Commonwealth Edison
Dresden Nuclear Power Station
R.R. #1
Morris, Illinois 60450
Telephone 815/942-2920

May 5, 1992

CWS LTR #92-246

U.S. Nuclear Regulatory Commission
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Licensee Event Report 89-019-01, Docket #050237 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.73 (a)(2)(iv). This revised report is being submitted to provide an update of the root cause and corrective actions implemented in regards to the main steam line radiation monitor.

Charles W. Schroeder
Station Manager
Dresden Nuclear Power Station

CWS/cfq

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
NRC Resident Inspector's Office
File/NRC
File/Numerical

(ZDVR/588)

IE22
1/1

LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1)	Docket Number (2)	Page (3)
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Title (4)

Scram/Group I Isolation Due to Main Steam Line Radiation Monitor Lockup and Spurious Steam Tunnel Temperature Trip

Event Date (5)			LER Number (6)			Report Date (7)			Other Facilities Involved (8)	
Month	Day	Year	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)
									NONE	0 5 0 0 0
0 7	1 2	8 9	8 9	0 1 9	0 1	0 5	0 5	9 2		0 5 0 0 0

OPERATING MODE (9)	N
POWER LEVEL (10)	0 6 3

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

	20.402(b)		20.405(c)	X	50.73(a)(2)(iv)		73.71(b)
	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		Other (Specify in Abstract below and in Text)
	20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		
	20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
	20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

Name		TELEPHONE NUMBER
		AREA CODE
Neil Spooner, Tech Staff System Engineer	Ext. 2789	8 1 5 9 4 2 - 2 9 2 0

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
X	J M	X X T S	U 4 7 5	Y					
X	I J	X X 4 5	G 0 8 0	Y					

SUPPLEMENTAL REPORT EXPECTED (14)		Expected Submission Date (15)	Month	Day	Year
Yes (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e, approximately fifteen single-space typewritten lines) (16)

On July 12, 1989 at 1049 hours with Unit 2 operating at 63% power while performing Dresden Technical Staff Surveillance (DTS) 500-2, Functional Testing of Reactor Protection System (RPS) Motor Generator (MG) Set and RPS Reserve Power Supply, Channel 'A' half primary containment Group I isolation and half scram signals could not be reset promptly due to difficulties encountered in resetting the 'A' main steam line (MSL) logrithmic radiation monitor (LRM). A spurious MSL tunnel area high temperature trip then occurred, resulting in a full primary containment Group I isolation and reactor scram. The cause of the MSL area high temperature trip was attributed to setpoint drift. The root cause of the MSL LRM reset difficulties (which occurred during transfer of power supplies in accordance with DTS 500-2) has been attributed to improper initialization of the LRM main computer and failure of the LRM power supply, as a result of high voltage transients on the 120 VAC supply line to the monitor. As corrective action, the 'A' MSL LRM was replaced, in addition to all of the Channel 'B' MSL tunnel area temperature switches. The safety significance of this event was minimal since the primary containment isolation and reactor scram functions occurred as designed. Operations Department personnel responded immediately by verifying that a valid Group I condition had not occurred and proceeded with a controlled scram recovery. A previous event involving a scram during the performance of DTS 500-2 was reported by LER 89-02/050249.

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2527 MWt rated core thermal power.

Nuclear Tracking System (NTS) tracking code numbers are identified in the text as (XXX-XXX-XX-XXXXX).

EVENT IDENTIFICATION:

Scram/Group I Isolation [JM] Due to Main Steam [SB] Line Radiation Monitor [IL] Lockup and Spurious Steam Tunnel Temperature Trip

A. CONDITIONS PRIOR TO EVENT:

Unit: 2 Event Date: July 12, 1989 Event Time: 1049 hours

Reactor Mode: N Mode Name: Run Power Level: 63%

Reactor Coolant System (RCS) Pressure: 956 psig

B. DESCRIPTION OF EVENT:

At 0928 hours on July 12, 1989, with Unit 2 at 63% rated core thermal power, a Technical Staff system engineer had begun testing of the Reactor Protection System (RPS) [JC] motor generator (MG) set electrical protection assemblies (EPAs) in accordance with Dresden Technical Staff Surveillance (DTS) 500-2, Functional Testing of RPS MG Set and RPS Reserve Power Supply. In accordance with DTS 500-2, the 'B' RPS bus was transferred from normal to reserve power and the 'B' RPS EPAs were tested satisfactorily. The 'B' RPS Bus was then transferred from reserve power back to its normal power source. The main steam line (MSL) logrithmic radiation monitors (LRMs) did not lose power during this evolution since MSL LRMs 'B' and 'D' are powered from the Essential Service bus.

The next test sequence in DTS 500-2 involved transferring the 'A' RPS bus to its reserve power supply. During this evolution, the 'A' and 'C' MSL LRMs momentarily lost supply power. This is expected as these monitor channels are powered from the RPS bus. The 'A' MSL LRM annunciated a "lockup unknown" condition upon completion of the power transfer process approximately five seconds after the normal power supply was deenergized. This prevented the reset of the 'A' MSL LRM, and resulted in inability to reset the associated half primary containment Group I isolation and half scram signals. In accordance with DTS 500-2, Instrument Maintenance Department (IMD) personnel in attendance for the surveillance then removed the 'A' MSL radiation monitor power supply fuse in an attempt to clear the alarm. The fuse was then removed a second time, each time for a one minute period. Both attempts were unsuccessful in clearing the 'A' MSL LRM alarm. The power supply fuse was then removed for a two minute duration which cleared the 'A' MSL LRM alarm. The half primary containment Group I isolation and half scram were then reset. Steps involving the removal of the power supply fuse and delaying five seconds prior to aligning the RPS reserve power supply had been recently added to DTS 500-2 as a result of a General Electric recommendation following a previous similar event involving difficulty in resetting the "lockup unknown" alarm. (Refer to LER 89-02/050249).

Following the satisfactory testing of the EPA relays, the 'A' RPS Bus was then transferred from reserve power back to normal power. During the transfer process, a second 'A' MSL LRM "lockup unknown" alarm occurred, again preventing reset of the half Group I isolation and half scram signals. IMD personnel again removed the 'A' MSL radiation monitor power fuse for a duration of approximately two minutes with the "lockup unknown" condition not clearing. A second attempt was then made to clear the alarm condition, but this was unsuccessful. Approximately one minute later at 1049 hours on July 12, 1989, with Unit 2 at 63% rated core thermal power, a full primary containment Group I isolation and reactor scram occurred. The Group I isolation, which initiated automatic closure of the main steam isolation valves (MSIVs), resulted from the Channel 'A' Group I isolation signal due to the 'A' MSL LRM reset difficulties concurrent with the spurious Channel 'B' MSL tunnel area high temperature signal. An automatic reactor scram on MSIV closure then occurred. Automatic primary containment Group II and Group III isolations also occurred as expected following the scram on a low reactor water level signal.

The Nuclear Station Operators (NSOs) immediately responded to the scram/Group I isolation by verifying that a valid Group I isolation condition had not occurred and proceeding with a controlled scram recovery. The 'A' reactor recirculation [AD] MG Set was manually run back since its scoop tube had been previously locked out. The Reactor Water Cleanup (RWCU) [CE] system was put back on to assist with reactor pressure control and the feedwater system [SJ] was used for reactor inventory control. The main steam isolation valves (MSIVs) were equalized and reopened after performing a MSL tunnel visual inspection to verify that no abnormal leakage had occurred in the MSL tunnel.

Upon completion of a scram investigation and implementation of immediate corrective actions, Unit 2 was brought critical at 1807 hours on July 13, 1989.

C. APPARENT CAUSE OF EVENT:

The cause of this event has been attributed to the spurious Channel 'B' MSL steam tunnel area high temperature signal. The difficulty encountered in resetting the 'A' MSL LRM "lockup unknown" condition was a contributing factor in this event because this resulted in an abnormal delay in resetting the half Group I isolation signal. This report is submitted in accordance with 10CFR 50.73(a)(2)(iv), which requires the reporting of any unplanned actuation of an Engineered Safety Feature, including the RPS.

The root cause of the spurious Channel 'B' MSL tunnel area high temperature signal was attributed to instrument drift. The MSL tunnel area temperature switches are bulb type thermal assemblies which are connected to a microswitch enclosure by a six foot long capillary and bellows housing. A plunger is seated inside the bellows housing for actuation of the microswitch. When high temperature is detected, the thermally sensitive material inside the bulb expands, causing the liquid to force the plunger to rise. This actuates the microswitch, initiating the trip signal.

The function of the MSL area temperature switches is to detect steam leaks in the MSL tunnel area and initiate a primary containment Group I isolation, which results in automatic closure of the MSIVs, main steam drain lines, Isolation Condenser [BL] steam vent lines and the Recirculation system sample lines. There are a total of 16 temperature switches connected in a one-out-of-two-twice logic as shown in Figure 1. The temperature switches are located at four different elevations in the MSL tunnel area with four switches in each area. Upon detection of high temperature in the MSL tunnel area, the temperature switches open causing sensor relays 595-101A through D to de-energize, which results in the de-energizing of trip relays 595-106A through D. These trip relays cause valve actuation relays to de-energize, causing automatic closure of the primary containment Group I isolation valves. An automatic reactor scram then occurs on MSIV closure (>/= 10% closure from full open). This scram is bypassed when reactor pressure is < 600 psig and the reactor mode switch is not in RUN.

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

In this event, a spurious Channel 'B' MSL tunnel area temperature signal was initiated by one of the temperature switches which drives relay 595-101B. This in turn resulted in de-energization of relay 595-106B, which made up the Channel 'B' primary containment Group I isolation logic. Because a Channel 'A' primary Group I isolation signal was pre-existing due to difficulties in resetting the 'A' MSL LRM "lockup unknown" alarm (MSL high radiation is also a Group I initiation signal), a full Group I isolation and reactor scram on MSIV closure occurred.

A review of maintenance and system history records indicates that MSL tunnel area temperature switch setpoint drift has been a recurring event. Corrective actions previously implemented have included revision of the calibration procedure to implement use of a fluid bath calibration technique, applying adhesive to the set screw, and verification that there is no capillary tube leakage. All temperature switches have been replaced with Model F-100 temperature switches (same manufacturer) which are less susceptible to setpoint drift. The performance of these switches is being evaluated while long term corrective actions, such as reducing the number of switches and replacing switches with Resistance Temperature Detectors (RTDs) and Programmable Logic Controllers (PLCs), will be reevaluated (refer to NTS item 249-200-88-07901) by the Nuclear Engineering Department (NED).

Investigation by IM personnel into the LRM "lockup unknown" condition, revealed that the LRM low voltage power supply (LVPS) had failed. Upon installation of a replacement monitor, the failed 'A' MSL LRM was sent to General Electric for further analysis. It was determined that the LRM "lockup unknown" condition was caused by high voltage transients on the 120 VAC line supplying power to the LRM chassis. The voltage transient results in a shorted diode rectifier bridge in the LVPS. This causes a LVPS failure, and can also cause the LRM line fuse to open, rendering the instrument unavailable and defeating the value of the redundant LVPS in the LRM. In addition to the LVPS failure, the LRM main computer could not properly initialize after experiencing the voltage transient. This prevented communication between the main computer and the display computer, causing the LRM to display "lockup unkonwn". Recommendations from General Electric, to protect against these conditions, consisted of replacing the LRM line fuse with a 5 amp slow blow fuse (refer to General Electric SIL No. 499) and installation of modified initialization control circuity to the LRM main computer.

D. SAFETY ANALYSIS OF EVENT:

The function of the MSL area temperature switches is to detect relatively small steam leaks in the MSL tunnel area and cause automatic MSL isolation prior to any gross leakage to the MSL tunnel. The function of the MSL radiation monitors is to prevent excessive turbine contamination during postulated fuel failure events. Both of these signals are included in the primary containment Group I isolation logic. In this event, the Channel 'A' half primary containment Group I isolation signal had occurred due to inability to reset the 'A' MSL LRM while the Channel 'B' half primary containment Group I isolation signal occurred due to the spurious MSL tunnel area high temperature signal. Operations Department personnel responded immediately and proceeded with a controlled scram recovery. The RWCU system was utilized for pressure control while the Feedwater system was used for reactor inventory control. Therefore, the safety significance of this event can be considered minimal.

E. CORRECTIVE ACTIONS:

As immediate corrective action, a review of the entire event was performed with all personnel involved in accordance with Dresden Administrative Procedure (DAP), 7-15, Scram/Engineered Safety Features (ESFs) Actuation Investigation Program. The purpose of the investigation was to reconstruct the event, make an assessment of any safety implications, review performance of personnel, and determine the root cause of the event prior to resuming power operation.

As corrective action for the temperature switches, all four MSL tunnel switches from the channel involved with the spurious MSL tunnel high temperature trip (switches 261-15B, 261-16B, 261-17B, and 261-18B) were immediately replaced. All four switches were replaced since it was impossible to determine which switch was the source of the spurious trip. During the replacement of the switches, the connectors were examined and cables agitated slightly to rule out any connector deficiencies. No abnormalities were observed. The removed switches were then tested to determine their as-found trip setpoints. All were in compliance with Technical Specification Table 3.2.1, which requires a trip setpoint of </= 200° Fahrenheit, but had drifted lower than their normal setpoint bands. Temperature switch 261-16B was observed to have the lowest as-found trip setpoint, and as such may have been responsible for the spurious trip. The previous calibration of these temperature switches (performed on February 5, 1989) used a new calibration technique which was modified using manufacturer's recommendations to reduce the possibility of setpoint drift and produce a more repeatable setpoint trip.

Diagnostic equipment was installed to monitor the new temperature switches following their replacement. An administrative control was also initiated to prohibit performance of any surveillances which potentially involve Group I isolation trips during the 48 hours following restart. In addition, an engineering study is being performed to evaluate the feasibility of replacing the temperature switches with RTDs and PLCs to detect MSL tunnel high temperature.

As corrective action for the 'A' MSL LRM, it was replaced with a spare monitor and calibrated in accordance with Dresden Instrument Surveillance (DIS) 1700-1, Unit 2 Main Steam Line Log Radiation Monitor System Calibration. The defective monitor was sent to the manufacturer for diagnostic evaluation of the power supply and the "lockup unknown" alarm condition. Subsequent corrective actions consisted of replacing the LRM line fuse with a 5 amp slow blow fuse, and modification of the LRM main computer initialization control circuitry (performed by General Electric) to prevent the "lockup unknown" condition. In addition, the monitors were returned to the manufacturer to modify the LVPS. This modification corrected a generic manufacturing problem, in which early degradation of a capacitor in the LVPS caused an abnormally high DC voltage drift in the LRM chassis (refer to General Electric SIL No. 499). Each corrective action, the fuse change-out, the computer circuit upgrade, and the LVPS upgrade, were performed on all 4 LRMs on both Units, and also to the monitors in Stores. A review of maintenance and system history records indicates that the LRM "lockup unknown" condition described in this report has not occurred during the performance of DTS 500-2, since these corrective actions were implemented.

F. PREVIOUS EVENTS:

LER Number	Title
12-3-89-001 (non-reportable event)	Load Reduction to Standby Conditions Due to Indication of Three Failed Main Steam Line Radiation Monitors

On January 2, 1989 at 0225 hours, an MSL Downscale alarm was received on the main Control Room panel 903-3. Upon investigation, the Channel 'B' MSL LRM was found to be indicating a failed downscale condition on the MSL LRM Control Room Diagnostic Panel. Also, the Channel 'A' and 'D' MSL LRM were indicating downscale failures on the diagnostic panel. The root cause of this event was attributed to a failure of a redundant low voltage power supply in the Channel 'B' MSL LRM, in conjunction with a programming deficiency within the Channel 'A' and Channel 'D' MSL LRM. As corrective action, the Channel B MSL LRM was removed and replaced, and the self-test function that monitors the downscale output contact was modified on MSL LRM Channels 'A', 'B', and 'D'.

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12-3-89-031 (non-reportable event) — Main Steam Line Area Temperature Switch 2-261-18D Failed Surveillance Testing Due to Relaxed Microswitch Spring

On February 5, 1989, the MSL tunnel area temperature switch 2-261-18D tripped but would not reset during the refuel outage surveillance. The root cause of the event was attributed to a failure of the internal microswitch to reset following its actuation. As immediate corrective action, the switch was replaced with a new Environmentally Qualified United Electric Model F-100 temperature switch.

12-3-89-020 — Reactor Scram Due to the Failure of an Electrical Protection Assembly Breaker

This event involved difficulty in clearing the MSL LRM "lockup unknown" alarm and a spurious EPA breaker trip during the performance of DTS 500-2. As stated elsewhere in this report, corrective actions included a revision to DTS 500-2 in accordance with General Electric recommendations.

G. COMPONENT FAILURE DATA:

Manufacturer	Nomenclature	Model Number	Mfg. Part Number
United Electric Controls Co.	Temperature Switch	F-7	76-B
General Electric	Logrithmic Radiation Monitor	304A3700	N/A

An industry-wide NPRDS data search conducted on the United Electric Controls temperature switches indicated 35 reported failures occurred on this type of switch at Dresden Station. Twenty of these failures were attributed to setpoint drift of the temperature switch. A second search conducted on the General Electric LRMs indicated 34 failures occurred on this particular model monitor. Six of these failures occurred at Dresden Station. Of the failures, nine power supply deficiencies were identified as the cause. Four additional failures were attributed to setpoint drift.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION — Form Rev 2.0

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

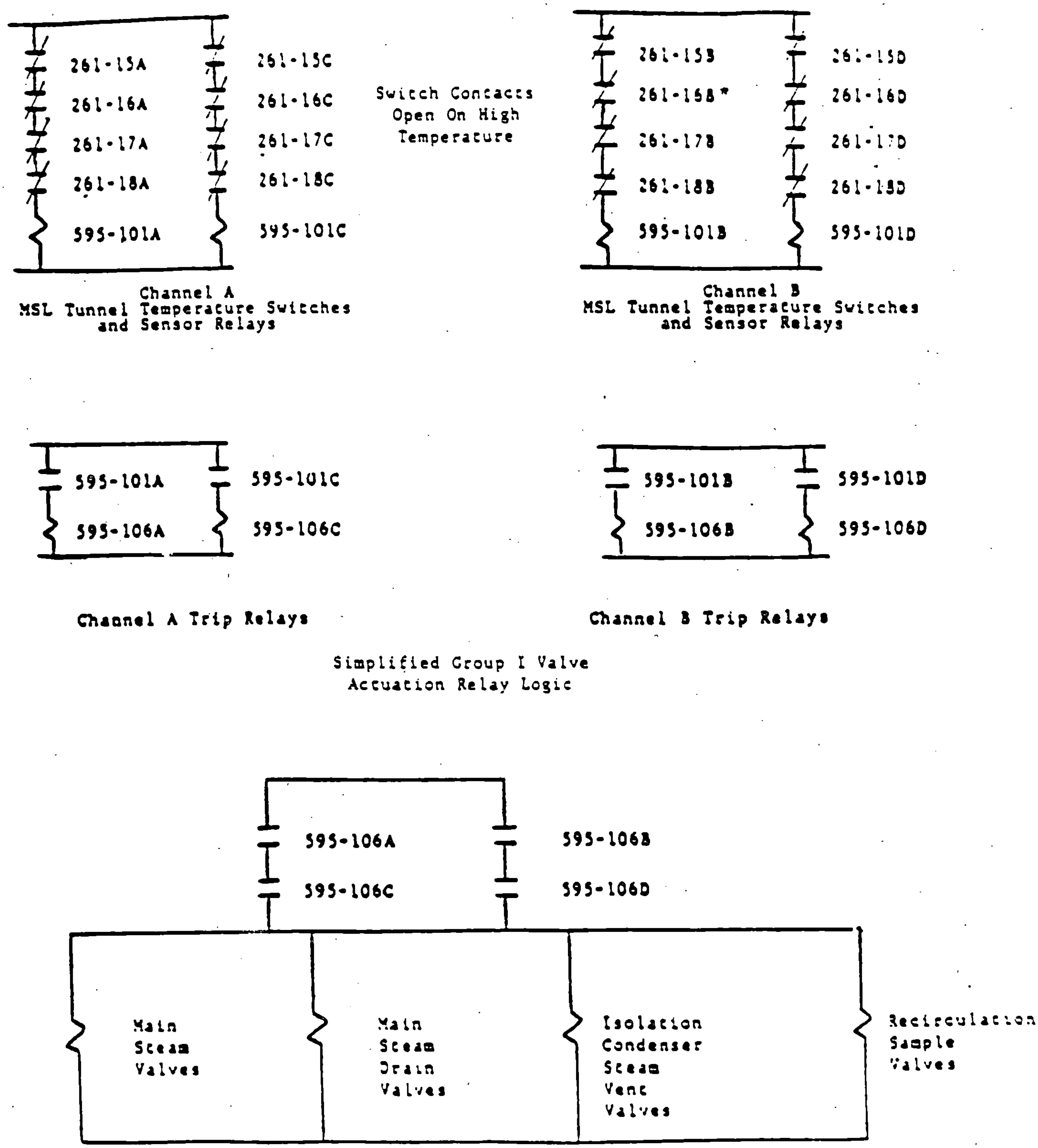

Figure 1