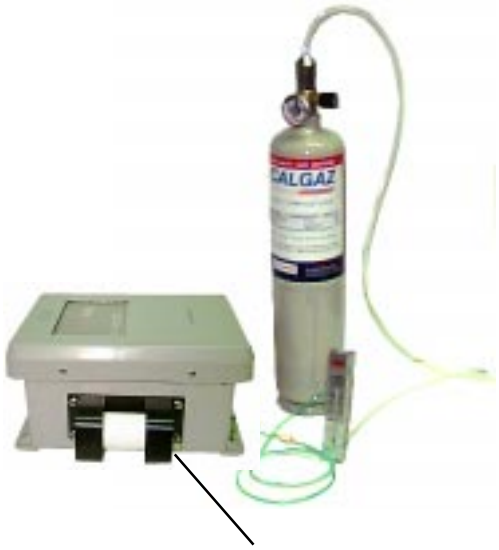
**Application Note: A 35**
***VTI-VALTRONICS, INC***

# $CO_2$ Diffusion Head Model 2156 Calibration Instructions

**$CO_2$ Diffusion Head Calibration Kit:**

2 cylinders of calibration gas:
99.8% **Nitrogen** (**ZERO** gas )
**1.0** +/-0.02% $CO_2$ (**SPAN** gas )
or a **0.5** +/-0.01% $CO_2$ for a 3% unit
Regulator:
reuseable **0.3** LPM (300 ml/min)
with on/off valve
Flow meter - 1-500 ml/min
Tubing, #10-32 hose barb
Twin-pack carrying case
To order please call (209) 754-0707
or FAX (209) 754-0104



#10-32 hose barb

Gas calibration should be done a minimum of once every (**6** ) six months (at least **ZERO** calibration).
If you keep a log book on calibration and record how much zero & span drift occur you can verify if the calibration interval is correct. You may find that ZERO calibration every 6 months and both ZERO & SPAN only once a year is sufficient to maintain accuracy.

**Calibration INSTRUCTIONS:** see **Application Note A46** for adjustment locations

1. Remove protective cap from top of nitrogen cylinder. Push and thread pressure regulator valve onto cylinder outlet. Nitrogen is**ZERO** gas. Fresh air is about **0.04**% $CO_2$
2. Connect plastic tubing from pressure regulator outlet to flow meter inlet. (bottom connection of flow meter) **Caution**: your breath contains about **3**% $CO_2$
3. Connect plastic tubing from flow meter outlet (top connection) to unit to be tested.
4. Make sure unit to be tested is turned on and has had a 5 minute warm-up.
5. Connect voltmeter to 0-5V output (pin# **9 + lead** and pin# **8 - lead** of voltmeter).
6. Make sure flow meter is in an upright position. Open flow valve slowly while observing flow meter.
7. Adjust the flow to between 250 - 350 ml/min (the regulator should limit flow to about 300).
8. After 3 minutes of continuous nitrogen flow, observe signal output and perform **ZERO** adjustment (**0.00 +/-0.05 volts**) if required.
9. Turn off flow valve and remove pressure regulator valve from nitrogen cylinder.
10. Replace nitrogen cylinder with cylinder containing SPAN gas (0.1%$CO_2$ for a 0.2% full scale unit, 0.5%$CO_2$ for a 1%unit, 1%$CO_2$ for a 2% or 3% FS unit, 2%$CO_2$ for a 5% FS unit, 5% $CO_2$ for a 10% FS unit )
11. Open flow valve and observe signal output. (see scale data for voltage reading)
12. Allow sample to flow until final indication is obtained. Adjust **SPAN** potentiometer if required. (see scale data for voltage reading) A Model 2156 5% unit will give 2.00 volts using 2.0% $CO_2$ tank. A 3% unit will give 1.67 V using 1.0% $CO_2$. A 1% unit will give 2.5 V using 0.5% $CO_2$ .
13. Turn off flow valve and remove pressure regulator from cylinder.

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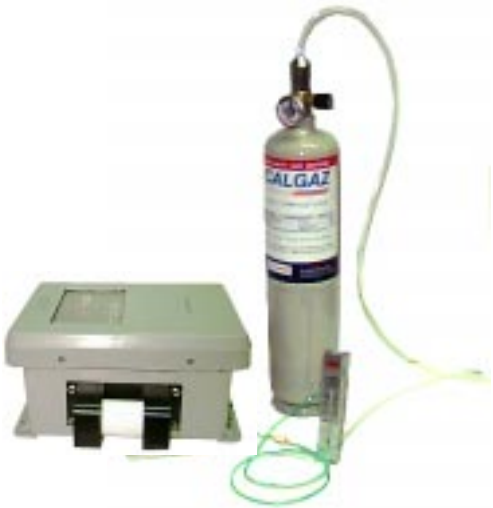
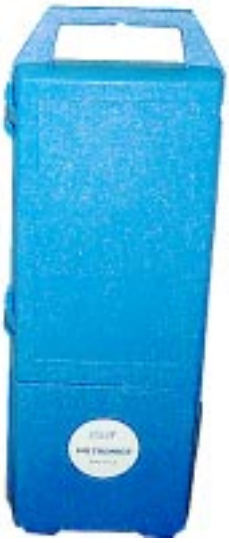
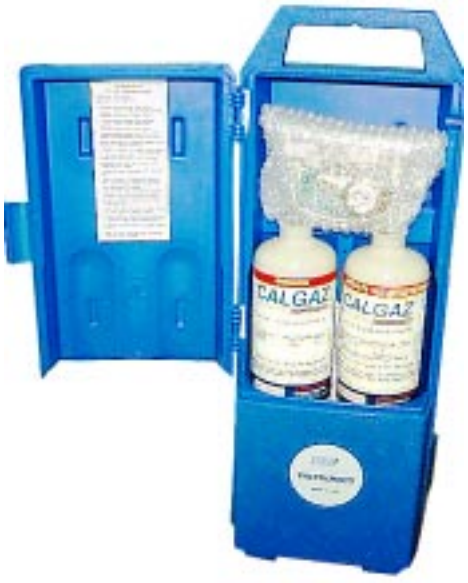
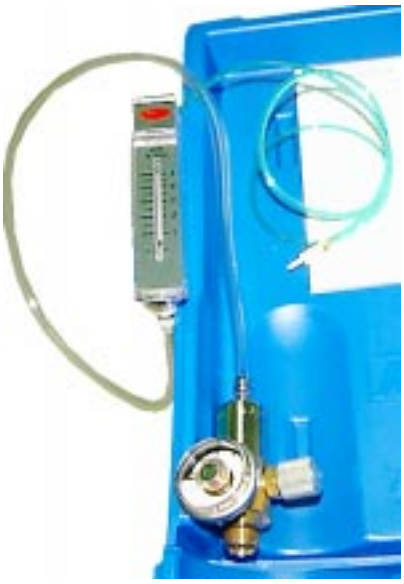



23 x 9 x 4.5 inches

0 to 500 ml/minute **flow meter #0290**, **tubing #651**, **#10-32 Hose barb #0308**, 0.3 L/min pressure **regulator# 362** with flow valve, two **#0304** plastic **hose barbs** for the flow meter & two **#0651** plastic tubes.





Notes:

- **Field Calibration Kits** are available. See **page 3** for Ordering **part numbers**
  they consist of: one tank with an 8 hour supply of 99.8% $N_2$
  one tank with an 8 hour supply of 5.0% $CO_2$
  a pressure regulator, flow meter, and carrying case
  Concentrations of 0.1% (1000 +/-20 ppm certified) $CO_2$, 0.2%, 0.5%, 1%, 5%, & 15% are in stock. These are all certified to be +/-2% of reading.
- Replacement 8 hour gas tanks for the $CO_2$ and for $N_2$.
  These 14" high tanks contain 3.6 $ft^3$ or 103 liters @70 degrees F and 1000 PSIG.
- Special gases and concentrations may be ordered with 3-6 week lead times depending on the specific gas ordered.
- All volume discounts are based upon a single shipment
- Prices are subject to change without notice.

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**VTI-VALTRONICS, INC**

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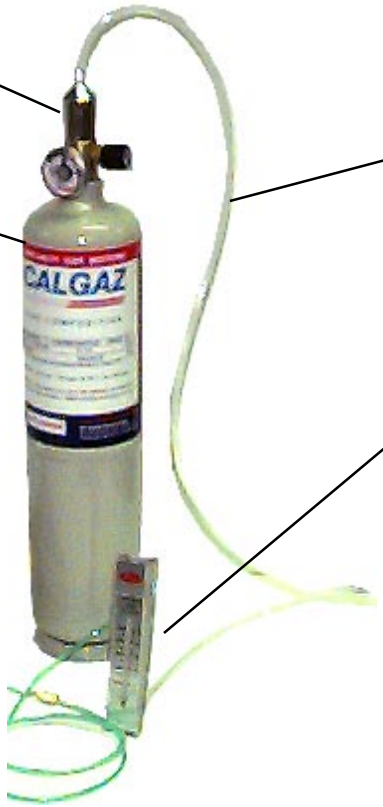
Table of **VALTRONICS** part numbers to order different concentrations of carbon dioxide.
You should use a **tank value** near mid-scale and **not at full scale.**
Examples: 1000 ppm (0.1%) $CO_2$ for a 2000 ppm full scale unit like a 6289.
1.0% $CO_2$ for a 3% full scale unit like a Model 2156 or 2166.
5.0% $CO_2$ for a 10% full scale unit like a Model 2008, 2166, or 2015SPI-3

| **VALTRONICS part #** | **Certified $CO_2$ concentration** |
|---|---|
| **030181** | **Kit 0.1**% (1000 ppm) $CO_2$ +/-2% of reading **Certified** = **0.100**+/-**0.002**% $CO_2$ |
| **030337** | **Kit 0.5**% (5000 ppm) $CO_2$ +/-2% of reading **Certified** = **0.500**+/-**0.010**% $CO_2$ |
| **030338** | **Kit 1.0**% (10000 ppm) $CO_2$ +/-2% of reading **Certified** =**1.000**+/-**0.020**% $CO_2$ |
| **030339** | **Kit 5.0**% (50000 ppm) $CO_2$ +/-2% of reading **Certified** =**5.000**+/-**0.100**% $CO_2$ |
| **0616** | Replacement **nitrogen** ($N_2$) **tank** for ZERO adjust. |
| **0615** | Replacement **0.1**% (1000 ppm) $CO_2$ **tank** for SPAN adjust on 2000 ppm units. |
| **0610** | Replacement **0.2**% (2000 ppm) $CO_2$ **tank** for SPAN adjust on 5000 ppm units. |
| **0611** | Replacement **0.5**% (5000 ppm) $CO_2$ **tank** for SPAN adjust on 1% units. |
| **0836** | Replacement **1.0**% (10,000 ppm) $CO_2$ **tank** for SPAN adjust on 2% or 3% units. |
| **0856** | Replacement **2.0**% (20,000 ppm) $CO_2$ **tank** for SPAN adjust on 3% or 5% units. |
| **0612** | Replacement **5.0**% (50,000 ppm) $CO_2$ **tank** for SPAN adjust on 10% units. |
| **0837** | Replacement **10**% (100,000 ppm) $CO_2$ **tank** for SPAN adjust on 20% units. |

Pressure regulator to limit flow to **300 ml** per minute.

**Tank of Certified $CO_2$** with balance of nitrogen




Two (2) #**0651** 3/16 ID x 3 ft long plastic tubes. One to bottom of flow meter & one from top of flow meter to the #**0308** #10-32 hose barb on the gas cell.

0 to **500 ml** (0.500 L/min ) per min. #**0290 flow meter** with two # **0304** 3/8 NPT to 3/16 ID hose barbs