IMPROVE
STANDARD OPERATING PROCEDURES

SOP 176
Calibration, Programming, and Site Documentation

Date Last Modified	Modified by:
09/12/96	EAR

SOP 176 Calibration, Programming, and Site Documentation.

TABLE OF CONTENTS

TABLE OF FIGURES

LIST OF FORMS

Technical References

TI 176A Calibration of Audit Devices Using Spirometer
TI 176B Final Flow Rate Audit Calculations
TI 176C Flow Rate Audits and Adjustment
TI 201A IMPROVE Aerosol Sampler Operation Manual

1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) describes the procedures for initiating new aerosol sampling sites according to IMPROVE sampling network protocol.

The IMPROVE protocol aerosol monitoring program is designed to collect quantitative information on the composition and concentration of fine ($PM_{2.5}$) aerosol particles that reduce visibility. Aerosol data in the IMPROVE network are frequently collected in conjunction with other monitoring such as characterization of haze through photography, and the measurement of optical extinction with transmissometers and nephelometers. These data provide an effective means of correlating visibility with aerosol concentrations and compositions.

Aerosol and visibility data provide information to decision-makers and the public on the state of the Class 1 area, causes of visibility impairment, and trends in visibility of a region. Finally, elemental analysis of aerosol samples identifies tracers of emissions sources.

An IMPROVE aerosol sampling site generally has a controller and four sampling modules, though the number of sampling modules can vary from 1 to 4 depending on the sampling requirements at the site. The modules run in parallel; the controller sends the same signals to each module. The four standard module types are A, B, C, and D. Module A collects fine particles (0 - 2.5 µm) on a stretched Teflon filter, and provides data on elemental composition of fine particles. Module B collects fine particles (0 - 2.5 µm) on a nylon filter, has a denuder before the nylon filter to remove acidic gases, and is used primarily for nitrate, though sulfate and chlorine data are also provided. Module C collects fine particles (0 - 2.5 µm) on a quartz fiber filter to measure organic and elemental carbon. Module D collects coarse particles (0 - 10 µm) on a stretched Teflon filter, and provides data on PM_{10} mass loading. At many sites, the Module D Teflon filter is followed by a quartz filter impregnated with K_2CO_2, used to collect SO_2 gas.

Each module is independent, with a separate inlet, sizing device, flow measurement system, critical orifice flow controller, and pump. Module A is the primary aerosol sampling module and is found at all sites. Modules B, C, and D are secondary aerosol sampling modules and are installed as needed. All modules must be connected to a common controller clock which, for IMPROVE protocol sampling, is programmed to collect two twenty-four hour samples per week, on Wednesdays and Saturdays from midnight to midnight.

The sampler is designed simply and ruggedly to withstand ambient field conditions, and for ease of operation and maintenance.

The purpose of this standard operating procedure is to facilitate calibration and programming of IMPROVE aerosol samplers by

- Providing standard protocols for site initiation, including verification of flow calibration, programming of the clock controller, site documentation, and training of site operators.

2.0 RESPONSIBILITIES

2.1 Field Specialist

The field specialist shall:

- Schedule an operator training session for all identified operators and the primary local contact.
- Install, or oversee the field technicians installation of the aerosol sampler, according to the installation and configuration requirements provided by the project manager.
- Complete the site specifications folder for the site files.
- Enter the site documentation and configuration information into the site database.
- Train field technicians to perform orifice meter and sampler calibrations.
- Review each orifice meter calibration equation prior to approval for use in site calibration.
- Review the site calibration equations derived by the field technician.

2.2 Field Technician

The field technician shall:

- Calibrate an orifice meter to use in site calibration.
- Set the flow rate and audit each sampling modules
- Program the clock controller for IMPROVE protocol sampling.
- Provide an operator training coarse for the site operators.

2.3 Lab Manager

The lab manager shall:

- Verify the addition of the new site in the aerosol samples and analysis databases.
- Create site specific filter and sampling date identification labels for the new site.
- Assemble cassettes, shipping boxes, and labels for shipping samples between Davis and the new site.
- Verify the address the which the samples will be shipped.
- Send out the filters to initiate sampling at the site, as scheduled by the project manager.

2.4 Local Contact

The local contact shall:

- Schedule operator training session with the field technicians and the field specialist
- Provide site access and installation assistance as needed.
- Verify site location and geographic reference specifications documented by the field specialist.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 Preparation for Flow Rate Set and Audit

The equipment necessary to assemble the materials for calibrating an IMPROVE aerosol sampler include:

a. Survey Spirometer, Collins
b. 1 leak checked IMPROVE cyclone, cover plate, and stack Tee assembly
c. 1 audit filter cassette, and three port plugs installed on the cyclone cover plate
d. 1 audit device (orifice meter) and calibration form
e. 1 flow restricting device to be mounted between the audit cassette and spirometer
f. 1 calculator capable of linear regression

3.2 Site Calibration Equipment

The materials required to calibrate an IMPROVE aerosol sampler include:

a. D module audit funnel
b. 1 calibrated audit device (orifice meter)
c. Flow rate audit form
d. 1 calculator capable of linear regression
e. 1 box of unexposed audit filter cassettes
f. Flow restricting device (valve) to install in line between the cassette and a solenoid.

3.3 Sampling Initiation Materials

The following materials are necessary for site initiation:

a. 2 boxes of unexposed filter cassettes configured for the new site and sampling dates. Each box containing the following, assuming the respective module is installed at the site:
    - 4 A module cassettes, labeled, leak checked, and containing pre-weighed Teflon filters
    - 4 B module cassettes, labeled, leak checked, and containing nylon filters
    - 4 C module cassettes, labeled, leak checked, and containing quartz filters.
    - 4 D module cassettes, labeled, leak checked, and containing pre-weighed Teflon filters.
    - 2 log sheets, each representing one week, for recording sampling data.
    - 2 zip lock bags, each containing one week of cassettes for the sampler, to prevent contamination of the cassettes during shipment.
    - 1 business reply label for returning the box to the Air Quality Group lab.
b. Sampler operator's manual for the site operator(s)

3.4 Site Documentation materials

The following materials are required to complete the site documentation process:

- One 35m camera for site documentation photos.
- Photographs of the site and final equipment configuration
- On-site documentation by the field technician during installation, including Form 1, Flow Calibration Form; Form 2, Site Documentation Form; and Form 3, Site Configuration Check List.
- Maps of the site location, and directions for access.

4.0 METHODS

This section describes site installation and documentation procedures, and includes four (4) major subsections:

4.1 Calibration of Audit Devices
4.2 Flow Rate Audit and Adjustment Procedures
4.3 Clock Controller Programming
4.4 Operator Training
4.5 Site Documentation.

4.1 Calibration of Audit Devices

As the IMPROVE protocol samplers are mounted semi-permanently at their sites, it would be inefficient to remove them to a laboratory setting for calibration and audits. This prevents utilizing primary measurement devices, such as a spirometers or manometers, to calibrate the flow at each site. The risk of damage to the primary measurement instruments would, alone, negate this approach. Instead, primary measurement devices are used in the lab to calibrate more rugged audit devices; namely pressure gauges and orifice meters. To verify the accuracy of these devices, they are calibrated prior to and immediately following each site maintenance trip. The pre and post calibrations are compared to ensure no drift in calibration occurred. If a difference is noted, the sites calibrated by the questionable audit devices are re-audited and, if necessary, re-calibrated.

There are two calibration procedures:

4.1.1 Calibration of Pressure Gauges
4.1.2 Calibration of Orifice Meters using the Spirometer

4.1.1 Calibration of Pressure Gauges

Calibrated pressure gauges are used to verify the pump vacuum readings at the site, and to ensure consistency in measurements of vacuum readings across the network. The procedures for calibrating pressure gauges check their accuracy by comparing the gauges to a mercury manometer.

1. Connect a pump to one side of a valve.
2. Connect the mercury manometer to the other side of the valve.
3. Connect the vacuum gauge in parallel with the manometer
4. Use the valve to set the manometer reading to 15" Hg (half scale value on the vacuum gauge)
5. Check that the vacuum gauge reading matches the manometer reading, indicating 15" Hg. If not,
   a. Unscrew the vacuum gauge clear plastic cover plate.
   b. Using a pair of pliers, carefully remove the pressure gauge indicator needle by pulling straight up.
   c. Re-install the pressure gauge indicator needle in the correct position, at 15" Hg on the dial, by firmly pressing it back in place.
   d. Verify the reading matches that on the manometer within 1/2" Hg.
   e. Re-install the protective clear plastic cover plate.

6. Use the valve to check two other points; set the manometer reading to the maximum for the system, @ 28" Hg at sea level, then set it to roughly 3" Hg, a typical filter reading.
7. Verify the vacuum gauge indicates within 1/2" Hg the value displayed on the manometer. If not, replace the vacuum gauge.
8. Use a marker pen to write the date of calibration on the side of the gauge.

4.1.2 Calibration of Orifice Meters using the Spirometer

The audit device, an orifice meter, is used as the standard against which each module in the field is calibrated. The audit device is calibrated against a primary flow device, a spirometer, at the Air Quality Group Lab both prior to and following calibration at a site.

A flow restricting device, a valve having a low pressure drop, is used to change the flow rate to develop the equation. The flow restricting device must be carefully checked for leaks once installed, as leaks could cause significant error in the calibration.

The procedures for calibrating an audit device are described in detail in TI 176A.

4.2 Flow Rate Audit and Adjustment Procedures

The procedures for flow calibration at an IMPROVE site involve the following steps.

4.2.1 Pre-Audit Calculations
4.2.2 Flow Rate Audit and Adjustment Procedures

Calibration of IMPROVE protocol samplers requires an audit device (orifice meter), audit cassettes, a flow restricting device, an audit log sheet, and a calculator capable of doing logs and linear regressions.

The field technician shall provide all supplies necessary for flow rate audits and adjustments and shall be thoroughly trained in their use. The audit device, an orifice meter, is used as the standard against which each module in the field is calibrated. The audit device is calibrated against a primary flow device, a spirometer, at the Air Quality Group Lab both prior to and following audits at a site. The calibration equation for the orifice meter is printed on a sticker on the face of the magnehelic, along with the date of calibration and name of the technician responsible for the equation. Audit cassettes are used in lieu of actual sampler cassettes during the sampler audit procedure. Each cassette is representative of an average sample cassette for the module being audited in terms of substrate type and pressure drop. The flow restricting device, a valve having a low pressure drop, must be suitable for mounting in line between the audit filter and the solenoid. The flow restricting device must be carefully checked for leaks once installed, as leaks could cause significant error in the audit. For leak checking procedures, see section 4.3.5, Sampler Function Check. Finally, a calculator for doing logs and linear regressions is required. Plotting capabilities on the calculator are useful, but not required.

4.2.1 Pre-Audit Calculations

The pre-audit calculations, though done on the computer for existing sites, are listed in detail in TI 176B. These calculations ensure the sampler is, on average, running at the appropriate ambient flow rate. A sample form for site audits follows in Form 1 though the actual audit form would have numbers in place of Q_0 Q_1 Q_2 Q_3 and M_0 M_1 M_2 M_3 .

FORM 1 Flow Rate Audit Form

Site Name:______________ Date of Calibration: ____/___/__ Sampler Serial #__________

elevation________ F(*elev.*)_______ (from Table) Field Technician: ______________________

Audit Device # _________ Audit Constants: a_o = _________ b_o = _________ T_____°C

audit mag. reading for nom. flow: $M_o = \left(\frac{Q_o}{F_{(elev)}} \frac{1}{10^{a_o}}\right)^{1/b_0}$ M_o(**A, B, C**) = ______ M_o(**D**) = ______

A Module: Q_o = 23 lpm

Flow Rate at sea level, 20°	Audit Device	System Magnehelic	System Vac. Gauge
Q_o	M_o=		
$Q_1=0.95*Q_o$	M_1=		
$Q_2=0.90*Q_o$	M_2=		
$Q_3=0.85*Q_o$	M_3=		

Magnehelic: r^2=___________

log(flow) = + * log(M)

Vacuum Gauge: r^2=___________

flow = + * (G)

Nominal flow @ site (sys):	mag. zero:	max vac:

C Module: Q_o = 23 lpm

Flow Rate at sea level, 20°	Audit Device	System Magnehelic	System Vac Gauge
Q_o	M_o=		
$Q_1=0.95*Q_o$	M_1=		
$Q_2=0.90*Q_o$	M_2=		
$Q_3=0.85*Q_o$	M_3=		

Magnehelic: r^2=___________

log(flow) = + * log(M)

Vacuum Gauge: r^2=___________

flow = + * (G)

Nominal flow @ site (sys):	mag. zero:	max vac:

B Module: Q_o = 23 lpm

Flow Rate at sea level, 20°	Audit Device	System Magnehelic	System Vac Gauge
Q_o	M_o=		
$Q_1=0.95*Q_o$	M_1=		
$Q_2=0.90*Q_o$	M_2=		
$Q_3=0.85*Q_o$	M_3=		

Magnehelic: r^2=___________

log(flow) = + * log(M)

Vacuum Gauge: r^2=___________

flow = + * (G)

Nominal flow @ site (sys):	mag. zero:	max vac:

D Module: Wedding (19.1) ☐ Sierra (16.9) ☐

Flow Rate at sea level, 20°	Audit Device	System Magnehelic	System Vac Gauge
Q_o	M_o=		
$Q_1=0.95*Q_o$	M_1=		
$Q_2=0.90*Q_o$	M_2=		
$Q_3=0.85*Q_o$	M_3=		

Magnehelic: r^2=___________

log(flow) = + * log(M)

Vacuum Gauge: r^2=___________

flow = + * (G)

Nominal flow @ site (sys):	mag. zero:	max vac:

4.2.2 Flow Rate Audit and Adjustment Procedures

Once the audit log sheet , Form 1, is available, or has been partly filled out following the procedures in TI 176B Pre-audit Calculations, actual audits of the modules may occur.

Audit and flow rate adjustment procedures for IMPROVE aerosol samplers are described in detail in TI 176C.

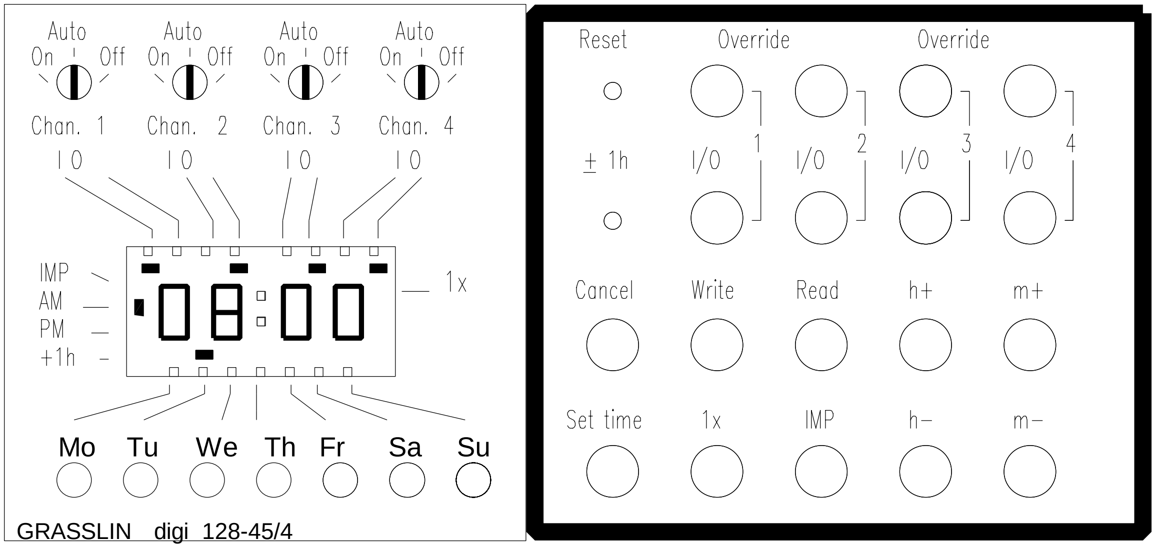
Once the modules have been audited successfully, the equations relating the system gauge readings to the ambient flow rate are entered into the IMPROVE database as the calibration equations for those modules. Subsequent audits, at roughly six month intervals, shall be done to verify the stability of the calibration. If the relation between the system gauges and the flow rate through the module changes, a new calibration equation shall be derived following an audit of the flow rate by the site operator.

4.3 Programming the Clock Controller

The final step of the installation procedures is programming the clock controller for IMPROVE protocol sampling. The controller is first programmed by a field technician for verification of functionality, then erased and reprogrammed by the site operators as part of the operator training.

The controller clock operates the pumps and the filter solenoids. The clock has four time channels, each controlling its own solenoid valve. Channel 1 corresponds to Filter 1, etc. Each one of the four channels is independently programmable on a weekly cycle. The left side of the clock contains the clock and status lights. The right side contains the override and programming buttons. The clock has a four to seven day battery backup; if this is exceeded, the clock is either blank or always reads 12:00 a.m., the time and memory will have to be reset. The clock has a specified operating range of -4° to +12°F. Figure 1 shows the clock face and the program buttons. These buttons are normally covered by a protective cover plate, on the back of which are printed programming procedures.

Figure 1 Clock Controller with Cover Plate Removed



4.3.1 Reading the Clock Controller Display

The clock uses 12-hour notation, with the hour and minute indicated directly and the a.m./p.m. shown by a black rectangle at the left of the time display. The day of the week is indicated by a black rectangle on the bottom of the time display. The status of each of the four output channels is indicated by black rectangles at the top of the time display. A black rectangle under "I" indicates the channel is on (open) and a black rectangle under "O" indicates the channel is off (closed). When a channel # is on, the solenoid for filter # is open, the vacuum pump is on, and a sample is being collected. The status shown in Figure 1 is Tuesday, 8:00 a.m., with channel 1 on, and channels 2,3, and 4 off.

4.3.2 Clock Controller Settings and Buttons

The following section describes the default settings used in IMPROVE protocol sampling, and the purpose of the buttons on the clock controller. Procedures to use the described buttons will follow in sections 4.3.3 and 4.3.4.

The four screws above the clock display should all be set to auto. Each screw represents the channel above which it is located. Setting a screw to "on" will force that channel to be always on. Similarly, setting a screw to "off" will force that channel to be always off. Since we want to use programs to turn channels on and off, the screws must be set to "auto".

The reset button is a recessed button to prevent it's being used accidentally. This button clears and erases all programs and time of day settings, but also clears internal errors in the clock that may be caused by power surges.   Whenever this button is used, the current time, as well as any programs in the clock controller must be re-entered.

The override buttons in the top row can be used to reverse the status of any respective channel (on to off, off to on). This continues in effect until canceled by pressing a command override button or following a programmed entry. The override may be used during installation to check operation of the solenoid valves or when calibrating the system vacuum gauge and magnehelic. For example, pressing the "override" button for Channel 1 will turn on the pumps and open solenoid number 1. The override button may also be used if the programs are entered after a desired change. Suppose a program was entered at 8:10 that was to have activated Channel 1 at 8:00. Since the clock checks only for programs for the present minute, Channel 1 will not turn on. By pressing the override button, it will turn on and will turn off at the programmed time.

The "± 1h" button is not used at any time. If a rectangle appears on the display to indicate the ± 1h function is being used, it should be turned off immediately by using a pen or pencil to press the "± 1h" button. If, after several attempts, the function will not turn off, use a pen to press the reset button, then reprogram the clock controller following the procedures in sections 4.3.3 and 4.3.4.

The override buttons in the second row, labeled "I/O", are used in programming the status of each respective channel (on, off, or not indicated). To program a channel to turn on, press the "I/O" button until the black indicator rectangle is under the "I" for that channel. To program a channel to turn of, press the "I/O" button until the black indicator rectangle is under the "O" for that channel. If no indicator rectangle is displayed, the channel will remain in it's current state. Of course, when the channel status is entered, the time and date for the change in the channel status must also be entered, but this is covered in section 4.3.7.4.

The "cancel" button is a programming button. It is used to delete an existing program. To use the cancel function, press the "read" button until the program to be deleted appears, then press the "cancel".

The "write" button is a programming button. It is used to store the current information on the display screen in memory as a program. It will not store the current time display as a program. Use of the write button is covered in section 4.2.4.

The "read" button is a programming button. It is used to review programs stored using the "write" button. It will always read the programs in the same order.

The "h+" button advances the time displayed on the clock by 1 hour each time it is pressed. Similarly, the "h-" button sets the time back by 1 hour each time it is pressed. When it is pressed while the "set time" button is being pressed, it will change the current time display. For programming, it is used without pressing the "set time" button.

The "m+" button advances the time displayed on the clock by 1 minute each time it is pressed. Similarly, the "m-" button sets the time back by 1 minute each time it is pressed. When it is pressed while the "set time" button is being pressed, it will change the current time display. For programming, it is used without pressing the "set time" button.

The "set time" button is held in when the current time is being set, or pressed to return the clock more rapidly from programming mode to the current time display status. It is used only to set the current time, not during programming for sampling.

The "1x" and "IMP" buttons are not used at any time. If a rectangle appears on the display to indicate the 1x or IMP functions are being used, it should be turned off immediately by pressing the respective button. If, after several attempts, the function will not turn off, use a pen to press the reset button, then reprogram the clock controller following the procedures in sections 4.3.3 and 4.3.4.

The clock display, except while the controller is being programmed, should always show the current time and day of the week. If it does not, press the "Set time" button and wait for twenty seconds. If the current time is still not displayed, the controller may be suffering from a malfunction. In this case, use a pen to press the reset button, then reprogram the clock controller following the procedures in sections 4.3.7.3 and 4.3.7.4.

4.3.3 Setting the Current Time

Setting the current time is a simple operation, thought it requires both hands.

- With one finger, hold in the "**set time**" button.
- With the other hand, select the day of the week by pressing the button under the correct day until the black indicator rectangle appears. Figure 1, as an example, shows the current day of the week to be Tuesday.
- If you select the wrong day, press the button under the indicated day to de-select it. The black rectangle will disappear, and the correct day may be selected by pressing the appropriate day button.
- Set the current time, local standard time, by using the **h+, h-, m+, m-** buttons to set the hour and minute respectively. Recall that the clock shows twelve hour time, so a.m. and p.m. must be correct. Note also, 12:00 am is midnight while 12:00 p.m. is noon.
- When the current time and date have been set and are correct, release the "set time" button. The : in the time display will blink on and off if the operation was done correctly.
- If the colon is not blinking, verify that the date and current time are indicated on the display. If not, hold in the "set time" button and enter the missing information.

<u>Set time (Example: Monday 8:38 AM)</u>

Hold	"Set time"	button depressed
Press	"Mo"	button -- bar shows above Mo
Press	"h+"	button until 08:__ AM shows in display and bar shows next to AM
Press	"m-"	button until 08:38 shows in display
Release	"Set time"	button -- seconds dot flashes

4.3.4 Entering IMPROVE Protocol Programs

Programming the clock controller is not complicated. Each program consists of the following three elements:

1. 1 to 7 days of the week
2. time of day
3. on/off command for each of channel 1, 2, 3, 4 (open/close solenoid 1, 2, 3, or 4) using the second row of override "I/O" buttons.

To enter a program into the controller, enter the above three elements, and then press the "write" button. Continue until all programs have been entered. If you hesitate longer than 15 seconds between button-pushing, the clock reverts back to the time output mode and the program is not entered. To turn a channel on, press the I/O button in the second row once. To turn a channel off, press the I/O button twice. A third press of the I/O button will return the program line to its original blank state (results in no action for that channel). Every command is registered immediately with a black rectangle or as hour: minute.

You may cancel a program completely or modify one or more elements. Press the "read" button until the desired program is reached. To cancel completely, press "cancel." To change one or more elements, press the appropriate buttons and then press "write."

For standard IMPROVE protocol sampling, six programs must be entered, as shown in below in Figure 2.

Figure 2 IMPROVE Clock Controller Programs

Program One (Channel 1 ON, Wednesday at midnight)

Press	"We"	bar shows above We
Press	"h +"	until 12:_ _ AM shows in display
Press	"m+"	until 12:00 AM shows in display
Press	channel 1 "I/O"	until bar appears in display below I for Chan. 1
Press	"write"	for program entry

Program Two (Channel 1 OFF, Thursday off at midnight)

Press	"Th"	bar shows above Th
Press	"h+"	until 12:_ _ AM shows in display
Press	"m+"	until 12:00 AM shows in display
Press	channel 1 "I/O"	twice until bar appears in display below 0 for Chan. 1
Press	"write"	for program entry

Program Three (Channel 2 ON, Saturday at midnight)

Press	"Sa"	bar shows above Sa
Press	"h +"	until 12:_ _ AM shows in display
Press	"m+"	until 12:00 AM shows in display
Press	channel 2 "I/O"	until bar appears in display below I for Chan 2
Press	"write"	for program entry

Program Four (Channel 2 OFF, Sunday at midnight)

Press	"Su"	bar shows above Su
Press	"h+"	until 12:_ _ AM shows in display
Press	"m+"	until 12:00 AM shows in display
Press	channel 2 "I/O"	twice until bar appears in display below 0 for Chan 2
Press	"write"	for program entry

Program Five (Channel 3 ON, Sunday at midnight)

Press	"Su"	bar shows above Su
Press	"h +"	until 12:_ _ AM shows in display
Press	"m+"	until 12:00 AM shows in display
Press	channel 3 "I/O"	until bar appears in display below I for Chan 3
Press	"write"	for program entry

Program Six (Channel 3 OFF, Sunday at 12:01 A.M.)

Press	"Su"	bar shows above Su
Press	"h+"	until 12:_ _ AM shows in display
Press	"m+"	until 12:01 AM shows in display
Press	channel 3 "I/O"	twice until bar appears in display below 0 for Chan 3
Press	"write"	for program entry

4.4 Operator Training

The operator training session is meant to review the Sampler Operation Manual, TI 201A. and answer any questions the operators may have about sampling, as well as provide them with supervised hands-on training in sampling. The training session is run by a field technician and generally lasts about one hour, depending on the number of people being trained, whether they read the sampling manual, and their level of experience. The subjects covered include:

- overview of the function and operation of each sampler module
- pump functioning
- sampler fuse function and location of spare fuse
- clock controller programming
- procedures for data recording prior to and following sampling
- filter cassette removal
- filter cassette installation
- troubleshooting
- phone numbers to call if problems arise.

4.5 Site Documentation

Site documentation for the IMPROVE protocol modular aerosol sampler involves completion of the Site Documentation Form, (Form 2), and the Site Configuration Check List, (Form 3). These information are filed with the site documentation data collected during the siting procedure.

Changes and updates to the site are recorded using Site Configuration Clarification Request, (Form 4).

Information required to complete the site configuration forms are described in detail in the following summaries:

Site code	Record the 5 letter site code, (e.g. GRCA1, or THSI1)
Site location	Record the full site name (e.g. Grand Canyon National Park, or Three Sisters Wilderness Area)
Study Name or Funding Source	Record the study name or funding source for the site (e.g. IMPROVE, or National Forest Service)
Location Description	Write a brief description of the site location, including significant landmarks and co-located structures. A detailed map will have been included in the siting documents.

Sampler Type:	Record the type of sampler being installed (e.g. IMPROVE protocol modules A, C)
Sampler ID (UCD#):	Record the University of California Inventory ID number. It is located on a metallic tag on the lower left interior wall of the controller module.
Date of First Sample	Expected date for regular sampling to begin at this site.
Ending Date:	Expected end date for sampling at this site, if known.
Channel Descriptions:	Record, above each column, the module to which the data pertains.
Substrate(s)	List the filter material being used for sampling (e.g. teflon, quartz, etc.)
Duration (hours)	Record the programmed sample duration (e.g. for IMPROVE protocol, duration = 24 hours)
Start Time(s) (hours)	Record the programmed start times for each channel (e.g., for IMPROVE protocol, channel 1 = 12:00 A.M. Wednesday, Channel 2 = 12:00 A.M. Saturday)
Nominal Flow (lpm)	Record the calibrated nominal flow rate in liters per minute, as calculated in Section 4.2.6.1
Cut point (µm)	Record the expected cut point (e.g. 2.5 µm or 10 µm)
Mask (M__)	Fill in the blank with the mask size. M0 = unmasked M1 = 2.2 cm^2 area M2 = 1.1 cm^2 area
Protocol/sampling cycle	Record the days of the week on which sampling will occur (e.g. Wed, Sat for IMPROVE protocol) and the expected day of the week on which the samples will be removed and replaced (e.g. Tues. for IMPROVE protocol)
Species	Record the expected output data (e.g. Na through Pb, + organic and elemental carbon) Record any special elements or compounds being sought at the site.

FORM 2 Site Documentation Form

Initiated by:_______________________________________ Date:____________

Site code:	Site location:	Funding Source or Study Name:

Location Description: (e.g. 2 miles west of Hopi Pt @ meteorological site)

Sampler Type:	Sampler ID (UCD#):

Date of First Sample (beginning Date):	Ending Date:

Channel Descriptions:

Substrate(s)				
Duration (hours)				
Start Time(s) (hours)				
Nominal Flow (lpm)				
Cut point (μ)				
Mask (M__)				
Protocol/sampling cycle				
Species				

Special scheduling or conditions at this site? PLEASE ELABORATE...

FORM 3 Site configuration Check List

Site name: Date:

Circle one: indoor outdoor Is it climate controlled?______________

Put an **X** next to all equipment present:

____A module ____module doors

____B module ____spare pump

____C module ____centigrade min/max thermometer

____D module ____available electrical outlet

____controller module ____phone or data line near sampler

____pump house *with* wiring and relays ____pump enclosure *without* wiring or relays

Where is the thermometer located?

Describe the power supply at the site.(e.g. is there an exclusive breaker for the sampler? where is the breaker?)

Approximately how tall are the inlet stacks (from T to inlet)?

Are the inlets OR stacks anodized? For which modules?

Circle the type of PM10 inlet: Wedding Sierra

If Sierra: plastic, metal, or glass jar?

What type of cyclones are present for each module (new or old)?

Are the elapsed timers: wired together ____ attached to the power strip with panduits ____

On the diagram, indicate the number and location of the solenoids, elapsed timers, and switches, as well as any other non-standard parts that are present:

FORM 4 Site Configuration Clarification Request

Initiated by:______   Date:__________

Sitecode:	Site location:	Study Name:

Date of First Sample (beginning Date):	Ending Date:

Description of Change: (i.e. Add or delete channels/modules; change SO_2)

Channel Descriptions:

Substrate(s)				
Duration (hours)				
Start Time(s) (hours)				
Nominal Flow (lpm)				
Cut point (μ)				
Mask (M__)				
Protocol/sampling cycle				
Species				

Special scheduling or conditions at this site? PLEASE ELABORATE...