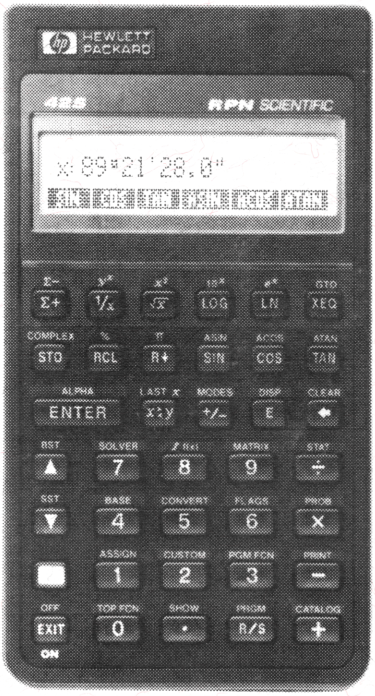
HP42S Alignment & Offsets



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TECHNICAL ASSISTANCE

The program material, instructions and procedures contained in this book assume that the user has a working knowledge of both surveying and the general operation of the HP-42S calculator.

Technical assistance is limited to verification of the results shown in the various examples used in the book.

If you have any questions or suggestions regarding this book or other **D'Zign** publications, please feel free to call us. The number is (818) 507-7408, and someone is available to answer technical questions from 3:00 A.M. to 5:30 A.M. and from 4:30 P.M to 6:30 P.M. (Pacific time), as a service to users from other time zones.

NOTICE

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Library of Congress Catalog Card No. 89-81216
ISBN 0-944889-10-7

Manufactured in the United States of America

published by D'Zign Land Survey & Development
Glendale, California, U.S.A. 1990

ISBN 0-944889-10-7

The programs included in this booklet are designed to take full advantage of the power of the Hewlett-Packard HP42S calculator. Programming this calculator is really simple, but a bit confusing at first. We will try to walk you through some of the 'harder to find' steps as we proceed.

the operations index

To find a function for the first time, HP has provided an "Operations Index" on pages 310 through 335 of the instruction manual, which tells you exactly what keystrokes to use to type in the function you want.

Even better, this index gives you the page number that you can refer to if you want to know more about the function you are using. If, while typing in a program, you aren't sure how to input a particular function, simply refer to the Operations Index.

Another handy tool is the function catalog. When you stroke the shifted + key, a menu appears in the lower portion of the display. The leftmost key will take you into the function catalog, which contains ALL of the functions. Scroll up or down through the list until you come to the function you want, stroke the corresponding key, and the function is entered as a program step.

the programs

The programs included in this booklet have been separated into accessable sub-programs to allow them to be used with other programs at a later date. For instance, if you are using the **HP42S Spiral Curves** booklet, you will find that a number of the subroutines you need for this program are already in the calculator.

A number of the subroutines will already have been input if you are using programs from the book, "**HP42S Surveying Solutions**". If a program or subroutine has the same NAME as one you already have (from any **D'Zign** publication) it is the same as the one in this book.

If this is your first try at programming the 42, we recommend that you read Chapter 8 of the manual before beginning.

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subroutines

Because of the way the calculator works, we will start by input of some subroutines.

Once the subroutine has been input, its name appears in the menu when you stroke XEQ, and all you have to do to add it as a step in the program you are typing in is stroke GTO or XEQ followed by keystroking the key corresponding to the subroutine to input the program step GTO XXX or XEQ XXX.

```
01▸LBL "YN"
02 "YES"
03 KEY 1 GTO 01
04 "NO"
05 KEY 2 GTO 02
06 MENU
07 STOP
08▸LBL 01
09 SF 10
10 GTO 03
11▸LBL 02
12 CF 10
13▸LBL 03
14 CLMENU
15 EXITALL
16 RTN
```

getting started

Begin by stroking the shift key, then the **XEQ** key. The display will show a menu which will be blank (if you haven't yet input any programs) except for **.END.** on the left. The keys just below each of the menu portions will correspond to the menu instruction above it. Stroke the key just below the **.END.** in the display.

```
00▸{ 0-Byte Prgm }
01 .END.
```

Next, go into **program mode** by stroking the shifted R/S key, and you should have a display similar to the one shown to the left. Begin typing in the program **"YN"**.

quick tip

Program steps 03 and 05 use a function which stores the prompt to the menu, and at the same time assigns the key.

To access the function, stroke [ ] [PGM.FCN] [▲] [KEYG]

You'll receive a prompt, **KEY_ .** Stroke the key number (we'll use 1 as the example), and you will get a prompt, **KEY 1 GTO__.**

In this case (step 03) answer 01 to complete the program step.

next subroutine

This one has 2 steps you'll want to review before you begin input:

02 ΣREG 00	To access this function, go to the "stat" menu (shifted divide key), and scroll down once. It's the second key from the right, and when you stroke it you will be prompted for the 00 to complete the program step.
03 CLΣ	This one is the leftmost key when you bring up the menu by stroking ←

To begin input, stroke the **shifted** R/S key, then the key that corresponds to the menu listing "**YN**", the program just input.

Scroll upward once with the ▲ key to put the pointer at step 00, and begin typing in the program steps shown to the right.

When you've finished stroke EXIT to leave program mode.

```
01▸LBL "CL"
02 ΣREG 00
03 CLΣ
04 ΣREG 11
05 CLΣ
06 0
07 STO 24
08 RTN
```

The step, CF IND ST X, (in the next group) is input through the FLAGS menu. To get to "IND", stroke the · key, then stroke it again to bring up the menu containing "ST X".

Go back into program mode (R/S). The program pointer should still be at step **08 RTN**. Type in the additional steps shown on the next page.

```
09▶LBL "FC0"
10 0.013
11▶LBL "FN0"
12 CF IND ST X
13 ISG ST X
14 GTO "FN0"
15 GTO IND ST X
16▶LBL 14
17 CF 19
18 CF 20
19 81.088
20 GTO "FN0"
21▶LBL 89
22 90.098
23 GTO "FN0"
24▶LBL 99
25 CLST
26 FS? 55
27 SF 08
```

We're going to add one more step, 28 END. Input this step by stroking ENTER, type in END, and then stroke ENTER again.

Input of the "**END**" step has separated this program from the program "**YN**". This general method of input will be used for almost all of the programs, starting at the 'top' of one program and then separating the two programs with an END as the last step of the new program. Using this method, we can put the programs in the menu where we want them.

back to work

This next one is the driver program for coordinate storage. start the input by going to "**CL**", and scroll up to put the pointer at 00.

```
01▶LBL "OUT"
02 RCL 13
03 2
04 X
05 24
06 +
07 ENTER
08 ENTER
09 1
10 -
11 RCL IND ST X
12 RCL IND ST Z
13 RTN
14▶LBL "IN"
15 RCL 13
16 2
17 X
18 24
19 +
20 X<>Y
21 STO IND ST Y
22 R↓
23 1
24 -
25 X<>Y
26 STO IND ST Y
27 RTN
28▶LBL "PIN"
29 STO 13
30 XEQ "PN"
31 GTO "IN"
32▶LBL "POUT"
33 STO 13
34 GTO "OUT"
```

The programs "**OUT**" and "**IN**" are used as subroutines by other programs, but "**PIN**" (**P**oint **IN**) and **POUT**" (**P**oint **OUT**) may also be used from the menu for storing and recalling coordinates.

To store a pair of coordinates by point number with "**PIN**", input the point number and execute PIN. The program will prompt you for the north coordinate. Input it and stroke the R/S key, which will bring up a prompt for the east coordinate. Input it and stroke R/S. The coordinate pair is stored under the point number you used.

To recall the coordinates, input the point number and execute POUT. The northing will be in the y-register and the easting in the x-register.

Another one to look at; the ⊢ symbol is "append", which adds to what is already in the **alpha** register.

The symbol, ␊, is "line feed", and we use it to control the display. You can input it by stroking

```
37 ⊢"␊    N =?"
```

This short subroutine can just be added to the end of the programs just input. It's the one that does the prompting when you use "**IN**".

```
35▶LBL "PN"
36 CLA
37 ⊢"␊    N =?"
38 PROMPT
39 CLA
40 ⊢"␊    E =?"
41 PROMPT
42 END
```

When you type in the END (last step) it becomes separated from the other programs.

You should have the hang of it now, so go to the top of "**YN**", and type in a long one:

```
01▶LBL "C↑"
02 CF 29
03 FIX 00
04 " "
05 35
06 XTOA
07 CLX
08 R↓
09 ARCL 13
10 ⊢"     "
11 FIX 04
12 ALENG
13 ⊢"N= "
14 ARCL ST Z
15 ⊢"␊"
16 XEQ IND ST X
17 ⊢"E= "
18 ARCL ST Y
19 AVIEW
20 R↓
21 ADV
22 RTN
23▶LBL 05
24 ⊢"      "
25 RTN
26▶LBL 06
27 ⊢"       "
28 RTN
29▶LBL 07
30 ⊢"        "
31 RTN
32▶LBL "DMS"
33 FS?C 19
34 CLA
35 ENTER
36 STO 19
37 IP
38 CF 29
39 FIX 00
40 ARCL ST X
41 ⊢"°"
42 -
43 100
44 x
45 ABS
46 STO 18
47 IP
48 XEQ 01
49 ARCL ST X
50 ⊢"'"
51 RCL 18
52 FP
53 100
54 x
55 FIX 02
56 RND
57 FIX 01
58 XEQ 01
59 ARCL ST X
60 ⊢"""
61 CLX
62 FIX 04
63 SF 29
64 RCL 19
65 RTN
66▶LBL 01
67 10
68 X<>Y
69 X<Y?
70 ⊢"0"
71 RTN
72▶LBL "A0"
73 "AZ"
74 SF 85
75 XEQ 06
76 ⊢" = "
77 FIX 04
78 SF 29
79 FS? 10
80 ⊢"?"
81 FS? 85
82 XEQ "DMS"
83 FS?C 85
84 RTN
85 FC? 10
86 ARCL ST X
87 FC? 10
88 RTN
89 PROMPT
90 RTN
91▶LBL "A1"
92 X<>Y
93 →HR
94 X<>Y
95 ENTER
96 ENTER
97 2
98 ÷
99 IP
100 180
101 x
102 X<>Y
103 LASTX
104 x
105 COS
106 R↑
107 x
108 -
109 FS? 10
110 RTN
111 →HMS
112 GTO "A0"
113 "BRG"
114 XEQ "A0"
115 →HR
116▶LBL "B1"
117 360
118 MOD
119 ENTER
120 SIN
121 ASIN
122 X<0?
123 +/-
124 →HMS
125 X<>Y
126 90
127 ÷
128 1
129 +
130 IP
131 STO 21
132 GTO IND ST X
133▶LBL 01
134 "N "
135 XEQ 05
136 ⊢" E"
137 RTN
138▶LBL 02
139 "S "
140 XEQ 05
141 ⊢" E"
142 RTN
143▶LBL 03
144 "S "
145 XEQ 05
146 ⊢" W"
147 RTN
148▶LBL 04
149 "N "
150 XEQ 05
151 ⊢" W"
152 RTN
153▶LBL 05
154 STO 21
155 R↓
156 STO 20
157 XEQ "DMS"
158 RTN
159▶LBL 06
160 X>0?
161 RTN
162 360
163 +
164 END
```

The first program in the last group handles the **display** of the coordinates. The second does the **display** of angles.

stationing output

The next program is shorter, and may be used independently as a sub-routine for layout programs you may want to write yourself.

Step `05 1E2`, is input by stroking the key, **E**, (third row down, second from the right), then the number.

Nothing will happen until you input the next step, usually 'times' or 'divide'.

```
01▶LBL "STA"
02 CF 29
03 FIX 00
04 STO 21
05 1E2
06 ÷
07 ENTER
08 IP
09 ARCL ST X
10 -
11 ⊢"+"
12 FIX 03
13 1E2
14 x
15 10
16 X>Y?
17 ⊢"0"
18 ARCL ST Y
19 RCL 21
20 SF 29
21 FIX 04
22 RTN
23▶LBL "PN?"
24 CF 22
25 "     PT NO?"
26 PROMPT
27 FS? 22
28 XEQ 01
29 RTN
30▶LBL 01
31 1
32 -
33 STO 13
34 R↓
35 END
```

This one can go above the last one. Go to "**STA**", up to 00, and begin.

```
01▶LBL "SETUP"
02 1
03 STO "G"
04 CLMENU
05 "∡ RT."
06 KEY 2 GTO 01
07 "AZIM"
08 KEY 5 GTO 00
09 MENU
10 "   SELECT OUTPUT"
11▶LBL 02
12 CF 21
13 AVIEW
14 SF 21
15 STOP
16▶LBL 01
17 SF 20
18▶LBL 00
19 CLMENU
20 "EXIST"
21 KEY 2 GTO 03
22 "NEW"
23 KEY 4 GTO 04
24 MENU
25 FS? 00
26 "Backsight?"
27 FC? 00
28 "Instrument at?"
29 XEQ 02
30▶LBL 03
31 XEQ "POUT"
32 FS? 00
33 GTO 05
34 STO "E"
35 R↓
36 STO "N"
37 SF 00
38 FC? 20
39 GTO 06
40 GTO 00
41▶LBL 04
42 XEQ "PIN"
43 XEQ "OUT"
44 FS? 00
45 GTO 05
46 STO "E"
47 R↓
48 STO "N"
49 SF 00
50 FS? 20
51 GTO 00
52 GTO 06
53▶LBL 05
54 RCL "E"
55 -
56 X<>Y
57 RCL "N"
58 -
59 →POL
60 X<>Y
61 STO "A"
62▶LBL 06
63 CLMENU
64 CLST
65 CLA
66 FS? 81
67 GTO "AL0"
68 END
```

Keep right on going, put this next one on top of the last one. We are almost finished with subroutines.

Go to "**YN**", and scroll up **past the label, to put the pointer at the first step above the END**.

Type in LBL "ALIGN" and scroll up once. Stroke ENTER and type in END, then stroke ENTER again to separate the programs. Begin typing in the program, starting with step 02.

```
01▶LBL "ALIGN"
02 XEQ "CL"
03 XEQ "FC0"
04 FS? 55
05 SF 08
06 SF 81
07 CLST
08 STO "A"
09▶LBL 04
10 CLMENU
11 "COORD"
12 KEY 1 GTO 01
13 "SPRAY"
14 KEY 3 GTO 03
15 "GRID"
16 KEY 5 GTO 05
17 MENU
18 CF 21
19 "SELECT OPTIONS"
20 AVIEW
21 SF 21
22 STOP
23 GTO 02
24▶LBL 01
25 SF 02
26 STOP
27 GTO 02
28▶LBL 03
29 SF 03
30 STOP
31 GTO 02
32▶LBL 05
33 "Grid→Ground Fac"
34 ├"tor?"
35 PROMPT
36 STO "G"
37 CLX
38 GTO 04
39 STOP
40▶LBL 02
41 CLMENU
42 FS? 02
43 XEQ 06
44 FS? 03
45 GTO "SETUP"
46 FS? 81
47 GTO "AL0"
48▶LBL 06
49 "First Pt.# for␊"
50 ├"Coord. Storage"
51 ├"?"
52 PROMPT
53 1
54 -
55 STO "D"
56 END
```

Put this next one on top of the program "**STA**".

```
01▶LBL "LCI"
02 RCL- "E"
03 X<>Y
04 RCL- "N"
05 →POL
06 FIX 02
07 "H. Dist. = "
08 ARCL ST X
09 ├"␊"
10 R↓
11 FS? 20
12 XEQ 00
13 0
14 X<>Y
15 X<0?
16 360
17 +
18 →HMS
19 FC? 20
20 ├"AZ = "
21 FS? 20
22 ├"∡ Rt = "
23 XEQ "DMS"
24 AVIEW
25 ADV
26 RTN
27▶LBL 00
28 RCL- "A"
29 RTN
30▶LBL "B→A"
31 XEQ "A1"
32 ├"␊"
33 GTO 01
34▶LBL "A→B"
35 →HR
36 XEQ "B1"
37 RCL 21
38 ├"␊"
39▶LBL 01
40 FS? 88
41 RTN
42 AVIEW
43 END
```

At this point you're probably wondering if it will ever end. The next program is the last of the subroutines.

```
01▶LBL "AL1"
02 CLMENU
03 "EXIST"
04 KEY 2 GTO 02
05 "NEW"
06 KEY 4 GTO 04
07 MENU
08 "Known Station "
09 ├"Pt.#?"
10 PROMPT
11▶LBL 02
12 XEQ "POUT"
13 GTO 03
14▶LBL 04
15 XEQ "PIN"
16 XEQ "OUT"
17▶LBL 03
18 STO 08
19 R↓
20 STO 07
21 CLMENU
22 "Station?␊"
23 PROMPT
24 STO 03
25 CLA
26 "Sta. "
27 XEQ "STA"
28 FS? 08
29 AVIEW
30 XEQ "OUT"
31 FS? 08
32 XEQ "C↑"
33 SF 10
34 "Tangent Be"
35 ├"aring?␊"
36 PROMPT
37 XEQ "A1"
38 STO 00
39 FS? 08
40 ADV
41 END
```

Proof-read everything. While you are doing the proof-reading look, in particular, for any steps or parts of steps which are in "ALPHA", but shouldn't be. It works the other way, too. Check that the steps which are meant to be in alpha are.

use it to check it

Some of the subroutines can be checked by using them. You can test "**PIN**" and "**POUT**" this way. Try storing a point with "**PIN**" (see page 5), clear the stack, put the point number back in and execute "**POUT**". This should bring the coordinates back into the registers.

At this point, check "**C↑**" by just executing it. You should now have the same coordinates in the registers, but they should be labeled with the point number and the "N= " and "E= ", as shown to the left.

```
#1   N= 100.0000
     E= 200.0000
```

Programs "**IN**" and "**OUT**" can also be checked by execution. Put a different set of coordinates into the registers (northing [ENTER], easting) and execute "**IN**". Clear the stack and execute "**OUT**". If the same new coordinates are back in the registers, the routine works.

Input 12.34567, clear the ALPHA register (CLA) and execute "**DMS**", then stroke [ ] [ENTER]. The alpha display should show **12°34'56.7"**.

Stroke [EXIT], and execute "**B→A**". The display should show **AZ = 12°34'56.7"**. If it does, it's okay. Stroke [EXIT] and execute "**A→B**". Now the display should show **N 12°34'56.7" E**.

Try those last two routines using all four quadrants, one at a time, so that the subroutines are all checked too.

Input the number, 1234.567, clear the ALPHA register, and execute "**STA**". Next, stroke ⎕ **ENTER** to see the alpha register. It should show **12+34.567** now. If it doesn't, something is wrong (it can also be seen by using "AVIEW").

the main program

This one can go on top of "**YN**", too. Scroll up to 00, and begin typing it in. It is a long one, so take your time.

```
01▶LBL "AL0"
02 XEQ "AL1"
03 RCL "D"
04 STO 13
05 SF 04
06 CLMENU
07▶LBL 00
08 "STA"
09 KEY 1 GTO 01
10 "O/S"
11 KEY 2 GTO 02
12 CLA
13 FS? 83
14 "S•"
15 FS? 84
16 "•O"
17 FS? 85
18 "S•O"
19 KEY 3 GTO 03
20 "SET/C"
21 KEY 4 GTO 04
22 "CLR/C"
23 KEY 5 GTO 05
24 "CURVE"
25 KEY 6 GTO 06
26 CLA
27 MENU
28 FS?C 04
29 XEQ 18
30 STOP
31▶LBL 03
32 CF 10
33 CLMENU
34 CF 21
35 "Station In"
36 ⊢"terval?"
37 AVIEW
38 SF 21
39 XEQ "YN"
40 RTN
41▶LBL 18
42 CF 21
43 RCL 03
44 XEQ "STA"
45 AVIEW
46 RTN
47▶LBL 04
48 XEQ 03
49 FS? 10
50 SF 83
51 FS? 10
52 XEQ 07
53 FC? 10
54 SF 84
55 FC? 10
56 XEQ 08
57 GTO 00
58▶LBL 07
59 STO 05
60 FS? 84
61 SF 85
62 "Next B.C.?↵"
63 FS? 83
64 PROMPT
65 STO 15
66 RCL 12
67 RTN
68▶LBL 08
69 STO 02
70 FS? 83
71 SF 85
72 RTN
73▶LBL 05
74 XEQ 03
75 FS? 10
76 XEQ 09
77 FC? 10
78 XEQ 10
79 GTO 00
80▶LBL 09
81 CF 83
82 CF 85
83 CLX
84 STO 05
85 RTN
86▶LBL 10
87 CF 84
88 CLX
89 STO 02
90 CF 85
91 RTN
92▶LBL 01
93 FC? 22
94 XEQ 22
95 ADV
96 STO 12
97 CLA
98 CF 21
99 XEQ "STA"
100 FS?C 87
101 ⊢" B.C."
102 FS?C 86
103 ⊢" E.C."
104 FS? 06
105 GTO 16
106 AVIEW
107 RCL 00
108 RCL 12
109 RCL- 03
110 →REC
111 RCL+ 07
112 X<>Y
113 RCL+ 08
114 STO 10
115 X<>Y
116 STO 09
117 X<>Y
118 SF 21
119 CF 22
120 STOP
```

```
121▶LBL 02
122 FC? 22
123 RCL 02
124 STO "O"
125 XEQ 11
126 FS? 06
127 GTO 20
128 90
129 RCL+ 00
130 X<>Y
131▶LBL 21
132 →REC
133 RCL 09
134 +
135 X<>Y
136 RCL 10
137 +
138 FS? 02
139 XEQ 13
140 FS? 03
141 XEQ 14
142 XEQ 19
143 GTO 00
144▶LBL 19
145 CF 22
146 RCL 12
147 CLA
148 XEQ "STA"
149 CF 21
150 AVIEW
151 SF 21
152 RTN
153▶LBL 20
154 RCL 24
155 RCL "O"
156 +/-
157 GTO 21
158▶LBL 22
159 FC? 83
160 RTN
161 RCL 12
162 RCL+ 05
163 FC? 06
164 RCL 15
165 FS? 06
166 RCL 16
167 X<Y?
168 XEQ 23
169 X>Y?
170 X<>Y
171 RTN
172▶LBL 23
173 FS? 06
174 SF 86
175 FC? 06
176 SF 87
177 RTN
178▶LBL 11
179 CF 00
180 X=0?
181 SF 01
182 FIX 02
183 X<0?
184 SF 00
185 FS? 00
186 +/-
187 ⊦" @ "
188 FS? 01
189 ⊦"C'Lineч"
190 FS?C 01
191 GTO 12
192 ARCL ST X
193 FC? 00
194 ⊦" Rtч"
195 FS?C 00
196 ⊦" Ltч"
197▶LBL 12
198 AVIEW
199 XEQ 19
200 RCL "O"
201 RTN
202▶LBL 13
203 1
204 STO+ 13
205 R↓
206 XEQ "IN"
207 XEQ "OUT"
208 XEQ "C↑"
209 RTN
210▶LBL 14
211 RCL- "E"
212 X<>Y
213 RCL- "N"
214 →POL
215 RCL× "G"
216 STO "D"
217 X<>Y
218 FS? 20
219 RCL- "A"
220 X<0?
221 XEQ 15
222 CLA
223 →HMS
224 FS? 20
225 "∡ Rt = "
226 FC? 20
227 "Azim = "
228 CF 19
229 XEQ "DMS"
230 FIX 02
231 ⊦"чH. Dist = "
232 ARCL "D"
233 AVIEW
234 ADV
235 RTN
236▶LBL 15
237 360
238 +
239 RTN
240▶LBL 06
241 SF 06
242 RCL 12
243 STO 15
244 RCL- 03
245 RCL 00
246 X<>Y
247 →REC
248 RCL+ 07
249 STO 09
250 R↓
251 RCL+ 08
252 STO 10
253 "Central "
254 ⊦"Angle?ч"
255 PROMPT
256 →HR
257 STO 14
258 X<0?
259 SF 05
260 RCL 00
261 90
262 FS? 05
263 +/-
264 +
265 STO 17
266 "Radius?ч"
267 PROMPT
268 STO 04
269 RCL 14
270 RCL 00
271 +
272 0
273 X<>Y
274 X<0?
275 360
276 +
277 STO 00
278 RCL 14
279 →HMS
280 CLA
281 "Central A"
282 ⊦"ngle = ч"
283 XEQ "DMS"
284 AVIEW
285 RCL 14
286 ABS
287 →RAD
288 RCL 04
289 " Radius = "
290 ARCL ST X
291 ⊦"ч"
292 x
293 STO 23
294 ⊦"  Length = "
295 ARCL ST X
296 AVIEW
297 RCL+ 15
298 STO 16
299 RCL 14
300 RCL÷ 23
301 STO 11
302 FIX 04
303 RCL 17
304 0
305 X<>Y
306 X<0?
307 360
308 +
309 RCL 04
310 →REC
311 RCL+ 09
312 STO 07
313 X<>Y
314 RCL+ 10
315 STO 08
316 180
317 STO- 17
318 XEQ 19
319 GTO 00
320 RTN
321▶LBL 16
322 AVIEW
323 RCL 12
324 RCL- 15
325 RCL 23
326 X<>Y
327 X≥Y?
328 GTO 17
329 RCL÷ 04
330 →DEG
```

```
331 FS? 05
332 +/-
333 RCL+ 17
334 STO 24
335 RCL 04
336 RCL 01
337 FS? 05
338 +/-
339 -
340 →REC
341 RCL+ 07
342 STO 09
343 X<>Y
344 RCL+ 08
345 STO 10
346 SF 21
347 CF 22
348 STOP
349▸LBL 17
350 CLX
351 RCL 16
352 STO 12
353 RCL- 15
354 RCL÷ 04
355 →DEG
356 FS? 05
357 +/-
358 RCL+ 17
359 RCL 04
360 →REC
361 RCL+ 07
362 STO 09
363 STO 07
364 X<>Y
365 RCL+ 08
366 STO 10
367 STO 08
368 RCL 16
369 STO 03
370 CF 05
371 FS?C 06
372 XEQ 07
373 CLA
374 XEQ 19
375 GTO 00
```

Add in the last step, 376 END, and it's done. Now it has to be proof-read and it'll be ready to go to work for you.

One quick check on this last program, it should contain 852 bytes. Keep in mind something that surveyors run into all of the time, though. Compensating error.

Speaking of bytes, the programming you have just entered (if you entered the whole book) contains 2182 bytes. There are a number of the programs and/or subroutines that are duplicates of some you may have already had installed from other of our publications.

Appendix 'A' lists and compares these with those used in other program books and booklets we have **currently** on the market.

sizing

With all of your programs in, size for maximum coordinate storage as follows:

1. Size to **0025**

2. Check the available memory (hold down the key under **MEM**, in CATALOG), and jot down the number.

   Divide by 9, and add 23 to this new number.

3. Re-size to the number you just calculated.

4. To calculate the number of points you can store, divide the number you jotted down by 18, subtract 1.

user's instructions

Bring up the program by stroking **XEQ** [MAGEJ]

prompt: **SELECT OPTIONS**
[COORD] [SPRAY] [GRID]

If you want to input a grid-to-ground factor, stroke [GRID]

If you want coordinates calculated and output stroke [COORD]

If you are calculating angle-distance ties for layout, stroke [SPRAY]

If you are planning to use the grid factor, it should be the first option selected. After you have selected the option(s) you want, stroke **R/S**

Different prompts will appear, depending on the options you have selected. Prompts when [GRID] has been selected are marked **(G)**, prompts which appear when [COORD] has been selected are marked **(C)** and prompts which appear when [SPRAY] is selected are marked **(L)**.

(G) prompt: **Grid Ground Factor?**
[COORD] [SPRAY] [GRID]

Input the factor and stroke **R/S**

(C) prompt: **First Pt.# for Coord. Storage?**

Input the point number you want to start with for the calculated coordinates. Stroke **R/S**

(L) prompt: **SELECT OUTPUT**
[& XY] [TRM]

For angle right output of the angles stroke [illegible]

For azimuth output of the angles stroke [illegible]

(L)prompt: **Instrument at?**
EXIST NEW

Input the point number of the instrument station and stroke EXIST OR NEW

If NEW was selected, the following two prompts will also appear:

prompt: **N =?**

Input the north coordinate, stroke **R/S**

prompt: **E =?**

Input the east coordinate for the point and stroke **R/S**

(L)prompt: **Backsight?**
EXIST NEW

This prompt only appears if angle right output was chosen. Input the point number for the backsight point, stroking either EXIST or NEW. If "NEW" was chosen, input the coordinates of the point in the same manner as described above.

(L)(C)prompt: **Known Station Pt.#?**
EXIST NEW

Input the point number which will correspond to the beginning station you are going to use. If it is a new pair of coordinates, again follow the input instructions above.

(L)(C) prompt: **Station?**

Input the beginning station and stroke

R/S

(L)(C) prompt: **Tangent Bearing?**

Input the bearing of the tangent and stroke

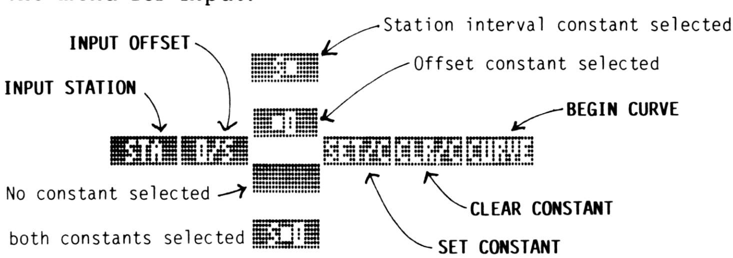
ENTER

Input the quadrant code, in the up-station direction, and stroke

R/S

prompt: **XX+XX.XXX**

At this point you may begin your calculations, using the menu for input.



using constants

When you input a constant and stroke a prompt, "**Station Interval?**" appears. If it is a station interval, stroke , and the indicator block will show . Answer the prompt if the constant is an offset, and the indicator block will show .

If both a station interval **and** an offset constant are stored, the indicator block will show .

Constants are cleared in the same way by stroking the key.

Note: When a station interval constant is requested, an aditional prompt, **Next B.C.?**, appears. This is to prevent overrun of the station.

prompt: **Next B.C.?**

If there is a curve in the alignment ahead, input the B.C. station and stroke **R/S**

or

If there is no curve in the alignment ahead, input a station that is past the end of the work area, stroke **R/S**

using curves

Curved portions of the alignment can be included in the calculations, with or without offsets. If offsets are calculated, they are calculated as **radial** offsets to the current station.

Input the B.C. station and stroke **STA**

When the B.C. station is displayed, calculate any needed offsets, and then stroke **CURVE**

(L)(C) prompt: **Central Angle?**

Input the value (°.'") of the central angle. If the curve is to the left, stroke the **+/-** key. Stroke **R/S**

(L)(C) prompt: **Radius?**

Input the radius of the curve, stroke **R/S**

The output will be the central angle, the radius and the length of the curve.

If a station which is upstation of the end of the curve is input, the station **at** the E.C. will be displayed instead.

Intentionally inputting a station which is too large is the correct procedure! It's faster than input of the longer station, with decimal feet included, and it also uses the (more accurate) calculated length, rather than the rounded off value.

station and offset

The prompt bar will be displayed with the begining station above it, as shown on page 14.

If you want to calculate offsets at this station, input the offset, stroke

If you do not want offsets at this station, input the station you want and then stroke

then

If you want the default offset, stroke

If you want a different offset, input the offset and then stroke

The output will depend on which options you have selected. After each output, the previous station is again displayed.

If you want an additional offset at this station, input the offset and then stroke

or

If a station interval constant is set stroke to bring up the next station.

or

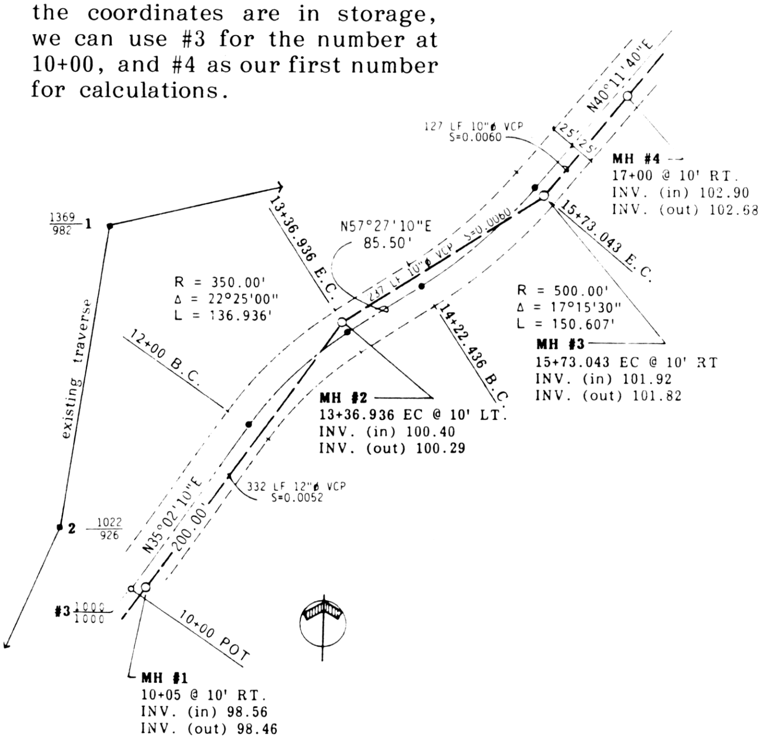
Input the next station and stroke

The station is only output with the first offset. The other calculations at the same station will be labeled "@ XX' Rt" or "@ XX' Lt".

The keystroke example will use the alignment illustrated below. The location of the manholes to be installed in the street are offsets from points on the centerline of the street.

Working from the existing traverse, with the instrument at point #1, the example uses point #2 as a backsight.

If we assume that none of the coordinates are in storage, we can use #3 for the number at 10+00, and #4 as our first number for calculations.



keystrokes

To begin, call up the program and get the first prompt by stroking

XEQ

SELECT OPTIONS

[COORD] [ ] [SURVY] [ ] [GRID] [ ]

keystrokes:

[COORD] [SURVY] [R/S]

First Pt# for Coord. Storage?

keystrokes:

[4] [R/S]

SELECT OUTPUT

[ ] [∠RT.] [ ] [ ] [AZIM] [ ]

keystrokes:

[∠RT.]

Instrument at?

[ ] [EXIST] [ ] [NEW] [ ] [ ]

keystrokes:

[1] [NEW]

N =?

keystrokes:

[1] [3] [6] [9] [R/S]

E =?

keystrokes:

[9] [8] [2] [R/S]

Backsight?

[ ] [EXIST] [ ] [NEW] [ ] [ ]

keystrokes:

[2] [NEW]

N =?

keystrokes:

[1] [0] [2] [2] [R/S]

E =?

keystrokes:

[9] [2] [6] [R/S]

Known Station Pt.#?

[ ] [EXIST] [ ] [NEW] [ ] [ ]

keystrokes:

[3] [NEW]

N =?

keystrokes:

[1] [0] [0] [0] [R/S]

E =?

keystrokes:

[1] [0] [0] [0] [R/S]

Station?

keystrokes:

[1] [0] [0] [0] [R/S]

output:

```
Sta.  10+00.000
 #3   N= 1000.0000
      E= 1000.0000
```

Tangent Bearing?

keystrokes:

[3] [5] [.] [0] [2] [1] [ENTER]

[1] [R/S]

display:

10+00.000

[STA] [O/S] [ ] [SET/C] [CLR/C] [CURVE]

keystrokes:

[1] [0] [0] [5] [STA]

display:
10+05.000
[STA] [O/S] [ ] [SET/C] [CLR/C] [CURVE]

keystrokes:

[1] [0] [O/S]

output:

```
10+05.000 @ 10.00 Rt

 #4  N= 998.3530
     E= 1011.0584

∡ Rt  = 346°20'58.9"
H. Dist  = 371.78
```

display:
10+05.000
[STA] [O/S] [ ] [SET/C] [CLR/C] [CURVE]

keystrokes:

[1] [2] [0] [0] [STA] [CURVE]

Central Angle?

keystrokes:

[2] [2] [.] [2] [5] [R/S]

Radius?

keystrokes:

[3] [5] [0] [R/S]

output:

```
Central Angle =
22°25'00.0"
 Radius = 350.0000
  Length = 136.9356
```

display:
12+00.000
[STA] [O/S] [ ] [SET/C] [CLR/C] [CURVE]

keystrokes:

[1] [4] [0] [0] [STA]

display:
13+36.936
[STA] [O/S] [ ] [SET/C] [CLR/C] [CURVE]

keystrokes:

[STA] [1] [0] [+/-] [O/S]

output:

```
13+36.936 @ 10.00 Lt

 #5  N= 1266.2871
     E= 1207.7171

∡ Rt  = 285°18'01.6"
H. Dist  = 247.99
```

display:
13+36.936
[STA] [O/S] [ ] [SET/C] [CLR/C] [CURVE]

keystrokes:

[1] [4] [2] [2] [.] [4] [3] [6] [STA] [CURVE]

Central Angle?

keystrokes:

[1] [7] [.] [1] [5] [3] [+/-] [R/S]

Radius?

keystrokes:

[5] [0] [0] [R/S]

output:

```
Central Angle =
-17°15'30.0"
 Radius = 500.0000
  Length = 150.6074
```

display:
14+22.436
[STA] [O/S] [ ] [SET/C] [CLR/C] [CURVE]

keystrokes:

[1] [6] [0] [0] [STA]

display
15+73.043
[STA] [O/S] [ ] [SET/C] [CLR/C] [CURVE]

keystrokes:

[STA] [1] [0] [O/S]

output:

```
15+73.043 @ 10.00 Rt

 #6  N= 1396.1848
     E= 1405.7401

∡ Rt  = 257°09'42.2"
H. Dist = 424.61
```

display:
15+73.043
STA O/S SET/C CLR/C CURVE

keystrokes:

1 7 0 0 STA

display:
17+00.00
STA O/S SET/C CLR/C CURVE

keystrokes:

1 0 O/S

output:

```
17+00.000 @ 10.00 Rt

 #8  N= 1493.1617
     E= 1487.6758

∡ Rt  = 247°02'13.9"
H. Dist = 520.70
```

The example used both coordinate output and layout (SPRAY) options, but could have used either one by itself. Or GRID. Using two options gives you an idea of what the output should look like for each.

When you use the program with coordinate option, the points are stored. This means that the actual lengths between the manholes can be found by inversing. With this in mind, the program is also handy for design work on storm and sanitary sewers.

It can also be used to set R/W points along the property lines of subdivisions during either the design or layout phases.

For rough grade staking, the limits of a street may be set without setting centerline first, and just sprayed in. A much faster method than setting the centerline and then occuping the curve points to offset them.

APPENDIX 'A'

ALSO USED IN	Spiral Solutions	Vertical Alignment	EDM Slope Staking	Triangle Solutions	Surveying Solutions bytes	program name
x	x	x		x	37	**YN**
x	x		x	x		**CL**
x					86	**FC0**
x						**FN0**
x				x		**OUT**
x				x		**IN**
x				x	110	**PIN**
x				x		**POUT**
x				x		**PN**
x				x		**C↑**
x		x	x	x		**DMS**
x				x	351	**A0**
x				x		**A1**
x				x		**B1**
x		x		x	81	**STA**
x				x	202	**SETUP**
x				x	195	**ALIGN**
x					82	**LC1**
x				x	38	**B→A**
x				x		**A→B**
					147	**AL1**
					852	**AL0**

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Vertical Curves (booklet, $$8.00)

Calculates CONTINUOUS vertical alignment without changing back and forth between Grade and Curve routines. Also calculates vertical intersections, symmetrical or asymmetrical vertical curves. Solves for station when the elevation is known, or the station can be given, to calculate the elevation.

Spiral Curves (booklet, $9.50)

Calculate the coordinates to any station, or offset to a station, within a spiral system. Options include coordinate output, auto-inverse, or both.

Calculates intersections of the entrance or exit spiral with a circular curve or straight line.

Triangle Solutions (booklet, $8.00)

The 42S version of the most complete triangle solutions program ever available. Solves with any of the following knowns: ASA SAA SAS SSA SSS Area-SS Area-AA Area-SA.

Topography (booklet, $8.00)

This one turns your 42S into a manual data collector, complete with a labeling system that you can customize to suit the type of topo work you do.

All shots are stored as finished data, by shot number, for later output. Choice of 3-D coordinates or Station-Offset-Elevation for the output.

EDM Slope Staking (booklet, $8.00)

Set up anywhere near an alignment and slope stake it. Sets slope stakes from the remote instrument location directly. Includes a three-point resection program for finding the instrument's location. All data needed to mark the stake is output (or may be stored), and there is a subroutine for setting the reference stake.

Urban Survey Programs (book, $20.00)

Contains programs for stakeout (or design) of street intersections, returns, culs-de-sac, bulbs and knuckles. A special program calculates and prorates blocks from the street intersections (with auto-store and auto-inverse of the points) from the street intersection setups for A.L.T.A. surveys.

Also contains layout programs for curb and gutter, or storm/sanitary sewers, which can store the data and later print out cut sheets before leaving the job site.

$9.00

ISBN 0-944889-10-7