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November 1, 1985

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

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

Re: Catawba Nuclear Station, Unit 2
Docket No. 50-414

Dear Mr. Denton:

Ms. E. G. Adensam's letters of September 10 and October 31, 1985 transmitted the results of the Staff's audit of the Catawba Unit 2 Safety Parameter Display System (SPDS). These reports included a number of requests for additional information. In order to expedite the review of the SPDS, attached is a response to the request for additional information on the E-MAX isolation devices (Section 4.3 of September 10, 1985 letter). Responses to the remaining requests will be provided by November 15, 1985.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

ROS:slb

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator
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REQUEST FOR ADDITIONAL INFORMATION ON THE E-MAX

ISOLATION DEVICES FOR THE CATAWBA SPDS

The following additional information is needed regarding the E-MAX isolators used on the radiation monitoring inputs to the SPDS:

A. For the E-MAX device used to accomplish electrical isolation, describe the specific testing performed to demonstrate that the device is acceptable for this application. This description should include elementary diagrams when necessary to indicate the test configuration and how the maximum credible faults were applied to the device.

RESPONSE

1. Input to output surge-withstand-capability (SWC) testing was performed by E-MAX.

2. Input to output dielectric withstand tests at 2500 volts RMS were performed satisfactorily.

3. These isolators were tested in the transverse mode as shown on Figure 1. A thirty (30) ampere source fused at twenty (20) amperes was applied across the signal output connections with the isolator energized. A storage type oscilloscope was used to monitor any propagation of the fault to the input signal circuitry. When the fault was applied to the output signal circuitry the following occurred:

   a. Resistors in the output circuit fused open.

   b. Output operational amplifiers leads fused open.

   c. Printed Circuit Board (PCB) foil in the output circuit fused open.

   d. Output transistors were overheated and deformed.

   e. Secondary side leads to the output circuit power supply transformer (in the isolator) fused open.

   f. The 20 amp fuse in the fault generation circuit did not blow. This can be attributed to the inherent current limiting design of the output circuit in which the components fused open.

   g. A 147 millivolt noise spike of a few milliseconds duration was recorded on the input oscilloscope.

   h. No damage was sustained by the input circuitry.

The isolators were proven to provide acceptable isolation to the maximum credible fault. The 147 millivolt spike recorded on the input leads can be attributed to noise generated by the fusing open of the output components. The level of noise generated was not detrimental to the input circuit. This is due to the fact that the SPDS radiation monitor circuits themselves have several stages of buffering and isolation, so that short-duration pulses and noise would be attenuated and cause no effects on the Class 1E circuits.

B. Provide data to verify that the maximum credible faults applied during the test were the maximum voltage/current to which the device could be exposed, and define how the maximum voltage/current was determined.

RESPONSE

The cabinets and cable trays interfacing with these devices were studied and a 120 volt AC source in series with a 20 ampere current-interrupting device was found to be representative of the conditions to which the isolators could be exposed. In fact, most of the circuits involved are actually limited to lower current fault values, but this current was chosen as a viable test value.

C. Provide data to verify that the maximum credible fault was applied to the output of the device in the transverse mode (between signal and return) and the other faults were considered (i.e., open and short circuits).

RESPONSE

1. Figure 1 shows the setup for the transverse mode fault test. Results of the test are discussed in (a) above.

2. The output of the isolator is designed to be powered with the output signal leads open in order to facilitate system testing.

3. A short circuit of the output signal leads could cause failure of the output transistors and resistors. By design this could not propagate back to the input circuit.

4. Input and output circuits have their own individual isolated regulated power supplies. A fault on one supply would not propagate to the other.

D. Define the pass/fail acceptance criteria for this device.

RESPONSE

The pass/fail criteria for the transverse mode test was that upon application of the fault to the output circuitry the input circuitry must sustain no damage and the fault should not propagate to the input.

E. State whether or not the isolation devices comply with environmental qualification requirements (10 CFR 50.49) and with the seismic qualification requirements which were the basis for plant licensing.

RESPONSE

The optical isolators were designed and tested to verify functionability in the environmental and seismic service conditions to which they are exposed in compliance with the requirements of NUREG-0588 and Catawba FSAR Section 3.10, as detailed in Duke Power Company's response to NUREG-0588 for Catawba Nuclear Station and the Catawba FSAR, respectively.

F. Provide a description of the measures taken to protect the safety systems from electrical interference (i.e., Electrostatic Coupling, EMI, Common Mode and Crosstalk) that may be generated by the SPDS.

RESPONSE

The measures implemented to protect the Class 1E radiation monitor circuits from electrical interference include extensive cable shielding and cabinet grounding per Duke Power Company installation specifications for electronic equipment. All cable trays are also properly grounded. In addition, the Class 1E circuits have several stages of buffering and isolation to attenuate and remove any such electrical interference. The operator-aid computer utilized for the SPDS functions has its own buffering circuit and utilizes a proven scanning method for reading SPDS inputs as a further filtering method so that signals are not propagated back into Class 1E circuits. The E-MAX isolators are optical devices and therefore, have some inherent filtering characteristics for eliminating the propagation of noise from output-to-input. Also refer back to question a., items 1 and 2 to note that the isolators were successfully tested for surge-withstand-capability and dielectric withstand performance.

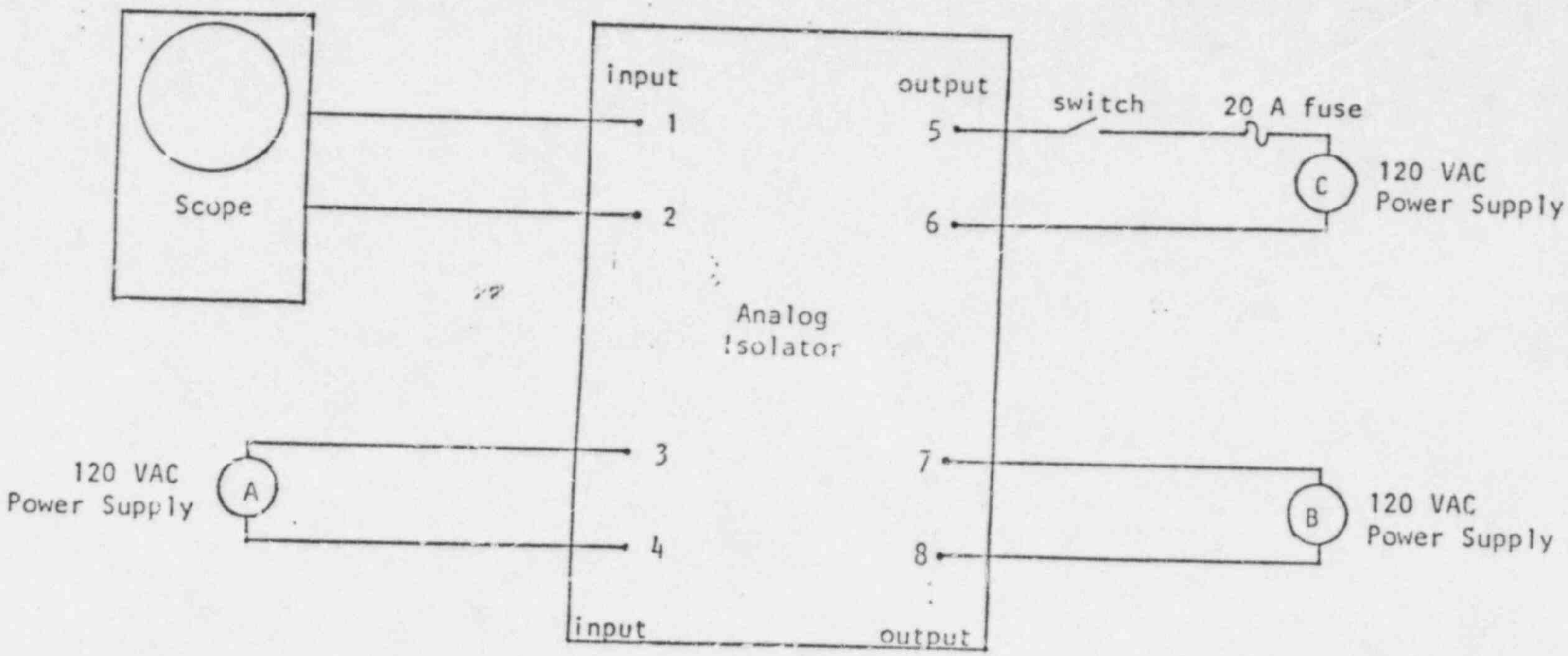

FIGURE 1: Test Set-up

NOTE: Power Supplies A, B and C are all separate sources.