



***Society of Cable
Telecommunications
Engineers***

**ENGINEERING COMMITTEE
Digital Video Subcommittee**

SCTE 56 2011

**DIGITAL MULTIPROGRAM DISTRIBUTION
BY SATELLITE**

This is a preview of "SCTE 56 2011". [Click here to purchase the full version from the ANSI store.](#)

NOTICE

SCTE assumes no obligations or liability whatsoever to any party who may adopt the Standards. Such adopting party assumes all risks associated with adoption of these Standards or Recommended Practices, and accepts full responsibility for any damage and/or claims arising from the adoption of such Standards or Recommended Practices.

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. SCTE shall not be responsible for identifying patents for which a license may be required or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention.

Patent holders who believe that they hold patents which are essential to the implementation of this standard have been requested to provide information about those patents and any related licensing terms and conditions. Any such declarations made before or after publication of this document are available on the SCTE web site at <http://www.scte.org>.

All Rights Reserved

© Society of Cable Telecommunications Engineers, Inc. 2011

140 Philips Road

Exton, PA 19341

Digital Multiprogram Distribution by Satellite

Table of Contents

1	INTRODUCTION.....	1
1.1	COMPLIANCE NOTATION.....	1
2	GENERIC REFERENCE MODEL FOR THE COMMON FUNCTIONAL REQUIREMENTS OF A SATELLITE IRD	2
3	UNIVERSAL ELEMENTS OF A SATELLITE IRD	4
3.1	DEMODULATION AND DECODING	5
3.1.1	<i>QPSK demodulator</i>	5
3.1.2	<i>Matched filter</i>	6
3.1.3	<i>Convolutional decoding</i>	6
3.1.4	<i>Sync byte decoder</i>	7
3.1.5	<i>Convolutional deinterleaver</i>	7
3.1.6	<i>Reed Solomon decoder</i>	7
3.1.7	<i>Energy dispersal removal</i>	7
3.2	TRANSPORT AND DEMULTIPLEXING	8
3.3	SOURCE DECODING OF VIDEO, AUDIO AND DATA.....	8
3.3.1	<i>Video</i>	9
3.3.2	<i>Audio</i>	9
3.3.3	<i>Data</i>	9
4	SUMMARY CHARACTERISTICS OF DIGITAL MULTIPROGRAM TV SYSTEMS BY SATELLITE	9
5	SPECIFIC CHARACTERISTICS	11
5.1	SIGNAL SPECTRUM OF THE DIFFERENT SYSTEMS AT THE MODULATOR OUTPUT	11
5.1.1	<i>Signal spectrum for System I</i>	11
5.1.2	<i>Signal spectrum for System II</i>	13
5.2	CONVOLUTIONAL CODING.....	19
5.2.1	<i>Convolutional coding characteristics for System I</i>	19
5.2.2	<i>Convolutional coding characteristics for System II</i>	19
5.3	SYNCHRONIZATION CHARACTERISTICS	20
5.3.1	<i>Synchronization characteristics for System I</i>	20
5.3.2	<i>Synchronization characteristics for System II</i>	20
5.4	CONVOLUTIONAL INTERLEAVER	22
5.4.1	<i>Convolutional interleaver for System I</i>	22
5.4.2	<i>Convolutional interleaver for System II</i>	23
5.5	REED SOLOMON ENCODER	24
5.5.1	<i>Reed Solomon encoder characteristics for System I</i>	24
5.5.2	<i>Reed Solomon encoder characteristics for System II</i>	24
5.6	ENERGY DISPERSAL.....	25

5.6.1	<i>Energy dispersal for System I</i>	25
5.6.2	<i>Energy dispersal for System II</i>	26
5.7	FRAMING AND TRANSPORT STREAM CHARACTERISTICS.....	28
5.7.1	<i>Framing and Transport stream characteristics for System I</i>	28
5.7.2	<i>Framing and Transport stream characteristics for System II</i>	28
6.	NORMATIVE REFERENCES	29
7.	LIST OF ACRONYMS	29

List of Figures

Figure 1 - Typical IRD protocol stack.....	3
Figure 2 - Generic reference model for a satellite IRD	4
Figure 3 – Block diagram for demodulation and channel decoding.....	5
Figure 4 - QPSK constellation	6
Figure 5 - Block diagram for transport and demultiplexing	8
Figure 6 - Block diagram for source decoding	9
Figure 7 - Template for the signal spectrum mask at the modulator output represented in the baseband frequency domain.....	11
Figure 8 - Template Of The Modulator Filter Group Delay.....	12
Figure 9a - Spectral density mask for standard mode.....	14
Figure 9b - Spectral density mask for truncated-spectrum mode	15
Figure 10a - Normalized group delay mask for standard mode.....	16
Figure 10b - Normalized group delay mask for truncated-spectrum mode	16
Figure 10c - System II spectral mask.....	18
Figure 11 - Convolutional encoder (rate 3/4 example).....	20
Figure 12 - Uplink processing	21
Figure 13 - Uplink packet reorder for odd numbered packets.....	22
Figure 14 - Conceptual diagram of the convolutional interleaver and de-interleaver.....	23
Figure 15 - Convolutional interleaver.....	24
Figure 16 - RS code applied to a packet	25
Figure 17 - Randomizer/de-randomizer schematic diagram.....	26
Figure 18 - Randomizer block diagram	27
Figure 19 - Framing structure	28

List of Tables

Table 1 - Summary characteristics of digital multiprogram TV systems by satellite (Normative)	10
Table 2 - Definition of points given in Fig. 7	12
Table 3a - Spectral density mask breakpoints for standard mode	13
Table 3b - Spectral density mask breakpoints for truncated-spectrum mode	14
Table 4a - Normalized group delay breakpoints for standard mode.....	17
Table 4b - Normalized group delay breakpoints for truncated-spectrum mode	17
Table 4c - System II spectral mask.....	18
Table 5 - Punctured code definition.....	19

This page left blank intentionally.

This is a preview of "SCTE 56 2011". [Click here to purchase the full version from the ANSI store.](#)

Digital Multiprogram Distribution by Satellite

1 Introduction

Satellite Digital TV systems have shown their advantages with respect to the analog TV allowing a more efficient use of the satellite frequency spectrum available and establishing a more robust scenario with respect to interference protection.

With the aim to promote the convergence on a worldwide standard for satellite digital multiprogram reception systems for television, sound and data services, the systems for the reception of Digital Multiprogram Distribution by Satellite are described. These descriptions configure the universal elements of the satellite Integrated Receiver Decoder (IRD).

The universal elements of the satellite IRD are capable of receiving emissions from System I, and System II.

The common and specific elements of each system have been analyzed and it has been concluded on the feasibility of the implementation of the universal elements of a Satellite IRD. This document analyses the common elements among existing systems, defines and describes the functions of a generic system model and identifies the processes and the minimum set of parameters of the various sub-systems of the universal elements of a Satellite IRD.

The feasibility of the implementation of the common elements in a satellite IRD has been demonstrated in consultation with the industry.

1.1 Compliance Notation

As used in this document, "*shall*" denotes a mandatory provision of the standard. "*Should*" denotes a provision that is recommended but not mandatory. "*May*" denotes a feature whose presence does not preclude compliance that may or may not be present at the option of the implementer.