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TITLE: <u>LOSS OF AN INSTRUMENT BUS</u>			
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(N)  
LOSS OF AN INSTRUMENT BUS  
SYMPTOM-ACTION MATRIX

ACTIONS	SYMPTOMS					
	1.1 Instrument Bus Undervoltage Non-Interrupt. Bus 1 1-06G, 2-1 (EI-92217)		1.2 Instrument Bus Undervoltage Non-Interrupt. Bus 2 1-06G, 2-1 (EI-92218)		1.3 Instrument Bus Undervoltage Interruptable Bus 3 1-06G, 2-1 (EI-92219)	
OPERATOR ACTIONS						
2.1 Terminate Defueling activities.	XX		XX		XX	
2.2 Dispatch Operator to restore power to failed bus		XX		XX		XX
2.3 Refer to TABLE N.4, "Effects of Loss of Instrument Bus" for effects of loss of a particular bus	XX	XX	XX	XX	XX	XX



## INTRODUCTION

Four separate 120 Volt AC Instrument Buses supply power for the Plant Protective System (PPS) and various control systems. Non-Interruptible Buses 1 and 2 are energized from the 125 Volt DC buses via power inverters (DC-AC). Loss of the DC bus or failure of the inverter will cause an automatic no-break switch to transfer to a dedicated instrument power transformer for backup power. The transformers are energized from 480 Volt Bus 1 for Instrument Bus 1 and 480 Volt Bus 3 for Instrument Bus 2. Non-Interruptible Bus 3 is supplied from a dedicated set of batteries via a power inverter. These batteries are kept charged by a battery charger fed from 480 Volt Bus 2. Failure of the inverter or loss of DC power will cause an automatic no-break switch to a dedicated instrument power transformer fed from 480 Volt Bus 1. Interruptible Bus 3 is fed normally from 480 Volt Bus 3. Failure of this source will cause an automatic switch to another transformer from 480 Volt Bus 1.

## DISCUSSION OF SYMPTOMS

### SYMPTOMS

- 1.1 Instrument Bus Undervoltage Non-Interrupt. Bus 1, I-06G 2-1 (EI 92217)
- 1.2 Instrument Bus Undervoltage Non-Interrupt. Bus 2, I-06G, 2-1 (EI 92218)
- 1.3 Instrument Bus Undervoltage Interrupt. Bus 3, I-06G, 2-1 (EI 92219)

These alarms indicate that an undervoltage condition exists at any one of the four A.C. instrument busses. A visual check of the four voltmeters located on I-06 will provide immediate identification of the effected bus.

## DISCUSSION OF OPERATOR ACTION

### OPERATOR ACTION

- 2.1 Terminate Defueling Activities.

If power supply to non-interrupt. Bus 1 or Bus 2 is lost, a single channel scram will lock in due to hinderance logic of startup channels 1 and 2. Loss of Interrupt. Bus 3 will result in loss of ability to move control rods.



**2.2 Dispatch operator to restore power to failed bus.****NON-INTERRUPTIBLE BUS 1**

If power has been lost to the non-interruptible bus, the static transfer to the dedicated backup transformer has failed. The operator should verify operability of the transformer and switch the manual bypass switch to the alternate power source. Refer to SOP 92-05 for transferring instructions.

**NON-INTERRUPTIBLE BUS 2**

If power has been lost to the non-interruptible bus, the static transfer to the dedicated backup transformer has failed. The operator should verify operability of the transformer and switch the manual bypass switch to the alternate power source. Refer to SOP 92-05 for transferring instructions.

**INTERRUPTIBLE BUS 3**

1. If normal power supply to Interruptible Bus 3 has been lost, an automatic transfer to a backup power supply should take place. Dispatch an Operator to confirm this action locally.
2. If the transfer does not take place automatically due to any reason, the Operator will need to perform a manual transfer by depressing the TEST pushbutton and moving the "RETURN SELECT" to "MAN". Also, while maintaining the TEST pushbutton depressed, move the manual bypass switch to the "BYP-PREF" position. The TEST switch may now be released.



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2.3 Refer to table N.4 "Effects of Loss of Instrument Bus" for effects of loss of a particular bus.

The effects of a loss of particular instrument bus on critical plant equipment is listed in Table N.4.



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TABLE N.4

EFFECTS OF LOSS OF INSTRUMENT BUS

FUNCTION	EFFECT OF LOSS OF NON- INTERRUPTIBLE INSTRUMENT BUS 1	EFFECT OF LOSS OF NON- INTERRUPTIBLE INSTRUMENT BUS 2	EFFECT OF LOSS OF INTERRUPTIBLE INSTRUMENT BUS 3	EFFECT OF LOSS OF NON- INTERRUPTIBLE INSTRUMENT BUS 3
CIRCUL- ATOR AUXIL- IARIES	LOOP 1 Buffer He suply fail open, buf- fer He return FC, thus circ. trips on high buffer/mid- buffer delta P.  LOOP 2, NO EFFECT  Bearing water supply & return Flow control valve on brng water FO, drain controls all pneumatic, no failure.	LOOP 2 Buffer He Suply fail open, buf- fer He return FC, thus circ. trips on high buffer/mid- buffer delta P.  LOOP 1, NO EFFECT  Bearing water supply & return Flow control valve on brng water FO, drain controls all pneumatic, no failure.	LOOP 1 & LOOP 2 NO EFFECT	NO EFFECT
CIRCUL- ATOR SPEED CONTROL	LOOP 1 Controls FAI shutdown by buf fer as above.  LOOP 2 No effect on water turbine drives.	LOOP 2 Controls FAI shutdown by buf fer as above.  LOOP 1 No effect on water turbine drives.	NO EFFECT	NO EFFECT

NOTE: Abbreviations - FC = Fail Closed  
FO = Fail Open  
FA = Fail "as is"  
SD = Shutdown



TABLE N.4
EFFECTS OF LOSS OF INSTRUMENT BUS

FUNCTION	EFFECT OF LOSS OF NON- INTERRUPTIBLE INSTRUMENT BUS 1	EFFECT OF LOSS OF NON- INTERRUPTIBLE INSTRUMENT BUS 2	EFFECT OF LOSS OF INTERRUPTIBLE INSTRUMENT BUS 3	EFFECT OF LOSS OF NON- INTERRUPTIBLE INSTRUMENT BUS 3
PPS SYSTEM	Lose trip capa- bility from 'A' logic. Single channel scram.	Lose trip capa- bility from 'B' logic. Single channel scram.	NO EFFECT	Single channel trips and sin- gle channel scram.
CIRCUL- ATOR TRIP & LOOP SD CAPA- BILITIES	Loss of circ. trip & Loop SD from "A" Logic capability  Should not re- sult in trip or loss of trip capability.	Loss of circ. trip & Loop SD from "B" Logic capability  Should not re- sult in trip or loss of trip capability.		Results in single channel trips.
CONTROL ROD DRIVES	Lose digital position indic- ation.	Lose analog pos- ition indicate	Lose capability of moving CRD's with hand switches or flux controller.	NO EFFECT
AUX. BOILER	Lose PCV 5201 control (FO) (Can control manually).	Lose all boiler controls.	NO EFFECT	

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TABLE N.4

EFFECTS OF LOSS OF INSTRUMENT BUS

FUNCTION	EFFECT OF LOSS OF NON- INTERRUPTIBLE INSTRUMENT BUS 1	EFFECT OF LOSS OF NON- INTERRUPTIBLE INSTRUMENT BUS 2	EFFECT OF LOSS OF INTERRUPTIBLE INSTRUMENT BUS 3	EFFECT OF LOSS OF NON- INTERRUPTIBLE INSTRUMENT BUS 3
ALARMS	All switched alarms function normally. All alarms fed from Bus 1 fail (no alarm).	All switched alarms function normally. All alarms fed from Bus 2 fail (no alarm).	All switched alarms function normally. All alarms fed from Bus 3 fail (no alarm).	NO EFFECT
REACTOR BLDG. EXHAUST FANS	Lose Fan 1A controls.	Lose Fan 1B, 1C controls.	NO EFFECTS	NO EFFECT
COMMUNI- CATIONS	Loss of tele- phone system (no bell).	Loss of public address system	NO EFFECT	NO EFFECT

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