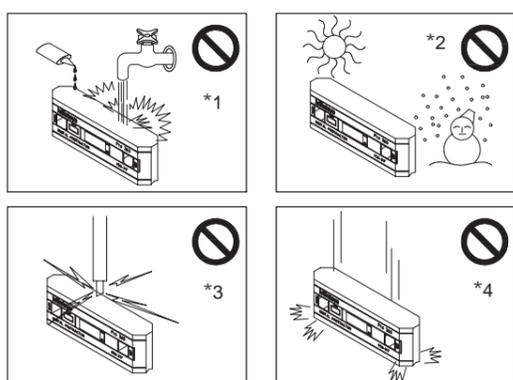


# DIGITAL PROTRACTOR

No. 99MAM013B  
SERIES No. 950



## Safety Precautions

To ensure operator safety, use the instrument in conformance with the directions and specifications given in this User's Manual.



### CAUTION

- Do not disassemble, short-circuit, charge, or heat the battery. Otherwise the battery content may leak to come into contact with the eye, or cause battery heating or explosion.
- If a battery is swallowed, immediately consult a physician.

### IMPORTANT

- Use only a 6LR61 battery (9V – Alkaline battery)
- If this DIGITAL PROTRACTOR will not be used for more than three months, remove the battery from the DIGITAL PROTRACTOR for safe keeping, or the battery could leak and cause a trouble.
- Do not use the DIGITAL PROTRACTOR at sites where it will be exposed to oil, water, and dust. \*1
- Do not use the DIGITAL PROTRACTOR at sites where it will be exposed to direct sunlight or blow of hot air. \*2
- Do not use an organic solvent such as thinner.
- Absolutely do not apply an external voltage to the DIGITAL PROTRACTOR, by such as an engraver. It may cause a trouble. \*3
- Do not apply excessive force to the DIGITAL PROTRACTOR or drop the DIGITAL PROTRACTOR. Also do not disassemble the DIGITAL PROTRACTOR except for removing the battery cover when replacing the battery. \*4

## 1. Name of Each Part

The names of each part of this DIGITAL PROTRACTOR are shown in the figure left.

- (1) Power ON/OFF button (2) ALT ZERO (Setting an alternate reference point) button (3) HOLD button

## 2. Battery Installation

The battery is not installed in the DIGITAL PROTRACTOR when delivered. Install the 6LR61 battery according to the instruction in the figure left.

### TIP

Change the battery when the display flashes "LO bAt" with angle measurements.

(NOTE: The DIGITAL PROTRACTOR does not display inaccurate angles due to a weak battery.)

## 3. Operating Instructions – Angle Measurement

To operate the DIGITAL PROTRACTOR, press the ON/OFF button; it will begin displaying angle readings immediately.

Set the DIGITAL PROTRACTOR on the surface to be measured and read the angle.

### NOTE

- To get the most accurate reading, allow the DIGITAL PROTRACTOR to settle for 5 seconds before noting the angle.
- When the DIGITAL PROTRACTOR is first turned on, the displayed angles will be in standard reference mode level (true horizontal) is display as 0.0° and plumb (true vertical) is displayed as 90.0°.
- An arrow on the left side of the display will indicate which way to move the DIGITAL PROTRACTOR to achieve level or plumb. Between 0° and 44.9°, the arrow " " will point toward level. Between 45° and 89.9°, the arrow " " will point toward vertical (plumb).

### 3.1 ALT ZERO (Setting on alternate reference point)

ALT ZERO allows you to set any angle as a 0.0° reference point from which to take measurements.

- To set an alternate reference point, place the DIGITAL PROTRACTOR on the new surface and wait 5 seconds.
- Press the ALT ZERO button once.
- "Alt" will appear on the display, followed by "-0-". The DIGITAL PROTRACTOR will then display angles using the new reference.

### NOTE

- A flashing " " will appear in the lower right hand corner of the display as long as the DIGITAL PROTRACTOR is in ALT ZERO mode.
- Press ALT ZERO again to return to standard reference mode.
- The DIGITAL PROTRACTOR also returns to standard reference when it is turned off or shuts off automatically.

### 3.2 HOLD (temporarily "freezing" a reading on the display)

(1) Place the DIGITAL PROTRACTOR on the surface and wait 5 seconds.

(2) Press the HOLD button.

(3) The readout will freeze and a flashing " " will appear in the right upper hand corner of the display and an arrow on the left side of the LCD will also flash.

(4) To release, press the Hold button again.

### NOTE

- The DIGITAL PROTRACTOR cannot be recalibrated (Superset) nor can a new reference point be established (ALT ZERO) when the HOLD feature is engaged.
- The HOLD feature is disengaged automatically when the DIGITAL PROTRACTOR shuts off or is turned off.

### 3.3 Accuracy Test

Perform the following simple test every time before using the DIGITAL PROTRACTOR. Also perform it anytime the DIGITAL PROTRACTOR has been dropped or is being used in an environment that varies more than 5°C (9°F) from the environment in which it was last calibrated.

### NOTE

If your DIGITAL PROTRACTOR fails this test, recalibrate it using Superset before using the DIGITAL PROTRACTOR further to measure angles.

- Position the DIGITAL PROTRACTOR with the display facing you on a clean, flat horizontal surface. (It doesn't have to be exactly level.)
- Wait 10 seconds so the DIGITAL PROTRACTOR is completely settled and note the angle on the display.
- Rotate the DIGITAL PROTRACTOR end-for-end so the display is facing away from you.
- Be sure to set the DIGITAL PROTRACTOR in exactly the same spot, and wait 10 seconds before reading the angle that is displayed.
- Now roll the DIGITAL PROTRACTOR toward you so that the display is facing you, but the lettering on the face of the DIGITAL PROTRACTOR is upside down.
- Wait 10 seconds, and note the angle on the display.
- Finally, rotate the DIGITAL PROTRACTOR end-for-end so the display is facing away from you (the lettering should still be upside-down).
- Wait 10 seconds and note the angle on the display.

### NOTE

If any of the four measurements varies from any other by more than 0.1°, recalibrate (Superset) your DIGITAL PROTRACTOR before using it further.

## 4. Superset

### NOTE

- Use any horizontal surface within 10° of level and any vertical surface within 10° of plumb to perform Superset.
- Use the same surfaces throughout the entire process.
- Reposition the DIGITAL PROTRACTOR each time during Superset, wait a minimum of 10 seconds before pressing the HOLD button to advance to the next step.

### 4.1 How to perform Superset

- Turn on the DIGITAL PROTRACTOR and place it on a flat surface.
- Press and hold the HOLD and ALT ZERO buttons simultaneously. (Keep them depressed for approximately three seconds.)
- Release the buttons when the symbol "SUP" appears.
- A "0" within flashing brackets will then appear.

### TIP

- These brackets are composed of four horizontal and four vertical segments.
- Note that as proceeding through the eight steps of Superset, a new segment will hold steady after completing each step.

#### <1>

- The DIGITAL PROTRACTOR faces you and white lettering on the face is right-side up. (See Fig.1)
- Align with an edge or line – wait 10 seconds.
- Press HOLD button until "[1]" appears.

#### <2>

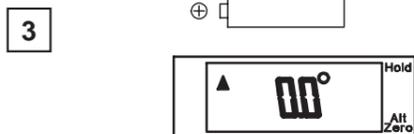
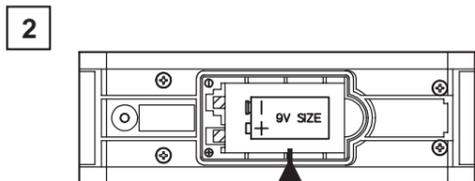
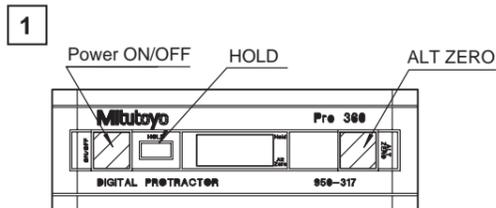
- Rotate the DIGITAL PROTRACTOR so it faces away from you, the lettering should still be right-side up. (See Fig.2)
- Align with the same edge or line – wait 10 seconds.
- Press HOLD button until "[2]" appears.

#### <3>

- Roll the DIGITAL PROTRACTOR so it faces you, the lettering should now be upside-down. (See Fig.3)
- Align with the same edge or line – wait 10 seconds.
- Press HOLD button until "[3]" appears.

#### <4>

- Rotate the DIGITAL PROTRACTOR so it faces away from you, the lettering should still be upside-down. (See Fig.4)
- Align with the same edge or line – wait 10 seconds.
- Press HOLD button until "[4]" appears.



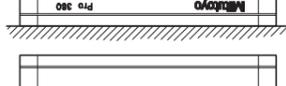
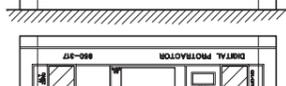
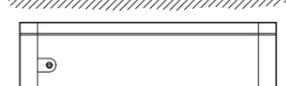
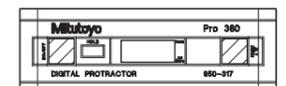
3.1



3.2



3.3



4



4.1

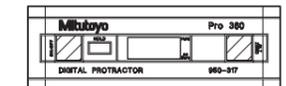


FIG. 1

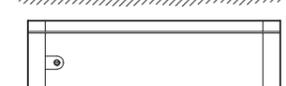


FIG. 2

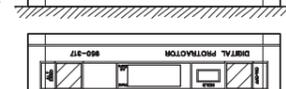


FIG. 3

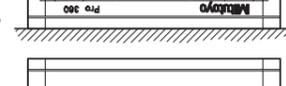


FIG. 4

4.2

FIG. 5

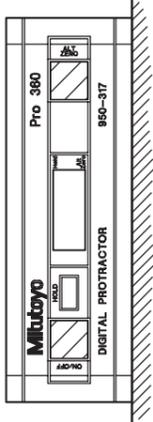


FIG. 6

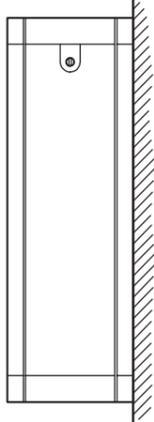


FIG. 7

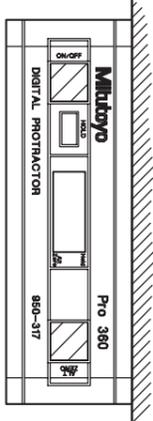
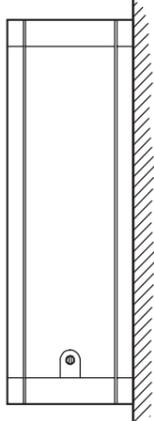


FIG. 8



4.2 Superset – Vertical Settings

<5>

- (1) Place the DIGITAL PROTRACTOR against vertical surface so it faces you, the lettering on the face should read from bottom to top. (See Fig.5)
- (2) Align with an edge or line – wait 10 seconds.
- (3) Press HOLD button until “[5]” appears.

<6>

- (1) Roll the DIGITAL PROTRACTOR so it faces away from you, the lettering should still read from bottom to top. (See Fig.6)
- (2) Align with the same edge or line – wait 10 seconds.
- (3) Press HOLD button until “[6]” appears.

<7>

- (1) Rotate the DIGITAL PROTRACTOR end-for-end so it faces you, the lettering should now read top to bottom. (See Fig.7)
- (2) Align with same the edge or line – wait 10 seconds.
- (3) Press HOLD button until “[7]” appears.

<8>

- (1) Roll the DIGITAL PROTRACTOR so it faces away from you, the lettering should still read top to bottom. (See Fig.8)
- (2) Align with the same edge or line – wait 10 seconds.
- (3) Press HOLD button. “[8]” will very briefly appear, followed immediately by regular angle measuring.

NOTE

Cancel Superset at any time during the process by turning the DIGITAL PROTRACTOR off.

5. Specifications

Order No.	950-317	950-318
Range	360° (For indication 90° × 4)	
Resolution	0.1°	0.01° (0° to 9.99°) 0.1° (10° to 90°)
Accuracy	±0.1° : Level ±10°, Plumb ±10° ±0.2° : Maximum error	±0.05° (0° to 10°) ±0.1° (80° to 90°) ±0.2° (10° to 80°)
Repeatability	±0.1°	±0.05°
Cross Axis Error	Minimal	
Battery	9V – ALKALINE Battery : 6LR61	
Battery Life	Approximately 500 hours	
Auto Power Off	5 minutes	
Function	ALT ZERO, HOLD Superset (Recalibrate)	
Output	N/A	RS-232C Compatible
Operating Temperature	-5°C to 50°C (23°F to 122°F)	
Storage temperature	-20°C to 65°C (-4°F to 176°F)	
Mass	289g (0.64lbs)	295g (0.65lbs)
Standard Accessories	Pouch	Plastic Box
Option		Cable, 10P-25P Order No. 50AAA983

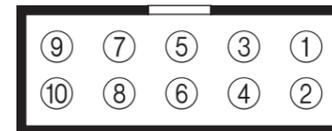
6. Data output Specifications (RS-232C compatible)

The order No. 950-318 (hereafter referred to as “950-318”) indicates the DIGITAL PROTRACTOR with a RS-232C compatible serial port and an ASCII formatted data output.

A rear side of the 950-318 connector (Ansley 609-1027, manufacturer : T&B) conforms to industrial standard cables.

The angle measurement and data output are carried out every 8/15 seconds (533ms).

- (1) Baud rate : 9600bps
- (2) Stop bit : 1
- (3) Parity bit : None
- (4) Home position : DCE (modem definition)
- (5) Connector specifications

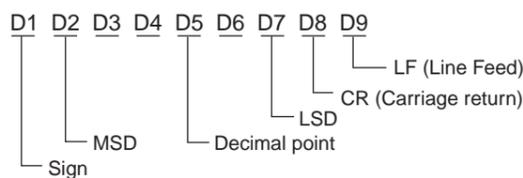


Pin number	Signal name	Function	in/out
1	S.G	Signal GND	
2	TD ×	Communication data High-impedance except when data is outputted.	out
3	(N.C)	Not assigned	
4	(N.C)	Not assigned	
5	REQ	Received data Output the data when “Hi” is inputted.	in
6	(N.C)	Not assigned	
7	(N.C)	Not assigned	
8	(N.C)	Not assigned	
9	BATT+	Power supply terminal (when the battery is installed : output, when no battery is installed : input)	Either
10	(N.C)	Not assigned	

- (6) Turning on the 950-318 when a foot switch is kept ON, the data will be outputted continuously at the interval of 8/15 seconds (533ms).
- (7) The data will be outputted once by keeping ON the foot switch for 100ms when the 950-318 is ON.

7. Data Format

- (1) When output the data



- (2) Examples of the data format

Display	Output data
+124.50	→ +124.50 CR LF
+ 32.70	→ + 32.70 CR LF
+ 9.38	→ + 9.38 CR LF
- 4.32	→ - 4.32 CR LF
-179.99	→ -179.99 CR LF

- (3) The measuring range for the 950-318 is 360° whereas its output range is from -180° to +180°.

8. Electric Characteristics

(RS-232C compatible)

Item	Min.	Type	Max.	Unit
REQ input voltage Low	-25	—	0.4	V
REQ input voltage Hi	2.4	—	25	V
REQ input resistance	3	5	7	kΩ
TD output voltage Low	—	-5	—	V
TD output voltage Hi	—	+5	—	V
BATT + input voltage	4.25	9	10	V