SIGNAL FORGE

Signal Forge 800

Digitally Synthesized Signal Generator



High-Performance Signal Generator with 800 MHz Range, Usable to 1 GHz

The Signal Forge 800 (SF800 and SF800E) signal generator is a versatile, high performance signal source that combines a rich feature set with a small, affordable package. Features include sine wave and square wave generation, frequency sweep, frequency modulation, amplitude modulation and arbitrary modulation. A frequency range up to 1 GHz with FSK, OOK and CHIRP features make the SF800 ideal for RF and spread spectrum test applications. A convenient, dedicated, digital output supporting TTL, LVTTL and STTL voltage levels is tailored for testing digital systems. In addition, an integral TCXO oscillator ensures a high level of precision and accuracy over wide time spans and temperature ranges.

All of the SF800 functions are controlled using the Wave Manager software, an embedded, menu-driven application that is accessed via a standard serial console.

The synthesized design provides fine resolution, a wide, stable frequency range with single-ended (A/C coupled), differential and digital outputs. Combining these features with a flexible, easy to use programming interface in a small portable package make the SF800 the perfect tool for a full range of IF, RF, and digital electronics test applications.

Key Features

- Frequency range of 1 KHz to 800 MHz, usable to 1 GHz
- Sine wave
- Square wave
- Digitally controlled FSK: unramped, ramped, triangle
- Programmable TTL, LVTTL, STTL voltage output
- Frequency and amplitude modulation
- On/Off Keying (OOK)
- Shaped On/Off Keying (OOSK)
- Fast, programmable linear sweep mode
- Arbitrary modulation / FM CHIRP
- External controls
- Best in class output jitter performance, ±20 ps, peak-peak
- Synthesized signal and TCXO provide outstanding precision and accuracy
- Auxiliary UART output
- Menu-driven Wave Manager software
- Small form factor (8.5”x5.6”x1.5”)
- Affordable

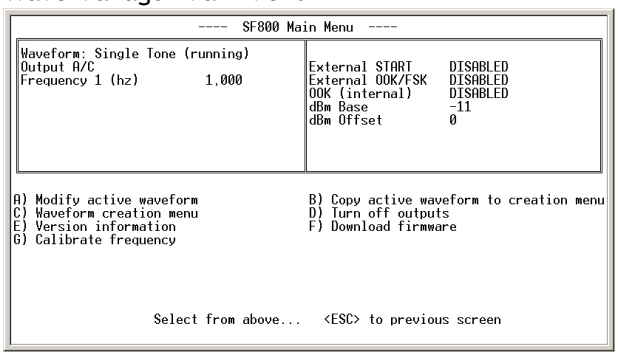
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Operation

Control and Programming

Setup, configuration and programming is accomplished using Wave Manager, the embedded, menu-driven software included with the SF800. The software uses an external serial console (typically a computer monitor) as the display device. Standard terminal console software, such as Windows HyperTerminal may be used as the console.

Wave Manager Main Menu



The physical connection is a standard RS-232 serial interface.

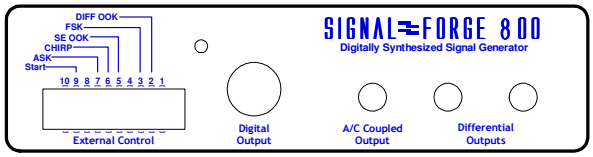
The SF800 automatically stores the most recent configuration and restarts using those settings. This eliminates the need to reprogram the unit when repeating test procedures and enabling it to operate in stand-alone mode.

Up to 4 instrument setting may be stored in the on-board non-volatile memory.

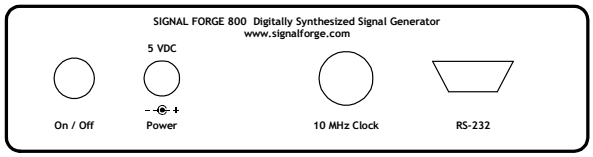
Connections

- One SMA connector for the AC coupled, sine wave output
- Two SMA connectors for the differential output (LVPECL)
- Dual-row 10-position header provides:
  - Remote start
  - ASK
  - CHIRP
  - FSK
  - Single-ended OOK
  - Differential OOK
- BNC for 10 MHz reference (output on model 800; input on model 800E)
- RS-232 connector for remote console

Front Panel



Rear Panel



Frequency Selection

Frequency resolution of 1 Hz across the complete range of 1 KHz to 1 GHz provides the flexibility needed to characterize narrow band communication systems, the IF and RF section of receivers and subsystems, and selected mobile and telemetry bands.

Outputs

The SF800 provides three output types:

- **AC Coupled / Sine wave**
- **Differential**
- **Digital**

AC Coupled

An AC coupled sine wave output with a frequency range of 100 KHz - 800 MHz (usable to 1 GHz) is provided.

Differential

A differential (LVPECL) output with a frequency range of 50 MHz to 800 MHz (usable to 1 GHz) is provided.

Digital

A dedicated digital output supporting TTL (3.3V), LVTTL (2.5V) and STTL (1.8V) voltage levels and a frequency range of 1000 Hz to 100 MHz is provided.

Waveforms

The SF800 provides a wide range of waveform modulation features from which you can create a variety of waveforms. Numerous waveform modifiers

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may be applied to customize the output to meet your specific testing needs. The waveforms, modifiers and options are configured using the Wave Manager software.

In addition, you may develop arbitrary modulation files to create your own unique type of FSK or AM modulated output.

Single Tone

The Single Tone waveform outputs a continuous tone at the user-selected output frequency.

FSK Unramped

The Frequency Shift Keying (FSK) Unramped waveform allows you to select two output frequencies which are alternately driven at a preprogrammed rate. Both internal and external control of the FSK Unramped waveform is provided.

FSK Ramped

The FSK Ramped waveform varies the output frequency within a specified range. The rate of frequency change is determined by the delta frequency (the amount that the frequency is changed at each step) and the ramp rate (at what interval the frequency is changed). Both internal and external control of the FSK Unramped waveform is provided.

FSK Triangle

FSK Triangle is similar to FSK ramped, except that ramping from one frequency to the next occurs automatically. When an end frequency is reached, the direction changes and ramping continues towards the other frequency.

Sweep

Sweep is similar to the FSK ramped mode of operation except that it allows frequencies to span the full operational range. It also allows any delta frequency. Sweep allows the user to pause, change direction, or single-step. When a sweep range completes, it starts over at the first frequency.

Square AM

For Square AM, the user specifies a single frequency (the carrier frequency) and two power values. The duty cycle may be programmed to a value other than 50%, which will result in the creation of an asymmetrical wave instead of a square wave.

Arbitrary waveform modulation may be used to completely customize an AM type waveform by downloading arbitrary amplitude descriptors from a user-generated file.

Sine AM

A Sine Wave AM waveform modulates power using a sinusoidal pattern. The SF800 outputs a discrete number of power levels to create the sinusoidal pattern. The existence of these discrete power steps is normally not an issue since an AM demodulator includes a low pass filter at its output that will remove any high frequency components.

Arbitrary Waveforms

Arbitrary waveform modulation allow the user to define specific frequency or power values at a specified sample rate. CHIRP testing can be executed easily with the SF800 by creating the appropriate arbitrary waveforms.

For example, for an FSK Arbitrary Waveform, a user developed file describing a set of frequency variations is written using a text editor or waveform editor and uploaded to the SF800 by the Wave Manager software.

Auxiliary UART

The SF800 also provides a transmit only UART port that may be used to send data characters to an internal or external modulation device. This port is completely separate from the UART port used for the console.

The data that is sent by the auxiliary UART port can be from a keyboard or from a file. The UART may be connected to an external modulating device or to the OOK/FSK control pins of the same SF800. In this way, you can create modulated waveform outputs, which are actually encoding UART driven data.

Calibration

The user may calibrate the SF800 against a known accuracy time base standard at any time. The Wave Manager software guides you through the calibration process. Calibration information is stored in non-volatile memory, loaded at power up, and used until the device is calibrated again.

Size

8.5” x 5.4” x 1.5”

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SPECIFICATIONS

General Description

The Signal Forge 800 covers a frequency range of 1000 Hz to 800 MHz, usable to 1 GHz, in 1 Hz increments. It is configured via Wave Manager, an embedded, menu driven application which is accessed using a standard serial console and any terminal software.

Frequency Range

1000 Hz - 800 MHz, usable to 1 GHz

Frequency Resolution

1 Hz

Amplitude Resolution

1 dB

Power Range (AC Output)

–11 to +7 dBm

Power Output Accuracy

+/-2 dB over full frequency and power range

Operating Limits

AC Coupled Output

100 KHz - 800 MHz, usable to 1 GHz

Differential Output

50 MHz - 800 MHz, usable to 1 GHz

TTL Output

1000 Hz - 100 MHz

Internal FSK Frequency Range

TTL	Any deviation allowed
AC Coupled	
1 Hz to 100 MHz	Any deviation allowed
>100 MHz	Deviation ±1% max
Differential	Deviation ±1% max

Duty Cycle (Freq1 Direction)

10% to 90%

External OOK/FSK (User-driven signal)

Limited to 4.5 KHz maximum

Internal OOK

Limited to 500 KHz

OOK Supported For

AC Coupled Output	Up to 100 MHz
Differential Output	Full range

Duty Cycle (ON percentage)

10 to 90% except near the highest modulating freq

Operating Ranges

OOK

Modulating freq 0.1 Hz to 500 KHz

FSK ramped & unramped

Modulating freq 0.1 Hz to 500 KHz

FSK Arbitrary

Modulating freq 0.1 Hz to 26 KHz

Sweep

Freq changes using step time of 10ms to 60s in 1ms increments

Square AM wave

Modulating freq 0.1 Hz to 45 KHz

Sine AM wave

Modulating freq 0.1 Hz to 65 K H

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Frequency Standard

TCXO

2.5ppm

Output

10 MHz reference into 50 Ω

Frequency Accuracy

5ppm (calibrated with 1ppm freq counter)

Frequency Precision

4ppm

Frequency Stability

May drift 3ppm in the first year, then 1ppm/year thereafter

Frequency Drift per Hour

0.0002% (After warm-up)

VWSR

Output Match (VSWR)

1 MHz to 7 MHz	<2:1 @ +7 dBm
7 MHz to 800 MH z	<1.3:1 @ +7dBm

External Control Header

A dual-row, 10-positin connector on the front panel

Input Voltage

3.3V (5V Tolerant)

Output voltage (TX_MOD pin)

5V

Spectral Purity

Harmonics

2 MHz to 50 MHz	< -50 dBc
50 MHz to 100 MHz	< -50 dBc
100 MHz to 500 MHz	< -20 dBc
500 MHz to 1GHz	< -20 dBc

Non-Harmonics

100 KHz to 100 MHz	< -65 dBc
100 MHz to 500 MHz	< -60 dBc
500 MHz to 800 MHz	< -60 dBc

Clock Feed-Through

< -85 dBm

Phase Noise

- 64 dBc/Hz @ 1 KHz Offset
- 90 dBc/Hz @ 10 KHz Offset
-110 dBc/Hz @ 100 KHz Offset

Power Requirements

AC Supply

5V DC (wall unit supplied)

Note: Output ratings at 100 MHz, 0 dBm output power and 25 ºC, unless otherwise specified.

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Models

SF800

Digitally Synthesized Signal Generator
Provides 10 MHz Clock Output

SF800E

Digitally Synthesized Signal Generator
Provides 10 MHz Clock Input. May be
Driven by External Clock Source

Both models may be driven the internal 10 MHz TCXO source.

Model Matrix

Features / Models	800	800E
10 MHz Clock Output	✔	
10 MHz Clock Input		✔

Options

SF-BRK

3 Unit, 1 U Rack Mount Bracket

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