Model 2030

Multifunction Waveform Synthesizer

The Model 2030 Multifunction Waveform Synthesizer is a high-performance, easy-to-use instrument that provides an unprecedented functionality and waveform fidelity at a very affordable price. With a large interactive graphic display, 50 MHz data point output rate, and an endless selection and combination of functions, it can address a wide range of applications in any situation that requires high precision, flexibility, and speed.

Incorporating GPIB control and a floating analog output, the 2030 meets the most stringent requirements of automated test systems, including tests where programmability and precisely generated signals, such as sine waves, pulses, arbitrary functions, random noise, combinations of functions, and modulations, are essential for successful testing.

By using a proprietary combination of digital signal processing and innovative state-of-the-art, high-speed analog techniques, this synthesizer offers a degree of waveform accuracy, stability, and resolution not previously achieved in any single synthesizer instrument. For example, harmonic distortion of the sine wave output is typically –80 dB (≤ 100 kHz), with an output amplitude flatness better than ± 0.1 dB, increasing to only 0.3 dB at 20 MHz.

The range of standard functions and features extends to phase, FM, and multimode AM modulation modes and includes many advanced features such as linear and logarithmic sweeping and sinx/x modulations. All standard functions, including noise and glitch, can be summed to achieve the desired custom output.

A library of additional waveforms includes Fast Rise Square Wave, Sin^3x, Sinx/x, Glitch, RC Low Pass and RC High Pass. For highly specialized functions, the unit will accept data files through its IEEE-488 interface. The deep dual memory capacity of over 250,000 data points with high-speed output (20 ns/point) makes this instrument an ideal signal source for bench, laboratory, and manufacturing test environments.

FEATURES

- ❑ High-Speed 50 MS/s Output
- ❑ Deep Dual 250k-point Memory
- ❑ High Purity Digitally Synthesized Output
- ❑ Isolated Output for High Noise Immunity
- ❑ Exceptional Amplitude Flatness – within 0.3 dB at 20 MHz
- ❑ Frequency Resolution of 0.1 ppm
- ❑ Easy-to-Use Interactive Graphic Interface
- ❑ Menu of a Wide Variety of Outputs
- ❑ Modulated Outputs
- ❑ Built-in Waveform Library
- ❑ Customized Waveform Capability
- ❑ Multi-unit Precise Synchronization for Production Test Flexibility
- ❑ Reliable Low-power Design
- ❑ Standard GPIB and ARB Software Download

APPLICATIONS

- ❑ Acoustics and Speech Analysis
- ❑ Electromechanical
- ❑ Geophysics
- ❑ Medical Research
- ❑ Digital Communications
- ❑ ATE
- ❑ Sonar Simulation
- ❑ Dynamic LCD Testing

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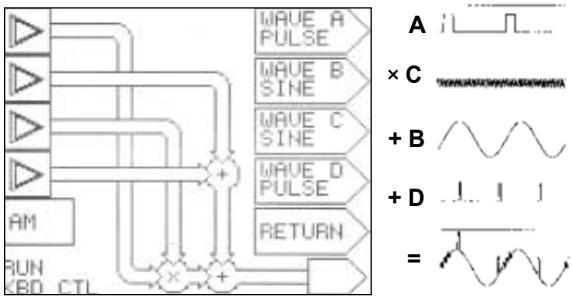
The World Resource for Precision Signal Technology

Fast, Easy Operation

With the 2030, generating precision waveforms is easier than ever. From simple menus, you can readily select either standard functions and modulations, or a host of functions from a built-in library. Frequency and other parameters are instantly set with a single, large control knob that gives the instrument a real-time "analog feel." Specific values are keyed-in directly. More than 50 complete waveform setups can be stored internally by name, for immediate output when needed.



Flow diagram represents modulator, carrier and waveforms added to obtain the output shown.

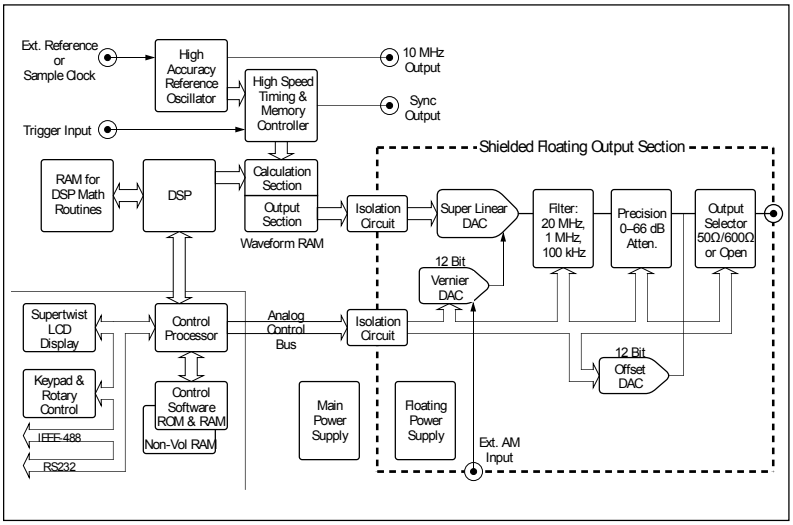
Exact bandwidth of the sinx/x modulated burst is menu-selectable.

Producing even complex, custom waveforms is no problem with the graphic display and soft keys. An interactive flow diagram enables the user to sum and modulate different standard functions as desired. In the example shown, Wave **A** (top input of diagram) modulates Carrier **C**; then **B** and **D** are added. Desired noise levels may be added before or after modulation. In fact, an endless variety of signal combinations are at the operator's fingertips.

Precision and Versatility

Because of its enormous flexibility in waveform generation and its excellent signal quality, the 2030 Waveform Synthesizer is virtually immune to obsolescence.

In production test, for example, where changes and upgrades to manufactured product often call for expensive new test equipment, the 2030 will be a viable signal source through many years of product change. Should new types of modulation or more accurate signals be required, the synthesizer is ready.



The Model 2030 Block Diagram.

The synthesizer's floating analog output to ensures immunity to noise problems encountered in system test set ups. It also offers triggered start, stop, or windowing, and generates counted waveform bursts that either stop at the end of a complete cycle or stop and hold the current level. A high-stability frequency reference is standard. Multiple-unit synchronization is provided through common clocking or by locking frequencies with an external reference.

Applications

The applications illustrated are samples of what the versatile 2030 Synthesizer can do.

Clocking Source for ATE

Ideal for general production test, the 2030 also provides accurate and flexible clocking for a variety of devices such as timing circuits, multiplexers, DACs, ADCs, and memories. A fast 15 ns pulse rise time drives clock-sensitive CMOS memories. Over 50 user test signals can be stored in the unit.

Digital Communications

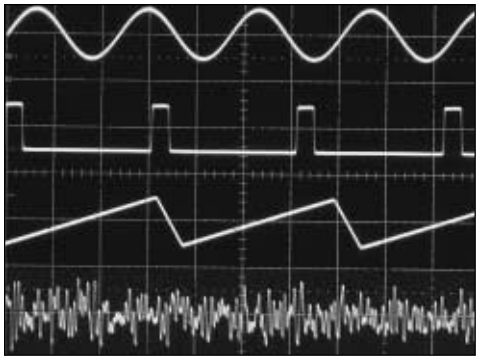
Testing modern communications products, such as modems, requires various special signals and modulations. The 2030 produces many of these, including phase shift keying and frequency shift keying, over a wide range of frequency and modulation rates. Menus allow fast, precise setup to industry-standard test specifications. To test jitter immunity, a specified phase modulation rate and maximum phase angle are entered.

Sonar Simulation

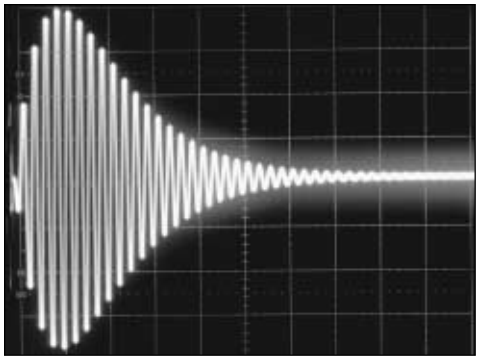
The 2030 tests the detection capability of a phased sonar array without the expense of field recording by simulating a target using 3 primary tones plus noise. The noise amplitude and spectral line spacing may be altered to mask some of the tones. Non-sinusoidal tones are simulated with square, triangle, or modulated signals.

Dynamic LCD Testing

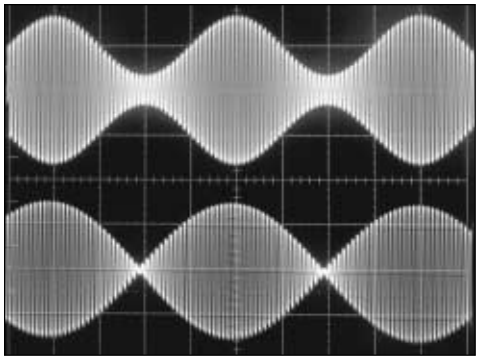
LCD displays require pulsed AC drive for fastest response. The 2030 provides full control of pulse modulation, enabling detailed study of LCD characteristics.



The full selection of standard functions includes programmable noise.



The exponential decay envelope simulates a drum beat or an RF loran burst.



Standard AM and suppressed carrier are generated with high accuracy.

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SPECIFICATIONS

FREQUENCY RANGE
DC - 50 MHz Data point rate. See individual functions for specific frequency ranges.

FUNCTIONS
Standard (Sine, square, triangle, pulse, ramp up/down, random noise, DC, glitch)
Modulations and Sweeps
Combined Waveforms
Arbitrary Waveforms
Waveform Library

OUTPUT
Source Impedance
50Ω/600Ω ±1%

Amplitude Range
5 mV to 10V p-p
10 mV to 20V p-p with no load

Amplitude Resolution
0.1% of output voltage within each of 11 cascaded auto-switching 2:1 attenuator ranges

Amplitude Accuracy
±1%, absolute
0.2%, relative, typ.

Offset Range
±5V in 1.25 mV steps
±10V with no load

Offset Accuracy
±1% ±200 µV (20 to 30°C)
±34 µV/°C

Frequency Stability
±2 ppm, 0° to 50°C
±2 ppm/yr

Frequency Resolution
1 ppm +1 mHz max.

Relative Frequency Accuracy
< 0.2 ppm

Noise
100 µV RMS DC to 10 MHz Typ.

Jitter
0.005% waveform period +100 ps RMS for sine, 0.05% +100 ps RMS for other waveforms

Protection
±15V

TRIGGER
Source
Manual., external, bus

Modes
Free run, counted burst, gated, start, stop, start/stop

SINE WAVE
Frequency Range
0.001 Hz to 20 MHz

Amplitude Flatness
±0.1 dB DC to 100 kHz
±0.2 dB 100 kHz to 1 MHz
±0.3 dB 1 MHz to 20 MHz

Harmonics + Spurious
–70 dBc 1 mHz to 20 kHz
–65 dBc 20 kHz to 100 kHz
–55 dBc 100 kHz to 1 MHz
–25 dBc 1 MHz to 20 MHz

Phase Range
±360° in 0.1° increments

Phase Accuracy
±1.0° DC to 100 kHz

TRIANGLE AND RAMP
Frequency Range
0.001 Hz to 2 MHz

Nonlinearity 10% - 90%
±0.05% up to 10 kHz
±0.5% 10 kHz up to 1 MHz

Ringing
< 0.1% up to 10 kHz
< 0.2% 10k to 1 MHz

Triangle Symmetry
User adjustable from 5% to 95% in 0.1% steps, with 0.1% accuracy

Triangle Delay Range
±360° in 0.1° steps

SQUARE AND PULSE
Frequency Range
0.001 Hz to 5 MHz

Pulse Polarity
Positive with zero volt baseline

Duty Cycle
Adjustable from 5% to 95% in 0.1% steps, with 0.1% accuracy

Delay Range
±1 waveform period in steps of 0.1 µs to 0.1 ms, depending on the frequency selected

Rise Time
15 ns DC to 1.47 Hz
10 µs 1.47 Hz to 1 kHz
1 µs 1 kHz to 10 kHz
50 ns 10 kHz to 5 MHz
15 ns in Fast Square

Overshoot and Ringing
< 0.1% up to 10 kHz
< 0.2% 10k to 1 MHz

NOISE FUNCTION
Amplitude Range
1 mV to 1.8V RMS-steps of 1 µV /1 mV(no load)

Noise Spectral Distribution
Pseudo random with the ability to set number of spectral lines

MODULATION AND SWEEPS
Modulation Types
AM DSB, DSB SC, AM SSB, SSB SC, FM, FM, Expon. Decay, Sinx/x

Carrier Range
0.001 Hz to 20 MHz

Modulation Rate
0.001 Hz to Carrier frequency in steps of <0.4% (<0.1 ppm with reduced carrier resolution)

Modulation Span–(within 20 MHz bandwidth)
AM: 0.0% to 200.0%
FM: lesser of ±carrier/2 or ±2 MHz
ΦM: ±7200 degrees

Envelope Distortion
AM: <1%

Exponential Decay Envelope
t^2e^{-at} envelope defined by peak time, duration

Sinx/x Envelope
Defined by bandwidth, repetition rate

External Modulation
0 to 40% AM

Sweeps
Linear and log, phase continuous

COMBINED WAVEFORMS
Up to 4 standard functions can be summed or used in modulation including glitch

Carrier
Any standard function

Modulator
Summation of up to 3 standard functions

Modulation Type
AM, FM, or ΦM

Post-modulation Summation
Up to 2 standard functions

ARBITRARY WAVEFORMS
Waveform Length
2k to 256k points

WAVEFORM LIBRARY
Fast Square, $\sin^3 x$, sinx/x, RC lowpass/high-pass filtered square wave
Additional libraries are being developed.

GENERAL
Non-volatile Memory
Over 50 instrument set ups

Rear Panel Inputs
Trigger, Ext. Clock/Reference, Modulation (AM)

Rear Panel Outputs
Function, 10 MHz Reference, Sync/Marker

Interfaces
RS-232 and IEEE-488

Operating Temperature
0 to 50°C

Power
< 30W, 100/120/220/240 VAC, 50/60 Hz

DIMENSIONS
8.5" x 5.2" x 16.9" (WxHxD)
216 x 132 x 429 mm

Weight
13 lb (6 kg)