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Approved by  
2015-07-02 Mikael Hallberg  
~~2015-07-02 Daniel Lopez~~

Order number  
BB000013S01B  
119970-W1

Author  
Markus Sjunnesson  
To  
Ibrahim Bachtay

Department  
SOFA

Telephone  
+46 122 84306

## **B13, Gainesville, SST 900, Startup after warranty work, Commissioning Report, 2015**

<b>B-number:</b>	B000013
<b>Catchword:</b>	Gainesville
<b>Turbine module:</b>	SST900
<b>Project leader:</b>	Ibrahim Bachtay, SIT
<b>Customer/ Contact person:</b>	Tommy Gardner
<b>Date for the visit:</b>	150508 – 150509
<b>Personnel on site:</b>	Markus Sjunnesson, Commissioning Engineer

### **Short summary of executed work**

GREC Gainesville was visited for a start-up of B000013 after warranty inspection of the inner turbine. Some remarks were made that can be found in the findings part of the report.

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## 01: Findings

### Speed reading

MAB10CS015 is not working properly. The correct speed is registered by the Overspeed card and can be seen in the Bentley software. The Tachometer card output does not give out pulses at turning gear speed and the BASI pulse diode is not flashing but gives a fix light at turning gear speed (MAB10CS005/010 tachometer card gives out pulses and BASI pulse diode is flashing). The input in PCS7 indicates zero speed with no faults but of course alarm for signal deviation.

In addition to this sometimes the speed disturbance alarm activates on MAB10CS005

The tachometer card on MAB10CS015 has been exchanged by customer.

There is a firmware difference between the tachometer cards. MAB10CS005/010/015 5.35/5.39/5.41

There is a stationary computer with network connection to the rack. The Serial connection we "normally" use at Siemens is blocked for downloading software to the rack.

There has been reported that it is a hardware fault in the tachometer cards that is installed at the moment. These tachometer cards should be replaced by the new cards supplied by Siemens.

### Rotor Earth Equipment

Original rotor earth equipment was replaced by a copper string by GREC. New coils should be ordered and should be mounted back in original bracket.

### Turning gear

Speed at turning gear: 28 Rpm

This is lower than normal. During next visit the jacking oil pump pressure should be measured and adjust the speed up to 52 rpm.

### Control Valve feedback

We spent a lot of time fault searching why the new feedback (Baluff) didn't work. It was found that the wiring was wrong on two places. This was fixed during commissioning.

### Casing water injector valve

LCE10AA050 is not operating correctly. Before start up I needed to help the pneumatic actuator to open the valve by using a wrench. This valve should be overhauled at next turbine stop to prevent high temperatures in the turbine exhaust.

### Wire break warning

There is a signal fault on CJJ20 U13/6CH4. This is due to a disconnected pressure transmitter used in performance tests.

### SICLOCK

The setup from new installation has been modified.

### Casing temperature measurement

Two casing temperature measurements were out of function. MAB10CT065 and MAB10CT070.

### ESV Position Feedback

The micro switches were wrongly connected. This was fixed during commissioning.

## 02: Start up

The turbine was started and synchronized on Friday with some remarks (see findings and below).

Activity	Remarks
Start of auxiliary systems	Not OK <sup>1</sup>
Performance of functional tests	Not OK <sup>2</sup>
Run up, selection of run up curve	OK
CV tightness test	OK
ESV tightness test	OK
Turning gear releases and jacking oil pump stops at 30% speed.	OK
Live over speed test	OK
Field breaker automatically close at >95% speed	OK
Synchronization	OK
Loading, selection of loading curve	OK
Check of Vibrations	OK
ESV part stroke test with turbine in operation	OK
Test of trip valves with turbine in operation	Not OK <sup>2</sup>
Note 1: The turning gear speed is too low and the water injector valve for turbine casing is not ok. Note 2: Individual speed channels could not be tested due to one faulty speed channel	

### Oscillation at full power

The Power/Pressure oscillations are still there but according to the operators there is a significant improvement from before. This might be because it was an offset from the MOOG balance point and the set point in the Logic before.

During testing the turbine regulation was set in internal output regulation. Operational trends have been sent to Finspång.

### The flow in the leak-off condenser

54,5 Gallon/hour at 83 MW

### 03: Operational data

Calc Operating hours	12344 h
Calc EQV Operating hours	13734 h
Cold starts	22
Warm starts	40
Hot starts	17
Note:	

## 04: Additional Information

### Used spare parts

- Baluff
- I/O card during fault finding of Baluff (old one OK)

### Recommended spare parts for supply

- Baluff
- Rotor earth coils

### Necessary adjustment by the Client

- Change the faulty tachometer cards
- Connect/fix the missing casing temperature measurement.
- Overhaul the casing water injector valve.
- Investigate/adjust the low turning gear speed.

### Recommended future activities

- Mount back the original rotor earth brackets with new coils.
- Keep the maintenance plan with MO/LI/SI
- Keep a log book of important values according to operational manual
- Place a resistor on CJJ20 U13/06 CH 4 to remove signal fault.
- Do a new setup of the time synchronization ES/OS/AS/SICLOCK

### Necessary updating of the documentation in Finspång

#### Backup of software

Backups of PCS7 and Bentley Nevada speed/vibration were taken

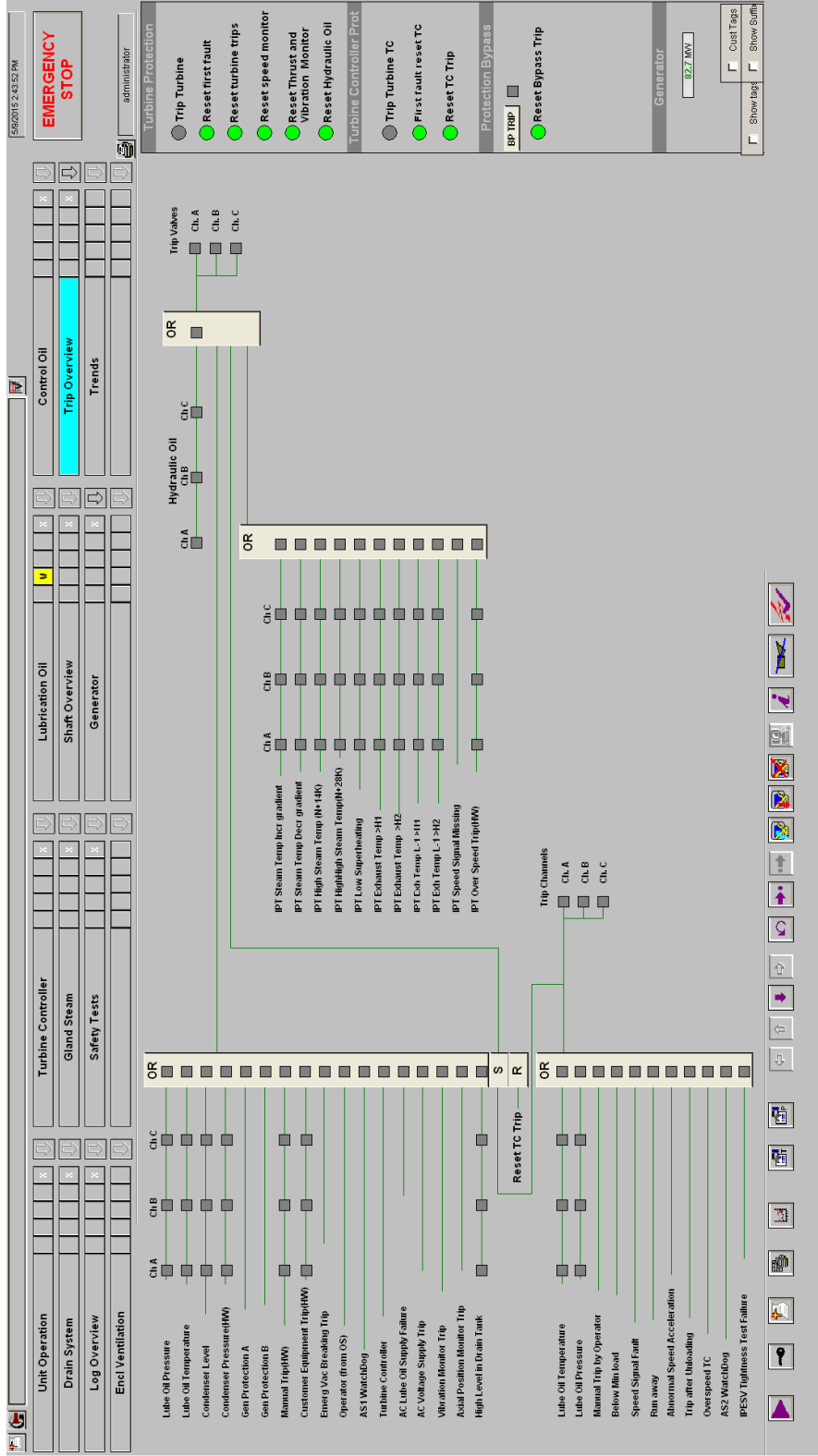
#### Circuit diagram

Stator temperature KKS are wrong in circuit diagram MKA10FT910, FT920, FT930.

## 05: Register of appendix

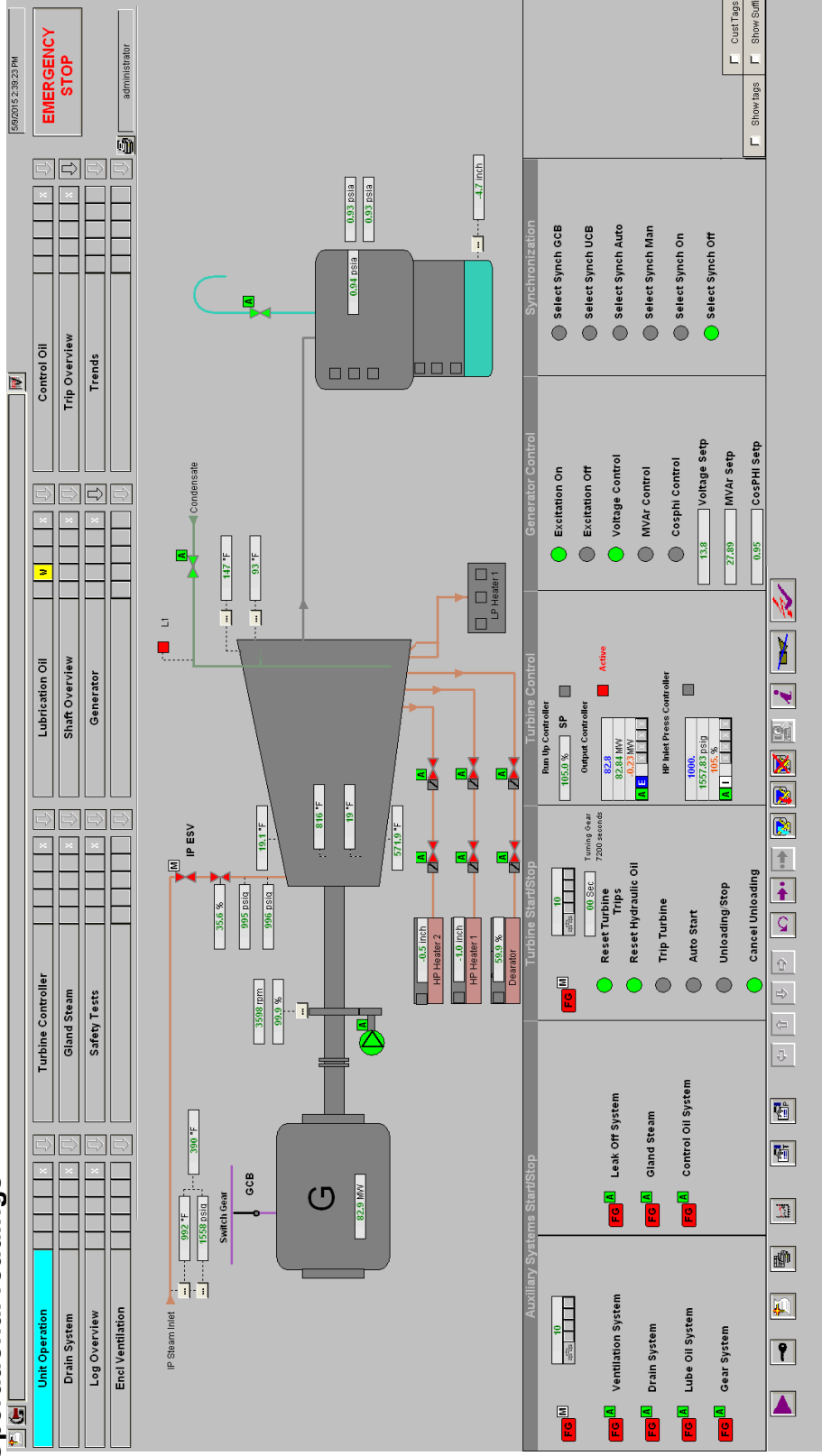
- Appendix 1: Turbine trips
- Appendix 2: Operational data

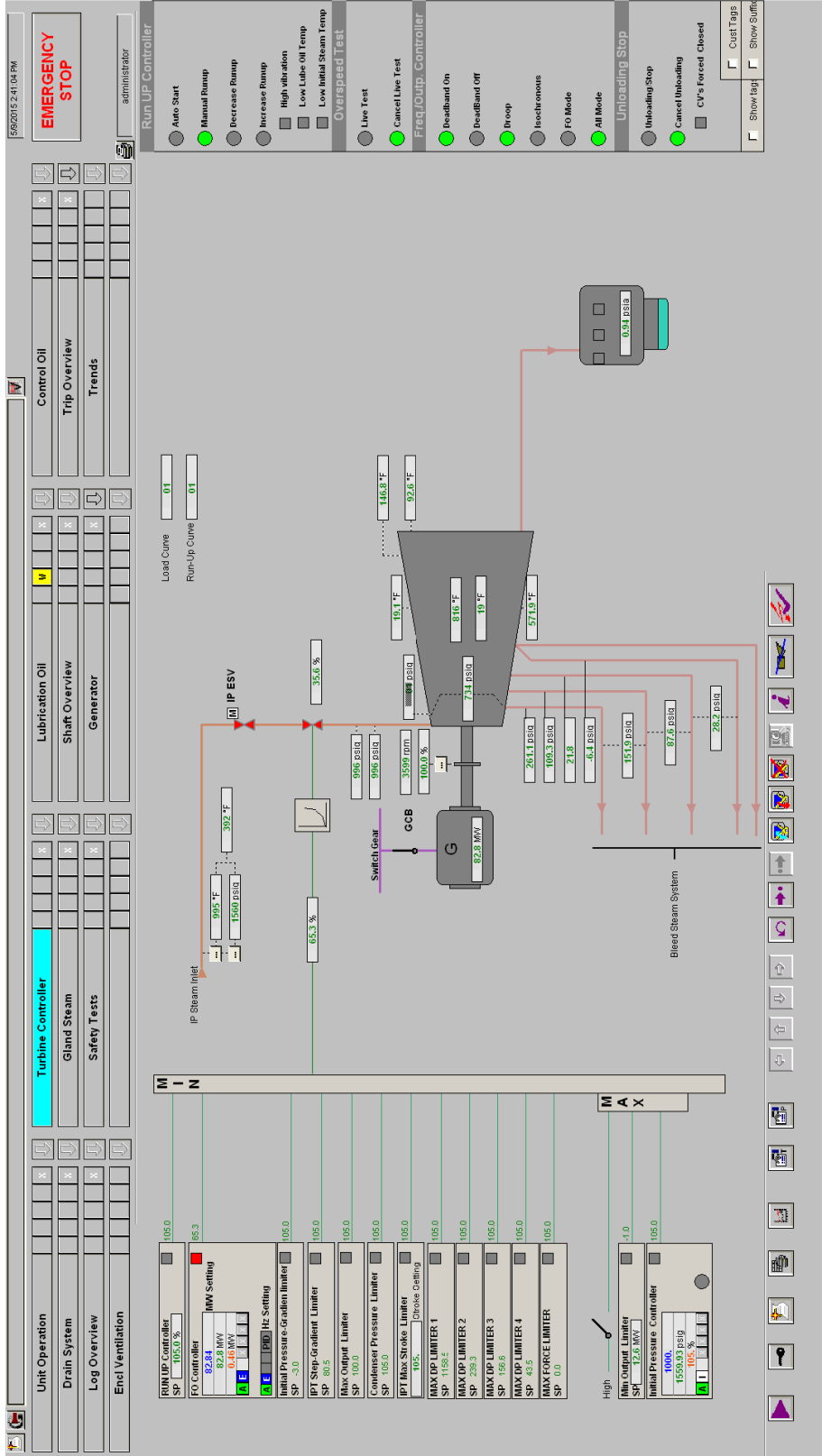
### Appendix 1 Turbine Trips

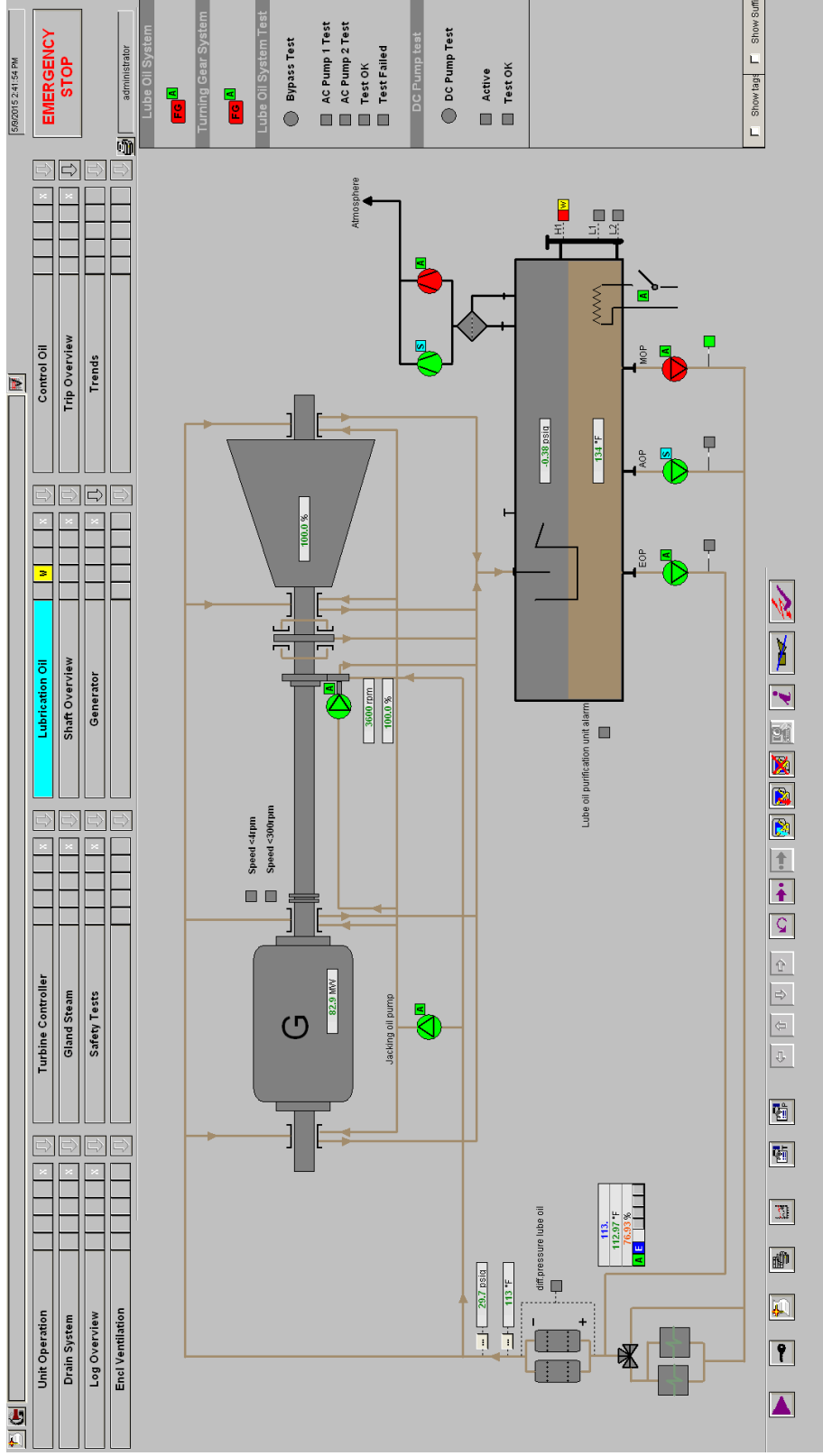


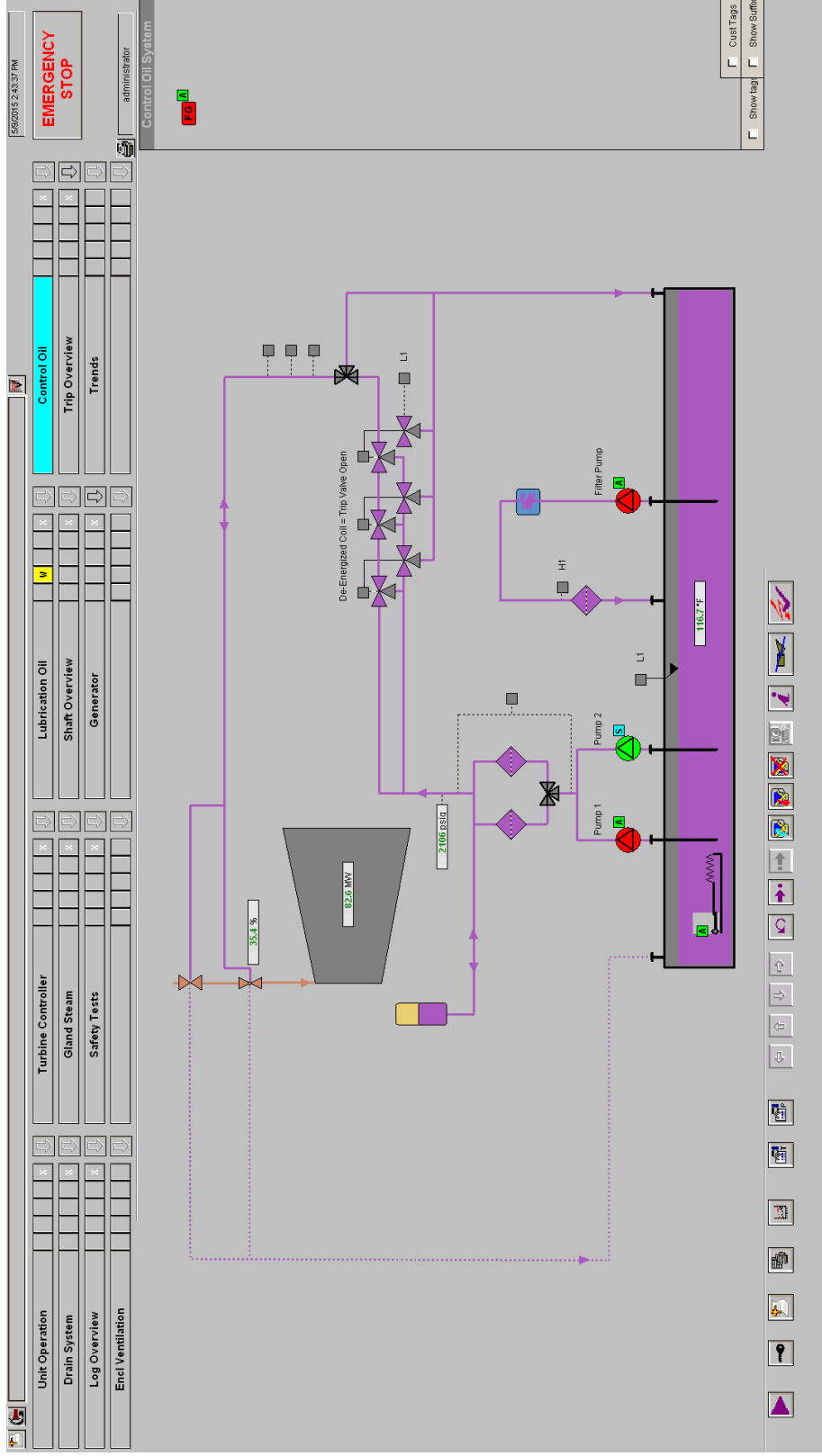


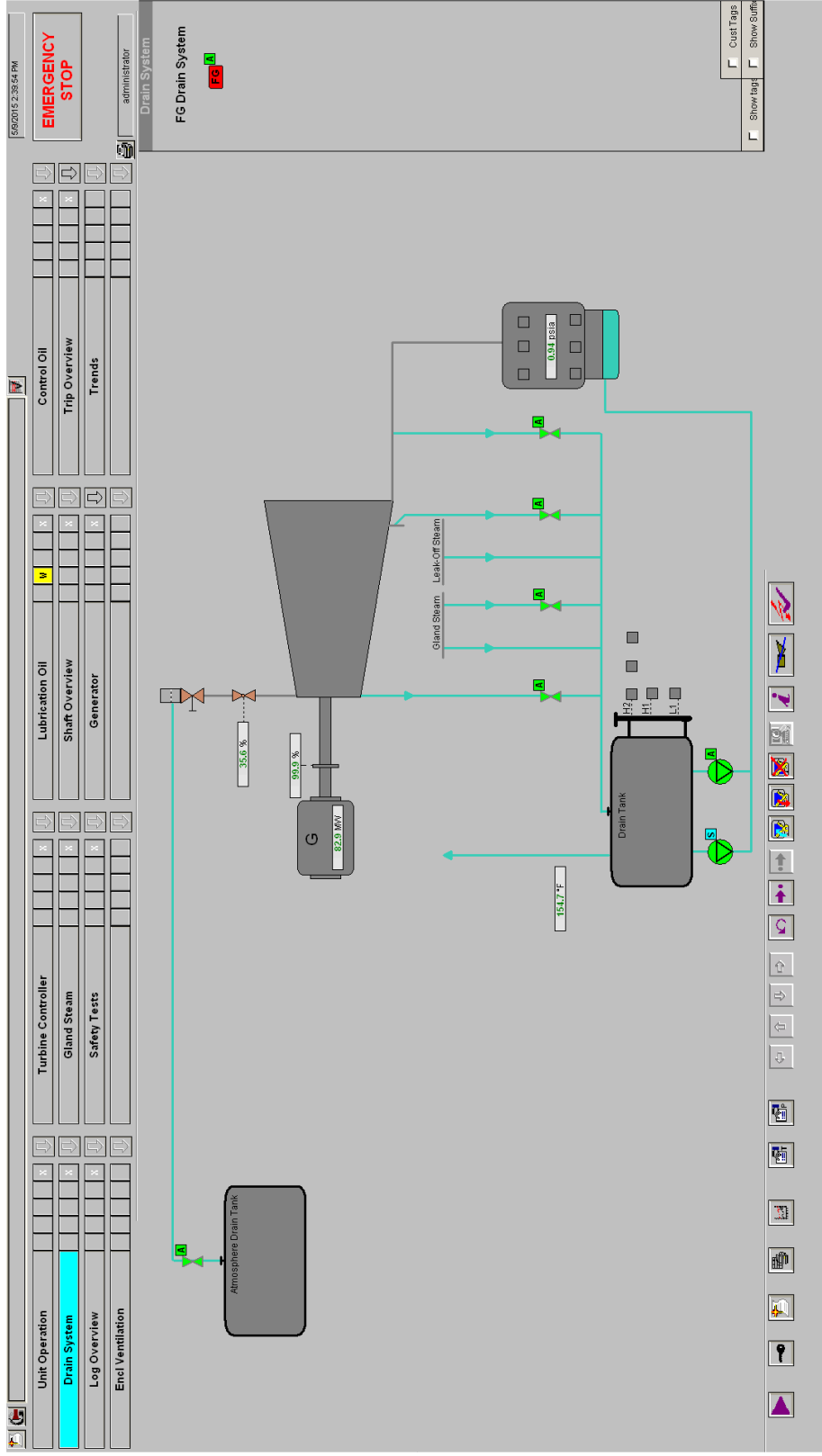
## Appendix 2 Operational readings

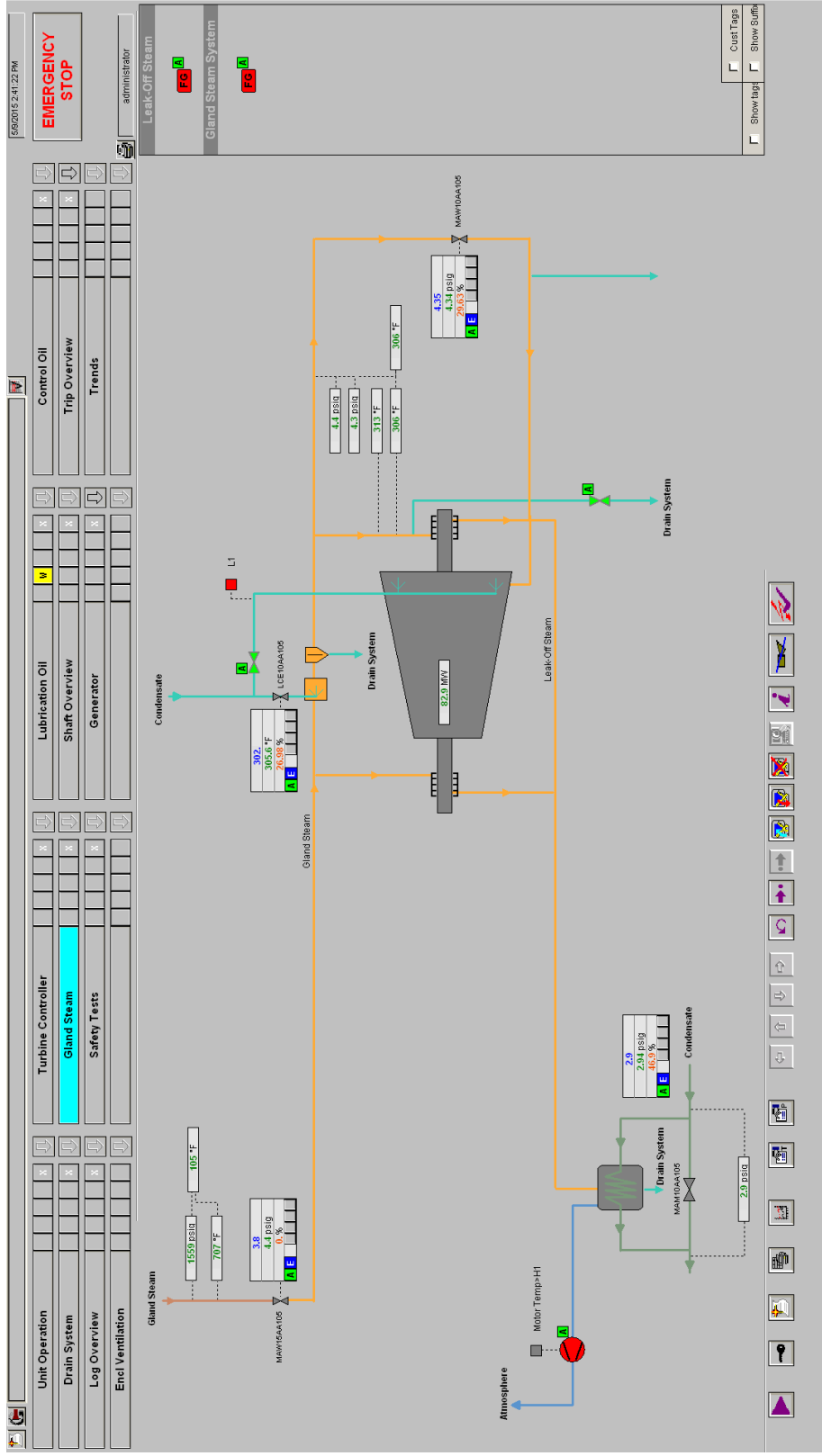


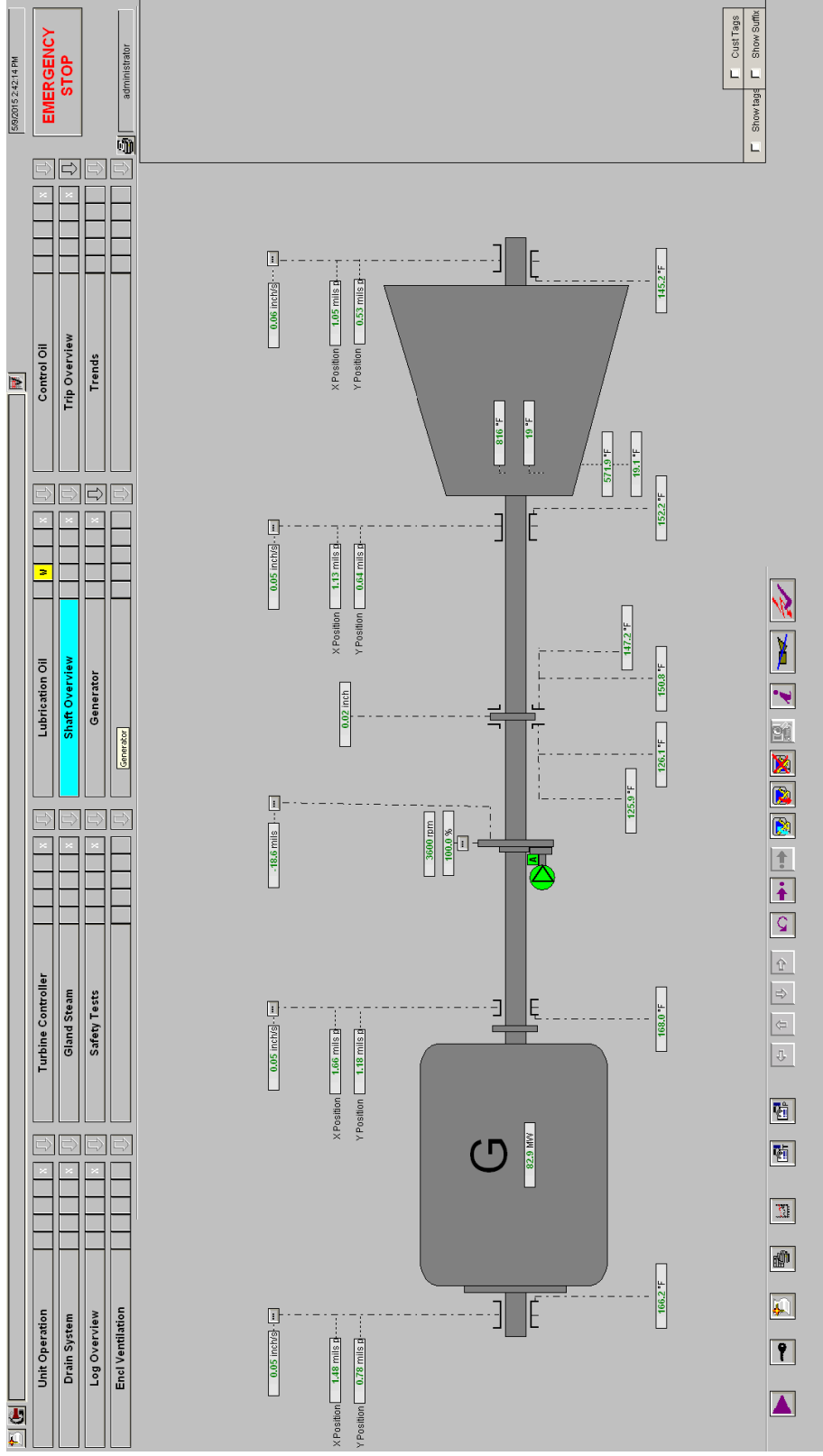












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**EMERGENCY STOP**

administrator

Reset Bypass Trip

Control Oil

Trip Overview

BP Trip Overview

Unit Operation

Drain System

Log Overview

Encl Ventilation

Turbine Controller

Gland Steam

Safety Tests

Lubrication Oil

Shaft Overview

Generator

Trip Overview

Trends

OR

AND

Reset Bypass Trip

Trip Bypass to Condenser

Condenser HH Pressure

Condenser HH Level

Turbine Exhaust Temperature

Shaft Speed >4rpm

Gland Steam Pressure

FG Gland Steam On

FG Turning Gear On

Spray Water Pressure OK

Trip Channels

Ch. A

Ch. B

Ch. C

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**EMERGENCY STOP**

administrator

Unit Operation

Drain System

**Log Overview**

Encl Ventilation

Turbine Controller

Gland Steam

Safety Tests

Lubrication Oil

Shaft Overview

Generator

Control Oil

Trip Overview

Trends

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**Bearing Data**

	Metal Temp	Solemic V/hr	x	y
IP-Turbine Inlet/Thrust Big	152.2 °F	0.05 inch/s	1.1 mil/s	0.6 mil/s
IP-Turbine Exhaust Big	145.2 °F	0.06 inch/s	1.0 mil/s	0.5 mil/s
Gen Exciter End Big	166.1 °F	0.05 inch/s	1.5 mil/s	0.8 mil/s
Gen Non Exciter End Big	168.0 °F	0.05 inch/s	1.7 mil/s	1.2 mil/s
IPT Thrust Big Upper Inner	147.3 °F			
IPT Thrust Big Lower Inner	150.8 °F			
IPT Thrust Big Upper Outer	125.9 °F			
IPT Thrust Big Lower Outer	126.1 °F			
IPT Thrust Position	-18.6 mil/s			

**Turbine Data**

Turbine Speed	99.9 %
Pos IP Inlet Control Valve	35.6 %
IP Turbine Casing Temp.	816 °F
Pressure Turbine Inlet	997 psia
Pressure Turbine Inlet	993 psia
Condensate Pressure	0.94 psia
IP Exhaust Temp before Inlet	117.0 °F
IPT Exhaust Temp	201.6 psia
	109.4 psia
	21.8
	54.1 psia

**Steam Data**

IP Inlet Pressure	1550 psia
IP Inlet Temperature	994 °F
IP Inlet Superheat Temp.	991 °F

**Generator Data**

Calc Number Of Cold Starts	22
Calc Number Of Warm Starts	40
Calc Number Of Hot Starts	17
Calc Operating Hours	12344h
Calc Evt Operating Hours	13734h

**Operating Data**

Temp in C.JU20	82 °F
Temp in C.JU30	85 °F
Temp in C.JU40	81 °F

**Generator Data**

Temp Phase 1	173.7 °F
Temp Phase 2	172.2 °F
Temp Phase 3	173.2 °F
Temp Air Cooler NE	92.6 °F
Temp Air Cooler EE	93.0 °F
Temp Before Cooler	169.3 °F

**Condensator Data**

Condensator Pressure AS1	0.94 psia
Condensator Pressure AS2	0.94 psia

**Lube Oil Data and Gland Steam Data**

Oil Pressure	29.8 psia
Oil Temp Bot Bearings	113.0 °F
Oil Tank Temp	134.6 °F
Oil Tank Pressure	0.1 psia

Gland Steam Temp 1	312.9 °F
Gland Steam Temp 2	305.4 °F
Gland Steam Pressure 1	4.34 psia
Gland Steam Pressure 2	4.33 psia
Gland Steam Supply Pressure	1557 psia
Gland Steam Supply Temp.	709 °F
Gland Steam Supply Superh Temp.	106.3 °F

Current phase L1	3.6 kA
Current phase L2	3.6 kA
Current phase L3	3.6 kA
Gen Voltage L1 L2	13.8 kV
Gen Voltage L2 L3	13.8 kV
Gen Voltage L3 L1	13.8 kV
Gen Reactive Power	25.9 MW
Gen Active Power	82.6 MW
Excitation Current	59.97 Hz
Excitation Voltage	3.8 A
	38.5 V

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**EMERGENCY STOP**

administrator

Unit Operation

Turbine Controller

Lubrication Oil

Control Oil

Trip Overview

Trends

Drain System

Gland Stream

Shaft Overview

Trip Overview

Generator

Trends

Log Overview

Safety Tests

Trip Overview

Trip Overview

Generator

Trends

Encl Ventilation

Trip Overview

Trip Overview

Trip Overview

Generator

Trends

**Speed Monitor Tests**

Channel Speed	Trip Valve A	Trip Valve B	Trip Valve C
100.0 %	100.0 %	100.0 %	0.0 %

Reset Speed Monitor

**ESV Tightness Tests**

IP ESV	Valve Position	Turbine Speed
Failed	35.5 %	100.0 %

Stroke Tests

**DC Lube Oil Pump Test**

DC Lube Oil	AS1	AS2
Failed	> H1	

**Speed Monitor Tests**

Selection	Active	Blocked	Ok	Failed
IPT Ch. A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IPT Ch. B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IPT Ch. C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Cancel

**ESV Tightness Tests**

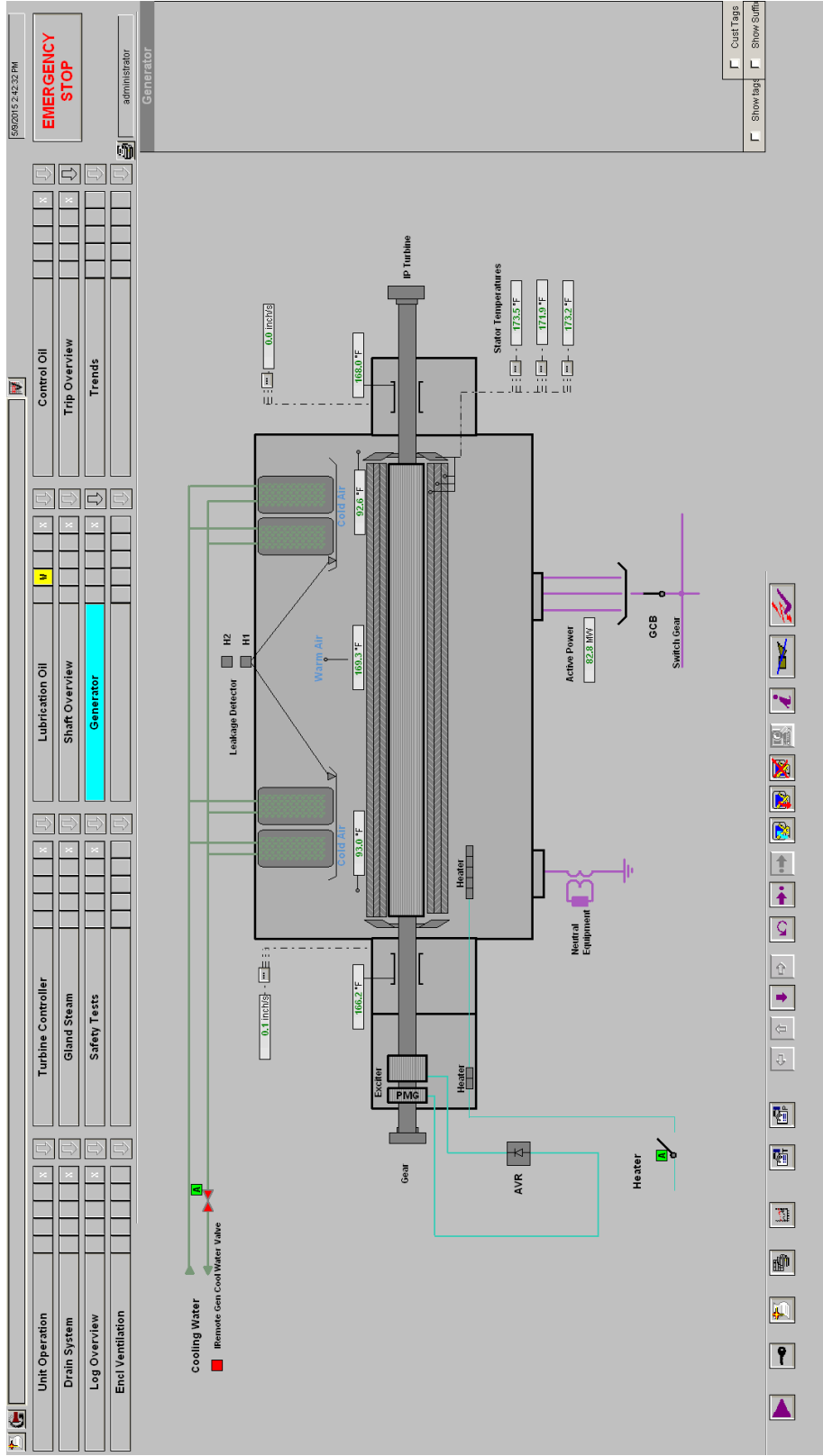
Selection	Active	Blocked	Ok	Failed
IP ESV	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
IP ESV	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NRV 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NRV 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NRV 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NRV 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NRV 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NRV 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Cancel

**DC Lube Oil Pump Test**

Selection	Active	Ok	Failed
DC Lube Oil	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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administrator

Ventilation System

Generator Main Data

Voltage, U	13.8 kV
Active Power, P	87.6 MW
Reactive Pow, Q	25.8 MVar
Frequency, f	60.0 Hz
Power Factor/PF	0.95
Current, I	3.6 kA

Generator

MP Turbine

Exc.

Sound Enclosure

Ventilation Fan

Ventilation Fan

108.5 °F

104.1 °F

0.0 PSIG

0.0 PSIG

Unit Operation

Drain System

Log Overview

End Ventilation

Turbine Controller

Gland Steam

Safety Tests

Lubrication Oil

Shaft Overview

Generator

Control Oil

Trip Overview

Trends