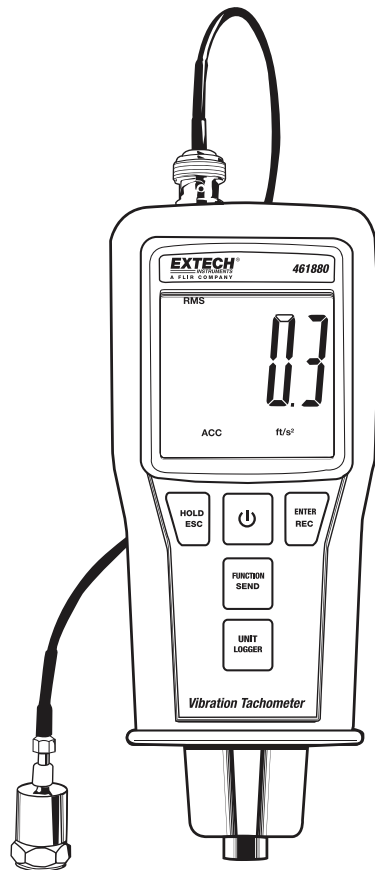




## User's Guide

# Vibration Meter and Laser Combination Tachometer

Model 461880



## ***Introduction***

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Congratulations on your purchase of the Extech 461880 Vibration Meter and Combination Laser Tachometer. The 461880 Vibration functions have a frequency sensitivity that meets ISO-2954, and measure Acceleration, Velocity and Displacement.

A 1000 point datalogger allows recording of data for download to a pc with included software. The Tachometer functions provide contact RPM and Linear Surface Speed, as well as non-contact RPM measurements. The 461880 is shipped fully tested and calibrated and, with proper use and care, will provide years of reliable service.

## ***Features***

### ***Vibration Function Features:***

- Measures Acceleration from 0.5 to 199.9 m/s<sup>2</sup>, 0.05 to 20.39 G or 2 to 656 ft/s<sup>2</sup>
- Measures Velocity from 0.5 to 199.9mm/s, 0.05 to 19.99 cm/s or 0.02 to 7.87 in/s
- Measures Displacement from 0.005 to 1.999 mm or 0.002 to 0.078 inches
- RMS measurements for Acceleration and Velocity
- Peak to Peak measurements for Displacement
- Peak function for Acceleration and Velocity
- Max Hold function for Acceleration (Peak), Velocity (Peak) and Displacement (Peak to Peak)
- Frequency range from 10 Hz to 1 kHz meets ISO 2954 standards
- Zero function
- 1000 point datalogger with adjustable sample rate
- Hold function freezes measured value on display
- MAX/MIN function to record maximum and minimum measured values
- Auto Power-Off conserves battery power
- Separate vibration sensor with magnetic mount included

### ***Tachometer Function Features:***

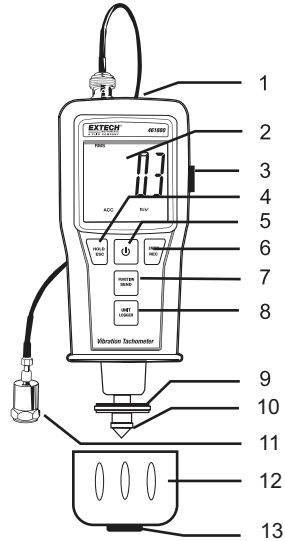
- Photo and Contact Tachometer functions
- Laser light source with long measuring distance, up to 1.5 meters (4.9 feet)
- Wide measurement range from 0.5 to 100,000 RPM
- 0.1 RPM resolution, <1000 RPM, 1 RPM resolution ≥1000 RPM
- Memory function with recall saved MAX, Min and Last Reading values
- Microprocessor with crystal time base provides 0.05% accuracy

### ***General Features:***

- Large LCD display
- Low Battery indicator
- High Performance microprocessor based circuitry
- Compact Heavy Duty housing
- Hard Carrying case

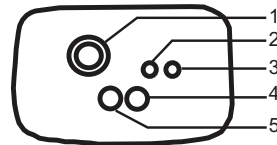
## Meter Description

1. Meter Top (see Meter Top Callout below)
2. LCD display
3. Tachometer Function pushbutton
4. HOLD/ESCAPE pushbutton
5. Power pushbutton
6. ENTER/RECORD pushbutton
7. FUNCTION/SEND pushbutton
8. UNIT/LOGGER pushbutton
9. Contact Tachometer Surface Speed wheel
10. Contact Tachometer RPM adapter
11. Velocity Sensor and Magnetic Mount
12. Contact Tachometer Protective Cover
13. Access Screw for Protective Cover

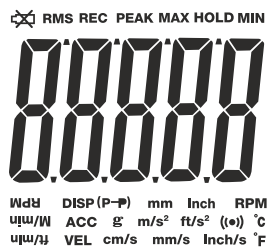


### Meter Top

1. BNC Connector
2. IR Temperature probe input (feature not supported)
3. RS232 Output Terminal
4. Photo Tachometer Laser Detector
5. Photo Tachometer Laser Light source



### Meter LCD Display

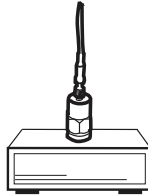


## ***Vibration Meter Operation***

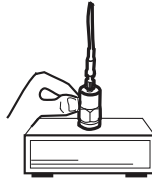
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### **Connecting Probe**

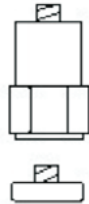
1. Note that this meter accepts only the supplied vibration probe.
2. Plug the BNC connector end of the probe cable onto the BNC connector at the top of the meter.
3. The probe can then be connected to the tested machinery in three ways:
  - a. Attach the magnetic end of the probe to a ferrous material on the equipment under test.



- b. Manually hold the probe in place against the equipment under test.



- c. Unscrew the magnet from the probe end and use the threaded mount to connect to a screw, bolt, or stud on the equipment under test.



### Powering the meter

1. Press the **POWER** key once to power the meter On. The meter will perform a short self-test.
2. Press and hold the **POWER** key to power the unit Off. The unit will beep and display OFF.

### Selecting Units

1. The unit powers on in Acceleration mode and in the units last used.
2. Use the UNIT/LOGGER key to scroll through the other available functions/units.  
(Acc, Vel, Disp)
3. To change displayed units (Metric or Imperial), press and hold the **UNIT/LOGGER** key for 2 seconds.

### RMS, PEAK, PEAK MAX HOLD, MAX HOLD

Press the **FUNCTION/SEND** key to select RMS, PEAK, or PEAK MAX HOLD (ACC and VEL); or PEAK or MAX-HOLD (DISP).

1. RMS - Typical selection for vibration measurements. (PEAK to PEAK for Displacement)
2. PEAK – For measurement of the peak value. Not available in the Displacement mode.
3. PEAK MAX HOLD – Holds and displays the maximum value. The display will update only when a new maximum is measured. Not available in the Displacement mode.
4. MAX HOLD – Holds and displays the maximum Peak to Peak value. Available in Displacement mode only.
5. To clear the MAX HOLD or PEAK MAX HOLD values, press the **HOLD/ESCAPE** key for more than 2 seconds. This will zero the display and restart the MAX HOLD or PEAK MAX HOLD function.

### DATA HOLD

To freeze the LCD display, momentarily press the **HOLD/ESC** key. The HOLD icon will appear on the upper right-hand corner of the LCD. Momentarily press the **HOLD/ESC** key again to return to normal operation (the HOLD' hold icon will disappear).

### MAX/MIN Record Function

1. Press the **REC** key to enter the MAX/MIN record mode. The REC icon will appear on the display. Subsequent presses of the Record key will select the Max or MIN record mode. Press and hold the **RECORD** key for more than 2 seconds.
2. To delete the MAX/MIN recorded values, press the **HOLD** button while the MAX/MIN value to be erased is on the display. The value will be erased and the MAX or MIN icon will disappear. The unit will remain in Record mode until the **REC** key is held for more than 2 seconds.

### ZERO Adjustment Procedure

The meter may not indicate zero with no signal applied to the meter (no vibration). Although this is usually not a problem, this procedure will bring the meter within a few digits of zero and improve measurement precision.

1. Connect the vibration sensor to the meter.
2. Turn the meter on and set the function to ACC and RMS.
3. Make sure the vibration sensor is perfectly still (no vibration).
4. Press and hold the **HOLD/ESC** key for > 2 seconds to allow the display to reach the zero value.

### Advanced Vibration Functions

The Advanced Functions Menu allows adjustment for the Auto-Power Off feature and Datalogging Sample Rate, as well as access to Memory status, and to Clear memory

1. Press and hold the **HOLD/ESC** key while powering the unit ON.  
Repeated presses of the **HOLD/ESC** key will scroll through the available functions:  
OFF – Auto-Power Off  
SEC – Datalogger Sample Rate  
Cnt – Number of data points available in memory  
CLr – Clear Datalogger Memory  
ESC – Exits the Advanced Functions Menu
2. Press the **HOLD** key to select the OFF function. Use the **FUNCTION/SEND** key or **UNIT/LOGGER** key to toggle the setting between “0” and “1”. “0” disables the Auto-Power Off function. “1” enables the function. Press the **ENTER** key to save the setting.
3. Press the **HOLD/ESC** key to select the SEC function. Use the **FUNCTION/SEND** key or **UNIT/LOGGER** key to scroll through the available sample rates: 0, 1, 2, 10, 30, 60, 600, 1800, or 3600 seconds. Press the **ENTER** key to save the setting.
4. Press the **HOLD/ESC** key to select the Cnt function. The display will flash the available Memory points available in the datalogger.
5. Press the **HOLD/ESC** key to select the CLr function. Use the **FUNCTION/SEND** key or **UNIT/LOGGER** key to toggle the setting between “0” and “1”. Select “1” to clear the datalogger memory. Select “0” to retain the data in memory. Press the **ENTER** key to execute.
6. Press the **HOLD/ESC** key to select the ESC function. Press the **HOLD/ESC** key again to exit the Advanced Functions menu. The meter will power OFF.

## Tachometer Operation

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### Safety

**WARNING:** Do not directly view or direct the laser pointer at an eye. Low power visible lasers do not normally present a hazard, but may present some potential for hazard if viewed directly for extended periods of time.



### Reversible LCD Display

The meter display indicates Photo Tachometer measurements in one direction and Contact measurements in the opposite direction. This permits the user to easily read the measurement digits in both measurement modes with the meter held in either direction.

### Selecting Function and Units

With the meter OFF, Press and hold the Tachometer Function pushbutton on the right side of the 461880. Repeated presses of the **FUNCTION/SEND** key will scroll through the available modes:

- RPM – Contact RPM measurement.
- M/min – Surface speed - Meters per Minute measurement.
- Ft/min – Surface Speed - Feet per Minute measurement.
- RPM – Non-contact RPM measurement.

### NON-CONTACT PHOTO TACHOMETER MEASUREMENTS

1. Apply an appropriately sized square piece of reflective tape to the surface of the object under test.
2. With the meter OFF, point the laser pointer end of the meter toward the device under test.
3. Press and hold the Tachometer Function Pushbutton (located on the right side of the meter). Press the **FUNCTION/SEND** key to select the non contact RPM mode. Align the laser pointer beam with the reflective tape.
4. Verify that the ((●)) Monitor Indicator appears on the LCD when the object under test passes through the light beam.
5. If the measurement is under 50 RPM, apply additional squares of reflective tape. Divide the reading shown on the display by the number of pieces of reflective tape squares used to calculate the actual reading.
6. When the reading on the display stabilizes, note the reading.

**NOTE:** Bright ambient light may interfere with the reflected light beam. Shading the target area may be necessary in some cases.

**CAUTION:** Rotating objects can be dangerous. Use extreme care.

#### **CONTACT TACHOMETER RPM MEASUREMENTS**

1. Remove the Tachometer Protective Cover by loosening the screw and gently pulling the cap away from the unit.
2. Install one of the RPM contact tips (stored inside the Tachometer Protective Cover) on the contact shaft.
3. With the meter OFF, Press and hold the Tachometer Function Pushbutton (located on the right side of the meter). Press the **FUNCTION/SEND** key to select the contact RPM mode.
4. Lightly press the contact tip against the center of a rotating shaft.
5. When the reading on the display stabilizes, note the reading.

#### **CONTACT LINEAR SURFACE SPEED (ft/min or m/min) MEASUREMENTS**

1. Remove the Tachometer Protective Cover by loosening the screw and gently pulling the cap away from the unit.
2. With the meter OFF, Press and hold the Tachometer Function Pushbutton (located on the right side of the meter). Press the **FUNCTION/SEND** key to select one of the linear speed modes (M/min or ft/min).
3. Lightly press the linear speed wheel on the moving surface to be measured.
4. When the reading on the display stabilizes, note the reading.

#### **RECALLING CONTACT TACHOMETER READINGS**

To recall Contact Tachometer readings, press and hold the **ENTER/REC** key. Values are displayed in 3 modes:

- LA – Last reading displayed.
- UP – Maximum value recorded
- dn – Minimum value recorded

Repeatedly pressing and holding the **ENTER/REC** key will scroll through the 3 modes. The value will flash, alternating between the mode indicator and value.

## ***Datalogging (Vibration mode only)***

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The internal datalogger memory can hold up to 1000 readings. Readings can be logged manually, with a button press, or automatically, at a programmed sample rate.

### **Sample Rate**

The sample rate can be set to 0 (manual), 1, 2, ~~10~~, 30, 60, 600, 1800 or 3600 seconds. See the Advanced Vibration Functions section for instructions on setting the sample rate.

### **Auto Data Logging**

1. Set the desired sample rate as described (do not select '0').
2. Turn the meter off and back on.
3. Press the **REC** button to enter the datalogging function. The **REC** symbol will appear in the display (upper left-hand corner).
4. Press the **LOGGER** button to start logging data. ((•)) indicator will flash in time with the selected sample rate.
5. Press the **LOGGER** button to pause/resume datalogging.
6. Press and Hold the **REC** button > 2 seconds to exit the datalogging mode.

### **Manual Data Logging**

1. Set the sample rate to '0' as described earlier.
2. Turn the meter off and back on.
3. Press the **REC** to enter the datalogging function. The **REC** symbol will appear in the display flashing.
4. Press the **LOGGER** button.
5. Press **LOGGER** again to log one data point. The ((•)) indicator will flash and an audible tone will sound. Repeat this step to store the desired number of readings.
6. Press and Hold the **REC** button > 2 seconds to exit the datalogging mode.



You, as the end user, are legally bound (**Battery ordinance**) to return all used batteries and accumulators; **disposal in the household garbage is prohibited!**

You can hand over your used batteries / accumulators at collection points in your community or wherever batteries / accumulators are sold!

**Disposal:** Follow the valid legal stipulations in respect of the disposal of the device at the end of its lifecycle

## PC Interface

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The meter is equipped with an RS-232 serial data port (located at the top of the meter next to the probe input jack). This interface was designed to operate with the optional Extech 407001A software package, which includes two programs and the required meter to pc interface cable.

1. **407001A** - Extech Data Acquisition Software: This software allows the user to connect the meter to a PC and view readings in real-time as they are taken (this software does not download the contents of the meter's memory to the PC)
2. **DL2005** - Datalogger Download Software: This software allows the user to download the contents of the meter's memory to the PC

### Download Stored Data to PC (requires DL2005 software)

The **SEND** button is used to send the contents of the meter's internal datalogger memory to the PC via the optional DL2005 software.

1. Connect the RS-232 cable to the PC
2. Install and run the DL2005 data logging software.
3. Press and hold the **SEND** button for > 2 seconds. "r-232" will flash repeatedly in the display.
4. In the DL2005 software, press **START**.
5. Press the **SEND** button again and the data will be sent to the meter's RS-232 port and onto the connected PC.
6. Press the **ESC** button to return to normal operation.

## Specifications

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|                        |                                                                              |
|------------------------|------------------------------------------------------------------------------|
| Display                | Dual Display Multi-function LCD                                              |
| Sampling Time          | Approximately 1 second                                                       |
| Datalogger memory      | 1000 point memory                                                            |
| Datalogger Sample Time | 0 (manual), 1, 2, 10, 30, 60, 600, 1800 and 3600 sec.                        |
| Over range indication  | "OL" appears on the LCD                                                      |
| Open input indication  | "0" appears on the LCD                                                       |
| Low battery indication | Battery symbol appears on the LCD                                            |
| Power supply           | 4 x 1.5V AA Batteries                                                        |
| Power Consumption      | Vibration: approximately 10.5 mA<br>Tachometer: approximately 21 mA          |
| Auto-Power Off         | On/Off selectable                                                            |
| Operating Temperature  | 0 to 50°C (32 to 122°F)                                                      |
| Operating Humidity     | less than 80% RH                                                             |
| Storage Temperature    | -10 to 60°C (14 to 140°F)                                                    |
| Storage Humidity       | 10 to 80% RH                                                                 |
| Dimensions             | Meter: 188x75.5x46.8mm (7.4x3.0x1.8")<br>Probe: 18 mm diameter, 40 mm height |
| Weight                 | Meter: 397g (0.87 lbs)<br>Probe: 110g (0.24 lbs)                             |

### Vibration Functions

|                                | Range                                                 | Resolution          | Accuracy<br>(% of reading)      |
|--------------------------------|-------------------------------------------------------|---------------------|---------------------------------|
| Acceleration<br>(RMS or Peak)  | 0.5 to 199.9m/s <sup>2</sup>                          | 0.1m/s <sup>2</sup> | ±(5% + 2 digits)<br>@160HZ&80HZ |
|                                | 0.05 to 20.39G                                        | 0.01G               |                                 |
|                                | 2 to 656ft/s <sup>2</sup>                             | 1ft/s <sup>2</sup>  |                                 |
|                                | Acceleration Peak Range: 1.0 to 199.9m/s <sup>2</sup> |                     |                                 |
|                                | Calibration point: 50 m/s <sup>2</sup> @ 160Hz        |                     |                                 |
| Velocity<br>(RMS or Peak)      | 0.5 to 199.9mm/s                                      | 0.1mm/s             | ±(5% + 2 digits)<br>@160HZ&80HZ |
|                                | 0.05 to 19.99cm/s                                     | 0.01cm/s            |                                 |
|                                | 0.02 to 7.87in/s                                      | 0.01in/s            |                                 |
|                                | Velocity Peak Range: 1.0 to 199.9mm/s                 |                     |                                 |
|                                | Calibration point: 50mm/s @ 160Hz                     |                     |                                 |
| Displacement<br>(peak to peak) | 0.005 to 1.999mm                                      | 0.001mm             | ±(5% + 2 digits)<br>@160HZ&80HZ |
|                                | 0.002 to 0.078in                                      | 0.001in             |                                 |
|                                | Calibration point: 0.14mm @ 160Hz                     |                     |                                 |
| Frequency<br>Range             | 10 Hz to 1 kHz – meets ISO 2954                       |                     |                                 |

### Tachometer Functions

|                                     | Range                                                                                                                                                                                                                        | Resolution                                         | Accuracy (%rdg) |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------------|
| Photo Tachometer                    | 10 to 99,999 rpm                                                                                                                                                                                                             | 0.1 rpm (<1000rpm)<br>1 rpm (≥1000 rpm)            | ± (0.05% + 1d)  |
| Contact Tachometer                  | 0.5 to 19,999 rpm                                                                                                                                                                                                            | 0.1 rpm (<1000rpm)<br>1 rpm (≥1000 rpm)            |                 |
| Surface Speed                       | 0.2 to 6560 ft/min                                                                                                                                                                                                           | 0.1 ft/min (<1000ft/min)<br>1 ft/min (≥1000ft/min) | ± (1% + 1d)     |
| Surface Speed                       | 0.05 to 1999.9 m/min                                                                                                                                                                                                         | 0.01 m/min (<100m/min)<br>0.1 m/min (≥100 m/min)   |                 |
| Photo Tachometer Detecting Distance | 2 to 59" (50 to 1,500mm) typical*<br>* specified using a 10mm square of reflecting tape at 1,800rpm. The max and min detecting distance will change with environmental conditions, reflecting tape, or speeds above 1800rpm. |                                                    |                 |

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