

FDC EPICS INTERLOCK

Hovanes Egiyan

Introduction

- There is a FDC hardware interlock that shuts off the MPOD power supply when the chiller status is OFF
 - Read from a relay on the FDC chiller
- No interlock on any temperature to shut off either the chiller or the FDC MPOD.
- We saw FD chiller run at temperatures above 30 °C and below freezing without getting shut off when temperature went above 30°C.
 - There was an alarm on the chiller when
- No interlock on any temperature to shut off either the chiller or the FDC MPOD.
- Need an interlock on actual temperatures to shut off the power supply, preferably in PLC.
- Quickly wrote an EPICS software interlock to shut off the power supply when the flow or the temperature as reported by the chiller is out of specified range.
 - Uses FDC chiller software developed and installed by Wesley.

chiller_smc.opi

FDC Chiller

● RUNNING

Temperature (C) 19.9 C Locally Set 20.0 C

Flow Rate (GPM) 15.0 GPM

Pressure (MPa) 0.79 MPa

STATUS

- Run (0=Stop, 1=Run)
- Fault Occurred
- Warning
- Flow Units (0=LPM, 1=GPM)
- Press Units (0=MPa, 1=PSI)
- Remote (0=Local, 1=Remote)
- AUTO PURGE Ready
- AUTO PURGE Running
- Time Out
- Temp Ready

ALARM FLAGS

- Water Leak Detect Fault
- Incorrect Phase Error Fault
- RFGT High Press Fault
- CPRSR Overheat Fault
- Reservoir Low Level Fault
- Reservoir Low Level Warning
- Reservoir High Level Warning
- Temp. Fuse Cutout Fault
- Reservoir High Temp. Fault
- --Reserved--
- Reservoir High Temp. Warning
- Return Low Flow Fault
- Return Low Flow Warning
- Heater Breaker Trip Fault
- Pump Breaker Trip Fault
- CPRSR Breaker Trip Fault
- Interlock Fuse Cutout Fault
- DC Power Fuse Cutout Fault
- FAN Motor Stop Warning
- Internal Pump Time Out Warning
- Controller Error Fault
- Memory Data Error Fault
- Communication Error Warning
- DI Low Level Warning
- Pump Inverter Error Fault
- DNET Comm. Error Warning
- DNET Comm. Error Fault
- CPRSR INV Error Fault

- Limits are settable
 - Persistent using autosave module
- Interlock can be enabled/disabled
- Interlock latches
- Once engaged, the interlock needs to be reset by clicking a button on a GUI.
- Need to add the temperature, flow rate and the software interlock status to the FDC voltage GUI

voltageInterlock.opi

FDC SOFTWARE INTERLOCK

Minium Temperature	Maximum Temperature	Measured Temperature	Interlock Delay
15 C	30 C	19.9 C	10 sec
Minium Flow	Maximum Flow	Measured Flow	Switch Setpoint
10 lpm	20 lpm	14.7 GPM	-1

● Instantenous interlock
 ● Delayed interlock
 ● Final Interlock Status

RESET INTERLOCK
DISABLE INTERLOCK

First check for faults

Second check for faults

Reset of interlocks

Interlock status

Disables interlock

Persistently turn off Power supply

```

calcout
$(P)first_check
INPA=#T_VAL
INPB=#P1_min
DESC=First temp test
SCAN=2 second
CALC=(C<A)||A<B||O<E||E<F)&(D#
DOPT=Use OCAL
OOPT=When Non-zero
OCAL=1
OUT=#P)second_check PP
INPD=#P)intlk_bypass
INPE=#Q_VAL
INPC=#P)1_max
INPF=#P)1_min.VAL
INPG=#P)1_max
  
```

```

$(P)q_min
VAL=10
EQU=1pm
  
```

```

ai
$(P)t_min
VAL=15
EQU=C
  
```

```

calcout
$(P)second_check
INPA=#T_VAL
INPB=#P)1_min.VAL
INPC=#P)1_max.VAL
CALC=(C<A)||A<B||O<E||E<F)&(D#
SCAN=Passive
DESC=Second check
PINI=NO
DOPT=Use CALC
OOPT=When Non-zero
OUT=#P)intlk_status.VAL PP
OCAL=1
INPD=#P)intlk_bypass
INPE=#Q_VAL
INPF=#P)1_min.VAL
INPG=#P)1_max
  
```

```

bo
$(P)intlk_reset
DESC=Reset interlock
VAL=0
SCAN=Passive
PINI=NO
UDF=0
OUT=#P)intlk_status.VAL PP
  
```

```

ai
$(P)t_max
VAL=30
EQU=C
  
```

```

ai
$(P)q_max
VAL=20
EQU=1pm
  
```

```

bo
$(P)intlk_bypass
SCAN=Passive
DESC=Bypass interlock
VAL=0
PINI=YES
ZNAM=NO BYPASS
ONAM=BYPASS
  
```

```

INPF
INPB
INPA
INPE
VAL
OUT
INPC
INPG
INPD
  
```

```

bo
$(P)force_off
OUT=#PV_2_ZERO) PP
DESC=Force Zero
VAL=0
SCAN=1 second
SDIS=#P)intlk_status.VAL
DISV=0
  
```

```

bo
$(P)intlk_status
DESC=Status of Interlock
SCAN=Passive
VAL=0
PINI=YES
ONAM=Engaged
ZNAM=Fine
ZSV=NO_ALARM
OSV=MAJOR
  
```

```

ao
$(P)intlk_delay
SCAN=Passive
PINI=YES
VAL=10
OUT=#P)first_check.ODLY
EQU=sec
  
```

```

INPF
INPB
INPA
INPE
OUT
INPC
INPG
INPD
ODLY
  
```

```

SDIS
OUT
  
```

```

PV_2_ZERO
  
```

