

The SMART option is a pre-processor which calculates area, line length, and volume before transmitting the answers to the host, thus saving calculation time in the host. SMART will also rotate the tablet axes, correct for non-orthogonal drawings, change scaling in either or both axes, and translate the origin of a drawing. These functions may be combined.

SMART processing reduces data rate, due to the complexity of the calculations involved. The option defaults to a data rate of 50 pairs per second on power up. This is the maximum data rate.

SMART also includes all the UNIVERSAL FORMATTER functions described on pages 95 through 130 except Binary data output.

A menu is included with the SMART firmware. The top two rows of menu blocks on the large menu are the SMART function blocks. The "DATAQUEUE" block will be active only if the DATAQUEUE option is installed. See page 146 for further information on DATAQUEUE.

The SMART option outputs its calculated answers in exponential format when it is active. If the SMART option is installed the tablet will output data in Integer or Fixed point formats. Tablets with the SMART option installed will not produce binary output at any time.

All numbers, such as factors or coordinates, entered for the SMART operations must follow the exponential format:

[ +/- ] [n] [.n] [E[ +/- ] n]

The following are all valid ways to input the number 32,500:

+ .325E + 05 or 3.25E4 or 3.25E + 04 or 32500

In the following discussion the exponential input is designated by **eexp**.

#### NOTES

If you do not enter a decimal point, the default is a trailing decimal. If you do not enter an exponent, the default is 1.

The cursor output is as follows:

|     |                                    |
|-----|------------------------------------|
| 0-9 | the button number, 0 through 9     |
| A   | - Minus sign                       |
| B   | RUBOUT                             |
| C   | , (ASCII comma)                    |
| D   | . (decimal point)                  |
| E   | End with a CR                      |
| F   | End with a comma, or next function |

To enter **eexp** from the cursor, you must enter the number without an exponent because "E" ends the cursor command string.

## LENGTH, AREA AND VOLUME CALCULATIONS

The SMART option can calculate length, area and volume; the answer is transmitted to the host. The output will be similar to the example below:

```
11.208, 1.598, AAU  
.23071440E+03 = AREA
```

A dummy data point is sent first with its Mode Status Character changed to the letter A, for Answer (the second "A" in AAU above). This is to let the host know that an answer follows. The answer will be output in exponential format as shown, labelled AREA or LINE LENGTH. The software must distinguish between line, area and volume answers.

Any user-defined format should include a Mode status character to act as a flag for answers.

Line length and area calculations may be done simultaneously.

The command X, Y ON AREA/LINE also allows for position data to be transmitted during area and line calculations. See page 136.

Length and area may be multiplied by factors before transmission. See LENGTH FACTOR or AREA FACTOR (VOLUME FACTOR).

## LINE LENGTH

The Line Length function will measure the distance between 2 or more points.

1. Ensure that the digitizer is in Point, Track, or Line mode.
2. Enter the line length command from host, menu or cursor.

Host      ESC % l CR (lowercase L)

MENU      

|                |    |
|----------------|----|
| LINE<br>LENGTH | CR |
|----------------|----|

Cursor      FFF0E

3. Digitize the end points of a straight line, the vertices of each segment of an angled line, or trace a curved line.

## ANSWER LINE LENGTH

The answer for this line length can be generated in 3 ways:

Host      ESC % k CR.

This will cause the tablet to calculate the answer, transmit the answer to the host and terminate Line Length calculations.

MENU      

|                          |    |
|--------------------------|----|
| ANSWER<br>LINE<br>LENGTH | CR |
|--------------------------|----|

This will also terminate Line Length calculations after the answer is transmitted to the host.

Cursor      A

Press the "A" button at the last point of the line being measured. This will generate an answer for the line length and allow further line length calculations to be made.

The line length will be output in the current data units.

3

## LENGTH FACTOR

The Length Factor multiplies the line length calculation before it is output. To enter a line length factor:

Host      ESC % m eexp CR  
MENU      

|                  |      |    |
|------------------|------|----|
| LENGTH<br>FACTOR | EEXP | CR |
|------------------|------|----|

  
Cursor      FFF1 eexp E

The line length will be multiplied by the factor before it is transmitted to the host.

## AREA

To calculate the area of a polygon:

1. Enter the AREA command from the host, cursor, or menu.

Host            ESC % a CR

MENU          

|      |
|------|
| AREA |
|------|

|    |
|----|
| CR |
|----|

Cursor        FFF A E

2. Select Point, Track, or Line mode.
3. Trace the area in a clockwise direction.

### NOTE

Moving in a counterclockwise direction will produce a negative area, or the negative area will be subtracted.

Lines must not be crossed on a polygon. For example, to obtain the area of a figure "8", trace one side (meeting the center) then the other (again meeting the center) without crossing lines.

## AREA ANSWER

The answer for this area can be generated in 3 ways:

Host            ESC % ' CR  
 which will also terminate Area calculations. (The command is the ASCII code 96 decimal or 60 Hexadecimal. It may appear on your keyboard as an accent grave like the mark over the "è" in grave or as a reversed single quote " ' ".)

MENU          

|                |
|----------------|
| AREA<br>ANSWER |
|----------------|

|    |
|----|
| CR |
|----|

This will terminate Area calculations.

Cursor        A

Press the "A" button at the last point in the polygon. This will generate an answer for the area and allow further area calculations to be made.

The area will be output in square data units. The units depend on the scaling factors currently in use.

### AREA FACTOR (VOLUME)

All area calculation results will be multiplied by this factor before being output. The factor will calculate a cylindrical or cubic volume, not a pyramidal or irregular volume.

Host        ESC % b eexp CR

MENU       

|                  |      |    |
|------------------|------|----|
| VOLUME<br>FACTOR | EEXP | CR |
|------------------|------|----|

Cursor     FFFB eexp E

### X,Y ON AREA/LINE

The X,Y On Area/Line command allows X and Y points to be transmitted during Area or Line Length calculation. This allows, for example, the corners of a rectangle to be recorded at the same time its area is measured. This function toggles each time the command is received.

Host        ESC% e CR

MENU       

|                         |    |
|-------------------------|----|
| X/Y ON<br>AREA/<br>LINE | CR |
|-------------------------|----|

Cursor     none

### Z DATA FACTOR

Z Data Factor allows you to enter Z values (height) for the host's calculations. The tablet doesn't use the Z Data Factors in its internal calculations; it transmits the Z Data Factor to the host. The format must be a user-defined one that includes "Z" as one of the defined data types.

Host        ESC % z eexp CR

MENU       

|                     |      |    |
|---------------------|------|----|
| Z<br>DATA<br>FACTOR | EEXP | CR |
|---------------------|------|----|

Cursor     FFFD eexp E

## DISPLAY FACTORS

To display all factors currently in effect, enter this command from the host, menu or cursor.

Host      ESC % d CR  
 MENU         
 Cursor    none

The factors are displayed as an exponential number, followed by a label, like the following example, which shows the default factors:

+ .0000000E-20, = X INC FACTOR  
 + .0000000E-20, = Y INC FACTOR  
 + .0000000E-20, = ROTA COS  
 + .0000000E-20, = ROTA SIN  
 + .0000000E-20, = ORTHO COT  
 + .0000000E-20, = ORTHO CSC  
 + .1000000E +01, = X SCALE  
 + .1000000E +01, = Y SCALE  
 + .0000000E-20, = X TRANSLATION  
 + .0000000E-20, = Y TRANSLATION

## CLEAR ALL

Enter the CLEAR ALL command from the host, menu or cursor. All SMART calculation factors previously entered will be cleared.

Host      ESC % c CR  
 MENU         
 Cursor    FFF C E

## WINDOW

Windowing allows the active area of the tablet to be made smaller by putting a "window" on the tablet's surface. Data points will only be sent while the transducer is in the "window". Using the Window feature will **not** deactivate the Calcomp menu even if it falls outside the active window. User menus may be affected.

Enter the window command from the host, menu or cursor.

**Host**      **ESC % w CR** <dpoint 1> <dpoint 2>  
**MENU**

|        |
|--------|
| WINDOW |
|--------|

|    |
|----|
| CR |
|----|

      <DPOINT1>      <DPOINT2>  
**Cursor**      **FFF 7 E** <dpoint 1> <dpoint 2>

Digitize the lower left corner of the desired window, followed by the upper right corner.

To clear the window, use the CLEAR ALL command. The CLEAR ALL will clear not only the Windowing, but any other SMART features being used.

### NOTE

There are two possible "windows" with a SMART 9100.

The SMART window will rotate and scale with any subsequent rotation and scaling commands. The standard function "window" is defined relative to the tablet surface and will not scale or rotate.



## DATA TRANSFORMATION FUNCTIONS

### NOTE

For maximum accuracy, when multiple data transformation functions are performed, it is suggested that they be done in the following order. Each function will affect the output of the previous functions.

1. Rotation
2. Orthogonality Correction
3. X and Y Scaling
4. Translation

The following equation is used for all data transformation calculations. Translation is performed last.

C = Calculation Constants used by the 9100 Digitizer, such as sines, cosines, etc.

$$X \text{ Transformation} = (X * C1) + (Y * C2) + C3$$

$$Y \text{ Transformation} = (X * C4) + (Y * C5) + C6$$

## ROTATION

The Rotation command shifts the tablet's axes, making exact placement of material on the tablet unnecessary. Rotating the axes will not affect the tablet origin or the menus.

**Host**      **ESC % r CR** <dpoint 1> <dpoint 2>

**MENU**      ROTATE    CR    <dpoint1> <dpoint2>

**Cursor**      **FFF4 E** <dpoint 1> <dpoint 2>

After the carriage return, digitize two points <dpoint 1 and 2> on the line that is to be the new X axis. The Y-axis rotates to stay perpendicular to the X-axis. The <dpoint 1> must be to the left of <dpoint 2>.

To cancel rotation, enter the CLEAR ALL command.

3

## ORTHOGONALITY CORRECTION

This corrects for non-orthogonal drawings or a source document which has stretched. Enter the ORTHO command from the host, menu or cursor. Digitize 2 points <dpoint 1> and <dpoint 2> parallel to the desired **Y-axis** of the drawing.

**Host**      **ESC % o CR** <dpoint 1> <dpoint 2>

**MENU**

|       |
|-------|
| ORTHO |
|-------|

|    |
|----|
| CR |
|----|

 <dpoint 1> <dpoint 2>

**Cursor**    **FFF 3 E** <dpoint 1> <dpoint 2>

To cancel orthogonal correction, enter the CLEAR ALL command.

## SCALING THE X AND Y AXES

Scaling multiplies or divides the digitizer output by a factor. The X and Y axes may be scaled simultaneously or separately. From the host, menu or cursor enter the command for scaling an axis, followed by the scaling factor desired, then CR.

### X,Y SCALING

Host           ESC % s eexp CR

MENU    SCALE    eexp    CR

Cursor    FFF 6 eexp E

### X SCALING

Host           ESC % x eexp CR

MENU    X  
SCALE    eexp    CR

Cursor    FFF 8 eexp E

### Y SCALING

Host           ESC % y eexp CR

MENU    Y  
SCALE    eexp    CR

Cursor    FFF 9 eexp E



Clear the scaling factors by entering the CLEAR ALL command.

## TRANSLATE

TRANSLATE is used when there is a known point on the drawing being digitized, and, due to the size of the tablet or the drawing, the drawing's origin does not coincide with the tablet's origin. Unlike the RELOCATE ORIGIN command, it is not necessary for the origin to fall on the tablet surface. Drawings larger than the tablet may be digitized in sections.

To relocate the tablet origin:

1. Enter the TRANSLATE command from the host, menu or cursor followed by the coordinates of a known point on the drawing that falls on the tablet. Enter the X coordinate (eexp1) first, then the Y (eexp2), then CR.
2. Digitize that point, < dpoint 1 >, on the drawing. The origin will be relocated relative to the point digitized. If a scale factor has been entered, the origin will be relocated with respect to that scale.

**Host**      ESC % t eexp1 , eexp2 CR < dpoint >

**MENU**

|        |
|--------|
| TRANSL |
|--------|

|         |
|---------|
| eexp1 , |
|---------|

|       |
|-------|
| eexp2 |
|-------|

|    |
|----|
| CR |
|----|

      < dpoint >

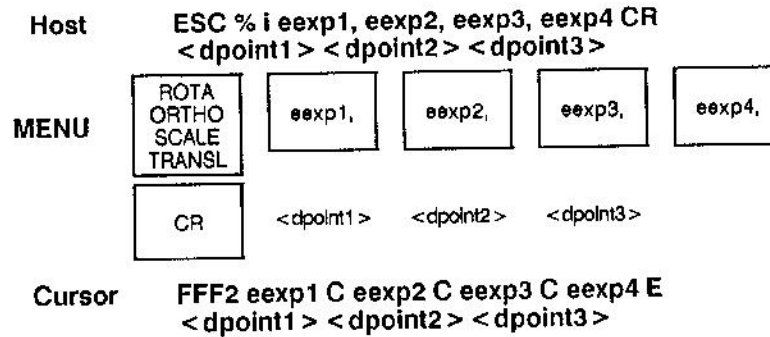
**Cursor**      FFF5 eexp1 C eexp2 E < dpoint >

### EXAMPLE

A known point on your drawing is at 10.5, 32.7. You enter 10.5 as eexp1 and 32.7 as eexp2, then digitize the known point. The origin will shift to a point -10.5, -32.7 from the point you digitized, whether or not the new origin is on the tablet surface.

## COMBINING ROTATE, ORTHO, SCALE, AND TRANSLATE

A single command may be used when combining data transformations. Refer to the illustration, page 144, for clarification.



Where the parameters are as follows:

### eexp1, eexp2,

The numerical coordinates of the point to be located at X1, Y1 (for example, X = 100 and Y = 200). The new origin will be calculated from this point. It also is one of the two points used for the X-axis transformations.

### eexp3, eexp4

The coordinates of the point located at X2, Y2 (for example, X = 300 and Y = 300). This establishes the new X-axis and X-scaling factor and is the first point of the Y-axis transformations.

**CR, [CR], or E**  
to finish the command.

On the drawing on the tablet surface, digitize point X1, Y1  
<dpoint1>.

On the drawing on the tablet surface, digitize point X2, Y1  
<dpoint2>.

On the drawing on the tablet surface, digitize point X2, Y2  
<dpoint 3>.

SEE EXAMPLE ON NEXT PAGE >>>

The origin will be translated with respect to point  $X_1, Y_1$ . The X-axis and X scaling is calculated from points  $X_1$  and  $X_2$ . The Y-axis and Y scaling is calculated from points  $Y_1$  and  $Y_2$ . All successive points digitized will be identified in relation to the new origin and scale.

#### NOTE

The points to be digitized must meet the following criteria:

$X_1, Y_1$  must be closer to the tablet's **default** origin than  $X_2, Y_2$ .

$X_1$  may not equal  $X_2, Y_1$  may not equal  $Y_2$ .

$X_1, Y_1$  and  $X_2, Y_1$  must be on the desired X-axis.

$X_2, Y_1$  must be perpendicular to  $X_2, Y_2$  on the material being digitized.

To cancel this command, enter the CLEAR ALL command.

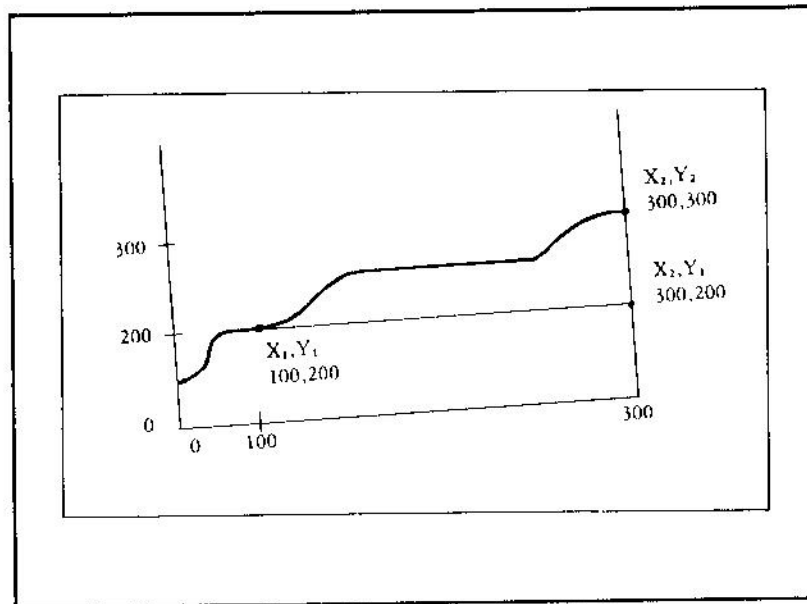


Fig 30. Combined Transformations

## SET INCREMENT VALUE

The command is:

HOST ESC % X eexp CR (for the X-axis)

HOST ESC % Y eexp CR (for the Y-axis)

MENU 

|                  |      |    |
|------------------|------|----|
| SET<br>X<br>INCR | eexp | CR |
|------------------|------|----|

MENU 

|                 |      |    |
|-----------------|------|----|
| SET<br>Y<br>INC | eexp | CR |
|-----------------|------|----|

CURSOR FF 8 eexp E

CURSOR FF 8 eexp E

Although this command also sets the minimum number of lines of resolution that must be crossed to cause the tablet to output a new data point, the SMART tablet multiplies the number of resolution lines crossed by the scaling factors in use before it calculates whether the Increment requirement has been satisfied. **The value entered for "eexp" must, therefore, take both the current resolution and scaling factors into account.**

It is easiest to adjust scaling and resolution so that the tablet output is in units that correspond to the measurements of the material being digitized. Then the Increment distance will correspond the units of measure.

### EXAMPLE:

Assume you are digitizing an aerial survey photograph with scaling of 1:10,000 and you want the tablet to output a data point every time the transducer has moved the equivalent of 50 units of measure on the ground that was photographed.

First set the resolution to 1000 LPI, and enter scaling factors of 10 for each axis. This will give output in "units". Now a move of one unit along either axis on the photograph will produce 10,000 data points (1000 LPI x 10 scaling factor). The output now has a 1:1 correspondence to the units of measure of the survey.

Enter a value of 50 for "eexp" in the Set Increment command and the tablet will output one data point every time the transducer moves a distance on the photograph which is the equivalent of 50 units on the ground.

## DATAQUEUE FIRMWARE OPTION

The DATAQUEUE option stores up to 16 thousand characters in a first in, first out buffer for transmission to the host through Port C. The DATAQUEUE option is only offered in conjunction with the SMART option.

The host starts and stops data transmission, receiving data points only when it is ready. When the queue is full, any new points digitized will be lost. The tablet beeps to indicate that the queue is in overflow. X,Y coordinate pairs will not be split, however, user messages may be split if sent while digitizing data and the queue becomes full.

To enable DATAQUEUE and set start and stop characters, enter the following command:

Host           ESC % O b1 b2 CR (uppercase o, not a zero)

|      |               |    |    |    |
|------|---------------|----|----|----|
| MENU | DATA<br>QUEUE | b1 | b2 | CR |
|------|---------------|----|----|----|

Where b1 is the start character and b2 is the stop character. Any start and stop characters may be chosen except @, CR, RUB, or BS.

To disable the DATAQUEUE firmware from the I/O port, enter:

Host           ESC % O CR

|      |               |    |
|------|---------------|----|
| MENU | DATA<br>QUEUE | CR |
|------|---------------|----|

### EXAMPLE

If you want to use the ASCII character "G" to start transmission and "S" to stop transmission, the entry for the above would be:

Host           ESC % O G S CR

|      |               |   |   |    |
|------|---------------|---|---|----|
| MENU | DATA<br>QUEUE | G | S | CR |
|------|---------------|---|---|----|

The host computer must send a "G", enabling data output, when it is ready for data. When it cannot take any more data it must send an "S" to stop data output. The DATAQUEUE will buffer newly digitized data until the host sends the "G" again.



## COMMUNICATION INTERFACE BOARD

The 9100 may have one or two I/O ports on the interface board. They will be accessible through ports A and/or B in a standard digitizer or through ports C and/or D if the optional SMART processor board displaces the communication board. Port A/C is the port closer to the power switch, Port B/D is further from the power switch.

The board may have:

RS-232C, single port, DTE or DCE

RS-232C, dual port, DTE and DCE

RS-449, single port, DTE or DCE

RS449/442, dual port, DTE and DCE

GPIB, single port or with an RS-232 or RS449/422 DCE port

### NOTES

There are two versions of GPIB/RS-232, depending on whether they have the earlier software (PROM 70045) or the current version (PROM 70076). See pages 152 – 154.

If the revision level of the U3 component on the Digitizing processor board is "F" or higher, some communication parameters may be changed by command from the host or menu. See page 59.

### SWITCH BANKS

The two switch banks on the board control some of the power-on defaults of the tablet. A list of the settings starts on page 16 of the installation procedure in Part One.

## RS-232C INTERFACE

### OVERVIEW

The RS-232C Interface supports the handshaking circuits of the RS-232C standard. However, the 9100 will also function with only the three-wire subset of Transmit, Receive and Signal Ground.

Port A/C is configured as Data Terminal Equipment (DTE), transmitting on pin 2. Port B/D is configured as Data Communication Equipment (DCE) and transmits on pin 3.

### NOTE

Compliance with the RS-232C standard does not guarantee compatibility between the 9100 and the host equipment. Please make a pin-by-pin comparison of the host's RS-232C port specifications if you have interfacing problems.

### JUMPERS

The transmit and receive lines on the RS-232C ports may be changed by the jumpers at M1 (for port A/C) or M2 (for port B/D). Remove the jumpers and re-install them as in Figure 31, below. "Jumpers" are black or blue, with squared corners. They should lift off easily. (The rounded blue components that are firmly attached to the board are not jumpers.)

Hold the board facing you so the ports are "up" and the connector is to your right. M1 is directly above switch 1 of "SW2". M2 is either between port B/D and the upper edge (GPIB/RS-232 boards) or below port B/D (dual RS-232 ports).

### NOTE

Only the transmit and receive lines are swapped by the jumpers. The handshaking remains fixed as DTE for port A/C and DCE for port B/D.

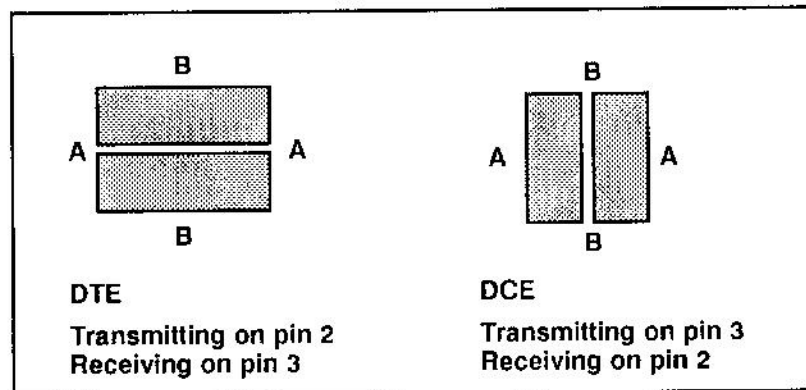


Fig 31. Jumper Positions

## CONNECTOR TYPES

The connector for port A/C (DTE) is a 25-pin male D connector.

The connector for port B/D (DCE) is a 25-pin female D connector.

Gender changers are included with CalComp cable kits, or may be obtained from local sources.

## RS-232C PIN ASSIGNMENT

| PIN | DESCRIPTION                      | DTE<br>PORT<br>A/C | DCE<br>PORT<br>B/C |
|-----|----------------------------------|--------------------|--------------------|
| 1   | Chassis Ground                   | ---                | ---                |
| 2   | Data                             | Output             | Input              |
| 3   | Data                             | Input              | Output             |
| 4   | Request To Send                  | Output             | Input              |
| 5   | Clear To Send                    | Input              | Output             |
| 6   | Data Set Ready                   | Input              | Output             |
| 7   | Signal Ground                    | ---                | ---                |
| 8   | Received Line<br>Signal Detector | Input              | Input              |
| 11  | -12v Option                      | ---                | ---                |
| 18  | +12v Option                      | ---                | ---                |
| 20  | Data Terminal Ready              | Output             | Input              |
| 24  | +5v Option                       | ---                | ---                |

## DATA ROUTING RS-232C AND RS-449 DUAL PORT BOARDS

| INPUT<br>FROM | OUTPUT TO  |            |            |          |
|---------------|------------|------------|------------|----------|
|               | Port A/C   | Port B/D   | Display    | Commands |
| Port A/C      | No         | Yes        | On Command | Yes      |
| Port B/D      | Yes        | If ECHO on | On Command | Yes      |
| Data          | If Enabled | If Enabled | If enabled | no       |
| Menu          | If Enabled | If Enabled | On Command | Yes      |
| Cursor        | If Enabled | If Enabled | Messages   | Yes      |

## RS-449 INTERFACE

### CONNECTOR TYPES

The connector for port A/C (DTE) is a 37-pin male D connector.

The connector for port B/D (DCE) is a 37-pin female D connector.

Gender changers are included with CalComp cable kits, or may be obtained from local sources.

### JUMPERS

There are no jumpers to switch transmit and receive lines on an RS-449 interface.

### RS-449 PIN ASSIGNMENTS

| PIN | DESCRIPTION         | LOGIC    | DTE    | DCE      |
|-----|---------------------|----------|--------|----------|
| 1   | Shield              | ---      | ---    | ---      |
| 4   | Data                | True     | Output | Input    |
| 22  | Data                | Inverted | Output | Input    |
| 6   | Data                | True     | Input  | Output   |
| 24  | Data                | Inverted | Input  | Output   |
| 7   | Request To Send     | True     | Output | Input    |
| 25  | Request To Send     | Inverted | Output | Input    |
| 9   | Clear To Send       | True     | Input  | Output   |
| 27  | Clear To Send       | Inverted | Input  | Output   |
| 11  | Data Mode           | True     | Input  | Output   |
| 29  | Data Mode           | Inverted | Input  | Output   |
| 12  | Terminal Ready      | True     | Output | Input    |
| 30  | Terminal Ready      | Inverted | Output | Input    |
| 13  | Receiver Ready      | True     | Input  | Output   |
| 31  | Receiver Ready      | Inverted | Input  | Output   |
| 19  | Signal Ground       | ---      | ---    | ---      |
| 28  | Terminal In Service | True     | Output | Not Used |

## GROUNDING SCHEME OF RS-232 AND RS-449 PORTS

Each port on the 9100 has two grounding lines: Signal Ground, which completes the circuit between the 9100 and the host, and Chassis Ground. In the 9100, Signal Ground and Chassis Ground are kept separate, except for a single connection inside the power supply.

The metal tablet frame of the 9100 is not connected to Pin 1 of the output port connectors, as is sometimes done. Instead, the connector body picks up Chassis Ground directly from the frame through the metal port inserts.

CalComp cables have metal connector bodies on both ends which connect to the braided shield of the cable with a full-coverage "RFI plumbing" connection. They also include a connection from the cable shield to Pin 1 of connector at the user end. This makes Chassis Ground available (via the metal connector and tablet frame at the tablet end of the cable) on Pin 1 to support the grounding pinout. Chassis Ground is also available on the connector body to provide an "RFI plumbing" connection to user equipment in RFI/EMI-critical applications.

With cables other than CalComp's, direct connection to the tablet frame through Pin 1 is not available. However, jumper holes are provided on the Communication Interface board to enable the user to tie Chassis Ground directly to Circuit ground.

### NOTE

Shield grounding for EMC, ESD, and ground loop control can be complicated. The 9100 uses a single-point connection between Chassis Ground and Circuit Ground.

CalComp does not recommend tying the chassis and Circuit ground systems together. Doing so may increase the susceptibility of the digitizer to ESD damage or degrade its performance by inducing ground noise. It may also cause the RFI emissions to increase beyond the FCC limits guaranteed by CalComp at the time of sale.

Each situation must be evaluated individually, and usually will require some experimentation on the part of the user. Contact your CalComp field service representative for more information on grounding the 9100 system.

## GPIB INTERFACE

### OVERVIEW

The General Purpose Interface Bus (GPIB) is a parallel interface bus most commonly used for connecting digital measurement instruments. It is addressed by the host as if it were a part of the host's memory, with a specific address.

The 9100 supports the full GPIB interface.

You may select addresses 0-31, using the switches on this board. See page 155 for the switch settings. Address 31 is equivalent to disabling the GPIB output.

There are two versions of GPIB/RS-232 firmware, which differ in their data routing. A label on chip U1 on the Communication Interface Board will identify the firmware as the older version (PN 70045) or the newer (PN 70076). See page 154.

### CONNECTOR TYPES

The connector for port A/C (GPIB) is a 24-pin female GPIB connector.

The connector for port B/D will vary, depending on the option: RS-232C, DCE or RS-449, DCE. See the appropriate Interface description.

Gender changers are included with CalComp cable kits, or may be obtained from local sources.

### NOTE

Calcomp recommends using our GPIB cable, which was designed to fit the tablet. The panel opening on the 9100 is 20mm wide and cannot accept many GPIB connectors (typical width 23mm).

## USING THE GPIB INTERFACE

Be sure the tablet is powered up before the application software is initialized. The software sends an "address to talk" signal. If the tablet doesn't receive this signal, it never receives permission to send data.

## USING THE GPIB/RS-232C INTERFACE

Dual port tablets may use either the GPIB port or the RS-232C port to communicate with the host or hosts.

### NOTE

This information applies only to tablets with the PN70076 chip as U1. The earlier version allowed data to flow between ports.

If both ports are active, and if the RS-232C port is transmitting, the tablet will stop transmitting when the GPIB buffer is full. The tablet will resume transmitting when requested to do so by the GPIB host.

You must disable the GPIB port by one of the following methods before you use the RS-232C port. (You don't have to disable the RS-232C port to use the GPIB port.)

|        |                                      |
|--------|--------------------------------------|
| Host   | ESC % A Ø CR                         |
| Menu   | [ENABLE/DISABLE I/O PORT A] [Ø] [CR] |
| Cursor | FF A Ø E                             |

## JUMPERS

There are no jumpers to swap transmit and receive lines on a GPIB-only or GPIB/RS-449 board. There is one jumper on the GPIB/RS-232C board. It is between the output connector and the edge of the board. See page 146 for the jumper positions.

**GPIB PIN ASSIGNMENTS**

| PIN   | ACRONYM | DESCRIPTION        |
|-------|---------|--------------------|
| 1     | DB1     | Data Bit           |
| 2     | DB2     | Data Bit           |
| 3     | DB3     | Data Bit           |
| 4     | DB4     | Data Bit           |
| 5     | EOI     | End Or Identify    |
| 6     | DAV     | Data Valid         |
| 7     | NRFD    | Not Ready For Data |
| 8     | NDAC    | Not Data Accepted  |
| 9     | IFC     | InterFace Clear    |
| 10    | SRQ     | Service ReQuest    |
| 11    | ATN     | Attention          |
| 12    | To M1   |                    |
| 13    | DB5     | Data Bit           |
| 14    | DB6     | Data Bit           |
| 15    | DB7     | Data Bit           |
| 16    | DB8     | Data Bit           |
| 17    | REN     | Remote ENable      |
| 18-24 | ----    | ground             |

**DATA ROUTING for PN 70076**

| INPUT FROM | OUTPUT TO  |            |            |          |
|------------|------------|------------|------------|----------|
|            | Port A/C   | Port B/D   | Display    | Commands |
| Port A/C   | No         | No         | On Command | Yes      |
| Port B/D   | No         | If ECHO on | On Command | Yes      |
| Data       | If Enabled | If Enabled | If enabled | no       |
| Menu       | If Enabled | If Enabled | On Command | Yes      |
| Cursor     | If Enabled | If Enabled | Messages   | Yes      |

**DATA ROUTING for PN 70045**

| INPUT FROM | OUTPUT TO  |            |            |          |
|------------|------------|------------|------------|----------|
|            | Port A/C   | Port B/D   | Display    | Commands |
| Port A/C   | No         | Yes        | On Command | Yes      |
| Port B/D   | Yes        | If ECHO on | On Command | Yes      |
| Data       | If Enabled | If Enabled | If enabled | no       |
| Menu       | If Enabled | If Enabled | On Command | Yes      |
| Cursor     | If Enabled | If Enabled | Messages   | Yes      |



## GPIB ADDRESSES

The switch settings marked with X are not important to the address. they are controlling other parameters.

| ADDRESS       | SWITCH |   |   |   |   |   |   |   |
|---------------|--------|---|---|---|---|---|---|---|
|               | 1      | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| ∅             | X      | X | X | C | C | C | C | C |
| 1             | X      | X | X | C | C | C | C | O |
| 2             | X      | X | X | C | C | C | O | C |
| 3             | X      | X | X | C | C | C | O | O |
| 4             | X      | X | X | C | C | O | C | C |
| 5             | X      | X | X | C | C | O | C | O |
| 6             | X      | X | X | C | C | O | O | C |
| 7             | X      | X | X | C | C | O | O | O |
| 8             | X      | X | X | C | O | C | C | C |
| 9             | X      | X | X | C | O | C | C | O |
| 10            | X      | X | X | C | O | C | O | C |
| 11            | X      | X | X | C | O | C | O | O |
| 12            | X      | X | X | C | O | O | C | C |
| 13            | X      | X | X | C | O | O | C | O |
| 14            | X      | X | X | C | O | O | O | C |
| 15            | X      | X | X | C | O | O | O | O |
| 16            | X      | X | X | O | C | C | C | C |
| 17            | X      | X | X | O | C | C | C | O |
| 18            | X      | X | X | O | C | C | O | C |
| 19            | X      | X | X | O | C | C | O | O |
| 20            | X      | X | X | O | C | O | C | C |
| 21            | X      | X | X | O | C | O | C | O |
| 22            | X      | X | X | O | C | O | O | C |
| 23            | X      | X | X | O | C | O | O | O |
| 24            | X      | X | X | O | O | C | C | C |
| 25            | X      | X | X | O | O | C | C | O |
| 26            | X      | X | X | O | O | C | O | C |
| 27            | X      | X | X | O | O | C | O | O |
| 28            | X      | X | X | O | O | O | C | C |
| 29            | X      | X | X | O | O | O | C | O |
| 30            | X      | X | X | O | O | O | O | C |
| 31 (Disabled) | X      | X | X | O | O | O | O | O |

## REDUCING RADIO-FREQUENCY EMISSIONS

The CalComp 9100 Digitizer is available with two different levels of radio-frequency emission certifications. The standard 9100 complies with the RFI emission requirements in Part 15, Subpart J of FCC rules (CFR 47) for a Class A computing device. This version is intended for industrial use only; operation of this version in a residential area may cause unacceptable interference to radio and TV reception. It is the responsibility of the 9100 operator to take whatever steps are necessary to correct the interference.

An optional version of the 9100 complies with the International VDE Ø871 Class B requirements. This version may be operated in a residential area with very little chance of causing radio or TV reception interference; however, should interference occur, it is still the responsibility of the digitizer operator to correct the problem.

The steps below are suggested to alleviate reception interference caused by the 9100.

### CHECK THE DIGITIZER

The VDE Class B version of the 9100 reduces its RFI emissions by the addition of special metallic connector plates and other internal shielding. **DO NOT REMOVE OR ALTER THESE PIECES.** If any of the pieces have been removed, they must be put back on the unit in their original configuration.

Ensure that all the connectors are tightly secured on the digitizer and host. Ensure that all the metal port covers are in place, including those on ports in use.

Any cables added by the user must be shielded.

### SEPARATE THE CABLES

Separate the power cable (especially the length between the power supply and the tablet) from the cable leading to the host as far as possible. Make sure the transducer cable does not hang down behind the tablet surface.

Keep the transducer on the tablet surface.

### ATTACH THE POWER SUPPLY TO THE TABLET

Bolt the power supply to the underside of the tablet frame, using the T-slot bolts provided. See page 22 for instructions. Coil the excess cable length.

## COIL THE CABLES

Coil all excess cable lengths into either circular or "figure-8" looping piles. Use 15 to 24 inches per loop.

## MOVE THE TABLET, HOST, OR RECEIVER

Changing the direction the tablet, host equipment, or the affected receiver is facing may alleviate the problem. Bear in mind that the radio-frequency emissions are not decreased by this; they are only directed away from the receiving equipment.

Moving the receiver farther from the tablet will decrease the strength of the emissions reaching the receiver.

Plug the host or tablet into a different outlet, so that they are on circuits controlled by different fuses or circuit breakers.

## PROTECT THE RECEIVER

RFI filters which protect receivers from emissions conducted through the power cables are commercially available. Radiated emission may be attenuated by placing conductive shielding material between the tablet and the receiver.

## GROUNDING

Changing the grounding scheme of the 9100 or host system may be effective; however, this may cause a loss of accuracy or induce ground noise into the digitizing system. Some experimentation is usually needed to determine the best emission-operation tradeoff. See page 151 for more information on 9100 grounding.

## CAUTION

The tablet uses magnetic coupling to detect the position of the cursor. The performance may be degraded (excessive jitter) by the presence of strong magnetic fields produced by AC sources. Potential sources of AC magnetic fields include some television sets and monitors with minimum shielding around their horizontal sweep circuits.

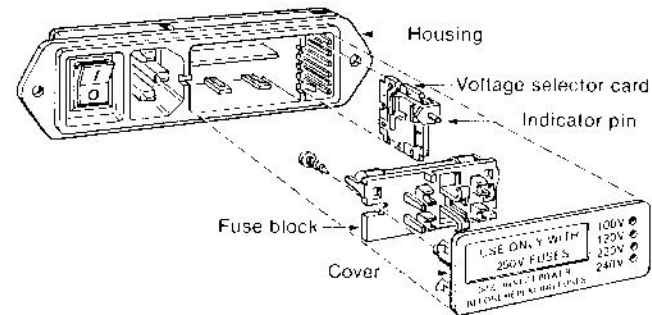
If this is a problem, increase the distance between the digitizer and the source of the magnetic fields. Changing the direction the monitor is facing may also minimize the interference.

Permanent magnets or other large pieces of ferrous metal will cause apparent position shifts if they are brought close to the transducer.

## CHANGING THE OPERATING VOLTAGE

The 2-Amp power supply may be operated at 100-125 Volts AC, or at 200-250 Volts AC.

1. DISCONNECT THE POWER SUPPLY FROM THE TABLET AND THE POWER OUTLET.



2. Insert a small flat blade screwdriver into the notch at the left of the fuse block cover. Gently pry the left end of the fuse block cover up and remove the fuse holder.  
Set aside cover/fuse block assembly for now.
3. Pull the voltage selector card straight out of its housing.
4. Orient the selector card so that the desired voltage label is right side up. Pull the indicator pin down to free it from the detent, turn it 1/4 turn to the right, then slide it up and to the right as far as possible.  
Turn the pin another 1/4 turn so it points up, or away from the desired voltage label, then slide the pin down into the detent at the top of the card.
5. Reinstall the selector card. The printed side of the card must face the power cord connector, and the indicator pin must point out.

## CHANGING THE FUSING

### CAUTION:

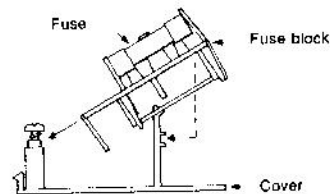
For protection against risk of fire or electric shock hazard, always replace fuses with the same type and rating of fuse.

Tablets operating at 100-125 V require one slow blow fuse rated at .25 A.

Tablets operating at 200-250 V require two slow blow fuses rated at .125 A.

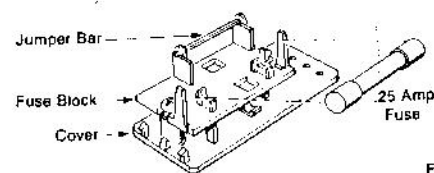
To change the fusing:

1. Loosen the Phillips screw on the fuse block one turn.
2. Remove the fuse block by lifting it free of the screw, sliding it away from the screw, then lifting up.



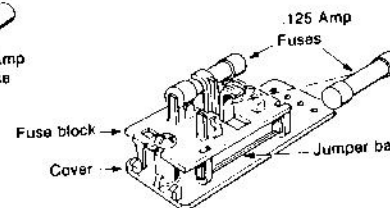
**Fuse Block/Cover Assembly**

3. Invert the fuse block and re-install it onto the pedestal. Insert the proper fuses into the holders.



**100-125 V Fusing Arrangement**

**200-250 V Fusing Arrangement**



4. Reinstall the cover assembly. The indicator pin should now be visible in the 240V position.

## REPACKING AND STORAGE

### REPACKING FOR SHIPMENT

Whenever electronic equipment is to be shipped it is best to repack it as it was originally shipped from the factory.

1. If the original packing material is unfit for use, or is not available, call the nearest CalComp representative for packing instructions.
2. Unplug all the cables from the digitizer tablet.
3. Leave all circuit boards inside the tablet during shipping. It is recommended, due to the highly static-charged packing materials, that the cursor or any extra electronics boards be shipped inside approved anti-static plastic bags. **Do NOT use ordinary plastic bags.** If no other material is available, wrap items in household aluminum foil prior to shipment.
4. Return the tablet and all accessories to their proper compartments within the tablet crate.
5. Re-close the tablet crate.

If you are shipping the tablet or accessories to a CalComp Service Center for repair, attach a tag to the equipment with the following information:

1. Model Number
2. Serial Number
3. Contract number under which the unit was purchased
4. Return Authorization Number (if applicable)

### TABLET STORAGE

1. Do not exceed storage temperature or humidity limits of the 9100 Digitizer specifications listed on page 162.
2. Store the tablet in its carton in an upright position, resting on one of the frame edges.
3. Do not place heavy weights on the carton.

## RETURNING A TABLET FOR SERVICE

Call the number listed below for your area. The service dispatcher will either arrange a service call, or give you a Return Authorization Number and the address of the nearest repair facility. If your area is not listed, contact your local CalComp distributor for repair information.

Do not ship a tablet to CalComp without this Return Authorization Number. Any tablets received without a Return Authorization Number are returned to the sender immediately.

|   |                |
|---|----------------|
| Southern California   | 1-800-247-5750 |
| Arizona, New Mexico, Nevada (southern)  | 1-800-331-0352 |
| Washington, Oregon, Northern California, Idaho, Alaska, Northern Nevada   | 1-800-451-7568 |
| Colorado, Utah, Nevada (western), N. Dakota, S. Dakota, Missouri, Nebraska, Kansas, northern Wisconsin, southern Illinois, Wyoming, Montana, Iowa | 1-800-433-1294 |
| Georgia   | 1-800-342-7371 |
| N. Carolina, S. Carolina, Tennessee, Florida, Alabama, eastern Arkansas, eastern Mississippi  | 1-800-962-2667 |
| Texas, Oklahoma, western Arkansas, western Mississippi, Louisiana   | 1-800-433-4915 |

## SPECIFICATIONS

### FUNCTIONAL

|               |   |
|---------------|---|
| Resolution    | variable, user selectable up to 1280 LPI, 50 LPmm.                      |
| Accuracy      | ± .01 inch (.254 mm) in the active area<br>± .005 inch option available |
| Repeatability | .001 inch   |
| Data Rate     | variable, user selectable up to 100 coordinate pairs per second.        |
| MTBF          | 19,000 hours  |
| MTRR          | 15 minutes  |

### ELECTRICAL

|               |  |
|---------------|--|
| Power         | 100 watts maximum (tablet)   |
| Consumption   | 460 watts maximum (light pan)  |
| Input Voltage | 90 - 110 VAC at 50 Hz<br>110 - 130 VAC at 60 Hz<br>190 - 210 VAC at 50 Hz<br>210 - 250 VAC at 60 Hz<br>+ 5, + 12, -12 VDC option available |

### REGULATORY

|                  |   |
|------------------|---|
| Safety:          | UL478 and DIN IEC 380/VDE 0806/8.81 and CSA Standard 22.2 |
| Electromagnetic: | FCC Class A, International VDE-B                          |

### ENVIRONMENTAL

|                     |  |
|---------------------|--|
| Temperature         |  |
| Operating:          | 50 to 105 degrees F<br>10 to 40 degrees C    |
| Storage:            | -131 to 167 degrees F<br>-55 to 75 degrees C |
| Humidity range:     | 0% to 95% non-condensing                     |
| Operating altitude: | up to 15,000 feet ASL                        |
| Storage altitude:   | up to 50,000 feet ASL                        |



**PHYSICAL**

| ACTIVE AREA                      | FRAME SIZE     | WEIGHT  |
|----------------------------------|----------------|---------|
| <b>STANDARD SURFACE</b>          |                |         |
| 14" x 36"                        | 26.5" x 48.5"  | 50 lbs  |
| 356 x 914 mm                     | 670 x 1230 mm  | 23 Kg   |
| 17" x 24"                        | 28.5" x 35.5"  | 40 lbs  |
| 432 x 610 mm                     | 720 x 900 mm   | 18 Kg   |
| 24" x 24"                        | 36.5" x 35.5"  | 50 lbs  |
| 610 x 610 mm                     | 930 x 900 mm   | 23 Kg   |
| 24" x 36"                        | 36.5" x 48.5"  | 60 lbs  |
| 610 x 914 mm                     | 930 x 1230 mm  | 27 Kg   |
| 36" x 48"                        | 46.5" x 58.5"  | 95 lbs  |
| 914 x 1219 mm                    | 1180 x 1490 mm | 43 Kg   |
| 44" x 60"                        | 55" x 70.5"    | 120 lbs |
| 1219 x 1524 mm                   | 1400 x 1790 mm | 55 Kg   |
| <b>BACKLIT WITH LIGHT PAN</b>    |                |         |
| 24" x 36"                        | 36.5" x 48.5"  | 110 lbs |
| 610 x 914 mm                     | 930 x 1230 mm  | 50 Kg   |
| 36" x 48"                        | 46.5" x 58.5"  | 160 lbs |
| 914 x 1219 mm                    | 1180 x 1490 mm | 73 Kg   |
| 44" x 60"                        | 55" x 70.5"    | 235 lbs |
| 1219 x 1524 mm                   | 1400 x 1790 mm | 106 Kg  |
| <b>BACKLIT WITHOUT LIGHT PAN</b> |                |         |
| 24" x 36"                        | 36.5" x 48.5"  | 60 lbs  |
| 610 x 914 mm                     | 930 x 1230 mm  | 27 Kg   |
| 36" x 48"                        | 46.5" x 58.5"  | 90 lbs  |
| 914 x 1219 mm                    | 1180 x 1490 mm | 41 Kg   |
| 44" x 60"                        | 55" x 70.5"    | 115 lbs |
| 1219 x 1524 mm                   | 1400 x 1790 mm | 52 Kg   |

**NOTE**

All standard tablets and backlit tablets without light pans are 2.2" (55 mm) deep. The backlit tablets with light pans are 7.5" (190 mm) deep.

## OPTIONS AND ACCESSORIES

To order any of the items below, either contact your CalComp distributor or call 1-800 CALCOMP (1-800-225-2667) and ask for order entry.

| MODEL<br>NUMBER | DESCRIPTION |
|-----------------|-------------|
|-----------------|-------------|

### STYLUS AND CURSOR OPTIONS

|       |                                   |
|-------|-----------------------------------|
| 91034 | 4-Button Cursor (In-line Pattern) |
| 91035 | 4-Button Cursor (Diamond Pattern) |
| 91036 | 16-Button Cursor                  |
| 91037 | 16-Button Cursor (9000 Style)     |
| 91093 | Pen Assembly w/o Ink              |
| 91094 | Pen Assembly w/Blue Ink           |
| 91095 | Pen Cartridge w/o Ink             |
| 91096 | Pen Cartridge w/Blue Ink          |
| 91097 | Pen Assembly w/Red Ink            |
| 91098 | Pen Cartridge w/Red Ink           |

### ACCESSORIES

|          |  |
|----------|--|
| 91020    | Magnifier Lens Assembly ( 1.5 X magnification) |
| 91021    | High Accuracy Tablet Option ( ± .005 in.)      |
| 91081    | LCD Display                                    |
| 91082    | Cursor/Pen Holder                              |
| 91083    | Accessory Tray                                 |
| 91070    | 110V/60Hz Power Lift Pedestal                  |
| 91071    | 220V/50Hz Power Lift Pedestal                  |
| 91061-01 | Tablet Menu (Standard)                         |
| 91061-02 | Tablet Menu (Smart)                            |
| 15047-1  | Operator's Manual                              |

### FIRMWARE OPTIONS

|       |   |
|-------|---|
| 91012 | Smart w/Universal Formatter               |
| 91013 | Smart w/Universal Formatter and Dataqueue |
| 91014 | Universal Formatter                       |

**COMMUNICATION INTERFACE OPTIONS**

- 91001 RS-232 Dual Port ( DCE and DTE)
- 91002 RS-449/442 Dual Port ( DCE and DTE)
- 91003 GPIB
- 91004 RS-232 Single Port (DTE)
- 91005 RS-232 Single Port (DCE)
- 91006 RS-449/422 Single Port (DTE)
- 91007 RS-449/422 Single Port (DCE)
- 91008 GPIB w/RS-232 Single Port (DCE)
- 91009 GPIB w/RS-449/422 Single Port (DCE)

**INTERFACE CABLE OPTIONS**

- 91041-01 RS-232 Dual Port Cable (For use with 91001) *14071-2*
- 91041-04 RS-232 Dual Port Cable (50 ft.) *-14071-1*
- 91041-02 RS-232 Single Port, DCE (For use with 91005)
- 91041-05 RS-232 Single Port, DCE (50 ft.)
- 91041-03 RS-232 Single Port, DTE (For use with 91004)
- 91041-06 RS-232 Single Port, DTE (50 ft.)
- 91042-01 RS-449/422 Dual Port Cable (For use with 91002)
- 91042-02 RS-449/422 Single Port, DCE (For use with 91007)
- 91042-03 RS-449/422 Single Port, DTE (For use with 91006)
- 91043-01 GPIB Cable Only (For use with 91003)
- 91043-02 GPIB w/RS-232 Port, DCE (For use with 91008)
- 91043-03 GPIB w/RS-449/422 Port, DCE (For use with 91009)

**POWER SUPPLY OPTIONS**

- 91051 110V/50Hz 2 Amp *13914-13*
- 91052 120V/60Hz 1 Amp (Used only with non-SMART options)
- 91053 120V/60Hz 2 Amp (Used with SMART Options)
- 91054 220V/50Hz 2 Amp
- 91055 240V/50Hz 2 Amp



**TABLETS**

Please contact your CalComp representative if you want to order a complete system. These model numbers are for the tablet surface only.

**OPAQUE SURFACE**

|       |                   |
|-------|-------------------|
| 91140 | 14" x 36" Surface |
| 91240 | 17" x 24" Surface |
| 91250 | 24" x 24" Surface |
| 91360 | 24" x 36" Surface |
| 91480 | 36" x 48" Surface |
| 91600 | 48" x 60" Surface |

**BACKLIT SURFACE**

|       |  |
|-------|--|
| 91362 | 24" x 36" Backlit Tablet (120 V), with Light Pan |
| 91482 | 36" x 48" Backlit Tablet (120 V), with Light Pan |
| 91602 | 44" x 60" Backlit Tablet (120 V), with Light Pan |
| 91365 | 24" x 36" Backlit Tablet (240 V), with Light Pan |
| 91485 | 36" x 48" Backlit Tablet (240 V), with Light Pan |
| 91605 | 44" x 60" Backlit Tablet (240 V), with Light Pan |
| 91246 | 17" x 24" Backlit Tablet, without Light Pan      |
| 91366 | 24" x 36" Backlit Tablet, without Light Pan      |
| 91486 | 36" x 48" Backlit Tablet, without Light Pan      |
| 91606 | 44" x 60" Backlit Tablet, without Light Pan      |

*CORNER PIECES*

*13893-1 - BOTTOM CORNERS*

*13892-1 - UPPER RIGHT*

*13892-2 - UPPER LEFT*



*Atlantic Park***AUTOCAD SETUP****INSTALLING THE TABLET**

Set the tablet's internal switches as follows:

**Digitizing Processor Board**

1000 LPI, Format 1, Run mode

SB1                    O O C C C C X X

The switches marked "X" are factory set for tablet size. Don't alter the setting.

**Communication interface board**9600 Baud, 1 stop bit, 7 data bits, even parity, small menu OFF,  
Cursor commands OFF, echo OFF, Port A and B ON, line feed OFF.

SW1                    C O O C C C C O

SW2                    O C C O C C C C

**CONNECTING THE CABLES**

AutoCad™ instructions specify that port "A" of the digitizer be used to connect the tablet and host. If your computer doesn't receive data on Pin 3 of the RS-232C port, you may have to use Port B, swap the transmit and receive lines of port A by moving the jumpers (see page 148) or perhaps use a null modem to swap the data lines.

**INSTALLING THE SOFTWARE**

When you install Autocad™, be sure you give it the correct size tablet.

**IMPORTANT**

Autocad™ has a bug in the CalComp 9100 tablet driver. You must indicate to the program that you are installing a 16-button cursor, regardless of which transducer you are really using.

*MICROSTATION**SB1**SW1**24-CC**36-CC**48-CC**100-CC*

## INSTALLING CHIPS

### CAUTION !

IF YOU INSTALL THE CHIP BACKWARDS, IT WILL BE **DAMAGED** WHEN YOU POWER UP.

IF YOU BREAK THE LEGS, THE CHIP IS NOT REPAIRABLE.

### REMOVING THE BOARD TRAIN

See pages 12 through 14 for instructions. Place the board train on the active area of the tablet, component side up. Make sure the board is flat on the active area and not partially on the frame.

To protect the tablet surface against scratches from the boards, place several layers of paper (newspaper is excellent) under the board.

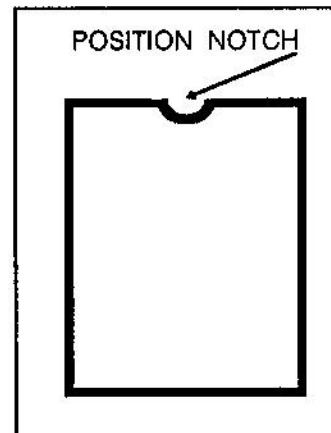
### REMOVING THE OLD CHIP

NOTE IN WHICH DIRECTION THE NOTCH ON THE OLD CHIP IS ORIENTED. THE NEW CHIP MUST BE INSTALLED IN THE SAME POSITION.

Insert a small flat-blade screwdriver under one end of the chip to be removed. Make sure you are **BETWEEN** the chip and its socket, not under the socket. Pry that end up a little bit, then insert the screwdriver under the other end and pry gently. Repeat this several times until the chip is free of the socket.

### INSERTING THE NEW CHIP

INSTALL THE NEW CHIP IN **EXACTLY THE SAME DIRECTION** AS THE OLD ONE. **THE NOTCHES MUST BE FACING THE SAME WAY.**



Align all the legs on one side with the holes in the socket and insert them partially. The legs on the other side may need to be pressed inward to fit into the socket. If so, press them into alignment and **partially** insert them.

**CHECK NOW** to be sure none of the legs are bent under the chip or outside the socket. If a leg is bent, remove the chip from the socket and carefully straighten the leg.

If all the legs are correctly aligned in the socket, place your thumbs on the chip and press it firmly into the socket. Apply the pressure equally on both ends of the chip.

Reinstall the board train and test your new features.

## **INSTALLING BACKLIT 36" AND 48" TABLETS; continued from page 6**

It is easier to first attach the brackets to the light pan, then attach the brackets and pan to the pedestal. Use the board brackets that came with the pedestal for a 91480 and the board brackets that came in the kit #14450-2 for a 91360.

1. Attach the pedestal legs, as explained on pages 4 and 5, if you have not already done so.  
  
Remove the remaining tape and packing material from the pedestal. Drape the switch box over the tubular member so it dangles toward the front of the pedestal. It must be positioned now for later installation.
2. Temporarily hold the board brackets in position, as shown in Figure 3, page 6. **DO NOT ATTACH THEM** at this time. Instead, note which of the slotted holes will be obstructed by the pedestal.
3. With another person's help, hold the tablet vertical, with the power input and fan of the light pan on the upper side.
4. Using the screws in the 14550-1 kit, loosely mount the board brackets to the light pan. **DO NOT USE A POWER SCREWDRIVER!**  
  
Do not use the hole that will be obstructed by the tilt mechanism. The round hole on each bracket should be at the top.  
  
The holes for the cap screws must be toward the **outer edge** of the tablet.  
  
**DO NOT TIGHTEN THE SCREWS YET** - you may need some movement in the brackets for step 6.
5. Move the tilt arms on the pedestal to horizontal. You might have to apply power to do this.
6. With another person's help, lift the tablet into position on the pedestal base so that the power input is toward the **REAR** of the pedestal from an operator's point of view. (This is easiest with two persons to lift and one to guide their movements.)  
  
The brackets must be outside the tilt arms.
7. Position the tablet so that the cap screws removed in Step 9, page 6, can be re-installed. Loosely start all of the cap screws, then tighten when all 4 (6) are in place.
8. As one or more persons supports the weight of the tablet, carefully tilt the tablet to vertical. Finish tightening the screws that hold the bracket to the light pan.
9. Return to page 8, step 4, and attach the lift switch. The remainder of the installation will be found on page 10 and succeeding pages.



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