



# 涡度通量系统常见故障、 分析仪 **Zero/Span** 及复位操作

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2023年8月17日

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- 与闭路系统气路有关的故障现象

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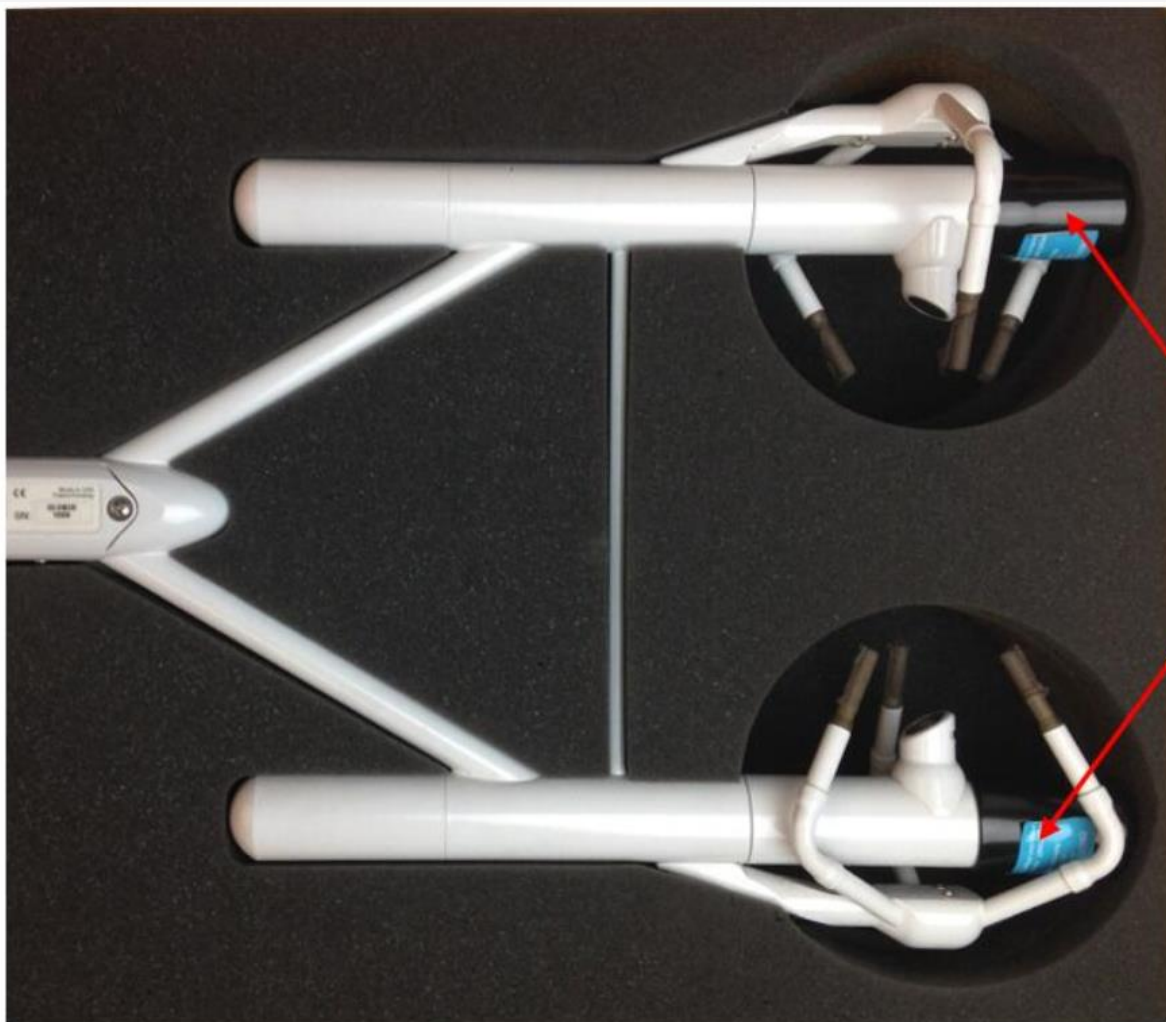
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# 1. 涡度通量系统常见故障现象

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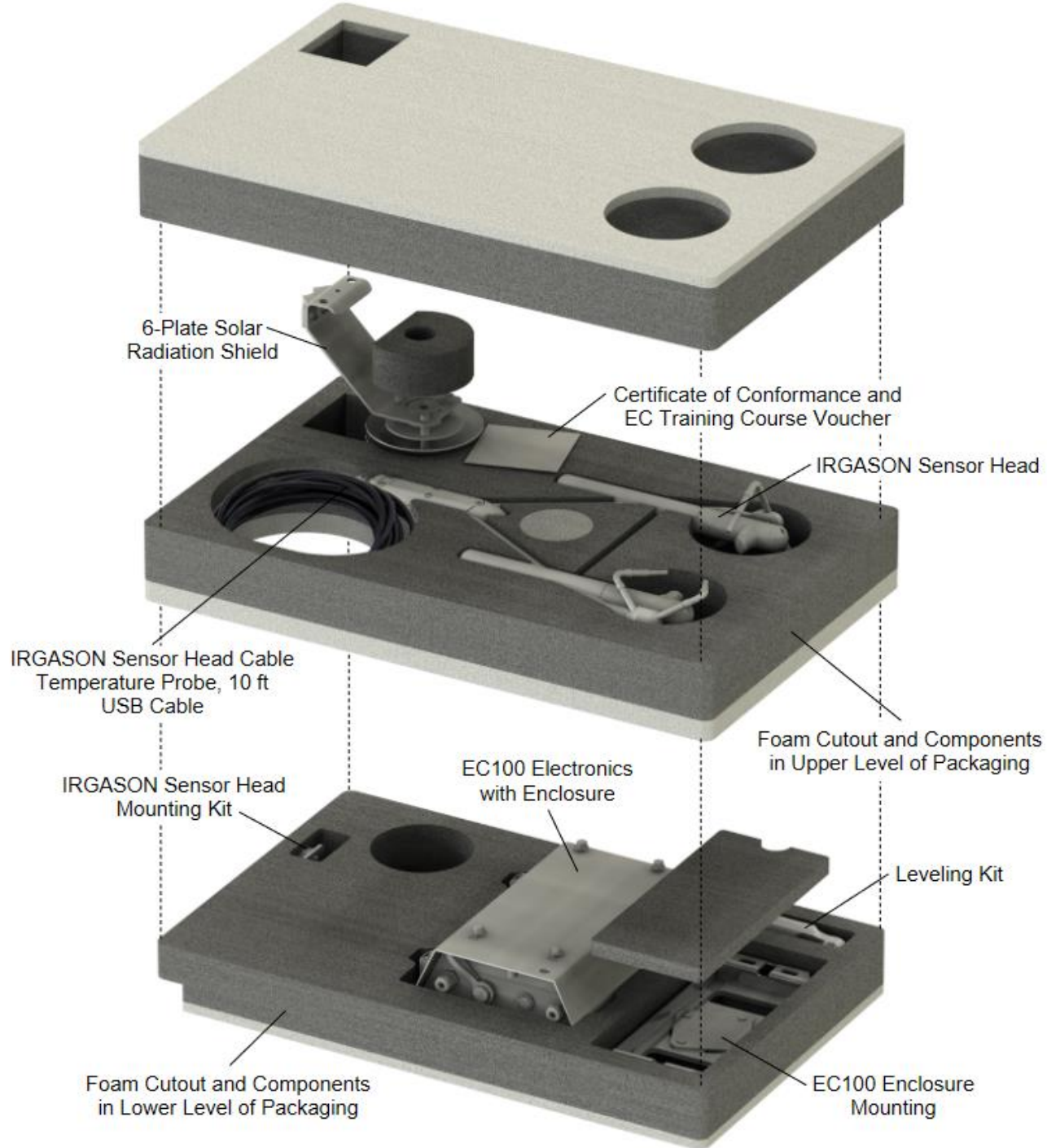
## 1.1 运输安全 (老版防护泡沫)



Protective shipping bumpers



# 运输安全 (新版防护泡沫)



# 运输安全 (实例 1)



# 运输安全 (实例 2)

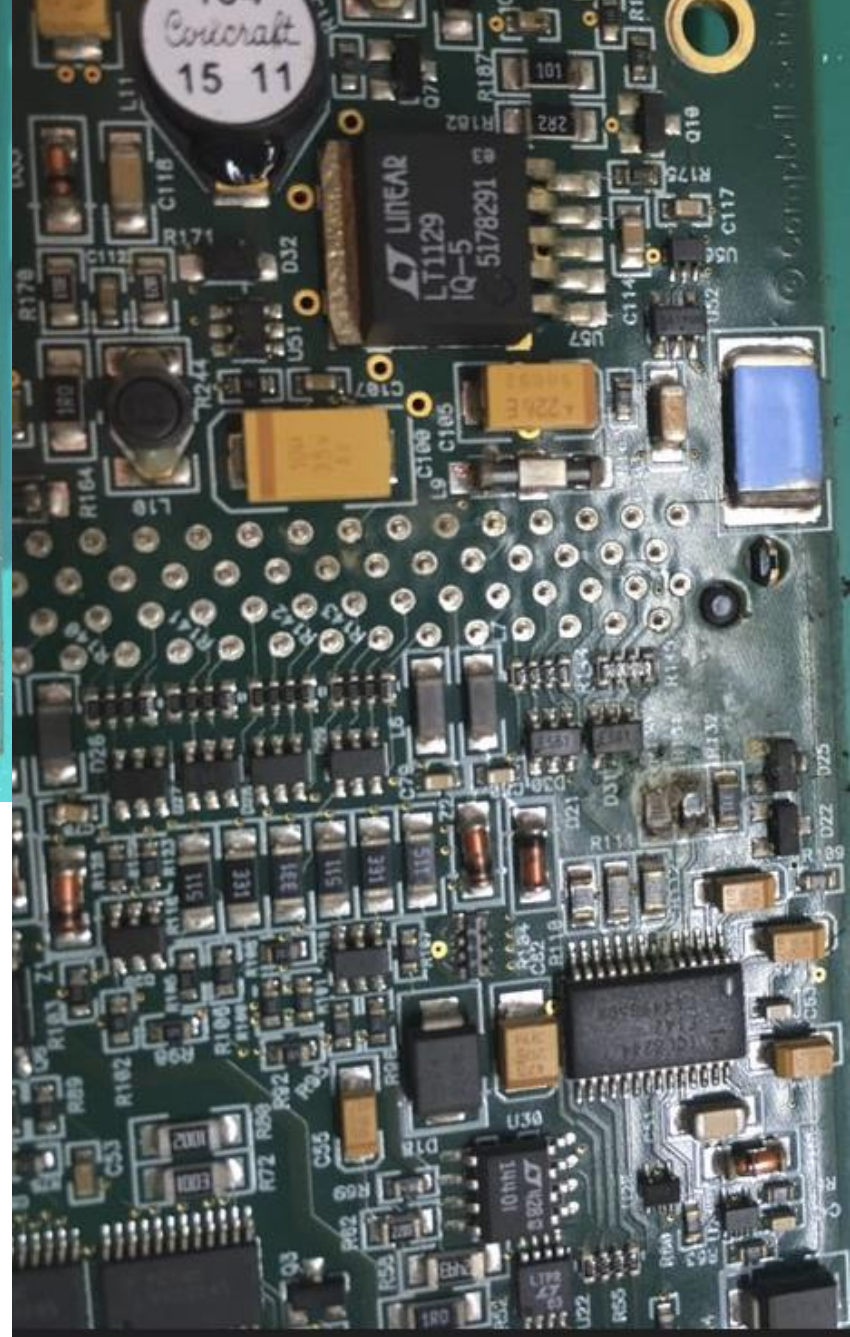
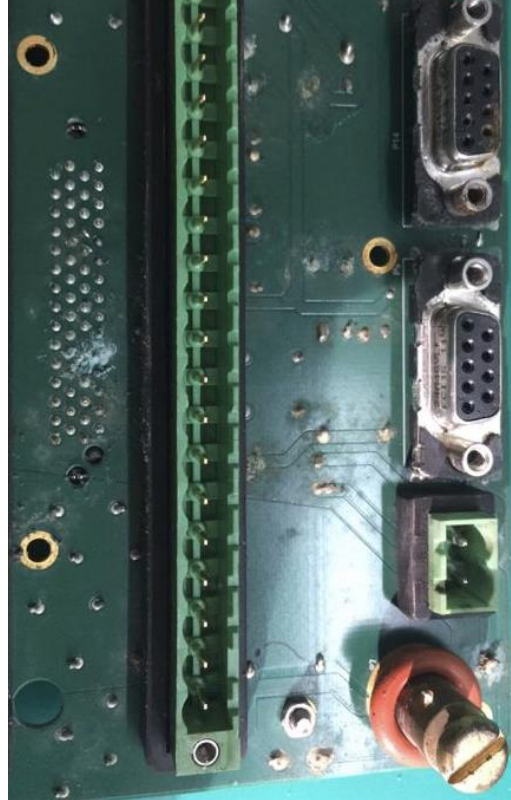




## 1.2 保持电子设备干燥



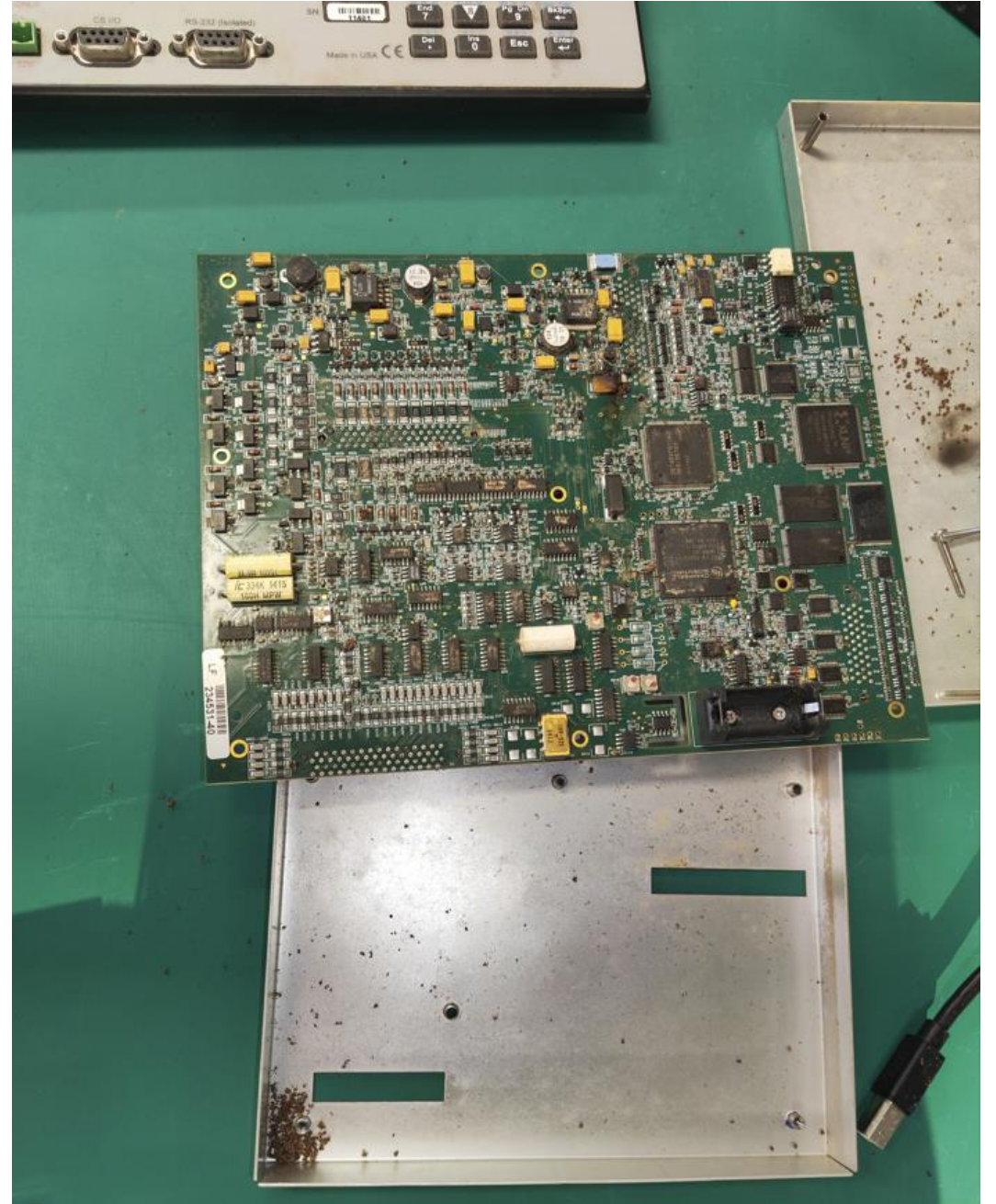
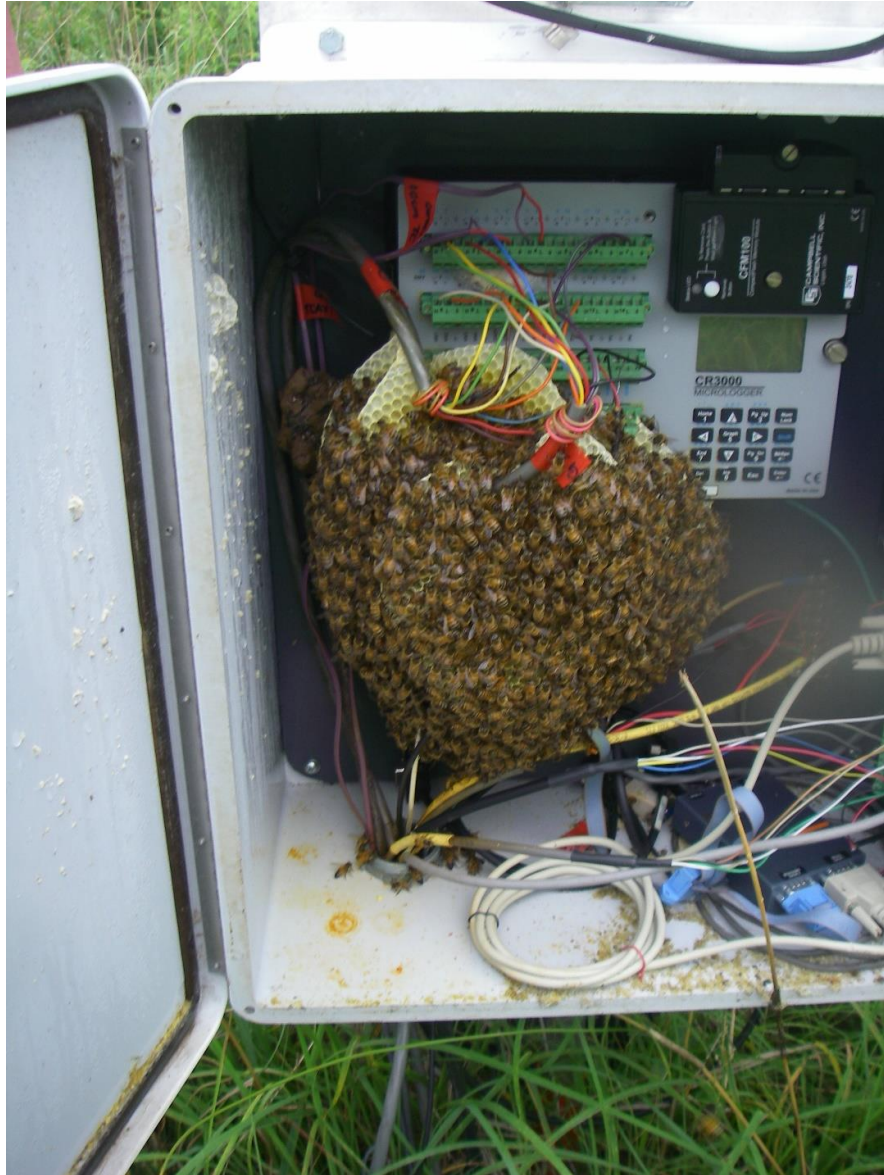
## ▶ 定期更换机箱内部的干燥剂



无凝结条件是保证电子设备长期安全可靠运行的重要保证!



## 1.3 防止动物侵入



# 1.4 分析仪故障诊断码

Gas analyzer diagnostic flags -- not connected

Flag Status	Description
N/A	No diagnostic flags are set
N/A	No general system fault
N/A	Gas analyzer is running
N/A	Motor speed within limits
N/A	TEC temperature within limits
N/A	Source power within limits
N/A	Valid source temperature
N/A	Source current within limits
N/A	Gas head powered
N/A	Gas input data in sync with home pulse
N/A	Valid ambient temperature
N/A	Valid ambient pressure
N/A	CO2 I within limits
N/A	CO2 Io within limits
N/A	H2O I within limits
N/A	H2O Io within limits
N/A	Moving variation in CO2 Io within limits
N/A	Moving variation in H2O Io within limits
N/A	CO2 signal level ok
N/A	H2O signal level ok
N/A	Gas head calibration signature ok
N/A	Heater control within limits
N/A	Differential pressure within limits

Gas head lifetime hours      not connected

Gas analyzer diagnostic flags good. No warning flags set.

Flag Status	Description
ok	No diagnostic flags are set
ok	No general system fault
ok	Gas analyzer is running
ok	Motor speed within limits
ok	TEC temperature within limits
ok	Source power within limits
ok	Valid source temperature
ok	Source current within limits
ok	Gas head powered
ok	Gas input data in sync with home pulse
ok	Valid ambient temperature
ok	Valid ambient pressure
ok	CO2 I within limits
ok	CO2 Io within limits
ok	H2O I within limits
ok	H2O Io within limits
ok	Moving variation in CO2 Io within limits
ok	Moving variation in H2O Io within limits
ok	CO2 signal level ok
ok	H2O signal level ok
ok	Gas head calibration signature ok
ok	Heater control within limits
ok	Differential pressure within limits

Gas head lifetime hours      16607.75 hours

# 分析仪故障诊断码

EC100 Series Monitor Software

File Help

**IRGASON** Setup Graphs Zero/Span **Status**

### CO<sub>2</sub>

60.58 mg/m<sup>3</sup>

1.38 mmol/m<sup>3</sup>

34.31 μmol/mol

1.92 μmol/mol (dry)

### H<sub>2</sub>O

-12203.87 g/m<sup>3</sup>

-677992.69 mmol/m<sup>3</sup>

-16894.18 mmol/mol

-944.12 mmol/mol (dry)

-52819.51 % rel. humidity

< -60 °C

Ux -nan m/s

Uy -nan m/s

Uz -nan m/s

Sonic Temperature -nan °C

CO<sub>2</sub> Signal Strength 0.07

H<sub>2</sub>O Signal Strength 0.05

Air Temperature 25.08 °C

Source Temperature 29.62 °C

Detector Temperature 28.94 °C

Barometric Pressure 99.51 kPa

Status

Warning! Gas analyzer data may be suspect.

Flag Status	Description
WARNING	Data are suspect
ok	No general system fault
ok	Gas analyzer is running
ok	Motor speed within limits
ok	TEC temperature within limits
ok	Source power within limits
ok	Valid source temperature
ok	Source current within limits
ok	Gas head powered
ok	Gas input data in sync with home pulse
ok	Valid ambient temperature
ok	Valid ambient pressure
WARNING	CO <sub>2</sub> I exceeds limits
WARNING	CO <sub>2</sub> I <sub>o</sub> exceeds limits
WARNING	H <sub>2</sub> O I exceeds limits
WARNING	H <sub>2</sub> O I <sub>o</sub> exceeds limits
ok	Moving variation in CO <sub>2</sub> I <sub>o</sub> within limits
ok	Moving variation in H <sub>2</sub> O I <sub>o</sub> within limits
WARNING	CO <sub>2</sub> signal level too low
WARNING	H <sub>2</sub> O signal level too low
ok	Gas head calibration signature ok
ok	Heater control within limits
ok	Differential pressure within limits

Gas head lifetime hours 16607.92 hours

Warning! Sonic anemometer data may be suspect.

Flag Status	Description
ok	Low amplitude
ok	High amplitude
ok	Signal level
ok	Delta temperature
WARNING	Acquiring ultrasound
ok	Sonic head calibration


## 1.5 三维超声故障诊断码

Sonic anemometer diagnostic flags -- not connected

Flag Status	Description
N/A	Low amplitude ok
N/A	High amplitude ok
N/A	Signal lock ok
N/A	Delta temperature ok
N/A	Sonic is running
N/A	Sonic head calibration signature ok

Sonic anemometer diagnostic flags good. No warning flags

Flag Status	Description
ok	Low amplitude ok
ok	High amplitude ok
ok	Signal lock ok
ok	Delta temperature ok
ok	Sonic is running
ok	Sonic head calibration signature ok

 Warning! Sonic anemometer data may be suspect.

Flag Status	Description
ok	Low amplitude ok
ok	High amplitude ok
ok	Signal lock ok
ok	Delta temperature ok
<b>WARNING</b>	<b>Acquiring ultrasonic signals</b>
ok	Sonic head calibration signature ok

# 判断三维超声读数的合理范围

CSI对每一台CSAT3系列三维超声  
对于Ux, Uy, Uz 三维风速数据, 符合指标

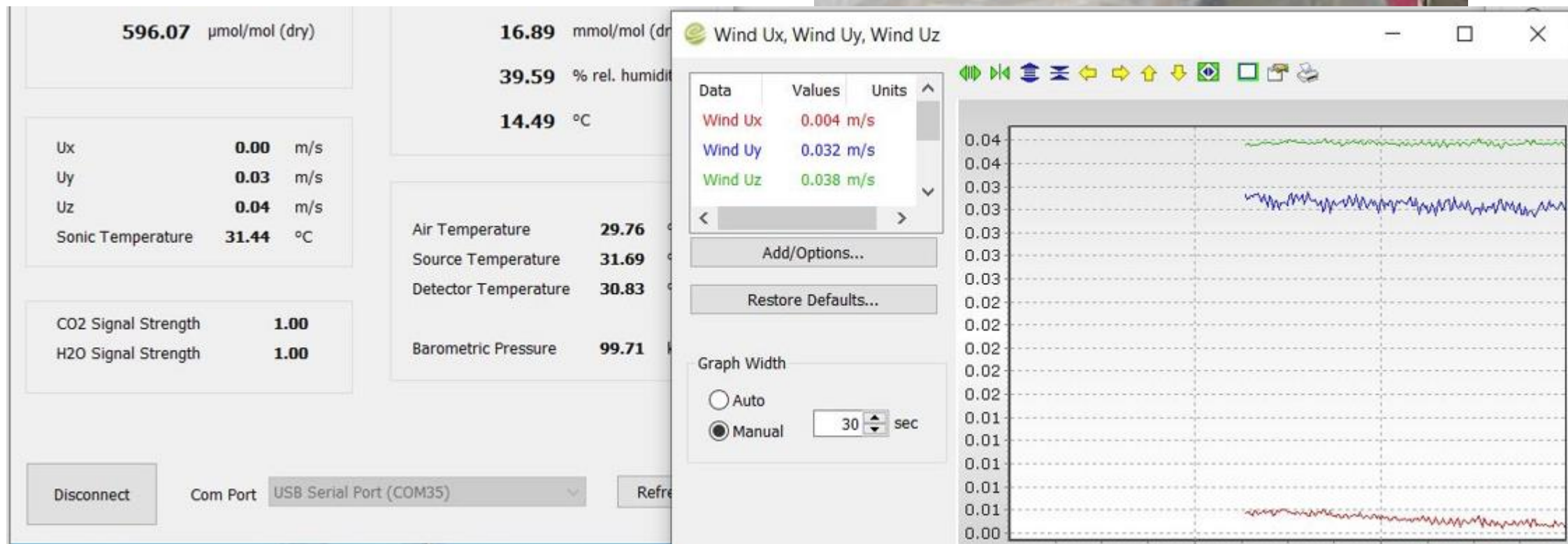
对于Ts, 可以通过与真实空气温度  
值是否合理

$$T_s = T (1 + 0.51q)$$

The screenshot shows the EC100 Series software interface. The main window displays a table of data with columns for various parameters. A red circle highlights the columns for CO2, Ux, Uy, Uz, and Sonic Temperature. The table data is as follows:

Parameter	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
CO2	0.0584	0.0513	0.0561	0.0609	0.0610	0.0548	0.0652
Ux	-0.1751	-0.1740	-0.1729	-0.1734	-0.1646	-0.1791	-0.1686
Uy	-0.1740	-0.1665	-0.1533	-0.1568	-0.1593	-0.1726	-0.1794
Uz	0.0584	0.0513	0.0561	0.0609	0.0610	0.0548	0.0652
Sonic Temp	36.6339	36.6973	36.6069	36.5616	36.5444	36.5878	36.6001
CO2 Signal Str	19.3166	19.3081	19.2545	19.1610	19.1091	19.1419	19.1143
H2O Signal Str	20.2479	20.0976	20.0466	20.1010	20.0328	20.0664	19.9889

# 判断三维超声读数的合理范围

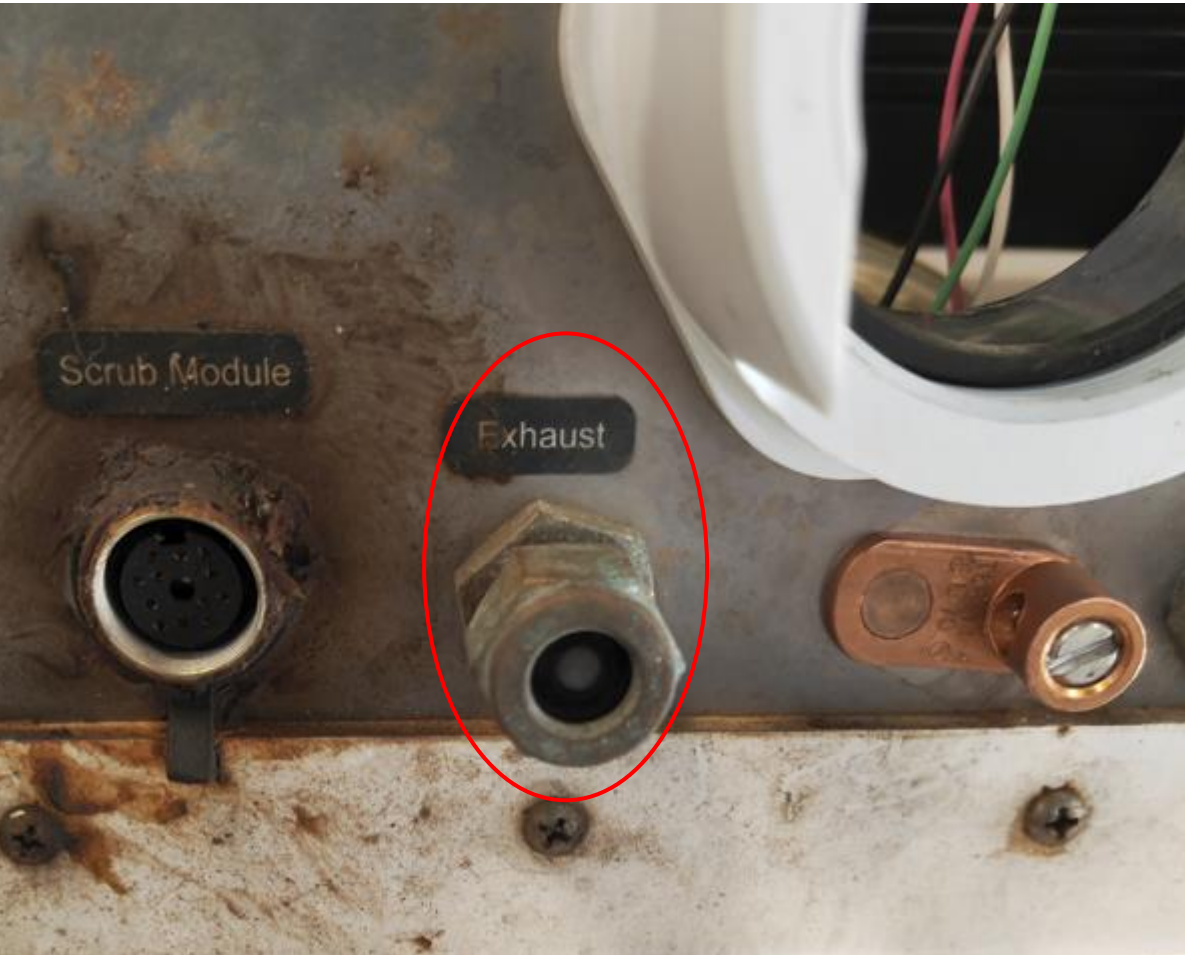




## 1.6 与闭路系统气路有关的故障现象



正确加工管接头，正确使用管接头！



RecNum	55141	ec155_pwr_off_	false	Ux	NAN	pump_press	100.3442
TimeStamp	3 16:04:16	ec155_vlt_low_	false	Uy	NAN	pump_flow_raw	7.713185
card_bytes_free	Undefined	ec155_actual_p	true	Uz	NAN	pump_flow_set_	8
card_storage_av	Undefined	ec155_user_set	true	diag_sonic	-1	pump_flow_duty	1
sonic_azimuth	0	sec_snc_last_m	Undefined	CO2_mixratio	1033.839	mode	1
latitude	41.766	CO2_zero_coef	Undefined	H2O_mixratio	4.091331	site_	fld smp
hemisphere_NS	1	CO2_span_coef	Undefined	diag_irga	0	CO2_span_gas	400
longitude	-111.855	H2O_zero_coef	Undefined	cell_tmpr	24.8363	Td_span_gas	10
hemisphere_EW	1	H2O_span_coef	Undefined	cell_press	100.5529	H2O_span_gas	12.41427
altitude	10	rst_CO2_zro_cc	Undefined	CO2_sig_strgth	0.9886448	e_span_gas	1.232984
height_measure	15	rst_CO2_spn_c	Undefined	H2O_sig_strgth	0.9902517	valve_tmpr_ctrl_	false
surface_type	6	rst_H2O_zro_cc	Undefined	diff_press	0	valve_tmpr	25.08197
height_canopy	Undefined	rst_H2O_spn_c	Undefined	pump_flow	7.709763	valve_tmpr_ok	true
displacement_us	0	do_zero_flg	false	sampling_regime	1	valve_diff_press	0
roughness_user	0	do_CO2_span_	false	cell_e	0.4097188	valve_ctrl_press	100.5523
separation_x_irg	0.1502	do_H2O_span_	false	cell_T_DP	-5.43538	valve_flow	0
separation_y_irg	-0.03218	prfrm_auto_zerc	true	cell_e_sat	3.150283	valve_flow_set_	1
dist_intrst_60_3	1500	attdnt_chck_se	Undefined	cell_RH	13.00578	valve_flow_duty_	0
dist_intrst_60_1	1500	alpha_PF_60_3	0	press	100.5529	counts_on_site	210
dist_intrst_170_	1500	beta_PF_60_30	0	Tc	24.8363	sec_on_site	20.9
dist_intrst_190_	1500	alpha_PF_60_1	0	e	0.4097188		
daytime	1	beta_PF_60_17	0	T_DP	-5.43538		
volt_batt	Undefined	alpha_PF_170_	0	e_sat	3.150283		
tmpr_panel	Undefined	beta_PF_170_1	0	RH	13.00578		
volt_CDM_VOL	Undefined	alpha_PF_190_	0	CO2_density	1839.046		
message	FLD_MEA.	beta_PF_190_3	0	H2O_density	2.97928		
press_source	0	Planar_Fit_flg	false	rho_d	1170.946		
set_press_sourc	false	d	0	rho_a	1.173925		
shadow_corr	0	z0	0.01	pump_tmpr	28.87357		
set_shadow_cor	false	Ts	NAN	pump_tmpr_ok	true		

- Add...
- Delete
- Delete All
- Options...
- Stop

Duty Cycle:  
占空比

RecNo	2150	ec155_pwm_on	false	Ux	NAN	pump_press	99.79984
TimeStamp	3 16:23:03	ec155_vlt_low_a	false	Uy	NAN	pump_flow_raw	7.998935
card_bytes_free	Undefined	ec155_actual_p	true	Uz	NAN	pump_flow_set	8
card_storage_av	Undefined	ec155_user_set	true	diag_sonic	-1	pump_flow_duty	0.8652391
sonic_azimuth	0	sec_snc_last_m	Undefined	CO2_mixratio	1033.977	mode	1
latitude	41.766	CO2_zero_coef	Undefined	H2O_mixratio	3.899221	site_	fld smp
hemisphere_NS	1	CO2_span_coe	Undefined	diag_irga	0	CO2_span_gas	400
longitude	-111.855	H2O_zero_coef	Undefined	cell_tmpr	24.96158	Td_span_gas	10
hemisphere_EW	1	H2O_span_coe	Undefined	cell_press	100.5279	H2O_span_gas	12.41739
altitude	10	rst_CO2_zro_cc	Undefined	CO2_sig_strgth	0.9716689	e_span_gas	1.232983
height_measure	15	rst_CO2_spn_c	Undefined	H2O_sig_strgth	0.9714174	valve_tmpr_ctrl	false
surface_type	6	rst_H2O_zro_cc	Undefined	diff_press	0	valve_tmpr	25.50372
height_canopy	Undefined	rst_H2O_spn_c	Undefined	pump_flow	7.998838	valve_tmpr_ok	true
displacement_us	0	do_zero_flg	false	sampling_regim	1	valve_diff_press	0
roughness_user	0	do_CO2_span_	false	cell_e	0.390458	valve_ctrl_press	100.5314
separation_x_irg	0.1502	do_H2O_span_	false	cell_T_DP	-6.067447	valve_flow	0
separation_y_irg	-0.03218	prfrm_auto_zerc	true	cell_e_sat	3.173911	valve_flow_set	1
dist_intrst_60_3	1500	atndnt_chck_se	Undefined	cell_RH	12.30211	valve_flow_duty	0
dist_intrst_60_1	1500	alpha_PF_60_3	0	press	100.5279	counts_on_site	805
dist_intrst_170_	1500	beta_PF_60_30	0	Tc	24.96158	sec_on_site	80.4
dist_intrst_190_	1500	alpha_PF_60_1	0	e	0.390458		
daytime	1	beta_PF_60_17	0	T_DP	-6.067447		
volt_batt	Undefined	alpha_PF_170_	0	e_sat	3.173911		
tmpr_panel	Undefined	beta_PF_170_1	0	RH	12.30211		
volt_CDM_VOLT	Undefined	alpha_PF_190_	0	CO2_density	1838.413		
message	FLD_MEA.	beta_PF_190_3	0	H2O_density	2.838032		
press_source	0	Planar_Fit_flg	false	rho_d	1170.387		
set_press_sourc	false	d	0	rho_a	1.173225		
shadow_corr	0	z0	0.01	pump_tmpr	32.37155		
set shadow cor	false	Ts	NAN	pump tmpr ok	true		

Duty Cycle:  
占空比

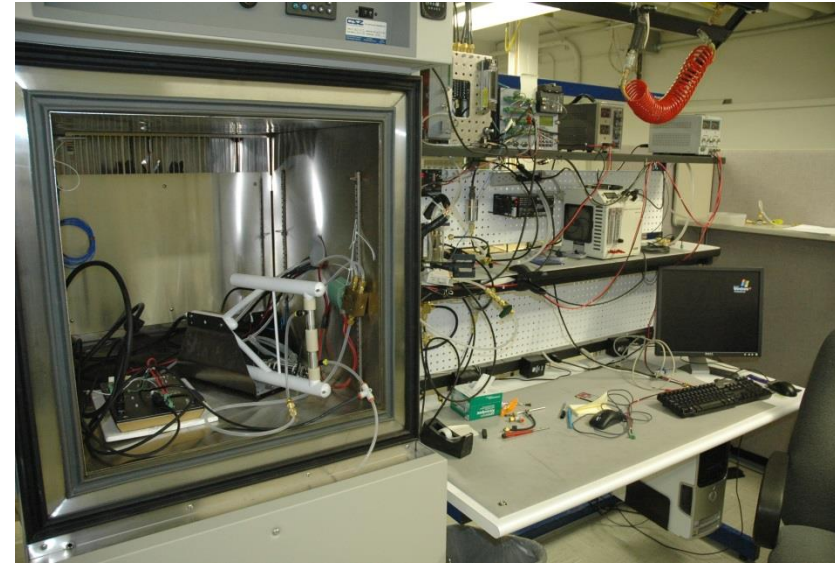
## 2. 分析仪 Zero/Span 操作

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# 为什么要校准

- **验证**仪器测量的准确性、可重复性
- 分析仪校准包括两部分：
  - 工厂校准
  - Zero/Span

# 气体分析仪工厂校准 —— 寻找分析仪的工作曲线

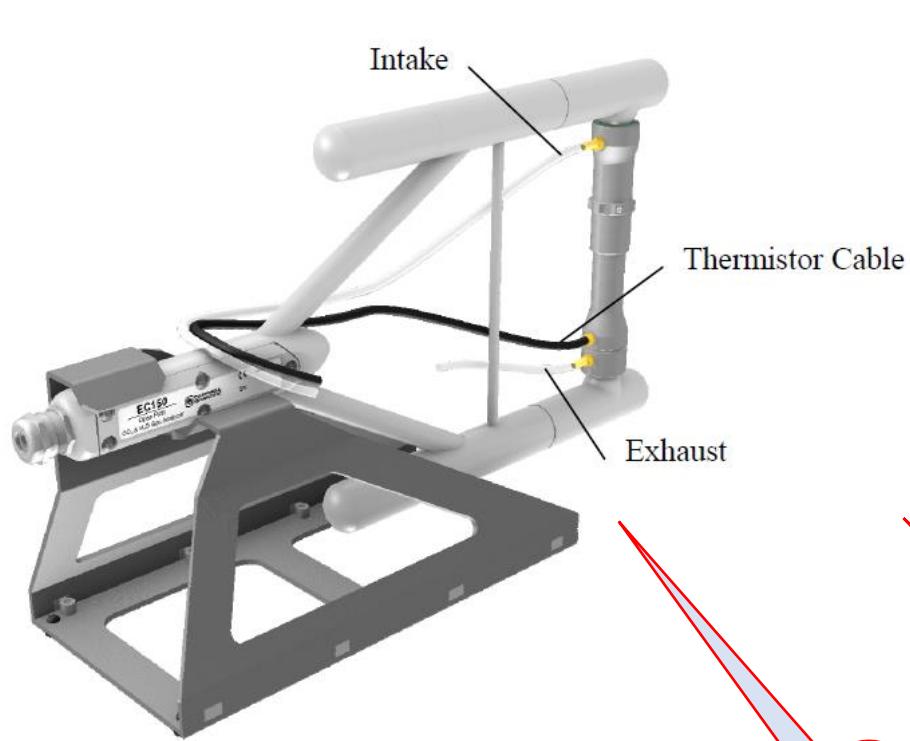


- factory calibration ( CO<sub>2</sub> concentrations, pressures, temperatures and dew points in combinations encountered in practice)

$$CO_2 = S_{CO_2} * f_{CO_2cal} \left\{ Z_{CO_2} * \left( \frac{CO_2 I}{CO_2 I_0} \right) \right\}$$

$$H_2O = S_{H_2O} * f_{H_2Ocal} \left\{ Z_{H_2O} * \left( \frac{H_2O I}{H_2O I_0} \right) \right\}$$

# ZERO 和 SPAN —— 进一步调整零点和跨度系数



▲ 2点校准 (零气和跨度标气)

$$CO_2 = S_{CO_2} * f_{CO_2cal} \left\{ Z_{CO_2} * \left( \frac{CO_2 I}{CO_2 I_0} \right) \right\}$$

$$H_2O = S_{H_2O} * f_{H_2Ocal} \left\{ Z_{H_2O} * \left( \frac{H_2O I}{H_2O I_0} \right) \right\}$$



# 很多因素都会影响分析仪的测量准确度

## Accuracy

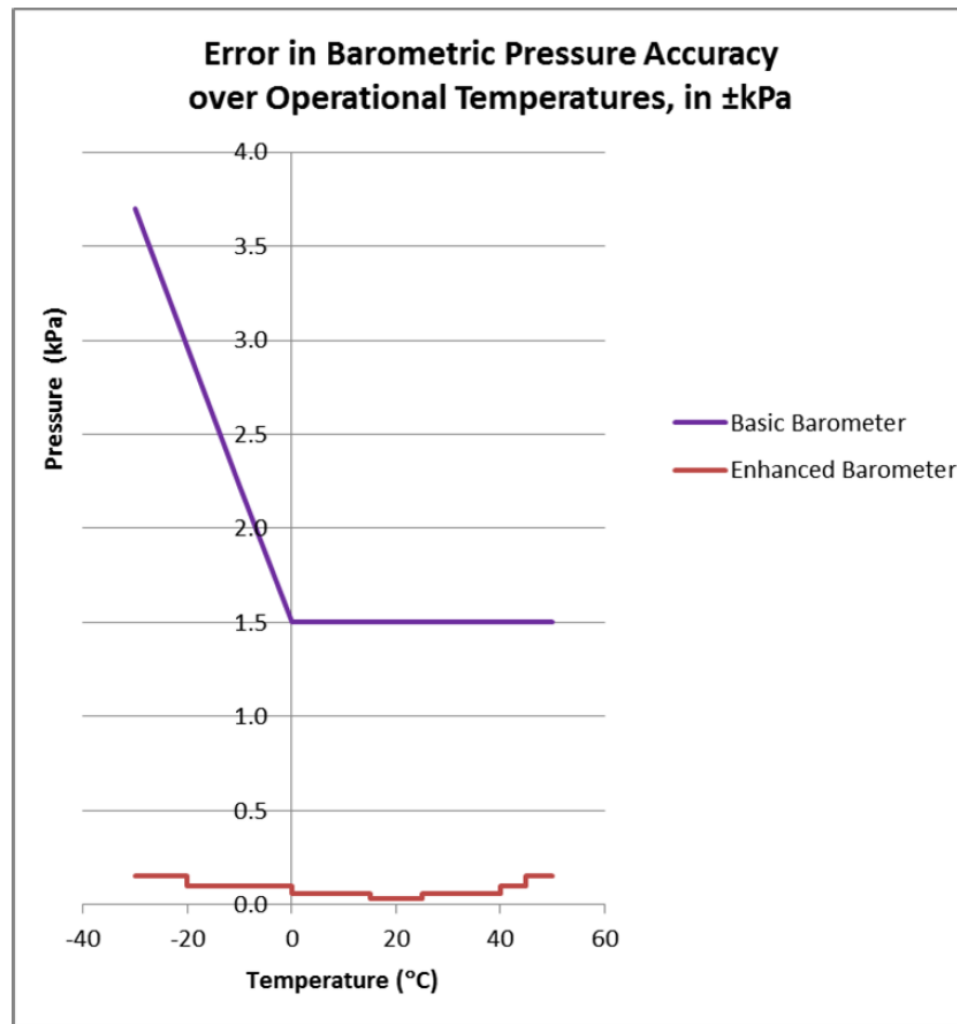
- 温度变化（环境温度和分析仪温度）
- 交叉干扰度 (CO<sub>2</sub>/H<sub>2</sub>O)
- 环境压力
- 光路的清洁程度
- 湿度
- 内部化学吸收剂的有效性
- 电子元件的老化

# 选择什么气压传感器？

- 基本型BB 或 增强型EB？

- 大气压P 用于计算空气密度，1%的气压误差会导致 1% 的显热通量误差。
- 尽管CO<sub>2</sub> 跨度校准是以浓度单位输入，但是需要大气压用于计算CO<sub>2</sub>/H<sub>2</sub>O 的密度，因此 1% 的气压误差会导致 1% 的CO<sub>2</sub>通量误差。
- 问题：在标况下（20°C和100kPa），1°C 温度误差和1kPa气压误差，哪一个导致CO<sub>2</sub>/H<sub>2</sub>O的密度读数误差更大？

## 两种类型气压计的准确度Accuracy指标:

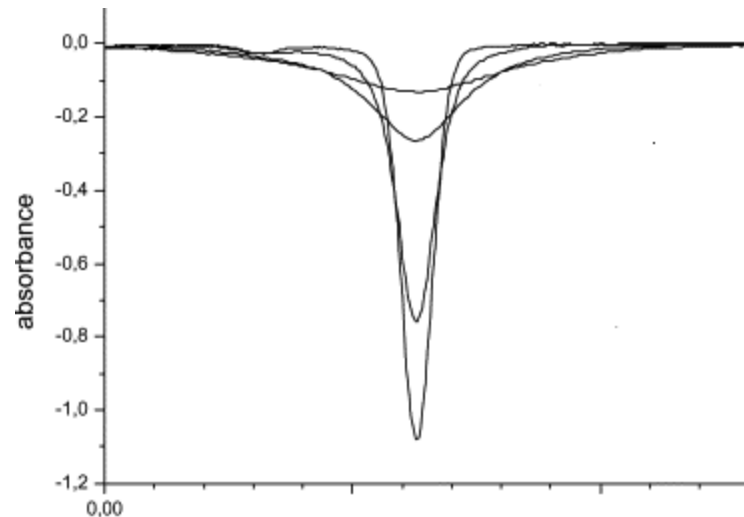


# 校准备件：

- 分析仪支架 —— PN 27278
- 光路气室 —— PN 26390
- 高压钢瓶减压器 和 流量计
- 铝塑管，带Swagelok接头，最好带三通 —— 21823-L20
- 零气发生器或高压零气，CO<sub>2</sub> Span 标气，H<sub>2</sub>O Span (露点仪)
- 其它 —— 30厘米长活动扳手、BEV管、直流电源

# ZERO 和 CO2 SPAN

- ✧ 零气：不含CO2的干空气 或 高纯N2
- ✧ Span 标气：以干空气为平衡气的CO2标气 不含 其它杂质气体

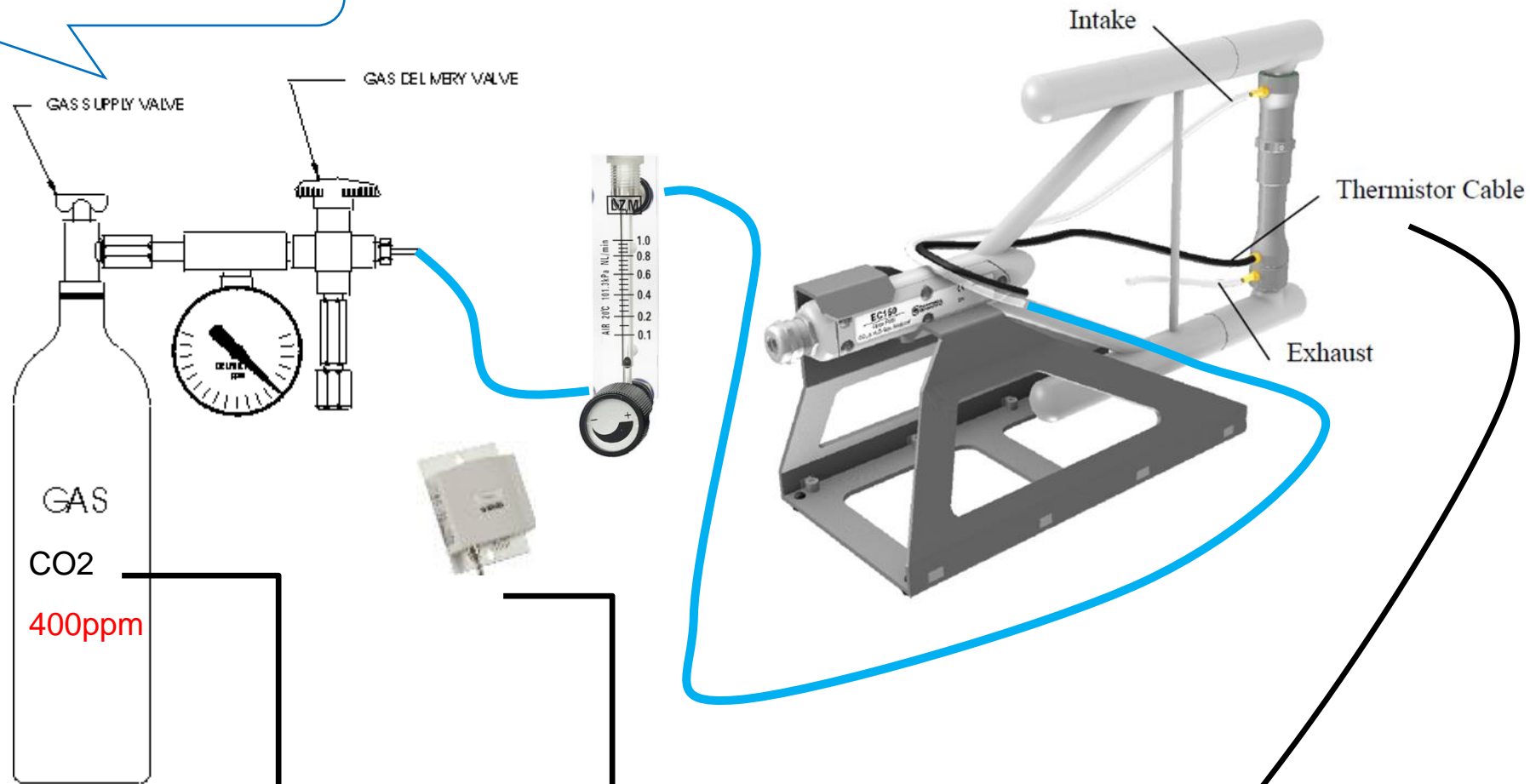


# 标气、零气与CO<sub>2</sub>标气

- ▶ 标气：已知组分浓度的标准气体源，或已知红外吸收特征的标准气体源
- ▶ 零气：不吸收红外辐射的标准气体源（例如惰性气体，高纯N<sub>2</sub>，或干空气等）
- ▶ CO<sub>2</sub>标气：已知CO<sub>2</sub>浓度的标准气体源（在通量研究中，因为测量对象是大气中的CO<sub>2</sub>浓度，CO<sub>2</sub>标气需要以干空气为平衡气，或N<sub>2</sub>/O<sub>2</sub>混合配比接近干空气）
- ▶ 红外光谱是分子能选择性吸收某些波长的红外线，而引起分子中振动能级和转动能级的跃迁，检测红外线被吸收的情况可得到物质的[红外吸收光谱](#)，又称分子振动光谱或振转光谱。（转自《百度百科》）
- ▶ 分子存在能使自己的[偶极矩](#)改变的振动模式，就有红外吸收。具体地说，[极性分子](#)都有红外吸收。非极性分子中，[单原子分子](#)和[同核双原子分子](#)都没有红外吸收，三原子以上的非极性分子一般也有红外吸收。（来自网络）

正确的操作顺序，避免  
污染标气。

## CO2 SPAN



$$\rho_c = \frac{X_c M_c}{10^6} \left( \frac{P}{R(T + 273.15)} \right)$$

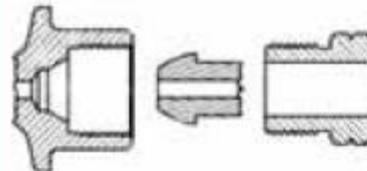
# 高质量的气瓶减压器



## CYLINDER VALVE CONNECTIONS

### CGA Connections

*Connection 590*  
.965-14NGO LH Int.



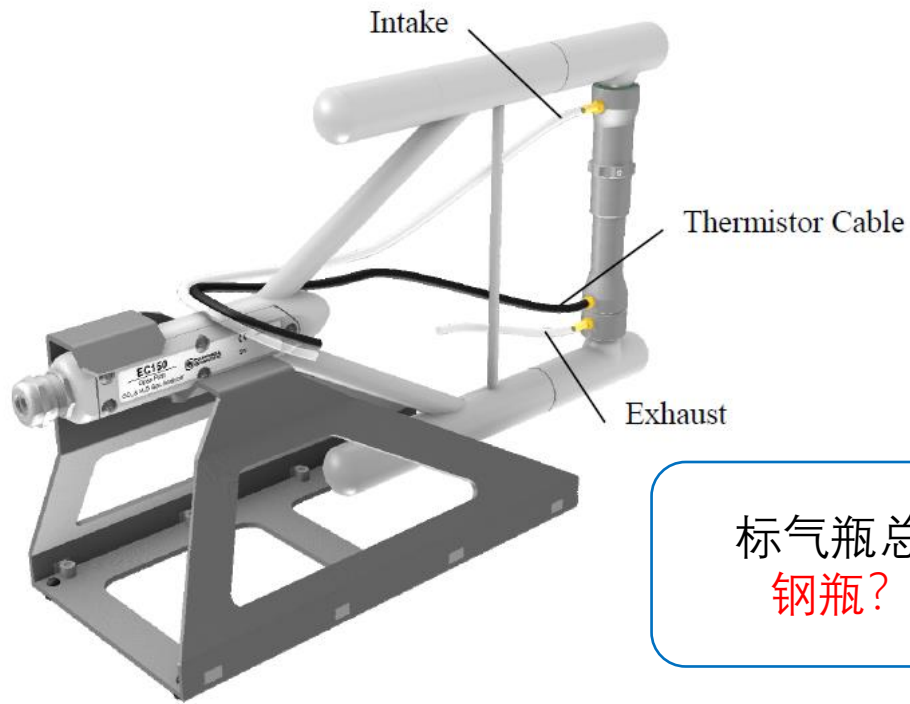
### Air (Industrial)

Nut	830 1215
Gland	830 4128 (2 ½)
	830 4123 (3)
	830 3274 (3 ½)
	830 4122 (4)

- ✧ Designed for use with ultra high purity gasses
- ✧ Clean
- ✧ Corrosion resistant materials
- ✧ Low internal volumes



# ZERO 和 SPAN



标气瓶总开关  
钢瓶? No!


▲ 2点校准 (零气和跨度标气)

$$CO_2 = S_{CO_2} * f_{CO_2cal} \left\{ Z_{CO_2} * \left( \frac{CO_2 I}{CO_2 I_0} \right) \right\}$$

$$H_2O = S_{H_2O} * f_{H_2Ocal} \left\{ Z_{H_2O} * \left( \frac{H_2O I}{H_2O I_0} \right) \right\}$$

## CO2标气中的平衡气应该与大气成分比接近

$$A = \log(I/I_0) = \epsilon cL$$



$$\epsilon = f(\text{gas composition})$$

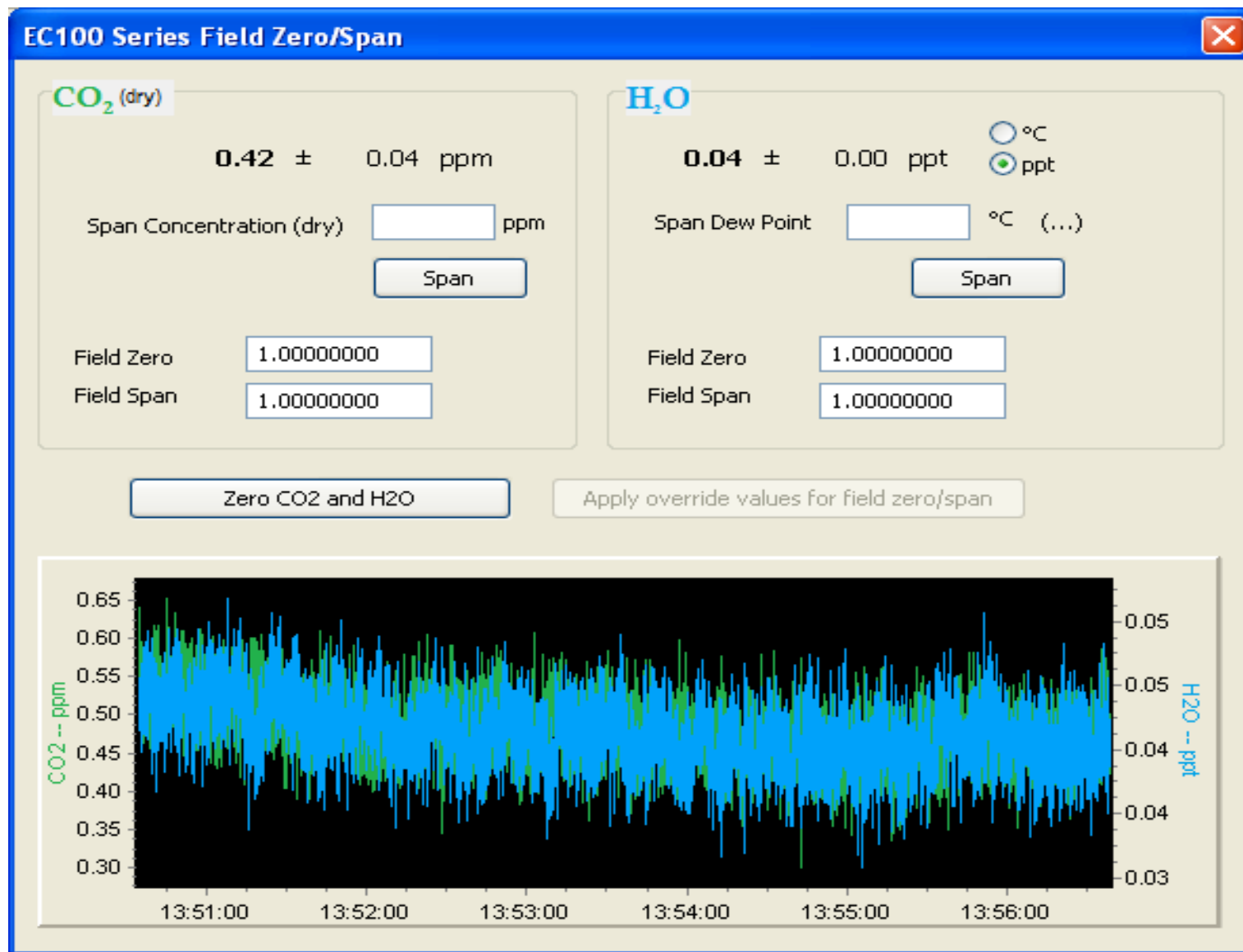
gas composition = 20.94% O<sub>2</sub> + 78.08% N<sub>2</sub> + 0.0004% CO<sub>2</sub>

- ✦ Use air as a balance gas, NOT nitrogen. The presence of oxygen changes the absorption coefficient
- ✦ Low levels of other contaminants (CH<sub>4</sub>, N<sub>2</sub>O, etc.)
- ✦ Check with NIST standards

## 工作环境：

- 远离日光直射、加热器、电风扇、空调出风口等不利于仪器稳定工作的环境。
- 分析仪 和 露点发生器需要充分预热
- 在校准之前，先用无水乙醇或医用酒精(75% vol/vol)清洁分析仪窗口；在操作中始终监视信号强度变化

# 监视读数是否稳定:

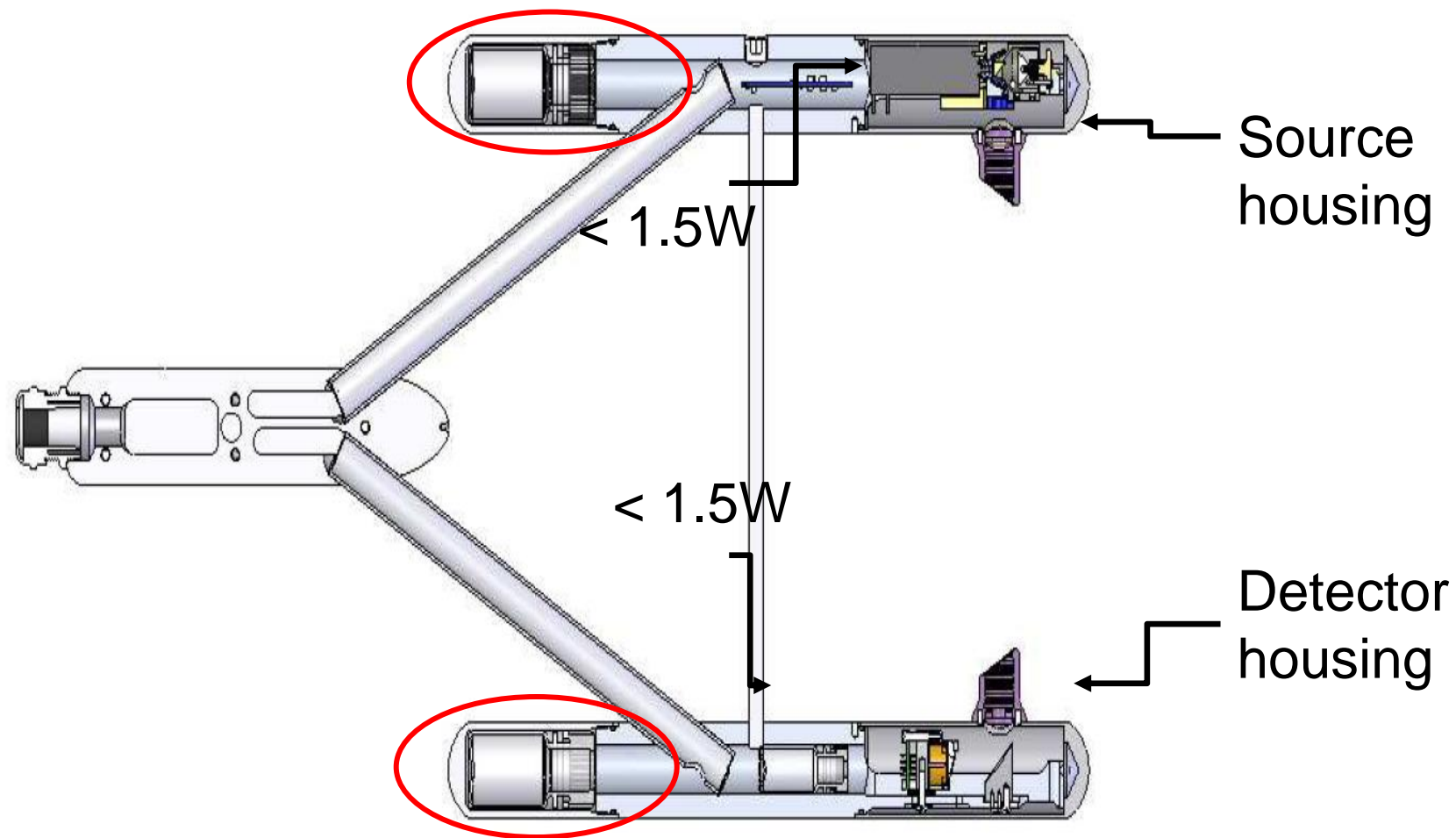


# 检查分析仪增益 (**Gain**) :

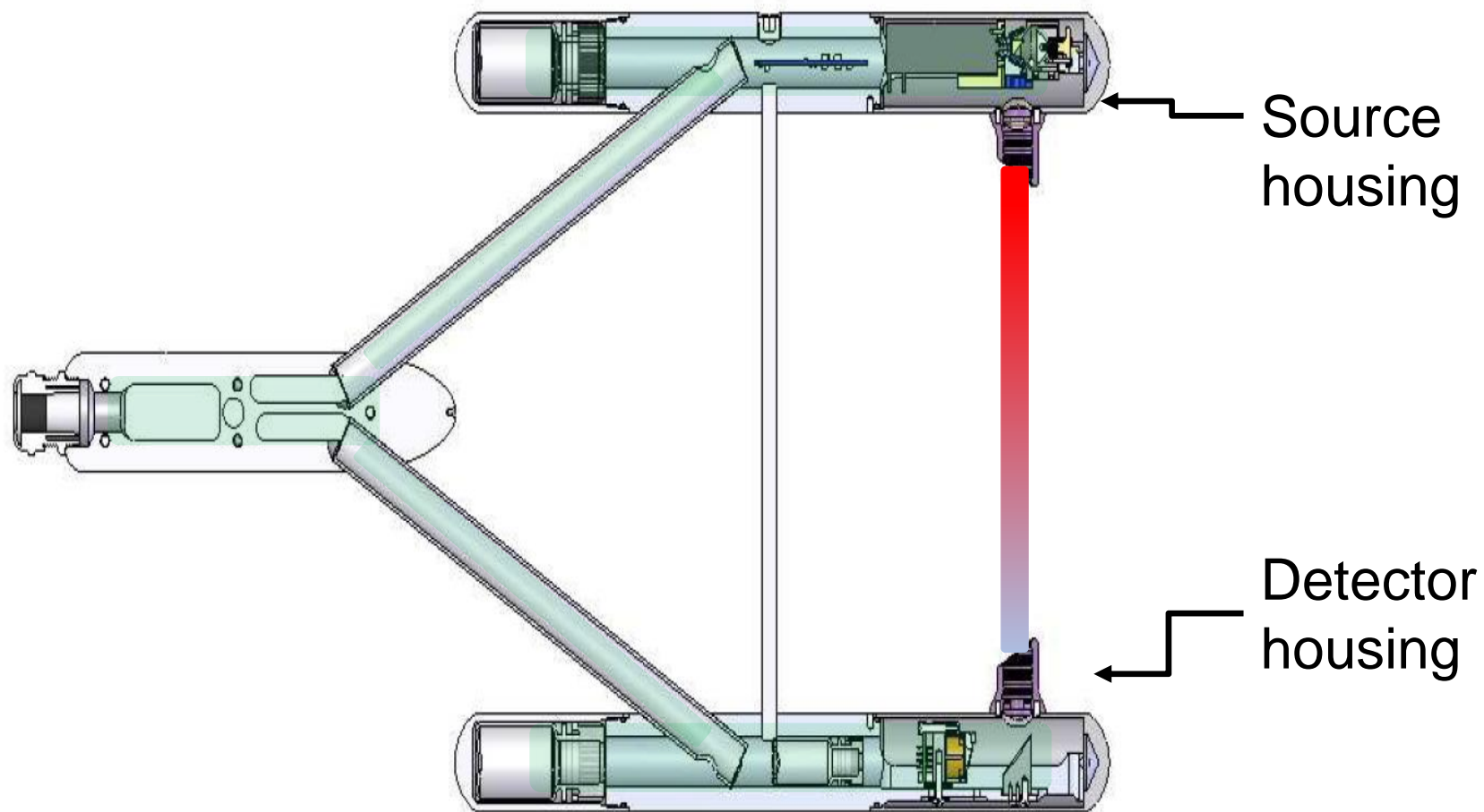
$$Gain = \frac{\text{标准CO}_2\text{浓度}}{\text{标准CO}_2\text{测定值} - \text{无CO}_2\text{测定值}}$$

- 如Gain=1, 且无CO<sub>2</sub>时气体分析的CO<sub>2</sub>测定值为0, 则无需进行CO<sub>2</sub>的零点和跨度重置。
- 如Gain < 0.95 或 Gain > 1.05, 应检查CO<sub>2</sub>吸收剂, 并根据吸收剂的已工作时间考虑更换。(若更换, 等待3天)

# 为什么要更换CO<sub>2</sub>/H<sub>2</sub>O吸收剂?



# 为什么要更换CO<sub>2</sub>/H<sub>2</sub>O吸收剂?



# 早期的高危险CO<sub>2</sub>/H<sub>2</sub>O吸收剂 与目前的分子筛CO<sub>2</sub>/H<sub>2</sub>O吸收剂

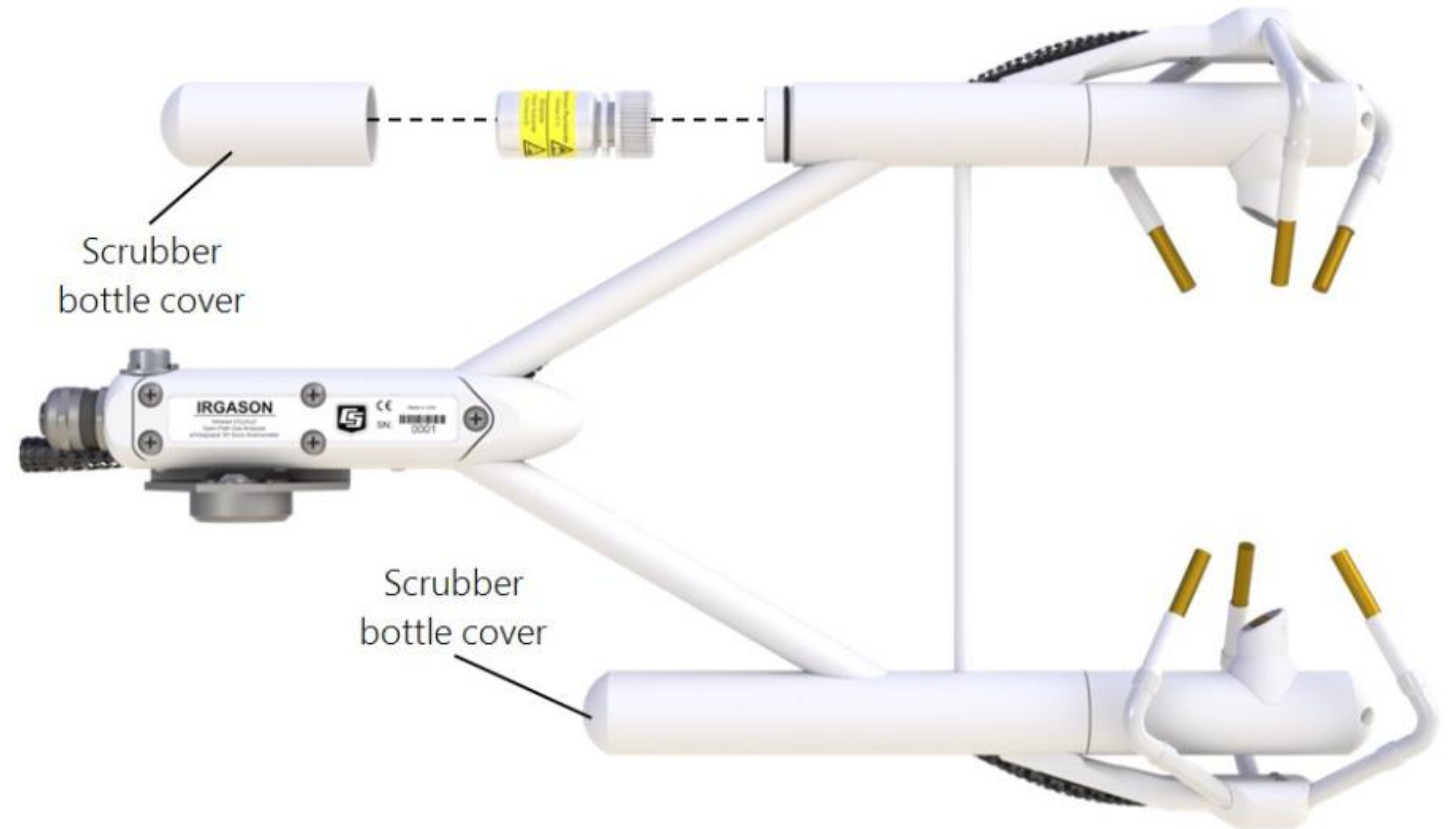
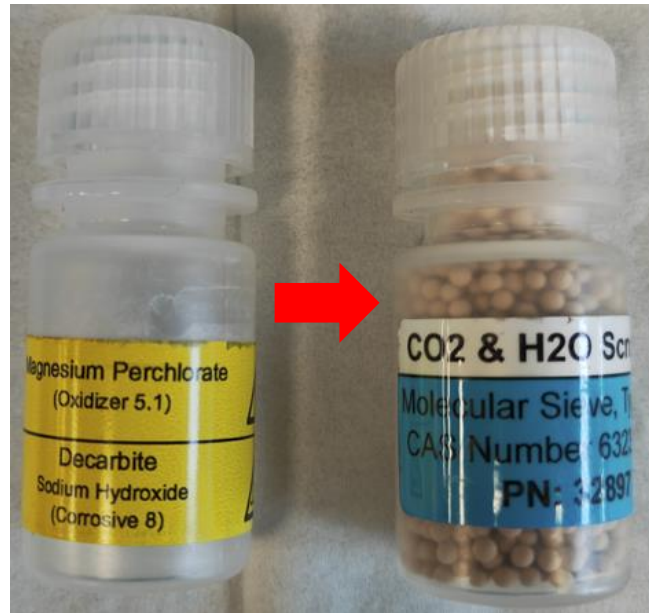


FIGURE 9-6. Replacing the desiccant and CO<sub>2</sub> scrubber bottles (replacement bottles purchased after July 2017 may appear different than in the figure)

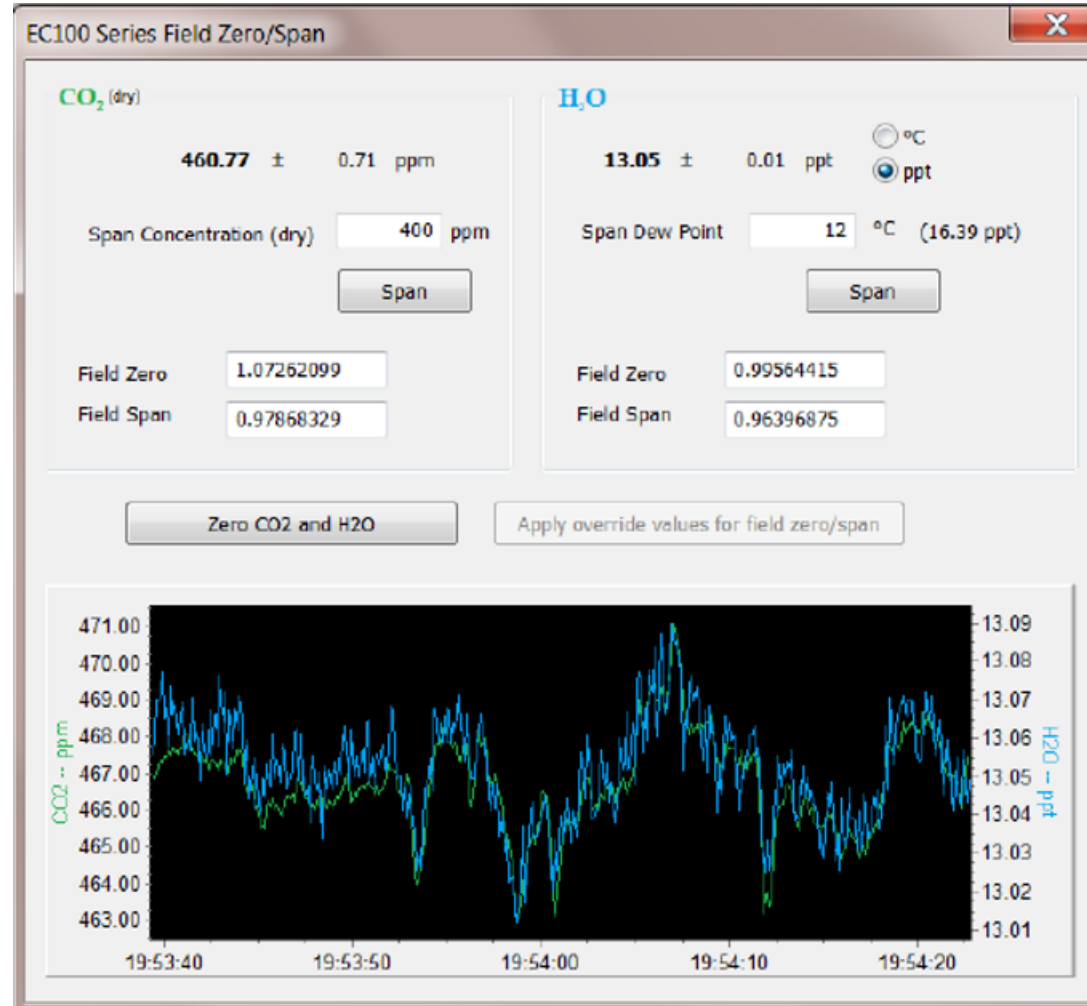


# 多长时间更换一次吸收剂？

- Campbell Scientific 建议每年更换一次
- 不过，如果zero 和span 系数发生较大漂移，则应该及时更换CO<sub>2</sub>/H<sub>2</sub>O吸收剂
- 新的吸收剂成分是分子筛，无毒无害

› 更换吸收剂后，等待3天，再实施Zero/Span

- 在条件允许的情况下，Campbell Scientific 推荐用户在站点现场对分析仪进行Zero/Span校准。但站点现场的校准操作一般需要等待更长的时间让读数达到稳定。



# 零气发生器

- 非常实用的一个工具
  - 用于对分析仪作零点校准
  - 方便携带





# 校准顺序:

- CO<sub>2</sub>/H<sub>2</sub>O Zero
- CO<sub>2</sub> Span
- H<sub>2</sub>O Span

**CO<sub>2</sub> (dry)**

**5.42 ± 0.00 ppm**

Span Concentration (dry)  ppm

Field Zero

Field Span

**H<sub>2</sub>O**

**1.81 ± 0.12 ppt**

Span Dew Point  °C (...)

Field Zero

Field Span

**CO<sub>2</sub> (dry)**

**-0.04 ± 0.03 ppm**

Span Concentration (dry)  ppm

Field Zero

Field Span

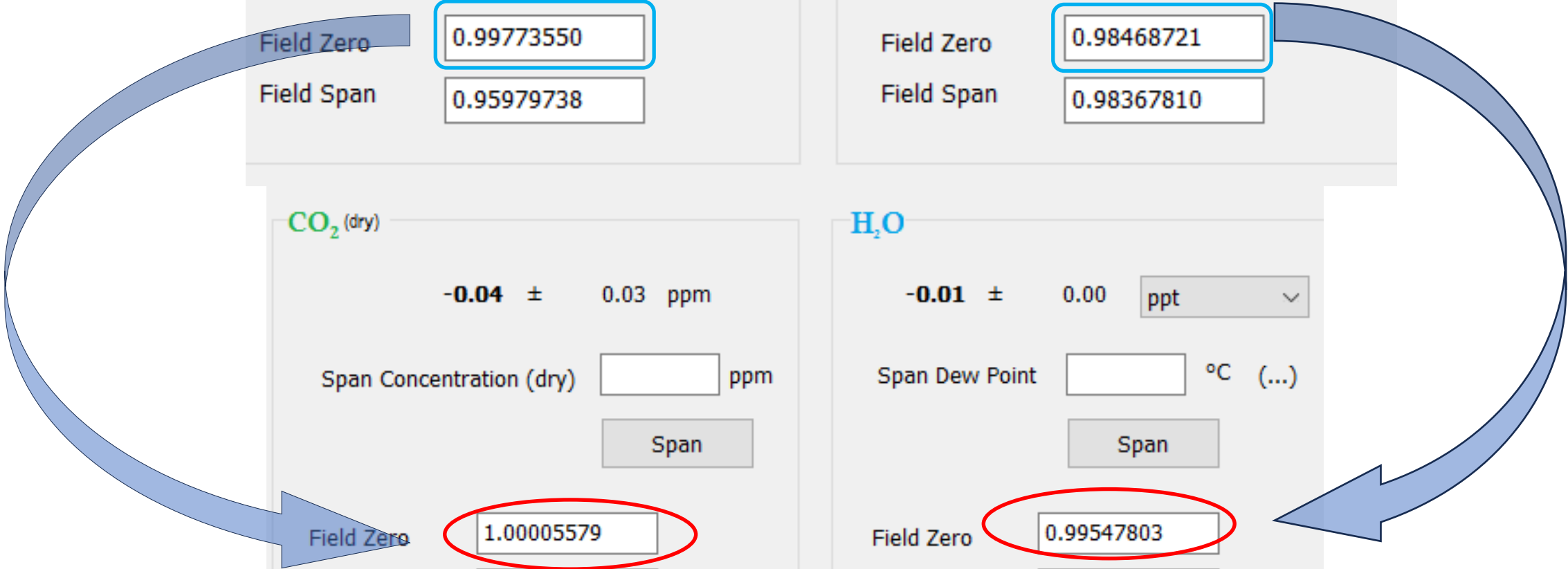
**H<sub>2</sub>O**

**-0.01 ± 0.00 ppt**

Span Dew Point  °C (...)

Field Zero

Field Span



**CO<sub>2</sub> (dry)**

**970.58 ± 0.08 ppm**

Span Concentration (dry)  ppm

Field Zero

Field Span

**CO<sub>2</sub> (dry)**

**1005.17 ± 0.03 ppm**

Span Concentration (dry)  ppm

Field Zero

Field Span

**H<sub>2</sub>O**

Calculator

Scientific

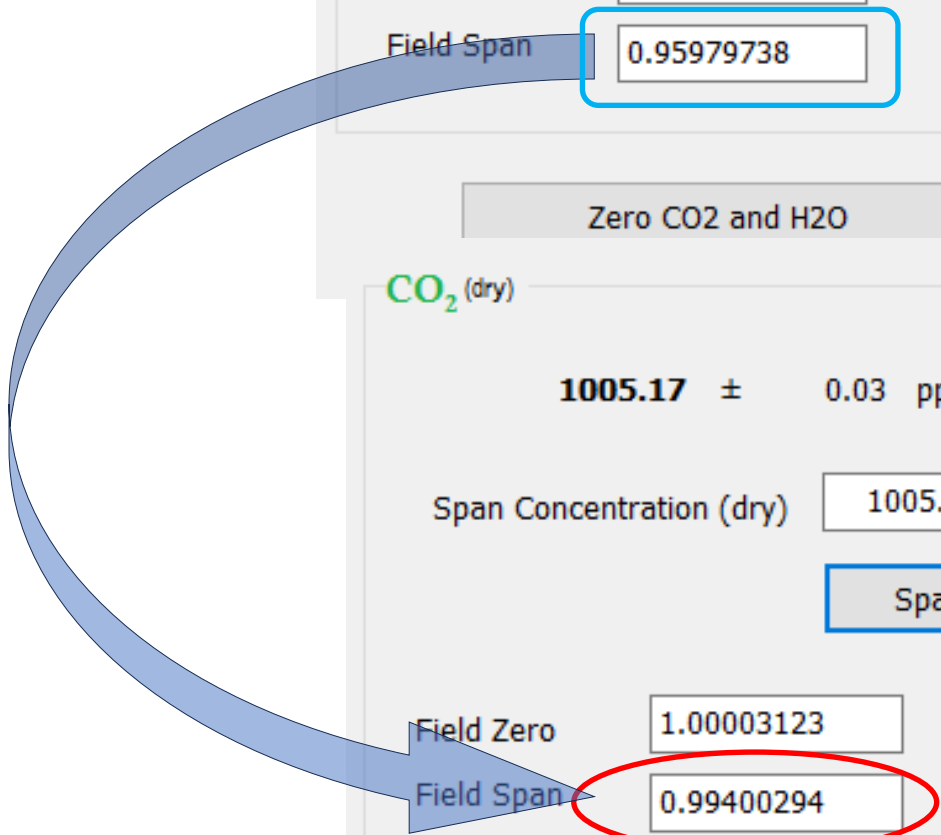
$0.95979738 \times 1005.2 \div 970.58 =$   
**0.99403277048362834593748068165427**

DEG F-E

MC MR M+ M- MS

Trigonometry  Function

2 <sup>nd</sup>	π	e	CE	<input type="button" value="⊗"/>
x <sup>2</sup>	1/x	x	exp	mod
$\sqrt[x]{\phantom{x}}$	(	)	n!	÷
x <sup>y</sup>	7	8	9	×
10 <sup>x</sup>	4	5	6	-
log	1	2	3	+
ln	+/-	0	<input "="" type="button" value="="/>	



Calculator

Scientific

$0.9836781 \times 12.4 \div 11.9 =$   
**1.0250091126050420168067226890756**

DEG F-E

MC MR M+ M- MS

Trigonometry Function

2<sup>nd</sup> π e CE ⊗

x<sup>2</sup> 1/x |x| exp mod

$\sqrt[x]{\quad}$  ( ) n! ÷

x<sup>y</sup> 7 8 9 ×

10<sup>x</sup> 4 5 6 -

log 1 2 3 +

ln +/- 0 . =

EC100 Series Field Zero/Span

± 0.00 ppt

Point 10.01 °C (12.40 ppt)

Span

0.99527359

0.98367810

Values for field zero/span

EC100 Series Field Zero/Span

CO<sub>2</sub> (dry) 1442.81 ± 0.96 ppm

Span Concentration (dry) 1005.20 ppm

Field Zero 1.00003123

Field Span 0.99400294

H<sub>2</sub>O 12.40 ± 0.00 ppt

Span Dew Point 10.01 °C (12.40 ppt)

Field Zero 0.99527359

Field Span 1.02394283

Zero CO2 and H2O

Apply override values for field zero/span

# Tips: 6↑1

The screenshot displays the EC100 Series Monitor Software interface. The main window shows real-time data for CO<sub>2</sub> and H<sub>2</sub>O. A secondary window titled "EC100 Series Field Zero/Span" is open, showing configuration options for both gases. A red box highlights the "Field Zero" and "Field Span" input fields for both CO<sub>2</sub> and H<sub>2</sub>O. A third window titled "Wind Ux, Wind Uy, Wind Uz" is also open, showing a data table and a graph. A red box highlights the "CO2 Signal Strength" and "H2O Signal Strength" fields in the main window, both set to 1.00.

**EC100 Series Field Zero/Span**

Parameter	CO <sub>2</sub> (dry)	H <sub>2</sub> O
Field Zero	0.99988317	1.00115788
Field Span	1.00040054	1.01063716

**CO<sub>2</sub> Signal Level, H<sub>2</sub>O Signal**

Data	Values
CO <sub>2</sub> Signal Level	0.9999
H <sub>2</sub> O Signal Level	1.0011
H <sub>2</sub> O std dev	0.0077 n

**Wind Ux, Wind Uy, Wind Uz**

Data	Values	Units
Wind Ux	0.004	m/s
Wind Uy	0.032	m/s
Wind Uz	0.038	m/s

**Main Window Signal Strengths**

CO <sub>2</sub> Signal Strength	1.00
H <sub>2</sub> O Signal Strength	1.00



# 小结：Zero/Span 操作中 可能会碰到的一些问题

- Zero/Span的操作顺序
- 温度的影响因素
- 压力的影响因素
- 校准中读数大小对Zero/Span系数的影响
- 水汽露点值大小的选取
- 冬季的Zero/Span 校准
- EC15x 分析仪在高原上的应用

# 3. EC15x 参数设置 及复位操作

---

# EC150/IRGASon 参数设置

- 选择合适 **Bandwidth**
- **Ambient Pressure**
  - Basic
  - Enhanced
- SDM地址 (默认 1)
- Ambient Temperature
- 超声阴影订正 (默认 无)
- 自动加热控制
- 加热电压 (可在DevConfig中设置)

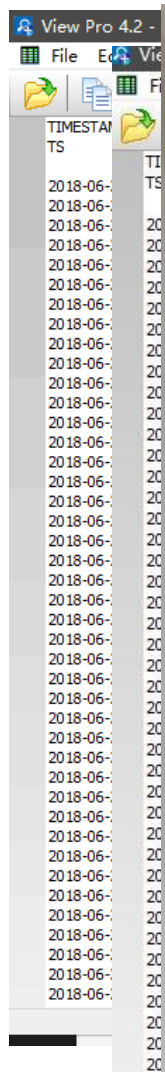
Air Temperature	<b>24.64</b>	°C
Source Temperature	<b>27.03</b>	°C
Detector Temperature	<b>26.18</b>	°C
Barometric Pressure	<b>102.46</b>	kPa

# EC155 参数设置

- 选择合适 **Bandwidth**
- EC100 Pressure Sensor
  - *Basic*
  - Enhanced
- Differential Pressure
  - *Absolute*
  - Differential
- SDM地址 (默认 1)
- Temperature Sensor
  - *Auto-detect*
  - *Thermistor*
  - Thermocouple
- 超声阴影订正 (默认 无)
- 自动加热控制
- 加热电压 (可在DevConfig中设置)

EC155 没有 Detector temperature.

# 实例 —— EC100 操作系统崩溃



EC100>TERM

```
CSAT>^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0172 -0.0064 0.0031 23.6700 23.1594 23.3589 000 4
```

CSAT>

```
CSAT>^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0135 0.0110 -0.0035 23.9309 23.3540 26.2248 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0191 0.0105 0.0000 24.0222 23.3731 23.7531 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0173 0.0115 0.0033 24.1320 23.5537 26.2088 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

```
^Wind0 Wind1 Wind2 Tmpr0 Tmpr1 Tmpr2 Abs/Dif- Diag
      0.0277 0.0055 0.0012 25.0213 24.4417 24.6776 000 4
```

_time_Max	buff_depth_
scans	
Max	
102	
140	
141	
140	
103	
103	
103	
142	
103	
141	
140	
140	
103	
101	
101	
65	
65	
65	
65	
65	
64	
65	
64	
64	
64	
64	
65	
64	
102	
103	
102	
2	

CSAT>??

CALFILE SN: Sn1306 Date: 09aug16 Version: 0

&=0 AA=40 AC=1 AF=40 AH=1 ao=4800 ar=0 AS=-5

AQ=0 BR=0 BX=0 C0c= 0 0 0 C0b= 0 0 0 CA=0 CD=0 CF=1 cs=0 CX=0 DC=8

dl=15 dm=c DR=3465 duty=0 DT=16240 et=0 fa=50 FD=2880 FL=7

fx=38 GN=121a go=0 ha=0 hg=24576 HH=49152 kt=0 lg=9830 LH=1600 MA=-20

MS=-10 mx=0 N5=0 ND=1 NI=2 OC=0 or=1 os=0 pd=0 ra=20 RC=0 rf=18 rh=15

RI=0 RS=0 rx=2 SD=0 SL=35 sr=0 ss=0 t0123=1000 TD=a TF=2600 2600 2600

TK=1 TO= 0 0 0 TP=0 ts=? UF=0 ux=0 WM=o WR=6 WT=6000 XD=d xp=0 xx=0 ZZ=0

5T=10.000000 5k=0.001667 SC=0

# 实例 —— Bandwidth 选择错误

The screenshot shows a gas analyzer interface with a warning message: "Warning! Gas analyzer data may be suspect." Below this is a table of flag statuses and descriptions. The right side of the interface displays various gas parameters, many of which are marked as "-nan", indicating data errors or missing values. The parameters include CO2, H2O, and various temperatures and pressures.

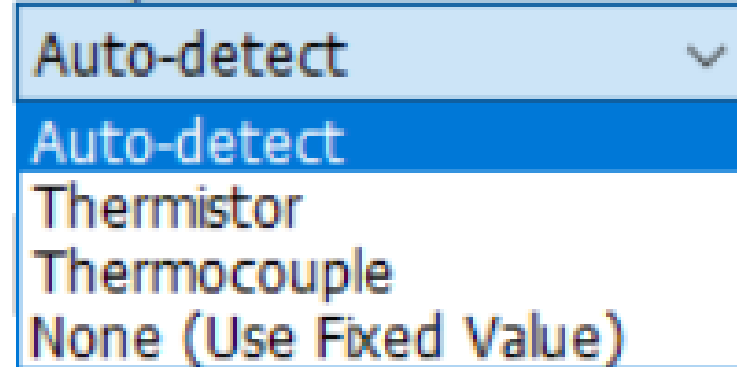
Flag Status	Description
WARNING	Data are suspect
ok	No general system fault
ok	Gas analyzer is running
ok	Motor speed within limits
ok	TEC temperature within limits
ok	Source power within limits
ok	Valid source temperature
ok	Source current within limits
ok	Gas head powered
ok	Gas input data in sync with home pulse
ok	Valid ambient temperature
ok	Valid ambient pressure
ok	CO2 I within limits
ok	CO2 Io within limits
ok	H2O I within limits
ok	H2O Io within limits
ok	Moving variation in CO2 Io within limits
ok	Moving variation in H2O Io within limits
WARNING	CO2 signal level too low
WARNING	H2O signal level too low
WARNING	Gas head calibration signature error
ok	Heater control within limits
ok	Differential pressure within limits

Parameter	Value	Unit
CO2	-nan	mg/m <sup>3</sup>
CO2	-nan	mmol/m <sup>3</sup>
CO2	-nan	μmol/mol
CO2	-nan	μmol/mol (dry)
H2O	-nan	g/m <sup>3</sup>
H2O	-nan	mmol/m <sup>3</sup>
H2O	-nan	mmol/mol
H2O	-nan	mmol/mol (dry)
H2O	-nan	% rel. humidity
Temperature	< -60	°C
Wind Speed	-inf	m/s
Wind Speed	-inf	m/s
Wind Speed	86650624	m/s
Barometric Pressure	-inf	°C
Air Temperature	15.73	°C
Source Temperature	16.55	°C
Detector Temperature	16.37	°C
CO2 Signal Strength	7646720	
H2O Signal Strength	2390784	
Barometric Pressure	100.28	kPa

# EC155 Sample Cell 参数设置错误

Temperature Sensor



Auto-detect

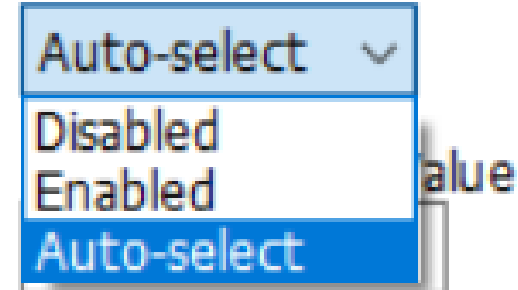
Auto-detect

Thermistor

Thermocouple

None (Use Fixed Value)

Differential Pressure



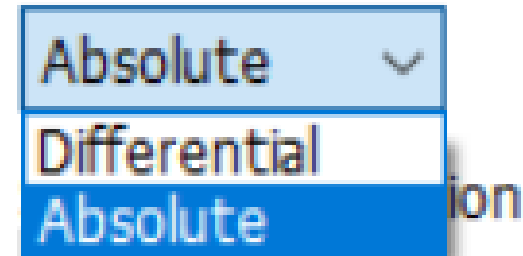
Auto-select

Disabled

Enabled

Auto-select

EC155 Pressure Sensor



Absolute

Differential

Absolute

# 实例 —— EC100操作系统崩溃，但不可修改参数

The screenshot displays the EC100 Series Monitor Software interface. The main window shows various sensor readings, including CO<sub>2</sub> and H<sub>2</sub>O concentrations, and wind speed components (Ux, Uy, Uz). A secondary window titled 'Wind Ux, Wind Uy, Wind Uz' shows a real-time graph of these values. A 'Setup' dialog box is open, showing configuration options for measurements and barometer settings. Overlaid on the setup dialog is an 'Error' dialog box with the following text:

**Error**

Unable to commit the changes to hardware.

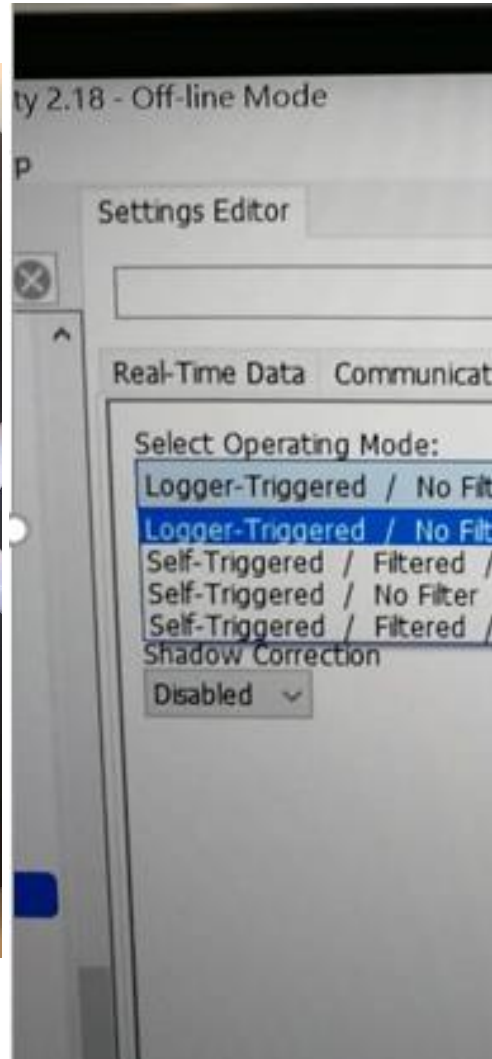
This might be a problem because either the sonic head or the gas head analyzer is not properly attached.

确定

The error message is circled in red. At the bottom of the main software window, a status bar indicates 'EC100 No hardware currently connected'.



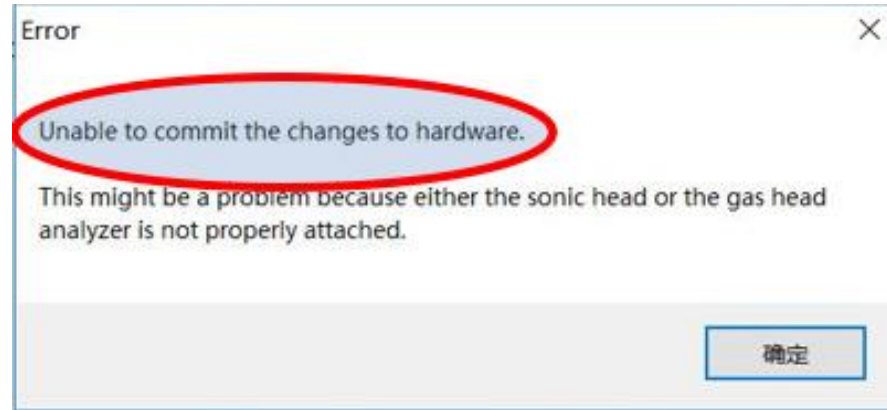
# 实例 —— 不合格的供电电源



# 实例 —— 软件版本过低

- ▶ 3种接口可用于参数修改
  - ECMon
  - DevConfig
  - 数据采集器
- ▶ 对于版本5的超声算法，或者新一代的EC155 Sample Cell，需要：
  - ECMon 版本1.6 或更新
  - DevConfig 版本2.16 或更新
- ▶ *如果你的电脑上软件版本不够，比如ECMon 1.6 和 DevConfig 2.12 同时，可能造成EC100 操作系统崩溃*

# 如果碰到EC100操作系统被锁死的情形，怎么办？



- ▶ EC15X分析仪头部或三维超声头部的校准参数保存在头部
- ▶ 其它参数通常保存EC100的内存中

# 步骤1：如果有另外一台正常的EC100...

- ▶ 将分析仪头部或CSAT3A/IRGASon三维超声头部连接到正常的EC100，来确认EC15X分析仪头部或三维超声头部是否正常

## 步骤2：单独升级EC100的OS

- ▶ 不连接分析仪头部或CSAT3A/IRGASon三维超声头部，单独给EC100供电，升级其操作系统（版本8.01或更新）

# 步骤3: 单独连接EC100, 恢复出厂默认设置 (ECMon)

The screenshot shows the 'Setup' window of the EC100 Series Monitor Software. The window is divided into several sections for configuring the device. A red box highlights the 'Factory Defaults' button at the bottom right of the 'Setup' window.

**EC150 Data:**

CO <sub>2</sub>	H <sub>2</sub> O
1384 mg/m <sup>3</sup>	4.46 g/m <sup>3</sup>
31.46 mmol/m <sup>3</sup>	247.89 mmol/m <sup>3</sup>
760.14 μmol/mol	5.99 mmol/mol
764.72 μmol/mol (dry)	6.03 mmol/mol (dry)
	19.80 % rel. humidity
	-0.00 °C

**Ux, Uy, Uz, Sonic Temperature:**

Ux	-0.05	m/s
Uy	0.03	m/s
Uz	0.02	m/s
Sonic Temperature	26.25	°C

**Temperatures:**

Air Temperature	24.64	°C
Source Temperature	27.03	°C
Detector Temperature	26.18	°C

**Signal Strengths:**

CO <sub>2</sub> Signal Strength	1.00
H <sub>2</sub> O Signal Strength	1.00

**Barometric Pressure:** 102.46 kPa

**Setup Configuration:**

- Measurements: Bandwidth 20 Hz
- Temperature Sensor:  Auto-Select (24.64 °C),  None (use fixed value) (25.00 °C)
- Heater Automatic Control:  Enable,  Disable
- EC100 Barometer:  EC100 Basic (102.46 kPa),  EC100 Enhanced,  User Supplied (Gain: 1.00, Offset: 0.00),  None (use fixed value) (100.00 kPa)
- Pressure Differential Enable:  Auto-Select,  Enable,  Disable
- Communications with Datalogger: SDM Address 1
- Unprompted Output:  USB Port,  RS485,  Disabled (RS485 Baud Rate: 115200, Unprompted Data Rate: 10 Hz)
- Analog Output:  Enable,  Disable
- Communications with ECMon: Update Rate 10 Hz

**Factory Defaults** button highlighted in red.

- EC100 firmware 8.01

## 步骤4：恢复合适的参数设置

- ▶ 断电，连接分析仪头部和三维超声头部到 EC100
- ▶ 上电，使用DevConfig 连接
- ▶ 如果是开路，重点检查Bandwidth等参数，Differential Sensor 需要设为Disable
- ▶ 如果是EC155，重点检查Bandwidth, Temperature sensor, Differential sensor 等参数

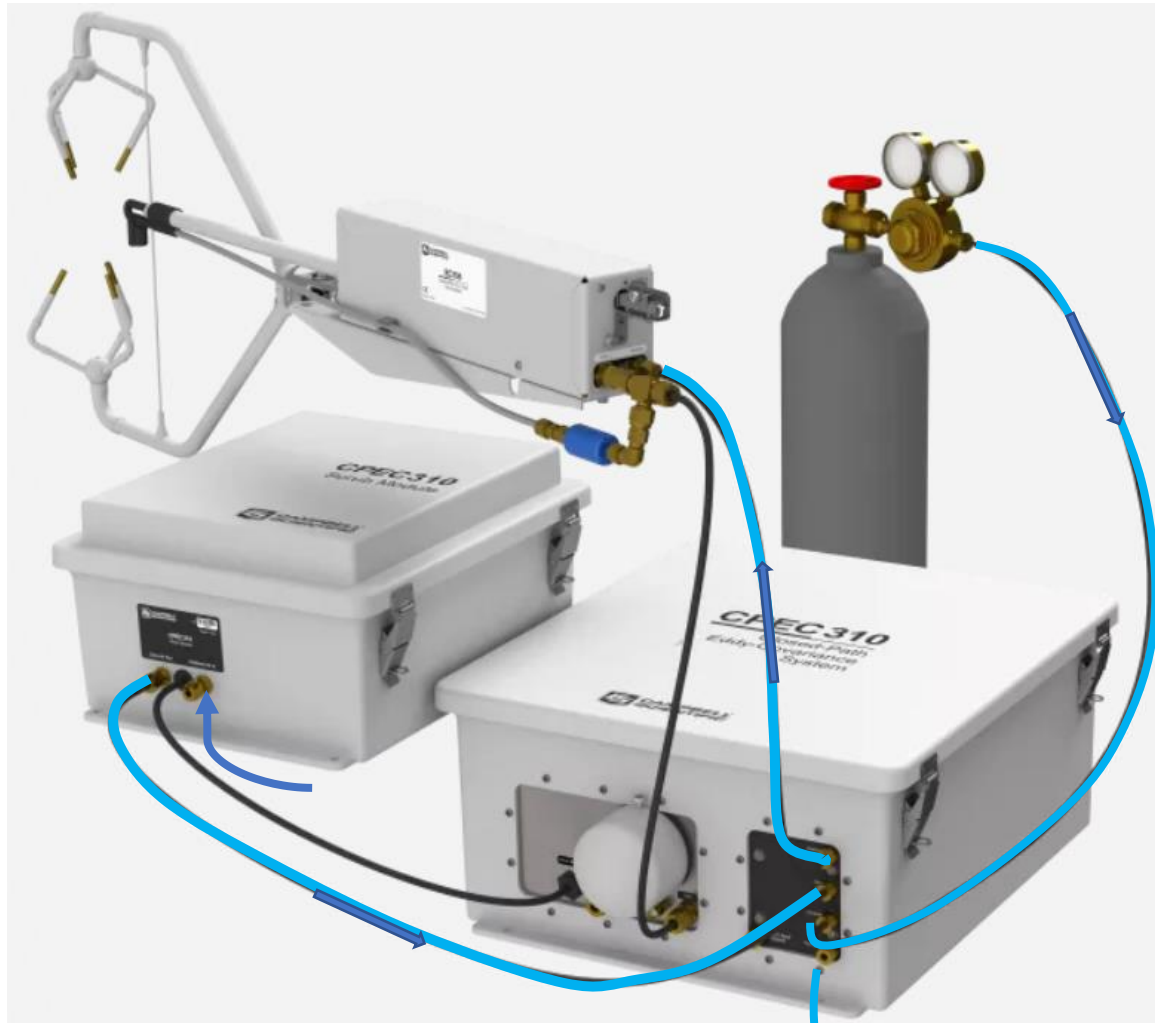


## 4. CPEC310

# 在线Zero/Span操作演示



# CPEC310 自动在线校准气路示意图



Valve Module



问题：在开路H<sub>2</sub>O Span中，气路中需要加一个三通，而闭路H<sub>2</sub>O Span的气路中没有三通，为什么？

# CPEC310 自动在线校准



- 程序自动控制
- 含 Valve Module
- Scrub Module (默认) 提供零气, CO2 标气瓶提供CO2 Span 标气
- 自动在线校准可实现 Zero All 和 Span CO2, 理论上也可以把 Span H2O 包含在自动校准序列里

# 自动在线校准参数预设置

## 1. 配置初始化参数

```
System Control
Initial Configuratrn >
Site Var Settings >
Run Station >
Attendant Zero/Span >
Const Table >
System Menu >
```

```
Initial Configuratrn >
Change Press Source >
Shadow Correction >
CO2 Spn Gas :400.000
H2O Span TDP:10.0000
Sample Flw :8.00000
Zro/Spn Flw :1.00000
Zero Span Coeffs >
```

```
Modify Value NUM
CO2 Spn Gas

Current Value:
400.000
New Value:
XXX.XX
```

## 2. 将自动校准选项设为真

```
Run Station :
Pump Tmpr Ok: True
Pump Tmpr : 30.0000
Pump flow : 8.00000
System diag : 0
Auto Z/S on True
pump off : FLD_MEA
EC155 PW on : True
```

## 3. 配置常数(校准时长、校准间隔等), 并启动程序

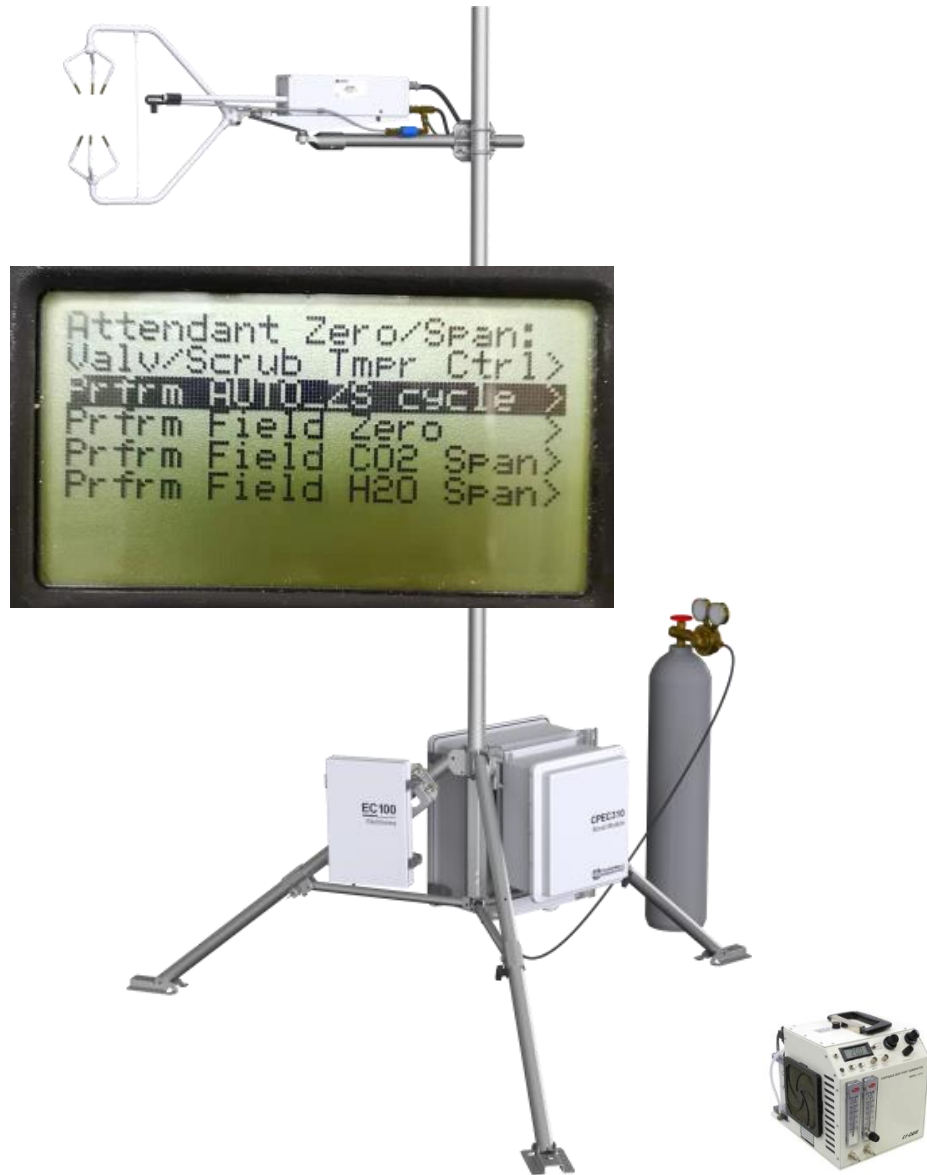
```
NMBR_HFP : 4
HFP_SNSTVT_1 : 62.0000
HFP_SNSTVT_2 : 62.0000
HFP_SNSTVT_3 : 62.0000
HFP_SNSTVT_4 : 62.0000
CAL_INTV : 1440
Apply and Restart
```



## 自动在线校准典型动作序列 (**Check** 和 **Set**)

Site	Description	Duration	
SITE_1	fld smp		测量
SITE_2	offst P	10 sec	泵停止
SITE_3	chk CO2	65 sec	检查CO2
SITE_4	chk zro	85 sec	检查 Zero
SITE_5	set zro	10 sec	设定 Zero
SITE_6	set CO2	90 sec	设定 CO2
SITE_7	chk H2O	185 sec	检查 H2O
SITE_8	set H2O	10 sec	设定 H2O
SITE_9	Equilib	30 sec	平衡, 泵启动
SITE_1	fld smp		测量

# CPEC310 现场校准



- 操作者控制 数采菜单
- 可实现：
  - Auto Zero/Span Cycle
  - Field Zero All
  - Field CO2 Span
  - Field H2O Span
- 阀控动作系列与自动在线校准类似 (Check 和 Set)

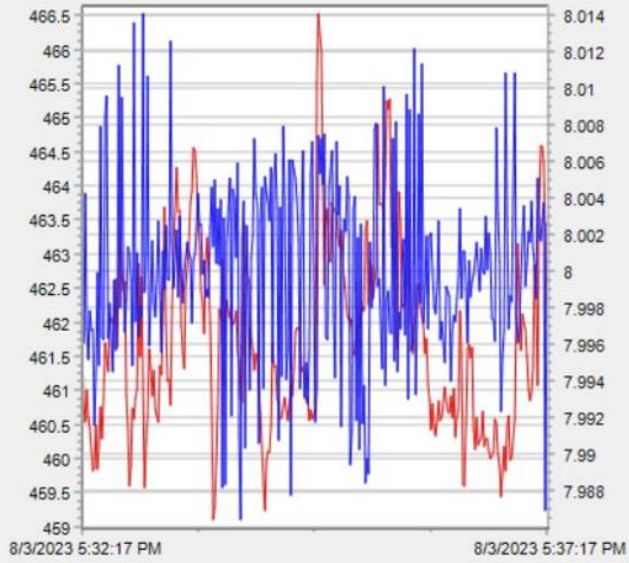
## 通过**LoggerNet** 操作现场校准

Mode	Abbreviation	Description
1	FLD_MEA	测量模式
2	PMP_OFF	泵停止
3	ZRO_ALL	零点校准
4	SPN_CO2	CO2 跨度校准
5	SPN_H2O	H2O 跨度校准
6	IRG_SLP	分析仪休眠
7	AUTO_ZS	零点/跨度 校准

CR6Series\_Training Graph 1: Real Time Monitoring (Connected)

Selected Fields

CO2_mixratio	461.9737
pump_flow	8.002676



Graph Width: 0 d 00 h 05 m 00 s

Drawing Mode:  Strip Chart  Shift Data

Shift %: 50

Options... Clear Rescale Stop

Show Units  Update Interval: 00 m 01 s 000 ms

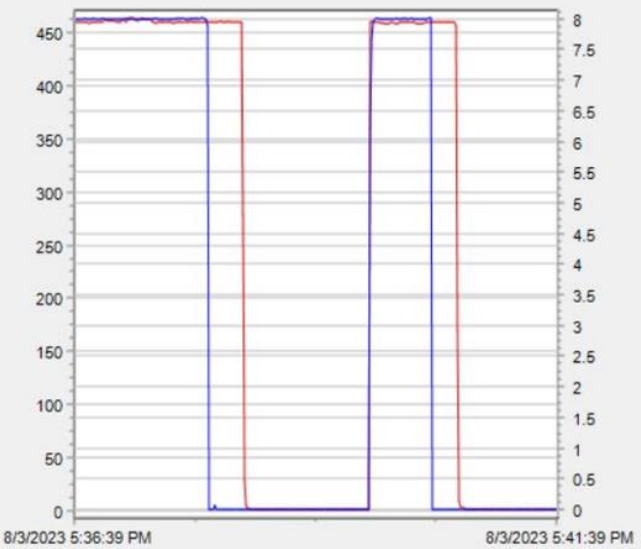
0.04037825	H2O_density	13.35592	
23.86247	rho_d	1150.568	
0.1191182	rho_a	1.163924	
0.09609101	VPD	8.003637	
0.09164259	FW	NAN	
ig_sonic	0	pump_tmpr	35.53476
m_rslt_get	130	pump_tmpr_ok	true <input checked="" type="radio"/>
m_rslt_snt	130	pump_press	91.74902
SAT3H_user_ctrl	false <input type="radio"/>	pump_flow_raw	7.98553
CO2_mixratio	461.9737	pump_flow_set_pt	8
O2_mixratio	18.66601	pump_flow_duty_cycle	0.8786455
ig_irga	0	mode	1
ll_tmpr	26.13443	site_	fld smp
ll_press	93.79695	CO2_span_gas	400
CO2_sig_strgth	0.9682423	Td_span_gas	16
O2_sig_strgth	0.9511614	H2O_span_gas	19.84555
f_press	-5.528961	e_span_gas	1.82523
pump_flow	8.002676	valve_tmpr_ctrl_flg	false <input type="radio"/>
sampling_regime	1	valve_tmpr	28.4325
cell_e	1.718733	valve_tmpr_ok	true <input checked="" type="radio"/>
cell_T_DP	15.06233	valve_diff_press_o	0
cell_e_sat	3.40215	valve_ctrl_press	94.19482
cell_RH	50.51903	valve_flow	0
press	99.32591	valve_flow_set_pt	1
Tc	22.12738	valve_flow_duty_cycle	0
e	1.820046	counts_on_site	6314
T_DP	15.95289	sec_on_site	631.4
e_sat	2.675437	scrub_tmpr	27.47385
RH	68.02797	scrub_tmpr_ok	true <input checked="" type="radio"/>
CO2_density	807.4814	scrub_press	0.8201375

*CPEC310 in FLD\_MEA mode*

dist_intrst_170_190	208.4175	prfrm_auto_zero_s	true <input checked="" type="radio"/>
dist_intrst_190_300	208.4175	alpha_PF_60_300	0
separation_x_FW	0.02627	beta_PF_60_300	0
separation_y_FW	-0.02408	alpha_PF_60_170	0
FW_diameter	7.62E-05	beta_PF_60_170	0
daytime	1	alpha_PF_170_190	0
volt_batt	12.30722	beta_PF_170_190	0
tmpr_panel	27.39737	alpha_PF_190_300	0
volt_CDM_VOLT	NAN	beta_PF_190_300	0
message	o FLD_MEA.	Planar_Fit_flg	false <input type="radio"/>
press_source	0 d		0.215825

Selected Fields

CO2_mixratio	0.9384224
pump_flow	0



Graph Width: 0 d 00 h 05 m 00 s

Drawing Mode:  Strip Chart  Shift Data

Shift %: 50

Options... Clear Rescale Stop

Show Units Update Interval 00 m 01 s 000 ms

0.04037825	H2O_density	0.02374957	
23.42478	rho_d	1156.318	
0.07368936	rho_a	1.156342	
0.006752043	VPD	8.003637	
0.06401467	FW	NAN	
ig_sonic	0	pump_tmpr	36.07947
m_rslt_get	174	pump_tmpr_ok	true <input checked="" type="radio"/>
m_rslt_snt	174	pump_press	99.38571
SAT3H_user_ctrl	false <input checked="" type="radio"/>	pump_flow_raw	0
CO2_mixratio	0.9384224	pump_flow_set_pt	8
O2_mixratio	0.03302696	pump_flow_duty_cycle	0
ig_irga	0	mode	3
ll_tmpr	26.14536	site_chk_zro	
ll_press	99.65039	CO2_span_gas	400
CO2_sig_strgth	0.9683854	Td_span_gas	16
O2_sig_strgth	0.9513811	H2O_span_gas	18.66142
f_press	0.3205566	e_span_gas	1.825551
pump_flow	0	valve_tmpr_ctrl_flg	false <input checked="" type="radio"/>
mping_regime	20	valve_tmpr	28.67578
cell_e	0.003291041	valve_tmpr_ok	true <input checked="" type="radio"/>
cell_T_DP	-55.73306	valve_diff_press_o	99.39168
cell_e_sat	3.404881	valve_ctrl_press	0.2594528
cell_RH	0.09665654	valve_flow	2.003638
press	99.32983	valve_flow_set_pt	1
Tc	26.14536	valve_flow_duty_cycle	1
e	0.003280454	counts_on_site	647
T_DP	-55.7594	sec_on_site	64.7
e_sat	3.404852	scrub_tmpr	27.58362
RH	0.09634644	scrub_tmpr_ok	true <input checked="" type="radio"/>
CO2_density	1.64846	scrub_press	5.11963

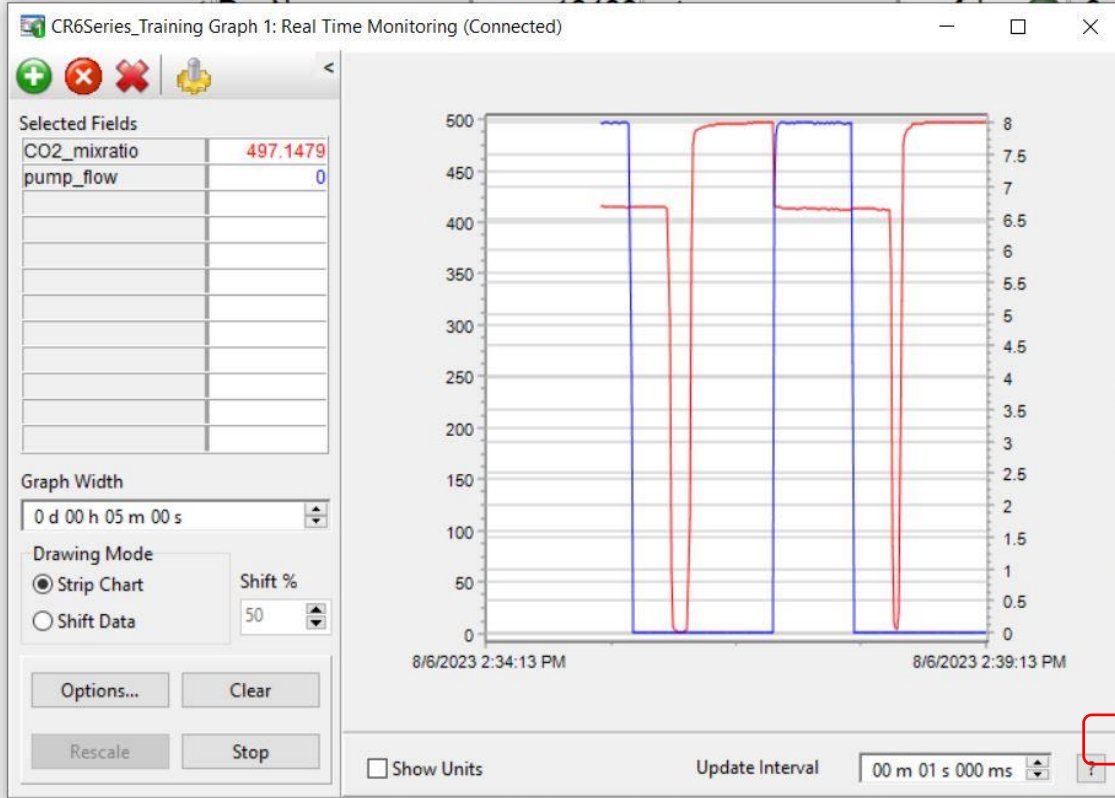
dist_intrst_170_190	208.4175	prfrm_auto_zero_sl	true <input checked="" type="radio"/>
dist_intrst_190_300	208.4175	alpha_PF_60_300	0
separation_x_FW	0.02627	beta_PF_60_300	0
separation_y_FW	-0.02408	alpha_PF_60_170	0
FW_diameter	7.62E-05	beta_PF_60_170	0
daytime	1	alpha_PF_170_190	0
volt_batt	12.30667	beta_PF_170_190	0
tmpr_panel	27.48358	alpha_PF_190_300	0
volt_CDM_VOLT	NAN	beta_PF_190_300	0
message	: Press offst.	Planar_Fit_flg	false <input checked="" type="radio"/>
press_source	0 d		0.215825

Show Units

Update Inte

CPEC310  
Zero w/ Scrub

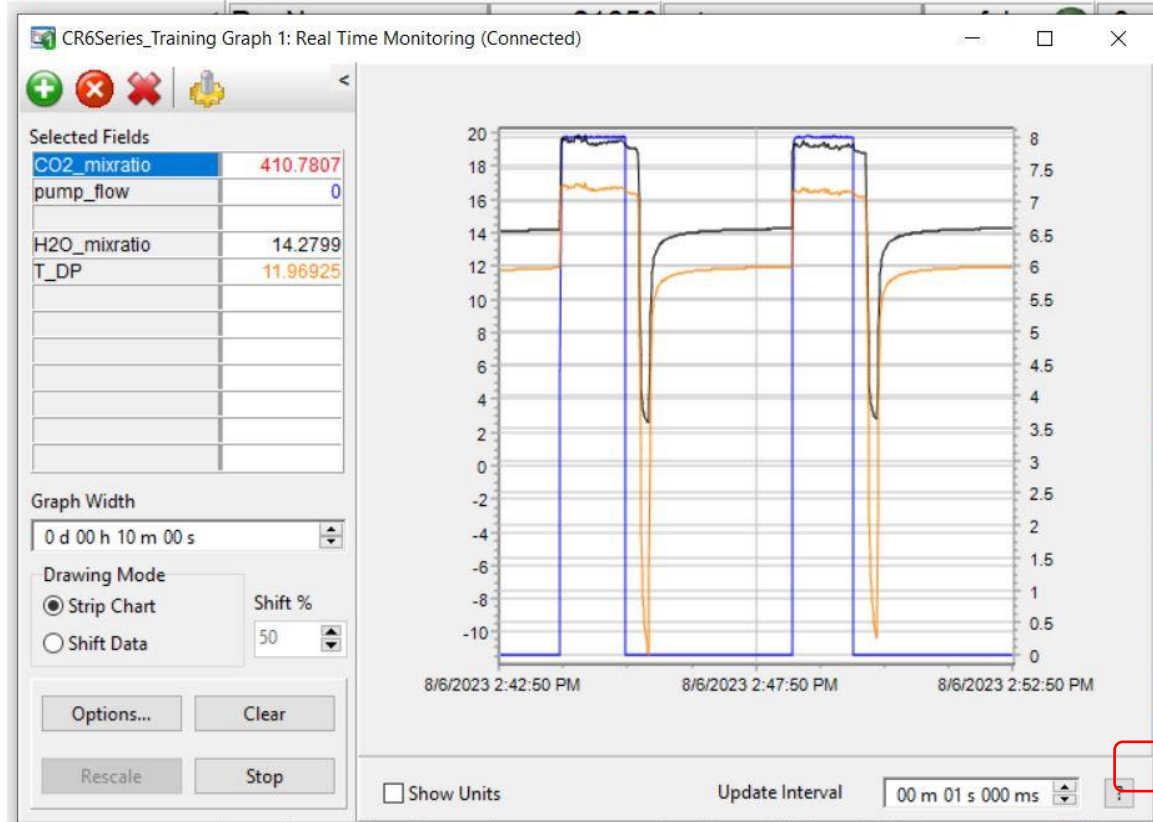




0.04037825	H2O_density	0.2030876	
25.04589	rho_d	1159.928	
-0.1327377	rho_a	1.160132	
0.2424036	VPD	11.5838	
-0.08615153	FW	NAN	
_sonic	0	pump_tmpr	34.23758
_rslt_get	224	pump_tmpr_ok	true <input checked="" type="radio"/>
_rslt_snt	224	pump_press	99.79621
T3H_user_ctrl	false <input type="radio"/>	pump_flow_raw	0
_mixratio	497.1479	pump_flow_set_pt	8
_mixratio	0.2815414	pump_flow_duty_cycle	0
_irga	0	mode	4
tmpr	26.67072	site_	set CO2
press	100.025	CO2_span_gas	505.83
_sig_strgth	0.9689132	Td_span_gas	12
_sig_strgth	0.9516318	H2O_span_gas	14.27968
press	0.1853409	e_span_gas	1.408217
p_flow	0	valve_tmpr_ctrl_flg	false <input type="radio"/>
plng_regime	38	valve_tmpr	30.60962
cell_e	0.02815326	valve_tmpr_ok	true <input checked="" type="radio"/>
cell_T_DP	-36.20005	valve_diff_press_o	99.90359
cell_e_sat	3.51207	valve_ctrl_press	0.1214218
cell_RH	0.8016146	valve_flow	0.99538
press	99.83969	valve_flow_set_pt	1
Tc	26.67072	valve_flow_duty_cycle	0.4983181
e	0.0281011	counts_on_site	70
T_DP	-36.21851	sec_on_site	7
e_sat	3.512053	scrub_tmpr	28.28088
message	: not zeroed.	scrub_tmpr_ok	true <input checked="" type="radio"/>
Planar_Fit_flg	false <input type="radio"/>	scrub_press	0.8242826
press_source	0	CO2_density	876.0314

CPEC310  
CO2 Span

dist_intrst_170_190	208.4175	prfrm_auto_zero_s	true <input checked="" type="radio"/>
dist_intrst_190_300	208.4175	alpha_PF_60_300	0
separation_x_FW	0.02627	beta_PF_60_300	0
separation_y_FW	-0.02408	alpha_PF_60_170	0
FW_diameter	7.62E-05	beta_PF_60_170	0
daytime	1	alpha_PF_170_190	0
volt_batt	12.31171	beta_PF_170_190	0
tmpr_panel	27.8891	alpha_PF_190_300	0
volt_CDM_VOLT	NAN	beta_PF_190_300	0
message	: not zeroed.	Planar_Fit_flg	false <input type="radio"/>
press_source	0	d	0.215825



0.04037825	H2O_density	10.15369	
24.2165	rho_d	1143.376	
-0.275452	rho_a	1.15353	
-0.03876012	VPD	11.5838	
0.09838642	FW	NAN	
_sonic	0	pump_tmpr	34.49359
_rslt_get	361	pump_tmpr_ok	true <input checked="" type="checkbox"/>
_rslt_snt	360	pump_press	99.74868
T3H_user_ctrl	false <input checked="" type="checkbox"/>	pump_flow_raw	0
_mixratio	410.7807	pump_flow_set_pt	8
_mixratio	14.2799	pump_flow_duty_cy	0
_irga	0	mode	5
tmpr	26.75504	site_	chk H2O
press	99.95679	CO2_span_gas	505.83
_sig_strgth	0.9669515	Td_span_gas	12
_sig_strgth	0.9496355	H2O_span_gas	14.28953
press	0.1365128	e_span_gas	1.408213
p_flow	0	valve_tmpr_ctrl_flg	false <input checked="" type="checkbox"/>
plng_regime	71	valve_tmpr	34.80701

CPEC310  
H2O Span

dist_intrst_170_190	208.4175	prfrm_auto_zero_s	true <input checked="" type="checkbox"/>	cell_e	1.407277	valve_tmpr_ok	true <input checked="" type="checkbox"/>
dist_intrst_190_300	208.4175	alpha_PF_60_300	0	cell_T_DP	11.98991	valve_diff_press_o	99.90505
separation_x_FW	0.02627	beta_PF_60_300	0	cell_e_sat	3.529533	valve_ctrl_press	0.05192566
separation_y_FW	-0.02408	alpha_PF_60_170	0	cell_RH	39.87148	valve_flow	0.439701
FW_diameter	7.62E-05	beta_PF_60_170	0	press	99.82028	valve_flow_set_pt	1
daytime	1	alpha_PF_170_190	0	Tc	26.75504	valve_flow_duty_cy	1
volt_batt	12.30883	beta_PF_170_190	0	e	1.405355	counts_on_site	1731
tmpr_panel	27.74246	alpha_PF_190_300	0	T_DP	11.96925	sec_on_site	173.1
volt_CDM_VOLT	NAN	beta_PF_190_300	0	e_sat	3.52952	scrub_tmpr	28.23434
message	: Press offst.	Planar_Fit_flg	false <input checked="" type="checkbox"/>	RH	39.81717	scrub_tmpr_ok	true <input checked="" type="checkbox"/>
press_source	0	d	0.215825	CO2_density	713.5131	scrub_press	0.8222561



*Thank you!*