DSG-Designed
Gas Controls and Monitoring Systems

Marc McMullen
Detector Support Group
06/28/2019
Hall B Detector Gas Controls

• DSG has designed LabVIEW/National Instruments-based operational controls for Hall B gas systems:
  
  – **Drift Chamber**
    • Two-gas mixing system with automated flow control that auto-adjusts to maintain pressure range in buffer volumes.
  
  – **MicroMegas Vertex Tracker/Forward Tracker**
    • Two and three-gas, pressure controlled, mixing system. Mixing and pressure controls work similarly to DC.
  
  – **Low Threshold Cherenkov Counter**
    • Automated, recirculating, pressure controlled, flow loop designed to minimize $C_4F_{10}$ loss.
    • Additional semi-automated PID controlled $C_4F_{10}$ purification system.
  
  – **High Threshold Cherenkov Counter and Silicon Vertex Tracker**
    • Purge gas system using $CO_2$ and $N_2$ respectively.
Drift Chamber Mixing and Regional Supply Controls

Automated mixing system with automatic pressure control for buffer volumes.

- Set point for regional supply MFCs calculate set points for mixing MFCs.

- Mixing MFCs use pressure signals from buffer volumes to increase or decrease flow into buffer tanks to maintain safe pressure range.
LabVIEW/NI-Based Gas Controls System

- **LabVIEW code**
- **Network switch**
- **Gas flow control and monitoring**
- **System monitoring**
- **MFC reset control**
- **GUI controls**
- **MFC power chassis**
- **MKS GE50/250 mass flow controller**

**Components:**
- **PC with LabVIEW software**
- **Gas controls interface chassis**
- **Sensor signal**
- **Sensor power**
- **System sensor**
- **NI 9035 cRIO**
- **MKS GE50/250 mass flow controller**
Conclusion

- DSG designed and built hardware and software to control multiple gas systems using LabVIEW software, National Instruments controls, and precision instrumentation.

- System controls flow of gas and provide data to EPICS monitoring and alarm handling system.

- All Hall B systems are operational.
  - Next upgrade will be Radial Projection Time Chamber, a premixed HeCO₂ supply system.
END
(Backup) DC Gas Controls Diagram

DC tab on Hall B Gas Controls GUI