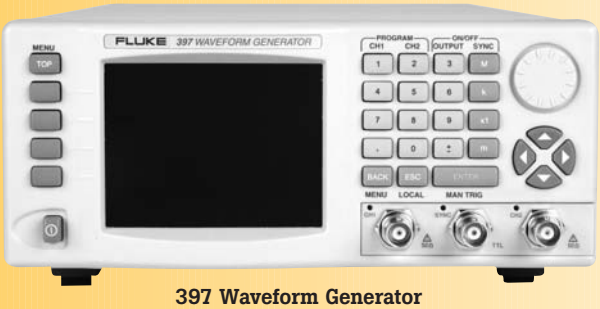
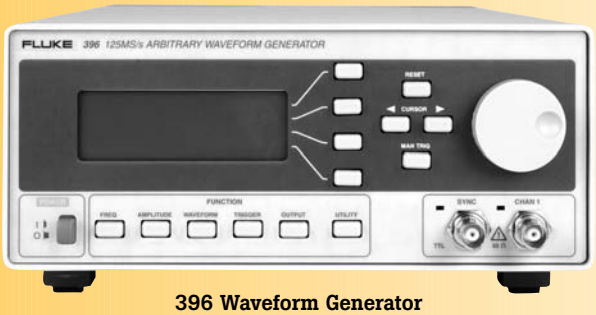
396/397 Universal Waveform Generators

FLUKE®

125 MS/s high performance universal waveform generators



397 Waveform Generator



396 Waveform Generator

- Unprecedented combination of universal generator and synthesizer
- Versatile performance
- High resolution and wide frequency range
- Extremely good performance-to-price ratio

Tech Tip

Waveform resolution
The 14-bit resolution provides 16,384 output levels. This means that even audio waveforms can be generated with excellent fidelity. It also allows video — and other complex waveforms — to be generated, with small details superimposed on large signals, in order to test the response of receiving systems.

The single-channel 396 and dual-channel 397 systems break new ground in universal waveform generator design. With their unprecedented combination of universal generator and synthesizer, versatility, high resolution and wide frequency range, and extremely good performance-to-price ratio, the 396 and 397 offer a range of benefits that will facilitate work in many fields.

The 14-bit resolution provides 16,384 output levels. This means that the 396 and 397 even generate audio waveforms with excellent fidelity. The 14-bit resolution also allows video — and other complex waveforms — to be generated with small details superimposed on large signals, so you can test the response of receiving systems.

The 125 MS/s sample rate allows the vertical accuracy to be converted into excellent performance at high frequencies. This opens up many applications in communication, video and television, telecommunication, radar, and ultrasonics.

Features include 11 basic waveforms with adjustable parameters: sine, triangle, square, pulse, ramp, sinc, Gaussian, exponential up, exponential down, noise, as well as dc. All are accessible from the front panel

The 396 and 397 also offer 1 Meg Word memory for arbitrary waveforms. Given the 14-bit resolution and its ability to operate the instrument with two different clock frequencies, the 396 and 397 offer enormous power. In addition, their memory can be divided into as many as 4,096 segments, which can be looped and linked in many different ways. Using 1 Meg Word at 25 MS/s to generate a video signal, for example, the duration is 0.04 s, 25 Hz, even without any looping of repetitive elements.

396/397 Universal Waveform Generators

Abbreviated Specifications

	396	397
Waveforms		
Waveforms	Standard waveforms: sine, square, triangle, ramp, sinc, pulse, noise, Gaussian as well as dc	
Sine		
Range	0.1 mHz to 50 MHz	
Resolution	7 digits or 0.1 mHz	
Accuracy	< 1 ppm for 1 year	
Temp. coefficient	< 1 ppm/°C	
Harmonic distortion and non related spurious below 10 MHz	< 0.1 % THD to 100 kHz (2000 waveform points) < –55 dBc to 1 MHz < –40 dBc to 5 MHz < –35 dBc to 10 MHz < –22 dBc to 50 MHz	
Square		
Range	0.1 mHz to 50 MHz	
Resolution	0.1 mHz or 7 digits	
Rise and fall times	< 10 ns	
Triangle		
Range	0.1 mHz to 12.5 MHz	
Resolution	0.1 mHz or 7 digits	
Accuracy	1 ppm for 1 year	
Linearity error	< 0.1 % to 100 kHz	
Pulse		
Range	0.1 mHz to 12.5 MHz	
Delay	0 % to 99.9 % of period	
Rise and fall times	0 % to 99.9 % of period	
High time	0 % to 99.9 % of period	
Resolution	0.1 %	
Arbitrary Waveforms		
Stored waveforms	Up to 4096	Up to 4096 each channel
Waveform length	16 to 4 M points	
Vertical resolution	14 bits	
Sample clock range	100 mHz to 125 MHz	
Waveform sequencing	Up to 4096 segments may be linked. Minimum segment duration 1 µs. Segments can be looped up to 1,000,000 times	
Amplitude		
Output impedance	50 Ω	
Amplitude	Range: 10 mVpp to 10 Vpp (20 mVpp to 20 Vpp into open circuit)	
Accuracy	< 1 % ± 25 mV between 1 V to 10 Vpp into 50 Ω	
Flatness	± 5 % to 10 MHz; ± 20 % to 50 MHz	
DC offset	± 4.5 V into 50 Ω. DC offset plus signal peak limited to ± 10 V. DC offset attenuated with amplitude range	
Output Filters		
Filter type	50 MHz Elliptic and 2 MHz Elliptical	
Modulation Modes		
Triggered burst	Each active edge of the trigger signal will produce one burst of the carrier waveform, waveforms starts from point n and completes at point n–1	
Gated	The selected waveform is output continuously at the programmed frequency while the selected gate signal is true	
Waveforms	All standard and arbitrary	
Carrier frequency	125 Msample/s for ARB and Sequence. 2.5 MHz or the maximum of selected waveform	
No. of cycles	1 to 1,000,000	
Trigger source	Manual trigger key, adjacent channel or internal trigger generator or external trigger input or remote trigger command	
Trigger rate	Internal trigger generator: 0.1 Hz to 2 MHz; External signal: dc to 2 MHz	
Start/stop phase	± 360 ° , settable to 0.1 ° subject to waveform frequency and type	
Frequency sweep	Manual, continuous, triggered; linear or logarithmic sweep; up or down. Variable sweep marker.	
Sweep range	1 mHz to 125 MHz	
Sweep time	1 ms to 999 s	
Sweep trigger source	External trigger input or remote trigger command	
Tone switching	FSK tone switching for all waveforms	
External AM	Via rear panel BNC input, dc–500 kHz for all standard and arbitrary waveforms	

Outputs and Inputs

	396	397
Main outputs	Single channel	Two channel
Sync outputs	Front panel BNC connector generates sync pulse synchronous with output waveform. In FM and sweep modes this output is synchronous with sample clock frequencies.	
Ext. trigger in	DC to 2 MHz. Threshold nominally TTL level; maximum input 5 V. Selectable as positive rising edge or negative falling edge. Minimum pulse width 20 ns for trigger and gated modes	
AM input	0 V to +5 V (5 Vpp) produce 100 % modulation	
Ref clock in	Input for an external 10 MHz reference clock. Threshold nominally TTL level.	
SCLK output, SCLK input and DSUB connector	Connect instruments to achieve synchronization. DSUB 9- pin connector and cable supplied.	

Inter-Channel Operations

	396	397
Inter-channel modulation	The waveform from any channel may be used to amplitude modulate (AM) the adjacent instrument/channel. Alternatively, any number of channels may be modulated (AM) with the signal at the modulation input socket.	
Carrier frequency	Entire range for selected waveform	
Carrier waveforms	All standard and arbitrary waveforms	
Modulation freq.	DC to 500 kHz	
Modulation depth	0 % to 100 %	
Inter-channel synchronization		Both channels are tightly synchronized in phase and waveform start. Channel 2 has sample clock divider for arbitrary and sequenced waveforms.
Phase resolution		1 sample clock period of channel 2
Skew error		± 2 ns
Inter-instrument synchronization	Two or more instrument may be slaved to one master instrument. Each Slave can have a unique phase angle relative to the Master.	
Phase error	4 points	
Skew error	± 15 ns, typically with 1 meter coax cables	
Inter-channel/instrument triggering	Any channel/instrument can be triggered by the previous or next channel instrument	

General Specifications

	396	397
Software		
Waveform Software	ArbExplorer Software for Windows is supplied with each instrument. This provides full waveform creation, editing and management including an equation editor, clipboard import/export and freehand drawing.	
Interfaces		
Interface types	GPIB and RS-232	GPIB, USB and Ethernet
Remote control	Full remote control facilities are available through the interfaces	
RS-232	Variable Baud rate, 115 k Baud. 9-pin D-connector	
GPIB	Conforms with IEEE-488.1 and IEEE-48.2	
Ethernet		Twisted pair 10/100Base-T, auto negotiation
USB		Type A receptacle, version 2.0
Display	20 character x 4 row alphanumeric LCD	3.5 in color LCD reflective, 320 x 240 pixels, back-lit
Size	88 x 415 x 212 mm (H x D x W)	
Weight	6 kg (13 lb)	
Power	85 V to 265 V, 48 - 63 Hz, 60W	
Operating temperature range	0 °C to 50 °C	
Operating humidity (non condensing)	11 °C to 30 °C 85 % RH; 31 °C to 40 °C 75 % RH; 41 °C to 50 °C 45 % RH	
Storage range	–20 °C to + 60 °C	
Environmental	Indoor use at altitudes to 2,000 m, Pollution degree 2	
Safety	Complies with EN61010-1	
EMC	Complies with EN61326, CE marked	

Ordering Information

Models

396 1 Channel 125 MS/s Arbitrary Waveform Generator & ArbExplorer Software, includes instrument synchronization cable

397 2 Channel, 125 MS/s Arbitrary Waveform Generator & ArbExplorer Software, includes instrument synchronization cable

Options and Accessories

Y396 396 Rackmount Kit

Y397 397 Rackmount Kit

Calibration Results (required)