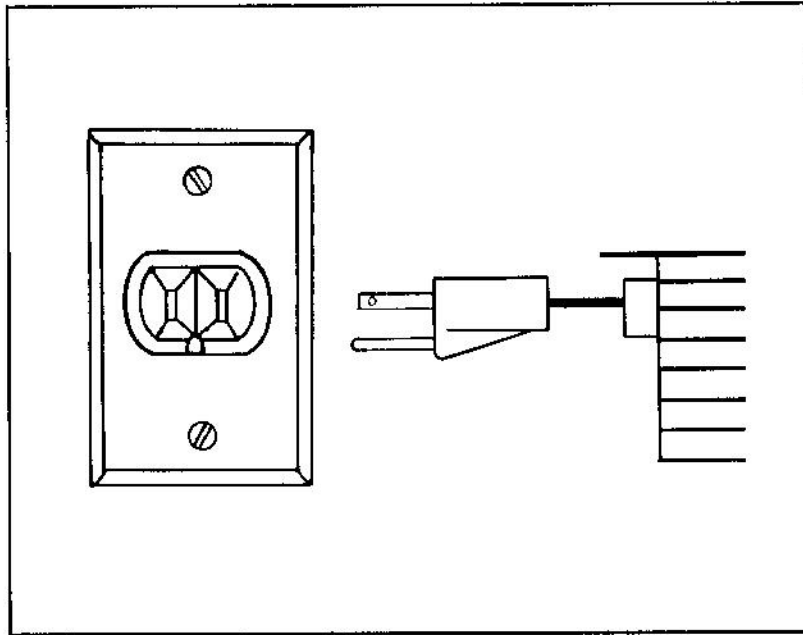


Fig 23. Plug Power Supply Into Wall

NOTE

The power cord for a backlit tablet plugs into an AC outlet and the MALE receptacle on the pan.

The female receptacle is an auxiliary AC receptacle.

ATTACHING THE ACCESSORIES

The optional display, pencil tray and cursor/stylus holder attach to the metal tablet frame. They may be mounted wherever is most convenient.

1

Fig 24. Attaching the Holders

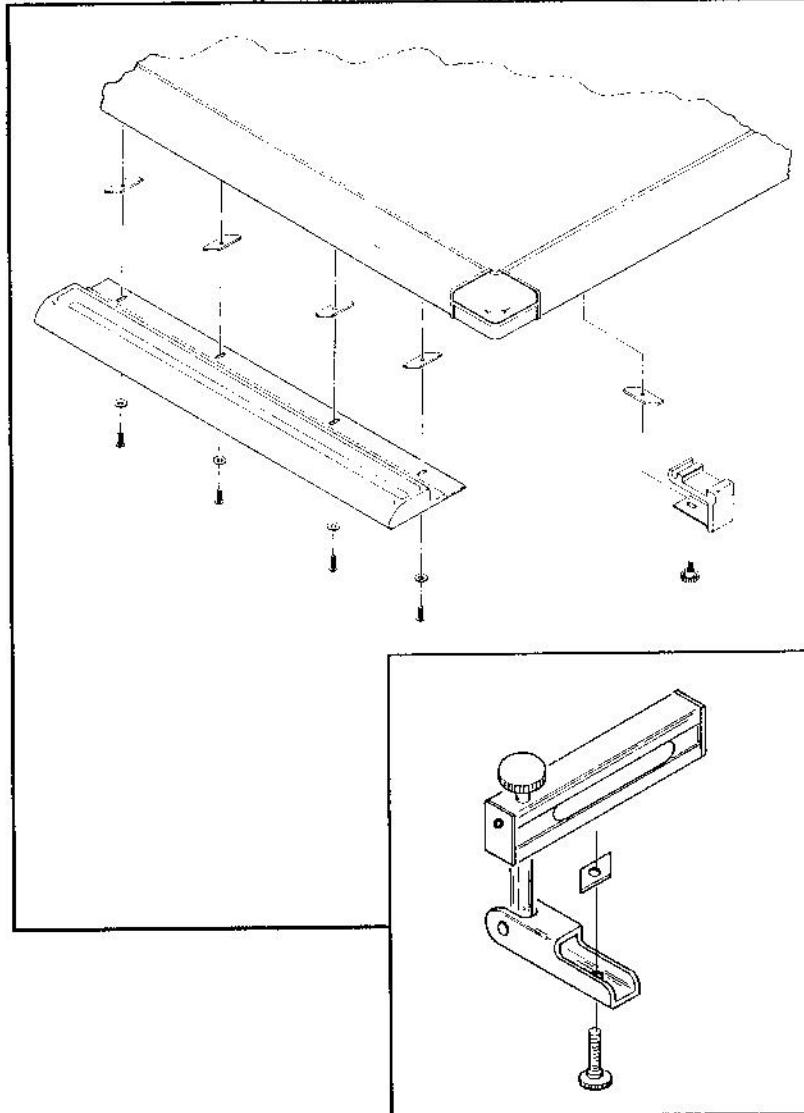


Fig 25. Attaching the Display

POWER UP PROCEDURE

Turn ON your computer and terminal.

Push the ON/OFF button at the top left of the tablet. The green LED should glow, and the tablet should beep. If the LED doesn't glow, and there is no beep, go to page 34 for troubleshooting hints.

The ON/OFF switch for the lights of a backlit tablet is at the bottom right corner of the pan.

NOTE

If the tablet is connected to a GPIB host, turn the tablet on **before** you start the software. The software sends a "permission to talk" when it powers up. If the tablet is off, it never receives permission to talk and will not send data.

INSTALLING THE SOFTWARE

Follow the instructions in the software user's manual. Make sure you indicate the correct size when asked which digitizer model to use.

Go to page 168 for instructions on setting up the tablet for AutoCad™.

OPERATING PROCEDURES

THE ACTIVE AREA

The tablet surface consists of the window opening, the active area, and the margin.

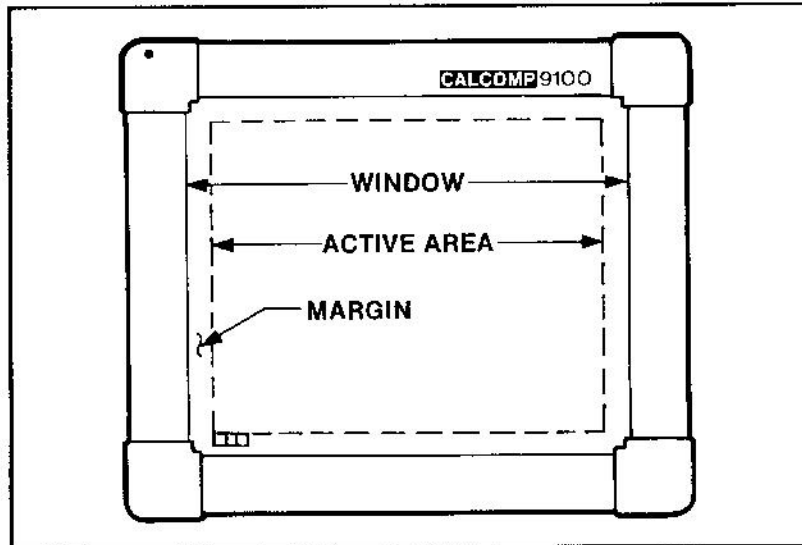


Fig 26. The Tablet Surface

The window opening is the entire visible surface inside the metal frame. The window opening is divided between the active area and the surrounding margin. All accurate digitizing occurs in the active area.

The tablet can detect the transducer up to 0.5 inches above the active area, allowing you to digitize through non-conductive materials. If the transducer is moved outside the active area or more than 0.5 inches above the tablet, the out-of-proximity indicator (LED #4) will light on the cursor. If out of proximity or margin data is enabled the tablet will transmit data, but at reduced accuracy, with the transducer out of the active area.

Accuracy and resolution decrease as the transducer is raised from the surface. Although the 9100 may track the transducer to a height greater than 0.5", and even indicate an in-proximity condition, the data taken above 0.5" is less accurate than data from the surface.

The **margin** is the portion of the window opening area surrounding the active area. Under default conditions, no data is transmitted when the transducer moves into the margin. The margin is electronically functional, however, and may be used for less accurate digitizing, such as menus. See page 74 for the command that activates the margin. Accuracy and effective resolution specifications are not guaranteed in the margin area.

The division between the active area and the margin is marked by a black dot at the default origin in the lower left corner of the active area. If you need to determine the precise location of the active area's borders, use the transducer.

Turn the tablet on, start your software and pass the cursor from inside the active area outward toward the approximate location of the border of the active area. When the cursor leaves the active area and enters the margin area, LED (#4) will light.

If you are using a stylus, the LCD display status character or the data output status character will change to "X". Or a graphics program that displays the stylus coordinates will usually freeze when the transducer leaves the active area.

USING THE CURSOR

Place the cursor flat on the drawing to be digitized. Look through the sighting lens as you move the cursor until the intersection of the cross-hairs covers the point to be digitized. The angle of the cursor body on the surface is not important. The cursor's crosshair design is etched on the bottom of the sighting lens, to minimize parallax error.

The factors which limit accuracy in most applications are the width of the crosshairs, and the operator's visual acuity or hand steadiness. A magnifying lens is available as an optional aid.

The buttons on the 16-button cursor may be used to send messages to the host computer or to send commands to the digitizer. See page 64 for the message feature, and page 80 for a summary of the available cursor commands.

The leftmost LED will light whenever a button is depressed and will stay lit as long as the button is down. (This is also a way to verify that the cursor is plugged in.)

The middle two LEDs are user definable, lit and extinguished by host commands. These may be used, for instance, to signal host computer status to the operator.

The rightmost LED is the out-of-proximity indicator. It will light whenever the cursor leaves the active area or whenever the cursor is too far above the active area to be detected by the tablet. When this LED is on, the digitizer is not transmitting data.

USING THE STYLUS

The stylus is essentially an "electronic pen" and handles like a pen or pencil. It is available with an inking or non-inking cartridge. The stylus tip is the equivalent of a cursor button. To activate the button, press the stylus tip down tightly against the tablet surface. Lift up on the stylus to release.

The stylus is intended for rapid, sketch-like digitizing. It is limited in its accuracy by the width of the ball point, 25 mils, and by the operator's ability to hold it steady. Holding the stylus vertically produces the most accurate data.

USING THE MENUS

There are two menus for the 9100. The "Small Fixed Menu" is a three-choice menu used to control the location and active state of the "Large Menu". The "Large Menu" is the one you will use to control the tablet operations.

When a menu is enabled, the menu region of the tablet surface does not transmit position data. Instead, picking the labelled blocks on the menu (or digitizing in the menu region) sends commands as if it were a keyboard.

NOTE

The mylar overlays are only a visual aid for the operator. The region of the tablet surface that sends the commands may be active whether or not the overlay is in position.

THE SMALL FIXED MENU

This menu area is permanently located below the lower left corner of the active area. There are no host or Large Menu commands to enable or disable the Small Fixed Menu. The setting of Switch 5 of Switch Bank 2 on the Communication Interface Board controls whether this menu will be enabled or disabled. On GPIB tablets, this area is **always** enabled.

When the Small Fixed Menu is active, digitizing over its area of the tablet surface may cause the Large Menu to appear at unexpected locations, with unexpected results.

The Small Fixed Menu blocks have these functions when picked:

LOCATE LARGE MENU

The lower left corner of the large menu will be located at the next point picked on the tablet surface.

ERASE LARGE MENU

Disables the Large Menu and returns that portion of the tablet surface to normal operation. You may leave the overlay in place and digitize over it.

RESTORE LARGE MENU

Once the Large Menu has been located, then erased, it can be reactivated in the same location by picking this block. To activate it in a new location, use the "LOCATE LARGE MENU" block.

ATTACHING THE OVERLAY

The overlay has a circle at the upper left corner of the "LOCATE LARGE MENU" block. A dot in the lower left corner of the tablet marks the location for the Small Fixed Menu. Center this dot in the circle and align the lower edge of the mylar with the frame of the tablet. Tape the overlay in position. Pick the center of the "LOCATE LARGE MENU" block, then pick the lower left corner of the Large Menu's border.

If you prefer a different location for the Large Menu, cut the two menus apart. Install the SFM as explained above. Tape the Large Menu to the tablet where you want it, being careful to align the edges of the menu with the tablet frame. Digitize the center of the "LOCATE LARGE MENU" block of the SFM, then digitize the lower left corner of the border of the Large Menu.

CUSTOM MENU BLOCKS

The four rows of blank blocks may be used as a user-defined menu. If the menu is enabled, picking these blocks transmits a coordinate pair as if it were a data point. (The menu area transmits a single ASCII character for the numbered blocks in the shaded area of the menu.) The Mode Status character is an "M" for MENU, the X-axis data is the block number (1 to 64), and the Y-axis data is not significant. The block numbers may be interpreted by a custom program as commands.

NOTE:

The output format must contain a Mode Status character or the software will not receive an indication that the custom menu is being used.

USING THE LARGE MENU

The Large Menu is used to send commands to the tablet, or messages to the host. This is explained in Section Two, page 50.

USING THE LCD DISPLAY

The optional Liquid Crystal Display provides a readout of the digitizer's numeric output, operating mode, and host messages.

The display initially shows the power-on banner message. This message will remain until the display is enabled (see page 58).

The contrast of the display is adjusted by the screw on the left side of the display. Contrast is also affected by the viewing angle. The best contrast is obtained by viewing the display head-on. To adjust the tilt and elevation, loosen the lock knob on top of the display head. Adjust the display head and tighten the lock knob.

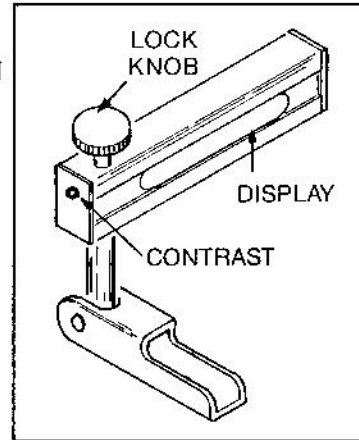


Fig 27. LCD Display

There are four ways to disable the LCD display:

1. The tablet may be reset by a command, in which case the banner message will return to the display.
2. The display may be disabled by a command, in which case the last data point displayed will be frozen.
3. The cursor may be put into message mode, in which case the message keyed from the cursor will be echoed on the display.
4. The host may be used to send a message to the tablet operator, in which case the message will appear on the display.

In all these cases, the display must be re-enabled to return it to the active data format.

DISPLAY FORMAT

The format of the data presented on the display is:

S # MC XXXXXXXX.XXXXX YYYYYYYY.YYYYY

Where S is System Status, continuously updated:

space	=	Transducer is on the active area
X	=	Transducer is out of proximity or in the margin area
M	=	Transducer is over the large menu, and the menu is active
W	=	Transducer is out of the windowed area
#	=	Indicates a space on the display

Where M is Mode Status, updated each time a new data point is transmitted:

M	=	Menu
R	=	Run
T	=	Track
P	=	Point
U	=	Line
I	=	Increment, any of the possible types
X	=	Transducer in margin, and margin data enabled

Where C is Cursor or Pen up/down, updated each time a new data point is transmitted:

U	=	Pen Up (or no cursor button pushed)
0	=	Pen Down
0-9, A-F	=	Indicates which cursor button is depressed. If the keys have been re-assigned, the new value will be displayed.

Where X and Y are the digits of the X and Y transducer position. These numbers are updated each time a new coordinate point is transmitted. They may be expressed as inches, millimeters, or counts, depending on the resolution setting.

NOTE

The format of the displayed X and Y numbers is related to, but not always identical to, the format of the transmitted coordinate pair data. Any resolution or format command which moves digits to the right of the decimal point in the transmitted data format affects the display also. Whenever the X or Y display field overflows, the display fills with asterisks (*) rather than erroneously truncate either number.

Example:

For a system using 1000 lines per inch, with the cursor connected and placed over the menu area, button "B" depressed, digitizer in RUN mode, and the cursor 12.369 inches to the right of and 19.092 inches above the origin, the display would read:

M # R B # #12369.00000 # #19092.00000

TROUBLESHOOTING AND DIAGNOSTICS

Please check the following before you call for service. Take the appropriate corrective action if you encounter a problem, then re-check the operation of the tablet.

NOTE

If the 9100 has **never** worked with the software, check the switch settings and re-install the software. If it **"used to work"** with the tablet, check connectors and power first. The BASIC program on page 36 may help in problem installations.

If no data is received by the host:

1. Is the tablet power supply plugged in to both the tablet and a live receptacle?
2. Is the tablet power switch on?
3. Are all cable connections tight?
Transducer to tablet?
Tablet to communications cable?
Host to communications cable or cables? And is the cable in the correct port of tablet and host?
Power supply to tablet?
4. Are the connector cables damaged? Check for bent pins, cut insulation and loose wires.
5. Is the host turned on and ready to receive data?
6. Has the tablet been disabled by a command?
7. Are the operating parameters set for values the software expects? Check the technical information in the software user's manual.
8. Was the software installed correctly?
9. If the tablet is using a GPIB interface, did you power on the tablet before loading the software?
10. Is the transducer in proximity?
11. If you are using the large power supply, check the fuses if the tablet power indicator isn't glowing.

If data is transmitted, but garbled or intermittent, check the following:

1. Are the operating parameters set for values the host expects? Check the switch settings.
2. Are the connector cables loose?

BANNER MESSAGES

At power up the 9100 will display a "Banner Message" on the LCD display, if it is installed, or on the terminal's screen. This message gives the digitizer model number, firmware identification and the results of the built-in diagnostic checks.

If the tablet displays a banner message with an error condition, write down the exact sequence of characters and call CalComp service.

- ST STANDARD firmware unit
- SM SMART firmware unit
- CC A two-character output indicating which firmware option is installed.
- ØA STANDARD firmware installed
- ØE SMART firmware installed
- 1E SMART and DATAQUEUE firmware Installed.
- EE A two-digit number indicating an error condition.
- ØØ No error (blank space here also indicates no error)
- Ø1 RAM error
- Ø2 RAM error
- Ø4 ROM error
- Ø8 ROM error
- 1Ø ROM error
- 2Ø ROM error
- 4Ø RAM error
- 8Ø RAM error
- CS The check sum of the PROM in error. This will only be output if there is an error condition.

EXAMPLE:

CALCOMP 9100 ST ØA 2Ø
 is a standard unit with a ROM error

CALCOMP 9100 SM ØE ØØ
 is a SMART unit with no problem

BASIC PROGRAM TO MAKE IBM PC ACT AS A DUMB TERMINAL

The following program, written in MICROSOFT BASIC, will cause the IBM PC or compatible system to accept and display Digitizer output data. Your computer must have MICROSOFT BASIC installed. If you are using another version of BASIC, this program may need changes to the statements to follow the rules of the other BASIC.

Set the DIP switches as follows:

	SWITCH	1	2	3	4	5	6	7	8
SB1 (processor board)		C	O	C	C	C	C	X	X
SW2 (RS-232 board)		C	O	O	C	C	C	C	O
SW3 (RS-232 board)		O	C	O	C	C	C	C	C

The program sets the PC to accept data at 9600 baud, even parity, 7 data bits, 1 stop bit, and without handshaking signals. The X and Y data will be displayed every time a button is pressed while the transducer is on the tablet.

```
10 OPEN "COM 1:9600, E, 7, 1, CS, DS" AS #1
20 PRINT INPUT $(1,1);
30 GO TO 20
```

To terminate this program, type CTRL BREAK.

If you get an I/O ERROR message when you try to run the program, try again. To keep the program short, we left out error checking. Also doublecheck the switch settings. The digitizer and computer must be using the same communication protocol.

If the terminal will display data from this program, the digitizer and host are connected properly. Re-install the software, and double check the DIP switch settings for it. If the software still doesn't work, and the 9100 is specifically supported by the software, call the software vendor.

NOTE

These switch settings are the same as the settings needed for AutoCad.

MAINTENANCE

CLEANING THE SURFACE

CAUTION

Abrasive cleaners, acrylic or lacquer paint thinners, and cleansers with an acetone or solvent base such as MDC or EDC, should NOT be used on the tablet surface.

The 9100 tablet surface is sealed with a Lexan Polycarbonate Film. Use only the cleaning materials listed below to clean the tablet surface:

- Denatured alcohol (methyl, isobutyl, etc.)
- Mild soap and water
- Isopropyl alcohol (rubbing alcohol)
- VM&P naphtha
- Freon T.F.

Use a soft, non-abrasive cloth to clean dust from the tablet surface. Hardened dirt may be removed with a cloth dampened in soapy water. To remove ink or pencil smudges follow these cleaning methods:

Ballpoint Pen Ink	Clean with Denatured Alcohol
Pen Ink	Clean with Denatured Alcohol
Pencil Lines	Clean with a "soft" cleanser or pencil eraser *
Black Smudges	Clean with Denatured Alcohol

*These cleaning methods may create an undesirable shiny spot on the tablet surface.

STYLUS MAINTENANCE

After 3-8 million clicks, the dome switch may have to be replaced. Contact your nearest CalComp field service office.

REPLACING THE INK CARTRIDGE

To replace the ink cartridge:

1. Unscrew and disconnect front and rear outside housing.
2. Draw out ink cartridge and replace with new ink cartridge.
3. Connect and screw together outside front and rear pen housing.

See page 164 for part numbers and ordering information.

THEORY OF OPERATION

The transducer (cursor or stylus) emits a weak electromagnetic field like a radio signal. A conductive grid in the tablet surface acts like an antenna. The part of the grid which is closest to the transducer picks up the signal and transmits it to the tablet's microprocessor.

The microprocessor uses the signal strength to calculate the exact position of the transducer on the grid, converts the position data into the desired output format and sends the information out the communication port to the host.

The host receives the information and passes it to a program, or software, which uses the information. The software may be a child's sketch program or a sophisticated mapping application. The software controls what happens to the position information that comes from the tablet.