

**Timetrax Model 185**  
Precision Electronic Timing Machine

**Users Guide**



The Adams Brown Company, Inc.  
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## Introduction

Thank you for purchasing a new Timetrax electronic timing machine. We are proud to back our products with a hassle-free warranty. We do ask that you take the time now to fill out and return the enclosed warranty registration card. If you do not return the card now, you may be required to submit a dated sales receipt in order to obtain warranty service. Warranty details are found at the end of this guide.

Care for your new timer as you would any precision instrument. The unit may be cleaned with a soft cloth dampened with a mild detergent/water solution. Avoid spilling or spraying liquid directly on the instrument. Most exterior surfaces are made of rugged ABS, but care should be taken not to scratch the display window or use any solvents which might attack the plastic. Avoid strong impact such as dropping. Do not store or use your timer in excessively hot, cold, or damp environments.

## What's New

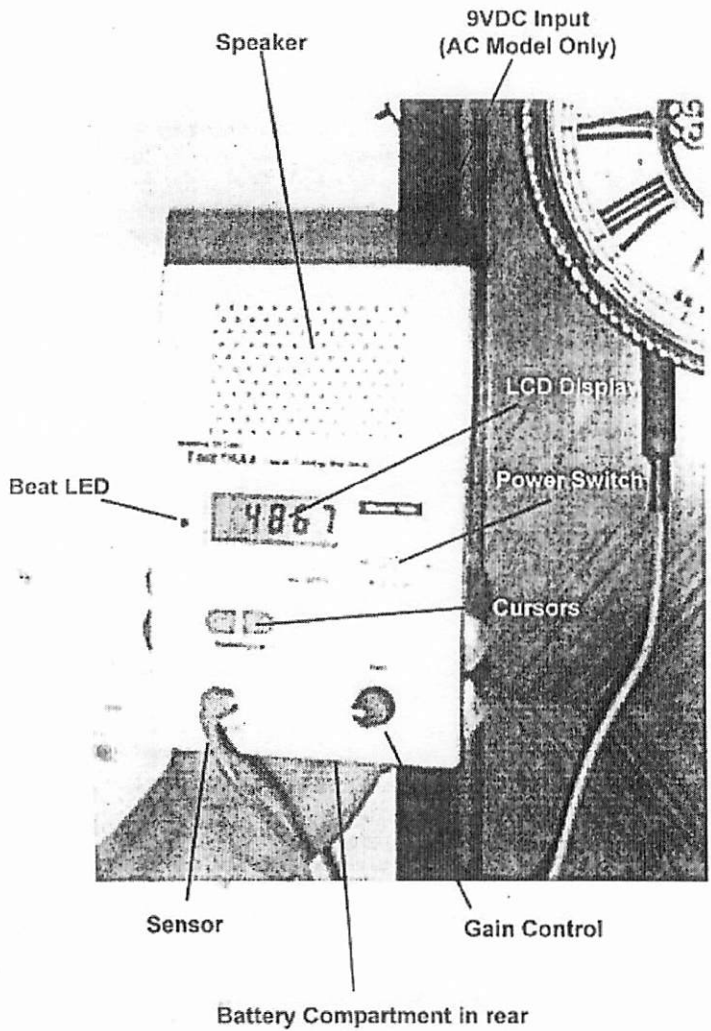
In late 1988 Adams Brown introduced the Tick-Tech Timer, the first truly low-cost electronic timing machine. Since then we've been refining and improving.

Your new Timetrax Model 185 features our advanced Double-Rate Update display, a digital balance measurement mode, a built-in beat amplifier, an expanded Train Data booklet, and a one year hassle free warranty.

The AC power option includes an AC adapter (wall pack) and related electronics required for AC line powered operation. The unit will automatically switch between line and battery power. Rechargeable Ni-cad batteries may be used, but they must be charged externally. The AC adapter will not act as a recharger.

For battery operation install a fresh 9 volt alkaline, or fully charged Ni-Cad battery in the rear compartment. When not in use, power should be switched to the far left 'OFF' position to conserve battery life. An alkaline battery will provide about 30 hours of normal use. Always try a fresh battery before sending the unit in for repair.

## Controls and Indicators



## Balance Mode

Before timing a clock it should be put 'in balance' or 'in beat'. A movement is said to be in balance when the time between ticks is equal, giving it a steady, even beat. Traditionally the adjustment has been made by ear. Now, Timetrax timers feature a balance mode that allows precise beat setting. In balance mode the timer provides accurate digital beat timing.

Balance should be roughly set by ear before proceeding. Connect the clip-on sensor and set the gain in the usual manner. To put the timer in balance mode, use the cursor keys as if you were selecting a Preset Average. As the display wraps from 130 to 2, or vice versa, there will be a display of BAL, indicating BALance mode. Upon stopping on BAL the unit will begin to function in the balance mode.

In the balance mode the timer makes a comparative measurement, relating the time intervals between ticks. Consider, for example, three sequential ticks. The first interval begins at the first tick and ends at the second. The second interval begins at the second tick and ends at the third. At the end of each interval a number is displayed, the magnitude of which indicates the relative difference of the two most previous intervals. If the second interval is the shorter the number is preceded by a minus sign.

A new number, positive or negative, will be displayed each time a tick is detected. The clock is in balance when the magnitude of the numbers is minimized. The timer provides a very fine reading of balance, so it is practically impossible to get many zeroes. Values under twenty should be considered excellent.

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## How it works

Each tick of a clock is a mechanical vibration which is converted to an electrical signal by the Model 20 sensor. These electrical signals are amplified inside the timer. The amount of amplification is controlled with a Gain adjustment, located on the front panel of the unit.

With the power switch in the TIMER position, the amplified sounds are converted to a stream of digital pulses, with one pulse per tick. An advanced microprocessor groups pulses together for measurement. The number of ticks that are grouped together is called the Preset Average. A precision quartz crystal timebase is used as a timing reference for all measurements.

After a series of mathematical calculations the result of a complete group of ticks is displayed on the direct reading liquid crystal display (LCD). Each time the Preset Average number of ticks have been processed, the display is updated with a new reading. For example, with a Preset Average of 30, the display is updated every 30 ticks.

## Double-Rate Update

Model 185 Plus incorporates a unique feature called Double-Rate Update, designed to save time for the professional repairman. In the example above, with a Preset Average of 30, the display is updated every 15 ticks! The result is still based on the previous 30 ticks, so accuracy is not diminished. This powerful feature becomes especially useful when taking readings over a full revolution of the escape wheel, probably 30 or more ticks.

Note: To maintain full accuracy the very first reading only must time over the full interval. So, with a Preset Average=30, the display updates after 30 ticks, then 15 ticks, 15 ticks, 15 ticks...

## **Connecting the Sensor**

A model 20 clip-on sensor is included with your timer. The sensor converts the vibrations of a ticking mechanical time-piece to electrical signals. To use the sensor, simply plug it in to the front panel of the timer and clip the other end onto the clock. It is best to choose a location on the movement itself and not on the case. Use care as the clip is made of steel, and may scratch softer materials such as brass. A winding arbor is generally an excellent location for the clip-on sensor. When using the instrument as a beat amplifier, the sensor should be connected as closely as possible to the components being monitored.

## **Using the Timetrax 185 as a Beat Amplifier**

The beat amplifier is generally helpful to anyone attempting to repair or diagnose mechanical clock movements. The experienced repairman can tell a great deal about a clock just by listening to the sounds it makes. The beat amplifier also simplifies the task of putting a clock in beat.

To use the Timetrax 185 as a beat amplifier, simply slide the power switch to the center position, marked 'AMP', connect a sensor, and set the gain to a comfortable listening level. Note that none of the timing functions operate in this mode. The display will remain blank, and the LED will remain unlit.

The beat amplifier mode requires more power from the battery than the timing mode. A weak battery will cause a loud 'whine' from the speaker, the first indication that a replacement battery is needed.

## **Using the Timetrax 185 as a Timing Machine**

Your new timer will function as a full featured timing machine with the power switch in the far right 'TIMER' position. The unit will provide readings with almost any settings, but for best results and ultimate satisfaction you should understand the effects of the various adjustments and modes available to you. The sections that follow detail each separately, and includes instructions for regulating a movement.

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## Quick Start - Operation Summary

1. Install a fresh 9 volt alkaline<sup>1</sup> battery
2. Plug the Model 20 sensor into the front panel sensor jack.
3. For timer operation: Slide power switch to TIMER position  
For beat amp operation: Slide switch to AMP position
4. Clip sensor to clock movement. Winding arbor usually works well.
5. Adjust GAIN control for a steady even flashing of BEAT LED.
6. Read display and compare to correct value obtained from tables or from calculation. Take several readings to allow movement to stabilize
7. For finest adjustment use UP and DOWN cursors to set twice the escape wheel teeth.
8. Adjust clock (platform or pendulum) to match correct rate.
9. To save battery life, turn off the timer when finished.

<sup>1</sup> Due to the high current consumption of the audio amplifier and speaker we recommend only alkaline or Nickel-Cadmium batteries. Ni-Cads must be charged externally. Zinc-Carbon type batteries are not suitable

## Regulating a Movement

With a sensor in place, and the gain and Preset Average properly set, the unit will begin timing. Initially the LCD shows a series of dashes, indicating that no computations have been made. No numbers will be displayed until a number of ticks (equal to the Preset Average) have been detected. At that point the timer will begin to display readings directly in units of beats per hour.

The display will continue to update as long as stable data is available. As previously described, the update rate is dependent on the value of Preset Average. If you have a problem getting stable data you should recheck the setting of the gain control and connection of the sensor to the timepiece. Look also for mechanical problems in the movement or other sources of extraneous noise. Be sure that you have a steady, even flashing of the LED.

The basic idea behind timing is simple; adjust the present rate of the timepiece until it matches the correct rate. This assumes the repairman knows the correct rate, either from tables or by direct calculation. A booklet of train tables and sample calculations is provided with your timer.

If neither of these methods is satisfactory there is an alternative originally described to us by Laurie Penman in Clockmakers Newsletter (203 John Glenn Ave., Reading, PA, Mr. Steven G. Conover, Editor). First measure and record the present train. Allow the clock to run for 24 hours, and record the error in seconds. The correct train may then be calculated with the following formula:

$$\text{CORRECT TRAIN} = \text{PRESENT TRAIN} / (1 + \text{ERROR}/86400)$$

Begin timing with a low Preset Average, increasing it as the numbers get close to the ideal value. Final readings should always be made with a Preset Average equal to a multiple of twice the escape wheel teeth. Example: with a 15 tooth escape wheel, make the final measurements using a Preset Average of 30. Even with a high Preset Average there will still be some variation in the displayed results, so take several readings and confirm consistent results.



## Setting the GAIN

The Model 185 is designed to be universally applicable to all mechanical clocks. A GAIN control is provided to compensate for the wide diversity of sound complexes these timepieces can produce. Gain is actually an electrical engineering term that refers to the amount of amplification. To the left of the display is a red LED which aids in proper gain adjustment. Each time a tick is detected the LED blinks on for about 1/10 of a second. Setting the gain is a simple matter of rotating the Gain control until the LED flashes exactly once for each and every tick. Clockwise rotation results in higher gain and higher susceptibility to stray noise. Counterclockwise rotation provides less gain and more chance that you could miss a weak tick. For most clocks the final setting will be near the low end of the gain adjustment range.

Because the pickup is actually a specialized vibration sensor, timing should be performed in a quiet, vibration-free environment. If possible, the movement should be acoustically isolated from its surroundings. For example, a clock on a wooden bench may pick up vibration produced by moving a chair along the floor. A felt pad between the bench and the clock would greatly reduce the potential problem.

### Setting the Preset Average

The Preset Average is the number of ticks that the timer groups together in train calculations. For example, with a Preset Average of 30, the timer bases its calculations on groups of 30 ticks. Preset Average is an important timing parameter which must be applied properly for accurate results. When setting Preset Average there are three basic factors to consider:

The first is cyclic variation due to the irregularity of escape wheel teeth. No mechanical part is absolutely perfect, and the escape wheel of a clock is no exception. There will be variations in both tooth size and spacing, especially on older clocks. These cyclic errors can be eliminated timing over exactly one (or more) complete revolutions of the escape wheel. Since each tooth produces two beats, one as it enters the verge and another as it exits, choose a Preset Average that is an integral multiple of twice the number of teeth on the escape wheel. For

## Autoranging

To make the most of the available 4 1/2 digit display the Model 185 will automatically select one of two available timing ranges. Most clocks have trains in the normal range, extending from 2000 to 19,999 beats per hour. For trains below 2000, the unit will switch to the long timing range, with an extra decimal point of resolution. No operator intervention is required, when you see the decimal point you will know that the unit has changed ranges.

Any time a movement is detected that is outside the range of timer (i.e. more than 19,999 beats per hour) the display will show E-or, indicating Error-out of range.

### Timing Range Summary

RATE	< 60	60.0 to 1999.9	2000 to 19,999	> 20,000
RANGE	out of range			out of range
DISPLAY	---	decimal point	no decimal point	E-or

### Warranty

The Adams Brown Company, Inc. (Adams Brown) warrants the Timetrax Model 185 to be free from defects in materials and workmanship at the time of manufacture and to operate normally for a period of one year from the date of purchase. For the stated period following the date of purchase, Adams Brown Company, Inc. will repair or replace, at their option, any defective parts without charge for parts or labor if the defective unit is delivered postage prepaid to Adams Brown Company, Inc., Box 357, Cranbury, NJ 08512. This warranty is subject to the following qualifications:

- The warranty registration card must be returned within ten days of purchase. If the card is not returned then no warranty work will be performed without a copy of the dated sales receipt showing unit serial number.
- The unit must be handled and stored normally. Adams Brown has no responsibility for Timetrax timers subjected to physical, electrical, or thermal abuse, or damaged by accident or negligence.
- Adams Brown is not responsible for timers that have been opened or tampered with in any way.
- This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.
- There are no other warranties expressed or implied. Adams Brown Co., Inc. will not be liable under any circumstances for consequential damage.
- The warranty applies to the original purchaser and is not transferrable.

Adams Brown manufactures only the Timetrax instruments and sensors, and NOT the clocks watches, chronometers or mechanical movements used with Timetrax instruments and/or sensors. Adams Brown is not responsible for, and this warranty does not cover the clocks, watches, chronometers or mechanical movements used with the Timetrax instruments and/or sensors, or any loss, damage, or injury arising out of the Timetrax instrument

### Repair Information

There are no user-serviceable parts inside the Timetrax unit. If your unit has failed within the warranty period **DO NOT OPEN THE UNIT OR ATTEMPT TO REPAIR IT.** Doing so will void your warranty.

Units requiring repair after the warranty period may be returned postage prepaid to Adams Brown Company, Box 357, Cranbury, NJ 08512. Units should be reshipped in the original shipping container, if possible, along with the sensor and any other accessories. Adams Brown will advise on the cost of the repair before performing any work.

### Calibration

Timetrax Model 185 requires periodic calibration for best results. The recommended interval is two years. Units requiring calibration may be returned postage prepaid to Adams Brown Company, Box 357, Cranbury, NJ 08512. There is a fixed charge of \$35.00 (US) for this service, which includes return shipping. Units returned for calibration will be inspected, and minor repairs will be made at no additional charge.



**Technical Specifications: Timetrax Model 185 Timer**

**Display:** 4 1/2 digit high contrast Liquid Crystal Display  
**Power Source:** 9 volt alkaline battery, 30 hour life  
AC line power (wall pack) optional  
**Monitor, visual:** bright flashing LED with each tick detected  
**Monitor, audio:** built in beat amplifier  
**Speaker:** 2 1/4 inch wide range dynamic, alnico magnet  
**Amplifier:** High impedance wide range, 100:1 variable gain  
**Processor:** 8 bit CMOS  
**Internal Resolution:** 1 microsecond (10 E-08 second)  
**Timebase, type:** quartz crystal, factory adjustable  
**Timebase, stability:** +/- 50 ppm 0 to 50 degrees C  
+/- 10 ppm 0 to 50 degrees C optional  
**Timing:** Double-Rate (two equal spaced readings per cycle)  
**Timing Ranges:** normal range: 2000 to 19,999 BPH  
low range: 60.0 to 1999.9 BPH  
**Balance Mode:** relative reading of beat error  
**Preset Average:** 2 to 130 in steps of 2  
**Warranty:** 1 year, parts and labor

**Specifications: Timetrax Model 20 Clip-on Sensor**

**Type:** passive  
**Impedance:** 7000 pF  
**Weight:** 1.5 ounces  
**Cable:** 72 inches w/3.5 mm (1/8") mini plug

All specifications, including price, subject to change at any time without notice.