The SURPAC MINING Module Applications

Underground Peg Calculation using the "Double Set Up" Method

- This application is designed to solve the common underground Mine Survey problem of determining and checking the [Y, X, Z] (or [E, N, Z]) ordinates a new Peg.
- The [Y, X, Z] (or [E, N, Z]) ordinates of both the Set Up Peg and the Back Sight peg must be known, and exist in the current Co-ordinate File.
- This technique provides a better overall check on the position of the New Peg than does the "Double Button" technique described below. The "Double Set Up' technique provides a full check on the distance between the two Pegs, and their relative elevations. However, until the Peg's position is verified by means of a closed traverse at some future date, its absolute position can not be assured.
- The required method of Survey is a Set up at the Set Up (or Fixing) Peg, plus a Setup at the New (or Fore-Sight) Peg.
- At the Set Up Peg , the following quantities should be measured or observed :-
  - Back Check Vertical Angles and Distance to the Back Sight Peg in order to verify the relative positions of these two Pegs, with respect to their theoretical values,
  - Face Left and Face Right Vertical Angles to the Fore Sight Peg,
  - One, or two, full Arcs (Face Left and Face Right) Horizontal Angles to the Fore Sight Peg and the Back Sight Peg,
  - The Slope Distance to the Fore Sight Peg, measured from the Height of Collimation of the Instrument to the Bob at the Fore Sight Peg,
  - The Height of Instrument (Collimation). If this value is measured from a Roof Peg, then the value must be entered as negative, and
  - The Height of the Bob at the Fore Sight Peg. If this value is measured from a Roof Peg, then the value must be entered as positive.
- At the Fore Sight Peg , the following quantities should be measured or observed :-
  - Face Left and Face Right Vertical Angles to the Set Up Peg,
  - The Slope Distance to the Fixing Peg, measured from the Height of Collimation of the Instrument to the Bob at the Set Up Peg,
  - The Height of Instrument (Collimation). If this value is measured from a Roof Peg, then the value must be entered as negative,
  - The Height of the Bob at the Set Up Peg. If this value is measured from a Roof Peg, then the value must be entered as positive, and
  - If required, the Roof to Floor Height value may be measured.
- The application allows for data entry by :-
  - Manual (keyboard) entry of Observations,

- From a pre-generated ASCII File (type ***.pg1), or
- Automatic loading of the observations from a SURPAC Observation File.

- Calculation will only take place if none of the angular and/or linear measurements exceeds the User specified limits. These limits are compared to the calculated differences for Vertical Angles, Horizontal Angles, Horizontal Distances and Vertical Height Differences. They also provide the option of forcing the User to carry out a Back Check before the new Fore Sight Peg can be calculated. The ability to modify these limits is limited to Users having the necessary Security Code. This Security Code prevents un-authorized Users from changing the limits, or resetting the Back Check option.
- Before the New Peg calculation takes place, a Back Check calculation may be carried out to verify the relative positions of the Back Sight Peg and the Set Up Peg against the theoretical values.
- After calculation takes place, the Co-ordinates, Peg Elevation and Floor Elevation of the Fore Sight Peg (New Peg) will be stored in the current Co-ordinate File.
- The results of the Peg calculation will also be stored in the Multi-Polar/Peg File of the current Co-ordinate File. This file will hold and display up to 4 determinations of a Peg, over and above the actual co-ordinates (current values) stored in the Co-ordinate File. Running the Edit a Multi-Polar/Peg File (found under the General main Menu) programme will generate a display of a summary of all determinations of existing Pegs in the Co-ordinate File. The stored ASCII file (type ***.pg1) can then be called, for any the Point/Peg determinations, which will in turn generate a full display of all the observational and derived data for the New Peg calculation.
- After calculating the New Peg, an ASCII Peg File (type ***.pg1) of all observed and derived data my be created. This ASCII Peg file has four main uses :-
  - The results of the New Point just calculated can easily be imported back into the application at any future time, preventing the time wasting and possible errors of re-entering these data manually. Even if the observational data originally came from an Observation file, the ASCII file contains extended information relative to the Peg calculation.
  - When doing a Right Button Click on a Point displayed in the Co-ordinate File, for example, it is possible to display the contents of any ASCII Peg file relative to a required Peg and to re-calculate the Peg.
  - If the User requires an output format different from the one used by SURPAC, the data from the ASCII Peg file can be easily imported into a User generated application.
  - It provides a backup for all observational data used to fix the Peg.
- The application also allows for the calculation of a Chain length at the New Peg. The Chain length is the height difference between the Peg elevation of the New Peg and a computed Grade Elevation, based on User input information.
- The option to Print the results is available, after the on screen entries have been made and checked and the New Peg calculated. The results of both the Back Check calculation and the Chain Length calculation may also be printed.

Underground Peg Calculation using the "Double Button" Method

- This application is designed to solve the common underground Mine Survey problem of determining and checking the [Y, X, Z] (or [E, N, Z]) ordinates a new Peg.
- The [Y, X, Z] (or [E, N, Z]) ordinates of both the Set Up Peg and the Back Sight peg must be known, and exist in the current Co-ordinate File.
- Although not as secure as the previously described "Double Set Up" technique, this technique does provide a "semi-check" on the distance between the two Pegs, and their relative elevations. Until the Peg's position is verified by means of a closed traverse at some future date, its absolute position can not be assured.
- The required method of Survey is a Set up at the Set Up (or Fixing) Peg.
- At the Set Up Peg , the following quantities should be measured or observed :-
  - Back Check Vertical Angles and Distance to the Back Sight Peg in order to verify the relative positions of these two Pegs, with respect to their theoretical values,
  - Face Left and Face Right Vertical Angles to the Fore Sight Peg, using two different Button positions.
  - Up to two full Arcs (Face Left and Face Right) Horizontal Angles to the Fore Sight Peg and the Back Sight Peg.
  - The Slope Distances to the New Peg, measured from the Height of Collimation of the Instrument to both the Button positions at the New Peg.
  - The Height of Instrument (Collimation). If this value is measured from a Roof Peg, then the value must be entered as negative.
  - The Heights of the two Button positions at the New Peg. If these values are measured from a Roof Peg, then the values must be entered as positive.
  - If required, the Roof to Floor Height value may be measured.
- The application allows for data entry by :-
  - Manual (keyboard) entry of Observations,
  - From a pre-generated ASCII File (type ***.pg2), or
  - Automatic loading of the observations from a SURPAC Observation File.
- Calculation will only take place if none of the angular and/ or linear measurements exceeds the User specified limits. These limits are compared to the calculated differences for Vertical Angles, Horizontal Angles, Horizontal Distances and Vertical Height Differences. They also provide the option of forcing the User to carry out a Back Check before the new Fore Sight Peg can be calculated. The ability to modify these limits is limited to Users having the necessary Security Code. This Security Code prevents un-authorized Users from changing the limits, or resetting the Back Check option.
- Before the New Peg calculation takes place, a Back Check calculation may be carried out to verify the relative positions of the Back Sight Peg and the Set Up Peg against the theoretical values.
- After calculation takes place, the Co-ordinates, Peg Elevation and Floor Elevation of the Fore Sight Peg (New Peg) will be stored in the current Co-ordinate File.
- The results of the Peg calculation will also be stored in the Multi-Polar/Peg File of the current Co-ordinate File. This file will hold and display up to 4 determinations of a Peg, over and above the actual co-ordinates (current values) stored in the Co-ordinate File. Running the Edit a Multi-Polar/Peg File (found under the General main Menu) programme will generate a display of a summary of all determinations of existing Pegs in the Co-ordinate

File. The stored ASCII file (type ***.pg2) can then be called, for any the Point/Peg determinations, which will in turn generate a full display of all the observational and derived data for the New Peg calculation.

- After calculating the New Peg, an ASCII Peg file (type ***.pg2) of all observed and derived data my be created. This ASCII file has four main uses :-
  - The results of the New Point just calculated can easily be imported back into the application at any future time, preventing the time wasting and possible errors of re-entering these data manually. Even if the observational data originally came from an Observation file, the ASCII file contains extended information relative to the Peg calculation.
  - When doing a Right Button Click on a Point displayed in the Co-ordinate File, for example, it is possible to display the contents of any ASCII Peg file relative to a required Peg and to re-calculate the Peg.
  - If the User requires an output format different from the one used by SURPAC, the data from the ASCII Peg file can be easily imported into a User generated application.
  - It provides a backup for all observational data used to fix the Peg.
- The application also allows for the calculation of a Chain length at the New Peg. The Chain length is the height difference between the Peg elevation of the New Peg and a computed Grade Elevation, based on User input information.
- The option to Print the results is available, after the on screen entries have been made and checked and the New Peg calculated. The results of both the Back Check calculation and the Chain Length calculation may also be printed.

Underground Peg Calculation using the "Double Back Fix" Method

- The programme is designed to handle a number of Peg Fixing and/or Checking for the Mine Surveyor.
- The main difference between this programme and the previous Double Set-Up and Double Button Methods, is that the Peg to be fixed, or checked, is the Set-Up Peg itself.
- This programme can be used, for example, for the following :-
  - Determining the [Y, X, Z] values for any new Peg, from which two other fixed Pegs can be seen. This method has the advantage that the Surveyor can determine where he wants to put a new Peg, place the Peg, set up under it and then fix the Peg (using this method), without having to set up at any other Peg.
  - Checking the [Y, X, Z] values for any existing Peg, from which two other fixed Pegs can be seen. When checking an existing Peg, this method provides a convenient and full technique for verifying the relative positions of the Set-Up Peg and the two sighted, Back Pegs.
  - Calculating the [Y, X, Z] values for a Peg on a new Inter connected by a Raise to a lower Inter. This method fixes the new Peg from twin Pegs established over the Raise and whose plumb lines can be sighted from both Inters (the Twin Raise solution). The plumb line Pegs themselves are fixed from existing Pegs on the lower Inter. The three Pegs on the upper Inter can either be in a straight line, or can form the apices of a triangle. When

using this option, the following procedure should be followed :-

- On the new Inter set two new Pegs such that their plumb lines can be lowered down through the Raise, to be visible from the lower Inter, containing the existing Pegs. These plumb line Pegs should be set as far apart as possible, to provide the best orientation accuracy. Place two buttons on each of these plumb lines to be visible fron the new Inter.
- Establish a new Peg to be used as the first Set-Up Peg on the new Inter. Set-up under this Peg and use the Double Back Fix method to obtain fixing data for this (new) Set-U Peg. If required, the two plumb lines and the Set-Up Peg may be placed in a straight line, but this is not essential. A well conditioned triangle (approximately equilateral) should, mathematically, provide the best result.
- On the lower Inter, change the buttons on the two plumb lines so that they are visible, set-up at the nearest fixed Peg to the two plumb lines, and then observe/measure data for fixing both the plumb lines (and hence their two respective Pegs) by means of the Double Button method.
- When calculating, first use the Double Button programme to calculate the two plumb line Pegs from the set-up at the fixed Peg on the lower Inter. Then use this Double Bac Fix application to calculate the new Set-Up Peg on the upper Inter, and also to determine the orientations from this Peg to the two plumb line Pegs.

- The programme provides for full double Arc measurements for both Horizontal and Vertical angles, and for double Buttons and double measurements for each sighted Peg. Users can either use these full observation and measurement options, or restrict the survey to a single Horizontal and Vertical Arc, the use of single Buttons and single Distance measurements to the sighted Pegs.
- The principle of the programme is relatively simple. It is based on the determination of Directions (or Bearings) plus a base distance comparison, using the “two sides and the included angle” technique for any three Pegs representing the apices of a triangle. The programme is also able to handle the situation where the three Pegs are in a straight line.
- The Height of the calculated Set-Up Peg is determined by Trigonometrical Heighting from observations taken to buttons (or bobs) suspended from the two sighted Pegs. For best results, the double buttons should be observed at each sighted Peg.

- The required method of Survey is a Set-up at the Peg to be fixed, or checked.
- At this Set-Up Peg, the following quantities should be measured and/or observed :-
  - Face Left and Face Right Vertical Angles to the Top and Bottom Buttons at both Back Pegs.
  - Up to two full Arcs (Face Left and Face Right) Horizontal Angles to both Back Pegs.
  - The Slope Distances to both Back Pegs, measured from the Height of Collimation of th Instrument to the Top and Bottom Buttons at each Back Peg.
  - The Height of Instrument (Collimation). If this value is measured from a Roof Peg, then the value must be entered as negative.
  - The Height of the two Buttons at both the Back Pegs. If these values are measured fro a Roof Peg, then the values must be entered as positive.
- The application allows for data entry by :-
  - Manual (keyboard) entry of Observations,

- From a pre-generated ASCII File (type ***.pg3), or
- Automatic loading of the observations from a SURPAC Observation File.

- Calculation will only take place if none of the angular and/ or linear measurements exceeds the User specified limits. These limits are compared to the calculated differences for Vertical Angles, Horizontal Angles, Horizontal Distances and Vertical Height Differences. The ability to modify these limits is limited to Users having the necessary Security Code. This Security Code prevents un-authorized Users from changing the limits.
- After calculation takes place, the Co-ordinates and Peg Elevation of the Set-Up Peg (New Peg) will be stored in the current Co-ordinate File.
- The results of the Peg calculation will also be stored in the Multi-Polar/Peg File of the current Co-ordinate File. This file will hold and display up to 4 determinations of a Peg, over and above the actual co-ordinates (current values) stored in the Co-ordinate File. Running the Edit a Multi-Polar/Peg File (found under the General main Menu) programme will generate a display of a summary of all determinations of existing Pegs in the Co-ordinate File. The stored ASCII file (type ***.pg3) can then be called, for any the Point/Peg determinations, which will in turn generate a full display of all the observational and derived data for the New Peg calculation.
- After calculating the Set-Up Peg, an ASCII file (type ***.pg3) of all observed and derived data my be created. This ASCII file has four main uses :-

  - The results of the New Point just calculated can easily be imported back into the application at any future time, preventing the time wasting and possible errors of re-entering these data manually. Even if the observational data originally came from an Observation file, the ASCII Peg file contains extended information relative to the Peg calculation.
  - When doing a Right Button Click on a Point displayed in the Co-ordinate File, for example, it is possible to display the contents of any ASCII Peg file relative to a required Peg and to re-calculate the Peg.
  - If the User requires an output format different from the one used by SURPAC, the data from the ASCII Peg file can be easily imported into a User generated application.
  - It provides a backup for all observational data used to fix the Peg.

  The option to Print the results is available, after the on screen entries have been made and checked and the New Peg calculated.

Recalling, Viewing and Re-Using Peg ASCII Files for a Peg Re-Calculation

- This function allows Users to recall any SURPAC ASCII Peg File for the purpose of :-
  - Viewing its contents,
  - Pasting the contents to the Windows Clipboard (for use in other applications),
  - Calling the appropriate SURPAC Peg application and loading the necessary calculation information from the ASCII File, ready for re-calculation.

- This function may be called in the following ways :-
  - By selecting the appropriate menu item from the "Mining" Main menu heading. In this case, all the available ASCII Peg Files will be displayed for selection. All ASCII Peg File types will be displayed, i.e. ***.PG1 for double Set Up Fixes, ***.PG2 for Double Button Fixes and ***.PG3 for Double Back Fixes.
  - By doing a Right Button Click on a Point displayed in the Co-ordinate File (when running the Co-ordinate File Editing application). If the clicked Point has any associated ASCII Peg Files, the displayed pop-up menu will provide an item that, when clicked, will display all Peg ASCII files associated with the clicked Point, and allow selection of these Files. All ASCII Peg File types will be displayed, i.e. ***.PG1 for double Set Up Fixes, ***.PG2 for Double Button Fixes and ***.PG3 for Double Back Fixes.
  - By running the "Editing a Multi-Polar/Peg File" application, which is found under the "General" Main menu heading. When viewing the contents of a Multi-Polar/Peg File, this application allows for the display of any associated ASCII Peg Files for a clicked Point, and allow selection of these Files. All ASCII Peg File types will be displayed, i.e. ***.PG1 for double Set Up Fixes, ***.PG2 for Double Button Fixes and ***.PG3 for Double Back Fixes.

Offset Surveys (Bord and Pillar) Technique

- This application provides for the calculation and plotting of Offset data, for a conventional offset survey.
- The basis of the calculation is :-
  - a Control Line defined by an existing Back Sight Peg and an existing Fore Sight Peg.
  - OffSet Pegs are calculated from these two Control Line Pegs.
  - These OffSet Pegs represent the terminal positions of the various OffSet Lines.
  - Offset information between these OffSet Pegs, and the Control Line if required, is then entered.
- Input of the above data is either done manually, or from an OffSet ASCII file.
- The application also calculates the Safety Factor of the pillars by means of the Squat Pillar formula .
- Quantities such as the mean bord width and average height of workings are computed from data input.
- The output consists of a plot of the Control and Offset beacons used, as well as the pillar sides running parallel to the offset lines.
- The tonnage, extracted area and the percentage of total area are also computed.
- Output of the OffSet information may be to :-
  - the Current Printer/Plotter which may be of A3 or A4 size,
  - an HPGL file or,
  - a DXF file, in 2D or 3D format.
  - a SURPAC OffSet ASCII file. These files must be in the SURPAC "OSF" format.

OffSets from an Observation File

- This application first computes co-ordinate values for Points that have been surveyed using a horizontal Offset Rod. It is designed to compute values for Points at which a reflecting prism cannot be directly positioned, due either to the location of the Points, or to the nature of the Points (e.g. the corners of pillars, centres of trees etc.)
- Observations and distances are taken to a Prism on the Offset Rod. The distance from this prism to the end of the Offset Rod that is held at the actual Point (the Offset distance) must be kept fixed for reductions at a given Set Up. The programme will compensate for the Offset distance, using one of two field methods, namely :-
  - First, the Offset Rod used may be aligned so that it is always held perpendicular to the observer's line of sight,
  - or it may be held so as always to be perpendicular to a defined Base Line.
- The observations made to fix the Set-Up Station and to determine the co-ordinates of the Offset Points must be held in a General Observation File.
- The application will use any two User identified, Fixed Points as the terminals of a Base Line. Theses terminals will be used to co-ordinate the Set-Up Station, as well as to define the Base Line Direction.
- The Set Up "Station" may be at any, arbitrary position. The application will determine the Set Up Station co-ordinates from appropriate observational data in the defined Observation File.
- Both the Base Line terminals must be observed and measured from the Set-Up Station. If one of the Base Line terminals has a zero, or non-measured distance, then the programme will assume that the Set Up Station is at this terminal.
- Any number of different Set-Ups may be accommodated in a single Observation File.
- For orientation at the Set Up Station :-
  - the First Base Line terminal may be sighted a second time, or
  - exterior Orientations may be taken.

Pillar Safety Factor Calculations

- This application is designed to calculate the Safety Factor for a pillar, employing a number of options, namely :-
  - Pillars may be defined as :-
    - Square , or
    - irregular .
  - The Pillar Type may be defined as being :-
    - Squat Pillar, or
    - Conventional .
  - If the pillars are defined as being Irregular then, for any mining depths, the user has a choice between :-

- the Wagner formula, or
- the Salamon formula.

- Output is to the Printer, an ASCII file or the Windows Clipboard.

Gyro Theodolite Calibrations

- This application computes the Azimuth of the Indicated True North of a Gyro-Theodolite .
- The following is a brief explanation of conventions used :-
  - A Great Circle is any circumference of the reference Ellipsoid which contains the centre of the Ellipsoid. The Equator and all lines of Longitude are Great Circles.
  - The Azimuth at any given Point on the Ellipsoid represents the Direction of the portion of the Great Circle passing through the given Point and the Northern Pole of the axis of the rotation of the earth.
  - True North is the Direction of the portion of the Great Circle passing through the Origin (Central Meridian) of the Gauss Conform System in which the given Point is determined, and the Northern Pole of the axis of rotation of the earth.
  - All Points in a given Gauss Conform System ("Lo" or "WG" System) will have the same True North. By convention in Southern Africa, True North is given a Direction, or Bearing, of 180 degrees.
  - Meridian Converge is the angular difference between True North and the Azimuth (plus 180 degrees) at any given Point. To obtain the True North at a given Point when the Azimuth is known, the Meridian Convergence is given the same Sign as the Sign of the Point's Y Co-ordinate.
- The application provides for calibration of a Gyro-Theodolite by using either the Transit Method, or the Schuler Means method.
  - Using the Transit Method :-
    - First, the names of the Set Up Beacon and Reference Beacon are entered, as well as Observed Bearing to the Reference Beacon .
    - The application will then compute and display the " Lo", or "WG" Bearing to the Reference, plus the Meridian Convergence .
    - Readings are separated into Left Readings and Right Readings.
    - The Time and Amplitude are entered for each Reading. From these, the Swing, Time Difference and the Mean Amplitude are computed.
    - Editing functions consist of :-
      - Deleting a Line.
      - Inserting a Line.
      - Adding a Line
      - Modifying a Line
    - In order to compute the Constant of Proportionality and the Azimuth of the Gyro Indicated North, the application requires that both Left Reading and Right Reading d sets are entered.

- After completing the entry of both the Left Reading and Right Reading information, the application will calculate the :-
  - Mean Time Difference and Standard Deviation,
  - Mean Amplitude and Standard Deviation,
  - Mean Gyro-Theodolite Reading ,
  - the Constant of Proportionality,
  - the Mean Gyro Angle to Reference,
  - the Bearing of the Gyro Indicated North, and
  - the Azimuth of the Gyro Indicated North .
- Making further entries will cause the above results to be modified as the new data are taken into
- Output may be to the Current Printer an ASCII file or the Windows Clipboard .

Using the Schuler Means (or Turning Point) Method :-

- First, the names of the Set Up Beacon and Reference Beacon are entered, as well as th Observed Bearing to the Reference Beacon.
- The application will then compute and display the "Lo", or "WG" Bearing to the Reference, plus the Meridian Convergence.
- The "West Readings" and "East Readings" for each observation line are entered. As these entries are made, the application will calculate the Schuler Means.
- Once you have entered at least two pairs of readings, the application will also calculate the :-
  - Mean Gyro-Theodolite Reading,
  - the Standard Deviation,
  - the Mean Gyro Angle to Reference,
  - the Bearing of the Gyro Indicated North, and
  - the Azimuth of the Gyro Indicated North .
- Making further entries will cause the above results to be modified as the new data are taken into consideration.
- Editing functions consist of :-
  - Deleting any Pair of readings,
  - Deleting a Schuler Mean,
  - Inserting a Pair of readings,
  - Editing an entered Reading.
- Output may be to the Current Printer an ASCII file or the Windows Clipboard.

Gyro Theodolite Bearing Reductions

- This application computes the Azimuth of the Indicated True North of a Gyro-Theodolite .
- For an explanation of conventions used refer to the previous topic
- The application allows for determination of the Gauss Conform, "Lo" or "WG", Bearing of a

defined Line from a Gyro-Theodolite by using either the Transit Method or the Schuler Means (or Turning Point) Method .

- Using the Transit Method :-
  - First, the names of the Set Up Beacon and Reference Beacon are entered, as well as Observed Bearing to the Reference Beacon .
  - The Constant of Proportionality and Theodolite Setting (N1') must also be entered.
  - The application will then compute and display the " Lo", or "WG" Bearing to the Reference, plus the Meridian Convergence .
  - Readings are separated into Left Readings and Right Readings.
  - The Time and Amplitude are entered for each Reading. From these, the Swing , Time Difference and the Mean Amplitude are computed.
  - Editing functions consist of :-
    - Deleting a Line.
    - Inserting a Line.
    - Adding a Line
    - Modifying a Line
  - In order to compute the Constant of Proportionality and the Azimuth of the Gyro Indicated North, the application requires that both Left Reading and Right Reading da sets are entered.
  - After completing the entry of both the Left Reading and Right Reading information, tl application will calculate the :-
    - Mean Time Difference and Standard Deviation,
    - Mean Amplitude and Standard Deviation,
    - Mean Gyro-Theodolite Reading ,
    - the Constant of Proportionality ,
    - the Mean Gyro Angle to Reference,
    - the Azimuth to the Reference, and
    - the "Lo" or "WG" Bearing to the Reference.
  - Making further entries will cause the above results to be modified as the new data ar taken into
  - Output may be to the Current Printer an ASCII file or the Windows Clipboard .
- Using the Schuler Means (or Turning Point) Method :-
  - First, the names of the Set Up Beacon and Reference Beacon are entered and the Meridian Convergence calculated.
  - Then the Observed Bearing to the Reference Beacon and the Azimuth of the Gyro Indicated North are entered. This last value must be obtained from a Calibration calculation using the defined Gyro-Theodolite.
  - The " West Readings" and " East Readings" for each observation line are entered. A these entries are made, the application will calculate the Schuler Means.
  - Once you have entered at least two pairs of readings, the application will also calcula the :-

- Mean Gyro-Theodolite Reading ,
- the Standard Deviation ,
- the Mean Gyro Angle to Reference
- the Bearing of the Gyro Indicated North,
- the Azimuth to the Reference, and
- the "Lo" or "WG" Bearing to the Reference.

- Making further entries will cause the above results to be modified as the new data are taken into consideration.
- Editing functions consist of :-
  - Deleting any Pair of readings,
  - Deleting a Schuler Mean,
  - Inserting a Pair of readings,
  - Editing an entered Reading.
- Output may be to the Current Printer an ASCII file or the Windows Clipboard .