



NR1

TITLE: LOSS OF A D.C. BUS

RESPONSIBLE FOR	<i>M E Denton</i>			
AUTHORIZED BY	<i>John L. ...</i>			
PORC REVIEW	PORC 877 APR 11 1990			EFFECTIVE DATE 4-19-90
DCCF NUMBER(S)	90-0166			

**FT. ST. VRAIN
NON-CONTROLLED
COPY**

VERIFY ISSUE STATUS
WITH SITE DOCUMENT
CONTROL CENTER PRIOR
TO USE

9005100050 900427
PDR ADOCK 05000267
P PDR

(P)
LOSS OF A DC BUS
SYMPTOM-ACTION MATRIX

ACTIONS	SYMPTOMS			
	1.1 DC Bus Undervoltage I-06F 2-5 BUS 1 (EI-92220)		1.2 DC Bus Undervoltage I-06F 2-5 BUS 2 (EI-92221)	
<u>OPERATOR ACTION</u>				
2.1 Dispatch operator to reclose supply breaker to affected bus	XX		XX	
2.2 <u>IF</u> the affected DC Bus cannot be reenergized, <u>THEN</u> transfer the DC feeds to the non- affected bus at the local transfer switch (see Table P.5)	XX	XX	XX	XX
2.3 Refer to Table P.4, "Loss of DC Bus" for the effect of a loss to each bus	XX	XX	XX	XX



INTRODUCTION

Two separate 125 Volt D.C. busses provide operating power to the following:

- a. 4160 and 480 Volt switchgear and main control room panels.
- b. Two instrument power inverters.
- c. Emergency hydrogen seal oil pump.
- d. Turbine-generator emergency bearing oil pump EHC supply.
- e. Boiler feed pumps emergency lube oil pump. BFP tripping capability, SV7, MSC, and recirc. valves.
- f. Circulating water pumps discharge valves.
- g. Various control relays and emergency lighting.
- h. Turbine - Generator EHC System.
- i. Generator and transformer protection lockout relays.
- j. Undervoltage relays.
- k. Auto start prohibit and tripping relays (loss of outside power).
- l. Main steam electromatic relief valves.
- m. Fire alarms (I-06).

The 125 Volt D.C. Busses receive their power from two 480 Volt A.C. Essential Busses via battery chargers, which provide the D.C. supply plus charging the station batteries. They also supply three instrument busses through DC-AC inverters.



DISCUSSION OF SYMPTOMS

SYMPTOMS

- 1.1 D.C. Bus Undervoltage BUS 1 I-06 F 2-5 (EI-92220).
- 1.2 D.C. Bus Undervoltage BUS 2 I-06 F 2-5 (EI-92221).

D.C. Bus 1 and D.C. Bus 2 undervoltage conditions will be alarmed on I-06F 2-5. This alarm is common for both Bus 1 and Bus 2. By observing the voltmeters on I-06 EI-92220 (Bus 1) and EI-92221 (Bus 2) the operator may readily identify the faulty bus.

OPERATOR ACTION

- 2.1 Dispatch operator to reclose supply breaker to affected bus.

If a momentary fault has caused the supply breaker to trip, it may be possible to reenergize the bus by reclosing the supply breaker. The D.C. Bus 1 and Bus 2 supply breakers are located in the Auxiliary Electric Equipment Room. No attempt should be made to use the bus tie until it is determined that the bus is free of faults.

- 2.2 IF the affected D.C. bus cannot be reenergized THEN transfer the D.C. feeds to the non-affected bus at the local transfer switches (see Table P.5).

The 4160 Volt switchgear and main control boards are supplied from 125V D.C. Bus 1 and Bus 2. One of these busses is either a main or alternate source of power. In the event of a failure of the main source of power, the alternate source may be selected. Equipment for which transfer capability is provided is listed in Table P-5.

- 2.3 Refer to Table P.4, "Loss of D.C. Bus" for effect of loss of effected bus.

Table P.4 shows the effect of a loss of a D.C. Bus on plant equipment. It also lists the main and alternate sources of D.C. power for the switchgear and control panels.



TABLE P.4

LOSS OF D.C. BUS

FUNCTION	EFFECT OF LOSS OF D.C. BUS 1	EFFECT OF LOSS OF D.C. BUS 2	NOTES
SWITCH YARD	Switching capability impaired. One of two trip coils lost. Pull main supply fuse block in "A" panel, close tie breaker in "B" panel and "A" panel.	One of two trip coils lost. Switching voltage is supplied from D.C. Bus 1.	
4160 V BUSES	Lose all switching on 4160 Busses including res. aux. and unit aux. trans. switching. This is normal supply. Throw switch to D.C. Bus 2 in I-15 and 4160 busses.	No effect, 4160 Busses, res. aux. and unit aux. trans. Normal feed is from D.C. Bus 1.	
480 V BUSES	None-Auto transfer to DC Bus 2	None-Auto transfer to DC Bus 1	
DIESEL GEN.	D-G start and switching cap. Lost to D-G Set "1A".	D-G start and switching cap. Lost to D-G Set "1B".	
INSTRUMENT BUS	Loss of Inverter supply, transfer to Instrument Power Transformer 1	Loss of Inverter supply, transfer to Instrument Power Transformer 2	
DATA LOGGER	No effect	Loss of inverter, automatic transfer to AC backup.	

TABLE P.4
LOSS OF D.C. BUS

FUNCTION	EFFECT OF LOSS OF D.C. BUS 1	EFFECT OF LOSS OF D.C. BUS 2	NOTES
CONTROL BOARDS	See listing of control board feeds Table P.6	See listing of control board feeds Table P.6	
LOSS OF 480 VOLT ESS. POWER RELAYS	No effect. All undervoltage relays will remain operable due to auto switch- ing of DC supply on a loss of a DC Bus.	No effect. All undervoltage relays will remain operable due to auto switch- ing of DC supply on a loss of a DC Bus.	
1) Degraded Voltage			
2) ATO			
3) Loss of Voltage - DG Start, Load Shed, and Sequen- cing			
4) Loss of Voltage - Reactor Scram			



TABLE P.5

LISTING OF PREFERRED D.C. BUS

PREFERRED BUS		
<u>EQUIPMENT</u>	<u>D.C. BUS 1</u>	<u>D.C. BUS 2</u>
Main Control Board I-05	X	
Main Control Board I-15	X	
Term. & Aux Rly. Cab I-63	X	
Term. & Aux Rly. Cab I-64		X
Term. & Aux Rly. Cab I-66	X	
480 Volt Bus 1	X	
480 Volt Bus 2	X	
480 Volt Bus 3		X
480 Volt Bus 4	X	
480 Volt Bus 5	X	
480 Volt Bus 6	X	
480 Volt Bus 7	X	
4160 Volt Bus 1	X	
4160 Volt Bus 2	X	
4160 Volt Bus 3	X	



TABLE P.6

125V D.C. FEEDS VIA MAIN CONTROL
BOARDS AND AUXILIARY RELAY CABINETS

I-05 (TRANSFER SWITCH)

FROM DRAWINGS E-1333 and E-1334

1. Relief Valve PV-22167 Loop 1
2. Relief Valve PV-22168 Loop 2
3. I-70 Alarm Bell

I-06 125V D.C.

FROM DRAWINGS E-1377 AND E-1351

BUS 1	BUS 2
Alarm Horn	Low air pressure alarm (deluge systems for main, aux, and reserve transformers.
MCC breaker position lights	Fire Alarms
Fire Alarms	
Turb lube oil reservoir	P-3101 lube oil reservoir
Lube oil storage rm	
Helium Circ turntable	H ₂ seal oil unit
Aux blr	
P-3103 Lube oil reservoir	



TABLE P.6

125V D.C. FEEDS VIA MAIN CONTROL
BOARDS AND AUXILIARY RELAY CABINETS

I-15 (TRANSFER SWITCH)

FROM DRAWING E-1392

1. Res Aux Transformer Trip Relays 86 RT.
2. Gen & Trans Aux Tripping Relays 86 GTI.
3. Res Aux Deluge Valves 86 RTD.
4. Main & Unit Aux Deluge Valves 86 MVD.
5. Unit Aux. Trip Relay 86TI (XRA-92128).
6. Gen 1 Aux Tripping Relay 86 GI (XRA-92122).
7. Gen Diff Aux Trip Rly 86 DID (XRA-92121).
8. Fire Protection Sys Riser VA Alm Cbts.
9. Main Trans Aux Rly CR-9213.
10. Fire Protection Sys. Deluge Valves for Main Unit,
Aux & Reserve Aux Deluge Valves.
11. Unit Aux Trans Seal-In Rlys.

Not on the transfer switch are the auto start prohibit and tripping relays which actuate on loss of 480 Volt Essential Bus.

I-63 (TRANSFER SWITCH)

FROM DRAWING E-1478

1. 4160 V Bus 1, 2 & 3 Undervoltage
Rly Dev 127-1, 2 & 3.
2. Rx. Pl. Ventilation System
Rx. Pl. Chilled Water Selector
3. Circ. Wtr. Make-Up Pump 1A Power
for TR-4101 to HV-4108
4. Circ. Wtr. Make-up Pump 1B Power
for TR-4103 to HV-4110
5. BFPT 1A Trip Signal Relay CR-3108
6. 125V D.C. 1A Undervoltage Relay
7. Turb Bldg HVAC Sys Panel I-7503X



TABLE P.6

125V D.C. FEEDS VIA MAIN CONTROL
BOARDS AND AUXILIARY RELAY CABINETS

I-64

1. Rx. Pl. Ventilation System
Chilled Water Selector
2. BFPT 1C Trip Signal Rly. CR-3109

I-65 (TRANSFER SWITCH)

FROM DRAWING E-1509

1. Rx. Pl. Ventilation System
Chilled Water Selector
2. CO₂ Alarm System
3. Rx. Pl. Exhaust Filter 1A (F-7301) Fire Protection
System
4. Rx. Pl. Exhaust Filter 1B (F-7302) Fire Protection
System
5. Rx. Pl. Exhaust Filter 1C (F-7302S) Fire Protection
System
6. Fire Extinguishing Sys 45 (DG's)
7. Feed to Rx Pl. HVAC Pn1 (I-7301)
8. Feed to Cont. RM HVAC Pn1 I-7501X

I-09 (125V D.C. BUS)

1. Annunciator Feeds to I-09 & Chemical Building
2. Main Generator RTD Temperature Readout.