

# User Manual



## GSM500

### Carbon Dioxide Monitor/Controller



## ***Introduction***

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Thank you for purchasing the Triplet GSM500 CO<sub>2</sub> controller. An external CO<sub>2</sub> sensing probe is included to help you measure the CO<sub>2</sub> level in a closed space. This GSM500 controller has a 120V US AC line cord plug to get AC power from wall power outlet, and provide controlling function to other connected devices, such as CO<sub>2</sub> generator and ventilation fan.

To ensure safety, please read this manual carefully before installation and follow up the instructions. Store this manual in a secure place for future reference.

### **Features:**

- Accurate & low drift NDIR CO<sub>2</sub> measuring
- External CO<sub>2</sub> sensor to be used in a closed space
- Display real time CO<sub>2</sub> value
- Display CO<sub>2</sub> chart with adjustable time scale (week/day/hour/min/auto)
- Auto Max. /Min. Recall on CO<sub>2</sub> chart
- Programmable CO<sub>2</sub> zone value & CO<sub>2</sub> center value to control output power on/off
- Audible alarm warns CO<sub>2</sub> concentration
- Target zone indicator on CO<sub>2</sub> chart
- Built-in Day/Night auto detection on CO<sub>2</sub> probe to override CO<sub>2</sub> control
- Backlight to assist operation in dark place
- Monitoring & Controlling CO<sub>2</sub> value in Green house, residential and commercial building

## ***Included***

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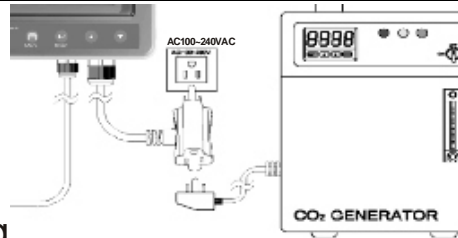
This package contains:  
Meter (controller + monitor)  
Operation manual  
Screws and tape

## ***Power Supply***

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The meter is powered by AC120 VAC directly.

The power plug is a USA piggyback plug type so you can plug in the device you want to control.



## ***Meter Placement***

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An external CO<sub>2</sub> sensing probe is included to help you measure CO<sub>2</sub> level in a closed space, the cable is 4.5 meter long to extend your measure spot 4.5 meter away from display. Please make probe and meter **away from water spray** to extend the life time.

Screws are provided in package. First using the provided wall sticker to locate the spot where you want to hang the sensing probe and controlling meter on , drill to fix screw and hang devices.



## ***Safety Fuse***




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The meter is powered by AC100~240 VAC directly and provide power through piggyback socket or EU/UK/FR/AU type socket to drive CO2 generator or ventilation. To avoid the damage by power overload, a 3kA@300VAC fuse is installed in meter. Contact distributor or shop to purchase new fuse while necessary. See appendix for detail.



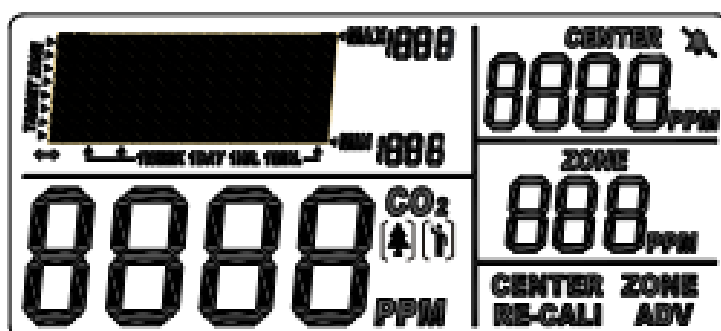
## ***Keypad and Function LEDs***

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- MENU Enter setup mode.
-  Save and finish settings.
-  Select mode or increase value in calibration and setup.
-  Change time scale. Select mode or decrease value in calibration and setup.

Power: Green on while powered  
Day time: Green on while detected light is >60 lux for 10 sec.  
Output: Green on while relay is ON

## LCD Display



CO2 Chart	CO2 trend in graphic
Max	Max of displayed chart
MIN	Min of displayed chart
Buzzer	Beeper alarm on/off indicator
Zone	Zone value for relay control
Center	Center value for relay control
CO2 PPM	Current CO2 value
Time scale	Chart time scale. Includes week, day, hour, min, auto
Target Zone	Controlling zone indicator
ADV	Advanced setting to customize your CO2 controller
RE-CALI	Operate to do CO2 calibration
	Plant mode or Human mode

## ***Operation***

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Plug the power plug into the wall socket to turn the controller on. While connect is successful, the device will show full display with a short beep and then performs 10 sec. countdown to warm up and also displays firmware information and “Warm Up” in chart display section.

Unplug the power plug to turn off the meter. While power on the meter again, the meter will retain the same setting from last operation, except the chart time will stay as 1 day while re-powered.

## Taking Measurements

The meter starts taking measurement after power on and updates readings every second. If your application is for green house CO2 control, no initial setup is needed. In the condition of operating environment change (ex. from high to low temp.), it takes 30 sec to respond for CO<sub>2</sub> change. Do not hold the probe close to face in case that exhalation affects CO<sub>2</sub>.





The device constantly displays current ambient CO<sub>2</sub>, set center value and set zone value.

### Trend Chart Zone

Below is a table that shows the available time scale and the duration of each division for corresponding scale:

Time Span	Time per division
1min	5sec/div
1hour	5 min/div
1day	2 hour/div
1week	0.5 day/div
Auto cycle	Cycle above

Using  to toggle the available time scale. When you choose auto cycle, you will see "  " on LCD and time scale exchange every 20 sec.

### MAX/MIN of displayed chart

At the right side of the displayed chart, there are two numerical indicators: Max and Min. They are the maximum

and minimum values on the displayed chart. While you press down key to change the chart time scale, these value update as well.

### **Display Backlight**

By pressing any key can activate the backlight for 30 seconds to help you operate in dark environment.

### **Auto Detect Day/Night**

In greenhouse application, CO2 control is not necessary while light is weak. The built-in Photo-Cell sensor in CO2 sensing probe can automatically detect whether it is Day (above 60 Lux) or Night (less than 20Lux). It can override the CO2 control and shut off the CO2 generator by turning off the output power during the night. Conversely, if the Photo-Cell detects light (>60Lux) and the CO2 level is consistently low for 30 seconds, the device will start the CO2 generator by turning on output power.

Above auto detect Day/Night function is ignored while users pick up “ Human” mode in advanced setting. With auto detection is ignored, the relay output control is only decided by CO2 value, only. Day or Night has no influence on it

### **Output Control**

Output power is on when CO2 value is lower Set Center-(1/2) Set zone, and off when CO2 concentration is above Set Center+(1/2) Set zone. For example, if the Set Center is 1200ppm, and the Set zone is 400ppm, the output power will shut off when CO2 over  $1200 + (1/2) * (400) = 1400$ ppm, and power on when CO2 below  $1200 - (1/2) * (400) = 1000$ ppm.

Above output control pattern is opposite

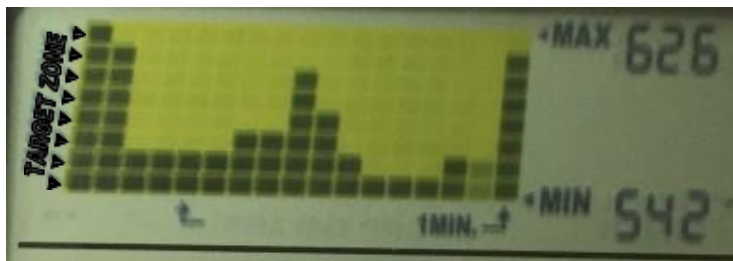
while users pick up “ Human” mode in advanced setting. You can check from display to know the existing setting is Human 🧑 or Plant 🌳 .

In Human mode, if the Set Center is 1200ppm, and the Set zone is 400ppm, the output power will turn on when CO2 over  $1200+(1/2)*(400)=1400$ ppm, and shut off when CO2 is below  $1200-(1/2)*(400)=1000$ ppm.

### Target Zone indicator

From displayed chart, users can easily know whether the current CO2 reading is the controlling target zone or not by checking the chart. Target zone is indicated by triangle icons.

For example, below picture shows the max. & min value of this time scale in last 85 seconds is 626ppm and 542ppm and it is all in controlling target zone.




### Buzzer Alarm



Buzzer alarm default as OFF (icon 🚫 ) . You may go for setup mode to turn the buzzer alarm function on (icon 🔔 ). While the buzzer is on, it beeps when CO2 value is over Set Center+Set zone, and off when CO2 concentration is below Set Center+Set zone. For example, if the Set Center is 1200ppm, and the Set zone is 400ppm, the beep will start when CO2 is over  $1200+400=1600$ ppm, and buzzer off when CO2 is below 1600ppm.


Above high alarm buzzer working pattern is applied to both Plant & Human mode.

## Setup

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Hold  key under normal mode to enter setup mode.

Press  key to choose the necessary setup function and then press  to enter.

To exit setup, press  key four times till it returns to normal mode. “Center”, “Zone”, “Re-CALI”, “ADV” and then return to normal display is a complete cycle of setup function.





In setup mode, if none of the keys are pressed within 1 min, the device will automatically return to normal status.

### **CENTER**


When entering setup mode, press  to enter “Center” value setup. The default value is 1200ppm for general plant. Press  or  to change the value and it is 50ppm/step. Then,



press  again to confirm it.


When entering setup mode, press  to enter “Zone” value setup. The default value is 400ppm for general purpose. Press  or  to change the value and it is 10ppm/step. Then, press  again to confirm it.

### **ZONE**

**Note:** One short cut for users to revert the Center and Zone to 1200& 400ppm : In normal mode, press  for 3 secs till an audible beep and LCD should show “ Back Home Done” .

### **RE-CALI**

While the accuracy of this device is a concern, you may use this function to calibrate this device with outdoor fresh atmospheric air in ~400ppm condition. It is suggested to do calibration in sunny day to ensure the fresh air is closed to 400ppm.

Leave the sensor in outdoor fresh air for 20 mins before you want to start the calibration. When entering setup mode, press keys to select “Re-CALI”, then hold  for 3 seconds until a beep and the chart will read “Calibration”. Leave the sensor in outdoor fresh air for 20 mins to complete the calibration.

To escape, press  to terminate without saving.

Make sure the device is far away from CO<sub>2</sub> source, not in direct sunlight, and not exposed to water.

#### **Note:**




The meter is calibrated at standard 400ppm CO<sub>2</sub> concentration in factory.




#### **Note:**




Do not calibrate the meter in the air with unknown CO<sub>2</sub> level. Otherwise, it will be taken as 400ppm and leads to inaccurate measurements.



## ADV(advance)



The last function in setup mode is called advance setting which allows you to customize your controller with more flexibility, includes: 1. buzzer alarm on/off, 2. CO2 altitude (pressure) compensation, 3. choose relay output to Human or 4. Plant mode, 5. restore to factory default status.


Press keys to select "ADV", then press  to enter. In ADV, press  or  to select Buzzer, Altitude, Restore or Human/Plant.

To enter Buzzer, press  and then use  or  to turn on/off buzzer alarm. The default is off.

To enter Altitude, press  and then use  or  to adjust. The range is 50M to 5000Meter. 50M/step.

To select Plant, you will see plant icon  is flashing, press  to confirm. Now, your relay output will be activated while Co2 value is lower than threshold.

To select Human, you will see human icon  is flashing, press  to confirm. Now, your relay output will be activated while CO2 value is too high.

To restore to factory default, press and hold  for 3 seconds till an audible beep. Now, all Center/Zone/Chart time/ Calibrate/Altitude will all restore to 1200 ppm/400ppm/1Day and 0M.

## Troubleshooting

### ? Can't power on

Check whether the power is well plugged.

Check whether the fuse is damaged

### ? Slow response

Check whether the air flow channels on the sensing probe is blocked.

### ? CO2 reading is "Hi"

Means the measured value is higher than 5000ppm. Remove the sensor to fresh air to revert it to normal display.

### ? Error messages

**Err4**, means IR lamp error.

Please reconnect power adapter

**Err5**, means Internal parameter error

Please reconnect power adapter.

**Err6**, means Communication error

Please reconnect sensor unit If above methods to release Err4 ~ 6 are not working,

## Specifications

Model	7530
<u>Measuring range</u>	
CO2	0~5000 ppm
Resolution	1ppm (0~1000); 0.1ppm (1000~2000); 1ppm (2000~5000)
<u>Accuracy</u>	
CO2 below 3000ppm	±50ppm or ±5% of reading, whichever is greater
Co2 above 3000ppm	±7% of reading
Warm-up time	30 seconds
<u>Response time</u>	
CO2	<2min for 63% of step change or <4.6min for 90% step change
LCD size	47 x 104 mm
Meter size	158 x 106 x 50 mm
Sensor size	124 x 33 x 26 mm
Operating condition	0~50 °C, 5~95% RH (avoid condensation)
Storage condition	-20~ 60 °C, 5~95%RH(avoid condensation)
Power supply	AC100~240VAC
Piggyback socket load	5A@250VAC; 10A@120VAC
Weight	700g
Standard package	Sensor, controller, manual, screws

## ***Warranty***

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Triplett / Jewell Instruments extends the following warranty to the original purchaser of these goods for use. Triplett warrants to the original purchaser for use that the products sold by it will be free from defects in workmanship and material for a period of (1) one year from the date of purchase. This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons in any way or purchased from unauthorized distributors so as, in our sole judgment, to injure their stability or reliability, or which have been subject to misuse, abuse, misapplication, negligence, accident or which have had the serial numbers altered, defaced, or removed. Accessories, including batteries are not covered by this warranty.

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## Appendix

### FUSE SPECIFICATION

Dimension:  
Dia.5 x 20(L) mm



- Amp code:1600
- Rated Current: 6.00A
- Max. Voltage:300 VAC  
300 VDC
- Max. Voltage Drop: 150 mV
- Breaking Capacity: 3kA@300V AC  
3kA@300V DC
- Typical Pre-arcing I2t (A<sup>2</sup>Sec):30

Location:  
The fuse is on the PCB.  
Please unscrew 7 screws  
on the back side of meter  
then you can find the fuse  
as shown.



### CO<sub>2</sub> LEVELS AND GUIDELINES

#### Plant

This CO<sub>2</sub> is default as 1200ppm for Target Zone (center) value and 1200ppm is suitable for most application. However, you still can adjust center and zone value to customize a best controlling output for your plant!

Plant Name	Target Zone/PPM
bean	600-900
chillies	800-1000
cucumber	1000-1500
grape	800-1400
orchid	800-1400
potato	1200-1800
strawberry	800-1200
tomato	800-1200

## Appendix

### **CO<sub>2</sub> LEVELS AND GUIDELINES**

#### **Non-Enforced Reference levels**

##### **NIOSH recommendations**

**250-350ppm:** normal outdoor ambient concentrations

**600ppm:** minimal air quality complaints

**600-1000ppm:** less clearly interpreted

**1000ppm:** indicates inadequate ventilation; complaints such as headaches, fatigue and eye/throat irritation will be more widespread. 1000ppm should be used as an upper limit for indoor levels.

#### **Regulatory exposure limit**

**ASHRAE Standard 62-1989:** 1000ppm

CO<sub>2</sub> concentration in occupied building should not exceed 1000ppm.

**Building bulletin 101 (BB101):** 1500ppm

UK standards for schools say that CO<sub>2</sub> at averaged over the whole day (i.e. 9am to 3.30 pm) should not exceed 1500ppm.

**OSHA:** 5000ppm

Time weighted average over five 8-hour work days should not exceed 5000ppm.