

DUNE PAB Test Stand Grounding Rules



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Subject: PAB Test Stand Grounding Rules

Introduction:

The DUNE PAB test stand will utilize an 'isolated' grounding scheme to provide a low noise environment for the sensitive TPC cold electronics system. This system defines two grounds; Detector ground and Building ground. The ground 'isolation' will be monitored for errant connections. In addition to providing AC power from a dedicated, custom designed, double-shielded transformer, all DC distribution, mechanical, and cryogenic equipment should follow the grounding rules established by the DUNE Grounding and Shielding committee. This document summarizes the Grounding Rules, as they apply to the test stand.

Cryostat:

- The cryostat shall be isolated from the concrete floor via isolation material such as G-10 and elastomer. The thickness is determined by capacitive coupling and weight considerations.
- The cryostat is defined as Detector ground.
- Cryogenic pipes shall include dielectric breaks located as close to the cryostat as reasonable. Ceramic or Teflon breaks are preferred.
- Cryogenic pipe supports shall be referenced to Building ground after the dielectric break. Supports prior to the dielectric break, connected directly to the cryostat, shall be referenced to Detector ground.
- Isolation material must not contain carbon black.

Cryogenic Electronics, Pumps, and Motors:

- Cryogenic sensor electronics, referenced to the Building ground, shall utilize optical or galvanically isolated signal conditioning electronics. Optical isolation is preferred.
- Warm and cold sensor cabling shall follow a low noise connectorization scheme in addition to utilizing filtering networks as needed.
- Signal conditioning electronics shall use slow DC ramps.
- Pumps and motors should use shielded AC power cords to Building power.
- Pump connections shall be on the Building side of pipe dielectric breaks.

Detector Power:

- AC power to detector electronics shall be sourced from the 'isolation' transformer.
- DC power shall be provided via low noise floating supplies and referenced directly at the cryostat to eliminate ground loops.

Mechanical:

- All conductive materials shall be grounded to either the Building ground or the Detector ground; no floating metal.
- 80/20 framing shall use grounding hardware specifically designed to penetrating the anodized coating.
- Ground connections to Unistrut shall be paint free.
- The TPC frame shall be isolated from the cryostat top plate.
- Interim support structures should provide isolation of the TPC frame if noise studies are to be conducted such that the Detector ground system may be utilized.
- Metal cable trays utilized for Detector powered equipment shall be connected to Detector ground. Cable tray supports must be isolated from building support structures with fiberglass Unistrut.

Cables:

- No direct conductive path is allowed between Building powered equipment and Detector powered equipment.
- Cable wiring schemes and shielding treatments should be reviewed before construction.