HARRIS®
assuredcommunications®

APPLICATION NOTE

DTP

Implementation of Emergency Alert System With DTP-300

Emergency messaging in broadcasting began in 1951 when President Harry S. Truman created CONELRAD (Control of Electromagnetic Radiation). CONELRAD provided a means for the president to address the American people, provide attack warning and supply emergency information.[1] CONELRAD soon became obsolete, however, and in 1963, President John F. Kennedy replaced it with the Emergency Broadcast System (EBS).[2] Our national warning system was further improved in 1994 when the Federal Communications Commission (FCC) adopted rules that replaced EBS with the Emergency Alert System (EAS). EAS represented not only a technological advancement, but also an expansion of the warning system beyond the traditional broadcast media, to include cable systems. In 1997, the Commission further extended EAS obligations to wireless cable systems.[3]

In November 2005, the FCC issued orders that mandated the implementation of the U.S. EAS in digital transmission systems, including Digital Television (DTV), Digital Audio Broadcast (DAB), digital cable, Direct Broadcast Satellite (DBS) and Satellite Digital Audio Radio Service (SDARS). The deadlines for implementation were December 31, 2006, for DTV, DAB, SDARS and digital cable, and May 31, 2007, for DBS.[4]

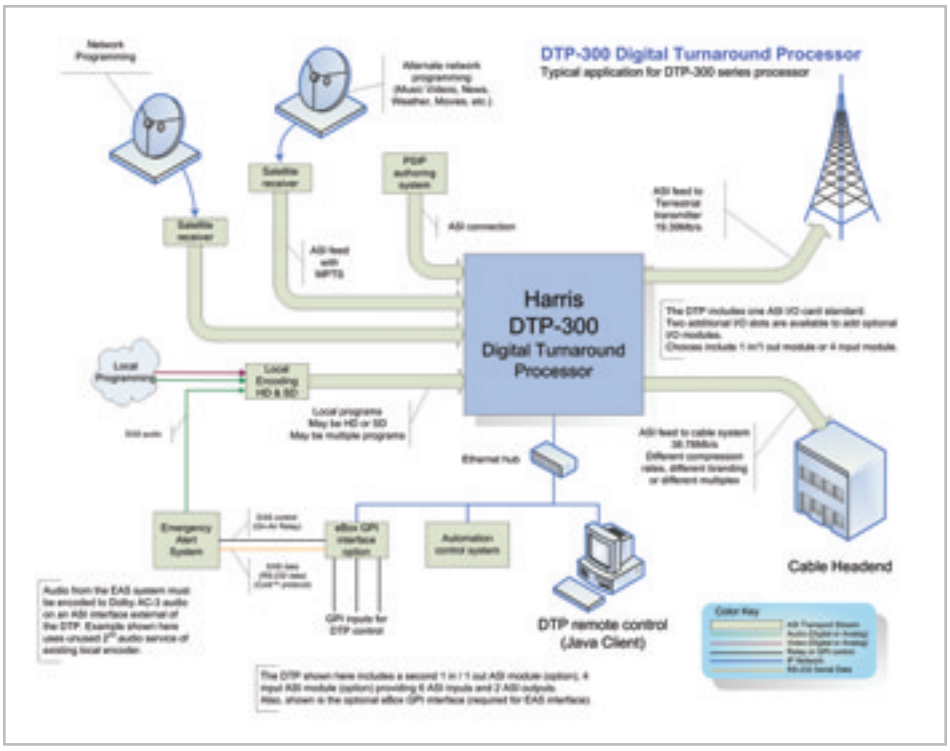
For DTV and other services that are capable of presenting multiple program channels in a single transmission carrier, the FCC concludes that all viewers should be informed of critical emergency information regardless of which program stream they are viewing. The FCC granted DTV broadcasters the flexibility to determine the method used to distribute EAS messages to all program streams, as long as all viewers receive the EAS message on the channel they are watching. For example, DTV broadcasters may separately transmit EAS messages on all program streams or, if the technology is available, transmit EAS messages on one stream and force tune all receivers to that stream. However, the FCC recognized the fact that most DTV receivers currently on the market do not have force tuning capabilities and, therefore, the FCC did not mandate force tuning.[5]

Even though 2006 was the deadline for DTV implementation, not all broadcasters have tackled the task of inserting EAS messages on multiple channels. Many broadcasters are transmitting only one channel — at times the channel is HD, and at other times it is upconverted SD. For now, their solution is to switch to the upconverted SD, which has EAS inserted in the NTSC master control. This meets the FCC requirements, but eventually the NTSC facilities will be phased out, and insertion in the HD path will be required.

One channel does not seem to be a problem. However, when the broadcaster starts to deal in the multichannel arena, the issues are compounded. Each channel needs a character generator to produce the video crawl from EAS data and a video keyer to insert the crawl, plus an audio switcher for each channel of audio. One or two programs may seem simple; however, with more programs, the project can grow to a formidable system with a control structure that may confuse some operators. Additionally, as more channels are added to the system, costs are also compounded.

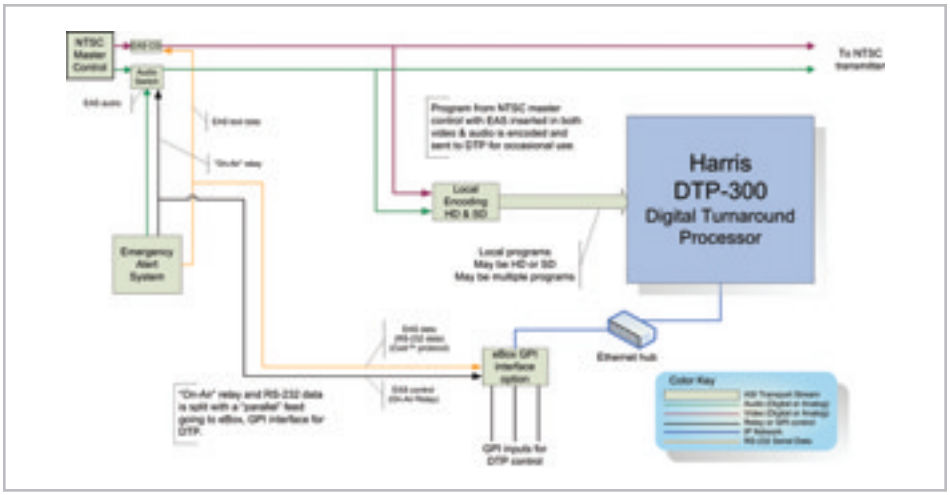
The Harris® Digital Turnaround Processor (DTP™) has found wide acceptance by DTV broadcasters, and for many, EAS insertion was the primary reason to install the system. In addition to the splicing, branding and statistical multiplexing features, the DTP™ serves as the EAS message insertion system for the entire DTV installation. It automatically generates text crawls from the data coming from the EAS decoder to match the type of video in each channel, regardless of whether it is HD or SD. The DTP™ also takes EAS audio that has been pre-encoded as Dolby® AC-3[6] audio and inserts it in all of the channels — even the channels with multiple audio services.

The diagram below shows a typical installation.



In this installation, with satellite feeds for multiple networks and multiple outputs, the Emergency Alert System is shown in the lower left corner. Data from the EAS decoder flows to the DTP™ via one of the serial connections on the "eBox" GPI interface, along with a relay closure to tell the DTP™ when an EAS message is "On-Air." The EAS audio from the EAS decoder must be encoded as Dolby® AC-3 audio before it is sent to the DTP™. In this illustration, the EAS audio is encoded using an unused secondary audio channel in a local ATSC encoder. In the DTP™, the secondary audio signal is identified as the EAS audio, and it is processed separately from the other signals in that ASI transport stream. While this is the most common method of processing the EAS audio, it is not the only way of providing encoding.

In the following illustration, the EAS audio is present in the MAIN audio signal coming from an existing NTSC master control.

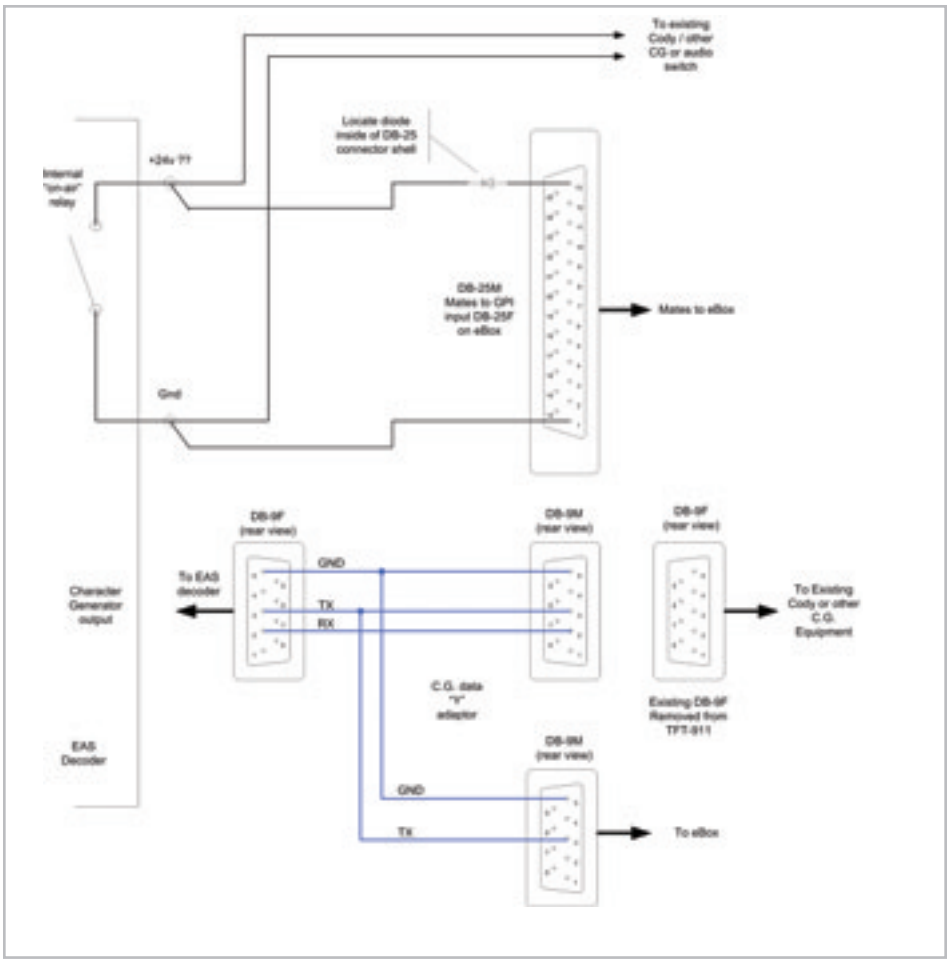


The NTSC signal is also used as a source for the DTP™ after it is encoded through an ATSC encoder, which does the MPEG-2 encoding of the video and Dolby® AC-3 encoding of the audio. The EAS audio signal is inserted in the main program audio immediately following the NTSC master control switcher. The switch interrupts the program audio from the master control switcher and substitutes the EAS audio. After the EAS message is completed, the program audio from the master control switcher is restored. The encoded NTSC signal can be used by the DTP™ as a secondary channel or as an occasional source for any of the programs that the DTP™ is processing. The key here is that the source is available to the DTP™ all the time, even if it is not being used on-air in the DTV transmitter.

When the DTP™ is signaled by the EAS decoder via the "on-air" relay that an EAS message is in progress, the DTP™ will use the MAIN audio from the NTSC program as the EAS audio source, and then restore the various audios when the EAS "on-air" relay opens.

The illustration to the right shows the method of splitting the "on-air" relay and the RS-232 data signals for distribution to both the NTSC and ATSC transmission paths.

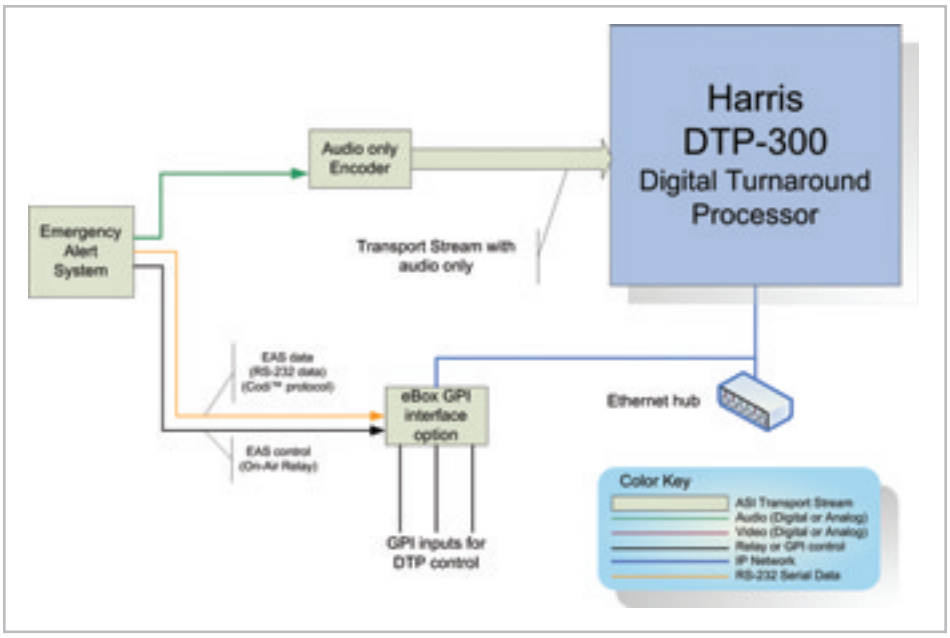
The "on-air" relay output is parallel, with one feed continuing to control the audio switch for the NTSC program audio, and the second feed of the relay going to the GPI input of the DTP™. The same method of paralleling is used on the transmit pair of the RS-232 data coming from the EAS decoder. The data continues to feed the character generator for the NTSC system and also feeds the serial input on the DTP™. The DTP™ has one serial input, via a female RJ-45 connector, on the rear of the chassis, which can be used for EAS data input or four DB-9F inputs on the "eBox" GPI interface.



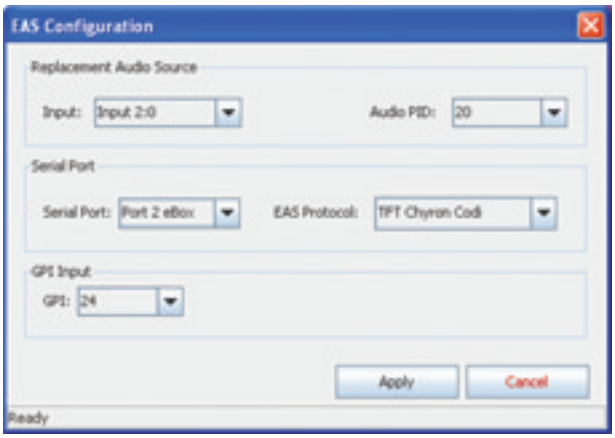
Finally, some EAS implementations may not have access to an existing ATSC encoder to process the EAS audio. In these applications, an "audio-only" encoder is generally used to reduce the cost of the installation.

This installation is similar to the first illustration, in that the RS-232 data and the "on-air" relay go directly to the "eBox." However, here the audio goes directly to an audio-only encoder that encodes the Dolby® AC-3 audio and delivers it to the DTP™ as an ASI transport Stream that only has audio service.

No matter which installation is chosen, the internal function of the DTP™ is the same. The DTP™ generates a text crawl from the RS-232 data using internal fonts that are sized appropriately for the type of video that is being processed in each channel. Each text crawl is properly sized to appear as the same percentage of picture height in HD and SD formats. The signal from the "on-air" relay tells the DTP™ when to substitute the EAS audio in each program. When the relay closes, the audio is substituted, and when the relay opens, the audio is restored to normal.



The configuration of the GPI interface and the connections and signal paths for the EAS system are done via the DTP™ remote control system. The eBox GPI interface configuration is accomplished by entering data for the network address and port number of the eBox in the pull-down menu. Status of the connection to the eBox can be verified in the same menu item.

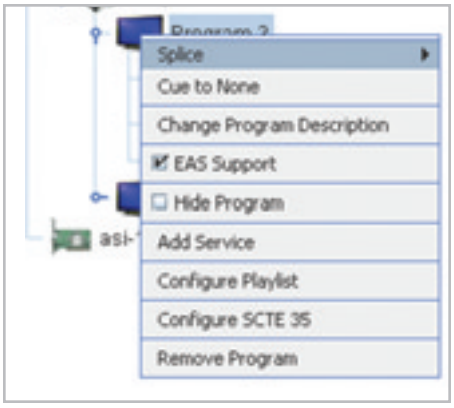


After the eBox GPI interface has been configured, the EAS connection and control information is entered in another pull-down menu. The EAS audio input, shown here as "Replacement Audio Source," is identified. The physical ASI input, in this case "Input 2:0," is defined as the source of the audio, and because that ASI input may have many audio streams, the PID for the EAS audio is also entered.

Next, the serial data port for the EAS data is identified, as is the communications protocol in which the data is formatted. The DTP™ emulates a Chyron EAS CODI® and supports communications from the TFT 911 and the Sage ENDEC.

The last of the configuration parameters is specifying which of the 24 GPI inputs on the eBox will be used for the EAS "on-air" relay, which is defined in the "GPI Input" area of the EAS Configuration menu. The other 23 GPI inputs can be used for other DTP™ control functions.

Finally, each program channel on the output of the DTP™ has a control to enable or disable "EAS Support." This makes it possible to turn EAS on or off on a channel-by-channel basis. Normally, a broadcaster would have EAS turned on in all channels to comply with the FCC requirements. However, in some cases, EAS messages may have been inserted "up-stream" from the DTP™, as in the case where a broadcaster is duplicating the NTSC program on one of the DTV channels. The NTSC channel already had EAS messaging inserted before it was encoded and, in this situation, it is not desirable to insert the EAS message again. By unchecking the EAS Support



in the channel control menu, EAS insertion is removed from this one channel. This control is available for all channels on the output multiplex and is surfaced to the user in three other ways: It is available via an automation interface; it is available for control via the GPI interface; and it is controllable via the DTP™ internal scheduling system.

This is useful when the EAS support requirement for a channel changes depending on the source that is being broadcast. In the example above, the NTSC channel is being rebroadcast on the digital transmitter, but only during times when local programming is in this channel. At other times of the day, HD programming directly from a network feed may be on this channel, and EAS support would be necessary. The EAS can be turned back on in the following ways: by the automation system, by a GPI closure from a tally from the switcher feeding the encoder, or from the DTP™ internal scheduling system that turns the EAS on and off at certain times of the day.

This combination of features makes the Harris® Digital Turnaround Processor simply the easiest and most effective way of implementing EAS in the broadcaster's DTV system.

[1] *Providing for Emergency Control Over Certain Government and Non-Government Stations Engaged in Radio Communication or Radio Transmission of Energy,* Exec. Order No. 10,312, 51 Fed. Reg. 14,769 (1951). *See also EAS NPRM, 19 FCC Rcd at 15776-78, paras. 6-8.*

[2] *Assigning Emergency Preparedness Functions to the Federal Communications Commission,* Exec. Order No. 11,092, 63 Fed. Reg. 2216 (1963).

[3] *Amendment of Part 73, Subpart G, of the Commission's Rules Regarding the Emergency Broadcast System,* Second Report and Order, FO Docket No. 91-301, FO Docket No. 91-171, 12 FCC Rcd 15503 (1997) *(Second Report and Order).*

[4] *Review of the Emergency Alert System,* First Report and Order and Further Notice of Proposed Rulemaking, EB Docket No. 04-296, FCC Rcd 191 (2005), paras 21-58

[5] *Review of the Emergency Alert System,* First Report and Order and Further Notice of Proposed Rulemaking, EB Docket No. 04-296, FCC Rcd 191 (2005), paras 25-26

[6] *Dolby® and Dolby® Digital are reregistered trade marks of Dolby Laboratories, Inc.*

For more information please visit www.broadcast.harris.com.

HARRIS®
assuredcommunications®

Broadcast Communications Division
4393 Digital Way | Mason, OH USA 45040 | Tel: 1 (513) 459 3400
www.broadcast.harris.com

AN_DTP_EAS_0407