

CERES 2010™

# CERES

Controlled Environment Research EcoSystem

L I F E   S C I E N C E   E N V I R O N M E N T A L   C H A M B E R

**T**he CERES 2010™ Research EcoSystem is aptly named for the Roman goddess of agriculture whose death and resurrection symbolized the regenerative power of the earth. CERES also shares the name with the first discovered and largest asteroid orbiting between Mars and Saturn. In keeping with the historical significance of its name the CERES 2010™ has combined the best of terrestrial and space environment technologies into a completely solid state table top life science environmental chamber that uses less electrical energy than most household microwave ovens.

The CERES 2010™ energy efficiency is the result of combining several innovative technologies developed for the United States Manned Space Program into one energy efficient compact unit. These technologies include the SNAP-LITE™ solid state modular lighting system, the solid state thermoelectric heating and cooling modules and the solid state Hygrothermoelectric humidity control system. All of these systems have been designed to be monitored and controlled by a simple but powerful computer interface that can be driven by a small laptop computer. The innovative control software is user friendly and readily adaptable for most life science applications.



## FEATURES

### COMPUTER CONTROL INTERFACE:

The Computer Control Interface (CCI) on the CERES 2010™ provides a simple and convenient digital interface for most small laptop computers that are able to run under the Microsoft Windows® environment. The CCI communicates through a standard DB 25 parallel port and has the capability to monitor and control all of the operating features listed below. Simple point and click screen control is translated into real time control over all operating parameters. The software provided with each CERES 2010™ can be tailored to meet most custom operating requirements.

### LIGHTING:

**Lighting Range: 0 to 400 umol/m/sec.**

**Spectral Quality: Blue/Red 470/670 nm**

The SNAP-LITE™ lighting system for the CERES 2010™ is an innovative, low maintenance, long life, solid state lighting system expressly developed for the controlled environment chamber industry. This lighting system is based on wavelength specific Light Emitting Diodes and is capable of providing unlimited options in light spectral quality and power. The SNAP-LITE™ system is comprised of individual 15 X 15cm modules that can be simply plugged together to produce the required lighting environment for the experiment. The only photon energy projected into the chamber is energy

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designed to be used in the research. All of the undesirable far IR photon energy is eliminated from the chamber by the patented thermal management system of the SNAP-LITE™ design thereby eliminating thermal absorption and the resultant stress on the experiment.

#### **THERMAL MANAGEMENT:**

**Temperature Range: +15 to + 40 deg C.**

**Tolerance +/- 0.5 deg C.**

Heating and cooling on the CERES 2010™ is accomplished by using solid state Thermoelectric Coolers (TEC). The TEC's have an excellent response time when coupled with the computer interface. TEC's offer a quiet alternative to the noisy mechanical refrigeration compressors of the past and there is no CFC refrigerant to leak into the atmosphere thereby making the CERES 2010™ very environmentally friendly.

#### **HUMIDITY:**

**Humidity Range 20 to 80% relative**

**Tolerance +/- 2.0 %**

The CERES 2010™ HygroThermoElectric (HTE) humidity control system was developed for NASA to maintain precise humidity control for the research plant chambers on board the Space Shuttle. The HTE system has been designed to be used in the humidifier or dehumidifier mode. The solid state construction of the HTE provides long term reliability and easy interface with CERES 2010™ computer interface.

#### **AIR MANAGEMENT:**

The CERES 2010™ has been designed to have a laminar counter flow controlled internal air velocity of 0.5m/sec. The low velocity has been designed to enhance the overall temperature and humidity control and to minimize mechanical stress on the experiment.

#### **CARBON DIOXIDE:**

**CO<sup>2</sup> range 500 to 3,000 ppm**

**Tolerance +/- 25 ppm**

The CERES 2010™ is equipped with computer assisted CO<sup>2</sup> monitoring and control system that can be used to maintain a predetermined level of CO<sup>2</sup> during the illuminated cycle of the experiment. In low level applications the CO<sup>2</sup> control opens a port to the room ambient. For higher level requirements a reagent tank of CO<sup>2</sup> can be connected to the port.

#### **ETHYLENE MANAGEMENT:**

The CERES 2010™ has been designed to accept an optional non-consumable ethylene removal unit when required. The Ethylene Management Unit (EMU) is a non-consumable photocatalytic ethylene oxidation unit and is offered as an option. The EMU has been expressly developed for the CERES 2010™ product line and is easy to install.

#### **ASTROCULTURE™ ROOT TRAY:**

The optional Astroculture™ Root Tray has been designed to provide a favorable root environment while providing the nutrient and water requirements for proper plant response. This root tray is similar to the hardware flown on several successful missions on board the U.S. Space Shuttle and has been designed to interface with the CERES 2010™ hardware and computer interface.

## **GENERAL SPECIFICATIONS**

#### **ELECTRICAL**

115/60 - 10 amps.

#### **GROWING HEIGHT**

23" (58 cm) without root tray

20" (50.8 cm) with root tray

#### **GROWTH AREA**

2.76 Sq Ft. (.223 m<sup>2</sup>)

#### **INTERIOR**

(W) 26.5" x (D) 15" x (H) 23.5"

(W) 58.6 cm x (D) 38.1 cm x (H) 59.7 cm

#### **EXTERIOR**

(W) 31" x (D) 26" x (H) 46"

(W) 78.74 cm x (D) 66.0 cm x (H) 116.8 cm

#### **CONSTRUCTION**

Interior and exterior constructed of 22-gauge electro-zinc plated steel. All seams and joints on the outer and inner shells are welded. Inner shell is solidly supported by a non-compressing and non-thermal conducting material to lock the inner liner in place without a metal-to-metal bond to the outer case. The chamber is completely self-contained, suitable for stacking one above the other.

#### **INSULATION**

Insulated with rigid urethane. Overall wall thickness is 2" (5.1 cm) providing ample insulation for maintenance of stated temperature range and vapor isolation in a 35 degree C room ambient.

#### **DOOR**

One door opening 26 13/16" W x 24" H provides full access to chamber interior. A magnetic gasket and latch provide a tight seal to door frame. (Window is for demonstration purposes only)

#### **SHELVING**

One tier of zinc and acrylic coated steel wire shelving adjustable vertically on 1/2" (1.27 cm) centers. Shelf dimensions are 12" x 26" (30.48 cm x 66 cm).

#### **FINISH**

Interior/exterior painted with highly reflective white baked enamel.

The logo for CERES ALLIANCE features the word "CERES" in a large, light blue, sans-serif font. To its right, the word "ALLIANCE" is written in a smaller, pink, sans-serif font. A thin blue horizontal line is positioned below the "CERES" text.

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The *CERES* representative in your area is