

DIGITAL COMPASS WITH ALTIMETER

Instruction Manual

1. Introduction

1.1 Features:

- Altimeter (m, feet)
- Digital compass
- Barometric pressure (hPa, inHg, mmHg)
- Temperature (°C or °F)
- 256 set of altitude and barometric pressure data history
- Forecast icons based on changing barometric pressure
- 12/24 clock format
- Perpetual calendar
- Time and date by manual setting
- LED backlight
- Lanyard included for easy carrying

1.2 Button function

If key idle 30minutes and pressure change within 0.4hpa, LCD off. Press any button again to resume normal LCD display.

1.2.1 The "ALTITUDE/+ " button

- While in setting mode, press "ALTITUDE/+ " button to increase the value
- While in normal display, press "ALTITUDE/+ " button to shift the display of barometer and absolute/relative altitude.
- While in absolute altitude display mode, hold the "ALTITUDE/+ " button for 2s, the absolute altitude will be reset to relative altitude and the initial value is zero. Hold the "ALTITUDE/+ " button for 2s, the relative altitude will be reset to absolute altitude again. Relative altitude mode is useful when accumulated altitude reading is desired.

1.2.2 The "COMPASS/- " button

- While in setting mode, press "COMPASS/- " button to decrease the value
- While in normal display, press "COMPASS/- " button to enter compass mode
- While in compass mode, press "COMPASS/- " to shift the display of the bearing direction in compass points and in digital.
- Hold the "COMPASS" button for 2s to enter Calibration mode.

1.2.3 The "SET" button

- While in normal display, press "SET" button to shift the display of time and date
- While in normal display, hold the "SET" button for 6s to enter energy saving mode: LCD off, but real time clock is still running. Press any button again to resume normal LCD display mode.
- While in normal display, hold the "SET" button for 2s to enter setting mode

1.2.4 The "HISTORY" button

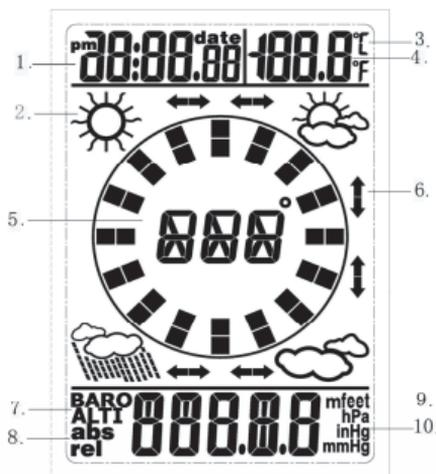
- While in normal display, press "HISTORY" button to display the history data of barometer or altitude with the time and date at which these data were recorded, press "ALTITUDE/+ " to

scroll up the history record, press "COMPASS/-" to scroll down the history record. Press "HISTORY" button again to exit the history mode and return the normal display. While in history mode, "HIS" will be displayed on the temperature reading area(4), the history data sets number will be displayed at the center of compass.

- While in normal display, press "HISTORY" button for 2s to enter store data interval setting. Press "ALTITUDE/+" button to increase the value. Press "COMPASS/-" button to decrease the value. Press "HISTORY" button to confirm the setting and exit
- The program mode can be exited at any time by pressing "HISTORY" button.

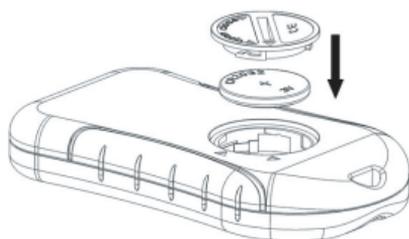
1.3 LCD display

The following illustration shows the full segment of the LCD for description purpose only and will not appear like this during normal operation.



1. Time / Date
2. Weather forecast icon
3. Temperature display unit (°C or °F)
4. Temperature
5. Digital compass
6. Weather tendency arrow
7. Barometer / Altitude
8. Pressure unit (relative or absolute)
9. Altitude display unit (m or feet)
10. Barometer display unit (hPa, inHg, mmHg)

1.4 Insert battery



When the unit is powered up, all LCD segments will light up for about 3 seconds

Caution: Do not reverse polarity of the batteries
Wait 10 seconds before re-insert the battery again to make a proper reset.

2. Altitude Mode

2.1 Absolute altitude

As the absolute altitude is calculated from the air pressure the change of air pressure would affect the altitude reading. To achieve a more accurate reading, it needs to be calibrated as pressure may change gradually.

Important note: In order to set the correct absolute altitude reading, the altitude must be known. That information can be found by utilizing a topographical map identifying the current location with the associated altitude marked. The user can then proceed and follow the instructions to calibrate the absolute altitude.

To calibrate the absolute altitude

In absolute altitude display mode, hold the "SET" button for 2s to enter setting mode, press "SET" button to select the absolute altitude setting. While the digits are selected (flashing), press the "ALTITUDE" button to increase the digit amount. Press "COMPASS" button to decrease the digit amount.

2.2 Relative altitude

Relative altitude can be set whenever required over the whole measurement range.

To set the relative altitude to zero

While in absolute altitude display mode, hold the "ALTITUDE/+ " button for 2s, the absolute altitude will be reset to relative altitude and the initial value is zero.

3.SET Mode

- Hold the "SET" button for 2s while in normal display to enter setting mode

- Press " SET" button to select the following setting in sequence:

- 12/24 hour format
- Manual time setting (hours/minutes)
- Calendar setting (year/month/date)
- Temperature display unit degree Celsius or Fahrenheit
- Pressure display unit in hPa or mmHg or inHg
- Altimeter display unit in m or feet
- Absolute altitude calibrate

In the above setting modes, press "ALTITUDE" button or "COMPASS" button to change or scrolls the value. Hold the "ALTITUDE" button or "COMPASS" button for 3 second will increase/decrease digits in great steps. Press the "SET" button to accept the change and advance to the next setting mode. Continue to press the "SET" button to toggle through the setting mode until return to the normal Mode

4. COMPASS Mode

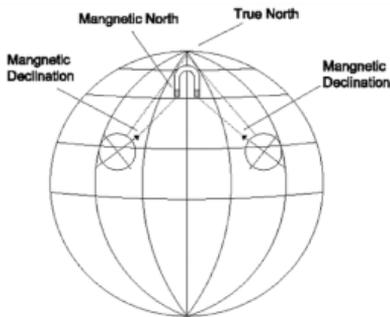
4.1 Precautions when using the Compass

- Keep your digital compass away from magnets or appliances which may contain magnetic objects, such as: mobile phones, speakers, motors, etc.
- This compass like most magnetic compasses, points to the magnetic North, which is slightly difference from the true North. Check section '3.2 Magnetic Declination' for more information.
- To achieve a accurate result, you should avoid measuring a direction on the following conditions:
 - The compass is too close to magnetic objects
 - The compass is too close to metal objects
 - The compass is too close to an electrical appliance.
 - The compass is inside a moving object or a concrete building

4.2 Magnetic Declination

What is Magnetic Declination

- The Magnetic North Pole is slightly difference from the True North Pole. Most magnetic compasses, point to the Magnetic North Pole. On the contrary, everything measured from a map is related to the True North Pole.
- The angular difference between Magnetic North Pole and True North Pole is called magnetic declination. Its amount (degrees and minutes) and direction (easterly and westerly) depend on where you are.



Magnetic Declination

- For serious compass user or users who intends to perform accurate navigation, the compass must be adjusted to compensate for magnetic declination.

Magnetic Declination Information

- Most topographic maps show magnetic north pole and or the magnetic declination information.
- The manual includes the magnetic declination for some major cities. Check the 'Magnetic Declination at Major Cities' section for more detail.
- For those cities whose names are not included in the list, you may like to refer to the online magnetic declination information.

4.3 Magnetic Declination Compensation

- compensate an object's bearing by subtract westerly (W) magnetic declination or add easterly (E) magnetic declination with the magnetic bearing.

Example

- 26° Westerly magnetic declination and the compass needle points 326° (MB).
- The true bearing will be $326^{\circ}(\text{MB}) - 26^{\circ}(\text{W}) = 300^{\circ}$

WS110 will compensate the compass bearing wherever the magnetic declination is either westerly declination or Easterly declination automatically, if the user inputs the magnetic declination angle of the city which is close to the user's current location during the calibration. Check the **4.5 Calibrating the compass** section for more details on the calibration.

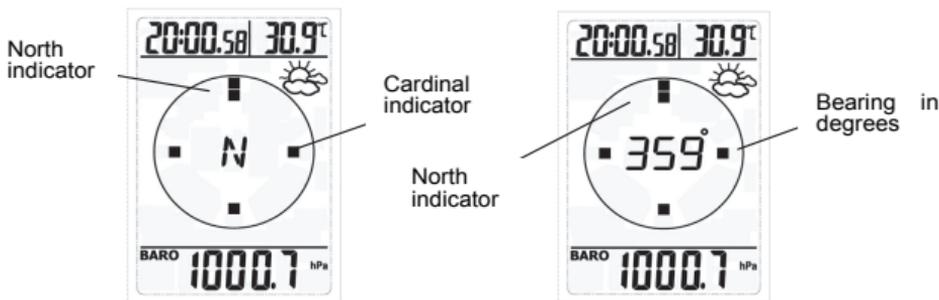
4.4 Magnetic Declination at Major Cities

No.	Major City	Declination	No.	Major City	Declination
1	Afghanistan	2-E	33	Netherlands	1-W
2	Australia	12-E	34	New Zealand	22-E
3	Austria	2-E	35	Norway	0
4	Bahrain	2-E	36	Pakistan	2-E
5	Bangladesh	0	37	Philippines	1-W
6	Belgium	1-W	38	Portugal	5-W
7	Brazil	19-W	39	Russia	9-E
8	Canada	14-W	40	Singapore	0
9	Chile	5-E	41	South Africa	23-W
10	China	6-W	42	Spain	3-W
11	China	2-W	43	Sweden	3-E
12	Costa Rica	0	44	Switzerland	0
13	Cuba	3-W	45	Taiwan	3-W
14	Czech Republic	2-E	46	Thailand	0
15	denmark	1-E	47	UAE	1-E
16	Egypt	3-E	48	United Kingdom	3-W
17	Finland	6-E	49	United States	10-W
18	France	1-W	50	Juneau	25-E
19	Germany	1-E	51	Phoenix	12-E
20	Greece	3-E	52	Little Rock	2-E
21	Hungary	4-E	53	Sacramento	16-E
22	India	1-E	54	Denver	10-E
23	Indonesia	1-E	55	Atlanta	4-W
24	Israel	3-E	56	Honolulu	10-E
25	Italy	1-E	57	Boston	16-W
26	Japan	7-W	58	Saint Paul	2-E
27	Jordan	3-E	59	Jackson	1-E
28	Kenya	1-E	60	Santa Fe	10-E
29	Korea	7-W	61	Oklahoma City	6-E

30Malaysia	Kuala Lumpur	1-E	62	Salem	18-E
31Mexico	Mexico City	6-E	63	Harrisburg	11-E
32Nepal	Katmandu	0	64	Slat Lake City	14-E

4.5 Calibrating the compass

- Press "COMPASS/-" button to enter compass mode. In compass mode, press "COMPASS/-" to shift the display of the bearing in cardinal indication and bearing in degrees.



- Perform the compass calibration in the following conditions:

- 1) When the compass is used the first time
- 2) The battery has been replaced,
- 3) When using the compass in a location different from the place in which the compass had been calibrated.

4.5.1 Rotation Calibration Mode

- 1) Hold the "COMPASS" button until "CAL" is shown on the display, which indicates the calibration screen.
- 2) Hold the compass a flat surface which is parallel to the horizon, then rotate the compass clockwise for 1 turns. The rotation should be completed in a slow and steady practice.
- 3) When the turning is completed, press "COMPASS" button to return to Compass Mode and start taking measurement.

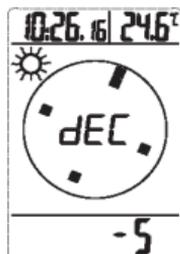
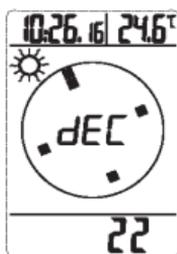
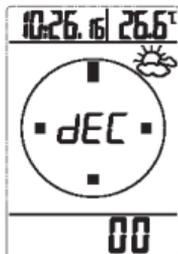
4.5.2 Magnetic Declination Mode

Check section "3.4 Magnetic Declination at Major Cities" to get the magnetic declination of the city nearest to your current position. Input this angle into the compass during the calibration

- 1) Press the "COMPASS" button to enter compass mode.
- 2) Press the "SET" button, the "DEC" indicator is shown on the display. The digit will start flashing.
- 3) Press "ALTITUDE" button or "COMPASS" button to increase or decrease the angle (from -90 to 90), until the desire magnetic declination has appeared.

Example 1:

Compensate the magnetic declination for Wellington in New Zealand (22-E), select +22 in the magnetic declination setting.



Example 2:

Compensate the magnetic declination for Lisbon in Portugal (5-W), select -5 in the magnetic declination setting:

Note: 1. The compass must be kept in a level position when in use.

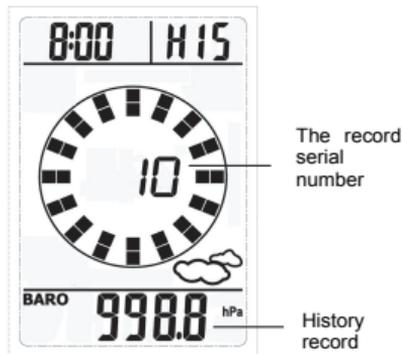
2. Compass readings are easily affected by disturbing sources of magnetism, so the compass should always be used in the open air.

5. HISTORY Mode

To set the history record interval time

1) Press "HISTORY" button until "HIS" is shown on the display and the history record interval time is flashing which indicates entering the history record interval time setting. Press "ALTITUDE/+" button to increase the value. Press "COMPASS/-" button to decrease the value. Press "HISTORY" button to confirm the setting and exit

2) History record interval time range: 1min ~ 60min (default 5min)



How to view the history record

1) While in normal display, press "HISTORY" button to display the history record of barometer or altitude (You can choose the barometer or altitude display by pressing "ALTITUDE" button while in normal display), press "ALTITUDE/+" to scroll up the history record, press "COMPASS/-" to scroll down the history record. The record serial number

will display automatic. The smaller the number corresponding to earlier time. This digits display is helpful when more than one day history data has been recorded.

- 2) Press "SET" button to shift the display of time and date of record.
- 3) Press "HISTORY" button again to exit the history mode and return the normal display.
- 4) Max. 256 set of altitude and barometric pressure data history

Note: The history record is circular and the new record will cover the oldest record when the record over 256set. The record cannot be cleared by the user.

6. Weather forecast



Sunny



Partly Cloudy



Cloudy



Rainy

The four weather icons Sunny, partly Cloudy, Cloudy and Rainy represent the weather forecasting. The weather forecast is based upon the change of pressure.

7. Special Features

- 1) A specially designed algorithm has been deployed in the firmware to filter out the influence of pressure change when you are climbing a mountain. This feature avoids wrong weather forecast while in motion. Vice versa, normal pressure change happened when you are not moving will not affect relative altitude reading.
- 2) **The device will increase pressure measurement frequency when the device sensed more than 0.5hpa pressure change.** While the device is stationary, the time interval of pressure measurement will be adjusted to 60s to extend the battery life.

8. Specification

- Compass range : 0° to 359°
1 to 16 pointers (graphical)
- Angle accuracy : +/-8°
- Height range : -500m to 8000m
- Relative Height accuracy : +/-3.0m
- Absolute Height accuracy : +/-12m
- Temperature range : -20°C to +60°C (-4°F to +140°F)
- Temperature accuracy : +/-1.0°C
- Measuring temperature interval : 60 sec during normal weather mode
3 sec during altitude sensing mode
- Pressure resolution : 0.1 hPa (0.1mmHg, 0.01inHg)
- Absolute Pressure accuracy : +/-1.5hPa

Power consumption

Single 3V lithium battery (CR2032)

Battery life: Minimum 12 months at energy saving mode (LCD off)

Minimum 6 months at normal display mode