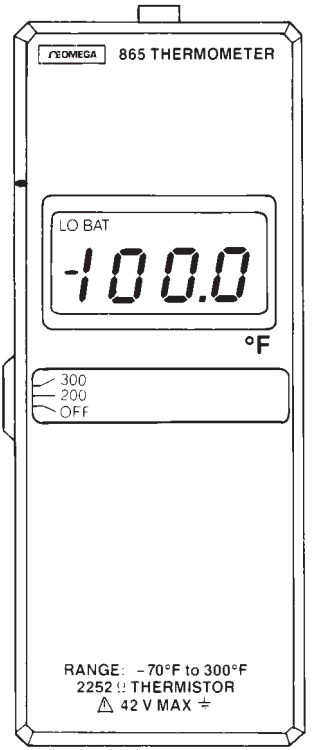
User's Guide



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Model 865 and 866
Digital Thermometers

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OMEGA®

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MODEL 865 AND 866 DIGITAL THERMOMETERS

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SECTION 1 INTRODUCTION

1.1 GENERAL DESCRIPTION

The OMEGA® Models 865 and 866 are Hand Held Digital Thermometers with large, easy to read, liquid crystal displays (LCD). The input connection for each instrument consists of a ¼ inch phone jack, which accommodates any one of the available accessory thermistor based probes and sensors. The resistance value of the thermistor at 25° C (77° F) is 2252 ohms. The instruments are powered by a 9 V battery. Continuous operation of 350 hours is typical with an alkaline battery or 200 hours typical with a carbon-zinc battery.

The Model 865 measures temperatures on two ranges. The 300°F range measures temperature from –70°F to 300°F with a resolution of 1°F. The 200° F range measures temperature from –70°F to 199.9°F with a resolution of 0.1°F.

The Model 866 measures temperature from –55° to 150°C, on one range, with a resolution of 0.1°C.

1.2 FEATURES

- High Accuracy/Resolution/Repeatability—to 0.1°
- Highly Versatile—Many applications with different probe configurations (probes not supplied)
- Continuous Automatic Linearization—Dual slope A/D
- Warning Indication—Overrange/Open Sensor/Low Battery
- Long-Life Battery—9 V Alkaline (MN-1604)
- Rugged Construction—Heavy-Duty ABS Plastic Housing

SECTION 2 BEFORE USING

2.1 UNPACKING

Remove the packing list and verify that all the equipment has been received. If there are any questions about the shipment, please call OMEGA Customer Service Department at (203) 359-1660.

Upon receipt of the shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipping is necessary.

2.2 PREPARATION FOR USE

The Models 865 and 866 are ready for use, after the battery is installed. To install the battery, refer to paragraph 5.2.3.

2.3 VERIFICATION CHECK

Install a probe and, at room temperature, hold the tip of the probe between your thumb and index finger. A reading between 25°C and 40°C should be obtained for the Model 866, and a reading of 77°F to 104°F should be obtained for the Model 865, to confirm the functioning of the instrument.

SECTION 3 OPERATION

3.1 SAFETY PRECAUTIONS

WARNING

A shock hazard exists on the input jack when probes or sensors are exposed to voltage levels greater than 42 volts, peak to earth ground. Do not exceed 42 volts, peak to earth ground

CAUTION

Do not attempt to measure temperatures beyond the range of the probe being used. Probe damage may occur. Maximum probe temperatures are given in the optional accessories section. Do not touch the probe tip when measuring excessively high or low temperatures.

3.2 OPERATING PROCEDURES

3.2.1 Model 865 (See Figure 3-1)

1. Turn power on by selecting the desired range.
2. Insert appropriate temperature probe into the input jack.
3. Touch the probe tip to the material to be measured and read the display in degrees Fahrenheit.

NOTE

An open sensor is indicated by a reading on the display of greater than -100.0°. Overrange is indicated by blanking of three least-significant digits. Low battery (10% life remaining) is indicated by LO BAT on the display.

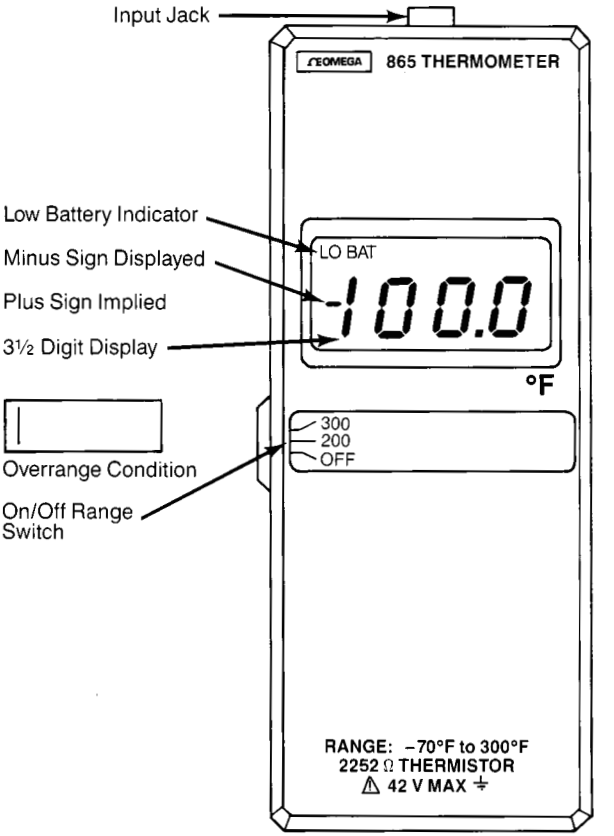


Figure 3-1 Model 865 Control Layout

3.2.2 Model 866 (See Figure 3-2)

1. Turn power on. Turning power on also selects the 150°C measurement range.
2. Insert appropriate temperature probe into the input jack.
3. Touch the probe tip to the material to be measured and read the display in degrees Celsius.

NOTE

An open sensor is indicated by a reading on the display of greater than -100.0°. Overrange is indicated by blanking of the three least-significant digits. Low battery (10% life remaining) is indicated by LO BAT on the display.

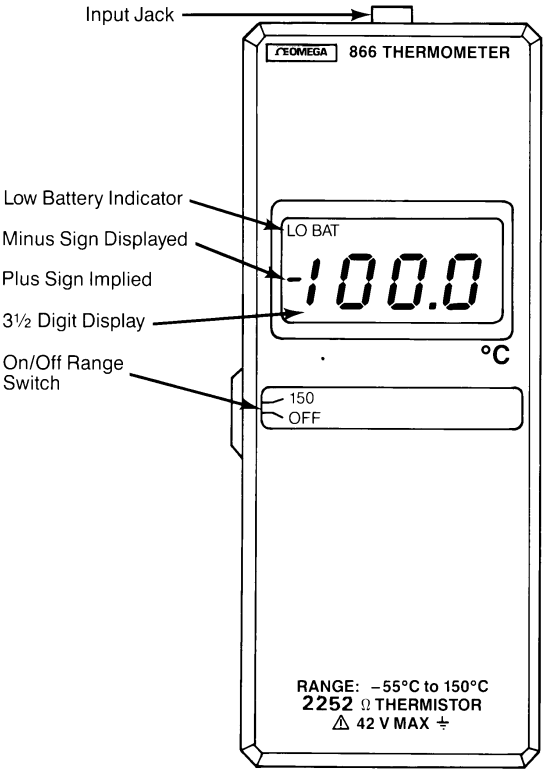


Figure 3-2 Model 866 Control Layout

SECTION 4 THEORY OF OPERATION

The temperature sensor is thermistor based. The thermistor sensor is a negative temperature coefficient device. This means that as the temperature increases, the resistance of the thermistor decreases. This relationship is a logarithmic function. The current that flows through the sensor is inversely proportional to the resistance of the sensor (Ohm's Law).

U104B and associated resistors minimize the "on" resistance of the gates of U101A and B. The input signal must be conditioned by the Log Ratio amplifier, before being digitized by the A/D converter. The Log Ratio amplifier operates on two phases: the signal phase and the zero phase.

Each phase has a duration equal to ½ of the backplane period of the A/D converter (U102).

In the signal phase (see Figure 4-1), the source voltage V_S is connected to the sensor R_T. The current that flows through R_T also flows into the collector of Q101. The output voltage of U104C is charged on capacitor C106. Also during this phase, the input to U104A is grounded and the voltage developed is charged on capacitor C105.

In the zero phase, the two charged values of voltage are transferred to other parts of the circuit, as depicted by Figure 4-2. The source voltage V_S is disconnected from the sensor and connected to a zero reference resistor R_Z. The current that flows through R_Z also flows in the collector of Q101. The output voltage of U104C is connected REF LO on U102 by way of C106 and U103B (see Schematic Diagram 866-106 or 865-106). The voltage that is applied to the input of U104A and across C111 is the difference between the output voltage of U104C and the voltage that was charged on C106 during the signal phase.

The voltage charged on C105 is now opposing the output of U104A and therefore transferred to C110. This is the voltage digitized by the A/D converter (U102). The fixed reference HI voltage for U102 is provided by current source U105 and its associated resistors.

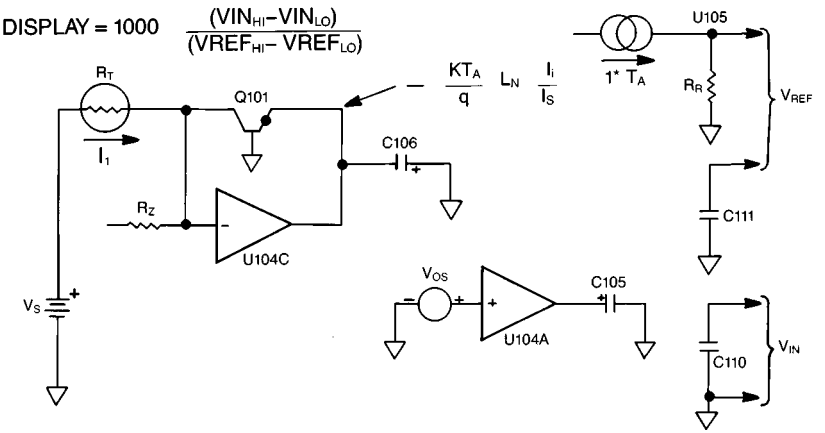


Figure 4-1 Signal Phase

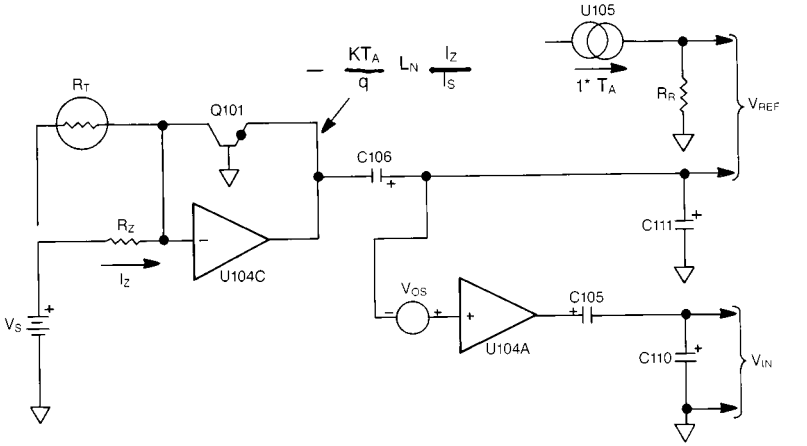


Figure 4-2 Zero Phase

SECTION 5 SERVICE INFORMATION

5.1 PERFORMANCE ACCURACY CHECK

1. Set up the equipment as shown in Figure 5-1.
2. Follow Table 5-1 to verify instrument performance.

NOTE

The LO of the resistance box must be connected to the LO (sleeve) of the ¼″ phone jack. The HI of the resistance box must by connected to the HI (tip) of the ¼″ phone jack.

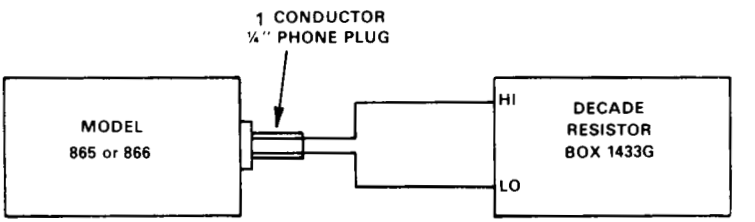


Figure 5-1 Calibration Setup

Table 5-1
PERFORMANCE VERIFICATION

MODEL 865

Step	Setting	Decade Resistance	Allowable Reading
1	200°F	75,750 ohms	–39.4 to –40.6
2	200°F	255,700 ohms	–68.8 to –71.2
3	200°F	19,220 ohms	–00.5 to 00.5
4	200°F	220.8 ohms	188.9 to 191.1
5	300°F	43 ohms	298 to 3021

MODEL 866

Step	Setting	Decade Resistance	Allowable Reading
1	150°C	75,790 ohms	–39.6 to –40.4
2	150°C	217,100 ohms	–54.2 to –55.8
3	150°C	7,355 ohms	–00.3 to 00.3
4	150°C	152.8 ohms	99.4 to 100.6
5	150°C	41.9 ohms	149.2 to 150.7

5.2 DISASSEMBLY

5.2.1 Special Handling Of Static-Sensitive Devices

CMOS devices are designed to function at high impedance levels. Normal static charge can destroy these devices. U101, U102, and U103 are all static-sensitive devices, and steps 1 through 7 provide instructions on how to avoid damaging these devices.

1. Devices should be handled and transported in protective containers, anti-static tubes, or conductive foam.
2. Use a properly grounded workbench and a grounding wrist strap.
3. Handle device by the body only; do not touch terminals, pins, etc.
4. PC boards must be grounded to bench while inserting devices.
5. Use anti-static solder suckers.
6. Use grounded tip soldering irons.
7. After devices are soldered or inserted into sockets, they are protected and normal handling can resume.

5.2.2 Disassembly Instructions

WARNING

Turn the instrument off and disconnect the temperature probe before removing the bottom cover.

NOTE

When disassembling the instrument, handle the PC board by the edges. Body oil, dirt, and moisture can degrade the circuit performance. Keep the PC board clean and free of contaminants.

1. Place the unit face down on a bench or other similar surface and remove the screws from the bottom cover.
2. Separate the bottom cover form the rest of the instrument by grasping the top of the case (above the display) and gently lifting it away from the display.
3. Remove the battery.
4. Remove the standoff that secures the PC board to the case. (It is located in the center of the PC board.)
5. Remove the switch cover for the Model 866 and for the Model 865.
6. Lift the PC board out of the top cover (front panel).

CAUTION

When removing the LCD from the PC board, be careful not to spread the four retaining hooks on the clear plastic bezel too far. Plastic bezel hooks may fracture.

7. The LCD is held in place on the PC board by a shock resistant-mounting and is assembled as shown in Figure 5-2.
8. To reassemble the unit, reverse the above procedure.

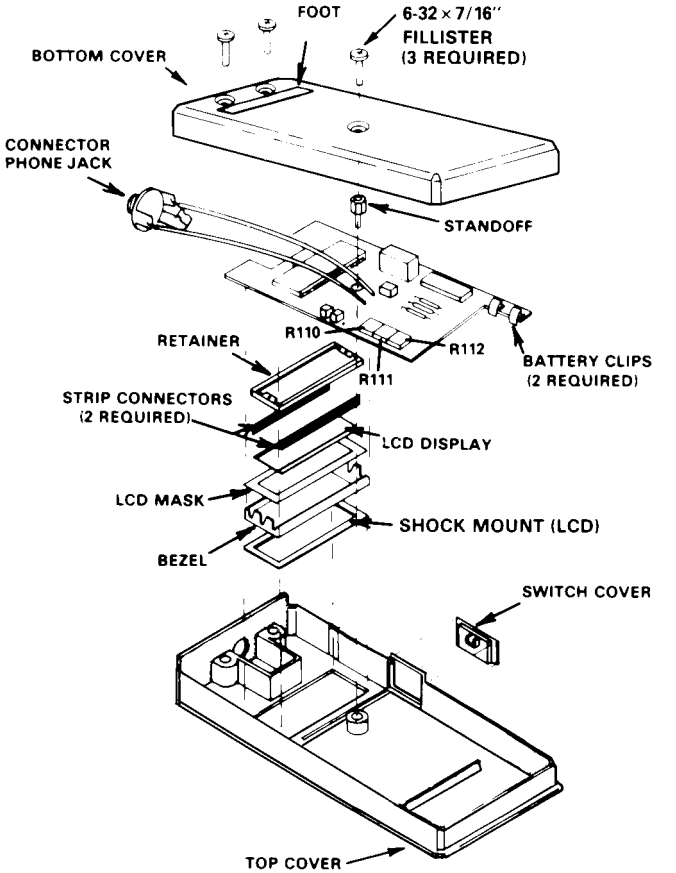


Figure 5-2 Models 865 and 866 Exploded View

WARNING

When reassembling the instrument, be sure to reinstall the switch cover. Common-mode voltage may be present on the switch, creating a hazard if the cover is not reinstalled.

5.2.3 Battery Replacement

WARNING

Turn the instrument off and disconnect the input probe before removing the bottom cover.

1. Remove the bottom cover of the instrument (see Figure 5-2).
2. Place the battery (MN-1604) in the battery compartment. Observe proper polarity (see Figure 5-3).
3. Reinstall the bottom cover.

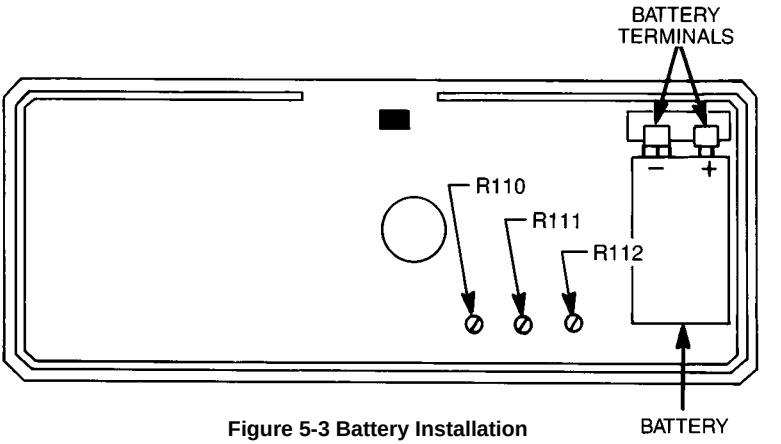


Figure 5-3 Battery Installation

5.3 CALIBRATION

Calibration should be performed yearly or whenever the performance verification procedure indicates that the instrument is out of specification under laboratory conditions, having an ambient temperature of 23°C±3°C and a relative humidity of less than 80%.

Use the following procedure to calibrate either Model 865 or Model 866. To locate the adjustment points, remove the bottom cover.

See Figure 5-3 above.

WARNING

To prevent a shock hazard, turn the instrument off and remove the input probe from the instrument before removing the bottom cover.

1. Set up the equipment as shown in Figure 5-1.
2. Turn on the instrument.
3. Perform calibration. refer to Table 5-2 or Table 5-3, as applicable.
4. Verify correct calibration. Refer to paragraph 5.1, performance accuracy check.
5. Reinstall the bottom cover.

TABLE 5-2
MODEL 865 CALIBRATION

Step	Range	Input	Adjustment	Reading
A	200°F	19220 ohms	R111	00.0 ± 0 counts
B	200°F	220.8 ohms	R110	190.0 ± ½″ counts
C	300°F	43 ohms	R112	300 ± 0 counts
D	R110 and R112 are interactive. Repeat steps B and C until the results are repeatable.			

TABLE 5-3
MODEL 866 CALIBRATION

Step	Range	Input	Adjustment	Reading
A	150°C	7355 ohms	R111	00.0 ± 0 counts
B	150°C	152.8 ohms	R110	100.0 ± ½″ counts
C	150°C	41.9 ohms	R112	150 ± 0 counts
D	R110 and R112 are interactive. Repeat steps B and C until the results are repeatable.			

5.4 TROUBLESHOOTING

The troubleshooting information, along with appropriate schematics and parts lists, are included to serve as a guide to enable equipment repair. The schematics and parts lists may vary slightly from actual production units and are to be used as a guide only. Likewise, the troubleshooting section is a guide only and cannot cover all possible contingencies that may occur.

Each Model 865 and 866 is covered by a 12-month warranty as described on the inside front cover of this manual. Warranty will be void if the unit shows evidence of having been tampered with.

5.4.1 DC VOLTAGE CHECKS

Using a precision digital voltmeter (DVM), make the following DC voltage checks in Table 5-4:

TABLE 5-4
DC VOLTAGE CHECKS

Step	Item/Component	Required Condition	Remarks
1	U102 pin 1 referenced to pin 26	>7.2V	Battery Voltage
2	U102 pin 1 referenced to pin 37	+5V ± 1V	5V Power Supply
3	U102 pin 1 referenced to pin 30	≈3V	

5.4.2 A/D MEASUREMENTS

To verify that the A/D and associated circuitry are operating properly, measure the four voltage points. Use the following formula to calculate the display reading.

1. Place a stable input to the instrument under test. For example, 190°F for the Model 865 and 150°C for the Model 866.

NOTE

All the measurements in steps 2 through 5 are referenced to analog common.

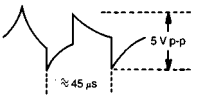
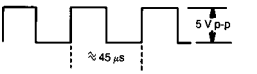
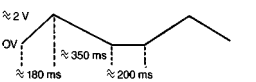
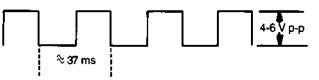
2. Measure the voltage at U102 pin 31 (IN HI) and record the value.
3. Measure the voltage at U102 pin 30 (IN LO) and record the value.
4. Measure the voltage at U102 pin 35 (REF LO) and record the value.
5. Measure the voltage at U102 pin 36 (REF HI) and record the value.
6. Calculate the display reading using the measured voltages and the following formula; Display Reading (disregarding decimal point) =

$$1000 \times \frac{\text{(Pin 31 voltage)-(Pin 30 voltage)}}{\text{(Pin 35 voltage)-(Pin 36 voltage)}}$$

5.4.3 WAVEFORM CHECKS

Using a precision oscilloscope, make the following waveform checks in Table 5-5:

TABLE 5-5
WAVEFORM CHECKS

Step	Item/Component	Waveform
1.	(Referenced to analog ground) U102 pin 40 (OSC 1)	
2.	U102 pin 39 (OSC 2)	
3.	U102 pin 38 (OSC 3)	(Same as step 2.)
4.	U102 pin 27 (INTEGRATOR) (with negative full-scale input of approximately 1900 counts)	
5.	U102 pin 21 (Backplane)	

SECTION 6 SPECIFICATIONS

MODEL 865

TEMPERATURE SENSOR TYPE: Thermistor (2252 Ohm @ 77°F)

RANGE	TEMPERATURE SPAN	RESOLUTION	ACCURACY* 65° TO 82°F; 1 year
200°F	– 40.0° to 199.9°	0.1°	± (0.3% rdg + 0.5°F)
	– 70.0° to – 40.1°	0.1°	± (0.3% rdg + 1.0°F)
300°F	– 70° to 300°	1°	± (0.3% rdg + 1°F)

***ACCURACY:** Includes repeatability, temperature coefficient (65° to 82°F), time stability (1 year), and linearization conformity errors. Excludes probe errors; however, probe errors around 32°F may be compensated by an internal adjustment.

REPEATABILITY: 0.2°F typical for 1 week at constant ambient temperature.

TEMPERATURE COEFFIECIENT: 65° to 82°F; included in accuracy specification. From 14° to 65° and 82° to 122°F: less than ± (0.06% rdg +0.01°F)/°F.

SENSOR VOLTAGE: 40 mV RMS maximum.

MODEL 866

TEMPERATURE SENSOR TYPE: Thermistor (2252 Ohm @ 25°C)

RANGE	TEMPERATURE SPAN	RESOLUTION	ACCURACY* 18° TO 28°F; 1 year
150°F	– 40.0° to 150.0°	0.1°	± (0.3% rdg + 0.3°C)
	– 55.0° to – 40.1°	0.1°	± (0.3% rdg + 0.6°C)

***ACCURACY:**	Includes repeatability, temperature coefficient (18° to 28°C), time stability (1 year), and linearization conformity errors. Excludes probe errors; however, probe errors around 0°C may be compensated by an internal adjustment.
REPEATABILITY:	0.1°C typical for 1 week at constant ambient temperature.
TEMPERATURE COEFFICIENT:	18° to 28°C; included in accuracy specification. From –10° to 18° and 28° to 50°C: less than ± (0.06% rdg + 0.01°C)/°C.
SENSOR VOLTAGE:	40 mV RMS maximum.

MODEL 865 AND 866 GENERAL SPECIFICATIONS (unless specified):

DISPLAY:	3 ½-digit LCD O.5" (13 mm) height. Polarity and decimal point indication.
CONVERSION RATE:	1.5 readings per second.
OPEN SENSOR INDICATION:	Display reads between –100° and –199°.
OVERRANGE INDICATION:	3 least significant digits blanked.
MAXIMUM COMMON MODE VOLTAGE:	42 V peak to earth.
COMMON MODE REJECTION (Model 865):	Less than 0.01°F/volt at dc, 50 and 60 Hz. (2kΩ unbalance, LO driven)
COMMON MODE REJECTION (Model 866):	Less than 0.01°C/volt at dc, 50 and 60 Hz. (2kΩ unbalance, LO driven)
ENVIRONMENTAL LIMITS FOR OPERATING (Model 865):	14° to 122°F, less than 80% relative humidity up to 95°F; linearly derate 1.5% R.H./°F from 95° to 122°F.
ENVIRONMENTAL LIMITS FOR OPERATING (Model 866):	–10° to 50°C, less than 80% relative humidity up to 35°C; linearly derate 3% R.H./°C from 35° to 50°C.

ENVIRONMENTAL LIMITS FOR STORAGE (Model 865):	–30° to 140°F, less than 90% relative humidity up to 95°F; linearly derate 1.5 R.H./°F from 95° to 140°F.
ENVIRONMENTAL LIMITS FOR STORAGE (Model 866):	–35° to 60°C, less than 90% relative humidity up to 35°C; linearly derate 3% R.H./°C from 35° to 60°C.
THERMISTOR LINEARIZATION:	Ratiometric dual-slope A/D with continuous linearization.
INPUT CONNECTION:	¼″ (6 mm) phone jack.
POWER:	9 V alkaline or carbon-zinc (NEDA 1604) battery.
BATTERY LIFE, CONTINUOUS:	350 hours typical with alkaline battery; 200 hours typical with carbon-zinc battery.
BATTERY INDICATOR:	Display indicates “LO BAT” when less than 10% of life remains.
DIMENSIONS, WEIGHT:	H: 6.3″ (160 mm) x W: 2.7″ (69 mm) D: 1.2″ (31 mm) Net weight 7.5 oz. (210 gm)
CONSTRUCTION:	Heavy duty ABS plastic housing.

OPTIONAL ACCESSORIES

Any OMEGA thermistors with 2252 ohms are suitable. See the ON series or the THX series in the latest OMEGA Temperature Measurement Handbook.

Model 8660 Tilt/Stand/Belt Clip/Probe Holder—for the Model 865 or 866. Model 8668 Soft Carrying Case is a padded vinyl carrying case that holds one hand held meter, a Model 8660 and a probe.

6.1 PARTS LIST FOR MODELS 865 AND 866

SCHEMATIC DESIG.	DESCRIPTION	SCHEMATIC LOCATION
BA101	9V Alkaline Battery, NEDA 1604	F1
C101	Capacitor, 0.047, 50V Metalized Polypropylene	E2
C102	Capacitor, 0.1μF, 50V Ceramic	F1
C103	Capacitor, 0.1μF, 50V Ceramic	G1
C104	Capacitor, 0.33μF, 63V Metalized Polyester	E2
C105	Capacitor, 0.33μF, 63V Metalized Polyester	D3
C106	Capacitor, 0.33μF, 63V Metalized Polyester	D1
C107	Capacitor, 1000p, 1000V Ceramic Disc.	C2
C108	Capacitor, 0.1μF, 50V Ceramic	F1
C109	Capacitor, 0.33μF, 63V Metalized Polyester	E3
C110	Capacitor, 0.33μF, 63V Metalized Polyester	E3
C111	Capacitor, 0.33μF, 63V Metalized Polyester	E1
C112	Capacitor, 47pF, 500V Silver Mica or Ceramic	E2
DS101	3 ½" Digit Liquid Crystal Display	G4
J1001	¼" Phone Jack	A1
J1002	Battery Clip	E1
J1003	Battery Clip	F1
Q101	NPN Transistor, MPS8099	C2
R101	Resistor, 910 kilohms, 5%, ¼W, Composition	E2
R102*	Resistor, 5.4 kilohms, 0.1%, ⅛W, Metal Film	D4
R102**	Jumper	
R103	Factory selected, part of 865-600	B-6
R104*	Resistor, 4.6 kilohms, 0.1%, ⅛W, Metal Film	D3
R104**	Resistor, 10 kilohms, 0.1%, ⅛W, Metal Film	D3
R105*	Resistor, 44 kilohms, 0.1%, ⅛W, Metal Film	D3
R105**	Resistor, 21.77 kilohms, 0.1%, ⅛W, Metal Film	D3
R106*	Resistor, 16.5 kilohms, 1%, ⅛W, Metal Film	C3
R106**	Resistor, 6.34 kilohms, 1%, ⅛W, Metal Film	C3
R107	Thick Film Resistor Network	SEV
R108	Factory selected, Part of 31410	E4
R109*	Resistor, 3.92 kilohms, 1%, ⅛W, Metal Film	F5
R109**	Resistor, 3.65 kilohms, 1%, ⅛W, Metal Film	F5
R110	Pot, 200 ohms	E4
R111*	Pot, 5 kilohms	C3
R111**	Pot, 2 kilohms	C3
R112	Pot, 10 ohms	D1
R113	Resistor, 392 kilohms, 1%, ⅛W, Metal Film	E2
S101	493T, Slide Switch	SEV

MODEL 865 AND 866 PARTS LIST (continued)

U101	Triple 2 Channel Analog Multiplexer, 4053	SEV
U102	3 ½ Digit Low Power A/D converter, ICL7136CPL	F2
U103	Triple 2 Channel Analog Multiplexer, 4053	SEV
U104	Quad Low Power J-FET, LF44CN	SEV
U105	Current Source, LM334	E4
VR101	6.2V, Zener Diode, 1N753	C1

* Model 865

** Model 866

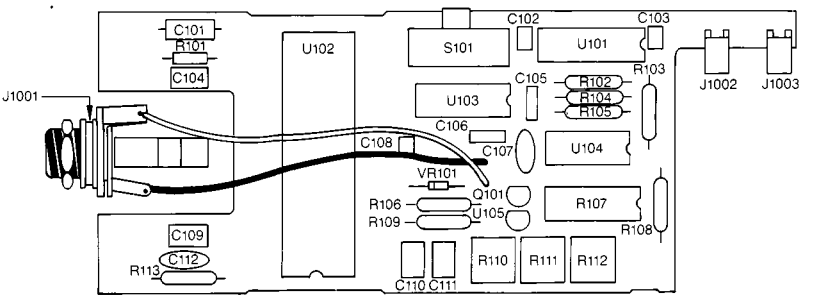
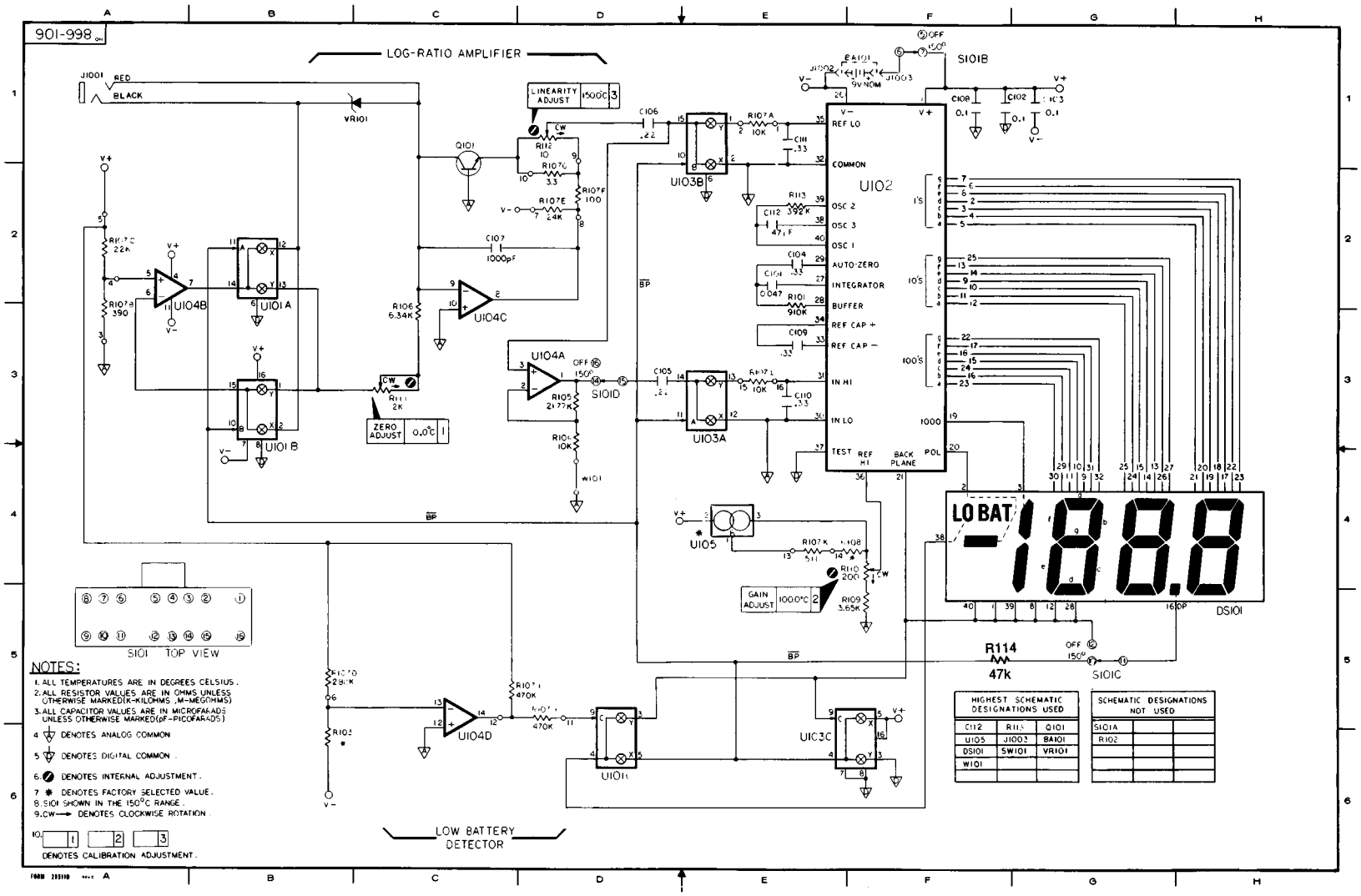
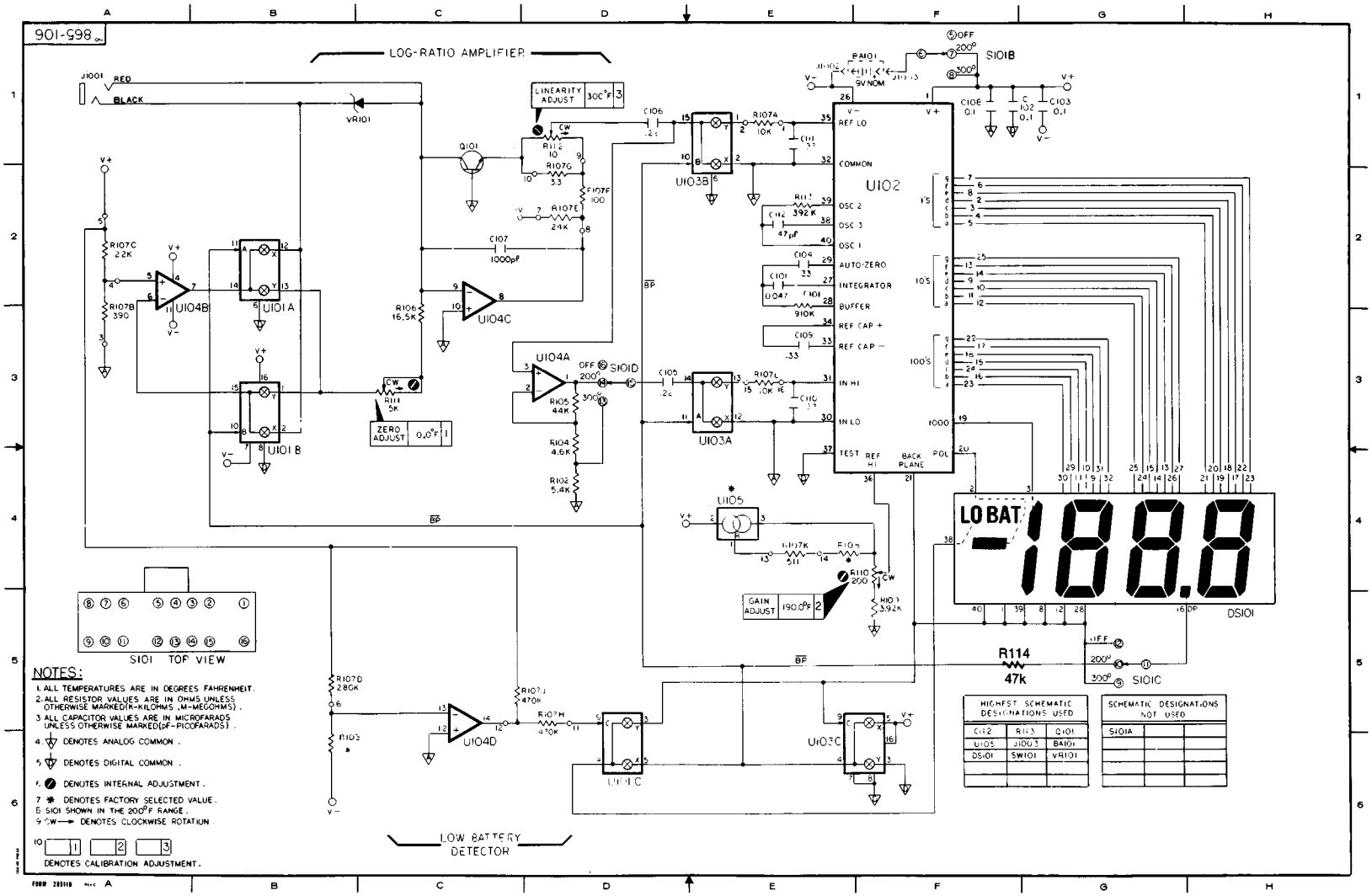


Figure 6-1 Component Layout


901-998
LOG-RATIO AMPLIFIER
LOW BATTERY DETECTOR
LO BAT
-188.8
DSIOI
SIOIB
SIOIC
SIOID
SIOI TOP VIEW
U102
U103B
U103A
U104A
U104B
U104C
U104D
U101A
U101B
U101C
U105
U1C3C
LINEARITY ADJUST
ZERO ADJUST
GAIN ADJUST
R114
47k
NOTES:
1. ALL TEMPERATURES ARE IN DEGREES CELSIUS.
2. ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE MARKED(K-KILOHMS, M-MEGOHMS)
3. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE MARKED(pF-PICOFARADS)
4. DENOTES ANALOG COMMON
5. DENOTES DIGITAL COMMON.
6. DENOTES INTERNAL ADJUSTMENT.
7. * DENOTES FACTORY SELECTED VALUE.
8. SIOI SHOWN IN THE 150°C RANGE.
9. CW → DENOTES CLOCKWISE ROTATION.
10. DENOTES CALIBRATION ADJUSTMENT.
HIGHEST SCHEMATIC DESIGNATIONS USED
SCHEMATIC DESIGNATIONS NOT USED


901-598
LOG-RATIO AMPLIFIER
LINEARITY ADJUST
ZERO ADJUST
GAIN ADJUST
LOW BATTERY DETECTOR
U102
U103A
U103B
U103C
U104A
U104B
U104C
U104D
U101A
U101B
U101C
U105
SW101
SIO1B
SIO1C
DSI01
LO BAT
-188.8
R114
47k
SIO1 TOP VIEW
NOTES:
1. ALL TEMPERATURES ARE IN DEGREES FAHRENHEIT.
2. ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE MARKED(K=KILOHMS, M=MEGOHMS).
3. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE MARKED(pF=PICOFARADS).
4. DENOTES ANALOG COMMON.
5. DENOTES DIGITAL COMMON.
6. DENOTES INTERNAL ADJUSTMENT.
7. * DENOTES FACTORY SELECTED VALUE.
8. SIO1 SHOWN IN THE 200°F RANGE.
9. CW DENOTES CLOCKWISE ROTATION.
10. DENOTES CALIBRATION ADJUSTMENT.
HIGHEST SCHEMATIC DESIGNATIONS USED
SCHEMATIC DESIGNATIONS NOT USED

MADE IN USA

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.

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- Air Velocity Indicators
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