1.0   SCOPE

This document is identical to SCTE 142 2009 except for informative components which may have been updated such as the title page, NOTICE text, headers and footers. No normative changes have been made to this document.

This Recommended Practice provides a common methodology for describing Transport Stream conformance criteria. This document explicitly describes the elements and parameters of SCTE 54 [2], along with ATSC A/53-3 [5] and A/65 [6] that should be verified in an SCTE Transport Stream for it to be considered a proper emission. It does not cover RF, captioning or elementary streams.

This Standard is based upon an ATSC Recommended Practice, A/78A [16], which provided a complete foundation for this work. SCTE would like to express its gratitude to the ATSC for this pioneering work.

While the SCTE standards define strict limits for each parameter, in practice the severity of the error may depend upon the magnitude of the deviation. This document recommends severity levels associated with the ranges of deviation from the standard in these parameters.

2.0   DEFINITIONS AND ACRONYMS

AEIT - Acronym for Aggregate Event Information Table.

AETT - Acronym for Aggregate Extended Text Table, defined in A/65C [6].

ANSI - Acronym for American National Standards Institute.

ARIB - Acronym for Association of Radio Industries and Businesses.

CM - Acronym for Component Missing.

CRC - Acronym for Cyclic Redundancy Check, defined in 13818-1 [14].

CVCT - Acronym for Cable Virtual Channel Table, defined in A/65C [6].

DPI - Acronym for Digital Program Insertion.

DTS - Acronym for Decoding Timestamp, defined in 13818-1 [14].

DTV - Acronym for Digital Television.

DVB - Acronym for Digital Video Broadcasting.

EAS - Acronym for Emergency Alert System.

EIT - Acronym for Event Information Table, defined in A/65C [6].

EPG - Acronym for Electronic Program Guide.

ES - Acronym for Elementary Stream, defined in 13818-1 [14].

ETT - Acronym for Extended Text Table.

FCC - Acronym for Federal Communications Commission.

GPS - Acronym for Global Positioning System.

L-VCT - Acronym for Long-form Virtual Channel Table, defined in A/65C [6].

MPEG - Acronym for Moving Picture Experts Group.

MGT - Acronym for Master Guide Table, defined in A/65C [6].

NIT - Acronym for Network Information Table, defined in 13818-1 [14].

NTT - Acronym for Network Time Table, defined in A/65C [6].

OOB-SI - Acronym for Out of Band - SI.

PAT - Acronym for Program Association Table, defined in 13818-1 [14].

PCR - Acronym for Program Clock Reference, defined in 13818-1 [14].

PES - Acronym for Packetized Elementary Streams, defined in 13818-1 [14].

PID - Acronym for Packet ID, defined in 13818-1 [14].

PMT - Acronym for Program Map Table, defined in 13818-1 [14].

POA - Acronym for Program Off Air.

PSI - Acronym for Program Specific Information, defined in 13818-1 [14].

PSIP - Acronym for Program and System Information Protocol, defined in A/65C [6].

PTS - Acronym for Presentation Time-Stamp, defined in 13818-1 [14].

PVR - Acronym for Personal Video Recorder.

QAM - Acronym for Quadrature Amplitude Modulation.

QoS - Acronym for Quality of Service.

RAM - Acronym for Random Access Memory.

RF - Acronym for Radio Frequency.

RP - Acronym for Recommended Practice.

RRT - Acronym for Rating Region Table, defined in A/65C [6].

SCTE - Acronym for Society of Cable Telecommunications Engineers.

SI - Acronym for Service Information, defined in ANSI/SCTE 54 [2].

SLD - Acronym for Service Location Descriptor, defined in A/65C [6].

STT - Acronym for System Time Table, defined in A/65C [6].

S-VCT - Acronym for Short-form Virtual Channel Table, defined in A/65C [6].

TNC - Acronym for Technically Non-Conformant.

TOA - Acronym for Transport Stream Off Air.

TVCT - Acronym for Terrestrial Virtual Channel Table, defined in A/65C [6].

TS - Acronym for Transport Stream, defined in ANSI/SCTE 54 [2].

T-STD - Acronym for Transport Stream System Target Decoder, defined in 13818-1 [14].

VCT - Acronym for Virtual Channel Table.

3.0   NORMATIVE REFERENCES

The following documents contain provisions, which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

3.1   SCTE References

[1]   ANSI/SCTE 43-2005, Digital Video Systems Characteristics Standard for Cable Television

[2]   ANSI/SCTE 54-2009, Digital Video Service Multiplex and Transport System Standard for Cable Television

[3]   ANSI/SCTE 65-2008, Service Information Delivered Out-Of-Band for Digital Cable Television

3.2 Standards from other Organizations

[4] ATSC A/52B: "Digital Audio Compression (AC-3, E-AC-3) Standard," Advanced Television Systems Committee, Washington, D.C., 14 June 2005.

[5] ATSC A/53-3:2007: "ATSC Digital Television Standard, Part 3 – Service Multiplex and Transport Subsystem Characteristics," Advanced Television Systems Committee, Washington, D.C., 3 January 2007.

[6] ATSC A/65C: "Program and System Information Protocol for Terrestrial Broadcast and Cable," Advanced Television Systems Committee, Washington, D.C., 2 January 2006.

4.0 INFORMATIVE REFERENCES

The following documents may provide valuable information to the reader but are not required when complying with this standard.

4.1 SCTE References

[7] ANSI/SCTE 35-2007, Digital Program Insertion Cueing Message for Cable

[8] ANSI/SCTE 18-2007 (also known as ANSI J-STD-042-2002), Emergency Alert Message for Cable

[9] SCTE 128-2007, AVC Video Systems and Transport Constraints for Cable Television

4.2 Standards from other Organizations

[10] ATSC A/69: "Recommended Practice: Program and System Information Protocol Implementation Guidelines for Broadcasters," Advanced Television Systems Committee, Washington, D.C., 25 June 2002.

[11] ATSC A/110A: "Synchronization Standard for Distributed Transmission, Revision A," Advanced Television Systems Committee, Washington, D.C., 19 July 2005.

[12] CableLabs OC-SP-HOST2.1-CFR-I01-070720, OpenCable™ Host Device 2.1 Core Functional Requirements, July 2007.

[13] ETSI TR 101 290 V1.2.1, Digital Video Broadcasting (DVB): Measurement guidelines for DVB systems, May 2001.

[14] ISO/IEC IS 13818-1:2000 (E), International Standard, Information technology – Generic coding of moving pictures and associated audio information: systems.

[15] ISO/IEC 13818-4:2004 (E), International Standard, Information technology – Genetic Coding of Moving Pictures and associated audio information: Conformance Testing.

[16] ATSC A/78A, Recommended Practice: Transport Stream Verification, 9 May 2007.

[17] ATSC A/54A, Recommended Practice: Guide to the Use of the ATSC Digital Television Standard, 4 December 2003.

5.0   INTRODUCTION

The SCTE and ATSC standards define the contents and characteristics of the emission Transport Stream. There may be a large number of interactions and interrelationships amongst various components. Successful tuning and display of programs can be enabled if this Transport Stream adheres to the SCTE standards. The connection between the emission remultiplexer and the QAM modulator is the reference analysis point assumed in this document, as shown in Figure 1.

Please note that this diagram shows only a conceptual, functional block view of a DTV system. In practice, actual implementations will only share MPEG data with other devices using the MPEG-2 Transport Stream (TS), as Elementary Streams (ES) or Packetized Elementary Streams (PES) cannot tolerate the introduction of any transmission errors and once synchronization is lost the system crashes. Furthermore, real systems may group the functions in different ways and will likely appear different on an electrical or physical block diagram.

This Standard uses terms and acronyms defined in ISO 13818-1 [14], A/53-3 [5] and A/65 [6], and assumes a fair degree of familiarity with MPEG-2 systems as implemented per the SCTE standards. Readers that do not recognize the terms should read A/54A [17], A/69 [10], SCTE 54 [2], and SCTE 65 [3].
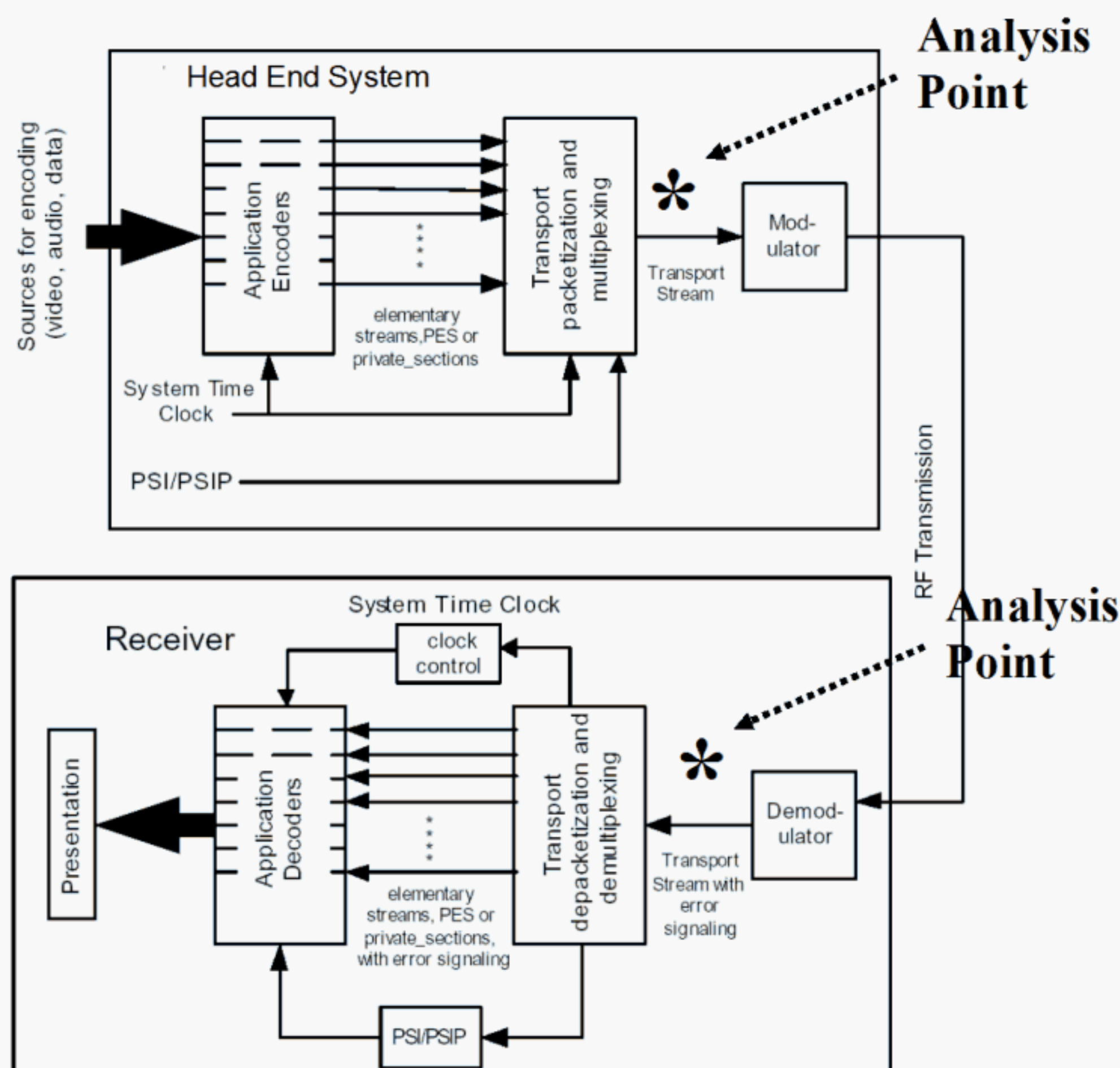
Figure 1 – Reference analysis point in the DTV system.

This Standard identifies transport stream issues by type, dividing errors into the following categories:

☐ Section 7.0: PSI tables (PAT and PMT)

☐ Section 8.0 Out-Of-Band Tables

☐ Section 9.0 In-Band Tables

☐ Section 10.0: PSIP tables (MGT, VCT, etc.)

☐ Section 11.0: Timing Model and Buffering

☐ Section 12.0: Consistency

☐ Section 13.0: General Errors

Each error type is also provided with an error severity, as listed below:

☐ Transport Stream Off Air (TOA)

☐ Program Off Air (POA)

☐ Component Missing (CM)

☐ Quality Of Service (QOS)

☐ Technically Non-Conformant (TNC)

6.0   ERROR CHARACTERIZATION

As noted earlier, in this document, errors are categorized as:

☐ Transport Stream Off Air (TOA)

☐ Program Off Air (POA)

☐ Component Missing (CM)

☐ Quality Of Service (QOS)

☐ Technically Non-Conformant (TNC)

The distinctions between these are important and should be taken into account both by equipment manufacturers of SCTE TS monitoring equipment and the users of that equipment.

6.1   Regarding "Technically Non-Conformant" error handling

Considering these classes of errors, particular attention needs to be paid to the "TNC" or "Technically Non-Conformant" class. In Standards as complex as MPEG-2 and those from the SCTE, situations arise where two "shall" statements collide. At such junctures, the Transport Stream (TS) may be momentarily non-conformant. An example of this might be "PAT repetition error" (see Section 7.1). If the multiplexer is faced with a choice of outputting a packet carrying a PTS on a video PID on the schedule required by Section 11.2 or a repetition of the PAT within the requirements of Section 7.1, an implementer may choose to output the PTS sample rather than the PAT. Either way, the TS is for a moment non-conformant. Neither choice of non-conformance will affect any real-world receivers. Neither will result in disruption of service. Either will be non-conformant. There is no avoiding these conflicts, and they arise periodically in real-world equipment.

Should a manufacturer of MPEG analysis equipment choose to make either of these errors the cause of an operator alarm, after multiple false alarms the operator may ignore all alarms. That is not desirable.

A number of the possible errors within this Section fall into these categories. While a continuous occurrence of any should constitute an operator alarm, a single occurrence of any should (as indicated by the table) be treated merely as a minor problem, which, unless re-occurring, is not significant.

6.2 Discussion of Error Classification

An explanation of the error classification scheme is as follows:

1. **Transport Stream Off Air (TOA)**: The transport is effectively off-air as the Transport Stream errors are severe enough that transport level logical constructs are damaged beyond utility. Receivers will not be able to tune and decode anything within the

transport. The complete or repeated absence of sync bytes would be an example of this level of error.

2. **Program Off Air (POA):** A main service (virtual channel) is flawed to the point that that service is effectively off air for conformant/reasonable receiver designs. This could involve all of the program elements being improperly constructed or incorrect/missing signaling about elements. The absence of a PMT instance for a service would be an example of this type of error.

3. **Component missing (CM):** One of the program components that is signaled by PSIP or PSI as present is either not present or cannot be found and decoded. One example would be a mismatch between the video PID signaled in the PMT and the actual PID used for the video elementary stream.

4. **Quality of Service (QOS):** Parameters are out of specification by such a margin that a significant fraction of the receivers can be expected to produce flawed outputs. In many cases, the broadcast is viewable, but may exhibit some form of degradation to the viewer. An example might be the PAT cycle time being somewhat longer than the specification, which would cause slower than normal tuning.

5. **Technically Non-Conformant (TNC):** Violates the letter of the standard, but in practice will have little effect on the viewing experience. Errors of this type should be corrected, but do not have the urgency of higher severity errors. An example might be a single instance of a 102 ms PAT cycle time (with the remainder of the PATs coming at less than 100 ms intervals).

In most cases the error threshold for what may appear to be escalating categorization is based on: 1) the official metric to twice the metric, 2) twice the official metric to 5 times the metric, and 3) over five times the metric. The nominal mathematical expression of this is shown below, where Tc is the metric for the cycle time and t is the time since the last arrival (note that for clarity of expression of the time intervals, this document ignores time advances during each millisecond increment):

1. $T_c < t \leq 2T_c$
2. $2T_c < t \leq 5T_c$
3. $5T_c < t$

This scale can prevent "shall-statement collisions" from producing meaningless error alarms, yet provides guidance to equipment makers and users regarding severities.

6.3   Regarding CRC errors

Readers may note that CRC errors are categorized as "TNC" rather than as higher severity. Analysis equipment may wish to track repetition rates of CRC errors and produce a higher level indication (such as QoS) if they reoccur with any frequency.

The sole exception to this categorization is for SCTE 35 messages, as loss of the message due to CRC error may result in loss of revenue to the operator of the ad insertion system. Thus this error is categorized as "CM" (Component Missing).

7.0 PSI ERRORS

An SCTE transport stream is also required to be MPEG-2 conformant (see Section 5 in reference [15]). Therefore, an SCTE transport stream must include the two mandatory Program Specific Information (PSI) tables. These two tables are known as the Program Association Table (PAT) and the Program Map Table (PMT). The syntax is defined within ISO/IEC 13818-1 [14]. The maximum interval for the PAT is specified in the SCTE standards as 100 ms. The maximum interval for the PMT is specified in the SCTE standards as 400 ms. Exceeding the interval on each of these tables by a small amount should not have a major impact on a receiver, especially since each SCTE conformant receiver should be able to fully tune to any SCTE channel through the use of the SCTE SI tables.

7.1 PAT

Error conditions for the Program Association Table are classified in Table 7.1

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X
Legend:						
TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant						
Notes:						
1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.						
2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.						
3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.						

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.

Table 7.1 PAT Error Conditions

Error Condition	Error Qualifier	TOA	POA	CM	QOS	TNC
PAT repetition error	PAT repetition interval error (100ms < cycle time ≤ 200ms)[1]					X
PAT repetition error	PAT repetition interval error (200ms < cycle time ≤ 500ms)				X	X
PAT absence error	PAT not found (cycle time > 500ms)	X	X	X	X	X
PAT syntax error	Packet with PID 0x0000 doesn't have table_id 0x00	X	X	X	X	X
PAT syntax error	CRC is incorrect for table_id 0x00 within PID 0x0000 [2]					X
PAT syntax error	scrambling_control_field is not '00' for packet within PID 0x0000 [3]	X	X	X	X	X

Legend:

TOA: TS Off Air, POA: Program Off Air, CM: Component Missing, QOS: Quality of Service, TNC: Technically Non-Conformant

Notes:

1) Or over 140 ms with regards to the hard limit of 80 kbps. In A/53-3, Section 6.4 it is noted that in cases where the table section sizes are such that the 100 millisecond repetition rate of the program_association_section() would cause the 80,000 bps maximum rate to be exceeded, the time interval between the byte containing the last bit of the program_association_section() may be increased but in no event shall exceed 140 milliseconds, so that under no circumstances the limit of 80,000 bps is exceeded.

2) Each instance of an incorrect CRC should be interpreted as the table not being present. This occurrence should be considered as part of a repetition or absence error determination. See Section 6.3.

3) An error in the setting of the scrambling control field is most likely an indicator of a hard failure or incorrect setting and will persist until corrected.