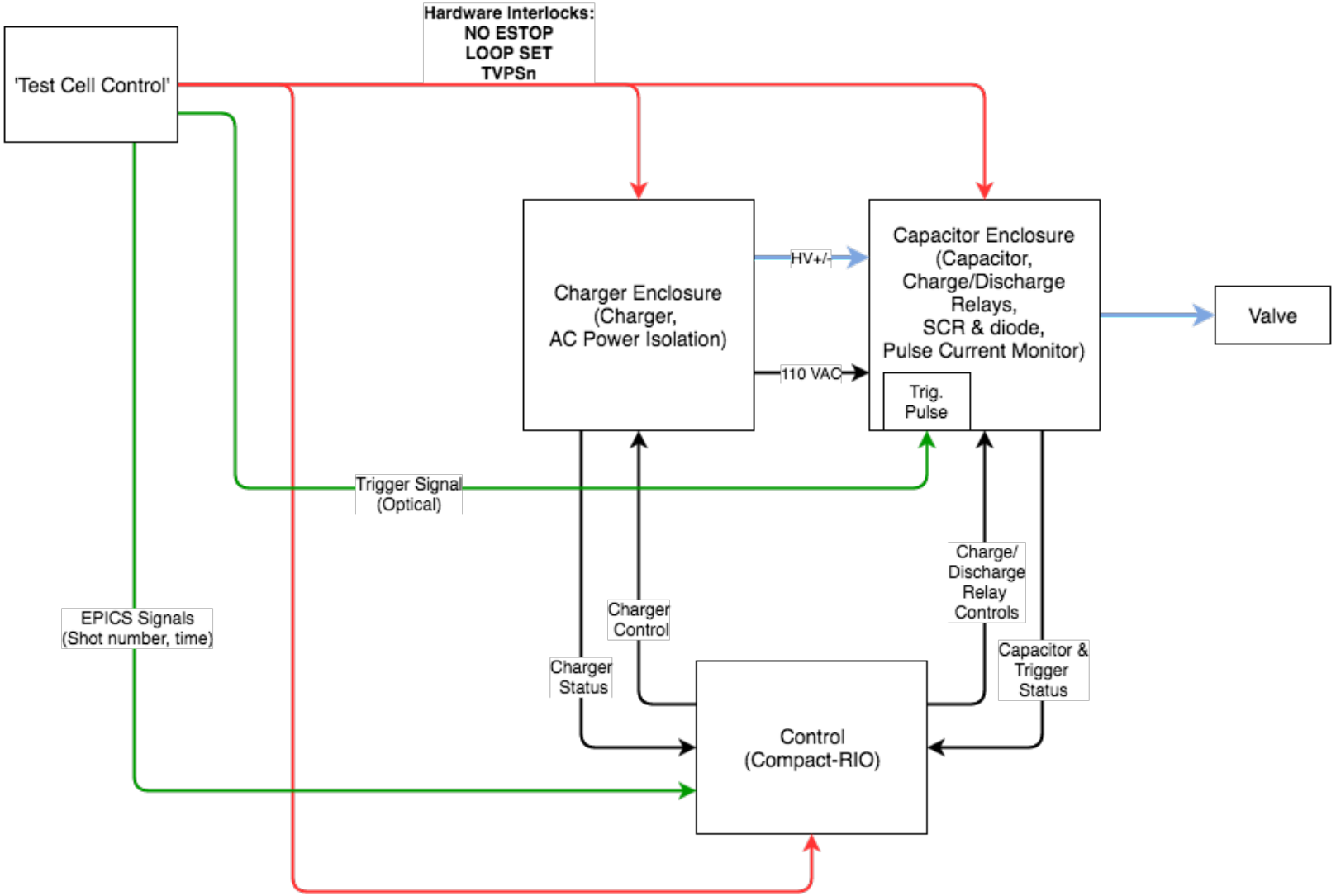
MGI ACC Review

May 5th 2016

Functional Overview

- MGI uses current pulse from discharging a capacitor to quickly open a valve
- Three separate systems
- Each system consists of three main sections
- Systems mounted in two equipment racks

MGI (Power) System Overview



Components

- Charger Enclosure
  - Capacitor Charger
  - AC Power isolation
- Capacitor Enclosure
  - Capacitor: 550uF, 1000V -> 275J
  - NC Discharge Relay
  - NO Charge Relay
  - Voltage & current sensors

Components (cont.)

- Control
  - NI Compact-RIO system (real-time controller)
  - Compact-RIO operated from remote GUI
  - Charges & discharges capacitor during NSTX-U shot following configurable time sequence
  - Monitors status of charger and capacitor
  - Records measurements
  - Observes all Hardware Interlock signals & reacts accordingly

Safety Signals

- Hardware Interlock Signals
  - NO ESTOP, LOOP SET
  - TVPS n
- Equipment Rack Door Switches
- Controller Related
  - EPICS signals: system powered down and cap. Discharged between shots
  - Controller Watchdog: forcing system into safe state if controller becomes unresponsive

Hardware Interlock Signal ‘NO ESTOP’

- Monitored in all MGI components
- Inactive NO ESTOP:
  - Removes AC power from charger
  - Forces closure of discharge relay and capacitor discharge
  - Removes power from trigger circuit

Hardware Interlock Signal ‘LOOP SET’

- Monitored in all MGI components
- Inactive LOOP SET:
  - Removes AC power from charger
  - Forces closure of discharge relay and capacitor discharge
  - Removes power from trigger circuit

Hardware Interlock Signal ‘TVPS n’

- One signal for each MGI system
- Inactive TVPS:
  - Removes AC power from charger
  - Forces closure of discharge relay and capacitor discharge
  - Prevents triggering of SCR

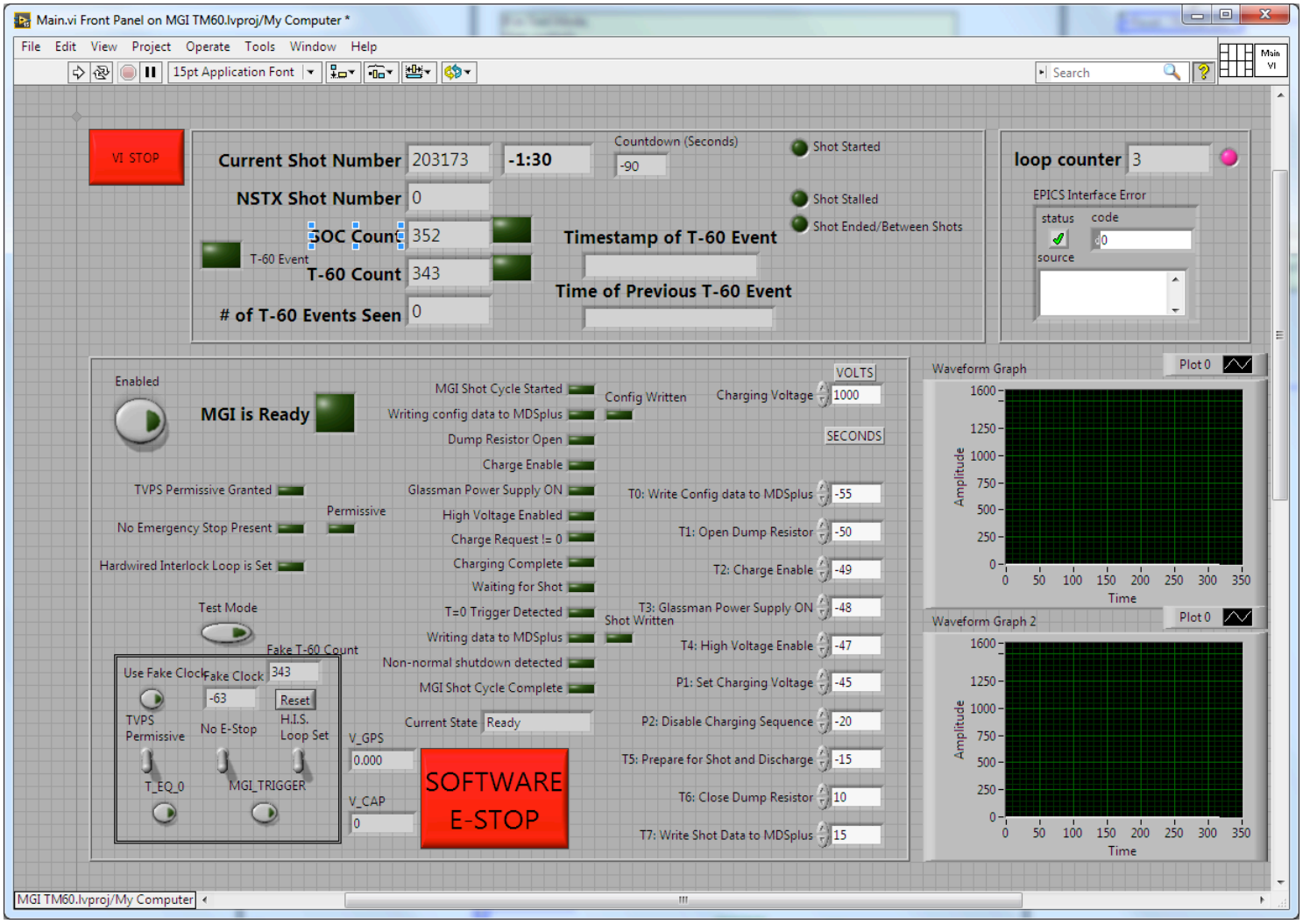
Equipment Rack Door Switches

- Two door switches in each rack
- Ensure that rack doors are closed during operation
- Inactive Door Switches:
  - Prevent charging of capacitor
  - Remove power from trigger circuit

Control Software Safety

- MGI only functions if under operator control
- Controller monitors all HW interlock signals and reacts accordingly
- Controller has built-in HW watchdog to force system into safe state if controller software becomes unresponsive

Remote Control GUI

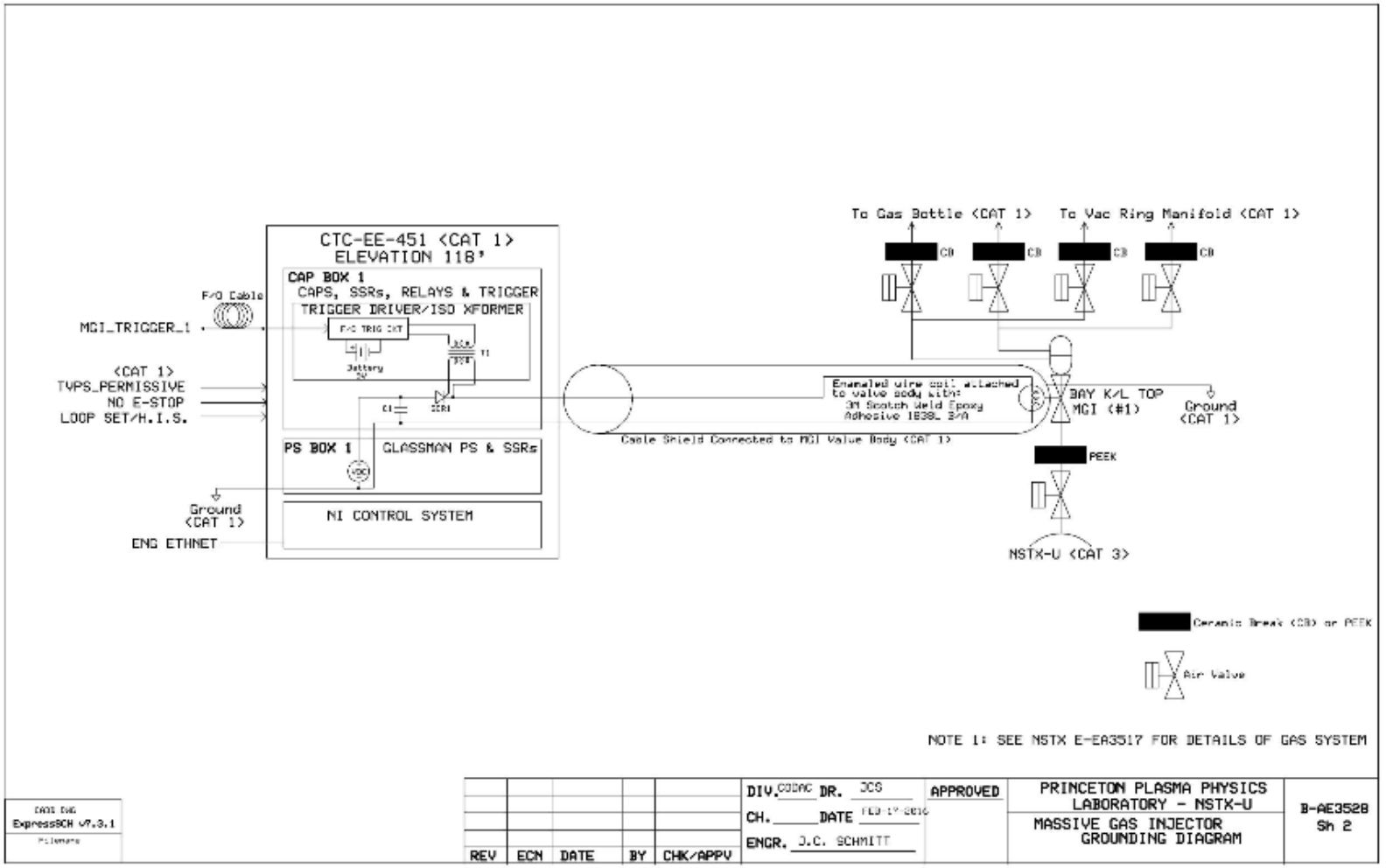


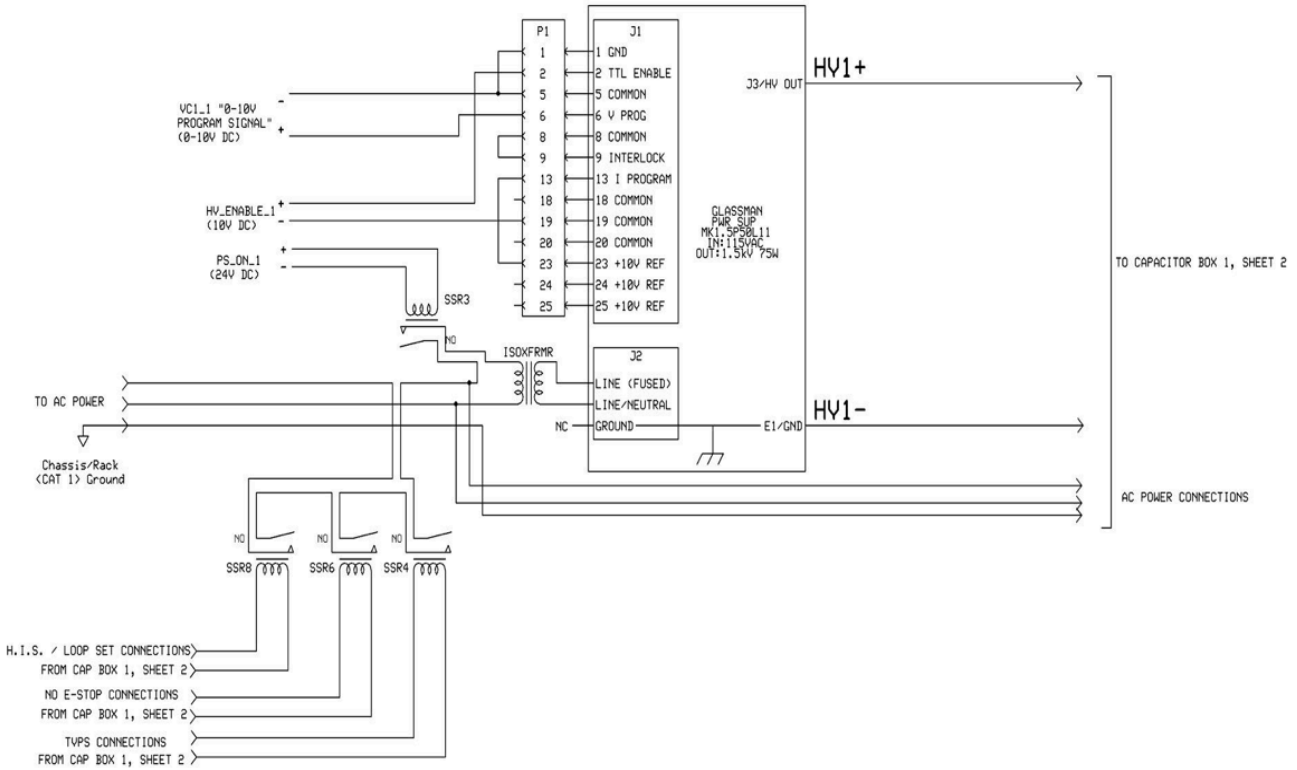
Procedures

- Capacitor Safing Procedure
  - Process to ensure capacitor is discharged & grounded before any maintenance
- MGI PTP
  - Defines functional tests for a MGI system before installation
- MGI ISTP
  - Defines functional tests after installation, before operation
- MGI Operation Procedure

Additional Slides …

Grounding Diagram





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DIV. CODAC DR. JCS
CH. ____ DATE FEB-17-2016
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PRINCETON PLASMA PHYSICS LABORATORY - NSTX-U

MASSIVE GAS INJECTOR POWER SUPPLY SCHEMATIC DIAGRAM

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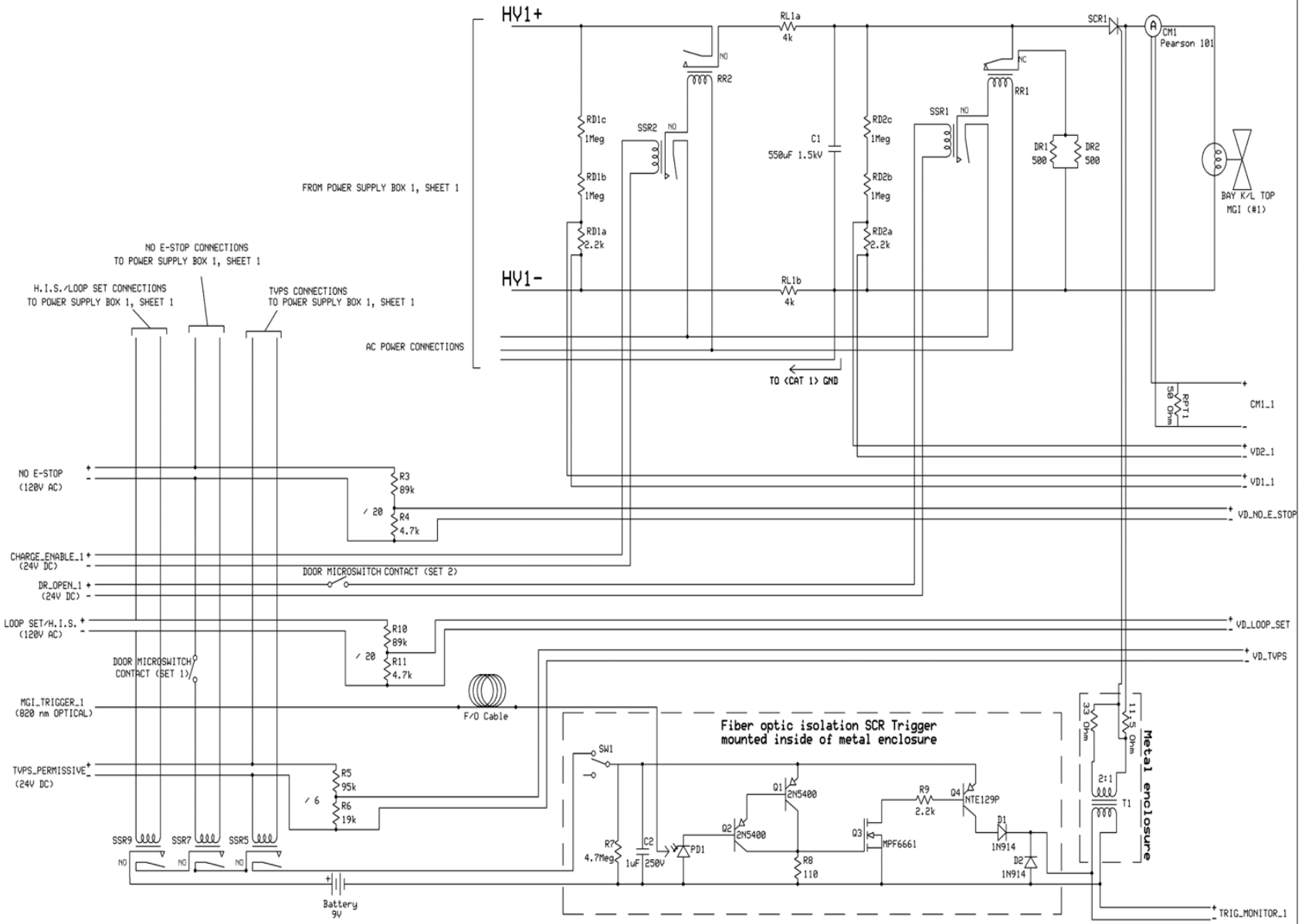
Sh 1



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PRINCETON PLASMA PHYSICS LABORATORY - NSTX-U

MASSIVE GAS INJECTOR POWER SUPPLY SCHEMATIC DIAGRAM

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