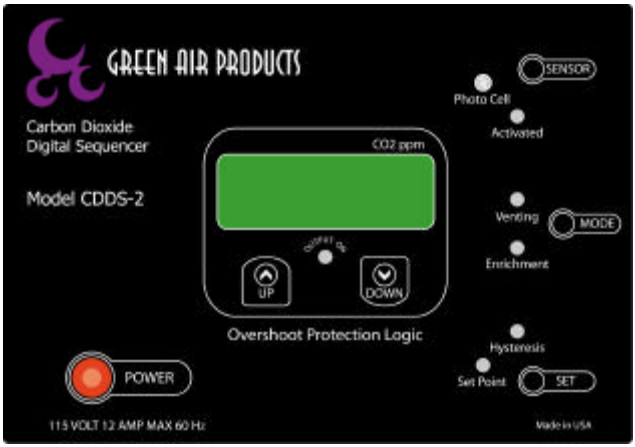
Green Air products

MODEL CDDS-2

CARBON DIOXIDE DIGITAL SEQUENCER



OPERATOR'S MANUAL

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Revision History

Date	Changes
12/15/00	First printing
5/01/01	Added "Setting the Elevation" (p. 5). Changed location of power output connector to right side panel.
5/7/01	Added typical performance graph and reference to brown-out protection in Introduction.

Introduction

The CDDS-2 controls the Carbon Dioxide CO_2 concentration within a space by acting as a ventilation or enrichment mode controller. The CO_2 concentration is sensed by an external gas sensor connected to the RJ11 jack (looks like a rectangular telephone connector) located on the bottom panel of the CDDS-2 case. The CDDS-2 can supply operating power to sensors for which it is wired.

When used in ventilation mode to remove excess CO_2, an external line-voltage-powered ventilator is plugged into the NEMA-15 jack (looks like a single position wall power outlet) on the right side of the CDDS-2. When used in enrichment mode to increase the CO_2 concentration, an external line-voltage-powered gas generator or injection valve is plugged into the CDDS-2. In either case, **the maximum current draw of the external controlled device must be under 12 Amps.**

In ventilation mode the CDDS-2 operates as a on-off setpoint controller. The output is activated whenever the detected concentration is above the setpoint plus hysteresis, and remains on until the output has dropped to the setpoint concentration.

In enrichment mode, a more sophisticated adaptive algorithm is implemented. This "Overshoot Protection Logic" algorithm "learns" the dynamics of the space being controlled to avoid the dramatic overshoots inherent to setpoint control (see Figure 1 on page 4). The learned control parameters are remembered even when the CDDS-2 is powered off.

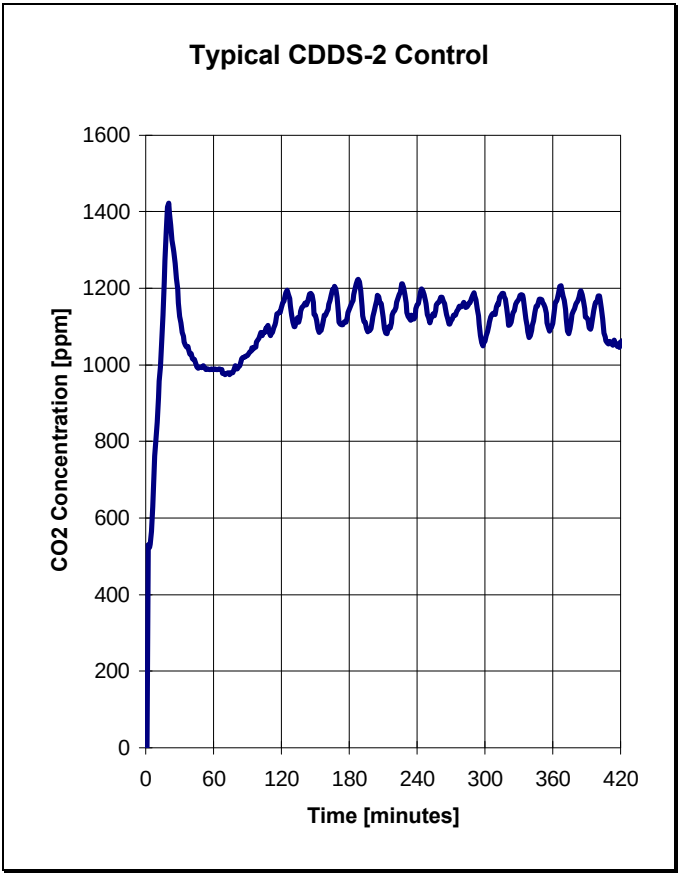

Figure 1: Typical Control Performance of **Overshoot Protection Logic** at 1200 ppm CO_2.

Operating Modes

The CDDS-2 operates in two fundamental modes designated **Enrichment** and **Venting**. It is imperative that the mode be set correctly for the intended application.

The operating mode is set with the front panel 'MODE' button to the right of the numeric display. Pressing and holding this button for several seconds changes the operating mode. The currently active mode is always indicated by an LED indicator in the front panel.

In either mode the red LED labeled 'OUTPUT ON' is lit when the power output connector is energized.

Venting Mode

Do not operate the CDDS-2 in Venting Mode with a gas generator or gas injection valve plugged into the power outlet connector.

Venting mode is used to **decrease** the concentration of CO_2 in the controlled space by activating a ventilator when the gas concentration rises above the setpoint value. In Venting mode a fan or other ventilator is connected to the power outlet connector. In this mode, the CDDS-2 energizes the power outlet connector to **decrease** the CO_2 concentration.

Enrichment Mode

Do not operate the CDDS-2 in Enrichment Mode with a ventilating device plugged into the power outlet connector.

Enrichment mode is used to **increase** the CO_2 concentration in the controlled space by activating a gas-generating device to increase the gas concentration as required. In Enrichment mode a gas-generating device such as an electric gas injection valve or electrically controlled burner is connected to the power outlet connector. In Enrichment mode the CDDS-2 energizes the power outlet connector to **increase** the CO_2 concentration.

Daylight Only Operation (photo mode)

A light sensor in the upper right hand corner of the CDDS-2's front panel can be activated to suppress the operation of the CDDS-2 during dark hours. Pressing and releasing the 'SENSOR' button in the upper right hand corner of the front panel activates and de-activates this feature. When the 'Activated' LED located under the 'SENSOR' button is lit, the sensor is active and the CDDS-2 does not turn on the output when the controlled space is dark.

In order for this feature to work correctly, the CDDS-2 must be mounted so that the front panel faces the controlled volume, and nothing casts a shadow over the sensor itself, which is located behind the window labeled 'Photo Cell' in the upper right of the front panel.

Turning the CDDS-2 On and Off

The large switch labeled 'POWER' in the lower left of the front panel turns the CDDS-2 on and off. Holding the switch down for about 1.5 seconds switches the unit from ON to OFF or vice versa. The button illuminates to indicate the unit is on.

The adaptive control settings are retained when the CDDS-2 is switched off with the power switch.

Control Settings

The setpoint and hysteresis are adjusted using the button marked 'SET' in the lower right of the front panel.

Setpoint is the target value of the CO_2 concentration in the controlled space. In Enrichment mode the power output connector is energized to increase the gas concentration when it falls below the setpoint value. In Venting mode the power output connector is energized to decrease the gas concentration when it exceeds the setpoint value.

The hysteresis setting can be used to fine tune the controller to the dynamics of the controlled space. A setting of 50 is recommended for most applications.

Setting the Setpoint Value

Pressing and releasing the 'SET' button once, lights the 'Set Point' LED and displays current setpoint value blinking in the numeric display. The 'UP' and 'DOWN' buttons under the numeric display are used to increase or decrease the displayed value.

After there have been no buttons pressed for about three (3) seconds, the display reverts to showing the concentration reported by the sensor and the 'Set Point' LED goes off.

Setting the Hysteresis Value

Pressing and releasing the 'SET' button twice lights the 'Hysteresis' LED and displays the current hysteresis value blinking in the numeric display. The 'UP' and 'DOWN' buttons under the numeric display are used to increase or decrease the displayed value. After there have been no buttons pressed for about three (3) seconds, the display reverts to showing the concentration reported by the sensor and the 'Hysteresis' LED turns off.

Setting the Elevation

The CDDS-2 can be set to its exact operating elevation to eliminate the measurement error caused by decreased barometric pressure at higher altitudes. To change the operating elevation:

1. Press and hold both the 'SET' and 'SENSOR' buttons for about five (5) seconds until all the yellow LEDs blink. The current elevation setting is displayed.
2. Use the 'UP' and 'DOWN' buttons to adjust the display reading to the current elevation in feet. The display moves in 10 foot increments.
3. After several seconds of no button activity the CDDS-2 reverts to its normal operating mode.

Connections

Input Power

The CDDS-2 is designed to operate from 100 to 130 Volt AC power lines. Plug the power cord into any standard 3-prong (grounded) power outlet. Be sure that the circuit powering the CDDS-2 is rated to supply the current consumed by the device connected to the power outlet connector.

Power Outlet Connector

The power outlet connector, located on the right side panel, is energized whenever the red LED labeled 'POWER ON' (located beneath the numeric display) is lit. When energized, the power outlet connector is directly connected to the power line. When de-energized, only the hot lead is disconnected. The ground and neutral leads of the power output connector are always connected to the ground and neutral leads of the power cord.

CO_2 Sensor

The CO_2 sensor is connected to the rectangular RJ11 connector in the bottom panel of the CDDS-2. The power outlet connector will not be energized if no sensor is connected.

The CDDS-2 expects the CO_2 sensor's analog output scaling to be 1mV equals 1ppm CO_2-(i.e. 5000 ppm = 5.00 volts)

Control Summary

Button Name	Location on Panel	Function
POWER	Lower left	Toggles unit between ON and OFF. Button must be held down for several seconds before it responds (to avoid accidental actuation).
SENSOR	Upper Right	Pressing and releasing this button toggles photo mode ON and OFF. Activated LED below button is lit when photo mode is ON. Light sensor is located to the left of the button.
MODE	Middle Right	Pressing and holding this button for several seconds toggles the controller's operating mode between *venting* and *enrichment* modes. The currently active mode is indicated by the illuminated LED to the left of the button.

Button Name	Location on Panel	Function
SET	Lower Right	Pressing and releasing this button once displays the current setpoint. Pressing and releasing it a second time displays the current hysteresis setting. Which parameter is being displayed is indicated by the two LEDs to the left of the button. The displayed value can be changed with the 'UP' and 'DOWN' buttons while the indicator LED is illuminated.
UP, DOWN	Underneath Display	These buttons are used to change the setpoint or hysteresis values when they are displayed using the 'SET' button.

Specifications

Parameter	Value
Operating Power Requirements	100 - 130 VAC, 50 - 60 Hz
Controller Switching Capacity	12 Amps MAX
CO_2 Control Range	300 - 5000 ppm
CO_2 Display	4 digit, .56" green LED
Operating Temp. Range	0 to +60 °C
Operating Humidity	0 -95% non-condensing
Warm-up Time	less than 5 minutes
CO_2 Sensor Input Range	0 - 5000 ppm
CO_2 Enrichment Algorithm	adaptive fuzzy logic
CO_2 Venting Algorithm	setpoint with adjustable hysteresis
CO_2 Sensor Analog Input Scaling	1 mV per ppm
Sensor Failure Detect	disconnects load if no sensor input
Relay: Mechanical Operations Electrical Operations	 10,000,000 operations 100,000
Enclosure Material	Black ABS
Enclosure Flammability	UL94 / V0
Dimensions (H x W x D)	5 x 7 x 2.85 (inch)
Weight	2 pounds
Storage Temperature	-40 to +85 °C
Warranty Period	1 year from date of purchase
Repair Service	return to manufacturer
Operating Life Expectancy	10 years typical