RKI INSTRUMENTS

SDM-E2 Docking Station Standalone Configuration Operator's Manual

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Warranty

RKI Instruments, Inc. warrants gas alarm equipment sold by us to be free from defects in materials and workmanship, and performance for a period of one year from date of shipment from RKI Instruments, Inc. Any parts found defective within that period will be repaired or replaced, at our option, free of charge. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired, or replaced on a routine basis. Examples of such items are:

Absorbent cartridges	Batteries
Pump diaphragms and valves	Filter elements
Fuses	

Warranty is voided by abuse including mechanical damage, alteration, rough handling, or repairs procedures not in accordance with the instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs, or contingent expenses incurred without our prior approval.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF RKI INSTRUMENTS, INC. INCLUDING BUT NOT LIMITED TO THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL RKI INSTRUMENTS, INC. BE LIABLE FOR INDIRECT, INCIDENTAL, OR CONSEQUENTIAL LOSS OR DAMAGE OF ANY KIND CONNECTED WITH THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCTS TO FUNCTION OR OPERATE PROPERLY.

This warranty covers instruments and parts sold to users only by authorized distributors, dealers, and representatives as appointed by RKI Instruments, Inc.

We do not assume indemnification for any accident or damage caused by the operation of this gas monitor and our warranty is limited to replacement of parts or our complete goods.

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CAUTION:	*Read and understand this manual before using the SDM-E2. Also read and understand the EAGLE 2 Operator's Manual.*

Chapter 1: Introduction

Overview

This chapter briefly describes the SDM-E2 Docking Station and the Single Module Data Viewer Program. This chapter also describes the *SDM-E2 Docking Station Standalone Operation Operator's Manual* (this document). Table 1 at the end of this chapter lists the SDM-E2's specifications.

About the SDM-E2

The SDM-E2 Docking Station is an advanced, reliable system that provides charging, calibration, bump testing, and calibration and bump test records for the EAGLE 2 portable gas monitor. It is designed to save the calibration and bump test records to a USB flash drive (standalone functionality) or to be connected directly to a computer (PC controlled functionality). If calibration and bump test records are stored to a USB flash drive while operating in the standalone configuration, the Single Module Data Viewer Program can then be used with a Windows-based personal computer to retrieve calibration and bump test data files from the USB flash drive or from the computer's hard drive if the files have been transferred to the hard drive from the flash drive. If you are using the PC Controller Program while operating in the PC controlled configuration, you may retrieve instrument data, bump test, and calibrate up to 10 instruments at once. Instrument information and data for each instrument can be viewed directly using the PC Controller Program and can be printed from the PC Controller Program. For instructions to use the SDM-E2 with the PC Controller Program, see the *SDM-E2 Docking Station PC Controller Configuration Operator's Manual*.

The purpose of this manual is to explain how to set up and use the SDM-E2 in Standalone configuration. It also explains how to use the Single Module Data Viewer Program. You will learn how to:

- install and launch the Single Module Data Viewer
- prepare the SDM-E2 for use
- perform a bump test
- perform a calibration
- save calibration and bump test records to a USB flash drive
- view, print, and export calibration and bump test records
- use the SDM-E2 to charge an EAGLE 2

CAUTION:	*The EAGLE 2 detects oxygen deficiency and elevated levels of oxygen, combustible gases, carbon monoxide, and hydrogen sulfide, all of which can be dangerous or life threatening. When using the EAGLE 2, you must follow the instructions and warnings in the EAGLE 2 Operator's Manual to assure proper and safe operation of the unit and to minimize the risk of personal injury.*

CAUTION:	*The operator of this instrument is advised that if the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.*

System Requirements

To use the Single Module Data Viewer Software, your personal computer must meet the following requirements:

- **Operating Systems:** Windows$^®$ XP, Windows$^®$ Vista, Windows$^®$ 7, Windows$^®$ 8, or Windows$^®$ 10.

- **Processor:** IBM$^®$ compatible PC running Pentium$^®$ 2 processor or equivalent minimum

- **Memory:** 32 MB RAM minimum

- **Hard Disk Space:** 32 MB minimum

- **Available USB port**

Specifications

Table 1: SDM-E2 Specifications

Input Power	12 VDC NOTE: AC Adapter with 100 - 240 VAC, 50/60 Hz, 0.6A input and 12 VDC, 1.2A output provided as standard.
Environmental Conditions	• For Indoor Use Only • -10° C to 40° C, below 80% Relative Humidity, Non-Condensing
Applicable Instrument	EAGLE 2
Memory Capacity	64 KB
Maximum Record Size	256 bytes
Maximum Number of Records Saved	200
Number of Calibration Gas Cylinders	Up to two calibration gas cylinders per bump test or calibration at a time *NOTE:* If your EAGLE 2 contains more than one non-standard gas, more than two gas cylinders may be needed to complete a bump test or calibration.
Standard Accessories	• AC Adapter • USB Flash Drive • Single Module Data Viewer Software* • SDM-E2 Docking Station PC Controller Software* • Inlet Air Filter • Instruction Manual • 10 Foot Long Exhaust Tube • Two 3 Foot Long Tubes for GAS 1 and GAS 2 Fittings • 3 T-Fittings for PC Controlled Configuration • Check Valve for PC Controlled Configuration • USB Cable, Type A to Type B
* *Not sent with SDM-E2. Download from www.rkiinstruments.com/sdme2.*	

About this Manual

The *SDM-E2 Docking Station Standalone Configuration Operator's Manual* uses the following conventions for notes, cautions, and warnings.

NOTE:	Describes additional or critical information.

CAUTION:	*Describes potential damage to equipment.*

WARNING:	*Describes potential danger that can result in injury or death.*

Cautions & Safety Information

- Use only polyurethane sample tubing with the SDM-E2. Consult RKI Instruments, Inc. for other materials.
- Do not subject the SDM-E2 to infrared or intense light. This may cause communication errors.
- Do not expose the SDM-E2 to water.
- Do not subject the SDM-E2 to any hard impact.

Chapter 2: Description

Overview

This section describes the SDM-E2 docking station. It is designed to be used on a table top and consists of the AC adaptor, Type A to Type B USB cable, air filter, check valve, sample tubing, instrument panel, back panel, control panel, status LEDs, and 2 USB ports.

AC Adapter

Single-Port AC Adapter

The single-port AC adapter is a wall plug style adapter with a 5 foot cable. The end of the cable has a plug that connects to the power jack on the SDM-E2's back panel. The AC adapter is rated 100 - 240 VAC input, 12 VDC 1.2 A output.

To Power Jack
on SDM-E2
Back Panel

Figure 1: Single-Port AC Adapter

3-Port AC Adapter

The 3-port AC adapter is a wall plug style adapter with three 5-foot cables. The end of each cable has a plug that connects to the power jack on the SDM-E2's back panel. The AC adapter is rated 100 - 240 VAC input, 12 VDC 2.0 A output.
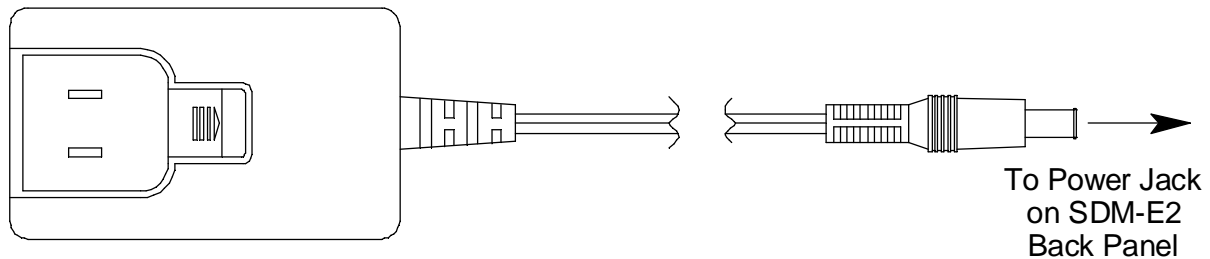
To Power Jack
on SDM-E2
Back Panels
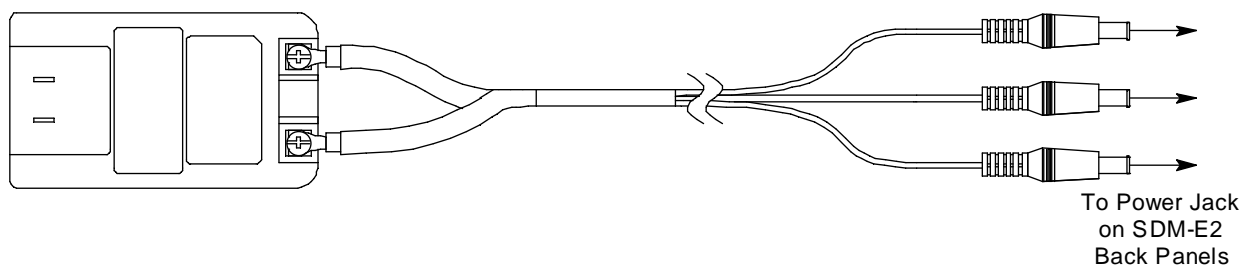
Figure 2: 3-Port AC Adapter

USB Cable

A Type A to Type B USB cable is provided with the docking station. It is only for use with the PC Controlled configuration. It is not used in the Standalone configuration.
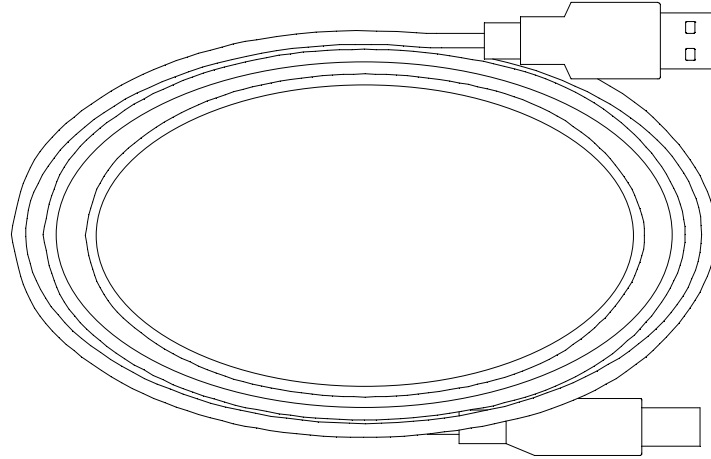
Figure 3: USB Cable

Air Filter, Sample Tubing, and Check Valve

A cylindrical particle filter with a short length of tubing is supplied with the SDM-E2 for installation to the AIR fitting on the back panel. The filter keeps particulate contamination out of the docking station.

Two types of sample tubes are included with the docking station. Two 3 foot lengths of 3/16 inch ID polyurethane tubing are provided to connect the regulator on a calibration cylinder to the GAS 1 and GAS 2 fittings on the back panel. In addition, a 10 foot length of 3/16 inch ID polyurethane tubing is provided for connection to the exhaust fitting on the back panel to allow routing of the exhaust to a location such as an open window where the exhaust can disperse.

Calibration Gas Sample Tubing, 3 feet,
Two Tubes Included

Exhaust Tubing, 10 feet

Particle Filter for Air Inlet
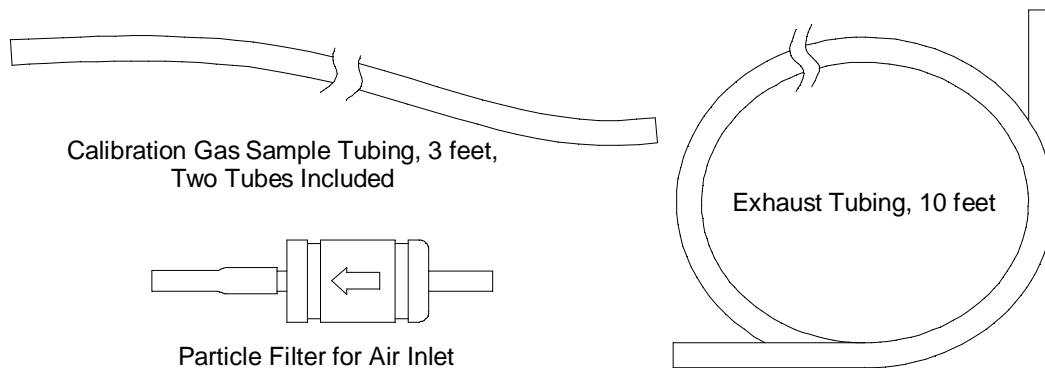
Figure 4: Air Filter & Sample Tubing

WARNING: *Do not use an exhaust tube that is longer than 30 feet. The increased flow restriction caused by a longer tube may affect gas response and cause inaccurate calibration and bump test results.*

A check valve is included with the SDM-E2 but is not needed for the Standalone configuration. It is used for the PC Controlled configuration.
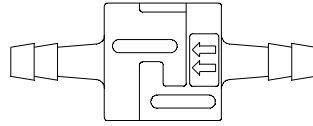
Figure 5: Check Valve

Instrument Panel

The instrument panel is located on the top of the SDM-E2 and includes the instrument cradle, the exhaust bellow, the IR port, the charging cord, and a recess for the fitting at the end of the gas out to EAGLE 2 line. The instrument cradle is a recessed area on the top of the SDM-E2 that is designed to accept the EAGLE 2. Insert the EAGLE 2 in the instrument cradle before you perform a bump test, calibrate, or charge an EAGLE 2. The exhaust bellow is at the back of the instrument panel and must line up with the exhaust port on the EAGLE 2 when it is in the cradle. The instrument panel also has a protective metal loop to protect the exhaust bellow and to prevent the EAGLE 2 from being accidentally dislodged from the cradle. Follow the instructions in this manual and at the center of the instrument cradle for installing the EAGLE 2 in the cradle to avoid damaging the exhaust bellow. An infrared (IR) port at the rear of the panel lines up with the EAGLE 2's IR port when it is inserted in the cradle and is used to communicate with the EAGLE 2. The charging cord and the fitting at the end of the gas out to EAGLE 2 line are stored in the instrument panel.
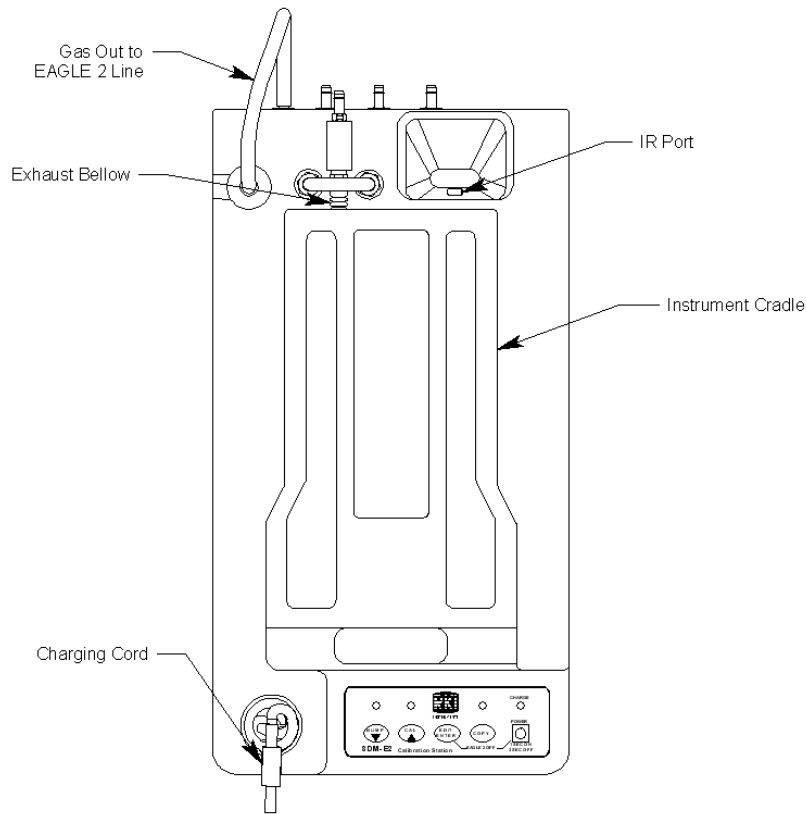
Figure 6: Instrument Panel

Back Panel

The back panel includes the power jack, sample fittings, gas out to EAGLE 2 fitting, and a USB PC connector.

Top View   Rear View
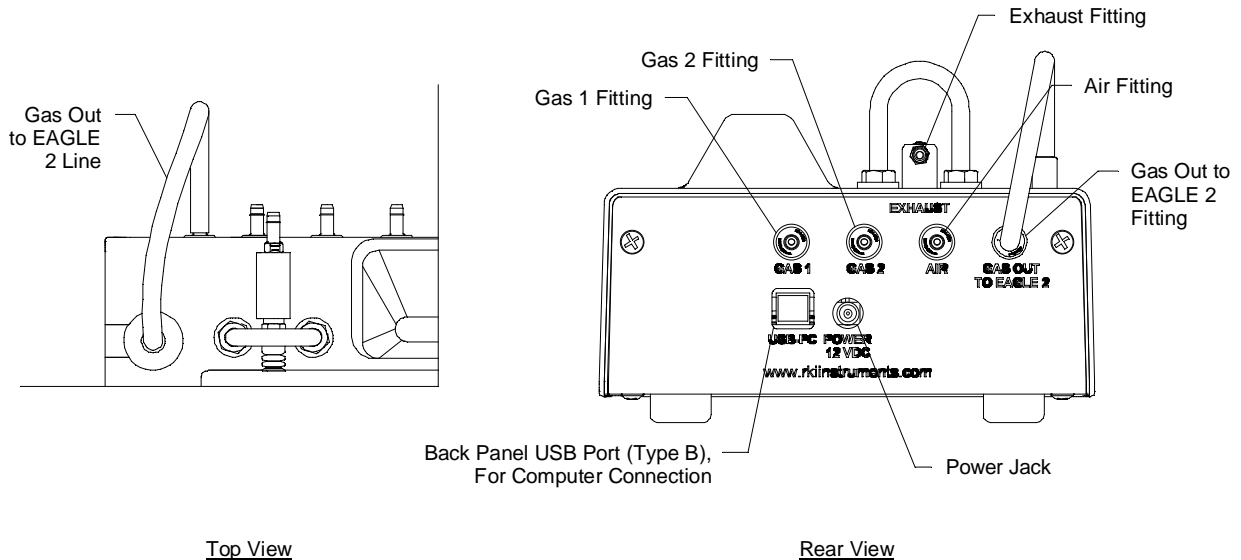
Figure 7: Fittings and Connections

Power Jack

The power jack is located in the center of the back panel. The plug on the end of the AC adapter cable mates to it.

Sample Fittings

Five sample fittings are located on the back of the SDM-E2. The gas out to EAGLE 2 fitting is in the upper right corner and has factory installed tubing connected to it. The gas out to EAGLE 2 fitting directs sample gas to the EAGLE 2 through the gas out to EAGLE 2 line. The gas out to EAGLE 2 line is stored in the top panel as shown in Figure 7 above. The AIR fitting is to the left of the gas out to EAGLE 2 fitting and draws air into the SDM-E2. The two GAS fittings are next to the AIR fitting and are used to connect the SDM-E2 to calibration gas cylinders. All three fittings accept 3/16 inch ID tubing.

An exhaust fitting is located above the back panel at the back of the exhaust bellow. It allows routing of the exhausted calibration gas to a convenient location. This fitting accepts 3/16 inch ID tubing. Even though the exhaust gas can be routed to an area to be safely dispersed, the docking station should still be installed in a well ventilated area.

PC Connection

A type B USB connection is located just to the left of the power jack on the SDM-E2's back panel. It is only used for the PC Controlled configuration and is not used in the Standalone configuration.

Control Panel

The control panel is used to setup and operate the docking station in the Standalone configuration. It is located at the front of the docking station. It includes the control buttons, the control button LEDs, and the CHARGE status LED.
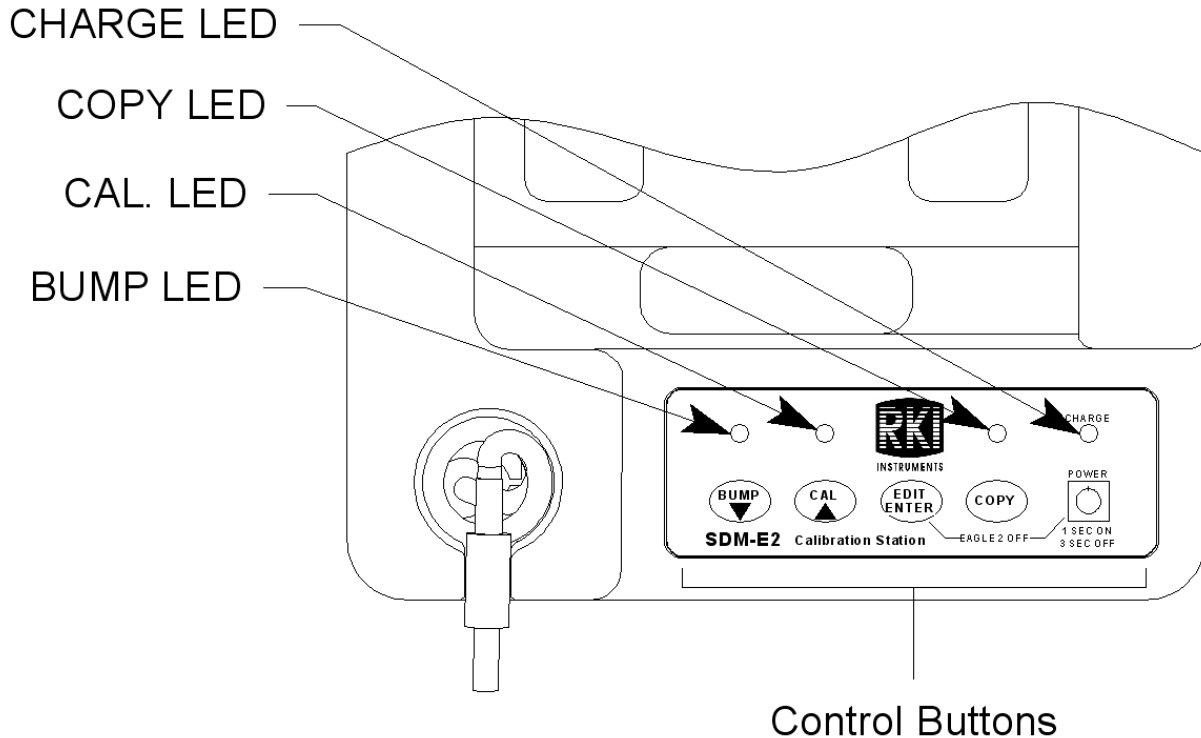
Figure 8: Control Panel

Five control buttons are located on the control panel. From left to right they are BUMP ▼ , CAL ▲ , EDIT ENTER, COPY, and POWER. The BUMP ▼ , CAL ▲ , and COPY control buttons each have an LED above them that indicates the status of the function controlled by that button. The CHARGE LED is located above the POWER button and functions as a pilot LED, a system failure LED, and a charge indication LED.

Table 2: Control Button Functions

Control Button	Control Button Function(s)	Control Button LED Function(s)
BUMP ▼	• Initiates a bump test • Cancels a bump test • Moves down a list of parameters • Decreases an adjustable parameter	Indicates status of a bump test in progress

Table 2: Control Button Functions

Control Button	Control Button Function(s)	Control Button LED Function(s)
CAL ▲	• Initiates a calibration • Cancels a calibration • Clears data from docking station memory (when used with COPY button) • Moves up a list of parameters • Increases an adjustable parameter	Indicates status of a calibration in progress
EDIT ENTER	• Puts docking station into various edit modes • Makes a displayed parameter editable • Escapes or cancels an operation • Turns off connected EAGLE 2 (when used with POWER button)	n/a
COPY	• Copies data to a USB flash drive. • Clears data from docking station memory (when used with CAL ▲ button)	• Indicates amount of docking station memory used • Indicates status of copying function • Indicates the result of a copy operation
POWER	• Turns on the docking station • Turns off the docking station • Turns off connected EAGLE 2 (when used with EDIT ENTER button)	n/a

Front Panel

A type A USB port is located on the front of the docking station. This port can be used to save calibration and bump test data to a USB flash drive. This USB port is for use only in the Standalone configuration of the SDM-E2.
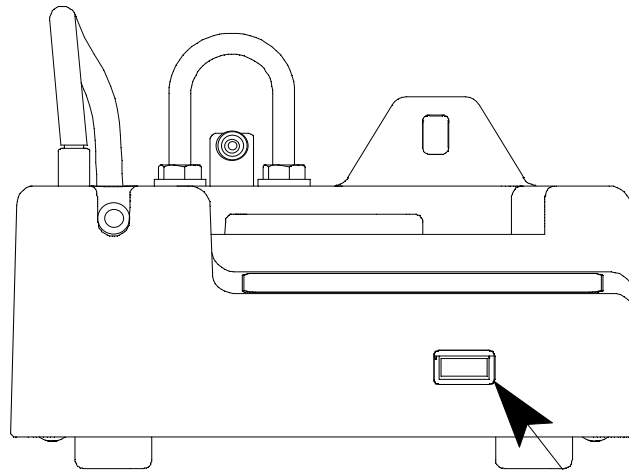
Front Panel USB Port (Type A),
For Flash Drive

Figure 9: Front Panel

NOTE: The SDM-E2 does not support connection of a computer to the front USB port, only a USB flash drive.

Chapter 3: Preparing to Use the SDM-E2

Overview

There are four tasks that must be completed before you can begin to use the SDM-E2: hardware assembly, setting or confirming the bump test and calibration parameters, connecting calibration gas, and installing the Single Module Data Viewer Software on your computer. This chapter describes how to assemble the parts that are shipped with the SDM-E2 and set or view the bump test and calibration parameters. It also describes how to install the Single Module Data Viewer Software on a Windows based personal computer.

Hardware Assembly

The hardware assembly consists of connecting the AC adapter, installing the air filter, and connecting the sample tubing. Perform the following to complete the hardware assembly:

1. Place the SDM-E2 on a convenient table top near an AC wall socket in a well ventilated area. A location near a window that can be opened is best so that the exhaust can be routed to the window.

2. Connect the AC adapter's wall plug into a wall AC socket.

3. Insert the round plug on the end of the AC adapter's cable into the power jack on the back of the SDM-E2.

NOTE:	If you have multiple SDM-E2s and are using a 3-port AC adapter, plug each of the round plugs on the end of the AC adapter into the power jack on the back of 3 separate SDM-E2s.

4. Install the air filter so that the arrow on the filter that indicates direction of flow is pointing towards the AIR fitting. Push the open end of the flexible tube that is on one end of the filter onto the AIR fitting on the back of the SDM-E2.

NOTE:	If you have an EAGLE 2 with an IR CO_2 sensor in the 0-10,000 ppm or 0-5.00 %vol range, be sure to replace the air filter at the AIR inlet fitting with the CO_2 scrubber when testing an instrument with a CO_2 sensor installed to ensure that the CO_2 present in fresh air is scrubbed out. Remove the black end caps from each end of the scrubber before installing onto the AIR inlet fitting. Replace the caps when the scrubber is not in use. See the "Spare Parts List" on page 81 for a scrubber with a tubing stub.

5. Install the 10 foot long 3/16 inch ID flexible tube that is included with the SDM-E2 on the exhaust fitting. Route the tube to an area where the exhaust can be

safely dispersed, such as an open window.

CAUTION: *The maximum recommended length for the exhaust tube is 30 feet. Do not use more than 30 feet of tubing or tubing with an ID of less than 3/16 inch for the exhaust tube or the bump test and calibration accuracy may be adversely affected. The tube that is shipped with the SDM-E2 has an ID of 3/16 inch and is 10 feet long.*

---

6. Install the 3 foot long 3/16 inch ID tubes that are included with the SDM-E2 on the GAS 1 and GAS 2 fittings.

Setting the Operational Parameters in Edit Mode

Once the hardware has been assembled, use Edit Mode to confirm or adjust bump test, calibration, and gas inlet parameters before using the SDM-E2.

The bump test parameters define how long fresh air and calibration gas are applied to an instrument during a bump test. They also define the tolerance used in determining whether an instrument fails or passes a bump test and whether or not a calibration automatically takes place if a bump test fails. The calibration parameters define how long fresh air and calibration gas are applied to an instrument during a calibration. The gas inlet parameters define what gas inlet fittings (GAS 1, GAS 2, or both) will be used during bump tests and calibrations.

The bump test and calibration parameters are saved in the SDM-E2's memory. If a parameter is changed with one particular EAGLE 2 installed in the SDM-E2, the change will be in effect for the bump test or calibration of any subsequent EAGLE 2 until the parameter is changed again.

Bump Test & Calibration Parameters

There are four bump test parameters and two calibration parameters. The two calibration parameters, air sample time and calibration gas sample time, are also bump test parameters. The parameters are described below. Table 3 below shows the factory settings for the bump test and calibration parameters. If you wish to use the factory settings, then you do not need to make any parameter adjustments. If you wish to confirm or change the parameter settings, follow the instructions below in "Setting the Bump Test Parameters" on page 18 or "Setting the Calibration Parameters" on page 20.

Table 3: Bump Test & Calibration Parameter

Parameter	Display Tag	Available Choices	Bump Factory Setting	Cal Factory Setting
Air Sample Time	AIR TIME	• 30 seconds • 45 seconds • 60 seconds	30 seconds	30 seconds

Table 3: Bump Test & Calibration Parameter

Parameter	Display Tag	Available Choices	Bump Factory Setting	Cal Factory Setting
Calibration Gas Sample Time	GAS TIME	• AUTO • 30 seconds • 45 seconds • 60 seconds • 90 seconds • 120 seconds	30 seconds	AUTO
Bump Test Check Tolerance	CHECK	• ± 10% • ± 20% • ± 30% • ± 40% • ± 50% • F ± 10% • F ± 20% • F ± 30% • F ± 40% • F ± 50%	F ± 50%	n/a
Automatic Calibration	AUTO CAL	• On • Off	On	n/a

Air Sample Time (AIR TIME)

The air sample time can be set separately for bump testing and calibration. It is the length of time that the SDM-E2 will draw air through the AIR fitting on the back of the docking station. Air is drawn during a bump test or calibration before an air adjust operation and to purge calibration gas from the system after calibration gas has been drawn through the GAS 1 or GAS 2 fittings on the back of the docking station.

Calibration Gas Sample Time (GAS TIME)

The calibration gas sample time can be set separately for bump testing and calibration. It is the length of time that the SDM-E2 will draw calibration gas through the GAS 1 or GAS 2 fittings on the back of the docking station during a bump test. If the GAS TIME is set to AUTO, the SDM-E2 applies calibration gas for the appropriate amount of time based on the sensors installed in the EAGLE 2.

Bump Test Check Tolerance (CHECK)

The bump test check tolerance only applies to bump testing. It determines how close the EAGLE 2 gas reading must be to the calibration gas concentration for each channel during a bump test in order to pass the bump test. It is defined as a percentage of the calibration gas concentration.The amount that the EAGLE 2 gas reading differs from the calibration gas concentration must be equal to or less than this percentage of the calibration gas concentration. For example, if the tolerance is set to ±50%, and the %LEL calibration gas concentration is 50% LEL, then the bump test gas reading for the LEL channel on the EAGLE 2 must be 50 %LEL ± 25 %LEL.

The F±10%, F±20%, F±30%, etc. options represent a fast bump tolerance. If one of these "F" type tolerances is selected and the gas reading for the sensor(s) being tested is above the lower tolerance and below the upper tolerance within 10 seconds, the sensor(s) pass bump testing, the gas application will be stopped, and the test will move on to the next sensor(s) or to the fresh air purge. If the gas reading on any of the tested channels is below the lower tolerance or above the upper tolerance within 10 seconds, the gas application will continue for the time period defined by the GAS TIME bump test parameter, and the pass/fail status of the sensor(s) will be determined at that point. Using an "F" type tolerance allows calibration gas to be saved when the sensor respond quickly and accurately.

Consider the following scenario as an example.

- 50% LEL methane used for bump testing the combustible gas channel

- GAS TIME bump test parameter set to 20 seconds

- Tolerance set to F±50%, which means that the acceptable reading range is 25% LEL - 75% LEL

The table below shows possible readings at 10 seconds and the effect on the gas application.

Table 4: Example Fast Bump Scenarios

Gas Reading 10 Seconds Into Fast Bump	Outcome
15% LEL (-70% of 50% LEL)	• Gas application continues for the full 20 seconds • Pass/fail determined at end of 20 seconds
30% LEL (-40% of 50% LEL)	• Gas application stops • Sensor passes bump testing
60% LEL (+20% of 50% LEL)	• Gas application stops • Sensor passes bump testing
80% LEL (+60% of 50% LEL)	• Gas application continues for the full 20 seconds • Pass/fail determined at end of 20 seconds

Automatic Calibration (AUTO CAL)

Automatic calibration only applies to bump testing. It can be set to on or off. If it is set to on, then the docking station will automatically perform a calibration if a bump test fails.

Turning on the SDM-E2 with an EAGLE 2

Do the following to turn on the SDM-E2 and establish a connection with an EAGLE 2:

1. Confirm that the AC Adapter is connected to the SDM-E2 and to an AC wall socket.

2. Press and hold the SDM-E2's POWER button. The LEDs will turn amber.

3. When the BUMP ▼ and CAL ▲ LEDs turn off, release the POWER button.

4. The COPY LED will be steadily on or off and the CHARGE LED will be blinking green if the SDM-E2 is operating properly or solid red if there is a system failure. The amount of free memory in the SDM-E2 will dictate the condition of the COPY LED (see "Available Memory in the SDM-E2" on page 69).

5. Install an EAGLE 2 in the instrument cradle. Set the EAGLE 2 onto the top of the SDM-E2 and slide the instrument forward until it falls into place as illustrated.

WARNING: *Inserting the EAGLE 2 improperly may damage the exhaust bellow at the back of the SDM-E2.*
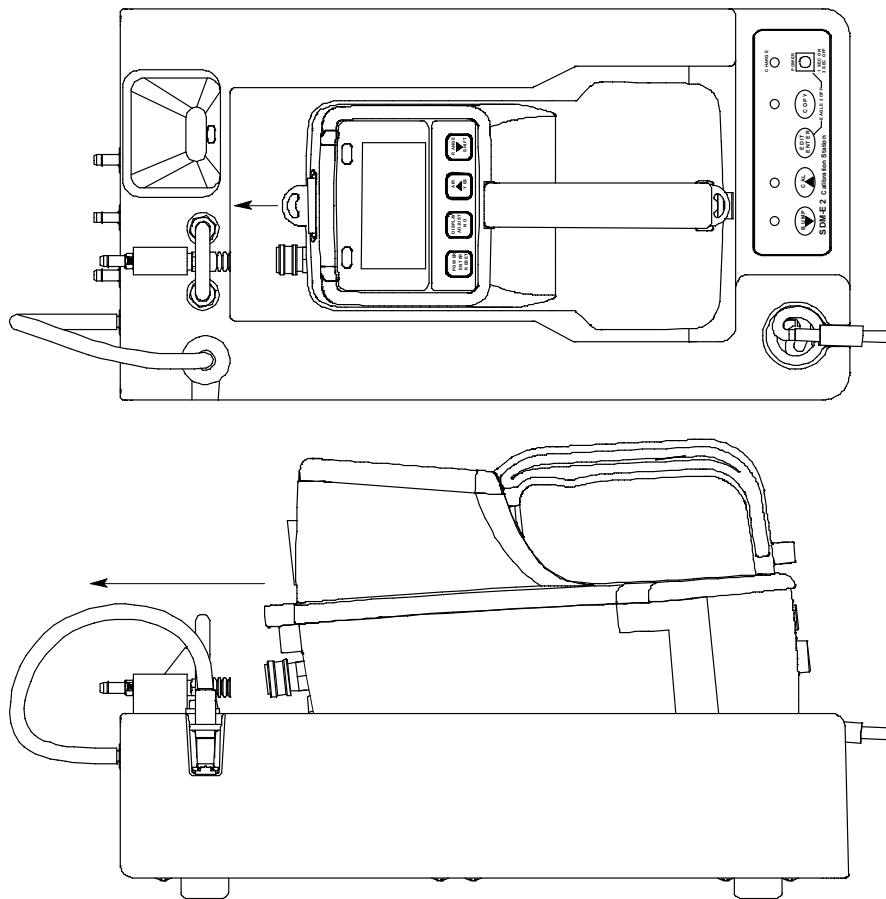
Figure 10: Inserting the EAGLE 2

6. If the EAGLE 2 is equipped with NiMH batteries and you wish to charge the batteries, connect the charging cable at the front of the SDM-E2 to the charging jack on the back of the instrument. The CHARGE LED will begin flashing amber. If the batteries are fully charged, the CHARGE LED will become solid green again after about 5 minutes. Typically a bump test or calibration will be initiated before this happens. See "Charging an Instrument in a Docking Station" on page 66 for a complete description of charging the EAGLE 2.

7. Press and hold the POWER ENTER RESET button on the EAGLE 2 until you hear a beep, then release it. The EAGLE 2 will begin its power up sequence. If a successful connection between the EAGLE 2 and the SDM-E2 occurs, the home screen will appear on the EAGLE 2 display at the end of the startup sequence.

```
CH4    50%LEL    GAS1
OXY   12.0vol%   GAS1
H2S   25.0ppm    GAS1
CO      50ppm    GAS1
---
---
```

NOTE: The screen shown above applies to a standard 4-channel EAGLE 2. If your EAGLE 2 has less than 4 channels, the inactive channels will not appear in the above screen or in any screens where channels are displayed. If your EAGLE 2 has a different gas combination, your gas names and auto calibration values will be different. All screens in this chapter assume a standard 4-channel EAGLE 2.

Setting the Bump Test Parameters

Do the following to set the bump test parameters after establishing a connection between an EAGLE 2 and the SDM-E2.

1. Turn on the SDM-E2 with an EAGLE 2 and establish a connection between them as described above in "Turning on the SDM-E2 with an EAGLE 2". The EAGLE 2 will display the home screen.

```
CH4    50%LEL    GAS1
OXY    12.0vol%   GAS1
H2S    25.0ppm    GAS1
CO      50ppm     GAS1
---
---
```

2. Press and hold the EDIT ENTER button for 2 seconds. The EAGLE 2 will display the Edit Mode screen.

```
        EDIT MODE
  BUMP  TEST    :    BUMP

  CALIBRATION  :  CAL

  GAS  INLET     :  EDIT
```

3. Press and release the BUMP ▼ button. The EAGLE 2 will display the following screen with the four bump test parameters and their settings.

```
 BUMP TEST PARAMETER
1.AIR  TIME:  30sec
2.GAS TIME:  AUTO
3.CHECK    :F+-50%
4.AUTO CAL:   OFF
```

4. If you wish to cancel setting the bump test parameters or were just viewing the parameters to confirm their values, press and release the BUMP ▼ button to return to the home screen.

    To continue and change parameters, press and release the EDIT ENTER button. A cursor will appear to the right of the first bump test parameter. For a description of the bump test parameters, see "Bump Test & Calibration Parameters" on page 13.

```
 BUMP TEST PARAMETER
1.AIR  TIME:  30sec        <
2.GAS TIME:  AUTO
3.CHECK     :F+-50%
4.AUTO CAL:   OFF
```

5. Use the BUMP ▼ and CAL ▲ buttons to move the cursor up and down until it is next to the desired parameter. If you move the cursor down past the last bump test parameter, the instrument will return to the home screen.

6. With the cursor next to the desired parameter, press and release the EDIT ENTER button. An asterisk (*) will appear on the EAGLE 2 display to the left of the cursor indicating that the parameter value can be changed. In the example below, the AIR TIME parameter has been selected for updating.

```
 BUMP TEST PARAMETER
1.AIR  TIME:  30sec        *<
2.GAS TIME:  AUTO
3.CHECK     :F+-50%
4.AUTO CAL:   OFF
```

7. Use the BUMP ▼ and CAL ▲ buttons to set the parameter to the desired value, then press and release the EDIT ENTER button. The asterisk next to the cursor will disappear.

8. Repeat step 5 - step 7 to set any other parameters.

9. When you are done setting the parameters, use the BUMP ▼ button to move the cursor down past AUTO CAL. The screen will indicate that the parameter changes have been saved and the EAGLE 2 will return to the home screen.

Setting the Calibration Parameters

Do the following to set the calibration parameters after establishing a connection between an EAGLE 2 and the SDM-E2.

1. Turn on the SDM-E2 with an EAGLE 2 and establish a connection between them as described above in "Turning on the SDM-E2 with an EAGLE 2". The EAGLE 2 will display the home screen.

```
CH4     50%LEL     GAS1
OXY    12.0vol%    GAS1
H2S    25.0ppm     GAS1
CO       50ppm     GAS1
---
---
```

2. Press and hold the EDIT ENTER button for 2 seconds. The EAGLE 2 will display the Edit Mode screen.

```
        EDIT MODE
 BUMP  TEST    :   BUMP

 CALIBRATION  :  CAL

 GAS  INLET     :  EDIT
```

3. Press and release the CAL ▲ button. The EAGLE 2 will display the following screen with the two calibration parameters and their settings.

```
   CAL    PARAMETER
1.AIR  TIME:  30sec
2.CAL TIME:  60 sec
```

4. If you wish to cancel setting the calibration parameters or were just viewing the parameters to confirm their values, press and release the CAL ▲ button to return to the home screen.

To continue, press and release the EDIT ENTER button. A cursor will appear to the right of the first calibration parameter. For a description of the calibration parameters, see "Bump Test & Calibration Parameters" on page 13.

```
      CAL    PARAMETER
1.AIR  TIME:  30sec        <
2.CAL TIME:  60 sec


```

5. Use the BUMP ▼ and CAL ▲ buttons to move the cursor up and down until it is next to the desired parameter. Do not move the cursor down past the CAL TIME selection unless you would like to return to the home screen.

6. With the cursor next to the desired parameter, press and release the EDIT ENTER button. An asterisk (*) will appear on the EAGLE 2 display to the left of the cursor indicating that the parameter value can be changed. In the example below, the AIR TIME parameter has been selected for updating.

```
      CAL    PARAMETER
1.AIR  TIME:  30sec       *<
2.CAL TIME:  60 sec


```

7. Use the BUMP ▼ and CAL ▲ buttons to set the parameter to the desired value, then press and release the EDIT ENTER button. The asterisk next to the cursor will disappear.

8. Repeat step 5 - step 7 to set any other parameters.

9. When you are done setting the parameters, use the BUMP ▼ button to move the cursor down past CAL TIME. The screen will indicate that the parameter changes have been saved and the EAGLE 2 will return to the home screen.

Setting the Gas Inlet Parameters

The gas inlet parameters define what gas ports are used during bump testing or calibration and lets you select the port for each channel in your instrument.

With the exception of the default settings outlined in "Appendix A: Bump Testing and Calibrating EAGLE 2s with IR Sensors" on page 84, all of the standard 4 sensors (catalytic LEL, O_2, H_2S, and CO) are assigned to GAS 1 and special sensors (PID, TC, IR, and ESM-01) are assigned to GAS 2. When you change a gas inlet assignment for a particular gas combination (for example, changing the gas inlet for a high range PID channel to GAS 1 so that a 5-gas cylinder can be utilized), the SDM-E2 will remember the gas inlet setting for other EAGLE 2s with the same gas combination. The SDM-E2 will remember the gas inlet setting for 10 EAGLE 2 gas combinations. When an 11th gas combination is connected, the 1st gas combination's gas inlet settings will be discarded.

Do the following to set the gas inlet parameters.

1. Turn on the SDM-E2 with an EAGLE 2 and establish a connection between them as described above in "Turning on the SDM-E2 with an EAGLE 2". The EAGLE 2 will display the home screen.

```
CH4    50%LEL    GAS1
OXY    12.0vol%  GAS1
H2S    25.0ppm   GAS1
CO      50ppm    GAS1
---
---
```

2. Press and hold the EDIT ENTER button for 2 seconds. The EAGLE 2 will display the Edit Mode screen.

```
        EDIT MODE
  BUMP  TEST    :   BUMP

  CALIBRATION  :   CAL

  GAS  INLET    :   EDIT
```

3. Press and release the EDIT ENTER button. The EAGLE 2 will display the following screen with the two gas inlet parameters and a cursor next to the first parameter. The USING setting will be visible.

```
GAS INLET PARAMETER
 1.USING   : GAS1&GAS2 <
 2.ASSIGN : . . .
```

4. To change the USING setting, move the cursor next to the USING parameter with the BUMP ▼ or CAL ▲ button if necessary and press and release the EDIT ENTER button. An asterisk will appear to the left of the cursor.

```
GAS INLET PARAMETER
 1.USING   : GAS1&GAS2*<
 2.ASSIGN : . . .
```

5. Use the BUMP ▼ and CAL ▲ buttons to scroll through the options: GAS1 ONLY, GAS1&GAS2, and GAS2 ONLY. If GAS1 ONLY is selected, when a bump test or calibration is performed, only those channels assigned to GAS 1 will be bump tested or calibrated. Similarly, if GAS2 ONLY is selected, when a bump test or calibration is performed, only those channels assigned to GAS 2 will be bump tested or calibrated. If GAS1&GAS2 is selected, all active channels will be bump tested or calibrated when one of these operations is performed.

6. Once you have made your selection, press and release the EDIT ENTER button. The asterisk will disappear.

7. To edit the gas assignments, move the cursor next to the ASSIGN parameter with the BUMP ▼ or CAL ▲ button if necessary and press and release EDIT ENTER. The gas assignment screen will be displayed.

```
CH4    50%LEL    GAS1   <
OXY    12.0vol%  GAS1
H2S    25.0ppm   GAS1
CO       50ppm   GAS1
---
---
```

NOTE: See the next section, "Connecting Calibration Gas", for guidelines to decide whether to assign a channel to GAS 1 or GAS 2.

---

8. Use the BUMP ▼ and CAL ▲ buttons to move the cursor next to the channel you wish to assign to a gas port and press and release EDIT ENTER. An asterisk will appear to the left of the cursor.

```
CH4    50%LEL    GAS1  *<
OXY    12.0vol%  GAS1
H2S    25.0ppm   GAS1
CO       50ppm   GAS1
---
---
```

9. Use the BUMP ▼ and CAL ▲ buttons to display the desired gas port.

10. Press and release the EDIT ENTER button. The asterisk will disappear.

11. Repeat step 8 through step 10 for any additional channels you wish to assign gas ports to.

12. When you are finished, use the BUMP ▼ button to move the cursor down past the last channel. You will return to the Gas Inlet Parameter Screen.

13. If you are finished making changes in the Gas Inlet Parameter Screen, use the BUMP ▼ button to move the cursor down past the ASSIGN item. The screen will indicate that changes are being saved and you will return to the home screen.

Connecting Calibration Gas

The GAS 1 and GAS 2 fittings on the back of the docking station are designed to be used with a calibration gas cylinder that is fitted with a demand flow regulator. The AIR fitting may be used with a demand flow regulator and a cylinder of zero emissions air, but this is not normally necessary since the docking station will generally be in a fresh air area.

The type of calibration gas cylinder used for the GAS 1 fitting depends on the gas sensors installed in the EAGLE 2. A 4-gas mix, LEL/Oxygen/CO/H2S, is used for the GAS 1 fitting if the instrument being used with the docking station is a standard 4-gas instrument or is a version that has less than 4 standard channels but still has an H_2S channel. If the instrument does not have an H_2S channel, then a 3-gas mix, LEL/Oxygen/CO, is used for the GAS 1 fitting. Although a 4-gas cylinder will work for an instrument of any standard gas combination, if you have multiple 3- and 4-gas instruments, you may want to keep a 4-gas cylinder and a 3-gas cylinder to help preserve the charcoal filter that protects the CO sensor in instruments without an H_2S channel.

The GAS 2 fitting is intended to be used for special sensors (i.e. PID, TC, ESM-01, etc.). If you have a special sensor installed (i.e. PID, TC, ESM-01, etc.), a special cylinder for the target gas of that sensor needs to be used for calibration. For example, if you have a standard 4-gas instrument plus a PID sensor, you will need both a 4-gas cylinder and a cylinder of 10 ppm isobutylene for low range or 100 ppm isobutylene for high range calibration. The isobutylene cylinder needs to be connected to the GAS 2 fitting on the back of the SDM-E2. Similarly, if you have a standard 4-gas EAGLE 2 plus an ammonia ESM-01 sensor, you will need a cylinder of 10 ppm ammonia connected to the GAS 2 fitting on the back of the SDM-E2. If you have a standard 4-gas EAGLE 2 plus a PID sensor and an ammonia ESM-01 sensor, you will need both an isobutylene calibration cylinder and an ammonia calibration cylinder. If you have an EAGLE 2 configuration for which a 5-gas cylinder is available (ie. standard 4 plus SO_2 or standard 4 plus high range PID), you may use the 5-gas cylinder and connect it to the GAS 1 fitting. The SO_2 or high range PID channel will have to be assigned to GAS 1 (see "Setting the Gas Inlet Parameters" on page 22).

For instruments with 2 special sensors, the calibration cylinder for the first special sensor channel (typically channel 5) needs to be connected to the GAS 2 fitting first. During bump testing or calibration, the EAGLE 2 screen will prompt you to change the GAS 2 calibration cylinder when it needs to calibrate the second special sensor (typically channel 6). If one of the two special sensors has a target gas that's in a 5-gas cylinder (ie. SO_2 or high range PID), no cylinder change will be required if the 5-gas cylinder is used and the appropriate channel is reassigned to GAS 1.

NOTE:	If your EAGLE 2 has an IR sensor installed, see "Appendix A: Bump Testing and Calibrating EAGLE 2s with IR Sensors" on page 84 for a brief description of operation specific to IR sensors.

Use Table 5 below as a guide in determining which calibration gas cylinder is appropriate for your system. See "Spare Parts List" on page 81 for a list of available cylinder part numbers.

Table 5: Recommended Gas Cylinders for Typical Instrument Types

Typical Instrument Types	Recommended Calibration Gas Cylinder
3-gas (LEL/Oxy/CO)	3-gas mix with LEL/Oxy/CO
Standard 4-gas (LEL/Oxy/H2S/CO)	4-gas mix with LEL/Oxy/H2S/CO
Standard 4-gas + low range PID	4-gas mix and IBL
Standard 4-gas + high range PID	5-gas mix with LEL/Oxy/CO/H2S/IBL
Standard 4-gas + NH3	4-gas mix and NH3
Standard 4-gas + low range PID + NH3	4-gas mix and IBL and NH3
Standard 4-gas + high range PID + NH3	5-gas mix with LEL/Oxy/CO/H2S/IBL and NH3
Standard 4-gas + SO2	5-gas mix with LEL/Oxy/CO/H2S/SO2

To connect calibration gas to the SDM-E2, do the following:

1. If the area around the docking station is not considered a fresh air area (an area free of combustible and toxic gases and of normal oxygen content, 20.9%) install a tube not longer than 10 feet on the filter attached to the AIR fitting on the back of the docking station and route it to a fresh air area or connect a cylinder of zero air with a demand flow regulator to the AIR fitting.

2. Install the demand flow regulator on the calibration gas cylinder(s).

WARNING: *RKI Instruments, Inc. recommends that you dedicate a regulator for use with chlorine (Cl_2) gas and that you do not use that dedicated regulator for any other gases, particularly hydrogen sulfide (H_2S).*

3. Connect the demand flow regulator to the GAS 1 or GAS 2 inlet fitting using the 3 foot length of 3/16 inch ID sample tubing provided with the docking station.

    For a 3- or 4-gas mix, connect the regulator to the GAS 1 inlet.

    For a special calibration cylinder (PID, TC, ESM-01, etc.), connect the regulator to the GAS 2 inlet.

Installing the Single Module Data Viewer Software

1. Launch Windows®.

2. Exit from all applications and open windows.

3. Go to www.rkiinstruments.com/sdme2.

4. Click on the **Download** tab.

5. Click the **SDM-E2 Standalone Single Module** link.

6. A .zip file will begin to download. Select whether you want to open or save the .zip file.

7. Extract the contents of the .zip file.

8. Double click the setup.exe file.

9. The Single Module Data Viewer InstallShield Wizard comes up to guide you through installation. Click **Next** to proceed to the License Agreement window.

10. Read the license agreement and click the agreement acceptance selection box, then click **Next** to proceed to the Customer Information window.

11. Enter a user name and organization and select if you want to install the program for all users on the computer or just for your user account, then click **Next** to proceed to the Destination Folder window.

12. The default installation folder (C:\Program Files\Single Module Data Viewer\) is displayed. If you want to install the software in the default folder continue with step 8. If you want to install the software in a different location, click **Change** and choose a new installation folder now and then continue with step 8.

13. Click **Next** to proceed to the Ready to Install the Program window.

14. Review the installation settings. If they are OK, click **Install** and the installation process will begin. If you want to change installation settings, click **Back** and change them to the desired settings.

15. During software installation, the installation program may find newer versions of Windows files on your computer than those in the downloaded .zip file. If this happens, the installation software will ask you if you want to keep these newer files. Click **Yes** to do so.

16. Follow the on-screen instructions to complete software installation.

Chapter 4: Operation

Overview

When you have completed the tasks in "Chapter 3: Preparing to Use the SDM-E2", you are ready to use the SDM-E2 docking station. The SDM-E2 is capable of performing bump tests and calibrations on the EAGLE 2. It can also charge the optional rechargeable NiMH batteries in the EAGLE 2. This chapter describes procedures for using the docking station to bump test, calibrate, and recharge EAGLE 2s in the standalone configuration of the docking station. It also describes the information that is saved in the docking station's memory and how to save that information to a USB flash drive for use with the Single Module Data Viewer Program.

Bump Testing Instruments with Standard Sensors

The following instructions apply to EAGLE 2s with one or more of the standard four sensors (catalytic LEL, O_2, CO, and H_2S). If your EAGLE 2 includes one or more special sensors such as a TC, PID, ESM-01, etc., see "Bump Testing an Instrument with Special Sensors" on page 42 for bump testing instructions.

When a bump test is performed, the SDM-E2 performs a fresh air adjustment on an EAGLE 2 and then applies calibration gas to the instrument. The docking station then analyzes the response results based on criteria defined by the bump test check tolerance parameter and determines if the instrument passed the bump test. The bump test check tolerance is defined in "Bump Test Check Tolerance (CHECK)" on page 14. If the automatic calibration parameter is set to ON, then the SDM-E2 will automatically perform a calibration if the bump test fails.

Do the following to perform a bump test:

1. Confirm that the AC Adapter is connected to the SDM-E2 and to an AC wall socket.

2. Press and hold the SDM-E2's POWER button. The LEDs will turn amber.

3. When the BUMP ▼ and CAL ▲ LEDs turn off, release the POWER button.

4. The COPY LED will be off or on steadily and the CHARGE LED will be blinking green if the SDM-E2 is operating properly or solid red if there is a system failure. The amount of free memory in the SDM-E2 will dictate the condition of the COPY LED (see "Available Memory in the SDM-E2" on page 69).

5. Install an EAGLE 2 in the instrument cradle. Set the EAGLE 2 onto the top of the SDM-E2 and slide the instrument forward until it falls into place as illustrated below.

Figure 11: Inserting the EAGLE 2

WARNING: Inserting the EAGLE 2 improperly may damage the exhaust bellow at the back of the SDM-E2.

---

6. If the EAGLE 2 is equipped with NiMH batteries and you wish to charge the batteries, connect the charging cable at the front of the SDM-E2 to the charging jack on the back of the instrument. The CHARGE LED will begin to flash amber. If the batteries are fully charged, the CHARGE LED will become solid green again after about 5 minutes. Typically a bump test or calibration will be initiated before this happens. See "Charging an Instrument in a Docking Station" on page 66 for a complete description of charging the EAGLE 2.

WARNING: ***Do not plug the charger cable into a battery pack that contains alkaline batteries. Do not attempt to charge alkaline batteries.***

7. Press and hold the POWER ENTER RESET button on the EAGLE 2 until you hear a beep, then release it. The EAGLE 2 will begin its power up sequence. If a successful connection between the EAGLE 2 and the SDM-E2 occurs, the home screen will display at the end of the start up sequence. If the charge LED was amber, it will begin to blink green.

```
CH4    50%LEL    GAS1
OXY    12.0vol%   GAS1
H2S    25.0ppm    GAS1
CO      50ppm     GAS1
---
---
```

NOTE: The screen shown above applies to a standard 4-channel EAGLE 2. If your EAGLE 2 has less than 4 channels, the inactive channels will not appear in the above screen or in any screens where channels are displayed. If your EAGLE 2 has a different gas combination, your gas names and auto calibration values will be different. All screens in this section assume a standard 4-channel EAGLE 2.

8. If necessary, confirm that the bump test check tolerance is set to the desired value. See "Setting the Bump Test Parameters" on page 18.

9. Verify that the appropriate calibration gas cylinder is connected to the GAS 1 and GAS 2 fittings on the back of the SDM-E2. See "Connecting Calibration Gas" on page 25 for calibration gas cylinder options and calibration gas connection procedures.

10. Connect the gas out to EAGLE 2 line to the inlet fitting on the EAGLE 2.

11. Press and hold the BUMP ▼ button until the BUMP ▼ LED turns on (about one second) then release it. The bump test begins. During the bump test, the BUMP ▼ LED will flash amber indicating that a bump test is in progress and the EAGLE 2 display will show the current readings.

```
CH4      0%LEL    Z
OXY   20.9vol%    Z
H2S     0.0ppm    Z
CO        0ppm    Z
---
---
```

If you wish to cancel the bump test, press and hold the BUMP ▼ button for at least one second until CANCEL appears on the screen.

12. If at any point during the bump test the gas flow to the instrument becomes too low, the bump test will be aborted and the screen will indicate a flow failure.

```
CH4      0%LEL    FLOW
OXY   20.9vol%    FLOW
H2S     0.0ppm    FLOW
CO        0ppm    FLOW
---
---
```

If a flow failure occurs, confirm all tubing connections are correct and that all lines are clear.

- To return to the home screen, press and hold the EDIT ENTER button for about 3 seconds.

- To start another bump test, press and release the BUMP ▼ button.

- To perform a calibration, press and release the CAL ▲ button.

13. The "Z" to the right of the gas reading indicates that air is being applied to the instrument for a fresh air adjustment (zero). The SDM-E2 will apply fresh air to the instrument for the time defined by the AIR TIME bump test parameter.

14. The SDM-E2 will perform a fresh air adjustment on the instrument.

- If the air adjustment is successful, the SDM-E2 will indicate that all channels passed with a "P" to the right of the "Z". The "Z" indicates it is a fresh air adjustment (zero) result. The SDM-E2 will continue as described in step 15 below.

```
CH4      0%LEL     Z  P
OXY   20.9vol%     Z  P
H2S     0.0ppm     Z  P
CO        0ppm     Z  P
 ---
 ---
```

- If one or more of the sensors fails the fresh air adjustment, the SDM-E2 will abort the bump test and will not apply calibration gas. If this happens, the BUMP ▼ LED will flash red indicating a failure and the following screen will appear indicating which channels passed and failed the fresh air adjustment with a P (pass) or an F (fail) to the right of the "Z". The "Z" indicates it is a fresh air adjustment (zero) result. In the following example, the H_2S channel failed the zero adjustment.

```
CH4      0%LEL     Z  P
OXY   20.9vol%     Z  P
H2S     5.0ppm     Z  F
CO        0ppm     Z  P
 ---
 ---
```

In this case, continue with step 18.

15. The SDM-E2 will apply calibration gas to the instrument for the time defined by the GAS TIME bump test parameter. A "B" will appear to the right of the gas reading to indicate that calibration gas is being applied for a bump test.

```
CH4      30%LEL    B
OXY      9.0vol%   B
H2S      3.0ppm    B
CO        15ppm    B
 ---
 ---
```

At the end of the calibration gas application, the SDM-E2 will determine if the bump test passed.

16. When the AUTO CAL bump test parameter is set to OFF:

    a. The instrument will indicate which channels passed or failed the bump test with a P (pass) or an F (fail) to the right of the "B" which indicates it is a bump test result. The bump test gas readings at the end of the gas application will be displayed.

```
CH4      48%LEL    BP
OXY     12.0vol%   BP
H2S      3.0ppm    BF
CO        47ppm    BP
 ---
 ---
```

    b. The BUMP ▼ LED will continue to flash amber while the docking station performs a fresh air purge for the time defined by the AIR TIME bump test parameter. After the purge is complete, if all channels passed the bump test, the BUMP ▼ LED will turn solid green. If any channels failed the bump test, the BUMP ▼ LED will turn solid red.

    c. Continue to step 18.

17. When the AUTO CAL bump test parameter is set to ON:

- If all channels pass the bump test:

    a. The following screen appears indicating all channels passed the bump test with a "P" to the right of the "B" for each channel:

    ```
    CH4      48%LEL     BP
    OXY   12.0vol%      BP
    H2S     24.0ppm     BP
    CO        47ppm     BP
     ---
     ---
    ```

    b. The BUMP ▼ LED will continue to flash amber while the docking station performs a fresh air purge for the time defined by the AIR TIME bump test parameter. After the purge is complete, The BUMP ▼ LED will turn solid green.

    c. Continue to step 18.

- If any channel fails the bump test:

    a. A calibration is automatically started and the calibration gas will continue to be applied.

NOTE:	GAS 1 calibration gas will continue to be applied so that the total gas application time is the time defined by the GAS TIME calibration parameter. This time includes the time that the instrument was being bump tested. If the GAS TIME **calibration parameter** is set to 90 seconds and the GAS TIME **bump test parameter** is set to 30 seconds, the instrument will sample gas for an additional 60 seconds if the bump test fails to bring the total exposure time to 90 seconds.

The current gas readings will be displayed along with the bump test results. A "C" will appear next to the channels indicating they are being calibrated. The BUMP ▼ LED will continue to flash amber and the CAL ▲ LED will begin flashing amber to indicate a calibration is taking place.

```
CH4     29%LEL      BF  C
OXY     18.0vol%    BF  C
H2S      25.0ppm    BP  C
CO        45ppm     BF  C
---
---
```

b. At the end of the calibration, the instrument displays the calibration gas readings at the end of the gas application and the results from both the bump test and the calibration with a P (pass) or an F (fail).

```
CH4     29%LEL      BF  CF
OXY     18.0vol%    BF  CF
H2S      25.0ppm    BP  CP
CO        45ppm     BF  CP
---
---
```

c. The BUMP ▼ LED and CAL ▲ LED will continue to flash amber while the docking station performs a fresh air purge for the time defined by the AIR TIME bump test parameter. After the purge is complete, the BUMP ▼ LED will turn solid red. If all channels passed the calibration, the CAL ▲ LED will turn solid green. If any channels failed the calibration, the CAL ▲ LED will turn solid red.

18. After a successful or failed bump test,

   •   To perform any other operations:

       To perform another bump test, press and hold the BUMP ▼ button until the pump starts. To perform a calibration, press and hold the CAL ▲ button until the pump starts. To return to the home screen, press and hold the EDIT ENTER button until the home screen appears.

   •   To turn the EAGLE 2 off:

       If the bump test was successful, the instrument will shut off after 15

seconds. If the bump test failed, the instrument will shut off after 10 minutes. If buttons are pressed before the SDM-E2 turns off the instrument, it will automatically turn it off 10 minutes after the last button push.

To turn off the instrument before it is automatically turned off, press and hold the EDIT ENTER and POWER buttons simultaneously for at least one second and then release them.

CAUTION: *When using the EAGLE 2 with the SDM-E2, do not turn off the instrument using the instrument power button. Use the EDIT ENTER and POWER buttons on the SDM-E2 to turn off the instrument.*

The BUMP ▼ or BUMP ▼ and CAL ▲ LEDs will remain on indicating the test results. If the same EAGLE 2 is turned on again, the test results will still be indicated by the BUMP ▼ or BUMP ▼ and CAL ▲ LEDs and on the EAGLE 2 screen. To clear the BUMP ▼ or BUMP ▼ and CAL ▲ LEDs, with the EAGLE 2 on, press and release the EDIT ENTER button to return to the home screen. If a new EAGLE 2 is turned on and connected, the results displayed by the BUMP ▼ or BUMP ▼ and CAL ▲ LEDs will automatically be cleared.

19. The results of the bump test or bump test and calibration will be stored in the SDM-E2's memory and will be available to copy to a USB flash drive. See "Copying Calibration and Bump Test Records to a USB Flash Drive" on page 69 for instructions to copy the saved bump test and calibration records to a USB flash drive.

20. Disconnect the charging cable, if connected, and the gas out to EAGLE 2 line from the EAGLE 2.

21. Remove the EAGLE 2 from the SDM-E2.

22. If you wish to bump test additional instruments, repeat step 5 - step 21 above for each additional instrument.

Calibrating Instruments with Standard Sensors

The following instructions apply to EAGLE 2s with one or more of the standard four sensors (catalytic LEL, O_2, CO, and H_2S). If your EAGLE 2 includes one or more special sensors such as a TC, PID, ESM-01, etc., see "Calibrating an Instrument with Special Sensors" on page 56 for calibration instructions.

When a calibration is performed, the docking station performs a fresh air adjustment on an instrument and then applies calibration gas to the instrument. The docking station analyzes the calibration results and determines if the instrument passed the calibration.

To perform a calibration on an instrument:

1. Confirm that the AC Adapter is connected to the SDM-E2 and to an AC wall socket.

2. Press and hold the SDM-E2's POWER button. The LEDs will turn amber.

3. When the BUMP ▼ and CAL ▲ LEDs turn off, release the POWER button.

4. The COPY LED will be off or on steadily and the CHARGE LED will be blinking green if the SDM-E2 is operating properly or solid red if there is a system failure. The amount of free memory in the SDM-E2 will dictate the condition of the COPY LED (see "Available Memory in the SDM-E2" on page 69).

5. Install an EAGLE 2 in the instrument cradle. Set the EAGLE 2 onto the top of the SDM-E2 and slide the instrument forward until it falls into place as illustrated below.
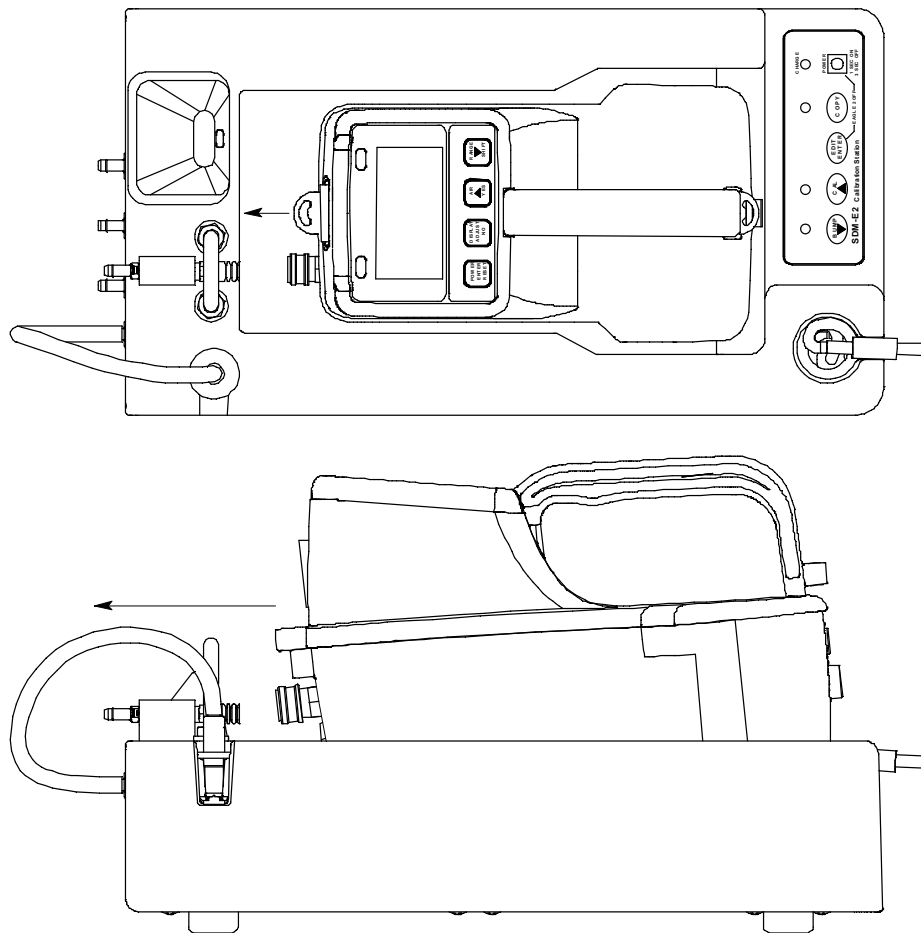

Figure 12: Inserting the EAGLE 2

WARNING: *Inserting the EAGLE 2 improperly may damage the exhaust bellow at the back of the SDM-E2.*

6. If the EAGLE 2 is equipped with NiMH batteries and you wish to charge the batteries, connect the charging cable at the front of the SDM-E2 to the charging jack on the back of the instrument. The CHARGE LED will begin to flash amber. If the batteries are fully charged, the CHARGE LED will become solid green again after about 5 minutes. Typically a bump test or calibration will be initiated before this happens. See "Charging an Instrument in a Docking Station" on page 66 for a complete description of charging the EAGLE 2.

WARNING: ***Do not plug the charger cable into a battery pack that contains alkaline batteries. Do not attempt to charge alkaline batteries.***

---

7. Press and hold the POWER ENTER RESET button on the EAGLE 2 until you hear a beep, then release it. The EAGLE 2 will begin its power up sequence. If a successful connection between the EAGLE 2 and the SDM-E2 occurs, the home screen will display at the end of the start up sequence. If the charge LED was amber, it will begin to blink green.

```
CH4    50%LEL     GAS1
OXY    12.0vol%   GAS1
H2S    25.0ppm    GAS1
CO       50ppm    GAS1
---
---
```

NOTE: The screen shown above applies to a standard 4-channel EAGLE 2. If your EAGLE 2 has less than 4 channels, the inactive channels will not appear in the above screen or in any screens where channels are displayed. If your EAGLE 2 has a different gas combination, your gas names and auto calibration values will be different. All screens in this section assume a standard 4-channel EAGLE 2.

---

8. Verify that the appropriate calibration gas cylinder is connected to the GAS 1 and GAS 2 fittings on the back of the SDM-E2. See "Connecting Calibration Gas" on page 25 for calibration gas cylinder options and calibration gas connection procedures.

9. Connect the gas out to EAGLE 2 line to the inlet fitting on the EAGLE 2.

10. Press and hold the CAL ▲ button until the CAL ▲ LED turns on (about one second) then release it. The calibration begins. During the calibration, the CAL ▲ LED will flash amber indicating that a calibration is in progress and the EAGLE 2 display will show the current readings.

```
CH4      0%LEL    Z
OXY   20.9vol%    Z
H2S     0.0ppm    Z
CO         0ppm   Z
---
---
```

If you wish to cancel the calibration, press and hold the CAL ▲ button for at least one second until CANCEL appears on the screen.

11. If at any point during the calibration the gas flow to the instrument becomes too low, the calibration will be aborted and the screen will indicate a flow failure.

```
CH4      0%LEL    FLOW
OXY   20.9vol%    FLOW
H2S     0.0ppm    FLOW
CO         0ppm   FLOW
---
---
```

If a flow failure occurs, confirm all tubing connections are correct and that all lines are clear.

• To return to the home screen, press and hold the EDIT ENTER button for about 3 seconds.

• To start another calibration, press and release the CAL ▲ button.

• To perform a bump test, press and release the BUMP ▼ button.

12. The "Z" to the right of the gas reading indicates that air is being applied to the instrument for a fresh air adjustment (zero). The SDM-E2 will apply fresh air to the instrument for the time defined by the AIR TIME calibration parameter.

13. The SDM-E2 will perform a fresh air adjustment on the instrument.

   • If the air adjustment is successful, the SDM-E2 will continue as described in step 14 below.

```
CH4      0%LEL     Z  P
OXY   20.9vol%     Z  P
H2S      5.0ppm    Z  P
CO        0ppm     Z  P
---
---
```

   • If one or more of the sensors fails the fresh air adjustment, the SDM-E2 will abort the calibration and will not apply calibration gas. If this happens, the CAL ▲ LED will flash red indicating a failure and the following screen will appear.

```
CH4      0%LEL     Z  P
OXY   20.9vol%     Z  P
H2S     25.0ppm    Z  F
CO        0ppm     Z  P
---
---
```

   In this case continue with step 17.

14. The SDM-E2 will apply calibration gas to the instrument for the time defined by the GAS TIME calibration parameter.

```
CH4     29%LEL         C
OXY    18.0vol%        C
H2S     25.0ppm        C
CO       45ppm         C
---
---
```

The "C" indicates calibration gas is being applied.

15. The SDM-E2 will then purge the system with fresh air for the time defined by the AIR TIME calibration parameter. The calibration results will be displayed

with a P (pass) or an F (fail) while the fresh air purge is performed.

```
CH4     29%LEL       CF
OXY     18.0vol%     CF
H2S      25.0ppm     CP
CO         45ppm     CP
 ---
 ---
```

16. Once the fresh air purge is finished, the CAL ▲ LED will stop blinking and be steadily green if the calibration passed or steadily red if the calibration failed.

17. After a successful or failed calibration,

   • To perform any other operations:

   To perform a bump test, press and hold the BUMP ▼ button until the pump starts. To perform another calibration, press and hold the CAL ▲ button until the pump starts. To return to the home screen, press and hold the EDIT ENTER button until the home screen appears.

   • To turn the EAGLE 2 off:

   If the calibration was successful, the instrument will shut off after 15 seconds. If the calibration failed, the instrument will shut off after 10 minutes. If buttons are pressed before the SDM-E2 turns off the instrument, it will automatically turn it off 10 minutes after the last button push.

   To turn off the instrument before it is automatically turned off, press and hold the EDIT ENTER and POWER buttons simultaneously for at least one second and then release them.

CAUTION: *When using the EAGLE 2 with the SDM-E2, do not turn off the instrument using the instrument power button. Use the EDIT ENTER and POWER buttons on the SDM-E2 to turn off the instrument.*

   The CAL ▲ LED will remain on indicating the test results. If the same EAGLE 2 is turned on again, the test results will still be indicated by the CAL ▲ LED and on the EAGLE 2 screen. To clear the CAL ▲ LED, with the EAGLE 2 on, press and release the EDIT ENTER button to return to the home screen. If a new EAGLE 2 is turned on and connected, the results displayed by the CAL ▲ LED will automatically be cleared.

18. The results of the calibration will be stored in the SDM-E2's memory and will be available to copy to a USB flash drive. See "Copying Calibration and Bump Test Records to a USB Flash Drive" on page 69 for instructions to copy the

saved bump test and calibration records to a USB flash drive.

19. Disconnect the charger cable, if connected, and the gas out to EAGLE 2 line from the EAGLE 2.

20. Remove the EAGLE 2 from the SDM-E2.

21. If you wish to calibrate additional instruments, repeat step 5 - step 20 above for each additional instrument.

Bump Testing an Instrument with Special Sensors

When a bump test is performed, the SDM-E2 performs a fresh air adjustment on an EAGLE 2 and then applies calibration gas to the instrument. The docking station then analyzes the response results based on criteria defined by the bump test check tolerance parameter and determines if the instrument passed the bump test. The bump test check tolerance is defined in "Bump Test Check Tolerance (CHECK)" on page 14. If the automatic calibration parameter is set to on, then the SDM-E2 will automatically perform a calibration if the bump test fails.

Instruments that have one or more special sensors installed need one or more gas cylinders to connect to the GAS 2 fitting. Be sure that you have the required calibration cylinders for your sensors. If you are using a 5-gas cylinder for a special sensor, be sure that the gas inlet parameters are appropriately assigned as described in "Setting the Gas Inlet Parameters" on page 22. If your EAGLE 2 has an IR sensor installed, see "Appendix A: Bump Testing and Calibrating EAGLE 2s with IR Sensors" on page 84 for a brief description of operation specific to IR sensors.

NOTE:	If you wish to calibrate only the standard four sensors or only the special sensors, be sure that the Gas Inlet Parameters are set appropriately as described in "Setting the Gas Inlet Parameters" on page 22.

Do the following to perform a bump test:

1. Confirm that the AC Adapter is connected to the SDM-E2 and to an AC wall socket.

2. Press and hold the SDM-E2's POWER button. The LEDs will turn amber.

3. When the BUMP ▼ and CAL ▲ LEDs turn off, release the POWER button.

4. The COPY LED will be off or on steadily and the CHARGE LED will be blinking green if the SDM-E2 is operating properly or solid red if there is a system failure. The amount of free memory in the SDM-E2 will dictate the condition of the COPY LED (see "Available Memory in the SDM-E2" on page 69).

5. Install an EAGLE 2 in the instrument cradle. Set the EAGLE 2 onto the top of the SDM-E2 and slide the instrument forward until it falls into place as illustrated below.

Figure 13: Inserting the EAGLE 2

WARNING: *Inserting the EAGLE 2 improperly may damage the exhaust bellow at the back of the SDM-E2.*

---

6. If the EAGLE 2 is equipped with NiMH batteries and you wish to charge the batteries, connect the charging cable at the front of the SDM-E2 to the charging jack on the back of the instrument. The CHARGE LED will begin to flash amber. If the batteries are fully charged, the CHARGE LED will become solid green again after about 5 minutes. Typically a bump test or calibration will be initiated before this happens. See "Charging an Instrument in a Docking Station" on page 66 for a complete description of charging the EAGLE 2.

WARNING: *Do not plug the charger cable into a battery pack that contains alkaline batteries. Do not attempt to charge alkaline batteries.*

7. Press and hold the POWER ENTER RESET button on the EAGLE 2 until you hear a beep, then release it. The EAGLE 2 will begin its power up sequence. If a successful connection between the EAGLE 2 and the SDM-E2 occurs, the home screen will display at the end of the start up sequence. If the charge LED was amber, it will begin to blink green. The example screen below shows a standard 4-channel EAGLE 2 that also includes an IR CO_2 sensor in channel 5 and an ESM-01 NH_3 sensor in channel 6. The GAS 2 to the right of the CO_2 and NH_3 channels indicate that the GAS 2 fitting will be used for these channels.

CH4	50%LEL	GAS1
OXY	12.0vol%	GAS1
H2S	25.0ppm	GAS1
CO	50ppm	GAS1
CO2	5000ppm	GAS2
NH3	25.0ppm	GAS2

NOTE: If your EAGLE 2 has less than 4 standard channels, only one special sensor, or different special sensors, your gas names and auto calibration values will be different. All screens in this section assume a channel setup as shown above.

8. If necessary, confirm that the bump test check tolerance is set to the desired value. See "Setting the Bump Test Parameters" on page 18.

9. Verify that the appropriate calibration gas cylinder is connected to the GAS 1 and GAS 2 fittings on the back of the SDM-E2. See "Connecting Calibration Gas" on page 25 for calibration gas cylinder options and calibration gas connection procedures.

WARNING: *RKI Instruments, Inc. recommends that you dedicate a regulator for use with chlorine (Cl_2) gas and that you do not use that dedicated regulator for any other gases, particularly hydrogen sulfide (H_2S).*

10. Connect the gas out to EAGLE 2 line to the inlet fitting on the EAGLE 2.

11. Press and hold the BUMP ▼ button until the BUMP ▼ LED turns on (about one second) then release it. The bump test begins. During the bump test, the BUMP ▼ LED will flash amber indicating that a bump test is in progress and the EAGLE 2 display will show the current readings.

```
CH4      0%LEL    Z
OXY   20.9vol%    Z
H2S     0.0ppm    Z
CO        0ppm    Z
CO2       0ppm    Z
NH3     0.0ppm    Z
```

If you wish to cancel the bump test, press and hold the BUMP ▼ button for at least one second until CANCEL appears on the screen.

12. If at any point during the bump test the gas flow to the instrument becomes too low, the bump test will be aborted and the screen will indicate a flow failure.

```
CH4      0%LEL    FLOW
OXY   20.9vol%    FLOW
H2S     0.0ppm    FLOW
CO        0ppm    FLOW
CO2       0ppm    FLOW
NH3     0.0ppm    FLOW
```

If a flow failure occurs, confirm all tubing connections are correct and that all lines are clear.

• To return to the home screen, press and hold the EDIT ENTER button for about 3 seconds.

• To start another bump test, press and release the BUMP ▼ button.

- To perform a calibration, press and release the CAL ▲ button.

13. The "Z" to the right of the gas reading indicates that air is being applied to the instrument for a fresh air adjustment (zero). The SDM-E2 will apply fresh air to the instrument for the time defined by the AIR TIME bump test parameter.

14. The SDM-E2 will perform a fresh air adjustment on the instrument.

   - If the air adjustment is successful, the SDM-E2 will indicate that all channels passed and continue as described in step 15 below.

```
CH4      0%LEL      Z  P
OXY   20.9vol%      Z  P
H2S      0.0ppm     Z  P
CO         0ppm     Z  P
CO2        0ppm     Z  P
NH3      0.0ppm     Z  P
```

   - If one or more of the sensors fails the fresh air adjustment, the SDM-E2 will abort the bump test and will not apply calibration gas. If this happens, the BUMP ▼ LED will flash red indicating a failure and the following screen will appear indicating which channels passed and failed the fresh air adjustment with a P (pass) or an F (fail) to the right of the "Z". The "Z" indicates it is a fresh air adjustment (zero) result. In the following example, the H_2S channel failed the zero adjustment.

```
CH4      0%LEL      Z  P
OXY   20.9vol%      Z  P
H2S      0.0ppm     Z  F
CO         0ppm     Z  P
CO2        0ppm     Z  P
NH3      0.0ppm     Z  P
```

In this case, continue to step 18.

15. The SDM-E2 will apply GAS 1 calibration gas to the instrument for the time defined by the GAS TIME bump test parameter. The fifth and sixth channels' gas reading will be replaced by dashes while the standard 4 sensors are being bump tested.

```
CH4      48%LEL    B
OXY    12.0vol%    B
H2S      3.0ppm    B
CO        47ppm    B
CO2    ---------
NH3    ---------
```

At the end of the calibration gas application, the SDM-E2 will determine if the standard 4 sensors passed the bump test.

16. When the AUTO CAL bump test parameter is set to OFF:

a. The instrument will indicate which standard 4 channels passed or failed the bump test with a P (pass) or an F (fail) to the right of the "B" which indicates it is a bump test result. The bump test gas readings at the end of the gas application will be displayed. The fifth channel will then be bump tested with the GAS 2 cylinder.

```
CH4      48%LEL    BP
OXY    12.0vol%    BP
H2S      3.0ppm    BF
CO        47ppm    BP
CO2     3500ppm    B
NH3    ---------
```

b. Once the GAS 2 calibration gas has been applied for the appropriate amount of time, the SDM-E2 will determine if the fifth channel passed the bump test and will indicate a P (pass) or an F (fail) to the right of the "B" which indicates it is a bump test result.

```
CH4      48%LEL     BP
OXY     12.0vol%    BP
H2S       3.0ppm    BF
CO         47ppm    BP
CO2     4500ppm     BP
NH3      ---------
```

NOTE: If your instrument has only one special sensor, continue to step 18.

---

c. If your instrument has more than one special sensor, as in this example, you will need to change the GAS 2 cylinder in order for the bump test to continue. In the example below, the EAGLE 2's second special sensor is an ESM-01 for NH_3.The EAGLE 2 screen will appear as shown below:

```
        CHANGE GAS2
          TO NH3


        OK :  EDIT
```

d. Once you have changed the GAS 2 cylinder to the appropriate gas, press and release the EDIT ENTER button on the SDM-E2. The bump test will continue.

```
CH4      48%LEL     BP
OXY     12.0vol%    BP
H2S       3.0ppm    BF
CO         47ppm    BP
CO2     4500ppm     BP
NH3       3.0ppm    B
```

e. Once the GAS 2 calibration gas has been applied for the appropriate amount of time, the SDM-E2 will determine if the sixth channel passed the bump test and will indicate a P (pass) or an F (fail) to the right of the "B" which indicates it is a bump test result.

```
CH4      48%LEL    BP
OXY   12.0vol%    BP
H2S      3.0ppm    BF
CO        47ppm    BP
CO2    4500ppm    BP
NH3      3.0ppm    BF
```

f. The BUMP ▼ LED will continue to flash amber while the docking station performs a fresh air purge for the time defined by the AIR TIME bump test parameter. After the purge is complete, if all channels passed the bump test, the BUMP ▼ LED will turn solid green. If any channels failed the bump test, the BUMP ▼ LED will turn solid red.

g. Continue to step 18.

17. When the AUTO CAL bump test parameter is set to ON:

   • If all standard 4 channels pass the bump test:

   a. The following screen appears indicating all standard 4 channels passed the bump test and a bump test will begin on the fifth channel.

```
CH4      48%LEL    BP
OXY   12.0vol%    BP
H2S     23.0ppm    BP
CO        47ppm    BP
CO2    3500ppm    B
NH3   ---------
```

b. GAS 2 calibration gas will be applied to the fifth sensor and the SDM-E2 will determine if it passed bump testing. If it passed, the following screen will appear:

```
CH4     48%LEL    BP
OXY    12.0vol%   BP
H2S    23.0ppm    BP
CO       47ppm    BP
CO2    4500ppm    BP
NH3    ---------
```

NOTE: If your instrument has only one special sensor, continue to step 18.

c. If your instrument has more than one special sensor, as in this example, you will need to change the GAS 2 cylinder in order for the bump test to continue. In the example below, the EAGLE 2's second special sensor is an ESM-01 for NH_3. The EAGLE 2 screen will appear as shown below:

```
CHANGE GAS2
   TO NH3

OK :  EDIT
```

d. Once you have changed the GAS 2 cylinder to the appropriate gas, press and release the EDIT ENTER button on the SDM-E2. The bump test will continue.

```
CH4     48%LEL    BP
OXY    12.0vol%   BP
H2S    23.0ppm    BP
CO       47ppm    BP
CO2    4500ppm    BP
NH3     3.0ppm    B
```

e. Once the GAS 2 calibration gas has been applied for the appropriate amount of time, the SDM-E2 will determine if the sixth channel passed the bump test and will indicate a P (pass) or an F (fail) to the right of the "B" which indicates it is a bump test result. If it passed, the following screen will appear.

```
CH4     48%LEL    BP
OXY   12.0vol%    BP
H2S    23.0ppm    BP
CO      47ppm     BP
CO2   4500ppm     BP
NH3    23.0ppm    BP
```

f. The BUMP ▼ LED will continue to flash amber while the docking station performs a fresh air purge for the time defined by the AIR TIME bump test parameter. After the purge is complete, The BUMP ▼ LED will turn solid green.

g. Continue to step 18.

• If any of the standard four channels fails the bump test:

```
CH4     29%LEL    BF  C
OXY   18.0vol%    BF  C
H2S    25.0ppm    BP  C
CO      45ppm     BF  C
CO2   ---------
NH3   ---------
```

a. A calibration is automatically started on the standard four channels and the GAS 1 calibration gas will continue to be applied. The current gas readings will be displayed along with the bump test results. A "C" will appear next to the channels indicating they are being calibrated.

NOTE: GAS 1 calibration gas will continue to be applied so that the total gas application time is the time defined by the GAS TIME calibration parameter. This time includes the time that the instrument was being bump tested. If the GAS TIME **calibration parameter** is set to 90 seconds and the GAS TIME **bump test parameter** is set to 30 seconds, the instrument will sample gas for an additional 60 seconds if the bump test fails to bring the total exposure time to 90 seconds.

The gas reading for the fifth and sixth channels will be replaced by dashes while the standard 4 sensors are calibrated. The BUMP ▼ LED will continue to flash amber and the CAL ▲ LED will begin flashing amber to indicate a calibration is taking place.

b. At the end of the calibration, the instrument displays the calibration gas readings and the results from both the bump test and the calibration for the standard 4 sensors with a P (pass) or an F (fail). A bump test then begins on the fifth channel.

```
CH4     29%LEL      BF  CF
OXY     18.0vol%    BF  CF
H2S     25.0ppm     BP  CP
CO        45ppm     BF  CP
CO2     3500ppm      B
NH3     ---------
```

c. GAS 2 calibration gas will be applied to the fifth channel and the SDM-E2 will determine if it passes bump testing. If it does not pass, a calibration will automatically begin on that channel. If it does pass, the bump test will continue as described in step e.

```
CH4     29%LEL      BF  CF
OXY     18.0vol%    BF  CF
H2S     25.0ppm     BP  CP
CO        45ppm     BF  CP
CO2     3500ppm     BF  C
NH3     ---------
```

d. Once the calibration is complete, the screen will indicate whether the fifth channel calibration passed or failed.

```
CH4     29%LEL      BF  CF
OXY     18.0vol%    BF  CF
H2S     25.0ppm     BP  CP
CO      45ppm       BF  CP
CO2     4500ppm     BF  CP
NH3     ---------
```

NOTE: If your instrument has only one special sensor, continue to step i.

---

e. If your instrument has more than one special sensor, as in this example, you will need to change the GAS 2 cylinder in order for the bump test to continue. In the example below, the EAGLE 2's second special sensor is an ESM-01 for NH_3. The EAGLE 2 screen will appear as shown below:

```
        CHANGE GAS2
          TO NH3


         OK :  EDIT
```

f. Once you have changed the GAS 2 cylinder to the appropriate gas, press and release the EDIT ENTER button on the SDM-E2. The bump test will continue.

```
CH4     29%LEL      BF  CF
OXY     18.0vol%    BF  CF
H2S     25.0ppm     BP  CP
CO      45ppm       BF  CP
CO2     4500ppm     BF  CP
NH3     3.0ppm      B
```

g. GAS 2 calibration gas will be applied to the sixth channel and the
    SDM-E2 will determine if it passes bump testing. If it does not pass,
    a calibration will automatically begin on that channel. If it does pass,
    the bump test will continue as described in step i.

```
CH4     29%LEL      BF  CF
OXY     18.0vol%    BF  CF
H2S     25.0ppm     BP  CP
CO        45ppm     BF  CP
CO2    4500ppm      BF  CP
NH3      3.0ppm     BF  C
```

h. Once the calibration is complete, the screen will indicate whether
    the sixth channel calibration passed or failed.

```
CH4     29%LEL      BF  CF
OXY     18.0vol%    BF  CF
H2S     25.0ppm     BP  CP
CO        45ppm     BF  CP
CO2    3500ppm      BF  CP
NH3     21.0ppm     BF  CP
```

i. The BUMP ▼ LED and CAL ▲ LED will continue to flash amber
    while the docking station performs a fresh air purge for the time
    defined by the AIR TIME bump test parameter. After the purge is
    complete, the BUMP ▼ LED will turn solid red. If all channels
    passed the calibration, the CAL ▲ LED will turn solid green. If any
    channels failed the calibration, the CAL ▲ LED will turn solid red.

18. After a successful or failed bump test,

- To perform any other operations:

    To perform another bump test, press and hold the BUMP ▼ button until the
    pump starts. To perform a calibration, press and hold the CAL ▲ button
    until the pump starts. To return to the home screen, press and hold the
    EDIT ENTER button until the home screen appears.

- To turn the EAGLE 2 off:

    If the bump test was successful, the instrument will shut off after 15
    seconds. If the bump test failed, the instrument will shut off after 10
    minutes. If buttons are pressed before the SDM-E2 turns off the

instrument, it will automatically turn it off 10 minutes after the last button push.

To turn off the instrument before it is automatically turned off, press and hold the EDIT ENTER and POWER buttons simultaneously for at least one second and then release them.

CAUTION: *When using the EAGLE 2 with the SDM-E2, do not turn off the instrument using the instrument power button. Use the EDIT ENTER and POWER buttons on the SDM-E2 to turn off the instrument.*

The BUMP ▼ or BUMP ▼ and CAL ▲ LEDs will remain on indicating the test results. If the same EAGLE 2 is turned on again, the test results will still be indicated by the BUMP ▼ or BUMP ▼ and CAL ▲ LEDs and on the EAGLE 2 screen. To clear the BUMP ▼ or BUMP ▼ and CAL ▲ LEDs, with the EAGLE 2 on, press and release the EDIT ENTER button to return to the home screen. If a new EAGLE 2 is turned on and connected, the results displayed by the BUMP ▼ or BUMP ▼ and CAL ▲ LEDs will automatically be cleared.

19. The results of the bump test or bump test and calibration will be stored in the SDM-E2's memory and will be available to copy to a USB flash drive. See "Copying Calibration and Bump Test Records to a USB Flash Drive" on page 69 for instructions to copy the saved bump test and calibration records to a USB flash drive.

20. Disconnect the charging cable, if connected, and the gas out to EAGLE 2 line from the EAGLE 2.

21. Remove the EAGLE 2 from the SDM-E2.

22. If you wish to bump test additional instruments, repeat step 5 - step 21 above for each additional instrument.

Calibrating an Instrument with Special Sensors

When a calibration is performed, the docking station performs a fresh air adjustment on an instrument and then applies calibration gas to the instrument. The docking station analyzes the calibration results and determines if the instrument passed the calibration.

Instruments that have one or more special sensors installed need one or more gas cylinders to connect to the GAS 2 fitting. Be sure that you have the required calibration cylinders for your sensors. If you are using a 5-gas cylinder for a special sensor, be sure that the gas inlet parameters are appropriately assigned as described in "Setting the Gas Inlet Parameters" on page 22. If your EAGLE 2 has an IR sensor installed, see "Appendix A: Bump Testing and Calibrating EAGLE 2s with IR Sensors" on page 84 for a brief description of operation specific to IR sensors.

NOTE:	If you wish to calibrate only the standard four sensors or only the special sensors, be sure that the Gas Inlet Parameters are set appropriately as described in "Setting the Gas Inlet Parameters" on page 22.

To perform a calibration on an instrument:

1. Confirm that the AC Adapter is connected to the SDM-E2 and to an AC wall socket.

2. Press and hold the SDM-E2's POWER button. The LEDs will turn amber.

3. When the BUMP ▼ and CAL ▲ LEDs turn off, release the POWER button.

4. The COPY LED will be off or on steadily and the CHARGE LED will be blinking green if the SDM-E2 is operating properly or solid red if there is a system failure. The amount of free memory in the SDM-E2 will dictate the condition of the COPY LED (see "Available Memory in the SDM-E2" on page 69).

5. Install an EAGLE 2 in the instrument cradle. Set the EAGLE 2 onto the top of the SDM-E2 and slide the instrument forward until it falls into place as illustrated below.
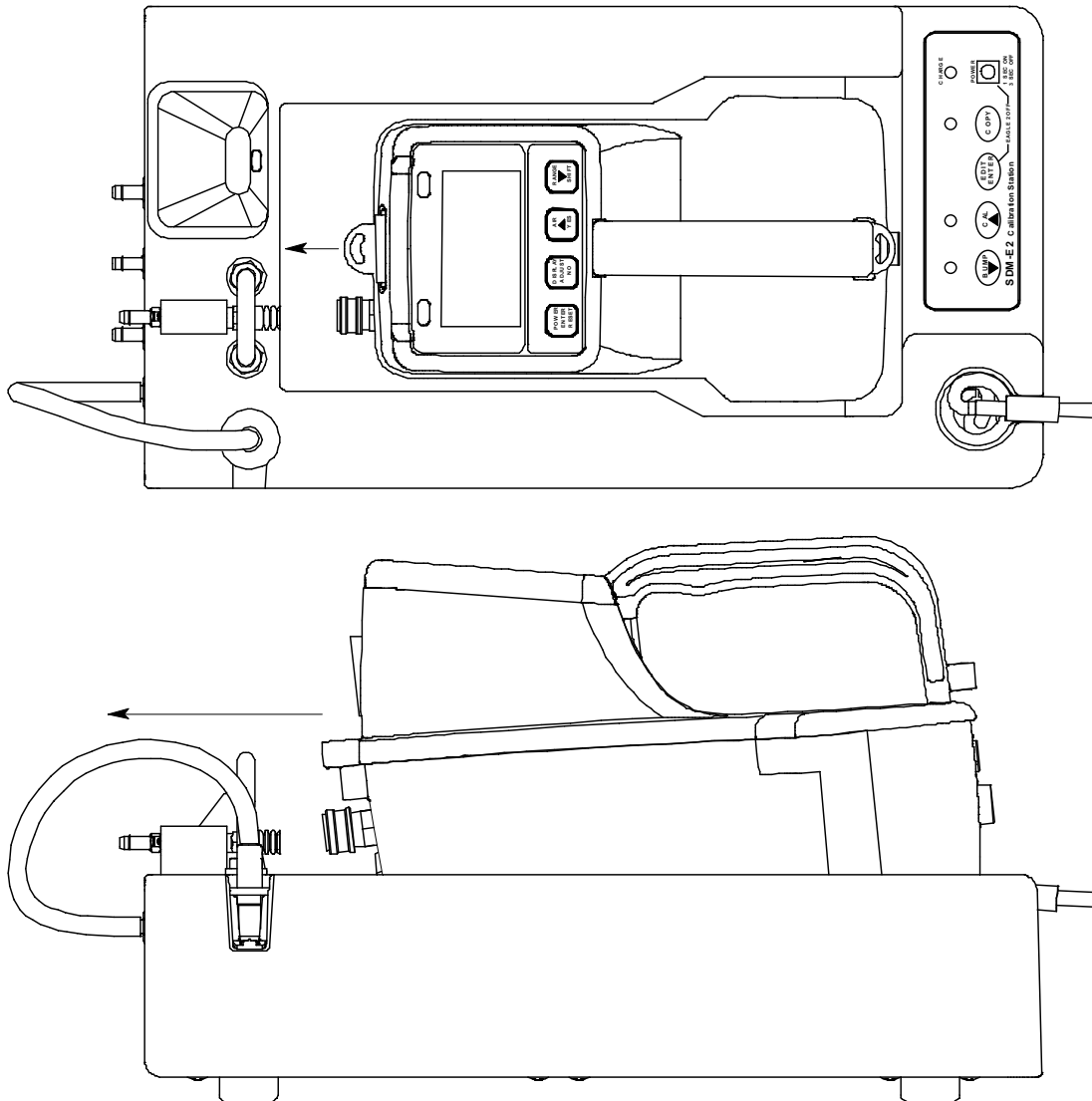

Figure 14: Inserting the EAGLE 2

WARNING: Inserting the EAGLE 2 improperly may damage the exhaust bellow at the back of the SDM-E2.

---

6. If the EAGLE 2 is equipped with NiMH batteries and you wish to charge the batteries, connect the charging cable at the front of the SDM-E2 to the charging jack on the back of the instrument. The CHARGE LED will begin to flash amber. If the batteries are fully charged, the CHARGE LED will become solid green again after about 5 minutes. Typically a bump test or calibration will be initiated before this happens. See "Charging an Instrument in a Docking Station" on page 66 for a complete description of charging the EAGLE 2.

7. Press and hold the POWER ENTER RESET button on the EAGLE 2 until you hear a beep, then release it. The EAGLE 2 will begin its power up sequence. If a successful connection between the EAGLE 2 and the SDM-E2 occurs, the home screen will display at the end of the start up sequence. If the charge LED was amber, it will begin to blink green. The example screen below shows a standard 4-channel EAGLE 2 that also includes an IR CO_2 sensor in channel 5 and an ESM-01 NH_3 sensor in channel 6. The GAS 2 to the right of the CO_2 and NH_3 channels indicate that the GAS 2 fitting will be used for these channels.

CH4	50%LEL	GAS1
OXY	12.0vol%	GAS1
H2S	25.0ppm	GAS1
CO	50ppm	GAS1
CO2	5000ppm	GAS2
NH3	25.0ppm	GAS2

NOTE: If your EAGLE 2 has less than 4 standard channels, only one special sensor, or different special sensors, your gas names and auto calibration values will be different. All screens in this section assume a channel setup as shown above.

8. Verify that the appropriate calibration gas cylinder is connected to the GAS 1 and GAS 2 fittings on the back of the SDM-E2. See "Connecting Calibration Gas" on page 25 for calibration gas cylinder options and calibration gas connection procedures.

WARNING: *RKI Instruments, Inc. recommends that you dedicate a regulator for use with chlorine (Cl_2) gas and that you do not use that dedicated regulator for any other gases, particularly hydrogen sulfide (H_2S).*

9. Connect the gas out to EAGLE 2 line to the inlet fitting on the EAGLE 2.

NOTE: If you have an EAGLE 2 with an IR CO_2 sensor in the 0-10,000 ppm or 0-5.00 %vol range, be sure to replace the air filter at the AIR inlet fitting with the CO_2 scrubber when testing an instrument with a CO_2 sensor installed to ensure that the CO_2 present in fresh air is scrubbed out. Remove the black end caps from each end of the scrubber before installing onto the AIR inlet fitting. Replace the caps when the scrubber is not in use. See the "Spare Parts List" on page 81 for a scrubber with a tubing stub.

---

10. Press and hold the CAL ▲ button until the CAL ▲ LED turns on (about one second) then release it. The calibration begins. During the calibration, the CAL ▲ LED will flash amber indicating that a calibration is in progress and the EAGLE 2 display will show the current readings.

```
CH4      0%LEL     Z
OXY   20.9vol%     Z
H2S      0.0ppm    Z
CO         0ppm    Z
CO2        0ppm    Z
NH3      0.0ppm    Z
```

If you wish to cancel the calibration, press and hold the CAL ▲ button for at least one second until CANCEL appears on the screen.

11. If at any point during the bump test the gas flow to the instrument becomes too low, the bump test will be aborted and the screen will indicate a flow failure.

```
CH4      0%LEL     FLOW
OXY   20.9vol%     FLOW
H2S      0.0ppm    FLOW
CO         0ppm    FLOW
CO2        0ppm    FLOW
NH3      0.0ppm    FLOW
```

If a flow failure occurs, confirm all tubing connections are correct and that all lines are clear.

• To return to the home screen, press and hold the EDIT ENTER button for about 3 seconds.

- To start another calibration, press and release the CAL ▲ button.

- To perform a bump test, press and release the BUMP ▼ button.

12. The "Z" to the right of the gas reading indicates that air is being applied to the instrument for a fresh air adjustment (zero). The SDM-E2 will apply fresh air to the instrument for the time defined by the AIR TIME calibration parameter.

13. The SDM-E2 will perform a fresh air adjustment on the instrument.

- If the air adjustment is successful, the SDM-E2 will continue as described in step 14 below.

```
CH4      0%LEL     Z  P
OXY   20.9vol%     Z  P
H2S      0.0ppm    Z  P
CO         0ppm    Z  P
CO2        0ppm    Z  P
NH3      0.0ppm    Z  P
```

- If one or more of the sensors fails the fresh air adjustment, the SDM-E2 will abort the calibration and will not apply calibration gas. If this happens, the CAL ▲ LED will flash red indicating a failure and the following screen will appear.

```
CH4      0%LEL     Z  P
OXY   20.9vol%     Z  P
H2S      0.0ppm    Z  F
CO         0ppm    Z  P
CO2        0ppm    Z  P
NH3      0.0ppm    Z  P
```

In this case, continue with step 22.

14. The SDM-E2 will apply GAS 1 calibration gas to the instrument for the time defined by the GAS TIME calibration parameter and first calibrate the standard four sensors.

```
CH4     29%LEL          C
OXY   18.0vol%          C
H2S     25.0ppm         C
CO        45ppm         C
CO2     ---------
NH3     ---------
```

The "C" indicates calibration gas is being applied. The gas readings for the fifth and sixth channels will be replaced by dashes since they are not being calibrated yet.

15. The calibration results for the standard 4 channels will be displayed by a P (pass) or an F (fail) to the right of the "C" which indicates it is a calibration result and the fifth channel's calibration will begin. Be sure that the appropriate cylinder for the fifth channel's gas is connected to the GAS 2 fitting.

```
CH4     29%LEL          CF
OXY     18.0vol%        CF
H2S     25.0ppm         CP
CO        45ppm         CP
CO2     3500ppm         C
NH3       ---------
```

16. GAS 2 calibration gas will be applied to the fifth channel and the SDM-E2 will determine if it passes calibration.

```
CH4     29%LEL          CF
OXY     18.0vol%        CF
H2S     25.0ppm         CP
CO        45ppm         CP
CO2     3500ppm         CF
NH3       ---------
```

NOTE: If your instrument has only one special sensor, continue to step 20.

---

17. If your instrument has more than one special sensor, as in this example, you will need to change the GAS 2 cylinder in order for the calibration to continue. In the example below, the EAGLE 2's second special sensor is an ESM-01 for NH_3.The EAGLE 2 screen will appear as shown below:

```
    CHANGE GAS2
      TO NH3

     OK :  EDIT
```

18. Once you have changed the GAS 2 cylinder to the appropriate gas, press and release the EDIT ENTER button on the SDM-E2. The calibration will continue.

```
CH4     29%LEL       CF
OXY    18.0vol%      CF
H2S     25.0ppm      CP
CO       45ppm       CP
CO2    3500ppm       CF
NH3      3.0ppm      C
```

19. Once the GAS 2 calibration gas has been applied for the appropriate amount of time, the SDM-E2 will determine if the sixth channel passed the calibration.

```
CH4     29%LEL       CF
OXY    18.0vol%      CF
H2S     25.0ppm      CP
CO       45ppm       CP
CO2    3500ppm       CF
NH3      3.0ppm      CF
```

20. The SDM-E2 will then purge the system with fresh air for the time defined by the AIR TIME calibration parameter. The calibration results will be displayed with a P (pass) or an F (fail) while a fresh air purge is performed.

```
CH4     29%LEL       CF
OXY    18.0vol%      CF
H2S     25.0ppm      CP
CO       45ppm       CP
CO2    3500ppm       CF
NH3      3.0ppm      CF
```

21. Once the fresh air purge is finished, the CAL ▲ LED will stop blinking and be steadily green if the calibration passed or steadily red if the calibration failed.

22. After a successful or failed calibration,

- To perform any other operations:

  To perform a bump test, press and hold the BUMP ▼ button until the pump starts. To perform another calibration, press and hold the CAL ▲ button until the pump starts. To return to the home screen, press and hold the EDIT ENTER button until the home screen appears.

- To turn the EAGLE 2 off:

  If the calibration was successful, the instrument will shut off after 15 seconds. If the calibration failed, the instrument will shut off after 10 minutes. If buttons are pressed before the SDM-E2 turns off the instrument, it will automatically turn it off 10 minutes after the last button push.

  To turn off the instrument before it is automatically turned off, press and hold the EDIT ENTER and POWER buttons simultaneously for at least one second and then release them.

CAUTION: *When using the EAGLE 2 with the SDM-E2, do not turn off the instrument using the instrument power button. Use the EDIT ENTER and POWER buttons on the SDM-E2 to turn off the instrument.*

The CAL ▲ LED will remain on indicating the test results. If the same EAGLE 2 is turned on again, the test results will still be indicated by the CAL ▲ LED and on the EAGLE 2 screen. To clear the CAL ▲ LED, with the EAGLE 2 on, press and release the EDIT ENTER button to return to the home screen. If a new EAGLE 2 is turned on and connected, the results displayed by the CAL ▲ LED will automatically be cleared.

23. The results of the calibration will be stored in the SDM-E2's memory and will be available to copy to a USB flash drive. See "Copying Calibration and Bump Test Records to a USB Flash Drive" on page 69 for instructions to copy the saved bump test and calibration records to a USB flash drive.

24. Disconnect the charger cable, if connected, and the gas out to EAGLE 2 line from the EAGLE 2.

25. Remove the EAGLE 2 from the SDM-E2.

26. If you wish to calibrate additional instruments, repeat step 5 - step 21 above for each additional instrument.

Troubleshooting

NOTE: This troubleshooting guide describes SDM-E2 problems only. See the EAGLE 2 Operator's Manual for problems you may encounter with the EAGLE 2.

Table 6: Troubleshooting the SDM-E2

Symptoms	Probable Causes	Recommended Action
• Fresh air adjustment fails	• The SDM-E2 is not in a fresh air environment or the cylinder being used is not a zero air cylinder. • If a zero air cylinder is used, the calibration cylinder is out of gas. • If a zero air cylinder is used, the gas out to EAGLE 2 line is not connected to the inlet of the EAGLE 2.	1. Confirm that the SDM-E2 is in a fresh air environment or that a zero air cylinder is attached to the AIR fitting. 2. If a zero air cylinder is used, verify that it contains an adequate supply of test sample. 3. Check to make sure the gas out to EAGLE 2 line is connected to the inlet of the EAGLE 2. 4. If a zero air cylinder is used, check all calibration tubing for leaks or for any bad connections. 5. If the fail condition continues, replace the sensor(s) in the EAGLE 2. 6. If the difficulties continue, contact RKI Instruments, Inc. for further instruction.
• Calibration fails	• The auto calibration values do not match the cylinder gas concentrations. • The calibration cylinder is out of gas or is outdated. • The calibration cylinder is not connected to the appropriate GAS 1 or GAS 2 fitting. • The gas out to EAGLE 2 line is not connected to the inlet of the EAGLE 2. • The tubing from the regulator to the GAS 1 or GAS 2 fitting is not connected.	1. Confirm that the auto calibration values match the concentrations listed on the gas cylinder. 2. Verify that the calibration cylinder contains an adequate supply of fresh test sample. 3. Verify that the calibration cylinder is connected to the appropriate GAS 1 or GAS 2 fitting. 4. Check to make sure the gas out to EAGLE 2 line is connected to the inlet of the EAGLE 2. 5. Check all calibration tubing for leaks or for any bad connections. 6. If the fail condition continues, replace the sensor(s) in the EAGLE 2. 7. If the difficulties continue, contact RKI Instruments, Inc. for further instruction.

• No IR connection between EAGLE 2 and SDM-E2	• SDM-E2 is not turned on. • The EAGLE 2 is not correctly inserted into the instrument cradle. • The IR window is dirty.	1. Turn on the SDM-E2. If it does not turn on, check that the AC adapter is plugged into an AC socket and to the jack on the back of the SDM-E2. 2. Check to make sure the EAGLE 2 is inserted properly. 3. Clean the IR window on the SDM-E2. 4. If the difficulties continue, contact RKI Instruments, Inc. for further instruction.
• Control buttons do not function correctly for standalone operation	• The SDM-E2 is connected to a computer and the PC Controller program is running.	1. Disconnect the USB cable from the back of the SDM-E2 if it is connected. See the SDM-E2 PC Controlled Configuration Operator's Manual for instructions to use the SDM-E2 in PC Controlled configuration.
• The COPY function does not copy files to the USB drive	• The USB drive is defective. • The USB drive is not inserted properly. • The SDM-E2 is connected to a computer, the PC Controller program is running, and an instrument is turned on.	1. Perform a COPY operation with a different USB drive. 2. Be sure that the USB drive is inserted correctly. 3. Disconnect the SDM-E2 from the computer. 4. If the difficulties continue, contact RKI Instruments, Inc. for further instruction.
• The batteries in the EAGLE 2 are not charging	• The EAGLE 2 has alkaline batteries installed. • One of the rechargeable batteries is faulty. • The charging plug from the SDM-E2 is not fully inserted in the EAGLE 2 jack. • The charger is malfunctioning.	1. Check to make sure your EAGLE 2 doesn't have alkaline batteries installed. 2. Replace the rechargeable batteries and attempt to charge them. 3. Be sure that the charging plug from the SDM-E2 is fully inserted in the EAGLE 2 jack. 4. If the difficulties continue, contact RKI Instruments, Inc. for further instruction.

Charging an Instrument in a Docking Station

The SDM-E2 can be used to charge the rechargeable NiMH batteries in an EAGLE 2 equipped with them. To maximize the EAGLE 2's run time and the battery life, make sure the batteries' charge is as low as possible before recharging them.

WARNING: *Do not plug the charger cable into a battery pack that contains alkaline batteries. Do not attempt to charge alkaline batteries.*

Recharing a Battery Pack After Performing a Bump Test or Calibration

1. Perform a bump test or calibration on an instrument as described in "Bump Testing Instruments with Standard Sensors" on page 28 or "Calibrating Instruments with Standard Sensors" on page 36.

2. After the bump test or calibration has been completed, turn off the instrument by pressing and holding the EDIT ENTER and POWER buttons simultaneously until the instrument turns off, about one second, and then releasing them. If no buttons are pressed for 10 minutes, the docking station will automatically turn off the instrument and begin the charge cycle.

3. Be sure that the AC adapter is plugged into a wall outlet, that the power jack is plugged into the back panel of the SDM-E2, and that the charger cable is plugged into the back of the EAGLE 2.

4. Before you plug in the charger cable, the CHARGE LED will be blinking green. After you plug in the charger cable, the CHARGE LED will blink amber. The BUMP ▼ and/or CAL ▲ LED will continue to be either green or red depending on the result of the previous bump test or calibration.

NOTE: The SDM-E2 does not start charging the batteries until the EAGLE 2 is off. If the charger cable is plugged into the charging jack on the EAGLE 2 while the instrument is still on, the CHARGE LED will blink green. Once the instrument is shut off, the CHARGE LED will begin to blink amber.

5. If the battery pack is fully charged, then the CHARGE LED will turn solid green in a few minutes.

   If the battery pack is drained enough for the docking station to charge it, the CHARGE LED will continue to blink amber while charging is taking place. The SDM-E2 will take approximately 10 hours to charge a fully discharged EAGLE 2.

   If you are attempting to charge alkaline batteries, the CHARGE LED will either turn steadily red or start to blink red 2-3 minutes after the charger cable has been plugged into the charger jack.

If the charging process encounters a fail condition, the CHARGE LED will turn steadily red. A fail condition could indicate that there is something wrong with the NiMH batteries, or that there is something wrong with the charger.

6. When the charge is complete, the CHARGE status LED will turn solid green.

Recharging a Battery Pack Without Performing Any Operations

1. Confirm that the AC Adapter is connected to the SDM-E2 and to an AC wall socket and that the power jack is plugged into the back panel of the SDM-E2.

2. Plug the charger cable into the EAGLE 2.

3. Press and hold the SDM-E2's POWER button. The LEDs will turn amber.

4. When the BUMP ▼ and CAL ▲ LEDs turn off, release the POWER button.

5. The CHARGE LED will be blinking amber.

6. If the battery pack is fully charged, then the blinking amber LED will turn solid green in a few minutes.

   If the battery pack is drained enough for the SDM-E2 to charge it, the CHARGE LED will continue to blink amber while charging is taking place. The SDM-E2 will take approximately 10 hours to charge a fully discharged EAGLE 2.

   If you are attempting to charge alkaline batteries, the CHARGE LED will either turn steadily red or start to blink red 2-3 minutes after the charger cable has been plugged into the charger jack.

If the charging process encounters a fail condition, the CHARGE LED will turn steadily red. A fail condition could indicate that there is something wrong with the NiMH batteries, or that there is something wrong with the charger.

7. When the charge is complete, the CHARGE status LED will turn solid green.

Batteries Too Drained for Standalone Operation

If the charger is connected to the EAGLE 2 and the batteries in the EAGLE 2 do not have enough power to keep the instrument on, it will go into a 20 minute charge cycle and the following screen will be displayed on the EAGLE 2.

```
LOW BATTERY

PLEASE WAIT
WHILE CHARGING

19'59"
```

It will not connect to the SDM-E2. The instrument cannot be bump tested or calibrated in the charge cycle. Once the 20 minute charge cycle has ended, the unit will automatically turn back on and connect to the SDM-E2. The unit can now be bump tested or calibrated.

Calibration and Bump Test Records

The SDM-E2 saves a record of each bump test and calibration performed. It is capable of saving up to 200 such records. When an SDM-E2's memory becomes full, the oldest record is overwritten when a new record is saved. The records saved in the SDM-E2's memory can be saved to a USB flash drive using the USB port on the front.

Available Memory in the SDM-E2

The COPY LED indicates how much of the SDM-E2's memory has been used. The table below describes the various indications.

Table 7: COPY LED Indications

COPY LED Indication	Memory Used
Off	None. No records are saved
Solid Green	Less than 80% of the SDM-E2's memory has been used.
Solid Amber	More than 80% of the SDM-E2's memory has been used.
Solid Red	The docking station's memory is full. A newly saved record will overwrite the oldest one.

Copying Calibration and Bump Test Records to a USB Flash Drive

The SDM-E2 will only perform a copy operation if there is at least one record saved in its memory. If there are no records saved in the docking station's memory, the COPY LED will be off and the COPY button will not function. Do the following to copy calibration and bump test records in the SDM-E2's memory to a USB flash drive.

NOTE: The USB port on the front of the docking station cannot be used to connect the SDM-E2 to a computer, only to save calibration and bump test records to a USB flash drive.

---

1. Confirm that the AC Adapter is connected to the SDM-E2 and to an AC wall socket.

2. Press and hold the SDM-E2's POWER button. The LEDs will turn amber.

3. When the BUMP ▼ and CAL ▲ LEDs turn off, release the POWER button.

4. The COPY LED will be off or on steadily and the CHARGE LED will be blinking green.The amount of free memory in the SDM-E2 will dictate the condition of the COPY LED (see "Available Memory in the SDM-E2" above).

5. Install a USB flash drive into the USB port on the front of the SDM-E2. The

SDM-E2 will take a few seconds to determine how much memory is available in the flash drive.

- If the flash drive's available memory is not enough for the contents of the SDM-E2's memory, the COPY LED will alternate between green and red. Enough memory will have to be cleared in the flash drive to make room for the records in the SDM-E2's memory.

- If there is enough available memory in the flash drive for the contents of the SDM-E2's memory, the COPY LED will begin flashing in the same color that it was before installing the flash drive.

6. Press and hold the COPY button until the COPY LED turns red, then release it. The COPY LED will become solid red while the records in the docking station's memory are copied to the flash drive. In addition, if the flash drive has an LED, it will begin to blink.

7. When the COPY LED returns to its original color and begins blinking again and the flash drive's LED (if it has one) stops blinking, the copy operation is complete. Remove the flash drive from the USB port.

NOTE: If you pull out the flash drive while its LED is still blinking and the COPY LED is still solid red, the file saved in the flash drive with the calibration and bump test records may be incomplete.

---

8. If the flash drive has not already been used with a docking station, a folder named **DAT** will be created on the flash drive and a file with all the saved calibration and bump test records will be saved to this folder.

    If the flash drive has been used before with a docking station, the file will be saved to the existing **DAT** folder.

9. The files on the flash drive can now be either transferred to a computer or kept on the flash drive for use with the Single Module Data Viewer Software. See "Bump Test and Calibration Record Files" below for a discussion of these files and how to use them.

Clearing the SDM-E2's Memory

Make sure that you save the bump test and calibration records in the SDM-E2's memory to a flash drive before clearing its memory. The docking station's memory can be cleared by simultaneously pressing and holding the CAL ▲ and COPY buttons for five seconds. After the SDM-E2's memory has been cleared, the COPY LED will turn off indicating there are no records to be copied.

Bump Test and Calibration Record Files

Each time a copy function is performed, a file is saved to the flash drive in the **DAT** folder. The file name will begin with "SDM-E2" and the remainder of the file name will depend on the serial number of the SDM-E2 used and the date of the most recent bump test or calibration performed on the SDM-E2. So it is possible to have multiple files in the DAT folder from the SDM-E2.

The files that an SDM-E2 saves to a USB flash drive are structured so that they can be imported into a database controlled by the Single Module Data Viewer Software. See "Importing Files Into the Database" on page 74 for instructions to add files to the database.

Bump Testing or Calibrating and Saving Files To a Flash Drive Multiple Times In One Day

The SDM-E2 assigns file names to calibration and bump test record files based on the day of the most recent calibration or bump test record saved in the docking station's memory. If a copy operation is performed, then additional bump tests or calibrations are performed, and another copy operation is performed with the same flash drive all on the same day, the existing file on the flash drive from the first copy operation will be overwritten by the file from the second copy operation because its name will be the same as the new file. In this case, no information is lost since the second file saved to the flash drive includes all the records that were in the first file.

However, if a copy operation is performed, and **the SDM-E2's memory is cleared**, then additional bump tests or calibrations are performed, and another copy operation is performed with the same flash drive all on the same day, this will result in the information in the file from the first copy operation being lost. This is because the file saved to the flash drive in the second copy operation only includes records since the memory was cleared and when it overwrites the file from the first copy operation, all the information in the first file is lost.

CAUTION: *If copying an SDM-E2's memory to a flash drive multiple times during the same day and the SDM-E2's memory is cleared, transfer the calibration/bump test record files from the flash drive to a computer hard drive or some other memory device before performing another copy operation to avoid loss of data.*

Chapter 5: Single Module Data Viewer Program

Overview

The Single Module Data Viewer Program is used to view, organize, and print bump test and calibration records that were created by the SDM-E2 while used in the standalone configuration. It can also be used to export these records from its database for use in other programs. This chapter describes how to use the Single Module Data Viewer Program.

Launching the Single Module Data Viewer Program

1. Click **Start** on the Windows® Icon Tray, then select **Programs/Single Module Data Viewer**.

NOTE: If you are starting the software for the first time, a message window appears informing you that a database has been created. If this occurs, click **OK**.

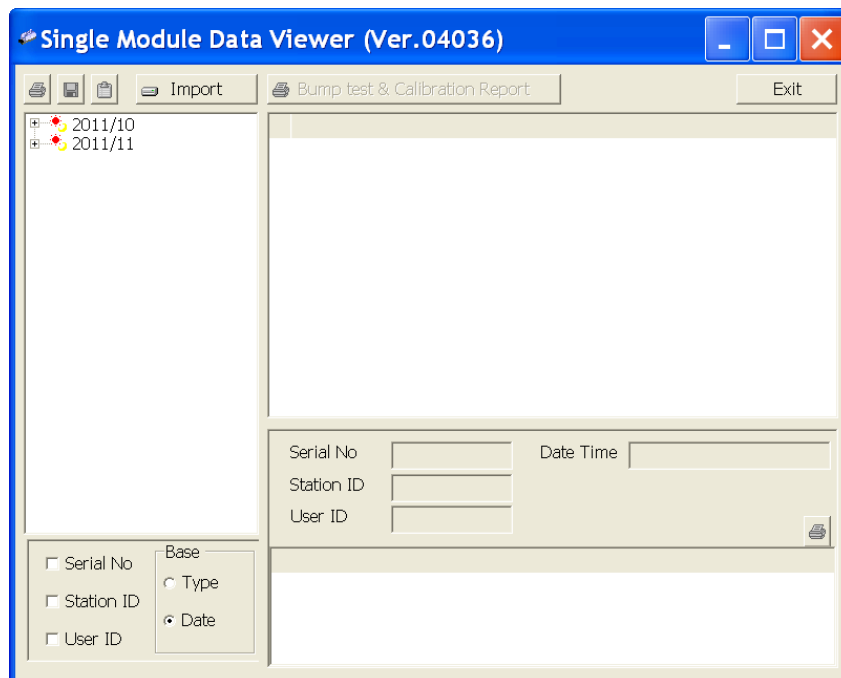2. The Single Module Data Viewer program is launched and the data viewing window appears.

Figure 15: Single Module Data Viewer Window

Using the Single Module Data Viewer Program
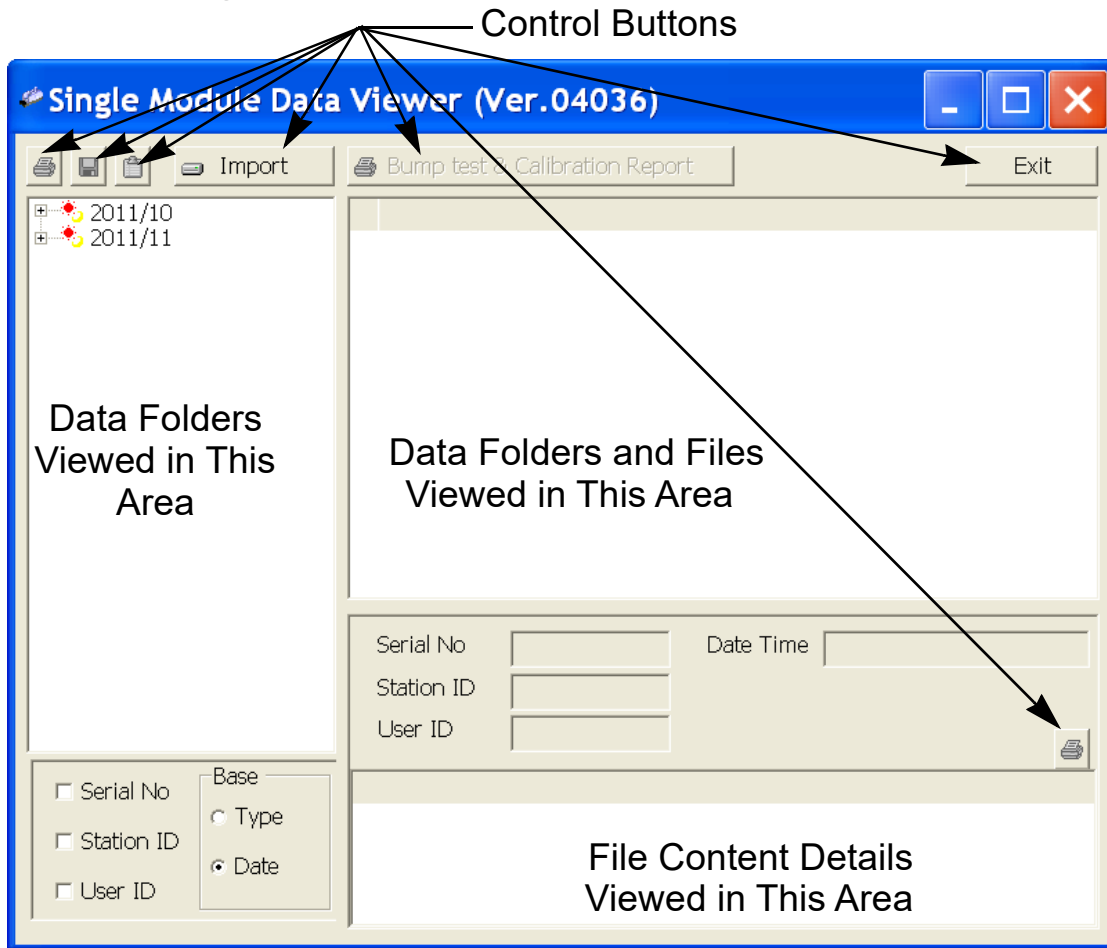
Data Viewing Window

Figure 16: Data Viewing Window

All of the operations that can be performed in the Single Module Data Viewer Program can be executed from the data viewing window. There are function buttons along the top of the window and one in the lower right that initiate the various operations. The upper left side of the window displays the contents of the database. The lower left corner of the window has selection boxes that allow you to organize the data. The upper right side of the window shows the contents of the item selected in the upper left side, and the lower right side indicates the contents of the item selected in the area above it. In the example above, the data is organized by date.

You can do the following in the data viewing window:

- Import files into the database that were created by an SDM-E2

- View the bump test and calibration data saved in the database.

- Delete data.

- Print bump test or calibration results (pass or fail indication only).

- Copy bump test or calibration records to the clipboard or to a particular location on your computer or network.

- Print a bump test or calibration report that includes the results and all gas readings.

Importing Files Into the Database

The files generated by the SDM-E2 are structured to be imported into the Single Module Data Viewer Program database. To import data files into the database, do the following:

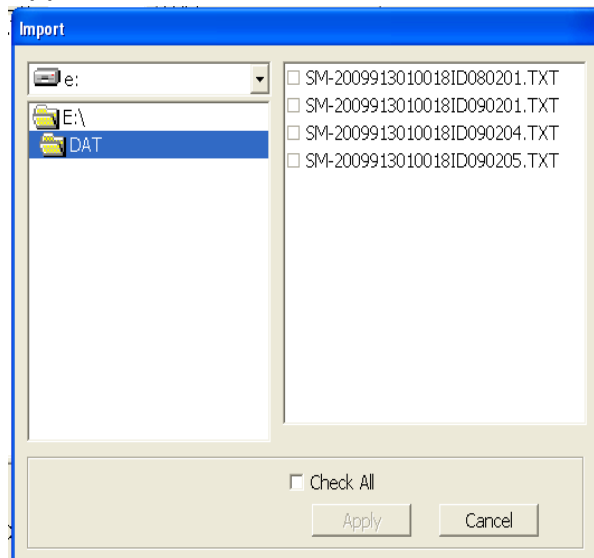1. While in the Data Viewing Window, click the **Import** button. The Import Window will appear.

Figure 17: Import Window

2. Navigate to the location of the files that you want to import into the database.

3. Select the files that you want to import or use the Check All box to select all of the files.

4. Click the **Apply** button. A window will appear for a few seconds indicating that the file or files are being imported.

5. The files are now added to the database.

Organizing the Data

When viewing the data, it can be organized in two ways:

1. Base View Format

    In base view format, neither of the Serial No, Station ID, or User ID selection boxes in the lower left of the window are selected and the Base box appears next to these selection boxes with two radio buttons. The data can be organized by either the data Type (bump test and calibration data) or by Date (year and month). The example below shows the data organized by Type.
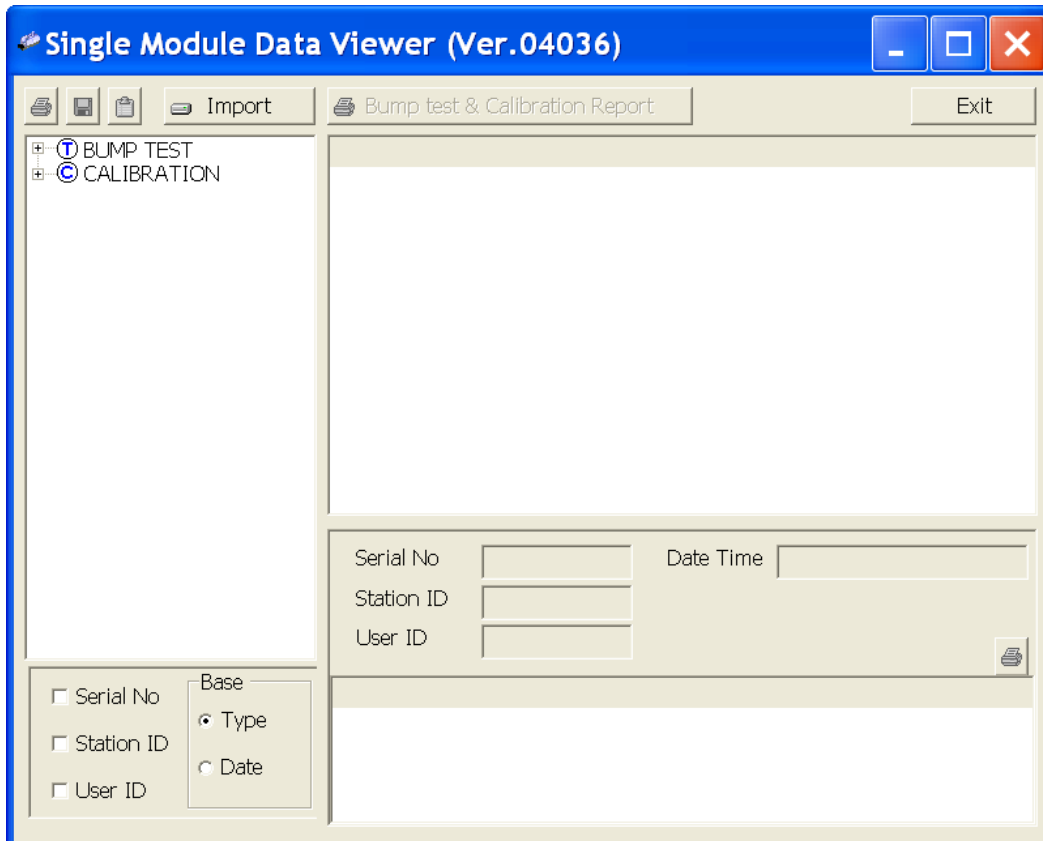
Figure 18: Data in Base Viewing Format

2. ID View Format

In ID view format, the data can be organized by one or more of the following items depending on which selection box or boxes in the lower left corner of the data viewing window are selected:

- Serial Number

- Station ID

- User ID

If any of these boxes is selected, the Base box disappears. The example below shows the data organized by serial number.
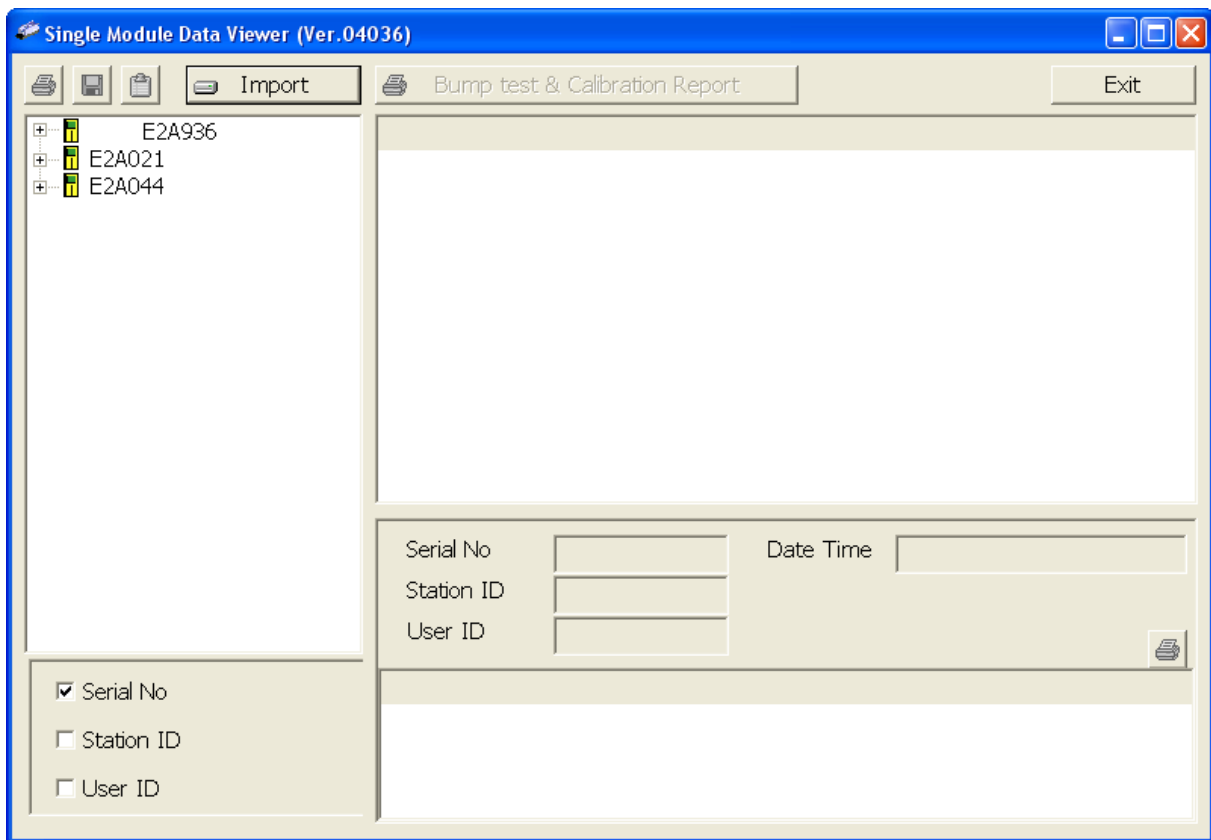

Figure 19: Data in ID Viewing Format

Viewing the Data

Once you have selected how you want to organize the data:

1. Click the expanded view symbol (+) next to an item, folder or icon, in the left side of the data viewing window or double click the item to view the contents below it. Single click on an item to view the contents in the right side of the window. If an item is expanded and you want to close it, click the (-) symbol next to the item or double click it.

2. When an item no longer has a (+) or (-) symbol next to it, single click it and the contents of the item will be shown on the right side of the window.

3. If you are viewing data in base view format with the data organized by type, expand the item, bump test or calibration, you wish to view. Icons organized by year/month will appear below the bump test or calibration icon. Click on the item whose contents you wish to see. The bump test or calibration files will be shown in the upper right side of the data view window.
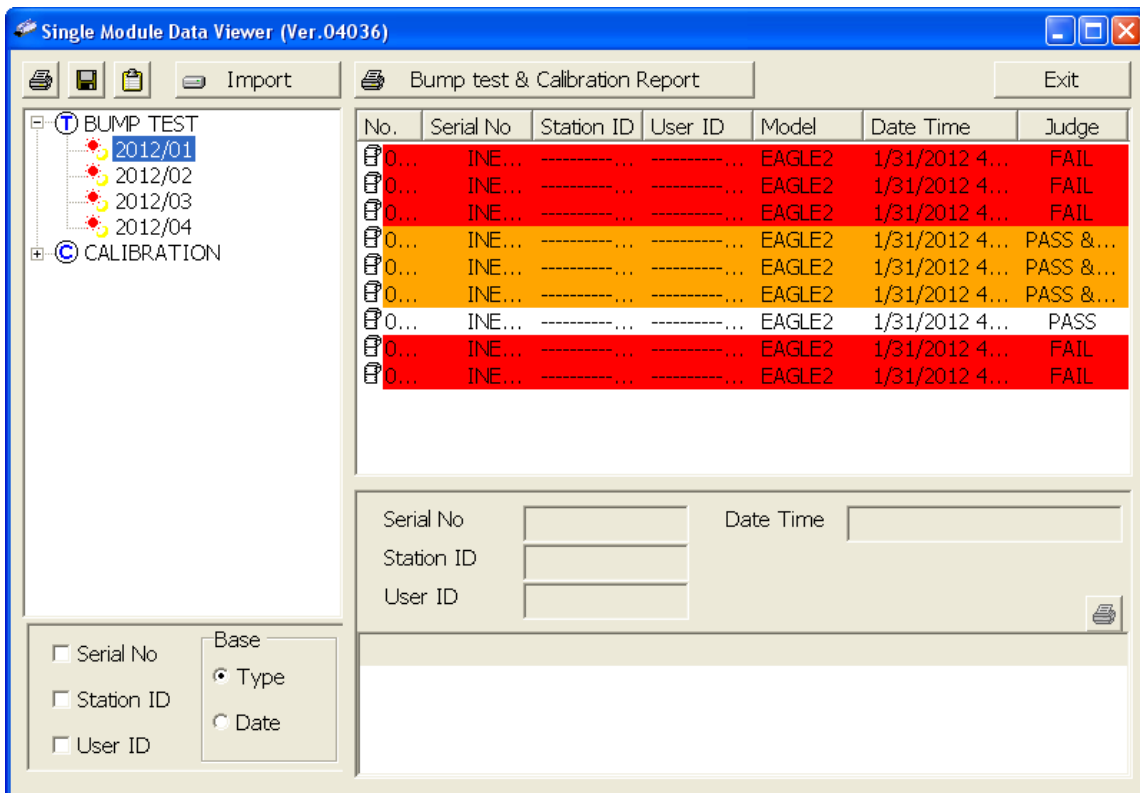

Figure 20: Calibration/Bump Test Files in Base View Format by Type

If you organize the data by date, then folders organized by year/month appear in the left side of the window. Expand the folder you want to see and click on the calibration or bump test folder. The calibration or bump test files will appear in the upper right side of the window.
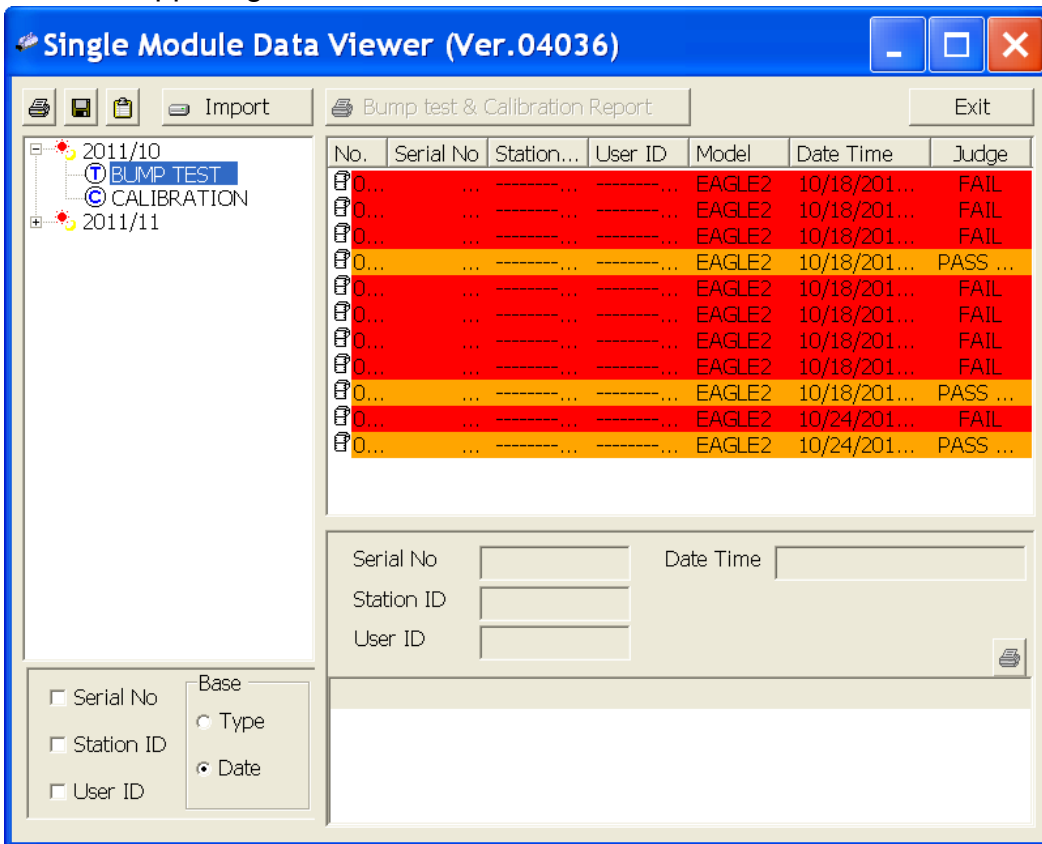

Figure 21: Calibration/Bump Test Files in Base View Format by Date

If you are viewing data in ID view format, expand the folders in the left side of the window until the bump test or calibration folder you wish to view is visible. Expand the folder by clicking the (+) symbol next to it. Folders organized by year/month will be listed below the calibration or bump test folder. Click the folder whose contents you want to view and the calibration or bump test files in it will be shown in the upper right side of the data view window. The example below is organized by serial number.
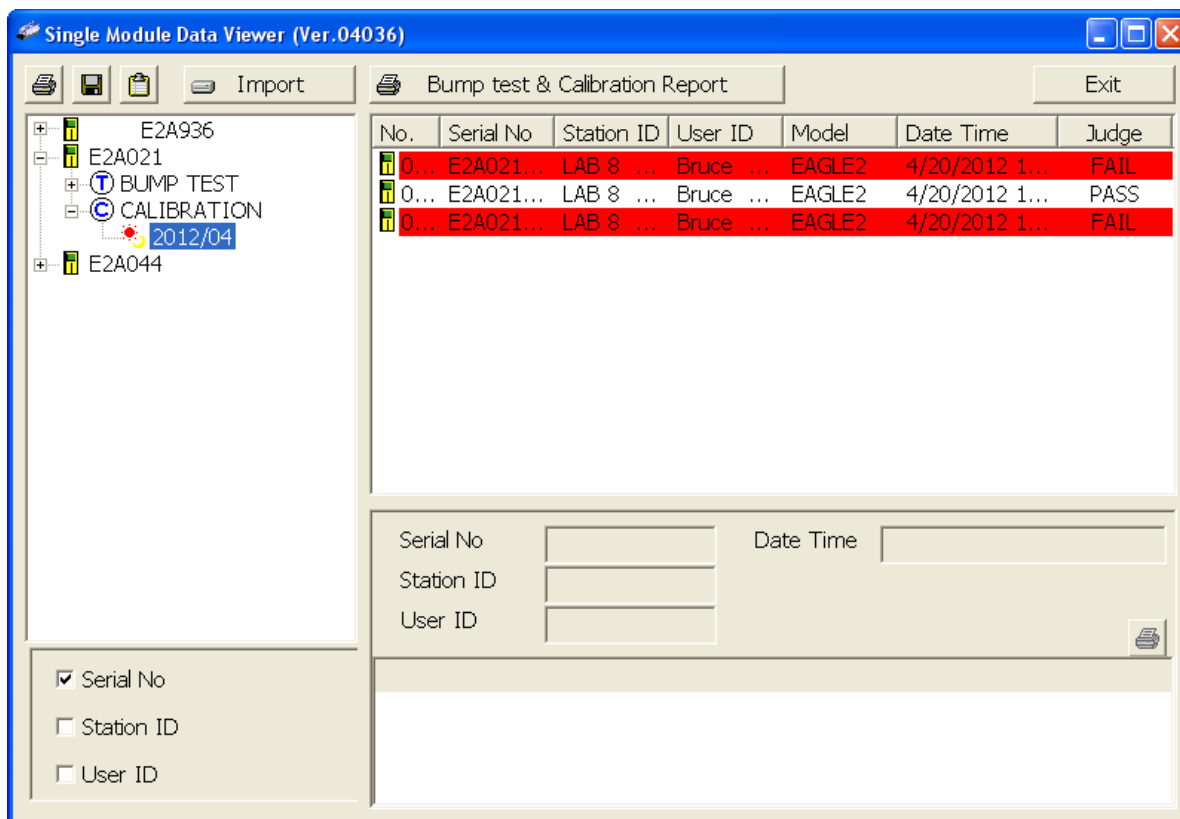

Figure 22: Calibration/Bump Test Files in ID View Format

4. Files that record a failed calibration or bump test on all channels are highlighted in red. Files that record a calibration or bump test where not all channels passed are highlighted in orange.

5. To view the file contents, click on the file in the upper right part of the data view window that you wish to view. The contents in the file will appear in the lower right part of the window. The contents include the instrument's serial number, station ID, user ID, bump test or calibration time, test gas, and gas readings during the operation.

6. To print the files as they appear in the upper right part of the data view window, click the print button in the upper left corner of the window. A dialog box will appear confirming if you want to print. Click **OK**.

7. To print only the pass or fail result of all files in the upper right window, click the **Bump test & Calibration Report** button above the files. A dialog box will

appear showing the selected printer and confirming if you want to print. Verify that the selected printer is correct and click **OK**.

8. To print the complete results, pass/fail and gas readings, of one of the files in the upper right part of the data view window, click on one of the files to select it and then click the print button that appears above the file details in the lower right. A dialog box will appear showing the selected printer and confirming if you want to print. Verify that the selected printer is correct and click **OK**.

9. To save files as they appear in the upper right part of the data view window, click the **Save To File** button to the right of the print button in the upper left corner of the window. The **Save To File** button has a floppy disk icon in it. A "Save As" dialog box will appear for you to specify the filename, file location, and file type. Select the **Text files (*.csv)** choice to save the information as a comma separated value file that may be opened with a spreadsheet program such as Microsoft Excel.

10. To save files to the clipboard as they appear in the upper right part of the data view window, click the **Copy To Clipboard** button. The **Copy To Clipboard** button has a clipboard icon in it. The file will be saved to the clipboard. It can then be pasted into a document by using the Paste command in an application.

Deleting Data

You can delete an instrument, bump test data, or calibration data in the data view window. The delete function is password protected to avoid accidental deletion of instruments or data. To delete an instrument or data, perform the following:

1. Find the item you wish to delete and right click it. A window will appear that says "Delete(D) Change Password(C)".

2. Click on "Delete(D)". A password entry window will appear.

3. Enter the password and click **OK**. The factory set password is "ABCDE" and is case sensitive. A confirmation window will appear.

4. Click **OK** to complete the deletion of the selected item.

Changing the Password

The factory password is "ABCDE" and is case sensitive. You can change the password in the data view window. To change the password perform the following:

1. Right click in the upper right or upper left part of the data view window. A window will appear that says "Delete(D) Change Password(C)".

2. Click on "Change Password(C)". A window will appear prompting you for the current password.

3. Enter the current password and click the **Current Password** button. A window will appear prompting you for the new password.

4. Enter the new password and click the **New Password** button. A confirmation

window will appear prompting you for the new password again.

5. Enter the new password again and click the **Confirm New Password** button. A window will appear indicating that the password has been changed.

6. Click **OK** to complete the password update.

Exiting the Program

To exit the Single Module Data Viewer Program, do the following:

1. Click the **Exit** button in the upper right corner of the data view window. A confirmation window will appear.

2. Click the **OK** button to exit the program or the **Cancel** button to return to the program.

Spare Parts List

Table 8: Spare Parts List

Part Number	Description
06-1248RK	Polyurethane tubing, 5/16-inch OD x 3/16-inch ID, for connecting to inlet fittings and the exhaust fitting
06-1248RK-03	3 foot length of 5/16-inch OD x 3/16-inch ID, for connecting calibration cylinder to inlet fittings
33-0167RK	Particle air filter replacement, CF-8369
33-6010RK-04	CO_2 scrubber
49-0115RK	Single-port AC adapter
49-2058RK-03	3-port AC adapter
71-0224RK	Operator's Manual, SDM-E2 Docking Station Standalone Configuration (this document)
71-0251RK	Operator's Manual, SDM-E2 Docking Station PC Controller Configuration
71-8006RK	Product CD, SDM-E2, includes Single Module Data Viewer and PC Controller Programs
81-0012RK-01	Calibration cylinder, 50 %LEL CH_4 in air, 34 liter steel
81-0012RK-03	Calibration cylinder, 50 %LEL CH_4 in air, 103 liter steel
81-0013RK-01	Calibration cylinder, 50% vol CH_4 in N_2, 34 liter steel
81-0013RK-05	Calibration cylinder, 50% vol CH_4 in N_2, 58 liter steel

Table 8: Spare Parts List

Part Number	Description
81-0018RK-01	Calibration cylinder, 50 %LEL isobutane in air, 34 liter steel
81-0018RK-03	Calibration cylinder, 50 %LEL isobutane in air, 103 liter steel
81-0023RK-01	Calibration cylinder, H_2, 8% volume in nitrogen, 34 liter steel
81-0024RK-01	Calibration cylinder, H_2, 100% volume, 34 liter steel
81-0025RK-01	Calibration cylinder, 35% CO_2/50% CH_4, balance N_2, 34 liter steel, intended for landfill applications
81-0071RK-01	Calibration cylinder, 5000 ppm CO_2 in nitrogen, 34 liter
81-0071RK-03	Calibration cylinder, 5000 ppm CO_2 in nitrogen, 103 liter
81-0072RK-01	Calibration cylinder, 2.5 %vol CO_2 in nitrogen, 34 liter
81-0072RK-03	Calibration cylinder, 2.5 %vol CO_2 in nitrogen, 103 liter
81-0073RK-01	Calibration cylinder, 15 %vol CO_2 in nitrogen, 34 liter
81-0073RK-03	Calibration cylinder, 15 %vol CO_2 in nitrogen, 103 liter
81-0076RK	Zero air cylinder,17 liter steel
81-0076RK-01	Zero air cylinder, 34 liter steel
81-0076RK-03	Zero air cylinder,103 liter steel
81-0090RK-01	Three-gas calibration cylinder, 50% LEL CH_4/12% O_2/50 ppm CO, 34 liter steel
81-0090RK-03	Three-gas calibration cylinder, 50% LEL CH_4/12% O_2/50 ppm CO, 103 liter steel
81-0103RK-01	Calibration cylinder, isobutylene, 100 ppm in air, 34 liter steel
81-0103RK-03	Calibration cylinder, isobutylene, 100 ppm in air, 103 liter steel
81-0103RK-04	Calibration cylinder, isobutylene, 100 ppm in air, 34 liter aluminum
81-0104RK-01	Calibration cylinder, isobutylene, 10 ppm in air, 34 liter steel
81-0104RK-03	Calibration cylinder, isobutylene, 10 ppm in air, 103 liter steel
81-0104RK-04	Calibration cylinder, isobutylene, 10 ppm in air, 34 liter aluminum
81-0142RK-02	5-gas calibration cylinder, CH_4/O_2/H_2S/CO/SO_2, 58 liter aluminum

Table 8: Spare Parts List

Part Number	Description
81-0142RK-04	5-gas calibration cylinder, $CH_4/O_2/H_2S/CO/SO_2$, 34 liter aluminum
81-0143RK-02	Five-gas calibration cylinder, $CH_4/O_2/H_2S/CO/IBL$, 58 liter aluminum
81-0143RK-04	Five-gas calibration cylinder, $CH_4/O_2/H_2S/CO/IBL$, 34 liter aluminum
81-0154RK-02	Four-gas calibration cylinder, 50% LEL CH_4/12% O_2/50 ppm CO/ 25 ppm H_2S, 58 liter aluminum
81-0154RK-04	Four-gas calibration cylinder, 50% LEL CH_4/12% O_2/50 ppm CO/ 25 ppm H_2S, 34 liter aluminum
81-0158RK-02	Four-gas calibration cylinder, 50% LEL Isobutane/12% O_2/50 ppm CO/25 ppm H_2S, 58 liter aluminum
81-0158RK-04	Four-gas calibration cylinder, 50% LEL Isobutane/12% O_2/50 ppm CO/25 ppm H_2S, 34 liter aluminum
81-0170RK-02	Calibration cylinder, 5 ppm SO_2 in nitrogen, 58 liter
81-0170RK-04	Calibration cylinder, 5 ppm SO_2 in nitrogen, 34 liter
81-0175RK-02	Calibration cylinder, 10 ppm NH_3 in nitrogen, 58 liter
81-0175RK-04	Calibration cylinder, 10 ppm NH_3 in nitrogen, 34 liter
81-0185RK-02	Calibration cylinder, 0.5 ppm PH_3 in nitrogen, 58 liter
81-0192RK-02	Calibration cylinder, 2 ppm Cl_2 in nitrogen, 58 liter
81-0192RK-04	Calibration cylinder, 2 ppm Cl_2 in nitrogen, 34 liter
81-0196RK-02	Calibration cylinder, 10 ppm HCN in nitrogen, 58 liter
81-0196RK-04	Calibration cylinder, 10 ppm HCN in nitrogen, 34 liter
81-1054RK	Demand flow regulator, 58/103 liter cylinders
81-1055RK	Demand flow regulator, for 17/34 liter steel cylinders
81-SDME2	Docking Station for EAGLE 2
814-101-P25	Calibration kit, 5-gas with IBL, 58 liter aluminum cylinder
814-101-P25-DLV	Calibration kit, 5-gas with IBL, 34 liter aluminum cylinder

Appendix A: Bump Testing and Calibrating EAGLE 2s with IR Sensors

The default gas port assignments for EAGLE 2s that have IR sensors installed are different from EAGLE 2s without IR sensors and depend on the type of IR sensor. Table 9 below outlines the default gas port assignments for various typical sensor combinations. The gas combinations listed under the "Multiple IR Sensors" section are listed as the channels appear on the screen. The gas port assignments can be changed if the default assignment is not desireable. See "Setting the Gas Inlet Parameters" on page 22 for instructions to change the gas port assignment.

NOTE: These default gas port assignments apply only to the SDM-E2 when used in its Standalone Configuration. See the SDM-E2 PC Controlled Configuration Operator's Manual for a description of the PC Controller Program's default gas port assignments for IR sensors.

Table 9: Default Gas Port Assignments for IR Sensors

EAGLE 2 Gas Combination	IR Sensor Gas Port Assignment
Infrared Hydrocarbon Sensors	
Standard 4 + IR "HC" (LEL only or autoranging)	GAS 1
IR "HC" (LEL or autoranging) only	GAS 1
Standard 4 + IR "IBU" (LEL only or autoranging)	GAS 1
IR "IBU" (LEL or autoranging) only	GAS 1
Standard 4 + IR "custom name" (LEL only or autoranging)*	GAS 2
IR "custom name" (LEL or autoranging) only*	GAS 1
Infrared Methane Sensors	
Standard 4 + IR CH4 (LEL only or autoranging)	GAS 1
IR CH4 (LEL or autoranging) only	GAS 1
Standard 4 + IR CH4 (volume only)	GAS 2
IR CH4 (volume only)	GAS 1
Infrared Carbon Dioxide Sensors	
Standard 4 + IR CO2 (any range)	GAS 2
IR CO2 (any range) only	GAS 1

Table 9: Default Gas Port Assignments for IR Sensors

EAGLE 2 Gas Combination	IR Sensor Gas Port Assignment
Multiple IR Sensors	
IR CO2 (any range) + IR "HC" (LEL only or autoranging)	IR CO2: GAS 2 IR "HC": GAS 1
IR CH4 (volume only) + IR "HC" (LEL only or autoranging)	IR CH4: GAS 2 IR "HC": GAS 1
IR CH4 (volume only) + IR "IBU" (LEL only or autoranging)	IR CH4 vol only: GAS 2 IR "IBU": GAS 1
IR CH4 (volume only) + IR "custom name" (LEL only or autoranging)*	IR CH4 vol only: GAS 1 IR "custom": GAS 2
IR CH4 (volume only) + IR CH4 (LEL only or autoranging)	IR CH4 vol only: GAS 2 IR CH4 LEL/auto: GAS 1
IR CH4 (volume only) + IR CO2 (any range)	IR CH4: GAS 1 IR CO2: GAS 2
* *Depending on special requirements, your infrared hydrocarbon channel's gas name may be something other than "HC" or "IBU".*	

An IR sensor that can be bump tested or calibrated with one or more of the standard 4 sensors (catalytic LEL, oxygen, H_2S, or CO) using a 3-gas or a 4-gas cylinder will be assigned to GAS 1, except for an IR HC sensor that has been given a custom name. If only an IR sensor is installed in an instrument, it will be assigned to GAS 1.

Generally, if there are 2 IR sensors installed in one EAGLE 2, the first channel listed will be assigned to the GAS 1 port and the second channel listed will be assigned to the GAS 2 port. If an LEL only or autoranging range of an IR CH4 or an IR HC sensor (without a custom name) is installed, that sensor will always be assigned to GAS 1 regardless of its place in the channel order.