

OMEGA

HH506R
Digital Thermometer



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

Internet e-mail
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Servicing North America:

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

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

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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
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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

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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. Two 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.

Maximum Differential Common Mode Voltage (Maximum Voltage between T1 and T2 during measurement): 1volt.

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.

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 **T1 T2/T1-T2 Main display Input Selection**

The input selection indicates which input is selected for main display; T1 thermocouple, T2 thermocouple or the difference between the two thermocouples (T1-T2), when the thermometer is turned on, it is set to T1, When main display input selected T1, then T1 input can select alternate of thermocouple by pressing TYPE key switch.

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

The TYPE key switch the T1 input circulating selects the K/J/T/E/R/S/N type thermocouple as input, when main display input selected T1. 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 main display T1 T2 T1-T2 key, 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 and AVG 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 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 the 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 **T1/T2 T1-T2 second display Input Selection**

The input selection indicates which input is selected for second display; T1 thermocouple, T2 thermocouple or the difference between the two thermocouples (T1-T2), when the thermometer is turn on, it is set to T2 input can select alternate of thermocouple by second display TYPE key switch.

⑪ **K/J/T/E/R/S/N T2 Input Thermocouple Type Select (Second display)**

The TYPE key switch the T2 input circulating selects the K/J/T/E/R/S/N type thermocouple as input, when second display input selected T2. When the thermometer is turned on, it is set to the type selected that was in use when the thermometer was last turned off.

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
B$ = MID$(A$, 10, 6)
DEC1 = 0
N = 6
FOR I = 0 TO 5
    C$ = MID$(B$, N, 1)
    N = N - 1
    D = INSTR(F$, C$) - 1
    DEC1 = DEC1 + (16 ^ I) * D
NEXT
DEC1 = DEC1 / 1000
C$ = MID$(A$, 9, 1)
IF C$ = "-" THEN
    DEC1 = DEC1 * -1
END IF
CLS
LOCATE 12, 33
PRINT " T1      T2"
LOCATE 13, 30
PRINT USING "#####.#  #####.#"; DEC; DEC1
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" T1/T2/T1-T2 Key (main display)

"F" TYPE Key (main display)

"G" MIN/MAX Key

"H" Exit record mode

" I " REL Key

"J" LIMITS Key

"K" T1/T2/T1-T2 Key (second display)

"L" TYPE Key (second display)

"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 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	A	S	H	H	H	H	H	A	
T1 present status								T2 present status							

1 1 1 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	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

08  T2 polarity  "-" Negative

02 — MSD  T1 Values= $[H_{07} \times 16^0 + H_{06} \times 16^1 + H_{05} \times 16^2$
 07 — LSD  $+ H_{04} \times 16^3 + H_{03} \times 16^4 + H_{02} \times 16^5] / 1000$

10 — MSD  T2 Values= $[H_{15} \times 16^0 + H_{14} \times 16^1 + H_{13} \times 16^2$
 15 — LSD  $+ H_{12} \times 16^3 + H_{11} \times 16^4 + H_{10} \times 16^5] / 1000$

08 — T1 Thermocouple Type  "K" ® K type

16 — T2 Thermocouple Type  "J" ® J type

"T" ® T type

"E" ® E type

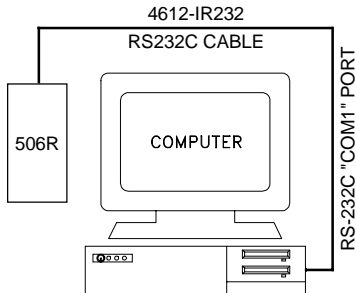
"R" ® R type

"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	—	none	—	"_"
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.

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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.
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