Siretta

Enabling Industrial IoT

SNYPER-LTE Graphyte

High performance 4G/LTE network signal analyser & data logger available in EU, USA and AP versions.

Applicable models:
SNYPER-LTE Graphyte
SNYPER-LTE Graphyte V2

User Manual

Rev 2.1

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User Manual

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Introduction

There are two base models of product covered by the User Manual. The original product, the SNYPER-LTE GRAPHYTE, and the SNYPER-LTE GRAPHYTE V2. The SNYPER-LTE GRAPHYTE V2 is an improvement on the original design, supporting additional cellular frequency bands and additional LiveSCAN modes. In all other respects the SNYPER-LTE GRAPHYTE V2 is the same as the original SNYPER-LTE GRAPHYTE.

This user manual will cover all the aspects of the features, setup and use of both versions of the SNYPER-LTE Graphyte (EU) and, SNYPER-LTE Graphyte (USA) and SNYPER-LTE Graphyte (AP). When describing features common to all versions of the product, the term 'SNYPER Graphyte' is used throughout this user manual. No prior knowledge of the operating principles of the cellular mobile network is required.

This manual explains how to use the SNYPER Graphyte to conduct cellular surveys, identify the cells available at the survey location, their characteristics and signal strength. This information may then be used to help successfully deploy a cellular connected device such as a modem or router.

This document describes the operation of the SNYPER Graphyte (all versions) with software version 6.10.10 – 4.01 loaded. Operation with other software versions may be different.

About Siretta

Siretta is a wireless communications company located in Reading, United Kingdom manufacturing & supplying industrial IoT products since 1998.

Siretta's product portfolio is made up of:

» Antennas, plus their associated Cable Assemblies & Adapters,

» Cellular Network Analysers

» Industrial Modems

» Industrial Routers

» Associated Cloud Management

Siretta supplies products directly and via a worldwide network of distributors, into numerous markets and applications across the globe.

Siretta's distribution partners range from industrial IoT specialists through to global catalogue organisations.

Whether "off the shelf" or custom solutions are required, Siretta has a wide portfolio of products to fit many types of application.

Siretta's extensive knowledge and experience in the wireless market allows support of a wide range of customer applications, focusing on frequencies between 400 MHz to 6 GHz. These encompass modems, routers and antennas for:

» Cellular technologies: GSM / UMTS / LTE (including Cat M & NB) / 5G NR and other cellular technologies as they emerge.

» Global positioning: GPS/GNSS

» WLAN/Wi-Fi

Whilst providing the above products for the industrial cellular market, Siretta also has a number of antennas to cover applications for:

» Bluetooth, Zigbee, ISM band, LoRa and Sigfox

With a heavy emphasis on design, Siretta has a team of dedicated Engineers and Product Managers, who specialise in wireless applications.

Siretta continually makes significant investment in R&D endeavouring to provide customers with market leading, future-proofed, wireless solutions. Siretta works closely with many technology partners to stay at the forefront of industrial IOT.

Overview

What's in the Box?

1. SNYPER-LTE Graphyte with support cradle underneath
2. USB Wall plug charger with adapters for UK, Europe, USA and Australasia/ China*
3. 2x USB cables - 0.5m and 1.8m
4. Omni-directional Antennas - General Purpose (Black) and 2600MHz (Silver/ Grey)**
5. Directional Antenna
6. Extension Cable for Directional Antenna
7. Stand for support cradle

Figure 1. SNYPER-LTE-Graphyte case contents

Portable carry case

*The USB Wall plug charger with adapters are not included with the SNYPER-LTE Graphyte (AP) V2.
**The Silver Grey Antenna (2600 MHz) as shown in Figure 1 is not applicable to SNYPER-LTE Graphyte (USA & AP) V2.

General Description

The SNYPER-LTE Graphyte (EU) is designed to survey the cellular networks in Europe and Africa used by mobile phones and data terminals. The SNYPER-LTE Graphyte (USA) and SNYPER-LTE Graphyte (AP) are complementary products designed to survey the cellular networks in the USA and Asia-Pacific regions respectively. The term “Graphyte” used in this manual refers to all models of the SNYPER Graphyte. The Graphyte enables the operator to first determine which networks are within coverage range, and then optionally to lock to a desired cell to monitor the received signal strength of that cell only (LiveSCAN mode). Additionally, both normal and LiveSCAN modes may be run continuously, logs of all measurements taken saved, and both html and .CSV formatted summary documents produced.

There are many different frequency bands that cellular equipment uses, and they vary region by region and country by country. In general, different regions tend to use common frequency bands, but there are always exceptions. While the SNYPER-LTE Graphyte (EU) was designed for the frequency bands typically found in Europe, in many cases these same bands can be found in other countries and regions around the world. Similarly, the SNYPER-LTE Graphyte (USA) can survey networks outside of the USA, especially other countries in North and South America and the Caribbean.

Additionally, just because a frequency band may be used in a country, that does not necessarily mean that an operator has taken out a license to do so. Please check the frequency bands supported by the Graphyte (see page 10) with the frequency bands used in the country in which the surveys are being conducted. One way to do this is to search for “List of mobile network operators by region” on Wikipedia, another is by directly contacting and asking the local network operators.

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Features

- Reports details of all cells on all networks in coverage range
- SNYPER-LTE Graphyte (EU) provides European coverage of 4G/LTE, 3G/UMTS & 2G/GSM cellular networks. Bands covered vary by model.
- SNYPER-LTE Graphyte (USA) provides North American coverage of 4G/LTE &, 3G/UMTS cellular networks. Bands covered vary by model.
- SNYPER-LTE Graphyte (AP) provides Asia-Pacific coverage of 4G/LTE & 3G/UMTS cellular networks. Bands covered vary by model.
- SIM free operation
- Perform automatic repeated surveys at programmable intervals to see how coverage at a site varies over time, or to discover all the cells visible over a route travelled.
- Download clear reports in .HTML format for reading in a web browser
- Download .CSV files for import into Excel
- Use the LiveSCAN feature to watch the received signal strength of a cell over time. Use this to correctly align a directional antenna and perform a cellular site survey.
- Store up to 84 surveys
- 240 x 320 resolution TFT display
- Powered by internal battery, or through USB connector
- Audible notification of events
- Language support for English, German, French, Italian and Spanish

Differences between SNYPER-Graphyte and SNYPER-Graphyte V2

The SNYPER-Graphyte V2 is an updated version of the original SNYPER-Graphyte product. There are two key differences between the products. The improvements that the V2 product offers are:

- The SNYPER-Graphyte V2 has additional frequency bands of operation
  - SNYPER-LTE Graphyte (EU) V2
    - UMTS Band 3 (1800) MHz
    - LTE Band 28A (700 MHz)
  - SNYPER-LTE Graphyte (USA) V2
    - UMTS Band 4 (1700 MHz)
    - LTE Band 14 (700 MHz), Band 66 (1700 MHz) & Band 71 (600 MHz)

- The SNYPER-Graphyte V2 has improved frequency bands of operation
  - LiveSCAN locks to the cell in addition to the frequency that the cell is operating at
    - This means that when moving away from the scanned cell, the signal level will eventually reduce to zero. The original SNYPER-Graphyte, because it locked to the frequency only, when moving away from the scanned cell eventually the signal strength would rise as an alternate cell using that frequency was approached.
  - LiveSCAN additionally shows the following:
    - UMTS: RSCP & ECIO
    - LTE: RSRP & RSRQ

The table over page shows typical test data for a SNYPER-LTE Graphyte in semi-urban location.

Table 1. SNYPER-LTE Graphyte survey storage

Number of Survey Cycles in Log	Test Condition File Size Observed (KB)	Rule of Thumb Guidance (KB)	Survey Capacity
1	62	78	84
5	118	148	73
10	155	194	55
15	188	235	46
25	250	313	34
50	404	505	21
75	637	796	13
100	904	1130	9
200	1467	1834	6
500	3782	4728	2

NOTE: These results could vary considerably between locations and are shown as an example of a semi-urban setting. The size of the log will be totally dependant on the number of cells discovered by the SNYPER-Graphyte. As a very general rule, the more urban the environment the greater the number of cells likely to be discovered.

Default settings used in the example are shown below.

- **Pre-set status:** Pre-set interval between one survey finishing and the next starting - 0 mins i.e. automatic back to back survey testing
- **File Status:** CSV and HTML files created
- **LiveSCAN Logs:** No LiveSCAN logs created due to variability of disk usage vs. time
- **Debug Logs:** No Debug logs created due to variability of disk usage vs. time

Specifications

Table 2. SNYPER-LTE Graphyte frequency band support

Network Technology:	SNYPER-LTE Graphyte (EU)	SNYPER-LTE Graphyte (USA)
2G	B3 – 1800 MHz (DCS) B8 – 900 MHz (Extended GSM)	Not supported
3G	B1 – 2100 MHz (IMT) B8 – 900 MHz (Extended GSM)	B2 – 1900 MHz (PCS) B5 – 850 MHz (Cellular)
4G	B1 – 2100 MHz (IMT) B3 – 1800 MHz (DCS) B7 – 2600 MHz (IMT-E) B8 – 900 MHz (Extended GSM) B20 – 800 MHz (Digital Dividend)	B2 – 1900 MHz (PCS) B4 – 1700 MHz (AWS) B5 – 850 MHz (Cellular) B12 – 700 MHz (Lower SMH) B13 – 700 MHz (Upper SMH)

Table 3. SNYPER-LTE Graphyte V2 frequency band support

Network Technology:	SNYPER-LTE Graphyte (EU) V2	SNYPER-LTE Graphyte (USA) V2	SNYPER-LTE Graphyte (AP) V2
2G	B3 – 1800 MHz (DCS) B8 – 900 MHz (Extended GSM)	Not supported	Not supported
3G	B1 – 2100 MHz (IMT) B3 – 1800 MHz (DCS) B8 – 900 MHz (Extended GSM)	B2 – 1900 MHz (PCS) B4 – 1700 MHz (AWS-1) B5 – 850 MHz (Cellular)	B1 – 2100 MHz (IMT) B5 – 850 MHz (Cellular) B6 – 800 MHz (UMTS 800) B8 – 900 MHz (Ext. GSM) B19 – 850 MHz (Upper 800)
4G	B1 – 2100 MHz (IMT) B3 – 1800 MHz (DCS) B7 – 2600 MHz (IMT-E) B8 – 900 MHz (Ext. GSM) B20 – 800 MHz (Digital Dividend) B28A** – 700 MHz (APT)	B2 – 1900 MHz (PCS) B4 – 1700 MHz (AWS) B5 – 850 MHz (Cellular) B12 – 700 MHz (Lower SMH) B13 – 700 MHz (Upper SMH) B14 – 700 MHz (Upper SMH) B66 – 1700 MHz (Ext. AWS) B71 – 600 MHz (Digital Dividend)	B1 – 2100 MHz (IMT) B3 – 1800 MHz (DCS) B5 – 850 MHz (Cellular) B8 – 900 MHz (Ext. GSM) B9* – 1800 MHz (DCS) B18 – 850 MHz (Lower 800) B19 – 850 MHz (Upper 800) B26 – 850 MHz (Ext. Cellular) B28 – 700 MHz (APT)

*B9 was intended for use in Japan, but not deployed
**B28A is a subset of B28 using the lower duplexer frequencies (Tx : 703-733 MHz / Rx : 758-788 MHz)

Table 4. Common SNYPER-LTE Graphyte Specification

Dimensions:	147mm x 76mm x 36mm
Weight:	200g (excluding antenna)
Operating temperature range:	-10 to +50°C*
Storage temperature range:	-20 to +50°C*
Operating humidity range:	45 to 85% RH non-condensing
Antenna connector:	SMA female
Display:	2.4" QVGA 320 x 240 TFT with LED backlight, 500 cd/m^2 brightness
Battery life:	48 hours normal use**
	6 months shelf life when fully charged***
Battery:	2000mAh Lithium Ion
Voltage:	3.7V
IP rating:	30
USB connector:	Mini-B
USB load current:	500 mA typical (battery on charge) 250 mA typical (battery fully charged, full survey in progress) 160 mA typical (battery fully charged, no survey in progress) 120 mA typical (battery fully charged, unit in standby with display dimmed)

*The battery will only charge when the temperature is between +10 to +45°C for safety and battery life reasons.

**Based on 20 surveys/day at room temperature with automatic power off enabled. Operating at the extremes of the operating temperature range will degrade battery life.

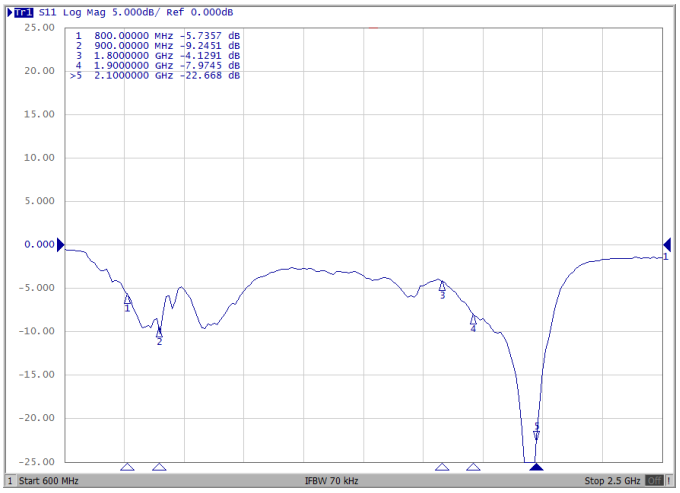
***SNYPER-Graphyte turned off and stored at 25 °C.

Directional Antenna Characteristics

The directional antenna should be used in conjunction with the 1.5m cable supplied.
The characteristics of the directional antenna are shown below.

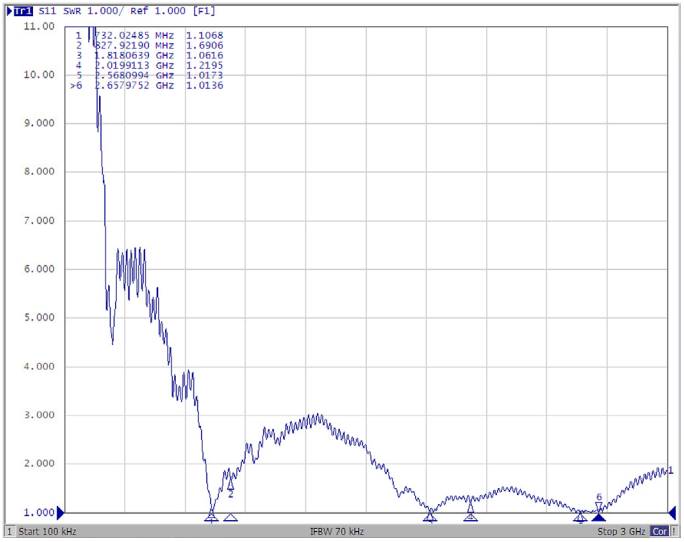
Directional Antenna - Return Loss Graph

Figure 2. Return loss graph



Directional Antenna - VSWR Graph

Figure 3. VSWR graph



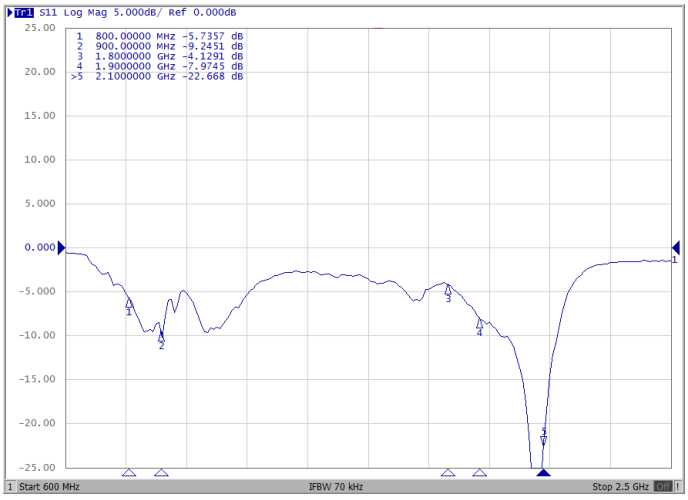
Omni-directional Antenna Characteristics

General Purpose Antenna (Black)

The characteristics of the black general purpose antenna are shown below.

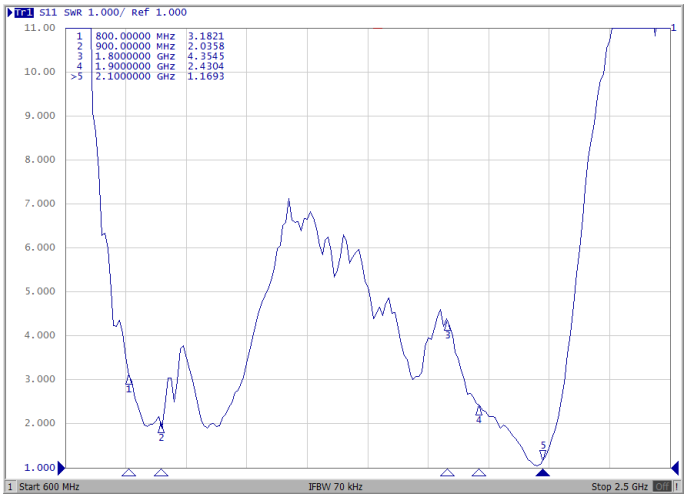
Black Antenna - Return Loss Graph

Figure 4. Return loss graph



Black Antenna - VSWR Graph

Figure 5. VSWR graph

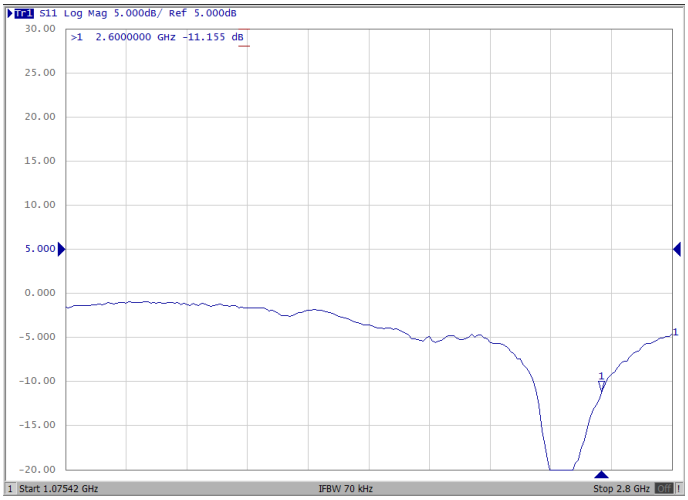


2600 MHz Antenna (Light Grey)*

The characteristics of the light grey 2600MHz antenna are shown below.

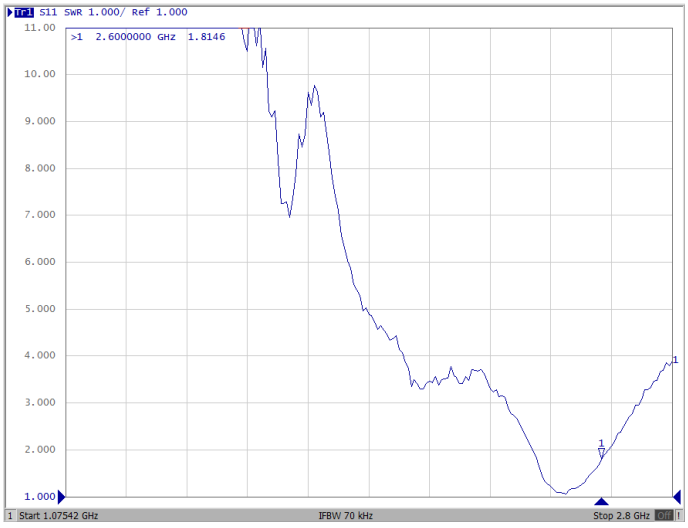
Light Grey Antenna - Return Loss Graph

Figure 6. Return loss graph



Light Grey Antenna - VSWR Graph

Figure 7. VSWR graph



* The light grey antenna is only supplied with the EU model.

Total SNYPER Graphyte Survey Storage

The maximum total number of surveys that the SNYPER Graphyte can store is 84. This means 84 presses of the survey button (single cycle surveys or multi-cycle surveys).

If multi-cycle surveys are performed, then the file size also comes into play. It then depends on how many cells are found during each survey and how many cycles are recorded in the survey. Disk space could now become the potential limitation on surveys recorded in dense network locations such as big cities.

Saving both HTML and CSV files are optional. Saving these files can be disabled in the setup options to conserve disk space.

Product Images

Figure 8. Front view of the SNYPER Graphyte

Figure 9. Bottom view of the SNYPER Graphyte

Figure 10. Top view of the SNYPER Graphyte

Figure 11. SNYPER attached to Tripod

*Although there is a SIM slot, **NO** SIM card is required to operate the SNYPER Graphyte.
**The tripod connects to the cradle using a standard ¼" screw fitting as used on camera mounting accessories. This allows the use of telescopic camera poles etc. to be used to position the SNYPER if required by the user.

First Time Use of SNYPER Graphyte

» Connect one of the supplied antennas to the Graphyte. It is suggested that the black antenna be used for the first survey as this is the most general-purpose antenna.

» When first received, the battery charge state may be very low. Before using the Graphyte for the first time it is recommended that the internal battery be charged for at least 4 hours by connecting the unit to a powered USB port (either computer or the supplied mains adapter)* using the supplied USB cable. If the USB port is supplying power correctly, the Graphyte will turn on and the red charge state LED in the top left of the front panel will illuminate. The Graphyte will always turn itself on when connected to a powered USB port. When not connected to a charging source, the Graphyte will be turned on by pressing the power button for at least half a second and then releasing it.

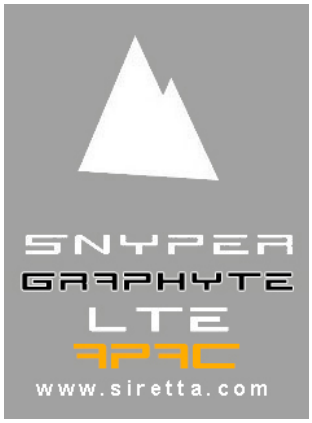
Figure 12. Power on

» On power up, the welcome screen will be displayed briefly (figure 13 shows the SNYPER-LTE Graphyte (EU) splash screen. Figure 14 shows the SNYPER-LTE Graphyte (USA) splash screen and figure 15 shows the SNYPER-LTE Graphyte (AP) splash screen. The hardware version number is not shown.)

Figure 13. EU splash screen

Figure 14. USA splash screen

Figure 15. AP splash screen



» The battery voltage is monitored by internal circuitry, and if the battery charge state is exceptionally low, the Graphyte will turn itself off again. The colour of the status bar at the top of the display indicates the charge state. If it is green, the Graphyte has enough battery capacity to be operated without connecting it to a charging supply. If the charge status bar is yellow or red, please connect the Graphyte to a charging supply.

» Set the DATE and TIME so that they are displayed correctly in the reports that the SNYPER Graphyte produces. See page 36 for more information.

*Mains adapter is not included with AP model variant.

Charging and Battery Status

Approximately 4 - 6 hours are needed to fully charge a SNYPER with a flat battery. The device will be charged when it is plugged into a USB power source - the supplied AC adaptor*. Other USB ports may be used to charge and power the SNYPER. The SNYPER is classed as a High-power USB device and is a 500 mA load. Some USB ports such as those found on laptops are designed to power low-power USB devices and will only provide 100 mA. Additionally, unpowered USB hubs will share the upstream USB power between all connected devices. The SNYPER will still charge in these circumstances, but will take proportionally longer to reach full charge.

Battery charging is indicated by a '+' sign on the right of the battery status bar and the red charge status LED turning on. To maximise the charge rate of the SNYPER Graphyte, turn it off while charging. The LED indication will still operate and will turn off when fully charged.

Figure 16. Charging and battery status

Charging and battery status bar:
A fully charged device is indicated by a green bar extending across the top of the display.

As the device is used and the battery discharges, the battery status bar will shrink to the right of the display and change from green, to yellow, to red.

Recharging is recommended once red bars are displayed on the device battery status bar.

If the device drops below allowable low battery usage the unit will switch off and charging will be required.

Table 5. Charge status indication

Status	LED Indication
Charging in progress	On
Charging off	Off
Temperature fault	Slow blink at 1.5/Sec
Battery fault	Fast blink at 6.1/Sec

*Mains adapter is not included with AP model variant.

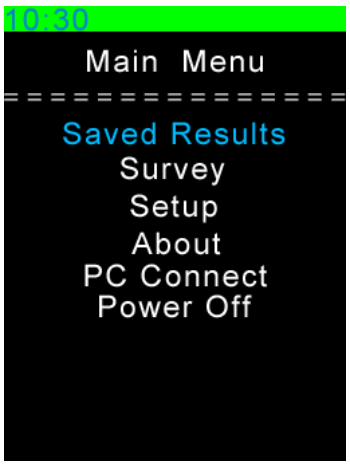
NOTE: To protect the battery from damage, charging is only allowed when the temperature is between +10 and +45°C. If a temperature fault is indicated, allow the battery temperature to settle naturally to the safe charging temperature range. Do not attempt to speed this process up by deliberately heating or cooling the SNYPER Graphyte as this may cause damage.
Important: If a battery fault is indicated, please do not continue to charge the SNYPER Graphyte.

Please contact Siretta for repair instructions.

Main Menu

The SNYPER main menu has 6 menus (as shown below in figure 17), these can be selected using the UP/DOWN buttons. Once the chosen menu is highlighted, click OK. Press the BACK button to return to the main menu.

Figure 17. 'Main Menu' screen



Saved Results: Access saved surveys.

Survey: Used to perform a new survey.

Setup: Allows personalisation of language, display, sound, reports and auto-power off.

About: Displays information about the device - model number, software and firmware versions, battery voltage and IMEI number.

PC Connect: Connects device to a PC as a memory stick to allow download of reports and updating of software.

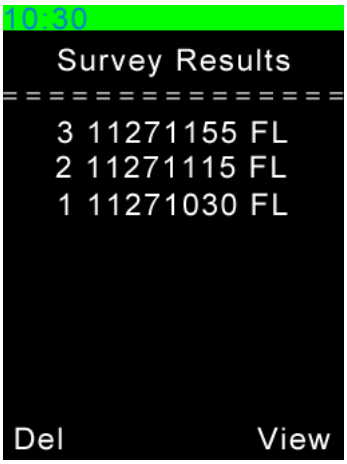
Power Off: Powers off the device.

Saved Results

Select ‘Saved Results’ from the main menu. The saved survey files are displayed and numbered in numerical order with file name and whether the survey was conducted in 2G (GSM), 3G (UMTS), 4G (LTE) or FL (Full Survey 2G, 3G & 4G) mode.

NOTE: The USA and AP versions of the SNYPER-Graphyte do not support 2G (GSM) surveys. A full survey for these products therefore only scans for 3G and 4G cells.

Figure 18. ‘Survey Results’ screen



Deleting a Saved Survey
To delete a saved survey, highlight the survey to be deleted by using the UP and DOWN buttons, and then press the left navigation button. This will delete the survey from the SNYPER Graphyte.

NOTE: No warning is given prior to deleting a saved survey.

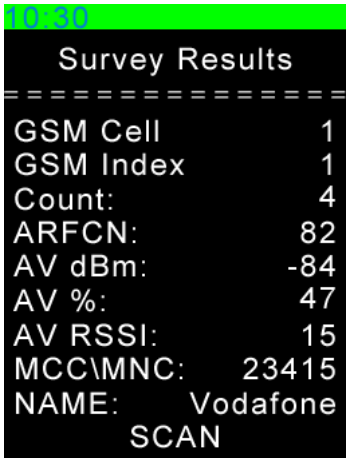
Viewing a Saved Survey
To view a survey, highlight it by using the UP and DOWN buttons, and press the OK or RIGHT navigation button. This navigates to the ‘Stored Survey’ menu as shown below in figure 19.

Figure 19. ‘Stored Survey’ screen

Show Results

Highlight 'Show Results' and press OK. The SNYPER Graphyte will display all results with numbered cells from strongest to weakest. To switch between all signals found in the survey, use the LEFT/RIGHT buttons. The buffer is circular so by pressing the LEFT button it is possible to immediately access the weakest cell. To see additional fields of information about the cell selected, use the DOWN button.

Figure 20. Displaying survey results



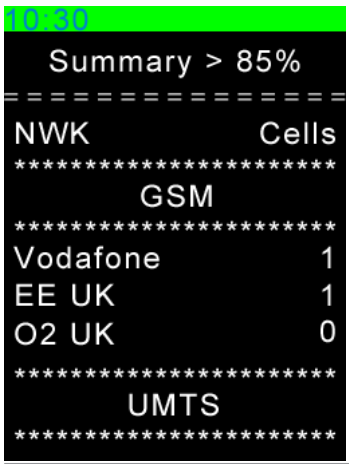
NOTE:
If SCAN is selected by pressing the OK button, this will start a LiveSCAN. Please read the section 'LiveSCAN on page 33 for full details of how to do this.

Show Summary

Highlight 'Show Summary' by using the UP and DOWN buttons, and press OK. The SNYPER Graphyte will display the number of cells by cellular network, technology, and signal strength. Use the LEFT/ RIGHT buttons to switch between signal strengths received on the device.

Press the DOWN button to scroll more information into view.

Figure 21. Displaying survey results



NOTE:
Two listings may be shown for one network operator. This listing is created by the MNC and is because two different MNC's may both be associated with the same network operator.

Use the LEFT button to replace the network operator names with the MCC/MNC (PLMN) numbers to see this. The RIGHT button returns the view to network operator name.

Export Results

Selecting ‘Export Results’ will cause the SNYPER Graphyte to create and export two files, XSURVRES.CSV and XSURVRES.HTM. These are equivalent to a single cycle survey .CSV and .HTM file based on the data collected during the survey.

This function allows a survey to be ‘recovered’ if the survey files have been deleted from the file system while the SNYPER Graphyte was connected to a PC using PC Connect (see page 39).

If a multi-cycle survey is exported, the full log of all surveys is unable to be recreated. The .CSV and .HTM files created by the export will lose information regarding the number of times a cell was seen. Only the averaged data is exported.

Survey Menu

The SNYPER Graphyte has 3 operational modes for performing surveys.

» **Single Survey:** A single, complete survey of the cellular environment as seen by the SNYPER Graphyte. The survey result is available as a .CSV file, with a .HTM summary file.

» **Multiple Cycle Survey**: In Multiple Cycle Survey, the user can conduct a survey over many cycles (user defined up to 500). These surveys can either run consecutively with each other, or after a user selectable time interval of up to 24 hours. The Graphyte will show the average of all the surveys carried out. Like Single Scan survey, .HTM and .CSV files will be created. In Multiple Cycle Survey there will be two .CSV files created. One with the averaged summary data, and one containing all the data from all the surveys that were conducted. Multiple cycle survey is a significant feature of the SNYPER Graphyte. Received signal strength of cellular networks is not a constant. They vary in even short spaces of time. Therefore, carrying out a multiple cycle survey in an area gives a much better view of the best signal strength for a specific network. It is recommended that users carry out a 5-cycle survey as a minimum to get a good view of signal strength available in any given location.

NOTE: The Graphyte can only record a maximum of 255 cells (combined total of all cell types). This will never be a problem when the Graphyte is not moving. If, however, the Graphyte is doing a multi-cycle log on a moving vehicle, then the maximum of 255 could be a limitation dependant on vehicle speed and number of measurement cycles. Please also remember that a survey is not instant – the Graphyte will be retuning its radios to listen to all the different frequencies that it supports (many hundreds!) as it conducts a survey, and this is the reason why a survey will take several minutes to complete. So a survey where the Graphyte is moving does not represent a survey of all frequencies at a single point on the ground, but a survey along the movement path between when the individual survey started and when it completed.

» **LiveSCAN:** This is a continuous survey where the SNYPER Graphyte is locked onto a user specified channel frequency. The SNYPER Graphyte graphically shows the received signal strength of that channel on a continuously updated rolling display until cancelled. In conjunction with the supplied directional antenna, this allows the user to move the antenna around until the direction with the greatest signal strength is found. In conjunction with an omni-directional antenna, this allows the user to move around a site to identify the location of the best signal strength of the channel locked onto. A .csv file of each survey taken during the LiveSCAN is kept for the user to analyse if required.

All surveys require that there is available disk space inside the SNYPER-LTE Graphyte to store the results of the survey. When the available disk space becomes critically low, the SNYPER Graphyte will not allow a survey to start. Should the SNYPER Graphyte run out of disk space while performing a multiple cycle survey or logging a LiveSCAN, it will save the surveys completed before the disk space ran critically low prior to terminating the survey gracefully. So a 25 cycle survey may only contain 21 surveys on premature completion as an example.

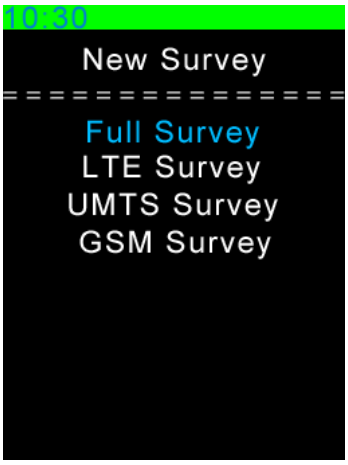
Performing a Single Survey

To perform a single survey using the SNYPER Graphyte, follow the steps below:

Step 1. Select 'Survey' from the main menu and press OK.

Step 2. Use the UP/DOWN buttons to select the type of survey to be performed and press OK.

Figure 22. Selecting survey to perform



Full Survey: Performs a survey of the LTE, UMTS and GSM* networks.

LTE Survey: Performs a survey for the LTE networks only.

UMTS Survey: Performs a survey for the UMTS network only.

GSM Survey: Performs a survey for the GSM* network only.

* GSM is only available on the EU versions of the SNYPER-Graphyte.

Step 3. Cycle option should be set at <1>. Press OK to perform a single survey. When the survey is complete (takes 2-3 minutes), a list of saved results as shown in figure 24 will be displayed.

Figure 23. Selecting survey to perform

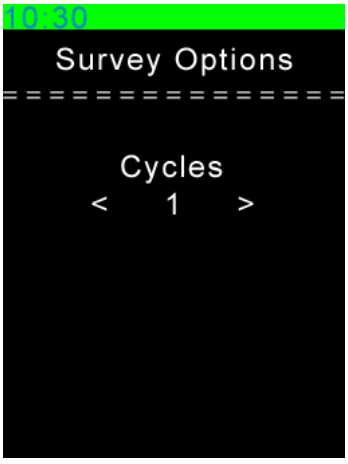


Figure 24. Survey complete

The file format is saved as: Month:Day:Hour:Minute

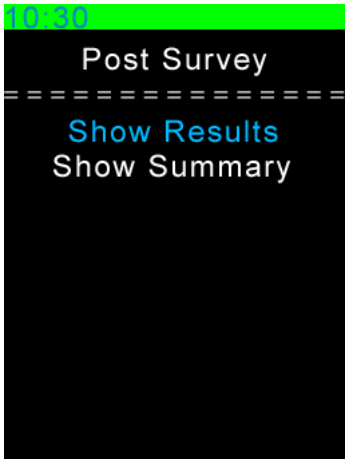
[no extension]: The directory name created into which the survey files will be written.

.CSV: Comma separated value file.

.HTM: HTML web browser file.

Step 4. Press OK to be taken to the post survey menu as show below in figure 25.

Figure 25. Post Survey menu

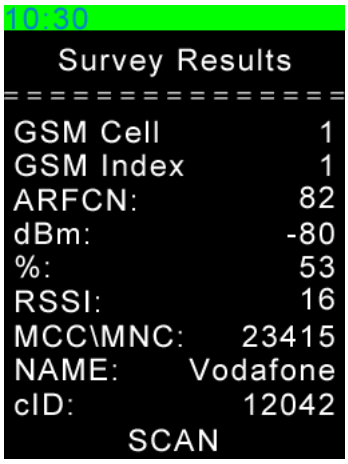


Show Results

Highlight 'Show Results' and press OK. The SNYPER Graphyte will display all results sorted first by technology (GSM/UMTS/LTE) and then with numbered cells from strongest to weakest signal strength. To switch between cells found in the survey, use the LEFT/RIGHT buttons. To see further detail of the cells discovered, use the DOWN button to display further information.

NOTE: GSM is only available on the EU versions of the SNYPER-Graphyte.

Figure 26. Displaying survey results

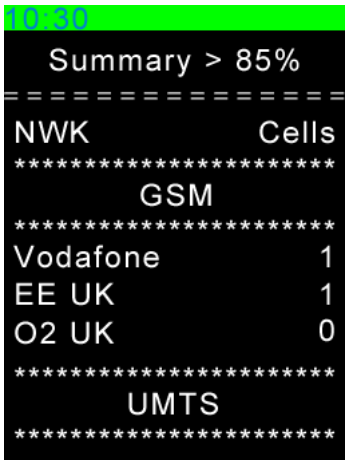


Show Summary

Highlight 'Show Summary' by using the UP and DOWN buttons, and press OK. The SNYPER Graphyte will display the number of cells by cellular network, technology, and signal strength. Use the LEFT/ RIGHT buttons to switch between signal strengths received on the device.

Press the DOWN button to view the summary of results in GSM, UMTS and LTE.

Figure 27. Displaying survey results



NOTE:
Multiple listings may be shown for a network operator. The listing is created by the MCC and MNC, and multiple MCC / MNC's may be assigned to the same network operator. This usually occurs because of network mergers and can therefore be country specific.

The network names database is actively maintained by Siretta. However, it is impossible to follow what is happening with the network operators worldwide so it is possible that in rare cases either the wrong operator name is displayed (in the case of a network being renamed) or an unknown network being discovered (if a new network operator starts operating in the region).

If this happens, in the first case please update the firmware in the SNYPER Graphyte as the latest firmware also has the latest netnames database. If the network name is still incorrect, please put the SNYPER Graphyte into debug mode (see page 36) and repeat the survey. Send both the survey and the log file to 'support@siretta.com' so that the problem/unknown network can be corrected in the database.

Save Results

With default settings, this menu option will not appear as survey results will automatically be saved at the completion of the survey. However, there is a setup option to turn auto save off, in which case the Save Results option appears at the completion of a survey. Use the UP/DOWN buttons to select Save Results and press the OK button to save the results, otherwise the survey results will be lost when the BACK button is pressed.

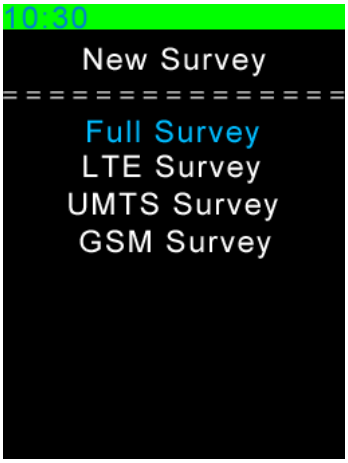
Performing a Multiple Cycle Survey

To perform a multiple survey on your SNYPER Graphyte, follow the steps below:

Step 1. Select 'Survey' from the main menu and press OK.

Step 2. Use the UP/DOWN buttons to select the type of survey to be performed and press OK.

Figure 28. Selecting survey to perform



Full Survey: Performs a survey of the LTE, UMTS and GSM* networks.

LTE Survey: Performs a survey for the LTE network only.

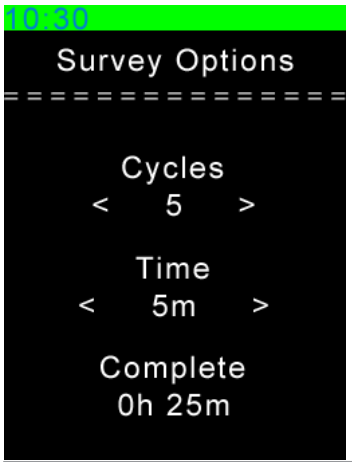
UMTS Survey: Performs a survey for the UMTS network only.

GSM Survey: Performs a survey for the GSM network only.*

* GSM surveys are only possible on the EU versions of the SNYPER-Graphyte.

Step 3. Use the RIGHT button to select number of survey cycles and the DOWN and then RIGHT buttons to select the survey interval (the time between the start of one survey and the start of the next). The estimated time for completion will be shown at the bottom of the display. Press OK to begin survey. For surveys that are expected to take longer than 10 minutes to complete, the SNYPER-Graphyte will suggest that the charger should be connected. If this message is displayed, then OK must be pressed a second time to start the survey.

Figure 29. Selecting multiple survey options



Cycles: Pressing the RIGHT button increments the number of cycles conducted in progressively larger steps. Up to 500 cycle surveys may be conducted.

Time: Use the RIGHT button to increase the time interval in minutes between each survey. Selecting zero (0) for the time interval will perform back to back surveys.

A Multiple Cycle Survey can be interrupted by pressing the back key for at least half a second. Any survey in progress will be completed, so it may take several minutes to stop a multi-cycle survey. If a logging survey is interrupted, any surveys completed before the interruption will be saved and reported.

When the survey is complete, a list of saved results as shown in **figure 30** will be displayed (assuming the default auto-document save settings are used).

Figure 30. Survey complete

The file format is saved as:
Month:Day:Hour:Minute

[no extension]: The directory name created into which the survey files have been written.

.CSV: Comma separated value files.

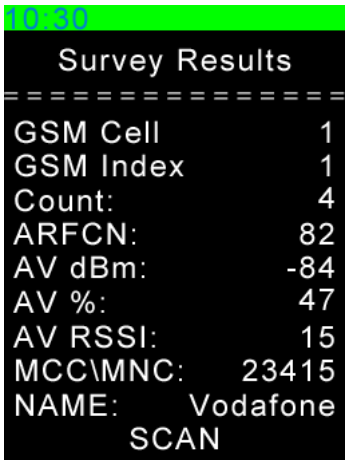
.HTM: HTML web browser files.

Press the BACK key to return to the Post Survey results screen.
Figure <24>. Post Survey

Show Results

Highlight 'Show Results' and press OK. The SNYPER Graphyte will display all results sorted first by technology (GSM/UMTS/LTE) and then with numbered cells from strongest to weakest signal strength. To switch between all signals found in the survey, use the LEFT/RIGHT buttons.

Figure 31. Displaying survey results



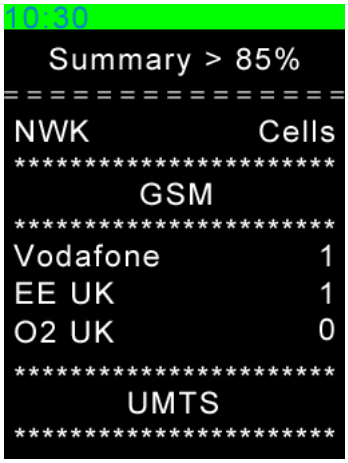
Show Summary

Highlight 'Show Summary' and press OK. The SNYPER Graphyte will display the number of cells by each network in frequency bands. Use the LEFT/ RIGHT buttons to switch between signal strengths received on the device.

Press the DOWN button to view the summary of results in GSM*, UMTS and LTE.

* GSM surveys are only possible on the EU versions of the SNYPER-Graphyte.

Figure 32. Displaying survey results



NOTE:
Multiple listings may be shown for a network operator. The listing is created by the MCC and MNC, and multiple MCC / MNC's may be assigned to the same network operator. This usually occurs because of network mergers and can therefore be country specific.

Save Results

With default settings, this menu option will not appear as survey results will automatically be saved at the completion of the survey. However, there is a setup option to turn auto save off, in which case the Save Results option appears at the completion of a survey. Use the UP/DOWN buttons to select Save Results and press the OK to save the results, otherwise the survey results will be lost when the BACK button is pressed.

LiveSCAN

LiveSCAN works by locking the SNYPER Graphyte's radio receiver to the operating frequency of a cell chosen by the user for monitoring. Once the SNYPER Graphyte locks to the frequency channel that the cell is operating at, a continuous update of the received signal strength of that cell will be reported on the SNYPER Graphyte. The SNYPER Graphyte V2 is additionally able to show RSCP & ECIO (3G) and RSRP & RSRQ (4G).

LiveSCAN can be used in two modes:

» **Directional LiveSCAN**: When conducting LiveSCAN with a directional antenna, moving the antenna horizontally will show the direction with the highest signal strength. A .csv file of each survey taken during the LiveSCAN is stored for analysis if required. A directional antenna covering all frequencies is supplied with the SNYPER Graphyte to perform this task.

» **Omni-directional:** When conducting LiveSCAN with an omni-directional antenna, moving the SNYPER Graphyte to different areas in a building will show "hotspots" with the highest signal strength.

Users are encouraged to use their own antennas when performing a survey or LiveSCAN on the SNYPER Graphyte.

Using the antenna which is intended to be used in the proposed installation will give the best indication of how the antenna will perform. Placing the antenna in potential mounting locations and orientations will allow the operator to make an informed choice about what the best antenna placement is for that installation.

Performing a LiveSCAN

To perform a LiveSCAN using a SNYPER Graphyte, follow the steps below:

Step 1. Conduct a survey of any type using an omni-directional antenna.

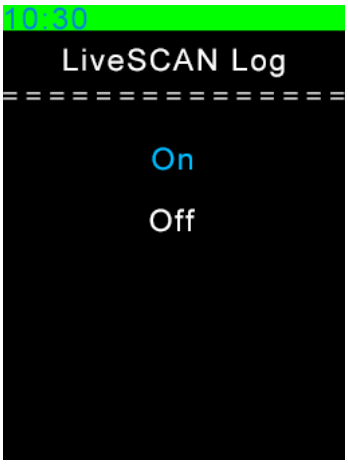
Step 2. When the survey is complete view the results acquired. Use the LEFT/RIGHT buttons to find the survey results of the cell on which a LiveSCAN is to be executed.

Step 3. Connect an appropriate antenna for the survey. This might be the supplied omnidirectional antenna for general signal strength measurement or a directional antenna in order to locate the direction in which the cell being scanned is located. It is recommended that the antenna which is to be installed be used as then the SNYPER Graphyte will see the same signal strengths as the equipment being installed.

Step 4. Press OK to initiate LiveSCAN.

Step 5. The option to log the LiveSCAN measurements is offered. Select 'On' or 'Off' using the UP/DOWN buttons. Press OK to begin LiveSCAN.

Figure 33. LiveSCAN logging

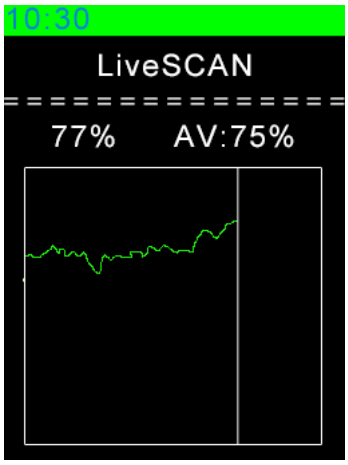


On: Performs a LiveSCAN and logs all captured results. Results will be available to download in .csv format by following the PC Connect steps on page 39.

The first LiveSCAN survey log file is named LL000000.csv, the second LL000001.csv, etc. There is NO .htm file stored for LiveSCAN logging.

Off: Performs a LiveSCAN without logging results.

Figure 34. LiveSCAN in progress



The default LiveSCAN view shows the current signal strength as a % of the maximum possible signal strength, and the average of all readings taken displayed in brackets (again as a %).

The vertical white line scrolls from left to right across the screen and indicates the current measurement position. The green line shows the actual and historical LiveSCAN signal strength measurement data.

Use the UP/DOWN buttons to switch between display modes:

- Signal strength in dBm
- Signal strength RSSI
- Elapsed time (number of measurements)
- Network operator name
- RSCP (3G) or RSRP (4G) - SNYPER Graphyte V2 only
- ECIO (3G) or RSRP (4G) - SNYPER Graphyte V2 only

The signal strength (be it measured as %, dBm or RSSI) is shown at all times as a green line. RSCP/RSRP (SNYPER Graphyte V2 only) will be shown as a red line and ECIO/RSRQ (SNYPER Graphyte V2 only)as a blue line. Should the SNYPER Graphyte be unable to acquire a measurement for any reason then the previous measurement will be repeated as a white dot to indicate that it is an assumed measurement.

IMPORTANT:Always start the LiveSCAN in the manner described from a fresh survey. Conducting LiveSCAN from old surveys or at a different location to that of the survey can cause unpredictable results.The SNYPER Graphyte locks to the frequency of operation of the cell. The frequency is not unique in the network and other cells will use the same frequency. The original SNYPER Graphyte is unable to tell which cell is broadcasting at that frequency so in a moving application the signal strength measured will decrease as the survey moves away from the initially surveyed cell until a point is reached where a new cell operating at the same frequency is entered, at which point the reported signal strength will then increase as the new cell is approached.The SNYPER Graphyte improves the LiveSCAN by also locking to the CellID. However, note that even the CellID cannot be assumed to be unique in a network. It is CellID concatenated with the LAC/TAC that is unique.

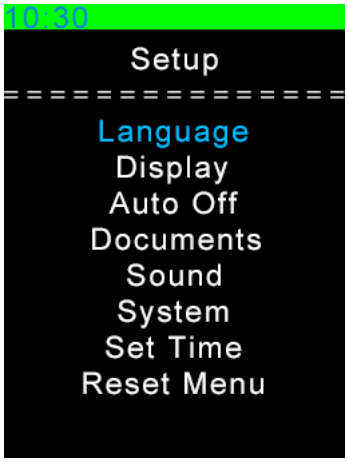
Siretta recommends to conducting a survey first and then running LiveSCAN from that survey.

Press the BACK button to abort LiveSCAN – the SNYPER Graphyte will return to the Survey Results screen. Further LiveSCANs can be conducted by selecting different cells from the survey results.

Setup Menu

By selecting ‘Setup’ from the main menu, the following setup changes can be made (as shown below in figure 35). To select a sub menu use the UP/DOWN button until relevant menu is highlighted, press OK and then use the LEFT/RIGHT buttons to amend preference. Setup options are automatically saved.

Figure 35. ‘Setup’ screen



Language: Language selection of your SNYPER Graphyte. English, German, French, Italian, Spanish. Default = English

Display: Determines the brightness, body text and highlighted text colour.

Brightness: 6 settings for display brightness. 0 (low) - 5 (high).

Body Text: 9 colour settings for body text.

Highlighted Text: 9 colour settings for highlighted text.

Disk Monitor: On or Off. When on, splits the battery capacity bar in two and adds a pale yellow bar showing remaining disk space

Default: Brightness = 5, B-Text = White, H-Text = Blue, Disk Monitor = Off

Auto Off: Is a method of power saving for the SNYPER Graphyte. It controls the automatic powering down of the unit if it has not been used for a period and dimming of the display to reduce power. This can be useful where the Graphyte has been left to do a survey without a charging supply to maintain the battery. This may be set to on or off. When set to off, the Graphyte will only power off when the user turns the power off from the keypad (or the battery runs flat). When set to off, the delay setting has no effect.

When set to on, the Graphyte will automatically turn itself off after a period of inactivity set by the delay setting. Surveying or pressing a button is counted as activity and resets the delay timer. The Graphyte will never turn itself off while conducting a survey, only after the survey completes and the subsequent delay timer expires. Note that when conducting a long survey, it is still recommended that the Graphyte be connected to a power source to prevent the battery from completely discharging during the survey.

Delay: This is the delay in minutes. Valid settings are 1, 2, 3, 4, 5, 6, 7, 8 or 9. The delay counter is reset while a survey is in progress or by a button press.

Auto Dim: This is the delay in minutes for the display to dim to a point where it is barely readable. Pressing any button on the keypad resets the timer, and if the display has dimmed will restore the displays brightness setting.

Default: Auto Off = On, Delay = 2, Auto Dim = 2

Documents: Following every survey, the user can save the survey files on the SNYPER Graphyte.

HTML: Save files in HTML format, this can be set to ON or OFF.

CSV: Other file formats such as .XML files can be created by first opening the .CSV file in Microsoft Excel and then saving/exporting into the desired format.

Auto Save: Valid settings are ON and OFF. This controls if files are automatically saved or not after a survey is conducted. If auto save is turned OFF, there will be a menu option displayed after every survey to allow that survey's results to be saved.

Default: HTML = On, CSV = On, Auto Save = On

Sound: SNYPER Graphyte and keypad sound.

Sound: Notification sound, this can be set to ON or OFF.

Keypad: Keypad sound, this can be set to ON or OFF.

Default: Sound = On, Keypad = On

System: The System function is used to operate the Graphyte in various modes, giving the user more information on the surveys.

Mode: The SNYPER Graphyte can report results in Standard, Advanced or Engineer mode. See 'Mode' section below.

Debug Log: This may be set to On or Off. Siretta Support may request that this be enabled, otherwise leave the setting off. If enabled, a debug file is created. The file is named 'DBGLOG.SCR' and is found in the root of the Graphyte file system. The file is a proprietary file format that can only be interpreted by Siretta support. Turning debug log on will cause surveys to take a little longer to complete.

The 'DBGLOG.SCR' file can grow very rapidly, so please only enable this when requested to do so. Turning debug log off will delete the log file, so please make sure that the log file has been copied from the SNYPER Graphyte before doing this.

Default: Mode = On, Debug Log = Off

Set Time: Date and time can be set using the UP/DOWN buttons.

Date: YYYY\MM\DD

Time: HH:MM:SS

Reset Menu

Factory Reset: Resets the SNYPER Graphyte to factory settings.

NOTE: Performing factory reset will delete all saved files from the SNYPER Graphyte's internal memory.

Factory reset does not reset the date and time, nor does it revert the software in the unit to the factory supplied version if it has been updated by the user. These are the only aspects of the Graphyte unaffected by a factory reset.

Delete Surveys: Deletes all stored surveys of all types when selected and OK pressed.

Mode

This has three settings, Standard, Advanced and Engineer. The factory default is standard. These modes determine what cell parameters are shown in the surveys. Additional parameters are shown on the results screen of the SNYPER Graphyte and in the HTM and CSV files.

Standard Mode - This is the default shown throughout the manual.

Advanced Mode - This additionally shows BSIC for GSM (2G) surveys; SCR, RSCP and ECIO for UMTS (3G) surveys; PhyCellID, RSRP, RSRQ and BW for LTE (4G) surveys.

Engineer - In addition to the extra information shown in advanced mode, this shows the DL and UL frequencies in MHz (calculated from the xRFCN) for all surveys.

See **table 6** below for breakdown of information provided in each mode.

For full description of survey parameters, see SNYPER Survey Terminology:
https://www.siretta.com/snyper-survey-terminology

Table 6. Breakdown of information provided

	Standard	Advanced	Engineer
Index - Survey index number assigned by the SNYPER-Graphyte (not obtained from the cellular network).	✓	✓	✓
Network - Name of the network provider	✓	✓	✓
MCC - Mobile Country Code being received	✓	✓	✓
MNC - Mobile Network Code being received	✓	✓	✓
dBm - Received signal strength. Signal strength ranges from -113 dBm to -51 dBm (GSM), -115 dBm to -25 dBm (UMTS); -100 dBm to -25 dBm (LTE). The less negative the number, the stronger the signal strength.	✓	✓	✓
RSSI - Received Signal Strength Indicator (Values range from 0 - 31 (GSM); 0 - 91 (UMTS); 0- 76 (LTE), the higher the number the higher the signal strength.)	✓	✓	✓
Signal - Received signal strength expressed as a percentage of the dBm signal strength range, where the higher the percentage, the greater the signal strength.	✓	✓	✓

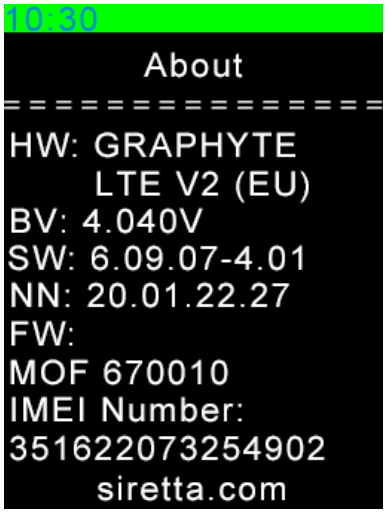
Table 6 (continued). Breakdown of information provided

	Standard	Advanced	Engineer
Band - Frequency band being received	✓	✓	✓
ARFCN - Absolute Radio Frequency Channel Number being received (GSM)	✓	✓	✓
UARFCN - UTRA Absolute Radio Frequency Channel Number being received (UMTS)	✓	✓	✓
EARFCN - E-UTRA Absolute Radio Frequency Channel Number being received (LTE)	✓	✓	✓
Cell ID - Cell ID of the network cell discovered	✓	✓	✓
SCR - Scrambling Code (UMTS)		✓	✓
LAC - Location Area Code (GSM & UMTS)	✓	✓	✓
TAC - Tracking Area Code (LTE)	✓	✓	✓
BSIC - Base Station Identity Code (GSM)		✓	✓
RSCP - Received Signal Code Power (UMTS)		✓	✓
ECIO - Ratio of Energy Chip / Interference in dB (UMTS)		✓	✓
RSRQ - Reference Signals Received Quality (LTE)		✓	✓
RSRP - Reference Signals Received Power (LTE)		✓	✓
BW - Channel Bandwidth in MHz (LTE)		✓	✓
DL – Channel Download Frequency			✓
UL - Channel Upload Frequency			✓

About Menu

By selecting 'About' from the main menu, information about the SNYPER Graphyte will be displayed (as shown below in **figure 36**).

Figure 36. 'About' screen



HW: SNYPER Graphyte hardware version.

BV: Measured battery voltage.

SW: Current application and boot loader software versions running on the SNYPER Graphyte.

NN: The current list of global network names stored on your SNYPER product as of the displayed date (dd.mm.yy).

FW: SNYPER Graphyte firmware version

IMEI Number: The unique IMEI number of the SNYPER Graphyte.

PC Connect

The PC Connect feature allows surveys stored on the SNYPER-Graphyte to be downloaded onto a PC using a USB connection.

When connected to a PC using a USB cable, the SNYPER-Graphyte is put into a mode where it appears to be a USB memory stick. Then saved files may be copied from the SNYPER-Graphyte file system to the PC. Files that will be available are HTML and CSV format files containing the collected survey data (when using the default settings). Note that creating and saving these files may be disabled under the Documents setup option.

To download data from the SNYPER Graphyte follow the steps below:

Step 1. Connect the supplied USB cable to the SNYPER Graphyte and PC.

Step 2. Select 'PC Connect' from the main menu, and use the RIGHT button to enable PC Connect.

Depending on how the PC is configured, Windows Explorer may open automatically with a drive named 'GRAPHYTE'. If Windows Explorer does not open automatically, open it by pressing and holding the Windows key and 'e'. A new drive called 'GRAPHYTE' will be visible, containing one directory with the same name as the files saved.

Figure 37. Prepare for data download

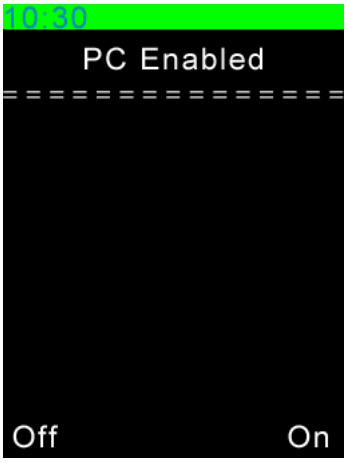
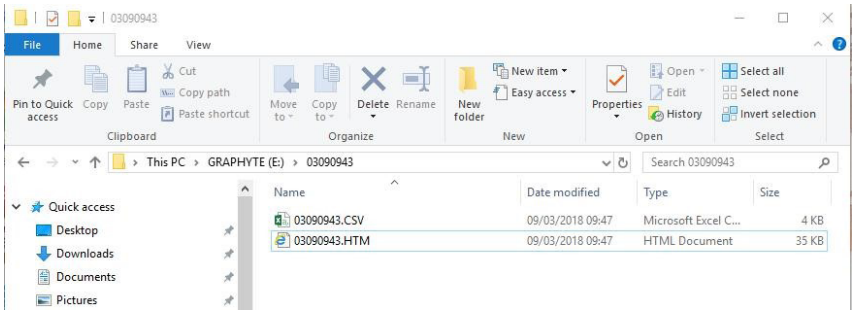


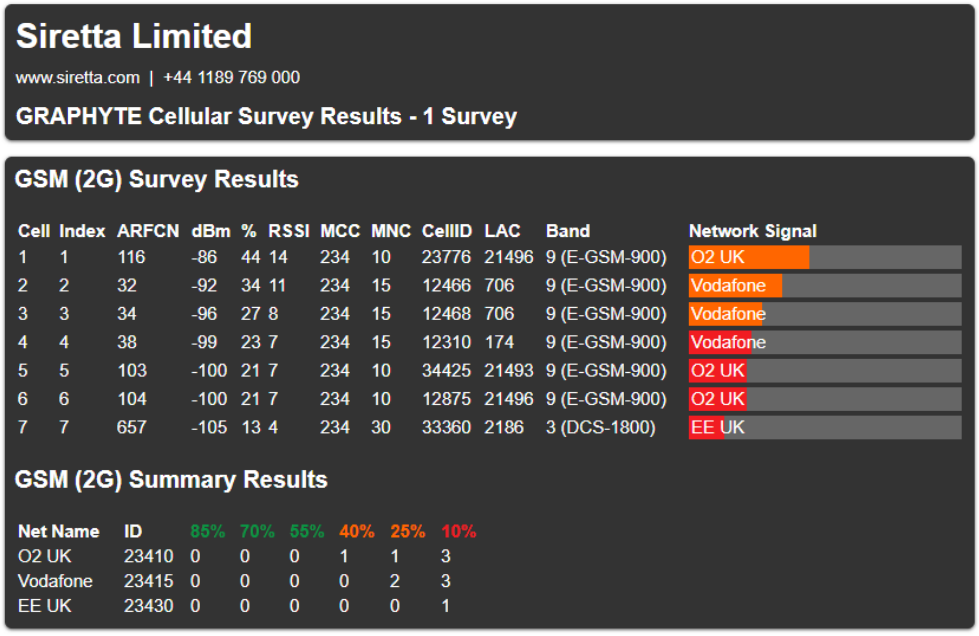
Figure 38. SNYPER-Graphyte connected to a PC



Step 3. Use copy and paste to transfer files from the SNYPER Graphyte to the desired location on the PC.

Step 4. Double click the .htm file to open it using the default web browser on the PC. Results will be shown similar to those shown below.

Figure 39. HTML results



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GRAPHYTE Cellular Survey Results - 1 Survey

GSM (2G) Survey Results

Cell	Index	ARFCN	dBm	%	RSSI	MCC	MNC	CellID	LAC	Band	Network Signal
1	1	116	-86	44	14	234	10	23776	21496	9 (E-GSM-900)	O2 UK
2	2	32	-92	34	11	234	15	12466	706	9 (E-GSM-900)	Vodafone
3	3	34	-96	27	8	234	15	12468	706	9 (E-GSM-900)	Vodafone
4	4	38	-99	23	7	234	15	12310	174	9 (E-GSM-900)	Vodafone
5	5	103	-100	21	7	234	10	34425	21493	9 (E-GSM-900)	O2 UK
6	6	104	-100	21	7	234	10	12875	21496	9 (E-GSM-900)	O2 UK
7	7	657	-105	13	4	234	30	33360	2186	3 (DCS-1800)	EE UK

GSM (2G) Summary Results

Net Name	ID	85%	70%	55%	40%	25%	10%
O2 UK	23410	0	0	0	1	1	3
Vodafone	23415	0	0	0	0	2	3
EE UK	23430	0	0	0	0	0	1

Step 5. To disable the PC connection, select ‘Disable’ on the SNYPER Graphyte and remove the USB cable.

The SNYPER Graphyte will now be back to stand alone mode.

Press the back button on the SNYPER Graphyte product to return to the ‘Main Menu’.

NOTE: When the SNYPER Graphyte is connected to the PC, deleting files from the SNYPER-Graphyte file system will not delete the files from the SNYPER Graphyte’s internal memory. The files may be recreated using the ‘Export Results’ function, see page 23.

Viewing Single Survey Results on a PC

A single survey will create 2 files in a new directory. The directory created will be in the root of the Graphyte's file system and the name of the directory and files will be the date and time. The files will be in .HTML and .CSV format.

.HTML Report

The information recorded in the .htm report will depend on the survey type performed.

Figure 40. .HTML report

GSM (2G) Survey Results

Cell	Index	ARFCN	dBm	%	RSSI	MCC	MNC	CellID	LAC	Band	Network Signal
1	1	104	-47	100	31	234	10	12875	21496	9 (E-GSM-900)	O2 UK
2	2	92	-47	100	31	234	15	12466	706	9 (E-GSM-900)	Vodafone
3	3	90	-63	81	25	234	15	12468	706	9 (E-GSM-900)	Vodafone
4	4	114	-64	79	24	234	10	22875	21496	9 (E-GSM-900)	O2 UK
5	5	121	-66	76	24	234	10	32875	21496	9 (E-GSM-900)	O2 UK
6	6	98	-71	68	21	234	15	12467	706	9 (E-GSM-900)	Vodafone
7	7	657	-72	66	20	234	30	33360	2186	3 (DCS-1800)	EE UK
8	8	116	-74	63	20	234	10	23776	21496	9 (E-GSM-900)	O2 UK
9	9	82	-78	56	17	234	15	12042	37	9 (E-GSM-900)	Vodafone
10	10	85	-86	44	14	234	15	28567	706	9 (E-GSM-900)	Vodafone
11	11	96	-87	42	13	234	15	9244	706	9 (E-GSM-900)	Vodafone
12	12	111	-88	40	12	234	10	18158	21496	9 (E-GSM-900)	O2 UK
13	13	95	-89	39	12	234	15	57326	317	9 (E-GSM-900)	Vodafone
14	14	108	-90	37	11	234	10	34831	21496	9 (E-GSM-900)	O2 UK
15	15	666	-95	29	9	234	30	53175	2027	3 (DCS-1800)	EE UK
16	16	75	-96	27	8	234	15	8644	37	9 (E-GSM-900)	Vodafone
17	17	661	-96	27	8	234	30	11357	2186	3 (DCS-1800)	EE UK
18	18	73	-97	26	8	234	15	26550	706	9 (E-GSM-900)	Vodafone

GSM (2G) Summary Results

Net Name	ID	85%	70%	55%	40%	25%	10%
O2 UK	23410	1	3	4	4	6	6
Vodafone	23415	1	2	4	6	9	9
EE UK	23430	0	0	1	1	3	3

.CSV Report

The information recorded in the .CSV report will depend on the survey type performed. The information contained is the same as the .HTML file, however in spreadsheet format. Additionally, the .csv file reports a timestamp field, which is the UNIX time version of the file creation time.

Figure 41. .CSV report

==========												
Siretta Limited												
==========												
GRAPHYTE Network Survey Results												
www.siretta.com												
+44 1189 769 000												
Survey Type	Full											
File Created	04/03/2020 17:01											
IMEI Number	'351622073254829											
Hardware Version	'SNYPER-LTE Graphyte (EU)											
Application Version	'6.10.10											
Firmware Version	'20.00.406											
Filename	'03041658.csv											
Timestamp	'1583341281											
==========												
2G Survey Results												
==========												
Index:	ARFCN:	dBm:	%:	RSSI:	MCC:	MNC:	CellID:	LAC:	Band N	Band:	Net Name:	Signal:
1	116	-86	44	14	234	10	23776	21496	9	E-GSM-900	O2-UK	|||||||||||
2	32	-92	34	11	234	15	12466	706	9	E-GSM-900	Vodafone	|||||||||

Viewing Multiple Cycle Survey Results on a PC

A multiple cycle survey will create 3 files in a new directory. The directory created will be in the root of the SNYPER Graphyte's file system and the name of the directory and files will be coded with date and time identifiers.

For mulltiple cycle surveys, there is an additional .CSV file containing all the data logged from all the individual surveys. This larger .CSV file has the letter 'L' as its first character to indicate that it contains all the logged data.

.HTML Report

The information recorded in the .HTML report will depend on the survey type you performed. Multiple cycle surveys also report the following:

» 'Seen' column - Count of how many surveys that each cell appeared in, and in brackets what percentage of surveys that represents.

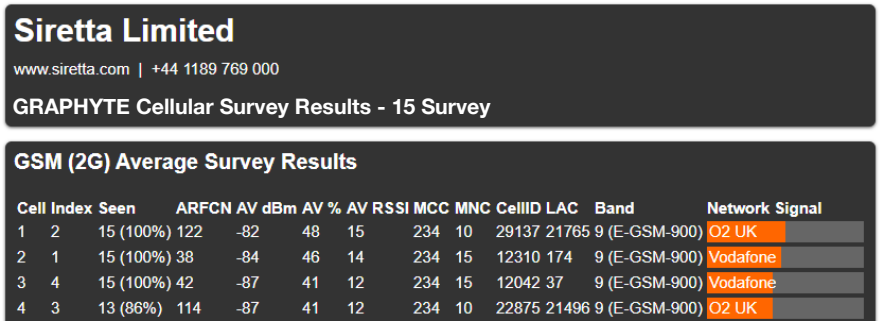
» dBm, % and RSSI column - Average signal strength of these parameters. Surveys where the cell was not detected are not included in the average.

» Summary results are based on the average % of the seen cells.

» At the bottom of each section there is a signal log. This shows how a cells signal strength varies over time.

NOTE - With large logs, these graphs can get very busy. Similar plots may be generated by the user using the .csv file that is generated, where user filters can be applied to make interpretation easier.

Figure 42. .HTML report



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GRAPHYTE Cellular Survey Results - 15 Survey

GSM (2G) Average Survey Results

Cell	Index	Seen	ARFCN	AV dBm	AV %	AV RSSI	MCC	MNC	CellID	LAC	Band	Network	Signal
1	2	15 (100%)	122	-82	48	15	234	10	29137	21765	9 (E-GSM-900)	O2 UK	
2	1	15 (100%)	38	-84	46	14	234	15	12310	174	9 (E-GSM-900)	Vodafone	
3	4	15 (100%)	42	-87	41	12	234	15	12042	37	9 (E-GSM-900)	Vodafone	
4	3	13 (86%)	114	-87	41	12	234	10	22875	21496	9 (E-GSM-900)	O2 UK	

Hovering over a data point on the graph with the mouse shows more information about that data point: The survey number, the network with index number in brackets, and the signal strength.

On a 50 or greater cycle survey, 'Summary Graph Data' and 'Detailed Graph Data' option buttons are displayed. The Summary Graph Data can be selected for 50+ cycle surveys, this cuts out some data points in order to de-clutter the view. The detailed graph view is the view used for surveys below 50 cycles. The Detailed Graph Data is the view used for surveys below 50 cycles.

NOTE - In both views, where there are multiple data points with the same signal strength it is only possible to display one data point (the strongest is chosen). Networks are colour coded.

Figure 43. Summary Graph Data

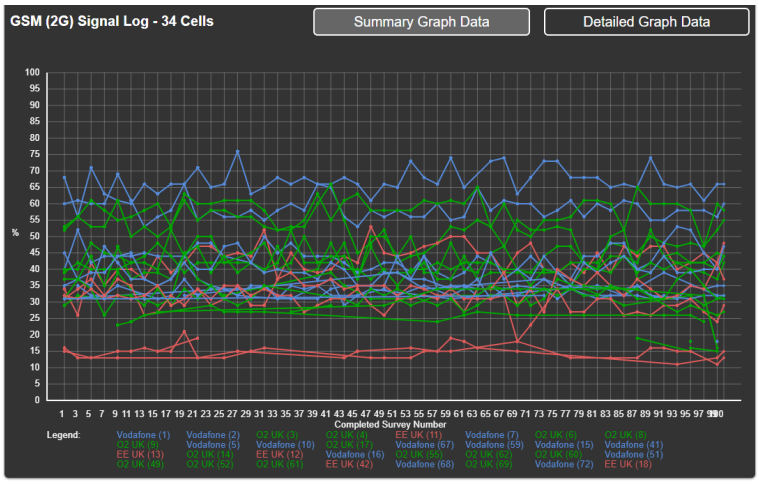
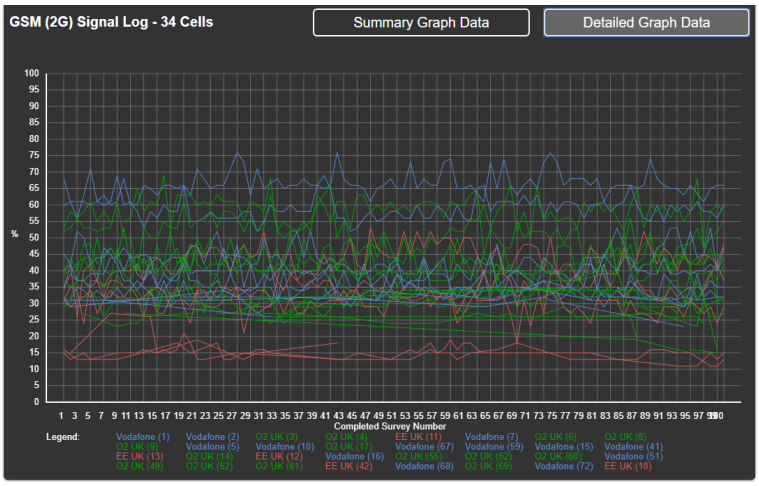


Figure 44. Detailed Graph Data



.CSV Report

There are two .CSV files produced by a multiple cycle survey. The first is very similar to the single cycle survey and the file name has the same format. This contains the averaged summary of all the cell measurements.

Figure 45. .CSV report

==========													
Siretta Limited													
==========													
GRAPHYTE Network Survey Results													
www.siretta.com													
+44 1189 769 000													
Survey Type	Full												
File Created	12/05/2022 17:01												
IMEI Number	'351626102384184												
Hardware Version	'GRAPHYTE LTE V2 (EU)												
Application Version	'6.10.10												
Firmware Version	'M0F.670010												
Filename	'05121651.csv												
Timestamp	1652374861												
Surveys	'5/5												
==========													
2G Survey Results													
==========													
Index:	Num Cells:	ARFCN:	AV dBm:	AV %:	AV RSSI:	MCC:	MNC:	CellID:	LAC:	Band Num:	Band:	Net Name:	Signal:
2	4 (80%)	12	-73	63	20	234	15	7568	304	8	E-GSM-900	Vodafone	|||||||||||||||
1	1 (20%)	116	-75	61	19	234	10	20184	21481	8	E-GSM-900	O2 - UK	|||||||||||||||
31	4 (80%)	10	-77	57	18	234	15	6053	304	8	E-GSM-900	Vodafone	|||||||||||||||
33	4 (80%)	119	-81	50	16	234	10	35251	21481	8	E-GSM-900	O2 - UK	|||||||||||||

The second file can be recognised by the first character of the file name being changed to ‘L’ to indicate that it contains logging data. The header follows the same format as the first .CSV file. It differs from the first in that it contains all the measurements taken during the logging process. This means that there are extra columns of data including index, timestamp and network.

Figure 46. .CSV logging report

==========															
Siretta Limited															
==========															
GRAPHYTE Network Survey Results															
www.siretta.com															
+44 1189 769 000															
Survey Type	Full														
File Created	12/05/2022 16:54														
IMEI Number	'351626102384184														
Hardware Version	'GRAPHYTE LTE V2 (EU)														
Application Version	'6.10.10														
Firmware Version	'M0F.670010														
Filename	'L5121651.csv														
Timestamp	1652374461														
Survey:	Timestamp:	Network:	Index:	xRFCN:	dBm:	%:	RSSI:	MCC:	MNC:	CellID:	LAC/TAC:	Band Num:	Band:	Net Name:	Signal:
1	12/05/2022 16:54	2G	1	116	-75	61	19	234	10	20184	21481	8	E-GSM-900	O2 - UK	|||||||||||||||
1	12/05/2022 16:54	2G	2	12	-77	58	18	234	15	7568	304	8	E-GSM-900	Vodafone	|||||||||||||||
1	12/05/2022 16:54	2G	3	667	-84	46	15	234	30	31755	2185	3	DCS-1800	EE	|||||||||||
1	12/05/2022 16:54	2G	4	666	-88	40	13	234	30	20023	2185	3	DCS-1800	EE	|||||||||

Viewing LiveSCAN Results on a PC

If LiveSCAN logging was enabled while conducting a LiveSCAN the logged results are found in the same directory as the survey logs. There is no .htm version of the LiveSCAN log, only a .CSV file.

The first LiveSCAN survey log file is named LL000000.CSV, the second LL000001.CSV, etc.

Each reading taken in the LiveSCAN survey takes around several seconds to complete. For this reason, there is not an entry in the log for every second.

Figure 47. LiveSCAN report

================				
Siretta Limited				
================				
GRAPHYTE LiveSCAN Survey Results				
www.siretta.com				
+44 1189 769 000				
File Created	04/03/2020 17:42			
IMEI Number	'351622073254829			
Hardware Version	'SNYPER-LTE Graphyte (EU)			
Application Version	'6.8.51			
Firmware Version	'20.00.404			
Filename	'LL000000.csv			
Timestamp	'1583343742			
Network	O2 UK			
Technology	GSM			
ARFCN = 122	MCC = 234	MNC = 10	CELLID = 29137	
Index	2			

Power Off

After use, remember to power off the SNYPER Graphyte. The device can be powered off in the following 2 ways:

» Selecting the 'Power Off' option from the main menu. The device will display a power off message as shown below in **figure 48**.

Figure 48. Select 'Power Off'

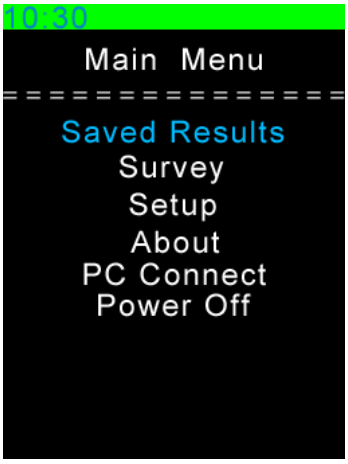
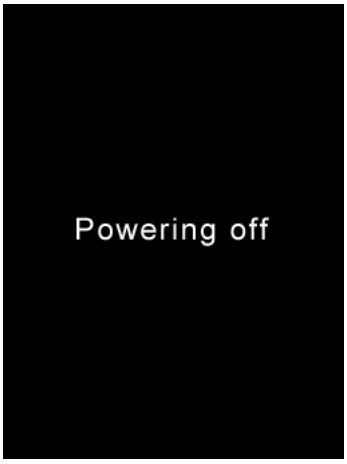


Figure 49. Power off message

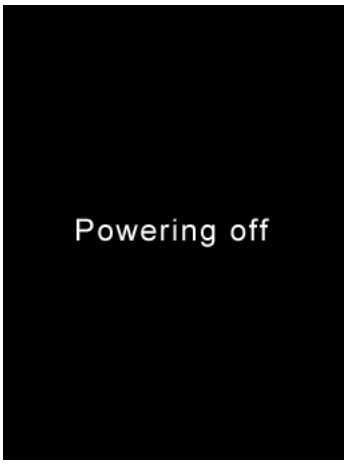


» Press and hold the ON/OFF button on the device for >2 seconds. The screen will display a power off message as shown below in **figure 51**.

Figure 50. ON/OFF button

ON/OFF Button

Figure 51. Power off message



Updating the SNYPER Graphyte Software

From time to time Siretta may make software updates available for the SNYPER Graphyte. Normally, these software updates will be made available as a complimentary service on the Siretta website. Updated Software may contain improvements and/or new features.

WARNING: Updating the software could cause loss of survey data. Please back up any surveys to a PC before starting the software upgrade procedure. User settings are retained throughout the upgrade process.

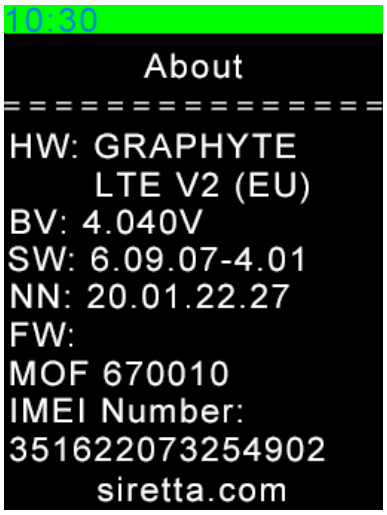
To perform a software update, follow the steps below:

Step 1. Go to "https://www.siretta.com/software-library/?tab=SNYPER-Plus-Software-Update" and download and save latest SNYPER Graphyte software.

The software version is part of the file name. For example, the file name for Version 6.10.10 software is SnyperV06_10_10.v6u. If the software has been supplied in a compressed file format such as a .zip or .rar file, it should be uncompressed before use.

Step 2. Verify that the new software is an update before proceeding further. You can do this by checking the 'About' menu on the SNYPER Graphyte.

Figure 52. Current software version



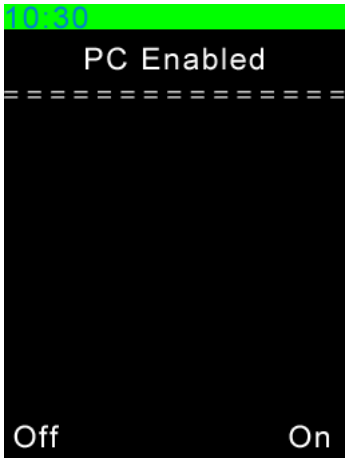
Here the software version shown is 6.09.07, so 6.10.10 will be an upgrade.

Step 3. Connect supplied USB cable to the SNYPER Graphyte and PC.

Step 4. Select ‘PC Connect’ from the main menu, and use the RIGHT button to enable PC Connect.

Depending on how your PC is configured, Windows Explorer Windows may open automatically with a drive named ‘GRAPHYTE’. If Windows Explorer does not open automatically, open it by pressing and holding the Windows key and ‘e’.

Figure 53. Enabling PC connect



The SNYPER Graphyte will turn on its USB port and appear as a USB drive named ‘Graphyte’ on the PC.

Step 5. Ensure that there are less than 250 files on the Graphytes drive otherwise the upgrade process will not be able to complete. Reminder: performing a software upgrade could cause loss of data, so it is always a good idea to at least back up if not remove all files from the Graphyte before proceeding further.

Step 6. Copy the new software file to the Graphyte USB drive.

Step 7. Disconnect the SNYPER Graphyte from the PC by clicking the LEFT button, this will disable the USB drive connection. Do not physically unplug the USB cable until the update process has completed, so that power is supplied to the Graphyte throughout the update process.

Step 8. Press the back button to initiate software update.

Step 9. A prompt will ask to confirm the software update. Click the RIGHT button to confirm performing a software update.

Figure 54. Confirm software update

Once the software update has been confirmed, the process will begin automatically. A progress bar will be displayed whilst the software update is installing, this will take approximately 25 seconds.

Figure 55. Progress bar

Once the software update is complete, the SNYPER Graphyte will turn off for approximately 60 seconds then power itself on.

Step 10. Confirm the software has updated by checking the 'About' menu. If successful, the SNYPER Graphyte is now ready for use.

If the software update was not successful, please contact your Siretta support representative.

Safety and Product Care

General Precautions

» Do not exceed the environmental and electrical limits as specified.

» Avoid exposing your SNYPER Graphyte product to lit cigarettes, naked flames or to extreme hot or cold temperatures.

» Never try to dismantle your SNYPER Graphyte product. There are no components on your SNYPER Graphyte product that can be serviced by the user. If you attempt to dismantle your SNYPER Graphyte product, you will invalidate the warranty.

» Do not connect any incompatible component or product to your SNYPER Graphyte product signal analysers.

Safety Recommendations

PLEASE READ CAREFULLY

Be sure the use of this product is allowed in the country intended and the environment required. The use of this product may be dangerous and has to be used with caution in the following areas:

» Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc

» Where there is risk of explosion such as gasoline stations, oil refineries, gas works etc

It is responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product, any mark of tampering will compromise the warranty.

Should there be any doubt, please refer to the technical documentation and the regulations in force.

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Please refer to the Siretta Ltd website for the latest software and documents.

Definitions

Term	Definition
2G	2nd Generation Mobile Telecommunications
3G	3rd Generation Mobile Telecommunications
4G	4th Generation Mobile Telecommunications
5G	5th Generation Mobile Telecommunications
ARFCN	Absolute Radio Frequency Channel Number
BSIC	Base Station Identity Code
CID	Cell Identity
dBm	Measured signal strength of the network in dBm
DL	Signal download frequency
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
ECIO	Ratio of Energy Chip / Interference (broadband) in dB
EDGE	Enhanced Data rates for GSM Evolution
E-UTRA	Evolved UMTS Terrestrial Radio Access
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HSDPA	High Speed Downlink Packet Access
HSPA+	Evolved High-Speed Packet Access
IMEI	International Mobile Equipment Identity
ITU	International Telecommunication Union
LAC	Location Area Code (GSM & UMTS)
LAI	Location Area Identification
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LTE	Long Term Evolution
MCC	Mobile Country Code
MNC	Mobile Network Code
MNO	Mobile Network Operator
PCI	Physical layer Cell Identity
RSCP	Received Signal Code Power
RSRP	Reference Signals Received Power (LTE)
RSRQ	Reference Signals Received Quality
RSSI	Received Signal Strength Indicator
SCR	Basestation Scrambling Code
SIM	Subscriber Identity Module
SMA	Sub Miniature version A
TAC	Tracking Area Code (LTE)
UARFCN	UTRA Absolute Radio Frequency Channel Number
UL	Signal upload frequency
UMTS	Universal Mobile Telecommunications System (Same as 3G)
USB	Universal Serial Bus
UTRA	Universal Terrestrial Radio Access

For full list of SNYPER glossary terms see:

https://www.siretta.com/snyper-glossary

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