

August 18, 2017

Charles Elias, Quality Manager
Pennatronics Corporation
75 Technology Drive
P.O. Box 638
California, PA 15419

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION OF PENNATRONICS CORPORATION REPORT NO. 99901481/2017-201

Dear Mr. Elias:

On July 10 to July 13, 2017, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Pennatronics Corporation (Pennatronics) facility in California, PA. The purpose of the limited-scope inspection was to assess Pennatronics' compliance with the provisions of selected portions of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," 10 CFR Part 21, Reporting of Defects and Noncompliance."

During this inspection, the NRC staff evaluated aspects of Pennatronics' fabrication and testing of build-to-print circuit boards, nonconformance, corrective action (CA), and commercial grade dedication program implementation. These activities were associated with current and completed activities related to purchase orders for Westinghouse AP1000 components parts and services, as well as for the operating fleet. The enclosed report presents the results of this inspection. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance (QA) or 10 CFR Part 21 programs.

Based on the results of this inspection, the NRC inspection team found that the implementation of your QA program meets NRC requirements imposed on you by your customers or NRC licensees. Within the scope of this inspection, no violations or nonconformances were identified. No response is required.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's Rules of Practice, a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system, Agencywide Documents Access and Management System, which is accessible from the NRC Web site at <http://www.nrc.gov/readingrm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material is withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your

claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Sincerely,

/RA/

Terry W. Jackson, Chief
Quality Assurance Vendor Inspection Branch-1
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99901481

Enclosure:
Inspection Report No. 99901481/2017-201
and Attachment

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION OF PENNATRONICS CORPORATION REPORT NO. 99901481/2017-201

Dated: August 18, 2017

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**U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS
DIVISION OF CONSTRUCTION INSPECTION AND OPERATIONAL PROGRAMS
VENDOR INSPECTION REPORT**

Docket No.: 99901481

Report No.: 99901481/2017-201

Vendor: Pennatronics Electric Company, LLC

Vendor Contact: Charles Elias, Quality Manager
Pennatronics Corporation
75 Technology Drive
P.O. Box 638
California, PA 15419
Email: celias@pennatronics.com

Nuclear Industry Activity: Pennatronics scope of supply includes build-to-print electronic assembly contract manufacturing of safety-related components including fabrication, testing, and delivery for the AP1000 new reactor combined license holders and applicants, and current operating fleet.

Inspection Dates: July 10-13, 2017

Inspection Team Leader: Greg Galletti NRO/DCIP/QVIB-1

Inspectors: Lisa Castelli R-II/DCI/CIB1
Aaron Armstrong NRO/DCIP/QVIB-1
Philip Natividad NRO/DCIP/QVIB-1

Approved by: Terry W. Jackson, Chief
Quality Assurance Vendor Inspection Branch-1
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Enclosure

EXECUTIVE SUMMARY

Pennatronics Electric Company
99901481/2017-201

The U.S. Nuclear Regulatory Commission (NRC) staff conducted this vendor inspection to verify that Pennatronics Electric Company, LLC (hereafter referred to as Pennatronics), implemented an adequate quality assurance program that complies with the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, and "Domestic Licensing of Production and Utilization Facilities," 10 CFR Part 21, "Reporting of Defects and Noncompliance." The inspectors conducted this inspection at the Pennatronics facility in California, Pennsylvania, on July 10-13, 2017.

This inspection evaluated aspects of Pennatronics' programs for the fabrication and testing of build-to-print circuit boards for use in nuclear safety-related system applications. The enclosed report presents the results of this inspection. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance (QA) or 10 CFR Part 21 programs.

During this inspection, the NRC staff evaluated aspects of Pennatronics' fabrication and testing of build-to-print circuit boards, and nonconformance, corrective action (CA), and commercial grade dedication (CGD) program implementation. These activities were associated with current and completed activities related to purchase orders for Westinghouse AP1000 components parts and services, as well as, the current operating fleet.

The following regulations served as the bases for this NRC inspection:

- Appendix B to 10 CFR Part 50
- 10 CFR Part 21

The inspectors used Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated July 15, 2013, and IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated January 27, 2017.

The information below summarizes the results of this inspection.

Design Requirements Translation and Integration

The inspectors concluded that Pennatronics' implementation of their policy and procedures for control of design requirements for fabrication of build-to-print circuit boards satisfy the regulatory requirements set forth in Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Commercial-Grade Dedication Program

The inspectors concluded that Pennatronics' implementation of their policy and procedures for CGD activities associated with build-to-print circuit boards and other equipment satisfy the regulatory requirements set forth in Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services." No findings of significance were identified.

Inspection

The inspectors concluded that Pennatronics' implementation of their policy and procedures for control of inspection activities associated with the build-to-print circuit boards satisfies the requirements of Criterion X, "Inspection," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Test Control

The inspectors concluded that Pennatronics' implementation of their policy and procedures for the control of testing activities associated with build-to-print circuit boards satisfy the regulatory requirements set forth in Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Non-Conformance and Corrective Action Program Implementation

The inspectors concluded that Pennatronics' implementation of their policy and procedures for the control of nonconforming items and corrective action activities associated with build-to-print circuit boards satisfy the regulatory requirements set forth in Criterion XV, "Control of Nonconformance," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

REPORT DETAILS

1. Design Requirements Translation and Integration

a. Inspection Scope

The inspectors reviewed a sample of purchase orders (POs) for electronic subcomponent assemblies procured by Westinghouse for use in safety-related systems. Inspectors reviewed Westinghouse Procedures QSP-201 and Westinghouse Business Policy BMS-SCM-10 regarding administrative controls required by the PO, as well as the required technical design material and assembly specifications in Westinghouse drawings. Inspectors verified that the sampled requirements were appropriately translated to Pennatronics' assembly travelers and work instructions. In addition, the inspectors evaluated the implementation of Pennatronics' design control process associated with the component interface module (CIM), safety remote node controller (SRNC), and Solid state Protection system (SSPS) Modules fabrication and assemblies.

The inspectors reviewed Pennatronics' process for preparation of fabrication drawings, and travelers, and the translation of quality and technical requirements into Pennatronics' procedures and process controls for PO 4500630849 – AP1000 CIM Assembly, PO 4500679796 – SRNC Module assembly, and PO 4500693984 – SSPS Series UVD. The NRC inspector's verified that the materials used in the construction of these assemblies appropriately conform to the material specification identified in the design drawing and the design conforms to code. In addition, the NRC inspection team verified Pennatronics design change process per Procedure QOP 42-04, "Change Notice," Revision 4, dated June 27, 2016, by reviewing changes initiated by Westinghouse and verified these initiated changes were performed in accordance with the approved Pennatronics procedure.

The NRC inspectors observed wave soldering per Work Order 0020040601, "6D30818G07, 7300 NAL Signal comparator cards," Revision 7, for PO 4500711489, "NAL Card, 7300 Redesigned, Signal comparator," dated January 16, 2017. The NRC inspections team also observed the pre-burn-in testing per Work Order 0020041266, "10060D44G01, Firing Circuit cards, ROD," for PO 4500717859, "Card, Firing Circuit," dated March 23, 2017.

The inspectors reviewed Pennatronics' Procedure QOP 74-03 Revision 7, dated January 3, 2012, that governed the control of purchased items for PO 4500630849 – AP1000 CIM Assembly, PO 4500679796 – SRNC Module assembly, and PO 4500693984 – SSPS Series UVD. The NRC inspectors also reviewed Certificate of Conformance (CofCs) and Nonconformance reports associated with the AP1000 CIM Assembly.

Inspectors observed Pennatronics' automated and manual manufacturing and inspection processes for individual steps of assembly travelers. Component traceability from inventory to loading of the automated feeder magazines, as well as setup of the automated surface mount technology machine, was observed.

Inspectors also reviewed Pennatronics' Procedures QOP-42-04 and QOP-4304-01 regarding administrative controls requiring evaluation of design changes.

A listing of documents reviewed and personnel interviewed is included in the attachment to this report.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors concluded that Pennatronics' implementation of their policy and procedures for control of fabrication of build-to-print circuit boards satisfy the regulatory requirements set forth in Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

2. Commercial-Grade Dedication Program (CGD)

a. Inspection Scope

The inspectors reviewed Westinghouse Commercial Grade Instructions (CGIs) associated with the sampled POs. Since Westinghouse retains design authority for the components, and Pennatronics only provides build-to-print manufacturing of these subcomponents. Westinghouse completes any associated CGIs and CGD process following their receipt of these subcomponents from Pennatronics. Furthermore, as an Appendix B supplier on Westinghouse's Qualified Supplier List, Pennatronics can be considered to provide Appendix B subcomponents wherein CGD is not required to be completed at Pennatronics.

For certain CGIs, where a portion of stated critical characteristics were indicated to be verified at Pennatronics, such as pre-assembly dimensional checks and post-burn-in functional tests, the inspectors reviewed a sample of the documented dedication acceptance activities, and found those documented evaluations were adequate. The inspectors interviewed assembly technicians and inspectors on the shop floor. Since Pennatronics does not create a sampling population for dedication and instead performs post-assembly tests on 100 percent of their safety-related manufactured components, NRC inspectors did not review any dedication sampling plan of completed lots/batches.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors concluded that Pennatronics' implementation of their policy and procedures for control of fabrication of build-to-print circuit boards satisfy the regulatory requirements set forth in Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

3. Inspection

a. Inspection Scope

The inspectors observed receipt inspection activities associated with a CIM input board (Pennatronics Part Number 305-0020736). The inspectors confirmed the technician implemented Procedure REC INSP-03, "Receiving Inspection Plan," which referenced Procedure IPC-A-600, "Receiving Inspection," for performance of dimensional and visual inspection activities. For this receipt inspection activity, 100 percent of the bare boards were inspected. The inspectors confirmed the measurement equipment consisting of a digital thickness gauge (Serial Number 004858) and digital caliper (Serial Number 8351279), were within current calibration specifications and suitable for the dimensional measurement activities based on a review of the respective certificates of calibration. The inspectors confirmed the inspection was performed using the proper revision of the design drawings and that recorded measurement values and associated measurement and test equipment (M&TE) were adequately documented on the receipt inspection forms.

The inspectors also reviewed Commercial Grade Survey (CGS) #1509001 performed by Pennatronics of the manufacturer of the printed circuit boards under inspection. The CGS was performed in accordance with Pennatronics Operational Procedure QOP-4307-01-1, "Commercial Grade Survey Plan," and associated CGS form. The inspectors confirmed the plan identified specific critical characteristics (CCs) of interest and associated acceptance criteria related to the specific controls on the scope of supply by the vendor. CC's included, but not limited to, procurement control, material identification and control, manufacturing and production, inspection and test, and M&TE were specifically evaluated.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors concluded that Pennatronics' implementation of their policy and procedures for control of build-to-print circuit boards satisfy the regulatory requirements set forth in Criterion XII, "Inspection," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

4. Test Control

a. Inspection Scope

The NRC inspection team reviewed policies, purchase order requirements and procedures associated with build-to-print services and safety related inspection and testing of printed circuits boards to verify compliance with Criterion XI, "Test Control," of Appendix B. The review included documentation associated with Component Interface Module Safety Related Node Controller (CIM-SRNC) subsystem assemblies for Westinghouse Electric Company PO 4500630849. In addition, the team observed in-process testing for additional purchase orders.

The NRC inspection team reviewed Procedure QSP-201, "Westinghouse Quality Specification for Procurement, Services Associated with Build-to-print Printed Circuit Board (PCB) Assemblies," Revision 7, dated February 2015, to assess assembly, test and inspection requirements for the implementation of PO 4500630849.

Per Procedure QSP Section 1.5,"Inspection," personnel performing inspection on Westinghouse items shall have an annual vision examination. The NRC inspection team reviewed Pennatronics Quality Operating Procedure, QOP-82-05, "Inspector Annual Eye Exam," to confirm it was consistent with the Westinghouse specification and to verify completion by reviewing a sample of visual exam records of personnel performing acceptance inspections. Per Procedure QSP-201, Section 1.5.2, "In-Process Inspections," PCB assemblies shall be inspected to meet the requirements of the Institute of Printed Circuits Standard, IPC-A-610. The team observed an in-process ball-grid arrays (BGA) X-ray Inspection 940-0024816-QC03, "R100NA Host Board," Revision 4 and sampled records to confirm the in-process inspection was performed by an inspector certified to Standard IPC-A-610 and trained per Pennatronics Work Instruction, WI-SMT-41, "NIS NXR-1525 X-Ray Working Instruction."

Per Procedure QSP-201, Section 1.4, "Assembly and Test," Pennatronics performed a series of tests in accordance with the Westinghouse procurement package. The inspection team sampled the quality data package to verify completion of the test scope as defined in the Westinghouse PO 4500630849. Specifically, the inspection team reviewed a sample of the results of in-circuit tests (ICT), BGA X-ray inspections, and functional tests to confirm the tests were adequately performed and documented.

The NRC inspection team observed in-process ICT Procedure, 940-0020810-CT01, "Sonix Main ICT," Revision 15. The purpose of the procedure is to verify correct placement and connectivity of components attached to the PCB assembly using the Agilent 3070. During performance of the procedure, the test technician identified an assembly failure. The NRC inspection team reviewed Procedure QOP-82-04, "In-Process, Test and Final Inspection Procedure," to confirm the test technician performed and adequately documented the finding on the process inspection Form QOP-82-04-1 and that the assembly was retested in accordance with the original testing requirements.

The NRC inspection team reviewed Engineering Deviation Request EDR #0916 to confirm it was initiated, completed and implemented in accordance with Procedure QOP-42-05, "Engineering Deviation," Revision 4. The inspectors reviewed the associated change notice, change notice review form, certificate of conformance, printed circuit board test report, and final inspection documentation. For the sample selected, the NRC inspectors confirmed the engineering deviation was adequately processed and completed.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team determined that Pennatronics implementation of its policies and procedures associated with test control satisfy the regulatory requirements set forth in Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50 based on the limited number of samples reviewed. No findings of significance were identified.

5. Nonconformance Program Implementation

a. Inspection Scope

The inspectors reviewed Procedure QOP-83-01, "Control of Nonconforming Product," Revision 13, dated June 8, 2017, to verify the vendors program provided adequate guidance for the identification, segregation, evaluation, and disposition of nonconforming items identified during receipt, production, testing, and final inspection.

The inspectors performed a walkdown of the facility nonconforming material reports (NCMRs) hold areas and verified the items segregated in those areas were adequately identified and accompanied by a populated NCMR form. The areas were adequately demarcated and physically separated from the production stock to minimize opportunity for inadvertently reintroducing nonconforming items into production.

The inspectors reviewed a sample of NCMRs to verify the vendor was actively identifying, documenting, evaluating, and correcting nonconforming conditions prior to and during production activities. The inspectors evaluated NCMRs identified from a range of activities including, receipt of material, stockroom activities, production, and testing.

- NCMR No. 9168, Installation Error or Damage, dated April 1, 2016
- NCMR No. 9766, Supplier Defect or Specification Issue, dated December 5, 2016
- NCMR No. 8868, Supplier Defect or Specification Issue, dated January 5, 2016
- NCMR No. 9446, Installation Error or Damage, dated July 21, 2016
- NCMR No. 10022, Damaged Handling, dated March 9, 2017
- NCMR No. 9483, Assy Failed Test, dated August 2, 2016
- NCMR No. 10042, Supplier Defect or Specification Issue, dated March 15, 2016
- NCMR No. 9243, Supplier Defect or Specification Issue, dated May 5, 2016
- NCMR No. 10042, Assy Failed Test, dated March 24, 2016
- NCMR No. 9138, Assy Failed Test, dated March 24, 2016
- NCMR No. 10057, PEM Issue, dated March 21, 2017
- NCMR No. 9074, Assy Failed Test, dated March 4, 2016

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors concluded that Pennatronics' implementation of their policy and procedures for control nonconforming items satisfy the regulatory requirements set forth in Criterion XV, "Control of Nonconforming Items," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

6. Corrective Action Program Implementation

a. Inspection Scope

The inspectors reviewed Procedure QOP-85-02, "Corrective and Preventive Actions," Revision 5, dated June 20, 2013, and Procedure QOP-85-03, "Supplier Corrective Action," Revision 4, dated March 2, 2015, to verify the vendors program provided adequate guidance for the identification, evaluation, and disposition of nonconforming items identified, but not limited to, results of process, product or system nonconformance, customer returns, external or internal audits, product recalls, or trends of quality problems.

The inspectors evaluated Pennatronics' implementation activities regarding corrective action identification and resolution. Specifically, the inspectors sampled several completed and ongoing supplier corrective action reports (SCARs) and corrective/preventive action notices (CPANs) to confirm the vendor was documenting nonconforming conditions and corresponding resolution activities. The inspectors confirmed that SCARs and CPANs require consideration of 10 CFR Part 21 applicability for nonconforming conditions associated with those reports and notices.

- CPAN No. 15020, Misaligned Relay, dated July 23, 2015
- CPAN No. 16017, EDS Control, dated February 24, 2016
- CPAN No. 16020, Assembly Damaged During Testing, dated March 22, 2016
- CPAN No. 16043, Calibration Service Suppliers, dated January 1, 2017
- SCAR No. 1506001S, Date Code Formatting, dated June 29, 2015
- SCAR No. 1511001S, Incorrect Splicing of Reel, dated November 12, 2015
- SCAR No. 1602004S, WAVE Process Anomalies, dated February 17, 2016
- SCAR No. 1705001S, Commercial Grade Survey Issues, dated April 27, 2017
- SCAR No. 1502002S, Wrong Part Received, dated January 27, 2015

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The inspectors concluded that Pennatronics' implementation of their policy and procedures for corrective actions satisfy the regulatory requirements set forth in Criterion XVI, "Corrective Actions," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

7. Entrance and Exit Meetings

On July 10, 2017, the inspectors presented the inspection scope during an entrance meeting with Mr. Charles Elias, Quality Manager, Pennatronics, and other Pennatronics personnel. On July 13, 2017, the inspectors presented the inspection results during an exit meeting with Mr. Charles Elias, Quality Manager, Pennatronics, and other Pennatronics personnel.

ATTACHMENT

1. PERSONS CONTACTED AND NRC STAFF INVOLVED:

Name	Affiliation	Entrance	Exit	Interviewed
Charles Elias	Pennatronics	X	X	X
David Spehar	Pennatronics		X	X
Jason Emes	Pennatronics	X	X	X
Stephen Parfitt	Pennatronics	X		
Ian Mihalo	Pennatronics	X	X	X
Ivan Ivanov	Pennatronics	X	X	X
John Burrell	Pennatronics			X
Jim Dillinger	Pennatronics			X
Jane Guthrie	Pennatronics			X
Bill Boger	Pennatronics			X
Rick Craig	Pennatronics			X
Stan Clish	Pennatronics			X
Louis Iannotta	Pennatronics			X
Donna Secleter	Pennatronics			X
Kevin Cyr	Pennatronics			X
Heith Kutty	Pennatronics			X
Greg Galletti	NRC	X	X	
Lisa Castelli	NRC	X	X	
Aaron Armstrong	NRC	X	X	
Philip Natividad	NRC	X	X	

2. INSPECTION PROCEDURES USED:

IP 43002, "Routine Inspections of Nuclear Vendors," dated July 15, 2013

IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated January 27, 2017

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED:

Item Number	Status	Type	Description	Applicable ITAAC
None	N/A	N/A	N/A	N/A

4. DOCUMENTS REVIEWED:

Procedures

- QSP-201, "Quality Specification for Procurement, Services Associated with Build-to-Print Printed Circuit Board Assemblies", Revision 7, dated February 2015
- QOP-82-04," In-Process, Test and Final Inspection," Revision 14
- QOP-42-05, "Engineering Deviation," Revision 4, dated December 1, 2011
- QOP-4304-01, "P.O. Procurement Plan", Revision 6, dated February 13, 2015
- QOP-62-01, "Training and Awareness," Revision 8, dated June 27, 2017
- QOP-62-01-1,"Training Roster WI-SMT-241, SMT Inspector," Revision 4, dated June 6, 2016
- QOP-82-04, "In-Process, Test and Final Inspection," Revision 14, dated June 9, 2017
- QOP-82-05, "Inspector Annual Eye Exam," Revision 1, dated November 23, 2010
- QOP-82-05-01, "Eye Exam form," Revision 2, Test Technician, dated January 30, 2017; June 6, 2017; and June 8, 2017
- QOP-83-01, "Control of Nonconforming Part," Revision 13, dated June 8, 2017
- Westinghouse Business Policy BMS-SCM-10, "Administrative Specification for the Procurement of Items and Services 54823", Revision 0.10, dated December 15, 2014

Purchase Orders

- PO 4500679796, "CIM, Logic/Feedback Y Port", dated October 30, 2015
- PO 4500679796, Change Notice 1, dated June 13, 2017
- PO 4500693984, "Upgraded Undervoltage Driver Board", dated May 19, 2016
- PO 4500693984, Change Notice 001, dated August 15, 2016
- PO 4500706031 Change Notice 002, Line item 25, dated October 26, 2016
- PO 4500706031, Change Notice 002, Certificate of Conformance, lot number 1634401, dated March 21, 2017
- PO 4500706031 Change Notice 002, change notice review form, dated March 14, 2017
- PO 4500706031, "Printed Circuit Card Test Report Assembly 10060d44G01 board," Revision 3, post burn, dated March 20, 2017
- PO 4500717859, "Card, Firing Circuit, dated March 23, 2017
- PO 4500711489, "NAL, Card 7300 Redesigned, Signal Comparator," dated January 16, 2017
- PO 4500630849," CIM base, CIM module, SRNC module and SRNC base, Termination units and Transition panel," dated February 14, 2014

Drawings

- Westinghouse Drawing 3D91161, "Component Interface Module (CIM) Assembly", Revision 4
- Westinghouse Drawing 3D91162, "Component Interface Module (CIM) Base Assembly", Revision 4
- Westinghouse Drawing 2C48022, "CIM Backplane Assembly & Schematic," Revision 12

- Westinghouse Drawing 2C48631, “Component Interface Module (CIM) Priority Logic Card Assembly and Schematic”, Revision 2
- Westinghouse Drawing 2C48632, “Component Interface Module (CIM) Field Interface Card Assembly and Schematic”, Revision 2
- Westinghouse Drawing 2C48030, “CIM Backplane Artwork”, Revision 4
- Westinghouse Drawing 2C48030, “CIM Backplane Artwork”, Revision 3
- Westinghouse Drawing 2C48030, “CIM Backplane Artwork”, Revision 2
- Westinghouse Drawing 2C48635, “Component Interface Module (CIM) Field Interface Card Artwork”, Revision 1
- Westinghouse Drawing 2C48635, “Component Interface Module (CIM) Field Interface Card Artwork”, Revision 0
- Westinghouse Drawing 3D91485, “Undervoltage Driver Board Artwork”, Revision 6
- Westinghouse Drawing 6D30350, “Under Voltage Driver Board Assembly Index”, Revision 9
- WEC DWG 5105-20000, “Component Interface Module (CIM) Assembly,” Revision 10
- WEC DWG 5105-10000, “Safety Remote Node Controller (SRNC) Assembly Drawing,” Revision 5
- WEC DWG 5105-10000, “Safety Remote Node Controller (SRNC) Assembly Drawing,” Revision 4
- WEC DWG 5105-31100, “Component Interface Module (CIM) Baseplate PCB Assembly,” Revision 3
- WEC DWG 5105-31100, “Component Interface Module (CIM) Baseplate PCB Assembly,” Revision 4
- WEC DWG 5105-31100, “Component Interface Module (CIM) Baseplate PCB Assembly,” Revision 5
- WEC DWG 5105-20300, “Component Interface Module (CIM) Output PCB Assembly,” Revision 5
- WEC DWG 5105-20300, “Component Interface Module (CIM) Output PCB Assembly,” Revision 6
- WEC DWG 5105-20300, “Component Interface Module (CIM) Output PCB Assembly,” Revision 7
- WEC DWG 2C48498, “CIM/SRNC Final Assembly,” Revision 15

Travelers and Work Instructions

- Assembly Traveler for WO 0020038063, Lot Number 1611206, “CIM Command PCBA 5105-20100G01,” Revision 7
- Assembly Traveler for WO 0020037017, Lot Number 1605608, “CIM Input PCBA 5105-20200G01,” Revision 6
- Assembly Traveler for WO 0020037016, Lot Number 1605312, “CIM Output PCBA 5105-20300G01,” Revision 7
- Assembly Traveler for, WO 0020037013, Lot Number 1604908, “SRNC Command PCBA 5105-10100G01,” Revision 7
- Assembly Traveler for Work Order 020037567, “3D91162G01, CIM BASE MODULE ASSEMB”
- Doc. Number 940-0010678-MI4501, “3D91162G01 CIM Base Assembly,” Revision 4, dated July 18, 2013

- Doc. Number 940-0010678-QC01, "Final Inspection", Revision 4, dated July 18, 2013
- Assembly Traveler for Work Order 0020037660, "2C48631G02, CIM PRIORITY LOGIC, YPOR"
- Work Instruction SMT-103, "SMT Feeder Component Verification", Revision 14, dated March 21, 2017
- Doc. Number 940-0020401-MI1502, "SMT Verification - Bottom", Revision 2, dated March 11, 2015
- Doc Number 940-0020401-MI1504, "SMT Verification - Top", Revision 2, dated March 11, 2015
- Doc Number 940-0020401-QC03, "Final Inspection", Revision 2, dated March 17, 2015
- Assembly Traveler for Work Order 0020038787, "6D30350G01, UNDER VOLTAGE DRIVER B", date completed August 30, 2016
- Doc. Number 910-0011645-MI4001, "Second Op", Revision 9, dated December 10, 2010
- Doc. Number 910-0011645-FT01, Functional Test Procedure "6D30350G01 Under Voltage Driver (UVD)", Revision 9-2, dated September 14, 2011
- Doc. Number 910-0011645-QC03, Revision 9
- SMT-241, "NIS NXR-1525 X-Ray Work Instruction," Revision 2, dated May 20, 2016
- WI-SMT-41, "NIS NXR-1525 X-Ray Working Instruction," Revision 2, dated May 20, 2016
- Doc. Number SMT-103, "SMT Feeder Component Verification", Revision 14, dated March 21, 2017
- Doc. Number SMT-235, "Panasonic CM602-L Intelligent Tape Feeder Set-up and Operation", Revision 1, dated July 28, 2010
- Doc. Number SMT-232, "Panasonic CM602 Set-Up", Revision 1, dated June 26, 2014
- Work Order# 0020041266, "10060D44G01, Firing Circuit Cards, ROD" Revision 3
- Doc # 910-0014637-MI3001, "NAL 6D30818G0" Revision 7
- Work Order# 0020040601, "6D30818G07, 7300 NAL (Signal Comparator, Rod)," Revision 7
- Assembly ID 910-0020688, CIM base, 2C48498G02 Revision 15, dated March 29, 2016
- Work Order #0020039992, lot number 1634401, "Assembly Traveler," dated March 21, 2017

Miscellaneous Documentation

- Change Notice Review Form for PO 4500679796, Change Notice 1, dated June 15, 2017
- PO 4500693984 package: First Article Dimensional Report, Purchase Order 20039627, Date Code 1552
- Test Specification 1TS2960, "SSPS Vintage Systems - Under Voltage Driver Board 6D30350G01/G02 Configuration Procedure For Manufacturing and Repair," Revision 2, Section 4 data sheet: "Under Voltage Driver Board Configuration Data Sheets", for Serial Numbers P1628009, P1628010, and P1628011 (Order Number 4500693984, dated August 22, 2016)

- Test Specification 1TS2998, "SSPS Vintage Systems - Under Voltage Driver Board 6D30350G01/G02 Functional Test Procedure For Manufacturing and Repair," Revision 5, section 11 "Test Data Sheets - Pre 100 Hours Burn-In"
- Commercial Dedication Instruction CDI-3193, "Under Voltage Driver Board 6D30350 when supplied as spare parts", Revision 5, dated October 20, 2014
- CDI-3193 Dedication Data Sheet, PO 4500693984, Serial Number P1628009
- CDI-4058, "Services associated with build-to-print printed circuit board assemblies," Revision 8, dated July 10, 2013
- WEC QR-16-666, "Quality Release and certificate of conformance for component interface module base," Revision 0, dated March 29, 2016
- WEC QR-16-381, "Quality Release and certificate of conformance for Safety Remote Node Controller Base," Revision 0, dated February 26, 2016
- Pennatronics CofC for W003 #03356~W003 #03375, W003 #03438~W003 #03477, W003 #03488~W003 #03492, dated March 24, 2016
- Viasystems CofC for Part no. 3015-033, Revision 3, dated January 22, 2016
- Pennatronics CofC for Safety Remote Node Controller Base W002 #03002 ~ W002 #03066, W002 #03068, W002 #03069, dated March 24, 2016
- Part 3015-033 Electrical Tests results, Revision 3, dated January 20, 2016
- CIM Baseplate Functional Test Procedure, Revision 1, date March 16, 2016
- ICP-A-610, "Acceptability of Electronic Assemblies Certified IPC Specialist," Serial No. 610MS 3855226598
- 940-0024816-QC03, "X-Ray Inspection R100NA Host Board," Revision 4
- 940-0020739-QC03, "X-Ray Inspection SRNC 5105-10100G01," Revision 7
- 940-0020739-QC03, "CIM Command 5105-20100G01," Revision 7
- 9400-0020810-CT01, "In-Circuit Test Procedure Sonix Main ICT," Revision 15, dated January 15, 2015
- EDR 0916, "Engineering Deviation Request 0916," dated March 14, 2017

Nonconformances

- Pennatronics NCMR 8801, "CIM/SRNC Front Cover 14GA, REV2," December 11, 2016
- Pennatronics NCMR 8802, "CIM/SRNC Front Cover 16GA, REV2," December 11, 2016
- Pennatronics NCMR 8803, "CIM/SRNC Baseplate Guide Bar," December 11, 2016
- Pennatronics NCMR 8804, "CIM/SRNC Rear Cover 14GA, REV2," December 11, 2016
- Pennatronics NCMR 8805, "CIM/SRNC Gide Bar Brace, 16GA, REV2," December 11, 2016
- Pennatronics NCMR 8806, "CIM/SRNC Baseplate, 0.125", REV2," December 11, 2016

Calibration Records

- Recorder calibration ID: PTC MRC-5000-2 expires April 30, 2018
- Oven temperature calibration ID: PTC 0706000006 expires April 30, 2018
- LCR meter calibration ID: PTC099-11-10161 expires August 7, 2018
- Fluke 8845A, S/N 1638002, expires March 31, 2018
- Excelon Generation CofC #0011015121 – Digital Caliper, dated March 2, 2017

5. ACRONYMS USED:

ADAMS	Agencywide Documents Access and Management System
BGA	Ball Grid Array
CA	Corrective Action
CC	Critical Characteristics
CDI	commercial grade dedication instruction
CFR	<i>Code of Federal Regulations</i>
CGD	Commercial Grade Dedication
CGI	Commercial Grade Item
CGS	Commercial Grade Survey
CIM	Component Interface Module
CofC	Certificate of Conformance
CPAN	Corrective/Preventive Action Notice
DCIP	Division of Construction Inspection and Operational Programs
DI&C	Digital Instrumentation and Control
EDR	Engineering Deviation Request
EQ	equipment qualification
QVIB	Quality Vendor Inspection Branch
IEEE	Institute of Electrical and Electronics Engineers
ICT	In-Circuit Test
IP	Inspection procedure
ITAAC	Inspections, tests, analyses, and acceptance criteria
M&TE	measuring and test equipment
NCMR	Non-Conforming Materials Report
NON	Notice of Nonconformance
NRC	(U.S.) Nuclear Regulatory Commission
NRO	Office of New Reactors
PCB	Printed Circuit Board
PMS	Protection and Safety Monitoring System
PO	Purchase Order
QA	quality assurance
QC	quality control
RG	Regulatory Guide
SCAR	Supplier Corrective Action Report
SMT	Surface Mount Technology
SR	safety-related
SRNC	Safety Remote Node Controller
SSC	Systems, Structures, and Components
SSPS	Solid State Protection System
U.S.	United States (of America)
UVD	Undervoltage Driver
WEC	Westinghouse Electric Company
Pennatronics	Pennatronics Corporation