

# PENTAX®

## Instruction Manual

### Electronic Total Station

# PCS-300 SERIES

## PCS-315/325/335

Before using this product, be sure that you have thoroughly read and understood this instruction manual to ensure proper operation.

After reading this manual, be sure to keep in a convenient place for easy reference.

### ASAHI PRECISION CO., LTD.

# PRECAUTIONS REGARDING SAFETY

## Safety Precautions (Must be Followed)

The following items are intended to prevent possible injury to the user or other people and/or damage to the instrument before it occurs. These safety precautions are important to the safe operation of this product and should be observed at all times.

### ■ Distinctive Displays

The following displays are used to distinguish precautions by the degree of injury or damage that may result if the precaution is ignored.



#### **WARNING**

Items indicated by this display are precautions which if ignored would result in death or serious injury.



#### **CAUTION**

Items indicated by this display are precautions which if ignored may result in injury or material damage.

- ※ Here "injury" refers to injuries such as cuts, burns or electric shock the treatment of which will not likely require hospitalization or long-term attention.
- ※ "Material damage" refers to damage to facilities, buildings, acquired data, etc.

This device complies with the protection requirement for residential and commercial areas. If this device is used close to industrial areas or transmitters, the equipment can be influenced by electromagnetic fields.

# PRECAUTIONS REGARDING SAFETY

## WARNING

- Never use the telescope to view intense light such as direct sunlight or sunlight reflected through a prism as this may result in loss of sight. Always be sure to attach a special solar filter (MU73) to the objective lens of this product when observing the sun.
- Do not use this product in a coal mine, in a location where there is coal dust, or near flammable material as there is a risk of explosion.
- Do not disassemble, modify or repair this product as there is a risk of fire, electric shock and burn injury. If you think the product requires repair, contact the retail outlet where you purchased it or an authorized repair site.
- Only use the MC04 battery charger intended for this product as the battery charger. Use of another battery charger entails a risk of fire or burn injury from the battery bursting into flames due to possible differences in voltage or polarity.
- Do not use a damaged electric cord plug or loose electric outlet when charging as there is a risk of fire or electric shock.
- Do not charge the battery while covered by clothes or similar item as there is a risk of fire if the clothes ignite.
- Do not use the battery or charger when wet as there is a risk of fire and burn injury due to short-circuit.
- To prevent making short-circuit when removing the battery and charger from the case and storing them, apply electrically resistant tape to the poles of the battery. Storing the battery and charger as-is may result in fire or burn injury due to short-circuit.
- Do not throw the battery into a fire or expose it to heat as there is a risk of injury if it explodes.

# PRECAUTIONS REGARDING SAFETY

## CAUTION

- Do not remove the handgrip without good reason. If it does come off, be sure to attach it securely to the main unit with screws. If it is not fastened securely, the main unit may fall when you grasp the handgrip, leading to possible injury.
- Do not short the poles of the battery or charger as there is a risk of injury or fire.
- Do not touch any fluid which may leak from the battery as there is a risk of chemical burn injury or reaction.
- Do not insert or remove the electric plug with wet hands as there is a risk of electric shock.
- Do not use the case to stand on as it is slippery and unstable and may cause you to fall, resulting in possible injury.
- Be sure the tripod itself and the instrument on the tripod are both installed securely as insecure installation may cause the tripod to fall over or the instrument to drop, resulting in possible injury.
- Do not carry the tripod with the metal shoe pointing toward another person as the person may be injured if they strike him or her.

# PRECAUTIONS REGARDING SAFETY

## Usage Precautions

Surveying instruments are high-precision devices. In order to assure that the Total Electronic Station PCS-300 Series product which you have purchased will provide long-lasting maximum performance, the precautions in this manual must be followed. Be sure to follow these instructions and use this product properly at all times.

### [Solar Observation]

#### **WARNING**

Never view the sun directly using the telescope as this may result in loss of sight.

Never point the objective lens directly at the sun as this may damage internal components. When using the instrument for solar observation, be sure to attach the special solar filter (MU73) designed for this product to the objective lens.

### [Usage]

- Never use any battery other than the MC04 battery intended for this product in the charger as this may result in damage to the instrument.
- If water should happen to splash on the instrument or the battery, wipe it off immediately and allow it to dry in a dry location. Do not put the instrument in the case until it is completely dry as this may result in damage to the instrument.
- Turn off the power when removing the battery from the instrument as removing the battery while the power is still on may result in damage to the instrument.
- The battery mark on displayed on the instrument is only an estimate of remaining battery power and is not completely accurate. Replace the battery quickly when it is about to run down as the time a battery lasts on one charge differs depending on conditions of use, ambient temperature, and the measurement mode of the main unit.
- In addition to these precautions, be sure to handle the instrument properly at all times following the descriptions given in the various sections of this manual to assure safe and proper measurements.

# PRECAUTIONS REGARDING SAFETY

## [Storage and Operating Environment]

### **WARNING**

To prevent making short-circuit when removing the battery and charger from the case and storing them, apply electrically resistant tape to the poles of the battery. Storing the battery and charger as is may result in fire or burn injury due to short-circuit.

- Avoid storing the instrument in places subject to extreme high, low or radically fluctuating temperature. (Ambient temperature range during use:  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ )
- Distance measurements may take longer when atmospheric conditions are poor such as when heat haze is present. We recommend increasing the number of prisms in such cases.
- When storing the instrument, always put it in its case and avoid storage in locations which are dusty or subject to vibration or extreme heat or humidity.
- Whenever there is a sharp temperature difference between the instrument's storage and usage locations or when using the Automatic Atmospheric Correction function, allow the instrument to adjust to the ambient temperature for an hour or more before use. Be sure to protect the instrument from the sun if the location is subject to intense direct sunlight.
- During surveys for which the survey precision or atmospheric measurement method has been defined measure the atmospheric temperature and pressure separately and enter those values rather than using the Automatic Atmospheric Correction function.
- The battery should be charged approximately once per month if the instrument is to be stored for an extended period of time. The instrument should also be removed from its case occasionally and aired out.

# PRECAUTIONS REGARDING SAFETY

## [Transporting and Carrying the Instrument]

- Be careful to protect this instrument from shock of impact and excessive vibration which may result in damage during transportation and shipment.
- When transporting the instrument, always put it in the case and wrap shock-absorbing material around it and be sure it is handled as "FRAGILE".

## [Inspection and Repairs]

- Always inspect the instrument before beginning work and check that the instrument is maintaining the proper level of precision. Pentax bears absolutely no responsibility for damages due to survey results obtained from surveys conducted without an initial instrument inspection.

### **WARNING**

Never disassemble the instrument, battery or charger even if you do detect an abnormality as there is a risk of fire or electric shock due to short-circuit. If you think the product requires repair, contact the retail outlet where you purchased it or an authorized repair site.

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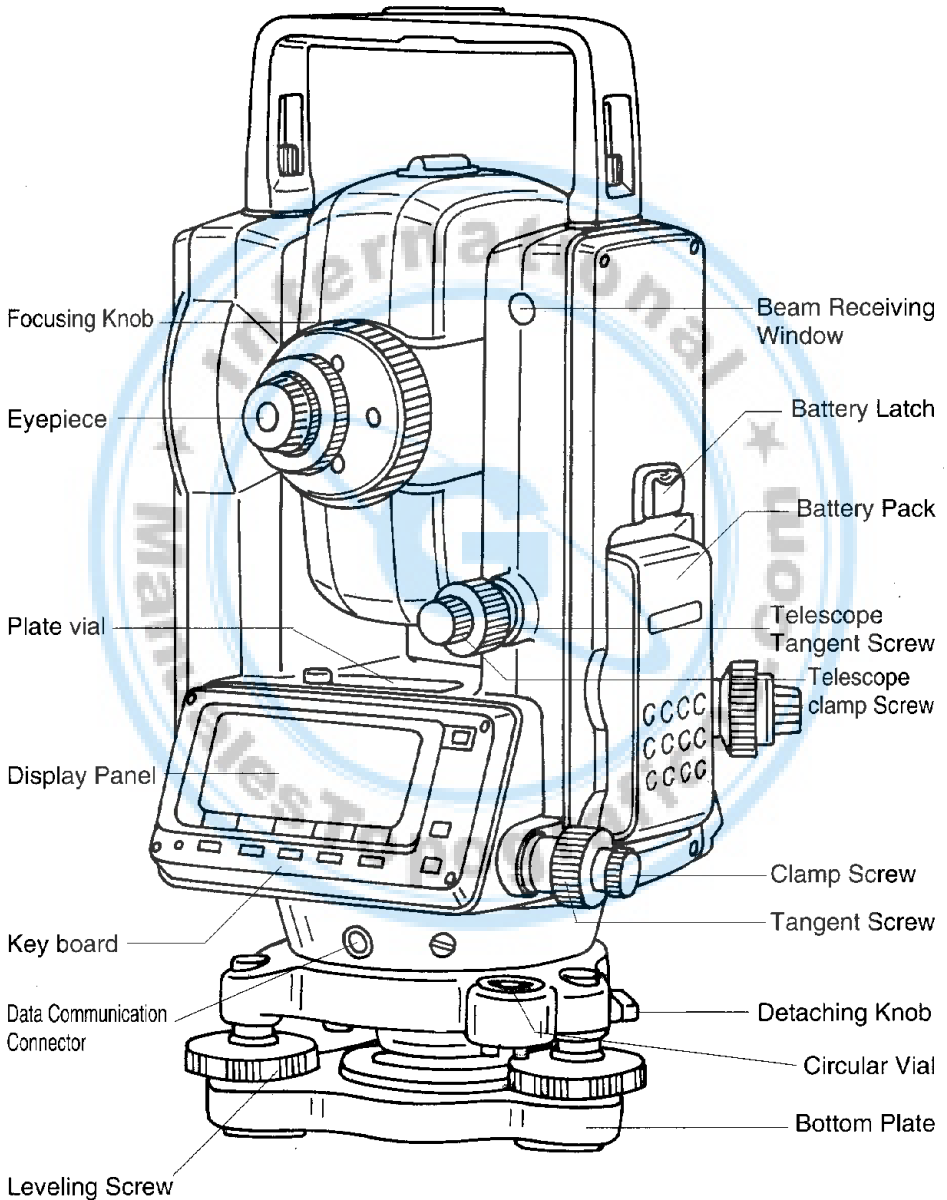
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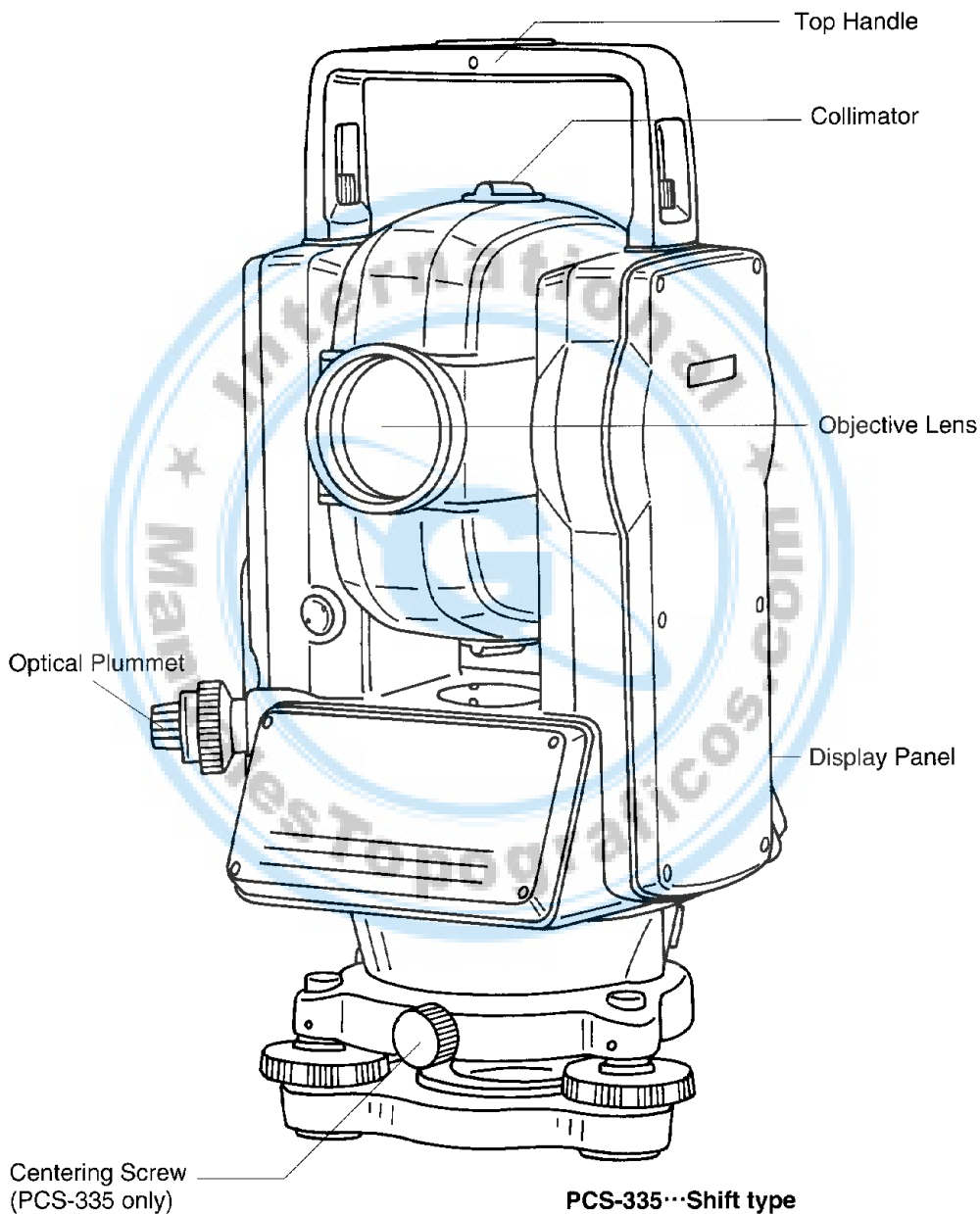
# 1 BEFORE USING THE INSTRUMENT

## 1-1 Names of Parts



PCS-325 Detachable type

# 1 BEFORE USING THE INSTRUMENT



PCS-335...Shift type  
PCS-315...Fixed type

# 1 BEFORE USING THE INSTRUMENT

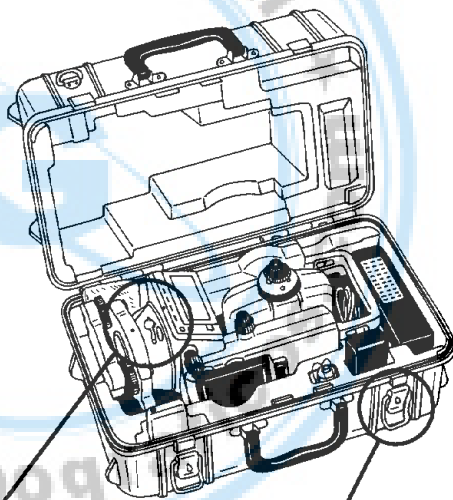
## 1-2 Unpacking and Packing

### Unpacking the Instrument from the Case

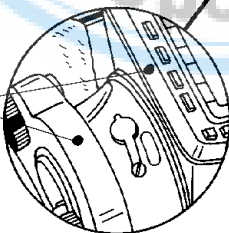
- (1) Set the case down gently with the lid facing upwards.
- (2) Open the latches while pressing down on the lock (safety mechanism) and open the lid of the case.
- (3) Remove the instrument from the case.

### Packing the Instrument in the Case

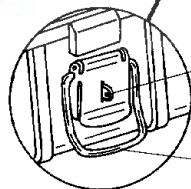
- (1) Make sure the telescope is fairly level and lightly tighten the telescope clamp screw.
- (2) Line up the housing marks (round yellow marks on the instrument) and tighten the upper and lower clamp screws.
- (3) With the housing marks facing upward, set the instrument gently in the case without forcing it.
- (4) Close the lid to the case and secure the latches.



Housing marks



Lock (safety mechanism)



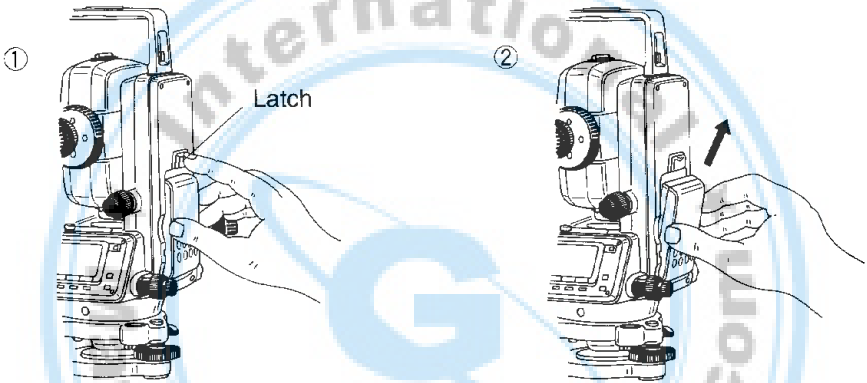
Latch

# 1 BEFORE USING THE INSTRUMENT

## 1-3 Attaching and Charging the Battery

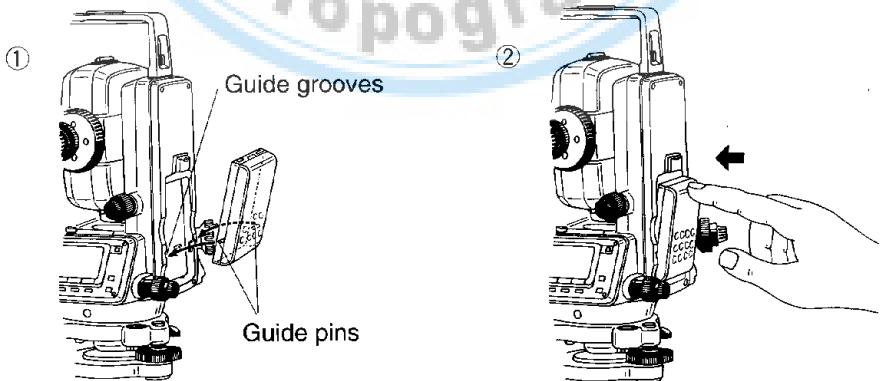
### Removing the Battery

- (1) Pressing down on the latch on the battery pack will cause the top of the battery pack to pop out slightly.
  - (2) Lift up the battery pack at an angle and remove it from the instrument.
- ※Be absolutely sure to turn off the power when removing the battery as removing the battery while the power is still on may result in damage to the instrument.
- ※When removing the battery pack, pulling forcefully sideways may damage the guide pins and guide grooves.




### Attaching the Battery

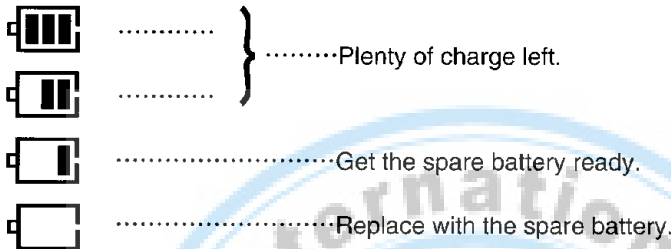
- (1) Align the guide pins on the battery pack with the guide grooves on the instrument and push the battery pack down into place.
- (2) The battery is attached when you hear the top of the battery pack click into place.



# 1 BEFORE USING THE INSTRUMENT

## Remaining Battery Charge

When the instrument's power is turned on, a battery mark "  " will be displayed on the right of the display screen. This mark can be used to check the charge status of the battery.



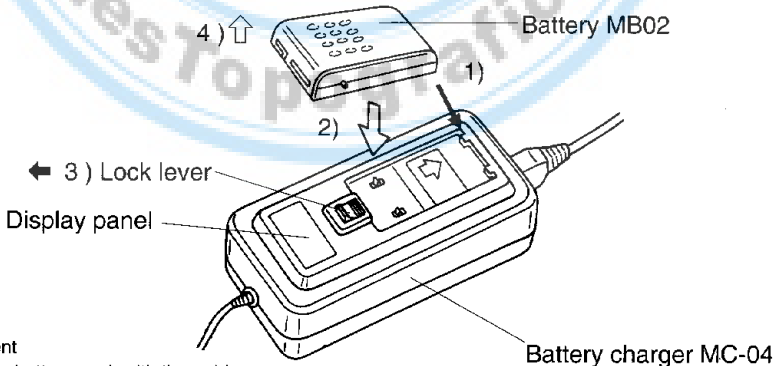
### Low battery

Please,change .....Replace with the spare battery and charge.

## Charging the Battery

The "General-Purpose Charging Unit MC-04" provided as an accessory should be used to charge the battery. Before charging the battery, please read the instruction manual that comes with the MC-04.

- Insert the AC plug on the charging unit into an AC power outlet.
- Insert the side of the battery pack. Press on the battery pack until it fits tightly together with the battery charger. When the two are properly aligned, the sliding latch will retract and lock the battery pack into the charger. The "↑ or ↓" lamp blinks and the "CHG" (Charge) lamp on the charging unit turns on.
- The charging lamp goes out, indicating that the battery is fully recharged.



\*Attachment

- Align the battery pack with the guide.
- Press battery pack down as indicated by arrow.

\*Detachment

- Move the lock lever in the direction indicated by arrow.
- Lift the battery pack up as indicated by arrow.

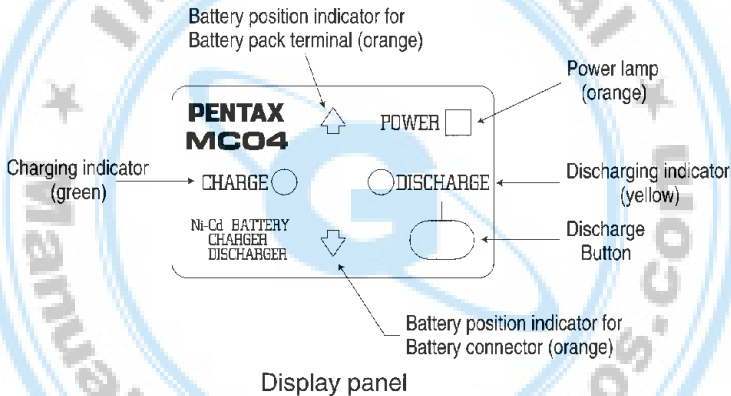


# 1 BEFORE USING THE INSTRUMENT

## Refreshing the Battery

One of the characteristics of Ni-Cd batteries is that, if the battery is repeatedly recharged before it has completely run down, a “memory effect” causes the amount of time that the battery can be used to be shortened, even though the battery has been fully charged. The battery voltage can be recovered, and the full operating time restored, by discharging the battery completely and then charging it.

- a. Press the “DISCHG” (Discharge) button in the procedure of above b.
- b. When the battery has been fully discharged, the “CHG” (Charge) lamp lights, and the charging process begins automatically.

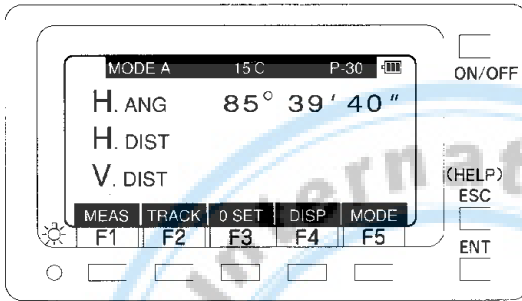


# 2 DISPLAY AND KEYBOARD

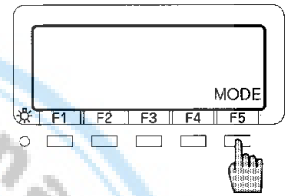
## 2-1 Sample Illustrations

Only those displays deemed necessary are indicated in sample illustrations of the display and key board used in this manual.

### Actual drawing

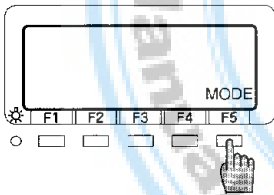


### Abbreviation

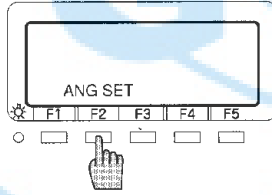


In this manual, a picture of a finger is used to indicate which key to press.

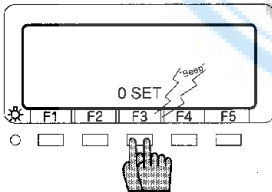
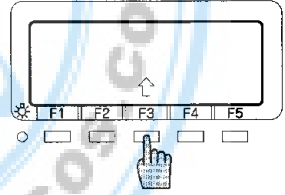
This means pressing the [MODE] key.



This means pressing the [ANG SET] key.



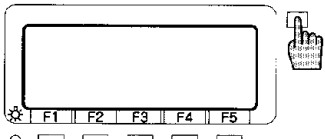
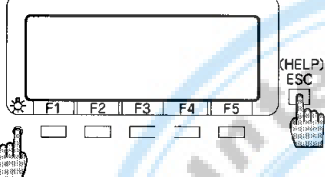
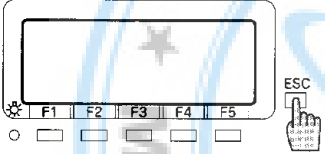
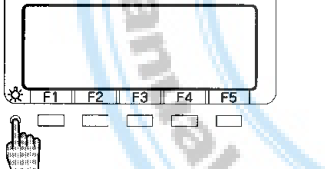
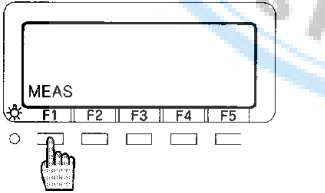
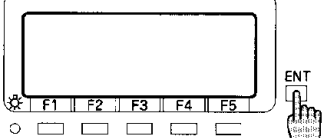
This means pressing the [ $\uparrow$ ] key.



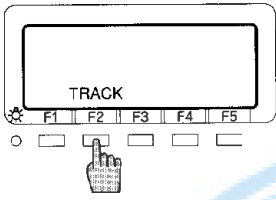
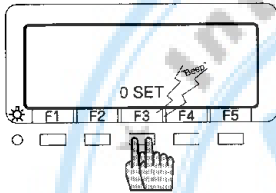
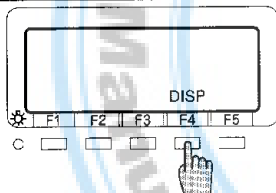
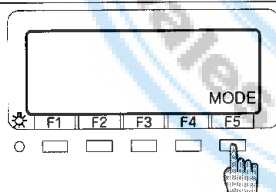
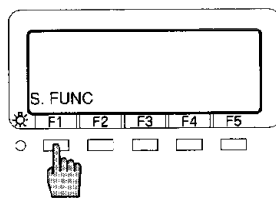
Two fingers mean that the same key should be pressed twice.  
The picture sound emanating from a key means that a buzzer will sound when the key is pressed and that the key should be pressed once more while the buzzer is still sounding.

# 2 DISPLAY AND KEYBOARD

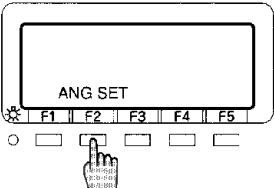
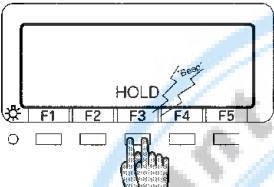
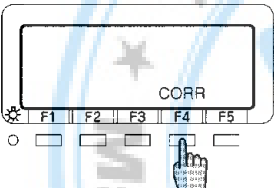
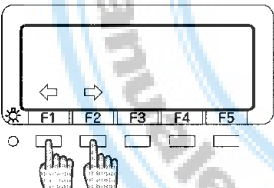
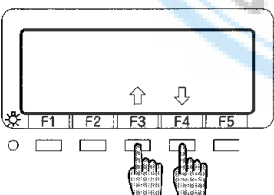
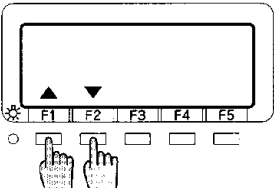
## 2-2 Key Functions

Key	Function
	<p>[POWER] key : Pressing this key turns the power on and off.</p>
	<p>[HELP] key : Pressing [ILLU]+[ESC] key causes a help menu to appear in A MODE or B MODE or causes a help message to appear during the execution of a special function.</p>
	<p>[ESC] key : Pressing this key causes the function currently executing to stop, restoring the screen to its state before execution started.</p>
	<p>[ILLU] key : Pressing this key turns the illumination of the LCD display and telescope reticle on and off.</p>
	<p>[MEAS] key : Pressing this key changes the measurement in mm units from "Shot Measurement" (specified number of times) to "Continuous Measurement" to "Measurement Stop". Note that the shot measurement and continuous measurement have changed places under the initial setting. (See page 47)</p>
	<p>[ENT] key : Pressing this key enters new settings or exits current screen.</p>

# 2 DISPLAY AND KEYBOARD

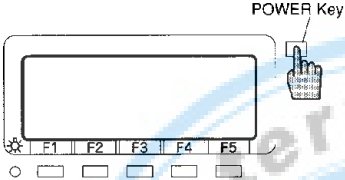


Key	Function
	<p>[TRACK] key : Pressing this key changes the measurement in cm or mm units from "Continuous Measurement" to "Shot Measurement" (specified number of times) to "Measurement Stop". Note that the shot measurement and continuous measurement have changed places under the initial setting. (See page 47)</p>
	<p>[0 SET] key : Pressing this key twice resets the horizontal angle to 0°0'0".</p>
	<p>[DISP] key : Pressing this key switches the display composition in the order "H.ANG/H.DIST/V.DIST", "H.ANG/V.ANG/S.DIST", and H.ANG/V.ANG/H.DIST/S.DIST/V.DIST".</p>
	<p>[MODE] key : Pressing this key switches the screen between A MODE and B MODE.</p>
	<p>[S.FUNC] key : Pressing this key enters selection mode for special functions (Distance stakeout, RDM, Coordinates, Offset shots, Coord. stakeout, REM, Resection, Data storage, Memory management).</p>

# 2 DISPLAY AND KEYBOARD

Key	Function
	<p>[ANG SET] key : Pressing this key brings up the angle setting screen for setting angle-related parameters (ANG, %GRADE, H.ANG INPUT and H.ANG R/L).</p>
	<p>[HOLD] key : Pressing this key twice retains (holds) the horizontal angle shown on the display.</p>
	<p>[CORR] key : Pressing this key brings up the screen for changing the prism constant, atmospheric temperature and atmospheric pressure settings.</p>
	<p>[←] key : Moves the cursor to the left. [→] key : Moves the cursor to the right.</p>
	<p>[↑] key : Moves the cursor up. Increments numeric values by one each time pressed when setting value. [↓] key : Moves the cursor down. Decrements numeric values by one each time pressed when setting a value.</p>
	<p>[▲] key : Goes back five items on the screen. [▼] key : Goes forward five items on the screen.</p>

# 3 TURNING THE POWER ON

## 3-1 Turning the Power On and Off

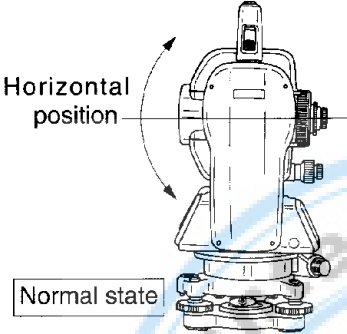
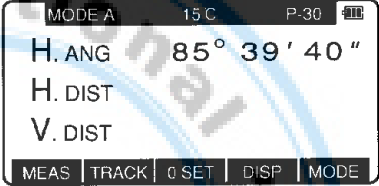
Operating Procedures	Displays
<p data-bbox="91 243 295 289"><b>POWER ON</b></p>  <p data-bbox="139 577 464 828">[POWER] key Pressing the [POWER] key causes the initial screen to appear and after a few seconds the V. Angle 0 point setting screen ("Turn telescope") will appear. (The [POWER] key is also used to turn the power off.)</p>	 <p data-bbox="762 489 784 525">↓</p>  <p data-bbox="612 817 929 871">Go to Setting V. Angle 0 Point (next page)</p>

- The Auto Power Off function will automatically turn the power off if no operations are performed for approximately 10 minutes.
- The [POWER] key is controlled by software while the instrument is working, and do not remove the attached battery.

For details on the automatic power-off function — See page 46.

# 3 TURNING THE POWER ON

## 3-2 Setting V. Angle 0 Point

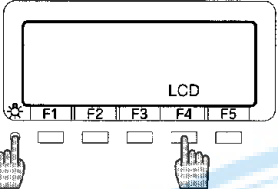
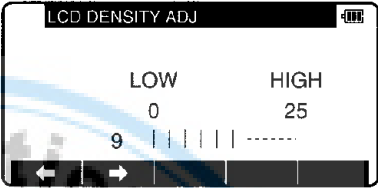
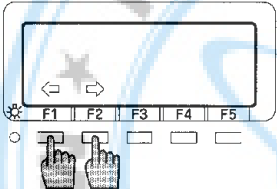
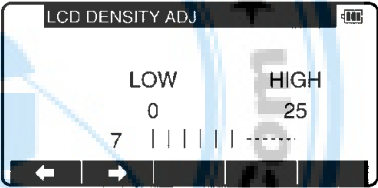
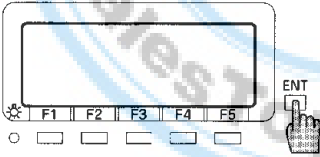
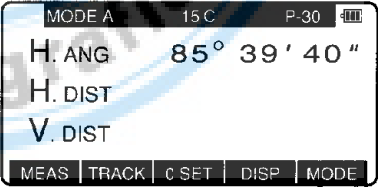
Operating Procedures	Displays
 <p>Horizontal position</p> <p>Normal state</p> <p>After power is turned on, moving the telescope up and down so that it passes through the horizontal position as instructed on the screen for setting V. Angle 0 Point ("Turn telescope") will set the V. Angle 0 Point thus putting the instrument into the mode for measuring Angle &amp; Distance.</p>	 <p>MODE A 15 C P-30</p> <p>H. ANG 85° 39' 40"</p> <p>H. DIST</p> <p>V. DIST</p> <p>MEAS TRACK 0 SET DISP MODE</p>

- The value displayed when the power was last time turned off will be displayed for the horizontal angle. If this horizontal angle is not needed, please perform horizontal angle 0 SET.

For details on changing to counterclockwise angle for the horizontal angle \_\_\_\_\_ See page 29.  
For details on setting the horizontal angle to zero \_\_\_\_\_ See page 25.  
For details on measuring the vertical angle \_\_\_\_\_ See page 24.  
For details on distance measurements \_\_\_\_\_ See page 30.

# 3 TURNING THE POWER ON

## 3-3 Adjusting LCD Contrast

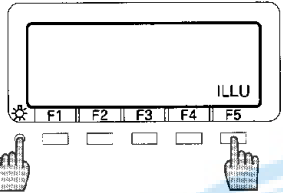

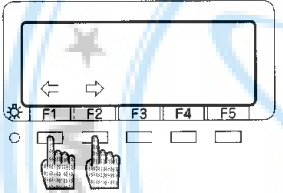
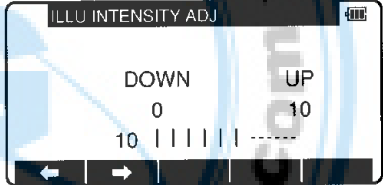
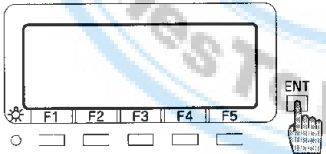
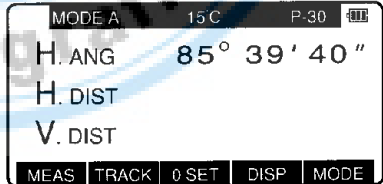
Operating Procedures	Displays
<p><b>1</b></p>  <p>Press [F4] while holding down the [ILLU] key to access the screen for adjusting LCD contrast.</p>	
<p><b>2</b></p>  <p>Pressing the [←] key will lighten the contrast, while pressing the [→] key will darken the contrast.</p>	
<p><b>3</b></p>  <p>Press [ENT] to exit adjustment mode and return to the previous screen.</p>	

- LCD contrast may be adjusted as necessary at any time.
- Contrast may be adjusted to any one of 25 levels.
- LCD contrast may be unappealing under certain environmental conditions such as high temperature. Adjust the LCD contrast as described above in such situations.



# 3 TURNING THE POWER ON

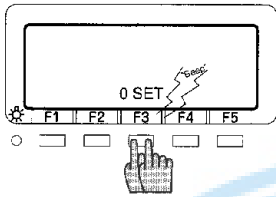
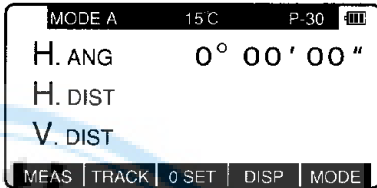
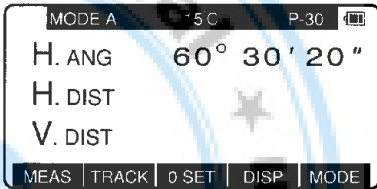
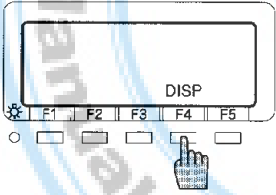
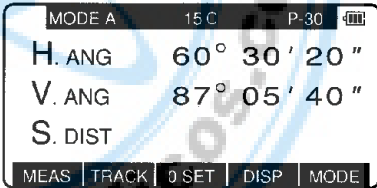
## 3-4 Adjusting Illumination Brightness

Operating Procedures	Displays
<p><b>1</b></p>  <p>Press [F5] while holding down the [ILLU] key to access the screen for adjusting illumination brightness.</p>	 <p>ILLU INTENSITY ADJ</p> <p>DOWN      UP 0            10 5           ----- ←   →</p>
<p><b>2</b></p>  <p>Pressing the [←] key will decrease brightness, while pressing the [→] key will increase brightness.</p>	 <p>ILLU INTENSITY ADJ</p> <p>DOWN      UP 0            10 10           ----- ←   →</p>
<p><b>3</b></p>  <p>Press [ENT] to exit adjustment mode and return to the previous screen.</p>	 <p>MODE A      15°C      P-30</p> <p>H. ANG      85° 39' 40'' H. DIST V. DIST</p> <p>MEAS   TRACK   0 SET   DISP   MODE</p>

- Illumination brightness of the LCD screen and telescope reticle may be adjusted as necessary at any time.
- Illumination brightness may be adjusted to any one of 10 levels.

# 4 ANGLE MEASUREMENT

## 4-1 Measuring an Angle

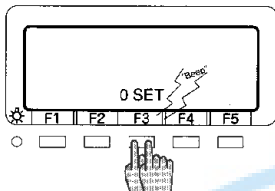
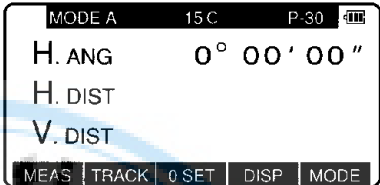
Operating Procedures	Displays
<p><b>1</b></p>  <p>Aim at the first target, then press the [0 SET] key twice in succession to reset the horizontal angle to 0.</p>	
<p><b>2</b></p> <p>Aim at the second target, then read the horizontal angle.</p>	
<p><b>3</b></p>  <p>Pressing the [DISP] key displays the vertical angle.</p>	

- The [0 SET] key cannot reset the vertical angle to 0.
- Pressing the [MODE] key cycles through the sets of display items: "H.ANG/H.DIST/V.DIST", "H.ANG/V.ANG/S.DIST", and "H.ANG/V.ANG/H.DIST/S.DIST/V.DIST".
- Even though you turn the power off during a survey, the horizontal angle displayed last time is saved, so that it is restored when the power is turned on next time.
- When the restored horizontal angle is not necessary, reset it to 0.

For details on resetting the horizontal angle to 0, See page 25.

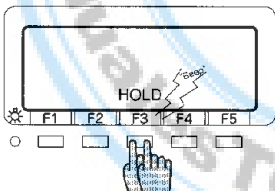
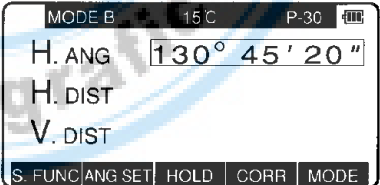
# 4 ANGLE MEASUREMENT

## 4-2 Resetting the Horizontal Angle to 0

Operating Procedures	Displays
 <p data-bbox="104 435 500 517">Pressing the [0 SET] key twice in succession resets the horizontal angle to 0°0'0".</p>	

- The [0 SET] key cannot reset the vertical angle to 0.
- Pressing the [0 SET] key accidentally during measurement does not reset the horizontal angle to 0 unless you press it again. Once the buzzer stops sounding, you can go to the next step.
- You can reset the horizontal angle to 0 any time except when it has been held.

## 4-3 Holding the Horizontal Angle

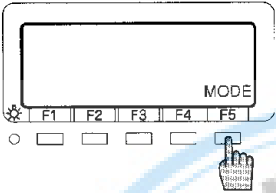
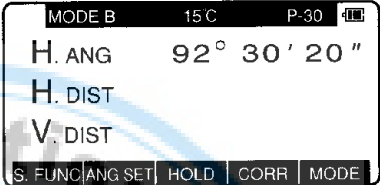
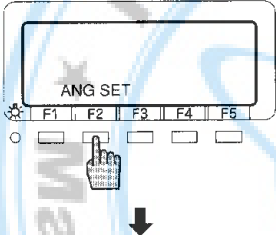
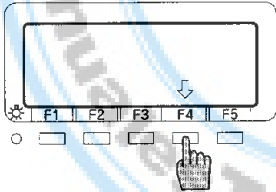
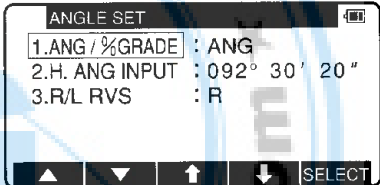
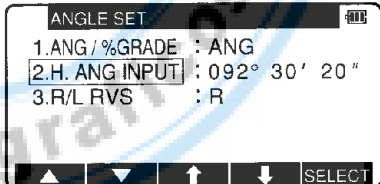
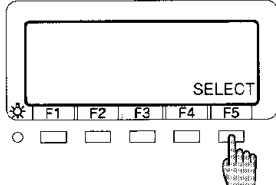
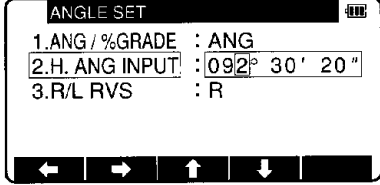
Operating Procedures	Displays
 <p data-bbox="104 1082 500 1248">To hold the horizontal angle currently being displayed, press the [HOLD] key twice in succession. The horizontal angle value is displayed in reverse video when being held.</p>	

- If you want to hold the horizontal angle when you are in mode A, press the [MODE] key first to switch to mode B, then press the [HOLD] key.
- The [HOLD] key cannot hold the vertical angle or distance.
- To release the horizontal angle from being held, press the [HOLD] key once.
- Pressing the [HOLD] key accidentally during measurement does not hold the horizontal angle unless you press it again. Once the buzzer stops sounding, you can go to the next step.

# 4 ANGLE MEASUREMENT

## 4-4 Entering an Arbitrary Horizontal Angle

In case of Horizontal angle  $123^{\circ} 45' 20''$  input

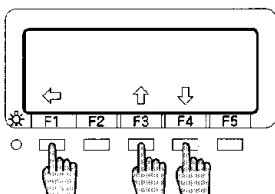
Operating Procedures	Displays
<p><b>1</b></p>  <p>Use the [MODE] key to enter mode B.</p>	
<p><b>2</b></p>   <p>Press the [ANG SET] key to display the angle setting screen, then use the [<math>\downarrow</math>] key to move the cursor to "2. H. ANG INPUT".</p>	 
<p><b>3</b></p>  <p>Use the [SELECT] key to open the horizontal angle input window.</p>	

# 4 ANGLE MEASUREMENT

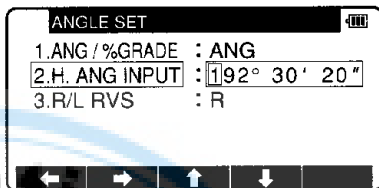
## Operating Procedures

## Displays

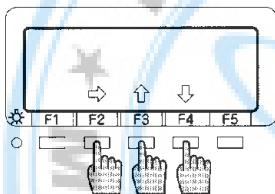
4



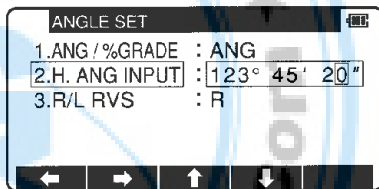
Use the [ $\leftarrow$ ] key to move the cursor to the left, then use the [ $\uparrow$ ] or [ $\downarrow$ ] key to set the value. (The [ $\uparrow$ ] or [ $\downarrow$ ] key increases or decreases the value, respectively. Pressing the [ $\uparrow$ ] or [ $\downarrow$ ] key one time increases or decreases the value by one.)



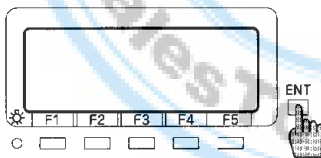
5



Use the [ $\rightarrow$ ] key to move the cursor to the right. Use the [ $\uparrow$ ] or [ $\downarrow$ ] key to set the horizontal angle value to 123°45'20" in the same way.



6



Press the [ENT] key to accept the horizontal angle set to 123° 45' 20" and change the screen to mode A.



- The PCS-325 can be used with the MU72 optional remote controller, which provides a ten-key pad for direct numeric value input. (The PCS-315/335 cannot be used with the MU72.)

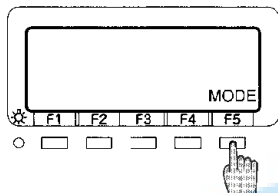
# 4 ANGLE MEASUREMENT

## 4-5 Displaying the % Slope of the Vertical Angle

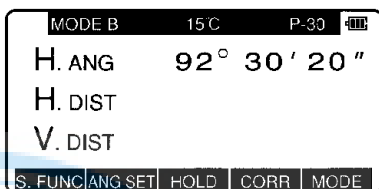
### Operating Procedures

### Displays

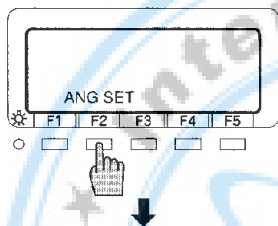
1



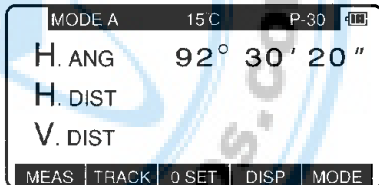
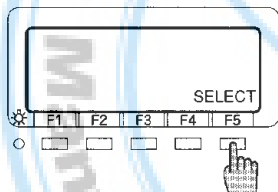
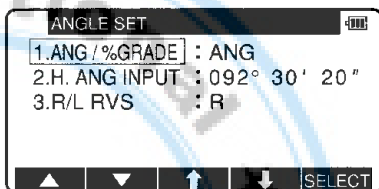
Use the [MODE] key to enter mode B.



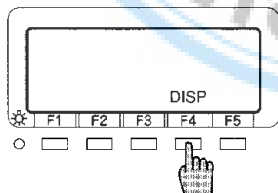
2



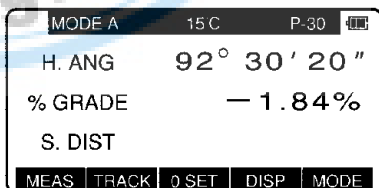
Press the [ANG SET] key to display the angle setting screen. Press the [SELECT] key to change the screen to the slope (%) of the vertical angle.



3



Press the [DISP] key to display the slope value in percentage.



● A 0 percent represents the horizontal. +100 percent and -100 percent represent 45° up and down slopes, respectively.

● To return the screen from the slope (%) display to the 360° scale, also take procedure 1 and 2 above. In procedure 2, press the [ENT] key to select the 360° scale.

● If the slope (%) exceeds [+/-]1000%, "Out of grade range" is displayed, indicating that the current vertical angle cannot be measured.

28 ● When the telescope returns to a slope within slope [+/-]1000%, the slope (%) display returns automatically from the "Out of grade range" message to the numeric value.

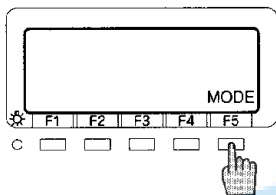
# 4 ANGLE MEASUREMENT

## 4-6 Changing the Horizontal Angle from Clockwise to Counterclockwise

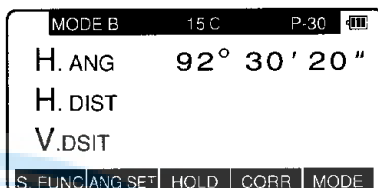
### Operating Procedures

### Displays

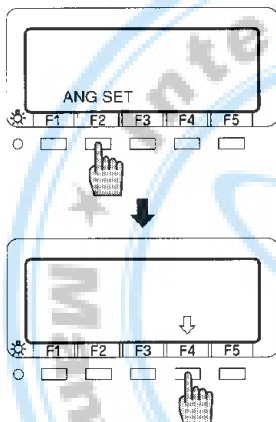
1



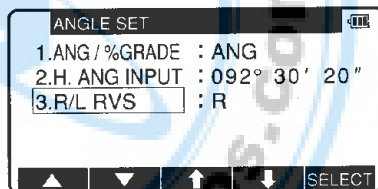
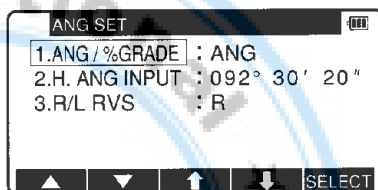
Use the [MODE] key to enter mode B.



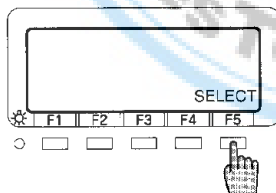
2



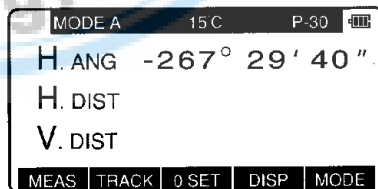
Press the [ANG SET] key to display the angle setting screen. Use the [ $\downarrow$ ] key to move the cursor to "3. R/L RVS".



3



Press the [SELECT] key to add a minus sign (-) to the horizontal angle value as a counterclockwise angle.

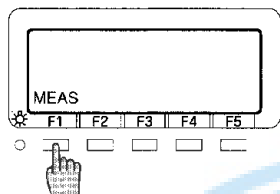


- To return the horizontal angle from counterclockwise to clockwise, also take procedures 1 and 2 above. In procedure 2, press the [SELECT] key to select the clockwise angle.
- When the counterclockwise horizontal angle is selected, the order of aiming at the targets becomes the reverse (the right one first, then the left one) of the order for the clockwise angle.

# 5 DISTANCE MEASUREMENT

## 5-1 Distance Measurement

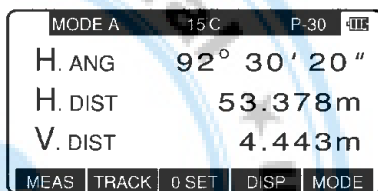
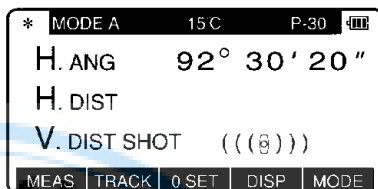
### Operating Procedures



Collimate the telescope at a prism and press the [MEAS] key to start measuring the distance.

Once distance measurement has been started, the distance measurement mark remains displayed. Upon reception of a reflected light from the prism, the device sounds the buzzer and displays the \* mark to start shot measurement automatically.

### Displays

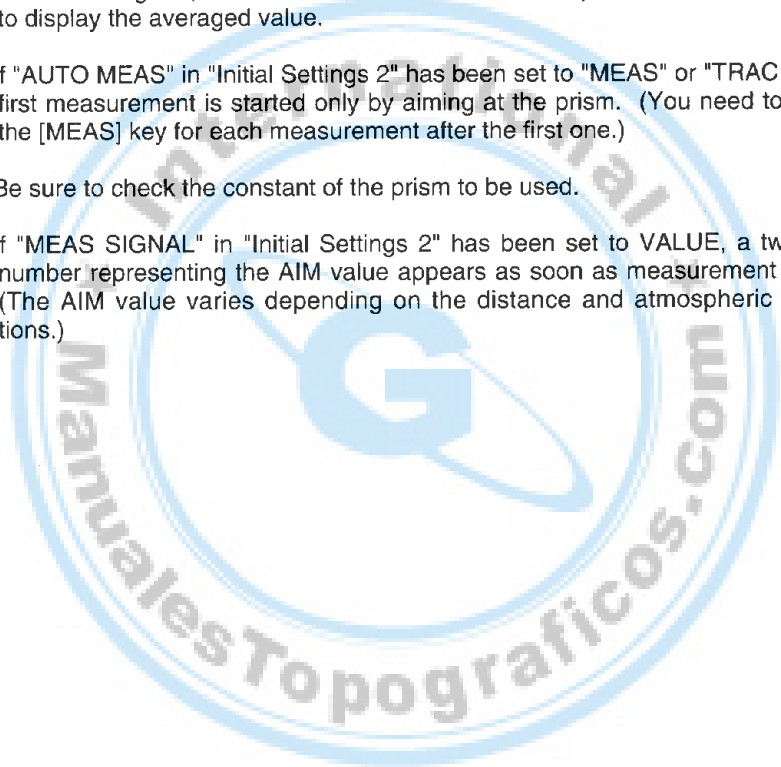


- If the device is in mode B, use the [MODE] key to switch to mode A and press the [MEAS] key.
- Pressing the [MEAS] key after collimating the telescope at the prism starts normal shot distance measurement with the "MEAS" text blinking. Distance measurement is completed and the "MEAS" text stops blinking the moment the distance measured by shot measurement is displayed. If you press the [MEAS] key again while the "MEAS" text is blinking, the device switches to continuous measurement. During continuous measurement, the "MEAS" text keeps on blinking. Pressing the [MEAS] button again terminates both distance measurement and blinking the "MEAS" text.
- Either "1 mm" or "0.1 mm" can be selected in "Initial Settings 2" as the minimum distance display unit for normal distance measurement.
- Pressing the [DISP] key cycles through the sets of display items: "H.ANG/H.DIST/V.DIST", "H.ANG/V.ANG/S.DIST", and "H.ANG/V.ANG/H.DIST/S.DIST/V.DIST".
- If you have selected shot distance measurement, the "MEAS" text stops blinking the moment the measured distance appears on the screen.



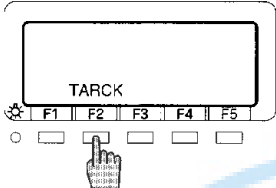
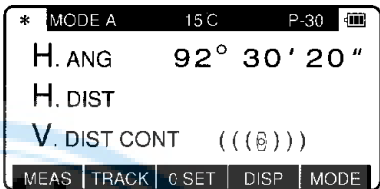
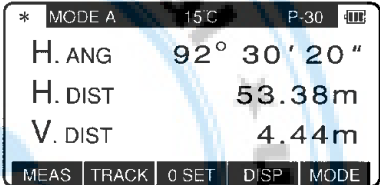
# 5 DISTANCE MEASUREMENT

- Pressing the [ESC] or [MODE] key during distance measurement stops it.
- Pressing the [TRACK] key during normal distance measurement starts "fast distance measurement". Pressing the [MEAS] key during "fast distance measurement" returns the device to normal distance measurement.
- If the shot number for distance measurement has been set to 2 or more in "Initial Settings 2", the distance is measured for the specified number of times to display the averaged value.
- If "AUTO MEAS" in "Initial Settings 2" has been set to "MEAS" or "TRACK", the first measurement is started only by aiming at the prism. (You need to press the [MEAS] key for each measurement after the first one.)
- Be sure to check the constant of the prism to be used.
- If "MEAS SIGNAL" in "Initial Settings 2" has been set to VALUE, a two-digit number representing the AIM value appears as soon as measurement starts. (The AIM value varies depending on the distance and atmospheric conditions.)



# 5 DISTANCE MEASUREMENT

## 5-2 Track Distance Measurement

Operating Procedures	Displays
 <p>The diagram shows a control panel with a central display area labeled 'TRACK'. Below the display are five function keys labeled F1, F2, F3, F4, and F5. A hand is shown pressing the F2 key. To the left of the F1 key is a small gear icon.</p>	 <p>The screenshot shows the device's display with the following information: '* MODE A', '15 C', 'P-30', and a battery icon. The main display shows 'H. ANG 92° 30' 20"', 'H. DIST', and 'V. DIST CONT (( ( ( )))'. At the bottom, there is a menu bar with 'MEAS', 'TRACK', '0 SET', 'DISP', and 'MODE'.</p>
<p>Collimate the telescope at a prism and press the [TRACK] key to start measuring the distance. Upon reception of a reflected light from the prism, the device sounds the buzzer and displays the * mark to start track distance measurement. From then on, the device repeats measuring the distance at intervals of about 0.4 second in centimeters or of about 0.8 second in millimeters.</p>	 <p>The screenshot shows the device's display with the following information: '* MODE A', '15 C', 'P-30', and a battery icon. The main display shows 'H. ANG 92° 30' 20"', 'H. DIST 53.38m', and 'V. DIST 4.44m'. At the bottom, there is a menu bar with 'MEAS', 'TRACK', '0 SET', 'DISP', and 'MODE'. A downward arrow points from the top screenshot to this one.</p>

- If the device is in mode B, use the [MODE] key to switch to mode A and press the [TRACK] key.
- Pressing the [TRACK] key after collimating the telescope at the prism starts continuous distance measurement at fast speed with the "TRACK" text blinking. It remains blinking during the measurement. If you press the [TRACK] key again, the device switches to the fast mode, shot distance measurement, in which distance measurement is completed and the "TRACK" text stops blinking the moment the measured distance is displayed.
- Either "1 mm" or "0.1 mm" can be selected in "Initial Settings 2" as the minimum distance display unit for fast distance measurement.
- Pressing the [DISP] key cycles through the sets of display items: "H.ANG/H.DIST/V.DIST", "H.ANG/V.ANG/S.DIST", and "H.ANG/V.ANG/H.DIST/S.DIST/V.DIST".
- If you have selected shot distance measurement, the "TRACK" text stops blinking the moment the measured distance appears on the screen.

# 5 DISTANCE MEASUREMENT

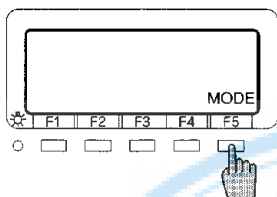
- Pressing the [ESC] or [MODE] key during fast distance measurement stops it.
- Pressing the [MEAS] key during fast distance measurement starts "normal distance measurement". Pressing the [TRACK] key during "normal distance measurement" returns the device to fast distance measurement.
- If the shot number for distance measurement has been set to 2 or more in "Initial Settings 2", the distance is measured for the specified number of times to display the averaged value.
- If "AUTO MEAS" in "Initial Settings 2" has been set to "MEAS" or "TRACK", the first measurement is started only by aiming at the prism. (You need to press the [MEAS] key for each measurement after the first one.)
- Be sure to check the constant of the prism to be used.



# 6 MEASUREMENT MODES

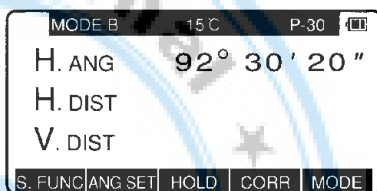
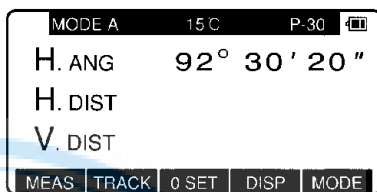
## 6-1 Modes A and B

### Operating Procedures



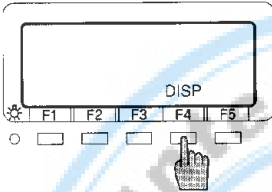
Use the [MODE] key to switch between modes A and B.  
Pressing the [MODE] key toggles between "Mode A" and "Mode B".

### Displays



# 6 MEASUREMENT MODES

## 6-2 Switching the Measurement Mode

Operating Procedures	Displays																																																																				
 <p>The diagram shows a control panel with a large rectangular display area. Below the display are five function keys labeled F1, F2, F3, F4, and F5. A hand icon is shown pressing the F4 key. Above the F4 key is the label 'DISP'. To the left of the F1 key is a small gear icon, and below the F1-F5 keys are five small square buttons.</p>	<table border="1"><tr><td>MODE A</td><td>15°C</td><td>P-30</td><td></td></tr><tr><td>H. ANG</td><td colspan="3">92° 30' 20"</td></tr><tr><td>H. DIST</td><td colspan="3">53.378m</td></tr><tr><td>V. DIST</td><td colspan="3">4.443m</td></tr><tr><td>MEAS</td><td>TRACK</td><td>0 SET</td><td>DISP   MODE</td></tr></table> <p>↓</p> <table border="1"><tr><td>MODE A</td><td>15°C</td><td>P-30</td><td></td></tr><tr><td>H. ANG</td><td colspan="3">92° 30' 20"</td></tr><tr><td>V. ANG</td><td colspan="3">85° 14' 30"</td></tr><tr><td>S. DIST</td><td colspan="3">53.563m</td></tr><tr><td>MEAS</td><td>TRACK</td><td>0 SET</td><td>DISP   MODE</td></tr></table> <p>↓</p> <table border="1"><tr><td>MODE A</td><td>15°C</td><td>P-30</td><td></td></tr><tr><td>H. ANG</td><td colspan="3">92° 30' 20"</td></tr><tr><td>V. ANG</td><td colspan="3">85° 14' 30"</td></tr><tr><td>H. DIST</td><td colspan="3">53.378m</td></tr><tr><td>S. DIST</td><td colspan="3">53.563m</td></tr><tr><td>V. DIST</td><td colspan="3">4.443m</td></tr><tr><td>MEAS</td><td>TRACK</td><td>0 SET</td><td>DISP   MODE</td></tr></table>	MODE A	15°C	P-30		H. ANG	92° 30' 20"			H. DIST	53.378m			V. DIST	4.443m			MEAS	TRACK	0 SET	DISP   MODE	MODE A	15°C	P-30		H. ANG	92° 30' 20"			V. ANG	85° 14' 30"			S. DIST	53.563m			MEAS	TRACK	0 SET	DISP   MODE	MODE A	15°C	P-30		H. ANG	92° 30' 20"			V. ANG	85° 14' 30"			H. DIST	53.378m			S. DIST	53.563m			V. DIST	4.443m			MEAS	TRACK	0 SET	DISP   MODE
MODE A	15°C	P-30																																																																			
H. ANG	92° 30' 20"																																																																				
H. DIST	53.378m																																																																				
V. DIST	4.443m																																																																				
MEAS	TRACK	0 SET	DISP   MODE																																																																		
MODE A	15°C	P-30																																																																			
H. ANG	92° 30' 20"																																																																				
V. ANG	85° 14' 30"																																																																				
S. DIST	53.563m																																																																				
MEAS	TRACK	0 SET	DISP   MODE																																																																		
MODE A	15°C	P-30																																																																			
H. ANG	92° 30' 20"																																																																				
V. ANG	85° 14' 30"																																																																				
H. DIST	53.378m																																																																				
S. DIST	53.563m																																																																				
V. DIST	4.443m																																																																				
MEAS	TRACK	0 SET	DISP   MODE																																																																		

Use the [DISP] key to select the measurement mode. Pressing the [DISP] key cycles through the sets of display items as shown on the right.

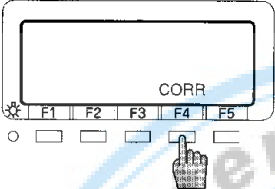
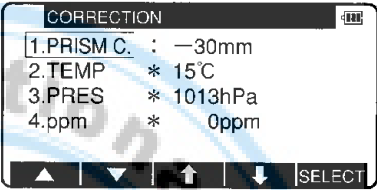
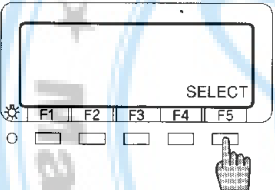
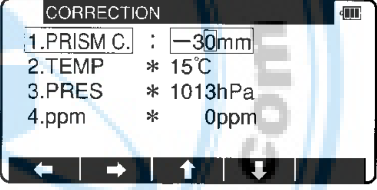
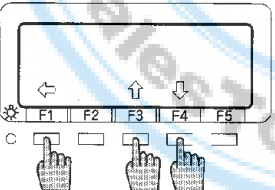
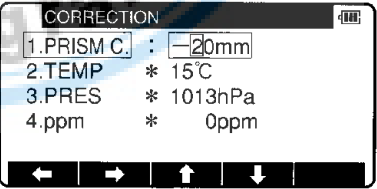
- Pressing the [DISP] key cycles through the sets of display items: "H.ANG/H.DIST/V.DIST", "H.ANG/V.ANG/S.DIST", and "H.ANG/V.ANG/H.DIST/S.DIST/V.DIST".

# 7 CORRECTION MODE

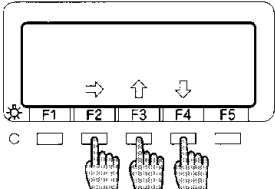
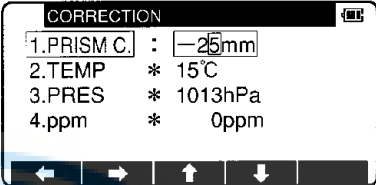
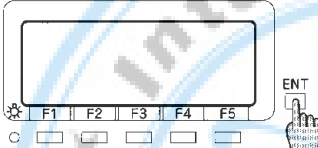
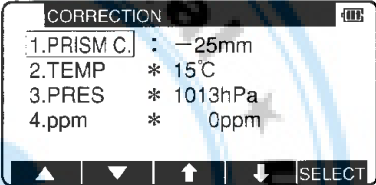
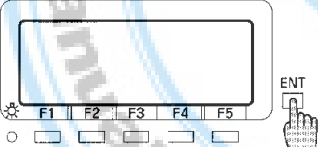
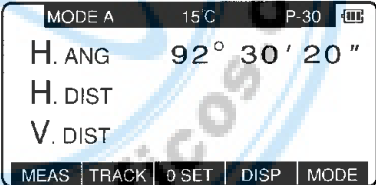
## 7-1 Changing the Prism Constant (Entering a Numeric Value)

The prism constant can be changed only when "PRISM CONSTANT" has been set to "INPUT" in "Initial Settings 1".

Example: Setting the prism constant to -25 mm

Operating Procedures	Displays
<p><b>1</b></p>  <p>Press the [CORR] key in mode B. (If the device is in mode A, use the [MODE] key to enter mode B.)</p>	
<p><b>2</b></p>  <p>Use the [SELECT] key to enable the prism constant to be changed.</p>	
<p><b>3</b></p>  <p>Use the [←] key to move the cursor to the left and the [↑] or [↓] key to set the desired value. (The [↑] or [↓] key increases or decreases the value, respectively. Pressing the [↑] or [↓] key one time increases or decreases the value by one.)</p>	

# 7 CORRECTION MODE

Operating Procedures	Displays
<p><b>4</b></p>  <p>Use the [⇒] key to move the cursor to the right. Use the [↑] or [↓] key to set the prism constant to -25 mm.</p>	
<p><b>5</b></p>  <p>Press the [ENTER] key to accept the prism constant to -25 mm.</p>	
<p><b>6</b></p>  <p>Pressing the [ENT] key returns the device to mode A.</p>	

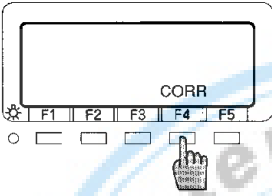
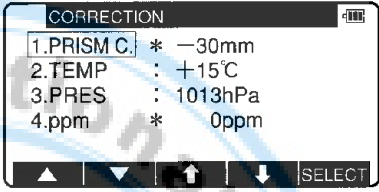
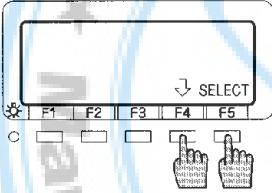
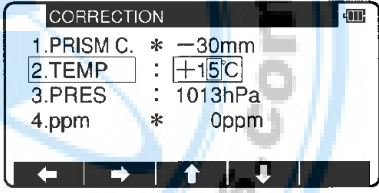
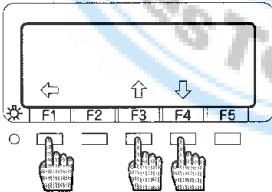
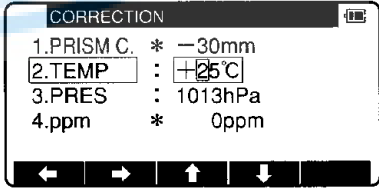
- To set the prism constant to "0" or "-30", take the above procedures in the same way and select "0" or "-30" for "PRISM CONST" in "Initial Settings 1".
- When "PRISM CONST" in "Initial Settings 1" has been set to "0" or "-30", "\*" is displayed to the left of "0" or "-30" on the correction menu screen for procedures 1. When "\*" is on the screen, the prism constant cannot be changed (by entering a numeric key).
- To set a mark (+ or -), position the cursor at the desired one and press the [↑] or [↓] key.
- Once set, the prism constant remains on the measurement screen as "P-30" or "P-0".
- The factory initial of prism constant is -30.
- Once set, the prism constant remains in memory even after the power is turned off.
- The PCS-325 can be used with the MU72 optional remote controller, which provides a ten-key pad for direct numeric value input. (The PCS-315/335 cannot be used with the MU72.)

# 7 CORRECTION MODE

## 7-2 Changing the Temperature

The temperature setting can be changed only when "Atmospheric correction" has been set to "Temperature & Pressure" in "Initial Settings 1".

Example: Setting the temperature to +22°C

Operating Procedures	Displays
<p><b>1</b></p>  <p>Press the [CORR] key in mode B. (If the device is in mode A, use the [MODE] key to enter mode B.)</p>	
<p><b>2</b></p>  <p>Use the [↵] key to move the cursor to "2. TEMP" and press the [SELECT] key to enable the temperature to be changed.</p>	
<p><b>3</b></p>  <p>Use the [←] key to move the cursor to the left and the [↑] or [↓] key to set the desired value. (The [↑] or [↓] key increases or decreases the value, respectively. Pressing the [↑] or [↓] key one time increases or decreases the value by one.)</p>	

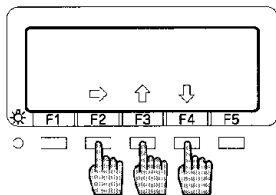


# 7 CORRECTION MODE

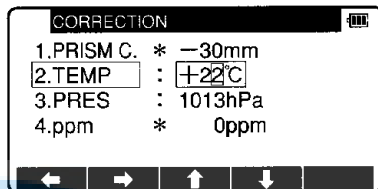
## Operating Procedures

## Displays

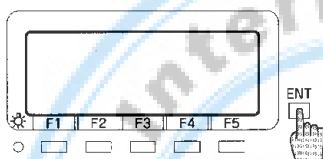
4



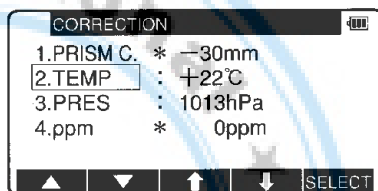
Use the [→] key to move the cursor to the right. Use the [↑] or [↓] key to set the temperature to +22°C.



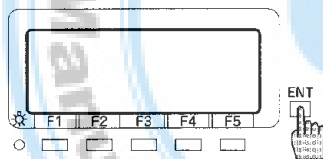
5



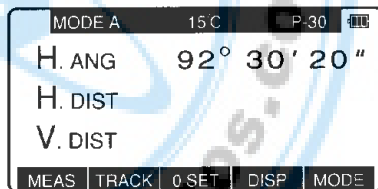
Press the [ENTER] key to accept the temperature to +22°C.



6



Pressing the [ENTER] key returns the device to mode A.



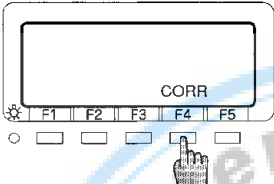
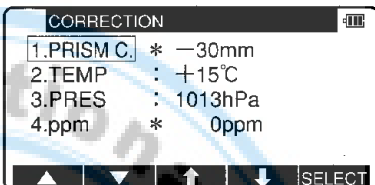
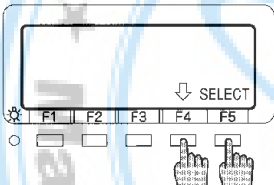
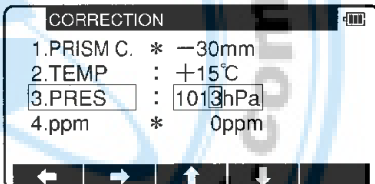
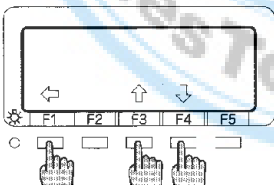
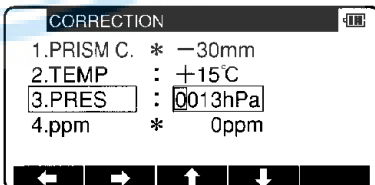
- The valid range of temperatures is from -30°C to +60°C.
- When "ATM CORR" in "Initial Settings 1" has been set to "1. AUTO" or "4. NIL", "\*" is displayed to the left of the temperature value on the correction menu screen for procedures 1. When "\*" is on the screen, the temperature cannot be changed. If "ATM CORR" in "Initial Settings 1" has been set to "3. ppm INPUT", no temperature is displayed on the correction menu screen for procedures 1.
- To set a mark (+ or -), position the cursor at the desired one and press the [↑] or [↓] key.
- Once set, the temperature is displayed at the center of the top of the measurement screen.
- The factory initial of temperature is "1. AUTO".
- Once set, the temperature remains in memory even after the power is turned off.
- Temperature correction is based on 15°C.  
If this device is used without correcting the temperature, a distance error per 100 m is about -0.1 mm per +1°C as a temperature difference from 15°C. A distance error per 100 m is about 0.1 mm per -1°C as a temperature difference from 15°C. (For more accurate values, See page 73.)
- The PCS-325 can be used with the MU72 optional remote controller, which provides a ten-key pad direct numeric value input.  
(The PCS-315/335 cannot be used with the MU72.)

# 7 CORRECTION MODE

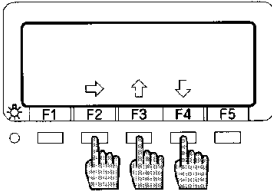
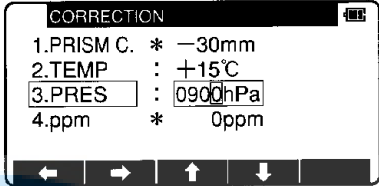
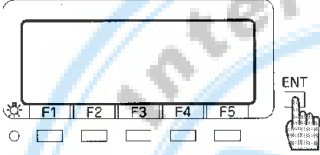
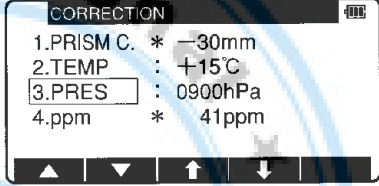
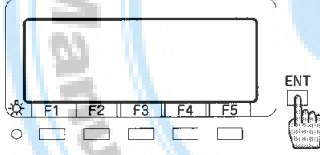
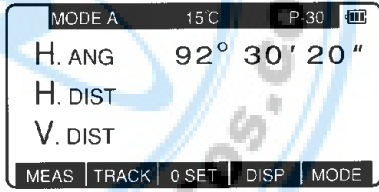
## 7-3 Changing the Atmospheric Pressure

The atmospheric pressure setting can be changed only when "Atmospheric correction" has been set to "Temperature & Pressure" in "Initial Settings 1".

Example: Setting the pressure to 900 hPa

Operating Procedures	Displays
<p><b>1</b></p>  <p>Press the [CORR] key in mode B. (If the device is in mode A, use the [MODE] key to enter mode B.)</p>	
<p><b>2</b></p>  <p>Use the [↓] key to move the cursor to "3. PRES" and press the [SELECT] key to enable the pressure to be changed.</p>	
<p><b>3</b></p>  <p>Use the [←] key to move the cursor to the left and the [↑] or [↓] key to set the desired value. (The [↑] or [↓] key increases or decreases the value, respectively. Pressing the [↑] or [↓] key one time increases or decreases the value by one.)</p>	

# 7 CORRECTION MODE

Operating Procedures	Displays
<p><b>4</b></p>  <p>Use the [→] key to move the cursor to the right. Use the [↑] or [↓] key to set the pressure to 900 hPa.</p>	
<p><b>5</b></p>  <p>Press the [ENTER] key to accept the pressure to 900 hPa.</p>	
<p><b>6</b></p>  <p>Pressing the [ENT] key returns the device to mode A.</p>	

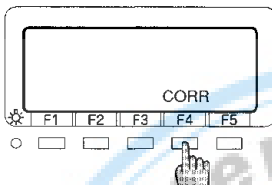
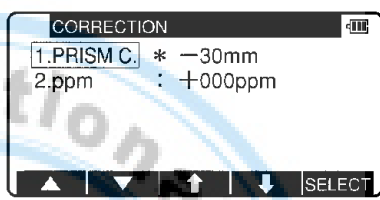
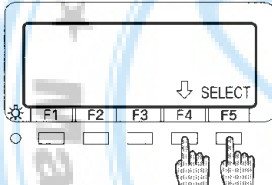
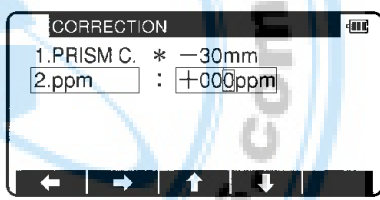
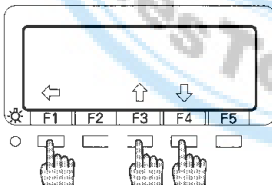
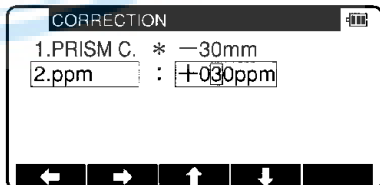
- The valid range of pressure is from 600 to 1120 hPa. (420 - 840 mmHg)
- When "ATM CORR" in "Initial Settings 1" has been set to "1. AUTO" or "4. NIL", "\*" is displayed to the left of the pressure value on the correction menu screen for procedures 1. When "\*" is on the screen, the pressure cannot be changed. If "ATM CORR" in "Initial Settings 1" has been set to "3. ppm INPUT", no pressure is displayed on the correction menu screen for procedures 1.
- Once set, the pressure is displayed at the center of the top of the measurement screen.
- The factory initial of pressure is "1. AUTO".
- Once set, the pressure remains in memory even after the power is turned off.
- Pressure correction is based on 1013 hectopascals (hPa).
- If this device is used without correcting the pressure, a distance error per 100 m is about -0.3 mm per -10 hPa as a pressure difference from 1013 hPa. (For more accurate values, see page 73.)
- The PCS-325 can be used with the MU72 optional remote controller, which provides a ten-key pad for direct numeric value input.

# 7 CORRECTION MODE

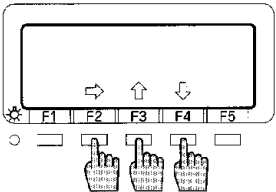
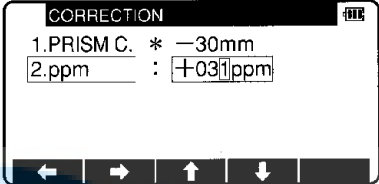
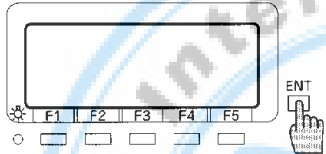
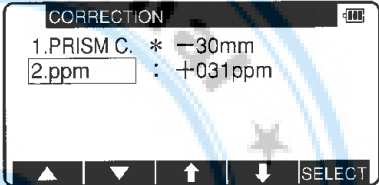
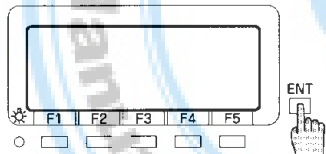
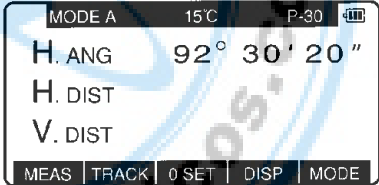
## 7-4 Changing the ppm Value

The ppm value can be changed only when "Atmospheric correction" has been set to "ppm INPUT" in "Initial Settings 1".

Example: Setting the ppm value to 31 ppm

Operating Procedures	Displays
<p><b>1</b></p>  <p>Press the [CORR] key in mode B. (If the device is in mode A, use the [MODE] key to enter mode B.)</p>	
<p><b>2</b></p>  <p>Use the [↓] key to move the cursor to "2. ppm value" and press the [SELECT] key to enable the ppm value to be changed.</p>	
<p><b>3</b></p>  <p>Use the [←] key to move the cursor to the left and the [↑] or [↓] key to set the desired value. (The [↑] or [↓] key increases or decreases the value, respectively. Pressing the [↑] or [↓] key one time increases or decreases the value by one.)</p>	

# 7 CORRECTION MODE

Operating Procedures	Displays
<p>4</p>  <p>Use the [→] key to move the cursor to the right. Use the [↑] or [↓] key to set the ppm value to 31 ppm.</p>	
<p>5</p>  <p>Press the [ENTER] key to accept the ppm value to 31 ppm.</p>	
<p>6</p>  <p>Pressing the [ENT] key returns the device to mode A.</p>	

- If "ATM CORR" in "Initial Settings 1" has been set to any item other than "ppm INPUT", "2. TEMP" and "3. PRES" are displayed on the correction menu screen in procedures 1.
- The valid range of ppm values is from -199 to +199.
- The ppm value can be changed only when the correction menu screen in procedures 1 appears with "1. PRISM C." and "2. ppm" (as shown on the previous page).
- To set a mark (+ or -), position the cursor at the desired one and press the [↑] or [↓] key.
- Once set, the ppm value is displayed at the center of the top of the measurement screen.
- The factory initial of ppm value is "1. AUTO".
- Once set, the ppm value remains in memory even after the power is turned off.
- The PCS-325 can be used with the MU72 optional remote controller, which provides a ten-key pad for direct numeric value input. (The PCS-315/335 cannot be used with the MU72.)

# 8 INITIAL SETTINGS

## 8-1 Overview

For the PCS-300, you can select and save the desired settings for a variety of prescribed machine conditions, called initial settings.

The initial settings are saved in four modes, "Initial Setting 1", "Initial Setting 2", "Initial Setting 4", and "Initial Setting 5", in which you can select and save the machine conditions described below.

The factor initial for each of these conditions is option No. 1 (shown in the screen dump).

To change initial settings, follow the Operating Procedures for entering each initial setting mode on Page 50 or 51 and the Operating Procedures for changing an initial setting on Page 52.

## 8-2 Initial Setting 1

### 1. Selection of atmospheric correction

Select whether atmospheric correction is to be performed by using the automatic measurement correction function with a atmospheric sensor, by entering the atmospheric temperature and pressure measured with a thermometer and barometer, by entering ppm value, or by fixing the ppm value to 0 (NIL) not to perform atmospheric correction.

1. AUTO
2. ATM INPUT
3. ppm INPUT
4. NIL

### 2. Selection of prism constant

Select whether the prism constant to be input is set to -30 mm, 0 mm, or to an arbitrary value to be entered from the keyboard.

1. -30mm
2. 0mm
3. INPUT

### 3. Selection for Refraction & Curvature corrections

Select whether the correction factor to be input for both differences (Refraction, Curvature) is set to 0.14, 0.2, or none (NIL). Selecting "3. NIL" results in no correction of both values.

1. 0.14
2. 0.2
3. NIL

### 4. Selection of inclination compensation

#### For the PCS-325:

Select whether inclination compensation is to be single-axis compensation, dual-axis compensation, or disabled (NIL).

1. 2 AXIS
2. 1 AXIS
3. NIL

#### For the PCS-315/335:

Select whether inclination compensation is to be single-axis compensation or disabled.

1. ON
2. OFF

# 8 INITIAL SETTINGS

## 8-3 Initial Setting 2

### 1. Selection for minimum distance display

Select the minimum distance display unit for normal distance measurement: 1 mm or 0.1 mm.

1. 1mm
2. 0.1mm

### 2. Selection for minimum distance display during fast distance measurement

Select the minimum distance display unit for fast distance measurement: 1 cm or 1 mm.

1. 1cm
2. 1mm

### 3. Selection of the shot number

Select whether the shot number for shot distance measurement is to be 3, 5, or an arbitrary number to be entered.

1. 1 TIME
2. 3 TIMES
3. 5 TIMES
4. INPUT

### 4. Setting the shot input

Set the shot number for shot distance measurement using the [↑] key (to increment the value) or [↓] key (to decrement the value). Use the [⇐] and [⇒] keys to move the cursor.

※The valid range of values for the shot number is from 1 to 99.

※This setting is enabled only when the shot number (condition 3 above) has been set to "4. INPUT".

02 TIMES

### 5. Selection of minimum angle display

Select whether to set the minimum angle display mode to "COARSE (5 seconds)" or "FINE (1 second)".

1. COARSE
2. FINE

### 6. Selection of vertical angle mode

Select whether the 0 point for vertical angle is set to be "Z.0", "H.0" or "COMPAS".

1. Z.0
2. H.0
3. COMPAS

# 8 INITIAL SETTINGS

## 7. Selection for horizontal angle saving

Select whether to enable or disable the horizontal angle save function when the power is turned off.

1. ON
2. OFF

## 8. Selection for automatic power-off function

Select the time interval (10, 20, or 30 minutes) for activating the automatic power-off function, or select NIL, disabling the function.

※The automatic power-off function automatically turns the power supply off after the specified period of time (in minutes) when no operation for distance measurement or for key entry has been performed with the angle remaining unchanged.

1. 10 MIN
2. 20 MIN
3. 30 MIN
4. NIL

## 9. Selection for distance measurement automatic power-off function

Select the time interval (3, 5, or 10 minutes) for activating the distance measurement automatic power-off function, or select NIL, disabling the function.

※The distance measurement automatic power-off function automatically power-off distance measurement after the specified period of time when no key operation has been performed with the measured value remaining unchanged (over about 0.1 m) during measurement.

1. 3 MIN
2. 5 MIN
3. 10 MIN
4. NIL

## 10. Selection for automatic illumination power-off function

Select the time interval (3, 5, or 10 minutes) for activating the automatic illumination power-off function, or select NIL, disabling the function.

1. 3 MIN
2. 5 MIN
3. 10 MIN
4. NIL

## 11. Selection for distance measurement buzzer

Select whether to enable or disable the buzzer to sound when the prism receives a light during distance measurement or during repeated distance measurement.

1. ON
2. OFF

## 12. Selection for 90° buzzer

Select whether to enable or disable the buzzer to sound at every 90° during angle measurement.

1. OFF
2. ON



# 8 INITIAL SETTINGS

## 13. Selection of distance measurement signal

Select whether to display a signal indicator or AIM value to be displayed from when distance measurement is started to when measured data is displayed.

1. MARK
2. VALUE

## 14. Selection of distance measurement continuous shot setting

Select the shot distance measurement for the specified shot number for normal distance measurement or the continuous distance measurement for repeating measurement until it is stopped.

1. SHOT
2. CONT

## 15. Selection of fast continuous shot setting

Select the continuous distance measurement for repeating fast measurement until it is stopped or the shot distance measurement for the specified shot number.

1. CONT
2. SHOT

## 16. Selection of automatic distance measurement

Automatic distance measurement repeats measurement automatically when the telescope has been collimated at the prism. Select whether to disable(NIL) automatic distance measurement, set it as normal distance measurement, or set it as fast distance measurement.

1. NIL
2. MEAS
3. TRACK

## 17. Selection for display priority

Select the display order of the sets of display items which pressing the [DISP] key cycles through. The set of display items selected here appears first after the power is turned on.

1. HA HD VD
2. HA VA SD
3. HA VA HD SD VD

## 18. Select the coordinate axes as XYZ, YXZ, NEZ, or ENZ.

Select whether to enable or disable the buzzer to sound at every 90° during angle measurement.

1. XYZ
2. YXZ
3. NEZ
4. ENZ

## 19. Selection of remote controller (PCS-325)

Select the 1.27 (for MU75) or 2.32 (for MU72) or 3. NIL.

※The device rejects remote control when "3. NIL" has been selected.

1. 27
2. 32
3. NIL

# 8 INITIAL SETTINGS

## 8-4 Initial Setting 4

### 1. Selection of temperature unit setting

Select °C or °F as the unit for Temperature.

1. °C
2. °F

### 2. Selection of pressure unit setting

Select hPa (hectopascal) or mmHg as the unit for pressure to be input.

1. hPa
2. mmHg
3. inchHg

### 3. Selection of distance unit setting

Select m or ft or ft+inch as the unit for Distance.

1. m
2. ft
3. ft+inch

### 4. Selection of angle unit setting

Select DEG or DEC or GRD or MIL as the unit for Angle.

1. DEG
2. DEC
3. GRD
4. MIL

# 8 INITIAL SETTINGS

## 8-5 Initial Setting 5

**1. Selection of transfer rate (baud rate)**

Select a baud rate of 1200, 2400, 4800, or 9600.

1. 1200
2. 2400
3. 4800
4. 9600

**2. Selection of data bits**

Select a data length of 8 bits or 7 bits.

1. 8
2. 7

**3. Selection of parity**

Select no (NIL) parity bit, even parity, or odd parity.

1. NIL
2. EVEN
3. ODD

**4. Selection of stop bit**

Select the number of stop bits to be used: 1 or 2.

1. 1
2. 2

**5. Selection of XON/XOFF**

Select whether to enable or disable XON/XOFF.

1. ON
2. OFF

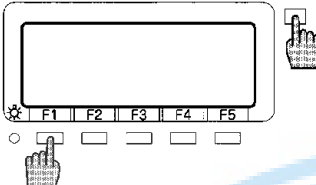
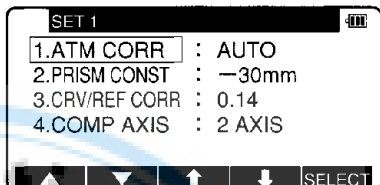
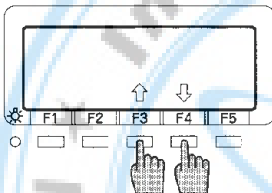
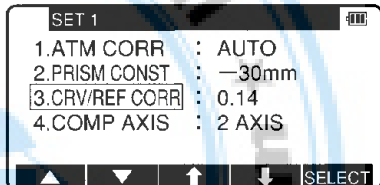
**6. Selection of through command**

Select whether to disable data output without receiving any data request command or enable the "a" to "f" command data output.

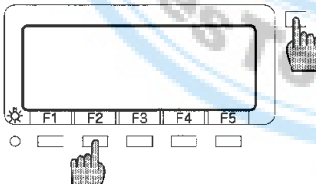
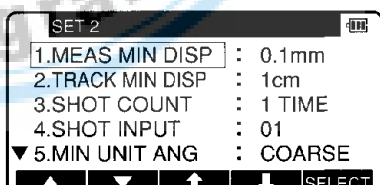
1. NIL
2. a
3. b
4. c
5. d
6. e
7. f

# 8 INITIAL SETTINGS

## 8-6 Entering the Mode for Initial Setting 1

Operating Procedures	Displays
<p>1</p>  <p>Press the [POWER] key while holding the [F1] key down to access the screen for Initial Setting 1.</p>	 <pre>SET 1 1.ATM CORR : AUTO 2.PRISM CONST : -30mm 3.CRV/REF CORR : 0.14 4.COMP AXIS : 2 AXIS</pre>
<p>2</p>  <p>Use the [↓] or [↑] key to position the cursor at the item of interest.</p>	 <pre>SET 1 1.ATM CORR : AUTO 2.PRISM CONST : -30mm 3.CRV/REF CORR : 0.14 4.COMP AXIS : 2 AXIS</pre>

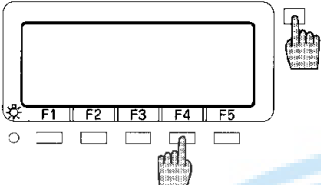
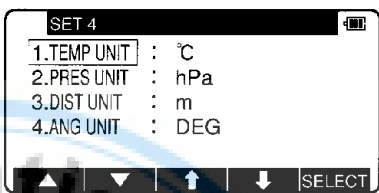
## 8-7 Entering the Mode for Initial Setting 2

Operating Procedures	Displays
<p>1</p>  <p>Press the [POWER] key while holding the [F2] key down to access the screen for Initial Setting 2.</p>	 <pre>SET 2 1.MEAS MIN DISP : 0.1mm 2.TRACK MIN DISP : 1cm 3.SHOT COUNT : 1 TIME 4.SHOT INPUT : 01 5.MIN UNIT ANG : COARSE</pre>

- Select the item of interest in the same way as in the mode for Initial Setting 1.
- Pressing the [▼] key scrolls the screen down five items; pressing the [▲] key scrolls it up five items.

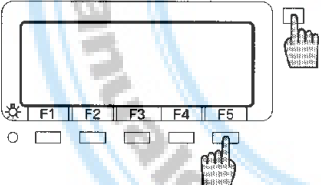
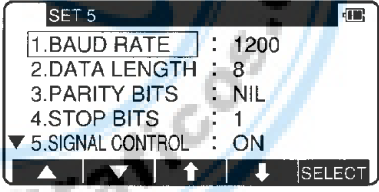
# 8 INITIAL SETTINGS

## 8-8 Entering the Mode for Initial Setting 4

Operating Procedures	Displays
<p>1</p>  <p>Press the [POWER] key while holding the [F4] key down to access the screen for Initial Setting 4.</p>	

- Select the item of interest in the same way as in the mode for Initial Setting 1.

## 8-9 Entering the Mode for Initial Setting 5


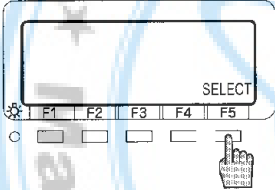
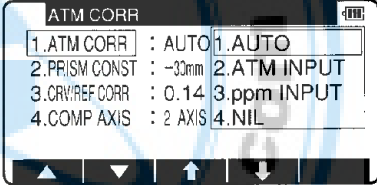
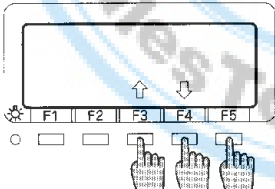
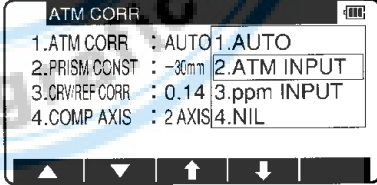
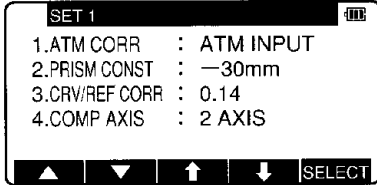
Operating Procedures	Displays
<p>1</p>  <p>Press the [POWER] key while holding the [F5] key down to access the screen for Initial Setting 5.</p>	

- Select the item of interest in the same way as in the mode for Initial Setting 1.
- Pressing the [ ▼ ] key scrolls the screen down five items; pressing the [ ▲ ] key scrolls it up five items.

# 8 INITIAL SETTINGS

## 8-10 Example of Changing an Initial Setting (Selection of Atmospheric Correction)


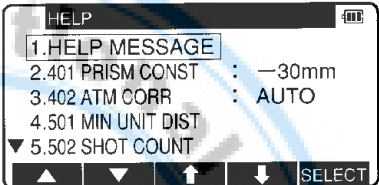
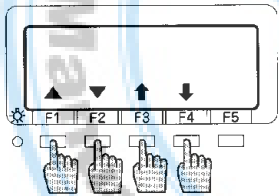
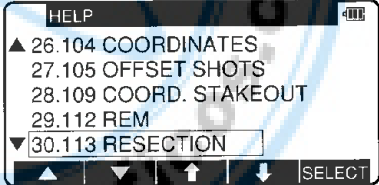
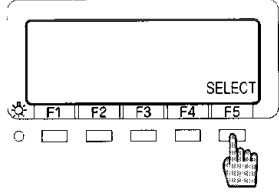
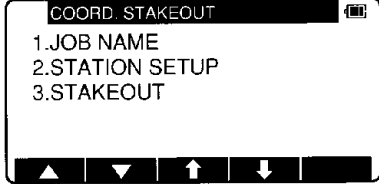
This section describes the Operating Procedures for selecting "1. ATM CORR" in Initial Settings 1 as an example of changing an initial setting. Use this example as a reference when changing other items because it is also applicable to the Operating Procedures for changing them.

Operating Procedures	Displays
<p><b>1</b></p> <p>Access the screen for Initial Setting 1 by taking procedures 1 "Entering the Mode for Initial Setting 1" on page 50.</p>	
<p><b>2</b></p>  <p>Use the [SELECT] key to open the screen for selecting the atmospheric correction.</p>	
<p><b>3</b></p>  <p>Use the [↓] or [↑] key to position the cursor at the desired item, then press the [ENT] key to select that item. Pressing the [ENT] key again settles the change of selected item and quits the initial setting screen and usual start screen appears. Pressing [ESC] key invalidates the change of selected item and quits the initial setting screen and usual start screen appears.</p>	 <p style="text-align: center;">↓</p> 

# 9 ACCESSING THE FUNCTIONS

## 9-1 Accessing by Help

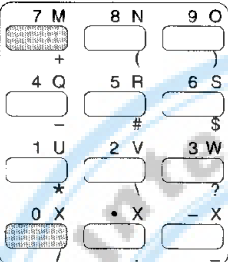
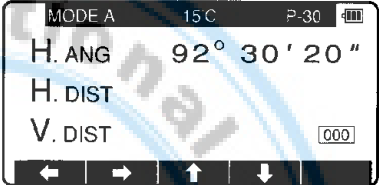
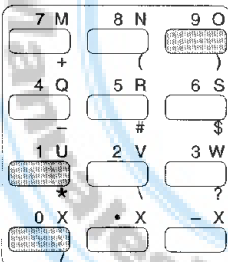
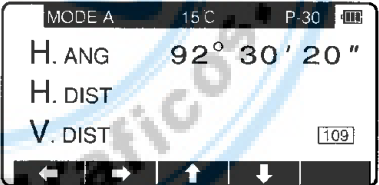
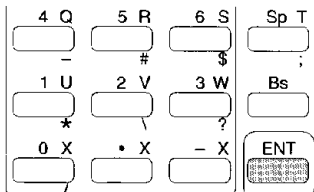

You can use the [HELP] key to display specific initial settings (such as the prism constant and priority mode) or to access survey programs for special functions (such as "Coordinate Stakeout").

Operating Procedures	Displays
<p><b>1</b></p>  <p>Press the [ILLU]+[ESC] key in mode A or B.</p>	
<p><b>2</b></p>  <p>The help menu will then be displayed. Use the [▲] [▼] or [↑] [↓] keys to position the cursor to the desired item (such as a special function of COORD. STAKEOUT).</p>	
<p><b>3</b></p>  <p>Use the [SELECT] key to access the COORD. STAKEOUT function.</p>	

# 9 ACCESSING THE FUNCTIONS

## 9-2 Accessing by 007

The PCS-325 allows you to enter a special code of 007 from the the supplied remote controller to display specific initial settings (such as the prism constant and priority mode) or to access survey programs for special functions (such as "Coordinate Stake-out").

Operating Procedures	Displays
<p><b>1</b></p>  <p>Press the numeric keys [0] [0] [7] on the remote controller in mode A or B. The screen will then change to the command input screen.</p>	
<p><b>2</b></p>  <p>Press the numeric keys for the desired command number in the Command No. Table. (For example, press [1] [0] [9] for Coordinate State-out.)</p>	
<p><b>3</b></p>  <p>Press the [ENT] key to access the Coordinate State-out function.</p>	



# 9 ACCESSING FUNCTIONS

## [Command No. list]

Functions	Command No.
DISTANCE STAKEOUT	101
RDM (REF. P.)	103
COORDINATES	104
OFFSET SHOTS	105
COORD. STAKEOUT	109
REM	112
RESECTION	113
DATA STORAGE	119
MEMORY MANAGEMENT	200

Functions	Command No.
MIN UNIT DIST	501
SHOT COUNT	502
CRV/REF CORR	503
MIN UNIT ANG	504
V. ANG STYLE	505
H. ANG SAVE	506
DIST BUZ	508
QUAD BUZ	509
AUTO OFF	510
EDM OFF	511
ILLU OFF	512
MEAS SIGNAL	514
PRIORITY SELECT	515
COORD AXIS	516
COMP AXIS	517
REMOTE	518

PRISM CONST	401
ATM CORR	402

ATM UNIT	701
DIST UNIT	702
ANG UNIT	703

SET UP COM.	801
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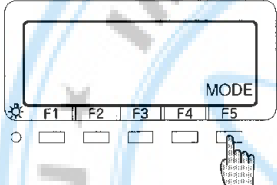
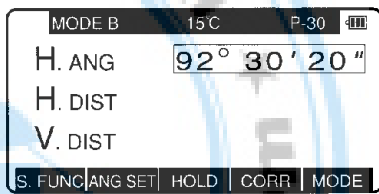
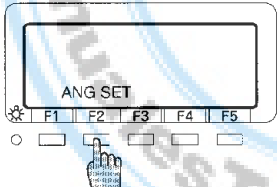
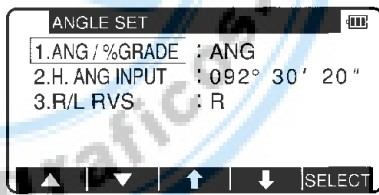
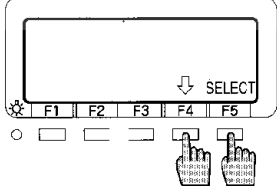
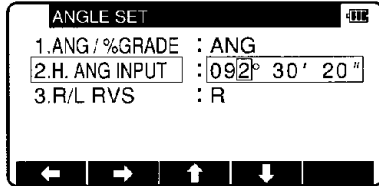
# 10 REMOTE CONTROLLER

The remote controller (MU72) is optional with the PCS-325.

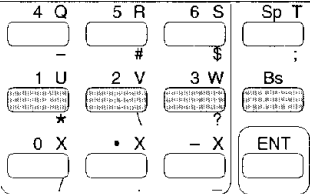
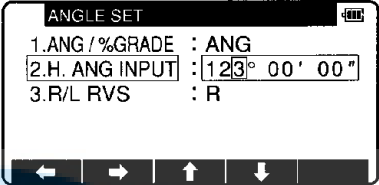
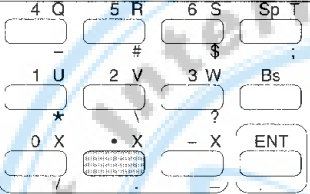
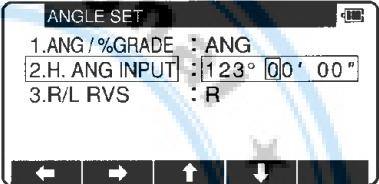
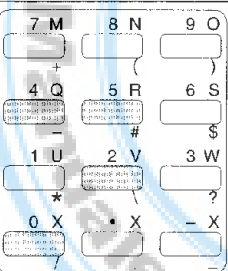
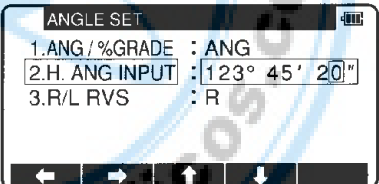
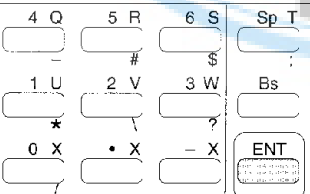
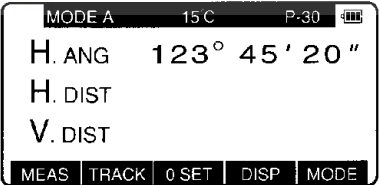
The keys on the remote controller make it easy to enter numeric values. (The remote controller MU72 cannot be used for the PCS-315/335.)

## 10-1 Using the Remote Controller to enter values

In case of Horizontal angle  $123^{\circ} 45' 20''$  input

Operating Procedures	Displays
<p><b>1</b></p>  <p>Use the [MODE] key to enter mode B.</p>	
<p><b>2</b></p>  <p>Use the [ANG SET] key to access the angle setting screen.</p>	
<p><b>3</b></p>  <p>Use the [<math>\downarrow</math>] key to move the cursor to "2. H.ANG INPUT", then press the [SELECT] key to open the horizontal angle input window.</p>	

# 10 REMOTE CONTROLLER

Operating Procedures	Displays
<p><b>4</b></p>  <p>Use the [Bs] key on the remote controller to reset the numeric display to 0. Enter [1] [2] [3] using the numeric keys.</p>	
<p><b>5</b></p>  <p>Enter [.] (The cursor will move to the 10')</p>	
<p><b>6</b></p>  <p>Enter [4] [5] [2] [0] using the numeric keys to set the horizontal angle to 123° 45' 20".</p>	
<p><b>7</b></p>  <p>Press the [ENT] key to accept the horizontal angle set to 123° 45' 20". The screen will then change to mode A.</p>	

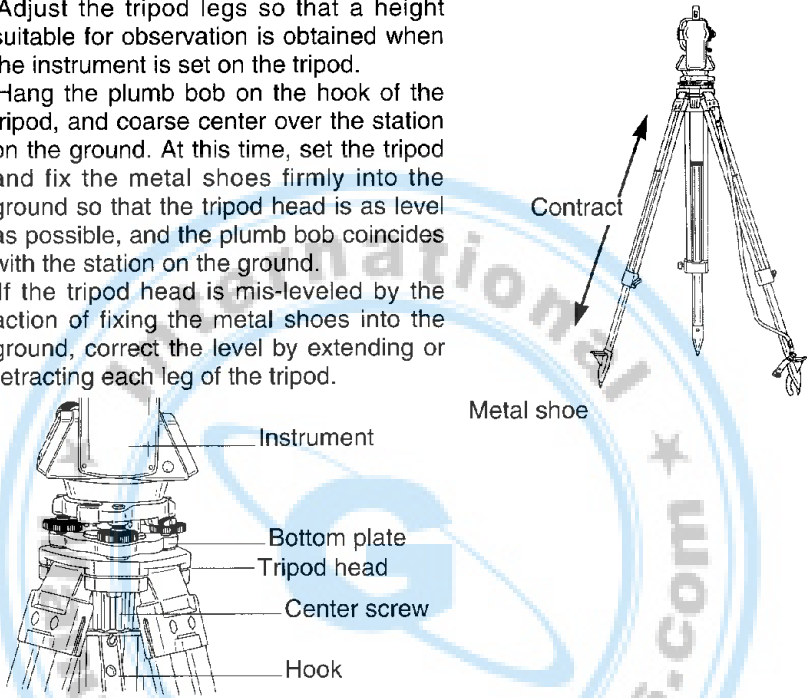
- Use the above Operating Procedures as a reference for entering values, for example, when using the remote controller to change the prism constant or temperature.

# 11 PREPARATION FOR SURVEYING

## 11-1 Centering and Leveling of the Instrument

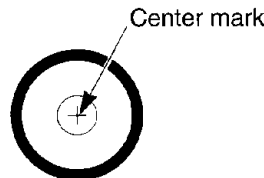
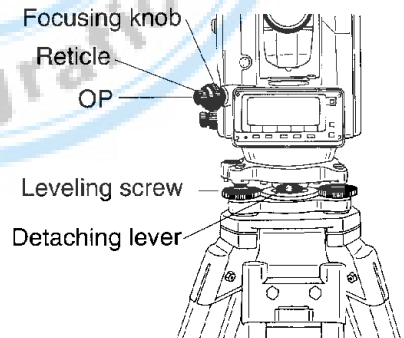
### Setting up the instrument and the tripod

- ① Adjust the tripod legs so that a height suitable for observation is obtained when the instrument is set on the tripod.
- ② Hang the plumb bob on the hook of the tripod, and coarse center over the station on the ground. At this time, set the tripod and fix the metal shoes firmly into the ground so that the tripod head is as level as possible, and the plumb bob coincides with the station on the ground.
- ③ If the tripod head is mis-leveled by the action of fixing the metal shoes into the ground, correct the level by extending or retracting each leg of the tripod.



### Centering and leveling with the optical plummet

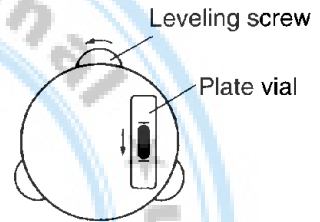
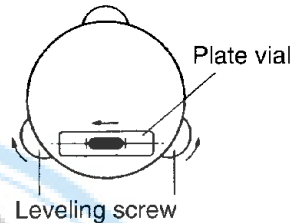
- ① Look through the optical plummet eyepiece, and rotate the eyepiece knob until the center mark can be seen clearly.
- ② Rotate the focusing knob of the optical plummet and adjust the focus to the station on the ground.
- ③ Loosen the center screw of the tripod. Look through the optical plummet, and shift the instrument base on the tripod head, taking care to avoid rotating the instrument, until the center mark coincides with the station.
- ④ Adjust the tripod legs to position the bubble of the circular vial to the center. (Be sure not to put your foot on the metal shoe, which may disturb the position of the metal shoes.)
- ⑤ Adjust the leveling screws to position the bubble of the circular vial to the center.



# 11 PREPARATION FOR SURVEYING

## Leveling with plate vial

- ① Place a plate vial in parallel with a line joining any two of leveling screws. Adjust the two leveling screws. And position the bubble in the center of the vial. To adjust the screws at the same time, turn them in opposite directions.
- ② Adjust the remaining leveling screw so that the bubble is positioned in the center.
- ③ Repeat ① and ② by rotating the plate vial through  $90^\circ$  so that the bubble is positioned in the center when the plate vial is moved in any direction.



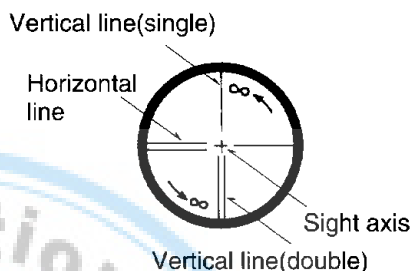
- See arrows in Fig. above for the relation between the direction of leveling screw rotation and the bubble shifting direction.
- If the bubble does not remain centered in ③, "Adjustment of plate vial" is necessary. Refer to page 62.

# 11 PREPARATION FOR SURVEYING

## 11-2 Eyepiece Adjustment and Sighting

### Eyepiece adjustment

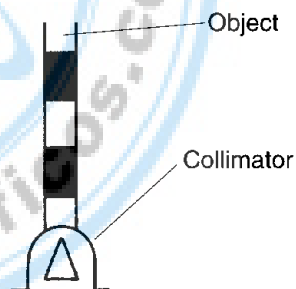
- ① Remove the telescope lens cap.
- ② Point the telescope at a bright object, and rotate the eyepiece ring full counter-clockwise.
- ③ Look through the eyepiece, and rotate the eyepiece ring clockwise until the reticle appears as its maximum sharpness.



- When looking into the eyepiece, avoid an intense look to prevent parallax and eye fatigue.
- When it is hard to see the reticle due to poor brightness, press (※) to illuminate it. For adjusting intensity of brightness, refer to page 23.

### Object sighting

- ① Point the telescope at the object using the collimator sight.
- ② Look through the telescope eyepiece and finely adjust the focusing knob until the object is perfectly focused. If focusing is correct, the reticle will not move, in relation to the object, even when you move your eye slightly left and right.
- ③ Accurately align the reticle with the object, using each tangent screw.



- Turn the focusing knob clockwise to focus on a near object. Turn the knob counterclockwise to focus on a far object.
- In ②, parallax may ruin the relation between the object and reticle, resulting in observation error.
- When aligning to an object using the tangent screw, always align by rotating the screw clockwise. If the screw is turned past the object, turn it back to the original position and then turn the screw clockwise to align the reticle on the object.
- Even when vertical angle measurement is not required, it is recommended that the object be placed close to the center of the reticle.

# 11 PREPARATION FOR SURVEYING

## 11-3 Attachment and Detachment of Tribrach

The tribrach of PCS-325 is detachable from the instrument if required when replacing the instrument with a target or unit prism for example.

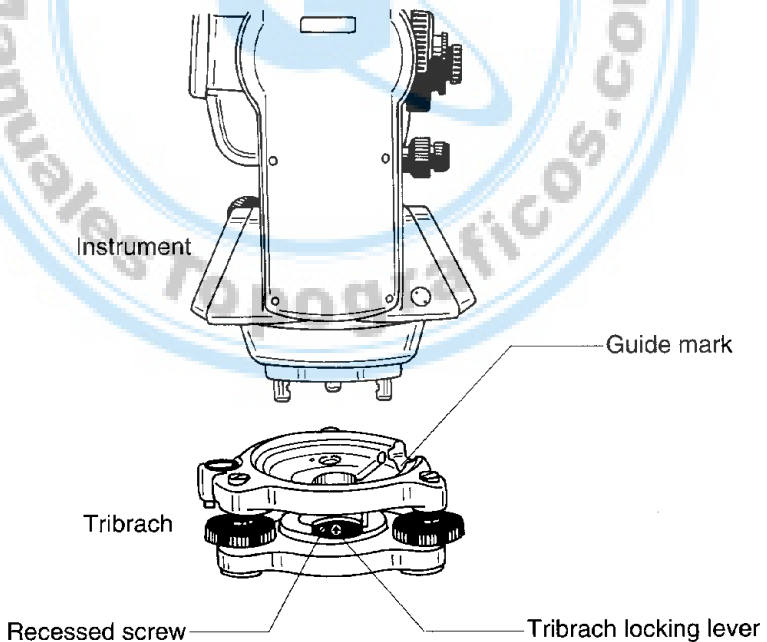
### Detachment

First loosen the recessed screw with a screwdriver, then rotate the locking knob until the arrow points upward, and lift the instrument up.

### Attachment

Mount the instrument on the tribrach with the guide marks coinciding, and rotate the locking knob until the arrow points downward.

- The guide and guide mark must be fitted to attach the instrument.
- When the tribrach does not need to be attached or detached or instrument is to be transported, tighten the recessed screw with a screwdriver to fix the locking knob.

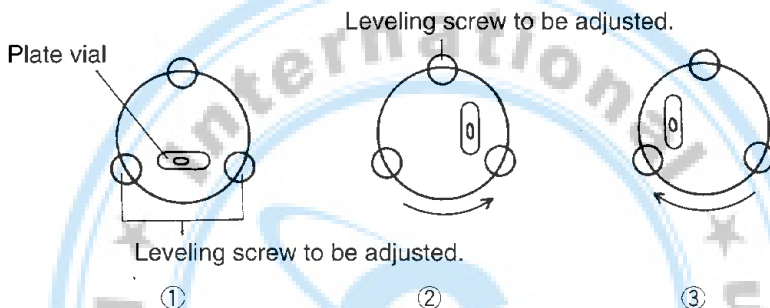


# 12 INSPECTION AND ADJUSTMENT

## 12-1 Plate vial

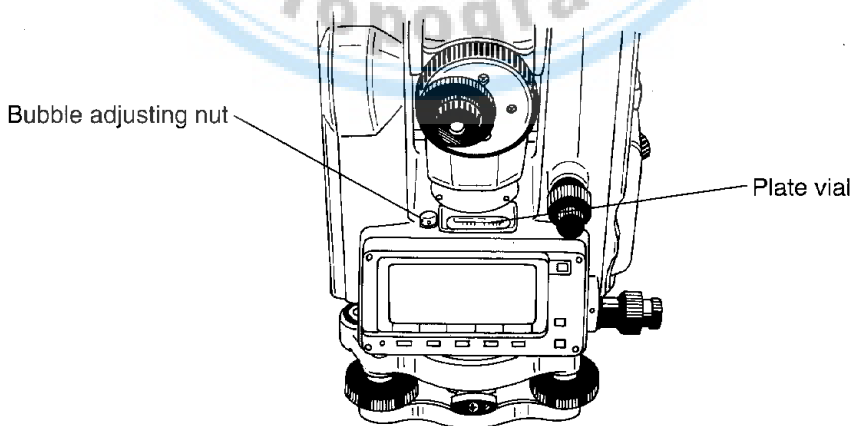
### Inspection

- ① Align the plate vial in parallel with a line joining any two of the leveling screws. Then, adjust the two screws to center the bubble in the vial.
- ② Rotate the instrument  $90^\circ$  and adjust the remaining leveling screw to center the bubble.
- ③ Loosen the upper clamp screw and rotate the instrument  $180^\circ$  around the vertical axis.
- ④ No adjustment is needed if the bubble stays in the center.



### Adjustment

- ① If the bubble of the plate vial moves from the center, bring it half way back to the center by adjusting the leveling screw(s) which is parallel to the plate vial.
- ② Correct the remaining half by adjusting the bubble adjusting nuts with the adjusting pin.
- ③ Confirm that the bubble does not move from the center when the instrument is rotated by  $180^\circ$ .
- ④ When the bubble moves, repeat from ① once again.





# 12 INSPECTION AND ADJUSTMENT

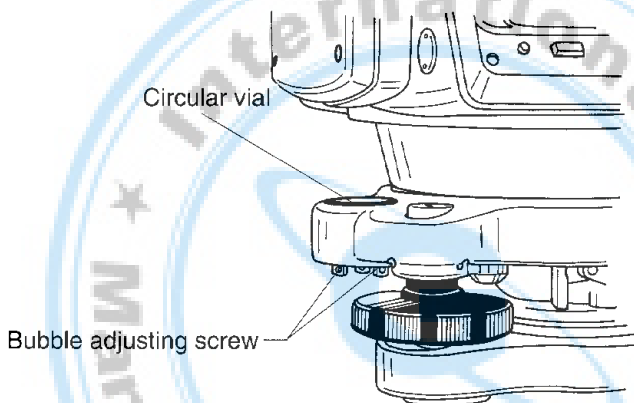
## 12-2 Circular vial

### Inspection

No adjustment is necessary if the bubble of the circular vial is in the center after inspection and adjustment of plate vias.

### Adjustment

If the bubble of the circular vial is not in the center, bring the bubble to the center by turning the bubble adjusting screws with an adjusting pin.

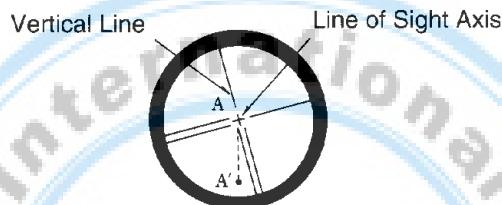


# 12 INSPECTION AND ADJUSTMENT

## 12-3 Inclination of Reticle

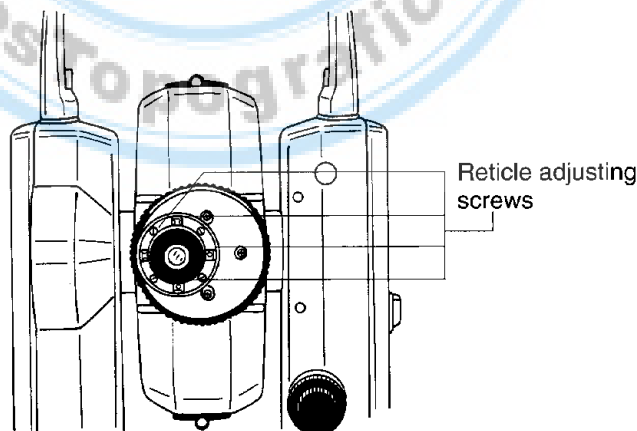
### Inspection

- ① Secure target Point A and sight it with the telescope.
- ② Using the telescope fine adjustment screws, move Point A to the edge of the field of view by screw (point A').
- ③ No adjustment is necessary if Point A moves along the vertical line of the reticle.



### Adjustment

- ① If Point A is off from the vertical line of the reticle, first remove the eyepiece cover.
- ② Using the adjusting pin, loosen the four reticle adjustment screws slightly, loosening each screw by the same amount, and then rotate the reticle line around the sight axis and align the vertical line of the sight axis with Point A'.
- ③ Tighten the reticle adjustment screws again by the same amount, and repeat the inspection to make sure the adjustment is correct.

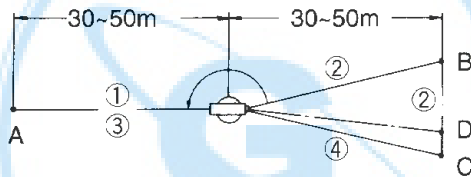


# 12 INSPECTION AND ADJUSTMENT

## 12-4 Perpendicularity of Line of sight to horizontal axis

### Inspection

- ① Position a target Point A at a distance 30-50 m away from the instrument, and sight it with the telescope.
- ② Loosen the telescope lock screw reverse the telescope on the vertical axis, until a point is sighted at a distance roughly equal to that of Point A. This is Point B.
- ③ With the telescope still reversed, loosen the horizontal lock screw, rotate the instrument around the vertical axis, and sight Point A again.
- ④ Loosen the telescope lock screw and reverse the telescope on the vertical axis, until a point is sighted at a distance equal to that of Point B. This is Point C. (Return the telescope to the normal position.)
- ⑤ No adjustment is necessary if Point B and C are aligned.



### Adjustment

- ① If Points B and C are not aligned, mark Point D at 1/4 the length of the BC, from Point C in the direction of Point B.
- ② Using the adjustment pin, rotate the reticle adjustment screws horizontally opposite each other (see preceding page), and move the reticle to sight Point D.
- ③ Repeat the inspection and make sure the adjustment is correct.

# 12 INSPECTION AND ADJUSTMENT

## 12-5 Vertical 0 point error

Be sure to follow inspection procedures mentioned below after making adjustments on reticle and perpendicularity of line of sight to horizontal axis.

### Inspection

- ① Set up the instrument and turn the power on.
- ② Sight the telescope at any reference target A. Obtain vertical angle ( $\gamma$ ).
- ③ Reverse the telescope and rotate the alidade. Sight again at back state and obtain vertical angle R.
- ④ If  $\gamma + R = 360^\circ$ , no further adjustment is necessary.

If the deviation  $d (\gamma + R - 360^\circ)$  is wide, contact your local dealer.

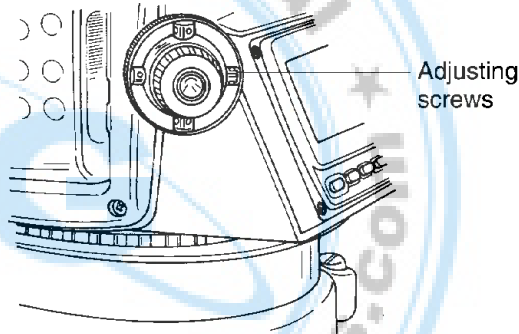
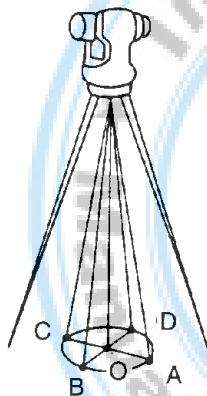


# 12 INSPECTION AND ADJUSTMENT

## 12-6 Optical Plummet

### Inspection

- ① Set the instrument on the tripod, and place a piece of white paper with a cross drawn on it right under the instrument.
- ② Look through the optical plummet, and move the paper so that the intersecting point of the cross comes to the center of the field of view.
- ③ Adjust the leveling screws so that the center mark of the optical plummet coincides with the intersecting point of the cross.
- ④ Rotate the instrument around the vertical axis. Look through the optical plummet each  $90^\circ$  of rotation, and observe the center mark position against the intersecting point of the cross.
- ⑤ If the center mark always coincides with the intersecting point, no adjustment is necessary.



### Adjustment

- ① If the center mark does not coincide with the intersecting point, rotate the optical plummet focusing knob cover and remove it.
- ② Mark the point set on the line of sight at each step of  $90^\circ$  on the white paper and call them A, B, C and D.
- ③ Join the opposed points (A,C and B,D) with a straight line, and set the intersecting point O.
- ④ Turn the four optical plummet adjusting screws with an adjusting pin so that the center mark coincides with the intersecting point O.
- ⑤ Repeat from ④, and check that adjustment is correct.

# 12 INSPECTION AND ADJUSTMENT

## 12-7 Offset Constant

The offset constant rarely changes. It is recommended, however, that inspection be done once or twice a year.

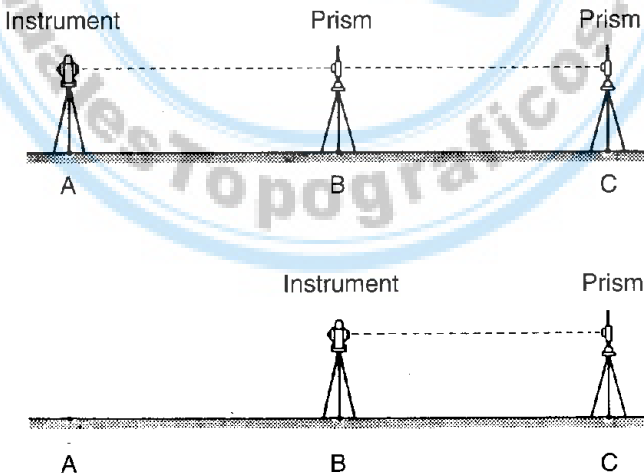
The inspection of the offset constant can be done on a certified base line. It can also be obtained in a simple way as described below.

### Inspection

- ① Locate points A, B and C at about 50m intervals on even ground.
- ② Set up the instrument at point A, and measure the distances between  $\overline{AB}$  and  $\overline{AC}$ .
- ③ Set up the instrument at point B, and measure the distance  $\overline{BC}$ .
- ④ Obtain the offset constant (K):

$$K = \overline{AC} - (\overline{AB} + \overline{BC})$$

■ Contact your local dealer for adjustment of the offset constant when the K is not nearly 0.



# 12 INSPECTION AND ADJUSTMENT

## 12-8 Beam axis and Line of sight

Be sure to check that the beam axis and line of sight are aligned when the adjustments on reticle and perpendicularity of line of sight to horizontal axis are made.

### Inspection

- ① Set the prism at a distance greater than 50 m.
- ② Accurately sight the center of the prism through the telescope.
- ③ Turn the power on and press(MEAS)to measure.
- ④ No adjustment is necessary if beam receiving buzzer sounds immediately and measurement value is displayed in a few seconds.

- If instrument function is not as described in④, contact your local dealer.
- This inspection should be done under good weather conditions.

### Cautions on Inspection and adjustments

- ◇ Make all inspection and adjustments in numerical order.
- ◇ Be sure not to make inspection and adjustment on "Perpendicularity of line of sight to horizontal axis" prior to those on "Reticle".  
When making adjustments on "Reticle" and "Perpendicularity of line of sight to horizontal axis", be sure to make inspection on "Vertical 0 point error" and "Beam axis and line of sight".
- ◇ When adjustment is completed, be sure that adjusting screws are completely tightened. When finishing turning adjusting screws, be sure that screws are turned in a direction for tightening.
- ◇ Repeat inspection after adjustment, and check if the instrument has been adjusted properly.

# 13 APPENDIX

## 13-1 Error Messages

Message	Meaning	What to do
Out of tilt range, ready?	<p>Displayed when the instrument is tilted beyond the vertical compensation range (<math>\pm 3'</math>) in case 1 axis or 2 axis automatic compensation is selected.</p> <p>This message may be temporarily displayed if the instrument is turned too fast.</p>	Relevel the instrument. Repair is needed if the message is displayed when it is properly leveled.
Over speed, swing scope	Displayed when the telescope is turned too fast.	Turn the telescope up and down. Remeasure.
Over speed, push 0 SET	Displayed when the alidade is turned too fast.	Press [0 SET] key. Remeasure.
Excess data	The input data exceeds the allowable range.	Press the [OK] key and enter the correct data.



# 13 APPENDIX

Message	Meaning	What to do
EDM ERROR 4 – EDM ERROR 6	Some problems found in the distance measurement system.	Turn the power off, and turn it on again. The repair is needed when the message is still on the display.
EDM ERROR 31 – EDM ERROR 32		
ETH ERROR 8 – ETH ERROR 16	Some problems found in the angle measurement system.	*Improper operation may display the message.
MEMORY ERROR 19	Some other problems in the instrument.	

## 13-2 Atmospheric Correction

The speed at which light travels through the air varies depending on the temperature and atmospheric pressure. The PCS-300 series is designed to measure distances at the speed of light. In order to measure accurately, atmospheric correction needs to be used. The instrument is designed to correct for weather conditions automatically if the temperature and pressure are input. Correction is then carried out based on the following formula.

Calculation formula

$$K = \left( 279.75207 - \frac{79.55626 \cdot P}{273.14941 + t} \right) \times 10^{-6}$$

K: Atmospheric correction constant

P: Atmospheric pressure (hPa)

t: Temperature(°C)

Distance after atmospheric correction  $D = D_s(1+K)$

$D_s$ : Measured distance when no atmospheric correction is used

# 13 APPENDIX

## 13-3 hPa and mmHg Conversion Tables

### Converting from hPa to mmHg

hPa	0	10	20	30	40	50	60	70	80	90
500	375	383	390	398	405	413	420	428	435	443
600	450	458	465	473	480	488	495	503	510	518
700	525	533	540	548	555	563	570	578	585	593
800	600	608	615	623	630	638	645	653	660	668
900	675	683	690	698	705	713	720	728	735	743
1000	750	758	765	773	780	788	795	803	810	818
1100	825	833	840	848	855	863	870	878	885	893
1200	900	908	915	923	930	938	945	953	960	968

### Converting from mmHg to hPa

mmHg	0	10	20	30	40	50	60	70	80	90
400	533	547	560	573	587	600	613	627	640	653
500	667	680	693	707	720	733	747	760	773	787
600	800	813	827	840	853	867	880	893	907	920
700	933	947	960	973	987	1000	1013	1027	1040	1053
800	1067	1080	1093	1107	1120	1133	1147	1160	1173	1187
900	1200	1213	1227	1140	1153	1167	1180	1193	1207	1220

# 13 APPENDIX

## 13-4 Deviation When No Atmospheric Correction Is made

When measurement is carried out with no atmospheric correction (with the settings fixed at a temperature of 15°C and an atmospheric pressure of 1013 hPa or 760 mmHg), the deviation per 100 meters in temperature and pressure will be as shown in the tables below.

### With hPa (15°C, 1013 hPa as standard)

°C \ hPa	1200	1100	1013	900	800	700	600	500
45	2.0	-0.5	-2.6	-5.5	-8.0	-10.5	-13.0	-15.5
35	3.0	0.4	-1.8	-4.7	-7.3	-9.9	-12.5	-15.1
25	4.0	1.4	-0.9	-4.0	-6.6	-9.3	-12.0	-14.6
15	5.2	2.4	0.0	-3.1	-5.9	-8.6	-11.4	-14.2
5	6.3	3.5	1.0	-2.2	-5.1	-8.0	-10.8	-13.7
-5	7.6	4.7	2.1	-1.3	-4.2	-7.2	-10.2	-13.1
-15	9.0	5.9	3.2	-0.2	-3.3	-6.4	-9.5	-12.6

Unit = millimeter

### With mmHg (15°C, 760 mmHg as standard)

°C \ mmHg	900	800	760	700	600	500	400
45	2.0	-1.3	-2.6	-4.6	-8.0	-11.3	-14.6
35	3.0	-0.4	-1.8	-3.9	-7.3	-10.8	-14.2
25	4.0	0.5	-0.9	-3.1	-6.6	-10.2	-13.7
15	5.2	1.5	0.0	-2.2	-5.9	-9.6	-13.3
5	6.3	2.5	1.0	-1.3	-5.1	-8.9	-12.7
-5	7.6	3.7	2.1	-0.3	-4.2	-8.2	-12.2
-15	9.0	4.9	3.2	0.8	-3.3	-7.4	-11.5

Unit = millimeter

※When the actual pressure is 1013 hPa (760 mmHg) and the temperature is 25°C, conducting the measurement with the temperature left at 15°C will result in the measurement being short by 0.9 mm per 100 meters.

# 13 APPENDIX

## 13-5 Atmospheric Refraction and Earth Curvature Correction

- Atmospheric refraction and earth curvature correction refers to correcting both the bending of the light beam caused by atmospheric refraction and the effect on the height differential and horizontal distance caused by the earth curvature.
- Correction called "atmospheric refraction and earth curvature correction" is initiated to correct deviation when the slope distance and vertical angle are used to determine the horizontal distance and the height differential. With this instrument, the following formula is used to correct these factors.
- Calculation formula when atmospheric refraction and earth curvature correction parameter is set to "ON":

Corrected horizontal distance (H)

$$H = S(\cos \alpha + \sin \alpha \cdot \frac{K-2}{2Re} \cdot S \cdot \cos \alpha)$$

Corrected vertical distance (V)

$$V = S(\sin \alpha + \cos \alpha \cdot \frac{1-K}{2Re} \cdot S \cdot \cos \alpha)$$

- Calculation formula when atmospheric refraction and earth curvature correction parameter is set to "OFF":

$$\text{Horizontal distance } H' = S \cdot \cos \alpha$$

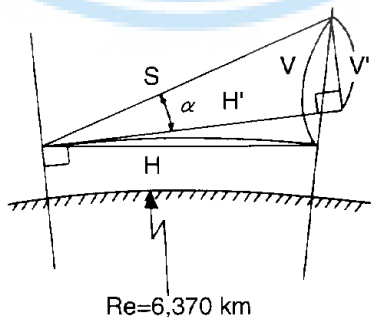
$$\text{Vertical distance } V' = S \cdot \sin \alpha$$

S : Slope distance

$\alpha$  : Vertical angle from horizontal

K : Atmospheric refraction coefficient (0.14 or 0.2)

Re: Diameter of earth (6,370 km)



## 13-6 Distance Range

Generally speaking, the maximum range which can be measured varies considerably depending on the atmospheric conditions. For this reason, the performance tables on the following pages illustrate the values for both optimum and ordinary weather conditions.

It is extremely difficult to judge when weather conditions are "optimum" and when they are "ordinary". With this instrument, the conditions noted below are used to differentiate between the two situations. (Optimum weather conditions for surveying are different from ordinary weather conditions, and in surveying situations, cloudy skies are considered more favorable than sunny skies.)

Weather conditions for measurement ranges are based on the following standard values:

Normal :Visibility of approximately 20 km, with slight haze.

Good :Visibility of approximately 40 km, overcast, no heat haze and moderate wind.

# 14 SPECIFICATIONS

## Telescope

Image .....Erect  
Magnification .....30 x  
Effective aperture .....40mm(EDM40mm)  
Resolving power .....3"  
Field of view .....2.6% (1°30')  
Minimum focus .....0.85m

## Distance measurement

Measurement range  
1P                   \*800m  
                     \*\*1000m  
3P                   \*1200m  
                     \*\*1500m

\*Normal conditions : 20km visibility with slight haze

\*\*Good conditions : 40km visibility, over-cast, no heat no haze and moderate wind

Accuracy  
 $\pm(3\text{mm} + 2\text{ppm} \times D)\text{mm}$   
\*  $\pm(3\text{mm} + 10\text{ppm} \times D)\text{mm}$

D: Distance

\* Automatic atmospheric correction

Minimum count

Normal : 1mm or 0.1mm

Fast : 10mm or 1mm

Measuring time

Normal:2sec.(1mm), 3sec.(0.1mm)

Fast:0.4sec.(10mm), 0.8sec.(1mm)

Measuring system

Automatically repeated or shot

(Shot: 1,3,5AV or input(1-99))

Maximum slope distance display

3000.000m

Atmospheric correction

AUTO/ATM INPUT/ppm INPUT/NIL

Temperature input,Pressure input

ppm INPUT (-199~+199ppm)

Prism constant

-30mm,0mm,INPUT

Atmospheric and earth curvature correction

0.14, 0.2, NIL

## Special functions

- Distance stakeout
- RDM
- Coordinates
- Offset shots
- Data storage
- Coordinate stakeout
- REM
- Resection
- Memory Management

## Angle measurement

Measuring method...Incremental  
  rotary encoder

Detection method ...Horizontal angle  
  ...Double  
  Vertical angle  
  ...Single

Minimum count .....1"(2cc)/5"(10cc)

Accuracy(DIN18723)5" standard deviation

Measuring time .....0.2"(Continuous)

Diameter of circles...79mm

Measuring mode

H ...R/L, Hold, Retention(in Power OFF)

V ...Zenith 0/Horizontal 0, %, Compass

# 14 SPECIFICATIONS

## Display section

Dot .....240 x 96  
Dot character and segment  
20 characters x 8 lines  
w/back light

## Sensitivity of vials

Plate vial .....30"/2mm (PCS325)  
40"/2mm (PCS315,335)  
Circular vial .....8/2mm

## Optical plummet

Image .....Erect  
Magnification .....3 ×  
Focus range .....0.5m - ∞

## Vertical axis. Tribrach type

Vertical axis .....Single  
Tribrach .....PCS-325(Detachable)  
PCS-335(Shift)  
PCS-315(Fixed)

## Data Output

Interface: RS-232C  
Baud rate: 1200, 2400, 4800, 9600  
Data bits: 8 bit, 7 bit  
Parity bits: Nil, Even, Odd  
Stop bits: 1, 2

## Auto Power off

Setting up time Nil, 10min.20min.30min.

## Ambient temperature

Working range -20°C ~ +50°C/4°F ~ 122°F

## Tripod thread

PCS-315/325 .....5/8" x 11 (JIS/B)  
PCS-335 .....35mm x 2 (JIS/C)

## Dimensions/Weight

Instrument  
156(W) x 341(H) x 158(L) mm/5.1kg  
Carrying case  
270(W) x 350(H) x 440(L) mm/3.8kg

## Battery pack MB02

Power source .....NiCd (Rechargeable)  
Output voltage ...DC6V  
Operation time .....Continuous Approx.2.5hrs.  
Weight .....Approx. 155g

## Charger MC04

Input voltage .....AC100-240V 50/60Hz  
Output voltage ...DC6V~7.2V(0.5A)  
Charging time .....Approx. 55min.(1100mAh)  
Weight .....Approx. 800g

## Internal Memory

Surveying data+Coordinates data  
.....Total 5000 points

# 15 EXTERNAL BATTERY

For longer continuous measurement, use the external battery MB07 (optional accessory).

## 15-1 External battery (MB07) specifications

Power supply .....NiCd battery (rechargeable)  
Output voltage .....DC7.2V  
Working time per charging .....11.5hrs. (continuous) (Distance & Angle Measurement)  
28hrs. (continuous) (Angle Measurement only)

Length of power supply cord ...2m

## 15-2 External battery charger (MC04) specifications

Input voltage .....AC120V or 220V  
Input frequency .....50/60Hz  
Charging time .....Approx.4hrs.  
Working temperature .....0°C ~+45°C (+32°F ~+113°F)

## 15-3 Usage

- ① Fit the external battery on the tripod and attach its connector and the external battery connector of the instrument using the power supply cord.
- ② Turn on the power supply switch of the instruments.

※ The battery adaptor (MU74) is needed to use the MB07 external battery.

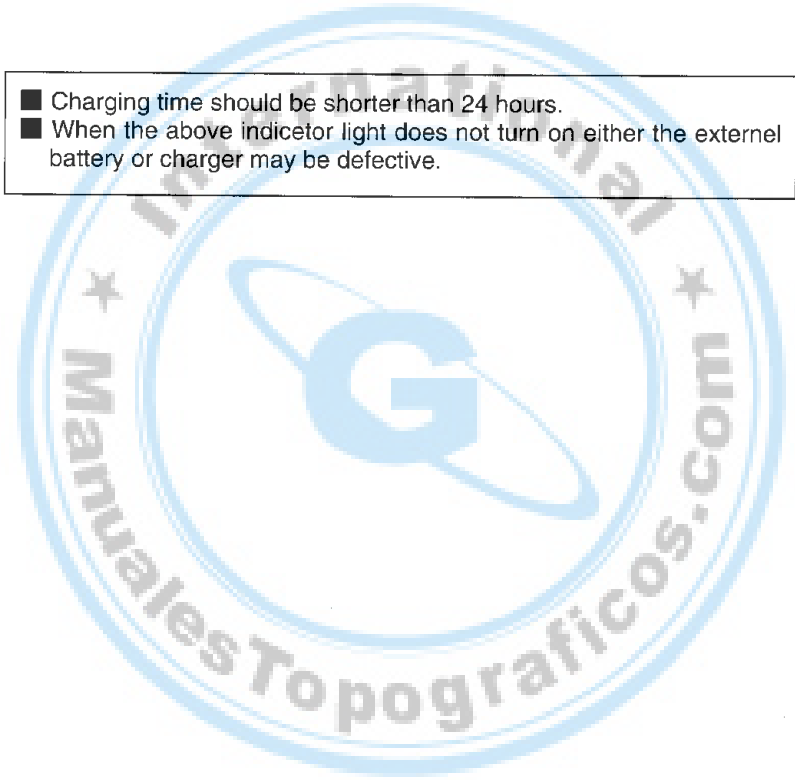


# 15 EXTERNAL BATTERY

## 15-4 Charging

- ① Attach the connector of the external battery charger MC04 to that of the external battery.
- ② Insert the plug of the battery charger into a wall socket (AC120V, 220V, 50/60Hz).
- ③ Check that the indicator light of the battery charger lights.
- ④ After Approx.4 hours, turn off the power supply switch and remove the connector and plug.

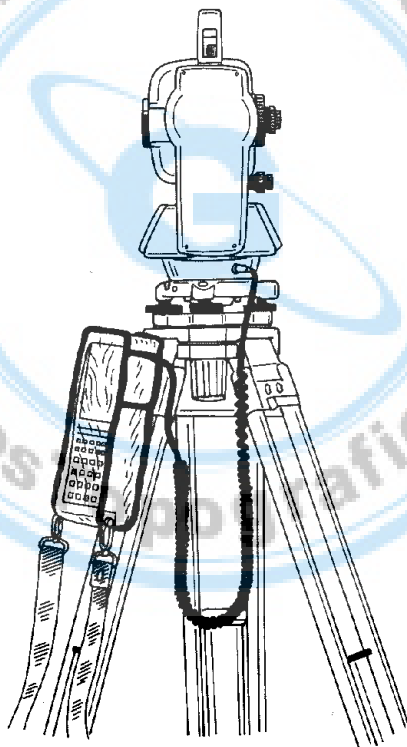
- Charging time should be shorter than 24 hours.
- When the above indicator light does not turn on either the external battery or charger may be defective.



# 16 DATA COLLECTOR

The instrument can communicate directly with a computer through the RS232C interface. By use of a data collector you can automate data entry from the collection of survey data to the transfer of the data to a computer. This is useful in saving time and protecting data integrity.

- About connection with data collector and the handling, please refer to an "instruction manual" of data collector.
- Connecting a data collector to a computer is different with every system. Please consult your local dealer about them.





The CE marking assures that this product complies with the requirements of the EC directive for safety.

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