NATIONAL WEATHER SERVICE

NOAA WEATHER RADIO (NWR) TRANSMITTERS

NWR SPECIFIC AREA MESSAGE ENCODING

NWR SAME

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1. BACKGROUND

The National Weather Service (NWS) is an agency within the Department of Commerce's (DOC) National Oceanic and Atmospheric Administration (NOAA). Beginning in the late 1950s, the NWS, then the U.S. Weather Bureau, started developing a voice radio broadcast systems to provide more frequent and specialized weather information to the general public and users with unique weather needs than was available from the commercial radio and television services. Coverage from stations during this period was primarily confined to large urbanized cities and along the coasts. The service was eventually named NOAA Weather Radio (NWR).

An NWR system consists of four elements, 1.) A voice messaging system, 2.) Communications link, 3.) Transmitter, and 4.) Receiver/monitor. The voice message system is a programming console located at the NWS office that records voice messages by NWS personnel or uses automated text-to-speech techniques. The various messages are programmed to play in a continuous sequence repeating every three to five minutes varying the messages depending on the time of day and type of weather pattern. Early versions of these consoles recorded the messages on continuous loop tapes much like Hi-Fi eight-track cartridges and manually placed in playback units. Later units digitized the voice messages and stored them in computer type memory chips. The recorded messages were stored in prearranged memory bins for playback. The current generation consoles are more automated computer based system with the messages stored on disk as files. This system called the Console Replacement System (CRS) can better manage the recording process, message scheduling, plus perform the text-to-speech operations.

Transmitters are normally located on commercially owned towers and connected to the consoles using dedicated telephone lines, microwave, or ultra-high frequency (UHF) links. Operating frequencies are in the Federal Government's Very High Frequency (VHF) band between 162.400 and 162.550 MHZ.

As the value of the system grew in popularity with the public, the number of sites slowly expanded, additional frequencies were assigned, and transmitter power was allowed to increase.

A special feature of the NWR system that evolved in the 1960's was the transmission of a single tone at 1050 Hz prior to the broadcast of any message about a life or property threatening event. This became known as the Warning Alarm Tone (WAT). Special receivers are made by several companies that are electronically on and receiving the broadcast signal but the speaker is in a muted state. When this type of radio detects the WAT, it automatically turns on the speaker allowing the message to be heard without the need for the owner/user to do anything.

In the Spring of 1974, the largest recorded outbreak of tornadoes in the nation's history occurred. Conclusions of a survey following the disaster recommended the expansion of the NWR network and to designate it as the only Federally operated broadcast system to communicate life and property threaten information "directly" to the public. This system was also tasked to disseminate any nuclear attack warnings or other national emergencies. Techniques were developed allowing warnings broadcast over the NWR to be rebroadcast over commercial radio and television stations as part of the Emergency Broadcast System (EBS).

The analog WAT technology served the NWR network well until the mid 1980s when the rapid expansion of cable television and the automation of commercial radio and television began to isolate the public from local sources of warning information. Typically the WAT was transmitted for any watch or

warning for an area of approximately 5,000 square miles or about seven to ten average size counties. Therefore, any receiver in the service area of the station could be activated from 70 up to 100 times before it was for the specific event and specific location of particular need of any individual user. Without staff at media facilities to manually evaluate the need to rebroadcast an NWR message using the EBS, automatic rebroadcasting of all messages preceded by just the WAT was unacceptable and impractical. Even if stations and others with that type of need were willing to allow for this type of automatic capture, assuming the events for activation were critical, there was no way for automated equipment at the station to know when the message was complete and restore it back to normal operation. There was also the perception by the general public with WAT decoding receivers that any message that set their radio off that did not apply to their geographical area was a "false alarm" regardless of whether the warning may have been valid for another area/county in the service area of the NWR transmitter.

Starting in 1985 the NWS began experimenting with putting special digital codes at the beginning and end of any message about a life or property threatening event. The intent was to ultimately transmit a code with the initial broadcast of all NWR messages. This system evolved into what is known today as NWR Specific Area Message Encoding (NWR SAME). The technical specifications are described in the following sections.

The NWS had been using an approach similar to the NWR SAME on text messages transmitted on its NOAA Weather Wire Service (NWWS), called the Universal Geographic Code (UGC), with great success and major service enhancements starting in the late 1970's. The NWR SAME was adopted by the NWS for national implementation in 1988 using a shared funding partnership arrangement with users in the local service areas of NWR stations. Full scale implementation was funded by the NWS in early 1996 when the NWR SAME technique was adopted by the Federal Communications Commission (FCC) as part of its new Emergency Alert System (EAS) that replaced the EBS in January 1997 and the NWR was an officially designated source for EAS messages from the NWS.

The NWR SAME process was originally achieved using an encoder panel consisting of a number of buttons representing the functions to be performed, types or content of messages, the affected areas, and valid time of the message. A microprocessor in the panel interprets button active status and creates the proper codes and places them at the beginning and end of each message. The panel was electronically connected to the various types of message programming and playback consoles used by the NWS to broadcast messages over the NWR transmitters.

In 1998, the NWS replaced all of its existing inventory of message recording and playback equipment with the CRS. The NWR SAME coding process is an integrated part of CRS. The existing encoder panels are used as emergency backup only in CRS.

2. SYSTEM CAPABILITIES

The main purpose of the code created by NWR SAME is to provide enough information before and after the broadcast of a message so software routines can match preprogrammed user instructions. Its greatest value is to significantly improve the automatic selection and distribution of messages about events that threaten people and/or property. Applications range from turning on a muted speaker in basic radios for specific classes of events and/or specific locations, capturing all-channel overrides of cable television systems, interrupting background music services, broadcasting over paging services, creating basic text messages from the code for the deaf, capturing and rebroadcasting NWR messages by EAS equipment at radio and television stations, or activating other types of attention signals, just to name just a few.

NWR SAME codes will appear on the initial broadcast or update of routine type messages such as forecasts, weather roundups, climate summaries, statements, river, lake, and tide stages among others once its application to emergency messages and interconnect to the EAS is completely mature. Equipment at radio stations could, for example, capture just the verbal part of a forecast or weather roundup, store it, and then play it back at scheduled times or as needed for event driven messages such as special statements.

The number of event type messages and geographic areas codes NWR SAME can identify is almost unlimited. However, there is a limit of 80 message types disseminated on the EAS because of equipment supplied to commercial radio, television, and cable TV systems under FCC rules. There will be a self-imposed practical limit on both the NWR and EAS to avoid too narrowly defining the types of messages and becoming an unmanageably large list that would exceed most consumer equipment resources and the public's ability to program such units. A similar condition exits for geographic areas with an EAS imposed limit of 31 in any one message. It is possible to address larger areas by grouping counties into regions and providing a single code for that area.

The End Of Message (EOM) code, as the name implies, tells a microprocessor based device it has received all of the verbal message and to process or further distribute the message as programmed.

A very important new and growing application of the NWR and SAME is its use as the primary broadcast warning system for industrial and military complexes (e.g., petro-chemical plants, nuclear power generators, chemical, nuclear, and biological weapons and storage areas). These facilities have very unique alerting requirements. They must be able to communicate directly with nearly 100 percent of the people in close proximity to these sites in less than a minute with highly specialized information. At the same time they must provide information to the broadcast media serving the area. People living in the designated alerting zones find the weather information that is available on these dual service receivers valuable and, therefore, are more likely to keep it working and properly maintained. This reduces the amount of replacement common with single purpose units. Facility emergency managers also have the advantage of cost savings using existing products already produced in large quantities for the general public as the basic platform with minor software adaptations to meet their special alerting and information needs.

3. TECHNICAL SPECIFICATIONS

An NWR SAME transmitted data message consists of six possible elements in the following sequence:

1.) Preamble
2.) Header code
3.) Warning Alarm Tone/Attention Signal
4.) Voice Message
5.) Preamble
6.) End Of Message (EOM)

Elements **1**, **2**, **5**, and **6** will **always** be transmitted in a NWR SAME message and repeated three times. Elements **3** and **4** may or may not be transmitted depending on the specific type of message or its application.

The coded message is transmitted, using Frequency Shift Keying (FSK), on the audio channel of the very high frequency (VHF) NOAA Weather Radio (NWR) transmitter system. In this application and that currently used by the Federal Communications Commission's (FCC) Emergency Alert System (EAS), it is more accurate to refer to the code format as Audio Frequency Shift Keying (AFSK). It is transmitted at no less than 80% modulation (± 4.0 kHz deviation minimum, ± 5.0 kHz deviation maximum).

The coded message and voice program audio is transmitted over the NWR transmitter network using standard pre-emphasis for narrow band VHF FM of 6 dB per octave increasing slope from 300 Hz to 3,000 Hz applied to the modulator.

The preamble and header code are transmitted three times with a one second pause (± 5%) between each coded message burst prior to the broadcast of the actual message. The End Of Message (EOM) consists of the preamble and EOM code transmitted three times with a one second pause (± 5%) between each EOM burst.

Each header and EOM data transmission consists of a series string of eight (8) bit bytes similar to standard asynchronous serial communications. However, there are, no start, no stop, or parity bits. Bit and byte synchronization is attained by a preamble code at the beginning of each header code or EOM data transmission. Data transmissions are phase continuous at the bit boundary.

Each separate header code data transmission should not exceed a total of 268 bytes if the maximum allowable geographic locations are included.

3.1 Bit Parameters

The following definitions of a bit are based on a bit period equaling 1920 microseconds (± one microsecond).

a.) The speed is 520.83 bits per second
b.) Logic zero is 1562.5 Hz.
c.) Logic one is 2083.3 Hz

d.) Mark and space bit periods are equal at 1.92 milliseconds.

3.2 Preamble Byte

The first 16 bytes (prior to the header code and EOM) of the data transmission is a preamble with each byte having the same value of hexadecimal AB (8 bit byte [10101011]). For all bytes, the least significant bit (LSB) is sent first. The bytes following the preamble constitute the actual message data transmission. The message data (header) code is transmitted using ASCII characters as defined in ANSI X3.4-1977 with the eighth (8th) bit always set to zero. (**NOTE: See Section 4. for a symbolic form of the coded message format).**

3.3 Warning Alarm Tone

The Warning Alarm Tone (WAT), if transmitted, is sent within one to three seconds following the third header code burst. The frequency of the WAT is 1050 Hz (± 0.3%) for 8 to 10 seconds at no less than 80% modulation (± 4.0 kHz deviation minimum, ± 5.0 kHz deviation maximum).

3.4 Voice Message

If transmitted, the actual voiced message begins within three to five seconds following the last NWR SAME code burst or WAT, whichever is last. The voice audio ranges between 20% modulation (± 1 kHz deviation) and 90% modulation (± 4.5 kHz deviation) with occasional lulls near zero and peaks as high as but not exceeding 100% modulation (± 5.0 kHz deviation). Total length of message should not exceed two minutes.

3.5 Special Sequence For NWR System Maintenance

The NWS will occasionally send a continuous string of Preamble code, (Hex AB) or a continuous tone through its communications links to the NWR transmitters, for several seconds up to around one minute This will be done to align the program console, communications links, and transmitters for optimum system performance.

4. MESSAGE CODE FORMAT / PROTOCOL

4.1 Symbolic Form

(Preamble) **ZCZC-WXR-EEE-PSSCCC-PSSCCC+TTTT-JJJHHMM-LLLLLLLL-**
(one second pause)
(Preamble) **ZCZC-WXR-EEE-PSSCCC-PSSCCC+TTTT-JJJHHMM-LLLLLLLL-**
(one second pause)
(Preamble) **ZCZC-WXR-EEE-PSSCCC-PSSCCC+TTTT-JJJHHMM-LLLLLLLL-**
(one to three second pause)

1050 Hz Warning Alarm Tone for 8 to 10 Seconds - *(if transmitted - see note below)*

Verbal /spoken oral text of message - *(if transmitted - see note below)*

(Preamble) **NNNN**
(one second pause)
(Preamble) **NNNN**
(one second pause)
(Preamble) **NNNN**

4.2 Symbol Definitions

NOTE: The use of **" "** is for clarity and emphasis purposes only. They are not part of the NWR SAME message structure.

4.2.1 (Preamble)

This is a consecutive string of bits (sixteen bytes of hexadecimal AB [8 bit byte 10101011]) sent to clear the system, set automatic gain controls and set asynchronous decoder clocking cycles. The preamble must be transmitted before each header code and EOM code.

4.2.2 "ZCZC-"

This header code block is the identifier, sent as ASCII characters ZCZC to indicate the start of the ASCII header code data transmission.

4.2.3 "-"(Dash)

This "Dash" is sent following each type of code information block in the header except prior to the message valid time.

4.2.4 "WXR-"

This header code block identifies the message as a voice message from a NWR system transmitter. There are other identifiers used by EAS stations as defined in FCC rules Part 11.

4.2.5 "EEE-"

This header code block identifies the type of Event and information contained in the verbal message, if a verbal message is sent. Section (**EVENT Codes**) of this document lists the approved Event codes. The event code may be sent with or without a WAT or verbal message as an alerting function only. It also may be sent as a control code for some NWR system control functions.

4.2.6 "PSSCCC-"

This header code block identifies the geographic area affected by the NWR SAME message. Each block of this coded information uniquely identifies a geographical area. A message may contain up to 31 blocks.

4.2.6.1 "P"

This part of the geographical area header code block allows for subdividing the area defined by the **"CCC"** into smaller parts in the case of very large or uniquely shaped area, or because of widely varying height, climate, or other geographic features. If a **"P"**= 0, it means the entire or unspecified area defined by **"CCC"** is affected. If **"P"** equals a number other than zero, the areas are defined as follows:

1 = Northwest 1/9
2 = North Central 1/9
3 = Northeast 1/9
4 = West Central 1/9
5 = Central 1/9
6 = East Central 1/9
7 = Southwest 1/9
8 = South Central 1/9
9 = Southeast 1/9

If the part is larger than 1/9 of the **"CCC"**, the following numbering convention is normally used depending on the desired size and/or orientation of the area such as from Northwest to Southeast, North to South, West to East, or Northeast to Southwest:

1 = Northwest ⅓ or ½ as appropriate
2 = North ⅓ or ½ as appropriate
3 = Northeast ⅓ or ½ as appropriate
4 = West ⅓ or ½ as appropriate
5 = Central ⅓
6 = East ⅓ or ½ as appropriate
7 = Southwest ⅓ or ½ as appropriate
8 = South ⅓ or ½ as appropriate
9 = Southeast ⅓ or ½ as appropriate

4.2.6.2 "SS"

This part of the geographical area header code block is the number of the state as defined by the Federal Information Processing System (FIPS) numbers as described in the U.S. Department of Commerce in National Institute of Standards and Technology (NIST) publication # 772. Special **"SS"** codes are assigned to those areas not defined by this publication such as the open waters of the Atlantic, Pacific, Gulf of Mexico and Great Lakes. The most current list of special **"SS"** codes may be obtained from the NWS or the FCC upon request.

4.2.6.3 "CCC"

This part of the geographical area header code block is a number normally assigned to each county in the United States by the FIPS. Special **"CCC"** codes are assigned to those areas not defined by the NIST publication # 772. These include the open waters of the Atlantic, Pacific, Gulf of Mexico and Great Lakes and to special alerting zones adjacent to and near unique storage or production facilities. A **"CCC"** of **000** applies to the entire state or area identified in the **"SS"** section of the code. The most current list of these special **"CCC"** codes may be obtained from either the NWS or the FCC upon request.

IMPORTANT NOTE Regarding The "PSSCCC" Code Block:

Location codes transmitted over NOAA Weather Radio (NWR) frequencies, but ***ORIGINATED INITIALLY*** by security or communications centers at special hazardous materials storage or production facilities, may contain a combination of numbers, letters, and other characters. The authorized set is ASCII characters decimal 10, and 13 and decimal 33 through decimal 127. ASCII characters decimal 43 and 45 may not be part of the six character location code, but used only at the end of the block as shown previously in the symbolic form. The ASCII character decimal 42, (e.g., "*****"), is reserved for use as a wild card only. These become special location codes containing a combination of geographic and instructional information to activate customized receivers, pre-stored text messages, and/or other special equipment.

These codes **WILL NOT** be sent as part of NWS originated NWR SAME messages. NWR receivers with SAME decoders should not respond to such codes for NWS NWR or EAS purposes. Systems receiving NWR broadcasts and providing further redistribution may want to pass them along in any retransmission of the header code. Radio, television, or cable systems covered by FCC Rules Part 11 are not prohibited from using these codes in peripheral equipment or ancillary functions to basic EAS equipment to further enhance the safety of the public in cooperation with local government officials or facility managers.

An NWR or EAS text standard over and above this special application of the location code is not defined under these specifications or EAS rules. A text standard could be developed using the basic NWR SAME/EAS protocol, but identified as a text message using a variation of the Originator code. The Originator Code in this section is reserved for voice messages only and decoders should reject any message that does not match this currently defined code set.

Numbers from 900 to 999 are reserved for assignment to unique non-FIPS defined alerting areas adjacent to facilities that store or produce nuclear, chemical, and biological material.

For the most current list of these areas, contact the NWS or FCC.

The **"SS"** numbers assigned to the open waters along the U.S. coast are shown in Attachment **1**.

4.2.7 "+TTTT-"

This header code block identifies the **PURGE** time of the message expressed in a delta time from the issue time in 15 minute segments up to one hour. Then in 30 minute segments beyond one hour up to six hours; i.e. **+0015-**, **+0030-**, **+0045-**, **+0100-**, **+0430-**, **+0600-**. This delta time, when added to the issue time, specifies when the **MESSAGE** is no longer valid and should be purged from the system, not to be used again. It is important to note that the valid or purge time of the **MESSAGE** will **NOT** always equal the event expiration time. For most short term events such as tornadoes and severe thunderstorms, the two times will most often be identical. For longer duration events such as a hurricane or winter storm that may not end for many hours or days, the valid time in the code only applies to that message, and is not an indicator when the threat is over.

4.2.8 "JJJHHMM-"

This header code block identifies the Julian Calendar date and the time the message was originally disseminated in hours and minutes using the 24 hour Universal Time Coordinated (UTC) clock.

4.2.8 "LLLLLLLL-"

This header code block identifies the originator of the message, or in the case of the EAS, that of a station rebroadcasting the message. NWS offices use the World Meteorological Organization office identification, e.g., KDTX/NWS for Detroit, MI, and KTOP/NWS for Topeka, KS. Radio and television stations use the stations call sign such as KFAB/AM or WDAF/FM.

4.2.9 "NNNN"

This code block is the End Of Message (EOM) code.

5. MESSAGE EXAMPLES

5.1 Most Common Code Transmission with Critical Verbal Warning Message

(Preamble [16 bytes]) **ZCZC-WXR-TOW-039173-039051-139069+0030-1591829-KCLE/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-TOW-039173-039051-139069+0030-1591829-KCLE/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-TOW-039173-039051-139069+0030-1591829-KCLE/NWS-**
(one to three second pause)
(**Warning Alarm Tone Transmitted for eight to ten seconds**)
(three to five second pause)
(**Verbal text of the Tornado Warning Message**)
(One to three second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**

This example is a tornado warning for Wood, Fulton, and northwest Henry counties in Ohio and valid for 30 minutes from the issue time of 1829 UTC (which was 2:29 PM local time) on the 159th day of the Julian Calendar from the National Weather Service office in Cleveland, OH.

NOTE: A visual message from television or special display for the deaf could be created by a small microprocessor and appear as shown below.

"THE NATIONAL WEATHER SERVICE OFFICE IN CLEVELAND OHIO HAS ISSUED A TORNADO WARNING EFFECTIVE UNTIL 3 PM EDT FOR PEOPLE IN THE FOLLOWING COUNTIES IN OHIO...WOOD...FULTON...AND NORTHWEST HENRY." (Some pre-stored call to action and a recommendation to monitor TV or another special source could be included)

5.2 Code Transmission of Critical Verbal Message With No Warning Alarm Tone

(Preamble [16 bytes]) **ZCZC-WXR-TOW-039173-039051-139069+0030-1591829-KCLE/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-TOW-039173-039051-139069+0030-1591829-KCLE/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-TOW-039173-039051-139069+0030-1591829-KCLE/NWS-**

(**NO WARNING ALARM TONE TRANSMITTED**)
(Three to five second pause)
(**Verbal text of the Tornado Warning Message**)
(One to three second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**

This example is a message broadcast over the NWR. It is intended for retransmission by an FCC Emergency Alert System (EAS) Local Primary (LP) radio and/or television station where the event threatens an area outside of the service area of the NWR, but is covered by the LP and other stations in the service area of the NWR. Users with analog WAT type NWR receivers will not be alerted and those with NWR SAME decoder receivers would likely not have those geographical areas programmed in their units and if they did it would be because they wanted to be alerted.

The visual message shown in the previous example could still be generated.

5.3 Transmission of Critical Event Code, But With No Warning Alarm Tone or Verbal Message

(Preamble [16 bytes]) **ZCZC-WXR-TOW-039173-039051-139069+0030-1591829-KCLE/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-TOW-039173-039051-139069+0030-1591829-KCLE/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-TOW-039173-039051-139069+0030-1591829-KCLE/NWS-**

(**NO WARNING ALARM TONE TRANSMITTED**)

(**NO VERBAL MESSAGE BROADCAST**)
(One to three second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**

This is an example of a special NWR SAME code only broadcast. It is intended for re-transmission by an FCC Emergency Alert System (EAS) Local Primary (LP) radio and/or television station for the purpose of notifying other stations in the EAS web and emergency management officials outside the coverage of the NWR station. In the application of this example, the event threatens a location outside the service area of the NWR, but is covered by the LP. Users with analog WAT type NWR receivers will not be alerted and those with NWR SAME decoder receivers would not likely have those areas programmed in their units. If they did, it would be because they did want to be alerted. The use of this method over the NWR will be rare, to solve a very unique problem, and confined to more rural areas.

The visual message shown in the previous examples could still be generated.

(Preamble [16 bytes]) **ZCZC-WXR-RWT-020103-020209-020091-020121-029047-029165-029095-029037+0030-3031700-KEAX/NWS-**

(one second pause)

(Preamble [16 bytes]) **ZCZC-WXR-RWT-020103-020209-020091-020121-029047-029165-029095-029037+0030-3031700-KEAX/NWS-**

(one second pause)

(Preamble [16 bytes]) **ZCZC-WXR-RWT-020103-020209-020091-020121-029047-029165-029095-029037+0030-3031700-KEAX/NWS**

(one to three second pause)

(**Warning Alarm Tone Transmitted for eight to ten seconds**)

(three to five second pause)

(**Brief verbal text of the weekly test describing the service provided, area covered, and application of the warning alarm tone and NWR SAME code**)

(One to three second pause)

(Preamble [16 bytes]) **NNNN**

(one second pause)

(Preamble [16 bytes]) **NNNN**

(one second pause)

(Preamble [16 bytes]) **NNNN**

This is an example of a Required Weekly Test (RWT) of the NWR, WAT, and NWR SAME that covers the Kansas City metro area. It was transmitted at 1700 UTC (11:00AM CST) on the 303rd day of the Julian Calendar from the National Weather Service office located at Pleasant Hill, MO.

(Note: Some NWS offices are more active participants in the local operational areas of the Federal Communications Commission's (FCC) Emergency Alert System (EAS) by periodically initiating the Required Monthly Test. These tests normally coincide with the time the NWS conducts its routine weekly tests. In these cases, the RWT code for Required Weekly Test will be replaced with the code, MT, for the Required Monthly Test. No other NWR test using the RWT code for that week would be conducted.)

(Note: Some old versions of NWR SAME specifications that date back several years show the use of the word "TEST" in the header either alone or in combination with another event code. Use of that word as part of any test function was discontinued in late 1995 when the NWR-SAME code was adjusted to fully integrate it with the EAS. The only test functions of NWR-SAME are as described in this section.)

5.5 Transmission of Non-critical Event Code With No Warning Alarm Tone, But With a Verbal Message

(Preamble [16 bytes]) **ZCZC-WXR-SPS-039173-039051-139069+0030-1591829-KCLE/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-SPS-039173-039051-139069+0030-1591829-KCLE/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-SPS-039173-039051-139069+0030-1591829-KCLE/NWS-**

(**NO WARNING ALARM TONE TRANSMITTED**)
(Pause for one to three seconds)
(**Broadcast of the verbal message**)
(One to three second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**

This is example of a non-critical message broadcast over the NWR with the NWR SAME code, and not intended for the EAS. Its primary use would be for recording and playback by automated or unattended radio stations, redistribution by other service providers such as pagers, along with a wide variety of other applications.

Special Note: The use of this coded message for routine, non-critical messages (e.g., forecasts, weather roundups, and climate summaries among others as illustrated in this example), will become common starting in early 1999 as the NWS takes full advantage of the features provided by the Console Replacement System. The code will precede the initial or update of nearly all its messages broadcast over the NWR in much the same way as the Universal Geographic Code is used on all its text messages disseminated on the "NOAA Weather Wire Service."

5.6 Transmission of a System Control Code but with No Warning Alarm Tone or Verbal Message

(Preamble [16 bytes]) **ZCZC-WXR-TXB-039173+0030-1591829-KCLE/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-TXB-039173+0030-1591829-KCLE/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-TXB-039173+0030-1591829-KCLE/NWS-**

(**NO WARNING ALARM TONE TRANSMITTED**)
(**NO VERBAL MESSAGE BROADCAST**)
(One to three second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**

This is an example of a special NWR SAME code. It is broadcast only to control equipment served by the Cleveland office. In this case, it is an instruction to the NWR system in state/county number 039173 to switch to the backup transmitter.

(Preamble [16 bytes]) **ZCZC-WXR-DMO-999000+0030-1561634-KEAX/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-DMO-999000+0030-1561634-KEAX/NWS-**
(one second pause)
(Preamble [16 bytes]) **ZCZC-WXR-DMO-999000+0030-1561634-KEAX/NWS-**
(one to three second pause)

(**1050 Hz Warning Alarm Tone NOT Transmitted. However, for realism, a non-alerting tone at another frequency might be transmitted for eight to ten seconds**)
(one to three second pause)
(**Brief verbal text of a message describing the reason for the interruption in normal service to someone who may have been coincidentally listening to the standard weather broadcast and the warning alarm tone and NWR SAME code**)
(One to three second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**
(one second pause)
(Preamble [16 bytes]) **NNNN**

This example has three types of applications. Its primary use is to provide NWS field office personnel a means of conducting exercises to practice issuing authentic warnings and other critical messages without disrupting the EAS network or turning on receiver decoders used by industry and the general public. The event code "**DMO"** should not normally be programmed into in receiver decoder and the location code of **"999000"** does not match any existing or future geographical area codes.

Another application of this type of code transmission is to demonstrate over the air in real time how NWR SAME and/or the EAS could be used. A NWR SAME or EAS receiver decoder could be set up at some meeting to respond to the **"DMO"** event and **"999000"** location code. When the code is transmitted, only that unit would respond providing a realistic demonstration.

A third use is a maintenance aid to, align/test the NWR SAME communications link; or check newly installed or repaired receiver decoders at EAS media facilities, cable television hubs, or similar facilities that have specialized needs or will redistribute to other users. To thoroughly test the system, the user programs in the event code **"DMO"** and location code "**999000"**, and sets the receiver decoder or other equipment to perform the desired task. When the NWS sends the code as shown in the example, the system should be able to perform the desired task at the receive site. If a more detailed test is required, the receive site can program the actual desired event code, but use the location code **"999000"**. After that test, the receive site could program in event code "**DMO"** and the desired location code. None of these three code transmissions should cause any other equipment to respond since they should not have the **"DMO"** and **"999000"** combination or the **"999000"** combined with

any other event or a real location code paired with the event code **"DMO"**. At the conclusion of the demonstration/test, the receive site should program only the desired event pair and location codes and remove the **"DMO"** event and "**999000**" location codes.

(Note: The geographic code 999000 will likely be replaced by the geographic code 999999 shortly after the FCC updates its EAS rules in late 1999. This will be done to create an entirely unique practice or demonstration county geographic area and to avoid any potential conflict with future wild card applications for the use of the 000 "county" geographic codes.)

6. EVENT CODES

NATURE OF ACTIVATION	EVENT CODE
National Immediate Threat	
Emergency Action Notification	EAN $
Emergency Action Termination	EAT $
National Information Center	NIC $
National Hazard Warning	NHW ?
National Administrative	
National Periodic Test	NPT $
Local Immediate Threat	
Tornado Watch	TOA
Tornado Warning	TOR # (Will Change to TOW)
Severe Thunderstorm Watch	SVA
Severe Thunderstorm Warning	SVR # (Will Change to SVW)
Flash Flood Watch	FFA
Flash Flood Warning	FFW
Flood Watch	FLA
Flood Warning	FLW
Winter Storm Warning	WSW
Blizzard Warning	BZW
High Wind/Dust Storm Warning	HWW
Hurricane/Tropical Storm Watch	HUA
Hurricane/Tropical Storm Warning	HUW
Tsunami Watch	TSA
Tsunami Warning	TSW
Coastal Flood Watch	CFA *
Coastal Flood Warning	CFW *
Special Marine Warning	SMW *
Avalanche Watch	AVA *
Avalanche Warning	AVW *
Volcano Watch	VOA
Volcano Warning	VOW *
Immediate Evacuation Warning	IEW *
Evacuation Immediate	EVI %
Shelter In Place Warning	SPW *

NATURE OF ACTIVATION	EVENT CODE

Local Immediate Threat-(continued)

Civil Danger Watch	CDA *****
Civil Danger Warning	CDW *****
Civil Emergency Message	CEM %
Local Area Emergency	LAE *****
Radiological Hazard Watch	RHA *****
Radiological Hazard Warning	RHW *****
Hazardous Materials Watch	HMA *****
Hazardous Materials Warning	HMW *****
Law Enforcement Warning	LEW *****
Fire Warning	FRW *****

Local Information

Network Message Notification	NMN *

Local Administrative

Required Monthly Test	RMT
Required Weekly Test	RWT
System Demonstration/Practice	DMO

NWS / NWR With Non-EAS Applications

Severe Weather Statement	SVS &
Special Weather Statement	SPS &
Flash Flood Statement	FFS &
Flood Statement	FLS &
Hurricane Statement	HLS &
Winter Storm Watch	WSA &
High Wind/Dust Storm Watch	HWA &

Transmitter Primary On	TXP @
Transmitter Backup On	TXB @
Transmitter Carrier On	TXO @
Transmitter Carrier OFF	TXF @

NOTES:

$ These codes are for use by the Federal Communications Commission (FCC) and the Federal Emergency Management Agency (FEMA) for distribution of national messages over the EAS. It is unlikely in the near future the NWS will **INITIATE** the transmission of these codes over the NWR. These codes, however, may be retransmitted over the NWR where EAS equipment is installed on a NWR program line and the NWR system is serving as an EAS Local Primary (LP) station.

? The FCC plans to issue updated rules to Part 11 (EAS) that will take effect in 1999. This event code will be added to the NWR code set at that time allowing the **NWS** to **originate** over the NWR a message related to a threat to the nation. Use of this code by EAS systems monitoring the NWR may optionally relay these messages. This code will ensure NWR-SAME programmable receivers are able to provide these types of messages to comply with an Executive Order that the NWR is the only federally sponsored radio transmission of warning information to citizens in their homes of an enemy attack, natural disaster, or other threat.

The FCC plans to issue updated rules to Part 11 (EAS) that will take effect in 1999. These two codes will be changed as noted to comply with the standard code format for events classified as warnings.

***** The FCC will issue updated rules to Part 11 (EAS) that will take effect in 1999. These are new codes that will be added to address the needs for a broader range of weather and non-weather related hazards.

% The FCC will issue updated rules to Part 11 (EAS) that will take effect in 1999. These are codes that will be removed as EAS and SAME codes because they will be replaced by new codes that define the events in greater detail.

& The FCC will issue updated rules to Part 11 (EAS) that will take effect in 1999. These are codes that will no longer be considered as appropriate for EAS, but they will still be used by the NWS over its NWR SAME. They will not be prohibited for use by radio, television, and cable systems for other non-EAS applications.

@ These are new codes to be used by the NWS to control its remote NWR transmitters.

7. DESCRIPTION OF EVENT CODE CATEGORIES

7.1 Warning: Those events that alone pose a significant threat to public safety and/or property, probability of occurrence and location is high, and the onset time is relatively short.

7.2 Watch: Meets the classification of a warning, but either the onset time, probability of occurrence, or location is uncertain.

7.3 Emergency: An event that by itself would not kill or injure or do property damage but indirectly may cause other things to happen that result in a hazard. Example, a major power or telephone loss in a large city alone is not a direct hazard but disruption to other critical services could create a variety of conditions that could directly threaten public safety.

7.4 Statement: A message containing follow up information to a warning, watch, or emergency.

7.5 Special Event Code: The third letter in special event codes are limited as follows:

W for **WARNINGS**
A for **WATCHES**
E for **EMERGENCIES**
S for **STATEMENTS**

8. NWR SAME RECEIVER PERFORMANCE RECOMMENDATIONS AND CONSIDERATIONS

8.1 NWR SAME Receiver/Decoders' Use Of The Partition Part of the Location Code

It is recommended that NWR SAME receiver/decoders be designed so that if the unit has a partition in the geographical area (location) code stored for processing (e.g., 129139), it will respond to a transmitted code from the NWS that has only the zero in the partition part of the location code (e.g., 029139). The zero signifies ALL or and unspecified part of the coded location, therefore, for safety purposes, the decoder should respond to the zero partition code because the zero implies that the partitioned area is potentially affected. On the other hand, if the receiver/decoder unit uses a default of zero in the partition part of the location code (e.g., 029139), it should respond to any transmitted partitioned location code that otherwise matches the **"SS"** and **"CCC"** part of the code (e.g., 129139). The use of the zero in the receiver/decoder location code implies the user wants to be alerted for an event anywhere within the geographical area defined by the location code.

8.2 Requirement to Decode a Discrete Event and Location Pair

For industrial, commercial, and especially EAS type applications, it is recommended that any alerting or activation process be conditional on matching a discrete pair of specific event and a specific location code. Except in the most basic and simple application in consumer type products, decoders should avoid having a table of event codes and a separate table of location codes. For example, an event table consists of: TOW, FFW, CFW, and SMW. The location table includes: 033001, 033005, 033011, 075709, 075711.

In this arrangement, the system will respond if any transmitted code is in the event table and in the location table. Users will often need to have the ability for the system to respond to a TOW for 033001 and 033005 but not from 033011, however, it needs a FFW for 033011, but not for 033005. Therefore, a single lookup or matching table should be created so each event is paired with a discrete location, (e.g. [TOW\033001], [TOW\033005], [FFW\033011], [CFW\033005], [SMW\075711], [SMW\075709]).

Consumer type equipment may be able to use a two table approach versus discrete pairs because the interest or need for information for any hazardous event will likely be confined to just one or possibly two location codes reducing the number of receiver activations by as much as 80 to 90 percent. Otherwise, there would be little advantage of having a NWR SAME decoding unit if the user is interested in many events for a large area.

8.3 Code Error Checking

It is recommended that for the best receiver decoder performance the software routine check that at least two of the three header code transmissions are identical before declaring a match or valid code and performing the preprogrammed task. If this test fails, do a bit-by-bit check of the three transmissions and attempt to reconstruct a valid code by comparing the bits in each position in each header code transmission and accepting as the valid bit that bit which appears in two of the three header code transmissions.

8.4 End Of Message Decode

For NWR SAME applications, a valid End-Of-Message (EOM) does not need to be conditional on the receipt of all four N's in three separate bursts. For NWR SAME applications, an EOM can be considered valid if the decoder detects the preamble followed by at least one, but preferably two (2) N's. The preamble and any number of N's will never be sent except at the end of the message.

8.5 Plain Language Text Messages Produced From The Header Code

Devices that create a plain language text message from the header code should pay special attention to the definition of the **"+TTTT-"** part of the code described in Section **4.2.7** on page 9. Any text message should avoid the implication that the **EVENT** defined by the "**EEE"** part of the header code expires at the time determined by the issue time plus the delta time defined by the **"+TTTT-"** part of the header code. Wording similar to the following would be a more accurate statement especially for longer term events and would also apply to short fused events as well by substituting the appropriate time from the **"+TTTT-"** part of the header code..."THIS EVENT IS EXPECTED TO LAST FOR AT LEAST 6 HOURS OR LONGER. PLEASE STAY TUNED FOR MORE DETAILS." If the unit has a real time clock and enough processing and storage capacity to calculate a time, the message might read as follows regardless of the **"+TTTT-"**, ..."THIS EVENT IS EXPECTED TO LAST UNTIL AT LEAST HH:MM OR LONGER. PLEASE STAY TUNED FOR MORE DETAILS."

If the text message is expected to be read by someone without access to hearing the NWR or other media voice broadcasts, the second sentence should use language directing them to an appropriate alternate source.

8.6 External DC Power Source

It is recommended NWRSAME receiver/decoders be equipped with a suitable connector so it can be powered from an external 12 VDC source for operation away from commercial power outlets. This would allow the unit to be powered by car, truck, boat, or camper 12 VDC power systems through a source such as a cigarette lighter receptacle. A typical 9 VDC internal emergency backup battery, though desirable during loss of commercial power, may not power the unit in a continuous monitoring mode for more than a few hours when removed from commercial power. This would reduce the value of the radio as a warning device for people in remote, vulnerable situations.

8.7 Recognition of Non-NWS Originator Code

It is recommended NWR-SAME receiver/decoders software accept and process a message broadcast over the NWR with any EAS authorized originator code. In addition to the WXR that identifies the NWS as an originator, it should include EAN for the Emergency Action Notification Network, PEP for the Primary Entry Point System, CIV for Civil Authorities, and EAS for Broadcast stations and Cable Television Systems. The NWR is evolving into a more comprehensive local, state, regional, and national warning system in keeping with its objective as an "All Hazards" source of information. A few NWR transmitter sites are currently equipped with EAS devices to support the critical warning needs of unique storage or production facilities. It is likely the NWS will allow for the expanded installation of these types of EAS devices to support state and local distribution of non-weather related emergency messages through the NWR and as a means to enter the EAS network. These messages could be potentially as important to owners of NWR receivers as a weather related message. Even though the message may be originally disseminated over the NWR, it would not originate from the NWS and therefore not have an WXR origination code. To ensure owners of NWR receivers receive the maximum protection possible from the system, NWR-SAME receivers should accept any originator code.

8.8 Receiver Tests

The NWS tests the NWR and SAME alerting technology weekly. These tests normally occur on Wednesday between 10 AM and Noon with some variations to accommodate local requirements. Some NWS offices are more active participants in the local operational areas of the FCC's EAS by periodically initiating the Required Monthly Test. These tests normally coincide with the time the NWS conducts its routine weekly tests. In these cases, the RWT code for Required Weekly Test will be replaced with the code, RMT, for the Required Monthly Test. No other NWR test using the RWT code for that week would be conducted. This test is postponed to the next good weather day if threatening weather is occurring at or near the time of the routine or scheduled test.

All types of NWR-SAME compatible receivers should respond to these tests in some form. There are two basic methods from which there are several variations. The first method is for the receiver to display a message or have some other visual indication the unit has successful been tested. Another approach is for the unit to notify the user only when the unit's internal software suspects an error.

Use of the visual positive and/or routine display of a successful test should not be based on the valid time of the message in the header. This is normally set to 30 minutes because that is the minimum time the NWR system will accept. It is recommended that it not purge for upwards of 12 hours. This would allow for those not able to observe the test, (i.e., working outside the home) to see that the receiver has been successfully tested. A purge time of 12 hours would ensure the largest number of people being able to acknowledge the test. Any real message for the area programmed in the receiver would automatically replace the test message.

The other method of testing the unit would occur after the receiver has not received a test message, RWT or RMT, or another code associated with a real event within some time frame. For example, if the unit does not receive a valid event code for a real event or test within, say 8 or 9 days (192/216 hours) the unit would display a message to check the receiver.

Both of the above suggestions should be based on the receiver getting a valid RWT/RMT or another event code associated with a real message, and, one of the geographic codes programmed in the receiver. The NWS sends all the geographic codes that applies to the service are of the monitored transmitter with each test message. The receiver should check to ensure at least one of the transmitted geographic codes matches one of those programmed in the unit. If it does not, then the unit should inform the user there may be something wrong. Just having the receiver acknowledge receipt of "A" or "any" code string would not be enough.

It is important to note that the event code DMO is **not** intended to be used as part of any routine testing. The event code DMO is to be used only as described in section 5.7.

9. ATTACHMENT 1

9.1 "SS" Code for Marine Areas

SS CODE	MARINE AREA DESCRIPTION CODE
73	Western North Atlantic Ocean, and along U.S. East Coast, from Canadian border south to Currituck Beach Light, NC.
75	Western North Atlantic Ocean, and along U.S. East Coast south of Currituck Beach Light, NC, following the coastline into Gulf of Mexico to Bonita Beach, FL, including the Caribbean.
77	Gulf of Mexico, and along the U.S. Gulf Coast from the Mexican border to Bonita Beach, FL
57	Eastern North Pacific Ocean, and along U.S. West Coast from Canadian border to Mexican border
58	North Pacific Ocean near Alaska, and along Alaska coastline, including the Bering Sea and the Gulf of Alaska
59	Central Pacific Ocean, including Hawaiian waters
65	Western Pacific Ocean, including Mariana Islands waters
61	South Central Pacific Ocean, including American Samoa waters
91	Lake Superior
92	Lake Michigan
93	Lake Huron
94	Lake St. Clair
96	Lake Erie
97	Lake Ontario
98	St. Lawrence River above St. Regis