MIROLUX 12

INSTRUCTION MANUAL

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Thank you for purchasing the Mirolux 12, a portable retroreflectometer that is useful for testing highway paint traffic markings for luminous reflectivity. By using angles of illumination and observation similar to those of an actual automobile and driver, the nighttime visibility of paint striping can be measured. Higher readings on the Mirolux 12 indicate greater reflectivity and thus, greater visibility and safety.

The Mirolux 12 is a durable device that has an enviable reputation in the industry. Over 580 units have been sold throughout the United States, Canada, Brazil, Columbia, and Japan.

Receipt of Instrument

The Mirolux 12 should be unpacked carefully upon receipt making sure that no defects occurred during shipment. If any defects did occur, they should be reported immediately to Mirolux Products, Inc.

Typically, the shipment consists of two pieces. The first should contain the following items:

- Aluminum carrying case containing:
  - Mirolux 12
  - Two battery packs
  - Two AC to DC battery chargers
  - Black-White test panel
  - Extra fuses

The second piece contains a sunshield and two foam rubber bottom seal replacement kits.

Features of Mirolux 12 Retroreflectometer

- Reliable performance evaluation of horizontal road markings
- Direct measurement in millicandelas/M^2/LX
- Measurement on dry surfaces in daylight or darkness
- Portable
- Durable self-contained construction
- Digital readout
- Rechargeable batteries complete with chargers
- Internal and external calibration plates for performance assessment and reliability
- Light weight and low cost

Putting Unit Into Service

1. Assess battery condition:
   - Toggle the power and lamp switches to their "on" positions (Figures 1 and 2)
   - Press red battery test button (Fig. 2)
   - Reading on the display should be 115 to 130 (11.5-13.0 volts)
   - Readings below 115 indicate a battery that requires recharging
   - Press the battery test button again to perform reflectivity measurements
   - Turn off the lamp to calibrate the machine prior to use

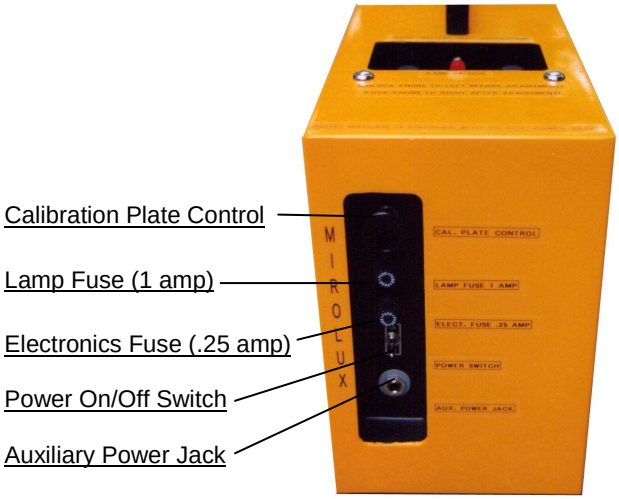

Figure 1

2. Place the Mirolux 12 on a flat, dry, clean surface in the vicinity of the road marking test area.
3. Allow one to three minutes to allow the electronics to stabilize.
4. Unlock Zero Adjust Knob (Fig. 2) and adjust until "000" reads on the digital display. ***Note: Both the Zero Adjust Knob and Calibration Knob have small levers at the bottom of the dials that keep settings secure. Move the levers to the left to change settings, and***

back to the right to lock the dials. The numbers on the dials themselves are primarily for factory calibration purposes. If the dial readings ever approach 100 or 900 while performing normal calibration, the machine may soon require factory cleaning and recalibration. At these extremes, little calibration adjustment remains.

5. After thirty seconds to three minutes, the digital display should remain at zero. If necessary, readjust Zero Adjust Knob to obtain zero on the display.

6. With Digital Display at "000", turn on the lamp (Fig. 2).

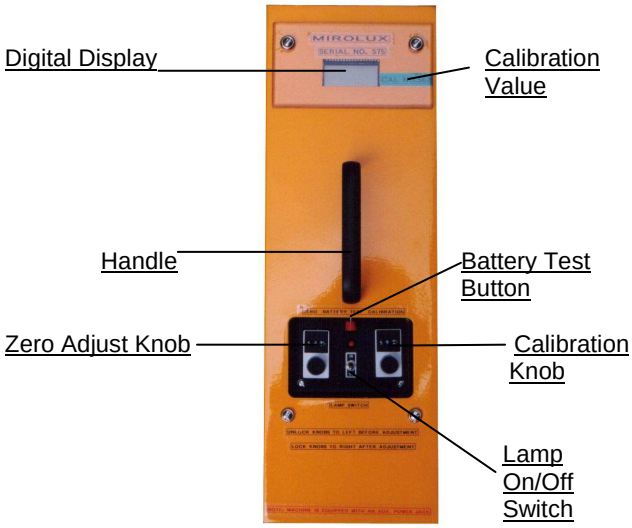

Figure 2

7. To assure an accurate check of the internal calibration, push and pull on the Calibration Plate Control (Fig. 1) two times and leave pushed in.

8. Unlock Calibration Knob and adjust until Digital Display matches the factory set Calibration Value recorded next to the display (Fig. 2).

9. The Mirolux 12 is now ready for use.

10. Place unit on calibration test panel (white side) and pull out on the Calibration Plate Control. The reading on the display should be within the range marked on the reverse side of the panel. Ensure that the Mirolux 12 is placed squarely on the test panel.

11. Turn the unit 180 degrees and check the reading on the black side of the test panel. The reading should be minus fifteen (-15) to plus fifteen (15). Readings outside this range indicate cleaning and factory recalibration of the machine may be necessary. Please call the factory if you experience this condition.

12. Carefully place unit on area to be tested, ensuring it is stable. Place the Mirolux 12 lengthwise on the stripe to be measured.

13. Pull Calibration Plate Control out and allow the reading to stabilize.

14. When the display stabilizes, record the reading.

Important Note: *Periodically check the battery level **and** the internal calibration while in use (see #7 above). If the battery level is below 11.5v (115), readings may be inaccurate. The battery should be recharged and replaced with a fresh one (see battery replacement procedures below).*

Recommended Measuring Procedure

Three readings on the same line within ten feet of each other should be +/-10% of the average of the readings. If not, two more readings should be taken.

Battery

The 10 cell Ni-Cad battery is located behind the Battery Access Panel (Fig. 3).

To Remove Battery

Open the panel and carefully disconnect the battery's socket from the Mirolux 12. Unscrew two black knobs and remove the hold-down plate. Pull on leather strap to free battery and remove. **Note:** *Do not pull on wires*.

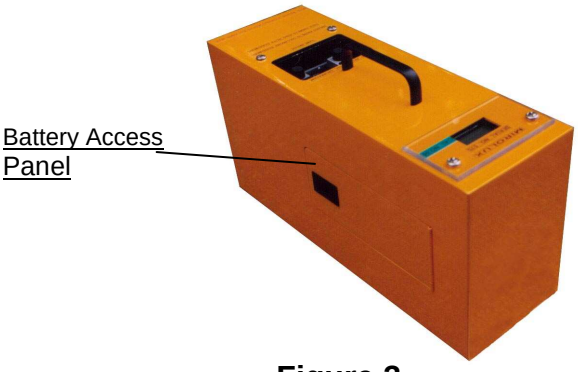

Figure 3

To Install Battery

Slide the new battery pack onto two mounting posts, place leather strap across the battery and install the hold-down plate with two black knobs. Attach the electrical socket securely and close the access panel. **Note:** *When the battery output is below 11.5v (115 on display), it should be removed and recharged.*

Recharging Battery

Every two to three weeks the battery should be discharged in the unit by turning on the power supply and lamp until the voltage reading is below 10.0v (100 on the display. Remember to press the Battery Test Button in Figure 2 when checking the voltage). This could take up to four hours depending on the battery's state of charge. This procedure will ensure that the Ni-Cad batteries do not develop a memory that will reduce their capacity.

To charge the batteries, remove them from the instrument. Insert the battery charger's plug into the battery, then plug the charger into a 110 volt AC wall outlet. The chargers that are supplied require 8-10 hours to fully charge the batteries.

Note: *For each hour the batteries are used they should be charged for two hours. The batteries cannot be overcharged. Fully charged batteries should operate the Mirolux 12 for 3-4 hours depending on conditions.*

Auxiliary Power Jack

All Mirolux 12 retroreflectometers shipped beginning with serial number 570 are equipped with an Auxiliary Power Jack on the back panel (Fig. 1). Instead of being powered by the supplied battery packs, the Mirolux 12 can be powered by any 12 volt DC source including a car battery, or 110 volt AC household current that has first passed through an optional inverter (**never** attempt to directly attach the Mirolux 12 to 110 volt AC current). Mirolux Products, Inc. can supply an optional 25-foot long cord to plug the unit into a vehicle's cigarette lighter.

When using the Auxiliary Power Jack, the Power On/Off Switch should be left in the "**OFF**" position. Upon insertion of the plug from the power source, the Mirolux 12 will automatically turn on. However, the lamp will still have to be turned on manually.

Note: *Earlier machines that have a charging jack in this position can be returned to the factory where the Charging Jack can be converted to an Auxiliary Power Jack.*

Operating Tips

- For best results, store and operate your Mirolux 12 between 40ºF and 100ºF. Avoid excessive temperatures, including the trunk of a car.
- When removing battery, be careful not to pull on the wires. When replacing the battery into the Mirolux 12, be sure its electrical socket is fully seated.
- Place the Mirolux 12 squarely on surface to be tested. Clear the area of all debris (stones, gravel, etc.).
- When taking a reading, the Mirolux 12 should be oriented to face the same direction as the flow of traffic.
- The Mirolux 12 can provide accurate readings **only** on sound pavement. Attempting to obtain readings on striping that has been applied to pavement with large cracks, depressions, holes, or heaving will produce values that are inconsistent with the remainder of the area being tested. Readings should not be attempted on a section of pavement displaying the above conditions. Move to a nearby area of pavement that is flat and level.
- Variability of Readings
    - The type of glass spheres, their position, and the quantity applied to the marking material will affect readings produced by the Mirolux 12.
    - The type and quantity of pigment, and the presence of dirt, dust, water, wear, etc. on the tested surface will affect the readings.
    - Due to its high sensitivity, very slight changes in the position of the Mirolux 12 on the traffic marking may produce different readings.
- The Calibration Plate Control should be left in the "out" position only when taking readings. Keeping it pushed in will help seal the sensitive area surrounding the photoreceptors from dust.
- Avoid moisture and dampness.

Operating Tips, continued

- Attempt to keep the digital display out of direct sunlight.
- Once calibrated and warmed up, leave the lamp on. It should be turned off only when measurements have been completed.
- Store the calibration test panel carefully in the carrying case. If it should become dirty, the white surface may be cleaned with glass cleaner and wiped dry with a lint free cloth.

Maintenance

The instrument does not require special maintenance. The optics are protected against dirt and dust. It is recommended that the outside cover be cleaned with a damp rag and a non-abrasive mild household cleaner. Avoid allowing water to enter the unit.

CAUTION: The optics housing should not be opened under any circumstances. The internal geometry has been precisely set at the factory and disturbance of the hardware could alter the geometry and negate any guarantee of proper operation. If altered, the internal geometry can only be adjusted in the factory.

LAMP: The lamp is the heart of the optical system. The lamp must be precisely positioned in its socket to guarantee optimum illumination. If the filament of the lamp is not in the precise position, the illumination will be degraded and readings will be inaccurate. The lamp glass should not be touched. If the lamp is handled, it must be cleaned thoroughly with alcohol.

Technical Support and Service

As a family owned and operated business, it's important that our customers remain satisfied with their Mirolux 12. Mirolux Products, Inc. offers technical support via telephone, fax, and E-mail. In addition, factory service is available with a five to seven day turnaround time depending on the production schedule. Rush repairs along with overnight delivery are available, but the factory must be consulted to discuss options.

Visit our Web site at **www.miroluxproducts.com** to see the latest offerings, product information and links to related sites.

Refurbishing Service

New replacement items are available to update the appearance of a Mirolux 12 and make an older unit look like new.

- New cover, battery access panel, handle, aluminum carrying case, carrying case foam rubber

Accessories

- Extra Battery Chargers
- Extra Battery Packs
- Test Panels
- Foam Rubber Bottom Seal Replacement Kits
- 25 foot auxiliary power cords
- 110 volt AC to 12 volt DC inverters
- Decal Kits
- Sunshields

Specifications of the Mirolux 12

Readout	3 Digit Digital Display
Light Source	12 volt, 12 watt Halogen lamp
Standard Calibration	Internal/External
Controls For:	Power On/Off, Lamp On/Off, Zero Adjustment, Calibration Adjustment, Battery Check
Power Requirements	12 volt DC
Dimensions	8 in. long, 6 in. wide, 9 in. high, (455 x 152 x 229 mm)
Weight	14 lbs. (6½ kg)
With carrying case	35 lbs. (16 kg)

Made in USA

Measuring Geometry

Illumination Angle	86½º
Observation Angle	1½º
Illuminated Opening	90 x 165 mm 3½ x 6½ in.
Illuminated Area	3½ x 6½ in.