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United States Nuclear Regulatory Commission  
Washington, DC 20555

**Subject:** HGA Relay Armature Binding

**Reference:** GE Relay Service Advice Letter (SAL) 516.1, "HGA Armature Binding," October 25, 1996.

This letter provides information concerning the potential for incorrect operation, due to armature binding, of safety related GE HGA relays manufactured between January 1989 and June 1991. The relays were manufactured by GE Electrical Distribution and Control (GE-ED&C), Power Management, Malvern, PA, and supplied to licensees as safety related components by both GE-ED&C and GE Nuclear Energy (GE-NE). Since the specific applications and associated safety functions of potentially affected HGA relays are not known to GE-ED&C or GE-NE, we transferred information to the affected licensees pursuant to 10 CFR Part 21.21(b). However, since additional licensees may have purchased these devices from other dedicating entities, we cannot assure ourselves that all end-users have been notified. We are therefore providing the information to the NRC for appropriate action.

HGA auxiliary relays are widely used in BWRs and PWRs to form control logic for functions such as emergency core cooling, primary containment isolation and reactor protection. There are a maximum of two normally open and two normally closed contacts per relay.

As documented in SAL 516.1 (Reference, attached), incorrect operation of 12HGA17S63 relays in a safety related application were recently reported at a domestic BWR. The relays, which were originally purchased from a "third party" dedicating entity, had been continuously energized and failed to provide correct contact operation when de-energized. Root cause analysis by the licensee and GE-ED&C concluded that the assembly hole location in the molded contact support was slightly out of tolerance (i.e., off center). This offset combined with the manufacturing tolerances of the armature and magnet frame, possible foreign matter in the hinge area and possibly excessive side pressure applied to the contact support when assembled could cause friction between the contact support and magnetic frame resulting in armature binding.

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From a review of manufacturing engineering records, it has been determined that the out of tolerance condition was caused by wear in one of two molds used to produce contact supports. The mold was reworked in 1990, and currently produced contact supports are well within the drawing tolerances. Since the molded contact support is common for use across the product line, any HGA relay manufactured between January 1989 and June 1991 may be affected.

When an HGA relay exhibits armature binding, the control logic may fail to function as designed.

Licensees known to have HGA relays manufactured between January 1989 and June 1991 have been advised to test the relays in accordance with SAL 516.1 to verify that a binding condition does not exist.

If you have any questions, please call me at (408) 925-1019.

Sincerely,



Michael A. Smith, Manager  
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### **RELAY SERVICE ADVICE LETTER**

Subject: HGA Armature Binding  
Issued by: Customer Service  
Prepared by: Peter A. Kotos

Number: 516.1  
Date: 10/25/96

There has been a report of incorrect operation of an HGA17S63 relay (date code: December, 1989). The relay had been continuously energized and failed to provide correct contact operation when de-energized. It was reported that the relay armature was not moving freely, it was mechanically binding at the hinge area.

The relay was returned for examination. We examined the relay and were not able to reproduce the binding condition that was reported. (The relay was returned disassembled. When assembled the relay operated properly electrically and mechanically). However, a dimensional analysis of the most critical parts indicated that the molded contact support was slightly out of tolerance. Specifically, the assembly hole of the contact support was slightly off center.

It is conceivable that this offset combined with the manufacturing tolerances of the armature and magnet frame, possible foreign matter in the hinge area and maybe excessive side pressure applied to the contact support when assembled could cause friction between the contact support and magnetic frame resulting in armature binding.

According to our Manufacturing Engineering, the mold that produces the contact support was reworked in 1990 to correct for mold wear and bring the part well within the drawing tolerances. Currently produced contact supports were checked and are well within the drawing tolerances and do not produce armature binding.

Based on the field report, it is assumed that some HGA's may have been shipped with a marginal condition of armature clearance until this condition was noted by Quality Control and the mold was corrected.

Although it is not possible to determine exactly when the possible problem began, it is estimated that relays manufactured between January, 1989, and June, 1991, (Date Codes: ND, OD, PD, RD, SD, TD, UD, VD, WD, XD, YD, ZD, NE, OE, PE, RE, SE, TE, UE, VE, WE, XE, YE, ZE, NF, OF, PF, RF, SF, AND TF) are suspect and may be checked for armature binding as follows:

1. De-energize the relay, coil and contacts.
2. Close the armature fully by hand, (push armature against the pole, see Fig. 1), and gradually release. For correct operation, the armature should move to the fully open position with no binding and with correct contact action. The normally open contacts should open and the normally closed contacts should close. If binding is detected, we recommend the following:

For "Nuclear 1E" Applications: Contact General Electric Nuclear Energy Division Customer Service Hotline: 1-800-425-8108 and refer to Service Advice No. 516.1.

For "Non - 1E" Applications: A replacement contact support is recommended.

Replacement contact supports (Part Number: 006118683P1) are available on a no-charge basis and should be ordered through your local GE district Sales Office. Requests for the contact supports must include:

- A. A reference to Service Advice No. 516.1
- B. Date codes of the relays for which the replacement contact supports will be used.

Installation of the contact support may be accomplished by following the steps outlined in Attachment A.

Replacement contact supports will be available through November 1, 1997.

Labor for installation of the contact support or relay are the responsibility of the purchaser.

### ATTACHMENT A - SA #516.1

The contact support should be replaced as follows: (Refer to Fig. 1)

1. Disengage the control spring from the armature end. (Note the groove location of the spring hook on the armature).
2. Remove the assembly screw with its lockwasher.
3. Remove the nameplate and spring housing assembly.
4. Remove the moving contacts from the contact support and note their location for correct reassembly.
5. Remove the contact support.
6. Install the new contact support. Make sure the armature is seated properly in the contact support.
7. Locate the moving contacts in the contact support.
8. Install the nameplate and spring housing assembly.
9. Tighten the assembly screw and lockwasher (16 in-lbs. approx.). Hold contact support and spring housing assembly together while tightening assembly screw.
10. Engage the control spring on the same groove on the armature of the relay.
11. Operate the armature of the relay by hand to make sure that there is no binding.
12. Electrically check, and adjust if needed, the pickup of the relay in accordance with instructions given in the Instruction Book of the particular relay model number.

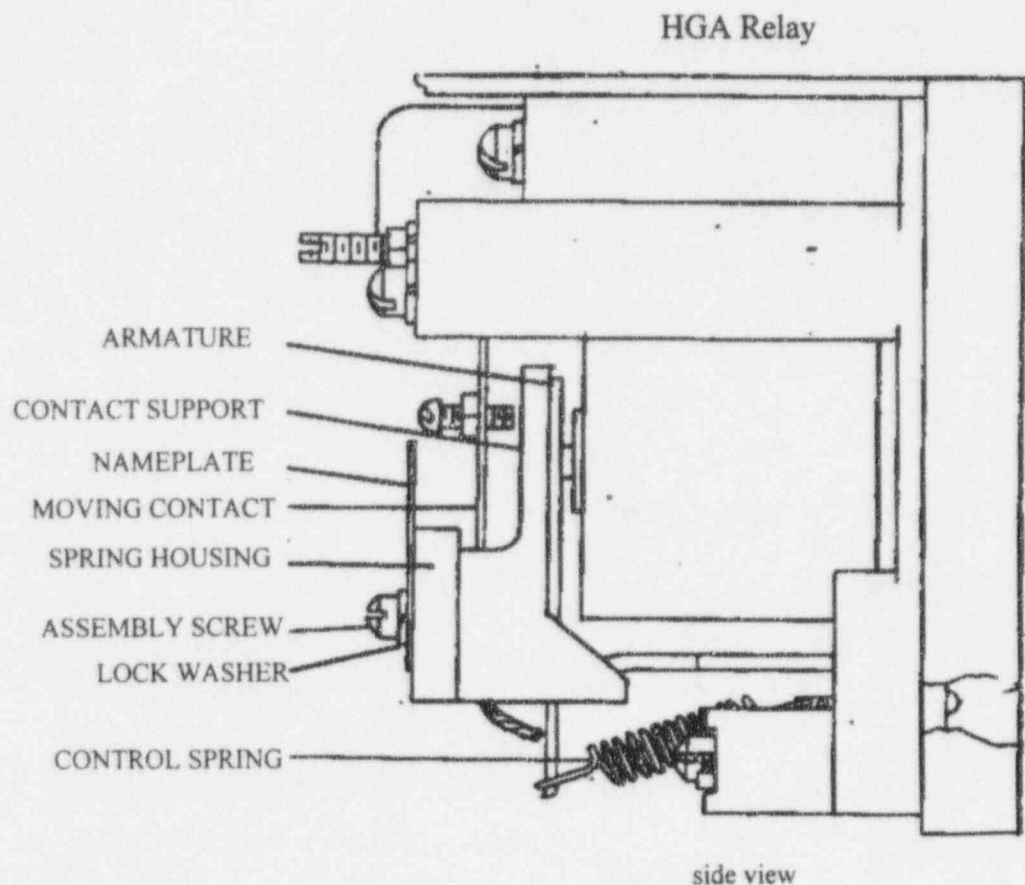


FIGURE 1