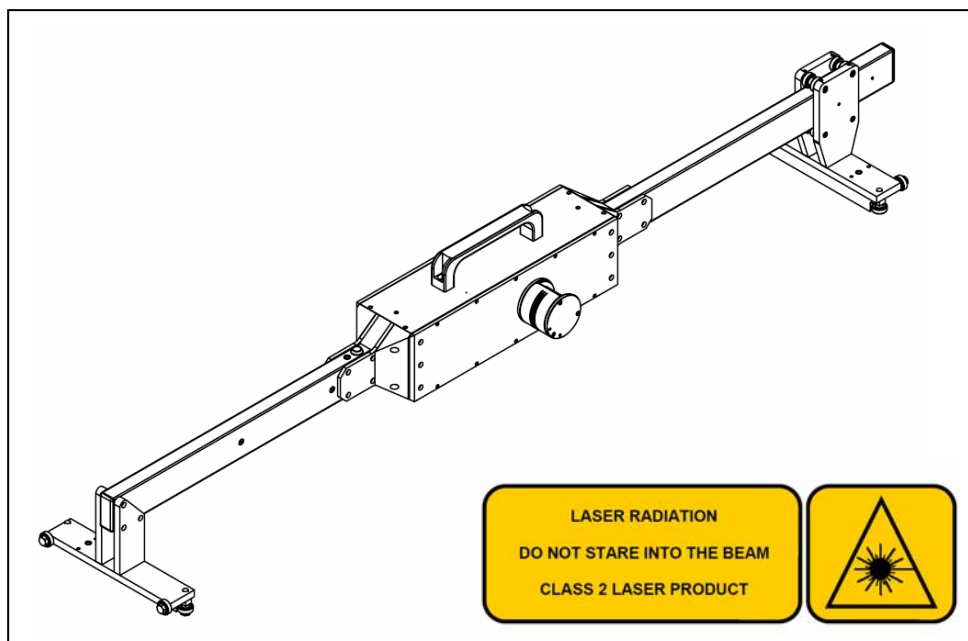




ABT4650 RouteScan



Instruction Manual


1.0 Index

1.0	Index	1
2.0	Item List	2
3.0	Specification	2
4.0	Getting Started	3
4.1	Overview	3
4.2	Assembly	4
4.3	Bluetooth Connection	4
4.4	Single Point Measurement	6
4.5	Recording Data	7
5.0	Software Features	9
5.1	Settings	9
5.2	View Results	9
5.3	File Types	10
5.4	Transferring Recorded Data Files to a PC	10
6.0	Target Pole	11
7.0	Maintenance	13
7.1	Before Each Use	13
7.2	Every 3 Months	13
7.3	Annual	13
8.0	Measurement Characteristics	14
8.1	Point Co-ordinates	14
8.2	Gauge	14
8.3	Super-Elevation	14
9.0	Trouble shooter	15
9.1	Tips for Good Recording	15
9.2	No Power	15
9.3	Cannot Connect	15
9.4	Cannot Save Data	15
9.5	Measurement Takes a Long Time	15

2.0 Item List

1. RouteScan
2. Control Unit
3. Carry Case
4. Instruction Manual
5. RouteScan Charger
6. Control Unit Charger
7. Optical Cleaning Kit
8. Target Pole (if purchased separately)

3.0 Specification

Weight	- On track(RouteScan)	9.5kg
	- (Control Unit)	0.2kg
	- In Box	25kg
Physical Dimensions	- On Track(RouteScan)	1655 x 250 x190 mm
	- In Box	Length:1755 mm
		Height:373 mm
Operating Temperature	-	-10°C to + 50°C (-4°F to 122°F)
Environmental Rating	-	IP54
Battery Life	- RouteScan	Up to 6 hours
	- Control Unit	Up to 6 hours
Operating System	-	
PC Connectivity	-	USB Bluetooth Wireless LAN

4.0 Getting Started

4.1 Overview

The 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 (9.5kg) and is provided with a protective box for easy transportation to and from site. All data is shown on a colour screen and is stored on an SD Memory Card for easy transfer to a PC, where 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 ABT4650:

- RouteScan
- Control Unit

The unit has been designed to be user-friendly with only limited training required.

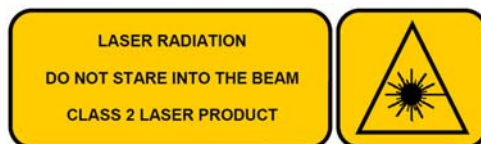
RouteScan is approved for use in the UK in areas of 3rd rail. The following guidelines should be adhered to when using RouteScan in an area of live 3rd rail:

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 PDA 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 7.1



RouteScan produces a visible (635nm wavelength) laser beam which emerges from the Laser Housing (Figure 2)

It is a Class II laser product in accordance with:

- 1) IEC60825-1 (2001) "Radiation safety of laser products"
- 2) EN60825-1 (2001) "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.

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 7.1 to clean the lens if necessary.

Please review Section 9.1 prior to using your ABT4650 for the first time.

4.2 Assembly

Upon receipt of your ABT4650 no assembly is required.

4.3 Bluetooth Connection

Before recording can start, a Bluetooth connection must be made between the Control Unit and the ABT4650 – imagine this step is like plugging in the cable:

1. 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
2. Load the Abtus Gauge Interface software from the Start Menu (as shown in Figure 1) – the software launches directly to the 'Connection' screen

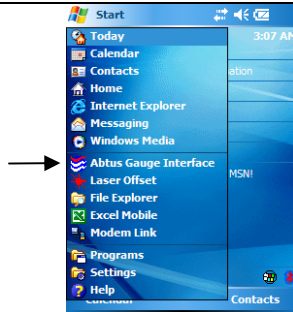


Figure 1

3. Ensure that the gauge is powered by pressing the Power Button – the Power Button should now display a green light (Figure 2).

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.

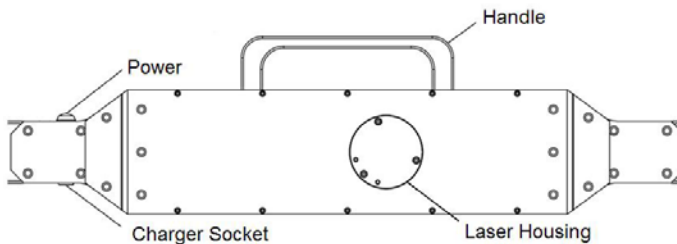


Figure 2

4. Select the desired gauge from the list¹ and click the 'Connect' button
5. Please be patient while the Control Unit makes the connection
6. When the connection has been made, the 'Options' screen is displayed (Figure 3)

¹ The Abtus Gauge Interface software is common to all Abtus Bluetooth products and so it is possible to 'Pair' the Control Unit with a number of different gauges

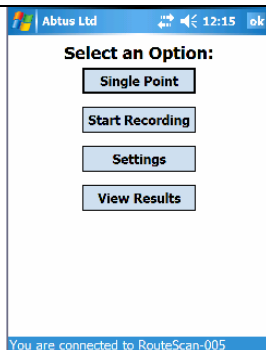


Figure 3

7. If the connection fails see Section 9.3 for help
8. Rotate the black lens cover to reveal the optical lens before attempting to take any readings (Figure 4)

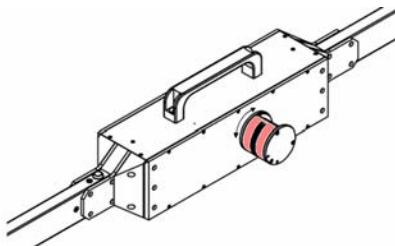


Figure 4

4.4 Single Point Measurement

To make a single point measurement:

1. Select 'Single Point' from the 'Options' screen (Figure 3) – this will display the 'Single Point' screen (Figure 5)
2. The position of the laser beam can now be controlled either by rotating the laser housing by hand
or
 by sliding the Rotate bar left/right on the Control Unit. When the laser beam is in the desired position, return the Rotate bar marker back to the centre position
3. The laser can be returned to Zero by clicking 'Zero'. The laser returns to either an absolute or a relative zero depending on the status of the 'Absolute' tick box
4. To take an offset measurement, click the 'Measure' button
 - An absolute or relative reading can be selected by ticking or un-

- ticking the 'Absolute' tick box
- Tick the 'Target Pole' tick box to measure to a point using the target pole²

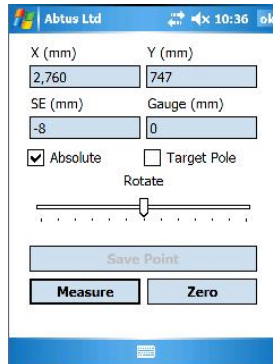


Figure 5

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 or closing a window.

4.5 Recording Data

Profile:

1. The parameters used when recording a profile are set in the 'Settings' Menu – see Section 5.1
2. Select 'Start Recording' from the 'Options' screen (Figure 1)
3. Select 'Profile' from the next menu (Figure 6) – note that it is also possible to add a series of Single Point measurements to a profile recording

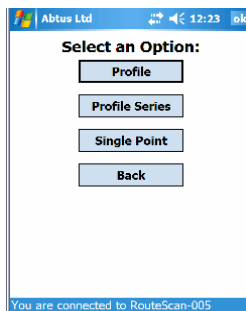


Figure 6

4. In the 'Session Details' screen, enter a file name. A start description

² See section 6.0 for more details.

- can be added by selecting 'More'. Hide the keypad and select 'Start Recording'
5. When ready, select 'Start' to begin the scanning process. The Laser Housing unit will begin to rotate and after a short period measurement data will begin to appear on the display. The scan is automatically broken up into sections. Scanned data is displayed on the Control Unit after each section has been scanned. By clicking 'Cancel' it is possible to stop the scan at any time; the scan will stop after it has completed the current section
 6. When the scan is complete, the laser will switch off and the Laser Housing will rotate back to its Zero position
 7. The profile can now be saved or re-measured – to insert additional points click 'Single Point'. Position the laser (see Section 4.4) and click 'Measure'. See below for more information on this step

Single Point

1. Select 'Start Recording' from the 'Options' screen (Figure 1)
2. Select 'Single Point' from the next menu (Figure 6)
3. Control the laser as described in section
4. Click 'Measure' – select 'Save Point' to confirm the measurement – a note can now be added against this point
5. After adding a note, hide the keypad and click 'Save Point' again.

Note – it is not possible to send commands, other than 'Cancel', from the Control Unit when the Laser Housing is rotating. Ensure that the Laser Housing is stationary before clicking any other buttons or closing a window.

5.0 Software Features

5.1 Settings

Within the settings page (Figure 7) it is possible to create/edit any number of scan parameter sets. The parameters in each set define how a scan is performed:

- Start Angle
- End Angle
- Increment (Resolution)
- Absolute/Relative

Predefined settings can be selected to suit the structure being scanned

1. Select 'Settings' from the options screen (Figure 1)
2. To create a new set of parameters, select 'Create Profile' from the Settings Profile drop down menu. 'New profile' will now be displayed, click and hold this in order to rename it
3. Click inside the corresponding box to change the various parameters – use the keypad to do this
4. If a Bluetooth connection to the RouteScan exists, it is possible to set the Start and End Angle visually:
 - Click and hold in either the 'Start Angle' or 'End Angle' box
 - Click 'Turn Laser On'
 - Point the laser at the desired point
 - Click 'Select Angle'
5. An absolute or relative reading can be selected by ticking or un-ticking the Absolute tick box

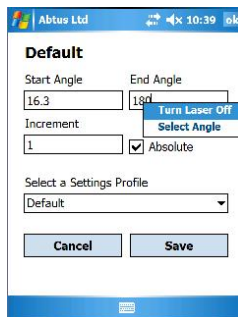


Figure 7

5.2 View Results

To review recorded Data Files click the 'View Results' button in the 'Options' screen. Select the file you wish to review from the drop down box at the bottom of the screen. Toggle between file types (see section 5.3) using the button in the bottom right of the screen.

5.3 File Types

The ABT 4650 automatically saves two files for each recording. The file types are:

- *.csv
- *.sec

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.

The SEC file contains exactly the same information as the CSV file but is encrypted. It is only possible to view this 'secure' file through the 'View Results' screen (see section 5.2) however it is not possible to edit it. This file is tamper-proof and is suitable for auditing purposes.

5.4 Transferring Recorded Data Files to a PC

Recorded Data is stored on the control unit in the following location:

\\SD Card\Abtus Gauge Interface\Recorded Data\RouteScan\....

Data can be transferred in one of two ways:

ActiveSync

1. Connect the control unit to the PC using either a USB cable or a Bluetooth connection
2. Open Windows Explorer on the PC and in My Computer, select Mobile Device
3. Navigate to the above location and copy the Data Files as required

(Depending on the PC's Operating System, the PC may try to download ActiveSync from the internet when it has sensed the connection between the Control Unit and the PC – follow the on-screen instructions to complete this step)

SD Card Reader

1. Remove the SD card from the control unit (always power down the control unit before removing the SD card) and insert it into the PC
2. Navigate to the above location on your PC using Windows Explorer and copy the Data Files as required

Abtus Ltd can supply SD Card readers that connect to a USB port.

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

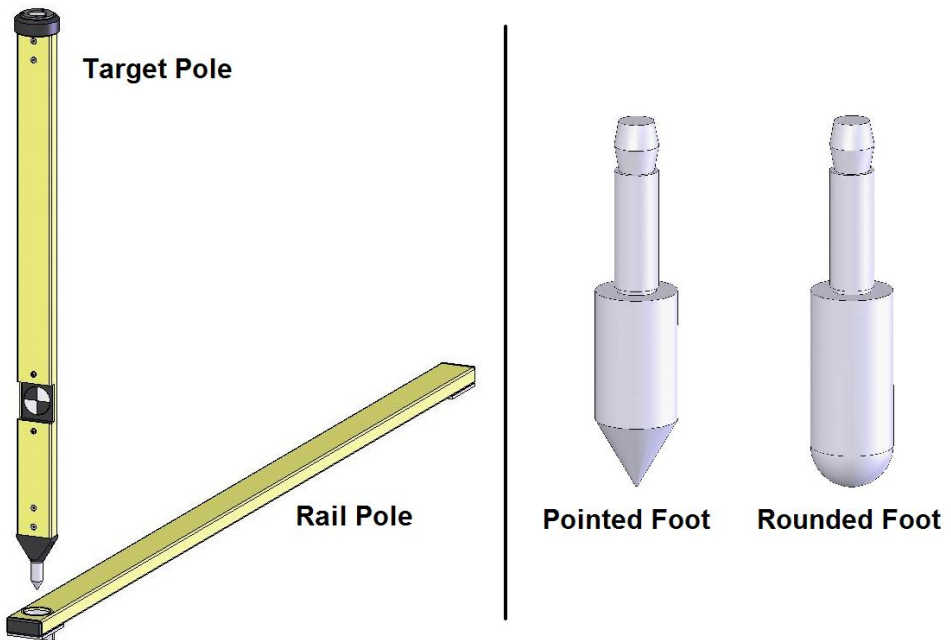


Figure 8

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 7.2).

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 Maintenance

7.1 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

7.2 Every 3 Months

Visually inspect the ABT4650 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 9. The foot should be replaced if it has worn by more than 1mm.

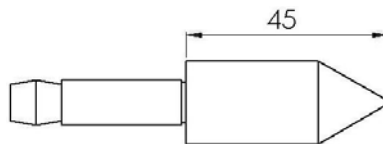


Figure 9

7.3 Annual

The ABT4650 is approved for use in the UK in areas of 3rd rail. An annual electrical insulation test should be carried out.

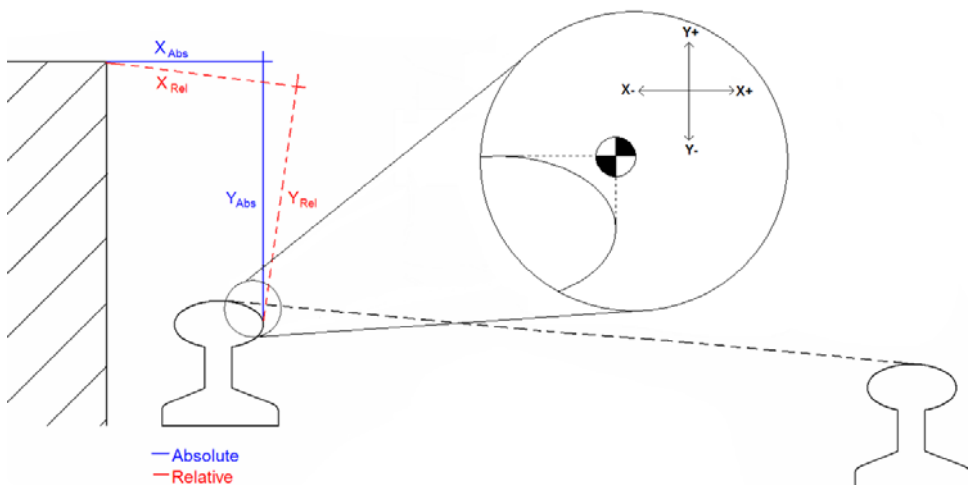
The ABT4650 must be returned to Abtus Ltd annually for re-calibration to ensure measurements are within specification. The ABT4650 will also be tested for electrical insulation compliance at the same time. If using the Target Pole accessory, this should be re-calibrated at the same time.

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

8.0 Measurement Characteristics

8.1 Point Co-ordinates

Range	0.2-30m
Accuracy	$\pm 3\text{mm}$ @ 4.0m $\pm 6\text{mm}$ @ 8.0m
Resolution	1mm



8.2 Gauge

Range	-15/+25mm (on nominal)
Accuracy	$\pm 0.5\text{mm}$
Resolution	0.1mm

8.3 Super-Elevation

Range	$\pm 200\text{mm}$
Accuracy	$\pm 1.2\text{mm}$
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

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

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

9.0 Trouble shooter

9.1 Tips for Good Recording

The ABT4650 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.

9.2 No Power

Check that all the batteries are fully charged. The RouteScan takes approximately **4hours** to charge and the Control Unit takes approximately **2hours**.

9.3 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).

9.4 Cannot Save Data

Check that the SD Card is not set to ‘Read-Only’ (the small white switch on the side of the card).

9.5 Measurement Takes a Long Time

The time taken to perform a point measurement is dependant on surface quality. Surfaces that are too shiny or too dull will effect the measurement time. On standard brickwork or masonry, RouteScan can complete up to 240 measurements per second.

RouteScan has been benchmarked on the same calibration surface as is used for calibrating the Structure Gauging Train in the UK and has been proven to work reliably.

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.