Operations Manual

SYNTHESIZED SIGNAL GENERATOR SSG

RF Test Equipment for Wireless Communications

Preface

This manual contains operation instructions and reference information for the **dBm** SSG. The SSG generates a CW sine wave output with variable amplitude.

This manual is prepared as a reference source for engineers and technicians to use the SSG as part of their Development and/or Production test effort.

The SSG operations manual is divided into the following sections:

- **Section 1: Introduction** shows the SSG equipment, control and connector locations, and describes connector functions.
- **Section 2: Local Operation** describes how to operate the SSG from the front panel.
- **Section 3: Remote Operation** shows how to operate the SSG through the Ethernet, IEEE-488.2, and RS-232 connection.
- **Appendix A: Installation and Troubleshooting** describes installation procedures and lists error messages.
- **Appendix B: Description and Specifications** gives an overview of the SSG technical design and provides technical specifications, and verification testing .
- **Appendix C: Maintenance and Warranty** describes the SSG warranty and directs how to return the SSG for repair or calibration.

Conventions Used in This Manual

Text Conventions

This manual uses the following text conventions:

- *Italic text* indicates new terms, directories and/or filenames.
- **Bold Text** indicates SSG selections or key presses.
- Monospaced text indicates SSG commands entered through remote mode.
- **Bold monospaced text** indicates SSG responses through remote mode.

Symbols

The following symbols appear in the manual.

See also, 

This symbol and its "see also" text is placed next to subject matter in the manual to tell you where to find more information.

*This icon indicates a **warning**. Failure to follow the instructions given here may result in **personal injury** or **damage to the equipment**.*

*This icon indicates a **tip**. Text marked this way may be an optional procedure for accomplishing a task, or a time-saving procedure for advanced or familiar users.*

Contacting dBm

We encourage you to contact us if you want more information or have any questions or concerns about this or any other dBm product or manual. Use any of the following methods:

Mail	dBm 32A Spruce Street Oakland, NJ 07436
Telephone	(201) 677-0008
Fax	(201) 677-9444
E-mail—Technical Support	*Info@dbmcorp.com*
www	*http://www.dbmcorp.com*

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Introduction Section

Introduction

This section introduces you to the Synthesized Signal Generator instrument and describes the features and controls.

Topics include:

- Front and rear views.
- Power and cable connections.
- Startup and shutdown procedures.

GENERAL INFORMATION

Front panel view.

The SSG generates a CW RF output signal with variable amplitude. Frequency is controlled through a rotary knob on the front panel. The frequency increment size can be set by moving the cursor to the desired digit, or by setting a step size using the STEP mode.

Amplitude is set and varied similarly.

Figure 1. Instrument Front Panel View

For custom SSG units, consult additional documentation provided with the instrument.

Rear Panel Connections

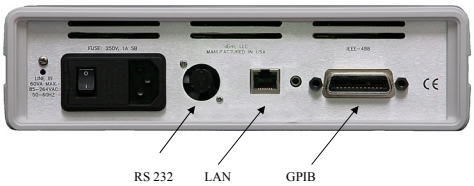

Figure 2. Instrument Rear Panel View

For custom SSG units, consult additional documented provided with the instrument.

Start and Shutdown Procedures

Starting the SSG

1. Connect the power cord and press the Line on/off switch on the rear panel. The instrument will initialize, and momentarily display the model number and firmware revision.

2. The power-on state will be local mode, with the last frequency and amplitude values, and the RF output will be off.

Shutting Down the SSG

1. Press the Line on/off switch on the rear panel to off.

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Local Operation Section

Local Operation

The SSG is a laboratory instrument designed to generate a synthesized CW signal with good spectral purity and variable amplitude. The instrument is controllable from the front panel or remotely via IEEE-488, LAN, and RS-232. The user can set the frequency and amplitude, and also turn the output signal off. The resolution step size is selected by positioning the cursor at the appropriate digit and then turning the front panel knob. Alternatively, a step size value can be set independently for the frequency and for amplitude, and the knob will then change the value by that step size.
The IEEE-488 address and LAN IP address are also selectable from the front panel.

Operating States

Power up and Preset

- Upon power-up, the instrument is set to the last frequency and amplitude before power was removed, and the RF output is turned off. The display will momentarily (3-5 sec) indicate the model number and the version of the installed firmware. Holding the **Frequency** key for 2 seconds will set the frequency to 50 MHz.

Front Panel Key Operation

This section describes how to edit the frequency and amplitude in local mode.

Press either **Frequency** or **Amplitude** to select the desired parameter. The display pointer moves to the selected parameter and the blinking cursor is positioned at the most recently selected digit for that parameter.
Use the ← and → keys to move the cursor left or right with each key press of the arrow keys. The cursor does not move beyond the field of the currently selected parameter.
Rotate the front panel knob to modify the value. Clockwise rotation increases the parameter and counterclockwise rotation decreases the parameter. The parameter value will continue to increase or decrease by the amount of the selected resolution until it reaches the maximum or minimum limit of the parameter.

Rem/Local Key

The **Rem/Local** key is used to return the instrument to local operation from the remote mode.
Press and hold the **Rem/Local** key for 3 seconds to invoke the Remote Address Setup menu, where the GPIB and LAN addresses are viewed and set. Press **Rem/Local** again to save any new values and return to the main menu.

Frequency Key

The **Frequency** key is used to select the frequency field.
Holding the **Frequency** key for 3 seconds causes the frequency to preset to 50 MHz.

Amplitude Key

The **Amplitude** key is used to select the amplitude field.

Arrow keys

The ← moves the cursor to the left. The → moves the cursor to the right.
In the Remote Address Setup Menu, the → arrow key moves the selected field from the GPIB address to the LAN address. The arrow

keys are also used to move the cursor in the IP address and the submask address.

RF On/Off key

The **RF ON/OFF** key toggles between RF output on and RF output off. "RF ON" or "RF OFF" is displayed.

STEP On/Off key

The **STEP ON/OFF** key determines the step size that is used to increment or decrement the frequency and amplitude.
When step mode is off, the parameter resolution is determined by the cursor position, and the digit changes by a count of one.
When step mode is on, the parameter changes by the step size amount, and the cursor is not displayed. The step size for frequency and amplitude are set independently.

SET STEP key

Pressing **SET STEP** invokes the step size menu. Pressing **SET STEP** again, returns to the main menu. A frequency step size and an amplitude step size are displayed. The ← and → keys are used to move the cursor position. The **Frequency** key and the **Amplitude** key are used to move the cursor between the frequency field and the amplitude field. Once the desired cursor position is set, the front panel knob is used to modify the step size value.
With step mode active, the parameter will increment or decrement by the selected step size.

Displayed Parameter Formats

Main display

There are two parameters displayed in the main menu: frequency and amplitude. In addition there is a Step mode on/off indicator and an RF output on/off indicator. The display is updated each time a value is changed.

Frequency-	The current value for center frequency.
Units:	MHz
Range:	10 to 4000 MHz
Resolution:	10 Hz below 2000 MHz 20 Hz above 2000 MHz
Amplitude-	The current value for output power.
Units:	dBm
Range:	-30.0 to +10.0 dBm
Resolution	0.1 dB
Output status -	The current state of the output signal
Units:	n/a
Default:	RF OFF
Range:	RF ON or RF OFF

Instrument Status Indicators
Remote Mode - illuminates when in GPIB, LAN, or RS-232 control
MAX - illuminates when an over-range value is attempted.
MIN - illuminates when an under-range value is attempted.
RF ON - illuminates when the Rf output is on
RF OFF- illuminates when the RF output is off
STEP ON - illuminates when step mode is active
STEP OFF- illuminates when step mode is off
SET STEP SIZE - illuminates in the Step Size menu

Remote Address Setup Menu

Enter the Remote Address Setup menu by pressing and holding the **Rem/Local** key for 3 seconds.
Press the **Rem/Local** key again to save values and exit the setup display when finished.
The Remote Address Setup menu display will show the following:
Line 1: Configure GPIB xx (range is 1-31)
Line 2: Configure Ethernet

Setting the GPIB Address

With the Remote Address Setup menu visible, use the rotary knob to modify the GPIB address. When finished, press the **Rem/Local** to return to the main menu or press the → key to invoke the Ethernet submenu.

Setting the Ethernet Address

After accessing the Remote Address Setup menu, press the → key to invoke the Ethernet submenu for IP address and submask address setup.
The Ethernet address submenu appears as follows:

Line 1: IP 192.168.1.102
Line 2: SM: 255.255.255.0

Use the ← and → keys to move the cursor to the desired position. The arrow keys will move the cursor within each address field. When the cursor is at the end of either the IP address or the submask address, pressing the arrow key again moves the cursor to the other address field. Once the cursor is in the desired position, use the front panel knob to modify the value at the cursor location.
The decimal points for the IP and submask address are fixed.

Upon exiting the setup menu using **Rem/Local** key, all values are stored.

*Holding the **Frequency** key while in the Remote setup menu will return the instrument to the main menu and reset the frequency. However, any modifictaions to the GPIB and LAN address will not be saved*

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Remote Operation Section

Remote Operation

The SSG can be controlled remotely via any of three interfaces: GPIB, LAN, and RS-232.
All GPIB commands are compliant with IEEE-488.2. The instrument can function as a talker or a listener, but not as a controller.
The LAN and RS-232 interfaces respond to the same commands as the GPIB

The instrument switches to remote mode upon being addressed with a valid command. Once communication is established on either LAN or GPIB, the other interface cannot be used until the instrument is cycled through local mode. The RS-232 interface is always active.

The instrument returns to local mode upon pressing the **Rem/Local** key or upon power-up.

When in remote, "REMOTE MODE" is shown in the lower left of the display.

GPIB Command Syntax

Terminator Codes

When sending data to the SSG, any of the following terminator codes are valid:

- Send EOI at end of Write
- Terminate read on EOS
- Set EOI w/EOS on Write
- 8-bit EOS (compare)

Concatenation Terminator

Multiple commands on a single line are separated by the semi-colon concatenation terminator ";".

Example: FREQ 1000; POW -12.5

Spaces

The ASCII space character may appear after any command, or after the concatenation terminator.

Case Insensitivity

Commands and queries may be sent in upper and/or lower case characters.

GPIB Commands

When addressed to listen, the SSG responds to the following commands:

Function	Listener Codes
Set Frequency	FREQ x, x is frequency value
Set Output Power	POW ± x
RF output on/off	OUTP on or off
Identification Query	*IDN?
Reset Command	*RST
Self-Test Query (return "0" on success)	* TST?
Operation Complete Command	*OPC
Operation Complete Query	*OPC?
Wait-to-Continue	*WAI
Clear Status	*CLS
Event Status Enable	*ESE
Event Status Enable Query	*ESE?
Event Status Register Query	*ESR?
Service Request Enable Command	*SRE
Service Request Enable Query	*SRE?
Read Status Byte	*STB?

Figure 4. GPIB Commands

Query command	Response	Default units
FREQ?	Frequency value	MHz
POW?	Output amplitude value	dBm
OUTP?	1 or 0 ("1" indicates RF on)	none

Figure 5. Other GPIB Query Commands

Notes:

- Mandatory IEEE 488.2 commands begin with an '*'. Details about these commands can be found in IEEE Std 488.2.
- X represents numeric values from 0 to 9.
- Spaces within the command are ignored.

IEEE 488.2 Status Reporting and Queries

The SSG supports IEEE-488.2 status reporting. Status is reported using an 8 bit Status Byte and an 8 bit Standard Event Status Register.

Status Register Bit Assignments

Bit #	*Description*
0	not used
1	not used
2	not used
3	not used
4	MAV
5	ESB
6	MSS
7	not used

Event Status Register Bit Assignments

Bit #	***Description***
0	Operation Complete
1	Request Control
2	Query Error
3	Device Dependent Error
4	Execution Error
5	Command Error
6	User Request
7	Power On

The Device Dependent Error bit is set when the signal or noise is out of range. The Command Error bit is set when an unknown command or query is received.

Mandatory IEEE 488.2 Commands

*RST - Reset Command

The Reset command performs a SSG reset. It does not affect the state of the IEEE 488 interface, nor any Event Enable Register setting including the Standard Event Status Enable Register settings.

*RCL

The recall function is used to configure the SSG in one of ten user-defined states. The recall registers are labeled 0 – 9. Registers for which the user has not written to will contain default settings. The recall function does not disturb the state of the IEEE-488 interface or any Event Enable Register settings.

*SAV

The save function is used to store the current SSG configuration in one of ten user-defined states. The save registers are labeled 0 – 9.

*IDN - Identification Query

The Identification query allows the SSG to identify itself over the system interface. The response is composed of four fields:

- Field 1 Manufacturer
- Field 2 Model
- Field 3 Serial number
- Field 4 Firmware version

Manufacturer: dBm LLC

Model: SSG-<min frequency>/<max frequency>

Serial number: 12 ASCII characters

Firmware level: Version number

An example response to the *IDN? query is:

"dBm LLC,SSG-10/4000,0306-007-00001,1.18"

*TST? - Self-Test Query

The self-test query causes the ASCII character "0" (zero) to be placed in the Output Queue upon successful completion of a self-test.

*OPC - Operation Complete Command

The Operation Complete command causes the SSG to set the Operation Complete bit of the Standard Event Status Register when all operations are finished.

*OPC? - Operation Complete Query

The Operation Complete query places an ASCII character "1" (one) into the SSG Output Queue when all operations are finished.

*WAI - Wait-to-Continue Command

The Wait-to-Continue command has no functional affect on the SSG since the SSG implements all commands sequentially. No commands are overlapped, that is, one command must finish before the next command is executed.

*CLS - Clear Status Command

The Clear Status command clears status data structures. The Clear Status command clears all bits in the Standard Event Status Register and its summary ESB bit in the Status Register. It does not necessarily clear all bits in the Status Byte Register. For example, the MAV bit may not be cleared by the *CLS command.

*ESE - Standard Event Status Enable Command

The Standard Event Status Enable command sets the Standard Event Status Enable (ESE) Register bits. The ESE is involved in the setting and clearing of the Event Summary Bit (ESB) of the Status Byte Register. The ESB is the inclusive OR of the bitwise combination of the Standard Event Status Register (ESR) and the ESE Register.

ESB is defined as

(ESR bit 0 AND ESE Register bit 0)
OR
(ESR bit 1 AND ESE Register bit 1)
OR
(ESR bit 2 AND ESE Register bit 2)
OR
(ESR bit 3 AND ESE Register bit 3)
OR
(ESR bit 4 AND ESE Register bit 4)
OR
(ESR bit 5 AND ESE Register bit 5)
OR
(ESR bit 6 AND ESE Register bit 6)
OR
(ESR bit 7 AND ESE Register bit 7)

*ESE? - Standard Event Status Enable Query

The Standard Event Status Enable query lets the programmer determine the contents of the Standard Event Status Enable Register.

*ESR? - Standard Event Status Register Query

The Standard Event Status Register query lets the programmer determine the contents of the Standard Event Status Register. The Standard Event Status Register is destructively read, that is, it is read and cleared with the *ESR? query.

Event Status Register Bit Assignments

Bit #	Description
0	Operation Complete
1	(Request Control)
2	(Query Error)
3	Device Dependent Error
4	(Execution Error)
5	Command Error
6	(User Request)
7	(Power On)

Bit assignments in parentheses are bits that have been assigned by the IEEE 488.2 standard but may not be currently used by the SSG.

Operation Complete Bit - set upon execution of the *OPC command.

Device Dependent Error Bit - set when any of the following errors occur:

- Frequency too high
- Frequency too low
- Output Power too high
- Output Power too low

Command Error Bit - set whenever an unknown command or query is received.

*SRE - Service Request Enable Command

The Service Request Enable command sets the Service Request Enable (SRE) Register bits. The SRE is involved in the setting and clearing of the Master Summary Status (MSS) bit of the Status Byte Register. The MSS bit indicates that the SSG has at least one reason for requesting

service. The MSS bit of the Status Byte Register is the inclusive OR of the bitwise combination (excluding bit 6) of the Status Byte (SB) Register and the SRE Register.

MSS is defined as

(SB Register bit 0 AND SRE Register bit 0)
OR
(SB Register bit 1 AND SRE Register bit 1)
OR
(SB Register bit 2 AND SRE Register bit 2)
OR
(SB Register bit 3 AND SRE Register bit 3)
OR
(SB Register bit 4 AND SRE Register bit 4)
OR
(SB Register bit 5 AND SRE Register bit 5)
OR
(SB Register bit 7 AND SRE Register bit 7)

*SRE? - Service Request Enable Query

The Standard Event Status Enable query lets the programmer determine the contents of the Service Request Enable Enable Register. This register is set to 16 (decimal) at power-on.

*STB? - Read Status Byte Query

The Read Status Byte query lets the programmer read the status byte.

Bit #	Description
0	-
1	-
2	-
3	-
4	MAV
5	ESB
6	MSS
7	-

Status Byte Register Bit Assignments

LAN Operation Overview

The SSG can be controlled remotely using its LAN interface. The instrument can be connected to any IEEE-802 network. It uses TCP/IP, and achieves transfer rates up to approximately 5 MBPS.

Programming control of the SSG can be implemented by two means: 1) Using the SSGControl Application provided by dBm with the instrument or 2) by creating an application, such as a test script.

The SSGControl Application provides a simple user interface to control the SSG.

Installing the SSG Remote Client on a PC

The SSGControl Application can be copied from the provided CD to a directory on a PC. Create a directory, for example c:\SSG Client, and copy the following files into the directory:

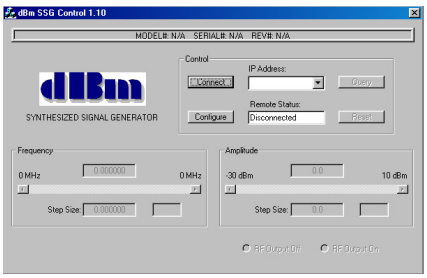
SSGControl.exe

Connecting to the SSG

To establish a connection from the PC to the SSG, connect the two devices to a local area network, or connect them directly using an ethernet crossover cable.

Description of the SSG Remote Client

The SSGControl provides a graphical interface to control the SSG from a PC via a LAN connection. The client can address multiple SSG instruments by changing the IP address in the control window.



SSG Control Window

Configure the Client

Select the Configure button to invoke the Configure window. In the Client configure window, enter the IP address(es) to match the SSG IP address(es).

In the Client main window, set the IP address to match the SSG IP address. Press "Connect". When the link is established, the same button will indicate "Disconnect" and the status window labeled *Remote Status* will also indicate "Connected". The client will poll the SSG once the connection is established and display the model number, serial number, and firmware version at the top of the window. The Query button forces the same function to occur.

Controlling the SSG with the Client

Upon startup, the client will command the SSG to the displayed frequency and amplitude values. These values can be modified by typing into the text box, by clicking an end arrow on the slider bar, or by clicking inside of the slider bar.

When typing into the text box, the new value is accepted when the cursor is moved to another field, or by pressing *Enter* on the PC keyboard.

The resolution of the slider end arrows is controlled by the Step Size text box. For example, if the current frequency is set to 12.345 MHz, and the step size value is 2 MHz, then clicking once on the right end arrow will change the frequency to 14.345 MHz.

Clicking inside of the slider bar provides a coarse step. The frequency change that occurs when clicking inside of the slider bar is controlled by the program, and does not correspond the step size text box.

Commands

The SSG LAN interface responds to the following ASCII command set, which mimics the GPIB commands:

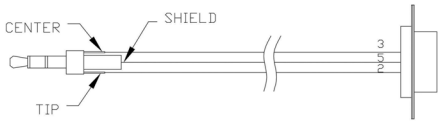
Function	Code
Set Frequency	FREQ XXXX.XXXXXX Default units are MHz
Set Output Power	POW +/-XX.X Default units are dBm
RF output on/off	OUTP on/off
Frequency Query	FREQ?
Power Query	POW?
RF Output State Query	OUTP?
Reset	*RST

RS-232 Serial Interface Operation Overview

The RS-232 serial port is configured as follows:

Baud	9600
Parity	none
Data Bits	8
Stop Bit	1
Flow control	none

Connection to the RS-232 port is via a phono jack located on the rear panel.



The SSG serial port responds to the following ASCII command set, which mimics the GPIB commands:

Function	Code
Set Frequency	FREQ XXXX.XXXXXX Default units are MHz
Set Output Power	POW +/-XX.X Default units are dBm
RF output on/off	OUTP on/off
Frequency Query	FREQ?
Power Query	POW?
RF Output State Query	OUTP?
Reset	*RST

A

Installation and Troubleshooting

Installation and troubleshooting

If your SSG unit does not appear to be performing as expected, vertification tests can determine whether the unit is functioning properly.

This section describes installation instructions and SSG vertification tests.

Topic includes:

- System Installation
- Performance verification

Installation

Unpacking the SSG

Remove the SSG materials from the shipping containers. Save the containers for future use.

The standard SSG shipment includes:

Quantity	Description
1	Synthesized Signal Generator
1	AC power cord
1	SSG Control CD
1	SSG User Manual

Initial Inspection

Inspect the shipping container (s) for damage. If container is damaged, retain it until contents of the shipment have been vertified against the packing list and instruments have been inspected for mechanical and electrical operation.

If the SSG appears to have been damaged during shipping, do not apply power to the unit. Contact dBm immediately.

Applying power

1. Place the SSG on the intended workbench and connect the AC power cord to the receptable on the rear of the unit.

2. Press the Line on/off switch on the rear panel. The front panel display should illuminate.

System verification

The following section provides the procedure to verify that the SSG is operating correctly.

1. Attach a main AC power cord and set the rear panel main power switch to the up position. The front panel display will illuminate.

2. Press the **Frequency** button and hold for 3 seconds to reset the frequency to 50 MHz and the amplitude to -10 dBm.

3. Set and measure the frequency and amplitude at each of the following points:

   10 MHz
   210 MHz
   410 MHz
   610 MHz
   810 MHz
   1000 MHz
   1500 MHz
   2000 MHz
   2400 MHz
   2750 MHz
   3390 MHz

   The frequency error shall be less than ± 2 PPM and the amplitude error shall be less than ± 0.5 dB.

4. Set the frequency to 1000 MHz. Connect the output to a spectrum analyzer and verify the phase noise complies with the specification.

B

Specifications Section

Specifications

Frequency Range	10 MHz - 4000 MHz
Frequency Resolution	10 Hz up to 1999.99999 MHz
	20 Hz for 2000 - 4000 MHz
Frequency Accuracy	+/- 2 PPM internal reference
	or per external reference
Frequency update rate	2 ms via LAN or GPIB
Settling time	2 msec typical
	200 usec for steps less than 10 MHz
	<12 msec at band crossings
	(1 GHz, 2 GHz)
Spectral Purity	
Phase Noise at 1 GHz	- 55 dBc @ 10 Hz
	-81 dBc @ 100 Hz
	-103dBc @ 1 kHz
	-107 dBc @ 10 kHz
	-108 dBc @ 100 kHz
	-128 dBc @ 1 MHz

Spurious	<-50 dBc
Output Noise floor	< -145 dBm/Hz
2nd Harmonic	<-15 dBc
3rd Harmonic	<-25 dBc
Output Power	
Power Range	+10 dBm to -30 dBm
Power Resolution	0.1 dB
Power Accuracy	+/- 0.5 dB, -20dBm to +10 dBm
	+/- 0.75 dB, <-20 dBm
Impedance	50 ohms
External Reference	10 MHz sine, +3 dBm to +6 dBm
Environmental	
Operating Temperature	0°C to +35°C
Shock and Vibration	MIL-PRF 28800F Type III Class 4
EMI	MIL-STD 461B RE02 Part 2 and CISPR II
Control and interface	
Local interface	Front panel keypad & display
Remote interface	IEEE-488.2, LAN, RS-232
Primary power	
Voltage	90-264 VAC autoranging
Frequency	48-66 Hz
Consumption	40 VA, maximum
Fuse	1A, slow-blow
Physical	
Ambient operating temp	0° to 35° C
Dimensions	10" W x 2.75" H x 10" D

Figure 8. SSG Specifications

C

Maintenance and Warranty Section

Maintenance and Warranty

This section describes the SSG maintenance procedures and warranty information.

- Maintenance Information.
- Warranty Information.

Maintenance Information

Adjustments and Calibration

To maintain optimum measurement performance, the SSG should be calibrated every year. It is recommended that the SSG be returned to dBm or to an authorized calibration facility. For more information please contact our Customer Service Department at (201) 677-0008.

Repair

The SSG should only be serviced by dBm service personnel or trained customer maintenance personnel using the dBm Service Manual for the SSG.

For instruments requiring service, either in or out of warranty, contact dBm Customer Service Department at (201) 677-0008 for pricing and instructions before returning your instrument. When you call, be sure to have the following information available:

- Model number.
- Serial number.
- Full description of the failure condition.

Note: Model and serial number can be found on the rear of the SSG unit, next to the the AC outlet.

Equipment Returns

All instruments returned to dBm for repair must be shipped prepaid. Instruments that are eligible for in-warranty repair will be returned prepaid to the customer. For all other situations the customer is responsible for all shipping charges. An evaluation fee may be charged for processing units that are found to have no functional or performance defects.

For out of warranty instruments, dBm will provide an estimate for the cost of repair. Customer approval of the charges will be required before repairs can be made. For units deemed to be beyond repair, or in situations which the customer declines to authorize repair, an evaluation charge may be assessed by dBm.

Warranty Information

All dBm products are warranted against defects in material and workmanship for a period of one year from the date of shipment.

dBm will, at its option, repair or replace products that prove to be defective during the warranty period, provided they are returned to dBm and provided the preventative maintenance procedures are followed. Repairs necessitated by misuse of the product are not covered by this warranty. No other warranties are expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose.

dBm is not liable for consequential damages. Please refer to the previous section for contact information and procedures to return the instrument to dBm.