Owner's Manual

NSL100B BUILDERS LEVEL
NSL500B TRANSIT LEVEL
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2. NOMENCLATURE

NSL100B

NSL500B
3. CARE AND MAINTENANCE

Your Northwest Siteline Levels and Transit Levels are designed for use generally in civil engineering and construction as well as for farm, mining and forestry industries. With the appropriate care, your instrument will need only minimal routine maintenance and minor adjustments under normal field use. In case your instrument is damaged or abused, it should be taken to a qualified instrument repair facility. Call Northwest to find the nearest service center.

1. The instrument should be kept in its carrying case properly when not in use for maximum protection.

2. Keep the instrument clean and free of dirt and moisture. After use, clean every part of the instrument completely before putting it back in its case.

3. If the instrument becomes wet, wipe off moisture completely, taking special care of the lenses by using a soft clean cloth or Lens tissue.

4. Do not attempt to clean, oil or repair interior parts. Do not remove any lenses. This should be done by a qualified repair technician.

5. When working near moving equipment, never leave your instrument unattended.

6. Always spread the tripod legs to insure a stable setup. When setting up on a pavement or hard surface, try to protect the legs from slipping by using tripod ties.

7. After working in dusty locations, remove all dust from the lenses with a clean, soft tissue or cloth and brush the leveling and tangent screws threads with a small brush.
8. Make sure not to over-tighten the leveling screw, clamp screw or adjusting screw.

9. It is recommended that you have a qualified service technician check your instrument periodically.
4. USING YOUR INSTRUMENT

4.1 Setting up Your Instrument

1) Loosen the straps around the tripod legs. Lift the extension quick-release clamps. With the tripod closed extend the legs to roughly eye level and re-tighten the quick clamps.

2) Position the legs in a triangular position, making sure the tripod head is approximately level. Press tripod shoes firmly into ground.

3) Take out you instrument gently from its carrying case. Note how the instrument is packed so that it can be put back in the same position.

4) Carefully position the instrument in the approximate center of the tripod head. Insert the centering screw into the base plate, taking care to align the threads properly. Firmly screw the instrument until it fits tightly to the tripod. However, Make sure not to over-tighten, cross or strip the threads.

5) If you are using a transit level, make sure the lock lever is engaged.

6) Position the telescope to the direction that aligns with 2 of the 3 leveling screws.

7) Hold one of the leveling screws (the one at front of telescope) with one hand using thumb and forefinger, and hold with your other hand the 2nd leveling screw (at rear of telescope) with thumb and forefinger.

8) Turn both leveling screws with your both thumbs and forefingers moving in opposite directions, loosening one while tightening the other, ensuring both screws sitting firmly on the base plate. Note the bubble in the plate vial always moves in the direction of your left thumb. You need to move the bubble to the center of the vial.
9) After you have centered the bubble, rotate the telescope 90° so that the telescope is positioned between the first 2 leveling screws, with the 3rd screw at the front or rear of the telescope. Use the 3rd screw only to center the bubble at this position.

10) Rotate the telescope another 90° and repeat your leveling procedure till telescope is turn back to its original position. The bubble should stay at the center now through out 360°. If the bubble does not stay at the center, the instrument needs to be checked by a qualified technician.

11) After leveling the instrument, turn the focusing knob to focus on the objective. Turn the knob slowly to avoid moving past a focused image.

4.2  Stadia Measurement
Your Northwest Instrument Siteline Level is equipped with a stadia reticle so you can make distance estimates. The stadia lines are located in the reticle as shown in Diagram 4.2A below. Sight a rod, and take readings of the upper and lower stadia lines. Calculate the difference of two readings and multiply by 100 to obtain the distance between the rod and the instrument.
4.3 Measuring Height Difference

(1) Set up the instrument at a point approximately halfway between points A and B. See (Fig 4.3A).

NOTE: The reticle stadia lines can be used to optically estimate the distances. See (Fig 4.2A)

(2) Position the rod vertically at point A. Take the reading a (backsight) on the rod at point A.

(3) Then sight the rod at point B and take the reading b (foresight).

(4) The difference (a-b) is the height difference (h) of B from A. (Fig 4.3A)
   Example: h=a-b =5.25ft-3.25ft =2.00ft

Therefore point B is 2.00ft higher than point A. (the value of h will be
negative if point B is lower than point A.)

When the distance between points A and B is large or if the height distance is great:

(1) Divide the distance into a number of sections and determine the height difference of each section.

(2) The height difference between points A and B is the total of the height differences of all the sections.

The general formula is:
Altitude of the required point = altitude of known point + total of backsight values - total of foresight values. NOTE: This simple leveling technique has no error check. It is better to measure from A to B and then measure back to A so that the error of closure can be calculated.

4.4 Horizontal Circle and Vernier Reading

Your instrument is equipped with an easy to read horizontal circle for simple angle turning. It is graduated every single degree and is numbered every 10 degrees.
Use the plumb bob provided and set up the instrument directly above the surveying point. Sight the objective and set the horizontal circle to 0 degrees by turning the horizontal circle positioning knob. Loosen the clamp, turn the telescope to view the second observation of your angle. Retighten the clamp and use the fine motion tangent screw can to bring crosshairs precisely on line with the tangent objective. Using the index line seen in the circular viewer, take the angle reading. The index line can be used for reading the circle in increments finer than single degrees. This process is for estimation but the average user can position the index line for finer readings.

**NSL500B TRANSIT LEVEL USES AND APPLICATIONS**

The NSL500B transit level has all the same functions and capabilities as the NSL100B level. By unlocking the lock lever, you make the instrument capable of measuring vertical angles.

A vertical dial is attached to the telescope and is read through an index pointer. Vertical angles can generally be read within +/- 45°.
5. Checking and Adjusting Your Instrument

Although this instrument has been calibrated and adjusted before shipping out of NWI, instruments may come out of calibration during shipping. Because of this, we strongly suggest that you have this instrument checked before use. The following procedures may help to fulfill this purpose.

5.1 Plate Vial

Set up your instrument properly on the tripod. Adjust the leveling screws to center the bubble in the plate vial. Turn the telescope 90° clockwise, check the bubble position, and then, turn the telescope 90° counterclockwise and check the bubble position again. If the bubble is off center, the plate vial needs to be calibrated by a technician.

5.2 Check Instrument Calibration

1) Place two rods facing each other at points A and B at a distance of 50 - 80 m apart. Set up your instrument at point C, which is about halfway between A and B.

2) Sight the rods and take readings on point A as A and from point B as B.

3) Set the instrument at point D, which is about 2 m from point A.

4) Sight the rods at point A, take reading as AA. And then, sight the rod at point B, take reading again as BB.

5) Use the following equation to calculate:
   \[ BB' = AA - (A - B) \]
   The instrument is in its perfect condition if \( BB' = BB \), otherwise, it needs calibration.
5.3 Crosshair

Level the instrument. Set up a vertical line with plumb bob 20 feet away from instrument. Observe the vertical line against the cross hair. If vertical lines do not match, instrument needs to be calibrated by a technician.

For calibration and adjustment, call NORTHWEST INSTRUMENT, INC. to find a service center near you.
## 6. SPECIFICATIONS

<table>
<thead>
<tr>
<th>NSL100B</th>
<th>NSL500B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telescope</td>
<td></td>
</tr>
<tr>
<td>Magnification</td>
<td>20x</td>
</tr>
<tr>
<td>Working Range</td>
<td>&gt;200 ft</td>
</tr>
<tr>
<td>Objective Aperture</td>
<td>22mm</td>
</tr>
<tr>
<td>Minimum Focus</td>
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</tr>
<tr>
<td>Stadia Ratio</td>
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<tr>
<td>Transit Capabilities</td>
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</tr>
<tr>
<td>Leveling Head</td>
<td>3 screws</td>
</tr>
<tr>
<td>Tripod Thread</td>
<td>5/8 x 11</td>
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<tr>
<td>Approx. Wt. with case</td>
<td>7 lb.</td>
</tr>
</tbody>
</table>
Standard Warranty Terms

Northwest Instrument, Inc. (Seller) warrants this instrument made by Northwest Instrument to be free from manufacturing defects in materials and workmanship. For claims to be made under this warranty the instrument must be inspected by Northwest and the defect must be proven to Seller’s satisfaction. At the time that it is proven to the Seller’s satisfaction that the instrument is defective, it shall be repaired or replaced, at the Seller’s option and returned to the original purchaser at no cost to them, including transportation charges. Seller’s sole obligation and the Buyer’s sole remedy are limited strictly to repair or replacement with these provisions below.

A. The instrument is returned to Northwest, properly packaged with the transportation charges prepaid and insured and accompanied by proof of ownership. Receipt and previous registration is required.

B. Except for ordinary wear and tear resulting from normal usage, the instrument, upon inspection by the Seller is determined to be defective in material and/or workmanship.

Under no circumstances shall the Seller be liable for any consequential, incidental or contingent damages whatsoever.

Limitations and Exclusions

A. This warranty does not apply to instruments subject to negligence, abuse, accident, improper operation, instruments damaged in transit or damage due to unauthorized service repairs made by someone other than Northwest or other Northwest authorized service personnel. Circumstances beyond Northwest Instrument’s
control cannot be warranted.

B. This warranty does not apply to regular required maintenance such as cleaning, adjusting, lubricating or calibrating unless required as a result of a defect in workmanship or materials.

If, upon examination of the instrument, Seller determines that additional repair services are required and not covered under this warranty, Seller shall notify the Buyer of such repair charges and proceed only after authorization has been received.

C. This warranty does not apply to instruments damaged in transit to or from Northwest Instrument or any authorized repair center. Other remedies may or may not be available for transportation damages.