MODEL 580S II

ORGANIC VAPOR METER/DATALOGGER

INSTRUCTION MANUAL
P/N 12697

(ENGINEERING DOCUMENT P/N 580II-9014)

ONLY AS TO INTRINSIC SAFETY
FOR HAZARDOUS LOCATIONS
74XL

Class I, Division 1 Groups A, B, C, D
Temperature code T3C

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Revision A

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CHAPTER 1
INTRODUCTION

The Model 580S II is a portable Organic Vapor Meter (OVM) that detects and quantifies organic vapors with a sensitive photoionization detector (PID). The instrument has an operating range of 0 to 2500 parts per million (ppm) with a minimum detectable reading of 0.1 ppm. The Model 580S II has the following features:

- Removable detector module
- Extensive data logging capabilities
- RS-232 interface
- Maximum signal hold
- Quick-change battery

The Model 580S II is a hand-held unit that requires no support gases and can operate for eight hours from a fully charged battery. The Model 580S II is ideally suited for use in the following applications:

- Industrial hygiene or environmental surveys
- Head space measurements
- Spill response programs
- Leak detection programs
- Fugitive emissions programs

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PRINCIPLE OF OPERATION

The Model 580S II is included in a class of instruments known as photoionization detectors (PIDs). These devices operate on the principle that many organic compounds can be ionized when subjected to ultraviolet (UV) light. When a photon of UV light ($h\nu$) strikes an organic molecule (RH), this results in a positively charged ion (RH^+) and a free electron (e^-), as show in the following formula:

$$RH \xrightarrow{h\nu} RH^+ + e^-$$

If this reaction occurs within an electrical field, the positive and negative charges create a current flow. This current can be measured and is proportional to the concentration of organic compounds in the sample. For ionization to occur, the energy level of the photon, expressed in electron-volts (eV), must exceed the ionization potential of the target molecule. Nearly all organic molecules have ionization potentials in the range of 8.5 eV to 11.5 eV, while the majority of inorganics and permanent gases have ionization potentials of 12.0 eV or higher. PID lamps that enable the Model 580S II to detect most organic compounds of common interest are available at energy levels of 10.6 eV and 11.8 eV.

An ambient air sample is continuously drawn into the Model 580S II through the inlet of the probe, as shown if Figure 1-1. The sample flows through a water trap filter located within the probe cap. It then passes through the detector, composed of a UV lamp, a bias electrode, and a collector. As the sample passes through the detector, any detectable organics that are present are ionized according to the reaction described above. The resulting current flow is measured and converted into a concentration by comparisons with measurements taken using a calibration gas of known concentration.

From the detector, the sample is drawn through the pump before exiting the instrument through the sample outlet. Since the PID is a non-destructive detector, the sample can be collected for further analysis as it exits the instrument.

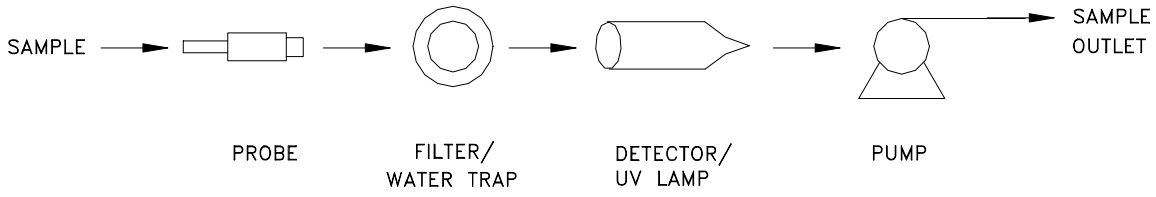

Figure 1-1. Model 580S II Flow Schematic

SPECIFICATIONS

Measurement

Technique:	Photoionization. Detector is user accessible for cleaning and replacement.
Range:	Autoranging 0.1 to 2500 ppm (isobutylene). Up to 25,000 ppm using the dilution probe.
Resolution:	0.1 ppm at 0 to 99 ppm. 1 ppm above 99 ppm.
Min. Detectable Level:	0.1 ppm benzene in air matrix.
Accuracy:	± 10 percent of actual concentration (10 to 120 percent of span concentration).
Response Time:	Less than 4.0 seconds.
Drift:	Less than 10 percent at span concentration per 8 hours. Less than 1 ppm zero drift per 8 hours.
Flow Rate:	275 ml/min (nominal).
Sample Conditioning:	Integrated, changeable filter/water trap.
Operating Temperature:	0 to 45 degrees C (32 to 113 degrees F).
Humidity:	0 to 90 percent RH, non-condensing.

Power Requirements

Battery:	Rechargeable NiCad battery pack. Field interchangeable and can be replaced in a hazardous location.
Service Life:	8 hours of internal battery charge. Operates from charger indefinitely.
Charger Requirements:	120 VAC 60Hz; 240 VAC 50 Hz.

Display/Controls

Readout:	Large, highly visible, 128 x 64 graphic LCD with wide viewing angle, wide operating temperature range, and backlighting. Operating mode can display Real-time and maximum readings simultaneously.

SPECIFICATIONS (continued)

Keypad:	Three large keys with tactile feedback. Keys are context sensitive; the key function changes with the menu and the bottom line of the display indicates the key's current function.

Data Output

Voltage:	0 to 0.85 volts DC, user-defined concentration range.
Alarm Levels:	Audible alarm and LED can be triggered at user-definable peak and STEL levels.
Communication:	9-pin RS-2323 port for communication with PC.
Data Points:	Datalogger capacity of up to 4000 points.

Physical Dimensions

Case Size:	12" (H) X 4.25" (W) X 3.5" (D) 30.5cm (H) x 11cm (W) x 9cm (D)
Weight:	3.0 lbs.
Safety Approvals	Underwriters Laboratories (UL) approved only as to the intrinsic safety for hazardous locations 74XL Class, I, Division 1, Groups A, B, C, and D Temperature code T3C. CENELEC System EEx ib IIC T3 Certified by KEMA No. Ex-98.E.4721

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CHAPTER 2
SETUP

This chapter describes the standard components shipped with the Model 580S II and the setup and operation of the hardware.

COMPONENTS

The following components are shipped with the standard instrument package:

- Model 580S II
- Standard Probe
- Hand strap
- Battery charger (110V or 220V)
- Sample exit fitting
- Water traps (5)
- Automobile charger adapter
- Charcoal scrubber probe
- Lamp cleaner kit
- Recorder cable
- Communication cable (RS-232)
- EZ Connect 32-bit Microsoft® Windows software (3 ½" disks, 2)
- Instruction manual
- Quickstart instruction sheet
- Carry bag (soft sided)
- Lamp extraction tool

In addition to the above components, the deluxe instrument kit contains the following items:

- Hard-sided carrying case
- Calibration kit that includes:
  - ✓ Cylinder (isobutylene, 100 ppm)
  - ✓ Constant flow regulator (1.0 lpm)
  - ✓ Union tee (polypropylene, 1/4")
  - ✓ Teflon tubing (3 pieces, 1/4" OD x 3/16" ID)
  - ✓ Tygon tubing (3 pieces)
  - ✓ Replacement charcoal (for scrubber probe)

HARDWARE OVERVIEW AND OPERATION

To operate the Model 580S II, it is important to become familiar with the various hardware components associated with the instrument. Figures 2-1 through 2-3 identify and briefly describe the operation of each component.

Pushbuttons (Keys)

Three pushbuttons are used to operate the Model 580S II software (see Figure 2-1). The pushbuttons have tactile feedback and are easily operated with a gloved hand.

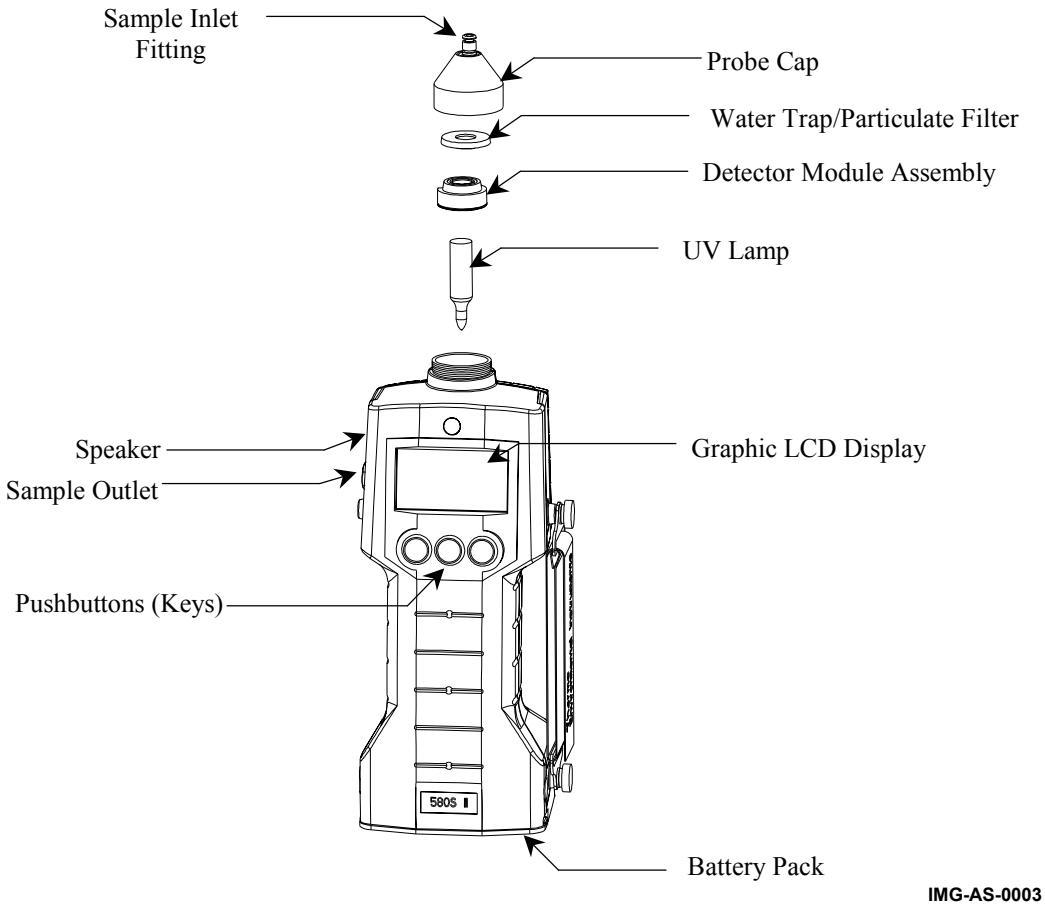


Figure 2-1. Model 580S II Front View

Display

The graphic LCD screen displays alphanumeric characters (see Figure 2-1). Since most of the menus contain more items than can be shown on the screen at one time, one of the pushbuttons is used to scroll through the selections. For more information, refer to Chapter 3, "Operation."

Speaker

The speaker is located on the left side when the instrument is viewed from the front (see Figure 2-1). In the RUN mode, the internal speaker clicks at a rate proportional to the concentration level. The speaker also sounds an alarm whenever the concentration exceeds the user-defined concentration alarm level or when the STEL (Short Term Exposure Limit) is exceeded. The speaker can also be turned off.

Standard Probe and Charcoal Scrubber Probe

The quick-change feature of the probes allows rapid installation on the Model 580S II without the use of tools (these probes are not illustrated, but are connected directly to the sample inlet fitting). The standard probe is used for general sampling, and the charcoal scrubber probe is used during calibration to generate *zero air*. A dilution probe is available as optional equipment, which dilutes high concentration sample 10:1. For information about optional equipment, refer to see Appendix C, "Accessory Equipment."

Alarm LED

The alarm LED is located on the front of the instrument (see Figure 2-1). It lights whenever the concentration exceeds either the user-defined peak or STEL (Short Term Exposure Limit) thresholds. The LED is also activated when the unit is turned on and is going through its self-test procedure.

Water Trap/Particulate Filter

A replaceable water trap/particulate filter protects the instrument from water and particulates. The filter is housed in the probe cap (see Figure 2-1).

Detector Module Assembly

The detector module assembly is the core element of the Model 580S II and can be easily accessed and removed for periodic cleaning. To access the detector module, remove both the probe cap and the water trap filter (see Figure 2-1).

Ultraviolet (UV) Lamp

The UV lamp can be easily accessed and removed for periodic cleaning. To access the UV lamp, remove the probe cap, water trap filter, and detector module assembly (see Figure 2-1). For the procedure to clean the lamp, refer to Chapter 5 "Maintenance."

Sample Outlet and Sample Exit Fitting

The sample is exhausted from the sample outlet. Because photoionization is a non-destructive method of detection, the sample can be collected at the sample outlet for further analysis. To collect a sample, one end of the supplied hose barbed sample exit fitting is screwed into the sample outlet and the other end is fitted to a piece of 1/16" ID tubing (not supplied) The tubing is connected to a collection bag or charcoal collection tube (both not supplied). For collection bag and charcoal collection tube techniques, refer to Appendix B, "Sample Collection Techniques."

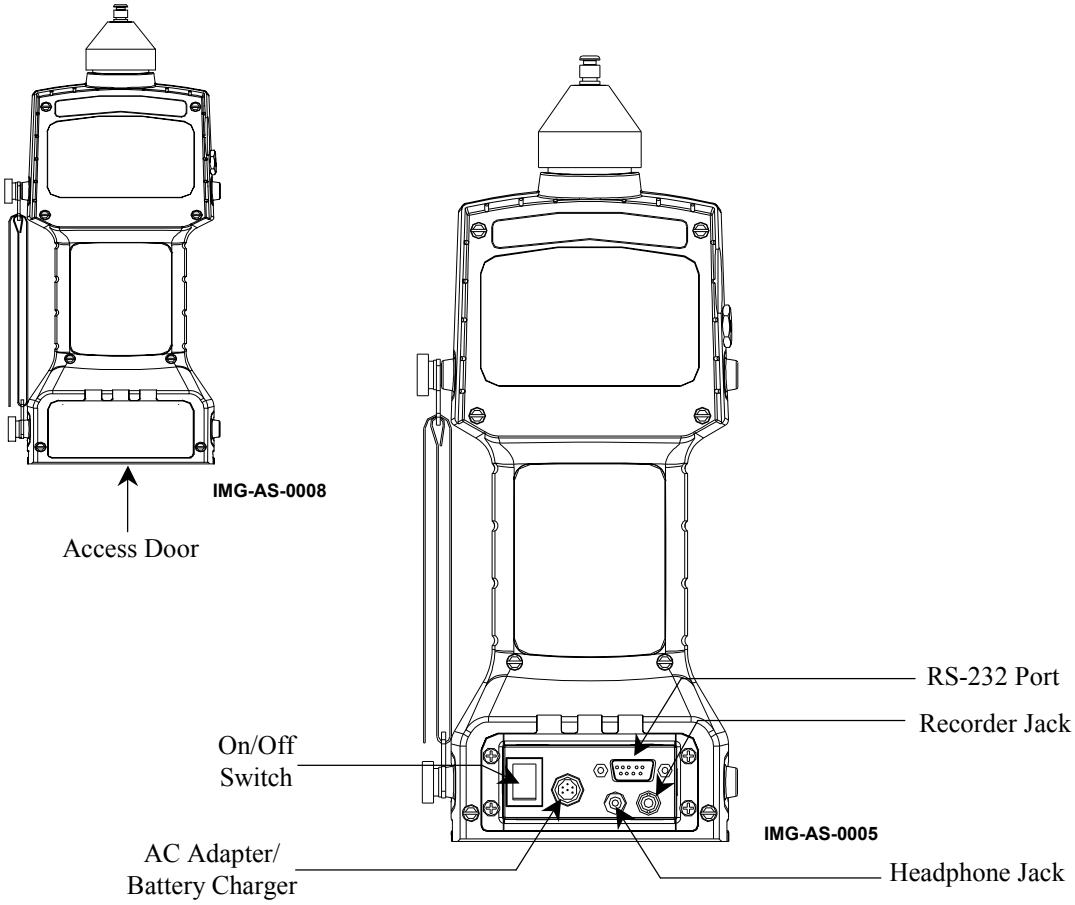


Figure 2-2. Model 580S II Rear Panel View

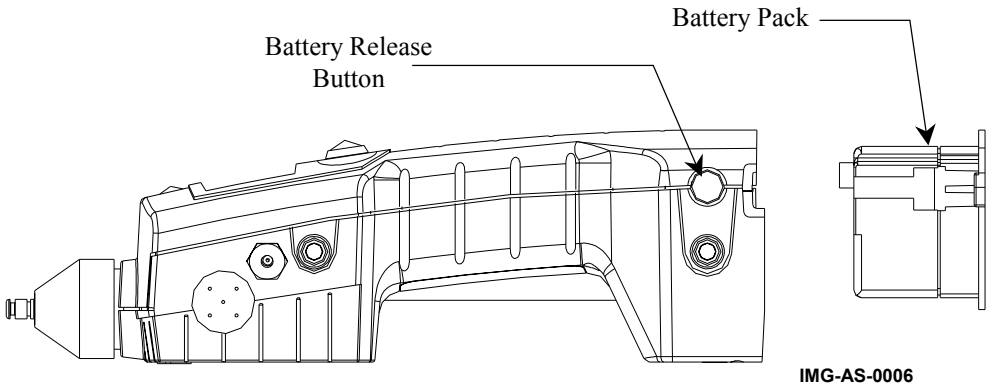


Figure 2-3. Model 580S II and Battery Pack

Battery Pack and AC Adapter/Battery Charger Jack

The internal battery can be recharged without removing it from the unit. To recharge the battery, connect the battery charger to the AC adapter/battery charger jack located in the rear of the instrument (see Figure 2-2). Using the appropriate adaptor provided, the battery charger can be plugged into either a 110 volt or 220 volt AC outlet or an automobile lighter. The rechargeable battery pack and AC adapter have the following features:

- When the charger is connected to the jack, the instrument can be operated with or without the battery.
- The Model 580S II can be powered indefinitely from the battery charger.
- When a battery is installed and the charger is connected to the jack, the battery is being charged regardless of whether the instrument is on or off.

  Note: If the unit is on, the charge time is increased.

- The battery charger includes a discharge circuit that is used to periodically discharge or cycle the battery to extend the battery life. For information about recharging times and for recommended intervals between discharges, refer to Chapter 5, "Maintenance."

To remove the rechargeable battery, depress the battery release buttons located on either side of the instrument and slide the battery pack out from the bottom (see Figure 2-3). When replacing the battery pack, slightly depress the battery release buttons, and then slide the battery pack into the instrument.

To extend the operating time of the Model 580S II, the battery pack can be replaced in the field. A spare battery pack and an adapter to charge the battery outside of the instrument are available options described in Appendix C, "Accessory Equipment."

! CAUTION: The battery **is not** UL/KEMA approved for recharging in a hazardous location, but can be replaced in a hazardous location.

Access Door

The access door is a rubber plate that serves as a protective cover for several of the instrument's rear panel controls (see Figure 2-2). To open the access door, grasp the rubber panel at the bottom corners and lift it away from the rear panel.

On/Off Switch

The on/off switch is located on the rear panel of the instrument under the access door (see Figure 2-2).

Headphone Jack

A headphone jack (see Figure 2-2) provides the same audible signals as the internal speaker and is located on the rear panel of the instrument.

> **! CAUTION:** The headphone jack is not UL/KEMA approved for use in hazardous locations.

Recorder Jack

The recorder jack (see Figure 2-2) provides an analog output (0 to 0.85 volts) of the concentration reading for a strip chart recorder, and is located on the rear panel of the instrument.

> **! CAUTION:** The recorder jack is not UL/KEMA approved for use in hazardous locations.

RS-232 Port

The RS-232 port is used for communication with a printer or computer (see Figure 2-2), and is located on the rear panel of the instrument. The Model 580S II communications software allows the Model 580S II operating parameters to be set from a personal computer and allows information from the internal datalogger to be downloaded. For information about the RS-232 port, refer to Chapter 4, "RS-232 and EZ Connect Software."

> **! CAUTION:** The RS-232 port is not UL/KEMA approved for use in hazardous locations.

CHAPTER 3
OPERATION

This chapter describes the operation of the Model 580S II using the display screen, pushbuttons, and menu-driven software.

DISPLAY SCREEN AND PUSHBUTTONS

The display screen presents a series of menus. Each menu contains several operational features. For example, the Setup menu lets you turn the lamp on and off. When a feature is selected, its current status or value appears in the display screen. This information can be changed, using the pushbuttons (see Figure 3-1) located below the display screen. The function of each pushbutton is indicated on the bottom line of the display screen and changes according to the particular menu or operational feature.

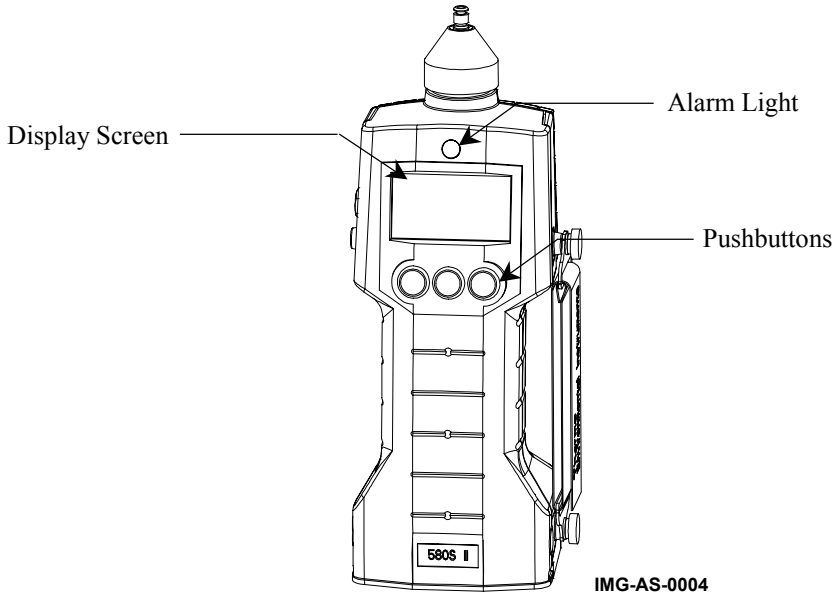


Figure 3-1. Model 580S II Display Screen and Pushbuttons

SOFTWARE OVERVIEW

Functions and features of the Model 580S II are controlled using menu-driven software. The flowchart shown below, in Figure 3-2, illustrates the configuration of the software.

The Startup screen, shown at the top of the flowchart, appears each time the instrument is powered on. Once the startup of the instrument is complete, the Main Menu screen appears. This menu contains a list of submenus that let you control the features and functions of the Model 580S II.

Many of the submenus contain more line items than can be displayed on a single screen. Scrolling past the last line shown on the screen, displays the remaining line items.

Note: The convention used in this manual is to display these items below the screen.

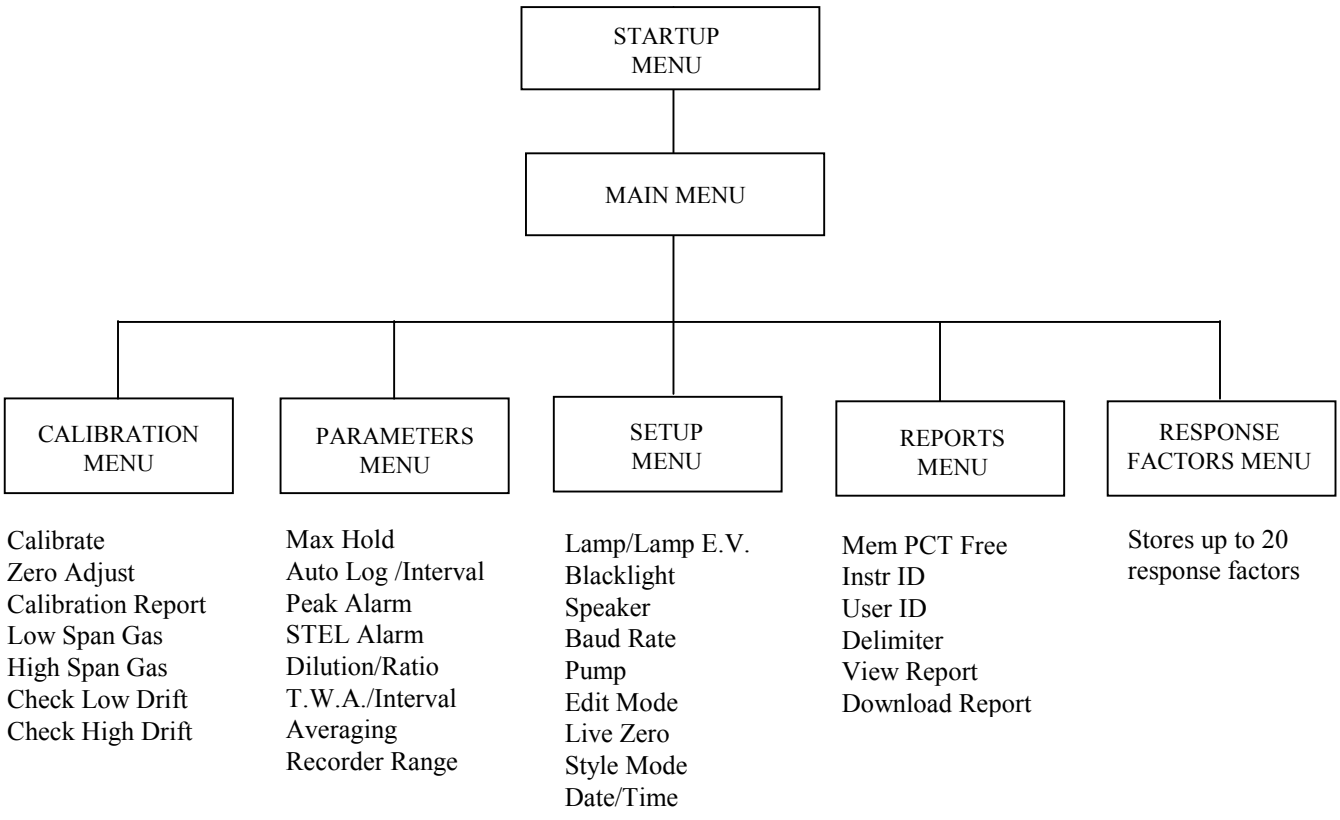


Figure 3-2. Flowchart of Menu-Driven Software

STARTUP

Before you attempt to operate the instrument, ensure that the battery is fully charged. To run the instrument, install a probe on the sample inlet fitting (see Figure 3-3). At the rear of the instrument, lift the rubber access panel and turn on the instrument.

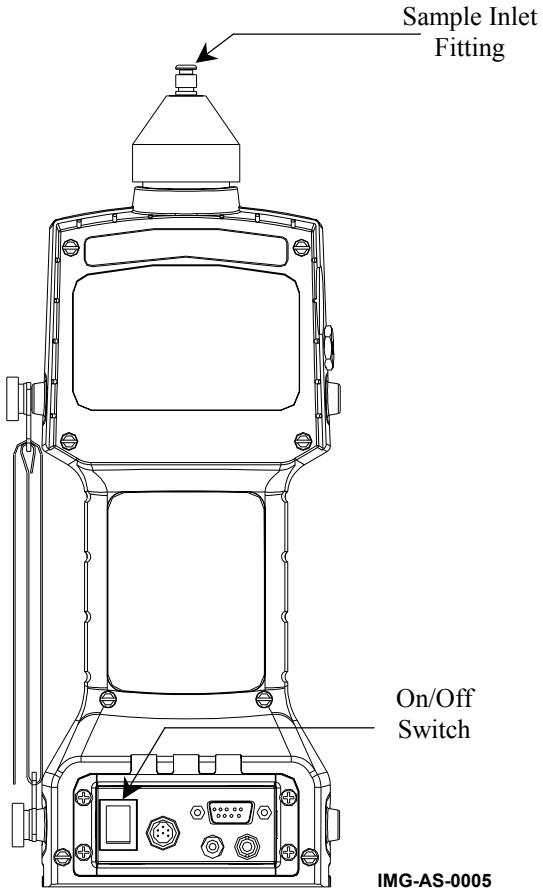


Figure 3-3. Model 580S II Rear Panel Controls

Startup Screen

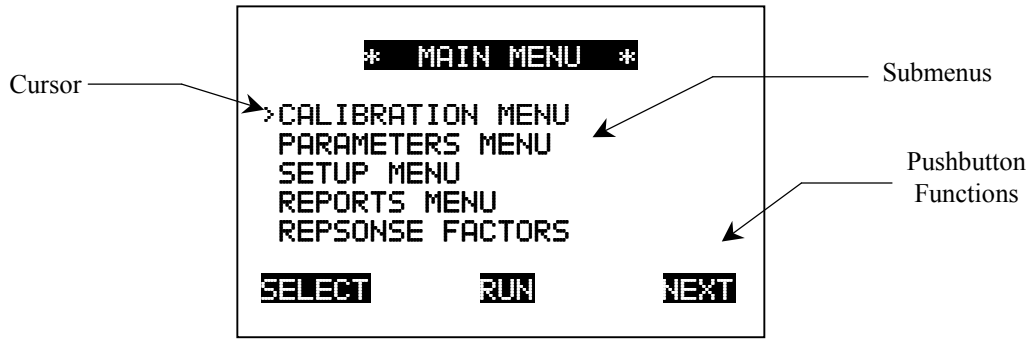
Each time the Model 580S II is powered on, it initiates a self-test procedure. During this test, several of the instrument's features are checked and the startup screen appears in the display. This screen shows the instrument model number and the software version number. When the self-test procedure is complete, the Main Menu screen appears. This screen is described in the following section.

Main Menu

The Main Menu contains the submenus and the pushbutton functions used to control the Model 580S II. Instrument parameters and features are accessed and controlled from the submenus, shown below. The pushbutton functions, located at the bottom of the screen, are activated using the pushbutton directly below that function (**SELECT**, **RUN**, and **NEXT**).

Using the Main Menu:

- To choose a submenu, press **NEXT** until the cursor (>) is beside the desired menu item, and then press **SELECT**.
- To access the Run screen, press **RUN**.



Main Menu

Run Screen

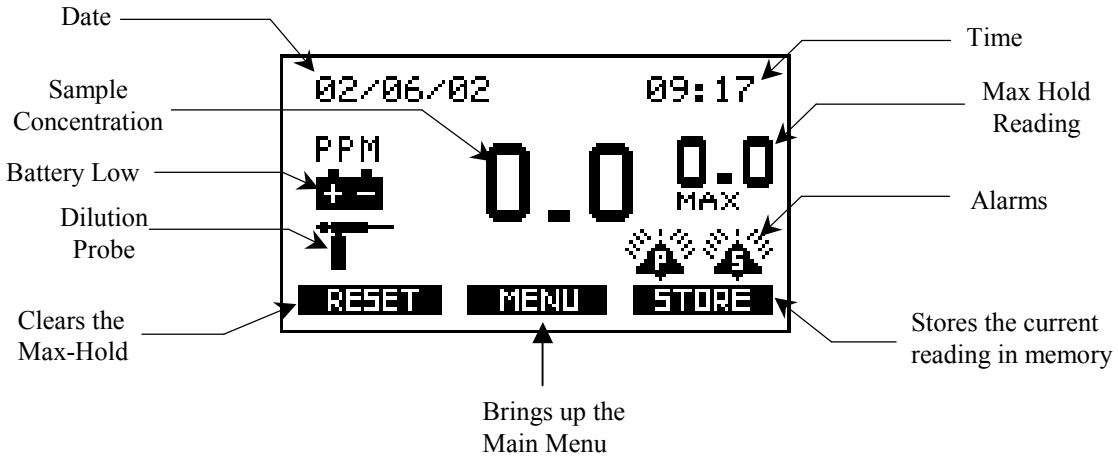
The Run screen is the standard operating screen and is accessed from the Main Menu using the **RUN** pushbutton. When **RUN** is selected, the UV lamp and pump are automatically activated, if they are not already on, and a corresponding message is briefly shown. Once the UV lamp and pump are activated and the instrument is operating normally, the Run screen appears.

Features and Functions of the Run Screen

Displayed in the center of the Run screen, as shown below, is the sample concentration. This value indicates the current concentration in parts per million (ppm) and is a sliding average, updated every second.

When enabled, the max-hold reading, to the right of the concentration, tracks the maximum ppm value. The current date and time (24-hour format) appear at the top of the screen and the pushbutton functions (**RESET**, **MENU**, and **STORE**) appear at the bottom of the screen. The function of the reset button is to clear the max-hold value. The menu button closes the run screen and brings up the main software menu. The store button is used to write concentration readings to the datalogger.

Depending on the current parameter settings, several icons are displayed in the Run screen, as shown below. For example, if the dilution mode is set, a representation of the dilution probe appears (refer to Parameters Menu/ Dilution section). In addition, two alarm icons are displayed. An icon representing a bell with a "P" indicates that the peak alarm limit has been exceeded. A bell with an "S" indicates that the short-term exposure limit (STEL) has been exceeded. (Both Peak and STEL alarm limits can be set from the Parameters Menu). An icon representing a battery indicates that the battery is low and needs charging (for information about battery recharging, refer to Chapter 5, "Maintenance").



Run Screen

To access the Run screen, start at the Main Menu and select **RUN**.

Using the Run screen:

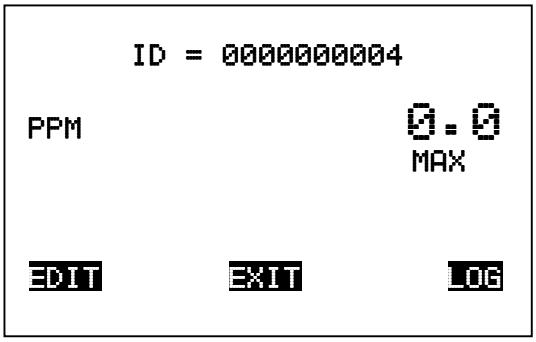
- To clear and reset the max-hold reading, press **RESET** (this reading is also reset when the Run screen is entered or when a data point is autologged).
- To save a data point, press **STORE**. If necessary, edit the identifier, and then press **LOG**.
- To return to the Main Menu, press **MENU**.

Store Command

The Store screen, shown below, is activated by pressing **STORE** from the Run screen. It lets you record information displayed on the Run screen in the datalogger. Each stored data point is associated with a unique user-defined identifier. Identifiers are stored with each logged data point and are downloaded with stored data. Stored data can also be recalled and viewed on-screen.

Using the Store screen:

- To change the identifier ID, press **EDIT**.
- To save the information and return to the Run screen, press **LOG**.
- To cancel the operation and return to the Run screen without saving the information, press **EXIT**.



Store Screen

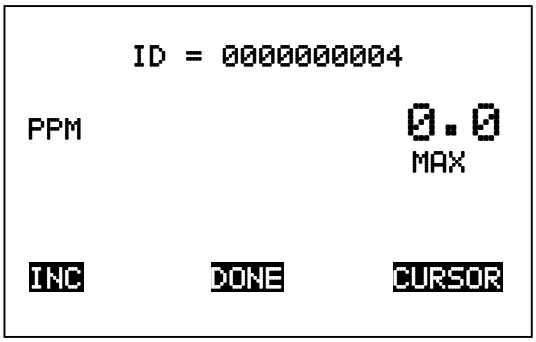
The user-defined identifier can consist of numeric or alphanumeric characters. The character choice is selected in the Setup Menu using the Edit Mode. For details on setting the Edit Mode, refer to the Edit Mode section in this chapter.

When **EDIT** is selected, one of two types of Store-Edit screens appears. One type lets you edit only numeric characters and the other lets you edit alphanumeric characters. Both screens are provided, since the numeric screen requires fewer steps to edit an identifier. These screens let you enter a unique combination of up to 10 characters as sample identifiers.

Note: If you choose not to edit the identifier, it automatically increments by one from the last logged data point identifier.

Using the numeric-only version of the Store-Edit screen:

- To increment a digit, press **INC** (digits allowed are 0 through 9, and underscore, _).
- To edit a new digit, press **CURSOR** (the cursor moves from right to left).
- To stop editing and return to the Store screen, Press **DONE**.

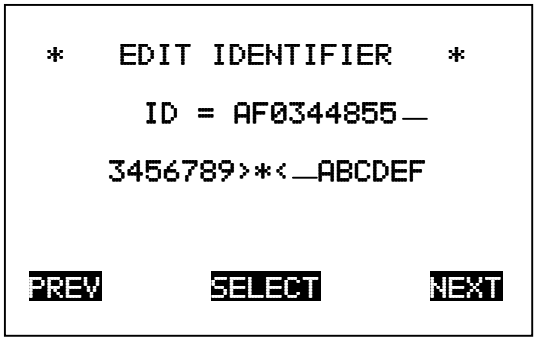


Numeric Store-Edit Screen

The alphanumeric Store-Edit screen, shown below, contains two lines. The upper row is the identifier and the lower row consists of alphanumeric characters that are selected, and then placed in the upper row.

Using the alphanumeric version of the Store-Edit screen:

- To move the cursor to the required character in the character selection row, press **PREV** or **NEXT**.
- To insert the character into the identifier row at the current cursor position, press **SELECT**.
- To move the cursor left or right in the identifier row, position the cursor on the < or > in the character selection row, and press **SELECT**. Continue to press **SELECT** until the desired position in the identifier row is reached.
- To exit the Store-Edit screen and return to the Store screen, position the cursor over the asterisk (*) in the character selection row and press **SELECT**.



Alphanumeric Store-Edit Screen

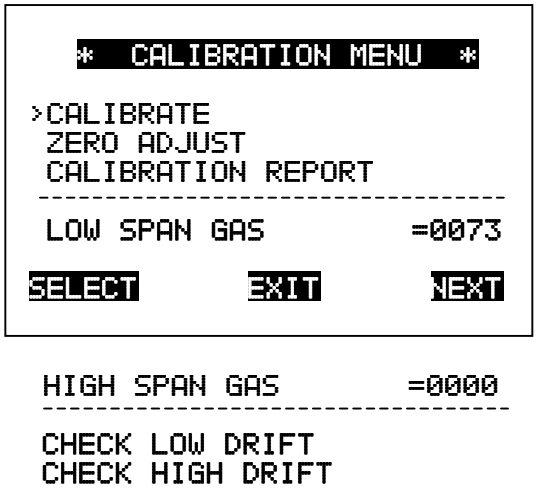
CALIBRATION MENU

The Calibration menu, shown below, lets you access the calibration features of the Model 580S II. For additional information about calibration and preparing calibration standards, refer to Chapter 7, "Calibration and Use of Response Factors."

To access the Calibration Menu and display the calibration features, start at the Main Menu, and press **SELECT**.

Using the Calibration Menu:

- To choose a calibration feature, press **NEXT** until the cursor (>) is beside the desired menu item, and then press **SELECT** (or edit where applicable).
- To return to the Main Menu, press **EXIT**.



Calibration Menu

Calibrate

Selecting Calibrate from the Calibration Menu initiates the calibration procedure, which requires either one or two span gases of known concentration and a zero air source. Before calibrating the instrument, place it in the intended environment and let it run for a minimum of five minutes. This allows the instrument to stabilize at the appropriate temperature and humidity levels.

Use these steps to access the Calibrate screen:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Calibration Menu and press **SELECT**.
3. Position the cursor beside Calibrate and press **SELECT**.

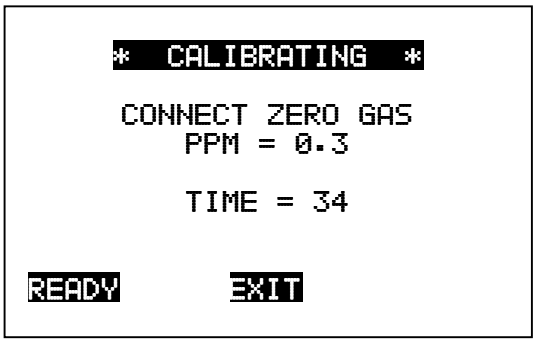
Note: Selecting Calibrate activates the pump and the UV lamp, if they are not currently in operation.

Connect Zero Gas

After selecting Calibrate, the Connect Zero Gas screen appears. This screen prompts you to connect the zero gas, displays the current concentration reading (based on the pervious calibration), and acts as a timer that counts down from 60 seconds, as shown below. It is recommended that the gas be allowed to flush through the instrument for 60 seconds to let the reading stabilize, and the counter is included only for reference purposes.

Using the Connect Zero Gas screen:

- Connect the instrument to a known zero gas source, either the charcoal scrubber probe or a cylinder of zero air.
- Once the instrument's reading is stable, press **READY** to initiate zero adjustment. *Zeroing* briefly appears on the screen to indicate that zero is being adjusted. If the adjustment is not successful, *Bad Cal* briefly appears on the screen.
- To abort the calibration and return to the Calibration Menu, press **EXIT**.



Connect Zero Gas Screen

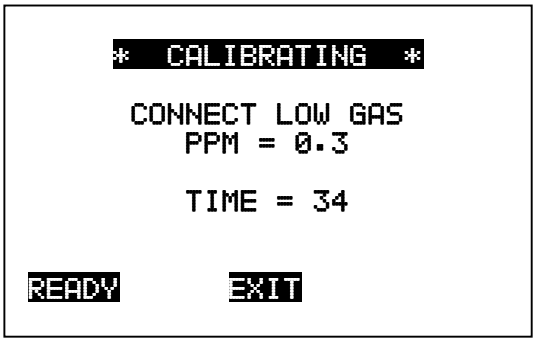
Connect Low Gas

Once the zero gas adjustment is complete, the Connect Low Gas screen appears. This screen prompts you to connect the low concentration span gas, displays the current concentration level reading (based on the previous calibration), and acts as a timer that counts down from 60 seconds. It is recommended that the gas be allowed to flush through the instrument for 60 seconds to let the reading stabilize, and the counter is included only for reference purposes.

Using the Connect Low Gas screen:

- Connect the instrument to a known low concentration span gas source.
- To abort the calibration and return to the Calibration Menu, press **EXIT**.
- To adjust the calibration using the low span gas concentration entered during the calibration setup, press **READY**. *Spanning* briefly appears on the screen to indicate that the low span concentration is being adjusted. If the adjustment is not successful, *Bad Cal* briefly appears on the screen.

Note: If **EXIT** is pressed instead of **READY** at this point, only the zero reading has been adjusted and the instrument returns to the Calibration Menu.



Connect Low Gas Screen

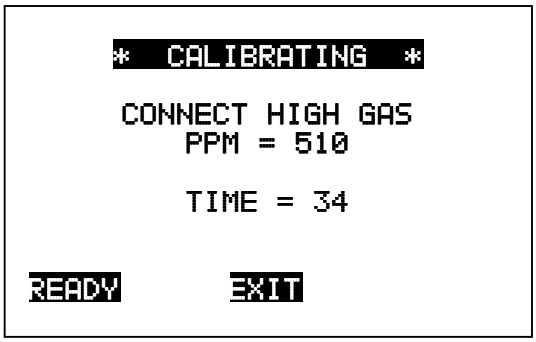
Connect High Gas

Once the low gas adjustment is complete, the Connect High Gas screen appears. This screen lets you enter a second, higher concentration span point if desired. For most applications this is not necessary. If a second span point is not needed, simply press **EXIT** to complete the calibration. This screen prompts you to connect the high span concentration gas, displays the current concentration level reading (based on the pervious calibration), and acts as a timer that counts down from 60 seconds. Again, the counter is included only for reference purposes.

Using the Connect High Gas screen:

- Connect the instrument to a known high concentration span gas source.
- To abort the three-point calibration and return to the Calibration Menu, press **EXIT**.
- To complete the three-point calibration using the high span gas concentration, press **READY**. *Spanning* briefly appears on the screen to indicate that the high span is being adjusted. If the adjustment is not successful, *Bad Cal* briefly appears on the screen. When the high gas adjustment is complete, *3 Point Best Fit* appears on the screen before returning to the Calibration Menu.

Note: If a concentration is entered for the high span gas, the instrument executes a three-point calibration. If the high span gas concentration is zero, a two-point calibration is executed.



Connect High Gas Screen

Zero Adjust

Selecting Zero Adjust from the Calibration Menu adjusts only the instrument zero and does not perform a complete calibration.

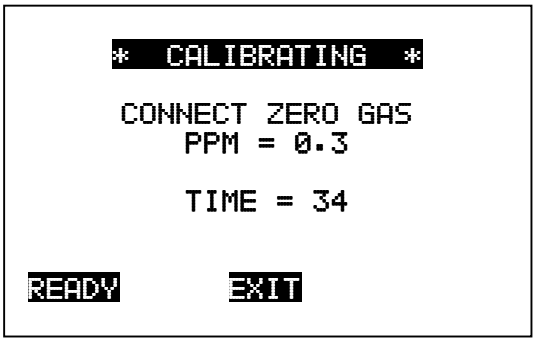
Use these steps to access the Zero Adjust screen:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Calibration Menu and press **SELECT**.
3. Position the cursor beside Zero Adjust and press **SELECT**.

The Zero Adjust screen prompts you to connect a zero air supply, displays the current concentration level reading (based on the previous calibration), and acts as a timer that counts down from 60 seconds. It is recommended that the gas be allowed to flush through the instrument for 60 seconds to let the reading stabilize, and the counter is included only for reference purposes.

Using the Zero Adjust screen:

- To complete the adjustment and return to the Calibration Menu, press **READY**. *Zero Adjusted* briefly appears on the screen to indicate that the zero reading adjustment is complete. If the adjustment is not successful, *Bad Cal* briefly appears on the screen.
- To abort the adjustment and return to the Calibration Menu, press **EXIT**.



Zero Adjust Screen

Calibration Report

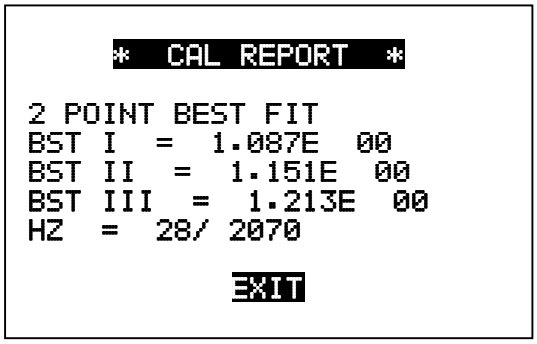
The Calibration Report screens, shown below, are used only for diagnostic purposes. The Calibration Report screen displayed depends upon whether the instrument is calibrated in a two-point mode (zero and a single span gas) or a three-point mode (zero, low, and high gas). If a two-point calibration is executed, *2 Point Best Fit* appears on the first line of the report screen. If a three-point calibration is executed, *3 Point Best Fit* appears.

Note: Should a service call be necessary, a TEI service technician might request the information displayed on these screens.

In the *2 Point Best Fit* calibration report screen, *BST I, II*, and *III* represent the relationship of the current span and zero Hz to the instrument's internal calibration curve. *HZ* represents the detector sensitivity expressed as zero to span ratio. The *3 Point Best Fit* calibration report screen lists the coefficients calculated for the three-point calibration (a best fit 2nd order quadratic equation).

Use these steps to access the Calibration Report screen:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Calibration Menu and press **SELECT**.
3. Position the cursor beside Calibration Report and press **SELECT**.



Calibration Report Screen
(2 Point Best Fit)

Calibration Report Screen
(3 Point Best Fit)

Low Span Gas and High Span Gas

These parameters let you change and set the low or high span gas concentration levels (ppm) for calibration purposes.

Use these steps to access and change the low and high span gas concentration levels:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Calibration Menu and press **SELECT**.
3. Position the cursor beside either Low or High Span Gas and press **EDIT** to change the gas concentration levels as follows:

    - To move the cursor to the next digit (left), press **CURSOR**.
    - To increment the highlighted digit, press **INC**.
    - To save the gas concentration level, press **DONE**.

Check Low Drift and Check High Drift

These screens let you quickly test the drift at the low and high span concentrations. For example, if the low gas source used in the previous calibration is connected, the instrument compares that span concentration with the current reading. If the current reading is lower than the concentration used during calibration, a negative percentage is displayed.

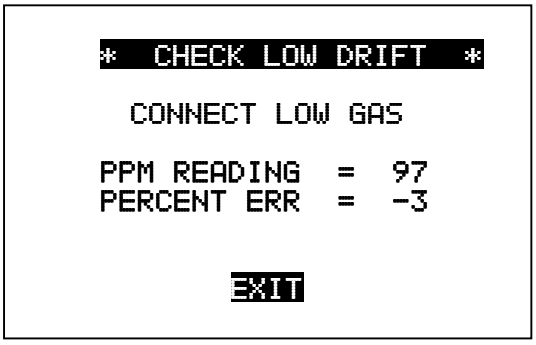
Both screens display the current ppm reading and the difference (%) between that value and the expected reading.

Use these steps to access and check the low and high drifts:

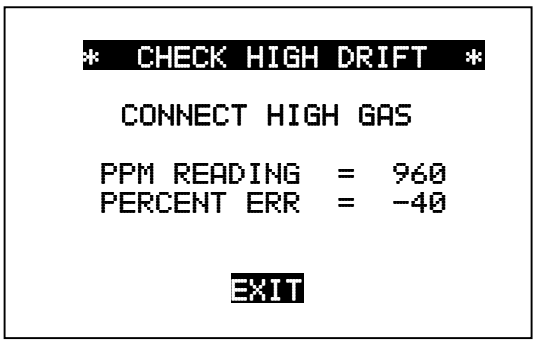
1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Calibration Menu and press **SELECT**.
3. Position the cursor beside either Check Low Drift or Check High Drift and press **SELECT**.

Using the Check Low Drift and Check High Drift screens:

- Connect the instrument to the low or high concentration gas source used for the previous calibration.
- Observe the current reading (PPM READING) and the difference (PERCENT ERR) between it and the expected reading.
- To return to the Calibration Menu, press **EXIT**.



Check Low Drift



Check High Drift

PARAMETERS MENU

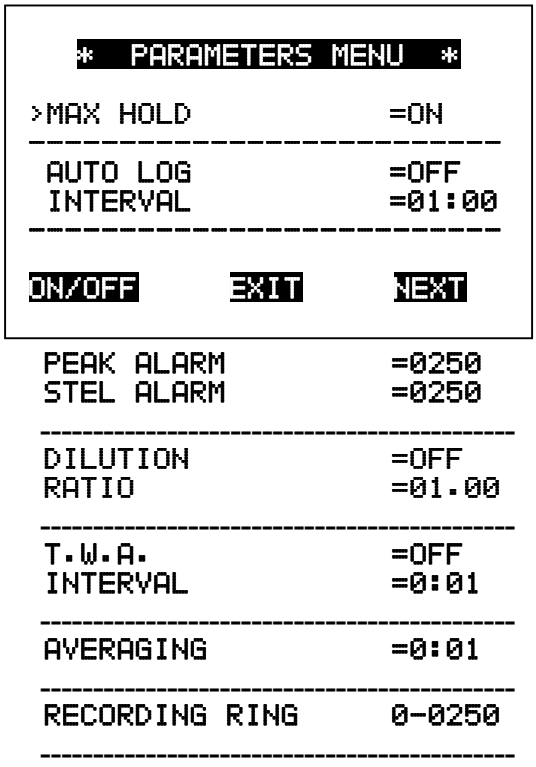
The Parameters Menu, shown below, lets you activate, deactivate, and set the ranges of the software functions that control the Model 580S II.

Use these steps to access the Parameters Menu.

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Parameters Menu and press **SELECT**.

Using the Parameters Menu.

- To choose a parameter, press **NEXT** until the cursor (>) is beside the desired menu item.
- To edit a value or setting, press **EDIT**.
- To toggle a function on or off, press **ON/OFF**.
- To return to the Main Menu, press **EXIT**.



Parameters Menu

Max Hold

The Max Hold function allows the 580S II to lock-in or record the maximum concentration reading that the instrument detects over a time period, which is operator controlled. This is useful for applications when the instrument's display cannot be monitored and it is necessary to know the peak reading over a certain time period or during a certain operation.

When the Max Hold function is turned *ON*, the maximum ppm reading detected since the last reset appears on the display, just to the right of the real-time concentration reading. Pressing the **RESET** button clears the Max Hold value and sets it to the current concentration reading.

The Max Hold function also has an effect on the behavior of the 580S II data logger. If Max Hold is turned *ON*, pressing the **LOG** button causes the Max Hold value to be stored in the data logger, rather than the instantaneous or current ppm reading. Also, if the Auto-Logging and Max Hold functions are both *ON*, the data logger automatically stores the highest or peak concentration value, which was detected during each auto-logging cycle. For example, if the Auto-Logging is *ON*, with an interval of 1 minute, the instrument stores one data point every minute, and that data point represents the maximum or peak reading that occurred during that time interval. The Max Hold value is automatically reset after a data point is logged.

Use these steps to access and change the Max Hold parameter:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Parameters Menu and press **SELECT**.
3. Position the cursor beside Max Hold and press **ON/OFF** to toggle the selection
4. Press **EXIT** to save the change and return to the Main menu.

Auto Log/Interval *(mm ss)*

The Auto Log and Interval parameters let you activate or deactivate automatic data storage. If Auto Log is set to *ON*, the time between the storage of data points is set with the Interval parameter. The logging interval can be set from 1 second to 99 minutes, 59 seconds.

Note: The current setting of the Max Hold parameter, discussed above, affects the type of data stored at the predefined interval. If Max Hold is *ON*, the peak ppm value detected during each interval is recorded. If Max Hold is *OFF*, the instantaneous or current reading at the end of each interval is recorded. Each logged data point includes a date and time stamp, and an identification number.

Use these steps to access and change the Auto Log and Interval parameters:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Parameters Menu and press **SELECT**.
3. Position the cursor beside Auto Log and press **ON/OFF** to toggle the auto-logging, or position the cursor beside Interval and press **EDIT** to change the setting as follows:

    - To increment the digit, press **INC**.
    - To move the cursor to the next digit, press **CURSOR**.
    - To save the new interval, press **DONE**.

Peak Alarm and STEL Alarm

These parameters let you set the Peak and Short Term Exposure Limit (STEL) alarm thresholds in ppm. The Peak alarm is an instantaneous alarm. When the set point level is exceeded, the LED in the front of the instrument remains lit, the speaker sounds, and a bell with the letter *P* appears in the Run screen. The STEL is based on a 15-minute rolling average. When the average concentration over a 15-minute period exceeds this set point, the LED blinks the speaker sounds, and a bell with the letter *S* appears in the Run screen. If both the Peak and STEL alarm levels are exceeded, both bells appear in the Run screen.

The audio and visual alarms continue to operate provided that the Run screen is displayed and the reading stays above the alarm level. When a menu item is selected, the alarms stop, but automatically reactivate if the Run screen is entered, and if the peak or STEL readings remain above the alarm levels.

Use these steps to access and change the Peak and STEL alarms:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Parameters Menu and press **SELECT**.
3. Position the cursor beside Peak Alarm or STEL Alarm and press **EDIT** to change the alarm thresholds as follows:

    - To increment the digit, press **INC**.
    - To move the cursor to the next digit, press **CURSOR**.
    - To save the new alarm threshold (ppm), press **DONE**.

4. To deactivate the alarms, set the alarm thresholds to zero.

Dilution and Ratio

These parameters let you use the 10 to 1 dilution probe to dilute the sample stream. This enables the instrument to measure higher concentration levels such as concentrations up to 25,000 ppm, without saturating the detector. The Dilution parameter toggles between *ON* (dilution probe attached) and *OFF*. The nominal 10:1 dilution ratio is approximate, and the Ratio parameter lets you input the exact ratio of the specific probe being used. For the part number of the dilution probe, refer to Appendix C, "Accessory Equipment."

Use these steps to access and change the Dilution and Ratio parameters:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Parameters Menu and press **SELECT**.
3. Position the cursor beside Dilution and press **ON/OFF** to toggle the parameter, or position the cursor beside Ratio and press **EDIT** to change the setting as follows:

    - Press **INC** to increment the digit that the cursor is over (10.00 = a 10-to-1 ratio).
    - Press **CURSOR** to move the cursor to the next digit.
    - Press **DONE** to retain the new ratio.

Calculating the specific dilution ratio:

- Calibrate instrument using the standard probe.
- Connect the dilution probe and introduce the calibration gas.
- Observe the instrument reading (ppm).
- Calculate the dilution ratio using the following formula:

$$Dilution\ ratio = \frac{actual\ calibration\ gas\ concentration\ (ppm)}{observed\ concentration\ using\ dilution\ probe\ (ppm)}$$

Using the example of a calibration gas concentration of 100 ppm and a reading through the dilution probe of 9.5 ppm, the dilution ratio is equal to 10.5 or 100 divided by 9.5.

T.W.A. (Time Weighted Average) and Interval *(hh mm)*

These parameters let you calculate and store an average concentration value over a specified time interval. If T.W.A. is *ON*, the averaged value is automatically stored in the datalogger at the end of the interval. For example, the T.W.A. interval can be set from 1 minute to 9 hours and 59 minutes; this parameter is independent of the averaging time (see *Averaging* below).

Use these steps to access and change the T.W.A. and Interval parameters:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Parameters Menu and press **SELECT**.
3. Position the cursor beside T.W.A. and press **ON/OFF** to toggle the parameter, or position the cursor beside Interval and press **EDIT** to change the setting as follows:

    - To increment the digit, press **INC**.
    - To move the cursor to the next digit, press **CURSOR**.
    - To save the new interval, press **DONE**.

Averaging

The Model 580S II samples at a rate of 10Hz and updates concentration readings shown on the screen every second. However, the values displayed are actually a rolling average of values taken over a user-defined interval. This parameter lets you set the length of time used in calculating the rolling average. For example, an averaging time of 0:10, indicates that the reading, shown on the screen at any given time, is based on the average concentration measured over the previous 10 seconds.

Lengthening the time that readings are averaged reduces noise, but slows the instrument's response time. Averaging times can be set from 1 second to 5 minutes, 59 seconds.

Use these steps to access and change the Averaging parameter:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Parameters Menu and press **SELECT**.
3. Position the cursor beside Averaging and press **EDIT** to change the setting as follows:

    - To increment the digit, press **INC**.
    - To move the cursor to the next digit, press **CURSOR**.
    - To save the Averaging time, press **DONE**.

Recorder Range (Rng)

This parameter lets you set the ppm range of the analog output from the recorder jack located on the access panel. The Model 580S II has a 0 to 0.85 volt analog output. For example, if the recorder range is set to 100 ppm and the instrument is currently reading 50 ppm, the analog output is 0.425 volts. Concentration readings above the set range result in the maximum analog output of 0.85 volts. The analog output uses a ppm range from 0 to 9999 ppm. The low end of the range is always 0 ppm.

Use these steps to access and change the Recorder Range parameter:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Parameters Menu and press **SELECT**.
3. Position the cursor beside Recorder Rng and press **EDIT** to change the setting as follows:

   - To increment the digit, press **INC**.
   - To move the cursor to the next digit, press **CURSOR**.
   - To save the new range, press **DONE**.

SETUP MENU

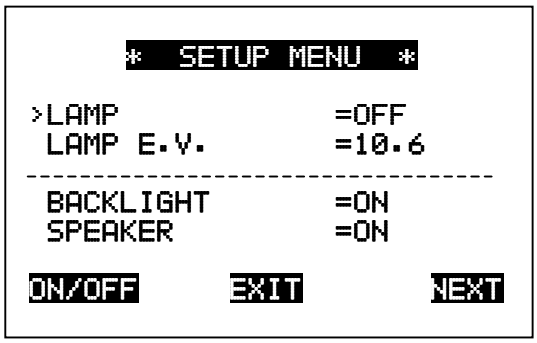
The Setup Menu, shown below, lets you activate, deactivate, or set features of the Model 580S II.

Use these steps to access the Setup Menu:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.

Using the Setup Menu:

- To move the cursor to a menu item, press **NEXT**.
- To modify the menu item or to toggle it on or off, press **CHANGE, SELECT,** or **ON/OFF**.
- To return to the Main Menu, press **EXIT**



Setup Menu

Lamp

This feature lets you turn the UV lamp and pump on or off. Use these steps to turn the UV lamp and pump on and off:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.
3. Position the cursor beside Lamp and press **ON/OFF** to activate or deactivate the UV lamp and pump.

Lamp Type (E.V.)

This feature lets you match the instrument amplifier to the installed UV lamp.

Use these steps to access and change the lamp type:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.
3. Position the cursor beside Lamp E.V. and press **CHANGE** to toggle between 10.6 and 11.8.

Backlight

This feature lets you turn the display screen back light on or off. Under normal daylight conditions, the light can be turned off to conserve the battery.

Use these steps to access and activate or deactivate the backlight:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.
3. Position the cursor beside Backlight and press **ON/OFF** to activate or deactivate the backlight.

Speaker

This feature lets you turn the speaker on or off. If the speaker is on, it clicks proportionately to the concentration that is being sampled. If the Peak or STEL alarm limits have been exceeded, an audible alarm sounds.

Use these steps to access and activate or deactivate the Speaker:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.
3. Position the cursor beside Speaker and press **ON/OFF** to activate or deactivate the speaker.

Baud Rate

This feature lets you set the baud rate for RS-232 communication between the Model 580S II and other devices. The following baud rates are available: 150, 300, 600, 1200, 2400, 4800, and 9600.

Use these steps to access and set the baud rate:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.
3. Position the cursor beside Baud Rate and press **CHANGE** to set the desired baud rate.

   Note: The value displayed on the screen is always the active baud rate.

Pump

This feature lets you turn the pump on or off and is independent of whether or not the lamp is lit.

Use these steps to access and activate or deactivate the Pump.

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.
3. Position the cursor beside Pump and press **ON/OFF** to activate or deactivate the pump.

Note: Running the 580S II (with the lamp lit) while connected to the charger and the pump turned off is one method of cleaning the lamp. The pump can also be run with the lamp off to purge the system or to collect a bag sample from the sample exit fitting. For more information, refer to Chapter 5, "Maintenance."

Edit Mode

This feature lets you choose between alphanumeric or numeric characters only when creating identifiers. Identifiers are used in the datalogger to label stored data points and to enter the instrument and user ID numbers. If possible, it is recommended that the numeric mode be used, because this mode allows faster and easier entry of identifiers.

Use these steps to access and set the Edit Mode:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.
3. Position the cursor beside Edit Mode and press **CHANGE** to set the mode.

Live Zero

This feature lets you set the 580S II to either display or suppress negative ppm readings in the Run Screen. Due to deposits that form on the UV lamp, photoionization detectors usually exhibit a negative drift over time. To avoid confusion regarding negative readings, the 580S II can be configured to display only positive readings and zero.

When this feature is *ON*, negative ppm readings can appear in the Run Screen. When it is OFF, only positive readings appear in the Run Screen. It is recommended that the 580S II operate with the Live Zero *ON*. The degree of negative drift can be used as a gauge to determine when the instrument needs recalibrating.

Use these steps to access and activate or deactivate Live Zero:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.
3. Position the cursor beside Live Zero and press **ON/OFF** to activate or deactivate the negative ppm readings.

Style Mode

This feature lets you set the notation of ppm values to be represented in the Run Screen as either U.S.A. standard decimal point notation or European standard comma notation. For example, a value displayed as 10.3 in U.S.A. mode is displayed as 10,3 in European mode.

Use these steps to access and set the Style Mode:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.
3. Position the cursor beside Style Mode and press **CHANGE** to set the style.

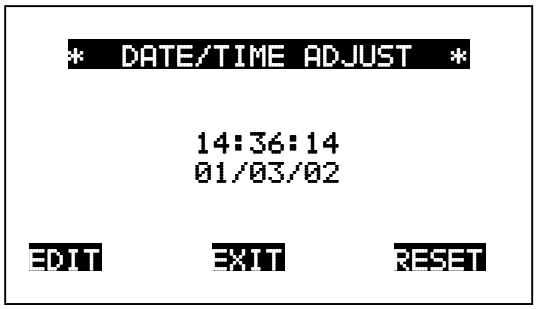
Date/Time

This feature lets you set the instrument date and time that is displayed in the Run screen, as shown below. The datalogger also marks each stored data point with the date and time.

Use these steps to access and set the Date/Time feature:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Setup Menu and press **SELECT**.
3. Position the cursor beside Date/Time* and press **SELECT** to change the setting as follows:

   - To change the Date/Time selection, press **EDIT**
   - To increment the digit, press **INC**.
   - To move the cursor to the next digit or between the date and time fields, press **CURSOR**.
   - To save the new date/time and return to the Setup Menu, press **SELECT**.



Date/Time Screen

*The time is displayed in 24-hour format (2:00 pm is 14:00 hours) and the date is displayed in standard U.S. format (mm/dd/yy).

REPORTS MENU

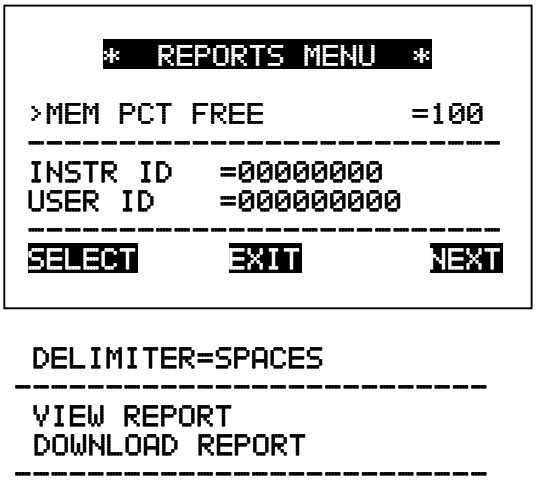
The Reports Menu, shown below, gives you access to features that are associated with the data logging and reporting functions of the Model 580S II.

Use these steps to access the Reports Menu:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Reports Menu and press **SELECT**.

Using the Reports Menu.

- To move the cursor to a menu selection, press **NEXT**.
- To modify or to toggle a new item ON or OFF, press **SELECT, EDIT,** or **CHANGE**.
- To return to the Main Menu, press **EXIT**.



Reports Menu

Mem PCT Free (Memory Percent Free)

The Memory Percent Free screen, shown below, lets you display the percent of unused memory remaining in the datalogger. The instrument can store approximately 4095 data points in memory; each entry decrements the available memory space by one. The exact number of records that can be stored in the datalogger varies, because of the differences in the type of information that might be stored. For example, information such as instrument ID, user ID, and calibration records, all using varying amounts of memory, can be stored in the datalogger.

Note: When memory space is depleted, an *Out of Memory* message appears in the Run Screen below the date. It is recommended, at this time, to download the datalogger and clear the memory of all log entries.

Use these steps to access the Mem PCT Free screen:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Reports Menu and press **SELECT**.
3. Position the cursor beside Mem PCT Free and press **SELECT**.

Using the Mem PCT Free screen:

- To clear the memory of all logged entries, press **RESET**. The instrument prompts you to confirm the action.

  Note: Once the memory is cleared, the records cannot be recovered.

- To clear the memory and return to the Reports Menu, press **YES**.
- To return to the Reports Menu without clearing the memory, press **EXIT** or **NO**.

Mem PCT Free Screen

Instrument (Instr) ID and User ID

These features let you identify each instrument and operator with unique identification numbers. These IDs are included in the logged data reports that are downloaded (see "Download Report" later in this section).

Use these steps to access the Instrument and User IDs:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Reports Menu and press **SELECT**.
3. Position the cursor beside Instr ID or User ID and press **EDIT** to change the ID as follows:

   - To increment the digit, press **INC**.
   - To move the cursor to the next digit, press **CURSOR**.
   - To save the changes, press **DONE**.

   For Alphanumeric:

   - To save the changes, position the cursor on the asterisk (*) and press **SELECT**.

   Note: If the Edit Mode is set to alphanumeric, both letters and numbers can be used as identifiers.

Delimiter

Reports from the datalogger can be printed using two types of delimiters: commas or spaces. This feature lets you set the delimiter, thus enabling information to be downloaded to a variety of databases. For spreadsheets, comma delimited data is recommended.

Use these steps to access and set the Delimiter feature:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Reports Menu and press **SELECT**.
3. Position the cursor beside Delimiter and press **CHANGE** to set the delimiter.

View Report

The View Report screen lets you review the data currently stored in the datalogger. The records consist of data points containing date, time, alphanumeric identifier, and ppm reading, as shown below. As discussed earlier, the ppm value can be the maximum value recorded during a specified interval (Max Hold), an average value recorded during a specified interval (T.W.A.), or the instantaneous reading taken at the time indicated.

Use these steps to access the View Report screen:

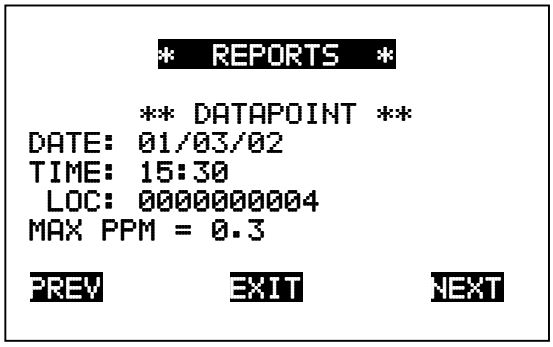
1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Reports Menu and press **SELECT**.
3. Position the cursor beside View Report and press **SELECT**.

Using the Reports Screen:

- To review a previous data point or element, press **PREV**.
- To review the succeeding data point or element, press **NEXT**.

Note: Each report contains information relating to the instrument and user ID numbers, calibration data, dilution, and so fourth. Although this information is visible when downloaded to a computer or printer, to save space on the display, it appears as *Header Record,* or *Calibration Record,* etc. These records can be bypassed to view only the logged data point records.

- To return to the Reports Menu, press **EXIT**.



View Report Screen

Download Report

The Download Report screen lets you send all data collected in the datalogger to the serial port, and then download it to a printer or computer. The data includes a descriptive header, calibration data, dilution data, and stored data points with the date, time, alphanumeric identifier, and ppm reading.

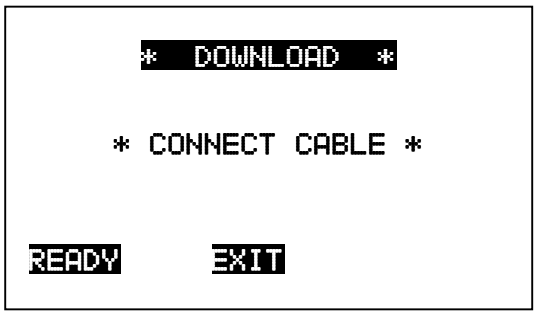
This report can be downloaded to a computer using the EZ Connect software included with your instrument, or any third party software. For more information about EZ Connect software, refer to Chapter 4, "RS-232 Communications and EZ Connect Software."

Use these steps to access the Download Report screen:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Reports Menu and press **SELECT**.
3. Position the cursor beside Download Report and press **SELECT**. If there are no records in the datalogger, a *Log Empty* message briefly appears and the instrument returns to the Reports Menu.

Using the Download Report screen:

- When prompted, connect the instrument to a computer using the cable supplied.
- To download a report, press **READY**. A message indicating that the instrument is transmitting data appears. When completed, it returns to the Reports Menu.
- To return to the Reports Menu without downloading a report, press **EXIT**.



Download Report Screen

RESPONSE FACTORS

Response factors are multipliers that are used to correct for the relative response levels produced by different organic compounds. For example, if the instrument is calibrated with isobutylene and used to measure benzene, a response factor can be used to correct for differences in PID sensitivity to these two compounds. The Model 580S II can store, recall, and use up to 20 response factors. The response factors are entered into memory using the EZ Connect software program for the PC. Once the response factor is in memory, it can be recalled and used at a later date. The default value is 1.00 and does not alter the instrument reading. For more information about the EZ Connect Software, refer to Chapter 4, "RS-232 and EZ Connect Software."

Note: Response factors can only be edited using the EZ Connect software.

Response factors are calculated in the laboratory as a ratio of the actual concentration of a test gas divided by the instrument reading that the test gas produces. For example, if the actual ppm concentration of a benzene source were 10 ppm, and the instrument read 16 ppm, based on an isobutylene calibration, the response factor is 0.63 (10/16). This factor is entered in the response factor table and recalled for use whenever benzene is measured. For a description of the response factors, refer to Chapter 7, "Calibration and Use of Response Factors."

Use these steps to access the Response Factors screen:

1. Start at the Main Menu.
2. With the **NEXT** button, position the cursor beside Response Factors and press **SELECT**.

Using the Response Factor screens:

- To scroll up the list of response factors, press **PREV** (the black bar indicates the selected factor).
- To scroll down the list of response factors, press **NEXT**.
- To choose a response factor and return to the Main Menu, press **SELECT**.

Note: The value of the default response factor can be changed if the required response factor is known, but not available in the list of response factors. If a response factor other than 1.0 is selected, the value appears in the upper left hand corner of the Run screen.

To change the default response factor value, press **SELECT** and set as follows:

- To increment the digit that the cursor is over, press **INC**.
- To move the cursor to the next digit, press **CURSOR**.
- To save the new response factor, press **DONE**.

CHAPTER 4

RS-232 AND EZ CONNECT SOFTWARE

The EZ Connect software is a Microsoft® Windows based application that enables communication between the Model 580S II and a personal computer. Many of the features controlled directly from the instrument's pushbuttons can be accessed remotely using this software. The EZ Connect software is designed to run on a 32-bit version of the Microsoft® Windows operating systems, and follows the conventions of Microsoft® Windows. A general knowledge of Microsoft® Windows is presumed. This chapter briefly describes the features of the EZ Connect software. For a more complete description of each operation, refer to the appropriate section in Chapter 3, "Operation."

INSTALLATION AND ACCESS

Use the these steps to install the software:

1. Insert disk 1 of 2 in the floppy disk drive.
2. From the Start menu, select **RUN**.
3. Type **a:setup** (where "a" is the drive letter of the floppy disk drive) and click **OK**.
4. Follow the on-screen instructions to complete the software installation process.

To use the EZ Connect software, your Model 580S II must be connected to the computer's serial port using the supplied RS-232 cable. It is suggested that the supplied RS-232 cable be used since there are a number of pin-through variations among RS-232 cables.

> **Note:** If the computer has a 25-pin Com Port, a 9 to 25-pin adapter (not supplied), must be used.

To access the EZ Connect software, click **Start →Programs →EZ Connect**. The EZ Connect Main Screen appears. The following section describes the Main Screen.

MAIN SCREEN

The Main screen of the EZ Connect software, shown below, includes pull-down menus, function buttons, and a status panel. The contents of the pull-down menus and corresponding buttons are described later in this section.

The status panel is used to display the action of each function button. When the mouse pointer is placed over a button, its function is displayed in the status panel. For example, in Figure 4-1, the pointer is positioned over the Calibration button and the status panel is displaying "Modify the calibration settings." This indicates that the calibration button is used to modify various calibration settings.

Items that appear dimmed are unavailable while the EZ Connect software and the Model 580S II are in their current operational state. For example, in Figure 4-1 the Settings/Retrieve and Settings/Transmit appear dimmed and cannot be accessed until the EZ Connect software is connected to the Model 580S II.

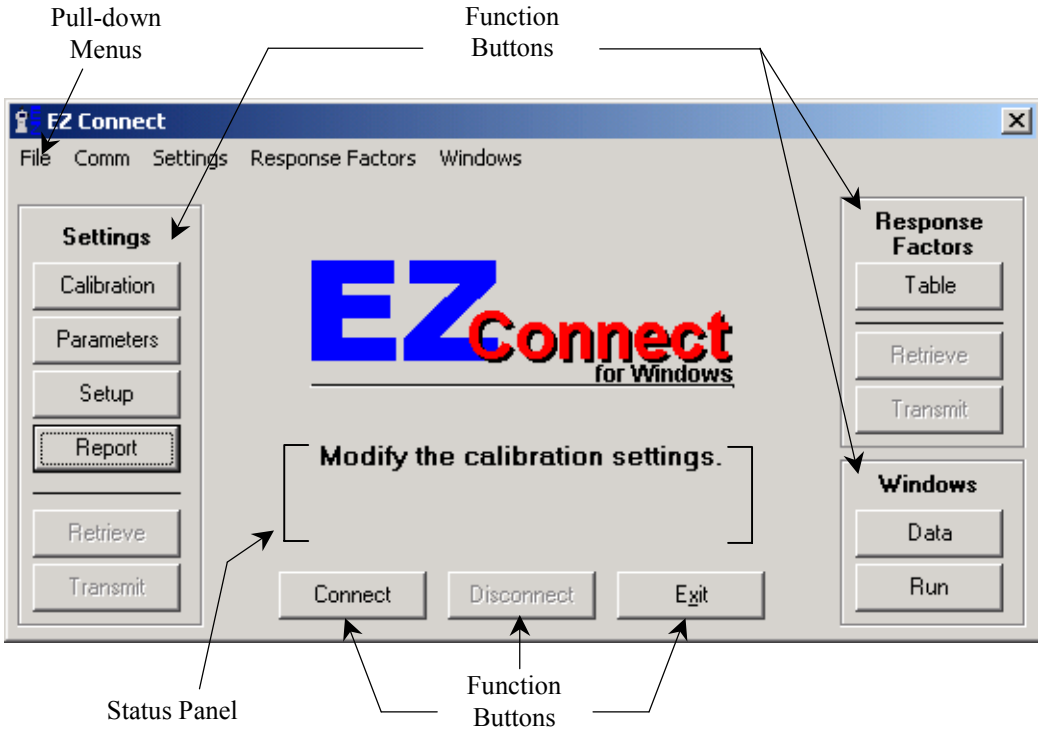


Figure 4-1. Main Menu, EZ Connect

FILE MENU

The File Menu (see Figure 4-2) lets you retrieve and load previously saved settings, and save instrument settings to a disk. Each selection included in the File Menu is described below.

Figure 4-2. File Menu

Restore Default Settings

This selection lets you restore the instrument to the factory default settings. During the initial startup of the EZ Connect software, the factory defaults are created. Use these steps to restore the factory default settings:

1. From the File menu, select **Restore Default Settings**.
2. At the prompt, click **OK** to execute the action. **Cancel** closes the EZ Connect prompt window.

Load Settings

This selection lets you retrieve and load settings that were previously saved to a disk or your computer. Use these steps to load settings:

1. From the File menu, select **Load Settings**.
2. At the Load 580EZ settings window, locate and click the settings file that you want to retrieve.
3. Click **Open** to access the file.
4. From the Main Screen, click **Transmit**. Transmit loads the settings into the Model 580S II.

Save Settings

This selection lets you save settings to disk so that they can be retrieved and reused. Use these steps to save settings:

1. From the File menu, select **Save Settings**.
2. At the Save 580EZ settings window, name the settings file that you want to save, and then click **Save**.
3. To reuse these settings, use the steps for *Load Settings*.

Exit

This selection lets you close the EZ Connect program. The Exit button, located at the bottom of the Main screen, performs the same action.

COMM MENU

The Comm Menu (see Figure 4-3) lets you connect and disconnect the link between the computer and the Model 580S II. This menu also establishes the baud rate between the computer and the instrument, and selects the computer port through which the communication occurs.

Figure 4-3. Comm Menu

Connect

This selection lets you open the serial port and establish a link between the computer and the Model 580S II. The same function can be performed using the Connect button located at the bottom of the screen. Before a link can be established, the supplied RS-232 cable must be connected from the Model 580S II to the computer.

Disconnect

This selection lets you terminate the link between the computer and the Model 580S II. The baud rate and port settings can be changed only when the link between the Model 580S II and the computer is closed. The same function can be performed using the Disconnect button located at the bottom of the screen.

Setup

This selection lets you set the baud rate and select the communication port (see Figure 4-4). The communication port is usually Com 1 or Com 2, and must be selected to match the hardware configuration of your computer. If an incorrect Com port is selected, the EZ connect program is unable to establish communication with the Model 580S II. The baud rate is normally set to 9600 and must match the baud rate set in the Model 580S II Setup Menu.

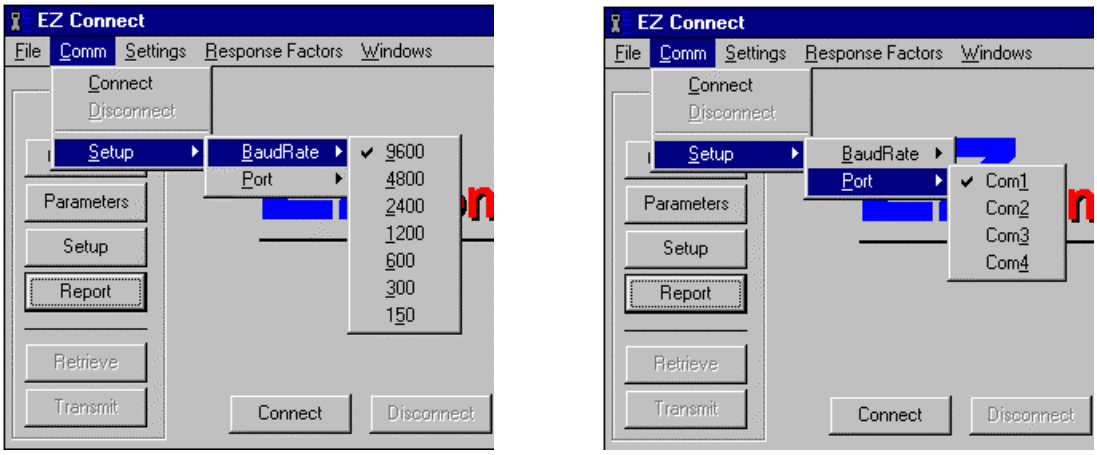


Figure 4-4. Comm Menu, Baud Rate and Port Selections

SETTINGS MENU

The Settings Menu (see Figure 4-5) is similar to the Model 580S II's Main Menu. It gives you computer access to many of the calibration, parameter, setup, and report operations that are normally accessed directly from the Model 580S II. The buttons located under the *Settings* section of the Main Screen perform the same functions. For detailed information regarding these parameter settings, refer to the appropriate section in Chapter 3, "Operation."

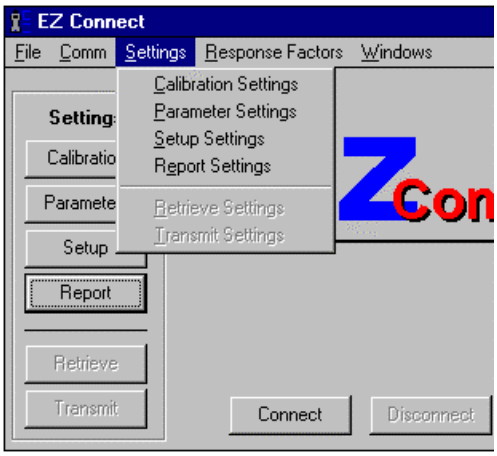


Figure 4-5. Settings Menu

Calibration Settings

This selection lets you access and set the low span and high span gas concentration settings. The same function can be performed using the Calibration button located in the *Settings* section of the Main Screen.

Parameter Settings

This selection lets you access and set these parameters; Auto Log/Interval, Time Weighted Average (TWA)/Interval, Dilution/Ratio, Maximum Hold, Averaging Time, Recorder Range, Peak Alarm, and STEL Alarm. The same functions can be accessed using the Parameters button located in the *Settings* section of the Main Screen.

Setup Settings

This selection lets you access the Backlight, Speaker, Edit Mode, Live Zero, Lamp, and Style Mode settings. The same function can be accessed using the Setup button located in the *Settings* section of the Main Screen.

Report Settings

This selection lets you access the Instrument ID, User ID, and Download Format. The same function can be accessed using the Report button located in the *Settings* section of the Main Screen. If the instrument is operating in Run mode, while using the Report Settings, the *Memory Reset* message appears.

Note: The following two selections, Retrieve Settings and Transmit Settings, are used to move information between the Model 580S II and EZ Connect program running on a PC. Changes in operating parameters that are made from the computer are not sent to the Model 580S II until the Transmit command is issued. Changes in the status or settings of the Model 580S II are not automatically updated in the EZ Connect program. To ensure that the settings shown in the EZ Connect program match those of the actual instrument, click the Transmit Settings or Retrieve Settings buttons after changing instrument settings.

Retrieve Settings

This selection lets you retrieve the current settings from the Model 580S II. Settings currently stored in the EZ Connect program are overwritten once values are retrieved. The same function can be performed using the Retrieve button located below the *Settings* section of the Main Screen.

Transmit Settings

This selection lets you transmit settings to the Model 580S II. Settings currently held in the instrument's memory are overwritten once the values are transmitted. The same function can be performed using the Transmit button located below the *Settings* section of the Main Screen.

RESPONSE FACTOR MENU

The Response Factor Menu (see Figure 4-6) lets you edit or add new values to the response factor table. This menu also lets you save the table to disk, retrieve existing response factors from the instrument, or send new response factors to the instrument.

Response Factor selections can be accessed either from the Response Factor Menu or by pressing the Response Factor Table, Retrieve, or Transmit buttons on the right side of the Main screen.

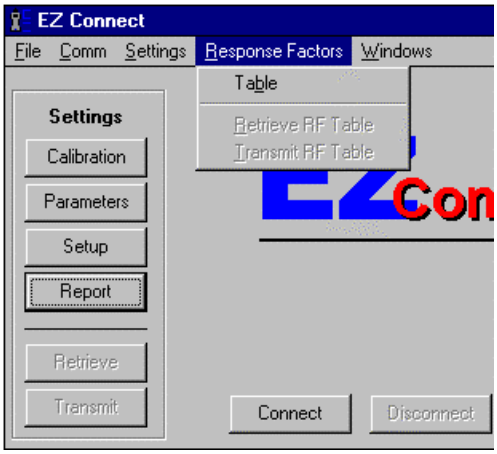


Figure 4-6. Response Factor Menu

Table

The Table screen (see Figure 4-7) lets you view and edit response factors. Each data field and button, displayed in the Table screen, is described below.

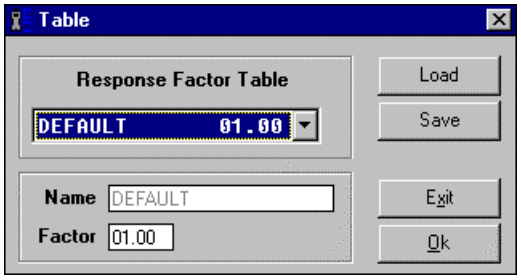


Figure 4-7. Response Factor Table

Response Factor Table: To make a selection from the response factor table, click the pull-down arrow.

Name: To rename a response factor, select the existing characters in the Name box and type over them. The first response factor, "Default," cannot be changed.

Factor: To edit the response factor, select the existing digits in the "Factor" box and type over them.

Load: This button retrieves an existing response factor file from disk.

Save: This button saves the response factor file to disk.

Exit: This button exits the Response Factor table screen without making the changes and returns to the Main screen.

OK: This button makes the changes, exits the Response Factor table, and returns to the Main screen.

Retrieve RF Table

This selection lets you retrieve the current table of response factors from the instrument. The same function can be performed using the **Retrieve** button located below the Response Factors section of the EZ Connect Main Menu screen.

Transmit RF Table

This selection lets you send the response factor table from the EZ Connect program to the instrument. The same function can be performed using the **Transmit** button located below the Response Factors section of the EZ Connect Main Menu screen.

WINDOWS MENU

The Windows Menu (see Figure 4-8) lets you access a Data Window and a Run Window. Both of these functions can be accessed with the Windows Data and Run buttons on the Main screen.

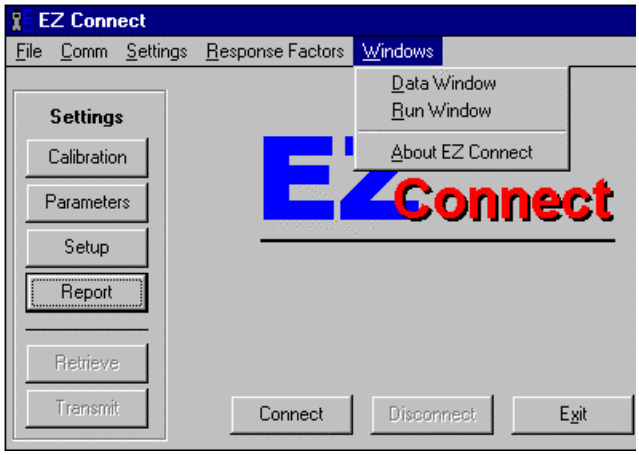


Figure 4-8. Windows Menu

Data Window

The Data Window (see Figure 4-9) displays the data stored in the Model 580S II data logger. Since not all of the data can fit on a single window, the scroll bar on the right hand side of the window lets you view data that cannot fit on the screen. The data window also includes a File Menu and three command buttons; Retrieve, Clear, and Exit.

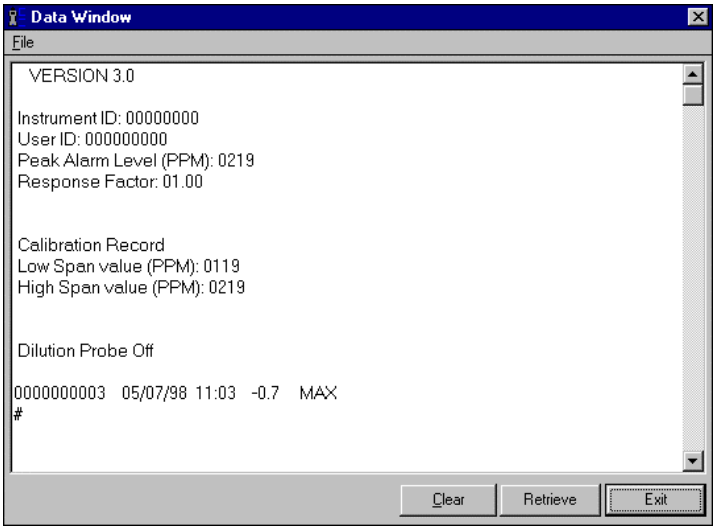


Figure 4-9. Data Window

Retrieve: This button copies data from the instrument to the computer.

Clear: This button erases the current data.

Note: This button does not erase the Model 580S II datalogger. It only clears the EZ Connect window.

Exit: This button closes the Data window and returns to the Main screen.

The Data Window/File Menu (see Figure 4-10) includes these options:

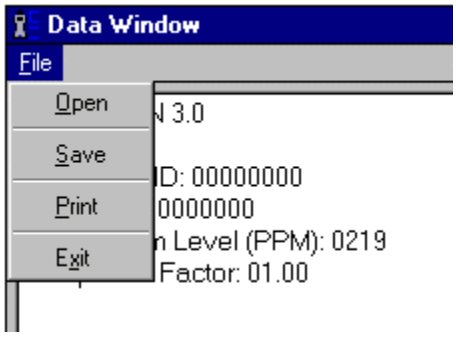


Figure 4-10. Data Window/File Menu

Open: Retrieves a previously saved data file from disk.

Save: Saves a data file to disk.

Print: Prints the current data file using the default printer.

Exit: Closes the Data Window.

Run Window

The Run Window (see Figure 4-11) is a real-time visual representation of the Model 580S II's current concentration readings.

Note: Before the Run Window can be used, the instrument must be in the Run mode.

The Run Window can be accessed with the EZ Connect software either from the Windows Menu or by pressing the Windows/Run button on the Main screen.

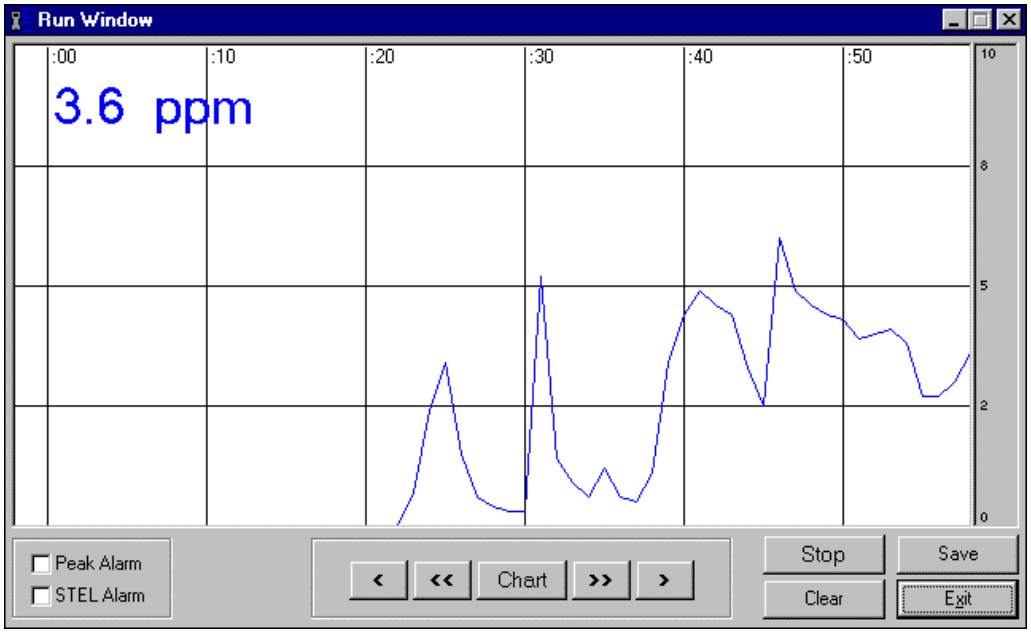


Figure 4-11. Run Window

The vertical axis represents the concentration readings in ppm. The scale of this axis can be changed from the Recorder Range selection, either in the instrument itself or through the EZ Connect software. If the range is changed at the instrument, the new settings must be retrieved using the EZ Connect Retrieve command (refer to the "Retrieve Settings" in the Settings Menu section of this chapter).

The horizontal axis represents elapsed time, with each division representing a 10-second interval. The divisions are not adjustable. The instrument readings are shown in blue. The Run Window displays ppm readings for a maximum period of 30 minutes and resets at the end of that time. The window is updated once per second.

The bottom of the Run Window includes the following options:

Peak Alarm: This check box inserts a red horizontal line at the peak alarm threshold.

STEL Alarm: This check box inserts a green horizontal line at the STEL alarm threshold.

Save: Saves the logged data that can be loaded into a spreadsheet or other program as a text file.

Clear: Clears the Run Window to allow a new set of readings. When this selection is accessed, a dialog box appears to ask for confirmation since clearing the window will erase all stored data.

<, <<, >>, >. These buttons let you scroll backward or forward in time by 1 second increments (back <, forward >), or by 60 second increments (back <<, forward >>).

Chart: Brings the screen back to the current time and restarts real-time updates.

Go/Stop: Go/Stop is a toggle button that lets you start or stop the data collection.

Exit:. Closes the Run Window.

About EZ Connect

The About EZ Connect window contains the version number of the EZ Connect software, and TEI's company address, Internet homepage address, and email address.

CHAPTER 5

MAINTENANCE

This chapter provides detailed procedures for performing maintenance tasks on the Model 580S II.

SPARE PARTS

Table 5-1 lists the recommended spare parts for the Model 580S II.

Part Number	Description
12902	Water Trap Filter
4158	Charcoal (for scrubber)
13171	Quick Connect Probe O-Ring
12689	Internal Probe Cap O-Ring
12689	Detector Module Assembly O-Ring
12602	Detector Module Assembly
12860	Lamp (10.6 eV)
12901	Lamp (11.8 eV)
18024	Battery Cell Assembly
13080	Battery Pack (UL Approved)
18020	Battery Pack (KEMA Approved)

Table 5-1. Spare Parts

REMOVING AND INSTALLING THE WATER TRAP FILTER, DETECTOR MODULE ASSEMBLY, AND UV LAMP

The water trap filter, detector module assembly, and UV lamp are easily removed from the 580S II for routine cleaning or replacement. It is important to keep critical areas, specifically the lamp window (flat part of the lamp) and the metal parts of the detector module assembly, clean and free of contaminants such as oil from hands and fingers.

Use these steps and Figure 5-1 to remove the water trap filter, detector module assembly, and UV lamp. To maintain cleanliness, place each component on a clean surface after removing them from the instrument.

1. Unscrew the probe cap.
2. Grasp the edges of the water trap filter and remove it.
3. Grasp each side of the detector module assembly and carefully tilt the instrument until the detector module slides out from the sleeve.
4. Using the lamp extension tool provided, gently grasp the UV lamp on each side (avoid getting finger oil on the flat part of the lamp), and remove it from the sleeve.

Use these steps and Figure 5-1 to install the water trap filter, detector module assembly, and UV lamp.

1. Place the UV lamp into the middle of the sleeve, as shown.
2. To maintain cleanliness, grasp the edge of the detector module assembly and re-insert it, O-ring side up, into the sleeve.
3. Grasp the edges of the detector module and rotate it until the notch aligns with the pins, and it seats properly.
4. Grasp the edges of the water trap filter and place it over the center of the detector module O-ring.
5. Replace the probe cap. Do not over tighten the probe cap.

Note: The detector module assembly is designed to center the water trap filter, but if it is not aligned properly, it can become wedged between the probe cap and the sleeve, causing leakage. After reassembling the components, you should not be able to see more than one full thread of sleeve.

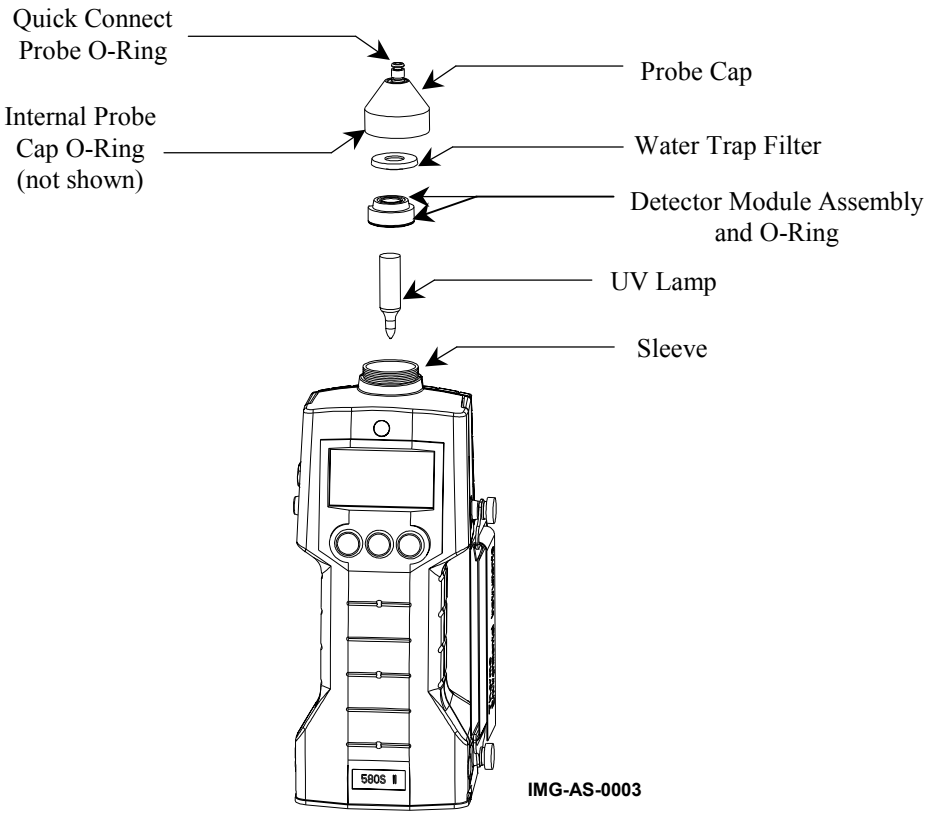


Figure 5-1. Model 580 SII, Exploded Front View

CLEANING THE UV LAMP

Due to deposits that form on the UV lamp window, the PID lamp must be removed and cleaned on a regular basis. The frequency of cleaning is dependent on how long the Model 580S II has been operating, and factors such as the amount of contaminants in the sample. In general, the lamp must be cleaned whenever the instrument becomes difficult to calibrate. If the calibration procedure fails due to poor lamp performance, an error message instructing you to clean the lamp appears on the display. The procedures for cleaning the two different lamp types are described below.

Use the these steps to clean the standard 10.6 eV lamp:

1. Place a small amount of aluminum oxide scouring powder (provided with the Model 580S II) on the window of the UV lamp.
2. Gently scour the window surface in a circular motion with a soft lint-free tissue or cloth.
3. Gently remove the remaining powder from the window with a clean tissue or blow the dust off with clean compressed air.

Use these steps to clean the 11.8 eV lamp:

1. Gently wipe the lamp window with anhydrous alcohol on a cotton swab, followed by an anhydrous methanol or ethanol rinse.
2. Immediately wipe the lamp dry with a soft tissue. To avoid a film, do not allow the alcohol to remain on the lamp's surface.

Note: Stubborn films may need to be cleaned multiple times for complete removal. Do not clean the 11.8 eV lamp with the aluminum oxide scoring powder provided with the Model 580S II; the powder scratches the lamp window.

Self-Cleaning Procedure

As an alternative to the cleaning procedure described above, the 10.6 eV lamp can be restored using the following over-night self-cleaning procedure:

1. Connect the 580S II to the battery charger.
2. Turn on the instrument and press **RUN** to light the lamp.
3. From the Main menu, select **SETTINGS**.
4. Scroll down to Pump and select **OFF**.
5. Leave the instrument on, but with the pump off for the entire charge cycle.

REPLACING THE WATER TRAP FILTER

The water trap filter, located under the probe cap, effectively stops water and particulates from entering the detector module assembly. When the water trap is dirty, it begins to discolor, and eventually restricts the sample flow into the instrument. If this occurs or if the filter is contaminated, discard it and replace it with a new filter. When replacing the water trap filter, refer to the instructions at the beginning of this chapter.

BATTERY CHARGING

The Model 580S II has a 7.2 volt NiCad rechargeable battery pack. With the instrument off, a normal recharge requires approximately five hours. Additional time is needed if the instrument is running while the battery is charging.

IMPORTANT: A low battery symbol appears on the screen when there is approximately one hour of operating time remaining.

> **! CAUTION:** The battery is UL/KEMA approved for replacement in a hazardous location, but it **is not** UL/KEMA approved for recharging in a hazardous location.

The battery pack must be charged overnight after a day of use. There is no danger of overcharging the battery pack. The charger switches to trickle charge when the battery pack reaches full charge.

Charging the Battery Pack

Use these steps and Figure 5-2 to charge the battery pack:

1. Connect the battery charger to the Model 580S II using the battery charger port located on the access panel.
2. Plug the AC receptacle into an appropriate AC outlet. When the green LED is lit, the battery is fully charged.

   Note: There is a green and a red LED located on the battery charger. These LED's indicate the status of the battery charge. If the green LED is lit, the battery is fully charged (trickle charging). If the red LED is lit, the battery is charging (fast charging).

3. To disconnect the battery charger, depress the button on the charger plug while pulling it firmly away from the access panel.

If the optional spare battery pack was purchased, it can be charged outside of the 580S II using the standard battery charger and the optional external battery charger adapter.

Automobile Charger

Alternatively, the 580S II can be charged from an automobile lighter socket using the car charger adapter. The adapter plugs into the 580S II battery charger in the same socket as the standard AC wall mount transformer. Due to power requirements, it is recommended that the car charger adapter be used only when the car is running.

Maintaining Battery Life

There is a recessed button on the battery charger labeled *discharge*. Approximately once every month, press this button while the unit is off and plugged into the charger. This fully discharges and then recharges the battery cells and is intended to increase cell longevity. The battery is fully charged once this cycle is complete. The discharge/charge cycle requires approximately 14 hours to complete, and during this time, both LEDs are lit.

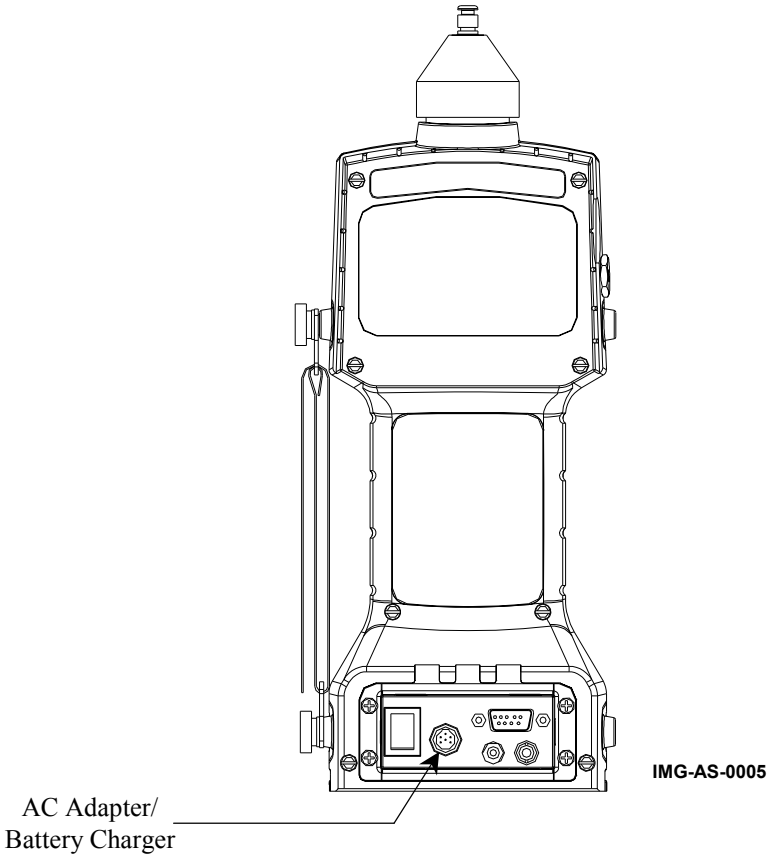


Figure 5-2. Model 580S II AC Adapter/Battery Charger

REPLACING THE CHARCOAL IN THE CHARCOAL SCRUBBER PROBE AND DILUTION PROBE

The charcoal scrubber is used to zero the instrument during calibration and prevent hydrocarbons from entering the detector. The concentration of hydrocarbons in the environment determines the operating life of the charcoal scrubber. The charcoal must be replaced if the concentration ppm reading increases when a known hydrocarbon source such as calibration gas is introduced through the probe, or if attaching the scrubber causes the reading to increase relative to ambient readings.

Use these steps and Figure 5-3 to replace the charcoal in the scrubber probe:

1. Holding the probe with the quick connect attachment on top, unscrew the charcoal holder from the spring holder and slowly separate the pieces.
2. Remove the scrubber screen and the mesh cloth disk from the top of the charcoal holder.
3. Remove and discard the used charcoal. If the second mesh cloth disk and screen comes out with the charcoal, reinsert the screen and then the mesh cloth into the charcoal holder.
4. Refill the charcoal holder with fresh charcoal from a sealed container; do not overfill.
5. Tap the scrubber to settle the charcoal, and leave enough space to fit the mesh cloth disk and scrubber screen on top of the charcoal. Replacement charcoal is available from TEI (Part Number 4158).
6. Place the mesh cloth disk on top of the charcoal and place the scrubber screen on top of the mesh cloth disk.
7. Make sure the O-ring is seated properly in the spring holder and place the spring in the holder.
8. Thread the spring holder back on the charcoal holder until it is snug.

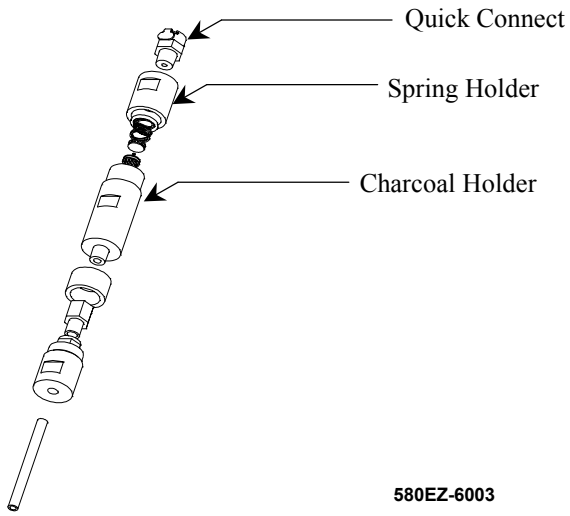


Figure 5-3. Charcoal Scrubber Probe

The optional dilution probe also contains charcoal that must be replaced if the ppm reading increases when a known hydrocarbon source such as calibration gas is introduced through the side arm of the probe.

Use these steps and Figure 5-4 to replace the charcoal in the dilution probe:

1. Holding the probe with the quick connect attachment on top, unscrew the charcoal holder from the spring holder and slowly separate the pieces.
2. Remove the screen and the mesh cloth disk from the top of the charcoal holder.
3. Remove and discard the used charcoal. If the second mesh cloth disk and screen comes out with the charcoal, reinsert the screen and then the mesh cloth into the charcoal holder.
4. Refill the charcoal holder with charcoal; do not overfill.
5. Tap the probe to settle the charcoal, and leave enough space to fit the mesh cloth disk and screen on top of the charcoal. Replacement charcoal is available from TEI (Part Number 4158).
6. Place the mesh cloth disk on top of the charcoal and place the screen on top of the mesh cloth disk.
7. Make sure the O-ring is seated properly in the spring holder and place the spring in the holder.
8. Thread the spring holder back on the charcoal holder until it is snug.

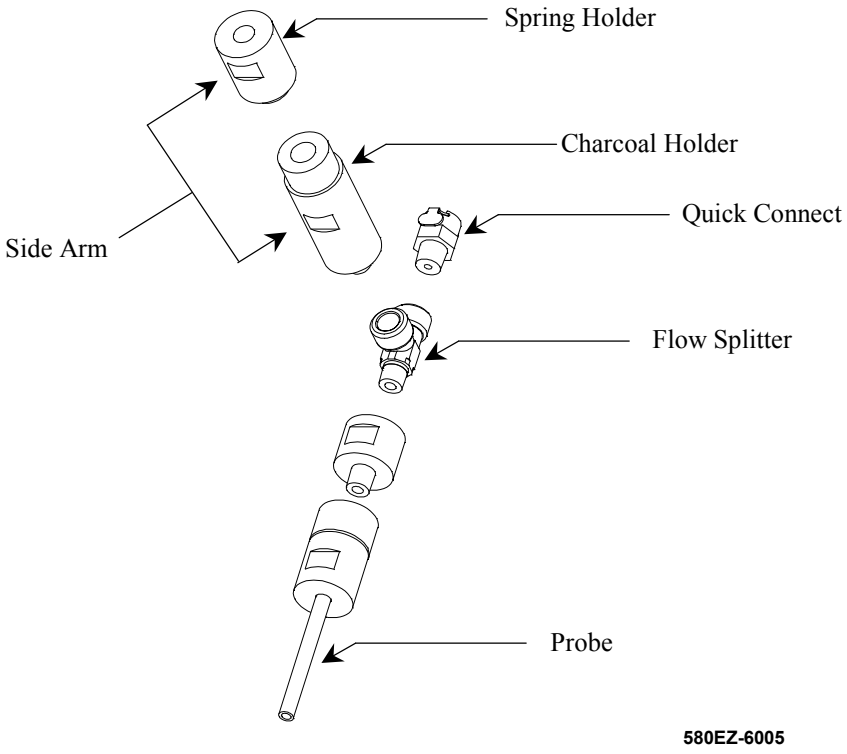


Figure 5-4. Dilution Probe

CLEANING THE DETECTOR MODULE ASSEMBLY

Depending on the frequency of use and environmental conditions, the Model 580S II detector module requires periodic cleaning. When used daily, it is recommended that an instrument be cleaned every three to six months. Under particularly humid conditions, a dirty or contaminated detector can exhibit inconsistent or extremely high readings (spikes).

The detector module can be cleaned with a mild laboratory detergent such as *Alconox*, followed by a rinse with distilled or de-ionized water.

Use these steps to clean the detector module assembly:

1. Remove the detector module assembly from the instrument as described earlier in this chapter.
2. Place the detector module into a small metal or glass container with enough cleaning solution to submerge the entire detector module.
3. If available, place the container in an ultrasonic cleaner for 20 minutes. Otherwise, let the detector module soak for approximately 60 minutes, frequently stirring the cleaning solution or gently shaking the container.
4. Rinse the detector module assembly thoroughly with clean tap water followed by a rinse with distilled or de-ionized water.

   Note: Rinsing with tap water alone can leave a residue or deposits that can interfere with operation.

5. Remove any excess water from the detector module assembly using clean compressed air. Be sure to remove the water inside the detector module as well.
6. If available, place the detector module assembly in a 60^{o} C (140^{o} F) oven for several hours to evaporate any water remaining inside the detector module assembly. Otherwise, air-dry the module 24 hours.

   Note: To ensure accurate readings, the detector module assembly must be completely dry before use.

7. Re-install the detector module assembly into the instrument.
8. Run the instrument overnight before attempting a calibration to ensure proper operation.

CHAPTER 6
TROUBLESHOOTING

This chapter provides a troubleshooting guide for locating and correcting problems that can affect the normal operation of the Model 580S II. This guide describes malfunctions, possible causes, and corrective actions. For additional assistance, contact Thermo Environmental Instruments' Customer Service department at 508-520-0430, 508-520-1460 (FAX), or web site: http://www.thermoei.com/.

TROUBLESHOOTING GUIDE

MALFUNCTION	POSSIBLE CAUSE	ACTION
Display is blank	Low battery/no power	Connect battery charger
	Blown fuse	Return, with battery charger, to TEI for service
No response to gas	Bad calibration	Re-calibrate or verify that the correct span gas is in use
	Response factor too low	Set response factor to 1.00
	Contaminated lamp	Clean lamp
	Poor contact to detector module assembly	Verify that the detector module assembly and water trap filter are installed correctly, and that the probe cap is tightened properly
Slow response time or pump not running	Clogged water trap	Replace water trap

MALFUNCTION	POSSIBLE CAUSE	ACTION
Model 580S II is not reading the correct calibration gas concentration	Incorrect Response Factor	Set response factor to 1.00
	Incorrect span gas concentration	Check the span gas concentration value to ensure it matches the concentration of the span gas cylinder or bag standard
	Unit has not been calibrated	Repeat calibration and check Calibration Report
Sample readings higher than Expected	Enhanced response due to known oxygen deficiency in sample	Check sample oxygen content and recalibrate with nitrogen based span gas if sample is oxygen deficient
	High humidity and contamination affecting the detector module assembly	Clean or replace the detector module assembly
	Condensation in detector	Allow instrument temperature to equilibrate with the sample temperature
	Incorrect response factor	Check response factor
	Unit has not been calibrated	Repeat calibration and check Calibration Report
Sample reading lower than expected	Signal suppressed by high methane or water concentration	Check sample for possible contaminants

MALFUNCTION	POSSIBLE CAUSE	ACTION
Sample reading lower than expected	Improper zeroing during calibration	Replace charcoal in scrubber or verify cleanliness of the sample bag
	Incorrect response factor	Check response factor
	Unit has not been calibrated	Repeat calibration and check Calibration Report
	Dilution is turned on in settings menu	Check and reset to *OFF*

CHAPTER 7

CALIBRATION AND USE OF RESPONSE FACTORS

The Model 580S II uses a photoionization detector that is capable of measuring various organic compounds at concentrations up to approximately 2500 ppm. As with all instrumentation, the ability to make accurate measurements with the Model 580S II is dependent upon proper calibration.

In general terms, calibration is the process that establishes a relationship between the detector's output signal, an electrical current measured in pico-amps, and the concentration of gas, usually expressed in ppm. Exposing the detector to one or more known concentrations of an organic compound and recording the detector's output at each test point, establishes this relationship. Once the response to known concentrations has been determined, a mathematical relationship can be developed that allows the concentration of unknowns to be calculated based on the detector response produced.

Some electronic instruments such as a voltmeter or oscilloscope can be calibrated once or on an infrequent basis and still produce accurate readings; however, chemical sensors are generally less stable and require more frequent calibration. In addition to normal drift that is experienced by all chemical sensors, a portable instrument such as the Model 580S II can also be affected by environmental factors, including ambient temperature and humidity. For these reasons, a stable factory calibration cannot be achieved and you must calibrate the instrument on a routine basis.

SELECTING A CALIBRATION GAS AND CONCENTRATION

In planning a calibration procedure, there are two important issues to consider: the choice of a specific organic gas and the calibration concentrations. As a rule, the best calibration gas is one that matches, as closely as possible, the actual composition of the sample. The concentration must also be similar to, or slightly higher than, the concentration expected in the actual sample.

For example, if the Model 580S II is measuring toluene emissions from a printing operation, the ideal span gas is a cylinder containing a known concentration of toluene in air. If the concentration is estimated based on past experience or other engineering considerations, the span gas must be prepared at a concentration slightly higher than that expected in the actual samples. Carefully selecting the span gas concentration avoids readings that require extrapolation outside the actual calibration curve.

While a span gas that simulates the sample provides the highest level of confidence in the measurements, it is not always practical to obtain this level of exactness. In these cases the calibration must be performed using a surrogate compound.

For most applications, the ideal calibration gas for the 580S II is isobutylene in air. Isobutylene is recommended because it provides a reliable response, is readily available from scientific gas suppliers, remains stable for long periods of time, and is not known to pose serious health risks. The concentration must be selected after considering the application. For example, if the application involves the measurement of head space vapors with an action level of 500 ppm, then select a calibration gas between 500 and 1000 ppm. Alternatively, if the application involves measuring worker exposures at only a few ppm, a 10 ppm calibration gas is more appropriate. For many applications, the 580S II can be calibrated with a cylinder containing approximately 100 ppm of isobutylene in air.

MODEL 580S II CALIBRATION OPTIONS

The Model 580S II lets you select either a two-point calibration, using a zero gas and a single calibration standard, or a three point calibration using a zero gas and two calibration standards. The three-point calibration is offered because self-quenching, which is inherent in photoionization systems, causes a slight non-linearity at high concentrations. This non-linearity does not constitute a problem for most applications as an accuracy of ±10% is achievable using a two-point calibration. However, if the application requires the highest possible accuracy over the widest possible concentration range, then a three-point calibration is beneficial. As a rule, if the measurement activities cover a concentration range exceeding 500 ppm, or if the application requires readings more than two times the span gas concentration, a three-point calibration can provide a noticeable improvement in performance.

Preparation of Zero Air

A reliable source of hydrocarbon-free zero air is required for calibration. The zero air is used to determine the baseline signal that the detector is expected to produce when there are no hydrocarbons in the sample. There are numerous ways to obtain hydrocarbon free air. The most reliable is to purchase a cylinder of certified zero air from a scientific gas supplier or directly from Thermo Environmental Instruments. Zero air can also be generated from standard compressed or house air using traps and filters or in the field using the Model 580S II's charcoal scrubber probe.

If zero air is generated from a compressor or house air system, it must be conditioned by running through a water and oil trap, a particulate filter, and a hydrocarbon trap containing activated charcoal. Filters and water traps are generally available from industrial supply houses, and gas scrubbers including charcoal are available from gas chromatography or scientific gas suppliers. Although these scrubber systems do not remove methane, the PID is not sensitive to this compound and the ability to establish an instrument zero is not affected.

For field use, the charcoal scrubber probe snaps onto the inlet fitting in place of the standard sampling probe and removes hydrocarbons from ambient air, as it is drawn into the instrument. If the charcoal scrubber is used, the charcoal eventually becomes saturated, at which point hydrocarbons begin to break through. For a quick test of the charcoal, attach the scrubber probe to the 580S II and then expose the inlet to a short burst of span gas. If the readings increase significantly, the charcoal must be replaced.

Preparing Span Gas

Either one or two calibration gases (span gases) containing known concentrations of hydrocarbons are needed. Because oxygen affects the instrument, span gases should be prepared in air, not nitrogen. The easiest and most reliable source of span gas is a certified cylinder. Pre-analyzed cylinders are available from Thermo Environmental Instruments or directly from scientific gas suppliers. As noted, isobutylene in air is the most common span gas for a PID; however, other organics can also be used. If a certified cylinder is not available, a standard from either a pure gas supply, or from a liquid can also be prepared. The simplest and most reliable method of preparation is the use of a gas-sampling bag, obtainable from most gas chromatography suppliers.

Connecting the Model 580S II to Calibration Gases

Calibration gases must be connected to the Model 580S II in a method that simulates actual sample introduction. For instance, the calibration gases must be connected to the probe with the water trap in place so, the instrument operates with its normal flow rate. If the charcoal scrubber probe or sampling bag is used, the instrument pump is allowed to draw in the sample. If calibration gases are provided from a cylinder, then an atmospheric dump (regulator and pressure vent) is needed.

When using the calibration kit, a pressure vent can be added by placing a TEE fitting between the cylinder and the Model 580S II (see Figure 7-1). A short piece of tubing must be attached to the third branch of the TEE and left open to the atmosphere. The flow rate from the cylinder must be adjusted to provide a small excess of flow that vents through the open arm of the TEE.

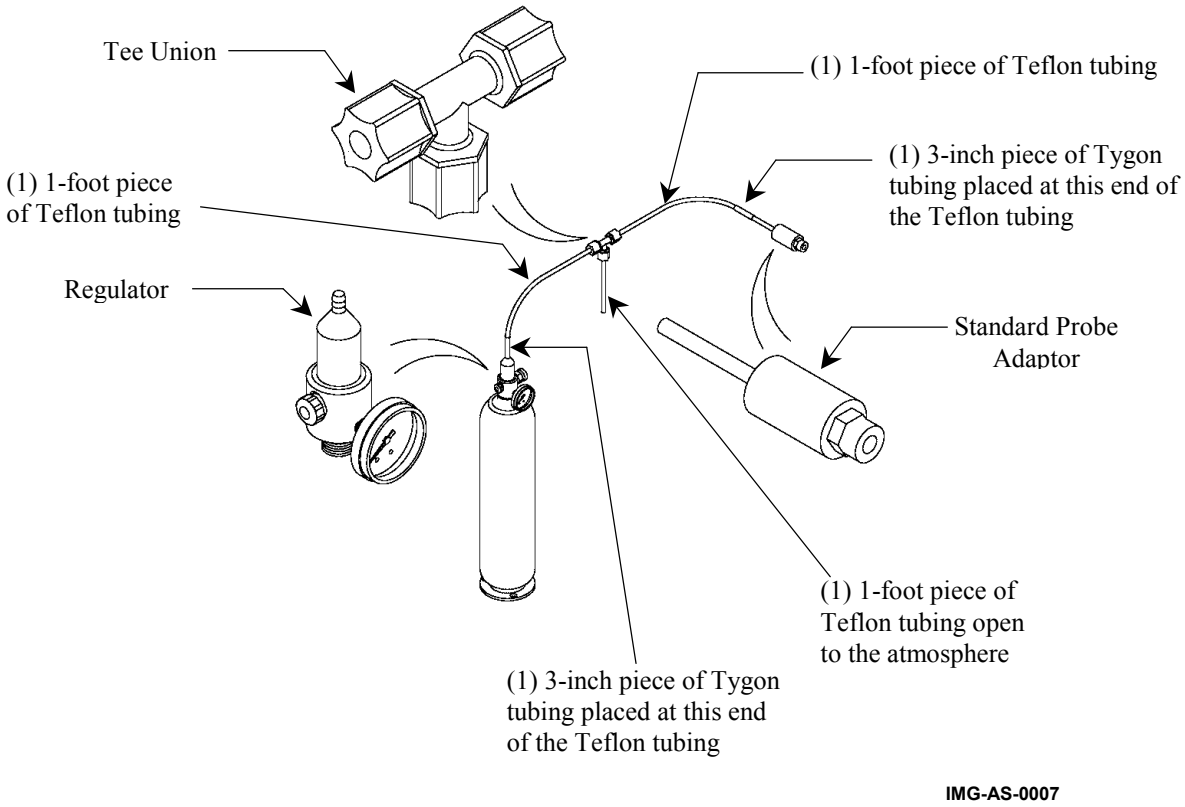


Figure 7-1. Calibration Kit

CALIBRATION PROCEDURE

This section provides instructions for two-point and three-point calibrations, and zero adjustment. For more information about the 580S II menu-driven software and related screens, refer to Chapter 3, "Operation."

Two-Point Calibration

Use this procedure to perform a two-point calibration:

1. Turn the Model 580S II's main power switch on and then press **RUN** to light the lamp and turn on the pump.

2. Let the instrument run for 5 to 15 minutes in the actual work environment so that the unit can stabilize at an ambient operating temperature and humidity.

3. Press **MENU**.

4. Move the cursor to **CALIBRATION MENU** and press **SELECT**.

5. Move the cursor to **LOW SPAN GAS**, press **EDIT**, and enter or edit the low span value to match the concentration of the span gas.

6. Press **DONE** to return to the Calibration Menu.

7. Move the cursor to **HIGH SPAN GAS**, press **EDIT**, enter a value of **0000** and press **DONE** to return to the Calibration Menu. A high span gas value of 0000 signals the instrument not to attempt a three-point calibration.

8. From The Calibration Menu, move the cursor to **CALIBRATE** and press **SELECT**.

9. Following the on-screen instructions, connect the zero air supply, wait 60 seconds, and then press **READY**. As indicated on the display, the Model 580S II adjusts the instrument zero to give a reading 0.0 ppm.

10. Wait for the on-screen prompt **CONNECT LOW GAS**, and then connect the span gas to the Model 580S II sampling probe. Wait 60 seconds and then press **READY**. The Model 580S II automatically adjusts the reading to match the span gas value that was previously entered as the low span concentration.

11. Press **EXIT**.

12. From the Main Menu press **RUN** to return to the normal run-time screen.

13. To check the calibration, sample the span gas directly from the cylinder while operating in the Run mode.

Three-Point Calibration

Use this procedure to perform a three-point calibration:

1. Turn the Model 580S II's main power switch on and then press **RUN** to light the lamp and turn on the pump.

2. Let the instrument run for 5 to 15 minutes in the actual work environment so that the unit can stabilize at an ambient operating temperature and humidity.

3. Press **MENU**.

4. Move the cursor to **CALIBRATION MENU** and press **SELECT**.

5. Move the cursor to **LOW SPAN GAS**, press **EDIT**, and enter or edit the low span value to match the concentration of the span gas.

6. Press **DONE** to return to the Calibration Menu.

7. Move the cursor to **HIGH SPAN GAS**, press **EDIT**, enter the concentration of the second calibration gas and press **DONE** to return to the Calibration Menu. A high span gas value, other than zero, signals the instrument to allow a three-point calibration.

8. From The Calibration Menu, move the cursor to **CALIBRATE** and press **SELECT**.

9. Following the on-screen instructions, connect the zero air supply, wait 60 seconds and then press **READY**. As indicated on the display, the Model 580S II adjusts the instrument zero to give a reading 0.0 ppm.

10. Wait for the on-screen prompt **CONNECT LOW GAS**, and then connect the low concentration span gas to the Model 580S II sampling probe. Wait 60 seconds and then press **READY**. The Model 580S II automatically adjusts the reading to match the span gas value that was previously entered as the low span concentration.

11. Wait for the on-screen prompt **CONNECT HIGH GAS**, and then connect the higher concentration span gas. Wait 60 seconds and then press **READY**. The Model 580S II automatically adjusts the reading to match the span gas value that was previously entered as the high span concentration.

12. Press **EXIT**.

13. From the Main Menu press **RUN** to return to the normal run-time screen.

14. To check the calibration, sample the span gas directly from the cylinder while operating in the Run mode.

Zero Adjust

During operation, the UV lamp used in photoionization detectors accumulates a film or coating of dirt. This film interferes with light transmission and causes the detector to display a slow, but visible negative drift. To compensate for this drift, the Model 580S II can be re-zeroed at any time without completing a full calibration. Use this procedure to zero adjust the instrument:

1. Start at the Main Menu, press **NEXT** to position the cursor on Calibration Menu, and then press **SELECT**.

2. Press **NEXT** to move the cursor down one line to **ZERO ADJUST**.

3. Press **SELECT**, and follow the prompts to connect the zero air supply or zero probe.

4. Wait 60 seconds and press **READY**. The Model 580S II automatically adjusts the zero and returns to the Calibration Menu.

5. Press **EXIT** and then **RUN** to return to normal operation.

USING RESPONSE FACTORS

Like most hydrocarbon monitors, the photoionization detector used in the Model 580S II responds to many different compounds. The signal strength produced by different compounds varies. For this reason, it is preferable to calibrate the instrument using the same compound that is measured in the field. It is also possible to calibrate using a surrogate compound such as isobutylene and to adjust the readings for known differences in response. The correction factor used in making this adjustment is called a Response Factor.

Response factors are determined in the laboratory by preparing a standard of known concentration and then taking a measurement with an instrument that has been calibrated with isobutylene. The response factor is calculated as the ratio of the true concentration of the sample divided by the instrument reading. For example, if the Model 580S II is calibrated with isobutlyene and used to sample a standard containing 100 ppm of benzene, the instrument reads 180 ppm. The response factor is then calculated as:

$$RF = \frac{100\ \text{ppm}}{180\ \text{ppm}}$$

$$RF = 0.55$$

The instrument can be calibrated with isobutylene and any benzene readings are then multiplied by 0.55 to obtain the true concentration in ppm of benzene. Response factors are very useful and aid in the collection of reliable quality data. However, the use of response factors introduces another variable to the measurement and this can increase the potential for errors.

The Model 580S II can be configured or programmed to automatically apply a response factor to all measurements. A table of response factors containing up to 20 values is accessible from the instruments Main Menu. For more details on using response factors, refer to Chapter 3, "Operation."

APPENDIX A
WARRANTY

Subject to the exceptions stated below, Thermo Environmental Instruments Inc. agrees to correct either by repair or at our option, by replacement, any defects in materials or workmanship which develop within one year from the date of delivery not to exceed eighteen (18) months from date of shipment, parts and labor supplied free of charge.

The exceptions mentioned above are: (1) All defective items must be returned to Thermo Environmental Instruments Inc., transportation charges prepaid, and will be shipped prepaid and charged to the customer unless the item is found to be defective and covered by the warranty in which case Thermo Environmental Instruments Inc will pay all surface transportation charges; (2) Thermo Environmental Instruments Inc. agrees to extend to the customer whatever warranty is given to Thermo Environmental Instruments Inc. by suppliers of component items purchased by Thermo Environmental Instruments Inc. and incorporated into products sold to the customer; (3) Thermo Environmental Instruments Inc. shall be released from all obligations under this warranty in the event repairs or modification are made by persons other than its own authorized service personnel, or service personnel from an authorized representative, unless such repair is minor, merely the installation of a new plug-in component; (4) if any model or sample was shown to Purchaser, such model or sample was shown merely to illustrate the article and not to represent that any article delivered hereunder would conform to the model or sample, and (5) Spare parts are warranted for ninety (90) days.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, IMPLIED, OR STATUTORY. SELLER DOES NOT WARRANT MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, OR MAKE ANY OTHER WARRANTY OR AGREEMENT EXPRESSED OR IMPLIED WITH RESPECT TO ANY ARTICLES COVERED HEREUNDER. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THOSE EXPRESSLY STATED IN THIS CONTRACT.

APPENDIX B

SAMPLE COLLECTION TECHNIQUES

The photoionization detector used in the Model 580S II responds to a wide range of organic compounds. For this reason, it is not possible to identify contaminants or to measure one specific compound that can be present in a complex mixture. To obtain meaningful data in this situation, combine the Model 580S II's direct reading capabilities with any one of several sample collection techniques. Both the bag and charcoal tube collection techniques are described later in this appendix.

The Model 580S II can be used to locate areas with high levels of organic contaminants and its internal pump can be used to collect a representative sample of the air. A laboratory can then perform further analysis of the sample. This method reduces the need to analyze numerous samples; thus, lowering laboratory costs.

Two design features of the Model 580S II make this type of operation possible. First, the photoionization detector used in the instrument is nondestructive. Therefore, the instrument is able to sense the organic vapor and exhaust it virtually unchanged. The second feature, a positive displacement pumping system, enables the sample to be drawn into the instrument and exhausted into a collection bag or charcoal tube.

BAG SAMPLE COLLECTION

One of the most convenient ways to analyze air is to trap a sample in a collection bag. Polymer bags made from Teflon or other materials, designed specifically for collecting gas samples, are available from a number of suppliers. However, organic vapor molecules can adsorb onto the inside surface of the bag. This adsorption begins immediately and continues until the vapor molecules on the bag are in equilibrium with the vapor molecules in the air. This equilibrium depends on the bag material, the chemical composition of the vapor, and the ambient temperature. After the sample has been collected, the bag should be analyzed immediately to reduce adsorption to an absolute minimum. The longer the sample stays in contact with the bag, the greater the adsorption of the organic vapors, resulting in a low concentration of organic vapors in the sample.

The size of the sample bag is based on the requirement of laboratory performing the analysis. If analyzing by gas chromatography, then only a few hundred milliliters of sample is required. However, if other analytical techniques are used, higher volumes of sample are required. Larger bags can be used with the Model 580S II, allowing up to several hours of sampling time.

When reusing collection bags, ensure that the sample previously contained in the bag has been completely desorbed from the wall. To check for this, fill the bag with clean air and allow it to sit for approximately one hour. Next, analyze the air in the bag. If the instrument shows measurable organics, then the air in the bag should be dumped and the process repeated until no measurable organics are read.

COLLECTION USING CHARCOAL TUBES

A common technique for collecting samples in industrial hygiene analysis is to use a small charcoal tube as a collection device. An air sample is pulled through the charcoal tube at a known flow rate for a known period of time. This flow rate and time determine the total volume of air or total sample size. The organic vapors in the air are adsorbed on the charcoal in the tube. These vapors are then desorbed from the charcoal by adding a known volume of desorbing solvent, usually carbon disulfide. The organics are released into the carbon disulfide. The carbon disulfide is then injected into a gas chromatograph using flame ionization detection (FID). The individual organic vapors can then be identified and quantified.

The charcoal tubes typically used for this type of work contain two sections. One section has approximately 100 milligrams of charcoal and a backup section has approximately 50 milligrams of charcoal. The backup section is analyzed separately from the main section to determine if there is organic vapor breakthrough from the main section.

The amount of total air that can be passed through charcoal tubes, before significant breakthrough occurs, depends on the concentration of organic vapor in the air and the particular organic vapor. For detailed information on the use of charcoal tubes, refer to the manufacturer or consult the NIOSH manual (see reference below).

NIOSH Manual of Analytical Methods. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Division of Physical Sciences and Engineering. Cincinnati, February 1984.

APPENDIX C

ACCESORY EQUIPMENT

The following accessories are available for the Model 580S II:

Part Number	Accessory	Description
13135	Carrying Case	Hard sided case with preformed foam for the 580S II and accessories.
18441	Calibration Kit	Cylinder of 100 ppm isobutylene in air, constant flow regulator, tubing assembly, and replacement charcoal for scrubber probe.
18270	Headset	Earphone style set that connects to the 580S II access panel and provides an audible signal for use in noisy environments (not UL/CENELEC approved).
13080	Spare Battery Pack	UL Approved battery pack.
18020	Spare Battery Pack	CENELEC Approved battery pack.
13117	External Charger Adapter	Adapter that allows charging of a spare battery pack outside of the instrument.
12902	Water Trap	Set of 20 replacement water trap/particulate filters.
13127	Dilution Probe	Designed to dilute a high concentration sample so that it is within the 580S II's range (approximately 10:1 dilution).
10248	Extension Probe	Quick connect, 3 ½-foot probe that attaches to the sample inlet fitting for sampling hard to reach areas.
18004	Headspace Analysis Kit	A closed re-circulating sample container for analysis of headspace vapors from soil or other similar samples.

APPENDIX D

COMMON ORGANIC SOLVENTS AND GASES

This appendix describes the physical constants and suggested lamp for some common organic solvents and gases. TEI does not guarantee the accuracy of the numeric values in this appendix. The standard UV lamp used in the photoionization detector has an ionization energy of 10.6 eV. Many organic materials are ionized at this energy level. However, there are some organic materials that have higher ionization potentials, and thus, are not detected. These include methane, ethane, propane, and several of the freons. Some of these compounds can be measured with the optional 11.8 eV lamp.

The ionization potentials listed here show the ionization energy required for detection of each material.

Note: This list does not indicate the sensitivity of the detector to a particular material. Different organic vapors respond differently and it is important to understand that even those organic vapors, with the same ionization potentials, can provide different readings on the Model 580S II.

CHEMICAL MATERIAL	F.W.[1] (G/MOLE)	DENSITY (G/ML)	B.P.[1] (^{o}C)	I.P.[1] (EV)
Acetaldehyde	44.05	0.788	21	10.21
Acetamide	59.07	1.159	221	9.77
Acetic Acid	60.05	1.049	116-117	10.37
Acetic Anhydride	102.1	1.10	138-117	9.88
Acetone	58.1	0.79	56	9.69
Acetonitrile	41.1	0.79	82	12.22
Acetophenone	120.15	1.033	202	9.27
Acetyl Bromide	122.96	1.52	75-75	10.55
Acetyl Chloride	78.50	1.104	52	11.02
Acetylene	26.02	0.90		11.41
Acrolein	56.06	0.8389	53	10.10
Acrylonitrile	53.06	0.8004	77	10.91
Allyl Alcohol	58.1	0.85	96-98	9.67
Allyl Chloride	76.5	0.94	44-46	9.9
Aniline	93.1	1.02	184	7.70
Anisole	108.13	0.9956	154	8.22
Ammonia	17.03	gas		10.15
Benzaldelyde	106.12	1.053	178-185	9.53
Benzene	78.1	0.88	80	9.25
Benzonitrile	103.12	1.010	188	9.71
Benzotriflouride	146.11	1.1886	102	9.68
Benzyl Chloride	126.6	1.10	177-181	9.14
Bromine	159.81	3.1023	58.8	10.55
Bromobenzene	157.02	1.495	156	8.98
1-Bromobutene	137.03	1.276	100-04	10.13
2-Bromobutene	137.03	1.255	91	9.98
1-Bromo-2-Chlorethene	143.42	1.723	106-07	10.63
Bromochloromethane	129.39	1.991	68	10.77

CHEMICAL MATERIAL	F.W.[1] (G/MOLE)	DENSITY (G/ML)	B.P.[1] (^{o}C)	I.P.[1] (EV)
1-Bromo-2-Flourobenzene	175.01	1.593	150	8.99
Bromoform	252.8	2.9	150-01	10.47
1-Bromo-2-methyl propane	137.03	1.260	90-92	10.09
2-Bromo-2-methyl propane	137.03	1.189	72-74	9.89
1-Bromopentane	151.05	1.218	130	10.10
2-Bromopropane	123.00	1.354	71	10.18
2-Bromopropene	123.00	1.310	59	10.08
1-Bromopropene	120.98	1.413	58-63	9.30
3-Bromopropene	120.98	1.398	70-71	9.70
2-Bromothiophene	163.04	1.684	149-151	8.63
M-Bromotoluene	171.04	1.4099	183.7	8.81
O-Bromotoluene	171.04	1.431	58.60	8.79
P-Bromotoluene	171.04	1.431	184	8.67
2-Butanone	72.1	0.81	80	9.53
1-Butene	56.10	0.6255		9.58
N-Butyl Acetate	116.2	0.88	124-26	10.01
S-Butyl Acetate	116.2	0.88	111-12	9.901
N-Butyl Alcohol	74.1	0.81	117.7	10.04
N-Butyl Amine	73.1	0.73	73	78
S-Butyl Amine	73.1	0.73	63	8.70
T-Butyl Amine	73.1	0.73	46	8.64
N-Butyl Benzene	134.21	0.8604	183	8.69
S-Butyl Benzene	134.21	0.8604	173-04	8.68
T-Butyl Benzene	134.21	0.8669	169	8.68
N-Butyraldehyde	72.10	0.8016	75	9.86
N-Butyric Acid	88.10	0.959	162	10.16
N-Butyronitrile	69.10	0.7954	115-17	11.67
Camphor	152.2	0.99	204	8.76
Carbon Dioxide	44.01	Gas		13.79
Carbon Monoxide	28.01	Gas		14.01
Carbon Tetrachloride	153.8	1.59	77	11.47
Chlorobenzene	112.6	1.10	132	9.07
Chloroform	119.4	1.48	60.5-61.5	11.37
1-Chloro-2-Methylpropane	92.57	0.883	68-69	10.66
2-Chloro-2-Methylpropane	101.64	0.851	51-52	10.61
1-Chloropropane	78.54	0.892	46-47	10.82
2-Chloropropane	78.54	0.859	34-36	10.78
3-Chloropropane	76.53	0.939	44-46	10.04
2-Chlorothiophene	118.59	1.286	127-29	8.68
M-Chlorotoluene	126.58	1.076	160-162	8.83
O-Chlorotoluene	126.58	1.0826	157-159	8.83
P-Chlorotoluene	126.58	1.0697	162	8.70
M-Cresol	108.1	1.034	203	8.52
O-Cresol	108.1	1.048	191	8.50
P-Cresol	108.1	1.034	202	8.38
Crotonaldehyde	70.09	0.853	104	9.73
Cumene	120.2	0.86	152-154	8.75
Cyanogen	52.04	0.9537		13.80
Cyclohexane	84.2	0.81	80.7-81	9.98
Cyclohexane	100.2	0.96	160-161	10.0
Cyclohexanone	98.1	0.95	155	9.14
Cyclohexene	82.1	0.81	83	8.95
Cyclo-Octatetraene	104.15	0.925	142-43	7.99
Cyclopentane	70.13	0.7460	50	10.53
Cyclopentanone	84.11	1.4366	130-131	9.26

CHEMICAL MATERIAL	F.W.[1] (G/MOLE)	DENSITY (G/ML)	B.P.[1] (^{o}C)	I.P.[1] (EV)
Cyclopentene	68.12	0.744	44	9.01
Cyclopropane	42.08	gas		9.91
Diborane	27.68	gas		11.00
Diazomethane	42.0	gas		9.0
Dibromodiflouromethane	209.83	2.297	22-23	11.07
1,2-Dibromoethane	187.87	2.180	131-32	9.45
1,3-Dibromopropane	201.90	1.937	167	10.07
M-Dichlorobenzene	147.01	1.288	172-73	9.12
O-Dichlorobenzene	147.01	1.306	179-180	9.07
P-Dichlorobenzene	147.01	1.241	173	8.94
1,1-Dichlorethane	99.0	1.18	57	11.06
1,2-Dichlorethane	98.96	1.256	83	11.12
1,2-Dichlorethylene	97.0	1.28	46-60	9.66
Dichloromethane	84.93	1.325	39.8-40	11.35
1,2-Dichloropropane	112.99	1.156	95-96	10.87
1,3-Dichloropropane	112.99	1.190	120-22	10.85
2,3-Dichloropropane	110.97	1.204	94	9.82
N,N-Diethyl Acetamide	115.18	0.925	182-86	8.60
Diethylamine	73.1	0.71	55	8.01
Diethyl Ether	74.12	0.7134	34.6	9.53
N.N-Diethyl Formamide	101.15	0.908	176-77	8.89
Diethyl Ketone	86.13	0.816	102	9.32
Diethyl Sulfide	90.19	0.837		8.43
Diethyl Sulfite	138.19	1.883	158-60	9.68
Dihydropyran	84.12	0.922	86	8.34
Diisopropylamine	101.2	0.72	84	7.73
1,1-Dimethoxyethane	90.12	0.863	64	9.65
N,N-Dimethyl Acetamide	87.12	0.937	164.5-66	8.81
Dimethyl Amine	45.1	0.68		8.24
N,N-Dimethyl Aniline	122.2	0.96	193-94	7.13
2,2-Dimethyl Butane	86.18	0.649	50	10.06
2,3-Dimethyl Butane	86.18	0.662	50	10.02
3,3-Dimethyl Butanone	100.16	0.801	106	9.17
N,N-Dimethyl Formamide	73.09	0.9445	153	9.12
Dimethlyl Sulfide	63.13	0.846	38	8.69
P-Dioxane	88.1	1.03	100-102	9.13
Dipropyl Amine	101.19	0.738	105-110	7.84
Durene	134.12	0.84	80-82	0.03
Ethanethiol	62.13	0.8315	35	9.2935
Ethyl Acetate	88.1	0.90	76.5-77.5	10.11
Ethyl Alcohol	46.1	0.80	78	10.48
Ethyl Amine	45.1	0.69	19.20	8.86
Ethyl Benzene	106.2	0.87	136	8.76
Ethyl Bromide	109.0	1.45	37-40	10.29
Ethyl Butyl Ketone	114.2	0.82	146-49	9.02
Ethyl Chloride	64.52	0.9214		10.98
Ethyl Disulfide	122.25	0.993	153	8.27
Ethylene Dibromide	187.9	2.17	131-132	10.52
Ethylene Dichloride	99.0	1.26	83	11.32
Ethyl Ether	74.1	0.73	34.6	9.59
Ethyl Formate	74.1	0.92	52-54	10.61
Ethyl Iodide	155.98	1.950	67-73	9.33
Ethyl Isothiocyanate	87.15	1.003	60	9.14
Ethyl Methyl Sulfide	76.16	0.842	66-67	8.55
Ethyl Nitrate	75.07	0.90	112	11.22

CHEMICAL MATERIAL	F.W.[1] (G/MOLE)	DENSITY (G/ML)	B.P.[1] (^{o}C)	I.P.[1] (EV)
Ethyl Propionate	102.13	0.891	99	10.00
Ethyl Thiocyanate	87.14	1.007		9.89
Ethynylbenzene	102.13	0.9300	142-44	8.82
Fluorine	37.99	gas		15.70
Flourobenzene	96.10	1.024	85	9.20
O-Fluorophenol	112.10	1.256	172-74	8.95
M-Fluorotoluene	110.13	0.997	178	8.92
O-Fluorotoluene	110.13	1.004	172-172	8.92
P-Fluorotoluene	110.13	1.001	185	8.79
Formaldehyde	30.03	1.083		10.87
Formahide	45.04	1.1334	210	10.25
Formic Acid	46.02	1.220	110-101	11.05
2-Furaldehyde	96.09	1.160	182	9.21
Furan	68.07	0.9371		8.89
Heptane	100.2	0.68	98	10.0
2-Heptanone	114.18	0.8068	149-50	9.33
Hexane	86.2	0.66	68-69	10.18
1-Hexane	84.16	0.673	64	9.46
Hexone	100.2	0.80		9.53
Hydrogen	2.017	gas		15.43
Hydrogen Bromide	80.92	gas		11.62
Hydrogen Chloride	36.47	gas		12.74
Hydrogen Cyanide	27.03	0.687		13.91
Hydrogen Flouride	20.01	gas		15.77
Hydrogen Iodide	127.93	gas		10.38
Hydrogen Selenide	80.98	gas		9.88
Hydrogen Sulfide	34.08	gas		10.46
Hydrogen Telluride	129.63	gas		9.14
Iodine	253.81	4.93		9.28
Iodobenzene	204.02	1.8384	188	8.73
1-Iodobutene	184.02	1.617	130-31	9.21
2-Iodobutene	184.02	1.4991	119-120	9.09
1-Iodo-2-Methylpropane	184.02	1.599	120-21	9.18
1-Iodopentane	198.05	1.517	154-55	9.19
1-Iodopropane	169.99	1.743	101-02	9.26
2-Iodopropane	169.99	1.703	88-90	9.17
O-Iodotoluene	218.04	1.713	211	8.62
M-Iodotoluene	218.04	1.698		8.61
P-Odotoluene	218.04		211-5	8.50
Isoamyl Acetate	130.2	0.88	142	9.94
Isoamyl Alcohol	88.2	0.81	130-1	10.42
Isobutyl Amine	73.14	0.724	64-71	8.70
Isobutyl Formate	102.13	0.885	98.4	10.46
Isobutylene	56.11	0.5942	-6.9	9.23
Isobutyraldehyde	72.11	0.794	63	9.74
Isobutyric Acid	88.11	0.950	153-54	10.02
Isoctane	114.2	0.70	98-99	17.9
Isopentane	114.23	0.692	30	10.32
Isoprene	68.12	0.681	34	8.85
Isopropyl Acetate	102.1	0.87	85	9.99
Isopropyl Alcohol	60.1	0.79		10.16
Isopropyl Amine	59.1	0.69	33-34	8.72
Isopropyl Benzene	120.2	0.86	152-54	8.75
Isopropyl Ether	102.2	1.37	68-69	9.20
Isovaleraldehyde	86.13	0.785	90	9.71

CHEMICAL MATERIAL	F.W.[1] (G/MOLE)	DENSITY (G/ML)	B.P.[1] (^{o}C)	I.P.[1] (EV)
2,3-Lutidine	107.15	0.945	162-63	8.85
2,4-Lutidine	107.15	0.927	159	8.85
2,6-Lutidine	107.15	0.9252	143-45	8.85
Malaic Anhydride	98.1	0.93	200	11.1
Mesitylene	120.19	0.8637	162-64	8.40
Mesityl Oxide	98.14	0.8592	129	9.08
Methane	16.04	gas		12.98
Methanethiol	48.11	0.96		9.44
N-Methyl Acetamide	73.10	0.957	204-05	8.90
Methyl Acetate	74.08	0.9279	57.5	10.27
Methyl Acrylate	86.1	0.96	80	9.9
Methyl Amine	31.06	gas	48	8.97
Methyl Bromide	95.0	gas		10.53
2-Methyl-1-Butane	70.16	0.650	31	9.12
3-Methyl-1-Butane	70.14	0.627	20	9.51
3-Methyl-2-Butane	70.14	0.643		8.67
Methyl Butyl Ketone	100.6	0.83	127	9.34
Methyl Butyrate	102.13	0.898	102-103	10.07
Methyl Chloride	50.5			11.28
Methyl Cyclohexane	98.19	0.770	101	9.85
Methyl Disulfide	94.20	1.046	109	8.46
Methyl Ethyl Ketone	72.10	0.805	80	9.53
Methyl Formate	60.1	1.34	34	10.815
2-Methyl Furan	82.10	0.827	63-66	8.39
Methyl Iodide	142.0	2.28	41-43	9.54
Methyl Isobutyl Ketone	100.2	0.80	117-18	9.30
Methyl Isobutyrate	102.13	0.891	90	9.98
Methyl Isopropyl Ketone	86.12	0.805	94-95	9.32
Methyl Isothiocyanate	73.12		37-39	9.25
Methyl Methacrylate	100.1	0.94	100	9.9
1-Methyl Napthalene	142.20	1.001	240-243	7.96
2-Methyl Napthalene	142.20	1,000	241-242	7.96
2-Methyl Pentane	86.18	0.653	62	10.12
3-Methyl Pentane	86.18	0.664	64	10.08
Methyl Propionate	88.11	0.915	79	10.15
Methyl Propyl Ketone	86.13	0.809	100.01	9.38
2-Methyl Styrene	165.4	1.068	131	10.07
Morpholine	87.1	1.01	129	8.88
Naphthalene	93.7	1.16	217.7	8.12
Nitric Oxide	162.2	1.01		9.25
Nitrobenzene	123.1	1.21	210-211	9.92
P-Nitrochlorobenzene	157.6	1.52		9.96
Nitrogen Dioxide	46.01	1.448		9.78
Nitroethane	75.1	1.38	112	10.81
Nitromethane	61.0	1.13	100.8-101	11.08
1-Nitropropane	89.1	0.99	131-32	10.88
2-Nitropropane	89.1	0.98	120	10.71
N-Nitrosodimethylamine	74.1	1.00	153	9.07
Nitrotoluene	137.1	1.16	225-238	11.63
Oxygen	31.9988	gas		12.08
Ozone	48.00	gas		12.08
Pentaborane	63.17	0.61		10.40
Pentane	72.15	0.62638	35	10.35
2,4-Pentanedione	70.13	0.6429	140.4	8.87
1-Pentene	70.13	0.6503	29.9-30.1	9.50

CHEMICAL MATERIAL	F.W.[1] (G/MOLE)	DENSITY (G/ML)	B.P.[1] (^{o}C)	I.P.[1] (EV)
Phenetol	122.16	0.967	169-70	8.13
Phenol	94.1	1.07	182	8.50
Phenyl Hydrazine	108.1	1.1	238-41	7.86
Phenyl Isocyanate	119.12	1.0887	162-63	8.77
Phenyl Isothiocyanate	135.18	1.1288	221	8.52
Phosgene	98.9	gas		11.77
Phosphine	34.0	gas		0.3
Phosphorous Pentachloride	208.2	1.6		10.7
Phosphorous Trichloride	137.3	1.57	76	10.5
2-Picoline	93.12	0.950	128-29	9.02
3-Picoline	93.12	0.9613	144	9.02
4-Picoline	93.12	0.9571	145	9.04
Propane	44.09	gas		11.07
1-Propanethiol	76.16	0.841	67-68	9.20
Propiolactone	72.06	1.146	162	9.70
Propionic Acid	74.08	0.99336	141	10.24
Propionaldehyde	58.08	0.8071	46-50	9.98
Propionitrile	55.08	0.7818	97	11.84
N-Propyl Acetate	102.1	0.84	120	10.04
Propyl Alcohol	60.10	0.804	97	10.20
Propyl Amine	59.11	0.719	48	8.78
Propyl Benzene	120.20	0.862	159	8.72
Propylene	42.08	Gas		8.73
Propylene Oxide	58.08	0.859	34	10.22
Propyl Ether	102.17	0.7360	88.90	9.27
Propyl Formate	88.10	0.901		10.54
Pyrene	202.3	gas		7.41
Pyridine	79.1	0.98	115	9.32
Pyrrole	67.09	0.9691	131	8.20
Styrene	104.14	9.9059	145-146	8.47
Styrene Oxide	120.2	1.054	194	9.04
Tetrachloroethylene	165.9	1.63	121	9.32
Tetrahydrofuran	72.10	0.8892	67	9.54
Tetrahydropyran	86.13	0.8814	88	9.26
Thiophene	84.1	1.53	84	8.86
Toluene	93.13	0.866	111	8.82
O-Toluidine	107.2	1.01	199-200	7.44
Trichloroethene	131.40	1.4649	87	9.45
Triethylamine	101.19	1.069	88.18	7.50
Trimethyl Amine	59.11	0.636	3-4	7.82
2,2,4-Trimethyl Pentane	114.23	0.692	98-99	9.86
Tripropyl Amine	143.27	0.753	155-58	7.23
Valeraldehyder	86.13	0.809	103	9.82
Valeric Acid	102.13	0.939	185	10.12
Vinyl Acetate	118	0.94	72-73	9.19
Vinyl Bromide	106.96	1.517	16	9.80
Vinyl Chloride	62.5	gas		10.00
Water	18.016	1.00	100	12.59
M-Xylene	106.16	0.8684	138-39	8.56
O-Xylene	106.16	0.8801	143-45	8.56
P-Xylene	106.16	0.8614	138	8.45