AL 24/28/32 - A/M Series

Auto Levels

User Guide

SPECTRA PRECISION

www.trimble.com

Trimble

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

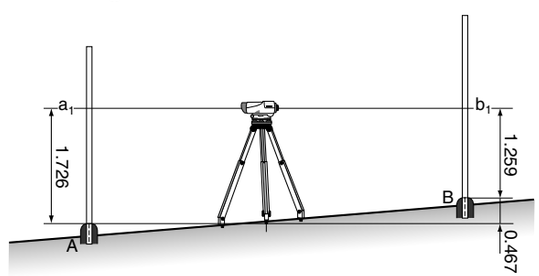
1. Align the telescope to the grade rod using the sighting guides.
2. Turn the focusing knob to bring the grade rod into sharp focus. Precisely sight the center of the grade rod in the telescope crosshairs using the horizontal tangent knob.
3. Check for parallax shift.

   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).

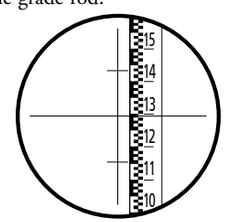
   Note: Point B is 0.467 higher than point A because the difference is a positive number. If point B were lower than point A, the number would be negative.

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 x 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 x 100)	28. 4 m

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.

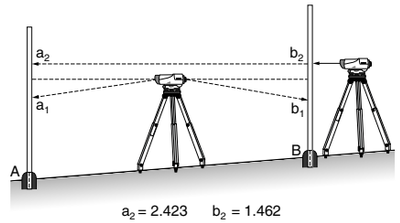
   Note: The first target is a known point.
6. Set the horizontal rotation ring to 0.
7. Accurately align the telescope to the second target and read the angle.

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



$a_2 = 2.423$ $b_2 = 1.462$
$+b_1 = 0.936$ $-d = 1.487$
$d = +1.487$ $c = 2.949$

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).

Notice to Our European Union Customers

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

Recycling in Europe

To recycle Trimble WEEE, call: +31 497 53 2430, and ask for the ÒWEEE associate,Ó or

mail a request for recycling instructions to:
Trimble Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL

Specifications

	AL24A / AL24M	AL28A / AL28M / AL28M-G	AL32A
Dimensions (L x W x H)			
Instrument	130 x 190 x 135 mm (5.1 x 7.5 x 5.3 in.)	130 x 190 x 135 mm (5.1 x 7.5 x 5.3 in.)	130 x 190 x 135 mm (5.1 x 7.5 x 5.3 in.)
Case	170 x 280 x 190 mm (6.7 x 11.0 x 7.5 in.)	170 x 280 x 190 mm (6.7 x 11.0 x 7.5 in.)	170 x 280 x 190 mm (6.7 x 11.0 x 7.5 in.)
Weight			
Instrument	1.6 kg (3.5 lb)	1.6 kg (3.5 lb)	1.6 kg (3.5 lb)
Case	1.25 kg (2.75 lb)	1.25 kg (2.75 lb)	1.25 kg (2.75 lb)
Accuracy			
Standard deviation according to DIN 18723 on 1 km of double leveling	+/–2.0 mm	+/–1.5 mm	+/–1.0 mm
Leveling accuracy	3 mm @ 46 m (1/8 in. @ 150 ft)	1.5 mm @ 60 m (1/16 in. @ 200 ft)	1.5 mm @ 75 (1/16 in. @ 250 ft m)
Telescope			
Magnification	24x	28x	32X
Aperture	30 mm (1.2 in.)	30 mm (1.2 in.)	36 mm (1.4 in.)
Telescope image	Erect	Erect	Erect
Field of view angle	1° 20'	1° 20'	1° 20'
Shortest focusing distance	0.60 m (1.97 ft)	0.60 m (1.97 ft)	0.60 m (1.97 ft)
Stadia constant	100	100	100
Addition constant	0	0	0
Automatic Compensator			
Type AL2XA, AL32A AL2XM (-G)	Wire suspension: Air damped Magnetic damped	Wire suspension: Air damped Magnetic damped	Wire suspension: Air damped

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.

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