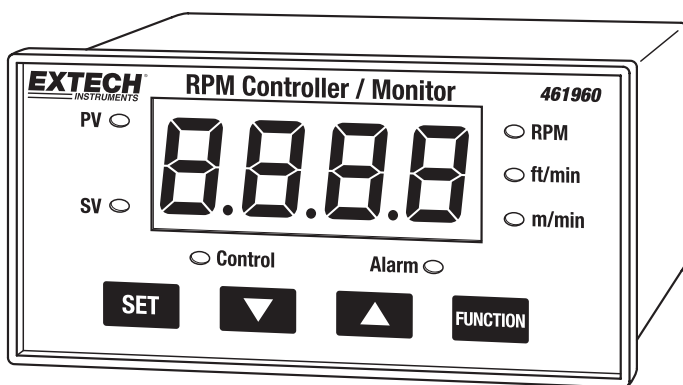# User's Guide

# EXTECH®
## INSTRUMENTS

# RPM Controller / Monitor

# Model 461960

# *Introduction*

Congratulations on your purchase of the Extech 461960 RPM Controller/Monitor. This meter is shipped fully tested and calibrated and, with proper use, will provide years of reliable service.

## Features

* Professional Tachometer (RPM, m/min., ft/min. ) monitor and controller.

* Build in control relay and alarm relay.

* Alarm Relay will close when the measured value reaches the high or low alarm value.

* Control Relay will close when the measured value reaches the control value.

* Hysteresis value setting for control and alarm function.

* Set the number of input pulses per revolution.

* Settable roller diameter for the surface speed ( m/min., ft/min. ) function.

* Works in conjunction with the optional proximity or photo sensor.

* Large easy to read red LED display.

* RS232 computer interface for use with optional software.

* Microprocessor circuit ensures high accuracy and provides special functions and features.

* Standard 96 X 48 mm DIN case.

* Optional data acquisition software.

## *Safety*

**International Safety Symbols**

*Caution :* Risk of electric shock !
This symbol, adjacent to a terminal, indicates that, under normal use, hazardous voltages may be present

*Caution :* Risk of electric shock !
This symbol, adjacent to another symbol or terminal, indicates the user must refer to the manual for further information.

Equipment protected throughout by Double Insulation or Reinforced Insulation.
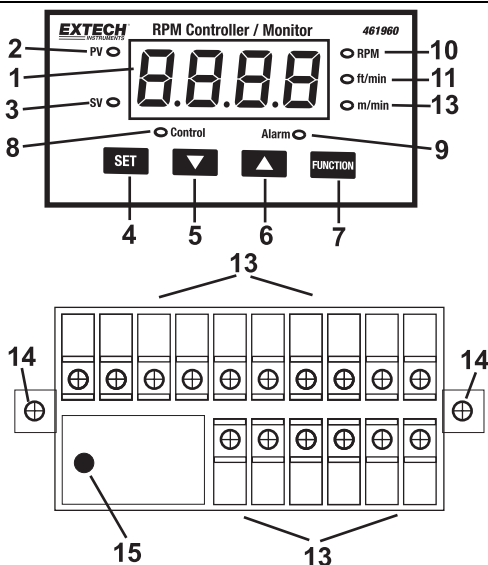
**Safety Procedures**

* Do not use fingers or any tool to touch the Wire Terminals.
* Do not exceed 0.5A relay contact load (resistive load).
* The instrument contains no user serviceable parts and should not be opened by the user.
* Repair or service should be done by a qualified technician only.
* Always apply the correct AC power voltage
* Cleaning - Only use the dry cloth to clean the plastic case !

**Operating conditions**

* Comply with EN61010. Transient overvoltage at Mains Supply 2500V.
* Pollution Degree 2.
* Altitude up to 2000 meters.
* Indoor use.
* Relative humidity 80% max.

# *Meter Description*

1. Display
2. PV ( process value ) indicator
3. SV ( set value ) indicator
4. Set Button
5. ▼ Button
6. ▲ Button
7. Function Button
8. Control relay indicator
9. Alarm relay indicator
10. RPM indicator
11. ft/min indicator
12. m/min indicator
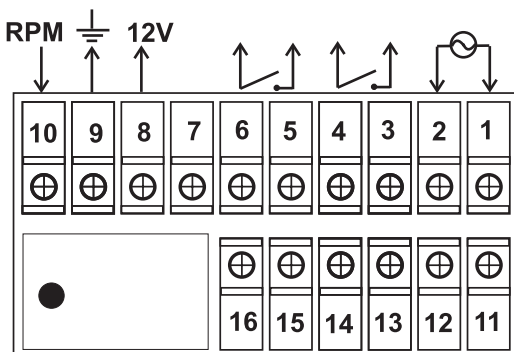13. Wire terminals
14. Case holder
15. RS232 terminal

## *Terminal connections*

⚠️ **Do not input an over voltage to the AC input terminals**

1. Input the ACV power (90 to 260 ACV) to T1, T2.
2. Connect the "Control Relay" output from T3, T4.
3. Connect the "Alarm Relay" output from T5, T6. 3)
4. Connect the proximity or photo sensor to the input terminal T8, T9, T10.
   T8 is DC 12 V power supply terminal.  (Brown wire)
   T9 is the ground ( - ) terminal.  (Blue wire)
   T10 is the pulse input terminal. (Black or green wire)

# *Operation*

## *RPM measurement*

1. Apply power to the meter.
2. Press the "Function Button" once until the "RPM" and the "PV" indicators are on.
3. The display will indicate the RPM value.
4. The RPM value equals :

$$\frac{\text{Total input signal (pulse) per min.}}{\text{Number of pulses per revolution}}$$

Example:
   If the total signal (pulse) input per minute is 5,124, the number of pulses per revolution is set to 1, the RPM value will be;

$$5,124/1 = 5,124$$

## *Surface speed ( m/min., ft/min. ) measurement*

1. Apply power to the meter
2. Press the "Function" button once until the "m/min" indicator is on. The display will show the m/min. value.
3. Press the "Function" button once until the "ft/min" indicator is on. The display will show the ft/min. value.
4. Under the surface speed measurement, the "PV" indicator will also light.
5. To calculate m/min:

$$\frac{\textit{Total input signal ( pulse ) per min.} \; x \; roller \; diameter \; ( cm ) \; x \; 3.14 \; \div 100}{\text{Number of pulses per revolution}}$$

Example: If the total input signal (pulse) per minute is 501, the number of pulses per revolution is set to 1, the roller diameter is 10 cm the m/min. value will be;

$$501/1 \; x \; 10 \; x \; 3.14/100 = 157.3$$

6. To calculate ft/min:

$$\frac{\textit{Total input signal ( pulse ) per min.} \; x \; roller \; diameter \; ( cm ) \; x \; 3.14 \; \div 30.48}{\text{Number of pulses per revolution}}$$

Example: If the total input signal (pulse) per minute is 501, the number of pulses per revolution is set to 1, the roller diameter is 10 cm the ft/min. value will be;

$$501/1 \; x \; 10 \; x \; 3.14/30.48 = 516.1$$

### 461955 Proximity Sensor
Brown wire (+12 V
Blue wire(Ground)
Black  wire (Signal)

### 461957  Photo Sensor
Brown wire (+12 V)
Blue wire (Ground)
Black wire (Positive to Negative transition) or Green wire (Negative to Positive transition)

| CtSP | Control value setting  (RPM/FPM  set point) |
|------|---------------------------------------------|
| LoLt | Alarm - Low limit value setting |
| HILt | Alarm - High limit value setting |

### Control Value Setting

1.  Press the "Set" button" once, the display will show " CtSP ", the meter is now ready for the " Control value " setting.
2.  Use the "▼" button and the "▲" to adjust the desired "Control value".

*Note: When adjusting the value, the "SV" indicator will light.*

### Low Limit Alarm Value Setting

1.  Press the "Set" button" twice, the display will show " LoLt ", the meter is now ready for the " Low Limit value " setting.
2.  Use the "▼" button and the "▲" to adjust the desired "Low limit value ".

*Note: When adjusting the value, the "SV" indicator will light.*

### High Limit Alarm Value Setting

1.  After setting the "Low Limit" value, press the "Set" button twice, the display will show "HILt", the meter is now ready for the humidity "High Limit" value setting.
2.  Use the "▼" button and the "▲" to adjust the desired "High limit value ".

*Note: When adjusting the value, the "SV" indicator will light.*

### 1st layer setting considerations;

1.  Under the normal display, if the "Function" button is set to the "RPM function" and the "RPM" indicator is on, then the 1st layer setting procedures will be ready for the "RPM" function.
2.  Under the normal display, if the " Function" button is set to the "m/min. function", and the "m/mi" indicator is on, then the 1st layer setting procedures will be ready for the "m/min." function.
3.  3) Under the normal display, if the "Function" button is set to the "ft/min. function" and the "ft/min" indicator " is on, then the 1st layer setting procedures will be ready for the "ft/min." function.

| PULS | Pulse no. per revolution setting |
|------|----------------------------------|
| dIA | Roller diameter value setting (cm) |
| CtHy | Control Hysteresis value setting |
| ALHy | Alarm Hysteresis value setting |

### Pulse no. per revolution setting (RPM)

1. Press and hold the "Set" button for at least two seconds, the display will show "PULS", now the meter is ready for the "Pulse no. per revolution" setting.
2. Use the "▼" button and the "▲" button to adjust the desired "Pulse no. per revolution".

*Note: When adjusting the value, the "SV" indicator will light.*

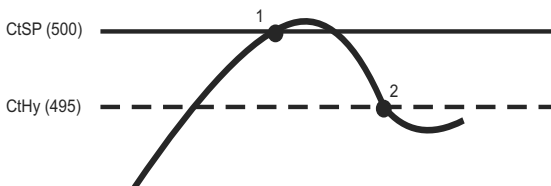### Roller diameter value setting  (Surface speed)

1. After setting the "Pulse no. per revolution", press the " Set" button twice, the display will show dIA ", now the meter is ready for the "Roller diameter value" setting.
2. Use the "▼" button and the "▲" button to adjust the "Roller diameter value" in the unit of cm.

*Note: When adjusting the value, the "SV" indicator will light.*

### Control Hysteresis value setting

1. After setting the "Roller diameter value", press the "Set" button twice, the display will show "CtHy", now the meter is ready for the "Control Hysteresis value" setting.
2. Use the "▼" button and the "▲" button to adjust the desired Hysteresis value".

*Note: When adjusting the value, the "SV" indicator will light.*



Example: Control value: 500, Control Hysteresis value : 5

The state of the control relay will stay ON for measured values up to 500 (1) and then turn OFF. The control relay will turn back ON when the measured value reaches 495 (2).
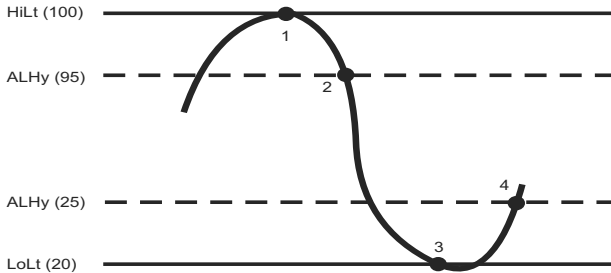
### Alarm Hysteresis value setting

1.  After selecting the "Control Hysteresis value" , press the "Set" button twice, the display will show " ALHy ", the meter is now ready for the "Alarm Hysteresis" value setting.
2.  Use the "▼" button and the "▲" button to adjust the desired Alarm Hysteresis value.

*Note: When adjusting the value, the "SV" indicator will light.*

Example :

High limit value : 100, Low limit value : 20, Alarm Hysteresis value : 5



The alarm relay will turn On when the measured value reaches100 (1).

The alarm relay will turn Off when the measured value reaches 95 (2).

The alarm relay will turn On when the measured value reaches 20 (3).
The alarm relay will turn Off when the measured value reaches 25 (4).

### SYSTEM RESET

Power on the meter. Press and hold the "Set" and "Function" buttons simultaneously for more than 5 seconds until the display shows the text "rSt".   Release the buttons.
"rSt" will flash 2 times and the display will then return to the normal screen. The system will be reset, all of the calibration data will be cleared, and the meters internal functions will return to the factory default values.

# *Specifications*

*General Specifications*

| | |
|---|---|
| Display | 4 digits red LED, digit size : 14 mm. |
| Unit | RPM \| RPM |
| | Surface speed \| m/min ( meter per min. )<br>ft/min ( feet per min. ) |
| Circuit | Custom chip of microprocessor LSI circuit. |
| Sampling Time | Approx. 1 second.<br>* Input : one pulse per revolution, ≥ 60 RPM |
| Relay Output | Two relays: Relay 1:Control relay, Relay 2: Alarm relay |
| | Max Load: 0.5 ACA/250 ACV or 0.5 DCA/24 DCV (resistive) |
| | Note: Do not apply a load current that exceeds 0.5A. Large currents will damage the relay and also void the warranty. |
| Setting Value | Control value setting. Alarm high limit value setting. Alarm low limit value setting. Pulse no. of each revolution. Roller diameter value setting. Hysteresis value setting.<br>* Setting for RPM, m/min., ft/min. |
| Input Signal Time base | Pulse, Quartz crystal |
| Sensor Power Supply | DC 12 V, 50 mA max. |
| Data Output | RS 232 PC serial interface. |
| Operating Temperature | 32 to 122°F (0 to 50 °C). |
| Operating Humidity | Less than 80% R.H. |
| Power Supply | 90 to 260 ACV, 50/60 Hz. |
| Power Consumption | Approx. 4.7 VA/AC 110V. Approx. 5.3 VA/AC 220V. |
| Weight | 384 g/ 0.84 LB. |
| Dimension | DIN size : 96 x 48 mm.<br>Depth : 110 mm. |
| Optional Accessories | Proximity sensor, 461955. * Photo sensor, 461957.<br>Data Acquisition software, 407001A |

*Electrical Specifications (23±5 °C)*

| | | | |
|---|---|---|---|
| Range | *Photo Tachometer :* 10 to 99,999 RPM | | |
| | *Surface Speed ( m/min. ) :*0.05 to 9,999 m/min.<br>*Surface Speed ( ft/min. ) :*0.2 to 32,805 ft/min. | | |
| Accuracy | ± ( 0.1 % + 1 digit ). | | |
| Resolution | RPM | 0.1 RPM | < 1,000 RPM |
| | | 1 RPM | 1,000 to 9,999 RPM |
| | | 10 RPM | 10,000 to 99,999 RPM |
| | m/min. | 0.01 m/min. | <100 m/min. |
| | | 0.1 m/min. | 100 to 999 m/min. |
| | | 1 m/min. | 1,000 to 9,999 m/min. |
| | ft/min. | 0.1 ft/min. | < 1000 ft/min. |
| | | 1 ft/min. | 1,000 to 9,999 ft/min. |
| | | 10 ft/min. | 10,000 to 32,805 ft/min. |

- *Above specification tests under the environment RF Field Strength less than 3 V/M & frequency less than 30 MHz only.*

### 461955 Proximity Sensor Specifications (23±5 °C)

| | |
|---|---|
| Output method | PNP, NO(normal open) |
| Sensing direction | Vertical. |
| Sensing distance | 4 mm. |
| Operating voltage | 10-30 VDC. |
| Standard Sensing object | Iron 18 x 18 x 1 mm. |
| Current consumption | 8 mA, no load. |
| Response frequency | 600 Hz. |
| Output current | 250 mA max. |
| Leakage current | 1.1 mA. |
| Residual voltage | 0.9 VDC. |
| Operating Temperature | -4 to 158°F (-20 to 70 °C) |
| Operating Humidity | 35 to 95% RH. |
| Wire Dimension | 4.7 mm Dia. x 2 m x 3 cores. |
| Cable length | 6 ft (1.8 meters) |

### 461957 Photoelectric Sensor Specifications

| | |
|---|---|
| Range | Up to 6000 RPM (100 Hz) |
| Power | 12 - 24VDC ±10%; Consumption: 40mA max. |
| Response time | < 1ms |
| Output | NPN transistor; Max load 80mA |
| Photo beam color | Green |
| Photo beam wavelength | 5500 Angstroms |
| Cable length | 6 ft (1.8 meters) |

## *Warranty*

**EXTECH INSTRUMENTS CORPORATION** (a FLIR company) warrants this instrument to be free of defects in parts and workmanship for **one year** from date of shipment (a six month limited warranty applies to sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department for authorization. Visit our website www.extech.com for contact information. A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

## Calibration and Repair Services

**Extech offers repair and calibration services** for the products we sell. Extech also provides NIST certification for most products. Call the Customer Service Department for information on calibration services available for this product. Extech recommends that annual calibrations be performed to verify meter performance and accuracy.

---

**Support lines: U.S. 877-439-8324, Intl. 603-324-7800**

Technical support: Option 3; E-mail: support@extech.com

Repair & Returns: Option 4; E-mail: repair@extech.com

**Product specifications subject to change without notice**

Visit our website: www.extech.com

Extech Instruments Corporation, 9 Townsend West, Nashua, NH 03063

*ISO 9001 Certified since 1995*

---