

<u>LIBRARY</u>	<u>PROGRAM</u>	<u>PRESENT</u>	<u>CHANGE</u>
<u>SURVEYING</u>			
A & B	09100-74003 (UI, 10th line)	ENTER DATA: Point B Nothing → Y Point B Easting → X	ENTER DATA: Point B Northing → Y Point B Easting → X
A & B	09100-74004	Step Key 7a — c (Code 16)	Step Key 7a — e (Code 12)
B	09100-74001	Example: Prec. Ratio 4,384,856:1 Point A = 1279'	Example: Prec. Ratio 5059.589 Point A = 1479'

STRUCTURES

A & B	0910074205	Add SET DEGREES to 1st page of User Instructions
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USER INSTRUCTIONS

EXAMPLES

SET: DEGREES
 PRESS: GO TO (0) (0) [or END]
 ENTER PROGRAM (Starting address is 0 - 0)
 PRESS: END
 PRESS: CONTINUE
 DISPLAY

0 — Z
 0 — Y
 1 — X

ENTER DATA: Point A Northing → Y
 Point A Easting → X

PRESS: CONTINUE

→ DISPLAY

0 — Z
 0 — Y
 2 — X

ENTER DATA: Point B Northing → Y
 Point B Easting → X

PRESS: CONTINUE

DISPLAY

Degrees — Z
 Minutes — Y
 Seconds — X

PRESS: CONTINUE

DISPLAY

0 — Z
 Distance — Y
 Quadrant — X
 Code

← PRESS: CONTINUE to enter a new course

1100 North
 800 East
 1300 North
 900 East

Answer:

$26^{\circ} 33' 54.184''$
 223.607'
 1 (Quadrant Code)

1300 North
 1200 East

Answer:

$90^{\circ} 00' 00''$
 300.000'
 2 (Quadrant Code)

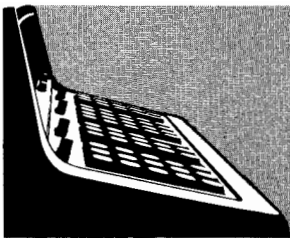
1000 North
 1000 East

Answer:

$33^{\circ} 41' 24.243''$
 360.555'
 3 (Quadrant Code)

Step	Key	Code	Display			Storage						
			x	y	z	f	e	d	c	b	a	
0	0	CLEAR	20									
1	1	01	DISPLAY 1 TO INDICATE FIRST ENTRY									
2	STOP	41	AE	AN	0	ENTER AN, AE						
3	ACC +	60	STORE STARTING COORDINATES									
4	↓	25										
5	2	02	DISPLAY 2 TO INDICATE SECOND ENTRY									
6	STOP	41	BE	BN	0	ENTER BN, BE						
7	↑	27										
8	$y \rightarrow ()$	24										
9	f	15										
a	$x \rightarrow y$	30										
b	-	34										
c	E	12										
d	CHG SIGN	32										
1	0	ROLL ↑	22	STORE FORWARD COORDINATES FOR FUTURE								
1	$x \rightarrow ()$	23	INVERSE PROBLEM. (NOTE: IN THE NEXT PROBLEM									
2	E	12	THESE COORDINATES WILL BE THE STARTING POINT.)									
3	+	33										
4	↓	25										
5	$x \rightarrow y$	30										
6	TO POLAR	62										
7	$x \rightarrow ()$	23										
8	d	17										
9	0	00										
a	IF $x < y$	52										
b	3	03										
c	2	02										
d	y	55										
2	0	9	11									
1	0	00										
2	IF $x > y$	53										
3	2	02										
4	a	13										
5	-	34										
6	3	03										
7	GOTO () ()	44										
8	4	04										
9	1	01										
a	$x \rightarrow y$	30	DETERMINE QUADRANT									
b	-	34										
c	2	02										
d	GOTO () ()	44										

HEWLETT-PACKARD FROM 6-7



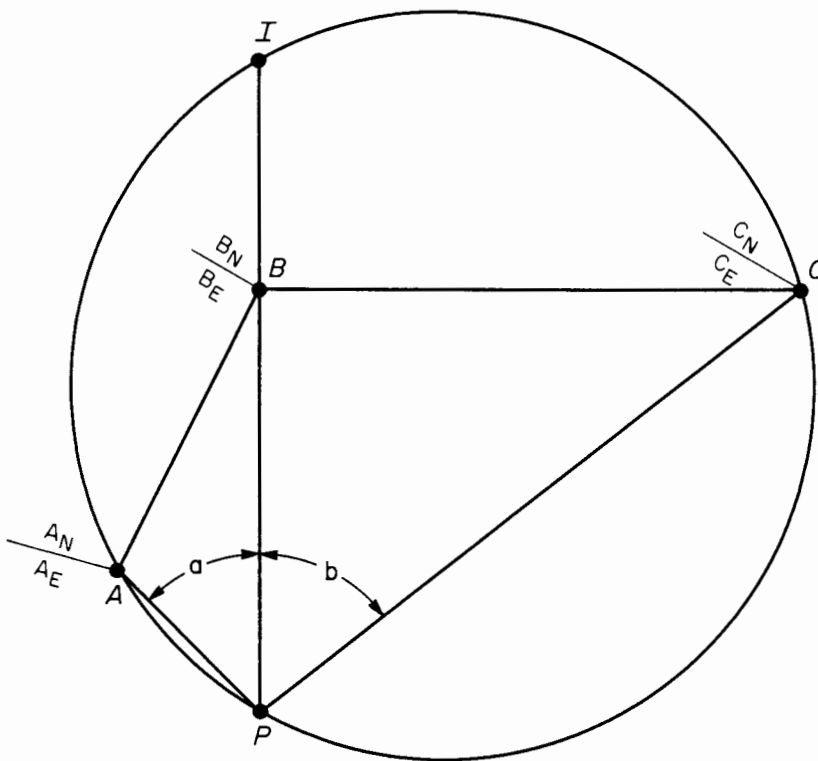
THREE POINT PROBLEM

The three point problem, sometimes known as Italian Resection, involves the determination of coordinates of an observers position (Point P) by measuring only angles a & b. The coordinates of points A, B & C must be known.

To make the solution possible it is necessary:

1. To construct a circle through points A, C, & P.
2. Project line P - B to intersect the circle at point I
(Note: No solution possible if "B" on circle)

See figure below:



USER INSTRUCTIONS

SET:

ENTER PROGRAM (Starting Address is 0-0)

PRESS: GO TO (0) (0) [or END]

PRESS: CONTINUE

DISPLAY

0	—	Z
0	—	Y
1	—	X

ENTER DATA: $A_N \rightarrow Y$, $A_E \rightarrow X$

PRESS: CONTINUE

DISPLAY

0	—	Z
0	—	Y
2	—	X

ENTER DATA: $C_N \rightarrow Y$, $C_E \rightarrow X$

PRESS: CONTINUE

DISPLAY

0	—	Z
0	—	Y
3	—	X

ENTER DATA: ANGLE a

 $a^0 \rightarrow Z$, $a' \rightarrow Y$, $a'' \rightarrow X$

PRESS: CONTINUE

DISPLAY

0	—	Z
0	—	Y
4	—	X

USER INSTRUCTIONS (con't)

ENTER DATA: ANGLE b

 $b^0 \rightarrow Z$, $b' \rightarrow Y$, $b'' \rightarrow X$

PRESS: CONTINUE

DISPLAY

0	—	Z
0	—	Y
5	—	X

ENTER DATA: $B_N \rightarrow Y$, $B_E \rightarrow X$

PRESS: CONTINUE

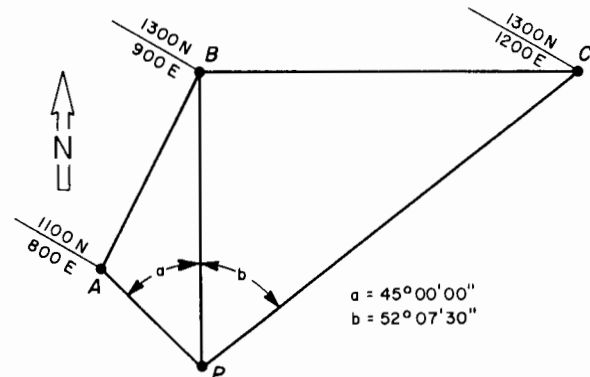
DISPLAY

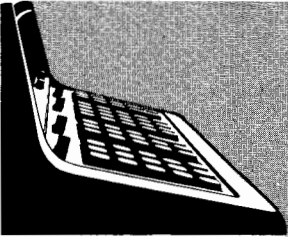
0	—	Z
Pn	—	Y
Pe	—	X

TO ENTER ANOTHER PROBLEM, PRESS: CONTINUE

EXAMPLE

DATA	ANSWERS
Coordinates, Point A 1100N, 800E	Observers Point (P) Coordinates 1000.00N, 1000.00E
Coordinates, Point C 1300N, 1200E	
Angle a 45° 00' 00"	
Angle b 52° 07' 30"	
Coordinates, Point B 1300N, 900E	





9100B ONLY
 PART NO.
 09100-74101

TRAVERSE WITH COMPASS RULE ADJUSTMENT
 OPTION

This program traverses by bearing and distance, calculates coordinates, closure error, total traverse distance and the precision ratio. The precision ratio is the ratio of the total distance traversed to the closure error distance from a fixed point.

The program may then be used to distribute the closure error by the Compass Rule. The Compass Rule assumes:

1. Course corrections are proportional to course lengths.
2. Angular measurement errors are equal to linear measurement errors.

The Compass Adjustment formulas used are:

$$\text{easting correction} = \left[\frac{\text{course distance}}{\text{total traverse distance}} \right] \times \left[\text{easting closure error} \right]$$

$$\text{northing correction} = \left[\frac{\text{course distance}}{\text{total traverse distance}} \right] \times \left[\text{northing closure error} \right]$$

QUADRANT CODE

4 = NW	1 = NE
3 = SW	2 = SE

USER INSTRUCTIONS

USER INSTRUCTIONS (Con't)

PRESS: END

ENTER PROGRAM: Side A followed by Side B

PRESS: CONTINUE

DISPLAY

0	—	Z
0	—	Y
0	—	X

ENTER COORDINATES:

Northing → Y
 Easting → X

PRESS: ACC+

ENTER BEARING ANGLE:

Degrees → Z
 Minutes → Y
 Seconds → X

PRESS: CONTINUE

DISPLAY: Bearing Angle

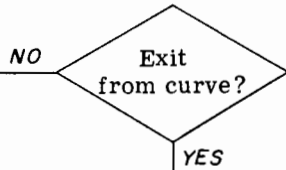
Decimal	—	Z
Degrees	—	
2	—	Y
2	—	X

ENTER DATA: Quadrant Code → X
 (NE=1, SE=2, SW=3, NW=4)

PRESS: CONTINUE

DISPLAY

0	—	Z
0	—	Y
3	—	X



ENTER DATA: Distance → Y, Distance → X

PRESS: CONTINUE

DISPLAY

Arc Length	—	Z
Chord	—	Y
Radius	—	X

PRESS: CONTINUE

DISPLAY: Central Angle

Degrees	—	Z
Minutes	—	Y
Seconds	—	X

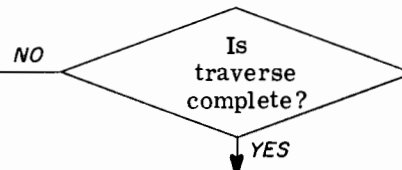
PRESS: CONTINUE

ENTER DATA: Distance → X

PRESS: CONTINUE

DISPLAY

0	—	Z
Northing	—	Y
Easting	—	X



ENTER FIXED COORDINATES:

Northing → Y
 Easting → X

PRESS: GO TO () ()

PRESS: d

PRESS: 1

PRESS: CONTINUE

DISPLAY

Precision Ratio	—	Z
Closure Error	—	Y
Distance Traversed	—	X

PRESS: CONTINUE

DISPLAY

0	—	Z
0	—	Y
1	—	X

ENTER STARTING COORDINATES:

Northing → Y
 Easting → X

USER INSTRUCTIONS (Con't)

USER INSTRUCTIONS (Con't)

→ PRESS: CONTINUE

DISPLAY

0	_____	Z
0	_____	Y
2	_____	X

ENTER Bearing Angles:

Degrees → Z

Minutes → Y

Seconds → X

PRESS: CONTINUE

DISPLAY: Bearing Angle

Decimal	_____	Z
Degrees	_____	
2	_____	Y
2	_____	X

ENTER DATA: Quadrant Code → X

PRESS: CONTINUE

DISPLAY

0	_____	Z
0	_____	Y
3	_____	X

ENTER DATA: Distance → X

PRESS: CONTINUE

DISPLAY

0	_____	Z
Corrected	_____	Y
Distance	_____	
Quadrant	_____	X
Code	_____	

PRESS: CONTINUE

DISPLAY: Corrected Bearing Angle

Degrees	_____	Z
Minutes	_____	Y
Seconds	_____	X

PRESS: CONTINUE

DISPLAY: CORRECTED COORDINATES

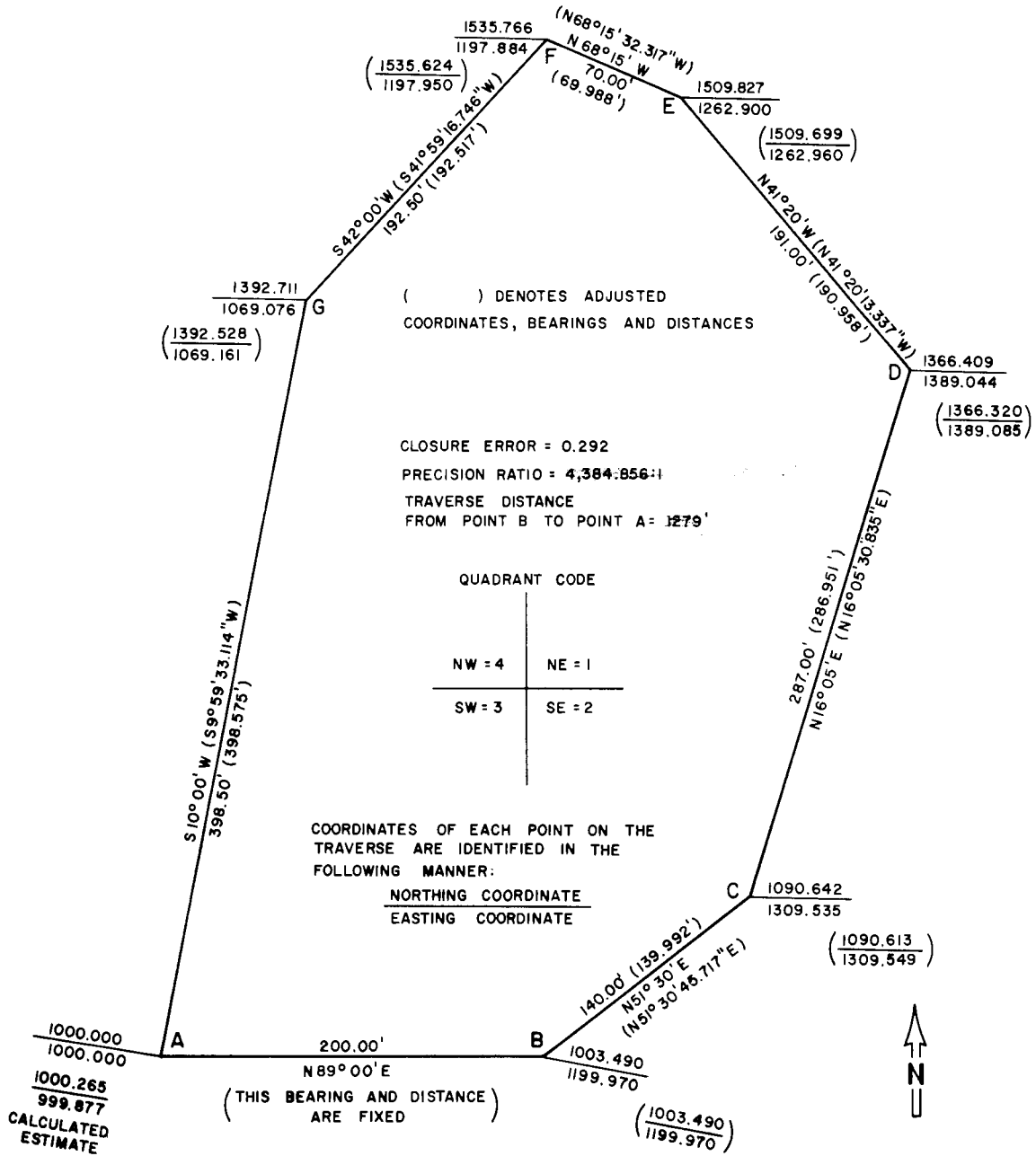
0	_____	Z
Northing	_____	Y
Easting	_____	X

← To continue with corrected traverse.

To enter new traverse data:

PRESS: END

EXAMPLE



POINT A IS FIXED
 POINT B IS CALCULATED FROM FIXED BEARING AND DISTANCE
 THIS POINT (B) IS THE STARTING POINT FOR TRAVERSE FROM B TO A IN A
 COUNTER-CLOCKWISE DIRECTION

HEWLETT-PACKARD

HEWLETT-PACKARD

HEWLETT-PACKARD

HEWLETT-PACKARD

Step	Key	Code	Display			Step	Key	Code	Display			Step	Key	Code	Display		
			x	y	z				x	y	z				x	y	z
0	CLEAR	20				3	C	16				6	1	01			
(+)	$\lambda \rightarrow ()$	23				(+)	5	05				(+)	8	10			
2	-	34				2	-	34				2	0	00			
3	f	15	ENTER SEC. MIN. DEG.			3	CLEAR X	37				3	CHG SIGN	32			
4	STOP	41	E.A. NO. 0			4	$y \rightarrow ()$	40				4	+	33			
5	ROLL \uparrow	22	DISPLAY			5	-	34				5	IF $x > y$	53			
6	$x \rightarrow ()$	23				6	E	12				6	C	16			
7	-	34				7	\uparrow	27				7	a	13			
8	E	12				8	ROLL \uparrow	22				8	y	55			
9	6	06				9	3	03	ENTER			9	$y \rightarrow ()$	40			
a	0	00				a	STOP	41	DIST. 0 0			a	-	34			
b	\div	35				b	IF $x = y$	50	DIST. DIST. 0			b	E	12			
c	\downarrow	25				c	SET FLAG	54				c	\div	35			
d	+	33				d	CONT	47				d	π	56			
10	6	06				4	$x \rightleftharpoons y$	30				7	CHG SIGN	32			
(+)	0	00				(+)	$x \leftarrow ()$	67				(+)	X	36			
2	\div	35				2	-	34				2	b	14			
3	$x \leftarrow ()$	67				3	E	12				3	X	36			
4	-	34				4	$x \rightleftharpoons y$	30				4	$y \rightleftharpoons ()$	24			
5	E	12				5	TO RECT	66				5	-	34			
6	+	33				6	ACC +	60				6	f	15			
7	2	02				7	TO POLAR	62				7	-	34			
8	\uparrow	27	ENTER			8	IF FLAG	43				8	$x \leftarrow ()$	67			
9	STOP	41	QUAD CODE 0 0			9	5	05				9	-	34			
a	$x \rightleftharpoons y$	30				a	a	13				a	E	12			
b	IF $x = y$	50				b	$y \rightarrow ()$	40				b	\uparrow	27			
c	C	16				c	b	14				c	2	02			
d	1	01				d	$x \rightleftharpoons y$	30				d	\div	35			
20	3	03				5	$x \leftarrow ()$	67				Storage					
(+)	IF $x = y$	50				(+)	-	34				f					
2	C	16				2	f	15				e					
3	0	00				3	+	33				d					
4	SET FLAG	54				4	$y \rightarrow ()$	40				c					
5	1	01				5	-	34				b					
6	IF $x = y$	50				6	f	15				a					
7	C	16				7	GO TO ()	44				9					
8	0	00				8	a	13				8					
9	ROLL \uparrow	22				9	7	07				7					
a	X	36				a	$x \rightleftharpoons y$	30				6					
b	9	11				b	$y \rightarrow ()$	40				5					
c	0	00				c	b	14				4					
d	IF FLAG	43				d	-	34				3					
												2					
												1					
												0					



HEWLETT-PACKARD

Step	Key	Code	Display			Step	Key	Code	Display			Step	Key	Code	Display		
			x	y	z				x	y	z				x	y	z
8 0	$x \leftrightarrow y$	30				b 0	CONT	47				0 0	$x \leftarrow ()$	67			
(+) 1	sin x	70				(+) 1						(-) 1	-	34			
2	X	36				2						2	F	15			
3	b	14				3						3	$x \leftrightarrow y$	30			
4	X	36				4						4	\div	35			
5	ROLL \downarrow	31				5						5	\uparrow	27			
6	+	33				6						6	$x \leftarrow ()$	67			
7	$y \rightarrow ()$	24				7						7	-	34			
8	-	34				8						8	f	15	DISPLAY		
9	f	15				9						9	STOP	41	dist. trav.	error	prec. ratio
a	ROLL \uparrow	22	DISPLAY			a						a	RCL	61			
b	STOP	41	raduis	chord	arc length	b						b	\uparrow	27			
c	$x \leftarrow ()$	67				c						c	$x \leftarrow ()$	67			
d	-	34				d						d	-	34			
9 0	E	12				c 0	CHG SIGN	32				1 0	f	15			
(+) 1	\uparrow	27				(+) 1	1	01				(-) 1	\div	35			
2	int x	64				2	GOTO ()	44				2	ROLL \uparrow	22			
3	-	34				3	2	02				3	$x \leftrightarrow y$	30			
4	$x \rightarrow ()$	23				4	9	11				4	\div	35			
5	-	34				5	+	33				5	ROLL \downarrow	31			
6	E	12				6	+	33				6	$y \rightarrow ()$	40			
7	6	06				7	GOTO ()	44				7	-	34			
8	0	00				8	3	03				8	f	15			
9	X	36				9	2	02				9	$x \rightarrow ()$	23			
a	$x \leftrightarrow y$	30				a	-	34				a	-	34			
b	\uparrow	27				b	-	34				b	E	12			
c	int x	64				c	GOTO ()	44				c	CLEAR	20			
d	-	34				d	6	06				d	1	01			
a 0	ROLL \downarrow	31				d 0	8	10				Storage					
(+) 1	X	36				(+) 1	ACC -	63				f					
2	$x \leftarrow ()$	67				2	RCL	61				e					
3	-	34				3	CHG SIGN	32				d					
4	E	12				4	$x \rightarrow ()$	23				c					
5	ROLL \downarrow	31	DISPLAY			5	f	15				b					
6	STOP	41	SEC. MIN. DEG.			6	1	01				a					
7	CLEAR X	37				7	CHG SIGN	32				9					
8	ROLL \downarrow	31				8	X	36				8					
9	RCL	61				9	$y \rightarrow ()$	40				7					
a	GOTO ()	44				a	E	12				6					
b	0	00				b	f	15				5					
c	4	04				c	TO POLAR	62				4					
d	CONT	47				d	$x \leftrightarrow y$	30				3					
												2					
												1					
												0					

HEWLETT-PACKARD

HEWLETT-PACKARD

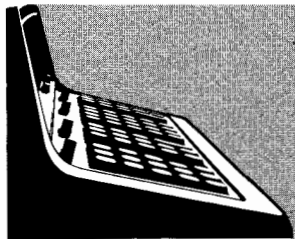
HEWLETT-PACKARD

HEWLETT-PACKARD

Step	Key	Code	Display			Step	Key	Code	Display			Step	Key	Code	Display		
			x	y	z				x	y	z				x	y	z
20	STOP	41	EA.	NO.	0	50	—	34				80	—	34			
(-)1	ACC +	60	ENTER			(-)1	CLEAR X	37				(-)1	3	03			
2	↓	25				2	y→()	40				2	GOTO()	44			
3	2	02	ENTER			3	b	14				3	9	11			
4	STOP	41	SEC.	MIN.	DEG.	4	↑	27				4	▯	13			
5	ROLL ↑	22				5	↑	27				5	x↔y	30			
6	x→()	23				6	3	03	ENTER			6	—	34			
7	b	14				7	STOP	41	DIST.	0	0	7	2	02			
8	6	06				8	↑	27				8	GOTO()	44			
9	0	00				9	ROLL ↑	22				9	9	11			
a	÷	35				a	x←()	67				a	▯	13			
b	↓	25				b	—	34				b	9	11			
c	+	33				c	▯	12				c	0	00			
d	6	06				d	X	36				d	IF x>y	53			
30	0	00				60	x←()	67				90	9	11			
(-)1	÷	35				(-)1	—	34				(-)1	7	07			
2	b	14				2	f	15				2	—	34			
3	+	33				3	ROLL ↑	22				3	4	04			
4	2	02				4	X	36				4	GOTO()	44			
5	↑	27	ENTER			5	y↔()	24				5	9	11			
6	STOP	41	QUAD	CODE	0 0	6	b	14				6	▯	13			
7	x↔y	30				7	TO RECT	66				7	x↔y	30			
8	IF x=y	50				8	ROLL ↓	31				8	—	34			
9	▯	16				9	+	33				9	1	01			
a	1	01				a	b	14				a	ROLL ↑	22			
b	3	03				b	ROLL ↑	22				b	CLEAR X	37			
c	IF x=y	50				c	+	33				c	ROLL ↓	31			
d	▯	16				d	ROLL ↓	31				d	y↔()	24			
40	0	00				70	ACC +	60				Storage					
(-)1	4	04				(-)1	TO POLAR	62				F					
2	SET FLAG	54				2	x→()	23				E					
3	1	01				3	b	14				d					
4	IF x=y	50				4	CLEAR X	37				c					
5	▯	16				5	IF x<y	52				b					
6	0	00				6	8	10				a					
7	ROLL ↑	22				7	b	14				9					
8	X	36				8	y	55				8					
9	9	11				9	9	11				7					
a	0	00				a	0	00				6					
b	IF FLAG	43				b	IF x>y	53				5					
c	▯	16				c	8	10				4					
d	5	05				d	5	05				3					
												2					
												1					
												0					

HEWLETT-PACKARD

Step	Key	Code	Display			Step	Key	Code	Display			Step	Key	Code	Display		
			x	y	z				x	y	z				x	y	z
a 0	b	14	DISPLAY			0					0						
(-) 1	STOP	41	QUAD	DIST.	0	1					1						
2	b	14				2					2						
3	↑	27				3					3						
4	int x	64				4					4						
5	-	34				5					5						
6	x→()	23				6					6						
7	b	14				7					7						
8	6	06				8					8						
9	0	00				9					9						
a	x	36				a					a						
b	x↔y	30				b					b						
c	↑	27				c					c						
d	int x	64				d					d						
b 0	-	34				0					0						
(-) 1	ROLL ↓	31				1					1						
2	x	36				2					2						
3	b	14				3					3						
4	ROLL ↓	31	DISPLAY			4					4						
5	STOP	41	SEC.	MIN.	DEG.	5					5						
6	CLEAR x	37				6					6						
7	ROLL ↓	31				7					7						
8	RCL	61	DISPLAY			8					8						
9	STOP	41	EA.	NO.	0	9					9						
a	↓	25				a					a						
b	GO TO ()	44				b					b						
c	2	02				c					c						
d	3	03				d					d						
c 0	CHG SIGN	32	Storage														
(-) 1	1	01				1						f					
2	GO TO ()	44				2						e					
3	4	04				3						d					
4	7	07				4						c					
5	+	33				5						b					
6	+	33				6						a					
7	GO TO ()	44				7						9					
8	5	05				8						8					
9	0	00				9						7					
a	END	46				a						6					
b						b						5					
c						c						4					
d						d						3					
												2					
												1					
												0					



COORDINATE GEOMETRY AND ENCLOSED AREA

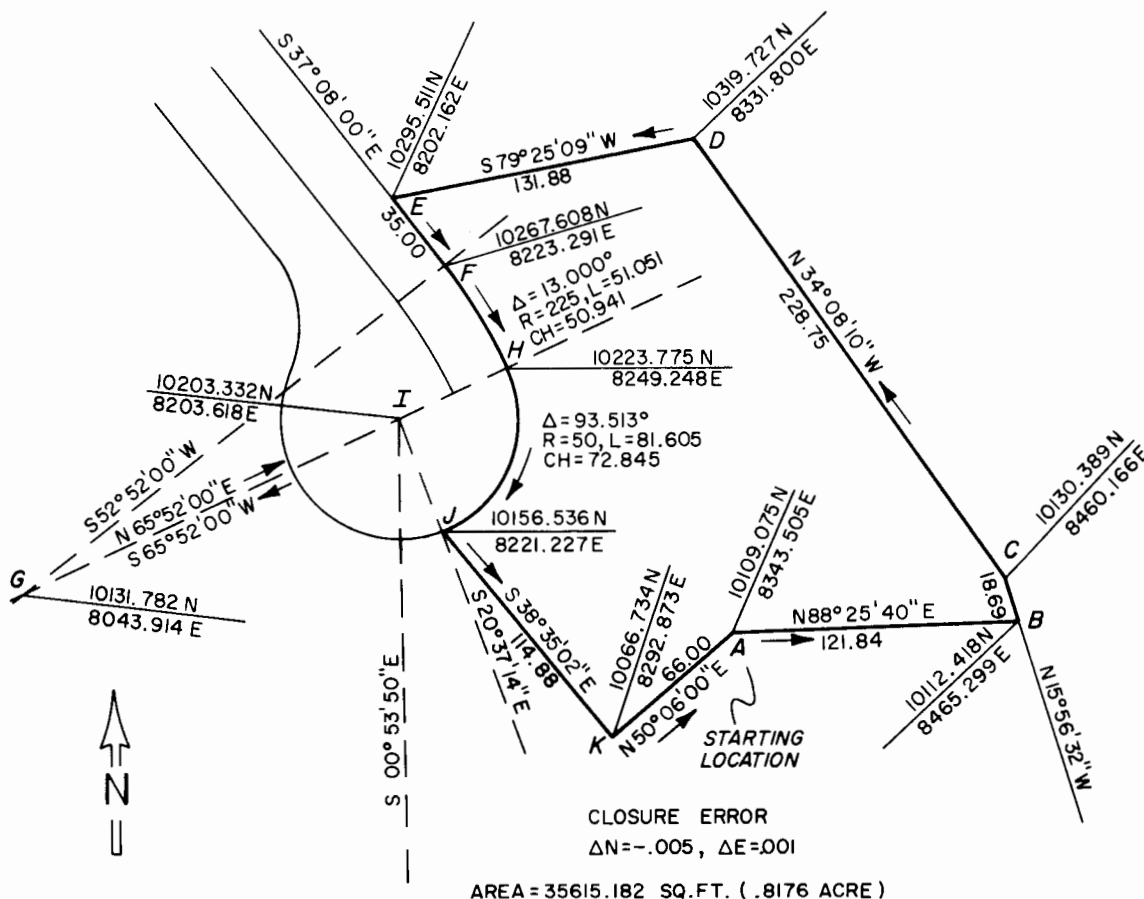
9100B ONLY
PART NO.
09100-74102

This program traverses by bearing and distance and calculates coordinates, enclosed area, and the following curve data:

1. Length
2. Chord
3. Central angle in decimal degrees
4. Coordinates of tangent points

This program is designed to traverse from point to point on a survey map indicating coordinates of successive points on the survey and also indicating the descriptive features of tangent curved portions. If direction of traverse is given in degrees and lengths in feet, then the area is given in square feet. The four quadrants are represented as follows: NE = 1, SE = 2, SW = 3, NW = 4.

QUADRANT CODE



USER INSTRUCTIONS

SET:

PRESS: END

ENTER PROGRAM: Side A followed by Side B

PRESS: CONTINUE

ENTER COORDINATES:

Northing → Y

Easting → X

PRESS: CONTINUE

DISPLAY

1	_____	Z
Northing	_____	Y
Easting	_____	X

ENTER BEARING ANGLE DATA: ←

Degrees → Z

Minutes → Y

Seconds → X

Note: Decimal Degrees, Decimal Minutes or Decimal Seconds may be entered provided they are entered in the proper register.

PRESS: CONTINUE

DISPLAY

Decimal Bearing	_____	Z
2	_____	Y
2	_____	X

ENTER DATA: Quadrant Code (1 = NE, 2 = SE, 3 = SW, 4 = NW) in X register

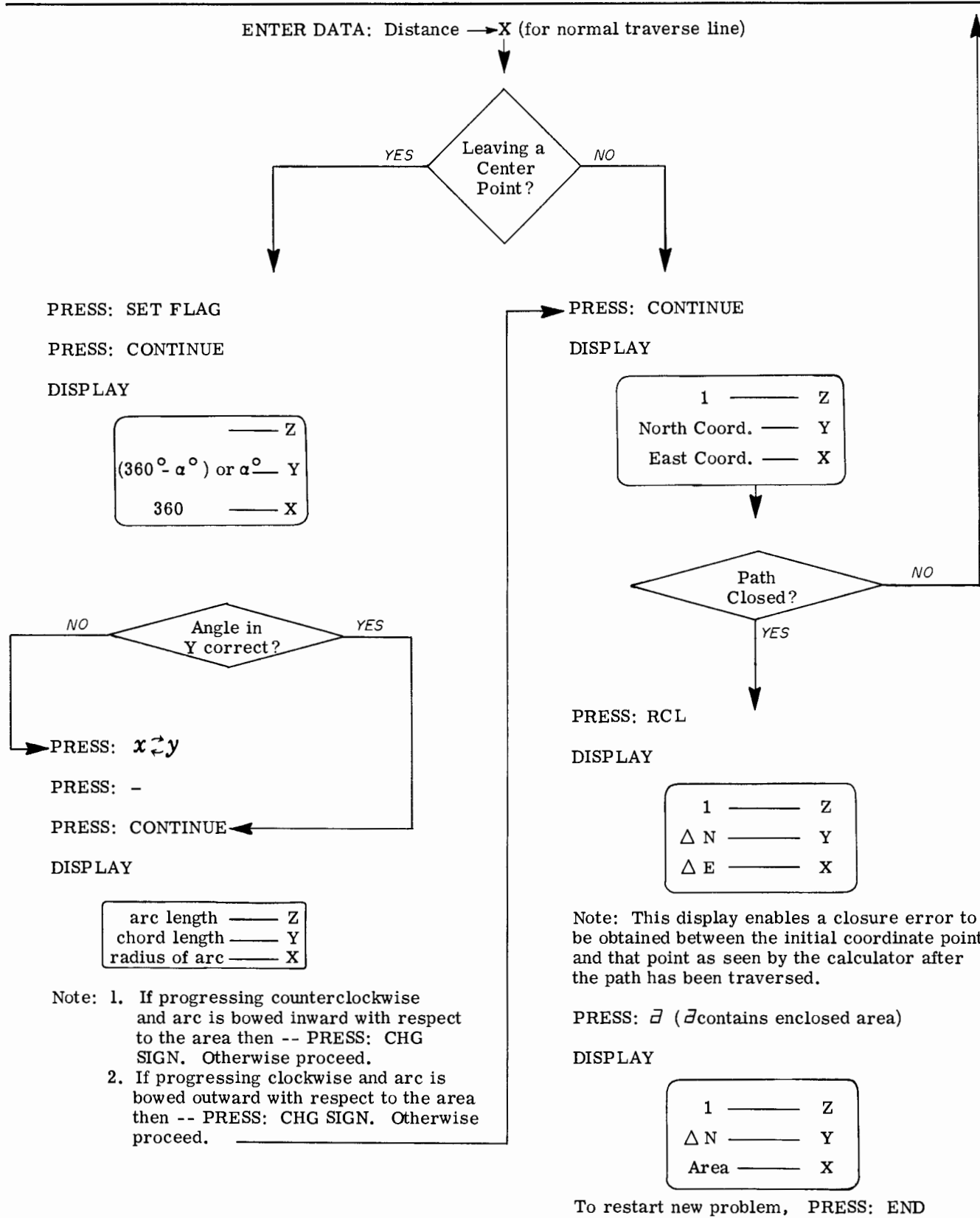
PRESS: CONTINUE

DISPLAY: Intermediate results

Inter. Res.	_____	Z
Inter. Res.	_____	Y
3	_____	X

NO

USER INSTRUCTIONS (con't)



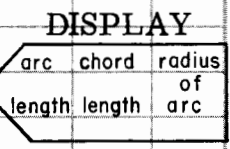
HEWLETT-PACKARD

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Step	Key	Code	Display			Step	Key	Code	Display			Step	Key	Code	Display			
			x	y	z				x	y	z				x	y	z	
8	ROLL ↑	22				1	4	04				0						
(+) 1	x↔y	30				(-) 1	5	05				1						
2	2	02				2	END	46				2						
3	÷	35				3						3						
4	x↔y	30				4						4						
5	sin x	70				5						5						
6	X	36				6						6						
7	b	14				7						7						
8	X	36				8						8						
9	STOP	41				9						9						
a	GO TO ()	44				a						a						
b	-	34				b						b						
c	0	00				c						c						
d	0	00				d						d						
90	+	33				0						0						
(+) 1	+	33				1						1						
2	GO TO ()	44				2						2						
3	3	03				3						3						
4	d	17				4						4						
5	CHG SIGN	32				5						5						
6	1	01				6						6						
7	GO TO ()	44				7						7						
8	3	03				8						8						
9	6	06				9						9						
a	CONT	47				a						a						
b	CONT	47				b						b						
c	CONT	47				c						c						
d	CONT	47				d						d						
00	ROLL ↑	22				0												
(-) 1	X	36				1												
2	2	02				2												
3	÷	35				3												
4	a	13				4												
5	+	33				5												
6	y→()	40				6												
7	a	13				7												
8	y↔()	24				8												
9	-	34				9												
a	a	13				a												
b	b	14				b												
c	GO TO ()	44				c												
d	+	33				d												



Storage

F
E
D
C
B
A
9
8
7
6
5
4
3
2
1
0

Step	Key	Code	Display			Storage														
			x	y	z	f	e	d	c	b	a									
9	0	C	16																	
	1	+	33	SUM COORDINATES FOR POSITION OF P																
	2	CLEAR x	37																	
	3	ROLL ↓	31																	
	4	x↔y	30																	
	5	END	46	P _E	P _N	0	DISPLAY													
	6																			
	7																			
	8																			
	9																			
	a																			
	b																			
	c																			
	d																			
	0																			
	1																			
	2																			
	3																			
	4																			
	5																			
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	d																			

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