



**Commonwealth Edison**  
72 West Adams Street, Chicago, Illinois  
Address Reply to: Post Office Box 767  
Chicago, Illinois 60690 - 0767

June 25, 1986

Mr. Harold R. Denton, Director  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Subject: Dresden Station Units 2 and 3  
Quad Cities Station Units 1 and 2  
Safety Parameter Display System  
Isolation Device Test Results  
NRC Docket Nos. 50-237/249 and 50-254/265

Reference: Letter from JR Wojnarowski to HR Denton dated  
June 4, 1986, same subject.

Dear Mr. Denton:

The referenced letter transmitted a summary of the test results for the signal isolators used in the Safety Parameter Display Systems at Dresden and Quad Cities stations. In response to verbal requests from your staff, we are providing additional information relative to the test results.

Attachment 1 provides a copy of our test procedure which includes diagrams of the test setup. Attachment 2 provides a copy of our consultants letter documenting the acceptability of the test results.

One signed original and ten (10) copies of this letter and the attachments are provided for your use.

Very truly yours,

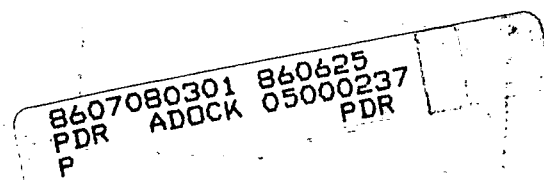
J. R. Wojnarowski  
Nuclear Licensing Administrator

lm

Attachments

cc: Resident Inspectors - D/QC  
Roby Bevan - NRR  
R. Gilbert - NRR

1800K



A001  
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FOR INFORMATION ONLY

"ACROMAG" Testing Procedure  
 REVISION 1, DATED 1/17/86

## 1. Purpose:

Establish a test procedure to test and insure the isolation quality of the "Acromag" signal isolation circuit.

## 2. References:

The following are lists of drawings and documents used to establish the test procedure:

Acromag signal isolator document 7-014.5  
 Acromag power supply module document 7-010.5  
 Acromag model 712-L isolator card drawing 4500-055A Rev.C  
 Acromag model 712-H,V millivolt/volt transmitter drawing 4500-055A Rev.C  
 CEco. S.N.E.D. Drawing 12E-6812 Rev.B  
 CEco. S.N.E.D. Drawing 12E-7812 Rev.E  
 CEco. S.N.E.D. Drawing 12E-6818 Rev.F  
 CEco. S.N.E.D. Drawing 12E-7818 Rev.F  
 IEEE 384-81 paragraph 7.2.2.1  
 OAD ELECTRICAL CONSTRUCTION TEST NUMBER 20.

## 3. Procedure:

## A. Test equipment needed.

1. Variac capable of 120VAC and 15 amp.
2. Current meter capable of 30 amps, PEAK HOLD CLAMP ON TYPE.
3. Recording device capable of 1 milisec response or faster.
4. Load box to calibrate AC current to 15 amps.
5. Substitute P/8 for isolator P/8 maybe used.
6. 15 AMP MOLDED CASE CIRCUIT BREAKER.

## B. Setup:

1. Connect test equipment and circuit as shown on attached drawings.

## C. Testing:

1. VERIFY VARIAC OUTPUT CAPABILITY BY ADJUSTING LOAD BOX FOR 15 AMPERE CURRENT FLOW AT 120VAC.
2. Turn AC test voltage off.
3. Start the recorder and open output circuit from the isolator. Observe the results and insure the recorded data, then stop the recorder.
4. Setup for "Short Test". Start the recorder and



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TEST SHEET

Isolator Circuit Card Model 722-TL-Y Serial 712L (0-1V)  
712L (1-5V)

4/4/86  
4/7/86  
4/8/86 Date Init JR

Test equipment Data (Serial #/Certification #):  
FLUKE DVM SN 3470189 QA# 127129T NEXT CAL 5/86  
AMP METER H42 QA# A51401SD NEXT CAL 11/86

4/2/86 JR

TEST:

1. Calibration:  
AC voltage 120 volts; AC current 15 amps

4/2/86 JR

2. "Open Output Circuit Test" data attached:

4/8/86 JR

3. "Shorted Output Circuit Test" data attached:

4/8/86 JR

4. "Grounded Output Circuit Test" data attached:

4/8/86 JR

5. "Hot Voltage Injection to Output Circuit Test" data attached:

4/8/86 JR

6. "Reverse Voltage Injection to Output Circuit Test" data attached:

4/8/86 JR

COMMENTS:

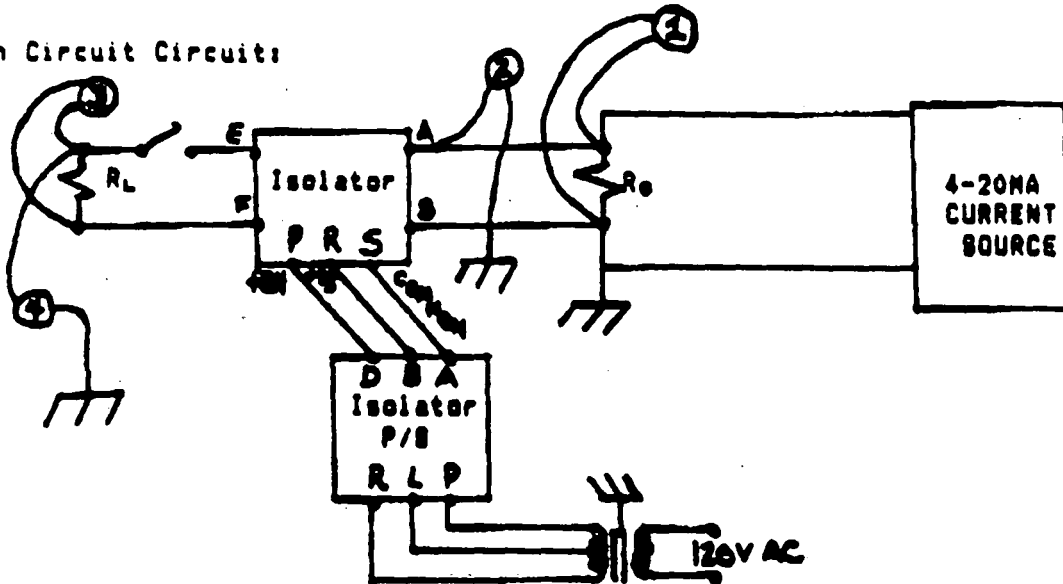
Three board types were tested, All  
Three tested satisfactorily. INPUT  
SIGNAL NEVER FAILED.

4/8/86 JR

1. Calibrated AC current circuit:



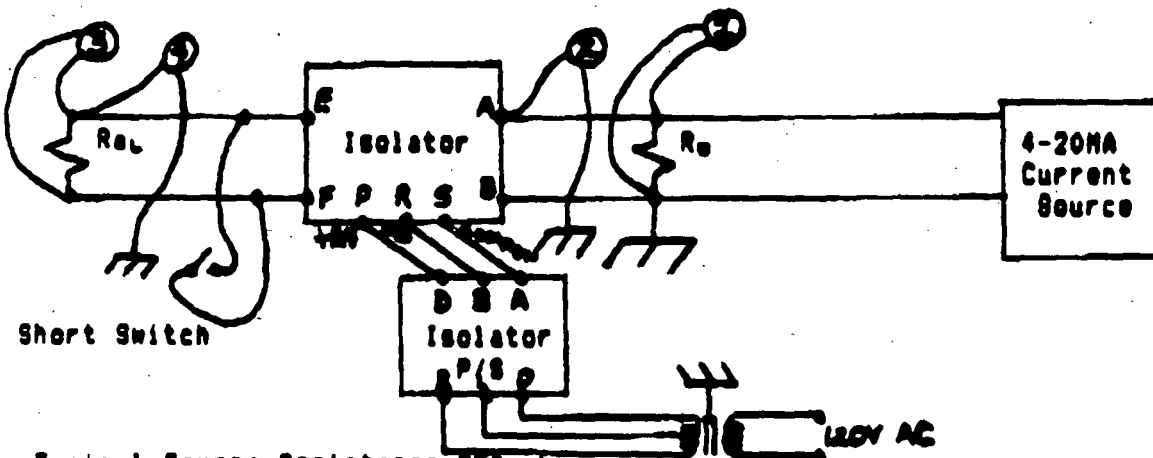
2. Open Circuit Circuits:



$R_o$  Typical Source Resistance 250 ohms.  
 $R_L$  Computer input resistance 5 ohms.

① ② ③ ④ Recorder Test Points

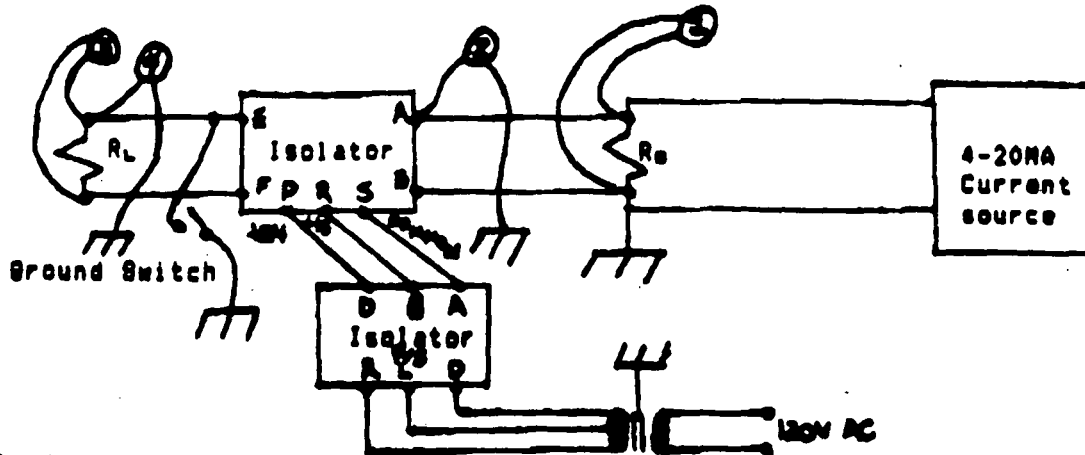
3 Shorted Circuits:



$R_o$  Typical Source Resistance 250 ohms.  
 $R_L$  Computer Input Resistance 5 ohms.

① ② ③ ④ Recorder Test Points.

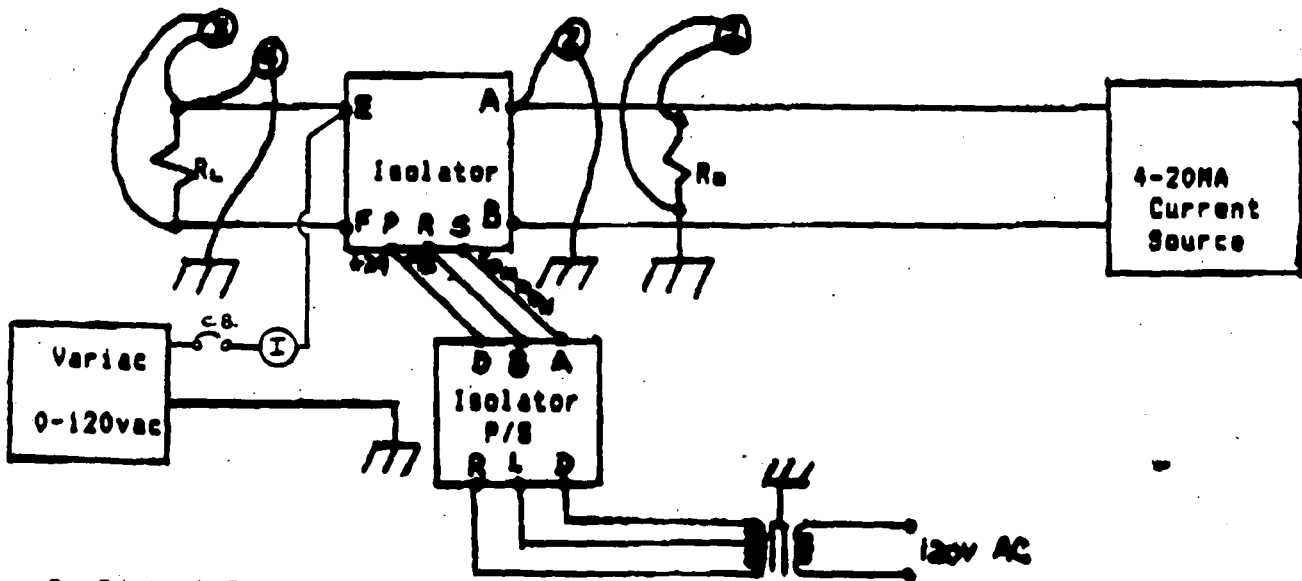
4. Grounded Circuit:



$R_s$  Typical Source Resistance 250 ohms.  
 $R_L$  Computer Input Resistance 5 ohms.

① ② ③ Recorder Test Points.

5 Hot Voltage Injection: OBSERVE CAUTION WITH THIS SETUP!!!

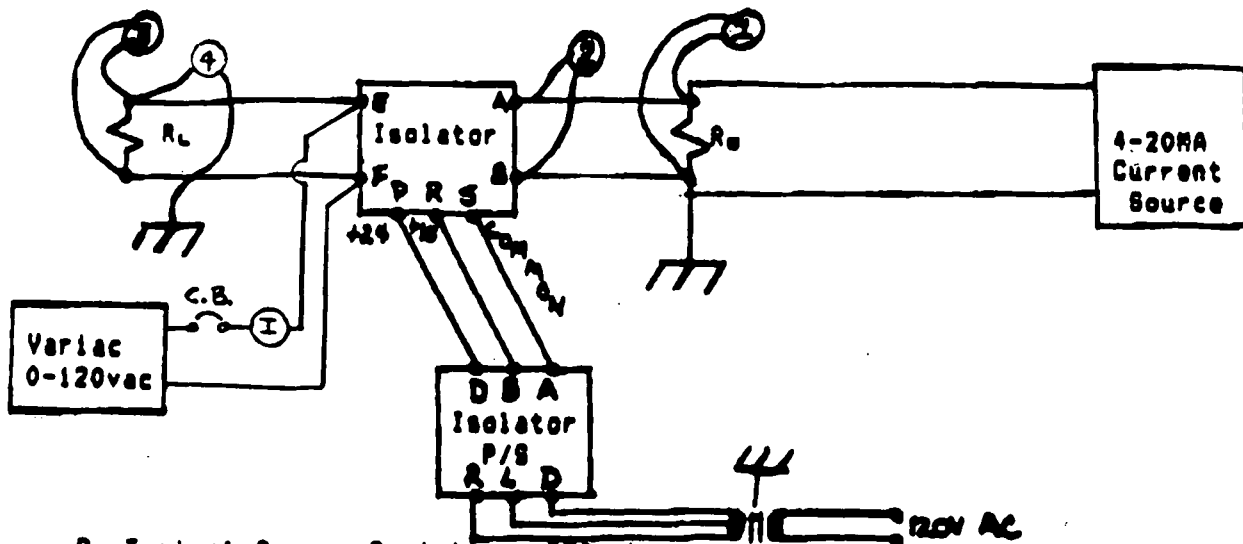


$R_s$  Typical Source Resistance 250 ohms.  
 $R_L$  Computer Input Resistance 5 ohms.

① ② ③ ④ Recorder Test Points.

Note: Reference VARIAC input ground to VARIAC output ground for this test.

6 Reverse Voltage Injection: OBSERVE EXTREME CAUTION WITH THIS TEST!!!



R<sub>s</sub> Typical Source Resistance 250 ohms.  
 R<sub>L</sub> Computer Input Resistance 5 ohms.  
 R<sub>Z</sub> Variable Load Box Calibrated to 15ANPS.

① ② ③ ④ Recorder Test Inputs.

Note: Reference VARIAC input ground to VARIAC output ground for this test.





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III. This document has been evaluated for:  
(Engineer to initial each item below)

	<u>YES</u>	<u>NO</u>	<u>NOT APPLICABLE</u>
e. economics of design	___	<u>JUST</u>	___
f. suitability of arrangement for operating	___	___	<u>JUST</u>
g. suitability of design for field construction	___	___	<u>JUST</u>
h. compatibility of materials	___	___	<u>JUST</u>
i. Registered Professional Engineer (to be qualified to ANSI N626.3-1979 for Code Work).	___	___	<u>JUST</u>

IV. Comment Meeting (if applicable)

Dated 1/17/86..

ATTENDED BY:

COMPANY/DEPARTMENT

1.	<u>MI. S. TUCKER</u>	<u>LECO/SUED</u>
2.	<u>BOB BOWERS</u>	<u>LECO/SOAD</u>
3.	<u>PETE ERIO</u>	<u>LECO/SOAD</u>
4.	___	___
5.	___	___

FOR INFORMATION ONLY

V. Supplemental SNED/PE Requirements (For Operating Plants Only)

- a. Verification of NSSS Vendor's interdisciplinary (i.e. mechanical, electrical, structural, etc.) review and identification of any incomplete design must be documented for construction drawings and Engineering Change Notices pertaining to operating stations.

\_\_\_\_\_ Yes \_\_\_\_\_ No TEST NA

- b. Verification that the A-E has completed a document review of the station Technical Specification and, as a minimum, indicate:

1. The systems involved with the design document release and the applicable Technical Specification, and
2. The nature of the interface with the systems listed in the Technical Specification, and
3. If the system being modified is operable or needs an outage during installation of this release, and
4. The compatibility of the design with the existing system.

\_\_\_\_\_ Yes \_\_\_\_\_ No TEST NA

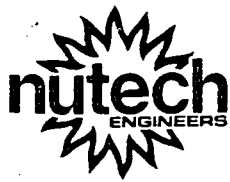
Comments:

- 1) PROVIDE REVISION NUMBER AND DATE
- 2) INDICATE TYPE OF AMMETER TO BE USED
- 3) REVISE TEST #1 FOR VERIFICATION OF VARIAC OUTPUT RATHER THAN EQUIVALENT SOURCE IMPEDANCE
- 4) INCLUDE CIRCUIT BREAKER AND AMMETER IN TESTS #5 AND 6; ELIMINATE SOURCE RESISTOR
- 5) INCLUDE REFERENCE TO OAD CONSTRUCTION MANUAL

ALL REVISIONS INCORPORATED AS REVISION 1

0781Q\*

*M. J. ... 1/17/86*



225 NORTH MICHIGAN AVENUE, 16th FLOOR • CHICAGO, IL 60601 • PHONE (312) 565-2900

May 21, 1986  
COM-47-051

Ms. K. Dages  
Station Nuclear Engineering Dept.  
Commonwealth Edison Company  
P. O. Box 767  
Chicago, Illinois 60690

SUBJECT: Isolation Device Test Results

Dear Ms. Dages:

NUTECH has reviewed test results data from the test program conducted in accordance with CECO's "Acromag Testing Procedure" Revision 1, dated 1/17/86. NUTECH has determined that these test results demonstrate the ability of the Acromag Signal Isolators Model 712-L and 722-TL-Y to prevent a variety of applied anomalous output conditions from affecting the performance of the input signals. In addition, comparison of the electrical schematics of the Model 712-L to those of the Acromag dc Voltage Transmitter Model 712-H, indicates that the Model 712-H would offer similar isolation capability between signal input and output circuits, and signal output and power supply circuits.

The above mentioned Acromag testing procedure, along with its associated test results, were received from CECO's K. Dages on April 28, 1986. The test results consisted of three original runs of recorder traces, as follows:

<u>Run</u>	<u>Acromag Isolation Device Model No.</u>	<u>Test Performed</u>	<u>Remarks</u>
I	712L	4/6/86 - 4/7/86	0-5 V input, 4-20 mA output
II	712L	4/8/86	0-1 V input, 4-20 mA output
III	722-TL-Y	4/4/86	20-100 mV input, 4-20 mA output

The three runs were initialed by J. Rudis, CECO OAD, and dated as indicated above.

Four recorder pens were utilized as directed by the test procedure's figures for each of the five tests, i.e. open circuit, short circuit, ground circuit, hot voltage and reverse voltage injection tests. Pens 1 and 2 measured the input signal, representing the

safety related signal inputs, while pen 3 measured the output signal, representing the non-safety related computer outputs. Pen 4 monitored the output positive leg and, because the output is floating and not tied to ground, continued to measure 0 V for all but the hot voltage tests, during which the pen trace indicated the applied 120 V ac.

Recorder traces for runs I and II were similar but for the applied input signal voltage. The Acromag Model 712L has its input rated 1-5 volts dc, and runs I and II tested each end of the range. Run I utilized a 5 V dc input, while run II utilized a 1 V dc input. Pens 1 and 2 did not indicate any fluctuation in input signal despite the applied anomalies on the output of the isolator recorded by Pens 3 and 4. The applied anomalies consisted of the five test conditions of open circuit, short circuit, ground circuit, hot voltage and reverse voltage injection. The plots of pens 1 and 2 demonstrated that credible faults, i.e. the above five test conditions, applied on the isolator card outputs have no adverse impact on the performance of the input signals to the isolator cards.

Run III was made to test the Acromag Model 722-TL-Y with an input signal of 100 mV monitored by pens 1 and 2. The five applied anomalies to its output were recorded by pen 3. Pens 1 and 2 did not indicate any fluctuation in input signal despite the application of credible faults on the output, thus demonstrating the ability of the Model 722-TL-Y to successfully isolate output from input.

As utilized at CECO's Dresden and Quad Cities Station, the Acromag signal inputs and power supply inputs are safety related circuits, while its signal outputs are connected to non-safety related circuits. These test results indicate that the above mentioned Acromag devices are able to provide adequate isolation between safety and non-safety circuits when the credible fault conditions required by CECO's "Acromag Testing Procedure, Revision 1, dated 1/17/86" were applied to the non-safety related output circuits.

If you have any questions or wish to further discuss these test results, please contact me at 565-2900.

Very truly yours,



John H. Gelston  
Manager of Systems  
Electrical Engineering

JHG/gnm

cc: D. Eggett  
M. Tucker