Arbitrary function generator

TOE 7761 – 40 MHz

TOE 7761

The TOE 7761 arbitrary function generator uses the direct digital synthesis (DDS) technique to create sine waves of high quality and accuracy. Square waveforms are provided with fast rise and fall times. The sampling rate of up to 80 MS/s can be controlled by an external clock.

Arbitrary signals can have up to 1 000 000 sampling points with a resolution of 14 bits, thus allowing a very good simulation of natural signals. A wide range of integral standard waveforms, such as sine, triangle, square, ramp, etc., simplifies the creation of new arbitrary waveforms.

The output amplitude can be set to a maximum of 20 V_{pp} (10 V_{pp} into 50 Ω) with offsets of up to ±10 V (±5 V into 50 Ω). Various triggered modes with an internal or external trigger source allow generation of an exact number of user-defined cycles. Various modulation and sweep options round off the instrument functions.

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

Operation is easy and convenient with the graphic LCD and a multifunction spinwheel. All functions can be configured with just a few inputs. It is additionally possible to save up to 50 instrument configurations in a non-volatile memory.

The included PC software Arbsoft allows easy creation, editing and downloading of complex waveforms. Multiple waveforms can be stored in the flash memory of the instrument ready for execution.

Technical specifications

Frequency characteristics

Sine	1 µHz to 40 MHz
Square	1 µHz to 40 MHz
Triangle	1 µHz to 5 MHz
Pulse	0.5 mHz to 10 MHz
Accuracy	0.002 % (20 ppm)
Resolution	12 digits or 1 µHz

Waveform characteristics

Sine	
Harmonic distortion	DC to 20 kHz -65 dBc 20 kHz to 100 kHz -60 dBc 100 kHz to 5 MHz -45 dBc 5 MHz to 40 MHz -30 dBc
Signal distortion (non-harmonic)	DC to 1 MHz < -60 dBc
Triangle	
Variable symmetry	10 % to 90 %
Square	
Transition times	< 8 ns at full amplitude into 50 Ω
Duty cycle	
< 10 MHz	20 % to 80 %, ±1 % max.
< 30 MHz	40 % to 60 %, ±5 % max.
< 40 MHz	50 % fixed
Symmetry error	< 1 % at 50 % duty cycle
Overshoots	Typ. < 3% of output amplitude ± 50 mV
Pulse	
Pulse width	> 50 ns or 0.0001 % of repetition rate
Overshoots	Typ. < 3 % of output amplitude ± 50 mV

Arbitrary characteristics

Resolution	
Horizontal	Up to 1 000 000 points
Vertical	14 bits (-8191 to +8191)
Sampling	12.5 ns/point to 100 s/point (80 MS/s max.) with 4 digits or 0.1 ns resolution
Accuracy	0.002 % (20 ppm)
Predefined waveforms	Sine, triangle, square, noise, ramp up and down, Sin(x)/x, exponential rise and fall, Gaussian pulse

Special features

- 1 µHz to 40 MHz sine and square waveforms
- Output amplitude up to 20 V_{pp}
- 80 MS/s sampling rate with arbitrary waveforms with 14 bit resolution and up to 1 000 000 sampling points
- Flash memory for 1 000 000 sampling points
- Many standard waveforms assist in creating arbitrary waveforms
- Various modulation and sweep options
- 50 instrument configurations can be stored
- Remote control via USB[1], GPIB and RS-232 interface

[1] USB via supplied RS-232 adapter

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Output characteristics

Amplitude	
Range	20 mV_{pp} to 20 V_{pp} max., 10 mV_{pp} to 10 V_{pp} into 50 Ω
Resolution	3 digits or 10 mV
Units	V_{pp}, V_{rms}, dBm
Accuracy	±1 % ± 20 mV of the set value at 1 V to 10 V
Linearity	0.1 dB up to 1 MHz, 1.5 dB up to 40 MHz
Offset	
Range	Up to ±9.99 V max., up to ±4.99 V into 50 Ω, depending on the set amplitude
Resolution	3 digits or 10 mV
Accuracy	±1% ±10 mV into 50 Ω
Main output	
Impedance	50 Ω
Filter	9th order elliptic filter and 5th order Bessel filter
Output protection	Short-circuit proof and resistant to external voltage up to ±15 V. The output is automatically disconnected in event of overload
Operating modes	
Continuous	Continuous output signal with the set parameters.
Trigger	Output retains last value of last waveform until a trigger event arrives, and exactly one complete waveform is subsequently output with the programmed parameters.
Gate	Like trigger mode except that the output signal is generated for the duration of the gate signal. The last started cycle is completed.
Burst	Like trigger mode except with a programmed number of 2 to 999 999 cycles.
Trigger characteristics	
Source	Internal, external, manual or remote-controlled interface
Start phase	-360° to +360° with 0.1° resolution
Repetition rate Internal	0.01 Hz to 1 MHz, accuracy ± 0.002 %
External	< 10 MHz (DDS signal), < 20 MHz (arbitrary)
Pulse width	> 20 ns, (TTL)

Modulation characteristics

Amplitude modulation	
Internal	0.01 Hz to 20 kHz sine, square or triangle, variable modulation from 0 % to 100 %
External	5 V_{pp} for 100 % modulation
Frequency modulation	
Internal	0.01 Hz to 20 kHz sine, square or triangle, variable modulation from 0 % to 100 %
External	5 V_{pp} for 100 % change in frequency
FSK	
Clock rate Internal	0.01 Hz to 1 MHz
External[2]	TTL signal, max. 1 MHz

Sweep characteristics

Characteristic	Linear or logarithmic, up or down
Sweep time	10 ms to 500 s
Trigger	Internal or external, all trigger modes
Inputs and outputs	
Summing In	The analog input signal can be added to the output signal
Modulation In	5 V_{pp} for full-scale output, bandwidth: DC to > 10 MHz, impedance 500 Ω 5 V_{pp} for 100 % modulation, bandwidth: DC to > 50 kHz, impedance 10 kΩ
Trigger In	TTL compatible, max. 20 MHz, pulse width > 20 ns, impedance 10 kΩ
Reference In	10 MHz square signal for device synchronization, TTL compatible, input impedance 1 kΩ
Reference Out	10 MHz square signal or arbitrary clock for device synchronization, TTL compatible, impedance 50 Ω
Marker Out	Positive TTL pulse as marker for arbitrary signals, freely-programmable, impedance 50 Ω
Sync Out	Positive TTL pulses synchronous with the output frequency, impedance 50 Ω

General data

Configuration memory	50 instrument settings, including last setting
Arbitrary memory	1 000 000 points in internal flash memory
Remote-controlled interfaces	IEEE 488.2 (GPIB), RS 232 (115 KB max.), USB[1], SCPI compatible
Dimensions (W x H x D) With feet	224 x 88 x 357 mm 224 x 104 x 357 mm
Weight	3.2 kg
Power supply	100 V to 240 V, 47 to 63 Hz, < 40 VA max.
Humidity	Up to 95 %, 0 °C to 30 °C
Operating temperature	0 °C to +50 °C
Storage temperature	-20 °C to + 70 °C
Emitted noise	In accordance with EN 55011, Class B
Noise immunity	In accordance with EN 55082-2
Device safety	In accordance with EN 61010-1, CE labeled

Ordering data

Arbitrary function generator	TOE 7761

[1] USB via supplied RS-232 adapter
[2] External FSK modulation uses Trigger In. Specifications subject to change without notice