



Air Pollution Control Division

Technical Services Program

APPENDIX GM6A

Standard Operating Procedure for the Determination of
Ozone in Ambient Air – 2BTech Analyzers

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1 SCOPE AND APPLICABILITY

The majority of information regarding health effects, reasons for monitoring, and analytical method are covered in the parent Appendix GM6 – O3 SOP and will not be repeated here.

1.1 Introduction

Beginning in the summer of 2014 the APCD/TSP developed and deployed temporary autonomous ozone analyzers to expand the breadth of the ozone monitoring program. These monitors are not intended, initially, to generate data that would flow fully through the data validation process to the final EPA AQS repository. They have been developed with special studies in mind.

1.2 Method Overview

Absorption of UV light has long been used for measurements of atmospheric ozone with high precision and accuracy. The ozone molecule has an absorption maximum at 254 nm, coincident with the principal emission wavelength of a low-pressure mercury lamp. Fortunately, there are few molecules found at significant concentrations in the atmosphere that absorb at this wavelength. However, interferences, such as organic compounds containing aromatic rings, can occur in highly polluted air. Mercury vapor can be a significant interference inside buildings where mercury spills have occurred in the past and in the vicinity of certain mining operations.

1.3 Format and Purpose

This appendix is written for analysis that does not result in data stored in EPA AQS. As such, it is only loosely based on the 1995 EPA guidance on preparing standard operating procedures. Parts of that guidance not found here are assumed to be in the parent Appendix GM6 – O3 SOP.

2 APPARATUS AND MATERIALS

The design of the seasonal ozone analyzer is intended to be autonomous and temporary. It is designed around a 12 volt power source capable of running the analyzer and data logger.

2.1 Monitoring Equipment

2.1.1 Analyzers

The 2B Technologies 205 Dual Beam Ozone Monitor™ is designed to enable accurate measurements of atmospheric ozone over a wide dynamic range extending from a limit of detection of 1 part-per-billion by volume (ppbv) to an upper limit of 100 parts-per-million (ppmv) based on the well established technique of absorption of ultraviolet light at 254 nm. The 205 Dual Beam Ozone Monitor™ is light weight (4.7 lb., 2.1 kg.) and has low power consumption (~5 watt) relative to conventional instruments.

Ozone is measured based on the attenuation of light passing through two separate 15-cm long absorption cells fitted with quartz windows. A single low-pressure mercury lamp is located on one side of the absorption cells, and photodiodes are located on the opposite side of the absorption cells. The photodiodes have built-in interference filters centered on 254 nm, the principal wavelength of light emitted by the mercury lamp. An air pump draws sample air into the instrument. A pair of solenoid valves switches in unison so as to alternately send ozone-scrubbed air and unscrubbed air through the two absorption cells. Thus, the intensity of light passing through ozone-scrubbed air (I_o) is measured in Cell 1 while the intensity of light pass through unscrubbed air (I) id measured in Cell 2. Every

2 seconds, the solenoid valves switch, changing which cell receives ozone-scrubbed air and which cell receives unscrubbed air.

Ozone concentration is calculated for each cell from the measurements of I_o and I according to the Beer-Lambert Law. The 2B Technologies instrument uses the same absorption cross section (extinction coefficient) as used in other commercial instruments. A new ozone measurement is made every 2 seconds for both cells, based on updated values of I and I_o . These two values are averaged and then output as both serial data and an analog voltage between 0 and 2.5 V. (2B Technologies, Inc., 2011)

2.1.2 Instrument Shelter

A weather-proof Hammond gray fiberglass enclosure (or similar) contains the analyzer, power system, data logger, modem, and zero-air charcoal container. A CPU style fan near the top and a protected opening below the battery allow for air flow. The fan is actuated if the internal temperature gets warm enough to merit the power consumption. Figure 1 shows the layout of the enclosure. Note that the modem is moved to the inside of the enclosure lid, an inch or so above the bottom of the inside of the enclosure. This is to keep any potential water from getting into the modem. The data logger and battery (though the battery is sealed) are also above the bottom of the enclosure. APCD has seen water enter the enclosure during severe storms.

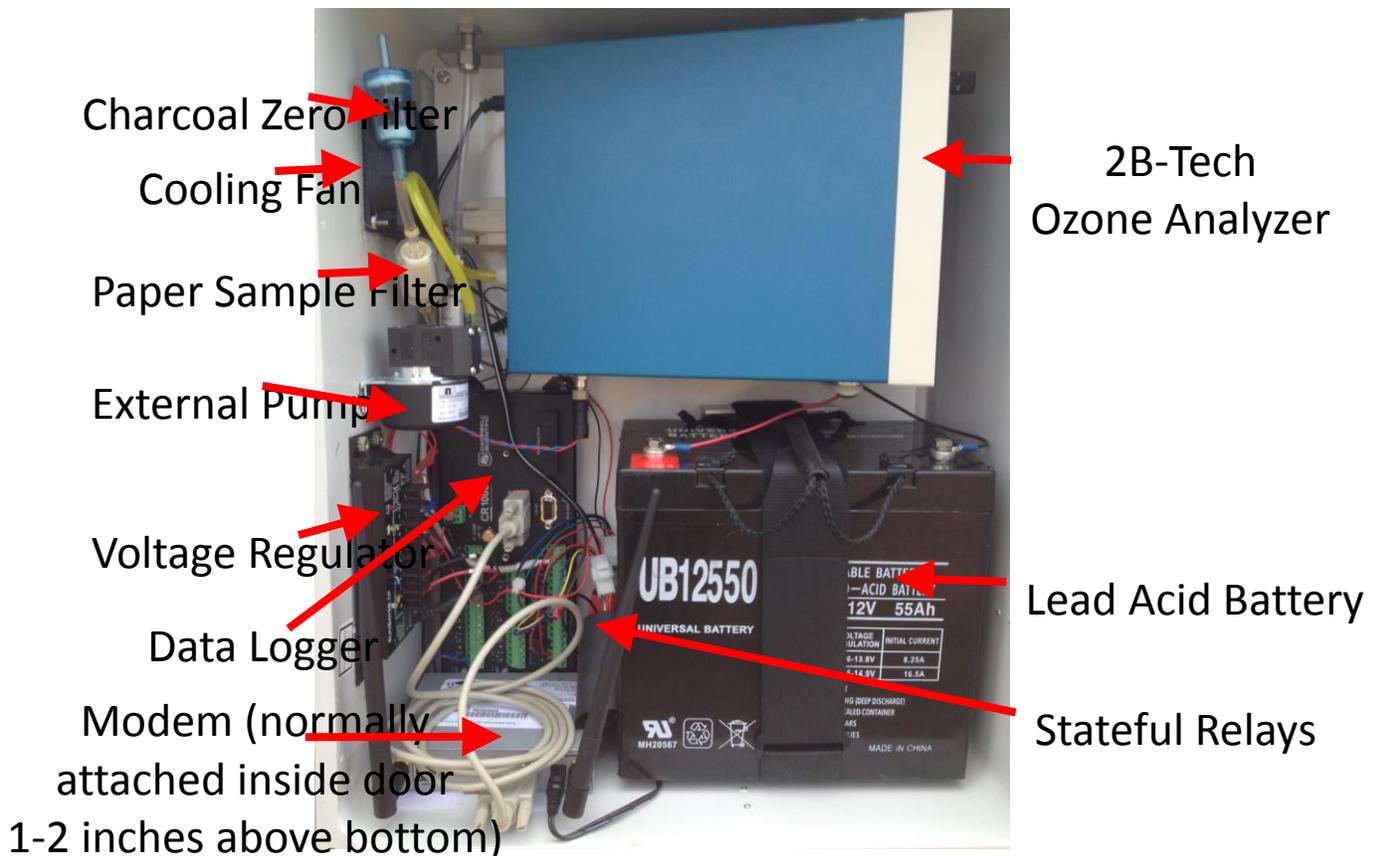


Figure 1. Internal Station Setup

The enclosure is based on a 12 volt system including a solar panel, a voltage regulator, and a lead acid storage battery. Under normal summer conditions the system shown is sufficient to run all equipment therein including

modems that have limited connectivity, thereby increasing their common draw. Initially the shelters have been configured as seen in Figure 2 where the solar panel is above and opposite the shelter. However, when possible, the solar panel should be used as a canopy for the enclosure by placing them both on the same side of the posts. This will reduce the amount of dirt collected on top of the enclosure and may reduce the amount of space for birds and other nuisance animals to congregate.

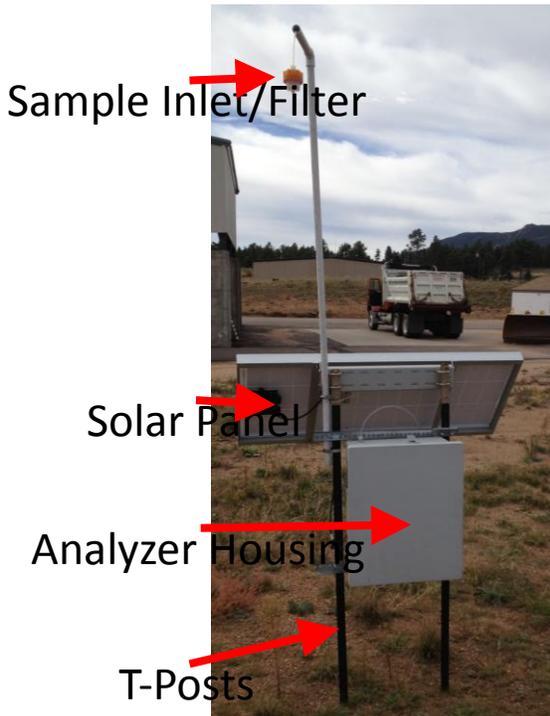


Figure 2. Exterior Enclosure Setup

Two t-posts are to be pounded into the ground at least one foot, at a width that matches the mounting hardware on the back of the enclosure. Then the enclosure is slid onto the posts and tightened into place, leaving at least two feet between the bottom of the enclosure and the ground. The solar panel should then be placed above the enclosure such that the door of the enclosure is unobstructed. Finally, a PVC stand is attached to a post to get the sample inlet as high above the ground as reasonable, keeping in mind the sample filter therein should be changed at least monthly.

2.1.3 Test Gas System

The ozone monitor is equipped with a solenoid in the sample stream that can be switched to a zero-path with a charcoal scrubber. At a prescribed frequency, or as triggered by the operator, the sample stream is switched to the charcoal scrubber so that both cells sample air that has been scrubbed. This constitutes measurement for zero drift of the analyzer.

2B Technologies manufactures an ozone source intended for field use on a 12 volt system, the model 306 Ozone Calibrator. Additionally, quality control personnel within the APCD use Teledyne 401 or 703 ozone sources. The APCD has certified both systems against a NIST traceable standard. See Section 3 for information on the model 306 and Appendix GM6 – O3 for information about the 401/703 approach.

2.1.4 Data Acquisition System

A Campbell Scientific CR1000 data logger is used to gather, aggregate, and store data. Details about the CR1000 can be found in the owner's manual.

For troubleshooting purposes, Figure 3 provides an illustration of how the CR1000 should be wired. Note this diagram is limited to the data logger and the subsequent relays. It is implied that the wiring continues from the relays to the appropriate systems.

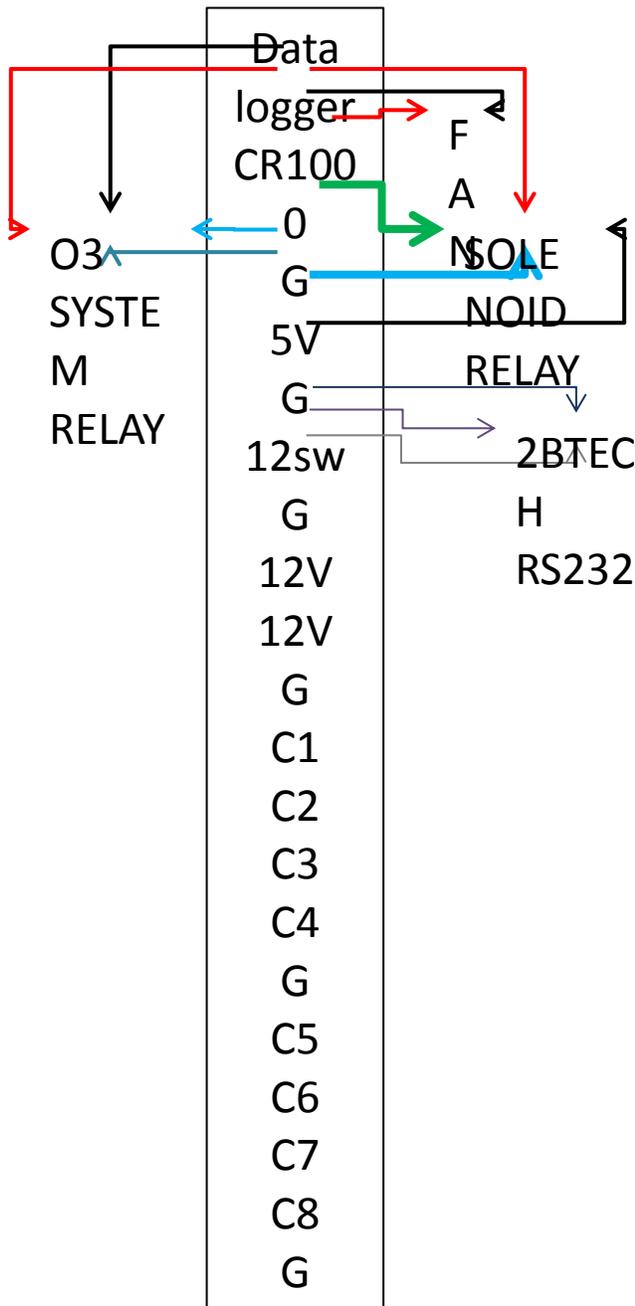


Figure 3. CR1000 Wiring Diagram

The CR1000 has two serial ports. One is proprietary and cannot be used, labeled CS IO. The other can be connected to the modem or a laptop, labeled RS-232.

2.1.5 Wiring, Tubing, and Fittings

The solar panel is wired into the voltage regulator following labeling on the voltage regulator. The battery should be wired to the voltage regulator again following the labeling. Power for all internal components should be pre-wired. The circuitry is protected by two 2-amp tube fuses.

Teflon tubing should be used for all connections from the sample port on top of the enclosure to the sample inlet. The sample inlet should have a filter holder with a filter at the end of the line. The sample inlet should be set so that it points downward preventing water from entering the sample stream.

2.1.6 Spare Parts and Incidental Supplies

Sample filters should be changed once per month at a minimum depending on the dusty nature of the location. Tube fuses may blow, it is best to have spare 2-amp tube fuses on hand. The paper inline sample filter and the charcoal zero filter should last longer than the field campaign but it is possible they will need replacement in exceptionally polluted environments.

In shady areas or in cases where the best sun angle cannot be achieved for the solar panel, a spare lead acid battery should be maintained on a battery cycling tender and used to swap when voltages drop below 11.5 volts.

2.2 Calibration Equipment

The 205 Ozone Analyzer can be calibrated by any

NIST traceable source. Refer to the parent Appendix GM6 – O3 SOP for required calibration equipment. In addition to the traditional TAPI 401 and 703 calibration sources, the 2B Technologies model 306 ozone generator (M306) may also be used as a calibration source.

3 CALIBRATION

In principle, the measurement of ozone by UV absorbance requires no external calibration; it is an absolute method. However, non-linearity of the photodiode response and electronics can result in a small measurement error. Therefore, each instrument is compared with a NIST-traceable standard ozone spectrophotometer in the laboratory

over a wide range of ozone mixing ratios (typically 0-300 ppbv for atmospheric applications). These results are used to calibrate the ozone monitor with respect to an offset and slope (gain or sensitivity). The user may change the calibration parameters from the front panel if desired. It is recommended that the ozone monitor be recalibrated at least once annually and preferably more frequently. The offset may drift due to temperature change or chemical contamination of the absorption cell. As discussed below, an accurate offset correction can be measured from time to time using the ozone scrubber supplied with the instrument. The user may change the slope and offset calibration parameters by entering the Menu option on the analyzer display.

3.1 Calibration Procedure

This procedure was developed from 2B Technologies Technical Note No. 015, Recommended Calibration Procedure for 2B Tech Ozone Monitors. The following procedure applies both for in-lab or in-field calibration of 2B-Tech Ozone monitors. While in the lab, the O3 level two transfer standard response will be used to calibrate the ozone monitor, rather than the ozone generator (level 3 transfer standard) reading.

- Set up the calibration train; refer to the parent Appendix GM6 – O3 SOP. If using the M306, then no vent is required as the M306 is equipped with an internal vent. All calibrations must be done through the sample probe with a Teflon filter in place.
- Record the 2B-tech analyzer's offset (Z) and slope (S).
- Set the calibration parameters to, $Z = 0.0$ and $S = 1.00$
- Generate zero air with the ozone calibrator and allow the ozone monitor to stabilize for several minutes.
- Collect 1 minute average data from the ozone monitor's front display or through the data logger's serial communication port.
- The new offset (Z) is the negative of the average instrument offset.
- Generate 5 different ozone levels that are equally spaced through the analyzer's range. Allow sufficient time for each point to stabilize and record the 1 minute averages.
- Perform a linear regression with the analyzers response and the Ozone generator's output data.
- The new slope (S) will be given by $1/(LR\text{-slope})$, where LR-slope is the slope of the linear regression line.
- Z must be within the range of -9 to 9 ppb and S within the range 0.99 to 1.09 ppb, if not then the instrument needs to be repaired or cleaned and all calibration activities must stop until rectified.
- Enter the new Z and S parameters into the Ozone monitor using the front panel menu.
- Perform a post-calibration check by generating zero, precision, and span to ensure calibration is accurate. If it is not, then adjust the Z and S parameters and repeat the multipoint linear regression.

4 OPERATION AND MAINTENANCE

4.1 Connecting to the CR1000

Diagnostic, meteorological, and analytical parameters can be viewed by connecting a laptop to the CR1000. The laptop must have Campbell Scientific PC200W software installed and correctly configured. The laptop must also have an RS-232 cable (straight, with a male end for the CR1000) connected to it.

Once physically connected, open PC200W and click on Monitor Data. The program will attempt to connect and, if successful, display all available parameters in a grid, updating in real-time. Any audits or calibrations done to the ozone monitor should use this display.

In the event information needs to be obtained from the ozone monitor itself, Figure 4 may be referenced, in addition to the manual, to display average data.

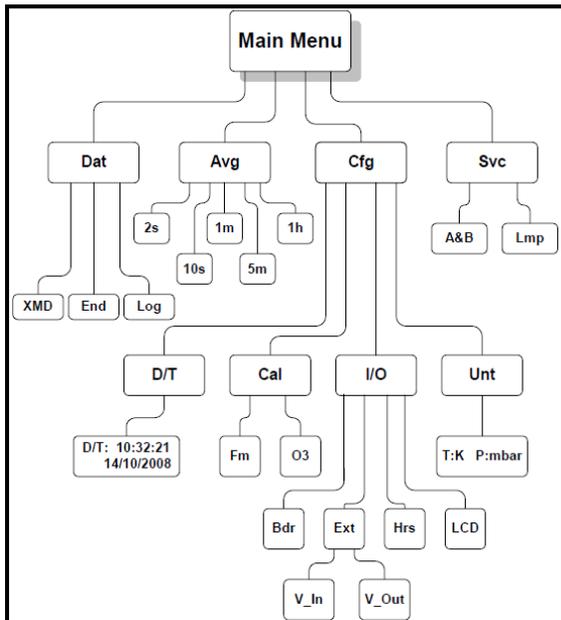


Figure 4. Ozone Monitor Menu Tree

4.2 Ozone Analyzer Programming

For reference, the program, which can be edited in a text editor, and exported to the data logger, is listed here:

```

'Declare Variables and Units
'T_Int is CR1000 thermistor temperature
Public SerNo,V_Batt,T_Int,T_Air
Public Analyzer_Serial_Raw as string * 80
Public Analyzer_Serial(9)
Alias Analyzer_Serial(1)=O3
Alias Analyzer_Serial(2)=T_inst
Alias Analyzer_Serial(3)=Cell_Pres
Alias Analyzer_Serial(4)=Flow
'Flag1=2B on/off
'Flag2=Cooling fan on/off
'Flag3=Zero solenoid on/off
Public Flag(3) as boolean
Alias Flag(1)=O3_Status
  
```

```
Alias Flag(2)=Fan_Status  
Alias Flag(3)=Zero_Status  
Const On=True  
Const Off=False
```

```
Units V_Batt=Volts  
Units O3=ppb  
Units T_Int=Deg C  
Units T_Air=Deg C  
Units Cell_Pres=mbar  
Units Flow=cc/min
```

```
'Define Data Tables
```

```
'Sample15 is the output table for 15-minute average ozone
```

```
DataTable(Sample15,1,-1)  
    DataInterval(0,15,Min,0)  
    Sample(1,SerNo,FP2)  
    Average(1,O3,FP2,False)  
    Maximum(1,O3,FP2,False,False)  
    Minimum(1,O3,FP2,False,False)  
    StdDev(1,O3,FP2,False)  
    Sample(1,T_Int,FP2)  
    Average(1,Flow,FP2,False)  
    Average(1,Cell_Pres,FP2,False)  
    Sample(1,T_Air,FP2)  
    Sample(1,O3_Status,FP2)  
    Sample(1,Fan_Status,FP2)  
    Sample(1,Zero_Status,FP2)  
    Sample(1,V_Batt,FP2)
```

```
EndTable
```

```
'Zero is the output table for zero data, taken every seventh day
```

```
DataTable(Zero,Zero_Status,-1)  
    DataInterval(0,5,Min,0)  
    Sample(1,SerNo,FP2)  
    Average(1,O3,FP2,False)  
    Maximum(1,O3,FP2,False,False)  
    Minimum(1,O3,FP2,False,False)  
    StdDev(1,O3,FP2,False)  
    Sample(1,Zero_Status,FP2)  
    Sample(1,V_Batt,FP2)
```

```
EndTable
```

```
'Main Program
```

```
BeginProg  
PortsConfig(&B11,&B11)  
SerialOpen(COM2,4800,0,500,240)  
Scan(1,Min,1,0)  
'CR1000 internal battery voltage measurement  
Battery(V_Batt)  
'Receives serial string from analyzer  
If O3_Status=On then  
    SerialIn(Analyzer_Serial_Raw,COM2,6000,CHR(13),80)  
    'Splits analyzer serial data into separate variables
```

```
SplitStr(Analyzer_Serial(),Analyzer_Serial_Raw,",",9,5)
'Flushes serial input buffer
SerialFlush(COM2)
EndIf
'Assigns null values to analyzer variables if analyzer is off
If O3_Status=Off then
    O3=NAN
    T_inst=NAN
    Cell_Pres=NAN
    Flow=NAN
EndIf
'Datalogger temperature measurement
'Measures interior temperature
PanelTemp(T_Int,_60Hz)
'Measures external temperature on Diff channel 2:
TCDiff(T_air,1,mV25C,2,TypeT,T_Int,True,0,_60Hz,1,0)
'Conditions for powering-up ozone analyzer
'Turns on analyzer if battery voltage is sufficient and T_Int>+3C
If O3_Status=Off then
    If V_Batt>12 then
        If T_Int>3 then
            PortSet(1,1)
            O3_Status=On
            Delay(1,2,2)
            PortSet(1,0)
        EndIf
    EndIf
EndIf
'Conditions for turning off ozone analyzer and fan
'Turns off analyzer and fan if battery voltage is too low OR if T_Int<0C
If O3_Status=On then
    If V_Batt<11 or T_Int<0 then
        PortSet(2,1)
        O3_Status=Off
        Delay(1,2,2)
        PortSet(2,0)
        PortSet(9,0)
        Fan_Status=Off
    EndIf
    'Turns on cooling fan if battery voltage is sufficient and datalogger T>30
    If T_Int>30 and V_Batt>11 then
        PortSet(9,1)
        Fan_Status=On
    EndIf
EndIf
If Fan_Status=On and T_Int<25 then
    PortSet(9,0)
    Fan_Status=Off
EndIf
'Writes output to internal storage
CallTable(Sample15)
CallTable(Zero)
'Executes zero check every 168 hours at 0015
```

```
'Zero equilibration 0015-0020  
'Sample 0020-0025  
'Ambient equilibration 0025-0030  
If (IfTime(15,10080,min)) and O3_Status=On then  
    PortSet(1,1)  
    Zero_Status=On  
EndIf  
If (IfTime(25,10080,min)) then  
    PortSet(1,0)  
EndIf  
If (IfTime(31,10080,min)) then Zero_Status=Off  
NextScan  
EndProg
```

4.3 Routine Operation and Maintenance

On each site visit

1. Check that the pump is running and that the ozone analyzer display has sensible data showing
2. Clean dirt and debris from the solar panel
3. Verify time on data logger and analyzer (+/- 2min).

Important Note! – All times on data loggers and analyzers are to be set to Mountain Standard Time and do not adjust for daylight savings. Data logger and analyzers clocks should appear to be running 1 hour late from March to November (daylight savings time period, clocks move one hour forward). Reference a calendar or other source to determine the exact and end dates of daylight savings.

4. Inspect condition of any wiring, specifically outside the enclosure (any antenna or power from the solar panel)
5. Change the sample filter

Once per day during deployment

1. Connect with the CR1000 by using the Central Polling copy of PC200W and the necessary RealPort configuration
2. Collect all data since the last poll (see Section 6)
3. View diagnostic and analytical data to watch for high temperatures or other inconsistencies

5 TROUBLESHOOTING

A comprehensive troubleshooting list can be found in operator’s manual troubleshooting section (Section 5).

Problems with the data logger can generally be resolved by either power cycling the data logger or re-pushing the programming listed above via Campbell Scientific’s PC200W software.

6 DATA ACQUISITION

Data is acquired from the CR1000 data loggers by use of the proprietary Campbell Scientific PC200W software. Installation instructions for the software can be found in section 4.2.3 of the Campbell Scientific CR1000 Measurement and Control System Operator’s Manual.

Any laptop used to manually collect data from the data loggers should be configured on campus. All data is stored (even if delivered by way of a laptop) in a folder structure existing on the share [\\APCPOLLING1\Technical Services 1\2BTech](#) folder. File naming convention should be as follows:

Minute Average Data	SiteName_Sample01
Hour Average Data	Site Name_Sample1
Zero sequence results (nightly zero checks)	SampleName_Zero

A folder should be created for each new site. After the folder is created, the PC200W software can be instructed to download data to that folder.

The PC200W software is also used to view data in both tabular and graphical forms in order to review for data quality and to check diagnostic parameters. Once the software is open (a connection to a data logger is not required), click the Tools menu and select View. This opens a new window wherein you may open data files. With a data file open, select a column of data by clicking on the header, then click the graph icon in the ribbon near the top of the window. Figure 5 is an example of a fully open data file.

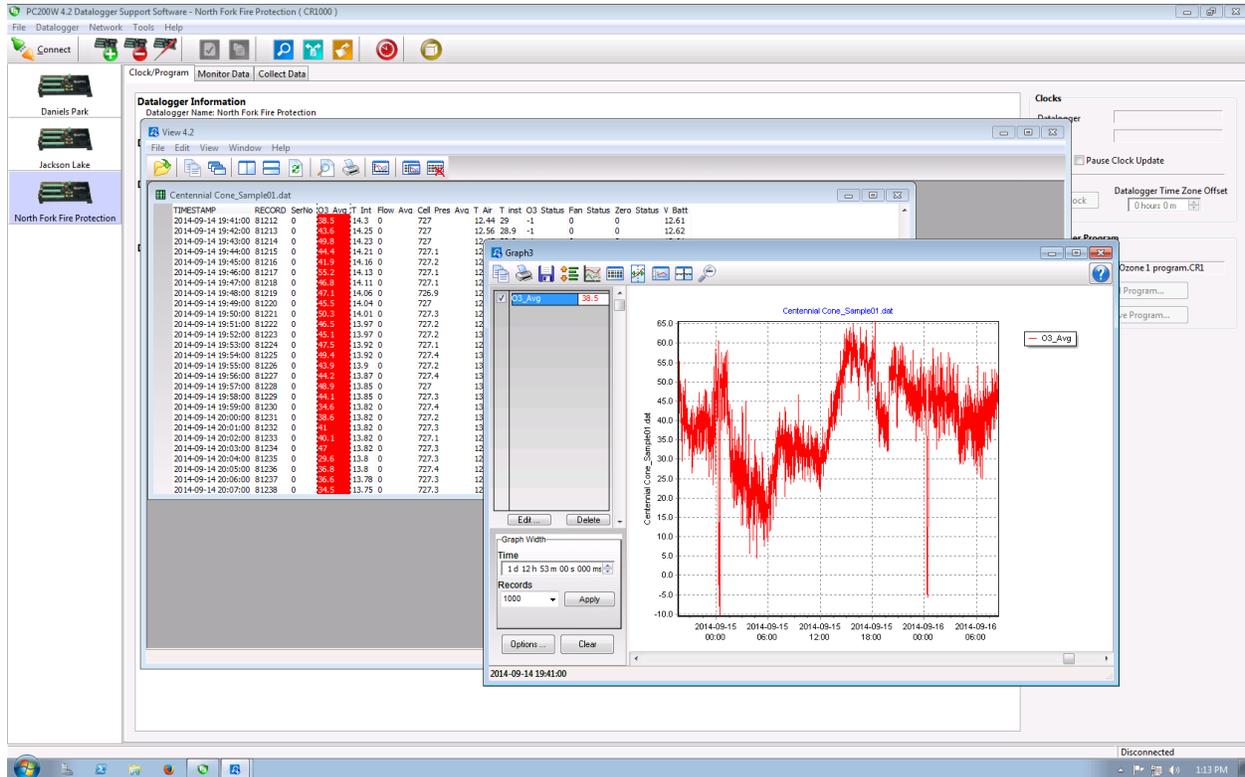


Figure 5. Example PC200W Window

7 2BTECH OZONE SOURCE M306 CERTIFICATION

The certification of the 2bTech M306 O₃ follows the same general procedure for O₃ source certification outlined in APCD’s Standards SOP. However the 2bTech M306 certification requires a different approach than the TAPI O₃ sources. Due to the low flow and different zero air sources the M306 cannot be directly output to the Level II O₃ transfer standard. Rather an O₃ analyzer, either a TAPI 400 or 2bTech M205, must be calibrated against the Level II O₃ transfer standard and a calibration curve developed. Refer to APCD’s Ozone SOP on procedures for calibrating O₃ analyzers. Figure 6 is an example of the certification workflow. Calibration data are entered into the Calibration database, using CDPHE lab as the site. Once complete, the 2bTech M306 can be directly hooked up (has an internal vent) to the calibrated O₃ analyzer and O₃ produced for seven points (two zero points, and five O₃ concentrations). The O₃ analyzer response is recorded and corrected with the calibration curve coefficients. These data are then entered into the Ozone database. Figure 7 shows the certification setup.

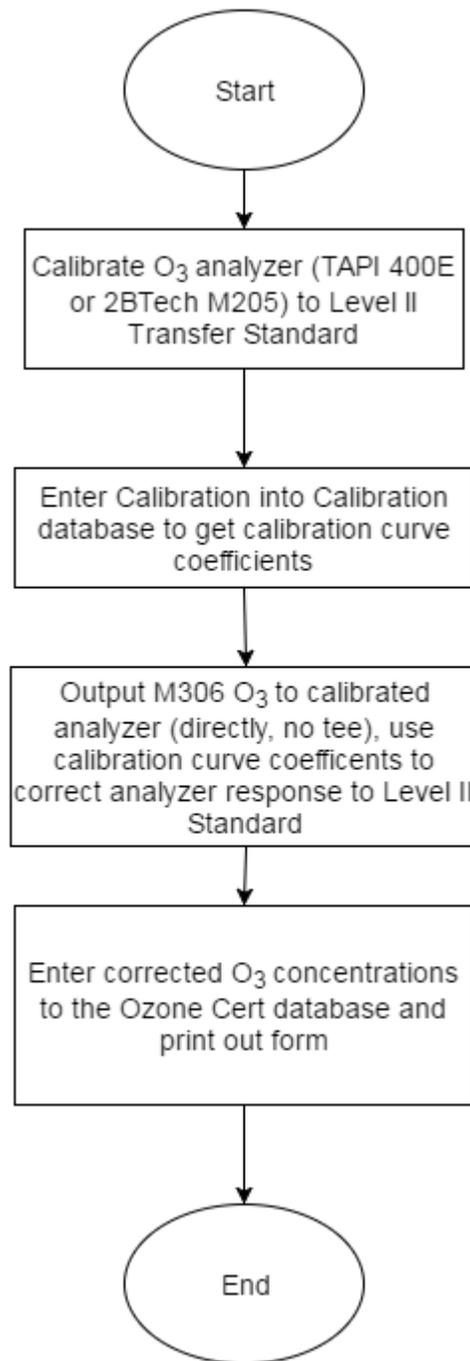


Figure 6 2bTech M306 O₃ source certification workflow

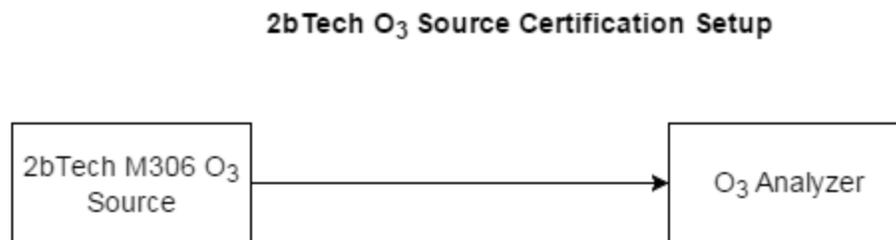
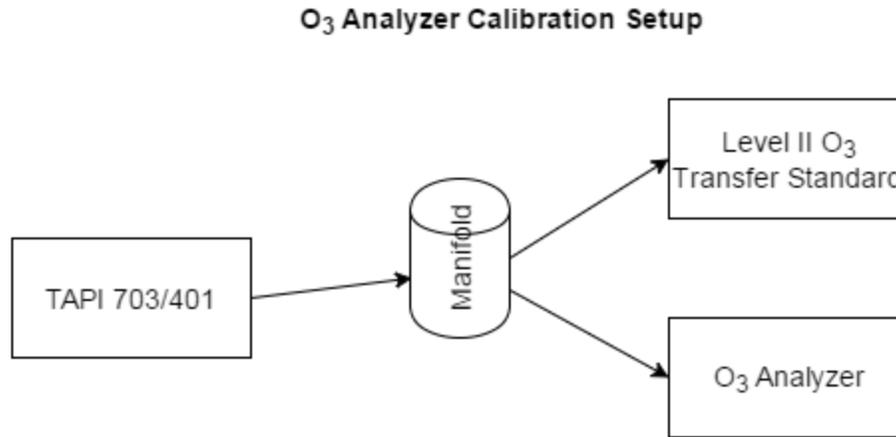


Figure 7 2bTech M306 O₃ source certification setup

7.1 2BTech O₃ Source Certification Procedure.

7.1.1 Calibrate O₃ Analyzer

To calibrate an O₃ analyzer to the Level II O₃ transfer standard, an ozone source and an ozone analyzer (either TAPI or 2bTech) is needed. The O₃ source will output ozone to both the Level II O₃ transfer standard and the O₃ analyzer to be calibrated. The following procedure outlines the steps to accomplish the calibration.

1. Turn on O₃ analyzer, O₃ source, and the Level II O₃ transfer standard and let warm up sufficiently.
2. Hook up the O₃ source and Level II O₃ standard to the same Zero air source.
3. Take the output of the O₃ source and connect it to the sampling manifold.

4. Connect the O₃ analyzer to the same sampling manifold.
5. Generate zero and span O₃ concentrations and adjust the O₃ analyzer's response to the Level II O₃ transfer standard readings.
6. Generate at total of five O₃ concentrations and record the O₃ analyzer and the Level II O₃ transfer standard responses to generate the calibration curve coefficients.
7. Enter the responses into the Calibration database form to generate the calibration coefficients.
8. Once complete, the O₃ analyzer is calibrated.

7.1.2 Certify the 2bTech O₃ source with the Calibrated O₃ analyzer

1. Turn on the 2bTech M306 O₃ source and let warm up.
2. Connect the M306 output directly to the calibrated O₃ analyzer. The M306 is internally vented, so no vent is required.
3. Follow the O₃ source certification outlined in APCD's Standards SOP. Generate two zeros and five O₃ concentration points.
4. Record the O₃ analyzer readings and correct to the Level II O₃ transfer standard using the calibration curve coefficients.
5. Enter the corrected O₃ analyzer readings in to the Ozone Cert database 7 point Certification Form. The O₃ analyzer corrected readings are placed in the "Primary Lab" row (Figure 8).
6. Enter the M306 target O₃ points into the "Transfer" row.
7. Capture the data.
8. Open the 7 Point 6x Certification Form and generate the certification sheet and label to determine if it passed.
9. If the M306 fails see the APCD's Standards SOP for next actions and troubleshooting. Otherwise, the M306 certification is complete.

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT Air Pollution Control Division - Technical Services Program 7 Point Ozone Standard Verification Data Form															
Date: <input type="text"/>		Time: <input type="text"/>		Initials: <input type="text"/>		New Data Form									
Primary Lab Standard			Backup Lab Standard			Transfer Standard									
Model:	<input type="text"/>		Model:	<input type="text"/>		Model:	<input type="text"/>								
SN:	<input type="text"/>		SN:	<input type="text"/>		SN:	<input type="text"/>								
SRP Cert Date:	<input type="text"/>		SRP Cert Date:	<input type="text"/>		DCPS (MV):	<input type="text"/>								
O3 bkgrd:	<input type="text"/>		O3 bkgrd:	<input type="text"/>		Box Temp (C):	<input type="text"/>								
O3 coef.:	<input type="text"/>		O3 coef.:	<input type="text"/>		O3 Offset (PPB):	<input type="text"/>								
5 Volt:	<input type="text"/>		5 Volt:	<input type="text"/>		O3 Slope:	<input type="text"/>								
+15 Volt:	<input type="text"/>		+15 Volt:	<input type="text"/>		Reg Press (IN-HG):	<input type="text"/>								
-15 Volt:	<input type="text"/>		-15 Volt:	<input type="text"/>		O3 Gen Temp (C):	<input type="text"/>								
Battery:	<input type="text"/>		Battery:	<input type="text"/>		O3 Gen Flow (LPM)	<input type="text"/>								
Bech Temp:	<input type="text"/>		Bech Temp:	<input type="text"/>		Ana Lamp Temp (C):	<input type="text"/>								
Bench Lamp:	<input type="text"/>		Bench Lamp:	<input type="text"/>		Sample Temp (C):	<input type="text"/>								
O3 Lamp:	<input type="text"/>		O3 Lamp:	<input type="text"/>		Sample Flow (CC/MIN):	<input type="text"/>								
Pressure:	<input type="text"/>		Pressure:	<input type="text"/>		Sample Press (IN-HG):	<input type="text"/>								
Flow Cell A:	<input type="text"/>		Flow Cell A:	<input type="text"/>		O3 Drive (MV):	<input type="text"/>								
Flow Cell B:	<input type="text"/>		Flow Cell B:	<input type="text"/>		O3 Gen Ref (MV):	<input type="text"/>								
Int Cell A:	<input type="text"/>		Int Cell A:	<input type="text"/>		O3 Ref (MV):	<input type="text"/>								
Int Cell B:	<input type="text"/>		Int Cell B:	<input type="text"/>		O3 Set:	<input type="text"/>								
Measurement Comparisons															
Standard	zero (ppb)	100 (ppb)	200 (ppb)	300 (ppb)	400 (ppb)	500 (ppb)	zero (ppb)	Slope	Intercept	Corr. Coeff.					
Primary Lab															
Primary Zero Corr.															
Backup Lab															
Backup Zero Corr.															
Transfer															
Transfer Zero Corr.															
								Primary Regression: <input type="radio"/> Backup Regression: <input type="radio"/>							
Analyzer Checks					Field Setup Checkout										
DFU Condition	<input type="text"/>	Sample Flow Check	<input type="checkbox"/>	1 Volt D/A Check:	<input type="checkbox"/>	Pump Switch = ON:	<input type="checkbox"/>	DFU Charcoal	<input type="text"/>	O3 Gen Flow Check	<input type="checkbox"/>	Event = A22S:	<input type="checkbox"/>	O3 Gen = 360:	<input type="checkbox"/>
Charcoal Renewed	<input type="text"/>	Visual Cell Check	<input type="checkbox"/>	Wait = 01_15 min:	<input type="checkbox"/>	Cover Secure:	<input type="checkbox"/>					Inlet Cap To Scrubber:	<input type="checkbox"/>	Feet OK:	<input type="checkbox"/>
Comments															

Figure 8 APCD's 7 Point Ozone Standard Verification Data Form