March 2003 Melbard

TI-86 COGO (coordinate geometry)

Program Notes

Copy the following files to your TI-86:

the **COGO** program, all **ZZ***** sub-programs, and the **YYY** matrix. You can link your TI-86 to another TI-86, then select and send the appropriate program files and the matrix file, or you can download these files from a PC with the TI LINK software. (Note you cannot send files from a TI-86 to a TI-85)

The COGO Program, sub programs and matrix require about 19,100 bytes of calculator memory. Also, while running the programs, another 1500 bytes will be used by variables.

Before loading and/or running the COGO programs, it would be a good to CLEAR out all unused variables and programs. This can be done with the [2nd] [MEM] keys, and then deleting unused variables in REAL, LIST, MATR, EQU, PRGM, PIC, CPLX, VECT, STRN, CONS and GDB.

When the program is loaded into the TI-86, you can run it by keying in [PRGM] and then [F1] (for a listing of program NAMES). Then choose the program **COGO** from the menu with the appropriate [F__] key that is below the program name **COGO**.

From the program's **MAIN MENU**, choose one of the following sub-programs, either the **PNTS** sub-program, the **SURV** sub-program, the **ANGLE** sub-program or the **CALCS** sub-program.

PNTS From the **POINTS** sub-program you have access to the 99 points that are stored in the YYY matrix. Points are identified with a Point Number, Northing, Easting and Elevation. You are limited to 99 points and the Point Numbers must be between 1 and 99.

In this sub-program, points are not created by computation. Instead, simply enter the point coordinate values and then store them as a point number from 1 to 99. Point numbers are like storage registers. When point data is stored with a Point Number, the previous point data that is stored with that point number is overwritten. Descriptions cannot be stored with the point data. It is suggested that you keep track on a sketch as to which point numbers relate to which locations or descriptions.

In the **POINTS** sub-program, you can LOOK at the point's NORTHING, EASTING and ELEVATION values. You can EDIT these values and you can Store new values. You can INVERSE between points and obtain the difference in N, E, and Elev. and obtain the length, azimuth and bearing. Remember that the INVERSE direction is dependent on the FROM and TO point numbers that you enter.

SURV The **SURVEY** sub-program, will allow you to take total station data and obtain coordinates of the points you survey. You must know at least two points before you start your survey and these are the Setup Point and BS Point. You must enter them into the calculator under the POINTS program before you start **SURV**. When in **SURV**, hit the **NO** key if you need to change the Setup Point, BS Point, HI (height of Inst) and SH (signal/prism height). View your changes with the **VIEW** key and accept these values with the **YES** key.

Hit **SHOOT** to enter the Horizontal Angle, Horizontal Distance, and Change in Elevation to the side shot point. Hit **STOPT** to store the point just sighted. Hit **SH** if the next point requires a new signal height. Hit **SHOOT** again for another survey point, or hit **MOVE** if you want to traverse to the point just stored. Note, you must store a point before you can traverse to it.

ANGLE The **ANGLE** sub-program computes angles between lines of known bearings and/or azimuths. Also, the angles between lines defined by stored points may be determined.

P-P-P will let you enter 3 stored point numbers with the middle point being the vertex of the angle. Angles are determined clockwise from the first point to the third point. Also, 360 minus the angle and 180 minus the angle are given to minimize additional computations.

AZ-AZ will determine the angle between lines of known azimuths and/or bearings.

PP-AZ will determine the angle between one line defined by stored points and the other of a known azimuth and/or bearing.

LN-LN will determine the angle between two lines defined by points, but where the vertex is not defined as a stored point. The lines defined by stored points, need not cross.

CALCS The **CALCS** (calculation) program will determine points by the standard COGO intersection (**INTSC**) procedures of Bearing-Bearing Intersection, Bearing-Distance Intersection and Distance-Distance Intersection.

B-B will find the Bearing-Bearing Intersection from two stored points and a known bearing and/or azimuth from each point.

B-D will find the Bearing-Distance Intersection from two stored points and a known bearing and/or azimuth from point A and a known distance from point B. The program will show N and E for each of two possible solutions. You can choose which solution to store.

D-D will find the Distance-Distance Intersection from two stored points and a known distance from each point. The program will prompt you if it should to compute the unknown point that is Right or Left of the line between points A and B.

SS Points can also be determined by standard COGO side shot **(SS**) procedures. You may want to store the solution of these computed points. Elevations may also be added to the points if desired.

When using the Side Shot (**SS**) program you must first enter the stored point from which the side shot will be computed from. You may then define the direction of the Side Shot point with an Azimuth, a Bearing, a Line (determined from stored points), a Line (determined from stored points) plus a clockwise angle or a Line (determined from stored points) minus a counter-clockwise angle. The new point coordinates for the side shot line are displayed. Also, the change in N and E for the side shot line is displayed.

The **AREA** of figures defined by stored points can be determined. When using this program, define the area by entering point numbers consecutively around the figure and ending with the starting point number.

The TI-86 COGO program was developed for surveying students, however it is useful in determining solutions to real world surveying problems. The program can be shared freely with others. It is intended for use by Land Surveying students and professionals. I wish to acknowledge Anthony J. Gromacki, RLS, John C. Kannard, RLS and James R. Holland for their advice and assistance during the program development. Comments about the program are welcome. Please call me at 414-297-7254.

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