



Enabling Industrial IoT



SNYPER-LTE Graphyte

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

User Manual

Rev 1.6



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Introduction

This user manual will cover all the aspects of the features, setup and use of the SNYPER-LTE Graphyte (EU) and SNYPER-LTE Graphyte (USA). 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 6.09.10 – 4.01 loaded. Operation with other software versions may be different.

Overview

What's in the Box?

- 1 SNYPER-LTE Graphyte with support cradle underneath
- 2 PSU with 4 Adapter Heads
- 3 2x USB cables - 0.5m and 1.8m
- 4 USB Cable Charger
- 5 Omni-directional Antennas - General Purpose (Black) and 2600MHz (Silver/Grey)
- 6 Directional Antenna
- 7 Extension Cable for Directional Antenna
- 8 Tripod

Figure 1. SNYPER-LTE-Graphyte case contents





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) is a complementary product designed to survey the cellular networks in the USA. 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 - LTE models only). Additionally, both normal and LiveSCAN modes may be run continuously, logs of all measurements taken saved, and html 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 8) 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.



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.
- » 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

Total SNYPER Graphyte Survey Storage

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

If you perform multi-cycle surveys 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 and if you want to conserve disk space you can choose to only save one type of file during a survey.

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.

Default settings used in 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 activated

LiveSCAN Logs: No LiveSCAN logs involved due to variability of disk usage vs. time

Debug Logs: No Debug logs involved due to variability of disk usage vs. time

Density of Cell Towers: A major variable is the number of cell towers present in the local area being surveyed.

The incidence of cell tower presence will vary from “many” in large cities to “sparse” in rural areas and the disk usage on the SNYPER Graphyte will vary as a result of the number of cell towers available.

Example 50 cycle survey in engineering mode used a total of 337 KB and took 100 minutes to complete at the fastest survey setting.



Specifications

Table 2. Specifications of SNYPER-LTE Graphyte

	SNYPER-LTE Graphyte (EU)	SNYPER-LTE Graphyte (USA)
2G/GSM supported bands:	B3 – 1800 MHz (DCS) B8 – 900 MHz (Extended GSM)	Not supported
3G/UMTS supported bands:	B1 – 2100 MHz (IMT) B8 – 900 MHz (Extended GSM)	B2 – 1900 MHz (PCS) B5 – 850 MHz (Cellular)
4G/LTE supported bands:	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)
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**	
Battery:	2000mAh Lithium Ion	
Voltage:	3.7V	
IP rating:	30	
USB connector:	Mini-B	
Current draw:	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.

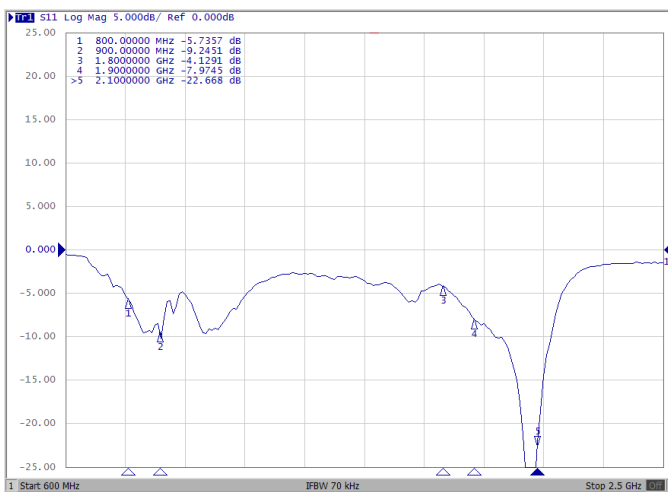


Directional Antenna Characteristics

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



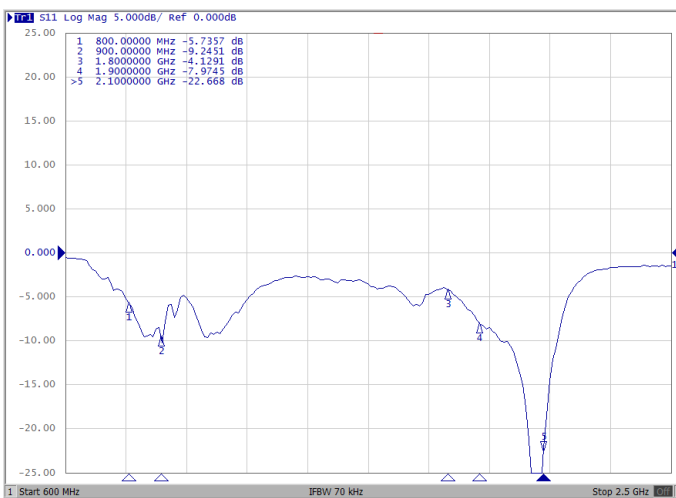
Omni-directional Antenna Characteristics

General Purpose Antenna (Black)

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

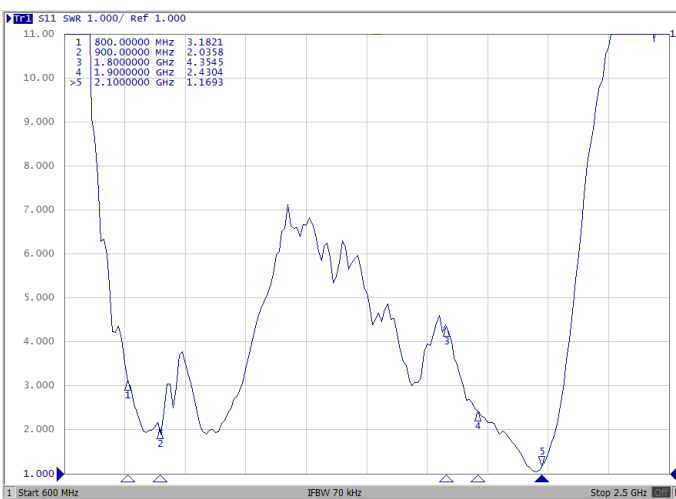
Black Antenna - Return Loss Graph

Figure 4. Return loss graph



Black Antenna - VSWR Graph

Figure 5. VSWR graph

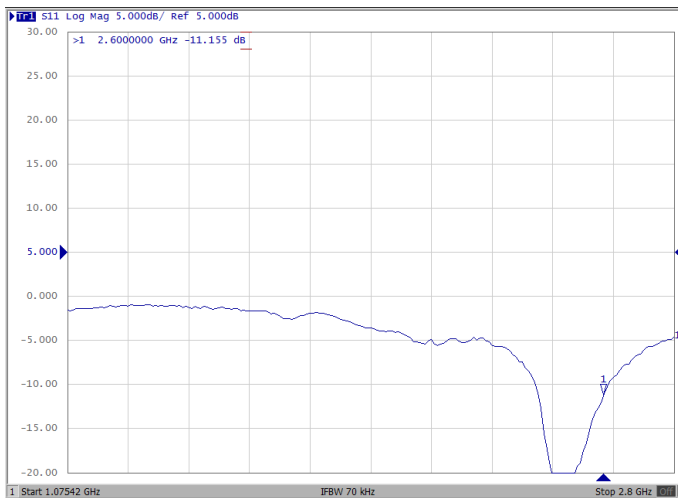


General Purpose Antenna (Light Grey)

The characteristics of the light grey general purpose antenna are shown below.

Light Grey Antenna - Return Loss Graph

Figure 6. Return loss graph



Light Grey Antenna - VSWR Graph

Figure 7. VSWR graph





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



*Although there is a SIM slot, **NO** SIM card is required to operate the SNYPER Graphyte.



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 you charge the internal battery 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.
- » On power up, the welcome screen will be displayed briefly (figure 12 shows the SNYPER-LTE Graphyte (EU) splash screen and figure 13 shows the SNYPER-LTE Graphyte (USA) splash screen).

Figure 11. Power on



Figure 12. EU splash screen



Figure 13. USA 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 for your time zone. See [page 32](#) for more information.

Charging and Battery Status

Approximately 4 - 6 hours are needed to fully charge your SNYPER. The device will be charged when it is plugged into a USB power source - the supplied AC adaptor or the USB host port on a PC or similar. The device's battery provides up to 48 hours use between charges, based on 20 surveys/day.

Battery charging is indicated by a '+' sign on the right of the battery status bar. 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 14. 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 3. 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

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.

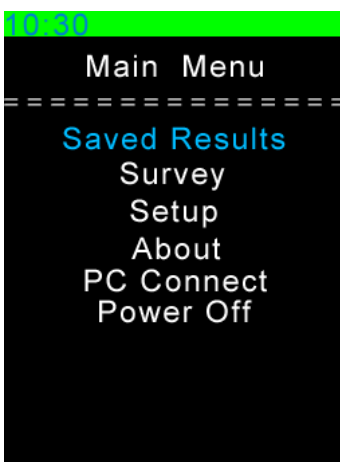
Please contact Siretta for repair instructions.



Main Menu

Your SNYPER main menu has 6 menus (as shown below in **figure 15**), 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 15. 'Main Menu' screen



Saved Results: Access saved survey.

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.

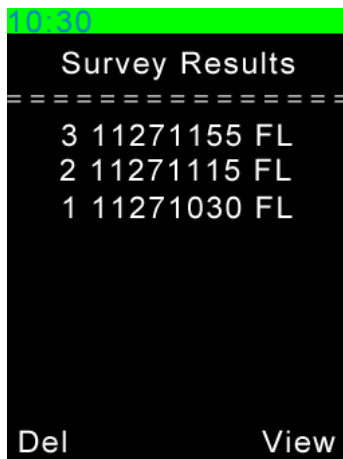
PC Connect: Connects device to a PC as a memory stick to allow download of reports and updating of software.

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.

Figure 16. 'Saved Surveys' screen



Deleting a Saved Survey

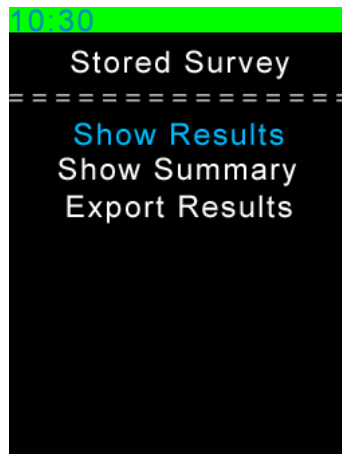
To delete a saved survey, highlight the survey you wish to delete and press the left navigation button. This will delete the survey from the SNYPER Graphyte.

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

Viewing a Saved Survey

To view a survey, highlight it and press the OK or right navigation button. You will be taken to the 'Stored Survey' menu as shown below in figure 17.

Figure 17. 'Saved Surveys' screen

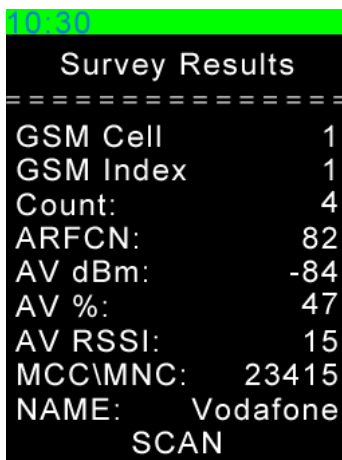




Show Results

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.

Figure 18. Displaying survey results



NOTE:

You are able to perform a LiveSCAN on any cell seen within the saved survey results. If performing a LiveSCAN using the saved results, be aware that these results are relevant for the location where the survey was performed. During a LiveSCAN the receiver locks to the Frequency Channel Number of the cell selected.

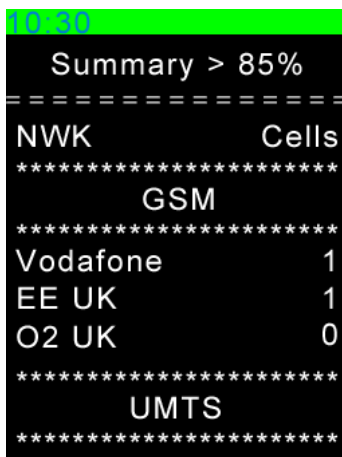
If you move to a different location and perform a LiveSCAN on previously saved results, the LiveSCAN might lock to the correct cell if the new location is similar geographically, or it might lock to a completely different cell that is using the same Frequency Channel Number of the cell that was selected. This is expected behaviour and care should be taken to ensure that LiveSCAN logs are only performed using recent survey results in the same vicinity.

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 scroll more information into view.

Figure 19. Displaying survey results



NOTE:

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

Use the LEFT button to replace the network operator names with the MCC/MNC 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 35).

If the survey was a multi-cycle survey, the full log of all surveys is not 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 remains in the files.



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 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 end up containing 21 surveys as an example.



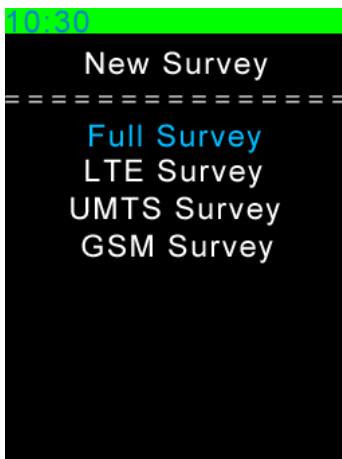
Performing a Single Survey

To perform a single 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 what survey you would like to perform and press OK.

Figure 20. 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.

Step 3. Cycle option should be set at <1>. Press OK to perform a single survey. When the survey is complete, a list of saved results as shown in figure 15 will be displayed.

Figure 21. Selecting survey to perform

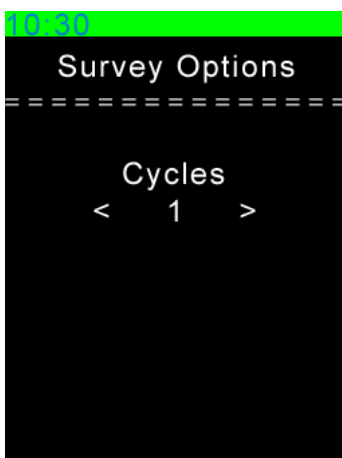


Figure 22. Survey complete



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

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

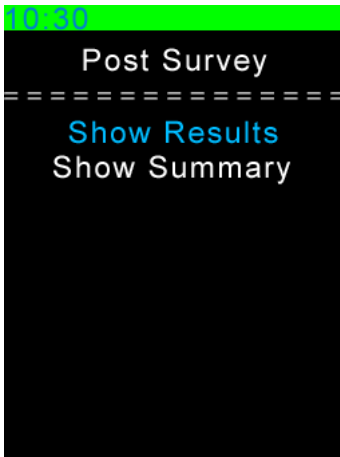
.CSV: Comma separated value files.

.HTML: HTML web browser files.



Step 4. Press OK to be taken to the post survey menu as show below in figure 23.

Figure 23. Selecting a post survey option

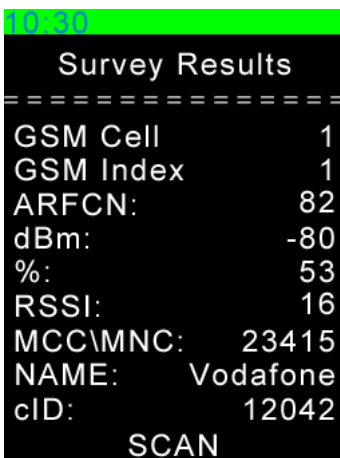


Show Results

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.

NOTE: The SNYPER-LTE Graphyte (USA) does not survey the GSM bands. As a result, there are no GSM survey options available for this model and they are not included as part of the survey options.

Figure 24. Displaying survey results



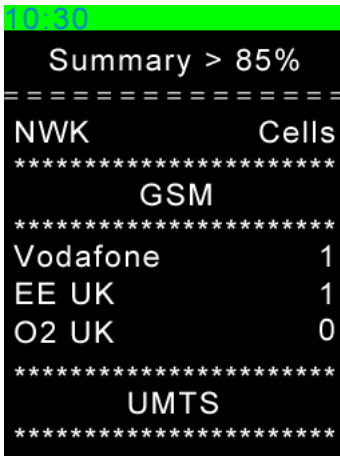


Show Summary

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.

Figure 25. 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 your 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 32) 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, it is not necessary to save the results as this is automatically done at the completion of the survey. However, if you have selected the user option to turn off automatic saving of results, you will need to highlight 'Save Results' and press OK to save results to the SNYPER Graphyte.



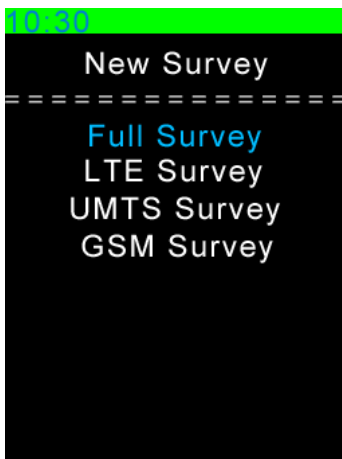
Performing a Multiple Cycle Survey

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 what survey you would like to perform and press OK.

Figure 26. Selecting survey to perform



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

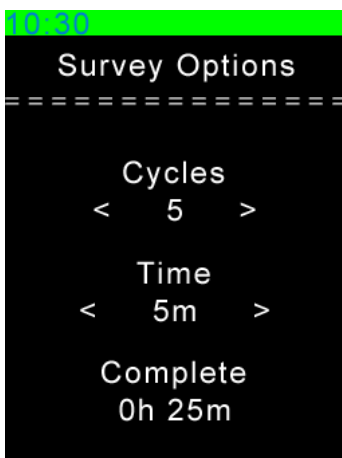
LTE Survey: Performs a survey for the LTE network only.

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

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

Step 3. Use the RIGHT button to select number of survey cycles and time of each cycle. Press OK to begin survey. You will be prompted to enter your charging cable for extended survey.

Figure 27. Selecting multiple survey options



Cycles: You can increase the number of cycles using the RIGHT button, increasing in increments of 5. You can perform a maximum of 500 cycles.

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

A Multiple Cycle Survey can be interrupted by pressing the back key for at least half a second. Depending where in the logging flow the SNYPER Graphyte is, it might take up to 30 seconds for the survey to be interrupted. 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 28** will be displayed.

Figure 28. 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.

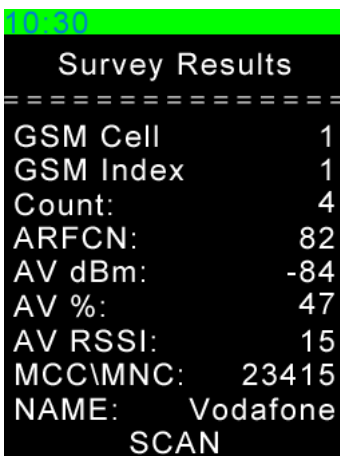
.CSV: Comma separated value files.

.HTML: HTML web browser files.

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.

Figure 29. Displaying survey results



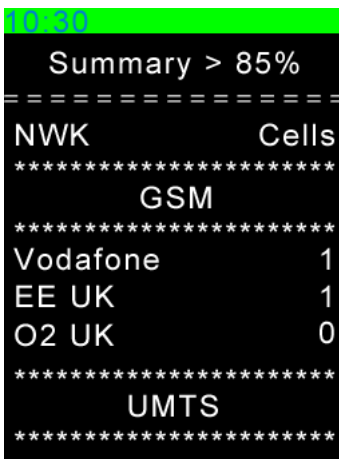


Show Summary

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.

Figure 30. 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, it is not necessary to save the results as this is automatically done at the completion of the survey. However, if you have selected the user option to turn off automatic saving of results, you will need to highlight 'Save Results' and press OK to save results to the SNYPER Graphyte.



Performing a LiveSCAN

LiveSCAN works by locking the SNYPER Graphyte to a selected base station channel and the cell it is operating on. Once the SNYPER Graphyte locks to a channel, a continuous update of the received signal strength of that cell will be reported on the SNYPER Graphyte.

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.



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

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

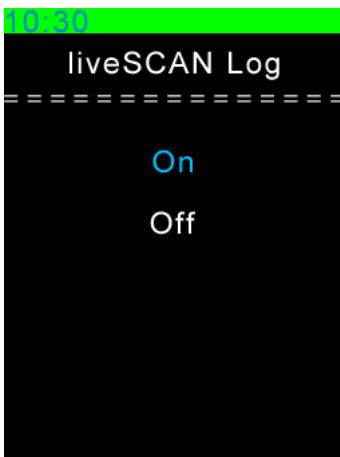
Step 2. When the survey is complete view the results acquired. Use the LEFT/RIGHT buttons to find the survey results you wish to LiveSCAN.

Step 3. Remove the connected omnidirectional antenna and connect a directional antenna, or the intended antenna for your installation (recommended).

Step 4. Press OK to initiate LiveSCAN.

Step 5. You will be given the option of logging the LiveSCAN results. Select 'On' or 'Off' using the UP/DOWN buttons. Press OK to begin LiveSCAN.

Figure 31. LiveSCAN logging



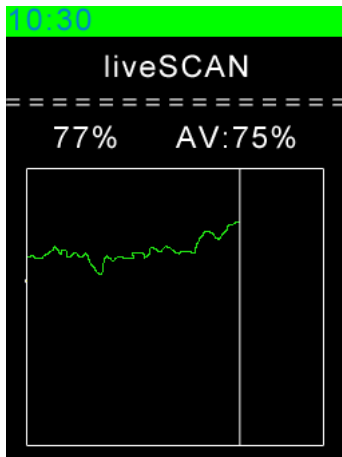
On: Performs a LiveSCAN and logs all captured results. Results will be available to download in .csv format by following the PC Connect steps on [page 35](#).

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 32. LiveSCAN in progress



The default LiveSCAN view shows the active signal strength as a %, and the average of all readings taken (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 measurement data.

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

- » Average reading
- » Number of readings
- » Elapsed time
- » Network operator

The active signal strength reading is shown at all times.

IMPORTANT: Starting a LiveSCAN from saved results will result in unpredictable behaviour, as the initial survey may have been performed under different circumstances.

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

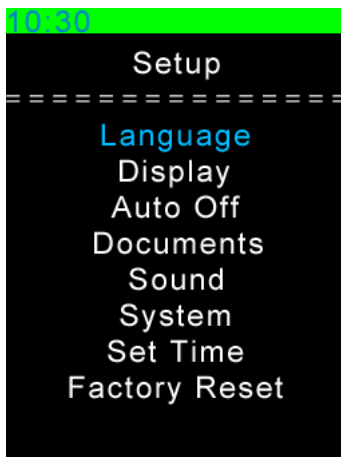
Press the BACK button to abort LiveSCAN – the SNYPER Graphyte will return to the Survey Results screen. A further LiveSCAN can be conducted by selecting different cells from the survey results.



Setup Menu

By selecting 'Setup' from the main menu, the following setup changes can be made (as shown below in figure 33). 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 33. '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: 10 colour settings for body text.

Highlighted Text: 10 colour settings for highlighted text.

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

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

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. ON is the factory default setting. 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 surveys 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.

Default: Mode = Standard



Region: This setting is required in engineering mode to ensure DL and UL frequencies are correctly calculated. This has three settings, EMEA (1) = Europe, Africa, the Middle East west of the Persian Gulf including Iraq, the former Soviet Union and Mongolia, AMER (2) = Americas, Greenland and some of the eastern Pacific Islands and APAC (3) = Asia, east of and including Iran, and most of Oceania.

Default Region SNYPER-LTE Graphyte (EU) = EMEA (1)

Default Region SNYPER-LTE Graphyte (USA) = AMER (2)

Debug Log: This may be set to On or Off. Siretta Support may ask you to enable this, otherwise leave the setting off. If enabled, a debug file is created. The file is named 'DBGLOG.TXT' and is found in the root of the Graphyte file system. The file is named as a '.TXT' file so that it can be easily sent via email, but is actually 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.TXT' 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.

Debug Log = Off

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

Date: YYYY\MM\DD

Time: HH\MM\SS

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.



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 4** 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 4. Breakdown of information provided

	Standard (S)	Advanced (A)	Engineer (E)
Index - Base station number assigned by your SNYPER Graphyte	✓	✓	✓
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 4 (continued). Breakdown of information provided

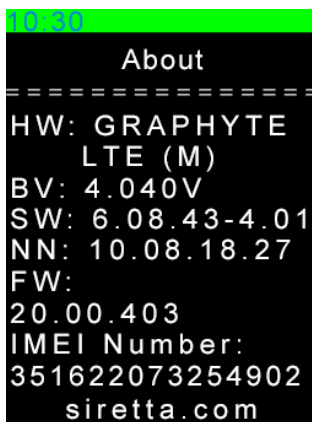
Band - Frequency band being received	✓	✓	✓
ARFCN - Absolute Radio Frequency Channel Number being received (GSM)	✓	✓	✓
UARFCN - UTRA Absolute Radio Frequency Channel Number being received (UMTS)	✓	✓	✓
EARFCN - E-UTRA Absolute Radio Frequency Channel Number being received (LTE)	✓	✓	✓
Cell ID - Unique ID of the network cell discovered		✓	✓
SCR - Scrambling Code (UMTS)		✓	✓
LAC - Location Area Code		✓	✓
TAC - Tracking Area Code			
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 - Downlink Bandwidth in MHz		✓	✓
DL - Signal Download Frequency			✓
UL - Signal Upload Frequency			✓



About Menu

By selecting 'About' from the main menu, information about your SNYPER Graphyte will be displayed (as shown below in **figure 34**).

Figure 34. 'About' screen



HW: SNYPER Graphyte model hardware version.

BV: Battery voltage.

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



PC Connect

The PC Connect feature allows you to download all stored surveys from your SNYPER Graphyte onto your PC.

The data is downloaded to your PC in CSV and HTML format. The downloaded data will include all the information about the cellular networks surveyed and saved.

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

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

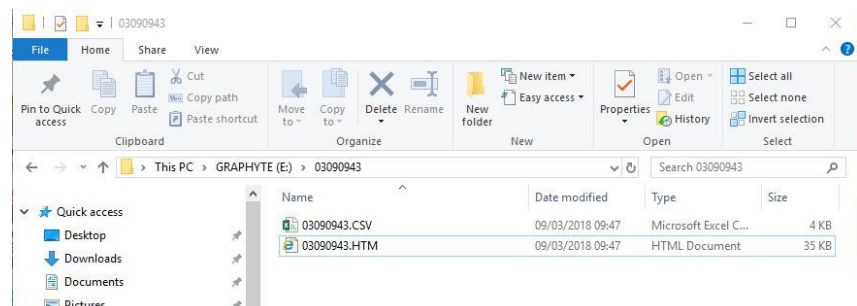
Step 2. Select 'PC Connect' from the main menu, and use the RIGHT button to enable PC Connect.

Depending on how your 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 35. Prepare for data download



Figure 36. Downloading your SNYPER Graphyte data to a PC

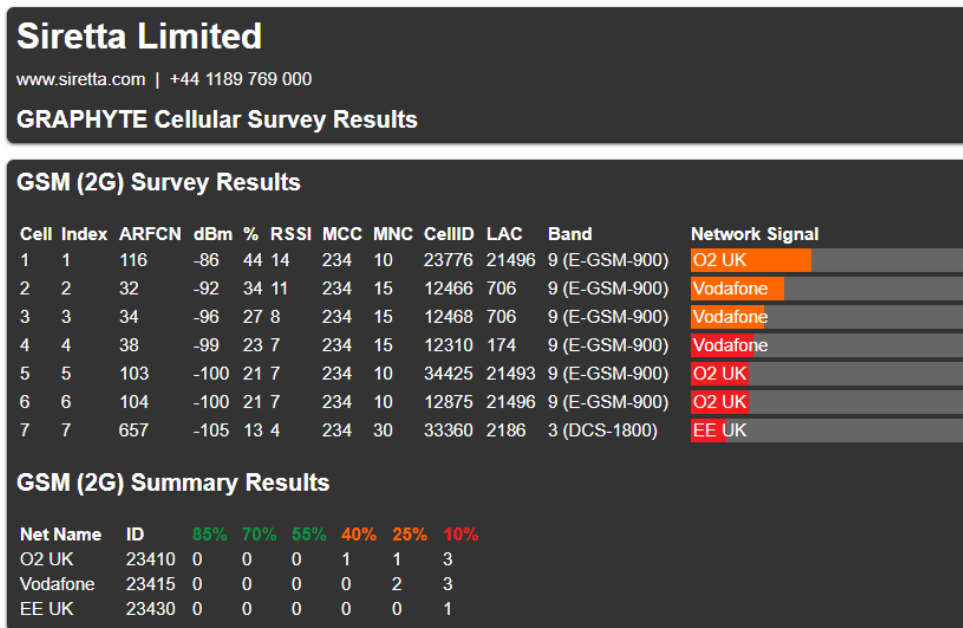


Step 3. Use copy and paste to transfer files from the SNYPER Graphyte to the desired location on your PC.



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

Figure 37. HTML results



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

Your SNYPER Graphyte will now be back to normal operation.

Press the back button on your SNYPER Graphyte product to return to the 'Main Menu'.

NOTE: When the SNYPER Graphyte is connected to the PC, deleting files from PC hard drive will not delete the files from the SNYPER Graphyte's internal memory.



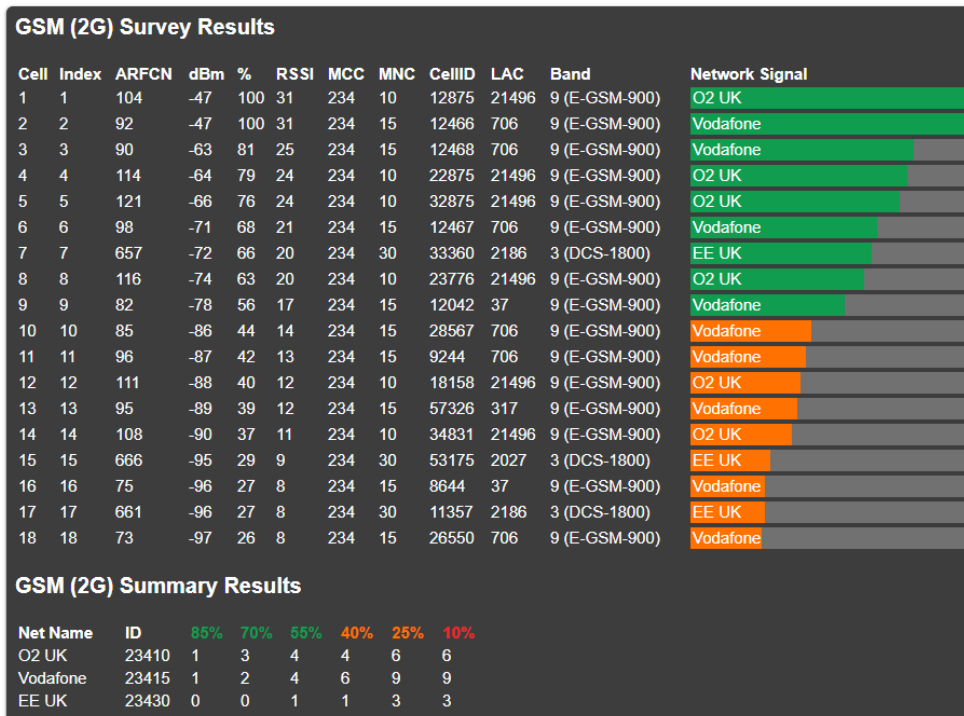
Viewing Single Survey Results on a PC

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 you performed.

Figure 38. .HTML report





.CSV Report

The information recorded in the .CSV report will depend on the survey type you selected. The information displayed 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 39. .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 '6.8.51												
Firmware Version '20.00.404												
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 multiple 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 selected. 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 log .csv file that is generated, where user filters can be applied to make interpretation easier.

Figure 40. .HTML report

Siretta Limited												
www.siretta.com +44 1189 769 000												
GRAPHYTE Cellular Average Survey Results												
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 41. Summary Graph Data

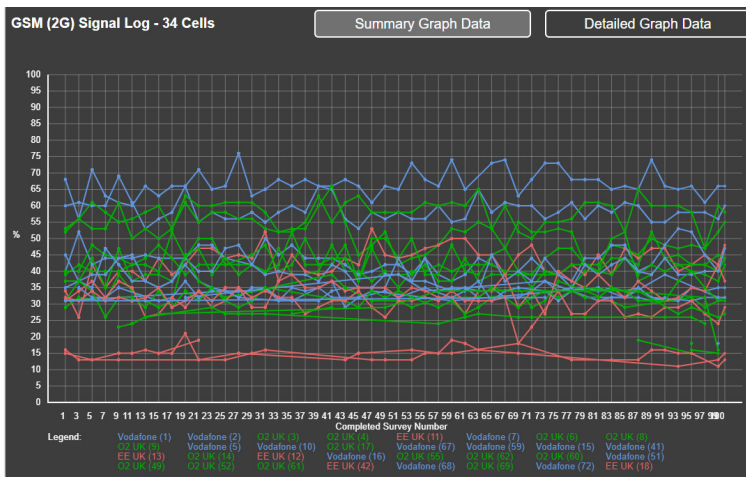
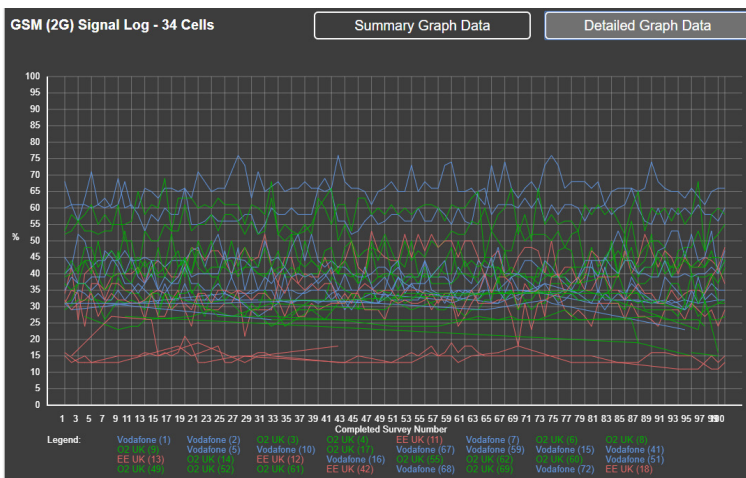


Figure 42. Detailed Graph Data





.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 43. .CSV report

```

=====
Siretta Limited
=====
GRAPHYTE Network Survey Results
www.siretta.com
+44 1189 769 000
Survey Type      Full
File Created     04/03/2020 17:36
IMEI Number      '351622073254829
Hardware Version  'SNYPER-LTE Graphyte (EU)
Application Versi '6.8.51
Firmware Version '20.00.404
Filename         '03041703.csv
Timestamp        '1583343390
=====
2G Survey Results
=====
Index:           Num Cells:   ARFCN:  AV dBm: AV %:   AV RSSI: MCC:   MNC:   CellID:  LAC:   Band Num:  Band:   Net Name:  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   |||||

```

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 44. .CSV logging report

```

=====
Siretta Limited
=====
GRAPHYTE Network Survey Results
www.siretta.com
+44 1189 769 000
Survey Type      Full
File Created     04/03/2020 17:05
IMEI Number      '351622073254829
Hardware Version  'SNYPER-LTE Graphyte (EU)
Application Version '6.8.51
Firmware Version '20.00.404
Filename         'L3041703.csv
Timestamp        '1583341532
Survey:          Timestamp:   Network Index: xRFCN: dBm: %:   RSSI:  MCC:   MNC:   CellID:  LAC/TAC: Band Num:  Band:   Net Name Signal:
-----
1  04/03/2020 17:05 2G      1      38    -80    53    16    234    15    12310   174     9 E-GSM-900 Vodafone |||||
2  04/03/2020 17:05 2G      2      122   -85    45    14    234    10    29137   21765   9 E-GSM-900 O2 UK   |||||
3  04/03/2020 17:05 2G      3      114   -87    42    13    234    10    22875   21496   9 E-GSM-900 O2 UK   |||||
4  04/03/2020 17:05 2G      4      42    -87    42    13    234    15    12042   37      9 E-GSM-900 Vodafone |||||

```



Viewing LiveSCAN Results on a PC

If LiveSCAN logging was enabled during your LiveSCAN, you can find the log results 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 1.96 seconds to complete. The smallest time unit that the SNYPER Graphyte uses is a second. For this reason, there is not an entry in the log for every second.

Figure 45. 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			
Time:	Elapsed:	dBm:	%:	RSSI:
	0	00:00:00	-111	3 1
	1	00:00:01	-86	44 14
	3	00:00:03	-86	44 14

Power Off

After use, remember to power off your 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 47.

Figure 46. Select 'Power Off'

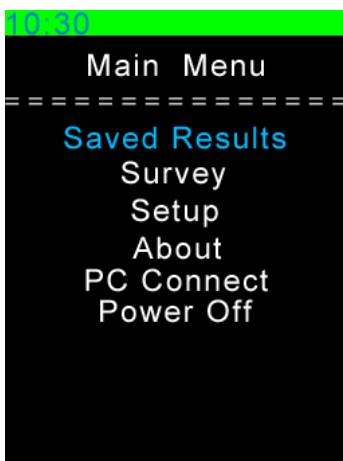
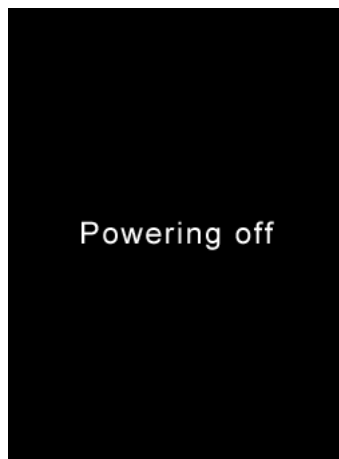


Figure 47. Power off message



- » 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 49.

Figure 48. ON/OFF button



ON/OFF Button

Figure 49. 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.

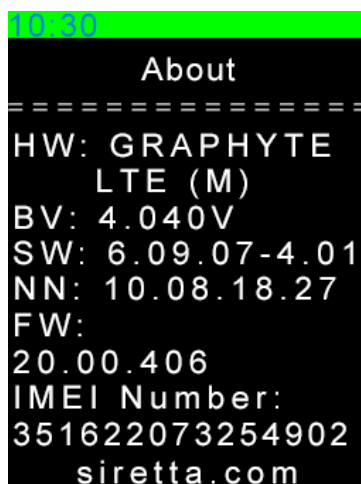
To perform a software update, follow the steps below:

Step 1. Go to '[https://www.siretta.com/software-ibrary/?tab=SNYPER-Plus-Analysers-\(V3\)](https://www.siretta.com/software-ibrary/?tab=SNYPER-Plus-Analysers-(V3))' and download and save latest SNYPER Graphyte software.

The software version is part of the file name. For example, the file name for Version 6.09.08 software is `SnyperV060908.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 50. Current software version



Here the software version shown is 6.09.07, so 6.09.08 will be an upgrade.

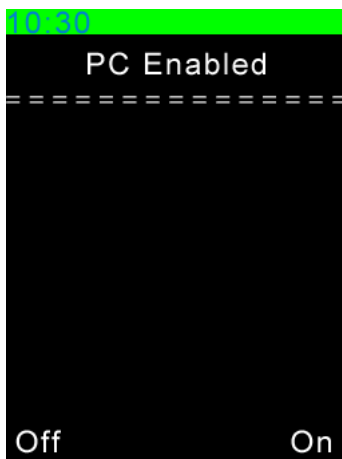


Step 3. Connect supplied USB cable to your SNYPER Graphyte and PC.

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 51. 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.



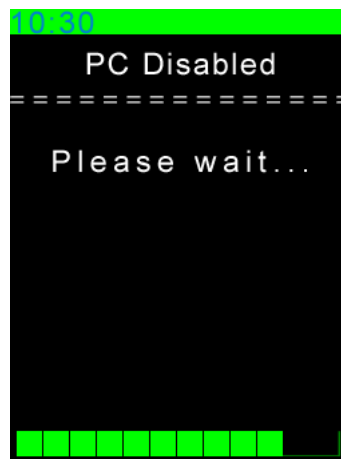
Step 9. You will be prompted to confirm the software update. Click the RIGHT button to confirm performing a software update.

Figure 52. Confirm software update



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

Figure 53. Progress bar



Once the software update is complete, the SNYPER Graphyte will turn off for approximately 90 seconds then power itself on.

On power up, a white spinning symbol will be displayed for approximately 60 seconds and then the SNYPER Graphyte will display the main menu.

Step 10. Confirm the software has updated by checking the 'About' menu. If successful, your 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.

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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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