

Nikon

Electronic Digital Theodolite NE-101 / NE-100

Instruction Manual



H176 E 04.8.VF.2

Thank you for purchasing the Nikon Digital Theodolite. This instruction manual was written for users of the Nikon Digital Theodolite Model NE-101 or NE-100. To ensure correct usage, read this manual carefully before operating the instrument.

Warning and Caution Symbols in This Manual

Though Nikon products are designed to provide utmost safety during use, incorrect usage or disregard of the instructions can cause personal injury or property damage. For your safety, read the instruction manual carefully and thoroughly before usage. Do not discard this manual but keep it near the product for easy reference.

Inside this instruction manual, safety instructions are indicated with the symbols shown below. Be sure to follow the instructions marked with these symbols for your safety.



WARNING

Disregarding instructions marked with this symbol may lead to death or serious injury.



CAUTION

Disregarding instructions marked with this symbol may lead to injury or property damage.

WARNING AND CAUTION Read This Section Before Use!



WARNING

- Never look at the sun through the telescope. Doing so may cause the loss of your eyesight.
- Never disassemble, modify or repair the instrument yourself. Doing so may cause fire, electric shock or burns.
- Never short-circuit the battery electrodes, or burn or heat the battery. Doing so may cause rupture, fire, burning, or instrument damage.



CAUTION

- Be careful in handling or carrying the tripod, as the ferrule is very sharp and may cause injury to yourself or others. Before setting up the tripod, check below to make sure no one's hands or feet are in the way.
- Before carrying the tripod or the instrument in the carrying case, check the shoulder straps are not damaged and that the clasps are secured. Failure to do so may cause the instrument to fall, resulting in injury or instrument damage.
- Fasten firmly the thumbscrews of the tripod legs before mounting the instrument. Failure to do so may cause the tripod to collapse, resulting personal injury or instrument damage.
- Secure the instrument on the tripod by tightly fastening the clamp screw of the tripod. Failure to do so may cause the instrument to fall, resulting in personal injury or instrument damage.
- Fasten securely the leveling base clamp knob. Failure to do so may cause the leveling base to become detached when carrying or picking up the instrument. This may result in personal injury or instrument damage.

WARNING AND CAUTION Read This Section Before Use!



CAUTION

- Do not use the carrying case as a stool. The plastic carrying case is unstable and slippery and should not be used for that purpose. Doing so may result in personal injury.
- Never swing or throw the plumb bob. Doing so may result in injury to yourself or others.
- Be careful not to insert your finger between the telescope and the instrument trunnion when rotating the telescope.
- Please note, the dry cells provided at delivery are to be used only to check the instrument functions prior to use. When using the instrument for the first time, please ensure that you replace the supplied dry cells.
- The dry cells in the battery pack installed in this instrument cannot be recharged. Do NOT recharge the dry cells.
- Install the dry cells with their electrodes set correctly.
- Avoid using new dry cells together with old ones. Do not use different types of dry cells together.
- Do not solder the dry cells.
- Immediately remove exhausted dry cells from the battery pack.
- Avoid storing the battery pack in direct sunlight, high temperatures or excessive humidity.
- Before attaching the battery pack, check that both attaching surfaces of the battery and instrument are clean. Press the battery pack into place until the battery-mounting button rises up to the battery pack top surface. If the battery pack is not attached securely, the watertight structure of the instrument will be adversely affected.

MAINTENANCE Read This Section Before Use!

- The Electrical Digital Theodolite is a precision instrument. Do not subject it to shocks or excessive vibration.
- Do not loosen or remove any screws unless specifically required.
- Do not carry the instrument mounted on the tripod on your shoulder.
- Avoid prolonged exposure to the sun or the heat of a closed vehicle. Failure to do so may adversely affect the efficiency of the instrument.
- If the instrument has been used in wet conditions, immediately wipe off any moisture and dry it completely before replacing it in its carrying case. Exposure to moisture or/and dust may cause severe instrument damage.
- Sudden changes in temperature, such as caused by bringing the instrument into a warm room from the cold outdoors, can cause internal condensation. This may result in reduced measuring accuracy or electrical system failure. Should this occur, leave the instrument in a warm location with the carrying case closed until the temperature of the instrument returns to room temperature.
- Avoid storing the instrument in hot, humid conditions. The battery pack should be stored in dry conditions and a temperature of less than 30°C. Higher temperatures and excessive humidity may result in growth of mold on the lenses and deterioration of the electronic components, leading to instrument failure.
- Battery operating hours tends to be reduced by continuous use at extremely low temperatures.

MAINTENANCE Read This Section Before Use!

- Operation in extremely low, ambient temperatures can cause delays in LCD operation.
- Always be sure to check the battery capacity before use.
- Remove the battery whenever the instrument is not to be used for an extended period of time.
- When storing the instrument in areas subject to extremely low temperatures, leave the carrying case open.
- Do not overtighten any of the clamp screws.
- When adjusting the vertical and horizontal tangent screws or leveling screws, fix them as close as possible to the center position, as indicated by the lines on the screws. Always be sure to finish the tangential adjustment with a clockwise rotation of the tangent screw.
- If you do not intend to remove the leveling base from the instrument for an extended period, lock the leveling base clamp knob and tighten its safety screw.
- Do not use organic solvents (such as ether or paint thinner) to clean the non-metallic parts such as the keyboard, and the painted or printed surfaces. Organic solvents will discolor the surfaces or remove the printed characters. Clean only with a soft cloth or tissue slightly moistened with water or a mild detergent. Clean the carrying case in the same way.
- Clean the optical lenses by wiping lightly with a soft cloth or tissue moistened with alcohol.
- Do not leave the carrying case exposed to rain for an extended period of time. If exposure to rain is unavoidable, be sure to place the carrying case with the "Nikon" nameplate facing upwards.

CONTENTS

Warning and Caution Symbols in This Manual	1
WARNING AND CAUTION.....	2
MAINTENANCE.....	4
I. NOMENCLATURE	8
II. PREPARATION	12
1. Unpacking and Packing the Instrument	12
2. Putting the Batteries in the Battery Pack.....	14
3. Setting up the Tripod	16
4. Centering	18
5. Leveling.....	22
6. Sighting	23
III. INITIAL SETTING	24
IV. OPERATION	27
1. Power Switch ON/OFF	27
2. Battery Capacity Level Display	28
3. Angle Measurement.....	29
1) Vertical Angle.....	30
<1> Vertical 0° Angle Orientation.....	30
<2> Angle Unit Selection	30
<3> Grade Display.....	31
2) Horizontal Angle.....	32
<1> Horizontal Angle Zero Reset.....	32
<2> Reverse Horizontal Angle Scale.....	32
<3> HOLD	33
<4> Repeat Horizontal Angle Measurement.....	34
<5> Horizontal Angle Priority Function	37
4. Other Functions	38
V. CHECKING AND ADJUSTMENT	39
1. Plate Level	39
2. Circular Level	40
3. Optical Plummet.....	41
4. Vertical Circle Zero Point Error.....	43
WARNING MESSAGES	46
VI. SPECIFICATIONS	48
VII. OPTIONAL ACCESSORIES	50

NOMENCLATURE

I

PREPARATION

II

INITIAL SETTING

III

OPERATION

IV

CHECKING AND ADJUSTMENT

V

SPECIFICATIONS

VI

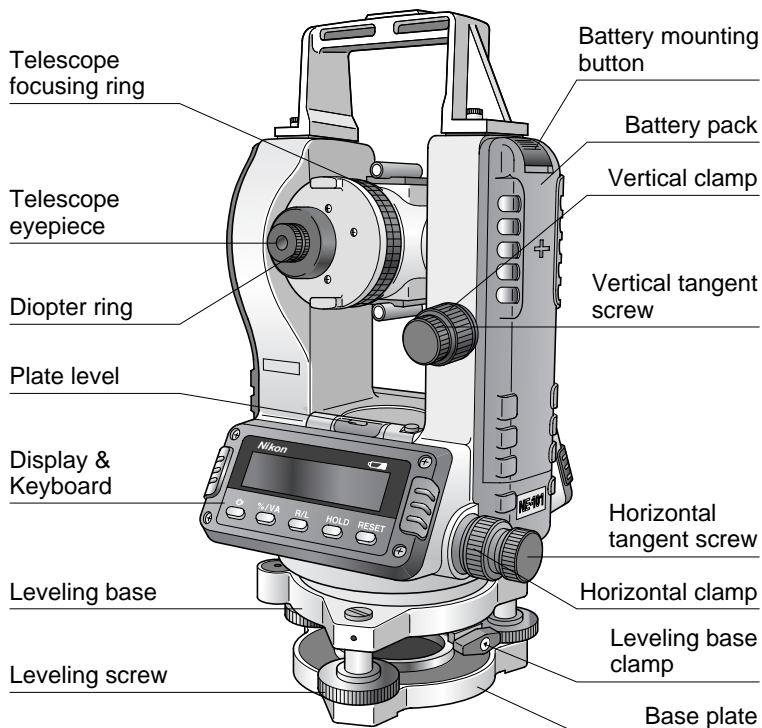
OPTIONAL ACCESSORIES

VII

I. NOMENCLATURE

Models with Detachable Leveling Base

● NE-101 / ● NE-100



Carrying handle

Carrying handle
clamp screw

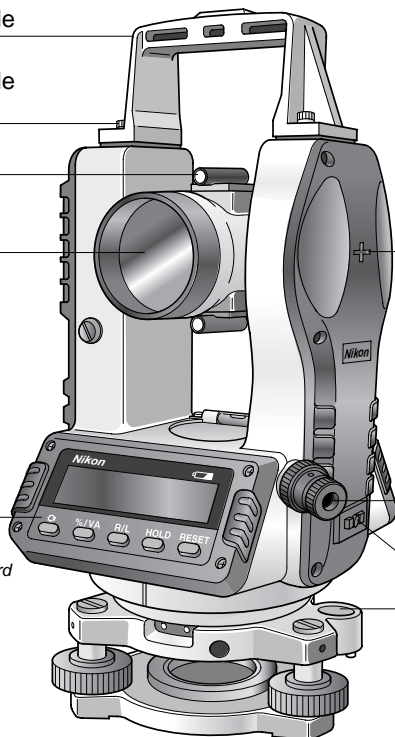
Optical sight

Objective

Horizontal axis
indication mark

Note

*NE-101/100 is not
equipped with the
display and keyboard
on this side.*



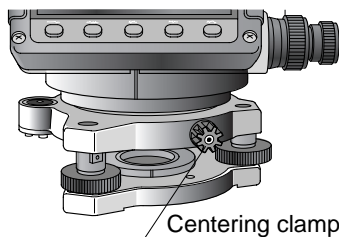
Optical plummet

Power switch

Circular level

Model with Centering Leveling Base

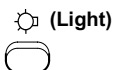
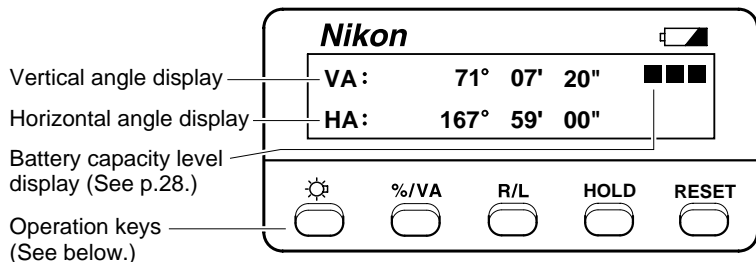
● NE-100



Centering clamp

*For other names, refer to the figures of the models with
detachable leveling base.*

Liquid Crystal Display (LCD) and Operation Keys



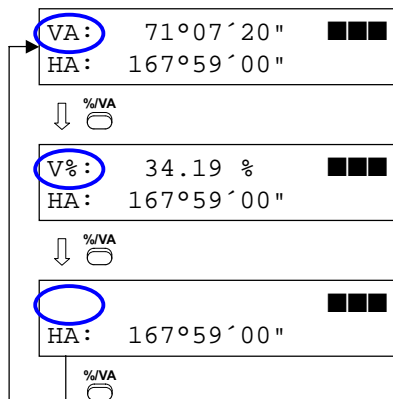
Telescope reticle light and LCD backlight key

(See p.38.)



Vertical angle grade display and Horizontal angle priority display switch-over key

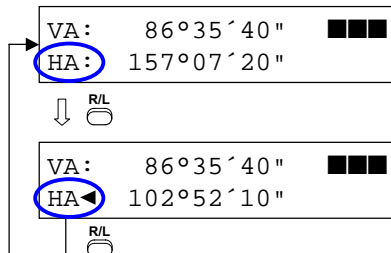
Switches vertical angle display to grade reading by percentage, and then to the display of horizontal angle only. (See p.31 & p.37.)





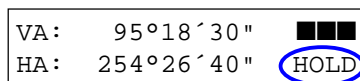
Horizontal angle reading direction display switch-over key

Switches the reading direction of horizontal angle. Clockwise reading “HA:” and counterclockwise reading “HL◀”. (See p.32.)

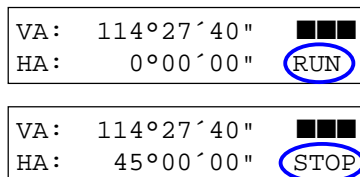


Horizontal scale hold and Horizontal angle summing key

Holds current horizontal angle reading, even when sighting direction is changed. (See p.33.)

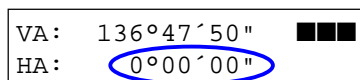


Enables summing of repeated horizontal angle measurements. (See p.34.)



Horizontal angle reset key

Resets horizontal angle to zero. (See p.32.)

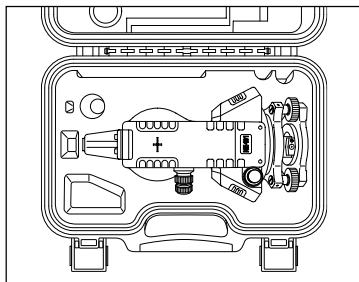


II. PREPARATION

1. Unpacking and Packing the Instrument

NOTE • Handle the instrument gently to guard against shocks or excessive vibration.

The instrument is placed in its carrying case as shown in the figure.



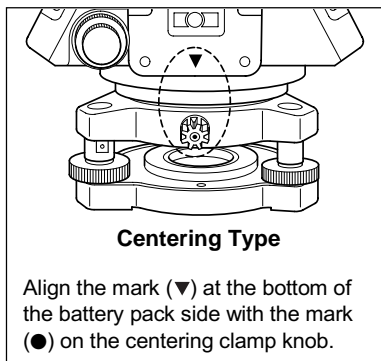
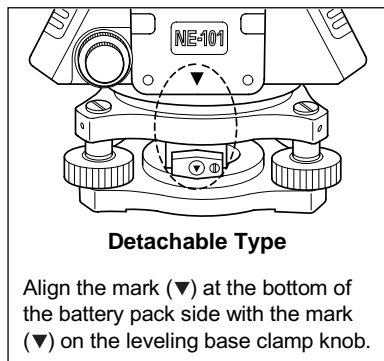
1) Unpacking

Hold the carrying handle and take the instrument out of the case.

2) Packing

Attach the battery pack to the instrument and turn the telescope downward. Align the storage marks as shown below, fasten lightly each clamp knob and replace the instrument in its case.

How to align the storage marks:



2. Putting the Batteries in the Battery Pack



WARNING

- Never short-circuit the electrodes of the battery, or never burn or heat the battery. Doing so may cause rupture, fire, burn or instrument damage.



CAUTION

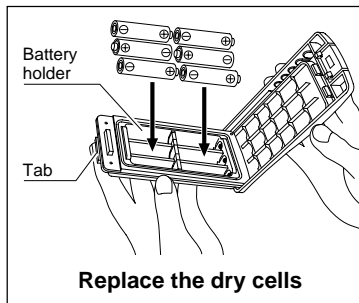
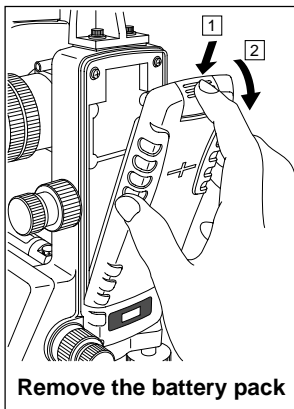
- Please note, the dry cells provided at delivery are to be used only to check the instrument functions prior to use. When using the instrument for the first time, please ensure that you replace the supplied dry cells.
- The dry cells in the battery pack for this instrument are not rechargeable type. Do NOT recharge the dry cells.
- Install the battery with its anode and cathode set correctly.
- Do not use a new dry cell together with an old one or other types of cell.
- Do not solder the dry cells.
- Immediately remove the exhausted dry cells from the battery pack.
- Avoid storing the battery pack in direct sunlight, high temperatures and excessive humidity.
- Before attaching the battery pack, clear dust or other foreign particles from the battery socket. Place the battery pack in the socket and press against the instrument until the mounting button is locked at the top surface of the battery pack. If the battery pack is not attached securely, it could adversely affect the watertight structure of the unit.

- (1) Hold down the battery mounting button on the top of the battery pack and pull the pack toward you to remove.
- (2) Hold down the tab on the battery holder and pull the holder out of the battery pack.
- (3) Replace all the dry cells with new ones. Take care that the direction of the electrodes are correct.
- (4) Reverse the procedures to reattach the battery holder, and to reattach the pack to the instrument.
- (5) Make sure that the battery mounting button is securely locked.
- (6) Turn ON the power switch and confirm that the instrument is operating correctly. (Refer to p.27.)



CAUTION

- When replacing the dry cells, replace all six cells with new ones of the same type.



3. Setting up the Tripod



CAUTION

- Be careful in handling or carrying the tripod, as the ferrule is very sharp and may cause injury to yourself or others.
- Before setting up the tripod, check below to make sure no one's hands or feet are in the way. Failure to do so may result in injury if hands or feet should be pierced by the legs of the tripod.
- Fasten firmly the thumbscrews of the tripod legs before mounting the instrument. Failure to do so may cause the tripod to collapse, resulting personal injury or instrument damage.
- Secure the instrument on the tripod by tightly fastening the clamp screw of the tripod. Failure to do so may cause the instrument to fall, resulting in personal injury or instrument damage.

- (1) Open the tripod legs sufficiently enough for the instrument to be stable.
- (2) Assure that the station point is located directly beneath the center hole in the tripod head.
- (3) Firmly press the tripod ferrules into the ground.
- (4) Level the top surface of the tripod head.

- A precise leveling is necessary when the plumb bob is used for the next section, “centering”.

- (5) Fasten firmly the clamp screws on the tripod legs.
- (6) Place the instrument on the tripod head. Insert the instrument clamp screw on the tripod into the center hole of the instrument’s base plate and tighten.

NOTE • Do not carry the instrument mounted on the tripod on your shoulder.

4. Centering

“Centering” refers to the precise alignment of the instrument’s central axis over the station point. This can be accomplished in two ways, through the use of a plumb bob, or the optical plummet.

1) Using Plumb Bob

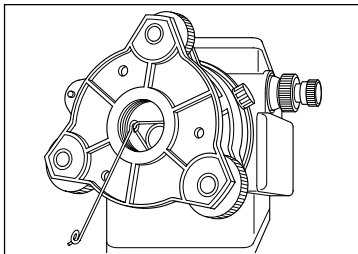
For the models with detachable leveling base

- (1) Place the instrument on the tripod head. Insert the instrument clamp screw into the center hole of the instrument’s base plate and tighten.
- (2) Hang the plumb line on the hook of the instrument clamp screw. Adjust the length of the plumb line so that the tip of the plumb bob is approximately level with the station point.
- (3) Slightly loosen the instrument clamp screw. Supporting the outer side of the leveling base with both hands, carefully slide the instrument on the tripod head until the tip of the plumb bob coincides with the center of the station point.

- Confirm precise alignment by viewing from two directions at right angles to each other.

For the model with centering leveling base

- (1) Hang a hook for plumb bob line on the V-shaped metal bracket inside of the center of the instrument's base plate.



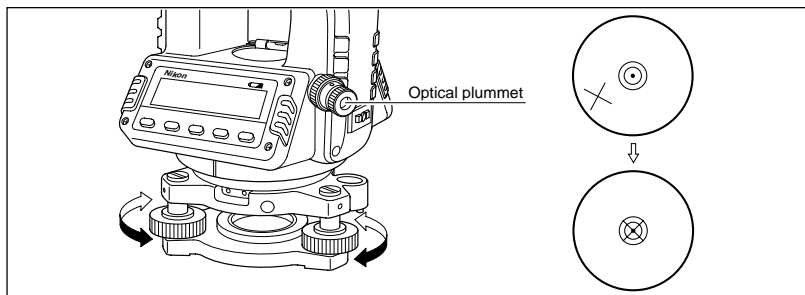
- (2) Pass the hook for plumb bob line through the hole of the instrument clamp screw. Place the instrument on the tripod head.
- (3) Insert the instrument clamp screw into the center hole of the instrument's base plate and tighten.
- (4) Hang the plumb line on the hook of the instrument clamp screw. Adjust the length of the plumb line so that the tip of the plumb bob is approximately level with the station point.
- (5) Slightly loosen the instrument clamp screw. Supporting the outer side of the leveling base with both hands, carefully slide the instrument on the tripod head until the tip of the plumb bob approximates the center of station point ($\pm 10\text{mm}$). Tighten the instrument clamp screw.
- (6) Loosen the centering clamp and slide the instrument so that the tip of the plumb bob coincides with the center of the station point.

2) Using Optical Plummet

- Carry out the “CHECKING AND ADJUSTMENT of Optical Plummet” (p.41) when the centering operation is performed at a position higher than the station point.
- For high accuracy, carry out the “CHECKING AND ADJUSTMENT of Optical Plummet” (p.41) before the centering operation.


For the models with detachable leveling base

- (1) Place the instrument on the tripod head. Insert the instrument clamp screw into the center hole of the instrument’s base plate and tighten.



- (2) Looking through the optical plummet, align the station point image with the center mark ◎ of the reticle by turning the leveling screws.
- (3) While supporting the tripod head with one hand, loosen the tripod leg clamps and adjust the length of each leg to center the air bubble in the circular level. Then tighten the tripod leg clamps.
- (4) Using the plate level, proceed to the leveling procedures described in the next section, “Leveling”.
- (5) Looking through the optical plummet, check if the station point image is still centered in the reticle mark ◎.
- (6) If a slight displacement is detected, loosen the instrument clamp screw and adjust the position by moving the instrument laterally (not rotationally) on the tripod head. If the displacement is large, repeat Steps from (2).

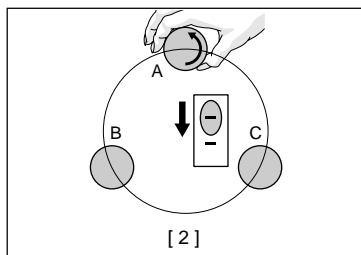
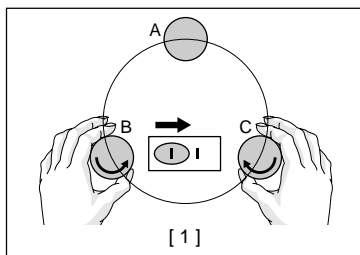
For the model with centering leveling base

- (1) ~ (5) Follow the procedures (1) through (5) described above.
- (6) If a slight displacement is detected, loosen the centering clamp and slide the instrument so that the station point image is centered in the reticle mark . If the displacement is large, repeat the above procedures (2) through (5).

5. Leveling

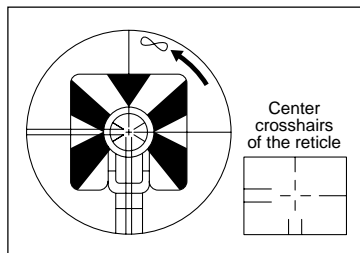
“Leveling” refers to the precise vertical alignment of the instrument’s vertical axis. The procedure for leveling by means of the plate level is described below.

- (1) Loosen the upper plate clamp. Rotate the alidade so that the plate level comes to the position parallel with any two of the leveling screws (B and C in Figure [1]).
- (2) Using these two screws, move the bubble to the center of the level.
- (3) Rotate the alidade approximately 90° and again move the bubble to the center of the level by turning the leveling screw A, as shown in Figure [2].
- (4) Repeat Steps (1) through (3) to center the bubble in both Figures [1] and [2].
- (5) Furthermore, rotate the alidade 180° . If the bubble in the plate level remains centered, leveling is complete.
- (6) If the bubble moves off center, refer to p.39 “CHECKING AND ADJUSTMENT of Plate Level” and adjust the plate level.



6. Sighting

“Sighting” refers to the aiming of the telescope at the target, bringing the target image into focus, and aligning it with the center crosshairs of the reticle.



WARNING

- Never look at the sun through the telescope. Doing so may cause the loss of your eyesight.

Notes on sighting are as follows:

- **Diopter Adjustment**

Direct the telescope towards a blank area, such as the sky or a piece of paper. Looking through the eyepiece, rotate the diopter ring to bring the reticle crosshairs into sharp focus.

- **Elimination of Parallax**

Rotate the focusing ring to bring the target image into focus on the reticle crosshairs. Move your eye vertically and laterally to see if the target image moves in relation to the reticle crosshairs. If the target image does not move, there is no parallax. If it moves, rotate the telescope focusing ring to eliminate the parallax.

III. INITIAL SETTING

Initial values can be selected for the items shown below. Confirm each setting value before starting measurement operation. **The bold-faced** values in the table represent the default settings prior to delivery.

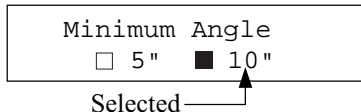
Item	Setting value		
	NE-101	NE-100	
Minimum Angle Unit	5" / 10" 1mG / 2mG 0.02MIL / 0.05MIL	10" / 20" 2mG / 5mG 0.05MIL / 0.1MIL	
Vertical 0° Orientation	Z-0 (Zenith 0° Horizon 90° (face-1))	H-0 (Horizon 0° (face-1) Zenith 90°)	COMPASS (Horizon 0° (face-1/2) Zenith 90° Nadir -90°)
Angle Unit	DEGREE (360°)	GON (400G)	MIL (6400MIL)
Automatic Power Cut-Off	OFF (Disable)	10'	30'

<Setting Procedure>

- (1) Turn ON the power switch while holding down the [RESET] key.
- (2) The LCD will light up for approximately 1 second then the screen will show the version No. display, followed by display of the first item, "Minimum Angle Unit", in the initial setting.

(3) Minimum Angle Unit Selection

- 5": 5 seconds / 1mgon / 0.02MIL
- 10": 10 seconds / 2mgon / 0.05MIL



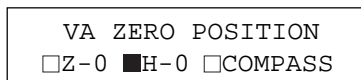
The value headed with the highlighted mark ☒ is currently selected.

To change the setting, depress the [RESET] key, and the position of the ☒ mark will be switched over.

Depress the [HOLD] key to fix the setting and proceed to the next setting item.



(4) Vertical 0° Orientation Selection



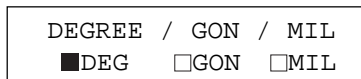
- Z-0: Zenith 0° Horizon 90° (face-1)
- H-0: Horizon 0° (face-1) Zenith 90°
- COMPASS: Horizon 0° (face-1/2) Zenith 90° Nadir -90°

Do the same key operation as in step (3).



(5) Angle Unit Selection

- DEG: 360 Degree
- GON: 400Gon
- MIL: 6400Mil



Do the same key operation as in step (3).



(6) Automatic Power Cut-Off Selection

AUTO POWER CUT OFF

■ OFF □ 10' □ 30'

- OFF: Auto cut-off disabled for continuous uninterrupted operation.
- 10': 10-minute interval before auto cut-off.
- 30': 30-minute interval before auto cut-off.

Selecting “10' ” or “30' ” enables the automatic power cut-off function. It automatically turns off the power when the instrument is left **unattended*** for the designated period of time, “10' ” or “30' ”, conserving battery life. The buzzer will sound 5 times a minute before the power cuts off.

* The term “unattended” means

(I) No key operation, or

(II) No changes in either horizontal or vertical angles.

Do the same key operation as in step (3).



[HOLD] key

- (7) Depression of the [HOLD] key in step (6) will save all settings in the internal memory.

TILT TELESCOPE ■■■
HA: 0°00'00"

The LCD will then revert to the initial start-up screen. You can proceed to measurement operations. (Refer to p.27)

Note

- To cancel the setting procedure mid-operation, turn OFF the power switch before the final depression of the [HOLD] key in step (6). In this case, any changes made to the setting will be invalid.
 - It is not possible to return to the previous setting item. To go to a previous setting item, turn OFF the power once and restart from the first item.
 - Input of any other key than those specified for the initial setting procedures will be ignored.
-

IV. OPERATION

1. Power Switch ON/OFF

- (1) Turn ON the power by depressing the power switch located on the side of the

TILT TELESCOPE	■■■■
HA:	0°00'00"

instrument. All segments of the LCD will light up for 1 second, followed by the display of the horizontal angle and the message "TILT TELESCOPE" on the vertical angle line.

- (2) Position the telescope in the face-1 position (refer to p.29 Section 3. Angle Measurement)

VA:	91°31'20"	■■■■
HA:	0°00'00"	

and tilt the telescope up and down through the horizontal plane.

When the telescope passes through the horizon, the buzzer sounds to indicate vertical angle reset and measurement capability.

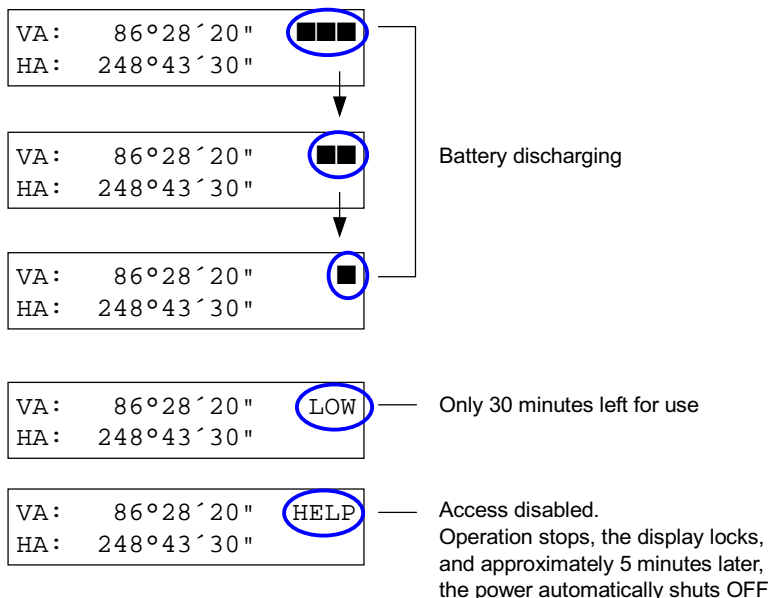
- (3) Keep depressing the power switch located on the side of the instrument for more than 1 second, and then release to turn OFF the power.

-
- NOTE**
- Tilt the telescope slowly. If the telescope is turned too quickly, a warning message will appear on the display. (Refer to p.46, "WARNING MESSAGES".)
 - Refer to p.24, "III. INITIAL SETTING" for the contents of the initial display.
 - Always be sure to check the battery capacity before use. If the batteries become discharged to the specified level, the message "BATTERY LOW" will be displayed when the power is turned ON.
-

VA:	BATTERY LOW
HA:	

2. Battery Capacity Level Display

The battery capacity level is displayed on the right upper-hand corner of the LCD.



- When the “LOW” display is seen, turn OFF the power and replace the batteries. (Refer to p.14)
- If the power switch is turned ON when the battery capacity discharges to the level insufficient for use, all LCD segments will light up, then the initial battery error warning message “BATTERY LOW” is displayed, and operation will stop.

3. Angle Measurement

“Face-1” and “Face-2” Measurement

The term “face-1” refers to observations made with the vertical circle positioned to the left of the telescope eyepiece. Likewise, “face-2” means the vertical circle is positioned on the right.

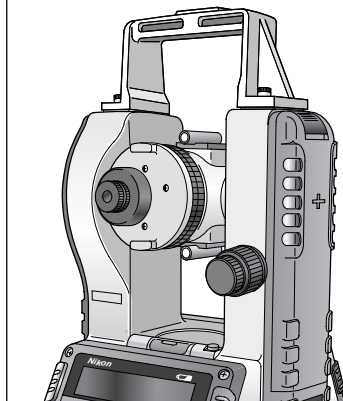


CAUTION

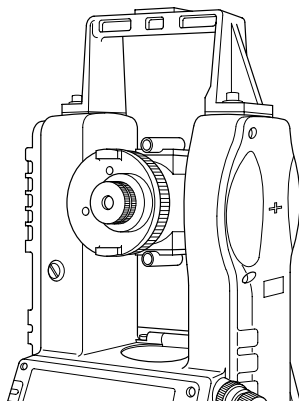
- Be careful not to insert your finger between the telescope and instrument standard when rotating the telescope.

- Mechanical constant error (except a few errors such as vertical axis error) can be effectively cancelled out by averaging the values in face-1 and face-2.

Face-1 measurement



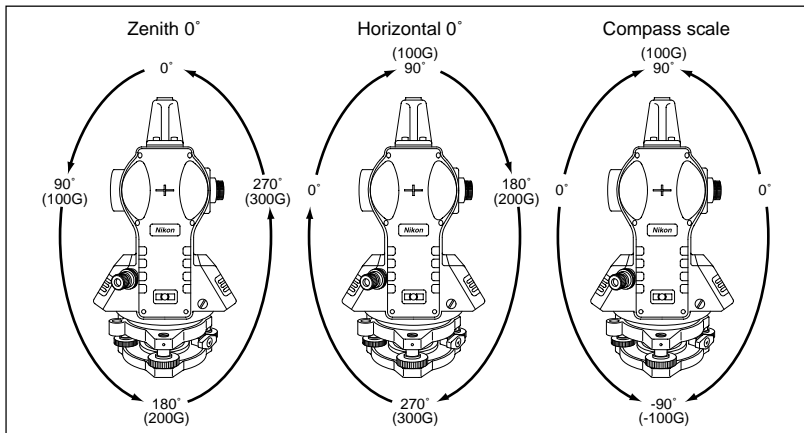
Face-2 measurement



1) Vertical Angle

<1> Vertical 0° Angle Orientation

The orientation of the vertical 0° reference angle can be set in the initial setting mode for either Zenith 0°, Horizontal 0°, or compass scale. (Refer to Chapter III, “INITIAL SETTING” for the setting procedure.)



* The factory setting is Zenith 0°.

<2> Angle Unit Selection

Either of three units of angle measure, DEG, GON, or MIL can be selected in the initial setting mode.

GON unit measurement is indicated by the display of “G” to the right of the measurement value display.

VA:	147.4750	G	■■■
HA:	287.6150	G	■■■

MIL unit measurement is indicated by the display of “MIL” to the right of the measurement value display.

VA:	2359.60	MIL	■■■
HA:	4601.88	MIL	■■■

<3> Grade Display

Depression of the [%/VA] key changes the vertical angle to “%” display, indicating grade measurement.

VA:	114°27'40"	■■■
HA:	286°52'20"	

↓ [%/VA] key

Vertical angle readings of 5"/1mG appear as 3-digit decimal numbers when converted to grade readings. 10"/2mG and 20"/5mG vertical angle readings appear as 2-digit decimal numbers.

V%:	-45.491 %	■■■
HA:	286°52'20"	

The grade display range is $\pm 100\%$ ($\pm 45^\circ/\pm 50G$) from horizontal. The message “OVER” is displayed if this range is exceeded.

V%:	OVER	■■■
HA:	286°52'20"	

↓ [%/VA] key

Depress the [%/VA] key again to delete the vertical angle display, leaving only the horizontal angle displayed.

HA:	167°59'00"	■■■
-----	------------	-----

This horizontal angle priority function facilitates operation when vertical angle readings are unnecessary. (Refer to p.37)

↓ [%/VA] key

Another depression of the [%/VA] key restores the vertical angle display.

VA:	114°27'40"	■■■
HA:	286°52'20"	

2) Horizontal Angle

<1> Horizontal Angle Zero Reset

Depress the [RESET] key to reset the horizontal angle to 0°.

VA:	136°42'50"	■■■
HA:	165°28'10"	

↓ [RESET] key

VA:	136°42'50"	■■■
HA:	0°00'00"	

NOTE • The [RESET] key must be held down until the buzzer sounds 3 times. The horizontal angle will not reset if the key is released before the third beep.

<2> Reverse (Counterclockwise) Horizontal Angle Scale

Depress the [R/L] key to display the reverse horizontal angle scale (HL ◀).

VA:	86°35'40"	■■■
HA:	157°07'20"	

↓ [R/L] key

The “HL ◀” angle display increases as the upper plate is rotated counterclockwise, as viewed from above.

Horizontal angle 0° reset can also be performed while the “HL ◀” angle is displayed.

VA:	86°35'40"	■■■
HL◀	102°52'40"	

↓ [R/L] key

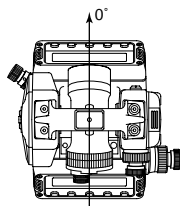
Depress the [R/L] key again to restore the regular angle display.

VA:	86°35'40"	■■■
HA:	157°07'20"	

<3> HOLD

The HOLD function is used to freeze the displayed horizontal angle readout, which remains unchanged regardless of sighting direction changes.

- Rotate the upper plate to display the desired horizontal angle, then depress the [HOLD] key to freeze the reading.
- To release the hold function, depress the [HOLD] key again.



VA:	90°35'20"	■■■
HA:	0°00'00"	

[1] Rotate the upper plate ↓

VA:	90°35'20"	■■■
HA:	30°00'00"	

Depress the [HOLD] key to hold the displayed horizontal angle (30°).

VA:	90°35'20"	■■■
HA:	30°00'00"	HOLD

[2] Rotate the upper plate ↓

Horizontal angle 30° freezes.

VA:	90°35'20"	■■■
HA:	30°00'00"	HOLD

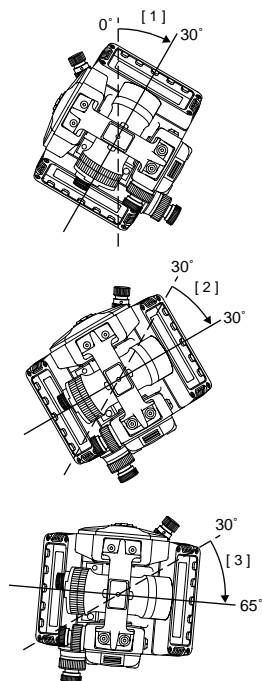
To cancel the hold function, depress the [HOLD] key.

VA:	90°35'20"	■■■
HA:	30°00'00"	

[3] Rotate the upper plate ↓

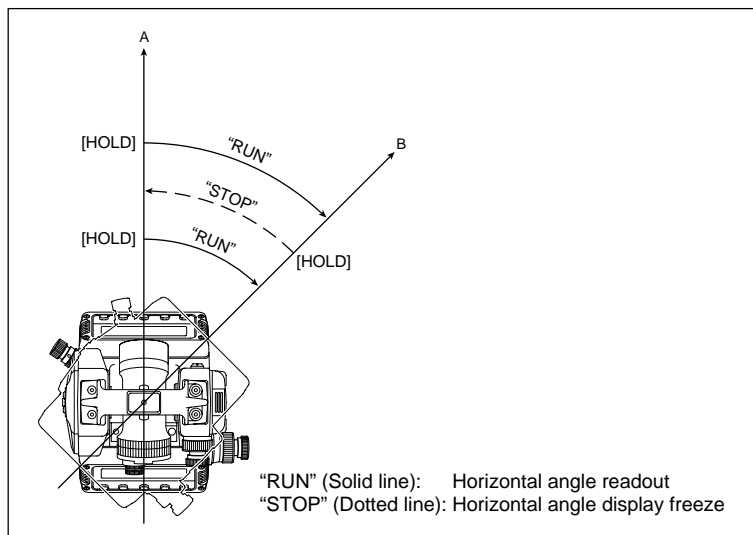
VA:	90°35'20"	■■■
HA:	65°00'00"	

Rotation angle by [3] (ex. 35° in this case) is added to the held readout angle (30°), and the sum angle 65° is displayed.



<4> Repeat Horizontal Angle Measurement

This function displays the summed angle of repeated angle measurements, permitting calculation of the average angle by dividing the final sum value by the number of repetitions to reduce read-out error.



(1) Sight Target A.

VA: 114°27'40" ■■■

HA: 87°47'10"

(2) Keep depressing the [HOLD] key.

After the third beep of the buzzer, the horizontal angle is reset to 0° and the display switches to repeat horizontal angle measurement mode.

↓ [HOLD] key

The message "RUN" appears on the display.

VA: 114°27'40" ■■■

HA: 0° 0'00" **RUN**

- (3) Sight Target B.
The horizontal angle changes while the “RUN” message is displayed.

VA:	114°27'40"	■■■
HA:	45° 0'00"	RUN

↓ [HOLD] key

- (4) Depress the [HOLD] key
(1 buzzer beep).
The horizontal angle display freezes and the “STOP” message is displayed.

VA:	114°27'40"	■■■
HA:	45°00'00"	STOP

- (5) Resight Target A.
The horizontal angle readout does not change while the “STOP” message is displayed.

VA:	114°27'40"	■■■
HA:	45°00'00"	STOP

↓ [HOLD] key

- (6) Depress the [HOLD] key
(1 buzzer beep).
Operation reverts to “RUN”.

VA:	114°27'40"	■■■
HA:	45°00'00"	RUN

- (7) Resight Target B.

VA:	114°27'40"	■■■
HA:	90°00'00"	RUN

↓ [HOLD] key

- (8) Repeat Steps (4) ~ (7).

·
·
·
·
·
·

- (9) Divide the final horizontal angle reading by the number of repetitions to calculate the average angle value.

VA:	114°27'40"	■■■
HA:	360°01'20"	RUN

Example: If the final reading after 8 repetitions is 360°01'20", the averaged reading will be:
 $360^{\circ}01'20''/8 = 45^{\circ}00'10''$

To cancel or return to normal operation following repeat horizontal angle measurement, depress the [HOLD] key again until the third beep of the buzzer (approx. 1 sec.).

The maximum summed readout range is less than $\pm 2000^{\circ}/\pm 2222.2222G$.

If exceeded, the "OVER" warning will be displayed and operation stops.

VA:	114°27'40"	■■■
HA:	OVER	RUN

To reset, rotate the instrument in the reverse direction to display the most recent repeat horizontal angle reading.

- Repeat measurement cannot be performed when the MIL unit is selected.

<5> Horizontal Angle Priority Function

Permits display of only horizontal angle readings when vertical readings are not required, and helps prevent mistaken readings.

- (1) Depress the [%/VA] key to change to the grade (%) display.

VA:	71°07'20"	■■■
HA:	167°59'00"	

↓ [%/VA] key

VA:	34.19 %	■■■
HA:	167°59'00"	

↓ [%/VA] key

- (2) Depress the [%/VA] key again to delete the vertical angle display, leaving only the horizontal angle reading.

		■■■
HA:	167°59'00"	

↓ [%/VA] key

- (3) Depress the [%/VA] key again to restore the vertical angle display.

VA:	71°07'20"	■■■
HA:	167°59'00"	



4. Other Functions

1) Horizontal Angle Memory Function

Saves the currently displayed horizontal angle in the memory when the automatic power cut-off function turns OFF the instrument.

The same horizontal angle reading will be displayed when the power is turned ON again.

2) Reticle light and LCD backlight

Depress the [] key to illuminate the reticle crosshairs and the LCD. Illumination switches off automatically approximately 1 minute after being enabled, or can be manually turned off with another depression of the [] key.

V. CHECKING AND ADJUSTMENT

1. Plate Level

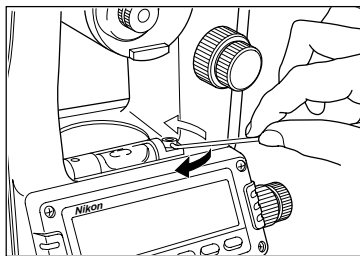
(Making the axis of the level vial at right angle to the vertical axis of the instrument)

1) Checking

- (1) Set up the instrument on the tripod and follow the leveling procedures described on p.22, Chapter II-5.
- (2) Rotate the alidade 180°.
- (3) Check to see if the bubble remains in the center of the vial. If a displacement is detected it should be adjusted. Refer to the following adjustment procedure.

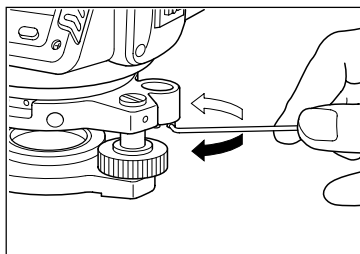
2) Adjustment

- (1) Using the adjusting pin supplied, rotate the plate level's adjustment screw to move the bubble to eliminate half of the displacement detected.
- (2) Take up the remaining displacement with leveling screw A (refer to Figure on p.22), centering the bubble.
- (3) Recheck, and repeat if necessary.



2. Circular Level

After confirming the plate level is in adjustment, check for any displacement of the bubble's centering in the circular level. If it is out of adjustment, use the adjusting pin to manipulate the three adjustment screws, centering the bubble.

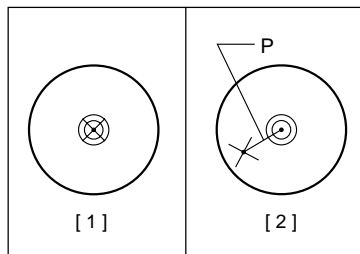
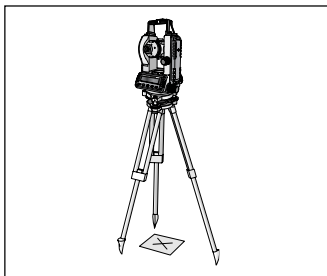


3. Optical Plummet

(Aligning the optical axis of the plummet with the instrument's vertical axis.)

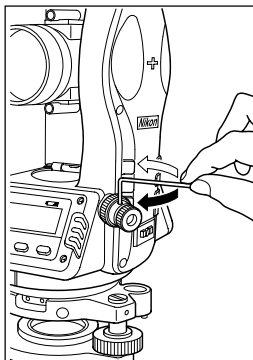
1) Checking

- (1) Place the instrument on the tripod (no leveling necessary).
- (2) Place a thick sheet of paper marked with an “X” on the ground directly underneath the instrument.
- (3) Looking through the optical plummet, adjust the leveling screws to move the image of the “X” mark to the center of the reticle's \odot marking. (Refer to the Fig. [1] below.)
- (4) Rotate the upper plate 180° .
- (5) If the “X” mark remains centered in the reticle, no adjustment will be necessary. If any displacement is detected (Refer to the Fig. [2] below.), proceed to the following adjustment procedure.



2) Adjustment

- (1) Using the supplied hexagonal wrench, turn the adjustment screws to move the “x” mark exactly halfway to the center of the reticle mark, as indicated by Point P in the Fig. [2] above.
- (2) Repeat Steps (3) ~ (5) of the checking procedure.



4. Vertical Circle Zero Point Error

1) Checking


- (1) Set-up the instrument on the tripod and perform leveling.
- (2) With the telescope in the face-1 position, aim at an arbitrary Target P positioned within $\pm 10^\circ/\pm 11G$ from the horizontal plane, and take a reading of the vertical angle...VR
- (3) Reverse the telescope to the face-2 position and take another reading of target P's vertical angle...VL
- (4) If $VR + VL = 360^\circ/400G$ when the zenith angle is set to 0° , or if $VR + VL = 180^\circ/200G$ (or $540^\circ/600G$) when the horizontal angle is set to 0° , no adjustment will be necessary. Otherwise, refer to the following adjustment procedure.

Vertical error ($2 \cdot e$) corresponds to the above angles (360° , 180° , & 540° or $400G$, $200G$, & $600G$), and is referred to as the vertical constant. The vertical constant is compensated for by doubling the zero point error (e) in the following procedure. Note that compass scale error ($2 \cdot e$) is not related to the vertical constant. Therefore, take a reading using either the zenith 0° or horizontal 0° , and check for error.

V

2) Adjustment

Before measurement, confirm the orientation of the vertical angle 0° in the initial setting mode.

- (1) While depressing the [] key, turn ON the power switch.
The entire display lights up and the current vertical constant value is displayed.

AC: $1^\circ 00' 20''$



- (2) Tilt the telescope across horizontal position on face-1 to reset the vertical angle.
Vertical angle "VR" appears on the upper line of the LCD.

VR: $86^\circ 36' 40''$

- (3) While in the face-1 position, sight an arbitrary Target P, located within $\pm 10^\circ$ of the horizontal plane.
VR becomes the vertical angle of Target P.

VR: $125^\circ 45' 20''$

- (4) Depress the [HOLD] key to save reading VR in memory.
The saved VR reading is displayed on the upper line of the LCD, while VL is displayed on the lower line.

VR: $125^\circ 45' 20''$

VL: $125^\circ 45' 20''$

- (5) Rotate the telescope to the face-2 position and sight the Target P again.

The target P's vertical angle is displayed as on the lower line.

VR: $125^\circ 45' 20''$

VL: $234^\circ 16' 00''$

- (6) Depress the [HOLD] key to save reading VL in memory.
The vertical constant is displayed one second after both face-1 and face-2 vertical angles are input.

AC: 0°01'20"

- (7) Depress the [HOLD] key.
The vertical angle compensation is calculated as half the vertical constant and saved in the memory.
The LCD reverts to the start-up display.

TILT TELESCOPE ■■■
HA: 0°00'00"

Other key entries besides the [HOLD] key are ignored during this operation.

To cancel the vertical angle compensation input while in progress, turn OFF the power.

During adjustment, if the automatic vertical constant (AC) exceeds $\pm 6'$, a buzzer sounds for 1 second, the "OVER" warning will appear on the display, and operation returns to Step (2).

AC: OVER

The newly corrected constant will remain stored in memory even after the power is switched OFF. All subsequent vertical angle measurements will be corrected by the new AC.

WARNING MESSAGES

If one of the following warning messages is displayed, proceed to the corresponding countermeasure.

Message	Contents : Cause	Countermeasure
SET VA AGAIN	Vertical overspeed: Encoder rotation exceeds standard speed (1.5rps)	Tilt the telescope across the horizon on face-1 to reset.
RST HA AGAIN	Horizontal overspeed: Encoder rotation exceeds standard speed (1.5rps)	Hold down the [RST] key till the third beep sounds to reset.

If one of the following warning messages is displayed, contact your dealer.

Message	Contents : Cause	Countermeasure
E-25	Theodolite RAM error:	Contact your dealer.
EEPROM Read Error	Data error at EEPROM:	

VI. SPECIFICATIONS

1. Main Unit

● Telescope

Image: Erect

Magnification: 30×

Effective objective diameter: 45mm (1.77in)

Field of view: 1°20' (2.3m at 100m/2.3ft at 100ft)

Minimum focusing distance: 0.7m (2.3ft)

Stadia multiplier: 100

Stadia addend: 0

● Angle Measurement

	NE-101	NE-100
Minimum display	5"/10", 1mgon/2mgon, 0.02Mil/0.05Mil	10"/20", 2mgon/5mgon, 0.05Mil/0.1Mil
Accuracy (Standard deviation based on DIN18723)	7"/2mgon	10"/3mgon

Reading system: Electronic readout by incremental optical encoder

- Single-side horizontal angle reading
- Single-side vertical angle reading

Display unit: Degree, Gon, or Mil

● Optical Plummet

Image: Erect

Magnification: 2.2×

Field of view: 5°

Focusing range: 1.3m (4.16ft) fixed

● Level Sensitivity

Plate level:	NE-101: 40"/2mm
	NE-100: 60"/2mm
Circular level:	10'/2mm

● Leveling Base

NE-101:	Detachable
NE-100:	Detachable and Centering

● Weight

Main unit (with batteries installed):

Detachable model: Approx. 4.5kg (9.8 lbs)

Centering model: Approx. 4.4kg (9.6 lbs)

Case (including accessories): 2.5kg (5.4 lbs)

● Operating Temperature Range: -20° ~ +50°C

● Battery Source: Standard 1.5V AA (R6P/SUM-3) x 6

Operating time: Approx. 22hrs
(with Manganese SUM-3 at 25°C)

2. Standard Components

- Main unit
- Tool set
- Objective cap
- Plastic cover
- Plumb bob
- Instruction manual
- Carrying case

VII. OPTIONAL ACCESSORIES

1. Diagonal Eyepiece Prism

Remove the telescope eyepiece and set the diagonal eyepiece prism in place, then remount the telescope eyepiece onto the open end of the diagonal eyepiece prism.

2. L & H Eyepieces

Can be attached in place of the telescope eyepiece. Remove the telescope eyepiece and screw in either the L (Low magnification) or H (High magnification) eyepiece.

3. Zenith Prism

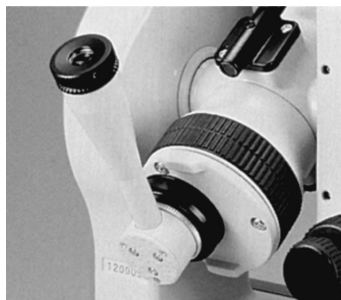
Can be used by mounting on the telescope eyepiece.

4. Suunto® Compass Adapter

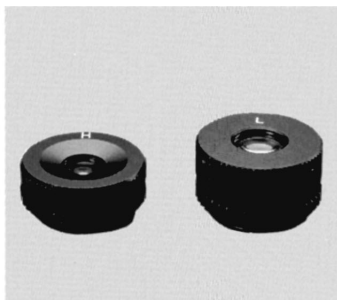
Refer to instructions supplied with compass adapter.

5. Solar Prism

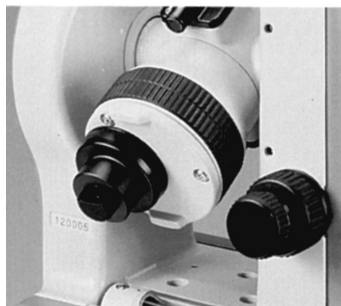
Refer to instructions supplied with solar prism.



• Diagonal eyepiece prism



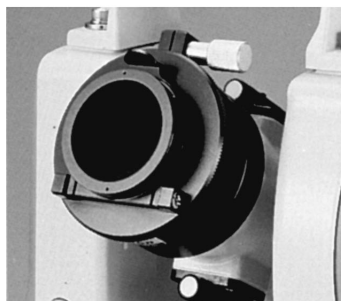
• L & H Eyepieces



• Zenith prism



• Suunto® compass adapter



• Solar prism

● Conforming Standards:

FCC: FCC 15B CLASS B satisfied

CE: EU EMC Directive satisfied



NOTE:

This equipment has been tested and found to comply with the limits for a Class B personal computer and peripherals, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

— WARNING —

This equipment has been verified to comply with the limits for a Class B digital device, pursuant to Subpart B of Part 15 of FCC Rules. Only computer and/or peripherals (computer input/output devices, terminals, printers, etc.) certified and/or verified to comply with the Class B limits may be attached to this equipment. Operation with non-certified or non-verified computer or peripherals is likely to result in interference to radio and TV reception. The connection of a non-shielded equipment interface cable to this equipment will invalidate the FCC Certification of this device and may cause interference levels which exceed the limits established by the FCC for this equipment.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Class B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

- It is prohibited to alter this manual in part or whole without expressed permission.
- The contents of this manual are subject to change without any notice.
- Although every effort has been made to ensure the accuracy of this manual, if you note any points that are unclear or incorrect, contact your dealer.

Trimble

5475 Kellenburger Road
Dayton, Ohio 45424-1099, U.S.A.
Phone +1-937-233-8921 • Fax +1-937-233-9004
www.trimble.com

TDS

Tripod Data Systems
PO Box 947
Corvallis, OR 97339, U.S.A.
Phone +1-541-757-7254 • Fax +1-541-752-7133
www.tdsway.com

Trimble Europe

Trimble GmbH
Am Prime Parc 11
65479 Raunheim, Germany
Phone +49-6142-2100-0 • Fax +49-6142-2100-550

Trimble Asia-Pacific

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