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ABT5650

Instruction Manual

RouteScan/AGI2



(Issue-02)

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2.0 Item list

1. RouteScan
2. RouteScan charger
3. Control unit
4. Control Unit charger
5. Storage bag
6. Optical cleaning kit
7. Instruction Manual
8. Target Pole (if purchased separately)

3.0 Specification

Weight	- -	On track (RouteScan) (Control Unit) In Box	13.6kg 0.5kg 18kg
Physical Dimensions	- -	On Track (RouteScan) In storage bag	1655 x 315 x 265mm Length:759 mm Height:378 mm Width:416 mm
Operating Temperature	-	-10°C to + 40°C (-4°F to 122°F)	
Environmental Rating	-		IP54
Battery Life	- -	RouteScan Control Unit	Up to 8 hours Up to 8 hours
Operating System	-	Windows 10	
PC Connectivity	-		USB Bluetooth Wireless LAN

4.0 Getting started

4.1 Overview

RouteScan has been developed to provide quick, accurate structure clearance measurements relative to the Permanent Way. With the RouteScan in position on the track the operator is able to control, from a position of safety, the measurement laser using the Control Unit via a Bluetooth connection.

The unit is a lightweight (13.6kg) and is provided with a protective box for easy transportation to and from site. All data is shown on a colour screen. The files can be opened and viewed in MS Excel.

The use of wireless technology in the RouteScan means that there are two separate batteries in the ABT5650:

- RouteScan
- Control Unit

RouteScan is approved for use in the UK in areas of 3rd rail and has been designed to be user-friendly with only limited training required. The following guidelines should be adhered to when using RouteScan in an area of live 3rd rail:

1. Never touch any part of RouteScan against the electrified 3rd rail
2. When carrying RouteScan on the track, take extra care to avoid tripping. Carry RouteScan on the opposite side of your body to the 3rd rail
3. When lifting RouteScan on or off the rail, ensure you have a firm footing and that you are standing between the running rails
4. When pointing the laser dot at a specific point, never place yourself or others in a position of danger. Wherever possible, control the position of the laser dot using the control unit from a safe position

Before Use:

Make sure there are no stains or marks on the optical window and that the optical window is NEVER touched directly.

For cleaning instructions see Section 8.1.



RouteScan produces a visible (635nm wavelength) laser beam which emerges from the Laser Housing.

It is a Class II laser product in accordance with:

1) IEC60825-1 (2014) “Radiation safety of laser products”
2) EN60825-1 (2014) “Radiation safety of laser products”
3) FDA 21 CFR 1040.10 and 1040.11 (US department of health and human service, Code of federal Regulations)

Laser Class II products:

Do not stare into the laser beam or direct it towards other people unnecessarily.
Eye protection is normally afforded by aversion responses including the blink reflex.

The warning label will be affixed to the rear of the RouteScan casing.

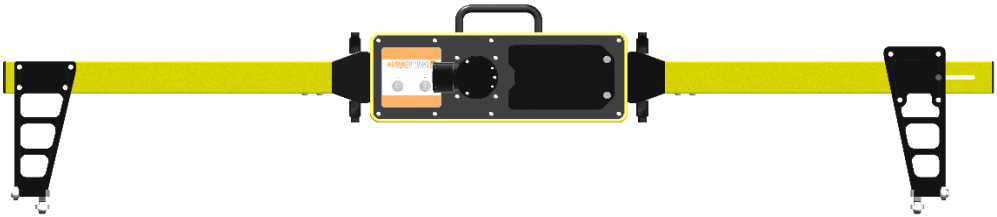
CAUTION
Looking into the laser beam may be hazardous to the eyes.
Laser may turn on without warning.

Do not allow water droplets to fall on the lens of the laser housing as this may compromise accuracy. If water does drop on the lens, carefully blot away using the lens tissue provided. Follow the instructions in Section 8.1 to clean the lens if necessary.

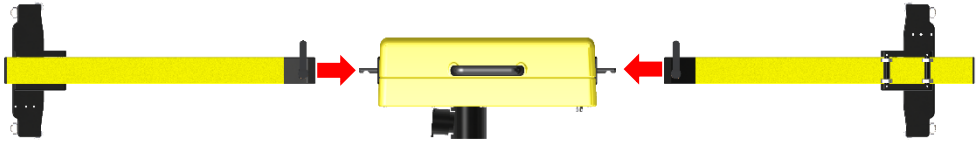
Please review Section 10.1 prior to using your ABT5650 for the first time.

4.2 Assembly

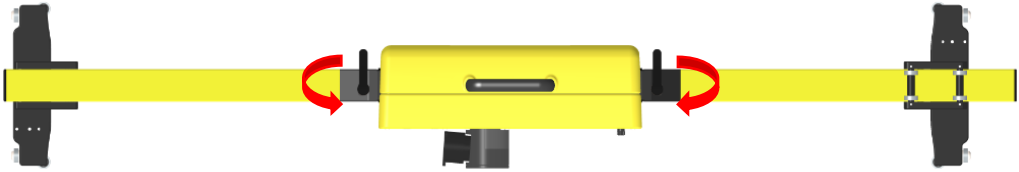
The ABT5650 is transported in 1 storage bag.



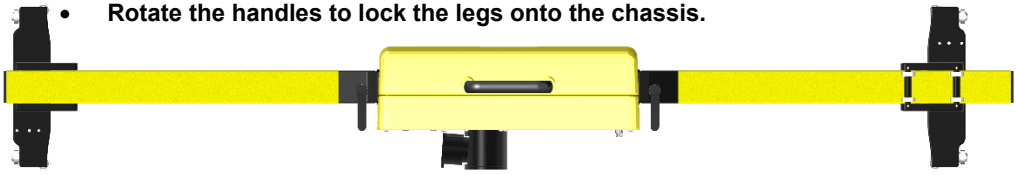
- **The Fixed foot attaches to the left side of the RouteScan chassis and the adjustable foot attaches to the right side of the RouteScan Chassis.**



- **Push the legs onto the chassis.**



- **Rotate the handles to lock the legs onto the chassis.**



- ***Note: The handles must be fully rotated 180° to lock the legs securely into place.***

Figure 1 - ***RouteScan Assembly Steps***

5.0 RouteScan features

5.1 Switching on

- Ensure that the gauge is powered by pressing the Power Button – the Power Button should now display a green light (Figure 2). Figure 3 shows you the some parts of the RouteScan.
- The first 5 seconds, the RouteScan shows you the Battery level status by the Battery Led indicator:
- Green: 100-to 70%
- Orange: 70-to 30%
- Red: 30-to 5%
- Blinking Red less than 5%. In this stage the RouteScan is not operative.

You can check the battery level at any time (no when the scan is in process or the spindle in movement) pressing the Battery indicator button.

N.B. Once the Power Button has been pressed, RouteScan goes through a start-up period – it is not possible to turn off RouteScan until start-up is complete. During start-up the Laser Housing will rotate as part of a self-calibration routine; do not interfere with it during this period.

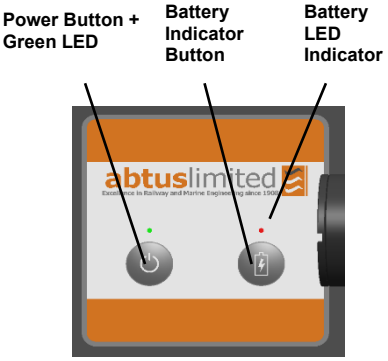


Figure 2

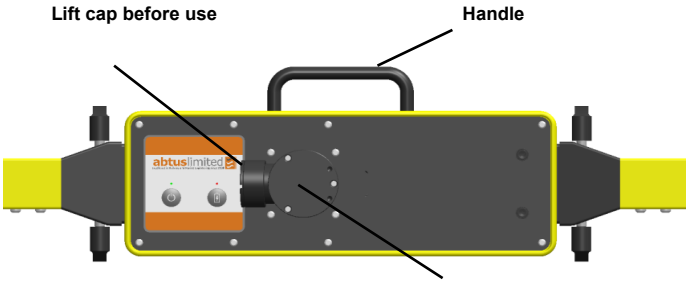


Figure 3

- The RouteScan is powered by a removable Tracer battery

To access the battery, the battery cover is removed by loosening the two battery cover thumb screws by hand, and lifting off the battery cover. Before removing the battery, the plug that connects the RouteScan to the battery's 12V output must be disconnected.

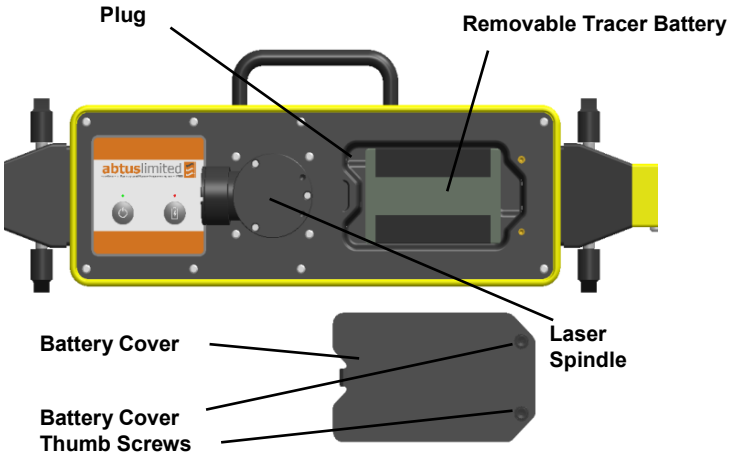
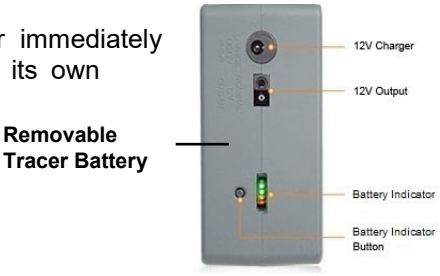


Figure 4

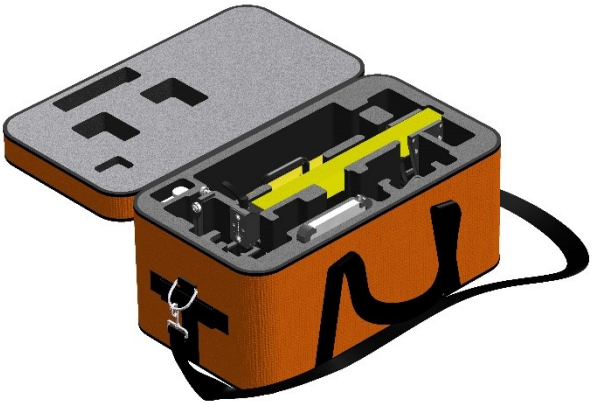
The battery can be removed for recharging or immediately swapped for another battery. Each battery has its own battery indicator button and battery indicator to show how much charge is remaining



- Rotate the black lens cover to reveal the optical lens before attempting to take any readings (Figure 5)



Figure 5



The RouteScan and all the accessories can be packed securely in the storage bag for easy transportation.

5.2 Software features

- Turn on the Control Unit (Please refer to manufacturers own operating manual for details of operation as Control Unit models may vary) – wait until the Windows operating system has fully loaded;
- Load the Abtus Gauge Interface 2 software (AGI2) from the Desktop *(Figure 6)* – the software launches directly to the welcome screen.



Figure 6 – ***Double click Abuts Gauge*** **Interface 2** ***icon (AGI2)***

The user is given two options by the welcome screen. *(Figure 7)*
Trackside has full functionality including a Bluetooth connection with the RouteScan.

Office mode does not provide a Bluetooth connection. It is used only for management and viewing of data already stored.



Figure 7

- Click on ‘Trackside’ or ‘Office’ as appropriate.

For trackside work, the software starts in the “Bluetooth Connect” page (*Figure 8);*

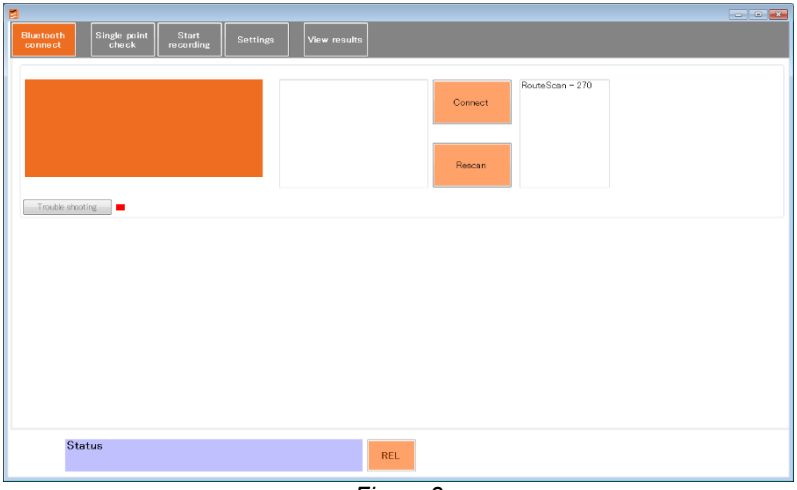


Figure 8

- Select your device clicking on it from the right side list box. And click on ‘Connect’
- Please be patient while the Control Unit makes the connection;

The device should connect directly and you get through the following blank screen. (Figure 9) You will be connected to your device that means you will be ready to start work with the RouteScan.

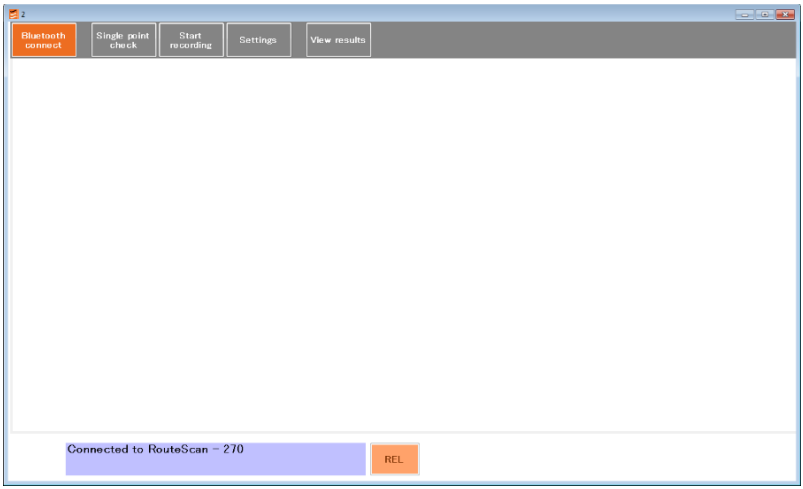


Figure 9

If you go back to the Bluetooth Connect 'page' (Figure 10) you can double check the device is connected on the orange box and a green indicator next to the 'trouble shooting' button means that your Bluetooth communication is established properly.

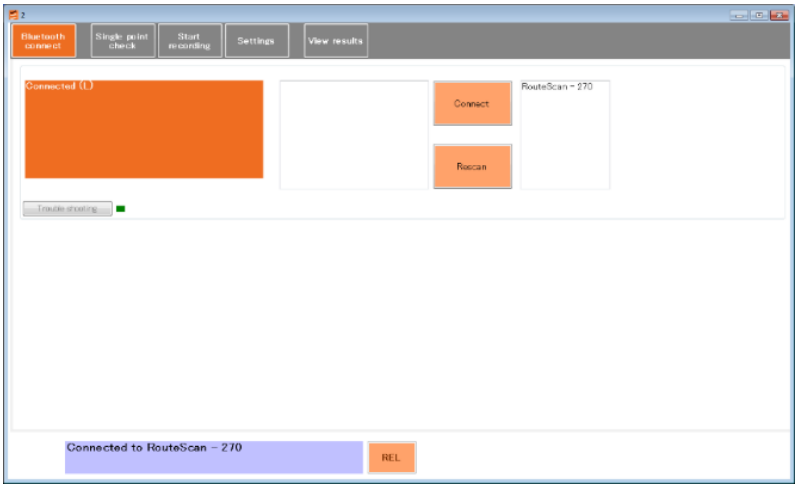
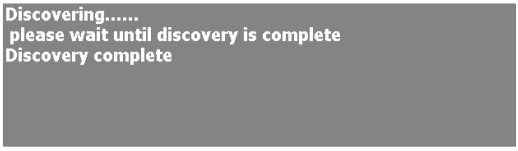


Figure 10

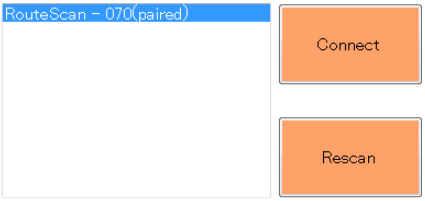
If you cannot see your device on the right list, please click on ‘Rescan’ button. It scans for Abtus devices that are turned on. The communication uses 'Bluetooth' technology. Look for the 'Discovering...' message.



You must wait until this process is over and you see...



Look for your Abtus product in the device found right box list and click on it there. Only paired devices will be listed in this box.



Click on the ‘Connect’ button.

If all is well, after a few seconds, the software will connect to the RouteScan and you get through the previous blank screen. You will be connected to your device that means you will be ready to start work with the RouteScan.

If there is a problem with the connection - see the following 'Bluetooth connection' section of this manual.

5.3 Bluetooth connection

Before recording can start, a Bluetooth connection must be made between the Control Unit and the ABT5650 RouteScan – imagine this step is like plugging in a cable between the RouteScan and the Control Unit.

Your Abtus device and associated tablet computer will already be set up in the factory with the Bluetooth communications established.

In the event of connecting to another gauge or tablet, the Bluetooth communication may need some configuration before it connects automatically.

If you follow the instructions in the Switching on section', but the gauge does not connect, click on 'Trouble shooting' button.

An extra control ‘panel’ appears.

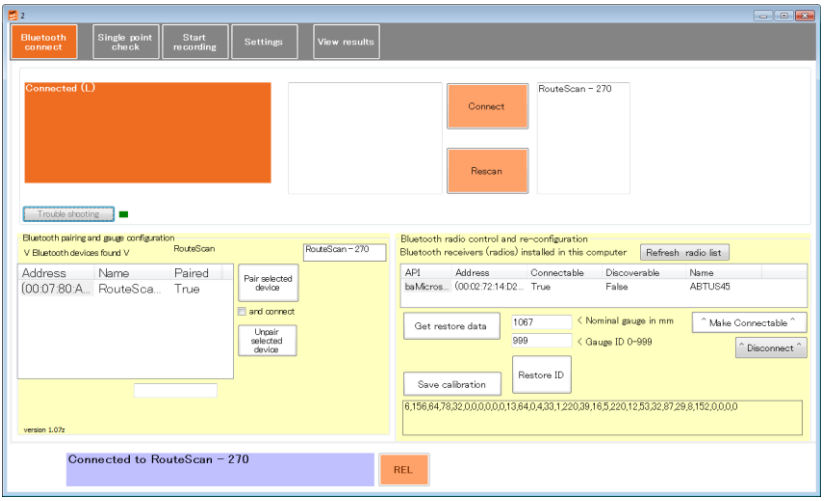


Figure 11 – ***Trouble shooting panel***

The list of ‘Bluetooth devices found’ shows those devices which the tablet / computer can see.

If DOES NOT mean that they are all in operation.

Click on ‘Rescan’ button



And wait for the list to re-fill.

5.4 Pairing

If the RouteScan is shown as not paired (Paired = false), highlight the device in the list and click on ‘Pair selected device’. Once paired, click on 'Rescan' so that the device will appear in the device found box list, then then connect to the device.

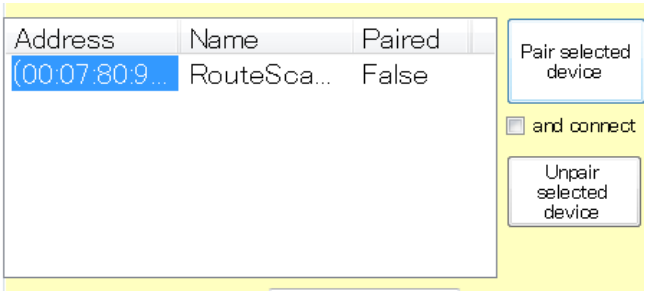


Figure 12

If a connection cannot be made, un-pair the selected device. Then try to pair with the device again with the option “and connect” on.

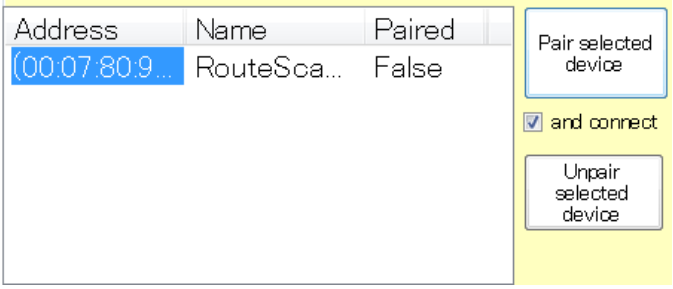


Figure 13

5.5 Single point check

The Abtus Gauge Interface 2 software provides a user interface/screen to check single points.

The position of the laser beam can now be controlled either by rotating the laser housing by hand or by the buttons 4, 5, 6, 8, and 9.

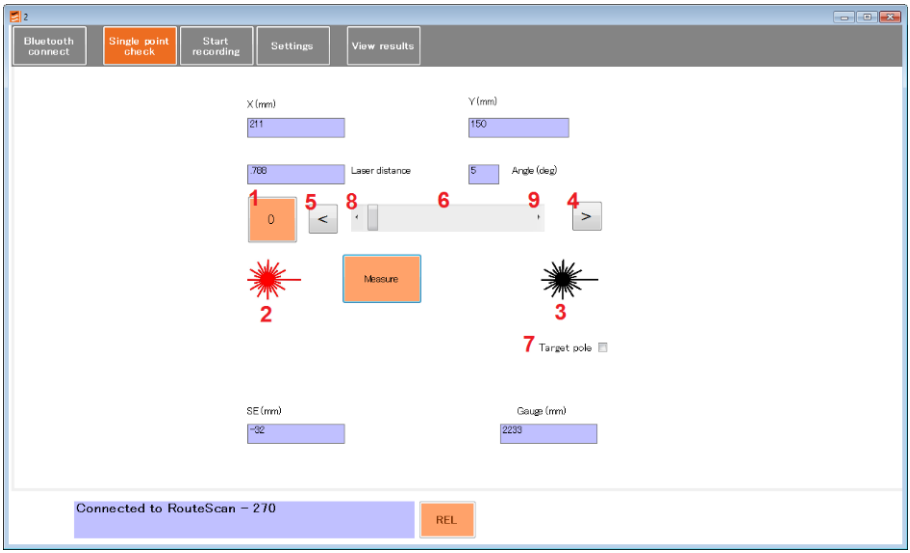


Figure 14

The user has the following input options:

1. Zero position button. It takes the RouteScan to 0°;
2. Laser ON;
3. Laser OFF;
4. Move the spindle +20°;
5. Move the spindle -20°;
6. Move the spindle from 0 to 180°;
7. Target pole option. That option adds 300mm to Y axis to compensate the Target pole;
8. Move the spindle -1°;
9. Move the spindle +1°;

The Measure button gives an instant measurement. The purple boxes show the measurement results for the single point:

- X & Y position in mm;
- Laser distance in mm;
- Angle in degrees;
- Super elevation in mm;
- Gauge in mm.

Note – it is not possible to send commands from the Control Unit when the Laser Housing is rotating. Ensure that the Laser Housing is stationary before clicking any buttons

5.6 Recording data

The Abtus Gauge Interface 2 software provides a versatile framework in which to record and analyse data. This section will only describe the steps necessary to start a recording.

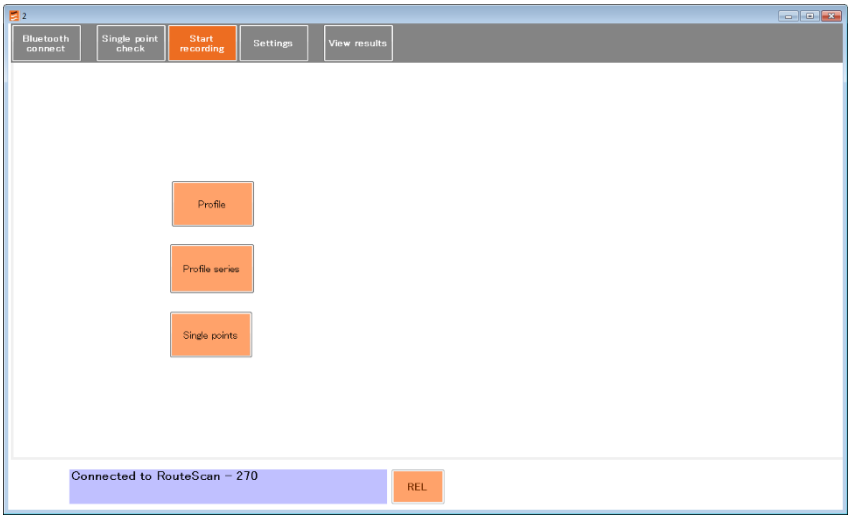


*Figure 15 – **Recording window***

The user can choose from four options.

- Profile: Record a profile.
- Profile series: Record a series of profiles. The user sets the chainage distance (start distance point) and the increment distance between each recording. The same profile is recorded at a series of positions separated by the same interval. Each new profile is saved in a separate file with the file name automatically appended with the distance at which that profile was recorded from the first profile.
- Single points: Record a set of single points.

If the user chooses Profile, Profile series or Single points, the next window is common to all three options. The user is able to fill in fields for ‘File name’, ‘Description’, ‘User name’ and ‘Track code/location’. The only mandatory field is ‘File name’. You can store and use later predefined fields right to each field.

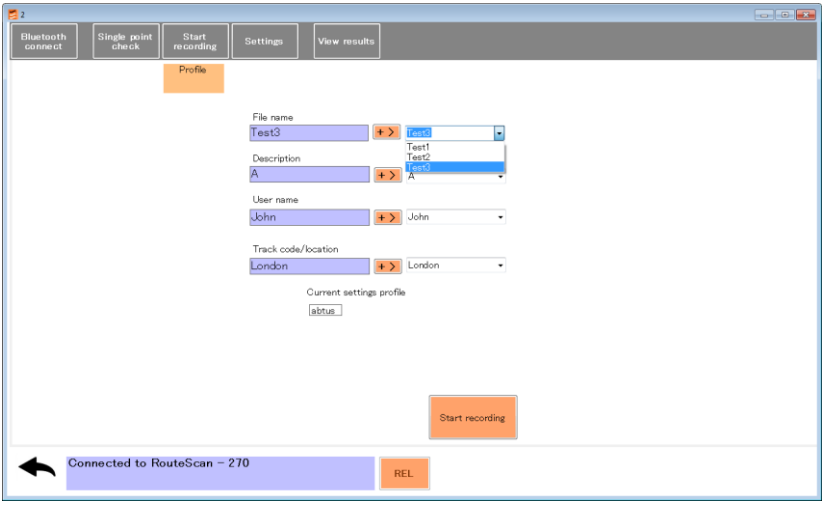


Figure 16

If the user chooses Profile series, the next window is:

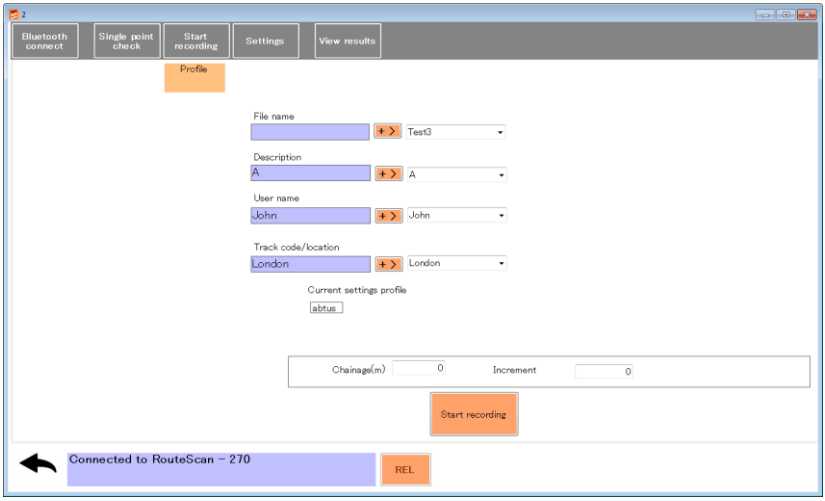


Figure 17

Where the user is given the two additional fields ‘Chainage’ and ‘Increment’.

After Clicking on Start recording button, the scan will start. The scan is automatically broken up into sections. Scanned data is displayed on the Control Unit after each section has been scanned.

During the scan you can see the following screen (Figure 18). All the other tab buttons will be unavailable to access while the scan is in progress.

The user has the following options while the scan is in progress and before save it:

1. Zoom in/out
2. Centre, drag and drop the result scan
3. Delete button. You can delete any point at the end of the scan before save. This button is only available when the scan is over.
4. Move selected points along the scan profile.
5. Stop the scan. The scan will stop after it has completed the current section
6. End scan allows to collect all the data at any time during the scan and finish it.
7. Single point. This function allows to you add single points at the end of the scan before you save it. This button is only available when the scan is over.
8. Save the data into a file. This button is only available when the scan is over.

NOTE: **If the scan stops suddenly and it is not over, please click on End scan button and after it save the scan.**



Figure 18 – ***Recording in progress***

You also can see in this screen the following information about the scan:

1. Current SE and Gauge in mm
2. Coordinates X & Y of each point of the scan from the left hand rail (LHR)
3. Graphical indication of the SE
4. Real position of the rails according to current gauge.
5. Centre of the track according to nominal gauge.
6. Relative or absolute mode: Relative mode doesn't take into account the current SE during the scan, all the points are relative to the rails.
   Absolute mode takes into account the SE and plots the points relative to this.

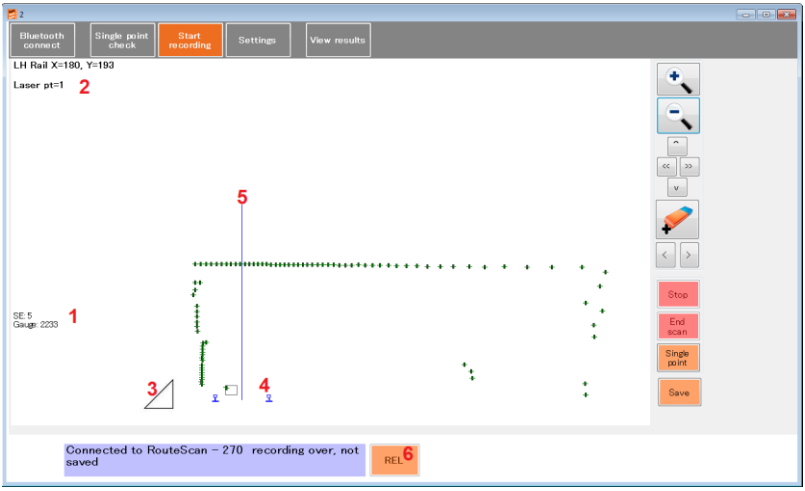


Figure 19

You can see in the following screen how to add single point into a scan. In addition to the single point check options you have two more options:

1. Once you have measured your point you can add into the scan.
2. You also can add to it a note. Which you will able to see in the results.

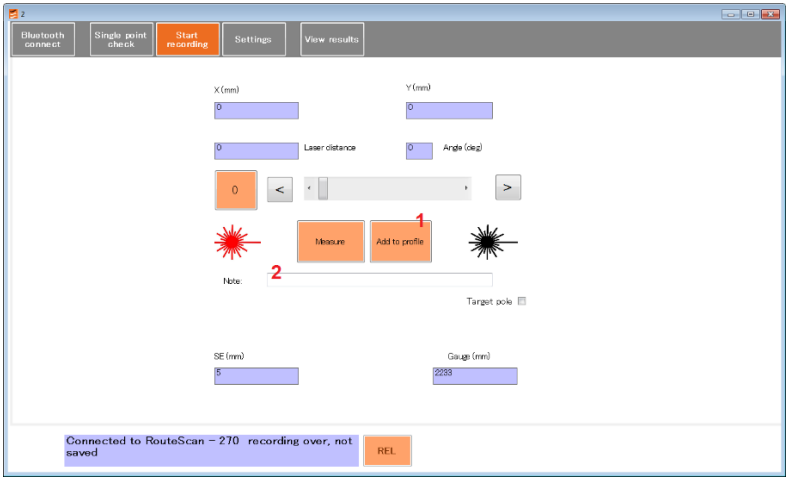


Figure 20

*Profile data structure in the *.csv file*

S/N:	RouteScan - 270		
Filename:	Test1		
Description:	A		
Start Date/Time:	16/02/2016 02:19		
User Name:	John		
Track code/Location	London		
Chainage	0		
	X (mm)	Y (mm)	
1	-334.5	289	
2	-332	409.5	
3	-330	531.5	
4	-325	658.5	
5	-322.5	796.5	
6	-318	943	
7	-420	1385	
8	-431	1633.5	
9	-436	1927	
10	238.5	2793.5	single point note: pipe
Relative			
SE(mm)	-27		
Gauge(mm)	2234		
Finish Date/Time	16/02/2016 02:20:00		
Nominal gauge	1067		

Annex 1

*Single point data structure in the *.csv file*

S/N:	RouteScan - 062	2				
Filename:	Single point Test					
Description:	A					
Start Date/Time:	19/02/2016 03:01					
User Name:	John					
Track code/Location	London					
	X (mm)	Y (mm)	SE(mm)	Gauge(mm)	Note	Mode
1	-1254.5	109.5	-225.5	1464.5	Pipe	Relative
2	-2251.5	819	-225.5	1464.5	pipe 2	Relative
3	-2425	1969.5	-225.5	1464.5	tree	Relative
Finish Date/Time	19/02/2016 03:01:48					
Nominal gauge	1435					

Annex 2

5.7 Settings

The settings screen tab is where the scan recording parameters are defined.

- Start Angle, [degrees]
- End Angle, [degrees]
- Increment (Resolution) [degrees].
- Absolute/Relative

In the settings tab, the mode can be changed between ‘ABS’ and ‘REL’ by clicking on the button at the bottom of the screen.



In absolute mode, super elevation is taken into account. In relative mode, the measurements are relative to the rails.

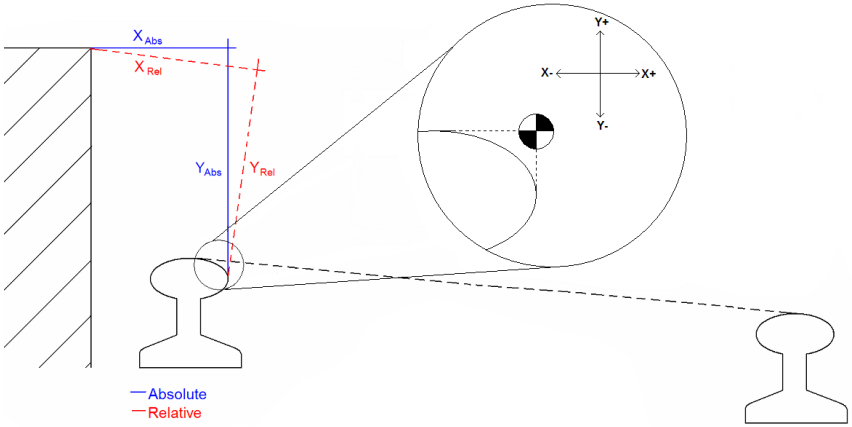


Figure 21

Up to three settings can be defined allowing up to three segments with different start and end angles and increments to be recorded in a single scan and saved in one file.

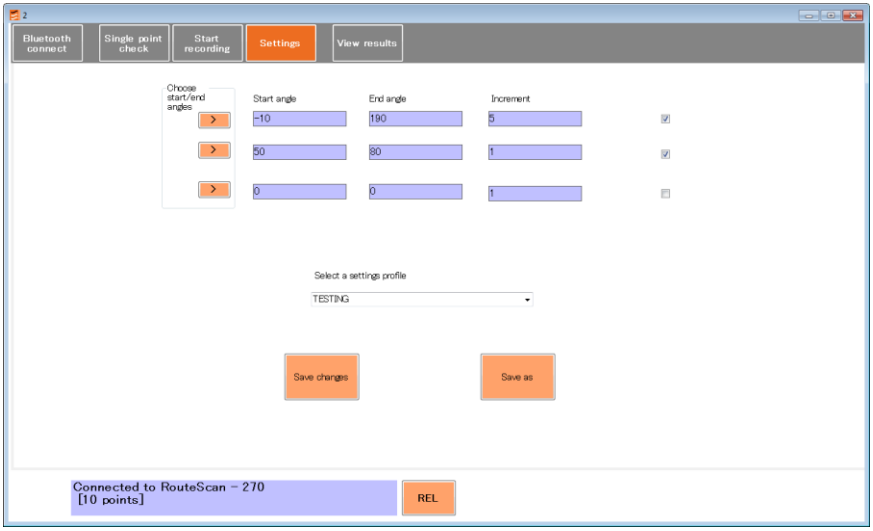


*Figure 22 – **Settings screen***

- A number of settings can be saved to suit different measurement conditions.
- Only in Trackside Mode (when the RouteScan is connected), the start and end angles can also be changed by clicking on the “Choose start/end angle” at the left. This takes the user to the single point check tab. Here the user can make test measurements to find the required start and end angles for the scan. **When both are chosen, start and end angle, the user should click in the back arrow to back to the settings tab**.

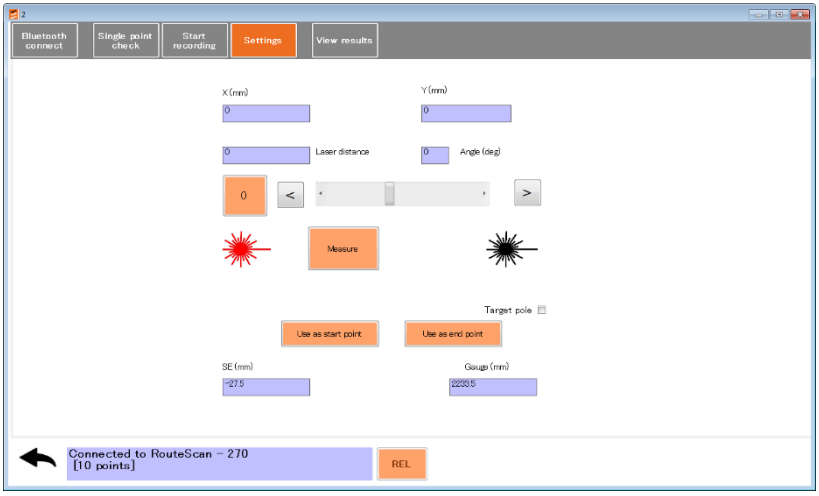


*Figure 23 – **Settings screen – start & end angle selection***

5.8 View results

To review saved Data Files, tap the 'View Results' tab. You can see graphical and numerical results. Viewing the result, you cannot modify them.



Figure 24 – ***Scan Profile graphical view***

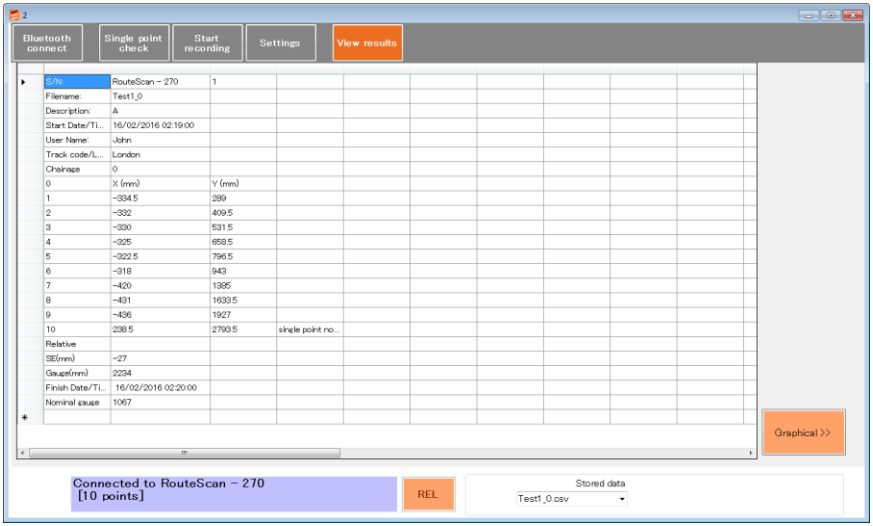


Figure 25 – ***Scan Profile numeric view***

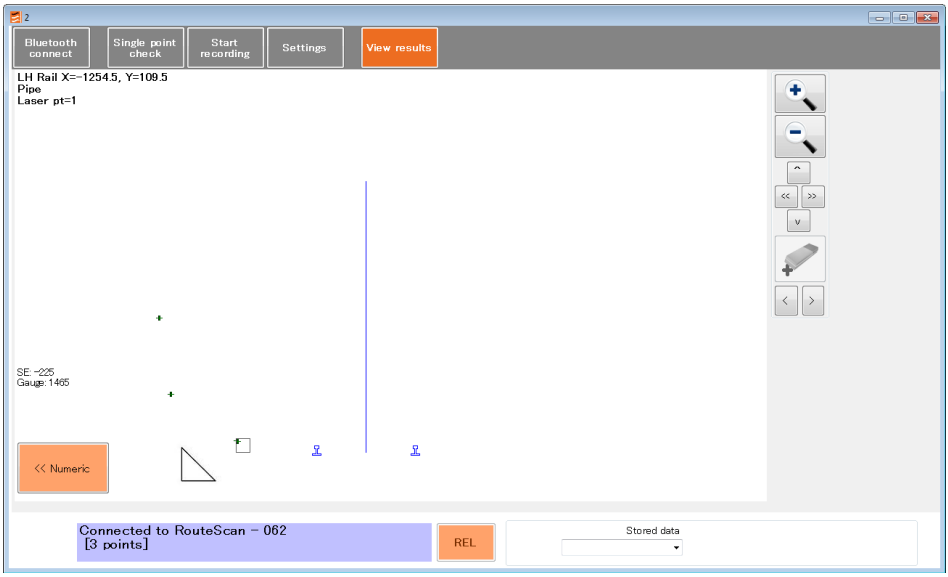


*Figure 26 – **Single Point Scan graphical view***

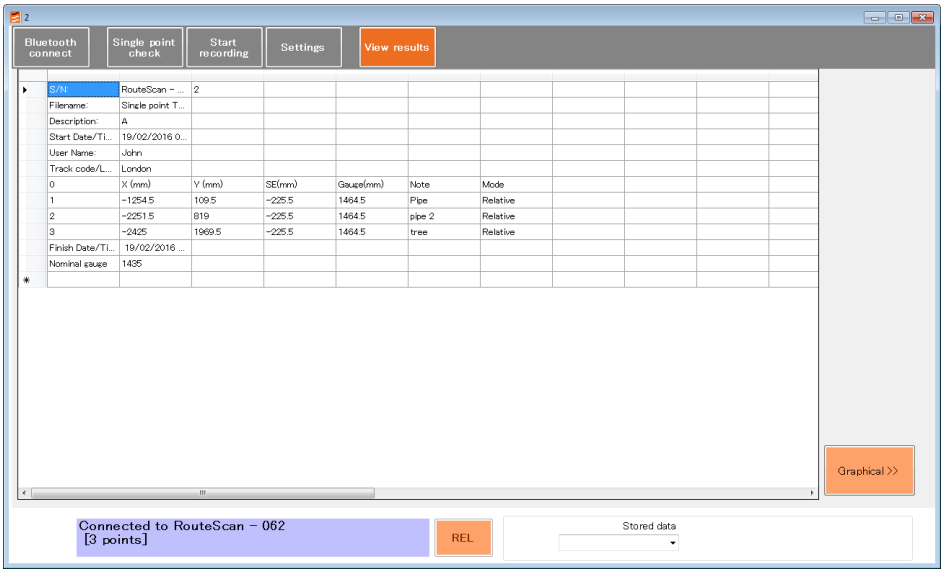


*Figure 27 – **Single Point Scan numeric view***

5.9 File types and recorded data

The Software automatically saves *.csv files for each recording.

The CSV file is in a standard format which will open in almost any software package (e.g. Excel, Word, Notepad etc.). This file contains all the Start and Finish information along with all the recorded data in an easy to read layout.

Recorded Data is stored in:
C:\abtus\recorded data\ROUTESCAN

6.0 Target Pole

The target pole is an optional accessory for RouteScan. It allows the measurement of points that cannot be 'seen' directly by the laser, such as the gauge corner of the rail on an adjacent track.

It is comprised of:

- Target Pole;
- Rail Pole;
- Pointed Foot;
- Rounded Foot.

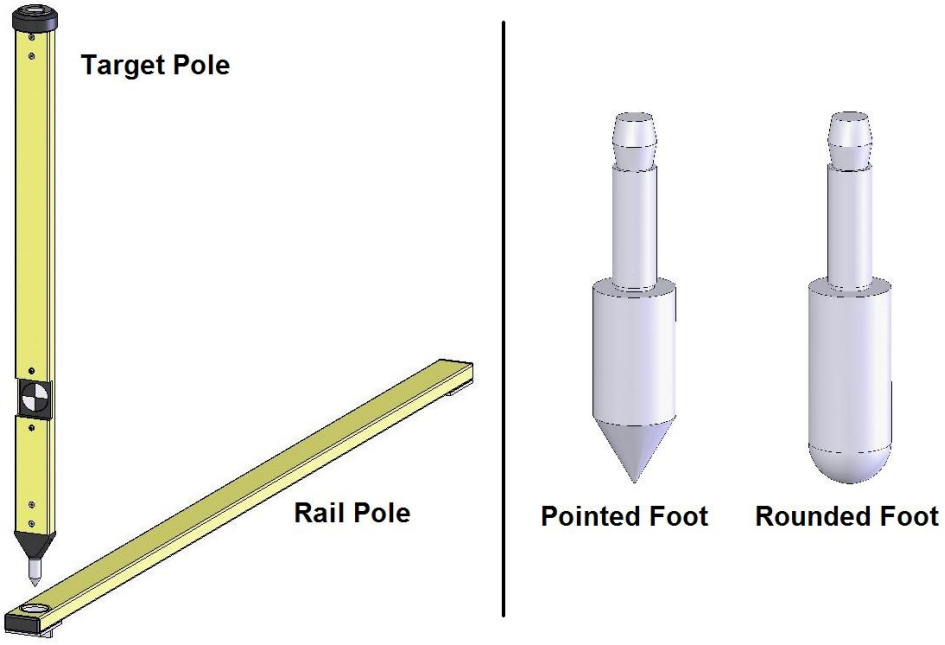


Figure 28

To measure a point using the target pole, load the Single Point screen and tick the 'Target Pole' tick box. The software will automatically adjust the measurement by the vertical height of the target.

When measuring to the Target Pole:

- Ensure that the target surface is ‘square’ to the laser;
- Check that it is held vertically by using the bubble embedded in the top of the pole – a 1mm offset of the bubble from the centre of the vial translates approximately to a 0.5mm error in the X-Y measurement.

The Pointed Foot and Rounded Foot click into the bottom of the Target Pole and are interchangeable. When using the Target Pole on its own, it is advisable to use the Rounded Foot to minimise wear to the Pointed Foot (refer to Section 6).

When using the Target Pole with the Rail Pole, the Pointed Foot must be fitted. When measuring the location of an adjacent track, the Rail Pole allows the Pointed Foot to be located accurately on the gauge corner of the rail.

1. Place the Rail Pole on the track to be measured;
2. Ensure that the Rail Pole is located ‘squarely’ across the track and that it is firmly located against the rail being measured;
3. Locate the Pointed Foot in the socket in the Rail Pole.

7.0 ABT4696 Platform Bracket

Place the ABT4696 Platform Bracket on the corner of the platform to be measured. The centre of the target is vertically aligned with the top surface of the platform. The back of the target is aligned against the front edge of the platform.
The laser hits the front of the target, 0.2mm in front of the front edge of the platform.

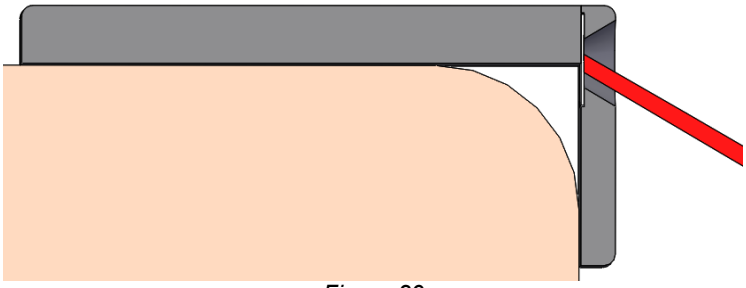


Figure 29

Use the ABT5650 RouteScan with AGI software in single point mode.

Please refer to single point measurements (Section 5.5 & 5.6) for further information on recording with the RouteScan. Manually point the laser dot so that it hits the centre of the target on the platform bracket.

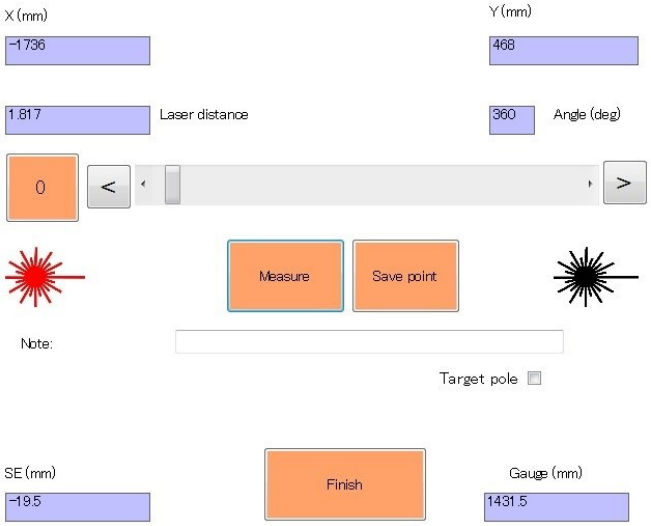


Figure 30

The purple boxes show the measurement results for the single point: X & Y position in mm, super elevation in mm and gauge in mm. The user can add a note for each saved point. Press measure and save to record each point.

8.0 Maintenance

8.1 Before each use

Make sure there are no stains, marks or dirt on the lens. After blowing off dirt and dust, the drag method can be used to remove fingerprints or other contaminants.

The lens is of an extremely high grade and is coated with a proprietary compound. Unlike many other optical coatings of this grade, this compound is tough enough to be cleaned using the lens tissues and cleaning solution provided. However, each clean detracts from the life time of the coating and so direct contact cleaning should be kept to a minimum.

NEVER touch the lens with anything other than the lens tissues provided!

NEVER use high pressure air to remove dirt/dust from the lens!

NEVER use a circular motion to clean the lens!

8.2 Every 3 months

Visually inspect the ABT5650 for signs of damage. If necessary, contact your local distributor for help.

If using the Target Pole accessory, check the Pointed Foot and Rounded Foot for wear by measuring the length as shown in figure. The foot should be replaced if it has worn by more than 1mm.

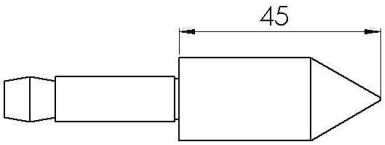


Figure 31

8.3 Annually

The ABT5650 is approved for use in the UK in areas of 3rd rail. An annual electrical insulation test should be carried out.

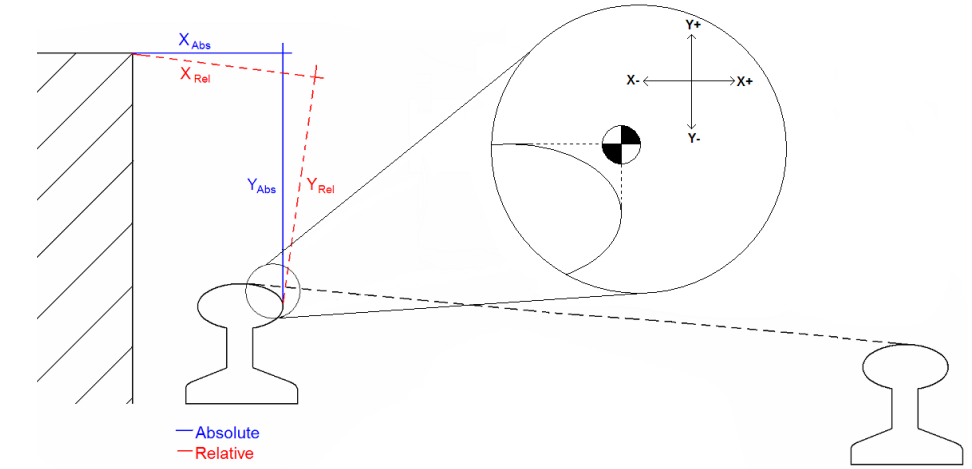
The ABT5650 must be returned to Abtus Ltd annually for re-calibration to ensure measurements are within specification. The ABT5650 will also be tested for electrical insulation compliance at the same time. If using the Target Pole accessory, this should be re-calibrated at the same time.

The condition of all components will be checked at this time and replaced as required.

9.0 Measurement characteristics

9.1 Point co-ordinates

Range	0.2 - 15m
Accuracy	±1mm per metre (e.g. ±5mm @ 5m)
Resolution	1mm



9.2 Gauge

Range	-25/+50mm (nominal 1435mm)
Accuracy	±1mm
Resolution	0.1mm

9.3 Super-Elevation

Range	±200mm
Accuracy	±1mm
Resolution	0.1mm

Super Elevation (SE) is measured across the running rails and is displayed as height differential between the high and low rail in millimetres

The default sign convention is:

-ive SE is the right rail ***lower*** than the left rail

+ive SE is the right rail ***higher*** than the left rail

(Contact Abtus regarding sign conventions if the user is accustomed to different sign conventions)

NB. The left end is the fixed end of the gauge

10.0 Troubleshooter

10.1 Tips for good recording

The ABT5650 is a very accurate piece of equipment – many of the parameters that it measures rely on extremely sensitive sensors. While every reasonable effort has been made to make it 'railway proof', users should treat it with extreme care.

10.2 No power

Check that all the batteries are fully charged. The RouteScan takes approximately **4 hours** to fully charge and the Control Unit takes approximately **3 hours**.

10.3 Cannot connect

The connection between the Control Unit and the RouteScan is via Bluetooth. Obstacles such as metal and water (the human body is mostly water!) can degrade wireless signals – ensure that nothing is restricting the signal.

Ensure that all batteries are fully charged (see Section 4.1 for more information on the batteries).

Ensure that the internal Bluetooth device is ON and there is only one stuck active.

10.4 Measurement takes a long time

The time taken to perform a point measurement is dependent on surface quality. Surfaces that are too shiny or too dull will affect the measurement time.

If the increment setting used in Profile settings is set to a lower value such as 0.2, the time taken to complete the profile measurement can take considerably longer.

When using RouteScan to measure Gauge and SE in Single Point mode; ensure that the laser is pointing at a near-by surface to minimise measurement time.

10.5 Refresh radio list

Bluetooth receivers (radio) installed have to appear in the list with the value 'true'. If this value is 'false' you have to refresh the radio list. Click on 'Refresh radio list' button, select the radio (API) and press 'Make Connectable' button.

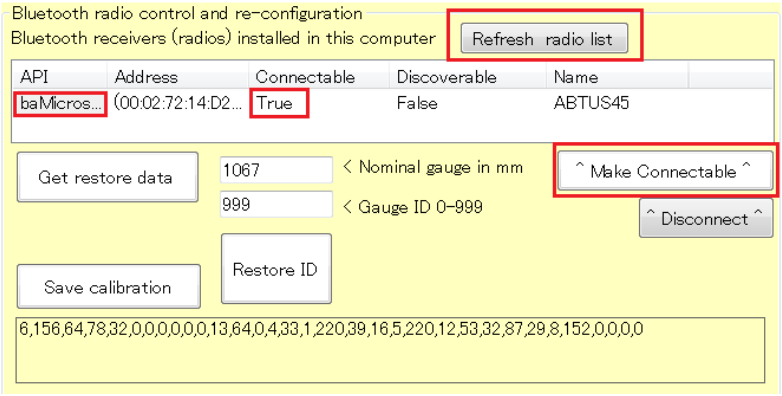


Figure 32

10.6 Restore data

The restore data process is a very sensitive one. Please ensure you understand it before you do it. Don't hesitate to contact Abtus if in doubt.

If the RouteScan's calibration file is corrupted, the RouteScan will produce incorrect results.
Press the 'Get restore data' button, choose the calibration file for the device and press open.
C:\abtus\system\Calibration Files

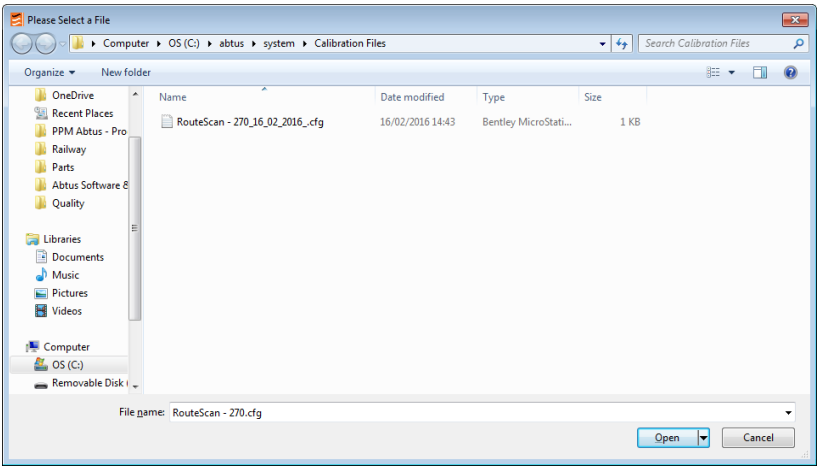


Figure 33

New values will now appear at the bottom of the screen and the ‘Restore calibration’ button will be shown. Press ‘Restore calibration’ to program the gauge with those values.

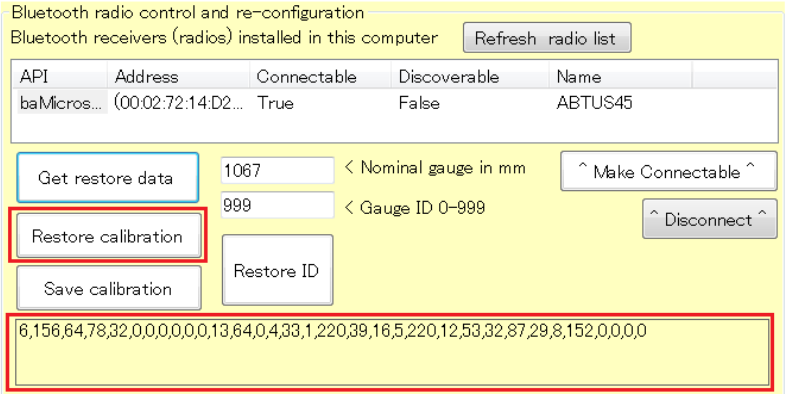


Figure 34

10.7 Save calibration data

If you wish to save the calibration data from the gauge, press ‘Save calibration’ button. It will be stored in C:\abtus\system\Calibration Files with the current date.

10.8 Disconnected warning message

This message means that the control unit has lost the Bluetooth connection with the RouteScan. It can be caused by:

- Low Voltage Battery. You will see the battery LED indicator blinking in red in this case. Charge the battery or you won’t be able to switch on the RouteScan because the battery is totally discharged.

