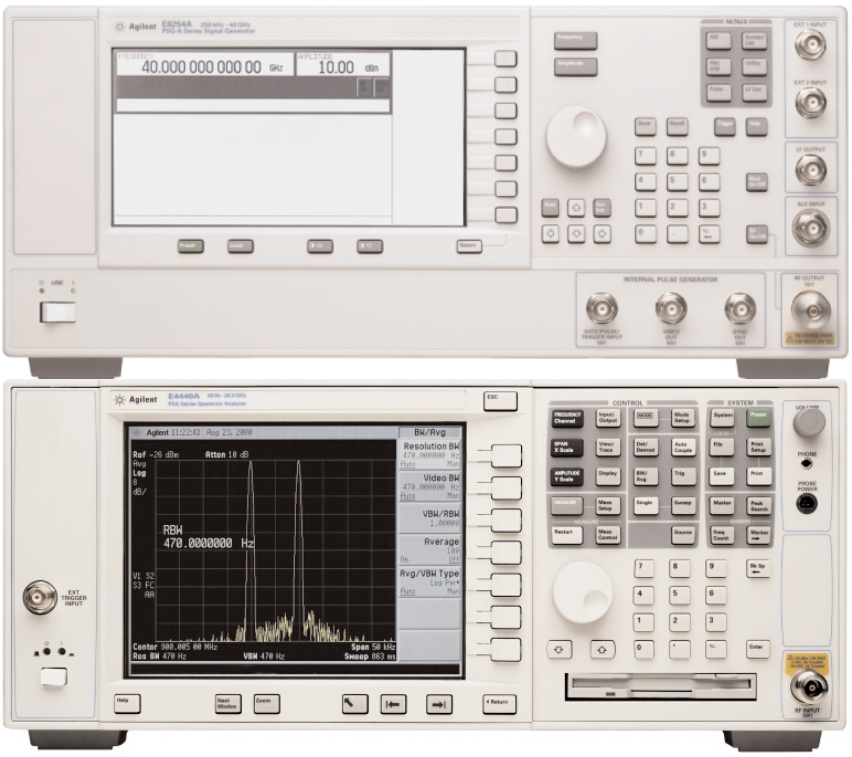
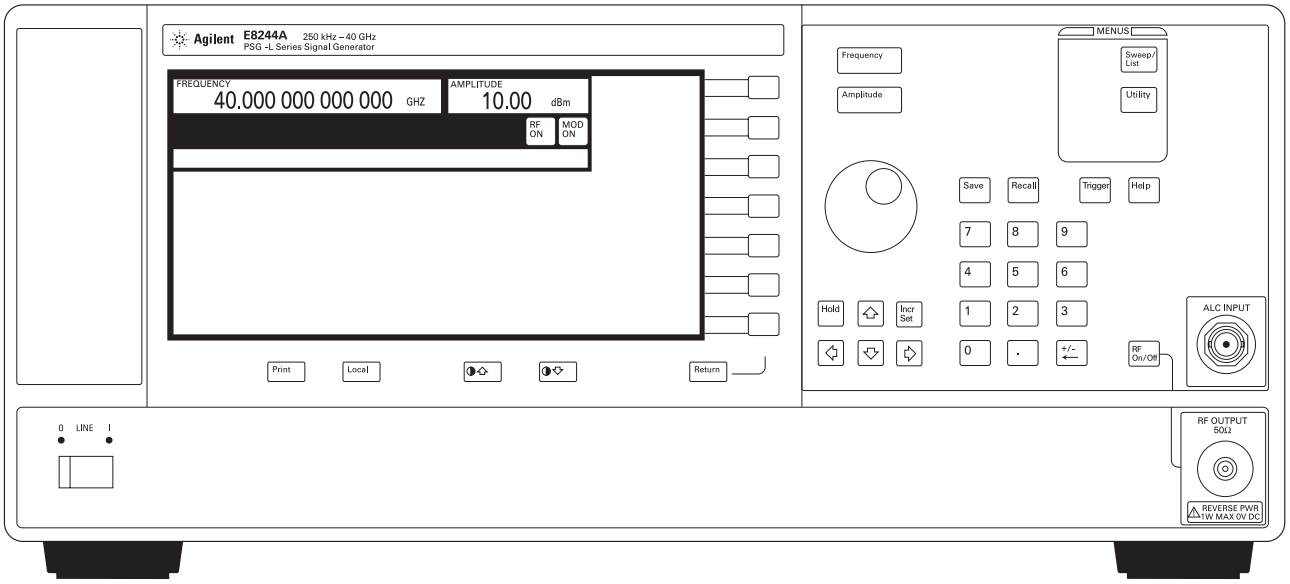
Agilent E8241A/44A/51A/54A PSG Series Performance Signal Generators Self Guided Demo

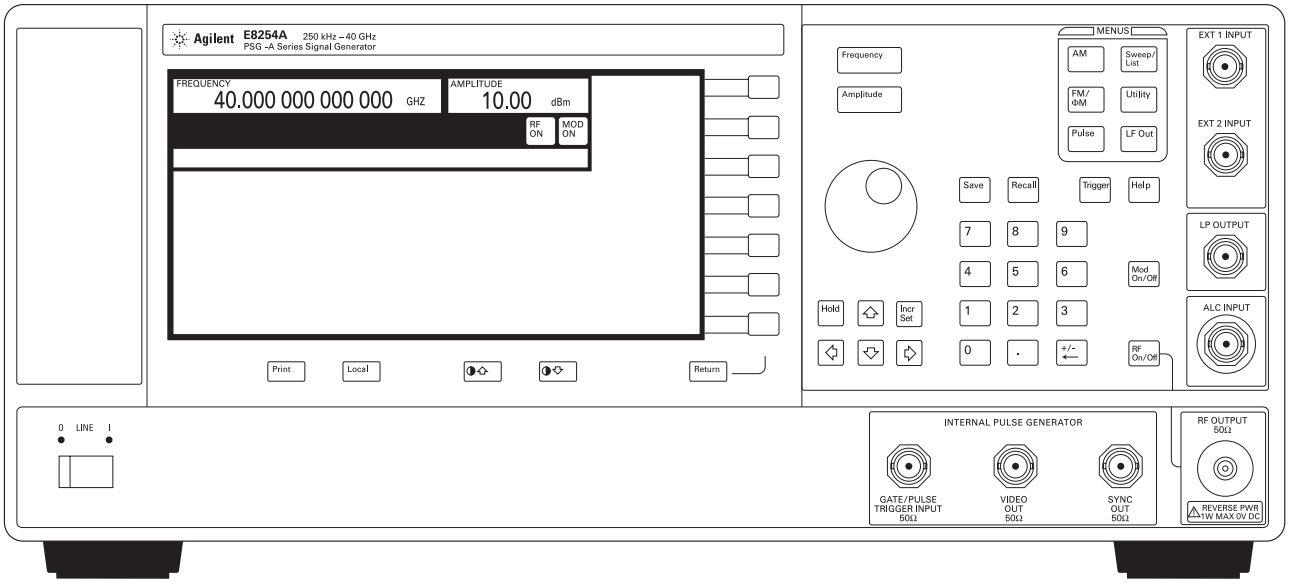
Product Note



Agilent Technologies



Agilent E8244A



Agilent E8254A

Table of Contents

Part 1:	Configuring the RF Output	2
Part 2:	Configuring Analog Modulation (PSG-A Series Only)	20
Part 3:	Configuring the LF Output (PSG-A Series Only)	22
Part 4:	Using Data Storage Functions	25
Part 5:	Using Table Editors	30
Part 6:	Configuring for Remote Control	31

Conventions used in this demonstration

In this self guided demonstration hard keys on the instrument front panel are shown as [Hard Keys]. The soft keys at the right of the display are shown as {Soft Keys}. Items which appear in the display area are shown as *DISPLAY*. Front panel items are shown as FRONT PANEL.

Sequential commands are separated by >.

Part 1:
Configuring the RF Output

This section explains how to create continuous wave and swept RF outputs.

Configuring a continuous wave RF output

Using these procedures, you will learn how to set the following parameters:

- RF output frequency
- frequency reference and frequency offset
- RF output amplitude
- amplitude reference and amplitude offset

Setting the RF output frequency

Instruction	Note
1. Press [Preset].	This returns the signal generator to the factory-defined instrument state.
NOTE	You can change the preset conditions to a user-defined instrument state. However, these examples, use the factory-defined preset state (the {Preset Normal User} softkey in the Utility menu must be set to Normal).
2. Observe the *FREQUENCY* area of the display (in the upper left-hand corner).	The value displayed is the maximum specified frequency of your signal generator.
3. Press [RF On/Off].	The [RF On/Off] hardkey must be pressed before the RF signal is available at the RF OUTPUT connector. The display annunciator changes from *RF OFF* to *RF ON*. The maximum specified frequency is now being output at the RF OUTPUT connector (at –135.00 dBm).
4. Press [Frequency] > [700] > {MHz}.	The new 700 MHz RF frequency is now displayed in the *FREQUENCY* area of the display and also in the active entry area.
5. Press [Frequency] > [Incr Set] > [1] > {MHz}.	This changes the frequency increment value to 1 MHz.
6. Press the up-arrow key.	Each press of the up-arrow key increases the frequency by the increment value last set with the [Incr Set] hardkey. The increment value is displayed in the active entry area.
7. The down arrow works like the up arrow.	Practice stepping the frequency up and down in 1 MHz increments. You can also adjust the RF output frequency using the knob. As long as frequency is the active function (the frequency is displayed in the active entry area), the knob will increase and decrease the RF output frequency.
8. Use the knob to adjust the frequency back to 700 MHz.	

Setting the frequency reference and frequency offset

The following procedure sets the RF output frequency as a reference frequency to which all other frequency parameters are relative. The frequency initially shown on the display will be 0.00 Hz (the frequency output by the hardware minus the reference frequency). Although the display changes, the frequency output does not change. Any subsequent frequency changes are shown as incremental or decremental to 0 Hz.

Instruction	Note
1. Press [Preset].	
2. Press [Frequency] > [700] > {MHz}.	
3. Press {Freq Ref Set}.	This activates the frequency reference mode and sets the current output frequency (700 MHz) as the reference value. The frequency displayed is *0.00 Hz* (the frequency output by the hardware, 700 MHz, minus the reference value, 700 MHz). The *REF* indicator is activated and the {Freq Ref Off On} softkey has toggled to On.
4. Press [RF On/Off].	The display annunciator has changed from *RF OFF* to *RF ON*. The RF frequency at the RF OUTPUT connector is 700 MHz.
5. Press [Frequency] > {Incr Set} > [1] > {MHz}.	This changes the frequency increment value to 1 MHz.
6. Press the up arrow key.	This increments the output frequency by 1 MHz. The frequency display changes to show 1 MHz (the frequency output by the hardware, 700 MHz + 1 MHz, minus the reference frequency, 700 MHz) and the output frequency changes to 701 MHz.
7. Press [Freq Offset] > [1] > {MHz}.	This enters a 1 MHz offset. The frequency display shows *2.000 000 00 MHz* (the frequency output by the hardware, 701 MHz, minus the reference frequency, 700 MHz, plus the offset, 1 MHz). The *OFFS* indicator is activated. The frequency at the RF OUTPUT connector is still 701 MHz.

Setting the RF output amplitude

Instruction	Note
1. Press [Preset].	
2. Observe the *AMPLITUDE* area of the display (in the upper middle of the display). The display reads *–135.00 dBm*. This is the normal preset RF output amplitude.	
3. Press [RF On/Off].	The display annunciator changes from *RF OFF* to *RF ON*. The RF signal is now being output at an amplitude of –135 dBm at the RF OUTPUT connector.
4. Press [Amplitude] > [–20] > {dBm}.	This changes the amplitude to –20 dBm. The new –20 dBm RF output power is now displayed in the *AMPLITUDE* area of the display and also in the active entry area. Amplitude is still the active function until you press another front panel function key. You can also change the amplitude using the up and down arrow keys and the knob.
5. Practice changing the amplitude using the arrow keys and the knob.	

Setting the amplitude reference and amplitude offset

The following procedure sets the RF output power as an amplitude reference to which all other amplitude parameters are relative. The amplitude initially shown on the display will be 0 dB (the power output by the hardware minus the reference power). Although the display changes, the output power does not change. Any subsequent power changes are shown as incremental or decremental to 0 dB.

Instruction	Note
1. Press [Preset].	
2. Press [Amplitude] > [–20] > {dBm}.	
3. Press [More (1 of 2)] > {Ampl Ref Set}.	This activates the amplitude reference mode and sets the current output power (–20 dBm) as the reference value. The *AMPLITUDE* area displays *0.00 dB* (the power output by the hardware, –20 dBm, minus the reference value, –20 dBm). The *REF* indicator is activated and the {Ampl Ref Off On} softkey has toggled to On.
4. Press [RF On/Off].	The display annunciator has changed from *RF OFF* to *RF ON*. The power at the RF OUTPUT connector is –20 dBm.
5. Use the up arrow key to increase the output power by 10 dB.	The *AMPLITUDE* area displays *10.00 dB* (the power output by the hardware, –20 dBm plus 10 dBm, minus the reference power, –20 dBm) and the output power changes to –10 dBm.
6. Press {Ampl Offset} > [10] > {dB}.	This enters a 10 dB offset. The *AMPLITUDE* area displays *20.00 dB* (the power output by the hardware, –10 dBm; minus the reference power, –20 dBm; plus the offset, 10 dB). The *OFFS* indicator is activated. The power at the RF OUTPUT connector is still –10 dBm.

Configuring a swept RF output

The signal generator has two sweep types: step and list.

Following an explanation of the differences between step sweep and list sweep, you will learn two ways to configure the signal generator's RF output to sweep a defined set of frequency, amplitude, and dwell time points. You will create a step sweep and then you will use these points as the basis for a new list sweep.

NOTE

Sweep data cannot be saved to the instrument state register.

Step sweep data cannot be saved to the instrument state register or to the memory catalog. Step sweep configurations are reset at preset or when the signal generator's line power is cycled.

List sweep data cannot be saved within an instrument state, but can be saved to the memory catalog. For instructions on saving list sweep data, see Storing Files in Part 4.

During swept RF output, the *FREQUENCY* and *AMPLITUDE* areas of the signal generator's display are deactivated.

Step sweep

Step sweep allows you to enter RF output start and stop frequencies and amplitudes, a number of equally spaced points (steps) to dwell upon, and the amount of dwell time at each point.

When a step sweep is activated, the signal generator will sweep the RF output based on the values entered for the parameters listed above. The frequency, amplitude, or frequency and amplitude of the RF output will sweep from the start amplitude/frequency to the stop amplitude/frequency, dwelling at equally spaced intervals defined by the [# Points] softkey value for the configured step dwell time.

Step sweep provides a linear progression through the start-to-stop frequency and/or amplitude values. You can toggle the direction of the sweep up or down. When the [Sweep Direction Down Up] softkey is set to Up, values are swept from the start frequency/amplitude to the stop frequency/amplitude. Set to Down, values are swept from the stop frequency/amplitude to the start frequency/amplitude.

NOTE

Step sweep data cannot be saved to the instrument state register or to the memory catalog.

List Sweep

List sweep allows you to create a list of frequency, amplitude, and dwell time values and sweep the RF output based on the entires in the List Mode Values table.

Unlike a step sweep that contains linear ascending/decending frequency and amplitude values spaced at equal intervals throughout the sweep, list sweep frequencies and amplitudes can be entered at unequal intervals and nonlinear ascending/decending or random order.

For convenience, the List Mode Values table can be can be configured based upon the values of a previously configured step sweep. Each step sweep point's associated frequency, amplitude and dwell time values are entered ino a row in the List Mode Values table, as the following example illustrates.

Configuring and activating a single step sweep

In this procedure, you will create a step sweep with nine, equally spaced points and the following parameters:

- frequency range from 500 MHz to 600 MHz
- amplitude from –20 dBm to 0 dBm
- dwell time 500 ms at each point

Instruction	Note
1. Press [Preset].	
2. Press [Sweep/List].	This opens a menu of sweep softkeys.
3. Press {Sweep Repeat Single Cont}.	This toggles the sweep repeat from continuous to single.
4. Press {Configure Step Sweep}.	
5. Press {Freq Start} > [500] > {MHz}.	This changes the start frequency of the step sweep to 500 MHz.
6. Press {Freq Stop} > [600] > {MHz}.	This changes the stop frequency of the step sweep to 600 MHz.
7. Press {Ampl Start} > [–20] > {dBm}.	This changes the amplitude level for the start of the step sweep.
8. Press {Ampl Stop} > [0] > {dBm}.	This changes the amplitude level for the end of the step sweep.
9. Press {# Points} > [9] > {Enter}.	This sets the number of sweep points to nine.
10. Press {Step Dwell} > [500] > {msec}.	This sets the dwell time at each point to 500 milliseconds.
11. Press {Return} > {Sweep} > {Freq & Ampl}.	This sets the step sweep to sweep both frequency and amplitude data. Selecting this softkey returns you to the previous menu and turns on the sweep function.
12. Press [RF On/Off].	The display annunciator changes from *RF OFF* to *RF ON*.
13. Press {Single Sweep}.	A single sweep of the frequencies and amplitudes configured in the step sweep is executed and available at the RF OUTPUT connector. The progression of the sweep is displayed by a progress bar.

Activating continuous step sweep

Instruction	Note
Press {Sweep Repeat Single Cont}.	This toggles the sweep from single to continuous. The *SWEEP* annunciator is activated indicating that the signal generator is sweeping. The progression of the sweep is displayed by a progress bar. A continuous repetition of the frequencies and amplitudes configured in the step sweep are now available at the RF OUTPUT connector.

Configuring a list sweep using step sweep data

In this procedure, you will leverage the step sweep points and change the sweep information by editing several points in the List Mode Values table editor. For information on using table editors, see Using Table Editors in Part 5.

Instruction	Note
1. Press {Sweep Repeat Single Cont}.	This toggles the sweep repeat from continuous to single. The *SWEEP* annunciator is turned off. The sweep will not occur until it is triggered.
2. Press {Sweep Type List Step}.	This toggles the sweep type from step to list.
3. Press {Configure List Sweep}.	This opens another menu displaying softkeys that you will use to create the sweep points. The display shows the current list data. (When no list has been previously created, the default list contains one point set to the signal generator's maximum frequency, an amplitude of –135 dBm, with a dwell time of 2 ms.)
4. Press {More (1 of 2)} > {Load List From Step Sweep} > {Confirm Load From Step Sweep}.	The points you defined in the step sweep are automatically loaded into the list.

Editing list sweep points

Instruction	Note
1. Press the right arrow key twice.	This highlights the dwell time value in row 1.
2. Press {More (2 of 2)} > {Edit Item}.	The dwell time for point 1 becomes the active function.
3. Press [100] > {msec}.	This enters 100 ms as the new dwell time value for row 1. Note that the next item in the table (in this case, the frequency value for point 2) becomes highlighted after you press the terminator softkey.
4. Using the arrow keys, highlight the frequency value in row 4.	
5. Press {Edit Item} > [545] > {MHz}.	This changes the frequency value in row 4 to 545 MHz.
6. Highlight any column in the point 7 row and press {Insert Row}.	This adds a new point between points 7 and 8. A copy of the point 7 row is placed between points 7 and 8, creating a new point 8, and renumbering the successive points.

Instruction	Note
7. Highlight the frequency item for point 8, then press {Insert Item}.	
NOTE	During this process, several error messages are generated to inform you that the frequency and power (or power and dwell) lists are of unequal size. You will correct this problem in the following steps, however the ERR annunciator does not turn off until you clear the error queue. To clear the error queue and return to the List Mode Values table editor, follow these steps. a. Press [Utility] > [Error Info] > [Clear Error Queue(s)]. This clears the error queue. b. Press [Sweep/List] > [Configure List Sweep]. This returns you to the List Mode Values table editor. Pressing Insert Item shifts frequency values down one row, beginning at point 8. Note that the original frequency values for both points 8 and 9 shift down one row, creating an entry for point 10 that contains only a frequency value (the power and dwell time items do not shift down). The frequency for point 8 is still active.
8. Press [590] > {MHz}.	
9. Press {Insert Item} > [–2.5] > {dBm}.	This inserts a new power value at point 8 and shifts down the original power values for points 8 and 9 by one row.
10. Highlight the dwell time for point 9, then press {Insert Item}.	A duplicate of the highlighted dwell time is inserted for point 9, shifting the existing value down to complete the entry for point 10.

Activating List Sweep for a Single Sweep

Instruction	Note
1. Press {Single Sweep}.	The signal generator will sweep the points in your list once. The *SWEEP* annunciator is activated during the sweep.
2. Press {More (1 of 2)} > {Sweep Trigger} > [Trigger] hardkey.	This sets the sweep trigger to occur when you press the Trigger hardkey.
3. Press {More (2 of 2)} > {Single Sweep}.	This arms the sweep. The *ARMED* annunciator is activated.
4. Press the [Trigger] hardkey.	The signal generator will sweep the points in your list once and the *SWEEP* annunciator is activated during the sweep.

Part 2: Configuring Analog Modulation (PSG-A Series Only)

PSG-A signal generators can modulate the RF carrier with four types of analog modulation: amplitude, frequency, phase, and pulse.

AM, FM, and ΦM Sources

- AM, FM, and ΦM have two source paths each. These multiple source paths are summed internally for composite modulation of the RF output.
- Each path can be fed by one of four sources: Internal 1, Internal 2, External 1 or External 2.
- Only one path can be active for each source. For example, if AM Path 1 is on and AM Path 1 source is set to Internal 1, if AM Path 2 is on, AM Path 2 source must be set to Internal 2, External 1 or External 2. Different paths cannot use the same source at the same time.
- Waveforms available from Internal 1 and Internal 2 include:

Sine
sine wave with adjustable amplitude and frequency

Dual-Sine
dual sine waves with individually adjustable frequencies and a percent-of- peak-amplitude setting for the second tone (available from function generator 1 only)

Swept-Sine
a swept sine wave with adjustable start and stop frequencies, sweep time, and sweep trigger settings (available from function generator 1 only)

Triangle
triangle wave with adjustable amplitude and frequency

Ramp
ramp with adjustable amplitude and frequency

Square
square wave with adjustable amplitude and frequency

Noise
noise, in a uniform or Gaussian distribution, with adjustable amplitude generated as a peak-to-peak value (RMS value is approximately 80% of the displayed value)

DC
direct current with adjustable amplitude

Pulse Sources

The following list summarizes the different sources available for pulse modulation.

External Pulse
modulates an external pulse signal connected to the signal generator's PULSE/TRIGGER GATE INPUT connector.

Internal Doublet
produces two pulses at the RF OUTPUT connector for each trigger event at the TRIGGER IN connector. The first pulse will follow the external trigger signal. The second pulse will have user-defined delay and width parameters.

Internal Free-Run
produces internal, free-run, pulse modulation with user-defined period, width, and delay.

Internal Gated
produces an internal, gated, pulse modulation. When a valid gate signal is applied to the TRIGGER IN connector, a pulse train (with user-defined width and pulse repetition frequency parameters) will occur at the RF OUTPUT connector.

Internal Trigger
produces an internal, triggered, pulse modulation. An RF pulse (with user-defined width and delay parameters) will occur at the RF OUTPUT connector whenever a valid trigger signal occurs at the TRIGGER IN connector.

Internal Square
produces internal, square, pulse modulation. The internal source is a sinewave which is later squared by the modulator to generate the pulse squarewave with a duty cycle set to 50%.

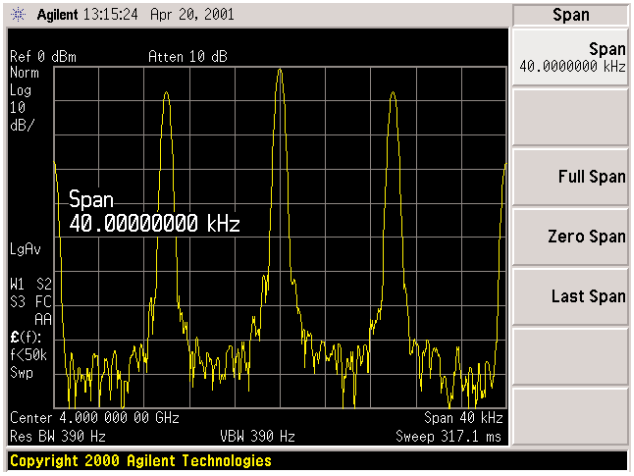
Internal Pulse
produces internal, rectangular, pulse modulation with with user-defined width and period parameters.

Configuring AM

Using this procedure, you will learn how to create a multipath amplitude-modulated RF carrier with the following characteristics:

- RF output frequency set to 4 GHz
- RF output amplitude set to 0 dBm
- AM Path 1 depth set to 90%
- AM Path 1 rate set to 10 kHz
- AM Path 1 waveform set to sine
- AM Path 2 depth set to 40%
- AM Path 2 waveform set to triangle
- AM Path 2 rate set to 5 kHz

Figure 1: AM



Setting the RF output frequency

Instruction	Note
1. Press [Frequency] > [4] > {GHz}.	The *FREQUENCY* area of the display now reads *4.000 000 000 00 GHz.*

Setting the RF output amplitude

Instruction	Note
1. Press [Amplitude] > [0] > {dBm}.	The *AMPLITUDE* area of the display now reads *0.00 dBm*.

Setting the AM depth

Instruction	Note
1. Press the [AM] hardkey.	The first level menu of softkeys is displayed.
2. Press {AM Depth} > [90] > {%}.	*90.0 %* is displayed below the {AM Depth} softkey.

Setting the AM rate

Instruction	Note
1. Press {AM Rate} > [10] > {kHz}.	*10.0000 kHz* is displayed below the {AM Rate} softkey.

Activating a AM configuration

Instruction	Note
1. Press [AM Off On]	
2. Press [RF On/Off].	

Viewing the signal on an Agilent E4440A PSA spectrum analyzer

Instruction	Note
1. Press [Preset].	
2. Press [Frequency] > [4] > {GHz}.	The Center *FREQUENCY* area of the display now reads *4.000 000 00 GHz.*
3. Press [Span] > [40] > {kHz}	The Span are of the display now reads *40 kHz.*
	The display on the PSA should now match Figure 1.

Creating a multipath AM configuration

Use these steps to configure a multipath AM configuration. AM Path 1 and AM Path 2 are summed internally for composite modulation. Either path can be switched to any one of the modulation sources (internal 1 or 2, external 1 or 2), though any given source can only be routed to one modulation type.

Note that the AM Source for AM Path 1 is set to Internal 1 as a default setting. Therefore, the AM Source for AM Path 2 must be set to another source, as explained in the following procedure.

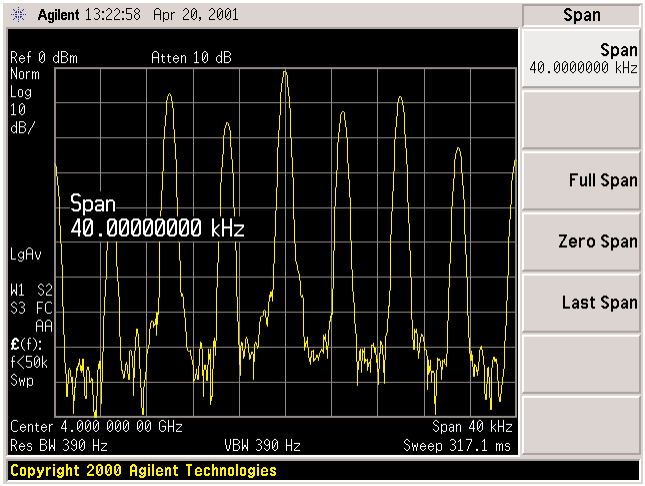
Instruction	Note
1. Press {AM Path 1 2} to toggle to AM Path 2.	This opens a menu of softkeys where you can define a second unique amplitude modulation configuration.
2. Press {AM Depth} > [40] > {%}.	The AM Path 2 AM depth is set to 40.0 %, as displayed below the {AM Depth} softkey.
3. Press {AM Rate} > [5] > {kHz}.	5.0000 kHz is displayed below the {AM Rate} softkey.
4. Press {More (1 of 2)} > {AM Waveform} > {Triangle}.	The AM Path 2 AM waveform is set to Triangle, as displayed below the {AM Waveform} softkey.
5. Press {More (2 of 2} > {AM Source} > {Internal 2}	The AM Path 2 AM source is set to Internal 2, as displayed below the {AM Waveform} softkey.

Activating a multipath AM configuration

The signal generator is now configured to output a 0 dBm, multipath amplitude-modulated carrier at 4 GHz. AM Path 1 is set to an AM depth of 90%, an AM rate of 10 kHz, and a sinewave as the default AM waveform. AM Path 2 is set to an AM depth of 40% with a triangle AM waveform at the rate of 5 kHz. Follow these remaining steps to output the amplitude-modulated signal.

Instruction	Note
1. Press {AM Off On}.	This activates the modulation on AM Path 2. The *AM* annunciator is activated, indicating that you have enabled amplitude modulation on AM Path 2.
2. Press {AM Path 1 2} > {Amp Off On}.	This toggles back to AM Path 1 and activates the modulation on AM Path 1.
3. Press [RF On/Off].	The *RF ON* annuciator is activated, indicating that the multipath AM signal is now available at the RF OUTPUT connector.

Figure 2:
Multipath AM



Viewing the signal on an Agilent E4440A PSA spectrum analyzer

Instruction	Note
1. Press [Preset].	
2. Press [Frequency] > [4] > {GHz}.	The Center *FREQUENCY* area of the display now reads *4.000 000 00 GHz.*
3. [Press Span] > [40] > {kHz}.	The Span are of the display now reads *40 kHz.* The display on the PSA should now match Figure 2

Configuring FM

Using this procedure, you will learn how to create a frequency-modulated RF carrier with the following characteristics:

- RF output frequency set to 4 GHz
- RF output amplitude set to 0 dBm
- FM deviation set to 75 kHz
- FM rate set to 10 kHz

Setting the RF output frequency

Instruction	Note
1. Press [Preset].	
2. Press [Frequency] > [4] > {GHz}.	The *FREQUENCY* area of the display now reads *4.000 000 000 00 GHz.*

Setting the RF output amplitude

Instruction	Note
1. Press [Amplitude] > [0] > {dBm}.	The *AMPLITUDE* area of the display now reads *0.00 dBm.*

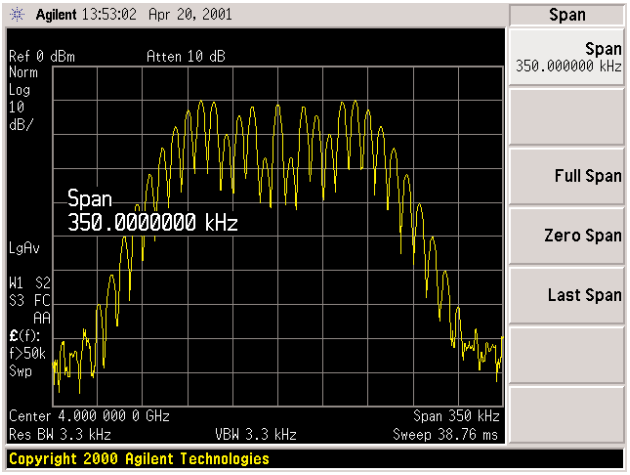
Setting the FM deviation

Instruction	Note
1. Press [FM/ΦM].	The first level menu of FM softkeys is displayed.
2. Press {FM Dev} > [75] > {kHz}.	*75.0000 kHz* is displayed below the {FM Dev} softkey.

Setting the FM rate

Instruction	Note
1. Press {FM Rate} > [10] > {kHz}.	*10.0000 kHz* is displayed below the {FM Rate} softkey.

Figure 3:
FM



Activating FM

The signal generator is now configured to output a 0 dBm, frequency-modulated carrier at 4 GHz with the FM deviation set to 75 kHz and the FM rate set to 10 kHz. The shape of the waveform is a sinewave. (Notice that sine is the default for the FM Waveform softkey. Press More (1 of 2) to see the softkey.) Follow these remaining steps to output the frequency-modulated signal.

Instruction	Note
1. Press [FM Off On].	The *FM* annunciator is activated, indicating that you have enabled frequency modulation.
2. Press [RF On/Off].	The *RF ON* annuciator is activated, indicating that the signal is now available at the RF OUTPUT connector.

Viewing the signal on an Agilent E4440A PSA spectrum analyzer

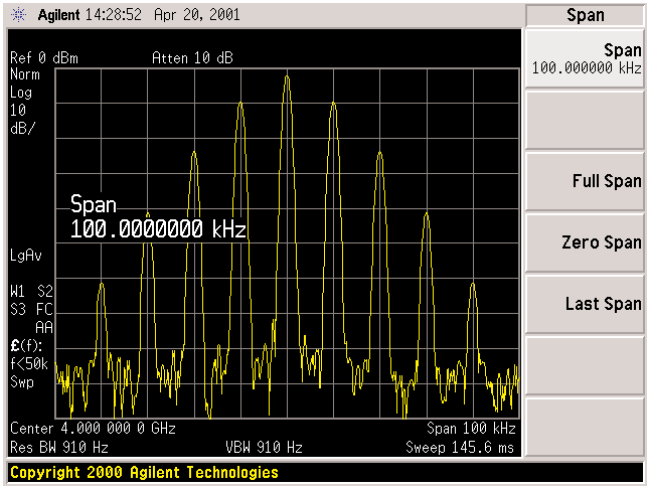
Instruction	Note
1. Press [Preset].	
2. Press [Frequency] > [4] > {GHz}.	The Center *FREQUENCY* area of the display now reads *4.000 000 00 GHz*.
3. Press [Span] > [350] > {kHz}.	The Span area of the display now reads *350 kHz*. The display on the PSA should now match Figure 3.

Configuring ΦM

Using this procedure, you will learn how to create a phase-modulated RF carrier with the following characteristics:

- RF output frequency set to 4.0 GHz
- RF output amplitude set to 0 dBm
- ΦM deviation set to 0.25 – radians
- ΦM rate set to 30 kHz

Figure 4: ΦM



Setting the RF output frequency

Instruction	Note
1. Press [Preset].	
2. Press [frequency] > [4] > {GHz}.	The *FREQUENCY* area of the display now reads *4.000 000 000 00 GHz.*

Setting the RF output amplitude

Instruction	Note
1. Press [Amplitude] > [0] > {dBm}.	The *AMPLITUDE* area of the display now reads *0.00 dBm.*

Setting the ΦM deviation

Instruction	Note
1. Press the [FM/ΦM] hardkey.	
2. Press the {FM ΦM} softkey.	The first level menu of ΦM softkeys is displayed.
3. Press {ΦM Dev} > [.25] > [pi rad].	This changes the ΦM deviation to 0.25 – radians.

Setting the ΦM rate

Instruction	Note
1. Press {ΦM Rate} > [10] > {kHz}.	This sets the ΦM rate to 10 kHz.

Activating ΦM

The signal generator is now configured to output a 0 dBm, phase-modulated carrier at 4 GHz with the ΦM deviation set to 0.25 – radians and the ΦM rate set to 10 kHz. The shape of the waveform is a sinewave. (Notice that sine is the default for the ΦM Waveform softkey. Press [More (1 of 2)] to see the softkey.) Follow these remaining steps to output the phase-modulated signal.

Instruction	Note
1. Press {ΦM Off On}.	The ΦM annunciator is activated, indicating that you have enabled phase modulation.
2. Press [RF On/Off].	The *RF ON* annuciator is activated, indicating that the signal is now available at the RF OUTPUT connector.

Viewing the signal on an Agilent E4440A PSA spectrum analyzer

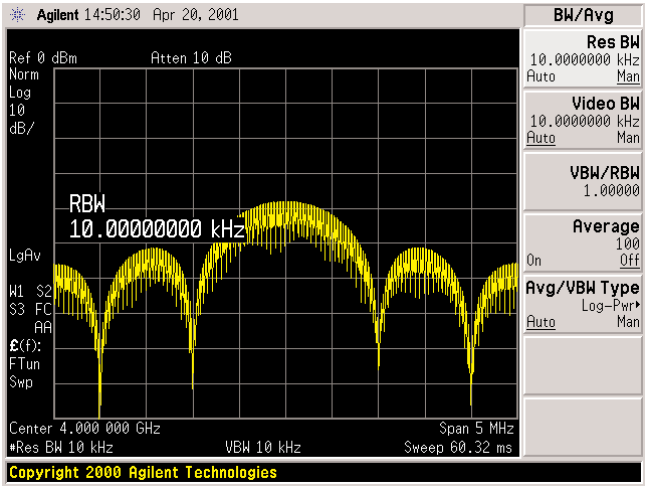
Instruction	Note
1. Press [Preset].	
2. Press [Frequency] > [4] > {GHz}.	The Center *FREQUENCY* area of the display now reads *4.000 000 00 GHz.*
3. Press [Span] > [100] > {kHz}.	The Span are of the display now reads *100 kHz.* The display on the PSA should now match Figure 4.

Configuring pulse modulation

Using the following procedure you will learn how to create a pulse-modulated RF carrier with the following characteristics:

- RF output frequency set to 4 GHz
- RF output amplitude set to 0 dBm
- pulse period set to 100.0 –sec
- pulse width set to 24.0 –sec
- pulse source set to internal free-run

Figure 5:
Pulse Modulation



Setting the RF output frequency

Instruction	Note
1. Press [Preset].	
2. Press [frequency] > [4] > {GHz}.	The *FREQUENCY* area of the display now reads *4.000 000 000 00 GHz.*

Setting the RF output amplitude

Instruction	Note
1. Press [Amplitude] > [0] > {dBm}.	The *AMPLITUDE* area of the display now reads *0.00 dBm.*

Setting the pulse period

Instruction	Note
1. Press [Pulse] > {Pulse Period} > [100] > {µsec}.	This sets the pulse period to 100 microseconds.

Setting the pulse width

Instruction	Note
1. Press [Pulse] > {Pulse Width} > [1] > {µsec}.	This sets the pulse period to 1 microseconds.

Activating pulse modulation

The signal generator is now configured to output a 0 dBm, pulse-modulated carrier at 4 GHz with the pulse period set to 100 microseconds and the pulse width set to 24 microseconds. The pulse source is set to internal free-run. (Notice that internal free-run is the default for the Pulse Source softkey.) Follow these remaining steps to output the pulse-modulated signal.

Instruction	Note
1. Press {Pulse Off On}.	This activates pulse modulation. The Pulse annunciator is activated indicating that you have enabled pulse modulation.
2. Press [RF On/Off].	The *RF ON* annuciator is activated, indicating that the signal is now available at the RF OUTPUT connector.

Viewing the signal on a Agilent E4440A PSA spectrum analyzer

Instruction	Note
1. Press [Preset].	
2. Press [frequency] > [4] > {GHz}.	The Center *FREQUENCY* area of the display now reads *4.000 000 00 GHz.*
3. Press [Span] > [5] > {MHz}.	The Span are of the display now reads *5 MHz.*
4. Press [BW/Avg] > [Res BW] > [10] > {kHz}.	The display on the PSA should now match Figure 5.

Part 3: Configuring the LF Output (PSG-A Series Only)

The PSG-A Series signal generator has a low frequency (LF) output. The LF output's source can be switched between an internal modulation source (internal monitor 1 or 2) or an internal function generator (function generator 1 or 2).

Using internal monitor 1 or 2 as the LF output source, the LF output provides a replica of the signal from either internal source (1 or 2) that is being used to modulate the RF output. The specific modulation parameters for this signal are configured through the AM, FM, or ΦM menus.

Using function generator 1 or 2 as the LF output source, the function generator section of the internal modulation source (1 or 2) drive the LO output directly. frequency and waveform are configured from the LF output menu, not through the AM, FM, or ΦM menus. You can select the waveform shape from the following choices:

Sine
sine wave with adjustable amplitude and frequency

Dual-Sine
dual sine waves with individually adjustable frequencies and a percent-of- peak-amplitude setting for the second tone (available from function generator 1 only)

Swept-Sine
a swept sine wave with adjustable start and stop frequencies, sweep time, and sweep trigger settings (available from function generator 1 only)

Triangle
triangle wave with adjustable amplitude and frequency

Ramp
ramp with adjustable amplitude and frequency

Square
square wave with adjustable amplitude and frequency

Noise
noise, in a uniform or Gaussian distribution, with adjustable amplitude generated as a peak-to-peak value (RMS value is approximately 80% of the displayed value)

DC
direct current with adjustable amplitude

NOTE The {LF Out Off On} softkey controls the operating state of the LF output when the LF output source is set to function generator 1 or 2. The {Mod On/Off} softkey controls the operating state of the LF OUTPUT connector when the LF output source is set to internal monitor 1 or 2.

The {RF On/Off} softkey does not apply to the LF OUTPUT connector.

Configuring the LF output with an internal modulation source

In this example, the internal FM modulation is the LF output source.

Configuring the internal modulation as the LF output source

Instruction	Note
1. Press [Preset].	
2. Press the [FM/ΦM] hardkey.	
3. Press {FM Dev} > [75] > {kHz}.	This sets the FM deviation to 75 kHz.
4. Press {FM Rate} > [10] > {kHz}.	This sets the FM rate to 10 kHz.
5. Press {FM Off On}.	The *FM* annunciator is activated indicating that you have enabled frequency modulation.

Configuring the Low frequency output

Instruction	Note
1. Press the [LF Out] hardkey.	This opens the Low frequency output menu. The LF output source is set to internal modulation 1 by default.
2. Press {LF Out Amplitude Into 50 Ω} > [3] > {Vp}.	This sets the LF output amplitude to 3 Vp. *3.000 Vp* is displayed below the {LF Out Amplitude} softkey.
3. Press {LF Out Off On}.	The LF output is a 3 Vp frequency modulated sinewave (the default signal shape), with FM deviation set to 75 kHz and FM rate set to 10 kHz.

Configuring the LF output with a function generator source

In this example, function generator 1 is the LF output source.

Configuring the function generator as the LF output source

Instruction	Note
1. Press [Preset].	
2. Press the [LF Out] hardkey.	
3. Press {LF Out Source} > {Function Generator 1}.	Function generator 1 becomes the LF output source and *FuncGen 1* is displayed below the {LF Out Source} softkey.

Configuring the waveform

Instruction	Note
1. Press {LF Out Waveform} > {Swept-Sine}.	This creates a swept-sine output and opens a menu that configures the sweep parameters of the swept-sine signal.
2. Press {LF Out Start Freq} > [100] > {Hz}.	This sets the swept-sine start frequency to 100 Hz.
3. Press {LF Out Stop Freq} > [1] > {kHz}.	This sets the swept-sine stop frequency to 1 kHz.
4. Press {LF Out Sweeps/Second} > [350] > {Hz}.	This sets the swept-sign sweeps-per-second to 350.
5. Press {Return} > {Return}.	This returns you to the LF output menu. The start frequency for the swept-sine waveform is displayed below the {LF Out Freq} softkey.

Configuring the low frequency output

Instruction	Note
1. Press {LF Out Amplitude Into 50 Ohms} > [3] > {Vp}.	This sets the LF output amplitude to 3 Vp.
2. Press {LF Out Off On}.	This activates the LF output. The LF output is a 3 Vp swept-sine waveform, sweeping from 100 Hz to 1 kHz with a sweep rate of 350 Hz.

Part 4: Using Data Storage Functions

This section explains how to use the two forms of signal generator data storage, the memory catalog, and the instrument state register.

Using the memory catalog

The signal generator's interface for stored files is the memory catalog. From there you can view, copy, rename, and delete files, either from the signal generator's front panel or via remote controller. (For information on performing these tasks remotely, see the programming guide.)

The memory catalog may contain the following file types and their associated data:

LIST
sweep data from the List Mode Values table including frequency, amplitude, and dwell time.

STAT
instrument state data, controlling instrument operating state parameters, such as frequency, amplitude, and mode.

UFLT
user flatness calibration correction pair data (user-defined frequency and corresponding amplitude correction values).

Viewing stored files

Instruction	Note
1. Press [Utility] > {Memory Catalog} > {Catalog Type}.	The default catalog type is All (all files in the memory catalog are listed in alphabetical order, regardless of type). When viewing all files, file name listings include a pointer to their file type, such as <file name>@STATE or <file name>@LIST.
2. Press [List].	The Catalog of List Files is displayed.
3. Press {Catalog Type} > {State}	The Catalog of State Files is displayed.
4. Press {Catalog Type} > {User Flatness}	The Catalog of USERFLAT Files is displayed.

Storing files

To store a file to the memory catalog, first create a file. For this example, use the default list sweep table.

Instruction	Note
1. Press [Preset].	
2. Press {Sweep/List} > {Configure List Sweep} > {More (1 of 2)} > {Load/Store}.	This opens the Catalog of List Files.
3. Press {Store to File}.	This displays a menu of alphabetical softkeys for naming the file. Store to: is displayed in the active function area.
4. Enter the file name LIST1 using the alphabetical softkeys and the numeric keypad.	
5. Press {Enter}.	The file is now displayed in the Catalog of List Files, including the file name, type, and size.

Copying stored files

Instruction	Note
1. Highlight the desired file.	
2. Press {Copy File}.	This opens the file naming text editor.
3. Press {Editing Keys} > {Clear Text}.	This clears the old file name.
4. Input the new file name using the alphabetical softkeys and the numeric keypad.	
5. Press {Enter}.	

Renaming stored files

Instruction	Note
1. Highlight the desired file.	
2. Press {More (1 of 2)} > {Rename File}.	
3. Press {Editing Keys} > {Clear Text}.	
4. Input the new file name using the alphabetical softkeys and the numeric keypad.	
5. Press {Enter}.	

Deleting stored files

Instruction	Note
1. Highlight the desired file.	
2. Press {Delete File}.	The {Confirm Delete} softkey appears.
3. Press {Confirm Delete}.	

Using the instrument state register

The instrument state register is a section of memory divided into 10 sequences (numbered 0 through 9), each containing 100 registers (numbered 00 through 99). It is used to store and recall frequency, amplitude, and modulation settings (PSG-A series generators only). It provides a quick alternative to reconfiguring the signal generator via the front panel or SCPI commands when switching between different signal configurations. Once an instrument state has been saved, all of the frequency, amplitude, and modulation settings can be recalled with minimum effort.

NOTE List sweep data is not saved within an instrument state. For instructions on saving list sweep data, refer to “Storing Files” in Part 4, “Using Data Storage Functions.”

Step sweep data cannot be saved to the instrument state register or to the memory catalog.

Saving an instrument state

Using this procedure, you will learn how to save current instrument settings to the instrument state register.

Instruction	Note
1. Press [Preset].	
2. Configure the signal generator with the following settings:	
a. Press [Frequency] > [800] > {MHz}.	
b. Press [Amplitude] > [0] > {dBm}.	
c. Press [AM] > {AM Off On}.	This enables amplitude modulation (*AM* annunciator is on).
3. Press [Save] > {Select Seq}.	The sequence number becomes the active function. The signal generator displays the last sequence that you have used. Set the sequence to 1 using the arrow keys.
4. Press {Select Reg}.	The register number in sequence 1 becomes the active function. The signal generator displays either the last register used, accompanied by the text: (in use), or (if no registers are in use) register 00, accompanied by the text: (available). Use the arrow keys to select register 01.
5. Press {Save Seq[1] Reg[01]}.	This will save this instrument state in sequence 1, register 01 of the instrument state register.
6. Press {Add Comment to Seq[1] Reg[01]}.	This allows you to add a descriptive comment to sequence 1 register 01. Enter your comment using the alphanumeric softkeys and press Enter.
7. Press {Edit Comment In Seq[1] Reg[01]}.	This allows you to change the descriptive comment for sequence 1 register 01, if desired. Change your comment using the alphanumeric softkeys and press Enter.
After making changes to an instrument state, you may save it back to a specific register by highlighting that register and pressing Re-SAVE Seq[n] Reg[nn].	

Recalling an instrument state

Using this procedure, you will learn how to recall instrument settings saved to an instrument state register.

Instruction	Note
1. Press [Preset].	
2. Press the [Recall] hardkey.	Notice that the {Select Seq} softkey shows sequence 1. (This is the last sequence that you used.)
3. Press [RECALL Reg].	The register to be recalled in sequence 1 becomes the active function. Press the up arrow key once to select register 1. Your stored instrument state settings have now been recalled.

Deleting registers and sequences

Using this procedure, you will learn how to delete registers and sequences saved to an instrument state register.

To delete a specific register within a sequence

Instruction	Note
1. Press [Preset].	
2. Press the [Recall] or [Save] hardkey.	Notice that the {Select Seq} softkey shows the last sequence that you used.
3. Press {Select Seq} and enter the sequence number containing the register you want to delete.	
4. Press {Select Reg} and enter the register number you want to delete.	Notice that the Delete Seq[n] Reg[nn] is now loaded with the sequence and register you want to delete.
5. Press {Delete Seq[n] Reg[nn]}.	This deletes the chosen register.

To delete all registers within a sequence

Instruction	Note
1. Press [Preset].	
2. Press the [Recall] or [Save] hardkey.	Notice that the {Select Seq} softkey shows the last sequence that you used.
3. Press {Select Seq} and enter the sequence number containing the registers you want to delete.	
4. Press {Delete all Regs in Seq[n]}.	This deletes all registers in the selected sequence.
CAUTION This will delete the entire contents, all registers and all sequences, contained in the instrument state register.	

To delete all sequences

Instruction	Note
1. Press [Preset].	
2. Press the [Recall] or [Save] hardkey.	Notice that the {Select Seq} softkey shows the last sequence that you used.
3. Press {Delete All Sequences}.	This deletes all of the sequences saved in the instrument state register.

Part 5: Using Table Editors

The PSG signal generator uses table editors to simplify configuration tasks such as creating a list sweep.

Using the List Mode Values table editor, the following section familiarizes you with basic table editor functionality.

Press [Preset] > [Sweep/List] > [Configure List Sweep].

The signal generator displays the List Mode Values table editor, as shown below.

Active Function Area
an area that displays the active table item while its value is edited

Cursor
an inverse video identifier used to highlight specific table items for selection and editing

Table Editor Softkeys
keys that select table items, preset table values and modify table structures

Table Items
values arraigned in numbered rows and titled columns

Table editor softkeys

The following table editor softkeys are used to load, navigate, modify, and store table item values. Press More (1 of 2) to view additional table editor softkeys.

Edit Item
displays the selected item in the active function area of the display where the item's value can be modified

Insert Row
inserts an identical row of table items above the currently selected row

Delete Row
deletes the currently selected row

Insert Item
inserts an identical item in a new row below the currently selected item

Delete Item
deletes the item from the bottom row of the currently selected column

Goto Row
opens a submenu of softkeys (Goto Top Row, Goto Middle Row, Goto Bottom Row, Page Up, and Page Down) used to quickly navigate through the table items

Page Up and Page Down
display table items that occupy rows outside the limits of the ten-row table display area

Load/Store
opens a submenu of softkeys (Load From Selected File, Store To File, Goto Row, Page Up, and Page Down) used to load table items from a file in the memory catalog, or to store the current table items as a file in the memory catalog

For more information on loading and storing files, "Using Data Storage Functions."

Modifying items in the table editor

To modify existing table items, follow these steps:

Instruction	Note
1. Use the arrow keys or the knob to move the table cursor over the desired item.	
2. Press [Edit Item].	The selected item is displayed in the active function area of the display.
3. Use the knob, arrow keys, or the numeric keypad to modify the value.	
4. Press {Enter}.	The modified item is now displayed in the table.

Part 6: Configuring for Remote Control

This section will show you how to configure the signal generator to interface with a remote controller. Follow the instructions in the appropriate section to configure your PSG signal generator for remote control.

NOTE For a complete system interface required equipment list and installation procedure, see the programming guide.

Configuring for a parallel GPIB (IEEE 488.2, 1987) interface

Selecting a GPIB Address

Instruction	Note
1. Press [Utility] > {GPIB/RS-232} > {GPIB Address}.	
2. Use the numeric keypad, the arrow keys, or rotate the front panel knob to set the desired address.	
3. Press {Enter}.	
The signal generator's GPIB address is set to 19 at the factory. The acceptable range of addresses is 0 through 30. The state of the GPIB address is not affected by a signal generator preset or by a power cycle.	

Configuring for a LAN (10-base T) interface

Instruction	Note
1. Press [Utility] > {GPIB/RS-232 LAN} > {LAN Setup}.	
2. Press {Hostname}.	Use the alphanumeric softkeys to enter a hostname.
3. Press {Enter}.	
4. Press {IP Address}.	Use the left and right arrow keys to move the cursor. Use the up and down arrow keys, the front panel knob or the numeric keypad to enter an IP address.
5. Press {Enter}.	This assigns a hostname and IP address to the signal generator. The hostname and IP address are not affected by an instrument preset or by a power cycle.

Configuring for a serial (RS-232) auxiliary interface

Instruction	Note
1. Press [Utility] > {GPIB/RS-232 LAN} > {RS-232 Setup}.	
2. Press {RS-232 Baud Rate}.	Press the desired baud rate softkey to set the baud rate.
3. Press {RS-232 Echo Off On}.	This toggles the state of the SCPI echoing on the RS-232 connection. Set as desired.
4. Press {Trans/Recv Pace None Xon}.	This toggles from no handshaking (Trans/Recv Pace None) to XON/XOFF handshaking (Trans/Recv Pace Xon) when transmitting or receiving data via RS-232. Set as desired.
5. Press {Reset RS-232}.	This deletes the data from the RS-232 buffer. Pressing this key will discard any unprocessed SCPI input received over RS-232.

These RS-232 parameters are not affected by an instrument preset or by a power cycle.

To find out more visit:
www.agilent.com/find/psg

Related Agilent literature

PSG Series Product Overview
literature number 5988-2411EN

PSG Series Data Sheet
literature number 5988-2412EN

PSG Series Product Note:
User Flatness correction
literature number 5988-2410EN

PSG Series Configuration Guide
literature number 5988-2413EN

PSG Series Product Note:
Millimeter Head
literature number 5988-2567EN

PSG Series Product Note:
Programming Conversion Guide
literature number 5988-2568EN

Warranty

The standard warranty is three years. An extended five-year warranty is available with Option W50.

Agilent Technologies' Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

By internet, phone, or fax, get assistance with all your test & measurement needs

Online assistance:
www.agilent.com/find/assist

Phone or Fax

United States:
(tel) 1 800 452 4844

Latin America:
(tel) (305) 269 7500
(fax) (305) 269 7599

Canada:
(tel) 1 877 894 4414
(fax) (905) 282 6495

Australia:
(tel) 1 800 629 485
(fax) (61 3) 9210 5947

Europe:
(tel) (31 20) 547 2323
(fax) (31 20) 547 2390

New Zealand:
(tel) 0 800 738 378
(fax) 64 4 495 8950

Japan:
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Asia Pacific:
(tel) (852) 3197 7777
(fax) (852) 2506 9284

Product specifications and descriptions in this document subject to change without notice.
Copyright © 2001 Agilent Technologies
Printed in USA June 8, 2001
5988-2414EN

Agilent Technologies