MONARCH INSTRUMENT

*Instruction Manual*

# PLT200 - POCKET LASER TACH 200
## Tachometer/Rate Meter/Totalizer/Timer


CE NIST CALIBRATION

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Amherst, NH 03031 USA
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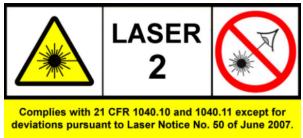
E-mail: support@monarchinstrument.com
Website: www.monarchinstrument.com

# SAFEGUARDS AND PRECAUTIONS




Diode Laser
Max. Output Power: **<1 milliwatt**
Wavelength: **650 nanometers (visible light)**
Beam Divergence: **<18 milliradian**
Output: **Continuous (CW)**
Laser Hazard Classification: **Class 2**

Laser Hazards
**Eye injury from beam** - Do not look into the direct or reflected beam; can cause eye injury up to 25 ft [7.5 m] away.

**Visual interference (glare) with pilots and drivers** - Interferes with vision up to 525 ft [160 m] away. Can be a distraction up to 1 mile [1.6 km] away. ***NEVER point any laser towards aircraft or vehicles; it is unsafe and illegal.***

**Safe Use Guidance:**
Class 2 lasers are considered safe for accidental eye exposure. Do not look or stare into beam. Do not aim at aircraft. ***This is not a toy.*** Always supervise children.

**Manufacturer:**
Monarch Instrument
15 Columbia Drive
Amherst, NH 03031 USA
Country of Origin: USA
Contact info: www.monarchinstrument.com

Read and follow all instructions in this manual carefully, and retain this manual for future reference.

Do not use this instrument in any manner inconsistent with these operating instructions or under any conditions that exceed the environmental specifications stated.

This instrument is not user serviceable. For technical assistance, contact the sales organization from which you purchased the product.

**In order to comply with EU Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE):** This product may contain material which could be hazardous to human health and the environment. DO NOT DISPOSE of this product as unsorted municipal waste. This product needs to be RECYCLED in accordance with local regulations; contact your local authorities for more information. This product may be returnable to your distributor for recycling; contact the distributor for details.

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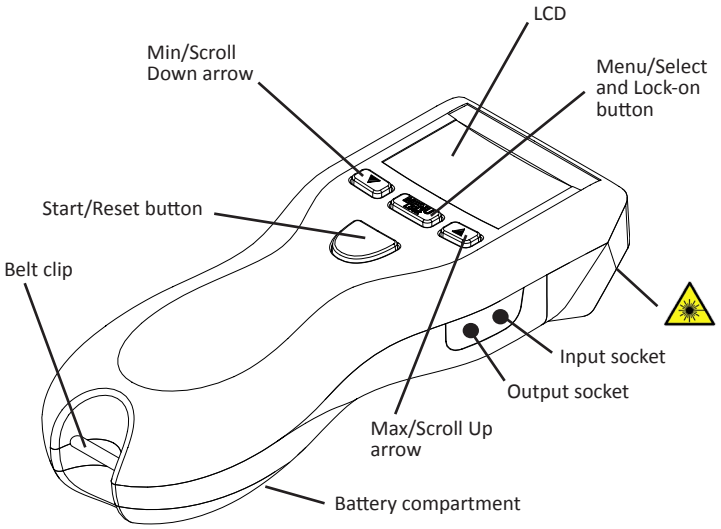
## 1.0 DESCRIPTION

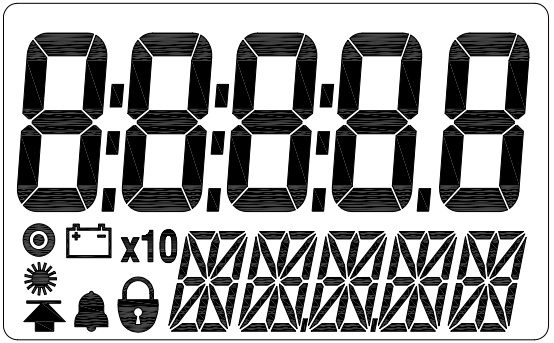
The Pocket Laser Tach 200 is a multifunction tachometer, ratemeter, totalizer and timer. It is programmable to read in English or metric units. An input socket accepts remote sensing devices and an output socket allows for pulse output to external indicating devices. The PLT200 can be tripod mounted and locked-on for accurate and continuous operation. This tachometer also stores minimum, maximum and last measurement in memory.

## 2.0 FEATURE LOCATIONS




**AVOID EXPOSURE**
**LASER BEAM IS EMITTED FROM THIS APERTURE**

## 3.0 LCD SYMBOLS




On-Target Indicator — blinks whenever there is an input signal and will appear to be solid on at higher frequencies

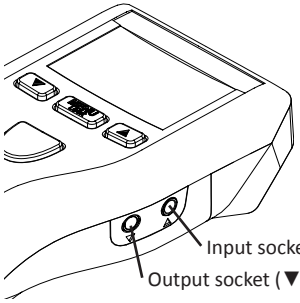
Low Battery icon — indicates that the batteries are low and need to be replaced.

x10 Times Ten icon — indicates that the value shown is ten times that which is displayed

**Laser Indicator — red laser is on when this indicator is illuminated**

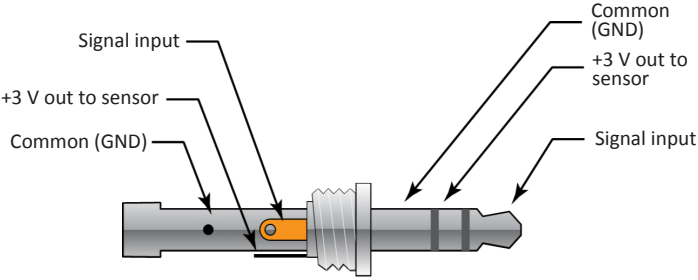
Lock icon — indicates that the unit is locked and making continuous measurements (Lock Mode)

## 4.0 INPUT/OUTPUT

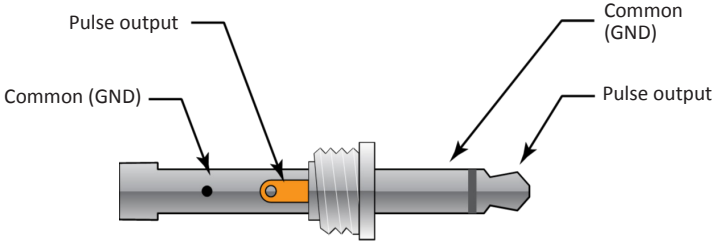



**Input:** Accepts remote sensor or Remote Contact Assembly (RCA)
*1/8" [3.5 mm] stereo phone plug*

**Output:** 1 pulse per revolution TTL output on internal operation; pulse repeater with external sensors
*1/8" [3.5 mm] mono phone plug*




***Input Connector Detail (stereo plug)***




***Output Connector Detail (mono plug)***

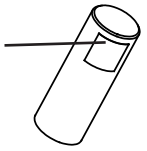
## 5.0 PREPARATION FOR MEASUREMENT

### 5.1 Noncontact Preparation

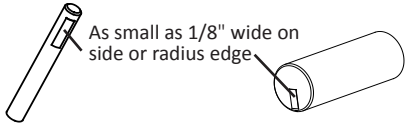
Follow the steps below for internal operation (red laser) or external operation using optional Remote Optical Sensor (ROS-Red LED):

**1.** Clean shaft.

**2.** Apply 1/2" square of T-5 Reflective tape.



For small shafts:

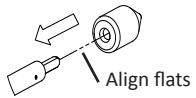



### 5.2 Direct Contact Preparation

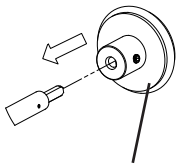
Follow external operation ONLY using optional Remote Contact Assembly (RCA):

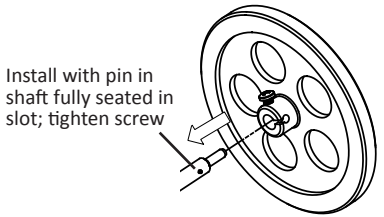
**Select and install contact option:**

**1.** Contact Tip (convex tip shown)
*Use concave tip for small shafts*

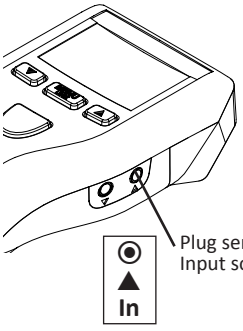



**2.** 10 cm Wheel **OR** **3.** 12 in. Wheel



## 5.3 Connecting External Sensors




Plug sensor into Input socket

Remote Contact Assembly (RCA)
(shown with optional 12-inch Wheel)

Remote Optical Sensor (ROS-P)

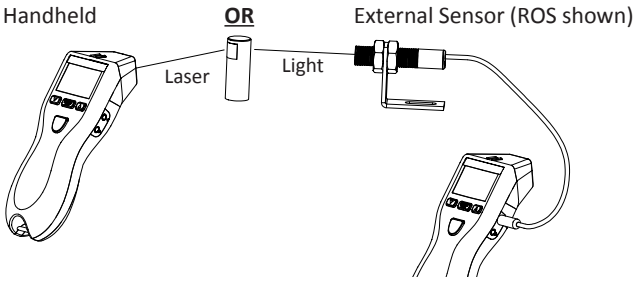
Infrared Sensor (IRS-P)

Magnetic Sensor with Amplifier (MT-190P)

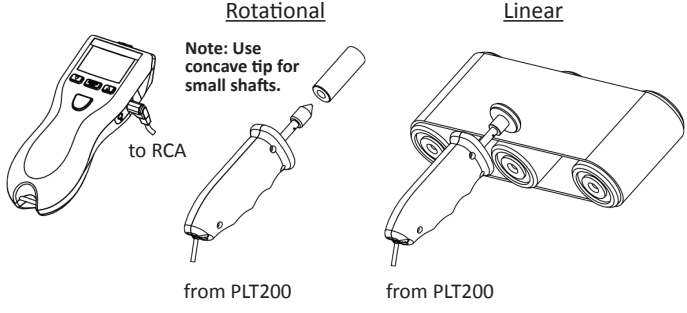
Please visit www.monarchinstrument.com for additional sensor options.

## 6.0 TAKING MEASUREMENTS

### 6.1 Noncontact Measurements




### 6.2 Direct Contact Measurements




**ONLY USE MODERATE PRESSURE**

**WARNING: Making measurements in direct contact with rotating equipment can be dangerous. Keep all loose clothing and hair away from exposed moving machinery. Keep the hand holding the instrument well behind the back end of the Remote Contact Assembly. Properly replace all machinery guards after completing measurement. Do not use for rotation greater than 20,000 RPM.**

## 7.0 TACHometer MODE

A tachometer measures speed or linear rate with respect to time; time intervals are seconds, minutes, or hours. Rotational speed can be measured in Revolutions (Revs) per second, per minute, or per hour. The most common measurement is RPM or Revs per minute using the optical Tachometer Mode.

### 7.1 TACHometer Setup

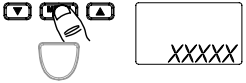
1. Turn Power ON


Last Units selected are displayed

1a. To toggle Lock On/Off

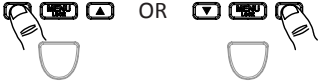

2. Enter Setup


3. Enter selection of Mode




Last mode selected is displayed

4. Select TACH Mode




Repeat until TACH displayed

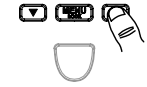
5. Save and advance

6. Enter selection of Units


RPS, RPM or RPH

7. Select Units

OR



Repeat until desired Units displayed

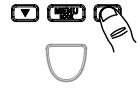
8. Save and advance


9. Enter selection of number of decimal places


NONE, 1, 2 or 3

10. Select decimal places

OR



Repeat until desired decimal places displayed

11. Save and advance


12. Exit Setup – ready to measure


DONE, then Units selected

The unit will remember these settings (including Lock On/Off) even if turned off then back on.

## 7.2 TACHometer Operation

Measure  OR 

Press and hold

Lock On

Recall Max  

Max speed

Recall Min  

Min speed

If unit Lock On 

Resets Max/Min

Power OFF 

OR Automatic after 90 seconds if unit not Locked On

## 8.0 RATE MODE

Measurement of units in addition to Revs requires the attachment of the Remote Contact Assembly and tips/wheels. With this attachment, the unit can measure RATE inputs-revs, inches, feet, yards, centimeters and meters either per second, per minute or per hour, as well as miles per hour.

**Note:** External Remote Contact Assembly (RCA) must be inserted into input socket.

## 8.1 RATE Setup

1. Turn Power ON


EXTRN, then scrolling message, then last Units selected

1a. To toggle Lock On/Off



Lock On

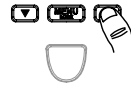
2. Enter Setup


3. Enter selection of Mode


Last mode selected is displayed

4. Select RATE Mode

OR



Toggles between RATE and TOTAL; select RATE

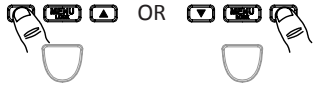
5. Save and advance


6. Enter selection of Units


Rotational: CRPS, CRPM or CRPH

Linear: IPS, IPM, IPH, FT/S, FT/M, FT/H, YPS, YPM, YPH, MPH, CM/S, CM/M, CM/H, M/SEC, M/M IN, M/H

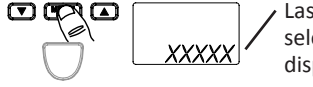
**RATE Setup (continued):**

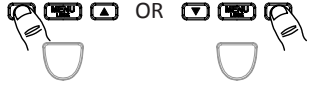
7. Select Units 

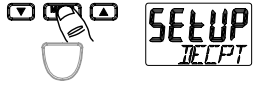

8. Save and advance 

Rotational Units Linear Units

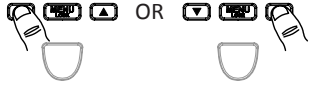
Only for Linear Units:

8a. Enter selection of Wheel 


8b. Select Wheel 


8c. Save and Advance 


9. Enter selection of number of decimal places 


10. Select decimal places 


11. Save and advance 

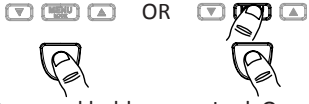
12. Exit Setup – ready to measure


or [Wheel selected], then Units selected

The unit will remember these settings (including Lock On/Off) even if turned off then back on.

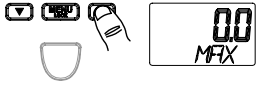
## 8.2 RATE Operation

Measure



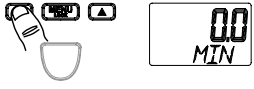

Press and hold  Lock On

Recall Max




Max Speed

Recall Min




Min Speed

If unit Locked On:

Resets Max/Min

Power Off

OR  Automatic after 90 seconds if unit not Locked On

## 9.0 TOTALIZER MODE

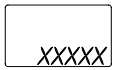
Totalizer accumulates input on an ongoing basis. In the simplest form the unit acts as an optical counter, incrementing the display each time an input pulse is sensed. Using the Remote Contact Assembly with various tips and wheels, the unit can totalize in revs, inches, feet, yards, centimeters, and meters.

### 9.1 TOTALizer Setup

1. Turn Power ON

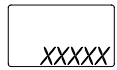
Different messages displayed for Internal or External operation

Internal optics or External optical sensor (i.e. ROS):




Last Units selected

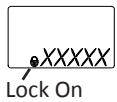
External Remote Contact Assembly:




*EXTRN*, then scrolling message, then last Units selected

1a. To toggle Lock On/Off

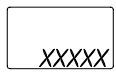
Press and hold




Lock On

2. Enter Setup


3. Enter selection of Mode




Last mode selected is displayed

4. Select TOTAL Mode

OR

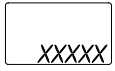
Repeat until *TOTAL* displayed

5. Save and advance


6. Enter selection of Units

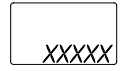
Different options displayed for Internal or External operation

Internal or External ROS:



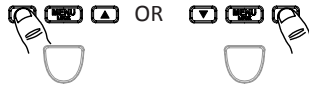

COUNT Only

External Remote Contact Assembly:




Rotational: REV
Linear: INCH, FEET, YARDS, CM, METER

7. Select Units



OR

Repeat until desired Units displayed

8. Save and advance

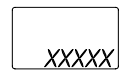

OR


COUNT or REV

Linear Units

Only for Linear Units:

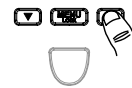
8a. Enter selection of Wheel




Last Wheel selected is displayed

8b. Select Wheel

OR



Toggles between 10CM and 12IN

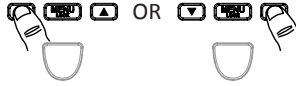
8c. Save and Advance

**TOTALizer Setup (continued):**

9. Enter selection of number of decimal places


*NONE*, *1*, *2* or *3*

10. Select decimal places




Repeat until desired decimal places displayed

11. Save and advance


12. Exit Setup - ready to measure


Units = *COUNT*:
*DONE*,
then *COUNT*

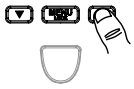
Rotational/Linear Units:
*DONE*,
*USE CONTACT TIP* or
[wheel selected],
then Units selected

The unit will remember these settings (including Lock On/Off) even if turned off then back on.

## 9.2 TOTALizer Operation

Measure


Recall Max or Min




Max or Min Speed (in last selected Tach or Rate mode units)

Recall Time in seconds


Shows time in seconds from when the Start/ Reset button is pressed until the last input signal measured

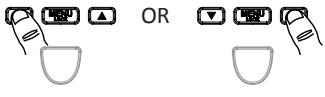
If unit is Locked On:

Resets Max/Min, Total and Measurement Time

Power Off

OR Automatic after 90 seconds if unit not Locked On

**Note:** Pressing



OR

Once before 90 seconds will keep measurements in memory and the display turned on longer

## 10.0 TIMER MODE

Accumulates time in minutes, seconds, and tenths of a second. There are two modes of operation. The Manual mode operates like a stopwatch, the timing period being started and stopped by the user. The Auto mode can be stopped and started by the user or a piece of reflective tape on objects. The user can freeze the display-and view/record a LAP time-at any time without affecting the count.

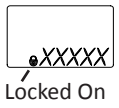
### 10.1 TIMER Setup

1. Turn Power ON


Last Units selected are displayed

1a. To toggle Lock On/Off

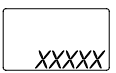
Press and hold




Locked On

2. Enter Setup Mode


3. Enter selection of Mode




Last mode selected is displayed

4. Select TIMER Mode

OR

Repeat until *TIMER* displayed

5. Save and advance

6. Enter selection of Timer function


MAN or AUTO

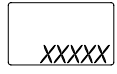
7. Select Timer function

OR

Toggles between Manual and Auto

8. Save and advance


9. Exit Setup – ready to measure




DONE, then Units selected

Unit will remember these settings (including lock on/off) even if turned off and back on.

### 10.2 TIMER Operation

Measure:

Manual

Each press toggles Start and Stop

Auto

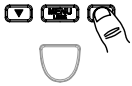
OR Start and Stop triggered by external remote optical sensor (ROS) or internal optics

Reset

With Timer stopped - resets time to 00:00.0

**TIMER Operation (continued):**

Lap



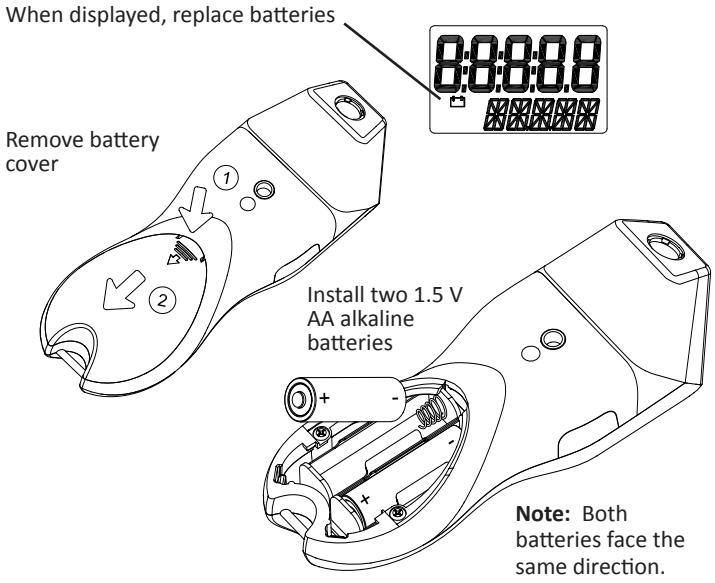
With Timer running - stops at elapsed time to date; to continue, press again

Power Off

OR If Timer stopped - automatic after 90 seconds if unit not Locked On

OR Automatic after 99:59.9

## 11.0 BATTERIES



## 12.0 SPECIFICATIONS

| Specifications* | PLT200 Pocket Laser Tachometer |
|---|---|
| **Laser Specifications:** | |
| **Classification** | Class 2 (per IEC 60825-1:2014)<br>This product complies with IEC60825-1 Ed.3 and 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50 of June 2007 |
| **Max Laser Output** | **< 1 mW** |
| **Pulse Duration** | Continuous |
| **Laser Wavelength** | 650 nm |
| **Beam Divergence** | 18 mrad |
| **Beam Diameter** | 4 mm x 7 mm typical @ 2 meters |
| **Laser Diode Life** | 8,000 operating hours MTBF (1 year warranty) |
| **Noncontact Specifications:** | |
| **RPM Range** | 5-200,000 |
| **RPS Range** | 0.084-3,333.3 |
| **RPH Range** | 300-999,999 |
| **Resolution - Fixed** | 1 (10 above 99,999) |
| **Resolution - Autoranging** | 0.001 to 1.0 (10 above 99,999) |
| **Accuracy** | ±0.01% of reading or resolution limit |
| **Operating Range** | Up to 25 ft. [7.62 m] or up to 70 degrees off perpendicular to T-5 Reflective Tape target |
| **Contact Specifications using optional Remote Contact Assembly:** | |
| **Range - Contact Tips** | 0.5-20,000 RPM |
| **Range - Wheels** | 0.5-12,000 RPM |

| Specifications* | PLT200 Pocket Laser Tachometer |
|---|---|
| **Contact Specifications (continued):** | |
| **Resolution - Fixed** | 1 (10 above 99,999) |
| **Resolution - Autoranging** | 0.001 to 1.0 (10 above 99,999) |
| **Accuracy - Revs** | ±0.05% of reading (RPM) or resolution limit (with no slippage) |
| **Accuracy - Linear** | ±0.5% of reading or resolution limit (with no slippage) |
| **Contact Measurement Ranges:** | |
| **Tachometer:** | |
| **RPM** | 0.5-20,000 |
| **RPS** | 0.0833-333.33 |
| **RPH** | 30-999,999 |
| **Rates:** | **Wheel Circumferences** |
| **Inches per Second** | 10 cm: 0.033 to 1312.3<br>12 in.: 0.100 to 2,400.0 |
| **Inches per Minute** | 10 cm: 1.969 to 78,740<br>12 in.: 6.000 to 144,000 |
| **Inches per Hour** | 10 cm: 118.11 to 999,990<br>12 in.: 360.00 to 999,990 |
| **Feet per Second** | 10 cm: 0.003 to 109.36<br>12 in.: 0.009 to 200.00 |
| **Feet per Minute** | 10 cm: 0.164 to 6,561.7<br>12 in.: 0.500 to 12,000 |
| **Feet per Hour** | 10 cm: 9.843 to 393,700<br>12 in.: 30.000 to 720,000 |
| **Yards per Second** | 10 cm: 0.001 to 36.453<br>12 in.: 0.003 to 66.667 |

| Specifications* | PLT200 Pocket Laser Tachometer |
|---|---|
| **Rates (continued):** | **Wheel Circumferences** |
| **Yards per Minute** | 10 cm: 0.055 to 2,187.2<br>12 in.: 0.167 to 4,000.0 |
| **Yards per Hour** | 10 cm: 3.281 to 131,233<br>12 in.: 10.000 to 240,000 |
| **Miles per Hour** | 10 cm: 0.002 to 74.564<br>12 in.: 0.006 to 136.36 |
| **Centimeters per Second** | 10 cm: 0.084 to 3,333.3<br>12 in.: 0.21 to 3,048.0 |
| **Centimeters per Minute** | 10 cm: 5.000 to 200,000<br>12 in.: 15.240 to 365,760 |
| **Centimeters per Hour** | 10 cm: 300.00 to 999,990<br>12 in.: 914.40 to 999,990 |
| **Meters per Second** | 10 cm: 0.001 to 33.333<br>12 in.: 0.003 to 60.960 |
| **Meters per Minute** | 10 cm: 0.050 to 2,000.0 M/MIN<br>12 in.: 0.153 to 3,657.6 M/MIN |
| **Meters per Hour** | 10 cm: 3.000 to 120,000<br>12 in.: 9.144 to 219,460 |
| **Totalizer:** | |
| **Counts** | 0 to 999.999 |
| **Scale Totals in Inches, Feet, Yards, Centimeters, or Meters** | |
| **Input** | Internal or external optics or contact wheel |
| **Timer Specifications:** | |
| **Minutes:Seconds, tenths to 99:59.9** | |
| **Accuracy** | ±0.2 second |
| **Resolution** | 0.1 second |

| Specifications* | PLT200 Pocket Laser Tachometer |
|---|---|
| **Display** | Dual LCD: 5-digit upper/scrolling and 5-digit alphanumeric lower display |
| **Batteries** | Two (2) AA 1.5 V ⎓ (DC) alkaline included (Note: Batteries are NOT rechargeable.) |
| **Battery Life** | 30 hours continuous typical with batteries provided |
| **External Input:** | |
| **Absolute Max** | -0.3 V to 5 V ⎓ (DC) pulse |
| **Minimum** | Low below 1.2 V and high above 2 V (TTL compatible) |
| **Edge** | Triggers on Positive edge |
| **Power Out** | 3.0 V nominal, approx. 2.8 V @ mA max |
| **Pulse Output** | 0 V to 3.3 V ⎓ (DC) pulse Same shape as External Input signal or high when internal optics sees a reflection |
| **Dimensions** (HxWxD) | 6.92 in. x 2.4 in. x 1.6 in. [17.58 cm x 6.10 cm x 4.06 cm] |
| **Weight** | Approx. 7 oz. (210 g) |
| **This product is designed to be safe for indoor use under the following conditions (per IEC61010-1):** | |
| **Installation Category II** | per IEC 664 |
| **Pollution Degree Level II** | per IEC 664 |
| **Temperature** | 40 °F to 105 °F (5 °C to 40 °C) |
| **Humidity** | Max relative humidity of 80% for temperatures up to 88 °F (31 °C) decreasing linearly to 50% relative humidity at 100 °F (40 °C) Humidity non-condensing |

***Specifications are subject to change without notice.**

## 13.0 CLEANING

To clean the instrument, wipe with a damp cloth using mild, soapy water.

## 14.0 SENSORS AND ACCESSORIES

See webpage for the complete list of accessories.

**Sensors:**

| | | |
|---|---|---|
| **RLS-P** | PN: 6180-081 | Rugged Laser Sensor with removable 3 m cable, M12 connector to 1/8" phone plug connector |
| **ROLS-P** | PN: 6180-029 | Remote Optical Laser Sensor with 8 ft. [2.5 m] cable |
| **ROS-P** | PN: 6180-057 | Remote Optical Sensor with 8 ft. [2.5 m] cable |
| **ROS-P-25** | PN: 6180-057-25 | Remote Optical Sensor with 25 ft. [7.6 m] cable |
| **IRS-P** | PN: 6180-020 | Infrared Sensor with 8 foot [2.5 m] cable for use without reflective target at 0.5 inch [12 mm] gap |
| **ROSM-P** | PN: 6180-902 | Modulated Remote Optical LED Sensor with 8 ft. [2.5 m] cable |
| **MT-190P** | PN: 6150-036 | Amplified Magnetic Sensor |

**Accessories:**

**Remote Contact Assembly (RCA)** PN: 6180-074
includes two contact tips and 10 cm wheel

**Input/Output Cable CA-4044-6** PN: 6180-028
mono phone plug to BNC connector

**Padded Pouch (with belt loop)** PN: 6180-047

**Latching Plastic Carry Case CC-11** PN: 6180-048

**Reflective Tape:**

| | |
|---|---|
| T-5 (single pack), 5 feet | PN: 6180-070 |
| T-50, 50 feet | PN: 6180-072 |
| T-5WP (waterproof), 5 feet | PN: 6180-079 |