

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-361/85-16 and 50-362/85-15

Docket Nos. 50-361 and 50-362

License Nos. NPF-10 and NPF-15

Licensee: Southern California Edison Company  
P. O. Box 800, 2244 Walnut Grove Avenue  
Rosemead, California 91770

Facility Name: San Onofre Nuclear Generating Station - Units 2 and 3

Inspection at: San Onofre Site, San Clemente, California

Inspection conducted: May 13-17, 1985

Inspector: Talbert Young Jr. 6-24-85  
K. D. Ivey, Jr., Reactor Inspector Date Signed

Consultants: P. Chan, Engineer, LLNL  
W. Wade, Engineer, EG&G

Approved By: Talbert Young Jr. 6-24-85  
T. Young, Jr., Chief, Engineering Section Date Signed

Summary:

Inspection during the period May 13-17, 1985 (Report Nos. 50-361/85-16 and 50-362/85-15)

Areas Inspected: An unannounced, safety inspection by an NRC regional based inspector and two NRC consultants for the follow-up of Generic Letter 83-28, "Required Actions Based on Generic Implications of Salem ATWS Events", licensee action on IE Circulars, and followup of previously identified items.

The inspection involved 38 hours by one NRC inspector and 68 hours by two NRC consultants.

Results: No violations or deviations were identified.

## DETAILS

### 1. Persons Contacted

\*J. G. Haynes, Station Manager  
\*J. T. Reilly, Manager, Station Technical  
\*M. E. Freedman, Compliance Engineer  
\*C. A. Kergis, Lead Compliance Engineer  
\*M. Rodin, Supervisor, Configuration Control  
\*R. N. Santosuosso, Supervisor, Instrumentation and Control  
\*T. A. Mackey, Jr., Supervisor, Compliance  
V. L. Powers, Quality Assurance Engineer  
\*C. L. Brandt, Quality Assurance Engineer  
\*R. A. Joyce, Units 2/3 Maintenance Manager  
\*D. B. Schone, Site Quality Assurance Manager  
\*F. Briggs, NSSS Electrical Supervisor  
\*L. I. Mayweather, Lead Compliance Engineer  
J. F. Grosshart, Quality Assurance Engineer  
R. Neal, NSSS Mechanical Supervisor  
\*R. J. McPherson, Supervisor, Maintenance Procedures  
\*D. A. Herbst, ISEG Supervisor  
\*N. Maringas, ISEG  
S. Foglio, NSSS Engineer  
J. Vandenbroek, NSSS Engineer  
L. Mueller, Maintenance Engineer  
M. Gratzl, Supervisor of Nuclear Plant Instrumentation, Unit 2  
J. Brower, Unit 3 Equipment Control Supervisor  
J. Bickerton, Unit 2 Instrument Supervisor  
J. M. Drapler, Scheduling Supervisor  
R. Stempien, Planning Supervisor  
R. F. Krueger, Electrical Foreman  
J. Grimms, Superintendent of Plant Maintenance  
S. L. Seymour, Electrical Test Planner  
J. R. Travis, General Foreman, Boiler and Condenser  
K. Abernathy, Operation Coordination Supervisor, Unit 2

\*Denotes those individuals attending the exit meeting on May 17, 1985.

The inspectors also held discussions with other licensee personnel during the inspection. These included maintenance and surveillance technicians and plant staff engineers.

### 2. Background

In February 1983, during startup of the Salem Nuclear Power Station Unit 1, the Westinghouse Type DB-50 reactor trip system (RTS) circuit breakers twice failed to open automatically upon receipt of a valid trip signal. The failure to trip was attributed to a binding within the undervoltage trip attachment (UVTA) located inside the breaker cubicle. Due to the failures at Salem and similar failures at other plants, and as a result of its investigations and reviews of the failures, the NRC Office of Nuclear Reactor Regulation issued Generic Letter (GL) 83-28 to all licensees and applicants on July 8, 1983. This letter required all

affected utilities to furnish the status of current conformance to the Generic Letter and their plans and schedules for any needed improvements.

The NRC Office of Inspection and Enforcement issued Temporary Instruction 2514/64, "Near-term Inspection Follow-up to Generic Letter 83-28", for Region-Based inspection to verify that actions stated in licensee's responses to GL 83-28 have been implemented. Four of the items in GL 83-28 are also identified for Region-Based inspection. They are:

- (a) Item 3.1            Post-Maintenance Testing (reactor trip system components)
- (b) Item 3.2            Post-Maintenance Testing (all other safety-related components)

The inspection is to address the adequacy and completeness of the Post-Maintenance Testing (including modifications) of safety-related components.

- (c) Item 4.1            Reactor Trip System Reliability (Vendor Related Modifications)
- (d) Item 4.5.1        Reactor Trip System Reliability (System Functional Testing)

The inspection is to ensure that vendor-recommended modifications and RTS changes are completed in PWRs and that on-line functional testing of the RTS is performed on all LWRs.

The licensee responded to GL 83-28 with a letter on November 29, 1983.

### 3. General

San Onofre Units 2 and 3 utilize the Combustion Engineering Reactor Trip System design and GE AK-2-25 reactor trip breakers. This design consists of eight reactor trip breakers (see Figure 1) which must operate in a one-out-of-two-twice logic in order to scram the plant (i.e., remove power from the control element drive mechanisms (CEDMs) and release all rods into the core). A ninth breaker, which connects the two motor-generator (MG) sets and normally locked closed, is provided so that an MG set will not be isolated during testing and does not receive reactor trip signals.

Reactor trip breakers utilize both an undervoltage trip attachment (UVTA) and a shunt trip device to trip (see Figure 2). A manual or automatic trip signal interrupts power to the UVTA and simultaneously applies power to the shunt trip device. During a loss of power or a low control voltage condition, the UVTAs would trip the breaker and scram the plant. The UVTAs are used in order to meet the overall system design criterion of General Design Criterion 23 to "fail safe" when power is lost.

4. Licensee's Procedures and Documents Reviewed

- ° Letter from F. R. Nandy, SCE to G. W. Knighton regarding response to GL 83-28. Enclosure: GL 83-28 Required Actions Based on Generic Implications of Salem ATWS Events. 120 Day Response Status of Conformance SONGS Units 2 and 3.
- ° Instrument and Test Procedure S023-II-3.4, Rev. 3, "Surveillance Requirement Plant Protection System Response Time Test for Channel D."
- ° Instrument and Test Procedure S023-II-3.3, Rev. 3, "Surveillance Requirement Plant Protection System Response Time Test for Channel C."
- ° Instrument and Test Procedure S023-II-3.2, Rev. 3, "Surveillance Requirement Plant Protection System Response Time Test for Channel B."
- ° Instrument and Test Procedure S023-II-3.1, Rev. 4, "Surveillance Requirement Plant Protection System Response Time Test for Channel A."
- ° Instrument and Test Procedure S023-II-1.1, Rev. 11, "Surveillance Requirement Reactor Plant Protection System Channel Functional Test."
- ° Maintenance Procedure S023-I-9.27, Rev. 0, "Breaker - G. E. AK-2-25 Annual Routine Maintenance."
- ° Instrument and Test Procedure S023-II-11.161, Rev. 5, "Surveillance Requirement Reactor Breakers Undervoltage and Shunt Trip Device Circuit Test."
- ° Maintenance Procedure S023-I-1.2, Rev. 3, "Maintenance Order Preparation, Use and Scheduling."
- ° Maintenance Procedure S023-I-4.68, Rev. 0, "2L033/3L033 Reactor Trip Breaker Switchgear Maintenance."
- ° Instrument and Test Procedure S023-II-1.4, "Surveillance Requirement ESFAS Manual Trip Buttons Channel Functional Test."
- ° Maintenance Procedure S0123-I-1.3, "Maintenance Documentation."
- ° Maintenance Procedure S0123-I-1.25, "Post-Maintenance Testing."
- ° General Procedure S023-XV-1.0, "Post-Maintenance Retest Program."
- ° Operating Instruction S023-0-13, "Work Authorizations."
- ° Administrative Procedure S0123-VI-1.0.1, "Temporary Change Notices."



5. Items 3.1.1 and 3.1.2 Post-Maintenance Testing (Reactor Trip Breakers)

San Onofre Units 2 and 3 utilize GE AK-2-25 circuit breakers in the reactor trip function. A scheme of nine breakers is used in each SONGS unit. This allows routine on-line maintenance and test of these breakers. SONGS Units 2 and 3 follow the Maintenance Procedure S023-I-9.27, "Breaker - GE AK-2-25 Annual Routine Maintenance" for the maintenance and test of reactor trip breakers. The inspectors reviewed the procedure and noted the following:

- a. The reference material listed in section 2.4.8 of the Maintenance Procedure S023-I-9.27 could not be found in the licensee's vault, better known as Corporate Documentation Management (CDM) Center. The subject reference material is the GE Service Advice Tab 175, No. 9.20, March 21, 1984, "Maintenance Upgrade of AK-25 Circuit Breakers with Undervoltage Trip Devices Used as Reactor Trip Breakers." The reference material referred to the use of a new lubricant, Mobil 28, and the reference was relevant to the Maintenance Procedure S023-I-9.27 on the June 6, 1984 date of the letter's issue. The following day, May 15, 1985, a copy of the subject reference was made available to the inspector from the licensee's engineering group. The inspectors noted that the licensee's response to GL 83-28, section 2.1, "Equipment Classification and Vendor Interface (Reactor Trip System Components)" states that, "the CDM responds to individual document requests from users and that vendor technical manuals are made available to those performing maintenance at the station." Subsequent to the inspection, the licensee stated that the Service Advice was stored in CDM under Code No. C841120G-124.
- b. Figures 5 and 11 in Attachment 8.2 of the Maintenance Procedure S023-I-9.27 are of a poor quality. Since these figures are used in the maintenance process, to show certain inspection points as outlined in the procedure, they should be clear enough to ensure proper work. The licensee, at the exit meeting, committed to take a look into this situation.

The inspectors reviewed several licensee's Maintenance Orders (MOs) for Unit 2 which were based on the Maintenance Procedure S023-I-9.27. Specifically, the MOs reviewed and the inspectors comments are as follows:

<u>Maintenance Order Reviewed</u>	<u>Discrepancies Noted</u>
#85020205000	None
#84080757000	None
#84122815000	None
#84080629000	None
#85031589000	None
#84050978000	None
#84120196000	None
#85021599000	None
#85022506001	None

#84051037000	None
#84122913000	None
#84112405000	None
#84070498000	None
#84120297001	None
#85011438000	None
#85022505001	None

These MOs were selected because they form a complete set of records of the most recent maintenance done on the nine reactor trip breakers in Unit 2. They also constitute (together with MOS No. 84101721002 - on which no discrepancies were noted) the set of records for the performance of the Instrument and Test Procedure S023-II-11.161, "Surveillance Requirement, Reactor Breakers Undervoltage and Shunt Trip Device Circuit Test," on the reactor trip breakers.

The licensee's response, dated November 29, 1983, to GL 83-28, Section 4.2.2, stated that, "the reactor trip breaker UV device and shunt trip device independent actuation, trip time and trip torque are all measured, and trending of these parameters is evaluated and documented." The licensee provided evidence of trending of two parameters. In a set of 18 graphs, the licensee depicted the trending of UV and shunt trip device opening times for the period April to December 1983. In a second submittal, the licensee showed the trending of the same two parameters for the period April 1983 to June 1984. The licensee also provided company memoranda on maintenance in general. The inspectors reviewed those memoranda, dated from April 1983 to January 1985, and noted that the need for trending was mentioned in some instances. However, the inspectors noted that the correspondence itself does not constitute the trending of parameters on the reactor trip breakers. The licensee offered, at the exit meeting, to submit existing trending information that has already been compiled on SONGS Units 2 and 3 Reactor Trip Breakers. The inspection of the trending of parameters at SONGS Units 2 and 3 is incomplete and will be reviewed in a subsequent NRC inspection. (85-16-01)

The inspectors observed a scheduled surveillance test being conducted in Unit 2. The I&C technicians conducting the test were following the Instrument and Test Procedure S023-II-1.1, "Surveillance Requirement, Reactor Plant Protection System Channel Functional Test, 31 Day Interval, "Rev. 11. The inspectors noted that there were 18 Temporary Change Notices (TCNs) associated with the Rev. 11 of this procedure. The inspectors reviewed licensee's Administrative Procedure S0123-VI-1.0.1 on Temporary Change Notices and noted section 6.1.6 stipulated that, "no more than ten (10) TCNs shall be issued against a Site Document." However, section 6.1.6.2 went further to say that, "a Site Document shall be revised and published within six (6) months of the date of issuance of the tenth TCN." In the case of the procedure in question, the tenth TCN was issued February 21, 1985, and superseded by TCN No. 17 on April 26, 1985. The inspectors noted that the licensee would have to publish Rev. 12 by August 21, 1985.

No violations or deviations were identified.

6. Items 3.2.1 and 3.2.2 Post-Maintenance Testing (Other Safety-Related Components)

The inspectors participated in an audit of the performance of maintenance work conducted under MO No. 8505043001, Cleaning of Unit 3 Component Cooling Water (CCW) System Heat Exchanger. All the inspectors queries were adequately addressed by the licensee. No discrepancies were noted.

The inspectors reviewed several licensee's MOs on safety-related systems other than reactor trip breakers.

<u>Maintenance Order Reviewed</u>	<u>Discrepancies Noted</u>
#85020917000	None
#84103884000	None
#84103885000	None
#84103886000	None
#84103887000	None
#84121361000	None
#83708985000	None
#8505043001	None
#8406017000	None

No violations or deviations were identified.

7. Item 4.1 RTS Reliability (Vendor-Related Modifications)

GL 83-28 Requirement

All vendor-recommended reactor trip breaker modifications shall be reviewed to verify that either: (1) each modification has been implemented; or (2) a written evaluation of the technical reasons for not implementing a modification exists.

Findings

The licensee's response to GL 83-28 stated that, "All vendor-recommended reactor trip breaker modifications have been reviewed and implemented as appropriate."

On March 21, 1984, GE issued a Service Advice (Tab 175, No. 9.20) recommending refurbishment of reactor trip breakers over eight years old containing Lubriko packed bearings. This refurbishment included changing out the bearings and switching the lubricant used in the breakers from Lubriko to a more modern lubricant (Mobil 28) which has shown to withstand high temperatures and aging better. Mobil 28 is the new standard lubricant for GE AK-2-25 breakers.

Per purchase order No. 8J054008, dated May 24, 1984, the licensee contracted to have GE refurbish and perform preventive maintenance on the twenty-four reactor trip breakers for San Onofre Units 2 and 3. The licensee stated that at present all of the reactor trip breakers have been refurbished and are in use in the two Units.

The licensee stated that all other vendor recommendations were reviewed and implemented as appropriate. Due to the absence of the licensee's RTB specialist, the inspectors were unable to verify the licensee's actions during this inspection.

This area will remain as an open item to be addressed in a future inspection (85-16-02).

No violations or deviations were identified.

8. Item 4.5.1 RTS Reliability (System Functional Test Description)

GL 83-28 Requirement

On-line functional testing of the reactor trip system, including independent testing of the diverse trip features, shall be performed on all plants.

Findings

Surveillance testing of the reactor trip breakers (RTBs) is performed in accordance with Technical Specification 3/4.3.3.1. This testing is accomplished using procedures S023-II-1.1, "Surveillance Required Reactor Plant Protection System Channel Functional Test", S023-II-3.1, -3.2, -3.3, -3.4, "Surveillance Required Reactor Plant Protection System Response Time Test for Channel A, -B, -C, -D", and S023-II-11.161, "S. R. Reactor Breakers UV and Shunt Trip Device Circuit Test".

The inspectors discussed the RTB surveillance program with licensee personnel with the following findings. S023-II-1.1 is a monthly surveillance of the Plant Protection System. This procedure tests the shunt and undervoltage trips together. S023-II-3.1, -3.2, -3.3, and -3.4 are used to test the response time of the individual channels of the Plant Protection System and are performed at refueling intervals. S023-II-11.161 is performed after any maintenance on a reactor trip breaker and on all breakers at refueling intervals. This procedure is used to test the independent actuation of the undervoltage and shunt trips.

The inspectors concluded that the surveillance program was adequate and satisfied the requirements of GL 83-28.

No violations or deviations were identified.



9. TI-2515/64 Rev. 1 (Closed), "Near-Term Inspection Followup to Generic Letter 83-28"

This TI was written to provide near-term followup on the licensee's response to GL 83-28, "Required Actions Based on Generic Implementation of Salem ATWS Events", July 8, 1983. The areas of inspection were equipment classification, vendor interface, and maintenance programs for selected safety-related components within safety-related systems. The inspectors had the following findings in these areas:

° Equipment Classification

Methods of equipment classification are outlined in the Units 2 and 3 FSAR Chapter 3.2, "Classification of Structures, Components, and Systems. Table 3.2-1 provides the quality classification of major plant structures, components, and systems. Those items designated as Quality Classes I, II, III, and IV make up the Project Q-list used in development, review, approval, and control of the design of major plant structures, components, and systems. The San Onofre Units 1, 2 and 3 Quality Assurance Program Manual Chapter 2-B, "Q-List Controls", defines the methods used for maintaining and updating the Q-lists for all three units.

The Maintenance Department has developed various working processes to ensure proper equipment classification:

- a. The San Onofre Maintenance Management System computerizes maintenance work orders and preventive maintenance schedules used as a daily reference for quality class of a component.
- b. Work procedures are written, reviewed and controlled by Maintenance Engineering in a manner that states whether a component or system is safety-related.
- c. All work orders and work procedures are reviewed by the Quality Assurance Organization.
- d. All replacement parts used on safety-related systems are reviewed prior to procurement by Procurement Engineering for proper source documentation and inspected upon receipt by Quality Control to verify proper materials have been received.

These processes along with the Q-List, Instrument Index, Equipment List, Valve Designation List, Design Drawings, and Vendor Drawings ensure that equipment is properly classified.

The inspectors reviewed the equipment classification status for the surveillance tests and maintenance orders used as samples in this inspection report and no problems were identified.

° Vendor Interface Program

The vendor interface program is defined for plant-wide implementation and control in procedure S0123-XIV-4.1,

"Configuration Document Change Control for Supplier Data". This area has been addressed in two NRC inspection reports during the past eight months (IE 50-206/84-27 and IE 50-361/85-07). Both inspections concluded that an acceptable program existed for incorporating vendor information into Configuration Documents. Based on the results of these inspections, the vendor interface program is acceptable.

o Maintenance Program

The routine preventive maintenance for the reactor trip breakers is performed annually using procedure No. S023-I-9.27, "Breaker - GE AK 2-25 Annual Routine Maintenance". This procedure provides the details for the inspection, cleaning, adjustment and testing of the GE AK-2-25 circuit breakers that are used as RTBs. Less than annual maintenance requirements are satisfied by performing appropriate sections of this procedure.

The licensee's response to GL 83-28 stated that, "Units 2 and 3 surveillance is currently being performed monthly and maintenance is performed every two months. This conservative frequency will be maintained until actual experience justifies a reduction in frequency".

Presently, the licensee is performing maintenance every two months in accordance with the procedure mentioned above. Since there have been no major problems with the RTBs, the licensee is taking action to lengthen the frequency so as not to damage the RTBs due to overcycling of the trip mechanisms. The licensee has decided to increase the frequency in one month increments with an intermediate holding frequency to be established at the six month interval. This is in accordance with the NRC "Staff SER on Reactor Trip Breakers" for Units 2 and 3, dated May 2, 1983.

The inspectors concluded that the maintenance program was adequate and was being implemented. TI 2515/64 Rev. 1 is closed for Units 2 and 3.

No violations or deviations were identified.

10. Followup on Previously Identified Items

a. IEC 81-12 (Closed), "Inadequate Periodic Test Procedure of PWR Protection System"

The inspectors reviewed the licensee's assessment of this item and the Surveillance Test Procedure S023-II-11.161, "Reactor Breakers Undervoltage and Shunt Trip Device Circuit Test". From these reviews the inspector determined that the licensee is testing the operation of the undervoltage and shunt trip coils independently; including position verification to ensure that the breaker trips. This item is closed for Units 2 and 3.

- b. During an inspection, March 12-25, 1983, inspectors noted the following items relating to the Reactor Trip Breakers. These items were left as Followup Items for future inspections and are closed by this report.

- ° 50-361/83-13-06 (Closed), "Justification of Undervoltage Coil Pickup Setting"

#### Previous Inspection

IE Bulletin 79-09 states that the pickup setting should be 106 VDC for a nominal voltage of 125 VDC. The inspectors noted that the nominal voltage at Unit 2 appeared to be about 133 VDC and the pickup voltage was set at 106 VDC. The licensee was asked to assess the advisability of raising the pickup voltage to a value of 80-85 percent of the 133 VDC nominal voltage which would correspond to a 106 VDC pickup setting for a 125 VDC nominal voltage.

#### This Inspection

The UVTA is energized during normal breaker operations. When energized, the magnetic force created by the coil picks up and holds in place a spring-loaded armature. The voltage at which the armature moves into place is called the pickup voltage. The upper limit on the pickup voltage is caused by the inability to arm the UVTA. If the UVTA cannot be armed, the circuit breaker is prevented from closing because the UVTA armature continuously holds the trip paddle in the unlatched position. The lower limit on the pickup voltage is caused by the inability to apply the proper torque to the trip shaft. If the proper torque is not applied, the trip shaft will not move enough to allow the toggle linkage to collapse and open the breaker contacts.

GE Service Advice 175 (CPDD) 9.3, dated April 2, 1979, defines the allowable pickup setting for a nominal voltage of 125 VDC to be 106 VDC with allowable tolerance of 104-110 VDC. The licensee has decided to leave the pickup setting a 106 VDC even though the nominal voltage at Unit 2 is approximately 133 VDC.

During a loss of power or a low voltage incident the UVTA will trip the breaker at the pickup setting value. The difference in operation of the UVTA at 133 VDC versus 125 VDC would be the trip time. The licensee has stated that this decrease in trip time is negligible and the present pickup voltage setting is appropriate. Furthermore, the breakers continue to meet requirements for response time tests conducted as part of the surveillance and maintenance programs. Any unacceptable response time would be discovered during these tests.

This item is closed.

- ° 50-361/83-13-07 (Closed), "Assessment of Lubrication Type and Frequency"

Previous Inspection

GE AK-2-25 Installation Manual GEK-7302 states that periodic inspection of the circuit breaker is recommended at least once a year and that bearing points and sliding surfaces should be lubricated at regular intervals. The licensee was asked to assess the type of lubricant and lubrication frequency for optimum safe operation of the GE AK 2-25-2 breakers.

This Inspection

The licensee has recently completed refurbishment of their reactor trip breakers which included a change in the lubricant type used (see paragraph 7). The new lubricant (Mobil 28) is now the GE standard for AK-2-25 breakers and has proven more dependable with aging and at high temperatures than the old lubricant.

The licensee is presently working to remove lubrication steps from the maintenance procedure. Lubrication will only be performed by the vendor per contract on the refurbished breakers. Inspection, cleaning, and testing will continue as presently done.

This item is closed.

- ° 50-361/83-13-08 (Closed), "Reactor Trip Breaker Environmental Qualifications"

Previous Inspection

The licensee was asked to respond to the environmental qualification of the Reactor Trip Breakers, including radiation and aging effects on the lubricant used for the trip shaft bearings and other important components.

This Inspection

The licensee took radiological measurements of the Units 2 and 3 reactor trip breaker locations and were unable to obtain a reading on instruments with a minimum scale of 0.2 mr/hr. Licensee representatives stated that the total dose to the breaker rooms over a 40 year lifespan would be 350 rem and they know of no lubricant that would break down under this exposure.

The licensee has installed air-conditioning in the breaker rooms which will enhance the lubricant life and performance. Furthermore, the new lubricant (see paragraph 7) has less susceptibility to high temperatures than the old lubricant.

This item is closed.



11. Exit Meeting

On May 17, 1985, an exit meeting was held with the licensee representatives identified in paragraph 1. The scope and findings of the inspection, as noted in this report, were discussed.

TCB BUS ARRANGEMENT

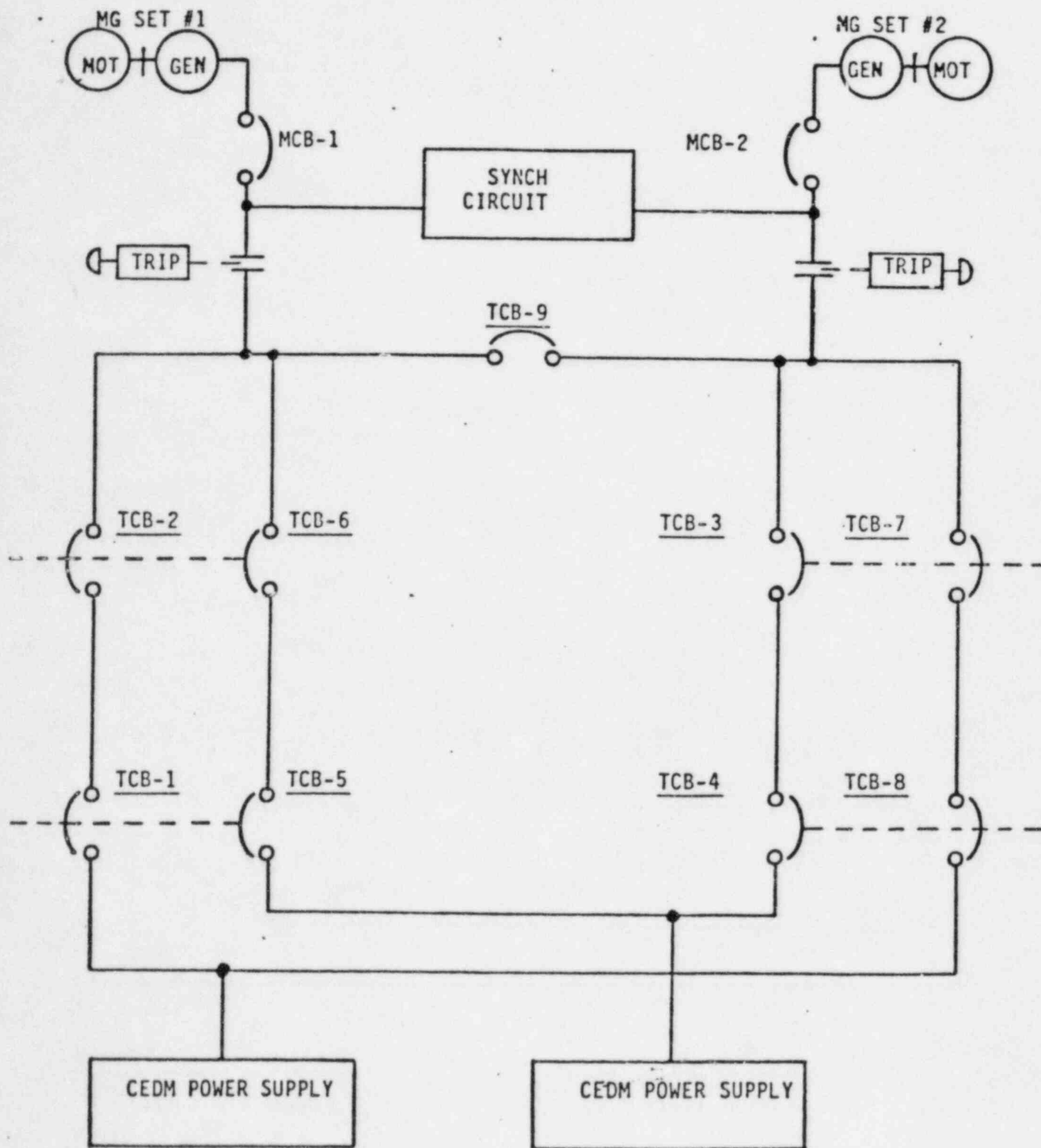
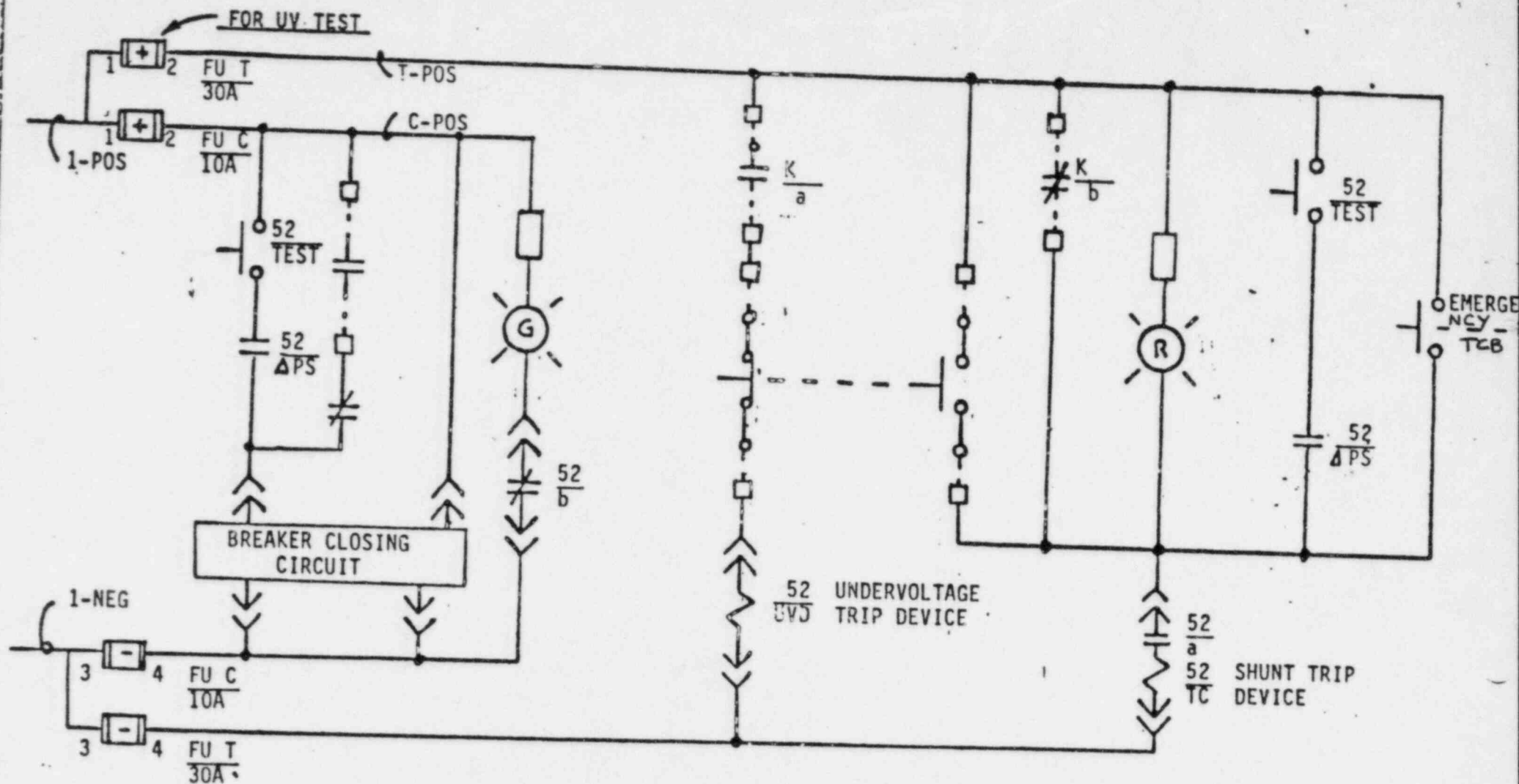


FIGURE 1



Elementary Diagram for Breaker Control