

Digital Level (DL150M)



Congratulations on your choice of this  **DaveBell**TM digital level. For the purpose of long-term use of this instrument, we suggest you to read this instruction manual carefully before using it.

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1. Functions and Features

LS160 is a new type of digital level, which can quickly and precisely measure the slope angles of any plane and pipe piece, and also can provide accurate angles for indoor layout and calibration. This kind of product is featured by easy manipulation and wide applications.

Features:

- Able to make angle measurement in the range of 360 degree
- Able to supply graduate sound indication, convenient for construction
- Magnetic base can be firmly attached onto the iron surface.

2. User Safety

- Do not use the instrument in corroding, flammable, exploded environment.
- Do not insert the instrument into water or make the instrument moist, in order to keep away from damage of digital circuit.
- Do not disassemble the instrument or attempt to perform any internal servicing. Repairs and servicing could be performed only by authorized service centers.

Please operate the instrument according to the methods described in this instruction manual.

3. Nomenclature

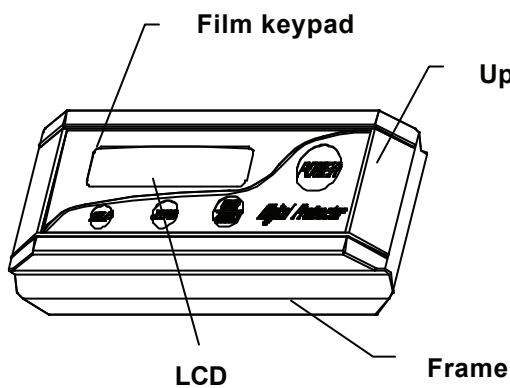


Figure 1

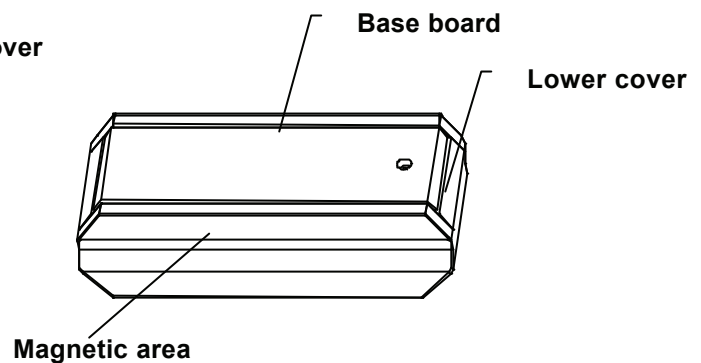


Figure 2

4. Operating instruction

4.1 Battery installation

LS160 is equipped with 3X AAA alkaline batteries

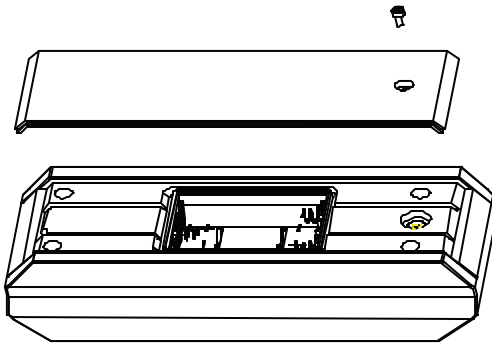


Figure 3

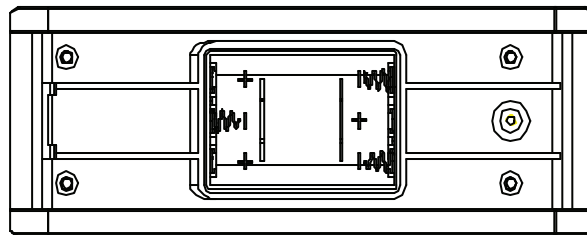


Figure 4

- 1) Make sure that the instrument is in power-off state.
- 2) Screw off the bolt (as figure 3), remove the old batteries, and install the new ones.
- 3) Turn on the unit to see if all functions are correct.

Note:

- 1) Be careful of polarities when replacing the batteries.
- 2) Always take the batteries out when the instrument is not in use for a long time

4.2 Key-press instruction

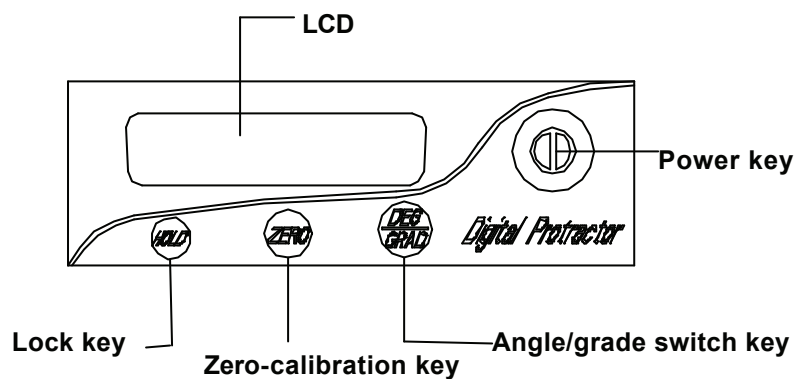


Figure5



Power key: turn on or off the instrument



Lock key: Hold the current displayed angle value.

Under angle measurement status, the displayed angle will vary with the slope angle. With the press of this key, the instrument enters lock state, and record the current angle degree with flash display. With the press of this key again, the instrument will exist lock state.



Angle/grade switch key:

Note: The state has the memory function, i.e. if the instrument is power off while grade display state, the instrument will still display grade degree after power on again. If the instrument is power off while angle display state, the instrument will still display angle degree after power on again.



Zero-calibration key:

The long press of this key means zero-calibration of the instrument, while the short press of this key means turning on or off the sound indication function.

Periodic checking should be conducted to this instrument, if find it out of alignment, recalibration would be necessary. This key is used for calibration the instrument to absolute horizontal and absolute vertical of this instrument. Its operation procedures presented in "self-check and calibration".

4.3 Assistant Functions

4.3.1 Auto-off

The instrument will be auto-off in 6 minutes without any key-press operation.

4.3.2 Low voltage indication

When the battery voltage is low, the battery symbol will flash in the left LCD (figure 6), and then need to replace the batteries immediately.

Battery symbol

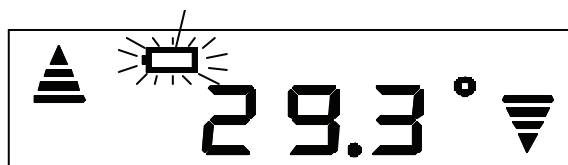


Figure 6

4.3.3 Slope indication

- ① To set the instrument into horizontal or vertical states, just turn the instrument as the figure 7 indicated.
- ② Figure 8 means the instrument is on leveling.

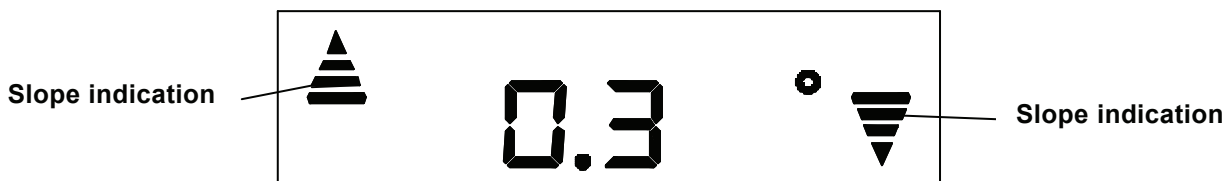


Figure 7





Figure 8

4.3.4 Sound indication

① Power on and press this key to activate the function of gradual sound indication.



Sound indication

② The sound-indication symbol will display on the LCD



③ When the measuring angle is less than 10° , the buzzer will give a short sound indication. When the measuring angle approaches to 0° more closely, the sound indication will become more rapid.



④ When the measuring angle is exactly equal to 0° , the buzzer will give a continuous long sound indication.



5. Application methods

Measuring the Inclining angle to the level plane (figure 9)

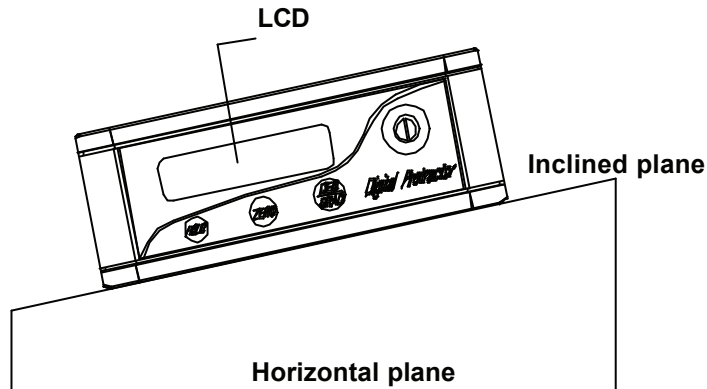


Figure 9

6. Self-check and calibration

Daily accuracy check would be necessary before operation, especially after serious shock or temperature difference up to 5 degrees, so as to guarantee the best measuring precision on grade degrees, plumb degrees or plane measurement. If the accuracy decrease, that means the unit need recalibration. The accuracy data is presented in Technical Specification. Calibration to horizontal and plumb is suggested be conducted at same time.

Note: In the angle-measurement lock state, the instrument cannot enter this function. If you want to make the instrument calibrated, it should exist the angle-measurement lock state first.

6.1 Horizontal angle check

(1) Turn on the instrument and put it on a smooth and leveling surface as figure 10, notice the LCD display, wait 10 seconds till the displayed digits stable and record the angle value.

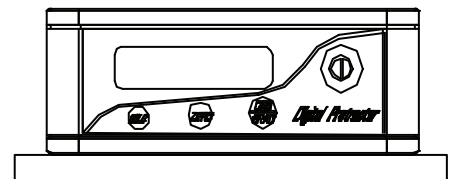


Figure 10

(2) Rotate the instrument by 180° in the same plane, see figure 11, wait 10 seconds till the displayed data stable then record the second angle value.

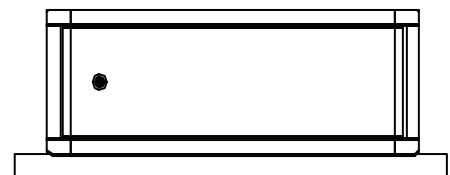


Figure 11

(3) Overturn the instrument in the same plane as figure 12, wait 10 seconds and record the third angle value when it is stable.

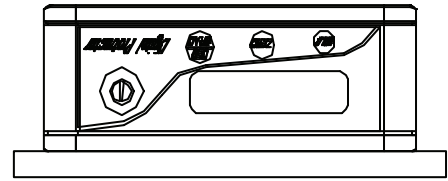


Figure 12

(4) Rotate the instrument 180° again on basis of figure 12, see figure 13, wait 10 seconds and write down the fourth degree value when it is stable.

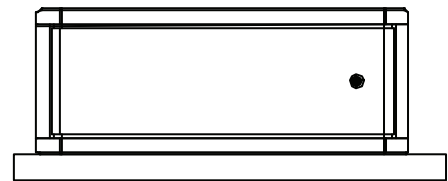


Figure 13

For the above four degree readings, if any of two values gap over 0.1°, the unit must have a new Zero plumb recalibration.

Note: above check should be conducted in the same position of one plane.

6.2 Vertical angel check

(1) Turn on the instrument and put it on a smooth and vertical plane, see figure 14, notice the LCD display, wait 10 seconds till the data reading is stable then record the angle degree.

(2) Rotate the unit 180° on the same plane as figure 15, wait 10 seconds till the data reading is stable, then record the second angle degree.

(3) Overturn the unit on the same plane as figure 16, wait 10 seconds and record the third angle degree when it is stable.

(4) Rotate the instrument 180° on basis of figure 16, see figure 17, wait 10 seconds and record the fourth angle degree when it is stable.

For the above four degree readings, if any two values gap over 0.1°, the unit must have a new Zero plumb recalibration.

Note: above check should be conducted in the same position of one plane.

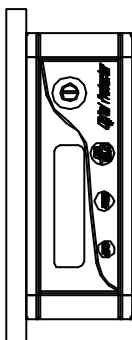


Figure 14

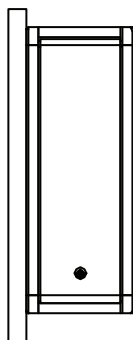


Figure 15

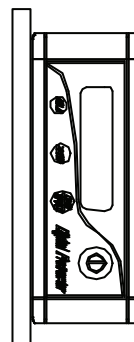


Figure 16

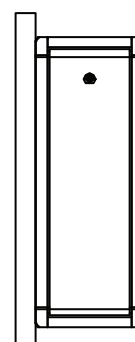


Figure 17

6.3 Horizontal calibration

(1) Turn on the instrument and put it on a smooth and horizontal surface, as shown in figure 18. With the press of “Zero calibration” key for more than 3 seconds, LCD will display “-0-“, and now it means the instrument has entered the calibration state.



Figure 18

(2) Wait ten seconds then press again the “Zero calibration” key, the LCD will display “-1-“;



Figure 19

(3) Rotate the instrument 180° on the same plane as shown in figure 20, wait 10 seconds and press the “Zero calibration” key again, the LCD will display “-2-“. Wait 2 seconds again, and the instrument will display the angle value.



Figure 20

(4) Turnover the unit on the same surface to make it upside down, as shown in figure 21, then press “Zero calibration” key for more than 3 seconds, the LCD will display “-0-“;

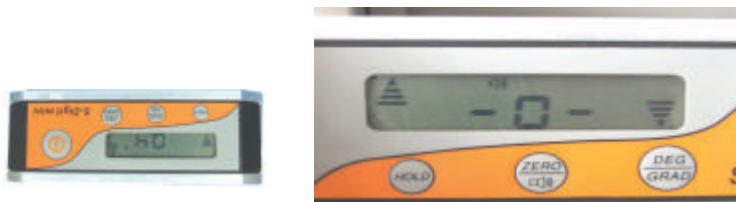


Figure 21

(5) After 10 seconds, press again the “Zero calibration” key, the LCD will display “-1-“, as shown in figure 22.



Figure 22

(6) Turn the instrument 180° on the same plane, as figure 23, wait 10 seconds, and press again the “Zero calibration” key, the LCD will display “-2-“. Wait 2 seconds again, and the instrument will display the angle value. Thus, the horizontal calibration of the instrument has been completed.



Figure 23

6.4 Vertical calibration

(1) Turn on the instrument and put it on a smooth and vertical benchmark surface I, as shown in figure 24. The two side surfaces of this benchmark should be as parallel as possible, such as glass door or window. Press “Zero calibration” key for more than 3 seconds, the LCD will display “-0-“, and now it means the instrument has entered the calibration state.

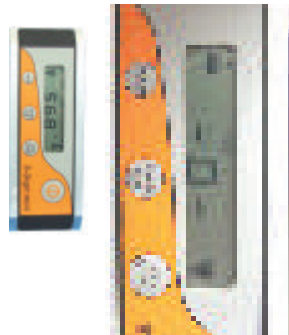


Figure 24

(2) Wait ten seconds then press again the “Zero calibration” key, the LCD will show “-1-“, as shown in figure 25.

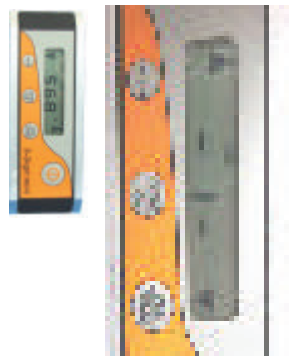


Figure 25

(3) Rotate the protractor to the other vertical surface II on the same benchmark plane, as figure 26, wait 10 seconds and press the “Zero calibration” key again, the LCD will display “-2-“. Wait 2 seconds again, and the instrument will display the angle value.

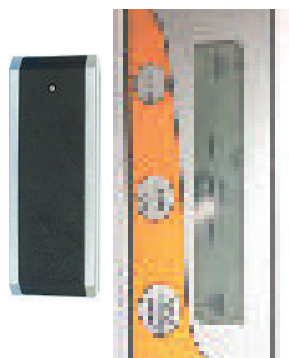


Figure 26

(4) Turnover the unit on the basis of figure 26 to make it upside down, as figure 27, then press “ Zero calibration” key for more than 3 seconds, the LCD will display “-0-“;



Figure 27

(5) After 10 seconds, press again the “Zero calibration” key, the LCD will display “-1-” , as shown in figure 28.



Figure 28

(6) Turn the instrument back to the first vertical surface I, which is still on the same benchmark plane, as shown in figure 29, wait 10 seconds, and press again the “ Zero calibration” key, the LCD will display “-2-” . Wait 2 seconds again, and the instrument will display the angle value. Thus, the vertical calibration of the instrument has been completed



Figure 29

7. Technical specifications

- Accuracy: $\pm 0.1^\circ$ (Within $0^\circ \sim \pm 10^\circ$);
 $\pm 0.2^\circ$ (Other angles)
- Temperature range: $-10^\circ\text{C} \sim +50^\circ\text{C}$.
- Power supply: 3XAAA alkaline batteries
- Battery life: About 60h
- Low battery indication: Battery symbol flashing displayed on the LCD

8. Application demonstrations

- Measure the inclining angle for single plane



- Measure the inclining angle which attaching on a iron block



9. Maintenance

- keep the instrument away from water or rain.
- As a precision instrument, it should be carefully operated and properly preserved, and any violent shock or falling will possibly result in the damage of instrument.
- Always keep the instrument clean.
- Take the batteries out when the instrument is not in use for a long time, and keep the instrument in the carrying case when it is unused.