

TECHNICAL DATA

Telescope:	Erect, 10.5" (26.5cm)
Magnification:	22X
Leveling accuracy:	± 1/4" @ 100 ft. (±5mm @ 30m)
Working range:	Up to 200' (60m)
Minimum focus:	4' (1.2m)
Clear objective aperture:	22mm
Field of view:	± 2' / 100 ft. (±0.6m / 30m)
Number of lenses:	5
Level vial:	4' per 2mm
Horizontal Circle Diameter:	110mm
Graduations:	1°
Number:	Each 10°, 0-90-0°
Vernier:	Double direct to 15 min.
Weight:	2.204 lbs (1Kg)
Mounting:	Screw 5/8-11 Thread

CARE AND HANDLING

Care must be taken to maintain the accuracy of the instrument.

- After each use, the instrument should be wiped clean and kept in its carrying case.
- Remove dust from the lenses with a soft brush or a nonabrasive wipe. Never touch the lenses with your fingers.
- Store the instrument in a dust-free area with low humidity.

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Operating / Safety Instructions
Consignes de fonctionnement / sécurité
Instrucciones de funcionamiento y seguridad

IMPORTANT:
Read Before Using

IMPORTANT
Lire avant usage

IMPORTANTE:
Leer antes de usar



model **TL20X**

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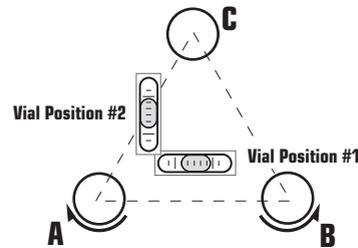
OPERATION

Set-Up

When setting up the tripod, make sure the tripod feet are firmly into the ground and the top of the tripod head is as level as possible. Adjust the height of the tripod to a comfortable viewing height, and secure the tripod legs. Attach the instrument to the tripod head with the center 5/8-11 screw and tighten securely.

Leveling

Mount the instrument on the tripod, lock the telescope in place with the lock lever and line up the telescope vial (**Vial Position #1**). Then grasp screws **A** & **B** so that both thumbs are moving in opposite directions, either toward each other or away from each other. Note that the bubble moves in the same direction as your left thumb.



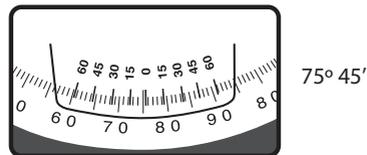
Keep about half the length engaged. When the bubble is centered (**Vial Position #1**), turn the instrument and observe the vial (**Vial Position #2**). Now center the bubble in **Vial Position #2** using only screw **C**. The instrument should now be leveled, but to be certain, double-check. Rotate the instrument 180° so the vial is reversed. If the bubble will not center when reversed, follow adjustment procedure outlined under "**Bubble Adjustment.**"

Focusing

Rotate the instrument by hand to aim the telescope to the far object. Rotate the focusing knob until the object can be observed clearly. Rotate the horizontal tangent knob, to place the vertical cross hairs on the object.

Reading the Horizontal Circle and Vernier

The 360° horizontal circle is divided into quadrants (0°-90°). Obtain degree readings by reading the exact degree at the intersection of the zero index mark on the vernier and the degree mark on the circle, or the vertical arc. For more precise readings, the vernier scale is used. The vernier lets you subdivide each whole degree on the circle into minutes (60 minutes equals a degree). If the vernier zero does not align exactly with a degree mark on the circle, note the last degree mark passed and, reading up the scale, locate a vernier mark that coincides with a circle mark. This will indicate your reading in degrees and minutes.



The Vertical Vernier Arc and Pointer

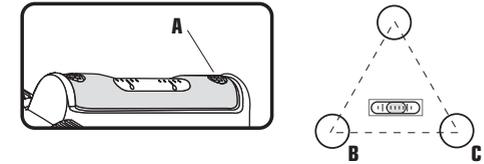
In reading the vertical vernier, the principle is exactly the same as the horizontal vernier. Note however, that the vernier is below the circle portion rather than inside as in the case of the horizontal. One other minor difference is that you will read angles up or down rather than left or right. Here again is a double vernier. The right hand side reads angles of elevation (up) and the left hand side reads angles of declination (down). These are the only differences between the horizontal and vertical verniers.

CALIBRATION

IMPORTANT: It is the responsibility of the user to verify the calibration of the instrument before each use.

Bubble adjustment

If the telescope bubble does not remain centered after having leveled the instrument, and reversed the telescope end for end (180°), as described under the **Leveling** section, the need for adjustment is indicated. Use the hex key.

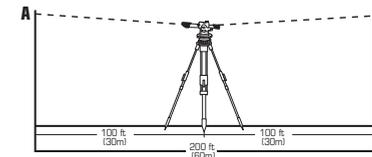


With the adjusting screw "**A**" facing to the right of the bubble and with telescope directly inline with two of the three leveling screws, note to which side the bubble is off. If to the left, loosen screw "**B**" and tighten screw "**A**" very slightly to remove ONE-HALF the error.

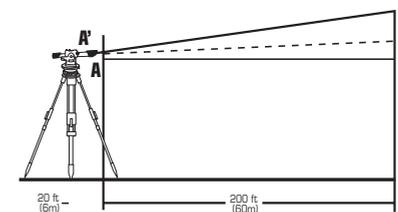
Remove the other half of the error with the two level screws in line with the telescope. If the bubble is still not exactly centered, repeat the procedure. If bubble is off to the right, loosen screw "**A**" and tighten screw "**B**". Otherwise the procedure is identical.

Accuracy Check

Set up the instrument in an area that is as level as possible and which is about 220 ft. long. Place two matching level rods about 200 ft. apart with the faces toward each other. Position and level the instrument so that the distance from the instrument to each rod is the same.



Take a reading on each rod with the instrument. Note the difference and record them. Next, move the instrument to another point in line with the two level rods. Level the instrument and take readings on the two level rods. The difference should be the same (A-A should equal B-B). The difference between A-A and B-B is the instrument error at 200 feet.



Instrument accuracy adjustment

If the error is more than 3/16" at 100', it is necessary to adjust the instrument. When adjusting the instrument:

1. Remove rubber cover to expose the two calibration set screws.
2. Using a 1.5mm Allen wrench, loosen the two calibration set screws.
3. Rotate the eyepiece seat to make the crosshair center in the reticle of instrument on the same level with a known reference point. Then rotate the eyepiece tube to make the horizontal hair on the reticle of instrument level by using a known level reference point.
4. Tighten the two set screws and restore rubber cover to its original position.