Monitoring point (16) is a proposed PSIP monitoring point. Monitoring point (17) is a proposed Conditional Access monitoring point. . Both of these are operational test points but not test signal injection points.

An Inter-Facility Link monitoring point is located at (18) with capabilities suitable for the Link.

Other Findings

Video format converters should display an indication of the original format of the source video and the converted output format for use in operational monitoring. That signal can be in the form of an under-monitor display or visible in an on-screen display (e.g., a special output similar to a VTR monitor output). Consideration should be given to passing on identification of the output video format to other devices in the station.

Issues Pending

The IS or its Specialist Groups may need to address the following issues:

Signal formats at the monitoring/test points must be identified with specific standards.

Further definition is required for the BERT loopback testing (10) on a real-time injection basis with the DTV broadcast bit stream. Other uses should also be examined for this type of signal (e.g., long-term field testing)

Due to the emphasis on the 12-month time horizon for this work, data broadcast functionality and monitoring points have not been addressed. These will include WAN, LAN and server interconnection, etc. The IS should consider this for future assignment.

Monitoring/test points for the Control Plane will need to be identified.

Summary

With future advancement of the art of the digital television infrastructure, monitoring and test techniques will need to be periodically reviewed. Market opportunities identified by manufacturers can be expected to affect techniques and practices for plant monitoring.

Description of Functional Blocks

0 Air Interface
The air interface is the traditional satellite or microwave transmission path as is currently used.

1 Satellite Downlink
The satellite downlink is the traditional satellite receiving system which is designed for the particular application and link requirements.

2 LNB (Low Noise Block Downconverter)
The LNB is the traditional converter unit which converts the satellite frequencies to a lower L band frequency for input into satellite demodulators. Same as 48.

3 Demodulator
This demodulator inputs L Band satellite signals and demodulates the signal to a digital bitstream containing audio, video, data and other signals intended for use within the facility. Similar to 49.

4 Demux
This demux (demultiplexer) inputs the demodulated satellite signals and separates the desired payload elements from the rest of the bitstream. The output is fed to SD video and audio decoders for feeding the SD routing system, directly to a compressed routing system within the facility, and/or to a bitstream splicer and the emission multiplexer for direct feeds to the terrestrial transmitter.

5 Video Decoder
The desired demultiplexed signal is delivered to the standard definition (SDTV) video decoder which decodes the signal to baseband video in either a digital or analog format.

6 Audio Decoder
The desired demultiplexed signal is delivered to the AC-3 audio decoder which decodes the signal to baseband audio in either a digital or analog format.

7 HDTV Down-Covert
The facility HD format signal(s) is down converted to the facility SD format signal(s). May be the reverse process of 51.

8 Format Converter
The facility SD format signal(s) is cross converted to the facility HD format signal(s). May be the reverse process of 102.

9 Video Decoder
The demultiplexed output of a microwave link carrying a digital multiplex is decoded into a desired SD format signal.

10 Audio Decoder
The demultiplexed output of a microwave link carrying a digital multiplex is decoded into a desired AC-3 audio signal.

11 Video Decoder
The demultiplexed output of a fiber link carrying a digital multiplex is decoded into a desired SD format signal.

12 Audio Decoder
The demultiplexed output of a fiber link carrying a digital multiplex is decoded into a desired AC-3 audio signal.

13 Video Decoder
The demultiplexed output of an optical laser link carrying a digital multiplex is decoded into a desired SD format signal.

14 Audio Decoder
The demultiplexed output of an optical laser link carrying a digital multiplex is decoded into a desired AC-3 audio signal.

15 Copper Input
A wired input, via an electrical "copper" conductor, is fed into the facility. This feed may be an uncompressed SD signal, or a compressed SD or HD signal.

16 Demodulator
The copper facility feed is demodulated, if required, to provide a baseband (unmodulated) feed to the facility.

17 Demux
The copper feed is demultiplexed, if required, to provide the desired baseband feed. In the case of an uncompressed feed this step may not be required. In the case of a single compressed program feed this step may also not be required. In the case of an uncompressed SD feed the output of the demux is fed to either the SD routing system. In the case of the compressed SD or HD feed the output may be fed directly to the emission multiplexer, or to a bitstream splicer whose out put is then fed to the emission multiplexer.

18 Optical Laser Input
Similar to the copper feed, an optical laser feed is input into the facility. This feed may be an uncompressed SD signal, or a compressed SD or HD signal.

19 Demodulator
Similar to the copper feed, an optical laser feed is demodulated, if required, to provide a baseband (unmodulated) feed to the facility.

20 Demux
Similar to the copper feed, an optical laser feed is demultiplexed, if required, to provide the desired baseband feed. In the case of an uncompressed feed this step may not be required. In the case of a single compressed program feed this step may also not be required. In the case of an uncompressed SD feed the output of the demux is fed to either the SD routing system. In the case of the compressed SD or HD feed the output may be fed directly to the emission multiplexer, or to a bitstream splicer whose out put is then fed to the emission multiplexer.

21 Microwave Input
Similar to the copper feed, a microwave feed is input into the facility. This feed may be an uncompressed SD signal, or a compressed SD or HD signal.

22 Demodulator
Similar to the copper feed, an optical laser feed is demodulated, if required, to provide a baseband (unmodulated) feed to the facility.

23 Demux
Similar to the copper feed, a microwave feed is demultiplexed, if required, to provide the desired baseband feed. In the case of an uncompressed feed this step may not be required. In the case of a single compressed program feed this step may also not be required. In the case of an uncompressed SD feed the output of the demux is fed to either the SD routing system. In the case of the compressed SD or

HD feed the output may be fed directly to the emission multiplexer, or to a bitstream splicer whose out put is then fed to the emission multiplexer.

24 Router

Represents the hub of the station's signal plane. The router provides the ability to select from a number of different inputs and direct them to a number of signal outputs for distribution throughout the plant. Routers are designed to handle particular signal formats and interfaces.

25 Splicer

This functional block provides the ability to splice or switch between two input signals. The splicer block represents a number of different implementations that could potentially operate on a variety of signal formats (e.g. compressed ES, TS, uncompressed signals). This block receives both of its inputs directly from the station's router. The output of the splicer is fed back as an input into the router, allowing the spliced signal to be directed to a number of destinations in the station.

26 Master Control Switcher

This block represents the central switching function for the standard definition plant.

27 VTRs

This block is intended to represent the various Video Tape Recorders that would exist within the plant. These VTRs receive inputs from a variety of sources for recording through the router. Outputs of the VTRs are similarly made available to a number of potential destinations through the router.

28 Servers

This block is intended to represent the various Video Servers that would exist within the plant. These Video Servers receive inputs from a variety of sources for recording through the router. Outputs of the Video Servers are similarly made available to a number of potential destinations through the router.

29 Graphics

This block represents equipment found in the station for creation and playout of graphics content, including overlays and title screens. The Graphics block receives inputs from a variety of sources through the router. Outputs are made available to a number of potential destinations through the router.

30 Production

This block represents other elements of content production facilities in the station that are available through the router. The router is able to send content to the production block from a variety of sources and in turn send its output to a variety of destinations.

31 Data Extractor

This block represents the operation of identifying data embedded in the routed signal that needs to be made available for subsequent processing or transmission. An example of data extraction would be closed caption data from the vertical blanking interval of a signal. This block may also locate and extract data from ancillary data channels or other areas identified for carriage of metadata. The Data Extractor receives it input from a variety of sources through the router. The extracted data may be sent to the Standard definition Video encoder for embedding in user data. The extracted data also sends its output to the data bridge which could in turn route the signal to a number of destinations.

32 Data Bridge
Provides a cross connection for signals carrying data services between the NTSC plant, the digital plant and the data server. The bridge can receive data from multiple sources and deliver data to multiple destinations. The Data Bridge can receive data that has been extracted from the VBI of the NTSC signal by Data Extractor [31]; extracted from user data carried within MPEG video by Data Extractor [77]; and data from the Data Server [88]. The Data Bridge can in turn deliver data to the Data Inserter [33] for insertion into the VBI of the NTSC signal; to the Video Encoder [79] for insertion as user bits in MPEG video; and deliver data to the Data Server [88].

33 Data Inserter
The data inserter represents the function that injects data into the vertical blanking interval of the NTSC signal. The data to be inserted arrives at the input to this block from the data extractor. The second input is the NTSC signal that is to be transmitted. The output of the Data Inserter is sent to the STL for transmission.

34 Video Encoder
This block provides MPEG-2 encoding of the SD video service consistent with the ATSC specification.

35 AC-3 Encoder
This block provides encoding of the multi-channel audio service into a compliant AC-3 stream, consistent with the ATSC specification.

36 Multiplex
The multiplex operates on a number of different streams each representing a service. The information is packetized and united into a single output stream for delivery to the home or other units within the plant. In many products, the Video and Audio encoders are often united in a single delivery along with the multiplexer.

37 Encoder
This block provides encoding of the NTSC video service delivered as part of the simulcast.

38 Splicer
This functional block provides the ability to splice or switch between two input signals. The splicer block represents a number of different implementations that could potentially operate on a variety of signal formats (e.g. compressed ES, TS, uncompressed signals. This block receives both of its inputs directly from the station's router. The output of the splicer feeds a functional block suitable for keying overlays.

39 Splicer
Same as Block 38. Provides ability to splice between two signals – first input provided from the router, and the second input provided from the audio/video encoder subsystem. Typically, this function is intended to splice between compressed streams either TS or ES. The output of the splicer feeds a functional block for keying overlays.

40 Splicer
Same as Block 38. Provides ability to splice between two signals – first input provided from the router, and the second input provided from the station's copper cable feed. The output of the splicer feeds a functional block for keying overlays.

41 Splicer
Same as Block 38. Provides ability to splice between two signals – first input provided from the router, and the second input provided from the station's optical fiber feed. The output of the splicer feeds a functional block for keying overlays.

42 Splicer
Same as Block 38. Provides ability to splice between two signals – first input provided from the router, and the second input provided from the station's microwave feed. The output of the splicer feeds a functional block for keying overlays.

43 Splicer
Same as Block 38. Provides ability to splice between two signals – first input provided from the router, and the second input provided from the station's satellite feed. The output of the splicer feeds a functional block for keying overlays.

44 Multiplexer
In the case of non-collocated downlinks or similar program receive facilities, an interfacility link will be required to deliver the signal to the main facility. In some cases portions of two or more satellite receive signals may be required. In any of these cases a multiplexer will be used to combine the desired video, audio, and data elements into a single bitstream of the bitrate required by the interfacility link. One common case is the digital microwave system carrying a DS3 signal which has a total bitrate of 44.736 Mbps. The various payload elements must be combined and wrapped into this single bitstream prior to entry into the interfacility link transmission system.

45 Transmitter
The interfacility link modulates the combined signal to its required transmission frequency and delivers the modulated signal its destination.

46 Receiver
The interfacility link signal is received and demodulated down to an unmodulated bitstream.

47 Demux
The reverse process of the interfacility link multiplexer is performed where the payload elements are separated out of the single interfacility link bitstream. The payload elements may still be multiplexed bitstreams.

48 LNB (Low Noise Block Downconverter)
Same as 2. The LNB is the traditional converter unit which converts the satellite frequencies to a lower L band frequency for input into satellite demodulators.

49 Demodulator
Similar to 3. The demodulator inputs L Band satellite signals and demodulates the signal to a digital bitstream containing audio, video, data and other signals intended for use within the facility. The outputs of this unit may be fed to an interfacility link in the case of non-collocated downlink facilities, may be fed to a demultiplexer (50) or may be fed directly to the facility's studio-to-transmitter link, or in the case of a collocated terrestrial transmitter, may be fed directly to the digital 8VSB exciter.

50 Demux

The demodulated bitstream is demultiplexed to extract the desired payload elements. These elements may be fed to HD video and audio decoders, may be fed to a compressed routing system, or may be fed to a data server.

51 HDTV Up-Convert

In facilities where both SD and HD exist in the system, there may be a desired to convert SD signals to HD. The input of this unit is fed from the facility's SD routing system and the output is fed to the facility's HD routing system. May be the reverse process of 7.

52 HD Video Decoder

In cases where uncompressed HD signals are handled within the plant the demultiplexed bitstream containing the HD compressed signal is fed to the decoder where the HD signal is decompressed.

53 Audio Decoder

In cases where uncompressed audio signals are handled within the plant the demultiplexed bitstream containing the compressed audio signal is fed to the decoder where the audio signal is decompressed. The audio coding process need not be AC-3 unless it is also intended at times for delivery to the terrestrial transmitter.

54 Number Not Used.

55 Microwave Input

This microwave source carries a compressed HD or SD program(s) which is either fed to a demultiplexer to extract the audio and video data, or is fed directly to the facility's studio-to-transmitter link and then to the DTV terrestrial transmitter, or in the case of a co-located facility directly to the DTV terrestrial transmitter.

56 Demodulator

See 55. This is the microwave demodulator which demodulates the signal carrying a bitstream with a HD and/or SD video(s) and associated audio(s).

57 Demux

See 55. This demultiplexer separates the HD and/or SD bitstream from the complete microwave bitstream. The output is fed to either the audio and video HD and/or SD decoders, or directly to the HD router in cases of compressed routing with the facility, and/ or to a data server.

58 HD Video Decoder

This decoder inputs the demultiplexed microwave source and decodes the signal to baseband HD or to a mezzanine level coding, as required within the facility.

59 Audio Decoder

This decoder inputs the demultiplexed microwave source and decodes the signal to baseband audio. This need not be an AC-3 coded signal unless the encoded stream is also intended for direct feed to the terrestrial transmitter.

60 Fiber Input

Similar to 55. This fiber source carries a compressed HD or SD program(s) which is either fed to a demultiplexer to extract the audio and video data, or is fed directly to the facility's studio-to-transmitter

link and then to the DTV terrestrial transmitter, or in the case of a co-located facility directly to the DTV terrestrial transmitter.

61 Demodulator
Similar to 56. See 60. This is the fiber demodulator which demodulates the signal carrying a bitstream with a HD and/or SD video(s) and associated audio(s).

62 Demux
See 55. This demultiplexer separates the HD and/or SD bitstream from the complete microwave bitstream. The output is fed to either the audio and video HD and/or SD decoders, or directly to the HD router in cases of compressed routing with the facility, and/ or to a data server.

63 HD Video Decoder
Similar to 58. This decoder inputs the demultiplexed fiber source and decodes the signal to baseband HD or to a mezzanine level coding, as required within the facility.

64 Audio Decoder
Similar to 59. This decoder inputs the demultiplexed fiber source and decodes the signal to baseband audio. This need not be an AC-3 coded signal unless the encoded stream is also intended for direct feed to the terrestrial transmitter.

65 Optical Laser Input
Similar to 55. This optical laser source carries a compressed HD or SD program(s) which is either fed to a demultiplexer to extract the audio and video data, or is fed directly to the facility's studio-to-transmitter link and then to the DTV terrestrial transmitter, or in the case of a co-located facility directly to the DTV terrestrial transmitter.

66 Demodulator
Similar to 56. See 65. This is the optical laser demodulator which demodulates the signal carrying a bitstream with a HD and/or SD video(s) and associated audio(s).

67 Demux
See 55. This demultiplexer separates the HD and/or SD bitstream from the complete microwave bitstream. The output is fed to either the audio and video HD and/or SD decoders, or directly to the HD router in cases of compressed routing with the facility, and/ or to a data server.

68 HD Video Decoder
Similar to 58. This decoder inputs the demultiplexed optical laser source and decodes the signal to baseband HD or to a mezzanine level coding, as required within the facility.

69 Audio Decoder
Similar to 59. This decoder inputs the demultiplexed microwave source and decodes the signal to baseband audio. This need not be an AC-3 coded signal unless the encoded stream is also intended for direct feed to the terrestrial transmitter.

70 HD Router
This block is similar to 24, but associated with the HD service. Represents the hub of the station's signal plane. The router provides the ability to select from a number of different inputs and direct them

to a number of signal outputs for distribution throughout the plant. Routers are designed to handle particular signal formats and interfaces.

71 Splicer
Similar to 25, but associated with the HD service. This functional block provides the ability to splice or switch between two input signals. The splicer block represents a number of different implementations that could potentially operate on a variety of signal formats (e.g. compressed ES, TS, uncompressed signals. This block receives both of its inputs directly from the station's router. The output of the splicer is fed back as an input into the router, allowing the spliced signal to be directed to a number of destinations in the station.

72 Master Control Switcher
This block represents the central switching function for the standard definition plant.

73 HD VTRs
Similar to block 27, this block is intended to represent the various HD Video Tape Recorders that would exist within the plant. These HD VTRs receive high definition inputs from a variety of sources for recording through the router. High definition outputs of the HD VTRs are similarly made available to a number of potential destinations through the router.

74 HD Servers
Similar to block 28, this block is intended to represent the various HD Video Servers that would exist within the plant. These HD Video Servers receive high definition inputs from a variety of sources for recording through the router. High definition outputs of the HD Video Servers are similarly made available to a number of potential destinations through the router.

75 HD Graphics
This block represents equipment found in the station for creation and playout of high definition graphics content, including overlays and title screens. The Graphics block receives inputs from a variety of sources through the router. Outputs are made available to a number of potential destinations through the router.

76 HD Production
This block represents other elements of production facilities for high definition content in the station that are available through the router. The router is able to send high definition content to the production block from a variety of sources and in turn send its high definition output to a variety of destinations.

77 Data Extractor
This block represents the operation of identifying data embedded in the routed high definition signal that needs to be made available for subsequent processing or transmission. This block may locate and extract data from ancillary data channels or other areas identified for carriage of metadata. The Data Extractor receives it input from a variety of high definition sources through the router. The extracted data sends its output to the data bridge which could in turn route the signal to a number of destinations.

79 HD Video Encoder
Similar to 34. This block provides MPEG-2 encoding of the HD video service consistent with the ATSC specification.

80 AC-3 Encoder
Similar to 35. This block provides encoding of the multi-channel audio service into a compliant AC-3 stream, consistent with the ATSC specification.

81 Multiplex
Similar to 36. The multiplex operates on a number of different streams each representing a service. The information is packetized and united into a single output stream for delivery to the home or other units within the plant. In many products, the Video and Audio encoders are often united in a single delivery along with the multiplexer.

82 HD Splicer
Same as Block 38, however this splicer is associated with the HD service. Provides ability to splice between two signals – first input provided from the router, and the second input provided from the station's copper cable feed. The output of the splicer feeds a functional block for keying overlays.

83 HD Keyer
Functional block that allows signals to be keyed in or overlayed on the encoded signal. Production issues such as logo insertion would occur in this block. Potentially, this function might be combined with splicer functions.

84 HD Splicer
Same as Block 38, however this splicer is associated with the HD service. Provides ability to splice between two signals – first input provided from the router, and the second input provided from the station's copper cable feed. The output of the splicer feeds a functional block for keying overlays.

85 HD Keyer
Same as 83. Functional block that allows signals to be keyed in or overlayed on the encoded signal. Production issues such as logo insertion would occur in this block. Potentially, this function might be combined with splicer functions.

86 PSIP Management
Functional block responsible for the generation of the various tables and information representing the Program and System Information Protocol (PSIP) standard. These tables are delivered to the ATSC multiplex to be included in the final transmitted signal. The PSIP management block must collect its information from a number of sources, including the data bridge, traffic systems, control systems, and potentially guide services.

87 CA Management
Conditional Access (CA) Management is envisioned to provide authorization to set top boxes and digital televisions with security elements installed. The CA management function will authorize services that consumers pay for. This function will exist in broadcast operations only if broadcasters decide to provide subscription-type services and the means to control those services are enabled in set top boxes or digital televisions.

88 Data Server
The Data server could be a critical block in the future delivery of digital data services. The server represents a central repository of information that could be delivered to the home. The server is able to collect information from various sources including contribution services and a wide area network connection. The Data server then provides the ability to deliver the available information on demand to

various destinations within the plant, including the multiplexers that combine the available services for broadcast to the home.

89 Wide Area Network (WAN)
This block, or more appropriately represented cloud, represents connection to a variety of services available within and outside the station. This network connection could be an important source of data services and provides the ability to direct this information through the data server to various points in the broadcast plant.

90 ATSC Multiplexer
Provides final multiplexing of the digital programs into the final transport stream. The transport streams may consist of an HD program or SD programs along with data broadcast and program specific information protocol (PSIP) data.

91 Scrambler
Provides secure encryption of the digital television signal. It is shown as accepting an in-the-clear digital signal input from the ATSC multiplexer [90]. The scrambler then encrypts the digital data information according to some pre-determined algorithm. While the purpose of the Scrambler functional block 91 is illustrated in the diagram, its final location in the system and its implementation may differ as standards surrounding Scrambling are not yet determined.

92 Multiplex
The Multiplex [92] will provide for transmission of the digital and analog signals over an STL. The digital signal will consist of the ATSC transport stream and the analog signal will be digitally encoded, generally on a separate transport stream and combined in the multiplex. The benefit of the multiplex is to transport both signals over the bandwidth of the STL.

93 Studio to Transmitter Link (STL)
The STL provides a link from the broadcast studio to the transmit facility when they are not co-located. The STL may consist of an RF or fiber transmission link with options for various data rates. STL's will generally be in place today before the digital television signal is added to the facility.

94 Non-RF Feed to Cable
This function provides a dedicated link, usually fiber, from the broadcaster to the cable operator. A non-RF link is used in order to obtain the highest signal quality possible for cable distribution.

95 Decoder
The decoder is used at the transmitter sight after the STL [93]. It provides decoding of the digitized NTSC signal for input into the NTSC transmitter [98].

96 Demultiplex
The Demux [96] separates the ATSC transport signal from the digitized NTSC signal after the STL [93] at the transmitter sight. Its function is to eliminate the data associated with carriage of the digitized NTSC signal while preserving the program specific data associated with the digital transport stream. The demux eliminates the need for re-generating this information re-sizing the bit stream to the ATSC transport rate.

97 8-VSB Exciter
Provides modulation of the ATSC transport stream to the ATSC modulation standard and converts the digital signal to the final channel output frequency. Its input is received form the Demux [96} and it outputs its signal to the DTV Transmitter [99].

98 NTSC Transmitter
Provides AM modulation of the analog baseband video and audio signals and conversion to the final channel frequency. In addition, it provides high power amplification for broadcast. Its analog inputs are derived from the Decoder [95] and its high power RF output is sent on to the Tower [100].

99 DTV Transmitter
Provides high power amplification of the DTV signal according to the broadcast station's license. Its input is received from the 8-VSB Exciter [97] and its high power output is sent to the Tower [100].

100 Transmitter Tower
Provides support for the NTSC and DTV transmit antennas. In some cases, both signals will not be transmitted from the same tower due to loading, RF characteristics, etc.. Inputs to the tower are from the DTV Transmitter [99] and the NTSC Transmitter [98].

101 BTSC Audio
This block functions to encode and deliver the BTSC Audio service to the NTSC transmitter.

102 Format Converter
In facilities where both SD and HD exist in the system, there may be a desired to convert SD signals to HD. The input of this unit is fed from the facility's SD routing system, and the output is fed to the facility's HD routing system. May be the reverse process of 8.

103 Keyer
Same as 83, however this block is associated with SD service. Functional block that allows signals to be keyed in or overlayed on the encoded signal. Production issues such as logo insertion would occur in this block. Potentially, this function might be combined with splicer functions.

104 Keyer
Same as 83, however this block is associated with SD service. Functional block that allows signals to be keyed in or overlayed on the encoded signal. Production issues such as logo insertion would occur in this block. Potentially, this function might be combined with splicer functions.

105 Keyer
Same as 83, however this block is associated with SD service. Functional block that allows signals to be keyed in or overlayed on the encoded signal. Production issues such as logo insertion would occur in this block. Potentially, this function might be combined with splicer functions.

106 Keyer
Same as 83, however this block is associated with SD service. Functional block that allows signals to be keyed in or overlayed on the encoded signal. Production issues such as logo insertion would occur in this block. Potentially, this function might be combined with splicer functions.

107 Keyer
Same as 83, however this block is associated with SD service. Functional block that allows signals to be keyed in or overlayed on the encoded signal. Production issues such as logo insertion would occur in this block. Potentially, this function might be combined with splicer functions.

108 Keyer
Same as 83, however this block is associated with SD service. Functional block that allows signals to be keyed in or overlayed on the encoded signal. Production issues such as logo insertion would occur in this block. Potentially, this function might be combined with splicer functions.

A1 Audio Decoder
The Audio Decoder provides the ability to decode and monitor signals that have been compressed to the "intermediate level" of rate reduction for distribution of multichannel DTV sound within the plant. It is the complement of the Audio Encoder (A2)

A2 Audio Encoder
The Audio Encoder provides "intermediate level " rate reduction for distribution of multichannel DTV sound. The Encoder will carry up to six or eight channels of audio in a single AES/EBU pair and is designed to survive 8 to 10 generations of encoding and decoding without causing audible artifacts. The encoder will pack the rate reduced audio data into the "audio payload" space of an AES/EBU signal that is used as the transport mechanism for the coded audio. If the data is carried in only the first 20 of the 24 available bits, the encoded signal can be recorded on common digital VTRs.

The ATSC audio specification depends on having information about the audio program data, or metadata, accompany the audio to the receiver. It includes information about the number of channels being broadcast, the physical arrangements of the channels, dynamic range information and timing information required to maintain audio to video synchronization. The metadata is carried to the receiver as part of the transport stream, so has to get to the Emission (Dolby Digital) encoder along with the audio. Existing TV plants don't have a path for the metadata, so space has been reserved in the Distribution coder signal for it.

A3 Audio Embedder
This device functions as an audio multiplexer. It is used to multiplex several groups of AES/EBU digital audio data streams into the horizontal ancillary data space of a serial digital video data stream.

A4 Audio Disembedder
This device functions as an audio de-multiplexer. It is used to de-multiplex several groups of AES/EBU digital audio data streams from the horizontal ancillary data space of a serial digital video data stream.

A5 Metadata Authoring Unit
The function of this block is to create, monitor and make any necessary changes to the metadata ultimately delivered to the Dolby Digital Emission encoder and the decoder in the home receiver. There may be one or more types of metadata authoring devices, depending on the application. In some cases, existing equipment, such as a console automation system, may provide some of the information required.

A6 Emulator
The Emulator is used to simulate the actions of a domestic receiver so that the production crew can evaluate the audio as it will be received in the home. The emulator will allow them to better evaluate

choices made in the downmix and selection of parameters in the authoring of metadata. The emulators' function is analogous to the small plastic cased "table radio" used in recording studios to find out how a certain mix will "play" in the home. Emulators will typically be inserted in the facility monitoring chain, and may be used or bypassed as required.

A7 Audio Decoder
Same as A1. This Audio decoder is used in conjunction with the HDTV service.

A8 Audio Encoder
Same as A2. This Audio decoder is used in conjunction with the HDTV service.

A9 Audio Embedder
Same as A3. This Audio Embedder is used in conjunction with the HDTV service.

A10 Audio Disembedder
Same as A4. This Audio Disembedder is used in conjunction with the HDTV service.

A11 Metadata Authoring Unit
Same as A5. This Metadata Authoring Unit is used in conjunction with the HDTV service.

A12 Emulator
Same as A6. This Emulator is used in conjunction with the HDTV service.