



Enabling Industrial IoT



SNYPER-5G Graphyte & SNYPER-IoT Graphyte

Applicable models:

SNYPER-5G Graphyte (GL)

SNYPER-IoT Graphyte (GL)

With Software 1.4.2

User Manual

Rev 1.1



SNYPER-5G & SNYPER-IoT Graphyte User Manual

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Introduction

The SNYPER-5G Graphyte (GL) and SNYPER-IoT Graphyte (GL) are designed to survey the cellular networks worldwide used by mobile phones, cellular routers and cellular IoT products. The SNYPER-5G Graphyte (GL) is designed to survey 5G NR (SA and NSA), LTE, LTE-M, NB-IoT and GSM networks while the SNYPER-IoT Graphyte (GL) is a subset of the SNYPER-5G Graphyte (GL) surveying only the LTE-M, NB-IoT and GSM networks most usually associated with IoT devices.

Surveying of all network technologies except for 5G NSA cells does not require a SIM card. Because of the nature of how 5G NSA works, initially appearing as an LTE cell, it is required to first register to an LTE cell before 5G NSA support by the cell can be determined. For this reason, a 5G SIM card capable of registering onto the network to be tested is required.

Visually, the SNYPER-5G Graphyte (GL) may be identified by its yellow protective bumper, and the SNYPER-IoT Graphyte (GL) by its green bumper. The term “Graphyte” used in this manual refers to both models unless stated otherwise.

The Graphyte enables the operator to first determine which networks and cells are within coverage range, and then optionally to lock to a cell to monitor its received signal strength (liveSCAN mode). Many operating parameters of the discovered cells are reported such as its operating frequency, Cell ID, signal strength and noise levels allowing the user to understand the surrounding cellular environment and make informed decisions about network suitability and selection. Additionally, both normal and liveSCAN modes may be run continuously. Logs of all measurements taken are saved, and HTML formatted summary documents produced.

Measurements may be uploaded via the USB cable to a PC where the HTML files can be viewed in a web browser and the CSV files imported into Microsoft Excel. From the PC, the survey may be saved to the [CloudSURVEY](#) portal where additional functions such as .pdf reports and the positions of the discovered cells may be shown on a map (Internet enabled PC required). Lifetime use of CloudSURVEY to store and view surveys is included with the purchase of the Graphyte and is a great way to both backup and share surveys with colleagues.

There are many different frequency bands that cellular equipment uses, and they vary country by country and region by region. The Graphyte has been designed to operate on all the popular cellular bands found worldwide. This covers frequency bands from 600 MHz to 4700 MHz which is an exceptionally large range of frequencies for a product to work on. Part of the Graphyte’s development necessitated the development of a special antenna (the supplied [Delta 47 antenna](#)) to be able to work well across this range of frequencies. This is supplied with the Graphyte and is also available to purchase separately should the user wish to use it in their own application.



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SNYPER-5G and SNYPER-IoT Graphyte features

- » Reports details of all cells on all networks in coverage range
 - » What is reported depends on the cellular technology of the cell discovered, but includes operational parameters such as band, channel frequency, Cell Id, operational frequency, band, RSRP, RSRQ, PCI, TAC and network operator.
- » Coverage of 2G/GSM, LTE-M and NB-IoT (all Graphyte models) and LTE and 5G SA & NSA (SNYPER-5G Graphyte).
- » NB-IoT stand-alone (within GSM bands), guard band and in-band modes of operation.
- » SIM free operation for all cellular technologies except 5G NSA.
- » Perform automatic repeated surveys at programmable intervals to see how coverage at a site varies over time, or to discover all the cells visible along a route travelled.
- » Download clear reports in HTML format
- » Download CSV files for import into Excel
- » Use the liveSCAN feature to watch in real time how the received signal strength of a cell varies over time/antenna position. Use this to correctly align a directional antenna
- » Store typically 10,000 surveys
- » 480 x 640 resolution TFT display with LED backlight and wide viewing angle
- » Powered by an internal rechargeable battery, or through the USB-C connector
- » Audible notification of events
- » Language support for English, German, French, Italian and Spanish
- » Integration with the CloudSURVEY portal to provide additional features such as cell mapping and .pdf reports.
- » Intelligent current sensing battery monitor accurately reports battery capacity.



SNYPER-5G & SNYPER-IoT Graphyte User Manual

SNYPER-5G Vs SNYPER-IoT Comparison

The SNYPER-5G Graphyte (GL) and SNYPER-IoT Graphyte (GL) are very similar products. Essentially, the SNYPER-IoT Graphyte (GL) is a SNYPER-5G Graphyte (GL) with some components removed to reduce the product cost. Removing these components removes the LTE and 5G capabilities of the Graphyte. This is summarised in the table below:

Table 1: SNYPER-5G and SNYPER-IoT comparison

Technology	SNYPER-5G Graphyte (GL)	SNYPER-IoT Graphyte (GL)
2G / GSM	●	●
LTE-M	●	●
NB-IoT	●	●
LTE	●	●
5G SA	●	●
5G NSA	●	●

Additionally, the products are visually identified by the colour of the protective rubber bumper attached to the enclosure. The SNYPER-5G Graphyte (GL) has a yellow bumper, the SNYPER-IoT Graphyte (GL) a green bumper.



SNYPER-5G & SNYPER-IoT Graphyte User Manual

Characteristics

Environmental

Operational Temperature Range:	-10 to +60 Celsius ^{See note 1}
Storage Temperature Range:	-20 to +60 Celsius up to 1 month ^{See note 2}
	-20 to +45 Celsius up to 3 months ^{See note 2}
	-20 to +25 Celsius up to 12 months ^{See notes 2,3}
Operating humidity range:	25 to 85% RH non-condensing

Note 1: The battery will only fast charge when the temperature is between +10 and +45 Celsius. Charging below 0 Celsius or above 60 Celsius is prevented completely. This is for safety and battery life reasons.

Note 2: The battery should be charged to between 50 and 70% of capacity before being placed into storage.

Note 3: When in long-term storage, it is recommended to charge the battery to approximately 50% capacity every 3 months to keep the battery in its best condition.

Current Consumption

Off (includes battery self discharge):	76 μ A
On, LCD maximally dimmed (user inactivity standby):	158 mA
On, LCD at full brightness, no ongoing survey activity:	239 mA
On, GSM/LTE-M/NB-IoT SIM free survey in progress:	255 mA (TBC)
On, LTE or 5G NR SIM freesurvey in progress:	279 mA (TBC)

Note: power consumption and resultant battery life depends not only on how the Graphyte is used, but the ambient temperature. The provided current measurements are typical values at 20 Celsius. The power figures provided show that having the backlight on represents a significant part of the power consumption while the Graphyte is being used. Allowing the backlight to dim is therefore desirable to prolong battery life. A fully charged battery will power the Graphyte for well over 8 hours when running a continuous LTE survey if the display is dimmed and factory default power settings are used.

Important Note: Using a SIM to survey for 5G NSA networks requires network registration onto the cell(s) tested (which is why the SIM is required). This will turn on the transmit circuits of the Graphyte and significantly increase the power consumption over and above those listed.



SNYPER-5G & SNYPER-IoT Graphyte

User Manual

Display

Dimensions:	2.4" diagonal
Resolution:	480 x 640 pixels
Type:	TFT, LED backlight
Viewing Angle:	80 degrees (all directions)
Brightness:	700 cd/m2

Keypad

Type:	Membrane Switch
Actuation Force:	400 ±50 g
Functional Lifetime	≥500,000 clicks

Battery

Technology:	Polymer Lithium Ion
Capacity:	3700 mAh
Voltage:	3.7 V
Battery Life:	≥500 cycles (80% of capacity)

Fast Charge Time: Approximately 2 hours from fully discharged to fully charged when charged at an ambient temperature of between +10 and +45 Celsius with a charging supply capable of 7.5 W power delivery.

Safety Features: Over-voltage protection
Over-current protection (charge and discharge)
Charge safety timer
Charge over/under temperature protection



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USB

USB-C Connector:	USB-C
USB Version:	2.0 High Speed (480-MBits/s)
Power Consumption:	7.5 W maximum (battery on fast charge).
Power Delivery Method:	Supports USB-C Configuration Channel (CC) detection for power delivery configuration and Battery Charging (BC) 1.2 for legacy USB power sources. Automatic current limit setting after charger type detection.

SIM Card Holder

Supported SIM Cards:	Mini-SIM (2FF) meeting ISO/IEC 7810:2019, ID-000 (25 mm x 15 mm). The SIM card should support 5G on the network to be surveyed.
SIM Card Reader Type:	Push-Push type with card detection switch
SIM Card Voltage Support:	1.8 V and 3 V
Durability:	10,000 cycles
Insertion Force:	7N Maximum

Antenna Connector(s)

Type:	SMA Jack (for use with a cellular antenna with SMA male connector)
Impedance:	50 Ω
Mating Torque:	0.8 to 1.1 N-m

Mechanical

Dimensions:	147mm x 76mm x 36mm excluding mounting clip
Weight:	SNYPER-5G Graphyte (GL) : 259 g (excluding antennas) SNYPER-IoT Graphyte (GL): 246 g (excluding antenna)
IP Rating:	30



SNYPER-5G & SNYPER-IoT Graphyte User Manual

Frequency Bands Supported

GSM/ 2G frequency band supported

- » GSM 850 – 850 MHz
- » E-GSM 900 – 900 MHz
- » DCS 1800 – 1800 MHz
- » PCS 1900 – 1900 MHz

LTE-M frequency band supported

- » Band 1 – 2100 MHz
- » Band 2 – 1900 MHz
- » Band 3 – 1800 MHz
- » Band 4 – 1700 MHz
- » Band 5 – 850 MHz
- » Band 8 – 900 MHz
- » Band 12 – 700 MHz
- » Band 13 – 700 MHz
- » Band 14 – 700 MHz
- » Band 18 – 850 MHz
- » Band 19 – 850 MHz
- » Band 20 – 800 MHz
- » Band 25 – 1900 MHz
- » Band 26 – 850 MHz
- » Band 27 – 800 MHz
- » Band 28 – 700 MHz
- » Band 66 – 1700 MHz
- » Band 85 – 700 MHz

NB-IoT frequency band supported

- » Band 1 – 2100 MHz
- » Band 2 – 1900 MHz
- » Band 3 – 1800 MHz
- » Band 4 – 1700 MHz
- » Band 5 – 850 MHz
- » Band 8 – 900 MHz
- » Band 12 – 700 MHz
- » Band 13 – 700 MHz
- » Band 18 – 850 MHz
- » Band 19 – 850 MHz
- » Band 20 – 800 MHz
- » Band 25 – 1900 MHz
- » Band 26 – 850 MHz
- » Band 28 – 700 MHz
- » Band 66 – 1700 MHz
- » Band 71 – 600 MHz
- » Band 85 – 700 MHz

LTE frequency band supported

- | | |
|----------------------|----------------------|
| » Band 1 – 2100 MHz | » Band 28 – 700 MHz |
| » Band 2 – 1900 MHz | » Band 29 – 700 MHz |
| » Band 3 – 1800 MHz | » Band 30 – 2300 MHz |
| » Band 4 – 1700 MHz | » Band 32 – 1500 MHz |
| » Band 5 – 850 MHz | » Band 34 – 2000 MHz |
| » Band 7 – 2600 MHz | » Band 38 – 2600 MHz |
| » Band 8 – 900 MHz | » Band 39 – 1900 MHz |
| » Band 12 – 700 MHz | » Band 40 – 2300 MHz |
| » Band 13 – 700 MHz | » Band 41 – 2500 MHz |
| » Band 14 – 700 MHz | » Band 42 – 3500 MHz |
| » Band 17 – 700 MHz | » Band 43 – 3700 MHz |
| » Band 18 – 850 MHz | » Band 46 – 5200 MHz |
| » Band 19 – 850 MHz | » Band 48 – 3500 MHz |
| » Band 20 – 800 MHz | » Band 66 – 1700 MHz |
| » Band 25 – 1900 MHz | » Band 71 – 600 MHz |
| » Band 26 – 850 MHz | |

5G NR(SA and NSA) frequency bands supported

- | | |
|----------------------|---------------------------|
| » Band 1 – 2100 MHz | » Band 29 – 700 MHz |
| » Band 2 – 1900 MHz | » Band 30 – 2300 MHz |
| » Band 3 – 1800 MHz | » Band 38 – 2600 MHz |
| » Band 5 – 850 MHz | » Band 40 – 2300 MHz |
| » Band 7 – 2600 MHz | » Band 41 – 2500 MHz |
| » Band 8 – 900 MHz | » Band 48 – 3500 MHz |
| » Band 12 – 700 MHz | » Band 66 – 1700/2100 MHz |
| » Band 13 – 700 MHz | » Band 70 – 1700/2000 MHz |
| » Band 14 – 700 MHz | » Band 71 – 600 MHz |
| » Band 18 – 850 MHz | » Band 75 – 1500 MHz |
| » Band 20 – 800 MHz | » Band 76 – 1500 MHz |
| » Band 25 – 1900 MHz | » Band 77 – 3700 MHz |
| » Band 26 – 850 MHz | » Band 78 – 3500 MHz |
| » Band 28 – 700 MHz | » Band 79 – 4900 MHz |



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Graphyte Surveying Kit Contents

The Graphyte is supplied in a storage/transport box complete with all the accessories that a user will require to be able to effectively use the Graphyte. The complete boxed kit weighs less than 1.8 Kg. The following components will be found in the kit:



1. Anthracite polypropylene hard case, outside dimensions 357 x 305 x 110 mm
2. SNYPER-Graphyte (IoT or 5G version)
3. USB-C to USB-C cable – 2m long. One end supplied with a tethered USB-A adapter.
4. [Delta 47](#) Omnidirectional general-purpose antenna (1 with SNYPER-IoT Graphyte (GL), 2 with SNYPER-5G Graphyte (GL)).
5. [Oscar 20A](#) LiveSCAN antenna with hand grip.
6. ASMA150A058L13 SMA male to SMA male 1.5m SLL200 extension cable (for use with Oscar 20A LiveSCAN antenna)
7. Tripod stand
8. Clip attachment for tripod stand



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Detailed Survey Kit Component Descriptions and Use

USB Cable

The supplied cable **(3)** is designed both to provide power to the Graphyte to charge the internal battery, and as a data cable to be able to download survey data from the Graphyte to a PC (or mobile device with USB-C connector supporting USB OTG).

Both ends of the cable are fitted with a USB-C connector, but one end also has a tethered USB-A adapter allowing the cable to be configured either as USB-C to USB-C, or as USB-C to USB-A (by fitting the adapter).



The Graphyte can be connected to any USB-C or USB-A port. As a data connection to the Graphyte there will not be any difference in the data transfer speed unless plugged into an exceptionally old USB-A port.

As a charging connection, any USB-C port will deliver 7.5 W which will give the fastest charge speed. It can be difficult to predict the power delivery capability of USB-A ports. Many are capable of 2.5 W or more, but in the worst case it could be only 0.5 W.



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Tripod stand and clip

The tripod stand **(7)** and clip attachment **(8)** must be assembled to form a stand that supports the Graphyte while it is surveying. Use of the stand is optional and the Graphyte will work just as well if left on a flat surface or held in the hand.



Tripod stand (folded)



Clip attachment

To assemble the stand, Screw the clip attachment to the tripod stand and spread the three legs of the stand. The Graphyte may then be clipped to the clip attachment using the integral clip on the back of the Graphyte. There is a recess in the clip attachment that the Graphyte's clip fits into.



Assembled tripod and attachment



Graphyte attached to stand



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Oscar 20A LiveSCAN Antenna and SMA cable

To use the LiveSCAN antenna (5), it must be connected to the Graphyte using the SMA cable (6). The LiveSCAN antenna is a directional antenna and is to be used when the LiveSCAN feature is being used. The LiveSCAN feature should only be used once the user is familiar with basic scanning as this is a more advanced feature. Use of this antenna is mutually exclusive with the Delta 47 general purpose antenna.

When using the SNYPER-5G Graphyte (GL) care should be used to connect it to the antenna input being used since one input is for LTE and 5G surveying and the other for GSM/LTE-M/NB-IoT surveying. Refer to the picture below:



In use, it is recommended that the LiveSCAN antenna be held vertically as shown in the picture for best performance.



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Delta 47 General purpose antenna

The Delta 47 antenna(s) **(4)** should be directly connected to the Graphyte by screwing them onto the antenna connector(s). The Delta 47 has a swivel joint that allows the antenna to point in any direction.



Delta 47 General Purpose Antenna



Graphyte with Delta 47 antennas attached



SNYPER-5G & SNYPER-IoT Graphyte User Manual

Preparing For First Use

This section explains how to prepare the Graphyte for surveying and learn the basics of the Graphyte operation through conducting a basic survey.

Graphyte Antenna Connection

The Graphyte comes with two (SNYPER-5G three) antennas. One (SNYPER-5G two) general-purpose hinged antenna (black), and a general-purpose directional antenna.

All the supplied antennas are interchangeable, having SMA male connectors. For the first survey, use the general-purpose black antenna(s). Screw the antenna(s) onto the SMA female connector(s) on the top of the Graphyte. For the SNYPER-5G there are two antenna connectors and two black hinged antennas supplied. In this case, a black hinged antenna should be fitted to each connector.

For best performance, the antenna should be positioned vertically. In the case of the Delta 47 general purpose antenna use the swivel joint to do this. In the case of the Oscar 20A LiveSCAN antenna, hold it vertically. Vertically positioning the antenna matches the antenna polarisation of the cells being searched for. In an urban environment multiple reflection paths means that polarisation is not particularly important, but in a rural area this could influence the results obtained.



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Graphyte USB-C Connector and SIM Card Reader

The bottom of the Graphyte has two interfaces on it:

1. USB-C connector.
2. SIM card slot.



USB-C Connector

USB-C connector. This is used for two purposes:

1. To power the Graphyte and charge the battery
2. To connect the Graphyte to a PC to view and download saved reports

Before first use, it is recommended that the Graphyte be placed on charge. When plugged into a USB charging source, the status LED will illuminate red and when fully charged the status LED will change from red to green.



To conduct a survey, it is not required to have a charging supply plugged into the USB connector unless the battery charge state is low, or a long running survey is to be conducted. A fully charged battery should be able to run a continuous survey for at least 8 hours at 20 Celsius.



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SIM Card Reader

SIM card reader. This is designed for a Mini-SIM (2FF), 25 mm x 15 mm.

Fitting a SIM card into a SNYPER-IoT Graphyte is not necessary and serves no purpose.

For SNYPER-5G Graphyte owners, if the user wants to be able to detect 5G NSA networks, it is required to fit a 5G enabled SIM into the Graphyte by following the pictures below:



Orientation of SIM card relative to the socket. Note position of polarising corner of SIM card and that the SIM contacts are facing down

Fitted SIM card. Note that the SIM will protrude very slightly (0.5 mm) when correctly fitted.

The SIM card socket is push-push. Push to fit the SIM and latch it, push again to release it. On push to release, the socket is spring loaded so the SIM will pop out about 5 mm so it can then be grasped and removed.

Important Note: A 5G enabled SIM card is required because 5G NSA detection first requires registration onto the LTE cell to be tested for 5G NSA capability. This means that the SIM must be enabled not only for 5G, but for the network to be tested. SIMs obtained directly from the network operator should be 5G enabled, especially on well-established 5G networks. SIMs from MVNO's need to be checked carefully to determine 5G capability. Roaming IoT SIM's are not likely to be 5G compatible. No data is used from the data allowance of the SIM used, so the cheapest contract or PAYG SIM card should be sufficient for 5G NSA survey support.



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Graphyte Display and Controls



Status LED	Red = USB charging supply attached Green = Battery fully charged Blue = Power on initialisation in progress
Current Time	As set by user in setup section. Used for timestamping survey logs
Charge Indication	Indication of the amount of battery charge remaining
Main Display	Main user interface
Back Button	Takes the user back up one menu level
Up, Down, Left, Right Buttons	Used for navigating the menu system
OK Button	Used to confirm or execute an action
Power Button	Turns Graphyte on and off (press and hold for 5 seconds to turn the Graphyte off)



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Getting Started

This manual provides users with step-by-step instructions to become familiarised with the controls of the Graphyte, perform basic surveys and interpret the results. To maximise user experience and unlock the full potential of the product, Siretta recommends reading the entire manual in detail. It comprehensively explores the features of the Graphyte, showcasing its capabilities as a powerful cellular network analyser.

Configuring The Graphyte For The First Time

1. Press and hold the power button to turn on the Graphyte.
2. The status LED positioned above the screen will illuminate blue upon initialisation then turn off.
3. The initial power-on splash screen will be displayed.
4. The user will be greeted with a welcome page. After, they will then encounter a second page instructing to visit www.siretta.com/go.

Out of the box, the Graphyte needs to be updated to both the latest software and firmware versions in order to use. The link provided will direct users to the 'Product Support' page, where the download for the SirettaSPARK tool can be found. The SPARK tool is an automated device management application developed by Siretta to keep our product offerings up to date with the latest software and firmware.

Product Support Getting you up and

Siretta supply a number of application specific solutions in th

Siretta offer everything from embedded industrial modems v availability. Siretta industrial routers offer a stable, robust an many different industry sectors.

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Find resources for your SNYPER-5G and SNYPER-IoT products to get up and running quickly and easily. Follow the quick start guide initially and for more information refer to the detailed user manuals.

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Find resources for your SNYPER to get up and running quickly. Follow the quick start guide to get up and running and then follow the details in the CloudSURVEY management portal. In addition the complete range of documents available for the SNYPER are listed under SNYPER documents.

SNYPER-5G / IoT Getting Started **SNYPER-5G / IoT Update Tool** SNYPER-5G / IoT Documents

Software Manuals

SirettaSPARK User Manual
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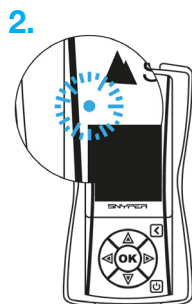
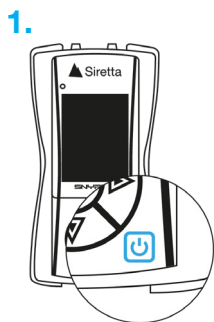
Software Downloads

Register to download the SirettaSPARK Tool
Download Now!



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5. Register an account (or sign-in if already registered) then download and install the latest version of SirettaSPARK.
6. Connect the Graphyte to the PC via its USB interface.
7. Open SirettaSPARK and Press the 'Connect device' button within SirettaSPARK to discover and connect to the Graphyte.
8. Update both firmware and software. Ensure that power is not interrupted throughout the duration of the update.
9. Upon completion, the Graphyte will automatically reboot itself and the update buttons within SirettaSPARK should appear greyed out. Disconnect the device from both SirettaSPARK and the PC
10. The device is now ready to use.

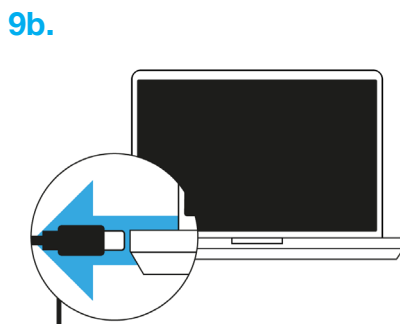
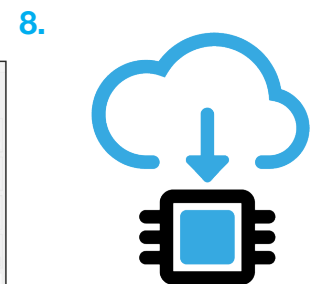
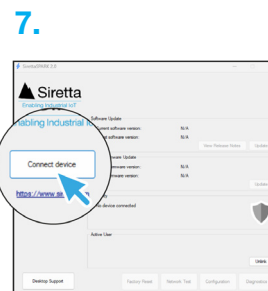
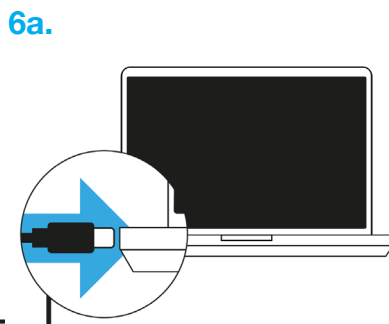


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Software Downloads

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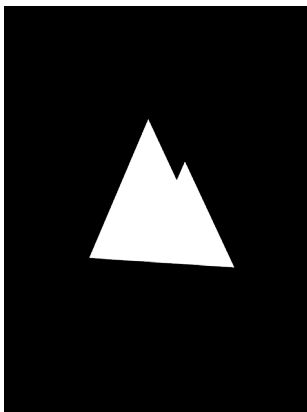
SNYPER-5G & SNYPER-IoT Graphyte User Manual

Conducting The First Survey

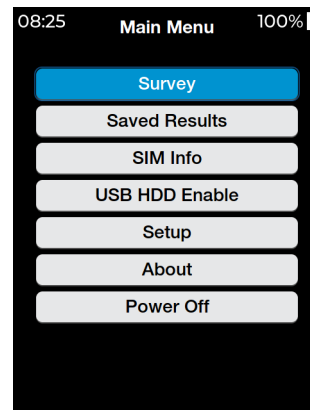
When first received, the battery charge state may be low. Therefore, prior to using the Graphyte for the first time, it is strongly advised to charge the unit for several hours.

Connect the [Delta 47](#) general-purpose antennas to the Graphyte then connect the unit to a powered USB port (i.e. the supplied mains adapter or a computer) using the supplied USB cable. The status LED at the top left of the front panel will illuminate red, indicating that a power supply is connected or, if the battery is fully charged it will illuminate green. Power on the Graphyte by pressing and holding the power button.

The status LED will turn blue while the Graphyte boots. The battery percentage icon at the top right shows the current charge state of the unit. The internal battery voltage is monitored by internal circuitry. If the battery charge state is exceptionally low and not connected to a charging supply, the Graphyte will turn itself off again.



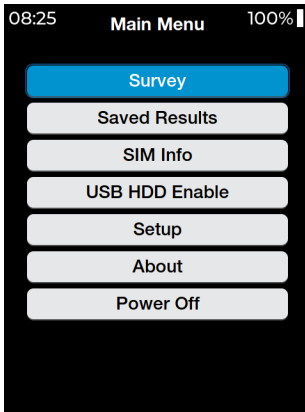
Initial power-on splash screen will be displayed for approximately 3 seconds.



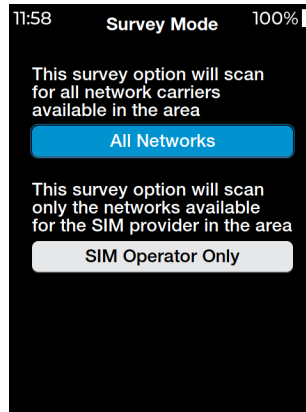
Following the splash screen, the main menu screen will be displayed.



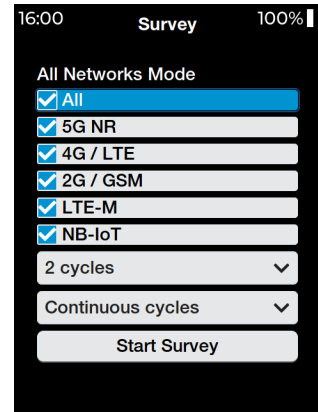
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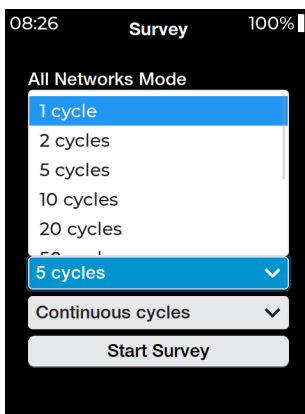
Press the 'OK' button to access the survey tab.



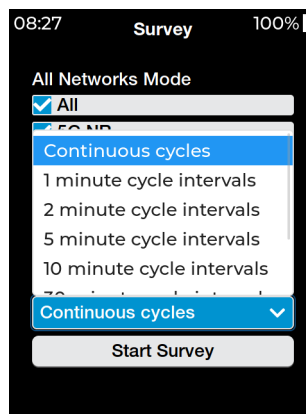
Select the desired survey mode.



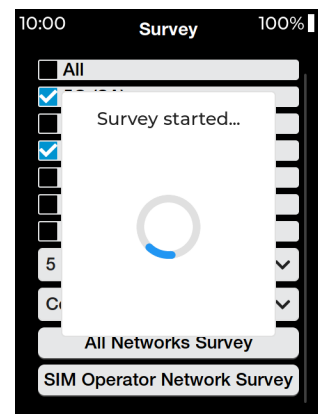
Check at least one of the available network types to survey.



Specify the number of cycles the device should conduct throughout the survey. [1 cycle – Infinite cycles]



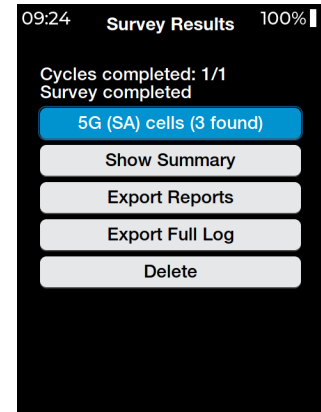
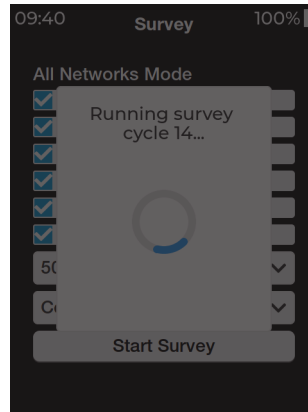
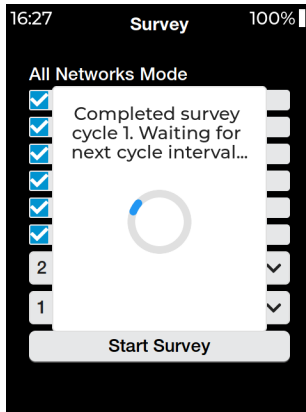
Specify the interval in minutes at which the cycles should occur. [Continuous; 1 min – 120 mins]



Navigate to the bottom of the menu and select "Start Survey". A progress wheel will be displayed, signifying that the survey(s) are currently in progress.



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If multiple cycles are selected, the display will show when each cycle is finished.

The display may dim during the process as a power-saving measure. Pressing any button (except power) reactivates full screen brightness.

Once the survey is completed the results are automatically saved.

The Graphyte should have successfully completed its first survey. The file names generated consist of the date and time that the survey was initiated, in the format: Year:Month:Day:Hour:Minute:Second.

The files are stored in the formats: HTML, CSV Summary and CSV Log.

HTML: HTML file that can be opened by in web browser. Presents logged data in a user-friendly layout.

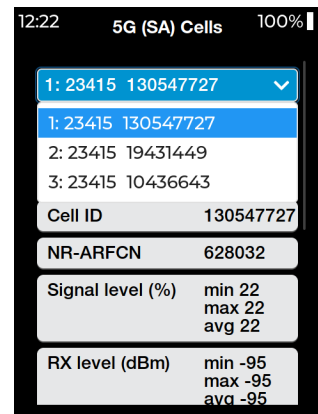
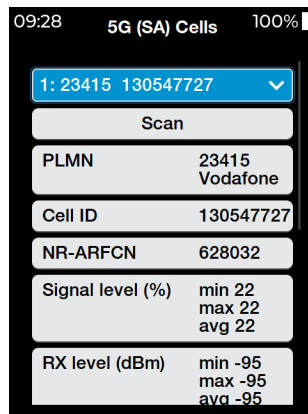
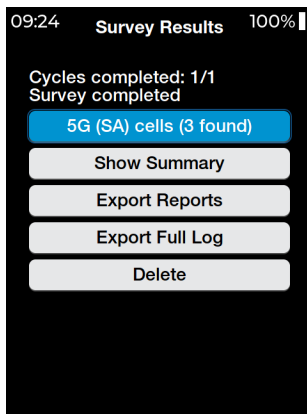
CSV: Comma Separated Value file. Contains all the data about the cellular network(s) logged by the Graphyte, together with the summary information. This file can be imported into many applications including Excel to allow for further analysis of the captured data.



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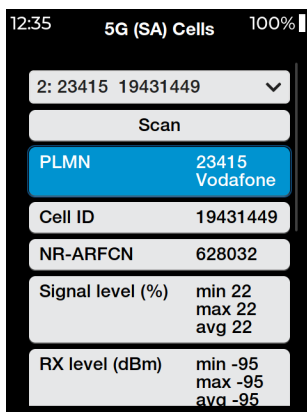
Viewing The Results On The Graphyte

Select an available survey result to access a detailed breakdown or, select 'Show Summary' to view a summary of results.



Survey data for the strongest LTE cell is shown. Navigate downward to access further details about the cell. (i.e. Band, EARFCN)

The drop down menu at the top presents the cell towers scanned during the survey in descending order of strength. Use the OK button to select a cell.



Alternatively, the left and right buttons can be used to scroll between cells.

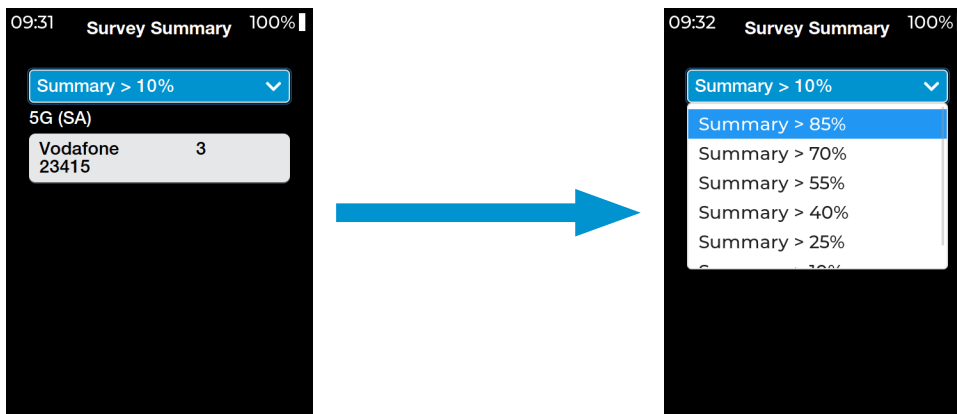
For a full explanation of the survey terminology, please refer to the [glossary](#).



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Survey Summary

A summarised list of surveyed cells, categorised by signal strength and corresponding network operator. The drop down list presents signal strength in descending order: 85%, 70%, 55%, 40%, 25%, 10%. A count of the cells that fall within that range will be displayed.

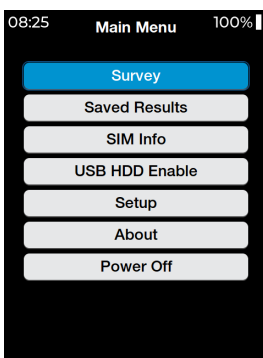




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Main Menu

The main menu serves as the primary navigation hub, offering access to the various features and functionalities of the Graphyte. It is the default landing page upon powering on the device.



Survey

Perform and capture surveys of the cellular environment as seen by the Graphyte. Select one or more of the cellular technologies to survey: 5G(SA), 5G(NSA), 4G(LTE), 2G(GSM), (LTE-M), (NB-IoT).

Saved Results

Access the results of any previously conducted cellular surveys. This information can provide valuable insights into the performance, characteristics, and nuances of the network.

USB HDD Enable

Enables survey results to be viewed on a PC.

Setup

Configure different functionalities of the Graphyte.

About

View build information of the Graphyte.

Power Off

Shutdown the device.



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Surveying With The Graphyte

This section covers in greater detail the survey operational modes of the Graphyte. There are three modes in total.

1. **Single Survey** - A single, complete survey of the cellular environment as seen by the Graphyte.
2. **Multiple Cycle Survey** - Multiple surveys of the cellular environment. The user may select how many surveys are carried out and the time interval between each survey. All survey results are collected and made available as either a CSV or HTML file. The HTML summary file shows the averaged results for each cell, together with the frequency at which the cell was observed. This mode is often referred to as logging. The received signal strength of a cellular networks is not static; it fluctuates even within short intervals. Consequently, conducting a multiple cycle survey in a given area provides a more comprehensive understanding of the optimal signal strength for a specific network. Users are advised to perform a minimum of 5 cycles for a more accurate assessment.
3. **LiveSCAN** - This is a continuous survey where the Graphyte is locked onto a user specified channel frequency. The Graphyte graphically presents the received signal strength of that channel on a continuously updated rolling display until the operation is terminated. When used with the provided directional (Yagi) antenna, this feature enables the user to scout around until the direction with the greatest signal strength is found. Alternatively, when paired with the omni-directional antenna, this allows the user to pin-point the location with the best signal strength. A CSV file of each survey taken during the liveSCAN is kept for the user to analyse if required.

Generally, users are encouraged to use their own antennas with the Graphyte. Using a more specialised antenna tailored for the intended purpose will provide the most accurate indication of performance. Conducting surveys with said antenna in various locations and different orientations allows the operator to make an informed decision regarding the optimal antenna placement.



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Single Survey

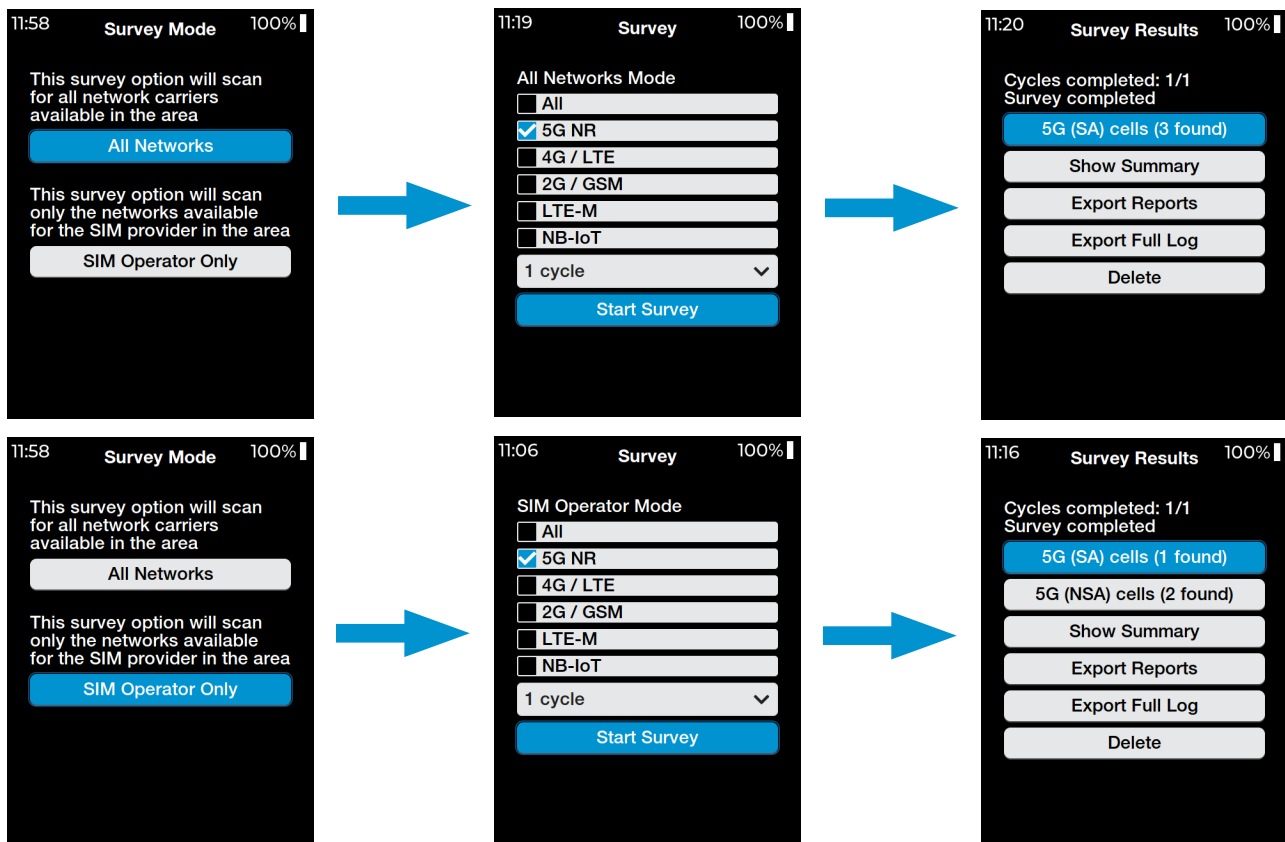
Single scan can be accessed under the survey tab.

- » From the Main Menu, select 'Survey'.
- » Select the desired survey mode.

“All networks” will survey all available network operators in the area, whereas “SIM Operator only” will only survey the network operator associated with the inserted SIM card e.g. Vodafone, T-Mobile, AT&T, Orange, O2, etc.

In SIM operator mode selecting 5G will search for both Standalone (SA) and Non-Standalone (NSA) networks. Whereas in 'all networks' mode, selecting 5G will exclusively search for Standalone (SA) networks.

Note: SIM operator survey will only be available if an activated SIM card is inserted.



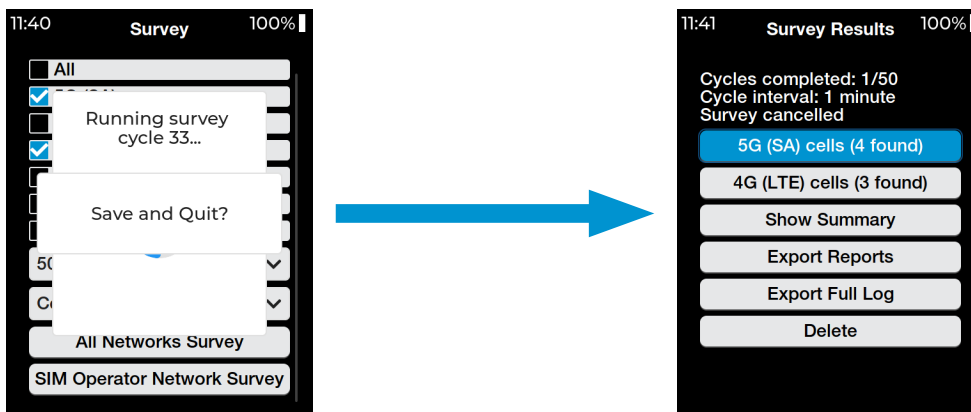


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- » Select at least one option from the available network types:
 - » 5G(NR), 4G(LTE), 2G(GSM), LTE-M, NB-IoT.
- » Navigate to cycle selection dropdown menu and choose the option for a single cycle (1 cycle).
- » Select “Start Survey” to begin.

If at any point, the user wishes to cancel the survey, press the back button. A text box will appear asking if the user would like to save and quit. Press the OK button to confirm.

Any results from completed cycles will be preserved; however, if no cycles have been completed at the time of cancellation, nothing will be saved.

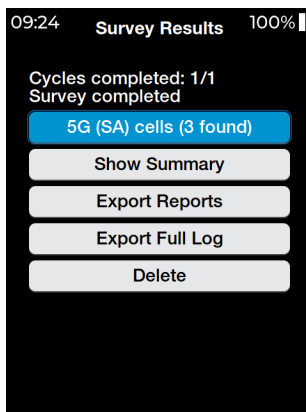




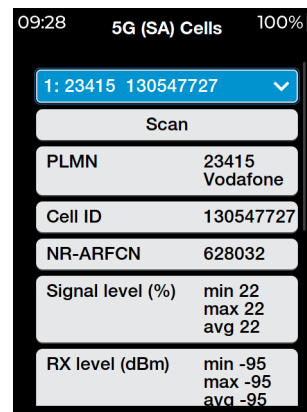
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Survey results can be stored as HTML, CSV or CSV log files. Surveys are automatically saved in both HTML and CSV format. As CSV log files are larger they are not auto-generated, and are instead left to the user's discretion. To generate a CSV log report, select 'Export Full Log.'

- » Once the survey has completed, select an available survey to access a detailed breakdown, or select 'Show Summary' to view a summary of results.



Use the up/down arrow buttons to scroll between menu items.



Use the up/down or right/left arrow buttons to scroll between each cell.



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Multiple Cycle Survey (Logging)

Multi-scan can be accessed under the survey tab.

- » From the Main Menu, select 'Survey'.
- » Select the desired survey mode

"All networks" will survey all available network operators in the area, whereas "SIM Operator only" will only survey the network operator associated with the inserted SIM card i.e. Three, Vodafone, EE.

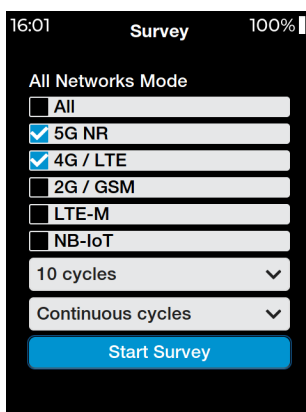
In SIM operator mode selecting 5G will search for both SA and NSA networks. Whereas in 'all networks' mode, selecting 5G will exclusively search for SA networks.

Note: SIM operator survey will only be available if an activated SIM card is inserted.

- » Select at least one option from the available network types:
 - » 5G(NR), 4G(LTE), 2G(GSM), LTE-M, NB-IoT.
- » Navigate to the cycle selection and select the desired number of cycles to perform from the available options: 2, 5, 10, 20, 50, 100, 500, 1000, infinite.
- » Navigate to the time interval selection and configure the time interval between each cycle from the available options: continuous, 1 minute, 2 minutes, 3 minutes, 5 minutes, 10 minutes, 30 minutes, 60 minutes, 120 minutes.

This defines how long the Graphyte will wait before starting the next survey. Choosing "continuous" means they will occur consecutively with no delay in-between.

- » Select "Start Survey" to begin.

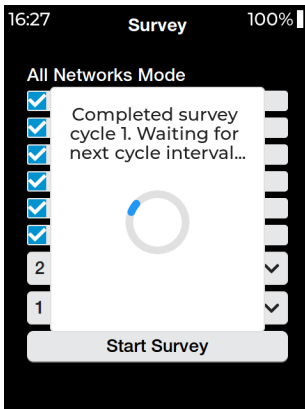


Caution: Please ensure the device is adequately charged prior to initiating an extended survey. Starting a survey with a duration surpassing the battery life may lead to loss of data. Connect the Graphyte to a power source to prevent any interruptions.

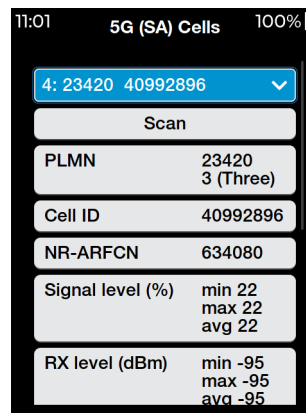
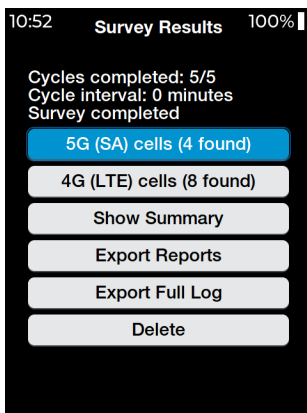


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Once the survey has started, a progress screen allows the user to keep track of the ongoing cycle.



- » Once the survey has completed, select an available survey to access a detailed breakdown, or select 'Show Summary' to view a summary of results.



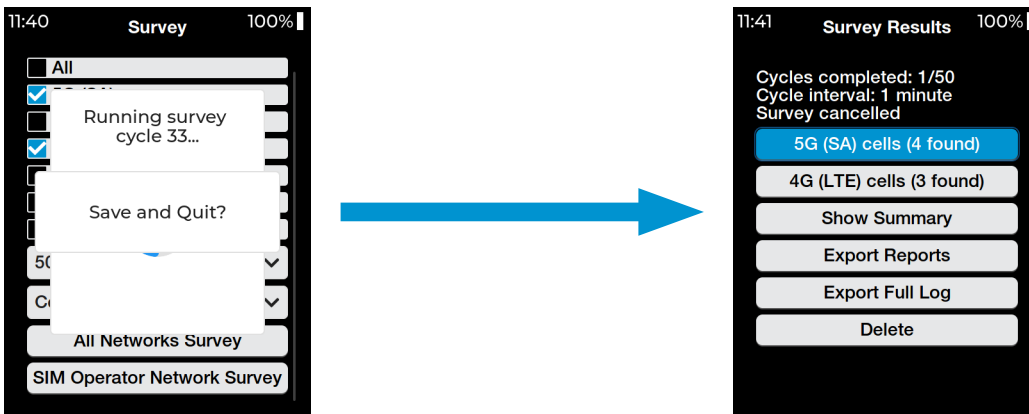
Use the up/down arrow buttons to scroll between menu items.

Use the up/down or right/left arrow buttons to scroll between each cell.



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If at any point, the user wishes to cancel the survey, press the back button. A text box will appear asking if the user would like to save and quit. Press the OK button to confirm. Any results from completed cycles will be preserved; however, if no cycles have been completed at the time of cancellation, nothing will be saved.



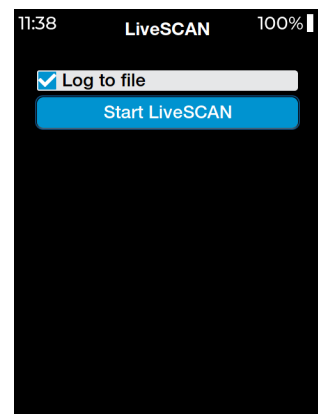
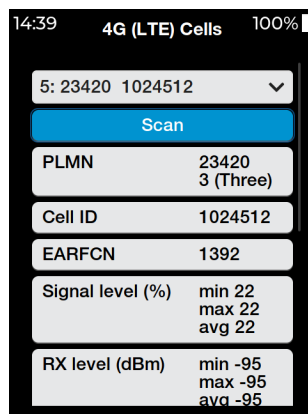
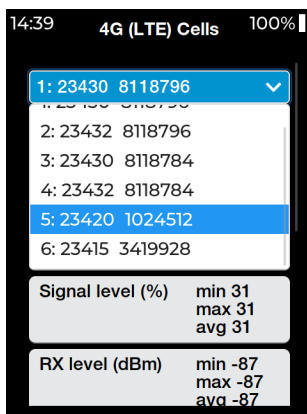


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LiveSCAN

LiveSCAN works by locking the Graphyte to a selected frequency channel (ARFCN/EARFCN/NR-ARFCN number). Once the Graphyte locks onto a channel, it provides a continuous update of the received signal strength of that cell on a rolling display. To access LiveSCAN, users must first conduct a survey.

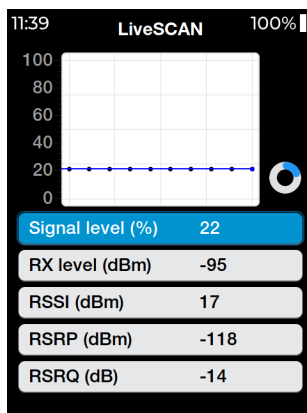
- » Conduct a survey of any type with an omni-directional antenna to find all the available networks.
- » View the results.



Navigate through to find the cell of interest.

Press 'Scan'.

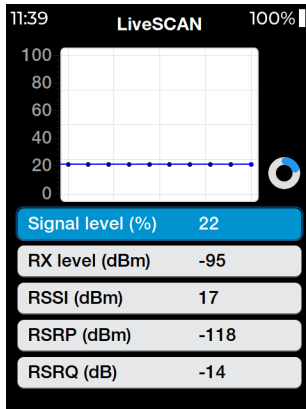
Check 'Log to file' to save the results to memory (optional). Then press 'Start LiveSCAN' to begin.



Observe the graph.



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The default LiveSCAN view shows the current signal strength as a percentage(%).

The black line represents the actual datapoints measured whilst the blue horizontal line represents the average of all current datapoints plotted on screen. The screen scrolls from right to left, displaying the most recent data on the right.

Use the up/down buttons to switch between the different displays: Signal strength, RX level, RSSI, RSRP, RSRQ.

Important: Performing a liveSCAN from saved results may result in unpredictable behaviour. Always start by performing a fresh survey and then running liveSCAN from the results of that survey. This approach ensures the selected channel frequency is actually present at the survey location.

LiveSCAN mode, when used with the provided directional antenna, serves to determine the direction of a cell. Connect the directional antenna to the Graphyte using the supplied cable. Hold the antenna upright by the handle and slowly orient it in various directions until identifying the direction with the strongest signal.

Press the back button at any time to cancel the LiveSCAN – the Graphyte returns to the Survey Results screen. Further LiveSCANS may be conducted by selecting different cells from the survey results.



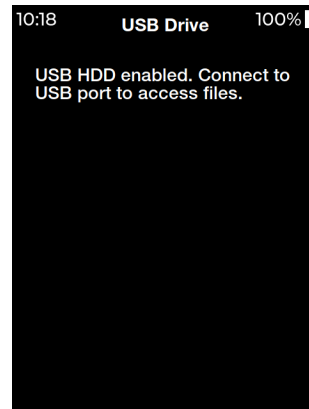
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USB HDD Enable

Connecting a unit to a PC allows users to view survey files. Users may copy the files to their local machine. Although it's possible to delete surveys from the Graphyte using the PC, it's not advisable. Deleted surveys will still be visible within the saved results list on the unit. Instead, delete unwanted surveys through the 'Saved Results' menu on the unit.

Connect the device to the PC via USB cable. Select 'USB HDD Enable' from the main menu. This will prompt the file location to open within file explorer.

Note: Files can only be accessed while remaining on the 'USB HDD Enable' tab.

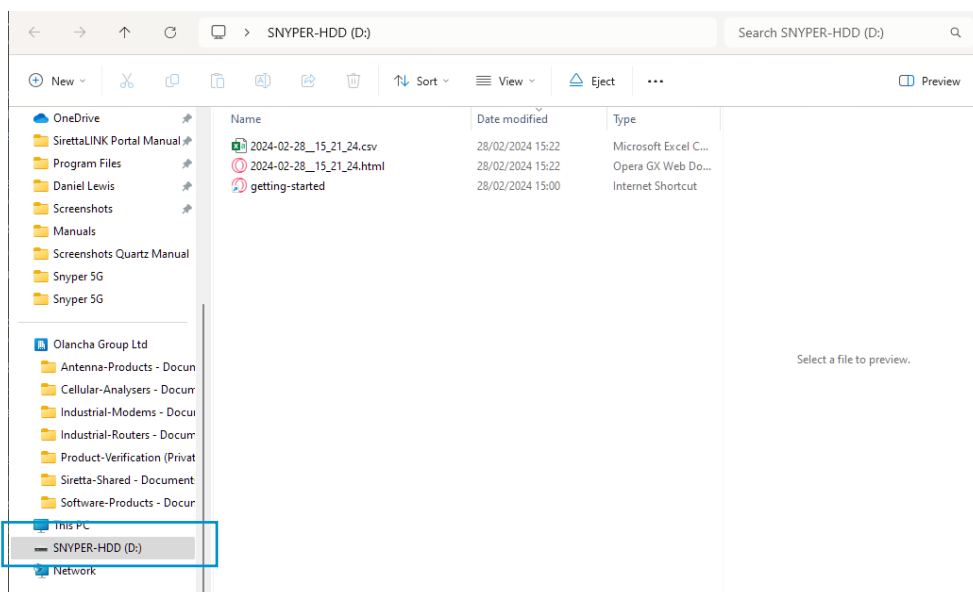


PC View: Single survey results

Files will be generated in the root directory of the Graphyte's file system with names following the date and time format: Year-Month-Day-Hour-Minute-Second.

The raw data captured is saved as both a CSV and HTML file.

The HTML file may be viewed in any modern web browser and allows the data to be presented in a graphical format .





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CSV file

The CSV file is formatted as illustrated below. In the given example the CSV file has been opened in Microsoft Excel. To enhance readability, a significant portion of the survey data has been cropped. This file contains the averaged summary of all the cell measurements.

```

=====
Siretta Limited
=====
SNYPER-5G Network Survey Results (All Networks)
www.siretta.com
+44 1189 769 000
Survey Type 4G
File Created #####
Primary IMEI Number 8.69E+14
Primary Modem Firmware Version V17
Secondary IMEI Number 8.68E+14
Secondary Modem Firmware Version RMS20NGLAAR01A07M4G
Hardware Version SNYPER-5G
Application Version 1.4.0
File Name 2024-03-07_09_21_05.csv
Survey Start Time 1.71E+09
Survey Cycles 01-Jan
Survey End Completed
=====
4G (LTE) Survey Results
=====
Index EARFCN dBm % RSSI MCC MNC CellID TAC Band Nur Band PCI RSRP RSRQ BW DL (MHz) UL (MHz) Net Name Signal
1 6300 -61 59 45 234 15 3419924 24701 20 800 MHz 42 -83 -12 10 806 847 Vodafone |
2 6400 -66 54 41 234 10 29020024 17056 20 800 MHz 290 -88 -9 10 816 857 O2 - UK |
3 6225 -67 53 40 234 32 8118796 22570 20 800 MHz 159 -89 -12 5 798.5 839.5 EE |
4 6225 -67 53 40 234 30 8118796 22570 20 800 MHz 159 -89 -12 5 798.5 839.5 EE |
5 3624 -67 53 40 234 15 3419926 24701 8 900 MHz 336 -89 -7 10 942.4 897.4 Vodafone |
6 6175 -76 43 33 234 20 1024518 5000 20 800 MHz 405 -98 -17 5 793.5 834.5 3 (Three) |
7 323 -82 36 27 234 15 3419928 24701 1 2100 MHz 400 -105 -10 15 2142.3 1952.3 Vodafone |
8 3725 -83 35 26 234 10 29028474 17056 8 900 MHz 111 -106 -12 10 952.5 907.5 O2 - UK |

```

Logged CSV file

The log.CSV file contains the complete set of logged data. The headers follow the same format as the other CSV file however, it differs in that it contains all the measurements taken during the logging process. For this, there are extra columns of data: Index, timestamp and network.

```

=====
Siretta Limited
=====
SNYPER-5G Network Survey Results (All Networks)
www.siretta.com
+44 1189 769 000
Survey Type 4G
File Created #####
Primary IMEI Number 8.69E+14
Primary Modem Firmware Version V17
Secondary IMEI Number 8.68E+14
Secondary Modem Firmware Version RMS20NGLAAR01A07M4G
Hardware Version SNYPER-5G
Application Version 1.4.0
File Name 2024-03-07_09_21_05_log.csv
Survey Start Time 1.71E+09
Survey Cycles 01-Jan
Survey End Completed
=====
Survey Cycle Timestamp Network Index xRFCN dBm % RSSI MCC MNC CellID LAC/TAC Band Nur Band BSIC PCI RSRP RSRQ BW DL (MHz) UL (MHz) Net Name Signal
1 2024-03-0 4G (LTE) 1 6300 -61 59 45 234 15 3419924 24701 20 800 MHz 42 -83 -12 10 806 847 Vodafone |
1 2024-03-0 4G (LTE) 2 6400 -66 54 41 234 10 29020024 17056 20 800 MHz 290 -88 -9 10 816 857 O2 - UK |
1 2024-03-0 4G (LTE) 3 6225 -67 53 40 234 32 8118796 22570 20 800 MHz 159 -89 -12 5 798.5 839.5 EE |
1 2024-03-0 4G (LTE) 4 6225 -67 53 40 234 30 8118796 22570 20 800 MHz 159 -89 -12 5 798.5 839.5 EE |
1 2024-03-0 4G (LTE) 5 3624 -67 53 40 234 15 3419926 24701 8 900 MHz 336 -89 -7 10 942.4 897.4 Vodafone |
1 2024-03-0 4G (LTE) 6 6175 -76 43 33 234 20 1024518 5000 20 800 MHz 405 -98 -17 5 793.5 834.5 3 (Three) |
1 2024-03-0 4G (LTE) 7 323 -82 36 27 234 15 3419928 24701 1 2100 MHz 400 -105 -10 15 2142.3 1952.3 Vodafone |
1 2024-03-0 4G (LTE) 8 3725 -83 35 26 234 10 29028474 17056 8 900 MHz 111 -106 -12 10 952.5 907.5 O2 - UK |
1 2024-03-0 4G (LTE) 9 2850 -85 33 25 234 15 3419932 24701 7 2600 MHz 196 -108 -7 20 2630 2510 Vodafone |

```



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HTML file

The GUI is divided into sections. A header, a segment dedicated to survey results categorised by network technology (i.e. NR / LTE / NB-IoT), CloudSURVEY and lastly, a footer.

The header displays Siretta's contact details, the product name and the title of the HTML document.

Siretta Limited
 www.siretta.com | +44 1189 769 000
GRAPHYTE Cellular Survey Results - 1 Survey (All Networks)

Survey results

The user is provided with a comprehensive analysis detailing all the measured parameters observed by the Graphyte. For a full explanation of the parameters, please refer to the [glossary](#).

LTE (4G) Survey Results																	
Cell	Index	EARFCN	dBm	%	RSSI	MCC	MNC	CellID	TAC	Band	PCI	RSRP	RSRQ	BW (MHz)	DL (MHz)	UL (MHz)	Network Signal
1	1	6300	-64	56	42	234	15	3419924	24701	20 (800 MHz)	42	-86	-13	10.0	806.00	847.00	Vodafone
2	2	6225	-67	53	40	234	30	8118796	22570	20 (800 MHz)	159	-89	-9	5.0	798.50	839.50	EE
3	3	6225	-67	53	40	234	32	8118796	22570	20 (800 MHz)	159	-89	-9	5.0	798.50	839.50	EE
4	4	6400	-71	48	37	234	10	29020024	17056	20 (800 MHz)	290	-93	-14	10.0	816.00	857.00	O2 - UK
5	5	6175	-78	41	31	234	20	1024518	5000	20 (800 MHz)	405	-100	-12	5.0	793.50	834.50	3 (Three)
6	6	3624	-78	41	31	234	15	3419926	24701	8 (900 MHz)	336	-100	-10	10.0	942.40	897.40	Vodafone
7	7	9360	-80	38	29	234	20	475997	5088	28 (700 MHz)	488	-103	-14	10.0	773.00	718.00	3 (Three)
8	8	2850	-87	31	23	234	15	3419932	24701	7 (2600 MHz)	196	-110	-7	20.0	2630.00	2510.00	Vodafone
9	9	1392	-89	29	22	234	20	1024512	1749	3 (1800 MHz)	402	-112	-15	15.0	1824.20	1729.20	3 (Three)
10	10	1761	-89	29	22	234	32	6663173	20271	3 (1800 MHz)	164	-112	-11	10.0	1861.10	1766.10	EE
11	11	1761	-89	29	22	234	30	6663173	20271	3 (1800 MHz)	164	-112	-11	10.0	1861.10	1766.10	EE
12	12	199	-89	29	22	234	10	29020028	17056	1 (2100 MHz)	290	-112	-12	10.0	2129.90	1939.90	O2 - UK
13	13	1617	-92	26	19	234	30	6663170	20271	3 (1800 MHz)	164	-115	-15	20.0	1846.70	1751.70	EE
14	14	1617	-92	26	19	234	32	6663170	20271	3 (1800 MHz)	164	-115	-15	20.0	1846.70	1751.70	EE
15	15	323	-94	23	18	234	15	3419928	24701	1 (2100 MHz)	400	-117	-15	15.0	2142.30	1952.30	Vodafone
16	16	99	-97	20	15	234	20	906057	1639	1 (2100 MHz)	87	-120	-14	10.0	2119.90	1929.90	3 (Three)
17	17	3350	-103	13	10	234	30	6938888	21591	7 (2600 MHz)	430	-127	-17	20.0	2680.00	2560.00	EE
18	18	3350	-103	13	10	234	32	6938888	21591	7 (2600 MHz)	430	-127	-17	20.0	2680.00	2560.00	EE

LTE (4G) Summary Results							
Net Name	ID	85%	70%	55%	40%	25%	10%
Vodafone	23415	0	0	1	2	3	4
EE	23430	0	0	0	1	3	4
EE	23432	0	0	0	1	3	4
O2 - UK	23410	0	0	0	1	2	2
3 (Three)	23420	0	0	0	1	3	4

Average Summary results

Shows how frequently each cell appears based on its corresponding signal strength.



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CloudSURVEY

Store Survey Results in CloudSURVEY

Clicking on the CloudSURVEY icon will direct the user to the CloudSURVEY Portal; a web-based application that allows users to not only store survey results but, to also view detected cell tower locations on an interactive map. The use and operation of the web portal is outlined in the [CloudSURVEY user manual](#).

Cell Index	Seen	EARFCN	dBm	% RSRP	MCC	MNC	CellID	TAC	Band	PhyCellID	RSRP	RSRQ	BW	DL (MHz)	UL (MHz)	Signal Strength
1	1	51000%	8480	86	34	31	234	32	31000	24701	28	(000)	1000	100	100	Violation (68 dBm) Min: 52% Avg: 54% Max: 55% Var: 3% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
2	3	51000%	8220	76	34	32	234	32	31000	22575	28	(000)	1000	100	100	EE (70 dBm) Min: 48% Avg: 50% Max: 51% Var: 3% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
3	3	51000%	8175	76	34	32	234	32	31000	22575	28	(000)	1000	100	100	3 (Three) (70 dBm) Min: 48% Avg: 50% Max: 50% Var: 4% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
4	4	51000%	8220	76	34	32	234	32	31000	22575	28	(000)	1000	100	100	EE (78 dBm) Min: 48% Avg: 50% Max: 51% Var: 3% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
5	5	51000%	8224	77	34	32	234	32	31000	24701	28	(000)	1000	100	100	Violation (77 dBm) Min: 39% Avg: 42% Max: 43% Var: 4% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
6	6	4000%	8480	79	34	32	234	32	31000	24701	28	(000)	1000	100	100	02-UK (79 dBm) Min: 35% Avg: 40% Max: 42% Var: 7% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
7	7	51000%	8360	79	34	32	234	32	31000	24701	28	(000)	1000	100	100	3 (Three) (78 dBm) Min: 35% Avg: 39% Max: 40% Var: 5% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
8	8	51000%	822	86	34	32	234	32	31000	24701	28	(000)	1000	100	100	Violation (85 dBm) Min: 32% Avg: 33% Max: 33% Var: 1% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
9	9	51000%	8260	87	34	32	234	32	31000	24701	28	(000)	1000	100	100	Violation (87 dBm) Min: 76% Avg: 31% Max: 31% Var: 5% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
10	10	51000%	1761	81	27	32	234	32	31000	22571	3	(1000)	1000	100	100	EE (81 dBm) Min: 25% Avg: 21% Max: 20% Var: 8% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
11	11	51000%	188	81	27	32	234	32	31000	17006	7	(100)	1000	100	100	02-UK (91 dBm) Min: 25% Avg: 21% Max: 20% Var: 5% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
12	12	51000%	1761	81	27	32	234	32	31000	22571	3	(1000)	1000	100	100	EE (91 dBm) Min: 23% Avg: 21% Max: 20% Var: 5% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
13	13	4000%	8417	82	34	32	234	32	31000	22571	3	(1000)	1000	100	100	EE (82 dBm) Min: 25% Avg: 20% Max: 20% Var: 7% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
14	14	4000%	8417	80	34	32	234	32	31000	22571	3	(1000)	1000	100	100	EE (82 dBm) Min: 22% Avg: 20% Max: 20% Var: 7% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
15	15	51000%	1360	85	25	32	234	32	31000	17469	3	(1000)	1000	100	100	3 (Three) (83 dBm) Min: 22% Avg: 25% Max: 27% Var: 5% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
16	16	100%	1761	83	25	32	234	32	31000	22571	3	(1000)	1000	100	100	EE (83 dBm) Avg 25% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
17	17	100%	1761	85	25	32	234	32	31000	22571	3	(1000)	1000	100	100	EE (83 dBm) Avg 25% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
18	18	100%	8417	86	22	32	234	32	31000	22571	3	(1000)	1000	100	100	EE (85 dBm) Avg 22% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
19	19	100%	8417	86	22	32	234	32	31000	22571	3	(1000)	1000	100	100	EE (85 dBm) Avg 22% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
20	20	51000%	84	86	21	32	234	32	31000	1630	1	(100)	1000	100	100	3 (Three) (86 dBm) Min: 19% Avg: 21% Max: 22% Var: 3% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3
21	21	4000%	3308	88	34	32	234	32	31000	21001	7	(2000)	1000	100	100	EE (103 dBm) Min: 10% Avg: 13% Max: 13% Var: 3% -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3



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Footer

The footer details relevant information about both the survey and the unit. This includes particulars such as the date & time, survey type, filename and current hardware and software versions within the unit.

© Siretta Limited 2024										
Date	Time	Filename	Survey Type	Application Version	Primary IMEI Number	Primary Modem Firmware Version	Secondary IMEI Number	Secondary Modem Firmware Version	Hardware Version	Result
23/02/2024	15:15:00	2024-02-23_15_15_00.html	4G/2G	1.2.1	868510050053544	V17	868371050452099	RM520NGLAAR01A07M4G	SNYPER-5G	Completed

PC View: Multi-cycle results

While much of the layout mirrors that of the single survey, there are some differences.

HTML file

The GUI is divided into sections. A header, a segment dedicated to the survey results categorised by network technology, CloudSURVEY and lastly a footer.

The file may be viewed in any web browser.

The user is provided with a comprehensive analysis detailing all the measured parameters observed by the Graphyte. For a full explanation of the parameters, please refer to the *glossary*.

Visually the GUI remains largely unchanged. A few extra columns of data have been introduced. The 'seen' column presents a count of how frequently each cell appears within each survey and the figure in brackets indicates the percentage of surveys represented.

LTE (4G) Average Survey Results														Network Signal				
Cell Index	Seen	EARFCN	AV dBm	AV %	AV RSSI	MCC	MNC	CellID	TAC	Band	PCI	RSRP	RSRQ	BW (MHz)	DL (MHz)	UL (MHz)	Network	Signal
1	50 (100.0%)	6300	-69	51	38	234	15	3419924	24701	20 (800 MHz)	42	-91	-8	10.0	806.00	847.00	Vodafone	
2	50 (100.0%)	6225	-73	46	35	234	30	8118796	22570	20 (800 MHz)	159	-95	-9	5.0	798.50	839.50	EE	
3	50 (100.0%)	6225	-73	46	35	234	32	8118796	22570	20 (800 MHz)	159	-95	-9	5.0	798.50	839.50	EE	
4	35 (70.0%)	6400	-73	46	35	234	10	29020024	17056	20 (800 MHz)	290	-95	-8	10.0	816.00	857.00	O2 - UK	
5	50 (100.0%)	3624	-74	45	34	234	15	3419926	24701	8 (900 MHz)	336	-96	-8	10.0	942.40	897.40	Vodafone	
6	49 (98.0%)	6175	-75	44	34	234	20	1024518	5000	20 (800 MHz)	405	-97	-11	5.0	793.50	834.50	3 (Three)	
7	15 (30.0%)	6400	-79	40	30	234	10	28702840	17056	20 (800 MHz)	393	-101	-15	10.0	816.00	857.00	O2 - UK	
8	1 (2.0%)	6175	-81	37	28	234	20	905992	5097	20 (800 MHz)	57	-104	-18	5.0	793.50	834.50	3 (Three)	
9	16 (32.0%)	9360	-83	35	26	234	20	475997	5088	28 (700 MHz)	488	-106	-15	10.0	773.00	718.00	3 (Three)	
10	50 (100.0%)	2850	-85	33	25	234	15	3419932	24701	7 (2600 MHz)	196	-108	-7	20.0	2630.00	2510.00	Vodafone	
11	7 (14.0%)	9360	-85	33	25	234	20	2058076	5000	28 (700 MHz)	328	-108	-19	10.0	773.00	718.00	3 (Three)	
12	50 (100.0%)	323	-85	33	25	234	15	3419928	24701	1 (2100 MHz)	400	-108	-8	15.0	2142.30	1952.30	Vodafone	
13	3 (6.0%)	9360	-86	32	24	234	20	2058077	5000	28 (700 MHz)	329	-109	-19	10.0	773.00	718.00	3 (Three)	

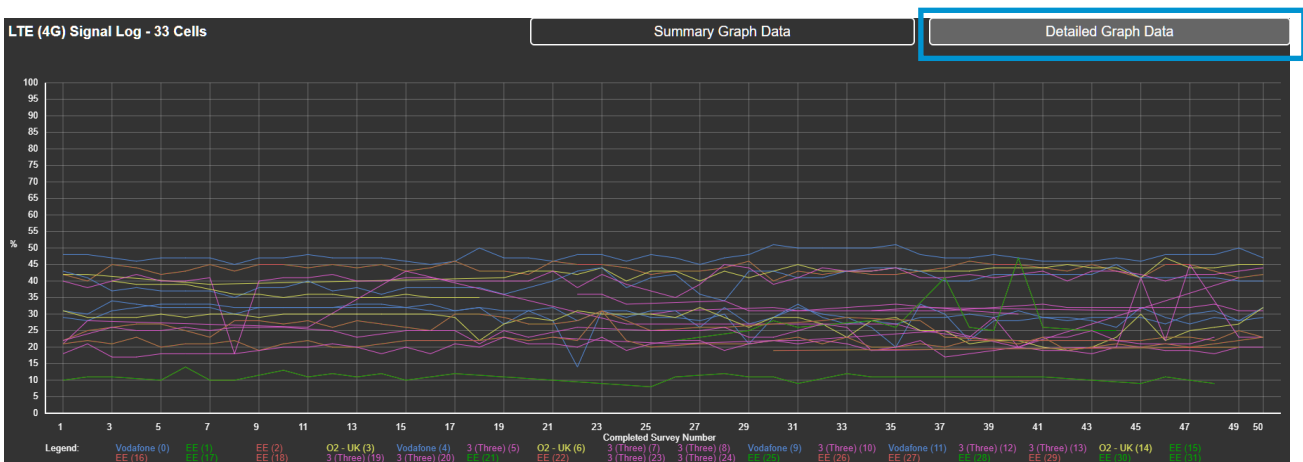


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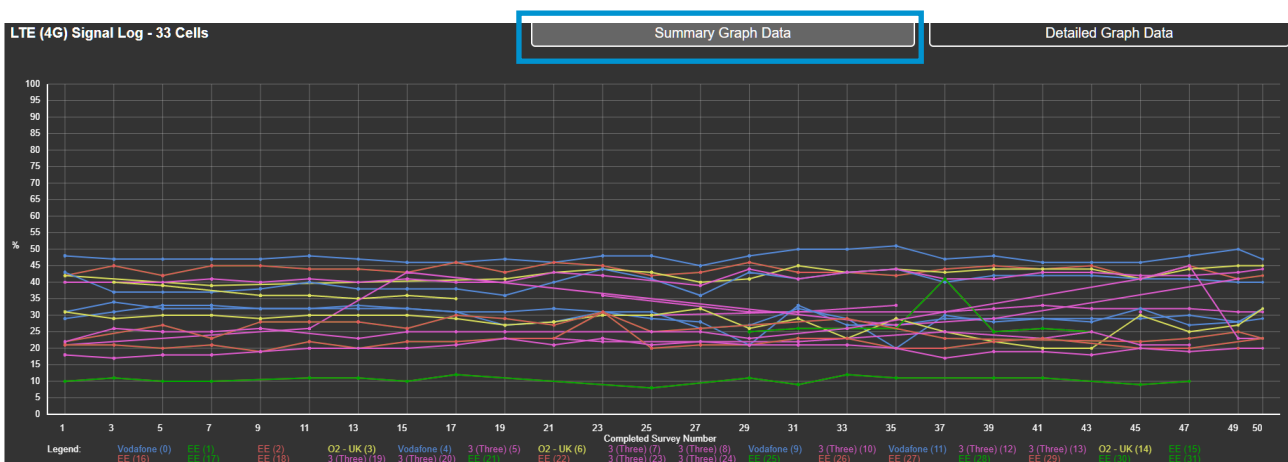
Signal Log

This feature illustrates the fluctuation in a cell's signal strength over time. Hovering over a data point reveals additional information: survey number, signal strength, the respective network and its index number (digit in brackets).

There are two different graph view options. Surveys with a cycle count of less than 50 are best suited for the detailed graph view.



Conversely, for surveys with 50 cycles or more, the summary graph data view is recommended. In this view, certain data points are omitted to enhance overall visual clarity. Please note that in either view, when multiple data points overlap by sharing the same signal strength, only one of the data points can be plotted and displayed. Networks are color-coded for easy identification and are accompanied by a corresponding legend.





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Average signal file

This contains the averaged summary of all the cell measurements.

```

*****
Siretta Limited
*****
SNYPER-5G Network Survey Results (All Networks)
www.siretta.com
+44 1189 769 000
Survey Type          4G
File Created         #####
Primary IMEI Number  8.69E+14
Primary Modem Firmware Version V17
Secondary IMEI Number 8.68E+14
Secondary Modem Firmware Version RM520NGLAAR01A07M4G
Hardware Version     SNYPER-5G
Application Version   1.4.0
File Name            2024-03-07_09_21_05.csv
Survey Start Time    1.71E+09
Survey Cycles        01-Jan
Survey End           Completed
*****
4G (LTE) Survey Results
*****

```

Index	EARFCN	dBm	%	RSSI	MCC	MNC	CellID	TAC	Band	Nur	Band	PCI	RSRP	RSRQ	BW	DL (MHz)	UL (MHz)	Net Name	Signal
1	6300	-61	59	45	234	15	3419924	24701	20	800	MHz	42	-83	-12	10	806	847	Vodafone	
2	6400	-66	54	41	234	10	29020024	17056	20	800	MHz	290	-88	-9	10	816	857	O2 - UK	
3	6225	-67	53	40	234	32	8118796	22570	20	800	MHz	159	-89	-12	5	798.5	839.5	EE	
4	6225	-67	53	40	234	30	8118796	22570	20	800	MHz	159	-89	-12	5	798.5	839.5	EE	
5	3624	-67	53	40	234	15	3419926	24701	8	900	MHz	336	-89	-7	10	942.4	897.4	Vodafone	
6	6175	-76	43	33	234	20	1024518	5000	20	800	MHz	405	-98	-17	5	793.5	834.5	3 (Three)	
7	323	-82	36	27	234	15	3419928	24701	1	2100	MHz	400	-105	-10	15	2142.3	1952.3	Vodafone	
8	3725	-83	35	26	234	10	29028474	17056	8	900	MHz	111	-106	-12	10	952.5	907.5	O2 - UK	

Logged CSV file

The log.CSV file contains the complete set of logged data. The headers follow the same format as the other CSV file however, it differs in that it contains all the measurements taken during the logging process. For this, there are extra columns of data: Index, timestamp and network.

```

*****
Siretta Limited
*****
SNYPER-5G Network Survey Results (All Networks)
www.siretta.com
+44 1189 769 000
Survey Type          4G
File Created         08/03/2024 12:12
Primary IMEI Number  8.6851E+14
Primary Modem Firmware Version V17
Secondary IMEI Number 8.68371E+14
Secondary Modem Firmware Version RM520NGLAAR01A07M4G
Hardware Version     SNYPER-5G
Application Version   1.4.0
File Name            2024-03-08_12_12_29_log.csv
Survey Start Time    1709899949
Survey Cycles        50/50
Survey End           Completed
*****

```

Survey Cycle	Timestamp	Network	Index	rFCN	dBm	%%	RSSI	MCC	MNC	CellID	LAC/TAC	Band	Nur	Band	BSIC	PCI	RSRP	RSRQ	BW	DL (MHz)	UL (MHz)	Net Name	Signal
1	2024-03-08 12:13:16	4G (LTE)	1	6300	-71	48	37	234	15	3419924	24701	20	800	MHz		42	-91	-8	10	806	847	Vodafone	
1	2024-03-08 12:13:16	4G (LTE)	2	6225	-77	42	32	234	30	8118796	22570	20	800	MHz		159	-95	-9	5	798.5	839.5	EE	
1	2024-03-08 12:13:16	4G (LTE)	3	6225	-77	42	32	234	32	8118796	22570	20	800	MHz		159	-95	-9	5	798.5	839.5	EE	
1	2024-03-08 12:13:16	4G (LTE)	4	6400	-77	42	32	234	10	29020024	17056	20	800	MHz		290	-95	-8	10	816	857	O2 - UK	
1	2024-03-08 12:13:16	4G (LTE)	5	3624	-76	43	33	234	15	3419926	24701	8	900	MHz		336	-96	-8	10	942.4	897.4	Vodafone	
1	2024-03-08 12:13:16	4G (LTE)	6	6175	-79	40	30	234	20	1024518	5000	20	800	MHz		405	-97	-11	5	793.5	834.5	3 (Three)	
1	2024-03-08 12:13:16	4G (LTE)	10	2850	-87	31	23	234	15	3419932	24701	7	2600	MHz		196	-108	-7	20	2630	2510	Vodafone	
1	2024-03-08 12:13:16	4G (LTE)	12	323	-89	29	22	234	15	3419928	24701	1	2100	MHz		400	-108	-8	15	2142.3	1952.3	Vodafone	
1	2024-03-08 12:13:16	4G (LTE)	14	1392	-96	21	16	234	20	1024512	1749	3	1800	MHz		402	-109	-14	0	1824.2	1729.2	3 (Three)	
1	2024-03-08 12:13:16	4G (LTE)	15	199	-87	31	23	234	10	29020028	17056	1	2100	MHz		290	-109	-9	10	2129.9	1939.9	O2 - UK	
1	2024-03-08 12:13:16	4G (LTE)	16	1617	-95	22	17	234	30	8118784	22571	3	1800	MHz		107	-110	-13	20	1846.7	1751.7	EE	
1	2024-03-08 12:13:16	4G (LTE)	19	1617	-95	22	17	234	32	8118784	22571	3	1800	MHz		107	-110	-13	20	1846.7	1751.7	EE	



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LiveSCAN saved files

If LiveSCAN logs are enabled, the saved file can be found in the same directory as the survey logs. There is no HTML version available for the liveSCAN log, only a CSV file is generated. The LiveSCAN files can be identified by the 'LiveSCAN.csv' suffix at the end of the file name.

The format of the generated CSV file is as shown below. In this example, the CSV file is being viewed in Microsoft Excel. To enhance readability, a portion of the survey data has been cropped.

SNYPER-5G LiveSCAN Survey Results							
www.siretta.com							
+44 1189 769 000							
File Created	27/02/2024 09:03						
Primary IMEI Number	8.6851E+14						
Primary Modem Firmware Version	V17						
Secondary IMEI Number	8.68371E+14						
Secondary Modem Firmware Version	RM520NGLAAR01A07M4G						
Hardware Version	SNYPER-5G						
Application Version	1.2.1						
File Name	2024-02-27_09_03_00_LiveSCAN.csv						
LiveSCAN Start Time	1709024580						
Network	23415 (Vodafone)						
Technology	4G (LTE)						
EARFCN	6300						
MCC	234						
MNC	15						
Cell ID	3419924						
TAC	24701						
Band Number	20						
Band	800 MHz						
PCI	42						
Bandwidth (MHz)	10						
DL (MHz)	806						
UL (MHz)	847						
Time	Elapsed	dBm	%	RSSI	RSRP	RSRQ	Signal
	3 00:00:03	-70	50	38	-92	-13	
	5 00:00:05	-71	48	37	-93	-12	
	7 00:00:07	-70	50	38	-92	-11	
	10 00:00:10	-70	50	38	-92	-13	
	13 00:00:13	-72	47	36	-94	-12	
	16 00:00:16	-68	52	39	-90	-10	
	20 00:00:20	-71	48	37	-93	-11	
	22 00:00:22	-71	48	37	-93	-11	

The header contains system information regarding the unit, and the survey on which the LiveSCAN was based. 'LiveSCAN Start Time' corresponds to the date and time the scan was initiated, and is presented in the UNIX time format. The ARFCN, MCC, MNC and CELLID values are extracted from the survey that initiated the LiveSCAN.



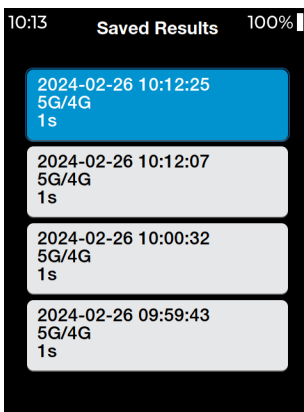
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Saved Results Menu

This menu serves to organise and catalogue the survey history stored on the Graphyte. Each entry is arranged chronologically with the most recent survey presented at the top and the oldest at the bottom.

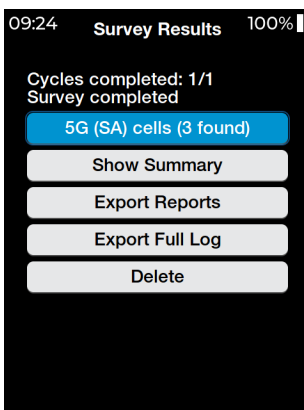
Use the down/up buttons to navigate between surveys as needed.

Each entry follows the format: Date, time, cellular network type, time taken to complete.



Survey results

When selecting a saved entry, it expands into a separate page that lists the different cellular network types surveyed, along with the respective count of cell towers found for each type. To return the previous screen, press the back button.



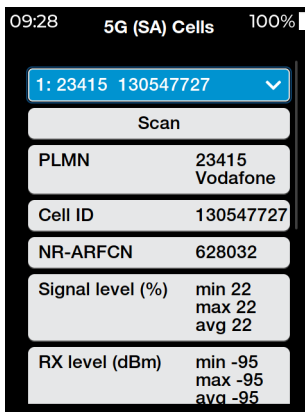
Users are presented with a number of options: view the saved survey data in full detail or in summary format, export a report, export a full log report or delete the survey data.



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Viewing survey data

The drop-down menu at the top, lists all identified cell towers based on signal strength in descending order. Select an entry then navigate downward to access further details about the cell.



Viewing summary data

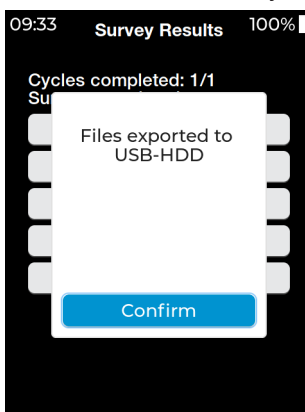
This provides a list of surveyed cells categorised by signal strength and corresponding network operator. The drop down lists presents signal strength in descending order: 85%, 70%, 55%, 40%, 25%, 10%. A count of the all cells that fall within that range will be displayed.

Export Reports

Saves the survey results to memory as a .csv file. This allows a survey to be 'recovered' if the survey files have been deleted from the file system.

Export Full Log

Saves the survey results to memory as a .csv log file. This allows a survey to be 'recovered' if the survey files have been deleted from the file system.





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Delete

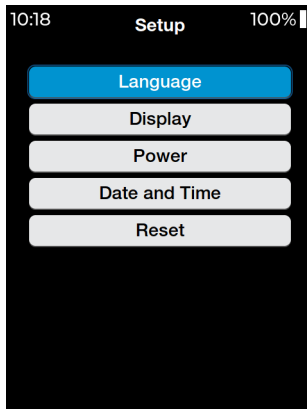
A warning window will appear asking the user to confirm their decision. Press the OK button to delete the survey.





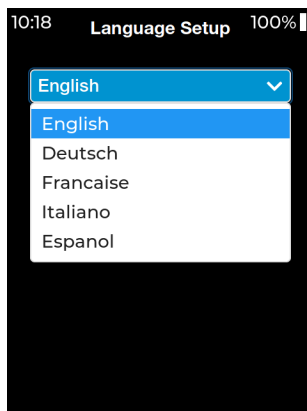
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Setup Menu



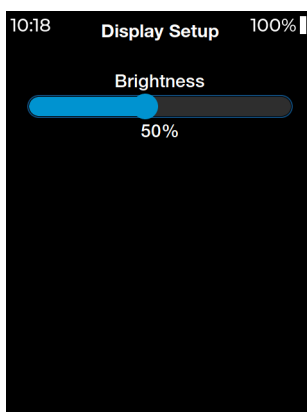
The setup screen, accessible from the main menu, allows user to configure specific functionalities of the Graphyte. This includes making changes to settings such as the language and display brightness. Any changes made take immediate effect once made, eliminating the need to power-cycle the unit.

Language Setup



The Graphyte provides language options including: English, German, French, Italian, and Spanish. English is the default factory setting. The language settings impact both the menus displayed on the Graphyte and the saved HTML and CSV files.

Display Setup



Allows the user to adjust the screen brightness.

Brightness: Increases in increments of 10%, ranging from 10% to 100%.



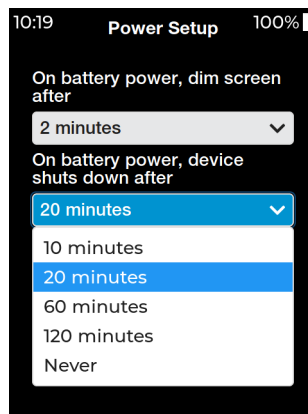
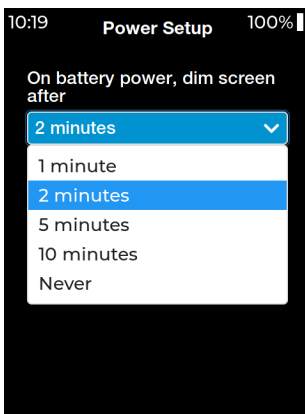
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Power Setup

This feature enables the Graphyte to either dim the display or power down the unit after a predefined time period with the intent of extending the device's battery life. This can be particularly beneficial when conducting multiple surveys without access to a charging supply.

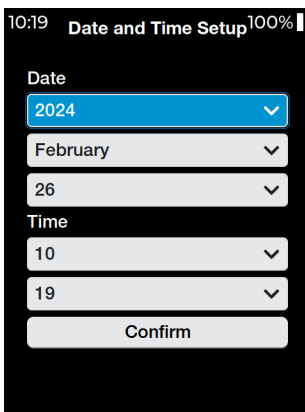
Screen dim: On battery power, dim screen after: 1 minute, 2 minutes, 5 minutes, 10 minutes, or never.

Power down: On battery power, power down device after: 10 minutes, 20 minutes, 60 minutes, 120 minutes, or never.



Date and Time Setup

Date and time can be configured here. This value is also used when timestamping the HTML and CSV files. Use the up and down arrow buttons to navigate between each drop-down menu and make selections using the OK button. To finalise the configurations, locate and press the confirm button. Press the back button to return to the previous screen.



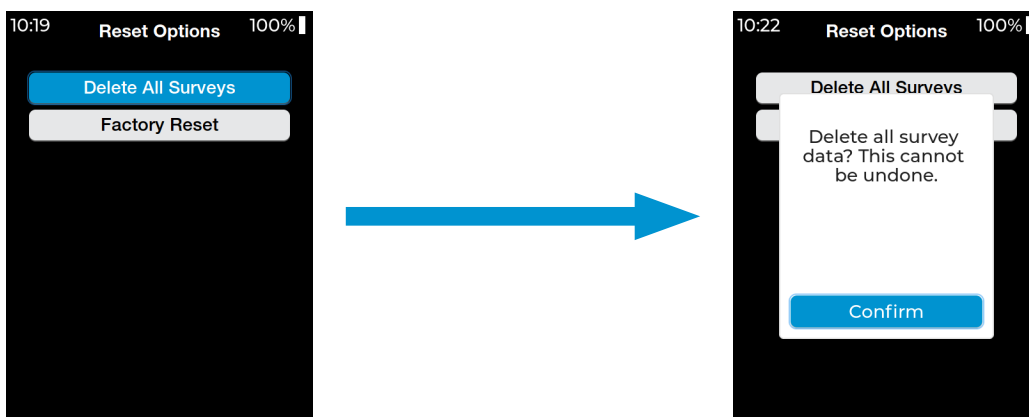


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Reset

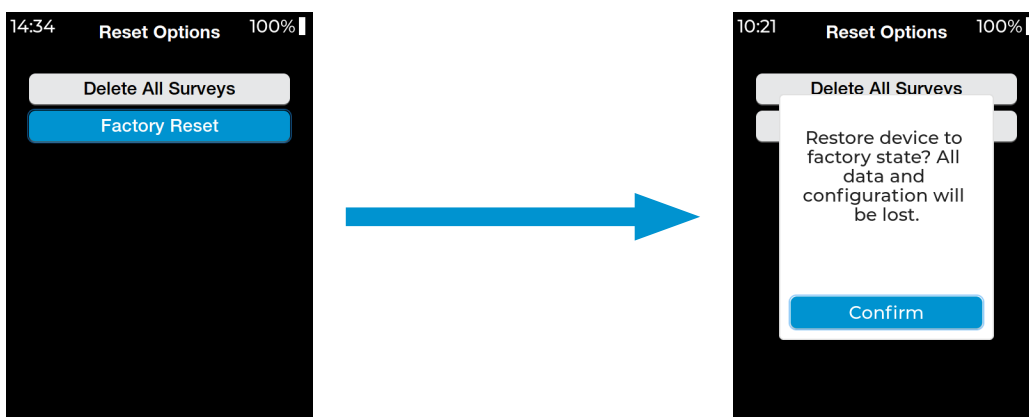
Delete All Surveys

This will erase all surveys and files within the internal memory. Please ensure that any files required have been backed up before continuing. A warning window will appear asking the user to confirm their choice, press OK to confirm.



Factory Reset

This will reset the unit back to factory settings. All configurations and any data stored on the device will be erased, including HDD storage. A warning window will appear asking the user to confirm their choice, press OK to confirm. A factory reset will not reset the date and time nor does it revert the software in the unit to the factory supplied version.





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About Menu

The about menu provides build information about the Graphyte.

Hardware Version: Hardware information.

Software Version: The current software release version operating on the unit.

Storage Info (Surveys): This is where surveys are stored locally. It displays the total available internal memory and the percentage of memory used.

Storage Info (USB-HDD): This is where exported files are stored. It displays the total storage available and the percentage of memory used.

Supported Cell Techs: List of cellular technologies supported by the unit.

SIM Info: View both the IMSI and ICCID numbers of the inserted SIM card.

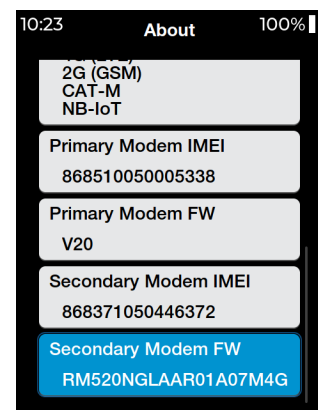
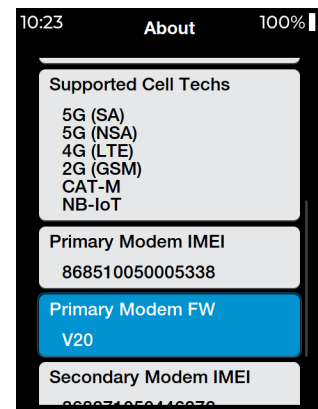
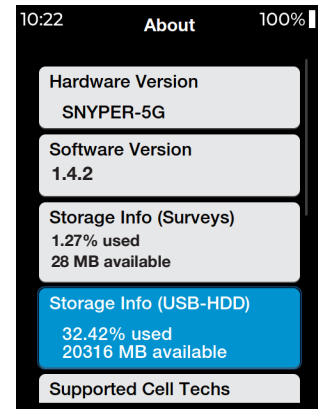
Primary Modem IMEI: 15-digit number uniquely identifying the Graphyte.

Primary Modem FW: The current firmware version operating on the unit.

Secondary Modem IMEI: 15-digit number uniquely identifying the Graphyte.

Secondary Modem FW: The current firmware version operating on the secondary module.

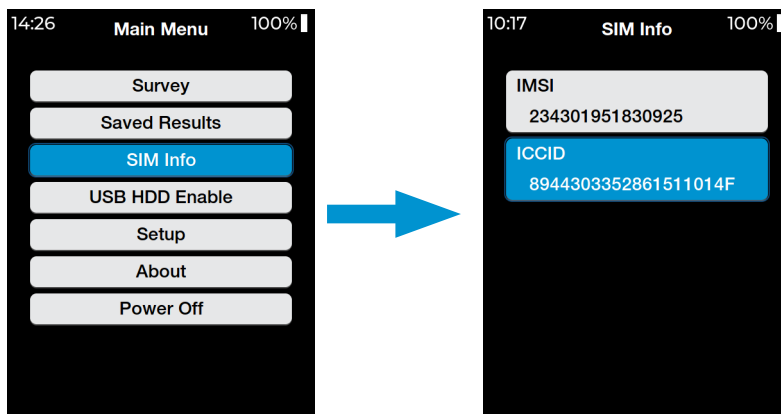
Note: The Sniper 5G is equipped with two distinct cellular modules: one is designed to manage 4G and 5G, while the other is responsible for handling 2G, LTE-M, and NB-IoT.





SIM Info Menu

This area showcases information related to the inserted SIM card. With a SIM card present in the device, the page will display the IMSI and ICCID; however, in the absence of a SIM card, the page will be inaccessible, and the tab will appear greyed out from the main menu.



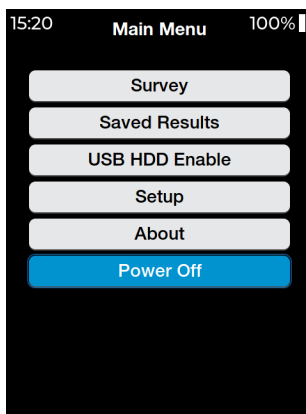


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Power Off

There are two ways to shut down the Graphyte.

1. Press and hold the power button for at least 2 seconds.
2. Power off from the main menu.



Use the up/down arrow buttons to select Power Off, then press the OK button.



Following the splash screen, the Graphyte shuts down.

The Graphyte can also be configured to automatically power down after a given period of inactivity. This is a feature that can be disabled/enabled within the 'Setup' tab on the 'Main Menu'.



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Battery Management

Battery Charging

To charge the Graphyte, simply connect the USB-C port to a compatible charging source. Charging will then commence if required and the battery is at a suitable charging temperature.

To avoid electrical waste, Siretta like many other companies assume that their customers will have a suitable charging supply available. The supplied USB cable has a dedicated USB-C connector at one end to connect to the Graphyte. The other end has a USB-C connector as well, but also has a tethered adapter so that it can be changed to USB-A. This allows the Graphyte to be plugged into either a USB-A or USB-C charging supply.

To charge the battery at the maximum rate a USB-C power supply is preferred because it will be able to deliver 7.5 W. USB-A sources are also acceptable, but many are unable to deliver 7.5 W which will result in longer charging times. The charging circuit in the Graphyte will negotiate power levels with the charging USB port and will adjust its power demand from the charging USB source to a level which the charging source can provide.

To prevent battery damage and to prolong the life of the battery, battery charging will automatically be suspended if the battery temperature falls below 0 Celsius or exceeds 60 Celsius. Fast charge will only occur between 10 and 45 Celsius. The status LED shows the USB charging supply and battery fully charged states:

Status	Status LED
Power on Initialisation	Blue
Battery fully charged	Green
USB power applied	Red

Status LED



States are shown in order of precedence. Blue>Green>Red.

To maximise the battery life, disconnect the Graphyte when the status LED turns green, and do refrain from charging at extremes of temperatures.

Note: The red LED only indicates that power is applied. This doesn't mean that the battery is charging (the temperature could be outside of limits).



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Battery Monitoring

The Graphyte incorporates a smart sensor which measures both the current going into and out of the internal battery and its terminal voltage. This circuit allows the Graphyte to accurately estimate and display the remaining battery capacity, accounting for variables such as temperature and discharge rate.

However, to achieve this accuracy the sensor must first learn the true capacity of the battery inside the Graphyte. To do this, the Graphyte should be fully charged and then fully discharged several times to achieve best accuracy.

With use, the battery capacity will gradually diminish throughout the life of the Graphyte. To maintain the accuracy of the sensor, the user should take the Graphyte through a full battery charge/discharge cycle annually.



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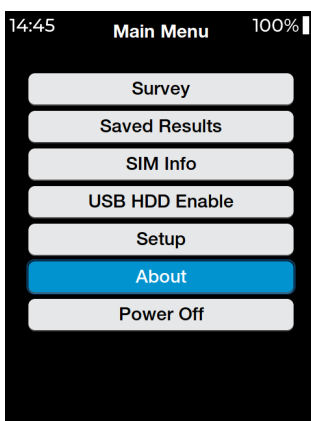
Updating the Graphyte Software

Periodically, Siretta may release software updates for the Graphyte. These software updates may include general improvements, bug fixes, and/or introduce new features.

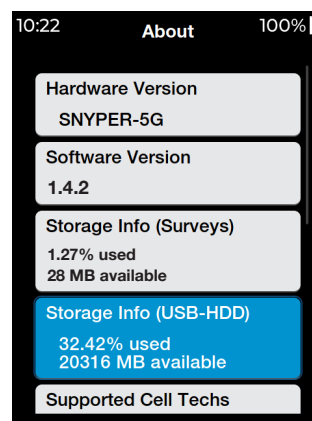
Important Note: Updating the software may result in the loss of survey data. It is advised to back up any surveys to a PC before initiating the upgrade procedure. User settings will be retained throughout the upgrade process.

Procedure

1. Download and install the latest version of SirettaSPARK from the Siretta website: <https://www.siretta.com/sirettaspark>. This tool is required to keep Siretta's modems and cellular analysers updated with the latest software and firmware. For further information please refer to the SirettaSPARK user manual: <https://www.siretta.com/document-library/>.
2. Open SirettaSPARK and connect the Graphyte to the PC via its USB interface. Press the 'Connect device' button within SirettaSPARK tool to discover and connect to the Graphyte.



From the Main Menu,
navigate to the 'About' page.



3. A software update may be performed on any unit that indicates that the current software version is earlier than the latest available version.
4. Press 'Update' to begin the software update. **Ensure that power is not interrupted throughout the duration of the software update.** This process is likely to take several minutes. A pop-up window will appear to display the progress.
5. Once the pop-up window closes, the software update has completed. The 'Update' button in the SPARK tool should now appear greyed out
6. Confirm the update was successful by visiting the about page.



SNYPER-5G & SNYPER-IoT Graphyte User Manual

Glossary

Term	Definition
3GPP	3rd Generation Partnership Project. This organisation publishes all the standards for cellular networks (GSM, LTE, 5G NR and beyond, despite what their name implies). https://www.3gpp.org .
ARFCN	Absolute Radio Frequency Channel Number. This is a GSM technology term (equivalent to EARFCN in LTE and NR-ARFCN in 5G NR). This is defined in specification 3GPP TS 45.005. Different number ranges of the ARFCN correspond to different frequency bands. For example, ARFCN 512 through 855 corresponds to GSM 1800.
Band	A number representing a standardised frequency range and channel arrangement defined by 3GPP TS 36.101 (LTE) and 3GPP TS 38.101-1 (5G NR).
BSIC	Base Station Identity Code. This is a GSM technology term. An identification number of between 0 and 63 to uniquely identify base stations operating on the same frequency. Defined by 3GPP TS 03.03.
Cell Id	Cell Identification. An identification number identifying the cell. For GSM, this is a 16-bit number (0 to 65,535) so is unlikely to be unique for any given network operator although it will be within a LAC. LTE uses a 28-bit numbering scheme (0 to 268,435,455) and 5G NR a 36-bit (0 to 68,719,476,735) and are effectively unique on a network. Defined by 3GPP TS 23.003 (GSM), 3GPP TS 36.413 (LTE) and 3GPP TS 38.423 (5G NR).
Cellular Network	The mobile phone network which carries not only voice but also data. Often referred to as the GSM network, GSM being the first digital mobile telephony network.
dBm	Decibel referenced to 1mW. The decibel is a logarithmic, dimensionless measurement of power ratios. When used in a cellular radio context, this is usually referenced relative to a 50 Ohm impedance (which is the impedance of the cables and antennas used). 0 dBm is defined as 1 mW of power into a terminating load such as an antenna. Signals less than 1 mW result in negative numbers due to the logarithmic nature of the unit of measurement.
DL	Download.
EARFCN	E-UTRA Absolute Radio Frequency Channel Number. This is a 4G technology term (equivalent to ARFCN in 2G and NR-ARFCN in 5G). This is defined in specification 3GPP TS 36.101. Different number ranges of the EARFCN correspond to different frequency bands.



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Term	Definition
EDGE	Enhanced Data rates for GSM Evolution. This is a 2G technology term. A packetized data implementation for the GSM network allowing data rates to 236.8 kBits/sec
E-UTRA	Evolved UMTS Terrestrial Radio Access. The radio air interface of the 4G LTE network.
GPRS	General Packet Radio Services. This is a 2G technology term. A packetized data implementation for the GSM network allowing data rates to 85.6 kBits/s.
GSM	Global System for Mobile Communications, the 2G cellular network.
ICCID	Integrated Circuit Card Identifier. A unique number that identifies a physical SIM card. This number is stored on the SIM card and is normally printed on the physical card. Defined by ITU-T recommendation E.118.
IMEI	International Mobile Equipment Identity. A 15 decimal digit number unique to the cellular device. Its structure is defined by 3GPP TS 23.003.
IMSI	International Mobile Subscriber Identity. A number stored on a SIM card that uniquely identifies the user of the SIM card to the network, and therefore how their calls will be routed. The first 3 digits of the number are the MCC of the country of the network, and the next 2 or 3 digits are the MNC of the network. The remaining digits are the MSIN (Mobile Subscription Identification Number). Its structure is defined by 3GPP TS 23.003.
ITU	International Telecommunication Union. A United Nations agency responsible for standardizing telecommunications. https://www.itu.int .
LAC	Location Area Code. A fixed length code of two octets (4 digits, 16 bits long) that forms part of the LAI. The LAC identifies a location area within a GSM PLMN. Its structure is defined by 3GPP TS 23.003.
LAI	Location Area Identification. Comprises the MCC, MNC and the LAC to uniquely define a geographical location.
LTE	Long Term Evolution, the 4G cellular network.
LTE-M	Long Term Evolution Machine Type Communication.
MCC	Mobile Country Code. Used to identify the country that the mobile network is operating in. Defined by ITU-T Recommendation E.212. Note that even though this is a country code, there are some non-geographical codes used for special purposes such as maritime.



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Term	Definition
MNC	Mobile Network Code. Used in conjunction with the MCC to uniquely identify a network operator. Defined by ITU-T Recommendation E.212.
MNVO	Mobile Virtual Network Operator. A mobile services operator which does not own mobile network infrastructure, but instead sells mobile services under its own brand name and uses a third party operator who does own physical network infrastructure (i.e. cell towers).
NB-IoT	Narrow Band-Internet of Things. A low bandwidth, low power, low data rate version of LTE designed for low-cost embedded devices.
NB-IoT stand-alone	NB-IoT working within spectrum that is not designated for an LTE network. Normally this means within the GSM spectrum, but other frequencies are possible.
NB-IoT guard band	NB-IoT working with normal LTE bands of operation but using its low bandwidth to operate in the guard bands in-between normal LTE carriers.
NB-IoT in-band	NB-IoT working with normal LTE bands of operation and carrier rules.
NR	New Radio. The name of the 5G network in the same way that the 4G network is referred to as LTE
NR-ARFCN	New Radio-Absolute Radio Frequency Channel Number. This is a 5G NR technology term (equivalent to ARFCN in 2G and EARFCN in 4G). This is a code defined in specification 3GPP TS 38.101-1. Each NR-ARFCN maps to a specific frequency.
NSA	Non-Standalone. A 5G NR term that refers to how the 5G network has been implemented (the other implementation being SA). In a 5G NSA network 5G NR and LTE cells are combined in a way that gives the speed advantage of dual-connectivity for 5G terminals while providing backward compatibility for LTE connections.
OTG	On The Go. Used with USB and called USB OTG. It's a USB specification that allows the device to act as a host, allowing devices such a flash drives, or in this documents case the Graphyte, to be attached.
PAYG	Pay As You Go. Used when describing a SIM card with no contract associated with it.



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Glossary

Term	Definition
PCI	In 4G networks, the PCI is a 9-bit value (ranging from 0 to 503), unique identifier assigned to each cell within the network to differentiate and distinguish between neighbouring cells. Whereas in 5G networks, the PCI is a 24-bit value (ranging from 0 to 1007). It serves the same purpose as in LTE, providing a unique identifier for each cell in the network. Defined in 3GPP TS 38.211
PLMN	Public Land Mobile Network. A PLMN code is the concatenation of the MCC and MNC, resulting in a five or six digit number.
RSRP	Reference Signal Received Power. This is a 4G technology term. The measured linear average power over the total power received in the frequency bandwidth of operation as measured at the antenna connector. In short, total power received. The reporting range of RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution. This term is defined in 3GPP TS 36.214.
SS-RSRP	RSRP in 5G NR is typically referred to as Synchronization Signal based Reference Signal Received Power. The reporting range of SS-RSRP for L3 reporting is defined from -156 dBm to -31 dBm with 1 dB resolution. Defined in 3GPP TS 38.133.
RSRQ	Reference Signal Received Quality. This is a 4G technology term. It is defined as the ratio $N \times \text{RSRP} / (\text{E-UTRA carrier RSSI})$, where N is the number of resource blocks (RB) of the E-UTRA carrier RSSI measurement bandwidth. In simple terms, it gives an indication of the quality of the signal relative to the noise level, helping to determine the overall performance and stability of the network. This term is defined in 3GPP TS 36.214.
SS-RSRQ	Synchronization Signal Reference Signal Received Quality. This is a 5G technology term. It is defined as the ratio of $N \times \text{SS-RSRP} / (\text{NR carrier RSSI})$, where N is the number of resource blocks (RB) in the NR carrier RSSI measurement bandwidth. This term is defined in 3GPP TS 38.215.
RSSI	Received Signal Strength Indication. This term is used in different wireless standards such as Wi-Fi and is not standardized across technologies. The Graphyte measures the received signal in dBm and converts to RSSI using the mappings defined in the appropriate cellular standard. For GSM, 3GPP TS 27.007 maps the RSSI range of -113 dBm to -51 dBm to the scale 0 to 31. For LTE (including LTE-M and NB-IoT) 3GPP TS 36.133 maps the RSSI range of -100 dBm to -25 dBm to the scale 0 to 76. For 5G NR, 3GPP TS 38.133 maps the RSSI range of -100 dBm to -25 dBm to the scale 0 to 76.
SA	Stand Alone. A 5G NR term that means that all radio access is via 5G and that there is no backward compatibility with LTE.



Glossary

Term	Definition
TAC	Tracking Area Code. Defines a unique geographical area of an LTE or 5G NR cellular network. This is a 16-bit binary number (0 to 65,535), but the values of 0 and 65,534 are special cases and any cell presenting these values may not be operational. Defined by 3GPP TS 24.301.
UL	Upload.
Yagi Antenna	This is an antenna optimised to give a very high gain in the direction in which it is pointed. But this optimisation means that its performance in other directions is very poor.



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Compliance Information

FCC Class B Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- » Reorient or relocate the receiving antenna.
- » Increase the separation between the equipment and receiver.
- » Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- » Consult the dealer or an experienced radio/TV technician for help.



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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.



Enabling Industrial IoT

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