

# TPOT Gas System

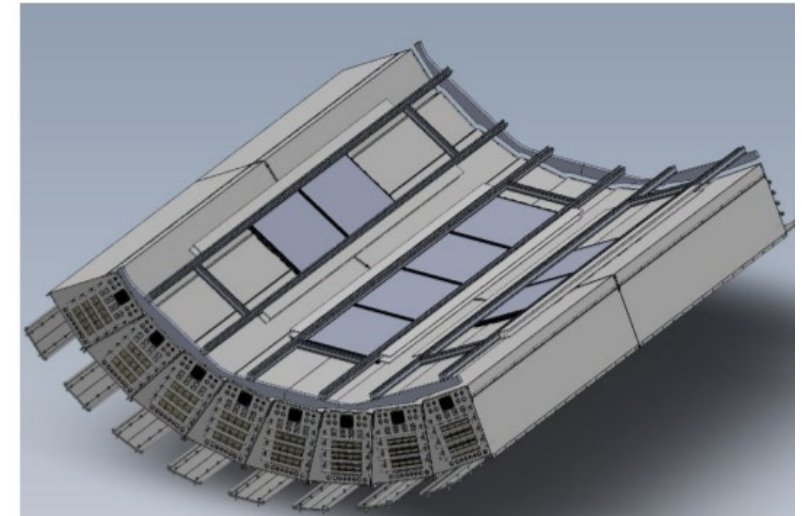
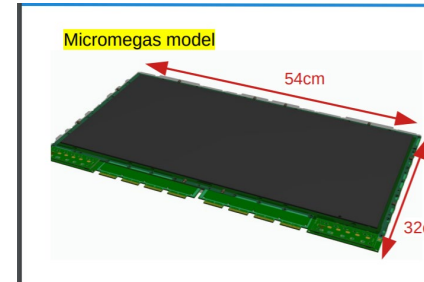
Robert Pisani

January 26, 2022

# Gas System Technical Overview

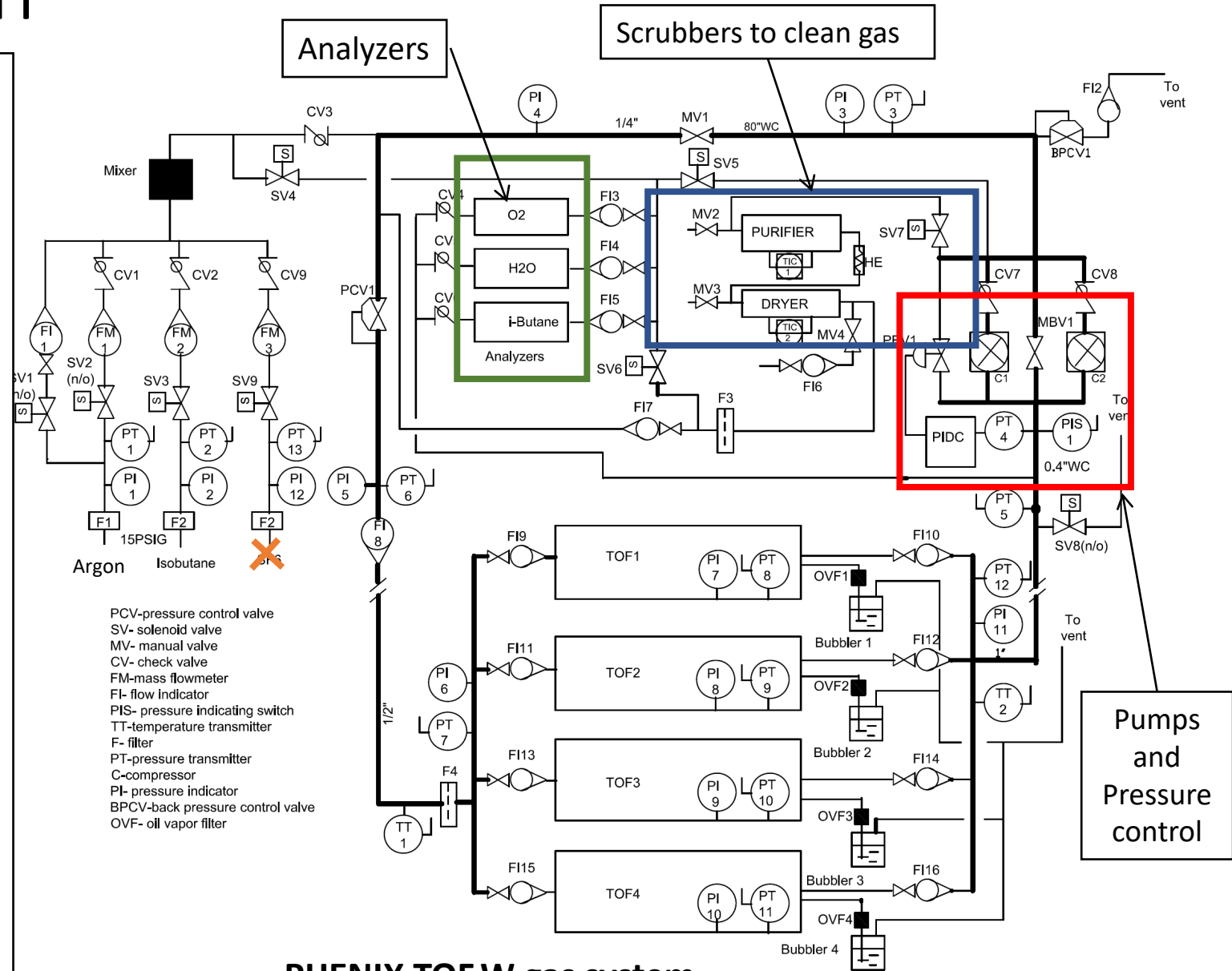
## TPOT Gas System Requirements

- Argon + 5% isobutane : mixture for good gain and stability, slow gas against Lorentz angle
- Module Volume 1.4 liters
- Total Volume 11.2 liters
- Few turns per hour
  - 50ccm per module (3L/hr)
  - 400ccm total
- Slight overpressure above atmosphere (1mBar 0.40" W.C)
- Compensate for changes in barometric pressure
- High purity system
- Single Pass
- Remote monitoring
- Alarmed



# The TPOT Gas System

- Has mixing capability for 3 gases (95.0% R134a / 4.5% Isobutane / 0.5% SF6)
- Will Switch to Argon mixture (Ar-Iso) (95-5)
- Calibrated mass flow controllers will mix gas and monitor ratio
- Isobutane analyzer will monitor mixture.
- Flowrate ~ 400ccm
- 0-2mBar (~0.5" w.c.) above atmosphere to +/- 1/8 w.c."
- Single Pass system
- Supply pressure from Rack ~ 30" W.C.
- Return Pressure –Atmosphere
- Analyzers to monitor mixture and impurities
- In line purifiers if needed
- High purity system
  - <500 ppm O2
  - <100 ppm H2O
- PC Controlled
- Fully alarmed
- All major components and materials installed



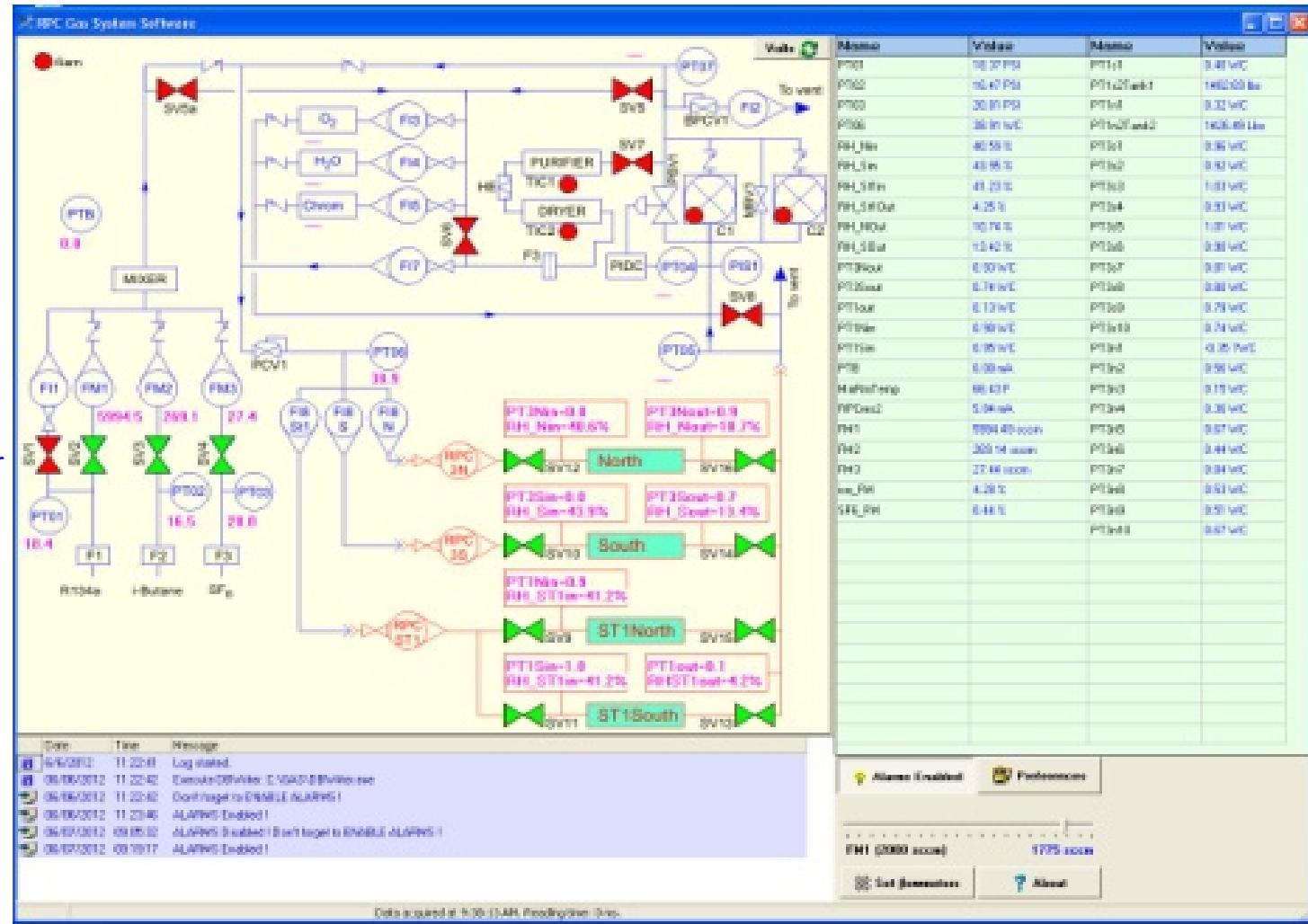
**PHENIX TOF.W gas system**

# Original TOF.W System Parameters

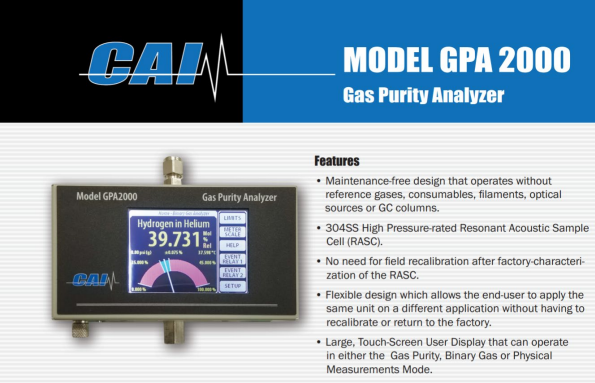
	TOF.W	For TPOT
Mixture	95%R134a + 4.5%Iso +0.5% SF6	95%R134a + 5%Isobutane
Compressor pressure	40-80 “ H2O	-----
Supply pressure	30”+/-0.05 H2O	30”+/-0.05 H2O
Return pressure	1” +/-0.05 H2O	Vent to Atmosphere
TOF.W Diff Pressure	1.5 +/- .05”WC	0.4” +/- .05”WC
Recirculation flow	650-1000 ccm	-----
Flow through chambers	Up to 850 ccm	Need 400ccm
Purge flow	2.0 l/m	2.0lpm
Make-up mixture flow	100-300 ccm	-----
Oxygen content	< 500ppm	< 500ppm
Water content	<100ppm	<100ppm

# TPOT Gas System Features

- Previously Operating PHENIX Gas system
- Basic Features
  - 95% Argon + 5% Isobutane
  - Mass flow controllers (calibrated every year)
  - Constant controlled pressure and flow
  - Straight through or recirculation
- Gas Monitoring
  - Monitors system and chamber pressures,
  - Flammable gas content, Independent Iso monitor
  - Monitor flow to chambers
  - O<sub>2</sub> and H<sub>2</sub>O levels monitored
- PC controlled and monitored system
  - Collects and logs system parameters
  - Warnings and Alarms
    - Example: if Argon runs low, Iso shut off
  - Remote access



# Major Components



**CAI** **MODEL GPA 2000**  
Gas Purity Analyzer

Model GPA2000 Gas Purity Analyzer

Hydrogen in Helium  
39.731

**Features**

- Maintenance-free design that operates without reference gases, consumables, filaments, optical sources or GC columns.
- 304SS High Pressure-rated Resonant Acoustic Sample Cell (RASC).
- No need for field recalibration after factory-characterization of the RASC.
- Flexible design which allows the end-user to apply the same unit on a different application without having to recalibrate or return to the factory.
- Large, Touch-Screen User Display that can operate in either the Gas Purity, Binary Gas or Physical Measurements Mode.

**CAI GPA2000 Gas purity analyzer with pressure compensation. Calibrated for Argon-Iso 0.1% accuracy**

**This will continually monitor the concentration of isobutane in our mixture.**



**Cermet II Hygrometer**  
Measurement Range -  
0.001 to 9999 PPM



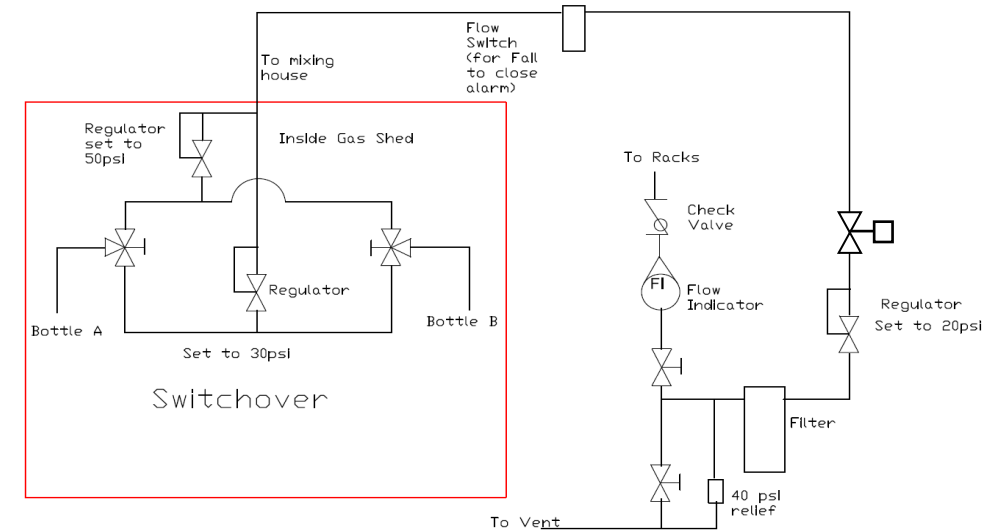
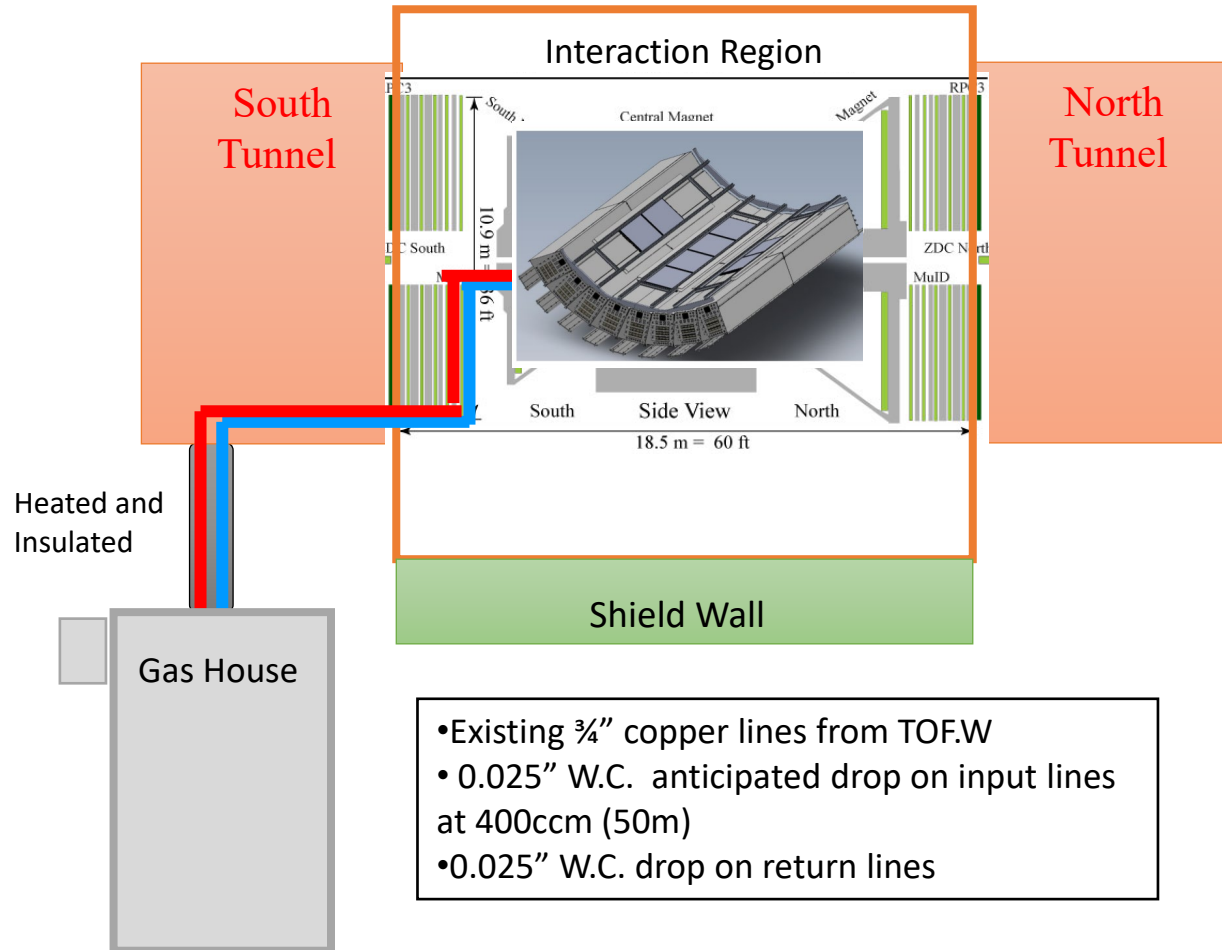
**Teledyne InstaTrans XD**  
O2 Monitor  
Range: 0-1000 PPM [configurable]



**TESCOM™ ER5000 Series Electropneumatic Actuator**---The ER5000 Series is a microprocessor based PID (Proportional, Integral, Derivative). Maintains return line pressure to better than 1/16" W.C.

**The 300 Vue Mass Flow Controller. Precise control for accurate mixing. (0.2% of Full Scale)**  
A high flow and low flow controllers are being used to get better accuracy in recirculation.

# TPOT gas lines to IR

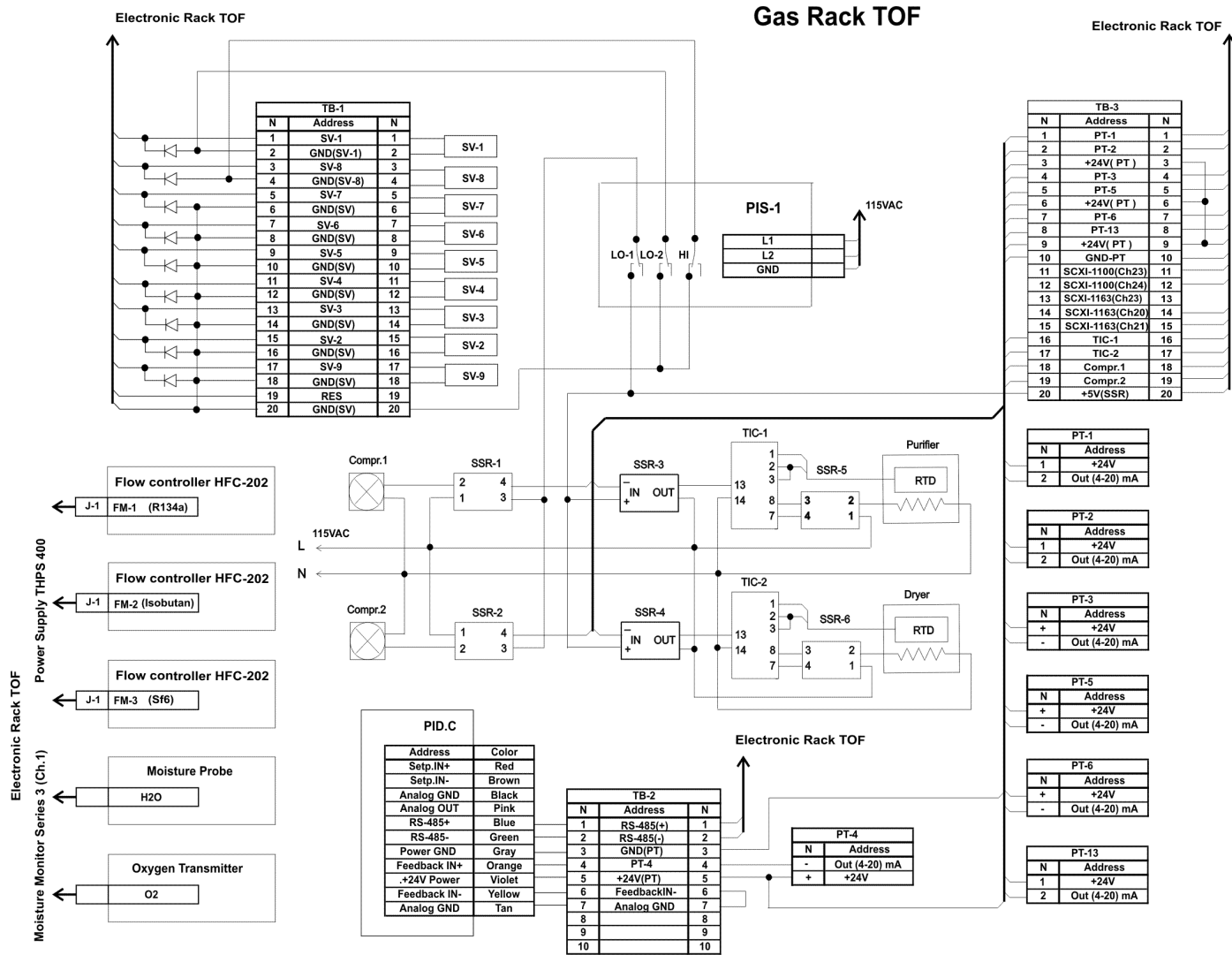


Low Pressure automatic switchover close to Gas House,

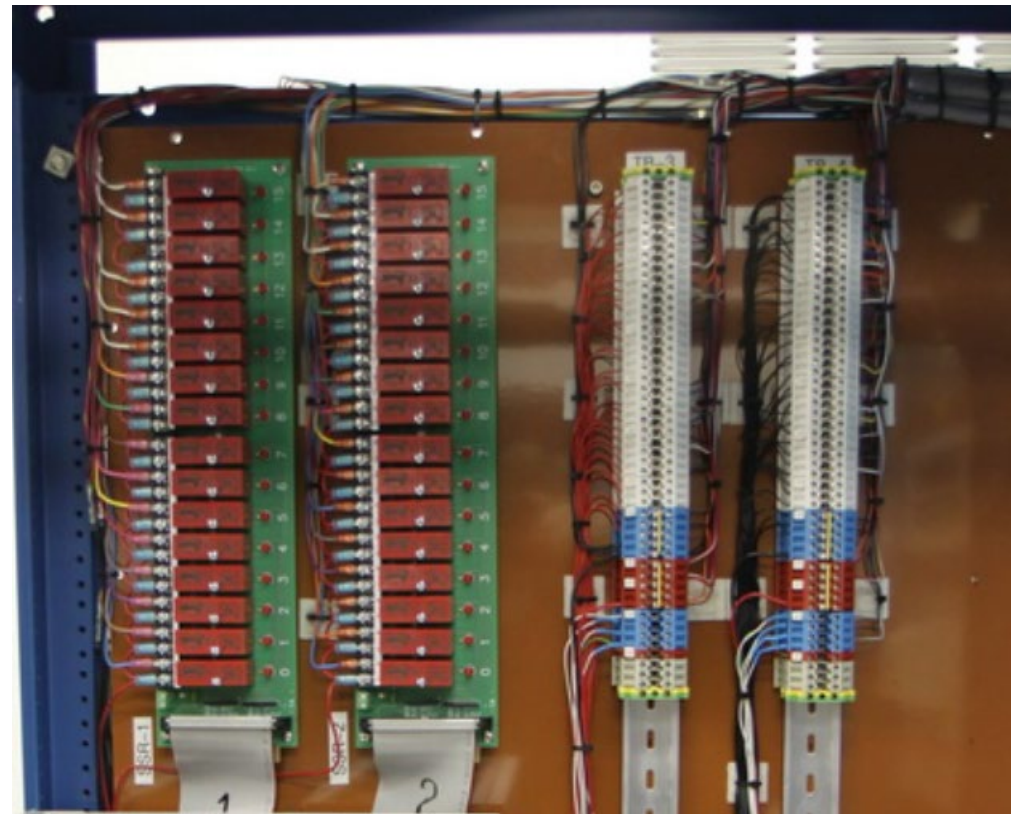
## PHENIX Iso Shed



# Existing Items



- Wiring exists
- Some minor work to modify for TPot
- All wiring and electrical components in Gas house are still intact.
- Some new runs to IR will be needed.

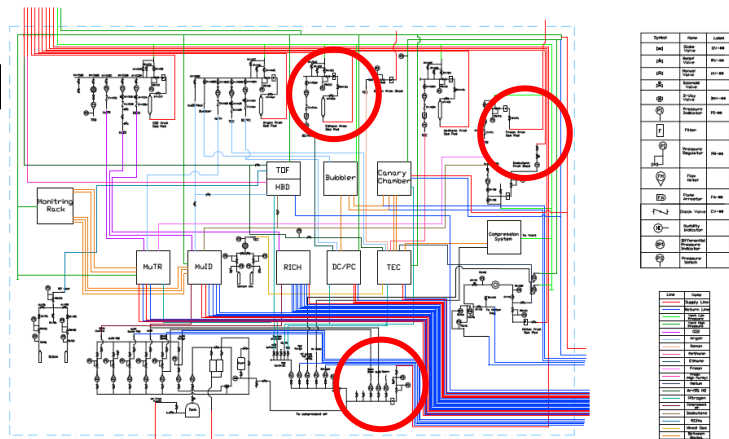




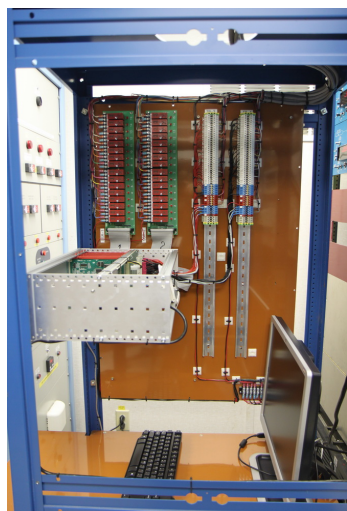
# Existing Item



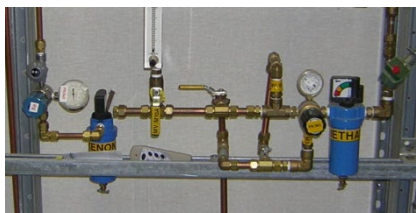
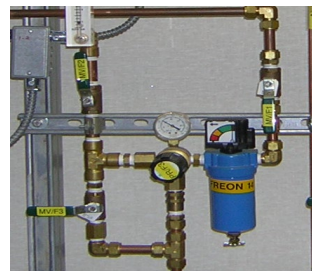
Existing TOF Gas Rack



Infrastructure  
for Supply  
Already exists



Existing TOF Electronics Rack



Existing TOF Controller and Flowmeters

1/26/2022

# Gas Summary

- PHENIX hosted many high purity gas systems (HBD detector, RPC, TOF, DC, PC, RICH, Mutr, Muid).
- The TPOT gas system will be the PHENIX TOF.W gas system which successfully ran for many years in PHENIX
- All major components exist.
- The system will have gas and contamination monitoring..
- For Flammables,
  - All mass flow controllers will be calibrated every year.
  - Calibrated flow controllers will be used to mix gas
  - A separate Isobutane analyzer will be run to monitor mixture
- The system will be fully alarmed with the ability of remote monitoring.