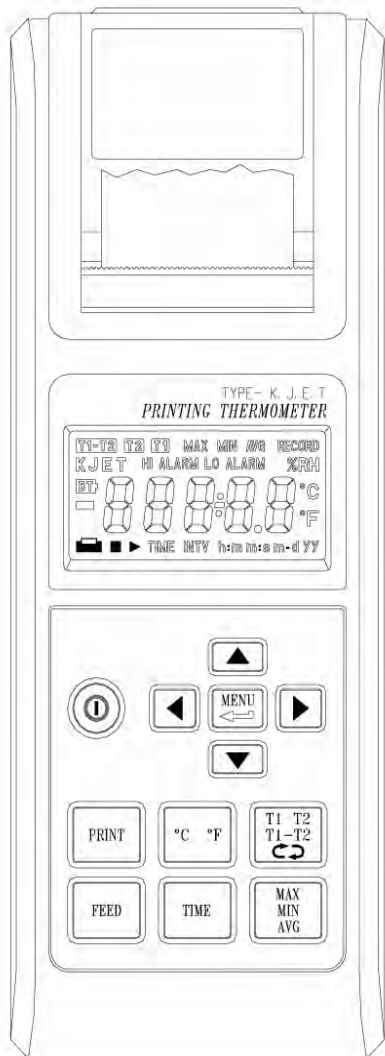


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WARNING: These products are not designed for use in, and should not be used for, human applications.

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I. SAFETY INFORMATION

- Read the following safety information carefully before attempting to operate or service the meter.
- Use the meter only as specified in this manual; otherwise, the protection provided by the meter may be impaired.
- Caution when working with voltages above 60V_{DC} or 24V_{AC} RMS. Such voltages pose a shock hazard.

Environment conditions

- ① Altitude up to 2000 meters
- ② Indoor use only
- ③ Relatively humidity 90% max.
- ④ Operation Temperature 0 ~ 50°C (32°F ~ 122°F)

Maintenance & Clearing

- ① Repairs or servicing not covered in this manual should only be performed by qualified personnel.
 - ② Periodically wipe the case with a dry cloth. Do not use abrasives or solvents on this instruments.
- Do not use abrasives or solvents on this instruments.

Safety symbols



Meter is protected throughout by double insulation or reinforced insulation.

When servicing, use only specified replacement parts.



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II. SPECIFICATIONS

2-1 General Information

Display : 4 1/2 LCD.

LCD Annunciator :

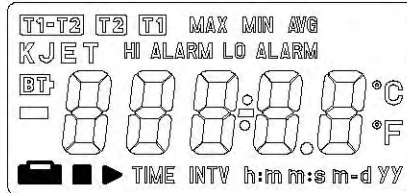


Fig-1

T1-T2 , **T2** , **T1** : Indicating function at channel.

MAX, MIN, AVG : Maximum or Minimum or Average of reading
 Average= $1/2(\text{Previous reading} + \text{Current reading})$

K J E T : Type K, J, E, T thermocouple.

HI ALARM : Over high temp point.

LO ALARM : Under/Equal Low temp point.

BT : Low battery symbol.

■ : Negative polarity; No symbol for positive polarity

°C, °F : Celsius unit or Fahrenheit.

🖨️ : Printer action symbol.

▶, ■ : Interval printing Start symbol/Stop symbol.

TIME : Calendar time.

INTV : Interval printing symbol.

h:m : Hour : Minute symbol.

m:s : Minute: Second symbol.

m-d : Month – Day symbol.

yy : Symbol year

🔢 : Seven segments for decimal count

Over Range Indication : **OL** or **-OL** appears.

Low Battery Indication :

BT shows up when the battery's voltage below the operating voltage.

Sampling Rate : about 1 time per second

Power Requirement :

6pcs 1.5V size AAA alkaline batteries or 9V DC adaptor /500mA minimum.

Battery Life (typ.) :

Approx. 30 hours. (interval printing = 60 minutes, excluding beeper)

70 hours (without printing & beeper)

Input protection : 60Vdc/24Vrms

Operating Temperature and Humidity :

0°C to 50°C (32°F to 122°F) below 90% RH

Storage Temperature and Humidity :

-10°C to 60°C (14°F to 140°F) below 70% RH

Dimensions : 193 (L) × 74 (W) × 37(H) mm

Weight :

Approx. 365g with batteries & thermo-paper.

Accessories :

Carrying case, Instruction manual, Batteries, 2 Rolls of thermo-paper, Alarm (OVER, UNDER) MINI DIN cable, type K probe.

Printer :

Thermo-printing type with 16 characters per line using 38mm width plain thermo-paper.

Instant printing : press-on printing anytime with 2 line of printing.

Interval printing : range from 00:00:03 to 23:59:59, according to interval time, continuous printing, can be set in two ways, stopped in three ways.

2-2 Electrical Specifications

Accuracy at 23°C ±5°C , below 80%RH

Type K: $\pm(0.01\% \text{ rdg} + 0.5^\circ\text{C})$ (0 ~ 982°C)

$\pm(0.05\% \text{ rdg} + 0.5^\circ\text{C})$ (982 ~ 1333°C)

$\pm(0.01\% \text{ rdg} + 0.9^\circ\text{F})$ (32 ~ 1800°F)

$\pm(0.05\% \text{ rdg} + 0.9^\circ\text{F})$ (1800 ~ 2431°F)

Type J: $\pm(0.01\% \text{ rdg} + 0.5^\circ\text{C})$ (0 ~ 760°C)

$\pm(0.01\% \text{ rdg} + 0.9^\circ\text{F})$ (32 ~ 1400°F)

Type E: $\pm(0.01\% \text{ rdg} + 0.5^\circ\text{C})$ (0 ~ 703°C)

$\pm(0.01\% \text{ rdg} + 0.9^\circ\text{F})$ (32 ~ 1297°F)

Type T: $\pm(0.01\% \text{ rdg} + 0.5^\circ\text{C})$ (0 ~ 400°C)

$\pm(0.01\% \text{ rdg} + 0.9^\circ\text{F})$ (32 ~ 752°F)

Type K/J/E/T: $\pm(0.5\% \text{ rdg} + 0.7^\circ\text{C})$ (-200 ~ 0°C)

$\pm(0.5\% \text{ rdg} + 1.4^\circ\text{F})$ (-328 ~ 32°F)

Resolution : 0.1°C/0.1°F

Temperature Coefficient:

0.1 times the applicable accuracy specification per °C from 0°C to 18°C and 28°C to 50°C (32°F to 64°F and 82°F to 122°F)

Measurement Range:

Type K: -200 ~ 1333°C (-328 ~ 2431°F)

Type J: -200 ~ 760°C (-328 ~ 1400°F)

Type E: -200 ~ 703°C (-328 ~ 1297°F)

Type T: -200 ~ 400°C (-328 ~ 752°F)

III. NAME OF PARTS AND POSITION

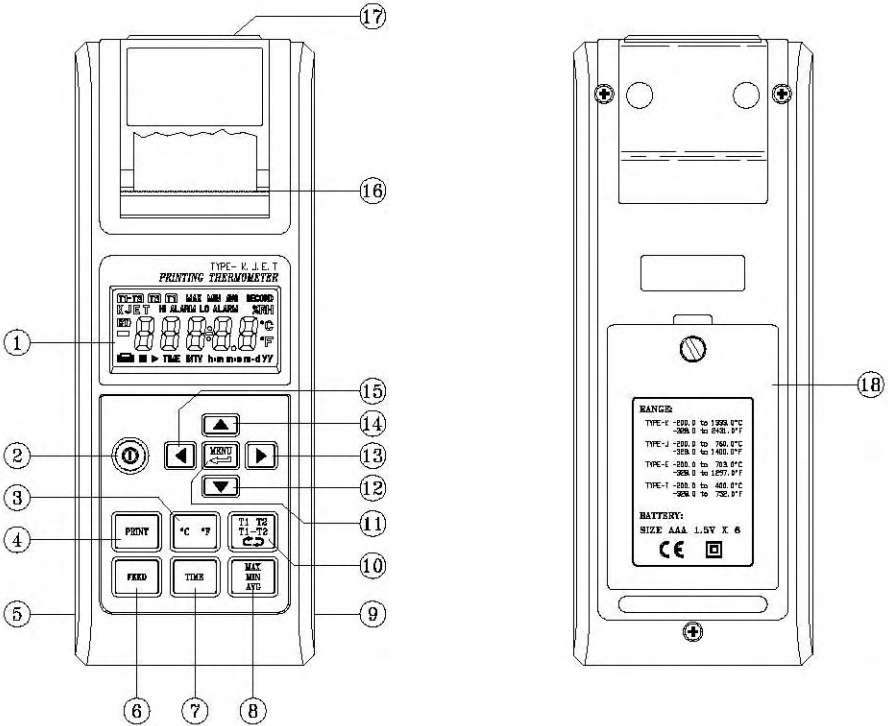


Fig-2

1. LCD :
Measured values, unit ,symbols, and decimal points are displayed.
2. POWER :
Button for power on/off
3. UNIT :
Button for exchanging temperature unit °C and °F.

4. PRINT :

① Button for start printing currently. The format as below:

LINE 1 1 0 : 5 1 : 1 2 1 1 - 0 2
LINE 2 T 1 K - 0 0 2 3 . 0 °C

Line 1 printing time hour: minute: second, month- day, line 2 printing measuring channel, type, value and unit.

- ② Stop interval printing at any time and printer will print current data.
- ③ Press this button for 2 seconds, the printer will be set to interval printing status, and won't stop unless this button is pressed again or FEED button is pressed.

5. 9V-ADAPTOR SOCKET (3.5 φ)

6. FEED PAPER (Fig-3) :

- ① Button for moving forward thermo-paper one line.
- ② Perform force stop printing, and skip any printing data.

7. TIME :

Button for calendar.

8. MAX / MIN / AVG :

Button for circularly selecting maximum, minimum and average of reading on measuring channel T₁/T₂ /T₁-T₂.

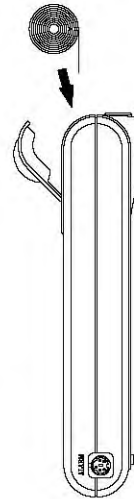


Fig-3

9. Hi/ Low Alarm output connector :

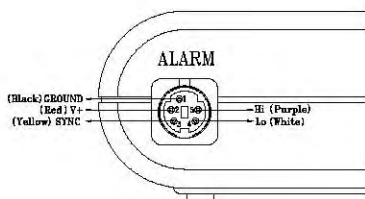


Fig-4

Pin 1: GND (external supply low voltage)

Pin 2: VCC (external supply high voltage)

Pin 3: SYNC(external trigger signal)

Pin4 (HiAlarm) and pin5 (LowAlarm) signals have to be synchronized with pin3. The pin5 and pin4 will not function (always low) unless SYNC (pin3) is in the high state. If SYNC is a low signal, then pin4 and pin5 will be in the low state.

Pin4¹: HiAlarm

If the reading is higher than the high alarm point, then (pin 4) will be in high state, otherwise, in Low state.

Pin 5¹: LoAlarm

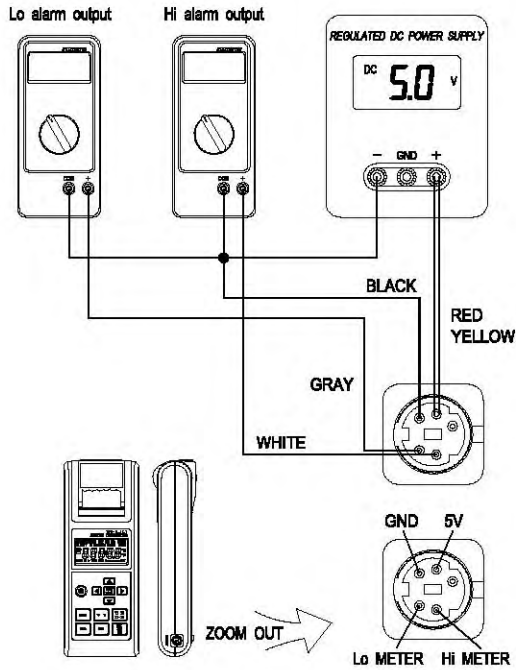
If the reading is lower than / equal the low alarm point, (pin 5) will be in high state, otherwise, in low state.

¹The output of Pin 4 and 5 might delay 0.4 sec due to the A/D scanning time in the data logger.

Description of the MINI DIN cable:

- ① Red wire : VCC (external supply high voltage)
- ② Black wire : GND (external supply low voltage)
- ③ Yellow : SYNC (external trigger signal)
- ④ White : HiAlarm
- ⑤ Purple : LowAlarm

Note: voltage VCC to GND is 16V Maximum, 5V Minimum.
 $GND \leq SYNC \leq VCC$



Example :

Hi Alarm= 1300.5°C , Lo Alarm= -50.5°C

If LCD reading $\geq 1300.5^\circ\text{C}$

Result : Hi Alarm output reading approx 5V

Lo Alarm output reading approx 0V

If LCD reading $\leq -50.5^\circ\text{C}$

Result : Lo Alarm output reading approx 5V

Hi Alarm output reading approx 0V

Example :

Hi alarm= 25.5°C , Lo alarm= 25.5°C

If LCD reading = 25.5°C

Result : Hi Alarm output reading approx 5V

Lo Alarm output reading approx 5V

10. T₁/T₂/T₁-T₂ measuring :
 Button for select display methods, T₁, T₂, T₁-T₂, cycle and normal cycle mode means it will perform T₁, T₂, T₁-T₂ measuring circularly.
11. MENU :
 Button for start/stop set-up parameters mode.
 The value will be increased much faster if user does not release the key.
12. UP :
 Button for increasing the value of parameters, increasing the parameter rapid.
13. RIGHT : Button for moving to the desired parameter.
14. DOWN : Button for decreasing the value of parameters.
15. LEFT :
 Button for moving to the desired parameter.
 Parameters (in sequence):
 K/J/E/T (type of thermocouple)
 00/01 (interval printing enable or disable)
 °C/°F (high/ low alarm temperature unit)
 Hi/Lo Alarm (high/low alarm point ranging from measure highest and measure lowest of temp type.)
 Ex: K Type (1333.3 ~ -200.0°C)
 J Type (760.5 ~ -200.0°C)
 INTV (printing interval ranging from 00h:00m:03s to 23h:59m:59s)
 Interval printing start/ stop time (ranging from 00h:00m to 23h:59m)
 Calendar year (ranging from 1900 to 2999 year)
 Calendar month-day (ranging from 01-01 to 12-31)
 Calendar hour-minute (ranging from 00h:00m to 23h:59m)
 Calendar minute-second (ranging from 00m:00s to 59m:59s)
16. Way out for thermo-paper.
17. Temperature probe sockets.
18. Battery cabinet and cover :
 6 pcs 1.5V size AAA alkaline batteries.

IV. PRECAUTIONS AND PREPARATIONS FOR MEASUREMENT

1. Before using this instrument, examine it to make sure no shipping damage has occurred.
2. Save all packing materials until you are sure this unit is operating normally.
3. Be sure the batteries are correctly placed in the case or the 9V adaptor is in the correct connection.
4. An unsecured battery cover will cause error measuring.
5. To avoid battery leakage, remove batteries if this meter will not be used for a long time.
6. Do not use or store this meter outside the operating / storage environment.

V. OPERATIONAL GUIDE



- A. This meter is supplied with batteries and an optional 9V adaptor.

If using batteries :






Remove the rear cover and install batteries. Pay attention to the polarity of battery socket.

If using 9V adaptor, make sure there is a firm connection to the adaptor socket of the meter.

Choose the right temperature probe for your application and insert it into the temperature probe socket.

- B. Press the  button to power on the meter. If “” appears, it indicates no temperature probe or the probe is broken.

To enter a test model first to display a version number, turn power on. Before entering measuring mode, “16” will be shown on the LCD.

- C. To start the parameter setting, press “” button, to stop, press it again. Press left and right switch ( or  button) to select the type of parameter; up and down switch ( or  button) to increase or decrease the value of parameters. When modifying parameters, the symbol will flick.

The parameter in detail sequence:

1. INTERVAL PRINTING STATUS (01/ENABLE, 00/DISABLE):
LCD displays as Fig-5



Fig-5

2. TYPE OF THERMOMETER (K/J/E/T) : LCD displays as Fig-6



Fig-6

3. ALARM UNIT (°C/°F):LCD displays as Fig-7



Fig-7

4. FIRST THREE DIGITS IN HI ALARM (-399~399):
LCD displays as Fig-8

Example :
Hi Alarm = 1234.5°C



Fig-8

5. LAST TWO DIGITS IN HI ALARM (00~99):
LCD displays as Fig-9



Fig-9

6. FIRST THREE DIGITS IN LO ALARM (-399~399):
LCD displays as Fig-10

Example :
Lo Alarm = -50.8°C



Fig-10

7. LAST TWO DIGITS IN LO ALARM (00~99):
LCD displays as Fig-11



Fig-11

8. HOUR OF INTERVAL PRINTING (00~23):
LCD displays as Fig-12



Fig-12

9. MINUTE OF INTERVAL PRINTING (00~59):
LCD displays as Fig-13



Fig-13

10. SECOND OF INTERVAL PRINTING (00~59):
LCD displays as Fig-14



Fig-14

11. HOUR OF START INTERVAL PRINTING TIME (00~23):
LCD displays as Fig-15



Fig-15

12. MINUTE OF START INTERVAL PRINTING TIME(00~59):
LCD displays as Fig-16



Fig-16

※ NOTE : Start print time must less than stop print time.

13. HOUR OF STOP INTERVAL PRINTING TIME (00~23) : LCD displays as Fig-17



Fig-17

14. MINUTE OF STOP INTERVAL PRINTING TIME (00~59): LCD displays as Fig-18



Fig-18

15. FIRST TWO DIGITS OF CALENDAR YEAR (19~29): LCD displays as Fig-19



Fig-19

16. LAST TWO DIGITS OF CALENDAR YEAR (00~99): LCD displays as Fig-20



Fig-20

17. MONTH DIGITS OF CALENDAR MONTH-DAY (01~12): LCD displays as Fig-21



Fig-21

18. DAY DIGITS OF CALENDAR MONTH-DAY (01 ~31):
LCD displays as Fig-22

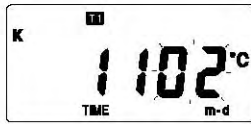


Fig-22

19. HOUR DIGITS OF CALENDAR HOUR-MINUTE (00 ~23):
LCD displays as Fig-23



Fig-23

20. MINUTE DIGITS OF CALENDAR HOUR-MINUTE (00 ~59):
LCD displays as Fig-24



Fig-24

21. SECOND DIGITS OF CALENDAR MINUTE-SECOND (00 ~59):
LCD displays as Fig-25

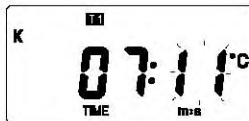


Fig-25

If interval printing is enabled by setup parameters, then the printer will action as below :

11 : 54 : 00 11-02
INTV : 00 : 00 : 10

First two lines:

Line1: hour:minute:second month-day (start printing time)
Line2: interval printing time hour:minute:second

Following two lines:

Line1: hour:minute:second month-day (interval printing time)
Line2: measuring channel, type, value and unit.

Last two lines:

Line1: hour:minute:second month-day (stop pointing time)
Line2: interval printing time hour:minute:second

※ NOTE : If print button is pressed during this period, then the last two lines won't be printed.

If print button is held for 2 seconds, it will perform as the following :

12 : 58 : 18 11-02
INTV : 00 : 00 : 10

12 : 58 : 28 11-02
T1 K - 0039.5 °C

12 : 58 : 38 11-02
T1 K - 0L. °C

12 : 58 : 48 11-02
T1 K - 0L. °C

12 : 58 : 58 11-02
T1 K - 0035.2 °C

12 : 59 : 08 11-02
T1 K - 0L. °C

12 : 59 : 18 11-02
T1 K - 0037.0 °C

12 : 59 : 20 11-02
T1 K - 0L. °C

First two lines:

Line1: hour:minute:second month-day

Line2: interval printing time hour:minute:second

Following lines:







Line1: hour:minute:second month-day(interval printing time)

Line2: function test channel, type and reading with polarity,
decimal point and unit.





To stop printing, press PRINT button or FEED button if FEED button is

VI. HOW TO SETUP INTERVAL PRINT

1. Setup interval print with 24 hours limitation.

- ① Entering menu mode by pressing MENU button.
- ② Enable interval print bit as described in page 11 fig-5 by pressing  /  button.
- ③ Use  /  to change menu function to interval print function as described in page 13 fig-12.
- ④ Setup Interval/Start/Stop print time by pressing  /  button as described in Page 13, 14, Fig-12 to fig-18, note that the start print time must less than the stop print time in this mode.
- ⑤ Press MENU again to enter normal function. The INTV symbol will be shown on LCD.

2. Setup interval print without 24 hours limitation.

- ① Entering Menu mode by pressing MENU button.
- ② Disable Interval Print bit as described in page 11 fig-5 by pressing  /  button.
- ③ Setup Interval Print Time by pressing  /  button as page 13, fig-12 to fig-14.
- ④ Press MENU again to enter normal function.
- ⑤ Press and hold PRINT button for about 3 second, the INTV symbol will be shown on LCD.

3. During the Interval Print period, no button can be available except PRINT and FEED button. When the PRINT button has been pressed, one more line will be printed, and the printing function will be stopped at once when the FEED button has been pressed.

4. Sample printing

normal printing T1 status :

11 : 53 : 32 02-17
T1 K 0020.7°C

normal printing T2 status :

11 : 54 : 00 02-17
T2 K -0020.0°C

normal printing T1-T2 status :

11 : 54 : 09 02-17
T12K OL.°F

scan printing status :

11 : 54 : 22 02-17
T1 K 0021.6°C

11 : 54 : 23 02-17
T2 K 0021.6°C

11 : 54 : 26 02-17
T12K 0000.0°C

VII. BATTERY REPLACEMENT

STEP:

1. When battery power is not sufficient, **BT** will be shown on the LCD. Replace with 6 pcs new of 1.5V size AAA batteries.
2. Remove any temperature probe and turn the meter power to off, then remove the battery cover.
3. Remove batteries from the holder and replace it with 6 pcs of 1.5V size AAA alkaline batteries.
4. Secure the battery cover.

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OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

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3. Repair instructions and/or specific problems relative to the product.

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- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

DATA ACQUISITION

- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Datalogging Systems
- ☑ Recorders, Printers & Plotters

HEATERS

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments