



DOCKING STATION STANDALONE CONFIGURATION MODEL CS460

OPERATOR'S MANUAL

P/N 6011738, REVISION A
DECEMBER 2018



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Safety



WARNING

Read and understand this manual before using the CS460. Also read and understand the GM460 Operator's Manual.

Cautions and Safety Information

- Use only polyurethane sample tubing with the CS460. Consult TSI Incorporated for other materials.
- **DO NOT** subject the CS460 to infrared or intense light. This may cause communication errors.
- **DO NOT** expose the CS460 to water.
- **DO NOT** subject the CS460 to any hard impact.

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Contents

Warranty	iii
Safety	v
Cautions and Safety Information	v
Contents	vii
About this Manual	xi
CHAPTER 1 Introduction	1-1
Overview	1-1
System Requirements	1-2
How to Build a System	1-2
CHAPTER 2 Description	2-1
Overview	2-1
CS460 Components	2-1
Touch Screen	2-2
Function Tab	2-3
Unit Tab	2-5
Status LED	2-6
Instrument Cradle	2-7
Gas In/Gas Out Cover	2-7
Left Panel Components	2-8
Secondary Connections	2-10
Exhaust Fitting	2-11
Air Filter and Exhaust Tubing	2-12
Connection Brackets	2-12
Accessories Included in Various Bundles	2-13
AC Adapter	2-13
Single-Station AC Adapter	2-13
Multi-Station AC Adapter	2-14
USB Cable	2-14
Ethernet Cable	2-15
SD Card and SD to USB Reader	2-15
Demand Flow Regulator	2-15
Calibration Tubing	2-15
Calibration Cylinder	2-15
Optional Accessories (<i>not included in any bundles</i>)	2-16
SV-3	2-16
Printer	2-16
Wall Mounting Brackets	2-16
CHAPTER 3 Preparing to Use the CS460	3-1
Overview	3-1
Installing the CS460-PC Docking Station PC Controller Software	3-1
Connecting Multiple CS460s Together	3-3
Connecting the SV-3 (<i>optional</i>)	3-6
Connecting the Printer (<i>optional</i>)	3-7
Hardware Assembly	3-8

Wall Mounting the CS460 (<i>optional</i>)	3-9
Connecting Calibration Gas (<i>No SV-3 attached</i>)	3-13
Connecting Calibration Gas, SV-3 Attached	3-16
Setting Basic Operational Parameters in the Config Menu	3-18
Bump Test Parameters	3-18
Pre-Sample Flush Time (AIR Flush)	3-19
Calibration Gas Sample Time (GAS)	3-19
Post-Sample Purge Time (AIR Purge)	3-19
Bump Test Check Tolerance (Tolerance)	3-19
Fast Bump (Fast)	3-19
Automatic Calibration (Auto Cal.)	3-20
Alarm Check	3-20
Auto Print	3-20
Automatically Bump Test if Past Due (Auto bump if past due) .	3-21
Calibration Parameters	3-21
Pre-Sample Flush Time (AIR Flush)	3-21
Calibration Gas Sample Time (GAS)	3-21
Post-Sample Purge Time (AIR Purge)	3-21
Alarm Check	3-22
Auto Print	3-22
Automatically Calibrate if Past Due (Auto cal if past due)	3-22
Viewing or Changing the Calibration Parameters	3-22
Inlet Parameters	3-25
Date, Time, and Date/Time Format	3-29
Language	3-32
Password	3-34
Setting Detailed Operational Parameters Using the CS460	
PC Controller Program	3-37
Launching the PC Controller Program and Connecting an CS460..	3-38
Accessing the CS460 Configuration Window	3-39
Updating the Data Logger Settings	3-40
Updating the Power Saving Settings	3-41
Updating the Expiration Date Settings	3-43
Updating the Automatic Execution Settings	3-44
Updating the Cylinders Settings	3-45
Selecting a Cylinder from the Predefined List	3-45
Defining New Cylinders	3-49
Clearing Cylinders	3-53
Removing Unused Gases	3-54
Setting Up LAN Connectivity	3-54
CHAPTER 4 Operation	4-1
Overview	4-1
Automatically Initiated Tests and Data Download	4-1
Turning on a CS460 System	4-2
Bump Testing	4-6
Calibration	4-11
Alarm Check	4-15
Downloading Instrument Logger Data	4-17
Troubleshooting	4-18
Charging a GM460 in a Docking Station	4-21
Recharging a Battery Pack after Performing a Test	4-21
Recharging a Battery Pack without Performing Any Operations ..	4-22
Batteries Too Drained for PC Controlled Operation	4-23

Bump Test, Calibration, and Alarm Check Records	4-24
Available Memory in the SD Card.....	4-24
Test Record Files.....	4-24
Transferring Record Files to a Computer	4-25
CHAPTER 5 Importing Data into the CS460 PC	
Controller Program	5-1
Overview	5-1
Importing from an SD Card.....	5-1
Importing Using the LAN Network.....	5-3
Viewing Imported Data.....	5-6
Exiting the Program.....	5-7
Spare Parts List.....	5-7
CHAPTER 6 Contacting Customer Service	6-1
Technical Contacts.....	6-1
International Contacts	6-1
Service	6-1
Technical Support.....	6-2
Returning for Service	6-3
APPENDIX A Specifications	A-1

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About this Manual

The CS460 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.

The CS460 Standalone Operator's Manual is organized as follows:

[CHAPTER 1 Introduction](#)

[CHAPTER 2 Description](#)

[CHAPTER 3 Preparing to Use the CS460](#)

[CHAPTER 4 Operation](#)

[CHAPTER 5 Importing Data into the CS460-PC Docking Station PC Controller Program](#)

[CHAPTER 6 Contacting Customer Service](#)

[APPENDIX A Specifications](#)

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CHAPTER 1

Introduction

Overview

This chapter briefly describes the CS460 Docking Station and the CS460-PC Docking Station PC Controller Program.

Specifications are listed in [Appendix A](#).

The CS460 Docking Station is an advanced, reliable system that can charge, bump test, calibrate, alarm check, and provide test records for up to 10 GM460 portable gas monitors at once.

It is designed to save the test records to an SDHC card (standalone functionality) or to be connected directly to a computer (PC controlled functionality). If test records are stored to an SDHC card while operating in the standalone configuration, the PC Controller Program can then be used with a Windows®-based personal computer to retrieve test data files from the SDHC card or from the computer's hard drive if the files have been transferred to the hard drive from the SDHC card.

If you are using the PC Controller Program while operating in the PC controlled configuration, you may retrieve instrument data, bump test, calibrate, and alarm check instruments. 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 CS460 in the PC Controlled Configuration, see the *CS460 Docking Station PC Controlled Configuration Operator's Manual*.

The purpose of this manual is to explain how to set up and use the CS460 in Standalone configuration. It also explains how to use the sections of the PC Controller Program associated with Standalone use. You will learn how to:

- Install and launch the PC Controller Program.
- Prepare the CS460 for use.
- Perform a bump test.
- Perform a calibration.
- Perform an alarm check.
- Download instrument data to the SD card.

- Import instrument data, bump test, calibration, and alarm check records to the PC Controller Program's database.
- Use the CS460 to charge a GM460.



Cautions	
<ul style="list-style-type: none"> • The GM460 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 GM460, you must follow the instructions and warnings in the GM460 Operator's Manual to assure proper and safe operation of the instrument and to minimize the risk of personal injury. • 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 CS460 PC Docking Station PC Controller Software, your personal computer must meet the following requirements:

Operating Systems	Windows® 7, 8, or 10 operating system
Processor	PC running Pentium® 2 processor or equivalent minimum
Memory	Minimum 32 MB RAM
Hard Disk Space	Minimum 32 MB
Available USB Port	
SD Card Slot	(recommended)

How to Build a System

Various accessories are included with the Model CS460 depending on what CS460 bundle is ordered. See the table below for what is included with each basic bundle.

Other bundles are available that include different calibration gas cylinders other than the 4-gas mix included in the 81-CS460-04. The accessories are described in more detail in [Chapter 2: Description](#).

Every installation needs only one each of the starred (*) items. There are two AC adapters listed. If you have a single-station system, you only need the single-station AC adapter (indicated by ^a). If you have multi-station system, you only need the multi-station AC adapter (indicated by ^b).

For example, if you have five (5) separate single-station systems where none of the five (5) stations are connected together, each system will need one (1) each of the starred items which means you will have a total of five (5) each of the starred items. For this system, you would need to order five (5) 81-CS460-01 bundles, five (5) 81-CS460-03 bundles, or five (5) 81-CS460-04 bundles depending on additional accessories desired.

If you have one multi-station system with five CS460s connected together, you will only need one each of the starred items in Table 1 below in order to operate all five (5) CS460s. For this system, you would need to order one (1) 81-CS460-02 bundle and four (4) 81-CS460 bundles. Any additional accessories would need to be ordered separately.

Table 1-1: CS460 Bundle Options

Bundle Part Numbers	Included Items	81-CS460	81-CS460-01	81-CS460-02	81-CS460-03	81-CS460-04
Docking Station		X	X	X	X	X
Exhaust Tube, 10 ft. Length		X	X	X	X	X
USB Cable*			X	X	X	X
Ethernet Cable, 5 ft. Length*			X	X	X	X
Single-Station AC Adapter ^a			X		X	X
Multi-Station AC Adapter ^b				X		
SDHC Card with SD to USB Reader*			X	X	X	X
Demand Flow Regulator					X	X
Calibration Tubing, 3 ft. Length					X	X
Calibration Cylinder Holder						X
Calibration Cylinder**						X
<p>* Each system needs only one each of these. ^a Used only for single-station systems. ^b Used only for multi-station systems. ** Type of calibration cylinder depends on bundle ordered.</p>						

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CHAPTER 2

Description

Overview

This section describes:

- [CS460 Components](#)
- [Accessories included in Various Bundles](#)
- [Optional Accessories \(not included in any bundles\)](#)

CS460 Components

The CS460 consists of the touch screen, status LED, instrument cradle, gas in/gas out cover, left panel, gas and electrical connections, exhaust fitting, air filter, exhaust tubing, and connection brackets.

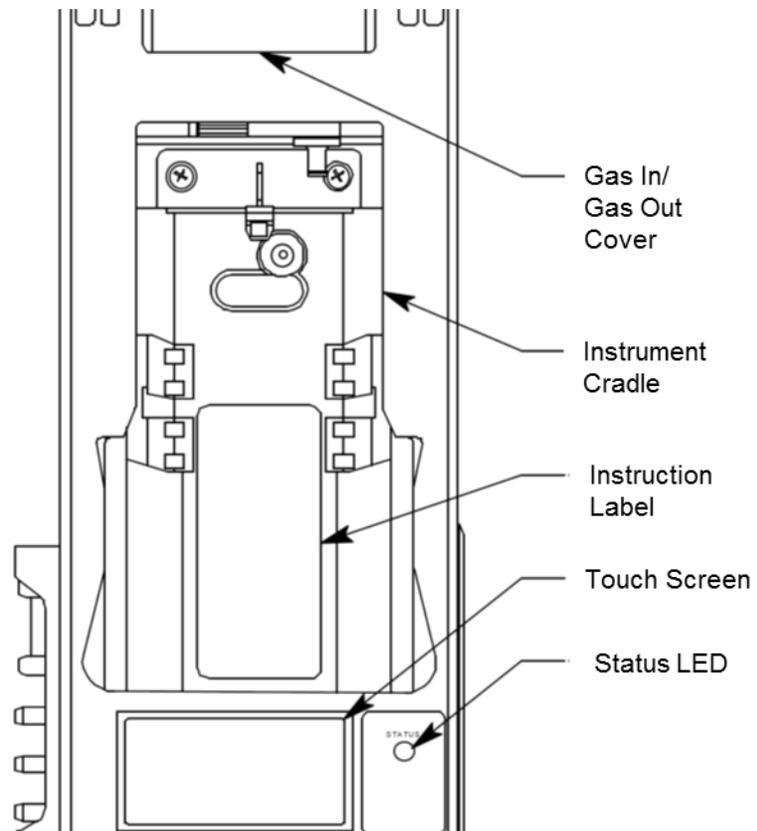


Figure 2-1: CS460 Component Location

Touch Screen

The LCD touch screen is located at the bottom front of the CS460. In a single CS460 system, the touch screen includes the **Function** and **Unit** tabs. In a multi-CS460 system, the primary (left-most) CS460's touch screen includes the **Function** and **Unit** tabs and any secondary CS460s' touch screens only display the Unit tab information. The **Function** and **Unit** tabs are described below in "[Function Tab](#)" and "[Unit Tab](#)".

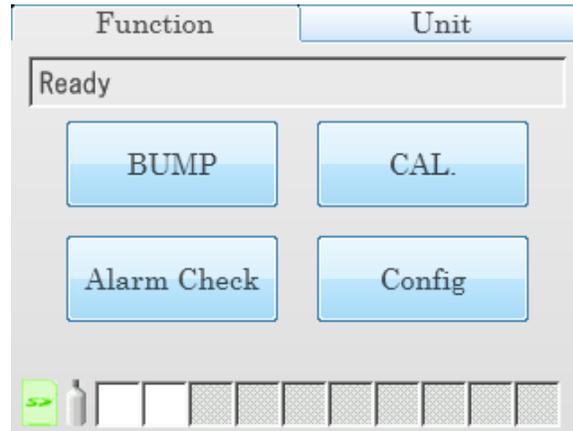
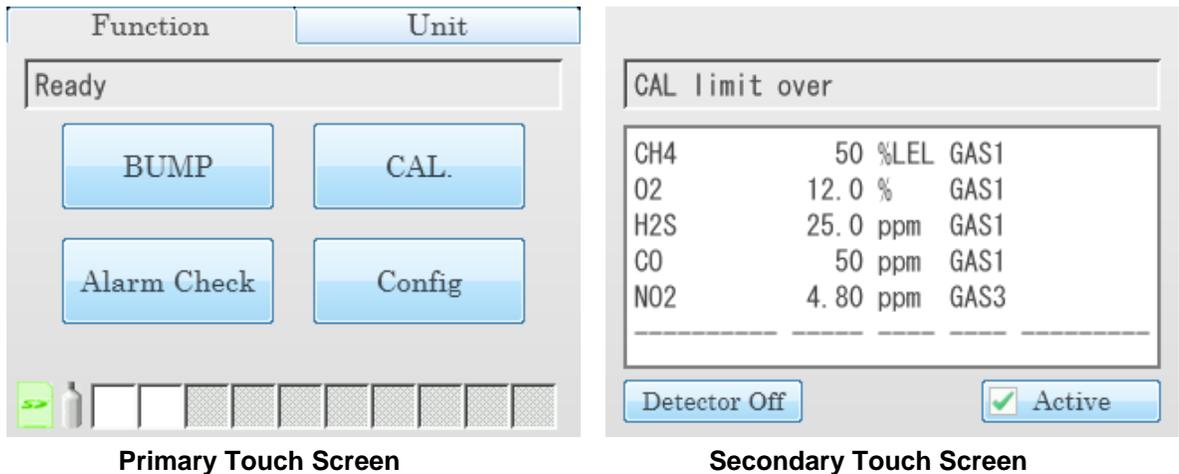


Figure 2-2: Single CS460 System Touch Screen



Primary Touch Screen

Secondary Touch Screen

Figure 2-3: Multi-CS460 System Touch Screens

Function Tab

The **Function** tab allows you to:

- Initiate a bump test
- Initiate a calibration
- Initiate an alarm check
- Set operational parameters

It is present on the touch screen of a single CS460 system and on the touch screen of the primary (left-most) CS460 in a multi-CS460 system. It has the same appearance in both systems. The text field above the **BUMP** and **CAL** buttons shows instrument or station status.

The SD card logo in the bottom-left corner of the **Function** tab indicates whether an SD card is inserted in the SD card slot and the status of an inserted SD card.

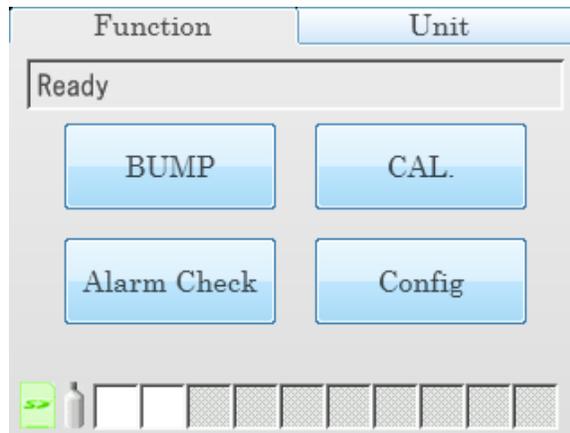


Figure 2-4: Function Tab

Table 2-1: SD Card Logo Colors

SD Card Logo Color	Meaning
Gray	No SD card inserted.
Green	More than 20% of the SD card's memory is available.
Yellow	Less than 20% but more than 1 MB (approximately 946 tests) of the SD card's memory is available.
Red	Less than 1 MB (approximately 946 tests) of the SD card's memory is available.

The cylinder logo in the bottom-left corner of the **Function** tab indicates the expiration status of the calibration cylinders. In order to set up the expiration status, the docking station must be connected to the PC Controller Program and the cylinder information entered into the **Cylinders** tab. If the docking station is never connected to the PC Controller Program to enter the cylinder information then the cylinder icon will always be gray. The table below lists all of the possible colors for the cylinder logo and describes their meaning.

Table 2-2: Cylinder Logo Colors

Cylinder Color	Meaning
Gray	Expiration date more than 10 days away OR cylinder information not set up with PC Controller Program
Yellow	Expiration date for one or more cylinders is less than 10 days away
Red	Expiration date for one or more cylinders is today or has already passed

The ten squares along the bottom of the **Function** tab are the Station/Instrument Indicators. They represent up to ten CS460s and GM460s in a CS460 system from left to right. In a single CS460 system only the left-most indicator is functional. In a multi-station system, the left-most indicator represents the primary station and the rest of the indicators represent additional stations in the system.

Colors and icons are used with the indicators to convey CS460 and GM460 status and test and calibration results.

If an indicator color is light gray, the same color as the background of the **Function** tab, there is not a CS460 installed in the system for that position. If an indicator color is white with no icon, a CS460 is installed in that position and the corresponding CS460 has no instrument connected to it. If an indicator is a color other than light gray and an icon appears in it then the corresponding CS460 has an instrument installed and connected to it.

Table 2-3: Docking Station Indicator Background Colors

Background Color	Meaning
White	<ul style="list-style-type: none">If no icon is showing, indicates that corresponding CS460 is operating normally.If icon is showing, indicates that corresponding CS460 is operating normally and connected instrument is not due for calibration, inlet assignments are correct, and gas in/gas out cover is engaged.
Orange	Calibration due in 10 days or less on connected instrument.
Red	Calibration due on connected instrument.
Yellow	Inlet assignment error for connected instrument.
Dark Gray	Gas in/gas out cover not engaged on connected instrument.

Table 2-4: Docking Station Indicator Icons

Icon	Meaning
None	GM460 is not connected
	GM460 is connected and Unit Tab's Active box is selected
	GM460 is connected and Unit Tab's Active box is not selected.
	Bump test, calibration, or alarm check in process.
	Test passed.
	Test failed.
	Datalogging information being downloaded.
	Charging.
	GM460 problem detected.
None	

Unit Tab

The **Unit** tab shows the gas combination of a connected GM460 along with calibration gas concentration values and the pass/fail status of any tests. Its appearance varies slightly depending on whether the CS460 is a single station system, the primary (left-most) station in a multi-station system, or a secondary station in a multi-station system. The text field above the gas combination which shows instrument or station status and the **Detector On/Detector Off** button in the lower-left which turns the GM460 on and off are common to each variation of the **Unit** tab.

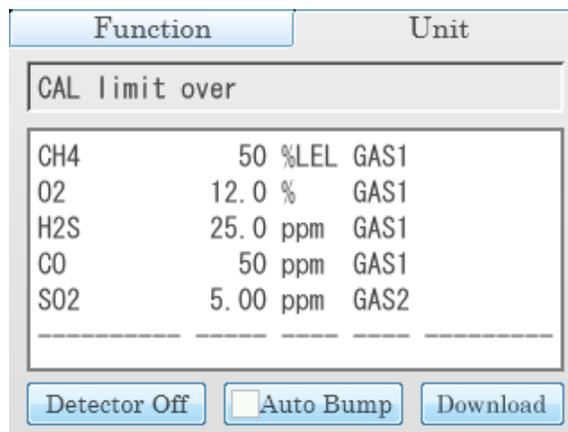


Figure 2-5: Unit Tab, Single CS460 System

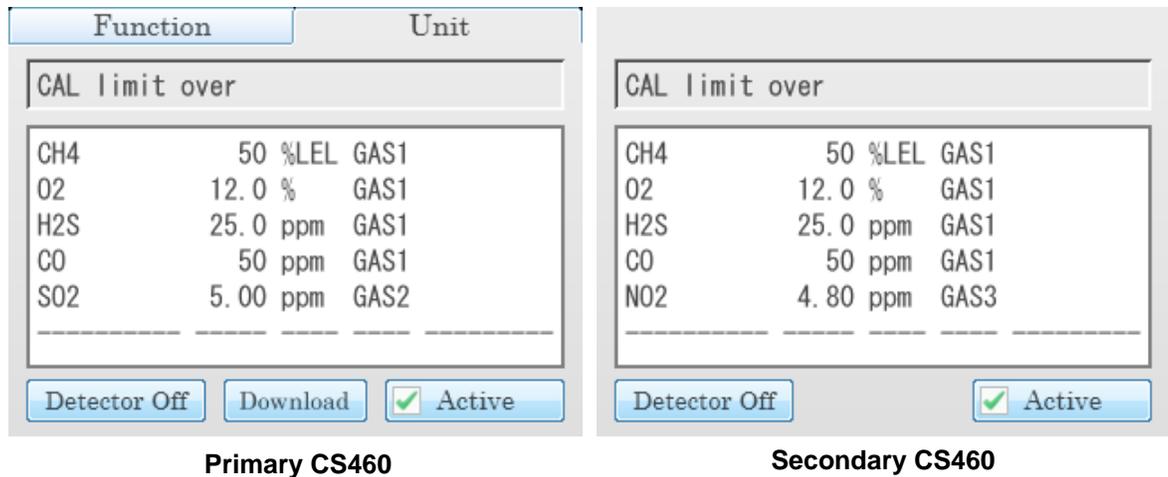


Figure 2-6: Unit Tab, Multi-CS460 System

The **Auto Bump** selection box appears at the bottom of the screen only in a single-station system. It can be selected or deselected. If selected, a bump test will automatically begin as soon as an instrument is connected regardless of whether or not a bump test is due. If deselected, a bump test will not automatically begin when an instrument is connected. In a multi-station system, the **Auto Bump** selection box will not appear.

The **Active** selection box appears in the lower-right corner of the screen in a multi-station system and includes or excludes an instrument from any testing. It appears on both the primary and secondary stations.

The **Download** button appears in the lower-right corner of the screen in a single-station system and in the lower-left corner of the primary station's screen in a multi-station system. It allows you to manually download instrument data from the instrument to an SD card.

Status LED

The **Status LED** is located to the right of the touch screen. The table below summarizes the meaning of the LED's different colors.

Table 2-5: Status LED Colors

Status LED Color	Meaning
Solid Green	No GM460 installed.
Blinking Green	GM460 installed and IrDA communication established.
Blinking Orange	Charging.
Solid Orange	Charging complete OR CS460 starting up.
Solid Red	CS460 problem detected.

Instrument Cradle

The instrument cradle is a recessed area in the middle of the CS460 that is designed to accept the GM460. Insert the GM460 in the instrument cradle with the belt clip facing out before you perform a bump test, calibration, alarm check or charge a GM460. Follow the instructions in this manual and at the center of the instrument cradle for installing the GM460. An infrared (IR) port at the back of the panel lines up with the GM460's IR port when it is inserted in the cradle and is used to communicate with the GM460. Charging contacts in the bottom of the cradle line up with the GM460's charging contacts.

Gas In/Gas Out Cover

The red gas in/gas out cover connects to the GM460's inlet and exhaust fittings and routes calibration gas to and from the GM460. The cover is spring loaded. To connect the cover to the GM460, push it down until it touches the GM460 and then release it. It should lock into place. To release the cover, push it toward the GM460 and then release it. It should return to its unconnected position at the top of the CS460.

Left Panel Components

The CS460's left panel includes:

- SD card slot
- USB PC connector
- USB printer connector
- LAN connector
- On/off switch
- Power jack
- Electrical connector
- Sample fittings

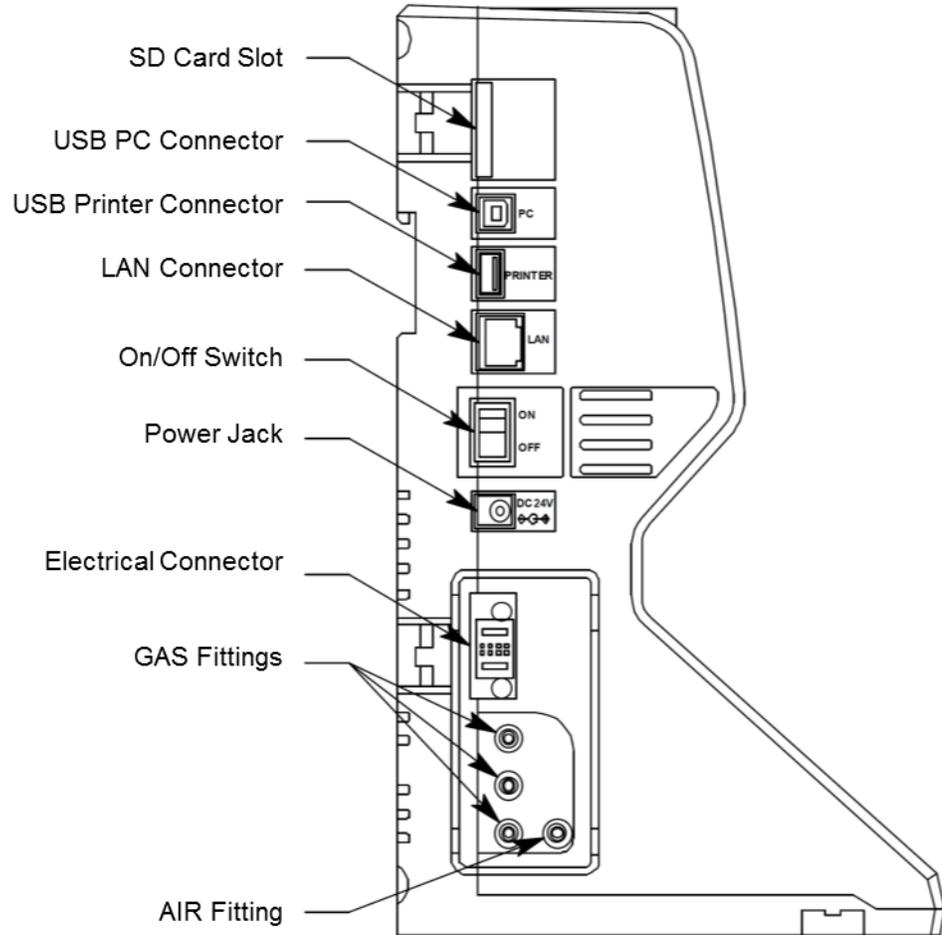


Figure 2-7: Left Panel Component Location

Component	Description
SD Card Slot	The SD card slot at the top of the left side of the CS460 allows for the installation of an SDHC card. The CS460's data files are saved to the SD card. If an SD card is not installed, no data will be saved during testing.
USB PC Connector	A Type B USB connection allows for the CS460 to be connected to a PC using a Type A to Type B USB cable. Connection to a PC is necessary for setting up the LAN function and for using the CS460 in its PC controlled configuration. This manual explains how to set up the LAN function but does not cover PC controlled configuration.

Component	Description
USB Printer Connector	<p>The USB printer connector allows for the optional printer accessory to be connected to the CS460.</p> <div data-bbox="852 317 1461 474" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">Note</p> <p>The CS460 only supports the Seiko Instruments, Inc. DPU-S245 USB printer. See "Printer" in Chapter 2 for more information.</p> </div>
LAN Connector	<p>The LAN connector allows for the CS460 to be connected to a building's network using an Ethernet cable. This function allows for the SD card's data to be downloaded to a computer connected to the same network.</p>
On/Off Switch	<p>The white on/off switch turns the station on or off. Push the top of the switch toward the station to turn it on. Push the bottom of the switch toward the station to turn it off.</p>
Power Jack	<p>The round power jack is located below the on/off switch. The plug on the end of the AC adapter cable connects to it.</p>
Electrical Connector	<p>The black electrical connector allows for an electrical connection to another CS460 or to an SV-3.</p>
Sample Fittings	<p>Four sample fittings are located on the left side of the CS460. The AIR fitting is the right-most fitting and the GAS fittings are arranged in a column to the left of the AIR fitting. The bottom to top order is GAS1, GAS 2, and GAS 3. All four fittings accept 3/16 inch ID tubing.</p>

Secondary Connections

The right side of the CS460 is shipped from the factory with a small panel attached to it with two screws. That panel should remain in place if the CS460 is being used alone or if it is the right-most station in a bank of connected stations. The panel needs to be removed in order to connect another CS460 to it. Beneath the panel is an electrical connection and plugged sample fittings for calibration gas connections.

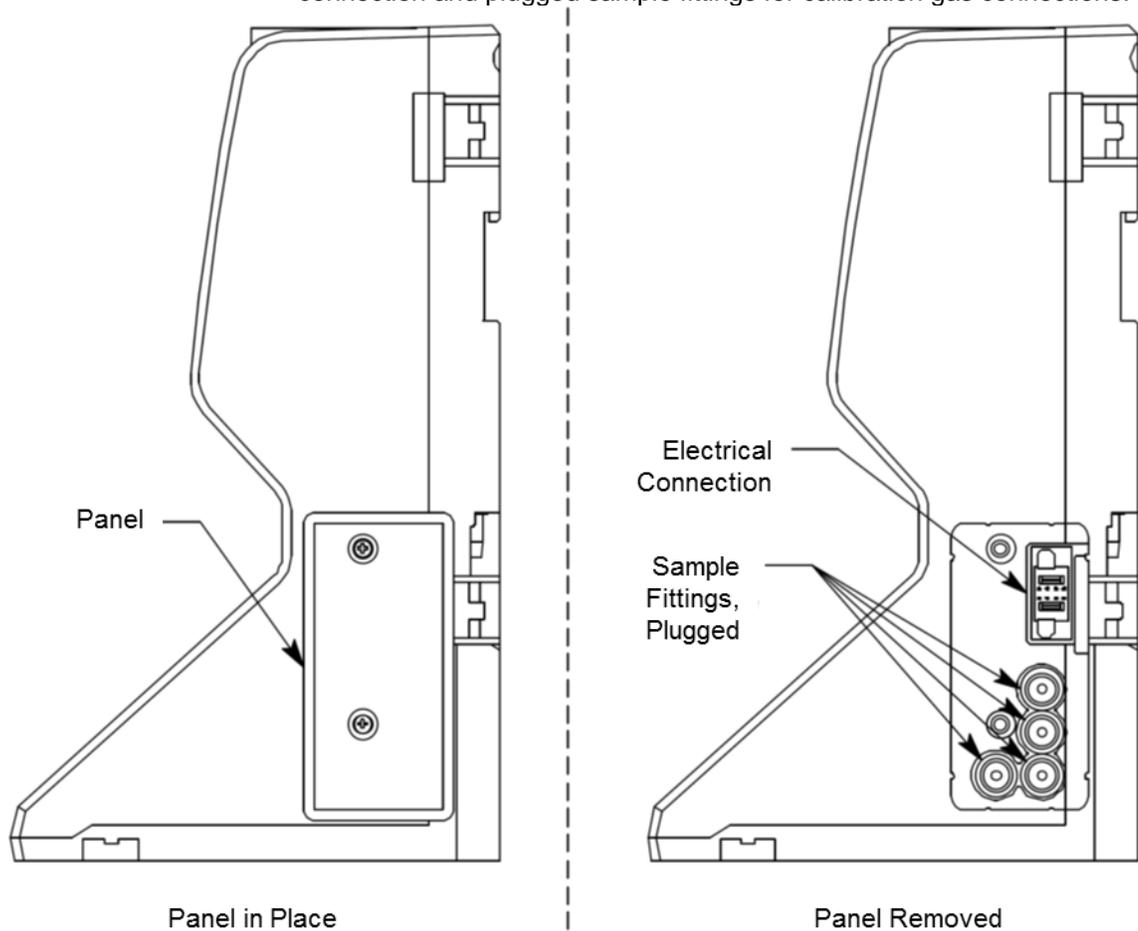


Figure 2-8: Right Panel Component Location

Exhaust Fitting

An exhaust fitting is located on the CS460's back panel. It allows routing of the exhausted calibration gas to a convenient location. This fitting accepts 5/16 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.

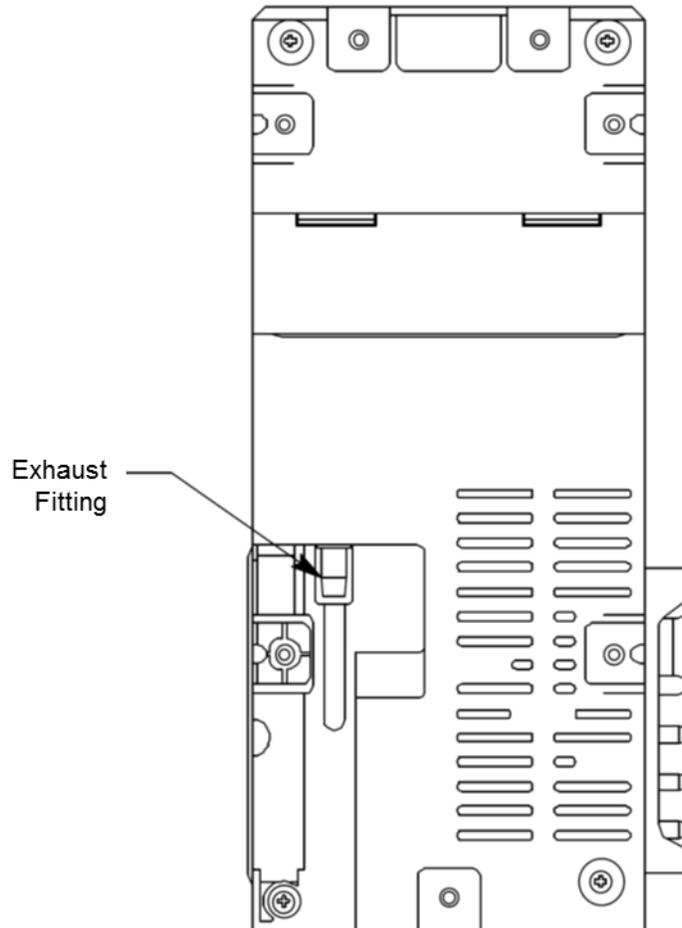


Figure 2-9: Back Panel Component Location

Air Filter and Exhaust Tubing

A cylindrical particle filter with a short length of tubing is supplied with the CS460 for installation to the **AIR** fitting on the back panel. The filter keeps particulate contamination out of the docking station.

A 10-foot length of 5/16 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.

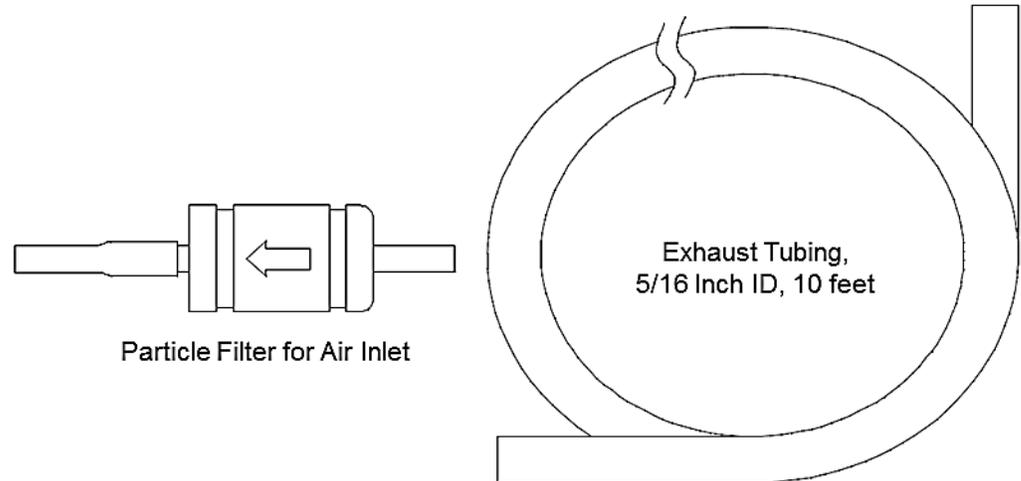


Figure 2-10: Air Filter & Exhaust Tubing



WARNING

DO NOT use an exhaust tube that is longer than 15 feet. The increased flow restriction caused by a longer tube may affect gas response and cause inaccurate calibration and bump test results.

Connection Brackets

Each CS460 is provided with three connection brackets that are used to mechanically connect one CS460 to another.

Accessories Included in Various Bundles

This section describes all of the accessories that are included as standard with the CS460, depending on the CS460 bundle purchased. These include:

- AC adapter
- Type A to Type B USB cable
- Ethernet cable
- SD card
- SD to USB reader
- Demand flow regulator
- Calibration tubing
- Calibration cylinder

You do not need one of each of these accessories for every CS460 in your installation but every installation needs one of each accessory. See ["How to Build a System" in Chapter 1](#) for information about what CS460 bundles include these items.

AC Adapter

Single-Station AC Adapter

The single-station 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 CS460's power jack. The AC adapter is rated 100 to 240 VAC input, 24 VDC 0.63 A output.

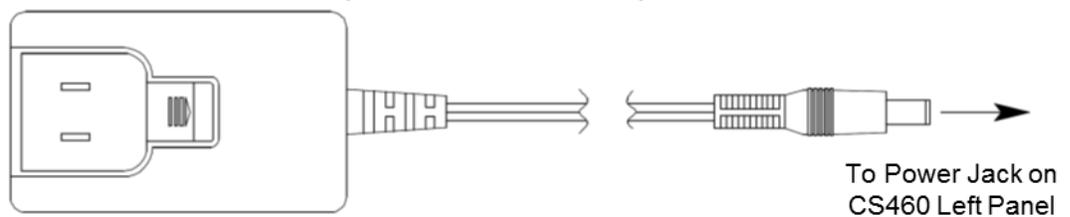


Figure 2-11: Single-Station AC Adapter

Multi-Station AC Adapter

The multi-station AC adapter is a larger adapter with a separate power cord and a plug that connects to the CS460's power jack. The adapter is intended to be used when more than one CS460 are connected together. Only the primary CS460 needs to be plugged into power. The AC adapter is rated 100 to 240 VAC input, 24 VDC 4.17 A output.

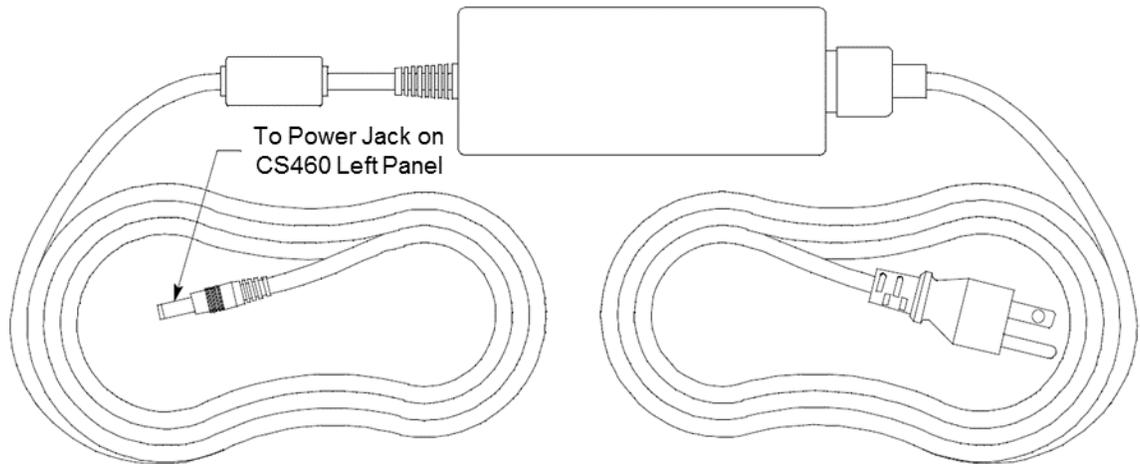


Figure 2-12: Multi-Station AC Adapter

USB Cable

A **Type A** to **Type B** USB cable is used to connect the CS460 to a PC which is required for setting up the LAN connectivity function of the CS460 or for using the CS460 in the PC Controlled configuration. If you have a multi-station system, the USB cable only needs to be plugged into the primary (left-most) station.

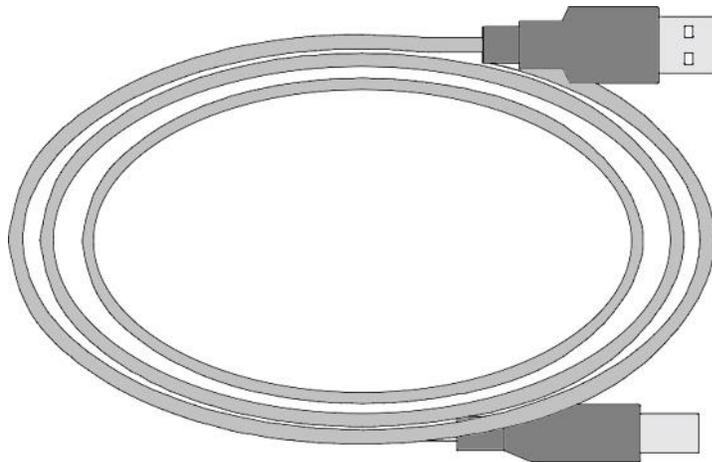


Figure 2-13: USB Cable

Ethernet Cable

A 5-foot length of black Ethernet cable allows for the LAN connectivity function of the CS460 to be used. One end of the cable is plugged into the LAN port on the left side of the CS460 and the other end is plugged into one of the building's network ports. If you have a multi-station system, the Ethernet cable only needs to be plugged into the primary (left-most) station.

SD Card and SD to USB Reader

The SDHC card needs to be installed in the SD card slot on the left side of the CS460 in order for data to be saved. If you have a multi-station system, the SD card only needs to be inserted into the primary (left-most) station's SD card slot.

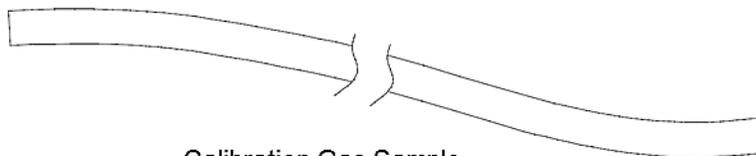
The SDHC card can be directly inserted into a computer's SD card slot if the computer is equipped with one. If the computer does not have an SD card slot, the provided SD to USB reader must be used.

Demand Flow Regulator

The demand flow regulator is screwed into the calibration gas cylinder and allows the CS460 to draw gas from the cylinder when the regulator is connected to the CS460 using the 3 feet of calibration tubing.

Calibration Tubing

A 3-foot length of 3/16 inch ID polyurethane tubing is provided with bundles that include a demand flow regulator. This calibration tubing is used to connect the regulator to gas fitting on the left side of the CS460 or on the left side of the SV-3.



Calibration Gas Sample
Tubing, 3/16 Inch ID, 3 feet

Figure 2-14: Calibration Tubing

Calibration Cylinder

The calibration gas cylinder must be used to calibrate the applicable sensors in a GM460. The particular calibration gas cylinder provided depends on which bundle is ordered.

Optional Accessories *(not included in any bundles)*

SV-3

The SV-3 increases the number of calibration cylinders that can be used with the CS460 from 3 to 6. It connects to the sample fittings and electrical connector on the left side of the CS460. If you have multiple CS460s connected together, the SV-3 will be installed on the left-most CS460.

The SV-3 comes with two connection brackets that are used to mechanically connect the SV-3 to the left-most CS460.

Printer

The printer supported by the CS460 is the Seiko Instruments, Inc. DPU-S245 USB printer. It allows for quick printing of bump test or calibration results. The printer comes with an AC adapter and power cord, a battery pack, a USB cable, and a roll of paper. It is connected to the CS460 via the USB Printer connection on the left side of the CS460.

Note

For questions about the printer, contact Seiko Instruments, Inc. at <http://www.sii.co.jp/sps/eg/contact.html>.

Wall Mounting Brackets

The CS460 can be mounted to the wall, if desired, using three mounting brackets. See "[Wall Mounting the CS460 \(optional\)](#)" in Chapter 3 for a description of how many wall mounting brackets are needed depending on how many CS460s are in your system.

CHAPTER 3

Preparing to Use the CS460

Overview

Setting up the CS460 for use includes:

- [Connecting Multiple CS460s Together \(optional\)](#)
- [Connecting the SV-3 \(optional\)](#)
- [Connecting the Printer \(optional\)](#)
- [Connecting the AC Adapter, Air Filter, and Exhaust Tubing](#)
- [Wall Mounting the Station \(optional\)](#)
- [Connecting Calibration Gas](#)
- [Setting basic operational parameters in the Config Menu](#)
- [Setting up the LAN connectivity \(optional\)](#)

Instructions to complete each of these tasks is in this chapter.

Although a single CS460 or a bank of CS460s does not need to be connected to the PC Controller Program for Standalone operation, the PC Controller Program is needed to import and view data and to access some CS460 setup parameters.

Installing the CS460-PC Docking Station PC Controller Software

Note

The PC Controller Program is not required for Standalone operation but is needed to import and view data and to access some setup parameters that cannot be accessed in the CS460's Config Menu.

1. Launch Windows® operating system.
2. Exit from all applications and open windows.
3. Go to www.tsi.com and select **Support | TSI Software and Firmware Wizard**.
4. Follow instructions on website to download software.
5. A .zip file will begin to download.

6. After the file has downloaded, save the .zip file to your computer.
7. Extract the contents of the .zip file.
8. Double-click the **setup.exe** file.
9. The CS460 PC Controller 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 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 (x86)\CS460**) is displayed. To install the software in the default folder continue with step 12. To install the software in a different location, click **Change** and choose a new installation folder and then continue with step 12.
13. Click **Next** to proceed to the **Ready to Install the Program** window.
14. Review the installation settings. If they are good, click **Install** and the installation process will begin. 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. A Device Driver Window will appear prompting you to install necessary drivers.

Note

You cannot continue the installation without installing the drivers.

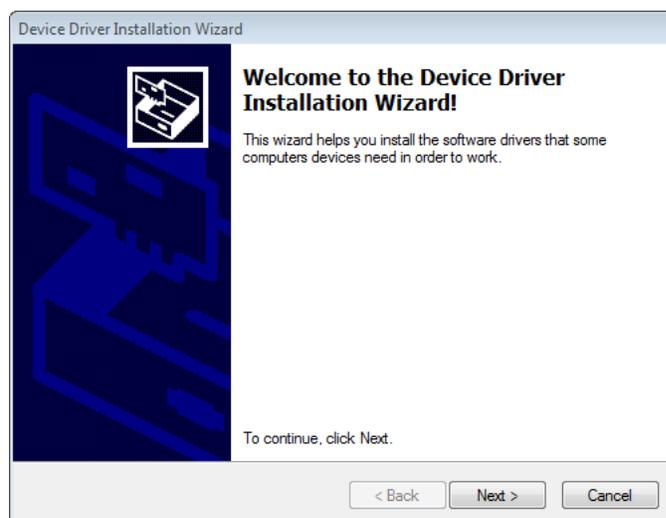


Figure 3-1: Device Driver Installation

17. Click **Next** to install the drivers. The Wizard will find the appropriate drivers.
18. Click **Finish** once the drivers are successfully installed.



Figure 3-2: Finish Device Driver Installation

19. The installation will continue.
20. Follow the on-screen instructions to complete software installation.
21. To complete the driver installation, ensure that your docking station (or the primary docking station if you plan to have a bank of them) are connected to your computer.
22. Turn on the docking station by flipping the power switch to the **ON** position.
23. The first time a CS460 is turned on after being connected to the computer, the CS460 needs some time to be recognized by the computer. The status bar will indicate that the drivers are being configured and will alert you when the CS460 is ready to use.

Connecting Multiple CS460s Together

Up to 10 CS460s can be connected together. The left-most CS460 is the primary station and the remaining stations are secondary stations. If you remove the left-most CS460 from the setup, the station that is now the left-most station becomes the primary but does not retain any of the settings that the old primary had.

1. Make sure that the CS460s **are not** connected to power.
2. For every station **except** the one that will be located on the far-right side of the bank:
 - a. Unscrew the two screws that retain the panel on the right side of the station. Be careful not to lose the screws.

- b. Pull the panel away from the CS460.
- c. Use needle nosed pliers to remove the clear plugs that are installed on the four sample fittings.
- d. Save the panel, the screws, and the four plugs in a safe place.

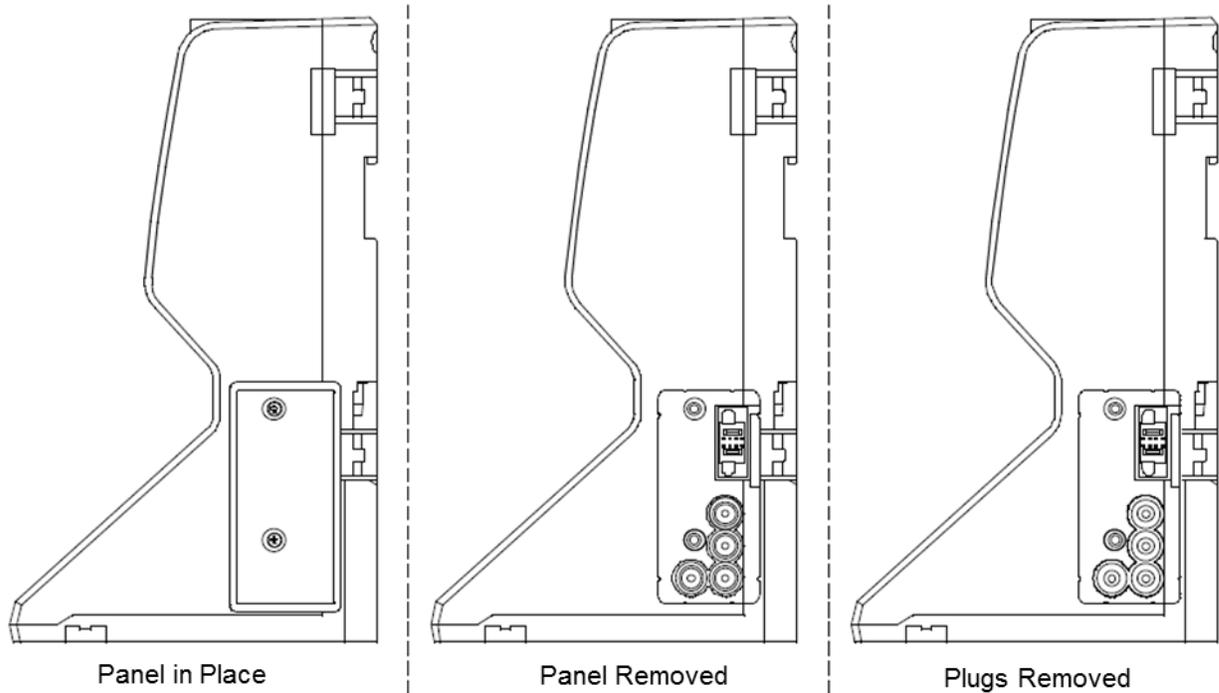


Figure 3-3: Panel and Plug Removal

- 3. Starting with the two left-most stations, line up the electrical connections and sample fitting connections and push the two stations together until the housings are touching.
- 4. Add stations to the right side of the bank using the same procedure. The last station installed should be the one that still has a panel on the right side.
- 5. Use the provided metal connection brackets and screws to secure the two connection points on each side of the CS460's back panel and on the bottom of the CS460 to each other.

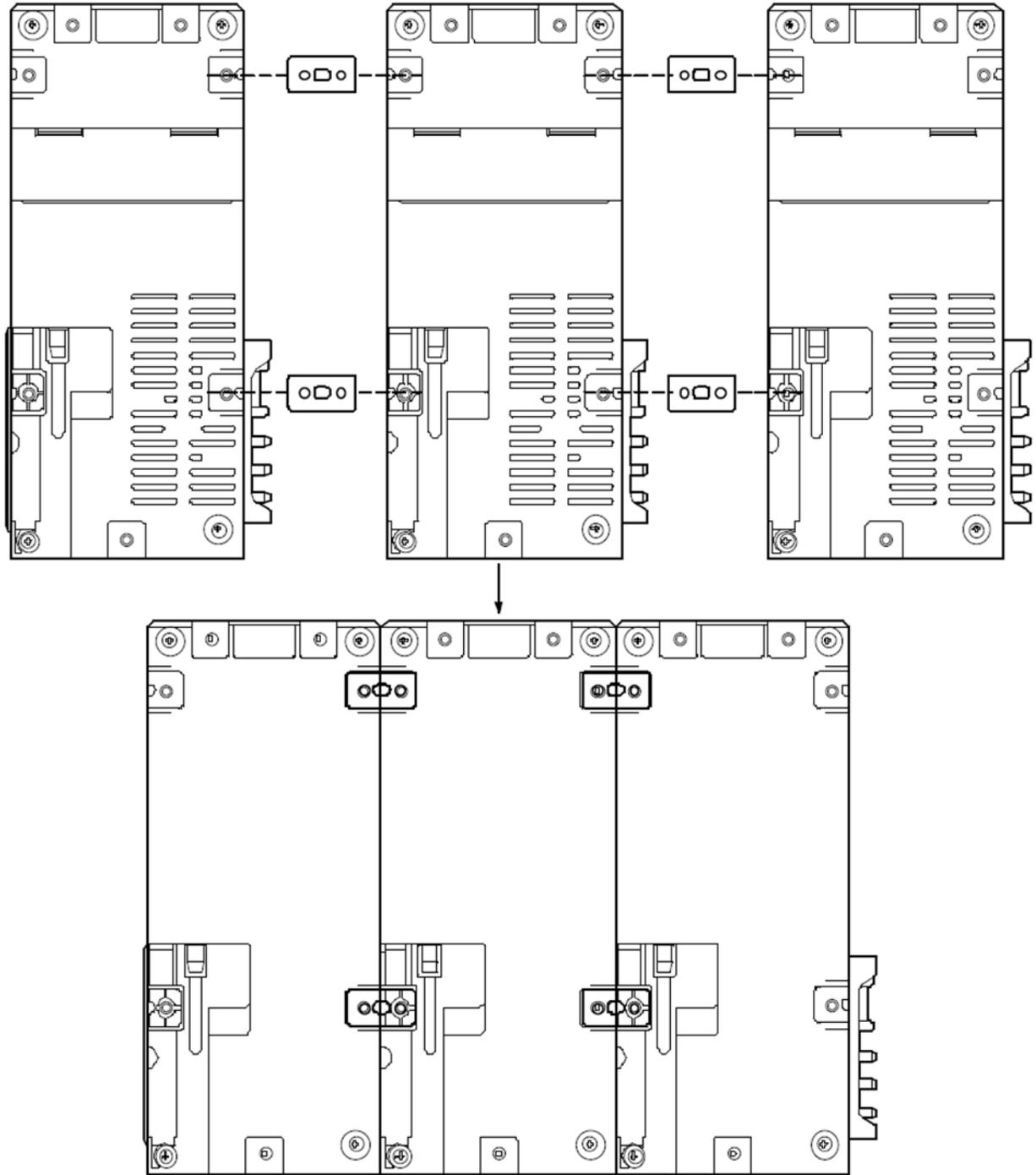


Figure 3-4: Connecting CS460s together, back panel

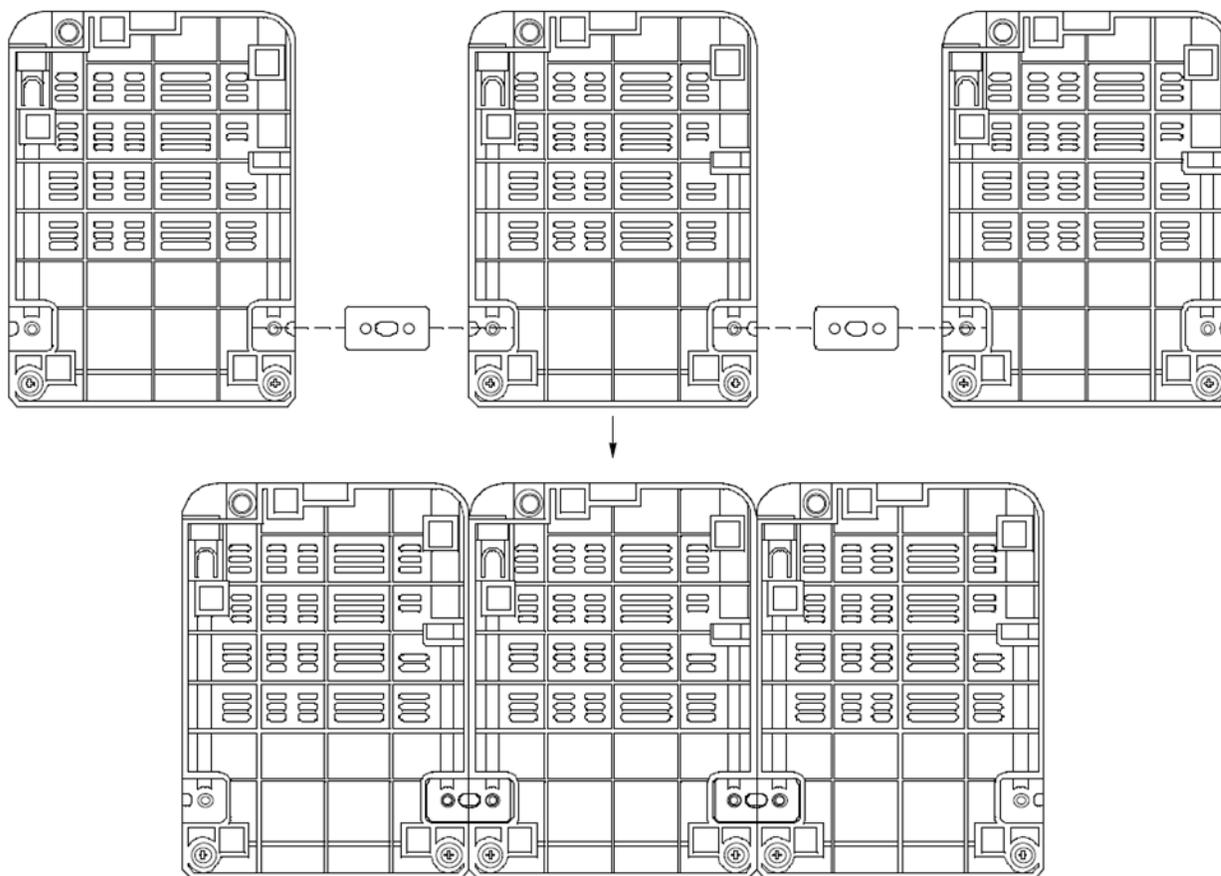


Figure 3-5: Connecting Multiple CS460s together, bottom panel

Connecting the SV-3 *(optional)*

1. Make sure that the CS460(s) **are not** connected to power.
2. Line up the electrical connection and sample fitting connections on the SV-3 with the electrical connector and sample fittings on the left side of the left-most CS460.
3. Push the SV-3 toward the CS460 until the housings are touching.
4. Use the provided metal connection brackets and screws to secure the back and bottom of the SV-3 to the CS460.

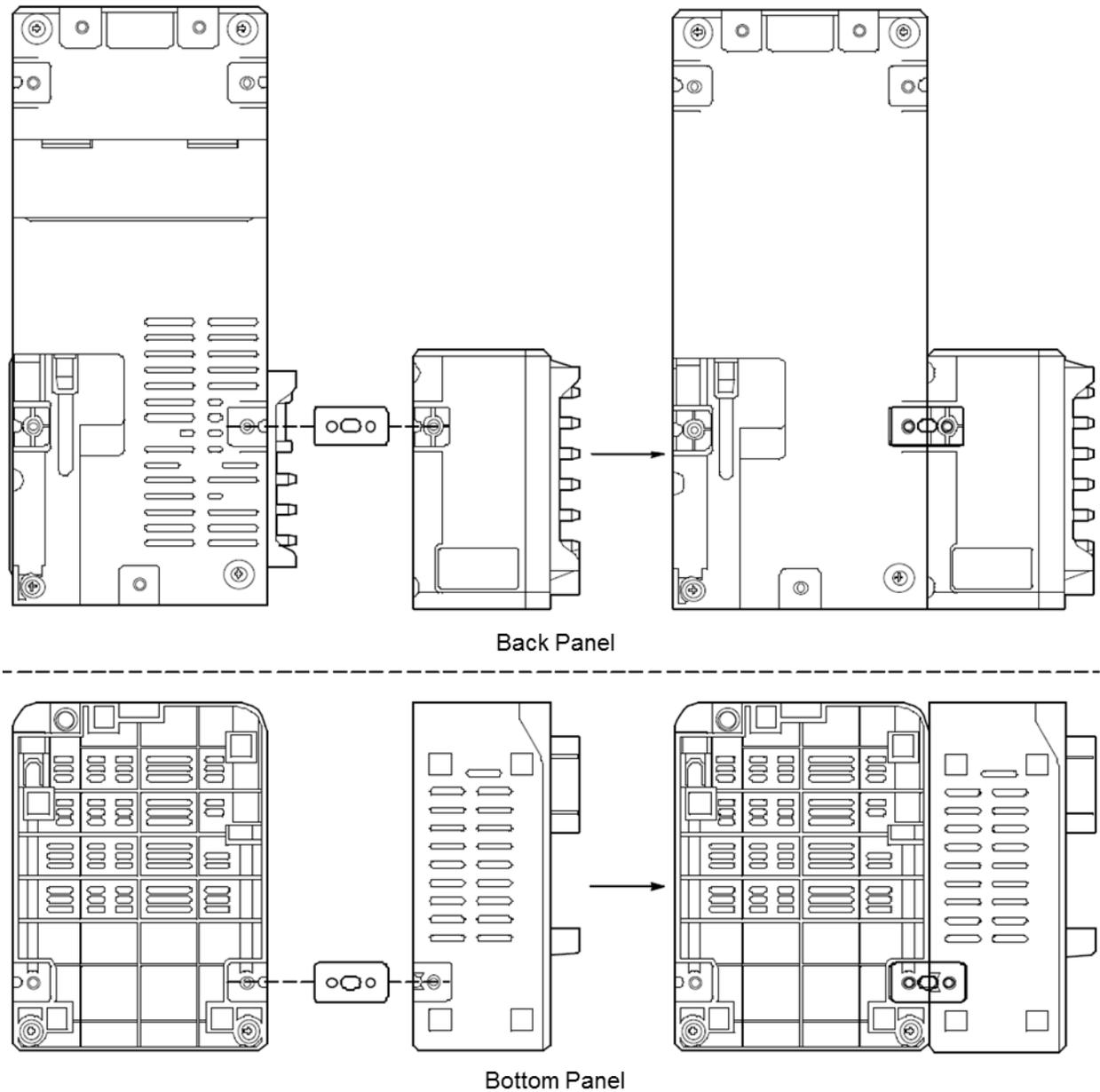


Figure 3-6: Connecting the SV-3

Connecting the Printer *(optional)*

1. To power the printer with the battery pack, install the battery pack.
2. To power the printer with AC power, plug the printer AC adapter's wall plug into a wall AC socket.
3. Connect the AC adapter to the printer's power jack using the provided cord.

4. Connect one end of the printer's USB cable into the printer's USB connection. Plug the other end of the printer's USB cable into the USB printer connector on the left-side of the CS460. Be sure to use the USB cable provided with the printer. The USB cable provided with the CS460 does not have appropriately sized USB connections for the printer.

Note

If you have any problems setting up the printer, contact Seiko Instruments, Inc. at <http://www.sii.co.jp/sps/eg/contact.html>.

Hardware Assembly

The hardware assembly consists of:

- Connecting the AC adapter
- Installing the air filter
- Connecting the exhaust tubing

Perform the following to complete the hardware assembly:

1. Place the CS460(s) 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 output cable into the power jack on the back of the CS460.

Note

If multiple CS460s are connected to each other, be sure to plug the multi-station AC adapter into the primary station.

4. Install the air filter so that the arrow on the filter that indicates direction of flow is pointing towards the **AIR** fitting.
 - a. If you are installing the air filter on a CS460, put the green tubing stub that comes with the air filter on the end with the arrow pointing to the air flow and install the other end of the green tubing stub on the CS460's **AIR** fitting.
 - b. If you are installing the air filter on an SV-3, the green tubing stub does not need to be used. Orient the air filter with the arrow pointing toward the SV-3 and insert the air filter into the **AIR** recess at the front of the SV-3's left side and push the air filter in until the SV-3's latch secures it in place.
 - c. If you are testing any instruments that need a special filter, attach them appropriately as shown in the figure below.

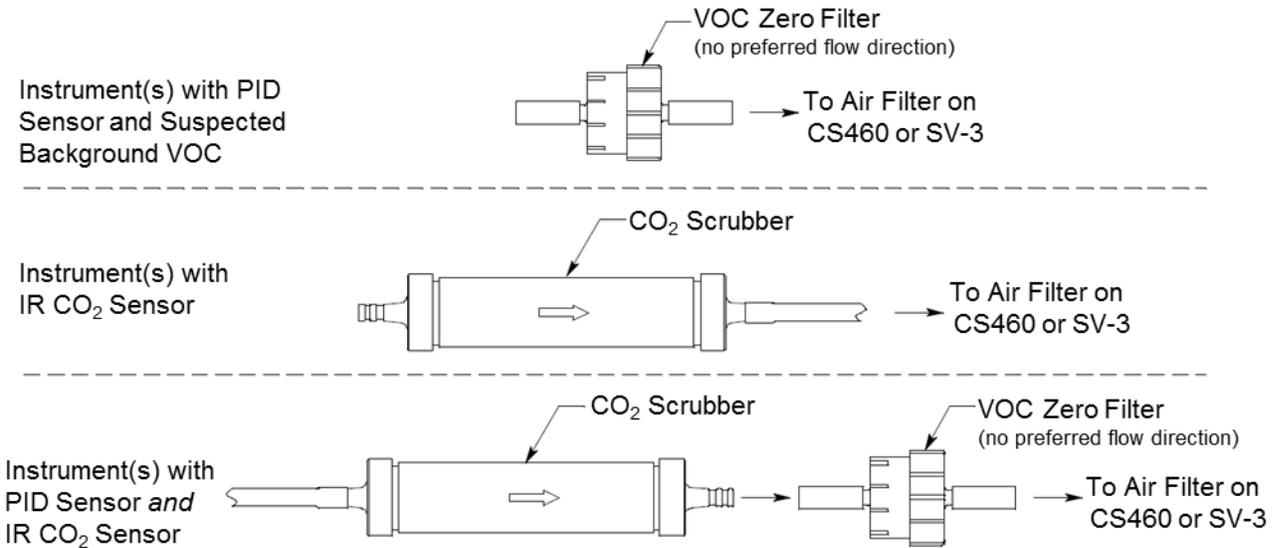


Figure 3-7: Air Inlet Filters

5. Install the 10-foot long 5/16 inch ID flexible tube that is included with the CS460 on the exhaust fitting. Route the tube to an area where the exhaust can be safely dispersed, such as an open window.

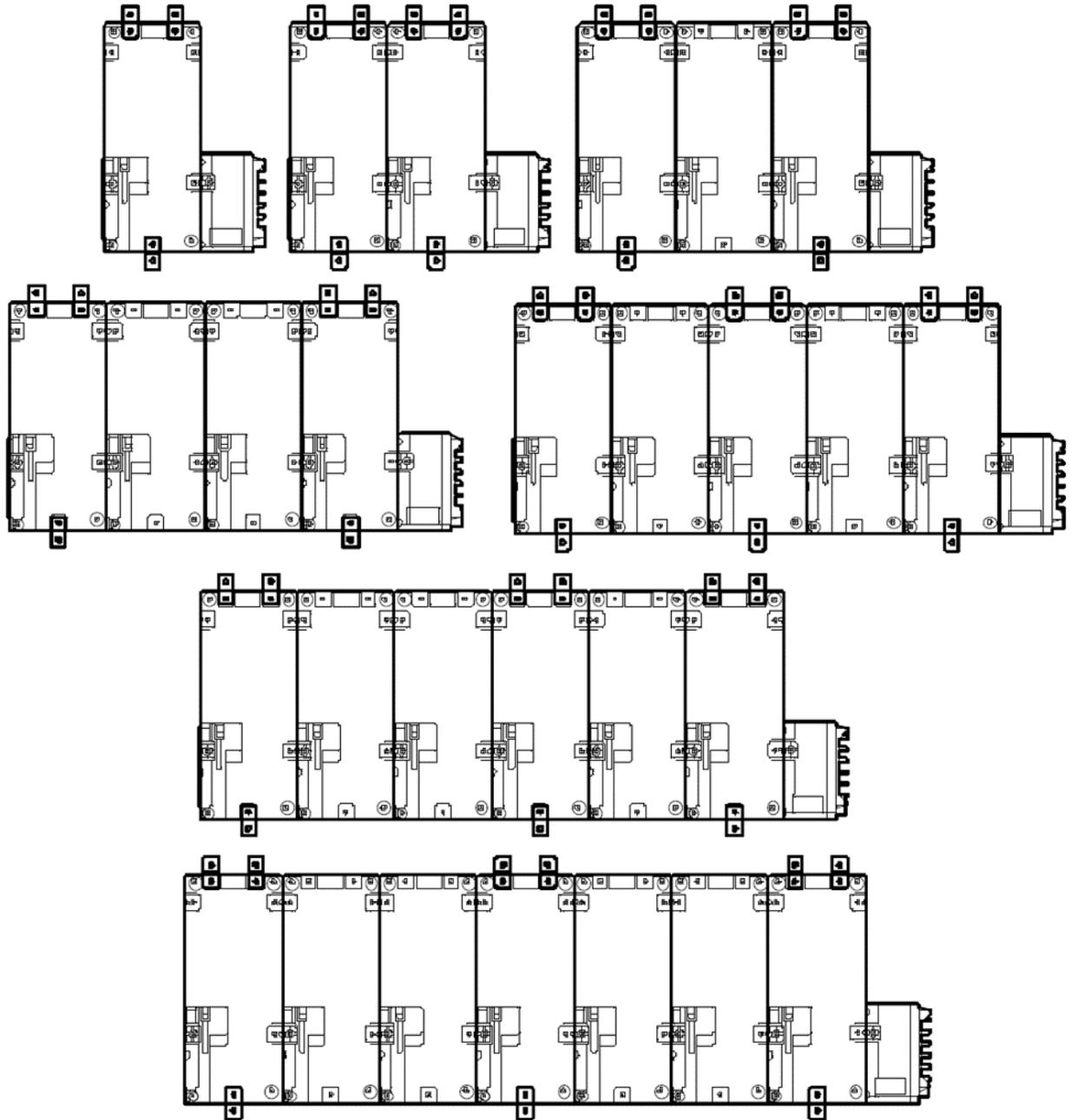


Caution

The maximum recommended length for the exhaust tube is 15 feet. **DO NOT** use more than 15 feet of tubing or tubing with an ID of less than 5/16 inch for the exhaust tube or the bump test and calibration accuracy may be adversely affected. The tube that is shipped with the CS460 has an ID of 5/16 inch and is 10 feet long.

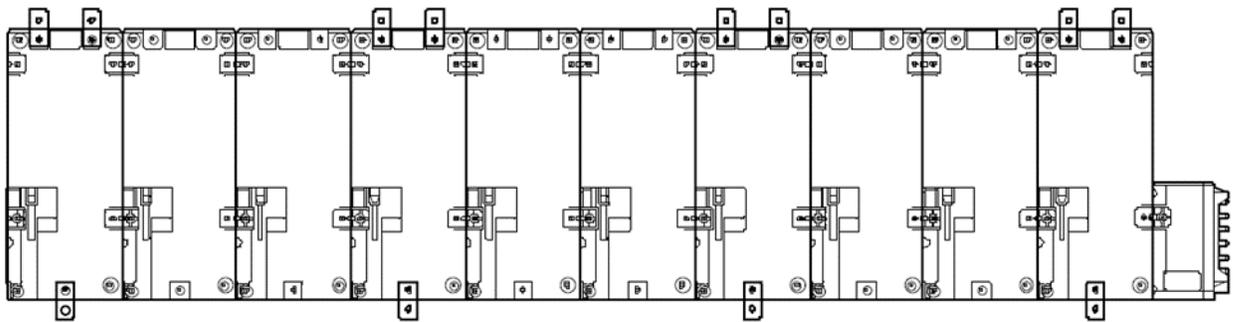
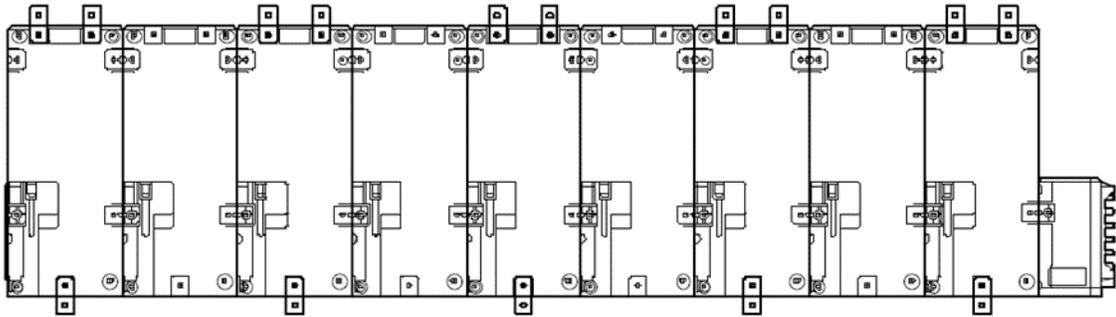
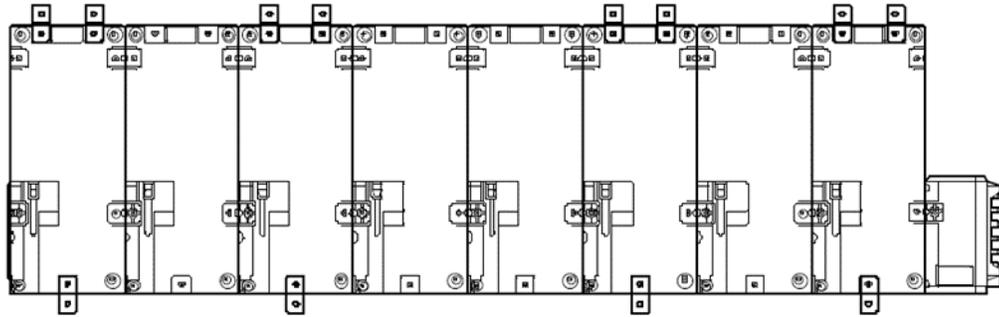
Wall Mounting the CS460 (optional)

Single CS460s or multiple CS460s connected together as described in ["Connecting Multiple CS460s Together"](#) can be mounted to the wall using mounting brackets. The wall mounting brackets are not supplied as standard with the CS460. If you are wall mounting a bank of CS460s, not every CS460 will need wall mounting brackets but each CS460 that will use wall mounting brackets needs three. See the figure below to determine how many wall mounting brackets you need to order.



# of CS460s with SV-3 or w/o SV-3	Total # of wall mounting brackets necessary
1 CS460	3 wall mounting brackets
2 to 4 CS460s	6 wall mounting brackets
5 to 7 CS460s	9 wall mounting brackets

Figure 3-8: Wall Mounting 1 to 7 CS460s



# of CS460s with SV-3 or w/o SV-3	Total # of wall mounting brackets necessary
8 to 10 CS460s	12 wall mounting brackets

Figure 3-9: Wall Mounting 8 to 10 CS460s

Note

Make sure that you have installed an exhaust line for each CS460 you intend to wall mount since access to the exhaust fitting will be very limited once the CS460 is mounted to the wall.

1. If you are mounting multiple CS460s, make sure your CS460s are properly connected and secured to each other. If you are using a SV-3, make sure that it is connected and secured to the left-most CS460.

2. Connect the wall mounting brackets to the CS460(s) using the provided screws. The wall mounting brackets are not straight. They have a short section and a long section. The short section has a smaller hole than the long section. Screw the short section into the CS460 making sure that the long section goes away from the station and is flush with the back of the CS460.

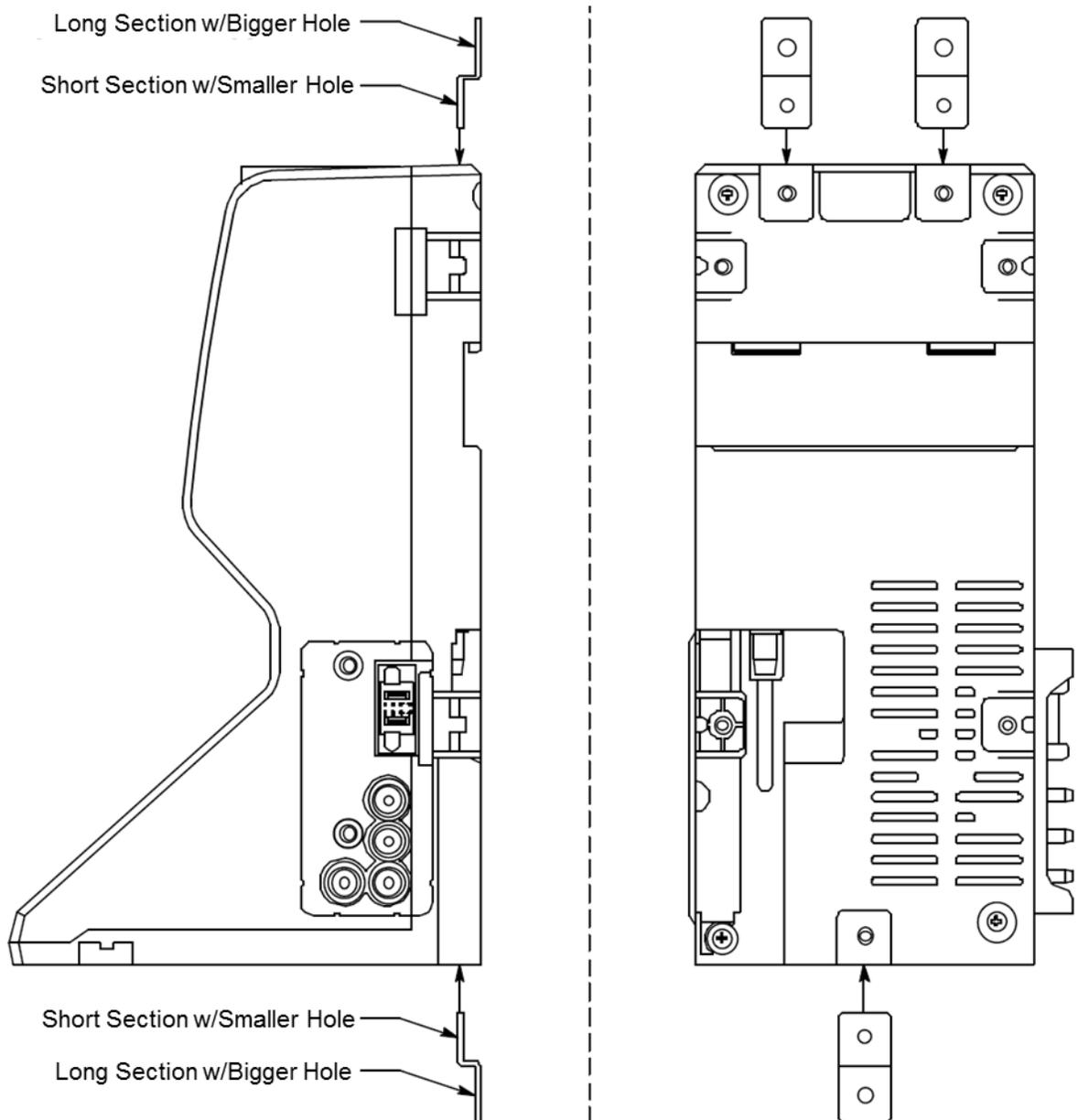


Figure 3-10: Wall Mounting Bracket Installation

3. Position the CS460(s) on the wall where you intend to mount them.
4. Screw the wall mounting brackets into the wall. Make sure the mounting screws and the material they are screwed into are appropriate to support the weight of the system.

Connecting Calibration Gas (No SV-3 attached)

Note

Chlorine (Cl₂) channels cannot be bump tested or calibrated using the CS460. If your instrument has a chlorine channel, you may test all other channels using the CS460 but must test the chlorine channel separately, using the GM460's Calibration Mode.

The **GAS 1**, **GAS 2**, and **GAS 3** fittings on the left side 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 GM460. A four-gas mix, LEL/Oxygen/CO/H₂S, is used for the **GAS 1** fitting if the instrument being used with the docking station contains the standard four sensors or is a version that has less than the four standard sensors but still has an H₂S sensor. If the instrument does not have an H₂S sensor then a three-gas mix, LEL/Oxygen/CO, should be used for the **GAS 1** fitting in order to protect the CO sensor's charcoal filter.

The **GAS 2** and **GAS 3** fittings are normally used for smart sensors (i.e., PID, ESS-03, etc.). If you have a smart sensor installed (i.e., PID, ESS-03, etc.), a special cylinder for the target gas of that sensor needs to be used for calibration. See the tables below for examples of needed cylinders for various instrument combinations. Keep in mind that if you are going to use a five-gas cylinder to calibrate one of the smart sensors, make sure that the special sensor is assigned to **GAS 1** (see "[Inlet Parameters](#)" in this chapter). See "[Spare Parts List](#)" in Chapter 5 for part numbers of available cylinders.

If your instrument has no standard sensors then the **GAS 1** fitting may be used for gas to test a smart sensor.

Table 3-1: Recommended Gas Cylinders and Gas Ports for Single-Station Use

Instrument Types	Recommended Calibration Gas Cylinder and Gas Inlet Selection
3-gas (LEL/Oxy/CO) + low range PID	GAS 1: 3-gas mix with LEL/Oxy/CO GAS 2: 10 ppm IBL
3-gas (LEL/Oxy/CO) + high range PID	GAS 1: 3-gas mix with LEL/Oxy/CO GAS 2: 100 ppm IBL
Standard 4-gas (LEL/Oxy/H ₂ S/CO) + low range PID	GAS 1: 4-gas mix with LEL/Oxy/H ₂ S/CO GAS 2: 10 ppm IBL
Standard 4-gas + high range PID	GAS 1: 5-gas mix with LEL/Oxy/CO/H ₂ S/IBL
Standard 4-gas + NH ₃	GAS 1: 4-gas mix with LEL/Oxy/H ₂ S/CO GAS 2: NH ₃

Instrument Types	Recommended Calibration Gas Cylinder and Gas Inlet Selection
Standard 4-gas + low range PID + NH ₃	GAS 1: 4-gas mix with LEL/Oxy/H ₂ S/CO GAS 2: 10 ppm IBL GAS 3: NH ₃
Standard 4-gas + high range PID + NH ₃	GAS 1: 5-gas mix with LEL/Oxy/CO/H ₂ S/IBL GAS 2: NH ₃
Standard 4-gas + SO ₂	GAS 1: 5-gas mix with LEL/Oxy/CO/H ₂ S/SO ₂

If you are connecting multiple CS460s together, it is possible to test instruments with different gas combinations at the same time. In order to completely calibrate all instruments, you cannot use more than three cylinders since the CS460 only has three gas ports on its left side.

If testing different instrument combinations at once requires more than three cylinders, you will have to test instruments one at a time and reassign the gas inlets when you change gases or test the gases common to all instruments at once and then test additional gases separately.

The table below shows some examples of instrument combinations that could be tested together if you have multiple CS460s connected together. Up to ten CS460s can be connected together. The table below only uses two GM460s as examples.

Table 3-2: Recommended Gas Cylinders and Gas Ports for Multi-Station Use

Instrument Types	Recommended Calibration Gas Cylinder and Gas Inlet Selection
Instrument 1: 3-gas + low range PID Instrument 2: 3-gas + high range PID	GAS 1: 3-gas mix with LEL/Oxy/CO GAS 2: 10 ppm IBL GAS 3: 100 ppm IBL
Instrument 1: 3-gas + high range PID Instrument 2: 3-gas + NH ₃	GAS 1: 3-gas mix with LEL/Oxy/CO GAS 2: 100 ppm IBL GAS 3: NH ₃
Instrument 1: Standard 4-gas + low range PID Instrument 2: Standard 4-gas + high range PID	GAS 1: 4-gas mix with LEL/Oxy/ H ₂ S/CO GAS 2: 10 ppm IBL GAS 3: 100 ppm IBL
Instrument 1: Standard 4-gas + high range PID Instrument 2: Standard 4-gas + high range PID + NH ₃	GAS 1: 5-gas mix with LEL/Oxy/ CO/H ₂ S/IBL GAS 2: NH ₃
Instrument 1: Standard 4-gas + NH ₃ Instrument 2: Standard 4-gas + SO ₂	GAS 1: 4-gas mix with LEL/Oxy/ H ₂ S/CO GAS 2: NH ₃ GAS 3: SO ₂
Instrument 1: Standard 4-gas + SO ₂ Instrument 2: Standard 4-gas + SO ₂ + NH ₃	GAS 1: 5-gas mix with LEL/Oxy/ CO/H ₂ S/SO ₂ GAS 2: NH ₃

Instrument Types	Recommended Calibration Gas Cylinder and Gas Inlet Selection
Instrument 1 and 2: Standard 4-gas + low range PID + NH ₃	GAS 1: 4-gas mix with LEL/Oxy/ H ₂ S/CO GAS 2: IBL GAS 3: NH ₃
Instrument 1 and 2: Standard 4-gas + high range PID + NH ₃	GAS 1: 5-gas mix with LEL/Oxy/ CO/H ₂ S/IBL GAS 2: NH ₃
Instrument 1: 3-gas + low range PID Instrument 2: 3-gas + high range PID	GAS 1: 3-gas mix with LEL/Oxy/CO GAS 2: 10 ppm IBL GAS 3: 100 ppm IBL
Instrument 1: 3-gas + high range PID Instrument 2: 3-gas + NH ₃	GAS 1: 3-gas mix with LEL/Oxy/CO GAS 2: 100 ppm IBL GAS 3: NH ₃

To connect calibration gas to the CS460, 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 no longer than 10 feet on the filter attached to the **AIR** fitting on the left side 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.

Note

If any filters are needed for the fresh air adjustment (i.e., for PID sensors and IR CO₂ sensors), they will need to be installed somewhere in the air line (see Figure 3-7).

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

Note

DO NOT connect pressurized gas directly to the CS460. Be sure to install a demand flow regulator on the cylinder before connecting it to the CS460.

3. Connect the demand flow regulator to the appropriate inlet fitting using 3/16 inch ID sample tubing.

Connecting Calibration Gas, SV-3 Attached

Note

Chlorine (Cl₂) channels **cannot** be bump tested or calibrated using the CS460. If your instrument has a chlorine channel, you may test all other channels using the CS460 but **must** test the chlorine channel separately, using the GM460's Calibration Mode.

The **GAS 1**, **GAS 2**, **GAS 3**, **GAS 4**, **GAS 5**, and **GAS 6** fittings on the left side of the SV-3 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 GM460. A four-gas mix, LEL/Oxygen/CO/H₂S, is used for the **GAS 1** fitting if the GM460 being used with the docking station contains the standard four sensors or is a version that has less than the four standard sensors but still has an H₂S sensor. If the GM460 does not have an H₂S sensor then a three-gas mix, LEL/Oxygen/CO, should be used for the **GAS 1** fitting in order to protect the CO sensor's charcoal filter.

The **GAS 2**, **GAS 3**, **GAS 4**, **GAS 5**, and **GAS 6** fittings are normally used for smart sensors (i.e. PID, ESS-03, etc.). If you have a smart sensor installed (i.e., PID, ESS- 03, etc.), a special cylinder for the target gas of that sensor needs to be used for calibration. See the table below for examples of needed cylinders for various GM460 combinations. Keep in mind that if you are using a five-gas cylinder to calibrate one of the smart sensors, make sure that the special sensor is assigned to **GAS 1** (see "[Inlet Parameters](#)" in this chapter). See "[Spare Parts List](#)" in [Chapter 5](#) for part numbers of available cylinders.

If your instrument has no standard sensors, the **GAS 1** fitting may be used for gas to test a smart sensor.

The SV-3 is useful for single-station use or multi-station use. If you have multiple GM460 configurations, instead of having to re-assign **GAS 2** or **GAS 3** every time you test a different configuration, like you would have to do if an SV-3 was not installed, you can assign the different gases to **GAS 4**, **GAS 5**, or **GAS 6**.

The gas inlets can be assigned as desired. The table below provides recommendations.

Table 3-3: Recommended Gas Cylinders and Gas Ports for Single- and Multi-Station Use

Instrument Types	Recommended Calibration Gas Cylinder and Gas Inlet Selection
Instrument 1: 3-gas + low range PID Instrument 2: 3-gas + high range PID Instrument 3: 3-gas + NH ₃	GAS 1: 3-gas mix with LEL/Oxy/CO GAS 2: 10 ppm IBL GAS 3: 100 ppm IBL GAS 4: NH ₃
Instrument 1: 3-gas + high range PID Instrument 2: 3-gas + NH ₃ Instrument 3: 3-gas + SO ₂	GAS 1: 3-gas mix with LEL/Oxy/CO GAS 2: 100 ppm IBL GAS 3: NH ₃ GAS 4: SO ₂
Instrument 1: Standard 4-gas + low range PID Instrument 2: Standard 4-gas + high range PID Instrument 3: Standard 4-gas + high range PID + NH ₃	GAS 1: 4-gas mix with LEL/Oxy/H ₂ S/CO GAS 2: 10 ppm IBL GAS 3: 100 ppm IBL GAS 4: NH ₃
Instrument 1: Standard 4-gas + high range PID Instrument 2: Standard 4-gas + high range PID + NH ₃ Instrument 3: Standard 4-gas + SO ₂ + NO ₂	GAS 1: 5-gas mix with LEL/Oxy/CO/H ₂ S/IBL GAS 2: NH ₃ GAS 3: SO ₂ GAS 4: NO ₂
Instrument 1: Standard 4-gas + NH ₃ Instrument 2: Standard 4-gas + SO ₂ Instrument 3: High range PID + NO ₂	GAS 1: 4-gas mix with LEL/Oxy/H ₂ S/CO GAS 2: NH ₃ GAS 3: SO ₂ GAS 4: 100 ppm IBL GAS 5: NO ₂
Instrument 1: Standard 4-gas + SO ₂ Instrument 2: Standard 4-gas + SO ₂ + NH ₃ Instrument 3: Low range PID + NO ₂	GAS 1: 5-gas mix with LEL/Oxy/CO/H ₂ S/SO ₂ GAS 2: NH ₃ GAS 3: 10 ppm IBL GAS 4: NO ₂
Instrument 1 and 2: Standard 4-gas + low range PID + NH ₃	GAS 1: 4-gas mix with LEL/Oxy/ H ₂ S/CO GAS 2: IBL GAS 3: NH ₃
Instrument 1 and 2: Standard 4-gas + high range PID + NH ₃	GAS 1: 5-gas mix with LEL/Oxy/ CO/H ₂ S/IBL GAS 2: NH ₃

To connect calibration gas to the CS460, 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 no longer than 10 feet on the SV-3's particle filter and route it to a fresh air area or connect a cylinder of zero air with a demand flow regulator to the SV-3's particle filter.

Note

If any filters are needed for the fresh air adjustment (i.e., for PID sensors and IR CO₂ sensors) they will need to be installed somewhere in the air line (see Figure 3-7).

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

Note

DO NOT connect pressurized gas directly to the CS460. Be sure to install a demand flow regulator on the cylinder before connecting it to the CS460.

3. Connect the demand flow regulator to the appropriate inlet fitting using 3/16 inch ID sample tubing.

Setting Basic Operational Parameters in the Config Menu

Once the hardware has been assembled, use the Config Menu to confirm or adjust:

- Bump test parameters
- Calibration parameters
- Gas inlet parameters
- Date/time parameters and settings
- Language setting
- Password setting

The operational parameters are saved in the CS460's memory. If a parameter is changed, the change will be in effect for any subsequent tests until the parameter is changed again. If you have multiple CS460s connected together, the secondary CS460s will use the same parameter values of the primary CS460. The parameters cannot be changed for each individual CS460 if they are all connected together. If the primary CS460 is removed from the installation, it will retain its settings but the new primary CS460 that is now the left-most CS460 will not remember the old primary's settings.

Bump Test Parameters

There are nine bump test parameters. The table below describes the parameters and shows the factory settings. To use the factory settings you do not need to make any parameter adjustments. To confirm or change the parameter settings, follow the instructions below.

Table 3-4: Bump Test Parameters

Parameter	Display Tag	Available Choices	Factory Setting
Pre-Sample Flush Time	AIR Flush	15 to 120 seconds in 1 second increments	15 seconds
Calibration Gas Sample Time	GAS	20 to 120 seconds in 1 second increments	20 seconds
Post-Sample Purge Time	AIR Purge	5 to 120 seconds in 1 second increments	15 seconds
Bump Test Check Tolerance	Tolerance	10% to 50% in 1% increments	50%

Parameter	Display Tag	Available Choices	Factory Setting
Fast Bump	Fast	<ul style="list-style-type: none"> • On • Off 	On
Automatic Calibration	Auto Cal.	<ul style="list-style-type: none"> • On • Off 	On
Alarm Check	Alarm Check	<ul style="list-style-type: none"> • On • Off 	On
Auto Print	Auto Print	<ul style="list-style-type: none"> • On • Off 	Off
Automatically Bump Test if Past Due	Auto bump if past due	<ul style="list-style-type: none"> • On • Off 	Off

Pre-Sample Flush Time (AIR Flush)

The **Pre-Sample Flush Time** is the length of time that the CS460 will draw air through the **AIR** fitting before performing an air adjust operation.

Calibration Gas Sample Time (GAS)

The **Calibration Gas Sample Time** is the length of time that the CS460 will draw calibration gas through each of the gas fittings.

Post-Sample Purge Time (AIR Purge)

The **Post-Sample Purge Time** is the length of time that the CS460 will draw air through the **AIR** fitting to purge calibration gas from the system.

Bump Test Check Tolerance (Tolerance)

The **Bump Test Check Tolerance** determines how close the GM460 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 GM460 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 GM460 must be 50% LEL \pm 25% LEL.

Fast Bump (Fast)

If **Fast** is not selected, the gas application during a bump test will continue for the time period defined by the **GAS** bump test parameter regardless of the sensor reading(s).

If **Fast** 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** bump test parameter, and the pass/fail status of the sensor(s) will be determined at that point. Turning **Fast** on allows calibration gas to be saved when the tested sensors respond quickly and accurately.

Consider the following scenario as an example.

- 50% LEL methane used for bump testing the combustible gas channel
- **GAS** bump test parameter set to 20 seconds
- **Tolerance** set to $\pm 50\%$, which means that the acceptable reading range is 25% LEL - 75% LEL
- **Fast** selected

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

Table 3-5: Example Fast Bump Scenarios

Gas Reading 10 Seconds Into Fast Bump	Outcome
15% LEL (-70% of 50% LEL)	<ul style="list-style-type: none"> • Gas application continues for the full 20 seconds • Pass/fail determined at end of 20 seconds
30% LEL (-40% of 50% LEL)	<ul style="list-style-type: none"> • Gas application stops • Sensor passes bump testing
60% LEL (+20% of 50% LEL)	<ul style="list-style-type: none"> • Gas application stops • Sensor passes bump testing
80% LEL (+60% of 50% LEL)	<ul style="list-style-type: none"> • 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.

Alarm Check

If **Alarm Check** is selected, a vibrator, LED, and buzzer test is done on the GM460 at the end of the bump test or calibration. The vibrator will vibrate, the LEDs will turn on for a few seconds, the buzzer will sound, and the CS460 will determine if these actions were completed successfully.

Auto Print

The printer must be connected for the **Auto Print** parameter to have any function. If **Auto Print** is selected, the CS460 will automatically print bump test results at the end of a bump test. If **Auto Print** is not selected, the CS460 will not automatically print bump test results but the results can still be printed by pressing the **Print** button at the end of a bump test.

Automatically Bump Test if Past Due (Auto bump if past due)

If the **Auto bump if past due** parameter is selected *and* if the connected GM460 is due for a bump test, the CS460 will automatically perform a bump test 60 seconds after the GM460 is connected. The number of gases used for this bump test depends on the instrument's **B--CHECK** setting. If **B--CHECK** is set to **4GAS**, only the standard four sensors will be automatically bump tested. If **B--CHECK** is set to **ALL**, all sensors will be automatically bump tested.

If the **Auto bump if past due** parameter is deselected, an automatic bump test will not be performed, even if the GM460 is due for one.

Calibration Parameters

There are six calibration parameters. The table below describes the parameters and shows the factory settings. To use the factory settings, you do not need to make any parameter adjustments. To confirm or change the parameter settings, follow the instructions below.

Table 3-6: Calibration Parameters

Parameter	Display Tag	Available Choices	Factory Setting
Pre-Sample Flush Time	AIR Flush	15 to 120 seconds in 1 second increments	15 seconds
Calibration Gas Sample Time	GAS	20 to 120 seconds in 1 second increments	60 seconds
Post-Sample Purge Time	AIR Purge	5 to 120 seconds in 1 second increments	15 seconds
Alarm Check	Alarm Check	<ul style="list-style-type: none"> • On • Off 	On
Auto Print	Auto Print	<ul style="list-style-type: none"> • On • Off 	Off
Automatically Calibrate if Past Due	Auto cal if past due	<ul style="list-style-type: none"> • On • Off 	Off

Pre-Sample Flush Time (AIR Flush)

The **Pre-Sample Flush Time** is the length of time that the CS460 will draw air through the **AIR** fitting before performing an air adjust operation.

Calibration Gas Sample Time (GAS)

The **Calibration Gas Sample Time** is the length of time that the CS460 will draw calibration gas through each of the gas fittings.

Post-Sample Purge Time (AIR Purge)

The **Post-Sample Purge Time** is the length of time that the CS460 will draw air through the **AIR** fitting to purge calibration gas from the system.

Alarm Check

If **Alarm Check** is selected, a vibrator, LED, and buzzer test is done on the GM460 at the end of the bump test. The vibrator will vibrate, the LEDs will turn on for a few seconds, the buzzer will sound, and the CS460 will determine if these actions were completed successfully.

Auto Print

The printer must be connected for the **Auto Print** parameter to have any function. If **Auto Print** is selected, the CS460 will automatically print calibration results at the end of a calibration. If **Auto Print** is not selected, the CS460 will not automatically print calibration results but the results can still be printed by pressing the Print button at the end of a calibration.

Automatically Calibrate if Past Due (Auto cal if past due)

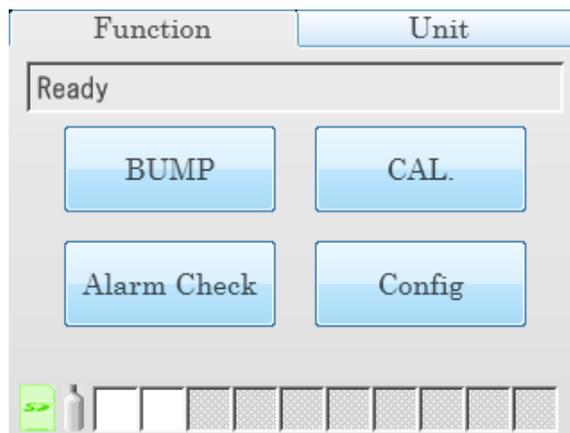
If the **Automatically Calibrate if Past Due** parameter is selected *and* if the connected GM460 is due for a calibration, the CS460 will automatically perform a calibration 60 seconds after the GM460 is connected. The number of gases used for this calibration depends on the instrument's **C--CHECK** setting. If **C--CHECK** is set to **4GAS**, only the standard four sensors will be automatically calibrated. If **C--CHECK** is set to **ALL**, all sensors will be automatically calibrated.

If the **Automatically Calibrate if Past Due** parameter is deselected, an automatic calibration will not be performed, even if the GM460 is due for one.

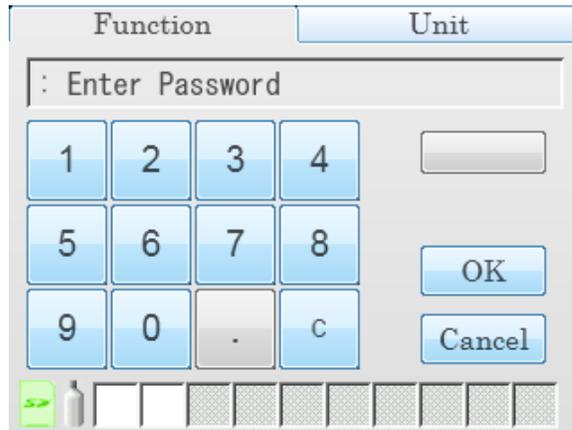
Viewing or Changing the Calibration Parameters

Perform the following to set the calibration parameters.

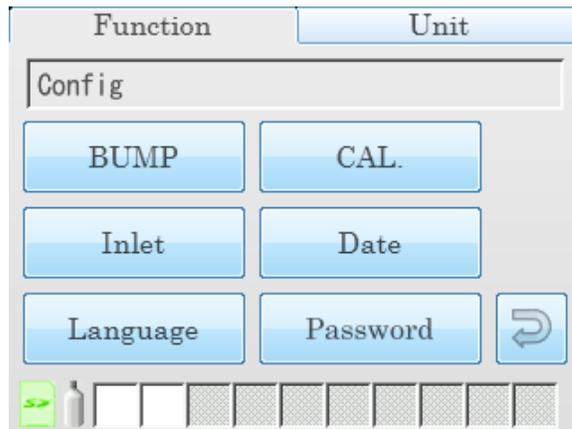
1. Turn on the CS460 system. The **Function** tab will be displayed on a single-station system's screen or on the primary station's screen in a multi-station system.



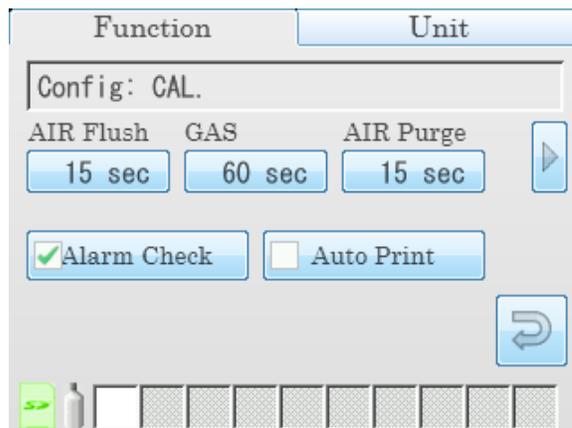
2. Press the **Config** button. If Password is set to **on** (factory setting is off), you will be prompted for a password. Enter the password and press **OK** to continue.



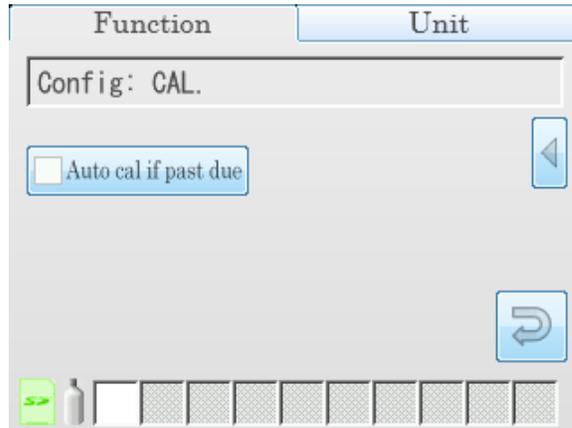
3. The **Configuration** Menu will be displayed.



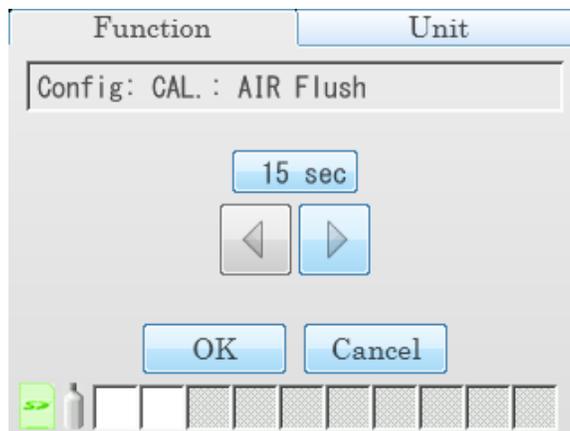
4. Press the **CAL** button. Five (5) out of six (6) calibration parameters and their current settings will be displayed.



5. The arrow in the upper-right corner takes you to the second page that shows the last of the calibration parameters and its current setting.



6. Adjust the **AIR Flush**, **GAS**, **AIR Purge**, and **Tolerance** parameters as described below. The procedure is the same for each parameter's adjustment. **AIR Flush** is shown as an example.
 - a. Press the current value for the parameter you want to change.



- b. Use the arrows to adjust the value.
 - c. Press **OK** to save the changes and return to the **Bump Parameters** screen.
 - d. Press **Cancel** to return to the **Calibration Parameters** screen without saving the changes.
 - e. Repeat steps (a) to (d) to set any other parameters.
7. Select or deselect the **Alarm Check**, **Auto Print**, and **Auto Cal if past due** parameters to turn them on or off.
8. When you are done setting the parameters, press the **Return** arrow button on the right-side of the screen. The **Configuration Menu** will be displayed.
9. To exit the **Configuration Menu** and return to the **Function** tab's main menu, press the return arrow on the right side of the screen.

Inlet Parameters

The gas inlet parameters define what gases are assigned to each port and lets you select the ports as active or inactive.

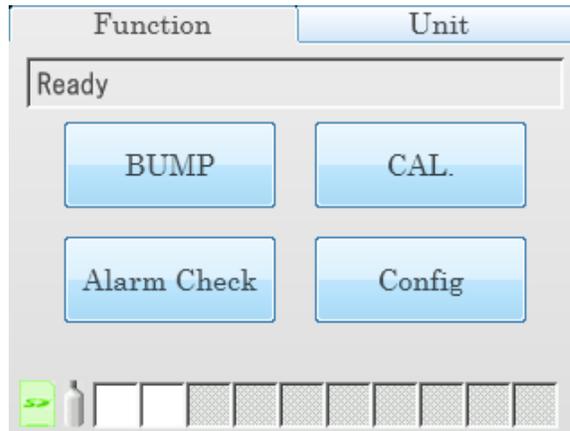
All of the standard four (4) sensors (catalytic LEL, O₂, H₂S, and CO) are generally assigned to **GAS 1**. If the SV-3 is not being used, smart sensors (PID, ESS-03, etc.) are generally assigned to **GAS 2** and **GAS 3**. If the SV-3 is being used, smart sensors can be assigned to **GAS 2**, **GAS 3**, **GAS 4**, **GAS 5**, or **GAS 6**.

Note

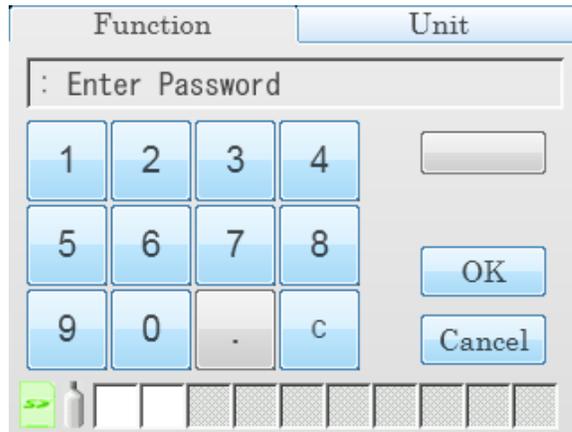
Chlorine (Cl₂) channels *cannot* be bump tested or calibrated using the CS460. If your instrument has a chlorine channel, you may test all other channels using the CS460 but must test the chlorine channel separately, using the GM460's Calibration Mode.

Follow the steps below to set the gas inlet parameters.

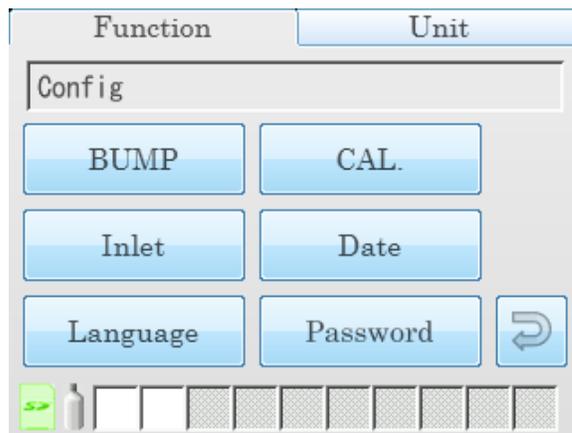
1. Connect the GM460 to the CS460 as described in "[Turning on a CS460 System](#)" in Chapter 4. If you have a multi-station system, connect GM460s with all of the gas combinations you plan on testing.
2. If necessary, press the **Function** button to display the **Function** tab.



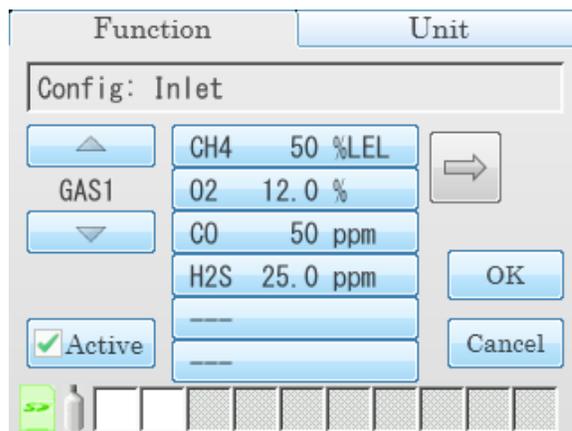
- Press the **Config** button. If **Password** is set to **on** (factory setting is off), you will be prompted for a password. Enter the password and press **OK** to continue.



- The **Configuration** Menu will be displayed.



- Press the **Inlet** button.

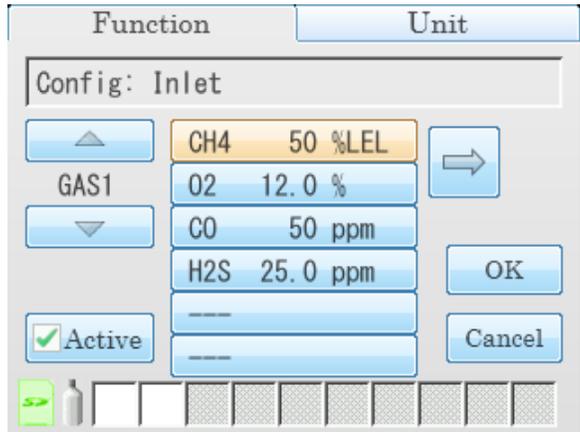


- **GAS 1** in the top-left-corner shows what gas inlet is currently selected for editing.
- The **Active** button in the bottom-left-corner selects whether the gas inlet is active. This feature is useful if you do not want to use a particular gas inlet for a test. For example, if you have a four-gas + low range PID GM460 but you only want to test the PID sensor, you could deselect the **Active** button for the four-gas inlet.

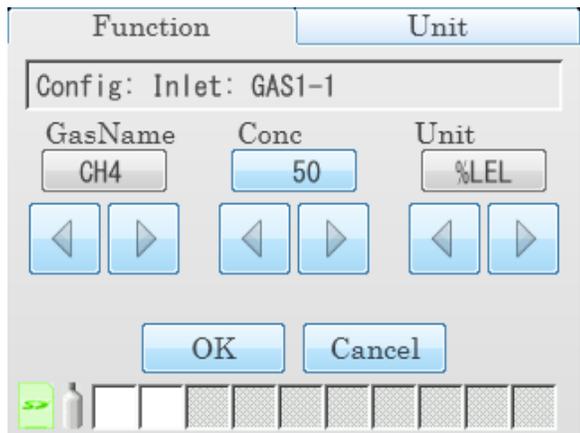
Note

Since the CS460 only has three (3) gas ports, **GAS 4**, **GAS 5**, and **GAS 6** cannot be selected as active if the SV-3 is not connected.

- Gas list in the middle of the screen shows what gas(es) are assigned to the selected inlet.
6. To change the gas(es) and/or concentration(s) for a gas inlet:
- a. Press the desired gas. You can only change one gas at a time.



- b. Press the arrow to the right of the gas list. The gas name, concentration, and units will be displayed.



- c. Scroll through the gas name choices using the arrows below the current selection. The same gas cannot be assigned to an inlet twice, so gases already assigned to the inlet you are editing will not appear as a choice when scrolling through the gas options. Only gases in currently or previously connected GM460(s) will appear as choices. To remove the chosen gas from the assigned inlet, scroll to the “ - - ” selection. To assign multiple gases to one inlet, it does not matter what order the gases are in.
- d. Adjust the concentration using the arrows or by pressing the current setting and manually typing in the concentration.

Note

When setting up inlet information for the first time, concentration information must match the auto calibration value being shown for the appropriate channel on the **Unit** tab in order to avoid an inlet error.

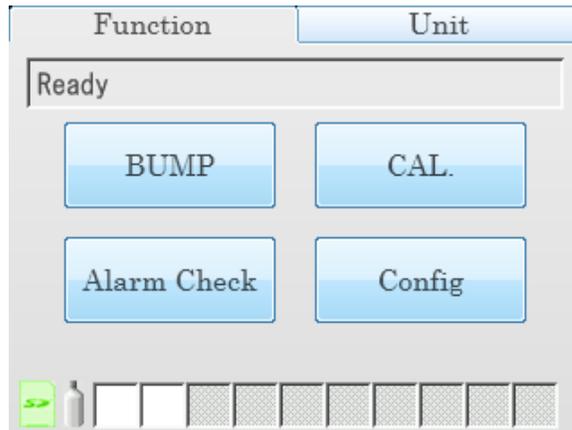
Once the inlet information is initially set up, that inlet information takes priority over the GM460's auto calibration values. After the initial setup, the inlet concentration does not need to match the instrument's auto calibration value.

- e. Scroll through the unit choices using the arrows below the current selection.
 - f. Press **OK** to save the changes and return to the **Inlet Parameter** screen.
 - g. Press **Cancel** to return to the **Inlet Parameter** screen without saving any changes.
7. Use the arrows above and below the gas inlet selection to change the gas inlet. The Active parameter's setting and the gas list will change.
 8. Repeat steps 5(a) to 5(g) for any additional channels you want to assign an inlet to.
 9. Repeat steps 1 to 8 if you only have one (1) CS460 but have another GM460 with a different gas combination that you want to configure the inlets for.
 10. When you are finished viewing or making changes to inlet parameters, press **OK** to save the changes and return to the **Configuration Menu** or press **Cancel** to return to the **Configuration Menu** without saving the changes.
 11. To exit the **Configuration Menu** and return to the **Function** tab's main menu, press the return arrow on the right side of the screen.
 12. To turn off the GM460(s), press the **Unit** button to display and **Unit** tab and then press the **Detector Off** button in the lower-left corner.

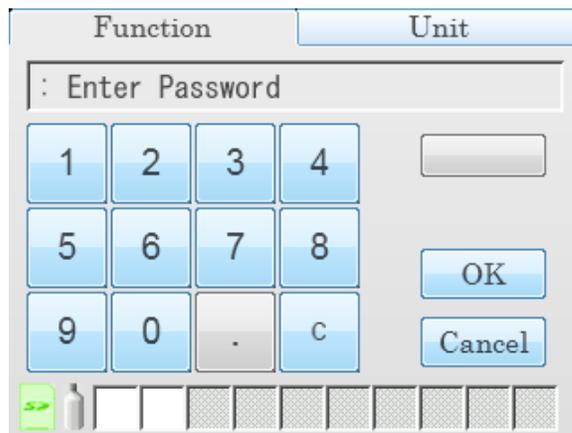
Date, Time, and Date/Time Format

Follow the steps below to view or change the docking station's date, time, or date/time format.

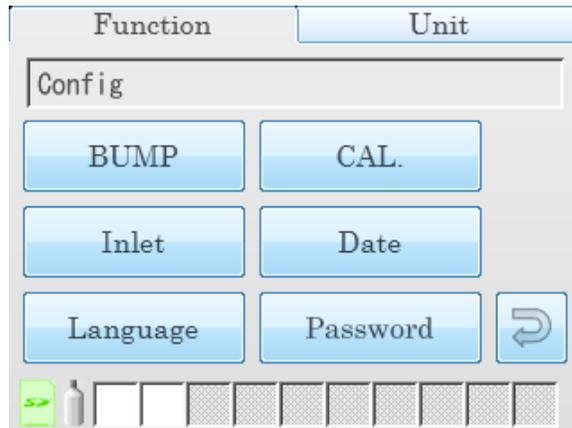
1. Turn on the CS460 system. The **Function** tab will be displayed on a single-station system's screen or on the primary station's screen in a multi-station system.



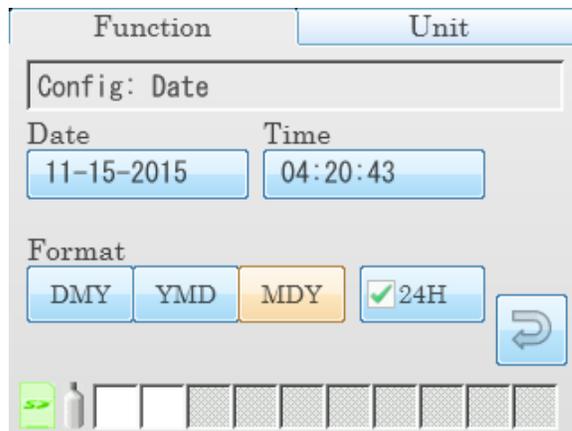
2. Press the **Config** button. If **Password** is set to **on** (factory setting is off), you will be prompted for a password. Enter the password and press **OK** to continue.



3. The **Configuration** Menu will be displayed.

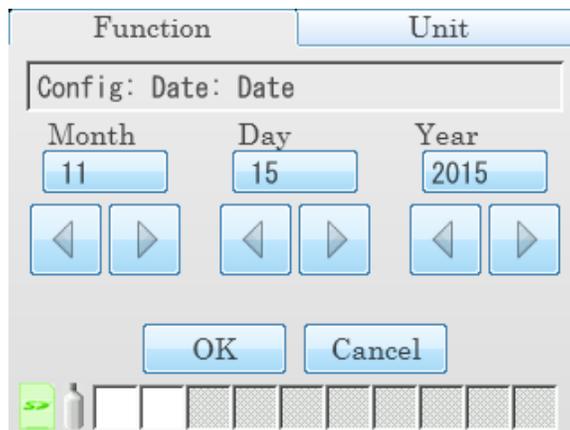


4. Press the **Date** button.



5. To change the date:

- a. Press the **Date** field.



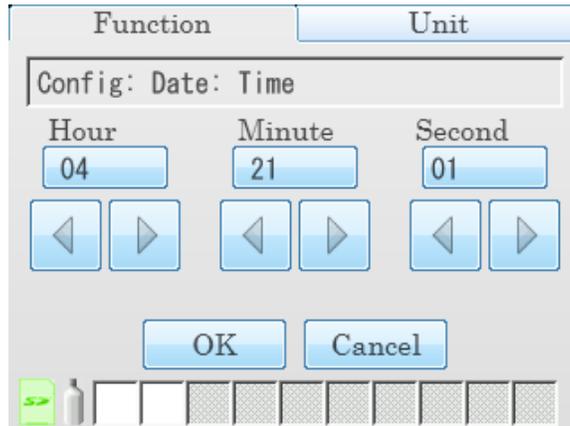
- b. To change any of the month/day/year settings, use the arrows below the setting or press the current setting and type in the desired value on the number pad that appears.

- c. Press **OK** to save the changes and return to the **Configuration Menu**.

Press **Cancel** to return to the **Configuration Menu** without saving any changes.

- 6. To change the time:

- a. Press the **Time** field.

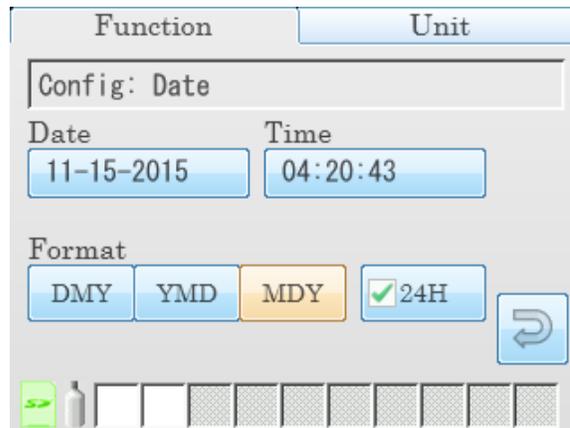


- b. To change any of the settings, use the arrows below the setting or press the current setting and type in the desired value on the number pad that appears. If the station is not using 24-hour time, the arrows below the hour must be used to scroll through the AM and PM times.

- c. Press **OK** to save the changes and return to the **Configuration Menu**.

Press **Cancel** to return to the **Configuration Menu** without saving any changes.

- 7. To change the date/time format:

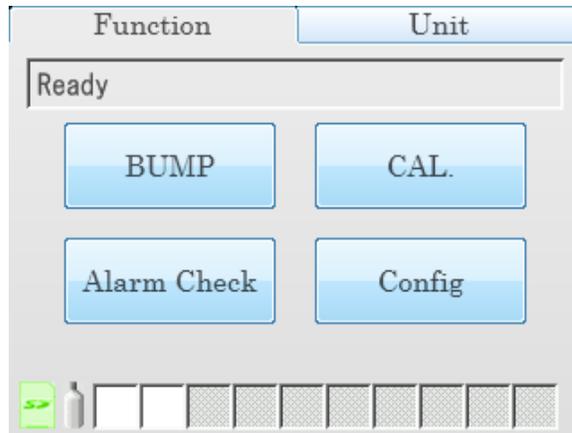


- a. Press the desired date format.
 - DMY: day, month, year
 - YMD: year, month day
 - MDY: month, day year
- b. Select or deselect the **24H** box to turn the 24-hour clock function on or off.
- c. Press the return button to return to the Configuration Menu.

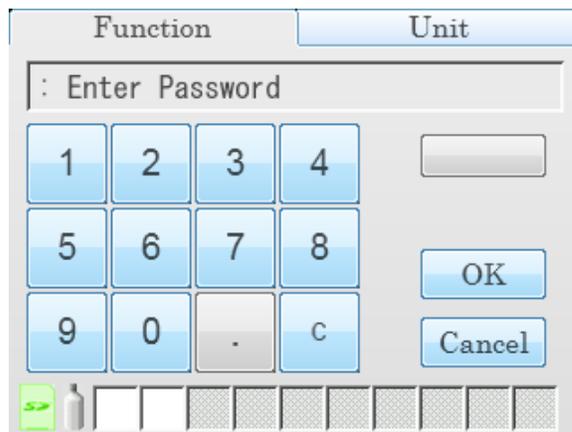
Language

Follow the instructions below to change the station's language.

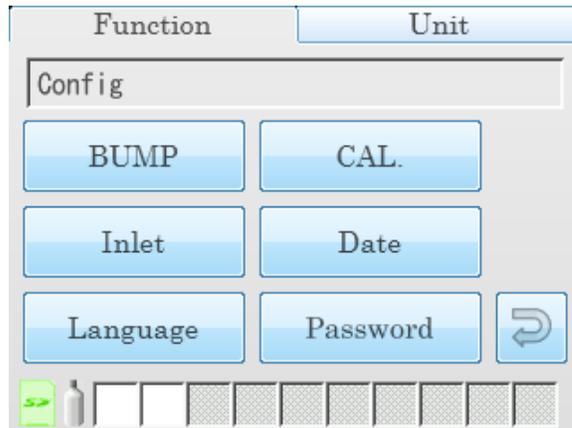
1. Turn on the CS460 system. The **Function** tab will be displayed on a single station system's screen or on the primary station's screen in a multi-station system.



2. Press the **Config** button. If **Password** is set to **on** (factory setting is off), you will be prompted for a password. Enter the password and press **OK** to continue.



3. The **Configuration** Menu will be displayed.



4. Press the **Language** button. The available language options will be displayed.

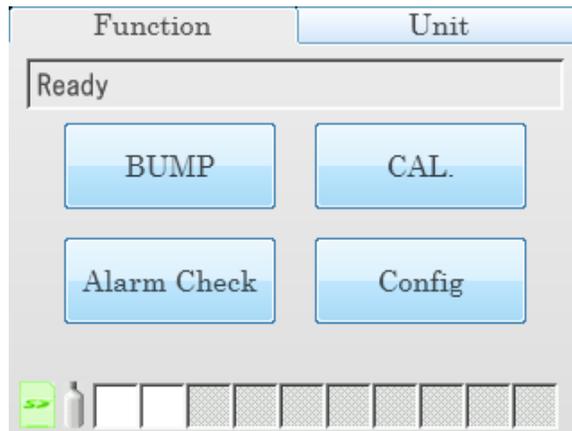


5. Press the desired language. There is no confirmation necessary for a language change and the CS460's language will immediately change. The **Language** screen will not go away until you press the return button so if you accidentally change the language, you can change it back right away.
6. Press the return button to return to the **Configuration** Menu.

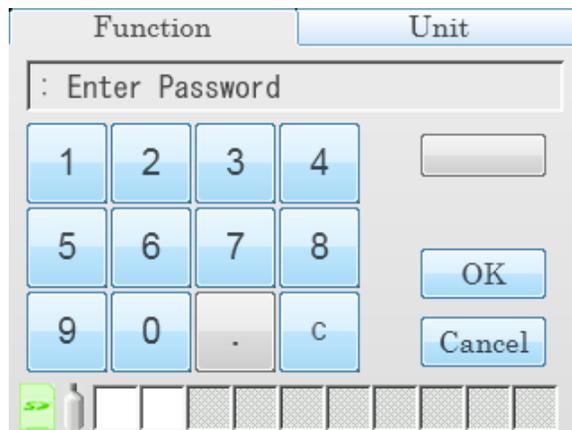
Password

If **Password** is set to **on**, a password will be required to enter the **Configuration** Menu. If **Password** is set to **off** (factory setting), no password is required to enter the **Configuration** Menu. Do the following to turn **Password** on or off.

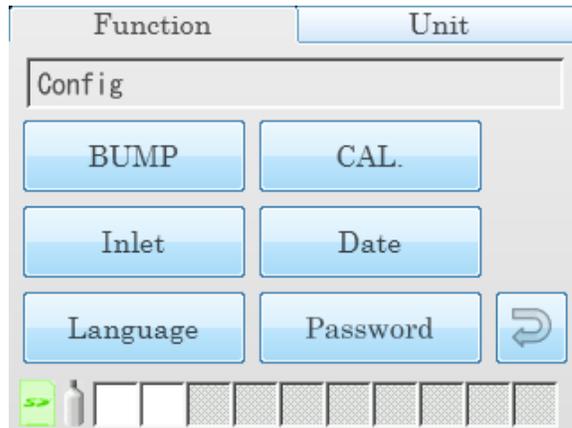
1. Turn on the CS460. The **Function** tab's main menu will be displayed.



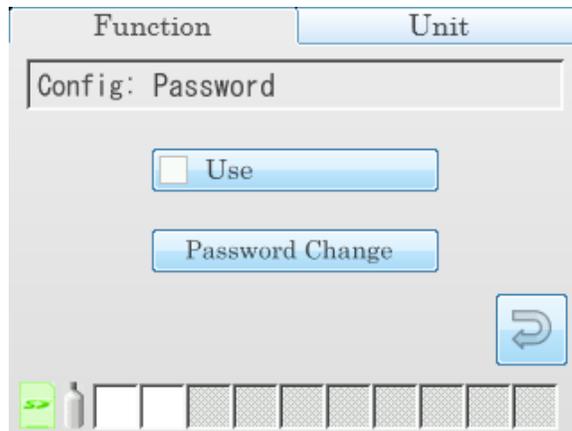
2. Press the **Config** button. If **Password** is already set to **on** (factory setting is off), you will be prompted for a password. Enter the password and press **OK** to continue.



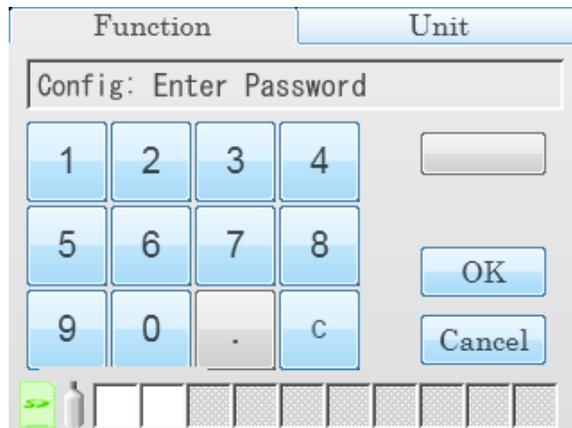
3. The **Configuration** Menu will be displayed.



4. Press the **Password** button. The **Password** Menu will appear.



5. To turn the password function on or off, select or deselect the **Use** selection box.
6. To change the password, press **Password Change**.
 - a. You will be prompted to enter the current password. The factory set password is "0000". Enter the current password and press **OK** to proceed or **Cancel** to return to the **Password Menu**.



- b. You will be prompted to enter the new password. Enter the new password and press **OK** to proceed or **Cancel** to return to the **Password Menu**.

Function				Unit
Config: New Password				
1	2	3	4	
5	6	7	8	OK
9	0	.	c	Cancel

- c. You will be prompted to confirm the new password. Reenter the new password and press **OK** to proceed or **Cancel** to return to the **Password Menu**.

Function				Unit
Config: Confirm New Password				
1	2	3	4	
5	6	7	8	OK
9	0	.	c	Cancel

7. You will be returned to the **Password Menu**.
8. Press the return button to return to the **Configuration Menu**.

Setting Detailed Operational Parameters Using the CS460 PC Controller Program

The CS460 PC Controller Program allows you to change more detailed parameters that affect the operation of the CS460 in Standalone Mode. These parameters are not available for editing in any of the CS460's Standalone Mode menu screens. The parameters that affect standalone operation but are only accessible using the PC Controller program are:

Parameters	Description
Data Logger	Set up the CS460 to automatically download the GM460's logger data to the SD card every time it is turned on or at an interval. Enable or disable manual downloading of the GM460's logger data to the SD card.
Power Saving	Select how much time goes by before the GM460 is automatically turned off after a successful test and after the last button push.
Expiration Date	Select how many days prior to when a calibration is due that the " Cal Limit Soon " message appears and how many days prior to a cylinder's expiration date that the cylinder icon turns yellow.
Automatic Execution	Set up what day(s)/time the CS460 will automatically bump test, calibrate, or alarm check an installed GM460.
Cylinders Tab	Enter cylinder information including an expiration date see the following sections for instructions to update these parameters.

Note

These parameters do not need to be edited in order for the CS460 to function properly. These parameters allow you to edit features or initiate certain operations that cannot be accessed using the CS460's Config Menu.

Launching the PC Controller Program and Connecting an CS460

1. Click **Start** on the Windows Icon Tray then select **Programs/CS460 PC**. You may also double-click the shortcut created on your desktop. The CS460 PC Controller Program is launched and the main program window appears.

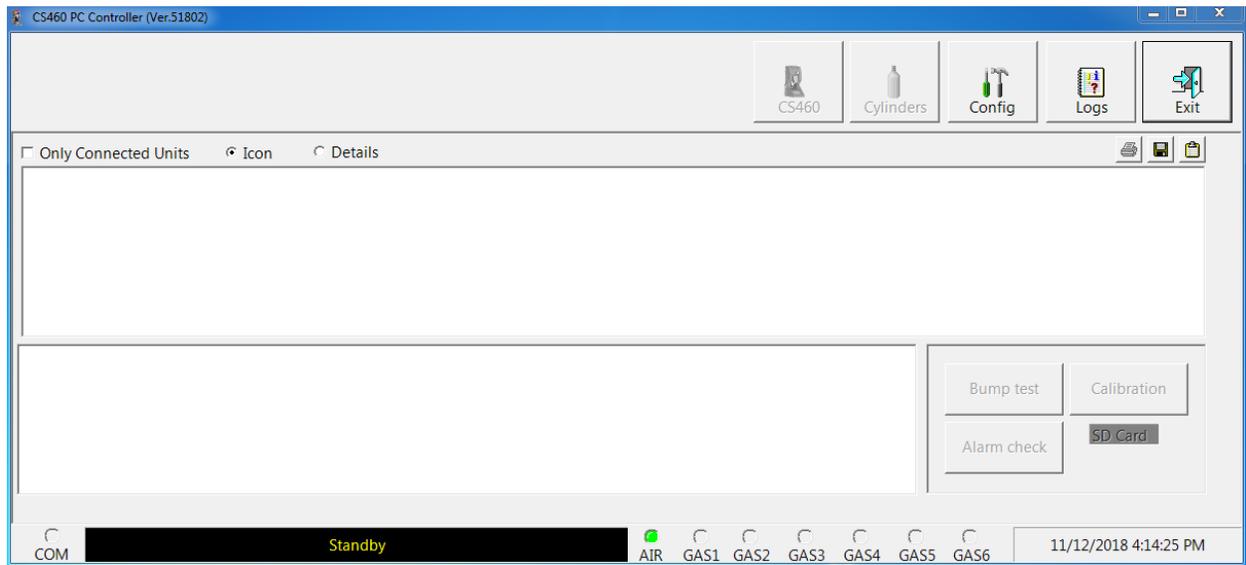


Figure 3-11: Main Program Window

2. When starting the software for the first time, a message window appears informing you that a database has been created. Click **OK** in that window.
3. Connect the AC adapter to the CS460 and to an AC wall socket. For a multi-station system, only the left-most CS460 should be connected to power.
4. Connect a **Type A** to **Type B** USB cable to the CS460 and to an available USB port on your computer. For a multi-station system, only the left-most CS460 should be connected to the computer with the USB cable.
5. Flip the CS460's power switch so that it is in the **ON** position. For a multi-station system, only the power switch of the left-most CS460 needs to be flipped.

Accessing the CS460 Configuration Window

1. Launch the PC Controller Program and connect your CS460(s) as described in the previous section.
2. Click the **CS460** button at the top of the screen.



3. If the Password parameter in the **Bump & Cal 2** tab of the CS460 Window is set to **ON**, the program will prompt you for a password to enter the CS460 Window. Enter the password and click **OK**.
4. The CS460 Window will open and the **Bump & Cal 1** tab will be displayed.

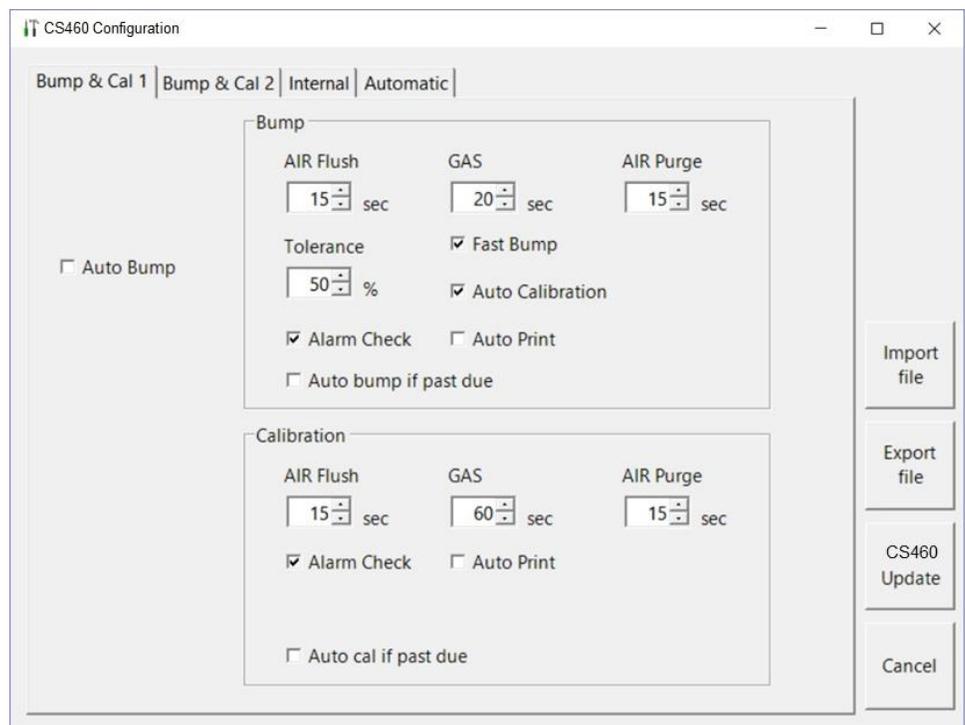


Figure 3-12: CS460 Configuration Window

Updating the Data Logger Settings

- 1 Launch the PC Controller Program and connect your CS460(s) as described in "[Launching the PC Controller Program and Connecting a CS460](#)" (in this chapter).
- 2 Access the CS460 Configuration Window as described in "[Accessing the CS460 Configuration Window](#)" (in this chapter).
- 3 Click the **Bump & Cal 2** tab.

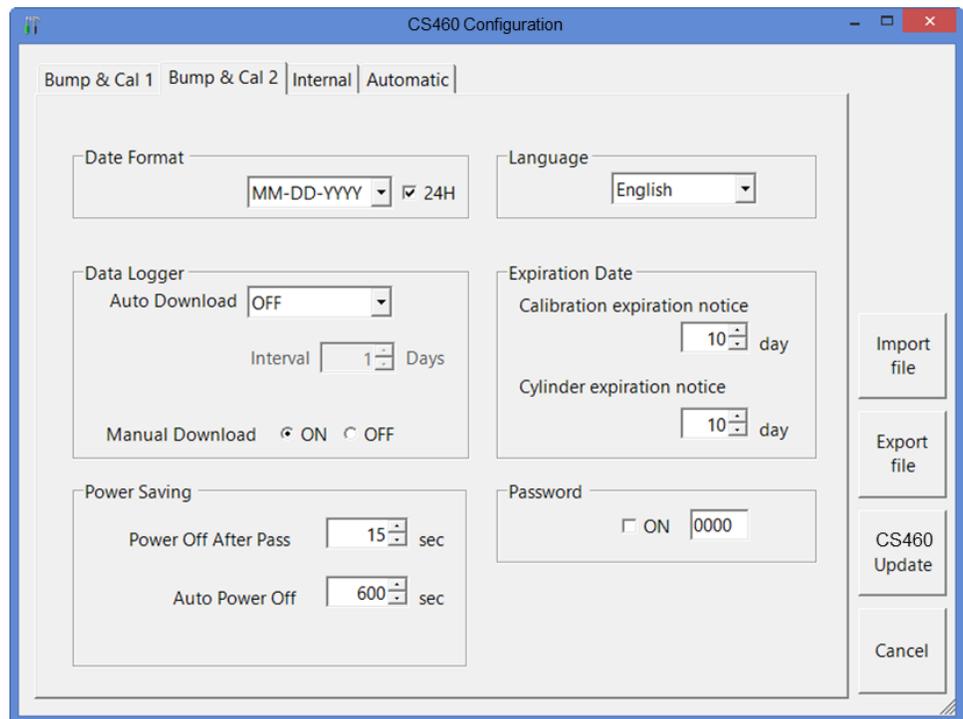


Figure 3-13: Bump & Cal 2 Tab

- 4 Use the drop-down menu to select the desired setting for the **Data Logger Auto Download** parameter.

Setting	Description
OFF	No data download to the SD card will be performed when a GM460 is connected to the CS460.
Every Time	A data download to the SD card will automatically occur every time a GM460 is connected to the CS460.
Interval	A data download to the SD card is performed once per interval. If this option is selected, the Auto Download Interval parameter becomes active and needs to be set. The Interval parameter is described below.

- 5 Set **Manual Download** to the desired setting:
 - When set to **ON** (default value), the **Download** button on the CS460 touch screen becomes active and a manual download in Standalone Mode of the GM460's logger data to the SD card can be performed.
 - When set to **OFF**, the Download button is not active and a manual download of the GM460's logger data to the SD card cannot be performed in Standalone Mode.
- 6 To save the changes, click **CS460 Update** and click **Yes** in the window that appears.

To return to the main window without saving any changes, click **Cancel** and click **OK** in the window that appears.

Updating the Power Saving Settings

- 1 Launch the PC Controller Program and connect your CS460(s) as described in "[Launching the PC Controller Program and Connecting a CS460](#)" (in this chapter).
- 2 Access the CS460 Configuration Window as described in "[Accessing the CS460 Configuration Window](#)" (in this chapter).
- 3 Click the **Bump & Cal 2** tab.

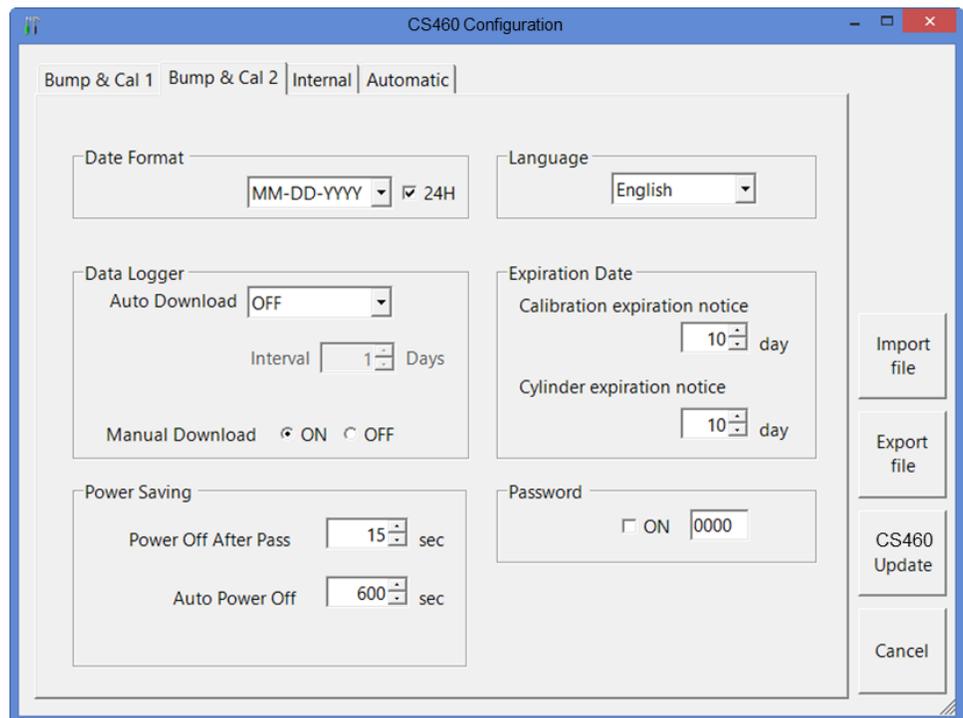


Figure 3-14: Bump & Cal 2 Tab

- 4 Select the desired setting for the **Power Off After Pass** parameter. This is the length of time that will pass after a successful bump test, calibration, or alarm check before the docking station will automatically shut off the GM460. Use the arrows to the right of the current setting to change the value or highlight the current setting and type in the desired value. It is defined in seconds with a maximum setting of **99,999** seconds. The factory setting is **15** seconds.
- 5 Select the desired setting for the **Auto Power Off** parameter. This is the length of time that will pass after the last operation is finished before the docking station will automatically shut off the GM460. If a successful bump test, calibration, or alarm check is performed, the docking station will automatically shut off the GM460 in the time defined in **Power Off After Pass** regardless of the **Auto Power Off** setting. Use the arrows to the right of the current setting to change the value or highlight the current setting and type in the desired value. It is defined in seconds with a maximum setting of **99,999** seconds. The factory setting is **600** seconds.
- 6 To save the changes, click **CS460 Update** and click **Yes** in the window that appears.

To return to the main window without saving any changes, click **Cancel** and click **OK** in the window that appears.

Updating the Expiration Date Settings

- 1 Launch the PC Controller Program and connect your CS460(s) as described in ["Launching the PC Controller Program and Connecting a CS460" \(in this chapter\)](#).
- 2 Access the CS460 Configuration Window as described in ["Accessing the CS460 Configuration Window" \(in this chapter\)](#).
- 3 Click the **Bump & Cal 2** tab.

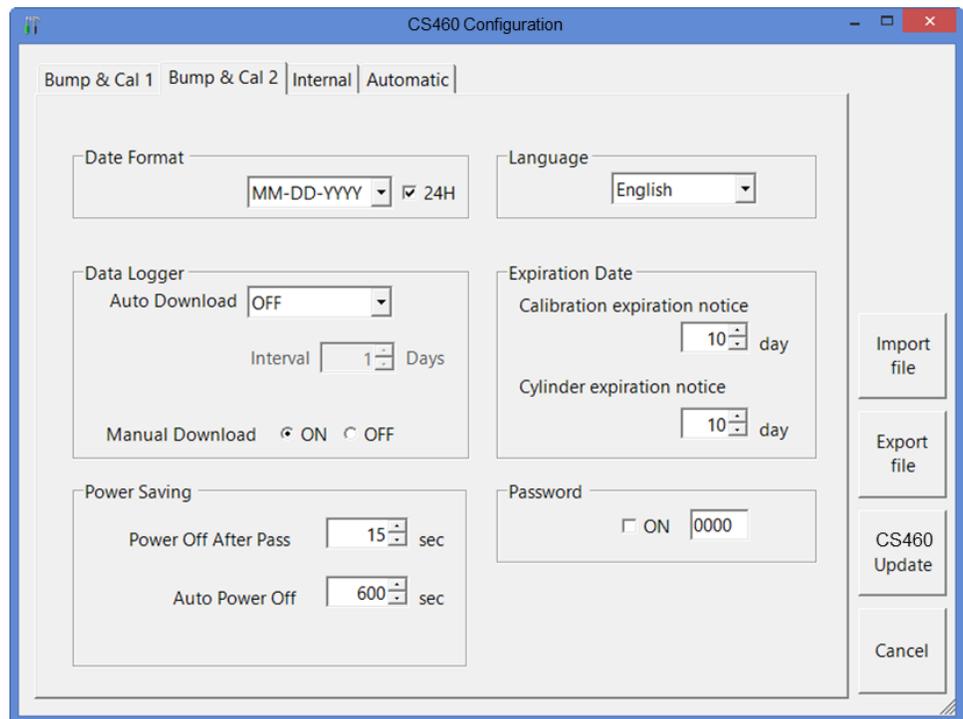


Figure 3-15: Bump & Cal 2 Tab

- 4 Select the desired setting for the **Calibration Expiration Notice** parameter. This is the length of time, in days, before a GM460 is due for calibration that the CS460 will give an indication that the GM460's calibration due date is approaching. So if calibration is due on 12/20/18 and the **Calibration Expiration Notice** is set to 10 days, the impending-calibration indication will begin appearing on 12/10/18. If the GM460 is connected to the CS460 within this time period, "**Cal Limit Soon**" will display in the text field above the **BUMP** and **CAL** buttons in the **Function** tab.
- 5 Select the desired setting for the **Cylinder Expiration Notice** parameter. This is the length of time, in days, before a cylinder's expiration date that the CS460 will give an indication that the cylinder's expiration date is approaching. So if the cylinder expires on 12/20/18 and the Cylinder Expiration Notice is set to 10 days, the cylinder-expiring indication will begin appearing on 12/10/18. The cylinder icon in the bottom left corner of the CS460's Function tab will change from green to orange.

- 6 To save the changes, click **CS460 Update** and click **Yes** in the window that appears.

To return to the main window without saving any changes, click **Cancel** and click **OK** in the window that appears.

Updating the Automatic Execution Settings

You can use the **Automatic** tab to set up a bump test, calibration, or alarm check to automatically occur at a specific time on the desired day(s). If a GM460 is installed in a CS460 at the specified day/time, the CS460 will turn the GM460 on, perform the test then turn the GM460 off.

- 1 Launch the PC Controller Program and connect your CS460(s) as described in ["Launching the PC Controller Program and Connecting a CS460" \(in this chapter\)](#).
- 2 Access the CS460 Configuration Window as described in ["Accessing the CS460 Configuration Window" \(in this chapter\)](#).
- 3 Click the **Automatic** tab.

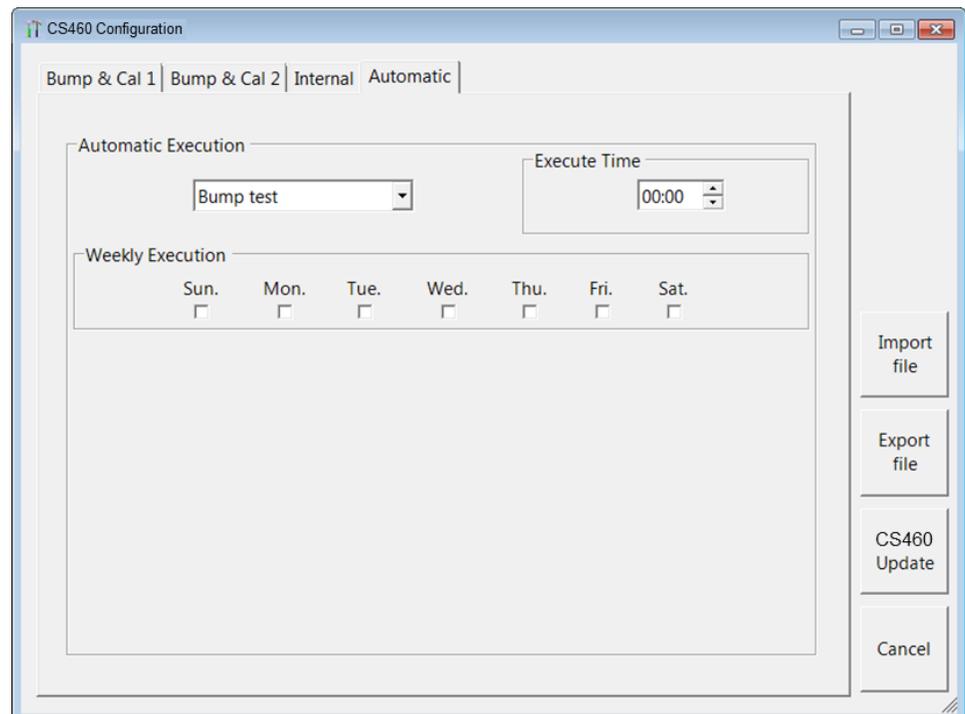


Figure 3-16: Automatic Tab

Updating the Cylinders Settings

This section describes how to use the **Cylinders** window to update cylinder parameters and assign cylinders to the CS460 or SV-3's gas inlets. If desired, the **Cylinders** window will keep track of those cylinders' expiration dates. If the CS460 is used in Standalone Mode, it will keep track of the expiration dates based on the settings made in the **Cylinders** window. The **Cylinders** window comes with a list of predefined cylinders that are fairly common. If a cylinder that you need to use is not on this list, you can define your own cylinder. Some of the parameters available for editing in the **Cylinders** window, such as gas name and concentration, do not need to be set using the PC Controller Program and can be set using the CS460's Config Menu. In order to provide more comprehensive instructions, this section will include instructions for setting parameters that can also be set using the CS460's Config Menu.

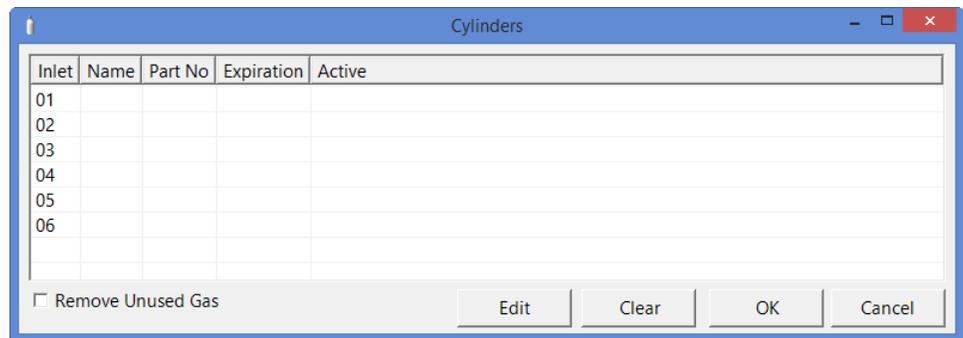


Figure 3-17: Cylinders Window

The **Cylinders** window shows the cylinder name, cylinder part number, expiration date, and active status for each cylinder.

Selecting a Cylinder from the Predefined List

The **Cylinders** window comes with several predefined cylinders that you can choose from.

Note

Even though chlorine (Cl₂) appears as a predefined cylinder, chlorine channels **cannot** be bump tested or calibrated using the CS460. If your instrument has a chlorine channel, you may test all other channels using the CS460 but must test the chlorine channel separately, using the GM460's Calibration Mode.

Setting up a cylinder in the **Cylinders** window is the same as setting the inlet parameters at the CS460 using the Config Menu.

- 1 Launch the PC Controller Program and connect your CS460(s) as described in "[Launching the PC Controller Program and Connecting a CS460](#)" (in this chapter).

- 2 Click the **Cylinders** button along the top of the main program window.



- 3 The **Cylinders** window will appear.

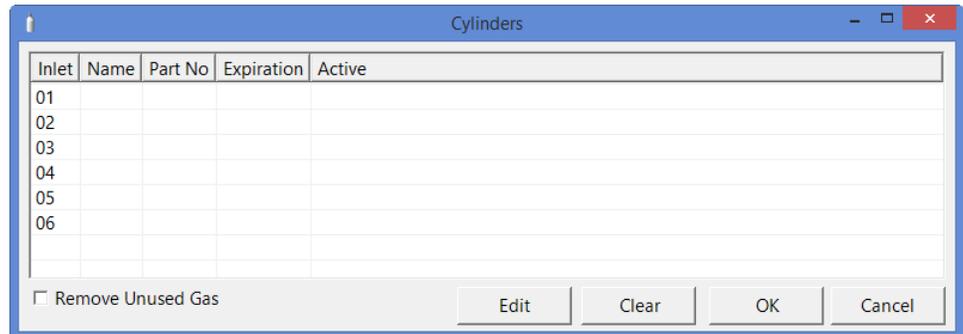


Figure 3-18: Cylinders Window

- 4 Double-click the line (or single-click the line and click **Edit**) that corresponds with the gas inlet you would like to set up. For example, double-click line 3 (or single-click line 3 and click **Edit**) to set up a cylinder for the **GAS 3** inlet on the CS460 or SV-3. The **Cylinder Detail** window will display.

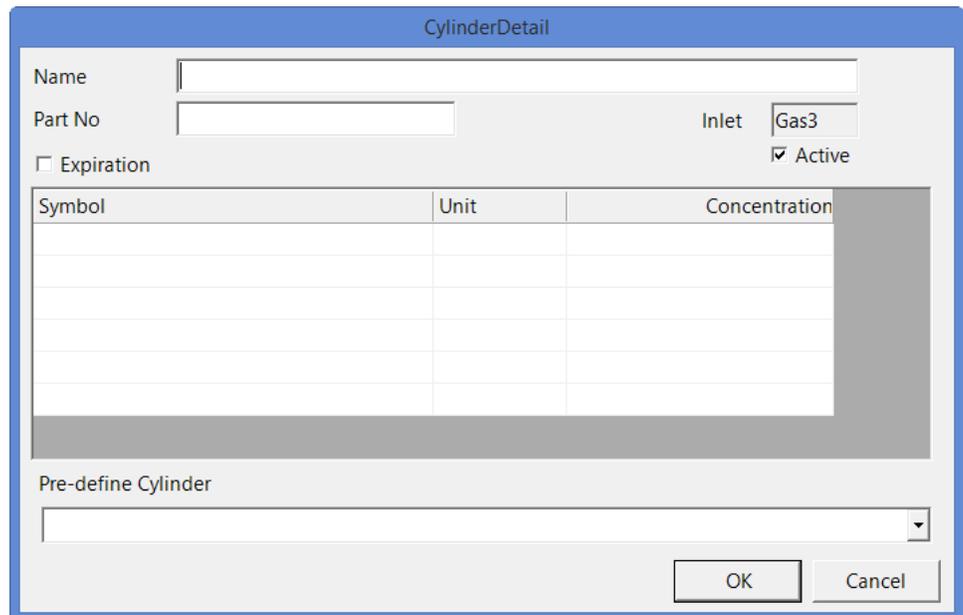


Figure 3-19: Cylinder Detail Window

- The pre-defined cylinders list is located in a drop-down menu at the bottom of the window. Click the drop-down arrow to view the pre-defined cylinders list. Scroll down to view additional cylinders.

The screenshot shows the 'CylinderDetail' window. At the top, there are input fields for 'Name' and 'Part No', and a dropdown for 'Inlet' set to 'Gas3'. Below these are checkboxes for 'Expiration' (unchecked) and 'Active' (checked). A table with three columns: 'Symbol', 'Unit', and 'Concentration' is shown below. At the bottom, a 'Pre-define Cylinder' dropdown menu is open, displaying a list of predefined cylinders with their symbols and concentrations.

Symbol	Unit	Concentration

Pre-define Cylinder

- 81-0016RK-05 : CH4(100vol%)
- 81-0154RK-02 : CH4(50%LEL)/O2(12%)/H2S(25ppm)/CO(50ppm)
- 81-0143RK-02 : CH4(50%LEL)/O2(12%)/H2S(25ppm)/CO(50ppm)/IBL(100ppm)
- 81-0142RK-02 : CH4(50%LEL)/O2(12%)/H2S(25ppm)/CO(50ppm)/SO2(5ppm)
- 81-0090RK-03 : CH4(50%LEL)/O2(12%)CO(50ppm)
- 81-0190RK-02 : Cl2(5 ppm)
- 81-0073RK-03 : CO2(15vol%)

Figure 3-20: Pre-Defined Cylinders List

Note

Even though chlorine (Cl₂) appears as a predefined cylinder, chlorine channels *cannot* be bump tested or calibrated using the CS460. If your instrument has a chlorine channel, you may test all other channels using the CS460 but must test the chlorine channel separately, using the GM460's Calibration Mode.

- Click the cylinder you would like to use. In this example, HCN has been selected. The **Name**, **Part No.**, **Symbol**, **Unit**, and **Concentration** fields will automatically be filled in.

CylinderDetail

Name

Part No

Inlet

Expiration Active

Symbol	Unit	Concentration
HCN	ppm	10

Pre-define Cylinder

Figure 3-21: Cylinder Detail Window Filled In with Pre-Defined Info

- If you would like to set an expiration date for the cylinder, select the box next to **Expiration**.

CylinderDetail

Name

Part No

Inlet

Expiration Active

Symbol	Unit	Concentration
HCN	ppm	10

Pre-define Cylinder

Figure 3-22: Expiration Date

- 8 Set the expiration date by clicking the drop-down menu arrow and selecting a date from the calendar that appears. If the number of days left before the cylinder expires is less than the time defined in the **Cylinder Expiration Notice** parameter in the CS460 Configuration Window, the line in the **Cylinders** window that corresponds to this cylinder will turn orange. The line in the **Cylinders** window that corresponds to this cylinder will turn red if the expiration date has passed.
- 9 Select or deselect the **Active** box for each cylinder. If the cylinder is active, the PC Controller Program will alert you at start up if the cylinder has passed its expiration date and will include the associated inlet in testing. If it is not active, the program will not alert you if the cylinder has passed its expiration date and will not include the associated inlet in testing.

If the **Active** box is deselected, the program will not consider it a cylinder is being used and will give you an inlet error if you connect an instrument that requires that cylinder for bump testing or calibration.

- 10 To return to the **Cylinders** window and save your changes, click **OK** in the **Cylinder Detail** window.

To return to the **Cylinders** window without saving your changes, click **Cancel**.

- 11 Make any necessary updates to other inlets.

- 12 To return to the **Main** window and save your changes, click **OK** in the **Cylinders** window and then click **Yes** in the window that comes up.

To return to the **Main** window without saving your changes, click **Cancel** in the **Cylinders** window and then click **OK** in the window that comes up.

Defining New Cylinders

If your GM460 configuration requires the use of a cylinder that is not in the predefined list, you can add that cylinder by either typing in the information for the cylinder or by editing the information for an existing cylinder.

Defining a cylinder in the **Cylinders** window is the same as setting the inlet parameters at the CS460 using the Config Menu.

- 1 Launch the PC Controller Program and connect your CS460(s) as described in ["Launching the PC Controller Program and Connecting a CS460" \(in this chapter\)](#).
- 2 Click the **Cylinders** button along the top of the main program window.



3 The **Cylinders** window will appear.

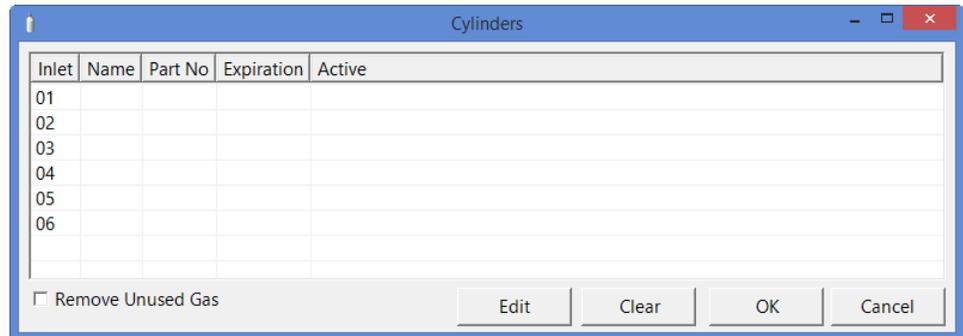


Figure 3-23: Cylinders Window

4 Double-click the line (or single-click the line and click **Edit**) that corresponds with the gas inlet you would like to set up. For example, double-click line 3 (or single-click line 3 and click **Edit**) to set up a cylinder for the **GAS 3** inlet on the CS460 or SV-3. The Cylinder Detail window will display.

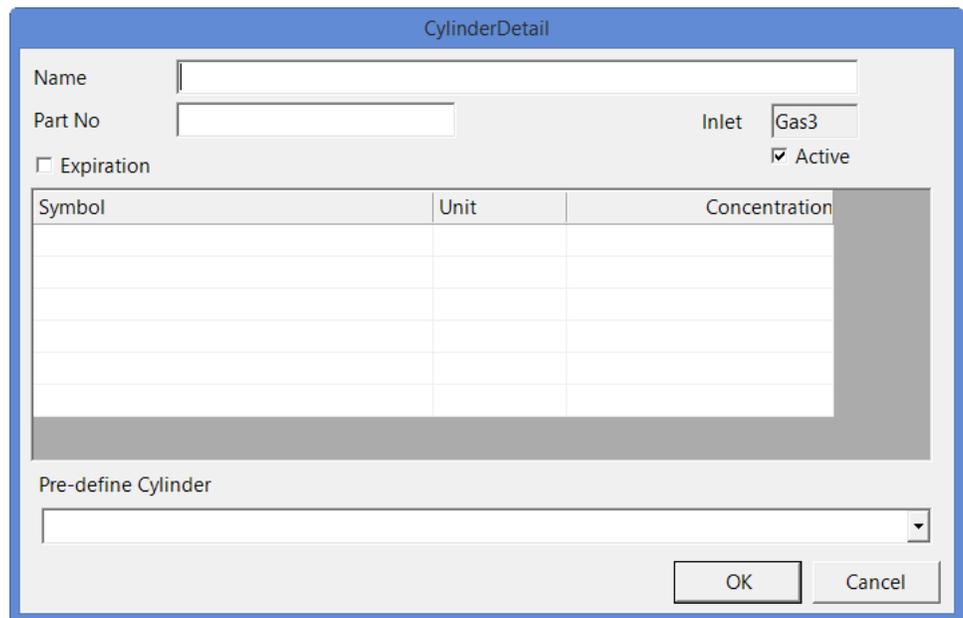


Figure 3-24: Cylinder Detail Window

- 5 Click in the **Name** field and type in a name for the cylinder. Use something descriptive that will help you distinguish it from other cylinders. You can also select a pre-defined cylinder and then edit the name that is automatically generated.
- 6 To enter a part number for the cylinder, click in the **Part No** field and type in a part number. This field is normally used for a TSI part number.

- 7 Enter a gas symbol for each cylinder component you want to identify. Click in the **Symbol** field of the desired line and type in characters or click the drop-down arrow and select a symbol from the list.

The screenshot shows the 'CylinderDetail' dialog box. At the top, there are fields for 'Name' and 'Part No'. To the right, there is an 'Inlet' dropdown menu set to 'Gas3' and a checked 'Active' checkbox. Below these are checkboxes for 'Expiration' (unchecked) and 'Active' (checked). The main part of the dialog is a table with three columns: 'Symbol', 'Unit', and 'Concentration'. The 'Symbol' column has a dropdown menu open, showing a list of gas symbols: CH4, CO, CO2, H2S, HCN, O2, and VOC. Below the table is a 'Pre-define Cylinder' dropdown menu. At the bottom right, there are 'OK' and 'Cancel' buttons.

Figure 3-25: Symbol List

- 8 Enter the units for cylinder component by clicking in the **Unit** field, clicking the drop-down arrow, and selecting units from the list.

This screenshot shows the 'CylinderDetail' dialog box with the 'Unit' dropdown menu open. The 'Symbol' column is empty. The 'Unit' dropdown menu lists the following units: vol%, %LEL, ppm, ppb, and %. The 'Concentration' column is also empty. The rest of the dialog box, including the 'Name', 'Part No', 'Inlet', and 'Active' fields, is the same as in Figure 3-25.

Figure 3-26: Symbol List

- 9 Enter the gas concentration for each cylinder component by clicking in the **Concentration** field and typing in the characters.

- 10 Set the expiration date by clicking the drop-down menu arrow and selecting a date from the calendar that appears. If the number of days left before the cylinder expires is less than the time defined in the **Cylinder Expiration Notice** parameter in the CS460 **Configuration** window, the line in the **Cylinders** window that corresponds to this cylinder will turn orange. The line in the **Cylinders** window that corresponds to this cylinder will turn red if the expiration date has passed.
- 11 Select or deselect the **Active** box for each cylinder. If the cylinder is active, the PC Controller Program will alert you at start up if the cylinder has passed its expiration date and will include the associated inlet in testing. If it is not active, the program will not alert you if the cylinder has passed its expiration date and will not include the associated inlet in testing.

If the **Active** box is deselected, the program will not consider it a cylinder is being used and will give you an inlet error if you connect an instrument that requires that cylinder for bump testing or calibration.
- 12 To return to the **Cylinders** window and save your changes, click **OK** in the **Cylinder Detail** window.

To return to the **Cylinders** window without saving your changes, click **Cancel**.
- 13 Make any necessary updates to other inlets.
- 14 To return to the **Main** window and save your changes, click **OK** from the **Cylinders** window and then click **Yes** in the window that comes up.

To return to the **Main** window without saving your changes, click **Cancel** from the **Cylinders** window and then click **OK** in the window that comes up.

Clearing Cylinders

Cylinders can be cleared from the **Cylinders** window list if they are no longer needed or if you want to clear the old cylinder before defining a new cylinder.

- 1 Launch the PC Controller Program and connect your CS460(s) as described in "[Launching the PC Controller Program and Connecting a CS460](#)" (in this chapter).
- 2 Click the **Cylinders** button along the top of the main program window.



- 3 The **Cylinders** window will appear.

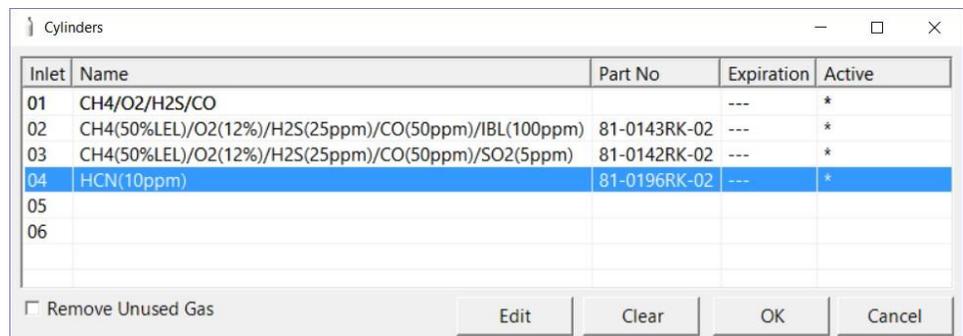


Figure 3-27: Cylinders Window

- 4 Single-click the line you want to clear.

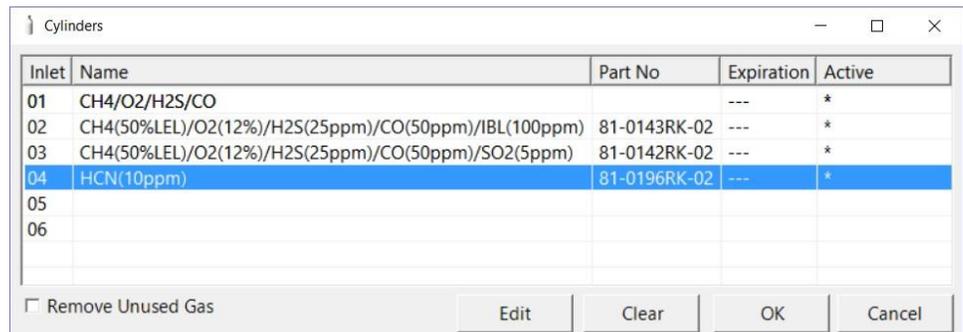


Figure 3-28: Cylinder Selected

- 5 Click the **Clear** button at the bottom of the screen.
- 6 Click **OK** in the window that comes up to clear the cylinder. The cylinder will disappear from the **Cylinders** window.

Removing Unused Gases

As you enter cylinder information for the inlets, the **Symbol** drop-down menu in the **Cylinder Detail** window will populate with those gas names. If you then clear the cylinders from the Cylinders Window, those gas names will still remain in the **Symbol** drop-down menu. Selecting **Remove Unused Gas** in the **Cylinders** window and then clicking **OK** removes those unused gas names from the **Symbol** drop-down menu.

- 1 Make the desired changes to the **Cylinders** window as described in the previous three sections.
- 2 Select the **Remove Unused Gas** box in the bottom left corner of the screen.
- 3 Click **OK** and then click **Yes** in the window that appears.

Setting Up LAN Connectivity

Connecting the CS460 to a LAN network allows you to download data from the CS460's SD card to the PC Controller Program using a computer connected to the same LAN network. This can be convenient if your CS460s are spread out throughout the building or if you do not want to remove the SD card from the CS460 in order to download the data. This section describes how to connect your CS460(s) to a network port and set up the LAN connectivity. [Chapter 5, "Importing Data into the CS460-PC Docking Station PC Controller Program"](#) describes how to import data once the LAN connectivity is set up.

- 1 If you have a DHCP network:

Note

For users with a DHCP network, keep in mind that if the LAN connectivity was set up but the CS460 lost power or the network went down for a period of time, you may need to set up the LAN connectivity again. A new IP address may have been assigned to the CS460 when power was restored or when the network came back up.

- a. Click **Start** on the Windows Icon Tray then select **Programs/CS460-PC**. You can also double-click the shortcut created on your desktop. The CS460-PC Docking Station PC Controller Program is launched and the main program window appears.
- b. When starting the software for the first time, a message window appears informing you that a database has been created. Click **OK** in that window.
- c. Connect the CS460 to the network port closest to its installed location using the CS460's LAN port and an Ethernet cable. When multiple CS460s are connected together, only the left-most CS460 needs to be connected to a network port. Be sure to connect all CS460s or CS460 banks you plan on having

connected to the LAN network. There is no need to connect one at a time to perform the setup. Be sure the CS460s are in their intended installation locations. They do not need to be close to the PC being used for setup.

- d. Connect the AC adapter to the CS460 and to an AC wall socket. When multiple CS460s are connected together, only the left-most CS460 should be connected to power.
- e. Flip the CS460's power switch so that it is in the **ON** position. If you have multiple CS460s connected together, only the power switch of the left-most CS460 needs to be flipped.
- f. Click the **Logs** button in the PC Controller Program.

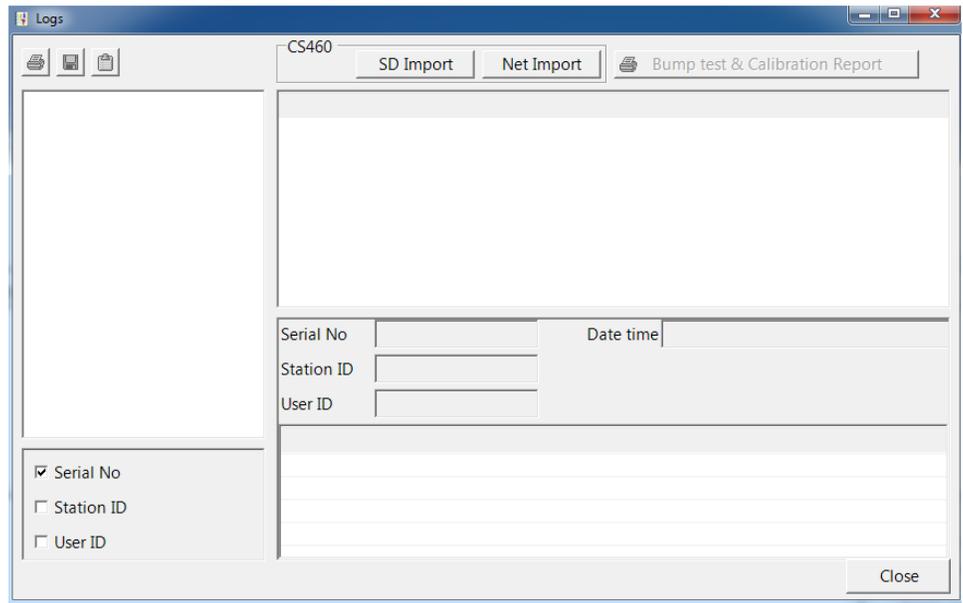


Figure 3-29: Logs Window

- g. Click **Net Import**.

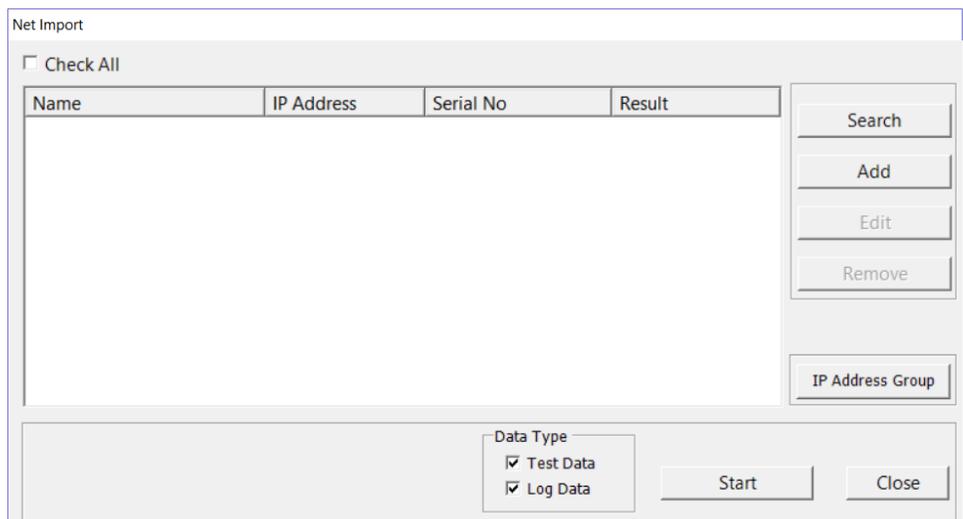


Figure 3-30: Net Import Window

- h. If the computer you are using is connected to the same network as the CS460, continue to step i.

If the computer you are using is not connected to the same network as the CS460 (for example, if your computer is connected to a wireless network), you will need to enter the CS460's IP address group using the **IP Address Group** button.

- Click **IP Address Group**.
- Type in the IP address group of the building's LAN network. The format is "**XXX.XXX.X.***" (i.e., 192.168.0.*). Consult your IT department to determine the IP address group.

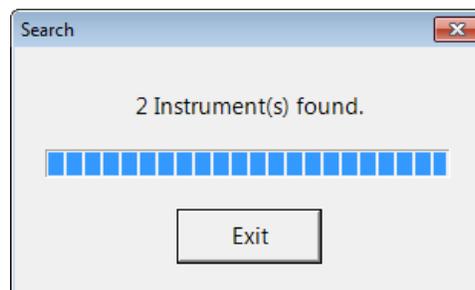
Note

You are **NOT** entering the full IP address for the CS460.



Figure 3-31: IP Address Group

- Click **OK**.
 - Continue to step i.
- i. Click **Search**. The program will find any CS460s that are connected to the same network as the PC you are using or to a network that you manually entered into the IP Address Group window.



- j. Once the program has completed the search, the found CS460(s) will appear in the **Net Import Screen** with their serial number(s) and assigned IP address(es).

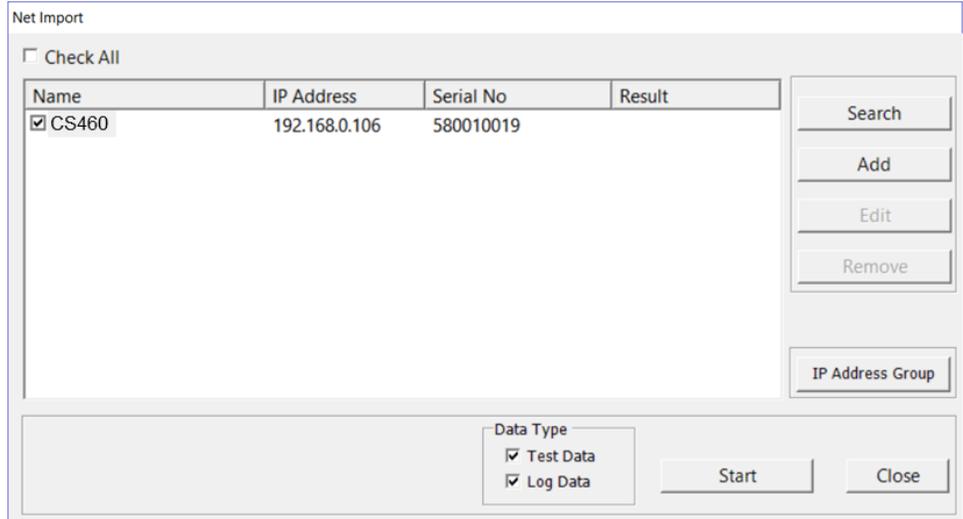


Figure 3-32: Net Import Window with Found CS460s

- k. To rename a CS460 to describe its location or some other defining parameter in more detail, click on the desired CS460 and then click **Edit**. Type in the desired name for the CS460. **DO NOT CHANGE THE IP ADDRESS FIELD.**

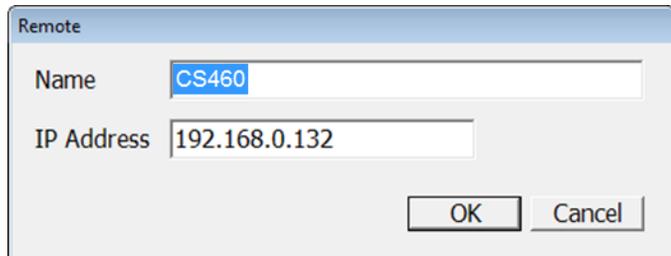


Figure 3-33: Edit Window

- l. Continue to step 3.
- 2. If you do not have a DHCP network:

Note

The LAN connectivity must be set up on one CS460 (or primary CS460 if you have a bank) at a time. You cannot have multiple CS460s connected to your PC while performing the LAN connectivity setup procedure.

- a. Click **Start** on the Windows Icon Tray then select **Programs/CS460-PC**. You may also double-click the shortcut created on your desktop. The CS460-PC Docking Station PC Controller Program is launched and the main program window appears.

- b. When starting the software for the first time, a message window appears informing you that a database has been created. Click **OK** in that window.
- c. Connect the CS460 to a PC using the CS460's PC port and a **Type A to Type B** USB cable. The CS460 does not need to be installed in its intended location or connected to the network in order to set up the LAN connectivity. It just needs to be connected to the PC Controller Program. When multiple CS460s are connected together, only the left-most CS460 needs to be connected to the PC.
- d. Connect the AC adapter to the CS460 and to an AC wall socket. If multiple CS460s are connected together, only the left-most CS460 should be connected to power.
- e. Flip the CS460's power switch so that it is in the **ON** position. If multiple CS460s are connected together, only the power switch of the left-most CS460 needs to be flipped.
- f. Click the **CS460** button.
- g. Click the **Internal** tab.

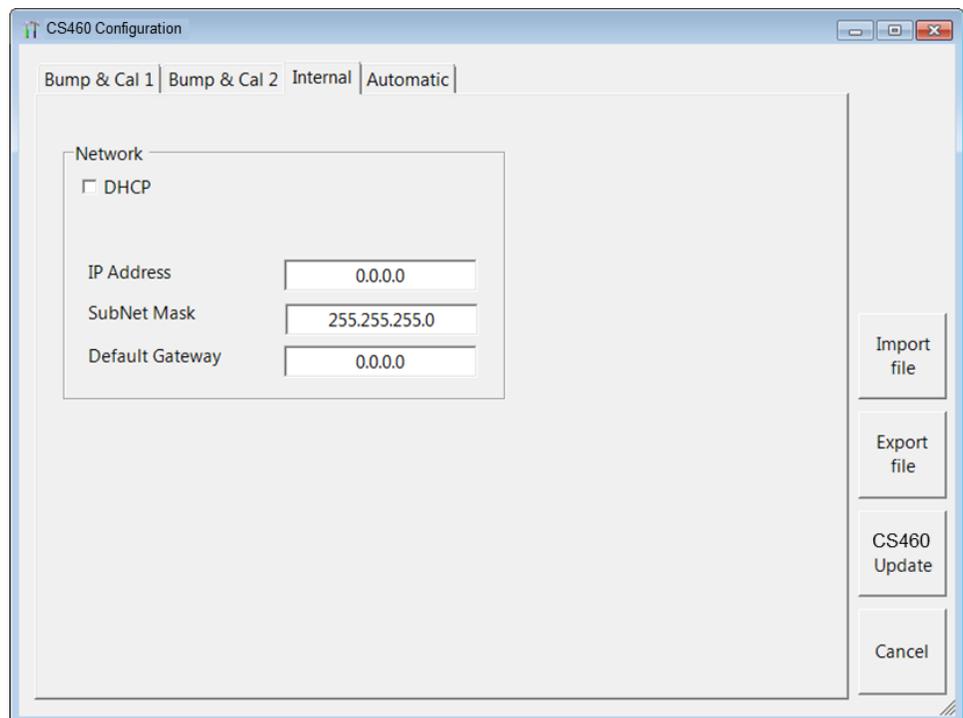


Figure 3-34: Internal Tab

- h. Be sure **DHCP** is deselected.
- i. Enter an **IP Address**, **SubNet Mask**, and **Default Gateway** for the CS460.
- j. Click **CS460 Update** and click **Yes** in the window that comes up.
- k. Turn the CS460 off and then on again before continuing.

I. Click the **Logs** button.

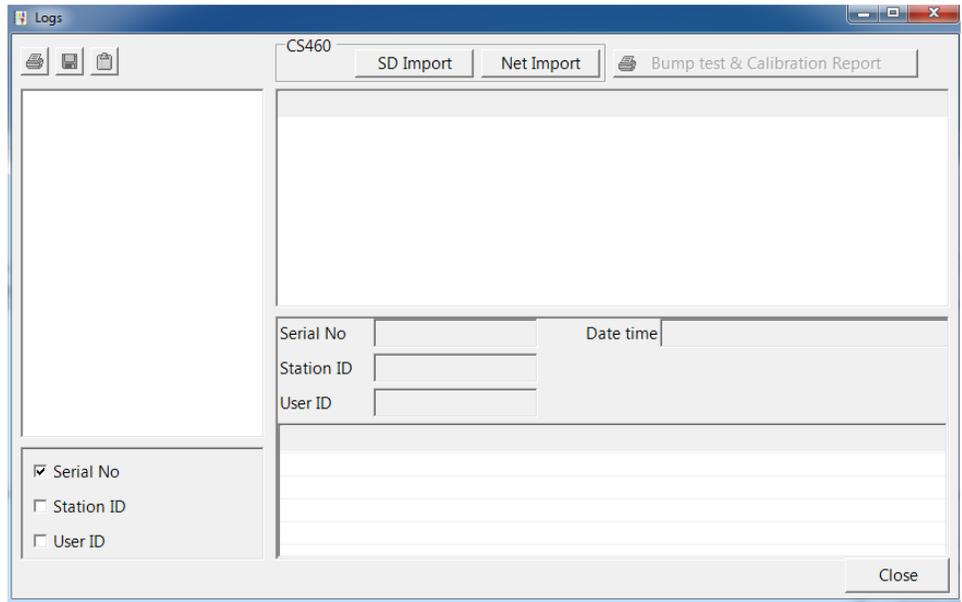


Figure 3-35: Logs Window

m. Click **Net Import**.

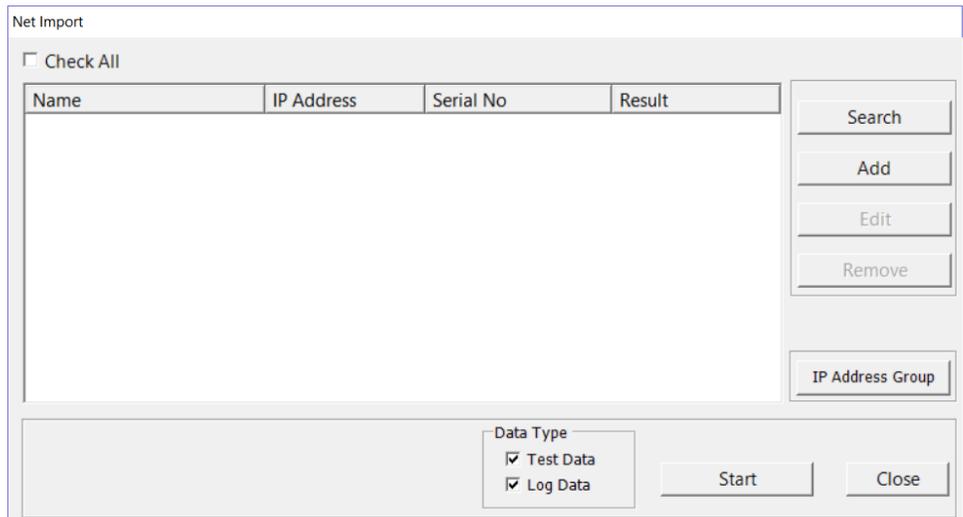


Figure 3-36: Net Import Window

n. Click **Add**.

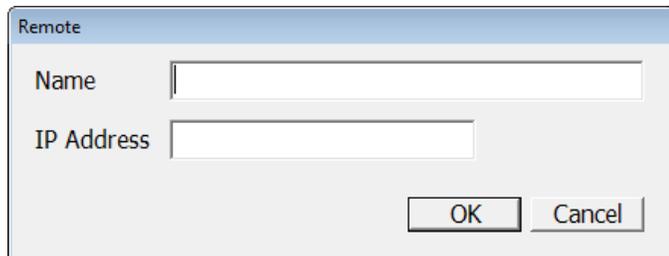


Figure 3-37: Add Window

- o. Enter a name for the CS460 and enter the IP Address that you assigned to the CS460 in the **Internal** tab of the CS460 Configuration window.
- p. Click **OK**. The newly added CS460 will appear.

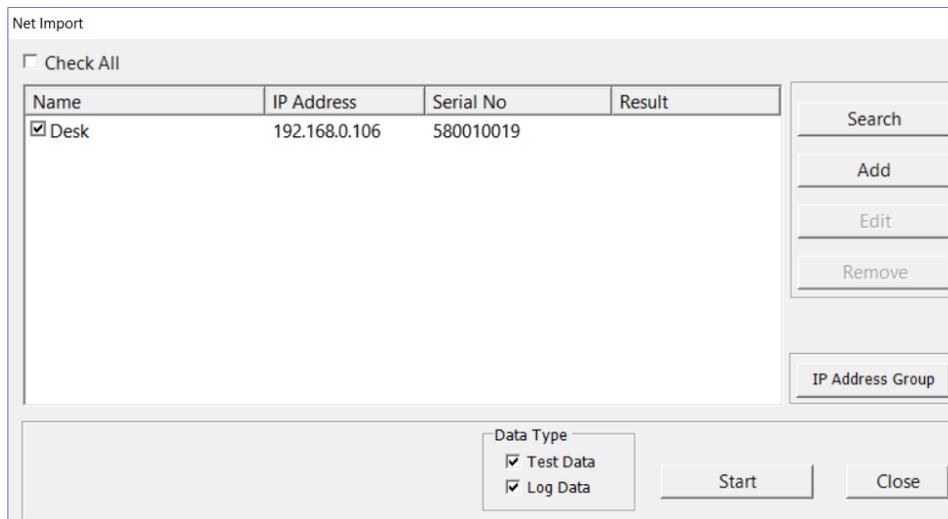


Figure 3-38: Net Import Window with Manually Added CS460

- q. Disconnect the USB cable from the CS460, turn off the CS460, and unplug the AC adapter from the wall.
 - r. Move the CS460 to its intended installation location and plug the AC adapter into the wall and turn on the CS460.
 - s. Connect the CS460 to a network port using the CS460's LAN port and an Ethernet cable. If multiple CS460s are connected together at the CS460 location, only the left-most CS460 needs to be connected to a network port.
 - t. Repeat steps 2(s) to 2(t) for any additional CS460s.
 - u. Continue to step 3.
- 3 Click **Close** in the **Net Import** window.
 - 4 Exit the CS460-PC program by clicking the **Exit** button.

CHAPTER 4

Operation

Overview

When you have completed the tasks in [Chapter 3, "Preparing to Use the CS460"](#), you are ready to use the CS460 docking station. The CS460 is capable of performing bump tests, calibrations, and alarm checks on the GM460. It can also charge the rechargeable Li-ion battery pack in the GM460.

This chapter describes procedures for using the docking station to bump test, calibrate, alarm check, download instrument logger data to the SD card, and recharge GM460s in the standalone configuration of the docking station. It also describes the information that is saved to an inserted SD card.

Automatically Initiated Tests and Data Download

If the PC Controller Program has been used to set up the auto bump, auto cal, or auto alarm check feature, the GM460 will be turned on at the set time on the set day(s) and perform the desired test.

If the PC Controller Program has been used to set up the auto download feature, the GM460 will download its data to the SD card at power up when a download is due.

Each test or download progresses as described in the appropriate section below, but no user involvement is required to start the test or download. For an automatic calibration or test, even after the GM460 is turned off, the test results will remain displayed in the **Unit** tab until you press the **BUMP End**, **CAL End**, or **Alarm Check End** button (whichever is appropriate) in the **Function** tab.

Turning on a CS460 System

To turn on the CS460 and establish a connection with a GM460:

- 1 Connect the AC adapter to the CS460 and to an AC wall socket. For a multi-station system, only the left-most CS460 should be connected to power.
- 2 Flip the CS460's power switch so that it is in the **ON** position. For a multi-station system, only the power switch of the left-most CS460 needs to be flipped.
- 3 The CS460's Status LED will be solid green if it is operating properly or solid red if there is a system failure.
- 4 In a single-station system, the **Function** tab will be on the screen when the CS460 is powered up.

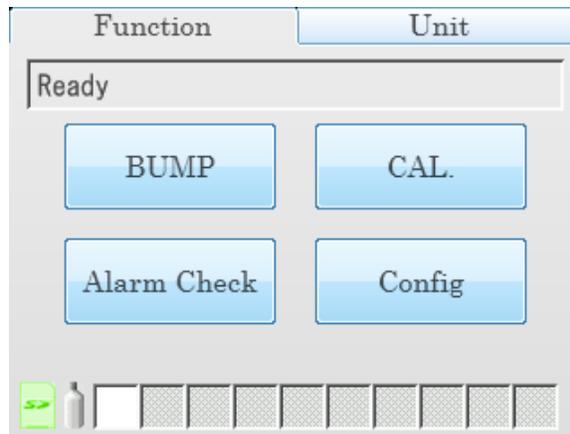


Figure 4-1: Single-Station Screen at Power Up, No Connected Instruments

- 5 In a multi-station system, the **Function** tab will be on the screen on the primary station and the secondary stations' screens will indicate the information normally shown on the **Unit** tab.

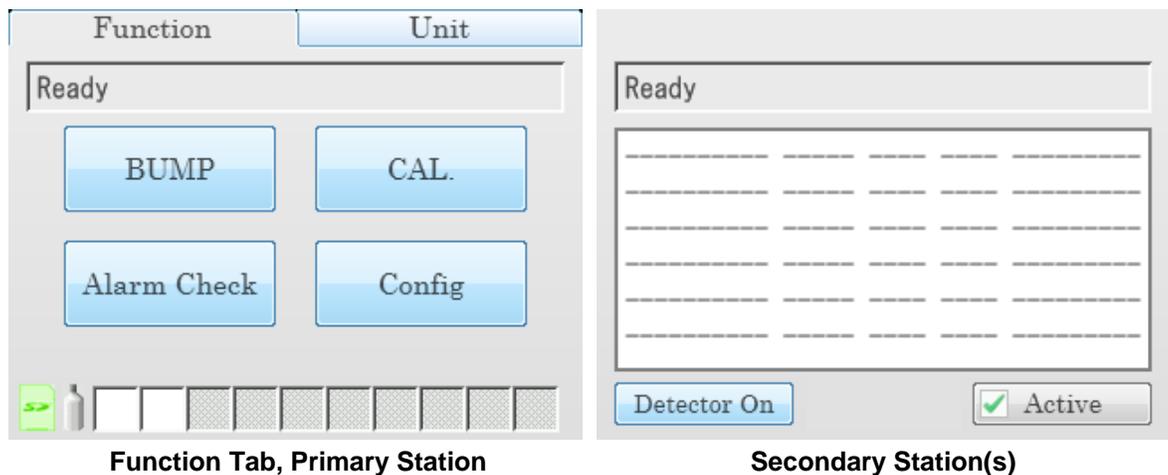
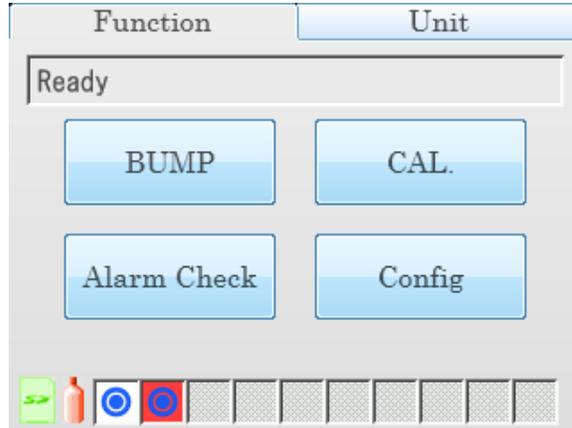


Figure 4-2: Multi-Station Screens at Power Up, No Connected Instruments

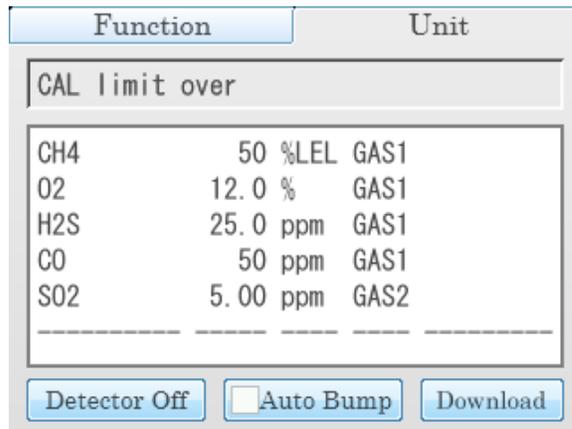
The Station/Instrument Indicator(s) along the bottom of a single-station system's or primary station's **Function** tab corresponding to each connected CS460 will be white. For a single-station system, only the left-most indicator will be white. Any indicators that are light gray mean that there is not a CS460 connected to the system in that position. The indicators in the **Primary Station Function** tab above show that two CS460s are connected in this system.

- 6 The SD card logo in the bottom-left corner of the **Function** tab will indicate if an SD card is installed and, if installed, the amount of memory that is available (see ["Available Memory in the SD Card" \(in this chapter\)](#)). Be sure that an SD card is installed so that test data and GM460 data logger data from automatically or manually initiated operations are saved. If you have a multi-station system, the SD card only needs to be inserted into the primary (left-most) station's SD card slot.
- 7 Install a GM460 in the instrument cradle (see Figure 4-3). Orient the GM460 so the belt clip is facing away from the CS460. Set the bottom of the GM460 in the bottom of the instrument cradle and push the top of the GM460 toward the CS460. When the front face of the GM460 touches the back of the cradle, push the GM460 gently towards the back of the cradle to snap it in place.
- 8 If the GM460 is equipped with a Li-ion battery pack that needs to be charged, the Status LED will begin to flash orange. If the battery pack is fully charged, the Status LED will be solid orange. See ["Charging a GM460 in a Docking Station" \(in this chapter\)](#) for a complete description of charging the GM460.
- 9 Push the red gas in/gas out cover down until it touches the GM460 and then release it. It should lock into place against the top of the GM460. If it returns to its original position, attempt to lock it in place again.
- 10 The GM460 will turn on once the gas in/gas out cover is in place. Any instrument charging that was taking place will stop and the CS460 Status LED will blink green.
- 11 Repeat steps 7 to 10 for any additional CS460s and GM460s.

- 12 The GM460 will begin its power up sequence. The status of the instrument is shown by the Station/Instrument Indicators at the bottom of the **Function** tab. The color of the corresponding indicator and the logo shown in it will indicate the status of the instrument. For example, the primary station screen below indicates that the instrument in position 1 is connected to the CS460 and the Active box in the **Unit** tab is selected. It also indicates that the instrument in position 2 is connected to the CS460, the Active box in the **Unit** tab is selected, and the GM460 is due for calibration. See "[Function Tab](#)" in [Chapter 2](#) for a complete description of the indicators' colors and logos.



- 13 If a successful connection between the GM460 and the CS460 occurs, the **Unit** tab screen will indicate the instrument's active channels and the calibration gas concentration values for each channel. If you have a single station system, press the **Unit** tab at the top of the screen to bring it to view it.



Single Station Unit Tab

If you have a multi-station system, press the **Unit** tab at the top of the primary station's screen to view it. The secondary CS460(s) stations' screens will indicate the information normally shown on the **Unit** tab.

Function		Unit	
CAL limit over			
CH4	50 %LEL	GAS1	
O2	12.0 %	GAS1	
H2S	25.0 ppm	GAS1	
CO	50 ppm	GAS1	
VOC	100.0 ppm	GAS3	
HCN	10.0 ppm	GAS4	

Active

Primary Station Unit Tab

CAL limit over			
CH4	50 %LEL	GAS1	
O2	12.0 %	GAS1	
H2S	25.0 ppm	GAS1	
CO	50 ppm	GAS1	
NO2	4.80 ppm	GAS3	

Active

Secondary Station

Note

The single-station screen shown above shows a four-gas + SO₂ GM460 installed in the CS460. The multi-station screens shown above shows a four-gas + high range PID + HCN GM460 installed in the primary CS460 and a four-gas + NO₂ GM460 installed in the secondary CS460. If you have different instruments, your screens will appear differently.

- 14 If you used the PC Controller Program to set up an automatic data download and if a download is due, the download will begin as soon as the GM460 is connected to the CS460.
- 15 If you are using a single-station system and the **Auto Bump** selection box is selected on the **Function** tab, a bump test will begin either as soon as the GM460 is connected to the CS460 or after instrument data is downloaded if you used the PC controller Program to set up an automatic data download and the a download is due.

Bump Testing

When a bump test is performed, the CS460 performs a fresh air adjustment on a GM460 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 \(Tolerance\)](#)" in [Chapter 3](#). If the automatic calibration parameter is set to on, the CS460 will automatically perform a calibration if the bump test fails.

Be sure that you have the required calibration cylinders for your sensors. If you are using a five-gas cylinder for a special sensor, be sure that the gas inlet parameters are appropriately assigned as described in ["Inlet Parameters" in Chapter 3](#).

Notes

Chlorine (Cl₂) channels **cannot** be bump tested or calibrated using the CS460. If your instrument has a chlorine channel, you may test all other channels using the CS460 but must test the chlorine channel separately, using the GM460's Calibration Mode.

To bump test only the standard four sensors or only the smart sensors, be sure that the **Gas Inlet Parameters** are set appropriately as described in ["Inlet Parameters" in Chapter 3](#).

To perform a bump test:

- 1 Turn on the CS460 system as described in ["Turning on a CS460 System" \(in this chapter\)](#).
- 2 Confirm that you have an SD card installed in the system.

Note

If an SD card is not installed, test data and instrument data logger data downloaded manually or automatically cannot be saved.

- 3 If necessary, confirm that the bump test parameters are set to the desired values. See ["Bump Test Parameters" in Chapter 3](#).
- 4 If a connected GM460's channels does not have an assigned gas inlet or if the gas inlet setup is not correct, a gas inlet error will occur. A bump test can still be initiated but the incorrectly set up channel will not be bump tested.
- 5 If you have a multi-station system and a secondary station is turned on but you do not want it to be included in the testing, deselect the Active box in the lower-right corner of the **Unit** tab.
- 6 Verify that the appropriate calibration gas cylinders are connected to the gas fittings on the left side of the CS460 or to the gas fittings on the SV-3. See ["Connecting Calibration Gas \(No SV-3 attached\)"](#) or ["Connecting Calibration Gas, SV-3 Attached"](#) in Chapter 3 for calibration gas cylinder options and calibration gas connection procedures.
- 7 Confirm that the appropriate filters are connected to the **AIR** inlet fitting (if necessary) as shown below.

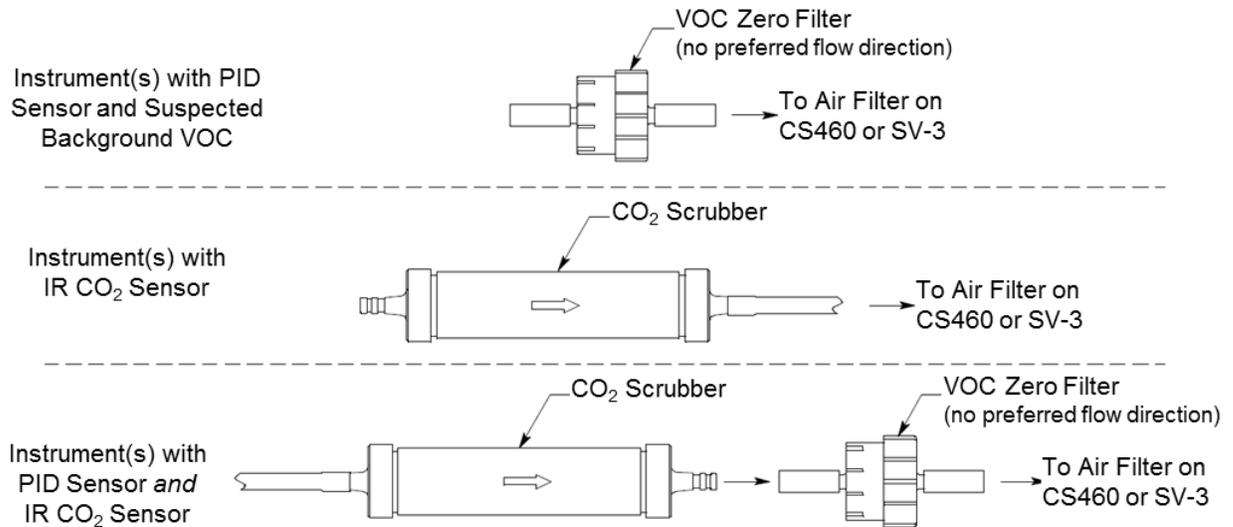
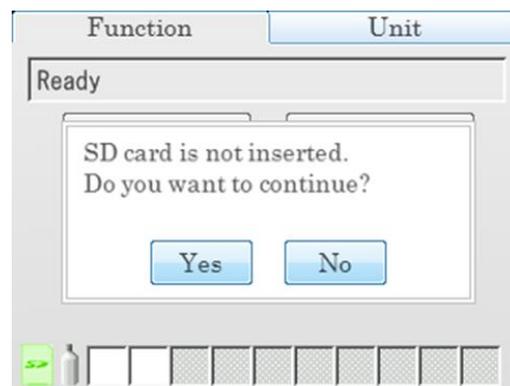
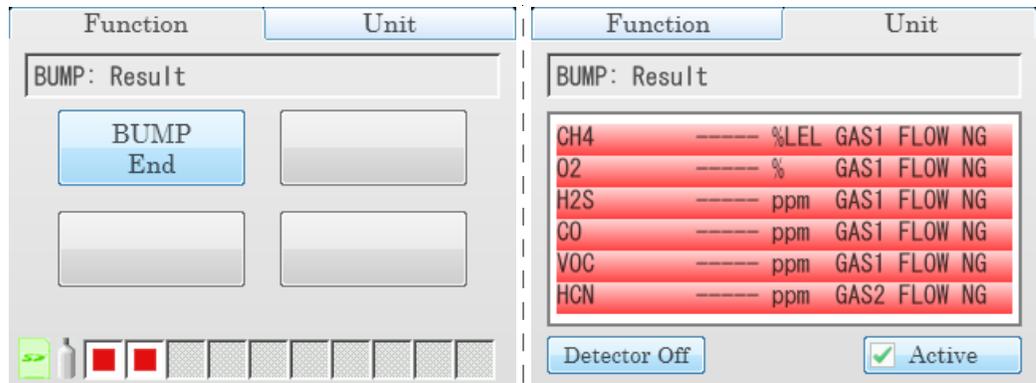


Figure 4-4: Air Inlet Filters

- 8 If necessary, press the **Function** tab in the upper-left corner to get the **Function** tab to appear.
- 9 Press the **BUMP** button to initiate a bump test.
To cancel the bump test, press the **BUMP Cancel** button in the **Function** tab and press **Yes** in the window that appears.
- 10 If no SD card is installed, a warning screen will appear. If no SD card is installed, no test data will be saved. Press **Yes** or **No** to continue with the bump test.



- 11 Throughout the bump test, the **Unit** tab will display the current gas readings along with the pass/fail status of a bump test or automatic calibration.
- 12 If at any point during the bump test the gas flow to the GM460 becomes too low, the bump test will be aborted and the screen will indicate a flow failure.



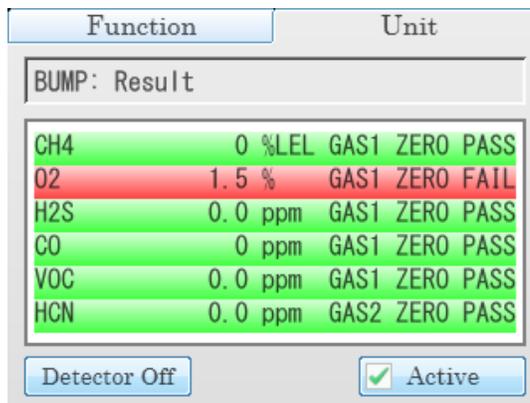
Function Tab in Flow Fail

Unit Tab in Flow Fail

If a flow failure occurs, confirm all tubing connections are correct, that all lines are clear, and that the gas in/gas out cover is fully locked onto the GM460(s).

Press the **BUMP End** button in the **Function** tab to return to the top level **Function** tab screen.

- 13 A pre-sample flush will begin. The CS460 will apply fresh air to the GM460 for the time defined by the **AIR Flush** bump test parameter.
- 14 The CS460 will perform a fresh air adjustment on the instrument.
 - a. If the air adjustment is successful, the CS460 will continue as described in step 15 below.
 - b. If one or more of the sensors fails the fresh air adjustment, the CS460 will abort the bump test and will not apply calibration gas. If this happens, the **Unit** tab will indicate which channels passed and failed the fresh air adjustment. In the following example, the O₂ channel failed the fresh air adjustment.



In this case, continue to step 20.

- 15 The CS460 will then apply calibration gas in the order of the instrument's sensors for the length of time defined in the **GAS bump test parameter**. For example, if you are bump testing a four-gas + low range PID instrument, gas will be applied to the four-gas sensors and then gas will be applied to the low range PID sensor regardless of what CS460 inlet fitting those gas cylinders are assigned to. The only exception is that HCN will always be applied before any other gas. The CS460 will analyze the results after the end of each gas application.

If the bump test fails and **Auto Cal.** is set to **On**, the gas will keep flowing and a calibration will automatically begin. Calibration gas will continue to be applied so that the total gas application time is the time defined by the **GAS calibration parameter**. This time includes the time that the GM460 was being bump tested. If the **GAS calibration parameter** is set to 90 seconds and the **GAS bump test parameter** is set to 30 seconds, the GM460 will sample gas for an additional 60 seconds to bring the total exposure time to 90 seconds.

Once the calibration is over, the CS460 will continue with the next gas application or with the post-sample purge, whichever is appropriate.

- 16 A post-sample purge will begin.
- 17 If the **Alarm Check** bump test parameter is selected, an alarm check will begin. The buzzer will sound, the LEDs will turn on for a few seconds, the vibrator will vibrate, and the CS460 will determine if these actions were completed successfully.
- 18 Once the bump test is over, the **Function** tab will display a **BUMP End** button.

To view the test results, press the **Unit** button to display the **Unit** tab. The displayed results will alternate between bump test results and alarm check results. The test results will display on the **Unit** tab until you press the **BUMP End** button in the **Function** tab even if the GM460 is turned off.

- 19 If a printer is connected:
 - a. If **Auto Print** is selected, the bump test results will automatically print.
 - b. If **Auto Print** is not selected, a **Print** button will appear in the **Function** tab's Bump Test screen. Press the **Print** button to print the bump test results.
- 20 Press the **Function** tab to display the **Function** tab if it is not already displayed. Press the **BUMP End** button to return to the top level **Function** tab screen. The test results that were being displayed in the **Unit** tab will disappear once the **BUMP End** button is pressed.
- 21 To perform any other operations, press the **BUMP**, **CAL**, or **Alarm Check** buttons on the **Function** tab.

- 22 To turn the GM460 off:
 - a. If the bump test was successful, the GM460 will shut off after 15 seconds. If the bump test failed, the GM460 will shut off after 10 minutes. If buttons are pressed before the CS460 turns off the GM460, the station will automatically turn the instrument off 10 minutes after the last button push.
 - b. To turn off the GM460 manually, press the **Detector Off** button in the lower-left corner of the station's **Unit** tab. For a multi-station installation, only the primary (left-most) station will have a **Unit** tab. The secondary stations will only have a main screen and the **Detector Off** button will be displayed in the lower-left corner.
- 23 The results of the bump test and calibration (if applicable) will be stored in the CS460's SD card.
- 24 Push the red gas in/gas out cover toward the GM460 and then release it. It should return to its unused state at the top of the CS460.
- 25 Remove the GM460 from the CS460.
- 26 Repeat steps 22 to 25 for any additional GM460s.

Calibration

When a calibration is performed, the docking station performs a fresh air adjustment on a GM460 and then applies calibration gas to the instrument. The docking station analyzes the calibration results and determines if the instrument passed the calibration.

Be sure that you have the required calibration cylinders for your sensors. If you are using a five-gas cylinder for a special sensor, be sure that the gas inlet parameters are appropriately assigned as described in ["Inlet Parameters" in Chapter 3](#).

Notes

Chlorine (Cl₂) channels **cannot** be bump tested or calibrated using the CS460. If your instrument has a chlorine channel, you may test all other channels using the CS460 but must test the chlorine channel separately, using the GM460's Calibration Mode.

To calibrate only the standard four sensors or only the smart sensors, be sure that the Gas Inlet Parameters are set appropriately as described in ["Inlet Parameters" in Chapter 3](#).

To perform a calibration on a GM460:

- 1 Turn on the CS460 system as described in ["Turning on a CS460 System" \(in this chapter\)](#).
- 2 Confirm that you have an SD card installed in the system.

Note

If an SD card is not installed then test data and instrument data logger data downloaded manually or automatically cannot be saved.

- 3 If necessary, confirm that the calibration parameters are set to the desired values. See ["Calibration Parameters" in Chapter 3](#).
- 4 If a connected GM460's channels does not have an assigned gas inlet or if the gas inlet setup is not correct, a gas inlet error will occur. A calibration can still be initiated but the incorrectly set up channel will not be calibrated.
- 5 If a multi-station system and a secondary station is turned on but you do not want it to be included in the testing, deselect the **Active** box in the lower-right corner of the **Unit** tab.
- 6 Verify that the appropriate calibration gas cylinders are connected to the gas fittings on the left side of the CS460 or to the gas fittings on the SV-3. See ["Connecting Calibration Gas \(No SV-3 attached\)"](#) or ["Connecting Calibration Gas, SV-3 Attached"](#) in Chapter 3 for calibration gas cylinder options and calibration gas connection procedures.
- 7 Confirm that the appropriate filters are connected to the **AIR** inlet fitting (if necessary) as shown below.

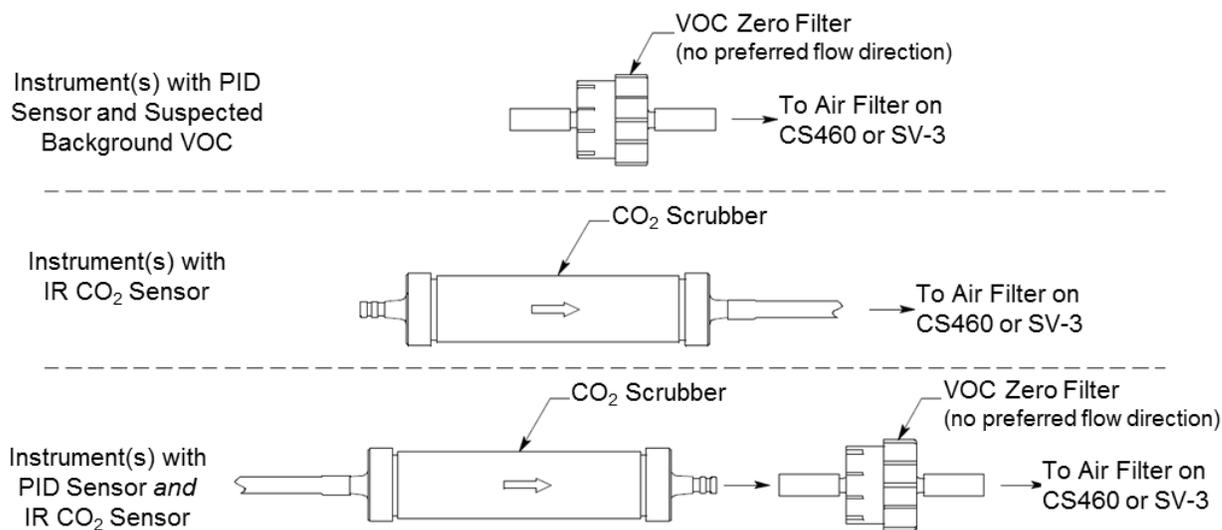
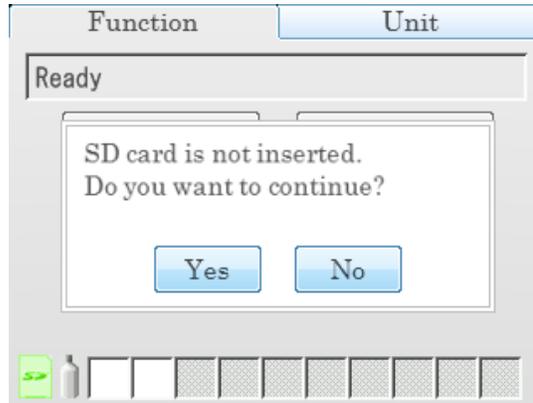
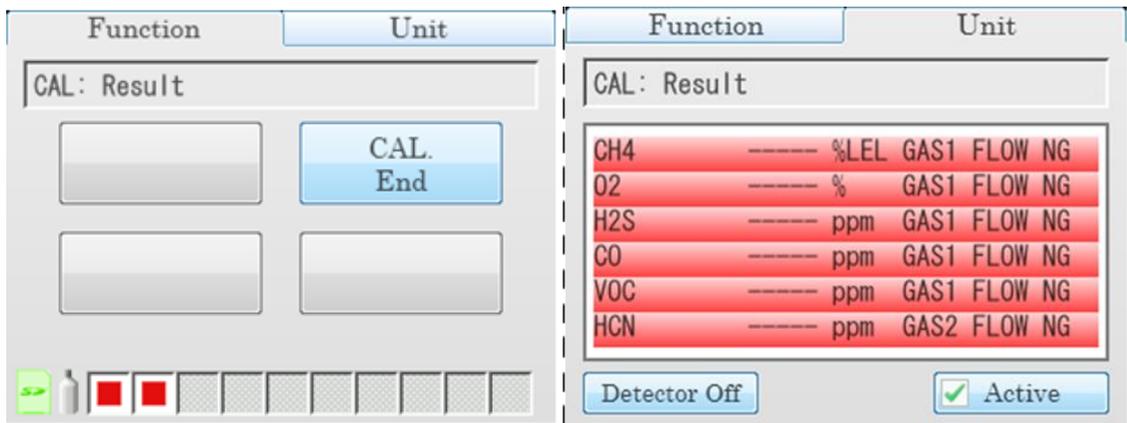


Figure 4-5: Air Inlet Filters

- 8 If necessary, press the **Function** tab in the upper-left corner to get the **Function** tab to appear.
- 9 Press the **CAL** button to initiate a calibration.
To cancel the calibration, press the **CAL Cancel** button in the **Function** tab and press **Yes** in the window that appears.
- 10 If no SD card is installed, a warning screen will appear. If no SD card is installed, no calibration data will be saved. Press **Yes** or **No** to continue with the calibration.



- 11 Throughout the calibration, the **Unit** tab will display the current gas readings along with the pass/fail status of the calibration.
- 12 If at any point during the calibration the gas flow to the GM460 becomes too low, the calibration will be aborted and the screen will indicate a flow failure.



Function Tab in Flow Fail Unit Tab in Flow Fail

If a flow failure occurs, confirm all tubing connections are correct, that all lines are clear, and that the gas in/gas out cover is fully locked onto the GM460(s).

Press the **CAL End** button in the **Function** tab to return to the top level **Function** tab screen.

- 13 A pre-sample flush will begin. The CS460 will apply fresh air to the GM460 for the time defined by the **AIR** Flush calibration parameter.

- 14 The CS460 will perform a fresh air adjustment on the GM460.
- If the air adjustment is successful, the CS460 will continue as described in step 15 below.
 - If one or more of the sensors fails the fresh air adjustment, the CS460 will abort the calibration and will not apply calibration gas. If this happens, the **Unit** tab will indicate which channels passed and failed the fresh air adjustment. In the following example, the O₂ channel failed the fresh air adjustment.

Function		Unit	
CAL: Result			
CH4	0 %LEL	GAS1	ZERO PASS
O2	0.0 %	GAS1	ZERO FAIL
H2S	0.0 ppm	GAS1	ZERO PASS
CO	0 ppm	GAS1	ZERO PASS
VOC	0.0 ppm	GAS1	ZERO PASS
HCN	0.0 ppm	GAS2	ZERO PASS

Detector Off Active

In this case, continue to step 20.

- 15 The CS460 will then apply calibration gas in the order of the instrument's sensors for the length of time defined in the **GAS** calibration parameter. For example, if you are calibrating a four-gas + low range PID instrument, gas will be applied to the four-gas sensors and then gas will be applied to the low range PID sensor regardless of what CS460 inlet fitting those gas cylinders are assigned to. The only exception is that HCN will always be applied before any other gas. The CS460 will analyze the results after the end of each gas application.
- 16 A post-sample purge will begin.
- 17 If the **Alarm Check** calibration parameter is selected, an alarm check will begin. The buzzer will sound, the LEDs will turn on for a few seconds, the vibrator will vibrate, and the CS460 will determine if these actions were completed successfully.
- 18 Once the calibration is over, the **Function** tab will display a **CAL End** button. To view the test results, press the **Unit** button to display the **Unit** tab. The displayed results will alternate between calibration results and alarm check results. The test results will display on the **Unit** tab until you press the **CAL End** button in the **Function** tab even if the GM460 is turned off.
- 19 If a printer is connected:
- If **Auto Print** is selected, the calibration results will automatically print.
 - If **Auto Print** is not selected, a **Print** button will appear in the **Function** tab's Calibration screen. Press the **Print** button to print the calibration results.

- 20 Press the **Function** tab to display the **Function** tab if it is not already displayed. Press the **CAL End** button to return to the top level **Function** tab screen. The test results that were being displayed in the **Unit** tab will disappear once the **CAL End** button is pressed.
- 21 To perform any other operations, press the **BUMP**, **CAL**, or **Alarm Check** buttons on the **Function** tab.
- 22 To turn the GM460 off:

If the calibration was successful, the GM460 will shut off after 15 seconds. If the calibration failed, the GM460 will shut off after 10 minutes. If buttons are pressed before the CS460 turns off the instrument, the station will automatically turn the instrument off 10 minutes after the last button push.

To turn off the GM460 manually, press the **Detector Off** button in the lower-left corner of the **Unit** tab. For a multi-station installation, only the primary (left-most) station will have a **Unit** tab. The secondary stations will only have a main screen and the **Detector Off** button will be displayed in the lower-left corner.
- 23 The results of the calibration will be stored in the CS460's SD card.

Alarm Check

To perform an alarm check on a GM460:

- 1 Turn on the CS460 system as described in ["Turning on a CS460 System" \(in this chapter\)](#).
- 2 Confirm that you have an SD card installed in the system.

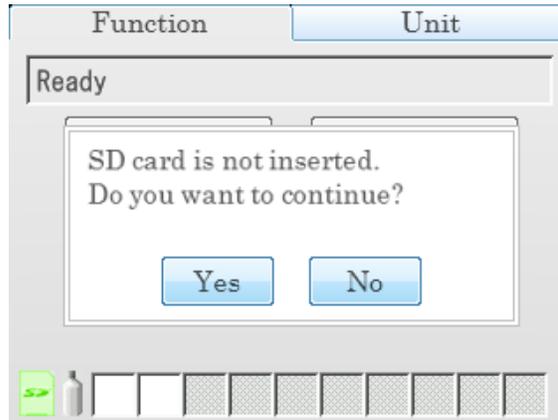
Note

If an SD card is not installed then test data and instrument data logger data downloaded manually or automatically cannot be saved.

- 3 If you have a multi-station system and a secondary station is turned on but you do not want it to be included in the testing, deselect the Active box in the **Unit** tab.
- 4 If necessary, press the **Function** tab in the upper-left corner to get the **Function** tab to appear.
- 5 Press the **Alarm Check** button to initiate an alarm check.

To cancel the alarm check, press the **Alarm Check Cancel** button in the **Function** tab and press **Yes** in the window that appears.

- 6 If no SD card is installed, a warning screen will appear. If no SD card is installed, no test data will be saved. Press **Yes** or **No** to continue with the alarm check.



- 7 The buzzer will sound, the LEDs will turn on for a few seconds, the vibrator will vibrate, and the CS460 will determine if these actions were completed successfully.
- 8 Once the alarm check is over, the **Function** tab will display an **Alarm Check End** button. To view the test results, press the **Unit** button to display the **Unit** tab. The test results will display on the **Unit** tab until you press the **Alarm Check End** button in the **Function** tab even if the GM460 is turned off.
- 9 If a printer is connected, a **Print** button will appear in the **Function** tab's **Alarm Check** screen. Press the **Print** button to print the alarm check results.
- 10 Press the **Function** tab to display the **Function** tab if it is not already displayed. Press the **Alarm Check End** button to return to the top level **Function** tab screen. The test results that were being displayed in the **Unit** tab will disappear once the **Alarm Check End** button is pressed.
- 11 To perform any other operations, press the **BUMP**, **CAL**, or **Alarm Check** buttons on the **Function** tab.
- 12 To turn the GM460 off:
If the alarm check was successful, the GM460 will shut off after 15 seconds. If the alarm check failed, the GM460 will shut off after 10 minutes. If buttons are pressed before the CS460 turns off the GM460, the station will automatically turn the instrument off 10 minutes after the last button push.
To turn off the GM460 manually, press the **Detector Off** button in the lower-left corner of the **Unit** tab. For a multi-station installation, only the primary (leftmost) station will have a **Unit** tab. The secondary stations will only have a main screen and the **Detector Off** button will be displayed in the lower-left corner.
- 13 The results of the alarm check will be stored in the CS460's SD card.
- 14 Push the red gas in/gas out cover toward the GM460 and then release it. It should return to its unused state at the top of the CS460.

- 15 Remove the GM460 from the CS460.
- 16 Repeat step 12 to 15 for any additional GM460s.

Downloading Instrument Logger Data

The CS460 allows you to download the data in a connected GM460 to the SD card. This can be done by setting up a CS460 system to download the data automatically at startup or it can be done manually. See ["Updating the Data Logger Settings" in Chapter 3](#) for instructions to setup a CS460 system for automatic instrument data downloading.

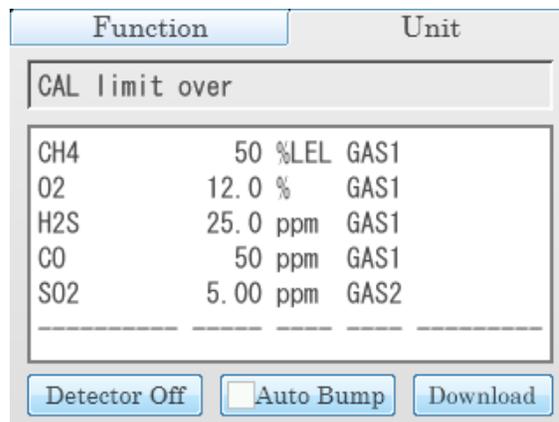
To manually download instrument data to the SD card, do the following:

- 1 Turn on the CS460 system as described in ["Turning on a CS460 System" \(in this chapter\)](#).
- 2 Confirm that you have an SD card installed in the system.

Note

If an SD card is not installed then test data and instrument data logger data downloaded manually or automatically cannot be saved.

- 3 If you have a multi-station system and a secondary station is turned on but you do not want the instrument in that station it to be included in the downloading, deselect the Active box in the **Unit** tab.
- 4 If necessary, press the **Unit** tab in the upper-right corner of the single or primary CS460 to get the **Unit** tab to appear.
- 5 Press the **Download** button at the bottom of the **Unit** tab. For a single-station system, the **Download** button is in the lower-right corner of the screen.



- 6 For a multi-station system, the **Download** button is on the primary station's **Unit** tab along the bottom middle of the screen.

Function	Unit	
CAL limit over		
CH4	50 %LEL	GAS1
O2	12.0 %	GAS1
H2S	25.0 ppm	GAS1
CO	50 ppm	GAS1
SO2	5.00 ppm	GAS2

Detector Off	Download	<input checked="" type="checkbox"/> Active

- 7 The CS460 will begin to download instrument data to the SD card. The **Download** button will change to **Download Cancel**. To cancel the data download, press the **Download Cancel** button.
- 8 When the data download is complete, the **Download Cancel** button will change to **Download**. The data is saved in the DAT folder on the SD card to an instrument specific file with a .dat file extension. See ["Test Record Files" \(in this chapter\)](#) for a complete description of the saved test and instrument data files.

Troubleshooting

Note

This troubleshooting guide describes CS460 problems only. See the GM460 Operator's Manual for problems you may encounter with the GM460.

Table 4-1: Troubleshooting the CS460

Symptoms	Probable Causes	Recommended Action
Fresh air adjustment fails	<ul style="list-style-type: none"> • The CS460 is not in a fresh air environment or the cylinder connected to the AIR fitting 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 red gas in/gas out cover is not pushed down and engaged with the GM460. • If a PID or IR CO₂ sensor is installed in the instrument, appropriate filters are not being used. 	<ol style="list-style-type: none"> 1. Confirm that the CS460 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 red gas in/gas out cover is pushed down and engaged with the GM460. 4. If a zero air cylinder is used, check all calibration tubing for leaks or for any bad connections. 5. If a PID or IR CO₂ sensor is installed, confirm that all necessary filters are installed according to Figure 3-7. 6. If the fail condition continues, replace the sensor(s) in the GM460. 7. If the difficulties continue, contact TSI Incorporated for further instruction.
Calibration fails	<ul style="list-style-type: none"> • 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 inlet fitting. • The red gas in/gas out cover is not pushed down and engaged with the GM460. • The tubing from the regulator to the gas inlet fitting is not connected. 	<ol style="list-style-type: none"> 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 inlet fitting. 4. Check to make sure the red gas in/gas out cover is pushed down and engaged with the GM460. 5. Check all calibration tubing for leaks or for any bad connections. 6. If the fail condition continues, replace the sensor(s) in the GM460. 7. If the difficulties continue, contact TSI Incorporated for further instruction.

Symptoms	Probable Causes	Recommended Action
No IR connection between GM460 and CS460	<ul style="list-style-type: none"> • CS460 is not turned on. • The GM460 is not correctly inserted into the instrument cradle. • The IR window is dirty. 	<ol style="list-style-type: none"> 1. Turn on the CS460. If it does not turn on, check that the AC adapter is plugged into an AC socket and to the jack on the left side of the CS460. 2. Check to make sure the GM460 is inserted properly. 3. Clean the IR window on the CS460 and GM460. 4. If the difficulties continue, contact TSI Incorporated for further instruction.
Touch screen is not functioning correctly for standalone operation	The CS460 is connected to a computer and the PC Controller Program is running	Disconnect the USB cable from the left side of the CS460 if it is connected. See the CS460 PC Controlled Configuration Operator's Manual for instructions to use the CS460 in PC Controlled configuration
The Li-ion battery pack in the GM460 is not charging	<ul style="list-style-type: none"> • The GM460 has an alkaline battery pack installed. • The Li-ion battery pack is faulty. • The GM460 is not fully inserted in the instrument cradle. • The charger is malfunctioning. 	<ol style="list-style-type: none"> 1. Check to make sure your GM460 does not have an alkaline battery pack installed. 2. Replace the Li-ion battery pack and attempt to charge it. 3. Be sure that the GM460 is fully inserted in the instrument cradle. 4. If the difficulties continue, contact TSI Incorporated for further instruction.
"CAP ERROR" is displayed on the CS460's screen	The red gas in/gas out cover is not pushed down and engaged with the GM460.	Check to make sure the red gas in/gas out cover is pushed down and engaged with the GM460.
"Inlet Error" is displayed on the CS460's screen	The gas inlets are not set appropriately for the installed GM460.	<ol style="list-style-type: none"> 1. Check to make sure that all gases in the GM460 have a corresponding inlet setting in the Config Menu's Inlet Screen. 2. Be sure that all appropriate inlets are selected as Active in the Config Menu's Inlet Screen.
Test or Instrument data is not being saved to the SD card	<ul style="list-style-type: none"> • The SD card is not fully engaged in the SD card slot. • The SD card is not installed in the SD card slot. • The SD card is defective. 	<ol style="list-style-type: none"> 1. Check to make sure that the SD card is installed properly in the SD Card slot. 2. Replace the SD card. 3. If difficulties continue, contact TSI Incorporated for further instruction.

Charging a GM460 in a Docking Station

The CS460 can be used to charge the rechargeable batteries in a GM460. To maximize the GM460's run time and the battery life, make sure the batteries' charge is as low as possible before recharging them.

Recharging a Battery Pack after Performing a Test

To recharge the battery pack in a GM460 after performing a bump test or calibration:

1. Perform a bump test, calibration, or alarm check on a GM460 as described in ["Bump Testing"](#), ["Calibration"](#) or ["Alarm Check"](#) in this chapter.
2. After the bump test, calibration, or alarm check has been completed, turn off the GM460 by pressing the **Detector Off** button in the bottom left corner of the **Unit** tab. If no buttons are pressed for 10 minutes, the docking station will automatically turn off the GM460 and begin the charge cycle.
3. Before the GM460 is turned off, the Status LED will be blinking green. Once the GM460 is turned off, the Status LED will blink orange if the GM460 needs to be charged. The Status LED will be solid orange if the GM460 is already fully charged.

Note

The CS460 does not start charging the batteries until the GM460 is off.

4. If the battery pack is drained enough for the docking station to charge it, the Status LED will continue to blink orange while charging is taking place. The CS460 will take approximately three (3) hours to charge a fully discharged GM460.

If you are attempting to charge an alkaline battery pack, the Status LED will be solid green and no charging will occur.

If the charging process encounters a fail condition, the Status LED will turn steadily red. A fail condition could indicate that there is something wrong with the Li-ion battery pack, or that there is something wrong with the charger.

5. When the charge is complete, the Status LED will turn solid orange.

Recharging a Battery Pack without Performing Any Operations

1. Connect the AC adapter to an AC wall socket and plug the power jack into the left side of the CS460. For multiple CS460s connected together, only the left-most CS460 should be connected to power.
2. Flip the CS460's power switch so that it is in the **ON** position. For multiple CS460s connected together, only the power switch of the left-most CS460 needs to be flipped.
3. The Status LED will be solid green if the CS460 is operating properly or solid red if there is a system failure.
4. Install a GM460 in the instrument cradle. Orient the GM460 so the belt clip is facing away from the CS460. Set the bottom of the GM460 in the bottom of the instrument cradle and push the top of the GM460 toward the CS460.

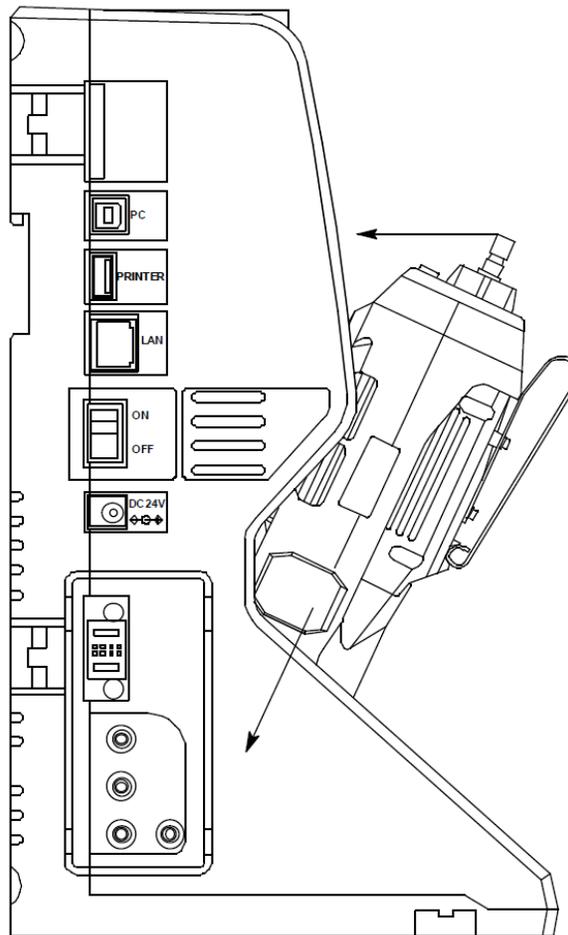


Figure 4-6: Inserting the GM460

5. If the battery pack is fully charged, the Status LED will be solid orange.

If the battery pack is drained enough for the CS460 to charge it, the Status LED will blink orange while charging is taking place. The CS460 will take approximately three (3) hours to charge a fully discharged GM460.

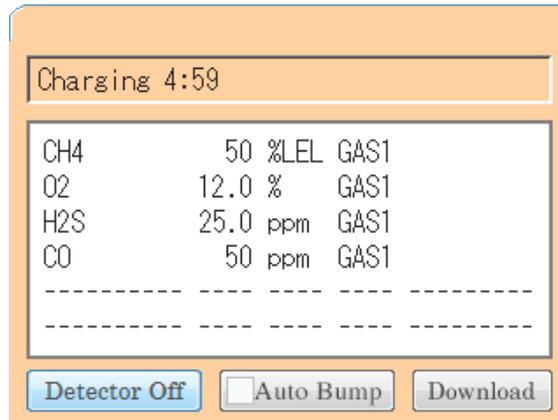
If you are attempting to charge an alkaline battery pack, the Status LED will be solid green and no charging will occur.

If the charging process encounters a fail condition, the Status LED will turn steadily red. A fail condition could indicate that there is something wrong with the Li-ion battery pack, or that there is something wrong with the charger.

6. When the charge is complete, the Status LED will turn solid orange.

Batteries Too Drained for PC Controlled Operation

If the batteries in the GM460 do not have enough power to keep the GM460 on during operations with the CS460, the GM460 will turn off and the CS460 will go into a 5-minute charge cycle and indicate it is charging the instrument. The following screen occurs on a single station system. The screens on a multi-station system will be similar.



The GM460 will not connect to the CS460. The instrument cannot be bump tested, calibrated, or alarm checked in the charge cycle. Once the 5-minute charge cycle has ended, the GM460 will automatically turn back on and connect to the CS460. The GM460 can now be bump tested, calibrated, or alarm checked.

Bump Test, Calibration, and Alarm Check Records

The CS460 saves a record of each alarm check, bump test, and calibration performed if an SDHC card is installed in the SD card slot. If no SD card is installed, data is not being saved. The number of records that can be saved solely depends on the SD card's available storage capacity. When an SD card's memory becomes full, the oldest record is overwritten when a new record is saved.

Available Memory in the SD Card

The SD card logo in the bottom-left corner of the **Function** tab indicates how much memory space is available in the installed SD card. The table below describes the various indications.

Table 4-2: SD Card Logo Indications

SD Card Logo Color	Meaning
Gray	No SD card inserted.
Green	More than 20% of the SD card's memory is available.
Yellow	Less than 20% but more than 1 MB (approximately 946 tests) of the SD card's memory is available.
Red	Less than 1 MB (approximately 946 tests) of the SD card's memory is available.

Test Record Files

A DAT folder is created on the SD card and all data is saved to that folder. For bump tests, calibrations, and alarm checks that are done, one .txt file per GM460 is saved to the folder. The file includes results for all tests done while the GM460 is installed in the CS460. The filename will begin with "CS460" and the remainder of the filename will depend on the serial number of the tested GM460 and the date of the most recent testing for that GM460 (i.e., CS460569010102160318.txt). The date format is YYMMDD (year, month, day). So multiple GM460s tested on the same day will have separate files because the serial numbers are different. And the same GM460 tested on different days will only have one file because the filename will be changed after each test to reflect the most recent test date.

Downloaded instrument data logger information is saved to a .dat file. The file contains interval trend, alarm trend, etc. data that was saved in the instrument and that was retrieved during an automatic data download. One .dat file is saved per GM460 and the file name is only the instrument serial number (i.e. 569010102.dat).

The files that a CS460 saves to the SD card are structured so that they can be imported into a database controlled by the PC Controller Software. See [Chapter 5, "Importing Data into the CS460-PC Docking Station PC Controller Program"](#) for instructions to add files to the database.

Transferring Record Files to a Computer

There are two ways to get the SD card data from the CS460 to your computer. Instructions for both options can be found in [Chapter 5, "Importing Data into the CS460-PC Docking Station PC Controller Program"](#).

1. Remove the SD card from the CS460 and insert it in your computer's SD card slot. If your computer does not have an SD card slot, you will need to use the SD to USB reader that is provided with CS460s that come with an AC adapter.
2. Set up a LAN connection between the CS460 and your computer using your building's network.

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CHAPTER 5

Importing Data into the CS460 PC Controller Program

Overview

This chapter describes how to import data collected in Standalone Mode into the CS460-PC Docking Station PC Controller Program. Importing can be done by bringing the CS460's SD card to the computer or by utilizing the building's LAN network.

Data importing is done through the Logs Window which is accessed by clicking the **Logs** button. The two control buttons associated with importing data are **SD Import** and **Net Import**.

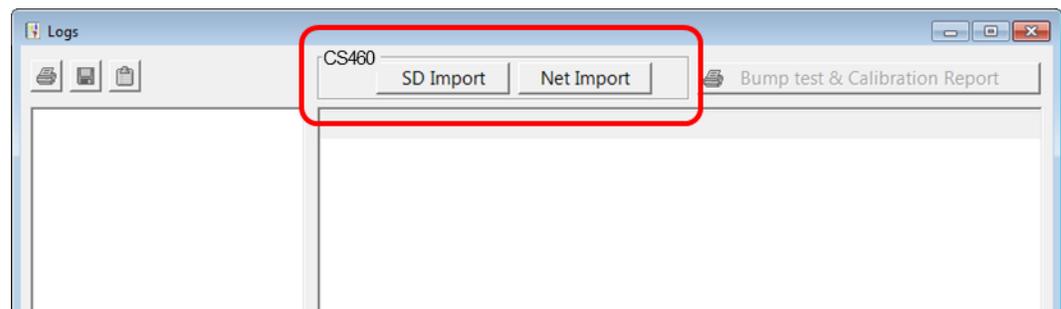


Figure 5-1: Import Buttons in Logs Window

Importing from an SD Card

1. Remove the SD card from the CS460.
2. Insert the SD card into the SD card slot on your computer. If your computer does not have an SD card slot, insert the SD card into a SD to USB reader. A SD to USB reader is provided as a standard accessory with a CS460 that includes an AC adapter.
3. Click **Start** on the Windows Icon Tray, then select **Programs/CS460-PC**. You can also double-click the shortcut created on your desktop. The CS460-PC Docking Station PC Controller Program is launched and the main program window appears.

Note

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

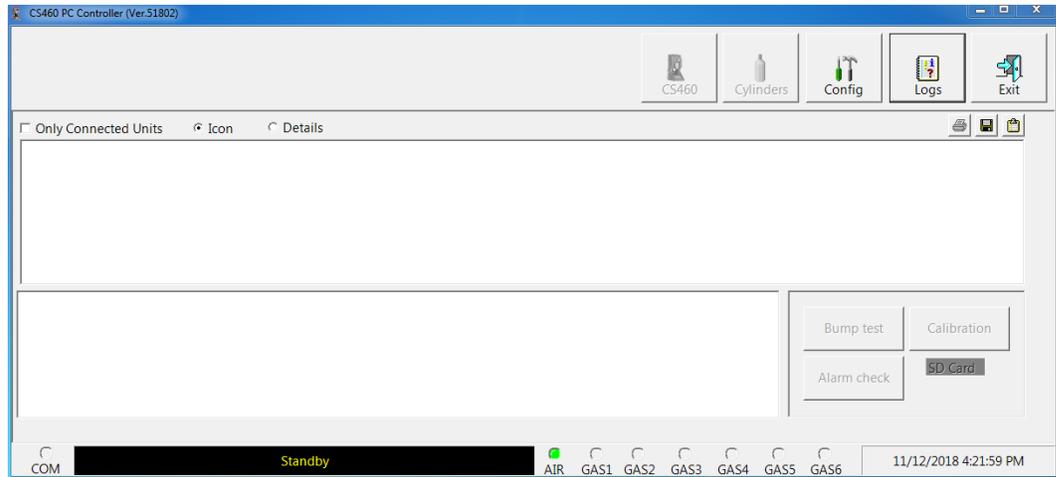


Figure 5-2: Main Program Window

4. Click the **Logs** button to display the **Logs** window.

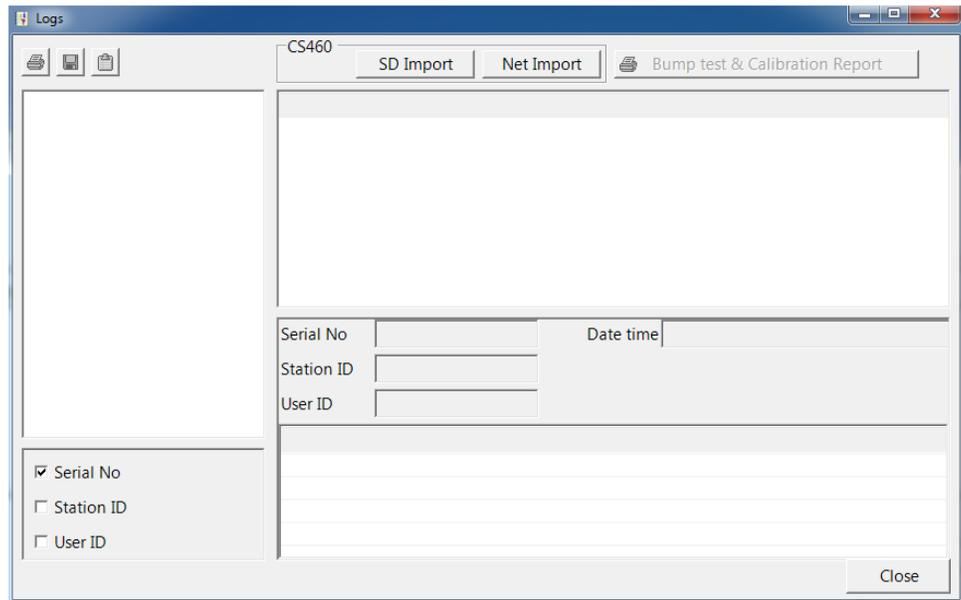


Figure 5-3: Logs Window

5. Click the **SD Import** button.
6. Navigate to the SD card location on your computer.

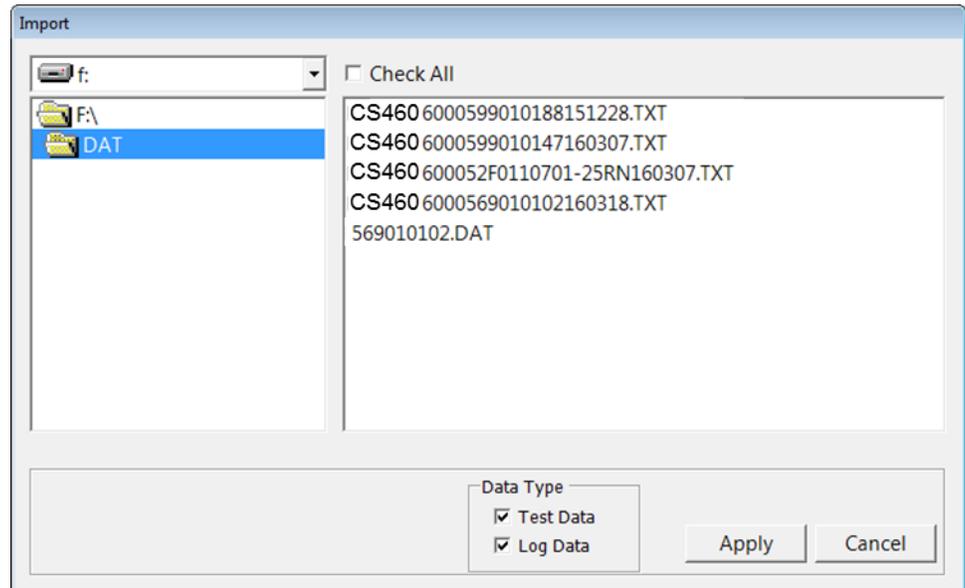


Figure 5-4: SD Card Import Window

7. Select the types of data you want to import. **Test Data** is data from bump tests, calibrations, and alarm checks done with the CS460 (in either Standalone or PC Controlled Mode) and is saved as a .txt file. It will not include data from tests done away from the CS460. **Logs Data** is saved instrument data that was downloaded to the SD card during a data download (in Standalone Mode only) and is saved as a .dat file. It will include Interval Trend data, Alarm Trend data, etc. If you select **Test Data**, only .txt files will be displayed for selection. If you select **Logs Data**, only .dat files will be displayed.
8. Select the files that you want to import or use the **Check All** box to select all of the files.
9. Click **Apply**. A window will appear for a few seconds indicating that the file or files are being imported.
10. The files are now added to the database.

Importing Using the LAN Network

Importing data using the LAN network allows you to import data (.txt and .dat files) from the SD card(s) in the CS460(s) on the network.

Before importing data using the LAN network, be sure that the LAN connectivity for the CS460(s) was set up as described in ["Setting Up LAN Connectivity" in Chapter 3](#).

Note

For users with a DHCP network, keep in mind that if the LAN connectivity was set up but the CS460 lost power or the network went down for a period of time, you may need to set up the LAN connectivity again. A new IP address may have been assigned to the CS460 when power was restored or when the network came back up.

1. Click **Start** on the Windows Icon tray then select **Programs/CS460-PC**. You can also double-click the shortcut created on your desktop. The CS460-PC Docking Station PC Controller Program is launched and the main program window appears.

Note

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

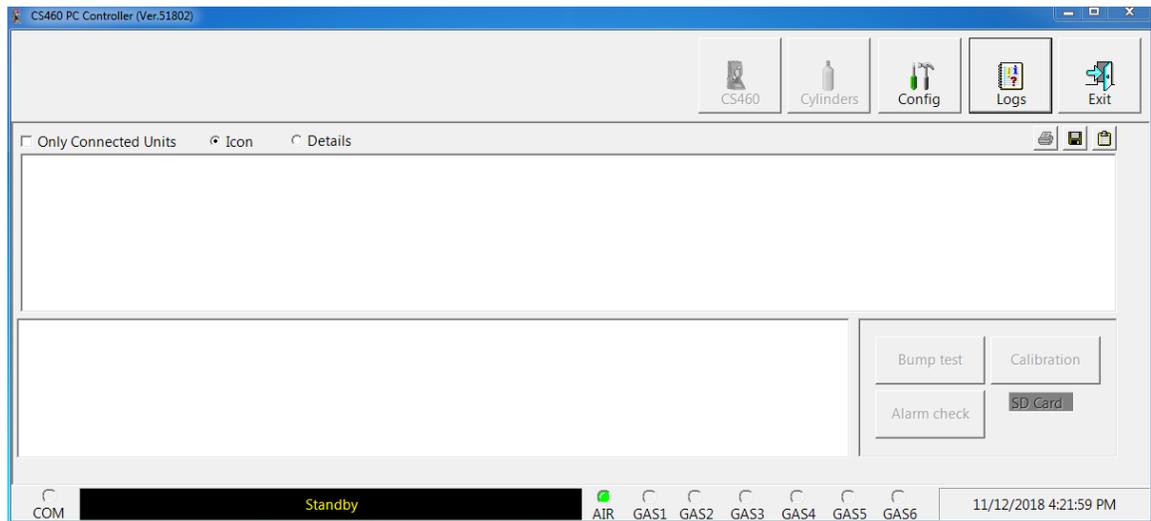


Figure 5-5: Main Program Window

2. Click the **Logs** button to display the **Logs** window.

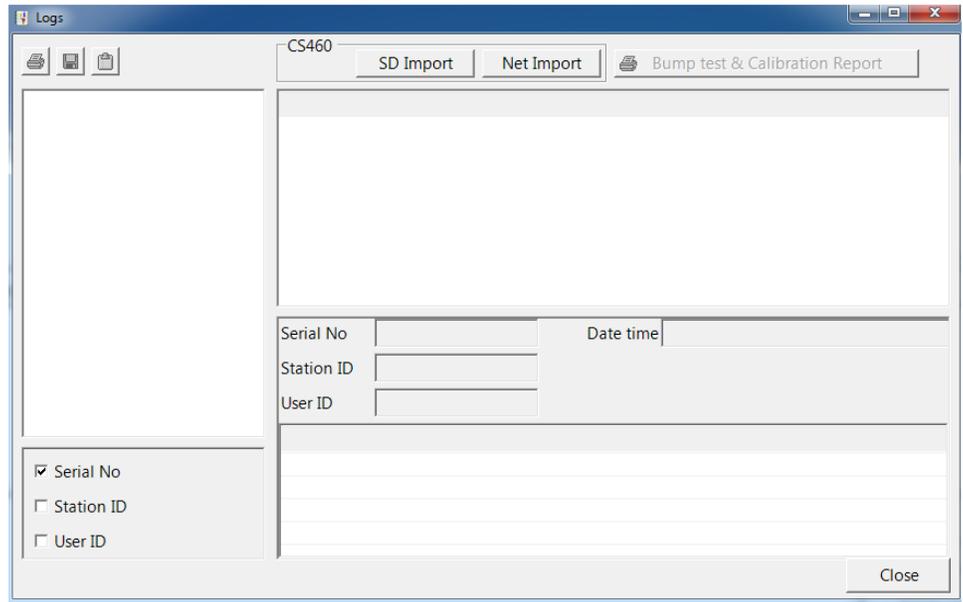


Figure 5-6: Logs Window

3. Click the **Net Import** button. The CS460s that you set up in ["Setting Up LAN Connectivity" in Chapter 3](#).

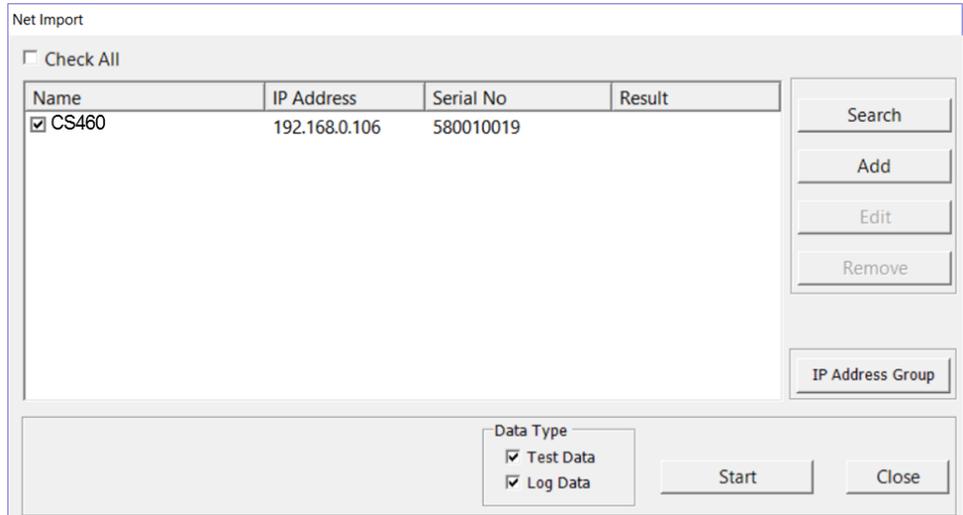


Figure 5-7: Net Import Window

4. Select the types of data you want to import. **Test Data** is data from bump tests, calibrations, and alarm checks done with the CS460 (in either Standalone or PC Controlled Mode) and is saved as a .txt file. It will not include data from tests done away from the CS460. **Logs Data** is saved instrument data that was downloaded to the SD card during a data download (in Standalone Mode only) and is saved as a .dat file. It will include Interval Trend data, Alarm Trend data, etc.
5. Select the CS460(s) that have the files you want to import or use the **Check All** box to select all of the CS460(s).
6. Click **Start**. The **Result** area for each CS460 will indicate that the program is communicating with the docking station and will indicate how many files were imported once the import is complete.

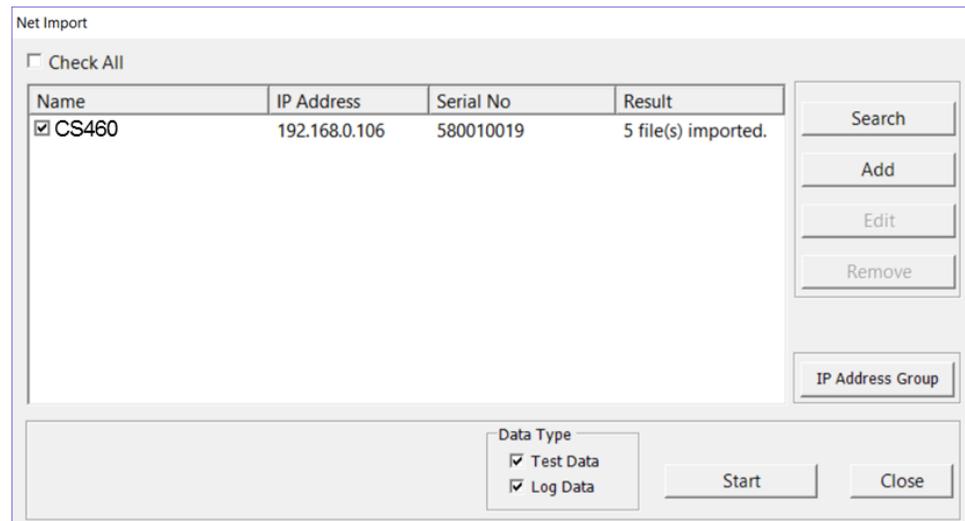


Figure 5-8: Net Import Successful

Note

If the data import is not successful, you may need to set up the LAN connectivity again. For users with a DHCP network, if the CS460 lost power or the network went down for a period of time, a new IP address may have been assigned to the CS460 when power was restored or when the network came back up.

7. Click **Close**.
8. The files are now added to the database.

Viewing Imported Data

See Chapter 6 in the CS460 PC Controller Program manual for instructions to organize, view, print, and delete data that has been imported.

Exiting the Program

To exit the PC Controller Program:

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 5-1: Spare Parts List

Part Number	Description
06-1248RK	Polyurethane tubing, 5/16-inch OD x 3/16-inch ID, for connecting to inlet fittings
06-1248RK-03	3-foot length of 5/16-inch OD x 3/16-inch ID, for connecting calibration cylinder to inlet fittings
06-1254RK	Polyurethane tubing, 7/16-inch OD x 5/16-inch ID, for exhaust tube, 15 feet maximum
06-1254RK-10	10-foot length of 7/16-inch OD x 5/16-inch ID, for exhaust tube
10-1233-06	Screw, M4 x 8 mm, for connection brackets and/or panel on right side of CS460
14-0401	Wall mounting brackets, set of 3, with screws
14-0402	Connection brackets, set of 2, with screws, for connecting SV-3 to CS460
14-0403	Connection brackets, set of 3, with screws, for connecting CS460s together
17-4710	Sample fitting plugs
21-1935	Panel cover for right side of CS460
33-0167RK	Particle air filter replacement, CF-8369
33-6015RK	CO ₂ scrubber
33-6098-01	VOC zero filter, charcoal, with tubing stub
47-1013RK	Multi-station AC adapter line cord only
47-1017	Printer power cord
47-5073RK	USB cable, Type A to Type B, for connecting to a computer
47-5085RK	Cable, USB A to USB mini, for connecting printer to CS460
47-5088	Ethernet cable, black, 5 ft.
49-0126	Single-station AC adapter
49-0128	Multi-station AC adapter with line cord
49-0128-01	Multi-station AC adapter, without line cord
49-0129	Printer AC adapter
49-1621	Printer battery pack
71-0385	Operator's Manual, CS460 Docking Station Standalone Configuration (this document)
71-0386	Operator's Manual, CS460 Docking Station PC Controller Program
71-8011	Product CD, CS460, includes PC Controller Program

Part Number	Description
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
81-0018RK-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
81-0076RK	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	Five-gas calibration cylinder, CH ₄ /O ₂ /H ₂ S/CO/SO ₂ , 58 liter aluminum
81-0142RK-04	Five-gas calibration cylinder, CH ₄ /O ₂ /H ₂ S/CO/SO ₂ , 34 liter aluminum
81-0143RK-02	Five-gas calibration cylinder, CH ₄ /O ₂ /H ₂ S/CO/IBL, 58 liter aluminum
81-0143RK-04	Five-gas calibration cylinder, CH ₄ /O ₂ /H ₂ S/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 ₂ S, 58 liter aluminum
81-0154RK-04	Four-gas calibration cylinder, 50% LEL CH ₄ /12% O ₂ /50 ppm CO/ 25 ppm H ₂ S, 34 liter aluminum
81-0158RK-02	Four-gas calibration cylinder, 50% LEL Isobutane/12% O ₂ /50 ppm CO/25 ppm H ₂ S, 58 liter aluminum
81-0158RK-04	Four-gas calibration cylinder, 50% LEL Isobutane/12% O ₂ /50 ppm CO/25 ppm H ₂ S, 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
81-0176RK-02	Calibration cylinder, 25 ppm NH ₃ in nitrogen, 58 liter
81-0176RK-04	Calibration cylinder, 25 ppm NH ₃ in nitrogen, 34 liter
81-0182RK-02	Calibration cylinder, 5 ppm NO ₂ in air, 58 liter
81-0182RK-04	Calibration cylinder, 5 ppm NO ₂ in air, 34 liter
81-0185RK-02	Calibration cylinder, 0.5 ppm PH ₃ in nitrogen, 58 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
81-1054-01	Demand flow regulator with 3 feet of calibration tubing, for 58/103 liter cylinders
81-1055RK	Demand flow regulator, for 17/34 liter steel cylinders

Part Number	Description
81-CS460	Docking station for GM460, includes docking station, air filter, exhaust tubing, and connection brackets
81-CS460-01	Docking station for GM460, includes docking station, air filter, exhaust tubing, connection brackets, single-station AC adapter, USB cable, Ethernet cable, and SD card with SD to USB reader
81-CS460-02	Docking station for GM460, includes docking station, air filter, exhaust tubing, connection brackets, multi-station AC adapter, USB cable, Ethernet cable, and SD card with SD to USB reader
81-0182RK-02	Calibration cylinder, 5 ppm NO ₂ in air, 58 liter
81-0182RK-04	Calibration cylinder, 5 ppm NO ₂ in air, 34 liter
81-0185RK-02	Calibration cylinder, 0.5 ppm PH ₃ in nitrogen, 58 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
81-1054-01	Demand flow regulator with 3 feet of calibration tubing, for 58/103 liter cylinders

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CHAPTER 6

Contacting Customer Service

This chapter gives directions for contacting TSI Incorporated for technical information and directions for returning the Model CS460 Docking Station Standalone Configuration for service.

Technical Contacts

- If you have any difficulty setting up or operating the CS460 Docking Station Standalone Configuration, or if you have technical or application questions about this system, contact an applications engineer at TSI Incorporated, 1-800-680-1220 (USA) or (651) 490-2860 or e-mail technical.services@tsi.com.
- If the CS460 Docking Station Standalone Configuration, does not operate properly, or if you are returning the instrument for service, visit our website at <http://rma.tsi.com>, or contact TSI Customer Service at 1-800-680-1220 (USA) or (651) 490-2860.

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Returning for Service

Visit our website at <http://rma.tsi.com> and complete the on-line "Return Merchandise Authorization" form or call TSI at 1-800-680-1220 (USA), (651) 490-2860, or 001 651 490-2860 (International) for specific return instructions.

Customer Service will need the following information:

- The instrument model number (CS4640)
- The instrument serial number
- A purchase order number (unless under warranty)
- A billing address
- A shipping address

Use the original packing material to return the instrument to TSI. If you no longer have the original packing material, seal off any ports to prevent debris from entering the instrument and ensure that the display and the connectors on the instrument front and back panels are protected. This instrument is very fragile and must be packed in a manner appropriate for a precision instrument.

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APPENDIX A

Specifications

Specifications are subject to change without notice.

Input Power	24 VDC
Environmental Conditions.	<ul style="list-style-type: none"> • For Indoor Use Only • 0° C to 40° C, below 95% Relative Humidity, Non-Condensing
Applicable Instrument	GM460
Memory Capacity.....	Dependent on capacity of installed SDHC card
Record Size	1.1 KB (bump test + calibration + alarm check)
Maximum Number of Records Saved	Dependent on capacity of installed SDHC card
Number of Calibration Gas Cylinders	<ul style="list-style-type: none"> • SV-3 not connected: Up to three calibration gas cylinders per bump test or calibration at a time • SV-3 connected: Up to six calibration gas cylinders per bump test or calibration at a time
Standard Accessories.....	<ul style="list-style-type: none"> • Instruction Manual* • CS460-PC Docking Station PC Controller Software* • Inlet Air Filter • 10-Foot Long Exhaust Tube • Connection Brackets
Available Accessories.....	<ul style="list-style-type: none"> • AC Adapter • USB Cable, Type A to Type B • Ethernet Cable • SDHC Card and SD to USB Reader • Demand Flow Regulator • 3-Foot Long Calibration Tubing • Calibration Gas Cylinder • SV-3 • Printer • Wall Mounting Brackets • CO₂ Scrubber

* Not included with CS460. Download from www.tsi.com.

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UNDERSTANDING, ACCELERATED

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