# Signal and Tracking Generator

USG Series

**USER MANUAL**

ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

This manual contains proprietary information, which is protected by copyright. All rights are reserved. No part of this manual may be photocopied, reproduced or translated to another language without prior written consent of Good Will company.

The information in this manual was correct at the time of printing. However, Good Will continues to improve products and reserves the rights to change specification, equipment, and maintenance procedures at any time without notice.

**Good Will Instrument Co., Ltd.**
**No. 7-1, Jhongsing Rd., Tucheng Dist., New Taipei City 236, Taiwan.**

# Table of Contents

SAFETY INSTRUCTIONS ..... 2

GETTING STARTED ..... 5
USG Series Introduction ..... 6
Appearance ..... 8
First Time Use Instructions ..... 15

OPERATION ..... 21
Signal Generator Function ..... 22
Tracking Generator Function (Primary RF Software) ..... 32

FAQ ..... 40

APPENDIX ..... 41
USG Specifications ..... 41
USG Dimensions ..... 46
Declaration of Conformity ..... 47

INDEX ..... 47

# SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow during operation and storage. Read the following before any operation to insure your safety and to keep the instrument in the best possible condition.

## Safety Symbols

These safety symbols may appear in this manual or on the instrument.

| | |
|---|---|
| WARNING | Warning: Identifies conditions or practices that could result in injury or loss of life. |
| CAUTION | Caution: Identifies conditions or practices that could result in damage to the instrument or to other properties. |
| | DANGER High Voltage |
| | Attention Refer to the Manual |
| | Earth (ground) Terminal |
| | Frame or Chassis Terminal |
| | Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. |

## Safety Guidelines

| | |
|---|---|
| General Guideline<br>⚠ CAUTION | • Do not place any heavy object on the instrument.<br>• Avoid severe impact or rough handling that leads to damaging the instrument.<br>• Do not discharge static electricity to the instrument.<br>• Use only mating connectors, not bare wires, for the terminals.<br>• Do not disassemble the instrument unless you are qualified.<br>• Ensure reverse power to the USG output terminal does not exceed +30dBm.<br>• Ensure the DC voltage connected to the USG output terminal does not exceed beyond the range of -25Vdc to +25Vdc. |
| Power Supply<br>⚠ WARNING | • 5V DC (USB power) |
| Cleaning | • Disconnect all cables or devices from the instrument before cleaning.<br>• Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid.<br>• Do not use chemicals containing harsh material such as benzene, toluene, xylene, and acetone. |
| Operation Environment | • Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below)<br>• Temperature: 5°C to 45°C<br>• Humidity: 65% @ 50°C |

| | |
|---|---|
| Storage environment | • Location: Indoor<br>• Temperature: -20°C to 60°C; 65°C @ 70% RH |
| Disposal | Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact. |

# GETTING STARTED

This chapter provides a brief overview of the USB Signal Generator (hereafter referred to as 'USG'), the package contents, instructions for first time use and an introduction to the signal generator display and tracking generator function.

USG Series Introduction ..... 6
Series lineup ..... 6
Main Features ..... 6
Package Contents and Standard Accessories ..... 7
Optional Accessories ..... 7
Appearance ..... 8
Front Face ..... 8
Rear Face ..... 8
Signal Generator Display - Java ..... 9
Signal Generator Display – Android App ..... 11
Primary RF – Tracking Generator Function ..... 14
First Time Use Instructions ..... 15
Installing the USG USB Driver ..... 15
Disabling the Device Driver Signature Enforcement in Windows 8 ..... 17
Installing the USG Software from Google Play ..... 18
Tracking Generator Software Installation (Primary RF) ..... 19

# USG Series Introduction

The USG series signal and tracking generators can be operated as standalone continuous wave generators, or when paired to a PC and the GSP-730 spectrum analyzer, they can be used as tracking generators.

As continuous wave generators, the USG can be configured using any java supported PC or an Android device. The device can generate continuous wave, sweep, power sweep and frequency hopping waveforms.

As a tracking generator, the USG can be connected to a PC using dedicated software (Primary RF) to synchronize the USG with the GSP-730 spectrum analyzer.

## Series lineup

The USG series consists of 5 models, spanning a number of different frequency ranges.

| Model | Frequency | Phase Noise |
|---|---|---|
| USG-LF44 | 34.5 MHz to 4.4 GHz | < -97dBc/Hz@1GHz, 10kHz |
| USG-0103 | 100 MHz to 300 MHz | < -100dBc/Hz@200MHz, 10kHz |
| USG-0818 | 800 MHz to 1.8 GHz | < -97dBc/Hz@1.3GHz, 10kHz |
| USG-2030 | 2.0 GHz to 3.0 GHz | < -93dBc/Hz@2.5GHz, 10kHz |
| USG-3044 | 3.0 GHz to 4.4 GHz | < -88dBc/Hz@3.7GHz, 10kHz |

## Main Features

| | |
|---|---|
| Performance | • Five models supporting a frequency range from 34.5 MHz to 4.4 GHz<br>• 10kHz resolution<br>• -30 dBm to 0 dBm output power |
| Features | • Signal generator operation supports a plethora |

of control devices:
Any java-enabled PC: Windows, Mac or Linux PCs.
Any android device that supports USB OTG (USB On The Go) operation (via Google Play).

- Continuous wave, sweep wave, frequency hopping wave, power sweep wave.

## Package Contents and Standard Accessories

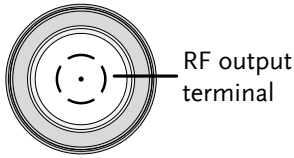
| Standard Accessories | Part number | Description |
|---|---|---|
| | Region dependant | User manual CD |
| | Region dependant | USB A to Mini USB cable |

## Optional Accessories

| Standard Accessories | Part number | Description |
|---|---|---|
| | ADP-003 | N female to SMA female adaptor |

# Appearance

## Front Face

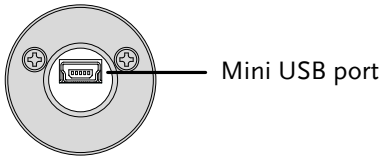



RF Output Terminal

RF output port. Accepts RF outputs.

- Output: 0 ~ -30dBm
- Input impedance: 50Ω
- N-type: male

## Rear Face

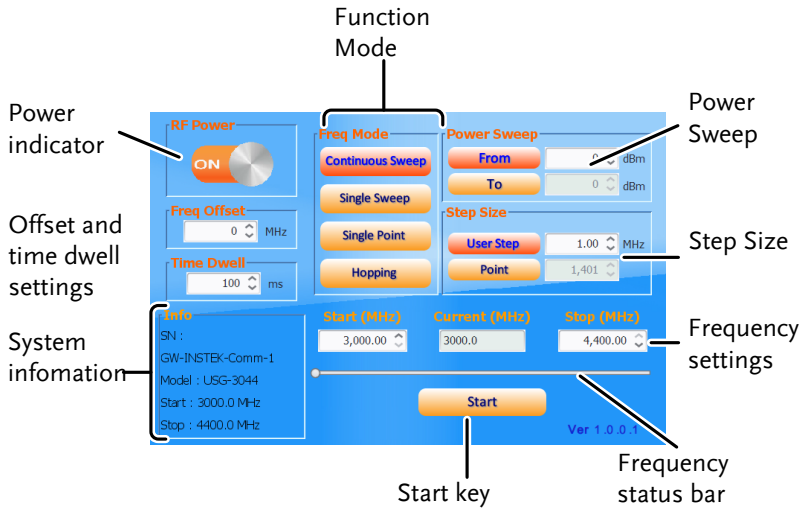



Mini USB port

Used to connect to a PC or Android device for configuration or control.

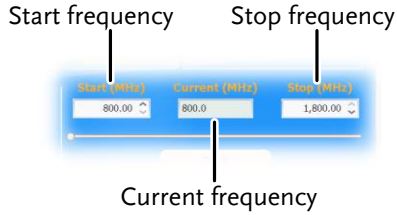
When connected to power, the mini USB port will be lit red.

## Signal Generator Display - Java



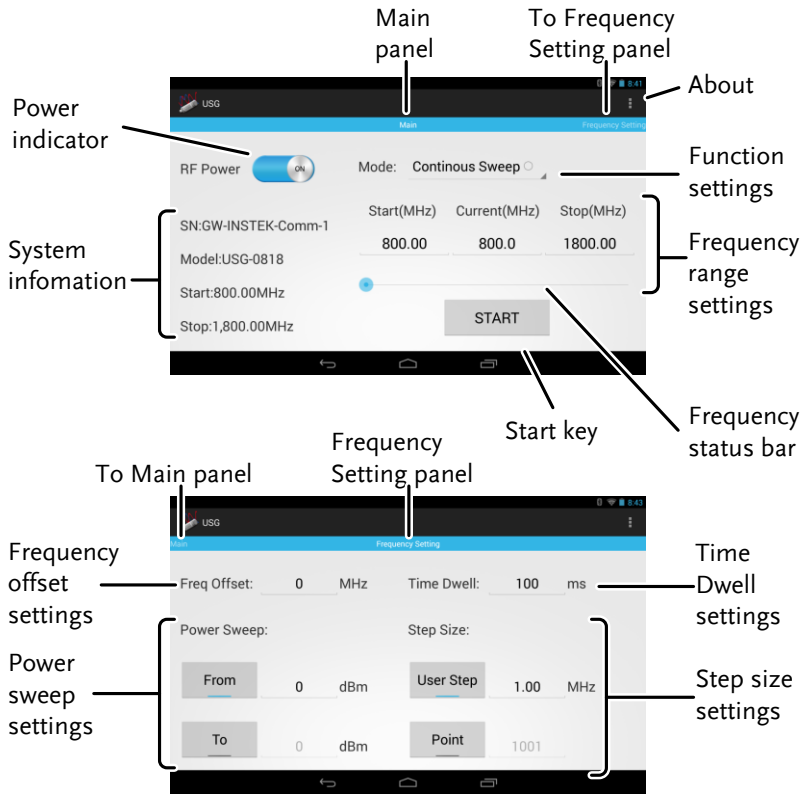

| | |
|---|---|
| Power Indicator | Turns the RF output on or off. |
| Function Mode | Chooses the type of function to be performed by the USG: Continuous Sweep, Single Sweep, Single Point or Hopping |
| Power Sweep | Sets the Start and Stop power level settings. The *From* setting set the initial power level at the start of the sweep and the *To* setting sets the final power level at the end of the sweep. |
| Step Size | Sets the sweep step settings |

| | |
|---|---|
| Frequency Settings | Sets the basic start and stop frequency parameter settings. It also displays the instantaneous (current) output frequency, as shown below. |



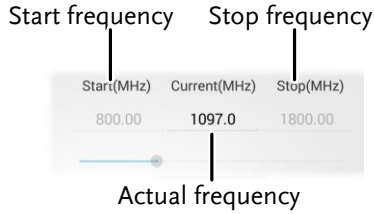

| | |
|---|---|
| Frequency Status Bar | When the output is on, the point on the frequency status bar indicates the instantaneous frequency that is being output. When the output is off, the status bar can set the start and stop frequencies. |
| Start key | Pressing Start will output the selected function. |
| System Information | The system information states the serial number, model and frequency range specifications. |
| Frequency Offset Settings | Offsets the frequency by ±50 kHz. |
| Time Dwell Settings | The time dwell settings determine how long the signal will stay (dwell) at each frequency point. |
| Step Size | The User Step and Point (inversely related) set the step resolution of the single and continuous sweep functions in hertz and number of points, respectively. |

## Signal Generator Display – Android App




| | |
|---|---|
| Power Indicator | Turns the RF output on or off. |
| System Information | The system information states the serial number, model and frequency range specifications. |
| Main panel | Indicates that the interface is in the Main panel. |
| To Frequency Setting panel | Indicates that swiping to the left will go to the Frequency Setting panel. |

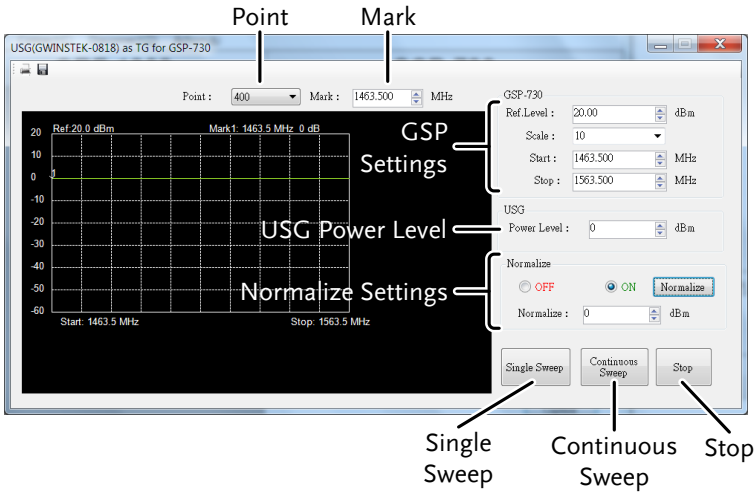
| | |
|---|---|
| Function Settings | Chooses the type of function to be performed by the USG: Continuous Sweep, Single Sweep, Single Point or Hopping. |
| Frequency Range Settings | Sets the basic start and stop frequency parameter settings. It also displays the instantaneous (current) output frequency, as shown below. |




| | |
|---|---|
| Frequency Status Bar | When the output is on, the point on the frequency status bar indicates the instantaneous frequency that is being output. When the output is off, the status bar can set the start and stop frequencies. |
| Start key | Pressing Start will output the selected function. |
| About | Pressing About will display the GNU lesser GPL license requirements. |
| To Main panel | Indicates that swiping to the right will go to the Main panel. |
| Frequency Setting panel | Indicates that the interface is in the Frequency Setting panel. |
| Frequency Offset Settings | Offsets the frequency by ±50 kHz. |
| Power Sweep Settings | Sets the start and stop power level settings. The *From* setting sets the initial power level at the start of the sweep, and the *To* setting sets the final power level at the end of the sweep. |

| | |
|---|---|
| Time Dwell Settings | The time dwell settings determine how long the signal will stay (dwell) at each frequency point. |
| Step Size Settings | The User Step and Point (inversely related) set the step resolution of the single and continuous sweep functions in hertz and number of points, respectively. |

## Primary RF – Tracking Generator Function




| | |
|---|---|
| Point | Sets the number of frequency points for sweep. |
| Mark | Sets the marker frequency. |
| GSP Settings | Sets the reference level, scale and start and stop frequencies. |
| Power Level | Sets the USG output power level. |
| Normalize Settings | Normalizes the USG output. |
| Single Sweep | Outputs a single sweep. |
| Continuous Sweep | Outputs a continuous sweep. |
| Stop | Stops the sweep output. |

# First Time Use Instructions

The following instructions will go over all installation instructions that are required to operate the USG from a PC or from an android device.

## Installing the USG USB Driver

| | |
|---|---|
| Description | The USG connects via USB to a PC using a virtual COM port driver.<br><br>For Linux and OS X systems, the USG device is recognized as a virtual COM port device automatically. *A device driver does not need to be installed for these systems.*<br><br>For Microsoft Windows operating systems, the USG will be recognized as a virtual COM port device only after the USB driver is installed. |
| Requirements | Operating System: Windows XP, Vista, 7, 8* |
| ⚠ Note | *Please note that for Windows 8, "Device driver signature enforcement" must first be disabled before the driver can be installed. See page 17 for details. |

Steps

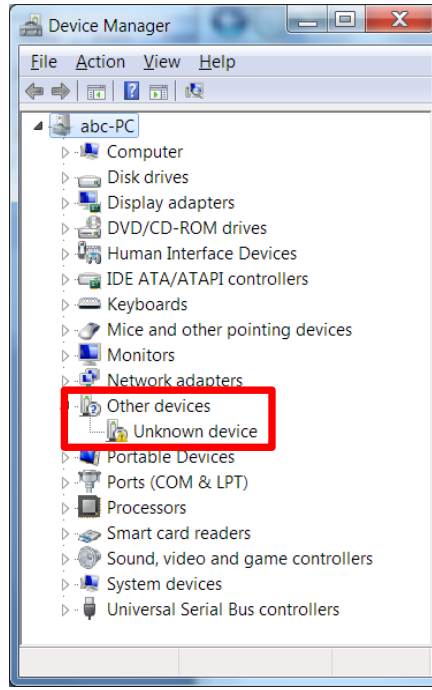
1. Connect the USG to the PC using the USB Type A - Mini-B cable.

   If the PC asks for the driver, please go to step 5.

2. Open the Windows Device Manager. On Windows 7 for example:

   *Start>Control Panel>Hardware and Sound>Device Manager*

3. From the device tree go to: *Other devices*>*USB Serial Port*




*The yellow error sign indicates that a driver has not been installed.*

4. Right-click USB Serial Port and select *Update Driver Software*.

5. Select *Browse* my computer for driver software when prompted.

   Manually select the *USG Driver* from the User Manual CD when prompted.

   If the Windows Security pop-up appears, choose *Install this driver software anyway*.

6. The USG will now become available in the device tree under PORTS (COM & LPT).

## Disabling the Device Driver Signature Enforcement in Windows 8

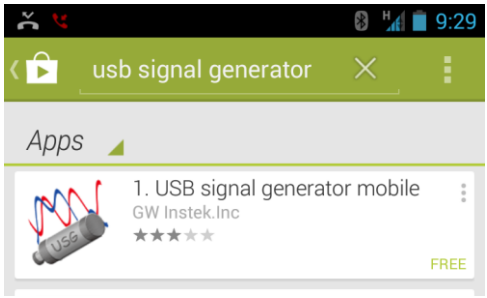
| | |
|---|---|
| Description | To install the USG USB driver on Windows 8 systems, you must first disable "Device driver signature enforcement". This procedure is shown below. |
| ⚠ Note | Applicable to Windows 8 only! |
| Steps | 1. Go to the Charms bar → Click on Settings → Click on Power → Hold the SHIFT key and click Restart → Click Troubleshoot → Advanced Options → Startup Settings → Restart → Select 7) Disable driver signature enforcement.<br>2. The PC will now restart.<br>3. After the PC restarts, it will now be possible to install the USG USB driver on Windows 8 using the procedure shown previously. |

## Installing the USG Software from Google Play

| | |
|---|---|
| Description | The USG software for controlling the USG as a signal generator can be found on the Google Play store. |
| ⚠ Note | Supported for Android 4.0 and above only. |

Steps

1. Open Google Play on your Android device.
2. Enter *USB Signal Generator* in the Google Play search bar.




3. Install the USB Signal generator mobile app (GW Instek.Inc.)
4. The USG app will now be available in your App Draw.

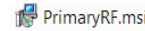
- By default, the USG app will automatically load each time the USG is attached to your USB device.

## Tracking Generator Software Installation (Primary RF)

| | |
|---|---|
| Description | Primary RF is used in conjunction with the USG as a tracking generator for the GSP-730. |
| ⚠ Note: Requirements | Only Windows operating systems (Windows XP, Vista, 7, 8) can be used with the Primary RF software. |
| ⚠ Note: USB Drivers | Before the tracking generator software can be installed, the USG USB driver must first be installed. See page 15 for details.<br><br>Note that the USB driver for the GSP-730's USB interface will be automatically installed when installing the Primary RF software. |
| ⚠ Note: NI 488.2 Software | The tracking generator function requires National Instruments NI 488.2 software to be installed. This software is available on the NI website, www.ni.com. |

Driver installation

1. Open the User Manual CD and click on PrimaryRF.msi.

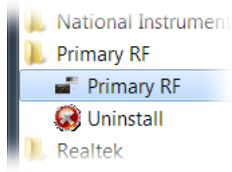



2. The Primary RF Setup Wizard will appear.

   Follow the prompts until it is all installed.

   Note: If the Windows Security pop-up appears, choose *Install this driver software anyway*.

3. Primary RF will now be available in the Windows Start Menu.



# OPERATION

Signal Generator Function ..... 22
Setup ~ PC ..... 22
Setup ~ Android Device ..... 23
Frequency Function Mode ..... 25
Selecting the Frequency ..... 26
Selecting the Frequency Step Size ..... 27
Time Dwell ..... 28
Frequency Offset ..... 29
Selecting the Power Sweep ..... 30
Turning the Output On ..... 31
Tracking Generator Function (Primary RF Software) ..... 32
Setup ..... 32
Tracking Generator Setup ..... 33
Normalizing the Tracking Generator ..... 35
Using the Tracking Generator ..... 37
Save Results - CSV ..... 38
Save Results - Print ..... 39

# Signal Generator Function

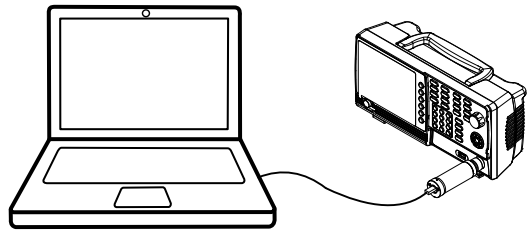
The signal generator function can be controlled with PC using a java program (using Windows, Mac OS X or Linux operating systems) or with an Android device.

## Setup ~ PC

| | |
|---|---|
| Description | The following chapter will show how to run the Java based application and the how to connect the USG to the PC.<br><br>Any Windows, Mac OS X or Linux PC that can install the Java runtime library can be used to operate the signal generator function. |
| Note | The Java runtime needs to be installed before continuing. Visit www.java.com to download and install the Java Runtime. |
| Note | For Windows, the USG USB driver must first be installed. See page 15 for details. Mac OS X and Linux systems do not need to install this driver. |

Connection

1. Connect the USG to the RF port of the GSP-730.
2. Connect the PC to the USG using a Type A-mini USB cable.



3. Open USG_GUI_v1001.jar file (accessible on the User Manual CD).

- The USG_GUI_v1001 file doesn't need to be installed.

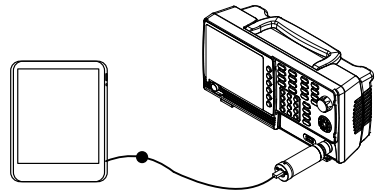
4. If it is not already, turn the RF power on for the USG.

## Setup ~ Android Device

| | |
|---|---|
| Description | The following chapter will show how to start up and connect the USG to an Android device. |
| ⚠ Note | Install the USB signal generator software before connecting the USB to your Android device. See page 17. |

Connection

1. Connect the USG to the RF port of the GSP-730.
2. Connect the Android device to a USB OTG cable.
3. Connect the OTG cable to the USG using a Type A-mini USB cable.



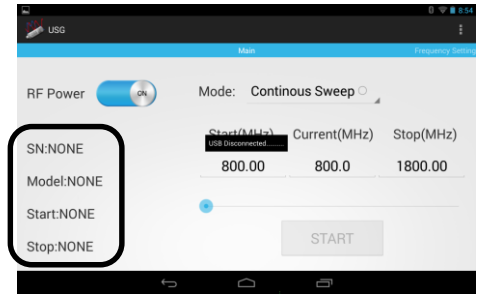
4. By default, the USG app should load up when the Android device is connected to the USG.

   - If the app does not automatically load up, go to the app drawer and run the USB signal generator app.

5. If it is not already, turn the RF power on for the USG.

Note

If the USB cable is not connected properly, the system information in the Main panel will show "NONE". In this case, re-insert the USB cable and the OTG cable.

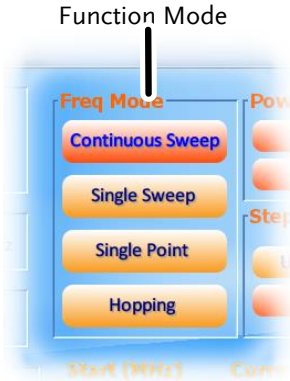


## Frequency Function Mode

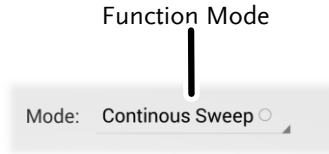
Description

There are four different frequency modes that can be selected.

Java App Display




Android App Display

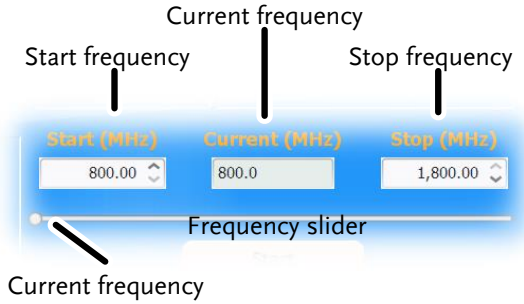
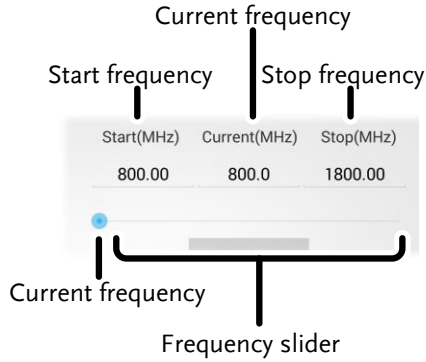



Steps

1. In the *Freq Mode* panel(Java)/*Mode* drop-down list(Android), select the frequency function mode:

| | |
|---|---|
| Continuous Sweep: | Outputs a continuous sweep |
| Single Sweep: | Outputs a single sweep |
| Single Point: | Outputs a single frequency |
| Hopping: | Frequency hops between two frequencies |

## Selecting the Frequency

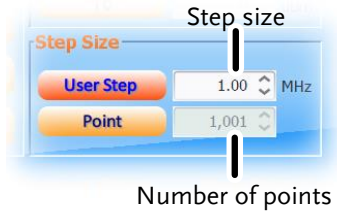
| | |
|---|---|
| Description | Sets the Start and Stop frequency for the USG. |
| Java App Display |  |
| Android App Display |  |
| Steps | 1. At the bottom of the screen set the Start and Stop frequencies for the continuous sweep, single sweep and hopping frequency modes.<br><br>For the Single Point frequency mode, only the Start frequency can be set. |
| ⚠ Note | The settable frequency range is limited by the USG model type. |

## Selecting the Frequency Step Size

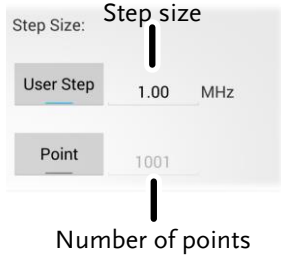
Description

The step size settings determine the number of frequency points for the sweep modes.

Java App Display




Android App Display




Steps

1. To set the span of each step of a sweep, press *User Step*.
2. To set the number of discrete steps in a sweep, press *Point*.
   - The number or points or the frequency span of each step depends on the USG model.

| | |
|---|---|
| User Step range | 0.01MHz~ 100 MHz |
| Point range | (Frequency span of USG model / User Step range) + 1 = Point range |

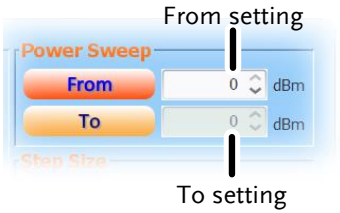
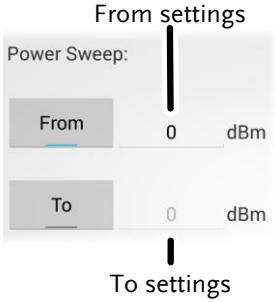
## Time Dwell

| | |
|---|---|
| Description | The Time Dwell setting determines the amount of time between each point in a sweep. |
| Java App Display | Time Dwell |
| Android App Display | Time Dwell |
| Steps | 1. Press Time Dwell to set the amount of time between each step in milliseconds.<br>• The Time Dwell setting range depends on the on the USG model.<br>Time Dwell 1ms~ 1000ms |
| Note | The minimum step time is automatically set by the PC software. A 1ms Time Dwell can only be achieved with a fast system. |

## Frequency Offset

| | |
|---|---|
| Description | The Frequency Offset setting will offset the frequency by ±0.05 MHz. |
| Java App Display | <br>Freq Offset |
| Android App Display | <br>Frequency Offset |
| Steps | 1. Press Freq Offset to set an offset to the frequency settings.<br><br>Offset ± 0.05 MHz |

## Selecting the Power Sweep

| | |
|---|---|
| Description | Sets the power level for the start and stop frequencies.<br><br>For the sweep functions, sets the power level from the Start frequency to the Stop frequency.<br><br>For the Single Point function, the *From* setting sets the initial power level and the *To* setting, if needed, sets the final power level.<br><br>For the Hopping function, the *From* setting sets the power level of the Start Frequency and the *To* setting set the power level at the Stop frequency. |
| Java App Display |  |
| Android App Display |  |

Steps

1. To set the initial power level, press *From*.
2. To set the final power level press *To*.
   - If you only want one power level, only set the *From* setting.

Power level range 0dBm ~ -30dBm

## Turning the Output On

Steps

After all the settings have been set press Start to turn on the output on.

For the single sweep function, press Start for each single sweep.

Java App Display

Android App Display

# Tracking Generator Function (Primary RF Software)

The Primary RF software can be used as a tracking generator for the GSP-730 to track the frequency response of a DUT.

⚠ Note

Please note that the Primary RF software has multiple functions and can be used for purposes other than as tracking generator software for the GSP-730. The other software functions are beyond the scope of this manual and will not be detailed.

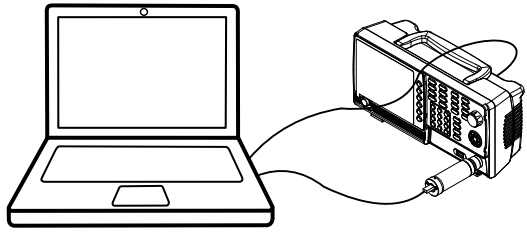
## Setup

Description

The following chapter will show how to connect the USG to the GSP-730 and to the host PC when using the USG as a tracking generator. To use the USG as a tracking generator, the Primary RF software must be used. See page 19 for installation details.

Connection

1. Connect the USG to the RF port of the GSP-730.
2. Connect the PC to the USG using a Type A-mini USB cable.
3. Connect the PC to the rear-panel USB B port on the GSP-730 using a Type A-Type B USB cable.



## Tracking Generator Setup

Description

The section will describe how to use the USG as a tracking generator for the GSP-730.

Operation

1. Launch PrimaryRF.
2. Click on the large GSP-730 button at the top of the window.

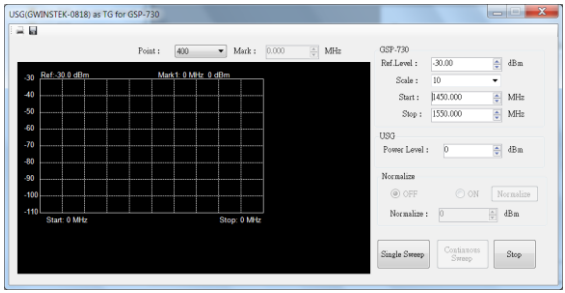
   The spectrum analyzer settings will be shown* when the connection to the GSP-730 is working.

Note

*Note: The above GSP-730 frequency and amplitude settings as well as the Capture function are not used for the tracking generator function and are thus not used in this manual. Using these functions is beyond the scope of this user manual.

3. Press *Action(A)* and select *USG as TG for GSP-730*.

   A new window will open for the tracking generator options.



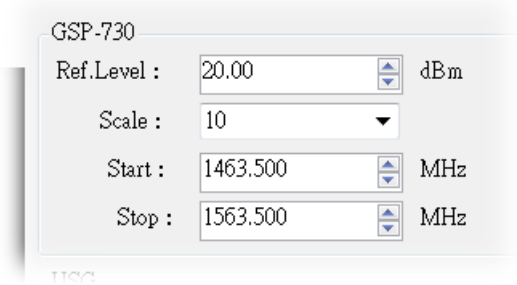

4. Press *Point* and set the number of frequency points that will be used in the sweep.

5. Press *Mark* and set the marker frequency.

- *The marker frequency and amplitude will be shown at the top of the grid.*

6. Under the GSP-730 panel set the basic spectrum analyzer settings:

   - *Ref.Level: -40 ~ 20 dBm*
   - *Scale: 1~10*
   - *Start frequency: Dependent on the connected USG model*
   - *Stop Frequency: Dependent on the connected USG model*




7. Set the USG power level:

   - *Power Level: 0 ~ -30 dBm*

## Normalizing the Tracking Generator

| | |
|---|---|
| Description | The tracking generator should first be normalized before a DUT is connected to the USG. |
| Operation | 1. Setup Primary RF as shown above. |

2. Press *Single Sweep* and perform a single sweep.

   - *It may take some time to complete a full sweep, depending on the fixed RBW (1MHz) and span 100MHz settings.*

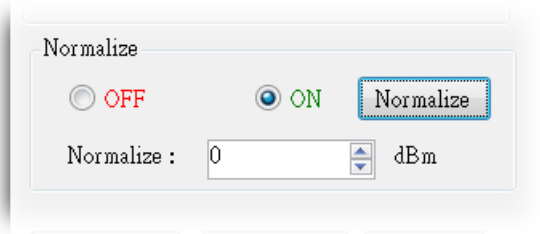
   - *The Normalize panel will be selectable after the first sweep is performed.*

3. Press *Normalize* after a full sweep has been performed. The Normalize radio button will then automatically be set to *ON*.

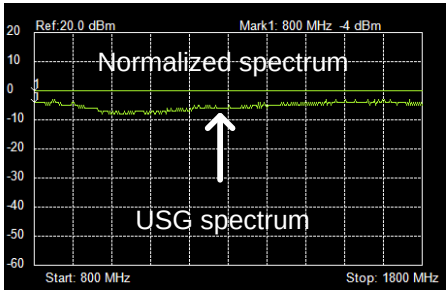
   - *This will normalize the USG output for the Primary RF software.*

4. Set the normalized amplitude level.

   - *Normalize: 0 ~ -30dBm.*




Display



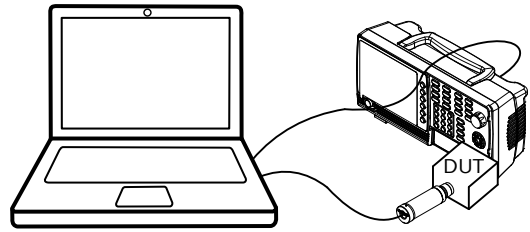
Note

Before performing normalization, make sure the USG has been on for at least 30 minutes to eliminate drift from effecting the normalization.

## Using the Tracking Generator

Description

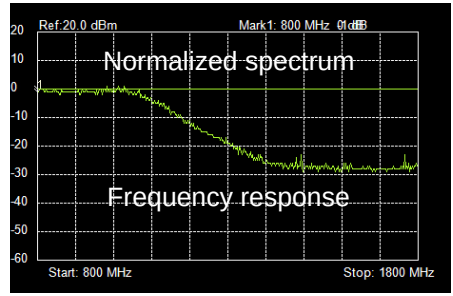
After normalization is performed, the USG can be used to measure the frequency response of a DUT.




Operation

1. Remove the USG from the GSP-730 and put the DUT between the USG and the GSP-730 RF ports.
2. Press *Sweep* or *Continuous* sweep to get the frequency response of the DUT.

Display



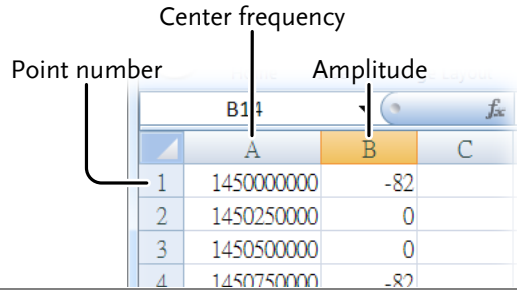

Example: Low pass filter frequency response.

## Save Results - CSV

Description

The spectrum results on GSP-730 can be saved as a CSV file.

CSV File Format




Operation

1. Perform either a sweep or a continuous sweep, as shown above. See page 37 for details.

2. After the sweep has completed, press the disk drive icon on the top left-hand side.

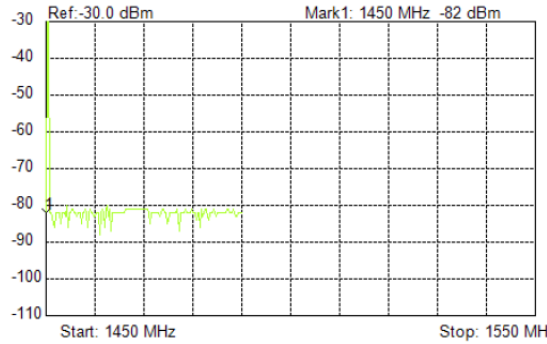
3. A pop-up window will now appear. Choose a file name and directory and select *Save*.

## Save Results - Print

Description

The spectrum results on the GSP-730 can be saved as a PDF or printed.

Print Format




Results are printed in an inverted color format.

Operation

1. Perform either a sweep or a continuous sweep, as shown above. See page 37 for details.
2. After the sweep has completed, press the print icon on the top left-hand side.

Print icon

3. A pop-up window will now appear. Choose a printer or choose to save as a PDF.
4. Press *Print* to print the results.

# FAQ

- The USG will not connect to the PC.
- Primary RF will not allow me to connect to the GSP-730.
- The performance does not match the specification.

## The USG will not connect to the PC.

If you are running a Windows system, make sure that the USG USB driver has been installed correctly, see page 15 for details. If you are running Windows 8, please make sure that "Device driver signature enforcement" is disabled before installing the driver, see page 17 for details.

## Primary RF will not allow me to connect to the GSP-730.

Make sure that all the USB cables from the USG and GSP-730 are connected correctly, then make sure that the NI.488.2 software is installed before Primary RF is installed. See page 19 for installation details.

## The performance does not match the specification.

Make sure the device is powered On for at least 30 minutes, within +20°C~+30°C. This is necessary to stabilize the unit to match the specification.

For more information, contact your local dealer or GWInstek at www.gwinstek.com / marketing@goodwill.com.

# APPENDIX

## USG Specifications

The specifications apply when the USG is powered on for at least 30 minutes to warm-up to a temperature of 20˚C to 30˚C, unless specified otherwise.

### USG-LF44

| | | |
|---|---|---|
| Frequency Range | 34.5 MHz to 4.4 GHz | |
| Output Power | -30 dBm to 0 dBm | in 1 dB steps |
| Internal Reference | 25 MHz | aging ±1 ppm at first year |
| Frequency Accuracy | ± 150 Hz | at 100 MHz, 0 dBm Output |
| Resolution | 10 kHz | |
| Output Control | On / Off | |
| On / Off Isolation | ≤ -75 dBc | |
| Mode Control | Fixed Frequency / Single Sweep / CW Sweep / Hopping | |
| Step Dwell | ≤ 1000 ms in 1* ms steps | |
| Frequency Offset | -50 kHz to 50 kHz in 10 kHz steps | |
| Amplitude Absolute Accuracy | 0 dBm ± 1 dB typical | at 2200MHz, 0 dBm Output |
| Output Flatness | ± 3.5 dB, ref. to 2200MHz | at 0 dBm Output |
| Phase noise | < -97 dBc/Hz | 10 kHz offset @ 1.0 GHz, typical -100 dBc/Hz |
| | < -107 dBc/Hz | 100 kHz offset @ 1.0 GHz, typical -110dBc/Hz |
| 2nd Harmonics | | 0 dB Attenuation |
| | ≤ -15 dBc, typical | 34.5 MHz to 2.0 GHz, fundamental |
| | ≤ -10 dBc, typical | 2.0 GHz to 3.0 GHz, fundamental |
| | ≤ -25 dBc, typical | 3.0 GHz to 4.4 GHz, fundamental |

| | | |
|---|---|---|
| 3rd Harmonics | | 0 dB Attenuation |
| | ≤ -5 dBc, typical | 34.5 MHz to 2.0 GHz, fundamental |
| | ≤ -20 dBc, typical | 2.0 GHz to 3.0 GHz, fundamental |
| | ≤ -40 dBc, typical | 3.0 GHz to 4.4 GHz, fundamental |
| Spurious related to Resolution settings (Single Point Mode) | ≤ -30 dBc, typical | Resolution < 1 MHz |
| | ≤ -65 dBc, typical | Resolution ≥ 1 MHz |
| Spurious related to the fundamental output (Single Point Mode) | ≤ -60 dBc, typical | |

## USG-0103

| | | |
|---|---|---|
| Frequency Range | 100 MHz to 300 MHz | |
| Output Power | -30 dBm to 0 dBm | in 1 dB steps |
| Internal Reference | 25 MHz | aging ±1 ppm at first year |
| Frequency Accuracy | ± 150 Hz | at 100MHz, 0 dBm Output |
| Resolution | 10 kHz | |
| Output Control | On / Off | |
| On / Off Isolation | ≤ -75 dBc | |
| Mode Control | Fixed Frequency / Single Sweep / CW Sweep / Hopping | |
| Step Dwell | ≤ 1000 ms in 1* ms steps | |
| Frequency Offset | -50 kHz to 50 kHz in 10 kHz steps | |
| Amplitude Absolute Accuracy | -1.2 dBm ± 1 dB typical | at 150 MHz, 0 dBm Output |
| Output Flatness | ± 1 dB, ref. to 150 MHz | at 0 dBm Output |
| Phase noise | < -100 dBc/Hz, typical | 10 kHz offset @ 200 MHz |
| | < -110 dBc/Hz | 100 kHz offset @ 200 MHz |
| 2nd Harmonics | | 0 dB Attenuation |
| | ≤ -45 dBc, typical | > 100 MHz, fundamental |
| 3rd Harmonics | | 0 dB Attenuation |
| | ≤ -7dBc, typical | ≤ 150 MHz, fundamental |
| | ≤ -35 dBc, typical | > 150 MHz, fundamental |
| Spurious related to Resolution settings (Single Point Mode) | ≤ -30 dBc, typical | Resolution < 1 MHz |
| | ≤ -65 dBc, typical | Resolution ≥ 1 MHz |
| Spurious related to the fundamental output (Single Point Mode) | ≤ -60 dBc, typical | |

## USG-0818

| | | |
|---|---|---|
| Frequency Range | 800 MHz to 1.8 GHz | |
| Output Power | -30 dBm to 0 dBm | in 1 dB steps |
| Internal Reference | 25 MHz | aging ±1 ppm at first year |
| Frequency Accuracy | ± 1.2 kHz | at 800MHz, 0 dBm Output |
| Resolution | 10 kHz | |
| Output Control | On / Off | |
| On / Off Isolation | ≤ -75 dBc | |
| Mode Control | Fixed Frequency / Single Sweep / CW Sweep / Hopping | |
| Step Dwell | ≤ 1000 ms in 1* ms steps | |
| Frequency Offset | -50 kHz to 50 kHz in 10 kHz steps | |
| Amplitude Absolute Accuracy | -0.8 dBm ± 1 dB typical | at 1000 MHz, 0 dBm Output |
| Output Flatness | ± 1 dB, ref. to 1000MHz | at 0 dBm Output |
| Phase noise | < -97 dBc/Hz<br>< -102 dBc/Hz | 10 kHz offset @ 1.3 GHz<br>100 kHz offset @ 1.3 GHz |
| 2nd Harmonics | ≤ -25 dBc, typical | 0 dB Attenuation<br>>800 MHz, fundamental |
| 3rd Harmonics | ≤ -25 dBc, typical<br>≤ -35 dBc, typical | 0 dB Attenuation<br>≤900 MHz, fundamental<br>>900 MHz, fundamental |
| Spurious related to Resolution settings (Single Point Mode) | ≤ -30 dBc, typical<br>≤ -65 dBc, typical | Resolution < 1 MHz<br>Resolution ≥ 1 MHz |
| Spurious related to the fundamental output (Single Point Mode) | ≤ -65 dBc, typical | |

## USG-2030

| | | |
|---|---|---|
| Frequency Range | 2.0 GHz to 3.0 GHz | |
| Output Power | -30 dBm to 0 dBm | in 1 dB steps |
| Internal Reference | 25 MHz | aging ±1 ppm at first year |
| Frequency Accuracy | ± 3 kHz | at 2 GHz, 0 dBm Output |
| Resolution | 10 kHz | |
| Output Control | On / Off | |
| On / Off Isolation | ≤ -75 dBc | |
| Mode Control | Fixed Frequency / Single Sweep / CW Sweep / Hopping | |
| Step Dwell | ≤ 1000 ms in 1* ms steps | |

| | | |
|---|---|---|
| Frequency Offset | -50 kHz to 50 kHz in 10 kHz steps | |
| Amplitude Absolute Accuracy | 0 dBm ± 1 dB typical | at 2500 MHz, 0 dBm Output |
| Output Flatness | ± 1 dB, ref. to 2500MHz | at 0 dBm Output |
| Phase noise | < -93 dBc/Hz<br>< -100 dBc/Hz | 10 kHz offset @ 2.5 GHz<br>100 kHz offset @ 2.5 GHz |
| 2nd Harmonics | ≤ -30 dBc, typical | 0 dB Attenuation<br>2.0 GHz to 3.0 GHz, fundamental |
| 3rd Harmonics | ≤ -45 dBc, typical | 0 dB Attenuation<br>2.0 GHz to 3.0 GHz, fundamental |
| Spurious related to Resolution settings (Single Point Mode) | ≤ -30 dBc, typical<br>≤ -65 dBc, typical | Resolution < 1MHz<br>Resolution ≥ 1MHz |
| Spurious related to the fundamental output (Single Point Mode) | ≤ -65 dBc, typical | |

## USG-3044

| | | |
|---|---|---|
| Frequency Range | 3.0 GHz to 4.4 GHz | |
| Output Power | -30 dBm to 0 dBm | in 1 dB steps |
| Internal Reference | 25 MHz | aging ±1 ppm at first year |
| Frequency Accuracy | ± 4.5 kHz | at 3 GHz, 0 dBm Output |
| Resolution | 10 kHz | |
| Output Control | On / Off | |
| On / Off Isolation | ≤ -75 dBc | |
| Mode Control | Fixed Frequency / Single Sweep / CW Sweep / Hopping | |
| Step Dwell | ≤ 1000 ms in 1* ms steps | |
| Frequency Offset | -50 kHz to 50 kHz in 10 kHz steps | |
| Amplitude Absolute Accuracy | 1 dBm ± 1 dB typical | at 3300 MHz, 0 dBm Output |
| Output Flatness | ± 2 dB, ref. to 3300MHz | at 0 dBm Output |
| Phase noise | < -88 dBc/Hz<br>< -94 dBc/Hz | 10 kHz offset @ 3.7 GHz<br>100 kHz offset @ 3.7 GHz |
| 2nd Harmonics | ≤ -25 dBc, typical | 0 dB Attenuation<br>3.0 GHz to 4.4 GHz, fundamental |
| 3rd Harmonics | ≤ -40 dBc, typical | 0 dB Attenuation<br>3.0 GHz to 4.4 GHz, fundamental |

| | | |
|---|---|---|
| Spurious related to Resolution settings (Single Point Mode) | ≤ -30 dBc, typical | Resolution < 1MHz |
| | ≤ -65 dBc, typical | Resolution ≥ 1MHz |
| Spurious related to the fundamental output (Single Point Mode) | ≤ -65 dBc, typical | |

*: Minimum step depands on the computer being used. This min. step will be automatically adjusted by the PC software. 1ms is achieved on a faster system.

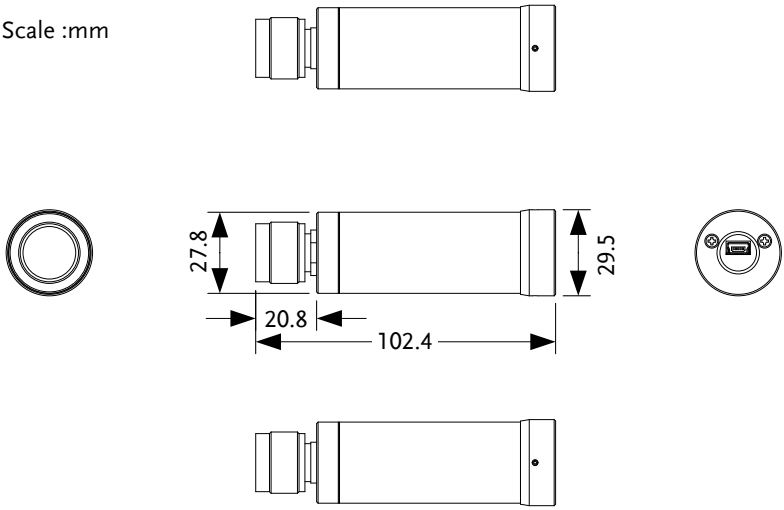
## Common Specifications

| | | |
|---|---|---|
| Software for PC: | | |
| a. Primary RF supports operating system: Windows 2000/XP/Vista/7/8 | | |
| b. Java USG Control Panel: Windows 2000/XP/Vista/7/8 Linux/OS X | | |
| Software for mobile device: | | |
| For Android 4.0 and higher with OTG* | | |
| Interface | USB 2.0 | |
| USB Connector Type | Mini-B | |
| Supply Voltage | 5V | nominal |
| RF Connector Type | N-type male | |
| Impedance | 50 ohm | nominal |
| Output VSWR | < 1.5:1 | Output level @ -30dBm |
| Max. DC voltage connected to output | +/-25VDC | |
| Max. Reverse Power | +30dBm | |

*Warning: Some Android devices with OTG support cannot run the USG app due to the OTG driver modifications by vendors.

# USG Dimensions

Scale :mm



# Declaration of Conformity

We

**GOOD WILL INSTRUMENT CO., LTD.**

declare that the CE marking mentioned product

satisfies all the technical relations application to the product within the scope of council:

Directive: EMC; LVD; WEEE; RoHS

The product is in conformity with the following standards or other normative documents:

| ◎ **EMC** | |
|---|---|
| EN 61326-1 | Electrical equipment for measurement, control and laboratory use –– EMC requirements |
| Conducted & Radiated Emission<br>EN 55011 / EN 55032 | Electrical Fast Transients<br>EN 61000-4-4 |
| Current Harmonics<br>EN 61000-3-2 / EN 61000-3-12 | Surge Immunity<br>EN 61000-4-5 |
| Voltage Fluctuations<br>EN 61000-3-3 / EN 61000-3-11 | Conducted Susceptibility<br>EN 61000-4-6 |
| Electrostatic Discharge<br>EN 61000-4-2 | Power Frequency Magnetic Field<br>EN 61000-4-8 |
| Radiated Immunity<br>EN 61000-4-3 | Voltage Dip/ Interruption<br>EN 61000-4-11 / EN 61000-4-34 |
| ◎ Safety | |
| EN 61010-1 : | Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements |

**GOODWILL INSTRUMENT CO., LTD.**
No. 7-1, Jhongsing Road, Tucheng District, New Taipei City 236, Taiwan
Tel: +886-2-2268-0389 Fax: +886-2-2268-0639
Web: http://www.gwinstek.com Email: marketing@goodwill.com.tw
**GOODWILL INSTRUMENT (SUZHOU) CO., LTD.**
No. 521, Zhujiang Road, Snd, Suzhou Jiangsu 215011, China
Tel: +86-512-6661-7177 Fax: +86-512-6661-7277
Web: http://www.instek.com.cn Email: marketing@instek.com.cn
**GOODWILL INSTRUMENT EURO B.V.**
De Run 5427A, 5504DG Veldhoven, The Netherlands
Tel: +31-(0)40-2557790 Fax: +31-(0)40-2541194
Email: sales@gw-instek.eu

# INDEX


Accessories ..... 7
Caution symbol ..... 2
Cleaning the instrument ..... 3
Declaration of conformity ..... 47
Display diagram
  Android ..... 11
  Java ..... 9
  Primary RF
    Tracking generator ..... 14
Disposal instructions ..... 4
Disposal symbol ..... 2
Environment
  Safety instruction ..... 3
FAQ ..... 40
First time use instructions ..... 15
Front face ..... 8
Ground
  Symbol ..... 2
List of features ..... 6
Marketing
  Contact ..... 40
Model differences ..... 6
NI Software
  NI 488.2 software ..... 19
Operation
  Signal Generator ..... 22
Power on/off
  Safety instruction ..... 3
Primary RF
  Installation ..... 19
Rear face ..... 8
Service operation
  About disassembly ..... 3
  Contact ..... 40
Signal Generator
  Android setup ..... 23
  Frequency ..... 26
  Frequency offset ..... 29
  Function mode ..... 25
  Output ..... 31
  PC setup ..... 22
  Power sweep ..... 30
  Step size ..... 27
  Time dwell ..... 28
Specifications ..... 41
  Common ..... 45
  Dimensions ..... 46
  USG-0103 ..... 42
  USG-0818 ..... 43
  USG-2030 ..... 43
  USG-3044 ..... 44
  USG-LF44 ..... 41
Tracking Generator
  normalizing ..... 35
  operation ..... 37
  Primary RF setup ..... 32
  Print results ..... 39
  save results ..... 38
  Setup
    hardware ..... 32
    software ..... 33
USB driver
  Installation ..... 15, 17
USG
  Google Play installation ..... 18
Warning symbol ..... 2