GENERAL®

COMBINATION CONTACT/ NON CONTACT LASER TACHOMETER

USER'S MANUAL

PCT2236B

Please read this manual carefully and thoroughly before using this product.

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INTRODUCTION

Thank you for purchasing General Tools & Instruments' PCT2236B Combination Contact/Non-Contact Laser Tachometer. Please read this user's manual carefully and thoroughly before using the instrument.

The PCT2236B is a general-purpose instrument that can measure the rotational speed of a motor's or generator's spinning shaft using either a contact or non-contact technique. In non-contact measurement mode, the instrument bounces a laser beam off a piece of reflective tape that has been affixed to the shaft and uses an integrated photocell to count the number of reflections produced per minute. In contact measurement mode, the instrument uses dedicated fittings that measure the speed of the shaft by rotating along with it. In contact mode, the PCT2236B also can measure the linear speed of a moving surface (such as a conveyor belt or the circumference of a wheel) and the dimensions of stationary objects.

In both operating modes, measurements are displayed in real time on a 0.7 in. (18mm) high backlit liquid-crystal display and stored in memory. Up to 96 measurements of rpm or linear speed can be stored, indexed and recalled, along with the last value, the minimum value and the maximum value of a series. In non-contact mode, the tachometer can measure the speeds of shafts spinning at up to 99,999 rpm. In contact mode, the instrument can measure rotational speeds from 0 to 20,000 rpm, linear speeds from 5cm/min (2 in./min) to 2km/min (6,562 ft./min), and lengths from 5cm to 10km (2 in. to 6.2 miles).

The PCT2236B is powered by four "AA" batteries (included) or an optional 6V AC/DC adapter.

KEY FEATURES

- Measures rotational speeds using contact or non-contact technique
- Autoranging is automatic
- Includes fittings for measuring the speed of a rotating shaft and the linear speed of a conveyor
- Wide measurement range and high resolution
- Backlit 0.7 in. (18mm) high display supports work in low light
- Stores and indexes up to 96 measurements
- Memorizes the last, minimum and maximum values of a series of measurements
- Also measures any dimension of a stationary object, in meters
- One-handed operation
- Auto power off function extends battery life

SAFETY INSTRUCTIONS

Spinning shafts and fast-moving conveyor belts can be dangerous. When using the tachometer, take care not to let your fingers, hands, hair or clothing make contact with moving parts.

LASER WARNING NOTE!

Do not point laser directly at eye.
Use caution around reflective surfaces.
Keep out of reach of children.

WHAT'S IN THE CASE

The PCT2236B comes fully assembled in a carrying case along with the following accessories (see Figure 1):

- Three rubber fittings—called **rpm adapters**—for making contact with the end of a rotating shaft of a motor or generator. Two have cone-shaped rubber tips that fit into a hollowed (concave) end of a metal shaft; one (B) has a large cone compatible with a 1/2 in. diameter shaft, the other (J) has a smaller cone that fits into shafts 1/4 in. across. The third (K) fitting has its own hollowed end; it is designed to fit over a 1/4 in. diameter shaft with a flat or slightly convex end.
- One rubber/plastic fitting (the surface speed wheel A) for making contact with a surface in linear motion. The surface speed wheel has a 1/8 in. slot into which moving wire, cable or rope fits snugly.
- Three 24 in. (6mm) long strips of 1/2 in. (12mm) wide adhesive reflective tape
- Three spare Phillips head screws
- Four “AA” batteries
- This user’s manual

Fig. 1

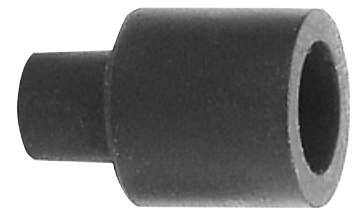
(B)

1/2" RUBBER RPM ADAPTER INSERTED IN BLACK PLASTIC SLEEVE

(A)

SURFACE SPEED WHEEL

(K)



RPM ADAPTER WITH HOLLOWED END FOR 1/4" DIAMETER SHAFTS WITH FLAT OR CONVEX END

(J)

1/4" RUBBER RPM ADAPTER

PRODUCT OVERVIEW

Figure 2 shows all of the controls and indicators and other physical features of the PCT2236B. Familiarize yourself with their names and locations before continuing.

A. Surface Speed Wheel
B. 1/2" Rubber RPM Adapter (shown inserted in plastic sleeve)
C. Tachometer Shaft
D. **Measurement** Button (on right side)
E. Function Switch, labeled "**m, m/min, rpm**"
F. **MEM** Button
G. Display Window
H. Battery Compartment Cover (in back)
I. Jack for 6-V AC/DC Adapter (on left side)
J. 1/4" Rubber RPM Adapter
K. 1/4" Rubber RPM Adapter with hollowed end
L. Refelctive Tape (on spinning motor or generator shaft)
M. Reflected Laser Light (to internal photosensor)

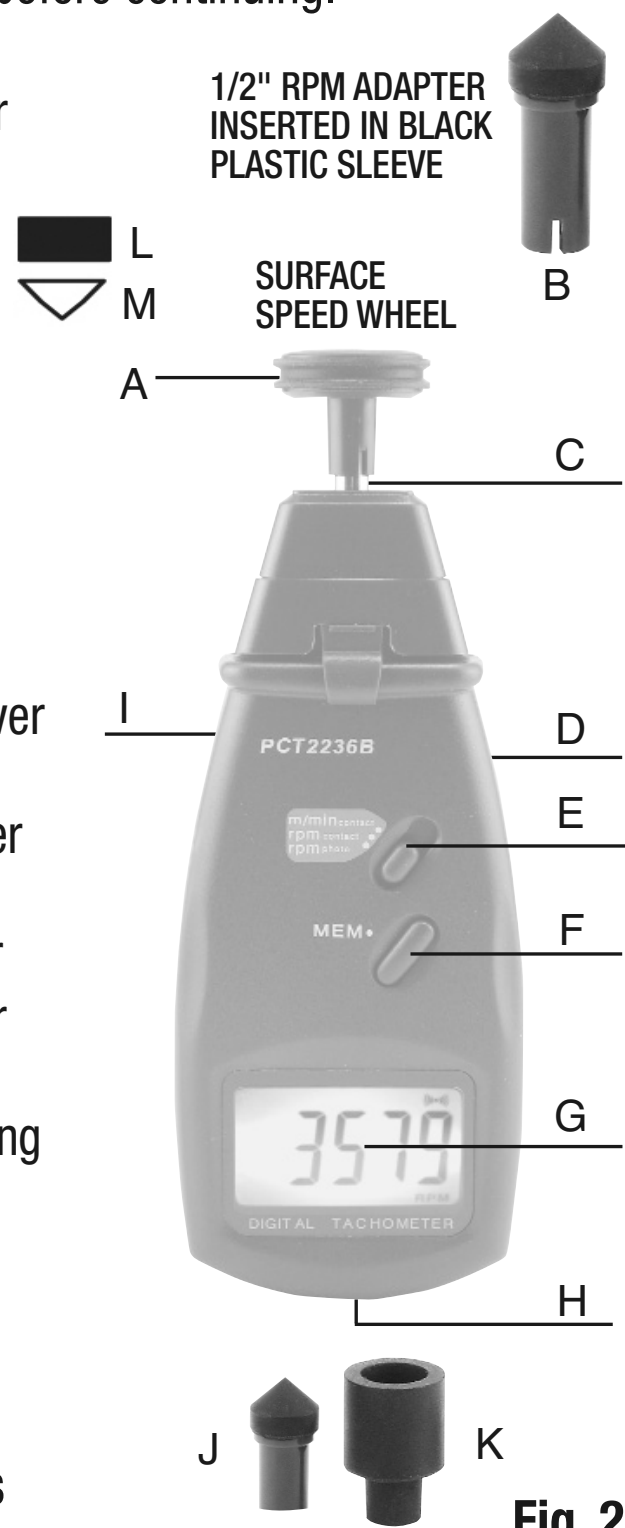


Fig. 2. The PCT2236B's controls and indicators and other physical features

Fig. 2

SETUP INSTRUCTIONS

INSTALL BATTERIES

To gain access to the battery compartment, remove the Phillips head screw securing its cover in the back of the instrument (callout H of Fig. 2). Slide the cover down and away from the unit. Then install four "AA" batteries in the correct orientation, using the polarity marks on the inside of the compartment as a guide. Don't forget to install the batteries over the ribbon, which makes it easier to remove them later. Replace the battery compartment cover, tucking the end of the ribbon under it, and secure it with the Phillips head screw.

OPERATING INSTRUCTIONS

SIMULATE MAKING, STORING AND RECALLING RPM MEASUREMENTS IN CONTACT MODE

Before using the PCT2236B on actual equipment, General suggests that you familiarize yourself with the way the instrument measures, stores and recalls speeds by spinning the tachometer's shaft by hand. By simulating readings you can expect to see in practice, you will safely gain expertise that will save you time later.

To get started, make sure the black plastic sleeve (see Fig. 1 (B)) is installed on the tachometer's shaft (callout C of Fig. 2), with the slot of the sleeve over the shaft's metal pin. Cradle the tachometer in your right hand. Move the function switch (callout E of Fig. 2) to either the "**m/min**" or "**rpm**" position. Then press the **Measurement** button on the right side of the instrument (callout D of Fig. 2) with your right

thumb. Note that this illuminates the display window. The display should show "**0**", either with the letters "**rpm**" directly below it or with the letters "**m/min**" below it to the left, depending on the position of the function switch.

To simulate a speed measurement, keep the tachometer cradled in your right hand and spin its shaft by "flicking" it with the middle two fingers on your left hand while pressing the **Measurement** button with your right thumb. Note how the display tracks the force of your flicks, and also how the instrument powers off whenever the **Measurement** button if released (this "dead man switch" feature extends battery life considerably).

To simulate storing measurements, keep the **Measurement** button depressed with your right thumb while you make three simulated speed measurements, as follows:

- Flick the shaft with your left index finger once. Store the displayed reading by pressing the **MEM** button with your left thumb.
- Flick the shaft again to make another simulated measurement. Store this reading by pressing the **MEM** button again.
- Flick the shaft a third time and store the third reading as well by pressing the **MEM** button.

After simulating and storing three measurements, release the **Measurement** button and do not press it again until instructed to.

To simulate recalling stored measurements, press the **MEM** button once and hold it. This illuminates the display, which now shows the highest of the three readings you have just stored. Note that if you continue holding the **MEM** button, the display alternates between showing the highest value and the letters "**UP**", signifying the maximum speed.

Also note that releasing the **MEM** button powers off the display and the instrument.

Now press the **MEM** button twice and hold it. This again illuminates the display, but now it shows the last reading you stored, indicated by and alternating with the letters "**LA**".

Finally, press the **MEM** button three times and hold it. This retrieves the slowest of the three speeds you measured and stored. This value is shown alternating with the letters "**dn**", signifying the minimum speed.

To try out other memory-related features, you can now press the **Measurement** button on the right side. Now press the **MEM** button once, twice and three times (holding it in each time) and note from the display that all three of your stored measurements have been erased (indicated by "**0.0**" readings for **UP**, **dn** and **LA**). You can confirm this by pressing and holding the **MEM** button until the display begins counting down from 20. When the count reaches 0, the display immediately switches to showing the letters "**AN**" on the left side and a number (in this case, "**0**") on the right. (The letters "**AN**" are an abbreviation for the Ancient Greek word for "recall.")

To complete this simulation exercise and put your new expertise to the test, make and store a set of five simulated measurements by hand-spinning the tachometer's shaft and using the **MEM** button. Then, remembering not to press the **Measurement** button, press and hold the **MEM** button as many times as needed to make the display go into countdown mode.

Note that because you have stored five measurements, the display will read "**AN 5**" once the countdown reaches zero. If you release the **MEM** button and then press and hold it again, the display will first read "**1**" and then the value of the first of the five measurements you stored. If you release the **MEM** button and then press and hold it again, the display will then show "**2**", followed by the value of your second measurement. Release, press and hold again, and the display will show "**3**", followed by the value of your third measurement. By repeating this sequence, you can retrieve up to 96 measurements in the order in which they were stored. Once all of the stored measurements have been displayed, the tachometer will return to the mode in which pressing the **MEM** button once, twice or three times calls up the minimum, maximum and last values of the set of measurements you have stored.

With this simulated experience under your belt, you can now confidently measure the rotational speed of a spinning motor or generator shaft, or the linear speed of virtually any conveyor belt.

MEASURING ROTATING SPEEDS IN CONTACT MODE

To measure the speed of a rotating shaft, first make sure that the black plastic sleeve (see Fig. 1 (B)) is installed on the tachometer's shaft (callout C of Fig. 2), with the slot of the sleeve over the shaft's metal pin. To measure the speed of a motor's or generator's shaft with a hollowed (concave) end, determine which of the two supplied cone-tipped rpm adapters (see Fig. 1) fits more snugly in the hollow. Push the flat end of that adapter into the end of the plastic sleeve. Then slide the function switch on the front panel (callout E of Fig.2) to the "**rpm**" position.

Cradle the tachometer in your right hand. While pressing the **Measurement** button on the right side of the instrument with your right thumb, gently push the cone-tipped end of the rpm adapter into the cavity at the end of the spinning motor or generator shaft whose speed you wish to measure. Take care to keep the two shafts aligned. When the displayed reading has stabilized, and while keeping the **Measurement** button depressed with your right thumb, press the **MEM** button on the front panel with your left thumb to store the measurement. Make and store as many measurements as you wish, using the lessons learned during the simulation exercise.

If the end of the shaft whose speed you want to measure is flat or slightly convex and has a diameter of 0.25 in, locate the rubber fitting with a 1/4 in. diameter hole at its wider end. Insert the narrow end of this fitting into the black plastic sleeve on the instrument's shaft. Make sure the function switch is set to "**rpm**". Then, while cradling the tachometer in your right hand, carefully push the other end of the fitting

around the end of the motor or generator shaft. Take care to line up the shafts of the equipment and the tachometer. Using the **Measurement** and **MEM** buttons, make and store as many readings of rotational speed as you wish.

MEASURING LINEAR SPEEDS

To measure the linear speed of a conveyor belt, remove the plastic sleeve and any rubber fitting inserted in it from the tachometer's metal shaft. Locate the surface speed wheel and install it on the tachometer's shaft, sliding the slot in the wheel's stem over the tachometer shaft's metal pin.

Set the function switch to the "**m/min**" position. Then, cradling the tachometer in your right hand, press the edge of the surface wheel against the moving object whose linear speed you wish to measure. Note that the circumference of the wheel has a 1/8-in.-wide slot into which wire, cable or rope of that diameter fits snugly.

Taking care to keep the tachometer perpendicular to the moving conveyor, use the function and **MEM** buttons to make and store as many measurements of linear speed as you wish. Linear speed measurements of moving objects obtained by placing them in contact with the outer diameter of the surface speed measurements are accurate as displayed. However, to compensate for the smaller inner diameter of the wheel within its slot, measurements made by placing wire, cable or rope within the slot should be multiplied by 0.9.

MEASURING SURFACE DIMENSIONS

The PCT2236B can also serve as a metric ruler. To operate it in that mode, move the function switch to the "**m**" position and

install the surface speed wheel directly onto the instrument's metal shaft.

Cradling the tachometer in your right hand and pressing and holding the **Measurement** button, roll the wheel across the length, width or depth of the object you wish to measure. The displayed value represents the dimension measured, in meters. Measurements made in this mode of operation cannot be stored, and disappear from the display when the **Measurement** button is released.

MAKING RPM MEASUREMENTS IN NON-CONTACT MODE

To use the PCT2236B to make non-contact rpm measurements, you must first remove the black plastic housing at the top of the instrument that covers the laser light source and lens.

To prepare to remove the housing, first remove the black plastic sleeve and any rpm adapter attached to it (callout B of Fig. 2) from the tachometer's shaft (callout C). Then remove the Phillips head screw securing the housing via a flange to the back of the tachometer. Next, carefully lift both plastic flanges (front and back) that keep the housing in place. Once you have unsnapped the housing, pull it up and over the tachometer's shaft and place it to one side. Note that when you now press the **Measurement** button, a red laser light shines out of the top of the PCT2236B.

Caution: The Phillips head screws securing both the housing and the battery compartment cover are not equipped with retainers, so they are easy to lose. The PCT2236B includes three spare screws designed to serve both purposes.

To measure the rotational speed of a motor/generator shaft:

1. **Identify the target.** Determine whether there is a larger surface to measure than the shaft itself. If something with a larger diameter (for example, a fan or a wheel of any type) is attached to the shaft, use any flat part of its surface as the measurement target instead.
2. **Prepare the target.** Either unplug the generator/motor or make sure that it cannot be turned on remotely or turn on automatically. Scrape the target area clean enough so a piece of tape will stick to it. If the target area is naturally reflective, cover it with black tape or paint.
3. **Attach reflective tape to the target.** Cut a 1/2 in. square piece of reflective tape, remove its backing, and apply it to the target area.
4. **Make the measurement.** Turn on the motor or generator. Cradling the tachometer in your right hand, move it as close to the shaft as possible, but no closer than 2 inches away. Position the instrument so its main axis is aligned with the end of the shaft. Using your right thumb, press the Measure button (callout 1-4) while shining the red laser beam on the reflective tape. Confirm that the tachometer is receiving a signal by checking that the (( )) Monitor Indicator icon flashes on the display each time the beam hits the moving tape. When the display reading stabilizes, release the Measure button.

TWO MEASUREMENT TIPS

1. **If your motor/generator's shaft spins slowly** (i.e., at less than 50 rpm), getting an accurate reading may require placing one or more additional squares of reflective tape on the target. Begin by adding a second square of tape on the circumference of the target 180º from the first square (at 6 o'clock relative to 12 o'clock). Then perform Step 4 above, but divide the display reading by two to account for the presence of the second square. If the result is still unsatisfactory, add another two pieces of tape at 3 o'clock and 9 o'clock and perform Step 4, but now divide the display reading by four.
2. **If bright ambient light is preventing the PCT2236B** from receiving the reflected beam, try shading the target.

STORING AND RECALLING RPM MEASUREMENTS IN NON-CONTACT MODE

To store and recall non-contact rpm measurements, use the same procedures for contact rpm measurements that you simulated beginning on p. 8.

As in contact measurement mode, in non-contact mode individual measurements or series of measurements can only be stored while the **Measurement** button is pressed and held. When the **Measurement** button is released, the contents of the instrument's memory are frozen. When the **Measurement** button is pressed again, the memory's contents are erased.

SPECIFICATIONS

Parameter	Specification— Contact Mode	Specification— Non-contact mode
Rotational Speed Measurement Range/Accuracy	0 to 20,000 rpm/±0.05% of reading plus one digit	2.5 to 99,999 rpm/±0.05% of reading plus one digit
Rotational Speed Measurement Resolution	0.1 rpm for readings below 999.9 rpm; 1 rpm for readings above 1,000 rpm	
Linear Speed Measurement Range	5cm/min (2 in./min) to 2km/min (6,562 ft./min)	N/A
Length Measurement Range	5cm to 10km (2 in. to 6.2 miles)	N/A
Detection Distance	N/A	5 to 50cm (2 to 20 in.)
Sampling Time	0.8 seconds at speeds over 60 rpm	
Memory Capacity	96 measurements	
Recallable Measurements	Maximum, minimum, last values	

SPECIFICATIONS (continued)

Parameter	Specification
Microcontroller	Single custom chip
Time Base	Quartz crystal
Display Type	5-digit yellow-green backlit liquid crystal
Display Height	0.7 in. (18mm)
Dimensions	8.27 x 2.91 x 1.18 in. (210 x 74 x 30mm)
Weight	7.76 oz. (220g), including batteries
Power Source	Four “AA” batteries
Current Consumption	65mADC
Operating Temperature Range	32º to 122ºF (0º to 50ºC) @ up to 80% relative humidity

MAINTENANCE TIPS

The PCT2236B requires no regular maintenance other than light cleaning of the housing and display with a soft, dry cloth.

When the text "**LO**" appears on the display, it's time to change the PCT2236B's four "AA" batteries because their total potential has fallen below 4.5 volts. To do so, follow the Setup Instructions on p. 7.

Remove the batteries whenever the instrument is expected to sit idle for an extended period of time (six months or more).

WARRANTY INFORMATION

General Tools & Instruments' (General's) PCT2236B Combination Contact/ Non-Contact Laser Tachometer is warranted to the original purchaser to be free from defects in material and workmanship for a period of one year. Subject to certain restrictions, General will repair or replace this instrument if, after examination, the company determines it to be defective in material or workmanship.

This warranty does not apply to damages that General determines to be from an attempted repair by non-authorized personnel or misuse, alterations, normal wear and tear, or accidental damage. The defective unit must be returned to General Tools & Instruments or to a General-authorized service center, freight prepaid and insured.

Acceptance of the exclusive repair and replacement remedies described herein is a condition of the contract for purchase of this product. In no event shall General be liable for any incidental, special, consequential or punitive damages,

or for any cost, attorneys' fees, expenses, or losses alleged to be a consequence of any damage due to failure of, or defect in this product including, but not limited to, any claims for loss of profits.

RETURN FOR REPAIR POLICY

Every effort has been made to provide you with a reliable product of superior quality. However, in the event your instrument requires repair, please contact our Customer Service to obtain an RGA (Return Goods Authorization) number before forwarding the unit via prepaid freight to the attention of our Service Center at this address:

General Tools & Instruments
80 White Street
New York, NY 10013
212-431-6100

Remember to include a copy of your proof of purchase, your return address, and your phone number and/or e-mail address.

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