

**NEXRAD Product Improvement
Open Radar Data Acquisition (ORDA)
Hardware Component Test Plan**



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1 Scope

1.1 Identification

This Hardware Component Test Plan establishes the test preparations and planning for performing formal hardware component testing of the Open Systems Radar Data Acquisition (ORDA) functional area, receiver and signal processing subsystem upgrade of the Next Generation Weather Radar (NEXRAD) system.

1.2 System Overview

NEXRAD consists of a number of WSR-88D Doppler radar installations across the United States and other worldwide locations. The NEXRAD radar system is used to gather and process weather information to be distributed to the National Weather Service (NWS), the Federal Aviation Administration (FAA), the Department of Defense (DOD), and commercial and private entities. The WSR-88D system is comprised of a Radar Data Acquisition (RDA) sub-system which gathers and processes base radar data and passes it to the Radar Product Generator (RPG) system, which generates and distributes weather graphic products. The WSR-88D System is evolving from a proprietary hardware platform and operating system to a standards-based open architecture. Improvements in data quality, operational utilization of advances in scientific algorithms and interoperability of the WSR-88D system with other agency-modernized systems will be improved. For example, the Advanced Weather Interactive Processing System (AWIPS), Meteorological Operational Capability (MOC), Weather and Radar Processor (WARP), and Integrated Terminal Weather System (ITWS).

1.3 Document Overview

The purpose of this document is to provide test planning and preparations for performing formal hardware component testing on the ORDA Functional Area of the WSR-88D system. Section 1 describes the scope of the NEXRAD system in general, and the ORDA Functional area in particular. Section 2 gives a description of referenced documents. Section 3 contains the test environment for the ORDA. Section 4 provides the test identifications. Section 5 references the test schedules. Section 6 requirements traceability. By using the links in DOORS, the test cases are linked to the actual specifications containing applicable requirements. Section 7 contains test notes. Section 8 contains annexes.

1.4 Relationship To Other Plans

The Hardware Component Test Plan will establish the hardware, software, and firmware necessary for hardware component-level testing. The Hardware Component Test Description will define the test descriptions necessary to achieve hardware component-level testing. The Hardware Component Test Report will summarize the test results from the Hardware Component Test Description.

2 Referenced Documents

2810000D

WSR-88D System Specification

OSTPLN-SEC-004	Test & Evaluation Master Plan
2660023	ORDA Hardware Component Test Description
2700016	ORDA Hardware Component Test Report

3 Hardware Test Environment

3.1 Test Site(s)

Hardware component testing will occur at the West Oaks ORDA Engineering facility in Norman, Oklahoma.

3.1.1 Software

The required software to perform hardware component level testing is outlined in section 3.1.2. Hardware and software Integration is planned to be conducted early in the formal integration test phase.

3.1.2 Hardware, Software, and Firmware Requirements

3.1.2.1 RCP8/RCW

Hardware Components

- Motherboard - Dual Processor Assembly - SIGMET p/n TBD
- I/O 62 Card - SIGMET p/n I/O-62 CCA
- Serial Port Card - Matrix Orbital p/n TBD
- 1 GByte Flash Drive - M-Systems p/n IDE-25-1024-S
- 20 GByte Hard Drive - SIGMET p/n TBD
- R/W CD Rom - American Portwell Technology p/n EZDRV-300-NDW
- Fluorescent 2x20 Matrix Display, Front Panel - Matrix Orbital p/n BVK202A-BK
- 450W Power Supply (Redundant) - American Portwell Technology p/n Orion-2253
- Power Supply Plug In - American Portwell Technology p/n TBD
- Air Filter Element - CG-Mupac p/n TBD
- Chassis Cooling Fan - EBM p/n 4484F

Software

- Redhat Linux Operating System, version 7.1.X (Manufacturer Installed)
- SIGMET Provided Software, version X.X

Firmware

- SIGMET Provided, version X.X

3.1.2.2 RVP8

Hardware Components

- Motherboard - Dual Processor Assembly - SIGMET p/n TBD
- Receiver Card - SIGMET p/n RX CCA
- I/O 62 Card - SIGMET p/n I/O-62 CCA
- 1 GByte Flash Drive - M-Systems p/n IDE-25-1024-S
- R/W CD Rom - American Portwell Technology p/n EZDRV-300 NDW

Fluorescent 2x20 Matrix Display, Front Panel - Matrix Orbital BVK202A-BK
450W Power Supply - American Portwell Technology p/n ORION-2253
Power Supply Plug In - American Portwell Technology p/n TBD
Air Filter Element - CG-Mupac p/n TBD
Chassis Cooling Fan - EBM p/n 4484F

Software

Redhat Linux Operation System, version 7.1.X (Manufacturer Installed)
SIGMET Provided, version X.X

Firmware

SIGMET Provided, version X.X

3.1.2.3 Intermediate Frequency Digitizer (IFD)

Hardware Component

IFD - SIGMET p/n IFD-D

Firmware

SIGMET Provided, version X.X

3.1.2.4 Router 1 (2620XM)

Hardware Component

Router - CISCO p/n 2620XM

T1 CSU/DSU Module - CISCO p/n WIC-1DSU-T1

Firmware

CISCO Provided, version X.X

3.1.2.5 Router 2 (2621XM)

Hardware Component

Router - CISCO p/n 2621XM

T1 CSU/DSU Module - CISCO p/n WIC-1DSU-T1

Firmware

CISCO Provided, version X.X

3.1.2.6 16-Port LAN Switch

Hardware Component

LAN Switch - 3COM p/n 3C16470-US

Firmware

3COM Provided, version X.X

3.1.2.7 8-Port Serial Switch

Hardware Component

8 Port Serial Switch w/Internal Modem - Western Telematic Inc. p/n APS-8M

Firmware

Western Telematic, Inc Provided, version X.X

3.1.2.8 Power Control Switch (Baytech)

Hardware Component

Power Control Switch - Bay Technical Associates p/n RPC5-15

Firmware

Baytech Provided, version X.X

3.1.2.9 Uninterruptible Power Supply (UPS)

Hardware Component

Uninterruptible Power Supply - American Power Conversion (APC) p/n SU1400RM2U

Battery - American Power Conversion (APC) p/n RBC24

SNMP Module - American Power Conversion (APC) p/n TBD

Firmware

American Power Conversion Provided, version X.X

3.1.2.10 Power Manager

Hardware Component

Power Manager - American Power Conversion p/n AP9211

Firmware

American Power Conversion Provided, version X.X

3.1.2.11 KVM ASSY

Hardware Component

KVM Assy - Broadax Systems, Inc. p/n RMK-518

Firmware

Broadax Systems, Inc Provided, version X.X

3.1.2.12 20dB Attenuator

Hardware Component

20 dB SMA In-line Attenuator - Pasternack p/n PE7001-20

3.1.2.13 20dB RF Attenuator

Hardware Component

20 dB RF SMA In-line Attenuator - Pasternack p/n PE7045-20

3.1.2.14 6dB Attenuator

Hardware Component

6 dB SMA In-line Attenuator - Pasternack p/n PE7001-6

3.1.2.15 3dB Attenuator

Hardware Component

3 dB SMA In-line Attenuator -Pasternack p/n PE7001-3

3.1.2.16 RF Mixer

Hardware Component

RF Mixer - Pulsar Microwave p/n MM-04-LC

3.1.2.17 RF Splitter

Hardware Component

2-Way RF Splitter - Pulsar Microwave P2-21-411

3.1.2.18 Required Test Equipment

Standard-issue, operational site equipment will be used to perform hardware component testing where possible. The test team has not yet procured a standard-issue toolkit with standardized tools and equipment. The test team may be able to borrow these standard-issue tools and equipment from the EMS section or ROC Engineering.

3.1.2.18.1 Oscilloscope

Hardware Component

Manufacturer and Model - TBD

3.1.2.18.2 Spectrum Analyzer

Hardware Component

Manufacturer and Model - TBD

3.1.2.18.3 Multimeter

Hardware Component

Manufacturer and Model - TBD

3.1.3 Other materials

None known at this time.

3.1.4 Proprietary Nature, Acquirer's Rights, and Licensing

N/A

3.1.5 Installation, Testing, and Control

Only configuration managed hardware (with any encapsulated firmware) will be tested in the formal hardware component test phase. The entry and exit criteria for hardware component test phase is:

Entry Criteria:

Successful completion of a hardware CDR for design stability
Hardware configuration baseline established
Components uniquely identified e.g. serial numbers
Test Plan complete with links to hardware component test description
Hardware component Test Description outline drafted

Exit Criteria:

All hardware components in the test plan tested with results posted in the test report
Test Description complete with links to hardware component test report
No critical defects in any hardware components

3.1.6 Participating Organizations

The ORDA contractor(s), with assistance by the local SIGMET representative will conduct the formal hardware component testing.

3.1.7 Personnel

The Hardware Component testing will consist of Team RSIS Test Engineering supported by Team RSIS Systems Engineering, as well as, SIGMET engineering. The Hardware Component testing will be conducted during normal business hours at the ORDA West Oaks facility. The West Oaks facility currently supports all hardware, software, and personnel requirements to complete the necessary ORDA hardware component level testing requirements. The ORDA engineering and support staff has the necessary training required to complete formal hardware component level testing. Listed below are the anticipated personnel resources. However, these personnel resources may be increased or adjusted at the discretion of ORDA project management.

Team RSIS Test Engineering: Frank Cabodie
Ray Delheimer
Roland Leatherman

Team RSIS Systems Engineering: Alan Free
Nita Patel

SIGMET: Rick Rhoton

3.1.8 Orientation Plan

No orientation or special training is required. Sigmet provided a SIGMET hardware briefing to the Test Engineering Team in January 2003.

3.1.9 Tests To Be Performed

Reference paragraph 4 for Hardware Component tests to be performed. Reference the ORDA Hardware Component Test Description for detailed test descriptions.

4 Test identification

4.1 General information

4.1.1 Test Levels

Testing of the ORDA functional area is accomplished in successive test phases. The first formal test phase includes the hardware and software components (units/modules). For additional details of the progressive test levels see paragraph 4.1.4. Hardware component testing will encompass test classes outlined in paragraph 4.1.2.

4.1.2 Test Classes

The content of this plan describes Hardware Component testing only. Software tests are documented in the Software Component Test documentation.

Test Classes include:

Component:

- Power-On Self Test (POST)
- On-line (Run-Time) Diagnostics
- Off-line Diagnostics
- TPS/UPS power backup (verify SNMP or other notifications are transmitted)
- Power Management Control
- Signal Attenuation
- RF/IO Mixing
- Signal Splitting

4.1.3 General Test Conditions

The ORDA hardware components will be configured and performance tested in accordance with the manufacturer's specifications at the West Oaks ORDA Engineering Facility. The ORDA test engineering team will perform all component and operational tests on the COTS Hardware. The ORDA test engineering team will not perform environmental testing, such as humidity and altitude, on any hardware. The West Oaks lab facility environmentally represents a WSR-88D shelter under normal operating conditions.

4.1.4 Test Progression

Engineering Prototype test PUIs are prefixed with RDA_ENG

Hardware Component PUIs are prefixed with RDA_HW_COMP and are documented in this plan.

Integration test PUIs are prefixed with RDA_INT

System test PUIs are prefixed with RDA_SYS

Acceptance test PUIs are prefixed with RDA_ACC

Beta test PUIs are prefixed with RDA_BETA

Installation test PUIs are prefixed with RDA_INCO

4.1.5 Data Recording, Reduction, and Analysis

The data collected during hardware component level testing will be maintained in DOORS in the Hardware Component Test Report for traceability to the Hardware Component Test Plan and the Hardware Component Test Description.

4.2 Planned Tests

Enumerated in the following subordinate paragraphs:

4.2.1 RCP8/RCW Hardware Component

4.2.1.1 RDA_HW_COMP_RCP8/RCW

- a. Objective: Verify correct operational characteristics of the Radar Control Processor.
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics, Off-line Diagnostics
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.2 RVP08 Hardware Component

4.2.2.1 RDA_HW_COMP_RVP8

- a. Objective: Verify correct operational characteristics of the Radar Signal Processor.
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics, Off-line Diagnostics
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.3 Intermediate Frequency Digitizer (IFD) Hardware Component

4.2.3.1 RDA_HW_COMP_IFD

- a. Objective: Verify correct operation of the IFD
- b. Test Level: Component

- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.4 Router (2620XM) Hardware Component

4.2.4.1 RDA_HW_COMP_RTR1

- a. Objective: Verify correct operation of the Router
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics, Off-line Diagnostics
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.5 Router (2621XM) Hardware Component

4.2.5.1 RDA_HW_COMP_RTR2

- a. Objective: Verify correct operation of the Router
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics, Off-line Diagnostics
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.6 LAN Switch Hardware Component

4.2.6.1 RDA_HW_COMP_LAN

- a. Objective: Verify correct operation of the LAN Switch
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration

- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics, Off-line Diagnostics
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.7 Serial Switch Hardware Component

4.2.7.1 RDA_HW_COMP_SSW

- a. Objective: Verify correct operation of the Serial Switch
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics, Off-line Diagnostics
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.8 Power Control Switch - Baytech Hardware Component

4.2.8.1 RDA_HW_COMP_PCS

- a. Objective: Verify correct operation of the Baytech Power Control Switch
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics, Off-line Diagnostics, TPS/UPS power backup (verify SNMP or other notifications are transmitted)
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.9 Uninterruptible Power Supply (UPS) Hardware Component

4.2.9.1 RDA_HW_COMP_UPS

- a. Objective: Verify correct operation of the Uninterruptible Power Supply
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration

- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics, Off-line Diagnostics, TPS/UPS power backup (verify SNMP or other notifications are transmitted), Full Load Testing
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.10 Power Manager Hardware Component

4.2.10.1 RDA_HW_COMP_MGR

- a. Objective: Verify correct operation of the Power Manager
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics, Off-line Diagnostics, TPS/UPS power backup (verify SNMP or other notifications are transmitted), Power Management Control
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.11 Keyboard-Video-Mouse Hardware Component

4.2.11.1 RDA_HW_COMP_KVM

- a. Objective: Verify correct operation of the Keyboard-Video-Mouse Assembly
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Power-On Self Test (POST), On-line (Run-Time) Diagnostics
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.12 20dB Attenuator

4.2.12.1 RDA_HW_COMP_ATT1

- a. Objective: Verify correct operation of the 20dB Attenuator
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration

- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Signal attenuation levels IAW Manufacturer Specifications
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.13 20dB RF Attenuator

4.2.13.1 RDA_HW_COMP_ATT2

- a. Objective: Verify correct operation of the 20dB RF Attenuator
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Signal attenuation levels IAW Manufacturer Specifications
- h. Data analysis/reduction required: N/A
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.14 6dB Attenuator

4.2.14.1 RDA_HW_COMP_ATT3

- a. Objective: Verify correct operation of the 6dB Attenuator
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Signal attenuation levels IAW Manufacturer Specifications
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.15 3dB Attenuator

4.2.15.1 RDA_HW_COMP_ATT4

- a. Objective: Verify correct operation of the 3dB Attenuator
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Signal attenuation levels IAW Manufacturer Specifications
- h. Data analysis/reduction required: Test Results Maintained In DOORS

- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.16 RF Mixer

4.2.16.1 RDA_HW_COMP_MIXER

- a. Objective: Verify correct operation of the RF Mixer
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Proper Mixing of RF and LO Signals IAW Manufacturer Specifications
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

4.2.17 RF Splitter

4.2.17.1 RDA_HW_COMP_SPLITTER

- a. Objective: Verify correct operation of the RF Splitter
- b. Test Level: Component
- c. Test Type: Engineering & Formal
- d. Qualification method(s): Inspection & Demonstration
- e. Requirements: See section 6
- f. Special requirements: None
- g. Data recorded: Proper Signal Splitting, Attenuation, and Phase Shifting IAW Manufacturer Specifications
- h. Data analysis/reduction required: Test Results Maintained In DOORS
- i. Assumptions and constraints: None
- j. Safety, Security, and Privacy: N/A

5 Test Schedules

Hardware Components will be tested during the Component Development & Test Phase currently scheduled between March 2003 through October 2003 and conducted as described in the TEMP. The hardware component testing overlaps software testing, both will be performed concurrently. Specific testing dates for each hardware component are not specified because they depend on production hardware availability and a release from hardware configuration management.

6 Requirements Traceability

See /ORDA/RAPS/REQUIREMENTS/All RAPs in the DOORS database. The RAPS module contains the necessary links to the SS and SRS for requirement traceability.

7 Notes

None

8 Annexes

None