Florida Power
CORPORATION

February 17, 1988
3F0288-12

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
NUREG 0737, Item II.F.2
TAC No. 45124

Dear Sir:

Florida Power Corporation (FPC) is submitting this response in accordance with your letter dated September 10, 1987. Enclosure 2 of your letter is addressed as requested. In addition, FPC noted a few discrepencies in the NRC/SER. Suggested clarifications are provided in Attachment 1. The milestones status as requested in Enclosure 2 of your letter is provided in Attachment 2. The delay in providing this response was coordinated with our Project Manager.

Sincerely,

E C Simpson

E. C. Simpson, Director
Nuclear Operation Site Support

ECS/EMG/sdr

Attachment

xc: Dr. J. Nelson Grace
Regional Administrator, Region II

Mr. T. F. Stetka
Senior Resident Inspector

A002
1/1

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ATTACHMENT 1

NRC Letter Clarifications:

1. Section 2.2, second paragraph, second sentence.

   Only sixteen (16) core exit thermocouples are recorded on the backup display.

2. Section 2.2, fourth paragraph, last sentence.

   The incore probe assemblies were not replaced with qualified units during Refuel V. The modification in Refuel V was to seal the incore detector connectors for the sixteen assemblies that had the core exit thermocouple recorded in the backup display. Sixteen (16) incore probe assemblies were replaced with assemblies that have qualified core exit thermocouples during the recent outage (Refuel VI).

3. Section 2.3, first paragraph, sixth sentence.

   Note that these are not true seal chambers; they are condensate pots. These condensate pots are not sealed and do not have diaphragms or bellows, they are water reservoirs only.

4. Section 2.3

   This section infers that we are measuring level where in fact the system is intended to trend reactor coolant inventory.

5. Section 2.3, third paragraph, last sentence.

   The coolant inventory trending indicators are actually reading between 85 and 90% and pulsating in that range when the reactor coolant pumps are operating. This is due to the system measuring differential pressure across a section of pipe with a moving medium (i.e. reactor coolant flow).

ATTACHMENT 2

INADEQUATE CORE COOLING INSTRUMENTATION MILESTONES

Milestone 1

Submit Final Design Description (by licensee) (complete the documentation requirements of NUREG-0737, Item II.F.2, including all plant-specific information items identified in applicable NRC evaluation reports for generic approved systems).

Status 1

The Final Design Description including key drawings are provided in attachment 1 and consists of section 7.3.4 and Figures 7-21,22,23,24,25 of the FSAR. The list of attached drawings are provided in attachment 3.

Milestone 2

Approval of emergency operating procedure (EOP) technical guidelines - (by NRC).

Note: This EOP technical guideline which incorporates the selected system must be based on the intended uses of that system as described in approved generic EOP technical guidelines relevant to the selected system.

Status 2

1) NRC letter dated October 1, 1984 provided a review of FPC's Procedures Generation Package (PGP) for the Emergency Operating Procedures (EOP). That letter requested additional information which was submitted back to the NRC in FPC letter dated July 31, 1985. A revised EOP Writer's Guide was forwarded to the NRC by FPC letter dated February 4, 1988.

2) Attachment 4 provides a list of each ICC Instrumentation Subsystem and implementing procedures.

Milestone 3

Reactor Coolant Inventory Tracking Systems (RCITS) installation complete (by licensee).

Status 3

FPC letter dated October 23, 1985 (3F1085-12) provided this response as part of the implementation report in accordance with NRC letter dated September 6, 1983, Enclosure 3. The implementation was completed in Refuel V, August 1985.

Milestone 4

ITS functional testing and calibration complete (by licensee).

Status 4

ITS functional testing was performed by the MAR that installed the system, MAR 83-03-04. The construction was completed during the last quarter of 1985 and the MAR officially closed on August 26, 1986.

ITS calibration is broken up into three separate surveillance procedures:

SP-144A - RCITS Reactor Vessel and Hot Leg Level Channel Calibration;

SP-144B - RCITS Void Trending Channel Calibration; and

SP-144C - RCITS Core Exit Thermocouple Calibration.

These procedures were last completed on 11/22/85, 9/20/85, and 9/20/85 respectively. The functional testing and calibration is therefore complete.

Milestone 5

Prepare revisions to plant operating procedures and emergency procedures based on approved EOP guideline (by licensee).

Status 5

Attachment 4 provides a list of each ICC Instrumentation Subsystem and implementing procedures. All EOP's have been revised based upon the Writer's Guide submitted on February 4, 1988.

Milestone 6

Implementation letter report to NRC (by licensee).

Status 6

Florida Power Corporation submitted the implementation letter dated October 23, 1985 (3F1085-12) in which we addressed each of the six (6) implementation letter report content items.

Item (4) of the implementation letter has been revised as follows:

Item (4)

Request for modification of Technical Specifications to include all ICC instrumentation for accident monitoring.

Revised Response to Item (4)

All ICC instruments (along with other Regulatory Guide 1.97 instruments) have been evaluated for inclusion in Technical Specifications. This evaluation utilized the criteria for determining the scope of Technical Specifications which is delineated in the NRC Policy Statement on Technical Specification Improvements for Nuclear Power Reactors, issued February 6, 1987. Technical Specification Change Request No. 159 was submitted on December 31, 1987 to include the ICC Instrumentation for post accident monitoring.

Milestone 7

Perform procedure walk-through to complete task analysis portion of ICC system design (by licensee).

Status 7

Functional and task analysis was performed for the following pertinent AP's, EP's, and VP's:

AP-241 through AP-277	EP-220	VP-580
AP-350	EP-260	
AP-450	EP-290	
AP-530	EP-390	

Milestone 8

Turn on system for operator training and familiarization.

Status 8

Operator training was provided by the Training Department at the time each of the four subsystems was installed. ICC operator training has been added to the replacement and requalification programs.

Milestone 9

Approval of plant-specific installation (by NRC).

Status 9

By NRC

Milestone 10

Implement modified operating procedures and emergency procedures (by licensee).

Status 10

Attachment 3 provides a list of each ICC Instrumentation Subsystem and implementing procedures.

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ATTACHMENT 3

FPC Drawings

201-151 Sht 1	Rev. 28	Main Control Board Layout
201-151 Sht 3	Rev. 1	Main Control Board Layout
201 151 Sht 5	Rev. 1	Main Control Board Layout
FSAR Shts 7-70, 7-70a, and 7-70b	Rev. 8	Additional Instrumentation Inadequate Core Cooling System
FSAR Figures 7-21, 7-22	Rev. 8	
FSAR Figures 7-23, 7-24 and 7-25	Rev. 7	

Foxboro Drawings

84N37139-A1-C00	Rev. A	RCITS Loop Diagram
84N37139-A1-C002	Rev. A	RCITS Loop Diagram
84N37139-A2-C001	Rev. A	RCITS Loop Diagram
84N37139-A2-C002	Rev. A	RCITS Loop Diagram
84N37139-A3-C001	Rev. A	RCITS Loop Diagram
84N37139-A3-C002	Rev. A	RCITS Loop Diagram
84N37139-A2-C003	Rev. B	Core Exit Thermocouples

with an accuracy of 5% when used in conjunction with an adjacent background detector. The sensitivity of the detector will decrease with exposure to neutron flux due to transmutation of the emitter in the detector. However, by use of integrated current inventories, it is felt that the additional inaccuracies shall be no more than 1% per year for the average flux conditions.

The use of the Incore Monitoring System to detect xenon oscillations is described in B&W Topical Report BAW-10010, "Stability Margins for Xenon Oscillations, Part 1 Modal Analysis, Part 2 One-Dimensional Digital Analysis, Part 3 Two-and Three-Dimensional Digital Analysis".

7.3.4 ADDITIONAL INSTRUMENTATION - INADEQUATE CORE COOLING SYSTEM

7.3.4.1 Design Bases

The inadequate core cooling (ICC) system design includes the subcooling margin monitors, core exit thermocouples, and the reactor coolant inventory tracking system (RCITS) incorporating inventory level and void fraction measurements. This system is designed to meet the parameters specified in NUREG-0737, Item II.F.2.

The RCITS provides a continuous indication of reactor vessel head and hot leg coolant inventory trending with reactor coolant pumps either running or tripped. When the pumps are tripped, the coolant level indicators provide the coolant inventory indication. When the pumps are running, the void fraction indicators provide inventory level trend measurement.

The entire system is redundant, seismically and environmentally qualified, and powered from Class IE power sources. The indicators are grouped and identified by usage.

7.3.4.2 System Description

7.3.4.2.1 Reactor Coolant Inventory Tracking System

The design encompasses the use of differential pressure (DP) measurements across vertical elevations of the hot leg and the reactor vessel to infer coolant level when the RCPs are tripped, plus the use of RCP motor power measurements and pump inlet temperatures to infer coolant inventory trends when the RCPs are running. The design also includes density compensation for DP measurements due to temperature effects on reference leg and process liquid density.

DP measurements cover a wide range measurement from the top to the bottom of the hot leg, plus a narrow range measurement from the top of the reactor vessel (RV) head to the bottom of the hot leg. A total of four DP transmitters are used to provide redundancy. Each pair of wide and narrow range transmitters are powered independently by Class 1E instrumentation power. They are mounted within the containment area. Seal chambers are located at the high point of each reference leg to keep the legs full of water.

The design includes removal of the center control rod drive mechanism to provide a penetration in the RV head for location of the top RV pressure tap. The top hot leg pressure taps are located off the hot leg high point vents.

Class 1E-qualified electronic analog equipment racks are used to power the DP transmitters and process their outputs with the reference leg and process temperature outputs to compute the equivalent water level. The racks provide outputs to indicating recorders in the control room and to the computer.

A non-1E electronic analog equipment rack is used to process the RCP inlet temperature and motor power inputs, and to compute the void fraction. The rack provides outputs to a control room indicator recorder and to the computer.

System details are shown in Figures 7-21 through 7-24.

7.3.4.2.2 Core Exit Thermocouples (CET) and Subcooling Margin Monitors

Three multipen analog temperature recorders are provided on the PSA main control board. A minimum of 16 CETs, four from each core quadrant, are recorded continuously over a range of 0°F to 2,500°F.

Two subcooling margin monitors are located on the PSA main control board. These instruments continuously display saturation temperature for each loop. In addition to displaying saturation temperature, each instrument can display, on demand, the hottest CET selected from a group of six CETs. A total of 12 CETs have been selected to provide representative temperatures from each core quadrant and the control region. These instruments display temperatures over a range of 0°F to 1,023°F, well above saturation temperatures. CET system details are shown in Figure 7-25.

7.3.4.2.3 Test and Calibration

Test and calibration facilities are built into the RCITS system. The facilities permit an accurate calibration of the system and detection of system failures in accordance with the requirements of IEEE-279-1968.

7.3.4.3 System Evaluation

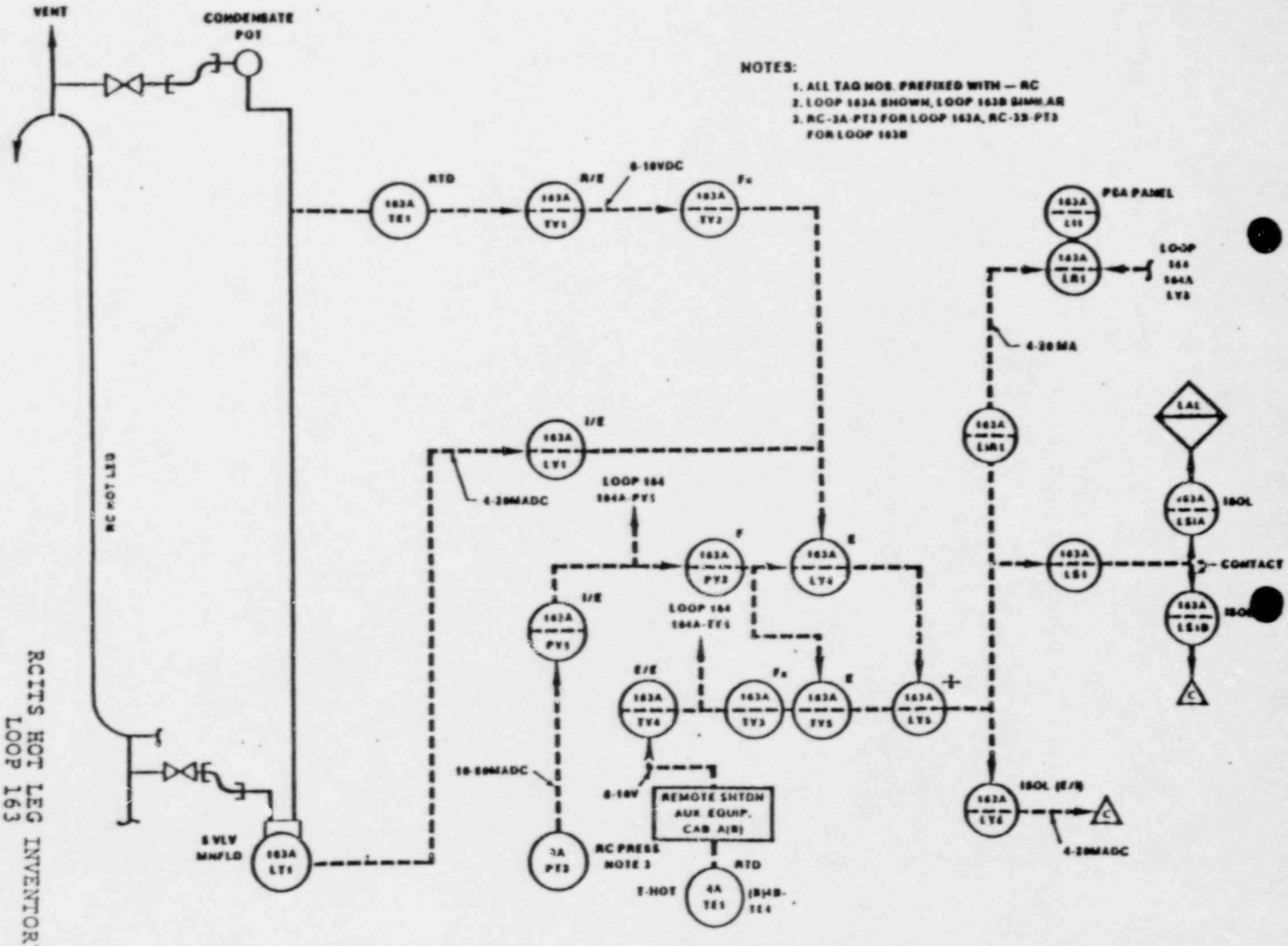
7.3.4.3.1 System Considerations

Redundant RCITS indications are available on the control room PSA panel.

This system is not used for control but is meant to provide trending of the reactor coolant inventory.

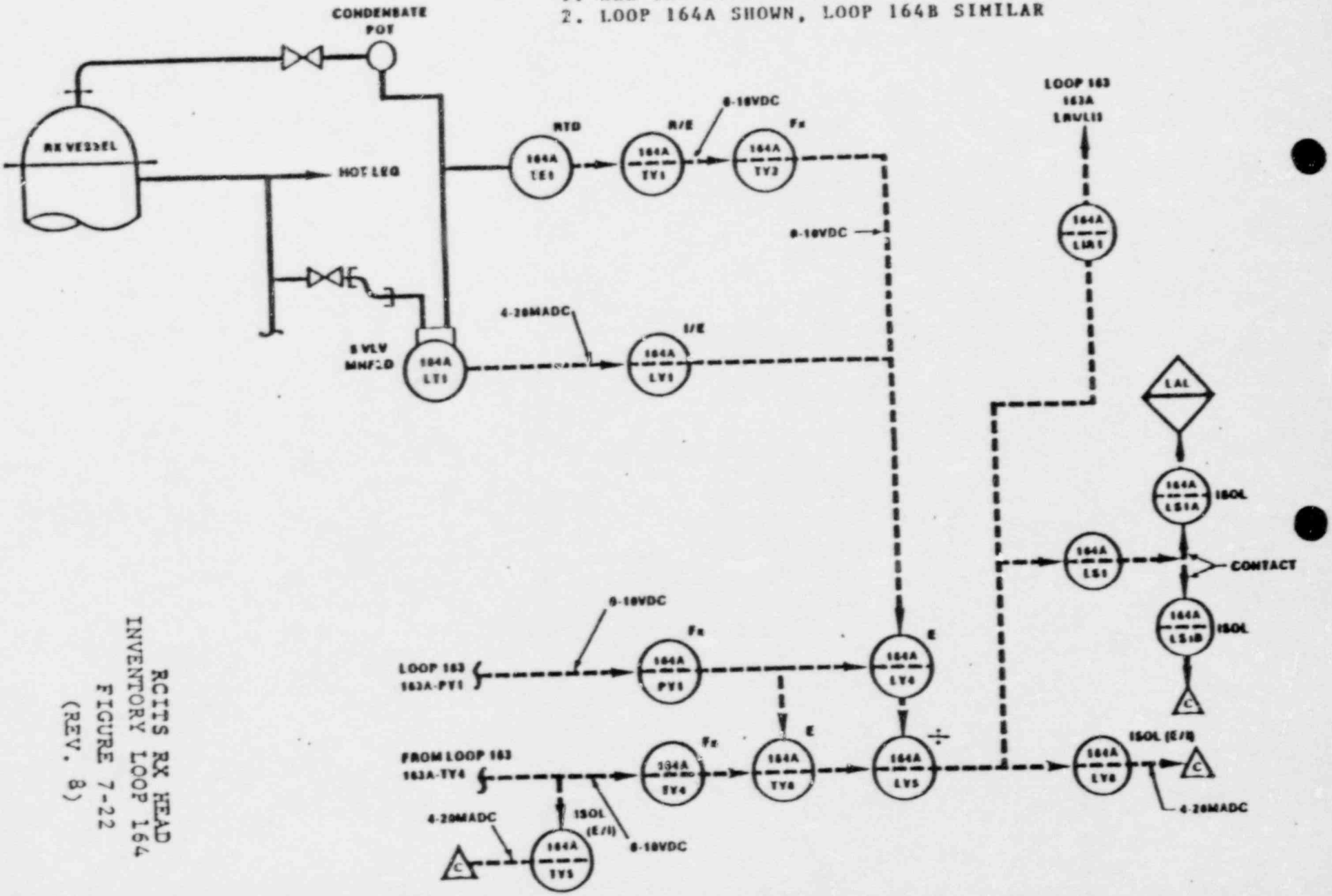
7.3.4.3.2 System Limitations

This system uses four DP transmitters with a common lower connection tap off the decay heat drain line. If this common line fails, all the DP measurements in the RCITS are rendered inoperative.

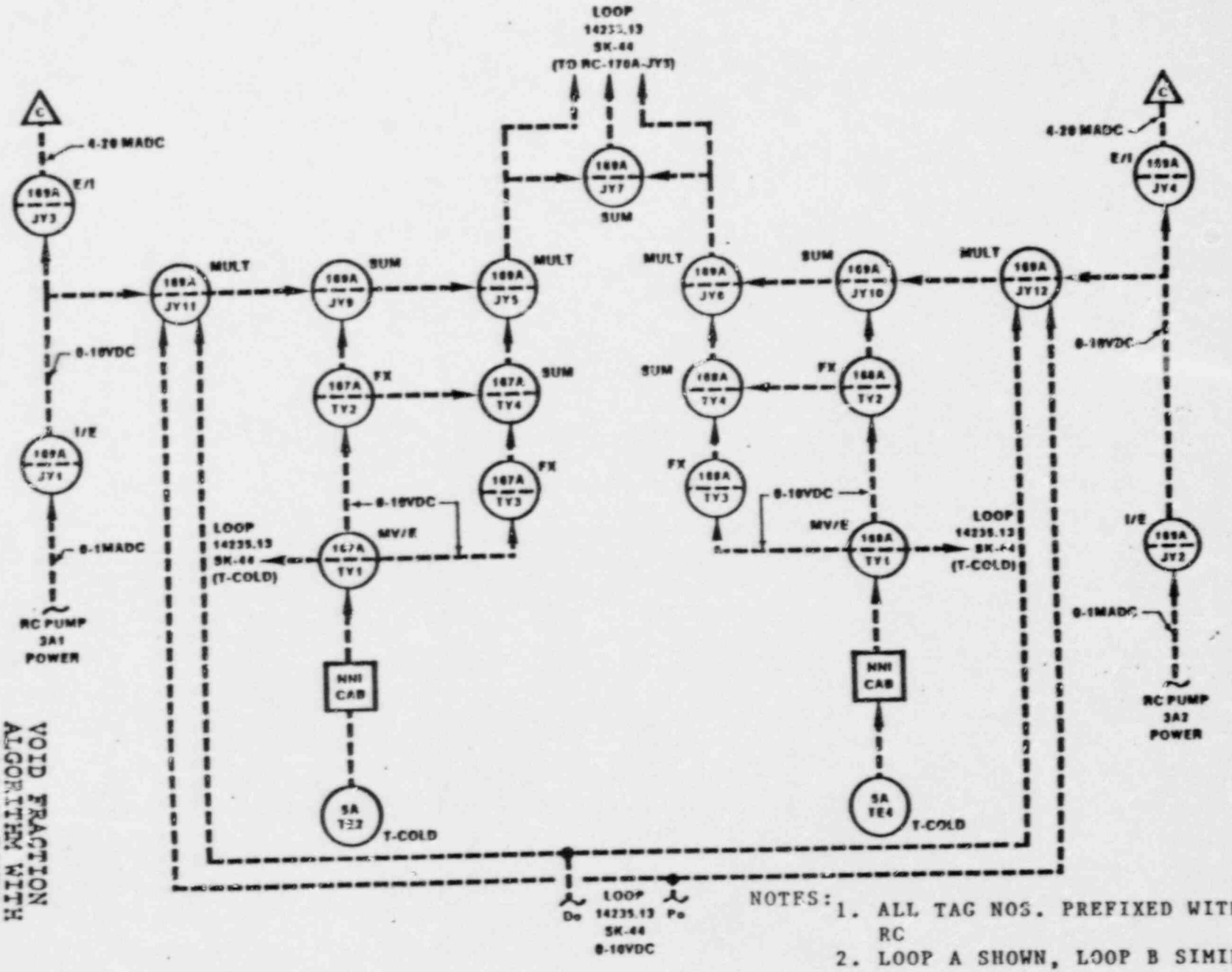


RCITS HOT LEG INVENTORY
LOOP 163
FIGURE 7-21
(REV. 8)

NOTES: 1. ALL TAG NOS. PREFIXED WITH -RC
2. LOOP 164A SHOWN, LOOP 164B SIMILAR

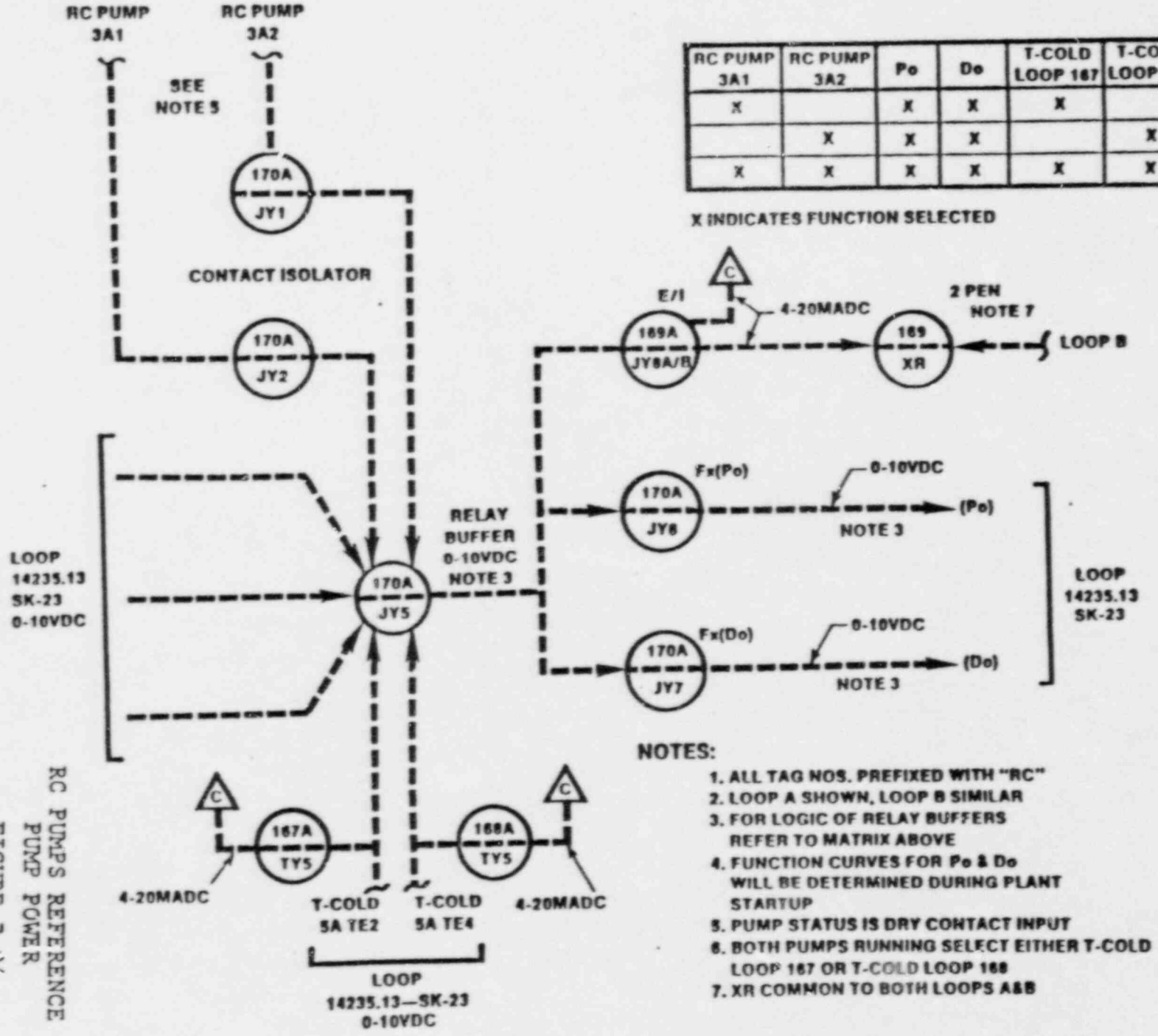


RCITS RX HEAD
INVENTORY LOOP 164
FIGURE 7-22
(REV. 8)



NOTES:
1. ALL TAG NOS. PREFIXED WITH RC
2. LOOP A SHOWN, LOOP B SIMILAR

VOID FRACTION ALGORITHM WITH RC PMP POWER
FIGURE 7-23
(REV. 7)



RC PUMP 3A1	RC PUMP 3A2	Po	Do	T-COLD LOOP 167	T-COLD LOOP 168	
X		X	X	X		
	X	X	X		X	
X	X	X	X	X	X	NOTE 6

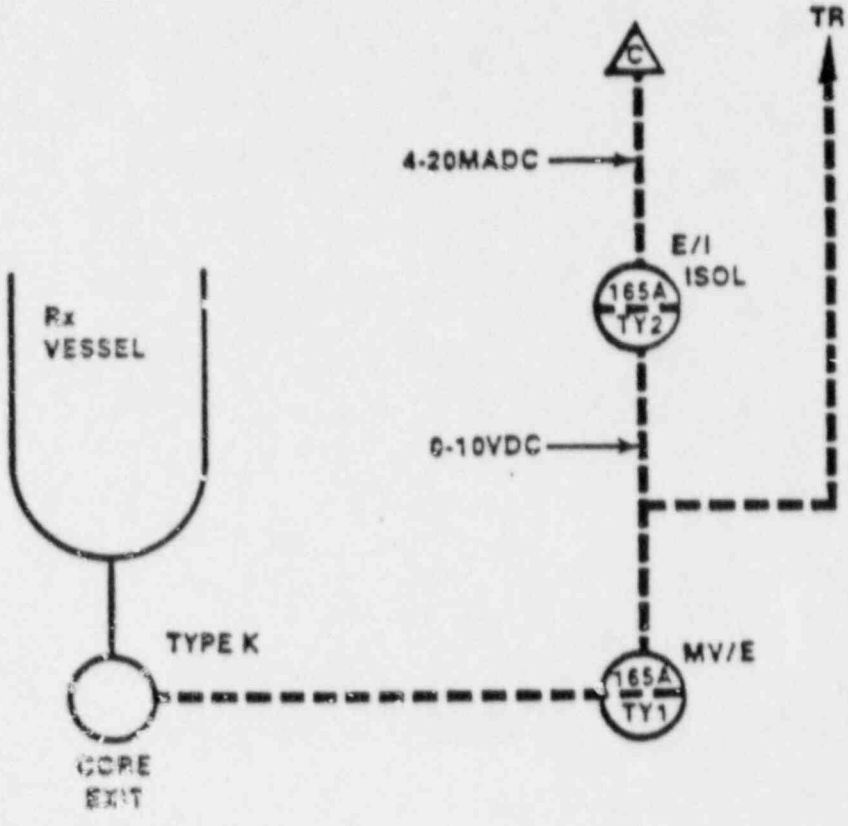
X INDICATES FUNCTION SELECTED

NOTES:

1. ALL TAG NOS. PREFIXED WITH "RC"
2. LOOP A SHOWN, LOOP B SIMILAR
3. FOR LOGIC OF RELAY BUFFERS REFER TO MATRIX ABOVE
4. FUNCTION CURVES FOR Po & Do WILL BE DETERMINED DURING PLANT STARTUP
5. PUMP STATUS IS DRY CONTACT INPUT
6. BOTH PUMPS RUNNING SELECT EITHER T-COLD LOOP 167 OR T-COLD LOOP 168
7. XR COMMON TO BOTH LOOPS A&B

RC PUMPS REFERENCE PUMP POWER

FIGURE 7-24 (REV. 7)



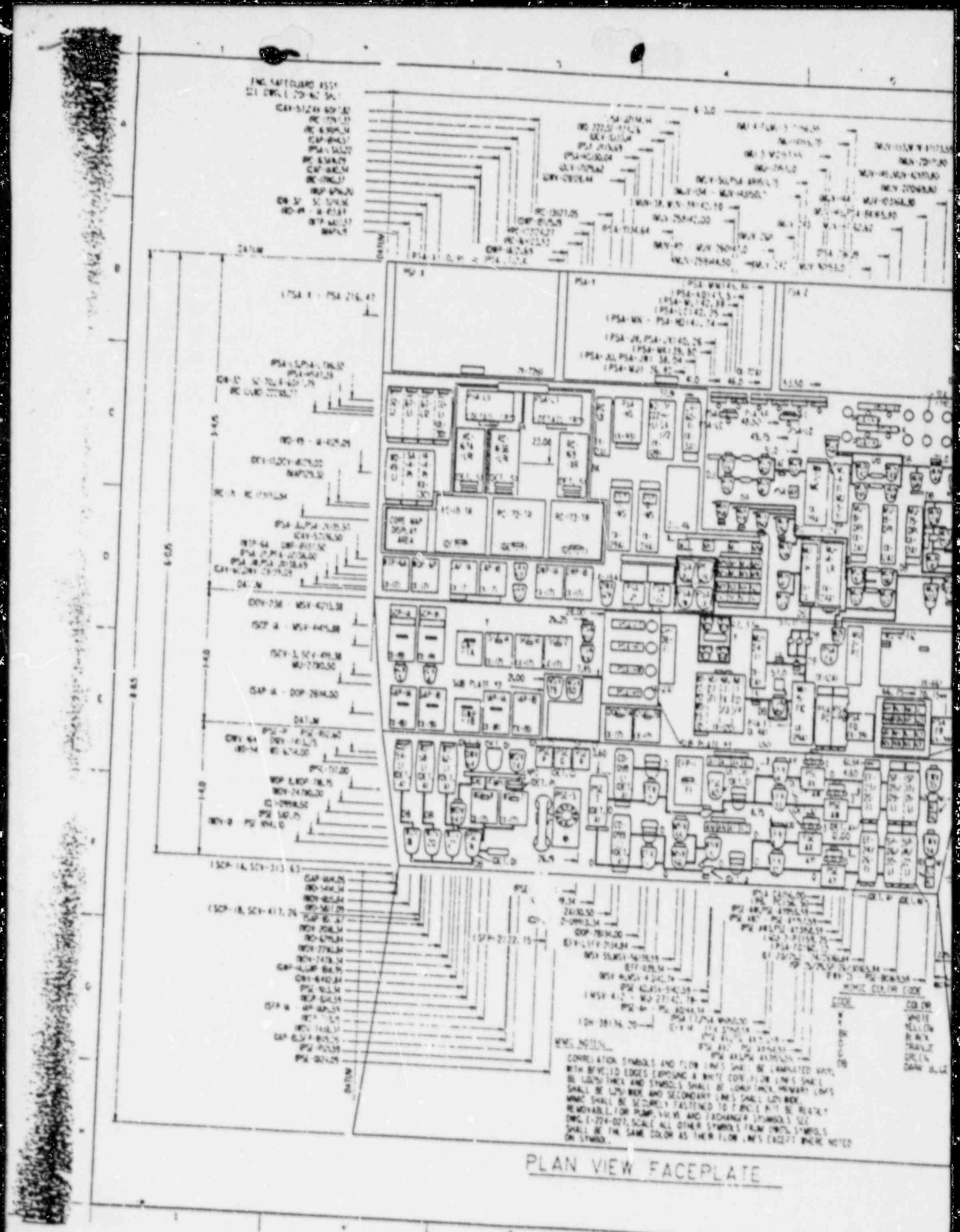
NOTES:

1. 16 LOOPS REQUIRED, NUMBERED RC-165A THRU RC-165P
   LOOP 165A SHOWN, OTHERS SIMILAR.

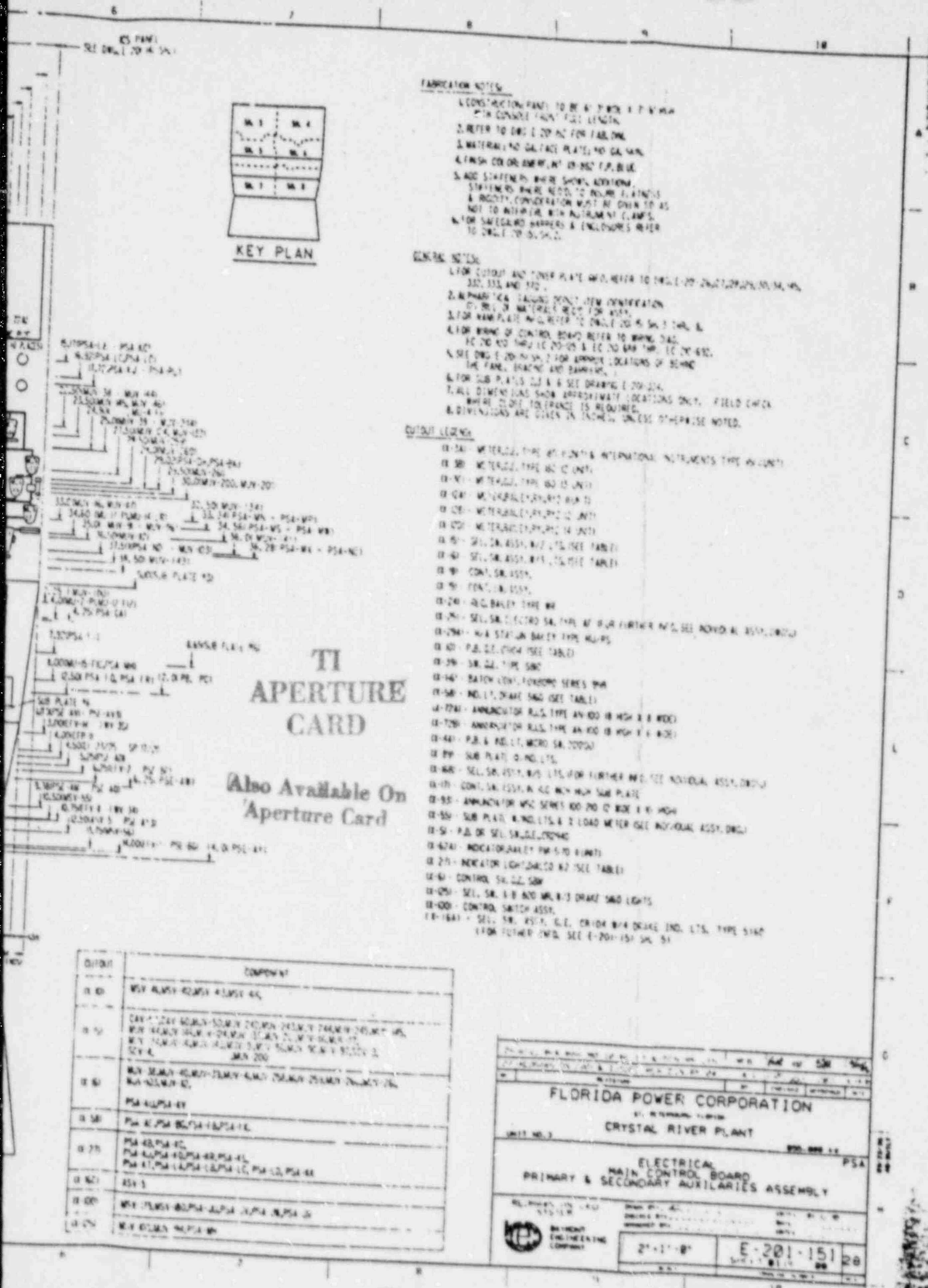
LOOP 165 CORE EXIT
THERMOCOUPLES

FIGURE 7-25

(REV. 7)



PLAN VIEW FACEPLATE



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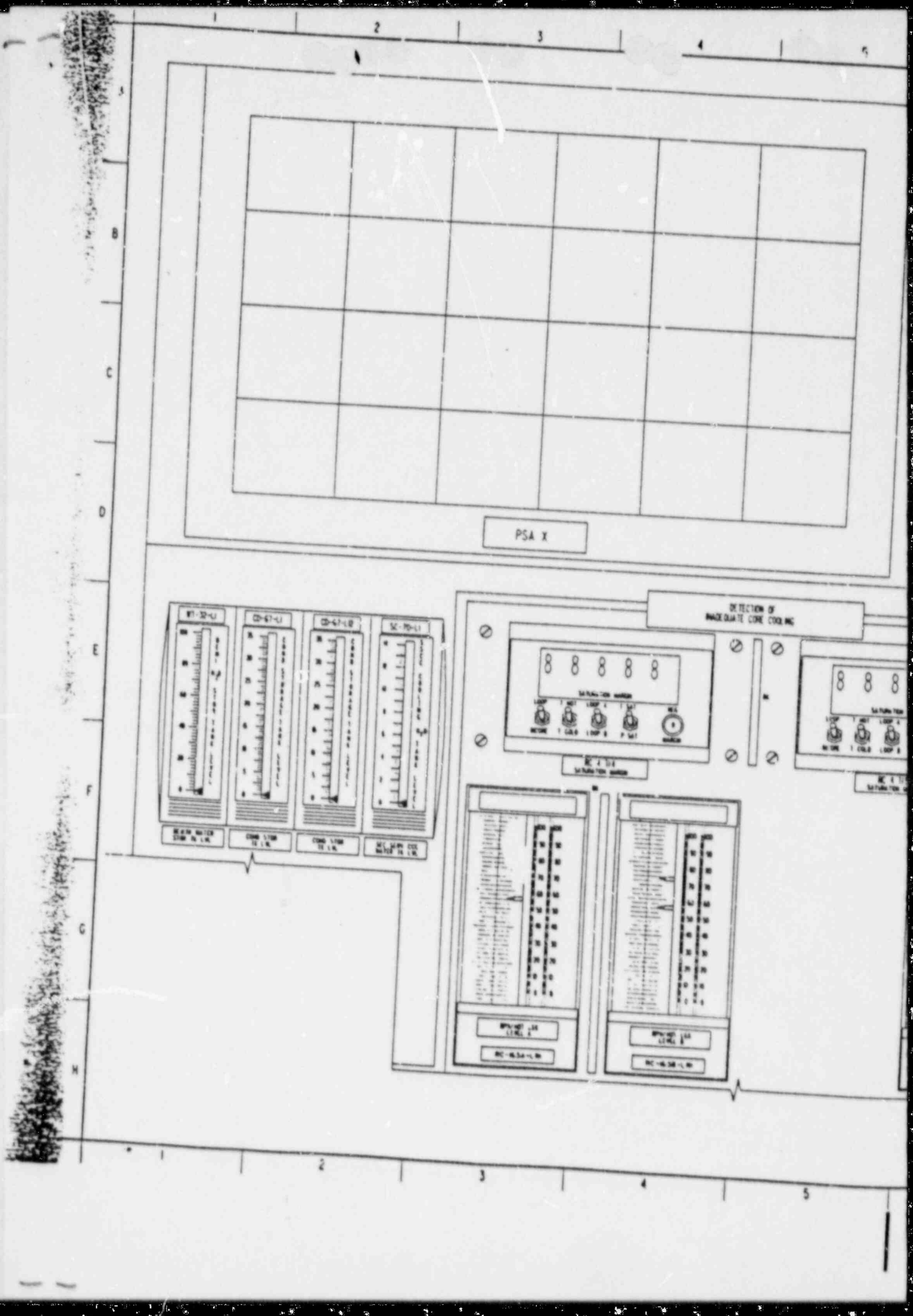
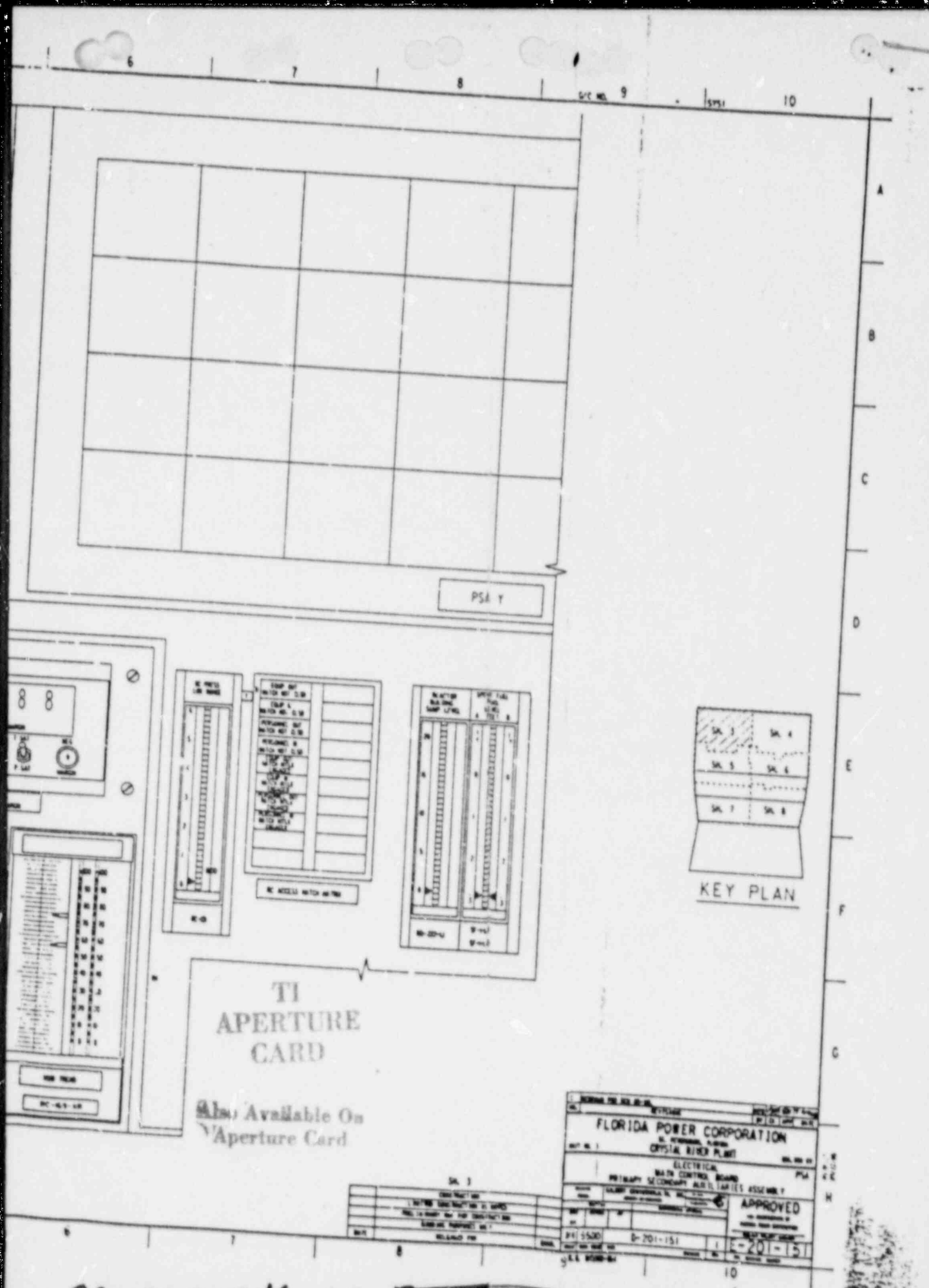
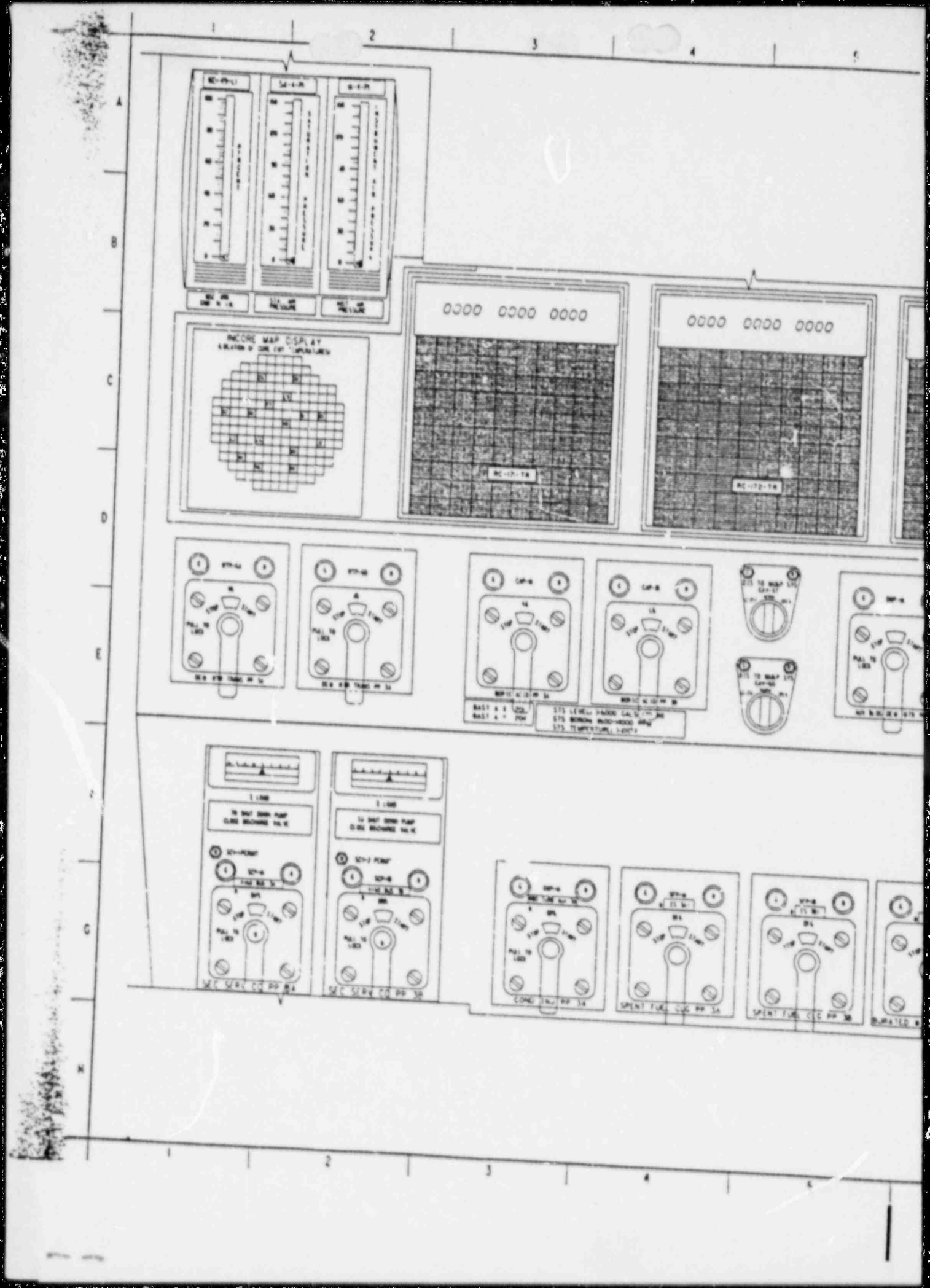

PSA X

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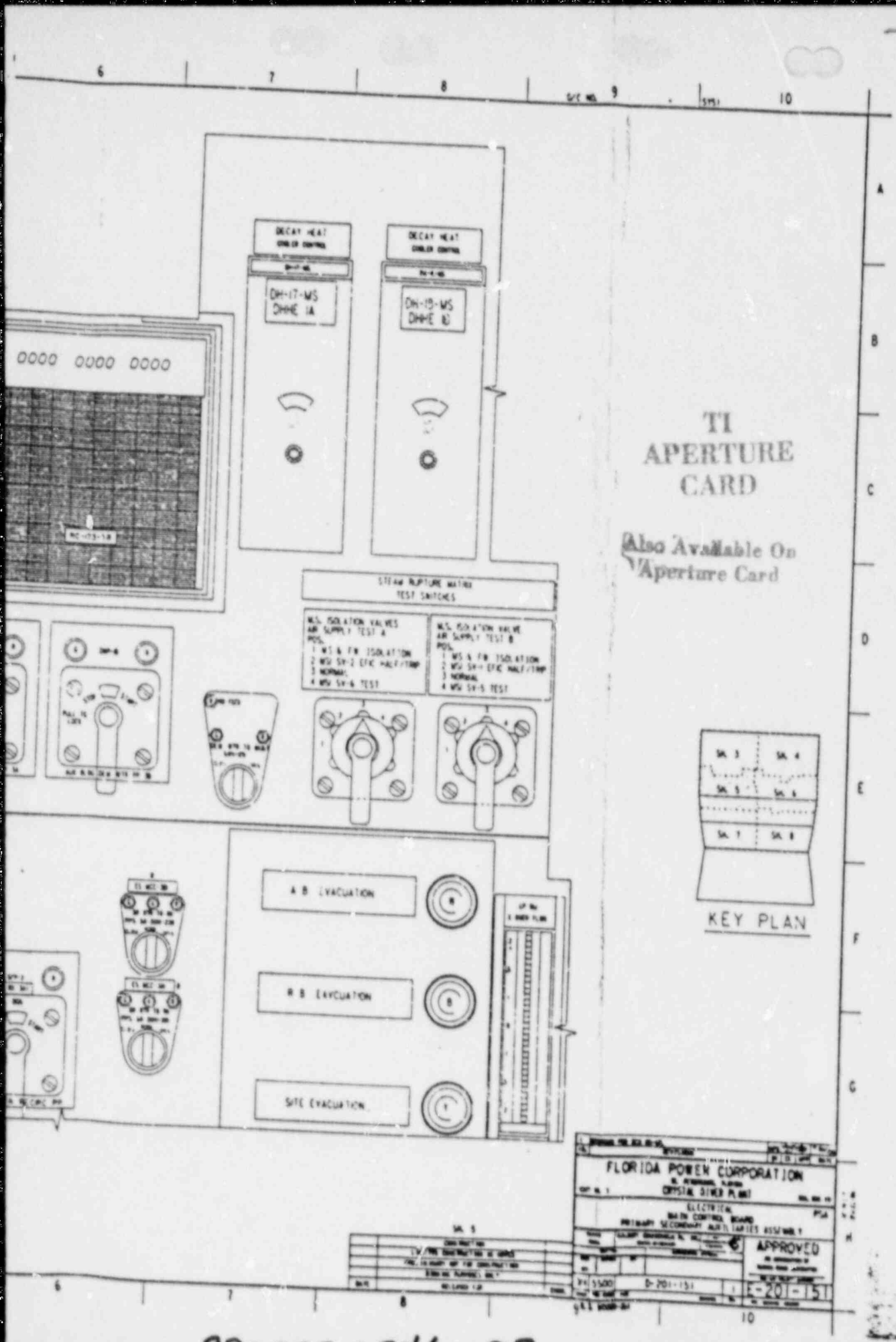

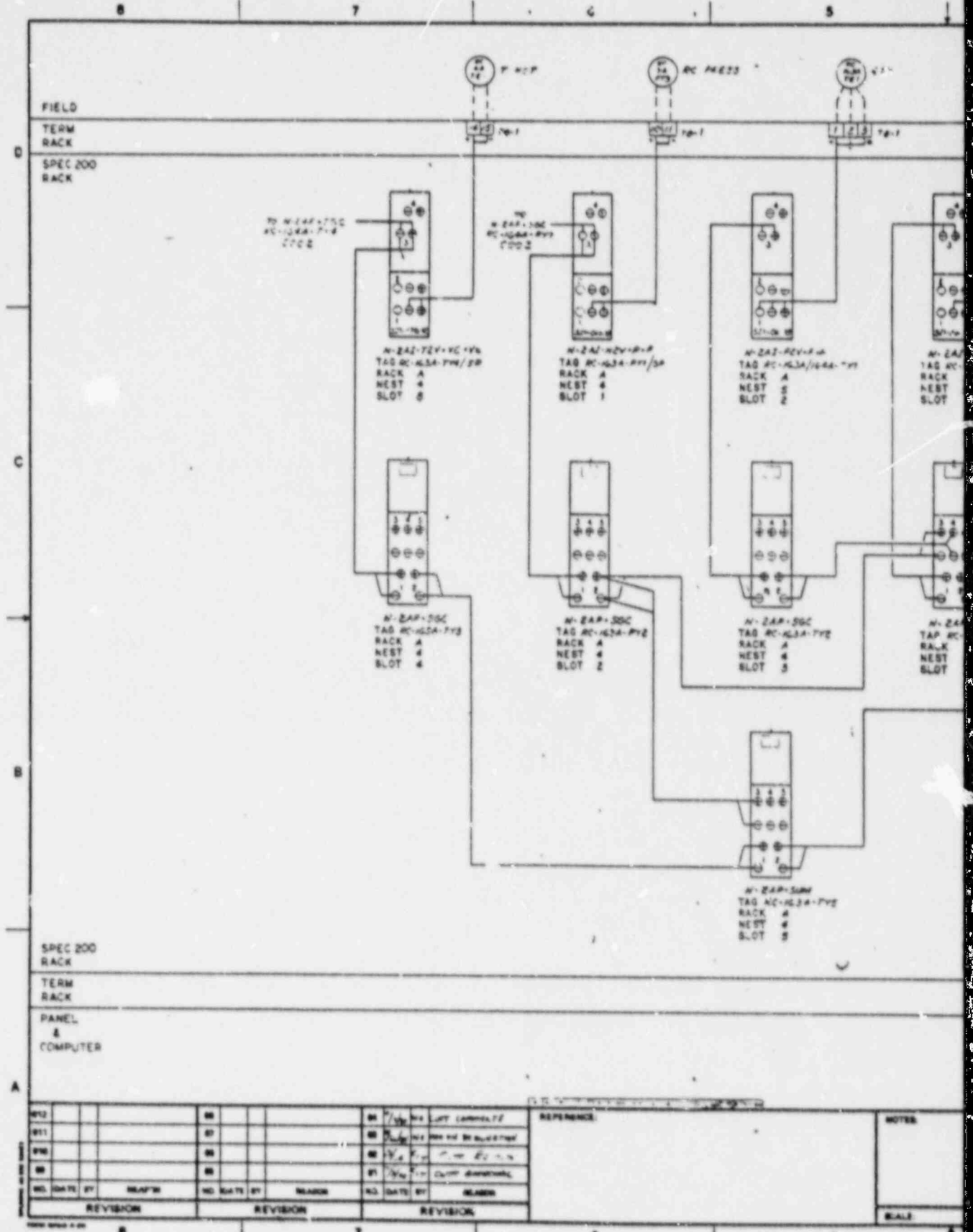
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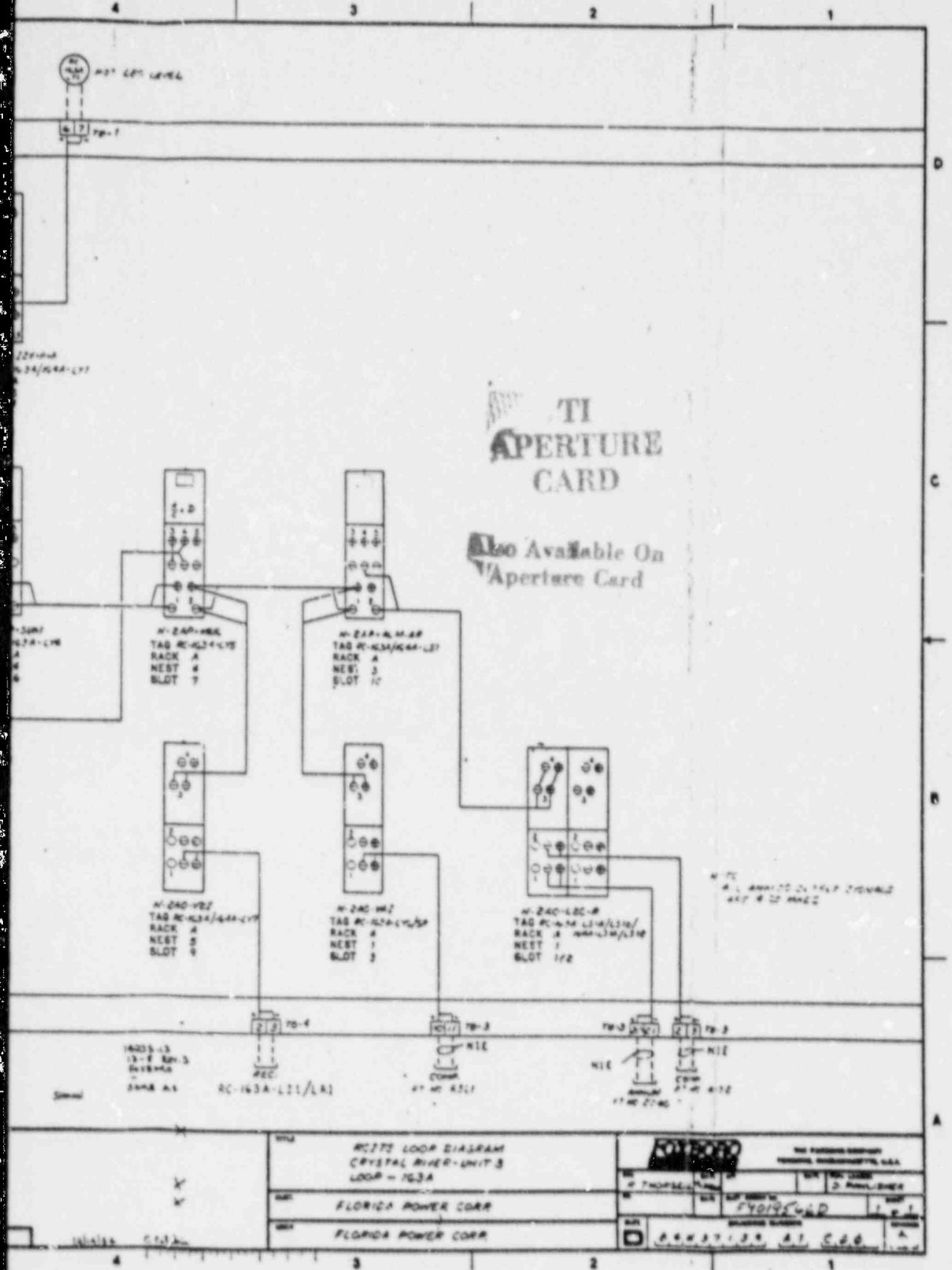

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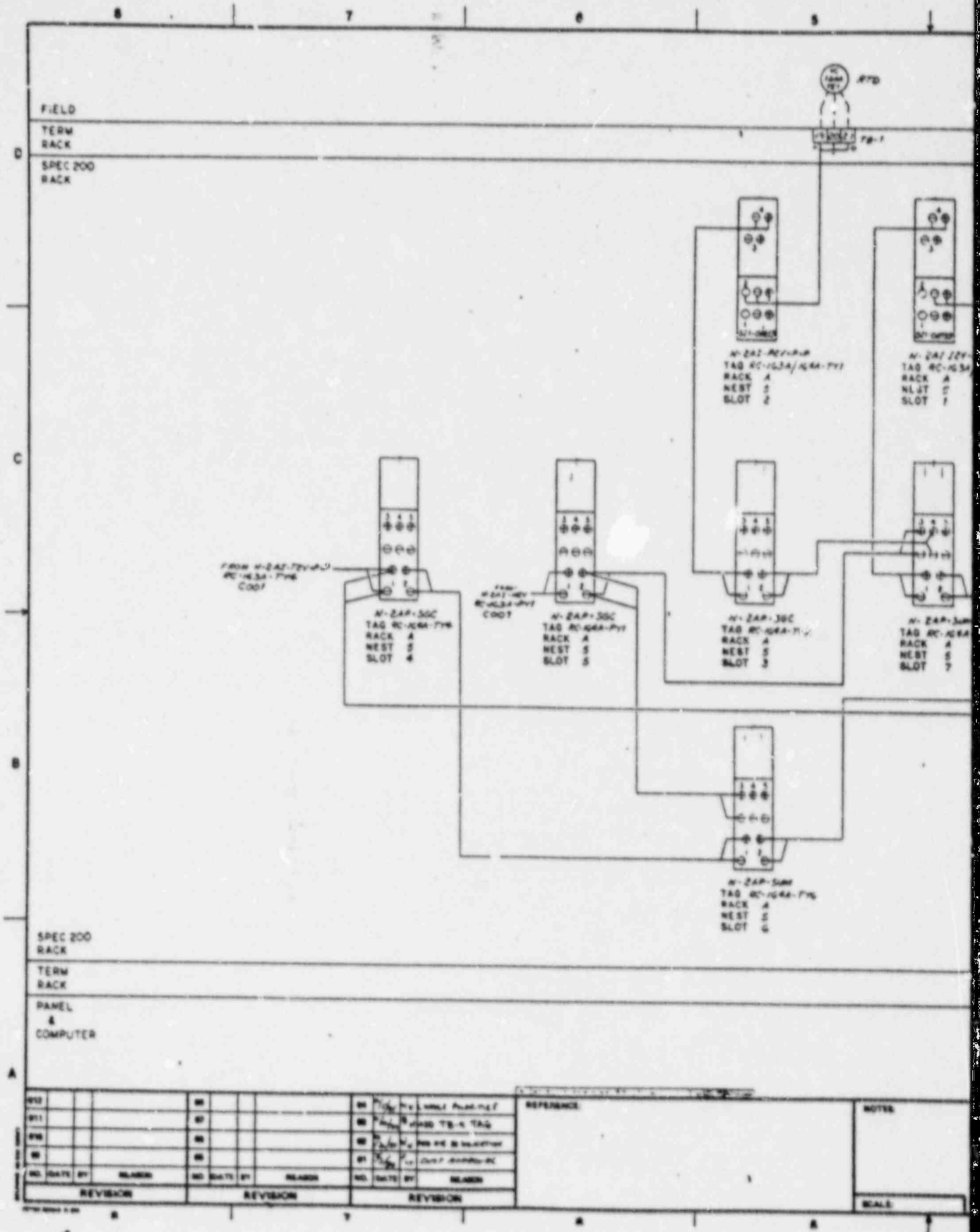
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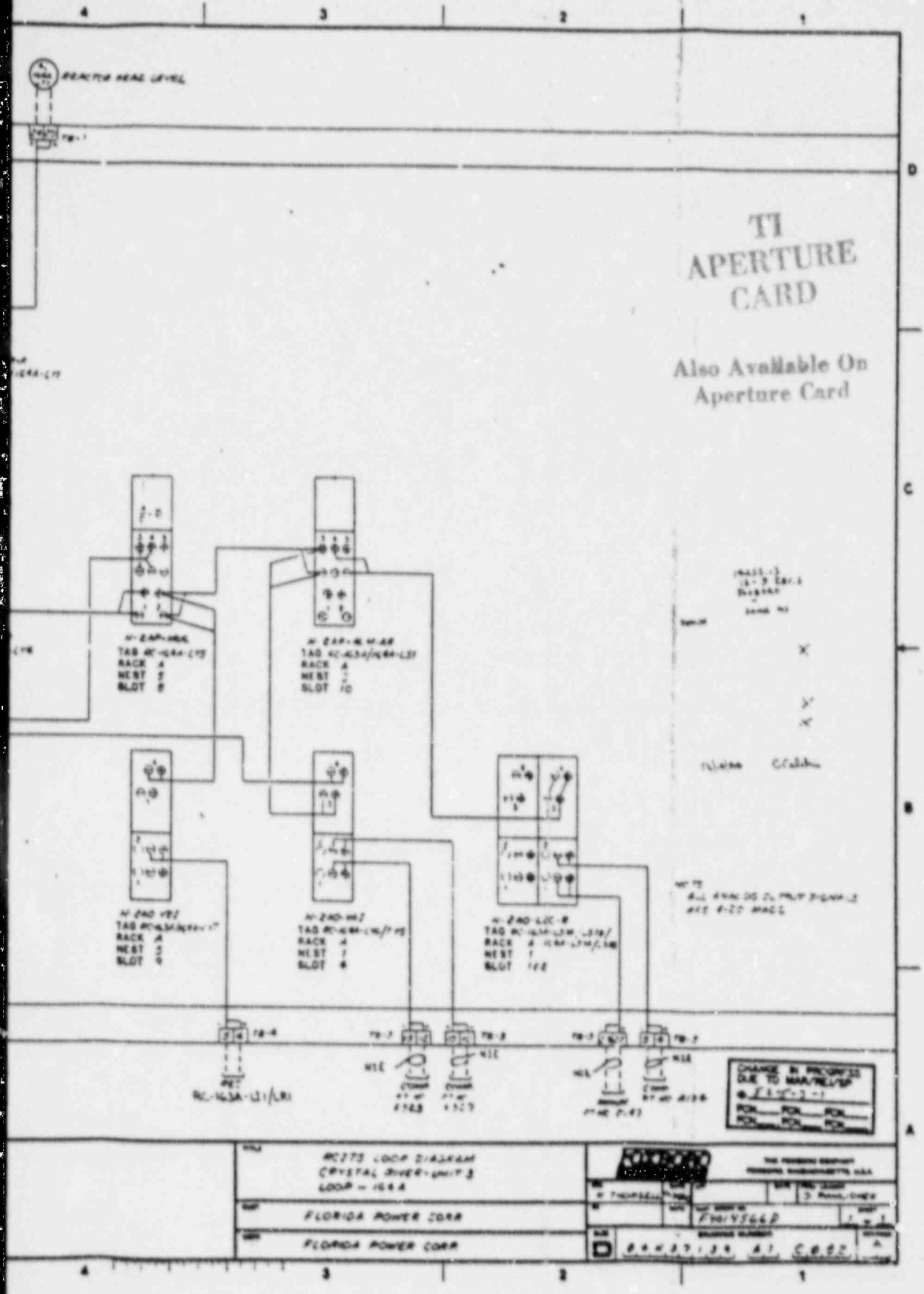

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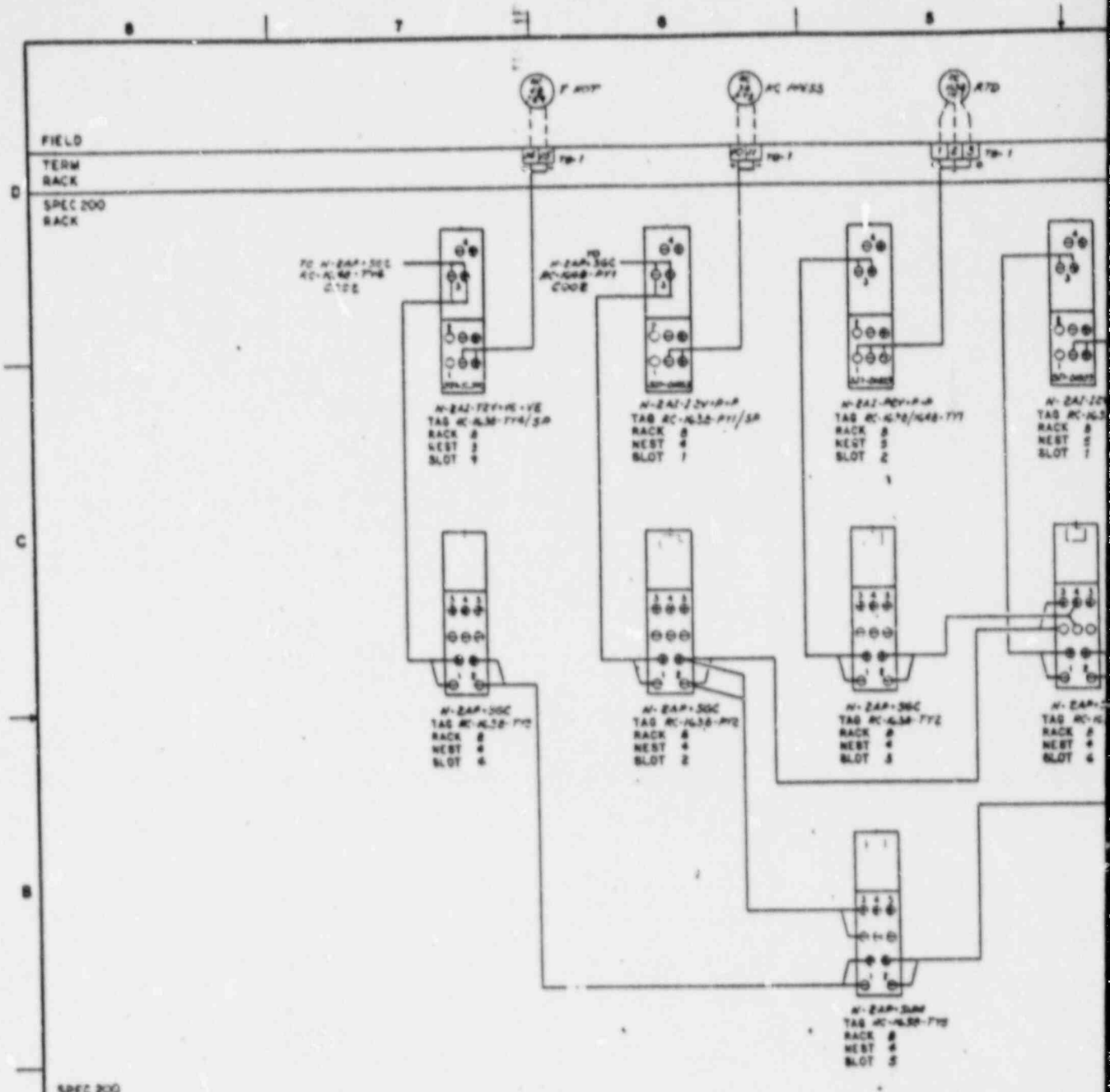
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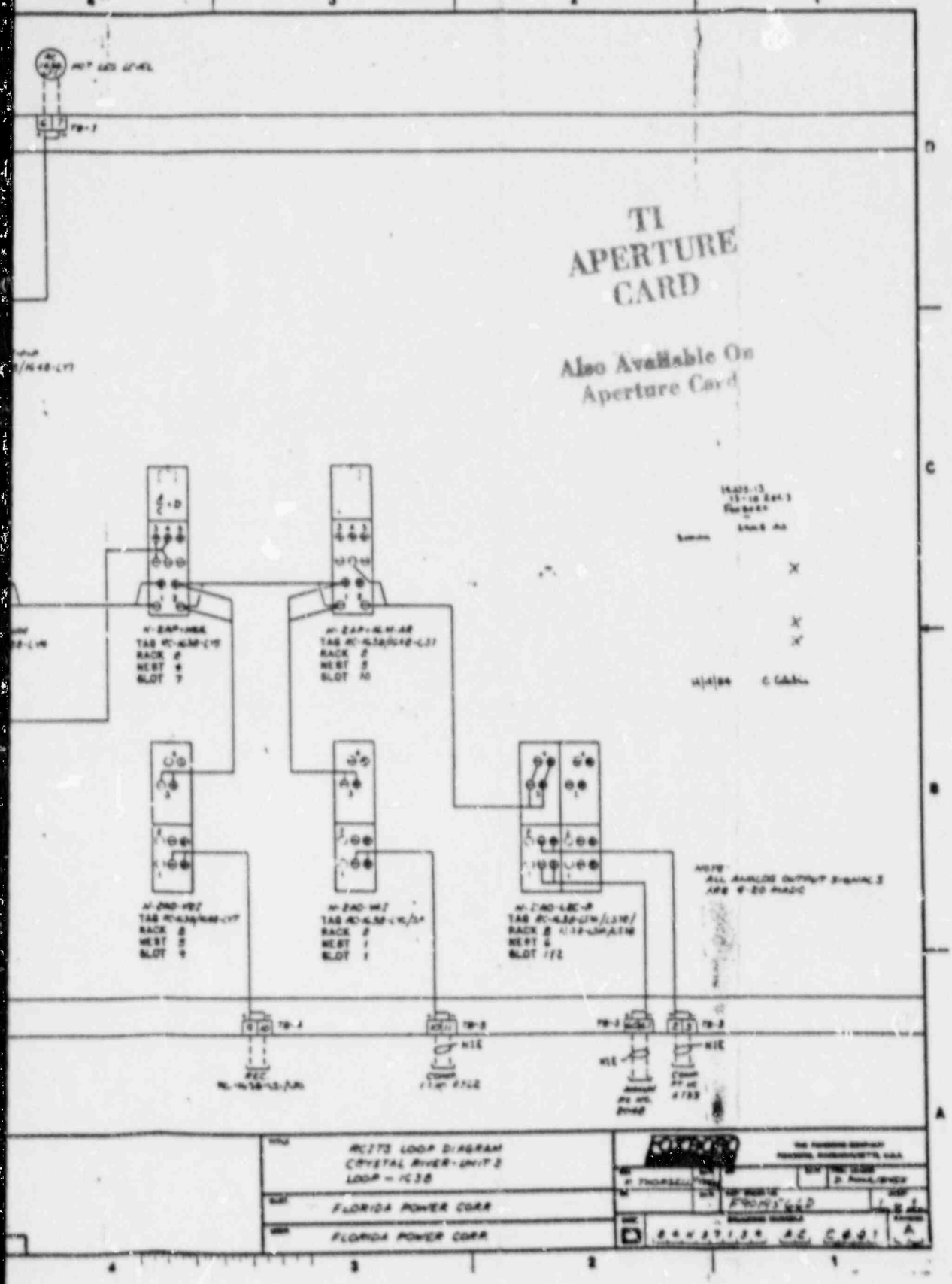

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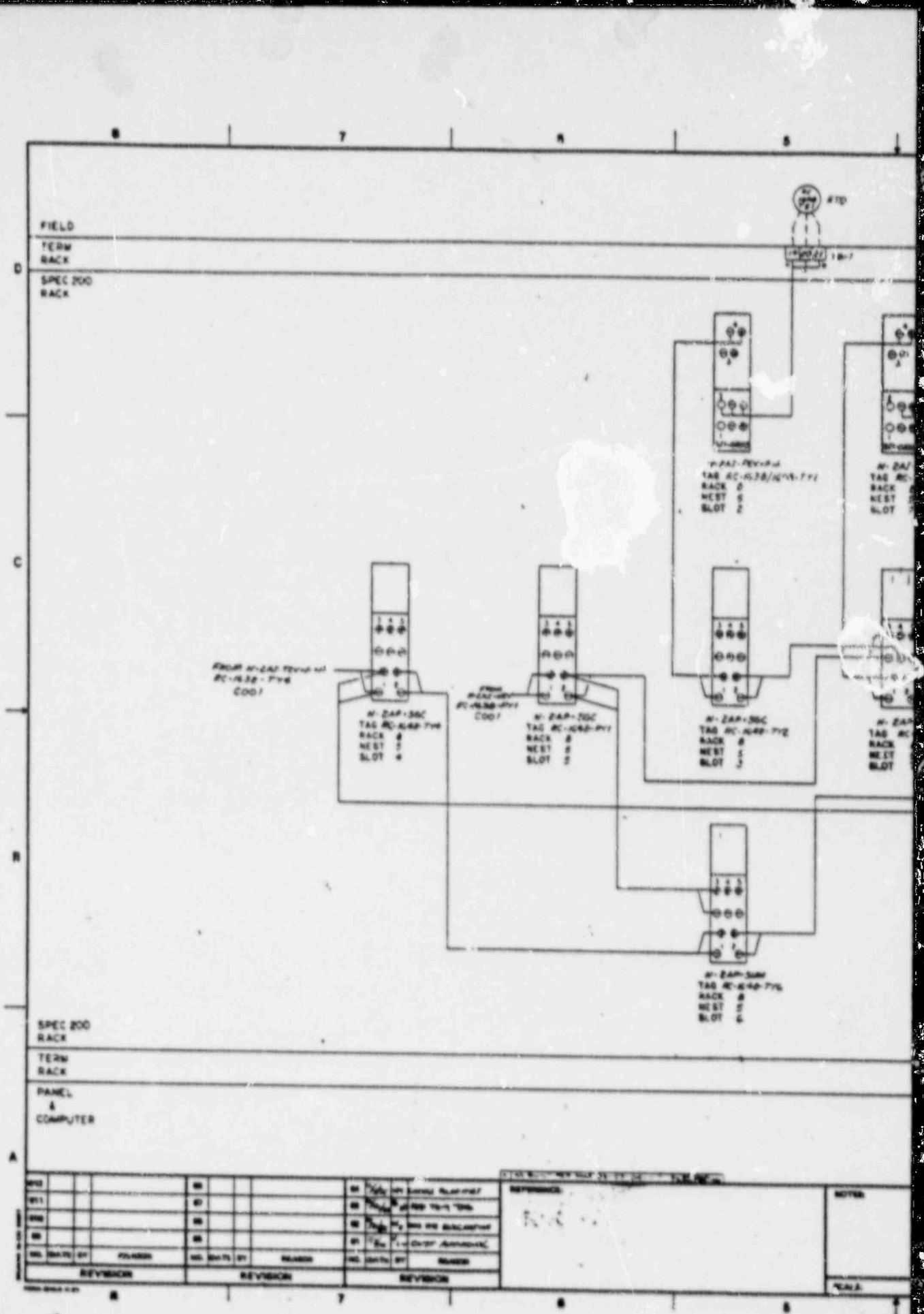
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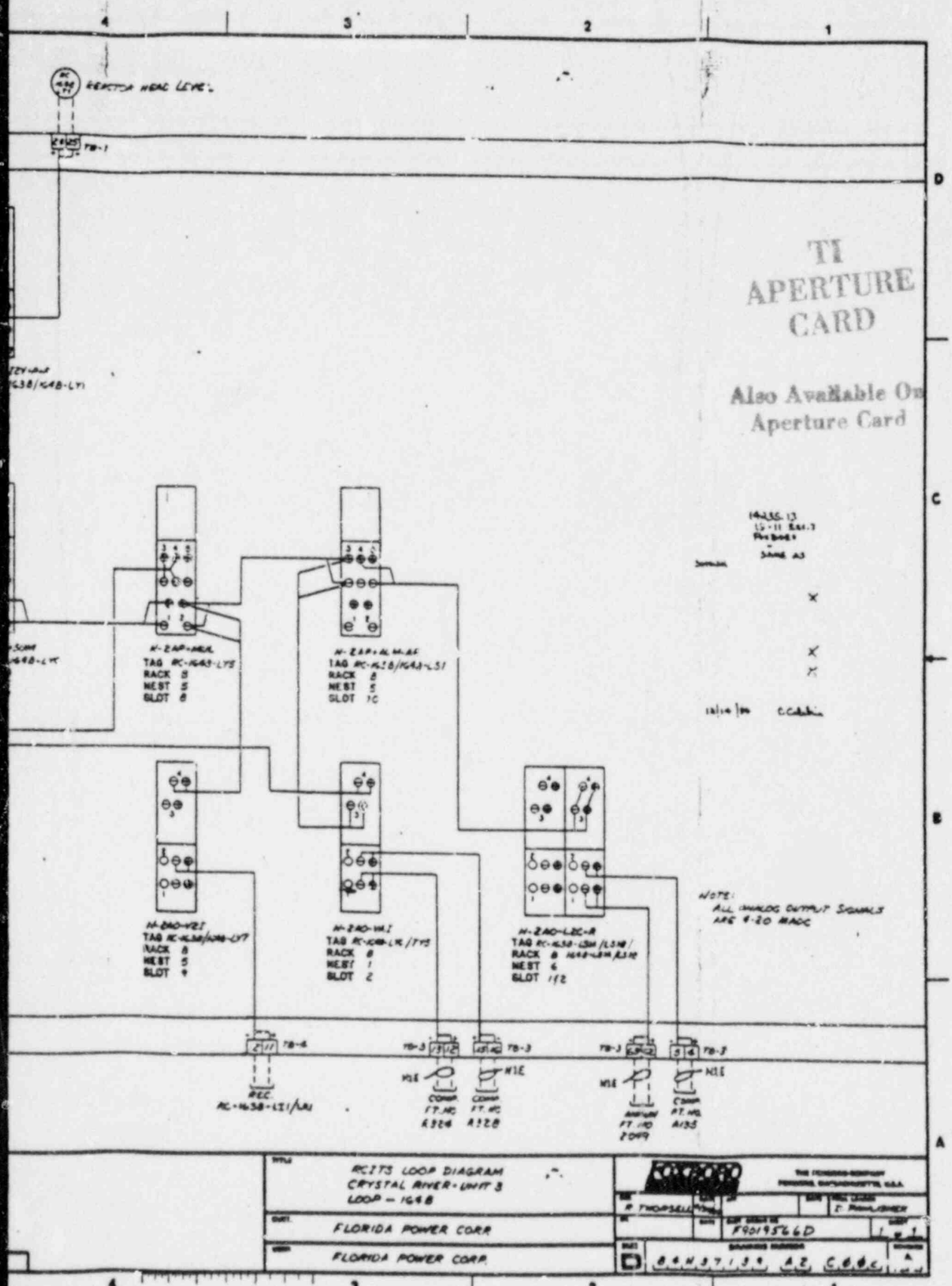

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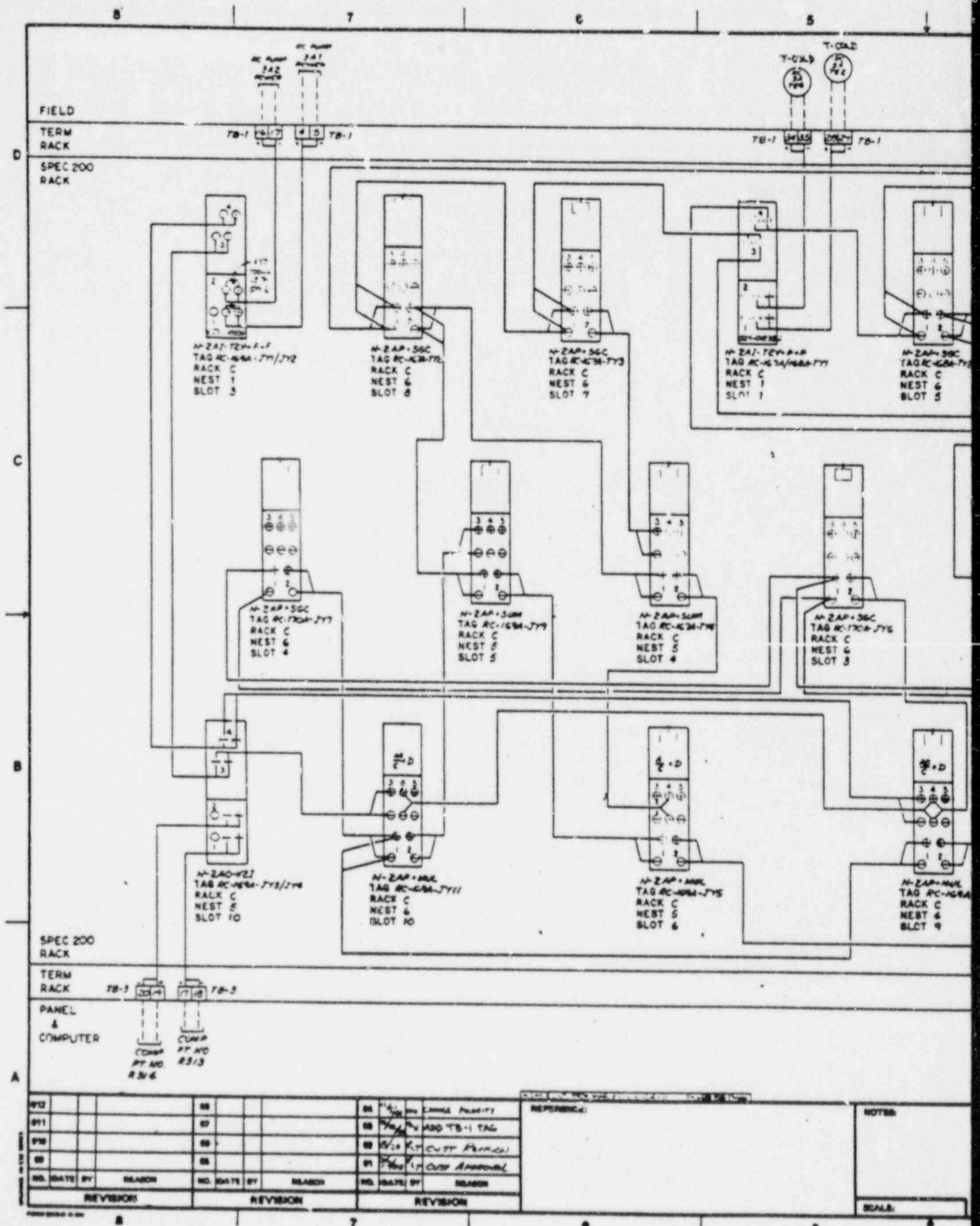
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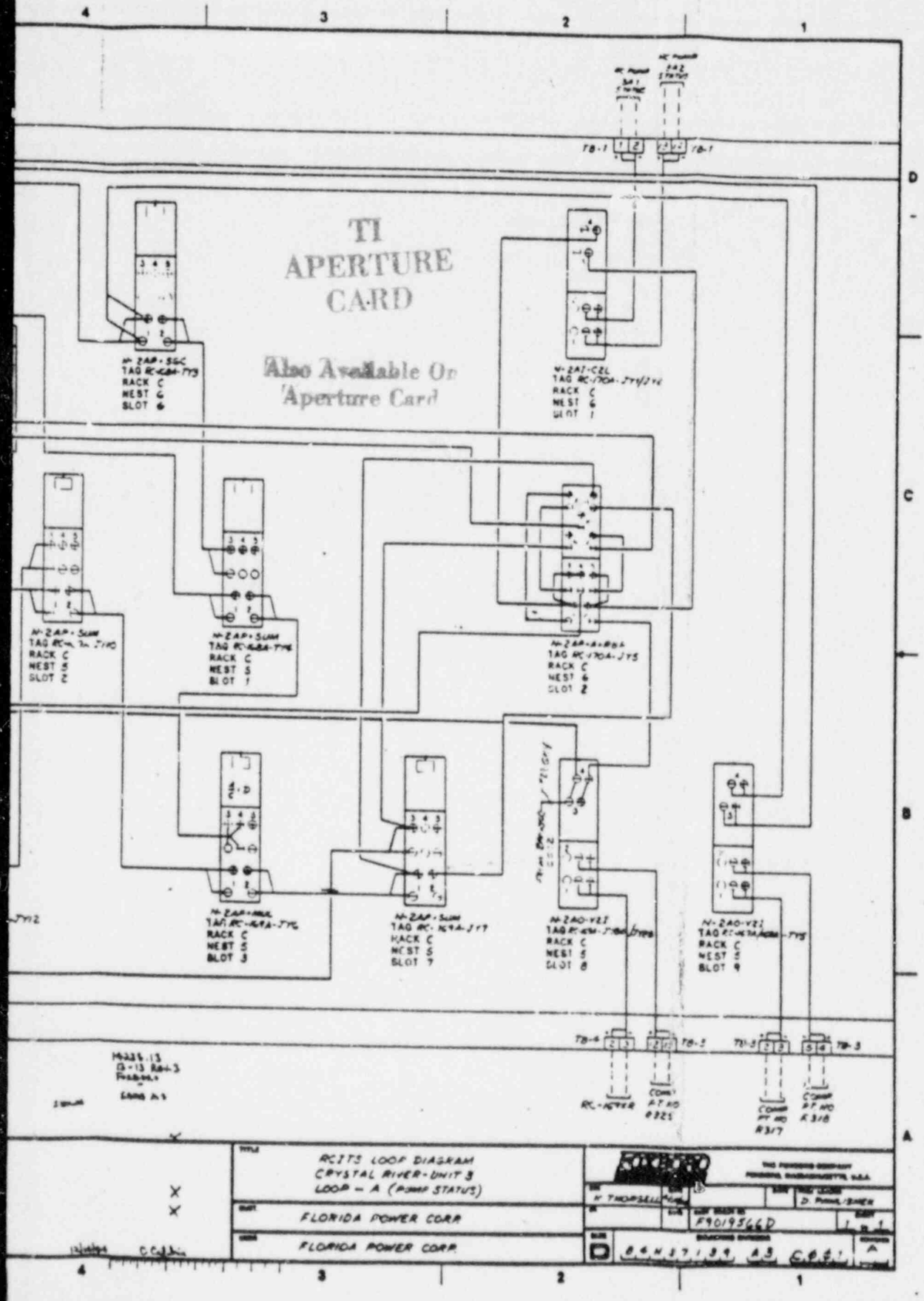

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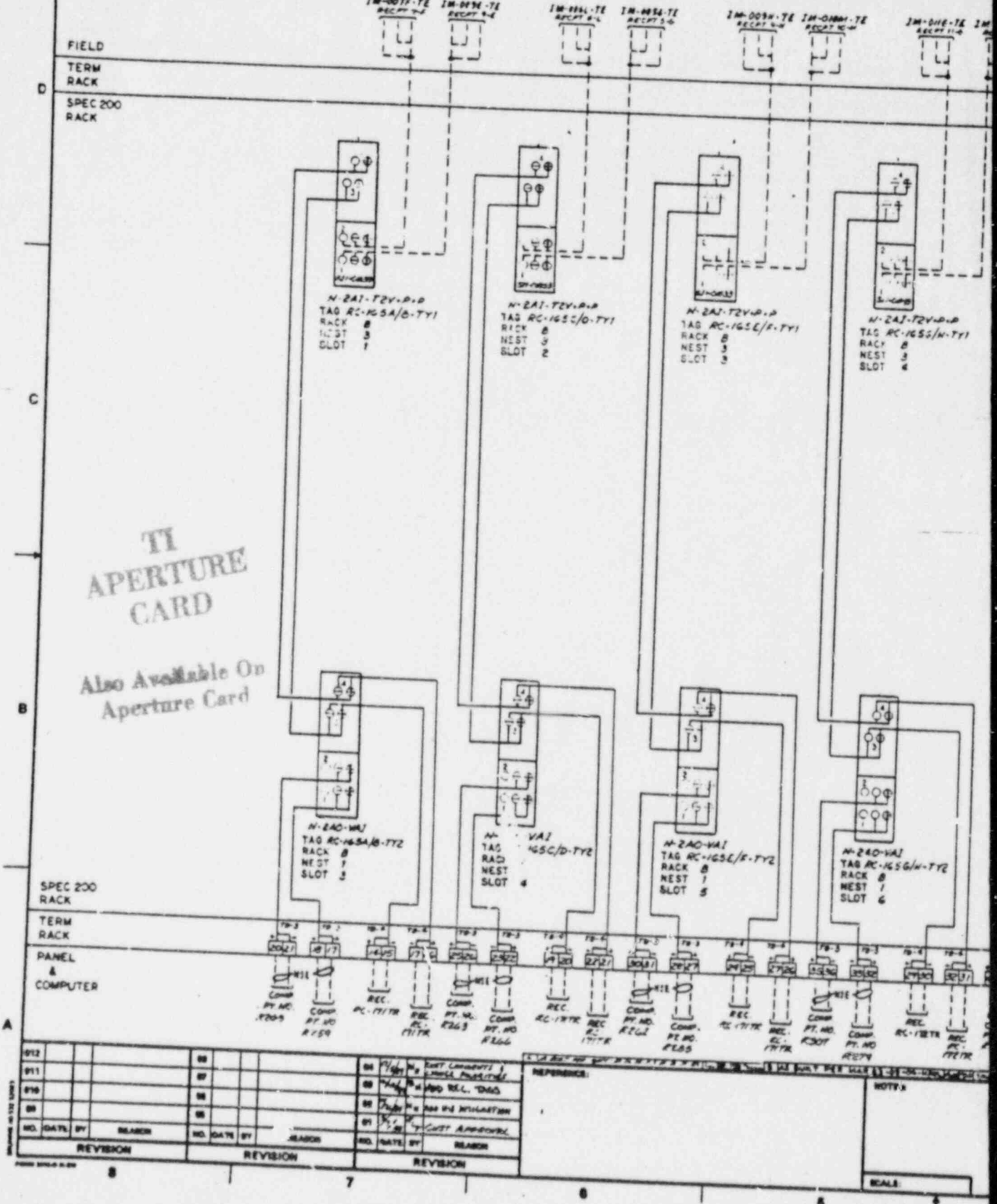

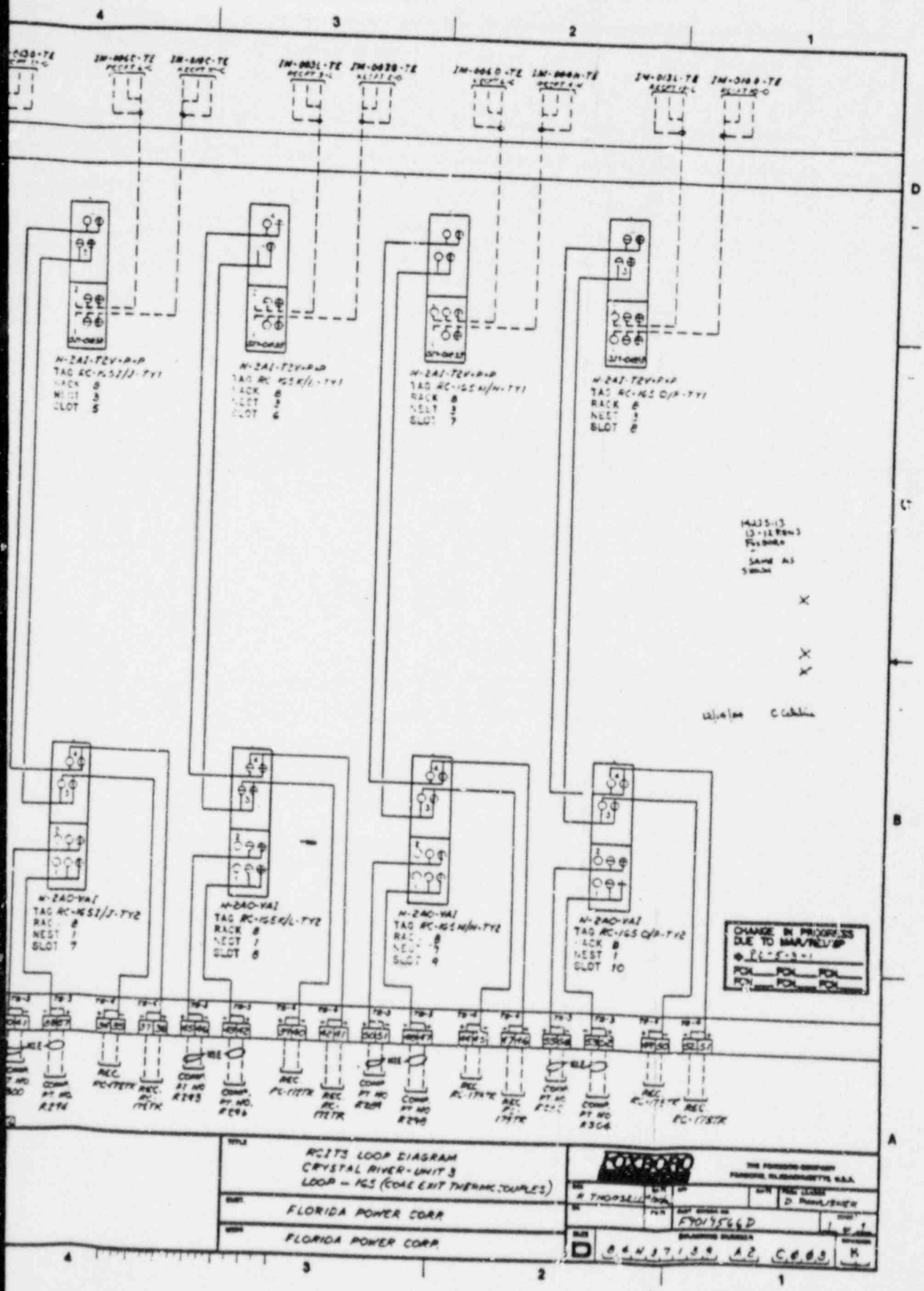

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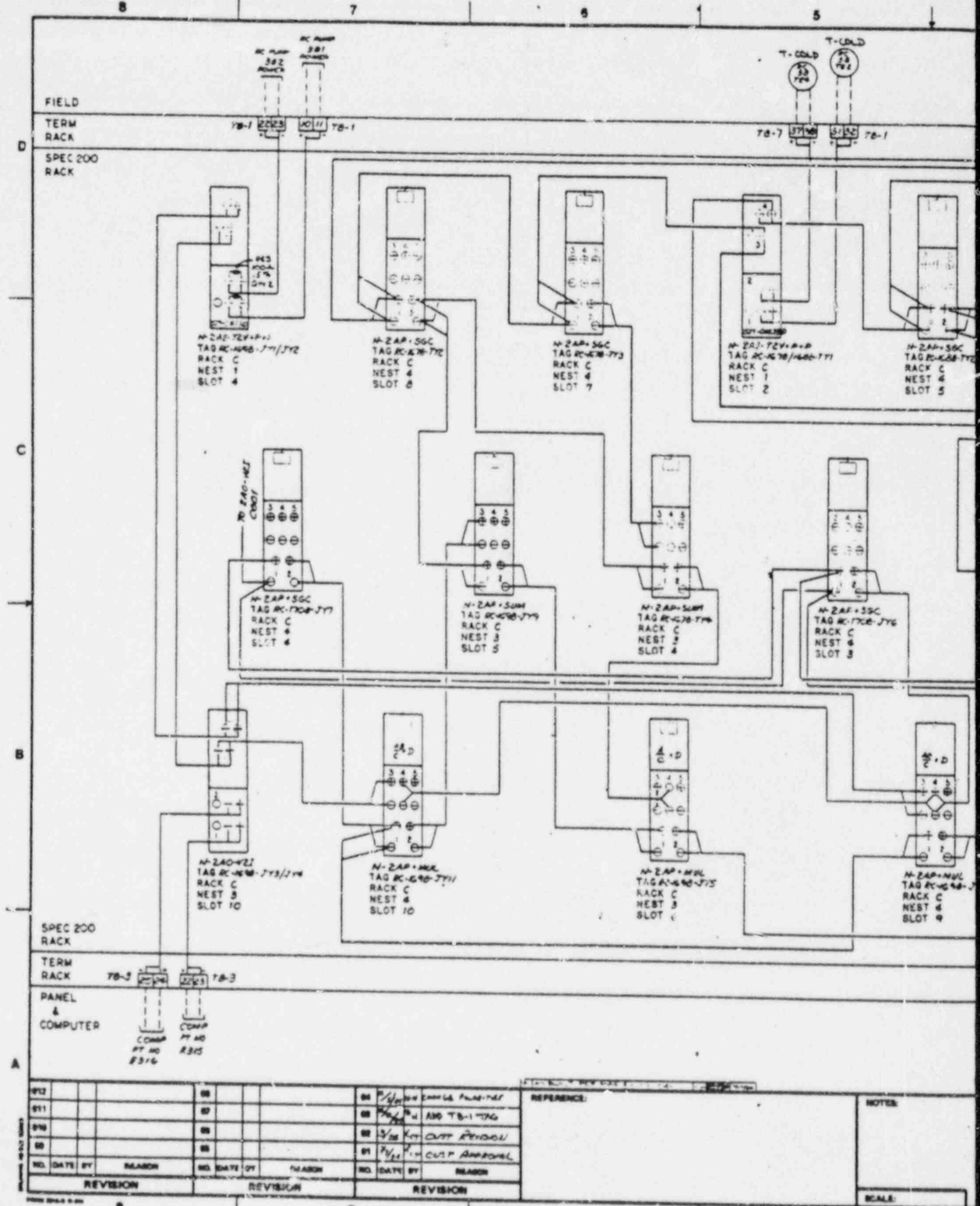
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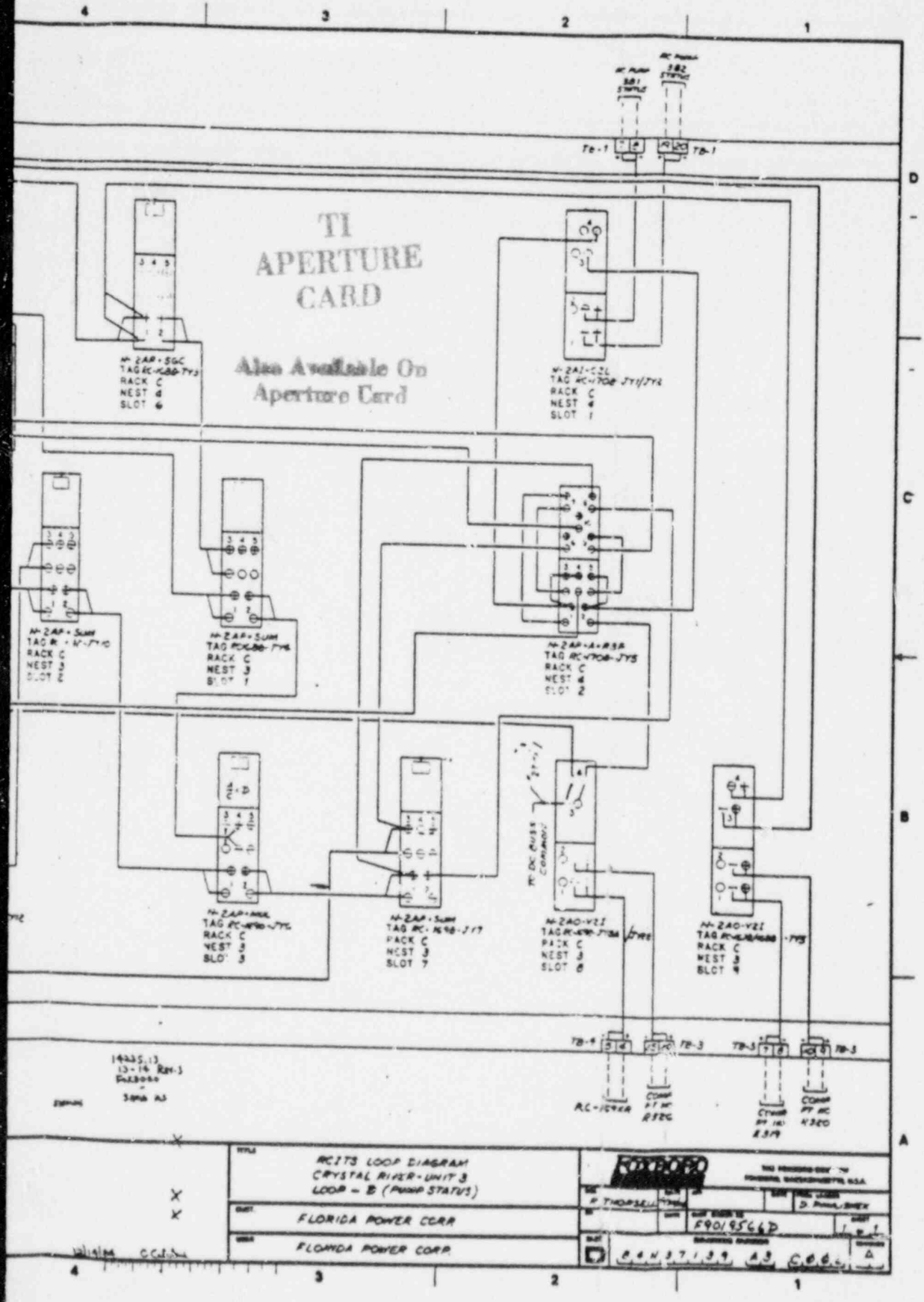

RC TS LOOP DIAGRAM
CRYSTAL RIVER - UNIT 3
LOOP - B (PUMP STATUS)

FLORIDA POWER CORP

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ATTACHMENT 4

A list of each ICC Instrumentation Subsystem and its implementing procedure is provided below:

Subcooling Margin Monitoring (SNM)

VP-580, Plant Safety Verification Procedure
EP-220, Pressurized Thermal Shock
EP-290, Inadequate Core Cooling
AP-380, Engineered Safeguards Actuation
AP-450, Emergency Feedwater Actuation
AP-460, Steam Rupture Matrix Actuation
AP-580, Reactor Protection System Actuation
AP-530, Natural Circulation
EP-260, Inadequate Decay Heat Removal
EP-390, Steam Generator Tube Rupture
AP-990, Shutdown from outside the Control Room

All of these procedures address the use of subcooling margin as an entry condition or a condition requiring operator action.

Core Exit Thermocouples:

VP-580, Plant Safety Verification Procedure
EP-290, Inadequate Core Cooling
AP-380, Engineered Safeguards Actuation
EP-220, Pressurized Thermal Shock
AP-530, Natural Circulation

Reactor Coolant Inventory Tracking System (RCITS)

AI-704, Reactor Trip Review and Analysis
AP-580, Plant Safety Verification

Reactor Coolant Pump Void Trend Monitoring System (RCPVTM)

AI-704, Reactor Trip Review and Analysis
AP-580, Plant Safety Verification

With the exception of plant procedure AI-704, all plant procedures were written to the Emergency Operating Procedure guidelines submitted to the NRC for review and approval. A new Writer's Guide incorporating NRC Inspection Comments, INPO assist visits, and a Battelle human factors review has been issued with all EOP's to be rewritten and issued in December, 1987.

With regard to the RCITS and RCPVTM, subsystems of Inadequate Core Cooling Monitoring Instrumentation, the following conditions apply:

1. The RCPVTM is only functional with Reactor Coolant Pumps operating. Inadequate Core Cooling would result following loss of subcooling margin and continued plant degradation. On loss of subcooling margin, the immediate operator action is to trip all Reactor Coolant Pumps, thus rendering the instrumentation inoperable. Should RCPs remain running or require restarting without the required SCM, adequate procedural guidance exists to regain core cooling conditions based on Core Exit Thermocouples and SCM. This data will be analyzed as required by the STA or plant staff personnel.

2. The complexity of the RCITS information, based on various flow conditions that could exist in the core (forced flow, natural circulation, HPI-PROV cooling, LPI/HPI break cooling, etc), does not allow for real time data analysis for the operator. This data will be analyzed as required by the STA or plant staff personnel.

All four systems have been in service since completion of Refuel V. Documentation of operability can be obtained from applicable surveillance procedures. Training for these systems was covered under the following lesson plans: ROT 4-1, ROT 4-9, ROT 4-11 and RCITS and RCPVTM, was specifically covered during Refuel V.