Multi-Band
Signal Generator

manual version 1.2

Contents

Berkeley's Multi-Band Signal Generator is a handheld, unit designed for laboratory and field use. The instrument generates RF signals in the ranges from 560-614 MHz and 1395-1432 MHz in step sizes of 25 kHz with a 0 to -70 dBm power range.

The Signal Generator uses an internal, rechargeable 2000mAh Li-PO (Lithium Polymer) battery system.

NOTE: BVS recommends charging the unit once every 2 weeks (once a month at an absolute minimum). Failure to do so may damage the battery and/or reduce battery run time. Not following these instructions may void warranty coverage on the battery.

At the bottom of the unit resides the power input for portable power such as a battery belt pack. A USB port at the bottom allows the BVS factory to perform quick calibrations for every unit that ships. It is not intended for customers to use. The power port on the right is for charging the unit's internal battery system.

At the top of the unit, the output power is a type "N" female connector.

The display is a color, backlit graphic LED.

Signal Generator KEYPAD

Signal Generator uses a raised plastic keypad as its only interface. Below are simple descriptions of the buttons and their features:

POWER - indicates unit's power status
CHARGE - indicates if unit is being charged
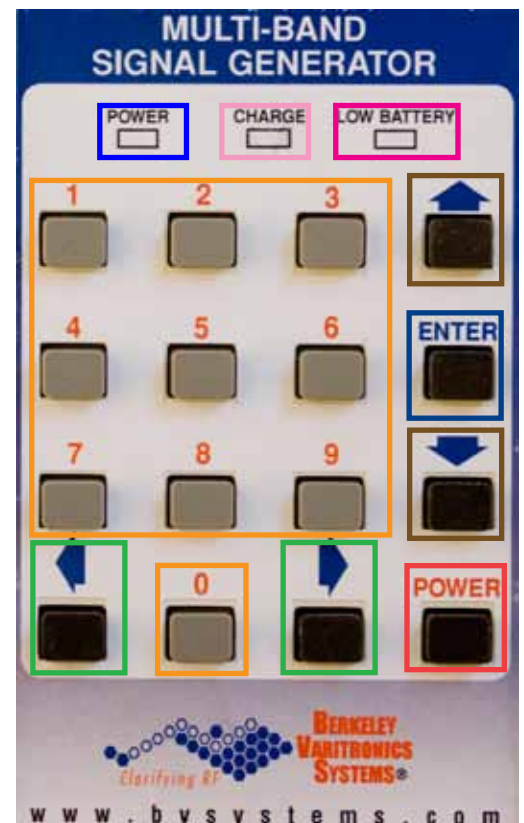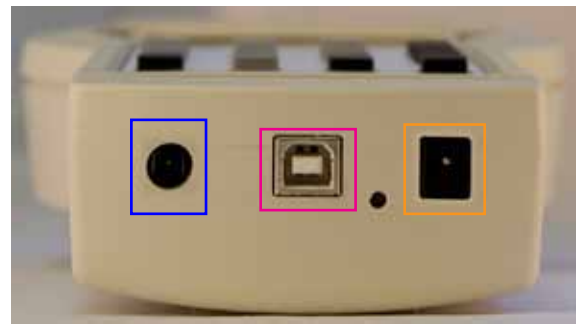**LOW BATTERY** - indicates low battery warning
0-9 - numerical keys for entering frequency and power
POWER - toggles unit power ON and OFF
ENTER - executes a highlighted selection
LEFT/RIGHT ARROWS - scolls to desired selection
UP/DOWN ARROWS - scrolls to desired selection

Signal Generator ACCESSORIES

Your **Signal Generator** includes all basic operational accessories including the following: external DC charger, protective rubber cover, carrying strap and hard carrying case.

GETTING STARTED

Operation of the **Signal Generator** is straightforward. Power on the Signal Generator by holding down the POWER button for about 2 seconds.

MAIN MENU SCREEN

FREQ - displays the current frequnecy and allows the frequency to be edited.

LEVEL - displays the current RF level in dBm and allows the level to be edited.

RF OUTPUT - displays the current state of the RF output (ON or OFF) and allows the state to be changed.

BATTERY STATUS - shows the current state of charge for the internal battery and also used to switch to the battery status screen which provides more complete battery information.

INFORMATION SCREEN - this switches to the informtion screen which provides RF tuning information and the firmware version number.

OPERATION OF UNIT

Selecting and moving between fields

When a field is selected for input, a rectangle appears that field. This rectangle is referred to as the selection cursor. If no selection rectangle appears on the screen, pressing any key will make it visible. If no further keys are pressed the selection cursor will disappear in a few seconds.

When the selection cursor is visible, the up, down, left, right arrows will move the selection cursor to different fileds on the screen.
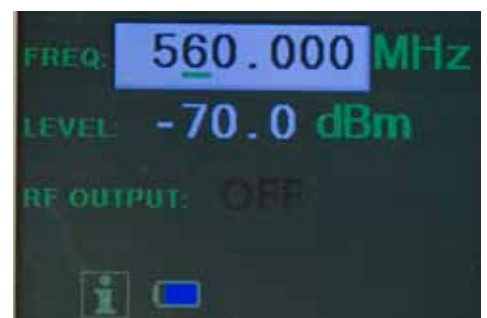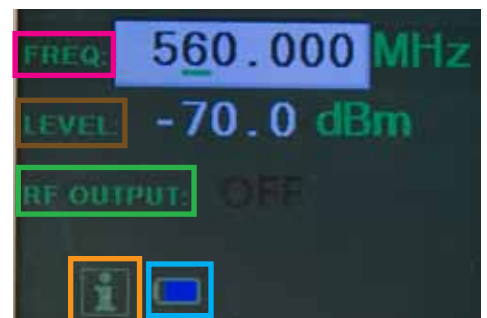
Setting The Frequency

To set the frequency, use the up, down, left, right arrow keys to move the selection cursor to the frequency control. Press the enter button to change the control to edit mode.

Enter the new frequency with the keypad. When the last digit is entered, the control will exit this mode and set the frequency. The arrow keys can also be used to change digits individually. The left and right arrow keys move the edit cursor left and right. The up and down arrow keys increment or decrement the digit above the cursor. Setting a frequency that is out of range will result in a default frequency being set. Setting a frequency that is not a multiple of the step size will result in the next lowest valid frequency being set.

Setting The Level

To set the RF level, use the up, down, left and right arrow keys to move the selection cursor to the level control. Press the enter button to change the control to edit mode.

Enter the new power level with the keypad. When the last digit is entered, the control will exit edit mode and set the level. The enter key can be pressed at anytime to exit the edit mode and set the power level. The arrow keys can also be used to change digits individually. The left and right arrow keys move the edit cursor left and right. The up and down arrow keys increment or decrement the digit above the cursor. Setting a level that is out of range will result in a default level being set. Setting the power level does not change the output status. If the output control is off, no RF power will appear at the connector when the level is set.

Enabling The Output

To enable output, use the up, down, left and right arrow keys to move the selection cursor to the level control. Press the enter button to change the control to edit mode.

Displaying The Information Screen

To enable the information screen, use the up, down, left and right arrow keys to move the selection cursor to the level control. Press the enter button while the selection cursor is visible to change to the battery status screen.

Displaying the battery status screen

To display the battery status screen, use the up, down, left, right arrow keys to move the selection cursor to the level control. Press the enter button while the selection cursor is visible to change to the battery status screen.

Information Screen

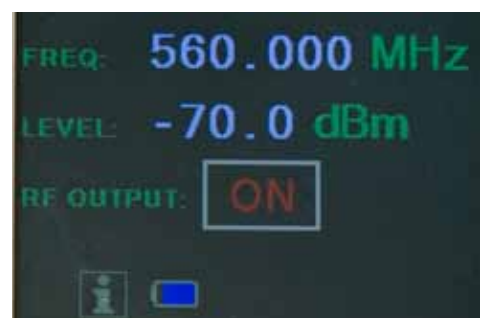To display the information screen, use the up, down, left, right arrow keys to move the selection cursor to the level control. Press the enter button while the selection cursor is visible to change to the information screen.

The information screen shows the RF frequency ranges, the step size and the output power level range. The firmware version number is also displayed on this screen.

To exit this screen, move the selection cursor to the back arrow on the bottom of the screen and press enter while the selection cursor is visible.
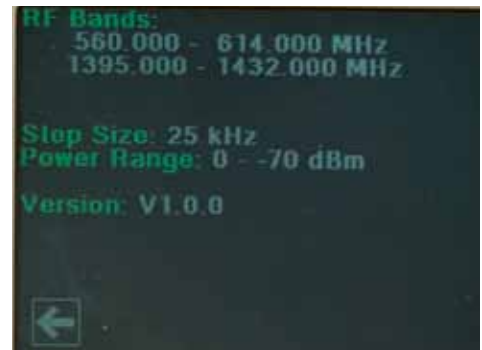

Battery Status Screen

To display the battery status screen, use the up, down, left, right arrow keys to move the selection cursor to the level control. Press the enter button while the selection cursor is visible to change to the battery status screen.

At the top of the screen, the current state of charge is shown as a percentage of total charge. Below that is a graphical indication of this level.

The bottom half of the screen displays the battery charger status. Possible indications are "Charging" and "Inaccurate". "Charging" is displayed when the battery charger is actually charging the battery. "Inaccurate" is displayed if the charge sensing hardware needs to be calibrated. To calibrate this hardware, charge up the unit fully and then discharge the unit until the "Inaccurate" status changes. When inaccurate, the text changes to a reddish color to be more obvious.

NOTE: BVS recommends charging the unit once every 2 weeks (once a month at an absolute minimum). Failure to do so may damage the battery and/or reduce battery run time. Not following these instructions may void warranty coverage on the battery.

NOTE: If unit is not being charged occasionally, the Lithium-Ion battery pack will completely discharge which permanently damages it. This is true for any Lithium-Ion powered device. BVS recommends charging the unit once every 2 weeks (once a month at an absolute minimum). Failure to do so may damage the battery and/or reduce battery run time. Not following these instructions may void warranty coverage on the battery.

To exit this screen, move the selection cursor to the back arrow on the bottom of the screen and press enter while the selection cursor is visible.
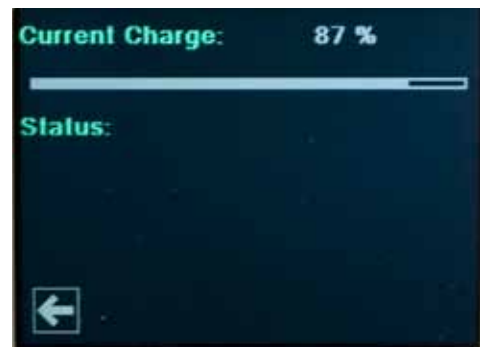

Multi-Band Handheld Signal Generator Specifications

Frequency Range 1:	560-614 MHz
Frequency Range 2:	1395-1432 MHz
Frequency Step Size:	25 kHz
Frequency Accuracy:	$\pm$ 2.5 PPM internal reference
Spectral Purity Phase Noise:	-93 dBc/Hz @ 10 kHz offset (1 Hz BW, typ.)
	-110 dBc/Hz @ 100 kHz offset (1 Hz BW, typ.)
2nd Harmonic:	< -23 dBc
3rd Harmonic:	< -25 dBc
Spurious:	< -55 dBc
Output Power Range:	0 dBm to -70 dBm
Power Resolution:	0.1 dBm
Power Accuracy:	$\pm$ 0.5 dB
Output Power Connector:	"N" Female, 50 ohm
Impedance:	50 ohm
VSWR:	2:1 maximum
Operating Temperature:	0 deg C to 35 deg C
Local Interface:	Front panel keypad and color graphic LED
Remote Interface:	USB
Power:	Internal battery: Lithium Polymer (2000 mAh, 2 cell)
	Runtime from internal battery: approximately 4+ hours
	Additional 4+ hours with external battery pack
	Charge time: 2.5 hours from external DC (11-20 VDC) transformer

Glossary of Acronyms

AC   Alternating Current
A/D   Analog to Digital converter
AGC   Automatic Gain Control
AP   Access Point
Applet   a small Application
BER   Bit Error Rate
BPSK   Binary Phase Shift Keying
BSS   Basic Service Set
BW   Band Width
CDMA   Code Division Multiple Access (spread spectrum modulation)
DC   Direct Current
D/A   Digital to Analog
dB   decibel
dBm   decibels referenced to 1 milliwatt
DOS   Digital Operating System
DSP   Digital Signal Processing
DSSS   Direct Sequence Spread Spectrum
ESS   Extended Service Set
FIR   Finite Impulse Response
GHz   GigaHertz
IF   Intermediate Frequency
I and Q   In phase and Quadrature
IBBS   Independent Basic Service Set
kHz   kiloHertz
LCD   Liquid Crystal Display
LO   Local Oscillator
MAC   Medium Access Control
Mbits   Megabits
MHz   MegaHertz
NIC   Network Interface Card
OFDM   Orthogonal Frequency Domain Multiplexing (802.11a)
PC   Personal Computer
PCS   Personal Communications Service (1.8 to 2.1 GHz frequency band)
PER   Packet Error Rate
PN   Pseudo Noise
QPSK   Quaternary Phase Shift Keying, 4-level PSK
RF   Radio Frequency
RSSI   Receiver Signal Strength Indicator
SSID   Service Set IDentification
UCT   Universal Coordinated Time
VAC   Volts Alternating Current
VGA   Video graphic
WEP   Wired Equivalent Protocol
WLAN   Wireless Local Area Network

IMPORTANT SAFETY INSTRUCTIONS

When using your telephone equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:

1)Read and understand all instructions.

2)Follow all warnings and instructions marked on the product.

3)Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

4)Do not use this product near water, for example, near a bath tub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool.

5)Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.

6)Slots and openings in the cabinet and the back or bottom are provided for ventilation, to protect it from overheating these openings must not be blocked or covered The openings should never be blocked by placing the product on the bed, sofa, rug or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.

7) This product should be operated only from the type of power source indicated on the appliance. If you are not sure of the type of power supply to your home, consult your dealer or local power company.

8)Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.

9)Do not overload wall outlets and extension cords as this can result in the risk of fire or electric shock.

10)Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electric shock. Never spill liquid of any kind on the product.

11) To reduce the risk of electric shock, do not disassemble this product, but take it to a qualified service facil4 when some service or repair work is required. Opening or removing covers may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electric shock when the appliance is subsequently used.

12)Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

A) When the power supply cord or plug is damaged or frayed. B) If liquid has been spilled into the product.

C)If the product has been exposed to rain or water.

D)   If the product does not operate normally by following the operating instructions. Adjust only those controls, that are covered by the operating instructions because improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal operation.

E) If the product has been dropped or the cabinet has been damaged. F) If the product exhibits a distinct change in performance.

13)Avoid using the product during an electrical storm. There may be a remote risk of electric shock from lightning.

14)Do not use the telephone to report a gas leak in the vicinity of the leak.

INSTALLATION INSTRUCTIONS

1. Never install telephone wiring during a lightning storm.

2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

4. Use caution when installing or modifying telephone lines.

INSTRUCTION FOR BATTERIES

CAUTION: To Reduce the Risk of Fire or Injury to Persons, Read and Follow these Instructions:

1.   Use only the type and size of batteries mentioned in owner's manual.

2.   Do not dispose of the batteries in a fire. The cells may explode. Check with local codes for possible special disposal instructions.

3.   Do not open or mutilate the batteries. Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.

4.   Exercise care in handling batteries in order not to short the battery with conducting materials such as rings, bracelets, and keys. The battery or conductor may overheat and cause burns.

5.   Do not attempt to recharge the batteries provided with or identified for use with this product. The batteries may leak corrosive electrolyte or explode.

6.   Do not attempt to rejuvenate the batteries provided with or identified for use with this product by heating them. Sudden release of the battery electrolyte may occur causing burns or irritation to eyes or skin.

7.   When replacing batteries, all batteries should be replaced at the same time. Mixing fresh and discharged batteries could increase internal cell pressure and rupture the discharged batteries. (Applies to products employing more than one separately replaceable primary battery.)

8.   When inserting batteries into this product, the proper polarity or direction must be observed. Reverse insertion of batteries can cause charging, and that may result in leakage or explosion. (Applies to product employing more than one separately replaceable primary battery.)

9.   Remove the batteries from this product if the product will not be used for a long period of time (several months or more) since during this time the battery could leak in the product.

10.   Discard "dead" batteries as soon as possible since "dead" batteries are more likely to leak in a product.

11.   Do not store this product, or the batteries provided with or identified for use with this product, in high-temperature areas. Batteries that are stored in a freezer or refrigerator for the purpose of extending shelf life should be protected from condensation during storage and defrosting. Batteries should be stabilized at room temperature prior to use after cold storage.