RefSet Mobile

Automatic Reference Line and Setout Program For Leica 1200 TPS

User Manual

Version 1.2

www.refset.com.au

Contents

1. RefSet Program Installation and Setup

GeoCom License Key Entry on TPS

- From the TPS start screen
- Select **Tools** then **Licence Keys**
- Select **Manual Entry of Key** for *Method*
- Arrow Down to *Key* and then enter the licence key
- Press **F1 (CONT)**

TPS Bluetooth Setup

- From the TPS start screen
- Select **Config** then **Interfaces** then **GeoCOM Mode**
- Press **F3 (EDIT)** to edit the interface setup
- Select **Yes** for the *Use Interface* setting
- Arrow down to *Port* and select **Port 3(BT)**
- Press **F5 (DEVCE)**
- Arrow down to **RS232 GeoCOM**
- Press **F3 (EDIT)** to edit the communication settings
- Press **F5 (DEFLT)** to select the default settings which should be:
  - *Baud Rate* **19200**
  - *Parity* **None**
  - *Data Bits* **8**
  - *Stop Bit* **1**
- Press **F1 (STORE)** to save the settings
- Press **F1 (CONT)** then **F1 (CONT)** then **F1 (CONT)** to finish setup

Windows Mobile Bluetooth Setup

- Make sure the TPS is turned on
- On the PDA tap on **Start** then **Settings**
- Select the *Connections* tab
- Tap on **Bluetooth**
- Select *Turn on Bluetooth*
- Can unselect *Make this device discoverable* or leave as is
- Select the *Devices* tab
- Tap on **New Partnership**
- The PDA will then scan for Bluetooth devices
- When the TPS has been discovered it will appear in the list as <[Instrument Type] [Serial No]> (eg: <TCRA1201+R1000 #260099>)
- Select the TPS in the list and then tap on **Next**

- Enter the *Passkey* as **0000** then tap on **Next**
- Select *Serial Port* then tap on **Finish**
- Tap on **ok** (top right corner of screen)
- Tap on **Bluetooth** again
- Select the *COM Ports* tab
- Tap on **New Outgoing Port**
- Select the TPS in the list then tap on **Next**
- Select a *Port* (eg:COM7) and then tap on **Finish**
- Tap on **ok** then close the settings screen

RefSet Mobile Installation on PDA

- Extract the *Install_RefSet_Mobile.exe* file from the zip file into any folder on the PC
- Connect the PDA to the PC
- Make sure *ActivSync* is running on the PC and the PDA is connected
- In *Windows Explorer* on the PC, double click on the *Install_RefSet_Mobile.exe* file
- RefSet Mobile will then start to install to the PDA
- Check the PDA screen and follow any additional steps required
- If the installation was successful a message will appear on the PDA
- To Start RefSet Mobile - on the PDA tap **Start** then **Programs**
- Tap the **RefSet Mobile** icon to run the program
- If an error occurs stating *This application requires a newer version of the Microsoft .NET Compact Framework* then:
  - Select **Quit**
  - Download the .NET Compact Framework 3.5 Redistributable to the PC
  - Connect the PDA to the PC
  - Run the downloaded file (**NETCFSetupv35.msi)** on the PC to install to the PDA
  - Restart the PDA
  - Tap **Start** then **Programs**
  - Tap the **RefSet Mobile** icon to run the program

RefSet Mobile Key File Installation on PDA

- Connect the PDA to the PC
- Make sure *ActivSync* is running on the PC
- Right click on the *ActivSync* icon in the taskbar and select *Explore*
- Copy the **RefSet_{serial number}.key** file to the *\Program Files\RefSet_Mobile* folder on the PDA
- Repeat the procedure for other key files for each TPS if multiple instruments will be used with this PDA

2. RefSet Program Configuration

- Start RefSet Mobile on the PDA
- Tap or select **Program Configuration**

- *COM Port* — Set to the same as that set in the PDA in the **Windows Mobile Bluetooth Setup** (eg: COM7)

- Comms Settings — *Baud Rate, Parity, Data Bits, Stop Bit*

  Set to the same as that set in the instrument in the **TPS Communications Setup** (eg: 19200, None, 8, 1)

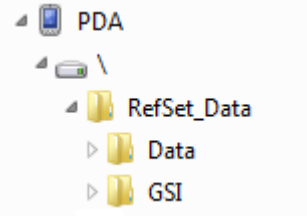
- *Data File Type* — Set to the type of data point file to use in RefSet:

  STR Surpac string file
  GSI Leica gsi data file

- *Data Folder* — Set to the path name of the folder of data point files on the PDA

  The *Data Folder* must have two subfolders:

  Data Surpac string files folder
  GSI Leica gsi data files folder



  (This is the same folder structure as on the Leica CF data cards used in the TPS)

- *Log Setout Data* — Set to **Y** to save the automatic setout points to a log file. The points setout in all automatic modes will be saved to this file which will be saved in a folder named **Log** under the **Data Folder**

- *Log File Type* — Set to the type of log file to save the automatic setout point data to:

  STR Surpac string file
  CSV Comma separated text file

- *Use Input Panel* — Set to **Y** to enable the screen keyboard when entering data into RefSet, Set to **N** if the PDA has a hardware keyboard that can be used to enter data

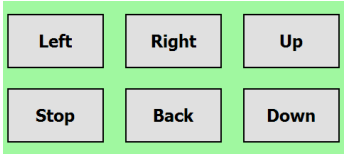
3. RefSet Program Operation

Program Startup

- Turn on the TPS
- Setup the TPS using the normal station setup procedures (eg: Resection, etc)
- When station setup is complete TPS can be left in any screen display
- Turn on the PDA
- Start RefSet Mobile on the PDA
- Tap or select **Connect to TPS**
- When the connection is made the menu will change to **Disconnect from TPS** and the TPS will beep once and display a connected icon next to the Bluetooth icon
- If no connection is made *Unable to Connect to TPS* will be displayed, if this occurs:
  - Check TPS is still on, if not restart TPS and try to connect again
  - If TPS is still on then select **Quit** in RefSet Mobile and then turn Bluetooth off on the PDA and then back on again, then restart RefSet Mobile and try to connect again
- If during operation the TPS switches off (eg: flat battery) *No Connection to TPS* will be displayed on the PDA, if this occurs:
  - Replace the battery on the TPS and turn the TPS on
  - Wait until the TPS has finished its startup sequence
  - Tap **Retry** on the *Check Connection* screen on the PDA
  - The program should then reconnect to the TPS
  - Continue with the program operation
- Note: During operation the TPS is controlled by RefSet mobile – any settings changed on the TPS by the operator (eg: changing the EDM Mode, changing the Reflector Ht) will be overridden by the settings in RefSet Mobile – to change these settings make the changes in RefSet Mobile
- At the end of the survey tap **Quit** to disconnect from the TPS and exit RefSet Mobile

Remote Control Operation

- During both the Refline and Setout programs the TPS may be turned remotely to point it at a specific position
- In the Refline or Setout program tap **Shift** then **Remote** to enter the remote mode
- Tap the direction buttons to move the TPS in that direction, each tap of the button will increase the speed of the TPS movement, tap the opposite direction button to decrease the speed of the TPS



- Tap **Stop** to stop the TPS at the required position
- Tap **Back** to return to the Refline or Setout program

External Button Operations

- To enable the use of the program with a minimal use of the touchscreen, various external buttons on the PDA can be used to control some of the program functions

RefSet Mobile Start Button

- To enable one of the external buttons to start the RefSet Mobile program
- Firstly in Windows Mobile tap the **Start** button then tap **Settings**
- Tap the **Buttons** icon then select the external button to reassign
- Select *RefSet Mobile* in the **Assign a program** list then tap on **ok**
- RefSet Mobile can now be started by pressing the assigned external button

Other Program Functions

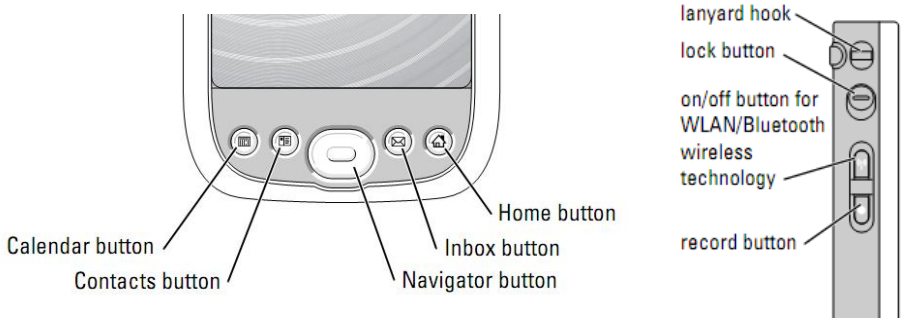
- Other program functions are assigned to various external buttons as shown in the table below (eg: When in the *Setout Selection* screen with the **Point** ID list selected, pressing **Button 1** will decrease the point number by 10, **Button 3** will increase it by 5)

Operation	**Button 1**	**Button 2**	**Left Button**	**Right Button**	**Button 3**	**Button 4**
Any Point Number Selection	-10	-5	-1	+1	+5	+10
Pt Increment	-2	-1	Change Sign -/+		+1	+2
Auto Interval ARef – Auto Offset AGrade – Auto Height ARing – Ring Spacing	-1.0	-0.5	-0.1	+0.1	+0.5	+1.0

External Buttons - Assigned Functions

- The button layout for a Dell X50 or X51 can be seen below
- A good button to use to start RefSet Mobile on the Dell X50 or X51 is the *Record* button (Button 5) which is located on the left side of the PDA
- The other buttons on the Dell X50 or X51 are numbered as follows

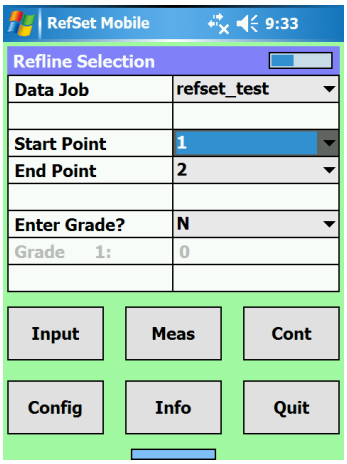
  Calender button = Button 1, Contacts button = Button 2
  Inbox button = Button 3, Home button = Button 4



Dell X50 & X51 External Buttons

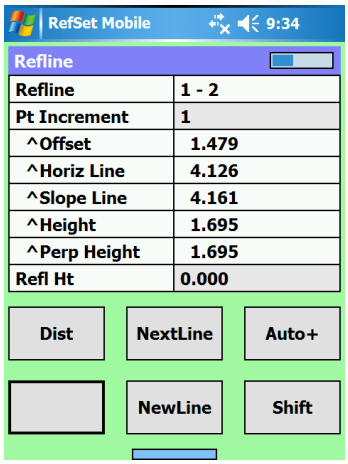
4. Refline

- With RefSet Mobile connected to the TPS
- Tap or select **Refline** on the start menu screen
- The *Refline Selection* screen will then be shown
- Select the *Data Job* to use from the list
- Select the *Start Point* and *End Point* of the refline from the lists OR
  - Select either the *Start Point* or the *End Point* list box
  - To enter the point coordinates from the keyboard - tap **Input** and then enter the new *Point ID* and coordinates for the selected point, then tap **Cont**, the new point will then be stored in the data file
  - To measure a point - tap **Meas**, then at the *Measure Point* screen, enter the new *Point ID* and then point the TPS to the point to measure and make sure a distance has been measured, then tap **Cont**, the new point will then be stored in the data file
- To manually enter a grade for the refline, select **Y** for *Enter Grade?*, then enter the grade to use (eg: 50 for up at 1 in 50 or -50 for down at 1 in 50). The refline will then go from the start point elevation towards the end point at the entered grade
- To display the refline details and the start and end point coordinates, tap on **Info**
- To start the refline measurement, tap **Cont**



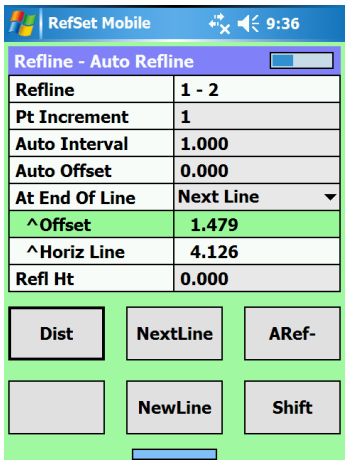
Refline Selection Screen

(Showing *Start Point* selected for **Input** or **Meas**)

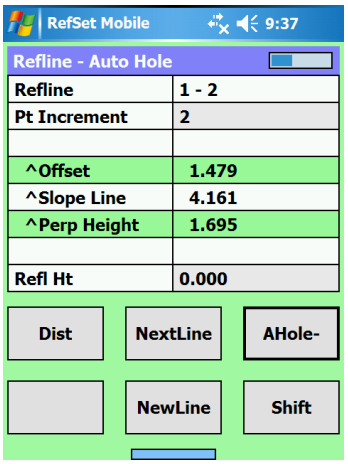


Main *Refline* Screen

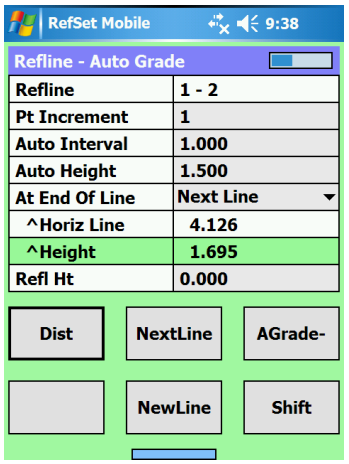
- Tap **NewLine** to return to the *Refline Selection* screen to enter new refline points
- Tap **NextLine** to go to the next refline by incrementing the refline start and end points by the *Pt Increment* value (eg: if *Pt Increment* is 1 then refline will change from 1-2 to 2-3, if *Pt Increment* is 2 then refline will change from 1-2 to 3-4, if *Pt Increment* is -1 then refline will change from 2-3 to 1-2)
- Tap **Shift** then **Quit** to exit refline and return to the main menu screen



Auto Refline Screen



Auto Hole Screen



Auto Grade Screen

Auto Grade Line Setout

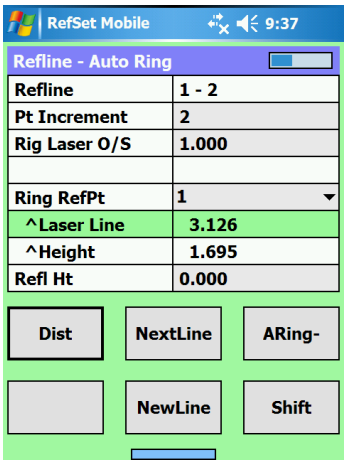
- Set up the refline start and end points using the design string points or use the **Meas** function to measure the points and then manually enter a grade in the *Refline Selection* screen, to extend an existing grade line if no design is to be used (eg: ore drives)
- Tap **Auto+** then tap **AGrade+** to turn on auto grade and go to the auto grade screen
- Check the *Auto Height* setting and set to the refline height offset that is to be set out (eg: 1.500 for a grade line 1.5m above the design)
- Point the TPS at the wall at the approximate position to start the setout and then tap on **Dist** to start measuring and start the auto grade setout
- The TPS will then move and setout the *^Height* value that has been set in the *Auto Height* setting (eg: 1.500), to within the *AGrade Height Accuracy* set in the refline configuration (eg: 0.025m) , near the start position
- When the refline has been setout the TPS will beep and flash the guide light to indicate that the auto setout point has been reached
- The TPS will then move along the refline at the set *Auto Interval* value (eg: 1.0m intervals), and setout each interval
- At the end point of the refline the auto setout function will respond according to the setting in *End Of Line* on the auto grade screen
  - If set to *Continue* the auto setout will continue past the ref line end point
  - If set to *Stop* the auto setout will stop near the ref line end point
  - If set to *Next Line* the auto setout will stop near the ref line end point, then will change to the next refline by incrementing the refline start and end points using the *Pt Increment* value (as when the **NextLine** button is tapped), auto grade setout will then continue using the new refline and setout the *Auto Height* value
- To stop auto grade setout, tap the **Stop** button
- To turn auto grade setout off, tap the **AGrade-** button

Auto Refline Setout

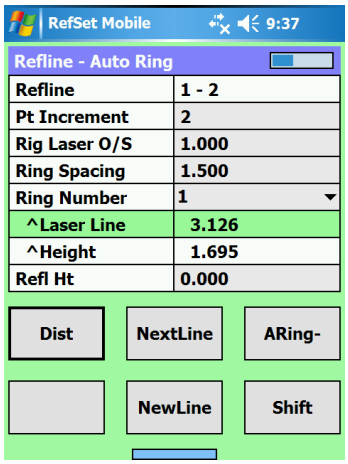
- Tap **Auto+** then tap **ARef+** to turn on auto refline setout and go to the auto refline screen
- Check the *Auto Offset* setting and set to the refline offset that is to be set out (eg: 0.000 for the centreline)
- Point the TPS at the wall or backs at the approximate position to start the setout and then tap on **Dist** to start measuring and start the auto refline setout
- The TPS will then move and setout the *^Offset* value that has been set in the *Auto Offset* setting (eg: 0.000), to within the *Auto Accuracy* set in the refline configuration (eg: 0.025m), near the start position
- When the refline has been setout the TPS will beep and flash the guide light to indicate that the auto setout point has been reached
- The TPS will then move along the refline at the set *Auto Interval* value (eg: 1.0m intervals), and setout each interval
- At the end point of the refline the auto setout function will respond according to the setting in *End Of Line* on the auto refline screen
  - If set to *Continue* the auto setout will continue past the refline end point
  - If set to *Stop* the auto setout will stop near the refline end point
  - If set to *Next Line* the auto setout will stop near the refline end point, then will change to the next refline by incrementing the refline start and end points using the *Pt Increment* value (as when the **NextLine** button is tapped), auto refline setout will then continue using the new refline and setout the *Auto Offset* value
- To stop auto refline setout, tap the **Stop** button
- To turn auto refline setout off, tap the **ARef-** button

Auto Hole Setout

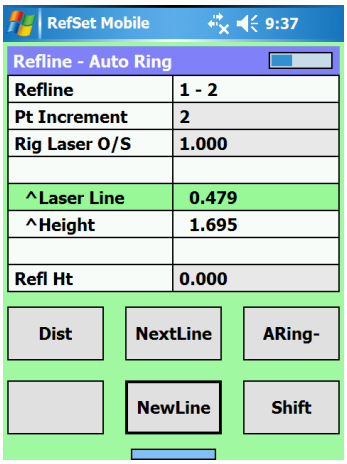
- Set up the refline start and end points to be the collar and toe points of the drill hole
- Tap **Auto+** then tap **AHole+** to turn on auto hole setout and go to the auto hole screen
- Point the TPS at the wall or backs at the approximate position of the hole
- Tap on **Dist** to start measuring and to start the auto hole setout
- The TPS will then move and setout the hole collar position by getting the *^Offset* and *^Perp Ht* values on the auto hole setout screen to zero, within the *Auto Accuracy* set in the refline configuration (eg: 0.025m)
- When the hole has been setout the TPS will beep and flash the guide light to indicate that the auto setout point has been reached
- The program will then change to the next refline by incrementing the refline start and end points using the *Pt Increment* value (as when the **NextLine** button is tapped), and will then setout the collar position of that hole
  - Note: The *Pt Increment* value is set to 2 when the **AHole** function is started
- To stop auto hole setout, tap the **Stop** button
- To turn auto hole setout off, tap the **AHole-** button



ARing by Ref Points Screen



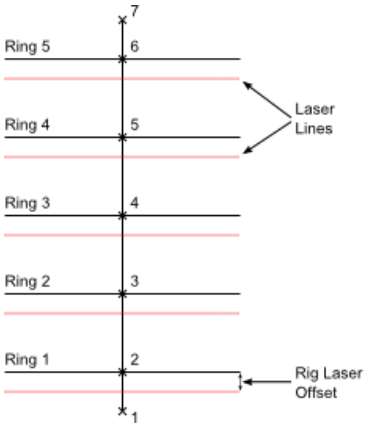
ARing by Ring Spacing Screen



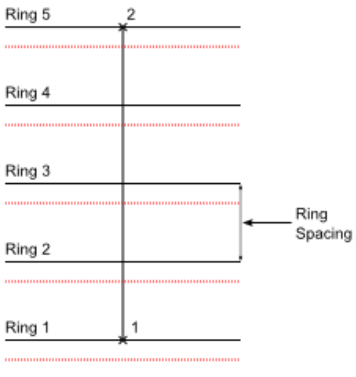
ARing by Ref Lines Screen

Auto Ring Setout

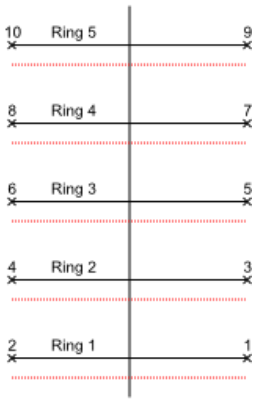
- The auto ring setout method can be set in the *Refline Configuration* and the setup of the data points for each method can be seen in the examples below.
- The *Ref Points* method needs a point for the start and end of the refline and reference points somewhere on each ring, these points do not have to be on the centreline
- The *Ring Spacing* method only requires a point for the start and end points of the refline, however the start point needs to be on the first ring and the ring spacing needs to be consistent for the entire ring markup. The point number of the start point should also match the ring number of the first ring if possible.
- The *Ref Lines* method needs two points for each ring line and needs to follow a consistent numbering system (eg: all the start points to the right of the refline and all the end points to the left of the refline)



ARing by Ref Points



ARing by Ring Spacing



ARing by Ref Lines

Auto Ring Setout by Ref Points

- Set up the refline with the start and end points (in the example above the start point would be 1 and the end point would be 7)
- Tap **Auto+** then tap **ARing+** to turn on auto ring setout and go to the auto ring screen

- Check the *Rig Laser Offset* setting on the auto ring setout screen, +ve values move the laser lines forward along the refline, -ve values move the laser lines back along the refline (in the example above it would be set to a negative value)
- On the auto ring setout screen select the *Ring RefPt* of the ring to setout (in the example above set it to point 2 to start setting out the rings at ring 1)
- Point the TPS at the wall at the approximate position of the ring
- Tap on **Dist** to start measuring and to start the auto ring setout
- The TPS will then move and setout the ring laser line position by getting the ^*Laser Line* value on the auto ring setout screen to zero, to within the *Auto Accuracy* set in the refline configuration (eg: 0.025m), it will also setout the same ^*Height* value as the start point, to within the *ARing Height Accuracy* set in the refline configuration (eg: 0.2m)
- When the ring laser line has been setout the TPS will beep and flash the guide light to indicate that the auto setout point has been reached
- The program will then increment the *Ring RefPt* value by the *Pt Increment* value and then setout the laser line of the next ring (in the example above if the *Pt Increment* is set to 1 the *Ring RefPt* will increment to 3 and setout the laser line of ring 2), the *Pt Increment* can be set to –ve values to decrement the *Ring RefPt* values
    - Note: The *Pt Increment* value is automatically set to 1 when the **ARing** by ref points function is started
- To stop auto ring setout, tap the **Stop** button
- To turn auto ring setout off, tap the **ARing-** button

Auto Ring Setout by Ring Spacing

- Set up the refline with the start and end points (in the example above the start point would be 1 and the end point would be 2), the start point needs to be located on the first ring and if possible needs to have the same number as the first ring
- Tap **Auto+** then tap **ARing+** to turn on auto ring setout and go to the auto ring screen
- Check the *Rig Laser Offset* setting on the auto ring setout screen, +ve values move the laser lines forward along the refline, -ve values move the laser lines back along the refline (in the example above it would be set to a negative value)
- Check the *Ring Spacing* setting on the auto ring setout screen and set to the distance between the rings
- On the auto ring setout screen select the *Ring Number* of the ring to setout. The numbering of the rings starts from the start point number and increases towards the end point for the number of rings between the start and end point (in the example above the ring numbers would start at 1 and go to 5)
- Point the TPS at the wall at the approximate position of the ring
- Tap on **Dist** to start measuring and to start the auto ring setout
- The TPS will then move and setout the ring laser line position by getting the ^*Laser Line* value on the auto ring setout screen to zero, to within the *Auto Accuracy* set in the refline configuration (eg: 0.025m), it will also setout the same ^*Height* value as the start point, to within the *ARing Height Accuracy* set in the refline configuration (eg: 0.2m)

- When the ring laser line has been setout the TPS will beep and flash the guide light to indicate that the auto setout point has been reached
- The program will then increment the *Ring Number* value by the *Pt Increment* value and then setout the laser line of the next ring (in the example above if the *Pt Increment* is set to 1 the *Ring Number* will increment to 2 and setout the laser line of ring 2), the *Pt Increment* can be set to –ve values to decrement the *Ring Number* values
    - Note: The *Pt Increment* value is automatically set to 1 when the **ARing** by ring spacing function is started
- To stop auto ring setout, tap the **Stop** button
- To turn auto ring setout off, tap the **ARing-** button

Auto Ring Setout by Ref Lines

- Set up the refline with the start and end points of the first ring (in the example above the start point would be 1 and the end point would be 2)
- Tap **Auto+** then tap **ARing+** to turn on auto ring setout and go to the auto ring screen
- Check the *Rig Laser Offset* setting on the auto ring setout screen, +ve values move the laser lines to the right of the ring, -ve values move the laser lines to the left of the ring (in the example above it would be set to a negative value)
- Point the TPS at the wall at the approximate position of the ring
- Tap on **Dist** to start measuring and to start the auto ring setout
- The TPS will then move and setout the ring laser line position by getting the *^Laser Line* value on the auto ring setout screen to zero, to within the *Auto Accuracy* set in the refline configuration (eg: 0.025m), it will also setout the same *^Height* value as the start point, to within the *ARing Height Accuracy* set in the refline configuration (eg: 0.2m)
- When the ring laser line has been setout the TPS will beep and flash the guide light to indicate that the auto setout point has been reached
- The program will then change to the next refline by incrementing the refline start and end points using the *Pt Increment* value (as when the **NextLine** button is tapped), and will then setout the *^Laser Line* position of the next ring
    - Note: The *Pt Increment* value is automatically set to 2 when the **ARing** by ref lines function is started
- To stop auto ring setout, tap the **Stop** button
- To turn auto ring setout off, tap the **ARing-** button

5. Refline Configuration Settings

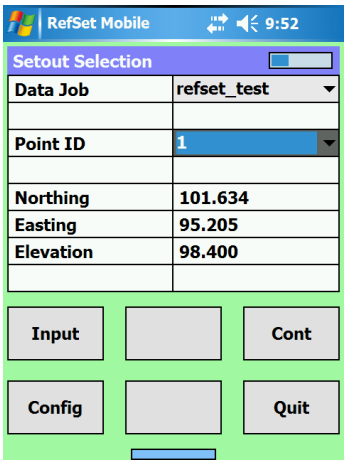
- *EDM Program* The EDM program to use in refline

  RL-TRK Reflectorless tracking
  RL-STD Reflectorless standard

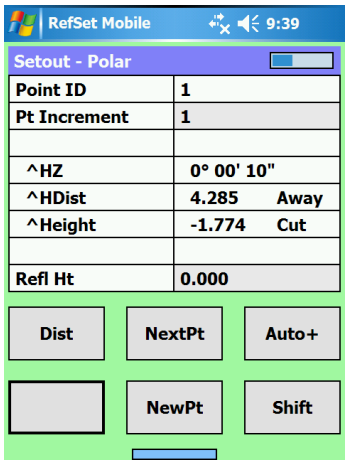
- *Start Measure?* Start distance measuring when refline starts
- *Auto Accuracy* Sets the accuracy at which points are setout in auto modes (eg: if set to 0.025 the TPS will get the points to within 25mm before moving to the next point)
- *ARing Height Acc* Sets the accuracy at which the ^*Height* is setout in the ARing mode (eg: if set to 0.200 the TPS will setout the laser lines to within 200mm of the ^*Height* of the first laser line setout)
- *AGrade Height Acc* Sets the accuracy at which the ^*Height* is setout in the AGrade mode
- *Auto Wait (secs)* Sets the time the TPS will stop on an auto setout point (eg: if set to 5 the TPS will wait 5 seconds after it sets out a point before it moves on to the next point)
- *Auto Interval* Sets the interval between setout points in the ARef and AGrade modes
- *ARef S/O Offset* The default *Auto Offset* value to setout in auto refline mode
- *AGrade S/O Height* The default *Auto Height* value to setout in auto grade mode
- *Auto End Of Line* Sets the behaviour of the auto setout mode when the end of the refline is reached in the ARef and AGrade modes

  Stop Stops auto setout at the end of the refline
  Continue Continues auto setout past the end of the refline
  Next Line Increments to the next refline at the end of the current refline

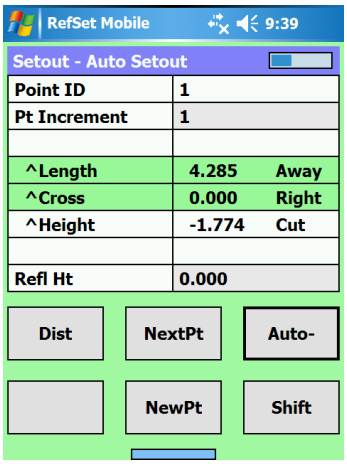
- *Auto Ring Method* The ring setout method in auto ring mode
- *Rig Laser O/S* The default *Rig Laser O/S* value in auto ring mode
- *Ring Spacing* The default *Ring Spacing* value in auto ring mode



Setout Selection Screen



Polar *Setout* Screen



Ortho *Setout* with **Auto** on

6. Setout

- With RefSet Mobile connected to the TPS
- Tap **Setout** on the main menu screen
- The *Setout Selection* screen will then be shown
- Select the *Data Job* to use from the list
- Select the *Point ID* from the list OR
  - To enter the point coordinates from the keyboard - tap **Input** and then enter the coordinates for the point, then tap **Cont**, the new point will then be stored in the data file
- To start the point setout, tap **Cont**
- The TPS will then turn towards the setout point if *Auto Posit* is set to **Y** in the setout config, and will start measuring if *Start Measure* is set to **Y** in the setout config
- Tap **NewPt** to return to the *Setout Selection* screen to enter a new setout point
- Tap **NextPt** to go to the next point by incrementing *Point ID* by the *Pt Increment* value
- Tap **Shift** then **Pos2D** (or **Pos3D** or **PosPP3D**) to position the TPS telescope back to the setout point, the positioning method is set by the *Posit Mode* setting in the setout configuration and has three modes
- Tap **Shift** then **Disp** to toggle the setout mode between *Polar* and *Ortho*
- Tap **Shift** then **Quit** to exit setout and return to the main menu screen

Auto Setout

- Tap **Auto+** to turn on auto setout mode
- If distance measuring is not active, tap on **Dist** to start measuring and start the auto setout
- The TPS will then setout the point (ie: get the *^HDist* to zero) to within the *Auto Accuracy* set in the setout configuration (eg: 0.025m)
- When the point has been setout the TPS will beep and flash the guide light to indicate that the auto setout point has been reached

- The program will then change to the next setout point by incrementing the *Point ID* using the *Pt Increment* value (as when the **NxtPt** button is tapped), and will then setout the position of that point
- To stop auto setout, tap the **Stop** button
- To turn auto setout off, tap the **Auto-** button

7. Setout Configuration Settings

- *Default Mode* — The default setout display mode

  Polar Display shows ^*Hz*, ^*HDist* and ^*Height*
  Ortho Display shows ^*Length*, ^*Cross* and ^*Height*

- *EDM Program* — The EDM program to use in setout

  RL-TRK Reflectorless tracking
  RL-STD Reflectorless standard

- *Start Measure?* — Start distance measuring when setout starts
- *Posit Mode* — Method of positioning the TPS telescope

  2D Setout point using horizontal coords only
  3D Setout point using horizontal and vertical coords
  PP3D Setout point using horizontal coords and vertical coord of previous point

- *Auto Posit* — Position the TPS telescope when setout starts
- *Auto Accuracy* — Sets the accuracy at which points are setout in auto modes (eg: if set to 0.025 the TPS will get the points to within 25mm before moving to the next point)
- *Auto Wait (secs)* — Sets the time the TPS will stop on an auto setout point (eg: if set to 5 the TPS will wait 5 seconds after it sets out a point before it moves on to the next point)