



Instrumentation & Controls Division
1350 Whitewater Drive.
Idaho Falls, ID 83402
(208) 497-3333

April 21, 2020

Attn: Document Control Desk
US Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SUBJECT: 10 CFR Part 21 Report Notification for Curtiss Wright Sciencetech certain RTL500 and RTL851 modules

Dear Madam or Sir:

The purpose of this letter is to inform the Nuclear Regulatory Commission about a defect in certain RTL 500 and RTL 851 modules

(i) Name and address of the individual or individuals informing the Commission.

Bart Humble
Sciencetech General Manager
Curtiss-Wright, Nuclear Division
1360 Whitewater Drive
Idaho Falls, ID 83402

(ii) Identification of the basic component supplied for such facility or such activity within the United States which fails to comply or contains a defect.

RTD, Thermocouple Low Level Amplifier Modules, manufactured by Sciencetech, Model RTL500, and RTL851, Part numbers NUS-A138PA and NUS-A135PA

(iii) Identification of the firm supplying the basic component which fails to comply or contains a defect.

Sciencetech, a business unit of Curtiss-Wright Flow Control Corporation
1350 Whitewater Drive
Idaho Falls, ID 83402

(iv) Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply.

Three RTL modules have been delivered to clients that may have included faulty resistors that could have remained undetected during functional testing.

MAY/MCY resistors are precision, low temperature coefficient, metal foil technology resistors used in circuits where stability with time and temperature is required. The MAY/MCY resistors are manufactured by Alpha Electronics, a Vishay Precision Group brand. The RTL module uses this style of resistor to achieve its accuracy and variable temperature effects specifications. Failures of MAY/MCY resistors began to occur with increasing frequency in the Sciencetech test process. The symptoms exhibited by faulty resistors were open circuit or changes in value in response to physical or thermal stress. The failures became numerous enough to suggest that there may be a manufacturing flaw in the resistors. Faulty resistors were sent to the manufacturer for failure analysis. The results of the failure analysis confirmed manufacturing defects in the faulty resistors. Cracks were discovered in the bond wires that connected the resistor leads to the resistor chip inside the resistor package.

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Equipment containing faulty MAY/MCY resistors can exhibit undesirable characteristics. The equipment deviate outside of its accuracy specification. The output from the equipment can exceed the temperature drift specifications. The faulty resistor may not be discovered initial testing and configuration. Instead, the faulty resistor may not appear until the equipment has been in service for some time.

Comparing the frequency of resistor failure with date code revealed a pattern. The failure rate of resistors manufactured in 2017 and 2018 was significantly greater than resistors manufactured in earlier years. Non-destructive screening techniques were used on recent production of equipment containing MAY/MCY resistors. The screening revealed 87 faulty resistors. The 87 faulty resistors were screened from a total number of 2585 MAY/MCY resistors in the production batches (3.4% failure rate). The 87 resistors are grouped by year of manufacture, based on date code, in the following table:

Year of Manufacture	Quantity of Failures
2014	2
2015	3
2016	1
2017	15
2018	66

A recent manufacturing process problem is suggested by the failure data with 93% of the faulty resistors having either a 2017, or 2018, date code.

The RTL module may be used in safety-related temperature measuring applications. It converts the resistance signal of an RTD sensor to a current signal that is a function of temperature. A module containing a faulty MAY/MCY series resistor could report inaccurate temperature information to the safety system.

MAY series resistors have been approved for use in RTL modules since 2004. The performance of the MAY series resistors in RTL module has been excellent. A search of the build records of RTL modules for MAY resistors with date codes falling in the 2017 to 2018 time interval resulted in three units. These three modules contain 10 k Ω resistors with date codes from 2017. There are two 10 k Ω resistors in an RTL module, R8 and R17 on the main circuit board assembly. Configured for an RTD input, only R8 is active. R8 sets the 1 mA excitation current for the RTD element. R17 is used in a voltage offset circuit that is only used in thermocouple and low level amplifier configurations.

(v) The date on which the information of such defect or failure to comply was obtained.

Submitted for evaluation 02/21/2020; evaluation completed 04/20/2020

(vi) In the case of a basic component which contains a defect or fails to comply, the number and location of these components in use at, supplied for, being supplied for, or may be supplied for, manufactured, or being manufactured for one or more facilities or activities subject to the regulations in this part.

Plant	Part Number	Quantity	Serial Numbers
Beaver Valley	NUS-A135PA-1/3	1	1800083
Indian Point 3	NUS-A138PA-3/13/W	1	1800334
Ginna	NUS-A138PA-1/4	1	1800666

(vii) The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action.

Contact Scientech-I&C-Repair@curtisswright.com to return these modules for further testing and rework, if necessary.

Non-destructive screening techniques to identify faulty MAY/MCY resistors have been successfully demonstrated. Rapidly cycling the ambient temperature of an operating assembly containing the resistors is one technique. Faulty resistors will cause erratic output measurements from the assembly as ambient temperature changes. Another technique is measuring resistance while applying pressure to the resistor body. A faulty resistor will have an unsteady resistance measurement with pressure applied. These techniques are being used on new equipment builds containing MAY/MCY resistors to screen faulty resistors.

(viii) Any advice related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.

A faulty MAY/MCY resistor not discovered during initial testing and configuration will eventually malfunction with time in service.

If the module has been in service for any significant amount of time with no problems, 12 weeks or more, then it is probable that R8, the only suspect resistor in the default configuration is not affected by this phenomenon. However, if the module has not seen significant service, then the module should be considered suspect. Additionally, if the module has been or could in the future be reconfigured to a low level amplifier or thermocouple application, then the same situation exists with R17, which is not used in the default configuration.

(ix) In the case of an early site permit, the entities to whom an early site permit was transferred.

Not applicable.

Should you have any questions regarding this matter, please contact:

Shanen Onken
Scientech Business Segment Manager
Curtiss-Wright Nuclear Division
sonken@curtisswright.com
Tel 208-497-3410, Cell 208-821-4054

Sincerely,



Bart Humble
Scientech General Manager
Curtiss-Wright, Nuclear Division
1360 Whitewater Drive
Idaho Falls, ID 83401

10CFR21 Evaluation No. 21-20-01 Rev. 0

Background

The I&C division of Sciencetech, a business unit of Curtiss Wright Flow Control Services Corporation, provides safety related instrumentation to commercial nuclear power plants for use in safety related applications.

Problem Reported On: 01/29/2020	Problem Documented In: CR201282
Description of Item: MAY and MCY series metal foil resistors from Alpha Electronics, a Vishay Precision Group brand	
<p>Description of Issue: Curtiss Wright has observed an increase in the failure rate of MAY and MCY resistors. The failure rate has been approximately 2%. This failure rate translates to one or two faulty resistors on a printed circuit board assembly with 50 of these resistors installed. A faulty resistor causes a spectrum of symptoms in an assembled circuit ranging from excessive drift with temperature, to excessive drift with time, to erratic output, to hard failure. At the component level the faulty resistors have unstable resistance values. The measured resistance will vary from a satisfactory value to open circuit. The value is observed to change when the faulty resistor is exposed to mechanical or thermal stress. Because the faulty resistor values are intermittent, the faulty resistors may not be discovered by the usual regimen of functional testing and burn-in.</p> <p>The manufacturer performed a failure analysis on a sample of the faulty resistors. The cause of the erratic resistance values was a cracked bond wire inside the resistor package. The cracked wire connected the resistor element to the package lead.</p> <p>MAY and MCY resistors are metal foil, stable, precision, low temperature coefficient resistors. These resistors are used in circuits where stability with time and temperature are important. Curtiss Wright uses this type of resistor in designs which require large gain such as the TCM series of thermocouple amplifiers and the RTL series of RTD amplifiers.</p>	
<p><i>ML12248A200: ...an item is delivered when the purchaser has accepted the item following the completion of a receiving inspection. [Specifically], completion of receipt inspection marks acceptance and the point of delivery.</i></p>	
<p>Has an item with the issue been delivered to a plant as a safety-related item? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	
<p align="center">IF NO, PROCEED TO CONCLUSION SECTION IF YES, INCLUDE PLANT INFORMATION AND CONTINUE</p>	
<p>Plants: Indian Point 3 Beaver Valley Ginna</p>	
<p>10CFR21: <u>Deviation</u> means a departure from the technical requirements included in a procurement document, or specified in early site permit information, a standard design certification or standard design approval.</p>	
<p>Is the problem a <u>deviation</u>? (include justification for answer) Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	
<p>Justification: Circuit board assemblies with faulty MAY or MCY resistors can fail to meet design specifications. Failure to maintain accuracy specification is possible. Drift with temperature greater than the variable temperature effect specification is possible.</p>	
<p align="center">IF NO, PROCEED TO CONCLUSION SECTION IF YES, CONTINUE</p>	
<p>10CFR21: <u>Defect</u> means:</p> <p>(1) A deviation in a basic component delivered to a purchaser for use in a facility or an activity subject to the regulations in this part if, on the basis of an evaluation, the deviation could create a <u>substantial safety hazard</u>;</p> <p>(2) The installation, use, or operation of a basic component containing a defect as defined in this section;</p> <p>(3) A deviation in a portion of a facility subject to the early site permit, standard design certification, standard design approval, construction permit, combined license or manufacturing licensing requirements of part 50 or</p>	

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part 52 of this chapter, provided the deviation could, on the basis of an evaluation, create a substantial safety hazard and the portion of the facility containing the deviation has been offered to the purchaser for acceptance;

(4) A condition or circumstance involving a basic component that could contribute to the exceeding of a safety limit, as defined in the technical specifications of a license for operation issued under part 50 or part 52 of this chapter; or

(5) An error, omission or other circumstance in a design certification, or standard design approval that, on the basis of an evaluation, could create a substantial safety hazard.

10CFR21: Substantial safety hazard means a loss of safety function to the extent that there is a major reduction in the degree of protection provided to public health and safety for any facility or activity licensed or otherwise approved or regulated by the NRC.

Can Sciencetech determine if the deviation is a defect?

Yes ☒ No ☐

IF NO, PROCEED TO CONCLUSION SECTION

IF YES, CONTINUE

Is the deviation a defect? (include justification for answer)

Yes ☒ No ☐

Justification:

The TCM series of thermocouple amplifiers and RTL series of RTD amplifiers may be used for safety related temperature measurement. The presence of a faulty resistor in one of these modules could result in inaccurate, or erratic, temperature indication.

Note: If it is determined that the deviation is a defect, ensure that a director or responsible officer subject to the regulations of 10CFR Part 21 is informed as soon as practicable, and, in all cases, within the 5 working days after completion of the evaluation.

CONCLUSION

- 1 - ☐ There is no deviation. No report is required.
- 2 - ☐ There is a deviation, but it does not exist in any safety-related item delivered to a plant. No report is required.
- 3 - ☐ There is a deviation, but it does not constitute a defect. No report is required.
- 4 - ☐ There is a deviation, but Sciencetech cannot determine if it is a defect. Forward to purchaser(s) for evaluation within 5 working days.
- 5 - ☒ There is a defect. Report to the NRC per 10CFR21 within 2 calendar days of notifying the responsible officer of the organization.

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Engineering: Signature / Date

Rodger W. Carpenter 04/19/2020
Print Name: Rodger W. Carpenter, Senior
Title: Electrical Engineer

Technical
Review:

Signature / Date

Nick Merrigan 4/19/20
Print Name: Nick Merrigan
Title: Engineering Supervisor

Quality
Assurance: Signature / Date

Dan Hunt 4/20/2020
Print Name: Dan Hunt
Title: Sr. Manager, Quality Assurance

Approved:

Signature / Date

Shan Onken 4-20-20
Print Name: Shanen Onken
Title: Division Manager
Approval required for Category 4 and 5 only.

NOTE: For Category 5, a defect is determined upon the signature of the Division Manager or his designee.