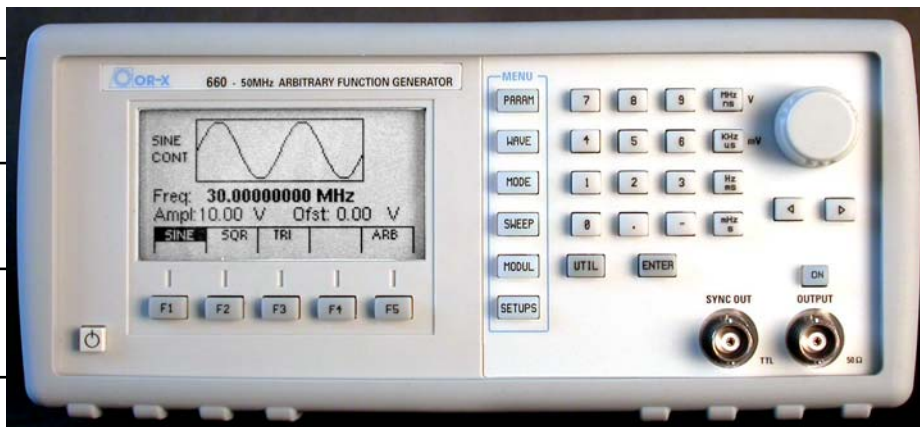




# MODEL 660

## ARBITRARY FUNCTION GENERATOR

- \* 50 MHz Sine and Square Waveforms
- \* 125 MHz Sampling, 4M-point Arbitrary Waveforms
- \* 14 bit Resolution
- \* IEEE488.2 and RS-232C



### Capabilities

The MODEL 660 can generate standard or user-defined waveforms with crystal controlled sampling rates of up to 125MHz, 14 bit vertical resolution and up to 4M points. The sampling rate can also be controlled by an external clock. All waveforms are internally generated with amplitudes to 10Vp-p into 50  $\Omega$ . An offset generator allows generation of signals with large offsets. A full range of triggering capabilities is available, including internal-external trigger source, gated and burst modes of operation. Two or more units can be parallel connected to produce multiple waveforms with adjustable phase.

### Easy Operation

A menu-driven front panel operation with a graphic easy-to-read LCD makes the MODEL 660 easy to operate. Parameter changes and data entry can be made using the numerical keys or rotary knob. Waveform editing can be done from scratch or by modifying standard waveforms. A PC software program, **Wave-X** Arbitrary Waveform Editor, allows you to easily create, edit and download complex waveforms. Multiple waveforms can be stored in the instrument flash memory.

### External Reference

A 10MHz external reference clock lets you synchronize the unit for precise phase adjustment.

### Standard Waveforms

The wide choice of build-in standard waveforms gives instant access to frequently used test signals. The standard waveforms are: sine, triangle, square, ramps, pulses and DC. AM, FM and FSK modulation are available with programmable internal or external signals.

### Programming

The instrument can be remotely controlled by the build-in GPIB IEEE-488.2 and RS-232C interfaces. All parameters, modes and functions are programmable and SCPI compatible.

# MODEL 660 - SPECIFICATIONS

The **MODEL 660** is a programmable **Function - Arbitrary Waveform Generator**, generating user defined waveforms or Sine, Square, Pulse, Triangle, Ramp up, Ramp down, etc.

## OPERATING MODES

**Continuous:** Output continuous at programmed parameters.

**Triggered:** Output quiescent until triggered by an internal, external, GPIB or manual trigger, then one waveform period is generated at the programmed point rate, amplitude and offset. Up to 20MHz trig rate for ARB waveforms and 10MHz in DDS mode.

**Gated:** Same as triggered mode except waveform is executed for the duration of the gated signal. The last waveform period started is completed.

**Burst:** Same as triggered mode for programmed number of waveform from 2 to 999,999.

**Phase:** Variable from  $-360^\circ$  to  $+360^\circ$  with  $0.1^\circ$  resolution.

## ARBITRARY CHARACTERISTICS

**Horizontal Resolution:** 4,000,000 points.

**Vertical Resolution:** 14 bits ( $-8191$  to  $+8191$ ).

**Point Execution Rate:** 8ns to 100s (125MHz) with 4 digits resolution (limited to 1ps) and 0.001% accuracy.

## FREQUENCY CHARACTERISTICS

**Sine:** 1uHz to 50 MHz.

**Square:** 1 uHz to 50 MHz.

**Triangle:** 1 uHz to 5 MHz.

**Pulse:** 0.5mHz to 25MHz with variable width, rise and fall times.

**Accuracy:** 10 ppm.

**Resolution:** 12 digits.

## OUTPUT CHARACTERISTICS

**Amplitude Range:** 10mV-10Vp-p into  $50\ \Omega$

**Resolution:** 3 digits (1000 counts)

**Accuracy:**  $\pm 1\%$   $\pm 20$ mV of the programmed output from 1V- 10V.

**Flatness:** 0.1dB to 1MHz  
1dB to 50 MHz

**Offset Range:**  $\pm 4.99$ V into  $50\ \Omega$ .

**Offset Resolution:** 3 digits, 10 mV.

**Offset Accuracy:**  $\pm 1\%$   $\pm 10$ mV.

**Output Impedance:**  $50\ \Omega$ .

**Filters:** 9 pole Elliptic and 5 pole Bessel filters.

**Protection:** The instrument is protected against short circuit to ground or to any voltage practically available in electronics laboratories.

## WAVEFORM CHARACTERISTICS

### Harmonic Distortion:

DC -20KHz -65dBc

20KHz-100KHz -60dBc

100KHz-5MHz -45dBc

5MHz-50MHz -30dBc

**Spurious:** DC-1MHz,  $< -60$ dBc

**Square Rise/Fall Time:**  $< 6$  ns (10% to 90%) at full amplitude into  $50\ \Omega$ .

### Variable Duty Cycle:

20% to 80% to 10MHz

40% to 60% to 30MHz,  $\pm 5\%$ .

**Symmetry:** at 50%  $< 0.5\%$ .

**Overshoot:**  $< 3\%$  of p-p  $\pm 50$  mV.

## MODULATION CHARACTERISTICS

**Amplitude Modulation:** Internal 0.01Hz-20KHz sine wave, square or triangle, variable depth from 0% to 100%.

External: 5 Vp-p for 100% modulation.

**Frequency Modulation:** Internal : 0.01Hz-20KHz sine wave, square or triangle. External: 5 Vp-p for 100% deviation.

**FSK:** Internal rate 0.01Hz-1MHz. External 1MHz max.

## SWEEP CHARACTERISTICS

**Sweep Shape:** Linear and Log.

**Sweep Time:** 10 ms to 500 s.

**Sweep trigger:** internal, external, continuous or burst

## INPUTS AND OUTPUTS

**Sync Output:** Positive TTL pulse at selected frequency,  $50\ \Omega$  impedance.

**Trigger Input:** TTL compatible,  $10\ \text{K}\Omega$  nominal impedance. Max. rate 20MHz, Minimum width 20ns.

**Modulation Input:** 5 Vp-p for 100% modulation,  $10\ \text{K}\Omega$  input impedance, DC to  $>50$  KHz bandwidth.

**Clock Input:** 10MHz, TTL compatible.

**Ref Output:** 10MHz or ARB clock, TTL levels

**Summing Input** 5Vp-p for aprox full scale output,  $500\ \Omega$  impedance

## INTERNAL TRIGGER

**Repetition:** 0.01Hz - 1MHz

**Resolution:** 4 digits

**Accuracy:**  $\pm 0.002\%$

## INTERFACE

IEEE488.2 (GPIB) SCPI compatible. RS-232

## GENERAL

**Store memory:** 50 full panel settings at power-off

**Arbitrary memory:** 1M points in internal flash memory

**Power Requirements:** 90-264V, 50 VA max.

**Dimensions:** Height: 88 mm (3.5 in)

Width: 213 mm (8.4in)

Length: 300 mm (12 in)

Weight: 3 Kg net.

**Operating Temperature:**  $0^\circ\text{C}$  to  $50^\circ\text{C}$

**Humidity:** to 95% RH,  $0^\circ\text{C}$  to  $30^\circ\text{C}$

**EMC:** EN55011, EN55082.

**Safety:** EN61010.

**CE Labeled**

## NOTES

Specifications are verified according to the performance check procedures in the technical manual. Specification not verified in the manual are either explanatory notes or general performance characteristics only.

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