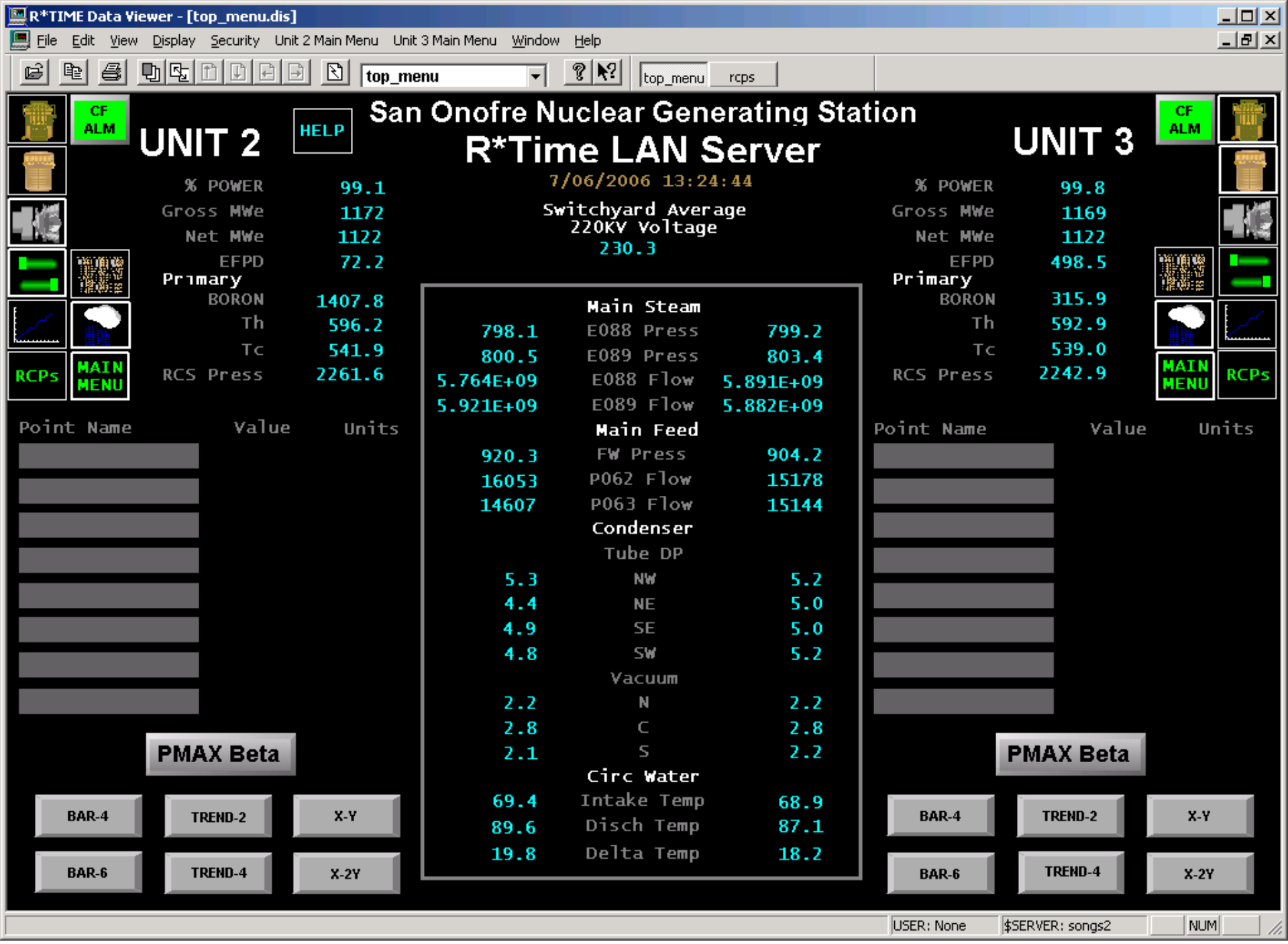
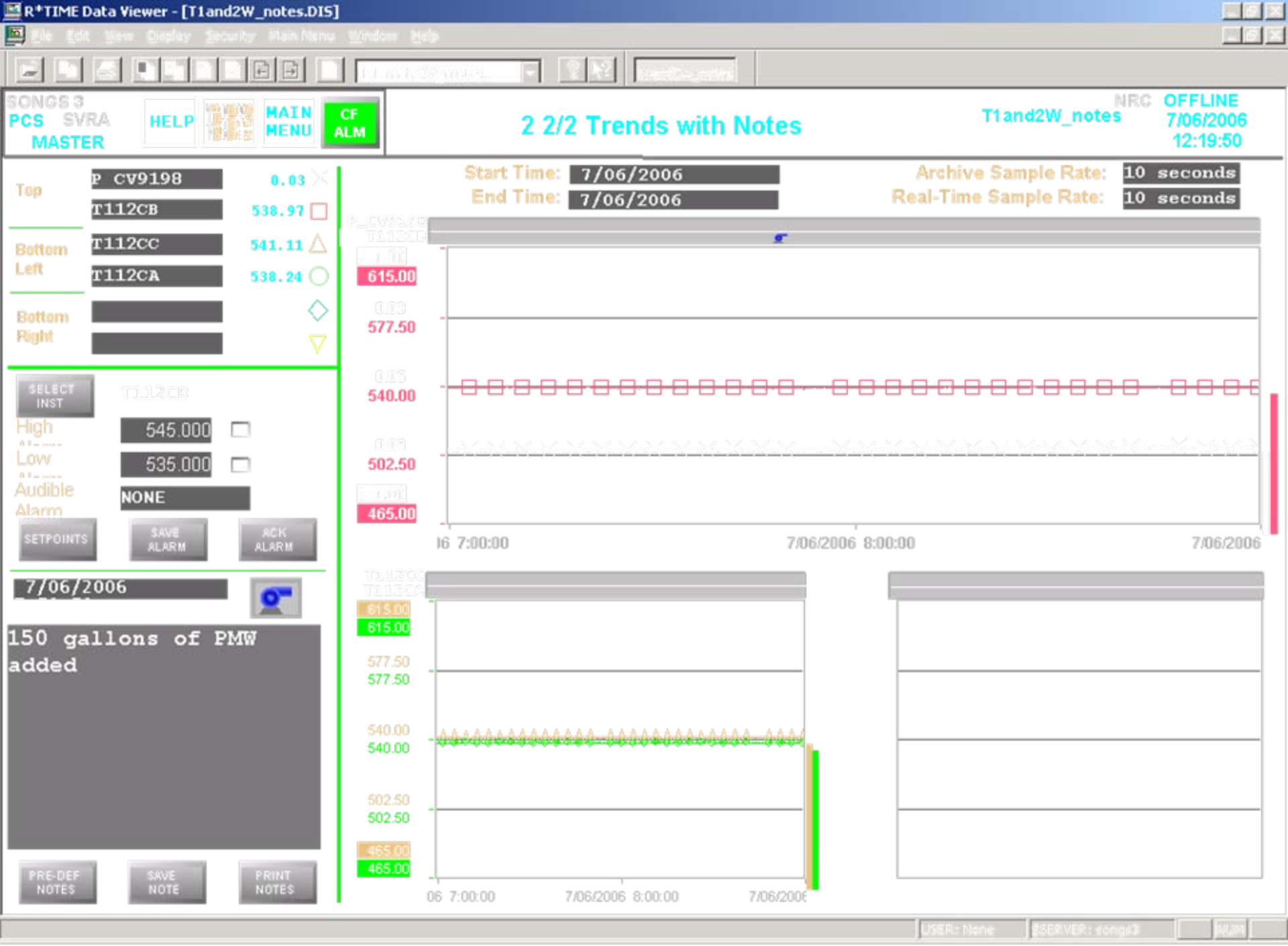
SONGS Custom Displays

Custom R*Time displays developed at SONGS.


R*TIME Data Viewer - [top_menu.dis]
File Edit View Display Security Unit 2 Main Menu Unit 3 Main Menu Window Help
top_menu
top_menu rcps
CF ALM
HELP
San Onofre Nuclear Generating Station
R*Time LAN Server
7/06/2006 13:24:44
UNIT 2
% POWER 99.1
Gross MWe 1172
Net MWe 1122
EFPD 72.2
Primary
BORON 1407.8
Th 596.2
Tc 541.9
RCS Press 2261.6
Switchyard Average
220KV Voltage
230.3
UNIT 3
% POWER 99.8
Gross MWe 1169
Net MWe 1122
EFPD 498.5
Primary
BORON 315.9
Th 592.9
Tc 539.0
RCS Press 2242.9
RCPs
MAIN MENU
Point Name Value Units
Main Steam
798.1 E088 Press 799.2
800.5 E089 Press 803.4
5.764E+09 E088 Flow 5.891E+09
5.921E+09 E089 Flow 5.882E+09
Main Feed
920.3 FW Press 904.2
16053 P062 Flow 15178
14607 P063 Flow 15144
Condenser
Tube DP
5.3 NW 5.2
4.4 NE 5.0
4.9 SE 5.0
4.8 SW 5.2
Vacuum
2.2 N 2.2
2.8 C 2.8
2.1 S 2.2
Circ Water
69.4 Intake Temp 68.9
89.6 Disch Temp 87.1
19.8 Delta Temp 18.2
PMAX Beta
BAR-4 TREND-2 X-Y
BAR-6 TREND-4 X-2Y
USER: None
$SERVER: songs2
NUM

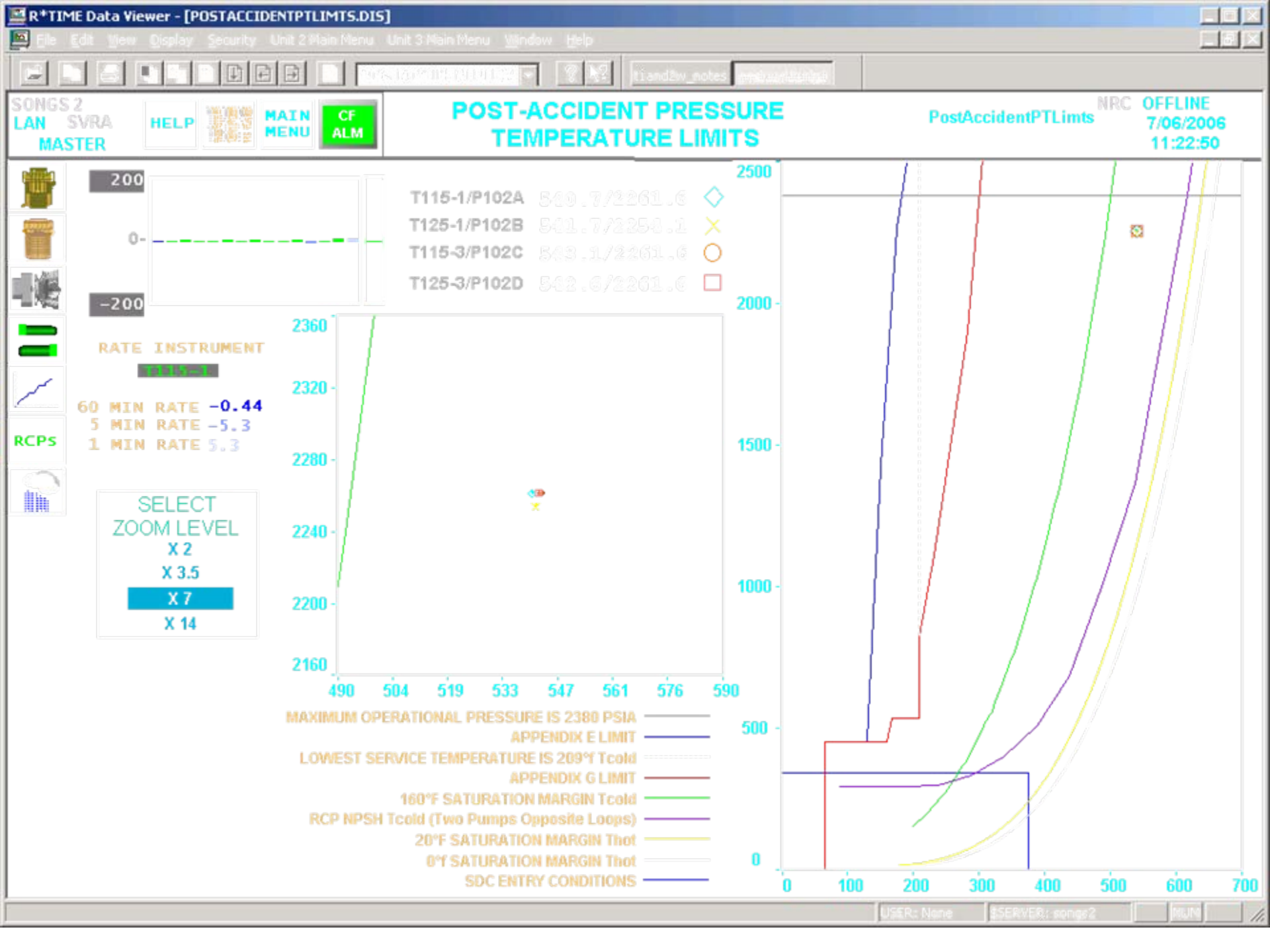
Trend with notes

- Simulates replaced chart recorders.
- Allows attaching notes to data points.
- Entering notes on one workstations and the notes will show up on all workstations with that point.
- View and print previous notes.


R*TIME Data Viewer - [T1and2W_notes.DIS]
File Edit View Display Security Main Menu Window Help
SONGS 3
PCS SVRA
MASTER
HELP
MAIN MENU
CF ALM
2 2/2 Trends with Notes
T1and2W_notes
NRC OFFLINE
7/06/2006
12:19:50
Top
P CV9198
0.03
T112CB
538.97
Bottom Left
T112CC
541.11
T112CA
538.24
Bottom Right
Start Time: 7/06/2006
End Time: 7/06/2006
Archive Sample Rate: 10 seconds
Real-Time Sample Rate: 10 seconds
615.00
577.50
540.00
502.50
465.00
7/06/2006 8:00:00
SELECT INST
T112CB
High
545.000
Low
535.000
Audible Alarm
NONE
SETPOINTS
SAVE ALARM
ACK ALARM
7/06/2006
150 gallons of PMW added
PRE-DEF NOTES
SAVE NOTE
PRINT NOTES
USER: None
SERVER: songs3

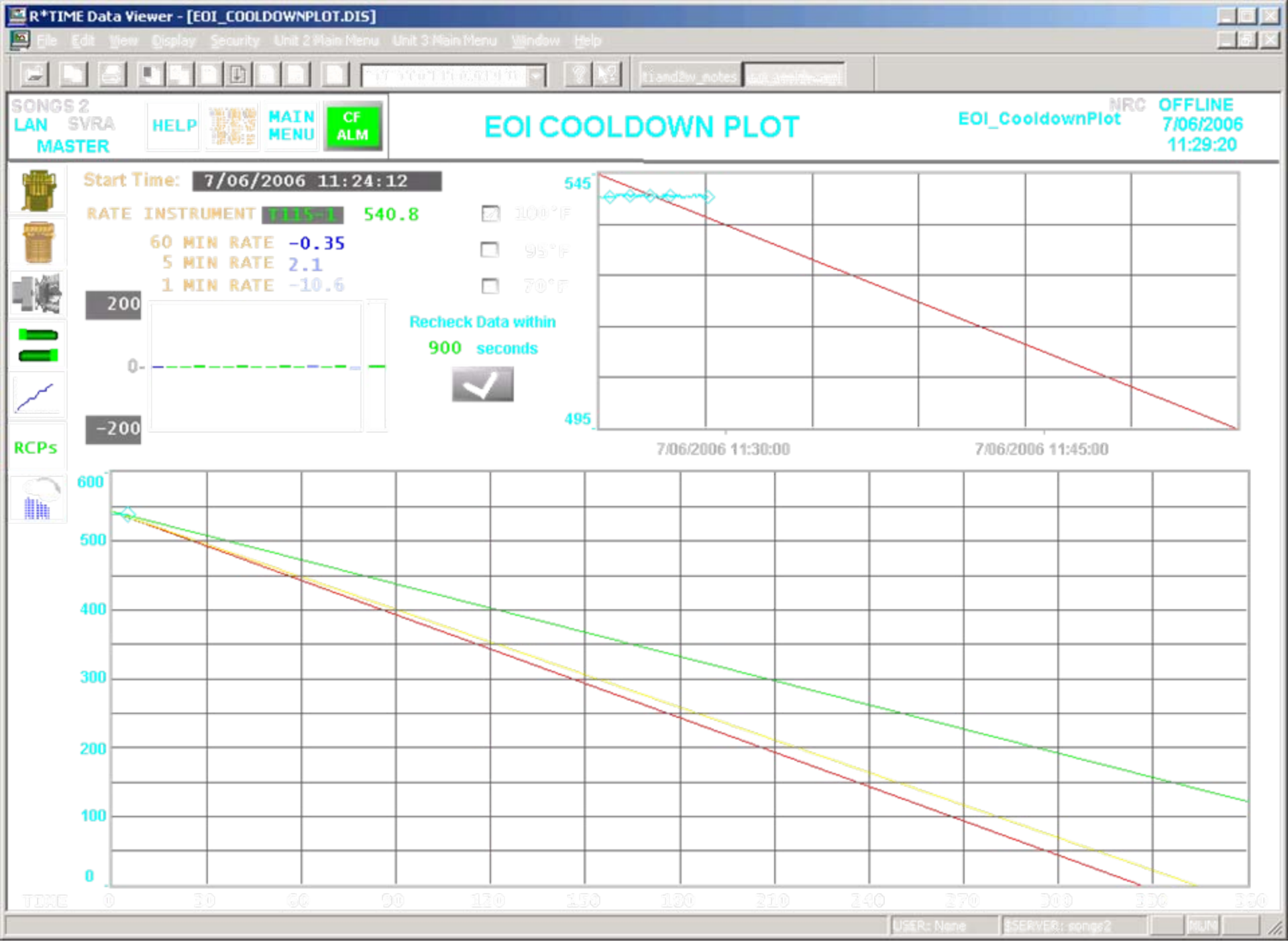
Post-Accident Pressure Temperature Limits

- Proportioned similar to hard copy.
- Made specifically for Post-Accident conditions.
- Plots four temperature / pressure pairs.
- Selectable zoom, which follows temperature and pressure changes.
- Heatup / Cooldown meter.


R*TIME Data Viewer - [POSTACCIDENTPTLIMTS.DIS]
File Edit View Display Security Unit 2 Main Menu Unit 3 Main Menu Window Help
SONGS 2
LAN SVRA
MASTER
HELP
MAIN MENU
CF ALM
POST-ACCIDENT PRESSURE TEMPERATURE LIMITS
PostAccidentPTLimts
NRC OFFLINE
7/06/2006
11:22:50
200
0
-200
RATE INSTRUMENT
60 MIN RATE -0.44
5 MIN RATE -5.3
1 MIN RATE 5.3
RCPs
SELECT ZOOM LEVEL
X 2
X 3.5
X 7
X 14
T115-1/P102A
T125-1/P102B
T115-3/P102C
T125-3/P102D
2360
2320
2280
2240
2200
2160
490
504
519
533
547
561
576
590
MAXIMUM OPERATIONAL PRESSURE IS 2380 PSIA
APPENDIX E LIMIT
LOWEST SERVICE TEMPERATURE IS 209°f Tcold
APPENDIX G LIMIT
160°F SATURATION MARGIN Tcold
RCP NPSH Tcold (Two Pumps Opposite Loops)
20°F SATURATION MARGIN Thot
0°f SATURATION MARGIN Thot
SDC ENTRY CONDITIONS
2500
2000
1500
1000
500
0
0
100
200
300
400
500
600
700
USER: None
SERVER: songs2

EOI Cooldown Plot

- Zoom with target temperature for selected Cooldown rate.
- Heatup / Cooldown meter.
- 15 minute count down timer. Reset from any Control Room workstation.


R*TIME Data Viewer - [EOI_COOLDOWNPLOT.DIS]
File Edit View Display Security Unit 2 Main Menu Unit 3 Main Menu Window Help
SONGS 2
LAN SVRA
MASTER
HELP
MAIN MENU
CF ALM
EOI COOLDOWN PLOT
EOI_CooldownPlot
NRC OFFLINE
7/06/2006
11:29:20
Start Time: 7/06/2006 11:24:12
RATE INSTRUMENT T115-1 540.8
60 MIN RATE -0.35
5 MIN RATE 2.1
1 MIN RATE -10.6
100°F
95°F
70°F
200
0
-200
Recheck Data within
900 seconds
RCPs
545
495
7/06/2006 11:30:00
7/06/2006 11:45:00
600
500
400
300
200
100
0
TIME

Natural Circulation

- Determines if Natural Circulation is met.
- Obvious from a distance, if conditions are not met.
- Displays inputs used to determine Natural Circulation.

R*TIME Data Viewer - [NATCIRC.DIS]

SONGS 2
PCS SVRA
MASTER

HELP | MAIN MENU | CF ALM

NATURAL CIRCULATION

NatCirc NRC OFFLINE
7/06/2006
12:53:44

LOOP 1/TRAIN A/E089

P001 P003

540.2 − 540.0 = 0.2 °F

600.0 500.0

540.2 °F Th
and
540.0 °F Tc

-10 min now

ABS(546.0 − 540.2) = 5.8 °F

32.0 °F

Head 100 %
Plenum 100 %

LOOP 2/TRAIN B/E088

P002 P004

540.3 − 539.0 = 1.3 °F

600.0 500.0

540.3 °F
539.0 °F

-10 min now

ABS(545.0 − 540.3) = 4.7 °F

35.0 °F

Head 100 %
Plenum 100 %

RCPs

ALL RCPs OFF

//06/06 12:46:21 +0:07:22

Th − Tc < 58°F

Th and Tc NOT rising

Th and REP CET within 16°F

Core Exit Saturation Margin >= 20°F

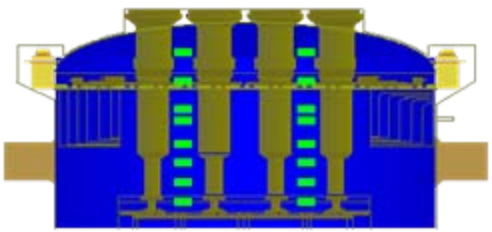
Reactor Vessel level >= 100% (Plenum)

Loop 1 Natural Circulation ESTABLISHED

a) Th - Tc < 58 °F
b) Th and Tc NOT rising
c) Th and REP CET within 16°F
d) Core Exit Sat Margine >= 20°F
e) Reactor Vessel level >= 100% (Plenum)

Reactor Vessel Level

Head 100 %
Plenum 100 %



Loop 2 Natural Circulation ESTABLISHED

a) Th - Tc < 58 °F
b) Th and Tc NOT rising
c) Th and REP CET within 16°F
d) Core Exit Sat Margine >= 20°F
e) Reactor Vessel level >= 100% (Plenum)

ESF Actuation Times

- Actuation times and Elapsed Time of ESF actuation.
- Time all four RCP’s are off.
- Single location for actuation times.

R*TIME Data Viewer - [ESF_ACTUATION.DIS]

File Edit View Display Security Unit 2 Main Menu Unit 3 Main Menu Window Help

SONGS 2
LAN SVRA
MASTER

HELP | MAIN MENU | CF ALM

ESF ACTUATION TIMES

ESF_Actuation NRC OFFLINE
7/06/2006
11:52:26

RCPs

ACTUATION TIME ELAPSED TIME

REACTOR NORMAL

SIAS NORMAL

CIAS NORMAL

CSAS NORMAL

MSIS NORMAL

EFAS 1 NORMAL

EFAS 2 NORMAL

CCAS NORMAL

RAS NORMAL

CPIS NORMAL

CRIS NORMAL

FHIS NORMAL

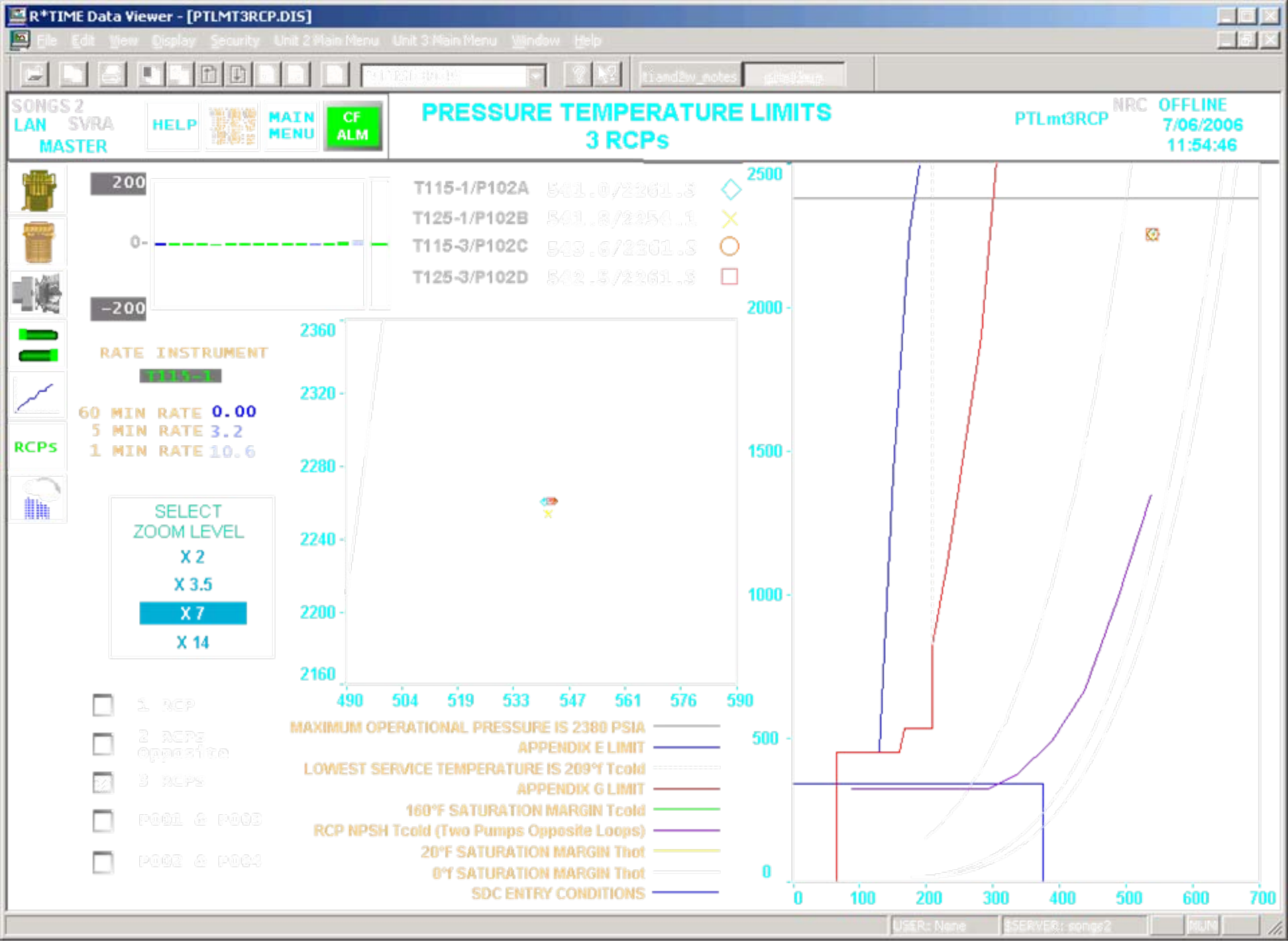
TGIS NORMAL

FOUR RCPs RUNNING

USER: None SERVER: songs2 RUN

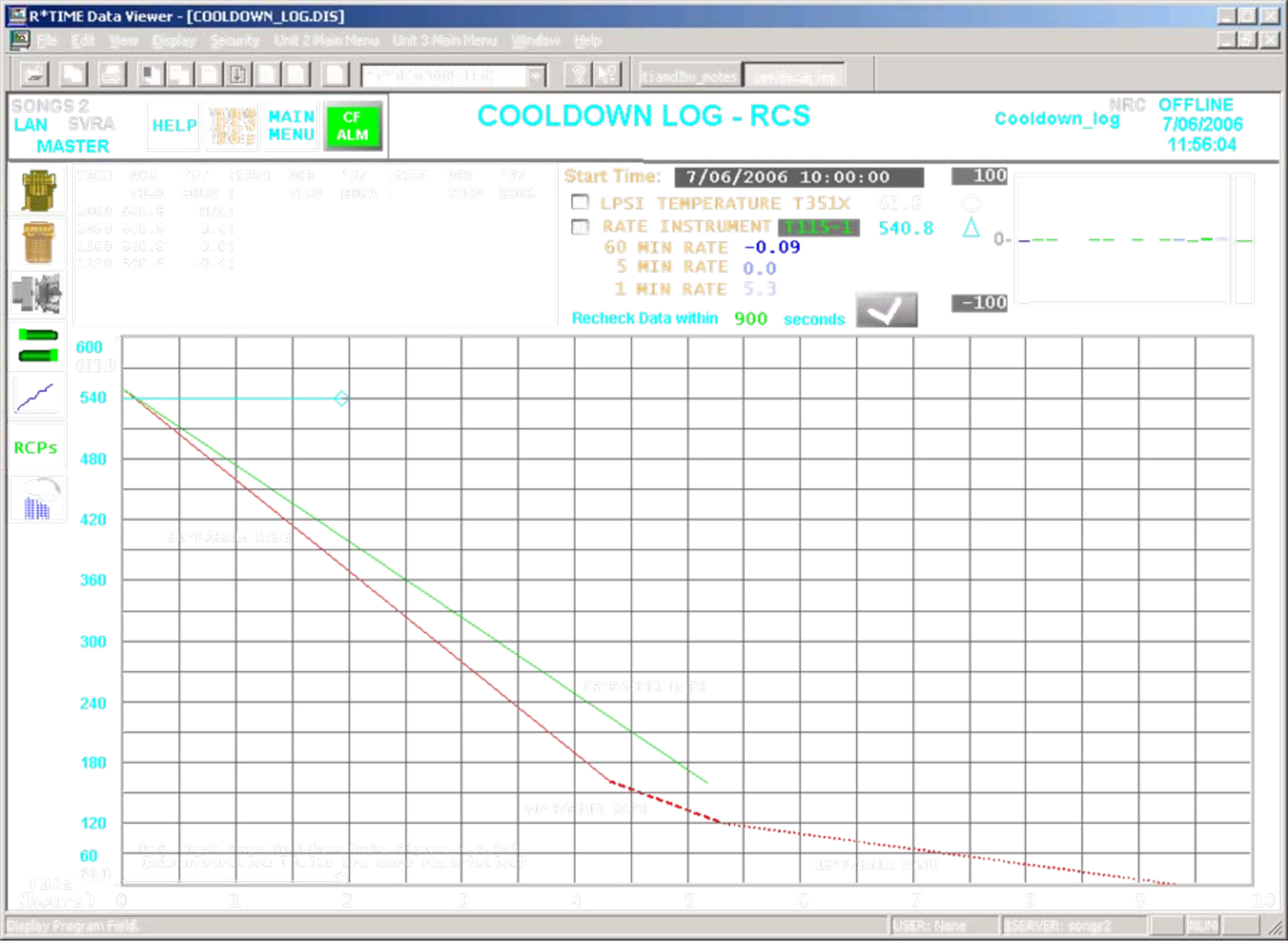
Pressure Temperature Limits

- Selectable zoom, which follows temperature and pressure changes.
- Heatup / Cooldown meter.
- Pump combination selectable.


R*TIME Data Viewer - [PTLMT3RCP.DIS]
File Edit View Display Security Unit 2 Main Menu Unit 3 Main Menu Window Help
SONGS 2
LAN SVRA
MASTER
HELP
MAIN MENU
CF ALM
PRESSURE TEMPERATURE LIMITS
3 RCPs
PTLmt3RCP
NRC OFFLINE
7/06/2006
11:54:46
200
0
-200
RATE INSTRUMENT
60 MIN RATE 0.00
5 MIN RATE 3.2
1 MIN RATE 10.6
RCPs
SELECT ZOOM LEVEL
X 2
X 3.5
X 7
X 14
T115-1/P102A
T125-1/P102B
T115-3/P102C
T125-3/P102D
2360
2320
2280
2240
2200
2160
490 504 519 533 547 561 576 590
2500
2000
1500
1000
500
0
0 100 200 300 400 500 600 700
MAXIMUM OPERATIONAL PRESSURE IS 2380 PSIA
APPENDIX E LIMIT
LOWEST SERVICE TEMPERATURE IS 209°f Tcold
APPENDIX G LIMIT
160°F SATURATION MARGIN Tcold
RCP NPSH Tcold (Two Pumps Opposite Loops)
20°F SATURATION MARGIN Thot
0°f SATURATION MARGIN Thot
SDC ENTRY CONDITIONS

Cooldown Log – RCS

- Charts Cooldown.
- Automatically fills in log data every 30 minutes.
- Pump combination selectable.


R*TIME Data Viewer - [COOLDOWN_LOG.DIS]
File Edit View Display Security Unit 2 Main Menu Unit 3 Main Menu Window Help
SONGS 2
LAN SVRA
MASTER
HELP
MAIN MENU
CF ALM
COOLDOWN LOG - RCS
Cooldown_log
NRC OFFLINE
7/06/2006
11:56:04
Start Time: 7/06/2006 10:00:00
LPSI TEMPERATURE T351X
RATE INSTRUMENT T115-1 540.8
60 MIN RATE -0.09
5 MIN RATE 0.0
1 MIN RATE 5.3
Recheck Data within 900 seconds
100
0
-100
RCPs
600
540
480
420
360
300
240
180
120
60
0
1
2
3
4
5
6
7
8
9
10
Time (hours)
Display Program Field
USER: None
SERVER: songs2
RUN

Reactor Coolant Pumps

- Displays RCP status.
  - Seal Pressures
  - Differential Pressures
  - Speed
  - Amps
- Obvious indication of seal failure.

R*TIME Data Viewer - [RCPS.DIS]

File Edit View Display Security Unit 2 Main Menu Unit 3 Main Menu Window Help

SONGS 3
LAN SVRA
MASTER

HELP

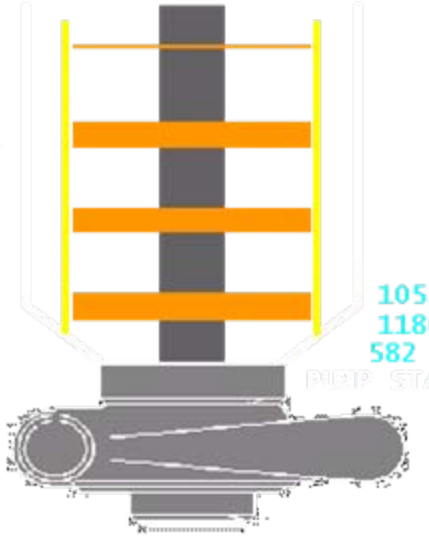
MAIN MENU

CF ALM

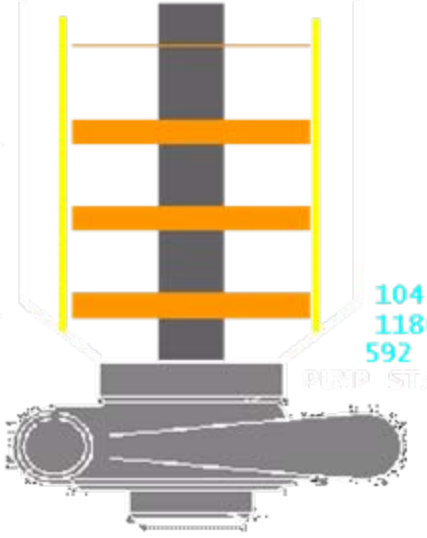
REACTOR COOLANT PUMPS

NRC OFFLINE
7/06/2006
rcps 11:57:47

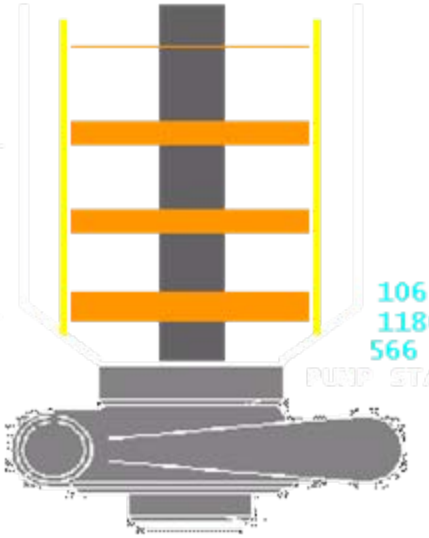
RCPs



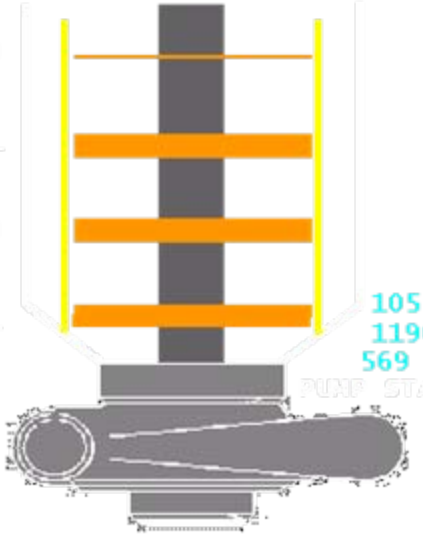
105.0 PSID
1186 RPM
582 AMP
PUMP STATUS RUNNING



104.6 PSID
1186 RPM
592 AMP
PUMP STATUS RUNNING

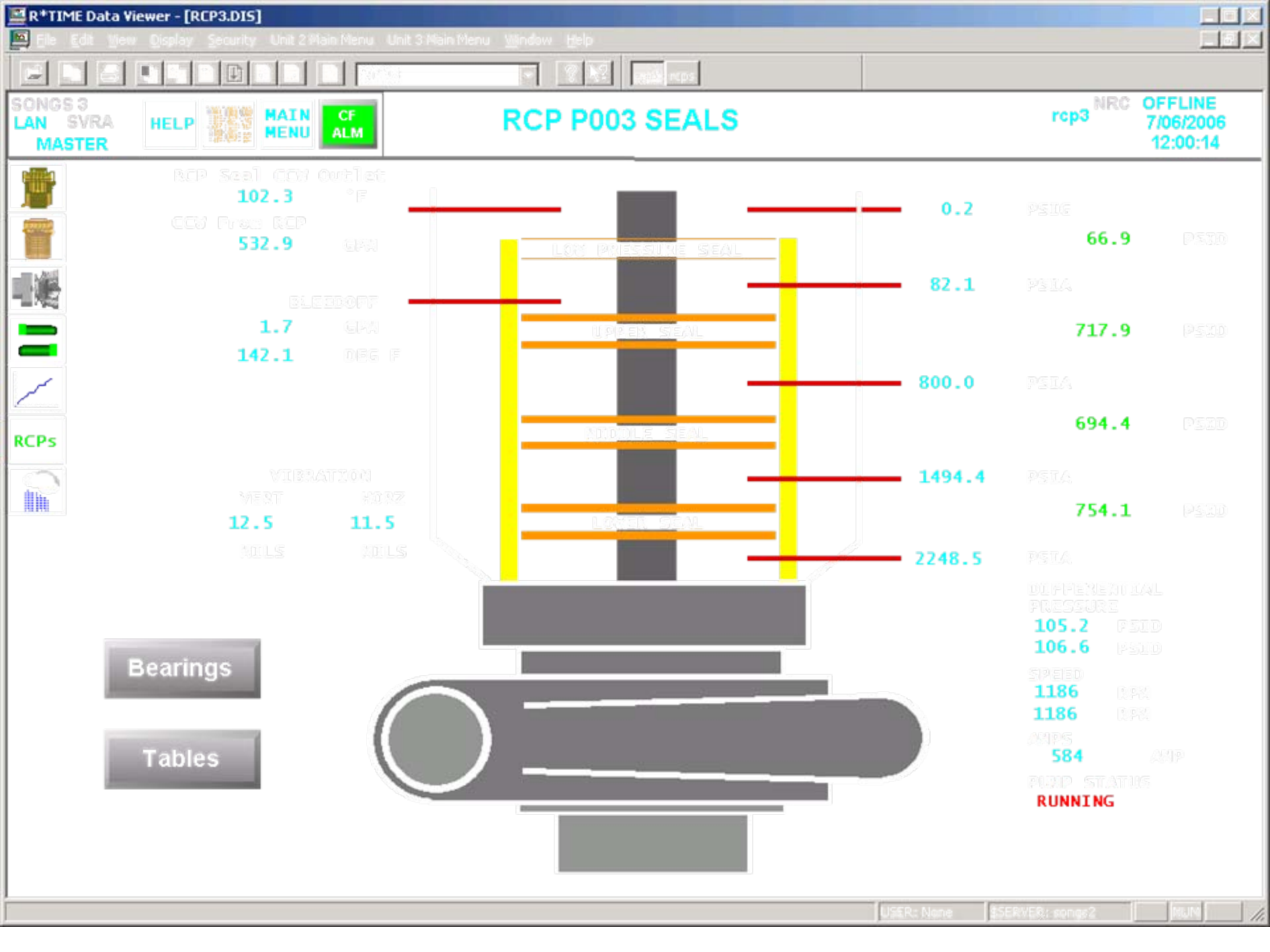


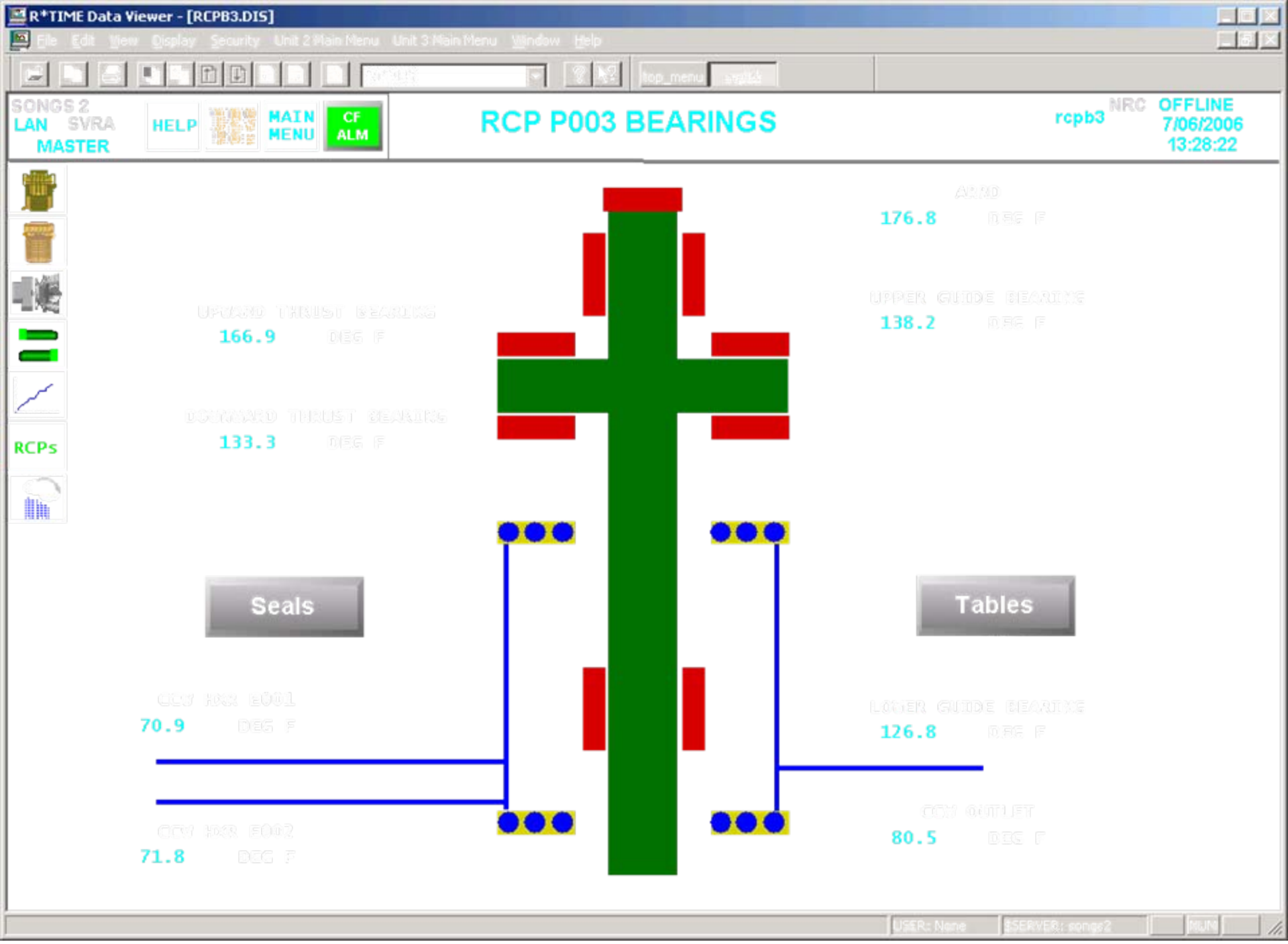
106.2 PSID
1186 RPM
566 AMP
PUMP STATUS RUNNING



105.4 PSID
1196 RPM
569 AMP
PUMP STATUS RUNNING

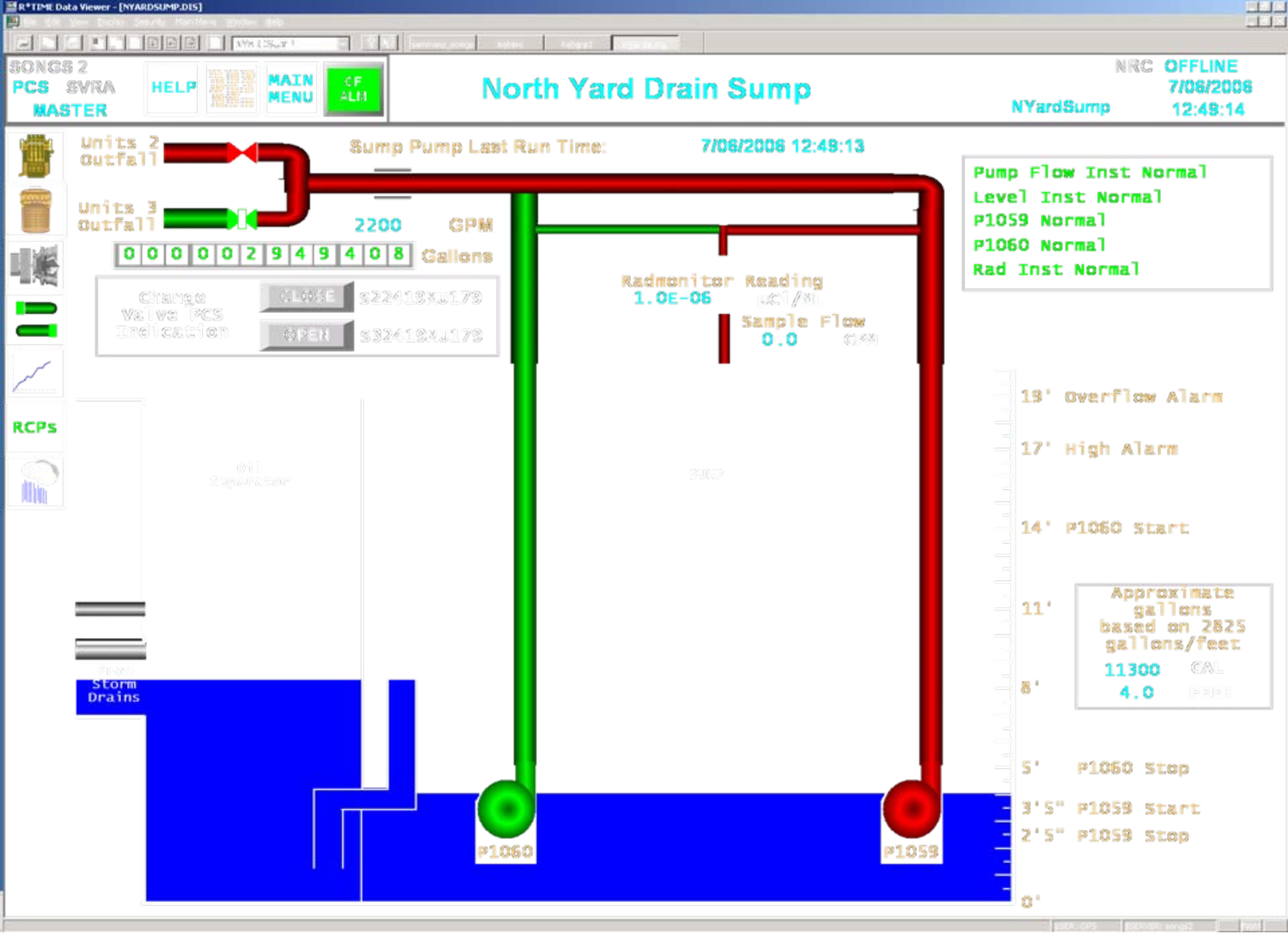
Display: songs3\rcp3.dis USER: None SERVER: songs2 RUN


R*TIME Data Viewer - [RCP3.DIS]
File Edit View Display Security Unit 2 Main Menu Unit 3 Main Menu Window Help
SONGS 3
LAN SVRA
MASTER
HELP
MAIN MENU
CF ALM
RCP P003 SEALS
rcp3
NRC OFFLINE
7/06/2006
12:00:14
RCP Seal CCW Outlet
102.3 °F
CCW From RCP
532.9 GPM
BLEEDOFF
1.7 GPM
142.1 DEG F
VIBRATION
VERT HORZ
12.5 11.5
MILS MILS
RCPs
LOW PRESSURE SEAL
UPPER SEAL
MIDDLE SEAL
LOWER SEAL
0.2 PSIG
66.9 PSID
82.1 PSIA
717.9 PSID
800.0 PSIA
694.4 PSID
1494.4 PSIA
754.1 PSID
2248.5 PSIA
DIFFERENTIAL PRESSURE
105.2 PSID
106.6 PSID
SPEED
1186 RPM
1186 RPM
AMPS
584 AMP
PUMP STATUS
RUNNING
Bearings
Tables
USER: None
SERVER: songs2
RUN


R*TIME Data Viewer - [RCPB3.DIS]
File Edit View Display Security Unit 2 Main Menu Unit 3 Main Menu Window Help
SONGS 2
LAN SVRA
MASTER
HELP
MAIN MENU
CF ALM
RCP P003 BEARINGS
rcpb3
NRC OFFLINE
7/06/2006
13:28:22
RCPs
176.8
UPWARD THRUST BEARING
166.9 DEG F
UPPER GUIDE BEARING
138.2 DEG F
DOWNARD THRUST BEARING
133.3 DEG F
Seals
Tables
CCW HDR E001
70.9 DEG F
LOWER GUIDE BEARING
126.8 DEG F
CCW HDR E002
71.8 DEG F
CCW OUTLET
80.5 DEG F
USER: None
SERVER: songs2
RUN

North Yard Drain Sump

- Graphic displays of Yard Sump status.
  - Alarm conditions: level, pump, instruments
  - Level
  - Flow and flow totalizer (12 digits)
  - Outfall valve position manually updated indication


R*TIME Data Viewer - [NYARDSUMP.DIS]
SONGS 2
PCS SVRA
MASTER
HELP
MAIN MENU
CF ALM
North Yard Drain Sump
NRC OFFLINE
7/06/2006
12:48:14
NYardSump
Units 2 Outfall
Units 3 Outfall
Sump Pump Last Run Time:
7/06/2006 12:48:13
2200 GPM
0 0 0 0 0 2 9 4 9 4 0 8 Gallons
Change Valve PCS Indication
CLOSE
OPEN
Radmonitor Reading
1.0E-06
Sample Flow
0.0
Pump Flow Inst Normal
Level Inst Normal
P1059 Normal
P1060 Normal
Rad Inst Normal
RCPs
Oil Separator
SUMP
From Storm Drains
P1060
P1059
13' Overflow Alarm
17' High Alarm
14' P1060 Start
11'
Approximate gallons based on 2825 gallons/feet
11300 GAL
4.0 FEET
8'
5' P1060 Stop
3'5" P1059 Start
2'5" P1059 Stop
0'

Rounds and Surveillances

- Software
- Database
- Performed by on shift Operators

Rounds and Surveillance Software

- Controlled by Computer Engineering.
- Program to start Excel.
- Macro running on Excel

Rounds and Surveillances Database

- Control by Operations Procedure Group.
- Uses Excel Workbooks.

Rounds and Surveillances Performed by

- Performed by on shift Operators.
- Operators never see Excel, only dialog boxes and printed output.
- Most data is collected from PCS.