

<i>Preface to the third edition</i>	<i>ix</i>
<i>Preface to the second edition</i>	<i>x</i>
<i>Preface to the first edition</i>	<i>xi</i>
<i>Acknowledgements</i>	<i>xii</i>

## **1 Basic video and magnetic theory** 1

Introduction, The video signal, Video source synchronization, Video bandwidth requirements, Adding colour to the signal, Colour difference signals, Component analogue video systems, Magnetic recording, Magnetic replay, Implications for video recording, Use of frequency modulation for video recording, Use of helical scan to improve write/read speeds, Control track, Timebase correction, Dropout compensation

## **2 Digital processing** 14

Introduction, The denary (decimal) system, The binary system, Binary-coded decimal, 2's complement coding, The hexadecimal system, Bit rate requirements, Simple digital codes, Organization of digital data, Causes of errors in digital systems, Error detection

## **3 The timecode word** 30

The original quadruplex cue track, The development of a longitudinal timecode (LTC) word, The biphasic mark code, User bits, The form of the LTC word, LTC byte arrangement, The detail of the 625/50 LTC, The detail of the 525/60 LTC, The requirement for vertical interval timecode (VITC), The form of the VITC word, The cyclic redundancy check bits, The detail of the 625/50 VITC, The detail of the 525/60 VITC, Timecode and MPEG-2, The time address and the associated colour TV signal, The 525/60 drop-frame code (M/NTSC), M/PAL drop-frame code, Digital VITC, Timecode and 1125/60 television systems, 24 frame film timecode, Timecode in ancillary data, Timing and synchronization within MPEG-2 Transport streams

## **4 Recording formats and timecode** 76

The U-Matic format, The 1in C-format, Betacam, Beta SP and MII formats, D-1 component digital format, Audio sector timecode and equipment type information, D-2 composite digital format, D-3 composite digital format, D-5 digital format, Digital Betacam, DV, The Hi-8 video format, Domestic and professional R-DAT, Timecode in the R-DAT system, DASH and Prodigy, Nagra D, 1/4in centre-track analogue audio, The Nagra IV-S TC, Audio analogue multi-track, Recording levels

## **5 Timecode and film** 112

Introduction, EBU/IRT and EBU/TDF timecodes, SMPTE film codes, DataKode<sup>®</sup>, Aaton and Arriflex timecode systems, Machine-readable film

timecodes, Film transfer to PAL video, 3-line VITC, Film transfer via 3/2 pulldown, Control of 4:3 scanning for the presentation of wide-screen films

## **6 Timecode and MIDI 135**

Introduction, Channel messages, System messages, MIDI synchronizers, MIDI and IEC timecode, Quarter-frame messages, Full-frame messages, Synchronization between IEC, MTC and MIDI clocks

## **7 Working with timecode 147**

LTC characteristics, LTC crosstalk, Regeneration of timecode, Adjusting for the decoding delay, Machine-to-machine operation, Using VITC, Timecode corruption, Dealing with LTC corruption, VITC corruption, Record-run and time-of-day codes, Power supply back-up, Setting the timecode, Multiple machine continuous jam-sync, Multiple machine momentary jam-sync, Control tracks and tacho pulses, Digital audio synchronization

## **8 Timecode on location 166**

Synchronization of video and audio machines, Radio links, Logging for non-linear editing, The playback shoot, Self-resolving of timecode, Resolving to video, The use of R-DAT for field recording, Remote timecode generation, Record-run and time-of-day codes, The problem with midnight, Cassette changes, Setting the VITC lines, Shooting without a slate, The Global Positioning Satellite (GPS) system and timecode, Terrestrial time and data code sources, Genlocking and jam-syncing

## **9 Timecode and linear post-production 190**

The transfer suite, Off-line editing, Assembly editing, Insert editing, Pre-roll requirements, The edit decision list, Editing and the colour frame sequence, Audio post-production, Synchronizers, The EBus, Synchronizer features, Synchronizer problems, DAT in digital post-production, Timecode and stereo pairs

## **10 Timecode and non-linear post-production 208**

What timecode to record, Basic organization of film production using non-linear editing, Label options, Syncing options for sound and pictures, Maintaining labels, 24 fps pictures in PAL, 24 fps pictures in NTSC, Digitizing without timecode, Creating logging databases externally, Working with external databases, Doing away with the external database, The future?

## **11 Timecode and the AES/EBU digital audio interface 223**

Introduction, AES/EBU digital interface, Alternatives for timecode in AES3 channel status

## **Appendices 230**

- 1 The colour frame sequence and timecode 230
- 2 LTC and VITC specifications 233
- 3 Timecodes conversion 237
- 4 The use of binary groups with film 241
- 5 The extended use of binary groups 246

6	AES/EBU interface channel status data	249
7	EBU recommendations for the recording of information in the user bits	253
8	3-line VITC for film-to-tape transfer	254
9	Global standard frequency and time transmissions	258
10	Nagra IV-S TC multifunction keypad facilities	260
	<i>Bibliography</i>	265
	<i>Index</i>	271