Section I: ECB Responsibilities

Sulfur Dioxide QA Plan
Revision 9

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2.8.1 Sulfur Dioxide QA Plan: ECB Responsibilities

2.8.1.1 Equipment Selection and Procurement

The ECB shall procure air monitoring equipment and supplies for the Air Quality Division. EPA's Reference or Equivalent methods list should be reviewed to determine the makes and models acceptable for monitoring sulfur dioxide at the levels dictated by National Ambient Air Quality Standards (NAAQS). Each monitor used must be a reference or equivalent method (40CFR53 and 40CFR58, Appendix C).

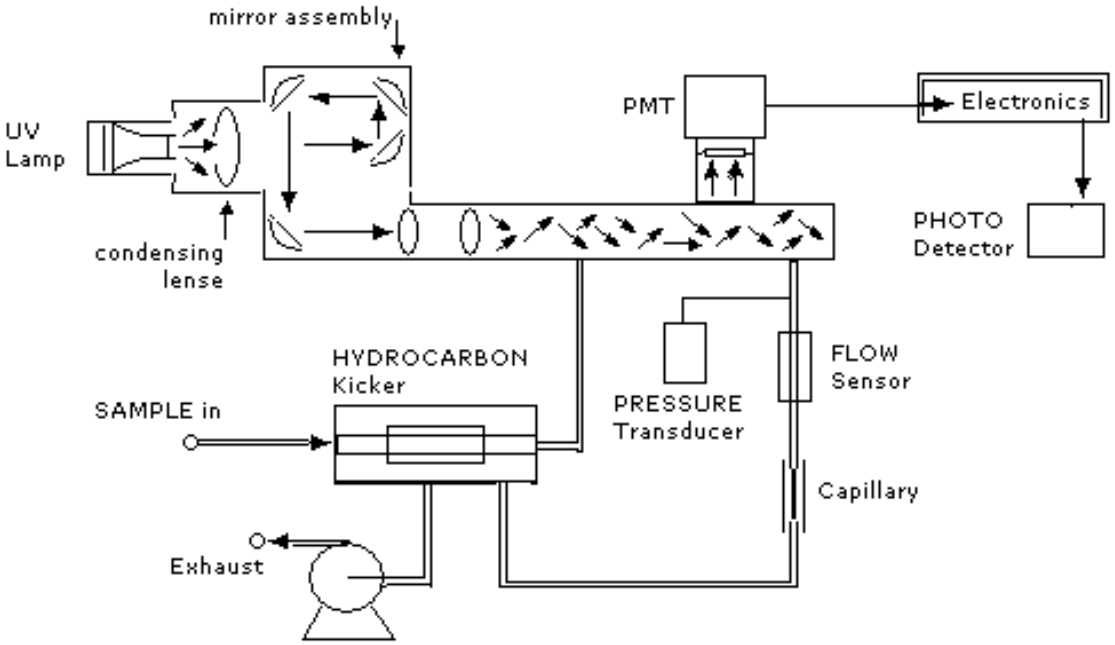
All sulfur dioxide monitors used for non-"trace" level applications must have an acceptable output for the data logging system deployed with the instrument (digital output or analog output of 0 to 10 volt DC). All monitors and calibrators must operate on 115 volt AC 60Hz line current. All analog data acquisition systems must be calibrated to accept a 0 to 10 volt DC output, have an accuracy of $\pm$ 0.002 ppm on the 0.5 ppm scale or $\pm$ 0.003 ppm on the 1.0 ppm scale agreement between the PDL and the BUDL, and must meet other specifications as necessary. All digital data acquisition systems must be at least 10-bit and have RS232 and/or Ethernet connections,

2.8.1.2 Description / Principle of Operation of the Thermo-Environmental Inc (TEI) Model 43C Sulfur Dioxide Analyzer

The Model 43C is based on the principle that SO_2 molecules absorb ultraviolet (UV) light and become excited at one wavelength, then decay to a lower energy state emitting UV light at a different wavelength. Specifically,

$$\mathbf{SO_2 + hv_1 \rightarrow SO_2^* \rightarrow SO_2 + hv_2}$$

The sample is drawn into the Model 43C through the **SAMPLE** bulkhead, as shown in '2.8.1 – Figure 1 Principles of Operation'. The sample flows through a hydrocarbon "kicker", which removes hydrocarbons from the sample by forcing the hydrocarbon molecules to permeate through the tube wall. The SO_2 molecules pass through the hydrocarbon kicker unaffected. The sample flows into the fluorescence chamber, where pulsating UV light excites the SO_2 molecules. The condensing lens focuses the pulsating UV light into the mirror assembly. The mirror assembly contains four selective mirrors that reflect only the wavelengths which excite SO_2 molecules. As the excited SO_2 molecules decay to lower energy states, they emit UV light that is proportional to the SO_2 concentration. The bandpass filter allows only the wavelengths emitted by the excited SO_2 molecules to reach the photo multiplier tube (PMT). The PMT detects the UV light emission from the decaying SO_2 molecules. The photo detector, located at the back of the fluorescence chamber, continuously monitors the pulsating UV light source and is connected to a circuit that compensates for fluctuations in the UV light. The sample then flows through a flow sensor, a capillary, and the shell side of the hydrocarbon "kicker". The Model 43C outputs the SO_2 concentration to the front panel display and the analog outputs. The instrument is best described in detail, by separating it into three sections: the analyzer, optics, and electronics.



2.8.1-Figure 1: Principles of Operation

Model 43C Monitor Description (Specifications)

Preset Ranges	0-0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, and 100 ppm 0-0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, and 250 mg/m^3
Zero Noise	0.5 ppb RMS (60 sec. avg. time)
Lower detectable limit	1.0 ppb (60 sec. avg. time)
Zero Drift (24 hour)	Less than 1 ppb
Span Drift (24 hour)	± 1%
Response Time	110 sec. (60 sec. avg. time)
Precision	1% of reading or 1 ppb (whichever is greater)
Linearity	± 1% of full-scale ≤ 100 ppm ± 5% of full-scale > 100 ppm
Sample flow rate	0.5 liters/min. (standard)
Interferences (EPA levels)	less than lower detectable limit except for the following: NO < 3ppb; m-Xylene < 2ppb; H_2O < 2% of reading
Operating temperature	20˚-30˚C (may be safely operated over the range of 5˚-40˚C)
Power requirements	105-125 VAC @ 50/60 Hz 100 Watts
Physical dimensions	16.75" (W) X 8.62" (H) X 23" (D)
Outputs	Selectable voltage 4-20 mA RS-232/485 Interface

2.8.1.3 Description And Operation of TEI Model 146C and Zero Air Supply

TEI Model 146C Calibrator

The Model 146C Calibrator supplies the required levels of SO_2 to perform zero, precision, span checks and multipoint calibrations. The Model 146C is operated remotely from the datalogger to perform zero, precision, and span checks. The Model 146C is an accurate mass flow controlled gas dilution system. SO_2 gas from a NBS traceable Protocol certified cylinder (connected to Port C) is blended with "zero-air" to provide a desired concentration. From the known calibration of the two mass flow controllers, the exact concentration can be calculated. A typical dilution ratio of about 100:1 to 1000:1 is used on cylinders.

Model 111 Zero-Air Supply System

The purpose of the Model 111 is to supply pollutant-free air ("zero air") for proper zeroing and to provide clean diluent air for spanning ambient air analyzers. The components removed are SO_2, NO, NO_2, O_3, CO and hydrocarbons.

Gas Cylinders

All gas cylinders must be traceable to a NIST-SRM.

2.8.1.4 Initial Laboratory Startup of the Model 43C

The ECB shall conduct and document, initial operational tests before deploying an instrument. Refer to '2.8.1 – Figure 2; TEI Model 43 C Flowchart' for a description of the instrument menu. Items to be completed include:

- Inspection
- Assembly (Modification, Range Setting, Flow Verification, and Lamp Verification)
- Leak Check and Calibration

Inspection

Visually inspect the exterior of all items for damage. Remove the cover and inspect the electronics assembly and circuit boards for loose wires, cables, broken components, or other damage. Reconnect any loose components and if necessary, contact the manufacturer.

Assembly, Modification and Initial Verification

Prior to deployment in the field, all instruments will undergo basic operational tests in the ECB lab. Results should be recorded in the instrument's logbook which remains on file in the ECB Lab.

The instrument should be set up in the lab with accompanying, calibrator, zero air system, cylinder, and data logging system.

> For new instruments, each 43C requires the addition of a 24 VDC solenoid valve to provide automatic zero and span capabilities. As shown on page 9-3 (6/5/97 version) of the TEI 43C manual and as approved by the EPA, this is an equivalent method (EQSA-

0486-060). The solenoid addition requires the rear panel bulkheads to be reconfigured by moving the sample inlet, adding a span inlet and labeling the inlets "SPAN" and "SAMPLE". The exhaust is located in the original position and labeled accordingly. The modified 43C rear panel has a separate port for span, sample and exhaust. Additionally, the sample and span inlets are directed through the solenoid and hydrocarbon kicker. All sample and span gasses pass through the hydrocarbon kicker before entering the optics.

Install a Teflon particulate inlet filter holder on the rear of the instrument. Connect the sample line to the particulate filter holder inlet. Connect the rear panel bulkhead labeled "exhaust" to a suitable vent outside of monitoring room (**do not** vent to room air). Plug in power cord and turn on power to instrument. The cooling fan, pump, mode lights and fluorescent source should now be powered. Check to see that the zero, span and sample modes are working by listening for solenoid clicks between modes.

Before the initial laboratory calibration is conducted on the 43C, zero and span must be equilibrated until no adjustments are necessary between the two settings. When the 43C zero and span require no adjustments, the other calibration points can be run. Ensure that the Digital Volt Meter (DVM), PDL and BUDL are connected to output #1.

Initial Laboratory Checkout

Attach a Teflon tube (FEP Teflon type only) from the fitting labeled "output" on the rear panel of the calibrator to the "span" input of the accepted monitor. Connect a source of zero-air to the inlet port labeled zero-air. Connect the standard SO_2 gas cylinder to the port labeled C. Refer to '2.8.1 – Figure 3; TEI Model 146C Flowchart' for a description of the instrument menu. Using the 146C front panel menu - Press **Enter** to go into "Local" mode. Activate the zero mode as follows:

1. Press the ↓ pushbutton to place ∗ / cursor, at 'gas offline'.
2. Using → , select **SO_2 C**, press **Enter.**
3. Press the ↓ pushbutton to move the ∗ / cursor, at **Span** line,
4. Using → , select **Span 0,** and press **Enter.**

Range Setting

Set the "range" setting on the 43C to the **"Single"** range mode to either 0.2 ppm, 0.5 ppm or 1.0 ppm. In the "Single" range mode, there is one range, one averaging time, and one span coefficient. To use the single range mode, **set option switches 4 and 5 off**. The 0.2 ppm, 0.5 ppm or 1.0 ppm setting is specific to the site where the monitor is to be installed. Using the 43C front panel, Choose **Range** from the Main Menu choices and do the following:

1. Press the ↑ and ↓ pushbuttons to move the cursor to each choice on the Range Menu.
2. Press **Enter** to select a choice.
3. Press **Menu** to return to the Main Menu.
4. Press **Run** to return to the Run screen.

Verify the Lamp Voltage

The Model 43C is equipped with a lamp voltage control circuit, which automatically corrects for

the degradation of the flash lamp with age. To display the lamp voltage: from the Diagnostics Menu, use the ↓ push-button to move the cursor to **Voltage**, and press **ENTER** to display the Lamp voltage screen. If this voltage is at 1200 V, it is necessary to either replace the lamp or adjust the lamp voltage control circuit. Log the lamp voltage in the instrument logbook**.** Press **Menu**, press **Run**.

Flow Measurement on Monitor
Choose Diagnostics from the Main Menu. Choose Flow from the Diagnostics Menu, verify the current sample flow rate and record in logbook. The flow is measured by an internal flow sensor. A flow rate of about 0.5 LPM should be observed, if a flow rate of less than 0.35 LPM is observed a leak may be present.

Leak Check and Calibration
Leak test the Monitor **SAMPLE** port. A leak test should be performed before deployment to the field, and also whenever the flow is observed to be less 0.35 LPM:

1. Disconnect the sample line from the analyzer above the filter and block the opening with a leak-tight cap.
2. Press **Menu** and move ↑ and ↓ buttons and select **Pressure** and press **"Enter"**. The pressure reading should be dropping. Wait until pressure drops below 180 mm Hg (flow should also be at zero). **NOTE:** If the pressure has not dropped below 180 mm Hg within three minutes, immediately remove the cap. Check that all fittings are tight and input lines are not cracked or broken and retest Do not cap off the line for more than three minutes or the system may pressurize.
3. Remove the cap and leak test the monitor SPAN port. Document in the logbook.

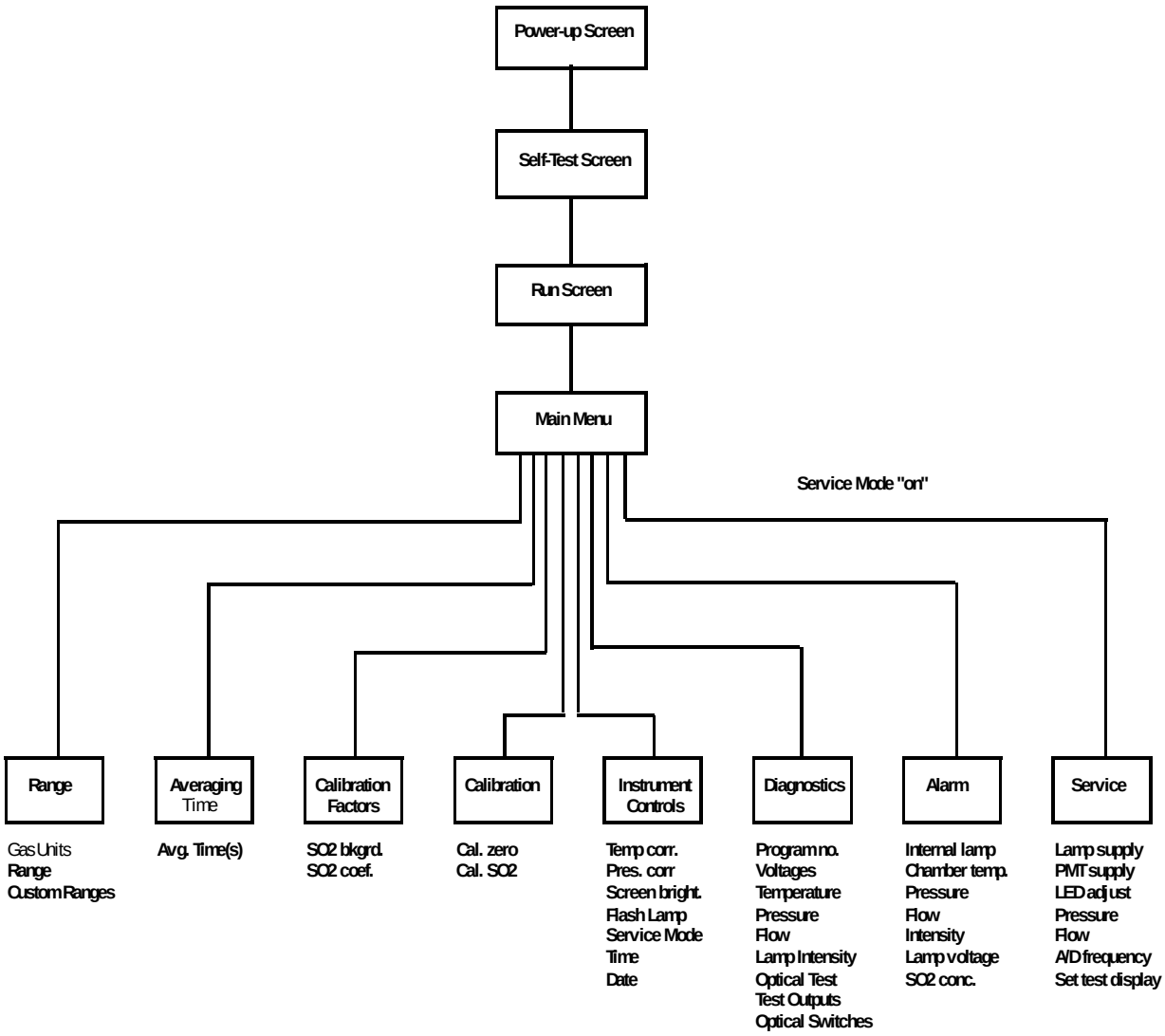
Leak test the Monitor **SPAN** port. Begin a "zero" event using the EDAS datalogging system, or by activating the span port via pin 1 and 2 on the solenoid activation barrier strip. Perform the following steps:

1. Disconnect the calibrator line from the span port on the 43C and connect the line above the filter where the sample line was. Block off the span port on the back of the 43C with the leak-tight cap.
2. Press **Menu** and move ↑ and ↓ buttons and select **Pressure** and press **"Enter"**. The pressure reading should be dropping. Wait until pressure drops below 180 mm Hg (flow should also be at zero). **NOTE:** If the pressure has not dropped below 180 mm Hg within three minutes, immediately remove the cap. Check that all fittings are tight and input lines are not cracked or broken and retest **Do not cap off the line for more than three minutes or the system may pressurize**.
3. If leak check passes, remove the cap, reconnect the calibrator line to the span port and the sample line to the sample inlet. Proceed to "multi point calibration". Document in the logbook. If leak check fails, troubleshoot the instrument and conduct any necessary repairs and repeat the leak check.

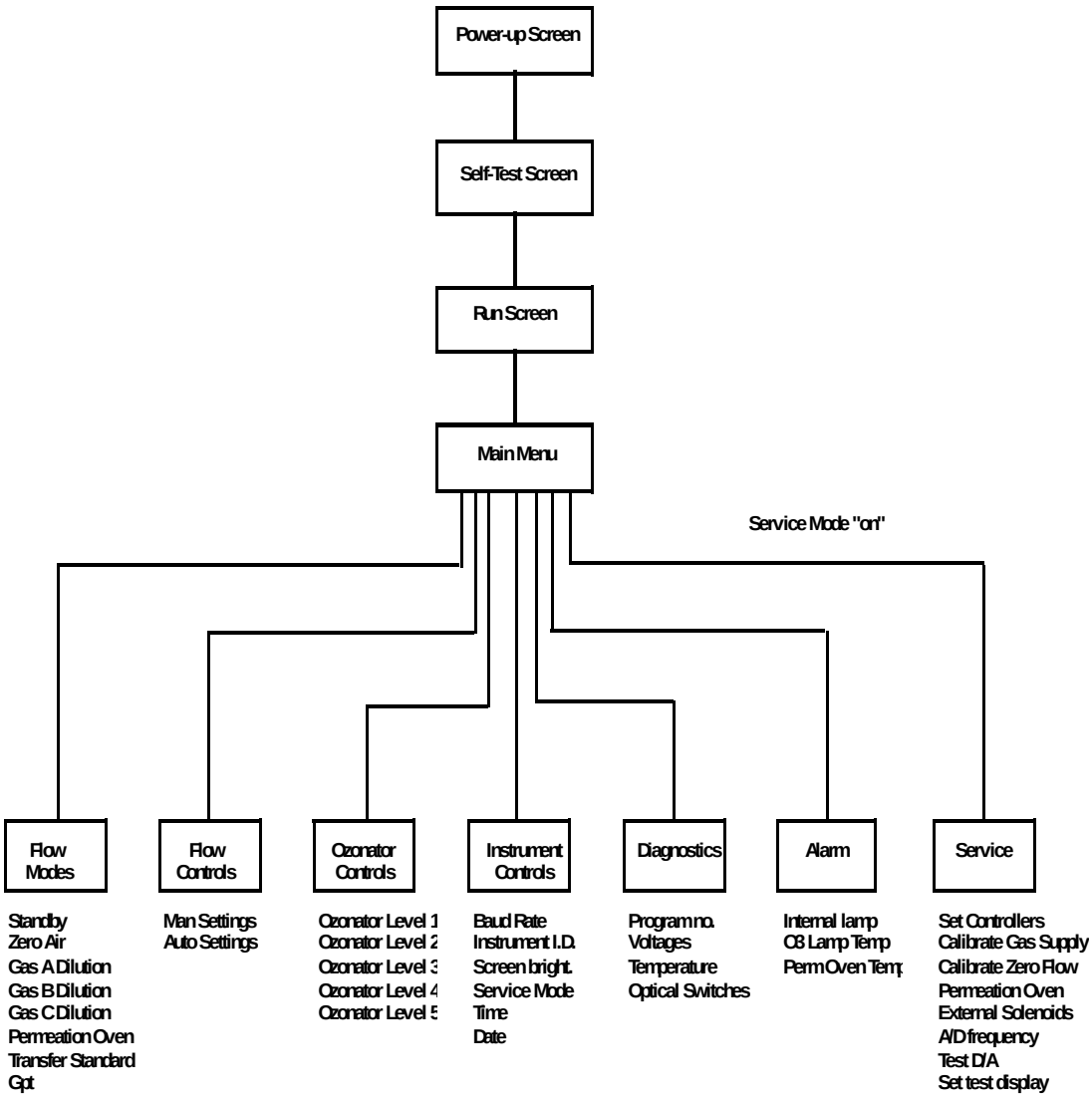
Conduct a multi point calibration
Conduct an adjusted calibration along with linearity checks over the course of a few days to indicate instrument stability and repeatability.

Verify that the instrument passed all tests and forward the Operational Test Form, primary and backup data logger and logbook to the Branch Supervisor.

Inventory
Upon approval of the tested unit, the unit shall be added to the fixed asset system. For each monitor, apply an inventory decal FAS # and complete an inventory load sheet showing the planned monitor location. Submit the inventory load sheet to the Branch Supervisor.



2.8.1 – Figure 2; TEI Model 43 C Flowchart



2.8.1 - Figure 3 TEI 146C Flowchart

2.8.1.5 On-site Installation

The ECB will install the monitor and its support equipment. Acquiring access to a site, and approval of the site is the responsibility of the regional office and the Projects and Procedures Branch. Phone service and electrical power should be secured by the regional office, along with any needed permits, new wiring, etc., prior to installation of the monitor equipment. The site location must meet the applicable site requirements and be approved by the Network Coordinator and EPA. Refer to '2.8.1 - Figure 4 Plumbing Diagram for Monitoring Setup' and '2.8.1 – Figure 5; Wiring Diagram for Monitoring Setup' for general schematic of the set-up.

Install

Verify that the building/shelter is sound and that the heating/cooling system is working. The sampling probe and lines must be FEP Teflon, or their equivalent. Lines must be clean, and have a sample residence time of less than 20 seconds. The inlet line should be wrapped with removable polyurethane foam in order to prevent condensation. In extreme cases, heat tape may be used. For continuous, year-round sites, the probe and funnel will be changed at least every two years during the audit (even calendar years).

Install one end of a short piece of vent line (any type of ¼" tubing) to the 43C monitor exhaust fitting and place the other end out of a vent hole or some other opening to vent the instrument (do not obstruct).

> **WARNING:** Do not plug in the monitor, calibrator, modem, data logger, and interface box until all cables are connected. ELECTRICAL SHOCK AND/OR EQUIPMENT DAMAGE MAY OCCUR OTHERWISE.

Connect the monitor, modem, data logger, backup data logger, and computer as shown in '2.8.1. Figure 4; Plumbing Diagram' and 2.8.1. Figure 5; Wiring Diagram'. Observe polarity markings. Connect all instruments and support equipment power cords to a grounded surge suppressor, connected to a 115v AC, 60 Hz grounded receptacle.

Configure the modem to auto answer on the first ring and to operate at 2400 bps. Configure the data loggers and PC software, including the scheduler, to run auto poll/cal. Primary and Backup data loggers can be ESC Model 8816's or 8832's. The ECB verifies that the system can be accessed remotely by phone from the ECB lab. (It is the responsibility of the region to program the E:DAS for the polling of information that is specific to the needs of the region.)
Verify that all operational events, such as solenoid on/off are working. Bleed the calibration cylinder regulators and lines to purge / minimize room air in the calibration system. Check the analog outputs on the instrument after performing the operational checks.

Check and Set Computer Time and Date

The times for the PDL, BUDL, and computer must be EASTERN STANDARD TIME. The "synchronization" function in the ESC software will not be employed by the central EDAS computer or the regions' polling computers to avoid possibly short-changing data sets by constantly resetting clocks before a full hour can be polled.

NOTES: The BUDL and PDL must have the same time and be synched to the NIST time provider in Colorado (± 1 minute). Sources of the NIST time include: cell phones-most automatically synch to local NIST time; calling Colorado (303-499-7111); setting a watch to the NIST website (http://nist.time.gov/) within 24hrs of visiting the site.

The site computer must be set 5 minutes *slower* than the dataloggers to ensure that a full hour of data is retrieved/stored during regularly scheduled polling.

Leak Check the System

Before running an installation zero or span, leak check the SO_2 sampling system.

For the Monitor SAMPLE port, the following leak test procedure below should be performed:

1. Disconnect the sample line from the "sample inlet port" on the rear of the instrument and block the opening with a leak-tight cap. (Do not disconnect the lines going to the filter inlet or the filter outlet.)
2. Press "**Menu"** and move ↑ or ↓ buttons to select **"Pressure"** and press **"Enter"**. The pressure reading should drop (flow should also be at zero). Wait until pressure drops below 180 mm Hg .

> **NOTE:** If the pressure has not dropped below 180 mm Hg within three minutes, immediately remove the cap. Check to see that all fittings (leak-tight cap, filter housing, and filter inlet/outlet fittings) are tight and input lines are not cracked or broken and retest. Do not cap off the line for more than three minutes or the system may pressurize. Remove the cap and document in the logbook.

For the Monitor SPAN port begin the test by running a zero. [ESC: select "**C**", (configure menu); select "**C**", (configuration calibration menu); select "**1**", (single phase phase cal); select "**SO2CAL**"; select "**ZERO**"; scroll down to "**Phase Duration**" and change to 30m; select "Start Single Cal NOW"] The zero should begin. **The zero must be active to conduct this check.** Then perform the following steps:

1. Disconnect the calibrator line from the calibration gas inlet port on the rear of the 43C and connect it to the sample inlet port on the rear of 43C. Block off the calibration gas inlet port on the back of the 43C with a leak-tight cap.
2. Press **Menu** and move ↑ and ↓ buttons and select **Pressure** and press **"Enter"**. The pressure reading should be dropping (flow should also go to zero). Wait until pressure drops below 180 mm Hg .

> **NOTE:** If the pressure has not dropped below 180 mm Hg within three minutes, the leak check has failed. Immediately remove the cap. Check to see that all fittings (leak-tight cap, filter housing, and filter inlet/outlet fittings) are tight and input lines are not cracked or broken and re-test. **Do not cap off the line for more than three minutes or the system may pressurize**. If the leak check passes, remove the cap, reconnect the calibrator line to the span port and the sample line to the sample inlet. Clear the zero mode by aborting the zero cal.

3. Document in the logbook.

Running an Installation Zero-Span-Precision
In order to ensure the monitoring equipment was not damaged in transit or during installation, run a three point check of the instrument to include; the zero point, the span point relative to the instruments expected operating range and, the precision point. This procedure **IS NOT** a substitute for the initial calibration to be performed by the region. The "installation Z-S-P" is intended as a field check to verify the instrument (and its associated components) have not suffered a catastrophic mishap from lab bench to field shelter. The sampling system should introduce, and the instrument should successfully recognize, SO_2 concentrations in the appropriate magnitudes. If a problem is found with any component of the sampling system, the installers will contact the region and the ECB office with the details to initiate a resolution.

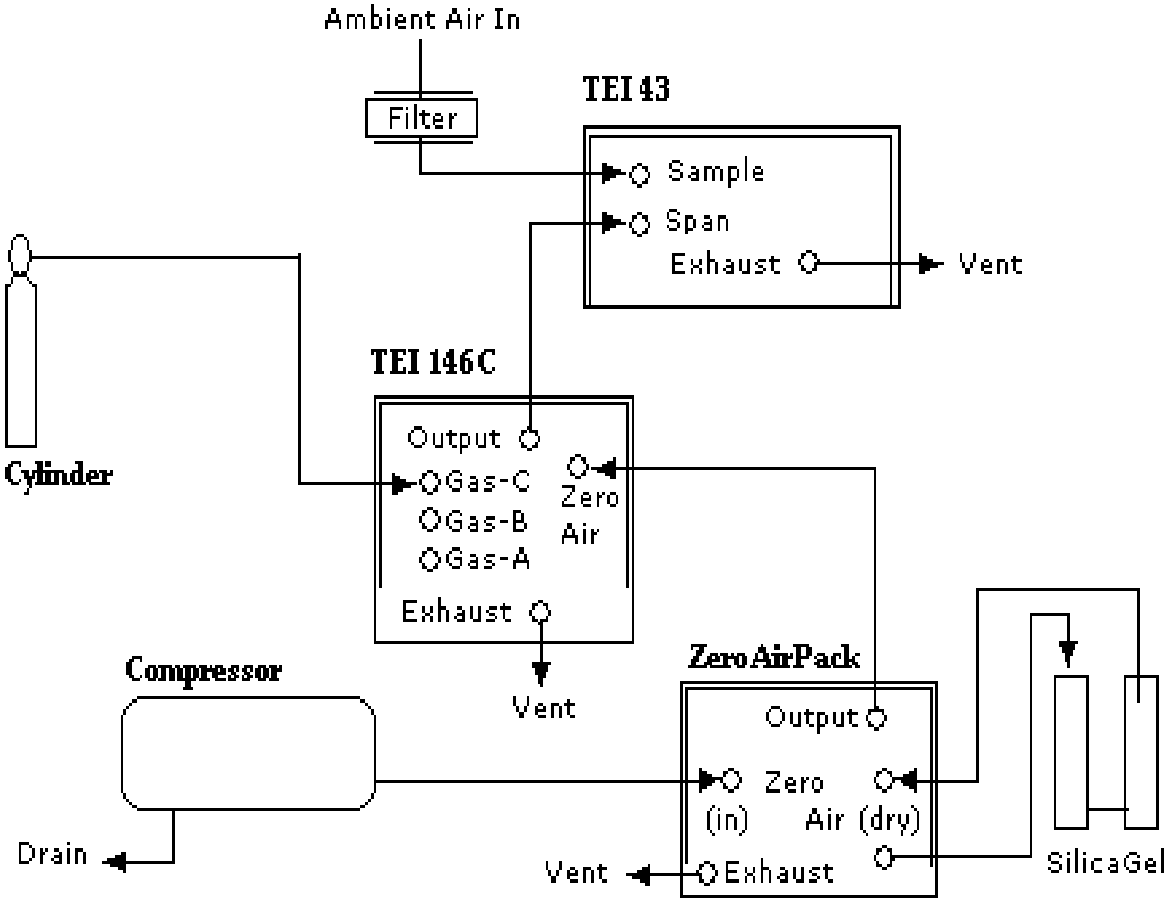
The Zero point will include checking the analog output (Z1) to the primary data logger and checking and adjusting the low-output engineering units to the back-up data logger. The Span point check will include checking the analog output (SP1) to the primary data logger and checking high-output engineering units to the back-up data logger. Whenever possible the PDL (Z1/SP1) should be adjusted as close to correct as possible (within +/- 0.005ppm).

In addition to new site installation, the "installation zero-span-precision" (z-s-p) check ***will be performed*** any time a component potentially affecting calibration is replaced, modified, or repaired including:

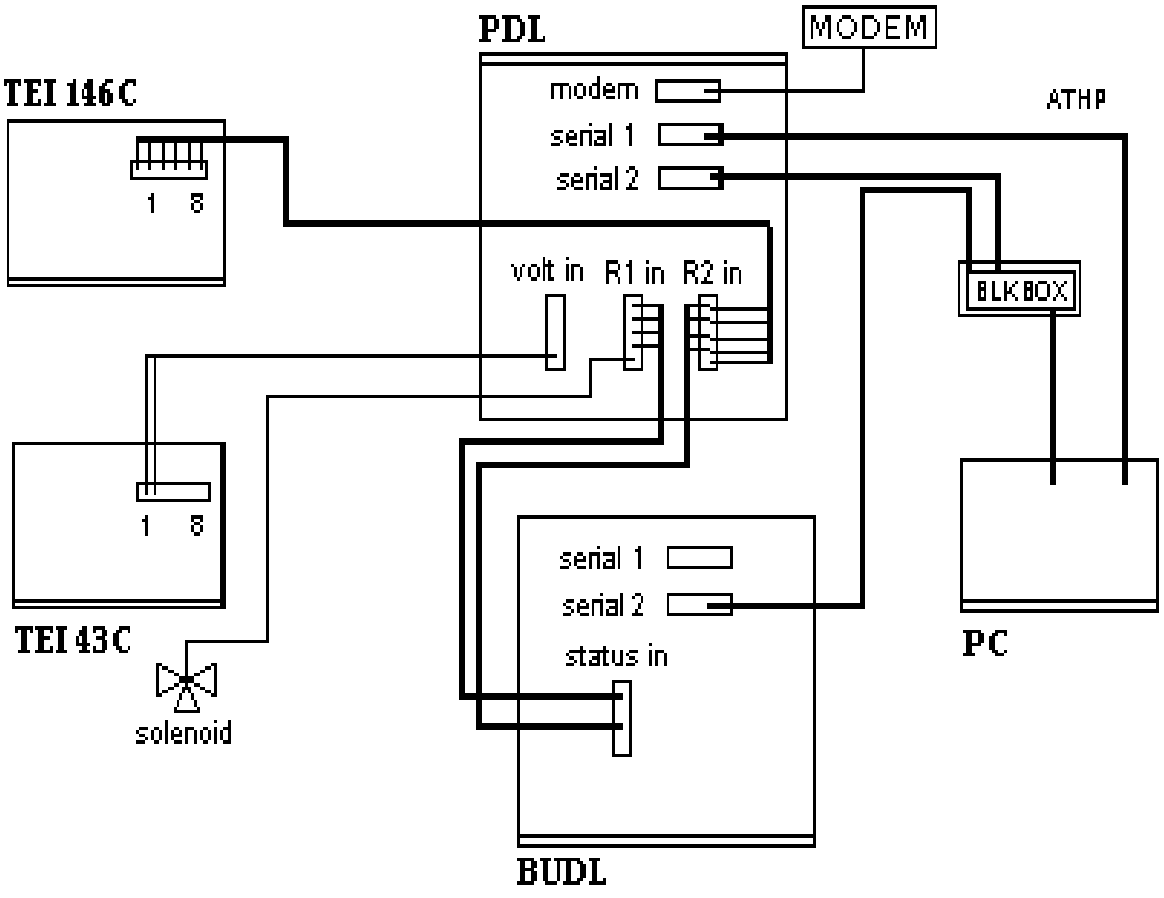
- Monitor replacement/repair
- Calibrator replacement/repair
- Zero air system replacement/repair
- Cylinder swap-out
- Lamp replacment

The installation z-s-p after any of these events **does not** replace the region's responsibility to perform a full calibration (and hence "take ownership" of the monitor), but is intended to boost the overall confidence in the equipment at the transition point between the ECB and the Operator(s).

Communication Confirmation
Whenever possible, it is recommended that the ECB office be contacted at the conclusion of an installation, and asked to poll the site to insure that it is 'reachable'. Before leaving the site, sign out and reset the scheduler for normal operation.



2.8.1 - Figure 4 Plumbing Diagram for Monitoring Setup



2.8.1 – Figure 5; Wiring Diagram for Monitoring Setup

2.8.1.6 Routine Maintenance

TEI 43C Analyzer
Periodic maintenance procedures should be performed when necessary to ensure proper operation of the 43C. Maintenance includes preventive, routine, and corrective tasks. ECB is expected to be entirely responsible for the corrective maintenance issues and to assist with preventative and routine maintenance that may fall outside the regions' comfort levels or capabilities.

Step-by-step procedures for all maintenance activities should be followed as presented by the manufacturer in the instrument's operation manual (Chapter 5, "Preventive Maintenance" and Chapter 7, "Servicing", 6/5/97 version). Always down / disable the PDL and BUDL data channels.

Items requiring maintenance by ECB are:

- Replacing the UV lamp (performed when lamp voltage approaches 1200 volts)
- Replacing the printed circuit boards (performed when operational problem is traced to a particular component)
- Leak Checks (performed after filter changes or when sample flow drops below 0.35 lpm as determined during bi-weekly QC checks)
- Replacing the pump diaphram (performed when sample flow of 0.35 – 0.65 lpm cannot be achieved as determined during bi-weekly QC checks)

TEI 146C Calibrator
Periodic maintenance and/or adjustment for the Model 146C is required to ensure proper operation. Refer to the "146C Calibrators" QA/Operation guidelines (separate document in preparation by Carlton Blakley) for details and the instrument manual (Chapter 4, "Preventive Maintenance" and Chapter 7, "Servicing", 11/20/98 version). Except for mass flow controller re-certification, which occurs every 9 months, the following maintenance activities are performed only when the calibrator malfunctions as determined by the site operator. Items requiring ECB maintenance are:

- Leak Checking
- Solenoid Replacement
- Cicuit Board Replacement
- Mass Flow Controller Replacement
- Replacement of DVM
- Internal Adjustments
- Certification of Mass Flow Controllers (see section 2.3.3.5 of 146C Calibrator QA Manual in preparation by Carlton Blakley)

Zero Air Pack and Compressor Checks
Periodic maintenance and/or adjustment for the Zero Air Pack is required to ensure proper operation. The ECB shall re-certify the zero air system once per year by:

- Replacing the silica gel with re-generated material (dark blue or purple color).
- Verifying that the pressure gauge on the Zero Air Supply is reading 20 psi ± 2 psi.
- Verifying that the outlet pressure on the air compressor is reading between 30 and 40 psi. (If pressures are outside of the specifications, check and tighten all fitting and/or rebuild the compressor by replacing the pump diaphragms.)
- Draining any water from the compressor.

After conducting any maintenance up the PDL and BUDL channels (enable/mark channels online), document the work done in the site logbook (and instrument logbook if appropriate), and flag the data.

2.8.1.7 Accuracy Auditing

Each calendar quarter, at least one quarter of the state's monitors must be audited by an audit device that is different from the standard and calibrator used for calibration and spanning. Several routine items that shall be included in the audit are:

- Security of the Building
- Site / Building Temperature
- Condition of the Sample Line, Probe, and Funnel (replace as required)
- Normal Operating Status of the Monitoring System

The audit calibrator must be certified against the primary standard quarterly. The auditor must not be the operator who conducts the routine monitoring, calibrations, and analysis. **Conduct the audit before making adjustments.** The monitor must operate in its normal sampling mode, and the audit gas must pass through the existing particulate filter. The difference between the actual concentration of the audit test gas and the concentration indicated by the analyzer is used to assess the accuracy of the monitoring data.

Allow audit calibrator to equilibrate at least one-half to one hour before challenging the monitor. Check and review the site temperature and the ambient SO_2 concentration for the day (never conduct an audit during an ambient SO_2 exceedance or a potential ambient SO_2 exceedance). Down (disable) the SO_2 channel.

Connect the audit calibrator as shown in '2.8.1- Figure 4 '(Plumbing Diagram). Make and record the following audit calibrator checks:

1. **Verify** the audit calibrator certification is current.
2. **Power ON -** Verify calibrator has power by observing red indicator light and by listening for the pump.
3. **Perform Audit** - At least four concentrations (zero plus three up-scale concentrations) must be introduced to an analyzer. Concentration ranges for instruments operating at specified span levels are given below:

Analyzer Span, ppm	0.2	0.5	1.0
Audit Gas 1	0.00	0.00	0.00
Audit Gas 2	0.006-0.010	0.030-.080	0.006-0.010
Audit Gas 3	0.060-0.080	0.150-0.200	0.030-0.080
Audit Gas 4	0.140-0.180	0.410-0.450	0.350-0.400
Audit Gas 5	NA	NA	0.800-0.900

Review and record on audit form (AQ-121) the current site temperature taken during audit.

4. For each audit setting, record on the audit form; the instrument concentration and five corresponding stable one-minute data logger averages (PDL & BUDL).
5. If the audit results are greater than +/- 15% of expected, contact the ECB supervisor and print out the last available auto calibration routine.

Reconnect the ambient sample line to the filter on back of analyzer, up the dataloggers, reset the scheduler, and sign out.

Calculate percent difference (d_2) at each concentration level (except zero) using the following equation:

$$\mathbf{d_2} = \frac{\mathbf{C_m - C_{ACT}}}{\mathbf{C_{ACT}}}$$

where: $\mathbf{C_m}$ = average SO_2 concentration measured (from the SO_2 channel)
$\mathbf{C_{ACT}}$ = average Actual Concentration (Ca) of audit gas produced by the audit calibrator (Output PPM). If d_2 exceeds +/- 15%, the regional auditor must initiate checks, troubleshooting, and recalibration.

- Record d2 on the (audit form/worksheet) and in the instrument logbook. Verify that the form is correct and complete, and forward to the ECB supervisor. If the audit results are suspicious or unacceptable, the ECB supervisor will initiate the investigation of the problem and notify the responsible regional chemist and the Project and Procedures Branch Supervisor of the issue.

The investigation can include, but is not limited to:

- Examination of the audit equipment
- Review of the calibration records (both auto and manual)
- Confirming the audit results with a follow-up audit