

# AL20M, AL24M, AL28M AL24A, AL28A, AL32A

## Auto Levels User Guide



www.trimble.com/spectra

## Features



1. Focusing knob
2. Sighting guide
3. Crosshairs' adjustment screws (under cover)
4. Crosshairs' focusing ring
5. Eyepiece
6. Horizontal rotation ring and angle index
7. Leveling screws
8. Base plate
9. Circular level adjustment screws
10. Horizontal tangent knob
11. Circular level
12. Mirror for reading circular level
13. Objective

## Maintenance and Care

- As with all precision instruments, the auto level should be transported and stored in its carrying case.
- When carrying the instrument mounted to a tripod, be sure to carry it vertically rather than over your shoulder.
- Whenever possible, store the instrument in a dry, shady area.
- Wipe the instrument clean with a cloth. Clean the objective and eyepieces with special care using a damp tissue or soft, clean, lint-free cotton cloth.
- When working in wet weather, wipe off the instrument and carrying case in the field and let them dry completely indoors with the case open.

## Safety Information

Included in this manual are **Cautions** and **Notes**. Each of these words represents a level of danger or concern. A **Caution** indicates a hazard or unsafe practice that could result in *minor* injury or property damage. A **Note** indicates important information unrelated to safety.

## How to Use the Instrument

### Setting Up the Instrument

1. Set up the tripod at a height appropriate for your use.  
**Note:** Make sure the tripod is stable and the tripod head is relatively level.
2. Attach the instrument to the tripod.
3. Level the instrument using the circular level as a reference.
4. Focus the telescope crosshairs by turning the crosshairs' focusing ring.

### Aligning the Instrument

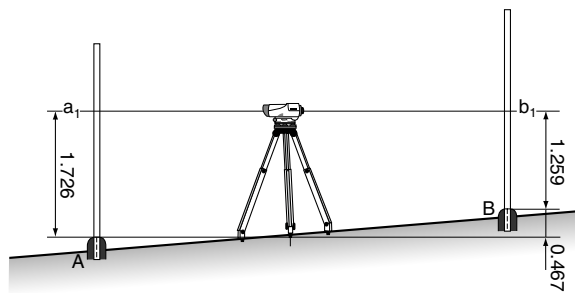
1. Align the telescope to the grade rod using the sighting guides.
2. Turn the focusing knob to bring the grade rod into sharp focus. Precisely sight the center of the grade rod in the telescope crosshairs using the horizontal tangent knob.
3. Check for parallax shift.

**Note:** No parallax exists if the crosshairs and the grade rod graduations remain in coincidence even when you change your viewing angle (move your eye up/down and left/right in front of the eyepiece).

**Note:** After the bubble in the circular level has been centered, the compensator corrects residual line-of-sight inclinations. The compensator does not, however, eliminate any tilts resulting from inadequate adjustment of the circular level or line of sight. These must be checked regularly (see Adjusting the Instrument for more information).

## Taking Measurements

### Determining the Difference in Elevation



1. Set up the instrument half way between two points (A and B).
2. Take a reading at point A ( $a_1 = 1.726$  m) and another one at point B ( $b_1 = 1.259$  m).  
**Note:** A slight deviation of the line of sight from horizontal will not cause any measuring error as long as the instrument is set up approximately half way between the two points.
3. Subtract  $b_1$  from  $a_1$  to get the difference between the points ( $d = 0.467$  m).

**Note:** Point B is 0.467 higher than point A because the difference is a positive number. If point B were lower than point A, the number would be negative.

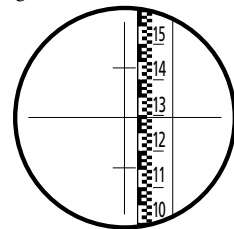
### Establishing an Elevation

1. Set up and level the instrument.
2. Set the grade rod on a known elevation (30.55 m) and take a grade rod reading (1.72 m).
3. Add the grade rod reading to the known elevation to get the height of instrument or HI ( $1.72 + 30.55 = 32.27$  m).
4. Subtract the elevation of the point you want to establish (31.02 m) from the HI (32.27) to calculate the difference between the two points ( $32.27 - 31.02 = 1.25$  m).
5. Go to the point you want to establish and adjust the height of the grade rod until the calculated difference (1.25) is centered in the crosshairs.

### Taking a Distance Measurement

**Note:** The instrument's stadia lines allow you to determine the distance between the instrument and the grade rod.

1. Take readings at the upper stadia line (1.436 m) and the lower stadia line (1.152 m).
2. Calculate the difference between the two readings ( $1.436 - 1.152 = 0.284$  m).
3. Multiply the difference by 100 to get the distance between the instrument and the grade rod ( $.284 \times 100 = 28.4$ ).



### Computation Example

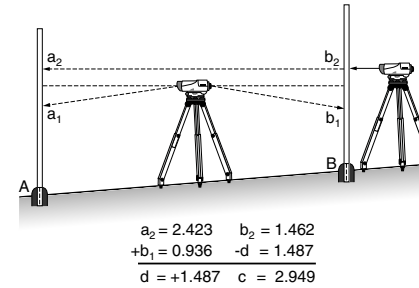
Elevation	
Center Line Reading	1.294 m
Distance Measurement	
Upper Stadia Line Reading	1.436 m
Lower Stadia Line Reading	1.152 m
Difference	0.284 m
Distance ( $0.284 \times 100$ )	28.4 m

## Adjusting the Instrument

### Circular Level

1. Set up the instrument.
2. Center the bubble of the circular level using the leveling screws.
3. Turn the telescope 180° (200 gon).
4. Check to see whether the bubble is still centered in the circle. If it isn't, eliminate one half of the error with the leveling screws and the other half with the two adjustment screws for the circular level.
5. Repeat the process until the bubble remains centered when the instrument is turned.

### Line of Sight



1. Set up the instrument half way between two points (A and B) that are 30 to 40 m apart.
2. Take a reading at point A ( $a_1 = 2.423$  m) and another one at point B ( $b_1 = 0.936$  m).
3. Subtract  $b_1$  from  $a_1$  to get the difference between the points ( $d = +1.487$  m). Make sure you note whether value d is a positive or negative number.

**Note:** Because the distance from the instrument to each of the points is equal, the difference in elevation is correct even if the line of sight is out of adjustment.

4. Move the instrument and reset it up so that it is about 2 m behind point B.
5. Take another reading at point B ( $b_2 = 1.462$  m).
6. Add  $b_2$  to d to get value c ( $1.462 + 1.487 = 2.949$  m).
7. Take another reading at point A ( $a_2$ ).
8. Compare value c (2.949) to  $a_2$ . If the line of sight is correct, both numbers should be the same. If they differ by more than 4 mm, reset the grade rod on point A and turn the crosshairs adjustment screws (unscrew the cover to expose them) until value c (2.949) is centered in the crosshairs.

**Caution:** The upper and lower adjustment screws are counter-screws and must not be set too tightly.

9. Repeat the process until the line of sight is correct (c and  $a_2$  are the same).

## Taking an Angle Measurement

1. Set up the tripod so that it is over a hub.  
**Note:** Make sure the tripod is stable and the tripod head is relatively level.
2. Hang a plumb-bob from the plumb-bob hook on the tripod.  
**Note:** Make sure the plumb-bob is over the hub.
3. Attach the instrument to the tripod.
4. Center the plumb-bob over the pin in the hub by varying the length of the tripod legs or by shifting the instrument on the tripod.
5. Accurately align the telescope to the first target using the sighting guides and a horizontal tangent knob.  
**Note:** The first target is a known point.
6. Set the horizontal rotation ring to 0.
7. Accurately align the telescope to the second target and read the angle.

- 9 -

- 10 -

- 11 -

- 12 -

## Specifications

	AL32A	AL28A	AL24A	AL28M	AL24M	AL20M
Magnification	32X	28X	24X	28X	24X	20X
Dampening	Air	Air	Air	Magnetic	Magnetic	Magnetic
Accuracy*	+/-1.0mm	+/-1.5mm	+/-2.0mm	+/-1.5mm	+/-2.0mm	+/-2.5mm
Leveling Accuracy @ 50m	0.5mm	0.7mm	1.2mm	2.5mm	2.5mm	2.5mm
Telescope:						
Aperture	30mm (1.2 in.)					
Telescope image	Erect					
Field of view angle	1°20'					
Shortest focus distance	0.60m (1.97 ft.)					
Stadia constant	100					
Addition constant	0					
Dimensions (L x W x H):						
Instrument	103 x 190 x 135mm (5.2 x 7.5 x 5.3 in.)					
Case	170 x 280 x 190mm (6.7 x 11 x 7.5 in.)					
Weight:						
Instrument	1.6 kg (3.5 lb)					
Case	1.25kg (2.75 lb)					

\* Standard deviation according to DIN 18723 on 1 km of double leveling

- 13 -

- 14 -

## Service Request

To locate your local dealer or authorized Trimble Service Center outside the U.S.A for service, accessories, or spare parts, contact one of our offices listed below.

**North-Latin America**  
Trimble / Spectra Precision Division  
8261 State Route 235  
Dayton, Ohio 45424-6383  
U.S.A.  
(888) 527-3771  
(Toll Free in U.S.A.)  
+1-937-203-4419 Phone  
+1-937-482-0030 Fax  
www.trimble.com/spectra

**Europe**  
Trimble Kaiserslautern GmbH  
Am Sportplatz 5  
67661 Kaiserslautern  
GERMANY  
Tel +49-(0)6301-71 14 14  
Fax +49-06301-32213

**Africa & Middle East**  
Trimble Export Middle-East  
P.O. Box 17760  
JAFZ View, Dubai  
UAE  
+971-4-881-3005 Phone  
+971-4-881-3007 Fax

**Asia-Pacific**  
Trimble Navigation Singapore PTE Ltd.  
80 Marine Parade Road, #22-06  
Parkway Parade  
Singapore, 449269  
+65 6348 2212 Phone  
+65 6348 2232 Fax

**China**  
Trimble Beijing  
Room 2805-07, Tengda Plaza,  
No. 168 Xiwai Street  
Haidian District  
Beijing, China 100044  
+86 10 8857 7575 Phone  
+86 10 8857 7161 Fax  
www.trimble.com.cn

- 15 -

### Notice to Our European Union Customers

For product recycling instructions and more information, please go to: [www.trimble.com/environment/summary.html](http://www.trimble.com/environment/summary.html)

#### Recycling in Europe

To recycle Trimble WEEE, call: +31 497 53 2430, and ask for the ÖWEEE associate, or mail a request for recycling instructions to:  
Trimble Europe BV  
c/o Menlo Worldwide Logistics  
Meerheide 45  
5521 DZ Eersel, NL



Trimble / Spectra Precision Division  
8261 State Route 235  
Dayton, Ohio 45424-6383  
U.S.A.

[www.trimble.com/spectra](http://www.trimble.com/spectra)



© 2012, Trimble Navigation Limited. All rights reserved.  
Reorder PN 1211-0200B (03/12)