

## 2. Description

---

This chapter describes the structure, assemblies, theories and specifications of the SR-2-SA.

The SR-2-SA Cavity Blackbody is comprised of two main units (see Figure 1-1):

### 2.1 The Temperature Controller

The Temperature Controller provides the power to heat the cavity and achieve its temperature control. Microprocessor is used to memorize the temperature sensor calibration curve.

The calibration curve is evaluated using a National Institute of Standards and Technology (NIST) traceable temperature probe, which is periodically compared with stable and certified temperature references.

### 2.2 The Emitter Head

The Emitter Head is the component of the system that houses the blackbody radiation source (emitter). The emitter itself is a heated cavity. Its temperature can be adjusted to any value between 100°C and 1000°C (or 1200°C in the SR-2-33). The temperature can be selected at 1°C increments.

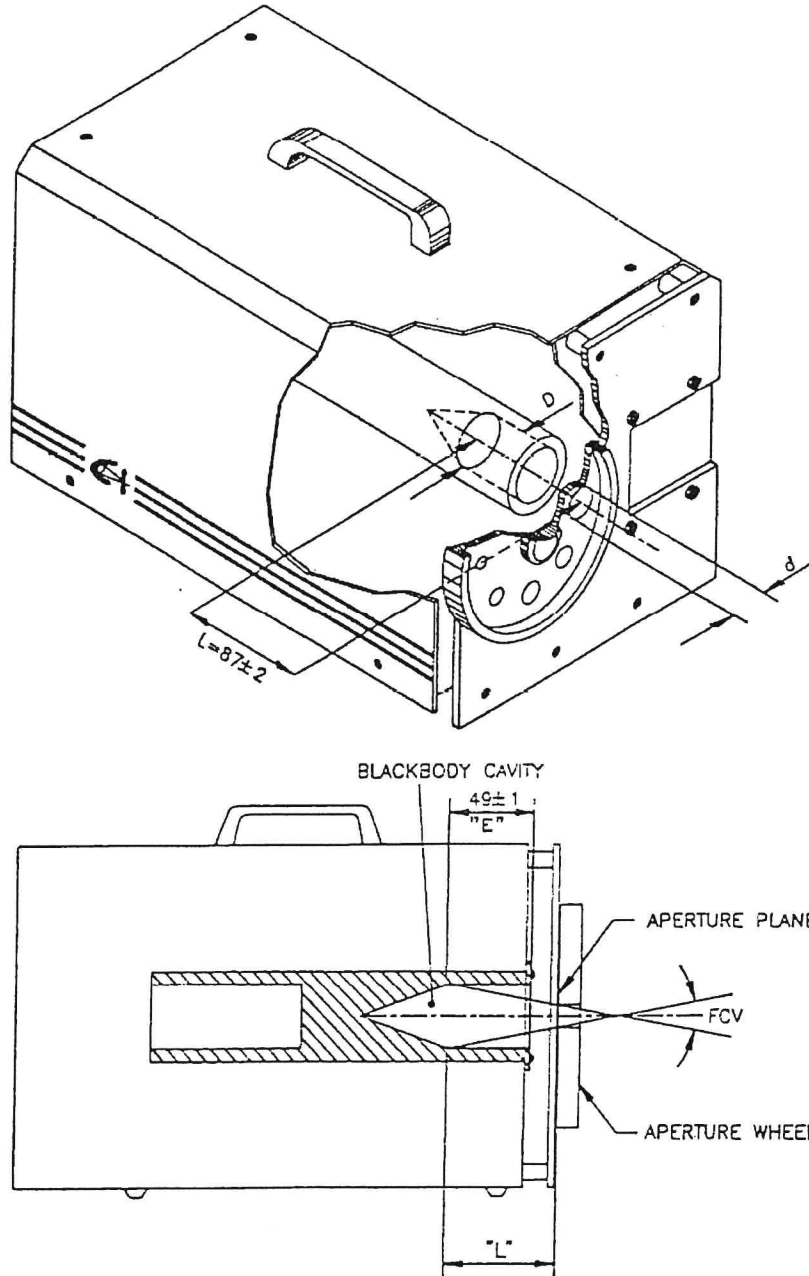
The temperature probe used is a type S platinum Rhodium thermocouple with cold junction compensation in the electronic control unit.

The Emitter Head emits a uniform beam of infrared radiation over a selectable Field of View (FOV), at a 0.99 emissivity level. The beam emitted through the selected aperture forms a cone. The SR-200's FOV depends on the value L (see Figure 2-1). Since L is fixed (87±2mm), the FOV depends on the aperture size. When the largest aperture is used, the uniformity versus angle is ±4° at 800°C over the defined angle.

The Emitter Head can be mounted on a bench or tripod, using its tripod mount (a NUC 1/4x20 thread). The Emitter consists of a heat resistance cylinder with a recessed conical cavity, whose surface is highly emissive. The surface's high emissivity and its conical shape give an effective emissivity of the radiation source very close to unity.

The aperture can be selected manually. With manual wheels, a positive-lock mechanism enables every aperture to return to a precise and repeatable position centered within the cavity.

Figure 2-1: The Emitter Head - Definition of the Cavity Field Of View



$$FOV = 2 * tg^{-1} \frac{(D - d)}{2L}$$

## 2.3 Specifications

### 2.3.1 Blackbody

Model No.	Cavity Diameter	Temp. Range (°C)	Average Steady State Power	FOV	FOV (2, 3)
SR-2-32	1.0"	50 - 1,000	800 W	11°	12°
SR-2-33		50 - 1,200			

- Aperture Diameters (in mm):  
1.6, 3.2, 6.4, 9.5, 12.7, 15.9, 22.2 and one blank.  
Aperture diameter accuracy: 1% for apertures smaller than Ø4mm; 2.5% for apertures larger than Ø4mm.
- "E" Option (no aperture wheel).
- It is recommended to wait an additional 10 minutes after the displayed temperature stabilizes on the set point, in order to allow the cavity temperature to stabilize across the entire exit aperture.

**Table 2-1: Blackbody Specifications**

Emissivity:	0.99±0.01
Aperture Wheel and Housing Temperature:	Air-cooled, maximum 10°C above ambient
Temperature Sensor:	Pt/PtRd 10% thermocouple (type "S")
Durability:	Designed and tested to withstand power and fan failure at maximum temperature
Operating Ambient Temperature:	0 to +50°C
Fan:	Thermostatically controlled after power off
Head Weight:	7 Kg.

### 2.3.2 Controller

*Table 2-2: Controller Specifications*

Set-point Resolution:	1°C
Temperature Accuracy:	
- SR-2-32:	±2.5°C (50°C - 1000°C) excluding cavity non-uniformity
- SR-2-33:	±3°C (50°C - 1200°C) excluding cavity non-uniformity
Temperature Stability:	±1°C
Temperature Display:	Display of both set-point and calibrated "true" cavity temperature
Operating Ambient Temperature:	5 to 50°C
Voltage:	230 or 115VAC 50/60Hz
Dimensions (cm):	30 x 18 x 14 (D x W x H)
Weight:	2.5Kg

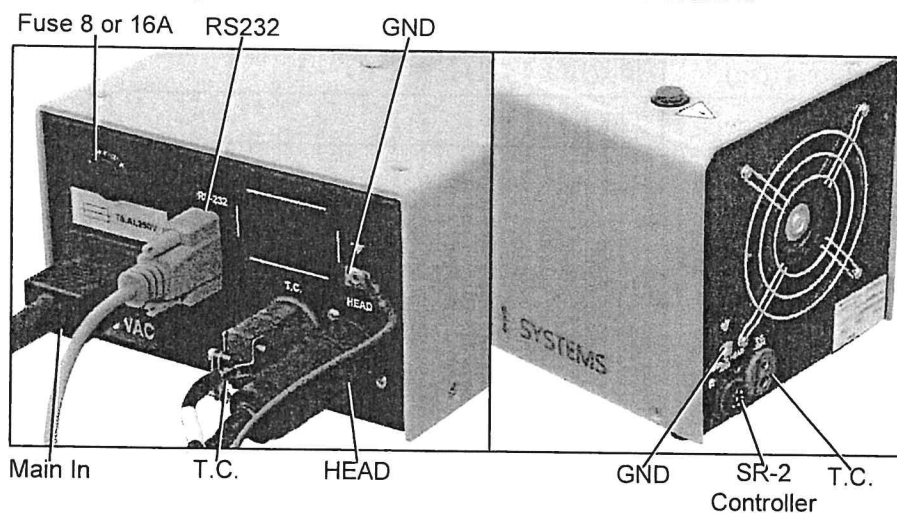
## 3. Operation

### 3.1 Set-up and Operation

The following is the step-by-step procedure to operate the SR-2-SA blackbody (see Figure 3-1):

1. Connect the Emitter Head cable to the Temperature Controller **SR/HEAD** connector.
2. Make sure that the Mains voltage matches the marked SR-2-SA voltage.
3. Connect the power cable to the **Power In** connector of the Temperature Controller.
4. Connect the power cable to Mains.

*Figure 3-1: SR-2-SA Controls and Connectors*



5. Switch ON the Temperature Controller.  
When turned on, the digital display shows the instantaneous value of the Emitter Head temperature.

6. To increase or decrease the set-point press the **Display UP** or **DOWN** button respectively.  
The Emitter Head temperature starts to change in the direction of the set-point temperature.
7. Wait for the Blackbody temperature stabilization.
8. To shut down, switch OFF the Temperature Controller.

### 3.2 RS232 Connector Pinout

*Table 3-1: RS232 Connector Pinout*

Pin #	Signal Name	Function
2	Rx	Received Data
3	Tx	Transmitted Data
5	GND	Local Earth

*Figure 3-2: RS232 Connector Pinout*

