SYSTEM OVERVIEW

MFC 1: 10 SLM, [   ] OFF   ON
Flow: [   ] L/min

MFC 2: 10 SLM, [   ] OFF   ON
Flow: [   ] L/min

MFC 3: 30 SCCM, [   ] OFF   ON
Flow: [   ] L/min

MFC 4: 30   SCCM, [   ] OFF   ON
Flow: [   ] L/min

[Gas Configuration]   [Flow Configuration]

[Calibration Tools]

[   ] MFC gas

[   ] MFC flow

OFF   ON

The system overview form is the start up screen for the system. This screen displays the current flow through all mass flow controllers, the fluid flowing through the mfcs, and the type of mfc. The four OFF-ON switches set the flow through each mfc to either zero, or the last input flow (which could be zero). MFC 4 can be a 30 SCCM or 1000 SCCM mfc, which is why the text dictating the type of mfc for MFC 4 is somewhat different than the rest.

The three lower buttons are used to move to gas configuration menu (Form 1), flow configuration menu (Form 2), and calibration tools (Form 4).

GAS CONFIGURATION

MFCs

MFC 1	10 SLM, Dry Air
MFC 2	10 SLM, Humid Air
MFC 3	30 SCCM, Gas
MFC 4	30 SCCM, Gas

Gas

Air(Dry)	Air(Humid)
O2	O3
N2	NO2
CO	CO2
R2	D2

Tank Concentration

PPM

+1000 +100 +10 +1 -1 -10 -100 Reset

Flow Concentration

PPB

+100000 +10000 +1000 +100 +10 -10 -100 -1000 -10000 Reset

Concentration

Relative Humidity

%

+10 +1 +0.1 -0.1 -1 -10 Reset

Confirm new settings

Back to main

Form 1, the gas configuration menu, setups the inputs into all the mfcs. This menu's information is the basis for most of the system, so it is vital that all pieces are input correctly. A single mfc can be selected at a time, with MFC 1 being locked to dry air and MFC 2 being locked to humid air. MFC 3 and MFC 4 can be changed to whatever gas they are connected to. This setup ensures that users do not try to manipulate the use of MFC 1 or MFC 2, which are used to balance flows after MFC 3 and MFC 4 flows have been considered.

Confirming settings here will not cause any flow to begin, only re balance an already flowing system. Changes in the amount of flow must be done on Form 2, the flow configuration menu.

The bottom right hand corner button sends user back to Form 0. Does not confirm changes.

FLOW CONFIGURATION

System Tempertaure
88 C

+10 +1 -1 -10 Reset

Desired Full System Flow
88.88 L/min

+1 +0.1 +0.01 -0.01 -0.1 -1 Reset

Individual MFC configuration

System Pressure
88.88 atm

+1 +0.1 +0.01 -0.01 -0.1 -1 Reset

System Humidity
88 %

+10 +1 +0.1 -0.1 -1 -10 Reset

Back to main

Confirm all changes

Form 2, the system configuration menu, is used to edit the general properties of the system. Temperature and pressure will effect the conversion factors from standard flow to operational flow, as well what temperature the second Arduino will regulate the system to. The full system flow is the combined flow of all four mfcs. System humidity dictates what percentage of the flow should come from MFC 2, which is the humid air flow. Confirming chanes here will result in a change to the system flow, as well as how each mfc calculates how much fluid is flowing through it.

It should be noted that a system flow which causes any mfc to flow less than 1% of its maximum operational flow (without being set to zero), can lead to poorly tuned flows, since the mfcs can not actuate their valves precisely at that level.

The Individual MFC configuration button sends the user to Form 3.

MFC CONFIGURATION

MFCs

MFC 1 — 10 SLM, Dry Air
MFC 2 — 10 SLM, Humid Air
MFC 3 — 30 SCCM, Gas
MFC 4 — 30 SCCM, Gas

MFC 4 Type

30 SCCM | 1000 SCCM

Technical Information

Signal In — 0-65535
Signal Out — 0-65535
Standard Flow — L/min

Collect Tech Info

MFC Flow

00.00 L/min

Signal Offset

000000 0-65535

+100 | +10 | +1 | -1 | -10 | -100 | Reset

Signal Gain

0000 per Volt

+100 | +10 | +1 | -1 | -10 | -100 | Reset

Confirm new settings

Back to main

Form 3, the mfc configuration menu, allows users to edit individual mfc settings. Technical Information for an mfc can be found here as well, though is unreliable as of now. Standard flow is the individual mfc's flow if it was at 1 atm and 25 C with the same signal strength. MFC 4's type can be changed from this menu too (30 SCCM to 1000 SCCM or vice versa). Confirming changes on this menu will change the signal strength sent to the affected mfc.

Concentration MFC 3

- OFF
- Low [____] PPB
- Medium [____] PPB
- High [____] PPB
- Increment through all
- Custom Incrementation

Relative Humidity

- 15 % | Off
- 40 %
- 65 %
- Increment through all

Concentration MFC 4

- OFF
- Low [____] PPB
- Medium [____] PPB
- High [____] PPB
- Increment through all
- Custom Incrementation

Temperature

- 5 C
- 20 C
- 35 C
- Increment through all

In Progress Stats

- MFC 3 [____] PPB
- MFC 4 [____] PPB
- RHum [____] %
- Temp [____] C

Increment Time

- 5 minutes at each increment
- 15 minutes at each increment
- 40 minutes at each increment

Purge Between Increments

- OFF
- ON, 1 minute
- ON, 5 minute

Time Elapsed

[____]

Confirm and Begin

Back to main

Stop

PAMM ID's

[green box] Concentration of fluid at each specified level.

[blue box] Information for the ongoing step of the calibration.

[yellow box] Time since calibration began.

Form 4, the calibration setup menu, is rather robust. A set of predetermined concentrations for MFC 3 and MFC 4 can be selected, or users can go to Form 5, the custom increment menu, to setup their own. Relativity humid as well as temperature refer to the system's properties, not any individual mfc. The length of each step of the calibration is selected under Increment Time.

Purge sets all flows besides dry air to zero. Thus "flushing" all mixtures besides air out of the system. This is good to use in order to see a stark contrast between each step, but causes steps to take longer to reach their stable value.

Confirm and Begin starts the calibration. To ensure no calibration stacking, the only responsive button when a call is in progress is the Stop button. PAMM ID's sends you to Form 6, PAMM ID input.

MFC 3

Initial Concentration

`PPB`

| +100000 | +10000 | +1000 | +100 | +10 | -10 | -100 | -1000 | -10000 | Reset |

Final Concentration

`PPB`

| +100000 | +10000 | +1000 | +100 | +10 | -10 | -100 | -1000 | -10000 | Reset |

Increment

`PPB`

| +100000 | +10000 | +1000 | +100 | +10 | -10 | -100 | -1000 | -10000 | Reset | Mirror Incrementation |

Confirm Custom Increments   Return to Calibration Setup

MFC custom increment is being made for.

Concentration for desired property.

Form 5, the custom incrementation menu, allows users to select what concentrations the calibration will step through for a given mfc. The Increment field should be perfectly divisible by Final Concentration minus Initial Concentration, otherwise the final concentration will be over shot on the last step; therefore it will be skipped. Mirror Incrementation can be selected to have the calibration step up through these custom increments, then back down; instead of ending when the final concentration is reached and its increment time finished. Return to Calibration Setup does not save any changes made, sends user back to Form 4. Confirm Custom Increments saves changes, and sends user back to Form 4.

The final concentration must be higher than the initial concentration before the initial can be increased.

Number of PAMM IDs

PAMM IDs in comma seperated string

Delete last ID

List of all PAMM ID's input.

7	8	9
4	5	6
1	2	3
Confirm	0	<-

Back to Calibration Setup

Form 6, the PAMM ID input screen, allows users to input which PAMMs will be used for the upcoming calibration. The PAMM ID's will show up as a comma separated list. The total number of input ID's is shown in the upper left hand side. Deleting a PAMM ID is done by pressing Delete last ID button. A PAMM ID can not be deleted from the middle of the list.

This is the only menu where the bottom right hand side circular button does not send you back to Form 0. Instead it sends you back to Form 4. All changes must be confirmed before pressing this button, if the user desires them to take effect.