

TM-164 and TM-164H

Intelligent, accurate, multi-function counter

Portable, powerful and easy to use

- Measure frequency, time, phase, voltage and much more
- Top performance:
 - 2.7 GHz frequency range
 - 700 ps time resolution
 - Oven controlled X-tal oscillator
- See what you measure on graphics screen
 - Values
 - Statistics
 - Waveform
- Measure and view simultaneously up to 10 parameters
- Easy-to-use, easy-to-understand
- Portable and rugged
- Affordable

The TM-164 Multi-Function Counter from Pendulum Instruments AB, the **Time-Master**, is a portable and rugged high-precision timer/counter with a new innovative design, including e.g. waveform display, voltmeter functions and a new user interface concept.

Time-Master is a tool for everyone that needs to measure time, frequency or phase. It is a tool suited for the advanced user as well as first time counter user. It fits equally well on the research bench as in field service under harsh conditions.



Not a conventional counter

This high-performance timer/counter is totally unconventional. Unlike traditional "blind" instruments, it has a graphical display with scope-like waveform presentation and Windows-like user interface that gives a totally new meaning to ease-of-use.

High-performance

The TM-164 can handle virtually all time and frequency measurements needed in the electronic industry. The TM-164 outperforms most other counters on the market. Frequency: The 10-digit display gives 9 digits of resolution in a second. The frequency range is 160 MHz on input channels A and Band 2.7 GHz on channel C.

Time and Phase: Time interval measurements have 700 ps single-shot resolution, while phase measurements have 0.01° resolution. Volt: As a voltmeter, it measures peak-peak-voltages up to 10 MHz, useable up to 60 MHz. Both V_{DC} and V_{AC} (true RMS) measurements are available.

Two models to choose from

The standard model 164 has a standard crystal oscillator (5 ppm accuracy). The enhanced model 164H has a high-stability oven oscillator (0.1 ppm).

Unrivalled ease-of-use

The TM-164 has features that other counters lack, to make operation easy and avoid set-up errors. For example:

- a graph of the repetitive input signal up to 50 MHz,
- a screen that can show up to 10 measurements simultaneously,
- a revolutionary user interface. If you are used to Windows, you can operate this counter. Even context sensitive help is built-in.
- The AUTO SET key that performs the smartest instrument set-up, ever found in a counter.

Graphical Waveform and Trigger information

The waveform display mode shows the waveform of repetitive input signals up to 50 MHz,

you can see what you count, without using an external oscilloscope. The TM-164 sets and displays its optimized hysteresis band to eliminate false counts on noisy and complex signals. The peak-to-peak voltage is also measured and displayed together with measurement result.

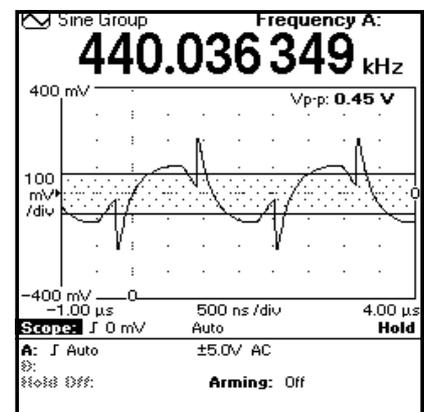


Figure 1. Waveform display showing trigger hysteresis band and level. There are no false counts even with the severe waveform distortion

Multi-Measurement display

Traditional counters communicate via numeric displays that show one result at a time, e.g. frequency. When the user wants to measure another signal parameter, e.g. rise time, he must change the instrument set-up and trigger conditions. This can easily result in operator errors. No more! The Pendulum-164 can display up to 10 time and voltage measurements simultaneously on its large bright backlit LCD display.

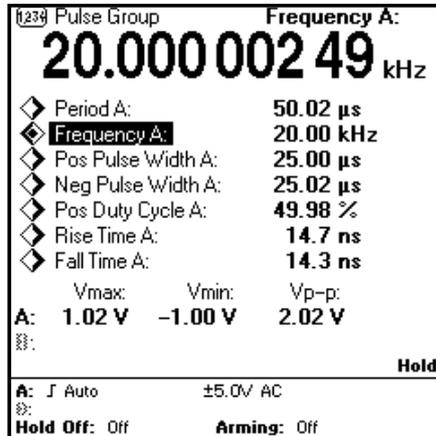


Figure 2. The pulse measurement group gives ten different measurements simultaneously.

Figure 2 shows the Pulse Group of measurements. A great deal of time and button pushing would be needed to get this wealth of information on a conventional counter/timer.

User Interface

The TM-164 has an uncluttered front panel and easy to understand menu selections; representing a breakthrough in simplicity for counter/timer operation. On-line context sensitive help is a button-push away. There is even an on-line tutorial, on-line measurement hints and 11 different test signals built-in.

Statistics display mode

In addition to the Numerical and Graphical display modes, the TM-164 also offers statistical measurement. This presentation mode gives a deeper insight into signal behavior that no single measurement reading could reveal. The screen gives information such as mean, standard deviation, max./min., and a Δ max.-min information. The sample size can be set up to 1,000,000 readings.

Compact, rugged and battery-powered

The TM-164 is portable and battery powered and can be used wherever the measurement has to be made, on the bench or in the field. Rechargeable batteries and a power adapter/charger are included as standard. The charge time is only 3 hours.

RS-232 interface

There is also an optically isolated RS-232 interface for PC-connection, for e.g. programming counter settings, collecting measurement results or screen images.

Specifications

Presentation Modes

Waveform: Waveform display like on a scope, 50 MHz / 3.5 ns rise time.
Values: Multiple parameter read-out of up to 10 simultaneous readings.
Statistics: Mean, Max., Min., Peak-peak, Std Dev. of up to 10^6 samples.

Measuring functions

Frequency, burst, ratio, RPM, period, time interval, pulse width, rise/fall time, phase, duty cycle, 4 totalizing modes and voltage (DC, AC, peak-peak).

Resolution

Frequency: 9 digits in 1 s
Time interval: 700ps (single-shot)
Phase: 0.01°
Voltage: 3 digits

Input A & B

Frequency Range:
AC Coupled: 20 Hz to 160 MHz
DC Coupled: 0 Hz to 160 MHz
Voltage Range:
 $\pm 0.500V$, $\pm 5.00V$ or $\pm 50.0V$

Max. sensitivity
20 mVrms sine (DC to 50 MHz)
Impedance: 1 M Ω /15 pF
Low Pass Filter: ≤ 100 kHz
Digital LP-Filter: ≤ 1 Hz to 3 MHz
Trigger Level:

Resolution: 1, 10 or 100 mV
Setting: AUTO, Manual.

AUTO Trigger:

Level: 50% of input signal's Vp-p (10% and 90% for Rise/Fall Time)
Trigger hysteresis: 33% of Vp-p (value for frequency/period).

Max. Voltage without damage: 240 Vrms
<1 kHz, 6 Vrms >10 MHz.

Input C

Frequency Range: 0.14 to 2.7 GHz
Operating Input Voltage:
10 mVrms to 5 Vrms
Impedance: 50 Ω , VSWR <2:1
Max. Voltage without damage: 12Vrms during 60 s

Other Inputs and Outputs

Ext. Reference Input

Frequency: 10 MHz

Test signals output

1, 50, 100 Hz, 1, 2, 10, 100 kHz, 1, 5, 10 MHz square wave. Low- and high-duty cycle pulses, Gate open/closed

Output levels: TTL levels into 50 Ω .

RS232 Data in/output

Connector: Isolated optical connector, for use with optional optical-to-RS232 adapter PM9080/001

Auxiliary Functions

Measuring Time

200 ns to 10s. Single cycle

External Arming

Delay: 200 ns to 1.6s

Trigger Hold-Off:

Delay: 200 ns to 1.6s

Mathematics:

Offset / scaling, 12 digits resolution

INFO

Context sensitive help and tutorial

SAVE / RECALL

10 instrument set-ups and 1 screen

Time-base oscillator

Aging/year 164: 5 ppm

164H: 0.1 ppm

Temp. stability 164: 5 ppm

(0 to 50°C) 164H: 0.1 ppm

General

Operating temperature: 0 to 50°C

Safety and EMC: CE

Safe Operation: 30 Vrms

Power Supply Line voltage adapter, rechargeable battery (charge time = 3h), or external DC.

Size

60x130x260 mm (2.4x5.1x10 in)

With holster 65x140x275 mm
(2.5x5.5x10.8 in)

Weight

1.5kg (3.3lb), with holster 1.8kg (4.0lb).

Ordering information

TM-164: 160 MHz / 2.7 GHz Multi-Function Counter incl. standard time-base oscillator (5 ppm).

TM-164H: As TM-164 plus a high stability oven oscillator (0.1 ppm).

Included with instrument

Rechargeable battery pack, AC mains adapter/battery charger, users manual and certificate of calibration. Eighteen (18) month warranty.

Optional Accessories:

Option 23/80 RS-232C Optically isolated interface adapter.

Option 23/01 Grey protective holster

Specifications subject to change without Notice.

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Pendulum Instruments AB
www.pendulum.se

- Experts in Time & Frequency Calibration, Measurement and Analysis