# Hall D WEDM

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  - Hall D controls and monitoring
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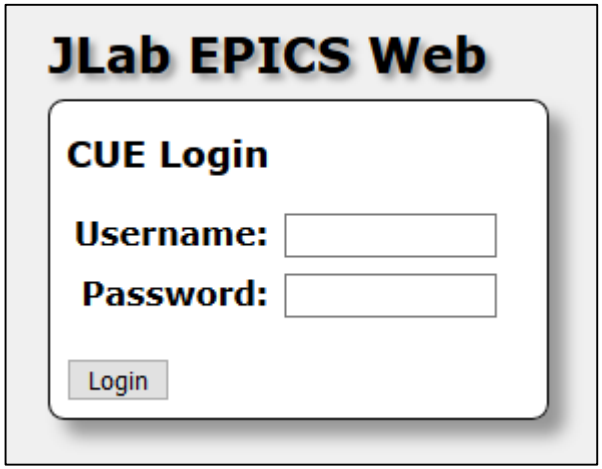
# Hall D's Current EPICS System

- Hall D's EPICS system uses Control Systems Studio (CSS) screens for user interfaces
- Screens accessible by remotely accessing controls server
  - Must go through "hallgw" (accelerator firewall gateway) with two-factor authentication if offsite
- DSG proposed converting critical operations screens to WEDM to improve ease of offsite monitoring

# Web Extensible Display Manager (WEDM)

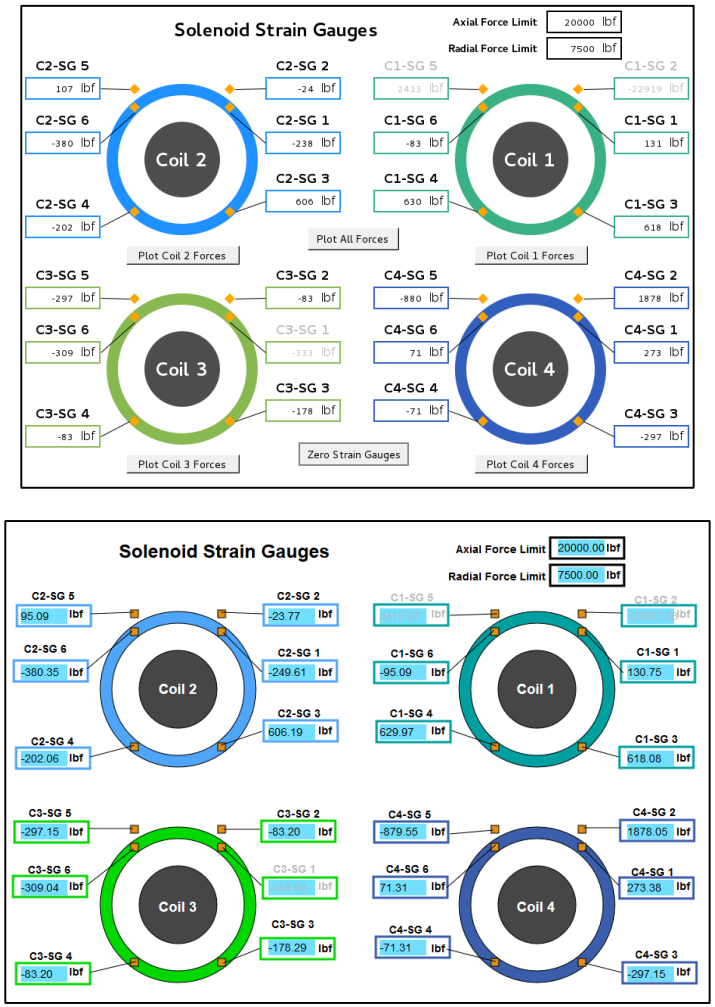
- Displays EDM screens as HTML in web browser
  - Login with CUE username and password required
- Read-only access; no controls
- Alarm display capabilities
  - Alarm values must already exist in IOC database
- Requires .opi files from CSS to be converted to .edl files for EDM




WEDM log-in screen

# How CSS Screens are Converted to WEDM

- Both .opi and .edl file formats are text
  - CSS .opi files are XML
  - EDM .edl files are plain text
- DSG-developed script parses .opi file for widgets and then creates equivalent widgets in .edl file
- Widgets able to convert:
  - Static text
  - Lines
  - Circles
  - Rectangles
  - GIF images
  - PNG images
  - Bar monitors
  - Text monitors
  - LEDs



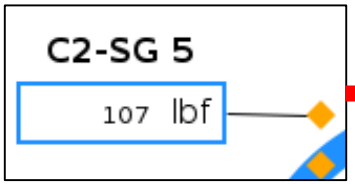




Comparison of Solenoid Strain Gauges CSS screen (top) and WEDM screen (bottom).

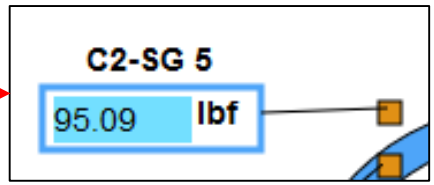
# Example Conversion of Widget

## Indicator in CSS .opi File




Graphics

## Indicator in WEDM .edl File




```
<widget typeId="org.csstudio.opibuilder.widgets.TextUpdate" version="1.0">
  <border_alarm_sensitive>true</border_alarm_sensitive>
  <visible>true</visible>
  <vertical_alignment>1</vertical_alignment>
  <show_units>false</show_units>
  <wuid>6dbd36b3:145d20a11c7:-7197</wuid>
  <auto_size>false</auto_size>
  <rotation_angle>0.0</rotation_angle>
  <scripts />
  <height>20</height>
  <name>Coil2-SG5</name>
  <forecolor_alarm_sensitive>false</forecolor_alarm_sensitive>
  <scale_options>
    <width_scalable>true</width_scalable>
    <height_scalable>true</height_scalable>
    <keep_wh_ratio>false</keep_wh_ratio>
  </scale_options>
  <format_type>0</format_type>
  <precision_from_pv>false</precision_from_pv>
  <transparent>false</transparent>
  <pv_name>SOL:i::Solenoid_Magnet-Coil2-SG5</pv_name>
  <background_color>
    <color red="255" green="255" blue="255" />
  </background_color>
  <foreground_color>
    <color red="0" green="0" blue="0" />
  </foreground_color>
  <widget type>Text Update</widget type>
  <enabled>true</enabled>
  <text>#####</text>
  <backcolor_alarm_sensitive>false</backcolor_alarm_sensitive>
  <precision>0</precision>
  <font>
    <opifont.name fontName="Sans" height="10" style="0">Default</opifont.name>
  </font>
  <width>60</width>
  <border_style>0</border_style>
  <rules />
  <pv_value />
  <border_width>1</border_width>
  <border_color>
    <color red="0" green="128" blue="255" />
  </border_color>
  <horizontal_alignment>2</horizontal_alignment>
  <actions hook="true" hook_all="true">
    <action type="OPEN_OPI_IN_VIEW">
      <path>stripchart.opi</path>
      <macros>
        <include_parent_macros>true</include_parent_macros>
        <input_pv>$(pv_name)</input_pv>
        <input_name>$(name)</input_name>
      </macros>
      <Position>4</Position>
      <description></description>
    </action>
  </actions>
  <y>29</y>
  <wrap_words>false</wrap_words>
  <tooltip>$(pv_name)</tooltip>
  <x>6</x>
</widget>
```

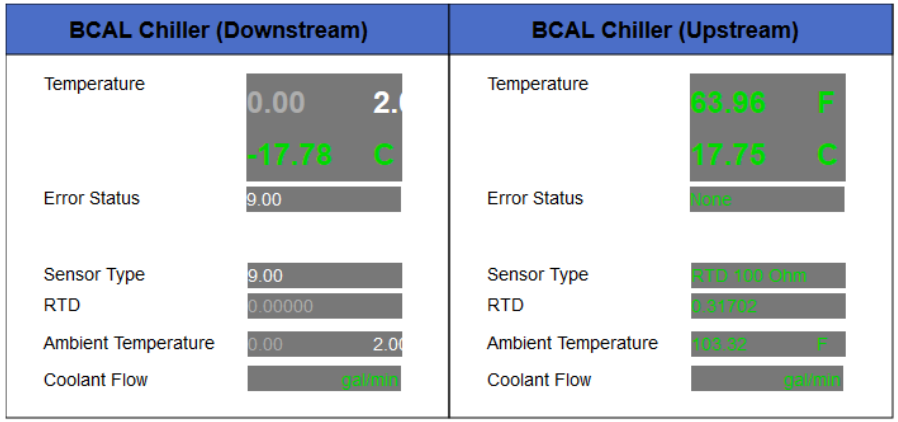
Text

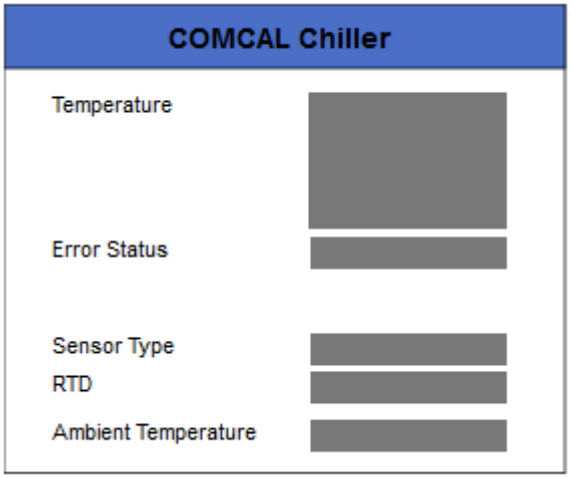
```
endObjectProperties

# (Textupdate)
object TextupdateClass
beginObjectProperties
major 10
minor 0
release 0
x 18
y 112
w 60
h 20
controlPv "SOL:i::Solenoid_Magnet-Coil2-SG5"
fgColor index 14
fgAlarm
bgColor index 51
fill
font "helvetica-medium-r-14.0"
endObjectProperties

# (Textupdate)
```

# Hall D WEDM Screens Requested

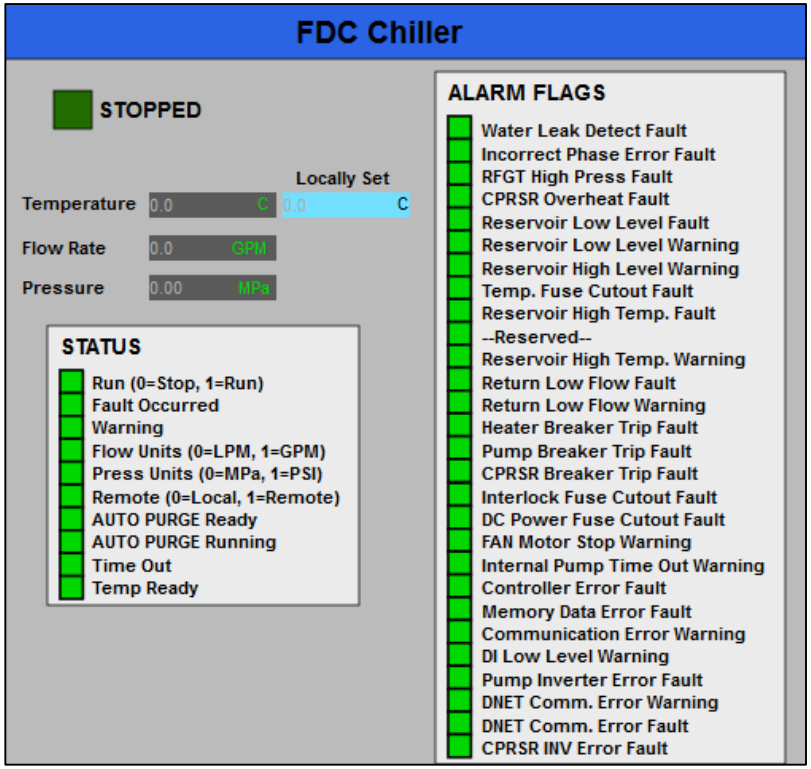
1. BCAL Chillers
2. ComCal Chiller
3. FDC Chiller
4. Beamline Vacuum
5. ComCal Environment
6. DIRC Environment
7. CDC/FDC Gas System
8. Hall D Ambient Environment
9. Tagger NMR Controls
10. Solenoid Power Supply
11. Solenoid Strain Gauges
12. Solenoid Interlocks
13. Solenoid Voltage Taps
14. Solenoid Vacuum Pumps
15. Solenoid Cryogenics
16. Solenoid Coil 1 Temperatures
17. Solenoid Coil 2 Temperatures
18. Solenoid Coil 3 Temperatures
19. Solenoid Coil 4 Temperatures

# BCAL, ComCal, and FDC Chillers

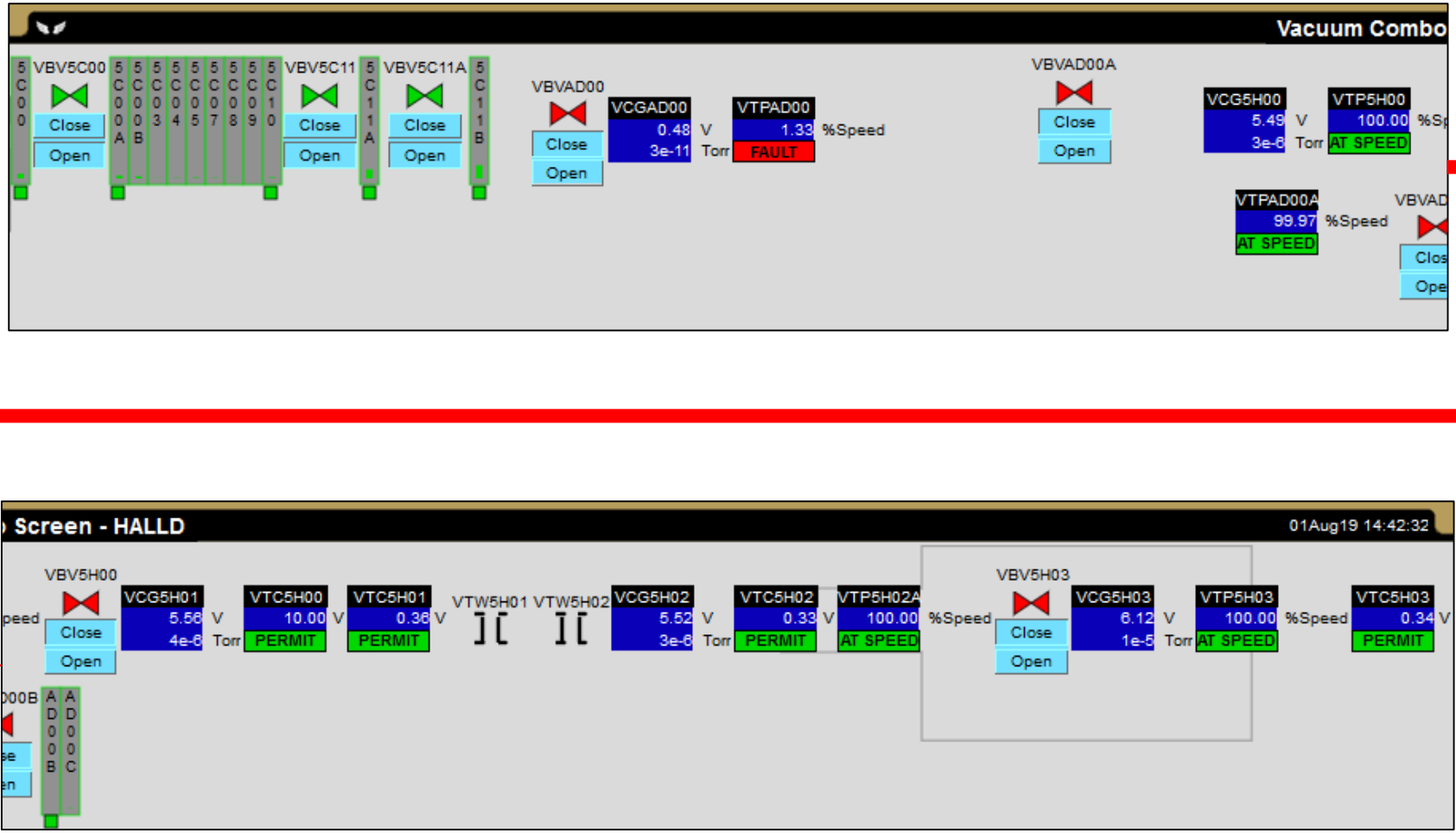



Empty indicators for ComCal Chiller are due to PVs being undefined in IOC at time of screenshot, not problem with WEDM screen.

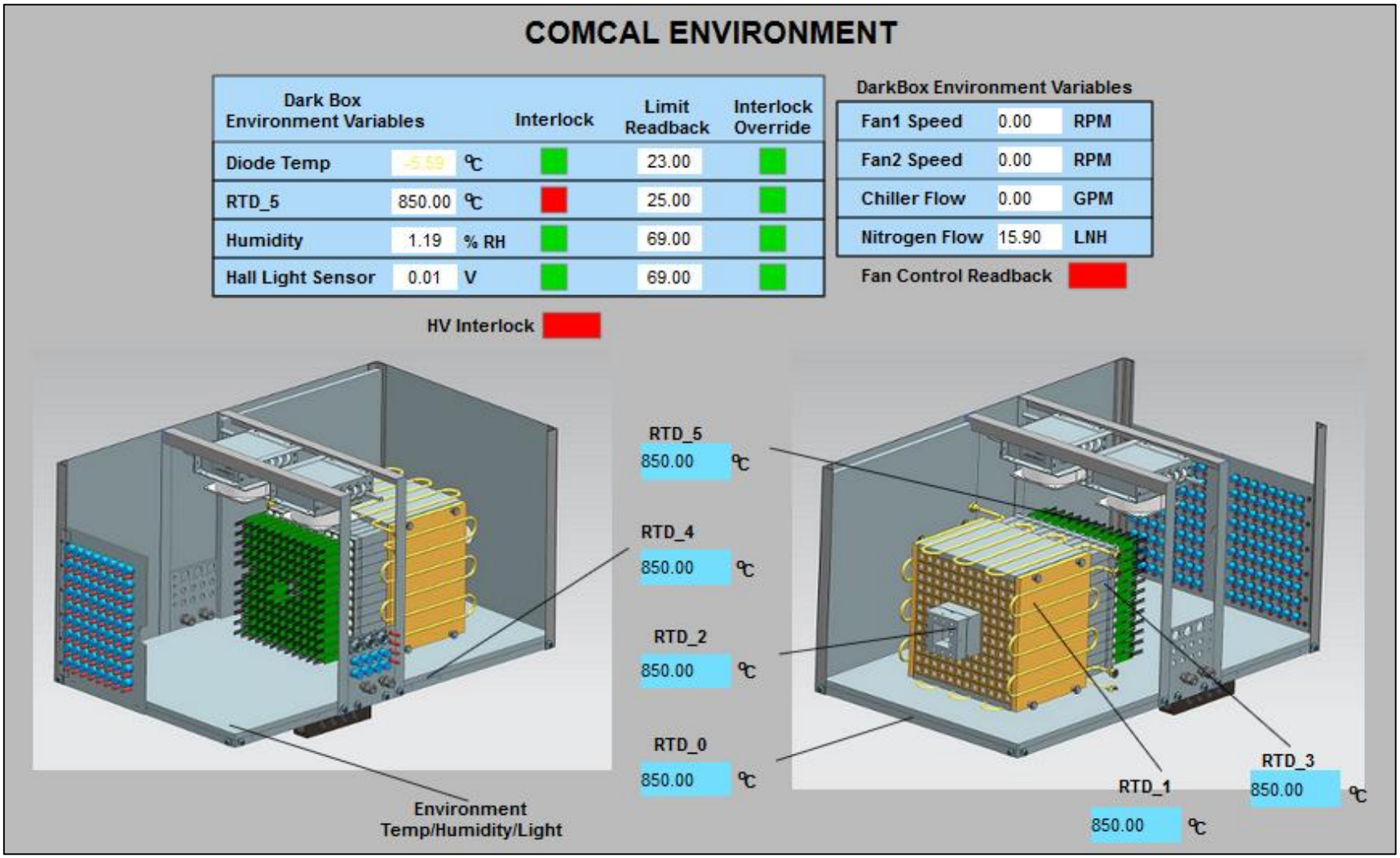


# Beamline Vacuum

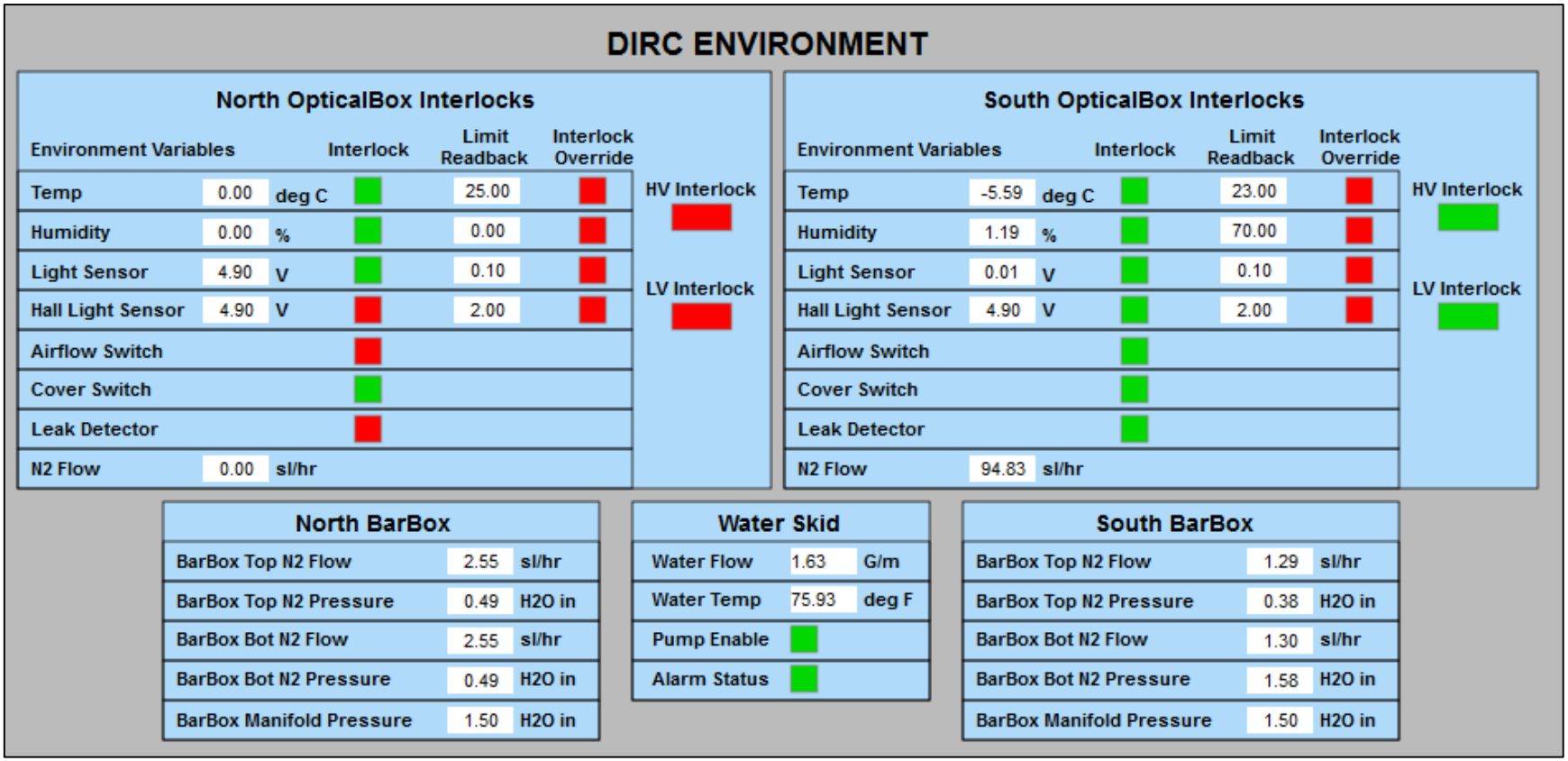



To show entire screen on one slide in a way that is readable, screen is split into two parts.

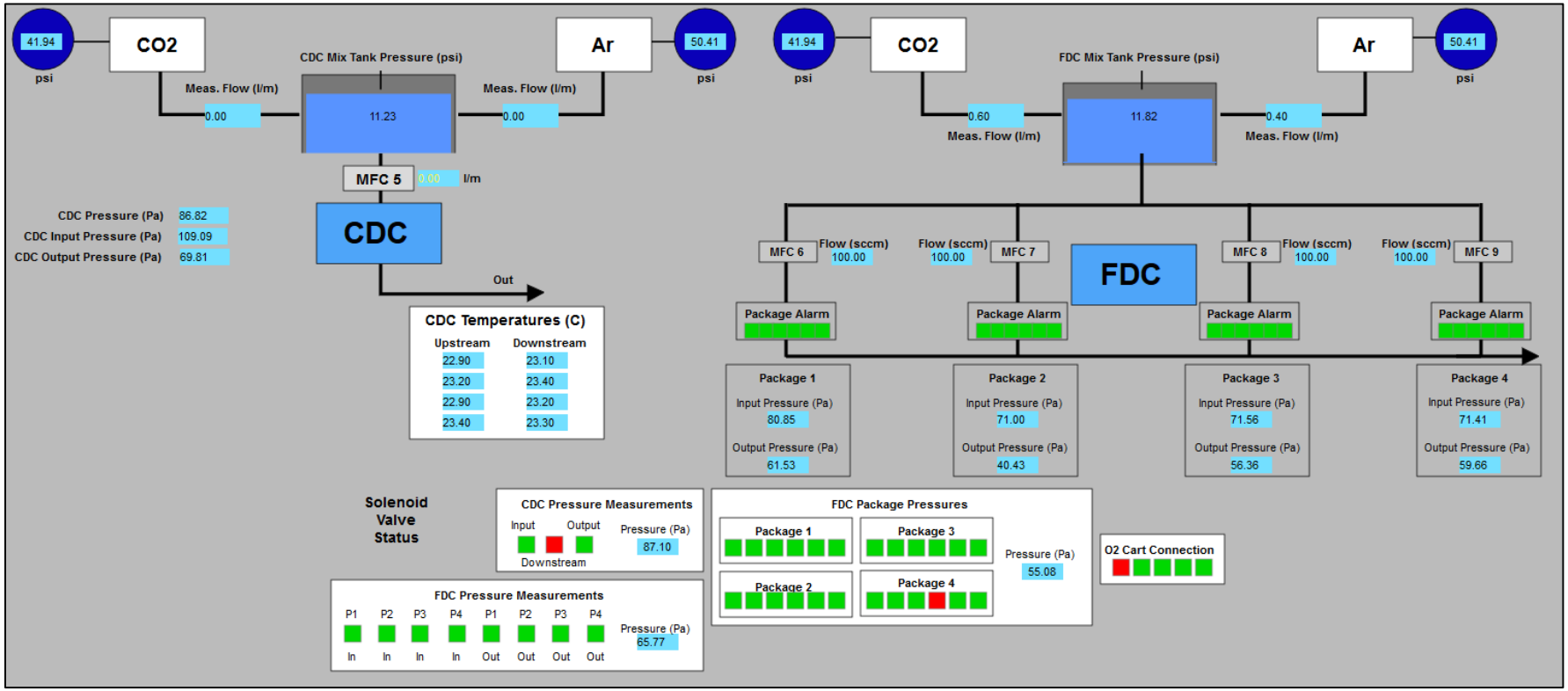
# ComCal Environment



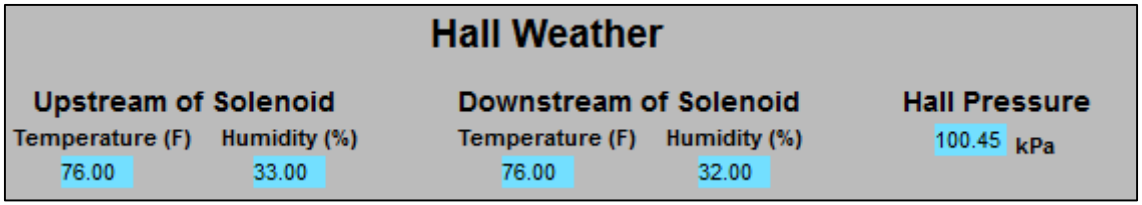
# DIRC Environment

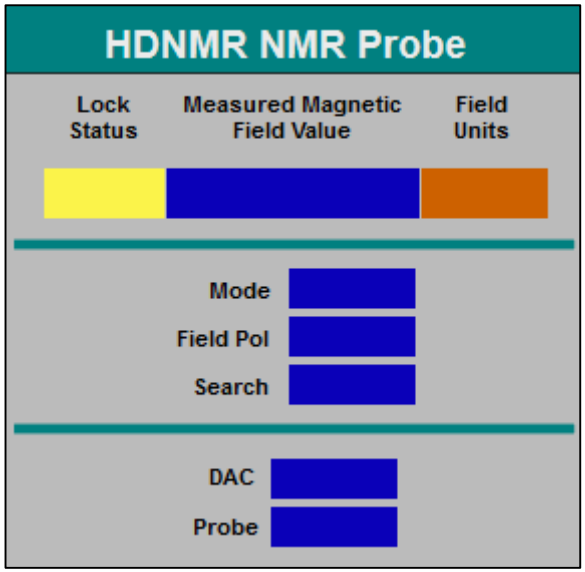


# FDC/CDC Gas System



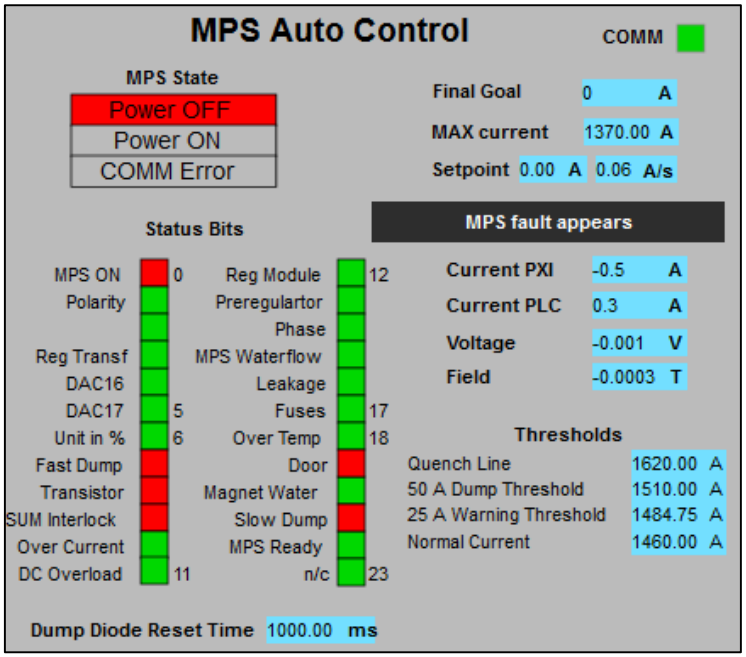
# Hall Ambient Environment and Tagger NMR

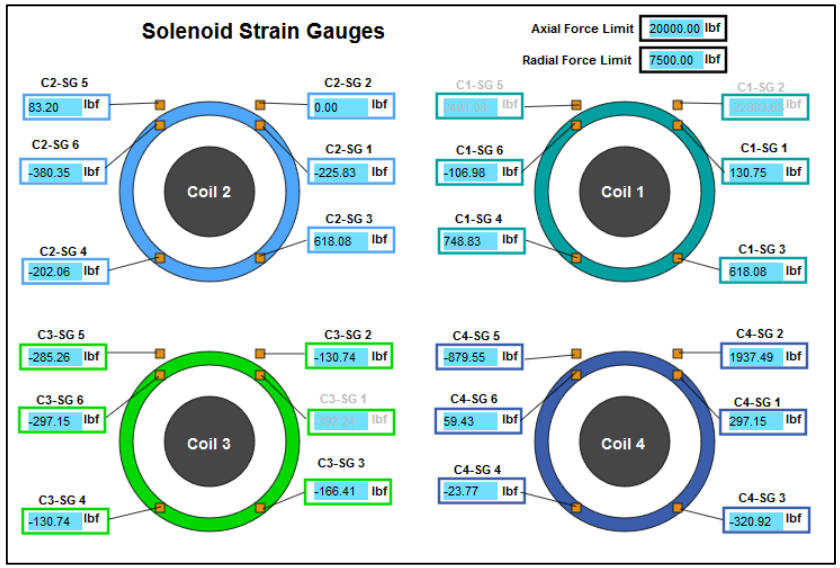


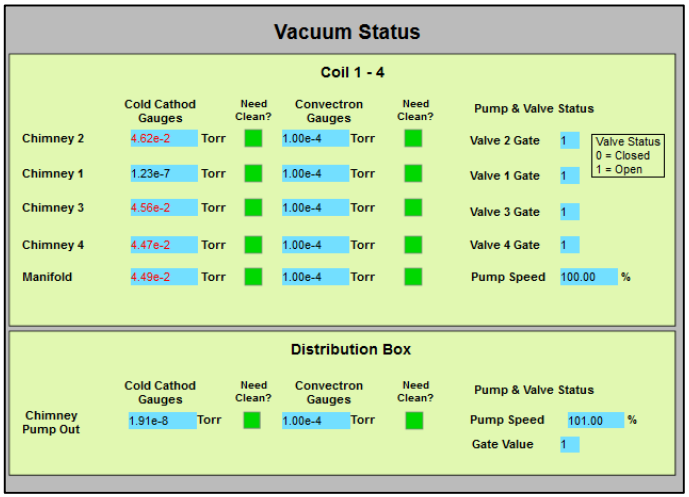




Empty indicators for HDNMR NMR Probe are due to PVs being undefined in IOC at time of screenshot, not problem with WEDM screen.

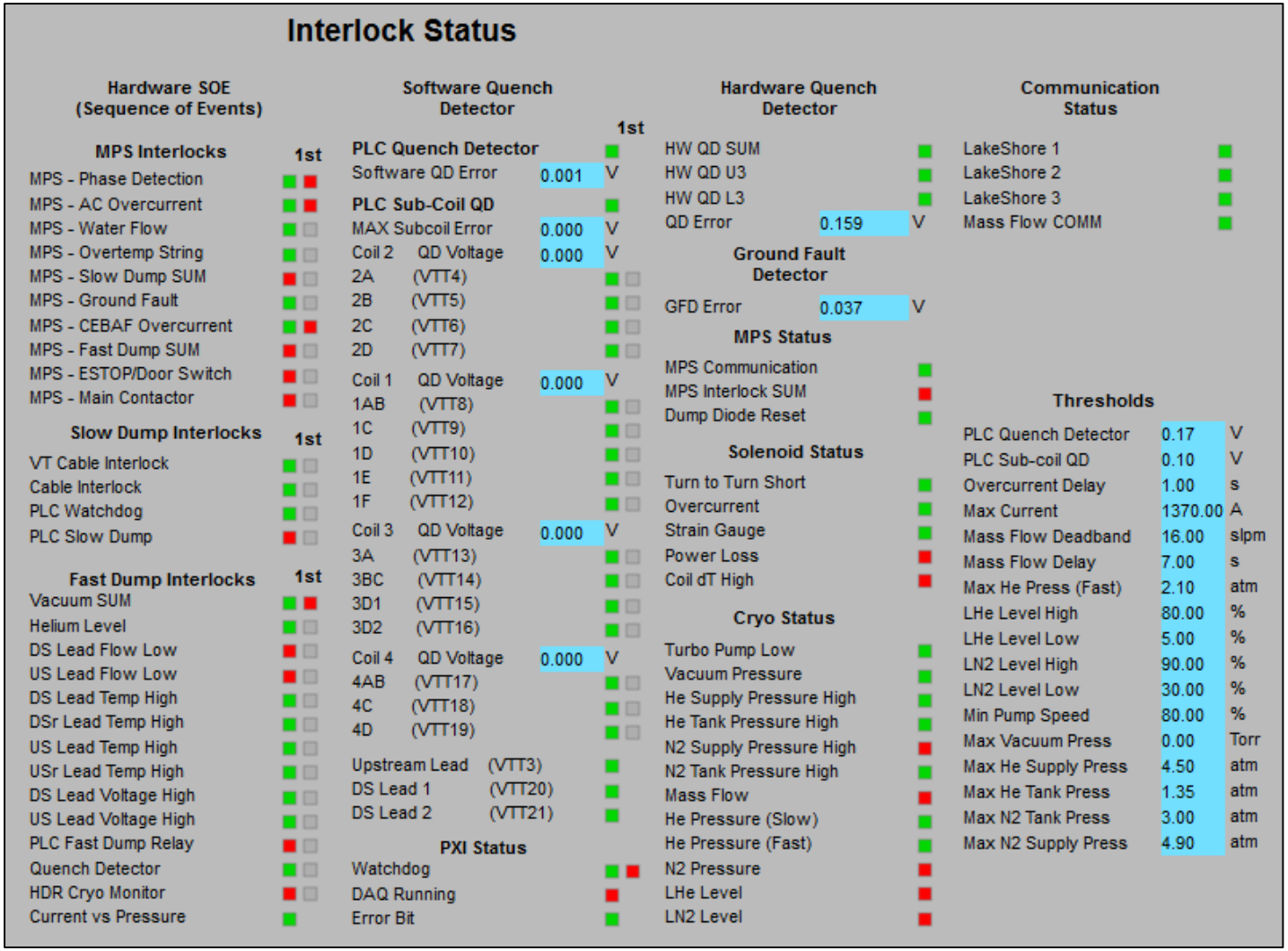
# Solenoid MPS, Strain Gauges, and Vacuum



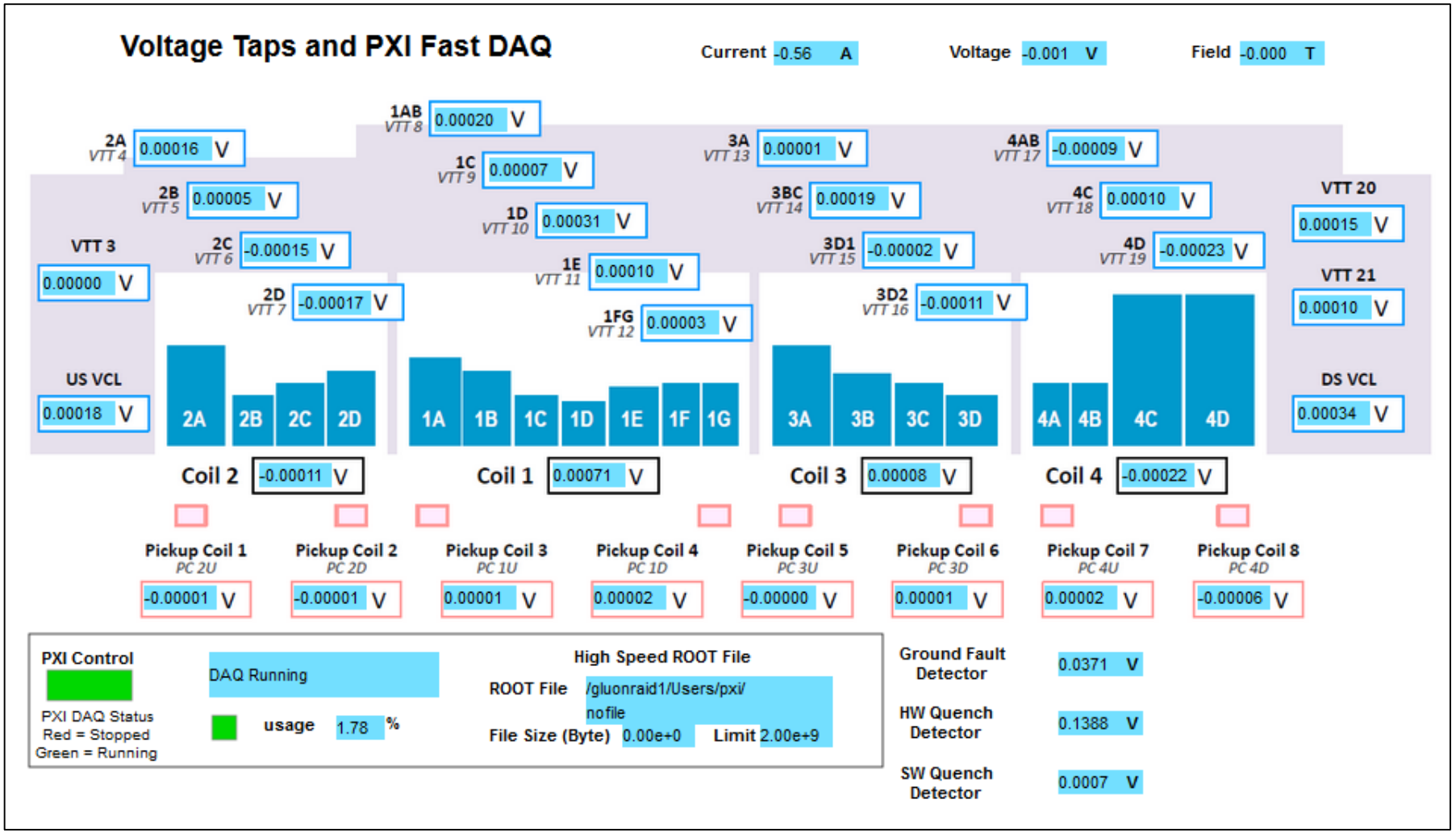



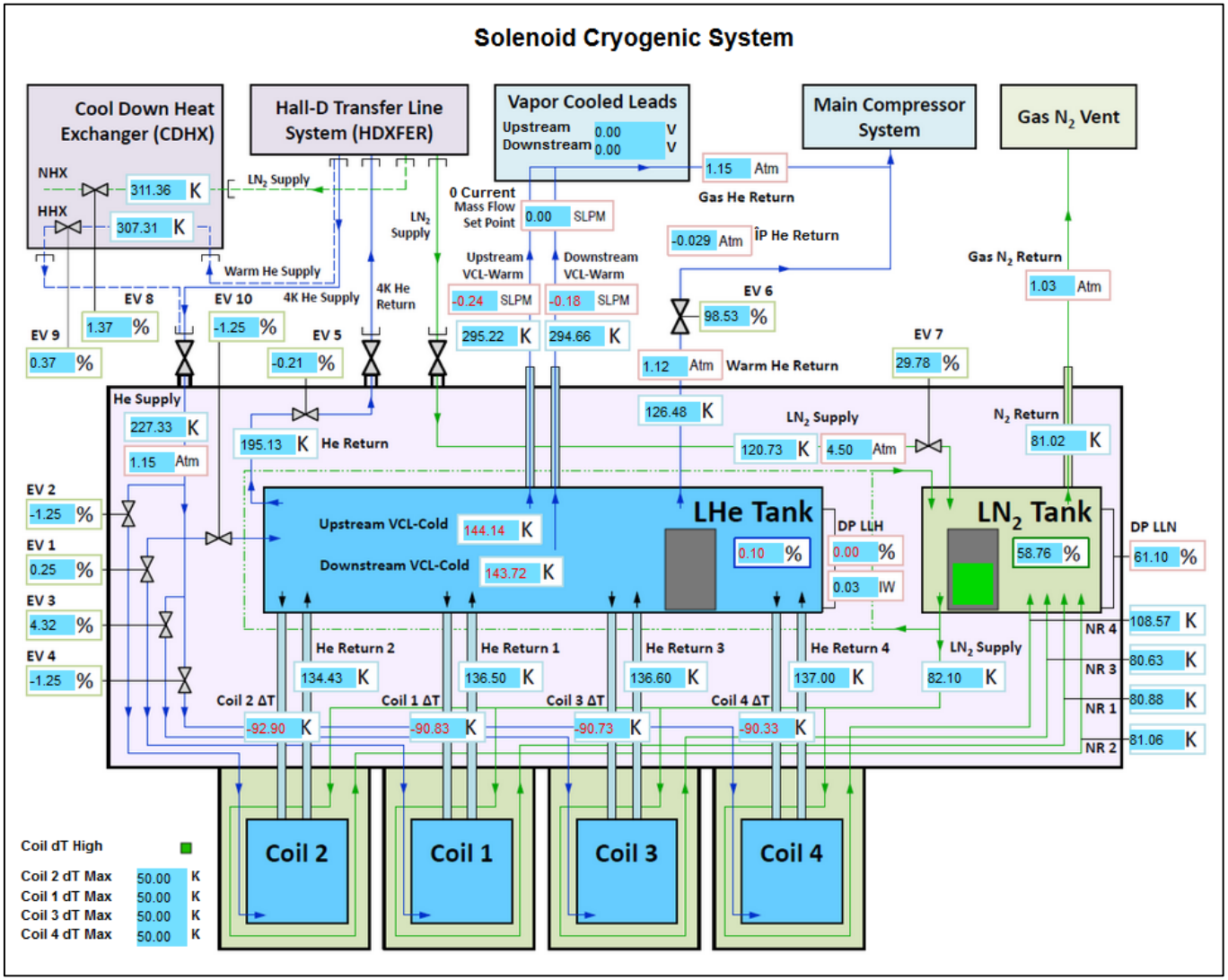
# Solenoid Interlocks



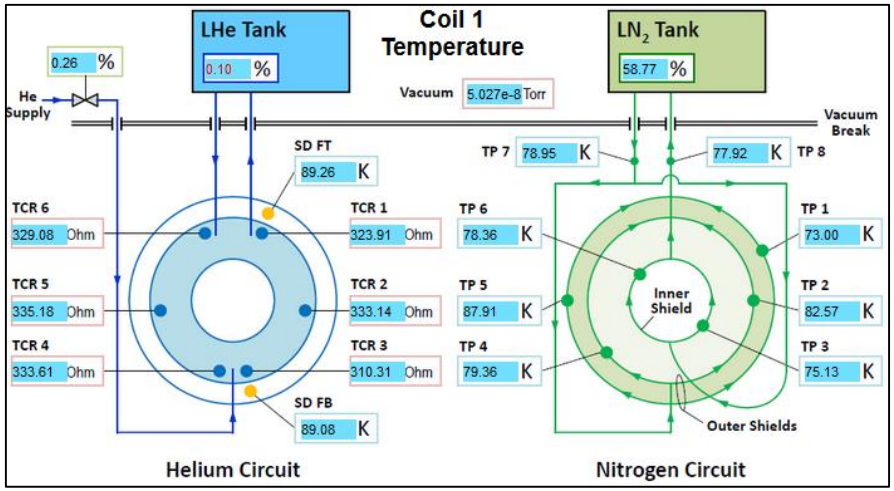
# Solenoid Voltage Taps

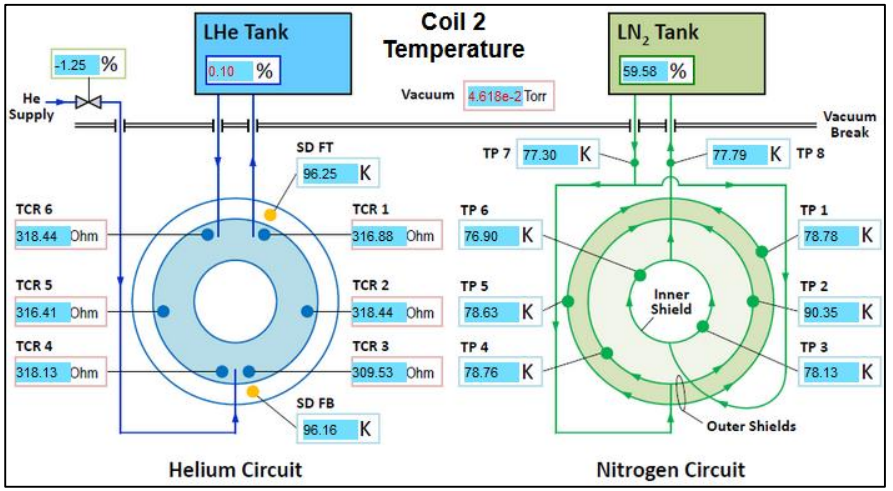


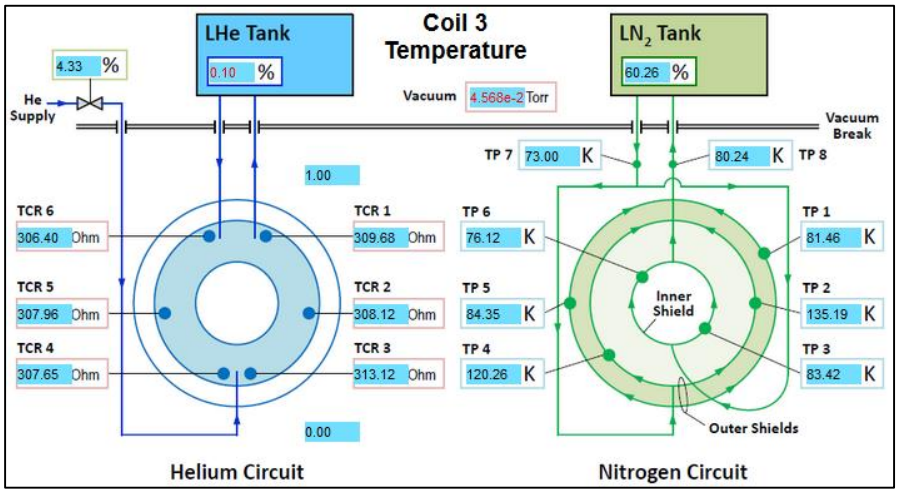
# Solenoid Cryogenics

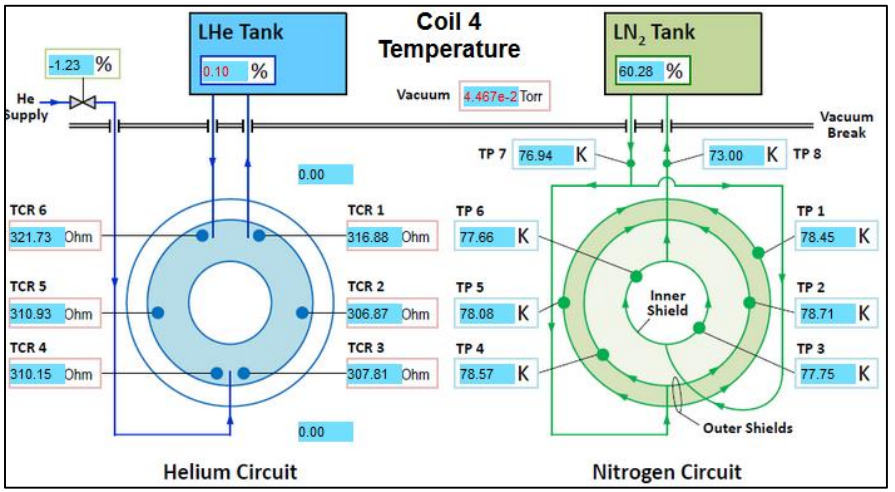


# Solenoid Coils 1, 2, 3, and 4 Temperatures



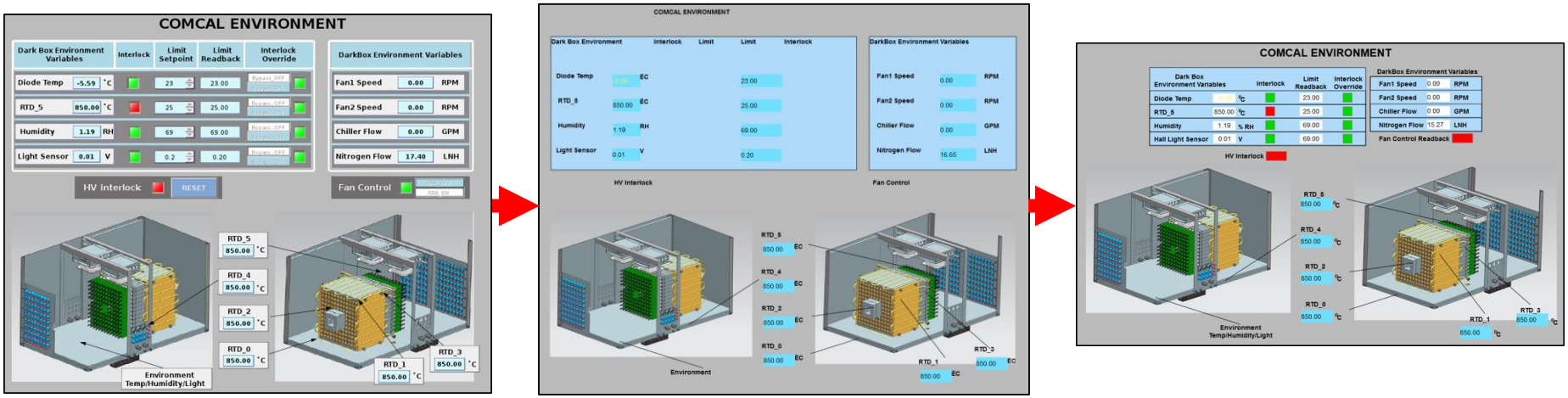



# Problems Faced

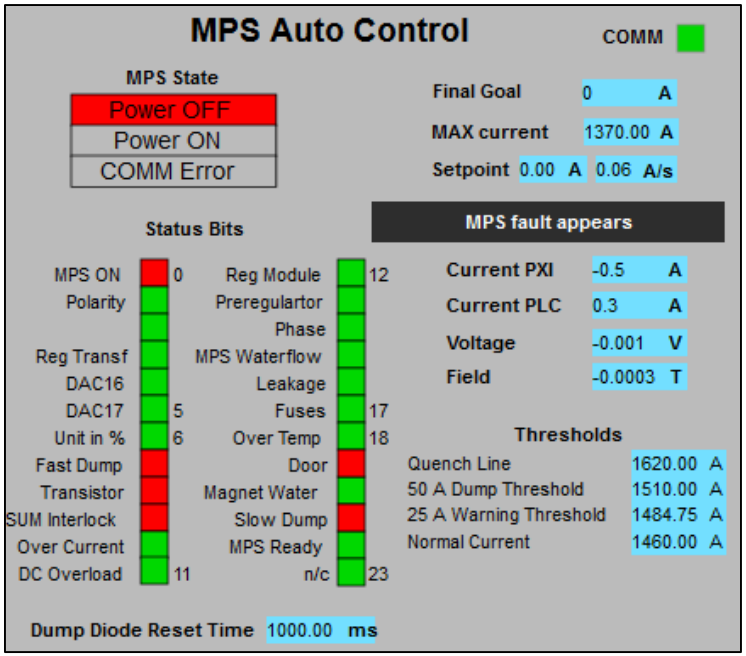
1. Lack of controls in WEDM and differences in text box behavior caused empty space to appear on converted screens
   - Screens affected: all screens
   - Solution: Rearrange WEDM screens to remove space from missing controls and manually resize text/text boxes



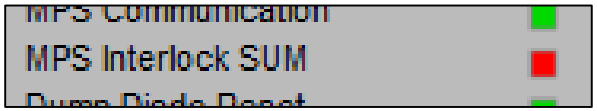

Comparison of ComCal Environment CSS screen (left), newly converted WEDM screen (middle) and deployed WEDM screen (right). WEDM screen leaves out "Limit Setpoint", "Interlock Override", "HV Interlock Reset", and "Fan Control" controls. Script also does not transfer text sizes, requiring labels to be manually resized and placed.

# Problems Faced

2. Some PVs were generated by script in CSS and do not exist outside of CSS runtime environment
   - Screens affected: MPS auto control, Solenoid interlocks, Solenoid voltage taps
   - Solution: Add PVs to EPICS IOC for status bits and perform simple calculations in EDM



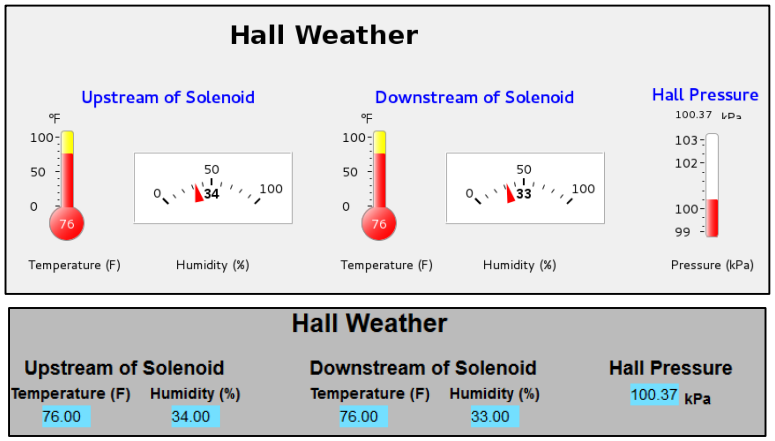

WEDM screen for MPS power supply. In CSS, PVs for status bit indicators were generated by script and had to be added to IOC for display in WEDM.

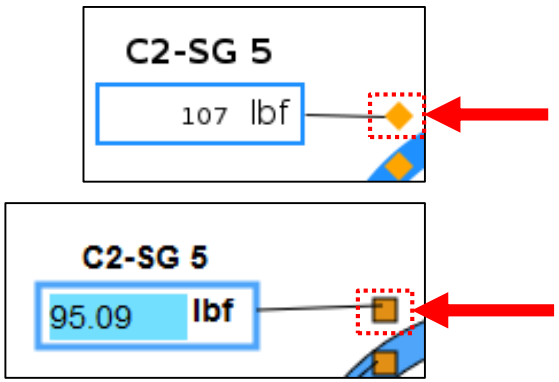

Top: Indicators displaying EDM calculation for summed coil voltages on Solenoid voltage tap WEDM screen. Bottom/Left: MPS interlock sum status bit on WEDM Solenoid interlocks screen whose PV was added to IOC.

# Problems Faced

3. Some CSS graphical widgets (thermometer, gauges, polygons) do not exist in WEDM.
   - Screens affected: Hall D ambient environment, CDC/FDC gas system, Solenoid strain gauges
   - Solution: Replace widgets with text monitors and basic shapes.




Comparison of Hall Weather CSS screen (top) and WEDM screen (bottom). WEDM does not support thermometer and gauge graphical widgets, so they were replaced with text indicators in WEDM.

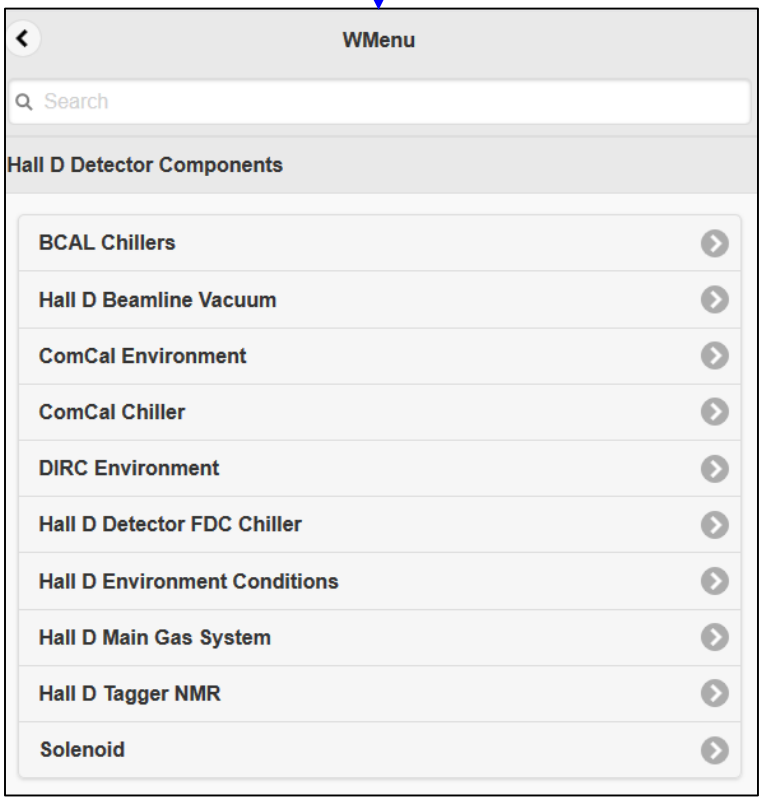



Top: Example of unsupported polygon in use on Solenoid strain gauge CSS screen.
Bottom: Example of polygon replaced with rectangle widget on Solenoid strain gauge WEDM screen.

# Conclusion

- CSS screens converted to WEDM using DSG-developed script
  - Problems faced during conversion have all been resolved
- Screens added to WEDM server with WMenu links
  - https://epicsweb.jlab.org/
- **All 19 requested screens have been converted**

**WMenu Path**
Main Menu
└ Standalone Menus
└ Hall D Standalone Menu
└ Hall D Detector Components




WMenu links for all Hall D WEDM screens.