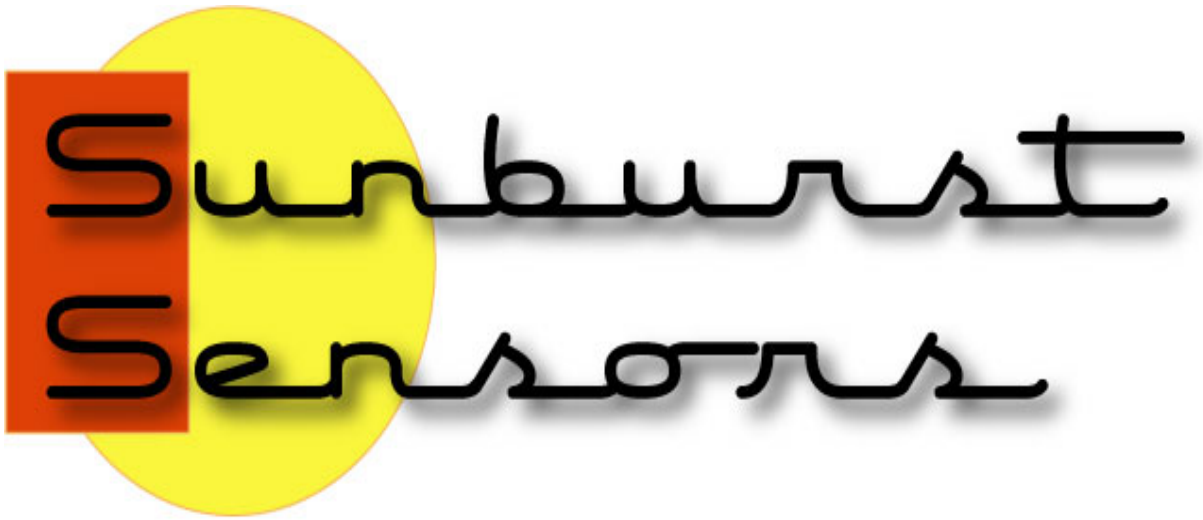

SAMI-CO_2
Owner's Manual

July 2007
Version 2.0

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Establishing Communication with the SAMI

Installing TFTools

1) From the software CD provided in the shipping crate with the SAMI, locate and open the folder named “TFTools 1.22”.
2) Double click the icon labeled “Setup TFTools-122.exe” and follow the on screen prompts. If asked to place a shortcut on your desktop, select YES.

The TFTools Operating Environment

1) Double click the TFTools desktop icon to open the program.
2) Connect the serial communications cable to the computer, and then to the SAMI 5 pin bulkhead marked with blue paint (or to the extension pigtail cable). ****Note the orientation of the large pin and socket**.
3) Briefly pass (or touch) a magnet to the red dot on the lower part of the SAMI housing to “trigger” it to run a sample.
4) If your SAMI is running the SingleCO2.tfb program, the word “RUNNING,” should be displayed on the monitor for about one minute followed by a string of data as shown below: (SingleCO2.tfb program only – other programs will vary).

RUNNING,21:38:11,08/25/06,23.89,2272,3223,3163,14413,42713,35040,68,191,158,0.3957,0.8532,60905,60592, 0

5) If instead, you see a string of odd characters as shown below, the Baud Rate setting will need to be changed.

ëë°Bk)-i'ë©å¯%©íë¥)«mo%á¯!ç%!©©e©!%eë¯©©+%-«-+%éÈ

6) To change the Baud Rate, simply click the first box in the lower left corner of the TFTools Terminal window (Tool Bar) to display a “Port Settings” window. Depending on which program your SAMI is running, the Baud Rate will be either 9600 or 19200.
7) To determine which program and baud rate is currently running on your SAMI, click “File” on the menu bar at the top of the TFTools window, then click “Open” and then locate, select, and open the program on the software CD sent with the SAMI. It is in the folder labeled “TFTools”. The baud rate will be listed near the top of the program.
8) After changing the Baud Rate, let the SAMI complete the sample, and then trigger the SAMI again to verify proper display.
9) If proper communication cannot be established, refer to the “**Troubleshooting Communication Problems**” section.

Stopping and Restarting the SAMI

1) To download data, change the sampling interval, or to change calibration values, the SAMI program must first be stopped.
2) Trigger the SAMI with a magnet and immediately (within about 20 seconds) press <Ctrl-c> on your keyboard to stop the program. A # symbol should appear on the monitor display. The # will be displayed each time the <Enter> key is pressed while the SAMI is stopped.

Note: It is very important that you press <**CTRL-C**> immediately (within 20 seconds) after triggering SAMI. If the SAMI is not stopped immediately it may compromise further data sequencing.

---

3) To download the data stored on the SAMI data logger refer to the section "**Data Download Instructions for Windows**" or "**TFX-11 Instructions**".
4) To change the sampling interval you must restart the SAMI and choose the desired interval when asked.
5) The recommended procedure for restarting the SAMI is to first erase the datafile. *** Be sure that you have already saved and verified any data from the SAMI that you want to keep, as it will be lost.**
6) From the "Tattletale" menu, select "Erase datafile" and select "Yes" when it asks if you're sure. Two more # symbols will appear.
7) Open the program in TFTools (section 2 step 7 above). From the menu bar, select "Tattletale", then "Run" from the drop down menu.
8) A progress bar should appear on the display while the program is loaded into RAM and then you will be asked if you want to set the time and date. Press 1 for yes, and follow the prompts. See the example below:

```
#
 *** THIS IS THE SAMI SINGLE LINE OUTPUT PROGRAM ***

     NOTE:  IF THIS PROGRAM WAS JUST LOADED OR IF POWER WAS LOST,
            YOU MUST SET THE TIME AND INTERVAL

Do you want to set the time and date? PRESS 1 for Yes OR 2 for No: 1

ENTER THE YEAR        (e.g. 2005) 2006
ENTER THE MONTH          (1 - 12) 9
ENTER THE DAY OF THE MONTH (1 - 31) 1
ENTER THE HOUR OF THE DAY  (0 - 23) 9
ENTER THE MINUTE         (0 - 59) 36
ENTER THE SECOND         (0 - 59) 30

Do you want to change the MEASUREMENT INTERVAL? PRESS 1 for YES OR 2 for NO: 1

ENTER MEASUREMENT INTERVAL (15,30,60,120 OR 180 MINUTES) 15

Would you like to RUN A BLANK? 1 for YES or 2 for NO: 2
```

NOTE: The time should be set to GMT (UTC), but can be set to local if desired.

9) Immediately following your input to the last question, the word "RUNNING," will be displayed. Approximately one minute later, the data string will appear resulting in a full line such as the example below:

RUNNING,09:36:30,09/01/06,23.89,2272,3223,3163,14413,42713,35040,68,191,158,0.3957,0.8532,60905,60592, 0

10) Approximately every three and a half days, the SAMI will run a "Blank" sample. When this occurs, the string will appear as:

RNBLANK,07:22:12,09/04/06,23.23,2230,3182,3156,14939,44136,36766,66,196,163,0.4063,1.2004,60764,60585,2222 <= insert comment about string always ending with 2222

NOTE: To view data such as pCO_2 it must first be converted from binary to ASCII and then copied and pasted into the Deployment Template. See "**TFX-11 Instructions**" or "**SAMI Decoder Instructions**" for instructions on data download, data conversion, and pCO_2 procedures.

Troubleshooting Communication Problems

1) **Verify that your interface computer and TFTools are configured correctly.** The Baud Rate should be set to either 9600 or 19200. (If your SAMI is a "Flow-Thru" (Underway) model see "**Underway SAMI Instructions**".) Other settings in the Control Panel under Device Manager are:
   Data Bits: 8
   Parity: None
   Stop Bits: 1
   Flow Control: None
   Use FIFO Buffers (checked) both set high
   If YES – Go to step 2, If NO – correct as needed.

2) **Determine if the SAMI is running.** You should hear a faint "click" from the pump housing on top of the SAMI approximately forty seconds after passing a magnet near the large red dot on the SAMI housing (or following the SAMI's scheduled measurement), and a few seconds later you should see fluid droplets exiting the blue PEEK tubing on the top of the SAMI. **If YES – Go to step 3,** If the SAMI does not appear to be running, press the keyboard combination <Ctrl-x> and reattempt communication. **If the SAMI is not running, please contact Sunburst Sensors.**

3) **Determine that your software is working correctly.** Reboot TFTools, Windows™, and/or your computer, and reattempt communication. **If still no communication, go to step 4.**

4) **Test your serial communication cable to the SAMI.** See the section "**Serial Cable Testing**". If you are using a USB to serial cable adaptor, ensure that the drivers are installed, the settings are correct, or try another one if possible. **If the cable passes the tests, got to step 5, If NO – repair or replace as needed.**

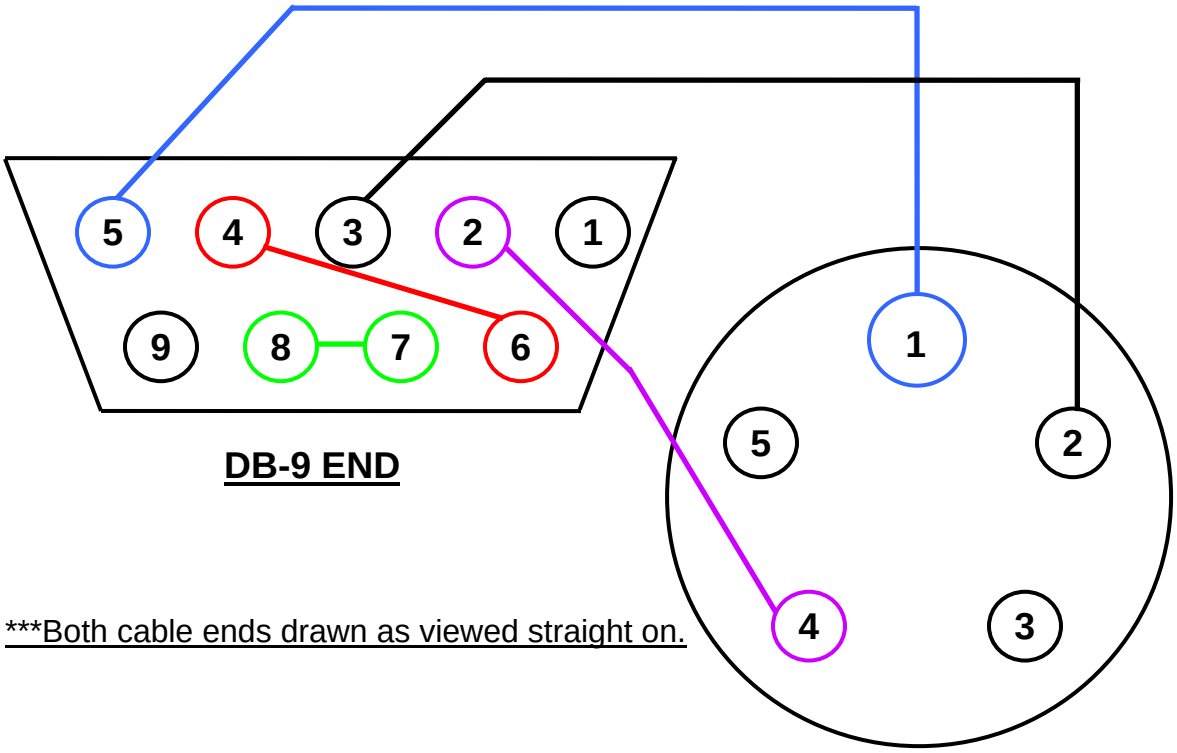
5) **Test for the presence of serial output voltages from the SAMI.** Refer to the photograph "**SAMI Top End Cap Layout**" to identify the correct location of the bulkheads, and then refer to the section "**Communication Bulkhead Voltage Outputs**". If the voltages are correct, proceed to step 6. If the voltages recorded are not correct, please contact Sunburst Sensors for further support.

6) **Test the Extension Communications Cable (if equipped).** If your SAMI has an extension cable protruding beyond the large copper cage (moored SAMI) or if you have a Flow-Thru SAMI, eliminate the possibility of the cable connecting the SAMI to your communication cable. Gain access to the 5-pin bulkhead on the SAMI, disconnect the extension cable, and connect a previously tested (and known good) communication cable directly to the SAMI. If still no communication, repeat test 5 above at the SAMI bulkhead connector. Refer to the following sections as needed:

Moored SAMI - Copper Cage Removal
Flow-Thru SAMI - Chamber Removal

7) **Test the SAMI battery voltages.** Refer to "**SAMI Battery Voltage Testing**". If the voltages are correct and all of the above steps have been performed with satisfactory results, or if the voltages are not correct, contact Sunburst Sensors for further assistance.

Serial Cable Testing



***Both cable ends drawn as viewed straight on.

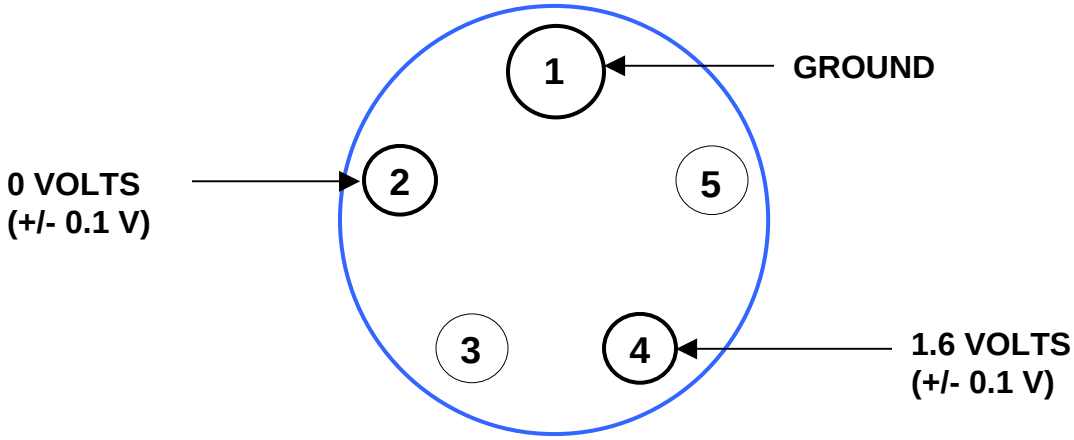
Using a standard ohmmeter, refer to the diagrams above and test for continuity as follows:

DB-9 END:
Pin 1 is Not Connected (NC)
Pin 2 to Bulkhead End Pin 4
Pin 3 to Bulkhead End Pin 2
Pin 4 to DB-9 Pin 6
Pin 5 to Bulkhead End Pin 1
Pin 6 to DB-9 Pin 4
Pin 7 to DB-9 Pin 8
Pin 8 to DB-9 Pin 7
Pin 9 NC

BULKHEAD END:
Pin 1 to DB-9 Pin 5
Pin 2 to DB-9 Pin 3
Pin 3 NC
Pin 4 to DB-9 Pin 2
Pin 5 NC

Communication Bulkhead Voltage Outputs:

Bulkhead and /or communication extension cable **male pins**:



Only pins 1, 2, and 4 are used (The obviously larger pin 1 is ground).

*The following voltages are typical, and may vary slightly.

Connect a digital voltmeter to pin 1 (ground) and pin 4 (positive). Use the "Min/Max setting if available as the voltages appear only very briefly. Be sure to use the "Range" feature to place the decimal point as shown below. The voltages are measured after triggering with a magnet, and before the end of the sample cycle about 58 seconds later. Using the DC Volt scale pin 4 should be 1.6 V (+/- 0.1V).

Next, connect the voltmeter to pin 1 (ground) and pin 2 (positive). Use the "Min/Max" setting again if available. The same measurement cycle will be used. Pin 2 should be 0 V (+/- 0.1V).

SAMI-xx Critical Information Sheet

NOTE: A completed Critical Information Sheet is provided each time a SAMI is shipped from Sunburst Sensors. Below is an example of the information included.

SAMI Serial #	SAMI-xx
Today's date	
Date of Manufacture	
Date of Refurbishment	
Owner	
Shipping Address Phone Fax	
Calibration pCO_2 Range	
Calibration Temp. Range	
Calibration Coefficients	A: B: C:
Ave. Calibration Temp	
Measurement Cycle Time	
Deployment Date	
Deployment Location	
SAMI Software Version	
Mooring Cage & Serial Number	
Accessory Equipment	
Bulkhead fitting specs	
A. Communications:	
B. External Power:	
C. MODEM:	
D. Spare:	
E. P/V	
Shipper	
Shipping Tracking #	
Housing Type (PVC, Al)	
Notes:	

TFX-11 Instructions

This section provides instruction for data download and pCO_2 calculation procedures for SAMI-CO_2 sensors with a TFX-11 processor. If you use the MONITOR.EXE program for underway pCO2 then these steps should not be necessary. There are effectively four sections: **1) Data download**, **2) Data file conversion**, **3) pCO_2 calculation**, and **4) Restarting SAMI-CO2.** The first section describes the removal of deployment data from the data logger. The procedure in Section 2 converts the TFX-11 binary data and resaves the file into an ASCII text file, readable by conventional software. The third section uses the ASCII file to determine *in situ* pCO_2, and the fourth section outlines steps for restarting the SAMI. Each step contains information regarding the PC environment, SAMI-CO_2 status, and user commands. For best results, please read and follow the instructions carefully. If you need assistance please contact Sunburst Sensors.

Note: Words in **Green** font represent user commands or choices.

1) Data Download Instructions for Windows

TFTOOLS: If TFTOOLS software is not saved onto your computer, do this now. It is included on the compact disc that accompanied the SAMI in the shipping crate. Once the software is installed, check to make sure that the SAMI-CO_2 is connected to the interface computer using the cable provided (PC: female 9-pin; SAMI-CO_2: female 5-pin bulkhead). Attach this cable to the 5-pin SAMI bulkhead marked with BLUE paint, and to your PC. Open the TFTOOLS folder from the SAMI software, and run the TFTOOLS.EXE program. (**Note:** If the SAMI-CO_2 program was previously stopped, the "#" character should appear on the screen once TFTOOLS is running, pressing **<ALT-R>** will restart the SAMI program). **Note:** If you cannot get the # character (or a string of odd symbols appears) check to see if you have the correct baud rate set on the computer. To check this, press <**ALT-C**> (COMPORTS) then go to the serial port option. Here you can change the Com Port number as well as the baud rate. The baud rate should be set at 9600 (19200 for single line CO_2).

Once the TFTOOLS environment is running, trigger the SAMI-CO_2's magnetic switch by briefly waving the red horseshoe magnet over the large red dot on the SAMI housing. The SAMI-CO_2 should respond by outputing the measurement cycle's results (this should appear in the TFTOOLS environment). If SAMI-CO_2 output does not appear, check your cable interface and restart TFTOOLS, and immediately press <**CTRL-C**>. This stops the SAMI-CO_2 program and the "#" character should appear on the screen. **Note:** It is very important that you press <**CTRL-C**> immediately after triggering SAMI-CO_2; if the SAMI-CO_2 is not stopped soon enough, it can compromise further data sequencing. Next, open the "Tattletale" menu by pressing <**ALT-T**>. In this menu, scroll down and select "**X-MODEM off-load….**" TFTOOLS prompts you for information regarding the

data file size to download. Download all available data stored in memory by entering the same number of bytes at the "**Bytes to off-load**" prompt. TFTOOLS then prompts for the file where the data is to be stored. This is a binary file, which must be converted to ASCII (see below). Once the filename is entered (e.g. **C:\OFFLOAD.DAT**) select "**OK**" to begin downloading. The file is useful ONLY after the conversion described in the next section. If the SAMI is not communicating or seems to be "locked up" use the **<CTRL-X>** command to re-establish communication with the SAMI. To restart the SAMI-CO_2, see section 4.

2) Data file conversion

*Use REV50.EXE or the **SAMI Decoder*** to convert the file to an ASCII file: If you haven't done so already, save the executable Microsoft® QUICKBASIC program *REV50.EXE* to your hard drive. Open the TFTOOLS folder and then double click on the REV50 icon. The program prompts you for the file containing the downloaded data (e.g. **C:\OFFLOAD.DAT**). Next enter the filename for the converted data (e.g. **C:\OUTPUT.PRN**). The program will run after you press enter. This should not take long and the resulting ASCII file contains the comma delimited deployment data. The data are formatted as follows:

h:min:s, mo/day/yr, temp, ext. 1, ext. 2, I_{434}, I_{620}, I_{740}, SD_{434}, SD_{620}, SD_{740}, batt. 1, batt. 2, blank

where ext. 1 and ext. 2 represent external sensor digital voltage, I_{434} is the voltage at 434 nm, SD_{434} is the standard deviation from the mean voltage, batt. 1 is the voltage for battery 1, and blank indicates a blank measurement cycle (blank = 2222). Save this file as a "read only" file to ensure the data is not altered. This file is used to determine pCO_2 in the spreadsheet application described in the next section.

3) p*CO_2 calculation*

Open the Microsoft® EXCEL file provided (Deployment Template.xls) and enable the macros. Since this file is a template for future calculations, it is recommended that you save it to a different name before manipulating new data. Before opening the ASCII file make certain that it is a read only file to ensure data is not altered, and then open the file in Microsoft® EXCEL format so that the data are in 14 separate columns. Select and copy all of the data.

Go to the Deployment Template and paste the data file in its respective columns (marked by aqua colored column titles). To place the file in its respective columns align the cursor of the mouse with the box labeled **"Paste Data Here"** under the aqua colored column labeled **Time (UTC)**. Right click on the mouse and select paste from the dropdown menu. You may also simply select the box labeled **"Paste Data Here"** under the column labeled **Time (UTC)** and enter the command **<CTRL-V>** to paste the data into the cells on the spreadsheet.

The columns marked with orange column headings hold current calibration information and should not be changed or copied unless otherwise noted. Utilize the template's macro by pressing <**Ctrl-d**>. This should fill in the constants necessary for pCO_2 calculation.

Note: Updated K_{434} and K_{620} constants are determined periodically via blank cycle measurements during deployment. For this reason, after downloading and manipulating data, the last constants determined should be recorded in case you need to work with data prior to the next blank measurement cycle. Contact Cory Beatty (*cory.beatty@umontana.edu*) if you have further questions regarding the use of this spreadsheet.

4) Restarting SAMI-CO_2

The SAMI-CO_2 should be restarted using TFTOOLS after you have downloaded the data and **backed up your data files**. First, after you have confirmed that data download was successful, it is recommended that you erase the SAMI-CO_2's memory. This is accomplished by first pressing <**Alt-t**> at the # sign in the TFTOOLS environment. Select "**Erase data file…**" and confirm the action. Once the data file is erased, press <**Alt-r**> to start the SAMI-CO_2 program again. You will have to enter the time and date (please use GMT) before the first measurement cycle will begin.

SAMI Decoder Instructions

******To be used with the SAMI program "SingleCO2.tfb – for other SAMI programs use REV50.EXE or **see note below**.

Due to its simplicity and speed, this decoder replaces REV50.exe although either method may be used. The decoder converts the TFX-11 binary data and resaves the file into an ASCII text file readable by conventional software.

1) Download the SAMI data normally using "XMODEM off-load" in the TFTools environment and save it to your computer keeping the .dat filename extension.

2) Open the SAMI Decoder program that was included on the software CD.

3) Click on "Choose File" and then select the location and filename of the datafile saved in the .dat format. Click "Open".

4) Select the folder and filename you want to save the file to (the default filename is "myData"). The data is reversed and stored as a .tsv file extension in the location you specified. Close the SAMI Decoder window.

5) Open Microsoft Excel to a new workbook and then from the menu bar open the file saved by the SAMI Decoder. (If you don't see the file, select "All Files" from the "Files of type" drop-down box).

6) Be certain that the "Delimited" box is check marked and click "Finish". The data is presented in the spreadsheet with the proper column headings.

7) Copy and Paste the data into the Excel Deployment Template on the software CD shipped with the SAMI. See "**TFX-11 Instructions**" **section 3: pCO2 Calculation**".

****NOTE:** If using the SAMI Decoder on programs other than SingleCO2.tfb, the resulting columns labeled Dark 434, 620 and 740 will actually display the Standard Deviation rather than the Dark Signals for those channels.

SAMI Battery Voltage Testing

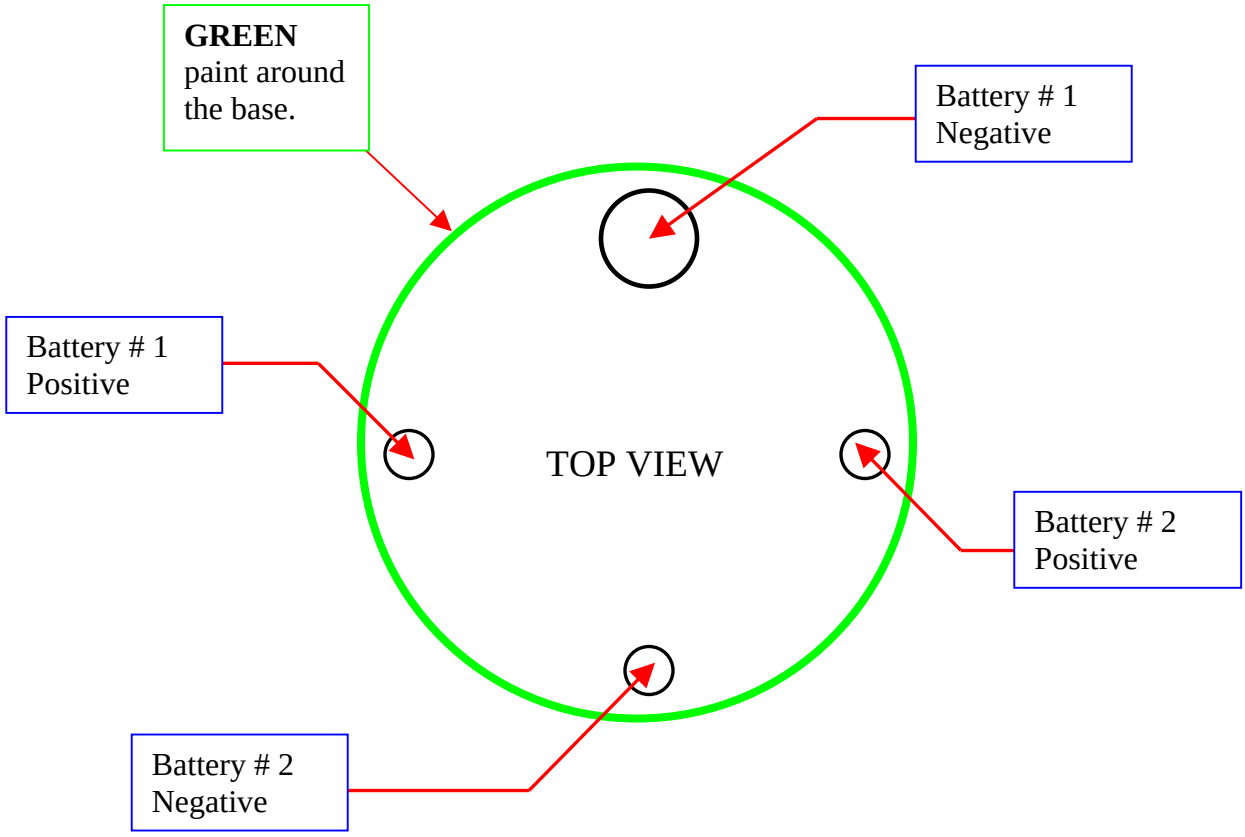


Figure 1 – Power Bulkhead

Cautions

This bulkhead can be easily identified by GREEN paint at its base and **FOUR** pins. If a voltage problem is suspected these tests must be conducted at the power bulkhead fitting.

**** CAUTION:** The tubing and fluid bags are very fragile. Do not let the bags hang from the tubes or let them fall and pull the tubing even partly out of the bags. These bags are easily punctured, creased, or otherwise damaged.

**** ALSO VERY FRAGILE** are the fiber optic segments. These are the black "tubes" that arc upward from the SAMI to the black plastic flow cell with the copper mesh on it. Refer to the picture of the "**SAMI Top End Cap Layout**" for the location of the **Optical Fiber Fittings**.

Voltage testing procedure

1) Refer to Figure 1 as a guide. The bulkhead is covered with a rubber cover and is secured with a threaded locking sleeve that must first be removed for access to the pins.

2) DO NOT disconnect or cut the tubes from the fluid bags or from the SAMI!

3) Identify the Power Bulkhead on the top of the SAMI sensor. See picture of "**SAMI Top End Cap Layout**".

4) Carefully reach into (or remove) the copper cage and unscrew (counterclockwise rotation) the locking sleeve holding the cover to the SAMI bulkhead. Pull the rubber cover straight up from the SAMI bulkhead fitting being careful not to twist or damage any of the pins or surrounding components. This may require significant force.

5) Using Figure 1 as a guide, measure battery voltages at the 4-pin power bulkhead connector:

DO NOT allow the meter probes to short any two pins together. There are two pins for power, and two for ground (two internal batteries). The largest pin is ground (negative), as is the one directly opposite of it. The other two pins are power and should measure roughly 8 to 14 volts dc (nominal). The grounds are shared, so there's no need to check from each ground pin. The voltage can be tested with a standard dc voltmeter.

If measured voltages are very low the battery will require replacement. If no voltage at all is measured on one or both batteries, there may be broken or disconnected wires inside the sensor. In either case please contact Sunburst Sensors, LLC before proceeding.

Battery Replacement or Reset (Bottom Accessible)

NOTE: All new and recently refurbished SAMI's are being converted to allow for battery removal from the bottom of the instrument. If battery replacement or data logger reset is required, please contact us to find out if your SAMI has been converted.

1) Inspect the bottom end cap of the SAMI for three threaded holes (**PHOTO**) with screws in them securing the end cap to the SAMI. (Aluminum SAMI's have only one extra hole (**PHOTO**) which will have an anode attached. Use the long plastic bolt to lift the end cap off the SAMI.)

**Not all SAMI's that have been converted will have the threaded holes mentioned. Some have notches in the bottom end cap.

2) If your sensor has been converted, remove the three retaining screws securing the bottom end cap to the SAMI.

3) **If the three spare threaded holes are present**, thread the screws into the extra holes slowly and evenly to lift the end cap from the SAMI. **Do Not** use metal wedges or tools to pry the cap. This will damage the cap, housing, and/or the o-ring that seals the SAMI.

   See step-by-step photographs here: **Internal Battery Removal**

4) **If no spare threaded holes are present**, locate the notches (**PHOTO**) in the SAMI bottom end cap where it meets the SAMI housing. Use a plastic or wooden wedge to gently pry the end cap from the housing. **Do Not** use metal wedges or tools to pry the cap. This will damage the cap, housing, and/or the o-ring that seals the SAMI.

5) Remove and set aside the foam spacer (if present).

6) Note any aligning marks (or make new ones) marking the relationship of the inside SAMI housing and the battery base plate, as this plate is unidirectional. **Do not** mark the o-ring seat on the SAMI housing as this could provide a path for water to get past the o-ring and into the housing.

7) Using a screwdriver, remove the three screws holding the battery base plate to the SAMI.

8) The battery orientation inside the SAMI is also unidirectional so note or place aligning marks for reassembly. Gently slide the battery pack from the SAMI.

9) Note the color-coding of the wires at the connectors. Disconnect the SAMI harness from the battery.

   A) **For SAMI battery reset**, leave the harness disconnected for approximately 20 seconds before reconnecting and testing for communication.
   B) **For battery replacement** simply connect the new battery to the SAMI wiring harness noting polarity and color-coding of the wires.

10) Reassembly is the reverse procedure of removal, noting these tips:

   A) Be certain the wiring does not get pinched or otherwise damaged, is aligned in the top plate groove, and the foam is placed between the battery base plate and the bottom SAMI end cap.

B) When reinstalling the battery base plate it may be helpful to rotate the SAMI slightly to more easily align the screw holes with the threaded posts.

SAMI-CO_2 Handling and Pre Cruise Check List

1) The SAMI is shipped ready to deploy. The instrument wakes up at its preset interval, and takes a partial pressure of CO_2 (pCO_2) and temperature measurement.

2) **To make sure that the instrument is functioning properly**, check for small droplets coming out of the coiled BLUE tubing located within the copper cage surrounding the sensor endcap (the copper cage helps prevent biofouling and protects the tubing from fish bites). The droplets should appear about 40 seconds after each measurement interval begins, e.g. 14:00:40. **Make sure to check for pumping after receiving the shipment and prior to the SAMI deployment.** Waving a magnet over the red dot located on the housing can force the SAMI into a measurement cycle. The instrument also periodically runs blanks, at which point it will pump more frequently for a period of about an hour. If it pumps continuously for an extended period without stopping, it has a problem. DO NOT DEPLOY IF THIS OCCURS OR IF THE SAMI IS NOT PUMPING.

3) The only exposed delicate part of the instrument is the tubing that exits the PVC reagent box. The tubing is covered by protective black plastic. **BE CAREFUL NOT TO DAMAGE THE TUBING!**

Other considerations:

4) **DO NOT STORE THE INSTRUMENT BELOW FREEZING, IN DIRECT SUNLIGHT, OR AT HIGH TEMPERATURES FOR EXTENDED PERIODS**.

5) The instrument can be deployed with either end up. If deploying close to the surface, deploy with the copper cage down to minimize solar heating.

Mooring Cage Instructions

Removing the SAMI from the Mooring Cage

Caution: When removing the SAMI from or placing the SAMI into the mooring cage, be extremely careful of the tubing that connects the fluid bags to the top of the SAMI. Do not allow this tubing to be kinked, pinched, cut, or damaged in any way.

1) Photograph, sketch, or take very careful note of the SAMI prior to removing it from the mooring cage so you can duplicate it during reassembly. **It is very important** that no parts extend beyond the perimeter of the Mooring Cage (e.g. the box containing the fluid bags should not stick out).

2) Remove any external sensors or cables that may interfere with removal of the SAMI. If there is a short communications cable extending outside of the copper cage, be certain that it is free to exit the mooring cage with the SAMI.

***Note:** The box containing the fluid bags does not require removal and should remain secured to the SAMI without disturbing any of the tubing.

****Note:** It is strongly recommended to have the help of an assistant when removing the brackets holding the SAMI to the mooring cage, as it can be difficult to balance the SAMI and remove them alone. **Do Not** allow the SAMI to fall from the cage as significant damage could result.

3) Loosen the two nuts on each of the two brackets securing the SAMI to the mooring cage, and then position the cage on its side so the brackets (and the SAMI) will be removed in an upward direction.

4) With an assistant holding the SAMI to balance it, remove the nuts (and washers if present) from the retaining brackets.

5) Carefully lift SAMI (bottom end first) from the mooring cage.

Placing the SAMI into the Mooring Cage

1) Lay the mooring cage on its side with the open side of the u-shaped brackets pointing up toward you. The bottom end of the SAMI (the end opposite the copper cage) will be laid in these brackets.

2) Carefully place the SAMI into the mooring cage. Tilt the SAMI slightly so the top copper end enters the cage first and position the lower end of the SAMI where the retaining brackets will secure it to the cage. The box containing the fluid bags is typically positioned above the brackets.

3) Insert the threaded half of the retaining brackets in their slots on the cage.

4) Make sure the copper cage at the top of the SAMI is **not in contact** with the cross bar at the top of the mooring cage.

5) Make sure the SAMI **does not protrude** beyond the perimeter of the Mooring Cage (e.g. the reagent box should not stick out).

6) Tighten the retaining brackets evenly until the SAMI is secure, and can't be rotated or shifted in the Mooring Cage. **DO NOT OVERTIGHTEN!**

7) Locate the two threaded holes in the Mooring Cage (one near the top and one near the bottom) and secure one zinc anode to each hole as needed. **DO NOT OVERTIGHTEN!**

Please contact us at Sunburst Sensors with any questions or concerns. We will be happy to assist you in any way possible.

Moored SAMI - Copper Cage Removal

1) Carefully note the position and alignment of the copper cage on the SAMI for re-installation purposes.

2) Look for and remove any wire/cable ties holding the tubing or cables to the copper cage since it will be lifted up and off of the SAMI top end cap. **BE VERY CAREFUL TO NOT CUT THE TUBING WHILE REMOVING THE CABLE TIES.**

3) Remove any ties from the stainless steel hose clamp at the base of the copper cage, then loosen the clamp enough to slide it down and off of the copper cage.

4) Carefully lift the copper cage from the SAMI being especially cautious of the fluid tubing and the fiber optic segments.

5) Push the communications extension cable end (if equipped) through the copper cage lid.

Re-Installing the Copper Cage

Re-installation of the copper cage is the reverse of the removal procedure, duplicating as closely as possible the way it was originally assembled, and using the following guidelines:

1) Be certain that the notched part of the copper cage allows the tubing to exit the cage without pinching or any other damage to the tubing.

2) After re-installing the extension communications cable (if equipped) to the SAMI, push the cable end through the lid of the copper cage as it is installed.

3) Be certain to seal off any large gaps around cables or tubing with ties so no fish or excess debris can enter the copper cage.

4) Align the bottom edge of the copper cage uniformly around the SAMI and about one inch below the top surface of the top end cap.

5) Secure the clamp tight enough so that you cannot move the cage in any direction. **Be careful not to damage the tubing coming from the fluid bags!**

Moored SAMI Reset Procedure

****Without bottom battery accessibility**

******To determine if your SAMI has bottom battery accessibility, refer to **"Battery Replacement or Reset (Bottom Accessible)**".

- **The fluid bags and tubing are very fragile!** Do not allow the bags to hang from the tubes or allow any other damage to occur.
- **Do not disconnect** the fluid bags from the tubing, as this will allow air to enter the system.
- You will need an assistant for this procedure.

Removing the SAMI from the Mooring Cage

(Also see: "**Mooring Cage Instructions**")

1) Remove any cable ties holding cables or other SAMI components to the mooring cage.

2) The SAMI can be awkward to handle alone as the clamps are removed. Have an assistant hold the SAMI steady while you loosen and then remove the nuts holding the two clamps to the mooring cage (two nuts on each clamp). **DO NOT allow the SAMI to fall from the cage to the work surface!**

3) Lift the bottom end of the SAMI from the cage first, and then lift the top (copper) end. Stand the SAMI where you can work on it, with the copper cage pointed up.

Removing the Copper Cage from the SAMI

(Also see "**Moored SAMI - Copper Cage Removal**")

1) Carefully note the position and alignment of the copper cage on the SAMI for re-installation purposes.

2) Remove any wire/cable ties holding the tubing or cables to the copper cage since it will be lifted up and off of the SAMI top end cap. **BE VERY CAREFUL! DO NOT CUT THE TUBING WHILE REMOVING THE CABLE TIES.**

3) Remove any ties from the stainless steel hose clamp at the base of the copper cage, then loosen the clamp enough to slide it down and off of the cage.

4) Carefully lift the copper cage from the SAMI being especially cautious of the fluid tubing and the fiber optic segments.

5) Push the communications extension cable end (if equipped) through the copper cage lid.

Checking Extension Cable (if equipped) for Communication

Unscrew the locking collar at the base of the extension communications extension cable attached to the SAMI (labeled with blue paint around the base of the bulkhead) and connect the serial communications cable from your computer to the SAMI communication bulkhead connector. Attempt to establish communications.

Removing the SAMI from the Pressure Housing and Resetting

1) Remove the three screws from the perimeter of the SAMI top end cap.

2) Using a non-metallic wedge (metal tools can cause damage to the cap, housing, and o-ring) carefully pry the gaps at the cap-to-housing seam, working around the outer edge of the SAMI until it pops free.

3) With an assistant holding the fluid bags, lift the SAMI from the housing and set it down in a safe place. **DO NOT ALLOW THE BAGS TO HANG FROM THE TUBING.**

4) Note the battery pack in the base, and the red and black wires that pass through the upper battery plate to another short (about 3 inch) harness, and then to a circuit board.

5) Make certain that these harnesses are securely attached to each other, and to the circuit board.

6) If not already done, connect your serial communication cable to the 5-pin bulkhead connector, and attempt to establish communication.

7) **** The battery connectors can be inserted backwards causing serious damage so pay close attention to color-coding of the wires in this step.** Disconnect the battery from the SAMI at the harness connector or at the circuit board for about twenty seconds, and then reconnect it. If you disconnect at the harness connector make sure the circuit board connector doesn't pull away from the board.

8) Again attempt to communicate with SAMI. The previous steps should have reset the SAMI and the message "Do You Want to Set the Time and Date?" should appear in the TFTOOLS terminal window (Note: If this program was just loaded or power was lost, you must set the time and interval).

9) If you still can't communicate with the SAMI, locate the wires directly below the 5-pin communication bulkhead fitting. These wires connect to what looks like a telephone cable and connector, and plug in to another circuit board. Disconnect the BATTERY again, then release the locking tab on the phone adapter and pull the cable from the board.

10) After about 20 seconds reconnect the phone connector, and then the battery. Again try to establish communication in TFTOOLS.

If these steps aren't successful, contact Sunburst Sensors for further directions.

Re-Assembly of the SAMI into the Housing

1) Locate the red dot on the SAMI housing, and the thermistor on the SAMI top end cap (between the communication (blue) and power (green) bulkhead fittings).

2) With an assistant holding the fluid bags, lower the SAMI into the housing making sure that the thermistor is aligned with the red dot. **Watch closely for any components protruding from the SAMI and interfering with smooth assembly.**

3) Use the three end cap screws as alignment guides only, and push SAMI into the housing by hand pressure alone. Excessive force indicates a problem.

4) Tighten the screws firmly, but be careful not to over tighten.

Re-Installing the Copper Cage and Fluid Bags

Re-installation of the copper cage and fluid bags is the reverse of the removal procedure, duplicating as closely as possible the way it was originally assembled, and using the following guidelines:

1) Be certain that the notched part of the copper cage allows the tubing to exit the cage without pinching or any other damage to the tubing.

2) After re-installing the extension communications cable (if equipped) to the SAMI push the cable end through the lid of the copper cage as it is installed.

3) Be certain to seal off any large gaps around cables or tubing with ties so no fish or excess debris can enter the cage.

4) Align the bottom edge of the copper cage uniformly around the SAMI and about one inch below the top surface of the top end cap.

5) Secure the clamp tight enough so that you cannot move the cage in any direction. **Be careful not to damage the tubing coming from the fluid bags!**

6) With the fluid bags in the box and the tubing passing through the notches, replace the lid and secure it with the screws.

7) Snugly secure (not too tight) fluid tubing with cable ties to avoid damage from snagging, etc.

Placing the SAMI into the Mooring Cage

1) Be extremely careful of the tubing that connects the fluid bags to the top of the SAMI. Do not allow tubing to be kinked, pinched, cut, or damaged in any way.

2) Carefully place the SAMI into the Mooring Cage so that the lower end of the SAMI is where the retaining brackets will secure it to the cage, and the box containing the fluid bags is above the brackets.

3) Do not allow any part of the SAMI or fluid bag box to protrude beyond the perimeter of the Mooring Cage.

4) Do not allow the copper cage at the top of the SAMI to contact the cross bar of the mooring cage.

5) Tighten the retaining brackets evenly until the SAMI is secure, and can't be rotated or shifted in the Mooring Cage. DO NOT OVERTIGHTEN!

Please contact us at Sunburst Sensors with any questions or concerns. We will be happy to assist you in any way possible.

Underway SAMI Instructions

****** It is **VERY STRONGLY RECOMMENDED** that you do not attempt to remove the flow-thru chamber without first contacting Sunburst Sensors. We also encourage you to contact us with any other concerns regarding the operation of the SAMI. Contact information is located at the beginning of this document, and we will be happy to assist you in any way possible.

Procedure for setup and communication with the Underway SAMI:

1) The SAMI is set to run at 15-minute intervals. If you have a computer to continuously collect serial data from SAMI, use the procedure described below. If not, SAMI will still log data internally, but you should use "**Data Download Instructions for Windows**" for downloading the data.

2) Remove the white locking sleeve and rubber dummy plug protector from the 5-pin bulkhead connector (marked with blue paint) on top of the Flow-Thru chamber. Attach the serial communications cable (originally provided) to the bulkhead. The bulkhead in the center of the lid (if present) is not functional.

3) Attach the alternate end of the cable to the 9-pin D serial COM port on a PC.

4) Create a folder on your desktop and name it SAMI-CO2. Insert the included CD into your PC, then copy and paste all its contents into the folder you created. The folder should now contain the following files:
    - Deployment Template (SAMI-XX). XLS
    - TFTools Folder:
        1) Setup TFTools-122 (for WINDOWS)
        2) SAMIMONx.TFB
        3) SAMI Decoder.EXE or REV50.EXE
        4) Monitorx.EXE
    - Underway SAMI Instructions
    - TFX-11 Instructions

5) Run the file named Monitor.EXE and follow the on-screen instructions. *You must use ONLY COM1 or COM2. Adjust this as needed in your

computer's Control Panel, Device Manager, Ports (COM & LPT), and Port Settings under "Advanced".

6) When prompted by the on-screen text, briefly wave the red horseshoe magnet (included in the shipping crate) across the red mark on the SAMI housing (located approximately 20 inches below the "**OUT**" fitting on the white housing). The display on the PC monitor will change to the continuous monitoring screen, and the following message will be displayed: "SAMI-CO2 measurement cycle, please wait…" ♦. An output data string should appear on the PC monitor in about 75 seconds, followed by repeated data strings every 15 minutes. As indicated at the top of the display, pressing "Esc" on your keyboard will begin an exit sequence to the program, but the SAMI will continue to run and log data internally.

♦**Approximately every three days the following message will appear:**
"Blank measurement cycle, please wait approx. 1.5 hrs…"
This is a normal and necessary function of this instrument.

Note: If you have difficulties establishing communications refer to **"Establishing Communication with the SAMI".**

Procedure for connecting the Underway SAMI to the ship's seawater line:

1) Attach a suitable length of ½" I.D. Tygon tubing from the seawater input to the **lower** barbed fitting on the white housing marked "**IN**". We recommend that an on/off valve be placed at the housing inlet.

2) Connect another length of the same type tubing to the top barbed outlet fitting (labeled "**OUT**") and run this to a drain. **IMPORTANT NOTE:** Never place an ON/OFF valve or flow constriction on the output.

3) Set the seawater flow so that it is between 3–5 Liters per minute. **Higher flow rates must be avoided** because they will pressurize the flow-thru housing and cause erratic functioning of the SAMI.

4) The SAMI will continuously sample and record data without further assistance for the duration of the supplied fluids (enclosed in the underway chamber housing) and internal battery life (approximately 3 months after shipping date when using a 15 minute sampling interval). To download data directly from the SAMI, refer to the "**Data Download Instructions for Windows**".

Underway SAMI Fluid Bag Replacement

Important Notes:

- The large fluid bag (5 x 7 inches) is the **"Reagent"** (Indicator) bag. The smaller (3 x 7 inch) fluid bag is the **"Blank"** bag.

- ******Replacing the reagent bag can result in slightly less accurate data because it may differ from the reagent used during the SAMI calibration.

- **DO NOT disconnect any fittings from the new fluid bag until instructed below as this could allow unwanted air to enter.**

- For SAMI component identification refer to the photograph "**SAMI (PVC)**".

Instructions:

1) Determine if the SAMI is still running by briefly touching a magnet to the red dot on the SAMI housing. If it is still running you should hear a faint click from the pump after approximately 40 seconds. (The pump is located within the cylindrical housing mounted on top of the SAMI). If there is still fluid remaining in the supply bags, you should also see small droplets appear at the end of the blue tubing located within the chamber on top of the SAMI.

NOTE: If the SAMI is not running there are other problems. Contact Sunburst Sensors immediately for further assistance.

2) **Do Not Disconnect the tubing yet**. Carefully cut and remove the plastic cable ties from the netting enclosure around the fluid bag to be replaced, as well as those used to secure the associated tubing connecting the bag to the SAMI. **Be very careful of the tubing!**

CAUTION: The tubing, bags, and fittings are very fragile! Do not allow the bag to drop or suspend from the tubing, or allow the tubing to become pinched or kinked.

3) Remove the fluid bag to be replaced from its pouch and ensure that the related tubing is free to the point where it connects to the white plastic union fitting.

4) Unscrew (counterclockwise) the gray bag-to-union fitting, and set the original bag aside.

5) While holding the new bag in one hand, gently squeeze it and remove the white plastic union fitting and plug at the end of the tubing attached to the bag. Keep slight constant pressure on the new bag so fluid drips from the remaining tubing end fitting and air is not allowed to enter.

6) Hold the gray fitting of the new bag to the white union and allow the dripping fluid to fill the union before screwing it (clockwise) into the white union. This reduces the amount of air induced into the system.

7) Place the new bag into the netted pouch, and secure the bag and tubing with new cable ties so that there are no kinks, pinching, or possible damage to any of the related components.

8) Reinstall the chamber lid. **CAUTION: Be careful to place the lid on the chamber in such a way that the lid cable does not touch the fiber optic segments, or interfere with any tubing components.**

9) Establish communications with the SAMI using TFTools v1.22. DO NOT open MONxx.EXE yet.

10) Trigger the SAMI with the magnet, and when "RUNNING" appears on the screen press <Ctrl-C> on your keyboard to stop the SAMI. A # symbol should appear.

11) From the menu bar at the top of the screen select "Tattletale", then "Erase datafile". Two more # symbols should appear.

12) Select "File", then "Open" and locate the file (on the software CD that was included with the SAMI) named "MONVxx.TFB" and open it.

13) Select "Tattletale" then click "Run". You will see a progress bar while the program is loading to RAM.

14) You will then see several prompts: "Do you want to set the time and date?" It is recommended that you press 1 and set the time and date.

Note: The time is typically set to UTC (GMT).

15) "Do you want to change the measurement interval?" Press 1 for YES and then 15 for the interval.

16) "Would you like to run a blank?" Press 1 for yes.

17) "When would you like to run a blank?" Press 4 for NOW. You should see the word "BLANK" appear on the screen.

18) The blank will run for about one to two hours. You can exit TFTools and open the MON43.EXE now if you want to, but triggering it won't result in a

response until the blank has finished running. You will however, see data begin to appear automatically once it begins normal measurement intervals. Whether you monitor it or not, the data will be stored in the SAMI data logger memory.

Underway SAMI Voltage Testing

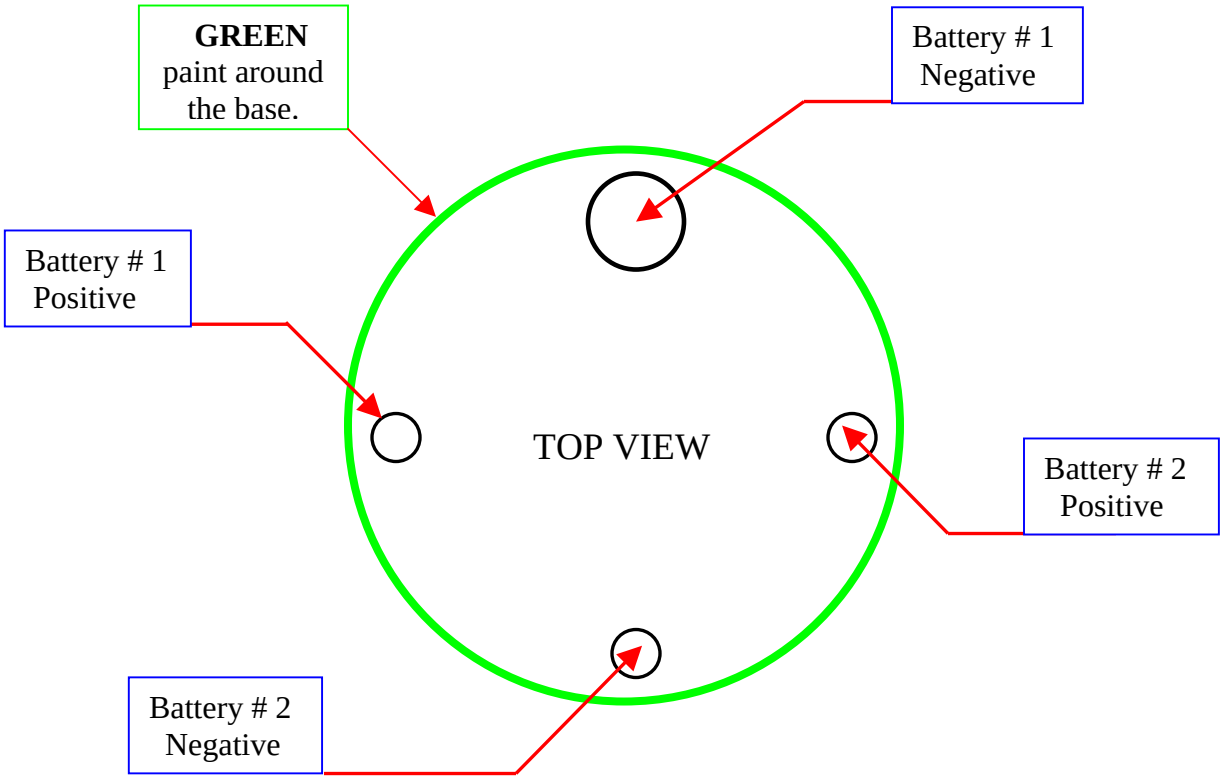


Figure 1 – Power Bulkhead

NOTE:
Not all flow-thru chamber lids are equipped with a Power Bulkhead fitting. This bulkhead (if equipped) can be easily identified by GREEN paint at its base, FOUR pins, and a second cable extending from the flow-thru chamber lid to the top of the SAMI instrument. If a voltage problem is suspected these tests must be conducted at one or both of the power bulkhead fittings to eliminate the possibility of a defective cable.

** CAUTION: The tubing and fluid bags are very fragile. Do not let the bags hang from the tubes or let them fall and pull the tubing even partly out of the bags. These bags are easily punctured, creased, or otherwise damaged.

** ALSO VERY FRAGILE are the optical fibers. These are the black "tubes" that arc upward from the SAMI to the black plastic flow cell. Refer to the photograph "**SAMI Top End Cap**" for the location of the **Optical Fiber Fittings**.

1) IF EQUIPPED: Test the battery voltages at the Power Bulkhead on the flow-thru lid using *Figure 1* above as a guide. The bulkhead is covered with a rubber plug, which is secured with a threaded locking sleeve that must first be removed for access to the pins.

2) Remove the six retaining screws holding the flow-thru chamber lid to the housing.

3) Using non-metallic wedges (avoiding damage to the o-ring seal on the lid) carefully pry the lid from the housing.

*Steps 4 through 8 below are to be used as guidelines as needed to aid in gaining access to the bulkhead connectors on the SAMI sensor. If the flow-thru housing must be removed please refer to "**Flow-Thru SAMI - Chamber Removal**".

4) DO NOT disconnect or cut the tubes from the bags or from the SAMI! Remove the cable ties from the tubing that connect the fluid bags to the SAMI being VERY CAREFUL of the tubes themselves. Also remove the ties holding the fluid bag(s) in their pouches.

** Have an assistant available to manage the fluid bags during the next steps. It may be helpful to lay the SAMI on its side so the bags can be laid on the deck or bench.

5) Remove the fluid bag(s) observing the CAUTIONS near the top of this page.

6) Identify the Power Bulkhead on the top of the SAMI sensor. It is marked with **GREEN** paint at its base and is covered with a black rubber plug (or lid cable) and secured with a threaded locking sleeve. Refer to "**SAMI Top End Cap**" photograph for locations.

7) Carefully reach into the housing and unscrew (counterclockwise rotation) the locking sleeve(s) holding the cable(s) to the SAMI bulkhead(s) and then pull the cable(s) from the SAMI bulkhead fittings being careful not to twist or damage any of the surrounding components. This may require significant force. Lay the lid aside in a safe place with the bulkhead PINS DOWN, and the CABLE UP to avoid damage to the cables.

8) Using the ***Figure 1 – Power Bulkhead*** as a guide, measure battery voltages at the 4 pin power bulkhead connector:

DO NOT allow the meter probes to short any two pins together. There are two pins for power, and two for ground (two internal batteries). The largest pin is ground (negative), as is the one directly opposite of it. The other two pins are power and should measure roughly 9 to 14 volts dc (nominal). The grounds are shared, so there's no need to check from each ground pin. The voltage can be tested with a standard dc voltmeter.

If measured voltages are very low, the battery will require replacement. If no voltage at all is measured on one or both batteries, there may be broken or disconnected wires inside the sensor. In either case please contact Sunburst Sensors, LLC before proceeding.

Flow-Thru SAMI - Chamber Removal

**** CAUTION:** The tubing and fluid bags are very fragile. Do not let the bags hang from the tubes or let them fall and pull the tubing even partly out of the bags. These bags are easily punctured, creased or otherwise damaged.

** The fiber optic segments are ALSO VERY FRAGILE. These are the black "tubes" that arc upward from the SAMI to the black plastic flow cell with the copper mesh below it. Refer to the photograph "**SAMI Top End Cap**" for the location of the Optical Fiber Fittings.

Removal of the Flow-Thru Chamber

1) Remove the six retaining screws holding the flow-thru lid to the chamber.

2) Using non-metallic wedges to avoid damage to the o-ring seal on the lid, carefully pry the lid from the chamber.

3) DO NOT disconnect or cut the tubes from the bags or from the SAMI! Remove all cable ties from the tubing that connects the fluid bags to the SAMI being **VERY CAREFUL** of the tubes themselves. Also remove the ties holding the fluid bags in their pouches.

** Note the location of, or make new alignment marks on the flow-thru chamber, the SAMI and/or lower chamber clamp with a permanent marker, scratch awl, or similar device. These marks will be used when reinstalling the Flow-Thru chamber.
** Have an assistant available to manage the fluid bags during the next steps. It may be helpful to lay the SAMI on its side so the bags can be laid on the deck or work surface.

4) Noting the cautions at the top of this section, remove fluid bags from their pouches without disconnecting any tubing.

5) Carefully reach into the housing and unscrew (counterclockwise rotation) the locking collars holding the cable(s) to the SAMI bulkhead(s) and then pull the cable(s) from the SAMI bulkhead fittings being careful not to twist or damage any of the surrounding components. This may require significant force. Lay the lid aside in a safe place with the bulkhead PINS DOWN, and the CABLE UP to avoid damage to the cables.

*If there have been communication problems perform step 6 now.
*If battery voltage problems are suspected perform step 7 now.
Otherwise proceed to step 8.

6) To test if the lid cable has failed, connect your serial communication cable to the 5-pin bulkhead connector making sure that the large hole in the cable end aligns with the large pin on the bulkhead fitting, and attempt to establish communication with the SAMI in TFTOOLS.

7) Using the figure "**Underway SAMI Voltage Testing**", measure the battery voltages at the 4 pin bulkhead connector with **GREEN** paint at its base:

DO NOT allow your meter probes to short any two pins together. There are two pins for power, and two for ground. The largest pin is ground, as is the one directly opposite of it. The other two pins are power and should measure roughly 10 to 14 volts dc (nominal). The grounds are shared, so there's no need to check from each ground pin. The voltage can be tested with a standard dc voltmeter.

* If very low power is measured, the battery must be replaced. Contact Sunburst Sensors, LLC before proceeding.

8) Remove the four Allen head bolts holding the upper chamber to the chamber locking collar. If necessary slightly loosen, but DO NOT REMOVE the two large bolts to the lower chamber locking collar!

9) Carefully lift the housing from the SAMI passing the fluid bags and tubing through as it is lifted clear of the SAMI. The housing is sealed to the SAMI with O-ring(s) and may require light tapping with your hand or a rubber mallet, but it must be raised evenly.

10) If the bags must be laid down, use a safe and stable surface for them, as the tubing isn't long enough to reach the deck or work surface from the top of the SAMI.

Installation of the Flow-Thru Chamber

Installation is the reverse procedure with the following notes:

1) Make certain that the o-ring(s) are in place and align the chamber in its original position using the alignment marks noted in the NOTE of section 3 prior to removal. If the Teflon pipe thread tape was present but, was damaged or removed it must be replaced prior to installing the chamber. Use several layers to ensure a proper seal.

2) The chamber o-ring must be clean and well lubricated. It should be pushed by hand onto the SAMI. If excessive force is required, the o-ring has likely shifted out of place. Use the bolts as guide pins, but **NOT** to pull the chamber onto the SAMI.

***NOTE 1:** If the locking collar was loosened to accommodate removal of the SAMI from the pressure housing, install two of the Allen head bolts into one half of the locking collar first. Then adjust the tightness of the two larger hex head bolts evenly until the remaining two flow-thru housing bolt holes line up with the corresponding holes in the other half of the locking collar. Tighten the 4 Allen head bolts snugly.

****NOTE 2:** If the flow-thru chamber is equipped with locating tabs inside the chamber on the top lip of the o-ring gland, the chamber should be pushed onto the SAMI until the tabs are resting flush against the SAMI top end cap. Be sure that they don't contact any other components or rest on top of a screw head. If your flow-thru chamber does not have these tabs push the housing evenly down onto the SAMI until the top lip of the o-ring gland is flush with the surface of the SAMI top end cap.

3) The large hole in the lid cable ends must align with the large pins on the 5-pin and 4-pin bulkheads. Carefully push the female cable ends from the flow-thru lid on to their corresponding bulkheads. Squeeze them firmly to force any trapped air out of them. Tighten the locking sleeves (clockwise) snugly.

4) Secure the bags in their pouches using cable ties or similar means so they don't come free during deployment or return shipping. Also secure the tubing in such a way to prevent unnecessary strain and to ensure that the lid cables won't interfere with them as the lid is reinstalled (Do not pinch the tubing).

5) Be extremely careful when reinstalling the chamber lid making certain that the cables don't interfere with the fiber optic segments or with the fluid tubing. Be sure that the lid o-ring is in place, clean, and lightly lubricated.

6) Align the chamber lid to the mounting holes and press it into place. Install the six screws and tighten them snugly.

SAMI Housing Removal (Underway SAMI)

Refer to "Flow-thru SAMI - Chamber Removal**" and remove the flow-thru chamber prior to continuing.

Removal of SAMI from Pressure Housing

1) Remove the three screws from the perimeter of the SAMI top end cap.

2) Using a plastic or wooden wedge (metal tools can cause damage to the cap, housing and o-ring) carefully pry the gaps at the cap-to-housing seam, working around the outer edge of the SAMI, until it pops free.

NOTE: If excessive force is required, note or place locating marks on both the flow-thru chamber locking collar and the SAMI housing for proper positioning during reassembly. Loosen the two large bolts on the locking collar to remove the locking collar.

3) With an assistant holding the fluid bags, lift the SAMI from the housing, and set it down in a safe place.

Re-assembly of SAMI into the Pressure Housing

1) Inspect the o-ring in the groove of the SAMI top end cap for damage and proper positioning. Ensure that it is clean and lightly lubricated.

2) Locate the large red dot on the SAMI housing, and the thermistor on the SAMI top end cap (between the communication and power bulkhead fittings).

3) With an assistant holding the fluid bags, lower the SAMI into the housing making sure that the thermistor is aligned with the red dot. **CAUTION:** Watch closely for any components protruding from the SAMI such as wiring harnesses or optical fibers. Protruding components may get damaged and interfere with smooth assembly.

4) Use the three end cap screws as alignment guides only, and push SAMI into the housing by hand pressure alone. Excessive force indicates a problem such as protruding components.

5) Tighten the screws firmly, but be careful not to over-tighten them.

6) Align locating marks if locking collar was removed. Tighten bolts only enough to hold the collar in place while reinstalling the flow-thru chamber. **DO NOT OVERTIGHTEN!**

Return to "Flow-Thru SAMI - Chamber Removal**" to reinstall the flow-thru chamber, fluid bags, and lid.

Underway SAMI Battery Reset Procedure

Note: This is for SAMIs without bottom battery accessibility. To determine if your SAMI has bottom battery accessibility, refer to "**Battery Replacement or Reset (Bottom Accessible)**".

Removing the SAMI from Pressure Housing

*Refer to "**Flow-Thru SAMI - Chamber Removal**"" and remove the flow-thru chamber prior to continuing.

1) Remove the three screws from the perimeter of the SAMI top end cap.

2) Using a plastic or wooden wedge, carefully pry the gaps at the cap-to-housing seam working around the outer edge of the SAMI until it pops free (***Caution**:* Metal tools can cause damage to the cap, housing, and o-ring).

NOTE: If excessive force is required, note or place locating marks on both the flow-thru chamber locking collar and the SAMI housing, and then loosen the two large bolts on the locking collar.

3) With an assistant holding the fluid bags, lift the SAMI from the housing and set it in a safe place.

4) Note the battery pack in the base, and the red and black wires that pass through the upper battery plate to another short (about 3 inch) harness, and then to a circuit board.

5) Make certain that these harnesses are securely attached to each other, and to the circuit board.

***If you measured no power at the bulkhead connector this is the most likely place for a problem, but look for any other obvious problems as well.

6) If not already connected, connect the serial communication cable to the 5-pin bulkhead fitting and attempt to establish communication.

7) Disconnect the battery from the SAMI at the harness connector or at the circuit board for about twenty seconds, and then reconnect it. ****These**

connectors can be inserted backwards causing damage. Pay attention to color-coding of the wires in this step. Also, if you disconnect at the harness connector make sure the circuit board connector doesn't pull away from the circuit board.

8) Again attempt to communicate with SAMI. If battery voltages are within range, this should reset SAMI. The message, “Do you want to set the time and date?” should appear in the TFTOOLS terminal window.

9) If you still can't communicate, locate the wires directly below the 5-pin communication bulkhead fitting. These wires connect to what looks like a telephone cable and connector, and plug into a circuit board. Disconnect the BATTERY again, then release the locking tab on the phone adapter and pull the cable from the board.

10) After about 20 seconds reconnect the phone connector, and then the battery. Again try to establish communication in TFTOOLS.

If these steps aren't successful, contact Sunburst Sensors for further direction.

Reassembly of SAMI

1) Inspect the o-ring in the groove of the SAMI top end cap for damage and proper positioning. Ensure that it is clean and lightly lubricated.

2) Locate the large red dot on the SAMI housing, and the thermistor on the SAMI top end cap (between the communication and power bulkhead fittings).

3) With an assistant holding the fluid bags, lower the SAMI into the housing making sure that the thermistor is aligned with the red dot on the outside of the housing. **CAUTION:** Watch closely for any components protruding from the SAMI such as wiring harnesses or optical fibers. Protruding components may get damaged and interfere with smooth assembly.

4) Use the three end cap screws as alignment guides only, and push SAMI into the housing by hand pressure alone. Excessive force indicates a problem such as protruding components.

5) Tighten the screws firmly, but be careful not to over tighten them.

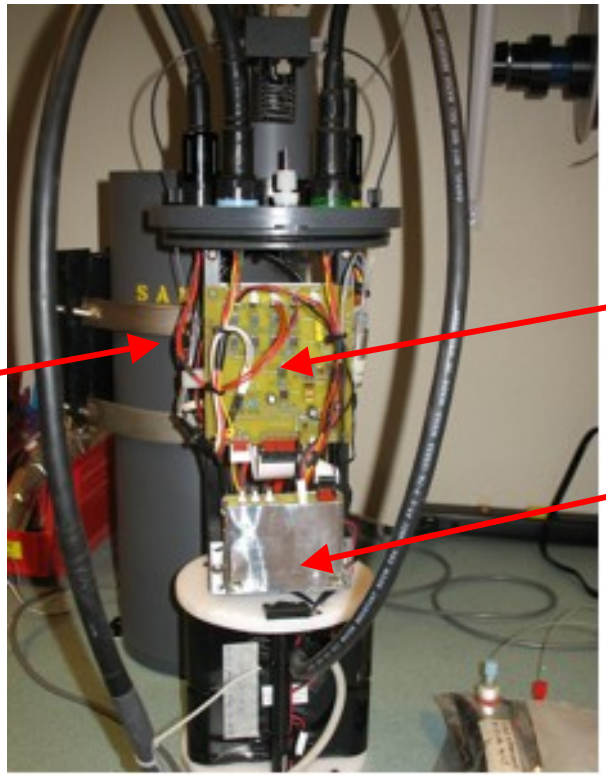
6) If locking collar was removed, align locating marks from step 2 in section 1. Tighten bolts only enough to hold the collar in place while reinstalling the flow-thru chamber. **DO NOT OVERTIGHTEN!**

Return to “Flow-Thru SAMI - Chamber Removal**”” to reinstall the flow-thru housing.

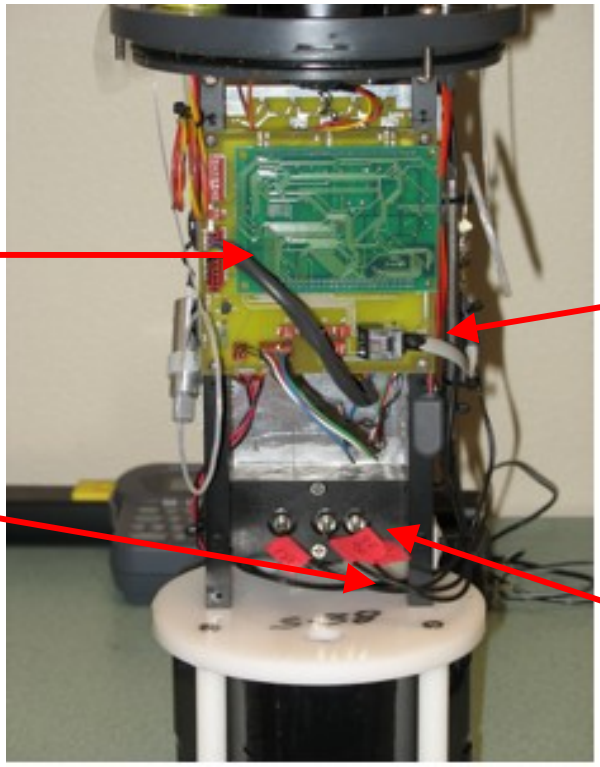
SAMI in PVC Housing

SAMI Outside of Housing

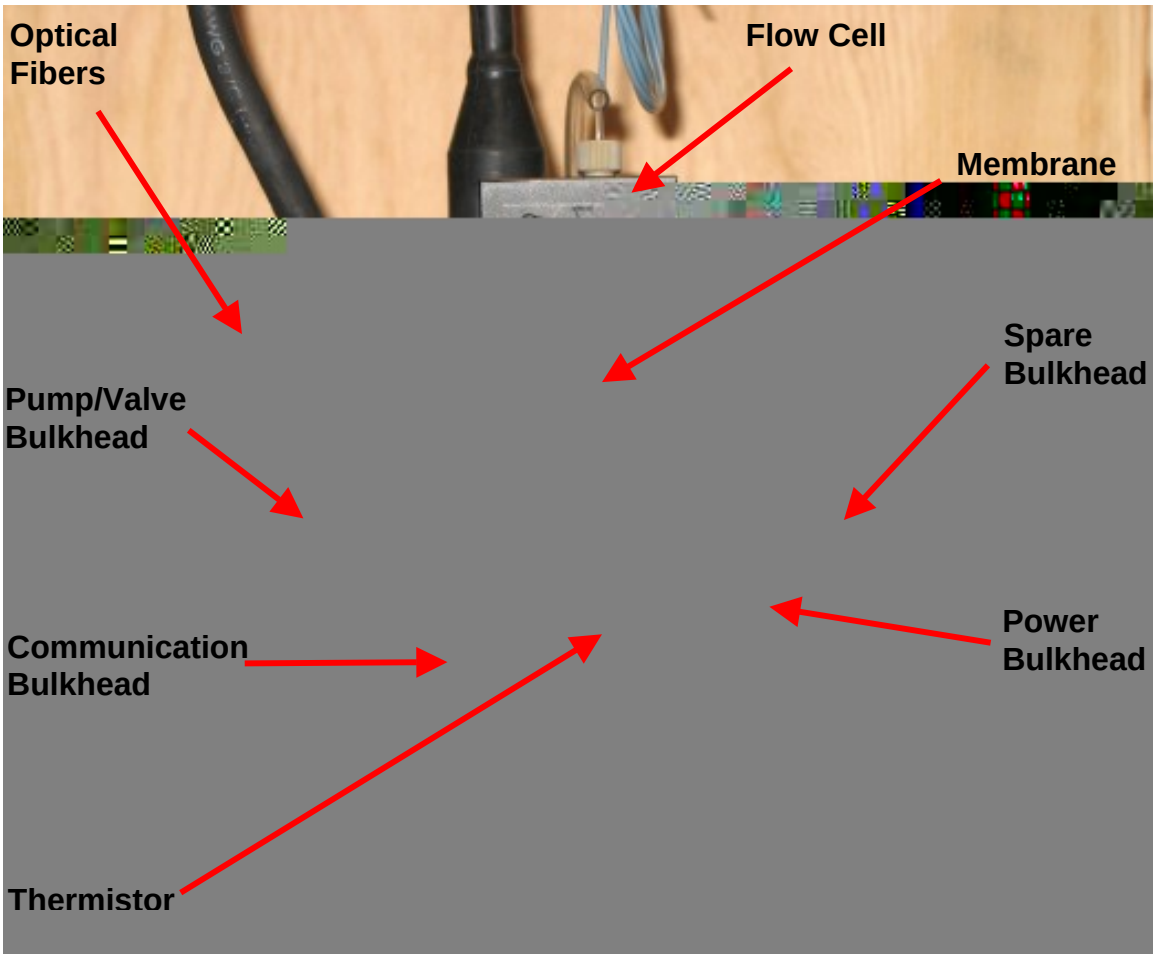
FRONT



BACK



SAMI Top End Cap



Components present on top of SAMI in PVC housing