

**Operation Manual  
For SWGPRS023  
GSM Radio Analyser**

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# GSM Radio Analyser - Operation Manual

## Description

The SWGPRS023 is a radio analyser for use with GSM and GPRS Radio Networks.

It may be used to position an antenna and to test the performance of antenna systems. The analyser will measure and display radio signal strength received. In addition the levels of interference may be measured and sources of interference identified.

The analyser contains a battery allowing remote operation for up to 12 hours. The internal battery may be recharged from the supplied mains power supply or a car lighter socket.

If the analyser is left switched on and unused the units will automatically switch off after 9 minutes.

The analyser is contained within a strong protective sleeve and is supplied complete with a charger, antenna and manual.

This operation guide is for Radio Analyser software version v1.00

**Warning: Only use with the supplied charger.**

# Analyser Contents

Mains Plug-top  
Charger



GSM Radio Analyser

# Using the Radio Analyser

Use the analyser to perform a site survey. See page 6.

1. Charge the battery before use.  
Connect the antenna  
See pages 15 and 17 for information.
2. Switch the analyser on.  
Press the **on/off** button until the Sequoia logo is shown  
This is followed by the **Startup screen**. \_\_\_\_\_  
See page 14 for information.

The startup screen will be shown during registration.  
(30 seconds max.)

3. The **MAIN Menu**  
See page 7 for information. \_\_\_\_\_

Press the Right button to select the SURVEY screen.



4. The **SURVEY** screen.  
See page 8 for information. \_\_\_\_\_

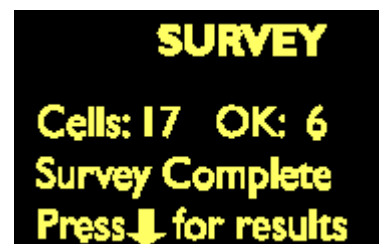
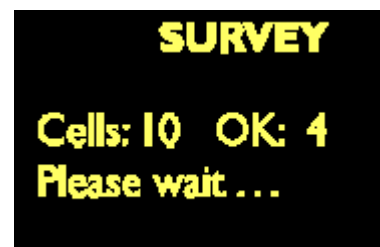
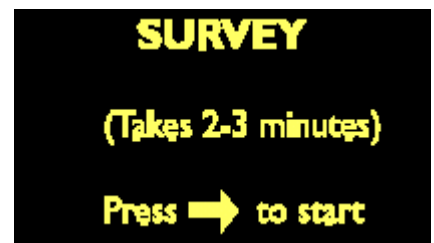
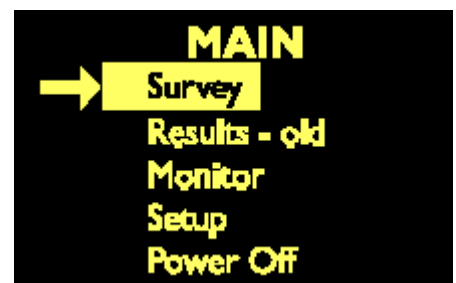
Press the **Right** button to start the Survey.



The analyser will measure all detectable base stations.  
Keep the antenna upright. \_\_\_\_\_  
Do not move or touch the antenna.

Survey complete (2 mins. Max)  
Shows number of base stations detected. \_\_\_\_\_

Press the **down** button to select the **RESULTS** screen.



## Using the Radio Analyser \_\_\_\_\_

5. The **RESULTS** screen.  
See page 9 and 10 for information.

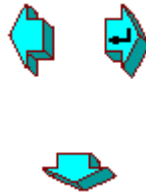
Press the **right** button to display a base station.



Signal strength and quality (BER) of each base station. \_\_\_\_\_

Press the **left** and **right** buttons to display each base station.

Press the **down** button to display the **MONITOR** screen.



6. The **MONITOR** screen \_\_\_\_\_  
See page 11 and 12 for information.

The display is updated every 6 seconds  
It will always jump to the strongest base station.

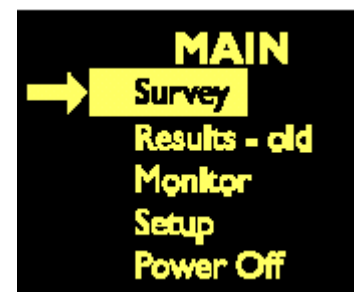
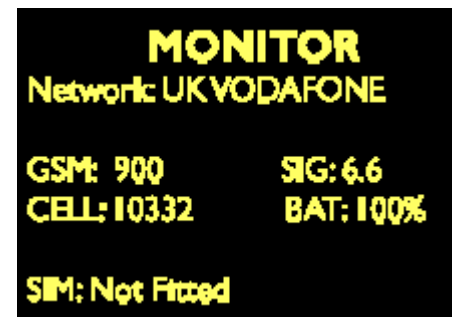
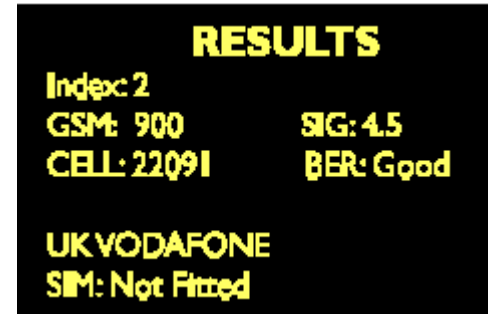
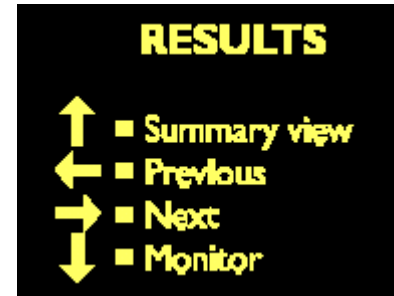
The display is used to locate a transmitter with the strongest signal strength.

Use this location when installing the antenna. See page 15 for more information.

7. Press the **down** button to return to the **MAIN Menu**.

Select a new survey etc as required.

8. To switch off, press and hold the **on/off** button for 2 seconds, then release. When no buttons are pressed for 9 minutes then the analyser will automatically switch off.



# Site Survey

It is strongly recommended that a Site Survey is conducted when:

- a. There may be a weak signal strength at the proposed site.
- b. It is known that the antenna will be fitted inside a sheet metal covered building or under a sheet metal roof.
- c. The antenna will be on lower floors of buildings in heavily built-up areas.

The SWGPRS023 GSM Radio Analyser is ideal for surveying a proposed site for a suitable radio signal. It is also ideal to locate the area of best signal reception.

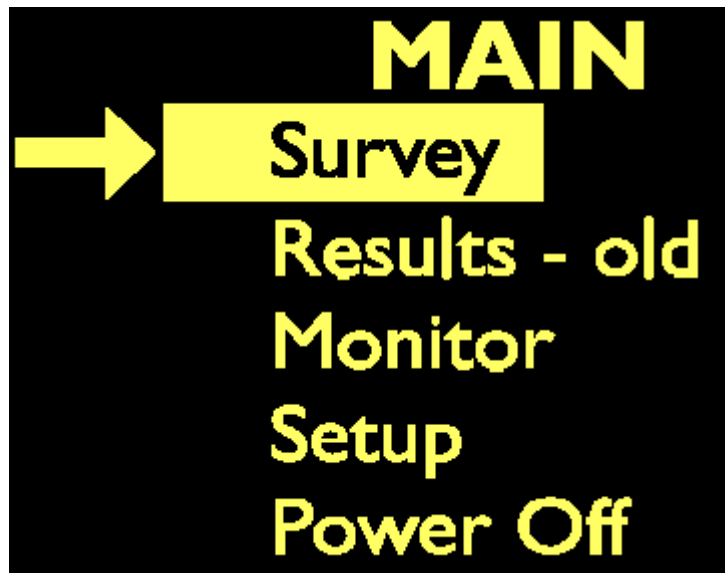
Benefits of finding the best reception:

- Maximise the SIG (High signal strength received from a base station)
- Minimise the BER (Reduce level of interfering signals)

Full details of optimising Signal Strength and BER is on pages 15 and 16.

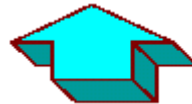
# Operation – MAIN MENU

This menu is where all functions are selected.



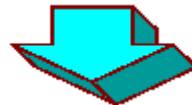
## Up (highlight an option)

Then select the required option (see below)



## Down (highlight an option)

Then select the required option (see below)



## Select the highlighted option

Survey = Page 8

Results = Page 9 -10

Monitor = Page 11-12

Setup=Page 13

Power Off=Switch off (same as Off button)



## Go to Startup Screen

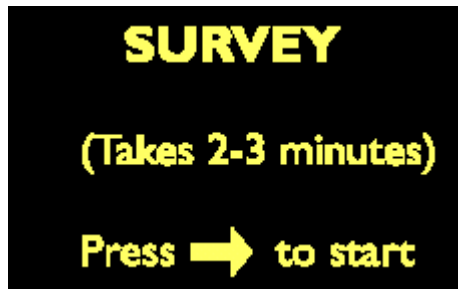
See page 14.



Note: When first switched on, the analyser will still retain the results from the last Survey. These will be available until a new Survey is started.

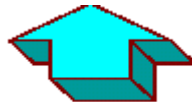
# Operation – SURVEY

Looks for all bases stations in the area and measures their performance.  
A Survey can take up to 3 minutes.



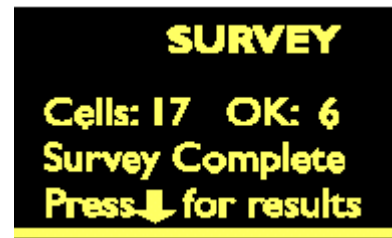
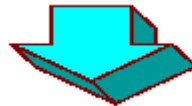
## Go to MAIN MENU

See previous page



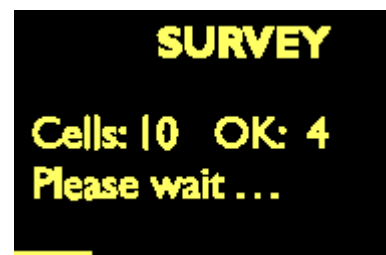
## Go to RESULTS

First, start the survey. See below.  
Shows qty of base stations.  
When complete use this button.  
See page 9 and 10.



## Start the Survey

This can take up to 3 minutes.  
Keep the antenna upright.  
Do not move the antenna.  
Do not touch the antenna.

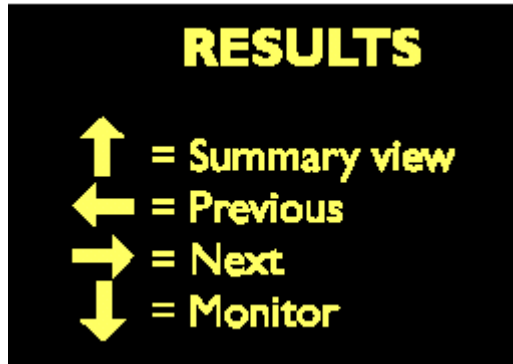


No action



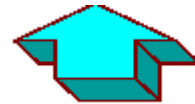
# Operation – RESULTS

Displays the performance of all base stations measured in the Survey. This screen shows the functions of the keypad buttons.



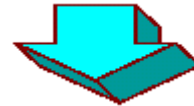
## Swap between Summary (basic) and Detailed views

See next page.



## Go to MONITOR

See page 11 and 12



## Display first and subsequent Base Station's results

See next page.



## Display previous Base Station's results

See next page.



Note: when first switched on the analyser will still retain the results from the last survey. These will be available until a new survey is started.

# Operation – RESULTS

## Summary (basic) View



**INDEX:** During the survey each detected base station is given a number. The base station with the strongest signal is given number 1. Higher numbers = lower strength signal.

**GSM:** 900 or 1800MHz

The radio frequency band used by the displayed base station. Radio signals using 900MHz penetrate better into buildings.

**CELL:** Cellular identification number of the base station.

**SIG:** Signal Strength

1% = Very low. 99%=Very high.

Similar to mobile phone 7-segment display (0 to 9). Should be at least 40% for reliable usage.

**BER:** Interference.

Good = none or low levels.

Bad = medium or high levels.

See page 20 for more information.

**NETWORK:** The network name of the displayed base station.

**SIM:** Not fitted, fitted or status.

### Detailed View:

**INDEX:** As above

**ARFCN:** Absolute Radio Frequency Channel Number

**BSIC:** Base Station Identity Code. Identified the beacon frequency.

**CELL:** As above.

**LAC:** Local Area Code. Identified the area in which the Cell is situated.

**SIM:** As above.

**dBm:** RSSI Signal Strength. Scale = decibels ref to 1 mW.

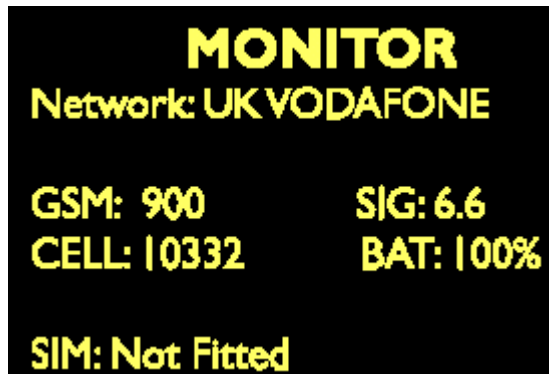
**BER:** Interference. Scale 1% = 1 bit corrupted per 100 bits received.

**MCC:** Mobile Country Code. A three digit number = country (234 = UK)

**MNC:** Mobile Network Code. A 2 or 3 digit number = network within the country.  
Vodafone = 15.

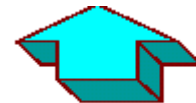
# Operation – MONITOR

Displays the base station with the strongest signal on the selected network. The readings are updated every 6 seconds.



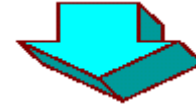
## Swap between Summary (basic) and Detailed views

See next page.



## Go to MAIN MENU

See page 7



## When SIM Card is fitted = no action

## When SIM Card absent = Select Network

First highlight the network required (use Left button), then press the right button to select. Then wait (1 min max)

See next page.



## When SIM Card is fitted = no action

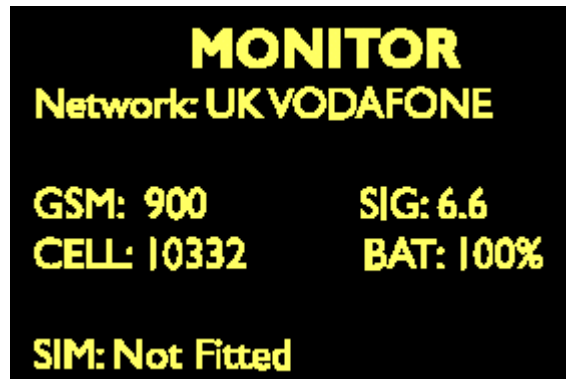
## When SIM Card absent = Highlight Network

Press repeatedly to highlight the required network then press the right button to select.



# Operation = MONITOR

## Summary (basic) View



The displayed base station is the strongest on the selected network. The display is updated every 6 seconds. As the antenna is moved, then a difference, stronger base station may be displayed.

GSM: 900 or 1800MHz

The radio frequency band used by the displayed base station. Radio signals using 900MHz penetrates better into buildings.

SIG: RSSI Signal Strength

1% - Very low. 99% = Very high

Similar to mobile phone 7 – segment display (0 to 9)

Should be at least 40% for reliable usage.

CELL: Cellular identification number of the base station.

BAT: % = charge remaining in battery. 100% = fully charged

EXT = Charger connected.

SIM: Not fitted, fitted or status.

### Detailed View:

NETWORK: The network to which the base station belongs e.g. Vodafone

GSM: As above

BSIC: Base Station Identity Code. Identifies the beacon frequency.

CELL: As above

SIM: As above

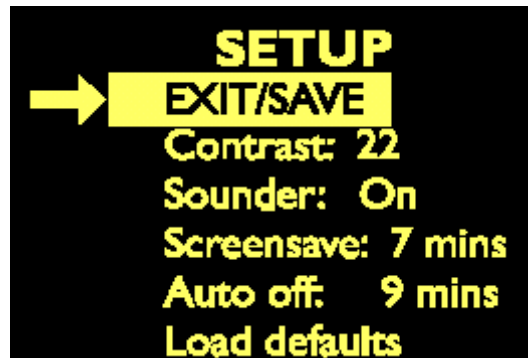
dBm: RSSI Signal Strength. Scale = decibels ref to 1 mW

CSQ: RSSI Signal Strength. Scale = 0-31

BAT: As above

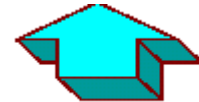
# Operation – SETUP

Setting to make the analyser operate how you require.



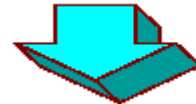
## Up (highlight an option)

Then select the option. See below.



## Down (highlight an option)

Then select the option. See below.



## Do this for the selected Option

EXIT/SAVE = save settings then go to MAIN Menu  
Contrast = Increase display brightness.  
Sounder = On  
Screensaver = Increase minutes before Screensaver starts  
Auto Off = Increase minutes to auto-power off  
Load Defaults = Load default settings



## Do This for the selected Option

EXIT/SAVE = DO NOT save settings then go to MAIN Menu  
Contrast = Decrease display brightness  
Sounder = Off  
Screensaver = Decrease minutes before Screensaver starts  
Auto Off = Decrease minutes to auto-power off  
Load Defaults = no action



## Operation = SCREENSAVER

Reduces batter usage to a minimum.

Moving  
Logo



Press any button to go to MAIN Menu  
See page 7

### Operation – Startup Screen

Shown during start-up and network registration. Shows version number.



Press any button to go to MAIN Menu  
See page 7

# Antenna Siting

Always do a site survey to find the point of best signal before installation. The antenna should be mounted vertically at the point of best signal. This is usually the highest point in the building (often the loft area). For security applications the position chosen should be inside the protected area.

Large metal structures can affect radio signals therefore, wherever possible, avoid installing the antenna directly under sheet metal roofs or within sheet metal covered buildings because this will reduce the signal strength. If this is unavoidable, the strongest signal will be found away from the metal roof or close to large external windows or skylights.

Many large buildings closely spaced together will reduce the signal strength particularly for antennas on the lower floors e.g. ground floor installations in city centres. The strongest signal will normally be found close to external windows or skylights as high as possible.

Wherever possible do not install the antenna close (within 2 meters) to sources of interfering signals. These include: fluorescent or neon lighting, power distribution panels, power cable runs, fridges, freezers, air-conditioning and ventilation equipment as well as electronic equipment e.g. photocopiers, fax machines, computers, televisions etc.

Reliable radio operation is unlikely with a low signal strength, with an incorrectly installed antenna or with strong interfering signals.

Use the analyser to find the point of best signal:

- Maximise the SIG (High Signal strength received from a base station)
- Minimise the BER (Reduced level of interfering signals)

The supplied short black antenna is for hand-held use i.e. roaming site surveys OR alternatively use an external antenna to monitor the on-site antenna.

Remember: It is always easier to find the point of best signal before the equipment is fitted to a wall. Moving antennas, cables, trunking etc after installation is wasted time and effort.

# BER (Bit Error Rate)

The BER (Bit Error Rate) is the level of GPRS interfering signals received by the analyser.

The BER measurement in the Results screen may be used to detect GPRS radio signals that are being corrupted by interfering radio signals.

Sources of interfering signals may be: fluorescent or neon lighting, power distribution panels, power cable runs, fridges, freezers, air-conditioning and ventilation equipment as well as other electronic equipment e.g. photocopiers, fax machines, computers, televisions etc.

This test may be used with a mobile antenna to detect locations where interfering signal strengths are stronger or weaker.

When determining a position for an antenna, for best performance select a location where there are no effects from interference. See page 15.

In most cases interfering sources only radiate short distances so that relocating the antenna 2 to 4 meters away from the source will cure interference effects.

When the BER measurement in the **Results** screen = **Good**

The measured BER value indicates none or low levels of interference.

This is the ideal BER reading that can only be achieved by locating the antenna away from sources of interference. Where occasional interference corrupts some data then the automatic error correction will repair this level of interference. Reliable radio operation should be expected.

When the BER measurement in the **Results** screen = **Bad**

The measured BER value indicates medium or high levels of interference. Error correction may repair some of the corruption caused by interference but reliable operation should be not expected in all instances. High levels of interference may completely inhibit operation. Relocation of the antenna to improve the BER is essential.

# Battery and Charging

Before first use fully charge the battery.

**When charging, use only the supplied mains plug-top power supply.**

A completely flat battery will recharge within 6 hours (typically 3 hours).

A fully charged battery will operate the analyser for up to 12 hours.

The battery state may be read on the Monitor screen. See page 11-12.

When the charger is connected then the unit is always on and the on/off button will not turn the unit off.

When the charger is disconnected then the analyser will automatically switch off within one minute or after the preset time has expired.

If the analyser is left switched on and unused (no buttons are being pressed), then to preserve the battery life, the unit will automatically switch off after 9 minutes. This preset time may be changed in the setup screen. See page 13.

The internal battery is a Solid Electrolyte Lithium Ion type that may be transported, charged and used in any orientation. It should be protected from frost and temperatures above 40 degrees centigrade.

As with all rechargeable batteries, over several years its capacity to store power will degrade. If the operational life of the battery reduces below 1 hour, contact your supplier for replacement information.

**Do not attempt to open the case or remove the battery.**

# APPENDIX 1

## Specification

Model	SWGPRS023
Dimension	(h x w x d) 135 x 78 x 33mm
Weight	210 grammes (including antenna)
Temperature	-20C to +60C transit, -4C to +40C operating
Humidity	0-80% non-condensing
Warranty	2 years
Radio Path	GPRS and GSM
Battery	4 volt, 500mA/h Solid Electrolyte Lithium Ion
Charger	Nokia Type ACP-12X or alternative
Power consumption	Mains 50mA (operation and battery recharging)

## International Packet Radio Approval

The SWGPRS023 Radio Analyser incorporates an independently tested and approved GSM/GPRS Radio Module that meets the requirements of European radio communication standards.

**Approval Authority: CE0168**

# APPENDIX 2

## Glossary of Terms

- BER** Bit Error Rate  
A count or the level of interfering signals received by the analyser.
- CELL** Cellular Identity Number  
A number to uniquely identify each GSM/GPRS Base Station in the UK.
- RSSI** Received Signal Strength Indication  
This is a value indicating the radio signal strength received from the base station at the analyser.
- GPRS** General Packet Radio Service  
A packet based network, within the GSM system where cost is determined by Data Quantity (as distinct from a circuit switched network, where cost is determined by time). Data rates range from 14.4 kbps, using just one of the available TDMA time slots up to a theoretical 115 kbps when all eight time slots are used. Being a packet switched system the bandwidth within each GPRS cell sector will be divided between all the subscribers.
- GSM** Global System for Mobile communication  
A second generation cellular telecommunication system, originally for Europe, now Global. A circuit switched network, where cost is determined by time. Operates in 4 frequency bands 850MHz, 1800MHz and 1900MHz.
- SIM** Subscriber Identity Module  
This is usually referred to as a SIM card. The SIM is the user subscription to the mobile network. The SIM contains relevant information that enables access onto the subscribed operator's network.