

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
Nuclear Reactor Facility
University of Florida



W.G. Vornetson, Director
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Gainesville, Florida 32611
Phone (904) 392-1429 - Telex 56330

March 28, 1988

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Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N.W.
Atlanta, Georgia 30323

Attention: J. Nelson Grace
Regional Administrator, Region II

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

Gentlemen:

Pursuant to the reporting requirements of paragraph 6.6.2(3)(c) of the UFTR Technical Specifications, a description of a potential abnormal occurrence as defined in the UFTR Technical Specifications, Chapter 1 is described in this interim 14-day report to include NRC notification, occurrence scenario and current solution status. The potential promptly reportable occurrence involved the failure of Safety Channel #1 circuit to provide proper power indication for several seconds on two occasions, the second during a test run.

NRC Notification

The Executive Committee of the Reactor Safety Review Subcommittee reviewed this occurrence on March 15, 1988 and concluded that it is a potential abnormal occurrence as defined in UFTR Technical Specifications, Chapter 1. The RSRS then instructed NRC notification as per Section 6.6.2 of the UFTR Tech Specs. This notification was carried out by both telephone to Mr. Paul Frederickson and a following telex on March 15, 1988 (see Attachment I). Subsequent to replacement of the failed feedback noise controlling capacitor in the Safety Channel #1 with successful checkout, the same occurrence (~4 second loss of indication on Safety Channel #1) recurred. This event was again reported via telephone conversation with Mr. Stephen Vias and a following telex on March 16, 1988 (see Attachment II). In addition to the discussion to update Mr. Frederickson on 18 March 1988, this interim report represents the 14 day followup report for this event as required in UFTR Tech Specs, Paragraph 6.6.2(3)(c).

Initial Event Scenario

At 1437 on March 14, 1988, with a Reactor Operations Laboratory class (ENU-5176L) in progress at 50% power, Safety Channel 1 failed to the bottom meter stop. P.M. Whaley, operator at the controls, noted the indication on Safety Channel 2, the log pen recorder, and the wide range indicator were normal and directed a reactor shutdown. Before the shutdown could be started, Safety Channel 1 returned to normal indication. The subjective evaluation was that the return was not instantaneous, but the meter returned to normal indication relatively slowly (i.e., not as if switched on, but rather as if recovering from an electrical transient). The shutdown was completed with all instruments responding normally at 1438.

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Corrective Action

The immediate indications were that an intermittent fault had developed in the circuitry for Safety Channel 1 (part of the wide range drawer) but not in any other section of the wide range drawer. With the reactor secured, Maintenance Log Page #88-9 was initiated to investigate the problem. The wide range drawer was de-energized and the linear channel circuit board removed for visual inspection. All components and connections were verified in good condition. Discussion of the failure mode indicated a possible failure of a capacitor, possibly an intermittent short circuit which was followed by a recharging of the capacitor. A capacitor in the feedback loop (in parallel to the primary feedback/current limiting resistor) was identified as the most likely component failure. The capacitor was removed and failed a bench test; the capacitor had open-circuited. The probable cause was now evaluated to be a short circuited capacitor that remained open from high current, resulting in first maximum feedback from the short then normal feedback from the feedback resistor as supported by the initial downscale indication followed by return to normal noted by SRO Whaley. The component was replaced with a substitute of different manufacturer under 10 CFR 50.59 Evaluation #88-4 with identical specifications intended to restore the circuit to normal operation.

Evaluation

Except during the transient, the functions of indication and trip were not inhibited or changed (except for situations where high circuit noise might cause erratic meter indications); that is, there was only a temporary loss of indication and trip function in Safety Channel #1. Since this capacitor is a noise suppression device in a DC circuit, the impact of this failure on system operation is minimized because this is a DC amplifier where the feedback coefficient is set by a precision resistor.

This Safety Channel #1 Circuit failure is potentially a promptly reportable occurrence per UFTR Technical Specifications, Section 6.6.2 delineating requirements for Special Reports where Paragraph (3)(c) states certain safety system failures are promptly reportable. Specifically, a special report is needed for a "reactor safety system malfunction that renders the reactor safety system incapable of performing its intended safety function, unless the malfunction or condition is discovered during maintenance tests or periods of reactor shutdowns" or involves components or systems in addition to these required by Tech Specs (see Attachment III for quotes of applicable Tech Spec Sections).

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Similarly one definition of Abnormal Occurrences for the UFTR in Tech Specs Section 1.0 is "a malfunction of a safety system component or other component or system malfunction that could, or threatens to, render the (safety) system incapable of performing its intended safety function." Since Reactor Safety System is also defined in Tech Specs Section 1.0 to be "a combination of measuring channels and associated circuitry that forms the automatic protective action to be initiated, or provides information which requires the initiation of manual protective action," this initial event was thought not to be strictly required to be promptly reported; that is, since the failed feedback capacitor only serves to reduce noise in the circuit, it is not really needed for the safety function of Safety Channel #1 which was recovered within a few seconds of the failure.

Basically, this event was considered to have no direct impact on safety and not to impact the health and safety of the public. However, reporting was recommended since there was at least a partial failure of the safety system. Nevertheless, safety implications are negligible since Safety Channel #2 was always operable and Safety Channel #1 was only lost for a few seconds after which it would have been subject only to more noise. After replacement of the failed capacitor, meeting the two requirements of a successful daily checkout and a 15 minute or longer power run was considered sufficient to assure proper operation and approval for return to normal operation.

Updated Event Scenario

Following a successful daily checkout, a 15 minute run at 100 kw was set as the final criterion prior to return to normal operations. Five minutes into this run, the failure indication on Safety Channel 1 recurred; initial checks indicated the capacitor was not failed this time so work has continued with a new prompt report filed with NRC on 16 March 1988 per communication with the RSRS Executive Committee.

Corrective Action/Evaluation

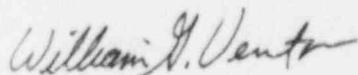
The reactor has been put on administrative shutdown per Attachment I¹⁷ and the RSRS met on March 22, 1988 with this event as one item on its agenda. All agree the situation is being addressed properly although the exact cause of the event has not yet been identified. Via a series of troubleshooting maintenance activities, the problem has been isolated to the fission chamber, preamp or connections shown in Attachment V which is Figure 1-8 of the UFTR Safety Analysis Report. There is a strong possibility that cleaning connectors on these components may have corrected the problem per conversation with one vendor.

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At this point a procedure is being prepared for RSRS review and approval to allow declaring the UFTR operable pending successful completion of all normal checks and proposing to permit restart as a test to verify proper operation of Safety Channel #1 by monitoring voltage levels in the linear channel section of the preamplifier with respect to ground, the current drawn by detector operation from high voltage supply and the high voltage power supply output voltage. Voltage measurements are the measurement of choice to prevent monitoring from affecting the operation of the system; the voltage measurements will be made by devices with large input impedances and will not draw significant current from the monitored points. In general, current measurements must be made in such a way as to minimize the potential for altering the signal parameters; to minimize the potential for such effects, the input to the high voltage filter in the preamplifier has been selected as the current monitoring point.

Based on the results of this test restart, the problem is expected to be demonstrated to be corrected or to be isolated to one of the components indicated in the Safety Channel #1 circuitry. Further information will be supplied and Region II will be notified prior to commencing the restart test.

Sincerely,



William G. Vernetson
Director of Nuclear Facilities

WGV/ps

Attachments

cc: P.M. Whaley
Reactor Safety Review Subcommittee

NUCLEAR ENGINEERING SCIENCES DEPARTMENT
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University of Florida



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ATTACHMENT I

March 15, 1988
Safety Channel #1 Circuit Failure

Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N.W.
Atlanta, GA 30323

Attention: J. Nelson Grace
Regional Administrator, Region II

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

As per telephone conversation on 15 March 1988 with Mr. Paul Frederickson, relative to failure of Safety Channel #1 Circuit for the UFTR, the Reactor Safety Review Subcommittee (RSRS) Executive Committee has reviewed this event and concluded this occurrence is potentially reportable occurrence per UFTR Technical Specifications, Section 6.6.2 delineating requirements for special reports. Paragraph (3)(c) indicates certain safety system failures are promptly reportable. The RSRS Executive Committee has instructed NRC notification as per Section 6.6.2 of the UFTR Tech Specs though the event may not be required to be promptly reportable depending on interpretation of the Tech Specs. Since the failed component was only a feedback noise controlling capacitor, its replacement has restored Safety Channel #1 to normal with RSRS permission granted to restart dependent only on a successful daily checkout.

William G. Vernetson
William G. Vernetson
Director of Nuclear Facilities
15 March 1988

WGV/ps

cc: P.M. Whaley
RSRS

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ATTACHMENT II

March 16, 1988
Safety Channel #1 Circuit Failure - 2

Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N.W.
Atlanta, GA 30323

Attention: J. Nelson Grace
Regional Administrator, Region II

Re: University of Florida Training Reactor
Facility License: R-56, Docket No. 50-83

As per telephone conversation on 16 March 1988 with Mr. Stephen Vias, relative to failure of Safety Channel #1 Circuit for the UFTR, the event described in our letter of 15 March 1988 recurred during a power run conducted as a final requirement set prior to returning to normal operations. Although a failed feedback noise controlling capacitor had been replaced, its replacement has not restored Safety Channel #1 to normal so that further checks and repairs are required.

The RSRS Executive Committee instructed NRC notification as per Section 6.6.2 of the UFTR Tech Specs though the event may still not be required to be promptly reportable depending on interpretation of the Tech Specs.

Further information will be provided prior to approving return to normal operations.

A handwritten signature in black ink, appearing to read "William G. Vernetson".
William G. Vernetson
Director of Nuclear Facilities
16 March 1988

WGV/ps

cc: P.M. Whaley
RSRS

8804610034-11

ATTACHMENT III

UFTR TECH SPEC QUOTES

1.0 DEFINITIONS*

Abnormal Occurrences: An abnormal occurrence is any one of the following:

- (3) A malfunction of a safety system component or other component or system malfunction that could, or threatens to, render the system incapable of performing its intended safety function.

Reactor Safety System: The reactor safety system is that combination of measuring channels and associated circuitry that forms the automatic protective action to be initiated, or provides information which requires the initiation of manual protective action.

6.6.2 Special Reports

There shall be a report not later than the following working day by telephone and confirmed in writing by telegraph or similar conveyance to the Commission, to be followed by a written report that describes the circumstances of the event within 14 days of any of the following:

- (3) Any of the following:

- (c) A reactor safety system component malfunction that renders the reactor safety system incapable of performing its intended safety function, unless the malfunction or condition is discovered during maintenance tests or periods of reactor shutdowns (Note: Where components or systems are provided in addition to those required by the Technical Specifications, the failure of the extra components or systems is not considered reportable provided that the minimum number of components or systems specified or required perform their intended reactor safety function).

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ATTACHMENT IV

March 18, 1988

MEMORANDUM

TO: Reactor Staff
WGV/ps
FROM: W.G. Vernetson, Director of Nuclear Facilities
SUBJECT: Administrative Shutdown of the UFTR

Because of the Safety Channel #1 Circuit Failure problem, the UFTR is placed on Administrative Shutdown until further notice.

This administrative shutdown precludes all reactor operations for which the reactor would be declared operable until further notice for which RSRS approval will be required. Performing weekly and daily checkouts as far as possible as well as normal maintenance activities are allowed.

The only other activities allowed during this administrative shutdown are routine administrative work (updating training records, etc.), tours of the facilities (no operations) as well as housekeeping and maintenance activities. Major maintenance is also possible provided approved by proper levels.

WGV/ps

cc: P.M. Whaley

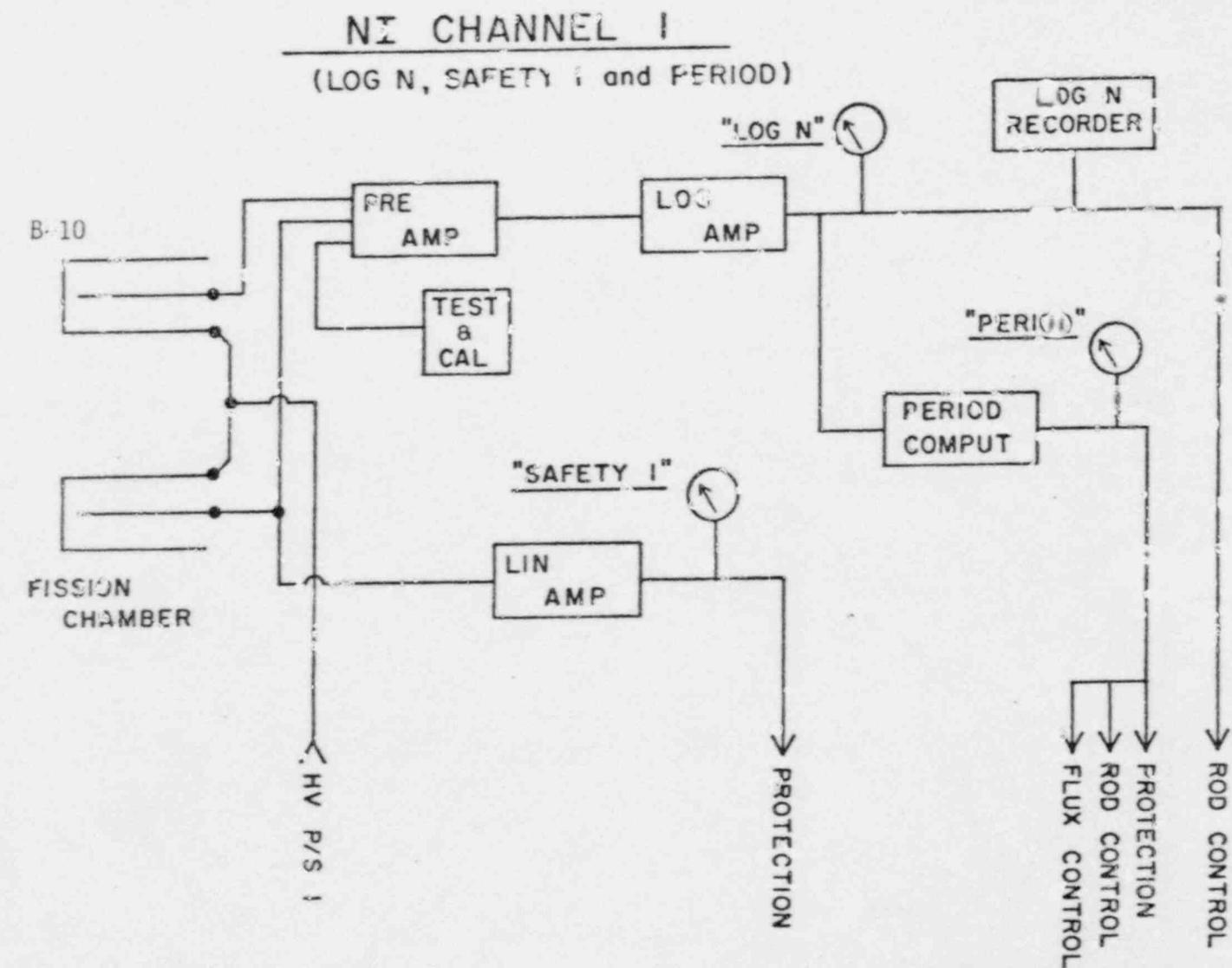


Figure 1-8. NI CHANNEL 1: UFTR Nuclear Instrumentation Channel 1 Diagram
(Log N, Safety #1 and Period Channels).