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Telecommunications
Engineers***

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Digital Video Subcommittee**

AMERICAN NATIONAL STANDARD

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**Digital Transmission Standard
For
Cable Television**

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140 Philips Road
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1 Introduction

This standard describes the framing structure, channel coding, and channel modulation for a digital multi-service television distribution system that is specific to a cable channel. The system can be used transparently with the distribution from a satellite channel, as many cable systems are fed directly from satellite links. The specification covers both 64 and 256 QAM. Most features of both modulation schemes are the same. Where there are differences, the specific details for each modulation scheme is covered.

The design of the modulation, interleaving and coding is based upon testing and characterization of cable systems in North America. The modulation is Quadrature Amplitude Modulation with a 64 point signal constellation (64-QAM) and with a 256 point signal constellation (256-QAM), transmitter selectable. The forward error correction (FEC) is based on a concatenated coding approach that produces high coding gain at moderate complexity and overhead. Concatenated coding offers improved performance over a block code, at a similar overall complexity. The system FEC is optimized for quasi error free operation at a threshold output error event rate of one error event per 15 minutes.

The data format input to the modulation and coding is assumed to be MPEG-2 transport. However, the method used for MPEG synchronization is decoupled from FEC synchronization. For example, this enables the system to carry Asynchronous Transfer Mode (ATM) packets easily without interfering with ATM synchronization. In fact, ATM synchronization may be performed by defined ATM synchronization mechanisms.

There are two modes supported: Mode 1 has a symbol rate of 5.057 Msps and Mode 2 has a symbol rate of 5.361 Msps. Typically, Mode 1 will be used for 64-QAM and Mode 2 will be used for 256-QAM. The system will be compatible with future implementations of higher data rate schemes employing higher order QAM extensions.

2 Symbols and abbreviations

2.1 SYMBOLS

For the purposes of this Recommendation, the following symbols are used:

α	Roll-off factor
byte	Eight bits
bps	Bits per second
$g(x)$	RS code generator polynomial
ms	millisecond
$p(x)$	RS field generator polynomial
q	Number of bits: 2,3,4 for 16-QAM, 32-QAM, 64-QAM, respectively
T	Number of bytes which can be corrected in RS error-protected packet

2.2 ABBREVIATIONS

For the purposes of this Recommendation, the following abbreviations are used:

ATM	Asynchronous Transfer Mode
FEC	Forward Error Correction
HEC	Header Error Control
HEX	Hexadecimal
LSB	Least Significant Bit
MPEG	Motion Picture Expert-Group
MSB	Most Significant Bit