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BB-2A **Blackbody Reference**

SECTION		PAGE
Section 1	Introduction	1-1
1.1	General Description	1-1
1.2	Safety Warnings and I.E.C. Symbols	1-1
Section 2	Installation	2-1
2.1	Unpacking and Inspection	2-1
2.2	Mounting	2-1
2.3	Power Connection	2-2
Section 3	Parts and Features	3-1
Section 4	Operation	4-1
4.1	Setting Temperature	4-1
4.2	Measuring Temperature	4-1
Section 5	Maintenance	5-1
5.1	Calibration	5-1
5.2	Cleaning	5-1
5.2.1	Main Body	5-1
5.2.2	Target Plate	5-1
5.3	Fuse Replacement	5-1
Section 6	Specifications	6-1
Section 7	Troubleshooting Guide	7-1
Section 8	Glossary of Terms	8-1

FIGURE	PAGE
1	BB-2A Blackbody Source Parts 3-1

Section 1 - Introduction

Omega's BB-2A Series Blackbody Calibration Source has been designed for ease of use and reliability whenever you have the need to test or calibrate non-contact infrared temperature instruments. It is important that you read this manual completely and follow all safety precautions before operating this instrument.

1.1 General Description:

The Model BB-2A is a portable, rugged, bench-top, blackbody calibration source. The calibrator is used to test and calibrate infrared pyrometers. The front 159 mm (6.25") square plate has a 133 mm (5 ¼") circular target area with an emissivity of 0.95 and can be set to any temperature between 66 to 343°C (150 to 650°F). For ease of reading, a bi-metal thermometer is included. Please note that we do not recommend this unit to be used as a primary calibration reference.

1.2 Safety Warnings and Precautions:

- Follow all safety precautions and operating instructions outlined in this manual.
- Never leave your calibration unattended when in use.
- Keep out of reach of all children.
- Never touch the target plate when hot.
- Never place any object within 3 inches of the plate when hot.
- Do not operate in flammable or explosive environments.
- Never operate with power cord other than the one provided with your unit.
- Remove and or disconnect main power cord before attempting any maintenance or fuse replacement.
- Do not connect this unit to a non-grounded, non-polarized outlet or power source.
- The target plate should not be used as a heating plate for any type of material or liquid.
- This unit is intended for indoor use only. Protect from moisture and rain.

NOTE

There are no user serviceable parts inside your unit. Attempting to repair or service your unit may void your warranty.

Section 2 - Installation

2.1 Unpacking

Remove the packing list and verify that you have received all your equipment, including the following items:

- BB-2A Blackbody Calibration Source
- Dial Temp. Thermometer, Model H
- Users Manual

If you have any questions about the shipment, please call our Customer Service Department at

1-800-622-2378 or 203-359-1660. We can also be reached on the Internet at **omega.com**

e-mail: cservice@omega.com

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

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

2.2 Mounting and Setup

Place the BB-2A Blackbody Reference on a sturdy surface in a vertical position and allow space on all sides of the unit for ventilation. Assemble the Dial Temperature thermometer by inserting the stem of the thermometer into the large hole in the middle of the top surface of the target plate. Make sure the rocker switch and the temperature control knob is on the OFF position. (Rotate the knob counterclockwise if necessary). Plug in the power cord into a convenient voltage outlet. The BB-2A is designed to operate within an ambient temperature range from 10°C to 35°C (50°F to 95°F).

2.3 Power Connection

Standard (120 VAC~, 50/60 Hz models)

The BB-2A comes with a standard North American 3-prong AC power cord. Do not use any other power cord other than the one provided.

This cord provides the proper grounding and has been safety tested by the proper safety agencies.

International (240 VAC~, 50/60 Hz models)

On 240 VAC~, 50/60 Hz models a European style power cord with the proper color code and approvals is provided with 3-prong connector.

CAUTION

- Line voltage variations are not to exceed $\pm 10\%$ of the rated input voltage.
 - Electrical connections and wiring should be performed only by suitably trained personnel.
 - To shut down the unit in an emergency, the power cord can be disconnected from the AC outlet.
-

Section 3 - Parts and Features

The BB-2A Hot plate is a general purpose temperature reference source intended for laboratory use with an operating temperature range from 66°C to 343°C (150°F to 650°F). The front target plate is heated by a resistance heater, embedded in the refractory material of the bottom plate. The plates are made of aluminum to aid in uniform surface temperature distribution. The temperature of the plate is controlled by a bimetallic thermostat sensor. The case supports the aluminum plates, and also serves to house the electrical connections and the temperature control components. See Figure 1 for the overall shape and the general features of the unit.

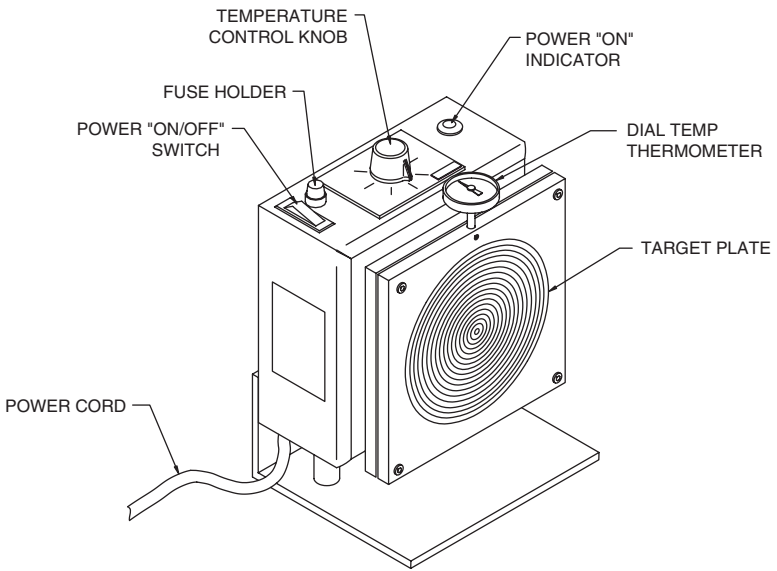


Figure 1. Blackbody Source Parts

Section 4 - Operation

4.1 Setting Temperature:

Prior to connecting your BB-2A hot plate to your electrical supply, be sure the rocker and the dial switches are in the OFF position. The power is turned ON or OFF by means of the rocker switch. Push the rocker switch to turn the unit ON. The hot plate will start heating up when the pointer is beyond the OFF mark on the dial plate. Turn dial clockwise to set desired temperature. Dial mark indicate approximate surface temperature in °C. The green cycle light will illuminate when the pointer on the dial passes the OFF mark on the dial plate.

When the temperature for a given dial setting has been reached, the light will cycle OFF and ON to hold that temperature. If the cycle light is off, hot plate may still be hot.

To turn OFF hot plate, turn dial switch to the fully counterclockwise position and push the rocker switch down to off position.

4.2 Measuring Temperature:

The 5 ¼" target area of the plate is a near ideal blackbody source. The emissivity of the plate is 0.95. When calibrating an IR pyrometer, hold the pyrometer perpendicular to the target plate for optimal performance. The proper distance between the IR pyrometer and the target plate depends on the field of view of the pyrometer. If the pyrometer is too far away it will scan unwanted surfaces outside of the perimeter of the target plate. Holding the pyrometer too close could introduce undesirable heat to the IR detector of the pyrometer.

WARNING

- The BB-2A's target plate can be set to very high temperatures. Exercise extreme caution when operating the unit. Keep hands and fingers away from the target plate area. Keep flammable products such as paper, plastics and clothing far from the unit.
 - The BB-2A is a Class II instrument. It is intended to be operated in a laboratory environment only. Never operate the unit outside or around children.
 - Nothing should come in contact with the target plate. Even when the unit is off.
 - Never unplug the unit while it is on. Let it cool down to lower temperature before turning it off.
-

Section 5 - Maintenance

5.1 Calibration

This unit has been fine tuned at the factory and calibrated to give optimum performance of its full temperature range. It is recommended that the unit be returned annually for re-calibration.

5.2 Cleaning

CAUTION

Remove all electrical connections and power before attempting any maintenance or cleaning.

5.2.1 Main Body

Only a damp soft rag with a mild cleaning solution should be used when cleaning the main body of this unit.

5.2.2 Target Plate

Do not attempt to clean the target plate. The target plate has a special coating applied and cleaning may change the emissivity and performance of your unit.

5.3 Fuse replacement

WARNING

Disconnect all power from source before attempting fuse replacement.

CAUTION

For continued protection against the risk of fire replace with only the same size, type and rating fuse indicated here.



Maintenance

For model:

- BB-2A** use 1 ea. 250 VAC~, T7A (Time-Lag, 7 Amp)
UL./CSA APPROVED (¼" dia. x 1 ¼" long).
- BB-2A-230** use 1 ea. 250 VAC~, T4A (Time-Lag, 4 Amp)
VDE APPROVED (¼" dia. 1 ¼" long)

Section 6 - Specifications

Target Plate Temperature Range:	66°C to 343°C (150°F to 650°F)
Ambient Environmental Conditions:	
Temperature:	10 to 35°C (50 to 95°F)
Humidity:	0 to 90% RH, non-condensing
Power:	
BB2A	120 VAC~, 50/60 Hz, 750W
BB2A-230VAC	240 VAC~, 50/60 Hz, 750W
Internal Control Sensor:	Bimetallic Thermostat
Accuracy:	±2% of the Reading
Stability:	±3°C (±5.4°F) [over entire range]
Display Accuracy:	Unit Accuracy
Target Plate Emissivity:	0.95 ± 2 unit
Dimensions:	165 W x 229 H x 140 mm D (6.5" W x 9.0 H x 5.5 in D)
Weight:	2.5 Kg. (5.5 Lbs.)

Section 7 - Troubleshooting Guide

Problem	Solution
1. Unit will not turn on.	<ol style="list-style-type: none">Check all electrical connections.Check top panel fuse.Unit requires service, contact our customer service department.
2. Unit turns on but the target plate will not get hot.	<ol style="list-style-type: none">Check that you have set a setpoint above the ambient temperature.Burned out heating element. Unit requires service, contact our customer service department.
4. Target plate temperature will not stabilize at the setpoint	<ol style="list-style-type: none">Unit may be out of calibration and requires service, contact our customer service department.

Glossary of Terms Used in This Manual

Blackbody

A theoretical object that radiates the maximum amount of energy at a given temperature, and absorbs all the energy incident upon it.

Calibration

The process of adjusting an instrument or compiling a deviation chart so that its reading can be correlated to the actual value being measured.

Emissivity

The ratio of energy emitted by a surface to the energy emitted by a blackbody at the same temperature.

Infrared (IR)

A range of the electromagnetic spectrum extending beyond red visible light from 760 nanometers to 1000 microns.

NIST

National Institute of Standards and Technology



The OMEGA® Family of Blackbody Calibrators

Listed below is a selection guide of OMEGA's current line of blackbody calibration sources in addition to the one you have selected. This family of rugged, portable and accurate calibrators cover a wide range of temperatures, target plate sizes and features making them perfect for infrared pyrometer field service testing and laboratory calibrations.

BB701 Hot/Cold Blackbody Calibration Source

Calibration Range: -18 to 150°C (0 to 300°F)	Accuracy: $\pm 0.8^{\circ}\text{C}$ ($\pm 1.4^{\circ}\text{F}$)
Emissivity: 0.95	Ambient Temp.: 4 to 43°C (40 to 110°F)
Cavity Size: 63.5 mm (2.5 in.)	Power: 120/230V, 50/60 Hz, 175W

BB702 Blackbody Calibration Source

Calibration Range: 32 to 215°C (90 to 420°F)	Accuracy: $\pm 0.5^{\circ}\text{C}$ ($\pm 0.9^{\circ}\text{F}$), $\pm 0.25\%$ of rdg.
Emissivity: 0.95	Ambient Temp.: 5 to 45°C (41 to 113°F)
Cavity Size: 63.5 mm (2.5 in.)	Power: 115/230V, 50/60 Hz, 175W

BB703 Mini Blackbody Calibration Source

Calibration Range: 32 to 400°C (90 to 752°F)	Accuracy: $\pm 1.4^{\circ}\text{C}$ ($\pm 2.5^{\circ}\text{F}$)
Emissivity: 0.95	Ambient Temp.: 0 to 40°C (32 to 104°F)
Cavity Size: 28.6 mm (1.125 in.)	Power: 115/230V, 50/60 Hz, 175W

BB704 4" Target Plate Blackbody Calibration Source

Calibration Range: 100 to 400°C (212 to 752°F)	Accuracy: $\pm 0.8^{\circ}\text{C}$ ($\pm 1.4^{\circ}\text{F}$)
Emissivity: 0.95	Ambient Temp.: 0 to 50°C (32 to 122°F)
Cavity Size: 101.65 mm (4 in.)	Power: 115/230V, 50/60 Hz, 425W

BB705 Laboratory Grade Blackbody Calibration Source

Calibration Range: 100 to 1046°C (212 to 1915°F)	Accuracy: $\pm 1.0^{\circ}\text{C}$ ($\pm 1.8^{\circ}\text{F}$) $\pm 0.25\%$ rdg.
Emissivity: 0.99	Ambient Temp.: 0 to 35°C (32 to 95°F)
Cavity Size: 44 mm (1.75 in.)	Power: 115/230V, 50/60 Hz, 1100W

BB-4A High Temperature Blackbody Calibration Source

Calibration Range: 100 to 982°C (212 to 1800°F)	Accuracy: $\pm 1.0^{\circ}\text{C}$ ($\pm 1.8^{\circ}\text{F}$) $\pm 0.25\%$ rdg.
Emissivity: 0.99	Ambient Temp.: 0 to 50°C (32 to 122°F)
Cavity Size: 22 mm (0.88 in.)	Power: 115/230V, 50/60 Hz, 400W

For a complete, updated specification sheet and price on any of the calibrators listed here visit our website at www.omega.com. Please call our sales or customer service department for information and pricing on any new models available.



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'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.

If the unit malfunctions, 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 having been 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, EXPRESS 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. Purchase Order 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. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the 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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