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50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251
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SUBJECT: Forwards response to NRC 920228 request for addl info re emergency power sys enhancement project,consisting of discussion of swing bus transfer scheme implemented at facilities & set of logic diagrams.

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L-92-135

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Re: Turkey Point Units 3 and 4
Docket No. 50-250 and 50-251
TAC Nos. M82839 and M82840
Response to Request for Additional Information

This letter provides Florida Power and Light Company's response to a Nuclear Regulatory Commission Request for Additional Information dated February 28, 1992. The Emergency Power System (EPS) Enhancement Project for Turkey Point Units 3 and 4 recently installed two new 480 volt swing load centers (one for each unit). Each swing load center can be powered from either Train A or Train B of the Emergency Power System with an automatic power transfer feature designed to operate as a voltage seeking, dead transfer scheme. Attachment 1 is a general discussion on the swing bus transfer scheme as implemented at Turkey Point, and provides specific responses to the three areas for which additional information was requested. Attachment 2 is a set of logic diagrams for use as reference.

Should there be any questions, please contact us.

Very truly yours,

T.F. Plunkett by C.W. Pearce

T. F. Plunkett
Vice President
Turkey Point Nuclear

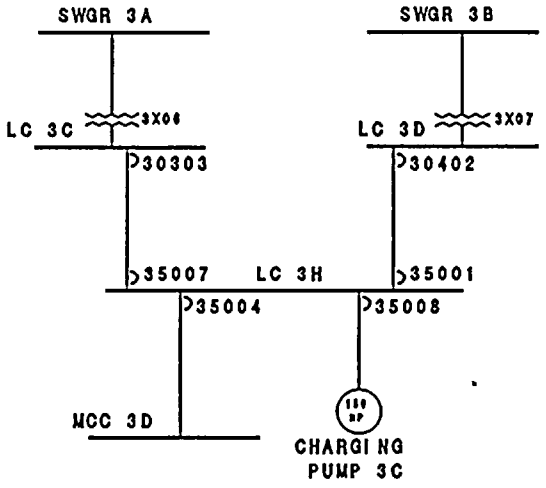
TFP/GS

attachments

cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant

A001

As described in the FPL Turkey Point Units 3 and 4 Emergency Power System (EPS) Enhancement Project Design Report, Sections 1.5.6, 1.5.8, 2.2, 3.3, 3.8.g, 4.2.5, (submitted by letter L-90-196, dated June 4, 1990), and in the Emergency Power System Enhancement Report Safety Analysis Sections 2.1, 3.2.1, 3.3.1, 3.5.2 and 3.5.4, (also submitted by letter L-90-196), the EPS Enhancement Project installed two safety related 480 volt swing load centers. The load centers were installed to replace the MCC D telemand transfer and to power the third charging pumps (Pumps C). The following is a simplified single line diagram of swing Load Center 3H providing power sources and loads (Load Center 4H is similar).



Load Center 3H Simplified Single Line Diagram

The following description provides further information of the design and operation of Load Center 3H for Turkey Point Unit No 3. The description is also applicable to Unit No 4, since the design for Load Center 4H is similar to that of Load Center 3H.

The Emergency Containment Cooler (ECC) and Emergency Containment Filter (ECF) systems at Turkey Point Unit 3 consist of three units. One is powered by Train A, one is powered by Train B, and one is powered by Load Center 3H via MCC 3D. The FSAR accident analysis requires a minimum of two ECCs and two ECFs to respond to a Safety Injection (SI) signal.

The 480 volt AC Emergency Power System consists of five load centers (LCs). Load Centers 3A and 3C are fed from 4160 volt Switchgear 3A (Train A). Load Centers 3B and 3D are fed from 4160 volt Switchgear 3B (Train B). Swing Load Center 3H can be powered by either Train A or Train B through Load Centers 3C or 3D, respectively. Load Center 3H has been designed as a voltage seeking, dead transfer swing bus in order to ensure that a minimum of two ECCs and two ECFs will be available in the event of a single train failure.

Load Center 3H is intertied to Load Center 3C (Train A) via two tie-breakers (30303 and 35007) and to Load Center 3D (Train B) via two tie-breakers (30402 and 35001) as shown above. Load Center 3H feeder breakers, 30402 and 30303, act as slave breakers to incoming breakers 35001 and 35007. The feeder breaker from Train A is located on Load Center 3C and the feeder breaker from Train B is located on Load Center 3D. The incoming breakers are located on Load Center 3H.

The voltage seeking, dead transfer scheme allows the load center on Loss of Offsite Power (LOOP) or on LOOP with concurrent Loss of Coolant Accident (LOCA) to retain its selected alignment and to re-energize upon power return 16.5 seconds after the event, (1 second for LOOP detection, 15 seconds to reach EDG rated frequency and voltage and close EDG breaker, and 0.5 seconds to operate the first load block and energize the load centers) or to transfer if the selected alignment train fails to re-energize. The Logic Diagrams for the tie breakers associated with Load Center 3H are provided in Attachment 2 (Unit 4 is similar).

The circuitry design features include:

1. Ability to manually transfer Load Center 3H from one train to the other.

2. Ability to respond to Loss of Offsite Power events (with or without LOCA) with power regained in the same train where Load Center 3H is aligned (no Load Center 3H transfer occurs).

3. Ability to respond to Loss of Offsite Power events (with or without LOCA) with failure of the train to which Load Center 3H is aligned to regain power (Load Center 3H transfer occurs).

4. Ability to automatically transfer Load Center 3H from one train to the other, as required, in response to certain single failures and faults.

The NRC's Request for Additional Information (RAI) stated that the swing buses (3H and 4H) could be utilized to tie the redundant trains together in the event an emergency diesel generator is not available. The swing

load centers are not intended to be utilized to tie redundant buses together and the load center bus tie-breakers are interlocked to prevent such occurrence. The RAI also expressed concern that an automatic transfer capability between redundant emergency buses could compromise the independence of redundant power sources and that the scheme may be vulnerable to a single failure. The RAI also requested additional information for three areas of design for the swing load centers. These specific areas are addressed below:

RAI 1
"Describe the transfer logic of the above swing buses (3H and 4H), including how the train is selected initially and the conditions under which transfer to the other train is accomplished, and the time delays for achieving this transfer".

Response to RAI 1:
Operating Procedure 3-OP-006 "480 Volt Switchgear System" provides the prerequisites, precautions/limitations and instructional guidance for start-up, normal and infrequent operations of the 480 V Switchgear System. This includes the initial alignment of Load Center 3H to be normally aligned to LC 3D (Train B).

A brief description of the control circuitry operation for the different anticipated modes is provided below:

1. Manual transfer of Load Center 3H from one train to the other.

   Manual transfer of LC 3H can be accomplished from the Control Room by operation of the control transfer selector switch. If LC 3H is aligned to LC 3C, tie Breakers 30303 and 35007 will be closed and 30402 and 35001 will be open. When placed in the "LC 3D" position, the control transfer selector switch will trip Breaker 35007, which in turn will trip Breaker 30303.

   After selecting LC 3D, a signal to close Breaker 35001 will be generated one second (dead time) following the trip of Breaker 35007 provided that the following permissives are satisfied: LC 3D is powered, Breaker 30402 overcurrent lockout protection has not operated and is in the reset position, Charging Pump 3C breaker failure detection has not been detected, Train B bus loading sequencer is not timing, Breaker 35007 overcurrent lockout protection has not operated (trip did not occur due to failure) and the breaker is open, and LC 3H has no voltage (i.e., dead bus).

   Upon closing breaker 35001, its slave breaker 30402 will close provided that breaker 35007 is open.

Manual transfer from LC 3D to LC 3C can be accomplished in a similar way by operating the control transfer selector switch CS to the "LC 3C" position.

2. Loss of Offsite Power with power regained in the same train where Load Center 3H is aligned (no Load Center 3H transfer).

Upon LOOP to the safeguards electrical trains, LC 3H is designed to maintain the selected alignment and repower the connected equipment upon return of power to the bus. Assuming that LC 3H is being powered from LC 3C and tie breakers 35007 and 30303 are closed, all tie breaker operation will be inhibited by undervoltage detection relays on a LOOP. Upon power return, the breakers will not operate and will retain the selected alignment.

The LC 3H transfer scheme includes 2.5 seconds for automatic transfer (1.5 seconds to trip the supply breaker of the selected aligned train and 1 second delay dead time, to close the other train supply breaker), for a total of 19 seconds from the occurrence to the LOOP or LOOP/LOCA event.

If LC 3H is being powered by LC 3C, breaker 35007 trip is inhibited by undervoltage detection on LC 3D. Upon regaining power to train A, the undervoltage trip signals are reset by power detection on LC 3C followed by power detection on LC 3H, thus maintaining the breaker in the closed position regardless of conditions on LC 3D. Breaker 30303 will not trip since the master breaker 35007 has not tripped.

3. Loss of Offsite Power with failure of the train to which Load Center 3H is aligned to regain power (Load Center 3H transfer).

On Loss of Offsite Power (LOOP) followed by an EDG failure to start (or any other postulated event resulting in loss of power to the aligned train), the LC 3H transfer scheme operates in the same mode as described in 2) above during the bus stripping process and EDG start. All tie breaker operation will be inhibited by undervoltage detection relays on a LOOP. The tie breakers that are aligned to the train where power fails to return will be tripped, and a closing command will be generated to close the tie-breakers from the opposite train.

Assuming that LC 3H is being powered from LC 3C and tie breakers 35007 and 30303 are closed when the LOOP occurs, all tie breaker operation will be inhibited by the undervoltage detection relays as previously described. If power is not restored in 16.5 seconds after the LOOP, the transfer scheme will detect that LC 3H is de-energized and aligned to a de-energized LC 3C while power is available at LC 3D. Upon detection of this condition, the trans-

fer scheme will initiate a signal to trip Breaker 35007 within 1.5 seconds. Breaker 35007 trip generates a closing command to Breaker 35001 one second (dead bus time) later. The permissive to close Breaker 35001 are the same as discussed in 1 above, except for the Load Center 3H transfer permissive.

In order to prevent unscheduled transfer of the Load Center 3H on the EDG's during the EDG Loading process, a transfer permissive has been incorporated as part of the Load Center 3H transfer scheme. The transfer permissive (KESAVI1) allows automatic transfer to occur only during the first block of the EDG loading (19 to 21.5 seconds after LOOP or LOOP/LOCA), during the seventh load block (55 to 60 seconds after LOOP/LOCA only), or any time 2 seconds after the sequencer loading process has been completed (for LOOP or LOOP/LOCA). This LC 3H transfer permissive prevents potential overloading of the available EDG.

RAI 2
"Explain how the swing bus transfer scheme between redundant safety trains satisfies Safety Guide 6 criteria (that is, such a design should not compromise the independence between redundant onsite power sources and should meet the single failure criterion)".

Response to RAI 2:
Interlocks have been provided to prevent paralleling Train A and Train B power supplies and assure independence. This is accomplished by the following features/permissive:

1. Permissive to close the incoming breakers include the verification that the feeder and supply breakers' overcurrent and lockout protection have not actuated.

2. The automatic or manual closing command for the incoming breakers is initiated by the opposite breaker open signal. The breaker close permissive also include verification of the opposite train breaker position.

3. Permissive to transfer include verification that the Load Center 3H is not energized. This is to provide further assurance that the bus is clear and isolated.

4. Each of the four breakers that are part of the LC 3H load transfer scheme are provided with overcurrent protection. Failure of a feeder breaker will result in trip of the supply breaker, actuation of the integral hand-reset "bell alarm" trip-free lockout device, and blocking of the transfer.

5. Overcurrent trip settings of the feeder breakers have been coordinated with the load center's supply circuit breakers for selective tripping. Overcurrent protection actuation (tie cable fault) of Breaker 30303 (30402) will result in tripping of its breaker and Breaker 35007 (35001). Overcurrent protection actuation (Load Center 3H bus fault) of Breaker 35007 (35001) will result in tripping of its breaker, Breaker 30303 (30402), and blocking Breaker 35001 (-35007) closure. The actuation of one of the feeder breakers' overcurrent trips (fault downstream of Load Center 3H) will allow transfer to the available train.

6. The main power feeds from LC 3C and LC 3D to LC 3H are routed in separate raceways to preclude failure of one power feeder from affecting either the alternate feed to its load center (3H) or a power feed to the other unit.

7. To mitigate the possibility of a single failure scenario which would interrupt dc power to both load centers, the 125V dc control power supplies to LC 3H and 4H are powered from separate sources (different trains) from opposite units. These cables are routed in separate dedicated raceways.

8. Failure of the swing Charging Pump 3C breaker to trip upon receipt of a LOOP signal may result in EDG overloading. Assuming alignment to Train A, upon any LOOP or LOOP/LOCA scenario, if the charging pump breaker does not clear within one second of its command to trip, Load Center 3C feeder Breaker 30303 will trip. Tripping of Breaker 30303 will trip Breaker 35007. The Charging Pump 3C breaker failure will also inhibit closure of Breaker 35001, and precludes closing of Breaker 30402. This failure does not affect the operation of LC 3C or 3D.

9. Breaker failure has also been evaluated for the second largest load (Normal Containment Cooling Fan 3D) connected to Load Center 3H via MCC 3D. EDG loading was verified to ensure that this additional load can be accommodated in addition to the anticipated loads, such that safe shutdown is not adversely affected.

A Circuit and/or Component Failure Effects Analysis (C/CFEA) was prepared to evaluate the effects of failures of the different components of the circuit on the transfer scheme. Included in this analysis are partial and total loss of DC supply to the Load Centers A, B and H breakers tripping and closing mechanisms, and overcurrent protection devices. The results of this C/CFEA shows that the single failure of

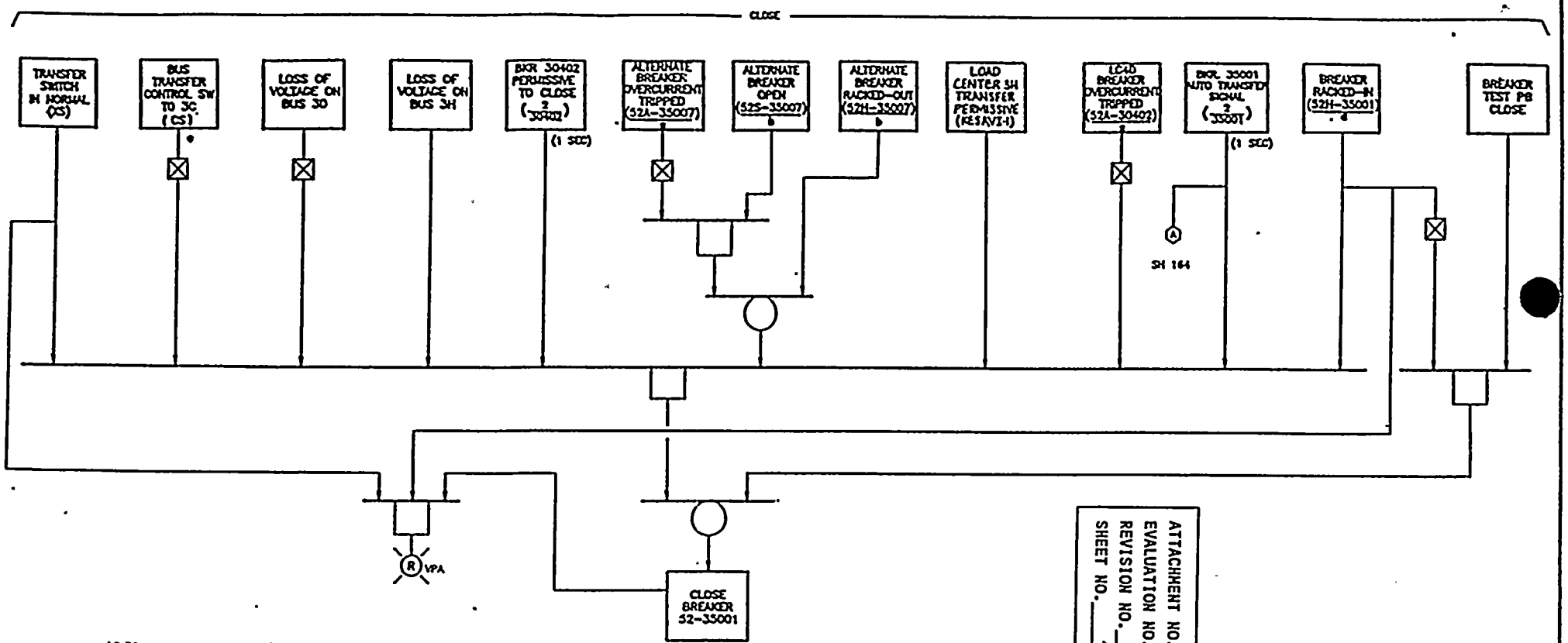
critical components of the transfer scheme does not affect redundant trains or the ability to perform safe shutdown.

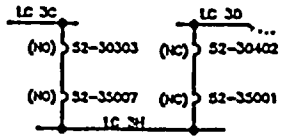
As previously discussed in the Supplemental Safety Evaluation for the Emergency Power System Enhancement Project, (NRC letter to FPL, forwarding License Amendments 138 and 133, dated September 26, 1991), Regulatory Guide 1.6 discourages the automatic transfer of safety loads from one power source to another since it is preferred that there is sufficient redundancy in the loads that an automatic transfer is not required. However, such redundancy does not always exist for older plants. The Safety Evaluation concluded that compared to the previous situation at Turkey Point, the addition of the swing bus improves reliability by quickly re-energizing needed safety loads upon loss of power from the primary source and that the interlock arrangement will prevent the inadvertent connection of two 480 volt trains.

RAI 3
"Describe how this design incorporates features to prevent automatic transfer of a fault (bus or load) to the redundant bus on a subsequent undervoltage condition and explain whether the system is able to perform its safety function without the use of the swing bus".

Response to RAI 3:
As described above, Load Center 3H transfer scheme monitors the actuation of the overcurrent trips of the feeder and supply breakers to LC 3H. The actuation of one of the feeder breakers' overcurrent trips (Breakers 30303 or 30402) will allow transfer to the available train. If the overcurrent actuation is of one of the supply breakers (Breakers 35001 or 35007), transfer will be blocked and LC 3H de-energized. Thus, for faults on the cable between Load Centers 3C/3D and 3H, the transfer will occur to the available train. However, for a bus fault, the tie breakers are coordinated to provide selective tripping and block the transfer. Coordination is also provided between the tie breakers and the swing load center load breakers such that a fault downstream will be cleared by the load breaker and no transfer will occur.

Load Center 3H and 4H power a third charging pump (3C and 4C) and Motor Control Center 3D and 4D, respectively. Motor Control Center 3D and 4D power swing loads and loads common to Units 3 and 4. As part of the Emergency Power System Enhancement Project, a Failure Modes and Effects Analysis (FMEA) was conducted as discussed in Section 5.0 of the Emergency Power System Enhancement Report Safety Analysis to ensure that the safety system function can still be accomplished even with a single failure. Therefore, the plant safety systems are able to perform their safety function without the use of the swing bus.





480V SWING BUS ARRANGEMENT

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SHEET NO. 1 OF 6

LEGEND
* MOMENTARY SIGNAL

NOTES:
1. FOR LC3H BREAKER 35001 OPEN CKT SEE DWG 5610-T-L1 SH 164

REFERENCE DRAWINGS:
5613-E-28 SH 122 ELEMENTARY DIAGRAM

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FLORIDA POWER AND LIGHT CO
TURKEY POINT PLANT
UNIT 3
LOGIC DIAGRAM
480V LOAD CENTER 3H
INCOMING BREAKER 35001 SH 1

DRAWING NUMBER
5610-T-L1
SH 163

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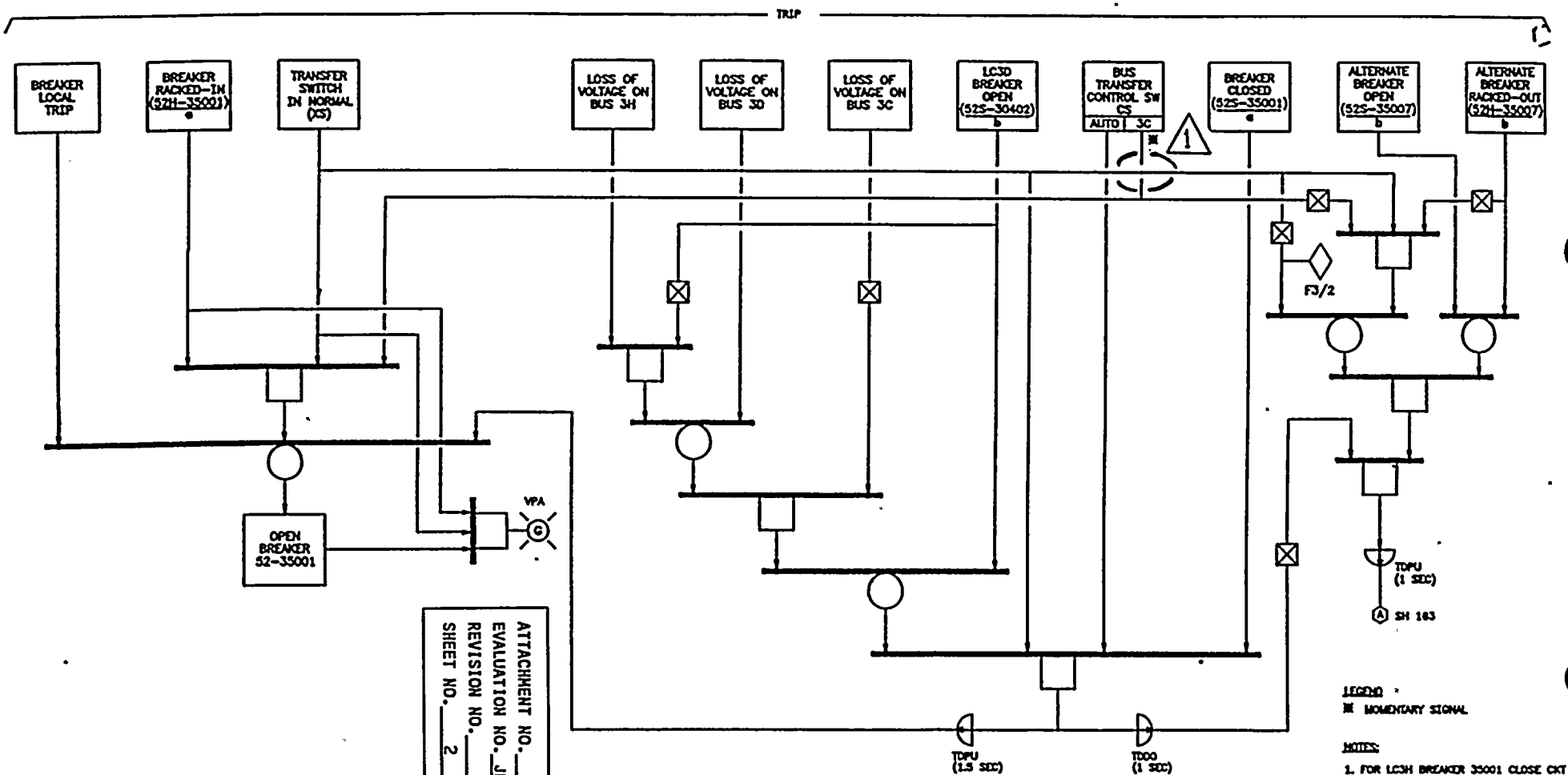

LEGEND:
M MOMENTARY SIGNAL

NOTES:
1. FOR LC3H BREAKER 35001 CLOSE CKT SEE DWG 5610-T-L1 SH 163

REFERENCE DRAWINGS:
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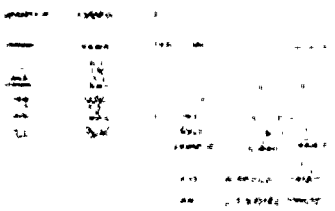
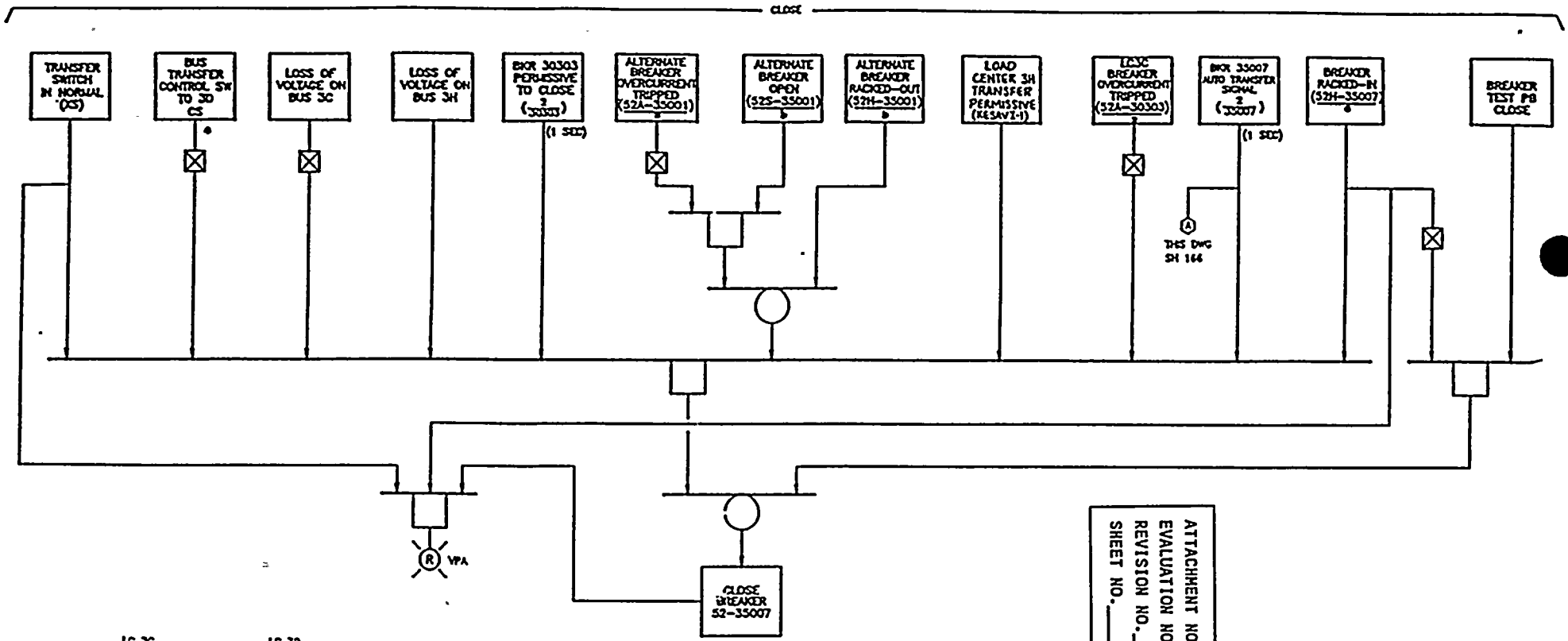
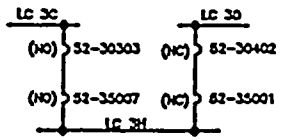
FLORIDA POWER AND LIGHT CO
TURKEY POINT PLANT
UNIT 3
LOGIC DIAGRAM
480V LOAD CENTER 3H
INCOMING BREAKER 35001 SH 2

DRAWING NUMBER
5610-T-L1
SH 164

REV 1







480V SWING BUS ARRANGEMENT

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EVALUATION NO. JPN-PTN-SEEP-92-011
REVISION NO. 0
SHEET NO. 3 OF 6

LEGEND
* MOMENTARY SIGNAL

NOTES:
1. FOR LC3H BREAKER 35007 OPEN CKT SEE DWG 5610-T-L1 SH 166

REFERENCE DRAWINGS:
5613-E-28 SH 122 ELEMENTARY DIAGRAM

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FLORIDA POWER AND LIGHT CO
TURKEY POINT PLANT
UNIT 3
LOGIC DIAGRAM
480V LOAD CENTER 3H
INCOMING BREAKER 35007 SH 1

DRAWING NUMBER
5610-T-L1
SH 165

REV
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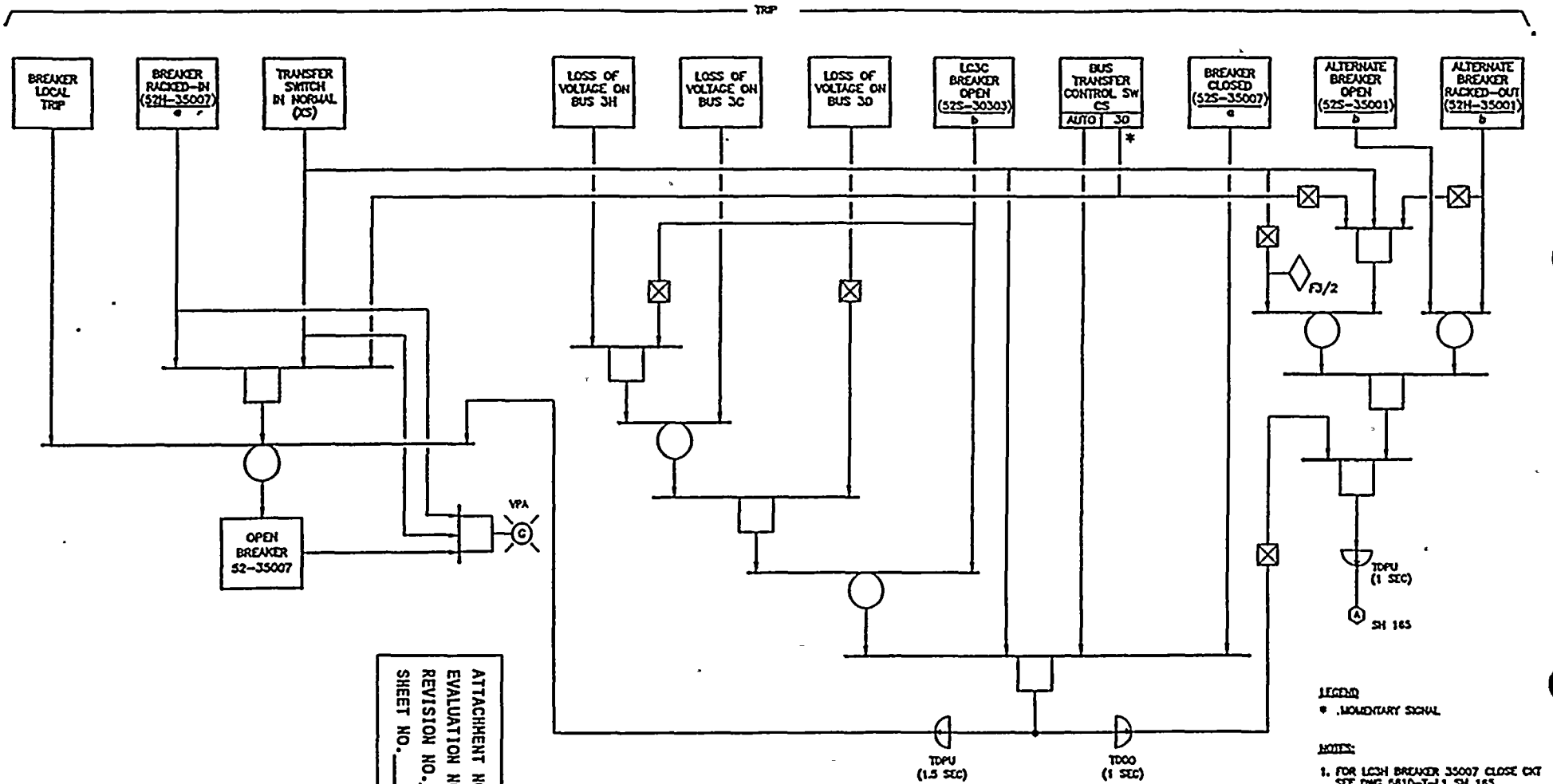

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NOTES:
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REFERENCE DRAWINGS:
5613-E-28 SH 122 ELEMENTARY DIAGRAM

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FLORIDA POWER AND LIGHT CO
TURKEY POINT PLANT
UNIT 3
LOGIC DIAGRAM
480V LOAD CENTER 3H
INCOMING BREAKER 35007 SH 2

DRAWING NUMBER
5610-T-L1
SH 166

REV
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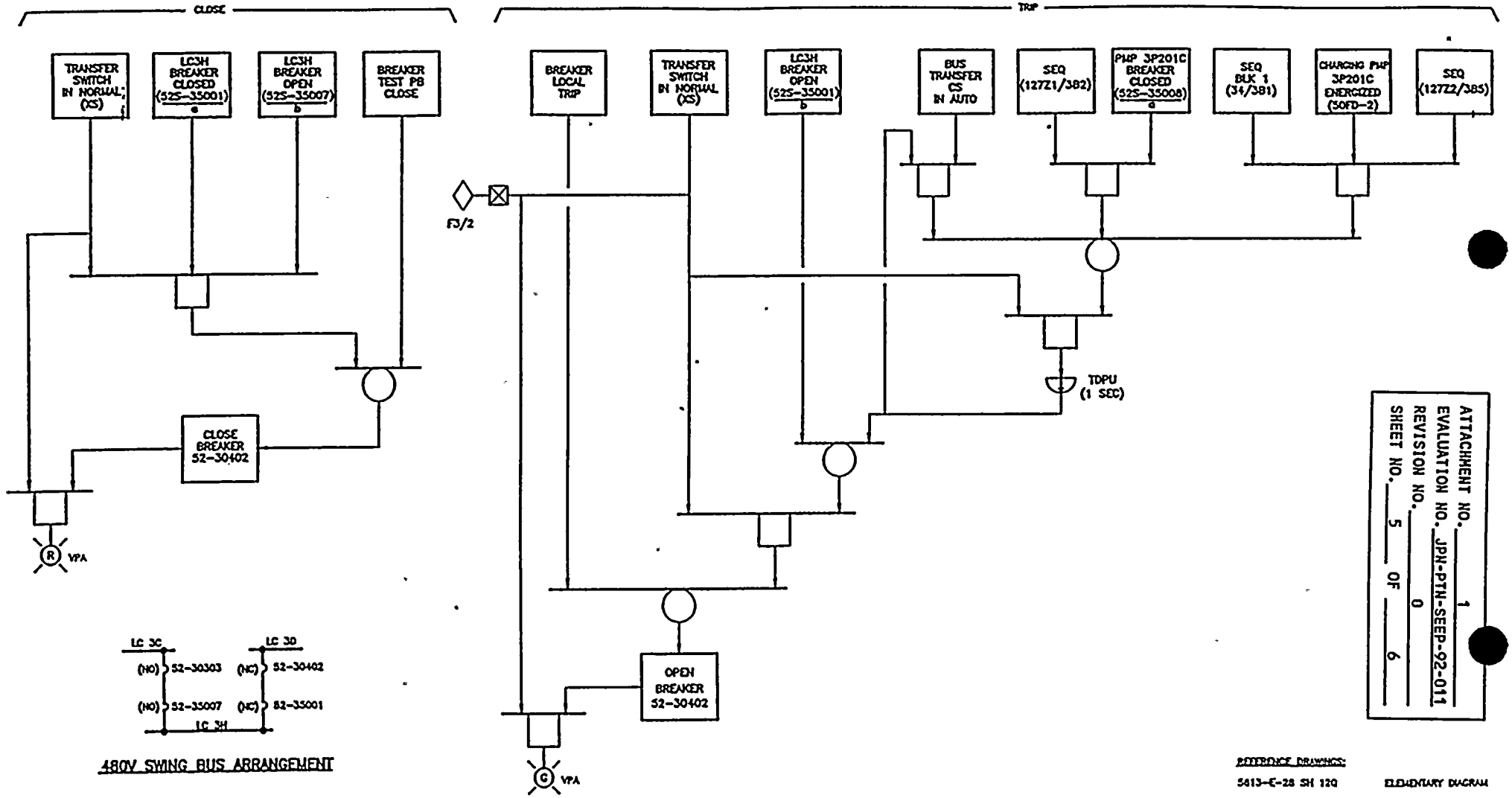

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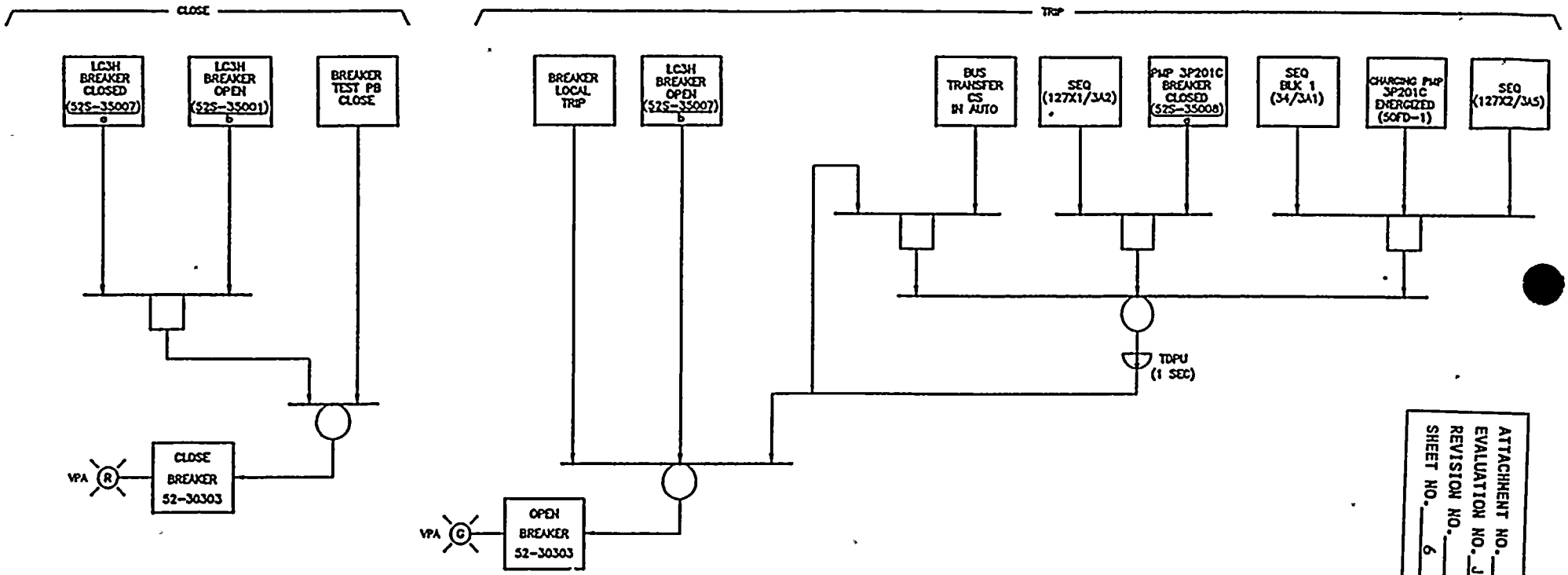
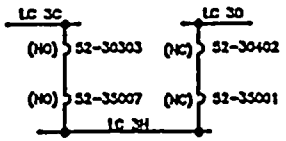
FLORIDA POWER AND LIGHT CO
TURKEY POINT PLANT
UNIT 3
LOGIC DIAGRAM
480V LOAD CENTER 3H
FEEDER BREAKER 30402

DRAWING NUMBER
5610-T-L1
SH 167

REV 0





480V SWING BUS ARRANGEMENT

ATTACHMENT NO. 1
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SHEET NO. 6 OF 6

REFERENCE DRAWINGS:
5613-E-28 SH 128 ELEMENTARY DIAGRAM

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FLORIDA POWER AND LIGHT CO
TURKEY POINT PLANT
UNIT 3
LOGIC DIAGRAM
480V LOAD CENTER 3H
FEEDER BREAKER 30303

DRAWING NUMBER
5610-T-L1
SH 168

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