

SURVEY PROGRAM (with COGO) for the HP-33S

NCEES Approved Calculator

Having problems getting ready for the NCEES Surveyors Exam because your calculator is not on the NCEES approved list? Try these HP33S Surveying and COGO programs. They will give you all the computing power you need to solve the exam problems. Best of all they are available at no charge and documentation is available at my web page at www.melbard.com

I have been writing Survey and COGO programs for my Civil Engineering Technology Students at Milwaukee Area Technical College since 1987. These programs have been written for the HP11C, HP32S, HP32SII, TI-85 and TI-86. When the NCEES approved calculator list came out last year I decided to upgrade some of these programs so they would run on the new HP33S calculator.

If you are familiar with basic survey calculations and COGO routines you will be able to solve problems with these programs even if you are not familiar with using HP calculators or RPN. If you are more familiar with algebraic calculators you may want to take two calculators to the exam (the HP33S with the Survey and COGO programs and an approved algebraic calculator, like the TI-36X for general math in algebraic mode, so working in RPN is not necessary)

Even though the HP33S is both an Algebraic and an RPN mode calculator, these programs are written for RPN mode, and it is not recommended to switch between the two modes while using the programs. Again experience with RPN is not necessary to run these programs, because all you need to do is input data in the correct format and record the answers that return.

The following is a brief summary of these Survey and COGO Programs that can be loaded into the HP33S. All programs must be manually entered line by line. It will take about 1 to 2 hours to key in the entire set of programs, however not all of them need to be entered. Optional programs are identified. These optional programs can be individually added or deleted from the calculator at any time.

XEQ W (same as the 1 key, so it is easier to think of it as **XEQ 1**) will store the Northing and Easting of Point 1. The coordinates of Point 1 will be used in several of the following programs.

XEQ X (same as the 2 key, so it is easier to think of it as **XEQ 2**) will store the Northing and Easting of Point 2. The coordinates of Point 2 will be used in several of the following programs.

XEQ Y (same as the 3 key, so it is easier to think of it as **XEQ 3**) will inverse from Point 1 to point 2 and will return the answer as Distance and Azimuth.

XEQ E will do a Side-Shot by Distance and Azimuth from Point 1 and will return the answer in Northing and Easting of the new point.

XEQ B Bearing–Bearing Intersection This program will compute the coordinates (Northing and Easting) of the intersection of two lines with specified azimuths from Points 1 and 2.

XEQ C Bearing–Distance Intersection This program will compute the coordinates (Northing and Easting) of the intersections of both solutions of a line with a specified azimuth from Point 1 and a specified distance from Point 2.

XEQ D Distance–Distance Intersection This program will compute the coordinates (Northing and Easting) of the intersection of that is the specified distance from Point 1 and a specified distance from Point 2.

XEQ Z will display the coordinates that are stored in XEQ 1 and XEQ 2 and will swap the point numbers of the coordinates if desired.

XEQ A will compute the area of a boundary defined by straight lines between points with known coordinates. (there is no limit to the number of points in the boundary)

XEQ U (same as the 5 key, so it is easier to think of it as **XEQ 5**) will Interpolate and/or Extrapolate between a data range stored in specified registers.

XEQ V will compute the stations and elevations of points on a Vertical Curve at a specified incremental distance like full, $\frac{1}{2}$ stations or $\frac{1}{4}$ stations, etc.

XEQ H will compute the station and elevation of the High or Low point of a Vertical Curve.

XEQ P will compute the elevation of any station specified on a Vertical Curve.

XEQ J will compute several Horizontal Curve components (when the Central Angle and Radius are known). Computed components include Arc Length, Tangent Length, Chord, Degree of Curvature (arc definition), External, Mid Ordinate, Sector area, Arc to Chord area.

XEQ K will compute several Horizontal Curve components (when the Central Angle and Arc Length are known). Computed components include Radius, Tangent Length, Chord, Degree of Curvature (arc definition), External, Mid Ordinate, Sector area, Arc to Chord area.

XEQ L will compute several Horizontal Curve components (when the Radius and Arc Length are known). Computed components include Central Angle, Tangent Length, Chord, Degree of Curvature (arc definition), External, Mid Ordinate, Sector area, Arc to Chord area.

If there are a few people interested in attending a Saturday class on using these HP33S Surveying and COGO programs I would be happy to run one. In fact, I would run the class at no charge, but it would need to be in Milwaukee at MATC. Contact me if you are interested in this possibility. My number is 414-297-7254.