

AS/NZS 4540:1999
ETS 300 429:1994

AS/NZS 4540

Australian/New Zealand Standard™

**Digital broadcasting systems
for television, sound and data
services—Framing structure,
channel coding and modulation
for cable systems**

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This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee CT/2, Broadcasting and Related Services. It was approved on behalf of the Council of Standards Australia on 30 December 1998 and on behalf of the Council of Standards New Zealand on 2 February 1999. It was published on 5 April 1999.

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CT/2, Broadcasting and Related Services, as one of a series of Standards intended to facilitate the operation of cable-based digital delivery services.

This Standard is identical with and has been reproduced from European Telecommunication Standard ETS 300 429:1994, *Digital broadcasting systems for television, sound and data services; Framing structure, channel coding and modulation for cable systems*.

The objective of this Standard is to assist manufacturers, service providers, carriers and consumers in the design, operation and maintenance of associated equipment and services, to ensure compatibility and optimum performance in the delivery of program content.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the annex to which they apply. A 'normative' annex is an integral part of a Standard, whereas an 'informative' annex is only for information and guidance.

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<i>Reference to International Standard or other Publication</i>		<i>Australian/New Zealand Standard</i>	
ISO/IEC		AS/NZS	
DIS 13818-1	Coding of moving pictures and associated audio	13818	Information technology Generic coding of moving pictures and associated audio information
		13818.1	Part 1: Systems

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AUSTRALIAN/NEW ZEALAND STANDARD

**Digital broadcasting systems for television, sound and data services—
Framing structure, channel coding and modulation for cable systems****1 Scope**

This European Telecommunication Standard (ETS) describes the framing structure, channel coding and modulation (denoted "the System" for the purposes of this ETS) for a digital multi-programme television distribution by cable. The aim of this ETS is to present a harmonized transmission standard for cable and satellite, based on the MPEG-2 System Layer ISO/IEC DIS 13818-1 [1], with the addition of appropriate Forward Error Correction (FEC) technique. This System can be used transparently with the modulation/channel coding system used for digital multi-programme television by satellite, see ETS 300 421 (bibliography). The System allows for further evolution as technology advances as described in Reimers document (see bibliography). It is capable of starting a reliable service as of now. The System is based on Quadrature Amplitude Modulation (QAM). It allows for 16, 32, or 64-QAM constellations and permits for future extension to higher constellations, such as 128-QAM and 256-QAM.

The System FEC is designed to improve Bit Error Ratio (BER) from 10^{-4} to a range, 10^{-10} to 10^{-11} , ensuring "Quasi Error Free" (QEF) operation with approximately one uncorrected error event per transmission hour.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] ISO/IEC DIS 13818-1 (June 1994): "Coding of moving pictures and associated audio".
- [2] IEEE Trans. Comm. Tech., COM-19, pp. 772-781, (October 1971) Forney, G.D.: "Burst-correcting codes for the classic bursty channel".

3 Symbols and abbreviations**3.1 Symbols**

For the purposes of this ETS, the following symbols apply:

α	Roll-off factor
A_k, B_k	Most Significant Bits at the output of the Byte to m-tupie converter
f_0	Channel centre frequency
f_N	Nyquist frequency
$g(x)$	RS code generator polynomial
HEX	Hexadecimal
I	Interleaving depth (bytes)
I, Q	In-phase, Quadrature phase components of the modulated signal
j	Branch index
k	Number of bytes mapped into n symbols
m	Power of 2^m -level QAM: 4,5,6 for 16-QAM, 32-QAM, 64-QAM, respectively
M	Convolutional interleaver branch depth for $j = 1$, $M = N/I$
n	Number of symbols mapped from k bytes
N	Error protected frame length [bytes]
$p(x)$	RS field generator polynomial
r_m	In-band ripple (dB)
R	Randomized sequence
R_s	Symbol rate corresponding to the bilateral Nyquist bandwidth of the modulated signal
R_u	Useful bit rate after MPEG-2 transport multiplexer
R_u'	Bit rate after RS outer coder
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
T_s	Symbol period

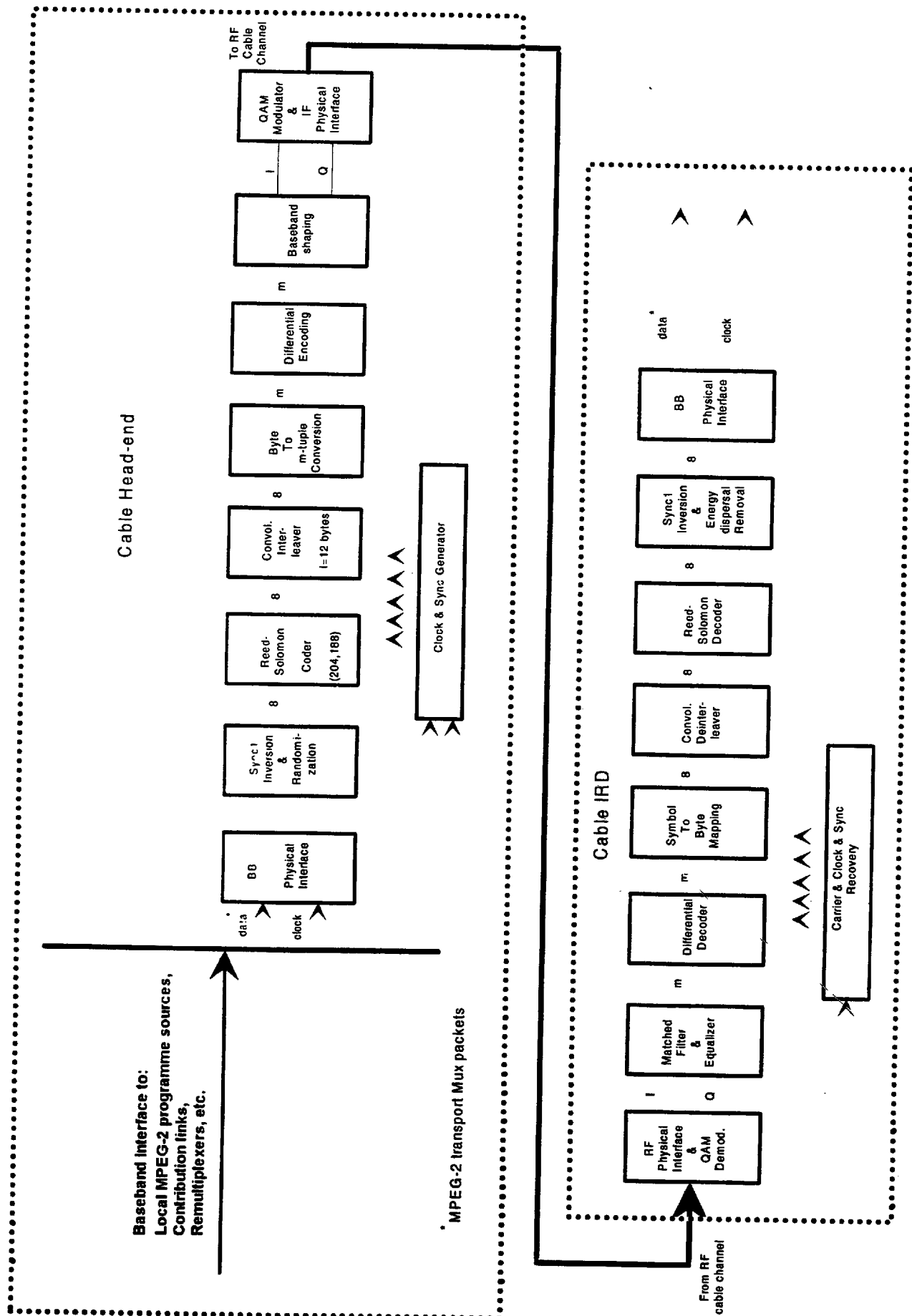


Figure 1: Conceptual block diagram of elements at the cable head-end and receiving site