



Chamber Environment Control

Control temperature, CO₂ and O₂ in a microscope chamber environment



The front panel of this ECU-HOC displays four monitored parameters: CO₂ level, O₂ level, air flow, chamber temperature.

This system offers precision control of temperature, carbon dioxide and oxygen, as well as remote control and data logging via a USB connection. The system is flexible and easy to configure for a variety of experimental conditions. A satellite **AirTherm** provides heat to the chamber, which is controlled by the Environmental Control Unit (ECU).

Control System Configurations

ECU-H5	Controller with heat only
ECU-HC	Controller with CO ₂ and heat
ECU-HOC	Controller with CO ₂ and O ₂
ECU-HCP	Controller with CO ₂ and heat, external probe

The **Environmental Control Unit (ECU)** houses all the electronics for:

- Regulating the CO₂ and O₂ flow and temperature in the chamber
- Controlling the temperature of our **AirTherm** Satellite or an auxiliary heater
- Monitoring the air flow, CO₂ level, O₂ level and temperature

The system comes in a variety of configurations:

- **ECU-H5**—Pre-mixed CO₂ gas of the desired concentration is pumped into the system, and this **ECU** regulates the airflow at the desired level. It also controls the heating and monitors the environment chamber.
- **ECU-HC**—This control unit mixes the air and CO₂ gas to the desired concentration. An internal CO₂ sensor (inside the **ECU** controller) monitors the concentration of the gas. The **ECU-HC** regulates the airflow at the desired level, controls the heating of the system and monitors the environment chamber.
- **ECU-HOC**—This unit performs like the **ECU-HC**. In addition to controlling the temperature and CO₂, this unit also controls the O₂ level. However, it offers no auxiliary heating options. Nitrogen is used to displace oxygen from the background air, which generally has about 20.7% oxygen. The O₂ level of the background gas can be regulated down to as low as 1%.
- **ECU-HCP**—This unit performs like the **ECU-HC**, except this unit comes with a remote CO₂ sensor that is positioned inside the stagetop environment chamber.



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The Satellite AirTherm can be controlled by the ECU to regulate temperature in an incubation chamber. The 220V is pictured above.

Satellite Heater Features

- USB-based remote control and data logging
- Electronic flow meter
- Programmable alarm for out of tolerance condition
- Compact and lightweight
- Adjustable setpoints for parameters, including:
 - Temperature PID controls for the environmental chamber with $\pm 0.1^\circ\text{C}$ precision
 - CO₂ and O₂ digital PID control with $\pm 0.1\%$ precision
 - Airflow digital PID control from 0–900 SCCM

SPECIFICATIONS

Power	110/240V, 50/60Hz
Operating Temperature (ambient)	10 – 50°C (50 – 122°F)
Operating Humidity (ambient)	15 – 70% RH, non-condensing
Warm up Time	20 minutes
Computer Interface	USB via external USB/RS232 converter
Sensor	Non-dispersive infrared (NDIR), dual beam, 20s response time

CO₂ Sensor (ECU-HCP and ECU-HC only)

Sensor Range	0 – 20% CO ₂
Control Range	0 – 20%
Control Precision	0.1% CO ₂
Control Accuracy	0.1 – 3% of reading
Drift	<2.5% reading/year

O₂ Sensor (ECU-HOC only)

Sensor Type	Zirconium Dioxide, diffusion, 4s response time
Sensor Range	0–25%
Control Range	0–25%*
Control Precision	0.1% O ₂
Control Accuracy	$\pm 0.5\%$ (2% of the full scale)

*The upper limit of the ECU-HOC oxygen control range is constrained by the oxygen content in the background gas. For example, if the background air has 20.7% oxygen, the ECU-HOC can only control up to 20.7% oxygen.

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