

**POTENTIAL FAILURE MECHANISM IN CERTAIN WESTINGHOUSE (W) AR RELAYS WITH LATCH ATTACHMENTS**

**DESCRIPTION OF CIRCUMSTANCES**

Westinghouse recently reported that a number of AR Relays, with a latch attachment to provide a seal-in feature, have failed during the system check-out of the Solid State Protection System (SSPS) at W Nuclear Instrumentation Control Division in Hunt Valley, Maryland. Westinghouse has determined that contacts of these AR Relays can reopen after the relay coil is de-energized even though the latch mechanism is engaged. Normal operation calls for the contacts to remain closed so that under abnormal conditions safeguards actions, once initiated, go to completion.

The failure mechanism has been found to be caused by insufficient manufacturing tolerances which prevent full travel of the relay contact assembly which is essential for proper relay operation. This reduction of contact movement resulted from a design change made in the relay contact assembly in mid-1973 by the W Control Products Division, Beaver, Pennsylvania. In addition to the tolerance problem, it was determined that excessive tightening of the contact cartridge terminal screw may also contribute to the malfunction of the contacts during relay operation where tolerances are marginal. AR Relays using latch attachments and produced prior to mid-1973 are not a matter of concern in this issue.

The enclosed W Technical Bulletin, NSD TB 77-10, was sent to all affected Westinghouse plants notifying them of the problem and of the corrective actions being taken. The technical bulletin describes in detail the action developed by W to correct the identified problem. The technical bulletin also provides specific wiring instructions to assure that design tolerances are not reduced by excessive tightening of electrical terminals on the relay.

**Action To Be Taken By Licensees and Permit Holders:**

For all power reactor facilities with an operating license or a construction permit:

1. Describe what action you have taken to determine whether the relays of the type and vintage described in the enclosed W Bulletin are in use or planned for use in safety related systems at your facility.

2. Describe what action you plan to take regarding replacement of any relays of the type and vintage described which are in use or planned for use in safety related systems. Further instruction pertaining to replacement procedures can be obtained from the W Nuclear Service Department in Monroeville, Pennsylvania.
3. Report to this office in writing within 45 days for facilities with an operating license and within 60 days for facilities with a construction permit the results of findings with regard to Item 1 or 2.

Approval of NRC requirements for reports concerning possible generic problems has been obtained from the U. S. General Accounting Office. (GAO approval B-180225 (R0072) expires 7/31/80).

Enclosures:

1. Extract from W Technical Bulletin NSD TB 77-10  
Entitled: AR Relays with Latch Attachment
2. List of IE Bulletins Issued in 1977

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(Extracted from W Technical Bulletin NSD TB 77-10)

**Subject:** AR RELAYS WITH LATCH ATTACHMENTS  
**Number:** NSD-TB-77-10  
**System(s):** Solid State Protection System (SSPS) and Auxiliary Safeguards Cabinets (ASC)  
**Date:** July 21, 1977  
**Affected Plants:** See following  
**S.O.(s)** 385

#### BACKGROUND INFORMATION

Westinghouse has recently experienced an increase in the number of failures of AR Relays with latch attachments during the SSPS system check-out at the supplier's (WNICD) shop. Discussions with WNICD and W Control Products Division (AR Relay supplier) on this subject identified that a design change was made in the contact cartridge assembly which may have compromised the operability and reliability of the AR relay with latch attachment assembly. This change was implemented in mid-1973 at W Control Products Division.

Specifically, the design change reduced the thickness of the moveable contact button which, in turn, reduced contact overtravel. In addition, it was also determined that overtightening of the contact cartridge terminal screw, which also acts as the cartridge holding screw, may deform the stationary contact assembly, further reducing contact overtravel. Once the relay is de-energized, the latch plunger back-travels to engage its mechanical stop. It is this action which allows the contacts to relax a distance approaching or exceeding that of the contact overtravel. The end effect is that on AR relays with latch attachments, contact continuity could be lost after the actuation coil has been de-energized even though the latch mechanism is working properly.

The above design change was made in mid 1973 and suspect relays can be identified by both:

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1. Manufactures code date - (located on underside of relay base which can be viewed only by removing the relay). Decode as follows: S-1, W=2, I=3, T=4, C=5, H=6, G=7, E=8, A=9, R=0 (Example - GGI=7/73)
2. Removing each contact cartridge: The moveable contact area will be round add-on button (A square, integral moveable assembly is the good pre-change style).

RECOMMENDED ACTION

- A. The following plants are to notify WNSD if they have replaced any original equipment relays with latches, or have added any relays with latches that have been identified as being made after 6/73 (HGI) and have the round, add-on contact button. Should any doubt exist as to this status, all AR relays with latches must be identified per the method above. Operating plants may postpone this action until a reasonable opportunity exists (i.e. shutdown), since this design deficiency is detectable during periodic safeguards testing. In any event, replacement parts will be made available as soon as they are qualified.

1. Solid State Protection System: OHI #1 Salem #1 & #2  
North Anna #1 & #2 Ringhals #2  
D.C. Cook #1 & #2 Sequoyah #1 & #2  
Joseph Farley #1 Beaver Valley #1

2. Auxiliary Safeguards Cabinet: D.C. Cook #1  
Beaver Valley #1

- B. The following plants will have contact cartridges available to them by the latter part of 1977 as replacements for all AR relays with latch attachments. Therefore, no customer action is required at this time.

1. Solid State Protection System: William McGuire #1 & #2 Braidwood #1 & #2  
OHI #2 Ringhals #3 & #4  
Joseph Farley #2 Beaver Valley #2  
Watts Bar #1 & #2 Marble Hill #1 & #2  
Almaraz #1 & #2 Millstone #3  
Virgil C. Summer KRSKO  
Lemoniz #1 Catawba #1 & #2  
ASCO #1 Comanche Peak #1

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2. Auxiliary Safeguards Cabinet: William McGuire #1 & #2 Byron #1 & #2  
OHI #1 & #2 Braidwood #1 & #2  
Joseph Farley #1 & #2 Beaver Valley #2  
Almaraz #1 & #2 Angra #1  
Virgil C. Summer D. C. Cook #2  
Lemoniz #1 & #2 North Anna #1 & #2

- C. On all future applications of AR relays with latch attachments, use only the approved contact cartridge that will result from the resolution of this problem. Once qualified, it will have a unique identification code.
- D. Upon installation of any contact cartridge, new or existing, or the changing of any wire terminations to any AR relay, the maximum torque applied to the terminal screws shall not exceed 10 inch-pounds.

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**LISTING OF IE BULLETINS  
ISSUED IN 1977**

<b>Bulletin No.</b>	<b>Subject</b>	<b>First Date Issued</b>	<b>Issued To</b>
<b>701</b>	<b>Pneumatic Time Delay Set Point Drift</b>	<b>4-29-77</b>	<b>All Holders of Operating License (OL) or Construc- tion Permit (CP)</b>