

PROPOSED CHANGE TO  
TECHNICAL SPECIFICATIONS  
SALEM GENERATING STATION  
UNIT NOS. 1 AND 2

Ref: LCR 85-12

Description of Change

Using the attached revised pages, modify Salem 1 Technical Specifications as follows:

Replace 3.1.3.1 through 4.1.3.2 with the attached revised Tech Specs 3.1.3.1 through 4.1.3.2.2.

Tech Specs 3.1.3.3 through 4.1.3.3 remain unchanged.

Replace 3.1.3.4 through 4.1.3.5 with the attached revised Tech Specs 3.1.3.4 through 4.1.3.5.

Tech Spec Figures 3.1-1 and 3.1-2 remain unchanged.

Replace Bases 3/4.1.3 with the attached revised Bases 3/4.1.3.

Using the attached revised pages, also modify Salem 2 Technical Specifications as follows:

Replace 3.1.3.1 through 4.1.3.2.2 with the attached revised Tech Specs 3.1.3.1 through 4.1.3.2.2.

Tech Spec 3.1.3.3 through 4.1.3.3 remain unchanged.

Replace 3.1.3.4 through 4.1.3.5 with the attached revised Tech Specs 3.1.3.4 through 4.1.3.5.

Tech. Spec Figures 3.1-1 and 3.1-2 remain unchanged.

Replace Bases 3/4.1.3 with the attached revised Bases 3/4.1.3.

Reason for Change

The purpose of these proposed Technical specification changes is to improve the method of calibration of the Analog Rod Position Indication (ARPI) system by providing more realistic operational requirements consistent with the real safety requirements of the ARPI system. These proposed changes are modeled on the revised Technical Specifications provided by Westinghouse in their July 23, 1981 letter, attached.

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Significant Hazards Consideration Evaluation

The proposed Technical Specification changes are based on the following conclusions:

Shutdown Banks and Control Banks A and B positions need to be known accurately in a very limited range, near the top and bottom of the core. Accurate knowledge of these bank positions permits the operator to verify that the control rods in these banks are either fully withdrawn or fully inserted, the normal operating modes for these banks. Knowledge of these bank positions in these two areas satisfies all accident analysis assumptions concerning their position.

Recognizing that the Analog Rod Position Indication (ARPI) is very temperature sensitive, immediate verification of position after rod movement is shifted (in the revised Technical Specifications) from the ARPI to the group step counters with subsequent verification by the ARPI after temperature equilibration. Comparison of the group demand counters to the bank insertion limits with verification of rod position with the ARPI (after thermal soak after rod motion) is sufficient verification that the control rods are above the insertion limits as assumed in the accident analyses.

Operation of the Salem Units in accordance with the proposed ARPI Technical Specification changes:

Would not involve a significant increase in the probability or consequences of an accident previously evaluated for the Salem Units, since there are no changes to conditions assumed in the accident analyses.

In no way creates the possibility of a new or different kind of accident from any accident previously evaluated for the Salem Units, since no plant modifications resulted from this change.

Does not involve a significant reduction in a margin of safety, since there are no changes to conditions assumed in the accident analyses.

Based on the above, we have determined that this change request involves no significant hazards consideration under 10CFR50.92.

REVISED PAGES - UNIT NO. 1

REACTIVITY CONTROL SYSTEMS  
3/4.1.3 MOVABLE CONTROL ASSEMBLIES  
GROUP HEIGHT

LIMITING CONDITION FOR OPERATION

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3.1.3.1 All full length (shutdown and control) rods, shall be OPERABLE and positioned within + 12 steps (indicated position) of their group step counter demand position within one hour after rod motion.

APPLICABILITY: MODES 1\* and 2\*

ACTION:

- a. With one or more full length rods inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.
- b. With more than one full length rod inoperable or mis-aligned from the group step counter demand position by more than + 12 steps (indicated position), be in HOT STANDBY within 6 hours.
- c. With one full length rod inoperable due to causes other than addressed by ACTION a, above, or mis-aligned from its group step counter demand position by more than + 12 steps (indicated position), POWER OPERATION may continue provided that within one hour either:
  1. The rod is restored to OPERABLE status within the above alignment requirements, or
  2. The remainder of the rods in the bank with the inoperable rod are aligned to within + 12 steps of the inoperable rod while maintaining the rod sequence and insertion limits of Figures 3.1-1 and 3.1-2; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.5 during subsequent operation, or
  3. The rod is declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied. POWER OPERATION may then continue provided that:

\*See Special Test Exceptions 3.10.2 and 3.10.3.

- a) A reevaluation of each accident analysis of Table 3.1-1 is performed within 5 days; this reevaluation shall confirm that the previously analyzed results of these accidents remain valid for the duration of operation under these conditions.
- b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.
- c) A power distribution map is obtained from the movable incore detectors and  $F_0(Z)$  and  $F_{\Delta H}^N$  are verified to be within their limits within 72 hours.
- d) The THERMAL POWER level is reduced to less than or equal to 75% of RATED THERMAL POWER within one hour and within the next 4 hours the high neutron flux trip setpoint is reduced to less than or equal to 85% of RATED THERMAL POWER. THERMAL POWER shall be maintained less than or equal to 75% of RATED THERMAL POWER until compliance with ACTIONS 3.1.3.1.c.3.a and 3.1.3.1.c.3.c above are demonstrated.

#### SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full length rod shall be determined to be within  $\pm 12$  steps (indicated position of the group demand position at least once per 12 hours (allowing for one hour thermal soak after rod motion) except during time intervals when the Rod Position Deviation Monitor is inoperable, then verify the group positions at least once per 4 hours.

4.1.3.1.2 Each full length rod not fully inserted in the core shall be determined to be OPERABLE by movement of at least 10 steps in any one direction at least once per 31 days.

TABLE 3.1-1

ACCIDENT ANALYSES REQUIRING REEVALUATION  
IN THE EVENT OF AN INOPERABLE FULL LENGTH ROD

Rod Cluster Control Assembly Insertion Characteristics

Rod Cluster Control Assembly Mis-alignment

Loss Of Reactor Coolant From Ruptured Pipes Or From Cracks In Large Pipes  
Which Actuates The Emergency Core Cooling System

Single Rod Cluster Control Assembly Withdrawal At Full Power

Major Reactor Coolant System Pipe Ruptures (Loss Of Coolant Accident)

Major Secondary System Pipe Rupture

Rupture of a Control Rod Drive Mechanism Housing (Rod Cluster Control  
Assembly Ejection)

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEMS - OPERATING

LIMITING CONDITION FOR OPERATION

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3.1.3.2.1 The shutdown and control rod position indication systems shall be OPERABLE and capable of determining the actual and demanded rod positions as follows:

- a. Analog rod position indicators, within one hour after rod motion (allowance for thermal soak);

All Shutdown Banks: + 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Control Bank A: + 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Control Bank B: + 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 160-228 steps.

Control Banks C and D: + 12 steps of the group demand counters for withdrawal range of 0-228 steps.

- b. Group demand counters; + 2 steps of the pulsed output of the Slave Cyclor Circuit over the withdrawal range of 0-228 steps.

APPLICABILITY: MODES 1 and 2.

ACTION:

- a. With a maximum of one analog rod position indicator per bank inoperable either:
1. Determine the position of the non-indicating rod(s) indirectly by the movable incore detectors at least once per 8 hours and within one hour after any motion of the non-indicating rod which exceeds 24 steps in one direction since the last determination of the rod's position, or
  2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.
- b. With a maximum of one group demand position indicator per bank inoperable either:

1. Verify that all analog rod position indicators for the affected bank are OPERABLE and that the most withdrawn rod and the least withdrawn rod of the bank are within a maximum of 12 steps of each other at least once per 8 hours, or
2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.

#### SURVEILLANCE REQUIREMENTS

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4.1.3.2.1.1 Each analog rod position indicator shall be determined to be OPERABLE by verifying that the demand position indication system and the rod position indication system agree within 12 steps (allowing for one hour thermal soak after rod motion) at least once per 12 hours except during time intervals when the Rod Position Deviation Monitor is inoperable, then compare the demand position indication system and the rod position indication system at least once per 4 hours.

4.1.3.2.1.2 Each of the above required rod position indicator(s) shall be determined to be OPERABLE by performance of a CHANNEL calibration at least once per 18 months.

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEM SHUTDOWN

LIMITING CONDITION FOR OPERATION

---

3.1.3.2.2 The group demand position indicator shall be OPERABLE for each shutdown and control rod not fully inserted.

APPLICABILITY: MODES 3\*#, 4\*#, and 5\*#

ACTION:

With less than the above required group demand position indicator(s) OPERABLE, either:

- a. Cease rod motion and return the required bank demand position indicator(s) to OPERABLE status within 8 hours; or
- b. Open the reactor trip system breakers.

SURVEILLANCE REQUIREMENTS

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4.1.3.2.2 Each of the above required group demand position indicator(s) shall be determined to be OPERABLE by movement of the associated control rod at least 10 steps in any one direction at least once per 31 days.

\*With the reactor trip system breakers in the closed position

#See Special Test Exception 3.10.5

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEM SHUTDOWN

LIMITING CONDITION FOR OPERATION

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3.1.3.4 All shutdown rods shall be fully withdrawn.

APPLICABILITY: MODES 1\*, and 2\*#

ACTION:

With a maximum of one shutdown rod not fully withdrawn, except for surveillance testing pursuant to Specification 4.1.3.1.2, within one hour either:

- a. Fully withdraw the rod,, or
- b. Declare the rod to be inoperable and apply Specification 3.1.3.1.

SURVEILLANCE REQUIREMENTS

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4.1.3.4 Each shutdown rod shall be determined to be fully withdrawn by use of the group demand counters, and verified by the analog rod position indicators within one hour after rod motion:

- a. Within 15 minutes prior to withdrawal of any rods in control banks A, B, C, or D during an approach to reactor critically, and
- b. At least once per 12 hours thereafter.

\*See Special Test Exceptions 3.10.2 and 3.10.3

#With  $K_{eff}$  greater than or equal to 1.0

## REACTIVITY CONTROL SYSTEMS

### POSITION INDICATION SYSTEM SHUTDOWN

#### LIMITING CONDITION FOR OPERATION

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3.1.3.5 The control banks shall be limited in physical insertion as shown in Figures 3.1-1 and 3.1-2.

APPLICABILITY: MODES 1\*, and 2\*#

#### ACTION:

With the control banks inserted beyond the above insertion limits, except for surveillance testing pursuant to Specification 4.1.3.1.2, either:

- a. Restore the control banks to within the limits within two hours, or
- b. Reduce THERMAL POWER within two hours to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the bank position using the above figures, or
- c. Be in at least HOT STANDBY within 6 hours.

#### SURVEILLANCE REQUIREMENTS

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4.1.3.5 The position of each control bank shall be determined to be within the insertion limits at least once per 12 hours by use of the group demand counters and verified by the analog rod position indicators within one hour of rod motion, except during time intervals when the Rod Insertion Limit Monitor is inoperable, then verify the individual rod positions at least once per 4 hours.

\*See Special Test Exceptions 3.10.2 and 3.10.3

#With  $K_{eff}$  greater than or equal to 1.0

## REACTIVITY CONTROL SYSTEMS

### BASES

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#### 3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) limit the potential effects of rod mis-alignment on associated accident analyses. OPERABILITY of the control rod position indicators is required to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits. OPERABLE condition for the analog rod position indicators is defined as being capable of indicating rod position to within  $\pm 12$  steps of the bank demand position for a range of positions. For the Shutdown Banks, and Control Bank A this range is defined as the group demand counter indicated position between 0 and 30 steps withdrawn inclusive, and between 200 and 228 steps withdrawn inclusive. This permits the operator to verify that the control rods in these banks are either fully withdrawn or fully inserted, the normal operating modes for these banks. Knowledge of these banks positions in these ranges satisfies all accident analysis assumptions concerning their position. The range for control Bank B is defined as the group demand counter indicated position between 0 and 30 steps withdrawn inclusive, and between 160 and 228 steps withdrawn inclusive. For Control Banks C and D the range is defined as the group demand counter indicated position between 0 and 228 steps withdrawn. Comparison of the group demand counters to the bank insertion limits with verification of rod position with the analog rod position indicators (after thermal soak after rod motion) is sufficient verification that the control rods are above the insertion limits.

The ACTION statements which permit limited variation from the basic requirements are accompanied by additional restrictions which ensure that the original criteria are met. Mis-alignment of a rod requires measurement of peaking factors or a restriction in THERMAL POWER; either of these restrictions provide assurance of fuel rod integrity during continued operation. The reactivity worth of a mis-aligned rod is limited for the remainder of the fuel cycle to prevent exceeding the assumption used in the accident analysis.

The maximum rod drop time restriction is consistent with the assumed rod drop time used in the accident analyses. Measurement with  $T_{avg} > 541^\circ\text{F}$  and with all reactor coolant pumps operating ensures that the measured drop times will be representative of insertion times experienced during a reactor trip at operating conditions.

Control rod positions and OPERABILITY of the rod position indicators are required to be verified on a nominal basis of once per 12 hours with more frequent verifications required if an automatic monitoring channel is inoperable. These verification frequencies are adequate for assuring that the applicable LCO's are satisfied.

REVISED PAGES - UNIT NO. 2

REACTIVITY CONTROL SYSTEMS  
3/4.1.3 MOVABLE CONTROL ASSEMBLIES  
GROUP HEIGHT

LIMITING CONDITION FOR OPERATION

---

3.1.3.1 All full length (shutdown and control) rods, shall be OPERABLE and positioned within  $\pm 12$  steps (indicated position) of their group step counter demand position within one hour after rod motion.

APPLICABILITY: MODES 1\* and 2\*

ACTION:

- a. With one or more full length rods inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.
- b. With more than one full length rod inoperable or mis-aligned from the group step counter demand position by more than  $\pm 12$  steps (indicated position), be in HOT STANDBY within 6 hours.
- c. With one full length rod inoperable due to causes other than addressed by ACTION a, above, or mis-aligned from its group step counter demand position by more than  $\pm 12$  steps (indicated position), POWER OPERATION may continue provided that within one hour either:
  1. The rod is restored to OPERABLE status within the above alignment requirements, or
  2. The remainder of the rods in the bank with the inoperable rod are aligned to within  $\pm 12$  steps of the inoperable rod while maintaining the rod sequence and insertion limits of Figures 3.1-1 and 3.1-2; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.5 during subsequent operation, or
  3. The rod is declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied. POWER OPERATION may then continue provided that:

\*See Special Test Exceptions 3.10.2 and 3.10.3.

- a) A reevaluation of each accident analysis of Table 3.1-1 is performed within 5 days; this reevaluation shall confirm that the previously analyzed results of these accidents remain valid for the duration of operation under these conditions.
- b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.
- c) A power distribution map is obtained from the movable incore detectors and  $F_0(Z)$  and  $F_{NH}$  are verified to be within their limits within 72 hours.
- d) The THERMAL POWER level is reduced to less than or equal to 75% of RATED THERMAL POWER within one hour and within the next 4 hours the high neutron flux trip setpoint is reduced to less than or equal to 85% of RATED THERMAL POWER. THERMAL POWER shall be maintained less than or equal to 75% of RATED THERMAL POWER until compliance with ACTIONS 3.1.3.1.c.3.a and 3.1.3.1.c.3.c above are demonstrated.

#### SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full length rod shall be determined to be within  $\pm 12$  steps (indicated position of the group demand position at least once per 12 hours (allowing for one hour thermal soak after rod motion) except during time intervals when the Rod Position Deviation Monitor is inoperable, then verify the group positions at least once per 4 hours.

4.1.3.1.2 Each full length rod not fully inserted in the core shall be determined to be OPERABLE by movement of at least 10 steps in any one direction at least once per 31 days.

TABLE 3.1-1

ACCIDENT ANALYSES REQUIRING REEVALUATION  
IN THE EVENT OF AN INOPERABLE FULL LENGTH ROD

Rod Cluster Control Assembly Insertion Characteristics

Rod Cluster Control Assembly Mis-alignment

Loss Of Reactor Coolant From Ruptured Pipes Or From Cracks In Large Pipes  
Which Actuates The Emergency Core Cooling System

Single Rod Cluster Control Assembly Withdrawal At Full Power

Major Reactor Coolant System Pipe Ruptures (Loss Of Coolant Accident)

Major Secondary System Pipe Rupture

Rupture of a Control Rod Drive Mechanism Housing (Rod Cluster Control  
Assembly Ejection)

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEMS - OPERATING

LIMITING CONDITION FOR OPERATION

---

3.1.3.2.1 The shutdown and control rod position indication systems shall be OPERABLE and capable of determining the actual and demanded rod positions as follows:

- a. Analog rod position indicators, within one hour after rod motion (allowance for thermal soak);

All Shutdown Banks: + 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Control Bank A: + 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Control Bank B: + 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 160-228 steps.

Control Banks C and D: + 12 steps of the group demand counters for withdrawal range of 0-228 steps.

- b. Group demand counters; + 2 steps of the pulsed output of the Slave Cyclor Circuit over the withdrawal range of 0-228 steps.

APPLICABILITY: MODES 1 and 2.

ACTION:

- a. With a maximum of one analog rod position indicator per bank inoperable either:
1. Determine the position of the non-indicating rod(s) indirectly by the movable incore detectors at least once per 8 hours and within one hour after any motion of the non-indicating rod which exceeds 24 steps in one direction since the last determination of the rod's position, or
  2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.
- b. With a maximum of one group demand position indicator per bank inoperable either:

1. Verify that all analog rod position indicators for the affected bank are OPERABLE and that the most withdrawn rod and the least withdrawn rod of the bank are within a maximum of 12 steps of each other at least once per 8 hours, or
2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.

#### SURVEILLANCE REQUIREMENTS

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4.1.3.2.1.1 Each analog rod position indicator shall be determined to be OPERABLE by verifying that the demand position indication system and the rod position indication system agree within 12 steps (allowing for one hour thermal soak after rod motion) at least once per 12 hours except during time intervals when the Rod Position Deviation Monitor is inoperable, then compare the demand position indication system and the rod position indication system at least once per 4 hours.

4.1.3.2.1.2 Each of the above required rod position indicator(s) shall be determined to be OPERABLE by performance of a CHANNEL calibration at least once per 18 months.

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEM SHUTDOWN

LIMITING CONDITION FOR OPERATION

---

3.1.3.2.2 The group demand position indicator shall be OPERABLE for each shutdown and control rod not fully inserted.

APPLICABILITY: MODES 3\*#, 4\*#, and 5\*#

ACTION:

With less than the above required group demand position indicator(s) OPERABLE, either:

- a. Cease rod motion and return the required bank demand position indicator(s) to OPERABLE status within 8 hours; or
- b. Open the reactor trip system breakers.

SURVEILLANCE REQUIREMENTS

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4.1.3.2.2 Each of the above required group demand position indicator(s) shall be determined to be OPERABLE by movement of the associated control rod at least 10 steps in any one direction at least once per 31 days.

\*With the reactor trip system breakers in the closed position

#See Special Test Exception 3.10.5

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEM SHUTDOWN

LIMITING CONDITION FOR OPERATION

---

3.1.3.4 All shutdown rods shall be fully withdrawn.

APPLICABILITY: MODES 1\*, and 2\*#

ACTION:

With a maximum of one shutdown rod not fully withdrawn, except for surveillance testing pursuant to Specification 4.1.3.1.2, within one hour either:

- a. Fully withdraw the rod,, or
- b. Declare the rod to be inoperable and apply Specification 3.1.3.1.

SURVEILLANCE REQUIREMENTS

---

4.1.3.4 Each shutdown rod shall be determined to be fully withdrawn by use of the group demand counters, and verified by the analog rod position indicators within one hour after rod motion:

- a. Within 15 minutes prior to withdrawal of any rods in control banks A, B, C, or D during an approach to reactor critically, and
- b. At least once per 12 hours thereafter.

\*See Special\_Test Exceptions 3.10.2 and 3.10.3

#With  $K_{eff}$  greater than or equal to 1.0

## REACTIVITY CONTROL SYSTEMS

### POSITION INDICATION SYSTEM SHUTDOWN

#### LIMITING CONDITION FOR OPERATION

---

3.1.3.5 The control banks shall be limited in physical insertion as shown in Figures 3.1-1 and 3.1-2.

APPLICABILITY: MODES 1\*, and 2\*#

#### ACTION:

With the control banks inserted beyond the above insertion limits, except for surveillance testing pursuant to Specification 4.1.3.1.2, either:

- a. Restore the control banks to within the limits within two hours, or
- b. Reduce THERMAL POWER within two hours to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the bank position using the above figures, or
- c. Be in at least HOT STANDBY within 6 hours.

#### SURVEILLANCE REQUIREMENTS

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4.1.3.5 The position of each control bank shall be determined to be within the insertion limits at least once per 12 hours by use of the group demand counters and verified by the analog rod position indicators within one hour of rod motion, except during time intervals when the Rod Insertion Limit Monitor is inoperable, then verify the individual rod positions at least once per 4 hours.

\*See Special Test Exceptions 3.10.2 and 3.10.3

#With  $K_{eff}$  greater than or equal to 1.0

## REACTIVITY CONTROL SYSTEMS

### BASES

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#### 3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) limit the potential effects of rod mis-alignment on associated accident analyses. OPERABILITY of the control rod position indicators is required to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits. OPERABLE condition for the analog rod position indicators is defined as being capable of indicating rod position to within  $\pm 12$  steps of the bank demand position for a range of positions. For the Shutdown Banks, and Control Bank A this range is defined as the group demand counter indicated position between 0 and 30 steps withdrawn inclusive, and between 200 and 228 steps withdrawn inclusive. This permits the operator to verify that the control rods in these banks are either fully withdrawn or fully inserted, the normal operating modes for these banks. Knowledge of these banks positions in these ranges satisfies all accident analysis assumptions concerning their position. The range for control Bank B is defined as the group demand counter indicated position between 0 and 30 steps withdrawn inclusive, and between 160 and 228 steps withdrawn inclusive. For Control Banks C and D the range is defined as the group demand counter indicated position between 0 and 228 steps withdrawn. Comparison of the group demand counters to the bank insertion limits with verification of rod position with the analog rod position indicators (after thermal soak after rod motion) is sufficient verification that the control rods are above the insertion limits.

The ACTION statements which permit limited variation from the basic requirements are accompanied by additional restrictions which ensure that the original criteria are met. Mis-alignment of a rod requires measurement of peaking factors or a restriction in THERMAL POWER; either of these restrictions provide assurance of fuel rod integrity during continued operation. The reactivity worth of a mis-aligned rod is limited for the remainder of the fuel cycle to prevent exceeding the assumption used in the accident analysis.

The maximum rod drop time restriction is consistent with the assumed rod drop time used in the accident analyses. Measurement with  $T_{avg} > 541^{\circ}\text{F}$  and with all reactor coolant pumps operating ensures that the measured drop times will be representative of insertion times experienced during a reactor trip at operating conditions.

Control rod positions and OPERABILITY of the rod position indicators are required to be verified on a nominal basis of once per 12 hours with more frequent verifications required if an automatic monitoring channel is inoperable. These verification frequencies are adequate for assuring that the applicable LCO's are satisfied.

Westinghouse  
Electric Corporation

Water Reactor  
Divisions



Public Service Electric and Gas Company  
Salem Unit No. 1  
Salem, New Jersey

July 23, 1981  
PSE-81-35

Mr. R. A. Uderitz, General Manager  
Nuclear Production  
Public Service Electric and Gas Company  
80 Park Plaza  
Newark, New Jersey 07101

Dear Mr. Uderitz:

Public Service Electric and Gas Company  
Salem Unit No. 1

REVISED ANALOG ROD POSITION INDICATION SYSTEM TECHNICAL SPECIFICATION

Attached for your information is the Standardized Technical Specifications revised by Westinghouse to allow continued operation by plants with the Analog Rod Position Indication System (ARPI). These specs were revised to address NRC and plant concerns about the accuracy and usefulness of the ARPI. An operating plant has had difficulty in maintaining the ARPI within Tech Spec required minimums. Specifically, work was performed allowing an increase in the inaccuracy of the APRI and an increase in the indicated misalignment allowed. However, this work was very plant and cycle specific and is heavily dependent on the size of the DNBR margin present in the cycle design. Recognizing that this method would not allow a generic solution to the problem of large ARPI inaccuracies, work was performed to determine what changes, if any, could be made to the plant Tech Specs to reflect the real safety requirements of the ARPI. After discussion with the NRC the attached suggested revisions were developed.

Page 1 of the attachment provides a new defined term to be included in the Tech Spec Definitions section. The term defines what will be considered the ARPI's Reference Position. The revised specs are based on the following:

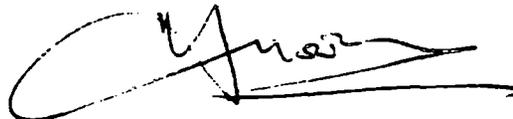
1. Shutdown Banks and Control A and B positions need to be known accurately in a very limited range, near the top and bottom of the core.
2. Control Banks C and D positions need to be accurately known at the bottom of the core and from somewhat below the Full Power insertion limits (~ 150 steps) to the top of the core.

3. Recognizing that the ARPI is very temperature sensitive, immediate verification of position after rod movement is shifted from the ARPI to the group step counters with subsequent verification by the ARPI after temperature equilibration.
4. Detection of a misaligned rod is primarily limited to Control Banks C and D and through the use of the Reference Position.

Pages 2, 3 and 4 of the attachment present the revised current NRC spec for a misaligned rod. Westinghouse recommends the use of this spec to assure an adequate response to a misaligned rod, including the evaluation of the transients listed on page 4. Pages 5 and 6 list the revised accuracy and operability requirements for the ARPI and the group demand counters. Page 7 is a revision of the NRC spec on RPI operability when not critical but with the trip breakers closed. The spec has been revised to place reliance on the group step counters. Pages 8 and 9 are revised insertion limit specs noting the use of the group step counters with ARPI verification. Pages 10 and 11 provide revised Bases for the attached Tech Specs revisions. Finally, page 12 provides a typical figure defining the Reference Position for a Control C or D Bank and is referenced in the attached Bases.

The attached have been informally reviewed by M. Duenfeld of the Core Performance Branch of the NRC and have been found to be acceptable. The Tech Specs should be included in the plant specific Tech Specs. It is believed that the attached will decrease the number of LERs filed and remove some of the problems associated with this system. These recommended changes should be made to your plant Tech Specs as soon as reasonably possible. If you have any questions please contact the undersigned.

Very truly yours,



F. Noon, Manager  
Operating Plant Service  
Eastern Region

Attachment

cc: H. J. Midura	J. Zupko
R. D. Rippe	T. N. Taylor
L. A. Reiter	B. E. Hall
F. Meyer	J. Driscoll
D. J. Jagt	C. F. Barclay W
R. P. Germann	E. A. Watjen W

## REFERENCE POSITION

Analog Rod Position Indication System REFERENCE POSITION is defined as:

- a. For all Shutdown Banks, Control Banks A and B, and the Part Length Banks; the group demand counter indicated position between 0 and 30 steps withdrawn inclusive and between 200 and 228 steps withdrawn inclusive.
- b. For Control Banks C and D; the group demand counter indicated position between 0 and 30 steps withdrawn inclusive and between 150 and 228 steps withdrawn inclusive. For the withdrawal range of 31 to 149 steps inclusive the REFERENCE POSITION shall be the individual rod calibration curve noting indicated analog rod position vs indicated group demand counter position.

REACTIVITY CONTROL SYSTEMS

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

GROUP HEIGHT

LIMITING CONDITION FOR OPERATION

3.1.3.1 All full length (shutdown and control) rods, and all part length rods which are inserted in the core, shall be OPERABLE and positioned within  $\pm 12$  steps (indicated position) of the REFERENCE POSITION corresponding to the group demand counter position within one hour after rod motion.

APPLICABILITY: MODES 1\* and 2\*.

ACTION:

- a. With one or more full length rods inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.
- b. With more than one full or part length rod inoperable or misaligned from the REFERENCE POSITION by more than  $\pm 12$  steps (indicated position), be in HOT STANDBY within 6 hours.
- c. With one full or part length rod inoperable due to causes other than addressed by ACTION a, above, or misaligned from its REFERENCE POSITION by more than  $\pm 12$  steps (indicated position), POWER OPERATION may continue provided that within one hour either:
  1. The rod is restored to OPERABLE status within the above alignment requirements, or
  2. The remainder of the rods in the bank with the inoperable rod are aligned to within  $\pm 12$  steps of the inoperable rod while maintaining the rod sequence and insertion limits of Figures (3.1-1) and (3.1-2); the THERMAL POWER level shall be restricted pursuant to Specification (3.1.3.6) during subsequent operation, or
  3. The rod is declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied. POWER OPERATION may then continue provided that:

\*See Special Test Exceptions 3.10.2 and 3.10.3.

- a) A reevaluation of each accident analysis of Table 3.1-1 is performed within 5 days; this reevaluation shall confirm that the previously analyzed results of these accidents remain valid for the duration of operation under these conditions.
- b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.
- c) A power distribution map is obtained from the movable incore detectors and  $F_Q(Z)$  and  $F_{\Delta H}^N$  are verified to be within their limits within 72 hours.
- d) The THERMAL POWER level is reduced to less than or equal to 75% of RATED THERMAL POWER within one hour and within the next 4 hours the high neutron flux trip setpoint is reduced to less than or equal to 85% of RATED THERMAL POWER. THERMAL POWER shall be maintained less than or equal to 75% of RATED THERMAL POWER until compliance with ACTIONS 3.1.3.1.c.3.a and 3.1.3.1.c.3.c above are demonstrated.

#### SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full and part length rod shall be determined to be within ± 12 steps (indicated position) of the REFERENCE POSITION corresponding to the group demand position at least once per 12 hours (allowing for one hour thermal soak after rod motion) except during time intervals when the Rod Position Deviation Monitor is inoperable, then verify the group positions at least once per 4 hours.

4.1.3.1.2 Each full length rod not fully inserted and each part length rod which is inserted in the core shall be determined to be OPERABLE by movement of at least 10 steps in any one direction at least once per 31 days.

TABLE 3.1-1

ACCIDENT ANALYSES REQUIRING REEVALUATION  
IN THE EVENT OF AN INOPERABLE FULL OR PART  
LENGTH ROD

Rod Cluster Control Assembly Insertion Characteristics

Rod Cluster Control Assembly Misalignment

Loss Of Reactor Coolant From Small Ruptured Pipes Or From Crack  
Large Pipes Which Actuates The Emergency Core Cooling System

Single Rod Cluster Control Assembly Withdrawal At Full Power

Major Reactor Coolant System Pipe Ruptures (Loss Of Coolant  
Accident)

Major Secondary System Pipe Rupture

Rupture of a Control Rod Drive Mechanism Housing (Rod Cluster Control  
Assembly Ejection)

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEMS-OPERATING

LIMITING CONDITION FOR OPERATION

3.1.3.2 The shutdown, control and part length individual rod position indication system and the demand position indication system shall be OPERABLE and capable of determining the actual and demanded control rod positions, respectively, as follows:

Analog rod position indicators, within one hour after rod motion (allowance for thermal soak);

All Shutdown Banks -  $\pm 12$  steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Control Banks A and B -  $\pm 12$  steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Control Banks C and D -  $\pm 12$  steps of the group demand counters for withdrawal ranges of 0-30 steps and 150-228 steps.  $\pm 12$  steps of the REFERENCE POSITION for withdrawal range of 31-149 steps.

All Part Length Banks -  $\pm 12$  steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Group demand counters;  $\pm 2$  steps

APPLICABILITY: MODES 1 and 2.

ACTION:

- a. With a maximum of one analog rod position indicator per bank inoperable either:
  1. Determine the position of the non-indicating rod(s) indirectly by the movable incore detectors at least once per 8 hours and within one hour after any motion of the non-indicating rod which exceeds 24 steps in one direction since the last determination of the rod's position, or
  2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.
- b. With a maximum of one group demand position indicator per bank inoperable either:

1. Verify that all rod position indicators for the affected bank are OPERABLE and that the most withdrawn rod and the least withdrawn rod of the bank are within a maximum of 12 steps (corrected indicated position) of each other at least once per 8 hours, or
2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.

#### SURVEILLANCE REQUIREMENTS

4.1.3.2.1 Each analog rod position indicator shall be determined to be OPERABLE by verifying that the demand position indication system and the rod position indication system (by use of the REFERENCE POSITION) agree within 12 steps (allowing for one hour thermal soak after rod motion) at least once per 12 hours except during time intervals when the Rod Position Deviation Monitor is inoperable, then compare the demand position indication system and the rod position indication system (by use of the REFERENCE POSITION) at least once per 4 hours.

4.1.3.2.2 Each of the above required rod position indicator(s) shall be determined to be OPERABLE by performance of a CHANNEL FUNCTIONAL TEST at least once per 18 months.

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEM-SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.3.3 The group demand position indicator shall be OPERABLE and capable of determining within  $\pm 2$  steps the demand position for each shutdown, control or part length rod not fully inserted.

APPLICABILITY: MODES 3\*#, 4\*# and 5\*#

ACTION:

With less than the above required group demand position indicator(s) OPERABLE, immediately open the reactor trip system breakers.

SURVEILLANCE REQUIREMENTS

4.1.3.3 Each of the above required group demand position indicator(s) shall be determined to be OPERABLE by movement of the associated control rod at least 10 steps in any one direction at least once per 31 days.

\* With the reactor trip system breakers in the closed position.

# See Special Test Exception 3.10.5

REACTIVITY CONTROL SYSTEMS

SHUTDOWN ROD INSERTION LIMIT

LIMITING CONDITION FOR OPERATION

3.1.3.5 All shutdown rods shall be fully withdrawn.

APPLICABILITY:        MODES 1\* and 2\*#

ACTION:

With a maximum of one shutdown rod not fully withdrawn, except for surveillance testing pursuant to Specification (4.1.3.1.2), within one hour either:

- a. Fully withdraw the rod, or
- b. Declare the rod to be inoperable and apply Specification (3.1.3.1).

SURVEILLANCE REQUIREMENTS

4.1.3.5 Each shutdown rod shall be determined to be fully withdrawn by use of the group demand counters, and verified by the analog rod position indicators within one hour after rod motion.

- a. Within 15 minutes prior to withdrawal of any rods in control banks A, B, C or D during an approach to reactor criticality, and
- b. At least once per 12 hours thereafter.

\*See Special Test Exceptions 3.10.2 and 3.10.3

#With  $K_{eff}$  greater than or equal to 1.0

REACTIVITY CONTROL SYSTEMS

CONTROL ROD INSERTION LIMITS

LIMITING CONDITION FOR OPERATION

3.1.3.6 The control banks shall be limited in physical insertion as shown in Figures (3.1-1) and(3.1-2).

APPLICABILITY:        MODES 1\* and 2\*#.

ACTION:

With the control banks inserted beyond the above insertion limits, except for surveillance testing pursuant to Specification (4.1.3.1.2), either:

- a. Restore the control banks to within the limits within two hours, or
- b. Reduce THERMAL POWER within two hours to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the bank position using the above figures, or
- c. Be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.6 The position of each control bank shall be determined to be within the insertion limits at least once per 12 hours, by use of the group demand counters and verified by the analog rod position indicators within one hour of rod motion, except during time intervals when the Rod Insertion Limit Monitor is inoperable, then verify the individual rod positions at least once per 4 hours.

\*See Special Test Exceptions 3.10.2 and 3.10.3

#With  $K_{eff}$  greater than or equal to 1.0

### 3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) limit the potential effects of rod misalignment on associated accident analyses. OPERABILITY of the control rod position indicators is required to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits. OPERABLE condition for the analog rod position indicators is defined as being capable of indicating rod position to within  $\pm 12$  steps of the reference position. For the Shutdown Banks, Control Banks A and B, and the Part Length Banks the REFERENCE POSITION is defined as the group demand counter indicated position between 0 and 30 steps withdrawn inclusive, and between 200 and 228 steps withdrawn inclusive. This permits the operator to verify that the control rods in these banks are either fully withdrawn or fully inserted, the normal operating modes for these banks. Knowledge of these bank positions in these two areas satisfies all accident analysis assumptions concerning their position. For Control Banks C and D the REFERENCE POSITION is defined as the group demand counter indicated position between 0 and 30 steps withdrawn inclusive, and between 150 and 228 steps withdrawn inclusive. For the withdrawal range of 31 to 149 steps inclusive the REFERENCE POSITION is defined as the individual rod calibration curve noting indicated analog rod position vs indicated group demand counter position (Figure B 3/4.1-1). Comparison of the indicated analog rod position to the calibration curve is sufficient to allow determination that a control rod is indeed misaligned from its bank. Comparison of the group demand counters to the bank insertion limits with verification of rod position with the analog rod position indicators (after thermal soak after rod motion) is sufficient verification that the control rods are above the insertion limits.

## REACTIVITY CONTROL SYSTEMS

### BASES

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The ACTION statements which permit limited variations from the basic requirements are accompanied by additional restrictions which ensure that the original design criteria are met. Misalignment of a rod requires measurement of peaking factors and a restriction in THERMAL POWER. These restrictions provide assurance of fuel rod integrity during continued operation. In addition, those safety analyses affected by a misaligned rod are reevaluated to confirm that the results remain valid during future operation.

Control rod positions and OPERABILITY of the rod position indicators are required to be verified on a nominal basis of once per 12 hours with more frequent verifications required if an automatic monitoring channel is inoperable. These verification frequencies are adequate for assuring that the applicable LCO's are satisfied.

(ALTERNATE)

The restriction prohibiting part length rod insertion ensures that adverse power shapes and rapid local power changes which may affect DNB considerations do not occur as a result of part-length rod insertion during operation.

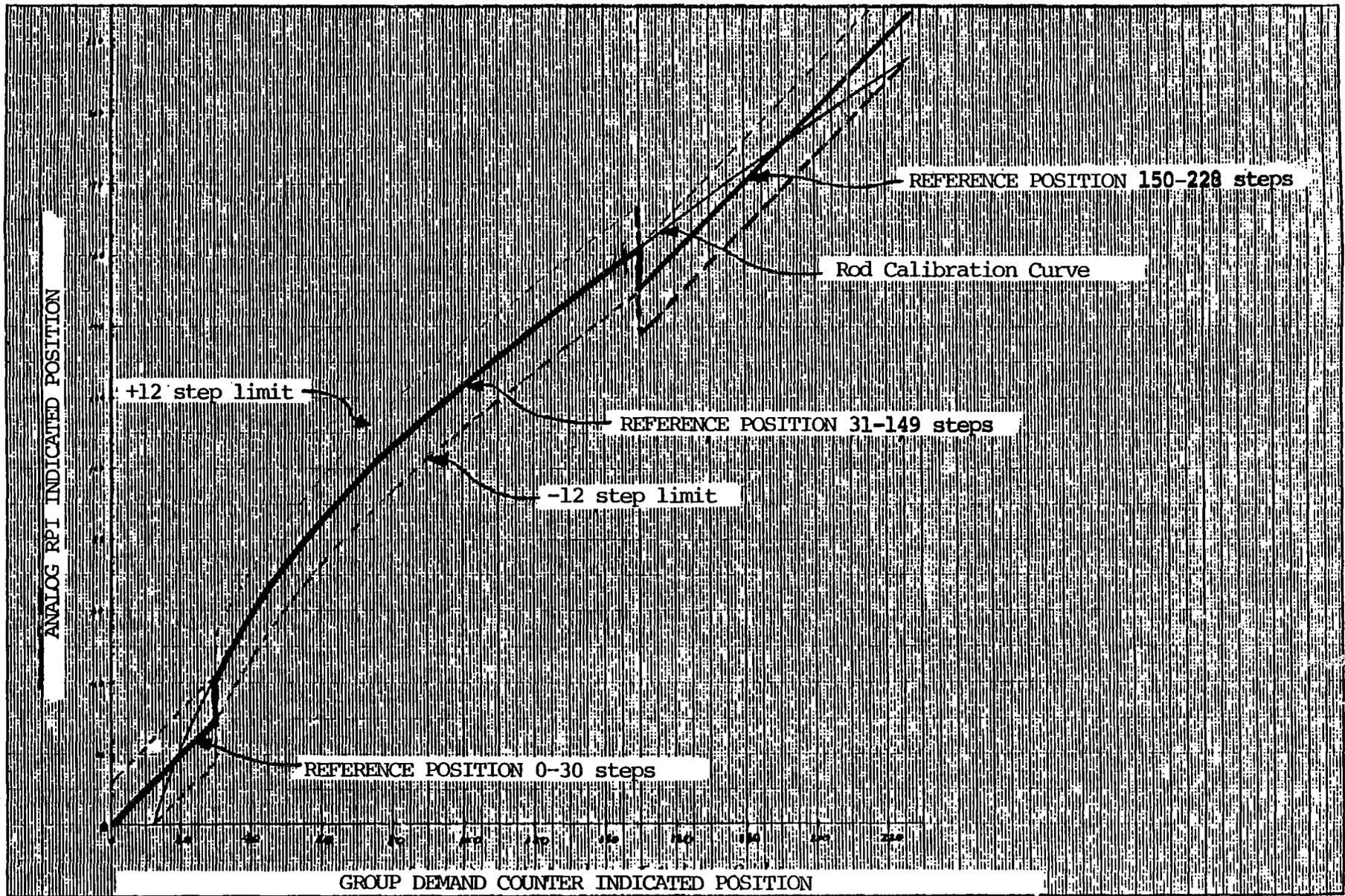


Figure B 3/4.1-1 ANALOG RPI vs. GROUP DEMAND INDICATED POSITION