



# **DEMONSTRATION PLAN**

For the

## **National Weather Radio (NWR) Nautel Transmitter Installations**

**August 2010**

**U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Weather Service/Office of Operational Systems  
Field Systems Operations Center/Test and Evaluation Branch**

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## 1.0 Introduction

This plan describes how the National Weather Service (NWS) will conduct the demonstration for the field installations and evaluation of the new National Oceanic Atmospheric Administration (NOAA) All-Hazards Weather Radio (NWR) Nautel NG300/NG1000 transmitters. This demonstration plan will describe the purpose, prerequisites, objectives, strategy for installations and monitoring, schedules, and evaluating problems found.

The demonstration will evaluate transmitter installation and checkout, and subsequently verify operational performance and monitor for successful operation. The Office of Operational Systems, Test & Evaluation Branch (OPS24) will be responsible for conducting and reporting of the demonstration.

The demonstration kickoff meeting will be held **July 28, 2010** to verify and confirm test site readiness and answer questions. The transmitter installations will start at the WFO Raleigh, NC (RAH) transmitter at Rocky Mount, on the week of August 2, 2010 and at the WFO Portland, OR (PQR) transmitter at Salem, OR on the week of August 16, 2010 (see **Table 1 Transmitter Locations**).

**Table 1 Nautel NG300/NG1000 Transmitter Locations**

<b>WFO</b>	<b>Transmitter Locations</b>	<b>Region</b>	<b>Type</b>	<b>Install Week</b>
WFO Raleigh, NC (RAH)	Rocky Mount, NC	ER	NG1000	August 2 <sup>nd</sup>
WFO Portland, OR (PQR)	Salem, OR	WR	NG300	August 16 <sup>th</sup>

## 2.0 Purpose

The purpose of the demonstration is to evaluate the on-site installations, evaluation, and monitoring of the Nautel NG300/NG1000 transmitters in an operational environment. The demonstration test sites were pre-selected by Disseminations Services Branch (OPS17) per solicitations from all the regional focal points.

## 3.0 Prerequisites

Prior to the start of the demonstration, the following prerequisites (and the responsible point of contact) must be met:

1. Required transmitter equipment, including all installation parts is complete and received by the field office focal points (OPS17).
2. Transmitter installation documentation and checkout procedures (Maintenance Notes – Installation for NG300 and NG1000 Nautel Transmitter, and Maintenance are available and provided to the field office focal points (OPS17).
3. Test sites will broadcast public information statement (PNS) to announce demonstration.
4. Test site field personnel supporting the installation will have been trained at classes held at the training center (NWSTC).

5. Test sites will verify that the configurations for the new transmitters will be pre-aligned and calibrated at CRS before actual installation. The actual input to the transmitter must be aligned at -10dbm.

## **4.0 Demonstration Objectives**

1. Verify installation and checkout procedures/instructions are available and accurate.
2. Verify installation and checkout are successful and not adversely affect current operations.
3. Verify transmitter alignment via test equipment traceable to NIST.
4. Verify transmitter primary to secondary power switching and vice versa.
5. Verify transmitter Remote Control and Monitoring functionality is operational.
6. Verify transmitter Remote Off-Air Monitoring System (ROAMS) functionality is operational.
7. Verify backup transmitter handling using CRS audio control panel backup live.
8. Verify transmitter broadcast of weather radio products, including watches or warnings with alert and NWRSAME tones (RWT can be used)
9. Verify transmitter operates within specifications set forth in NWS Directives NWSI 10-1712, Appendix A: NWR SAME Message Format.
10. Verify site personnel understand making addition/deletion in EMRS for new transmitter system
11. Verify site personnel understand procedures on adding asset to NOAA Property Accounting and disposal procedures for legacy transmitters
12. Verify no reported outages and problems were experienced.

## **5.0 Demonstration Strategy**

### **5.1 Background**

The existing NOAA Weather Radio (NWR) service is provided by means of a network of over 1000 VHF radio transmitters licensed, operated, and maintained either directly or under the auspices of the NWS. The radio equipments (i.e., transmitters, antennas, and programming consoles) are primarily Government-owned, although there are some cases where non-NWS public and private organizations (hereafter known as Cooperators) own and operate the transmitters under Memoranda of Agreement (MOA) with NWS.

The system currently delivers a continuous stream of audio programming in the form of weather messages (known as "products") directly to the public from NWS Forecast Offices. These messages can range from an informational climatological Outlook, or a River Recreation Statement, to an action oriented Tornado Warning. The system utilizes VHF FM broadcast technology in the 162.400 to 162.550-MHZ land mobile band. The service is available in all 50 states plus Puerto Rico, the Virgin Islands, American Samoa, and the Mariana Islands.

The intent of NWS is to replace the old transmitters with new ones that will cost effectively meet or exceed the high level of performance provided by the current NWR network, while delivering a more meaningful and extensive range of more timely NWS products to a larger number of users.

The Nautel NG300/NG1000 transmitters have been selected by NWS to replace older transmitters and comply with the required high availability requirements and fully redundant systems.

Both Nautel NG300/NG1000 transmitters have undergone successful factory acceptance burn in testing in February, 2010. These test results are recorded in Section 5.0 datasheets of the Nautel NG300 Test Procedures Burn In document, latest version 3.0 dated March 5, 2010, and in the Nautel NG1000 Test Procedures Burn In document, latest version 3.0 dated March 5, 2010. In **Appendix B**, the list of specifications tested and passed during the NG300 Burn In last February 2010 are listed for reference. **Appendix C** will include the burn in results information for the NG1000 transmitter.

## 5.2 Demonstration Conduct

**The demonstration will start with a kickoff meeting on Wednesday July 28, 2010 at 2:00pm EDT** with all test participants, including regional and site focal points to discuss the upcoming demonstration and to verify that all prerequisites have been met (see Section 3.0).

The Nautel NG300/NG1000 transmitter installations will be performed at the sites listed in **Table 1** using the installation instructions in the provided by the Dissemination Systems Branch (OPS17). Test site field personnel will perform the transmitter installation and will be supported by the regional maintenance/equipment specialists (see Section 7.0).

The on-site installation procedures will be performed on two test sites for two types of transmitters. Representative(s) from OPS24 (see Section 7.0) will travel onsite, at both sites, to monitor and evaluate the Nautel transmitter installation and to conduct the evaluation listed in **Appendix A**. After successfully performing the installation and evaluation, each site will monitor their systems. All problems and/or issues found will be reported to the personnel listed in Section 7.0.

### 5.2.1 Transmitter Installation

OPS17 will provide the complete and accurate installation instructions. At each of the test sites, the test site personnel will perform the transmitter installations with support from their regional maintenance/equipment specialists. The actual transmitter instructions and checkout procedures will be **NWS Maintenance Notes (Installation instructions for the Nautel NG300 and NG1000)**, **NWS Maintenance Notes (Alignment instructions for the Nautel NG300 and NG1000 transmitters)**, and the **Nautel NG300/NG1000 Installations Manual**. These documents will be disseminated by OPS17 to the test sites prior to the actual day of installation.

After the new transmitter installations, the previous transmitters removed from connections will be deactivated and packed. In order to mitigate risks of the new transmitter failing and the field office left without an operational transmitter, both RMS personnel at the Rocky Mount and Salem transmitter sites has assured backup transmitter capabilities will be provided if needed.

This transmitter installation activity should take at least one day.

### 5.2.2 Evaluation

After a successful installation at each of the test sites, the test site personnel with support from the RMS personnel will connect the transmitter for live on-air confirmation. The test team will then evaluate the newly installed transmitter. The evaluations will include:

- a. Transmitter alignment via calibrated test equipment and documentation
- b. Primary/Secondary power switch
- c. Remote control monitoring software verification
- d. ROAMS verification
- e. Transmitter backup handling
- f. Broadcast of weather products including watches or warnings with alert and NWR SAME tones (use RWT if possible).
- g. Tone and voice modulation within specifications set forth in NWS Directives NWSI 10-1712, Appendix A: NWR SAME Message Format.
- h. EMRS activation of new transmitter and deactivation of legacy transmitter
- i. Property transfer requirements to Sunflower for new system

See **Appendix A** for the listed evaluation checklist and corresponding action. This evaluation activity should take at least one day.

### 5.2.3 Operational Monitoring

The operational monitoring will commence immediately after the evaluations are completed. During this period, the new transmitters will operate under normal and/or backup operations with live NWR broadcasts. Test site focal points will verify that the transmitters are broadcasting all messages and report any message transmission failures. This monitoring activity should last for the duration of the demonstration.

For WFO Raleigh, NC, the monitoring period will be from August 5, 2010 through August 25, 2010. For WFO Portland, OR, the monitoring period will be from August 16, 2010 through August 25, 2010.

## 6.0 Schedule

The schedule of events is listed in Appendix D.

## 7.0 Test Personnel

For the duration of the demonstration, the test sites will report results and problems to the following personnel:

Name/Email	Organization	Phone
Jae Lee <a href="mailto:Jae.Lee@noaa.gov">Jae.Lee@noaa.gov</a>	OPS24 (NWSHQ)	(301) 713-0326 x160

Bert Vioria <a href="mailto:Bert.Vioria@noaa.gov">Bert.Vioria@noaa.gov</a>	OPS24 (NWSHQ)	(301) 713-0326 x131
Ronald Vaillant <a href="mailto:Ronald.Vaillant@noaa.gov">Ronald.Vaillant@noaa.gov</a>	OPS17 (NWSHQ)	(301) 713-9478 x171
Brian Campbell <a href="mailto:Brian.Cambell@noaa.gov">Brian.Cambell@noaa.gov</a>	Regional Equipment Specialist Sys Operations Div Greer, SC	(864) 968-9695 x229 (864) 275-2588 (Cell)
Gerald Deiotte <a href="mailto:Gerald.Deiotte@noaa.gov">Gerald.Deiotte@noaa.gov</a>	Regional Maintenance Specialist WFO Phoenix AZ	(801) 524-5120 x282 (435) 868-1089 (Cell)
Joe Lachacz <a href="mailto:Joe.Lachacz@noaa.gov">Joe.Lachacz@noaa.gov</a>	Supervisory Electronic Technician WR421	(801) 524-5120 x280 (801) 971-2728 (Cell)

## 8.0 Conclusion

**The demonstration ends on Wednesday August 25, 2010. Afterwards, a wrap-up meeting will be scheduled on Thursday August 26, 2010** to discuss the status of the transmitter installations and any problems found. Afterwards, OPS24 will provide a brief demonstration report outlining all of the activities and results from the installation and testing, including all recommendations from the sites and test personnel.

## Appendix A – Demonstration Evaluation

Item	Evaluation	Pass	Fail
1	<b>Transmitter Alignment via calibrated test equipment and document</b> – transmitter frequency, modulation, and authorized power are within specification		
2	<b>Primary/Secondary power switch via CRS transfer tone utility</b> – switch from primary to secondary power and vice versa. Check broadcasting is still operational.		
3	<b>Remote Control and Monitoring verification</b> – dial up and/or local connectivity using user interface tested and verified.		
4	<p><b>ROAMS verification</b> – manually contact ROAMS unit via phone call to verify ROAMS functionality.</p> <p>The following personnel will need to program the newly installed transmitter first before the verification can be performed:</p> <ul style="list-style-type: none"> <li>• Wayne Hart (301-713-1847 x192) Primary <a href="mailto:Wayne.Hart@noaa.gov">Wayne.Hart@noaa.gov</a></li> <li>• Wendell Nakamine (301-713-1743 x110) Alternate <a href="mailto:Wendell.Nakamine@noaa.gov">Wendell.Nakamine@noaa.gov</a></li> </ul>		
5	<b>Transmitter Backup handling</b> – use CRS backup live capability using CRS Audio Control Panel to verify transmitter backup live functionality is operational.		
6	<b>Watches and warning broadcast</b> – <i>If scheduled</i> , confirm watches and/or warnings message broadcast via CRS and transmission on weather radios. <i>If possible, schedule RWT message to confirm.</i>		
7	<b>Transmitter compliance to NWSI 10-1711, Appendix A</b> – Insure SAME preamble, Alert Tone, and Voice modulation meet criteria set forth in Appendix A of NWSI 10-1711. <i>If possible, schedule RWT message to confirm.</i>		
8	<b>EMRS activation of new transmitter and deactivation of legacy transmitter</b> - Gaining WFO is briefed on EMRS activation of new system and decommissioning of legacy system		
9	<b>Property transfer requirements for Sunflower for new system</b> – Gaining WFO is briefed on transfer POC's for addition of new transmitter system, and disposal instructions for legacy transmitter		

## Appendix B – NG300 Transmitter Burn In Results

Specification	Required Value	Burn In
Carrier Frequency:	162.475 MHz	
Output Power/Impedance:	300W into 50 ohm load and standby on to dummy load at 375W	
Deviation:	5 dBm input @ 1000 Hz audio	
System Controller Compression Boost Enable:	Off	
Audio Generator:	1000 Hz at 60% deviation	
RF Output:	300 W	Passed
Maximum Deviation:	± 5 kHz	Passed
Frequency Stability:	≤ ± 5ppm	Passed
VSWR RF Output:	300W ± 1dB	Passed
Spurious Harmonics:	-68dBc	Passed
Remote status functional:	Yes	Passed
Reliability:	No anomalies	Passed
Maintainability:	No repairs	Passed

## Appendix C – NG1000 Transmitter Burn In Results

Specification	Required Value	Burn In
Carrier Frequency:	162.475 MHz	
Output Power/Impedance:	1000W into 50 ohm load and standby on to dummy load at 1250W	
Deviation:	5 dBm input @ 1000 Hz audio	
System Controller Compression Boost Enable:	Off	
Audio Generator:	1000 Hz at 60% deviation	
RF Output:	1000 W	
Maximum Deviation:	$\pm 5$ kHz	Passed
Frequency Stability:	$\leq \pm 5$ ppm	Passed
VSWR RF Output:	1000W $\pm 1$ dB	Passed
Spurious Harmonics:	-73dBc	Passed
Remote status functional:	Yes	Passed
Reliability:	No anomalies	Passed
Maintainability:	No repairs	Passed

## Appendix D – Schedule

7/26/2010 - 8/27/2010						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
July 25	26	27	28	29	30	31
			Kickoff Meeting 2:00pm EDT			
August 1	2	3	4	5	6	7
	Install / Evaluate @ WFO Raleigh / Rocky Mount, NC Monitoring period 8/5/10 – 8/25/10					
8	9	10	11	12	13	14
15	16	17	18	19	20	21
	Install / Evaluate @ WFO Portland / Salem, OR Monitoring period 8/19 – 8/25/10					
22	23	24	25	26	27	28
			Demonstration End	Wrap-up Meeting 3:00pm EDT		