
Model 187 Box Level

Model 187-S Stride Level



Operation, Maintenance, and Adjustment Manual



**Instrument
Company**

Helping the World Measure



Since 1927

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*Thank you for purchasing
a Brunson vial-type level.
Remember that our customer
support does not stop after
shipment of a product — we
are here to help you with
any measurement challenges
that you may have.*



Model 187 and 187-S Vial-Type Levels

This manual applies to both the Brunson Instrument Company **Model 187 Box Level** and the **187-S Stride Level**. The 187 and 187-S are identical except for their bases. These products share the same spirit vial, folded optics assembly, and viewing turret. The 187 Box Level has a flat base, and the 187-S has an inverted "V"-block base suitable for locating it on round instruments such as our alignment telescopes and collimators. The 187-S includes an elastic strap which is placed around the telescope and used to hold the level in place.

Operation

The 187 and 187-S are *coincidence-type* levels which display an easy-to-read indication when the spirit vial is not perpendicular to the gravity vector. These levels allow you to see a split image of both ends of the bubble, folded back on one another. When the ends of the bubble are perfectly matched (See Figure 1), the spirit vial is dead level. A slight break in the image can represent an out-of-level condition of 2 arcseconds or less. The level is not designed to quantify the tilt, but rather to be used as a tool with which you can bring any surface to "dead level".

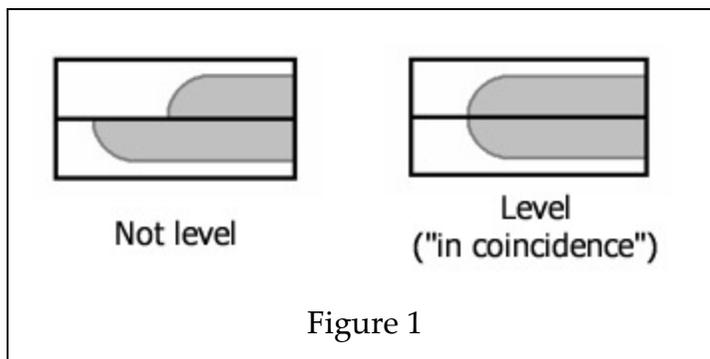


Figure 1

Before using either level, be sure that the surface on which they will be placed is completely free of dust, oil, or any other foreign objects. Verify also that the flat base (187) or V-blocks (187-S) of the level are clean and dry.

When placing the 187 Box Level on a surface, it is good practice to slide it around in a circle or a "figure 8" before coming to rest in the final desired position. This helps any remaining dust particles to be rolled up into the "dust gutters" on the bottom of the unit.

A small bull's eye vial is provided on top of the unit to evaluate whether the surface is nominally level before proceeding. If the surface is out of level such that the bull's eye vial is not fairly well centered, the main spirit vial will be out of range. This bull's eye vial may also be used to adjust the roll axis of a 187-S which is

Remember that it only takes a speck of dust about 60 millionths of an inch in diameter to throw the level off by about 2 arcseconds.

mounted on a telescope barrel.

If the unit is calibrated properly, any surface may be precisely leveled by adjusting the attitude (tilt) of that surface until no break is observed in the split bubble image.

Adjusting Your Level

Note that you cannot calibrate, or test the 187-S Stride Level for proper calibration, by placing its "feet" on a flat surface. You must use the surface of the inverted "V"-ways which are specifically designed to fit on a radiused barrel.

These units may be field tested for proper calibration. For the 187, you will need any stable surface which is outfitted with some adjustment for tilt such that it may be brought to dead level. For the 187-S, you will need a good quality cylindrical surface like a telescope barrel (2¼" diameter is optimal) that may be similarly tilted. To test for proper calibration, use the following steps:

1. Place the 187 or 187-S on the test surface. Make a mark or put a piece of tape on the test surface to mark the position of the level. This will be used to return the level to the exact same spot on that surface.
2. Rough-level the unit by tilting the test surface so that the bubble in the bull's eye vial is centered under the inscribed circle.
3. Turn the turret to a comfortable viewing angle and watch the folded image of the bubble. Bring the two halves of the bubble together precisely, again by making small adjustments to the test surface. After each movement, allow enough time for the bubble to stabilize so that you can reliably evaluate its position.
4. Once the bubble images are in coincidence, reverse the level 180°, placing it back again in exactly the same location on the surface as it had been previously.
5. Look at the bubble image again. If the unit is calibrated properly, the bubble will again be exactly in coincidence. If not, continue with the steps below.
6. The amount of mismatch observed in step 5) above represents *twice* the actual error in the vial.
7. Remove half the error by adjusting the test surface on which the level rests.
8. Remove the other half of the error by adjusting the vial itself. This is accomplished as follows. On one side of the unit, the vial itself is visible through a window. The vial is held in place by opposing nuts on each of the vial mount. (See Figure 2, with cover removed.) Moving the nuts up or down on the appropriate end of the vial adjusts the location of the bubble. The cover on this side of the unit has four elongated slots, which give access to the vial adjustment nuts. (See Figure 3.) To make adjustments, use the adjusting pins provided. Follow these steps to bring the vial into proper

This is a delicate process due to the sensitive nature of the vial. Practice and patience are required to bring the vial into proper adjustment.

calibration:

- Loosen both top adjusting nuts slightly with the adjusting pins provided.
- Adjust either of the lower adjusting nuts to remove the remaining half the error.
- Retighten the upper adjusting nuts, making sure the bubble is not disturbed.

Repeat steps 3 through 8 until no error in the coincidence vial is observed after rotating the unit 180 degrees.

Periodically wipe the base of the 187 Box Level, or the bottom side of the V-blocks of the 187-S, with a lightly oiled cloth. Follow by wiping with a clean, dry cloth to remove any excess oil (which would tend to pick up dust).

Maintenance

If your level is used in dusty surroundings it may be necessary to periodically clean off the mirror and prism surfaces. To do this:

- 1) Look directly down on the top of the level. Remove the 4 screws (one in each corner) that secure the top cover to the main housing, and remove this top cover. (The turret is attached to this cover as an assembly.)
- 2) Using compressed air (preferably from a can), lightly blow all dust off the surfaces of the 45° mirrors and the center mirror that are located on the mounting plate under the cover.
- 3) If dust still remains, use a small camel's hair brush very lightly. The brush, dipped in denatured alcohol and shaken dry, can also be used to remove dust or debris.
- 4) Replace the top cover once the mirrored surfaces are clean.

The prism face of the turret may also be cleaned in a similar fashion.

It is prudent to occasionally inspect the flat base of the 187 and the inverted V-ways on the 187-S. These are precision surfaces - any damage, nicks, or rust on these surfaces may cause the unit to read erroneously. Your level is simple in design but nonetheless is a precision instrument - keep it clean and dry for best results and a long working life.

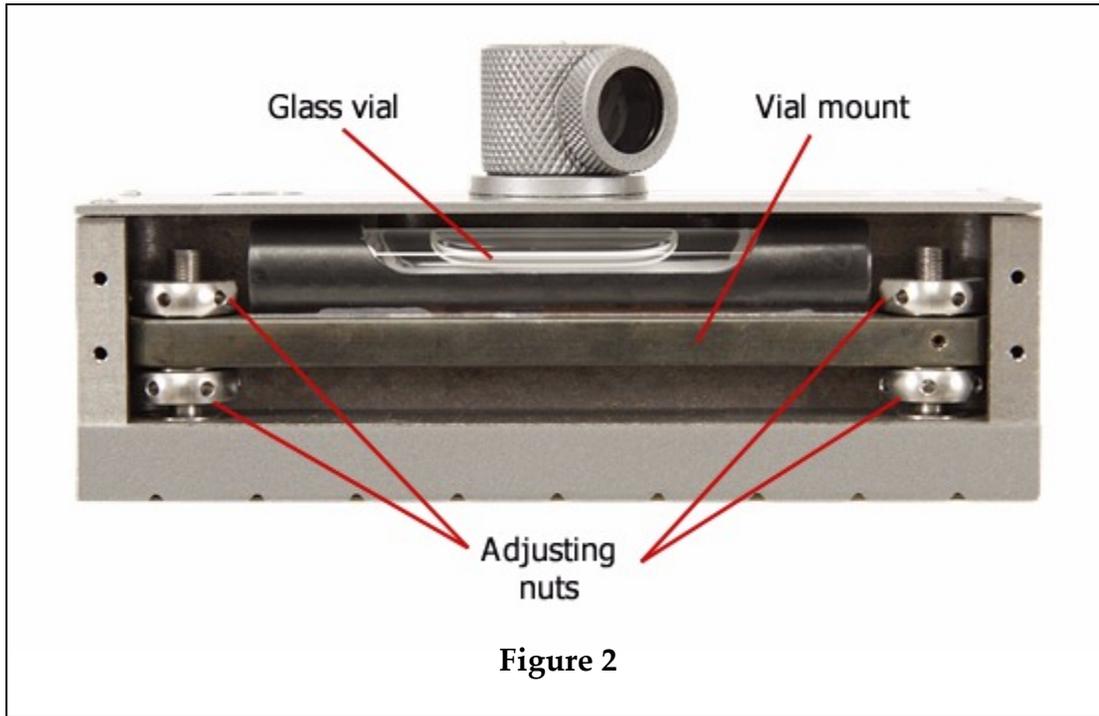


Figure 2

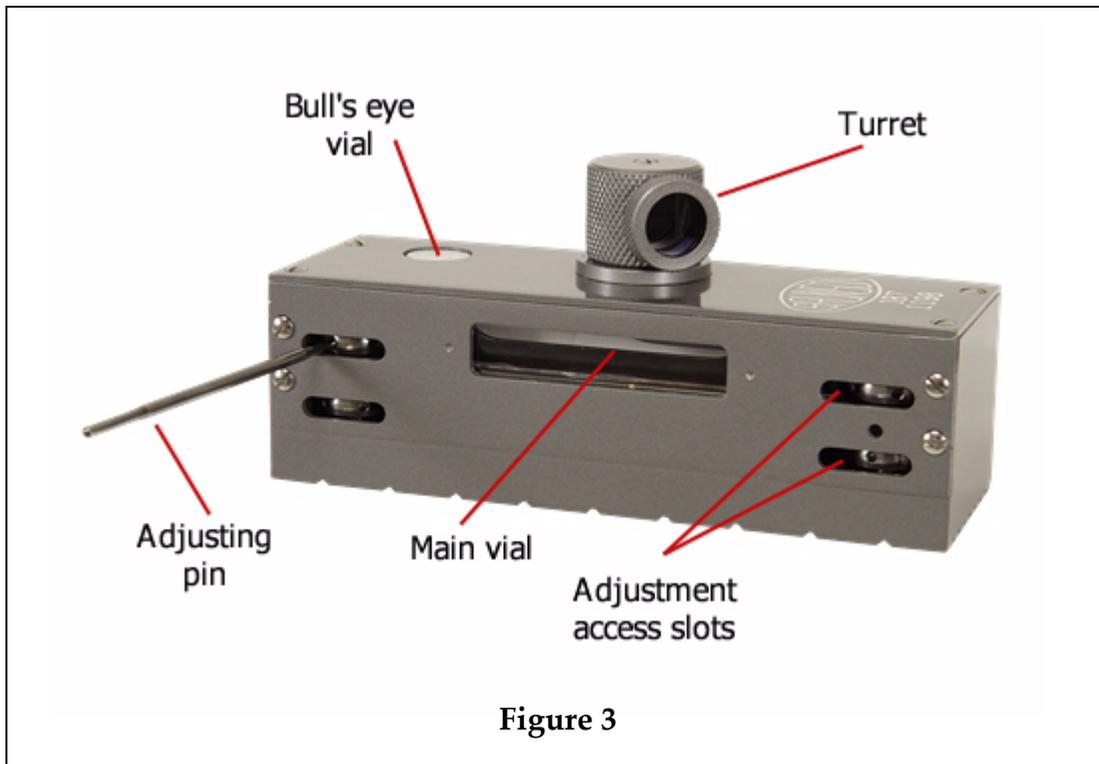


Figure 3