Radio Guide

Radio's Technology Forum

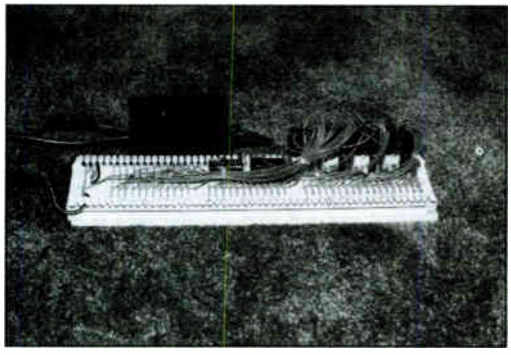
January 1995

Extra Relays

George Whitaker — Editor

At KLTY in Dallas it became necessary to add some relays in the control room for ancillary gear. The relay in the console would handle muting the monitor and cue, plus turn on the warning light. But, we had a phone speaker to mute, the newsroom intercom to mute, the air check machine to start and stop, and a couple of things I have probably forgotten at this point.

So, the question was, how to package a group of auxiliary relays. I suggested to Dave that he take a 66B4-50 punch block and remove a group of the terminals down one side to make room for the relays, then use the remaining terminals for connecting it all up. The photo shows what we came up with.



We are using a little "plug-in-the-wall" 24 VDC power supply to operate the relays. The console warning light closure is used to pull the first relay on the auxiliary panel. This pulls in a second DPDT relay, giving us four extra DPDT contacts. One set of contacts on the first relay is now used to pull the warning light relay. The first relay also fires a one-shot relay when it is first pulled in, and another when it releases. This gives us a momentary start closure and a momentary stop closure to operate the air-check machine. Plus, if we ever need them, there are three extra contacts on each one-shot.

All of the relay contacts are brought out to the remaining punch-down terminals, making hook-up easy, and allowing for changes in the future. The relays and timing capacitors are held in place with double-faced tape.

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Quick Audio Pads
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Radio Guide

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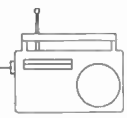
The Radio Forum



George Whitaker — Editor

Do You Remember . . . ?

One of the most interesting sidelights of the S.B.E. convention in Los Angeles was watching some of the old-timers play with the computer containing the Technologist certification practice exams. Most of us would get right up in front of the screen so that the other guys standing around couldn't see when we missed a simple question. Dave and I found out we could still pass. However, it was surprising, sometimes, what we didn't remember. It probably was a good thing that it didn't have the higher grade exams in it, or some of us might have been quite embarrassed.

As a result of this experience, Dave and I realized that purchasing the study guides for all of the levels would be a good way of keeping us sharp. I bought the Technologist study guide and Dave bought the Broadcast Engineer guide, for starters. It has turned out to be a very fun way of reviewing basics and keeping the mind exercised.

Yes, I have my Professional Broadcast Engineer's certification, but so much of what we have learned over the years is information that is seldom used. However, when we need it we usually are out at a transmitter site in the middle of nowhere at 2 o'clock in the morning, when reference books are somewhat scarce. Using the study guides as a game, keeps a lot of this information fresh in our minds.

So far, I have not begun to go through all of the questions in even one of the two we bought. Yet, I am surprised at how much faster I am getting, at recalling information that has been stored in the back of my mind for years. It is a proven fact that the mind can be exercised, just like a muscle, to improve its performance.

So, if you want to have some fun, and build your competency level at the same time, get the S.B.E. study guides. I think you will be surprised at what the review can do for you.

George

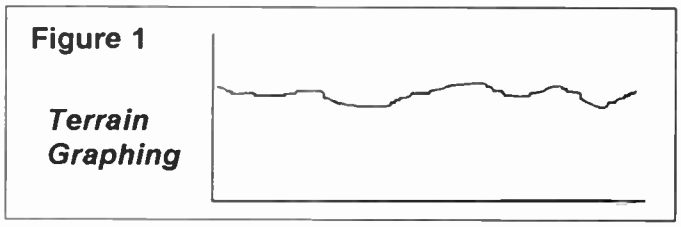
H.A.A.T. — Height Above Average Terrain

George Whitaker — Editor

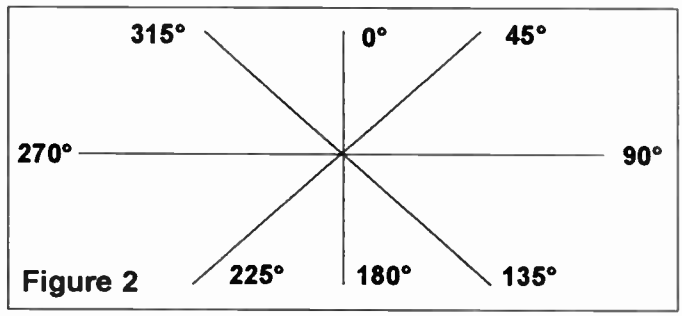
Understanding how HAAT is computed can be vital when selecting a transmitter site. Proper use of the method can result in improved coverage, in situations where you have rising terrain on one side of your site and your market area on the other. I have been responsible for site selection on somewhere between 100 and 200 FM's and have found many cases where we could use the HAAT calculations to our advantage.

Looking at the FCC definition of HAAT, we find that the rule (73.310) says, "HAAT is calculated by determining the average of the antenna heights above the terrain from 3 to 16 kilometers (2-10 miles) from the antenna for the eight directions evenly spaced for each 45° of azimuth, starting with True North (a different antenna height will be determined in each direction from the antenna), and computing the average of these separate heights." The rule goes on to point out some exceptions, and a later rule says that you have to plot a radial that goes through the city of license. However, that radial is not used in computing the HAAT.

What you have done is put lines on a map that are in the configuration shown in **figure 2**. It would take too much space to reproduce even a reduced scale actual map, so visualize that we have drawn these on 7.5 minute U.S.G.S. topo maps.



Next, from 2 to 10 miles (I can't think in kilometers), we would select enough points along each line to produce a graph that would be the terrain as seen from the side. It would look something like **figure 1**, except on a much larger scale. Now, we would take enough points to produce an average terrain value for that radial. These eight radials are then averaged to get the average of the terrain above sea level.

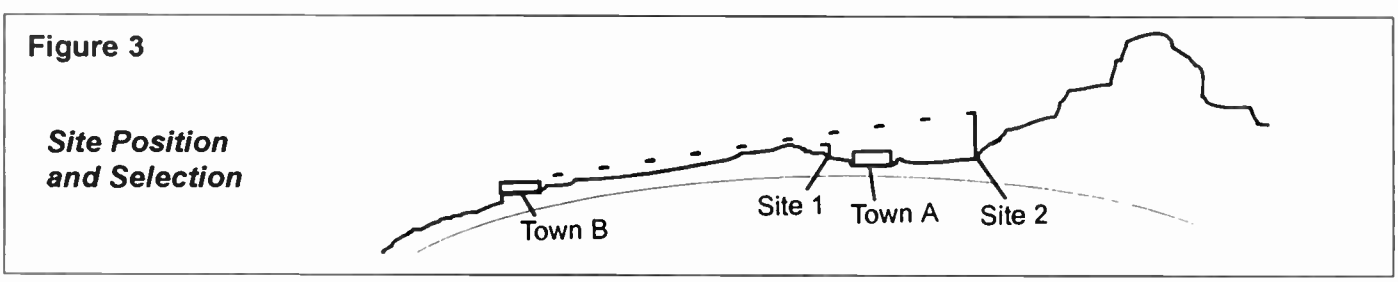


At this point we take the height above sea level of the antenna site, add to it the height of the antenna, then subtract the average of the eight radials. This yields what is known as Height Above Average Terrain.

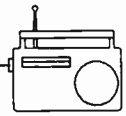
The method described above is the FCC preferred method and the one I used for years. Now, I ask the computer and it does in five minutes what it used to take me 2 or 3 days to do. The FCC rules provide for computer modeling as long as the program fits the description given in 73.??? However, in the event of a dispute, the old fashioned way takes precedence.

Now, understanding that we are actually only averaging 2 to 10 miles, can be used to your advantage. Looking at **figure 3**, we have a town (A), down in the lower ground, and a town (B), a few miles away, and heading into the hills it becomes farm land. I have seen this scenario many times in doing site selection. This drawing is not to scale, nor detailed enough to calculate. However, to illustrate the point, lets say that sites #1 and #2 are both 328 feet above average terrain. Site #2 is higher above sea level, because you get to figure in the hills behind it, thereby raising the average height of the ground above sea level.

Site #2 would be the site to use because of the distance to the horizon. Site #1 is 328 feet above average terrain, but the distance to the horizon precludes a straight shot into town (B). Site #2 is also 328 feet above average terrain, but has a straight shot into town (B). Since FM is basically line-of-sight, site #1 would have very poor, or no, reception in town (B). I used the hills northwest of Ft. Worth in this very scenario, to develop a station that would put a line-of-sight signal into Ft. Worth and Dallas.



Unattended Transmitter Operation



John Bredesen — KLCC, Eugene, Oregon

As you may have noticed, the FCC has been busy in the Broadcast regulation/deregulation arena lately. Last month I covered some of the main points of the new EAS, (Emergency Alerting System). Get used to the new term, because it's going to be a part of your life for years to come! This month I want to fill you in on the new proposal from the FCC relating to unattended transmitter operation.

Transmitters, and their ancillary equipments, have grown increasingly stable and reliable, as the technology upon which they are based becomes more sophisticated. The FCC, in their cautious way, has acknowledged this periodically. Perhaps the biggest single leap forward was the adoption of wording in the Rules allowing remote control of transmitters. For those of you not yet contemplating retirement, this meant that prior to the adoption of the Remote Control rules, every transmitter site had to have an operator on duty whenever the transmitter was on-air.

Transmitters were seldom co-located at the studios, so a person with a First Class Radiotelephone Operator's License had to be on duty anytime the transmitter was on the air. It was expensive to have a separate transmitter operator, but they were needed to keep the often unstable beasts on course. Remote control simply wasn't a viable option until the 1960s, when it was felt that transmitter technology had become stable enough to allow control to be transferred to the studio. The Rules remained (and continue to remain) in place which specify the technical parameters regarding transmitter operation, and it was (and remains) the responsibility of the licensee to maintain their transmission facilities within legal parameters. If a transmission system was old and tired, it probably wasn't a candidate for remoting. The onus was on the individual station to make that determination.

I've talked with engineers who long for the "good old days," when the rules were specific about how to do things: Take meter readings every thirty minutes, etc. The deregulation tack the FCC has been pursuing for years, allows engineers to think for themselves (Assuming the GM/owner goes along with whatever it is the engineer is thinking!). After all, who knows a particular transmission system better than the person who lives with it on a regular basis. If the transmitter and array are stable, for instance, why should it be necessary to take a set of readings every half hour? It probably isn't, but only the site engineer knows for sure.

Deregulation continues, often at the urging of the National Association of Broadcasters. Most often this urging is prompted by a desire to save money on personnel. Such would seem to be the case with one of the latest proposals from the FCC; Notice of Proposed Rule Making (NPRM), released on the 7th of December, 1994. It deals with proposed changes in operator, control and monitoring requirements.

The first element of the NPRM would eliminate the need for a duty operator at broadcast stations, and for those stations that chose to retain a duty operator, it would eliminate the need for that operator to have a Restricted Permit. *"Our basic premise in this proceeding is that the requirement for a licensed duty operator and the costs and burdens imposed by such requirement no longer appear to be necessary or appropriate in light of the many improvements which have been made in the stability, reliability and automatic control of transmission systems." (Quotations which appear in this article are from the NPRM.)*

The NPRM, in eliminating the need for a "duty operator," also eliminates the need for "operator duty points." While current rules require a "duty operator," that operator may be practically anywhere, as long as he or she can control and monitor the transmission system. And the operator must be on duty, able to monitor and control the transmitter anytime the station is on the air.

Under the NPRM, *"... licensees would be afforded maximum operational flexibility to employ any of a number of methods of transmitter control. Direct manual or remote control by a station employee or other person designated by the licensee would remain an option. Another method of achieving such compliance would be the use of specially designed, highly stable state-of-the-art transmitters. The use of accurate automated measurement and control (ATS-like) equipment would be another method of achieving reliable, unattended system control."*

Any of these methods would be acceptable for unattended operation, as long as the chosen method is capable of maintaining transmitter operation within the limits of the rules applicable to the station, and to any special limits placed on the station by the station license. If any condition were to occur which violates these provisions, and which could result in interference, the station must be removed from the air within three minutes if the problem can't be fixed within that time. As far as control of the transmitter is concerned, the proposal is aiming for what you might call the bottom line: *"From an enforcement standpoint, we propose to place more emphasis on the technical integrity of emitted signals than with the method of transmitter control."*

One interesting facet being proposed, would eliminate the requirement of operator notification if an ATS (auto-

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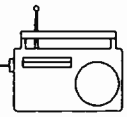
Unattended Operation



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matic transmission system) controller removed the transmitter from the air as a result of operating out of tolerance. The ATS could simply shut the system down if it can't bring it back within tolerance within the three minute window.

Out-of-tolerance operation falls into one of two categories: 1) interference causing, such as over-power, over-modulation or a directional array malfunction, or 2) potentially non-interference causing, such as under-power or under-modulation.

The NPRM contains a proposal to allow continued operation during those out-of-tolerance conditions which would not cause interference. The FCC would have to be notified only after 10 days of uncorrected operation. An STA (special temporary authorization) could be obtained for continued operation, if necessary, if the out-of-tolerance operation were to continue beyond 30 to 90 days.

The FCC is proposing to allow a station, for the purpose of correcting an interference producing problem, to go on the air, up to the three minute limit, acknowledging that sometimes testing into a dummy load isn't satisfactory for correcting a problem.

In the NPRM, the FCC will tie any new unattended operation rules to the implementation of the new EAS system. As you'll recall, the July 1, 1996 date is the deadline for installation of the new requirement, but the FCC will grant approval for a state or local area to begin using the new system earlier, if all stations in that area agree to the earlier date and have appropriate equipment installed. That date then would also become the date when unattended operation can begin.

The NPRM is interesting in many ways. For instance it contains a plain language discussion of what a station is to monitor. Let me quote some of the language in the proposal by the FCC:

"During normal daily operation, several of a station's operating parameters may vary. Factors such as transmitter and antenna configuration, power line voltage regulation and environmental conditions at the transmitting site determine the degree of variation and whether any particular parameter exceeds compliance limits."

"We often receive inquiries asking which particular technical parameters should be monitored (and how often) in order for the licensee to comply with the rules. We continue to believe that the optimum monitoring schedule varies from parameter to parameter and station to station. However, inspections of broadcast stations by our Field Operations Bureau (FOB) reveal many technical violations involving antenna lighting, overpower operation, improper directional antenna patterns, and over-modulation conditions that could be cured if licensees gave closer attention to monitoring operating parameters and the general maintenance and adjustment of their stations. To help licensees meet their responsibility, we propose to list as minimum requirements the basic parameters that every station should be able to monitor and control."

"We propose that each licensee be able to monitor and adjust its transmitter power and modulation level. In addition, licensees responsible for broadcast towers that require lighting would need to monitor such lighting. Finally, each licensee of an AM station that changes its mode of operation during the broadcast day would need to monitor and control such changes. Licensees of AM stations employing directional arrays would need to be able to monitor and control the array parameters. In the context of unattended operation, the monitoring and control of these parameters must be performed by equipment that would take the station off the air (if a parameter variance capable of causing interference occurred) or else contact some person designated by the licensee (this would appear particularly appropriate in the case of a tower lighting failure)."

"We caution licensees that an occasional glance at a few meter readings does not and cannot constitute an adequate monitoring program. Licensees must implement monitoring procedures to detect and correct problems before technical limits are exceeded. Because actual monitoring procedures, schedules, and technical analyses needed to comply with our rules can vary with each station, we will continue to leave particular methods of implementation largely to the discretion of the licensee. The status of tower lighting must be checked at least once daily consistent with Section 17.47. However, we stress that a licensee must arrange somehow to ensure that transmission system parameters are in compliance and an inability to correct an out-of-tolerance condition would still require termination of station operation (a basic control function that always must be provided)."

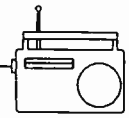
"At the present time, carrier frequency measurement is not required on a regular basis (see Section 73.1540), despite the possibility that operation outside the prescribed tolerances could result in interference."

I must emphasize that all this information is from a NPRM. One of the aspects of a NPRM is that the Commission is asking for comments from people who will be impacted by any changes made to the rules.

Comments and reply comments are due before January 20, 1995, and February 6, 1995, respectively. Further information may be obtained from James E. McNally, Jr. or Gordon W. Godfrey, Mass Media Bureau, Engineering Policy Branch, (202) 632-9660.

I can be reached on the Internet at **jab@efn.org.**

What is the New Emergency Alert System?



Darryl Parker — TFT Inc., Santa Clara, California

The FCC has finally acted on a replacement system for the old EBS. The new system is quite different and requires new equipment. TFT is attempting to provide assistance to stations in making the transition, as well as making the required equipment available. The following questions and answers should help you understand what is required, and when.

What is EAS?

EAS is an acronym for Emergency Alert System adopted by the FCC on November 10, 1994.

Whose System Did the Commission Adopt?

The Commission did not adopt a specific "system" but did require that the new Emergency Alert System have certain characteristics. Those characteristics are almost identical to the EIS 911 System that TFT proposed and developed for the FCC field tests in Denver and Baltimore in 1993.

What is the Schedule for Implemetation for Radio and TV Broadcast Stations?

	July 1, 1995	July 1, 1996	July 1, 1997	
NOAA Compatible Digital Encoding & Decoding	Optional (See Note 1)	Optional (See Note 1)	Mandatory	Mandatory
2-Tone Encoding	22-25 Seconds	8-25 Seconds	8-25 Seconds	8-25 Sec. Only For Real Alert or Monthly Test
2-Tone Decoding	May be Modified to Respond to >8 Sec. Tones	Must Respond to 8 Second Tones	Not Required	Not Required

Note (1) Broadcasters and cable operators are authorized to purchase and install the new EAS equipment before the 1996 and 1997 deadlines. Authorization for early deployment of EAS can be obtained from the Commission upon written request to the FCC's EAS office after all broadcast stations in an EAS local area have installed the required EAS equipment, demonstrated representation of cable systems in their state or local emergency communications committee plans, and demonstrated compliance with certain other rules.

Who Will Be Required to Install Compliant Equipment?

All radio and television broadcasters. Class D FM and low power television stations must have decoders but are not required to have encoders.

What Are Some Important Technical Characteristics of EAS?

Standard, non-proprietary protocol.

Digital header code, attention signal, emergency message, and EOM (end of message). Compatibility with NOAA weather radio digital transmissions (WRSAME)

Protocol can be received on any radio or television receiver.

Protocol can be sent on multiple transmission systems.

New equipment can be programmed for manual or automatic operation.

All EAS messages to have Universal Coordinated Time code.

What is WRSAME?

WRSAME is an acronym for Weather Radio Specific Area Message Encoding. It is a digital burst of data approximately one second long in a specific protocol for generating a "header" that precedes an emergency message. For reliable reception, this burst is repeated three time.

What is in This Burst of Data?

Because it is a digitally coded signal that can be sent through any voice channel, the WRSAME header can contain an identification of the emergency originating point.

- The type of emergency that exists.
- The level of severity of that emergency.
- The county areas effected by the emergency.
- The duration of the alert.
- A date and time stamp.

Why is WRSAME Called A "Header?"

Because it "heads up" a voice or data message that follows, in order to set off alarms, alert personnel, and route message traffic. It also allow the message to be screened digitally and automatically to avoid false alarms and unnecessary alerts.

Why Was WRSAME Chosen for This Task of Emergency Messaging? Aren't There Faster Systems?

WRSAME is an FSK (frequency shift keyed) modulated signal which operates at a rate of 520 baud. It can be transmitted through VHF and UHF FM radios, single-side band radio, telephone, AM broadcast, FM broadcast, TV

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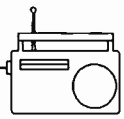
New Emergency Alert System



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aural broadcast, cellular telephone, paging systems and satellite, with the full carrier power of the transmitter. This baud rate is less likely to receive interference from computer data. Because emergency messages are very short, speed is not a major concern; reliability is.

Why Use WRSAME Rather Than Some Other Standard?

WRSAME was developed by the National Weather Service and is an open, NON-PROPRIETARY protocol available to any manufacturer who chooses to build this type of equipment. WRSAME, thoroughly tested for many years in the U.S., is now in use at dozens of NOAA Weather radio stations throughout the country. The National Weather Service already has plans to equip all NOAA Weather stations with WRSAME transmitters and will cover 96% of the country's population. Because 85% of all activations of the Emergency Broadcast System are weather related, WRSAME transmissions by NOAA Weather radio will form the primary source of information for activating the nation's emergency broadcast system.

Why is WRSAME a Better Choice Than RDS?

WRSAME is a short, audible, in-band burst of digital signal that uses all of the carrier power available from a transmitter, not just a fraction of it. RDS is a much older technology developed in the 1970's in Europe for use in FM broadcast stations. The RDS signal is applicable only to FM broadcast stations with a special 57 kHz subcarrier that uses only 2% of the station's power.

RDS, for emergency alerting, has a single bit flag as an agreed-upon standard in the U.S.; the remainder of the code, that tells "who", "what", "when", "where", and "why", is not universal and can be adapted by any manufacturer in any manner. Therefore, RDS emergency alerting schemes by different manufacturers may not be compatible. As a result, fewer people may be alerted in the event of an emergency.

Can WRSAME Codes Be used to Activate Peripheral Equipment?

Yes. WRSAME already contains the necessary address information to activate devices to a resolution of one-ninth of a county. By adding a few bits at the end of the header, individual or group addressing is possible.

Darryl Parker may be reached at TFT, at (800) 838-9119.

When Will WRSAME Be Available in My Area?

Many areas of the country already receive WRSAME bursts in advance of emergency information from the National Weather Service. Remaining stations will be equipped within the next two years. Areas especially prone to natural disasters, such as Alabama and Florida, will be targeted for installation first.

What Are Some Important Operational Characteristics of EAS?

New EAS testing will be weekly (unobtrusive) and monthly (on-air)

Monthly test announcements created by state and local committee.

Both encoder and decoder are required (except Class D FM and LPTV)

New EAS requires creation of new state and local operational plans.

Owners can program the equipment to interrupt programming upon specific criteria.

New EAS signals will be able to interface with computers and digital devices.

Automatic and remote control operation is authorized.

Ability to issue alerts and tests in languages other than English.

Provisions for the hearing and visually impaired.

What is TFT's Involvement With EAS?

TFT has supplied over 70% of the AM, FM, and TV stations with their equipment for the Emergency Broadcast System. At the invitation of the FCC, TFT participated in tests in Denver and Baltimore leading to the development of EAS. For these tests, TFT developed an automatic, unattended system, Model EIS 911, for broadcast, EOC, and cable television applications. TFT EIS 911 and companion 912 generators met all the objectives of the FCC tests.

How Can I Use Existing TFT EBS Equipment?

Decoder - must be modified by July 1, 1995

- **Models 886/887-Change DIP switches**
- **Model 760-Install modification kit**
- **Unusable after July 1, 1997**

Encoders - must be modified for 8 second transmission

- **Models 886/887-Change DIP switches**
- **Model 760-Install modification kit**
- **Useable after July 1,1997, only for actual alerts and monthly tests**
- **Receivers in Models 886, 887, and 760 can be used with new EAS 911**