MODEL 625A SMARTARB

A BEST BUY

The Model 625A **SMART***ARB was designed to provide more operating modes, more functions and more measurement modes than any other unit in its price class. Further upgrading and additions of these modes and functions are made possible via field-installable software. Eliminated are the phase shifts and missed points that are present in many other arbitrary waveform designs when one changes the waveform frequency. All these performance enhancements, combined with the low price, makes the Model 625A a solid best buy.*

All parameters simultaneously displayed

Eliminates Phase Jitter



Functional User Interface

Quick and easy controls are the hallmarks of our interface. We present all operating parameters on a single display avoiding complicated submenus. Values can be entered via the numeric keypad or rapidly changed with a rotary knob. Modes are clearly labeled on and selected by the keypad in a single operation.

Function and Pulse Generator

The function generator provides ramps, triangles, exponentials, random and sinewave functions in both continuous or triggered operation. The pulse generator provides adjustable amplitudes, offsets, repetition rates and duty cycle in both continuous or triggered operation.

Arbitrary Waveform Generator

Design or easily download your own waveforms. Store them in non-volatile memory for generation anytime, anywhere. Unlike the competition, the 625A SMARTARB has no phase jitter or skipped points as the rep rate is changed. Downloading requires no special protocol so downloading from programs, spreadsheets and sampling scopes is easy.

Every point generated at every rate
12-bit resolution
Continuous/Triggered operation
32,768 maximum waveform points
Many data formats supported

ARB / FUNCTION / PULSE GENERATOR

Free of Skipped Points

Ramp
Sine
Exponential
Triangle
Random

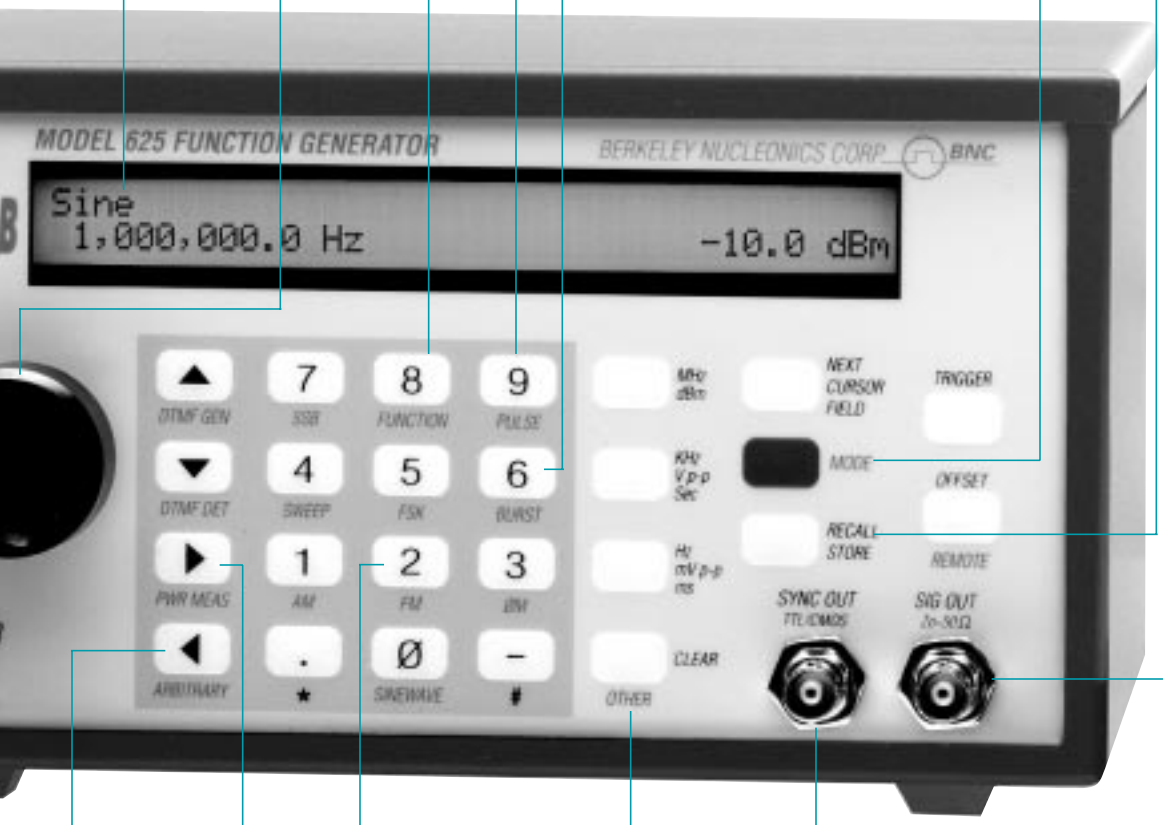
Rapidly change numerical values

Continuous/Triggered
P-P signals up to 10 V
Offsets up to 8 V
Separate TLL/CMOS output

Internal/External Triggered Bursts

Easy MODE Selection with no scrolling thru menus

Store up to 10 complete instrument states



10V P-P signals
8V offsets
50 ohm source

Measure Power
Measure Voltage

Upgradable-more modes and new applications

Square Version of SIG OUT
Function Generator Sync
Clock for Multi-unit locking
Data Generator in ARB mode

Dual Function Pushbuttons
One-step MODE selection

Arbitrary Waveform Generator without Skipped Points

Our ARB clock is fully synthesized, as opposed to a clock generated by a DDS phase accumulator which can result in phase jitter and missed points. Other designs simply replace the sinewave lookup table with arbitrary waveform data points. The missing points, with these other designs, are evident as you increase the frequency of your waveform. For some applications, phase shifts and missing segments can be a serious problem. We use an accurate synthesized clock which will generate every point, every time, regardless of repetition rate.

Internal and External Modulation Available Throughout

In all of our modulation modes, *i.e.* AM, FM, PM, SSB, FSK and BPSK, the modulation source can be internal or external. In the Internal mode, our fully synthesized sinewave or internal timer is the modulating source. In the External mode, the signal on the Ext Mod connector is the modulating source. For example, an audio signal can Externally Modulate a SSB signal and provide up to +15 dBm at the output.

Phase Locking of Several Units

Users may combine several of our units to generate signals that are locked together in frequency with a specific phase offset. The user may adjust that phase offset to 0.01 degree. Waveforms of differing shapes may be locked together if they have the same number of points. The user determines which of the units will be a Lock Master (the remaining units will be Lock Slaves). The Master provides a Sync signal and a Clock signal to the Slaves.

Design Details

The Model 625A's architecture incorporates the latest in Direct Digital Synthesis, (DDS) and Digital Signal Processing (DSP) to provide waveforms with no missing points or phase jitter. We do not replace the sinewave lookup table with arbitrary waveform data points, the cause of missing points, but generates a fully synthesized clock for each frequency. As you change the frequency, the waveforms exhibit no missing points or phase jitter. This architecture also allows the inclusion of a large number of functions, and both operating and measurement modes.

Non-volatile Storing of Settings

Up to 10 complete sets of instrument states may be stored for later recall into non-volatile storage. There is a Store/Recall pushbutton on the front panel keypad for easy access.

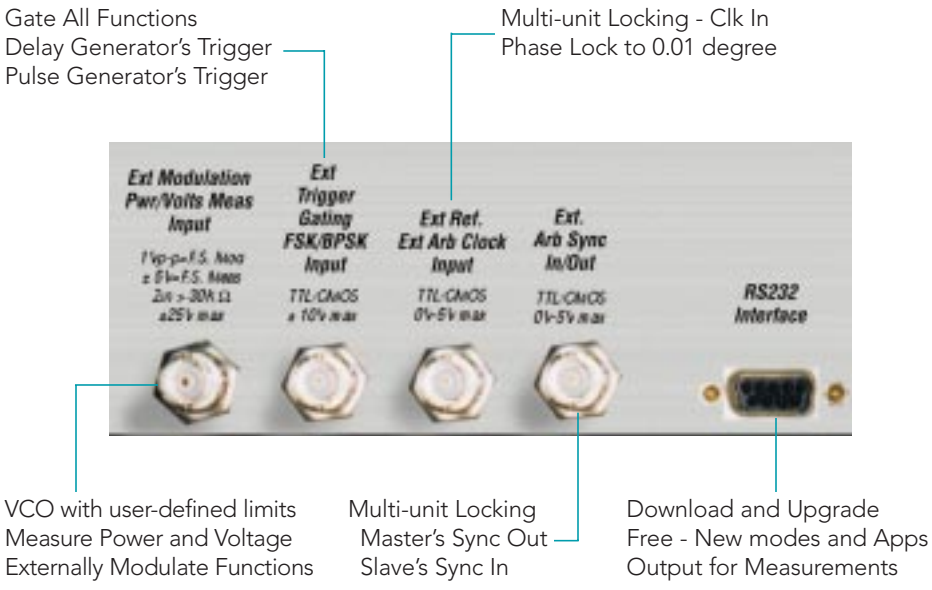
Externally Gate All Functions

All pertinent functions, namely sinewave, internal and external AM, internal and external FM, internal and external PM, frequency sweep, internal FSK, internal and external SSB, DTMF generate, internal BPSK can be gated with a TTL compatible signal. An appropriate level turns the output off.

User's Manual

BNC provides both a one page Quick Start Guide and a complete instruction manual with front panel example for each operating mode. Downloading examples and formats are included. Software programs for specific application are provided on the floppy attached to the manual's back cover. ***For an E-Manual now, call the factory!***

Model 625A Rear Panel Section



Data Modulation and Word Generation

This mode provides for a generation of a binary message with the user being able to digitally modulate a binary message up to 960 bits. The data modulation and word generation mode operates with a trigger using the FSK mode. The user selects mark and space frequencies and baud rate.

Output with Offsets

All modes provide signals with offsets from a 50Ω source impedance. Into a high impedance the signal level is adjustable to 10 V and the offset to 8 V. Into 50Ω, it is half those amounts.

Multiple Formats for Arb Waveform Generation

Floating point, time and value floating point, digital for binary outputs, integer, hexadecimal, binary, .CSV and .PRN are all accepted. No special protocols or software is needed for waveform downloads, allowing easy downloading from a variety of programs, spreadsheets and sampling oscilloscopes. A data generator program, example waveforms, and a downloader utility are provided.

VCO Mode

Using an externally applied voltage into the External Modulation input, the user may adjust the output frequency between presettable limits. One limit occurs with a -5 V input; the other limit occurs with a +5 V input. Bandwidth of this control is 35 kHz.

Measurement Modes

Voltage and Power measurement and DTMF detect comprise the measurement modes. The signal on the Ext Mod In connector is measured and displayed on the front panel. True RMS power is calculated by the DSP with a user-specified system impedance. In the voltage measurement, the DC component of the signal is displayed by the LCD and sent to the RS232 port. The Dual Tone Multi Frequency detect mode decodes and displays the Touchtone dialing tones for the American telephone network. Signals are applied to the External Mod In connector. The DTMF digit is displayed by the LCD and also sent to the RS232 port.

Instrument Upgrades and Accompanying Floppy

Add new modes and applications-specific features with software upgrades to our flash memory. As these become available, customers are welcome to download the software from our website. We also provide a floppy with sample programs to remotely control the 625A, SMARTARB, to parse detected DTMF digits, to emulate a television remote control.

DC Operation Option

The user may select a power source from 9-36 VDC. It is ideal for portable and remote applications. Other input ranges are available. Contact the factory.

High Stability Timebase Option is Available

For more demanding applications a TCXO with a timebase stability that is guaranteed to ± 5 ppm over a 0 to 40°C range is available. The standard crystal, ± 10 ppm, is calibrated to better than 1 ppm when it leaves the factory, and we supply a utility that allows for quick and easy frequency calibration.

Demo Available
Inquire with the factory about the demo unit for your application.

Applications Ideas

Adjustable Delay Generator

The 625A, SMARTARB, may be used to generate delayed trigger signals using the burst mode of operation. Delays from 1 ms to 99.999 s may be generated with 1 ms resolution. The 625A's Burst mode, may be triggered or continuous, with a delay or "off" time and "on" time associated with each trigger. The user specifies the amount of delay time to 1 ms and the amount of "on" time. The "on" time may be set for a single pulse or multiple pulses.

Digital Clock Source with "Jitter"

Generate a digital clock with phase or frequency "jitter." This can be useful for testing the tracking capability of a Digital Phase Locked Loop (DPLL). In the FM mode, set the carrier frequency to the desired clock center frequency and adjust the modulation rate and deviation to achieve the desired clock "jitter." The output is the SYNC OUT signal, a TTL/CMOS level signal.

Variable Bandwidth Noise Generator

The 625A's function generator includes a noise waveform as one of its standard functions. The noise waveform is generated by filling the arbitrary waveform memory with random samples. The function generator has a rep rate field which determines how often the generator repeats the buffer of random samples. A precise method of controlling the sample rate is to use the Arbitrary Waveform generator. First switch the unit to Function Generator mode and select "random" as the desired waveform. Next, set the waveform repetition rate to 1 Hz. (This fills the Arbitrary waveform memory with the maximum number (16,000) of random samples. Now switch the unit to Arbitrary Waveform mode and directly enter a sample clock frequency, from 0.01 Hz to 40 MHz in 0.01 Hz steps. In this way you may control the bandwidth of the noise generator from DC to 10 MHz.

Very Low Frequency (VLF) with Extreme Resolution

Using the arbitrary waveform generator system to generate the function generator waveforms results in precise, repeatable, and stable function generator waveforms. It also means that you can use the Arbitrary Waveform Generator to precisely control the sample clock. To do this, first switch the unit to Function Generator mode and select a function waveform (sine, square, triangle, etc). Next, set the waveform repetition rate to 1 Hz. (This fills the ARB waveform memory with 16,000 points of the desired waveform). Now you may switch the unit to Arbitrary Waveform Mode and set a precise sample clock frequency (from DC to 40 MHz in 0.01 Hz steps). The function repetition rate is then given by: Rep Rate = Sample Clock Frequency/16,000. As an example: 6.25 microhertz to 2500 Hz with 6.25 microhertz resolution.

FDA Susceptibility Testing

A medical product manufacturer needed a signal source which performed a 1,000 second sweep between two frequencies while AM modulating at 80% modu-lation. The customer applies this signal to a power amplifier and transmitting antenna for susceptibility testing. Our software solution steps the carrier frequency in Internal AM mode. The program adjusts all parameters: sweep frequencies, time, AM modulation frequency and depth.

Audio Pitch Shifter

Upshift the frequency spectrum of an audio signal. Simply apply the audio signal to the External Modulation In Connector. Attach a speaker or other listening device to the SIG OUT connector. Next set the 625A for External Single Sideband (Ext SSB) mode and select Upper Sideband. Now you can specify any amount of frequency upshift by adjusting the carrier frequency, from 0 Hz to 21.5 MHz in 0.01 Hz steps!

BNC SPECIFICATIONS/OPERATING MODES

SPECIFICATIONS

Main Output

Frequency: DC to 21.5000000 MHz, 0.01 Hz steps
Level: 2 mV p-p to 5.000 V p-p, 1 mV steps (into 50 Ω) or -50.0 dBm to +18.0 dBm, 0.1 dBm steps (into 50 Ω)
Level Accuracy: ± 1%
Flatness: ± 0.2 dB (DC-20 MHz)
DC offset: 0 V to ± 4.0 V, 1 mV steps (into 50 Ω)
Output impedance: 50 Ω
Freq. Accuracy: ± 10 ppm (± 5 ppm optional)
Phase Noise: < -55 dBc in a 30 kHz band
Spectral Purity:

DC to 100 kHz:	> -50 dBc
100 kHz to 1 MHz:	> -45 dBc
1 MHz to 12 MHz:	> -40 dBc
12 MHz to 20 MHz:	> -35 dBc

Ext. Trigger/Gating/FSK/BPSK Input

Input impedance: 80 KΩ; Max. input level: ± 10 V; Max. gating freq: 3 MHz

SYNC Output

Amplitude: 0 V to +5 V (TTL/CMOS compatible)
Rise/Fall Time: Rise: < 8 ns; Fall: < 3 ns
Output Current: ± 24 mA

External Modulation Input

Maximum full scale input: ± 5 V (10 V p-p)
Input Impedance: 30 KΩ

Ext. Arb Clock Input

Input level: TLL/CMOS Max. clock freq.: 40 MHz

Connectors

Front Panel: Sync Out; Sig Out
Rear Panel: Ext Modulation, Power/Volts Meas Input; Ext Trigger, Gating, FSK/BPSK Input; Ext Ref, Ext Arb Clock; Ext Arb Sync In/Out

RS232 port

Asynchronous, no parity, 1 start bit, 1 stop bit
Baud rate: Adjustable, 300 bps to 115,200 bps
Remote operation from a terminal or host computer

General

Power: 100-240 VAC 47-63 Hz, 30 W, 3 prong IEC connector
Display: 2 line by 40 character, LCD, backlit
Weight: Approx. 3.5 lbs.
Dimensions: 5.1" x 9.3" x 10.2" (H x W x L)
Operating Temperature: 0 to 40 deg. C ambient

Ordering Options

TC High stability timebase: ± 5 ppm over 0 to 40°C range
DC DC operation - operates over a 9-36 VDC range.

Prices and Specifications Subject to Change

OPERATING MODES

Other Modes and Applications Information

The carrier frequency for all modulation modes is 0 Hz to 21.500000 MHz, 0.01 Hz steps
All internal modulation frequencies are synthesized and are accurate to 0.01%.

Basic Sinewave (CW) Mode

Output frequency: 0 Hz to 21.500 MHz, 0.01 Hz steps

Frequency Modulation (FM) Mode

Int. modulation freq: 0 Hz to 10 kHz, 1 Hz steps
Ext. modulation freq: DC to 35 kHz
Peak frequency deviation: 0 Hz to ± 5.0 MHz, 1 Hz steps

Phase Modulation (PM) Mode

Int. modulation freq: 0 Hz to 10 kHz, 1 Hz steps
Ext. modulation freq: DC to 35 kHz
Peak phase deviation: 0 to ± 180 deg., 1 deg. steps

Sweep Mode

Start/Stop freq: 0 Hz to 21.500 MHz, 0.01 Hz steps
Linear or Log sweep. Up or Down sweep direction
Free Run or Triggered sweep (Int/Ext)
Sweep time: 1 ms to 60 s 1 ms steps

Burst Mode

Continuous or triggered from front panel, RS232 or Ext Trig
Duration: 1 ms to 99.999 s, 1 ms steps
Delay: 0 ms to 99.999 s, 1 ms steps

Dual Tone Multi Frequency (DTMF) Generate Mode

Dialing digits generated: 0 to 9, #, *, A, B, C, D
Duration: 1 ms to 10.000 s, 1 ms steps
Delay: 0 ms to 10.000 s, 1 ms steps

Custom Dual Tone Generate Mode

Tone 1, Tone 2 Frequency: DC to 10.000 kHz, 1 Hz steps
Phase Offset: 0 deg. to 359 deg., 1 deg. steps
Output ON time: Cont. or 1 ms to 10.000 s, 1 ms steps
Output OFF time: 0 ms to 10.000 s, 1 ms steps

Voltage Controlled Oscillator (VCO) Mode

Endpoint Frequencies: 0 Hz to 21.5000000 MHz in 0.01 Hz steps
Control input range: ± 5.0 V
Control signal bandwidth: DC to 35 kHz

Amplitude Modulation (AM) Mode

Int. modulation freq: 0 Hz to 10 kHz, 1 Hz steps
Ext. modulation freq: DC to 35 kHz
Percentage modulation: Variable 0% to 100%, 1% steps

Single Sideband (SSB) Mode

Int. modulation freq: 0 Hz to 5 MHz, 1 Hz steps
Ext. modulation freq: DC to 8500 Hz
Upper or Lower Sideband selectable

Frequency Shift Keying (FSK) Mode

Int. modulation freq: 0 Hz to 130 kHz, 1 Hz steps
Ext. modulation freq: 0 Hz to 3 MHz
Mark/Space freqs: 0 Hz to 21.5 MHz, 0.01 Hz steps

Power & Voltage Measurement Mode

Input signal range: ± 5 V
Input signal bandwidth: DC to 50 kHz
Power calc. impedance: Variable from 1 to 999 ohms

Binary Phase Shift Keying (BPSK) Mode

Int. modulation freq: 0 Hz to 130 kHz, 1 Hz steps
Ext. modulation freq: 0 Hz to 10 kHz

Dual Tone Multi Frequency (DTMF) Detect Mode

DTMF digits detected: 0 to 9, #, *, A, B, C, D
Detection range: 10 V p-p max., 20 mV p-p min.
Detection time: 100 ms

Data Modulation Mode

Message Date Length: 1 to 960 bits. Nonvolatile storage: 10 locs.
Baud Rate: 1 Hz to 130 kHz in 1 Hz steps
Mark/Space freqs: 0 Hz to 21.5000000 MHz in 0.01 Hz steps

Other Modes

New modes are constantly being added. They can be obtained via www, email, or floppy disk and downloaded to the 625A SMARTARB. Please check with factory.

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BNC

LOW PRICES

ARB/PULSE/FUNCTION GENERATOR



- Sine, Square, Ramp, Triangle, Random
- AM, FM, PM, FSK
- ARB with no phase jitter nor missed points
- Word and Data generator
- Phase Lock between units
- Burst - continuous or triggered
- Voltage and Power Measurement
- SSB, BPSK - Internal & External Modulation
- DTMF - Generate & Detect

MODEL 625A