

OMEGA

HH507R
Digital Thermometer



OMEGAnetSM On-Line Service
<http://www.omega.com>

Internet e-mail
info@omega.com

Servicing North America:

USA: ISO 9001 Certified
One Omega Drive, Box 4047
Stamford, CT 06907-0047
Tel: (203) 359-1660
FAX: (203)359-7700
e-mail: info@omega.com

Canada:
976 Bergar
Laval (Quebec) H7L5A1
Tel: (514) 856-6928
FAX: (514) 856-6886
e-mail: info@omega.com

For immediate technical or application assistance:

USA and Canada:
Sales Service: 1-800-826-6342 / 1-800-TC-OMEGASM
Customer Service: 1-800-622-2378 / 1-800-622-BESTSM
Engineering Service: 1-800-872-9436 / 1-800-USA-WHENSM
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

Mexico and Latin America:
Tel: (95) 800-TC-OMEGASM
FAX: (95) 203-359-7807
En Español: (203) 359-7803
e-mail: espanol@omega.com

Servicing Europe:

Benelux:
Postbus 8034, 1180 LA Amstelveen,
The Netherlands
Tel: (31) 20 6418405 FAX: (31) 20 6434643
Toll Free in Benelux: 06 0993344
e-mail: nl@omega.com

Czech Republic:
ul. Rude armady 1868, 733 01 Karvina-
Hranice, Czech Republic
Tel: 420 (69) 6311627 FAX: 420 (69) 6311114
e-mail: czech@omega.com

France:
9, rue Denis Papin, 78190 Trappes
Tel: (33) 130-621-400 FAX: (33)130-699-120
Toll Free in France: 0800-4-06342
e-mail: france@omega.com

Germany/Austria:
Daimlerstrasse 26, D-75392
Deckenpfronn, Germany
Tel: 49 (07056) 3017 FAX: 49 (07056) 8540
Toll Free in Germany: 0800 82 66342
e-mail: germany@omega.com

United Kingdom: ISO 9002 Certified
One Omega Drive
Riverbend Technology Centre Northbank, Irlam,
Manchester, M44 5EX, England
Tel: 44 (161) 777-6611 FAX: 44 (161) 777-6622

Toll Free in England: 0800-488-488
e-mail: sales@omega.com.uk

It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification. The information contained in this document is believed to be correct but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient connected application.

INTRODUCTION

This instrument is a 4½ digit, compact-sized portable digital thermometer designed to use external K/J/T/E/R/S/N-type thermocouples as temperature sensor. Temperature indication follows Reference Temperature/Voltage Tables (N.I.S.T. Monograph 175 Revised to ITS-90) for K/J/T/E/R/S/N-type thermocouples. One K-type thermocouple are supplied with the thermometer.

SAFETY INFORMATION

It is recommended that you read the safety and operation instructions before using the thermometer.

WARNING


To avoid electrical shock, do not use this instrument when working voltages at the measurement surface over 24V AC or DC.

WARNING

To avoid damage or burns, do not make temperature measurement in microwave ovens.

CAUTION

Repeated sharp flexing can break the thermocouple leads. To prolong lead life, avoid sharp bends in the leads, especially near the connector.

The  symbol on the instrument indicates that the operator must refer to an explanation in this manual.

SPECIFICATIONS

ELECTRICAL

Temperature Scale: Celsius or Fahrenheit user-selectable
Measurement Range:

Thermocouple	Range
K-TYPE	-200°C to 1372°C, -328°F to 2501°F
J-TYPE	-210°C to 1050°C, -346°F to 1922°F
T-TYPE	-200°C to 400°C, -328°F to 752°F
E-TYPE	-210°C to 790°C, -346°F to 1454°F
R-TYPE	0°C to 1767°C, 32°F to 3212°F
S-TYPE	0°C to 1767°C, 32°F to 3212°F
N-TYPE	-50°C to 1300°C, -58°F to 2372°F

Resolution:

K-TYPE	0.1°C, 0.1°F (0°F to 700°F) 0.2°F on other range
J-TYPE	0.1°C, 0.1°F (0°F to 500°F) 0.2°F on other range
T-TYPE	0.1°C, 0.1°F (0°F to 600°F) 0.2°F on other range
E-TYPE	0.1°C, 0.1°F (0°F to 450°F) 0.2°F on other range
R-TYPE	1°C, 1°F
S-TYPE	1°C, 1°F
N-TYPE	0.1°C, 0.2°F

Accuracy: Accuracy is specified for operating temperatures over the range of 18°C to 28°C (64°F to 82°F), for 1 year, not including thermocouple error.

K/J/T/E-TYPE $\pm(0.05\% \text{ rdg} + 0.3^{\circ}\text{C})$ -50°C to 1370°C
 $\pm(0.05\% \text{ rdg} + 0.7^{\circ}\text{C})$ -50°C to -210°C
 $\pm(0.05\% \text{ rdg} + 0.6^{\circ}\text{F})$ -58°F to 2498°F
 $\pm(0.05\% \text{ rdg} + 1.4^{\circ}\text{F})$ -58°F to -346°F

N-TYPE $\pm(0.05\% \text{ rdg} + 0.7^{\circ}\text{C})$ -50°C to 0°C
 $\pm(0.05\% \text{ rdg} + 0.3^{\circ}\text{C})$ 0°C to 1300°C
 $\pm(0.05\% \text{ rdg} + 1.4^{\circ}\text{F})$ -58°F to 32°F
 $\pm(0.05\% \text{ rdg} + 0.6^{\circ}\text{F})$ 32°F to 2372°F

R/S-TYPE $\pm(0.05\% \text{ rdg} + 2^{\circ}\text{C})$ 0°C to 1767°C
 $\pm(0.05\% \text{ rdg} + 4^{\circ}\text{F})$ 32°F to 3212°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).

Input Protection: 24V dc or 24V ac rms maximum input voltage on any combination of input pins.

Reading Rate: one time per second.

Input Connector: Accepts standard miniature thermocouple connectors (flat blades spaced 7.9mm, center to center).

ENVIRONMENTAL

Ambient Operating Ranges: 0°C to 50°C (32°F to 122°F) <80% R.H.

Storage Temperature: -20°C to 60°C (-4°F to 140°F) <70% R.H.

GENERAL

Display: 4½ digit liquid crystal display (LCD) with maximum reading of 9999.9.

Overload: "----.-" is display.

Battery: Standard 9V battery.

Battery Life: 100 hours typical with carbon zinc battery.

Auto power off: The meter key switch inactive for more than 30 minutes,
press power key to resume operation.

Dimensions: 192mm(H) x 91mm(W) x 52.5mm(D).

Weight: 365g.

OPERATING INSTRUCTIONS

① ① Power Switch

The ① key turns the thermometer on or off. In the MIN MAX record mode can not power off, must leave MIN MAX record mode then power off.

② °C/°F Selecting the Temperature Scale

Readings are dual displayed in either degrees Celsius(°C) or degrees Fahrenheit(°F). When the thermometer is turned on, it is set to the temperature scale that was in use when the thermometer was last turned off. To change the temperature scale, press the °C/°F key.

③ HOLD Mode (only Main display)

Pressing the HOLD key to enter the Data Hold mode, the "HOLD" annunciator is displayed. When HOLD mode is selected, the thermometer held the present readings and stops all further measurements.

Pressing the HOLD key again to cancel HOLD mode causing thermometer to resume taking measurements.

In the MIN/MAX recording mode, press HOLD key to stop the recording. Press HOLD key again to resume recording. (Previously recorded reading are not erased).

④ **TIMER STOP-WATCH Mode**

Press TIMER STOP-W key to enter stop-watch mode stop-watch is displayed in second display. Press start/stop key to toggle stop-watch starts and stops (Time goes up to 99 minutes & 59.9 seconds). In the this mode the automatic power-off feature is disabled.

Press Clear key to zero the stop-watch.

Press TIMER STOP-W key again to exit the stop-watch mode.

⑤ **K/J/T/E/R/S/N T1 Input Thermocouple Type Select (Main display)**

The TYPE key circulating selects the K/J/T/E/R/S/N type thermocouple as input.

When the thermometer is turned on, it is set to the type selected that was in use when the thermometer was last turned off.

⑥ **MIN MAX with Time record Mode (only Main display)**

Press MIN MAX key to enter the MIN MAX Recording mode, (displays the Maximum reading with time, Minimum reading with time and Average reading stored in record mode). In the this mode the automatic power-off feature is disabled and ① key, °C/°F key, REL key, SET key, Hi/Lo Limits key and TYPE key are disabled.

The beeper emits a tone when a new minimum or maximum value is recorded.

Push MIN MAX key to cycle through the Max/Min/Avg/Present readings. If an overload is recorded, the averaging function is stopped and average value display "----.-".

The true average of all the reading taken over at least 22 hours period can be displayed. If 22 hours is exceeded, new averages are no longer calculated. The last calculated value is retained as the average reading, but the actual minimum and maximum reading will continue to be captured.

In the this mode, press HOLD key to stop the recording of readings, all values are frozen, press again to restart recording.

To prevent accidental loss of MIN, MAX and AVG data, in this mode can only be cancelled by pressing and hold down the MIN MAX key for 2 seconds to exit and erased recorded readings.

⑦ **REL Relative mode (only Main display)**

Pressing REL key to enter the Relative mode, zero the display, and store the displayed Reading as a reference value and annunciator REL is displayed. Press REL key again to exit the relative mode.

The relative value can also be entered by the user. (See "SET mode" later in this manual.)

When the desired Relative value has been entered, press REL key to enter the Relative mode, press SET key use set Relative value as a reference value. Press REL key again to exit the relative mode.

In the Relative mode, the value (can not $\geq \pm 3000.0$ counts) shown on the LCD is always the difference between the stored reference and the present reading.

⑧ **Hi/Lo LIMITS mode (only Main display)**

Press Hi/Lo LIMITS key to enter the Hi/Lo Limits comparative mode, "LIMIT" is displayed. In this mode the automatic power-off feature is disabled and REL key, HOLD key, MAX/MIN key are disabled, when input temperature value exceed Hi. The beeper emits a continuity pulse tone and "Hi" is displayed, and when input temperature value exceed Lo value. The beeper emits a discontinuous pulse tone and "Lo" is displayed. Press Hi/Lo LIMIT key again to exit the Hi/Lo LIMIT mode.

⑨ **SET mode (Relative value set, Time set and Hi/Lo Limits value set and Time set)**

1. Press SET key to enter Relative value SET mode (Press ENTER key can escape relative value set mode), REL set mode. = = = =. = is displayed in main display. Relative value is entered via overlay numbers, when you want to get negative values push (- 0) key for end of numbers, then press overlay ENTER key, stored the relative value, enter Hi/Lo Limits value set mode.
2. Hi Limit value set mode, (Press ENTER key can escape Hi Limit value set mode), = = = =. = is displayed in main display, Hi Limit value is entered via overlay numbers, when you want to get negative values push (- 0) key for end of numbers, then press overlay ENTER key, stored the Hi Limit value, enter Lo Limit value set mode (Press ENTER key can escape Lo Limit value set mode), = = = =. = is displayed in main display, Lo Limit value is entered via overlay numbers, when you want to get negative values push (- 0) key for end of numbers, then press overlay ENTER key, stored the Lo Limit value, enter Time set mode.

3. Time set mode, (Press ENTER key can escape Time set mode) = : = = = is displayed in third display. Time (hours, minutes, seconds) value is entered via overlay numbers, then press overlay ENTER key. Time start from set time value and exit set mode.

⑩ **Relative value Recall display mode**

Press REL RECALL key to display the Relative set value on second display. Press REL RECALL key again to exit this mode.

⑪ **Hi/Lo Limits value Recall display mode**

Press Hi/Lo RECALL key to display the Hi set Limit value on second display. Press Hi/Lo RECALL key again to display the Lo Limits set value on second display. Press Hi/Lo RECALL key again to exit this mode.

⑫ **"*" Button**


Press "*" button to toggle on and off of backlight. The backlight will switch-off automatically after 60 seconds.

OPERATOR MAINTENANCE

WARNING

To avoid possible electrical shock, disconnect the thermocouple connectors from the thermometer before removing the cover.

Battery Replacement

Power is supplied by a 9 volt "transistor" battery. The "" appears on the LCD display when replacement is needed. To replace the battery, remove the two screws from the back of the meter and lift off the battery cover. Remove the battery from battery contacts.

RS-232 Operation Using Quick BASIC

The following example shows how to send command instruction and receive data responses over the RS-232 interface using Quick BASIC.

The program example is set up on "COM1".

```
CLS
E$ = "A"
ST1:
CLOSE #1
OPEN "COM1:1200,E,7,1,DS,RS" FOR OUTPUT AS #1
PRINT #1, E$;
CLOSE #1
OPEN "COM1:1200,E,7,1,DS,RS" FOR RANDOM AS #1
ST2:
INPUT #1, A$
B$ = MID$(A$, 2, 6)
DEC = 0
F$ = "0123456789ABCDEF"
N = 6
FOR I = 0 TO 5
    C$ = MID$(B$, N, 1)
    N = N - 1
    D = INSTR(F$, C$) - 1
    DEC = DEC + (16 ^ I) * D
NEXT
DEC = DEC / 1000
C$ = MID$(A$, 1, 1)
```

```
IF C$ = "-" THEN
  DEC = DEC * -1
END IF
CLS
LOCATE 13, 34
PRINT USING "#####.#"; DEC
E$ = INKEY$
IF E$ = "" THEN
  GOTO ST2
END IF
GOTO ST1
```

RS-232 Transmit and Receive Comammand Summary

1. Control letter should use Capital Letter.
2. If you write you own program, the host computer must send the "A" letter to activate data transmission.
3. If you should stop data transmission the host computer must send the "B" letter to extend battery life.
4. Communication Parameters

Baud rate: 1200

Parity check: EVEN

Data bits: 7

Stop bits: 1

"A" Activate data transmission

"B" Stop data transmission

"C" °C/°F Key

"D" HOLD Key

"E" TIMER STOP-W Key

"F" TYPE Key (main display)

"G" MIN/MAX Key

"H" Exit record mode

"I" REL Key

"J" LIMITS Key

"K" REL RECALL Key

"L" Hi/Lo RECALL Key

"M" " * " Key

"P" Turn off power of meter

OUTPUT DATA FORMATS

The data format consists of 32 bytes.

byte

0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6

S	H	H	H	H	H	H	H	A	S	H	H	H	H	H	H	A
T1 present status									Not Used							

1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3

7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2

D	D	D	D	D	D	A	A	A	A	A	A	A	A	A	A	CR	nl
-3 rd display reading-						Meter status											

S: Negative sign or positive sign

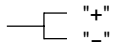
H: Hexadecimal digits


D: Numeric digits

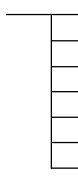
A: Capital Letter or "-" sign

CR: Carriage return character

nl: newline character

01 — T1 polarity  Positive
Negative

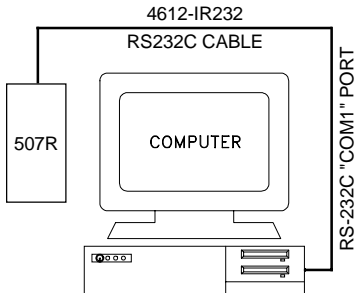
02 — MSD  $T_1 \text{ Values} = [H_{07} \times 16^0 + H_{06} \times 16^1 + H_{05} \times 16^2 + H_{04} \times 16^3 + H_{03} \times 16^4 + H_{02} \times 16^5] / 1000$

08 — T1 Thermocouple Type 

- "K" ® K type
- "J" ® J type
- "T" ® T type
- "E" ® E type
- "R" ® R type
- "S" ® S type
- "N" ® N type

17	— MSD	}	Hours
18	— LSD		
19	— MSD	}	Minutes
20	— LSD		
21	— MSD	}	Seconds
22	— LSD		
23	— Record mode	┌───	"R" ® Record mode
			"M" ® MAX mode
			"I" ® MIN mode
			"A" ® AVG mode
			"_" ® normal mode
24	— REL mode	┌───	"R" ® Relative mode
			"_" ® normal mode
25	— HOLD mode	┌───	"H" ® HOLD mode
			"_" ® normal mode
26	— LIMITS mode	┌───	"L" ® Limits mode
			"_" ® normal mode
27	— Hi LIMITS	┌───	"H" ® Hi Limits
			"_" ® normal mode
28	— Lo LIMITS	┌───	"L" ® Lo Limits
			"_" ® normal mode
29	— Not Used	—	"_"
30	— Battery status	┌───	"B" ® Low battery
			"_" ® normal mode

COMMUNICATION



1. Install the RSR232C cable between computer "COM1" and Thermometer RS232C port.
2. Turn on Thermometer.
3. Utilize the Quick BASIC for inputting programs.
4. Use the capital control letter and input "A" letter from the keyboard to start sending messages to computer.
5. Input "C" letter from the keyboard and then you can change the temperature scale.
6. Input "F" letter from the keyboards and then you can circulating select the T1 input type.
7. Input "G" letter from the keyboard and then the meter enter record mode, and then you can push "G" again to circulate through Maximum/Minimum/Average/Record mode.
8. When you want to stop transmission mode you should push "B" letter from the keyboard in order to conserve battery life.

HH 506(R)/HH 507(R) CALIBRATION PROCEDURE

Note: The following calibration procedure should perform only by qualified technicians who have access to the items as following.

Equipment: The class of calibrator had better 10 times greater than the measured meter.

1. Set the jumper position on J1 position.
2. Input DCV 17mV to the T1 after the display is stabilized (forward 4 digits), then press " HOLD " key and "0.0" is displayed in main display.
3. Input DCV 60mV after the display is stabilized (first 4 digits), then press " HOLD " key and "0.1" is displayed in main display.
4. Input 0°C (K-type) after the display is stabilized (first 4 digits), then press " HOLD " key and "0.2" is displayed in main display.
5. Don't push any key and the meter will turn off automatically after 20 seconds.
6. After adjustment set the jumper back to J3 position.
7. Turn on the meter then input 0°C (K-type). The display reading reads 0°C if the calibration procedure is right.

WARRANTY / DISCLAIMER

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 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. If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY / DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

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:

1. P.O. number under which the product was PURCHASED.
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair.
2. Model and serial number of product , and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering. OMEGA is a registered trademark of OMEGA ENGINEERING, INC. © Copyright 1999 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without prior written consent of OMEGA ENGINEERING, INC.

Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

TEMPERATURE

- Thermocouple, RTD & Thermistor
Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

PRESSURE/STRAIN AND FORCE

- Transducers & Strain Gauges
- Load Cells & Pressure Gauges
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters
& Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- 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