Handy Type Thermometer with Printer

AP-400 Series

User's Manual

(AE-100234 Third edition November 2017)

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Precautions for Safe Use

⚠Caution

Make sure to observe the following instructions to safely operate the device, conduct measurements correctly, and prevent product damage.

- This product is for temperature measurement. Never use this product for anything other than its intended purpose.
- If you notice anything abnormal, stop using the product immediately.
- Never attempt to disassemble or modify the product.
- Use only commercially available dry cells and the dedicated adaptor for the power supply.
- Be aware that measurement readings may be unstable under certain electromagnetic conditions.
- Do not handle the power plug in an environment in which an electrostatic discharge is likely to occur.

Note About the Batteries

※ This product is not designed for use with rechargeable batteries.
Always observe the following cautions to prevent battery leaks, overheating, or fire.

⚠Warning

- Never short-circuit, disassemble, heat, or drop the product into a fire.
- Never recharge the dry cells.
- Use only batteries specified for the product.

⚠Caution

- Install the batteries in the correct polarity (+/-) position.
- When the batteries are completely out of charge, or if you do not intend to use the device for an extended period of time, remove the batteries.
- Do not mix new and old batteries, or use different types of batteries at the same time.
- Battery life depends largely on the ambient temperature.

Preface

Thank you for purchasing the Anritsu Meter.
This user's manual is provided to ensure this product is operated and used correctly. Carefully read this manual and familiarize yourself with each function of the product before use.

Caution

■ The contents of this manual and the specifications of this product are subject to change without notice.
■ The unauthorized reproduction of this manual in whole or part is strictly prohibited.
■ Every effort has been made to ensure that the information in this manual is accurate. However, if you feel that important information has been omitted, have doubts about the information contained herein, or find any errors, contact Anritsu Meter or your distributor.
■ We assume no responsibility for any of the results obtained through the use of this product.

Warranty and after-sale service

● Warranty

Our products are carefully inspected before shipment. However, if your receive a product that was damaged by manufacturing defects or mishandling during transportation, contact Anritsu Meter or your distributor. Our products are warranted for one year from the date of delivery. If a failure occurs within the warranty period, we will repair the product free of charge, provided that the failure is clearly attributable to Anritsu Meter.
Please note that under no circumstances will any of following be covered by this warranty.

・Failure or damage resulting from force majeure events, such as fires or earthquakes.
・Failure or damage resulting from the incorrect use, inappropriate handling, or modification of the product (opening the casing or loosening the screws are considered to be modifications).
※ The thermocouple sensor is a consumable part, and thus is not covered by this warranty.

● After-sale service

If you feel the instrument is not functioning properly, consult this manual for advice on how to fix the problem. If you are still unable to fix the problem, contact Anritsu Meter or your distributor.

Repairs within the warranty period are conducted in accordance with the conditions listed on the warranty card. Any repairs after the expiration of the warranty period will be conducted at the customer's expense. Please note that in this case we will only conduct repairs if we believe they will help to improve and maintain the performance of the product.

When you return the product to Anritsu Meter for repair or calibration, use the box and other packing materials in which the product was originally packaged. If these items are unavailable, sufficiently wrap the product in cushioning material to prevent potential damage during transportation.

Table of Contents

1. Product Overview

The AP-400 is a handy type thermometer that comes with a printer. The product is highly precise, reliable, and easy to operate. The thermometer conducts incredibly stable and accurate measurements through the use of both microcomputer-powered digital calibration and analog precision technology.

The measurement data can be printed easily and reprinted later from the product's memory.

Data can be stored indefinitely in the memory. Even when the batteries of the main unit are running low, the data is not deleted.

2. Unpacking

2. 1. Unpacking

When you open the product package, check to make sure that all of the following items are included. The product is carefully packed before shipment, but if there are any missing or defective items, contact Anritsu Meter or your distributor.

Item	Quantity
1. Main unit	1
2. Soft case	1
3. AA alkaline dry cell batteries	4
4. Paper jam fixer	1
5. User's Manual	1
6. Printer paper	1 box (5 rolls)
7. Test results sheet	1
8. Warranty card	1

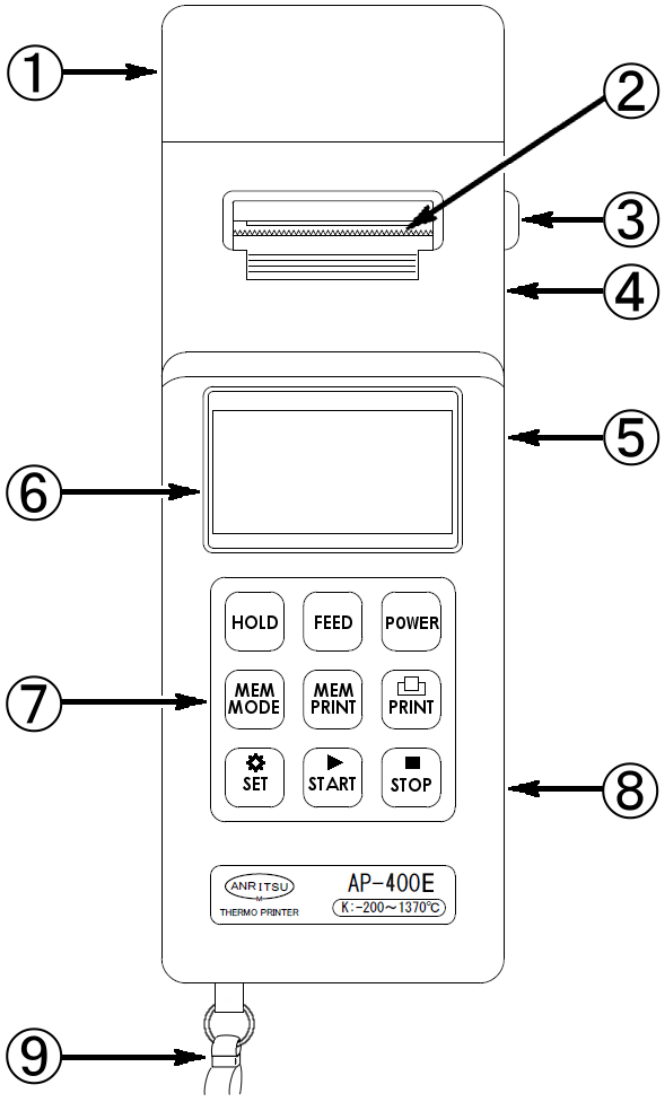
2. 2. Repacking

When moving this product (or transporting it by vehicle), use the box and other packing materials in which the product was originally packaged. If these items are unavailable, sufficiently wrap the product in cushioning material (such as foam pads) to protect the product during transportation. Make sure to use dry, dust-free packing materials because dust and moisture can damage the product.

3. Parts and Functions

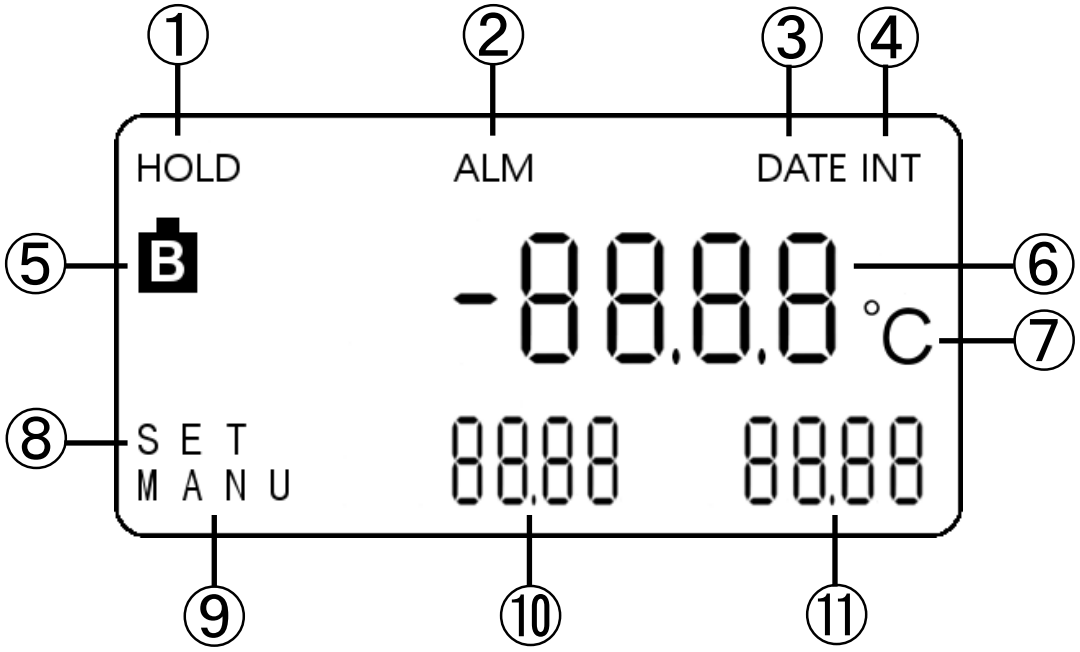
3. 1. External Appearance

(AP-400)



①Paper compartment
②Paper cutter
③Printer gear cover
④Sensor input connector
⑤AC adaptor jack
⑥Display
⑦Key switch panel
⑧Battery holder
⑨Hand strap

3. 2. LCD

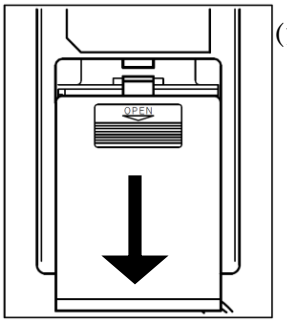


		Description
①	HOLD segment	Lights up when the HOLD function is enabled.
②	ALM segment	Lights up when an error (such as the disconnection of a sensor wire) occurs.
③	DATE segment	Lights up when Sub-display 2 is in Absolute Time mode.
④	INT segment	Lights up when the Interval function is enabled.
⑤	BL (mark) segment	Lights up when the battery power is low.
⑥	Main display	Main display area
⑦	ºC segment	Displays the temperature measurement unit.
⑧	SET segment	Lights up when the Interval function is set.
⑨	MANU segment	Lights up when a manual measurement is made in Interval mode.
⑩	Sub-display 1	Sub-display area (mainly used to display the time interval)
⑪	Sub-display 2	Sub-display area (mainly used to display the present time)

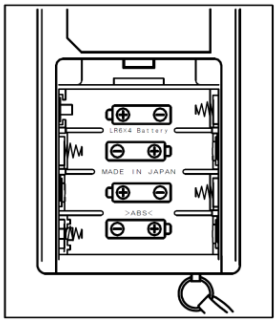
4. Preparing to Use the AP-400

4. 1. Installing the batteries

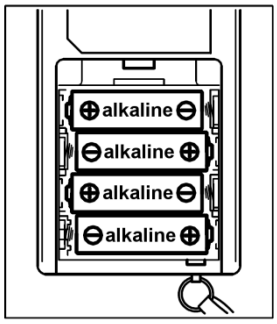
Always turn the power off before replacing the batteries.



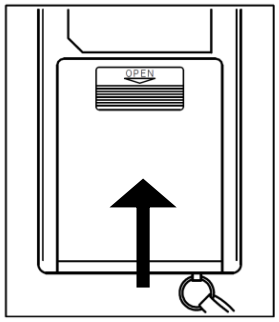
(1) Locate the battery holder at the bottom on the back side of the main unit. Slide the cover in the direction of the "OPEN" arrow to remove the cover.



(2) Install the dry cells in the correct polarity position.



(3) Use AA alkaline dry cells.



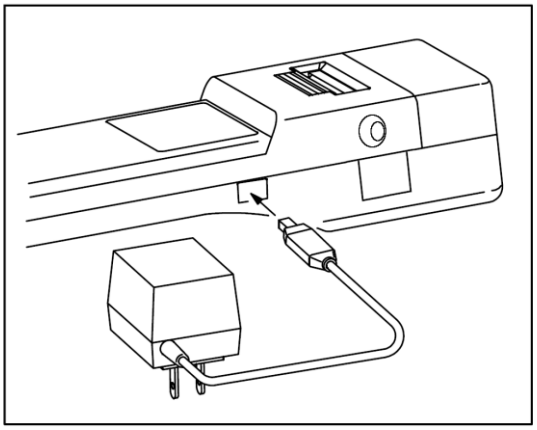
(4) Slide the cover in the opposite direction of the "OPEN" arrow to close the cover.

- Notes on dry cell batteries -

- Use AA alkaline dry cells. The battery life of manganese dry cells is less than half the period specified in this manual.
- Always install the batteries in the correct polarity (+/-) position.
- Do not mix batteries of different manufacturers or types. Do not mix old and new batteries. Doing so significantly diminishes battery performance.
- When the batteries are fully depleted and need to be replaced, the low battery icon B will appear on the LCD display.
  Replace the batteries immediately. If you do not intend to use the device for an extended period of time, remove the batteries to prevent the battery juice from leaking.

4. 2. Connecting the AC power

(1) Turn off the power of the main unit, and then plug in the AC adaptor cable as shown in the illustration below.



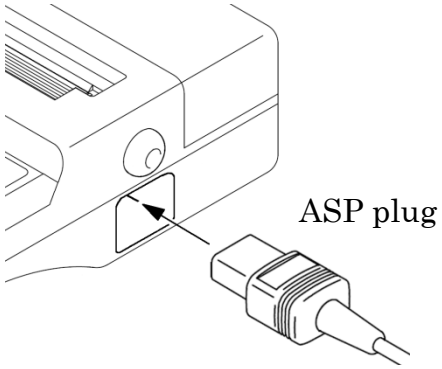
(2) Plug the AC adaptor into a commercially available power source (100 VAC).

※ Always use the separately supplied AC adaptor specified by Anritsu Meter.

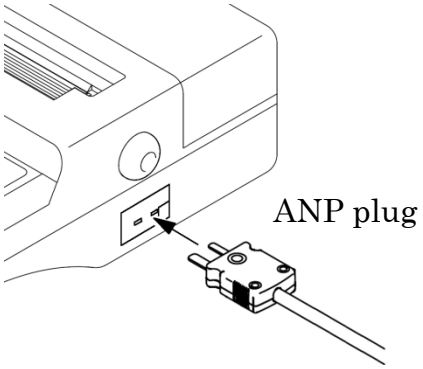
4. 3. Connecting the sensor

Plug the sensor cable into the main unit as shown in the illustration below. The AP series sensors are designed so that the plug is inserted in the correct polarity position. Forcibly inserting the plug into the terminal in the wrong position will damage the equipment. Be sure to insert the plug correctly.

[AP-400＊]



[AP-450＊]



4. 4. Using the soft case

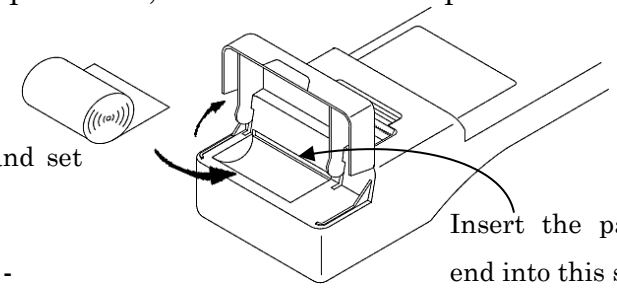
Use the provided soft case to protect the instrument from dirt and damage.

5. Setting the Printer Paper

The procedure for setting the paper in the printer is as follows:

1) Open the plastic cover on the top of the printer.
2) Turn on the power switch.
3) Insert the free end of the paper, with the printing surface face down, into the slot at the bottom of the paper compartment.
4) Press the FEED key and gently feed the paper by hand until several centimeters of paper come out of the opening.
5) Set the roll in the paper compartment, and then close the plastic cover.

Make sure the cut end is straight and set perpendicular to the feed direction.



Insert the paper end into this slot.

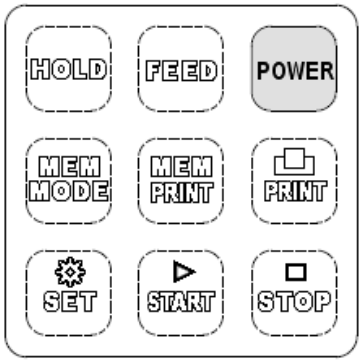
- Notes about the printer paper -

- The reverse side of the paper cannot be used to print. Always set paper with the printing surface face down.
- The free end of the paper tends to curl inside the compartment and may be pulled into the paper slot. Make sure the paper end remains outside the compartment.
- Do not pull out the inserted paper in the opposite direction. It will cause breakdown.
- Do not apply excessive force to the plastic cover. Doing so may damage the cover.
- This printer uses heat sensitive paper. Make sure to observe the following use and storage precautions:

a. Always use the specified type of paper.
b. Thermal printer paper tends to darken over time when heated to a temperature of approximately 70°C. Avoid placing the paper near heating appliances or in locations exposed to direct sunlight.
c. Humidity can also affect the paper quality. Once unpackaged, try to use the paper as quickly as possible.
   Use water-based glue or paper bond to fasten printed paper. You can also use adhesive and double-sided tape, but the use of these kinds of tape may sometimes cause the paper to darken.
d. Make copies if you wish to store printed data for an extended period of time.

6. Using the AP-400

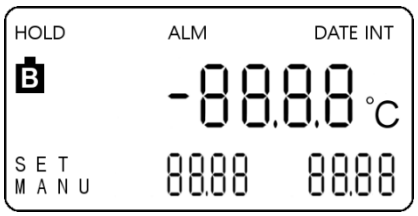
6. 1. Turning the power on and off



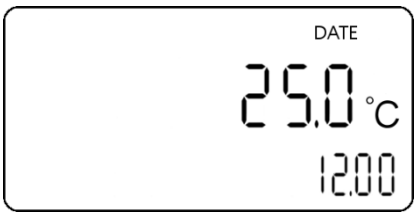
Press the POWER key to turn the power on. The entire LED display will light up for approximately two seconds, and then the instrument will start conducting measurements.

Press the POWER key again to turn the power off.

Fully-lit display



Normal mode display



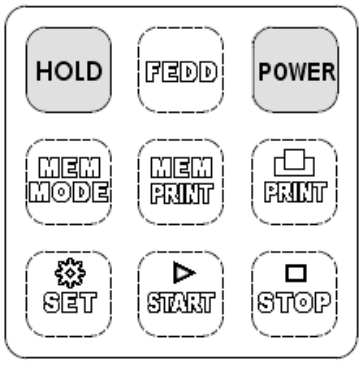
6. 2. Setting the time

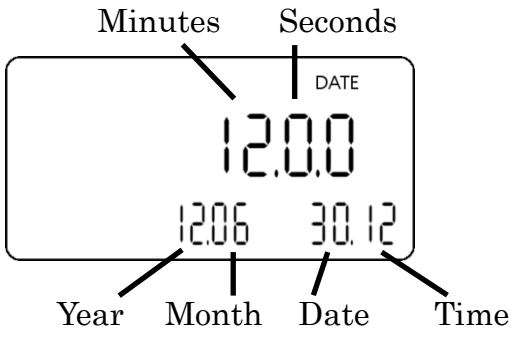
This product is equipped with clock functionality.

Perform the following procedure to configure the clock after you purchase the product or when you need to make adjustments.

To turn the power on after the main unit has been powered off, hold down the HOLD key and then press the POWER key.

The time configuration screen appears. The currently selected item flashes.





※ The “Seconds” field is fixed at “00”.

Press the START key to select the item you want to change, and then press the SET key to increase the value. After you have finished setting the "Minutes" field, press the START key to complete time configuration.

※ The clock displays time in the 24-hour format.

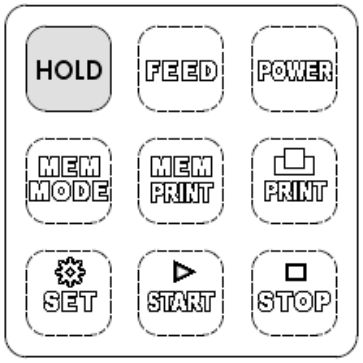
※ A lithium coil cell is used to back up the clock. When the battery power of the lithium coil cell is low, the configured time settings are lost and the wrong time may be displayed. In this case, the lithium coil cell needs to be replaced. Contact Anritsu Meter or your distributor and submit a request to replace the cell. The cell will be replaced at the customer's expense.

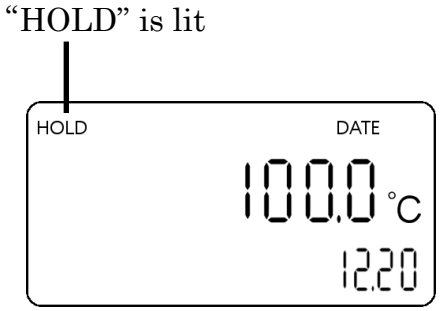
6. 3. HOLD function

To hold the currently measured temperature reading, press the HOLD key. Press the HOLD key again to release the temperature reading.

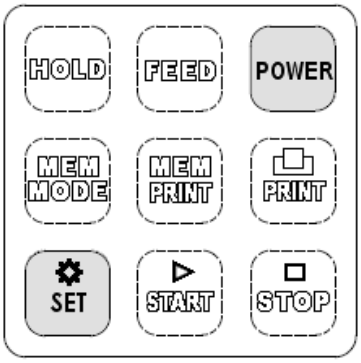
If you print measurement data while in HOLD mode, the currently held value (the value displayed on the screen) will be printed.

The HOLD key cannot be used during Interval printing or Numbered Count printing.





6. 4. Configuring the time mode



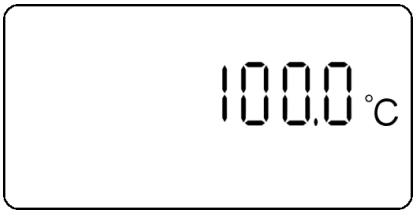
While the power of the main unit is off, hold down the SET key and press the POWER key to turn the power on. The unit enters Relative Time mode, and the word "DATE" and the current time disappear from the screen.

The current time is displayed in Absolute Time mode. To select this mode, hold down the SET key and press the POWER key while the power of the main unit is off. When the unit starts Interval printing while in Relative Time mode, the unit prints the measurement data as well as elapsed time, starting from 00(H):00(M):00(S), each time the set interval time period elapses.

Absolute Time mode

Current time
Hour:Minutes

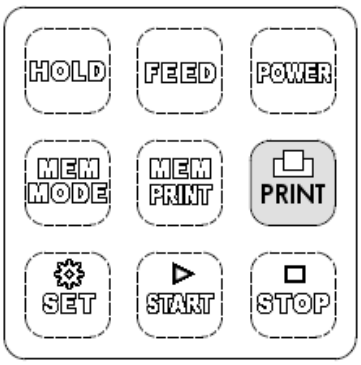
Relative Time mode



※ The unit is set to the Absolute Time mode when it is shipped from the factory. The current mode is held even after the unit is powered off.

7. Printer Functions

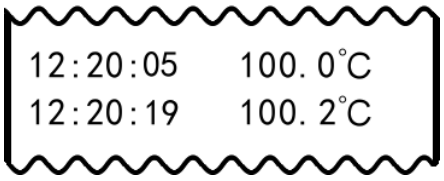
7. 1. Printing with the PRINT key



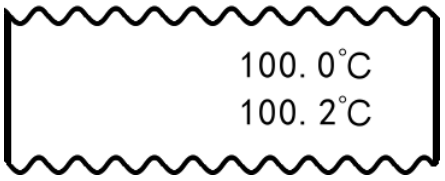
When you press the PRINT key during measurement, the unit immediately prints the current time and measured temperature value.

The current data is printed each time the PRINT key is pressed.

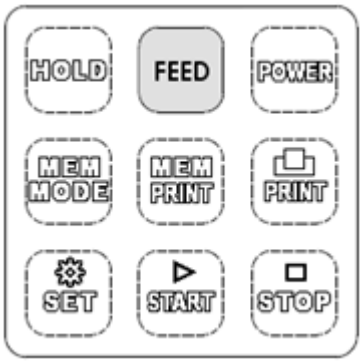
Absolute Time mode



Relative Time mode

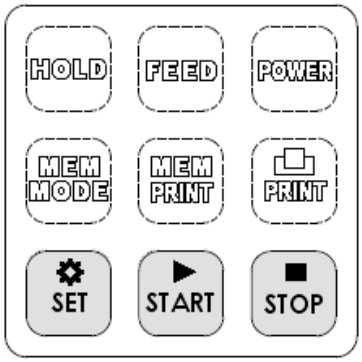


7. 2. Paper feeding with the FEED key



Press the FEED key to feed paper one line at a time or insert a blank line.

7. 3. Interval printing function

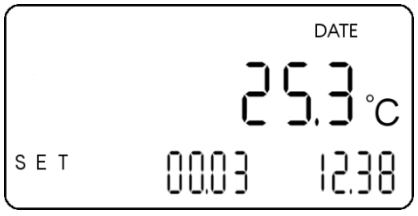


In this mode, the unit prints the time and measurement value at set time intervals.

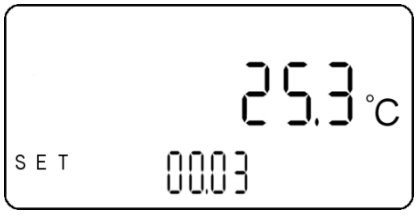
When you press the SET key, the default set interval ("00.03") and the word "SET" are displayed on the screen. For example, "00.03" indicates three seconds, and "01.00" indicates one minute.

3-second interval configuration screen

Absolute Time mode



Relative Time mode



When you press the SET key, the word "SET" on the screen flashes and the currently set interval is displayed. Each time you press the SET key, a different interval option is displayed.

The intervals are displayed in the following order: 3 seconds → 10 seconds → 30 seconds → 1 minute → 5 minutes → 10 minutes → 30 minutes → 60 minutes → Numbered Count measurement → Normal measurement.
Repeatedly press the SET key until the desired interval appears.
After you specify the desired interval, press the START key. The word "INT" on the screen lights up and the unit starts printing at the selected interval.
Press the STOP key to end Interval measurement.

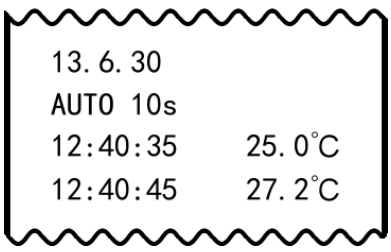
10-second interval measurement screen

Absolute Time mode

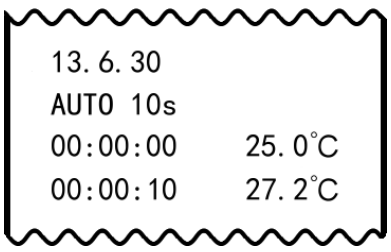
Relative Time mode

10-second interval printing

Absolute Time mode

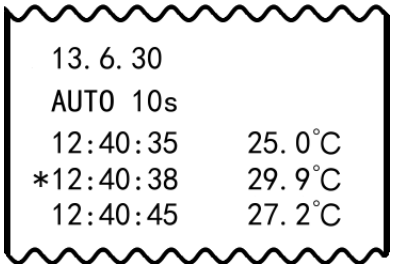


Relative Time mode

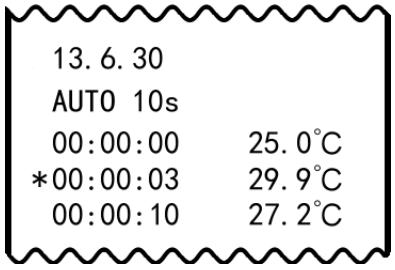


※ Press the PRINT key at anytime during Interval measurement to print the current measurement data. The data is preceded by an asterisk (∗) when it is printed.
Note that during Interval printing, operational lags in the printer may cause data to be printed slightly after the specified time.

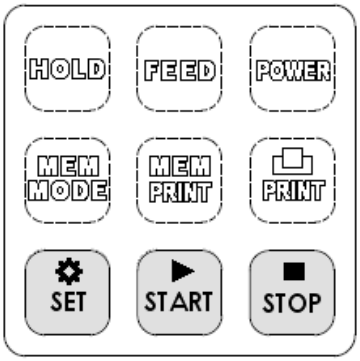
Absolute Time mode



Relative Time mode



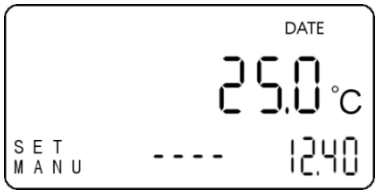
7. 4. Numbered Count printing function



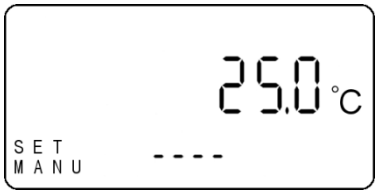
In this mode, the unit prints the measurement values and the measurement count whenever the START key is pressed.
Each time you press the SET key, the unit cycles through the available options in the following order: 3 seconds → 10 seconds → 30 seconds → 1 minute → 5 minutes → 10 minutes → 30 minutes → 60 minutes → Numbered Count measurement → Normal measurement

Repeatedly press the SET key until the word “Manual Number” appears.
The unit enters Numbered Count printing mode. The words “SET” and “MANU” are displayed in the lower left of the screen, and “---- (number)” is displayed in the bottom center.

Absolute Time mode



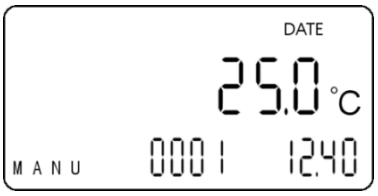
Relative Time mode



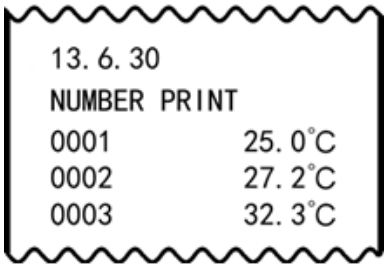
When you press the START key, the unit prints a measurement value. The measurements are numbered in order, beginning with “0001”.

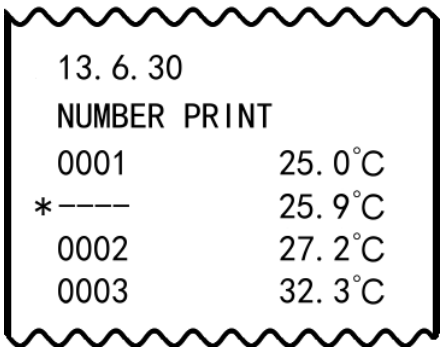
Each time you press the START key, a measurement value is printed and the count increases by one (“0002,” “0003,”…). At the same time, the count displayed in the lower right of the screen also increases by one.

Absolute Time mode



Relative Time mode





※ Press the PRINT key at anytime during Manual measurement to print the current measurement data. The data is preceded by an asterisk (＊) and “---- (number)” when it is printed.

Press the STOP key to end Manual measurement. “SET”, “MANU”, and “---- (number)” will be displayed in the same way they are displayed on the configuration screen.

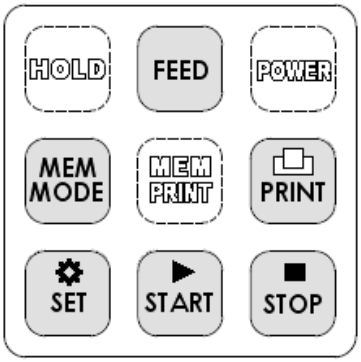
When you press the START key again, Manual measurement starts over from “0001”.

Press the SET key to exit Manual measurement and return to Normal measurement mode.

8. Memory Function

8. 1. Memory measurement mode

The Memory function makes it possible to batch print the measurement data stored in the internal memory. Thus, instead of printing while measurements are being conducted, you can select to print the data later after all the measurements are finished.



Press the MEM MODE key to enter Memory mode.

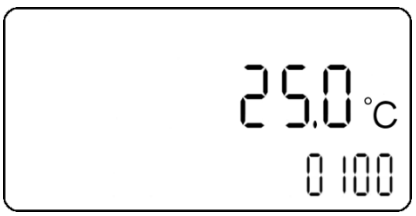
When you press the PRINT key, the current time and measured temperature value are stored in the memory. The number displayed in the lower right of the screen decreases by one. This number indicates the number of lines remaining in the memory.

When you press the FEED key, a paper feed is stored in the memory. The number displayed in the lower right of the screen decreases by one. This paper feed is output as a blank line during batch printing. Press the MEM MODE key again to exit Memory mode.

Absolute Time mode

Number of lines remaining in the memory

Relative Time mode



※ Up to 100 lines of data can be stored in the memory.

※ During Memory mode, the number of remaining lines in the memory is displayed in the lower right of the screen.
The number “0 (zero)” blinks when the number of lines remaining in the memory has reached zero. After this happens, the buzzer will sound each time you press the PRINT/FEED key or each time a set interval elapses in Interval mode.

8. 2. Printing data stored in the memory

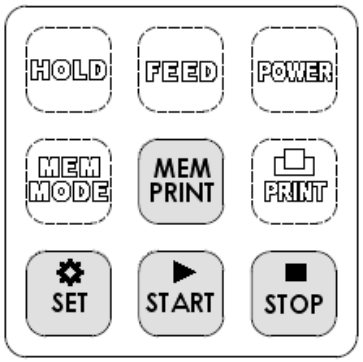
Press the MEM PRINT key to print data stored in the memory. You can specify the range of data to print as you check the stored temperature data.

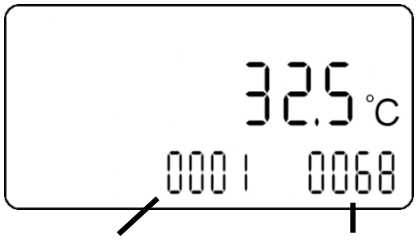
When you press the SET key, the number "0001" displayed in the lower left of the screen starts flashing. This number indicates the first data line stored in the memory.

Each time you press the SET key, the line number increases by one. Repeatedly press the SET key until you reach the line number that indicates the start of the desired print range.

At this time, the temperature which corresponds to the flashing line number will appear on the main display.

※ The word "FEEd" is displayed to indicate a paper feed stored in the memory.





Number of the first line in the print range

Number of the last line in the print range

Press the START key to confirm the setting. The number displayed in the lower left of the screen stops flashing, and the number displayed in the lower right starts flashing. This number indicates the last data line stored in the memory.

Each time you press the SET key, the line number decreases by one. Repeatedly press the SET key until you reach the line number that indicates the end of the print range.

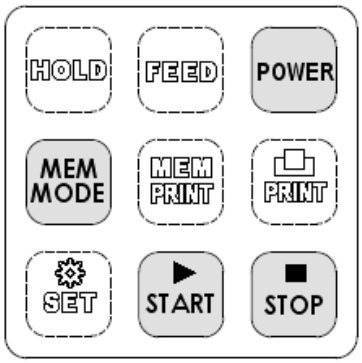
Press the START key to confirm the setting. The unit will then start printing the specified range of measurement data.

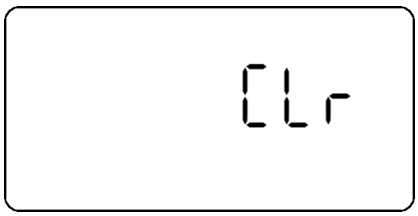
The unit returns to Normal measurement mode when printing is complete.

8. 3. Clearing the memory

While the power of the main unit is off, hold down the MEM MODE key and press the POWER key to turn the power on. The word “CLr” is displayed (flashing), and then the Clear Memory screen appears.

Press the START key to clear the memory, or press the STOP key to exit without deleting the data.



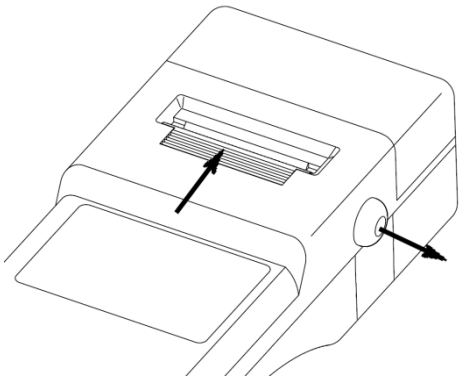


※ Once deleted, data can never be restored. Make sure the data is really the data you want to permanently remove.

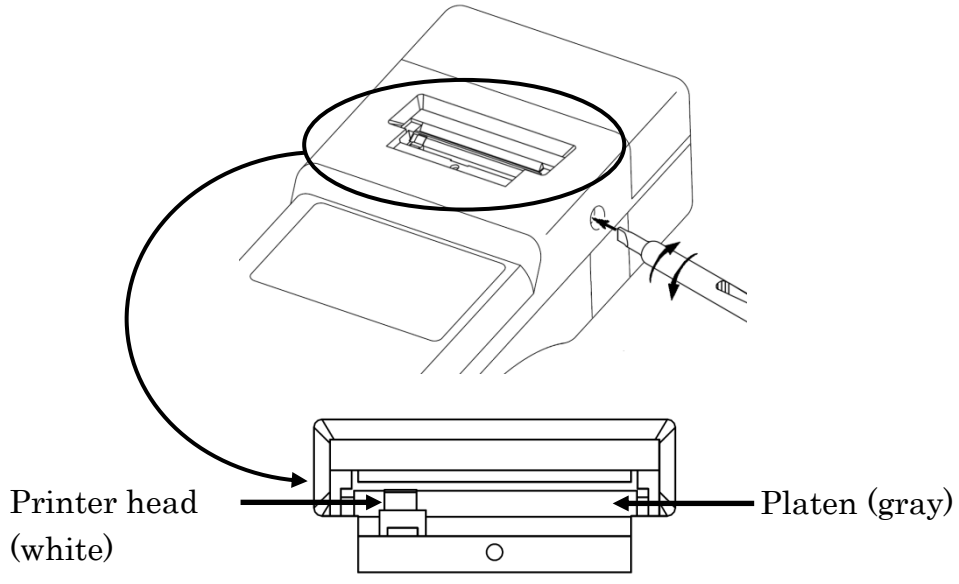
9. Fixing Paper Jams

If a paper jam occurs, perform the following procedure to remove the jammed paper from the printer:

(1) Push the paper cutter in the direction of the arrow (shown below), and then remove it.
Likewise, pull the printer gear cover in the direction of the arrow (shown below), and then remove it.



(2) If there is a paper jam in the printer head, use the paper jam fixer (straight blade screwdriver). After you remove the printer gear cover, insert the tool into the opening where the cover was located. Use the screwdriver to turn the gear, and then remove the jammed paper.



※ Handle the printer head and platen with care to avoid scratches.

※ If you are still unable to print after you remove the paper, the printer may be broken. Contact Anritsu Meter or your distributor and request to have the printer repaired.

※ Do not pull out the inserted paper in the opposite direction. It will cause breakdown.

(3) After you remove the jammed paper, perform the reverse of the procedure descibed in (1) to return the paper cutter and printer gear cover to their original positions.

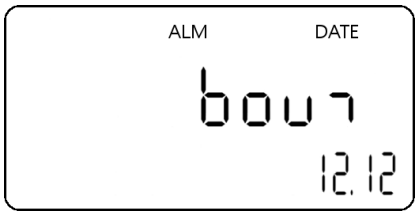
10. Error Messages

The following are examples of common error messages displayed by this measurement instrument. If any of these messages are displayed, follow the corresponding instructions described below to fix the problem.

(1) Disconnected sensor wire

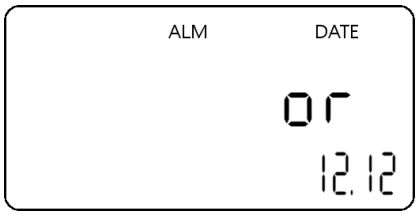
A "bout (burnout)" message is displayed when the sensor wire is severed or disconnected.

Replace or reconnect the sensor.

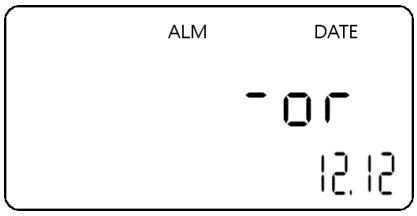


(2) Overrange

An overrange message is displayed when the measured temperature value exceeds the measureable range.



- An overrange messasge may also be displayed when the sensor is partially disconnected. If the measured temperature value is clearly within the measureable range, check the sensor.

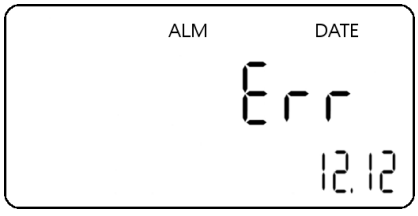


- An overrange error will not affect the performance of the instrument, but may cause the sensor to wear down. Move the sensor to a location where the temperature is within the acceptable range.

(3) Internal failure

The instrument needs to be repaired.

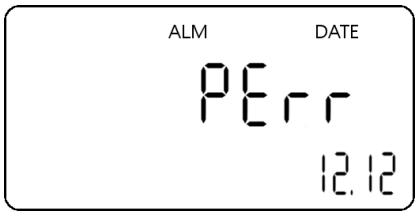
Contact Anritsu Meter or your distributor.



(4) Printer error

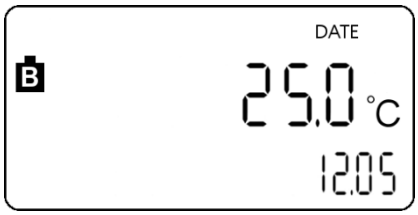
This message appears when there is a problem with the printer, such as a paper jam. Follow the procedure described in Section 9 “Fixing Paper Jams” to remove the jammed paper.

If you are still unable to print after you remove the jammed paper, the printer may be broken. Contact Anritsu Meter or your distributor and request to have the printer repaired.



(5) Low battery notice

When the batteries are depleted and need to be replaced, the low battery icon B on the LCD display will light up. Replace the batteries with new batteries.



(6) Low paper notice

The red bar on the printer paper indicates that only about 50 more lines can be printed. Replace the roll of paper with a new roll.

Always use the separately supplied paper specified by Anritsu Meter.

11. Maintenance

11. 1. Storing the Product

Do not store the product in any of the following locations:

- ☐ A location near a heating appliance or exposed to direct sunlight
- ☐ A location subjected to strong vibrations and shaking
- ☐ A location exposed to high humidity (85% RH or higher)
- ☐ A location exposed to extreme temperatures (higher than 50°C or lower than -20°C)
- ☐ A location exposed to dirt, dust, salt, or corrosive gases
- ☐ A location exposed to a strong electromagnetic field

※ When storing the product for an extended period of time, remove the batteries and then protect the product from damage using the box and other packing materials in which the product was originally packaged.

11. 2. Cleaning the product casing

If the casing is dirty, gently wipe it with a soft cloth slightly moistened with water or a neutral cleaning agent. Do not use alcohol, thinner, or benzene because they may deform or discolor the casing.

11. 3. Inspection

If you experience any problems while conducting measurements, or if there are any problems with the results, check the following points:

- ☐ The power switch is turned on but the product does not respond.
- ◆ Check the power switch.
- ◆ Check the battery voltage and polarity (+/-).
- ◆ When an AC adaptor is used, check the commercially available battery and the adaptor cable.
- ☐ Erroneous values are displayed.
- ◆ Check the sensor connection.
- ◆ Check the appearance of the sensor.
  Specifically, check to see if the contact has become disconnected or if the cord is severed.
- ◆ Check the area around the instrument. Move the instrument away from any large motors or other possible sources of noise.

※ Incorrect use of the sensor may result in erroneous results. Make sure to use the sensor properly.
If you use a sensor other than the one supplied by Anritsu Meter, pay special attention to the quality of the connector.

12. Specifications

Input	Type E or Type K thermocouple
Number of input points	One
Display	7-segment LCD (liquid crystal display)
Operation switch	Membrane keypad
Linearizer	Digital linearizer (JIS C 1602-1995 compliant)
Sampling time	See below
Signal source resistance	500Ω
Power supply	Four AA (LR6) alkaline dry cells or AC adaptor (supplied separately)
Operating environment	Temperature: 0 to 40°C, Humidity: 0 to 85% RH (no condensation)
Storage environment	Temperature: -20 to 50°C, Humidity: 0 to 80% RH (no condensation)
External dimensions	68 (W) × 201 (H) × 42 (D) mm
Weight	Approximately 350 g (including dry cells)
Accessories	Soft case, four AA (LR6) alkaline dry cells, paper jam fixer, User's Manual, test results sheet, warranty card, Printer paper
Memory	Flash memory
Internal battery	Lithium coil cell (used to back up the clock) Battery life: Approximately 5 years (in normal temperature range)

Sampling cycle and continuous operation (with AA alkaline dry cells)

Non-printing mode	Approx. 1 times/500ms	Approx. 110 hours
3-second interval	Approx. 1 times/500ms	Approx. 15 hours
10-second interval	Approx. 1 times/5s	Approx. 60 hours
30-second interval	Approx. 1 times/5s	Approx. 90 hours
1-minute interval	Approx. 1 times/10s	Approx. 120 hours
5-minute interval	Approx. 1 times/1m	Approx. 8 day
10-minute interval	Approx. 1 times/1m	Approx. 9 day
30-minute interval	Approx. 1 times/1m	Approx. 10 day
60-minute interval	Approx. 1 times/1m	Approx. 10 day

Temperature Characteristics

Input	Type E	
Measurement range	-200 to 800°C	
Resolution	1°C	0.1°C
Display range	-205 to 805°C	-104.9 to 504.9°C
Accuracy	More than 0°C ± (0.1% of reading + 1°C) Less than 0°C ± (0.5% of reading + 1°C)	More than 0°C ± (0.05% of reading + 0.2°C) Less than 0°C ±0.5°C
Reference contact compensation accuracy	± 0.2°C at 25°C ± 10°C	
Temperature coefficient	± 0.01% of measurement range/°C: Outside 25°C ± 10°C	

Input	Type K	
Measurement range	-200 to 1370°C	
Resolution	1°C	0.1°C
Display range	-205 to 1372°C	-104.9 to 504.9°C
Accuracy	More than 0°C ± (0.1% of reading + 1°C) Less than 0°C ± (0.5% of reading + 1°C)	More than 0°C ± (0.05% of reading + 0.2°C) Less than 0°C ±0.5°C
Reference contact compensation accuracy	± 0.2°C at 25°C ± 10°C	
Temperature coefficient	± 0.01% of measurement range/°C: Outside 25°C ± 10°C	