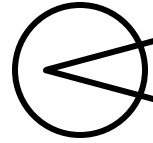# LIMITED WARRANTY

ONE-YEAR LIMITED WARRANTY AND LIMITATION OF LIABILITY: Hoto Instruments, for itself and its related companies (hereinafter described collectively as "Hoto Instruments") warrants that all Hoto Instruments products sold will be free of defects in materials and workmanship for a period of one (1) year from date of delivery to end-user. The foregoing one (1) year warranty shall not be extended or changed by Hoto Instruments furnishing any replacements, additions, attachments, adapters, batteries, cables, accessories or repairs to the products subsequent to the date of delivery or acceptance. The foregoing warranty is the sole and exclusive warranty of Hoto Instruments regarding the products.

DISCLAIMER OF OTHER WARRANTIES: Other than the foregoing warranties, there are no express or implied warranties or any affirmations of fact or promises by Hoto Instruments with respect to the products. Hoto Instruments disclaims any warranties, express, implied or statutory, not specifically set forth above, including any implied warranties of merchantability and fitness for any particular purpose..
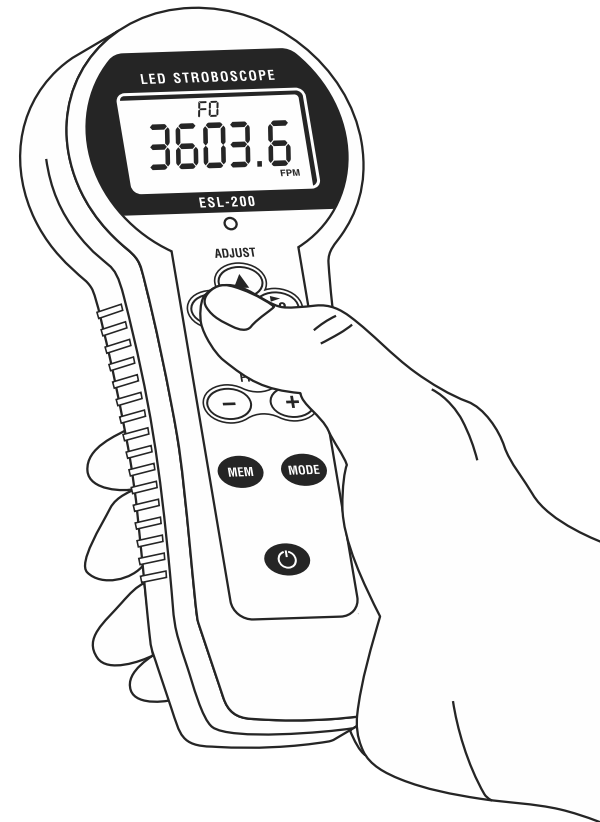
LIMITATION OF LIABILITY AND REMEDIES: Hoto Instruments' sole responsibility and liability incurred as a result of the sale and/or use of the products, and the purchaser's exclusive remedy against Hoto Instruments under any warranty shall be limited to the repair or replacement, at Hoto Instruments' option, of product components not conforming to the warranty.

PURCHASER'S DAMAGES AND LIMITATIONS: In no event shall Hoto Instruments be liable to purchaser, its assigns or agents, for economic loss, incidental or consequential damages, in contract or in tort, including but not limited to, any damages for lost profits, down-time, lost production, failure to meet purchaser's sales contracts, or defects in purchaser's material or workmanship. Hoto Instruments' limited warranty is terminated in the event of product overload, shock load, misuse, negligence, accident, or if repairs are attempted by the customer or third-parties without notice to and authorization by Hoto Instruments.

INSTRUCTIONS FOR OBTAINING WARRANTY REPAIR OR REPLACEMENT: Please contact our customer service department for a return authorization number. After you have obtained the authorization number, please return the subject product to Hoto Instruments with all freight, duty and brokerage costs prepaid.

LED Stroboscope
Model ESL-200

INSTRUCTION MANUAL

LED Stroboscope Model ESL-200

Introduction

Model ESL-200 is an enhanced LED, battery operated, stroboscope designed to measure and observe rotating, reciprocating and linear motion in a large variety of production, quality control and academic applications.

- High efficiency LED solid-state light source – never needs replacement
- Extended battery life of 6 hours continuous use at 6,000 fpm/rpm
- Highly stable drift free operation
- Auto wide measuring range – up to 150,000 fpm/rpm
- Push button operation with x2 and ÷2 buttons for quick adjustment
- Store up to 9 flash rates in memory for records or quick retests
- Rugged aluminum housing – compact size
- Easy-to-read 5 digit 0.47" (12 mm) high LCD

Important

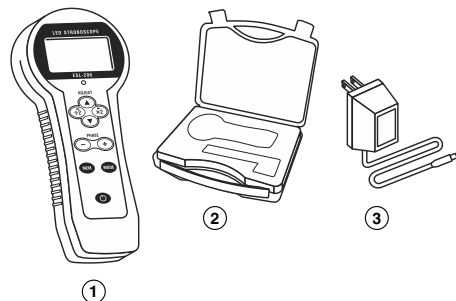Do not look directly at the emitted light.

Instrument is fragile – handle with care.

Do not operate instrument in a humid or dusty environment.

To clean, wipe surface with a damp, soapy cloth. Avoid harsh chemicals.

List of Equipment

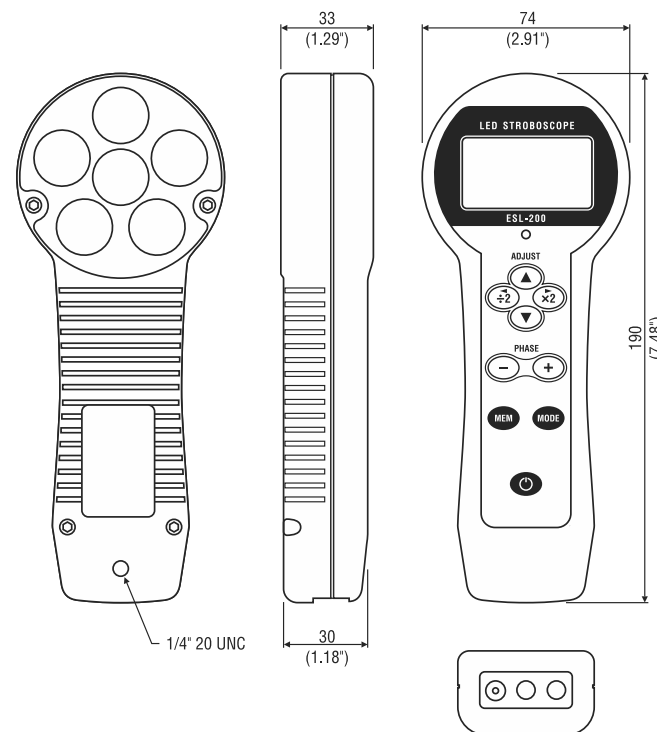① ESL-200 LED Stroboscope
② Carrying case
③ AC Adapter/Charger

Range	Resolution
12.0 – 9999.9 fpm/rpm	±0.1 fpm/rpm
10000 – 150000 fpm/rpm	±1 fpm/rpm Display flashes over 100000 rpm

Specifications

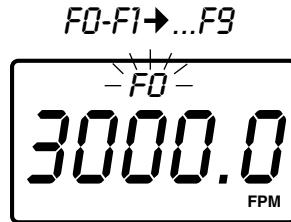|	
Selectable Units:	FPM or Hz
Accuracy	±0.01%, ±1 LSD
Power	NiMH rechargeable battery
Display	12mm, 5 digit LCD
Tripod Thread	¼ - 20 UNC
Operating Temperature	0 – 45°C
Storage Temperature	-10 – 50°C
Weight	1.2 lb/540 g

Dimensions

FLASH DURATION

Changing Flash Duration (increasing sharpness)

Flash duration is set at F0, which is suitable for most applications. However, images can be sharpened by decreasing flash duration.
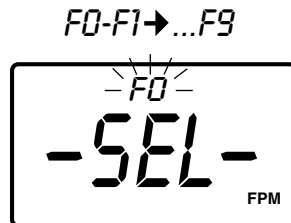
After synchronizing the flash rate with the moving object, press and hold the **MODE** key, then press the ▲ or ▼ arrows to select levels F0, F1, F2, ... F9. As flash duration shortens the image gets sharper and less bright. Longer flash durations are brighter and less sharp.

The display is retained for two minutes after the strobe is powered off. If turned back on while the display is on, the strobe returns to the flash rate shown on the display. The strobe powers off after five minutes of non-use.

F0-F1➜...F9

– F0 –
3000.0
FPM

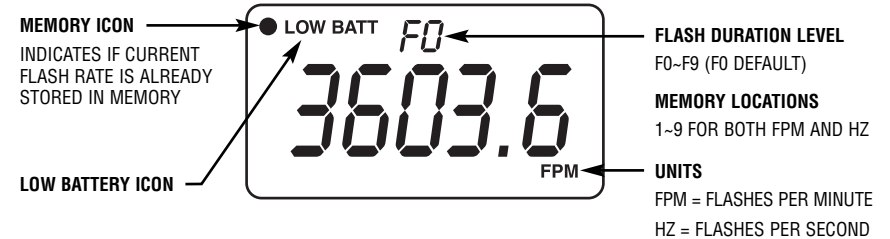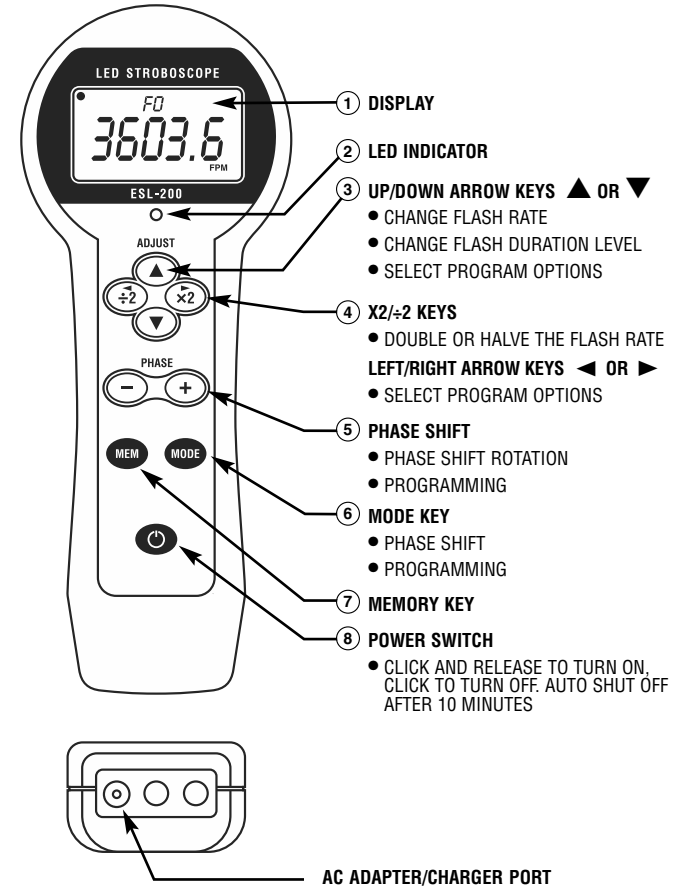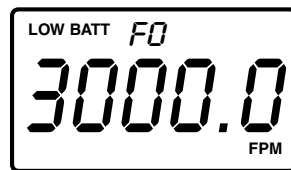SELECT WITH UP/DOWN ARROWS

Changing Default Flash Duration

F0 is the default, good for most applications. To change, turn off the strobe. Press and hold the **MODE** key, then press the power switch ⏻. SEL is displayed, then press the ▲ or ▼ arrows to select F0, F1, F2, ... F9. The selected flash duration level becomes the default when the strobe is powered on. Press ⏻ to exit.

F0-F1➜...F9

– F0 –
–SEL–
FPM

SELECT WITH UP/DOWN ARROWS

RECHARGING THE BATTERY

IMPORTANT! *Use the provided HOTO AC adapter/ charger exclusively and plug into the correct AC output; others will cause damage.* When the Battery icon appears on the display, turn off the unit and connect to the AC adapter/charger. The indicator light near the On/Off button will flash and turn solid as the unit is charged. The indicator will go off when the strobe is fully charged.

LOW BATT F0
3000.0
FPM

---

① **DISPLAY**

② **LED INDICATOR**

③ **UP/DOWN ARROW KEYS ▲ OR ▼**
- CHANGE FLASH RATE
- CHANGE FLASH DURATION LEVEL
- SELECT PROGRAM OPTIONS

④ **X2/÷2 KEYS**
- DOUBLE OR HALVE THE FLASH RATE

LEFT/RIGHT ARROW KEYS ◄ OR ►
- SELECT PROGRAM OPTIONS

⑤ **PHASE SHIFT**
- PHASE SHIFT ROTATION
- PROGRAMMING

⑥ **MODE KEY**
- PHASE SHIFT
- PROGRAMMING

⑦ **MEMORY KEY**

⑧ **POWER SWITCH**
- CLICK AND RELEASE TO TURN ON, CLICK TO TURN OFF. AUTO SHUT OFF AFTER 10 MINUTES

AC ADAPTER/CHARGER PORT

MEMORY ICON
INDICATES IF CURRENT FLASH RATE IS ALREADY STORED IN MEMORY

LOW BATTERY ICON

FLASH DURATION LEVEL
F0~F9 (F0 DEFAULT)

MEMORY LOCATIONS
1~9 FOR BOTH FPM AND HZ

UNITS
FPM = FLASHES PER MINUTE
HZ = FLASHES PER SECOND

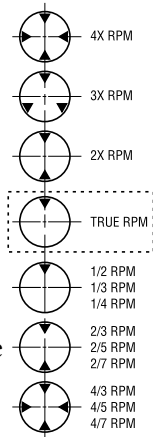## PREPARATION

Changing Units (FPM is the factory default)

Turn off the strobe (the strobe light goes off and the display stays on for two more minutes). Press and hold **MODE**, then press the power switch ⏻ and SEL is displayed. Press the ◄ or ► arrows to select FPM or Hz. The selected unit becomes the default when the strobe is powered on. Press the power switch ⏻ to exit.

```
       FO
  -SEL-
              FPM
```

FPM, FLASHES PER MINUTE IS BEST FOR MOST APPLICATIONS. HZ IS FLASHES PER SECOND. SELECT WITH LEFT/RIGHT ARROWS

MEASURING

1. Visually note a unique feature on the object to be measured or physically mark it with reflective tape or chalk.
2. Press ⏻ to turn on the strobe. The LED indicator blinks and the strobe flashes at 3,000 FPM factory default or previous power down value.
3. Set flash rate to maximum and aim at the object. Press the ▼ arrow until the object appears frozen. To find true rpm, press the ÷2 button, ▲ or ▼ arrows, to adjust the flash rate until the first time a single mark appears.

   The flash rate changes more rapidly the longer the ▲ or ▼ arrow key is held, then resets 1.5 seconds after it is released.

   Advanced users: *After releasing the ▲ or ▼ arrow, the numeric place of the flashing digit indicates the rate of change. While the digit is flashing, press the ◄ or ► arrows to move the numeric place of the flashing digit higher or lower. Then press the ▲ or ▼ arrow to change the flash rate using that increment.*
4. Press ⏻ to turn off the strobe (the display remains for two more minutes). The strobe shuts off automatically after 10 minutes.

4X RPM
3X RPM
2X RPM
TRUE RPM
1/2 RPM
1/3 RPM
1/4 RPM
2/3 RPM
2/5 RPM
2/7 RPM
4/3 RPM
4/5 RPM
4/7 RPM

NOTE: IF THE FLASH RATE IS 1/2 OF TRUE RPM, 1/3, 1/4, ETC., A SINGLE MARK ALSO APPEARS.

IF THE FLASH RATE IS 2X TRUE RPM, TWO MARKS APPEAR, 3X TRUE RPM, THREE MARKS, 4X, FOUR MARKS, ETC.

IF THE FLASH RATE IS 2/3 OF TRUE RPM, 2/5, 2/7 ETC., TWO MARKS APPEAR. AND 4/3, 4/5 AND 4/7 FOUR MARKS APPEAR, ETC.

Digital Phase Shift (image rotation)

After synchronizing the flash rate with the moving object, press ━ or ✛ to adjust the angle. When the strobe is turned off, the phase shift resets to zero.

MEMORY (FPM and Hz units each have nine separate memory locations)

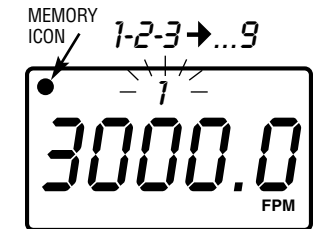### Saving Flash Rates in Memory

Turn on the strobe and synchronize the flash rate with the moving object. Press and hold **MODE**, then press **MEMORY**, a memory location number appears briefly and the flash rate is saved to that memory location. When nine locations have been saved FUL appears on the display.

```
 ●     FO
  -FUL-
              FPM
```

Memory Recall

Turn on the strobe. Press **MEMORY** to enter memory mode and memory location '1' appears at the top of the display. Press **MEMORY** again to select another location. If no flash rates are stored, numbers do not appear.

MEMORY ICON

```
1-2-3 ➔ ...9
        1
  3000.0
              FPM
```

PRESS MEMORY TO CHANGE LOCATION
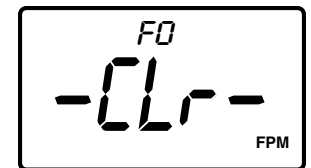
Changing Memory Values

Select a memory location (see Memory Recall above). The memory icon indicates the stored flash rate matches the current flash rate. Use the arrow keys to change the flash rate (the memory icon disappears). To save the new flash rate, press and hold **MODE**, then press **MEMORY**. The memory icon reappears and shows that the current flash rate is stored.

Clearing All Memory

Turn off the strobe. Press and hold the **MODE** key, and then press the power switch ⏻. SEL is displayed. Press and hold **MODE**, then press **MEMORY** to display CLr. Press **MEMORY** again and stored memory is cleared (CLr disappears in three seconds). After memory is cleared the strobe returns to default measuring mode (3,000 FPM).

```
       FO
  -SEL-
              FPM
```

PRESS AND HOLD MODE, THEN PRESS MEMORY TO DISPLAY CLR

```
       FO
  -CLr-
              FPM
```

PRESS MEMORY TO CLEAR