

PRECISION TIMER / STOPWATCH CALIBRATOR

Stopwatch • Frequency Totalizer to Time Converter • RPM Generator

TFC 1901



- High Precision **10 MHz OCXO/TCXO** Time base option
- **Three** Independent Operating Modes

- **Multi-Stopwatch Fixture** Support to avoid the manual START/STOP time error

Introduction

The **Timer Calibrator TFC-1901** is a precision instrument. It is Primarily designed to generate the accurate time intervals for calibrating time-related devices, ensuring traceability to **National/International standards**. Built with a internal 10MHz **OCXO/TCXO** time base Oscillator or External input Frequency from standard Lab source and also with Non contact RPM calibrating source all in a single unit — with potential-free **MOSFET** trigger output connector terminal to support an external **Multi-stopwatch fixture (Model : TFC-19F)** — to **eliminate manual START/STOP timing error** and 10MHz OCXO/TCXO Reference frequency output is provided on rear side terminal of Instrument.

Applications

Timer Mode & Frequency Totalizer Mode

- Analog Stopwatches
- Digital Stopwatches
- Analog Timers
- Digital Timers
- Panel Mount Timers
- Multi-Channel Timers
- Analog & Digital Quartz Clocks
- Timer Controllers
- Autoclave Timers

RPM Generator Mode

- Non-contact tachometers and other non-contact RPM measuring instruments

Features

- **Three independent operating modes** on one platform — Precision Stopwatch/Timer Calibrator, Frequency/ Totalizer to time converter, and RPM Generator for non-contact Tachometer Calibration.
- **4.3"** Multi colour TFT touchscreen display.
- Internal **High-accuracy 10 MHz OCXO/TCXO** time base or External **10 MHz** Standard frequency input.
- Dedicated **OCXO/TCXO 10 MHz** Isolated output (BNC) as a reference for the external application.

- **Calibration due-date tracking**, with last-calibration and due-date storage.

1. Stop watch Time Mode:

- Potential-free (dry contact) START / STOP / RESET trigger input from an external source (Calibration Mode), for calibrating the TFC-1901.
- Front-end START/STOP & RESET provision via touchscreen or mechanical switch for manual triggering application.
- Pairing input & output in two modes selectable for START/STOP:
 - a. **PULSE MODE** – 30μs output pulse to START and STOP the timer
 - b. **CONTINUOUS MODE** – START pulse should be continuously high until press the STOP key; other devices can be controlled the same way.
- Potential-free (dry contact) Start / Stop / Reset trigger OUTPUT (Master Mode) to simultaneously start, stop, and reset the unit under calibration.
- **Auto-Stop mode (Master Mode only)** with a programmable target time and selectable Up / Down counting.
- Selectable timer/display resolution of Six ranges from **10μs** to **1s**.

- Field-adjustable long-run correction — signed, per-hour drift correction applied to the elapsed count.
- Dedicated external **multi-stopwatch fixture support (TFC-19F accessory)** — a single trigger output physically actuates up to 5 analog or digital portable stopwatches in parallel for simultaneous UUC calibration **to avoid the manual time errors.**

2. Frequency/Totalizer to Time Conversion Mode:

- This mode of Timer Totalizer can be run from an External Lab frequency standard instead of internal OCXO/TCXO.
- Fully hardware-based pulse counting in Frequency Totalizer mode — every input pulse is captured directly, so

- none are ever missed or double-counted, even at the highest input rates.
- Continuous totalizer run of **24 hours at 100 kHz** without rollover (1.728×10^{10} pulses).
 - 6 decade of measurement resolution for **(1s to 10μs)** based on the selected input frequency range of **(1 Hz to 100KHz)** in accordance with DUC resolution.

3. RPM Generator Mode:

- RPM Generator with dedicated front-panel LED output.
- Range from **0 to 204,000 RPM**, 50% duty-cycle square wave for **Calibrating a non-contact tachometer.**

1. Stop watch Time Mode :

2026-08-21 05:05:55

Timer Master mode

Input : 1000 Hz

3600.00000

Sec

01:00:00.00000

Target Count:60.000

START

RESET

MENU

Indicates whether the device is in Timer Master or Calibration mode.

External Frequency Selection – Incoming Frequency Display and Blinking of Unmatched Frequency

Displayed seconds

Seconds are converted and displayed as HH:mm:ss.fraction.
Example:
3661.12345 seconds → 01:01:01.12345

When Auto Stop is enabled, the target value is displayed.

Touch the Reset icon to return the timer to zero.

Touch the Start/Stop icon to start or stop timing.

NOTE:
 START/STOP AND RESET Touch keys are disabled in TFC 1901 Calibration Mode. Use the external input or mechanical switch to start or stop timer.

2. Frequency/Totalizer to Time Conversion Mode :

Timer and Frequency/Totalizer-to-Time Conversion in Timer Mode – Two Modes on the **Same Screen**
Difference: Frequency/Totalizer-to-Time Conversion – Decade-Step External Frequency Input with Resolution-Based Time Selection

Resolution	Required Frequency
0.00001 s	100 kHz
0.0001 s	10 kHz
0.001 s	1 kHz
0.01 s	100 Hz
0.1 s	10 Hz
1 s	1 Hz

Enable/Disable Options in Master/Calibration Mode

Feature	Master	Calibration
Control	Touch	External
Outputs	Enabled	Disabled
Auto Stop	Available	Not available
Count modes	Up / Down	N/A

Trigger : Pulse (30 μs) or Continuous High; Reset always a trigger.

Max duration : Max 24 Hours.

3. RPM Generator Mode: Optical output for non-contact tachometer calibration

2026-08-21 05:05:55

Range:0 to 204000 RPM

RPM

6000

Revolutions per minute

MENU

Displayed RPM — touch to set the value from 0 to 204,000 RPM.

LED blinks at 50% duty cycle, matching RPM — 1 RPM = 1 blink/sec, for non-contact stroboscope-style checks. Displayed RPM is touch-settable from 1 to 204,000 RPM.

Time base options

Optional Model	TFC 1901-1	TFC 1901-2
Time base type	TCXO	OCXO
Uncertainty due to		
Aging per day	$\pm 2.7 \times 10^{-9}$	$\pm 0.2 \times 10^{-9}$
Aging per month	$\pm 0.1 \times 10^{-6}$	$\pm 6 \times 10^{-9}$
Aging per year	$\pm 1 \times 10^{-6}$	$\pm 50 \times 10^{-9}$
Temperature variations 0 to 50°C	$\pm 2.5 \times 10^{-6}$	$\pm 0.5 \times 10^{-9}$
25°C $\pm 2^\circ\text{C}$	$\pm 0.1 \times 10^{-6}$	$\pm 0.1 \times 10^{-9}$
Short-term Stability 1s to 100s	Not specified	$\pm 5 \times 10^{-9}$
Supply Voltage Stability	$\pm 0.2 \times 10^{-6}$	$\pm 0.5 \times 10^{-9}$
Frequency calibration @ 25°C $\pm 2^\circ\text{C}$	$\pm 1 \times 10^{-6}$	$\pm 50 \times 10^{-9}$

Technical Specifications

Model	TFC 1901
Display	4.3" Multi colour TFT touchscreen display.
Range	Digital Electronic Stopwatch : 100 ms to 86400.00000 s , Mechanical Stopwatch & Electronic Industrial Timer : 1 s to 86400.00000 s
Resolution	10 μs to 1 s (selectable: 0.00001 / 0.0001 / 0.001 / 0.01 / 0.1 / 1 s)
Display Format	Time in HH:MM:SS.fraction
Mode 1 — Precision Stopwatch / Timer A high-resolution elapsed-time counter driven directly from the Precision internal Oscillator reference. Supports free-run stopwatch and preset auto-stop timer operation, with Master and DUC triggering.	
Time base	Directly referenced to the internal 10 MHz OCXO/TCXO;
Auto-Stop	Auto-Stop at user-set target time
Master vs. calibration mode	Master: touch control, outputs enabled, Auto-Stop available, Up/Down count. calibration: external-input control, outputs disabled, input detection enabled, no Auto-Stop
Accuracy **	Digital Electronic Stopwatch: OCXO: $\pm(5.02 \times 10^{-8} \times T_e + 2 \text{ ms})$ TCXO: $\pm(1.003 \times 10^{-6} \times T_e + 2 \text{ ms})$ Mechanical Stopwatch & Electronic Industrial Timer: OCXO: $\pm(5.02 \times 10^{-8} \times T_e + 5 \text{ ms})$ TCXO: $\pm(1.003 \times 10^{-6} \times T_e + 5 \text{ ms})$ Where: T_e = elapsed time
Trigger I/O	Master: generates START/STOP/RESET output pulses 30 μs and continuous output. Calibration: accepts external START/STOP/RESET. Pulse mode (START/STOP), RESET; Continuous mode also selectable
Mode 2 — Frequency Totalizer A precision pulse totalizer that counts input events entirely in hardware, converts the count to elapsed time at the selected resolution for the external input frequency, and simultaneously measures live input frequency referenced to the OCXO/TCXO.	
Run Time	24 hours continuous run at 100 kHz without rollover (1.728×10^{10} pulses)

Input / Counting	Dedicated pulse-count input, standard logic-level pulse train; fully hardware-based counting — no missed/double-counted pulses even at highest rates
Frequency Measurement	Measured against OCXO/TCXO reference ~once/sec, OCXO/TCXO-grade accuracy; range from 1 Hz–100 kHz
Resolution / Frequency Map	0.00001s↔100kHz, 0.0001s↔10kHz, 0.001s↔1kHz, 0.01s↔100Hz, 0.1s↔10Hz, 1s↔1Hz — each input pulse advances displayed time by exactly one count tick

Mode 3 — RPM Generator

The front-panel LED blinks at 50% duty cycle, matching the RPM value — e.g., 1 RPM = 1 blink/sec. In RPM Mode, this lets the user visually check the RPM without needing contact, using a stroboscope or similar method.

Range for Non-contact	0 to 204,000 RPM
Output / Conversion	Front-panel LED output, 50% duty-cycle square wave; $f \text{ (Hz)} = \text{RPM} / 60$

NOTE:

1. Due to continuous improvement, published specifications may change without notice.
2. **If we use the Stopwatch Fixture, an additional 2 ms error will be added with accuracy.

Operating Conditions

- Humidity: 5% to 95% RH @ 10 to 30°C, 5% to 75% RH @ 30 to 40°C ➤ Operating Temperature: 0 to 50°C ➤ Power: 500W(Approx.)
- Storage Temperature: -30 to 60°C ➤ Dimension : 244 x 115 x 170 mm(WxHxD) ➤ Weight : 2.2kg(Approx.)

Accessory — Multi-Stopwatch Fixture - TFC-19F

The TFC-19F is an external fixture for the physical actuation of multiple portable stopwatches during calibration. It connects to a single potential-free trigger output from the TFC-1901 and simultaneously operates the START/STOP mechanism of 1 to 5 analog or digital portable stopwatches, to be calibrated together in a single test cycle.

- Simultaneously actuates 1 to 5 analog or digital portable stopwatches (UUC)
- Driven from a single trigger output of START/STOP and RESET pulse from TFC-1901
- Reduces calibration time & manual error for batch testing of portable stopwatches
- Triggering Speed Accuracy: $\pm 2 \text{ ms}$
- Easily Adjustable Mounting Option for Multibrand Stopwatches
- BNC connector option is provided to connect the Stopwatch fixture in series



Multi-Stopwatch Fixture - TFC-19F

Ordering Code

Option 1	TFC 1901-TC-01
Option 2	TFC 1901-OC-02

Standard Delivery

1. Basic Instrument
2. Power card
3. Test Certificate

Optional

1. Multi-Stopwatch Fixture - TFC-19F
2. Carrying case
3. ISO/IEC 17025 Accredited calibration certificate



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ISO/IEC 17025 Accredited Calibration Laboratory by NABL CC - 2879
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