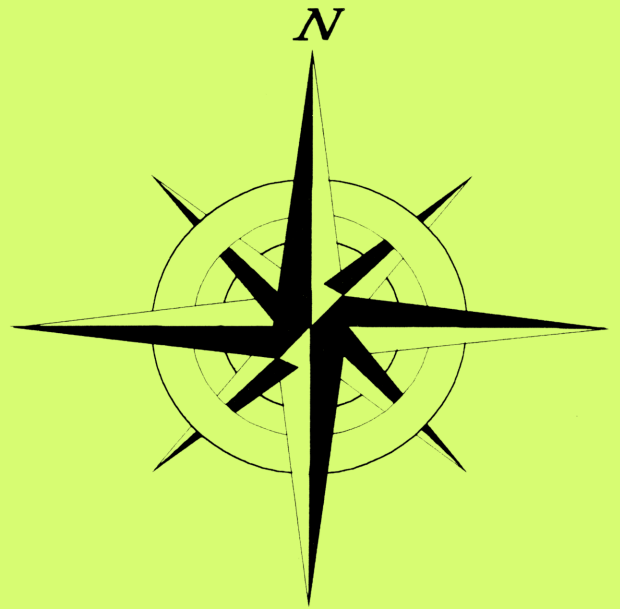


**SURVEY
PAC**

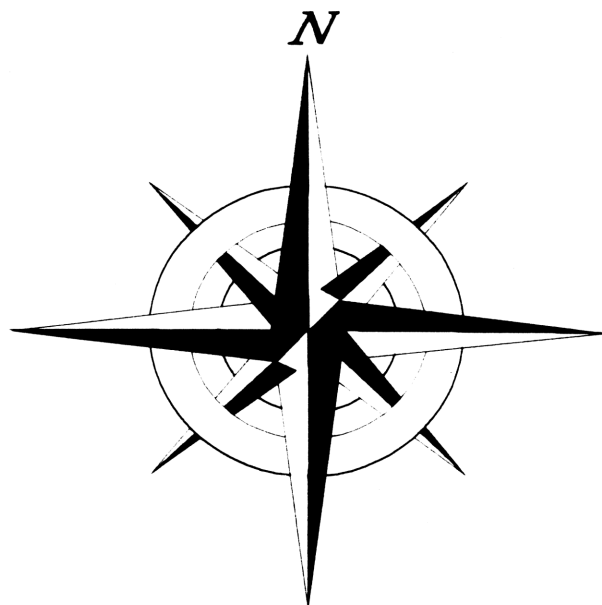


**CVP
3.7**

**FOR THE
HP-48SX & HP-48GX
by
CVP MICRO SYSTEMS**

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**SURVEY
PAC**



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by
CVP MICRO SYSTEMS**

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**This program is dedicated to:
Madison Leigh**

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CVP

CO-ORDINATE VECTOR PROGRAM

By Dan Mac Neil

INTRODUCTION

The Co-ordinate-Vector-Program (CVP) for the Hewlett Packard HP-48SX is a series of routines that collectively provide an accurate, simple, and safe means to do nearly all survey calculating, staking, data manipulation, plan interpretation, coordinate geometry, vertical and horizontal alignments and adjustments. As-built surveys, form checks, and in-field designs are expedited by CVP's ability to generate stations, offsets, and elevations instantaneously from field positions; then relate them to plan positions, both horizontally and vertically.

On the construction site, CVP greatly simplifies stake-out procedures while increasing speed, productivity, and accuracy. Any staking procedures such as slope stakes, sewer stakes, curb stakes, lay-out stakes, which require cut/fill calculations, coordinate geometry and/or plan interpretation are improved and accelerated.

From control points or by using resection, set-ups are conveniently close as well as safely out of harms way (i.e., traffic, heavy machinery, undesirable environmental hazards, etc.).

The operator can freely switch between slope staking, cut/fill staking, foresights, sideshots, and data collection with just one or two key strokes. All routines are self-checking which reduces operator error.

In the field, bearing-bearing intersections are accomplished in mere seconds rather than minutes!

All information can be read on-screen and printed for a hard copy of all in-field operations.

By electronically connecting to total stations, CVP eliminates the chance of incorrectly reading, recording, and inputting angles and/or distances. This increases speed while improving accuracy.

Data collection and transfer, to most popular computer software, is elementary for CVP. In-field data collection is as simple as sighting and shooting. Each field shot is stored on-board in a dynamic file which greatly increases on-board memory.

All field shots can be adjusted to meet different needs in various situations.

CVP interfaces perfectly with the SDR, MAP and CIVILSOFT mapping software, as well as other softwares.

CVP does Co-ordinate Geometry (COGO), including intersections (bearing-bearing, bearing-dist, dist-dist) offsets from lines, bearing azimuth, and/or field angle traverse with error of closure, compass rule adjustment, rotation, and translation.

CVP also includes routines which generate coordinates from input stations and offsets and vice versa. It can do area calculations, as well as adjustments, by merely inputting point numbers. Co-ordinate positions are easily transferred

between different coordinate files. (NOTE: These files must be in the same coordinating grid for their relationship to be correct.)

CVP differs from other current software by using file manipulation. This enables the user to enter horizontal and/or vertical alignment from plan or field data in a simple, easy-to-follow procedures. Files need be inputted only once and are self checking. The PLAN and/or GRADE files are input, and do not need be input again, so the possibility of a data entry error is decreased significantly.

Overall, CVP will vastly improve productivity and accuracy while reducing liability and time wasted on remeasurement and recalculation.

Since data is only input once and is self checked, errors in data manipulation are eliminated. The data collection routines alone can reduce the field-time spent on profiles by 50 percent. By interfacing with our computer plotting routines, days spent on drawing plat are reduced to hours. CVP's COGO routines will save countless field measurement and office calculation hours spent on balancing and adjusting the traverse. By continually providing checks, errors can be easily spotted and corrected. The HP-48SX, working in conjunction with the CVP software, has a cost of one-tenth that of most data collectors, and abilities far greater than any data collector.

A plan file can be made by coordinating the beginning and end of curves, radius points, as well as any existing angle points on control line, or any line. This is easily done with CVP COGO. These coordinated series of line segments and curves can be obtained from any relationship between points, either in the field, or in the office. This relationship can be expressed in either coordinates, stations, and offsets or bearings and distances.

When inputting the plan file, all stations may be entered manually or may be generated automatically using AUTO-STATION. This allows the user to either hold to street plan stations, even if they are in error, or generate perfect stationing, to correct or check design plans.

When inputting a grade file, as in the profile example, all G.C. stations, B.V.C. and E.V.C. stations are entered manually. The rate of grade between these input G.C.'s is calculated and printed so that plans are again easily checked.

Now that these files have been entered, they never need to be input again.

Both vertical and horizontal alignment is now stored in memory and will be used whenever desired.

Once both the plan (horizontal control) and grade files (vertical control) have been created, any position within the range of the plan file (stations) can be obtained, staked, and/or coordinated.

or both vertical and horizontal alignment.

HOW TO USE THIS MANUAL

This manual will take you through all off the routines, step by step, and explain them as you go. It is advisable to use this manual until you are comfortable with the programs operation.

Some things you should be familiar with that will not be referenced later in this manual are:

1. The menu key [MORE] will display the next page of the menu. Pressing [←] [MORE] will display the previous menu page. Pressing [→] [MORE] will redisplay the current menu features. The menu keys are still active even if the menu display is not present.
2. [PRT] is a routine that prompts for a printer. If answered "yes", all displays will be printed. If answered "no", all displays will be on the screen. Press [ENTER] to continue.([PRT□] = Printer on [PRT] = Printer off)
3. "Bypass" - The term bypass means to press [ENTER] without any data entry.
4. All angles are in DDD.MMSS format.
5. When creating coordinate, plan and grade files, they must be given the prefix "C", "P" or "G", respectively so the file names show up under file listings.(See [FLIST] pg. 11)
6. Menu keys are located at the bottom of the display screen and relate to keys A-F directly below them.
7. When inputting stations and offsets, they relate to the current active coordinate and plan files.

9. The term "INPUT" means type in your entry and then press [ENTER].

10. If no printer is being used, most displays will remain on the screen until you press [ENTER]. If a printer is being used, the screen information will be printed.

11. It is advisable to sit down with the HP-48SX and become familiar with its operation so as to facilitate the use of this program.

12. Whenever the distance measure sequence is initiated, you will be prompted H.DIST: You can now input the horizontal distance or bypass and input the slope distance and zenith angle. If you do the former, you will be asked for a vertical difference if the routine you are in requires elevations.

13. If you press the [A] key, to the prompt "press enter to measure" you now have terminated the routine you were in and no measurement will be taken.

14. Any routine can be aborted by pressing the [ON] key twice (use only if absolutely necessary).

15. If the menu has an escape [ESC→]. Use it.

16. If the display asks for a rod height, press [ENTER] if the displayed rod is correct or else type in the new rod and press [ENTER].

17. It is advisable to use the key assignments to facilitate using this program.

18. This program creates variables needed to operate and they will show up in the [VARS] menu. Most of these variables will regenerate themselves, some won't. They take up very little memory, and it is not necessary to purge them because they will regenerate. Those that won't regenerate are "?", "C", "P", "G", "setup", "clist", "plist", "glist", "ga", "\$zset", " α ", "altf", "docf", "dsf", "sF", "cnt", "snum", "aoc", "BA", "StaF", "CODE.LIBRARY", and " $\delta\epsilon\sigma$ ". If any of these are purged, they should be reentered or else the program will error at some given point.

19. The library numbers used for this program are 890,891, and 989.

Apologies if these conflict with any other libraries you may be using.

20. If "?" appears as a file name, this indicates there is no active file.

21. Co-ordinates can be recalled at anytime (as long as you are not running any programs) by typing in the point number and typing "RC", then pressing [ENTER]. This is also assigned to the [←] [^] keys if key assignments are used.

22. "POINT NUMBER ?". You will be prompted for a point number which the coordinate pair will be assigned. Pressing [ENTER] without prior data entry will not save the coordinates, but in all cases the coordinates will be displayed. (If the printer is enabled, they will be printed or else they will be displayed. Press [ENTER] to clear screen of coordinate display.) If the coordinate point number selected has coordinates already assigned to it, a tone and the display "USED!" with the point number will show up on the screen to overwrite the old coordinates. Press [ENTER] to type in a different number and press [ENTER]. If a different number was selected, it too will be checked for previous usage.

GETTING STARTED

To start:

Turn off the HP-48SX. Insert card into open port in the back of the HP.

Turn it on again.

The CVP program will self-install when the card is inserted into your calculator.

To make the key assignments used by this program, type [α] KEYS press [ENTER]. This program adds CVP to the custom menu. It also assigns CVP to the "CST" key. NOTE: If the card is removed, the key assignments will remain.

To delete these key assignments, type zero [0], then press blue modes ([\rightarrow] [CST]), then press the menu key "DELK" ([D]). This will unassign all key assignments. All key assignments will be active only if the HP is in user mode.

To activate user mode, press [\leftarrow] [α]. This will toggle in and out of user mode.

The key assignments used by this program can also be made by the user for any keys desired. If this is the case, do not type "KEYS". See page number seventy-five for key assignment definitions.

CVP MAIN MENU

The main menu is accessed by pressing [CST] in the user mode.

[NEW] To create new coordinate files. Press [NEW]. Input names up to 24 characters. The coordinate file name must begin the letter prefix "C". This allows its name to show up in file listings (see [FLIST] page 11). Examples: "CJOB"; "CWEST". Press [ENTER].

If file name is already used, you will be asked if you wish to overwrite, answer by pressing 'Y' or 'N'. "WITH DESCRIPTIONS?" [Y/N?] . This allows for descriptions to be added to coordinate pairs (see COGO [ID] page 14). Press 'Y' or 'N'. Input desired file size, press [ENTER]. You can now input any known coordinate values. (See [IC&E] in COGO page 14).

[PLAN] To create, review, and/or print, plan files (see Plan, page 34).

[GRAD] To create, review, and/or print grade files (see Grade, page 41).

[COGO] To input coordinates and elevations, to input descriptions, traverse, intersections, and redial stake-out (see COGO, page 14).

[FILES] Displays the active files and scale factor. Also permits these to be changed by pressing the appropriate menu key [S.F.] [COORD] [PLAN] [GRADE]. After typing in file name, press [ENTER] (i.e., press [COORD], type, CJOB, press [ENTER]. This will make CJOB the active file. If the file does not exist, a tone and "File does not exist" will be displayed. For station file see page 85. NOTE: When typing in file name, just type over the name displayed. If the new name is

CVP MAIN MENU (CONT.)

shorter than the name being typed over, use the [DEL] key to remove the extra characters. Do not use [SPC]. This will not work. The displayed name can also be erased by pressing the [ATTN] ([ON]) key once. When finished with this routine press [ESC→].

CVP MAIN MENU (2)

[PRT?] A sub-routine which prompts for a printer see printer instructions, page 78.

[SIZE] Resize file. This routine will allow for viewing the size of the current active coordinate file, and changing it, if necessary.

Press [SIZE] The file name and its size are displayed. Press [ENTER]. ":NEW SIZE?: is displayed. (At this point you can press [ENTER] without entering anything and no resizing will occur.) Type in the desired size of the coordinate file. Press [ENTER]. Both the old size and the desired size are displayed, but no resizing has yet occurred. This display allows you to make sure that the desired size is correct. (If a coordinate file is sized less, then its original size. The points that are outside the file range will be lost. If the new size is incorrect DO NOT Press [ENTER]. Press [A] and the resizing will be aborted.) If the displayed new size is correct, press [ENTER] and the resizing of the file will be done.

[FLIST] File listing. Press [FLIST]. The files will now be compiled. After the compiling, either the [COORD] [PLAN] or [GRAD] will display the coordinate, plan or grade files respectively. Press [ENTER] to continue display (if more files exist, then can be displayed on one screen) or terminate the display (if all files have been displayed). To print the files, type [←] before pressing either [COORD] [PLAN] [GRADE]. NOTE: Files must be given the correct C, P, or G prefix to be included in the printout or display.

[PURGE] Purge file. This will purge files from memory. Type in the name of the doomed file and it will be purged: **CAUTION** This routine assumes you want to remove the file typed in and gives no chance for recovery, so if you have accidentally typed in the wrong name, then press [ON] twice to abort the purging of the file. If you press [ENTER] you can bid the named file a fond adieu because it's a goner! Also, see HP-48SX Reference Manual, page 114, "Purging Variables."

[TRAN] Transfer. This routine allows for file transfer (Co-ordinate, Plan, and Grade) between type HP-48's or a HP-48 and a PC. (These transfer uses kermit file transfer protocol with a 9600 Baud rate 0 parity 3 checksum (cyclic redundancy check) and a 0 translation code.

File transfer from Hp to HP uses the infra-red send/receive capability. File transfer to a PC uses the cable connector which will tie into which ever PC you are using.

To transfer either HP or a PC, press the menu key "TRAN" ([D]) then select and press either 'HP-HP' or 'HP-PC' menu key. Now type ['] and turn alpha-on by pressing ([α]) and type the name of the file you wish to transfer.

Now press the [SEND] menu key.

To receive, press the [RECV] menu key. NOTE: When using kermit, one unit must be the sender and the other must be the receiver. For more information on kermit file transter, see HP-48SX **MANUAL**.

CVP MAIN MENU (3)

- [SHEET] Cut/fill sheet menu; printing and editing menu. See document edit and print. See page number 68.
- [MISC] Miscellaneous utilities. See page number 89.
- [PLOT] Screen plotting. See page number 72.
- [RENA] Rename file. Press [RENA] ('D'). Input the old name of the file to be renamed and press [ENTER]. Input the new name to be given to that file and press [ENTER]. File will be renamed. If the new name is already used, "Name Conflict" will be displayed and no name change will take place.
- [RC] Recall Co-ordinates: Type the point number, then press [RC]. If key assignments are used, after typing in the point number, press [←[Δ].

CVP COGO

[IC&E] To input any coordinates and elevations into the active coordinate file

: Point #: Input desired point number Press [▽]

: N'ing: Input Northing press [▽]

: E'ing: Input Easting press [▽]

: ELEV:O: Input elevation press [ENTER]

Press [ENTER] without data entry to terminate. If the point number is currently used, a signal tone and a "USED!" will be displayed. Press [ENTER] to overwrite old coordinates or input a new number. (The new number will be checked for usage also.) NOTE: If no elevation is to be input, [ENTER] may be pressed after entering the Easting. If an elevation is input, it is not necessary to delete the leading zero. The computer does not recognize leading zeros.

[IE] To input elevations for point numbers without having to reinput the coordinates.

(This sub-routine will not check for a previous elevation SO BE CAREFUL!) Input point number press [▽]. Input elevation press [ENTER].

[ID] If descriptions were chosen when a coordinate file was created then pressing [ID] will allow you to add descriptions to points within that file. Press [ID], input point number to be described, press [ENTER]. Input the point description, press [ENTER].

The point description will be displayed when the coordinates are recalled.

COGO: TRAVERSE

[TRAV] The traverse routine does all common coordinate geometry functions, as well as compass rule adjustment, rotation and translation. Area calculations can also be performed from traversing or by sequentially inputting point numbers. Coordinates can also be generated by simply inputting stations and offsets. Stations and offsets can in turn be generated from input point numbers or input Northing and Eastings. Both will be relative to the current active plan file. To execute TRAVERSE, press [TRAV]. Or by pressing [←] ['], (if using key assignments).

TRAVERSE (1)

[START] Input beginning point number. Press [ENTER] or bypass and input Northing, press [ENTER] , Easting, press [ENTER] or bypass and input station. Press [▽] input offset. Press [ENTER]. (If station and offset was selected then you will be prompted for a point number if you wish to save the coordinates. This routine will check for point usage. If not, press [ENTER]. Without data entry coordinates will be displayed.). "Back Bearing?" is then displayed. Input back bearing. Press [ENTER]. Input quadrant then press [ENTER] or else bypass the "Back Bearing?" prompt. "Back Site Pt. #?" is displayed. Input backsite point number or, if backsite orientation is not necessary (i.e., first course is a bearing not an angle) bypass.

[BRNG] Prior to pressing the [BRNG] key, type bearing in DDD.MMSS format, then press [BRNG] key *, input quadrant code, press [ENTER]. Bearing will be printed. See H.Dist., page 17.

[AZM] Type in Azimuth in DDD.MMSS format. Then press the [AZM] key. Bearing will be printed. See H.Dist. page 17.

[∠/D∠] Type in angle in DDD.MMSS format. Positive for angle right, negative for angle left press [∠/D∠]. For deflection angles, type in the deflection angle positive for deflection right, or negative for deflection left. Then press [←] [∠/D∠], (see H.Dist.).

" * " (you can optionally press either the [BRNG] or [AZM] keys prior to typing in the DDD.MMSS value. You will then be prompted for the DDD.MMSS value. This requires more key strokes and thereby is a bit slower.)

TRAVERSE (1)

[CURVE] Type in delta positive for a tangent curve to the right or negative for a tangent curve to the left. Press [CURVE]. You will then be prompted for a radius. Input the radius of the curve and press [ENTER]. The curve information will be displayed. Press [ENTER]. You will now be prompted to give the radius point a point number after which you will be prompted to give the end of curve or point of tangency a number. After this your traversing will be left at the point of tangency with your back orientation directed towards the curve's P.I.. **NOTE:** To continue from here, you now press 180 [∠/D∠] or press zero (0) [←] [∠/D∠]. This will continue your traverse tangential away from the curve.

"H.DIST" After inputting direction, you will be prompted for the horizontal distance. Input the horizontal distance, press [ENTER] or bypass. Input slope distance [∇] and zenith angle, press [ENTER]. The horizontal distance will be displayed and printed. You may also press ['] and type in incremental distances separated with either a " + " (if adding) or a " - " (if subtracting). After typing in increments, press [ENTER]. If increments were used, a total distance will be displayed for approximately two seconds.

Examples: :H.DIST: 157.32 [ENTER]
:H.DIST: '286.65+30.54-25.02' [ENTER]

:H.DIST: [ENTER]
:SLOPE DIST: 197.63 [∇]
:ZENITH: 93.2645 [ENTER]

TRAVERSE (2)

- [INVER]** To inverse from current position to a coordinated point number, input number, press [ENTER] or bypass and input Northing, press [ENTER] and Easting, press [ENTER] or bypass and input station [∇] and offset, press [ENTER]. (If the latter you will be prompted for a point number.) Inverse will be displayed as an angle right, bearing and distance . Your position will still be retained for further traversing.
- [CLOSE]** After traversing, to initiate a closure, press [CLOSE]. Input either a point number or bypass and enter a closing Northing and Easting. A closing bearing, closing distance precision ratio and total length of traverse will be displayed. Press [ENTER] to initiate a compass rule adjustment. Press either [N] or [Y] to the prompt, "Compass rule adjust" to initiate compass rule, (see Display, page 20). NOTE: All points in traverse must be numbered in order for compass rule adjustment to be correct. Original coordinates will be overwritten by adjusted coordinates.
- [CRA]** To initiate a compass rule adjustment without traversing, press [CRA]. Input point numbers in order will be displayed. Enter point numbers in sequence of adjustment pressing [SPC] between each number or, if the point numbers are in succession, you can type in the beginning and ending numbers, separating them with a decimal point. Example: for all points from 3 to 16, inclusive, type in 3.16. After the points have been entered, press [ENTER], "Closing Point #?" will be displayed. Input closing point number or bypass and input closing Northing and Easting. Closing bearing, closing distance, precision ratio, and total length of traverse will be displayed. Press [ENTER] to continue. See display, page 20.

TRAV. (cont.)

[TRAN] To translate coordinate point numbers from one datum to another, keeping their relative positions, use translations. Press [TRAN]. Input point numbers to translate. Use a [SPACE] between each or use the decimal point method as explained in Compass Rule Adjustment. Make note of the first point number entered. It will be used to compute the translation. Now you can either a) Input the bearing and distance of the translation; (b) Input a point number which the first point entered will be translated to, or (c) Input the Northing and Easting of which the first point entered will be translated to. See Display, page 20.

[ROT] To initiate a rotation of a series of points, press [ROT]. Input the pivot point point number of the rotation, press [ENTER]. Input point numbers to be rotated. "Angular rotation, clockwise positive, counter-clockwise negative" is now displayed. Type in angular rotation for the series of points inputted, press [ENTER]. This will rotate the points and overwrite the point coordinates with the adjusted ones. See Display, page 20.

DISPLAY:

After Compass Rule Adjusting, Rotation, or Translation, the adjustment print menu will appear.

- [A] Print Adj. Coords.
- [B] Print Adj. Traverse
- [C] Both of the above
- [F] Escape

Press [A] to print adjusted coordinates in order

Press [B] to print adjusted traverse in order

Press [C] to print adjusted traverse and coordinates in order

For rotation, translation, or CRA, the traverse printed will be from the segments between the input point numbers.

TRAVERSE (3)

[AREA] By pressing the [AREA] menu key, the menu below will be displayed.

[A] From input point numbers

[B] From traverse

[C] Pre-determined

[D] Curve areas

[]

[F] Escape to traverse

[PT#] To calculate areas from coordinated points, press [A]. Input the point numbers in succession around the perimeter of the figure whose areas is to be calculated. The numbers are entered the same as they are in [CRA]. See page number 18.

[TRAV] This will display the area of the figure last traversed. It will compute the area of an open traverse by closing the figure back to the point of beginning.

[PRE] Predetermined area. A line parallel to the baseline will be calculated with a prescribed area within the enclosed figure. Press [PRE]. Input point one at one end of the baseline. Input point two at the other end of the baseline. Input the bearing and quadrant from point one. Input the bearing and quadrant from point two. Input the area which is desired. The bearings and distances from the base points will be displayed. Press [ENTER]. You may now give point numbers to these calculated points.

[CURVE] This will calculate the area of the sector, segment, and fillet of a curve with the delta and radius known. Press [D], input the delta of the curve, press [ENTER]. Then input the radius of the curve, press [ENTER]. The areas are now displayed.

[F] Return to Trav. menu.

[PRC] This routine is used to print coordinates of the active coordinates files. Press [PRC]. Input starting point at which you want to coordinate printout to commence from, press [ENTER]. Input end point at which to terminate printout. Press [ENTER]. Printout will be complete with date, time, and file name. This routine will automatically assume there is a printer.

[DELE] This routine is the same as PPrint Co-ordinates, except it is used to delete coordinates from the current active coordinate file.

[C→S] This routine the active coordinate file in conjunction with the active plan file: Press [C→S]. It will generate a station and offset for any given pair of coordinates provided they are within the limits of the active plan file. See example: "Begin Search?" Input segment at which your search is to begin. Refer to page. Press [ENTER]. Input coordinate point number which a station and offset is desired. Press [ENTER] else bypass and input northing press [ENTER] then easting press [ENTER]. The station and offset will be displayed for the information input.

[S→C] Station to Co-ordinates. This routine uses the active coordinate file in conjunction with the active plan file: Press [S→ C].

Input a station [V] and offsets that are within the limits of the active plan file. Press [ENTER]. A coordinate pair will be calculated for that station and offset. You will then be prompted for a point number for which to store the coordinates. After which the northing and easting will be left on the stack.

2: Northing,

1: Easting.

TRAVERSE (4)

- [INFO]** This will display the last point number and position of the current traverse, the bearing last traversed, but in the opposite direction. It will tell you if the next number is activated or not and if the printer has been enabled
- [SOLVE]** To solve for unknown parts of a curve press [SOLVE]. Press menu key of the information that is known (i.e., press [RAD] input radius, press [ENTER]). To input the middle ordinate, press [←] [T/MO] or the external press [←] [LC/EX]. The hierarchy of the data is the order in which they are displayed. You may at any time attempt to solve for the remaining parts by pressing the menu [SOLVE] key if there is not enough information to solve the remaining parts. All zeros (0) will be displayed. If you wish to divide the curve into equal parts, press [DIV]. Input the appropriate information and deflection angle, long chord, and station will be displayed. Press [ENTER] to continue.

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TRAVERSE EXAMPLE

First, it is necessary to tell the HP-48SX if you are using a printer or not. (See Prt, page 5). To begin, create a coordinate file in which to work. If a file already exists that you want to work within, you may use that. Press [COGO] [IC&E] to input coordinates at which you will begin. For this example, we will create a coordinate file called "CNORTH". Press [CST] to bring up custom menu. Press [NEW]. At the prompt , "FILE NAME?" type C N O R T H , press [ENTER].

The prompt " WITH DESCRIPTIONS (Y/N) ?" will be displayed. If descriptions are desired press [Y] (see [ID] pg. 14). "NUMBER OF POINTS? " will be displayed. Type in the number of points this file will contain. Type 3 0. Press [ENTER]. Type in the Northing . Press [∇]. Type in the Easting. Press [ENTER]. Type in the elevation. Press [ENTER]. For this example we will use 1000, 1000 for point number one with an elevation of zero. After entering point number one press [ENTER] without any data entry to terminate manual coordinate entry. Now switch over to the TRAVERSE routine by pressing [COGO] [TRAV] which is also assigned to the [←] ['] key.

Press [START] to initiate traverse. Input 1 to the prompt "POB?", because we will be starting with point one. Press [ENTER] to the prompt "BACK BEARING" since we don't have one. Press [ENTER] to the prompt "BACK SITE PT. #?" since we don't need any backsite orientation. (It is needed only if your traversing is to begin with an angle.)Type in 5.05 and press [BRNG]. Input 4 to the quadrant prompt indicating Northwest. Type in 110.36 to the ":H.DIST:" prompt. Press [ENTER]. Input the number 2 to the point number prompt. Press [ENTER]. Now type in the delta 38.3015 (positive indicating a curve right) and press [CURVE]. You will be prompted to input a radius. Input 500, press [ENTER]. The curve data will now be displayed. Press [ENTER] and assign a point number

TRAVERSE EXAMPLE (cont.)

to the radius point. We will use 3. Press [ENTER]. After coordinate display, input a number for the E.C. We will use 4. At this point, you are at the E.C. backsighting the PI. Since the curve is a tangent curve you could enter 180° and press [$\angle/D\angle$] or, type \emptyset and press [\leftarrow] [$\angle/D\angle$] or, type in the bearing 33.2515 and press [BRNG] input 1 to Quad prompt and press [ENTER] (if the curve was non-tangent , you could now traverse from the E.C. in any direction you choose). After doing the above, bypass the prompt "H.DIST" and input a slope distance of 283.25. Press [∇] and input a zenith of 82° 19' 16" - the horizontal distance will be printed and input a point number of 5, for this example. Type in the delta -22.1250. Be sure to change sign to a negative, indicating a curve left using the [+ / -] key, press [CURVE]. Type in 385.00 to the "Radius?" prompt. Again, the curve data will be displayed. Press [ENTER] and give both the radius point and E.C. point numbers, same as above. (NOTE: For all plan files curve BC's radius points and E.C.'s must have a point number). We will use the coordinate point number 6 and 7, respectively.

Since we are traversing through a reverse curve, we now input the delta 52.4710, keeping the sign positive for a right hand curve and press [CURVE]. Input 415.00 to the "Radius?" prompt. Curve data will be displayed. Press [ENTER] to continue. Assign point numbers to the R.P. and E.C. to complete traverse. We will use the numbers 8 and 9, respectively.

This ends the traverse example. To view the coordinate values you may recall coordinates or print coordinates. If you wish, you can also use this example to experiment with intersections, areas, or compass rule adjustments (NOTE: This example will be referred to later, so if the coordinate values for points 1 - 9 are changed, later examples might not work correctly!).

COGO: INTERSECTIONS

[INTER] Intersections. When the 'INTER' key ([E]) is pressed on the COGO menu, the intersection menu is displayed. These intersections work by using point numbers assigned to coordinate pairs.

[BB] Bearing-bearing. Press the 'BB' menu key ([A]). (This example uses the example in traverse.)

:Pt #1: Input first point, press [ENTER]

:Pt #2:: Input second point, press [ENTER]

:Bearing 1: Input bearing one (bearing from point one)

:Line Pt #?: or bypass and input the number of a point on the line of bearing one (line point) in either direction toward or away from the point of intersection. Press press [ENTER].

:Bearing?: Input bearing two (bearing from point 2) OR bypass same as above. If bearing is input (in DDD.MMSS format), you will be

:Quad: prompted for a quadrant code. The information returned will be bearing one and a distance to the point of intersection and bearing two and a distance to the intersection. This display will remain until you press [ENTER]. You will then be prompted to give the coordinates at the point of intersection a point number.

Brng 1 → Bearing toward intersection

Distance to intersection

Brng 2 → Bearing toward intersection

Distance to intersection

COGO: INTERSECTIONS

- [BD] Bearing-distance intersect. Press the menu key 'BD' ([B])
- :Pt 1?: Input point one, the point at which the bearing line will originate.
 Press press [ENTER].
- :RP Pt #?: Input the radius point or point at which the distance will originate.
 Press [ENTER].
- :Bearing 1? Input the bearing from point one. Press [ENTER]. Then input the
 quadrant code, OR bypass bearing one and
- :Line Pt. #?: Input a point number of a point on the line of bearing one

Since bearing-distance intersections have two possible solutions, both will be displayed. Bearing 1 and the distance, and bearing 2 and the distance to the point of intersection will be displayed for the first possible solution. The display will remain until you press [ENTER]. You will then be prompted to give the coordinates at the point of intersection a number, if you desire, after which the second possible solution will be displayed. Repeat the same procedure as above for the second solution.

Brng 1 → Bearing toward intersection

Distance to intersection

Brng 2 → Bearing toward intersection

Distance to intersection

COGO: INTERSECTIONS

[DD] Distance - distance intersect. Press the menu key [DD].

:Pt #1?: Input the point at which distance #1 will originate, press [ENTER].

:Pt #2?: Input the point at which distance #2 will originate, press [ENTER].

:Dist #1?: Input the distance from point #1, press [ENTER].

:Dist #2?: Input the distance from point #2, press [ENTER].

Since there are two possible solutions, both will be displayed. The solution display is the same as the bearing-distance intersection solution display (See page 29).

COGO: INTERSECTIONS

[LP] Line point. This routine will calculate a bearing-bearing intersect using an angle and a line.

Press the menu key [LP].

:POB?: Input the point number at which the angle will pivot, press [ENTER].

:Back Site #: Input the point number from where the angle is to be turned from, press [ENTER].

:Base Pt. #?: Input the point number from which the line to intersect originates, press [ENTER].

:Bearing #?: Input the bearing (DDD.MMSS format) of the line to be intersected, press [ENTER].

:Quad?: Input the quadrant code for bearing 2, press [ENTER] or bypass the bearing 2 prompt, and

:Line Pt. #?: Input the number of a point on the line to be intersected, press [ENTER].

:Field \angle ?: Input the angle from the back site for which to intersect the line.

The solution display is the same as the bearing-bearing solution display (see pg. 28)

Because this routine is repetitive, press [ENTER] to the field angle prompt without data entry to terminate.

COGO: INTERSECTIONS

[O/S] To calculate the perpendicular offset of a point from a line, press the menu key **[O/S]**

:POB?: Input the point from which the line to offset from originates, press
 [ENTER].

:Bearing?: Input the bearing of the line (DDD.MMSS), press **[ENTER]**.

:Quad?: Input the quadrant code, press **[ENTER]** or bypass the bearing prompt,
 and

:Line Pt. #?: Input the number of a point on the bearing line to be offset from,
 press **[ENTER]**.

The solution display is the same as the bearing-bearing intersection solution display.

(See page 28.) Because this routine is repetitive, press **[ENTER]** to the **O/S PT #?**
prompt without data entry to terminate.

[ESC] Return to coordinate geometry menu.

NOTE: When inputting a line point number instead of a bearing, the line point can be either in the direction towards the intersection or away from the intersection. The resulting solution will show a negative distance if the line point number entered was in the opposite direction of intersection.

CVP MAIN MENU

[PLAN] Plan files are a consecutive series of stations and coordinated point numbers. : Radii and radius point numbers. These stations and point numbers define line, segments, and curves which collectively make up a plan file. **See example.** It is *necessary* to do all plan coordinate calculations first before making a plan file.

Plan files coupled with coordinate files enable the user to generate stations and offsets from coordinate pairs or coordinates from an input station and offset. They also allow for defining a road cross-section for staking various positions in that cross-section.

Plan files may be changed if necessary, but once created, they cannot be added to. A plan can be any length.

A WORD ABOUT PLAN FILES:

Plan files are simply the coordinate point numbers of all segments within the plan file. The coordinate file in which the plan file point numbers exist must be the active coordinate file when using that particular plan file.

CVP PLAN

[NEW] To create a new plan file which will also become the active file, input file name up to 24 characters, press [ENTER].

INPUTTING PLAN FILE: Auto-station? (Y/N). If auto station is selected, only the beginning station need be input. All other stations will be calculated exactly. If auto station is not selected, a station error will be calculated for each segment and displayed and the input station will be used.

:STA/-RAD.:

:COORD PT#?:

Input station (if auto station) is ON, only input starting station. Enter 0 for all other stations. Correct station will be displayed and stored, press [▽] then input the corresponding point number.

PRESS [▽] TO

FILL INPUT STACK:

Repeat inputting all BC's, radii and radius points (inputting radii as a negative with the radius point number as the coordinate point number) and E.C.'s. Station error for each segment will be displayed (if auto station is OFF, see example). Press [ENTER] without data entry to terminate

[REV] Input the segment number at which review is to be initiated (review is for the active file only, to review different [FILES], go to [FILES], and change active file). Display will show either station and coordinate point number or curve direction, radius, and radius coordinate point number.

[REV] (cont.)

CHANGING FILE: To step through entries, press [ENTER]. To change entry, press 'C' then input new station or radius and appropriate coordinate point number. Press [∇] between typing in "STA/RAD" and "COORD PT#?", press [ENTER] when data is typed in. Altered data will be displayed. Then press [ENTER] to continue review. Press any key but [ENTER] at any time to terminate review.

[PRINT] Will print out a complete copy of the active plan file with name and date bearing distances and/or curve delta and radii.

[REPRT] See station-offset report, page 87.

[ESC] Will escape routine and return to main menu.

PLAN FILE

EXAMPLE:

To create a plan file for the example in traverse, page 26, press [CST] [PLAN] [NEW]. The current active coordinate file is now displayed. This must be the coordinate file in which this plan file will exist. If it is, press [ENTER]. If it is not, press [5] and change the active coordinate file to the correct one (see [FILES], page 9. Type in the new plan file name using the "P" prefix. We will use "PNORTH" for this example. Press [ENTER]. Now select auto station (A.S.), if desired, by pressing either (Y) or (N). If Auto-stationing was not selected, a station error will be displayed for each station entered. Although an error may exist, the inputted station will still be used. In this example we will use Auto-Station.

PLAN FILE EXAMPLE (cont.)

If Auto-Station (A.S.) is selected, all stations, except for the beginning station, will be calculated and displayed. Remember, during entry a place holder must be inserted for a station, although it will not be used, zero is recommended.

NOTE: when using auto-station, after the calculated station is displayed, you **MUST** press [ENTER] to proceed to the next screen for which to input the next station and coordinate point numbers. Pressing [ENTER] stores the displayed station value in the plan file.

PLAN

STA/-RAD:

CO-ORD PT. #: Input the starting station. We will use 1+00, type 1,0,0, press the cursor down key [▽]. Type in the related coordinate point number, type 1, press [ENTER] (at the top of the screen will be displayed the last station and coordinate point number. This will allow you to check what you just entered.) if Auto-Stationing was not selected.

Now input the station 2+10.36, type 2, 1, 0, [.] , 3, 6. If A.S. was selected type zero (0). Press the cursor down key [▽]. Now type in the corresponding point number, type 2, press [ENTER]. If A.S. was selected the correct station 2+10.36 will now be displayed. Press [ENTER] to continue. (NOTE: If the stationing displayed appears incorrect, the coordinate values may be in error and should be checked.)

Since our plan has now reached a curve, we will input the radius, but as a negative number. Type 5,0, 0 [+/-], press the cursor down key [▽] and we will type in the radius point, coordinate point number, type 3, press [ENTER]. The lower menu will now change. Select either [LEFT] or [RIGHT] for the direction the curve is turning. We will press [RIGHT] since our curve is curving to the right. Now input the end of curve (P.O.T.) station. If A.S. was selected, input zero (0). Press the cursor down key. Input the corresponding coordinate point number, type 4, press [ENTER]. The P.O.T. station 5+46.37 will now be displayed. Press [ENTER]. Input the next station or type zero (0). If A.S. was selected, press the cursor down key [▽]. Input the

PLAN FILE EXAMPLE (cont.)

corresponding coordinate point number, type 5, press [ENTER]. The station of 8+27.08 will be displayed. Press [ENTER] and type in the radius of 385 and be sure to change its sign to negative by pressing [+/-], because it is a radius. Press [∇] and input the radius point coordinate point number, type 6, press [ENTER]. Now select [LEFT] from the lower menu since this curve is a curve left. Input the P.O.T. or in this case the P.R.C. station or zero for A.S. Press [∇], type 7, press [ENTER]. The P.R.C. station of 9+76.35 will be displayed, press [ENTER]. Since we are proceeding through a reverse curve we will now input the next radius of 415.00 and press [+/-] to make it a negative. Now press [∇] and type in the radius point coordinate point number, type 8, press [ENTER]. Since the curve is turning to the right press [RIGHT] from the lower menu. Now type in the last station or type zero for A.S.. Press [∇] and type in the radius point coordinate point number, type 9, press [ENTER]. The station of 13+58.68 will now be displayed. Press [ENTER]. Now without data entry press [ENTER] conclude making a plan file. (In this example consecutive point numbers were used. This is not at all necessary.) The plan file may now be printed out by pressing [PRT] on the plan menu. (Be sure to have either a HP-82240 infra-red printer or a serial printer ready. Printer types may be selected using [PRT] on the CVP main menu #2 or by pressing [←] [EVAL] if key assignments are used.

NOTES:

1. After making a plan file it becomes the current active plan file.
2. All radii must be entered as a negative when making a plan file.
3. You can now stake any station in this plan file at any offset desired, or read any point within the limits of the plan file and obtain its station and offset.
4. By using Station to Coordinate you can now generate coordinate values for any input station and offset. (Provided it falls within the limits of the plan file.)

CVP MAIN MENU (GRADE)

[GRADE] Grade files are a sequence of grade change stations and their elevations, inputted in ascending order with vertical curves.

The G.C. stations are tied to the plan stations in which they will be used in conjunction with

These will be used to define a road template.

The program will assume straight grade between inputted stations and elevations or calculate vertical curve elevations using $EL = r/2 + bx + c$.

CVP : GRADE

[NEW] To create a new grade file which also becomes the current active grade file, press **[NEW]**. Input the file name up to 24 characters. Be sure to add a "G" to the beginning of the name and press **[ENTER]**.

INPUTTING GRADE FILE:

Input Grade Change (G.C.) station, press **[∇]**. Input the G.C. elevation, press **[ENTER]**.

INPUTTING VERTICAL CURVES:

Input Begin Vertical Curve station and elevation as you would a grade change. Next input the vertical curve P.I. station except as a negative (this signals the program that this is a vertical curve).and the vertical curve P.I. elevation as you would a grade change. Then input the End Vertical Curve as you would a grade change.

[REV] Input point at which to initiate review (review if for active file only), press 'C' to change. Re input altered GC station and/or elevation, press **[ENTER]**. To continue review, press **[ENTER]**. Press any key but **[ENTER]** to terminate review.

[PRINT] Will print a complete copy of the active grade file with the name and date on either the serial printer or infra-red printer.

[REFEL] Will return a reference elevation per the active grade file for any input station (be sure station is within file limits).

[ESC→] Will escape routine and return to main menu.

CVP GRADE FILE INPUT

Straight Grade: To input a grade file that is straight grade between grade changes:

1. Input the grade change station. Press cursor arrow down key.
2. Input the grade change elevation. Press [ENTER]. Repeat until entire grade file (or portion thereof) is input. For vertical curves, see below.

Vertical Curve: To input a vertical curve into a grade file:

1. Input the B.V.C. as you would a grade change.
2. Input the vertical curve P.I. station the same as a grade change, except with a negative sign. Press cursor arrow down key. Input the P.I. elevation. Press [ENTER].
3. Input the E.V.C. as you would a grade change.

This routine will calculate reference grades along the vertical curve. It is also possible to input compound vertical curves with this format.

REMEMBER: B.V.C.;-P.I.; E.V.C. -- IN THAT ORDER!!

NOTE: All beginnings of curves and end of curves **MUST** be input into grade file for the grade file to work correctly.

GRADE FILE EXAMPLE

We will create a grade file to use with our example plan file "P N O R T H" created on page 36. To create, press [CST] [GRADE] [NEW]. Type in the desired name. We will use "G N O R T H", press [ENTER]. Now per our profile on page 89, we will now input the grade changes in sequential order, starting at 1 + 00, which is the beginning of our profile. Type in 100 for the station, press [▽]. Type in the elevation of 237.53, press [ENTER].

Now input the next grade change in the same manner. Type in 210.36, press [▽].

This is not a grade change (GC), but all beginnings and endings of curves must also be input into the Grade File. Input the elevation 240.86, press [ENTER]. Type 240.86, press [ENTER]. Note: The rate of grade between grade changes is now also displayed at the top of the screen. This is a rate per foot. Input the next GC, type in 375, press [▽] and input the elevation of 242.80, press [ENTER]. Now type in the next station of 546.37 and an elevation of 243.19, press [ENTER]. Our next grade change is BVC, so we will enter this the same as a GC. Type in the station 600.00 and the BVC elevation of 243.31, press [ENTER]. Now, since we are going through a vertical curve, type in the vertical curve PI station as a negative. This will let the program know this is a vertical curve. Type 700 [+/-], press [▽]. Input the vertical curve PI elevation, type 243.54, and press [ENTER]. We now will input the EVC the same as a GC. Type in the station 800.00 and the elevation of 239.76, press [ENTER]. Type in the GC station 827.08 and the elevation of 238.74, press [ENTER]. Type in the next GC station 976.35 and the elevation of 237.14, press [ENTER]. Type in the last GC station of 1358.68, press [▽] and the elevation of 230.00, press [ENTER]. Now to conclude making this plan file, press [ENTER] without data entry. You may now print out the grade file by pressing [PRT] on the grade menu.

COGO: RADIAL STAKE OUT

When first pressing Radial Stake-Out [RSO], "Instrument set-up, occupy Pt. #?" will be displayed. To this prompt you can input the point number which you are set up on and press [ENTER] or bypass and input the Northing and Easting of you set-up point after which you will be prompted for the elevation of that point. Input the elevation, press [ENTER] or bypass the Northing prompt and input the station and offset of the point you are occupying and then enter its elevation. At the elevation prompt a value must be entered, even if it is zero (0). BACK BRG will be prompted. Input the bearing, press [ENTER], the quadrant, press [ENTER]. This back bearing is oriented in the direction you are looking, away from the instrument, or bypass the "BACK BRG?" prompt and input a "BACKSITE PT#?". Or, bypass and input a station press [∇] and offset, press [ENTER], after which you will be prompted for an elevation input and press [ENTER].

The elevation assigned to your set-up point number. will now displayed, (If you need to input an elevation for your set-up point number then see [IE] pg. 14. This must be done prior to occupying the point when initiating RSO.) while you are being prompted for a push-up. If no elevations are going to be used, then simply press [ENTER] without inputting a push-up and no elevations will be generated; otherwise, input your push-up above the occupied point. To enter RSO without inputting a set-up point or to continue using your last set-up point, press [→] [>] , or in the COGO menu press [←] [RSO].

NOTE: ALL radial stake out procedures can be executed in either manual mode or in auto mode using a total station. If in auto mode, all information (i.e. horizontal distance, slope distance, horizontal and zenith angles) will be electronically be downloaded from the instrument automatically.

1. Any time the prompt “:H.DIST” appears, when RADIAL STAKING, you can, if desired, press [∞] [A]. The display will show “:H.DIST:A.” You can now press [ENTER] and be electronically reconnected to the same total station you were previously connected to without having to exit the routine you are in (see AUTO).

2. If your line of sight to the prism becomes blocked, causing a measurement abort, “Check Instrument” will appear. This halts the measurement routine. To recover, press [ENTER]. The display “PRESS ENTER TO MEASURE” will return. You can now reinitiate the measurement.

3. To abort BEFORE measuring, press [A].

4. To abort WHILE measuring, press [ON]; Once to halt the measurement routine (instrument will continue measuring but will not send information into HP48). This can be recovered from by next pressing press [ENTER] or twice to abort altogether.

5. All angles displayed are to the right, doubles included.

6. Always set 0°00'00” on your backsight. Never use an azimuth on the instrument or else the program won’t work.

7. Standard stake-out procedure is:

(a) Type in point number, northing and easting or station and offset, turn off displayed angle

(b) Give line

(c) Shoot dist

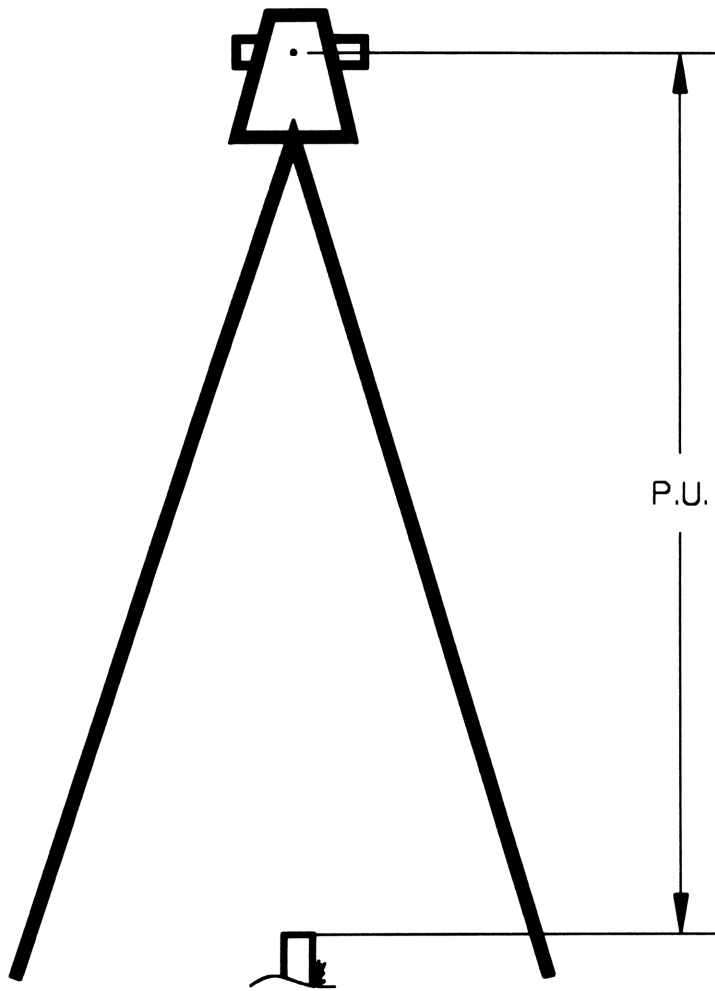
(d) Measure move by hand

(e) Give line and set stake

(f) Reshoot to verify move and to ascertain elevation

(g) Document shot information

CONVENTIONS USED BY CVP IN R.S.O.



THIS IS CONSIDERED THE PUSH-UP
NOT THE H.I.

$$\begin{array}{r} \text{ELEV.} \\ + \text{ PUSH-UP} \\ \hline = \text{H.I.} \end{array}$$

YOU WILL NEVER INPUT THE H.I.
(EXCEPT IN SPECIAL SITUATIONS)

[F.S.] Input any coordinate point number or optionally bypass to
a northing and easting, or bypass to input station and offset. The
display will read (Forsight point number or station and offset)
Angle Right
Double Right will be displayed if no total
station is used using [AUTO]
Distance Bearing

All of the same screen will be printed after which H.Dist is displayed or, if you are in auto, "PRESS ENTER TO MEASURE" is displayed. After the measurement is made, the distance to move with "TO THE GUN" or "AWAY FROM THE GUN" will be displayed. If using [AUTO], the calculated angle and the angle error will also be displayed and/or printed (if printer is enabled). If printer is disabled, the display will remain until the [ENTER] key is pressed. If printer is enabled, the display will change after screen information is printed. Measurements can be repeated as often as desired for each input. Point number by pressing [5] to initiate a remeasurement. If auto is off, input Hor. Dist. or bypass and input slope dist and zenith angle. NOTE: If auto is not active and if horizontal distance is entered and elevations are being used, a vertical difference must be input.

Once the distance is small enough to be measured easily by hand, press [ENTER] to continue. If elevations are being used, the point elevation will be displayed.

[S SHOT] Allows for taking a sideshot. This routine will put coordinates and elevation (if elevations are activated) on the point shot.

After the shot information is either entered manually or automatically, the bearing of the line of sight will be printed or displayed. You are then prompted for a point number. Next, you will be prompted "STATION (Y/N?)." If (Y) is pressed, will return station and offset per the current active plan file then prompted for a reference elevation and cut or fill from the current active grade file.

Be sure that if you request a station and offset and/or reference grade that you are within the range of the current files. You may now use Doc (See document, page no. 70).

[SLOPE] Slope staking can be done with respect to any plan and grade file. Top and toe offsets are from the plan file. First input begin search for the area to be staked. The current slope ratios and top/toe offsets are displayed, press [ENTER].

[RATIO] To change slope ratios and/or top toe offsets.

[STAK] To begin staking.

[FILES] To change files (see FILES).

[SRCH?] Allows for moving search point up to expedite staking.
(See Begin Search, page no. 79.)

[PRT?] To turn printer on or off. (See [PRT], page no. 78.)

[ESC] Return to RSO menu.

After initiating a shot, the station, O/S and elevation are displayed, press [ENTER]. The reference elevation, cut or fill and vertical (VC) catch and horizontal, (HC) catch are displayed. To reshoot, simply press [START]. See DIAGRAM. If the position is good or the horizontal catch can be made level, press [SET]. This will print and display the CORRECTED slope stake information with the offset from the plan file line. You can now use document feature See DOCUMENT. Press CONTINUE to stake R.P. Hand measure the desired reference point. Offset and initiate another shot. (This will also check that any horizontal catch movement made for the slope stake was correct.) After shooting the station for the R.P. is printed and displayed as as to check station with the slope stake, press [ENTER]. Same as was done for the slope stake. Disregard the display of horizontal and vertical catch. Now press [RP]. The RP information is now printed and displayed and can be documented. See DOCUMENT. (Page no. 70.)

It should be noted that the RP is referencing the last slope stake [SET] so in order to use the [RP] routines the [SET] routine must have been executed for the related slope stake.

[C/F] Cut/Fill. This is used to set any station and offset within the active plan file. Press [←] [C/F] to activate auto-interval. Press either "Y" to activate or "N" to reactivate this feature. If "Y" is input, interval desired, press [ENTER]. This will automatically increment you stations to any interval you desire while keeping the offset the same. (Good for staking stations at 25', 125', or 50' intervals. Try it, you'll like it.) Auto-interval can be deactivated the same way. (See Auto-Interval, page no. 82)

[C/F] (cont.)

:STA:

:O/S: Input the desired station, press [▽]. Input the desired offset to stake and press

[ENTER]. If auto-interval is active you need only press [ENTER] if the displayed data is correct. If not use the cursor control keys to move and correct the incorrect data.

The angle, bearing and distance will now be displayed and/or printed. If a printer is enabled the display will remain until the information is printed.

Once the angle has been turned press [ENTER] to initiate the measurement sequence. After the measurement has been made the angle, angular error (if auto is on) and distance error are now displayed. After the horizontal move is made and the stake set, re measure to check the stake position while establishing the elevation of the stake. Now press [ENTER] to continue. This will initiate the grade calculations and display and or print the station, offset, elevation, reference elevation and cut or fill. You may now use [DOC]. See DOCUMENT page 70.

[LP] Line point (Bearing-Bearing).

Base Point?: Input the point number of the current active coordinate file of the line you wish to intersect and press [ENTER].

Bearing 2?: Input the bearing of the line you wish to intersect and press [ENTER], then the quadrant, or bypass and input a point number of any point on the line to be intersected.

Initiate the measuring sequence. The horizontal move to the intercept point is now displayed. To remeasure now press [5]. Press [ENTER] to display the bearing bearing intercept information. Press [ENTER]. You have the option of giving the point of intersection a point number, after which you can simply reshoot for another line point on the same line.

NOTE: If using auto, there is no need to be on exactly the same line of sight for a reshot because the program recomputes the intersection for whatever angle when then shot is made.

RSO MENU (2)

[DATA] See Data Collection pg. 57.

[SETE] Will read an elevation at any remote point and will store the elevation at any point number if desired. To not save the elevation simply press [ENTER] without inputting any point number. You will be prompted for a slope distance and zenith angle unless auto is on

[GETHI] Allows for getting a height of instrument from any remote location. Input the benchmark point number, (if the elevation is assigned to a point number) press [ENTER], or bypass and input the actual elevation of the benchmark . Press [ENTER].

If in Auto mode, Press [ENTER] to measure or else input the slope distance, press [∇], input the zenith angle and press [ENTER].

The H.I. is displayed at the top of the screen. Input the instrument push-up, press [ENTER].

The elevation of the set-up point is now displayed. To store this elevation input the point number the instrument is occupying. Press [ENTER]. to bypass press [ENTER] without further data entry. The H.I. now obtained will become the current H.I.. To recall the H.I. at any time type [α] [H] [\leftarrow] [i] and press [ENTER]. The current height of instrument will be left on the stack.

[S/O-E] Station off-set and elevation. Input begin search number. (See Begin Search, page no. 79.) Press either 'Y' or 'N' if reference grades with cut or fill are necessary. Now simply shoot and all information is printed and displayed and may subsequently be documented. (See Document, page no. 70.) The Begin Search only needs to be input once for a series of [S/O-E'S]. The search point can be updated by pressing [↵] [S/O-E]: You may now input a new search point.

RSO Menu 3

- [SHEET] See Document Creation, page no. 66.
- [DIST] Is a routine to just reduce slope distances to horizontal or measure if Auto is on.
- [RECOV] Can be used to recover from accidentally pressing press [ENTER] during RSO operations instead of pressing [5] to remeasure. This will return to the screen with the last move towards or away from the instrument, allowing for the shot to be redone or the rod to be changed so the documented information can be corrected.
- [G. ADJ] Press [G.ADJ]. This allows for a vertical difference to be input from the grade file. This will automatically add (if positive) or subtract (if negative). This value from the elevation generated by a grade file. This allows for the use of the same grade file for grade lines that are parallel (i.e., top of curb and flowline, finish surface and subgrade, or top of footing). NOTE: Be sure to set grade adjust back to zero when finished to avoid costly mistakes.
- [INFO] Press [INFO]. This will show the latest position the instrument was occupying with backsight orientation, vertical control. If any current active document file, press [ENTER]. The status of the following features is displayed. Auto, next number, auto-interval, printer, and grade adjustment.

[MODE] Allows for changing the current measuring mode. Press [MODE]. Press either [COARS] for coarse or [FINE] for fine measurement mode. Press [AVE] to increment the average of measurements, press [ESC→] to return to RSO Menu (3). NOTE: Certain instruments must have the average of measurements done manually.

RSO Menu 4

- [NN] To activate or deactivate next number, see Next Number, page no. 81.
- [AUTO] To activate auto, see page no. 84.
- [ESC→] Return to COGO menu.

When traversing in the field, it is better facilitated by using radial stake-out procedures, rather than using the traverse routines. In RSO, input your set-up point number back bearing or backsight point number and push up, if needed, at each set-up along your in-field traverse. This is a quick and easy method. The [TRAV]erse routine will turn auto (see page no. 84) off. [TRAV]erse menu is designed for office traversing, not field traversing.

If, when using radial stake-out procedures, it becomes necessary to use Traverse procedures, simply press [C S T] [COGO] [TRAV] or with key assignments made, press [←] (orange) [']. NOTE that when returning to radial stake-out, you must reestablish the point you're set up on. Traversing will change your current set-up position so you must reorient the program. To the prompt "H.DIST:" or "Angle:" pressing [α] (alpha) [A] will put you back in auto with the last instrument selected.

The point number you occupy must be in the active coordinate file. After establishing instrument position, you may change coordinate files.

DATA COLLECTION

When [DATA] is selected from the RSO menu, you are moved into the Data Collection menu. This now allows you to perform data collection from your current set-up position. NOTE: A new file must be created for every set-up!!

[NEW] This is used to create a new data collection file. This is necessary for every set-up.

You will be prompted for a file name. This is the name that this data collect file will be stored as. " Job Description" is the identifier that will be transferred to the computer at the time of down loading. All the current set-up information used in RSO will be used in the new data collect file.

[FILES] This will allow you to change data files for possible editing, review and/or re-configuration.

[REV] This allows for review and/or correction of shots in the current active data file.
Your new menu becomes,

[VIEW] Allows for viewing the coordinates and elevations of shots.

Press [VIEW]. Input the shot number to view and press [ENTER].

The shots coordinates will be displayed. The new menu becomes,

[PT?] By pressing [PT?] you can now transfer the shot coordinates into the current active coordinate file and give them a point number in the file (point number will be checked for usage). To not save the coordinates press [ENTER]

[CORR] This allows you to change any of the field data, for any shot, in the active data file. Press [CORR]. Input the shot number to correct and press [ENTER]. You may now move the cursor to any position and make the appropriate correction. Once done press [ENTER]. You may now change the shot memo. Press [ENTER] when done. -

RSO: DATA COLLECTION (cont.)

[CORR] press **[ENTER]**.

[SHOOT] This is for taking shots. There are four different shot routines. They are all followed by the "Memo" prompt, at which time your memo is input. **NOTE:** If using SDR.MAP software, description length should not exceed the "↓" marker. These menu keys will initiate a shot when pressed.

The **[SHOOT]** menu is as follows:

[SHOOT] This takes all the information from the total station for the position of the rod.

[O/S] Collects the distance, zenith angle, and then lets you turn the horizontal angle to another position for recordation (i.e., center of tree, center of power pole).

[+/-] After measurement you will be prompted for a distance. Move either + (away) or - (toward) the instrument. This will generate the shot at a position either directly toward or away from the instrument. After the shot, input either (+) or (-) followed by the horizontal move.

Example: +6.5 or -.75 (no space between + or - and the distance).

[L/R] After measurement, press **[L]** or **[R]** followed by the distance to move, either left or right. The shot information will reflect the adjusted position. The movement left or right is made perpendicular to the line between the rod and the instrument. Left is the instrument man's left and right is the instrument man's right.

Example: L4.6 or R.51 (no space between L or R and distance).

[CALL] This routine will generate a new shot for the position specified. All movements are from the ground position of the last measured shot. The format necessary is + or - distance from the instrument followed by {L} or {R} distance perpendicular to the line of sight from the instrument using the instrument operators right or left. [U]p or [D]own elevation change. This will generate a shot in the new position specified.

Examples:

+5L3U1.2

-14.1R6D4.3

After the move is typed in press [ENTER]. You will now be prompted for a description. Calls should not be made for a shot that has been corrected or changed using [REV]. The call information generated will be incorrect. You will not be prompted for a rod height.

NOTE: This will increment shot counter by one.

DATA COLLECT MENU(1)

After taking any shot, you will be prompted for a rod height. If the rod height is the same as shown, press [ENTER] or else type in new rod height then press [ENTER]. You will now be prompted for any description you would like to put with the shot.

[ESC] Return to Data Collect menu, page no. 57.

The description length will be controlled by the length defined in the description length command [LENG]. (See page no. 61.)

NOTE: If using SDR.Mapping software, your description length is 16 characters, but if you would like long descriptions, make your description length 76 characters (see Description Length, page no. 61). Now, when descriptions are typed in, the first 16 characters will be the description for the shot and the remaining will be a note immediately following the shot which will be used by that shot (see SDR.Mapping User's Manual). Be sure not to have a description straddle. The 16 character length (denoted on the screen by the "↓" when inputting descriptions). This will cause the word straddling it to be split between shot description and the following note.)

You may either now start typing in the description or turn alpha off and press the codes which are displayed in the menu area (see Codes, page no. 63). Press the menu key directly below the desired code. If more codes exist in the library than are displayed, pressing the [NXT] key will display the additional codes in the menu area.

You can also turn alpha on and start typing at any time, if you wish. When description is complete, press [ENTER].

DATA COLLECT MENU (2)

[DLIST] This will display all the Data Collect files in memory, either raw or configured.

[CONF] Configure file. This will allow the current Data Collect file to be configured for the plotting software being used. Press [CONF]. Now select which software to configure the file for:

[SDR.M] Lietz SDR Mapping software

[CIVIL] Civilsoft Mapping softwares

[SURV.] Surv-EDM Mapping software

[DATA] Data Pro Mapping software

[RED] Will reduce shots to coordinate list

[EST→] Return to Data Collect Menu (2)

[→PC] This will send the collected file to the coputer in ASCII, using Xon-Xoff protocol at a baud rate of 9600. with 0 parity.

[INT] Will do interpolation between shoots. By shoot numbers after first reducing the data file (this takes a minute or so to reduce but will not alter the raw data file and will create an auxillary file titled "xfx." Once reduced, this will will remain until you escape the Data Collect menu.

[LENG] To control description length, press [LENG]. You may now type in the desired description length. Press [ENTER] during data collection. This will automatically check all descriptions typed in and will alert you if the description is too long. The default length is 40 characters. It will

show how long the description is and allow you to change and/or remove characters until the desired length is achieved. If the length is too long, the cursor will also blink on the character which is at the maximum length. NOTE: Alpha is also activated.

DATA COLLECT MENU (3)

[CODES] Codes used in shot descriptions can be typed in manually or entered from code libraries. Codes will show up in the menu area when entering the description for a data collect shot. They are simply a typing aid. Many libraries can be made and used alternatively. These libraries are also editable.

[NEW] To create a new code library, press [NEW]. Type in the name for the new library. Press [ENTER]. Codes may now be typed in. They should be typed in the order you wish them to appear on the menu. Press [ENTER] after typing in each code. When finished, press [ENTER] without typing anything and entry will be terminated.

[EDIT] To edit the active library, press [EDIT].

[ADD] To add a code to the active library, press [ADD]. Type in the additional code and press [ENTER].

[DELE] To delete a code from the active library, press [DELE]. Type in the code to delete (it must be typed in the exact same way or it won't be deleted). Press [ENTER].

[VIEW] Pressing [VIEW] will display the codes in the active library. Pressing [ENTER] will show the next screen of codes or return the screen if all codes have been displayed.

[ESC→] Return to code library menu.

[DELE] To delete a library, press [DELE]. Type in the name of the library you wish to delete. Press [ENTER].

[DISP] Pressing [DISP] will display all code libraries in memory.

[LIB] To change the active library, press [LIB]. Type in the name of the library you wish to become active. Press [ENTER].

[ESC→] Return to Data Collect Menu (3)

NOTE: Data Collection description codes can be easily made and/or purged, making it simple to make a custom set of codes for different jobs, using codes that pertain to a specific situation or putting codes in a specific order to best facilitate data collection.

DATA COLLECTION NOTES

1. When data collecting , be sure to enter a memo/code, even if you type in nothing. to complete the program cycle. (This is indicated by returning to the shooting menu.) Failure to do so will alter the format on which the information is stored.)

2. Data collect information is stored as a list under the name specified by the user when the data file was created. This list contains the setup northing and easting, the elevation of the ground beneath the setup, the height of instrument the backsit azimuth in DDD.MM.SS format, the job identification number, and the number 1 (used by the computer). It then contains each shot's raw information starting with the shot number, the slope distance, the rod height, the zenith, then horizontal angle in DDD.MM.SS format. The last item is the memo/code for the shot, stored as an ASCII string. This information is put in this order by the program.

3. Data collection only saves the raw data for each shot. It also only transfers raw data to plotting software. (Except for civilsoft. For this the program reduces the data.)

DOCUMENT CREATION

An electronic cut / fill sheet can be made and held in the memory of the HP-48SX. Stations, elevations, reference elevations (which are automatically computed from grade files) cuts or fills, and descriptions are all recorded on the cut / fill sheet. These cut / fill sheets are then printed on a serial printer, or to the computer.

[SHEET] (From Radial Stake-Out Menu 2), pressing **[SHEET]** will now display the new menu:

[NEW] This will create a new document. Press **[NEW]** "Save document as. . . ." . Type in the name that the document will be stored in memory as. **NOTE:** The extension ".doc" will automatically be added to the name. Only create a document **AFTER** you have occupied a point in R.S.O.. The set-up information used in R.S.O. is transferred to the document, so do not create the document first.

"PROJECT:" Type in the project header, which will be printed at the top of each cut / fill sheet. Input the field book number. Press **[∇]** and input field book page number that the cut / fill sheets will start, press **[ENTER]**. **NOTE:** These page numbers will be automatically incremented as the document exceeds the page lengths. Type in the description for the reference elevation (i.e., top of curb, invert of pipe flow line, etc.).

You have now created a document that can be electronically written to.

[CONT] Pressing **[CONT]** will add new set-up information to the current active document. See CUT \ FILL SHEET example.

[FILE] This allows you to change the current active document. Press [FILE].
Type in the desired file name and press [ENTER].

[DISP] This will display the documents in memory. NOTE: If display persists,
press [ON] once to remove from screen.

DOCUMENT EDIT AND PRINT

[SHEET] (From CVP Main Menu 3). This will allow for editing and printing the current active document. Press [SHEET].

[EDIT] Pressing [EDIT] will now change the menu to the edit menu below.

[HDR] Pressing [HDR] will now allow for header correction. NOTE: Alpha is not on, allowing you to move the cursor using the cursor keys. After changes have been made, press [ENTER]. You now can change the field book starting page or move the cursor up and change the field book number. After corrections have been made, press [ENTER].

[SHOTS] Pressing [SHOTS] will now allow for the information to be corrected for any given station. Input the station to be corrected. The station, elevation, reference, and cut or fill is displayed. You may now move the cursor up and down to change any information on the screen. NOTE; Do not remove, delete, or overwrite the colon. This will interrupt the program! Also, if either the elevation or reference elevation is changed, a new cut or fill will be automatically calculated, so it is not necessary to change the cut or fill. Press [ENTER]. You may now edit the description for that point. NOTE: Alpha is not on, so you may move the cursor back and forth to any position. So, remember to turn alpha on when typing in corrections!

[NOTE] Notes are edited by sequential note number (i.e., first note = 1, second note = 2, etc.). Input the note number to be corrected, then press [ENTER]. You may now move the cursor to the point of correction and type in the changes necessary. Remember to turn alpha on and not to add carriage returns [→] [•].

[ADD] Pressing [ADD] allows for the addition of stations with elevation and reference elevation. Press [ADD]. Type in station to add and press [V]. Type in the point elevation and press [V]. Type in the reference elevation and press [ENTER]. The menu changes to the documentation menu. Now press [DOC] ('B') if the displayed information is correct, or press [CONT] if it is incorrect. After pressing [DOC], you may now type in a description for that point. Press [ENTER]. "Shot Documented" is displayed. At this time, you may also add notations, if desired. Press [CONT] to return to edit menu.

[DELE] Input the station to delete and press [ENTER].

[ESC→] Return to sheet menu.

[PRT] This will start the document printing to serial printer. NOTE; Be sure serial printer was selected, using [PRT] (see [PRT], page no. **78**).

[DLIST] This will show a list'ng of all documents in memory.

[ESC→] Return to CVP Main Menu 3.

DOCUMENTATION

After setting a point using [C/F] or reading a point using [S/ -E] in the RSO Menu, you can now document the station elevation, reference elevation with a description using [DOC].

After one of the above routines, the document menu will appear allowing for the information to be retained electronically.

This menu is:

[SET] Will display the zenith angle to set the instrument at so the bottom of the rod used will be at the correct reference elevation. It will also make the document reflect that the point elevation is the same as the reference elevation and a ^{CUT} of 0.00 but will not add this information to the document until you press [DOC].

[DOC] Pressing [DOC] will actually put the station elevation, reference elevation, and cut or fill on the document and allow you to type in the description desired. Press [ENTER]. NOTE: The previous description is retained, so simply pressing [ENTER] will make the description the same as the previous one. Also, note that alpha is on, so if you want to move the cursor back and forth, be sure to turn alpha off!!

[NOTE] Will add a notation to the document. Press [NOTE], type in desired notation, and press [ENTER].

[SORT] This will put the station to be documented in ascending order with the stations already on the document.

[MAN] This will put the station to be documented in the order in which it was shot.

NOTE 1: Whichever format (sort or manual) is currently being used, will be highlighted with a "□" preceeding it.

NOTE 2: Be sure the desired format (sort or manual) is selected prior to pressing [DOC].

[CONT] To leave the documentation menu and return to the RSO menu. If cut/fill staking, it will prompt you for next station and offset to set. If you were using S/O-E, you will be returned to the RSO (2) menu.

PROJECT: SUNSET BLVD - SOUTH CURB STAKES

: F.B.: 40137 : PG: 891

WED 04/07/93 08:16:09A

INST. STA.=101 N=5155.748 E=5066.873 EL=203.130

REFERENCE : PUSH UP=5.050 H.I.=208.180

B.S.=103 Bk. Azm.=207 43'29"

REFERENCE :

REFERENCE ELEVATION=TOP OF CURB

STATION	ELEV.	REF.	CUT	FILL	DESCRIPTION
162+94.93	207.41	207.69		0.28	SET 1X2 5' O/S LEFT CF / GC
163+10.00	206.82	207.28		0.46	SET 1X2 5' O/S LEFT CF
163+25.01	205.97	206.88		0.91	SET 1X2 5' O/S LEFT CF / GC
163+50.00	205.34	206.07		0.73	SET 1X2 5' O/S LEFT CF
163+75.00	204.96	205.26		0.30	SET 1X2 5' O/S LEFT CF
163+97.00	205.47	204.55	0.92		SET 1X2 5' O/S LEFT CF / GC
164+15.00	204.63	204.01	0.62		SET 1X2 5' O/S LEFT CF
164+35.00	203.54	203.40	0.14		SET 1X2 5' O/S LEFT CF
164+56.48	202.90	202.75	0.15		SET 1X2 5' O/S LEFT CF / GC
164+61.76	202.39	202.65		0.26	SET 1X2 4' O/S LEFT CF / HI DR
164+85.76	201.67	202.20		0.53	SET 1X2 5' O/S LEFT CF / CL DWY (THEORETICAL TOP OF CURB)
165+09.76	203.33	201.75	1.58		SET 1X2 5' O/S LEFT CF / HI DR
165+15.90	203.50	201.63	1.87		SET 1X2 5' O/S LEFT CF / GC
165+35.00	202.86	201.42	1.44		SET 1X2 5' O/S LEFT CF
165+57.67	202.46	201.16	1.30		SET 1X2 5' O/S LEFT CF / LD / GC
165+62.67	202.15	201.14	1.01		SET 1X2 5' O/S LEFT / INLET
165+76.67	201.82	201.10	0.72		SET 1X2 5' O/S LEFT / CL CB / GC
165+90.67	201.88	201.20	0.68		SET 1X2 5' O/S LEFT / INLET
165+95.67	201.36	201.23	0.13		SET 1X2 5' O/S LEFT / LD / GC
165+98.17	200.47	201.27		0.80	SET 1X2 5' O/S LEFT / HI DR
166+16.17	200.74	201.58		0.84	SET 1X2 5' O/S LEFT / CL DWY / GC (THEORETICAL TOP OF CURB)
166+34.17	200.91	202.02		1.11	SET 1X2 5' O/S LEFT / HI DR

PLOTTING (1)
(Screen Plotting)

[PLOT] Pressing this key will change the menu to the screen plotting menu and erase the plotting screen.

[PT#] Pressing this key will plot point number from the current coordinate file. Type in the numbers separated by a space ([SPC]) or, if the numbers are in succession, type the beginning number and the ending number separated by a decimal point (i.e., for numbers 3 to 16, inclusive, type 3.16). Press [ENTER].

[PLAN] Pressing this key will automatically add the active plan to the plot with radials from the RP to both the BC and the EC.

[CONX] Pressing this key allows you to connect points with straight lines. Type in the first point, press the cursor down, type in the second point, and press [ENTER].

[DRAW] Pressing this key will build a plot file (it may take a minute). Then, ask if you would like to highlight any points. Press either "Y" or "N." If "Y" then input the number to highlight separated by a space ([SPC]). The plot will then be shown on the screen. Press [ENTER] to clear screen.

[ERASE] Pressing this key will erase the plot drawn.

[MORE] Pressing this key will change the menu to Plot (2) Menu.

PLOTTING (2)

- [DATA] This will reduce and plot the current data collection file. This enables the user to see the areas which have been shot or areas which may have been overlooked. This routine takes a moment, so be patient.
- [ESC→] This will return to the Main CVP Menu (3).

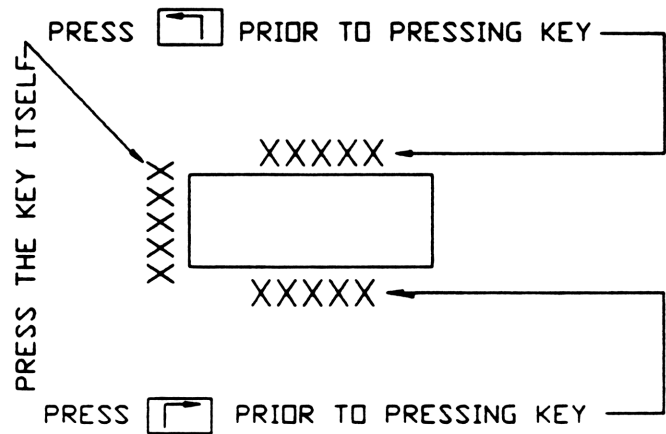
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KEY ASSIGNMENTS

C.V.P. KEY ASSIGNMENTS LOCATIONS

DATA	S-C	CVP		RC	FILES
INFO		CST		GC	
TRAV	C-S	PRT?	PINV		RSO
	CHGO	AUTO	CINV		RSO*
					ALT
4 FIX					EXIT
	7	8	9		
	4	5	6		
→HR	1	2	3		
→HMS	0	.	SPC		

DESCRIPTION OF ASSIGNMENTS



KEY ASSIGNMENTS

- [SC] Station to coordinate ([←] [PRG]). This will prompt you for a station and offset within the current active plan file. It will then prompt for point number after which it will leave the coordinates on the stack 2: N and 1: E. These coordinates can then be transferred to another file by using [ALT] (See ALT file).
- [CS] Co-ordinate to station ([→] [PRG]). Input begin search? (See BEGIN SEARCH). Then input point number or bypass to northing and easting. The station and offset for the input information is then displayed and/or printed. Press [ENTER] and the station and offset are left on the stack.
- [INFO] Information ([MTH]) will display traverse information when traversing or the radial stake-out information for radial stake-out. Press [ENTER] after first display to see the additional RSO information.
- [DATA COLLECT] Data collect ([←] [MTH]) will put you into the data collection menu.
- [RC] Recall coordinates (to screen). Input point number then press left shift (orange) [←] cursor arrow up [Δ].
- [GC] Get coordinates recalls coordinates to stack 1: Easting & 2: Northing. Type in point number. Press left shift (blue) [→] Cursor arrow up [Δ]. This is a subroutine used in many other routines. Therefore, the northing and easting are not labeled.

KEY ASSIGNMENTS (cont.)

[FILES] [←] [NEXT] (See FILES, page 9).

[TRAV] [←] ['] (See TRAV, page 15).

[P2P] [←] [<]. Point inverse; put two point numbers on the stack then press [←] [<].

This routine will return the bearing, azimuth, and distance of the inverse.

[C2C] [→] [<]. Coordinate inverse: Put the coordinates on the stack.

4: N1

3: E1

2: N2

1: E2

Press [→] [<]; This will return the bearing, azimuth and distance of the inverse.

[RSO] [←] [>]. To enter an instrument set-up point number and the RSO menu. (See page 44).

[ALT] [←] [1/X] , (See ALT file, page 79).

[EXIT] [→] [1/x] (Exit CVP)

[→HMS] [←] [ON] Puts a decimal angle into degrees, minutes, and seconds.

[HMS→] [←] [→] Puts degrees, minutes, seconds into decimal degrees.

[AUTO] By pressing [→] [EVAL] auto is executed Auto (Y/N)
will be displayed. This will put you in auto mode so you may directly
hook the HP-48SX into one of three types of total stations. If "Y" is
pressed, a display will show the three instrument types the HP-48 will
operate with. Use the cursor control keys to highlight the desired
instrument, then press [ENTER]. You are now set to be tied into that
instrument.

[PRT?] By pressing [←] [EVAL] printer operations are now selected. Answer
[YES] or [NO] to the printer types.

If serial printer is selected, press the menu key that corresponds to the
baud rate of that printer. This program uses ASCII value for character:
10 for linefeed, 12 for form feed, and 13 for carriage return.

BEGIN SEARCH?

This routine is used to facilitate a search for computed stations and offsets. The search for the station and offset should begin at the beginning of the segment in which the target point lies. Or, at the beginning of a segment at a lesser station than the suspected station. The prompt "begin search" will also have the plan file name displayed above it. The number to be inputted will correspond with a position within the plan file. Radius points are considered and displayed "illegal search points" and are not allowed. The numbers are sequential, starting at the first segment of the plan.

NOTE: If "bad search" is displayed, the program will reinitiate a search at the beginning of the active plan file. It should be noted that your search point should be moved back (lesser station). If "Coord out of file limits is displayed, the coordinates for which the station and offset was requested do not fall within the range of the current active plan file.

[ALTFILE] If it ever becomes necessary to transfer coordinates from one file to another, it can be easily accomplished using this routine. Altfile takes a pair of coordinates from the stack and puts them into another coordinate file. This may be done in one of the following manners:

1. By using * [GC]: Input point number, press * [GC]. The northing and easting from the active coordinate file will be returned to the stack.
2. To put the coordinates from a station and offset in another file, execute [SC] ([←][PRG]). After a moment the point number prompt will be displayed. Press [ENTER] (or type in a point

number if you wish to save the coordinates in the active coordinate file) after this the coordinates will be left on the stack.

3. Type in northing, press [ENTER]. Type in easting, press [ENTER].

To execute ALT file, press *[ALT] ([←][1/x]) alternate file.

Type in file name in which to transfer coordinates. Press [ENTER] (if file name is already displayed, press [ENTER] without typing in anything). Now you will be prompted for a point number same as before.

NEXT NUMBER

[NN] This routine will ask if you want to activate or deactivate next number. Next number simply will display the next available point number in the current coordinate file when you are prompted for a point number. It does not automatically use the number. You must type it in for the coordinates to be assigned to that number.

NOTE: As the next number available in a file becomes larger, it will take longer for the program to find the next available point number.

AUTO-INTERVAL

Auto-interval can be activated by pressing [←] [C/F] on the RSO (1) menu. When using the cut and fill [C/F] procedures, the stations will automatically be incremented by the value entered. Press [←] [C/F]. Press either "Y" or "N" to the prompt "Auto-Interval? (Y/N)." If yes, input the desired stationing interval.

When using auto-interval, the first station must be typed in. All following stations will then be incremented. The incremented stations will appear on the screen after the first station has been processed. You must press [ENTER] to process the incremented station after it appears on the screen. You may also change the displayed station and/or offset, if desired, by moving the cursor with the cursor control keys and typing over the displayed station.

This is a typing aid only. It simply adds the interval to the last inputted station. The interval can be changed by aborting the cut and fill routine (press [ON] twice) and pressing [←] [C/F] to input a new interval. This method can also be used to end auto-interval.

INFO

[INFO] By pressing the [MTH] key, the current information is displayed.

In TRAVERSE: The traverse terminus point number and coordinates are displayed. The backsight point number and the last traversed bearing are also displayed. It will also inform you if the next number is active and which printer, if a printer is selected. It is not necessary to press [ENTER] to end this display. You may now continue typing or press [ON] once to clear the screen.

In RSO: The instrument set-up point number and coordinates are displayed. The backsight point number and backsight bearing are also displayed. Both the push-up and height of instrument are displayed if the vertical control is being used. The current active document file is also displayed. Press [ENTER].

The stake-out status is now displayed if auto is on or off with the instrument selected. If next number is on or off, if auto-interval is on or off, if a printer is activated, and which type. Also, the grade adjustment is displayed.

It is not necessary to press [ENTER] after the second display. You may just continue typing or press [ON] once to clear the screen.

DISTANCE MEASUREMENT

All CVP routines work in both manual measuring and automatic measuring mode.

In manual mode: To the prompt, "H.DIST:" simply type in the measured horizontal distance and, if necessary, you will be prompted for a vertical difference, or else you may bypass the "H.DIST:" prompt and input a slope distance, press [∇], and a zenith angle.

To change to auto measurement mode, either use the [AUTO] from key assignments or the RSO Menu (4).

It can also be activated by inputting "A" (Press [α] [A] [ENTER]) to the prompt "H.DIST" or the prompt "Angle:". You will automatically reconnect the HP-48SX with the last instrument used.

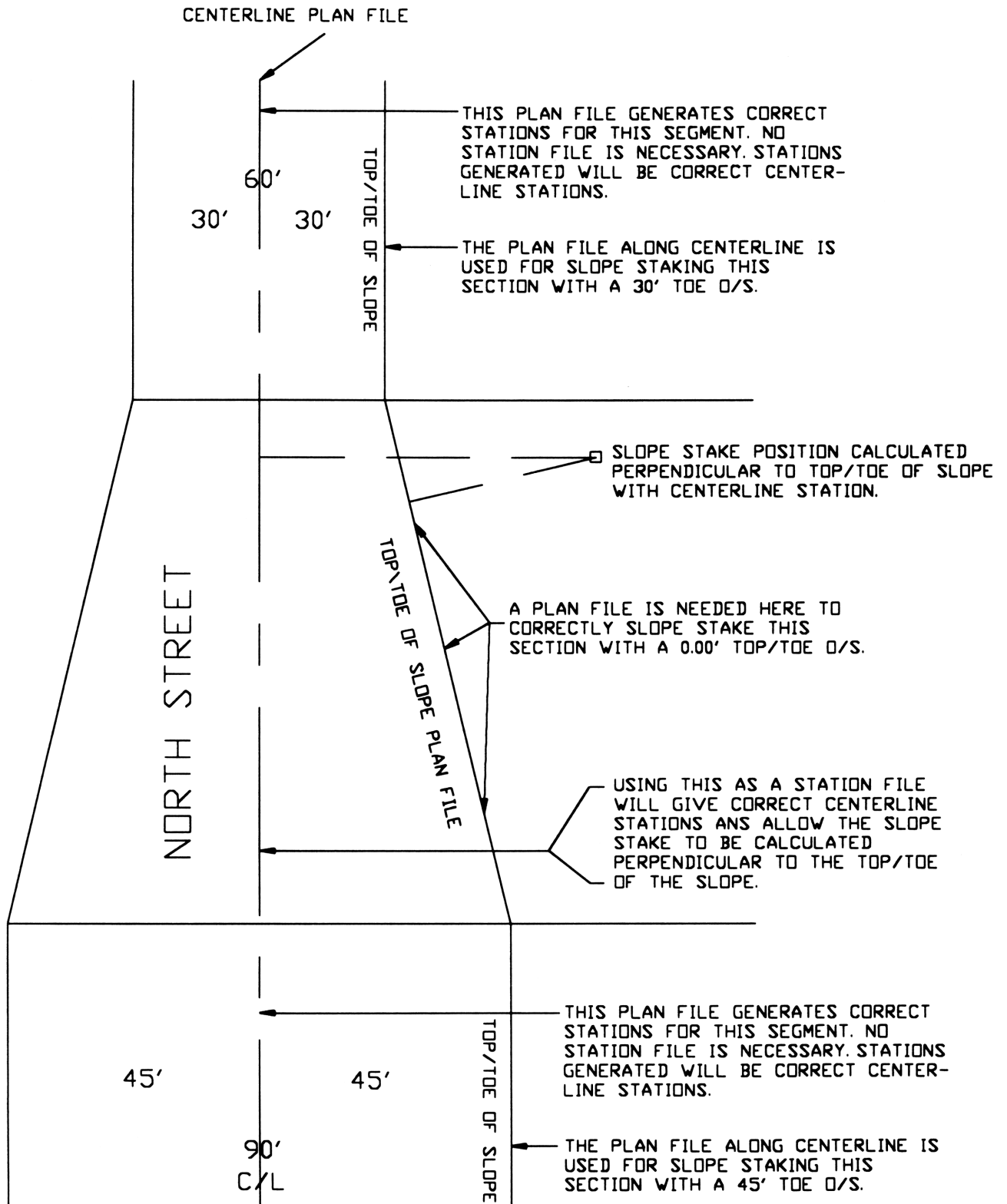
STATION FILE

When changing plan files, you will be prompted "Station File? (Y/N)". This will allow for double stations and offsets for shots taken in the field only. Do not confuse this with generating stations. All plan files will generate stations. If Station File is selected, then when a station and offset is generated from a shot position, it will first return the station and offset to the Station File, then the station and offset to plan file. Stations generated by a Station File will not be used for grade calculations. Only stations generated by a plan file will generate grades.

In essence, a Station File is a plan file that will be used to generate stations only.

This is generally used when slope staking and the top of fill, or toe of cut does not parallel the plan file. (Example: when slope staking a street the top/toe of slope parallels the center of the street, then at a certain point it no longer runs parallel. By making a plan file down the top/toe of the non-parallel area, you can now use your plan file down the centerline of the road for a Station File and the file made along the non-parallel area for a plan file. This allows slope stakes put on either side of centerline to be put on the same centerline station, but the slope stake's position will be calculated perpendicular to the top/toe of the slope. This should only be used if necessary to have opposing slope stakes on the same station. If it is not necessary then answer [N]o to the prompt "Station File? (Y/N)".

(See Example Pg 86



STATION - OFFSET REPORT

[REPT] Using a serial printer, this routine provides for printing out of a series of stations and offsets (from a non-active plan file) from the input coordinate point numbers (from the active coordinate file).

Press **[REPT]**. Type in the name of the remote plan file from which the stations and offsets will be generated. **NOTE:** The current active plan file appears on the screen. You may type over this or use it, if desired. Press **[ENTER]**, type in the coordinate file that controls the remote plan file. **NOTE:** The current active coordinate file appears on the screen. You may use it or type over it, press **[ENTER]**. Input where to begin searching for these stations and offsets (See **Begin Search**, page 79). Input the coordinate point numbers for which stations are desired (be sure these point numbers are within range of the remote plan file). For inputting point numbers, use the same format as used in **Compass Rule Adjustment**. (See **[CRA]**, page 18).

The output will be in a format for a serial printer; be sure to select serial printer using **[PRT]**, see page 78, before initiating the station-offset report.

TRIANGLE SOLVER

This routine has 5 triangle solutions.

Press [TRI]: Select the triangle solution which is desired. Input the prompted information.

The remaining parts will be solved and the area will also be displayed. Press [ENTER] to continue after solution information is displayed.

[MISC] Miscellaneous Utilities

[LR] Linear regression

Input stations and elevations pressing [∇] between each till the input stack is full, then press [ENTER]. The starting station and elevation with the rate of grade will be left on the stack.

[STA] Type in the station for which an elevation is desired then press [STA].

The station and elevation will be displayed. Press any key to continue.

[EL] Type in the elevation for which a station is desired then press [EL].

The station for the input elevation will be displayed. Press any key to continue.

[RATE] Pressing this key will display the slope gradient as a rate per foot.

[START] This will re-initiate the linear regression routine.

[CURVE]

[HORZ] See curve solve pg. 24

[VERT] Input B.V.C station ,press [∇]. Input B.V.C. elevation, press [ENTER]
Input the E.V.C. station and elevation in the same manner, press [ENTER]. Input the grade into the vertical curve or bypass and input a station and elevation of a point on the grade line. Next do the same for the grade out of the vertical curve

[HI/LO] This will display the station of the high or low point of the curve.

[STA] Input the station in the vertical curve for which an elevation is desired. The elevation will then be displayed.

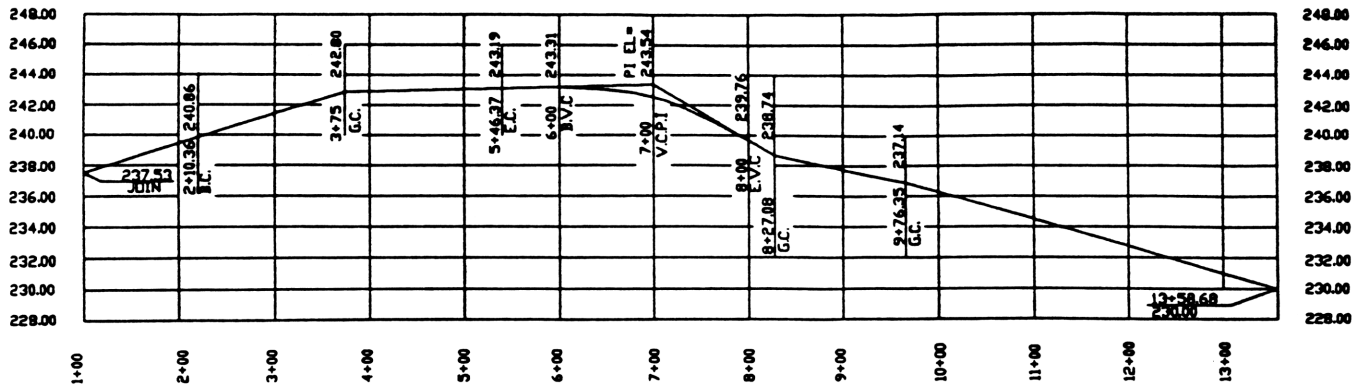
[MISC] (cont.)

[TRI] See triangle solver pg. 88

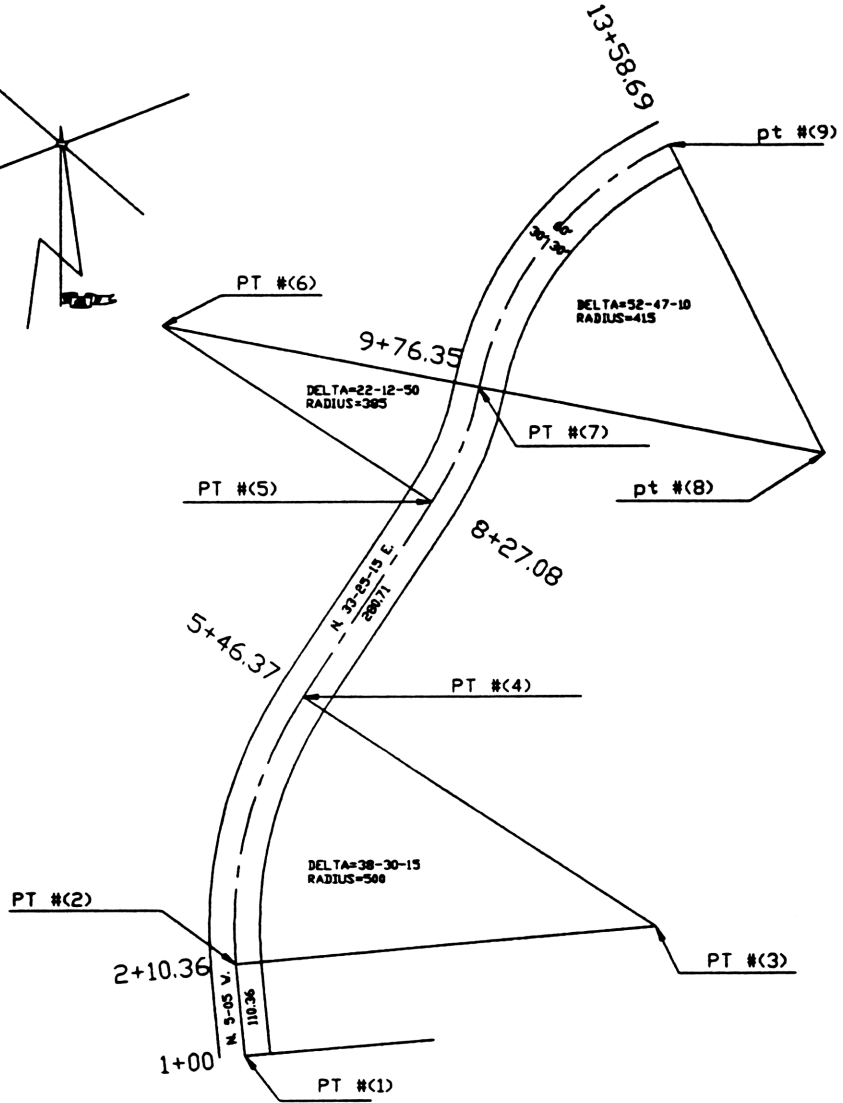
[NN] See next number pg. 81

[VER] Display that radially stakes out the program version you are running.

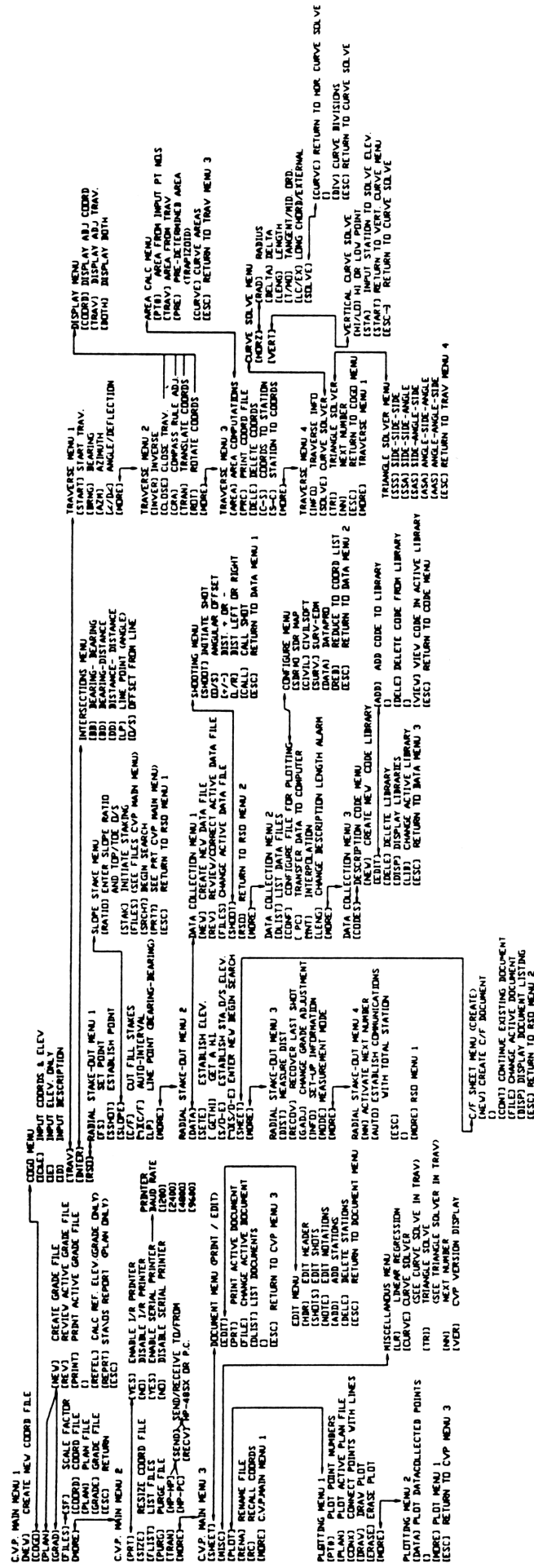
PROFILE VIEW



NORTH AVE PLAN VIEW



C.V.P. TRAVERSE MENU



ADDENDUM TO MANUAL FOR RELEASE 3.7

ADDENDUM: ADJUSTMENTS to TRAVERSES [ADJ] ([ADJ] REPLACES [CRA] ON TRAVERSE MENU #2.)

TRAVERSES CAN NOW BE ADJUSTED USING TRANSIT RULE OR ANGULAR ADJUSTMENT IN ADDITION TO COMPASS RULE. THESE ADJUSTMENTS CAN BE INITIATED AFTER TRAVERSING OR BY INPUTTING SEQUENTIAL POINT NUMBERS. (SEE [CRA] PG. #18.)

ANGULAR ADJUSTMENTS DIVIDE ANGULAR CLOSING ERROR EQUALLY TO ALL LEGS OF THE TRAVERSE.

ADDENDUM: 2 POINT RESECTION [RSECT]

TWO POINT RESECTIONS CAN BE EXECUTED FROM THE RSO MENU #3. ([RSECT] MOVED [INFO] TO RSO MENU #4 SEE PG. #54.)

THIS ROUTINE USES DISTANCE-DISTANCE INTERSECTIONS FROM TWO COORDINATED POINT NUMBERS. IT WILL ALSO DISPLAY THE ANGULAR ERROR OF THE ANGLE TURNED.

THE COORDINATES GENERATED WILL AUTOMATICALLY BECOME YOUR SET-UP COORDINATES AND THE FIRST POINT SIGHTED WILL AUTOMATICALLY BECOME YOUR BACKSITE ORIENTATION.

NOTE: BE SURE TO SET ZERO ON FIRST POINT SIGHTED.

ADDENDUM: BEGIN SEARCH?

THE BEGIN SEARCH ROUTINE NOW PROMPTS FOR A STATION FOR WHICH TO BEGIN COMPUTING STATIONS AND OFFSETS RATHER THAN A SEGMENT NUMBER. (SEE PAGE #79). TO BEGIN THE STATION SEARCH FROM THE BEGINNING OF THE PLAN FILE SIMPLY PRESS [ENTER], IF A BEGIN SEARCH STATION IS INPUT THEN THE PROGRAM WILL AUTOMATICALLY DISPLAY THE STATION AT THE BEGINNING OF THE SEGMENT IN WHICH THAT INPUT STATION LIES.

ADDENDUM: CURVATURE AND REFRACTION

CURVATURE AND REFRACTION CAN NOW BE TURN ON OR OFF IF DESIRED BY PRESSING THE APPROPRIATE KEY IN THE MEASUREMENT MODES MENU (RSO MENU #3)

ADDENDUM: MULTIPLE FILE TRANSFER

MULTIPLE DATA COLLECT FILES CONFIGURED FOR SDR MAPPING SOFTWARE CAN NOW BE MERGED AND TRANSFERRED AS A SINGLE DATA FILE WHEN DOWNLOADING TO THE SDR PLOTTING SOFTWARE.

ADDENDUM TO MANUAL FOR RELEASE 3.7

(CONT.)

ADDENDUM: FILE TRANSFER BAUD RATE

WHEN TRANSFERRING FILES YOU MAY NOW SELECT THE TRANSFER BAUD RATE. YOU WILL BE PROMPTED FOR THE BAUD RATE ON VARIOUS ROUTINES. SIMPLY PRESS THE SOFTKEY WHICH CORRESPONDS TO THE DESIRED TRANSFER RATE.

ADDENDUM: PRINT TRAVERSE BY POINT NUMBERS

TRAVERSES CAN NOW BE PRINTED OUT BY INPUTTING SEQUENTIAL POINT NUMBERS (SEE [CRA] PAGE #18). THIS PRINT OUT CAN BE ON EITHER A SERIAL PRINTER OR THE INFRA-RED PRINTER. THE PRINT OUT WILL CONTAIN THE ANGLE TO THE RIGHT, BEARING AND DISTANCE FROM POINT TO POINT. THE COORDINATES OF EACH POINT MAY ALSO BE PRINTED IF DESIRED.

ADDENDUM: [CURVE] IN TRAVERSE MENU #1 NOW CONTAINS CURVE SOLVE.

WHEN TRAVERSING THROUGH CURVES YOU MAY TYPE IN THE CURVE DELTA THEN PRESS [CURVE] OR YOU MAY PRESS [CURVE] AND INPUT ANY TWO KNOWN CURVE PARTS AND SOLVE THE CURVE. YOU MAY SOLVE THE CURVE AS MANY DIFFERENT TIMES AS YOU LIKE BY PRESSING THE SOFTKEY [CURVE]. WHEN THE DESIRED CURVE IS SHOWN PRESS THE SOFTKEY [CONT] TO TRAVERSE ALONG THE CURVE. BE SURE TO SELECT EITHER CURVE RIGHT OR CURVE LEFT BY PRESSING THE APPROPRIATE SOFTKEY ON THE CURVE SOLVE MENU. AFTER TRAVERSING THROUGH THE CURVE YOU WILL BE POSITIONED AT THE CURVE E.C. WITH YOUR ORIENTATION TOWARDS THE P.I..

C.V.P.
ADDENDUMS TO MANUAL FOR RELEASE 3.6

8/13/1993

Addendum 1:

When changing from RADIAL STAKE OUT to TRAVERSE the Auto function in Radial Stake Out will no longer be disabled.

Addendum 2:

BACK UP:

The COGO menu now includes a back up routine for coordinate files. This routine will create a duplicate file of the active coordinate file and store the file as "filename.BAK". This is useful if you are compass rule adjusting, rotating or translating a coordinate file because it will save the original coordinate values. If an adjustment is done incorrectly then the original file can be restored.

NOTE: Each time the coordinate file is backed up it overwrites the previous back up file with the present coordinate values.

RESTORE:

The restore routine will replace the active coordinate file with the file stored as "filename.BAK".

Addendum 3:

SUN SHOT:

The RADIAL STAKE OUT menu now includes a sun shot routine.

This is the same routine that can be found in the Lietz Solar Ephemeris.

Addendum 4:

TRAVERSE:

The TRAVERSE menu now includes radial traversing. This is accessed by pressing the [←] key prior to pressing the [A] (start traverse) key. This will allow you to traverse radially from the latest traverse position.

NOTE: The radial traverse routine must be re-initiated for each radially traversed leg.

C.V.P.

ADDENDUM TO MANUAL FOR RELEASE 3.5

Addendum: NEXT NUMBER (pg. 81)

This routine was added to various menus as "NN". (I.e. Traverse, Radial Stake Out, CVP; misc.) When enabled this routine will display the next available point number active in the active coordinate file.

Per this addendum If there are no more unused point numbers in the coordinate file then the coordinate file size will automatically be increased by ten points and the new next number will then be displayed.

NOTE: The displayed NEXT NUMBER will not be used unless it is subsequently typed in.

Addendum: FILE TRANSFER:

Added to the file transfer routines In the CVP main menu #2 are DATA FILE TO PLOT (which transfers data collect files to plotting software's. This is the same routine which appears in the data collection menu #2. See pg. #61). Also COORDS TO PLOTTING SOFTWARES. This routine allows you to transfer coordinates from the coordinate file directly into the various plotting software's listed. It should be noted that when running this routine that the [PT#] menu key will allow you to select point numbers the same way as the "INPUT POINT NUMBERS" routine works in COMPASS RULE ADJUSTMENTS. (see pg. #18) The only difference is that you may do more than one sequence of point numbers by pressing the [PT#] key again after the first sequence has been input and entered.

Addendum: SOKKIA SDR DATA COLLECTOR DESCRIPTION EXTENDER

To extend the length of the description for the SDR data recorder include a hyphen (-) in the description code before the sixteenth character (That's where the little down arrow is located on the screen). This will act the same as adding a note to the shot just taken. See the SDR manual for more information on adding notes to extend shot descriptions.

Example: BLD - DESCBLD 15 -8 23 17

This example will use BLD as the shot code and DESCBLD and its descriptive distances as the NOTE following the code.

Addendum: DATA COLLECTION

Data Collect shots may now be aborted at any time by pressing [ON] twice. This will NOT damage the data file configuration (See pg. 65 #1)

C.V.P.

ADDENDUM TO MANUAL

Usage Notes:

The question mark grade file can be used to simulate a grade file of 0.00 elevation for any input station. This will allow the reference elevation to be 0.00 at all stations or controlled by using the GRADE ADJUST routine.

The question mark grade file can be typed in while executing the FILES routine by typing left shift then then pressing the DROP key (just above the division key)