

An HP 35S scientific calculator is shown in the upper right corner, partially overlapping a background of mathematical formulas. The formulas include the quadratic formula, the integral of $\frac{x^{2n-1}}{X^n}$, and the integral of $\frac{dx}{X}$. The calculator's keypad is visible, showing keys like STO, ENTER, SOLVE, and various function keys.

Two Nifty Programs

That Will Make Your HP 35S Calculator “Cry And Sing!”

I often think of this line when it comes to programming HP calculators. I’ve seen many a person “skin that smoke wagon” for no other reason than their fingers only go up to ten. HP RPN calculators are one of the most powerful and oft overlooked tools that a surveyor can employ. The HPS 35s is comfortable, compact, readable, and approved for the NCEES tests. The HP 35s is a great calculator for keystroke programming. “Keystroke” is the HP equivalent to Microsoft’s “macro”. The 35s has a good chunk of memory and up to 800 accessible storage registers.

Enough of the good features, let’s focus on the bad! Where is the rectangular/polar conversion key? WHERE IS THE RECTANGULAR/POLAR CONVERSION KEY? **WHERE IS THE RECTANGULAR/POLAR CONVERSION KEY? WHERE IN THE HECK IS THE...** okay, I’ve made my point. HP forgot that Surveyors really enjoy the value of the traditional rectangular/polar conversion logic included on HP calculators for the past 30+ years. The good news is that rectangular/polar conversions on the 35s are performed through a display setting when viewing complex numbers. Oh by the way, when I say “good news” I mean get ready to hear something nuttier than squirrel droppings. This “new” display logic is a loser, plain and simple (if you’re a grumpy old surveyor). However, HP’s redemption lies in their effort to distribute two short

“Check out Guitar George, he knows all the chords; but it’s strictly rhythm. He doesn’t want to make it make it cry or sing...”

—Dire Straits “Sultans of Swing” circa 1978

programs that overcome this deficiency. I’ve slightly modified the listing that HP provides via their website. The good folks at the HP Museum of Calculators are credited with developing the programs. I too assign credit to the “Museum” folks and note that my listings are simple modifications to their outstanding work.

Let’s start with some basic information about how the 35s works. There is a “run” mode, which is the normal everyday “punch-the-keys-and-get-an-answer” mode. Then there is “program” mode. This mode enables the 35s to write and store a series of keystrokes for future use. It’s like a macro in Microsoft Excel. To access program mode simply press the blue shift (right arrow shift) and the R/S key (most upper left key). You’ll notice “PRGM” is written in blue on the bottom of the R/S key. To escape from program mode simply do the

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same blue shift and R/S sequence. You can also hit the “C” clear key as well. You label a program with a “letter” label. The red alpha labels are located on the lower right area of certain keys. You are limited to 26 labeled programs A-Z. To run a program hit the XEQ key followed by your desired alpha label key. You’ll notice that several program lines are contained in quotation marks. These lines are actually equations. You must hit the EQN key to initiate the equation and the enter key to exit the equation. REGX, REGY, REGZ, REGZ are available in program mode by hitting the roll down key then using the left/right grey arrows to select. The listings are presented as you will see them in the display with the exception of the quotation marks. Refer to the user’s guide or go to HP’s support site and download the pdf found at the link listed below for examples of the actual key strokes. The user’s guide has a listing of all keystrokes in appendix “G”. Feel free to email any questions to rls43185@gmail.com

POLAR PROGRAM LISTING

P001	LBL P
P002	CF 10
P003	ABS
P004	CLx
P005	LASTx
P006	R▼
P007	R▼
P008	“REGZ+i*REGT”
P009	ENTER
P010	R▼
P011	R▼
P012	“ARG(REGT)”
P013	“ABS(REGT)”
P014	RTN

RECTANGULAR PROGRAM LISTING

R001	LBL R
R002	CF 10
R003	ABS
R004	R▼
R005	R▼
R006	“LASTx*COS(REGT)+i*LASTx*SIN(REGT)”
R007	ENTER
R008	R▼
R009	R▼
R010	“ABS(REGZ)*SIN(ARG(REGZ))”
R011	“ABS(REGT)*COS(ARG(REGT))”
R012	RTN

What do the programs do?

Polar enables you to enter a northing (y-register) and an easting (x-register) and convert them to an azimuth and a distance. The steps are as follows:

1. Type your easting.
2. Hit the enter key.
3. Type your northing.
4. Hit the XEQ key and the () key for “P”.
5. Hit the enter key to run the program.

The azimuth will be displayed in decimal degrees in the y-register and the distance will be displayed in the x-register.

Rectangular enables you to enter an azimuth and distance and convert them to easting and northing.

Type your azimuth in decimal degrees.

1. Hit the enter key.
2. Type your distance
3. Hit the XEQ key and the 7 key for “R”.
4. Hit the enter key to run the program.

The easting will be displayed in the y-register and the northing will be displayed in the x-register. Remember you are working with Cartesian coordinate system and HP’s special azimuth circle of +/- 180°. If you find that your answers appear “almost right” then double check these two items as likely culprits. You may find your northing and easting are reversed or your azimuth is negative or rotated 90°.

Sample Data

Convert rectangular coordinates to polar values

Note: set display to fix 4 for angles but be realistic about your distance precisions!

500 [ENTER] 100 [XEQ] [P] [ENTER] should yield the result of:
Y: 78.6901 (azimuth-dd) **X:** 509.9020 (distance)

600[ENTER] 200 [+/-] [XEQ] [P] [ENTER] should yield the result of:
Y: 108.4349 **X:** 632.4555

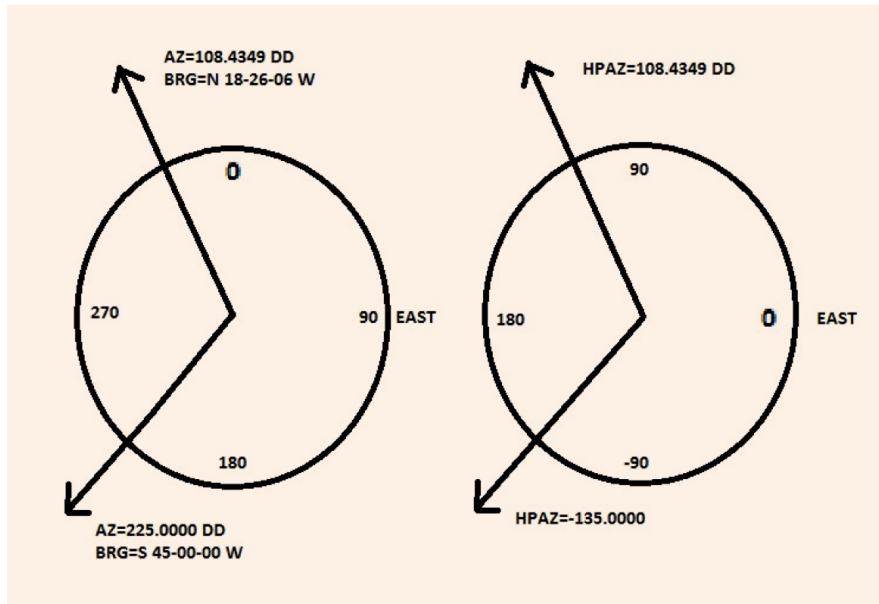
300 [+/-] [ENTER] 300 [+/-] [XEQ] [P] [ENTER] should yield the result of:
Y: -135.0000 **X:** 424.2641

Convert polar values to rectangular coordinates

30 [ENTER] 250 [ENTER] [XEQ] [R] [ENTER] should yield the result of:
Y: 125.0000 (northing) **X:** 216.5064 (easting)

135 [ENTER] 200 [ENTER] [XEQ] [R] [ENTER] should yield the result of:
Y: 141.0000 **X:** -141.0000

Note: HP Azimuth starts with 0° as east or the equivalent 90° in earth based units. Positive angles represent counterclockwise rotation north of the equatorial zero whereas negative angles represent clockwise rotation south of the equatorial zero to 180° or west.



HP calculators refer to a hemispherical azimuth system as illustrated on the right. Angles are displayed 0° to 179° 59'59" North of the equatorial zero and 0° to -179° 59'59" South of the equatorial zero.

Links

www.hpmuseum.org

This link is to HP's support site. There's a link to order a pdf copy of the programs at the bottom of the page:

h20000.www2.hp.com/bizsupport/TechSupport/Document.jsp?objectID=c01748452&prodSeriesId=3442983

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