



Time Electronics

7027 Universal Frequency Counter



- 0.001Hz to 3000MHz frequency range
- TCXO timebase - better than 1ppm stability
- Frequency, period, & pulse width modes
- Frequency ratio & event counter modes
- Reciprocal counting measurements
- High impedance measurement up to 125MHz
- Low pass filter, attenuator & trigger level control
- AC/DC coupling, 1M/50Ω selection, polarity invert
- Large 10 digit LCD display with annunciators
- Remote control and readback via USB

DESCRIPTION

The 7027 is a high quality 3GHz universal frequency counter module which offers period measurement, frequency ratio, pulse width and event counting.

It uses an advanced reciprocal frequency counting technique to achieve high resolution at all frequencies. A DC coupled input enables VLF measurements to be made (down to 1mHz). The timebase uses a high quality TCXO crystal with a very low ageing rate. An external reference can also be used.

The large 10 digit LCD display has a full set of annunciators. Measurement times can be set between 0.3 seconds and 10 seconds.

Pulse width measurements can be made from rising to falling or falling to rising edge with adjustable thresholds. A variable attenuator is incorporated the input impedance is switchable between 1MW and 50W.

Full remote control and read-back is provided via a USB interface, situated at the rear of the calibration bench console.

7027 Features and Specifications

FEATURES

High measurement accuracy

The 7027 uses a high quality temperature compensated internal frequency reference (TCXO) which has a low aging rate and is stable to within ± 1 ppm over the full temperature range. Its short warm-up time allows accurate measurements.

An External Reference input is provided and changeover from the internal timebase is automatic when an external reference standard is connected.

High resolution

For frequency, period and frequency ratio functions the instrument uses a reciprocal counting technique to provide high resolution at all frequencies. Eight significant digits of answer are produced in a 1 second measurement time, nine digits in 10s and ten digits in 100s with a granularity of less than 2 counts in the least significant digit.

Flexible signal conditioning

Input A has configurable coupling (AC or DC), input impedance (1MW or 50W), attenuation (1:1 or 5:1), threshold (fully variable) and active edge, and can be used for frequencies in the range 0.001Hz to >125MHz.

Input B is a nominal 50W input for frequencies in the range 80MHz to > 3GHz.

Multiple measurement functions

The 7027 can measure frequency, period, pulse width, duty cycle and frequency ratio, as well as event counting (totalise).

Remote control and read-back via USB

The 7027 incorporates a USB interface which allows it to be remotely controlled using RS232 protocol via a computer's USB port. Connection is via the rear of the calibration bench.

Ten digit LCD

The high contrast display has ten 12.5mm (0.5") high digits along with a comprehensive set of annunciators. These show input configuration and function, measurement time and status, external reference connection, low battery and the units of the measurement which may be Hz, kHz, MHz, ns, us, ms or s.

INPUT SPECIFICATIONS

Input A

Input Coupling	AC or DC
Input Impedance	1MW//25pF (DC or AC coupled), or 50W (AC coupled only)
Attenuation	1:1 or 5:1
Active Edge	Rising or falling, or width high or low
Low Pass Filter	50kHz cut-off, or None
Frequency Range	0.001Hz to > 125MHz (1MW, DC coupled) < 30Hz to > 125MHz (1MW, AC coupled) < 500kHz to > 125MHz (50W, AC coupled).
Sensitivity	Sinewave - 15mVrms 30Hz to 100MHz, 25mV to 125MHz at optimum threshold adjustment.
Signal Range	1MW, DC - 0 to 3.3V (1:1) or 1 to 12V (5:1), 1MW, AC - up to 1Vrms (3Vpp) (1:1) or up to 4Vrms (12Vpp) (5:1) 50W, AC - up to 1V rms above 300kHz
Trigger Threshold	DC coupled - 0 to 2V (1:1) or 0 to 10V (5:1) AC coupled - Average ± 200 mV (1:1) or ± 1 V (5:1)

Input B

Input Impedance	50W (AC coupled)
Frequency Range	<80MHz to >3000MHz
Sensitivity	Sinewave - 12mVrms 80MHz-2GHz, 25mV to 2.5GHz, 50mVrms to 3GHz
Signal Range	<0dBm recommended, +13dBm (1Vrms) maximum

External Reference

Input Impedance	> 100kW, AC coupled
Frequency	10MHz
Signal Level	TTL, 3Vpp to 5Vpp CMOS or 1 to 2Vrms sinewave

Maximum Input Voltage

Input A and Input B	30Vdc; 30Vrms 50Hz/60Hz reducing to 1Vrms above 1MHz
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Note that the inputs will not be damaged if subjected to an accidental short-term connection to a 50/60Hz line voltage not exceeding 250V rms.

7027 Specifications

MEASUREMENT SPECIFICATION

Frequency

A Input Range	0.001Hz (DC coupled) to >125MHz
B Input Range	80MHz to >3000MHz
Resolution	up to 10 digits (see Note) or 0.001Hz

Period

A Input Range	8ns to 100s (DC coupled)
B Input Range	333ps to 12.5ns
Resolution	up to 10 digits (see Note)

Pulse Width Mode (Input A only)

Functions	Width high, width low, ratio H:L (high time to low time) and duty cycle
Pulse Width Range	40ns to 1000s
Averaging	Automatic within measurement time selected, up to 50 pulses
Resolution	20ns for one pulse; up to 1ns or 10 digits with multiple pulse averaging 0.01% for Ratio H:L and Duty Cycle.

Total Count (Input A only)

Count Range	1 to 9 999 999 999
Minimum Width	8ns

Frequency Ratio B:A

Resolution	Equal to the resolution of the two frequency measurements, If the ratio exceeds 10 digits, 6 digits and the exponent are displayed.
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Measurement Time

Selectable as 100s, 10s, 1s or 0.3s. The instrument displays the average value of the input signal over the measurement time selected, updated every 2s, 1s, 0.5s or 0.3s respectively. The hardware captures the count values and continues measuring without any dead time.

Resolution

The displayed resolution depends upon measurement time and input frequency. The basic resolution of period is 8 digits for every 2 seconds of measurement time. Frequency resolution is the reciprocal of period resolution. Usable resolution can be reduced by noise at low frequencies.

Accuracy

Measurement accuracy is timebase accuracy + measurement resolution + 2 counts.

TIMEBASE

Measurement Clock	50MHz
Internal Reference	10MHz TCXO with electronic calibration adjustment (> +/- 8ppm)
Temperature Stability	Better than ± 1 ppm over rated temperature range
Initial Error	$< \pm 0.2$ ppm at 25°C
Ageing Rate	$< \pm 1$ ppm/year

OPERATING FACILITIES

Noise Filter

The Filter key controls a low pass filter, with a cut-off frequency of about 50kHz, to ensure more stable readings at low frequencies.

Hold

Pressing the Hold key will stop further measurements being made and the current measured value will remain in the display, with the Hold indicator on, until the Hold key is pressed again. A long press on the Hold key clears old data and restarts the measurement.

Intelligent Power Switching

The unit automatically selects the best available power source of AC adaptor, USB or battery. Intelligent switching avoids discharging the battery overnight when operated from externally switched AC power. A press-to-measure facility allows a quick measurement to be made by pressing a function select key which will power the instrument up in the corresponding function. The instrument will automatically switch off 15 seconds after the last key-press.

Signal Activity Indication

Dual bi-colour LEDs show signal activity and indicate whether a DC coupled signal is above or below the trigger threshold.

GENERAL SPECIFICATIONS / ORDERING INFORMATION

Display	10 digits
Interface	1 x USB at rear of bench console
Module Width	295mm (primary console fitting only)
Ordering Information	7027: 3GHz Universal Frequency Counter Module

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

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