KENDAL POWER STATION

MV SWITCHGEAR INTERLOCKS

DOCUMENT HISTORY

AUTHORS	REVISION	DATE	DOCUMENT TYPE
TL Martin JM Grobler ALP Pretorius	0	20 June 1995	Functional spec

Approved:

K Babst
Kendal Engineering Manager

C Schutte
Kendal Operations Manager

F Holmes
Kendal P & M Manager

KENDAL POWER STATION

MV Switchgear Interlocking

Document prepared by: PTM (Witbank)

TABLE OF CONTENTS

1.	INTRODUCTION	4
2.	INTERLOCKING PHILOSOPHY (KENDAL POWER STATION)	5
3.	LEGEND FOR INTERLOCKS	6
4.	STATION CONTROL INTERLOCK CONCEPT	7
5.	INCOMER "A" INTERLOCK (WITHOUT LOOP SUPPLY BRK)	8
6.	INCOMER "B" INTERLOCK	9
7	BUS SECTION INTERLOCK (WITHOUT LOOP SUPPLY BRK)	10
8.	11kV UNIT BOARD INCOMER "A" INTERLOCK	11
9	11kV UNIT BOARD BUS SECTION INTERLOCK	12
10	LOOP SUPPLY BREAKERS	13 - 22
11	STATION BOARD 1 &2 INCOMER FROM GT BOARD	23 - 24
12	GAS TURBINE BOARD INTERLOCK	25 - 26
13	400kV BREAKER INTERLOCKS AT UNIT PLC	27
14	11kV FEEDER TO 6.6kV OR 3.3kV BOARD	28
15	11kV STN BOARD FEEDING TO 11kV SUBSTATION BOARD	29
16	22kV CSY BOARD FEEDING TO 3.3kV CSY BOARD	29
17	DESCRIPTION LIST	30
18	DRAWINGS	

1. INTRODUCTION

This document defines the interlocking logic used for the MV switchgear at Kendal Power Station, as decided at a workshop held at the Megawatt Park Conference Center on 1 June 1995. The following people attended the workshop:

H Barnard	Generation Engineering
C Brozio	Generation Engineering
P Przybysz	Generation Electrical Engineering (Kendal)
A Kuzelj	Generation Electrical Engineering (Kendal)
J Grobler	PTM (Kendal)
A Pretorius	PTM (Witbank)

2. INTERLOCK PHILOSOPHY (KENDAL POWER STATION)

- The software interlocks only cater for remote operations and local or mechanical operation can still be done locally by the electrical Operator.

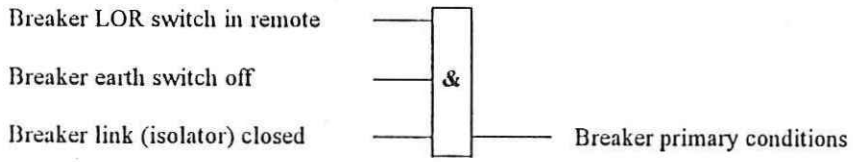
- Software interlocking only prohibits closing of breakers and the Electrical Operator will be able to open any of the MV breakers at any given time.

- Two units should never supply the same station board simultaneously.

- The same station board should never supply two units simultaneously.

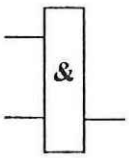
- All MV boards, excluding the 11kV station boards and the 11kV unit boards, shall be interlocked in a 2- out of -3 manner. Which means that only two breakers are allowed to be closed at the same time. (On these boards the interlocks only refer to the bus section breaker and the two incomers.)

- Definition for "Breaker Primary Conditions".

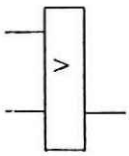


3. LEGEND FOR INTERLOCKS

- And gate



- Or gate



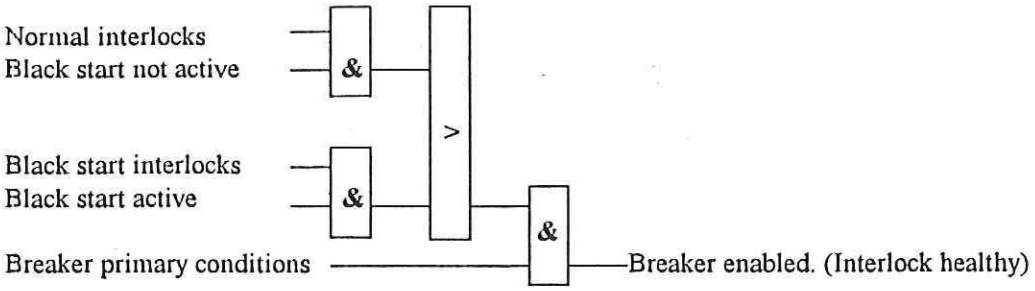
- Abbreviations

BD	Board	CSY 1	Coal stockyard 1 board
BS	Bus section	CSY2	Coal stockyard 2 board
LINK	Link (Isolator)	CSY3	Coal stockyard 3 board
E/S	Earth switch	CSY4	Coal stockyard 4 board
OPEN	Opened	DUMP	Ash dump board
CLOSE	Closed	TRANS	Ash transfer board
OFF	Off	HV	HV Yard
STN	Station board	GT	Gas turbine
SS1	Sub south 1 board	LOR	Local/Off/Remote
SS2	Sub south 2 board		
SE	Sub east board		

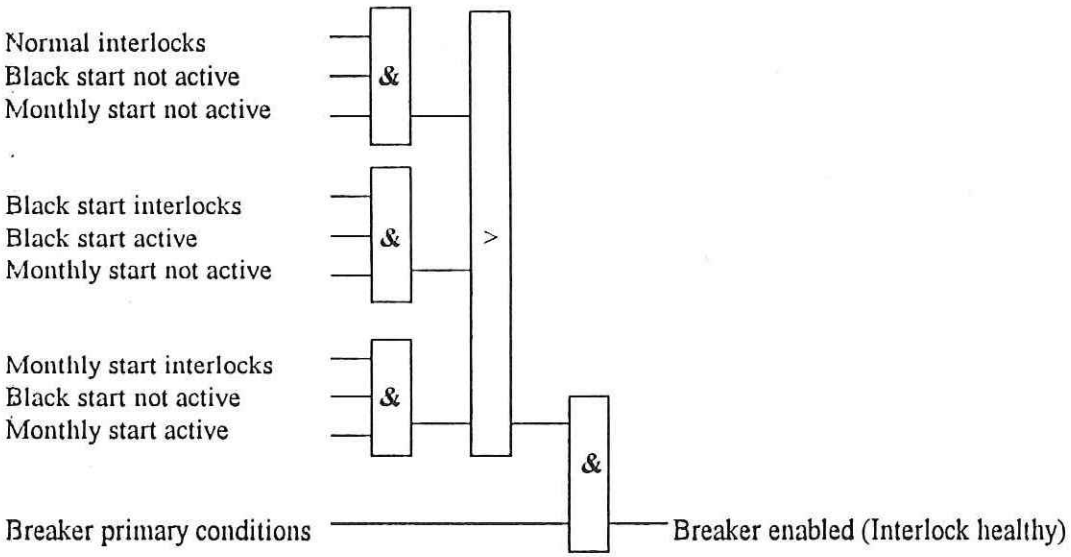
Input status	Logic
Breaker opened	**1**
Breaker closed	**0**
Isolator opened (link)	**0**
Isolator closed (link)	**1**
Earth switch on	**1**
Earth switch off	**0**
LOR switch local or off	**1**
LOR switch in remote	**0**

4. STATION CONTROL INTERLOCK CONCEPT (11kV board)

Concept for unit 1 to 6 ***(Loop supply breaker,two incomers and bus section breaker)***



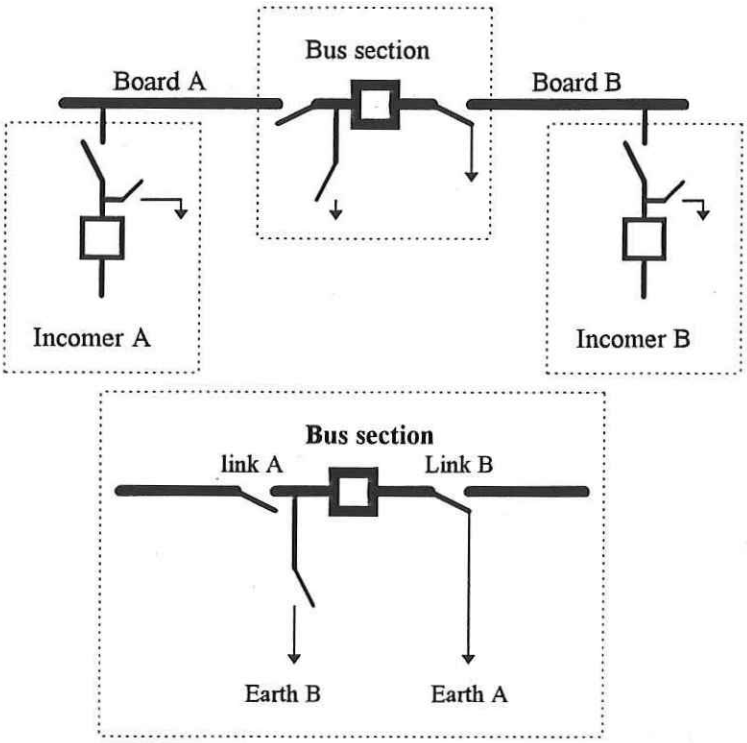
Concept for station board one and two ***(Two incomers and the loop supply feeders)***

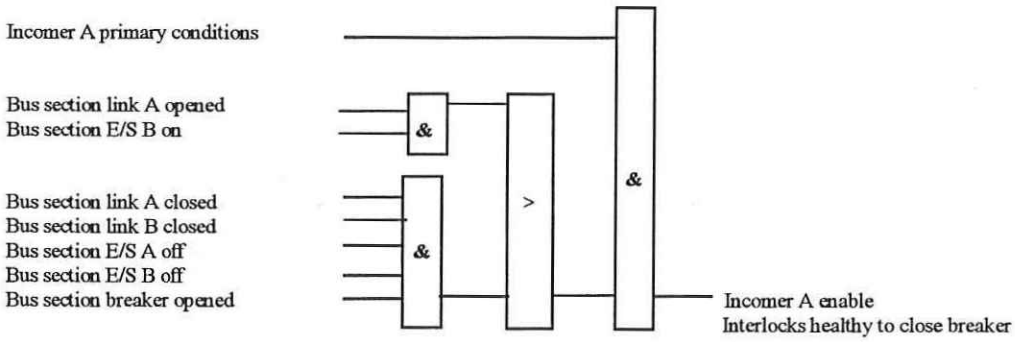


Black start active	Signal from GT PLC "Black start" - program active.
Black start interlocks	Interlocks to prevent a breaker from closing as per flow chart.
Monthly start active	Signal from GT PLC "Monthly start" -program active.
Monthly start interlocks	Interlocks to prevent a breaker from closing as per flow chart.

5. INCOMER "A" INTERLOCK

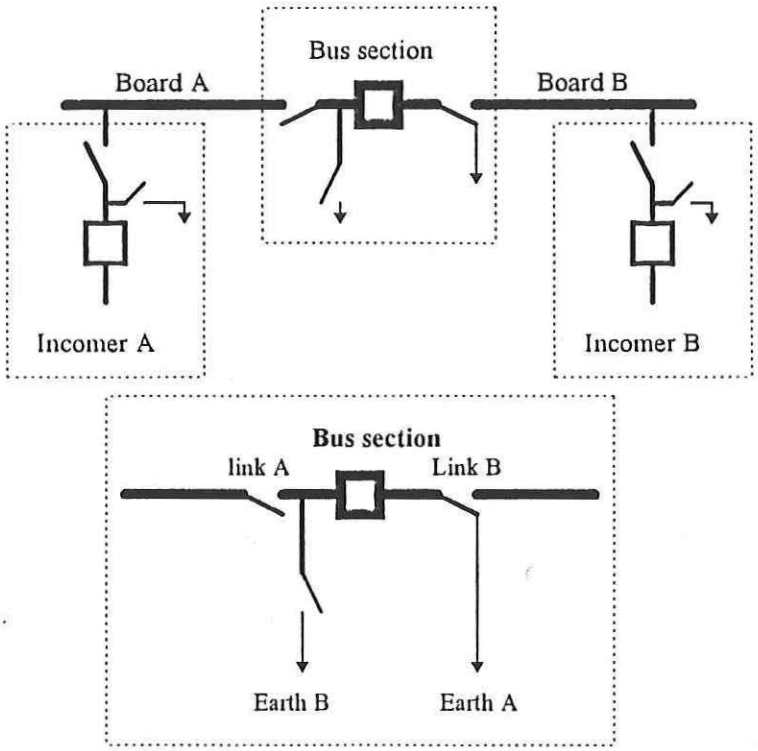
(MV BOARD WITHOUT LOOP SUPPLY BREAKER)

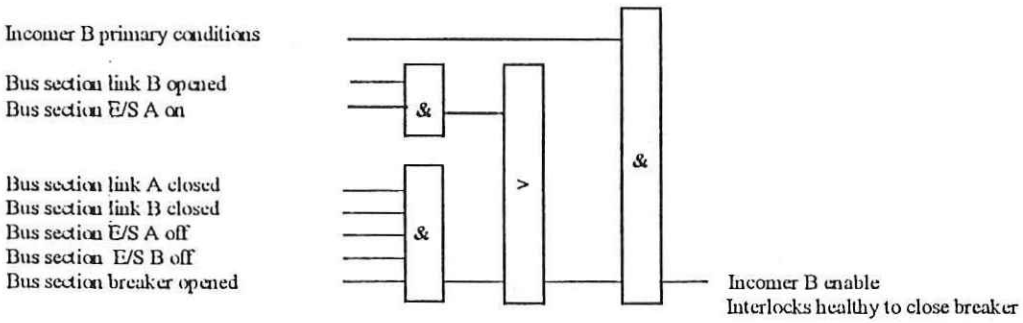




Incomer A breakers: *All 3.3kV boards.*
All 6.6kV boards.
All 11kV boards ecxept for the unit and station boards.

6. INCOMER "B" INTERLOCK

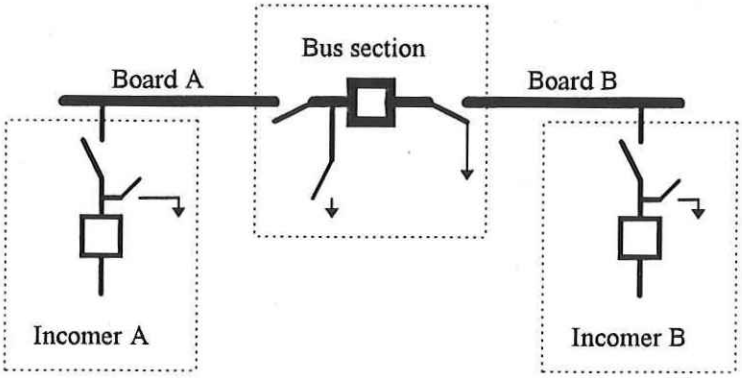


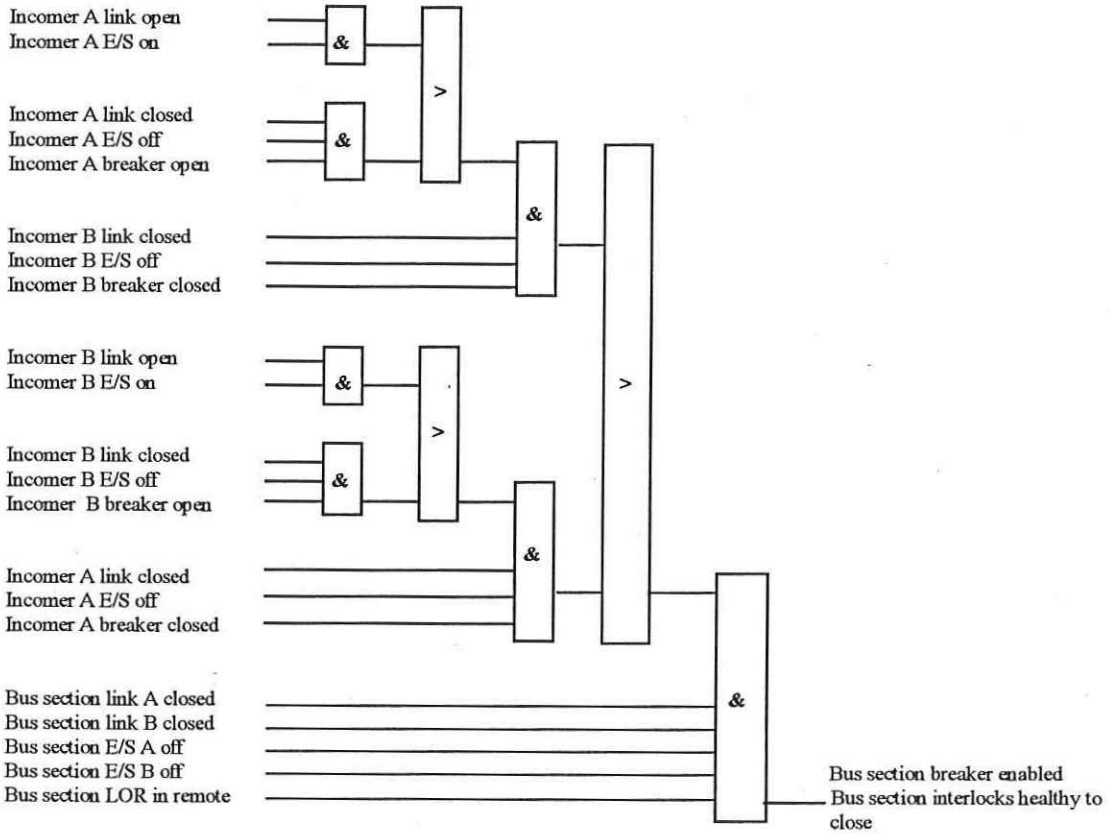


Incomer B breakers: *All 3.3kV boards.*
All 6.6kV boards.
All 11kV boards exept for the station boards.

7. BUS SECTION INTERLOCK

(All MV boards without loop supply breakers)

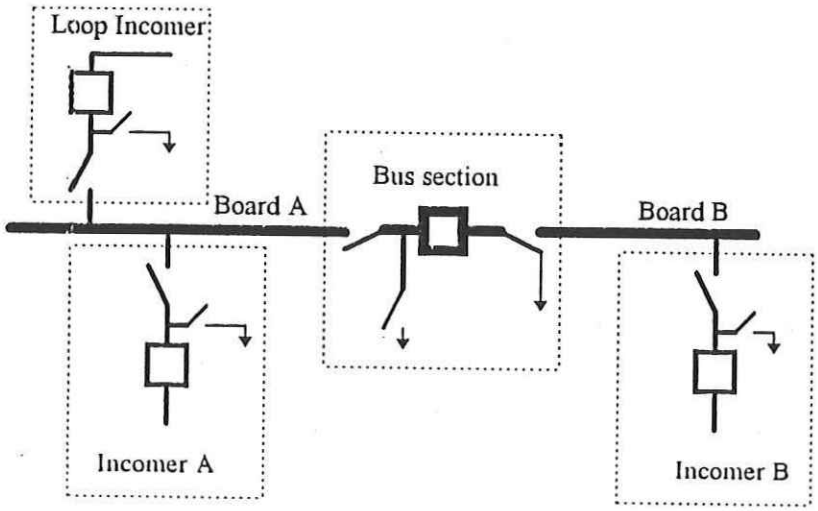


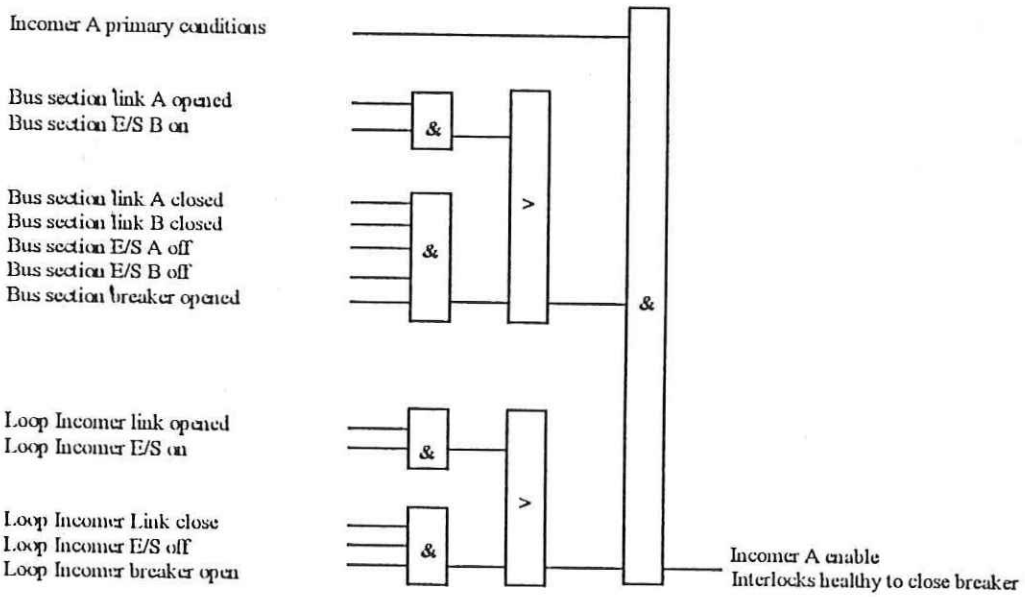


Bus section breakers: All 3.3kV boards.
All 6.6kV boards.
All 11kV boards ecxept for the unit and station boards.

8. 11kV UNIT BOARD INCOMER "A" INTERLOCK

(MV Boards with loop supply breakers)

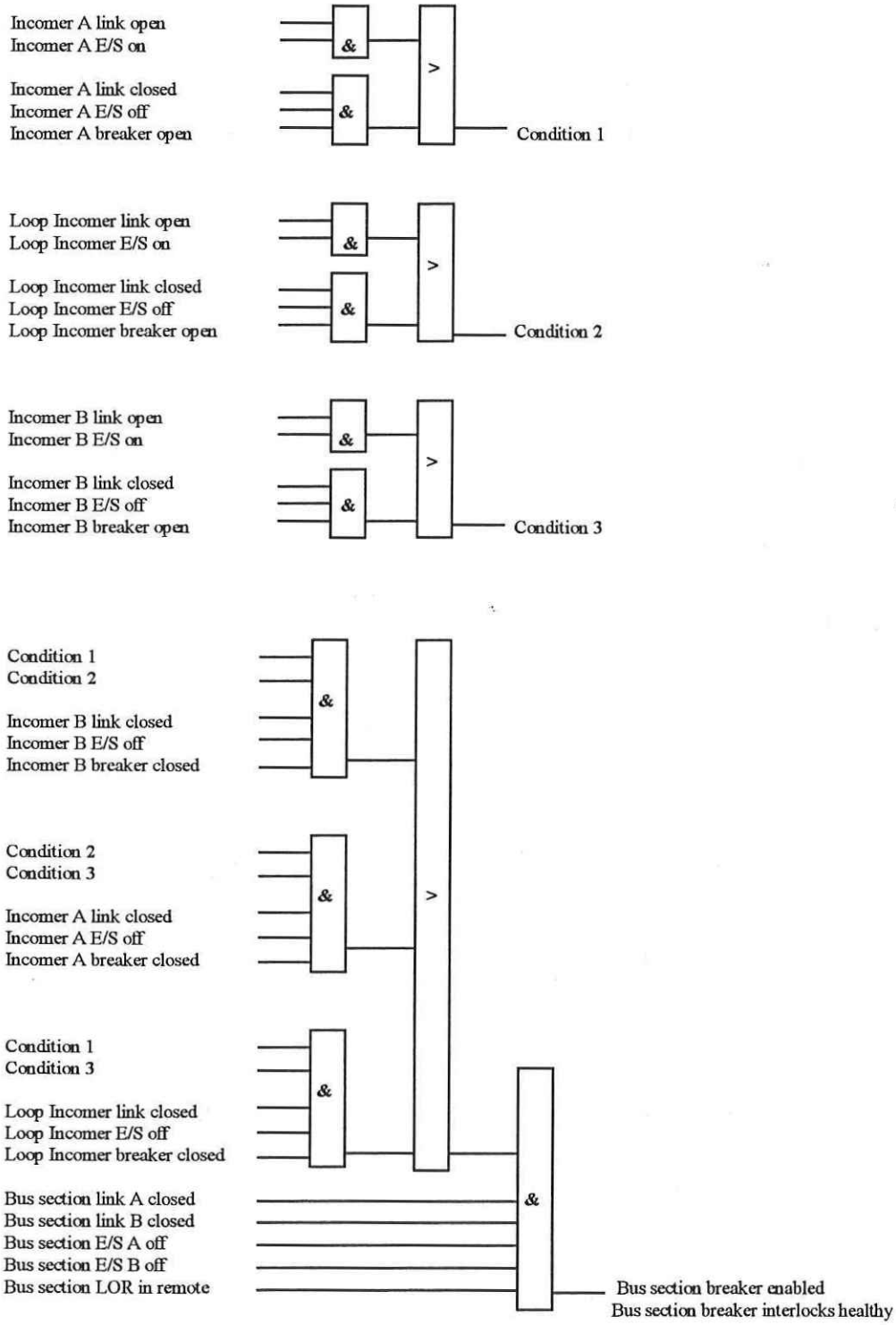




Incomer A breakers: All 11kV unit boards.

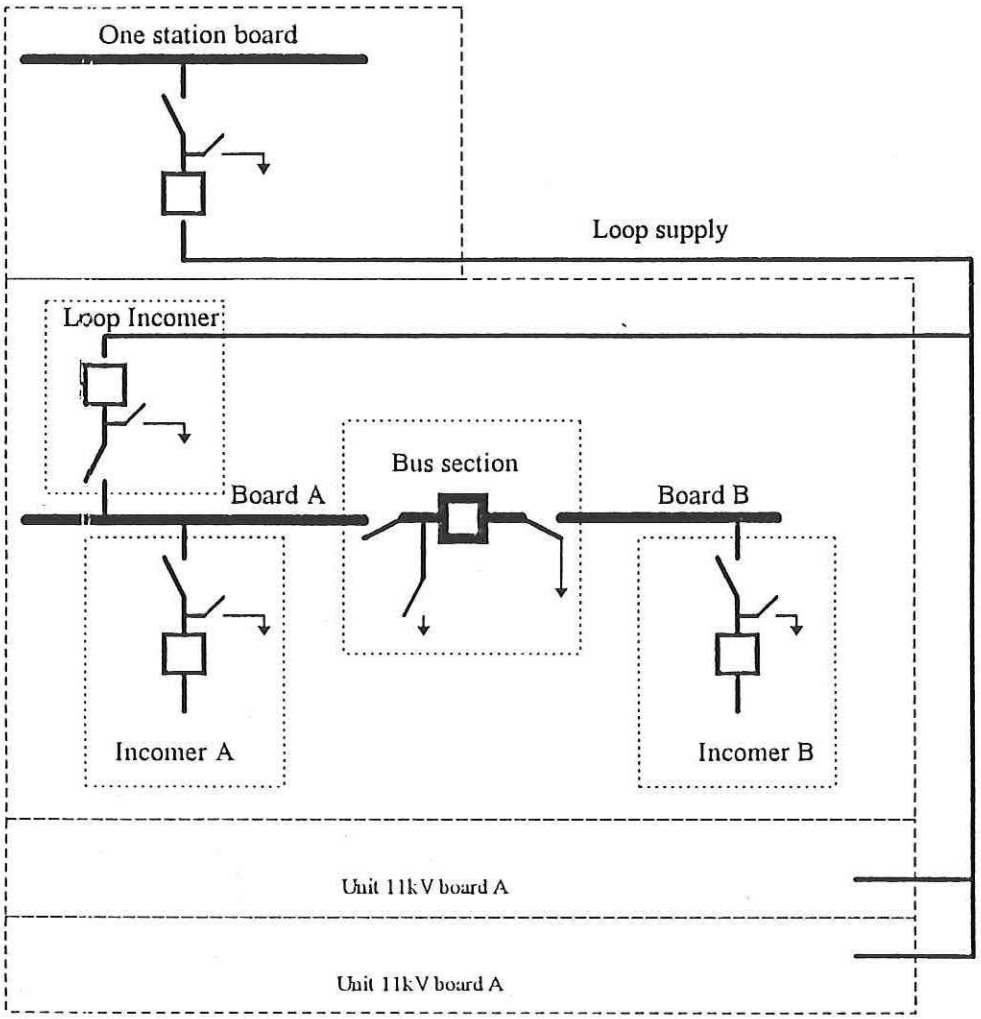
9. 11kV UNIT BOARD BUS SECTION INTERLOCK

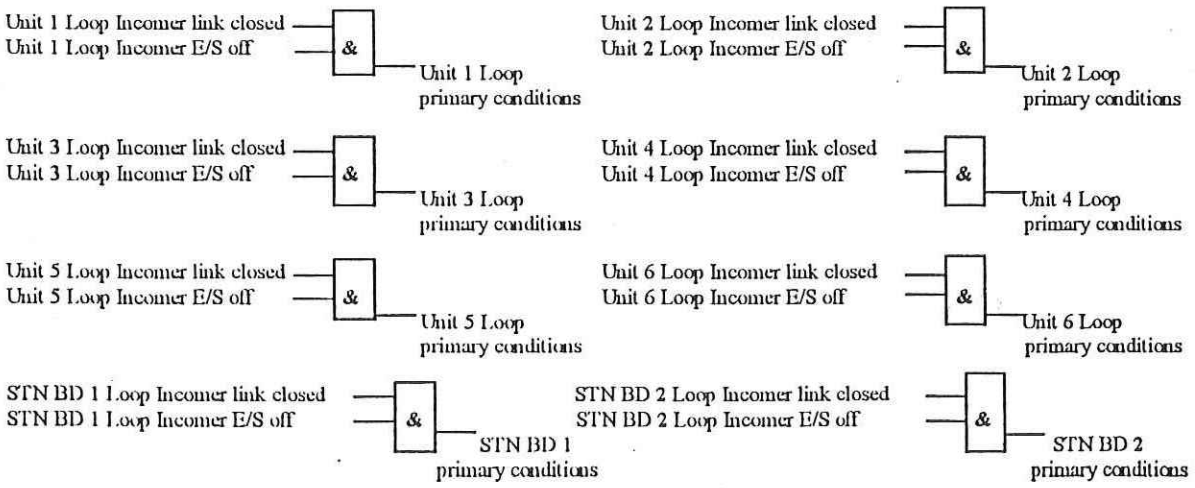
(MV switchgear with loop supply breakers)

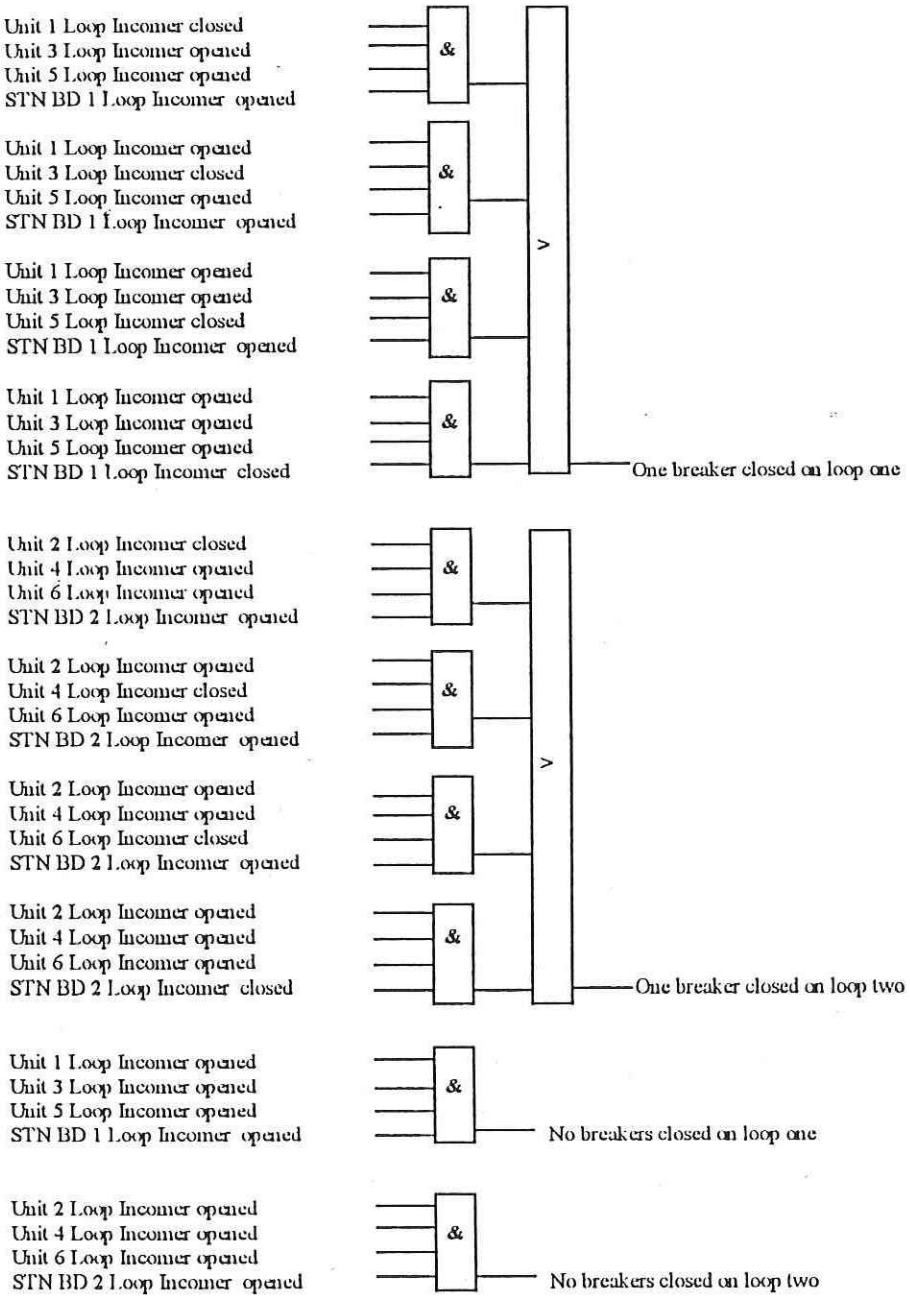


Bus section breakers: All 11kV unit boards.

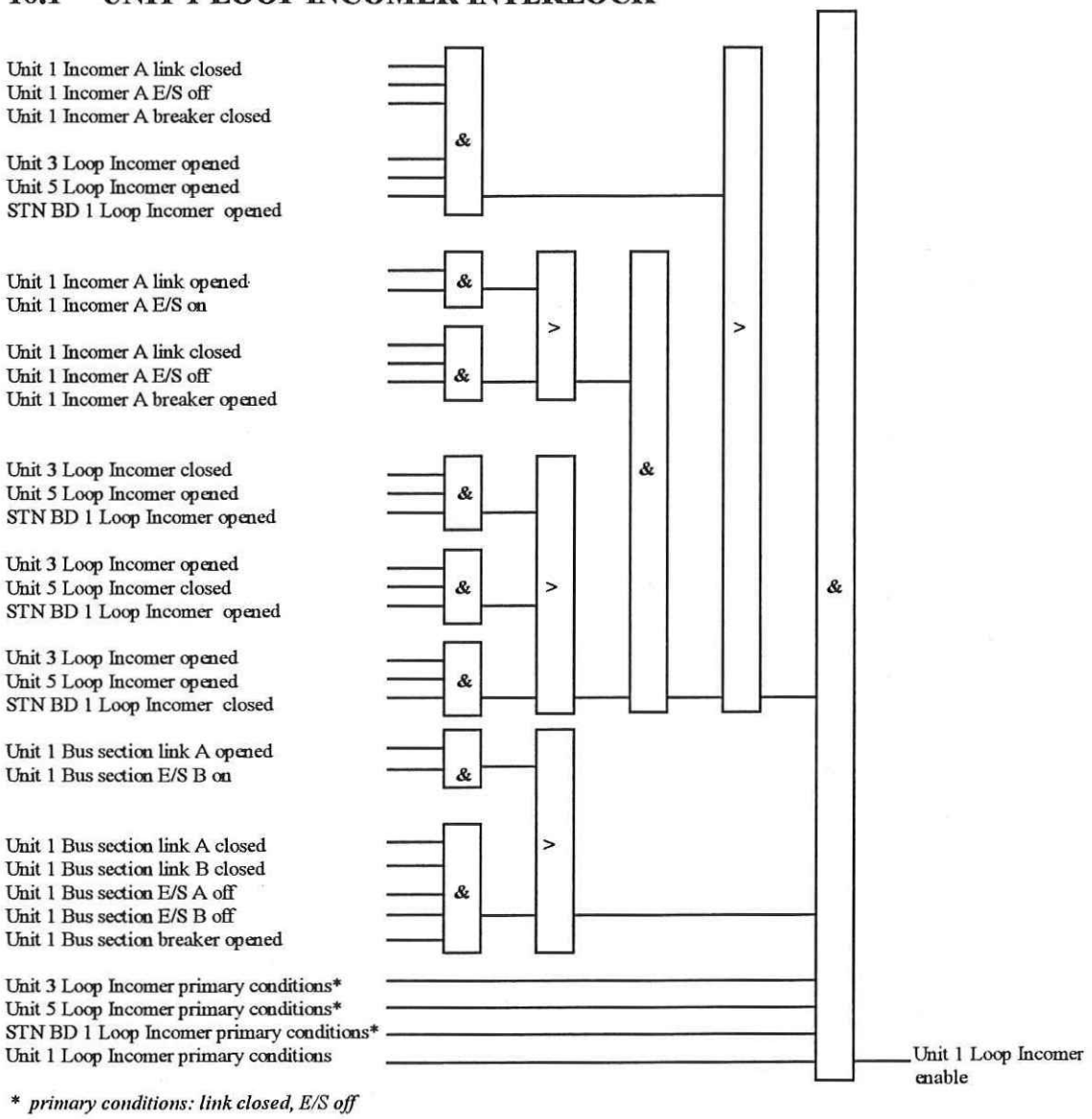
10. LOOP SUPPLY BREAKERS





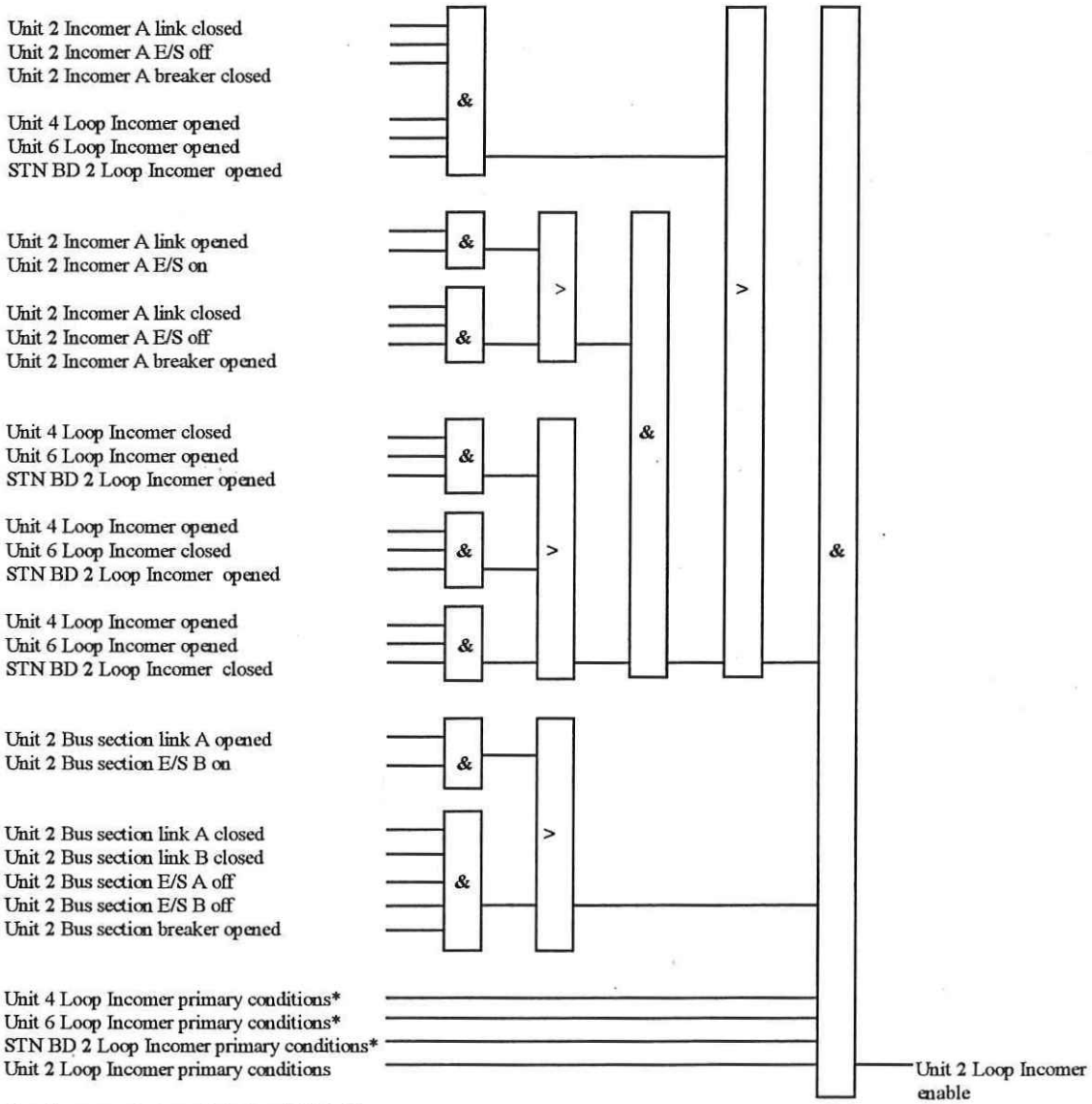

Unit 1 Loop Incomer closed
Unit 3 Loop Incomer opened
Unit 5 Loop Incomer opened
STN BD 1 Loop Incomer opened
Unit 1 Loop Incomer opened
Unit 3 Loop Incomer closed
Unit 5 Loop Incomer opened
STN BD 1 Loop Incomer opened
Unit 1 Loop Incomer opened
Unit 3 Loop Incomer opened
Unit 5 Loop Incomer closed
STN BD 1 Loop Incomer opened
Unit 1 Loop Incomer opened
Unit 3 Loop Incomer opened
Unit 5 Loop Incomer opened
STN BD 1 Loop Incomer closed
&
&
&
&
>
One breaker closed on loop one
Unit 2 Loop Incomer closed
Unit 4 Loop Incomer opened
Unit 6 Loop Incomer opened
STN BD 2 Loop Incomer opened
Unit 2 Loop Incomer opened
Unit 4 Loop Incomer closed
Unit 6 Loop Incomer opened
STN BD 2 Loop Incomer opened
Unit 2 Loop Incomer opened
Unit 4 Loop Incomer opened
Unit 6 Loop Incomer closed
STN BD 2 Loop Incomer opened
Unit 2 Loop Incomer opened
Unit 4 Loop Incomer opened
Unit 6 Loop Incomer opened
STN BD 2 Loop Incomer closed
&
&
&
&
>
One breaker closed on loop two
Unit 1 Loop Incomer opened
Unit 3 Loop Incomer opened
Unit 5 Loop Incomer opened
STN BD 1 Loop Incomer opened
&
No breakers closed on loop one
Unit 2 Loop Incomer opened
Unit 4 Loop Incomer opened
Unit 6 Loop Incomer opened
STN BD 2 Loop Incomer opened
&
No breakers closed on loop two

10.1 UNIT 1 LOOP INCOMER INTERLOCK



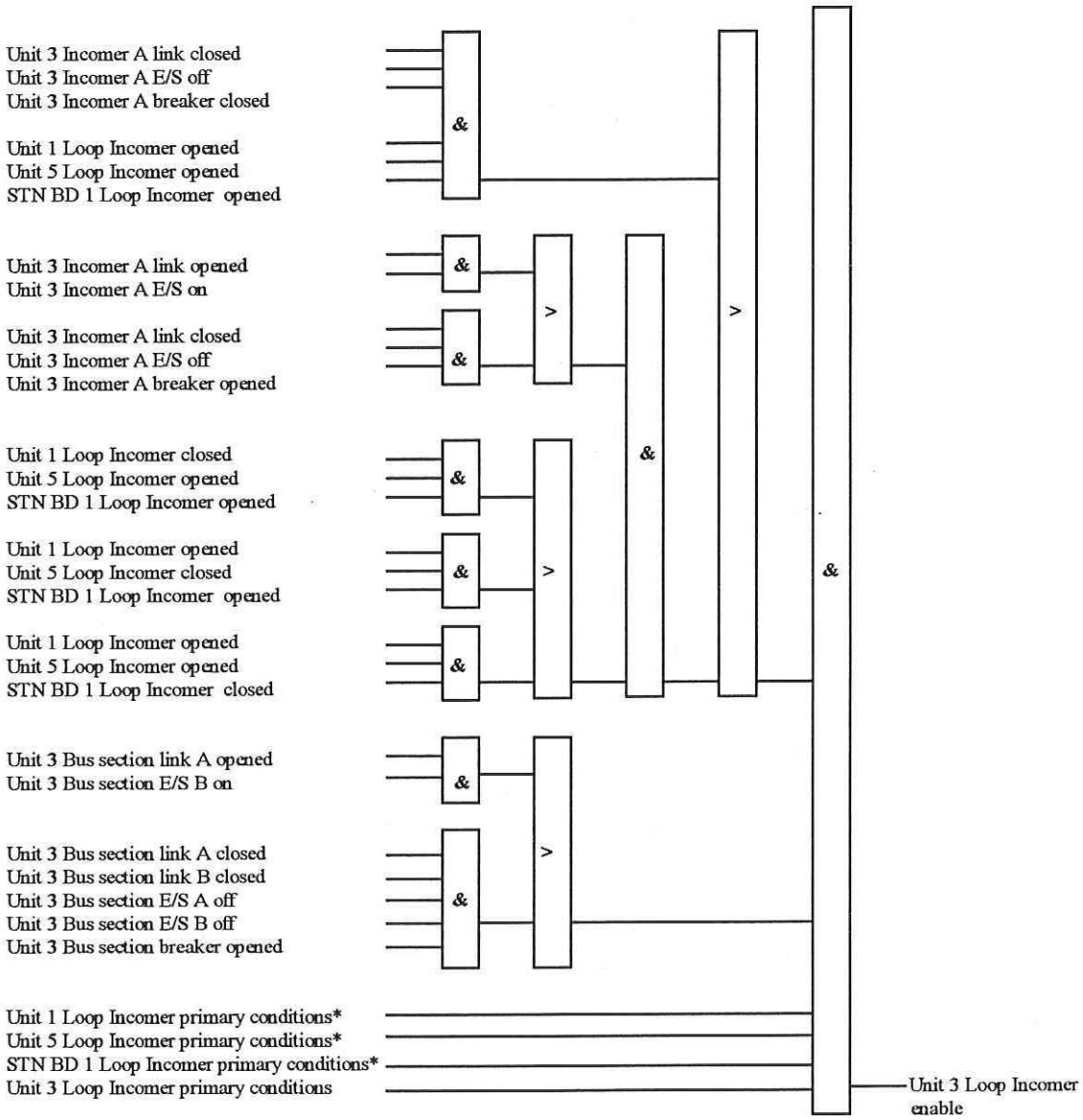
** primary conditions: link closed, E/S off*

10.2 UNIT 2 LOOP INCOMER INTERLOCK



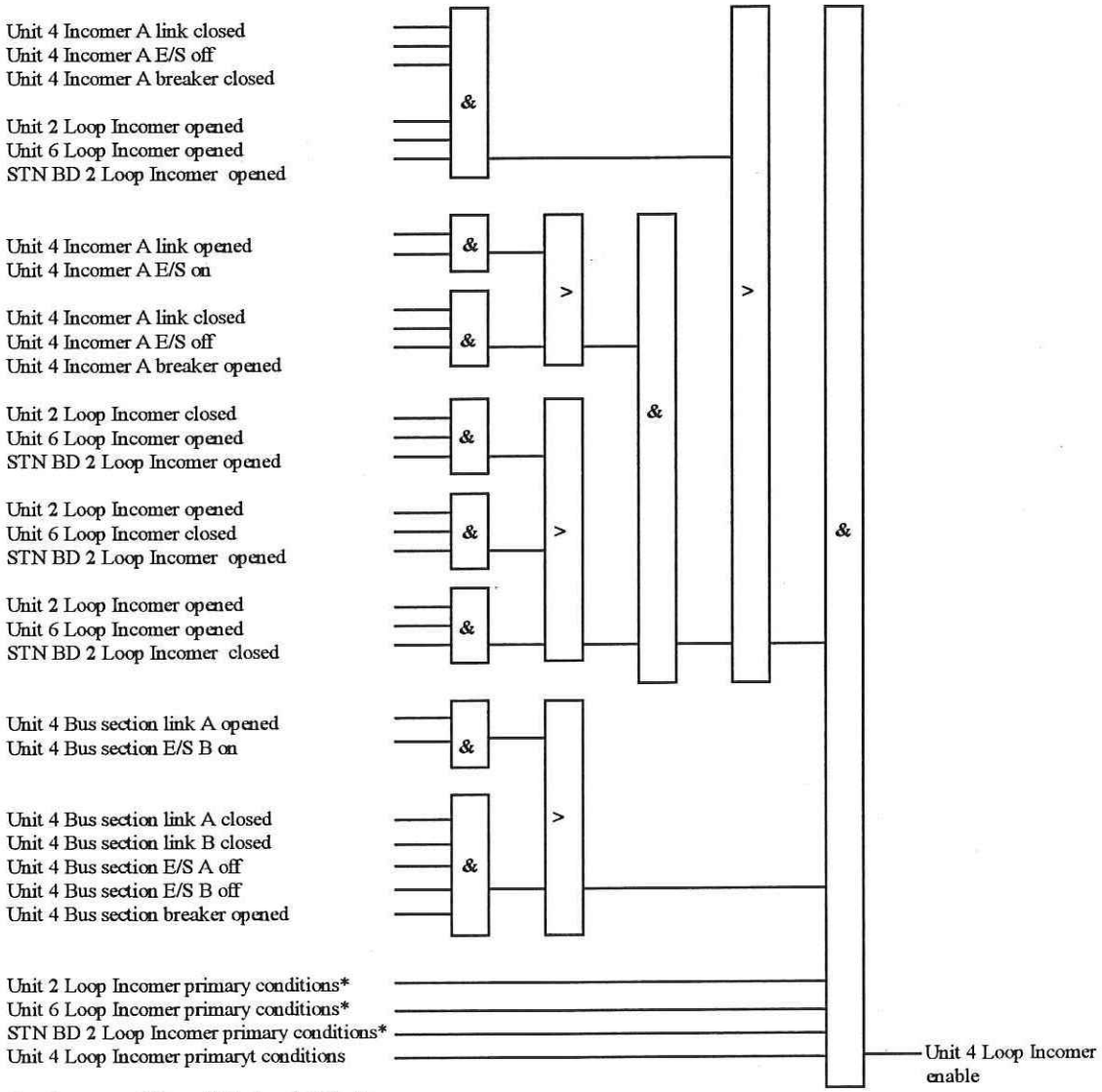
** primary conditions: link closed, E/S off*

10.3 UNIT 3 LOOP INCOMER INTERLOCK



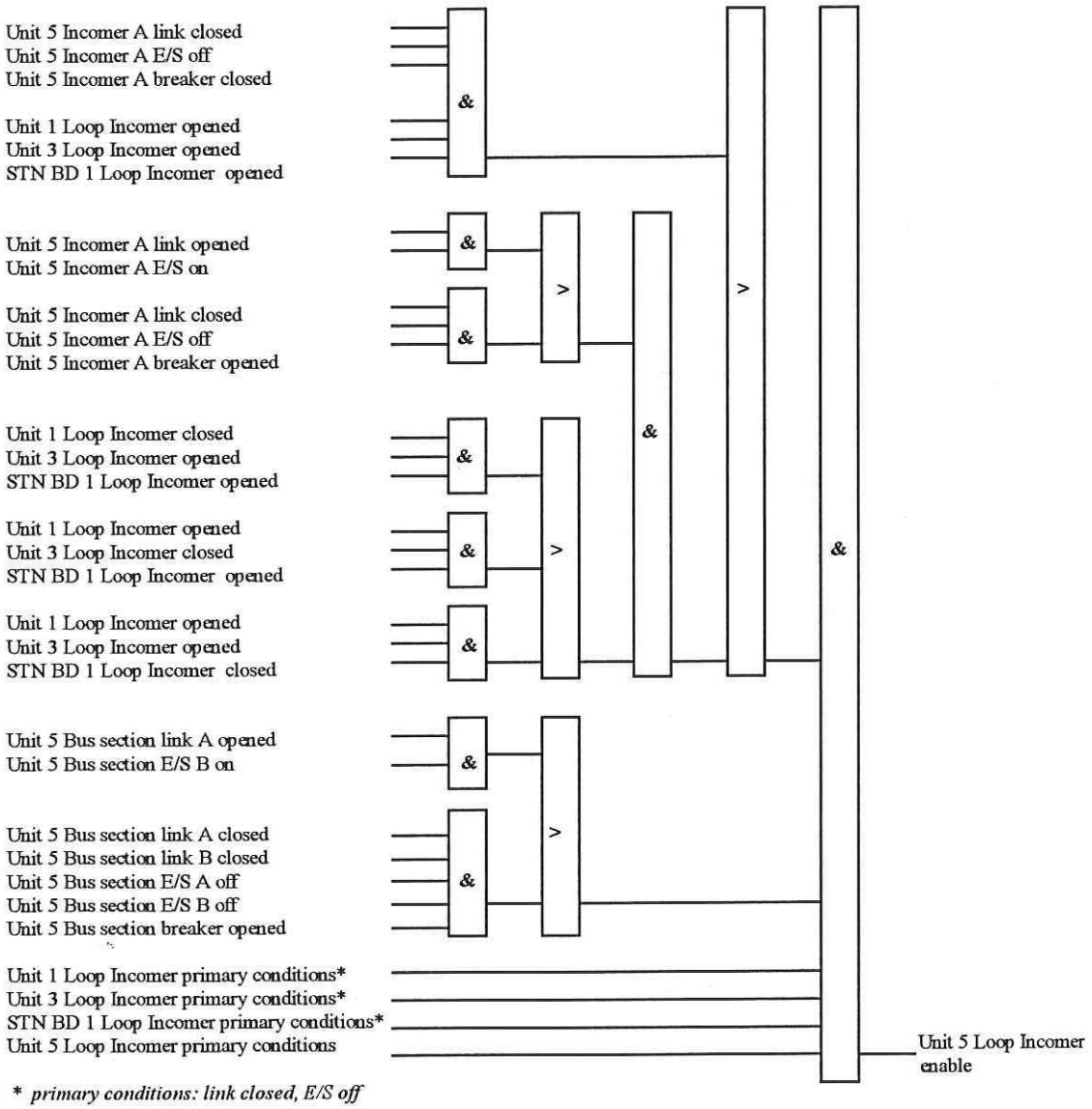
** primary conditions: link closed, E/S off*

10.4 UNIT 4 LOOP INCOMER INTERLOCK



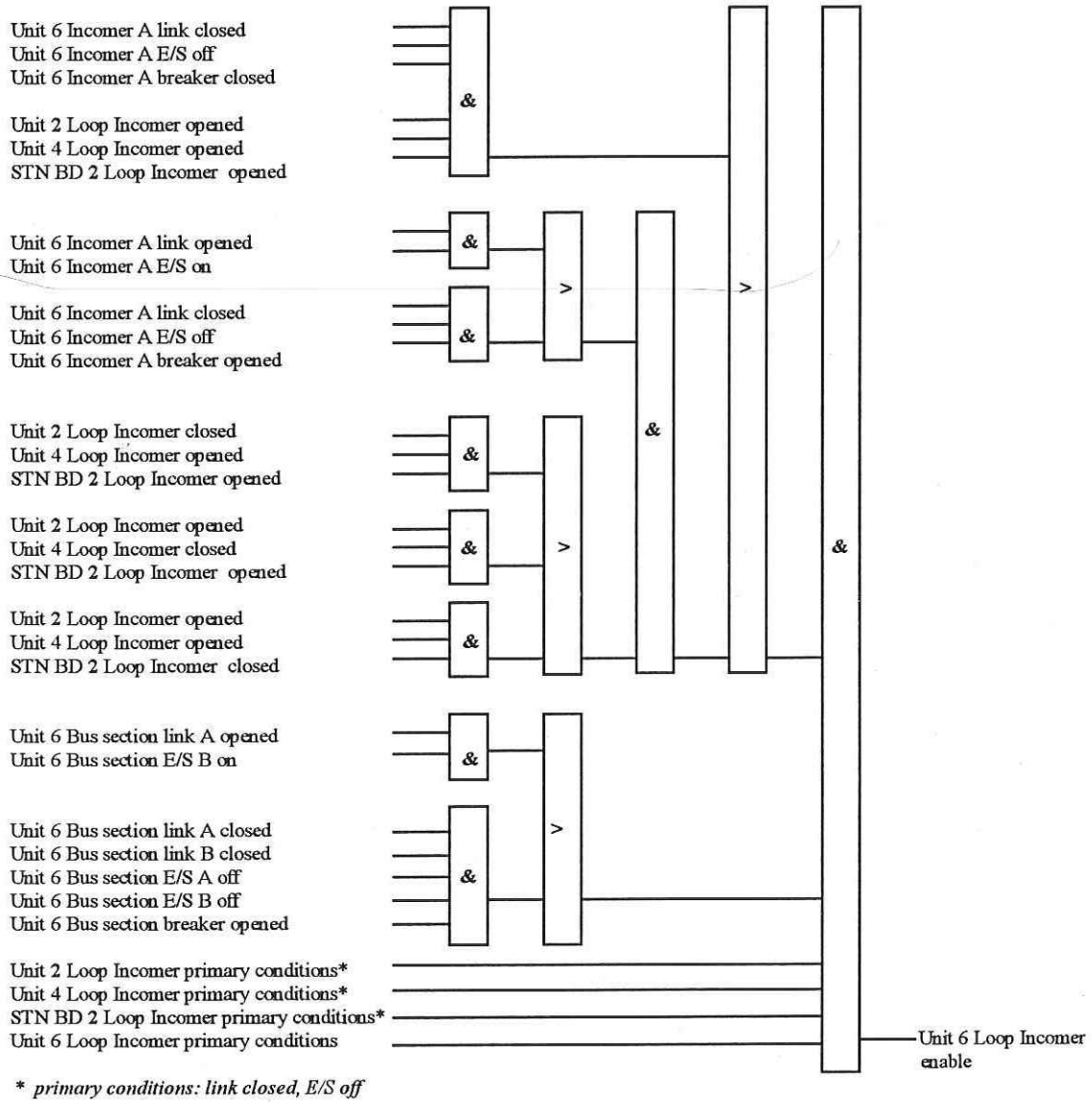
** primary conditions: link closed, E/S off*

10.5 UNIT 5 LOOP INCOMER INTERLOCK



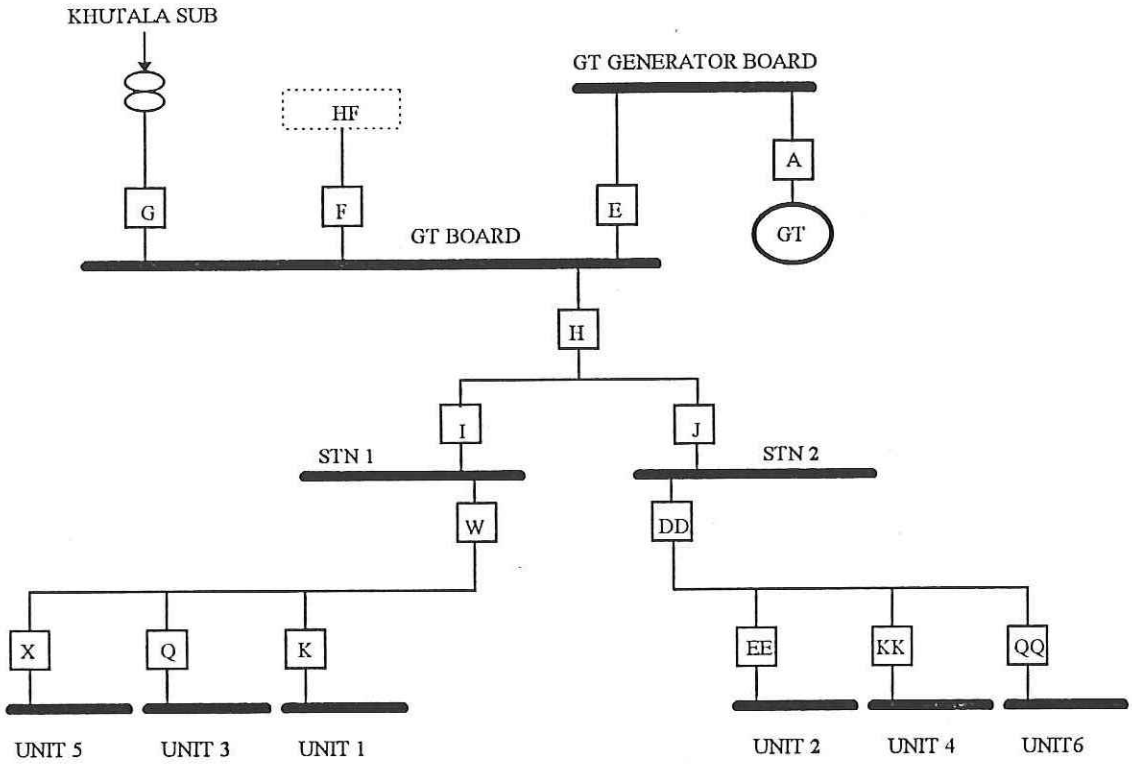
** primary conditions: link closed, E/S off*

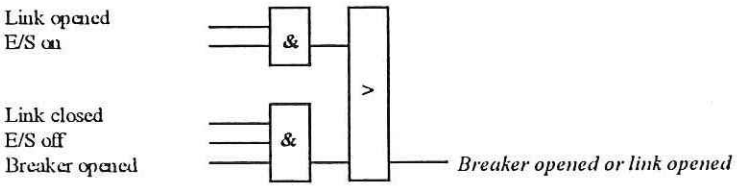
10.6 UNIT 6 LOOP INCOMER INTERLOCK



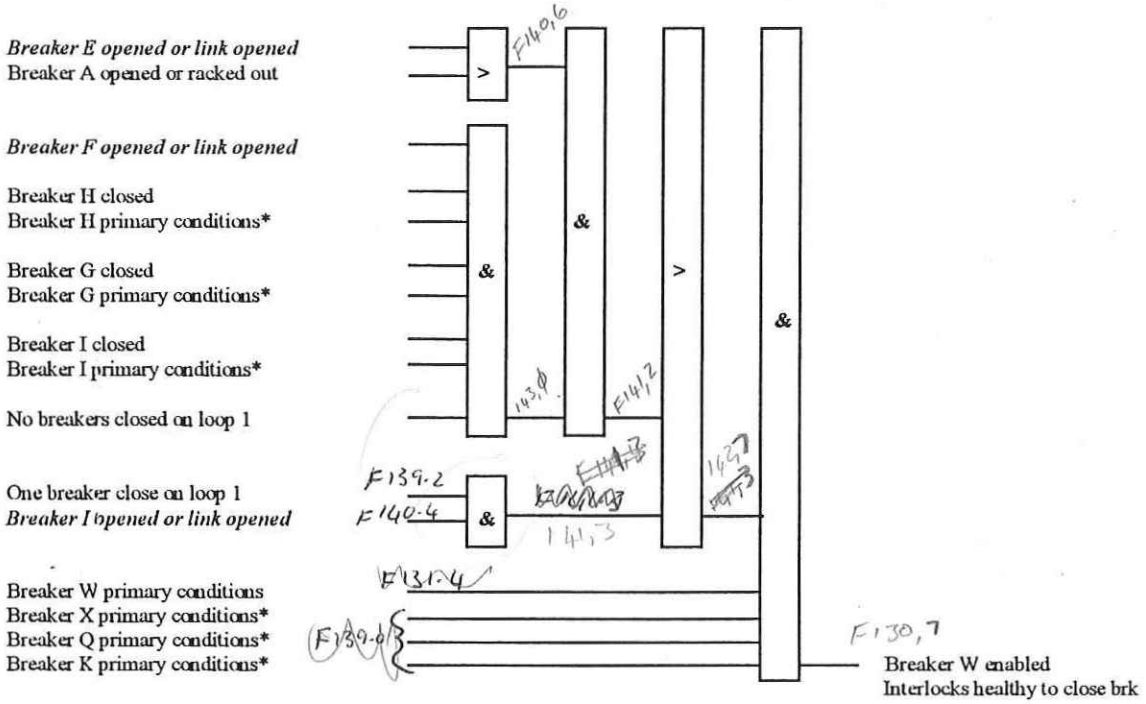
** primary conditions: link closed, E/S off*

10.7 STATION BOARD LOOP INCOMER INTERLOCK

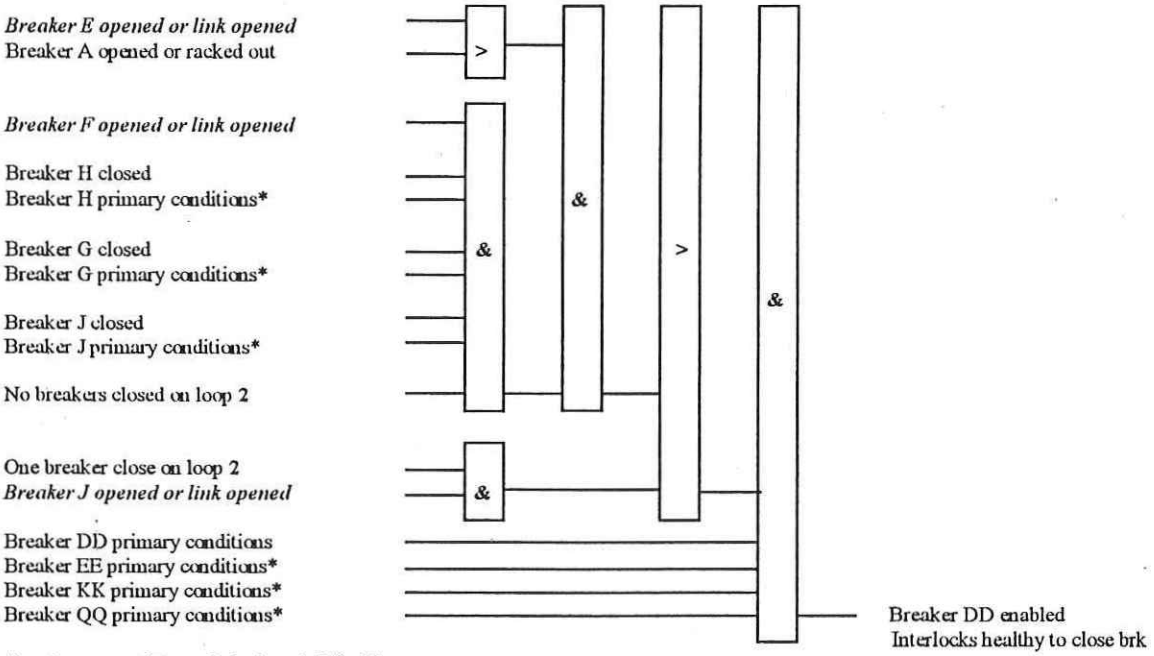




10.7.1 STATION BOARD 1 LOOP INCOMER INTERLOCK

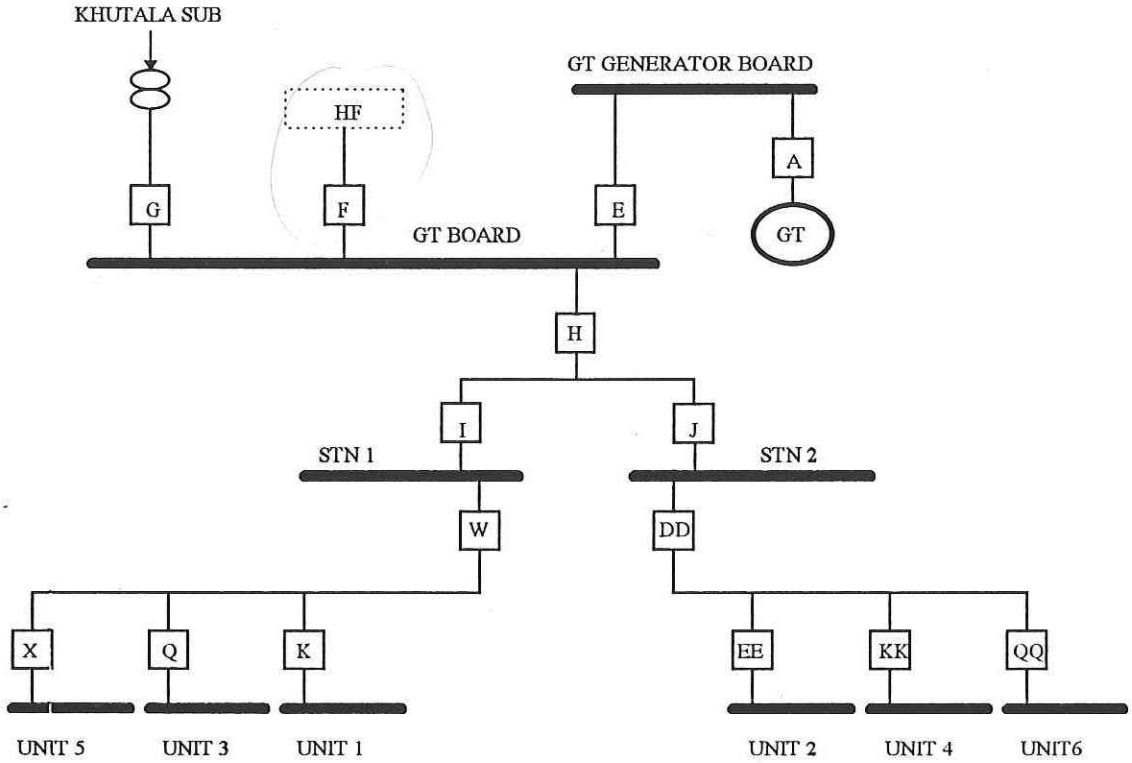


10.7.2 STATION BOARD 2 LOOP INCOMER INTERLOCK

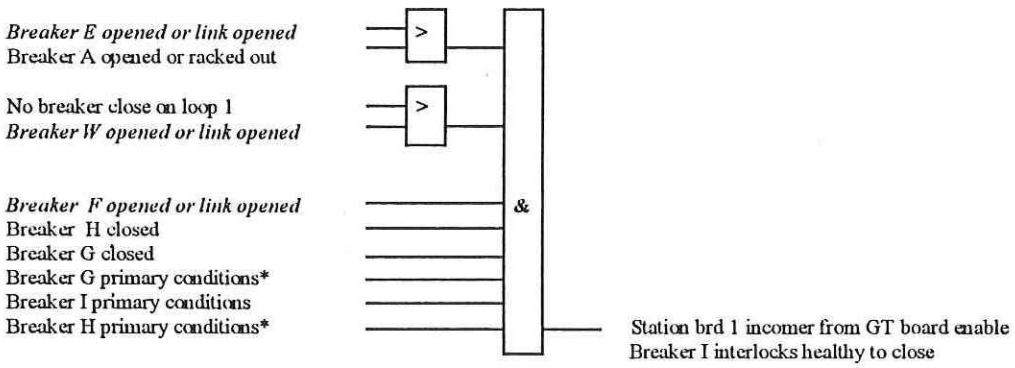


* *primary conditions: link closed, E/S off*

11. STATION BOARD INCOMER FROM GT BOARD

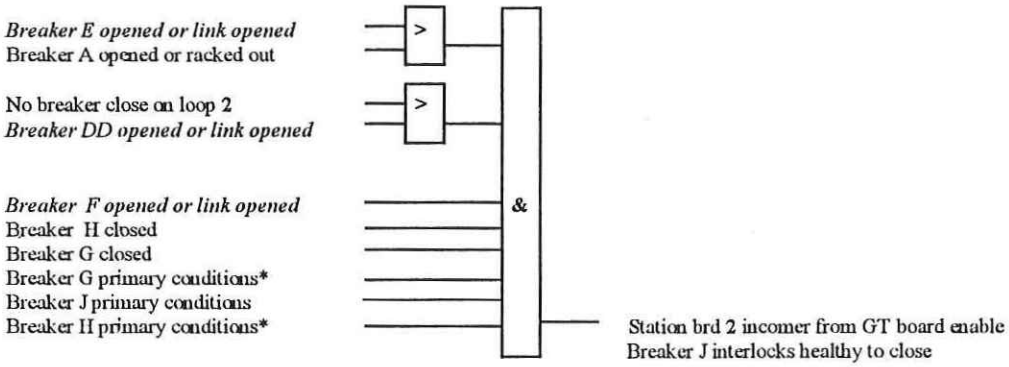


11.1 STATION BRD 1 INCOMER FROM GT BOARD INTERLOCK



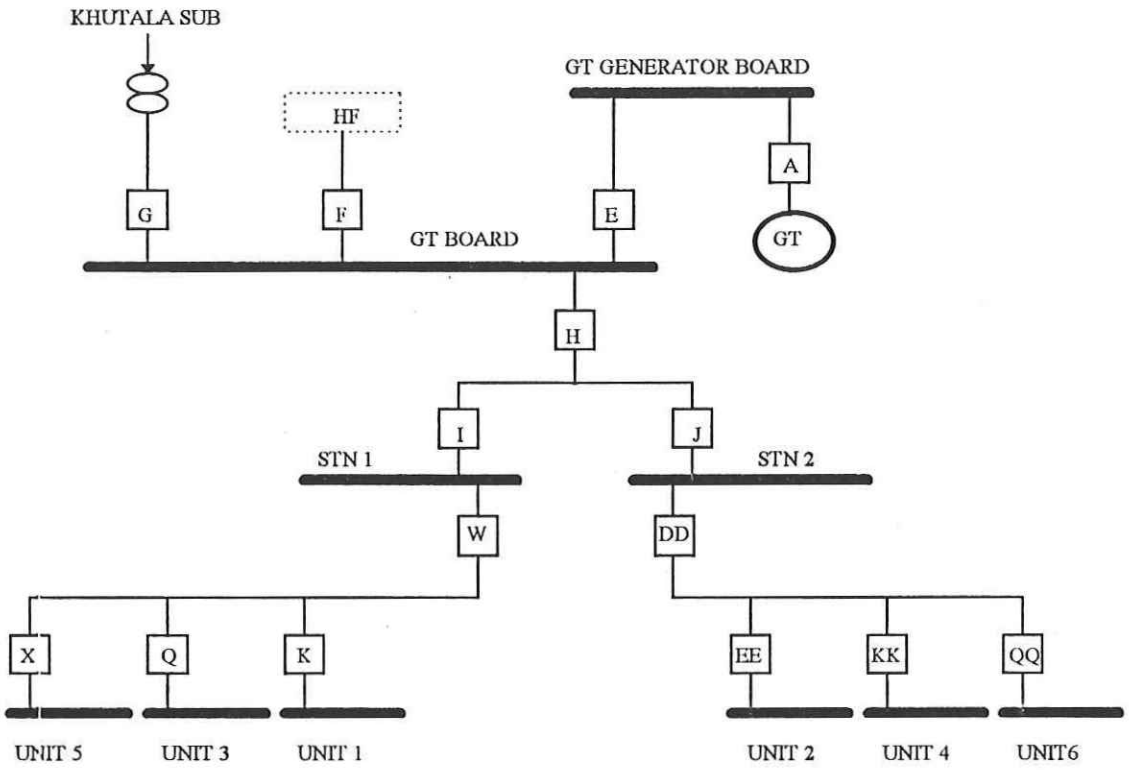
* *primary conditions: link closed, E/S off*

11.2 STATION BRD 2 INCOMER FROM GT BOARD INTERLOCK



* *primary conditions: link closed, E/S off.*

12. GAS TURBINE BOARD INTERLOCKING



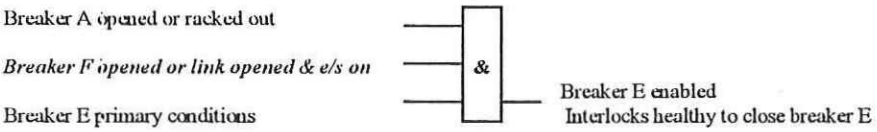
12.1 11.5kV GAS TURBINE BREAKER (A) INTERLOCK

Operator at station control room can only open the breaker from remote.
Operator can not close breaker (A) from remote.

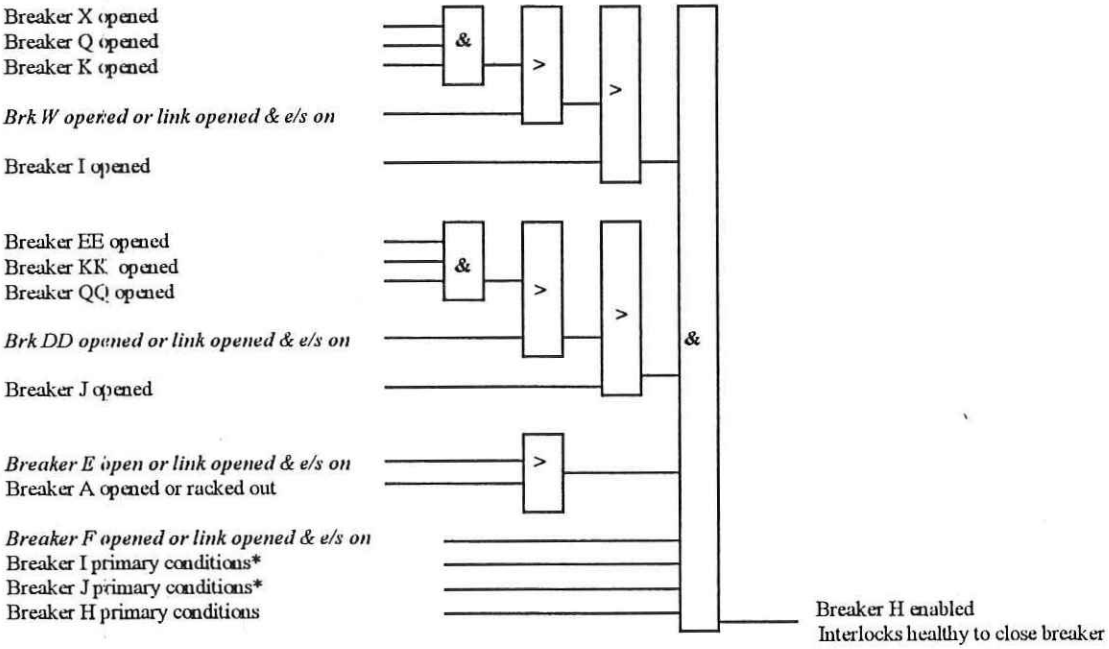
12.2 HARMONIC FILTER BREAKER (F) INTERLOCK

Operator at station control room can only open the breaker from remote.
Operator can not close breaker (F) from remote.

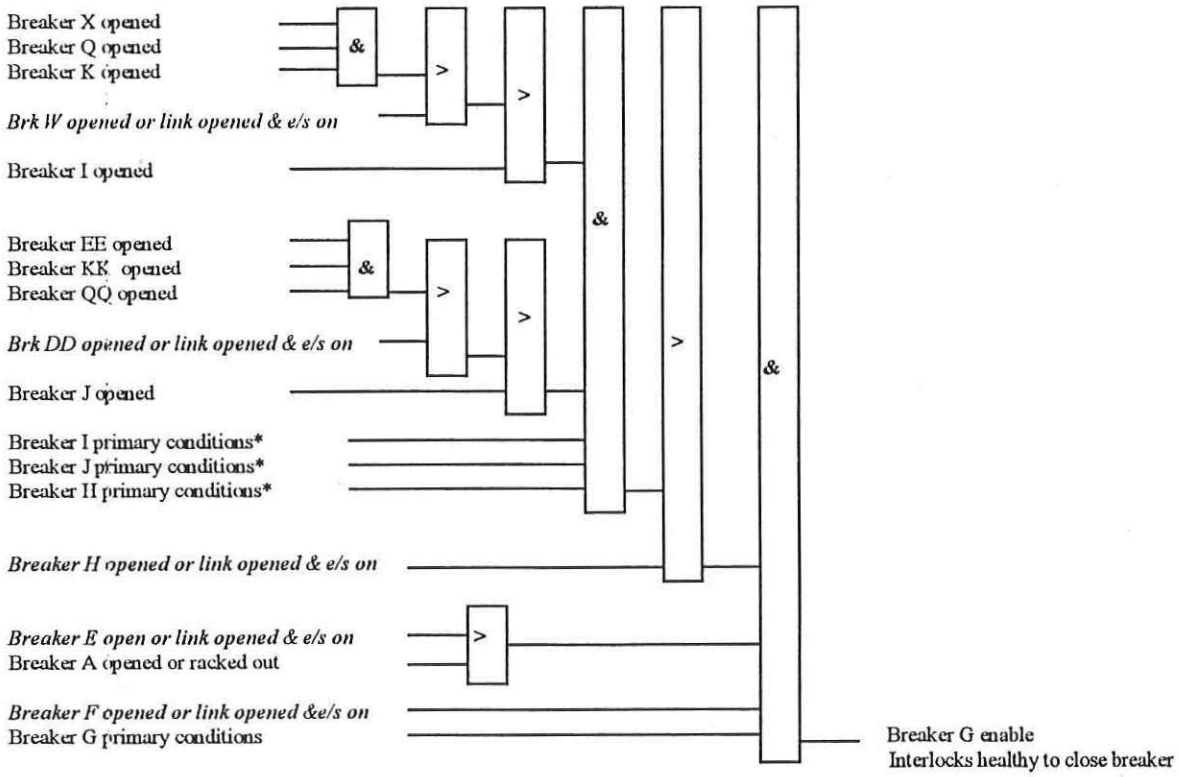
12.3 GT INCOMER (E) FROM 11.5KV GT BOARD INTERLOCK



12.4 GT FEEDER TO STATION BOARD 1 & 2 INTERLOCK



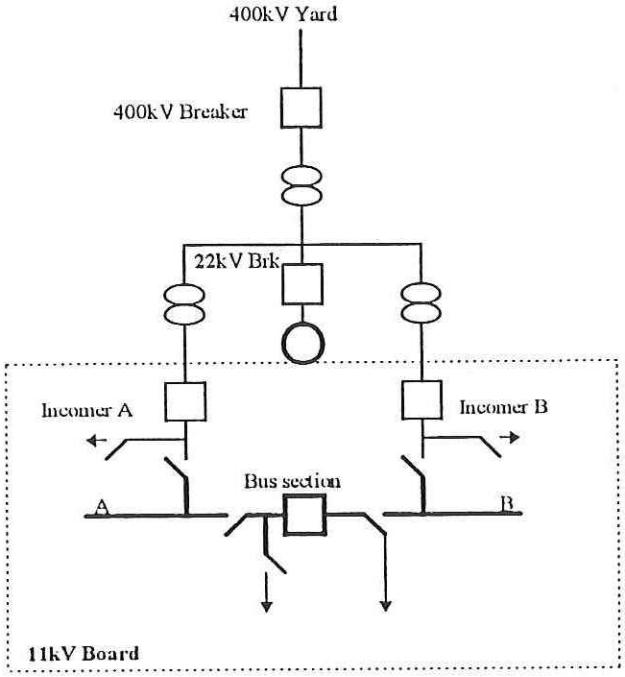
12.5 GT BOARD INCOMER FROM KHUTALA INTERLOCK

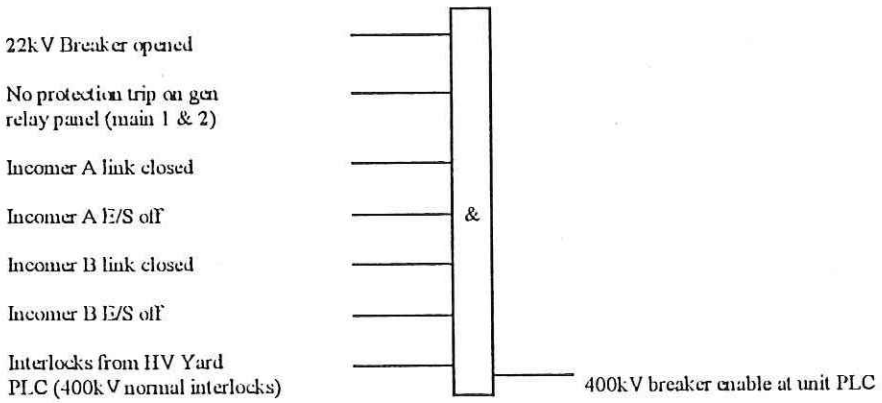


* *primary conditions: link closed, E/S off*

13. 400kV TO UNIT 11kV BOARD INTERLOCK

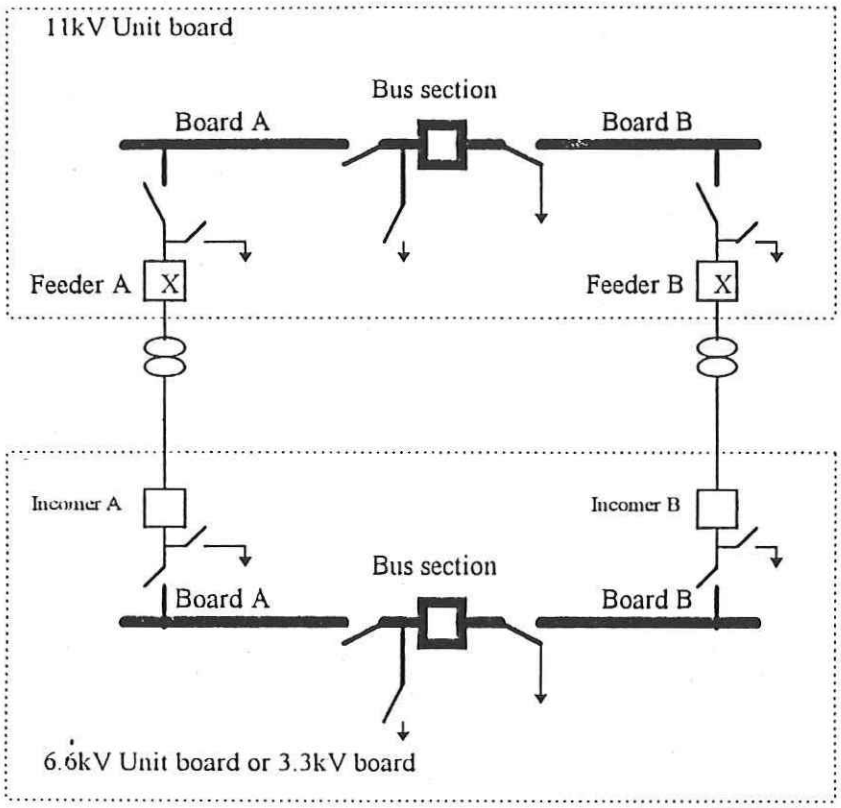
(Interlocking on 400kV breaker at unit PLC)



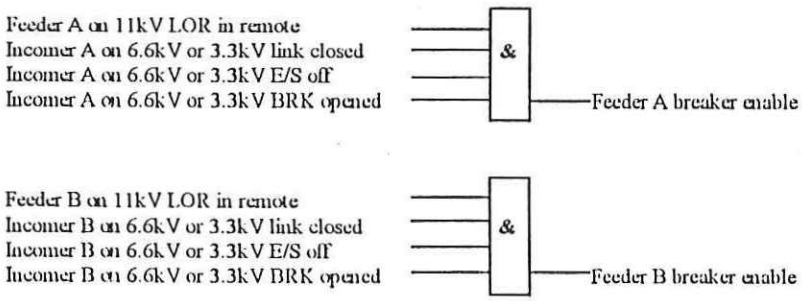


14. 11kV FEEDER TO 6.6kV OR 3.3kV BOARD

(Interlocking on the 11kV feeder circuit)

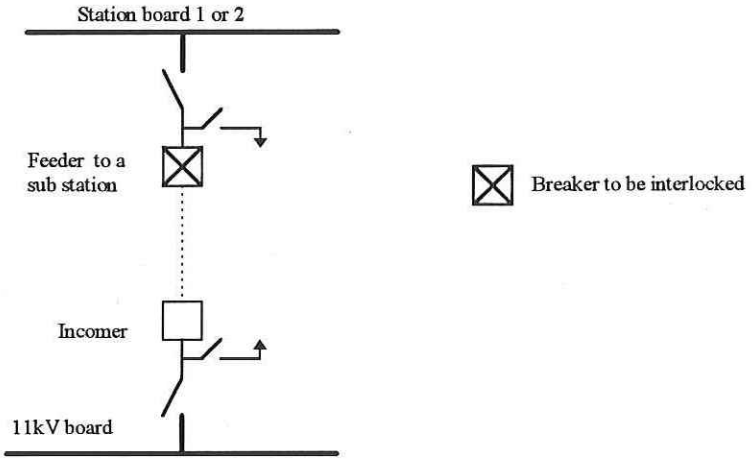


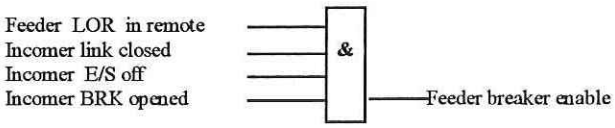
X-Breakers to be interlocked



15. 11kV STATION BOARD FEEDING TO 11 kV SUB STATION BOARD

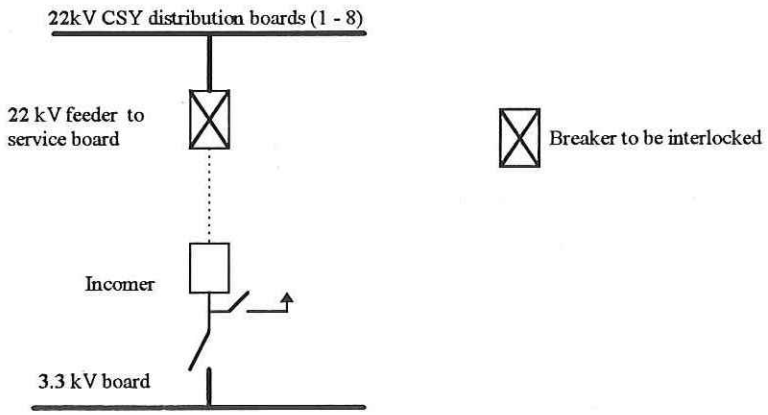
(Interlock on station board 1 & 2 feeder circuit to other 11kV boards)

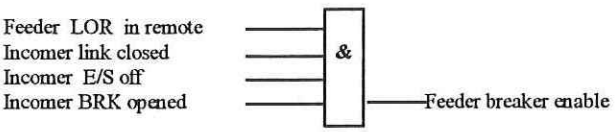




16. 22kV CSY DISTRIBUTION BOARD FEEDING TO 3.3kV CSY BOARD

(Interlock on 22kV breakers feedfing the 3.3kV CSY service boards)





C 957517