



## Duquesne Light

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August 1, 1984

United States Nuclear Regulatory Commission  
Region I  
631 Park Avenue  
King of Prussia, PA 19406

ATTENTION: Dr. Thomas E. Murley  
Administrator

SUBJECT: Beaver Valley Power Station - Unit No. 2  
Docket No. 50-412  
Significant Deficiency Report 82-04  
"Westinghouse Solid State Protection System"

Gentlemen:

The attached report provides the information required by 10CFR 50.55(e), with respect to the previously reported potential for an undetectable failure of the Westinghouse Solid State Protection System.

Paragraph No. 5 of the attached report addresses the corrective action which will rectify this problem in the Beaver Valley Power Station - Unit No. 2 SSPS.

No further reports are anticipated on this matter.

DUQUESNE LIGHT COMPANY

By E. J. Woolever  
E. J. Woolever  
Vice President

RW/nml  
Attachments

cc: Mr. R. DeYoung, Director (3) (w/a)  
NRC Document Control Desk (w/a)  
Mr. G. Walton, NRC Resident Inspector (w/a)  
Ms. M. Ley, Project Manager (w/a)  
Mr. E. Licitra, Project Manager (w/a)  
INPO Records Center (w/a)

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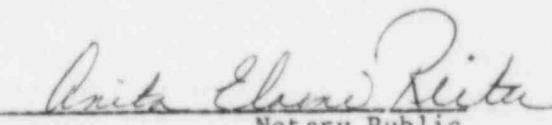
SUBSCRIBED AND SWORN TO BEFORE ME THIS  
31st DAY OF July, 1984.

Anita Elaine Reiter  
Notary Public

ANITA ELAINE REITER, NOTARY PUBLIC  
ROBINSON TOWNSHIP, ALLEGHENY COUNTY  
MY COMMISSION EXPIRES OCTOBER 20, 1986

COMMONWEALTH OF PENNSYLVANIA )  
 ) SS:  
COUNTY OF ALLEGHENY )

On this 31st day of July, 1984, before me,  
a Notary Public in and for said Commonwealth and County, personally  
appeared E. J. Woolever, who being duly sworn, deposed and said that (1) he  
is Vice President of Duquesne Light, (2) he is duly authorized to execute  
and file the foregoing Submittal on behalf of said Company, and (3) the  
statements set forth in the Submittal are true and correct to the best of  
his knowledge.

  
Notary Public

ANITA ELAINE REITER, NOTARY PUBLIC  
ROBINSON TOWNSHIP, ALLEGHENY COUNTY  
MY COMMISSION EXPIRES OCTOBER 20, 1986

BEAVER VALLEY POWER STATION - UNIT NO. 2  
DUQUESNE LIGHT COMPANY

Report on Significant Deficiency 82-04  
"Westinghouse Solid State Protection System"

1. SUMMARY

Westinghouse has identified a potential problem in the solid state protection system (SSPS) on-line testing circuits for system relays which could result in an undetectable failure. The SSPS provides protection and control of plant equipment, reactor trips, and actuates the engineered safety features systems.

2. IMMEDIATE ACTION TAKEN

Westinghouse notified the Nuclear Regulatory Commission of the potential problem in a letter dated August 6, 1982, from E. P. Rahe to Richard DeYoung, Director of the Office of Inspection and Enforcement. On August 30, 1982, Duquesne Light Company (DLC) notified R. Keimig of the Region I office by telephone. Interim reports dated September 29, 1982 and May 19, 1983, provided additional information.

3. DESCRIPTION OF DEFICIENCY

Periodic testing of the solid state protection system requires actuation of system master relays and continuity test of the output relays. During testing, the voltage applied to the output relays is reduced from 120V ac to 15V dc. A pushbutton test switch actuates the master relays and opens a switch contact shunting a proving lamp which verifies continuity of the output relays. Upon completion of the test, 120V ac is restored to the output relay circuits. If the shunt contact fails to close and the system is called upon to operate, 120V will be applied to the output relay through the proving lamp. The result could be burnout of the lamp and failure of the output relay to actuate.

4. ANALYSIS OF SAFETY IMPLICATIONS

Failure of the SSPS output relays to actuate when required would prevent safety systems from automatically performing their safety function.

5. CORRECTIVE ACTION TO REMEDY DEFICIENCY

The design of BVPS-2 will incorporate the hardware changes described in Westinghouse Technical Bulletin NSD-TB-84-01. DLC expects that these changes will be incorporated in the BVPS-2 SSPS prior to July 1, 1985.

6. ADDITIONAL REPORTS

Duquesne Light Company does not anticipate that additional reports will be required on this matter.



**Westinghouse  
Nuclear  
Service  
Division**

RECEIVED REGION 1

1984 AUG -6 PM 4:55

DESIGNATED ORIGINAL

Certified By *J. R. Terry*

**Technical Bulletin**

*SDR 82-04*



An advisory notice of a recent technical development pertaining to the installation or operation of Westinghouse-supplied Nuclear Plant equipment. Recipients should evaluate the information and recommendation, and initiate action where appropriate.

P.O. Box 2728, Pittsburgh, PA 15230

Subject		Number
<b>POTENTIAL UNDETECTABLE FAILURE-ONLINE TEST SWITCH</b>		NSD-TB-84-01
System(s)		Date
<b>SOLID STATE PROTECTION SYSTEM</b>		MARCH 20, 1984
Affected Plants	AFFECTS SAFETY RELATED EQUIPMENT	S.O.(s)
<b>SEE ATTACHMENT III</b>	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>	387
References	Sheet <u>1</u> Of <u>7</u>	
<b>SRC-ID-82-194 CHANGE CONTROL NO 6156</b>		

In 1982, reviews of the Solid State Protection System (SSPS) revealed a potential undetectable failure which could develop in connection with use of the System's on-line test features. By generic letter, all sites were advised of a minor revision to the test procedure which would assure that such a failure could not go undetected.

The postulated potential failure is described in Attachment I, and the preventive additional testing is described in attachment II. Although no design changes were deemed necessary to resolve safety concerns, Westinghouse undertook a design review of the matter in the interest of prudent engineering.

That review has now been completed, and affected plants (see Attachment III) will be sent formal change recommendations for a relatively minor circuit modification which will obviate the need for the special testing. Conceptual descriptions of the changes are shown in Attachment IV, and detailed change recommendations will be sent as soon as they are completed.

Additional Information, if Required, may be Obtained from the Originator. Telephone 412 - 733-5777 or (WIN) 286 - 5777

Originator

*W. H. Furfari*  
W. H. Furfari

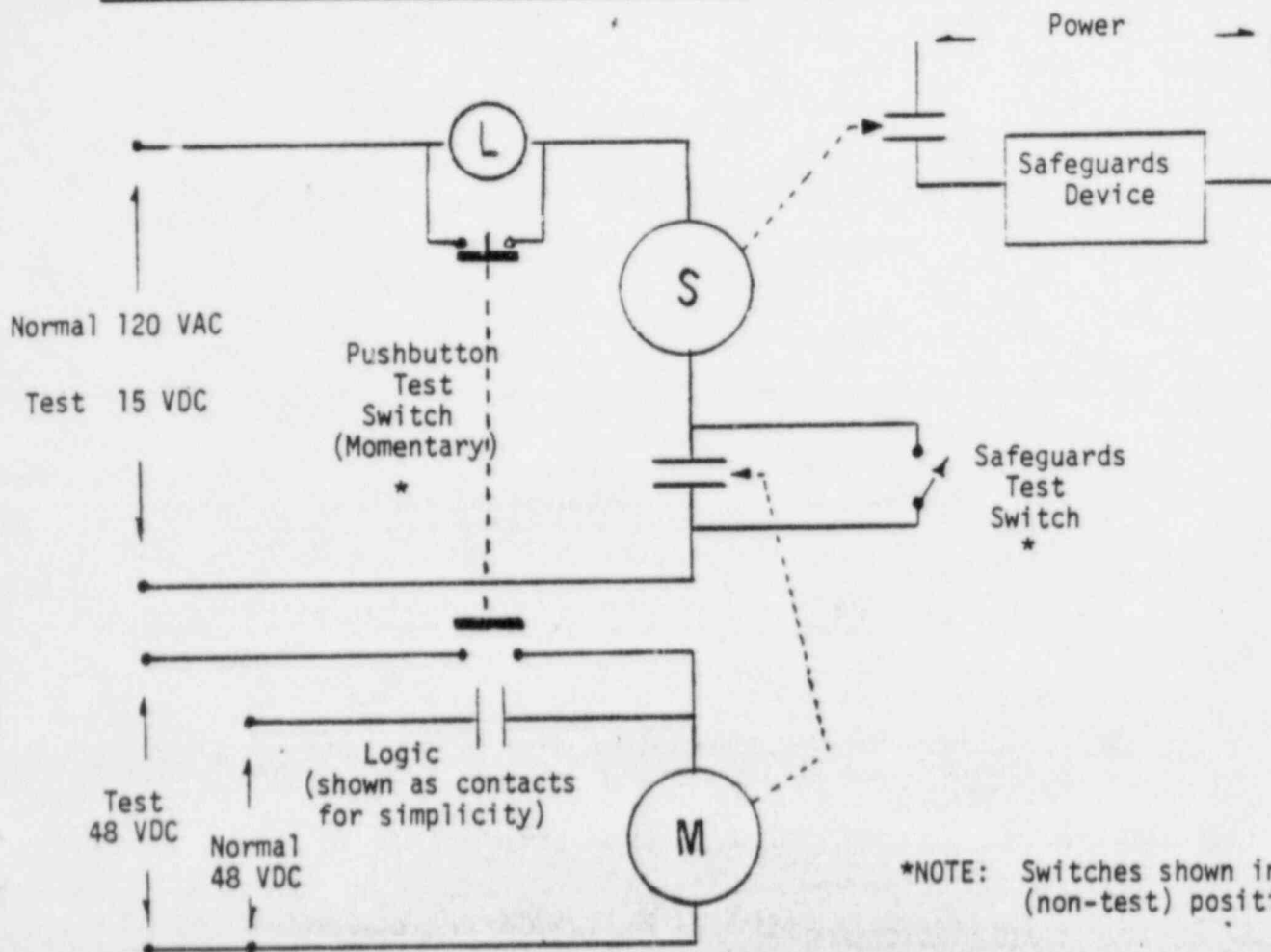
Elec. & Inst. Services

Approval

*J. R. Terry*  
J. R. Terry, Manager

Elec. & Inst. Services

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NORMAL OPERATION: Logic contacts close to pick up Master relay M. Master relay contacts close to apply 120 VAC to Slave relay S. Slave relay contacts close to power the Safeguards device.

TEST OPERATION:

- \*Relay mode selector switch (not shown) to TEST position switches slave relay power from 120 VAC to 15 VDC. Master relay power remains 48 VDC.
- \*Pushbutton test switch contact (1) picks up Master relay M. Pushbutton contact (2) removes lamp shunt so that 15 VDC is applied to Slave relay coil thru proving lamp L.
- \*Slave relay is not picked up because of reduced voltage of 15 VDC.

PROBLEM: If the contacts shunting the proving lamp L do not reclose when the pushbutton is released and the system is returned to normal, then 120 VAC would be applied to the Slave relay coil thru the proving lamp if Safeguards actuation were called for by the logic contacts. (Lamp may fail before relay S operates)

SIMPLIFIED SKETCH OF TYPICAL SAFEGUARDS ACTUATION RELAY TESTING IN THE SSPS

FWM 8-5-82 (Redrawn 3/2/84)

ATTACHMENT I



**SOLID STATE PROTECTION SYSTEM MASTER RELAY AND OUTPUT RELAY TEST**

Perform the test described below immediately following completion of the Solid State Protection System (SSPS) Output Relay Testing.

This test will ensure that the pushbutton or relay contacts used to shunt the output relay continuity lamps located on the Output Relay Test Panel have returned to the closed position.

To check the output relay continuity lamp shunts on the Output Relay Test Panel, utilize the Safeguards Test Cabinets as described below:

1. For each of the output relay continuity lamps, select an output (slave) relay which has its continuity checked through the lamp. For plants with the standard 2-train SSPS this will be eight relays per train and for plants with the "new" 2-train SSPS or the 3-train SSPS this will be sixteen relays per train. This selection can easily be performed by using the Output Relay Test Panel Selections table located in the System Maintenance section of each SSPS Technical Manual.
2. Using the Engineered Safeguards System Final Device or Actuator Test Procedure select the sections of the test which pertain to the output relays selected above. This can easily be done by referring to the table of contents.
3. Before proceeding with the selected test sections, verify that all instructions pertaining to precautions, limitations and initial conditions have been followed.
4. Ensure that the Mode selector switch on the SSPS logic train Output Relay Test Panel is placed in the Operate position.
5. From the Safeguards Test Cabinet (STC) proceed with the selected sections of the Engineered Safeguards System Final Device or Actuator Test Procedure. For each of the test sections verify that the output relay continuity lamps on the associated SSPS Output Relay Test Panel do not illuminate while rotating and depressing the STC test switches. If the SSPS output relay continuity lamps do not illuminate and the selected sections of the STC tests are successfully completed, all of the continuity lamp shunt contacts have properly returned to the closed position.
6. If an output relay continuity lamp illuminates during testing from the STC it is an indication that the lamp's shunting contact is open. Should this occur, remove the associated SSPS logic train from service and replace the Output Relay test pushbutton (for "new" 2-train and 3-train SSPS, replace the relay whose contacts used for shunting the lamps failed to close). After replacement, retest the master and output relays from the Output Relay Test Panel and perform the tests listed above.
7. If an output relay continuity lamp does not illuminate during testing from the STC and the STC test is unsuccessful it may be an indication that the continuity lamp shunt contact is open and that the continuity lamp itself has opened. If this is the case, replace the Output Relay Test pushbutton and the continuity lamp and retest. If the continuity lamp and its associated shunting contact are found operational, this is an indication of a failure in the Final Device or its Actuation circuit.

## ATTACHMENT 4

## APPLICABLE DOMESTIC AND INTERNATIONAL PLANTS

PLANTS WITH STANDARD 2-TRAIN SSPS

Salem 1\* and 2\*  
Cook 1\* and 2\*  
+ Ringhals 2\*, 3\*, and 4\*  
Farley 1\* and 2\*  
Beaver Valley 1\* and 2  
Diablo Canyon 1 and 2  
Trojan\*  
+ Angra 1\*  
Byron 1 and 2  
Braidwood 1 and 2  
North Anna 1\* and 2\*  
Sequoyah 1\* and 2\*  
Watts Bar 1 and 2  
+ Almaraz 1\* and 2\*  
  
+ Asco 1\* and 2  
Virgil Summer\*  
+ Ohi 1\* and 2\*  
McGuire 1\* and 2\*  
Catawba 1 and 2

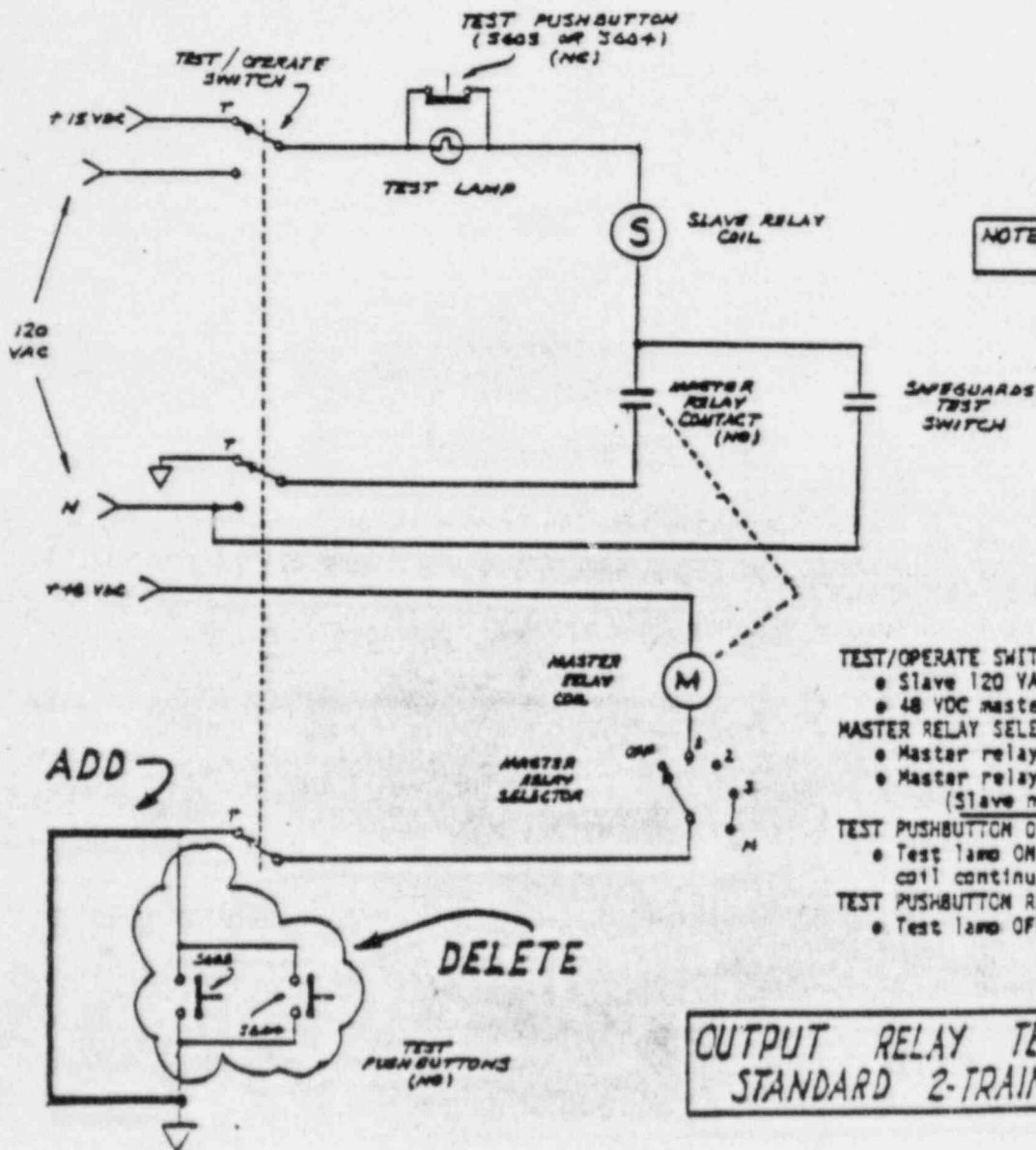
PLANTS WITH "NEW" 2-TRAIN SSPS

Millstone 3  
Seabrook 1 and 2  
Comanche Peak 1 and 2  
Wolfcreek 1  
Callaway 1  
Shearon Harris 1  
+ Krsko\*  
+ Ko-Ri 2\*  
+ Maanshan 1 and 2  
Vogtle 1 and 2  
+ Korea 5, 6, 7, and 8  
+ Vandelllos 2  
+ Napot Point 1

PLANTS WITH 3-TRAIN SSPS

South Texas 1 and 2

\* Operating Plant  
+ International Plant



NOTE: MODE SELECTOR SWITCH IS SHOWN IN TEST POSITION

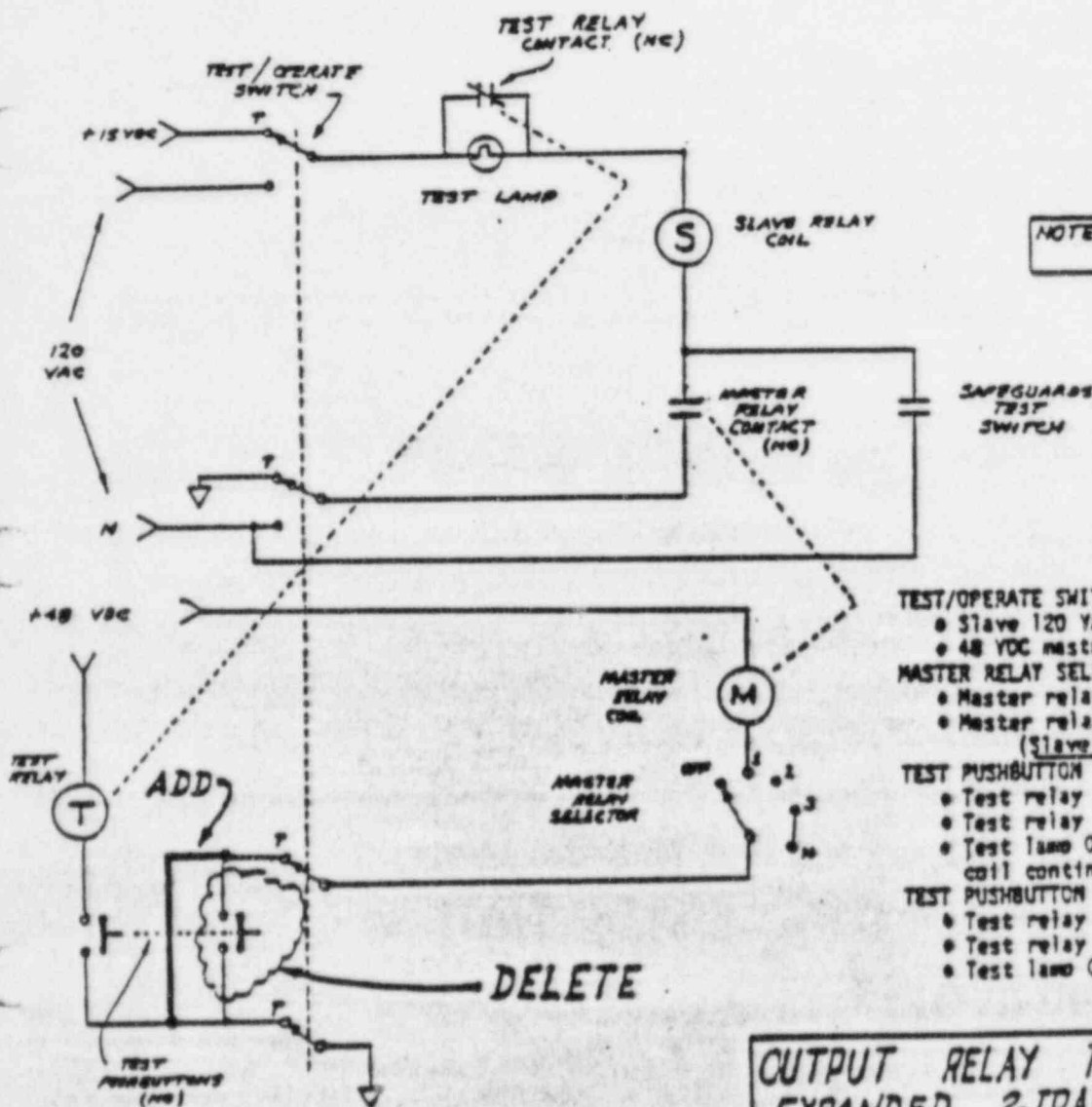
#### OPERATION

- TEST/OPERATE SWITCH TO TEST
- Slave 120 VAC reduced to 15 VDC
  - 48 VDC master relay ground returned
- MASTER RELAY SELECTOR SWITCH TO RELAY BEING TESTED:
- Master relay energizes
  - Master relay contacts close 15 VDC to slave (Slave not energized on 15 VDC)
- TEST PUSHBUTTON DEPRESSED
- Test lamp ON confirms circuit and slave relay coil continuity.
- TEST PUSHBUTTON RELEASED
- Test lamp OFF confirms test lamp shunted

OUTPUT RELAY TEST CIRCUIT  
STANDARD 2-TRAIN SSPS

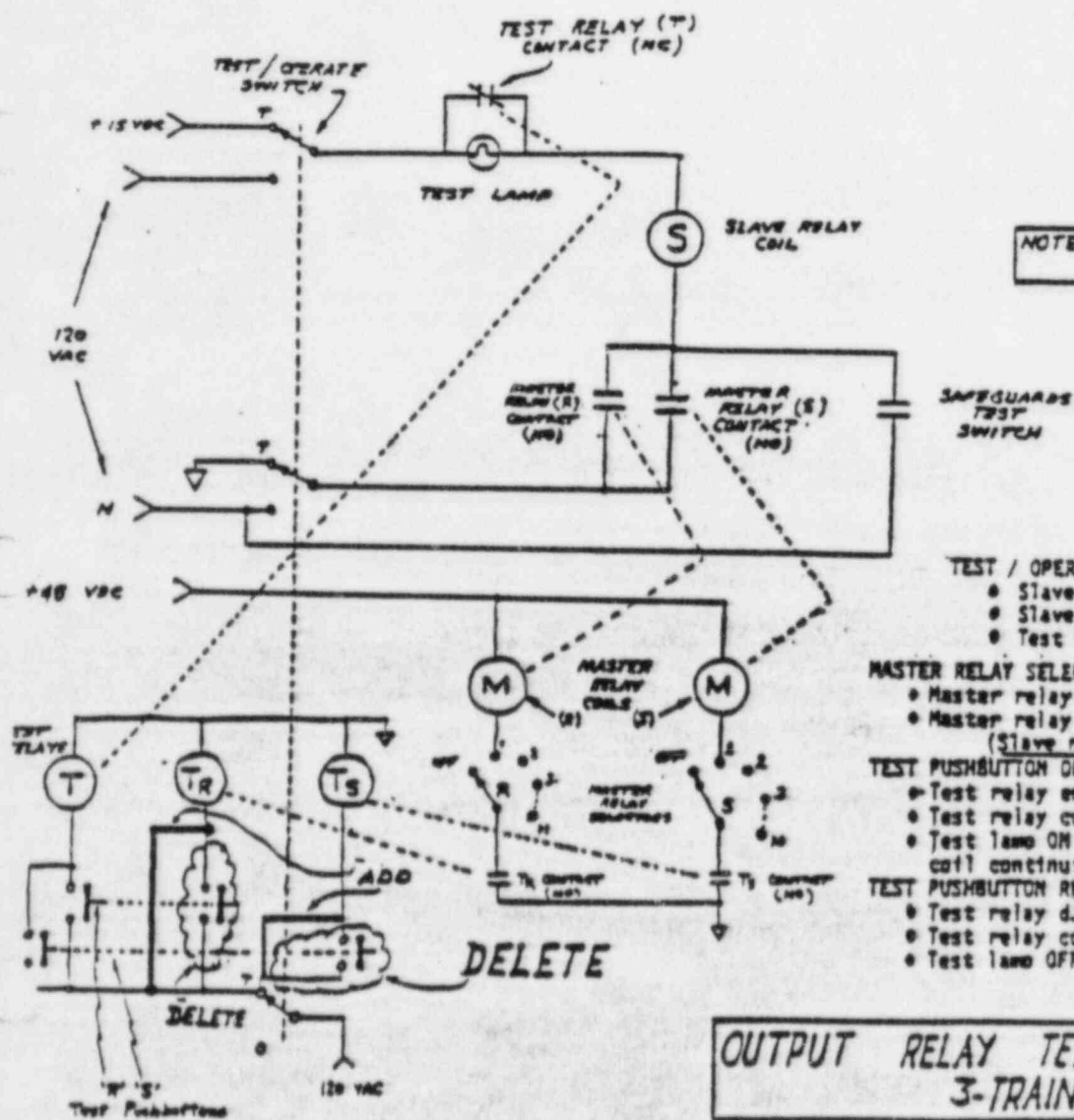
ATTACHMENT IV A





OUTPUT RELAY TEST CIRCUIT  
EXPANDED 2-TRAIN SSPS

ATTACHMENT IV E



NOTE: MODE SELECTOR SWITCH IS SHOWN IN TEST POSITION

## OPERATION

TEST / OPERATE SWITCH TO TEST

- Slave 120 VAC reduced to 15 VDC
- Slave relays ground returned
- Test relays  $T_6$  &  $T_8$  energized

MASTER RELAY SELECTOR SWITCH TO RELAY BEING TESTED

- Master relay energizes
- Master relay contacts close 15 VDC to slave  
(Slave not energized on 15 VDC)

TEST PUSHBUTTON DEPRESSED

- Test relay energizes
- Test relay contacts open
- Test lamp ON confirms circuit and slave relay coil continuity

TEST PUSHBUTTON RELEASED

- Test relay dj-energized
- Test relay contacts close
- Test lamp OFF confirms test lamp shunted

OUTPUT RELAY TEST CIRCUIT  
3-TRAIN SSPS

ATTACHMENT IV C