

April 19, 1990

Mr. Julian Wells
Quality Assistance Manager
Eberline Instrument Corporation
504 Airport Road
P.O. Box 210F
Santa Fe, New Mexico 87504-21-8

Dear Mr. Wells:

Enclosed for your information is a draft NRC information notice concerning the potential for dose-rate survey instruments underresponding to the true radiation fields. This draft information notice is based on a review of the DOE Safety Action Notice on the RO-2 series of instruments, Bicron's corrective actions as discussed in their letter, dated March 16, 1990 to NRC, and discussions between my staff and other technical experts on the subject. We encourage any comments concerning the technical and/or factual accuracy of information contained in the enclosed draft information notice by c.o.b. May 4, 1990.

In accordance with our policy this letter, along with its enclosures, will be placed in the Public Document Room. If you have any questions, please call me at (301) 492-1111 or Joseph Wang at (301) 492-1147.

Sincerely,

/s/
LeMoine J. Cunningham, Chief
Radiation Protection Branch
Division of Radiation Protection
and Emergency Preparedness
Office of the Nuclear Reactor Regulation

Enclosure:
As stated

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555
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Sincerely,

A handwritten signature in dark ink, which appears to read "LeMoine J. Cunningham", is written over the typed name.

LeMoine J. Cunningham, Chief
Radiation Protection Branch
Division of Radiation Protection
and Emergency Preparedness
Office of the Nuclear Reactor Regulation

Enclosure:
As stated



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

D R A F T

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

date

NRC INFORMATION NOTICE No. 90-XX: Dose-rate Survey
Instruments Underresponding To The True Radiation Fields

Addressees: ALL NRC Licensees

Purpose:

This information notice alerts addressees to potential problems resulting from dose-rate survey instruments underresponding to the true radiation fields. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate to avoid similar problems. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

The Department of Energy recently issued a Safety Action Notice that described an event where two Bicron RSO-5 dose-rate instruments underresponded by a factor of about 100 on the second (0-50 mR/h) range. The problem occurred when two health physics personnel were providing radiation protection coverage at a DOE contractor facility. A normal reading was observed on the dose-rate instrument's third range (0-500 mR/h). No personnel overexposure to radiation occurred due to these instrument failures. This type of problem can also occur for other instruments which have the same type of magnet arm switching design as the RSO-5.

The instruments were taken out of service and returned to the manufacturer. Bicron's examination confirmed the effect and found the cause of the failure to be improper positioning of the magnet which activates reed switches in the ion chamber. This magnet moves on a cam actuated arm attached to the range switch. Figure 1 gives typical magnet arm positions for the Bicron RSO series of instruments. At the zero position (one end) of the range switch rotation, the arm moves the magnet over the zero reed switch and shorts the electronics input for zeroing. Switching from zero to the first (0-5 mR/h) and second (0-50 mR/h) ranges, the cam moves the end of the magnet arm to the center position between the zero and high range reed switches, and neither reed switch is closed. If the magnet arm is not properly aligned with the cam at the point of contact, the extra room allowed (play) for movement of the

magnet arm with respect to the cam can result in the magnet at the other end of the magnet arm to be placed sufficiently past the center position to close the high range reed switch upon range switching between the first (0-5 mR/h) and the second (0-50 mR/h) lower two ranges even though the magnet arm is not supposedly to move.

Because of the possibility for the above mechanical problem, severe underresponse to the true radiation fields for these dose-rate survey instruments can occur as a result of switching between these lower two ranges. This is because when the high range reed switch is in the closed position, a different electronic circuit is actuated which reduces the sensitivity on these ranges by a factor of about 100, requiring a true dose-rate of 5,000 mR/h to produce a full scale deflection on the (0-50 mR/h) scale or a true dose-rate of 500 mR/h to produce a full scale deflection on the (0-5 mR/h) scale.

The Instrument Engineering Department of Bicron has added an additional quality assurance test to ensure the proper alignment of the magnet arm with respect to the reed switch. This test is to be performed during the final acceptance test of a new instrument and again prior to calibrating the new instrument for shipment.

Discussion of Safety Significance:

All licensees need to be aware of the potential for underresponse at the lower two ranges for all magnet arm switching dose-rate instruments. Failure (i.e. high range reed switch in the open position) at the high range settings (0-500 mR/h, 0-5,000 mR/h) can only result in overresponse of the instrument. If a licensee performing a survey with the instrument is not sure that he/she is in a high radiation field, the licensee can ensure that the instrument is not underresponding by switching first to the high range settings to quantify the upper limit of the radiation ~~field~~ before range switching to the lower range settings.

This type of instrument problem reinforces the benefits of source checking the instrument prior to use, consistent with good ALARA practices.

Licensees should also be aware that use of these type of magnet arm switching instruments in areas with high magnetic fields can inadvertently actuate the reed switches in the instrument without movement of the magnet arm. (ANSI N42.17A, Performance Specifications For Health Physics Instrumentation -Portable Instrumentation For Use In Normal Environmental Conditions.)

In addition to the Bicron Model RSO-5, we have identified that malfunctions may also occur for the following instruments:

Bicron Model RS0-50
Eberline Model R0-2
Eberline Model R0-2A

The Department of Energy Safety Action Notice has recommended that all magnet arm switching dose-rate instruments be inspected for proper alignment of the magnet arm and the presence of set screws to maintain the proper positioning of the magnet arm. For copies of revised maintenance procedures and other technical information concerning their instruments, contact the appropriate manufacturer at:

Bicron Corporation
12345 Kingman Road
Newbury, OH 44065
John Nedorest
(216) 564-8000

Eberline Instrument Corporation
504 Airport Road
P.O. Box 2108
Santa Fe, NM 87504-2108
Ed Bethel
(505) 471-3232 (Ext 654)

Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contact: Joseph C. Wang, NRR
(301) 492-1147

Attachments:

1. Figure 1, Typical Magnet Arm Position, RS0 Instruments
2. List o Recently Issued NRC Information Notices

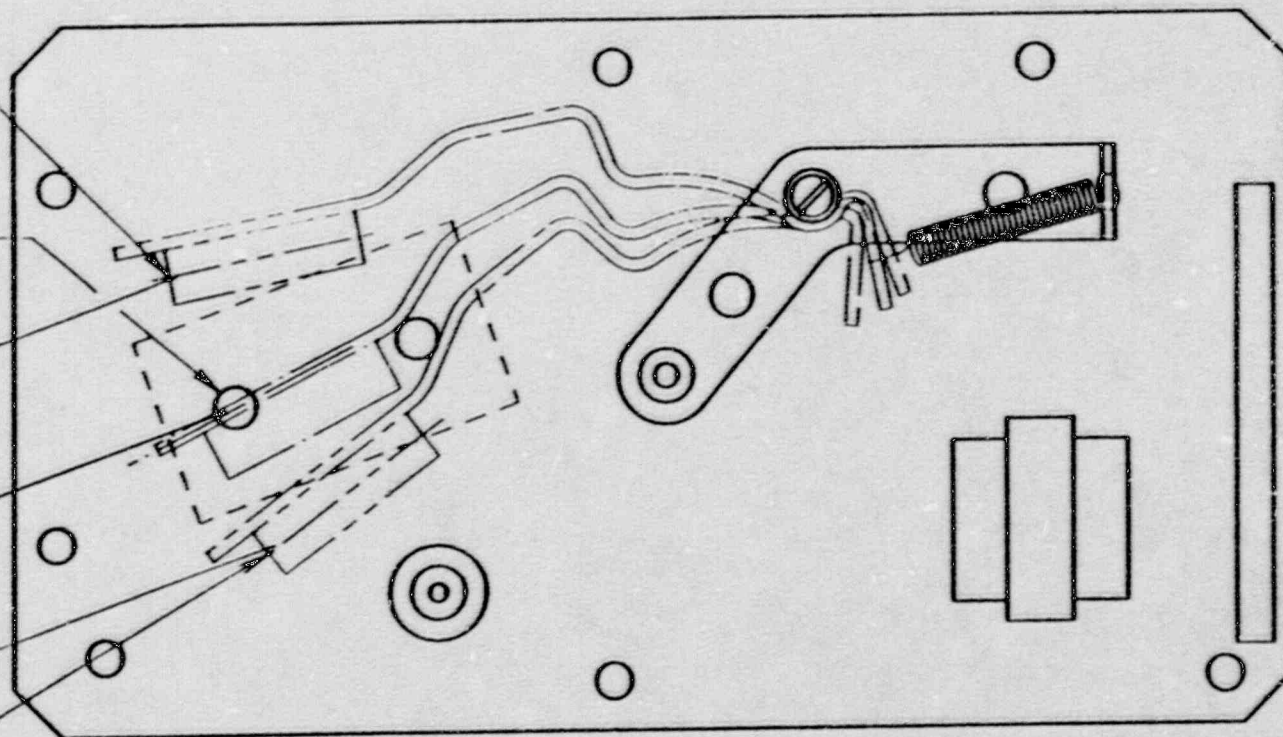
Typical "B"
Position For
Zero Reed
Switch Closure.

"A"

.375"
Min.

.375"
Min.

Typical "C"
Position For
High Range Reed
Switch Closure.



TOLERANCES UNLESS
OTHERWISE SPECIFIED

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