

# ***SUPER SURVEYOR<sup>TM</sup>***

**HP-71B**

DATA COLLECTOR AND STAKE OUT COMPUTER  
software developed by a land surveyor

for use with all  
ELECTRONIC TOTAL STATIONS

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## A. INTRODUCTION

The *SUPER SURVEYOR™* software was initially developed to fill the need for a data collector which would support the HP-3820A Electronic Total Station. It is now a field measurement system capable of supporting all Electronic Total Stations.

This manual, although tutorial for the use of the software, is not intended to teach the user surveying techniques nor the mathematical principles used in surveying. **It is recommended that the user read the manual from cover to cover before attempting to use the system.** It contains hints on how to optimize the use of the system. In addition it gives hints on how to integrate the measurement process with calculations made in the "Survey Pac". Once the user is familiar with each function key the Manual will probably not be needed for more than a quick reference. The manuals included with the other elements of the system are also required reading.

The process of field measurement is facilitated by the *SUPER SURVEYOR™* in its simplicity of concept and use. The functions are kept to a minimum to avoid distracting the user.

This system represents the minimum effort required to perform a data collection or stake out survey. The user is reminded that he is free and possibly obligated to employ any additional methods or techniques which he might judge necessary in the performance of his duty as a Land Surveyor or subordinate.

Richard H. Cassera, LS 4283 (Calif)

August 1, 1985

Revised: November 1, 1986

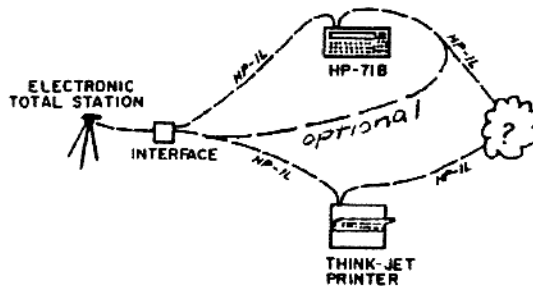
## B. HARDWARE CONFIGURATION

The minimum hardware required by the system is:

1. TOTAL STATION (may be semi-auto and used with HANDNTRY)
2. HP71B COMPUTER
3. HP82401A HP-IL MODULE
4. Field Interface (not necessary for HANDNTRY)
5. *SUPER SURVEYOR™* firmware
6. HP82483A SURVEYING PAC
7. Optional Memory Modules or Portable Disk (HP9114)

The list of optional peripheral devices is limited to those which communicate on the HP-IL. You may wish to add a mass memory to the system if you require larger point storage capacity. The ThinkJet printer may be used interactively or at a later time through the use of the "PRINTFILE(0)". The printer used interactively provides a valuable backup and helps develop confidence in the new system. Either way the printer provides a legible and accurate record of the field work thus the operator is relieved of most of the burden of taking field notes.

The system is wired according to the schematic:



**NOTE:** Devices on the loop can be connected in any order. Only the first interface, first printer device and first mass storage device are utilized by the program.

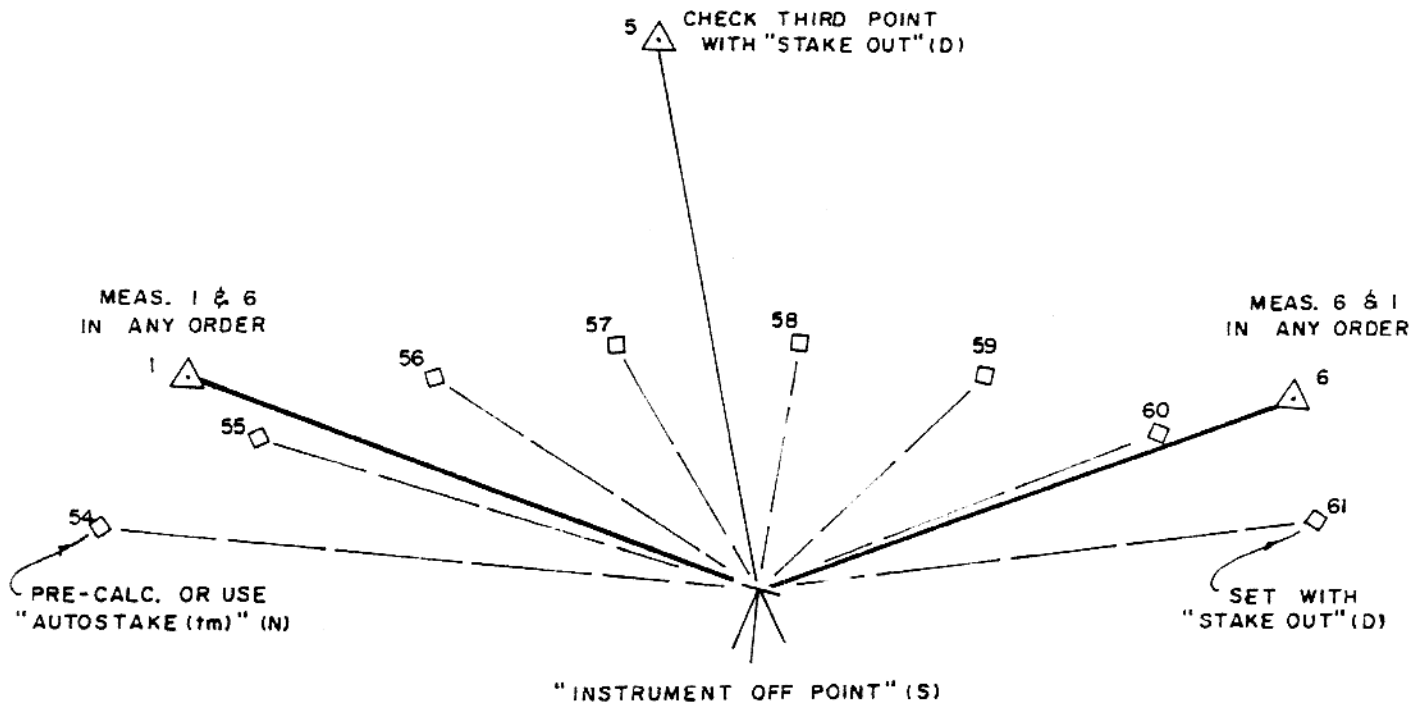
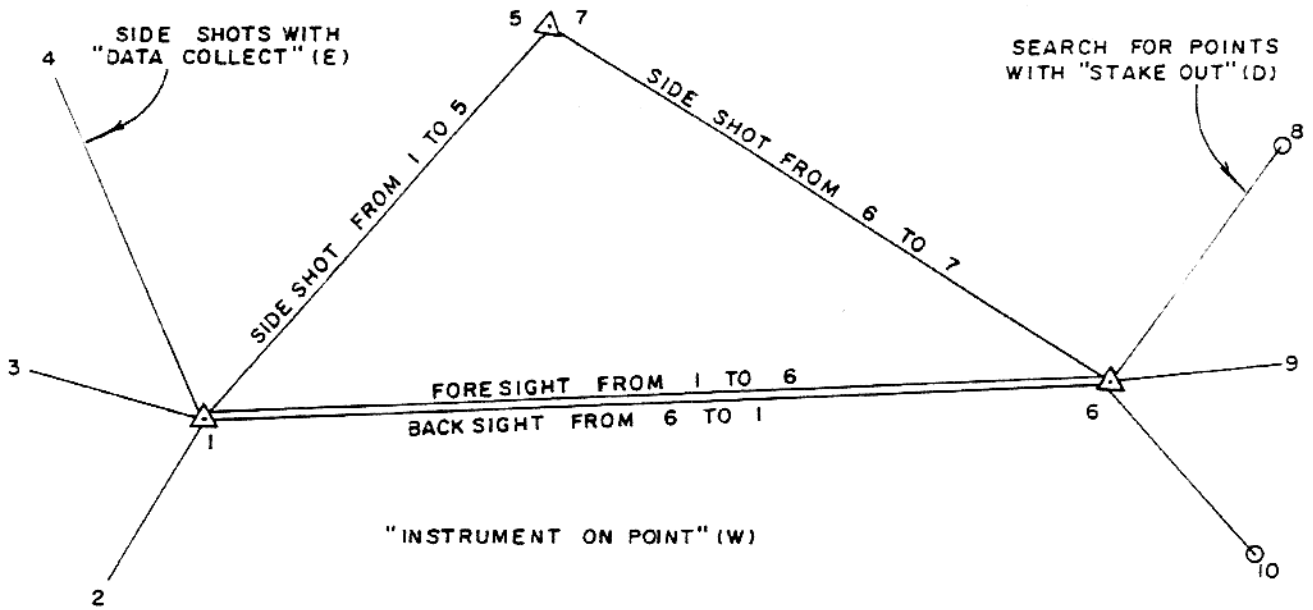
## C. METHODOLOGY

As with traditional surveying techniques, a data collector survey must be organized ahead of time to insure that the objectives will be met. The following discussion will serve as a guide to that necessary planning.

*SUPER SURVEYOR™* operations are commenced and completed at a single instrument Set Up. Each instrument Set Up is treated as if it were a complete survey. The raw measurements are processed into coordinates as they are being made. Because of this, the order of Set Ups may be dictated by the need to carry control forward. However, different Set Ups may also be on assumed bases and linked together later in the office through their common observations.

- I. Traversing is accomplished by linking Set Ups together through the "INSTRUMENT ON POINT"[W] function.
- II. Side shots and future Set Ups are established by the "DATA COLLECT"[E] function.
- III. Inversing or Radial stake out is calculated and performed with the "STAKEOUT"[D] function.
- IV. Locating the instrument by re-section is accomplished through the "INSTRUMENT OFF POINT"[S] function.
- V. Multiple measurements in traversing are made with one combination of "INSTRUMENT ON POINT"[W] and "DATA COLLECT"[E] for each set. Collect the foresights into different point numbers and average them using the [\*] function in "COGO"[X].

(CHECK ON 5 BY MEASURING FROM 6)  
(IF ACCEPTABLE AVERAGE COORDS. (X))



## D. FUNCTION KEY DEFINITIONS

There are just a few simple rules to follow when operating the *SUPER SURVEYOR™*:

- In general, the keys are organized to be selected from top to bottom and the rows are organized from left to right. You should not have to execute "NEW SETUP"[Q] or "INSTRUMENT ON/OFF POINT"[W/S] more than once per Set Up.
- When you see the prompt *Select function* you are in the Function Mode and can press any function key. If you do not see *Select function*, you can return to Function Mode by pressing any blank or un-programmed key. When you are in any other mode you can **not necessarily** press any function key. The FUNCTION KEY DEFINITIONS will explain when you can.
- When you enter a function **always respond to the prompts.** *SUPER SURVEYOR™* will only ask you for necessary information and will usually provide a default input.
- If a default value appears after a prompt, you can enter it by pressing "ENTER"[END LINE]. or change it using display editing (alpha -numeric keys and arrow keys).
- Defaults for [Yes/No] answers are always [No] to prevent you from accidentally making a wrong choice.
- To end a Set Up, press "END SETUP"[Z].
- To turn the HP71B off press (gold)[f]; [ON]
- Note that **Curvature and Refraction corrections** are computed and applied to the raw data by the *SUPER SURVEYOR™* in the same manner as the Total Station. For equations refer to the Total Station Manual.

Conventions for depicting and contrasting the various displays and printouts are:

[Q] denotes an actual key stroke (e.g. "Q" key).

*italics* denote information in the display of the HP-71B (both prompts and results).

<*intermittant display*> indicates information which will flash on the display but is not important enough to note, observe or print out.

**Bold face** denotes user input through HP-71B key board

Normal Print denotes information output to Printer and/or printer-file.



## GETTING STARTED

It will be helpful to have the overlaid keyboard or picture in front of you as you go through this manual.

If you have just taken delivery of this product read the part on "INITIALIZE"[M] (page 23) and "COGO"[X] (page 11) and then return to this point. The program module must be inserted into **PORT(4)** or **PORT(5)** in order for it to locate the right keys file. Turn the computer on and execute **RUN SUPRSURV**. When the Banner message is finished and you see the Function Mode prompt (*Select Function*), press the "INITIALIZE"[M] function key and enter the information prompted for. The HP-71B will now contain the additional files: NOFILE, SAVE, LOGO, keys, and SURV3. **When you finish with "INITIALIZE"[M] the program will send you to "NEW SETUP"[Q] automatically.**

Power up the peripherals first. Then press the [ON] key on the HP-71B and it will display the following:

```
[ON]the SUPER SURVEYOR(tm)
      Copyright 1985 by
      CASSERA SURVEYS, INC.
      <intermittant display>
      Select Function
```

**HINT:** The printer will skip over the paper perforation if the paper is positioned at the top prior to powering up the printer.

"NEW SETUP"[Q]:

This function is used for each new instrument setup and also to change the coordinate file name for a new job. A computing or data transfer session is also a "NEW SETUP"[Q] Press function key "NEW SETUP"[Q] and enter coordinate file name when prompted. The printer will print your own logo and time, date and file name. The program will return to Function Mode. You can now select a function from the second column or "END SETUP"[Z].

**HINT:** You may **FREEPORT** any RAM Module and establish your file in that PORT for additional protection against an accidental *MEMORY LOST* condition.

*EXAMPLE OF INPUT FOLLOWS*

Select Function [Q]  
<intermittant display>  
"YOUR COMPANY NAME"  
"YOUR ADDRESS"  
"YOUR CITY, STATE, ZIP"  
"YOUR TELEPHONE NUMBER"  
SURVEY OF 07/23/85 Time 15:59:10  
File? BAYSHORE:PORT(1) [END LINE]  
File name: BAYSHORE  
Scale factor> 1.000000000 [ENDLINE]  
<intermittant display>  
Select Function

**NOTE:** If "NOFILE" appears in the display, then you must create the coordinate file by responding to the prompt: *(Old,New,Ignore) file>* [N];[ENDLINE].and entering the information prompted for.

"RESTART"[A]:

This function is analogous to a reset key. "RESTART"[A] is used to reset the HPIL interface. The setup, reference and rod information are remembered. If you get the message: "Stmt not fd" then press (blue)[g];"RESTART"[A]; "RESTART"[A]. If you still get the same message press [RUN].

"END SETUP"[Z]:

Press the "END SETUP"[Z] when the current instrument set up is finished. **Do not** press "END SETUP"[Z] if you are **not** finished with the Set Up. You may turn the HP71B off with out executing "END SETUP"[Z]

"INSTRUMENT ON POINT"[W]:

This option is used primarily for control surveying and data collection but can also be used for radial stake out. You must be setup over a coordinated point and measure another point for a backsight.

Enter the instrument and backsight point numbers when prompted and also the height of instrument and height of staff. When "Measure Backsight" appears in the display, make a complete measurement\* and output.

Since the backsight measurement is in effect a reciprocal or redundant measurement, it can be used to increase the precision of the currently occupied point when traversing. This feature is an option offered by the display at the end of the backsight measurement. If no distance was output the correction option will be skipped.

When the measurement has been made and accepted, the option "*Apply cor (n=e,el=)?[Y,N]*" will appear in the display. Entering Yes will cause the currently occupied point to be corrected by the average of the two measurements between occupied and backsight points and store the corrected coordinates in the occupied point number. Entering No will end the function without changing any points.

```
      Select Function [W]
      Inst , Bk st? 1, 2;[END LINE]
      HI, HS? 5.25, 4.40;[END LINE]
Instrument over Point 1          Backsight Point 2
Instrument Height 5.25          Rod Height 4.40
Control point 1 N=1000.000 E=1000.000 EI=100.000
Control point 2 N=2353.567 E=3245.123 EI=212.769
      Measure Backsight [output measurement]
      Apply Cor (-0.03, 0.02, 0.03)? [Y];[ENDLINE]
Point No. 1 changed to 999.970 1000.020 100.030
      Select Function
```

**\*NOTE:** A complete measurement is Direction, Zenith angle and Slope distance even though the slope distance may be zero. See APPLICATION NOTES for Specific Total Stations. Note that **Curvature and Refraction corrections** are computed and applied to the raw data by the *SUPER SURVEYOR™* in the same manner as the Total Station. For equations refer to the Total Station Manual.

"INSTRUMENT OFF POINT"[S]:

This function is used primarily for radial stake out but can also be used for establishing new control points and data collection. You can setup any where you can observe two coordinated points. The only restriction is that the angle at the occupied point between the two control points be greater than 90 degrees but less than 270 degrees. This is to insure a geometrically strong figure for locating the instrument (See **CAUTION** below).

Enter the two control point numbers in the order that they are to be observed and also the height of staff when prompted. When "Shoot Pt. n" appears in the display and an audible tone is heard, make a complete measurement. This is done once for each control point. When the measurement has been made and accepted, the option "Store Inst.?" will appear in the display. Entering a No will end the function without storing any points in the coordinate file. Entering a Yes will obtain the prompt: "Pt. No. to Save?". Entering a point number will obtain the prompt: "Inst. Height?". When you have entered the H.I. the coordinates of the point set under the instrument will be stored in the coordinate file for later use.

Select Function [S]

1st , 2nd Pt? 3, 4;[END LINE]

H.S. 1st Pt, 2nd Pt.? 4.40,4.40;[END LINE]

Staff? 4.40 [END LINE]

Instrument Off Station

First Point Shot 3 Second Point Shot 4

Glass Height Pt 3 is 4.40 Glass Height Pt 4 is 4.40

Rod Height 4.40

Control point 3 5000.000 5000.000 100.000

Control point 4 5123.456 5432.123 89.650

Shoot Pt. 3 (beep) [output measurement]

Shoot Pt. 4 (beep) [output measurement]

Instrument Coordinates 5445.271 5440.439 83.950

Store Inst.? [Y/N] [Y];[END LINE]

Pt. No. to Save? 5;[END LINE]

Inst. Height? 5.25;[END LINE]

Instrument Height 5.250

5 5445.271 5440.439 78.700

Select Function

**HINT:** The measured distance and elevation differential between the two control points are compared with the previously stored values and any difference is distributed proportionally along the triangle sides. **This makes it desirable to check a third control point with "STAKE OUT"[D].** The "STAKE OUT"[D] function does not make any adjustment to the measurements and thus will show the precision with which the instrument was located.

"COGO"[X]:

This function key will save all the currently occupied information and send program control to the "Survey Pac" for any necessary calculations you may need to perform on the collected data or changes in the stake out data. The coordinate file structure is discussed in the Surveying Pac Owner's Manual. You can re-enter the Data collector from the "Survey Pac" through the top menu function [S].

```
      Select Function [X]
      <intermittant display>
      file name BAYSHORE [END LINE]
COORD FILE: BAYSHORE
(perform calculations, when you wish to return
to the data collector Exit to Top Menu)
      File, Cogo, Suprsurv, *> [S] [ENDLINE]
      the SUPER SURVEYOR(tm)
      Copyright 1985 by
      CASSERA SURVEYS, INC.
      <intermittant display>
      Select Function
```

The top menu selection "[\*]" will take you to the enhanced functions: Offsets from a Line and Point Average.

The Offsets routine will display the distance along a line and the offset from a line as defined by two point numbers. Pressing "ENTER"[ENDLINE] in response to the prompt will exit to the menu.

The Point Average routine will take the coordinates of points one at a time, make a running average and store the average into the first point number selected. Pressing "ENTER"[END LINE] will exit to the menu.

**CAUTION:** If you use "COGO"[X] to alter your setup control then you must re-execute "NEW SET UP"[Q] and "INSTRUMENT ON/OFF POINT"[W]/[S]. Also if you create a new file "COGO"[X] will take you to "NEW SETUP"[Q] automatically.

"DATA COLLECT"[E]:

This function is used to measure existing points such as monuments or topographic features and store the three dimensional coordinates in the coordinate file. After pressing the "DATA COLLECT"[E] function key the display will prompt you for "1st Pt to Collect?". Enter the first number in a block of empty point numbers or the one empty point number you want to store measured coordinates in. The display will then prompt you to "Measure Pt No. n". Make a complete measurement to the target. The display will increment the points by one each time and prompt you to measure the next one. The data collector is continuously waiting for incoming data from the Electronic Total Station. You can **exit** the data collect mode by **outputting data which does not include the distance**. You will see the prompt "Slope dist or EXIT>". Press the "EXIT"[C] to return to Function Mode.

```
      Select Function [E]
      <intermittant display>
      1st Pt to Collect? 2 [END LINE]
Data Collection
Point      Northing      Easting      Elevation
  2  Measure Pt No. 2 [output measurement]
      5450.323      5430.898      80.919
  3  Measure Pt No. 3 [output measurement]
      5450.229      5430.849      80.695
      Measure Pt No. 4 [output incomplete meas]
      Slope dist or EXIT> [C]
      Select Function
```

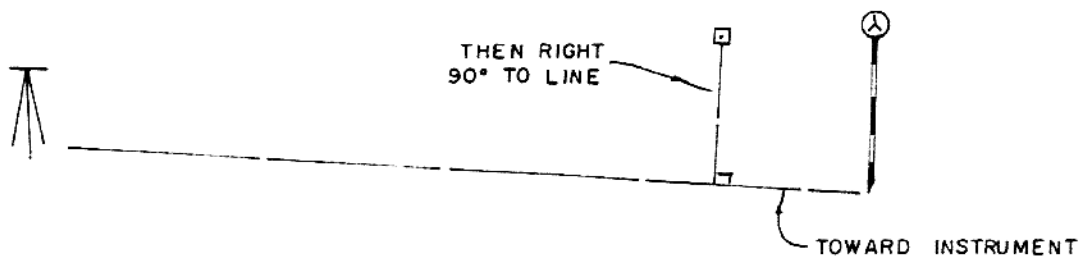
## "STAKE OUT"[D]

This function is used to set precoordinated points (may be created with "AUTOSTAKE™"[N] ) which are stored in a coordinate file. If design elevations are stored then the program will compute Cut or Fill.

Enter the "STAKE OUT"[D] mode and you will be prompted with "Slope staking?". If you enter YES you will then be prompted for two slope ratios. Enter the two slopes as "2" for 2:1 or "1.5" for 1-1/2:1. You will then be prompted for "Stake Point?". Enter the number of the desired point to set and display will give the distance from the instrument and the "DIR" to track to obtain line on the point. Press the "ENTER"[ENDLINE] or "RESUME"[V] key on the HP-71B to continue.

Make a complete measurement when prompted to do so. When the measurement has been made and accepted the display will show corrections to the rod to obtain the desired location. **The corrections will be in the rodman's frame of reference:** "T" or "A" = Towards the instrument from the rodman or Away from the instrument through the rodman; "R" or "L" = rodman's Right or Left looking at the instrument; "C" or "F" = Cut or Fill from stake elevation to design elevation. Corrections are given in feet and two decimals thereof. You may now scroll the display left to view the stake elevation. Press the "ENTER"[END LINE] or "RESUME"[V] key on the HP-71B to continue. The display will return to "Stake Point?" and the number of the point being set. Pressing "ENTER"[END LINE] will repeat the process until the corrections are acceptable. **The next four function keys can be pressed when in the "STAKE OUT"[D] mode in response to the prompt "Stake Point?" as well as in the Function Mode.**

```
Select Function [D]
<intermittant display>
Radial Stake Out
Slope Staking? NO [END LINE]
Stake Point# 2 [END LINE]
Trk Dir 193 18 57 Dist out 500.45 [END LINE] or [V]
Make Shot [output measurement]
T 3.01 R 2.13 F 1.23 (display continues)
Design Elev=124.78 Stake Elev=123.45 [END LINE] or
[V]
Stake Point# 2
```

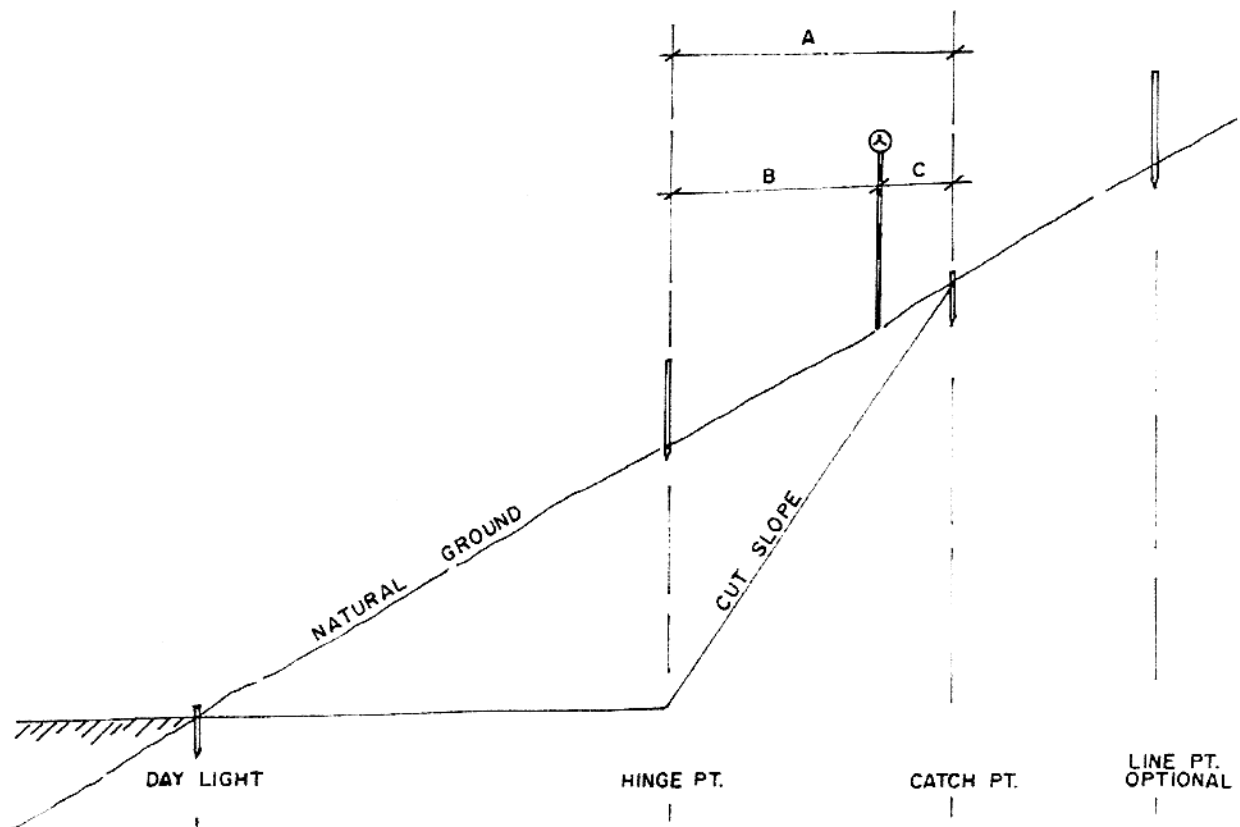


**Slope Staking:** This is a sub-program of "STAKE OUT"[D]. It combines the slope ratio (hinge point to catch point) with the measured cut/fill (rod to hinge point) to calculate the theoretical distance from hinge point to catch point if the ground were flat from the rod. Since the slope of existing ground is entirely unpredictable from the instrument, this gives the rod man the discretion to compensate for local slope.

When prompted for *Stake Point#* enter the hinge point number. You may now set the hinge point for a sight or use the "Move in/out" distance to adjust the rod closer to the catch point.

In the diagram "A" is the "Catch at" distance; "B" is the "Rod at" distance and "C" is the "Move in/out" distance. Line is obtained visually by the rod man sighting through either hinge points, centerline or line points. This reduces the number of trials necessary to achieve the "Catch point". Once it is set, shot and printed, the coordinates, elevation and slope staking information are all available to make any necessary double checks.

The day light point may be set like any other slope stake if you convert the pad slope from the percentage that is usually given to a slope ratio: **[slope ratio] = 100/[percent slope]** ie.  $100/[1\%] = [100:1]$ . Flat slopes are more easily staked from the cut/fill than the distance in/out. If the pad is level, use the hinge point for elevation only (ignore the corrections) and search for a cut/fill of zero (grade).





"EXIT"[C]:

When stake out is finished or interrupted you can return to the command mode by pressing this function key. You can also use "EXIT"[C] to return to the Function Mode from any measurement mode by **outputting a measurement without the distance** to obtain the prompt "*Slope dist or EXIT>*".

"PRINT"[F]:

This function is used to print the **stake out "cut sheet"** information when the stake is set in the proper location and a record of the accuracy and elevation information is desired. The "PRINT"[F] function key may be pressed when the corrections are displayed or when the prompt "*Stake Point?*" is displayed. It is **used exclusively in the "STAKE OUT"[D] mode.**

```
Stake Point? [F] PRINT
Point Number 2 Set at 16:03:02      08/15/86
Design Coordinates N=5000.000 E=5000.000 Design Elevation
EI=400.00
Stake Coordinates N=5000.001 E=4999.998 Design Elevation
EI=398.00
L 0.01 T 0.02 F 2.00
Stake Point?
```

If the "PRINTFILE(0)" is active then all information intended for the printer will also be stored in a sequential text file named after the coordinate file with a "P" appended to the end. Remember to allow approximately 100 points (2400 bytes) **worth of memory** for each page to be stored out in the printer-file. The printer file may be sent to HP-IL device one (printer or interface to host computer) by pressing (blue)[g];"DATA OUT"[J]. You can erase the printer-file with the built-in PURGE function.

"OBSERVE REFERENCE"[R]:

This function may be disregarded for all instruments which have an electronic Zero Set feature. It is recommended that a reference object be selected and used for Zero Set prior to the Instrument location function. This will enable the operator to periodically check his Zero backsight and correct up at will independently of the *SUPER SURVEYOR™*.

See the APPLICATION NOTE: HP3820A USERS

"CHANGE ROD"[V]:

It sometimes becomes necessary to extend or collapse the rod to avoid obstructions to a clear sighting of the reflector. When this is done press the "CHANGE ROD"[V] function key and enter the new rod or staff height when prompted to do so. **If it is changed back, do not forget to "CHANGE ROD"(V) in the computer.** This key may be pressed in the "STAKE OUT"[D] mode as well as the Function Mode.

*Select Function [V]*  
*<intermittant display>*  
*Staff? 5.40 [END LINE]*  
Rod Height changed to 5.40  
*Select Function*

"PLAN"[Y]:

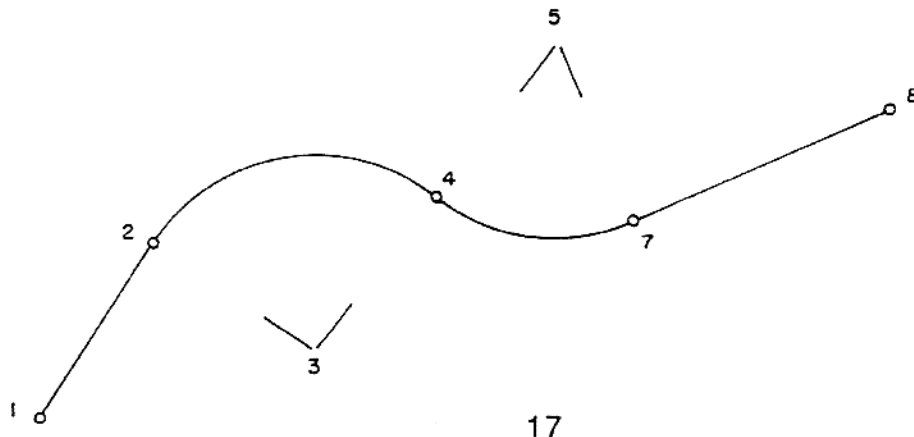
This is the entry into the Plan Figure Editor. The entire row of keys ("PLAN"[Y], "PROFILE"[H] & "AUTOSTAKE™"[N] ) will print interactively to the ThinkJet printer but do not print to the print file. There are three menu items: [List/Del/Add] and no entry for exiting to the Function Mode.

"List" will display all the Plan Figure numbers on the display and all the contents of all the Plan Figures on the printer. It is recommended to make a "List" prior to any "AUTOSTAKE™"[N] activities.

"Del" will erase the selected figure from memory after you make a confirmation. Entering "A" or "All" instead of a figure number will enable you to kill all of the stored figures and start over. This is helpful if the figures have been corrupted some how.

"Add" will prompt you for a new figure number and then prompt for Point number; if it is an Angle point or Radius point and if the curve goes to the Right, Left or Not applicable. The point numbers do not need to be in any numerical order or even be coordinated points at the time of Figure formation. Three items are necessary for each input line and so [N] can be the last item (curve direction) entered for an Angle point. The figures are stored in the coordinate file starting with the first non-accessable point number and ending with -999999/-999999/-999999. See the APPENDIX for an example of stored figures in the office computer.

```
Select Function [Y]
[List,Del,Add] figs? [A];[ENDLINE]
Figure#> 1;[ENDLINE]
Pt#,Ap/Rp,Rt/Lt/Na> 1,A,N;[ENDLINE]
Pt#,Ap/Rp,Rt/Lt/Na> 2,A,N;[ENDLINE]
Pt#,Ap/Rp,Rt/Lt/Na> 3,R,R;[ENDLINE]
Pt#,Ap/Rp,Rt/Lt/Na> 4,A,N;[ENDLINE]
Pt#,Ap/Rp,Rt/Lt/Na> 5,R,L;[ENDLINE]
Pt#,Ap/Rp,Rt/Lt/Na> 7,A,N;[ENDLINE]
Pt#,Ap/Rp,Rt/Lt/Na> 8,A,N;[ENDLINE]
Pt#,Ap/Rp,Rt/Lt/Na> [ENDLINE]
Finished? [Y];[ENDLINE]
```



## "PROFILE"[H]:

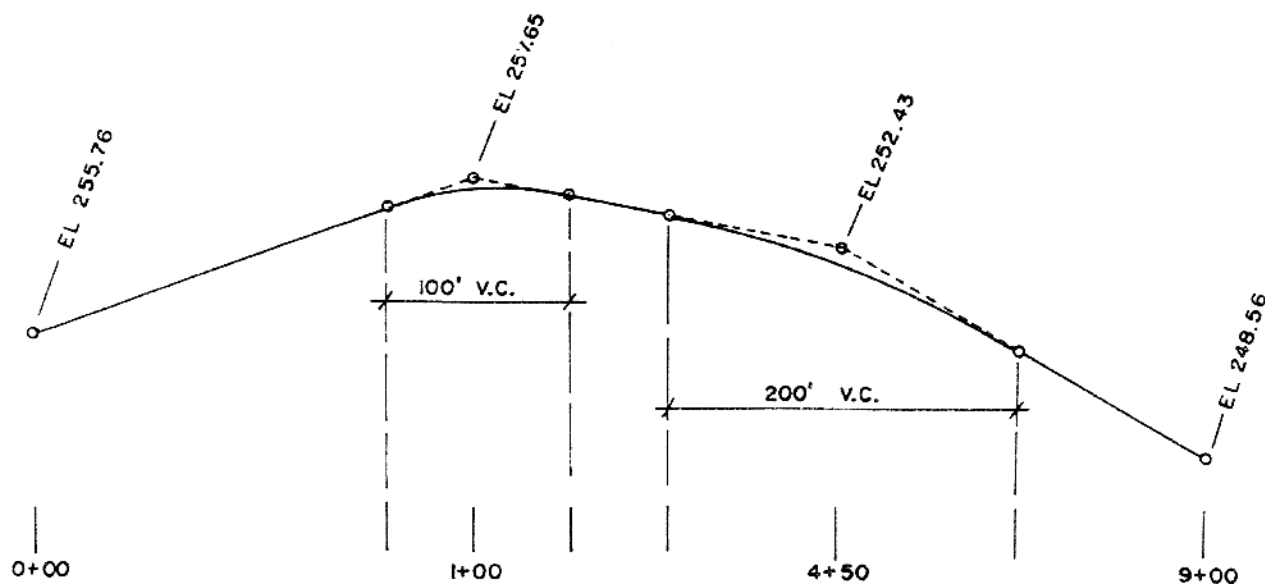
This is the entry into the Profile Figure Editor. The entire row of keys ("PLAN"[Y], "PROFILE"[H] & "AUTOSTAKE™"[N] ) will print interactively to the ThinkJet printer but do not print to the print file. There are three menu items: [List/Del/Add] and no entry for exiting to the Function Mode.

"List" will display all the Profile Figure numbers on the display and all the contents of all the Profile Figures on the printer. It is recommended to make a "List" prior to any "AUTOSTAKE™"[N] activities.

"Del" will erase the selected figure from memory after you make a confirmation. Entering "A" or "All" instead of a figure number will enable you to kill all of the stored figures and start over. This is helpful if the figures have been corrupted some how.

"Add" will prompt you for a new figure number and then prompt for Station, Elevation and Length of Vertical Curve (if any). If the Station is a grade break the Length is entered as zero. The Stations need to be in order. The figures are stored in the coordinate file starting with the first non-accessible point number and ending with -999999/-999999/-999999. See the APPENDIX for an example of stored figures in the office computer.

```
Select Function [H];[ENDLINE]
{List,Del,Add} figs? [A];[ENDLINE]
Figure#> 1;[ENDLINE]
PIVC,Sta,El,Len VC> 0,255.76,0;[ENDLINE]
PIVC,Sta,El,Len VC> 100,257.65,100;[ENDLINE]
PIVC,Sta,El,Len VC> 450,252.43,200;[ENDLINE]
PIVC,Sta,El,Len VC> 900,248.56,0;[ENDLINE]
PIVC,Sta,El,Len VC> [ENDLINE]
Finished? [Y];[ENDLINE]
```



## "AUTOSTAKE™"[N]

In order to automatically compute coordinates from station/offset and assign design elevations to the staking coordinates, you must first have a Plan Figure and/or a Profile Figure with the same number defined as per the above instructions. If no Profile Figure is present, "AUTOSTAKE™"[N] will end with each point's station stored in its elevation field.

For each computation run you will be prompted once for Figure number, Beginning Station (station of the first point in the Plan Figure), first new point number to begin the block of points being computed, vertical offset from the stored profile to the structure being staked (i.e. -3.00 from centerline finish grade to top of water pipe).

If "DESCRIPTORS(2)" are active then "AUTOSTAKE™"[N] will store the Station/Offset of each new point in its descriptor for later printing on cut sheet. You should make sure the descriptors are large enough for a full Station/Offset without having them too large for available memory.

There are three possible inputs to the prompt: *"[All/Odd] Stations?"*

1. If you press **[A];[ENDLINE]** you will be prompted for interval between stations and offset from plan line (+right,-left). the program will then compute all of the X, Y coordinates, store them in consecutive points beginning with the number you input as first. The stations will be stored in the elevation field of each point for later processing with the Profile Figure. "AUTOSTAKE™"[N] will then return to the *"[All/Odd] Stations?"* prompt. All the computed information will be printed as its being computed.
2. If you press **[O];[ENDLINE]** you will be prompted for offset and station of the odd point. The program will compute the coordinates of the point, store them in the next point number, store the station in the elevation field of the point and return to the *"[All/Odd] Stations?"* prompt.
3. If you press **[ENDLINE]** the program will search for a Profile Figure with the same number. If one is found the elevations will be computed and replace the stations previously stored in the elevation fields. All of the computed information will be printed as its being computed. If no Profile Figure is found the program will exit to Function Mode. See the APPENDIX for an example of a complete "AUTOSTAKE™"[N] calculation.

*EXAMPLE OF INPUT FOLLOWS*

Select Function [N];[ENDLINE]  
Figure#> 1;[ENDLINE]  
Begin Sta> 100;[ENDLINE]  
1st New Pt#> 54;[ENDLINE]  
Vertical O/S> 0;[ENDLINE]  
[All/Odd] Stations? [A];[ENDLINE]  
Offset> -10;[ENDLINE]  
Interval> 25;[ENDLINE]

(computations are being made)

[All/Odd] Stations? [O];[ENDLINE]  
Offset> -10;[ENDLINE]  
Station> 123.45;[ENDLINE]

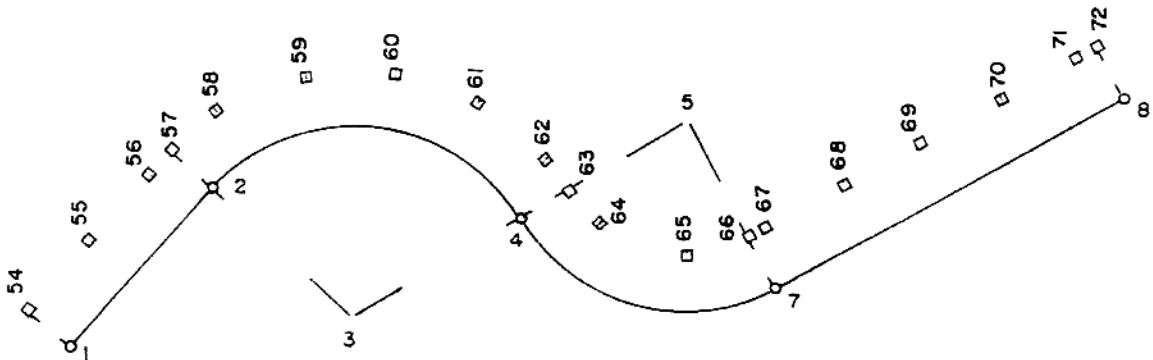
(computations are being made)

[All/Odd] Stations? [ENDLINE]

(computations are being made)

Finished

Select Function



"DATA IN"[U]:

This function provides an opportunity to **enter elevations** alone into points through the keyboard and **edit descriptors** as well as being a general coordinate input to be used with one of the data converters (HP-IB or RS-232C to HPIL) and any computer containing the desired points to be set. If HP-IB is used, the converter should be set to MAIL BOX MODE. If the HP Series 80 HP-IL card is used, it should be set for **not** controller and address 9. If RS-232C is used, the computer's I/O should be set to 1200 baud rate and 8 bit words. DTR and DSR (pins 6 & 20) are used for hardware handshake and receiver protocol is used for software handshake (X-ON; X-OFF).

The input routine expects to enter the data in four or five components as: Point number, Northing or "Y" coordinate, Easting or "X" coordinate, Elevation or "Z" coordinate and descriptor if selected. If your computer does not carry elevations then output a zero for that value. If points in the range to be transferred are skipped the input will skip them also. Enter the range of points to be transferred when prompted to do so. An alternate method of transferring points to the HP-71B would be through an HP-IL compatible computer as a complete coordinate file.

*Select Function [U]*  
*<intermittant display>*  
*Elev Only? NO;[END LINE]*  
*Edit Descriptors? NO;[END LINE]*  
*1st Pt , last Pt? 1, 999;[END LINE]*  
*Waiting on Host*  
*Point nnn Transferred*  
*Select Function*

"DATA OUT"[J]:

This is a general coordinate output to be used with one of the data converters (HP-IB or RS-232C to HP-IL) and any computer which is to process the data collected by *SUPER SURVEYOR™*. If HP-IB is used, the converter should be set to MAIL BOX MODE. If the HP Series 80 HP-IL card is used, it should be set for **not** controller and address 9. If RS-232C is used, the computer's I/O should be set to 1200 baud rate and 8 bit words. CTS (pin 5) is used for hardware handshake and receiver protocol is used for software handshaking (X-ON; X-OFF).

The output will be four or five components of a measurement (Point Number; Northing or "Y"; Easting or "X"; and Elevation or "Z") and descriptor if selected. A "?" chr\$(63) is output at the end of the transfer. If your computer does not carry elevations you must still input the elevation to stay in proper sequence. Enter the range of points to be transferred when prompted to do so. An alternate method of transferring points from the HP-71B would be through an HP-IL compatible computer as a complete coordinate file.

*Select Function [J]*  
*<intermittant display>*  
*1st, last Pt? 1, 999;[END LINE]*  
*Waiting on Host*  
*Point nnn Transferred*  
*Select Function*

If a printer is the only device connected to the loop, **you can simulate data transfer to the printer** as if it were another computer. The resulting printout is identical to the information which is output to the computer.

"OUTPUT PRINTFILE(0)"(blue)[g][J]

This function will send the "PRINTFILE(0)" to the ThinkJet printer or Interface to office computer provided it is connected as Loop Device No. 1.



## "INITIALIZE"[M]

This function is to initialize the computer when you first take delivery of the *SUPER SURVEYOR™* software or to change the custom logo\* which is printed at the top of each page at a "NEW SETUP"[Q]. Press the "INITIALIZE"[M] function key and enter **four** lines of information one at a time when prompted to do so. Each line of information can be any text 80 characters or less.

The next display will be an available Total Station Interface Code. Pressing "ENTER"[ENDLINE] will step you through all of the available total station codes one at a time. When you want to select the code in the display, erase the "?" character with [delete] or a [space] and press "ENTER"[ENDLINE].

The next two prompts will be for Descriptor size (5 min; 71 max) and Default Descriptor. A size of 20 should be adequate for storing Station/Offsets in the "AUTOSTAKE™"[N] routine. Remember that one 21 character Descriptor will take up the same amount of memory as one point in the coordinate file.

The last four options let you select the default conditions for "PRINTFILE(0)"; "POINT PROTECT(1)"; "DESCRIPTORS(2)"; "RAW DATA(3)". These features may also be toggled on/off/on from the keyboard in Function Mode. The visible flag annunciators reveal the state of each feature.

You will then be prompted for date and time. The program will set the system date and time. Note that the order of year, month, and day has been switched around to make it less confusing to the user.

\*Name, Address, Telephone number are merely suggested title information. The four lines will be stored in a file named "LOGO" and be printed when ever the "NEW SETUP"[Q] function key is pressed.

```
      Select Function []]
      <intermittant display>
      YOUR COMPANY'S NAME [END LINE]
      YOUR COMPANY'S ADDRESS [END LINE]
      YOUR COMPANY'S CITY, STATE AND ZIP [END LINE]
      YOUR COMPANY'S TELEPHONE NUMBER [END LINE]
      Total Station? [space]HANDNTRY [ENDLINE]
      Printer File OFF [ENDLINE]
      Point Protect OFF [ENDLINE]
      Descriptors OFF [ENDLINE]
      Raw Data Print OFF [ENDLINE]
      Desc Size (71 max) 20
      Default Desc 20 char max> topo pt
      Date? 08/01/85 (month/day/year)
      Time? 10:15:10 (hours:minutes:seconds-24 hour time)
      Please Wait
      Select Function
```

## "TOGGLE PRINTFILE(0)"[O]

The "PRINTFILE(0)" described under "PRINT"[F] page 15 may be activated and deactivated by pressing [O]. To output the "PRINTFILE(0)" press (blue)[g][J] (See "DATA OUT"[J]).

## "TOGGLE POINT PROTECT(1)"[L]

There are two point protect features: Empty point detection and Full point detection. If you attempt to use empty points for Set up control the program will exit to Function Mode. If you attempt to Data Collect into a full point the program will prompt you for *Overwrite/Search*> . Entering [O][END LINE] will overwrite the point. Entering the default [S][END LINE] will obtain the prompt: *Begin Search W/Pt#*. The default value is the point you attempted to overwrite. Search will find the next empty point and return to Data Collection.

## "TOGGLE DESCRIPTOR(2)"[P]

The descriptor file is named after the coordinate file with a "D" appended to the end. If you select descriptors, a file will be created to supply the default descriptor for each point in your coordinate file. **A 7 char Desc will cut down on the point storage by approximately 25%.** If there is not enough memory the computer will advise you to decrease your file size to the proper number. Each time a point is measured and stored you will be prompted for a descriptor (either the default or the last one entered). Each time staked point information is printed, the descriptor will be printed next to it. Down loading and up loading from and to the office computer must contain a provision for transferring the descriptor as the fifth element of one complete point. If you deselect descriptors they will be ignored but retained for later use. **The "TOGGLE DESCRIPTOR"[P] key will select or deselect descriptors for that setup only.** The Descriptor size only restricts what is stored in the D-File. If Data Collector notes are being kept in a "PRINTFILE(0)" the description will be printed regardless of length.

## "TOGGLE RAW DATA(3)"[=]

If "RAW DATA(3)" is active, each time a measurement is made the angles and distance will be printed. This is useful in documenting a boundary survey or keeping track of how many tries were necessary to achieve a stake point. Since the "RAW DATA(3)" is uniquely identified in the "PRINTFILE(0)", an office program could be written to recognize and utilize it.

# ***AUTO STAKE™***

EXAMPLES

.16	.17	.18	.19	.20	.21	.22	.23	.24	.25	.26	.27	.28	.29	.30	.31	.32	.33	.34	.35	.36	.37	.38	.39	.40	.41	.42	.43	.44	.45	.46	.47	.48	.49	.50	.51	.52	.53	.54	.55	.56	.57																										
.33	.34	.35	.36	.37	.38	.39	.40	.41	.42	.43	.44	.45	.46	.47	.48	.49	.50	.51	.52	.53	.54	.55	.56	.57	.58	.59	.60	.61	.62	.63	.64	.65	.66	.67	.68	.69	.70	.71	.72	.73	.74	.75	.76	.77	.78	.79	.80	.81	.82	.83	.84	.85	.86	.87	.88	.89	.90	.91	.92	.93	.94	.95	.96	.97	.98	.99	1.00

EXAMPLE OF FIGURE STORAGE IN OFFICE COMPUTER  
 SSSMANU 10/20/86

POINTS IN USE FROM 201 TO 225

POINT      NORTHING      EASTING      ELEV or DESC

201	1.000	1.000	5.000
202	1.000	.000	0.000
203	2.000	-1.000	0.000
204	3.000	.000	0.000
205	4.000	1.000	0.000
206	5.000	.000	0.000
207	2.000	1.000	7.000
208	7.000	.000	0.000
209	8.000	-1.000	0.000
210	9.000	.000	0.000
211	6.000	1.000	0.000
212	10.000	.000	0.000
213	11.000	-1.000	0.000
214	12.000	.000	0.000
215	1.000	.000	5.000
216	446.750	367.480	0.000
217	565.110	366.300	100.000
218	665.110	368.800	100.000
219	805.000	376.630	100.000
220	881.170	377.390	0.000
221	2.000	.000	3.000
222	.000	376.010	0.000
223	130.890	377.960	50.000
224	277.880	375.400	0.000
225	-999999.000	-999999.000	-999999.000

NUMBER OF ITEMS IN FIGURE  
 FIGURE TYPE: 1=PLAN / 0=PROFILE  
 FIGURE NUMBER

ALWAYS ZERO FOR PLAN  
 CURVE DIRECTION: 1=RIGHT / -1=LEFT  
 POINT NUMBER

LENGTH OF VERTICAL CURVE  
 ELEVATION  
 STATION

END OF FIGURES CODE

FIGURE ONE - CENTERLINE COORDINATES  
 SSSMANU 10/20/86

POINTS IN USE FROM 1 TO 6

POINT	NORTHING	EASTING	ELEV or DESC
1	10000.000	10000.000	BC
2	10751.803	10273.481	R=800
3	9955.326	10198.484	PRC
4	9457.528	10151.611	R=500
5	9921.466	10338.056	POC
6	9882.551	10414.965	CUL-DE-SAC

FIGURE TWO - CUL DE SAC AND EDGE OF PAVEMENT COORDINATES  
 SSSMANU 10/20/86

POINTS IN USE FROM 7 TO 12

POINT	NORTHING	EASTING	ELEV or DESC
7	9927.960	10361.179	PRC
8	10022.047	10403.092	R=103
9	9919.418	10411.827	PRC
10	9863.899	10383.011	PRC
11	9811.977	10294.055	R=103
12	9907.548	10332.463	POC

-----  
STREET LAYOUT W/CUL-DE-SAC  
CASSERA SURVEYS, INC.  
890-F MONTEREY STREET  
SAN LUIS OBISPO, CA 93401 (805) 541-8040  
-----

NEW SET UP 10/20/86 Time 12:26:29  
Instrument Used: HANDNTRY  
Scale factor is 1  
File Name: JOBFIL

-----  
Plan Figure # 1

Point# 1 is an Angle Point/BC/EC  
Point# 2 is the Radius Point of a Curve to the Left  
Point# 3 is an Angle Point/BC/EC  
Point# 4 is the Radius Point of a Curve to the Right  
Point# 5 is an Angle Point/BC/EC

-----  
Plan Figure # 2

Point# 7 is an Angle Point/BC/EC  
Point# 8 is the Radius Point of a Curve to the Left  
Point# 9 is an Angle Point/BC/EC  
Point# 6 is the Radius Point of a Curve to the Right  
Point# 10 is an Angle Point/BC/EC  
Point# 11 is the Radius Point of a Curve to the Left  
Point# 12 is an Angle Point/BC/EC

-----  
Profile Figure # 1

Station 448.75 is a Grade Break with an Elevation of 367.48  
Station 565.11 is a P.I.V.C. with a Length of 100.00 and an Elevation of 366.30  
Station 665.11 is a P.I.V.C. with a Length of 100.00 and an Elevation of 368.80  
Station 805.00 is a P.I.V.C. with a Length of 100.00 and an Elevation of 376.63  
Station 881.17 is a Grade Break with an Elevation of 377.39

-----  
Profile Figure # 2

Station 0.00 is a Grade Break with an Elevation of 376.01  
Station 130.89 is a P.I.V.C. with a Length of 50.00 and an Elevation of 377.65  
Station 277.88 is a Grade Break with an Elevation of 375.40  
-----

Begin AUTOSTAKE(tm) Calculations 12:16:33

Figure #1

Point	Station/Offset	Northing (Y)	Easting (X)	Desc
# 14	4+46.75/Lt18.00	10016.916	10006.153	P.O.C.
# 15	4+50.00/Lt18.00	10015.836	10009.141	P.O.C.
# 16	4+75.00/Lt18.00	10007.936	10032.265	P.O.C.
# 17	5+00.00/Lt18.00	10000.762	10055.625	P.O.C.
# 18	5+25.00/Lt18.00	9994.322	10079.198	P.O.C.
# 19	5+50.00/Lt18.00	9988.621	10102.960	P.O.C.
# 20	5+75.00/Lt18.00	9983.666	10126.889	P.O.C.
# 21	6+00.00/Lt18.00	9979.461	10150.961	P.O.C.
# 22	6+25.00/Lt18.00	9976.010	10175.152	P.O.C.
# 23	6+50.00/Lt18.00	9973.316	10199.440	P.O.C.
# 24	6+50.75/Lt18.00	9973.247	10200.171	E.C.
# 25	6+75.00/Lt18.00	9970.266	10225.115	P.O.C.
# 26	7+00.00/Lt18.00	9965.972	10250.651	P.O.C.
# 27	7+25.00/Lt18.00	9960.366	10275.938	P.O.C.
# 28	7+50.00/Lt18.00	9953.544	10300.915	P.O.C.
# 29	7+75.00/Lt18.00	9945.462	10325.519	P.O.C.
# 30	7+94.87/Lt18.00	9938.168	10344.768	E.C.
# 31	4+46.75/Rt18.00	9983.064	9993.947	P.O.C.
# 32	4+50.00/Rt18.00	9981.955	9996.972	P.O.C.
# 33	4+75.00/Rt18.00	9973.691	10021.161	P.O.C.
# 34	5+00.00/Rt18.00	9966.167	10045.596	P.O.C.
# 35	5+25.00/Rt18.00	9959.451	10070.254	P.O.C.
# 36	5+50.00/Rt18.00	9953.488	10095.110	P.O.C.
# 37	5+75.00/Rt18.00	9948.304	10120.140	P.O.C.
# 38	6+00.00/Rt18.00	9943.905	10145.320	P.O.C.
# 39	6+25.00/Rt18.00	9940.296	10170.626	P.O.C.
# 40	6+50.00/Rt18.00	9937.478	10196.031	P.O.C.
# 41	6+50.75/Rt18.00	9937.405	10196.797	E.C.
# 42	6+75.00/Rt18.00	9934.651	10220.007	P.O.C.
# 43	7+00.00/Rt18.00	9930.636	10243.768	P.O.C.
# 44	7+25.00/Rt18.00	9925.439	10267.298	P.O.C.
# 45	7+50.00/Rt18.00	9919.072	10290.539	P.O.C.
# 46	7+75.00/Rt18.00	9911.552	10313.433	P.O.C.
# 47	7+94.87/Rt18.00	9904.764	10331.344	E.C.

Centerline Elevations are 0.30 + Design Elevations shown

Point	Station/Offset	Design Elevation
# 14	4+46.75/Lt18.00	367.18
# 15	4+50.00/Lt18.00	367.15
# 16	4+75.00/Lt18.00	366.90
# 17	5+00.00/Lt18.00	366.65
# 18	5+25.00/Lt18.00	366.42
# 19	5+50.00/Lt18.00	366.36
# 20	5+75.00/Lt18.00	366.53
# 21	6+00.00/Lt18.00	366.91
# 22	6+25.00/Lt18.00	367.51
# 23	6+50.00/Lt18.00	368.31
# 24	6+50.75/Lt18.00	368.34
# 25	6+75.00/Lt18.00	369.30
# 26	7+00.00/Lt18.00	370.49
# 27	7+25.00/Lt18.00	371.85
# 28	7+50.00/Lt18.00	373.25
# 29	7+75.00/Lt18.00	374.56
# 30	7+94.87/Lt18.00	375.40

# 31	4+46.75/Rt18.00	367.18
# 32	4+50.00/Rt18.00	367.15
# 33	4+75.00/Rt18.00	366.90
# 34	5+00.00/Rt18.00	366.65
# 35	5+25.00/Rt18.00	366.42
# 36	5+50.00/Rt18.00	366.36
# 37	5+75.00/Rt18.00	366.53
# 38	6+00.00/Rt18.00	366.91
# 39	6+25.00/Rt18.00	367.51
# 40	6+50.00/Rt18.00	368.31
# 41	6+50.75/Rt18.00	368.34
# 42	6+75.00/Rt18.00	369.30
# 43	7+00.00/Rt18.00	370.49
# 44	7+25.00/Rt18.00	371.85
# 45	7+50.00/Rt18.00	373.25
# 46	7+75.00/Rt18.00	374.56
# 47	7+94.87/Rt18.00	375.40

Finish AUTOSTAKE(tm) Calculations 12:21:59

-----  
 Begin AUTOSTAKE(tm) Calculations 12:22:12

Figure #2

Point	Station/Offset	Northing (Y)	Easting (X)	Desc
# 48	0+00.00/Lt3.00	9930.700	10362.400	P.O.C.
# 49	0+13.89/Lt3.00	9926.059	10375.050	P.O.C.
# 50	0+27.78/Lt3.00	9923.160	10388.210	P.O.C.
# 51	0+41.67/Lt3.00	9922.057	10401.640	P.O.C.
# 52	0+51.91/Lt3.00	9922.407	10411.573	E.C.
# 53	0+55.56/Lt3.00	9922.548	10415.513	P.O.C.
# 54	0+69.45/Lt3.00	9919.561	10430.140	P.O.C.
# 55	0+83.34/Lt3.00	9911.420	10442.653	P.O.C.
# 56	0+97.23/Lt3.00	9899.258	10451.309	P.O.C.
# 57	1+11.12/Lt3.00	9884.769	10454.904	P.O.C.
# 58	1+25.01/Lt3.00	9869.971	10452.936	P.O.C.
# 59	1+38.90/Lt3.00	9856.925	10445.679	P.O.C.
# 60	1+52.79/Lt3.00	9847.449	10434.145	P.O.C.
# 61	1+66.68/Lt3.00	9842.861	10419.939	P.O.C.
# 62	1+80.57/Lt3.00	9843.802	10405.040	P.O.C.
# 63	1+94.46/Lt3.00	9850.139	10391.524	P.O.C.
# 64	2+08.35/Lt3.00	9860.991	10381.273	P.O.C.
# 65	2+09.86/Lt3.00	9862.387	10380.420	E.C.
# 66	2+22.24/Lt3.00	9872.376	10373.754	P.O.C.
# 67	2+36.13/Lt3.00	9882.543	10364.910	P.O.C.
# 68	2+50.02/Lt3.00	9891.429	10354.780	P.O.C.
# 69	2+63.91/Lt3.00	9898.871	10343.547	P.O.C.
# 70	2+77.80/Lt3.00	9904.736	10331.415	P.O.C.
# 71	2+77.87/Lt3.00	9904.764	10331.344	E.C.

Centerline Elevations are -0.00 + Design Elevations shown

Point	Station/Offset	Design Elevation
# 48	0+00.00/Lt3.00	376.01
# 49	0+13.89/Lt3.00	376.22
# 50	0+27.78/Lt3.00	376.42
# 51	0+41.67/Lt3.00	376.63
# 52	0+51.91/Lt3.00	376.78
# 53	0+55.56/Lt3.00	376.84
# 54	0+69.45/Lt3.00	377.04
# 55	0+83.34/Lt3.00	377.25
# 56	0+97.23/Lt3.00	377.46



# 57	1+11.12/Lt3.00	377.56
# 58	1+25.01/Lt3.00	377.75
# 59	1+38.90/Lt3.00	377.73
# 60	1+52.79/Lt3.00	377.58
# 61	1+66.68/Lt3.00	377.34
# 62	1+80.57/Lt3.00	377.09
# 63	1+94.46/Lt3.00	376.85
# 64	2+08.35/Lt3.00	376.61
# 65	2+09.86/Lt3.00	376.58
# 66	2+22.24/Lt3.00	376.37
# 67	2+36.13/Lt3.00	376.13
# 68	2+50.02/Lt3.00	375.89
# 69	2+63.91/Lt3.00	375.64
# 70	2+77.80/Lt3.00	375.40
# 71	2+77.87/Lt3.00	375.40

Finish AUTOSTAKE(tm) Calculations 12:25:54

