



# AFS Operator's Manual Erdman Integrated

*Every AFS machine is fully tested, lines balanced and gas sensors calibrated before it leaves the factory. Please follow instructions in the following pages to ensure setpoints are correct for your facility.*

**Note:** This manual contains photographs and screen shots of an AFS-i2. This manual and all operator functions are applicable to: AFS-i1 and AFS-i2. All efforts have been made to cover all settings and any changes to recommended settings should be fully understood by the operating facility.

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## General Information

The AFS-Integrated systems(i1 or i2) are designed to replace the resident air in an insulating glass unit (IGU) with argon gas on an automated IG line. The argon gas acts as an insulating agent along with resisting fogging. The process used to complete this function utilizes flow in/out balancing which allows the process to be both fast and safe by reducing the breakage due to over pressurization of the IGU or over-vacuum created by other non-balanced flow systems. The AFS system does not use a vacuum pump to create the flow out of the IGU, so the loud noise, maintenance and mess of a vacuum pump is not an issue.

## Components

The AFS-integrated systems consist of the following major components:

- Enclosure (NEMA-12)
- Programmable Logic Controller (PLC with 5.7 color screen)
- Programmable logic controller input/output modules
- Emergency stop pushbutton (E-STOP)
- Alarm horn
- Male argon feed port (two on i2)
- Male plant air port (two on i2)
- Argon feed ports
- Vacuum return ports
- 24 VDC power supply
- Argon pressure transducer(s)
- Plant air pressure transducer(s)
- Gas level sensor/transmitters (One for each line, located in the vacuum return line)
- Argon flow meters (each line independent)
- Vacuum line flow meters (each line independent)
- Vacuum generators (each line independent)
- Argon pressure regulator(s)
- Plant air pressure regulator(s)
- Misc. terminals, wire connectors and fittings
- Optional panel mounted start button(s)

## SET UP

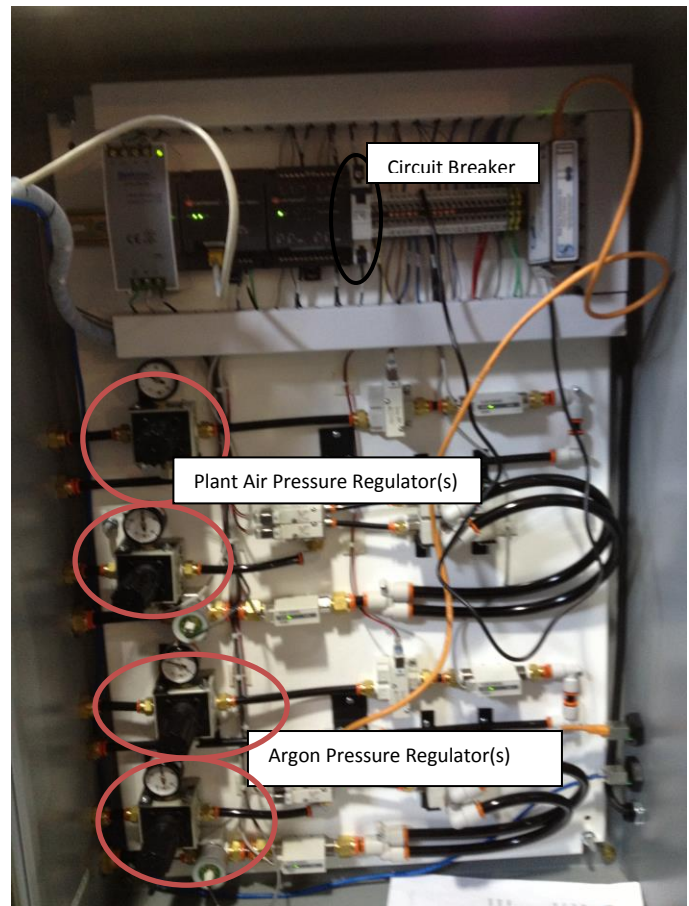
The AFS-i1 (2) panel must be securely mounted, power must be connected to the internally mounted terminals labeled L, N, G, plant air-line must be connected to each male 'AIR' port, argon line must be connected to each male 'ARGON' port and then the internal power "Circuit Breaker" must be turned to the on position.

Plant Air pressure ~ 100 PSI (recommend ½" feed line from main header)

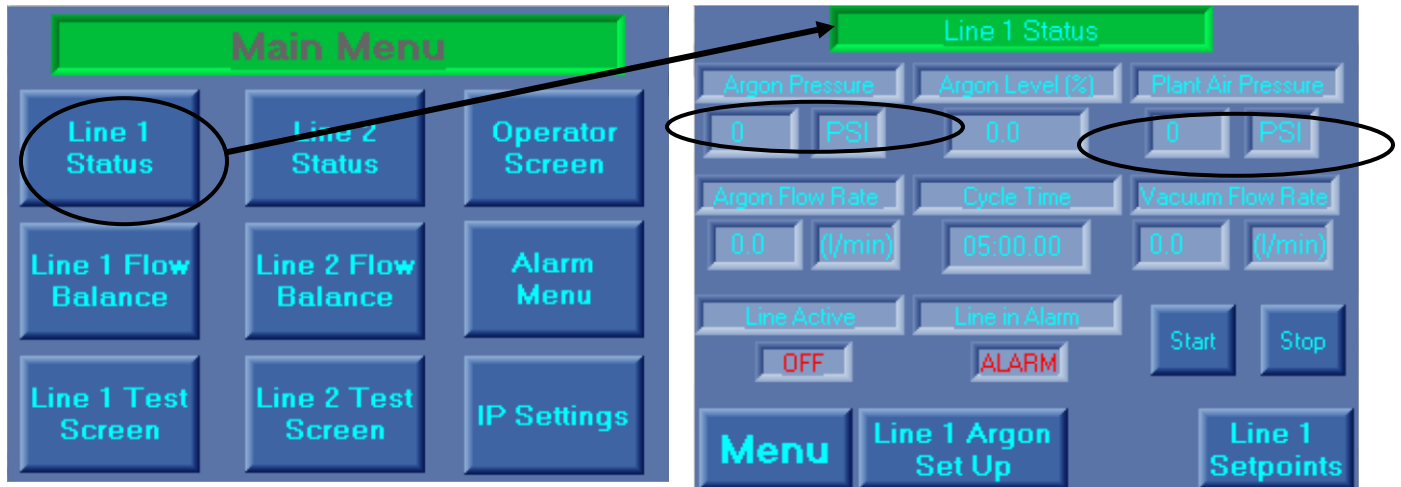
Argon Pressure at tank regulator ~ min. 80 PSI

**Note:** To ensure enough plant air, we recommend at least ½ inch line from main air manifold/header.

Ensure the argon tank manifold and hose is capable of 200 lpm.



From the 'Main Menu' screen – press the 'Line 1 Status' button



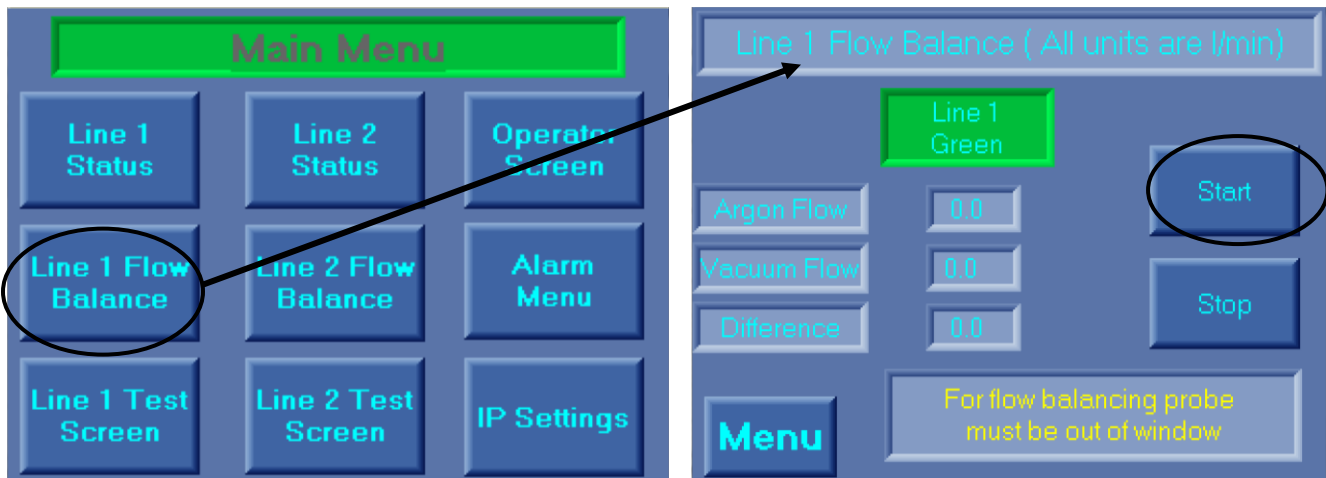
Start each line by navigating to the "Line 1 (2) Status" screen – then touch the "START" button. Once started, adjust the internal "Argon Pressure Regulator" until the PLC reading for 'Argon Pressure' reads **40 PSI**. Repeat the same procedure for the incoming 'Plant Air Pressure', adjust the "Plant Air Pressure Regulator" until the on-screen pressure reads **80 PSI**.

Press the 'Menu' button to return to the 'Main Menu'.

## FLOW BALANCE SETPOINTS (required for each line)

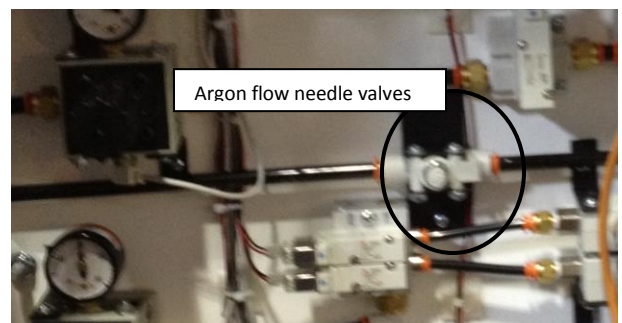
While the system will be factory calibrated before shipment, it is advised and good practice to balance the feed and vacuum flows for each line. Balancing of each line is also advised on a periodic basis or when adjustments are made to argon feed level pressure or plant air pressure. Periodic balancing is required to allow the system to contend with variances in ongoing conditions including temperature, humidity, wear and tear of equipment, etc. Balancing of a line is achieved by the following procedures:

Note: When flow balancing, the tubing lines and probes must be connected – with argon and plant air turned on. Probe must be out of any IGU or calibration chamber.



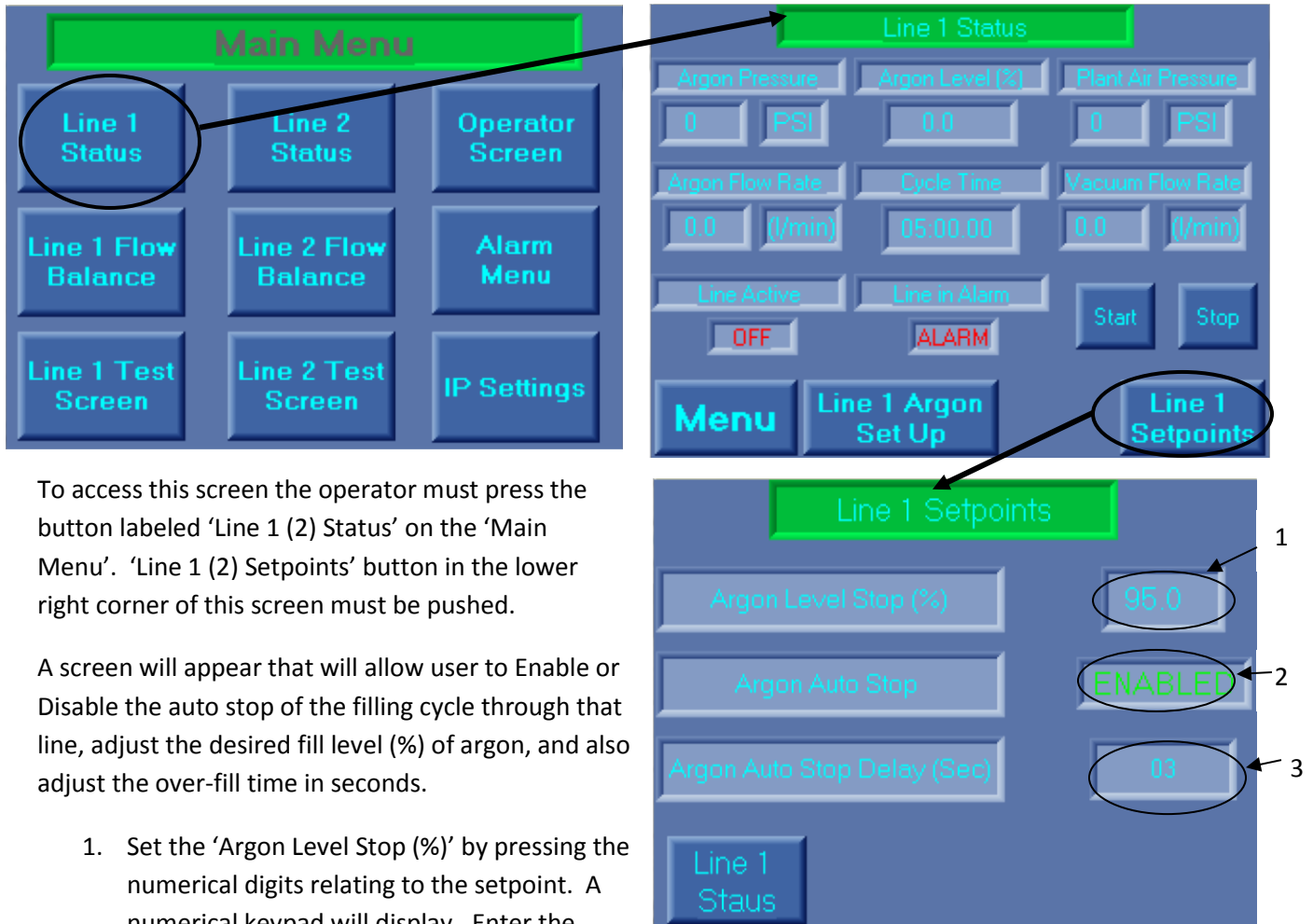
1. Connect the argon and vacuum tubing to the ports to be balanced as labeled on the right side of the enclosure.
2. Make sure that the probe assembly is securely connected to the end of the tubing.
3. From the 'Main Menu' screen, press the 'Line 1(2) Flow Balance' button on the PLC touch screen. The 'Line 1(2) Flow Balance' screen will then appear.
4. This screen displays the 'Argon Flow', 'Vacuum Flow' and the 'Difference' between these flows for each of the four lines. Proper flow balancing provides a slightly positive 'Argon Flow' over 'Vacuum Flow' reducing the chances of a pressure differential that cause the window to explode or implode.
5. With the probe left out of the IGU, press the start icon on the "Line 1(2) Flow Balance" screen for the line you are balancing. Observe the argon and vacuum flow rates via the flow balancing screen.
6. Adjust the appropriate argon needle valve located inside the panel until the desired flow rate is achieved.

**Note:** The vacuum line flow needle valve is fully opened at the factory for maximum flowrate – typically only the argon side of each line needs to be adjusted.



## GAS SENSOR SETPOINTS

For each line, there exists a setpoint screen allowing for a selectable 'Argon Level Stop %' and an over-fill timer that starts counting when the fill level reaches the desired setpoint.



To access this screen the operator must press the button labeled 'Line 1 (2) Status' on the 'Main Menu'. 'Line 1 (2) Setpoints' button in the lower right corner of this screen must be pushed.

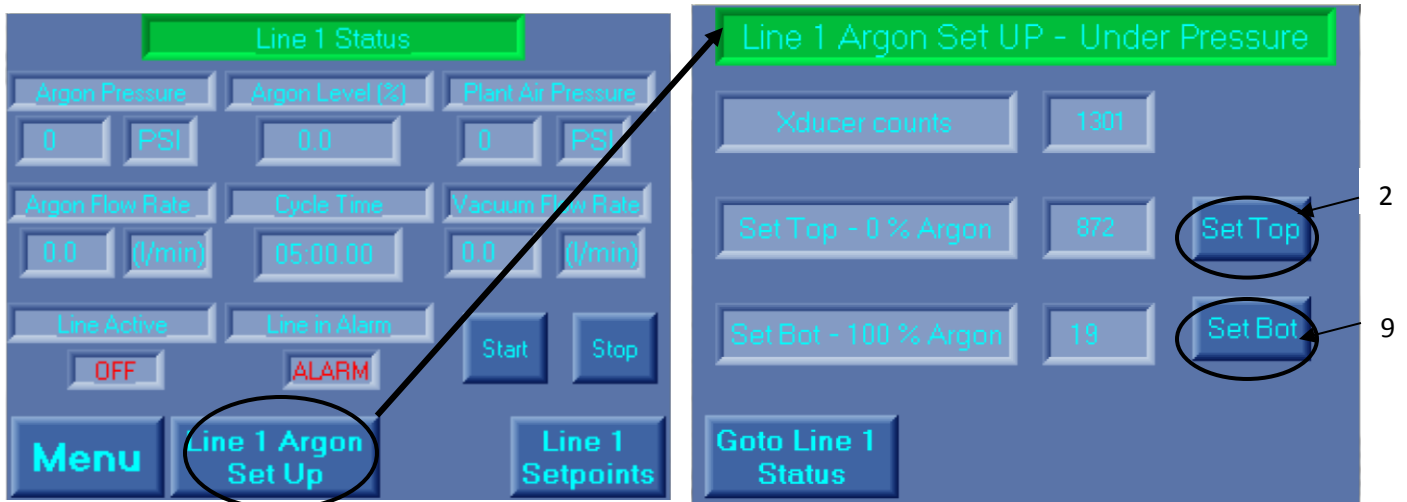
A screen will appear that will allow user to Enable or Disable the auto stop of the filling cycle through that line, adjust the desired fill level (%) of argon, and also adjust the over-fill time in seconds.

1. Set the 'Argon Level Stop (%)' by pressing the numerical digits relating to the setpoint. A numerical keypad will display. Enter the desired Argon fill level (in % fill) and hit the enter key.
2. To Disable the Argon Auto Stop – Touch the 'Enable' button. To Enable, touch the Disable button. **(DISABLE THIS FEATURE ONLY FOR GAS SENSOR MAINTENANCE OR REPLACEMENT)**
3. Set the desired 'Argon Auto Stop Delay' by touching the numerical button – and enter the desired number of seconds to fill after 'Argon Level Stop' value is reached. This feature allows for a timed over-fill, increasing the level of the final fill. A 3 second delay is a typical value.

After these adjustments have been made, back out of this display to the 'Line 1(2) Status' screen and then back to the 'Main Menu' screen. The individual line setpoint screen only has to be used when initially setting up the system and then only periodically thereafter when maintenance chooses to alter any of the three parameters listed on that screen.

## GAS SENSOR CALIBRATION

Initially and as a **monthly maintenance function**, the setpoints for the gas sensors should be reviewed. From the 'Main Menu', select the 'Line # Status' for the line to be adjusted, then press the 'Line # Argon Set Up'.



### Set 0% Argon Setpoint

1. With the probe in ambient air and not in an IGU , start the Argon filling cycle by pressing the start icon on the flow balance screen for the same line.
2. Wait until the 'Xducer counts' remains nearly constant. Compare the 'Xducer counts' value with the 'Set Top 0% Argon' value, after Xducer counts value has stablized, press the 'Set Top' button to reset the 0% Argon setpoint of the sensor.
3. Stop the filling process by pressing stop icon on the flow balance screen for the same line.

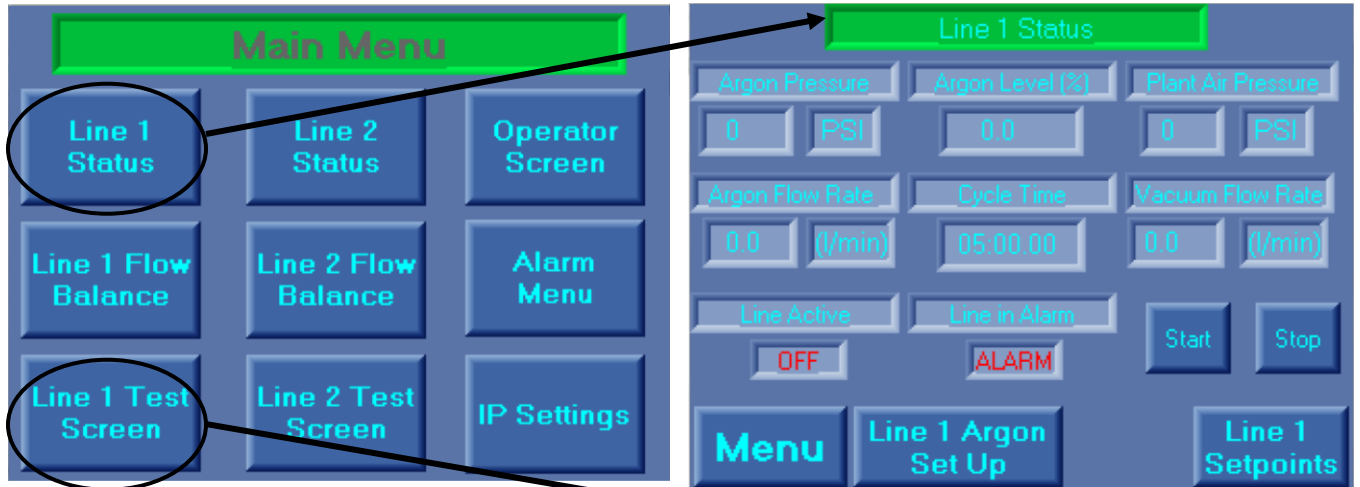
### Set 100% Argon Setpoint

4. Go back one screen to the 'Line # Status' screen. (see page 5)
5. Press 'Line # Setpoints'
6. After the 'Argon Auto Stop', Press the 'Enable – Disable' button to disable the Argon Auto stop alarm.
7. Return to the 'Line # Argon Set Up' screen.
8. Place the probe in a small IGU ensure flow balance is compete and correct) or small sealed test chamber. Start the Argon filling cycle by pressing the start icon on the flow balance screen for the same line. The IGU or chamber should fill to nearly 100% argon concentration.
9. Wait until the 'Xducer counts' remains nearly constant. Compare the 'Xducer counts' value with the 'Set Bottom 100% Argon' value, after Xducer counts value has stablized, press the 'Set Bot' button to reset the 100% Argon setpoint of the gas sensor. Stop the filling process by pressing stop icon on the flow balance screen for the same line.
10. Before finishing this procedure, re-enable the 'Argon Auto Stop' by repeating steps 4-6, set to "ENABLED".

**NOTE: Complete for each line**

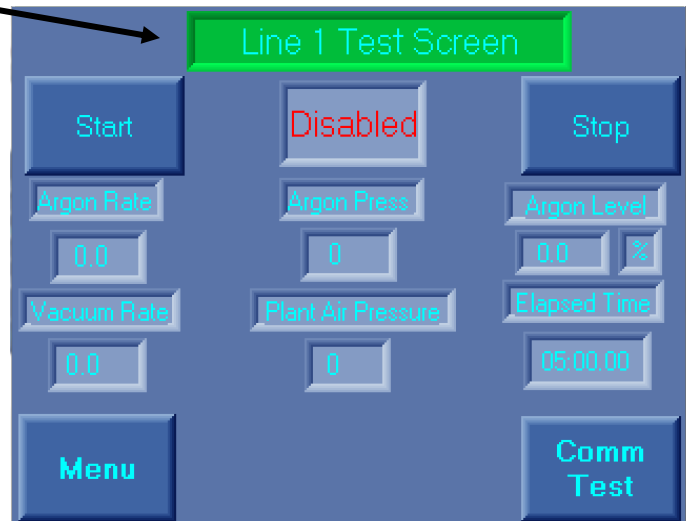
## OPERATING OPTIONS

Once the AFS-i1(2) machine has been set up, balanced and calibrated, the system is ready for operation. There are screens that allow the operator to view the system as it operates. If the operator only wishes to view one line and wants to view all the operating parameters of that line in a tabular format, the choice is to press the 'Line 1(2) Status' button on the main menu.



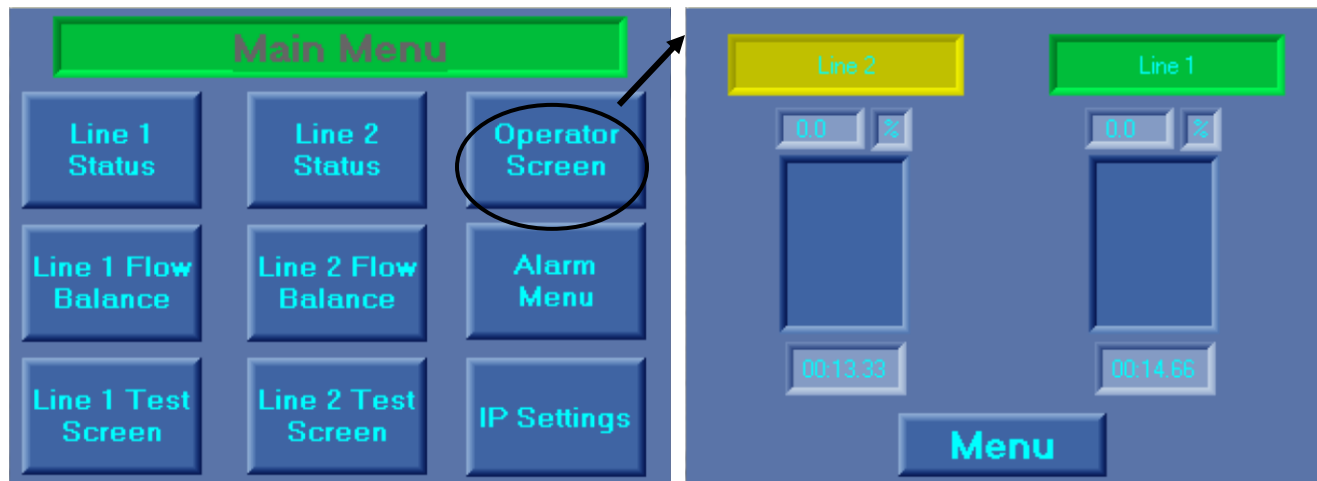
This display numerically indicates the system argon pressure (PSI), system vacuum pressure (actually plant air pressure) (PSI), individual argon level (%), the individual argon flow rate (l/min), the current cycle time, the individual vacuum flow rate (l/min), the line active status and the line alarm status.

If the operator wishes to view the individual line information with the ability to troubleshoot by starting and stopping the line, the "Line1(2) Test Screen" provides flow rate, pressure, Argon % information. **The "Comm Test" button is use by Integrator only.**





## NORMAL OPERATION ----- THE 'OPERATOR SCREEN'.



### Filling an IGU with Argon:

1. The IGU moves into place and the probes are automatically inserted.
  - a. The filling process will be automatically initiated.
2. Once the process starts the argon percentage will begin to rise on the PLC screen
3. The argon will continue to rise until the argon % reaches the preselected stop level and the selected stop delay time has expired
  - a. The PLC screen displays the maximum Argon level reached by the gas sensor
4. Filling probed are automatically removed from the IGU and the system is prepared for the next IGU.

**AFS-i2 – both lines may be used at one time.**

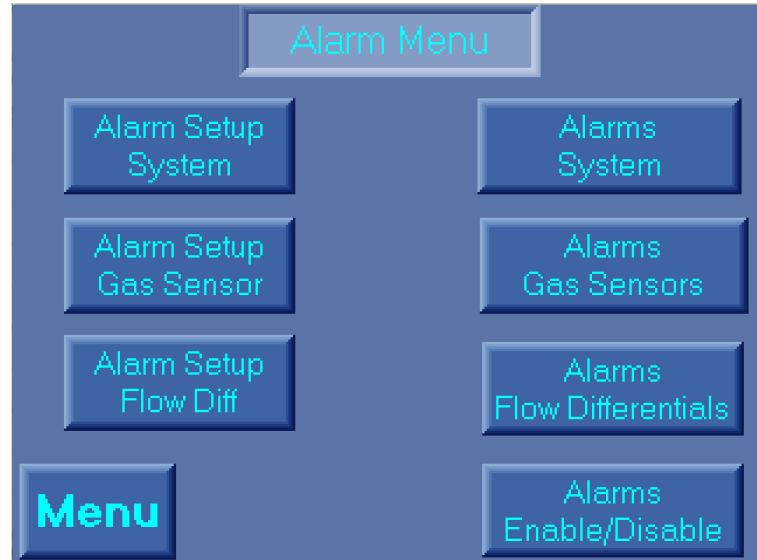
**E-STOP:** The emergency stop (E-Stop) pushbutton is a push-pull type. When the E-Stop pushbutton is pushed, all filling cycles are ceased. The E-Stop button must be pulled back out before and filling can again be initiated.

## System Alarms

Should any system alarm occur, the alarm horn on the front of the panel will sound and the operator screen will automatically advance to a screen which will indicate to the operator which alarm was initiated. When an alarm screen is displayed due to an alarm occurrence, a silence button located on the bottom of the screen allows the operator to silence the alarm. The alarms condition will also be sent to the IG line controller along with the ability to silence the alarms.

The possible alarm conditions are:

- Emergency Stop (E-Stop)
- Argon Feed Low Pressure
- Plant Air Low Pressure
- Line 1 Gas Sensor Alarm
- Line 2 (i2 only) Gas Sensor Alarm
- Line 1 Flow Differential between the argon flow to the window and the vacuum flow from the window has exceeded an operator selectable setpoint
- Line 2 (i2 only) Flow Differential



For each of the above alarms an operator selectable alarm delay time and setpoint (except E-Stop) is made available. An enable/disable function is also available for each alarm. These delay times, setpoints and enable/disable can be viewed and adjusted by pressing the 'Alarm Menu' button on the lower right hand corner of the main menu. At this time an 'Alarm Menu' will appear which allow for these adjustments.

### Gas sensor alarm

An alarm setting may be configured to notify the user when an errant gas sensor calibration is made or when the gas sensor is to be replaced. A minimum difference between the 'Xducer counts' 0% argon condition (top) versus 100% argon condition (Bot) can be set. A suggested minimum setting for this alarm is 200 counts. The status of this alarm is on the gas sensor alarm screen.

## Troubleshooting

Issue	Solution
<p>Line will not flow balance or remain balanced</p> <p><b>Note:</b> <i>The AFS Test Vessel (Bucket) is a good verification tool to use after doing a flow balance. While holding the vessel and the probe fully inserted into the lid of the test vessel, start the filling process. Any excessive expansion or contraction of the vessel indicates the line is not balanced. A slight positive pressure is desired.</i></p>	<p>Plant air supply:</p> <ul style="list-style-type: none"> <li>• Ensure tubing is properly connected</li> <li>• Ensure adequate pressure and tubing size for required flow-rate</li> </ul> <p>Argon supply:</p> <ul style="list-style-type: none"> <li>• Ensure tubing is properly connected</li> <li>• Ensure adequate pressure and tubing size for required flow-rate</li> </ul> <p>Tubing to IG:</p> <ul style="list-style-type: none"> <li>• Check to ensure probe(s) are properly attached and not clogged</li> <li>• Ensure filter is clean, cover properly installed and not broken</li> <li>• Check all fittings to ensure tight fit</li> <li>• Ensure probe is not in any IG or test chamber during flow balancing</li> </ul> <p>Inside panel:</p> <ul style="list-style-type: none"> <li>• Ensure regulators are set at proper pressure</li> <li>• Check for debris in any components: venturis, flow meters, flow needle valves, etc. Remove tubing and clean as needed</li> <li>• Check all fittings to ensure tight fit</li> <li>• Ensure jam nuts are tightened on regulators and needle valves</li> </ul>
<p>Line starts but argon filling process does not complete</p>	<p>Ensure Argon Auto Stop is Enabled (see page 6) and fill % is properly set</p> <p>Check vacuum line probe, filter and tubing to ensure no leaks</p> <p>Ensure gas sensor is properly installed and body of sensor is not cracked</p>
<p>Breaking Glass</p>	<p>Ensure Flow balance is completed properly</p> <p>Ensure no plugs in vacuum or argon lines and probes</p> <p>Ensure all alarms are properly set and enabled (<i>note the flow differential alarm</i>)</p>
<p>Line does not start</p>	<p>Check flow differential alarm setting – make sure value is &gt; 0 lpm</p> <p>Ensure solenoid valve wires are connected</p> <p>Ensure solenoid valves are opening (<i>push button on side of vale to manually cycle</i>)</p> <p>Ensure proper signal coming from main PLC (<i>consult Integrators manual</i>)</p>

## Recommended Maintenance Schedule

Maintenance Procedure	Frequency
Check lines and probes for plugs/cracks/breaks	On-going / daily
Flow Balance	Weekly EVERY PROBE CHANGE
Gas Sensor Calibration	Monthly
Clean vacuum line filters	Monthly/As required
Test Flow Balance Alarms <ul style="list-style-type: none"> <li>• Manually plug argon line while operating</li> <li>• Manually plug vacuum line while operating                             <ul style="list-style-type: none"> <li>○ Ensure alarm stops line</li> </ul> </li> </ul>	Monthly

## System Requirements

	AFS-i1	AFS-i2
<b>Plant Air Pressure</b>	100 PSI – minimum ½” supply line recommended to ensure adequate flowrate	
<b>Argon Supply Pressure</b>	80 PSI – ensure line and manifold are capable of minimum flowrate	
	100 lpm 215 scfm	200 lpm 425 scfm



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