CE DECLARATION OF CONFORMITY

As Manufacturer:

Monarch Instrument

Division of Monarch International Inc.

15 Columbia Drive, Amherst NH 03031 USA

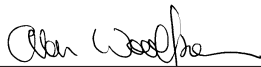declares under Monarch's sole responsibility that the product:

Pocket Laser Tach 200

to which this declaration relates is in conformity with the following directives and standards when installed and operated in accordance with the user manual:

Directives:	**EMC 89/336/EEC**
Standards:	**EMC: EN61326:1997**
	Electrical Safety: IEC61010-1:2001
	Laser Safety: IEC60825-1:2001

References: Retlif Testing Laboratories, (Report No. R-4283N)
Technical Construction File PLT-0704 of July 2004

24th June 2004
Manufacturer (Amherst,NH)   Alan Woolfson, VP Engineering (Authorized Signature)

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1071-4838-112

Pocket Laser Tach 200 (PLT200)
Tachometer / Rate Meter / Totalizer / Timer

SAFEGUARDS AND PRECAUTIONS


```
LASER RADIATION
AVOID DIRECT EYE EXPOSURE
CLASS 3R LASER PRODUCT
MAX OUTPUT POWER: 3mW
EMITTED WAVELENGTH: 650nm
CLASSIFIED TO IEC 60825-1:2001
```

WARNING - This product emits a visible beam of laser light. Avoid exposure to the laser radiation. The use of optical viewing aids (binoculars, for example) may increase the ocular hazard.

CAUTION - The laser beam should not be intentionally aimed at people or animals.

CAUTION - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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.

Monarch Instrument's Limited Warranty applies. See www.monarchinstrument.com for details.

Warranty Registration and Extended Warranty coverage available online at www.monarchinstrument.com.

14.0 OPTIONS /ACCESSORIES

T-5	Reflective Tape, 5 foot [1.5 m] roll, ½ inch [13 mm] wide
RCA	Remote Contact Assembly with 10 cm wheel, concave and convex tips
CTE	Concave/convex contact tips and 10 cm linear contact wheel
12 inch Wheel	12 inch circumference wheel for use with RCA
CA-4044-6	6 foot Input/Output cable, 1/8" mono phone plug to BNC connector
ROS-P	Remote Optical Sensor
ROS-P-25	Remote Optical Sensor with 25 foot cable
EC-25P	25 foot extension cable for all sensors
MT-190-P	Amplified Magnetic Sensor
IRS-P	Infrared Sensor
CC-10	Padded Nylon Carrying Case
CC-11	Latching Carrying Case for Pocket Tach and accessories
CAL-N.I.S.T.	N.I.S.T. Traceable Certificate of Calibration

12.0 BATTERIES

When displayed, replace batteries.

Remove battery cover
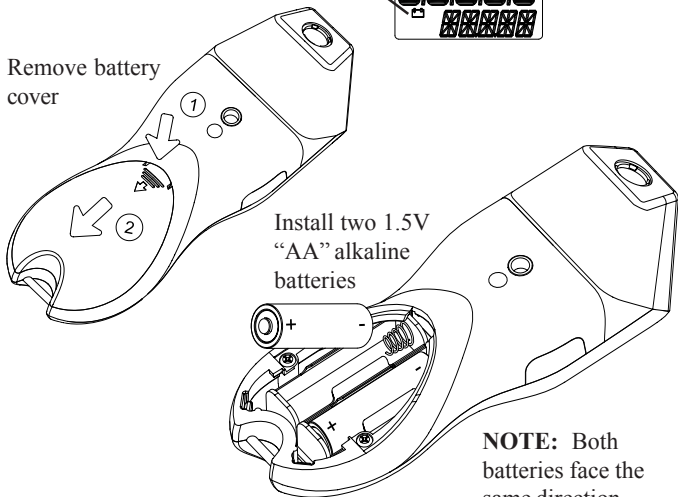
Install two 1.5V "AA" alkaline batteries

NOTE: Both batteries face the same direction.

13.0 CLEANING

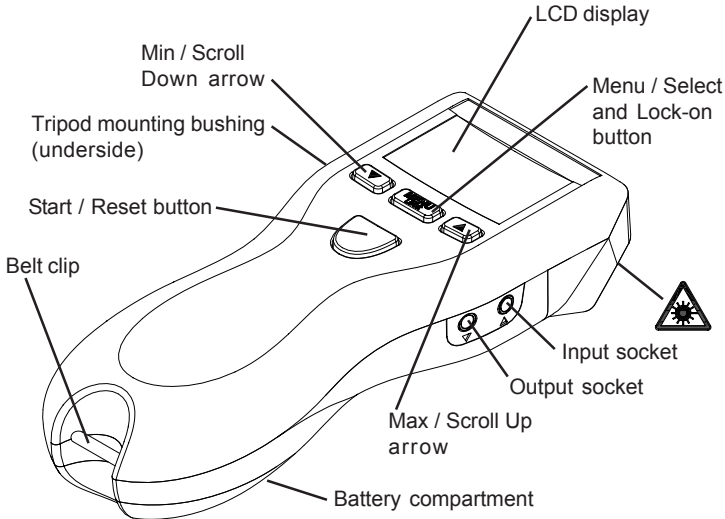To clean the instrument, wipe with a damp cloth using mild soapy solution.

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1.0 OVERVIEW

The Pocket Laser Tach 200 is a precision hand-held multifunction Tachometer, Ratemeter, Totalizer and Timer. It is programmable to display directly in Revs, Inches, Feet, Yards, Miles, Centimeters and Meters or function as a stopwatch or interval timer. Input / output sockets allow for remote sensing and pulse output to external indicating devices. For ease of use, the instrument can be "Locked-on" for continuous operation.

2.0 FEATURE LOCATIONS

Min / Scroll Down arrow

Tripod mounting bushing (underside)

Start / Reset button

Belt clip

LCD display

Menu / Select and Lock-on button

Input socket

Output socket

Max / Scroll Up arrow

Battery compartment

AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE

11.0 INPUT / OUTPUT

Input socket (▲)

Output socket (▼)
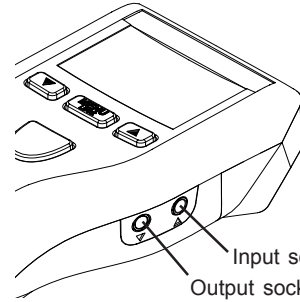
Input: Accepts remote sensor or Remote Contact Assembly (RCA). 1/8" (3.5mm) stereo phone plug.

Output: 1 pulse per revolution TTL output on internal operation. Pulse repeater with external sensors. 1/8" (3.5mm) mono phone plug.

Signal Input

+3V Out to Sensor

Common (GND)

Common (GND)

+3V Out to Sensor

Signal Input
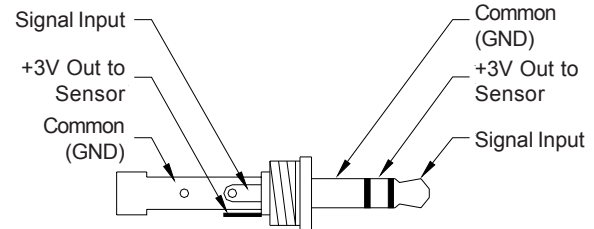
Input Connector Detail (Stereo plug)

Signal Input

Common (GND)

Common (GND)

Signal Input
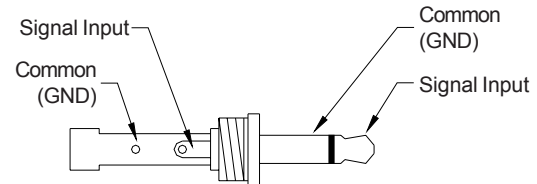
Output Connector Detail (Mono plug)

10.0 MAKING MEASUREMENTS

10.1 Non-Contact Measurements

Hand-held   OR   External Sensor (ROS shown)

(Not shown:
IRS-P,
MT-190P)

Laser   Light
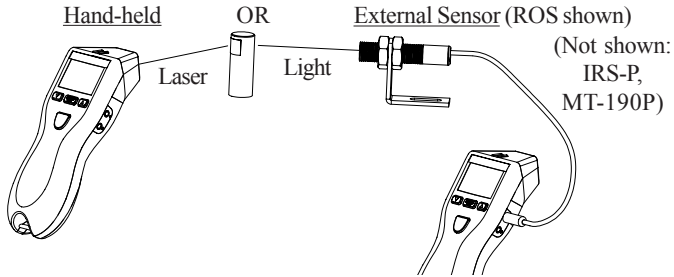
10.2 Direct Contact Measurements

Rotational   Linear

(Use concave
tip for small
shafts)

to RCA

from PLT200   from PLT200
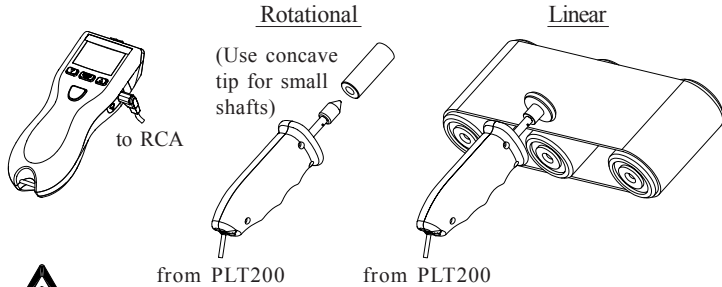
ONLY USE MODERATE PRESSURE

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.

3.0 LCD DISPLAY SYMBOLS
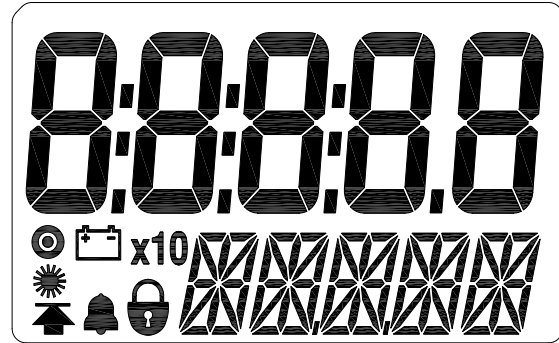
⊙   On Target Indicator. Blinks on whenever there is an input signal. Will appear to be solid on at higher frequencies.

🔋   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" on and making continuous measurements (Lock mode).

4.0 PLT200 SPECIFICATIONS

Laser Specifications:

Classification: Class 3R (per IEC 60825-1 Ed 1.2 2001-8)
Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.

Maximum Laser Output:	3mW
Pulse Duration:	Continuous
Laser Wavelength:	650 nm
Beam Divergence:	< 1.5 mrad
Beam Diameter:	4 x 7 mm typical at 2 meters
Laser Diode Life:	8,000 operating hours MTBF (1 year warranty)

Non-Contact Specifications:

Ranges:	RPM	5 – 200,000
	RPS	0.084 – 3,333.3
	RPH	300-999,990

Resolution:	Fixed:	1 (10 above 99,999)
	Auto-ranging:	0.001 to 1.0 (10 above 99,999)
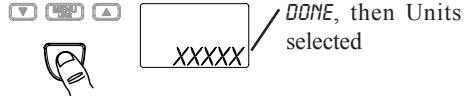
Accuracy: ±0.01% of reading or resolution limit

Operating Range: up to 25 feet (7.62 m) or up to 70 degrees off perpendicular to T-5 tape target

Contact Specifications using optional Remote Contact Assembly:

Range:	Contact Tips:	0.5 to 20,000 RPM
	10 cm / 12-inch Wheel:	0.5 to 12,000 RPM

Resolution:	Fixed:	1 (10 above 99,999)
	Auto-ranging:	0.001 to 1.0 (10 above 99,999)

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.

9.2 TIMER Operation

Measure:

Manual — Each press toggles Start and Stop

Auto — OR Start and Stop triggered by Remote Optical Sensor (ROS)

Reset — With Timer stopped - Resets time to 00:00.0

Lap — With Timer running - Stops at elapsed time to date. To continue, press again.
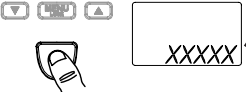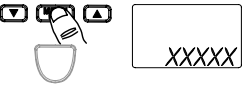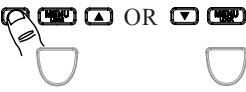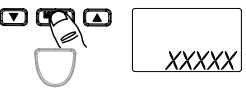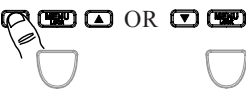
Power Off — OR Automatic after 90 seconds if unit not Locked on

9.0 TIMER Mode

9.1 TIMER Setup

1. Turn Power ON — Last Units selected are displayed

2. 1a. To toggle Lock On/Off — Press and Hold — Locked On

3. Enter Setup Mode — SETUP MODE

4. Enter selection of Mode — Last Mode selected is displayed

5. Select TIMER Mode — OR — Repeat until *TIMER* displayed

6. Save and advance — SETUP TIMER

7. Enter selection of Timer function — *MAN* or *AUTO*

8. Select Timer function — OR — Toggles between Manual and Auto

Contact Specifications (continued):

Accuracy: Revs: ±0.05% of reading (RPM) or resolution limit (with no slippage)

Linear: ±0.5% of reading or resolution limit (with no slippage)

Contact Measurements Ranges:

TACHOMETER:

Revolutions per Minute (RPM)	0.5 to 20,000 RPM
Revolutions per Second (RPS)	0.0833 to 333.33 RPS
Revolution per Hour (RPH)	30 to 999,990 RPH

| **RATES:**	**Wheel Circumference:**	
Inches per Second	**10 cm:**	0.033 to 1312.3 IPS
	12 in:	0.100 to 2,400.0 IPS
Inches per Minute	**10 cm:**	1.969 to 78,740 IPM
	12 in:	6.000 to 144,000 IPM
Inches per Hour	**10 cm:**	118.11 to 999,990 IPH
	12 in:	360.00 to 999,990 IPH
Feet per Second	**10 cm:**	0.003 to 109.36 FT/S
	12 in:	0.009 to 200.00 FT/S
Feet per Minute	**10 cm:**	0.164 to 6,561.7 FT/M
	12 in:	0.500 to 12,000 FT/M
Feet per Hour	**10 cm:**	9.843 to 393,700 FT/H
	12 in:	30.000 to 720,000 FT/H
Yards per Second	**10 cm:**	0.001 to 36.453 YPS
	12 in:	0.003 to 66.667 YPS
Yards per Minute	**10 cm:**	0.055 to 2,187.2 YPM
	12 in:	0.167 to 4,000.0 YPM

Contact Measurements Ranges (continued):

RATES:		Wheel Circumference:
Yards per Hour	**10cm:**	3.281 to 131,233 YPH
	12 in:	10.000 to 240,000 YPH
Miles per Hour	**10 cm:**	0.002 to 74.564 MPH
	12 in:	0.006 to 136.36 MPH
Centimeters per Second	**10 cm:**	0.084 to 3,333.3 CM/S
	12 in:	0.21 to 3,048.0 CM/S
Centimeters per Minute	**10 cm:**	5.000 to 200,000 CM/M
	12 in:	15.240 to 365,760 CM/M
Centimeters per Hour	**10 cm:**	300.00 to 999,990 CM/H
	12 in:	914.40 to 999,990 CM/H
Meters per Second	**10 cm:**	0.001 to 33.333 M/SEC
	12 in:	0.003 to 60.960 M/SEC
Meters per Minute	**10 cm:**	0.050 to 2,000.0 M/MIN
	12 in:	0.153 to 3,657.6 M/MIN
Meters per Hour	**10 cm:**	3.000 to 120,000 M/H
	12 in:	9.144 to 219,460 M/H

TOTALIZER:

Counts: 0 to 999,999

Scale Totals in Inches, Feet, Yards, Centimeters or Meters

Input: Internal or External optics or linear contact wheel

Timer Specifications:

Minutes:Seconds.Tenths to 99:59.9

Accuracy: ±0.2 second

Resolution: 0.1 second

8.2 TOTALizer Operation
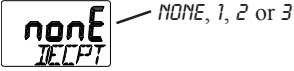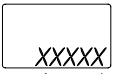
Measure		Press and hold Lock on
Recall Max		Max Speed
		MAX
Recall Min		Min Speed
		MIN
If unit is Locked on:		Resets Max/Min and Total
Power Off		OR Automatic after 90 seconds if unit not Locked on

TOTALizer Setup (continued):

9. Enter selection of number of decimal places

 nonE DECPT — NONE, 1, 2 or 3

10. Select decimal places

 OR Repeat until desired decimal places displayed

11. Save and advance

 SETUP MODE

12. Exit Setup – Ready to measure

 XXXXX

Units = COUNT: DONE, then Units selected

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

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

Display: 5 x 0.5" (12.7mm) numeric digits plus 5 Alpha-numeric LCD

Batteries: 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)

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 @ 20 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: 6.92" (17.58 cm) H x 2.4" (6.10 cm) W x 1.6" (4.06 cm) D

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: Maximum 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 subject to change without notice.

5.0 PREPARATION FOR MEASUREMENT

5.1 Non-Contact Preparation

For Internal operation (Red laser) or External operation using optional Remote Optical Sensor (ROS-Red LED).

1. Clean Shaft

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

For Small Shafts:

As small as 1/8" wide on side or radius edge
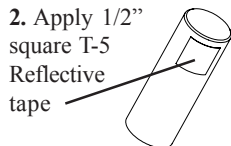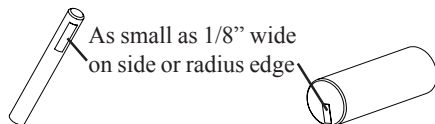
5.2 Direct Contact Preparation

For 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.)

Align flats
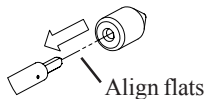
6. Enter selection of Units — Different options displayed for Internal or External operation.

Internal or External ROS: *COUNT* Only / XXXXX

External RCA: XXXXX / Rotational: *REV* Linear: *INCH*, *FEET*, *YARDS*, *CM*, *METER*

7. Select Units — OR — Repeat until desired Units displayed

8. Save and advance — **SETUP** *DECPT* OR **SETUP** *WHEEL*

COUNT or *REV*   Linear Units

<u>Only for Linear Units:</u>

8a. Enter selection of Wheel — XXXXX — Last Wheel selected is displayed

8b. Select Wheel — OR — Toggles between *10CM* and *12IN*

8c. Save and Advance — **SETUP** *DECPT*

8.0 TOTALizer Mode

8.1 TOTALizer Setup

1. Turn Power ON — ▽ 🖲 △ Different messages displayed for Internal or External operation.
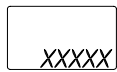
Internal or External ROS: | External RCA:

XXXXX — Last Units selected

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

1a. To toggle Lock On/Off — ▽ 🖲 △ Press and Hold

● XXXXX — Locked On
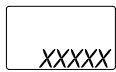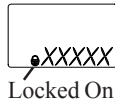
2. Enter Setup Mode — ▽ 🖲 △

SETUP
MODE

3. Enter selection of Mode — ▽ 🖲 △
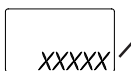
XXXXX — Last Mode selected is displayed
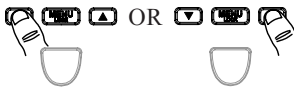
4. Select TOTAL Mode — 🖲 △ OR ▽ 🖲 — Repeat until *TOTAL* displayed.

5. Save and advance — ▽ 🖲 △

SETUP
UNITS

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2. 10 cm Wheel   **OR**   **3.** 12 inch Wheel
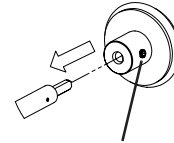
Tighten screw securely into flat on shaft.

Install with pin in shaft fully seated in slot. Tighten screw.
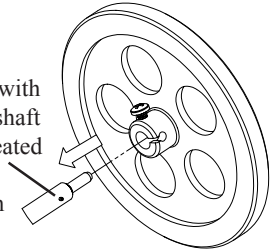
5.3 Connecting External Sensors
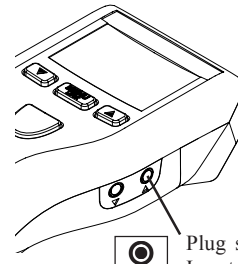
Plug sensor into Input socket

◉
▲
In

Remote Contact Assembly (RCA)
(shown with optional 12 inch wheel)

Remote Optical Sensor (ROS-P)
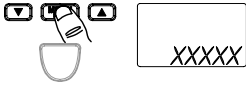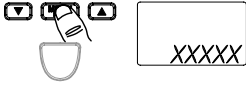
Infrared Sensor (IRS-P)

Magnetic Sensor with Amplifier (MT-190P)

6.0 TACHometer Mode
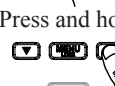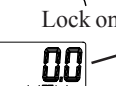
6.1 TACHometer Setup

1. Turn Power ON

   XXXXX / Last Units selected are displayed

   1a. To toggle Lock On/Off

   Press and Hold

   •*XXXXX*

   Locked On

2. Enter Setup Mode

   SETUP MODE

3. Enter selection of Mode

   XXXXX / Last Mode selected is displayed

4. Select TACH Mode

   OR   Repeat until *TACH* displayed

5. Save and advance
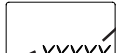
   SETUP UNITS

6. Enter selection of Units

   XXXXX / *RPS*, *RPM* or *RPH*

11. Save and advance

    SETUP MODE

12. Exit Setup – Ready to measure

    XXXXX / *DONE*, *USE CONTACT TIP* or [wheel selected], then Units selected

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

7.2 RATE Operation

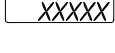Measure   OR

Press and hold   Lock on

Recall Max   **0.0** MAX — Max Speed

Recall Min   **0.0** MIN — Min Speed

If unit Locked on: Resets Max/Min

Power Off   OR   Automatic after 90 seconds if unit not Locked on

RATE Setup (continued):

6. Enter selection of Units [buttons] [XXXXX]
   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/MIN, M/H

7. Select Units [buttons] OR [buttons] Repeat until desired Units displayed

8. Save and advance [buttons] SETUP DECPT OR SETUP WHEEL
   Rotational Units   Linear Units

Only for Linear Units:

8a. Enter selection of Wheel [buttons] [XXXXX] Last Wheel selected is displayed

8b. Select Wheel [buttons] OR [buttons] Toggles between 10CM and 12IN

8c. Save and Advance [buttons] SETUP DECPT

9. Enter selection of number of decimal places [buttons] nonE DECPT — NONE, 1, 2 or 3

10. Select decimal places [buttons] OR [buttons] Repeat until desired decimal places displayed

7. Select Units [buttons] OR [buttons] Repeat until desired Units displayed

8. Save and advance [buttons] SETUP DECPT

9. Enter selection of number of decimal places [buttons] nonE DECPT — NONE, 1, 2 or 3

10. Select decimal places [buttons] OR [buttons] Repeat until desired decimal places displayed

11. Save and advance [buttons] SETUP MODE

12. Exit Setup – Ready to measure [buttons] [XXXXX] DONE, then Units selected

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

6.2 TACHometer Operation

Measure   ▽ ▭ △   OR   ▽ ▭ △
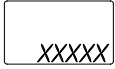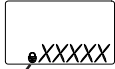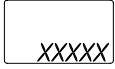
Press and hold   Lock on

Recall Max   ▽ ▭ ◁

0.0
MAX — Max Speed

Recall Min   ▷ ▭ △

0.0
MIN — Min Speed

If unit Locked on: ▽ ▭ △   Resets Max/Min

Power OFF   ◁ ▭ ▷   OR   Automatic after 90 seconds if unit not Locked on

7.0 RATE Mode

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

7.1 RATE Setup

1. Turn Power ON   ▽ ▭ △

XXXXX — EXTRN, then scrolling message, then last Units selected

   1a. To toggle Lock On/Off   ▽ ▭ △

Press and Hold

•XXXXX
Locked On

2. Enter Setup Mode   ▽ ▭ △

SETUP
MODE

3. Enter selection of Mode   ▽ ▭ △

XXXXX — Last Mode selected is displayed

4. Select RATE Mode   ◁ ▭ △   OR   ▽ ▭ ◁   Toggles between RATE and TOTAL. Select RATE.

5. Save and advance   ▽ ▭ △

SETUP
UNITS