JASON E. FOOSE, PS

the HP 35s calculator

A Field Surveyor's Companion

Part 5—Inverse to a Line or Perpendicular Offset

This Month's Program

This program is comparable to "inverse to line" and "station/offset" routines. The user enters a base point and defines a direction by point or azimuth, then selects a third point for reference. I use this routine frequently when evaluating rights-of-way lines.

STA-OFFSET

0001	LBL 0
0002	FIX 2
0003	SF 10
0004	EQN "STA-OFFSET"
0005	EQN "BASEPOINT"
0006	FIX 0
0007	INPUT J
0008	RCL (J)
0009	STO B
0010	EQN "DIRECTION"
0011	EQN "RCL PT=1 INP=0"
0012	x=0?
0013	GTO 0021
0014	INPUT J
0015	RCL (J)
0016	R▲
0017	-
0018	ARG
0019	STO X
0020	GTO 0026
0021	EQN "AZIMUTH"
0022	FIX 4
0023	INPUT A
0024	RCL A
0025	STO X
0026	EQN "OFFSET PNT"
0027	RCL B
0028	FIX 0
0029	INPUT J
0030	RCL (J)
0031	x<>y
0032	R▼
0033	x<>y
0034	-
0035	ARG
0036	STO Y
0037	LASTx
0038	ABS
0039	STO Z
0040	RCL X
0041	RCL Y
0042	-
0043	STO W
0044	SIN
0045	RCL x Z (see "recall arithmetic" User Manual 3-6)
0046	SF 10
0047	EQN "OFFSET -LT RT+
0048	+/-
0049	STO 0
0050	FIX 2
0051	VIEW 0
0052	RCL W
0053	COS
0054	RCL x Z
0055	STO L
0056	FIX 2
0057	EQN "LINE DIST"
0058	VIEW L
0059	EQN "RPT LINE=0"
0060	x=0?
0061	GTO 0026
0062	GTO 0002
0063	RTN

Example Data and Running the Program

Use program H "POINTS" to enter our sample points as follows:

1: N-5000.00, E- 5000.00
2: N-5210.00, E-5204.12
3: N-4872.00 E-5101.00

KEYSTROKE STEPS	RESULTANT DISPLAY	ACTION
XEQ E ENTER	Y-reg : X-reg : STA-OFFSET	Executes program {0} and displays program annunciator. E is 2 keys right of ENTER
R/S	Y-reg: X-reg: BASEPOINT	Annunciator for Basepoint input.
R/S	Y-reg : J? X-reg : default value	Prompt for input point.
1 R/S	Y-reg : X-reg : DIRECTION	Annunciator for Direction input.
R/S	Y-reg: X-reg: RCL PT=1 INP=0	Annunciator asking user to key either "0" or "1" for the desired action. SEE BELOW FOR INPUT OPTION.

KEYSTROKE STEPS	RESULTANT DISPLAY	ACTION
1 R/S	Y-reg : J? X-reg : default value	Prompt for input point defining line direction.
2 R/S	"RUNNING" then Y-reg : X-reg : OFFSET PNT	Annunciator for offset point.
R/S	Y-reg : J? X-reg : default value	Prompt for input point.
3 R/S	"RUNNING" then Y-reg : X-reg : OFFSET –LT RT+	Annunciator reminder that negative values are left of line and positive values are right of line.
R/S	Y-reg : 0= X-reg : 161.64	Point 3 is 161.64 units right of the line from Point 1 to Point 2.
R/S	"RUNNING" then Y-reg : X-reg : LINE DIST	Annunciator reminder that line distance will follow. Negative values fall perpendicular before the p.o.b. and positive values intersect after the p.o.b.
R/S	Y-reg : L= X-reg : -21.39	Point 3 is 21.39 units behind the Point 1 in the direction of Point 2.
R/S	Y-reg: X-reg: RPT LINE=0	Enter 0 to hold the existing line information and compare another point. Otherwise press R/S to escape or define a new line.
R/S	Y-reg: X-reg: STA-OFFSET	Returned to top of program.

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Input Option

Run program as above to prompt

KEYSTROKE STEPS	RESULTANT DISPLAY	ACTION
R/S	Y-reg: X-reg: RCL PT=1 INP=0	Annunciator asking user to key either "0" or "1" for the desired action.
0 R/S	Y-reg: X-reg: AZIMUTH	Annunciator reminder to enter Azimuth (decimal degrees).
R/S	Y-reg: A? X-reg: default value	Prompt for Azimuth in decimal degrees.
1 0 R/S	Y-reg: X-reg: OFFSET PNT	Enter sample azimuth of 10 degrees and continue the program as listed above. The offset for Point 3 holding Line Point 1 in the direction of 10 degrees is 121.69 right and -108.52 (behind or backwards) from Point 1.

STA-OFFSET is a great tool for evaluating lines and perpendicular offsets. Your interest and feedback is greatly appreciated. Hopefully the information presented herein is clear and genuinely explanatory. We've covered some basic tools and operations so far. In the future I will present intersections, areas, translate/rotate, stake out, and areas with curves. Please do not hesitate to send any comments, concerns, questions, or criticism to *rls43185@gmail.com*. ■

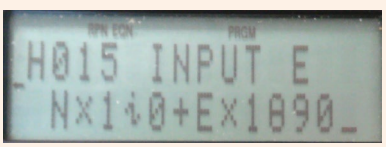
Jason Foose is the County Surveyor of Mohave County Arizona. He has been licensed since 11111010000 and believes there are 10 types of people in the world, those who understand binary and those who don't.

Polecat of the Month

The Polecat dumpster is awfully full this month. My undying gratitude is presented to a Lobo, a Buckeye, a Duck, and a Terrapin. My appreciation goes out to Jeff Richter of Truth or Consequences, New Mexico, Doug Crawford of Wapakoneta, Ohio, Al Skeesick of Oregon, and Adam Rook of Burtonsville, Maryland. Thank you for your participation, comments and concern towards making things better for the readers!

A retrospective observation from the readers:

"Line H016 of program H "Points" is a bit confusing as printed". The screen shots below show the full line scrolled left and right.



Wapako-whatta???

Doug Crawford of Wapakoneta, Ohio, kindly pointed out that the "Bonus Equation" from the December issue should refer to the command "RMDR" rather than "RMD". The RMDR command is found on the INTG menu accessed through keystrokes YLS TAN 3.