ecotech
environmental monitoring solutions

# VOC 1000

## Methane/Non-methane Analyser

## User Manual

**Version: 1**

www.ecotech.com

# Manufacturers statement

Thank you for selecting the Ecotech VOC 1000 methane/non-methane analyzer.

This User Manual provides a complete product description including operating instructions, calibration, and maintenance requirements for particulate sampling techniques.

Reference should also be made to the relevant standards, which should be used in conjunction with this manual. Some relevant standards are listed in the References section of this manual.

If, after reading this manual you have any questions or you are still unsure or unclear on any part of the VOC 1000 then please do not hesitate to contact Ecotech.

Ecotech also welcomes any improvements that you feel would make this a more useable and helpful product then please send your suggestions to us here at Ecotech.

Please help the environment and recycle the pages of this manual when finished using it.

# Notice

The information contained in this manual is subject to change without notice. Ecotech reserves the right to make changes to equipment construction, design, specifications and /or procedures without notice.

# WARNING

Hazardous voltages exist within the analyzer and caution should always be used when performing any maintenance within the instrument. Ensure the power cord, plugs and sockets are maintained in a safe working condition.

Protective earth straps fitted to doors and within the electronics enclosure must be connected at all times when power is connected to the sampler.

Ecotech recommends the use of Earth-Leakage Protection Circuit Breakers (ELCB) on the power supply to the VOC 1000. If operating from a generator, power conditioner, isolation transformer, or other floating supply, refer to the section on Instrument setup, as some important modifications are required.

## Safety requirements

- To reduce the risk of personal injury caused by electrical shock, follow all safety notices and warnings in this documentation.
- If the equipment is used for purposes not specified by Ecotech, the protection provided by this equipment may be impaired.
- Replacement of any part should only be carried out by qualified personnel, only using parts specified by Ecotech. Always disconnect power source before removing or replacing any components.

# Factory service/warranty

This product has been manufactured with care and attention.

The product is subject to a 12-month warranty on parts and labour. The warranty period commences when the product is shipped from the factory. Consumable items are not covered by this warranty.

To ensure that we process your factory repairs and returned goods efficiently and expeditiously, we need your help. Before you ship any equipment to our factory, please call your local Ecotech service response centre (or distributor) to obtain a return authorisation number.

When you call please be prepared to provide the following information:

1. your name, telephone number and email
2. Your company name
3. The model number or a description of each item
4. The serial number of each item, if applicable
5. A description of the problem or the reason you are returning the equipment (eg, sales return, warranty return, etc)

If you are required to return the equipment an accompanying document with:

1. Your name, number and email
2. Your company name with return shipment
3. The model number or a description of each item
4. The serial number of each item, if applicable

A description of the problem/reason you are returning the equipment

# Claims for Damaged Shipments and Shipping Discrepancies

**Damaged shipments**

1. Inspect all instruments thoroughly on receipt. Check materials in the container(s) against the enclosed packing list. If the contents are damaged and/or the instrument fails to operate properly, notify the carrier and Ecotech immediately.

2. The following documents are necessary to support claims:

    a. Original freight bill and bill lading
    b. Original invoice or photocopy of original invoice
    c. Copy of packing list
    d. Photographs of damaged equipment and container

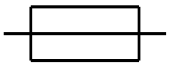
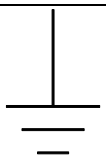
    You may want to keep a copy of these documents for your records also.

    Refer to the instrument name, model number, serial number, sales order number, and your purchase order number on all claims. Upon receipt of a claim, we will advise you of the disposition of your equipment for repair or replacement.

**Shipping Discrepancies**

Check all containers against the packing list immediately on receipt. If a shortage or other discrepancy is found, notify the carrier and Ecotech immediately. We will not be responsible for shortages against the packing list unless they are reported promptly.

# Internationally recognised symbols used on Ecotech Equipment

| | | |
|---|---|---|
|  | Electrical fuse | IEC 60417, No. 5016 |
|  | Earth (ground) terminal | IEC 417, No. 5017 |
|  | Equipotentiality | IEC 417, No. 5021 |
|  | Alternating current | IEC 417, No. 5032 |
|  | Caution, hot surface | IEC 417, No. 5041 |
|  | Caution, refer to accompanying documents | ISO 3864, No. B.3.1 |
|  | Caution, risk of electric shock | ISO 3864, No. B.3.6 |

# Manual Revision History

**Ecotech Manual ID:** **MAN 0079**
**Manual PN:** **M010037**
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**Date released:** **May 2011**
**Description:** **User Manual for the Ecotech VOC 1000 methane/non-methane analyzer**

This manual is a newly created document for use of the VOC 1000 methane/non-methane analyzer.

| Edition | Date | Summary | Affected Pages |
|---|---|---|---|
| 1.0 | May 2011 | First release | All |
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# 1 Introduction

## 1.1 Description

The VOC 1000 Methane/Non methane Hydrocarbon Analyzer is suitable for industrial and environmental applications. The instrument can be purchased in a variety of configurations.

The analyzer is based on a flame ionization detector (FID) with FlowGuard electronic control that delivers a small portion of the sample gas to the detector flame. During the combustion process, organic or hydrocarbon-based gases in the sample are ionized then they are detected by the instrument and reported as a concentration.

The VOC 1000 NMHC can be configured with internal components for single or multipoint analysis of noncondensing gas samples. The automatic calibration feature enhances the long-term analytical stability of the instrument. These features place the instrument well ahead of the competition in performance, automation, and configurability.

## 1.2 Specifications

### 1.2.1 Measurement

**Range:**

- 0-200 ppm

**Lower detectable limit:**

- 0.06 ppm

### 1.2.2 Precision/Accuracy

**Response time:**

- 30 seconds

**Accuracy**

- ± 1%

**Span drift:**

- ± 1% (24 hrs)

**Zero drift:**

- ± 0.1% (24hrs)

**Repeatability:**

- ± 1% full scale response

### 1.2.3 Power

**Operating voltage:**

- 100 – 240 VAC, 50/60Hz, 3A.
- **Relay Outputs:** 5 programmable form A relays rated to 3A @ 230V.
- **Analog Outputs:** 1 programmable 0-20mA or 4-20mA isolated output.
- **Digital Outputs:** RS-232, Ethernet

## 1.2.4 Operating conditions

**Ambient Temperature Range:**

- 0 - 40 °C (32 - 104 °F)

**Operating Humidity:**

- 0 – 95% (non-condensing)

## 1.2.5 Physical dimensions

**Case dimensions:**

- LxWxH = 483 mm x 362 mm x 133 mm

**Weight:** 9.07.kg

## 1.3 Background/ Theory

### 1.3.1 Background

The Methane / Non-Methane Analyzer utilizes an FID in conjunction with a catalytic oxidizer. The system uses a two-step method to determine the total hydrocarbon (THC) content and, separately, the methane (C1) content of the sample. The total non-methane hydrocarbon (TNMHC) component of the sample is then determined by subtraction as follows:

TNMHC = THC - C1

To perform the analysis the sample is split into two different streams, only one of which is analyzed at any one time. One of the sample streams is routed through the catalytic oxidizer the other is not. A valve arrangement allows the two sample streams to be sent to the detector independent of each other.

First, the oxidized sample is sent to the detector. By selecting a proper operating temperature the oxidizer will destroy all heavy hydrocarbons leaving only methane. It is in this mode that the methane (C1) component of the sample is determined.

Next, the sample is sent directly to the detector for the total hydrocarbon (THC) measurement. As the THC content is determined the system begins to calculate and report the TNMHC content continuously.

The catalytic oxidizer is switched back in periodically to update the C1 component value.

### 1.3.2 Measurement Theory

The VOC 1000 Methane/Non methane Hydrocarbon Analyzer is configured with a flame ionization detector (FID).

This detector uses a flame produced by the combustion of a fuel gas and air. When an organic compound enters the flame it is ionized. This results in the production of electrons and positive ions. The stream of freed electrons is directed to a measuring circuit by a polarizing electrode within the detector. The measurement circuit senses the electron stream as a current that is proportional to the amount of organic compound in the flame. This current measurement is reported as a concentration by the analyzer.

## 1.4 Instrument description

The VOC 1000 methane/non methane hydrocarbon analyzer uses the flame ionization detector in a continuous mode to sense the presence of hydrocarbons in the sample stream. Continuous analysis provides a "total" reading. This implies, and indeed means, that the concentration values or even the presence of specific substances cannot be determined. Refer to the appendix for the internal plumbing diagram of your instrument.

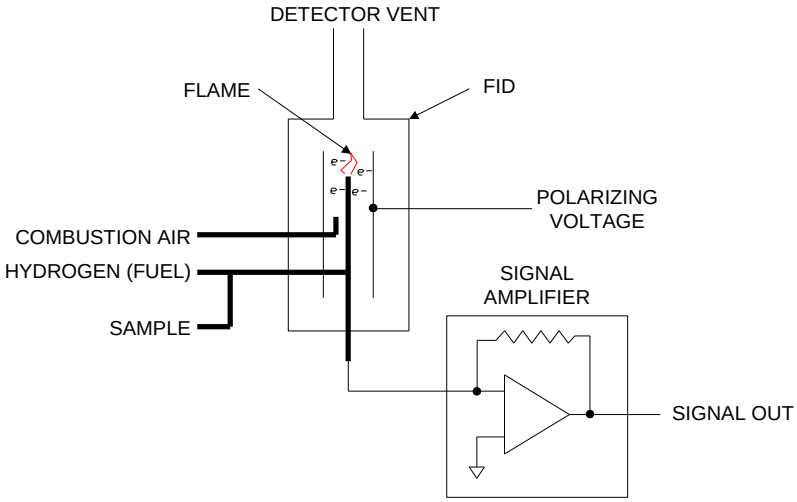


**Figure 1 FID diagram**

Each system contains a power supply, motherboard, oxidizer, and a detector support module. Optional equipment includes support for sample and calibration valves, relays, and 0-20mA outputs.

All system electronic circuit cards are connected through a serial communication bus. This allows the system components to be arranged in a variety of configurations.

# 2 Installation

## 2.1 Initial check

1. Remove the analyzer from the shipping box.
2. Inspect the pneumatic connections, front panel, and case, to verify that the instrument was received in good condition. The analyzer kit contains the following items:
   - VOC 1000 methane/ hydrocarbon analyzer
   - User's Manual
   - Power Cord
   - Certified Test Report

   **Note:** Be sure your kit is complete before proceeding.

3. Familiarize yourself with the front panel of the analyzer.
   The front panel features a graphical display, and a keypad. The display is used in conjunction with the keypad to operate the instrument and report analytical results.
4. Familiarize yourself with the back panel of the analyzer.
   Looking at the back panel of the instrument, gas ports and vents are located on the left side and electrical connections are on the right.

## 2.2 Mounting/Siting

1. Evaluate the installation site.
   The analyzer has an operating temperature range of 32-104$^{o}$F (0-40$^{o}$C). Verify that the installation site will not exceed this range.
2. Verify that the installation site will provide sufficient clearance around the analyzer.
3. Instrument rack mount ears cannot be used as the sole hardware for cabinet or enclosure mounting, slide rails must be used or instrument damage can occur.
4. Locate all rear panel gas connections. Connect all gas lines as shown on your plumbing diagram.
5. A step-down regulator must be placed in pressurized gas streams to avoid damage to the instruments internal gas manifold. Refer to the gas pressures table (located in the appendix) to determine the correct inlet pressures for your analyzer.
6. Exhaust all vents at ambient pressure. Never attach a pressurized line to an analyzer vent. Doing so will damage the analyzer.
7. Depending on the application and the toxicity of the sample gas or gases, all vents should be routed to a safe location. Flows rates and functions of vents are shown on your plumbing diagram.
8. If applicable connect the instrument outputs as they are documented in the appendix.

   **Note:** That the event mapping for each relay is defined using the system software. (Refer to section 3.4.4.4)

9. Attach the AC power cord. AC power service needs to be (115/230VAC, 50/60Hz, 3 Amp).

# 3 Operation

## 3.1 Warmup

The steps documented in this subsection assume some familiarity with the operating software and interface. If you are not familiar with the Main screen, alarm prompts, and basic menu structure of the software, review the interface overview presented in the front of this section prior to startup.

### Startup Instructions

**IMPORTANT WARNING:**
Be sure you have completed the installation procedure described in Section 1 of this manual prior to starting the analyzer. Improper installation of the analyzer can cause damage to the analyzer, and potentially endanger the safety of the operator.

1. Turn on the support, and sample gas flows to the analyzer. Verify that the inlet pressures are adjusted according to the recommended inlet pressures listed in Appendix A – Temperature and Pressure settings.

**WARNING:**
Operating the analyzer without support gases may cause permanent damage to the analyzer.

2. Turn the power switch (located at the back of the analyzer) on.
3. When the software initializes, the software version is briefly reported on the screen. Following this prompt, the Main screen opens.
4. Verify the operating temperature in the Temperature Setup screen matches the temperature settings listed in Appendix A – Temperature and Pressure settings.
5. Open the Flow Setup screen and verify that the support and sample gas flows are set as described in the appendix.
6. Define the concentration alarms as desired. (Procedure documented in 3.4.4.2.)
7. Define the configuration of the relays and analog output(s). (Procedure documented in *Section 3.4.4.4 and 3.4.4.5*.)
8. The analyzer goes through a sequence of events from power-on to normal operation. These events are as follows:
   a. The Main screen will typically open with a message to wait for the temperature. The warm-up period for the analyzer is typically between 15-20 minutes.
   b. After reaching its operating temperature the analyzer will turn on the Fuel, Air, and Sample flows to the detector. During this time the Main screen will display a message to wait for the flows. The time for the flows to stabilize is less than a minute.
   c. After the flows have stabilized the analyzer will ignite the flame. During this time the Main screen will display a message to wait for flame ignition.

d. After the flame has successfully been ignited the Main screen will display the sample purge screen and then change to the normal operating Main screen.

> **Note:** Wait a minimum of one hour to allow the analyzer to stabilize before performing a calibration.

9. Calibrate the analyzer as described in Section 4.

Following calibration the analyzer should be reporting accurate, real-time readings.

## 3.2 General operational information

The front panel interface consists of a graphic display, and a keypad. The display is used in conjunction with the keypad to operate the system. It communicates analytical results and provides the on-screen prompts necessary to guide you through the software menu's Main Screen

When the analyzer is turned on and the instrument has reached operating temperature, the Main screen opens automatically. The primary function of the Main screen is to display analytical results and alarms.

The Main screen is formatted so that the parameters monitored by the instrument are reported clearly and consistently.

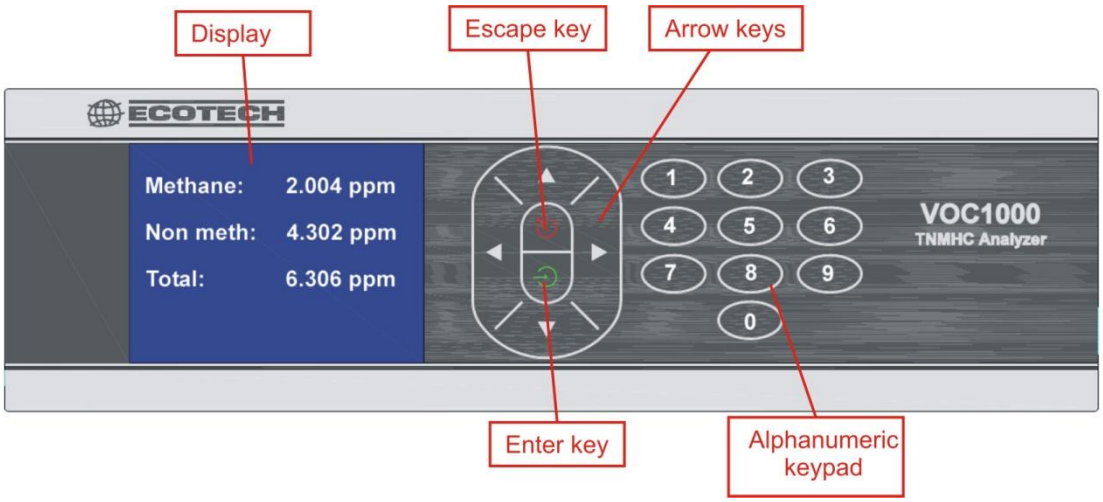


**Figure 2 Front panel**

## 3.3 Main screen

The measured concentration is displayed from top to bottom as methane, non-methane, and total hydrocarbons. The unit of measurement is directly to the right of the concentration values. The port number to the bottom of the display of the display is highlighted to indicate which port is currently being sampled if configured with the four port option.

### 3.3.1 Concentration & Status Messages

The analyzer will periodically report results, internal events, and system alarms on the Main screen.

In the normal state, the real-time concentration for the active port is reported on the Main screen.

If a system alarm or other internal event occurs, the concentration is replaced by an on-screen message that indicates the occurrence of the event being monitored. Events that appear in the Main screen are listed below.

| | |
|---|---|
| **Automatic CAL** | Indicates that an automatic calibration is taking place. |
| **Sample Purge** | Indicates that the analyzer is purging the sample line of residual gas. The unit automatically purges the line after switching sample ports or switching between Methane and modes |
| **Temperature Alarm** | Indicates that a temperature controlled zone has deviated significantly from its set point or the instrument is in the process of warming up |
| **Flow Alarm** | Indicates that the electronic flow sensors have detected a significant change in the fuel, air or sample flow |
| **Flameout Alarm** | Indicates that the auto ignition sequence has failed, or that the FID flame has been extinguished in the active detector |

### 3.3.2 Main Screen Concentration Alarms

Located at the bottom of the screen is the number of ports as well as any alarms associated with the individual ports. If the analyzer is configured as a single port, only the concentration alarm will be displayed.

Concentration alarm flags are displayed in the lower portion of the screen. If an alarm is active on a given port, a one letter code indicating the alarm threshold violated will display directly below the port where the alarm was detected. The alarm codes are: "C" for Caution; "W" for Warning; "A" for Alarm level.

### 3.3.3 Main Screen States

The Main screen can be in one of two states, Normal or Alarmed.

#### Main Screen in the Normal State

When the Main screen is in the *Normal* state, there are no active concentration or system alarms.

In the Normal state, pressing either the left arrow or the right arrow button will open the Main menu. The Main menu is a top-level menu that allows you to initiate one of three lower-level menus: Operation, Calibration, or Setup menu. These selections are detailed in the M*ain Menu* subsection coming up.

#### Main Screen in the Alarmed State

When the Main screen is in the *Alarm* state, a concentration or system alarm is active. In the Alarm state, pressing either the left arrow or the right arrow button will open the Main menu.

A concentration or system alarm can be acknowledged by going to "Operation\Reset Alarms" in the menu system and pressing "Enter". Once a concentration alarm is acknowledged, the alarm code below the affected port will still be displayed until the alarm condition no longer exists; however, any audible alarms or relays mapped to the alarm will be deactivated.

Note that if multiple alarm thresholds are violated on a given port, the software displays the alarm code associated with the highest alarm level violated. The software uses the concentration alarm hierarchy shown below.

- **Caution - Lowest Priority**
- **Warning - Medium Priority**
- **Alarm - Highest Priority**

For example, if a sudden spike of the monitored substance was detected in the sample stream directed to port two, all alarm thresholds could be violated. In this case, the software would indicate the violations with the alarm code "A" indicating the highest alarm threshold violated in this incident. If you opt to reset the alarm, all alarm conditions would be acknowledged. Following a reset, the Main screen reopens.

## 3.4 Menus and screens

The analyzer receives its instructions from the front panel keypad. The functions of the keys are as follows:

**Arrow Keys** - Used to navigate throughout the menu. Typically in a dialog window the left arrow is used to remove a value and the right arrow is used to move to the next field. The up and down arrows may also be used to move vertically in some dialog windows.

**Enter Key** - Used to select a menu item or to save a parameter.

**Escape Key** - Used to go back to the previous menu.

**Alpha/Numeric Keys** - Used to enter information required in dialog windows.

**Menu Navigation** – To access lower-level menus:

1. From the Main screen, press (← or →) to open the Main menu.
2. Press (← or →) until the pull-down menu desired is shown.
3. Press (↑ or ↓) to highlight the desired option and press "Enter" to select.

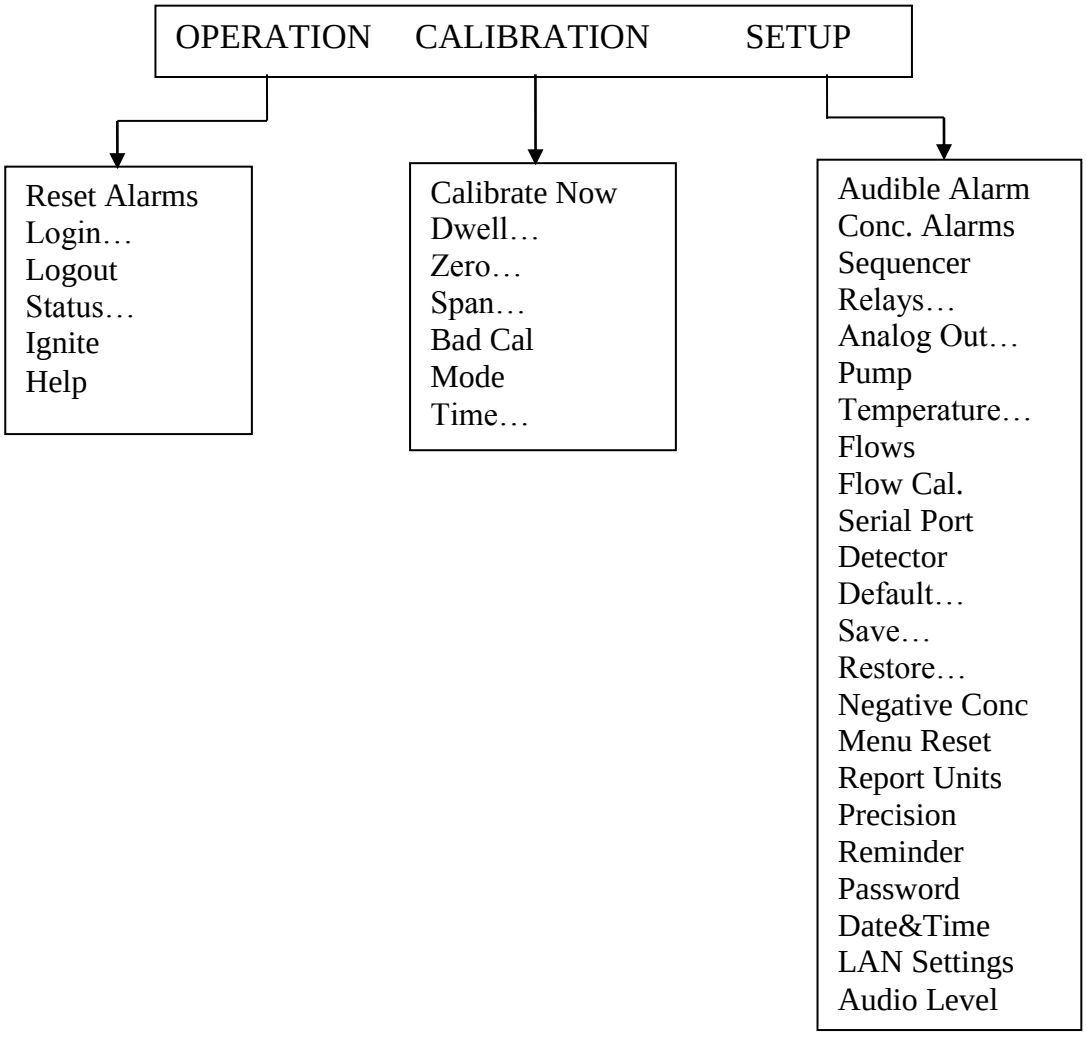


**Figure 3 Main Software Tree**

## 3.4.1 Main Menu

Selections in the Main menu are divided into three sub-menus: Operation, Calibration and Setup.

**OPERATION**

The options in the Operation menu are the basic options that an operator might use on a daily basis. These options include a Reset Alarm option, Login/Logout option, System Status, and Help screens. The Operation menu is discussed in greater detail below in section 3.4.2

**CALIBRATION**

The options in the Calibration menu are for the setup and operation of the detector calibration. The Calibration menu will be discussed in greater detail in section 3.4.3.

**SETUP**

The options in the Setup menu is where the parameters associated with the analyzer, including relays, pumps and other devices, are configured. The Setup menu will be discussed in greater detail in section 3.4.4.

## 3.4.2 Operation Menu

All the basic operations associated with the analyzer are located in the OPERATION menu.

### *Reset Alarms*

A concentration or system alarm can be acknowledged by going to "Operation\Reset Alarms" in the menu system and pressing "Enter". Once a concentration alarm is acknowledged, the alarm code below the affected port will still be displayed until the alarm condition no longer exists; however, any audible alarms or relays mapped to the alarm will be deactivated.

### *Login*

To Login, go to "Operation → Login" in the menu system and press "Enter". Follow the instructions at the bottom of the screen to input the password.

> **Note:** The Login feature must first be enabled in the Setup Menu. If the password feature has been enabled but the user has not logged in, the analyzer will still operate normally; however, the user will have limited access to the options in the Menu.

### *Logout*

To Logout, go to "Operation\Logout" in the menu system and press "Enter".

> **Note:** the Login feature must first be enabled in the Setup Menu.

### *Status*

The Status screen can be viewed by going to "Operation\Status" in the menu system and pressing "Enter". The status screen shows live readings of the basic system parameters.

### *Ignite*

A flame ignition sequence can be started by going to "Operation\Ignite" in the menu system and pressing "Enter". The ignition sequence will ignite the FID detector after the system verifies that the temperature and flows are in there normal operating range.

### *Help*

To access the Help Screens go to "Operation\Help" in the menu system and press "Enter". The Help Screens provide the user with basic information, which will help the user resolve many problems on their own. There is also contact information if the user needs to contact the service department.

## 3.4.3 Calibration menu

All the parameters and operations associated with calibration are located in the Calibration menu.

**Note:** It is recommended that the analyzer be calibrated every 24 hours.

**Note:** At any point in the menu structure, repeated presses of the Escape button will return you to the Main screen. Changes made to a calibration parameter are not saved until the Enter button is pressed.

### *Calibrate Now*

The Calibrate Now option immediately initiates either a manual or an automatic (unscheduled) calibration sequence, depending upon the present mode setting. This feature is covered in more detail in section 4.8.

### *Dwell Time*

The Dwell option allows the user to set the length of time each calibration gas will be applied to the detector when performing an automatic calibration.

### *Zero Gas*

The Zero option allows the user to set the value of the zero gas source for both the Methane mode and the Non methane mode. The zero gas should be the same as the balance of the span gas and the expected sample.

### *Span Gas*

The Span option allows the user to set the value of the span gas source for both the methane mode and the  mode. The span gas should be in the same range as the expected sample.

### *Bad Calibration*

The Bad Cal option allows the user to set a minimum and maximum detector gain value to detect a bad calibration. The purpose of the Bad Calibration option is to guard against some common problems such as the calibration gas being disconnected, incorrect calibration gas, reversal of the zero and span gas at their inlets, and the performance of the detector.

The gain of the detector is specified as pA/ppm which is the detector current in pA ($1.00E^{-12}$A) per one ppm (Parts per Million) of span gas. The Bad Calibration Menu will display the detector gain value from the last calibration. It is recommended that the user allow for some deviation of the gain due to small operating changes.

### *Mode*

The calibration mode can be set to one of the following:

**Manual:** In this mode a calibration is always initiated by the user.

**Interval:** This mode allows the user to calibrate the analyzer at a given interval up to 24 hours. For example if an interval of 30 minutes is selected the analyzer will perform an auto-calibration exactly 30 minutes after the last calibration is completed. Note: This interval is the time between the end of a calibration and the start of the next calibration.

**Hourly:** The Hourly mode allows the user to calibrate the analyzer every hour at a particular time of the hour. For example the analyzer can be set to perform an auto-calibration exactly 15 minutes after the beginning of each hour.

**Daily:** The Daily mode allows the user to calibrate the analyzer at a particular time every day.

**Weekly:** The Weekly mode allows the user to calibrate the analyzer at a particular time every week.

**Monthly:** The Monthly mode allows the user to calibrate the analyzer at a particular time every month.

**Yearly:** The Yearly mode allows the user to calibrate the analyzer at a particular time every year.

### *Time*

The Period/Time option is displayed in the menu only when the calibration mode selected requires an auto-calibration time i.e. Interval, Hourly etc. If any mode other than Manual is selected the user must setup the correct time for the calibration.

The right arrow moves to the next field, the left arrow removes the last character or number from the field, the alpha/numeric keys are used to enter a new value, the escape key is used to go to previous menu, and the enter key is used to save the displayed values and exit the screen.

## 3.4.4 Setup Menu

In the Setup menu, you can configure the analyzer for different applications by defining the software selectable features in the Setup Menu. This section of the manual provides the following information for each user-defined feature:

- A brief description of the feature
- Complete setup instructions

Typically in a dialog window the left arrow is used to change a value and the right arrow is used to move to the next item. The up and down arrows may also be used to move vertically in some dialog windows. At any point in the menu structure repeatedly pressing the Escape button will return you to the Main screen. Changes made to a parameter are not saved until the "Enter" button is pressed.

### 3.4.4.1 Audible Alarm

The user can be alerted to the occurrence of an event by turning on the audible alarm associated with that event. The audible alarm consists of an electronic beep. A brief description of the Audible Alarm events are:

**Trouble:** This event consists of a temperature, flow, or flameout alarm.

**Caution:** A low-level concentration alarm.

**Warning:** A medium-level concentration alarm.

**Alarm:** A high-level concentration alarm.

**Calibration:** There will be a beep when a calibration is taking place.

**Key press:** There will be a beep when a key is pressed

#### Setting up audible alarms

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Audible Alarm.
2. Use the ← key to go to the submenu.Use the ↑ or ↓ to select an event that will require an audible alarm.
3. Pressing the Enter key will toggle the highlighted item on and off.

### 3.4.4.2 Concentration alarms

The analyzer supports three concentration alarm levels: Caution, Warning, and Alarm. Each alarm can be enabled or disabled and the alarm threshold for each alarm is programmable. The alarm levels can be set individually for methane, , and total hydrocarbons. The displayed alarm does not differentiate between methane, , or total hydrocarbons but represents an alarm on a particular sample port.

**Note** If multiple alarm thresholds are exceeded on a given port, the software displays the alarm code associated with the highest alarm level. The software uses the concentration alarm hierarchy shown below.

**Caution - Lowest Priority**
**Warning - Medium Priority**
**Alarm - Highest Priority**

The displayed alarm code will clear when the alarm condition is no longer detected. If a critical alarm condition clears, yet a less critical alarm is still active, the alarm code will update in the Main screen to indicate the presence of the active alarm.

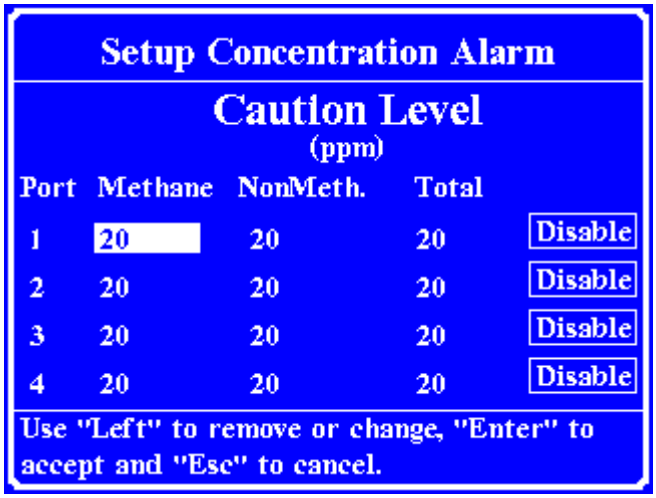


**Figure 4 Concentration alarm Setup screen**

#### Setting Alarm Levels

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Conc Alarms.
2. Use the ← key to go to the sub-menu and highlight the concentration alarm that needs editing. Press Enter to select the alarm and a screen similar to Figure 4 will open.
3. To change a value use the ← key to delete the highlighted value, and use the alpha/numeric keys to enter the new value. Press “Enter” to save the displayed value or Escape to go back to the previous menu without saving the value.

### Purge/Dwell Time

The purge time is the amount of time it takes for the previous sample source to be cleared out of the analyzer. Dwell time is the length of time the analyzer is in the methane and  modes as it monitors a port. The concentration alarms are active if enabled.

> **Note:** If the analyzer is configured for more than one port, the purge and dwell times are set in the Sequencer option.

### Setting Purge/Dwell Time

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Purge Time.
2. Press Enter to open the Purge Time Setup screen.
3. To change a value use the ← key, to go to the next field press the → key, press Enter to select the displayed value or Escape to go back to the previous menu without saving the value.

## 3.4.4.3 Sequencer

If the analyzer is configured for more than one sample port, the sequencer menu allows each sample port to be configured separately. From the Setup Sequencer menu several parameters can be configured including:  port on/off, purge time, dwell time, and sampling sequence.

Each port may be turned on or off by selecting + (Enabled) or – (Disabled) in the sequencer menu.

The purge time is the length of time that readings are ignored directly after selecting the next sample port in the sequence. The previous sample is cleared out of the analyzer during this time.  The purge time also applies when the analyzer switches from methane to the  mode.

Dwell time is the length of time the analyzer is in the methane and  mode as it monitors a port. The dwell time can be individually set for the methane and  modes. The concentration alarms are active if enabled.

There are three options shown at the bottom of the Sequencer screen: Enable, Lock, and File.

**Enable:** Allows the user to enable the normal port sequence if another mode has been selected.

**Lock:** Allows the user to indefinitely lock on to one particular port.

**File:** Allows the user to use a text file to use a sequence other than a continuous loop. For instructions on how to create sequence file and install it in the analyzer, please contact the Ecotech service department.

> **Note:** The purge time and dwell time are additive.  In other words, dwell time does not start until the purge cycle is complete.

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Sequencer.
2. Press Enter to open the Sequencer Setup screen.

3. To change a value, use the ← key. To go to another field press the →, ↑, or ↓ keys. Press Enter to select the displayed values or Escape to go back to the previous menu without saving the parameters.

### 3.4.4.4 Relays

A relay can be mapped to one of several events: Power, Trouble, Flame, Zero M, Span M, Zero NM, Span NM, Cal, Methane, Bad Cal, Caution, Warning, Alarm, and Port. Relays have three attributes: the relay event mapping, the normal energy configuration, and the latch configuration. All relay attributes are programmable.

#### Setting up Relays

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Relays.
2. Press Enter to open the Relay Setup screen.
3. To change a value use the ← key. To go to another field press the →, ↑, or ↓ keys. Press Enter to select the displayed values or Escape to go back to the previous menu without saving the value.

#### Relay Events Assignment

The events a relay can be mapped to are:

| | |
|---|---|
| Power | Allows the user to remotely monitor the power to the analyzer. In this mode the relay is always energized when the analyzer is on. |
| Trouble | Includes the temperature, flow, and flameout alarms |
| Flame | Detector flameout alarm |
| Zero M | The time zero gas is applied to the detector during a calibration in the Methane mode |
| Span M | The time span gas is applied to the detector during a calibration in the Methane mode |
| Zero NM | The time zero gas is applied to the detector during a calibration in the mode |
| Span NM | The time span gas is applied to the detector during a calibration in the mode |
| Cal | The total time of a calibration |
| Bad Cal | A bad calibration alarm |
| Methane | Indicates that the analyzer is in the Methane mode |
| Caution | A caution concentration alarm |
| Warning | A warning concentration alarm |
| Alarm | An alarm concentration alarm |
| Port | The sample port that is currently active |

#### Relay Port Selection

If the relay is mapped to a concentration alarm event, the user may select the individual port number for the alarm or “Any” may be selected if the concentration alarm applies to all ports. If the relay event does not apply to a sample port a “N/A” will be displayed in the Port column.

#### Relay Latch Configuration

Under the Latch column the user may select “Yes” or “No”. If “Yes” is selected the relay will remain active until the user acknowledges or resets the alarm in the Operation menu. If “No” is selected the relay will remain active only as long as the alarm event is active.

#### Relay Energized Configuration

Under the Energize column the user may select “Yes” or “No”. If “Yes” is selected the relay will be normally energized when the mapped event is not in the active or alarm condition. If “No” is selected the relay will not be normally energized when the mapped event is not in the active or alarm condition. The most common configuration under the Energize column is “No”.

### 3.4.4.5 Analog Out

An analog output can be mapped to one of several modes: Conc, CNC, Raw, and RNC. Analog outputs have five attributes: the analog channel mapping, the port number, the component name, the current setting, and the maximum value of the range. All analog output attributes are programmable.

#### Setting up Analog Outputs

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Analog Out.
2. Press Enter to open the Analog Output Setup screen.
3. To change a value, use the ← key. To go to another field press the →, ↑, or ↓ keys. Press Enter to select the displayed values or Escape to go back to the previous menu without saving the value.

#### Channel Selection

There are a maximum of four analog channels that can be selected.

#### Analog Output Modes

The events an analog output can be mapped to are:

- **Conc (Concentration):** Allows the user to monitor the reported concentration. This mode will also output the reported concentration during a calibration.
- **CNC (Concentration with no Calibration):** Allows the user to monitor the reported concentration. This mode will not output the reported concentration during a calibration, but will output the last reported concentration from the sample port.

- **Raw:** This is the raw current generated by the detector before it is converted to a concentration value. It is a live signal during the sample and calibration mode of the analyzer. One cnt represents a current of $1E^{-14}$A. For example: 1pA ($1.000E^{-12}$A) would equal 100 cnts.
- **RNC(Raw with no Calibration):** This is the raw current generated by the detector before it is converted to a concentration value. It is a live signal only during the sample mode of the analyzer. One cnt represents a current of $1E^{-14}$A. For example: 1pA ($1.000E^{-12}$A) would equal 100 cnts.

#### Analog Output Port Selection

If the analyzer is configured for multiple sample ports, this parameter allows the user to map the analog output to a particular port. If the user would like the analog output to represent all the sample ports, An "A" (All Ports) should be selected.

#### Component Name

The concentration Component names that can be set are:

- **Methane:** This is the reported concentration in the Methane mode. The analog output is only active during the Methane mode. When the analyzer is in the non methane mode it outputs the last value of the Methane mode.
- **Non methane:** This is the reported concentration in the Non methane mode. The analog output is only active during the Non methane mode. When the analyzer is in the Methane mode it outputs the last value of the Non methane mode.
- **M & NM (Methane and Non methane):** The output is active during the Methane mode and the Non methane mode.
- **Total:** The output is active during the Non methane mode and outputs the Total concentration. When the analyzer is in the Methane mode it outputs the last Total concentration value of the Non methane mode.

#### Analog Output Range Selection

There are two ranges that can be selected 0-20mA and 4-20mA. The 0 or 4mA represents the current that is output at 0 concentration. The 20mA represents the current that is output at the maximum concentration range.

#### Analog Output Maximum Range Selection

The user can set the maximum value that will equal 20mA. In Conc or CNC modes this value will be in ppm or % units. If the analog output is set to Raw it will be in cnt units (1 cnt = $1E^{-14}$A).

### 3.4.4.6 Pump

The analyzer can be equipped with a single sample pump. Using the pump setup feature, the pump can be turned on or off, or placed in automatic mode. In automatic mode, the pump will not turn on until the detector block comes up to temperature. Automatic mode is the recommended pump setting for most applications.

### Pump Setup

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Pump.
2. Use the ← key to go to the sub-menu to highlight an item.
3. Pressing the Enter key will toggle the item on and off.

## 3.4.4.7 Temperature

Typically the analyzer is configured with one controlled temperature zone. Additional zones may be added for other applications such as an oxidizer. The default value is 65°C for the detector and 200°C for the oxidizer. The user should never need to adjust these values. Changing the temperature setpoints could damage the analyzer.

To monitor the current temperature of the detector and oxidizer, go to the Operation Menu and select Status.

### Setting Temperatures

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Temperature.
2. Press Enter to open the Setup Temperature screen.
3. To change a value, use the ← key. Press Enter to select the displayed values or Escape to go back to the previous menu without saving the value.

## 3.4.4.8 Flows

The standard flow control configuration for the VOC 1000 Methane/Non methane Hydrocarbon Analyzer includes three settings:

- Sample flow
- Fuel flow
- Air flow

The VOC 1000 Analyzer is equipped with electronic flow sensors that allow you to set the sample, fuel, and combustion gas flows from the front panel.

To monitor the flow zones, go to the Operation Menu and select Status.

### Setting Flows

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Flows.
2. Press Enter to open the Setup Flow screen.
3. To change a value, use the ← key. Press Enter to select the displayed values or Escape to go back to the previous menu without saving the value.

### 3.4.4.9 Flows Cal

Each flow zone uses an electronically controlled valve and pressure sensor to create a stable flow to the detector. Each flow zone requires a two point calibration. The first calibration point is the zero point with no flow through the analyzer and the second point is the span point with pressure applied to the flow zone. The "Press. Cnts" shown on the screen refers to the pressure measurement from the sensor.

### 3.4.4.10 Comm Mode

The analyzer is equipped with a RS232 and Ethernet port. There are five modes of operation.

| | |
|---|---|
| **1 sec Conc Fields** | This mode outputs the date, time, and concentration as ASCII text in 1 second intervals |
| **10 sec Conc Fields** | This mode outputs the date, time, and concentration as ASCII text in 10 second intervals |
| **1 sec All Fields** | This mode outputs the date, time, concentration, and system parameters as ASCII text in 1 second intervals |
| **10 sec All Fields** | This mode outputs the date, time, concentration, and system parameters as ASCII text in 10 second intervals |
| **Binary** | This mode enables the analyzer to communicate with a PC application used to create and download methods to the analyzer as well as to upload a method from the analyzer |

The serial and Ethernet port and the five modes are covered in more detail in section six.

#### Setting the Communication Mode

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Comm. Mode.
2. Use the ← key to go to the sub-menu to highlight an item.
3. Pressing the Enter key will select the item high-lighted.

### 3.4.4.11 Detector

The detector configuration for the VOC 1000 Methane/Non methane Hydrocarbon Analyzer allows the user to set the collector voltage and the electrometer offset. Typically these parameters are never changed by the user.

#### Collector Voltage

The collector voltage may be set to one of four settings:

| | |
|---|---|
| **Off** | This mode allows the user to turn off the collector voltage |
| **Low** | This mode is typically used for low range applications (0 – 2,000ppm) |
| **Medium** | This mode is typically used for medium range applications (0 – 20,000ppm) |
| **High** | This mode is typically used for high range applications (0 – 100%) |

**Note:** This procedure is done at the factory and the user should never have to adjust this value.

#### Setting the Collector Voltage

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Detector.
2. Use the ← key to go to the Collector Voltage item and press Enter to open the Setup Collector Voltage Screen.
3. To move between settings use the ↑ or ↓ key to highlight a selection and press Enter.

#### Detector Offset

The detector offset must be set for each individual electrometer gain stage. The electrometer gain is determined by the jumper settings on the PCB. The offset should be set with no signal at the detector (Flame Off). A value slightly below the current counts displayed should be entered as the desired offset.

**Note:** This procedure is done at the factory and the user should never have to adjust this value.

#### Setting the detector Offset

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Detector.
2. Use the ← key to go to the Offset (Low, Med, High) Gain item and press Enter to open the Setup Offset screen.
3. To change a value, use the ← key. Press Enter to select the displayed values or Escape to go back to the previous menu without saving the value.

### 3.4.4.12 Default

If necessary the user may select a default method to replace the existing method. A method is a file that contains the configuration of the analyzer.

If the user selects the default method, all flow zones as well as the detector will need to be re-calibrated. All user programmable items such as port sequence, concentration alarms, relays, and analog outputs will need to be reset.

**Selecting the Default Method**

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Default.
2. Press “Enter” and a message will appear that will prompt you to press “Enter” again to select the default method or “Escape” to exit the menu.

### 3.4.4.13 Save

The user may save the current method in the analyzer and restore the analyzer to the saved method at a future date. A method is a file that contains the configuration of the analyzer.

For example, before a user makes changes to an analyzer he could save the method and then make the changes to the analyzer. If the user is not happy with the changes, he can restore the analyzer to the saved method.

**Save Current Method Procedure**

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Save.
2. Press “Enter” and a message will appear that will prompt you to press “Enter” again to save the current method or “Escape” to exit the menu.

### 3.4.4.14 Restore

If a method has previously been saved, the user may restore the saved method to the analyzer. The analyzer may need to be re-calibrated depending on the changes to the analyzer since the method was saved.

**Restore Method Procedure**

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Restore.
2. Press “Enter” and a message will appear that will prompt you to press “Enter” again to restore the saved method or “Escape” to exit the menu.

### 3.4.4.15 Negative Conc

The reported concentration for the VOC 1000 Methane/Non methane Hydrocarbon Analyzer can be set to display both positive and negative concentration values or to display just positive concentration values. The two modes are shown as:

- **Enabled:** This mode will display both negative and positive concentrations.
- **Disabled:** This mode will display only positive concentrations. Any concentration less than zero will be shown as zero.

#### Setting up Negative Concentration

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Negative Conc.
2. Use ← key to high-light an item and press Enter to select it.

### 3.4.4.16 Menu Reset

The time the menu remains active without user input can be set by the user. For example if a time of one minute is selected and the analyzer does not detect a key press for one minute the display will automatically revert back to the main screen.

#### Setting up Menu Reset

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Menu Reset.
2. Use ← key to high-light an item and press Enter to select it.

### 3.4.4.17 Report Units

The reported concentration units are displayed as either a ppm unit or a % unit. The user can configure the analyzer to either automatically change from a ppm unit to a % unit or the analyzer can be set to a static value where it remains as either a ppm unit or a % unit depending on the range of the instrument.

If the analyzer is configured with a range of 0 – 2000ppm or 0 – 20000ppm, the unit will be a ppm value in the static mode. If the analyzer is configured with a range of 0 – 100%, the unit will be a % value in the static mode.

#### Setting Report Units

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Report Units.
2. Use ← key to high-light an item and press Enter to select it.

### 3.4.4.18 Precision

The precision of the reported concentration may be set by the user. The precision can be set to one of the following:

- **Low:** The precision of the reported concentration is limited to a maximum of two places to the right of the decimal. The display may show three places to the right of the decimal, but the last character will be zero.
- **High:** The precision of the reported concentration can be up to three places to the right of the decimal.

**Setting Display Precision**

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Precision.
2. Use ← key to high-light an item and press Enter to select it.

### 3.4.4.19 Reminder

The user can enable a service reminder option. If enabled, a message will appear to remind the customer to perform any scheduled or routine maintenance to the analyzer. The user may enable or disable this message; however, the time interval can only be set by authorized personnel.

There are two settings:

- **Enabled:** The service message will appear when the analyzer is powered up after the designated time has elapsed. After the user has acknowledged the message, it will not re-appear.
- **Disabled:** The service message will not ever appear.

**Setting up the Reminder**

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Reminder.
2. Use ← key to high-light an item and press Enter to select it.

### 3.4.4.20 Password

The analyzer can be setup to use a password system. To activate the password system a password must be entered in the Setup Password screen. When the password system is activated, only basic operations under the operations menu are accessible to a user without a password.

The password may be numbers or letters up to 14 characters in length.

**Setting the password**

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Password.
2. Press Enter to open the Setup Password screen.
3. To remove a character, use the ← key. To switch to capital letters use the → key. Press “Enter” to select the displayed password or “Escape” to go back to the previous menu without saving the value.

### 3.4.4.21 Date&Time

The Analyzer has an internal clock to track the timing of internal and external events. The current time of the internal clock can be set by the user.

**Setting the time and date**

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Date&Time.
2. Press Enter to open the Setup Date and Time screen..
3. To remove a character, use the ← key. To go to the next field use the → key. Enter a new time or date using the alphanumeric keypad
4. Press “Enter” to save the displayed time and date or press “Escape” to go back to the previous menu without saving any changes.

### 3.4.4.22 LAN settings

The Analyzer can be connected to a Local Area Network (LAN). It is recommended that the user consult with the network administrator when setting up the analyzer for use with a LAN.

**Configuring the LAN**

1. From the Main screen, press the ← or → key. Go to the Setup menu and select LAN Settings.
2. Use ← key to high-light an item and press Enter to select it.

### 3.4.4.23 Audio Level

The Audio level of the Analyzer that indicates key presses and alarms can be set to Low, Medium, or high.

**Setting the Audio Level**

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Audio Level.
2. Use ← key to high-light an item and press Enter to select it.

# 4 Calibration

## 4.1 Manual calibration

When the analyzer is in Manual calibration mode, it allows the user to manually step through a zero and span of the detector.

Follow the procedure below to perform a manual calibration. Note that the ← key must be pressed to update the displayed value and ENTER must be pressed to save the current zero or span value. These instructions assume the analyzer is properly connected to appropriate sources of zero and span gas. If the analyzer is equipped with the auto-calibration option the appropriate valves will automatically be turned on as needed. Otherwise the appropriate calibration gas will need to be applied, as the sequence demands it.

1. From the Main screen, press the ← or → key. Go to the Calibration menu and verify that the Mode is set to Manual. Next from the Calibration menu select "Calibrate Now" and press Enter.

   This action opens the first calibration screen as shown in Figure 5. At this point Zero gas is directed to the detector in the Methane mode. The detector current, target concentration value and actual concentration value will be displayed on the screen.

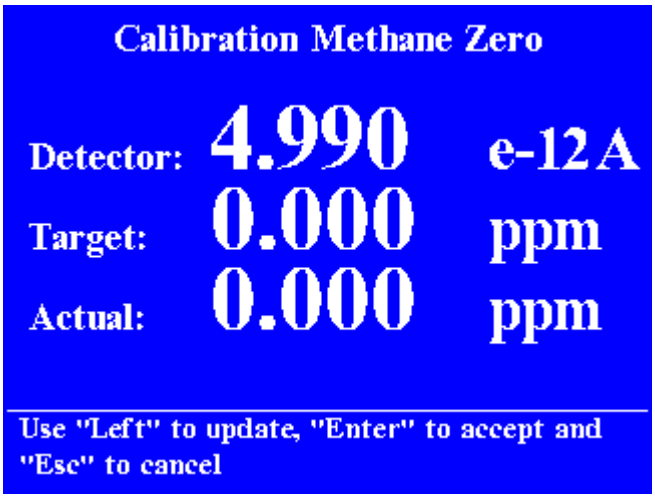


**Figure 5 Calibration. methane zero screen**

2. Monitor the zero gas detector current and actual concentration readings until they stabilize. This could take several minutes.
3. When satisfied with the stability of the zero gas readings press the ← key to update the actual concentration value to match the target concentration.
4. Press the Enter key to accept this calibration value or Escape to skip to the next screen without saving the zero point.

   Once the zero point is entered Span gas is directed to the detector and the Methane Calibration Span screen will open as shown in Figure 6.

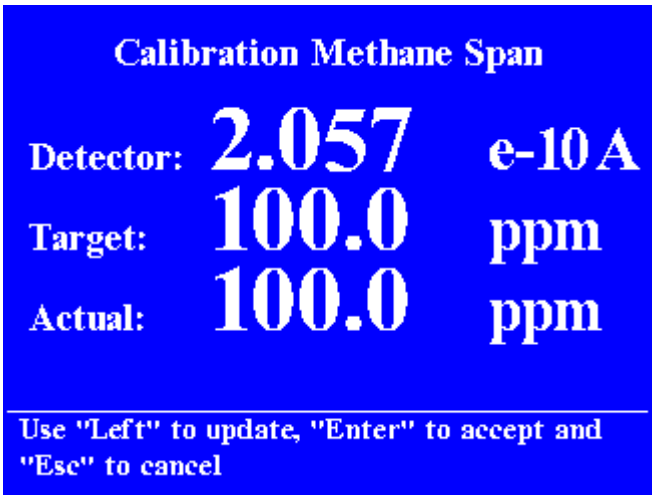


**Figure 6 Calibration methane span screen**

5. Monitor the span gas detector current and actual concentration readings until they stabilize. This could take several minutes.
6. When satisfied with the stability of the span gas current reading press the ← key to update the actual concentration value to match the target concentration .
7. Press the Enter key to accept this calibration value. If the reading seems to fluctuate after a single span, press the ← key again, monitor the readings, and press the Enter key to accept the final span value.

   Once the Span value is entered the analyzer switches to Non methane mode and Zero gas is directed to the detector and the Non methane Calibration Zero screen will open as shown in Figure 7.

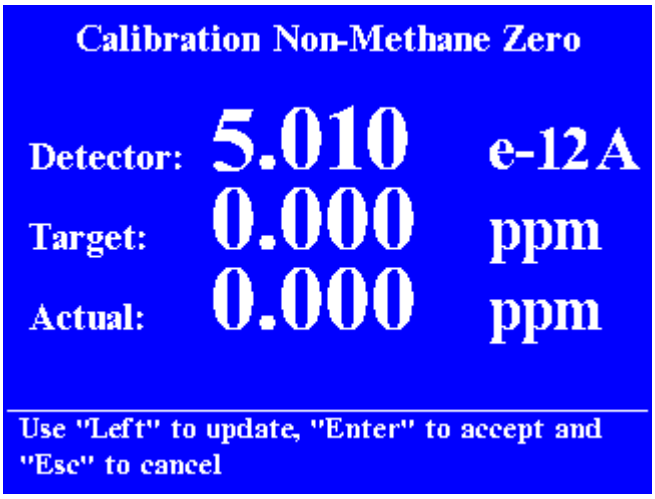


**Figure 7 . Calibration. non methane zero screen**

8. Monitor the zero gas detector current and actual concentration readings until they stabilize. This could take several minutes.
9. When satisfied with the stability of the zero gas readings press the ← key to update the actual concentration value to match the target concentration.

10. Press the Enter key to accept this calibration value or Escape to skip to the next screen without saving the zero point.

    Once the zero point is entered Span gas is directed to the detector and the Non methane Calibration Span screen will open as shown in Figure 8

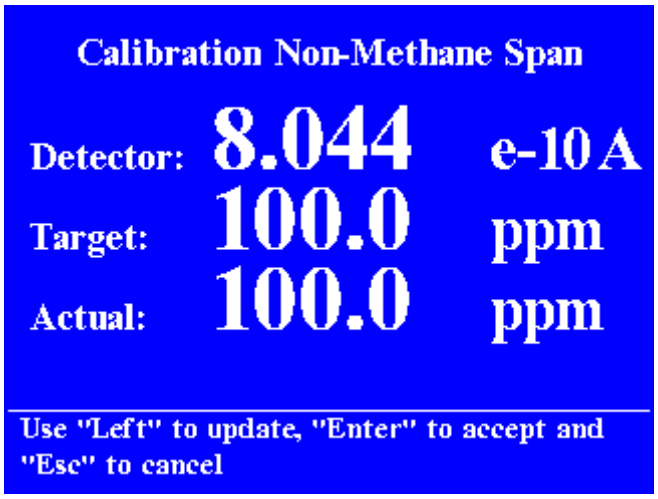


**Figure 8 Calibration. non methane span screen**

11. Monitor the span gas detector current and actual concentration readings until they stabilize. This could take several minutes.
12. When satisfied with the stability of the span gas current reading press the ← key to update the actual concentration value to match the target concentration .
13. Press the Enter key to accept this calibration value. If the reading seems to fluctuate after a single span, press the ← key again, monitor the readings, and press the Enter key to accept the final span value.

    After pressing the Enter key, the manual calibration is over and the main screen will appear.

## 4.2 Automatic Calibration Sequence

Follow the procedure below to perform an unscheduled automatic calibration. The ← key may be used at any time to zero or span the current value. By pressing the Enter key the current value will be saved and go immediately to the next screen. The Escape key will skip the current screen without saving any value.

These instructions assume the analyzer is properly connected to appropriate sources of zero and span gas. If the analyzer is equipped with the auto-calibration option the appropriate valves will automatically be turned on as needed.

1. From the Main screen, press the ← or → key. Go to the Calibration menu and verify that the Mode is set to a mode other than Manual.
2. From the Calibration menu select “Calibrate Now” and press Enter.

   This action opens the first Methane calibration screen as shown in Figure 9. At this point Zero gas is directed to the detector. The real-time concentration and detector current will be displayed on the screen.

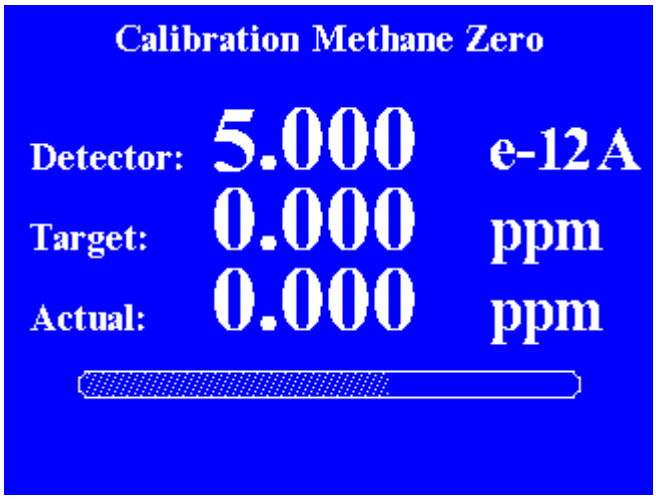


**Figure 9 Auto calibration methane zero screen**

3. The Methane Calibration Zero screen will remain open for the length of the dwell time. At the end of the dwell time the zero point will be saved and the actual concentration value will automatically be adjusted. After the Zero point has been saved, Span gas is directed to the detector and the Methane Calibration Span screen will open as shown in Figure 10.

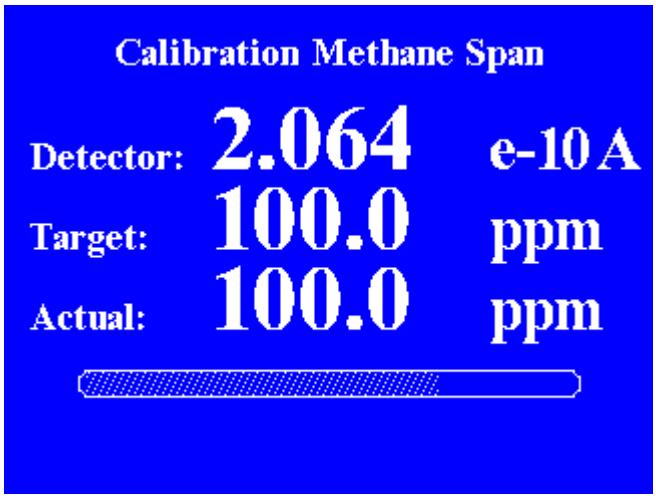


**Figure 10. Auto calibration methane span screen**

4. The Methane Calibration Span screen will remain open for the length of the dwell time. At the end of the dwell time the span point will be saved and the actual concentration value will automatically be adjusted. After the Span point has been saved, the analyzer switches to the Non methane mode and Zero gas is directed to the detector and the Non methane Calibration Zero screen will open as shown in Figure 11.

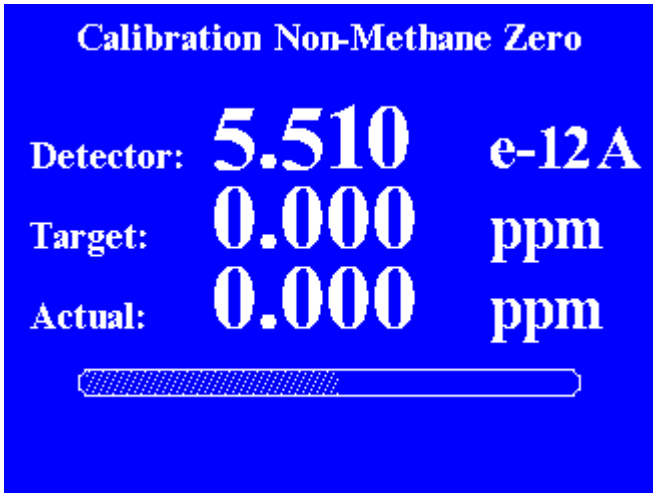


**Figure 11. Auto calibration non methane zero screen**

5. The Non methane Calibration Zero screen will remain open for the length of the dwell time. At the end of the dwell time the zero point will be saved and the actual concentration value will automatically be adjusted. After the Zero point has been saved, Span gas is directed to the detector and the Non methane Calibration Span screen will open as shown in Figure 12.

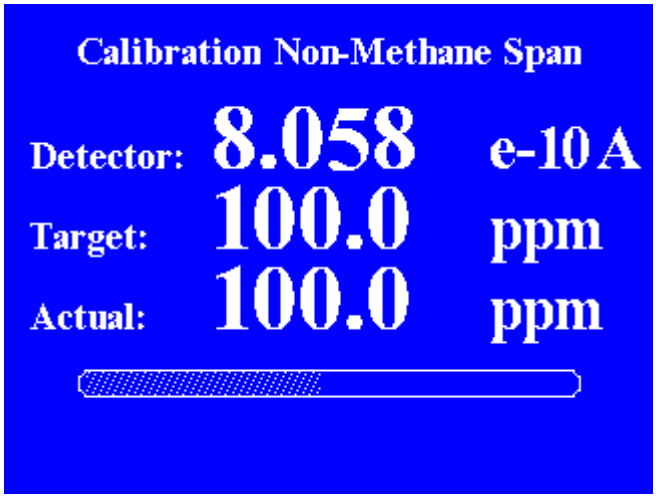


**Figure 12. Auto calibration non methane span screen**

6. The Methane Calibration Span screen will remain open for the length of the dwell time. At the end of the dwell time the span point will be saved and the actual concentration value will automatically be adjusted.

   After the span point has been saved the calibration is over and the main screen will appear.

## 4.3 Flow Calibration

Each flow zone uses an electronically controlled valve and pressure sensor to create a stable flow to the detector. Each flow zone requires a two point calibration. The first calibration point is the zero point with no flow through the analyzer and the second point is the span point with pressure applied to the flow zone. The “Press. Cnts” shown on the screen refers to the pressure measurement from the sensor.

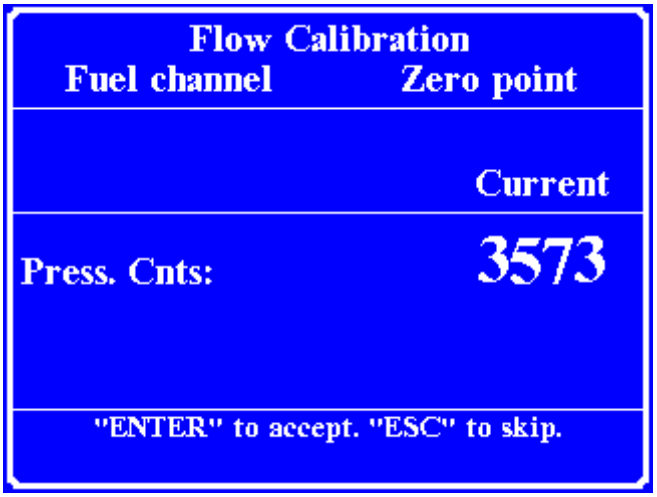


**Figure 13 Flow calibration (zero point) screen**

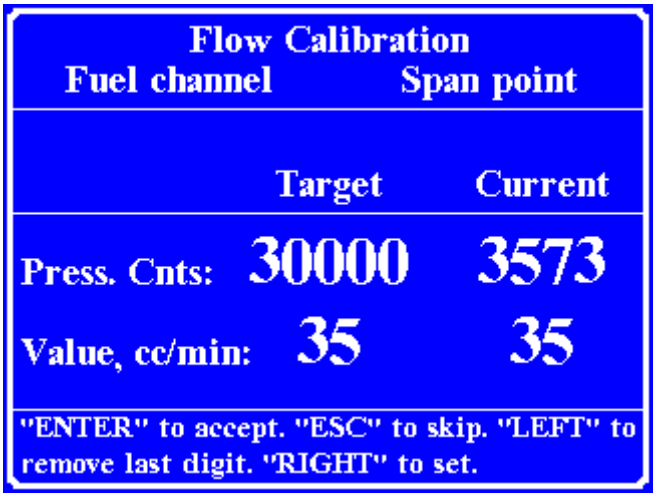


**Figure 14. Flow calibration (span point) screen**

### 4.3.1 Performing Flow Calibration

1. From the Main screen, press the ← or → key. Go to the Setup menu and select Flows Cal.
2. Use the ← arrow to select either Fuel, Air, or Sample. Press Enter to open the Flow Calibration screen (Zero Point). See Figure 13.
3. Remove all pressure from the analyzer and allow time to stabilize.
4. When the displayed pressure counts are stable, press “Enter” to accept the zero point or “Escape” to skip this step.
5. The Span Point calibration screen is now shown. See Figure 14.
6. Apply the recommended pressure (20psi) to the inlet port for the flow zone being calibrated.
7. Wait until the current pressure counts are equal to or close to the target pressure counts. Measure the flow out of the detector vent on the back panel and compare the measured value with the target flow shown on the display. If necessary use the ← key and the numeric keypad to change the target pressure counts. Use the → key to update the new value. Wait for the pressure counts to stabilize and re-measure the flow at the detector vent.
8. When the measured flow equals the target flow, press “Enter” to save the span point or press “Escape” to discard changes and exit the flow calibration.
9. Repeat the above steps for all three flow zones.

# 5 Communications

The VOC 1000 platform provides access to certain operating parameters and concentration data through an RS-232 and Ethernet interface. A simple ASCII, tab delimited protocol has been implemented. External personal computers can acquire analytical information from the analyzer using a simple communications program such as Windows Hyper Terminal.

A full description of the RS-232 and Ethernet output can be found in Section 6 of this manual.

## 5.1 Data stream

The analyzer sends the following data fields when set to concentration fields.

1. Date (Year/Month/Day)
2. Time (Hour:Minutes:Seconds)
3. Methane Concentration for sample port one.
4. Unit of concentration (ppm).
5. Non methane Concentration for sample port one.
6. Unit of concentration (ppm).
7. Total Concentration for sample port one.
8. Unit of concentration (ppm).
9. Sample Mode (M,N,-).

**Note:** Fields 3 – 8 are repeated for ports 2 through 4 if the analyzer is equipped with the four port option.

Example of data stream from a single port analyzer with only concentration fields selected:

2007/11/05 (TAB) 13:18:50 (TAB) 1.00 (TAB) ppm (TAB) 2.00 (TAB) ppm (TAB) 3.00 (TAB) M (CRLF)

The analyzer sends the following data fields when set to all fields:

1. Date (Year/Month/Day)
2. Time (Hour:Minutes:Seconds)
3. Methane Concentration for sample port one.
4. Unit of concentration (ppm).
5. Non methane Concentration for sample port one.
6. Unit of concentration (ppm).
7. Total Concentration for sample port one.
8. Unit of concentration (ppm).

**Note:** Fields 3 – 8 are repeated for ports 2 through 4 if the analyzer is equipped with the four port option.

9. Sample Mode (M,N,-).

10. Sample Flow (cc/min.)
11. Fuel Flow (cc/min.)
12. Combustion Air Flow (cc/min)
13. Detector Methane Current (Amps)
14. Detector Total Current (Amps)
15. Methane Calibration Slope (Whole parts/Ampere)
16. Non methane Calibration Slope (Whole parts/Ampere)
17. Methane Calibration Zero Offset (Whole parts)
18. Non methane Calibration Zero Offset (Whole parts)
19. Detector Temperature (Deg C)
20. Oxidizer Temperature (Deg C)

Example of data stream from a single port analyzer with all fields selected:
2007/11/05 (TAB) 13:18:50 (TAB) 1.00 (TAB) ppm (TAB) 2.00 (TAB) ppm (TAB) 7.00 (TAB) M (TAB) 16.1 (TAB) 35.0 (TAB) 175.2 (TAB) 6.00e-12 (TAB) 1.20e-11 (TAB) 1000000 (TAB) 300000 (TAB) -.000005 (TAB) -.000002 (TAB) 65.00 (TAB) 235.00 (CRLF)

## 5.2 Commands Accepted by the Analyzer

| Hex Value | Keyboard Value | Function |
|---|---|---|
| Ox13 | ^S | Stop Shipping Data |
| Ox11 | ^Q | Start Shipping Data |
| Ox12 | ^R | Initiate Auto Calibration |
| Ox14 | ^T | Update Methane Zero Value |
| Ox08 | ^H | Update Methane Span Value |
| Ox05 | ^E | Update Non methane Zero Value |
| Ox19 | ^Y | Update Non methane Span Value |
| Ox06 | ^F | Acknowledge Alarms |

^ designates the “Ctrl” key on the keyboard. For example: Pressing the “Ctrl” key and the “Q” simultaneously would send the command to the analyzer to start sending data.

## 5.3 Communications Framing Parameters

The analyzer sends a stream of ASCII data every 1 or 10 seconds. The data stream is tab delimited and terminated by a carriage return and line feed. Communication parameters are as follows:

- Baud Rate = 9600
- 8 Data Bits
- 1 Stop Bit
- No Parity Checking

## 5.4 Explanation of Data Fields

| | |
|---|---|
| **Date** | Contains the date. |
| **Time** | Contains the time of day |
| **Methane Concentration** | Contains the current methane concentration at the specific port |
| **Concentration Unit** | Contains the unit of measurement for the previous concentration field. This field will be “ppm” |
| **NonMethane Concentration** | Contains the current non methane concentration at the specific port |
| **Concentration Unit** | Contains the unit of measurement for the previous concentration field. This field will be “ppm” |
| **Total Concentration** | Contains the current total concentration at the specific port |
| **Concentration Unit** | Contains the unit of measurement for the previous concentration field. This field will be “ppm” |
| **Sample Mode** | A single character that indicates which mode the sample stream is in. An "M" indicates that it is in the methane mode. A "N" indicates that it is in the mode. And an "-" indicates that the detector is not ready |
| **Sample Flow** | Contains the sample flow rate to the detector and is expressed in cc/min |
| **Fuel Flow** | Contains the fuel flow rate to the detector and is expressed in cc/min |
| **Combustion Air Flow** | Contains the combustion airflow rate to the detector and is expressed in cc/min |
| **Detector Methane Current** | Contains the methane detector current, in amperes, measured by the analyzer. The current, along with the calibration information is used to determine the reported concentration. |
| **Detector Total Current** | Contains the total detector current, in amperes, measured by the analyzer. The current, along with the calibration information is used to determine the reported concentration |
| **Methane Calibration Slope** | Contains the slope of the methane calibration curve. The slope is expressed in whole parts per ampere and only changes when the analyzer is re-calibrated |
| **NonMethane Calibration Slope** | Contains the slope of the non methane calibration curve. The slope is expressed in whole parts per ampere and only changes when the analyzer is re-calibrated. |
| **Methane Calibration Offset** | Contains the offset value or "y intercept" of the methane calibration curve. The offset is expressed in whole parts and only changes when the analyzer is re-calibrated. The offset is a negative concentration. See the figure below for an illustration of the Calibration Curve |
| **NonMethane Calibration Offset** | Contains the offset value or "y intercept" of the non methane calibration curve. The offset is expressed in whole parts and only changes when the analyzer is re-calibrated. The offset is a negative concentration. See the figure below for an illustration of the Calibration Curve. |
| **Detector temperature** | Contains the operating temperature of the FID detector. |
| **Oxidizer temperature** | Contains the operating temperature of the oxidizer |

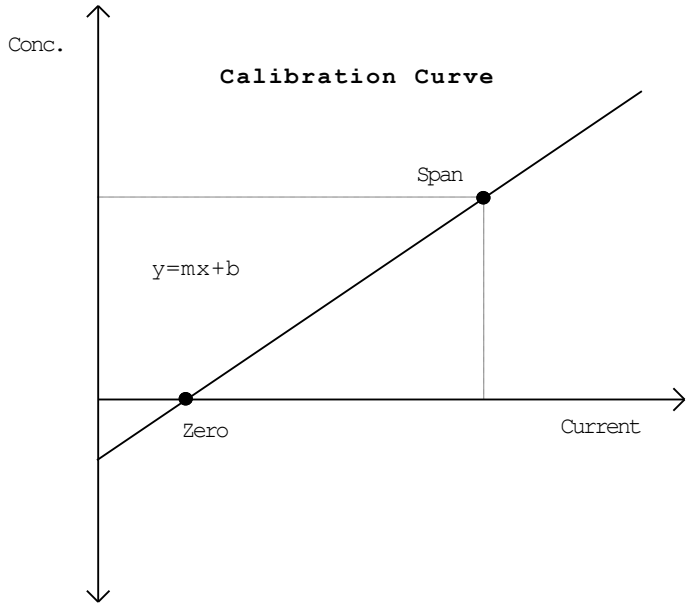


**Figure 15 well known equation for a line, y=mx+b where:**

- y=concentration
- m=slope
- x=current
- b=offset

# 6 Troubleshooting

If the analyzer continues to display an alarm prompt after a reasonable warm-up period, follow the steps documented below for the active alarm.

### Temperature Message

A temperature message indicates that the unit has deviated from the current temperature setting or failed to reach its operating temperature.

1. Verify that the analyzer feels warm at the back panel near the detector vent.
2. If the unit is warm, go into Operation mode and look at the current temperature reported in the "Status…" screen. The analyzer will initiate an alarm whenever the current temperature differs from the target temperature by more than 10%. If the analyzer does not feel warm, call Ecotech service department.

### Flow message

A flow message indicates that the support or sample gas flows have deviated from the value specified in the analyzer setup parameters.

1. Check the regulators on all attached gas sources to be sure the bottles are on and set to the correct pressure.
2. Verify they are set and calibrated properly.

### Flame out message

Indicates that the auto-ignite sequence has failed, or that the FID flame has been extinguished. The ignite sequence will not initiate until the analyzer reaches its operating temperature, and all flows are at their set points.

## 6.1 Power related

| Symptom | Probable Cause | Remedy |
|---|---|---|
| No indication of power | Power switch “off”. | Turn power switch “on” |
| | Power cord disconnected. | Connect |
| | Instrument fuses blown. | Replace fuses |
| | No line voltage. | Check main breaker |
| | Power supply failure. | Replace power supply board. |
| | Power cord failure. | Replace |
| Intermittent power | Loose power cord | Reconnect |
| | Main power fluctuations | Check to see that power is within instrument specifications. Check for other equipment on the same main circuit, which may cause intermittent power surges (i.e.: compressors, Air conditioners, etc.) |
| | Power cord failure | Replace |
| | Power supply failure | Replace power supply |

## 6.2 FID ignition

| Symptom | Probable Cause | Remedy |
|---|---|---|
| FID will not light or will not stay lit | Temperature problem. | Check to see that detector block is up to temperature and is controlling properly. |
| | | If a temperature problem is suspect, review the following common temperature failure symptoms. |
| | Combustion Air or Fuel gas problem. | Check to see that the instrument flows are reading within 10% of the set point and controlling properly. If a flow problem is suspect, review the following common flow failure symptoms. |
| | H2 and Air flows are out of calibration | Re-Calibrate flows. |
| | Electrometer cable is unplugged from main board or electrometer board. | Re-Connect. |
| | Electrometer not securely connected to FID. | Seat board onto FID and tighten into place. |
| | FID thermocouple failure. | Replace the FID. |
| | Damaged FID ignite coil. | Replace the FID. |
| | Dirty FID | Clean |
| | Electrometer cable failure. | Replace cable. |
| | Electrometer board failure. | Replace electrometer board. |

## 6.3 Temperature failure

| Symptom | Probable Cause | Remedy |
|---|---|---|
| Temperature fails to increase to set point. | Heater is unplugged from controller board. | Reconnect |
| | Broken heater wire or bad connection. | Replace heater assembly. |
| | Heater failure. (Open) | Replace heater assembly. |
| | Broken wire or bad connection on thermal cutoff. | Replace thermal cutoff assembly. |
| | Thermal cutoff failure. (Open) | Replace thermal cutoff assembly. |
| | RTD unplugged from the main board. | Reconnect. |
| | Broken RTD wire or bad connection. | Replace RTD assembly. |
| | RTD failure. (Open) | Replace RTD assembly. |
| | Controller board failure | Replace controller board. |
| Temperature runs away. | RTD Failure. (Short) | Replace RTD assembly |
| | Controller board failure | Replace controller board. |
| Temperature read point is unstable or bouncing. | Bad or intermittent heater wire connection. | Replace heater assembly. |
| | Bad or intermittent connection on thermal cutoff. | Replace thermal cutoff assembly. |
| | Thermal cutoff failure | Replace thermal cutoff assembly. |
| | RTD failure. | Replace RTD assembly. |
| | Controller board failure | Replace controller board. |

## 6.4 Flow failure

| Symptom | Probable Cause | Remedy |
|---|---|---|
| Flow fails to increase to set point | Block is not up to temperature. | Allow the instrument time to warm up. If temperature alarm persists, see the common temperature failure symptoms. |
| | Flow source is not connected or set to the proper inlet pressure. | Connect flow source and set inlet pressure. If it is the sample flow, verify that the pump is on. |
| | Flow source failure. | Repair or replace. |
| | Leak in the internal or external gas train. | Find and repair leak. |
| | Control cable is unplugged from the controller board. | Reconnect. |
| | Broken wire or bad connection on control cable. | Replace cable assembly. |
| | Restrictor is plugged. | Replace |
| | Flows are out of calibration | Recalibrate flows. |
| | Pressure transducer failure. | Replace controller board. |
| | Electronic regulator is not plugged into the controller board. | Reconnect. |
| | Electronic regulator failure. | Replace regulator assembly. |
| | Controller board failure | Replace controller board. |
| Flow read point is unstable or bouncing | Leak in the internal or external gas train. | Find and repair leak. |
| | Flow inlet pressure unstable | Repair or replace combustion air source. |
| | Bad or intermittent connection on control cable. | Replace cable assembly. |
| | Pressure transducer failure. | Replace controller board. |
| | Electronic regulator failure. | Replace regulator assembly. |
| | Controller board failure | Replace |

## 6.5 Common signal problems

| Symptom | Probable Cause | Remedy |
|---|---|---|
| No detector signal | Incorrect installation, setup or programming of the instrument. | Review operation manual. |
| | Temperature Alarm | Rectify alarm condition |
| | Air Flow Alarm | Rectify alarm condition |
| | Fuel Flow Alarm | Rectify alarm condition |
| | Sample Flow Alarm | Rectify alarm condition |
| | Flame out Alarm | Rectify alarm condition |
| | External recording device or data acquisition system wired incorrectly or disconnected from the instrument. | Connect to rear panel terminal strip. |
| | Analog outputs not setup properly | Verify connections |
| | No sample flow | Verify all flows have been properly set and calibrated |
| | Restrictor plugged | Replace |
| | Detector failure | Replace |
| | Electrometer cable is unplugged. | Reconnect. |
| | Electrometer not securely connected to FID. | Seat board onto FID and tighten into place. |
| | Electrometer cable failure. | Replace cable. |
| | Electrometer board failure. | Replace electrometer board. |
| | Analog output failure | Replace I/O board. |
| Excessive Signal Noise | Dirty support gas | Support gasses should contain less than 1 PPM total hydrocarbons. |
| | Incorrect flow rate | Reset flow rates |
| | Contaminated gas connection lines | Replace lines |
| | Faulty regulation of support gasses | Replace |
| | Contaminated detector | Clean |
| | Contaminated electrometer | Clean |
| Excessive Signal Drift | Dirty support gasses | Support gasses should contain less than 1 PPM total hydrocarbons. |
| | Excessive fuel flow rate | Reset hydrogen flow. |
| | Contaminated gas connection lines | Replace |
| Excessive Background Ionization | Incorrect fuel and air flow rates | Reset flows |
| | Contaminated support gasses | Support gasses should contain less than 1 PPM total hydrocarbons. |
| | Contaminated detector | Clean |
| | Contaminated electrometer | Clean |
| | Contaminated gas connection lines | Replace |
| | Calibration valve leak | Replace |
| Low Sensitivity | Below or reaching lower detectable limits | Verify gain settings are correct. |
| | Incorrect gain | Verify gain settings are correct. |
| | Leaks in internal plumbing | Leak check system. |
| | Loss of detector collector voltage | Replace electrometer board |
| | Contaminated detector | Clean |

| | | |
|---|---|---|
| | Detector failure | Replace |
| | Electrometer failure | Replace |
| High Sensitivity | Incorrect gain settings | Verify gain settings are correct. |
| Non-Linear signal | Beyond linear range of detector | Decrease Sample flow. |
| | Inaccurate calibration standards | Verify calibration gasses are certified and new. |
| | Improper gain settings | Adjust gain settings |
| | Loss of collector voltage | Replace electrometer board |
| | Calibration valve leaks | Replace |
| | Excessive fuel or air flows | Reset flows |
| Poor Reproducibility | Leaks within the internal gas train | Leak check instrument |
| | Variation in support gas flow rates | Reset flows and verify they are constant over time. |
| | Variations in temperature | Verify temperature is constant over time. |
| | Extreme fluctuation in sample flow rate | Verify sample flow rate is constant over time. |

# Appendix A – Temperature and Pressure settings

## *Temperature Settings*

| Temp Zone | Assigned to | Setting °C | Max Temp °C |
|---|---|---|---|
| Zone 1 | Detector Manifold | 65 | 65 |
| Zone 2 | Oxidizer | 200 | 250 |

## *Gas Pressures and Flow Settings*

| Description | Range | Inlet Pressure (psig) | Setting (cc/min) |
|---|---|---|---|
| Fuel (H2) | All | 20 | 35 |
| Fuel (Blend) | All | 30 | 90 - 110 |
| Combustion Air | All | 20 | 120 - 200 |
| Zero | All | 20 | Same as Sample Port(s) |
| Span | All | 20 | Same as Sample Port(s) |
| Sample Port(s) | 200 ppm (Methane/Air) | * 15 | 10 - 45 |
| Sample Port(s) | 1000 ppm (Methane/Air) | * 15 | 10 - 45 |
| Sample Port(s) | 200 ppm (Methane/O2) | * 15 | 10 - 45 |

*** If an Analyzer is equipped with an internal pump the inlet is at ambient pressure.**

**Note:** Refer to the test report shipped with the analyzer for the exact settings for your application.