

# **PENTAX®**

**AUTO FOCUS LEVEL**

## ***AFL* SERIES**

***AFL-320***

***AFL-280***

***AFL-240***

***AFL-240<sub>R</sub>***

**INSTRUCTION MANUAL**

**ASAHI PRECISION CO., LTD.**

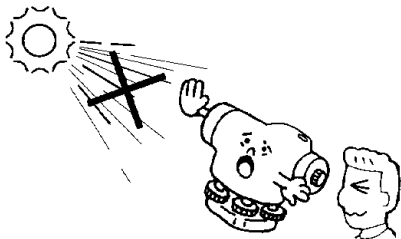
## Precautions Regarding Safety

The following safety precautions should be observed when using this equipment. Pentax cannot accept any responsibility for problems which may result if the precautions noted here, or other precautions listed for individual items, are not observed.



## WARNING

● Looking directly at the sun without attaching a filter to the telescope can result in a loss of eyesight.



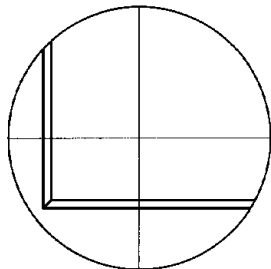
### Auto Focus

\* The Auto-Focus mechanism is very precise but will not function under every condition. Focusing depends on brightness, contrast, the shape and the size of the target. In such a case, please select the focus mode [MF] and do manual focusing by turning the focusing knob.

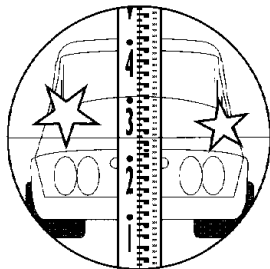
\* AFL is the acronym for Auto Focus Level.

# General

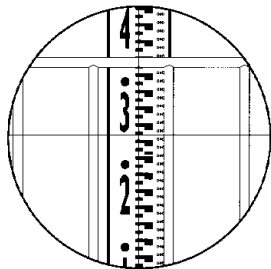
No contrast, at all, like a white wall



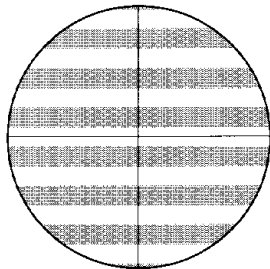
Bright backlight



Obstacle in front of target



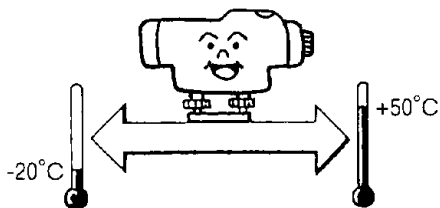
A wall composed of single horizontal lines



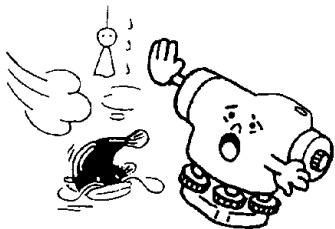
# General

## Caution

- The instrument should not be stored or used in extreme temperature or job on a place subject to rapid change of temperature. (Refer to ambient temperature range.) The instrument may not function properly if used out of the ambient temperature range.

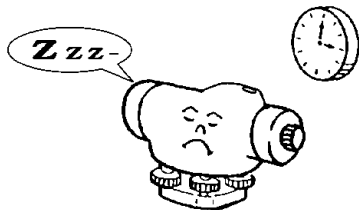


- Put into the carrying case for storage and place in a dry area not subject to vibration, dust or high moisture.



# General

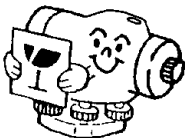
- When storage and usage temperatures are widely different, leave the instrument in the case until it can adjust to the surrounding temperature.



- The instrument should be transported or carried carefully to avoid impact or vibration.

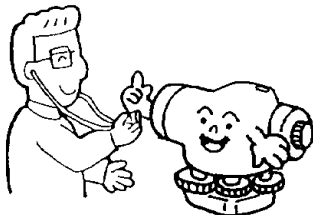


- The instrument should be stored in the carrying case and packed with cushion material, and handled with care as "Fragile".

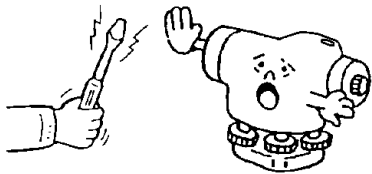


# General

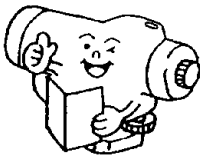
- After the instrument has been stored a long time, or it has suffered an impact or vibration, be sure to check to see if it functions before use.



- Do not try to dismantle the instrument. Have it repaired by your dealer or authorized repair shop. Dismantling it by yourself may worsen the trouble.



- Be sure to observe the items in the instruction manual for proper use of the instrument.



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# **1 .For proper use of the Instrument**

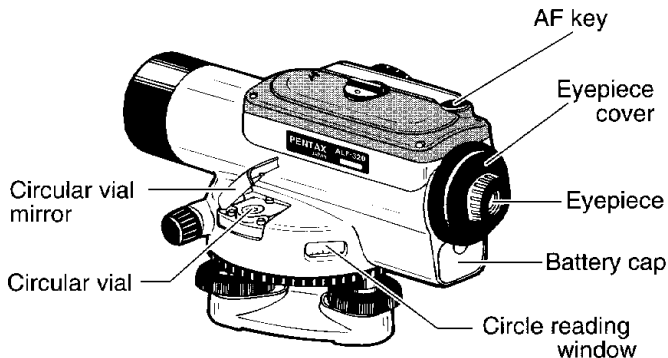
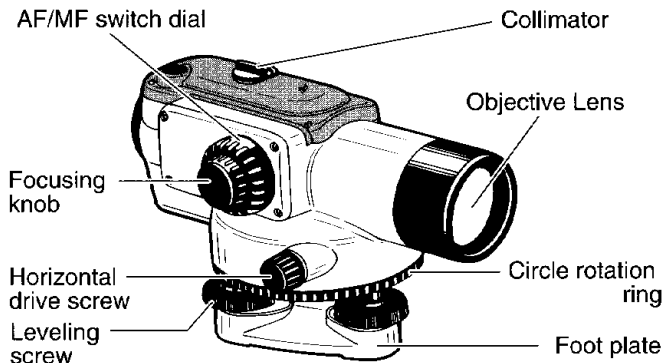
## **1-1 Standard configuration**

Instrument	1
Objective cap	1
6 V Li battery (2CR5)	1
Plumb bob	1
Hexagonal wrench	1
Brush	1
Rain cover	1
Silicon cloth	1
Carrying case	1
Instruction manual	1



# 1. For proper use of the Instrument

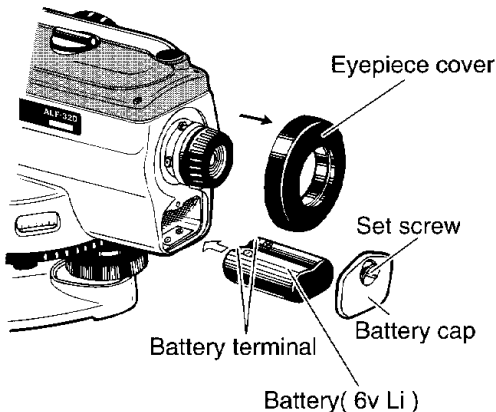
## 1-2 Description



# 1. For proper use of the Instrument

## 1-3 Battery insertion

- ① Turn the eyepiece cover counterclockwise and remove it from the instrument.
- ② Loosen the screw by means of coin and remove the battery cap.
- ③ Insert the battery into the battery box according to its(+)and(-) marks and attach the battery cap.



### NOTICE:

In case of battery exhaustion, an alarm sound rings when the auto focus key is pressed. Replace the battery with the new one ASAP.

## 2. Operation

### 2-1 Preparation for surveying

#### 1) Setting up the tripod

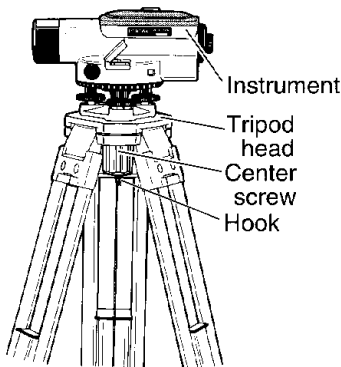
- ① Use a tripod having a center locking screw with 5/8" x11 thread.
- ② Dig the legs firmly into the ground and adjust the tripod to the height suitable for observation when the instrument is attached.

#### NOTICE:

- \*Tripod head height is adjusted by extension and leg angle of tripod.
- \*For angle measurement, set the tripod so that the center of the tripod head is positioned right above the ground point.
- \*A dome-head tripod can be used, for fast setup, on very steep terrain.

#### 2) Setting up the instrument

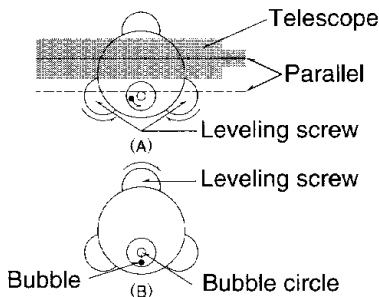
- ① Mount the instrument on the tripod head and secure it using the center lock screw.
- ② Suspend the plumb bob from the hook, adjusting the length of the string. (for angle measurement)
- ③ Loosening the center lock screw, slide the instrument on the tripod head. Tighten it when the plumb bob coincides with the ground point. (for angle measurement)



## 2. Operation

### 3) Leveling

- ① Place the telescope in parallel to the line connecting any two leveling screws, and turn them to move the bubble of the circular level at a position even to the left and the right. (Fig. A) Turn the two leveling screws in opposite directions.
- ② Turning a remaining leveling screw, shift the bubble to the center. (Fig. B)
- ③ Make sure that the bubble stays in the center of the circle after turning the telescope  $180^\circ$ .



#### NOTICE:

\*See arrows in Fig. A and B for the relation between the direction of leveling screw rotation and the bubble shifting direction. The bubble moves towards the direction of left thumb's movement or opposite direction of right one.

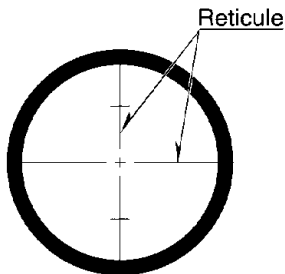
\*If the bubble shifts from the center (Step3), please refer to the "Adjustment of the circular level" on page 16 .

## 2. Operation

### 2-2 Observation

#### 1) Reticule collimation

- ① Remove the objective cap. If necessary, attach the sunshade.
- ② Direct the telescope to the bright background and rotate the eyepiece counterclockwise to the rotation limit.
- ③ While looking into the eyepiece, rotate it clockwise until the cross hair of the reticule comes to its extreme sharpness.



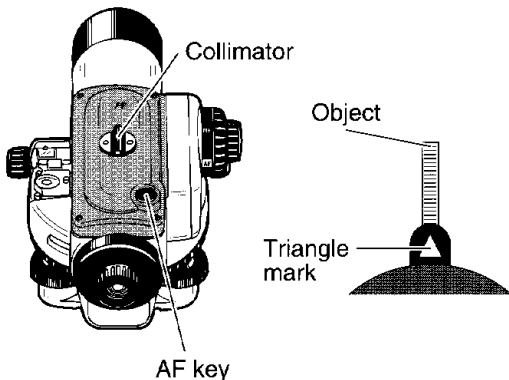
#### NOTICE:

It is advisable to relax when looking into the eyepiece. An intense look at the reticule may tend to cause parallax or eye fatigue.

## 2. Operation

### 2) Sighting

- ① Sight the telescope at the object looking through the collimator.
- ② Looking into the eyepiece, press the auto focus key and confirm if the objective becomes clearly visible and the cross hair does not change even when you move your eye up and downward.
- ③ Align the reticule to the target using the tangent screw.



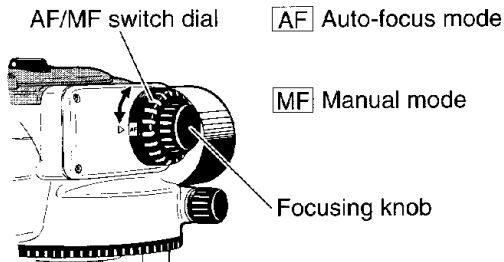
#### NOTICE:

If parallax exists in 2), the relation between the object and the cross hair may change. This may cause surveying error. Auto focusing may not be perfect for every object type. Please switch the focus mode knob to [MF], and manually focus.

## 2. Operation

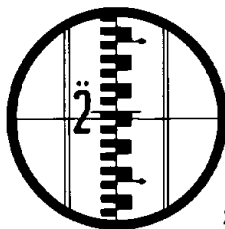
### NOTICE:

There are 2 focus mode positions. Please select the [AF] mode position for auto focus measurement.



### 3) Reading the staff

How to read the graduation on the staff.



Reading value  
2.195m

### NOTICE:

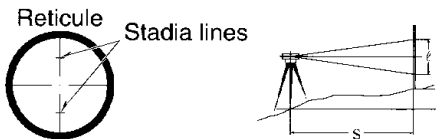
Reading the staff should be done at the center of the cross hair on the reticule.

## 2. Operation

### 2-3 Application

#### 1) Stadia survey

Distance from the instrument to the staff can be measured by the Stadia hairs visible within the field of view of the telescope.



Measuring distance is easy as Stadia constant is 0.

S: Horizontal distance

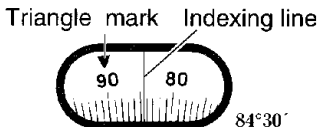
$\ell$  : Difference in reading between of upper and of lower Stadia lines

$$S=100 \times \ell$$

#### 2) Angle measurement

Models equipped with a horizontal circle are capable of horizontal angle measurement.

\* Example



#### NOTICE:

When reading a horizontal angle, be sure observe from a position squarely in front of it of the observation window. Angle can be estimated to 0.1 graduation.

Use the symbols  $\blacktriangle$  marked every 90° or 100G for right angle setting.



## 3. Maintenance and inspection

### 3-1 Maintenance after use

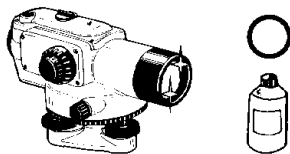
#### Grime on the main body

- ① Brush dust off and wipe off with tissue paper.
- ② Clean off any stains with a soft, dry cloth.
- ③ Excessive stains should be removed with a soft cloth soaked in a water diluted neutral detergent and squeezed dry.



#### Grime on the glass surface

- ① First, brush dust off.
- ② Gently wipe off stains with a silicone cloth for eye glass lenses.
- ③ Excessive stains should be wiped off with soft cotton cloth impregnated with a cleaning liquid of eye glass lenses.



#### NOTICE:

\*Wipe off the water and dry the instrument and store in the case.

\*Do not use benzine, thinner, gasoline and other chemicals.

\*Be careful not to scratch the glass surface.

# 3. Maintenance and inspection

## 3-2 Inspection

### 1) Circular level

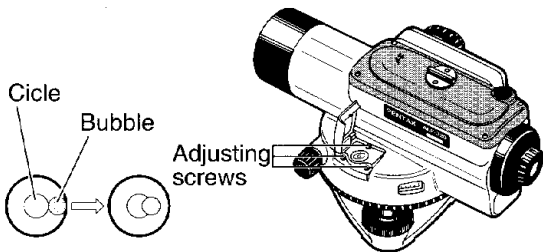
(Inspection)

- ① Attach the instrument to a tripod and level it so that the bubble of circular level is positioned at the center of the circle.  
(Refer to P. 10 "Leveling".)
- ② Turn the telescope 180°.
- ③ No further adjustment is necessary if the bubble stays at the center of the circle.

### 2) Adjustment

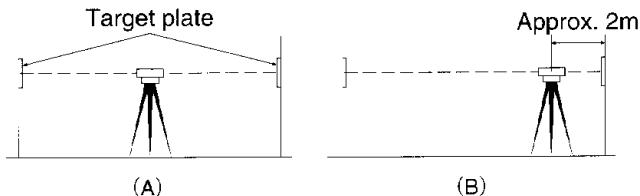
- ① If the bubble moves out of the center in the circle, turn the leveling screws to shift the bubble halfway to center.
- ② Shift the bubble, the remaining halfway to the center, by turning adjustment screws with included H.Wrench.
- ③ Turn the telescope 180° to check to see if the bubble stays at the center of the circle.
- ④ Repeat again from 1., should the bubble moves.

\*When doing adjustment, finish with the screws being firmly tightened.



## 3. Maintenance and inspection

### 3) Leveling line of sight



### 4) Inspection

- ① Prepare two target plates. Set up the instrument midway between two walls at a distance of 50 to 100 meters, level it. (A)
- ② Sighting both walls alternately, adjust the target plates to the height so that the height readings of the target plates are identical, and secure them in position.
- ③ Move the instrument to a position approx. 2 meters from one target plate and level it. (B)
- ④ Read both target plates.
- ⑤ No adjustment is necessary if readings of both target plates are identical.

#### NOTICE:

When readings of the target plates are not identical by this inspection, further adjustment is needed. Please contact the local dealer or our company.

## 4. Specifications

	AFL-240R	AFL-240	AFL-280	AFL-320
<b>Telescope</b>				
Image	Erect			
Magnification	24X		28X	32X
Objective aperture	45mm			
Resolving power	3.5"		3"	2.5"
Field of view	1°20' / 2.3%			
Minimum focus distance	0.6m / 24inches			
Stadia ratio	1			
Stadia constant	0			
<b>Auto focus mechanism</b>				
Detection method	Phase contrast method			
<b>Power source</b>	6 V Li battery [2CR5] 1 pcs			
Operation times	Approx. 6000 times			
<b>Automatic Compensation</b>				
Compensation range	±12'			
Setting accuracy	±0.5"			±0.3"
Standard deviation※	±2.0mm		±1.5mm	±0.8mm
(1km double run)※※				±0.4mm
<b>Circular vial</b>				
Sensitivity	8' / 2mm			
<b>Horizontal circle</b>	Metal			
Diameter	96mm			
Graduation	1°			
Reading method	Index			
Estimation	0.1°			
<b>Leveling base</b>	Spherical	3 screws		
<b>Tripod attaching screw</b>	JIS standard B type			
Tripod thread	W 5/8" x 11			
<b>Dimensions and weight</b>				
Instrument	247mm(L) × 153mm(W) × 149mm(H) / 2.1kg			
Carrying case	364mm(L) × 200mm(W) × 180mm(H) / 1.5kg			

※Normal    ※※With parallel plate micrometer

## 5. Optional accessories

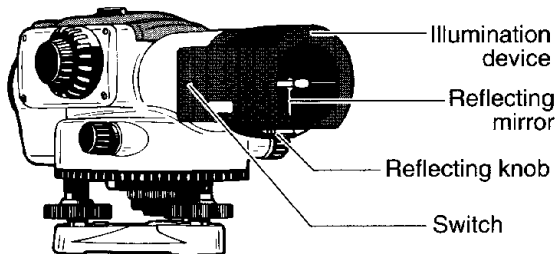
### 5-1 Electric illumination device [EP]

Electric illumination device permits usage in a tunnel or any dark place by way of illuminating the reticule.

Light source.....Green LED

Power supply.....2 pcs 1.5 V dry batteries (AA)

- ① It can be mounted in the same way that a sunshade is attached to the telescope objective.
- ② Turn the switch on and adjust the brightness by rotating illuminator knob while looking into the telescope.



Remove the batteries when the device will not be used for an extended period because extended storage may cause damage to the device due to leakage of battery acid.

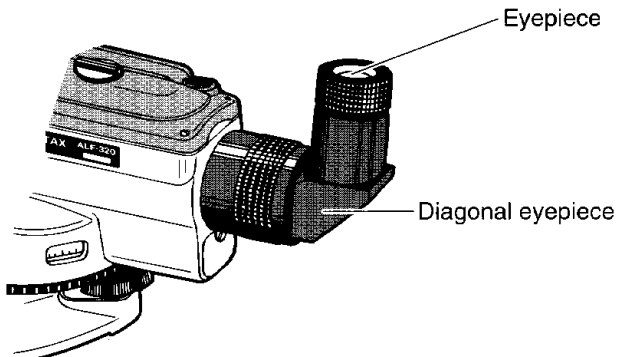
## 5. Optional accessories

### 5-2 Diagonal eyepiece [SBL2]

Diagonal eyepiece [SBL2] is to be used for surveying in a limited space or when the instrument is set at a lower position where it is hard to lock into the telescope.

#### Operation

- ① Remove the eyepiece cover, turning it counterclockwise.
- ② Screw the diagonal eyepiece onto the attaching thread of the eyepiece cover.
- ③ Looking into the eyepiece lens of the diagonal eyepiece, focus the reticule.



Prior to attaching the diagonal eyepiece to the instrument, focus the reticule with the standard eyepiece.

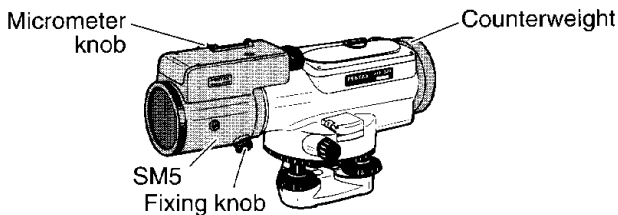
## 5. Optional accessories

### 5-3 Parallel plate micrometer [SM5]

The parallel plate micrometer is used for leveling or civil engineering work requiring precise accuracy. With a bright microscale etched on optical glass, it provides direct reading down to 0.1mm.

#### Operation

- ① Remove the eyepiece cover.
- ② Mount the parallel plate micrometer horizontally on the telescope objective.
- ③ Install the counterweight on eyepiece cover attaching thread.
- ④ Turning the micrometer knob, accurately put the staff graduation between the wedged-shaped lines.



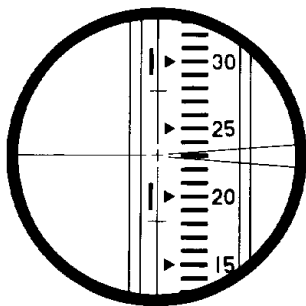
#### NOTICE:

\*When using the parallel plate micrometer, replacement of the standard reticule with a wedge-pattern reticule is recommended.  
(Contact your local dealer for replacement.)

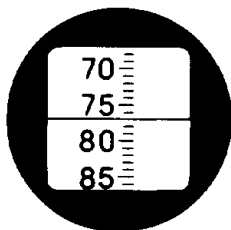
\*It is also recommended that a precision reading staff be used to achieve full performance of the parallel plate micrometer.

## 5. Optional accessories

- ⑤ Read the staff (A) and microscale (B)



(A) Staff



(B) Microscale

Example:

Staff reading                    123.00cm

Micrometer reading            0.77cm

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123.77cm



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

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