SANSEL®
INSTRUMENTS AND CONTROLS

Precision | Reliability | Innovation

FLAGSHIP MODEL

TFC 1901

PRECISION TIMER / STOPWATCH CALIBRATOR

Three Modes. One Instrument.
Every Second Traceable.





- ✓ *10 MHz OCXO / TCXO Time Base*
- ✓ *Three Independent Modes*
- ✓ *4.3" TFT Touchscreen*
- ✓ *Multi-Stopwatch Fixture Support*
- ✓ *Input Option for Rubidium / GPS-Disciplined Oscillator*

10 MHz OCXO / TCXO
High-precision time base or external 10 MHz

THREE OPERATING MODES
Stopwatch · Totalizer · RPM Generator

10 µs RESOLUTION
Six selectable ranges 10 µs to 1 s

0 – 204,000 RPM
Non-contact tachometer calibration

24 h @ 100 kHz NO ROLLOVER
1.728 × 10^{10} pulses, hardware counted

MULTI-STOPWATCH FIXTURE
1 to 5 stopwatches in one test cycle

Built for Time & Non-contact RPM Calibration

Analog Stopwatches · Digital Stopwatches · Analog & Digital Timers · Panel Mount Timers · Multi-Channel Timers · Timer Controllers & Autoclave · Non-contact Tachometers

01 / OVERVIEW

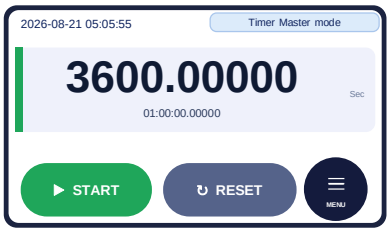
Three Modes. One Instrument.

Stopwatch · Frequency Totalizer to Time Converter · RPM Generator

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 option from Rubidium / GPS-Disciplined Oscillator / Frequency 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.

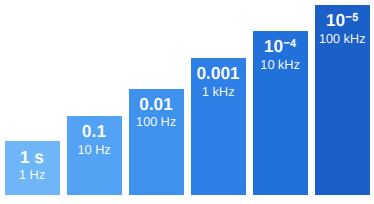
10MHz	10µs	86,400	3	204k	24h
OCXO / TCXO TIME BASE	FINEST RESOLUTION	SECONDS MAX RANGE	INDEPENDENT MODES	MAX RPM	TOTALIZER RUN @ 100 kHz

MODE 01
Precision Stopwatch / Timer



- **Range:** 100 ms – 86,400 s (electronic) · 1 s – 86,400 s (mechanical)
- **Auto-Stop** at a target time; Up / Down counting
- Master & Calibration trigger modes

MODE 02
Frequency / Totalizer to Time Converter



Resolution (s) ↔ required input frequency

- Runs from an **external lab frequency standard**
- **Hardware pulse counting** — no missed or double counts
- 24 hr at 100 kHz without rollover

MODE 03
RPM Generator (Non-contact)



- Range **0 – 204,000 RPM**, touch-settable
- Front-panel **LED output**, 50% duty cycle
- f (Hz) = RPM / 60 · 1 RPM = 1 blink / s

Applications

- **Analog Stopwatches**
- **Digital Stopwatches**
- **Analog Timers**
- **Digital Timers**
- **Panel Mount Timers**
- **Multi-Channel Timers**
- **Timer Controllers**
- **Autoclave Timers**
- **Non-contact Tachometers & other RPM Meters**

Traceable, End to End FROM NATIONAL STANDARD TO YOUR STOPWATCH

National / International Standards
Primary time & frequency reference

→

TFC 1901
10 MHz OCXO / TCXO
External input option from Rubidium / GPS-Disciplined Oscillator

→

Your Instruments Under Calibration
Stopwatches · timers · clocks · tachometers

02 / FEATURES & OPERATION

Engineered for Every Tick

Three Modes, One Platform
Stopwatch / Timer calibrator, Frequency / Totalizer to time converter, RPM generator.

4.3" TFT Touchscreen
Multi-colour display; time shown as HH:MM:SS.fraction.

10 MHz OCXO / TCXO
High-accuracy internal time base, or external 10 MHz standard input.

Isolated 10 MHz Output
Dedicated OCXO / TCXO reference output
(BNC, rear panel).

Dry-Contact Trigger Input
Potential-free START / STOP / RESET from an external source (Calibration mode).

Dry-Contact Trigger Output
Master mode — start, stop & reset the unit
under calibration simultaneously.

Touch or Mechanical Keys
Front-panel START/STOP & RESET for manual triggering.

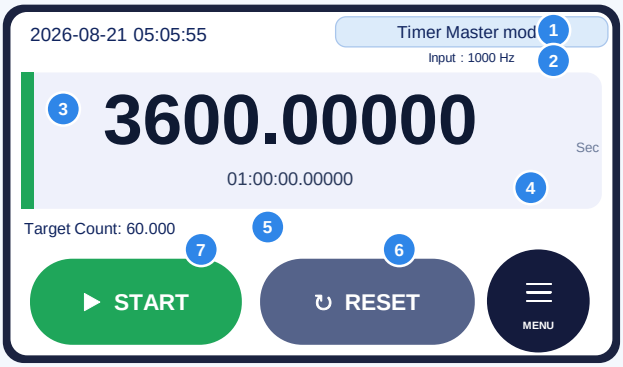
Pulse or Continuous Trigger
30 µs pulse to start / stop, or continuous-high until STOP.

Auto-Stop & Up / Down
Programmable target time with Up / Down counting (Master mode).

Six Resolution Ranges
Selectable 10 µs, 100 µs, 1 ms, 10 ms, 0.1 s and 1 s.

Long-Run Drift Correction
Field-adjustable, signed, per-hour correction applied to elapsed count.

Calibration Due-Date Tracking
Stores last-calibration and due dates on the instrument.



1. Shows whether the unit is in Timer Master or Calibration mode
2. External frequency selection — incoming frequency shown, blinks if unmatched
3. Elapsed time in seconds, up to 10 µs resolution
4. Converted to HH:mm:ss.fraction — e.g. 3661.12345 s → 01:01:01.12345
5. Target value shown when Auto-Stop is enabled
6. RESET returns the timer to zero
7. START / STOP begins or ends timing

Note: touch keys are disabled in Calibration mode — use the external input or mechanical switch.

∞ Resolution ↔ Required Frequency (Mode 2)

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

Hardware pulse counting against an external 5 V, 50% duty-cycle frequency standard. Max duration 24 hours.

Master vs 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 is always a trigger.

03 / TECHNICAL SPECIFICATIONS

The Numbers

Accuracy · Time base · Modes · Operating conditions

TIME BASE OPTIONS

Optional Model	TFC 1901-01	TFC 1901-02
Time base type	**TCXO**	**OCXO**
Uncertainty due to Aging per day Aging per month Aging per year Temperature variations 0 to 50°C 25°C ±2°C	 $\pm 2.7 \times 10^{-9}$ $\pm 0.1 \times 10^{-6}$ $\pm 1 \times 10^{-6}$ $\pm 2.5 \times 10^{-6}$ $\pm 0.1 \times 10^{-6}$	 $\pm 0.2 \times 10^{-9}$ $\pm 6 \times 10^{-9}$ $\pm 5 \times 10^{-8}$ $\pm 0.5 \times 10^{-9}$ $\pm 0.1 \times 10^{-9}$
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 ±2°C	$\pm 1 \times 10^{-6}$	$\pm 50 \times 10^{-9}$

GENERAL

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

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:** $\pm(5.02 \times 10^{-8} \times Te + 3\ ms)$ **TCXO:** $\pm(1.003 \times 10^{-6} \times Te + 3\ ms)$ **Mechanical Stopwatch & Electronic Industrial Timer:** **OCXO:** $\pm(5.02 \times 10^{-8} \times Te + 5\ ms)$ **TCXO:** $\pm(1.003 \times 10^{-6} \times Te + 5\ ms)$ **Where:** **Te = 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

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
Input / Counting	Dedicated pulse-count input, standard logic-level pulse train; fully hardware-based counting — no missed/double-counted pulses even at highest rates

MODE 3 — RPM GENERATOR

Range for **Non-contact**	0 to 204,000 RPM
Output / Conversion	Front-panel LED output, 50% duty-cycle square wave; f (Hz) = RPM / 60
Accuracy	0.01% of rdg + 1 rpm

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

STORAGE TEMPERATURE
-30 to 60°C

POWER
500W(Approx.)

WEIGHT
2.2kg(Approx.)

DIMENSION
244 x 115 x 170 mm (WxHxD)

NOTE:

1. *Due to continuous improvement, published specifications may change without notice.*
2. ***If we use the Stopwatch Fixture, an additional 3 ms error will be added with accuracy.*
3. *The above accuracy specifications are based on the internal oscillator only. Accuracy may vary when using the external Rubidium / GPS-disciplined oscillator input option.*

04 / ACCESSORY & ORDERING

Calibrate Five at Once

Multi-Stopwatch Fixture TFC-19F · ordering codes



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: ±3 ms
- Easily Adjustable Mounting Option for Multibrand Stopwatches
- BNC connector option is provided to connect the Stopwatch fixture in series

TFC 1901-TC-01

OPTION 1

TCXO Time Base

See Time Base Options, page 4

TFC 1901-OC-02

OPTION 2

OCXO Time Base

See Time Base Options, page 4

Standard Delivery

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

Optional

1. Multi-Stopwatch Fixture TFC-19F 2. Carrying Case
3. ISO/IEC 17025 Accredited Calibration Certificate

SANSEL INSTRUMENTS AND CONTROLS

SANSEL CALIBRATION LABORATORIES LLP

ISO/IEC 17025 Accredited Calibration Laboratory by NABL CC – 2879 (Thermal, Mechanical, Electro-Technical, Dimension Parameters)

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