



Description

The 5045 is a versatile, high accuracy calibrator capable of calibrating digital and analogue oscilloscopes, timer/counters, and frequency meters. It provides a wide range of outputs for amplitude, frequency, period and bandwidth. Amplitude calibration is achieved by a DC signal or 1 kHz square-wave, ranging from 1 mV to 220 V (2 V max for 50 ohm loads). Deviation up to $\pm 9.99\%$ allows fine adjustment of amplitude and direct read-out of error. Accurate frequencies are generated from a temperature controlled quartz crystal oscillator. Alternatively a 10 MHz reference input in can be used. Timing accuracy of 0.1 ppm is suitable for most oscilloscopes and timer counters. A precise square-wave output provides a fast rise time of less than 300 ps, which allows bandwidth testing up to 600 MHz.

Simple Operation

Functions and ranges are easily accessed from the front panel. Increase and decrease keys per digit, are used to quickly set the output value. Deviation control then enables the user to finely adjust the output value as a percentage ($\pm 9.99\%$). All this information is shown on a clear, easy to read LED display.

Additionally the 5045 is supplied with Time Electronics Windows based virtual control interface software. This enables the user to control the instrument via a laptop or PC.

2.2 GHz Levelled Sine-Wave Option

For precise bandwidth determination and frequency response analysis the 2.2 GHz option is available. The ability to adjust the frequency output from 50 MHz to 2.2 GHz and adjust the amplitude from 0.35 V to 3.5 V pk-pk ensures accurate analysis of oscilloscope input amplifiers.

Current Probe Calibration

For calibration of oscilloscope current probes an external adaptor is available. This converts the amplitude of the 5045 output to current and covers the range of 0.1 mA to 100 mA pk-pk, with 0.2 % accuracy, DC or 1 kHz.

Rubidium Frequency Reference

Enhanced timing performance is available by specifying the rubidium high stability frequency reference option (9762). This option achieves timing accuracies required to calibrate high performance timer/counters to 1 part in 10^{10} .

Features

- 1 mV to 220 V square wave/DC
- Frequency 0.1 to 100 MHz
- Time markers 10 s to 10 ns
- Fast rise < 300 ps
- Front panel or PC virtual control
- External reference input
- 2.2 GHz levelled sine option
- Rubidium frequency reference option
- Current probe adaptor option
- RS-232, USB, GPIB interface

EasyCal Calibration Software

The 5045 can be controlled via Time Electronics EasyCal software to automate the calibration process. This provides increased speed of calibration and consistency of results. Produce traceable calibration certificates and test reports for quality standards with additional uncertainty information for ISO 17025 conformance.





Technical Specifications

Specifications are for 1 year and apply between 23 °C ± 5 °C

Standard features

Function	Range	Specification (± output + floor)		Resolution
Amplitude DC or 1 kHz Square wave	2 to 200 mV (1 MΩ) 0.2 to 20 V (1 MΩ) 20 to 220 V (1 MΩ) 1 to 200 mV (50 Ω) 0.2 to 2 V (50 Ω)	DC Signal	Square Wave Signal	
		± 0.20 % + 10 μV	± 0.25 % + 100 μV	10 μV
		± 0.05 % + 10 μV	± 0.25 % + 1 mV	1 mV
		± 0.05 % + 10 μV	± 0.25 % + 10 mV	10 mV
		± 0.25 % + 15 μV	± 0.25 % + 200 μV	100 μV
		± 0.25 % + 15 μV	± 0.5 % + 1 mV	1 mV

The square wave signal is a chopped DC voltage with defined high and low levels, accuracy applies to the top line measurement relative to ground. Calibration is performed using the DC signal. Amplitude frequency accuracy < 10 ppm.

Frequency	0.1 Hz to 10 MHz 20 MHz to 100 MHz	± 0.1 ppm ± 20 ppm	Fixed outputs in 1, 2, 5, 10 sequenced steps
Period	10 s to 100 ns 50 ns to 10 ns	± 0.1 ppm + 30 ps ± 20 ppm + 50 ps	
Square wave from 0.1 Hz to 50 MHz; sinusoidal at 100 MHz. Amplitude > 0.9 Vpp into 50 Ω.			
Duty Cycle	0 to 100% at 100 Hz, 1 kHz, 10 kHz	Derived from the period (time interval) specification	0.01 % at 100 Hz 0.1 % at 1 kHz 1 % at 10 kHz
Fast Rise*	10 MHz	Rise time less than 300 ps (> 400 mVpp into 50 Ω)	

2.2 GHz Levelled Sine-Wave (option 9769)*

Amplitude Range	0.35, 0.5, 1, 1.5 Vpp			
Frequency Range	50 to 199.9 MHz	200 to 499.9 MHz	500 to 999.9 MHz	1 to 2.2 GHz
1 year absolute accuracy	3 %	4 %	5.5 %	6.5 %

Amplitude Range	2, 2.5, 3 Vpp			
Frequency Range	50 to 199.9 MHz	200 to 499.9 MHz	500 to 999.9 MHz	1 to 1.6 GHz
1 year absolute accuracy	3 %	4 %	5.5 %	6.5 %

Amplitude Range	3.5 Vpp			
Frequency Range	50 to 199.9 MHz	200 to 499.9 MHz	500 to 999.9 MHz	1 to 1.3 GHz
1 year absolute accuracy	3 %	4 %	5.5 %	6.5 %

Frequency accuracy 20 ppm, resolution 0.1 MHz. Amplitude deviation of ±5 % on 0.5, 1, 1.5, 2, 2.5, 3 and 3.5 V ranges, +5 % on 0.35 V range. The levelled sine option is calibrated at the terminal. Any external losses must be accounted for.

*Accredited calibration is not available for this function/option.

Note: 2.2 GHz levelled sine-wave option specifications apply to models manufactured after 2020. For models prior to this year please consult legacy specifications or contact us.

External Options

Rubidium reference (option 9762)	Rubidium atomic clock 10 MHz frequency reference. Increases accuracy to 1 part in 10 ¹⁰ . (Applies to 10 MHz maximum output on 5045)
Current probe adaptor (option 9764)	Battery powered external adaptor for checking current probes. 0.1 to 100 mA, 0.2 % accuracy.



General specification

Warm up	30 minutes to full accuracy.
Settling time	Less than 5 seconds.
Standard interfaces	GPIB (IEEE-488), RS-232, USB.
Temperature performance	Operating: 10 to 40 °C, Full Spec: 23 °C ± 5 °C, Storage: -10 °C to 50 °C.
Operating humidity	< 80 % non-condensing.
Altitude	0 to 3 km. Non operating: 3 to 12 km.
Mains voltage	100 to 230 V AC 50/60 Hz.
Power consumption	60 W typical, 80 W maximum.
Dimensions	W 450 x D 272 x H 152 mm (18 x 11 x 7 ").
Weight	8.2 kg (18 lbs).
Supplied with	Virtual control software, user manual, RS-232 cable, USB adaptor/cable.

Ordering Information

5045	Oscilloscope and Timer/Counter Calibrator
9769	Scope 2.2 GHz levelled sine generator
9762	Rubidium high stability frequency reference
9764	Current probe calibration adaptor
9519	Test lead and adaptors set
9728	19 " universal rack mount kit
ECFLA	EasyCal Calibration Software (see separate datasheet for details and options)
C147	Traceable calibration certificate (Factory)
C128	Accredited calibration certificate (ISO 17025)
EW03	Extended warranty: 3 years covering parts and labour

Due to continuous development Time Electronics reserves the right to change specifications without prior notice.