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PART 21 IDENTIFICATION NO. 80-205-002 COMPANY NAME Rosemount

DATE OF LETTER 4/17/80 DOCKET NO. _____

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ACTION:

PRELIMINARY EVUALATION OF THE ATTACHED REPORT INDICATES LEAD RESPONSIBILITY FOR FOLLOW-UP AS SHOWN BELOW:

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Rosemount

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April 17, 1980

80-205-002

U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellen, Illinois 60137

Attention: Mr. C.T. Oberg

Subject: Report of a Potential Application Problem of the Rosemount 1151 Pressure Transmitters with Output Codes A or D on your purchase order

Reference: 10CFR21.2

Gentlemen:

This report is being made as permitted by the referenced regulation in reference to a commercial grade item not subject to the regulations of 10CFR Part 21.

Accordingly, we are hereby providing you with our report detailing the currently available information. It should be noted that the transmitters meet all published specifications, but do present a potential applications problem.

Please feel free to contact the undersigned if you require further clarification or information relative to this report.

Sincerely,

D.W. Bulen
Product Manager
Nuclear Products
612 937 3465

DWB:gbg
Enclosure

MAY 1 1980

TECHNICAL EXPLANATION OF POTENTIAL 1151 OVERRANGE AND REVERSE PRESSURE PROBLEMS

Reverse Pressure

For any calibration within the limitation set forth in the instruction manual, when a differential pressure is applied from the low side of the sensor to the high side (i.e. reverse pressure), the output of the transmitter will drop below 4mA but subsequently may rise above 4mA as the magnitude of this differential pressure exceeds 140% of upper range limit. Reverse pressures of <140% of upper range limit will not cause this characteristic and output will always remain <4mA.

The 140% point is determined from the mechanical characteristics of the sensor. At >140% of URL the center diaphragm is bottomed out and the capacitance between the diaphragm and deposited plate is shorted out. This shorted condition causes the oscillator to draw more current, increasing from $\approx$0.7mA to $\approx$2-3mA or more. The rest of the circuit consumes about 1.5mA so total current increases from $\approx$2mA to 3.5mA or more.

The output stage of the 1151 A or D output uses a P channel FET to control the base current on a series pass transistor which in turn regulates the 4-20mA loop current. This FET requires a pinch-off voltage of from 3.0 to 5.5 from gate to source in order to shut off the pass transistor. When a reverse pressure condition occurs, the output current drops below 4mA. This starves the internal voltage regulator in the 1151 for current and internal supply voltage decreases to less than 5 volts. Output current is then determined by the equilibrium condition between internal and supply current, internal supply voltage and the gate to source voltage on the FET.

During reverse pressure of <140% of URL the equilibrium is always less than 4mA, because internal supply current demands are low. For reverse pressure conditions of $\geq$140% of URL, the equilibrium may be greater than 4mA because the oscillator current demands increase.

Overpressure

For any calibration as allowed in the 1151 instruction manual for overpressure conditions of $\geq$140% of URL, the output of the transmitter will exceed 20mA, but subsequently may drop below 20mA. Overpressures of <140% of URL will not cause this characteristic and output will always remain above 20mA.

At $\geq$140% of URL the center diaphragm is bottomed out and the capacitance between the center diaphragm and the deposited plate is shorted out. This shorted out condition causes the oscillator to begin oscillating with a modulated output. Oscillator current also increases from $\approx$ 0.7mA to >5mA. It is this secondary oscillation that may cause output to drop below 20mA.

Example of a Potential Application Problem

We envision that a problem could occur, for example, as follows: initially the over/under-range condition triggers an alarm. If the alarm is unlatched, the alarm condition will not be indicated once the transmitter reaches the region of ambiguous output, or, if the alarm is latched and "alarm acknowledge" is selected, the alarm will not reappear if the transmitter is operating in the ambiguous output region. In either event, the control system could receive an indication that the pressure is within range when in fact an over/under-range condition exists.

Proposed Corrective Action

The system should be analyzed in view of this report to determine if a potential application problem exists and appropriate corrections to the system should be implemented.