National Association of NAB BROADCASTERS
TV TechCheck
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ATSC TRANSPORT STREAM VERIFICATION

The ATSC has just released a recommended practice (RP) on DTV transport stream (TS) verification. Document A/78, "ATSC Recommended Practice: Transport Stream Verification," outlines a common methodology for describing transport stream conformance criteria. This document explicitly describes the elements and parameters of ATSC Standards A/53 and A/65 that should be verified in a transport stream for it to be considered a compliant emission. The document does not cover RF, captioning, or elementary streams. A/78 has been approved by a letter ballot of the ATSC membership. It can be found at http://www.atsc.org/standards/practices.html with the other ATSC recommended practices.

ATSC standards strictly define the contents and characteristics of the DTV emission transport stream. Successful tuning and display of programs by a receiver are ensured if the transport stream adheres to the applicable ATSC standards. However, in the real world there are a number of interactions and interrelationships among various components (including human error and equipment failures) that can result in slight variances from the "straight and narrow" strictly conforming TS. The objective of the RP is to provide guidance on the severity of specific error conditions and the impact those errors will have on DTV reception issues. An example of such an error condition might be a "PAT timing error." This can occur when the multiplexer is faced with a choice of outputting either a packet carrying video with a PTS on the schedule required or a packet with the PAT data within its timing requirements and the multiplexer outputs the packet with the PTS sample first. This results in the PAT data being "late" and the PMT timing interval is exceeded. So the TS, for one or two packet times, will be non-conformant. There is no avoiding these types of conflicts, and they arise periodically in real-world equipment. This particular non-conformance will not affect any real-world receivers nor will it result in disruption of service. However, some implementations of monitoring equipment raise a "red" flag indicating a violation has occurred. But, more serious and perhaps fatal errors will also raise a "red" flag indicating that a violation has occurred. So without having extensive knowledge of the importance of each parameter it's difficult to determine which red flag will result in reception problems. Thus a "false alarm" or "cry wolf" problem can occur.

The RP offers a classification system that addresses the false alarm issue. Each error type is provided with a defined "error severity," as detailed below:

- Transport Stream Off-Air (TOA)
- Program Off-Air (POA)
- Component Missing (CM)
- Quality of Service (QoS)
- Technically Non-Conformant (TNC)

The term Transport Stream Off-Air means that the error(s) is so severely out of specification that no receiver can be expected to be able to determine that any DTV signal is present. Program Off-Air means that the content of one of the channels in the multiplex is flawed to the point where it cannot be rendered. Component Missing covers such things as missing audio, or any element that is signaled but not present in renderable form. Quality of Service covers errors that are expected to degrade the presentation such as a slower channel change time, or a recording missing a few seconds of content because the STT was not accurate. Technically Non-Conformant means the letter of the standard has been violated, but the degree of violation is not expected to have any perceptible impact to a consumer. The RP provides more information about each class, including examples.

The Proposed Recommended Practice also classified transport stream issues by type, dividing errors into the general following categories:

- Program Specific Information (PSI) errors
- PSIP errors
- Timing model and buffering errors
- Consistency errors

The table below shows the Consistency error conditions.

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
TSID values in PAT and VCT (transport_stream_id) do not match [1]	<none>	X	X	X	X	X
PAT/VCT mismatch [2]	Different number of programs found in VCT than signaled in PAT [3]		X		X	X
VCT/PMT mismatch	SLD/PMT mismatch (number of services)			X	X	X
VCT/PMT mismatch	SLD/PMT element mismatch (different “parameters” for matching program elements)			X	X	X
PMT/EIT-0 descriptor mismatch [4]	Mismatch in duplicated descriptors for current event between PMT and EIT-0			X	X	X
ETT syntax errors	ETT has invalid ETM_ID or ETM_ID does not match existing event_id in EIT (excludes channel ETT)			X [5]	X	X
ETT syntax errors	ETT has ETM_ID of channel ETT, but MGT does not flag channel ETT on this PID				X	X
Multiple sources of PSI	Version numbers for particular PSI tables should never decrease (except at wraparound) [6]	X	X	X	X	X
Daylight Savings time settings	STT contains invalid values for Daylight Savings time switchover					X
Service Location Descriptor missing from VCT	No Service Location Descriptor in VCT		X	X	X	X
Dangling source_id	source_id mismatch (either source_id in VCT does not have a corresponding source_id in EIT or source_id in EIT does not have a corresponding source_id in VCT)		X	X	X	X
MGT mismatch	Version number and/or size of tables signaled in MTG does not match with actual table [7]				X	X
MGT mismatch	PSIP table found in stream, but not signaled in MGT					X

Table Notes:

1) Receivers may not tune if these fields do not agree.

2) While some receivers may operate correctly, others may not display the program in this case.

3) Conditional on the state of the hidden flag in the VCT, whether the virtual channel is digital or analog and whether the virtual channel is in another transport

4) This error condition may cause captioning to not work.
5) The text description of the event is the missing component.
6) This condition is indicative of multiple sources of PSI tables (from both multiplexer and PSIP generator).
7) Tables signaled differently than the actual parameters can lead to variable behavior, dependant on the receiver and the actual table.

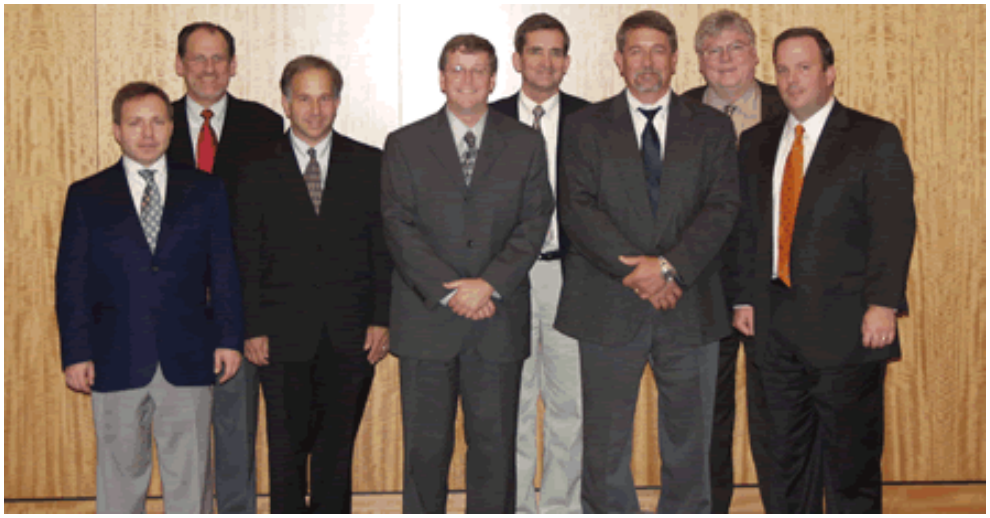
The RP is a "must read" for all DTV station engineers. It is only 20 pages and provides significant insight into the core of the ATSC standards, without the stilted formalisms that make many of the sections of the standards tedious to read. It is also hoped that the definitions in the RP can enable monitoring equipment designs that have a uniform classification of error severity.

NAB Trains Engineers in Safe and Interference Free Satellite Operations

Thirty-three engineers attended the fall NAB Satellite Uplink Operators seminar held at NAB headquarters in Washington, DC last week. The students from the U.S., Brazil, Denmark, Haiti and Venezuela participated in four days of uplink operator training designed to instruct students in the proper technical and operational practices that will ensure safe, successful and interference free satellite transmissions. Sidney Skjei of Skjei Telecom, Inc. conducted the seminar for NAB. In addition to classroom instruction, the students toured the PBS Satellite Operations Center in Alexandria, VA and received hands-on training in an SNG truck supplied to NAB by Tribune Broadcasting, Washington, DC. Shown in the photo to the left standing next to the Tribune Broadcasting SNG truck are Christian Galdabini of 2 Force Productions, Martin Reiman of WTXF-TV, Rich Chamberlain of Tribune Broadcasting and Sidney Skjei.

For information on the next NAB Satellite Uplink Operators Training Seminar on May 21-24, 2007 at NAB call NAB Science & Technology at 202-429-5346.

NAB Broadcast Engineering Conference Committee Begins 2007 Planning



The NAB Broadcast Engineering Conference committee met at NAB headquarters last week to begin planning for the NAB 2007 Conference. The Committee members shown in the photo to the right are (left to right) Gary Kline, Cumulus Media; Lew Zager, PBS; Paul Shulins, Greater Media; Steve Fluker, Cox Radio; Talmadge Ball, Bonneville International; Wayne Kube, Belo Broadcasting; Dave Converse, ABC/Disney Stations Group and Jeff Smith, Nassau Broadcasting Partners.

If you have a suggestion for a presentation for the 2007 NAB Broadcast Engineering Conference, go to the NAB Call for Proposals web site at: http://www.nabshow.com/nab2007/callForProposals.asp.

ATSC VSB Combo Seminar

Wednesday & Thursday, November 8-9, 2006
Birmingham, AL

The VSB Combo Seminar to be offered in November in Birmingham, Alabama includes both the Fundamentals and Measurements Seminars. The Fundamentals seminar covers the ATSC's Digital Television (DTV) VSB transmission system while the Measurement Seminar focuses on the types of VSB measurements that are desired in the laboratory, at transmitter sites and at remote field sites. The seminars will be presented by Gary Sgrignoli of Meintel, Sgrignoli & Wallace from 1:00 - 5:30 pm on November 8 and from 8:30 am-5:45 pm on November 9. For more information contact Gary Sgrignoli at (847) 259-3352, gary.sgrignoli@ieee.org or check out the Meintel, Sgrignoli and Wallace Web site at www.mswdtv.com.