*Data*FID™ Flame Ionization Detector

LD Version

USER MANUAL

Warning: Limitation of Liability

The ultimate responsibility of the consequences of use of toxic compounds rests with the user.
The Manufacturers role is as a supplier of instrumentation to assist in the early detection of hazardous conditions involving such compounds.

It is vitally important to ensure that the *Data***FID** is maintained in accordance with Photovac's instructions and that proper calibration is regularly performed.

*Data***FID** service should be performed only by The manufacturer, or an authorized repair center. Unauthorized service may void the Intrinsic Safety Certifications.

As with any complex device, the *Data**FID*** is subject to failure and, while the manufacturer has taken, and continues to take, all possible precautions to (a) reduce the possibility of failure, and (b) warn the user in the event of failure, circumstances may occasionally occur in which there is a failure despite such precautions on the manufactures part. The manufacturer regrets that it cannot accept liability for damages of any kind caused as a result of either failure of the user to follow instructions or of the *Data***FID** to

Release History

Part Number	Release	Publication
Date **MN201101-01**	**A**	**Dec. 23, 2009**

Notices

The information contained in this document is subject to change without notice. Photovac makes no warranty of any kind with regard to the material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

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*Data***FID**™

*Smart*Probe™

*LDAR*Probe™

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A component of this device is licensed under U.S. Patent No. 7,369,945 B2

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For Your Safety

Strictly follow the Instructions for Use

Any use of this instrument requires a full understanding and strict adherence to these instructions.

The instrument is only to be used for the purposes specified in this manual.

Maintenance

The *Data***FID** must be inspected and serviced by trained service personnel at regular intervals. Repair of the *Data***FID** may only be carried out by Photovac factory authorized service personnel. Only authentic Photovac spare parts may be used for maintenance. Review chapter “Maintenance Intervals” on page 33.

Use in areas subject to explosion hazards

The *Data***FID** has been tested and approved according to EMI and intrinsic safety requirements defined by the US (FCC Pt. 15 and UL 913 5th edition). Declarations of conformity are found on page 8.

Modifications of components or the use of faulty or incomplete parts is not permitted. When making repairs to equipment or components of this type, Intrinsic Safety Certifications may be violated if the *Data***FID** is serviced by individuals or organizations that are not Photovac factory certified for repair services.

Liability

The liability for the proper functioning of the *Data***FID** is irrevocably transferred to the owner or operator to the extent that the instrument is improperly serviced or repaired by personnel not employed or authorized by Photovac, Inc., or if the *Data***FID** is used in a manner not conforming to its intended use.

Photovac, Inc. cannot be held responsible for damage caused by non-compliance with the recommendations given above.

The warranty and liability limitations provisions of the terms of sale and delivery of Photovac, Inc., are likewise not modified by the recommendations given above.

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Trademarks

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Notices and Warnings

FCC Warning

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Subpart B, Class B of Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their expense.

Data*FID* Intrinsic Safety Notice

THE *Data***FID** IS CLASSIFIED FOR USE IN CLASS I, DIVISION 1, GROUPS A, B, C, D HAZARDOUS LOCATIONS. T4 (135°C) RATING.

*The Data***FID** *has been listed by Intertek, Inc., to comply with Underwriters Laboratories® Inc. UL® 913 Standard for Intrinsically Safe Apparatus and Associated Apparatus for use in Class I, Division 1, Groups A, B, C, D Hazardous (Classified) Locations.*

***Data*FID Safety Label**

If there is any indication of physical damage to the *Data*FID after it has been dropped, the unit must be checked out by a service technician to ensure instrument integrity.

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WARNING

THE *Data***FID** IS NOT INTENDED TO DETECT COMBUSTIBLE LEVELS OF GASES.

THE *Data***FID** IS CLASSIFIED FOR USE IN ATMOSPHERES CONTAINING COMBUSTIBLE LEVELS OF GASES.

These accessories are for use with the *Data***FID** in a hazardous location:

Name and description	**Part No:**
*Smart*Probe	A1201103

Do not use any other accessories with the *Data***FID** in a hazardous location.

Substitution of components may affect the safety rating.

WARNING

CAUTION

To reduce the risk of fire or injury to persons, read and follow these instructions:

1. All calibration, maintenance and servicing of this device, including battery charging, must be performed in a safe area away from hazardous locations. Disconnect all power before servicing.

2. There are no operator replaceable parts for the *Data***FID** except the battery pack, exhaust frit, and sample inlet filter.

3. There are no operator serviceable parts inside the *Data***FID**.

WARNING

1. Do not dispose of the battery pack in a fire. The cells may explode. The battery pack must be disposed of properly. Check with local codes for possible special disposal instructions.

2. Do not open or mutilate the battery pack. If the *Data***FID** is used in a manner not specified, the protection provided by the *Data***FID** may be impaired.

3. Exercise care in handling battery packs in order not to short the terminals with conducting materials such as rings, bracelets and keys. The battery or conductor may overheat and cause burns.

4. Do not defeat proper polarity orientation between the battery pack and battery charger.

5. Charge the battery pack using the AC battery charger provided with or identified for use with this product only in accordance with the instructions and limitations specified in this manual. To charge the battery, use only the Photovac Universal Battery Charger Part No. A1201221. When using the battery charger, do not block access to the mains outlet in use with adapter. The AC battery charger is not to be used in a hazardous area.

WARNING

1. All calibration, maintenance and servicing of this device, including battery charging, must be performed in a safe area away from hazardous locations.

2. Disconnect all power before servicing.

3. Do not open the *Data***FID** exhaust frit when the unit is operating.

WARNING	Do not open the *Data***FID** or SmartProbe housings to access the internal components. This action will invalidate the Intrinsic Safety rating for these products

1. INTRODUCTION

About this Manual

This manual provides detailed instructions for the setup, operation and maintenance of the *Data***FID** Portable Flame Ionization Detector.

Before unpacking the instrument, please read the **Warnings and Safety Practices** on page 12. This section describes possible hazards that may injure the user, damage the instrument or compromise its operation. Some general safety information is also provided.

To help you learn to use *Data***FID** quickly, this manual is organized by tasks beginning with:

- Chapter 2 Using the *Data***FID**
- Chapter 3 User Functions
- Chapter 4 Wireless Communication
- Chapter 5 Supplemental Air Instructions -
Chapter 6 Routine Maintenance
- Chapter 7 Troubleshooting
- Chapter 8 Appendices

The *Data***FID** manual uses a few conventions for key names on the keypad and for text that is shown on the display.

UPPERCASE	Key names are denoted by uppercase text. An ARROW key is the collective name for the UP ARROW and DOWN ARROW keys.

"Display Text"	Text that appears on the *Data***FID** display is in quotation marks.
<Angle Brackets>	Computer keyboard names are denoted by angle brackets, e.g. <Ctrl>.
FID	Text that must be typed in using the computer keyboard is shown in italics.

In the User Manual text various warnings and notes are displayed, including:

WARNING	A warning indicates an operation that could cause personal injury if precautions are not followed.

CAUTION	*A caution indicates an operation that could cause damage to the instrument if precautions are not followed.*

NOTE!	*A note indicates significant information.*

UNPACKING THE *Data*FID - LD

The following accessories are included with your *Data***FID**:

*Data***FID** Instrument CD Manual

70 Liter hydrogen cylinder

15-hour battery pack

*Data***FID** Multi-Tool

Universal Battery Charger with Line Cord

Replacement Sample Inlet Filters

Ensure all of these accessories have been included with the instrument. If any items are missing or damaged, contact Photovac immediately.

WARNINGS AND SAFETY PRACTICES

Please read this section before operating the *Data***FID.**

Throughout this manual notes are provided to inform you of the limitations of usage for the *Data***FID**.

Approved Models of the Data*FID*

This manual provides operational information for the LD version of the *Data***FID**. The *Data***FID - LD** is intrinsically safe and approved for use in hazardous locations. Refer to the Notices and Warnings section of this manual for details of each approval.

WARNING	If the *Data***FID** being used is not specifically identified as intrinsically safe with a location on the body of the *Data***FID**, do not use it in a location where flammable concentrations of gases and vapors may exist.

Intended Use

	The *Data***FID** only measures the concentration of airborne gases and vapors that can be ionized by a flame ionization detector.
	The *Data***FID** automatically displays and can record the concentration values.
WARNING	The reading displayed represents the total concentration of all flame ionizable chemicals present in the sample. The *Data***FID** can display concentration values in ppm and ppb.

Excessive Heat and Cold

WARNING	Do not expose the instrument to intense sunlight for prolonged periods. Exposure to excessive heat may result in erroneous readings. At low temperatures, water vapor, a by-product of the hydrogen flame, may condense at the exhaust port. At sub-zero temperatures the water vapor will freeze and obstruct the exhaust port. If the exhaust port becomes obstructed, pump operation will be inhibited. Flame out may also result.

Flame Ionization Detector Operation

The *Data***FID** uses a flame ionization detector for the measurement of combustible organic compounds in air at parts-per million levels. The permanent air gases (argon, carbon dioxide, nitrogen, oxygen, water vapor, etc.) are not ionized by the flame.

When the *Data***FID** is flamed on, the internal pump draws air in through the *Data***FID** inlet. This sample air provides the oxygen necessary for combustion in the hydrogen fed flame.

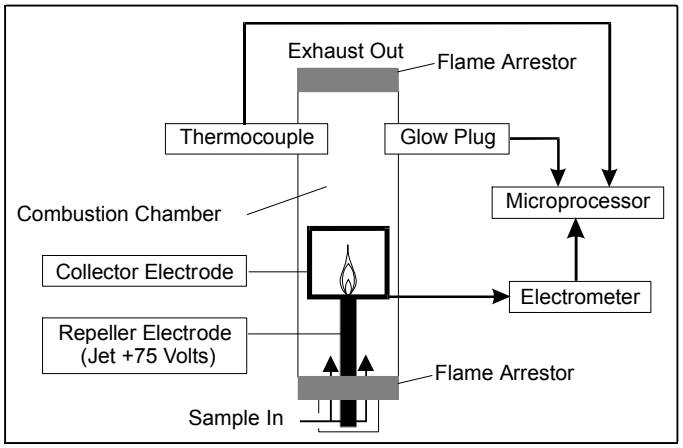


Figure 1. Flame Ionization Detector

When the proper ratio of hydrogen to air is present in the combustion chamber, the flame is started automatically with a glow plug. A thermocouple is used to monitor the status of the flame.

When the sample passes through the flame, the combustible organic compounds in the sample will be ionized. After the compounds have been ionized by the flame, the ionized particles are subjected to a continuous electric field between the repeller electrode at the jet (+75V) and the collector electrode.

The ions move in the electric field, generating a current, which is proportional to the concentration of the ionized molecules in the ionization chamber. An electrometer circuit converts the current to a voltage that is then fed to the microprocessor.

After the sample passes through the flame and has become ionized, it is vented from the detector through a flame arrestor. The flame arrestor prevents the flame from igniting any flammable gases present in the sampling location.

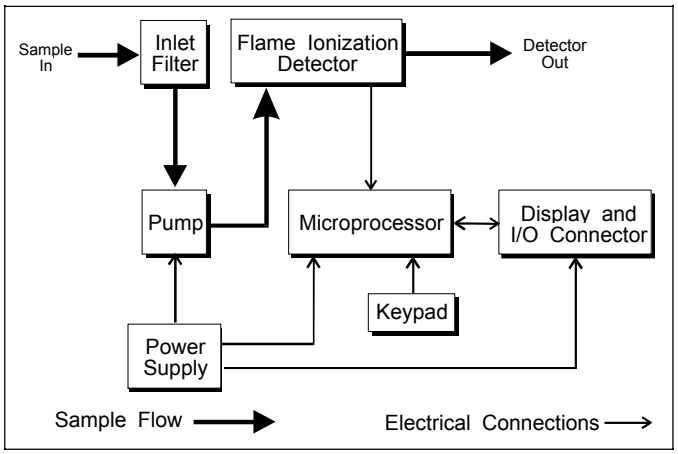


Figure 2. Block Diagram

Detector Response

The *Data***FID** is strictly an organic compound detector. It does not respond to inorganic compounds. The *Data***FID***'s* sensitivity is highly dependent on chemical structure and bonding characteristics. The combustion efficiency of a compound determines its sensitivity.

Simple saturated hydrocarbons (methane, ethane etc.) possess high combustion efficiencies and are among the compounds that produce the highest *Data***FID** response. Organic fuels (acetylene, refined petroleum products), burn easily and are also extremely well detected.

The presence of substituted functional groups (amino, hydroxyl, halogens) on a simple hydrocarbon reduces its combustion efficiency and thus *Data***FID**'s sensitivity to the compounds methanol and chloromethane, for example, are detectable with the *Data***FID** but not as well as methane. A greater number of carbon atoms can offset this loss of sensitivity due to substitution. For example, the *Data***FID** is more sensitive to n-butanol than it is to methanol.

Note: The list of *Data***FID** compound Response Factors is maintained on Photovac's web site: www.photovac.com.

Support Equipment and Consumables

Compressed Gases

Cylinders of compressed gas, such as hydrogen and calibration gas, must be handled with extreme care. When using the calibration gas bag adapter, take care not to kink or stress the tubing. For safety, the hydrogen and calibration gas cylinders must be secured before use.

Please observe the following handling procedures:

Do not mutilate cylinders.

Do not expose the cylinders to direct sunlight.

Do not heat the cylinders. The cylinders may rupture at high temperatures.

Use only the specified regulator for the calibration gas. Confirm regulator type and material with your specialty gas supplier.

Use only the *Data***FID** Hydrogen Filling Station for the hydrogen cylinder, Part No. A1201222 or *Data***FID** Hydrogen Filling Station Manifold System Part No. A1201223.

Always secure cylinders before removing the cylinder valve protection cap.

Do not drag or roll cylinders. Use a cylinder hand truck to move large cylinders.

Wear safety glasses when working with compressed gases.

Store cylinders in an upright position.

Do not store cylinders in a hazardous location.

Store cylinders away from possible sources of ignition.

Keep regulators and related equipment in the same gas service. Do not change service or adapt equipment without consulting your gas supplier.

Regulators for Compressed Gases

When connecting a regulator to a large cylinder:

Ensure the cylinder valve and regulator connection match.

Ensure the regulator construction materials are compatible with the gas, and that the cylinder pressure gauge will withstand the cylinder pressure.

Never use the regulator as a shut-off valve. Close the cylinder valve when it is not in use.

Do not subject the regulator to an inlet pressure greater than recommended.

Do not move or detach the regulator when it is pressurized or when it is in use.

Before connection, ensure the gas cylinder valve and the regulator CGA connection are clean.

Turn the pressure control valve on the cylinder all the way out (close the cylinder). Turn the regulator outlet to off. Open the gas cylinder valve slowly and check for leaks. Adjust the delivery pressure and then open the regulator outlet valve.

Hydrogen Gas

The *Data***FID** detector uses a hydrogen flame to ionize samples and produce Total Volatile Organic Compound (TVOC) readings. The quality and purity of the Hydrogen gas is very important to the accuracy of the detector.

	Hydrogen gas is a fire and explosion hazard when exposed to heat or flame. The lower explosive limit (LEL) is 4%. The lower explosive limit is the minimum concentration of gas or vapor in air that will ignite in the presence of a source of heat or sparks.
WARNING	Refer to the Material Safety Data Sheet (MSDS) before handling this gas. The MSDS will be provided by the gas supplier when the gas is ordered.

You must obtain a tank of hydrogen from which you can fill the internal cylinder. When ordering hydrogen, specify ultra high purity hydrogen, 99.999% pure. This grade of hydrogen is also referred to as Grade 5 or Ultra zero grade. The hydrogen must have less than 0.1 ppm hydrocarbon contamination.

You can obtain the hydrogen in various size cylinders and pressures. Specify a tank with no more than 2400 psig (16547 kPa).

The hydrogen cylinder must also have CGA 350, male outlet.

The *Data***FID** Hydrogen Filling Station Part No.A1201222 A1201222 or *Data***FID** Hydrogen Filling Station Manifold System Part No. A1201223 is required to fill the *Data***FID** hydrogen fuel cylinder. You cannot fill the *Data***FID** hydrogen cylinder without the *Data***FID** hydrogen filling station.

Calibration Gas

Adequate ventilation must be provided when the *Data***FID** is being calibrated.

If compound threshold limit values (TLV) are exceeded, you should use a gas bag for sampling and calibration.

To determine the TLV of the compounds contained in the calibration gas, refer to the Material Safety Data Sheet (MSDS) supplied with your calibration gas cylinder.

Oxygen Concentration Limits

A minimum of 17% oxygen is required to start the hydrogen flame. The oxygen is supplied from the sample as it is drawn in by the pump. A minimum of 10% oxygen is required to maintain the hydrogen flame. An oxygen deficiency will reduce the height of the flame or cause the flame to be extinguished and may affect the displayed reading.

If the *Data***FID** is used in a highly contaminated area where it is possible that the oxygen content is below 10%, watch for indications of reduced flame height such as lowered detection limits or a flame out fault.

Flammable Gases

High concentrations of flammable gases (gases within their flammable range) can act as an additional fuel source. When this happens, the flame height may increase beyond the confines of the combustion chamber. The hydrogen supply will then be cut off and the flame will go out.

Flame out may also occur when the concentration of sample gas is so great that it causes an oxygen deficiency. This may occur when sampling enclosed or confined spaces where vapors and gases cannot escape. Watch for indications of increased flame height such as erratic readings or sudden high concentrations followed by a flame out fault.

ACCESSORIES

Computer

The *Data***FID** will send information stored in its logged memory or will continuously stream data to a computer or PDA via Bluetooth wireless communication. This feature may be used if you need to prepare reports based on the *Data***FID** recorded data.

Information prepared on a PC such as “routing or tag information” may be uploaded to the *Data***FID** via Bluetooth as well.

WARNING	The *Data***FID** is not classified for use in hazardous locations with computers.

Gas Sampling Bag

A gas sampling bag is required for calibration of the *Data***FID**. If you are unsure of the quality of ambient air you should use an additional gas bag filled with zero air. Connect the sample bag to the inlet fitting with the gas bag adapter. See Calibration on page 26 for more information.

One sampling bag is included in the *Data***FID** calibration kit Part No. MX396011. Additional gas bags are also available (Part No. MX396017).

Charcoal Filters

A charcoal filter (Part No.MX396022, package of 10) may be connected to the *Data***FID** during calibration and sampling to provide clean air to the *Data***FID**. The filter will remove hydrocarbon contamination from room air to provide zero grade air to the *Data***FID**.

NOTE: The charcoal filter does not filter methane or ethane. If these compounds are present, you should use a gas bag with a supply of commercial zero air for calibration purposes.

To connect a charcoal filter:

1. Load the Teflon ferrules into the nut. The nut and ferrules are supplied with the filter. See Figure 3.

2. Connect the nut to the *Data***FID** inlet. Do not tighten the nut.

CAUTION	Over-tightening the Teflon ferrules will results in damage to the ferrules.

3. Remove the charcoal filter from its plastic bag and insert it into the nut. Finger-tighten the nut onto the inlet. If the filter is not secure, ensure you have inserted the tube stub far enough into nut. Do not over-tighten the fitting.

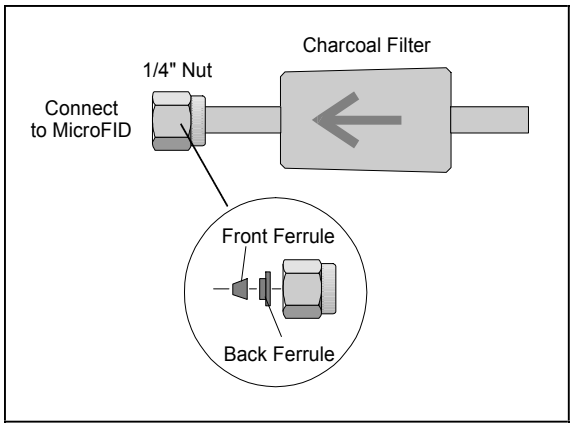


Figure 3 Connecting the Charcoal Filter

The charcoal filter will remove hydrocarbon contaminants for up to 4000 ppm hours. This means that the filter will be good for 1 hour removing 4000 ppm of hydrocarbon contaminants or will last for 4 hours removing 1000 ppm. The exact time will be determined by the operating environment. You will notice an increased hydrocarbon background when the filter requires replacement.

To replace the charcoal filter:

1. Loosen the nut on the *Data***FID** inlet.

2. Remove the used filter.

3. Insert the new charcoal filter into the nut and finger-tighten the nut onto the inlet. Do not over-tighten the fitting.

4. When the charcoal filter is not in use, place it in its plastic bag and store it in a clean, dry place.

2. USING THE *Data*FID

*Data*FID Feature Layout

The photograph below shows the basic layout of the *Data***FID** – LD Version components. The LD version requires the *LDAR*Probe or equivalent and an intrinsically safe PDA for operation (must be purchased separately.

NOTE: The cover must be attached for the *Data*FID to operate and to maintain the intrinsic safety rating.

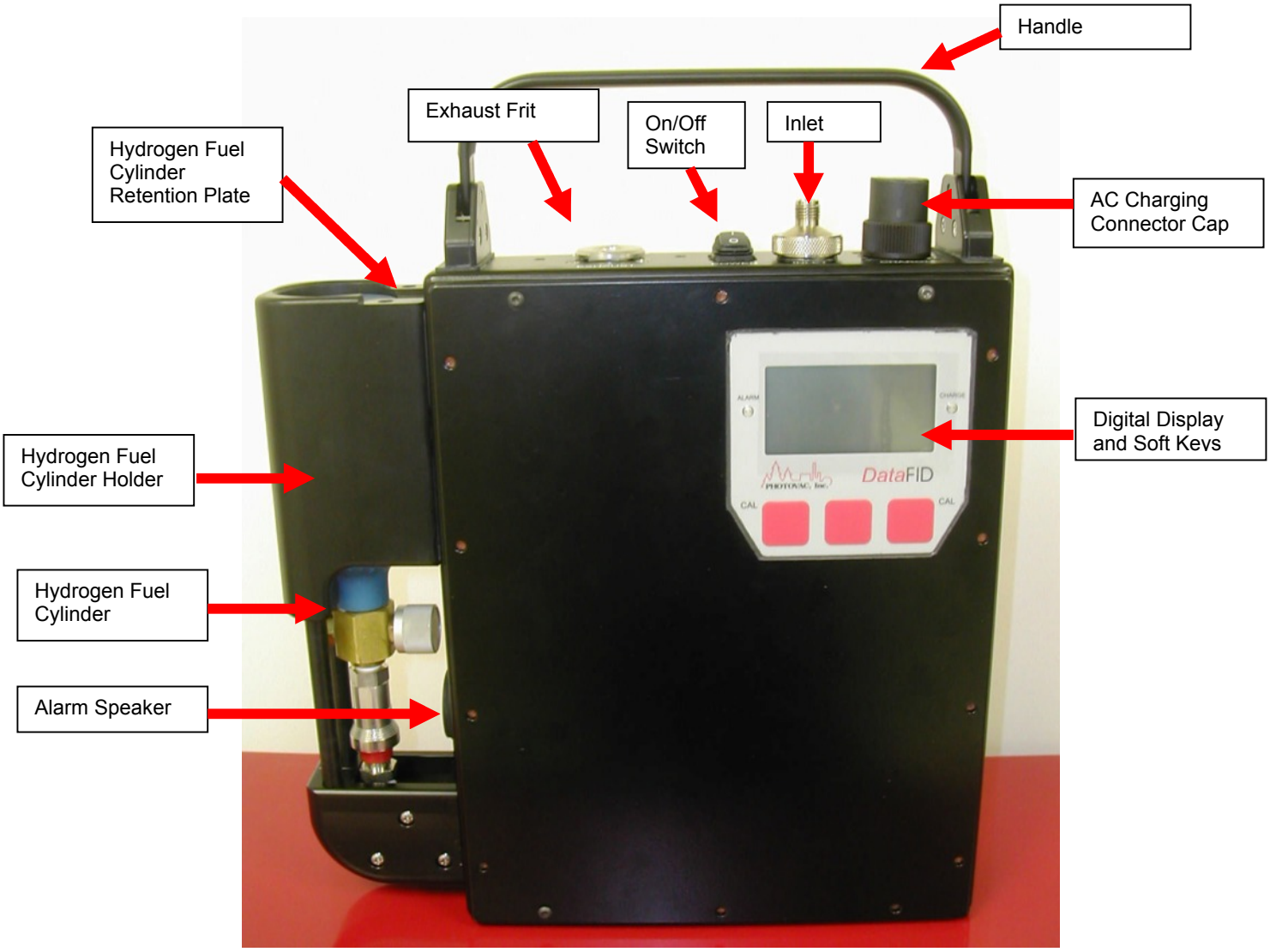


Figure 5. *Data***FID – LD version.**

*LDAR*Probe and PDA

The DataFID LDARProbe or equivalent and a PDA must be used to operate the DataFID-LD for LDAR monitoring.

Figure 6. *LDAR*Probe and PDA

WARNING	The PDA must be rated intrinsically safe in order to operate in a hazardous environment.

Using the *Data*FID Battery Charger

READ THESE INSTRUCTIONS BEFORE USING THE CHARGER

The *Data***FID** battery charger is only designed for indoor use and should not come into contact with water or dust. In order to avoid overheating, the charger should not be covered when it is in use.

The charger is turned on by connecting it to the mains socket.

Disconnecting it from the mains socket turns the charger off. If the charger is equipped with a mains cord, verify that the cord has not been damaged. If the cord is damaged, the charger must not be used.

The charger contains dangerous voltages and the cover should not be removed.

CHARGER FUNCTIONALITY

This charger is a fast charger for NiMH batteries. The charger will automatically charge the battery at a fast rate, and then charge to a slow rate near the end of the cycle. This prevents over-charging.

CAUTION

Do not charge batteries at too high or too low temperatures. Charge only in areas between 38-110°F (3-43°C).

HOW TO USE THE CHARGER

The Charger is started by connecting the battery pack to the charger. The LED will be orange before the fast charge starts and the LED changes to red. When the batteries are fully charged, the charger will go into a top-off charge mode before it goes over to trickle charge mode. During top-off charge, the LED will be green with short intermittent orange light. When the top-off charge is completed, the charger will go into trickle charge mode and the LED will be green. The charge current is now reduced to a safe level, which allows the charger to stay connected to the NiMH batteries without damaging the battery. If the battery voltage is far below normal, the charger will cut off the fast charge current and go to trickle charge mode. The LED will then indicate ‘error’ by flickering green and red light. If the mains is turned off, the charger will reset and start a new charge cycle if the mains is turned on again. If new batteries are to be connected, the charger must idle for approximately 15 seconds to make sure all parameters in the microprocessor have been reset. The LED changing to yellow light shows this and a new charge cycle can begin.

CHARGE CYCLE AND LED INDICATIONS

LED	MODE
Orange	Battery not connected
Orange	Battery initialization & analysis
Red	Fast Charge
Green with intermittent orange flash	Top-off charge
Green	Trickle charge
Alternating red-green	Error

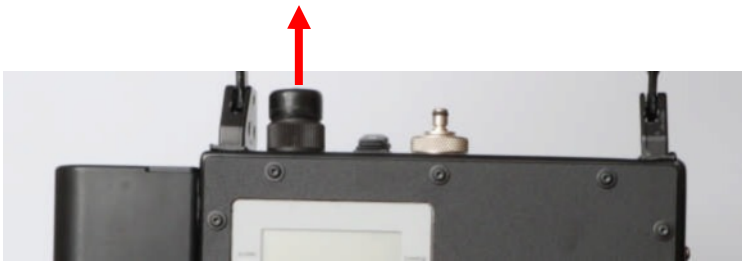
Table 1. Battery Charger Indications

With mains connected, the LED will be orange the first 5-7 seconds, and will be orange when the initialization and analysis starts. If a battery is connected, the actual charging will start a few seconds later when the LED changes to red.

CAUTION: Use only *Data*FID Battery Charger P/N 1201221 to charge the LD version.

To Charge the Battery

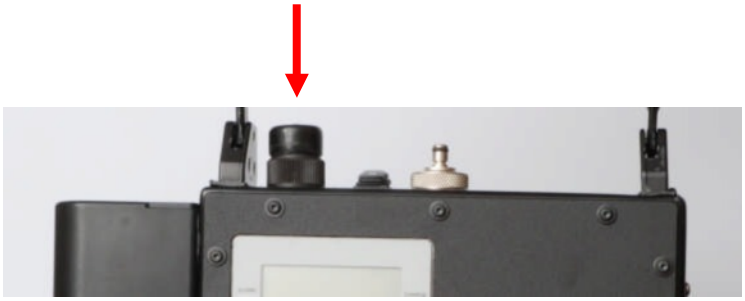
1. To charge the *Data***FID** – LD battery, unscrew the cover for the charging connector cap.



2. Connect the charge adapter to the *Data***FID** charging connector.

3. When the battery charge indicates there is a full charge to the battery, disconnect the charge adapter from the *Data***FID** charging connector

4. Install the charging connector cap to the charging connector.



Note: The *Data*FID will not operate without the charging connector cap in place.

Note: The *Data*FID will not operate with the AC Adapter plugged into the *Data*FID.

Filling the Hydrogen Fuel Cylinder

The *Data***FID** hydrogen fuel cylinder is a metal hydride design that requires relatively low hydrogen pressure to fill it.

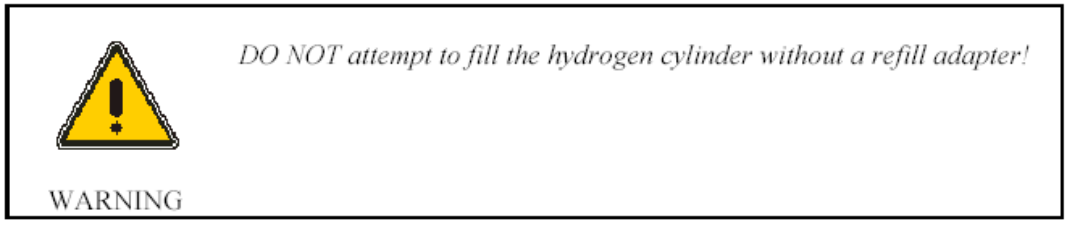
Figure 7. *Data***FID** Hydrogen Cylinder

The hydrogen fuel cylinder (see Figure 7), when full, will provide the *Data***FID** with up to 70 hours of continuous operation in a single fill. To fill the hydrogen fuel cylinder, the *Data***FID** hydrogen filling station Part No. A1201222 is required (see Figure 8). The hydrogen fill station is outfitted with a CGA 350 adaptor for use with a high pressure hydrogen cylinder that contains at least 99.999% pure grade hydrogen (also known as ultra high purity hydrogen).

Caution: H_2S, SO_2, Cl_2, and CO are contaminating substances for the cylinder alloy. Do not expose the cylinder interior to these substances.

Caution: Lower grades of hydrogen will damage the fuel cell with impurities and decrease the overall longevity of the fuel cell. Ensure the hydrogen is ultra high purity.

Caution: Do not modify or alter the hydrogen cylinder or fittings.



The Hydrogen Filling Station (Part No.A1201222) consists of an adapter fitting with a left-handed thread for cylinder attachment, an output valve and a hydrogen fuel cylinder quick connect. The Hydrogen Filling Station delivers a fixed 260 psi to the hydrogen fuel cylinder. The output valve is positioned to deliver gas from the cylinder to the hydrogen fuel cylinder. Additionally, in the final stages of filling the hydrogen fuel cylinder, the output valve is used to release gas held in the quick connect after filling.

The *Data***FID** Hydrogen Fuel Cylinder is composed of metal hydride material. The process of filling this cylinder involves the low pressure adsorption of hydrogen on the metal hydride surface, rather than the high pressure filling process for conventional hydrogen cylinders. Table 2 illustrates the charge time versus fill time for the *Data***FID** hydrogen cylinder.

A 5 minute charge provides 10 hours of usage. Other charge times versus usage are as follows:

5 minutes	10 hours of use
10 minutes	30 hours of use
30 minutes	50 hours of use
60 minutes	65 hours of use

The hydrogen fuel cylinder is over 85% full after one hour. Thereafter, the cylinder charges more slowly up to the full 70+ hours.

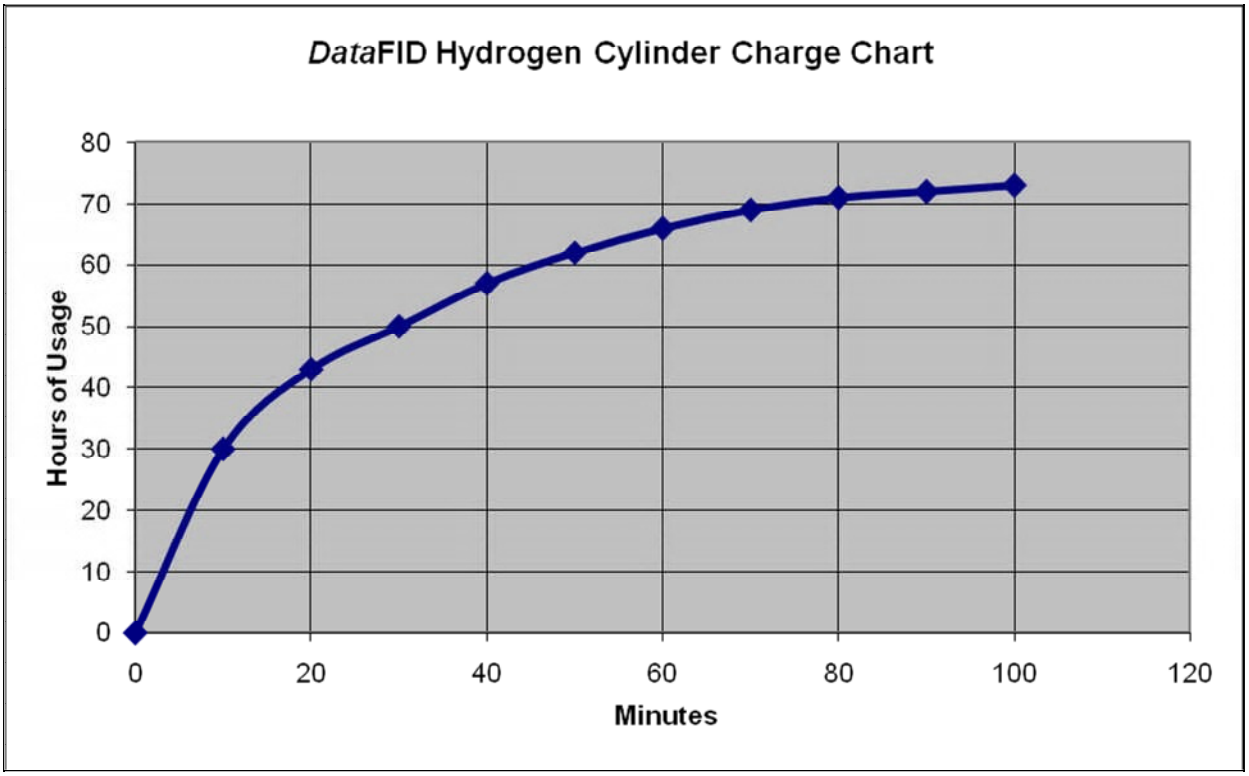


Table 2. Charging Time and Usage Time

Use only the *Data***FID** Hydrogen Fill Station p/n A1201222 or *Data***FID** Hydrogen Fill Station Manifold System p/n A1201223.Use of any other filling device will void the warranty.

WARNING

WARNING	The regulator pressure is set at the factory Do not adjust the regulator on the hydrogen filling station. Adjustment of the hydrogen filling station regulator will void the warranty.

WARNING	Do not exceed 250 psi when filling the *Data***FID** Hydrogen Cylinder. The fuel cells in the hydrogen cylinder will be damaged and will void the warranty.

CAUTION: When filling the *Data***FID** Hydrogen Cylinder, ensure that the hydrogen cylinder on/off valve is completely open in the counterclockwise position.

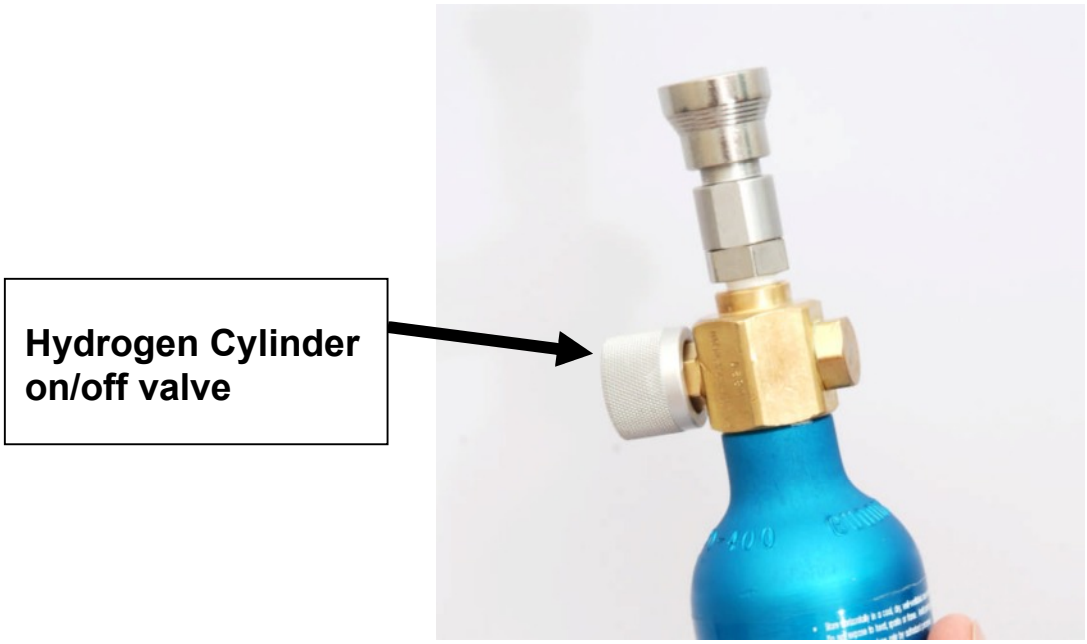


Figure 8. Hydrogen fuel cylinder on/off valve

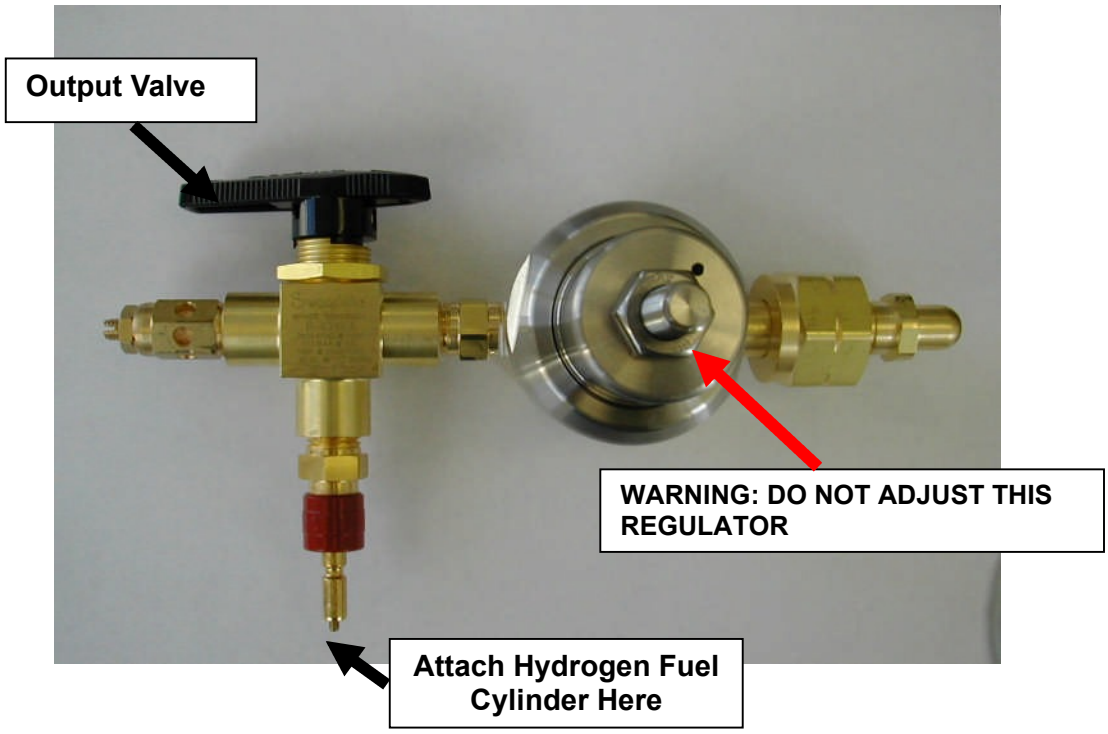
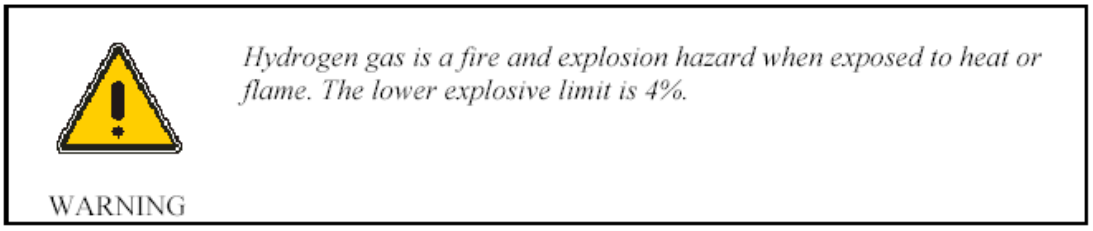


Figure 9. Hydrogen Fuel Cylinder Filling Station

NOTE: Read through this section before filling the hydrogen fuel cylinder.

Store the hydrogen supply tank in a well ventilated area, well away from heat or possible ignition sources.



Directions for Attaching the Hydrogen Filling Station to the Hydrogen Supply Tank

1. Connect the hydrogen fuel cylinder filling station to the tank of hydrogen. Hydrogen is supplied with a CGA 350 cylinder valve outlet. The filling station is supplied with the matching fitting for ease of connection. The threads of the adaptor will tighten counterclockwise.

NOTE: Do not force the connection. Do not use Teflon tape with CGA fittings. In general, these fittings are designed for metal to metal sealing.

Do not use adapters to connect one CGA fitting to another type of CGA fitting. If the refill adapter does not match the outlet on your hydrogen tank, contact Photovac.

2. Tighten the hydrogen cylinder filling station onto the tank with a wrench. Do not over tighten.

DO NOT use an open flame to test for leaks!

WARNING

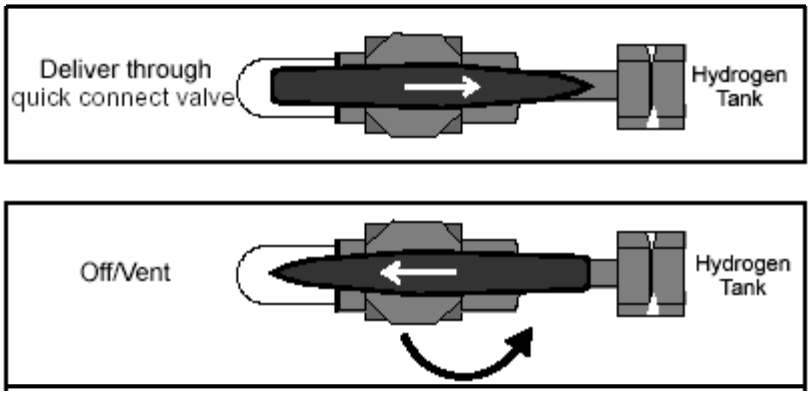
Filling the Internal Hydrogen Cylinder

Do not fill the hydrogen cylinder in a hazardous location.

WARNING

Filling the Hydrogen Fuel Cylinder

1. Rotate the output valve to point toward the main cylinder of hydrogen (Filling Position)



Filling Position

Venting Position

Figure 9. Output Valve

2. Attach the *Data***FID** hydrogen fuel cylinder to the quick connect mate on the hydrogen filling station (see Figures 8 and 10).

3. Open the on/off valve on the hydrogen fuel cylinder. See figure 8.

4. Open the valve on the hydrogen supply tank.

5. Allow the unit to fill for the amount of usage time required as per the above chart.

Note: The hydrogen fuel cylinder will become warm during the filling process and will be warm to the touch. Once the fuel cells are full, the cylinder will begin to cool down and become room temperature. Hydrogen cylinders that are only partly depleted of hydrogen may take less time to fill.

6. Close the valve on the main cylinder of hydrogen

7. Rotate the output valve to point away from the main cylinder of hydrogen, (Venting Position)

8. Wait approximately 5 seconds, and then rotate the output valve once again toward the main cylinder of hydrogen. (Filling Position)

9. Disconnect the full hydrogen fuel cylinder from the quick connect on the filling station by holding the release ring of the hydrogen fuel cylinder with one hand and holding the red release ring with the other. Push up the hydrogen fuel cylinder release ring and the hydrogen fuel cylinder will be separated from the hydrogen fill station. The hydrogen fuel cylinder will be cool to the touch when it is remove from the hydrogen fill station. With time, the hydrogen fuel cylinder will become room temperature.

10. Ensure the main hydrogen supply tank valve is closed.

11. If the hydrogen cylinder will not be used immediately after the filling process is complete, close the hydrogen cylinder by turning the on/off valve completely clockwise.

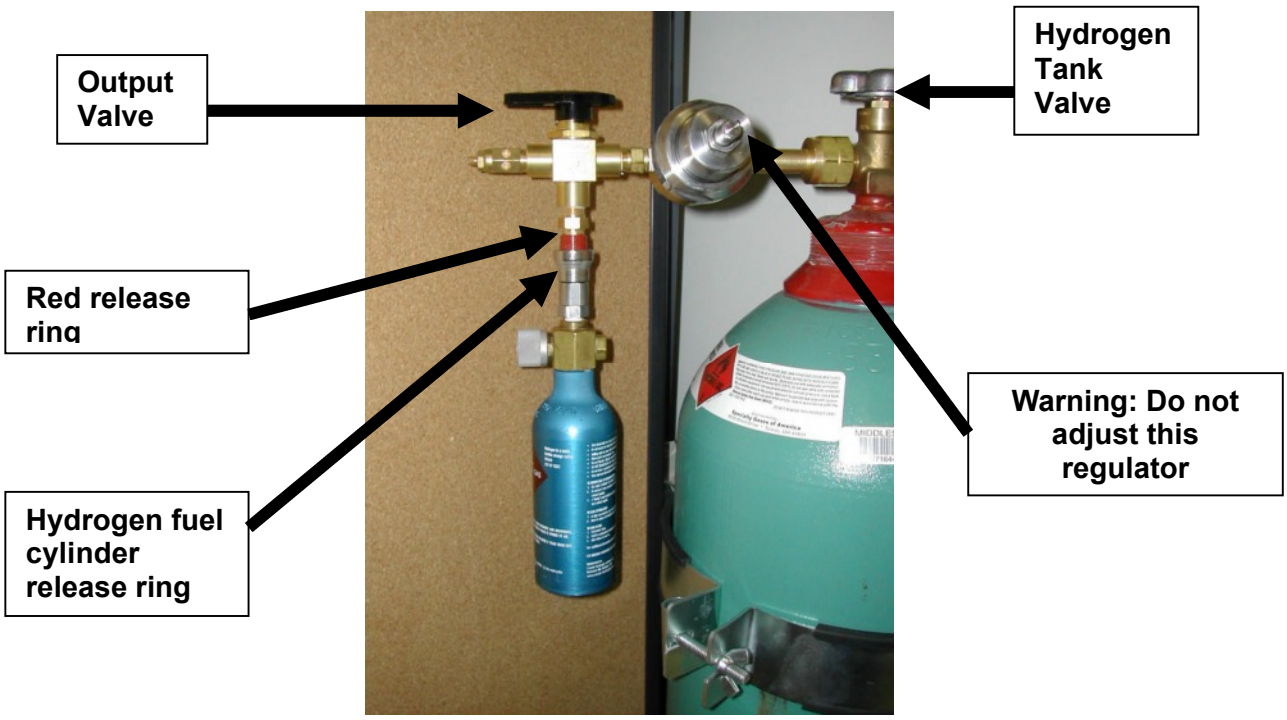
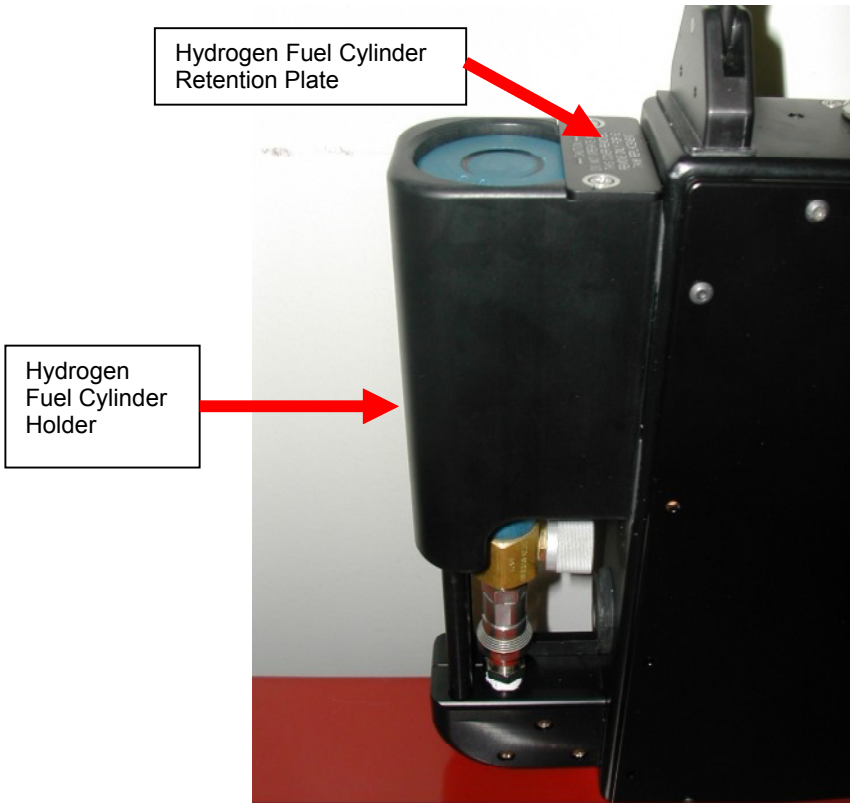


Figure 10. Hydrogen Fuel Cylinder Connected to Filling Station

Installing the Hydrogen Fuel Cylinder in the *Data*FID

1) If the hydrogen fuel cylinder retention plate is installed on the DataFID, remove it and set it aside.

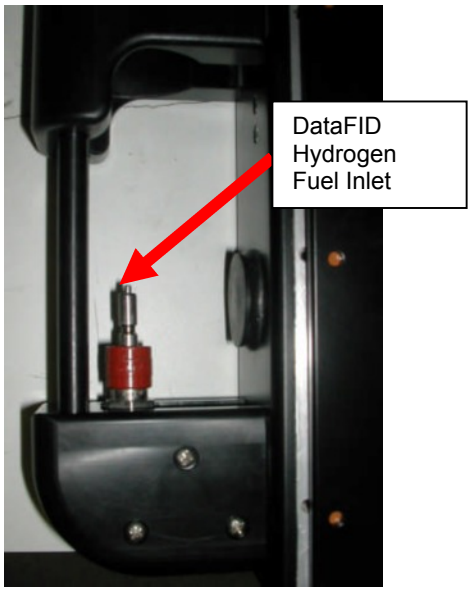


2) Insert the hydrogen fuel cylinder into the hydrogen fuel cylinder holder.

3) Guide the hydrogen fuel inlet into the *Data***FID** hydrogen fuel inlet.

4) Push the hydrogen fuel cylinder until you hear a distinct click.

5) Attach the hydrogen fuel cylinder retention plate with the two set screws.

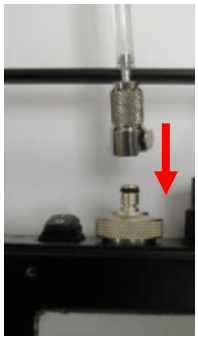


WARNING	The hydrogen fuel cylinder retention plate MUST be installed on the *Data***FID** to retain the intrinsic safety rating.

6) Open the hydrogen fuel cylinder on/off valve if monitoring is to be started.

Attaching the *LDAR*Probe to the *Data*FID

1.. The LDAR Probe has a quick disconnect fitting. Push in the tab on the female connector of the LDAR Probe and firmly insert it into the *Data*FID inlet male connector.



The LDAR Probe connector can be released by pressing in the tab located on the connector.

Basic Operating Instructions

The following steps should be followed to operate the basic functions of the *Data***FID**.

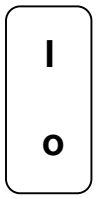
1. Ensure that the *Data***FID battery** has been fully charged.

2. Attach the hydrogen cylinder to the left side of *Data***FID** instrument body. The cylinder slides through an open holder, and the swage connector engages the cylinder with the instrument. A distinct click will be heard when this occurs.

3. Install the hydrogen cylinder holding plate with the two screws that are attached.

4. Turn on the hydrogen fuel cylinder on/off valve (see Figure 8) by rotating the knob counter-clockwise. Wait a few minutes for the hydrogen fuel to flow to the *Data***FID** detector.

5. Turn on the *Data***FID** using the “OFF /ON” power switch on the top right of *Data***FID** instrument body. On is the symbol” **I**” and off is the symbol “**o**”.



6. The display screen on the probe will show the “Top Level Menu” depicted in the Section: User Menu Functions, page 32.

7. The *Data***FID** body display has three red soft keys (see Figure 6) that operate all menu functions facilitating single handed use of the instrument.

8. The DataFID will automatically start with “DataFID Setup” on the main display. Simply press the middle red soft key (“meas”) to initiate the “Flame ON Procedure.” After a few moments, measurements in ppm should be shown on the display, and the flame icon should be present.

9. The calibration function is initiated by pressing both the left and right soft keys at the same time.

NOTE: See Calibration section immediately following these steps for a full discussion on the calibration process.

10. To turn off the *Data***FID**, follow all the steps shown on the display screen on pages 32-34, “Top Level Menu Shut-down.”

Calibration

The *Data***FID** must be calibrated in order to display concentration in ppm units equivalent to the calibration gas. See the section on calibration starting on page 47 for a full description of calibration procedures for the *Data***FID**. **Note: The *Data*FID must be operated in an upright position during calibration.**

Data Communication

The *Data***FID** links to external devices via Bluetooth. This wireless technology is used as the communication link to external PC’s used for uploading information to the *Data***FID** and for downloading measurement data collected during the process of field monitoring activity. It can also communicate with external PDA’s which may be used for Method 21 LDAR monitoring

Refer to section 4 for more information regarding Bluetooth communication set-up and operation.

Method 21 Operation

Method 21 is a US EPA sampling protocol for the determination of volatile organic compound (VOC) leaks in process equipment. You must be familiar with the Method 21 protocol to use the *Data***FID** for Method 21 monitoring. You must use the specifications outlined in the Method 21 documentation for monitoring the sites.

As part of the Method 21 operation, you can setup the *Data***FID** to identify and monitor various locations. Since each location may contain different compounds and concentration ranges you will store a Cal Memory and the associated response factor and alarm level as part of each event. In this way you can sample numerous locations without having to re-calibrate the *Data***FID** at each location.

Response Factors for Gases and Vapors

To use the response factors:

1. Press the CAL key and enter the response factor for the specific compound.

2. Calibrate the *Data***FID** with zero air and 500 ppm methane as described in the section on calibration

3. Expose the *Data***FID** to the sample. The displayed reading is the approximate concentration of the specific compound.

The response factors on the Photovac web site serve as a guide to concentrations measured by the *Data***FID**.

NOTE: It does not matter which Cal Memory is selected or which response factor is entered, *Data*FID's response is not specific to any one compound. The displayed reading represents the total concentration of all ionizable compounds in the sample.

Preparing for Field Operation

Field Check List

The following items should be carried into the field to reduce or eliminate instrument down time. If you will be in the field for a single 8-10 hour day, you should include the following accessories:

- Calibration kit(s) (Part No. MX396011)
- Tank(s) of calibration gas (Part No. MX396028)
- Spare gas bag for zero air (Part No. MX396017)
- Gas bag adapter for zero air (Part No. MX396010)
- Supply of commercial zero air
- Charcoal filters (Part No. MX396022, pkg. 10)
- Spare inlet filters (Part No. MX396015, pkg. 25)
- *Data***FID** Instrument Manual (Part No. MN201101)

Table 3. Check List for Field Operation

If you will be in the field for more than one day you should include the following additional items:

- Battery charger (Part No.A1201221)
- Hydrogen Filling Station (Part No. A1201222 or A1201223)
- Hydrogen fuel (Part No. MX754112)
- Computer or PDA

Table 4. Additional Field Items

Operational Check List

Before beginning field work, set up and calibrate the *Data***FID** for your particular application. Ensure the instrument is in working order before heading into the field.

To prepare the *Data*FID for field work:

1. You should not transport the *Data***FID** with the hydrogen fuel cylinder attached to the *Data***FID.** Remove the hydrogen fuel cylinder from the *Data***FID** and package it individually for transport.

2. Press the SETUP key and ensure the correct date and time are entered.

3. Program and calibrate all the Cal Memories you will be using. After calibration is complete, sample the bag of calibration gas and the bag of zero air to ensure the *Data***FID** has been calibrated correctly.

4. If you are using an averaging interval, you may also want to delete all events from the datalogger to avoid confusion between different days' data and to avoid running out of space in the datalogger.

5. If you are performing Method 21 monitoring, ensure you have programmed and calibrated all the Cal Memories. You must also program your monitoring schedule.

3. USER FUNCTIONS

Display

The *Data***FID** has a graphic display for reporting detected concentrations and to guide you through configuration options. All functions of the *Data***FID** will be reported on the display.

Graphic Display

The *Data***FID** uses an 8 line graphic display. The display will always be used for reporting detected concentration. In order to accommodate the range of concentrations the *Data***FID** can detect, the meter reading will be reported using one of three resolutions. A resolution of 0.01 ppm will be used for concentrations below 10 ppm, a resolution of 0.1 ppm will be used for concentrations between 10 ppm and 999.9 ppm, and a resolution of 1 ppm will be used above 1000 ppm.

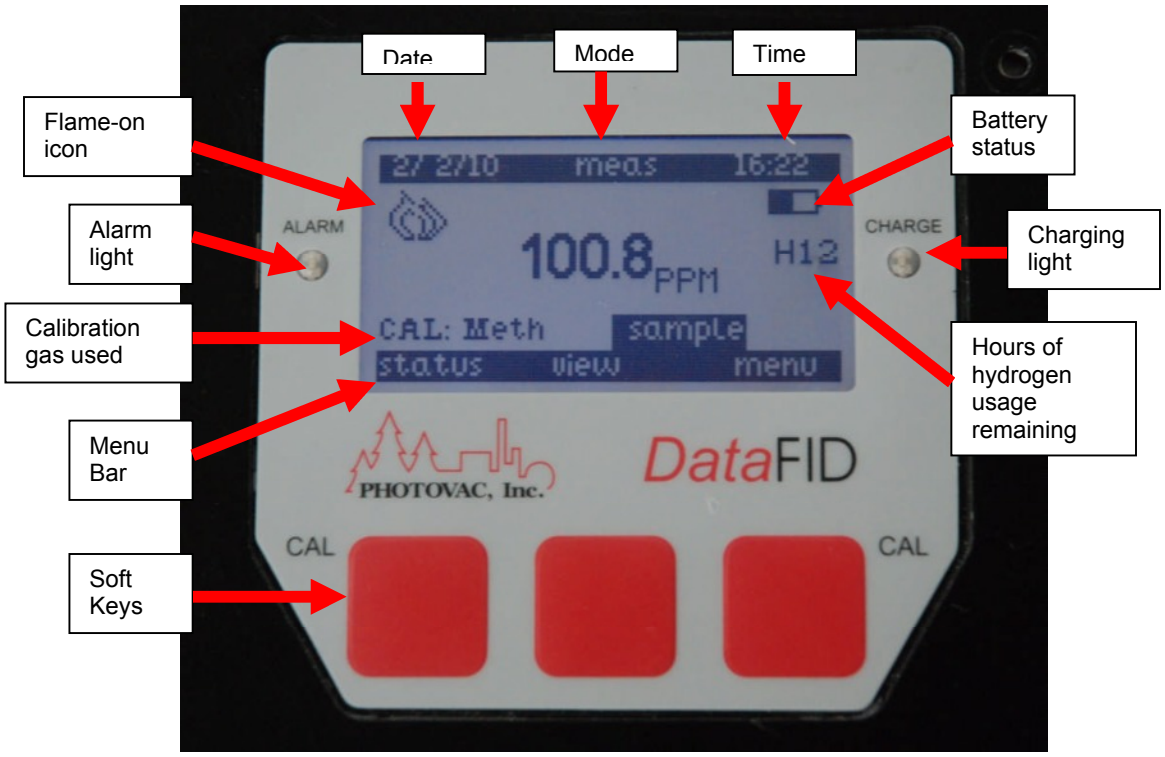


Figure 11. *Data*FID Display

Menu Function Displays

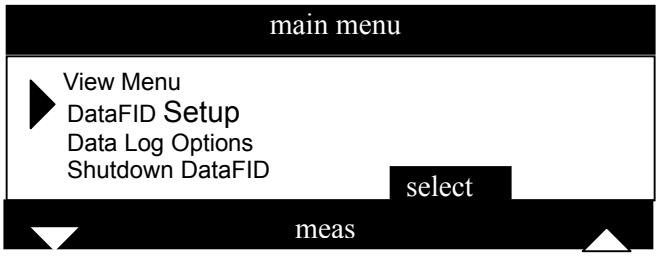


Figure 12: The DataFID Main Menu Display

The display reports instantaneous concentrations at all times when the flame is on. There are four User modes: Logging Off, Interval, Location, and Method 21. In all four modes, the display will report instantaneous concentrations.

The *Data***FID** is designed for ease of use with a logically organized internal menu structure/user interface.

The four submenus for the *Data***FID** are expanded in *Figures 13, 14, 15, and 16.*

The *Data***FID-LD** has three soft keys, and they are located under the graphic LCD display. Each display screen will always show the available functions of the soft keys.

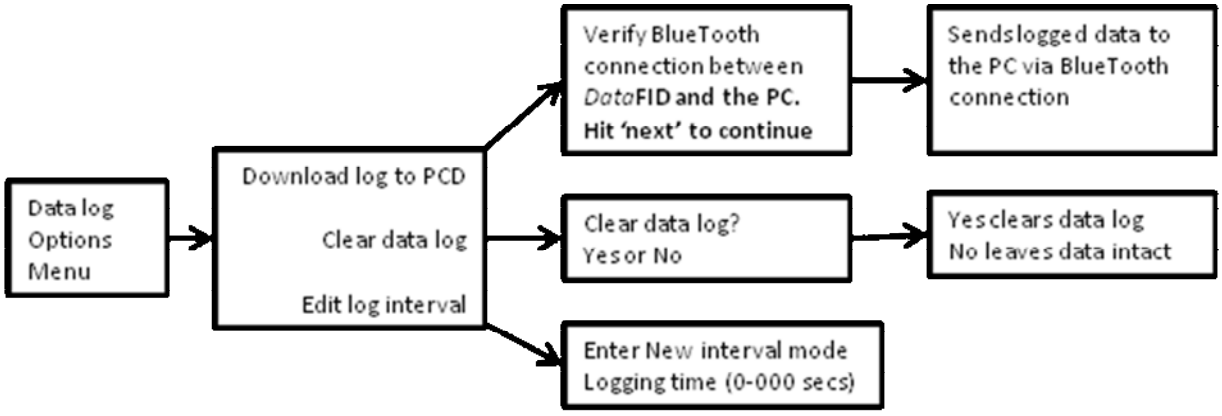


Figure 13. Data Log Options Menu

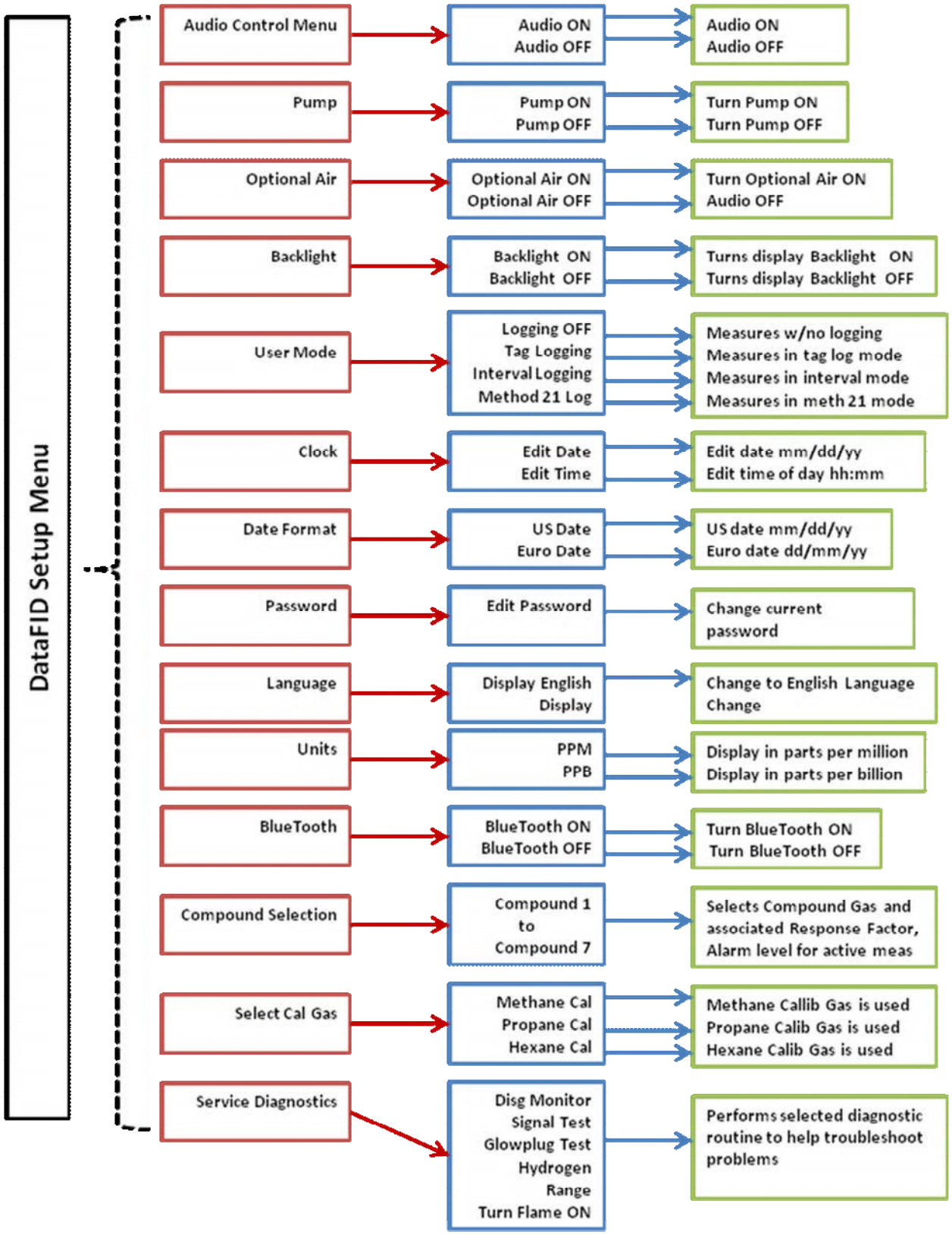


Figure 14. DataFID Setup Menu

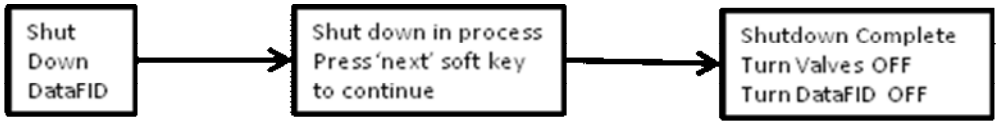


Figure 15 : Shut Down DataFID Menu

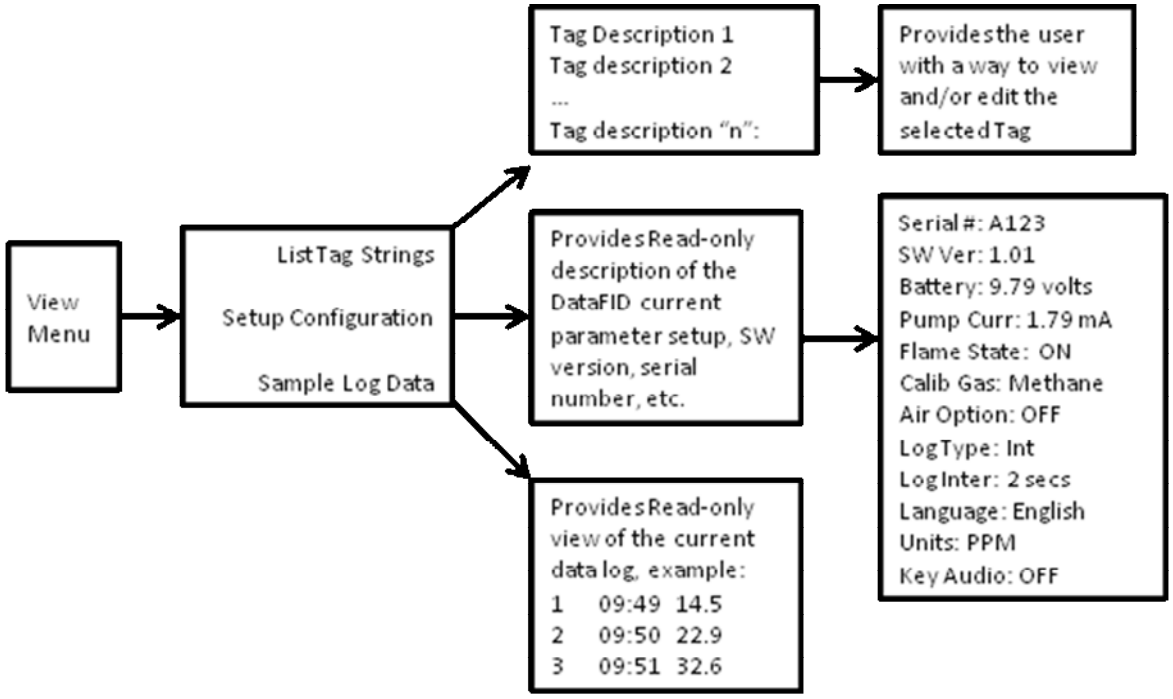


Figure 16: View Menu

Keys

Fixed ON/OFF Key

The ON/OFF key is used to both power on to the *Data***FID** and to power off the *Data***FID**. To turn on the *Data***FID**, press the ON/OFF key. To turn off the power, press the ON/OFF key. It is recommended that the Shutdown *Data***FID** option in the Main Menu be used to ensure proper shutdown before pressing the OFF key.

Soft Keys

Three soft keys are located directly below the display. Each of these soft keys has varying functions for configuring the *Data***FID**, editing the data, and controlling the display. Since only three soft keys are available, each function is broken down into a path. Maps, showing each path and the resulting functions, are shown in *Figures 13, 14, 15,* and *16*.

Beginning Operation

Turning on the *Data*FID

1. Turn the *Data***FID** on by pressing the ON/OFF key. See *Figure 5* for the location of the ON/OFF key.

2. The *Data***FID** will display the instrument's software version number. Next, the *Data***FID** will proceed to the Main menu display.

3. For maximum accuracy and stability, allow the *Data***FID** to warm-up for 20 minutes prior to calibration.

Default Display

The *Data***FID** always starts in the Main menu after start up. The unit's setup will be restored to the previous entries at the time it was powered down. The Up and Down arrows (soft key 1 and 3) provide a way for the user to choose from the 4 main options: (DataFID Setup, Data Log Options, Shutdown DataFID, and View Menu). The Measure function (soft key 2) provides a way for the user to start or return to TVOC measuring mode.

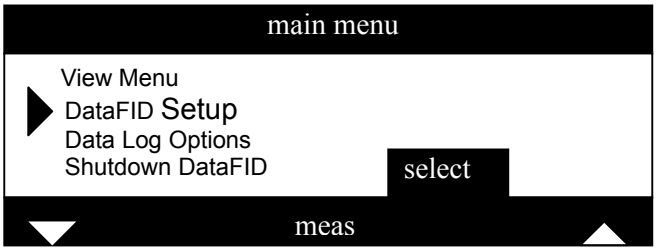


Figure 17: Main Menu Display

Numeric Value, Duration, Time and Date Entry

In cases where the system requires the user to enter a number, duration, time, or date, the following mechanism is used. The number of digits to be entered depends on the type of value being entered. In some cases, units may be specified (e.g., ppm or hh:mm); in others there may be no units. Upon entering a value entry screen, see Figure 18, a bar icon below the left most digit highlights it as the active digit. The up (middle soft button) and down (left soft button) arrows are used to increase/decrease the digit. The bar icon is moved to the next digit to the right using the right soft button. The 'done' soft key (probe trigger button or soft keys 2 and 3 simultaneously) is pressed once the user has finished entering the value and the new value is stored into memory.

No cancel option is available to the user. If a user decides against editing, then simply pressing the done key (probe trigger) will exit with no changes to the current value.

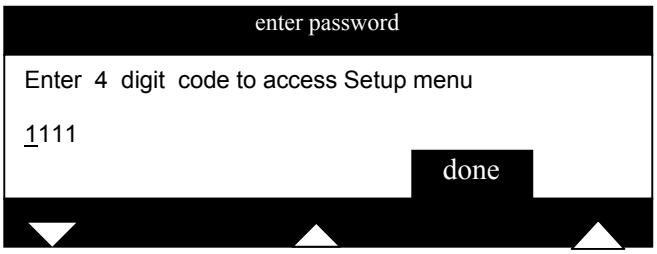


Figure 18. Numeric Value Display

Instrument Status

The instrument status is shown on the left of the first line, lower left of the last line, or with various message screens that will display the status of the *Data***FID**. Each status has a priority assigned to it. If more than one status is in effect, then the status with the highest priority is displayed until the condition is corrected or until the option is turned off. *Table 5* is a list of the possible system alerts.

*Data*FID Display	Description
Flame Icon with line through it	Flame has been extinguished and needs to be relit
TVOC high level alarm screen	TVOC concentration alarm exceeded set value for selected compound
Low Battery Icon	Low battery
Pump Error	Pump fault
Displayed value blinking ON and OFF	TVOC concentration over instrument operating range
TVOC Display Max Err	TVOC concentration over instrument operating range
Hi Chamber temp	Chamber temperature too high
Recommend H2 Fill	Hydrogen cylinder has 10 hours of use remaining
H2 Critically Low!	Hydrogen Cylinder has 5 hours of use remaining
Sending log data to the PC	Instrument sending log data to PC
Cal Zero Error	Zero value too high during calibration
Span Gas Error	Span gas too low during calibration

Table 5: System Alerts

System Alerts and Alarms

While operating the instrument, system alerts can occur. To accurately identify the source of the alarm, each type of alarm has been given a unique status.

In addition to the status, the *Data***FID** also has an audio alarm and an alarm LED. A soft key is used for acknowledging alarms and is named “Accept”. To clear the alarm, press the “Accept” key. Once acknowledged, the alarm indicators are cleared. The alarm status will remain until the alarm condition clears.

The *Data***FID** updates the instantaneous concentration once every second. Following every update, the instantaneous concentration is compared to the selected compounds high alarm level, and if exceeded, an alarm is triggered.

During calibration, all alarms are disabled. Once the calibration is complete, the alarms are re-enabled.

User Interface – Basic Menu

The *Data***FID** is designed for ease of use with a logically organized internal menu structure/user interface. The *Data***FID**'s Main Menu options are shown in *Figures 13, 14, 15, and 16*.

The *Data***FID** has three soft keys under the graphic LCD display which always show available functions of the soft keys in any screen.

Passcode

The *Data***FID** allows setup data to be saved and accessed only through the use of a password.

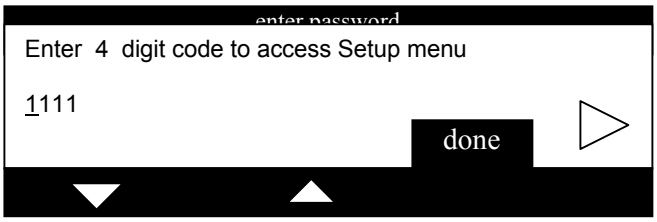


Figure 19. Enter Password Display

When the *Data***FID** Setup menu is selected, the next display will ask for the operator to enter a 4 digit code to access the Setup menu. The default passcode is 1111

User Modes

The four User Modes of the *Data***FID** can be selected in the *Data***FID** Setup menu by selecting the User Mode option (See *Data***FID** Setup – User Mode, page 45). The *Data***FID**'s default User mode is the Interval mode with a default interval of 15 seconds. The user can select any one of the four options:

- Location
- Interval
- Method 21
- Logging Off

The *Data***FID** can power up in the Interval, Location, Method 21, or Logging Off User Mode depending on the mode that was set by the previous user prior to power down. While the user is in one of these four modes, the resolution of the display changes with the magnitude of the reading. A resolution of 0.01 ppm will be used for concentrations below 10 ppm, a resolution of 0.1 ppm will be used for concentrations between 10 ppm and 999.9 ppm, and a resolution of 1 ppm will be used above 1000 ppm.

Each of the four modes is described in the following sections.

Location Mode Display

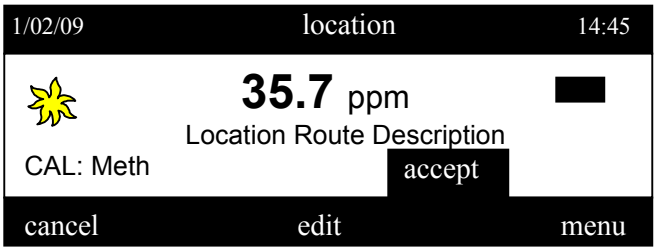


Figure 20: Location Mode Display

Location mode is identified by the 20 character Location string on the line below the current TVOC value being displayed. Location mode will continuously display the instantaneous concentration of total volatile compounds. Location mode also allows the user to manually location and log readings. Location mode allows the user to datalog a reading by pressing the accept key (soft keys 2 and 3 together).

Location strings are loaded into the *Data***FID** via a PC using the Photovac ProComm software. In Location mode, the soft keys are CANCEL, EDIT, and MENU.

CANCEL exits Location user mode and returns to the default Interval user mode.

EDIT selects “Modify Location numb”, “Edit current Location”, or “Insert new Location”.

MENU selects the DataFID’s Main menu.

Interval Mode Display

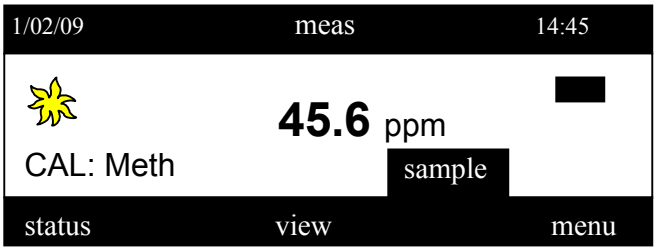


Figure 21: Interval Mode Display

Interval displays the instantaneous readings. Interval mode also automatically stores these readings in the *Data***FID**’s memory at a preset interval selected by the user. In Interval mode, the soft keys are STATUS, VIEW, and MENU.

STATUS displays a read-only version of the important setup parameters.

VIEW displays a read-only view of the current data log.

MENU returns to the *Data***FID**’s Main menu while continuing to measure in the background.

Method 21Mode

This section describes Method 21 setup if the user chooses to perform Method 21 readings without a PDA.

The Method 21 user mode displays the current detected concentration. The reading is updated once a second. The *Data***FID** can also store the maximum background and maximum component concentrations for a selected component. At the end of every interval, one entry is placed in the log.

To enter the Method 21 logging mode, the *Data***FID** Setup menu must be entered. After entering the 4 digit pass code, scroll down to the User Mode entry and press the select mode on the display. Then, scroll down to Meth 21 log mode and press the select mode on the display. Hit the *back* soft key to return to the main menu and press the "*meas"* soft key to start taking measurements in the Method 21 logging format.

Method 21 Mode Displays

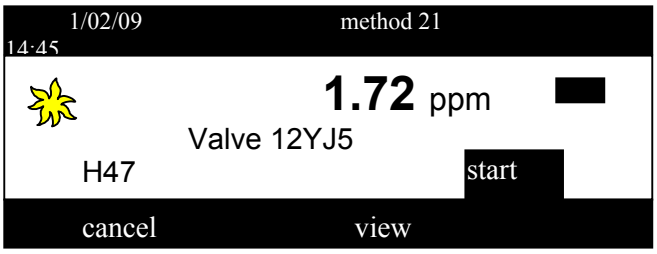


Figure 22: Method 21 Mode Background Start Display Example

The first Method 21 screen is shown in Figure 22. The purpose of this step is to take a BACKGROUND reading. When the user is ready to begin measuring a BACKGROUND value simply press the ‘start’ soft key. The screen will change to that shown in Figure 23.

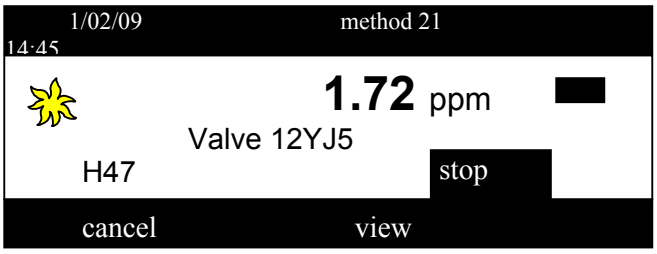


Figure 23: Method 21 Mode Background Stop Display Example

When the user has a valid BACKGROUND reading on the display, simply press the ‘stop’ soft key. The maximum value measured between ‘start’ and ‘stop’ will be saved into the log associated with the current Method 21 tag. The screen will change to that shown in Figure 24.

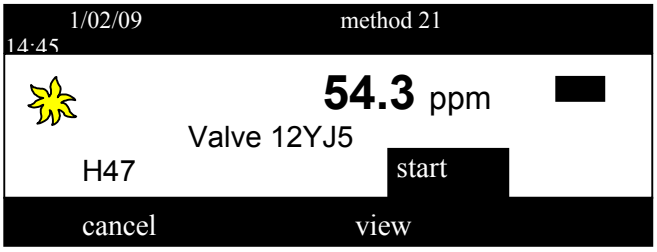


Figure 24: Method 21 Mode Component Start Display Example

Now that the Background value has been successfully logged, the COMPONENT value must be measured for the current tag. When the user is ready to begin measuring a COMPONENT value, press the ‘start’ soft key. The screen will change to that shown in Figure 25.

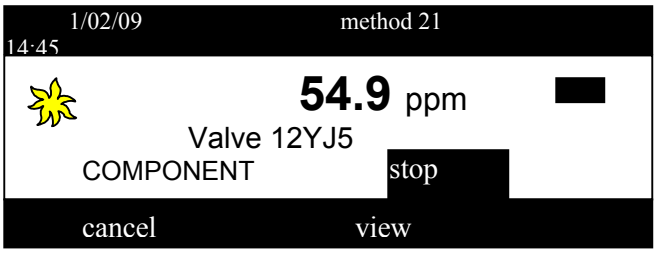


Figure 25. Stop Display Example

When the user has a valid COMPONENT reading on the display, press the ‘stop’ soft key. The maximum value measured ‘start’ and ‘stop’ will be saved into the log associated with the current Method 21 tag. The screen will change to that shown in Figure 26.

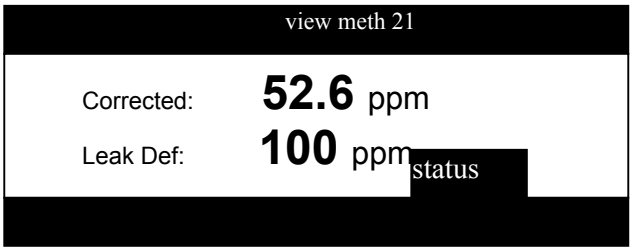


Figure 26: Method 21 Mode Results Display Example

This view displays the Corrected value which is the maximum COMPONENT value minus the BACKGROUND max value. It also displays the Leak Definition for the current tag and allows the user to compare the Leak Definition with the Corrected value. Once the comparison is performed, the status key should be selected by pressing the ‘status’ soft key. The screen will change to that shown in Figure 27.

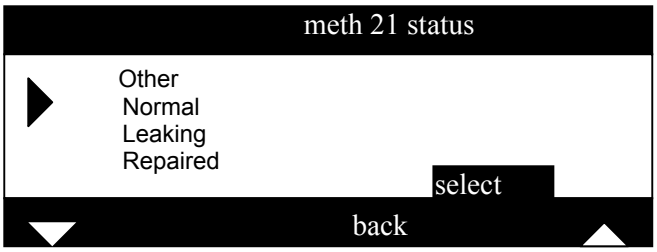


Figure 27: Method 21 Mode Status Display Example

The user can choose the status for the current tag by first moving the cursor up or down to the proper status designation and then press the 'select' soft key. Once a status designation is chosen for the current tag, the *Data*FID automatically increments to the next tag and the whole process is repeated starting with Figure 22.

If a repeat reading for the same tag is needed, press the 'view' soft button and select the specific tag by moving the cursor to the appropriate location. Then, press the 'select' soft key. The display as shown in figure 22 will be presented.

Logging Off Mode

In the Logging Off mode, the *Data***FID** will display the current TVOC reading but will not log any values or display any Location strings. Logging Off will continuously display the concentration of total volatile compounds present that the *Data***FID** can ionize. The reading is updated approximately once per second. Logging Off mode has the same display format as the Interval Mode.

Data Logging

The *Data***FID** reading is updated once a second. In the background, the *Data***FID** is sampling the concentration and logging the average concentration for either a selected time period (Interval) or at the time the trigger key on the probe is pressed (Location and Method 21). All logs record the date, time, status, and TVOC reading. In the Location and Method 21 modes, a character string up to twenty characters is also recorded. In addition, Method 21 mode adds more details to a log which are described in the 'Method 21 Operation' section.

The *Data***FID** has the ability to change log modes without erasing the log. In other words, if the user switches User modes from Interval mode to Location mode the previous Interval log entries are NOT erased as in older style instruments.

The *Data***FID** also operates in a 'circular-logging' mode. This means that the log will never fill and stop logging but will loop back to the first entry and start logging at entry number 1.

Interval Log Mode

Interval mode logs readings at user selected intervals of 1 second to 999 seconds. The microprocessor accumulates all readings in an averaging interval that you select, and determines the average reading. It stores this number along with the highest priority instrument status and the current time and date.

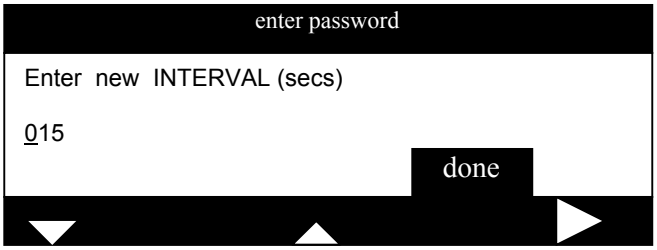


Figure 28: Interval time adjustment

Location Log Operation

In the Location mode of operation, data is logged only when the 'accept' soft key on the probe trigger is pressed. The date, time, average reading at the time the trigger is pressed, along with the current tag string that is currently on the display are also stored.

Method 21 Log Operation

In the Method 21 mode of operation, data is logged only when the 'status select' soft key on the probe trigger is pressed. The date, time, average reading at the time the trigger is pressed, along with the current tag string that is currently on the display, is also stored.

Clearing or Downloading Data

There are two options for data manipulation under the Data Log Options selection.

The first option is the "Clear Data Log" option which deletes all readings in the *Data***FID** memory.

NOTE: *Deleted information cannot be recovered. You should download the contents of the datalogger before deleting any information.*

To delete data logged in the *Data***FID**:

1. Press the MENU key.
2. Use the DOWN ARROW key to choose "Data Log Options", and then press the SELECT key.
3. Choose "Clear Data Log", and then press the SELECT key.

4. Press either the YES or NO key in response to “Are you sure you want to clear all data?”.

The second option is the “Download to PC” which begins the download of stored data from the *Data***FID** to the PC. The Bluetooth connection between the *Data***FID** and the PC must be established and active before beginning the data download. Prepare for Hyperterminal connection with your computer or, the *Data***FID** software package, ProComm, must be installed and running on the PC prior to download.

To download data:

1. Press the MENU key.
2. Use the DOWN ARROW key to choose “Data Log Options” the press the SELECT key.
3. Use the DOWN ARROW key to choose “Download to PC”, then, press the SELECT key.
4. Press the NEXT key at the “Connect Instrument to PC” prompt.
5. The display will show “Downloading Data” and data will now download to the PC. Press the DONE key once the download has completed.

Uploading Pre-Set Data from a computer to the *Data*FID

For <u>METHOD 21</u> Route Entry from a PC

The *Data***FID** will accept a pre-set routing schedule via the Bluetooth connection from a PC to the *Data***FID**. The routing schedule is entered in a PC and then uploaded to the *Data***FID**

1) Method 21 Route Entry Description

A single Method 21 list entry will take place in the following manner:

<meth21> <list#> <”Location descript.” > <”Drawing descript.” > <”Class”> <Leak definition> <CR> <LF>
where:
a) ***meth21*** = the keyword that must appear at the start of every line in order for DataFID to recognize an entry.
b) ***list#*** = Location Route number in the list.
c) ***”Location description”*** 21 character (max) Location description that must be surrounded by quotes (" ").
d) ***"Drawing description"*** 20 character (max) Drawing description that must be surrounded by quotes (" ").
e) ***"Class"*** 3 character (max) Class code that must be surrounded by quotations (" ").
f) ***Leak definition*** in ppm. This is the value at which the measured value gets compared against the leak definition for this component.
g) ***CR LF*** = Carriage Return and Line Feed are accomplished by pressing the ‘Enter’ key at the end of each line.
NOTE: <> are used as separators and are NOT included in the text file.

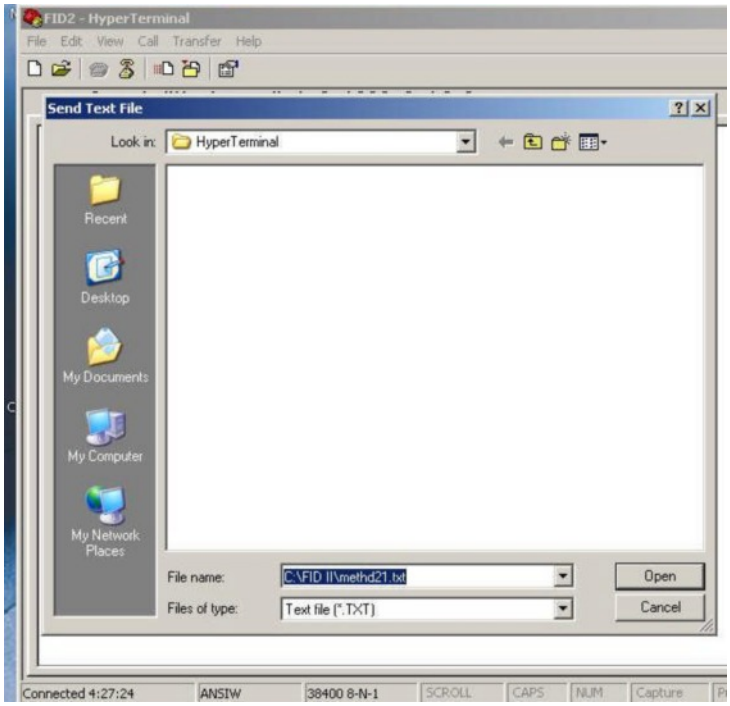
2) Example Method 21 File

meth21 1 "Method 21 Location 1" "First Meth21 Drawing" "AAA" 10.0
meth21 2 "Method 21 Location 2" "Second Meth21 Drawin" "AAB" 15.0
meth21 3 "Method 21 Location 3" "Third Meth21 Drawing" "AAC" 20.0
meth21 4 "Method 21 Location 4" "Fourth Meth21 Drawin" "AAD" 25.0
meth21 5 "Method 21 Location 5" "Fifth Meth21 Drawing" "AAE" 30.0

3) Download from PC to DataFID

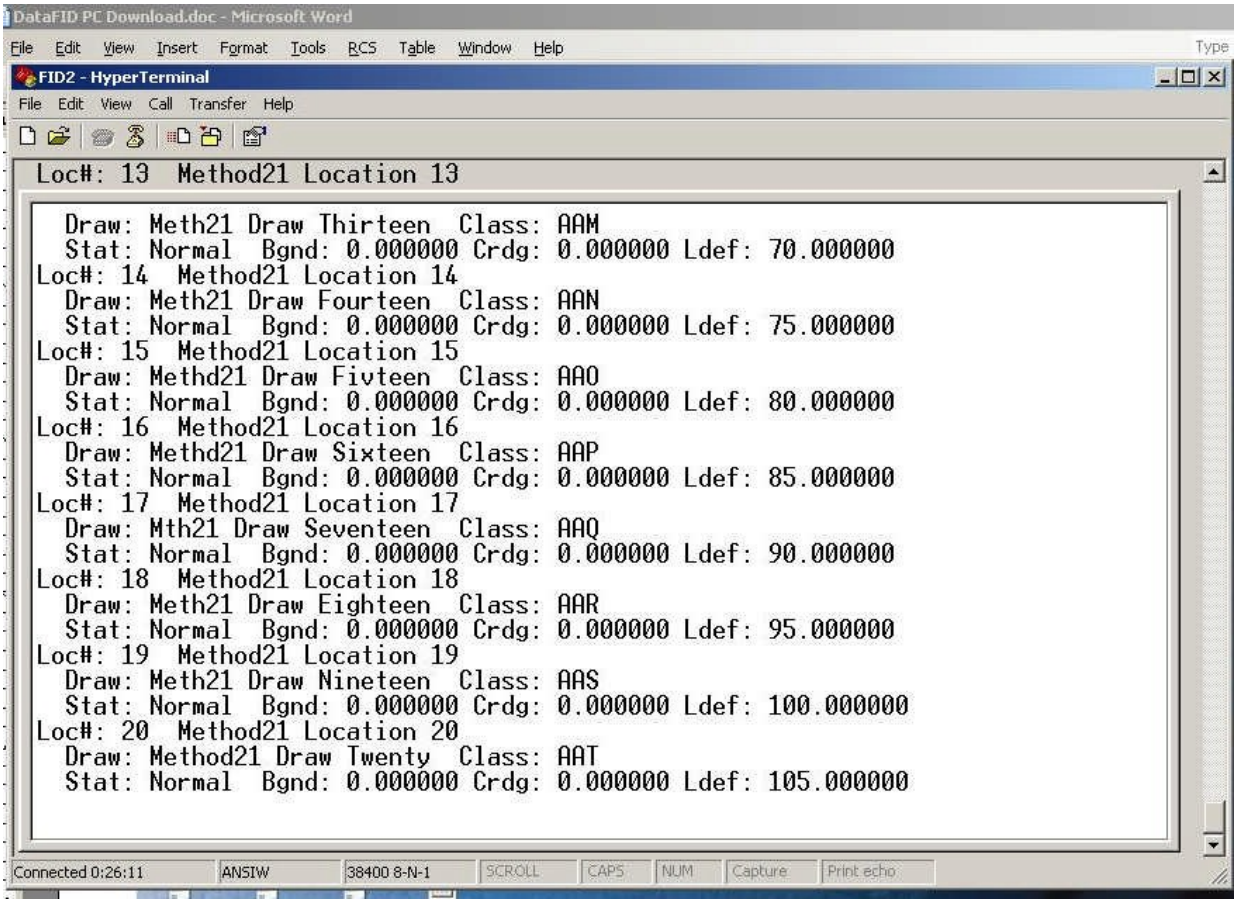
The following is a PC screen snapshot of how a Method 21 list text file is sent from a PC to the *Data***FID**:

a) The first step is to open a PC terminal program such as Hyper Terminal.
b) The next step is to select 'Send Text File' from the 'Transfer' menu.
c) Find the previously created Method 21 text file and select it by choosing the 'Open' option.



4) Viewing the Method 21 list in the *DataFID*

In order to verify that the Method 21 list was successfully transferred to the *Data***FID** from the PC, the 'viewlocs' command can be typed in, resulting in the following response from the DataFID to the PC:



Method 21 routing information can be added or subtracted from the file as necessary.

For <u>Location</u> Route Entry from PC:

1) Single Location Route Entry Description

A single Location Route list entry will take place in the following manner:

<locroute> <list#> <"Location description" > <CR> <LF>
where:
a) ***locroute*** = keyword that must appear at the start of every line in order for DataFID to recognize an entry.
b) ***list#*** = Location Route number in the list.
c) ***"Location description"*** = 21 character (max) Location description that must be surrounded by quotes (" ").
d) ***CR LF*** = Carriage Return and Line Feed are accomplished by pressing the 'Enter' key at the end of each line.
NOTE: <> are used as separators and are NOT included in the text file.

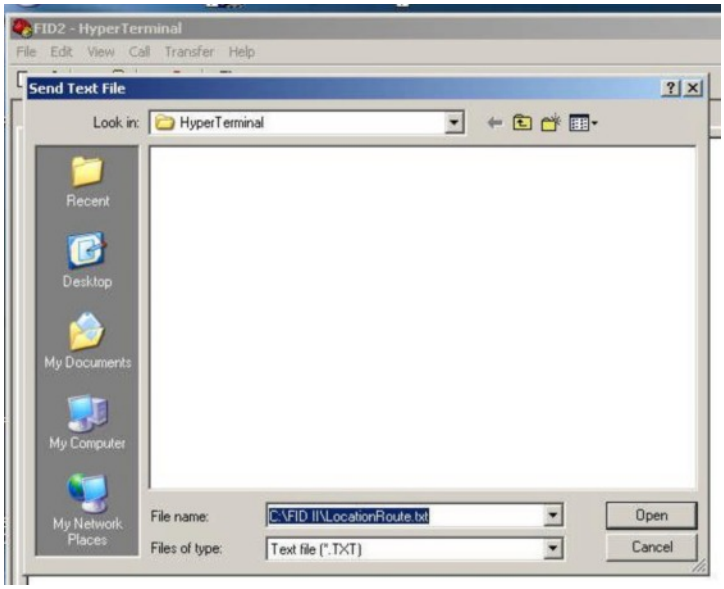
2) Example location route file

locroute 1 "First Route Location "
locroute 2 "Second Route Location"
locroute 3 "Third Route Location "
locroute 4 "Fourth Route Location"
locroute 5 "Fifth Route Location "

3) Sending location route list file from PC to the *Data*FID

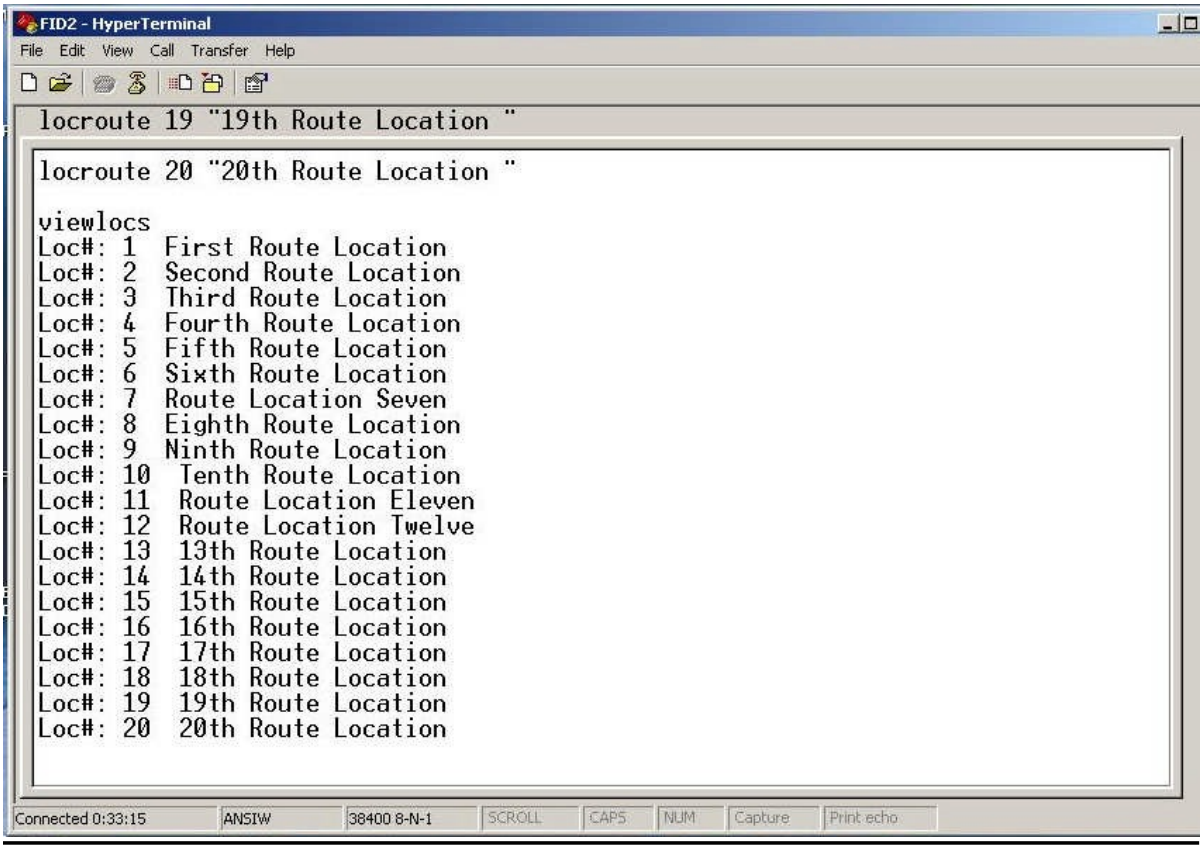
The following is a PC screen snapshot of how a Location list text file is sent from a PC to the DataFID:

a) The first step is to open a PC terminal program such as Hyper Terminal.
b) The next step is to select 'Send Text File' from the 'Transfer' menu.
c) Find the previously created Tag text file and select it by choosing the 'Open' option.



4) Viewing the location route list in the *Data*FID

In order to verify that the Location Route list was successfully transferred to the DataFID from the PC, the 'viewlocs' command can be typed in, resulting in the following response from the DataFID to the PC:


FID2 - HyperTerminal
File Edit View Call Transfer Help
locroute 19 "19th Route Location "
locroute 20 "20th Route Location "
viewlocs
Loc#: 1 First Route Location
Loc#: 2 Second Route Location
Loc#: 3 Third Route Location
Loc#: 4 Fourth Route Location
Loc#: 5 Fifth Route Location
Loc#: 6 Sixth Route Location
Loc#: 7 Route Location Seven
Loc#: 8 Eighth Route Location
Loc#: 9 Ninth Route Location
Loc#: 10 Tenth Route Location
Loc#: 11 Route Location Eleven
Loc#: 12 Route Location Twelve
Loc#: 13 13th Route Location
Loc#: 14 14th Route Location
Loc#: 15 15th Route Location
Loc#: 16 16th Route Location
Loc#: 17 17th Route Location
Loc#: 18 18th Route Location
Loc#: 19 19th Route Location
Loc#: 20 20th Route Location
Connected 0:33:15
ANSIW
38400 8-N-1
SCROLL
CAPS
NUM
Capture
Print echo

For <u>Compound</u> Entry from PC:

1) Single Compound Entry Description

A single Compound list entry will take place in the following manner:
<memslot> <list#> <"Compound name" > <Response Factor> <Alarm Level> <Formula Weight> <CR> <LF>
where:
a) ***memslot*** = keyword that must appear at the start of every line in order for DataFID to recognize an entry.
b) ***list#*** = Compound number in the list.
c) ***"Compound name"*** = 21 character (max) Compound description that must be surrounded by quotes (" ").
d) ***Response Factor*** =
e) ***Alarm Level*** =
f) ***Formula Weight*** =
g) ***CR LF*** = Carriage Return and Line Feed are accomplished by pressing the 'Enter' key at the end of each line.
NOTE: <> are used as separators and are NOT included in the text file.

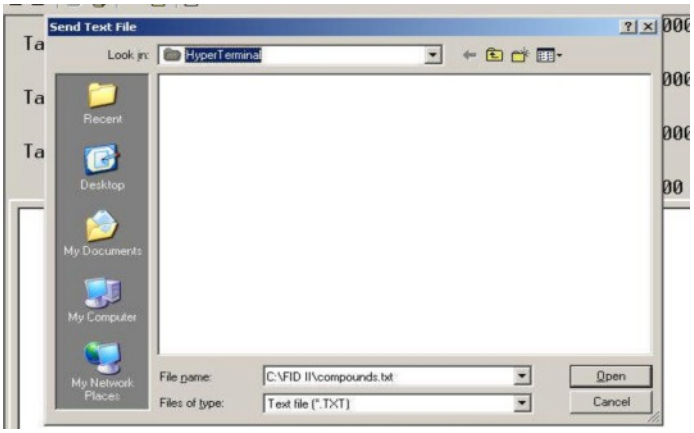
2) Example Compound File

The following is an example of how a compound file will look with multiple Compound list entries:
memslot 1 "Methane " 1.0 1000.0 16.0
memslot 2 "Hexane" 0.9 200.0 8.7
memslot 3 "Methane2" 1.0 1000.0 16.0
memslot 4 "Propanol" 1.6 500.0 6.1
memslot 5 "Isobutyl" 4.3 750.0 27.8
memslot 6 "Benzene" 7.9 250.0 37.9

3) Sending the compound list file from a PC to the *Data***FID*.***

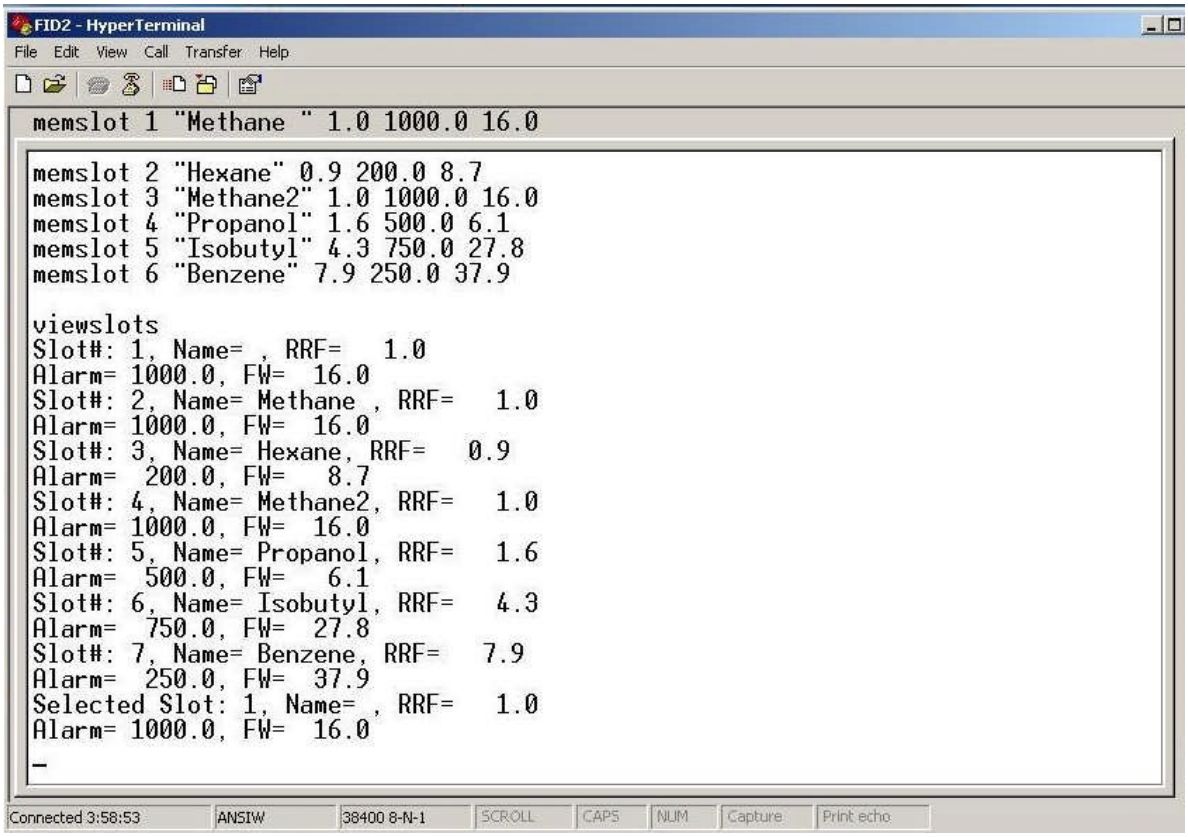
The following is a PC screen snapshot of how a Compound list text file is sent from a PC to the DataFID:

a) The first step is to open a PC terminal program such as Hyper Terminal.
b) The next step is to select 'Send Text File' from the 'Transfer' menu.
c) Find the previously created Compound text file and select it by choosing the 'Open' option.



4) Viewing the compound list in the *Data***FID**

In order to verify that the Compound list was successfully transferred to the *Data***FID** from the PC, the 'viewslots' command can be typed in, resulting in the following response from the *Data***FID** to the PC:



*Data*FID Setup Functions

*Data***FID** Setup functions are used to select the *Data***FID** features (See Figure 14). There are fourteen functions which can be set on the *Data***FID**; **Pump, Optional Air, Backlight, User Mode, Clock, Date Format, Password, Language, Units of Measure, Blue Tooth, Compound Selection, Select Cal Gas, Service Diagnostics, and Audio Control Menu.** Figure 14 shows a menu detailing the *Data***FID** Setup functions. Press the MENU key in any operating mode to access "*Data***FID** Setup" When prompted, enter the correct 4-digit password. Once the correct password is entered, the user will be allowed to enter the *Data***FID** Setup menu.

Pump

The Pump function turns the pump on and off.

When the pump and the detector are off, the meter display will continue to read normally but the instantaneous reading is at 0.0. Turn the pump and flame off when concentration measurements are not necessary, and the *Data***FID** will only be used for setup or reviewing data. By operating the instrument with the pump and flame off when you do not need them, you will conserve the battery and the hydrogen.

To turn on the pump:

1. Press the MENU soft key, "*Data***FID** Setup", press SELECT, "Pump", press SELECT, "On", then press SELECT.

To turn off the pump:

2. Press the MENU soft key, "*Data***FID** Setup", press SELECT, "Pump", press SELECT, "Off", then press SELECT.

Optional Air – HC Version Only

The Optional Air function is used with the HC Version of the *Data***FID** only.

Backlight

The Backlight function is used to switch the backlighting on and off when there is insufficient light to read the display.

To switch the Backlighting on and off:

1. Press the MENU soft key and select "*Data***FID** Setup".

2. Select BACKLIGHT and then press the SELECT soft key. Press the DOWN ARROW soft key to either turn the backlight on or off.

3. Press SELECT soft key to return to the main display.

To extend the operating life of the battery pack, turn the backlighting off when it is not required.

User Mode

User mode selects one of the four logging modes. The four logging modes are Logging Off, Location, Interval, and Method 21 mode.

Logging Off mode displays instantaneous readings only. The display is updated continuously and readings are not logged.

Location mode displays instantaneous readings. The user has the option to manually store the instantaneous reading as either a data point with a tag and a sample reading.

Interval mode displays the instantaneous reading. In interval mode data is logged at a user selected interval value between 1 second and 999 seconds.

To access the User Mode Section:

1. Press the MENU soft key and select "*Data***FID** Setup".

2. Select User Mode and then press the SELECT soft key. Press the UP or DOWN ARROW soft key to choose the applicable User Mode, that is, Logging Off, Location, Interval, or Method 21.

3. Press SELECT soft key to return to the main display.

Clock

The Clock function is used to set both the current date and time.

Entering Numbers with the Soft Keys to Set the Clock

For all information entry in clock mode, the left, center and right soft keys correspond to the up, down, and right arrow. See *Figure 29*. The up and down arrows are used to change the character highlighted by the cursor. The right arrow is used to advance the cursor to the next character on the right. To accept the changes, press the DONE soft key.

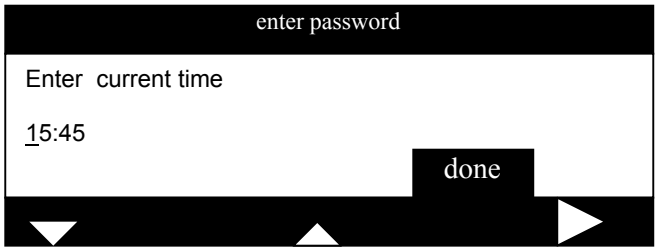


Figure 29: Setting the Time

To set the time and date:

1. From the *Data***FID** Setup, use the Up or Down arrow soft key to select the Clock option. Press the SELECT soft key. This allows you to edit the current time and to edit the current date.

The up and down arrow soft keys are used to change the character underlined by the cursor. The right arrow is used to advance the cursor to the next character on the right. When the cursor is advanced past the right most character, it wraps around to the first character again. Formatting characters, such as the colon (:) in the time, the decimal (.) in a concentration, and the slash (/) in date are skipped when advancing the cursor.

Use the “arrow keys” to enter the correct time. The time is formatted as Hour:Minute.

2. Press the DONE soft key to confirm the time and move to the date option.

3. When setting the date, the *Data***FID** prompts you for the current date formatted as Month/Day/Year. Use the ARROW KEYS to enter the correct date.

4. Press the DONE soft key to confirm the date and the display will return to the main screen.

Date Format

The date format can be expressed either as **MM/DD/YYYY**, or as **DD/MM/YYYY**. Using either the Up or Down arrow soft key, choose either option via the SELECT soft key.

Password

Sensitive options are those which can affect the *Data***FID**’s readings. These options are located within the *Data***FID** Setup menu. Whenever the *Data***FID** Setup menu is selected, the *Data***FID** will prompt you to enter a 4-digit password before you can access the functions.

The unit always has a password in force. When shipped from the factory, the code is 1111. To change the *Data***FID** password:

1. Use the DOWN ARROW soft key to point to PASSWORD, the press the SELECT soft key.

2. You will be prompted with the current password. Using the UP, DOWN and RIGHT ARROW soft keys, enter the new password. Press the DONE soft key when finished.

Note: If the incorrect password is entered, the menu reverts back to *Data***FID** Setup and does not allow you to go further into the *Data***FID** Menu.

CAUTION*: If you change the password, make sure you record the setting. If you cannot remember your password once the instrument is locked, there is no way to unlock it without sending the unit back to Photovac.*

Language – Note: This feature is not yet available.

Units

The *Data***FID** can display readings in two units of measure: PPM (parts per million) or PPB (parts per billion). On selecting Units from the MENU, the two choices will appear as a list.

Using either the Up or Down arrow soft key, highlight the desired Units of Measure and use the SELECT soft key to set the choice.

Real Time Data

When the *Data***FID** is being used in conjunction with a Computer or a PDA, the current TVOC reading can be sent to a PDA only if the Real Time Data option is ON. The Real Time Data function is used to switch on and off the Bluetooth message transmission. To switch the Bluetooth messaging to the PDA on and off:

1. From the Main Menu display, select the "*Data***FID** Setup" option.

2. Select the Real Time Data option and then press the SELECT soft key. Press the DOWN ARROW soft key to either turn the Bluetooth messaging to the Computer/PDA on or off.

3. Press SELECT soft key to return to the *Data***FID** Setup menu display.

Compound Selection and Response Factors

The response of a flame ionization detector to a compound is dependent on its ionization potential. In certain situations when the user is confident that only a **single specific compound** exists, they can set up the *Data***FID** using a Methane, Hexane, or Propane calibration to mimic the *Data***FID** response as if the *Data***FID** was calibrated using that specific single compound.

The *Data***FID**'s 6 memory slots can be used to store compound information for 6 different gases. A 7th memory slot exists as Memory Slot 1 but it is reserved for TVOC and its default settings are that of Methane. The TVOC slot appears when this option is selected. The TVOC memory slot 1 appears with the Compound name as a blank, Response Factor set to 1.0, Alarm Level set to 1000.0, and a Formula Weight of 16.0.

The *Data***FID**'s other 6 memory slots can be used to store compound information for 6 different gases. By using the Up and Down arrow soft keys, the current values for these compounds can be viewed one at a time. When the desired compound appears on the screen, the select soft key can be used to choose that compound and its associated parameters (Response Factor, Alarm Level, Formula Weight) as the active compound in which all measurements are performed. See figure 30.

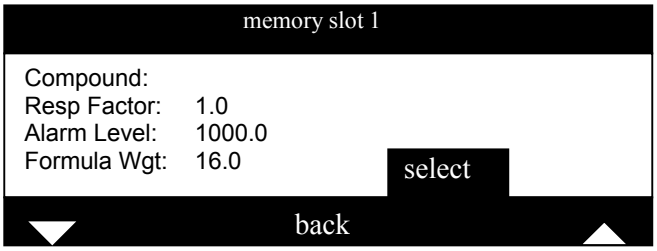


Figure 30: Setting the Compound Memory

Select Calibration Gas

There are three Gas types of which any one can be used to perform a *Data***FID** calibration. On selecting 'Select Cal Gas', the three calibration type gases will appear as a list. They are Methane, Propane, and Hexane. Using either the Up or Down arrow soft key, highlight the desired calibration gas and use the SELECT soft key to set the gas.

Edit H2 Timer

The H2 is used to count down the number of hours of use remaing in the hydrogen fule cylinder. Each time the hydrogen fuel cylinder is filled, the timer should be set to 50 (reprsenting 50 hours reaming of hydrogen fuel use). Shorter periods of use can be enterd if the hydrogen fuel cylinder is connected to the hydrogen supply for short amounts of time (See Table 2 Charging Time and Usaje Time).

1) On selecting Edit H2 Timer from the MENU, the choice of entering 2 digits in hours will appear. The up and down arrow soft keys are used to change the character underlined by the cursor. The right arrow is used to advance the cursor to the next character on the right. When the cursor is advanced past the right most character, it wraps around to the first character again.

   Use the "arrow keys" to enter the correct hours.

2. Press the DONE soft key to confirm the time and move to the date option.

Service Diagnostics

If problems with the *Data***FID**'s operation ever occur in the field, this menu provides the user or service technician with a way to troubleshoot the problem. These options are Diagnostics Monitor, Signal Test, Glow Plug Test, Hydrogen test, Range Test, and Turn Flame ON. On selecting 'Service Diagnostics', these options will appear as a list. Using either the Up or Down arrow soft key, highlight the desired troubleshooting operation and use the SELECT soft key to perform the diagnostic routine.

Audio Control Menu

The Audio Control function is used to switch the keypad beeper on and off whenever a user selects a key or presses a button. To switch the Audio key beeping function on and off:

1. From the Main Menu display, select the "*Data***FID** Setup" option.

2. When prompted, enter the correct 4-digit password. Once the correct password is entered, the user will be allowed to enter the *Data***FID** Setup menu.

3. Select Audio Control Menu and then press the SELECT soft key. Press the DOWN ARROW soft key to either turn the Audio key beep function on or off.

4. Press SELECT soft key to return to the *Data***FID** Setup menu display.

Calibration Technical Description

<u>Note: The DataFID must be calibrated in the upright position.</u>

The *Data***FID** will always detect all ionizable compounds present in a sample regardless of the response factor (RF) selected.

NOTE: *Even if the Data**FID** has been calibrated with a specific compound, its response is not specific and the presence of another ionizable impurity may render the numerical result invalid.*

It is often impractical to carry a range of different standards into the field. Approximate results can be obtained by calibrating the *Data***FID** with the recommended span gas and entering the appropriate response factor. The response factor is based on the ratio of the response of the specific compound to the response of the span gas. The response factor multiplies the *Data***FID**'s reading, then displays and records it.

WARNING	*The Data**FID** is a total VOC instrument and will **ALWAYS** respond to all ionizable compounds present in a sample. The Data**FID** will NOT respond only to a specific compound if an RF is programmed. It is the responsibility of the user to be aware of the limitations of Flame Ionization Detection instruments.*

Calibration is required for the *Data***FID** to compensate for temperature/climate changes as well as output changes due to inlet filter restrictions, ionization chamber cleanliness, sample pump wear and other factors. It is also needed in order to display concentration in ppm units equivalent to the calibration gas.

During calibration, the *Data***FID** is first exposed to zero air which contains no ionizable gases or vapors, is used to set the *Data***FID**'s zero point. A small signal is generated and the zero signal is stored by the microprocessor.

*Data***FID** is next exposed to span gas. This span gas signal is stored by the microprocessor. The microprocessor subtracts the zero signal from the span gas signal and divides the difference by the user-entered span gas concentration. The resulting sensitivity is stored in the selected Cal Memory with the zero signal and the alarm level. This number is then multiplied by the response factor and displayed.

*Data***FID** readings are always relative to the calibration gas. After calibration with a span gas, *Data***FID** will respond directly in units equivalent to that span gas. Almost all combustible organic compounds will be detected by *Data***FID**. It cannot distinguish between the selected calibration gas and other ionizable compounds. A reading of 10 ppm indicates all ionizable compounds that are present have generated an ion current proportional to 10 ppm of the selected calibration gas. *Data***FID** readings give an indication of the total ionizables present and their concentration relative the calibration gas.

Due to the *Data***FID**'s sensitivity, outdoor air is usually unsuitable for calibration. A charcoal filter (Part No. MX396022) may be connected to the instrument to produce clean air from otherwise unsuitable ambient air. For best results, use a commercial source of zero grade air and a second sampling bag. Zero air should have not more than 0.1 ppm total hydrocarbons (THC).

Methane in air is recommended as span gas. However, Hexane or Propane can also be used as span gas. The choice is made from the Calibration Menu – Select Span Gas. The concentration of the calibration gas will depend on your application. When ordering calibration gas, specify methane or any compound to be calibrated with in hydrocarbon free air. Balance air should have not more than 0.1 ppm total hydrocarbons (THC).

NOTE: Method 21 protocol requires that commercial cylinders of calibration gas be analyzed and certified to be within +/- 2% accuracy and that a shelf life must be specified on the cylinder. At the end of the shelf life, the cylinder must be replaced or re-analyzed.

NOTE: It is advisable to allow the unit to warm for at least 15 minutes before calibrating to insure accurate calibration.

Calibration Accessories and Preparing for Calibration

It is best to prepare the accessories and the necessary equipment before the user will calibrate. Following the procedures outlined here will make the actual calibration step easier for the user.

Preparing the Calibration Gas Bag and the Zero Air Bag

Use the calibration kit (Part No. MX396011) as follows:

Observe proper handling techniques for all gases! See Compressed Gases on page 13

WARNING

1. Connect the regulator to the calibration gas cylinder.

If you are using a portable tank of calibration gas, connect the regulator supplied with the calibration kit.

If you are using a large cylinder of calibration gas, you must obtain a high purity regulator. Be sure to match a regulator with the gas tank fitting. Connect the regulator to the tank of calibration gas.

NOTES: Do not force the connection. Do not use Teflon tape with CGA fittings. In general, these fittings are designed for metal to metal sealing. Do not use adapters to connect one CGA fitting to another type of CGA fitting. If the regulator does not match the outlet on your calibration tank, contact your specialty gas supplier.

2. Tighten the regulator onto the tank with a wrench. Do not over-tighten.

3. Attach the knurled nut on the gas bag adapter to the regulator. Finger-tighten the fitting.

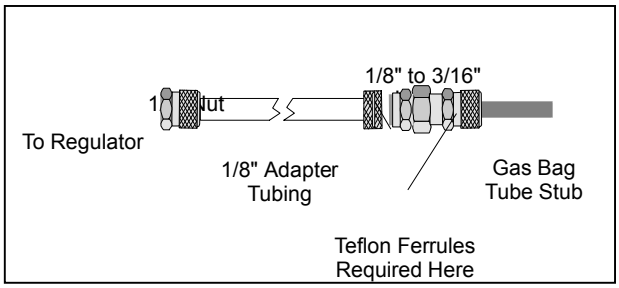


Figure 31. Gas Bag Adapter

4. Loosen the knurled nut on the reducing union of the bag adapter.

NOTE: Do not remove the nut from the union, as the Teflon ferrules contained inside the nut may be lost.

5. Insert the tube stub from the gas bag into the knurled nut. Tighten the knurled nut and ensure the tube stub is secure. If the gas bag is not secure, ensure you have inserted the tube stub far enough into the knurled nut. Do not over tighten the fitting.

WARNING	**Over-tightening the Teflon ferrules will result in damage to the ferrules.**

6. The union should be connected to the gas bag adapter. If it is not, then tighten the nut on the adapter tube to the union.

7. Open the gas bag valve. Turn the knurled plastic knob counter clockwise to loosen it, then use the knurled collar on the valve tube to gently push the valve tube toward the bag.

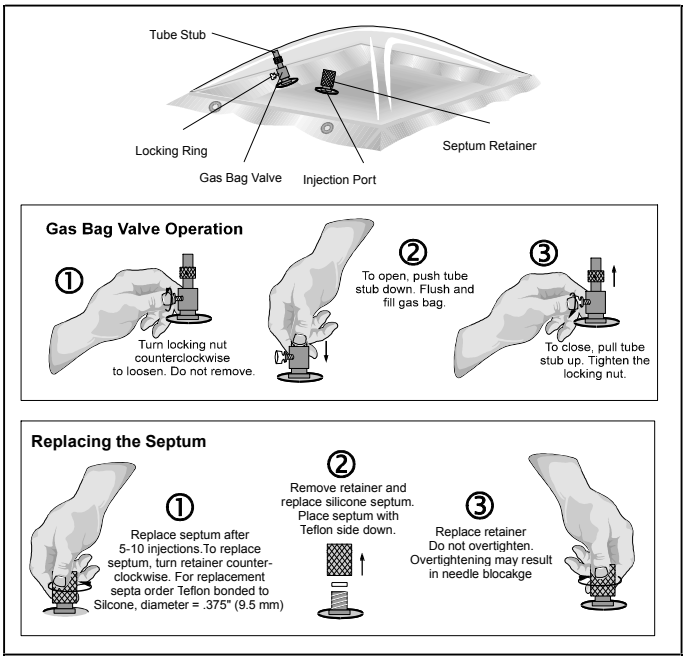


Figure 32. Using the Gas Bag

8. Turn the regulator knob counter clockwise about half a turn to start the flow of gas. Fill the gas bag about half full and then close the regulator.

9. Disconnect the gas bag from the gas bag adapter and empty the bag. Flush the bag a few times with the calibration gas and then fill it.

10. Close the gas bag valve. Gently pull the valve tube away from the bag, and then turn the knurled plastic knob clockwise to tighten it against the valve tube.

11. Remove the knurled nut on the adapter tube from the regulator.

12. Repeat this procedure, if necessary, to prepare a bag of zero air.

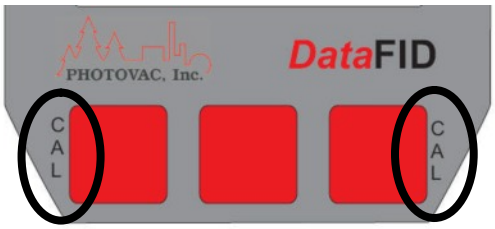
NOTE: Do not use the same gas bag or gas bag adapter for the bag of zero air. You will contaminate the bag of zero air.

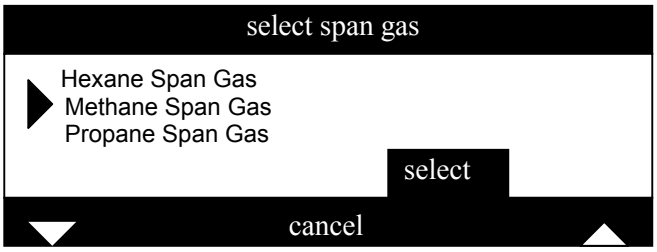
Calibrating the *Data*FID (General)

Before calibration begins, make sure the *Data***FID** is turned on and is in measure mode.

To calibrate the *Data***FID**:

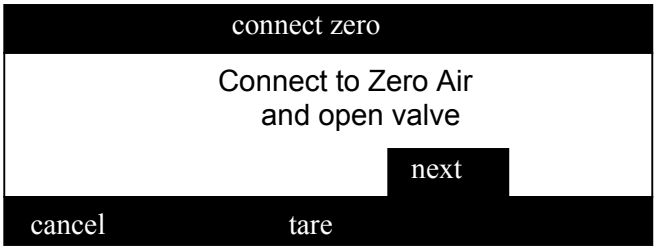
1. Press both the left and right user keypad buttons together. This will initialize the *Data***FID**. Calibration Mode Screen





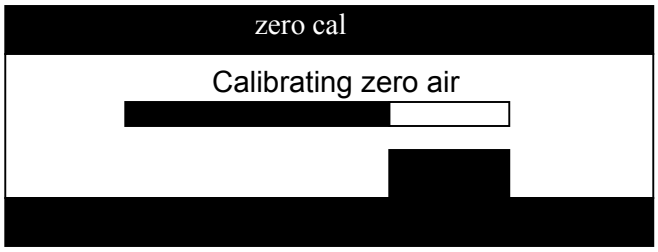
2. Select the desired Calibration Gas. The *Data***FID** has 3 Calibration Memories and can be calibrated with 3 different span gases or response factors if desired. Only one Cal Memory can be used at a time.

3. Connect the supply of zero air and press Next to set the Zero Point for calibration

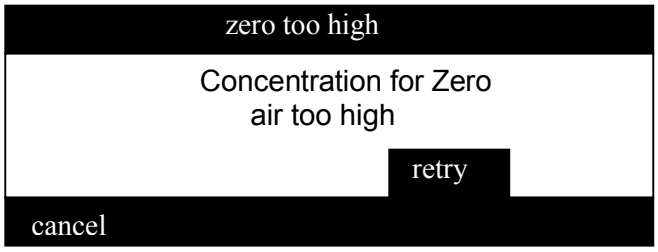


4. If you are using a charcoal filter, connect the filter as outlined on page 17. Press Next and the *Data***FID** will set its zero point. NOTE: The charcoal filter does not filter methane or ethane. If these compounds are present, use a gas bag with a supply of commercial zero air.

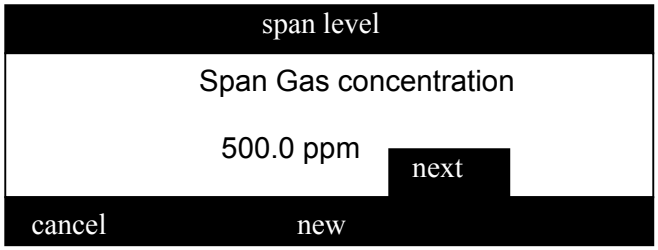
5. If you are using a gas bag with zero air, connect the gas bag adapter to the inlet. Open the bag and press Next and *Data***FID** sets its zero point.



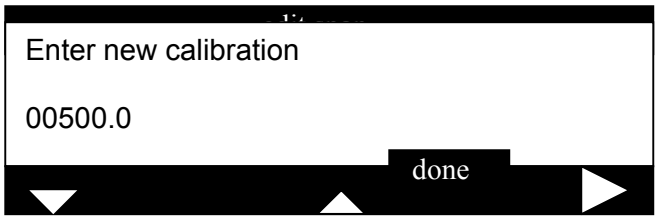
Should a fault condition arise such as Concentration for Zero Air too high the user will be prompted to Retry the Zero point for calibration again. Users should also look to the Troubleshooting Section to further investigate causes for fault conditions



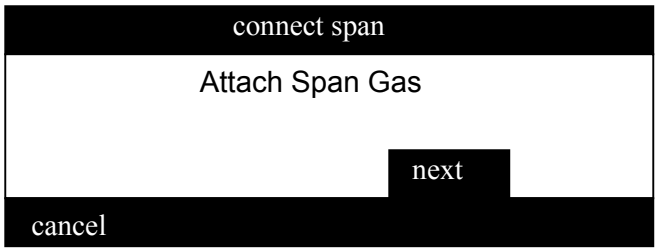
5. The *Data***FID** then asks for the span gas concentration. Enter the known concentration or select New to enter a different span gas concentration and then connect the gas bag adapter to the inlet.



Selecting New will prompt the user to reset the digits for the span gas value. The left and center keys will change the corresponding values up or down while the right key will move the place holder over to the right. If the place holder moves too far to the right, press the right arrow key until the cursor moves back to the left to edit changes. Once the selection has been edited, select the trigger button to accept the changes and continue to the Span segment of calibration.

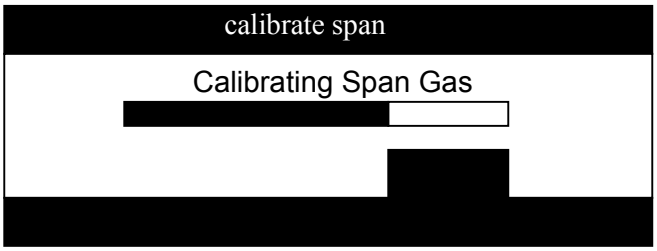


6. Open the span gas (bag/regulator) and press Next

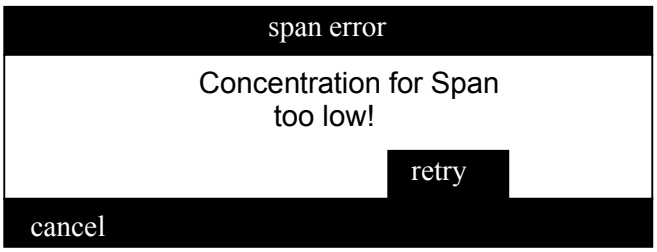


7. The unit will now begin setting its sensitivity to the entered calibration span value.

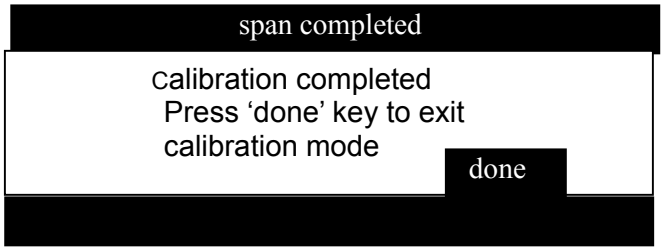
NOTE: Readings may fluctuate slightly as the gas bag empties. Do not allow the DataFID to evacuate the bag completely.



Should a fault condition arise such as Concentration for Span Too Low the user will be prompted to Retry the Span point for calibration again. Users should also look to the Troubleshooting Section to further investigate causes for fault conditions



8. When the *Data***FID** has completed the calibration cycle the user will prompted to select Done.



9. The *Data***FID** is now calibrated and ready for use. Remove the span gas bag or regulator from the inlet.

Note: Calibration does not bring a user into the Run Mode automatically. After pressing the 'done' soft key, the user is returned to the screen that was displayed before performing the calibration.

Example: If the user is in the User Mode screen while editing an Interval timing and the unit flames out, all you simply need to do is press the 2 Cal keys, invoke the calibration cycle and, upon completion of calibration, the unit will revert to the User Mode edit Interval timing screen again.

If the user wishes to go into the Run mode screen at any time, all you need to do is select 'meas' and the Run Mode screen will appear.

4. WIRELESS COMMUNICATION

The *Data***FID** uses a Bluetooth communication chip as the means to download and upload information to and from the *Data***FID** memory. The users must be sure that the Bluetooth communication device software and Bluetooth device are running, paired and active when trying to communicate with the *Data***FID**.

Please Note: When the unit has been powered off, the computer or PDA must reinitiate communication with the Bluetooth chip in the *Data***FID**.

<u>This must be done each time the unit has been powered off.</u>

Wireless Communication Range

Most Bluetooth devices are capable of transmission approximately 30 feet away from the send/receive device (in this case the computer or PDA to the *Data***FID** and vice versa). Users should be aware that the signals sent from the *Data***FID** and the computer/ PDA are not capable of transmissions through such items as steel doors and floors which disperse and block the transmission signal. Most manufacturers will provide some sort of signal strength meter within their software that will advise the user if a communications link between the receiving device and the sending device is functioning and, in some cases, the signal strength.

Pairing

Bluetooth-enabled instruments need to be paired with the receiving or sending base which is typically a computer or PDA. The pairing protocol will create a communications port for the

computer linking device, and will then begin a search for Bluetooth serial communications devices. This pairing will occur during a send receive from the unit setup within the computer/PDA when the user selects a specific device serial number from within the *Data***FID** unit. Most software programs from Bluetooth-enabled devices will find available *Data***FID** units with the sending unit. This serial number will not be the Photovac *Data***FID** serial number which is etched into the casing but rather the serial number of the Bluetooth send/receive chip within the *Data***FID**. For instance, *Data***FID** unit serial number AZ300505 has a Bluetooth chip within it having the serial number ending in: C001. Users should rename and add in the *Data***FID** serial number to the information for the Bluetooth serial number as to not confuse the data transmission and download or upload from other units accessing the Bluetooth software program.

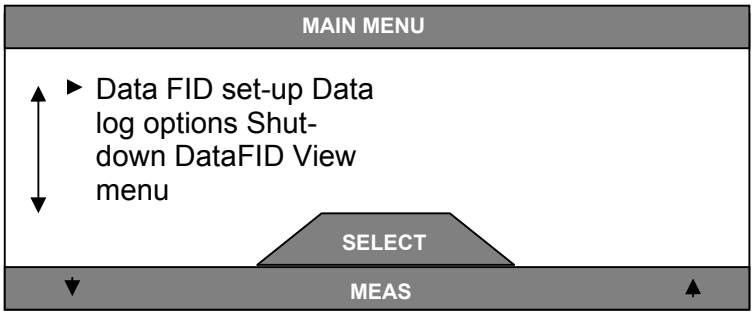
Note: The Pairing password for the *Data***FID** is 1234

Enabling Blue Tooth Communication

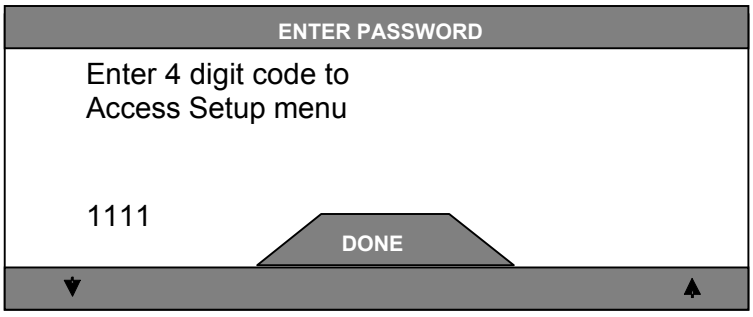
Once the Bluetooth communication is properly setup and paired between the Computer/PDA and the *Data***FID**, operations such as Data log Download, Compound Upload, and Tag Upload are available without any further menu selections.

Users of Computer/PDA enterprise datalogging LDAR software programs as LeakDAS will need to perform the following steps in order for the *Data***FID** to emit a real-time VOC reading when the unit is actively measuring (i.e., Flame is On).

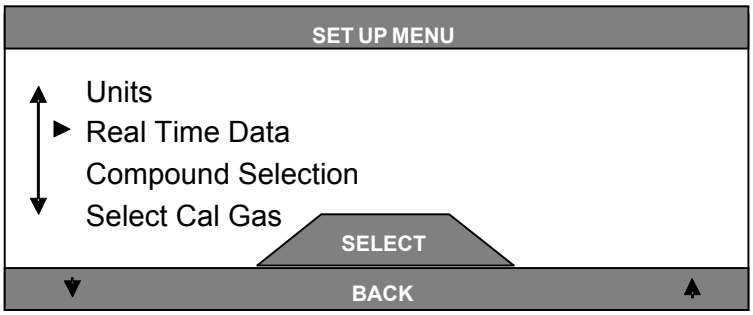
- Select *Data***FID** Setup.



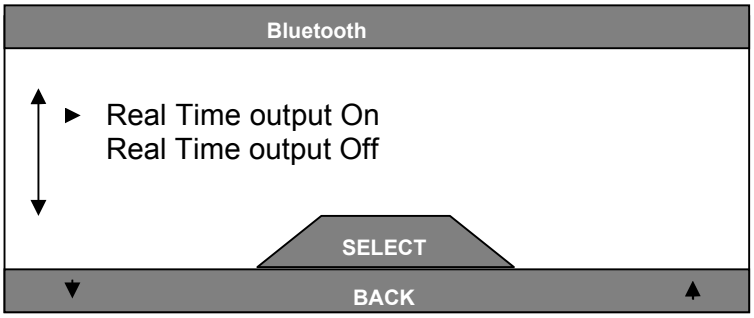
Enter the password when the “enter password” screen appears



Then scroll down using the arrow keys to the Real Time Data option and enter Select



Select Real Time Data output ON, then select the Back option 2 times to enter the top level menu or select Measure to resume direct measuring.



Once the Real Time Data output has been turned to the ON position the *Data***FID** will begin sending a transmission which will become auto-detected by most computer Bluetooth enabled communication software programs.

Please note that the Bluetooth transceivers do not need to be turned on. This is the location for turning Off the transceiver if needed

Data Transfer

Photovac uses a generic data transfer program called HyperTerminal which is resident in Windows Operating Systems up to XP. For the Windows OS Vista, HyperTerminal is no longer resident and must be downloaded into the operating system.

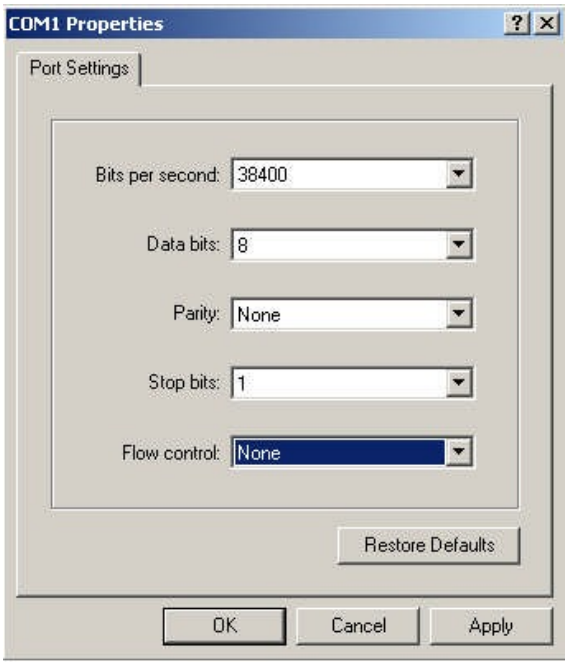
Data Transfer Procedure:

· Wirelessly connect the *Data***FID** to the Compute/PDA using the correct communications port. The *Data***FID** must have the Bluetooth communications protocol open and running. Take note of which communications port is assigned by the Bluetooth software (for example, COM4).

· To access Hyper Terminal, select Start, then Program, Accessories, Communications, Hyper Terminal and then select the Hyper Terminal Icon. A “Connection Description” box will appear. Enter a name (e.g., *Data***FID**). A “Setup Connection” box will open. Enter the instrument name

and select an icon (if you choose to save the session after you have completed downloading the data, this icon will then appear in the Hyper Terminal group).

A "Com Properties" Box will appear, please enter the following information



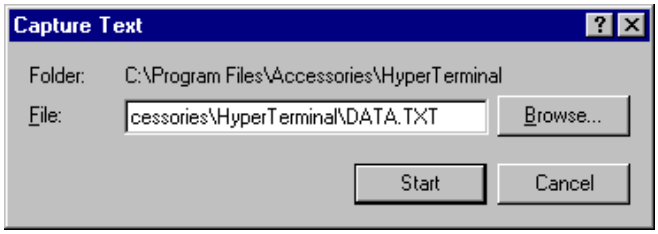
Bits per second 38400

Data Bits 8

Parity None

Stop bits 1

Flow Control None



Open the Transfer menu

Select Capture Text.

A “Capture Text” box will appear.

Enter the filename you choose and select Start.

· Prepare the instrument to begin data transfer. Choose the data to be downloaded and begin the transfer. Once the transfer is complete, the logged data can then be Copied and Pasted into a new or existing document or spreadsheet.

Interfacing Blue Tooth Communication

Typical communications software programs guide you through the steps that are necessary to activate the communications interface and allow transfer from PDA’s and Computers. This is an

example of the steps required to interface with an HP IPAC PDA and the *Data***FID**. (Note: The HP IPAC ODA is not rated intrinsically safe for use in hazardous environments). All PDA's will have the same function setup with Bluetooth and the Bluetooth device will have the following information;

- Device name
- Device class
- List of services

PDA Communication Setup

From the Settings Menu

1. Select 'Connections' and then 'Bluetooth'

2. When first entering the program, the Bluetooth screen status will be 'Off'. The user should remain in the 'Off" setting until the Bluetooth device is configured to work with the *Data***FID**.

3. Enter the 'Accessibility' setup and select the most generic Bluetooth setup when first configuring the device. The selections are typically;

- 'Allow other devices to Connect'

- 'Other Devices can discover PDA'

- 'All Devices or Paired Devices' The user will choose 'All Devices'

4. Enter the 'Services' section and select;

- 'Serial Port'

- Check 'Enable Service'

- Ensure that Authorization and Encryption are Deselected.

5. Take notice of the 'Inbound and Outbound' communication port numbers. These will be needed when setting up enterprise datalogging LDAR software programs such as "Leak DAS" and others

6. In the General Tab, select 'Bluetooth On'

On completion of the Setup section, return to the Bluetooth Manager and select the Bluetooth Device ID for the one installed in your *Data***FID**.

Note: It is important that the Bluetooth Device is setup as a "Generic Device", without any encryption.

Computer Communication Setup

Follow the manufacturer's instruction for the Setup Software and Drivers that are needed for the computer operating system. These are usually in CD form and come with the Bluetooth-enabled device. (Contact the manufacturer or Windows download for the correct drivers needed). The user may also use Windows OS to select most Bluetooth-enabled devices although the drivers will still need to be installed when required.

Unlike a PDA, most computers will rely on a Bluetooth wireless adapter for the data transmission, which is typically inserted and used through a USB port on the computer. There are a few key elements that all setup software will ask:

- The Bluetooth wireless adapter ID to the computer - simply the name of the device being added
- Service selection - which type of device is being selected…anything from headphones to network services
- Security connection - whether the device will require authorizations to work or not

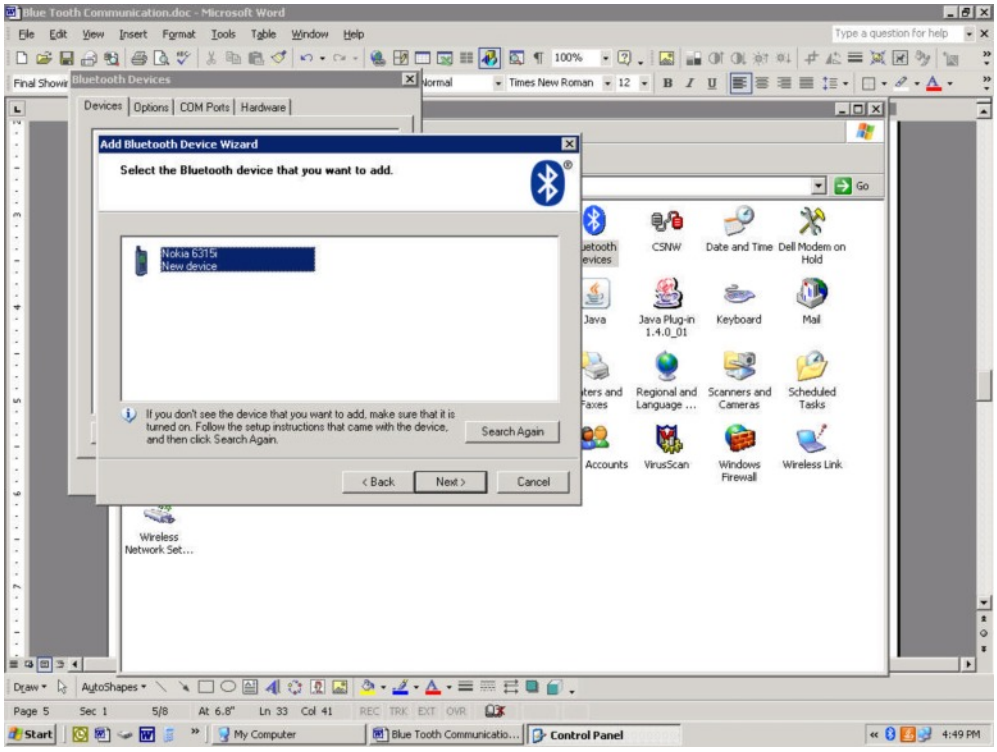
OS Platforms step through the computer Bluetooth wireless adapter search and location and advise the user to turn on the adapter to make it "discoverable".

From Windows, the "Control Panel" will have an Icon that will be Locationed "Bluetooth" Devices and Configuration. As with the instructions for the PDA communication setup, open a port in the serial communications area in the Software and Windows, assign the port, complete the transfers without authorizations, and make the port "Generic"

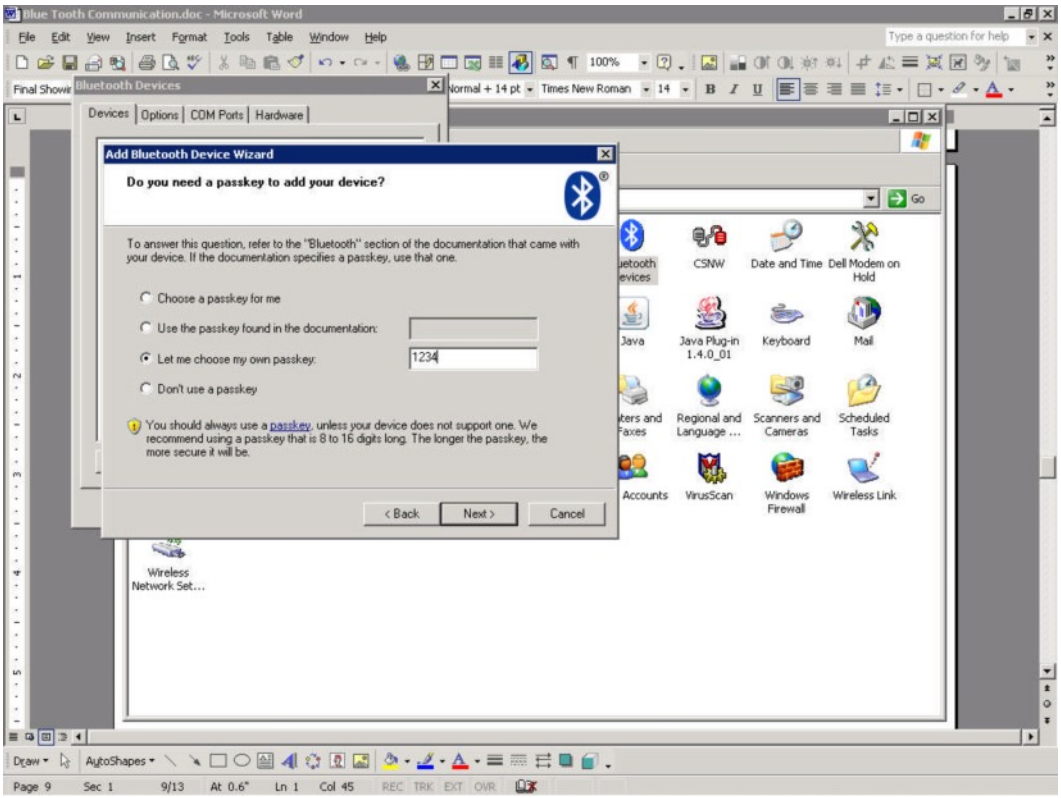
1. Select Settings and then Control Panel from the Windows Start Menu

2. Select Bluetooth Devices

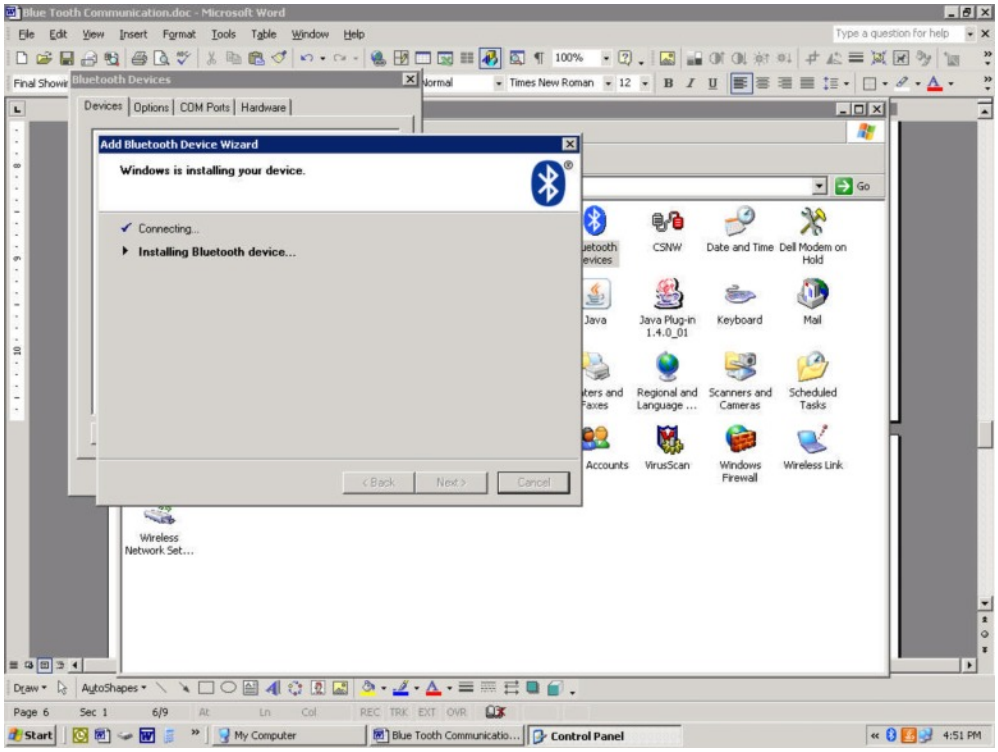
3. Select the Devices tab and select "add"



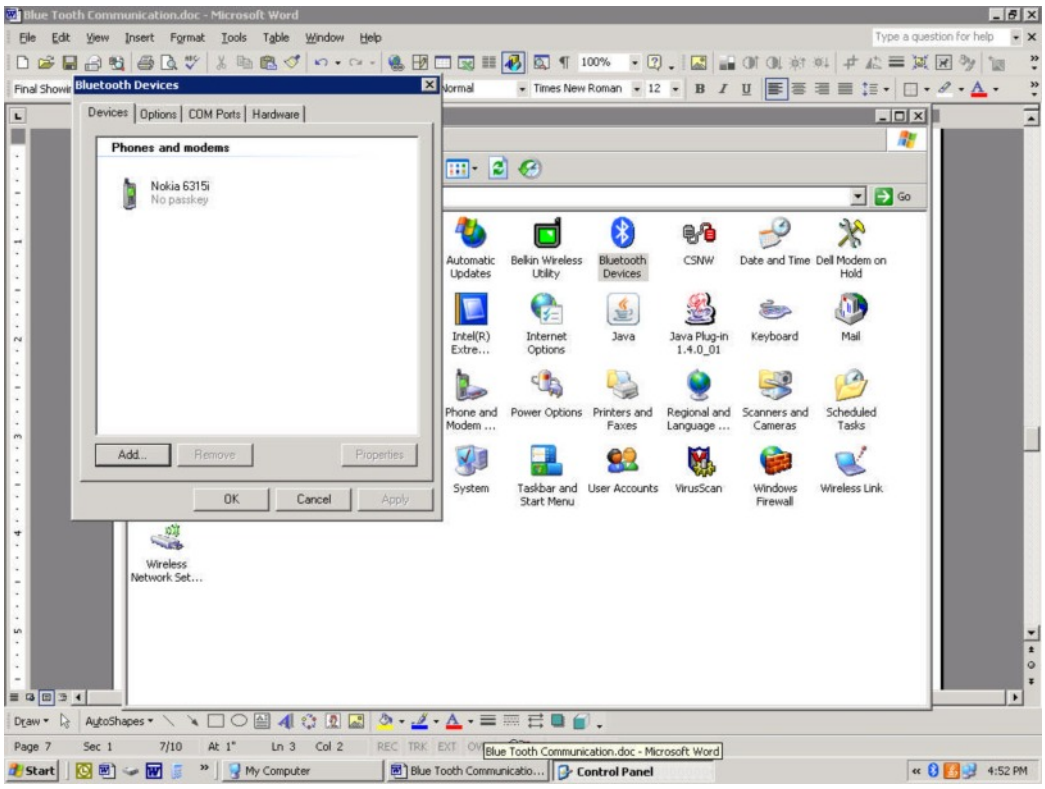
4. Select Next and then use the passkey 1234



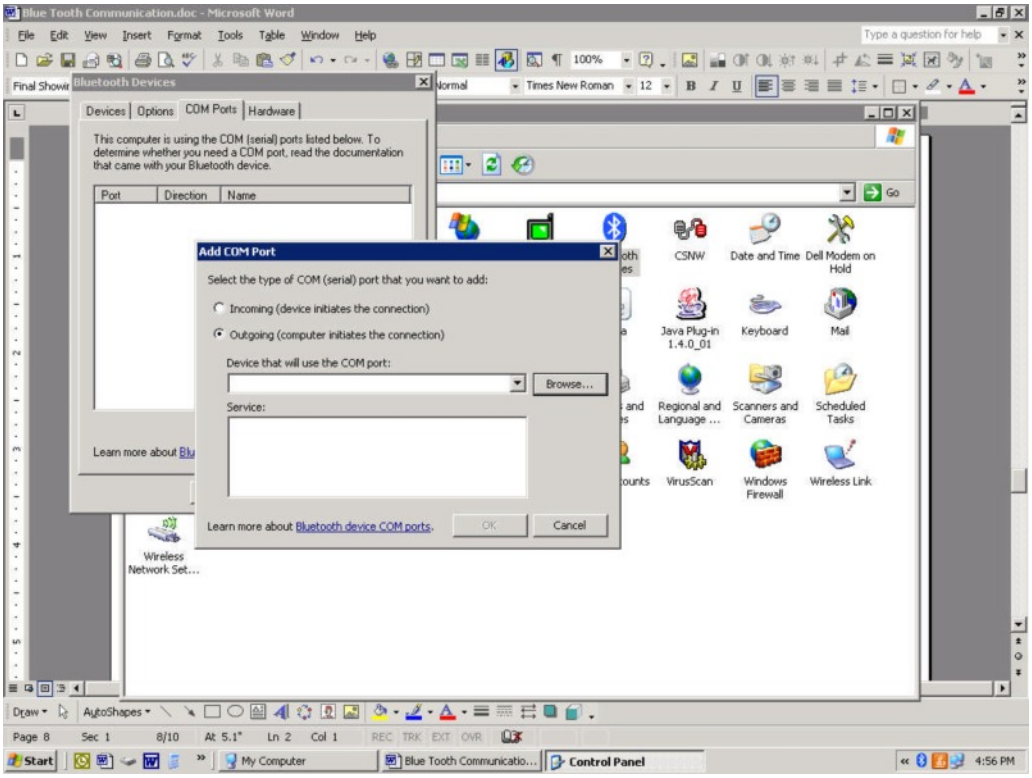
5. Windows will now install the Blue Tooth Device



6. Select finish and the device will now be in the Devices Tab



7. Select the Ports by going to the COM Ports tab and select Add. The computer will then initiate the pairing for send and receive port numbers and report back the numbers automatically



Select Finish, and the device is now paired and ready for use. Initializing HyperTerminal will have data stream automatically when transfer within the program begins.

5. ROUTINE MAINTENANCE

The following section outlines the procedures for proper maintenance of the *Data***FID**

Maintenance Intervals

Maintenance intervals are a function of the total use of the instrument and can be broken down into the cumulative hours that the unit has been used and the need to ensure proper running performance of the unit.

It is advised that the *Data***FID** should have filters changed and an inspection calibration performed at least once a month along with daily calibrations of the unit before use in the field. Of course, filter change-out and calibration are a function of use in the field, conditions of the sampling environment (dusty, etc.) and the critical nature of the measurements.

Battery Charging

The *Data***FID** battery pack must be charged for 8 to 12 hours prior to using the instrument to ensure proper charge/discharge timing with future uses.

A fully charged battery powers the *Data***FID** for approximately 15 hours.

When the instrument status displays “Low Battery Error!”, the battery pack requires charging. When the “Low Battery Error!” status is displayed, you have a few minutes of operation left. The *Data***FID** will turn itself off before the battery pack becomes critically low.

CAUTION: *Do not remove the battery pack in a hazardous location.*

CAUTION*: Do not connect the battery charger to the Data**FID** in a hazardous location.*

Upon return from field work, charge the battery pack as outlined in Chapter 2. You will need one charger for each battery pack. **Note:** Use only the *Data***FID** battery charger.

NOTE: *Do not leave battery packs uncharged for an extended period of time. This will result in damage to the battery packs.*

The charger automatically charges at a high charge rate until the battery pack is fully charged. It then maintains the full charge with a low continuous charge rate indefinitely so there is no danger of over-charging.

NOTE: *Leaving the Data***FID** *for more than 3 months without turning it on may result in the loss of recorded data and setup parameters. If the Data***FID** *is not used for long periods of time, turn on the instrument for a few hours every month to avoid loss of data.*

Maintenance of the Flame Ionization Detector

The *Data***FID** detector is a not a field replaceable unit (FRU) and should not be serviced by the user. Any problems which are occurring with the detector should be directed to Photovac Service.

Replacing Inlet and *Smart*Probe Filters

The Data***FID*** uses two filters; one located in the instrument inlet and the other in the *Smart*Probe inlet. The filters are designed to remove dust and water to reduce detector contamination. As the filter collects dust, the *Data***FID**'s inlet flow rate and sensitivity decrease. The filter will not allow water to pass through, but the filter will not stop all solvents.

NOTE: *Do not aspirate liquid samples with Data***FID***!*

*Replace the filter on a monthly basis, or more frequently if the Data***FID** *is used in a dusty or wet environment. You must replace the filter if the Data***FID** *has been exposed to liquid water. The pump will sound labored when the filter requires replacement.*

CAUTION: *Do not replace the inlet filter in a hazardous location.*

1) Turn off the instrument. Unscrew the filter housing from the probe housing or unit housing. Be careful not to lose the O-ring seal. See

Figure

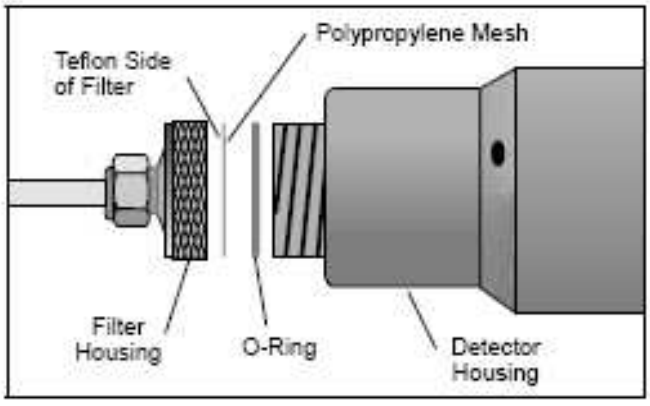


Figure 35. Inlet Filter

2) Remove the Teflon/Polypropylene filter and install the new filter (Part No. MX396015). Place the filter in the filter housing with the Teflon side facing outward in the filter housing and the polypropylene mesh side facing the *Data***FID** unit or *Data***FID** *Smart*Probe. Handle the filter disk only by the edges. The mesh may be damaged or contaminated by excessive handling. Use forceps if possible.

NOTE: *Each filter is protected by a piece of blue plastic. Remove the plastic before installing the filter in DataFID.*

3) Replace the filter housing.

4) Calibrate all Cal Memories that you are using before continuing operation.

NOTE: *Do not operate the Data***FID** *without an inlet filter.*

Replacing the Sintered Filter (Exhaust Filter)

Through normal use of the *Data***FID**, the exhaust frit and cap (Part No. A3201116) can become clogged with fine carbon ash from continuous burning of vapors and gases which exit from the detector. It is vital that this piece be replaced often and a supply should be kept on hand. One of the principle reasons this part needs to be changed out is from excess humidity in the air while the unit is being used. Excess water saturation of the filter element can cause the element to trap and bind particulates from the burn process more easily and accelerate the clogging process. It is suggested that the filter be changed at least once a month to maintain data and machine integrity if sampling is done in a hot and humid condition or when sampling high concentrations of organic vapors and gases. If the use of the *Data***FID** is infrequent, the filter can be changed once every six months.

1. Turn off the unit power and close the hydrogen valve.

2. Locate the exhaust frit and cap on the main unit, identified as “Exhaust”. (See Figure 34)

3. Use the multi-tool to unscrew the old exhaust element counterclockwise and replace the exhaust element with a new one (Part No. A3201116).

4. The old exhaust frit and cap can be cleaned and reused. Use methanol or alcohol in an ultrasonic bath.

Calibration

- Daily Calibration

The *Data***FID** should be calibrated on a daily basis before use.

It is necessary to calibrate the *Data***FID** at the temperature at which the unit will be used to minimize the effects of vapor pressure changes with temperature. Performing calibration at the same temperature allows the calibration gas and the sample gas to have equal ionization in the detector.

- Monthly Quality Check

Calibration of the *Data***FID** as a routine maintenance activity should include measuring the machine against a known standard of good quality gas, and then comparing the result before the calibration. This quality check is most commonly known as a "bump test" and helps define the unit linearity and whether cleaning of the detector collector electrode is necessary. The

unit's performance should be within 20% of the calibration level used. This should be performed once a month and recorded to verify if any changes in the quality check have changed and if the unit should be sent in for service.

- Yearly Service Evaluation

Photovac advises that the *Data***FID** be sent to Photovac Service once a year for preventive maintenance and calibration. Sending the unit to Photovac on a yearly basis allows the user to receive upgrades to software, preventive maintenance, cleaning and calibration, along with a calibration certificate. Contact Photovac Customer Service for information on ProCare™ Annual Maintenance.

Maintenance Schedule Table

Item/Operation	**Frequency/Usage**
Battery Pack Charging	For 8 hours of use, charge 4 hours
Hydrogen Cylinder Filling	15 minutes for 9 hours of use (see Table 2 for cell charge times)
Inlet Filter Replacement	When dirty or once per week
Sintered Filter Replacement	Once every month in wet/concentrated environments
Calibration - Daily	In condition unit will be used
Calibration - Monthly	Record readings. Send to Photovac Service if inaccuracy consistently over 20%

Waste Electrical and Electronic Equipment (WEEE)

EU regulations for the disposal of electric and electronic appliances that have been defined in the EU Directive 2002/96/EC and in national laws became effective in August 2005 and apply to this device.

Common household appliances can be disposed of using special collecting and recycling facilities. However, as the *Data***FID** has not been registered for household usage, it must not be disposed of through those means. The device can be returned to your national vendor/sales organization for disposal. Please do not hesitate to contact your vendor/sales organization if there are any questions on this issue.

7. TROUBLE SHOOTING

General Information

If you have a service related question about the *Data***FID,** consult this manual first. If you cannot find the answer in this documentation, contact the Photovac Service Department.

When you call, you should have your *Data***FID** in front of you. You should also have this manual at hand.

Lastly, please have the following information ready:

1. A description of what happened and what you were doing when the problem occurred.

2. Any corrective action that has been taken.

3. The exact wording of any messages that appeared on the display.

Do not service the *Data***FID** in a hazardous location. **WARNING**

*Data*FID Fault Messages

When the “Check” status is displayed, the *Data***FID**’s operation is compromised. Go to the “View menu – List error codes” menu selection to obtain a description of the fault. One exception is the flame out fault. When a Flame-out fault occurs, the instrument display will show “flame out”.

Fault: Detector flame has gone out.

Cause: The hydrogen gas has run out.

Action: Ensure the shut-off valve is open.

Action: Refill the hydrogen cylinder if necessary

Cause: Oxygen supply is deficient.

Action: Ensure there is an adequate supply of oxygen. If you are sampling very high concentrations, it is possible you are sampling above the flame out concentration. The flame out concentration for methane is approximately 52,000 ppm (5.2% methane in air).

A minimum of 17% oxygen is required to start the hydrogen flame. The oxygen is supplied from the sample as it is drawn in by the pump. A minimum of 10% oxygen is required to maintain the hydrogen flame.

Flame out may also occur when sampling enclosed or confined spaces where vapors and gases cannot escape. Watch for indications of increased flame height such as erratic readings or sudden high concentrations followed by a flame out fault.

If you will be using the *Data***FID** in a highly contaminated area where it is possible the oxygen content is below 10%, watch for indications of reduced flame height such as lowered detection limits or a flame out fault.

Cause: High concentrations of flammable gases (gases within their flammable range) are present. High concentrations of flammable gases can act as an additional fuel source. When this happens, the flame height may increase beyond the confines of the combustion chamber. The hydrogen supply will then be cut off and the flame will go out.

Action: Move to a location where there is an adequate supply of air and restart the flame. See the information above. Watch for indications of increased flame height such as erratic readings or sudden high concentrations followed by a flame out fault.

Cause: Exhaust port is blocked.

Action: At low temperatures, water vapor, a by-product of the hydrogen flame, may condense at the exhaust port. At sub-zero temperatures, the water vapor will freeze and obstruct the exhaust port. If the exhaust port becomes obstructed, pump operation will be inhibited. Flame out may also result. Operate the *Data***FID** within the operating temperature range 4 to 40°C (40 to 104°F).

Action: The flame arrestor has become plugged. Contact the Service Department.

Cause: Sample line is blocked.

Action: Ensure the sample line is not obstructed in any way

Cause: Inlet filter is plugged.

Action: Replace inlet filter. See Replacing Filters on page 69.

Fault: Signal from zero gas is too high.

Cause: Contamination of sample line or fittings before the detector.

Action: Clean or replace the sample line or the inlet filter. See Replacing Filters on page 69.

Cause: Span gas and zero air mixed up.

Action: Ensure clean gas is used to zero the *Data***FID.** Mark the calibration and zero gas bags clearly.

Cause: Ambient air is contaminated.

Action: If you are unsure about the quality of the ambient air, use a charcoal filter or a supply of commercial zero grade air.

Cause: Hydrogen supply is contaminated

Action: Hydrogen may react with the carbon in the steel, inside the tank to produce methane. This will only occur if the cylinder is in poor condition and if the hydrogen has a high moisture content. Replace the hydrogen tank. Empty and refill the *Data***FID** hydrogen fuel cylinder with fresh hydrogen.

Fault: Signal from span gas is too small.

Cause: Span gas and zero air mixed up.

Action: Ensure calibration gas is used to calibrate the *Data***FID.** Mark the calibration and zero gas bags clearly.

Action: Ensure the span gas is of a reliable concentration.

Fault: Detector field voltage is low

Cause: Internal fault in the electronics.

Action: Contact the Service Department.

*Data*FID Troubleshooting

Problem: No instrument response detected, yet compounds are known to be present.

Cause: The *Data***FID** has not been calibrated properly.

Action: Ensure calibration gas is of a reliable concentration and then calibrate the instrument as outlined in Chapter 3. After the instrument has been calibrated, sample the bag of calibration gas. A reading equivalent to the calibration gas should be displayed. If not, contact the Service Department.

Cause: Background contamination from the hydrogen.

Action: It is possible that the hydrogen has become contaminated and is contributing a high background signal, and the hydrogen supply should be replaced with a new cylinder. When ordering hydrogen, specify ultra high purity hydrogen, 99.999% pure. Refill the hydrogen fuel cylinder with the clean hydrogen supply.

Cause: There is an undetermined problem.

Action: Contact the Service Department.

Problem: Date and time settings are not retained.

Cause: The *Data***FID** has not been used for 3 months or more and the internal battery (not the external battery pack) has been discharged.

Action: Turn the *Data***FID** on and allow it to run until a “LoBatt” status appears. This will take approximately 15 hours. Remove the battery pack and recharge it overnight. Repeat this procedure for 3 or 4 days. While the *Data***FID** is running the internal battery is charging.

Problem: Cannot fill the hydrogen fuel cylinder.

Cause: The hydrogen supply tank has insufficient pressure. You can only fill the internal cylinder to a pressure of less than or equal to the tank pressure.

Action: Fill the hydrogen fuel cylinder or replace the hydrogen fuel cylinder with a full one.

Cause: There is a problem with the refill adapter.

Action: Contact the Service Department.

DO NOT modify or disassemble the refill adapter! If you have any problems, the unit must be returned for repair or replacement.

WARNING

Problem: Instrument status shows “Over”.

Cause: Rapid change in signal level. The detector electronics have been momentarily saturated.

Action: Wait a few seconds for the status to return to “Ready”.

Cause: The detector has become saturated.

Action: Move the *Data***FID** to a location where it can sample clean air. Sample zero air until the reading stabilizes around 0.

Problem: Display is blank

Cause: Battery pack is critically low.

Action: Recharge the battery pack.

Cause: The battery pack is not connected to the instrument properly.

Action: Ensure the battery pack charger connection is attached properly to the *Data***FID**.

Problem: Sample flow rate varies from 600 ml/min. +/- 10%.

Cause: Inlet filter has not been installed.

Action: Install an inlet filter into the inlet filter cap.

Cause: Inlet filter cap has not been tightened onto the detector cap.

Action: Finger-tighten the filter cap.

Cause: Inlet filter is plugged.

Action: Replace the inlet filter

Cause: Pump has been damaged.

Action: Contact the Service Department.

Cause: Exhaust port is blocked.

Action: At low temperatures, water vapor, a by-product of the hydrogen flame, may condense at the exhaust port. At sub zero temperatures the water vapor will freeze and obstruct the exhaust port. If the exhaust port becomes obstructed, pump operation will be inhibited. Flame out may also result. Operate the *Data***FID** within the operating temperature range -20° to 50°C.

Action: The exhaust frit has become plugged. Contact the Service Department.

Problem: Flame will not ignite.

Cause: The hydrogen gas has run out.

Action: Ensure the shut-off valve is open.

Action: Refill the hydrogen cylinder if necessary.

Cause: Oxygen supply is deficient.

Action: Ensure there is an adequate supply of oxygen. Do not attempt to ignite the flame in a location where there is greater than 10,000 ppm methane or the equivalent concentration of a flammable gas. Move to a location where there are lower concentrations and start the flame and then begin sampling higher concentrations.

If the flame goes out while you are sampling very high concentrations, it is possible that you are sampling above the flame out concentration. The flame out concentration for methane is approximately 52,000 ppm (5.2% methane in air).

A minimum of 17% oxygen is required to start the hydrogen flame. Oxygen is supplied from the sample as it is drawn in by the pump. A minimum of 10% oxygen is required to maintain the hydrogen flame.

If you will be using the *Data***FID** in a highly contaminated area where it is possible the oxygen content is below 10%, watch for indications of reduced flame height such as lowered detection limits or a flame out fault.

Cause: Exhaust port is blocked.

Action: At low temperatures, water vapor, a by-product of the hydrogen flame, may condense at the exhaust port. At sub zero temperatures the water vapor will freeze and obstruct the exhaust port. If the exhaust port becomes obstructed,

pump operation will be inhibited. Flame out may also result. Operate the *Data***FID** within the operating temperature range -20° to 50°C.

Action: The exhaust frit has become plugged. Contact the Service Department.

Cause: Hydrogen supply lines are full of air.

Action: If the *Data***FID** has not been used for some time, it is possible that the hydrogen supply lines contain air. Fill the hydrogen cylinder and then open the hydrogen shut-off valve. Allow the hydrogen to purge the system for about 5 minutes and then turn on the *Data***FID** to start the flame.

Cause: Hydrogen supply lines are blocked.

Action: Contact the Service Department.

Problem: Liquid has been aspirated.

Cause: The *Data***FID** has been exposed to a liquid or condensing vapor that can pass through the Teflon/Polypropylene filter.

Action: Contact the Service Department.

8. APPENDICES

_Data_FID Specifications – LD Versions

EPA Standards:	Meets and exceeds USEPA Method 21 regulations for fugitive emissions monitoring (LDAR)
Detector:	Flame ionization
Size:	14”L x 11”W x 2.75” D (35.5cm x 27.5cm x 7cm)
Weight:	11.0 pounds
Display:	Large 2.8” (7.1 cm) diagonal active area. Backlight manually activated
Keypad:	Four menu keys
Connectivity:	Modern Bluetooth Technology
Datalogger memory:	24,000 readings interval mode; 5,000 readings location mode
Hydrogen operating Time:	70 hours
Hydrogen tank pressure:	80psi (4,136 mmHg)
Flame-out re-light	Can be re=lit from LDAR Software program
Battery type:	Nickel-metal hydride (NiMH)
Battery Capacity:	15 hours
Response time:	90% of full scale in < 3 seconds
Operating concentration range:	0.1 ppm to 50,000 ppm
Operating temperature range:	32°F (0°C) to 122°F (50°C)
Operating humidity range:	0 to 100%
Repeatability:	+/- 2%

Alarm level:	Preset by operator
Alarm:	Audible at 85 dB, visual red LED on probe
Calibration Standards:	Methane, hexane or propane
Intrinsic Safety;	Class 1, Division 1, Groups A, B, C & D
FCC:	Class B digital device, pursuant to Subpart B, class B of Part 15 of the FCC rules

Hydrogen Fuel Cylinder Specifications

Hydrogen Storage Material: Metal hydride

Hydrogen Storage Capacity: 75 liters +/- 5%

Diameter: 2.0 in (51mm)

Length: 6.5 in (165mm), 8.0 in (203mm) with coupling

Weight: 1.9 lbs. (0.8 kg)

Hydrogen Supply Purity Required: 99.999% (ultra high purity

Shipping Designation: UN3468 classified for air cargo shipments

Warranty

The *Data***FID** is warranted for one year against defects in materials and workmanship.

Photovac, Inc. warrants that its manufactured product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment to the Customer. This may be voided if, in the opinion of Photovac, Inc., the product has been abused or treated in a negligent manner so as to cause damage or failure. Negligent use includes, but is not limited to, exposure of the internal parts of the equipment to water. Damage caused thereby is expressly excluded from this Warranty. Consumable supplies and parts routinely replaced are not warranted.

Photovac, Inc., and its vendors disclaim any implied warranty of merchantability or fitness for a particular purpose. Photovac and its vendors will not be liable for any indirect, special, incidental, or consequential damages, irrespective of whether Photovac or the vendor has advance notice of the possibility of such damages.

Photovac's sole liability under this warranty is limited to the repair or replacement of the product at its Service/Repair facility and return to the Customer.

When Photovac, Inc., is made aware of a problem, which would be eligible for remedy under Warranty, it will issue a Return Authorization Number (RMA) to the Customer. No return will be accepted unless such authorization has been obtained. The customer is responsible for insurance and shipping to the designated Service/Repair facility.

Service and repair of your instrument	

Response Factors

This list of response factors was determined at (nominally) 500 ppm, based on 500 ppm methane calibration gas. Methane will have a response factor of 1.0. The following formula was used for calculation of the response factors:

$$\text{Response Factor} = \frac{\text{Actual Concentration}}{\textit{Data}\textbf{FID Response}}$$

A response factor less than 1.0 indicates a compound response better than that of methane/hexane/propane. A response factor greater than 1.0 indicates a lower response than that of methane/hexane/propane.

NOTE: It does not matter which Cal Memory is selected or which response factor is entered, *DATAFID*'s response is not specific to any one compound. The displayed reading represents the total concentration of all ionizable compounds in the sample.

When using response factors, results are expected to be accurate to +/- 10 ppm or +/- 25%, whichever is greater.

Standards used for determination of these response factors were derived from a variety of sources:

C Certified gas cylinder, +/- 2% analytical accuracy (Isobutylene +/- 5% analytical accuracy)

G Standard prepared by dilution of pure gas into zero air, accuracy unknown

L Standard prepared by addition of pure liquid to zero air, accuracy unknown

*DATA*FID Typical Compounds Detected and Response

Saturated Hydrocarbons	
Methane (calibrant)	high
Ethane	high
N-Butane	moderate
Hexane	moderate
Cyclohexane	high
Octane	high
Unsaturated Hydrocarbons	
Acetylene	very high
Ethylene	high
Propylene	moderate
Butadiene	low
Cyclohexene	high
Aromatic Hydrocarbons	
Benzene	very high
Xylene	high
Toluene	high
Phenol	moderate
Naphthalene	moderate
Aldehydes and Ketones	
Acetone	moderate
Methyl ethyl ketone	high
Formaldehyde	not detected
Acetaldehyde	low
Sulfur and Nitrogen Compounds Dimethyl sulfide	low
Acrylonitrile	moderate
Chlorinated Hydrocarbons	
Methylene chloride	high
Chloroform	moderate
Carbon Tetrachloride	low
Vinyl chloride	moderate
Trichloroethylene	moderate
Tetrachloroethylene	moderate
Other Oxygenated Compounds	
Methyl alcohol	low
Ethyl alcohol	low
Isopropyl alcohol	moderate
Diethyl ether	low
Ethylene oxide	moderate
Propylene oxide	moderate
Ethyl acetate	moderate
Acetic acid	high

References

Scott Specialty Gases, Catalog, 1994.

American Conference of Governmental Industrial Hygienists. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices (1994-1995).

METHOD 21 - DETERMINATION OF VOLATILE ORGANIC COMPOUND LEAKS

1.0 Scope and Application.

1.1 Analytes. Analyte CAS No.Volatile Organic Compounds (VOC) No CAS number assigned

1.2 Scope. This method is applicable for the determination of VOC leaks from process equipment. These sources include, but are not limited to, valves, flanges and other connections, pumps and compressors, pressure relief devices, process drains, open-ended valves, pump and compressor seal system degassing vents, accumulator vessel vents, agitator seals, and access door seals.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method.

2.1 A portable instrument is used to detect VOC leaks from individual sources. The instrument detector type is not specified, but it must meet the specifications and performance criteria contained in Section 6.0. A leak definition concentration based on a reference compound is specified in each applicable regulation. This method is intended to locate and classify leaks only, and is not to be used as a direct measure of mass emission rate from individual sources.

3.0 Definitions.

3.1 *Calibration gas* means the VOC compound used to adjust the instrument meter reading to a known value. The calibration gas is usually the reference compound at a known concentration approximately equal to the leak definition concentration.

3.2 *Calibration precision* means the degree of agreement between measurements of the same known value, expressed as the relative percentage of the average difference between the meter readings and the known concentration to the known concentration.

3.3 *Leak definition concentration* means the local VOC concentration at the surface of a leak source that indicates that a VOC emission (leak) is present. The leak definition is an instrument meter reading based on a reference compound.

3.4 *No detectable emission* means a local VOC concentration at the surface of a leak source, adjusted for local VOC ambient concentration that is less than 2.5 percent of the specified leak definition concentration. That indicates that a VOC emission (leak) is not present.

3.5 *Reference compound* means the VOC species selected as the instrument calibration basis for specification of the leak definition concentration. (For example, if a leak definition concentration is 10,000 ppm as methane, then any source emission that results in a local concentration that yields a meter reading of 10,000 on an instrument meter calibrated with methane would be classified as a leak. In this example, the leak definition concentration is 10,000 ppm and the reference compound is methane.)

3.6 *Response factor* means the ratio of the known concentration of a VOC compound to the observed meter reading when measured using an instrument calibrated with the reference compound specified in the applicable regulation.

3.7 *Response time* means the time interval from a step change in VOC concentration at the input of the sampling system to the time at which 90 percent of the corresponding final value is reached as displayed on the instrument readout meter.

4.0 Interferences. [Reserved]

5.0 Safety.

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

5.2 Hazardous Pollutants. Several of the compounds, leaks of which may be determined by this method, may be irritating or corrosive to tissues (*e.g.*, heptane) or may be toxic (*e.g.*, benzene, methyl alcohol). Nearly all are fire hazards. Compounds in emissions should be determined through familiarity with the source. Appropriate precautions can be found in reference documents, such as reference No. 4 in Section 16.0.

6.0 Equipment and Supplies.

A VOC monitoring instrument meeting the following specifications is required:

6.1 The VOC instrument detector shall respond to the compounds being processed. Detector types that may meet this requirement include, but are not limited to, catalytic oxidation, flame ionization, infrared absorption, and photoionization.

6.2 The instrument shall be capable of measuring the leak definition concentration specified in the regulation.

6.3 The scale of the instrument meter shall be readable to ±2.5 percent of the specified leak definition concentration.

6.4 The instrument shall be equipped with an electrically driven pump to ensure that a sample is provided to the detector at a constant flow rate. The nominal sample flow rate, as measured at the sample probe tip, shall be 0.10 to 3.0 l/min (0.004 to 0.1 ft3/min) when the probe is fitted with a glass wool plug or filter that may be used to prevent plugging of the instrument.

6.5 The instrument shall be equipped with a probe or probe extension for sampling not to exceed 6.4 mm (1/4 in) in outside diameter, with a single end opening for admission of sample.

6.6 The instrument shall be intrinsically safe for operation in explosive atmospheres as defined by the National Electrical Code by the National Fire Prevention Association or other applicable regulatory code for operation in any explosive atmospheres that may be encountered in its use. The instrument shall, at a minimum, be intrinsically safe for Class 1, Division 1 conditions, and/or Class 2, Division 1 conditions, as appropriate, as defined by the example code. The instrument shall not be operated with any safety device, such as an exhaust flame arrestor, removed.

7.0 Reagents and Standards.

7.1 Two gas mixtures are required for instrument calibration and performance evaluation:

7.1.1 Zero Gas. Air, less than 10 parts per million by volume (ppmv) VOC.
7.1.2 Calibration Gas. For each organic species that is to be measured during individual source surveys, obtain or prepare a known standard in air at a concentration approximately equal to the applicable leak definition specified in the regulation.

7.2 Cylinder Gases. If cylinder calibration gas mixtures are used, they must be analyzed and certified by the manufacturer to be within 2 percent accuracy, and a shelf life must be specified. Cylinder standards must be either reanalyzed or replaced at the end of the specified shelf life.

7.3 Prepared Gases. Calibration gases may be prepared by the user according to any accepted gaseous preparation procedure that will yield a mixture accurate to within 2 percent. Prepared standards must be replaced each day of use unless it is demonstrated that degradation does not occur during storage.

7.4 Mixtures with non-Reference Compound Gases. Calibrations may be performed using a compound other than the reference compound. In this case, a conversion factor must be determined for the alternative compound such that the resulting meter readings during source surveys can be converted to reference compound results.

8.0 Sample Collection, Preservation, Storage, and Transport.

8.1 Instrument Performance Evaluation. Assemble and start up the instrument according to the manufacturer's instructions for recommended warm-up period and preliminary adjustments.

8.1.1 Response Factor. A response factor must be determined for each compound that is to be measured, either by testing or from reference sources. The response factor tests are required before placing the analyzer into service, but do not have to be repeated at subsequent intervals.

8.1.1.1 Calibrate the instrument with the reference compound as specified in the applicable regulation. Introduce the calibration gas mixture to the analyzer and record the observed meter reading. Introduce zero gas until a stable reading is obtained. Make a total of three measurements by alternating between the calibration gas and zero gas. Calculate the response factor for each repetition and the average response factor.

8.1.1.2 The instrument response factors for each of the individual VOC to be measured shall be less than 10 unless otherwise specified in the applicable regulation. When no instrument is available that meets this specification when calibrated with the reference VOC specified in the applicable regulation, the available instrument may be calibrated with one of the VOC to be measured, or any other VOC, so long as the instrument then has a response factor of less than 10 for each of the individual VOC to be measured.

8.1.1.3 Alternatively, if response factors have been published for the compounds of interest for the instrument or detector type, the response factor determination is not required, and existing results may be referenced. Examples of published response factors for flame ionization and catalytic oxidation detectors are included in References 1-3 of Section 17.0.

8.1.2 Calibration Precision. The calibration precision test must be completed prior to placing the analyzer into service and at subsequent 3-month intervals or at the next use, whichever is later.

8.1.2.1 Make a total of three measurements by alternately using zero gas and the specified calibration gas. Record the meter readings. Calculate the average algebraic difference between the meter readings and the known value. Divide this average difference by the known calibration value and multiply by 100 to express the resulting calibration precision as a percentage.

8.1.2.2 The calibration precision shall be equal to or less than 10 percent of the calibration gas value.

8.1.3 Response Time. The response time test is required before placing the instrument into service. If a modification to the sample pumping system or flow configuration is made that would change the response time, a new test is required before further use.

8.1.3.1 Introduce zero gas into the instrument sample probe. When the meter reading has stabilized, switch quickly to the specified calibration gas. After switching, measure the time required to attain 90 percent of the final stable reading. Perform this test sequence three times and record the results. Calculate the average response time.

8.1.3.2 The instrument response time shall be equal to or less than 30 seconds. The instrument pump, dilution probe (if any), sample probe, and probe filter that will be used during testing shall all be in place during the response time determination.

8.2 Instrument Calibration. Calibrate the VOC monitoring instrument according to Section 10.0.

8.3 Individual Source Surveys.

8.3.1 Type I - Leak Definition Based on Concentration. Place the probe inlet at the surface of the component interface where leakage could occur. Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for approximately two times the instrument response time. If the maximum observed meter reading is greater than the leak definition in the applicable regulation, record and report the results as specified in the regulation reporting requirements. Examples of the application of this general technique to specific equipment types are:

8.3.1.1 Valves. The most common source of leaks from valves is the seal between the stem and housing. Place the probe at the interface where the stem exits the packing gland and sample the stem circumference. Also, place the probe at the interface of the packing gland take-up flange seat and sample the periphery. In addition, survey valve housings of multipart assembly at the surface of all interfaces where a leak could occur.

8.3.1.2 Flanges and Other Connections. For welded flanges, place the probe at the outer edge of the flange- gasket interface and sample the circumference of the flange. Sample other types of nonpermanent joints (such as threaded connections) with a similar traverse.

8.3.1.3 Pumps and Compressors. Conduct a circumferential traverse at the outer surface of the pump or compressor shaft and seal interface. If the source is a rotating shaft, position the probe inlet within 1 cm of the shaft-seal interface for the survey. If the housing configuration prevents a complete traverse of the shaft periphery, sample all accessible portions. Sample all other joints on the pump or compressor housing where leakage could occur.

8.3.1.4 Pressure Relief Devices. The configuration of most pressure relief devices prevents sampling at the sealing seat interface. For those devices equipped with an enclosed extension, or horn, place the probe inlet at approximately the center of the exhaust area to the atmosphere.

8.3.1.5 Process Drains. For open drains, place the probe inlet at approximately the center of the area open to the atmosphere. For covered drains, place the probe at the surface of the cover interface and conduct a peripheral traverse.

8.3.1.6 Open-ended Lines or Valves. Place the probe inlet at approximately the center of the opening to the atmosphere.

8.3.1.7 Seal System Degassing Vents and Accumulator Vents. Place the probe inlet at approximately the center of the opening to the atmosphere.

8.3.1.8 Access door seals. Place the probe inlet at the surface of the door seal interface and conduct a peripheral traverse.

8.3.2 Type II - "No Detectable Emission". Determine the local ambient VOC concentration around the source by moving the probe randomly upwind and downwind at a distance of one to two meters from the source. If an interference exists with this determination due to a nearby emission or leak, the local ambient concentration may be determined at distances closer to the source, but in no case shall the distance be less than 25 centimeters. Then move the probe inlet to the surface of the source and determine the concentration as outlined in Section 8.3.1. The difference between these concentrations determines whether there are no detectable emissions. Record and report the results as specified by the regulation. For those cases where the regulation requires a specific device installation, or that specified vents be ducted or piped to a control device, the existence of these conditions shall be visually confirmed. When the regulation also requires that no detectable emissions exist, visual observations and sampling surveys are required. Examples of this technique are:

8.3.2.1 Pump or Compressor Seals. If applicable, determine the type of shaft seal. Perform a survey of the local area ambient VOC concentration and determine if detectable emissions exist as described in Section 8.3.2.

8.3.2.2 Seal System Degassing Vents, Accumulator Vessel Vents, Pressure Relief Devices. If applicable, observe whether or not the applicable ducting or piping exists. Also, determine if any sources exist in the ducting or piping where emissions could occur upstream of the control device. If the required ducting or piping exists and there are no sources where the emissions could be vented to the atmosphere upstream of the control device, then it is presumed that no detectable emissions are present. If there are sources in the ducting or piping where emissions could be vented or sources where leaks could occur, the sampling surveys described in Section 8.3.2 shall be used to determine if detectable emissions exist.

8.3.3 Alternative Screening Procedure.

8.3.3.1 A screening procedure based on the formation of bubbles in a soap solution that is sprayed on a potential leak source may be used for those sources that do not have continuously moving parts, that do not have surface temperatures greater than the boiling point or less than the freezing point of the soap solution, that do not have open areas to the atmosphere that the soap solution cannot bridge, or that do not exhibit evidence of liquid leakage. Sources that have these conditions present must be surveyed using the instrument technique of Section 8.3.1 or 8.3.2.

8.3.3.2 Spray a soap solution over all potential leak sources. The soap solution may be a commercially available leak detection solution or may be prepared using concentrated detergent and water. A pressure sprayer or squeeze bottle may be used to dispense the solution. Observe the potential leak sites to determine if any bubbles are formed. If no bubbles are observed, the source is presumed to have no detectable emissions or leaks as applicable. If any bubbles are observed, the instrument techniques of Section 8.3.1 or 8.3.2 shall be used to determine if a leak exists, or if the source has detectable emissions, as applicable.

9.0 Quality Control. Section Quality Control Measure Effect 8.1.2
Instrument calibration precision check Ensure precision and accuracy, respectively, of instrument response to standard 10.0 Instrument calibration

10.0 Calibration and Standardization.

10.1 Calibrate the VOC monitoring instrument as follows. After the appropriate warm-up period and zero internal calibration procedure, introduce the calibration gas into the instrument sample probe. Adjust the instrument meter readout to correspond to the calibration gas value. **NOTE**: If the meter readout cannot be adjusted to the proper value, a malfunction of the analyzer is indicated and corrective actions are necessary before use.

11.0 Analytical Procedures. [Reserved]

12.0 Data Analyses and Calculations. [Reserved]

13.0 Method Performance. [Reserved]

14.0 Pollution Prevention. [Reserved]

15.0 Waste Management. [Reserved]

16.0 References.

1. Dubose, D.A., and G.E. Harris. Response Factors of VOC Analyzers at a Meter Reading of 10,000 ppmv for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2-81051. September 1981.

2. Brown, G.E., *et al*. Response Factors of VOC Analyzers Calibrated with Methane for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2-81-022. May 1981.

3. DuBose, D.A. *et al*. Response of Portable VOC Analyzers to Chemical Mixtures. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2-81-110. September 1981.

4. Handbook of Hazardous Materials: Fire, Safety, Health. Alliance of American Insurers. Schaumberg, IL. 1983.

17.0 Tables, Diagrams, Flowcharts, and Validation Data.
[Reserved]

For Further Information contact
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