



Signal Forge 1000™ Portable Signal Generator



Flexible Design Enables Testing of RF and Clock-driven Systems

The Signal Forge 1000 combines a 1 GHz frequency range with three dedicated outputs to deliver the capabilities a signal source and a function generator in a small, high-performance system.

The SF1000 provides an AC-coupled output, a Digital output and a Differential output, making it one of the most flexible signal generators on the market.

The RF output combined with a wide frequency range and modulation functions such as ASK, FSK and OOK is ideal for testing receivers and other RF devices.

The digital and differential outputs along with functions such as BPSK and Chirp provide the capabilities needed for testing clock driven systems such as serial storage devices and RFID, Zigbee and Wi-Max chip sets.

An integral TCXO clock source ensures stability and accuracy over wide time spans and temperature ranges. The SF1000 may optionally be driven by an external clock source enabling the user the increase the accuracy and stability as needed.

All of the SF1000 functions are controlled using the Wave Manager software, an embedded, menu-driven application that eliminates the need to install software on a client PC.

The SF1000 is small and lightweight making it an ideal tool for field application engineers.

Key Features

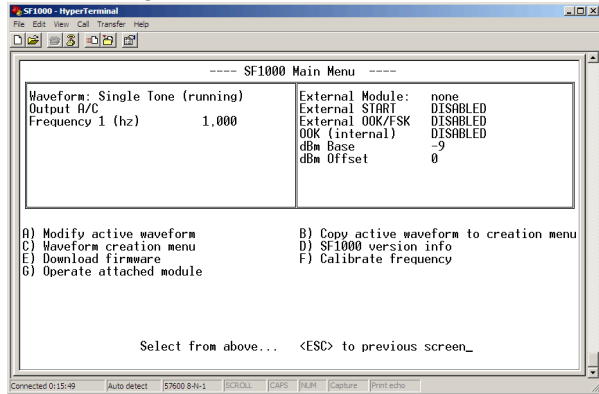
- Frequency range of 1 Hz to 1 GHz
- AC-coupled, Differential and Digital outputs
- Programmable TTL voltage levels: 3.3V, 2.5V, 1.8V
- Power output -13 dBm to +7 dBm
- Sine wave , square wave
- Modulation functions include: AM, Arbitrary, ASK, BPSK, Chirp, Chirp Pulsed, FM, FSK, OOK, Sweep
- FSK options: unramped, ramped , triangle
- BPSK, FSK, OOK and START may be controlled internally and externally
- Synthesized signal and TCXO provide superior accuracy and stability
- Embedded Wave Manager software
- Portable form factor (8.5"x5.6"x1.5")

Operation

Control and Programming

Setup, configuration and programming is accomplished using Wave Manager, the menu-driven software embedded in the SF1000. There is no need to install client-based software since Wave Manager is installed on the SF1000 and is accessed using any standard serial terminal communication software such as Windows HyperTerminal.

Wave Manager Main Menu



Remote Control

Since the physical connection is a standard RS-232 serial interface the SF1000 to be connected to and driven by control devices other than a terminal or to be controlled programmatically.

Auto-start

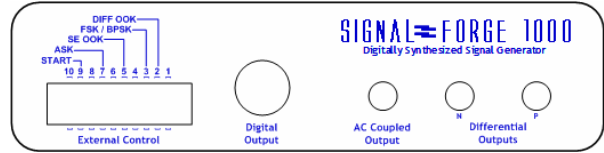
The SF1000 automatically stores the most recent waveform configuration and automatically loads and starts the stored waveform. This eliminates the need to reprogram the unit when repeating test procedures and enables it to operate in stand-alone, PC-free mode.

Connections

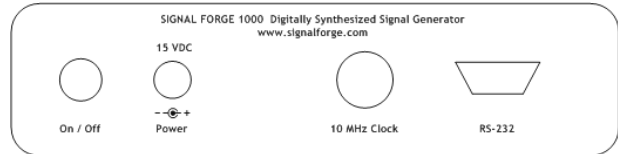
- One SMA connector for the AC-coupled output
- Two SMA connectors for the Differential output
- One BNC for the Digital output
- Dual-row 10-position header provides:
 - Remote start
 - ASK
 - BPSK
 - FSK
 - OOK (AC-coupled and differential)
 - Connection for option modules

- BNC for 10 MHz reference clock
 - Output on model 1000
 - Input on model 1000E
- RS-232 connector for the terminal console

Front Panel



Rear Panel



Frequency Selection

Frequency resolution of 1 Hz across the complete range of 1 Hz to 1 GHz provides the flexibility needed for testing high-speed serial interface devices such as Serial ATA and Serial SCSI disk controllers, and to test and characterize narrow band communication systems, the IF and RF section of receivers and subsystems, and selected mobile and telemetry bands.

Outputs

The SF1000 provides three output types:

- **AC Coupled**
- **Differential**
- **Digital**

AC Coupled

An AC coupled, sine wave output with a frequency range of 100 KHz to 1 GHz is provided.

Differential

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

Digital

A dedicated digital output supporting TTL (3.3V), LVTTTL (2.5V) and STTL (1.8V) voltage levels and a frequency range of 1 Hz to 110 MHz is provided.

Waveforms

The SF1000 provides a wide range of waveform modulation features with numerous waveform modifiers 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 modulated output.

ASK

Asynchronous Shift Keying allows an internal frequency source or an external square wave of arbitrary frequency to turn the AC Coupled output on or off.

BPSK

The Binary or Bipolar Phase Shift Keying waveform outputs a single frequency that quickly changes between two user-selected phase offsets.

BPSK modulates at 1bit/symbol and is used for testing low data-rate applications such as IEEE 802.11g wireless LAN standard. It is also suitable for testing low-cost passive transmitters such as those used in the RFID standards which have been adopted for biometric passports, credit cards and other applications. ZigBee devices which operate in the 868–915 MHz frequency band also employ BPSK.

Chirp

The Chirp waveform ramps the output from frequency 1 to frequency 2 over a specified time, then jumps to the starting frequency to begin the next chirp.

Pulsed Chirp (Pulsed FM)

The pulsed-chirp (sometimes referred to as pulsed FM) waveform ramps the output from frequency 1 to frequency 2 over a specified time, jumps to the starting frequency, then idles at frequency 1 until the next chirp.

FSK Arbitrary

Arbitrary FSK allows the user upload a file describing a set of frequency variations to the SF1000. The user-created data may include the center frequency, deviation, sample rate, deviation descriptors.

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.

Single Tone

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

Sine AM

A Sine Wave AM waveform modulates power using a sinusoidal pattern. The SF1000 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.

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.

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.

Arbitrary Waveforms

Arbitrary waveform modulation allows the user to define specific frequency or power values at a specified sample rate.

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 SF1000 by the Wave Manager software.

Auxiliary UART

The SF1000 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 SF1000. In this way, you can create modulated waveform outputs, which are actually encoding UART driven data.

Calibration

The user may calibrate the SF1000 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"

Weight

2.8 pounds

SPECIFICATIONS

General Description

The Signal Forge 1000 is a portable signal generator. It is configured via Wave Manager, an embedded, menu driven application which is accessed using serial communication software across a standard RS232 interface (USB Adapter available).

Frequency Range

1 Hz to 1 GHz

Frequency Resolution

1 Hz

Frequency Stability

0.001 % (15-35 °C ambient)

Operating Voltage

10V to 15V

Operating Current

600mA min to 700mA max

Amplitude Range

50 mVRMS to 500 mVRMS

143 mVp-p to 1414 mVp-p

Amplitude Resolution

1 dB

Power Range (AC Output)

-13 to +7 dBm

Power Output Accuracy

±2 dB from 100 KHz to 300 MHz

±3 dB from 300 MHz to 1 GHz

Operating Limits

RF (AC Coupled) Output

1 KHz to 1 GHz

Differential Output

50 MHz to 1 GHz

Digital (TTL) Output

1 Hz - 110 MHz

Frequency Standard

TCXO

2.0ppm

Output

10 MHz reference into 50 Ω

Frequency Accuracy

4ppm

Frequency Stability

1ppm/year after the first year

Frequency Drift per Hour

0.0002% (After warm-up)

VWSR

Output Match (VSWR)

1 MHz to 7 MHz <1.5:1 @ +7 dBm

7 MHz to 1 GHz <1.3:1 @ +7dBm

External Control Header

A dual-row, 10-position 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	< -40 dBc
50 MHz to 100 MHz	< -40 dBc
100 MHz to 500 MHz	< -20 dBc
500 MHz to 1GHz	< -20 dBc

Non-Harmonics (worst case)

100 KHz to 100 MHz	< -50 dBc
100 MHz to 500 MHz	< -30 dBc
500 MHz to 1 GHz	< -30 dBc

Clock Feed-Through

< -85 dBm

Phase Noise ≤100 MHz

- 50 dBc/Hz @ 10 KHz Offset
- 73 dBc/Hz @ 100 KHz
- 90 dBc/Hz @ 1000 KHz

Phase Noise: >100 MHz

- 20 dBc/Hz @ 10 KHz Offset
- 60 dBc/Hz @ 100 KHz
- 90 dBc/Hz @ 1000 KHz

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

Power Requirements

AC Adapter Provided

15 VDC
1.3A

Actual Operating Requirements

10V min to 15V max
600mA min to 700mA max

Models

SF1000

Portable Signal Generator
Provides 10 MHz Clock Output

SF1000E

Portable Signal Generator
Provides 10 MHz Clock Input. **External clock source required.**

SF1020

Battery Powered Signal Generator
SF1000 features with rechargeable battery

Special Requests

Our standard products can be modified to fit your application. For example, for one application, the power output of the SF1000 was lowered to -50 dBm to -70 dBm.

If your application requires a special feature or custom output specifications, contact us at sales@signalforge.com or call 512.275.3733.

Add-on Modules and Accessories

2500M

RF Frequency Expansion Module RF Signal Generator with frequency band 1.5 GHz to 2.6 GHz (attaches to SF1000/SF1000E)

1800M

Frequency Expansion Module RF Signal Generator with frequency band of 950 MHz to 1.8 GHz (attaches to SF1000/SF1000E)

SF-BRK

3 Unit, 1 U Rack Mount Bracket

Purchasing Information

- Buy online at www.signalforge.com
- Place your order by phone: 512-275-3733
- Fax your order to 512-275-3735