The RTPC Gas Supply System Layout

Introduction

The RTPC gas supply system delivers pre-mixed gas, 20% CO2 in He, to the RTPC detector and DMS gas volumes.

The pre-mix gas cylinders are located at the Hall B target gas pad behind the counting house. Gas is delivered via a stainless steel gas line that runs from the target gas pad to the Hall B space frame.

Gas flow to the RTPC and DMS gas volumes is metered by a mass flow controller. Gas flows first to the DMS, Drift Monitor System, which measures the electron drift speed in the gas mix. Gas then flows to the RTPC, Real Time Projection Chamber, which tracks particles emitted from the target. Gas exits the RTPC and is vented to atmosphere.

Gas Line Runs and Connections

There are pre-existing lines running from the target gas pad to the hall that are available. These lines terminate at the downstream end of the space frame. New lines can be run that terminate at the upstream end of the space frame to minimize line length required.

The pre-existing gas line runs from the Hall B target gas pad and terminates at the downstream end of the space frame. This line must be extended to connect to the RTPC gas panel which supports the mass flow controller, the pressure sensors, and system valves. This location must be outside of the magnetic field for proper MFC operation.

The RTPC replaces the SVT on the beam line and moves with the cart. There are three gas lines that run from the gas panel to the RTPC on the cart; Gas supply, gas exhaust, and a pressure instrumentation line.

The three gas lines that run to the cart from the gas panel must move with the cart along the track. The exhaust line should run from the valve panel to atmosphere through the target gas pad penetration.

Gas System Components

Gas is supplied in high pressure, 2000 psi, pre-mix cylinders of 20% CO2 in He, each containing 220 SCF each. Pressure regulators reduce the gas supply pressure to 30 psi for the mass flow controller.

The gas system components are all mounted on a compact panel to afford portability for testing at W&M and the EEL prior to hall installation.

Pressure gauge, PI1, indicates the gas pressure at the inlet of the mass flow controller at the valve panel on level 1 space frame in Hall B.. The valve panel isolation valve, MV7, is used to isolate the gas supply from the gas panel for maintenance.

The mass flow controller, MFC1, meters flow to the DMS and RTPC volumes. An absolute pressure transducer, PT1, monitors the absolute pressure inside the RTPC detector volume. A differential pressure transducer, PT2 monitors the differential pressure between the DMS and RTPS gas volumes.

The DMS can be isolated and bypassed using the manual valves, MV3, MV4, and MV5. A check valve, CV1 limits pressure in the DMS volume to 2 psi in case of human error.

The option of a second or alternate gas supply is provided by a tee connection and isolation valve, MV7.

The oil filled bubblers act as a check valve to prevent backflow of air into the system while maintaining the desired detector pressure and providing a visual indication of gas flow.

The exhaust line directs the exhausted 20% CO2 in Helium gas to atmosphere outside of the hall.

The valve panel and DMS location on L1 space frame must to be determined prior to running the new gas lines.

Controls and Instrumentation

A National Instruments cRio is used to control the MFC and read back the gas system flow and pressure signals.