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US Safety-Related

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Commercial Dedication Instruction

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Product Name	RCV module
Model Number	HNS0541

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1. Product Identification

a. Part Number: See following table

b. Model Number: HNS0541

c. Drawing Number: 5Q8K0015 Rev.5

d. Manufacturer's Name: TOSHIBA Corporation, Power Systems Company, Power Platform Development Department (PPDD)

Sub supplier:

Toshiba Design and Manufacturing Service Corporation (TDMS)

e. Manufacturer's Model Number: See following table

f. Manufacturer's Catalog Number: N/A

g. Name plate data: N/A

h. Applicable Material/Part Specification Number: N/A

i. Identification of Parent Component: See Section 2.3

j. Software Version: N/A

k. Firmware Version: N/A

FPGA Code Name	FPGA Identification*	Applicable Module (Part Number)
[redacted]a,c	100500	P001
[redacted]a,c	111003	P001
[redacted]a,c	111100	P002
[redacted]a,c	111200	P002

* The first 6-digit numeric strings in registration number of FPGA fuse-map

Table 1 Part Number List

Part Number: (Procurement/Purchase Specification Number/ Part Number)	Manufacturer's Model Number	Description
5Q8K0015/P001	HNS0541B00000	-
5Q8K0015/P002	HNS0541B00001	P001 with Cyclic Redundancy Check (CRC) function

2. Product Description

2.1 Definitions

a. General Name of Product: RCV module

b. Product Name of Manufacturer: RCV module

c. Description of Terms

- APRM: Average Power Range Monitor, a safety-related subsystem of Neutron Monitoring System (NMS).
- APRM unit: A parent component of RCV module where two RCV modules are mounted. APRM unit measures core flow (safety function) and averaged power level (safety function) using the LPRM levels.
- CELL module: CELL module mounted on OPRM unit calculates neutron flux oscillation (safety

function) using LPRM levels received from RCV module in OPRM unit.

- GAF: Gain Adjustment Factor (GAF) is used to adjust the LPRM Icals. The Icals are the LPRM detector currents at 100% power. GAF is a factor to compensate a previous Ical value. For example, when the previous Ical is 1,000μA and GAF is 1.1, then the new Ical becomes 1,100μA.
- LPRM: Local Power Range Monitor, a safety-related subsystem of Neutron Monitoring System (NMS).
- LPRM unit: A parent component of RCV module where an RCV module is mounted.
- LPRM module: This module is mounted on LPRM unit. This module receives current signals from LPRM detectors and provides LPRM level (safety function) to CAL/ST module in LPRM unit. CAL/ST module transmits LPRM level to TRN module in LPRM unit.
- LVPS: LVPS module, a low voltage power supply that is used in a unit to supply DC power to modules in the unit. Each unit has two LVPS modules that are redundant power supplies of the unit.
- NMS: Neutron Monitoring System, NMS consists of three safety-related subsystems: Startup Range Neutron Monitor (SRNM), Local Power Range Monitor (LPRM), and Average Power Range Monitor (APRM) which includes Oscillation Power Range Monitor (OPRM). The LPRM, OPRM, and APRM are collectively called the Power Range Neutron Monitor (PRNM).
- OPRM: Oscillation Power Range Monitor, a safety-related subsystem of Neutron Monitoring System (NMS). OPRM is functional sub-system of APRM.
- OPRM unit: A parent component of RCV module where two RCV modules are mounted.
- PRNM: Power Range Neutron Monitor, the parent system of the LPRM unit, the APRM unit and the OPRM unit. For Advanced Boiling Water Reactor (ABWR) application, four divisions of PRNM are installed to plant. Each of those four PRNM divisions contains four LPRM units, an APRM unit and an OPRM unit.
- TRN module: This module is used to transmit optical signal between units in PRNM, and also used to transmit optical signal to external system.

d. Abbreviation

ABWR	Advanced Boiling Water Reactor
AQ	Augmented Quality
CC	Critical Characteristics
CCD	Critical Characteristics for Design
CCA	Critical Characteristics for Acceptance
CDI	Commercial Dedication Instruction
CFI	Counterfeit and Fraudulent Item
CG	Commercial Grade
CRC	Cyclic Redundancy Check
C of C	Certificate of Conformance
DC	Direct Current
DDS	Detailed Design Specification
DR	Design Review
EMC	Electromagnetic Compatibility
EQ	Equipment Qualification
FPGA	Field Programmable Gate Array
FMEA	Failure Mode and Effect Analysis
IV&V	Independent Verification and Validation
MDS	Module Design Specification
NICSD	Nuclear Instrumentation and Control Systems Department
NICS-QA	Quality Assurance Group for Nuclear Instrumentation & Control Systems

NICS-QC	Quality Control Group for Nuclear Instrumentation & Control Systems
NISD	Nuclear Instrumentation Systems Development & Designing Group
NSR	Non-Safety-Related
PPDD	Power Platform Development Department
QA	Quality Assurance
QC	Quality Control
SR	Safety-Related
TDMS	Toshiba Design and Manufacturing Service Corporation
WDT	Watch Dog Timer

2.2 Function of Product

P001: A RCV module (P001) is used mounted on units that are parent components specified in Section 2.3. The RCV module has four optical inputs. The RCV module receives optical signals from external system connected by optical cable and converts an optical signal into a serial signal by decoding the Manchester Code, and provides them to middle plane printed circuit board for use by other modules in the same unit. The RCV module decodes LVPS alarm information included in optical signal, and generates LVPS alarms. The RCV module detects the time-out, parity error and Unit Type/ID error of received optical signal and provides the previous data and alarms in case of error.

P002: A RCV module (P002) has the function of RCV module (P001) with CRC function. The RCV module detects the multi-bit errors in received optical signal using 32-bit CRC and provides the previous data and alarms in case of error.

2.3 Function of Parent Component

Table 2 Function of Parent Component

Part No.	Model No.	Parent Component	Function of Parent Component (Safety Function)	Functional Classification of Parent Component
P001, P002	HNS0541	LPRM unit	LPRM Level, which represents a local neutron flux	Safety Related
		APRM unit	APRM Level, which represents an average neutron flux Simulated Thermal Power Core Flow Level APRM Upscale Flux Trip Simulated Thermal Power Upscale Trip APRM Inoperative Core Flow Rapid Coastdown	Safety Related
		OPRM unit	Neutron flux oscillation Growth Rate-Based Trip Amplitude-Based Maximum Trip Period-Based Trip OPRM Inoperative	Safety Related

3. Safety Related Function

The RCV module is required to perform before, during, and after abnormal environmental conditions (seismic, environmental and Electromagnetic Compatibility (EMC) conditions). The RCV module shall perform the safety related functions described in the following table. The environmental and EMC qualification of the RCV module are not performed as a standalone item. The verification of environmental and EMC qualification will

take place at a higher level as part of system equipment qualification effort (Refer to Section 6.2.1).

Table 3 Safety Related Function

Part No.	Model No.	Safety Related Function	Functional Classification
P001, P002	HNS0541	<LPRM application> The RCV module is mounted on and electrically connected to LPRM unit which has safety-related functions. The RCV module receives GAF values from TRN module mounted on APRM unit, and transmits those to CAL/ST module mounted on LPRM unit. GAF values are necessary to calculate LPRM levels (safety function).	Safety Related (Having an effect on performance of the system safety function)
		<APRM application> Two RCV modules are mounted on and electrically connected to APRM unit which has safety-related functions. <Application 1> One RCV module receives LPRM levels (safety signal), which are needed to calculate averaged power (safety function) in APRM unit, from TRN module mounted on LPRM unit, and transmits those to APRM module mounted on APRM unit.	Safety Related (Having a safety function)
		<Application 2> The other RCV module receives GAF values from Plant Information and Control System, and transmits to TRN module mounted on APRM unit. GAF values are necessary to calculate the LPRM levels (safety function) in LPRM unit.	Safety Related (Having an effect on performance of the system safety function)
		<OPRM application> Two RCV modules are mounted on and electrically connected to OPRM unit which has safety-related functions. <Application 1> One RCV module receives LPRM levels, which are needed to calculate the neutron flux oscillation (safety function), from TRN module mounted on LPRM unit and transmits those to CELL module mounted on OPRM unit.	Safety Related (Having a safety function)
		<Application 2> The other RCV module receives APRM level and Core Flow Level, which are needed to bypass the trip algorithms (safety function) automatically if the APRM is less than setpoint or Core Flow Lever is grater than setpoint, from TRN module mounted on APRM unit and transmits to CELL module mounted OPRM unit.	Safety Related (Having an effect on performance of the system safety function)

The RCV module is required to operate during and after the defined design basis events.

■ Seismic Sensitive Part/Assembly

□ Not Seismic Sensitive

□ Application Does Not Require Seismic Adequacy

The RCV module is attached to a parent system, and the seismic integrity of the RCV module is verified by qualification testing (Refer to Section 6.2.1).

3.1 Functional Classification

The functional mode and functional classification were evaluated and identified as follows.

a. Functional Mode : □ Active Functional Mode

■ Passive Functional Mode

b. Functional Classification : ■ Safety-Related (SR)

□ Non-Safety-Related (NSR)

□ Augmented Quality (AQ)

4. Critical Characteristics for Design

Table 4-1 shows the Critical Characteristics for Design (CCD) and technical evaluations. Table 4-2-1 and Table 4-2-2 show the result of Failure Mode and Effect Analysis (FMEA). This evaluation is performed base on technical requirements for the RCV modules of OPRM application.

Nuclear Instrumentation Systems Development & Designing Group (NISD) evaluated following supplier's module design:

Manufacturer's Model Number : HNS0541A10000 (Commercial use)

Module Design Specification :5G8HA761 Rev.6 (Reference (2))

This module was developed under the ISO-9001 Quality Assurance (QA) process but not verified with the Independent Verification and Validation (IV&V) process under the Nuclear Instrumentation and Control Systems Department (NICSD) Appendix-B QA program. For dedication of this module, NICSD requires PPDD to apply additional QA and documentation requirements specified in Purchase Specification (Reference (1)). By applying additional requirements based on the Purchase Specification (Reference (1)), manufacturer's model number is changed to the following to distinguish the commercial use and US safety-related use. NISD also evaluated following supplier's module design:

Manufacturer's Model Number : P001: HNS0541B00000 (US safety-related use)

Module Design Specification : P001: 5G8HC109 Rev.2 (Reference (7))

The RCV module (P001) was developed under the ISO-9001 Quality Assurance (QA) process, and this module was verified with the Independent Verification and Validation (IV&V) process under the Nuclear Instrumentation and Control Systems Department (NICSD) Appendix-B QA program as a commercial grade item. The RCV module (P002) has the function of the RCV module (P001) with CRC function to detect the multi-bit errors. Through technical evaluation NISD has classified the CRC function of the RCV module (P002) as a function of the performance characteristics (data transmission function and fault management and diagnostics), which is a CCD as is the case with the parity check function. During the technical evaluation it was confirmed that the scope of design change to add the CRC function would only cover the change of FPGA logics for respective processes; no change would be made to hardware of the module at all. As the result of this technical evaluation NISD concluded that CCA of the RCV module (P002) would have the same result as that of the RCV module (P001). For dedication of the RCV module (P002), NICSD requires PPDD to apply QA and documentation requirements specified in the Purchase Specification (Reference (1)) which are equivalent to the QA and documentation requirements applied to the RCV module (P001). By design change from the RCV module (P001), manufacturer's model number was newly assigned as below to distinguish from the RCV module (P002) from the RCV module (P001). NISD also evaluated following supplier's module design:

Manufacturer's Model Number : P002: HNS0541B00001 (US safety-related use)

Module Design Specification : P002: 5G8HC109 Rev.2 (Reference (7))

Table 4-1 CCD and Technical Evaluation

Part No.	No	CCD	Manufacturer's specification	Technical Evaluation
P001	1	Physical Characteristics -Dimension Section 6 of purchase specification*1 (30.1W × 128.4H × 172.4D mm) Permissible deviations for dimensions are specified in receiving inspection specification (Reference (5)). -Mass Section 6 of purchase specification*1 (300g or less)	Dimension is specified in Section 4.1.1 of MDS*2 (30.1W × 128.4H × 172.4D mm) Mass is specified in Section 4.1.2 of MDS*2 (300g or less)	Manufacturer's item meets the purchaser requirement. This characteristic does not directly contribute to safety function. However, this characteristic related to item compatibility, form or fit is important when considering replacement and Counterfeit and Fraudulent Items (CFI) issues. Mass is a factor which may affect seismic capability of parent component.
	2	Physical Characteristics -General configuration and shape Module configuration and shape is described in Section 6 of purchase specification*1	Module configuration is described in Section 4.1 of MDS*2	Manufacturer's item meets the purchaser requirement. This characteristic does not directly contribute to safety function. However, this characteristic related to item compatibility, form or fit is important when considering replacement and CFI issues. These characteristics contribute to Equipment Qualification (EQ) and EMC capability.
	3	Performance Characteristics -Data transmission function Sections 5.2.6-1, and -2. of Unit DDS*3 specifies data transmission functions.	Data transmission function is specified in Sections 5.1, 5.2, and 6.1 of MDS*2	Manufacturer's item meets the purchaser requirement. This characteristic contributes to accuracy requirement that is safety function of parent component.
	4	Performance Characteristics -Fault Management and Diagnostics Sections 9 of Unit DDS*3 specifies functions of FPGA operation monitor (Watch Dog Timer (WDT)), and data transmission monitor. Section 5.2.6 -3 of Unit DDS*3 specifies data transmission monitor function. Section 8 of Unit DDS*3 specifies initializing processes.	Input timeout error detection function is specified in Sections 6.1.2 of MDS*2. Functions of Unit ID check, parity check, LVPS alarm check is specified in Section 6.1.2 of MDS*2. WDT function is specified in Section 10.1 of MDS*2. Power on reset function is specified in Section 9 of MDS*2.	Manufacturer's item meets the purchaser requirement. This characteristic does not directly contribute to safety function. However, the failure of fault management and diagnostic function may lead to failure to detect malfunctions of item's safety functions.
	5	Dependability	-	FPGA modules that include FPGA logic need special attention when indentifying CCDs. Dependability becomes significantly more important when dedicating digital equipment. If there is a problem in the FPGA logic that degrades the dependability of a FPGA-based module, it reflects a design error that was built into the FPGA-based module, or a mismatch between the functional requirements and the FPGA-based module design. The "Dependability" is a CCD of FPGA-based module.
P002	1	Physical Characteristics -Dimension Section 6 of purchase specification*1 (30.1W × 128.4H × 172.4D mm) Permissible deviations for dimensions are specified in receiving inspection specification (Reference (5)). -Mass Section 6 of purchase specification*1 (300g or less)	Dimension is specified in Section 4.1.1 of MDS*2 (30.1W × 128.4H × 172.4D mm) Mass is specified in Section 4.1.2 of MDS*2 (300g or less)	Manufacturer's item meets the purchaser requirement. This characteristic does not directly contribute to safety function. However, this characteristic related to item compatibility, form or fit is important when considering replacement and Counterfeit and Fraudulent Items (CFI) issues. Mass is a factor which may affect seismic capability of parent component.
	2	Physical Characteristics -General configuration and shape Module configuration and shape is described in Section 6 of purchase specification*1	Module configuration is described in Section 4.1 of MDS*2	Manufacturer's item meets the purchaser requirement. This characteristic does not directly contribute to safety function. However, this characteristic related to item compatibility, form or fit is important when considering replacement and CFI issues. These characteristics contribute to Equipment Qualification (EQ) and EMC capability.
	3	Performance Characteristics -Data transmission function Sections 5.2.6-1, and -2. of Unit DDS*3 specifies data transmission functions.	Data transmission function is specified in Sections 5.1, 5.2, and 6.1 of MDS*2	Manufacturer's item meets the purchaser requirement. This characteristic contributes to accuracy requirement that is safety function of parent component.

Part No.	No	CCD	Manufacturer's specification	Technical Evaluation
	4	Performance Characteristics -Fault Management and Diagnostics Sections 9 of Unit DDS*3 specifies functions of FPGA operation monitor (Watch Dog Timer (WDT)), and data transmission monitor. Section 5.2.6 -3 of Unit DDS*3 specifies data transmission monitor function. Section 8 of Unit DDS*3 specifies initializing processes.	Input timeout error detection function is specified in Sections 6.1.2 of MDS*2. Functions of Unit ID check, parity check, LVPS alarm check is specified in Section 6.1.2 of MDS*2. WDT function is specified in Section 10.1 of MDS*2. Power on reset function is specified in Section 9 of MDS*2.	Manufacturer's item meets the purchaser requirement. This characteristic does not directly contribute to safety function. However, the failure of fault management and diagnostic function may lead to failure to detect malfunctions of item's safety functions.
	5	Dependability	-	FPGA modules that include FPGA logic need special attention when indentifying CCDs. Dependability becomes significantly more important when dedicating digital equipment. If there is a problem in the FPGA logic that degrades the dependability of a FPGA-based module, it reflects a design error that was built into the FPGA-based module, or a mismatch between the functional requirements and the FPGA-based module design. The "Dependability" is a CCD of FPGA-based module.

*1 Purchase Specification, 5Q8K0015 Rev.5 (Reference (1))

*2 MDS: Module Design Specification, 5G8HC109 Rev.2 (Reference (7))

*3 Unit DDS: Unit Detailed Design Specification, 5B8K0041 Rev.3 (Reference (3))

Table 4-2-1 Failure Mode and Effect Analysis (P001)

No	Function	Failure Mode	Failure Mechanism	Effect on System	Effect on Plant Operation	Remarks
1	Initializing -Power-on Reset Circuit	Fail On	Device failure	The OPRM unit panel LED indicates -Trip on the CELL module. -Inoperative on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Trip - OPRM Inoperative	The display in main control room indicates 'NMS' alarm.	
		Fail In Reset	Device failure	None	None	The RCV module would not restart once.
2	Power Supply -DC/DC converter output	Fail Low	A failure of DC/DC converter or inductor Contact failure on middle plane connector	The OPRM unit panel LED indicates -Trip on the CELL module. -Inoperative on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Trip - OPRM Inoperative	The display in main control room indicates 'NMS' alarm	
3	LPRM levels input - receive optical signal from the TRN module mounted the LPRM unit by optical cable (Safety-related function)	Incorrect optical data	Circuit failure Contact failure on optical cable Breaking of optical cable	The OPRM unit panel LED indicates -Fail on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Minor Failure	The display in main control room indicates 'NMS' alarm	
		Fail On	Device failure Circuit failure	The OPRM unit panel LED indicates -Fail on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Minor Failure	The display in main control room indicates 'NMS' alarm	
		Fail OFF	Device failure Circuit failure	The OPRM unit panel LED indicates -Fail on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Minor Failure	The display in main control room indicates 'NMS' alarm	

No	Function	Failure Mode	Failure Mechanism	Effect on System	Effect on Plant Operation	Remarks
4	LPRM values output - provide electric signal to the CELL module (Safety-related function)	Incorrect electric serial data	Circuit failure Contact failure on middle plane connector	The OPRM unit panel LED indicates -Fail on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Minor Failure	The display in main control room indicates 'NMS' alarm	
5	HMI -Front Panel display LED	Burn out	Device failure Circuit failure	None	None	
6	ID -set ID number by using digital switch	Incorrect set ID number	Device failure	The OPRM unit panel LED indicates -Fail on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Minor Failure	The display in main control room indicates 'NMS' alarm	

Table 4-2-2 Failure Mode and Effect Analysis (P002)

No	Function	Failure Mode	Failure Mechanism	Effect on System	Effect on Plant Operation	Remarks
1	Initializing -Power-on Reset Circuit	Fail On	Device failure	The OPRM unit panel LED indicates -Trip on the CELL module. -Inoperative on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Trip - OPRM Inoperative	The display in main control room indicates 'NMS' alarm.	
		Fail In Reset	Device failure	None	None	The RCV module would not restart once.
2	Power Supply -DC/DC converter output	Fail Low	A failure of DC/DC converter or inductor Contact failure on middle plane connector	The OPRM unit panel LED indicates -Trip on the CELL module. -Inoperative on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Trip - OPRM Inoperative	The display in main control room indicates 'NMS' alarm	
3	LPRM levels input - receive optical signal from the TRN module mounted the LPRM unit by optical cable (Safety-related function)	Incorrect optical data	Circuit failure Contact failure on optical cable Breaking of optical cable	The OPRM unit panel LED indicates -Fail on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Minor Failure	The display in main control room indicates 'NMS' alarm	
		Fail On	Device failure Circuit failure	The OPRM unit panel LED indicates -Fail on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Minor Failure	The display in main control room indicates 'NMS' alarm	
		Fail OFF	Device failure Circuit failure	The OPRM unit panel LED indicates -Fail on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Minor Failure	The display in main control room indicates 'NMS' alarm	
4	LPRM values output - provide electric signal to the CELL module (Safety-related function)	Incorrect electric serial data	Circuit failure Contact failure on middle plane connector	The OPRM unit panel LED indicates -Fail on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Minor Failure	The display in main control room indicates 'NMS' alarm	
5	HMI -Front Panel display LED	Burn out	Device failure Circuit failure	None	None	
6	ID -set ID number by using digital switch	Incorrect set ID number	Device failure	The OPRM unit panel LED indicates -Fail on the CELL module. - Fail on the DAT/ST module. The OPRM unit generates - OPRM Minor Failure	The display in main control room indicates 'NMS' alarm	

5. Critical Characteristics for Acceptance, Verification Methods and Responsibilities

5.1 Verification of Physical and Performance Characteristics Depending on Supplier Testing

The physical characteristics and performance characteristics are able to be measured as CCAs by the supplier testing and Nuclear Instrumentation and Control Systems Department (NICSD) intends to receive Certificate of Conformance (C of C) and the supplier's test record during the receiving inspection, the following supplier's process to control CC shall be verified, as a minimum, through Commercial Grade (CG) survey of PPDD and receiving inspection.

- Design Control (Document Control)
- Inspection and Test Control
- Measuring and Test Equipment Control

To supplement verification of the general configuration and shape, supplier's control capability regarding "Configuration Control and Traceability of Hardware" shall be verified through CG Survey of PPDD, evaluation of sub-suppliers, and receiving inspection. Refer to Table 5-1.

5.2 Verification of "Dependability" of Module

To verify the dependability of modules, the following CCAs related to supplier's control capability of CC shall be verified through CG survey of PPDD, evaluation of sub-suppliers, receiving inspection, oversight of design review meeting, review of supplier documents, oversight of supplier testing, and witness of FPGA implementation.

- Built-in Quality
- Configuration Control and Traceability of Software and Hardware

Refer to Table 5-1.

Table 5-1 CCA and Verification Method (Common to P001 and P002)

Item No	Critical Characteristics for Acceptance	Verification Method for Qualification	Responsibility	Verification Method for Production	Responsibility
1	Physical Characteristics -Dimension -Mass -General Configuration and Shape	-	-	Receiving Inspection (Receiving C of C and supplier's test record, Section 6.1.1)	NICS-QC
2	Performance Characteristics -Data Transmission Function -Fault Management and Diagnostics	-	-	Receiving Inspection (Receiving C of C and supplier's test record, Section 6.1.1)	NICS-QC
3	Design Control (Document Control)	CG Survey of PPDD (Section 6.2.2)	NICS-QA	Receiving Inspection (Receiving C of C, Section 6.1.1)	NICS-QC
4	Inspection and Test Control	CG Survey of PPDD (Section 6.2.2)	NICS-QA	Receiving Inspection (Receiving C of C, Section 6.1.1)	NICS-QC
5	Measuring and Test Equipment Control	CG Survey of PPDD (Section 6.2.2)	NICS-QA	Receiving Inspection (Receiving C of C, Section 6.1.1)	NICS-QC

Item No	Critical Characteristics for Acceptance	Verification Method for Qualification	Responsibility	Verification Method for Production	Responsibility
6	Build in Quality	CG Survey of PPDD (Section 6.2.2)	NICS-QA	Oversight of design review meeting (Section 6.1.2)	NICS-QC
				Review of supplier documents (Section 6.1.3)	NICSD IV&V Team
				Oversight of supplier testing (Section 6.1.4)	NICSD IV&V Team
7	Configuration Control and Traceability of Software and Hardware	CG Survey of PPDD, Evaluation of sub-suppliers (Section 6.2.2)	NICS-QA	Witness of FPGA implementation (Section 6.1.5)	NICS-QC

NICSD Nuclear Instrumentation and Control Systems Department
NICS-QA Quality Assurance Group for Nuclear Instrumentation & Control Systems
NICS-QC Quality Control Group for Nuclear Instrumentation & Control Systems
IV&V Independent Verification and Validation

6. Verification Instruction

6.1 Recurring Activities

6.1.1 Receiving Inspection

Receiving inspectors or QC inspectors from NICS-QC shall implement the receiving inspection in accordance with the "Receiving Inspection Procedure (Section 9-(1))" and the "Standard Receiving Inspection Specification (Section 9-(2))." The verification results are recorded in the form of "Receiving Inspection Check List/Report (Section 7-(1))."

6.1.2 Oversight of Design Review Meeting

NICSD shall perform oversight of Design Review (DR) meetings conducted by PPDD in accordance with Section 9.1.1 of the Commercial Dedication Instruction (Reference (6)).

6.1.3 Review of Supplier Documents

NICSD shall perform review of supplier documents in accordance with Section 9.1.2 of the Commercial Dedication Instruction (Reference (6)).

6.1.4 Oversight of Supplier Testing

NICSD shall perform oversight on FPGA Testing and Module Validation Testing conducted by PPDD supplier documents in accordance with Section 9.1.3 of the Commercial Dedication Instruction (Reference (6)).

6.1.5 Witness of FPGA Implementation

NICSD shall perform witness of the FPGA implementation work by TDMS in accordance with Section 9.1.4 of the Commercial Dedication Instruction (Reference (6)).

6.2 Periodic Activities

6.2.1 Environmental Conditions Qualification

Equipment qualification testing and EMC qualification testing are performed in a type test using test specimen. Successful completion and continued application of qualification testing verifies that the item is capable of performing its intended safety function. Any time a design change is made to the item or item is used in another application, impact on all previous qualification programs shall be evaluated to determine if re-qualification is required.

The responsible design engineers from NISD shall identify a test report in Section 7 of this Commercial Dedication Instruction (CDI) after qualification test, which shows successful compliance with qualification test requirements. If any changes are made to a configuration as the result of qualification test, the responsible design engineers shall identify a baseline after change in the CDI. The responsible design engineers evaluates any changes to an item that are made after baseline establishment, determines the need for an additional qualification test, and documents the evaluation result in the CDI. In order to continuously purchase items with same configuration, the "Configuration Control and Traceability of Hardware" of supplier shall be verified through CG Surveys as described in Section 6.2.2.

6.2.2 Vendor Evaluation

NICSD shall perform CG Survey of PPDD and evaluation of sub-suppliers in accordance with Section 9.2 of the Commercial Dedication Instruction (Reference (6)).

7. Acceptance Documentation

(1) Receiving Inspection Check List/Report (Attachment to NQ-3024 (Reference (4)))
(2) Certificate of Conformance (Attachment to Reference (1))
(3) Test record by supplier (As per supplier's form)
(4) Nuclear Instrumentation & Control Systems Department
Environmental Qualification Report for Safety-Related Oscillation Power Range Monitor (OPRM)
FC51-7513-1000 Rev.0 (5B8K0077 Rev.0)
(5) Nuclear Instrumentation & Control Systems Department
Dynamic Qualification Report for Safety-Related Oscillation Power Range Monitor (OPRM)
FC51-7513-1003 Rev.0 (5B8K0094 Rev.0)
(6) Nuclear Instrumentation & Control Systems Department
EMC Qualification Report for Safety-Related Oscillation Power Range Monitor (OPRM)
FC51-7513-1001 Rev.0 (5B8K0078 Rev.0)

8. References

(1) PURCHASE SPECIFICATON for in-house (5Q8K0015 Rev.5)
(2) RCV MODULE HNS540/HNS0541 Equipment Design Specification (5G8HA761 Rev.6)
(3) OPRM Unit Detailed Design Specification for Power Range Neutron Monitor (5B8K0041 Rev.3)
(4) Receiving Inspection Procedure, NQ-3024
(5) Standard Receiving Inspection Specification for Modules from Power Platform Development Department (5T8K0001 Rev.1)
(6) Commercial Dedication Instruction for Dedication of Modules from Commercial Supplier (Common

Requirements) (9B8K0057 Rev.1)

(7) RCV Module HNS0541 Series Module Design Specification (5G8HC109 Rev.2)

9. Inspection and Test Procedure

(1) Receiving Inspection Procedure (Reference (4))

(2) Standard Receiving Inspection Specification (Reference (5))

10. Supplements

N/A

変 更 記 録 REVISIONS						
変更記号 REV. MARK 変更発行日 REV. ISSUED	ページ PAGE	変更箇所・変更内容 CHANGED PLACE AND CONTENTS	承認 APPROVED BY	調査 REVIEWED BY	担当 PREPARED BY	保管 REGISTERED
① Jul.17, 2012	3 - 11	For detailed changed contents and impact evaluation, refer to DECN-9B8K0055-01 Rev.0.	K. Wakita Jul. 17, 2012	T. Tarumi Jul. 17, 2012	T. Furusawa Jul. 17, 2012	H. Ito Jul. 17, 2012
② Aug.22, 2012	-	For detailed changed contents and impact evaluation, refer to DECN-9B8K0055-02 Rev.0.	K. Wakita Aug.22, 2012	T. Tarumi Aug.22, 2012	T. Furusawa Aug.20, 2012	H. Ito Aug.22,2012
③ Dec.27,2012	-	For detailed changed contents and impact evaluation, refer to DECN-9B8K0055-03 Rev.1.	K. Wakita Dec.27, 2012	T. Tarumi Dec.26, 2012	H. Ito Dec.27,2012	H. Ito Dec.27,2012
④ Feb.18, 2013	-	For detailed changed contents and impact evaluation, refer to DECN-9B8K0055-04 Rev.0.	K. Wakita Feb.18, 2013	T. Furusawa Feb.14, 2013	H. Ito Feb.14, 2013	H. Ito Feb.18, 2013
⑤ Jan.16.2014	-	For detailed changed contents and impact evaluation, refer to DECN-9B8K0055-05 Rev.0.	K. Wakita Jan.16.2014	T. Tarumi Jan.16.2014	T. Furusawa Jan.16, 2014	H. Ito Jan.16.2014