# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preface</strong></td>
<td>xi</td>
</tr>
<tr>
<td><strong>Acknowledgments</strong></td>
<td>xiii</td>
</tr>
<tr>
<td><strong>1 Introduction</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>BROADCASTING BASICS</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>2 Types of Broadcasting</strong></td>
<td>5</td>
</tr>
<tr>
<td>Analog Radio</td>
<td>5</td>
</tr>
<tr>
<td>Digital Radio</td>
<td>6</td>
</tr>
<tr>
<td>Satellite Radio</td>
<td>8</td>
</tr>
<tr>
<td>Analog Television</td>
<td>9</td>
</tr>
<tr>
<td>Digital Television</td>
<td>10</td>
</tr>
<tr>
<td>Satellite Television</td>
<td>11</td>
</tr>
<tr>
<td>Cable Television</td>
<td>12</td>
</tr>
<tr>
<td>Groups and Networks</td>
<td>13</td>
</tr>
<tr>
<td>Internet Radio and Television</td>
<td>14</td>
</tr>
<tr>
<td><strong>3 Sound and Vision</strong></td>
<td>17</td>
</tr>
<tr>
<td>Sound and Audio</td>
<td>17</td>
</tr>
<tr>
<td>Light and Video</td>
<td>20</td>
</tr>
<tr>
<td>Baseband</td>
<td>22</td>
</tr>
<tr>
<td><strong>4 Radio Frequency Waves</strong></td>
<td>23</td>
</tr>
<tr>
<td>Electromagnetic Waves</td>
<td>23</td>
</tr>
<tr>
<td>Frequencies, Bands, and Channels</td>
<td>25</td>
</tr>
<tr>
<td>RF Over Wires and Cables</td>
<td>26</td>
</tr>
<tr>
<td>Modulation</td>
<td>27</td>
</tr>
</tbody>
</table>
5 Analog Color Television 33
   NTSC 33
   PAL and SECAM 42
   HD Analog Video 43

6 Digital Audio and Video 45
   Digital Audio 45
   SD and HD Digital Video 52

7 Information Technology 61
   Binary 61
   Computers 63
   Storage 65
   Computer Networks 68
   Internet Streaming 70

STUDIOS AND PRODUCTION FACILITIES 75

8 Radio Studios 77
   Types of Studios 77
   Studio Operations 78
   System Considerations 81
   Audio Mixing Consoles 84
   Microphones 87
   Loudspeakers and Headphones 89
   CD Players 91
   Hard Disk Recorders and Audio Workstations 92
   Radio Program Automation 95
   Digital Record/Playback Devices 96
   Analog Devices 98
   Telephone Hybrids 100
   Remote Sources 101
   Audio Delay Units 101
   Emergency Alert System 102
   Audio Processing Equipment 103
   Signal Distribution 109
   Ancillary Systems 111
   Radio Master Control 112
   Other Considerations and Capabilities 113
## 9 Television Studios

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station and Network Operations</td>
<td>117</td>
</tr>
<tr>
<td>Types of Studios</td>
<td>119</td>
</tr>
<tr>
<td>Studio Lighting</td>
<td>121</td>
</tr>
<tr>
<td>Studio Control Rooms</td>
<td>122</td>
</tr>
<tr>
<td>System Considerations</td>
<td>123</td>
</tr>
<tr>
<td>Studio System</td>
<td>125</td>
</tr>
<tr>
<td>Video Switchers and Effects Units</td>
<td>127</td>
</tr>
<tr>
<td>Picture and Waveform Monitoring</td>
<td>130</td>
</tr>
<tr>
<td>Television Cameras</td>
<td>132</td>
</tr>
<tr>
<td>Film in Television</td>
<td>137</td>
</tr>
<tr>
<td>Videotape Recorders</td>
<td>140</td>
</tr>
<tr>
<td>Analog VTRs</td>
<td>144</td>
</tr>
<tr>
<td>Digital VTRs</td>
<td>145</td>
</tr>
<tr>
<td>HD Digital VTRs</td>
<td>149</td>
</tr>
<tr>
<td>Optical, Solid-State, and Hard Disk Recorders</td>
<td>151</td>
</tr>
<tr>
<td>Video Editing</td>
<td>152</td>
</tr>
<tr>
<td>SMPTE Timecode</td>
<td>153</td>
</tr>
<tr>
<td>Video Servers</td>
<td>154</td>
</tr>
<tr>
<td>Nonlinear Editing</td>
<td>156</td>
</tr>
<tr>
<td>Character Generators and Computer Graphics</td>
<td>158</td>
</tr>
<tr>
<td>Electronic Newsroom</td>
<td>159</td>
</tr>
<tr>
<td>Signal Distribution</td>
<td>159</td>
</tr>
<tr>
<td>Video Timing</td>
<td>162</td>
</tr>
<tr>
<td>Audio for Television</td>
<td>163</td>
</tr>
<tr>
<td>Ancillary Systems</td>
<td>166</td>
</tr>
<tr>
<td>Ingest and Conversion</td>
<td>167</td>
</tr>
<tr>
<td>Television Master Control</td>
<td>169</td>
</tr>
<tr>
<td>Television Automation</td>
<td>174</td>
</tr>
<tr>
<td>ATSC Encoding</td>
<td>176</td>
</tr>
<tr>
<td>Multicasting Operations</td>
<td>177</td>
</tr>
<tr>
<td>Closed Captioning Equipment</td>
<td>177</td>
</tr>
<tr>
<td>PSIP Generator</td>
<td>178</td>
</tr>
<tr>
<td>Data Broadcasting Equipment</td>
<td>178</td>
</tr>
<tr>
<td>Bitstream Distribution and Splicing</td>
<td>178</td>
</tr>
<tr>
<td>Internet Streaming</td>
<td>180</td>
</tr>
</tbody>
</table>

## 10 Remote Broadcasting

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio News Gathering</td>
<td>181</td>
</tr>
<tr>
<td>Radio Remote Production</td>
<td>183</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td><strong>15 ATSC Digital Television</strong></td>
<td></td>
</tr>
<tr>
<td>Carriers and Channels for DTV</td>
<td>231</td>
</tr>
<tr>
<td>8-VSB Modulation</td>
<td>232</td>
</tr>
<tr>
<td>ATSC Compressed Bitstream</td>
<td>233</td>
</tr>
<tr>
<td>ATSC Video Formats</td>
<td>235</td>
</tr>
<tr>
<td>MPEG-2 Compression</td>
<td>236</td>
</tr>
<tr>
<td>AC-3 Audio</td>
<td>238</td>
</tr>
<tr>
<td>Multiplexing</td>
<td>245</td>
</tr>
<tr>
<td>Quality and Bit Rates</td>
<td>249</td>
</tr>
<tr>
<td>Multicasting</td>
<td>250</td>
</tr>
<tr>
<td>Closed Captions</td>
<td>252</td>
</tr>
<tr>
<td>Program and System Information Protocol (PSIP)</td>
<td>253</td>
</tr>
<tr>
<td>DTV Data Broadcasting</td>
<td>254</td>
</tr>
<tr>
<td><strong>16 Transmitter Site Facilities</strong></td>
<td>261</td>
</tr>
<tr>
<td>Incoming Feeds</td>
<td>262</td>
</tr>
<tr>
<td>Processing Equipment</td>
<td>263</td>
</tr>
<tr>
<td>Exciters</td>
<td>264</td>
</tr>
<tr>
<td>Power Amplifiers</td>
<td>266</td>
</tr>
<tr>
<td>Transmission Lines and Other Equipment</td>
<td>269</td>
</tr>
<tr>
<td>AM Antenna Systems</td>
<td>271</td>
</tr>
<tr>
<td>FM and TV Antennas</td>
<td>275</td>
</tr>
<tr>
<td>Towers</td>
<td>278</td>
</tr>
<tr>
<td>Translators and Repeaters</td>
<td>279</td>
</tr>
<tr>
<td>Transmitter Remote Control</td>
<td>280</td>
</tr>
<tr>
<td><strong>17 Radio Wave Propagation and the FCC Rules</strong></td>
<td>283</td>
</tr>
<tr>
<td>FCC Rules</td>
<td>283</td>
</tr>
<tr>
<td>AM Propagation</td>
<td>284</td>
</tr>
<tr>
<td>FM Propagation</td>
<td>286</td>
</tr>
<tr>
<td>IBOC Considerations</td>
<td>289</td>
</tr>
<tr>
<td>TV VHF and UHF Propagation</td>
<td>290</td>
</tr>
<tr>
<td>ATSC DTV Considerations</td>
<td>290</td>
</tr>
<tr>
<td><strong>18 Conclusion</strong></td>
<td>293</td>
</tr>
<tr>
<td>Further Information</td>
<td>293</td>
</tr>
<tr>
<td><strong>Index</strong></td>
<td>295</td>
</tr>
</tbody>
</table>
Index

1080I, 43, 54, 57, 237
24 frames per second (fps), 34, 35, 55, 56, 139, 251
30 frames per second (fps), 34, 42, 56, 57, 139, 168, 251
3:2 pulldown, 139–140
5.1 channel. See Surround sound
601 video, 55
720p, 43, 55, 57, 237
8-VSB modulation, 11, 30, 233–235, 266

A
A/52 Digital Audio Compression Standard, 231
A/53 Digital Television Standard, 231
A/65 Program and System Information Protocol, 231, 254
AAC. See Advanced Audio Coding
AAF. See Advance Authoring Format
AC-3 audio, 95, 164, 165, 216, 231, 245–249, 250, 252
Acoustic treatment, 120
Advanced Audio Coding, 94–95, 249
Advanced Authoring Format, 157
Advanced Television System
Committee digital television, 10, 231–260
8-VSB modulation, 30, 233–235
AC-3 audio, 245–249
bitstream, 200
carriers and channels for DTV, 232–233
channel navigation and branding, 233
closed captions, 253–254
compressed bitstream, 235–236
DTV data broadcasting, 256–260
encoder, 174–176, 235, 238
exciter, 266
MPEG-2 compression, 238–245
multicasting, 252–253
multiplexing, 249–250
NTSC versus, 231, 235, 236, 245
Program and System Information Protocol, 254–256
quality and bit rates, 250–252
reception considerations, 290–291
sidebands and bandwidth, 233
video formats, 55, 236–238
AES/EBU digital audio, 50–51, 92, 109
AES3, 50
Affiliates, 14
Air chain, 82, 83, 105
Air-conditioning, 121, 270
AM. See Amplitude modulation
Amplitude modulation
antenna systems, 261, 271–275
audio, 263
carrier and channels for, radio, 204
daytimers, 285
diagram, 28
high frequency (HF) band, 6
IBOC, 30, 81, 216–218
IBOC exciter, 265
long wave band, 6
medium frequency (MF) band, 5
propagation, 284–286, 287
quadrature. See Quadrature amplitude modulation
radio wavelength, 25
INDEX

radio exciter, 265
shortwave radio broadcasting, 6
transmission, 5, 204–205
Analog cable, 12–13
Analog color television, 33–44
active video and blanking, 36–38
actual NTSC frame and field rates, 42
channel bandwidth, 43
decoding at receiver, 41–42
film projection, 35–36
frames, 33–34
HD analog video, 43–44
interlacing, 34–35
luminance, chrominance, and composite video, 40–41
NTSC, 33–42
PAL and SECAM, 42–43
progressive scan, 36
scanning, 34, 42
synchronizing pulses, 38–39
video waveform, 39–40
Analog radio, 5–6, 203–212
amplitude modulation transmission, 5, 204–205
data system, 212
emission masks, 205–206
frequency modulation transmission, 5, 206–208
stereo coding, 208–211
subcarriers, 211–212
Analog signal. See Sound waves
Analog television, 9
NTSC. See National Television System Committee
PAL and SECAM, 9
Analog versus digital, 1, 81
Analog video, 22, 43–44
Analog videotape recorders, 144–145
Analog-to-digital converter, 46, 49, 59, 81, 200
Analog waveform, 45
Ancillary information, 227
Antenna
amplitude modulation, 261, 271–275
amplitude modulation IBOC, 275
ATSC digital television, 278
combined channel, 277–278
directional, 273
directionality
frequency modulation and television, 275–278
frequency modulation IBOC, 277
height, 275, 290
microwave, 198
multiple bay, 276–277
portable, 183
satellite link, 195, 196
towers and, 278
wideband, 277
Archiving, 155
Aspect ratio, 10, 54, 58, 236
Asset management, 96
ATSC. See Advanced Television Systems Committee
Audio, 18–19
Audio codec, 216
Audio compression, 216
Audio data compression, 94–95
Audio delay unit, 82, 101–102
Audio distribution amplifier, 111
Audio editing, 80, 94, 163–164
Audio Engineering Society, 50
Audio file, 79, 80
Audio-follow-video, 171
Audio for television, 163–166
Audio interconnections, 109–110
Audio level compression, 86
Audio mixing consoles, 81, 84–87
effects and processing units, 86
inputs, 85
operation, 86–87
outputs, 85
Audio monitoring, 85–86
Audio patch panel, 110
Audio processing, 82
equalization,
compression/expansion, 106–108
equipment, 103–109
limiting and clipping, 109
loudness, 104–105
reasons for, 103–104
for television, 165
Audio quality, 252
Audio routing switcher, 101, 110–111
Audio storage, 80–81
Audio subcarrier, 226
Audio sweetening, 164
Audio-video workstation, 80, 93–94
Audio-video synchronization, 165–166
Automation
  ingest, 167
  radio, 79
  television, 173–174, 177
AVC/H.264, 245

B
Band(s)
  amplitude modulation radio, 25
  C-band, 11, 26
  frequency modulation radio, VHF, 25
  K-band, 26
  Ka-band, 26
  Ku-band, 26
  L-band, 7, 9, 26
  S-band, 8, 26
  super high frequency, 26, 193
  typical signals, 25–26
  ultra high frequency, 25, 26, 193
  very high frequency, 5
  X-band, 26
Bandwidth, 18–19
  ATSC digital television data
    broadcasting, 257
  channel, 26, 43
  chrominance signals and, 40
  data, 63
  frequency modulation transmission, 207–208
  sidebands and, 31, 205
Barn doors, 122
Baseband, 22, 33, 45, 178, 226
Beam splitter, 136
Betacam, 145
  digital, 147–148
  SX, 149
  SP, 145, 184
Big ugly dishes (BUDs), 11
Binary
  bits and bytes, 62
  data bandwidth, 63
  decimal number and, 62
  digits, 62
  numbers, 45, 48, 52, 61–62
Bit(s), 48, 61, 62
  per second (bps), 63, 251
  starvation, 253
  user, 177
  video user, 254
Bitstream, 48
  ATSC, 200
  compressed, 160, 179, 233, 235–236, 252
  digital television, 264
  distribution, 178–180
  mezzanine-level distribution, 179–180
  recording, 179
  serial, 48
  server, 179
  splicing, 178–179
  video, 177
Broadcasting
  basics, 3–73
  definition, 5
Broadcasting types, 5–15
  analog radio, 5–6
  analog television, 9
  cable television, 12–13
  digital radio, 6–8
  digital television, 10–11
  groups and networks, 13–14
  Internet radio and television, 14–15
  satellite radio, 8–9
  satellite television, 11–12
BT.601 standard
  Buffering, 243
  Byte(s), 49, 61, 62
C
  Cable and satellite networks, 14
  Cable equalizer, 111, 161
  Cable modem, 72
  Cable television, 12–13
    analog, 12–13
INDEX

digital, 13
multiple service operator (MSO), 12
Camcorder, 184
Camera(s)
cable, 132, 133
control unit, 132, 133
crane, 137
film, 138
imaging, 134–136
lenses, 134
newsgathering for television, 184–185
portable, 133–134
slow-motion, 189
studio, 132–133
support, 137
television, 21, 132–137, 187
tube, 135
Caption server, 177
Captions. See Closed captions/captioning
Carrier(s), 27
analog television, 224
digital television, 232
frequency, 203, 204, 206
for IBOC, 215
wave, 27, 203, 204, 206
Cart machine, 99
Cassette recorder, 99–100
CAT-5 cable, 109–110
Cathode ray tube, 36, 42, 130, 131, 138
C-band, 11, 26
CCD. See Charge-coupled device
CCU. See Camera, control unit
CD. See Compact discs
CD player, 91–92
CD-ROM, 64
CEA. See Consumer Electronics Association
Central processing unit, 64
Central technical area, 123
Centralcasting, 14, 80, 119, 169, 174
Channel
audio mixer, 85
back, 259
bandwidth, 26, 43
major, 233
minor, 233
radio band, 26
return, 259
surround sound, 51
transmission, 204
Character generator, 126, 158–159
Charge-coupled devices, 38, 135–136
area-array, 138
film scanners and, 139
imaging process diagram, 135
line-array, 138
Chroma, 40, 53
Chromakey, 128–129
Chrominance, 29, 40–41, 60, 225
bandwidth, 40
subcarrier, 40
Client(s), PC, 65
Cliff effect, 214, 215, 234–235, 289
Clippers, 105, 109
Clocks, 111–112, 166
Closed captions/captioning, 177
ATSC digital television and, 253–254
content advisory ratings and, 227–228
embedded, 177
equipment, 177
Federal Communications Commission and, 227
vertical blanking interval and, 177, 253
as video data, 247
CMOS. See Complementary metal oxide semiconductor
Coaxial cables, 49, 50, 51, 60, 68, 110, 160, 167, 270
Coded orthogonal frequency division multiplex, 11, 27, 30, 194, 215, 265, 266, 289
COFDM. See Coded orthogonal frequency division multiplex
Color and light. See Light and color
Color bars, 41
correction, 139
difference signal, 40, 53
filters, 21
   hue, 20
saturation, 20
subcarrier, 40, 225
subsampling, 21, 53
temperature, 121
Combined channel antennas, 277-278
Combo studio, radio, 77
Compact discs, 47, 67
   players, 91-92
   super audio, 91
Complementary metal oxide semiconductor, 136
Component video, 44, 136
Composite
   stereo audio, 209-210
   video, 40, 53
Compressed bitstream, 160, 179, 233, 235-236, 252
Compression
   advanced systems, 244-245
   algorithm, 113, 238
   artifacts, 113, 251, 252, 253
   audio, 248-249
   audio level, 86, 216
   bit rates and, 59, 238
   expansion and, 105, 106-108
Computers, 63-65
   applications, 64
   automation controlled by, 79
   clients, 65
   directories, 66
   disk drives, 66
   files and folders, 655-666
   hard disk recorders and, 92-93
   hardware components, 64
   operating system, 64
   optical disks, 67
   personal, 63-64
   rack-mount units, 64
   radio program automation, 95-96
   security, 70
   servers, 64-65
   specialized processors and, 65
   storage, 65-68
   tape, 66-67
   Computer-based remote control, 281
   Computer networks, 68-70
   Conditional access, 259-260
   Consumer Electronics Association
      CEA-608 standard, 228
      CEA-708 standard, 254
   Content advisory, 227-228, 255
   Contribution links
      for radio, 193-195
      for television, 191-193
   Control
      board, 77, 84
      remote, transmitter, 113, 280-281
      room, studio, 78, 122-123
      switcher, master, 171-172
   Cooling system, transmitter, 268
   CPU. See Central processing unit
   Crosspoint, 100
   CRT. See Cathode ray tube
   Cue audio, 85, 86, 182-183
   Cue feed, 85, 101, 185
   Cue light, 112
   Cycle, 24
   Cyclorama, 121, 122
D
   D1, 147
   D2, 147
   D3, 147, 148
   D5, 148
   D5 HD, 150
   D9 Digital-S, 148-149
   D9 HD, 150
   DA. See Directional antenna;
      Distribution amplifier
   DAB. See Digital Audio Broadcasting
   DAT. See Digital audio tape recorder
   Data bandwidth, 63
   Data broadcasting
      analog television, 228-229
      digital television, 256-260
      equipment, 178
      receivers, 260
   Data carousel, 258
   Data rate, 72-73
   Data segments and ISDT-T, 11
Data server, 178
Data services
  types, 258–259
  using IBOC, 220–221
Data transmission and storage, units for, 63
Datacasting, 10, 178, 228, 250, 256–260
dB. See Decibel
DBS. See Direct broadcasting by satellite
DCC. See Directed channel change
Decibel, 85
Decoder, 238, 243
Decoding, 41–42, 243, 244
Demodulation, 27
Deviation, 207
Digital
  analog versus, 1, 81, 124
cart, 96
  components and color subsampling, 53
  light processing, 131
  sideband, 216, 218–219
  signal and noise relationship, 52
  signal processing, 86
  signal robustness, 51–52
  subscriber line, 72
Digital audio, 45–52; see also Digital audio and video
cart, 96
color subsampling, 53
digitization, 86
light processing, 131
sideband, 216, 218–219
signal and noise relationship, 52
signal processing, 86
signal robustness, 51–52
subcarrier, 72
Digital audio and video, 45–60
AES/EBU digital audio standard, 50–51
audio A/D and D/A converters, 49
bitstream and bit rate, 48–49
quantizing, 48
resolution, 48
sampling, 46–47
SD and HD digital video, 52–60
signal robustness, 51–52
SDIF, 51
Digital Audio Broadcasting, 6–7
digital audio editing, 94
digital audio tape recorder, 97–98
INDEX

video compression for recording, 146–147
Digital8, 149
Digital-S, 148–149
Digital-to-analog converter, 49, 59, 81, 200
Digitizing, 157
Dimmer, lighting, 122
Diplexer, 269, 271
Direct broadcasting by satellite, 12
Direct to home, 12
Directed channel change, 256
Directional antenna, 273, 276–277
Directional array, 273–274
DirectTV, 12
Dish Network, 12
Disk drives, 66
Distortion, 19, 252
Distribution amplifier
audio, 111
video, 161
Distribution system, 82
DLP. See Digital, light processing
dNTSC, Dotcast, 228–229
Dolby
A, 100
AC-2, 249
AC-3, 51, 245
B, 100
C, 100
Digital, 245
E, 164
Downconversion, 136, 168
Downlink, 196
DRM. See Digital Radio Mondiale
DSL. See Digital, subscriber line
DSP. See Digital, signal processing
DTH. See Direct to home
DVB-T, 10–11
DVCAM, 149, 151
DVCPRO, 148, 149, 151, 184, 185, 186
DVCPRO HD, 150
DVCPRO50, 148, 149, 184
DVD. See Digital versatile disc
DVE. See Digital video, effects
DVTR. See Digital videotape recorder
Dynamic range, 105, 252
E
EAS. See Emergency Alert System
EAV. See End of active video
EBU. See European Broadcasting Union
Echo, 86, 288
Edit controller, 127, 152
Edit decision list, 152
Edit suites, 127
EDL. See Edit decision list
EFP. See Electronic field production
EITs. See Event information tables
Electromagnetic waves, 23–25
description, 23
frequency, bands, and channels, 25–26
frequency, wavelength, and amplitude, 24–25
light as, 20, 23
properties, 26
types, 23–24
Electron gun, 36, 37, 41–42
Electronic field production, 184, 186–187
Electronic news gathering, 30, 147, 183–184, 185, 186, 187, 193, 194
Electronic newsroom, 159
Electronic program guide, 10, 255–256
Embedded
audio, 50–51, 161–162
closed captioning, 177
systems, 65
Emergency Alert System, 82, 102–103, 158, 171, 172
Emissions masks, 205–206
Encoder(s)
- ATSC, 174–176, 235, 238
- hardware, 71
- Internet, 71
- MPEG, 243, 250
- Encoding, efficient, 244
- Encryption, 11, 70
- End of active video, 60

ENG. See Electronic news gathering

EPG. See Electronic program guide

Equalization, 84, 100, 104, 106–108
- Equalizer, audio, 104, 105, 111

Ethernet, 68

ETT. See Extended text tables

European Broadcasting Union, 50

Event information tables, 255

Exciter, 233, 261, 264–266

Extended hybrid, FM IBOC, 219, 221

Extended text tables, 256

F

Fader, 84, 86, 87

Fast motion, 143, 156

FCC. See Federal Communications Commission

FEC. See Forward error correction

Federal Communications Commission
- antenna height and, 290
- ATSC digital television and, 231
- closed captioning information and, 227
- frequency and power allocations, 283–284
- HD Radio, 213
- IBOC, 213, 217, 218
- mask, 205, 215, 216, 219
- modulation limit, 104, 105, 106, 107
- NTSC specifications and, 223
- objective of rules of, 283
- radio regulation and, 203
- radio wave propagation and rules of, 283
- rules, 223, 227, 237, 283
- spectrum recovery, 233
- television regulation and, 223
- towers and, 279

vertical blanking interval lines and, 227

Fiber-optic cable, 50, 51, 60, 68, 110, 160, 167, 188, 199

Fiber-optic links, 31, 199

Fields, 34

Field editing, 185

Field rate, 42

File server, 93

File transfer, 124, 167

Files and folders, 65

Film camera, 138

Film in television, 137–140
- 3:2 pulldown, 139–140
- acquisition, 137–138
- film scanners, 139
- telecines, 138–139

Film projection, 35–36

Film scanners, 139

Firewall, 70

Flags, 122

Flash memory, 68, 96

Flicker, 35–36, 56, 57

Flying spot scanner, 138–139

FM. See Frequency modulation

Format converter, 167, 168

Forward error correction, 30, 91, 215, 234, 291

Frame(s)
- analog color television and, 33–34
- for ATSC digital video, 56
- bidirectionally predictive coded, 240–243
- digital audio, 50
- intracoded, 240–243
- MPEG, 240–243
- NTSC, 33–34, 42
- predictive coded, 240–243
- rate, 42, 54, 56–57
- synchronizer, 162

Frequency
- allocations and Federal Communications Commission, 283–284
- cycles per second, 17

Hertz, 17–18
radio waves. See Radio frequency waves
response, 19, 252
swing, 207
units used, 24
Frequency, bands, and channels,
25-26; see also Band(s)
Frequency and power allocations,
283-284
Frequency modulation, 5, 28
audio, 263-264
carriers and channels for, 207
IBOC, 218-220, 226
IBOC antenna, 277
propagation, 286, 288-289
radio exciters, 265
television antenna and, 275-278
transmission, 5, 206-208
very high frequency band, 5, 25, 207

G
Gamma correction, 40
Gels, 122
Geostationary satellite, 8, 12, 195
Ghost, 22, 234, 235, 290
Global Positioning System, 112
GOP. See Group of pictures
GPS. See Global Positioning System
Graphics system, 123, 126, 158
Graphics tablet, 159
Ground
conductivity, 274, 286, 287
radials, 274
rows, 122
Groundwave, 26, 274, 286
Group of pictures, 242-243
Groups and networks, 13-14
affiliates, 14
cable and satellite, 14
centralcasting, 14
owned and operated (O and Os), 13
terrestrial broadcasting, 13-14

H
Hard disk, 66
recorders, 79, 92-93, 152
HD. See High definition
HDC compression, 95, 213, 216
HDCAM, 150
HDCAM SR, 150-151
HD Radio, 213
HD-SDI. See High definition-serial
digital interface
HDTV. See High definition television
HDV, 151
Headphones, 89, 90-91
Hearing impaired service, 247
Helical scan, 97, 141-142
Helicopter, 185, 194
Hertz, 17-18
HF. See High frequency
H.18, 145, 149
High definition digital video, 52-60
High definition digital videotape
recorders, 149-151
High definition-serial digital interface,
60
High definition television, 10, 123-124,
253
High definition analog video,
43-44
High frequency, 6
Horizontal blanking interval, 36, 37,
238
Hue, 20
Human eye characteristics, 21
Hybrid IBOC, 214, 216, 217, 218, 219,
220-221

I
iBiquity, 213, 217, 220
IBOC. See In-band on channel
Icing, tower, 279
I-frame, 240-241, 242, 243
IMX, 149, 151
In-band on-channel digital radio, 6,
213-221
all-digital phase, 214-215
amplitude modulation IBOC,
216-218
audio compression, 216
audio processing equipment, 264
carriers and channels for, 215
data broadcasting, 220–221
frequency modulation IBOC, 218–220
hybrid phase, 214, 216, 217, 218, 219, 220–221
modulation and forward error correction, 215
nighttime operations, 217–218
phased introduction, 214–215
radio wave propagation and, 289
surround sound, 220
studios for, 113–114
Incandescent, 122
Information technology, 61–73
binary, 61–63
computer networks, 68–70
computers, 63–65
Internet streaming, 70–73
storage, 65–68
Ingest, 80, 167
Integrated services digital network, 192, 197
Interactive services, 259
Intercom, 112, 166
Interference, 204
Interframe coding, 239–240
Interlacing, 34–35, 36, 57
Interleaving, 30
International Telecommunications Union, 55, 147
Internet, 68–69
Internet broadcasting, 14–15
Internet radio and television, 14–15
service implications, 14–15
streaming technologies, 14–15
Internet streaming, 70–73, 114, 180
background, 70–71
data rate and signal quality, 72–73
technology, 14–15, 71–72
video standards, 73
Intraframe coding, 239, 240–241
Intranet, 69
Ionosphere, 285
IP address, 69
ISDB-C, 13
ISDB-S, 12
ISDB-T, 11
ISDB-TSB, 7
ISDN. See Integrated services digital network
Isocam, 137
ITU. See International Telecommunications Union
J
Jack plug, 110, 160
Judder, 34, 140
K
Ku-band, 26
satellite television and, 11, 12
super high frequency, 25
L
LAN. See Local area network
L-band, 7, 9, 26
LCD. See Liquid crystal display
Lenses, 134
Letterboxing, 58
LFE. See Low frequency effects
Light(s)
cue, 112
fixtures and fittings, 121–122
on-air, 112
soft, 121
source, 122
Light and color, 20–21
electromagnetic wave, 20
filters, color, 21
human eye characteristics, 21
hue, 20
luminance level, 20
primary colors, 20
saturation, 20
white light, 20
Light modulation, 31
Lighting
cable, 122
core, 122
direct, 122
grid, 120–121
INDEX

studio, 121–122
Limiter, 105
Line 21, 37–38, 227–228
Line input, 85
Line-of-sight propagation, 286, 287
Linear faders, 84
Linear pulse code modulation, 50
Linear recording, 93, 154
Links, 191–200
analog and digital systems, 199–200
compressed, 200
contribution links for radio, 193–195
contribution links for television, 191–193
for DTV, 200
network distribution links for radio and television, 195–196
studio-transmitter links for radio and television, 196–199
Lip sync, 163, 165, 166
Liquid crystal display, 38, 130–131
Live assist, radio, 79
Local area network, 68, 69, 70, 155, 193, 196
Local station, 169
Long wave, 6
Long-playing record, 98
Loudness, 104–106
Loudspeakers and headphones, 18, 89–91
analog, 82
audio monitoring and, 85
midrange, 90
power ampliher, 90
subwoofer, 90, 245
tweeter, 90
woofer, 90
Low frequency effects, 245, 246
Luma, 40
Luminaire(s), 121
Luminance, 40–41, 60
color subcarrier and, 225
cross-color and, 225
level, 20
sampling, 53
signal, 40

M
Magnetic data tapes, 67
Magnetic recording, 141
Magnetic tape storage, 66
Main program service, 219
Major channel, 233, 254–255
Master clock, 112, 166
Master control
centralcasting, 169
network, 169
radio, 112–113
room, 120
switcher, 171–172
television, 169–173
Matrix, 110, 161
Matte system, 129
M/E. See Mix-effects
Media eXchange Format, 152, 156, 157, 167
Medium frequency, 5, 25
Medium wave, 5
Metadata, 156, 157, 177–178
Mezzanine level, 179–180
MF. See Medium frequency
Mic. See Microphone(s)
Microphone(s), 18, 87–89
boom, 163
condenser, 88–89
dynamic, 87–88
moving coil, 87–88
patterns, 89
processor, 86
radio news gathering, 181
ribbon, 88, 89
shotgun, 89
wireless, 163
Microwave
link, 193–194, 197–199
radio links, 167
M-II, 145
MiniDisc recorder, 96, 97, 181
MiniDV, 145, 148
Minor channel, 233, 254–255
Mix-effects, 127, 128, 130
Mixing board, 84, 86–87
Mix-minus, 85, 101, 182
Modem, 64, 72
Modulation, 22, 27-31
8-VSB, 233-235
amplitude, 5, 6, 27-28
carriers and subcarriers, 27
COFDM, 11, 27, 30, 194
controlling, 105-106
definition, 27
digital, 233
digital systems, 29-30
frequency, 5, 28
light, 31
limits, 104, 106, 107
phase shift keying, 30
QPSK, 11
quadrature amplitude, 28-29
sidebands, 31
Monitor wall, 123, 130, 131
Mono (monophonic) sound, 19
radio studio and, 81
Motion estimation, 239-240
MovieBeam, 229
Moving Pictures Experts Group, 70-71, 94, 146, 238-245, 249
MP3, 71
MPEG. See Moving Pictures Experts Group
MPEG-2 compression, 94, 146, 238-245, 251
MPS. See Main program service
MSO. See Multiple service operator
Multibay antennas, 276-277
Multicast, Internet streaming, 72
Multicasting, 10, 123, 172, 176, 252-253
Multichannel, 114
Multicore cable, 109
Multipath, 30, 234, 288, 289, 290
Multiple service operator, 12
Multiplexer, 176, 178, 235, 271
Multiplexing, 206, 249-250, 253
Multitrack, 114
MXF. See Media eXchange Format

N
NAB. See National Association of Broadcasters

National Association of Broadcasters, 217-218
National Radio Systems Committee, 203, 212, 213
National Television System
Committee analog television, 9, 33-42, 223-229
active video and blanking, 35-38
analog cable television and, 13
ATSC versus, 231, 235, 236, 245
audio processing, 263-264
audio signal, 226
carriers and channels for, 223-224
channel bandwidth, 43
chrominance information, 29, 225
closed captioning and content advisory ratings, 227-228
color bars waveform diagram, 41
data broadcasting, 228-229
decoding at receiver, 41-42
exciter, 266
film projection, 35-36
frame and field rates, actual, 42
frames, 33-34
interlacing, 34-35
luminance, chrominance, and composite video, 40-41
progressive scan, 36
scanning, 34, 42
sidebands and bandwidth, 224
synchronizing pulses, 38-39
vertical blanking interval ancillary information, 227
video processing equipment, 264
video signal, 224-225
video waveform, 39-40
Network, 64
center, 64
distribution system, 117
master control, 169
monitoring systems, computer-based, 281
release center, 117
television, 118
Newsroom, 159
Nighttime operations, 217-218
Noise
   audio, 252
   reduction, 100
   video, 251
Nonlinear editing, 94, 153, 154, 156–157
Nonprogram-related data, 258–259
NRSC. See National Radio Systems Committee
NTSC. See National Television System Committee

O
On-air light, 112, 166
On-air studio, 155
Operations
   radio studio, 78–81
   television station and network, 117–119
Opportunistic data, 257
Optical
   audio output, 49
   disc recording, 67, 151
   sound track, 31

P
P2, 151–152, 157, 184
Packet, data, 69, 235
PAD. See Program-assisted data
Paint system, 159
PAL. See Phase Alternating Line
Pan-and-tilt head, 137, 185
Pan-pot, 84
Patch cord, 110
Patch panel, 110, 160
PC. See Personal computers
PCM. See Pulse code modulation
Peak program meter, 86
Pedestal
   camera, 120, 137
   robotic, 137
Perceptual coding, 94, 248
Persistence of vision, 21, 33
Personal computers, 63–64
PFL. See Prefade listen monitoring
P-frame. See Predictive coded frame
Phase Alternating Line, 9, 42–43, 73
Phase shift keying, 30
Phosphors, 36
Photomultiplier, 139
Pickup cartridge, 98, 99
Picture element, 52
Picture monitor(s), 21, 22, 130–131
Pixel, 52, 55–56, 251
Plasma screen, 38, 130–131
PMCP. See Programming Metadata Communication Protocol
Post-house, 119
Postproduction, 117, 119, 127, 153, 155, 157, 163–164
Potentiometer, 84
Power amplifier
   audio, 90
   cooling devices, 268
   transmitter, 261, 266–269
tubes and solid-state devices, 267–268
PPM. See Peak program meter
Predictive coded frame, 240, 241, 242, 243
Prefade listen monitoring, 85, 86
Preset-take, 171
Primary colors, 20–21
Pro (professional) channel, 185, 226
Processing equipment, 261, 263–264
Production
   center, 117
   switcher, 127
   trucks, 187–188
Profanity delay, 101–102
Program and System Information Protocol, 235
ATSC digital television and, 254–256
directed channel change, 256
electronic program guide, 255–256
Federal Communications Commission and, 231
generator, 177–178
major and minor channels, 254–255
multiplexing and, 250
Program-associated data, 220, 221
Program-related data, 258
Programming Metadata
  Communication Protocol, 178
Progressive scan, 36, 54, 56, 57
Protocols, 69
PSIP. See Program and System Information Protocol
PSK. See Phase shift keying
Pulse code modulation, 30, 50, 91

Q
QAM. See Quadrature amplitude modulation
QPSK modulation, 11
Quad, 144
Quadruplex, 144, 152
Quadrature amplitude modulation, 11, 13, 28–29, 30, 206, 217, 225, 265
Quantizing, 48
Quicktime, 70, 71, 73

R
Radio; see also Analog radio; Digital radio; Internet radio and television; Satellite radio
data system, 212, 263
frequency, 5, 204, 206–208, 234
Radio Broadcast Data System, 212
Radio frequency waves, 23–31
  bands, channels, and frequencies, 25–26
  electromagnetic waves, 23–25
  modulation, 27–31
  over wires and cable, 26–27
Radio networks, major, 13
Radio news gathering, 181–183
Radio program automation, 95–96
Radio receiver, 27, 208
Radio remote production, 183
Radio studios, 77–115
  acoustic treatment, 77
  air chain, 82, 83, 105
  analog devices, 98–100
  analog versus digital, 81–82
  ancillary systems, 111–112
  audio delay units, 82, 101–102
  audio mixing consoles, 81, 82, 84–87
  audio processing equipment, 82, 103–109
  automation and live assist, 79
  CD players, 91–92
  combo studio, 77
  considerations and capabilities, other, 113–115
  digital record/playback devices, 96–98
  editing, 80
  Emergency Alert System, 82, 102–103
  hard disk recorders and audio workstations, 92–95
  ingest, 80
  loudspeakers and headphones, 89–91
  master control, 112–113
  microphones, 87–89
  noise reduction, 100
  operations, 78–81
  program automation, 95–96
  remote sources, 101
  remote voice-tracking, 79–80
  scheduling, 96
  signal distribution, 109–111
  stereo versus mono, 81
  system considerations, 81–83
  telephone hybrids, 100–101
  types, 77–78
Radio wave diagram, 25
Radio wave propagation and FCC rules, 283–291
  amplitude modulation propagation, 284–286, 288
  ATSC DTV considerations, 290–291
  frequency and power allocations, 283–284
  frequency modulation propagation, 286, 288–289
  IBOC considerations, 289
  TV VHF and UHF propagation, 290
RAID. See Redundant array of independent disks
INDEX

RAM. See Random access memory
Random access memory, 64, 94, 156
RBDS. See Radio Broadcast Data System
RDS. See Radio data system
RealMedia, 71
Receiver, radio. See Radio receiver
Receiver, television. See Television receiver
Recorder
analog audio, 99–100
digital audio, 96–98
television remote production and, 187
videotape. See Videotape recorders
Redundancy, 239
Redundant array of independent disks, 66
Reel-to-reel audio recorder, 99
Refresh rate, 33
Reject load, 271
Remote broadcasting, 181–189
cameras and recorders, 184–185
news gathering for radio, 181–183
news gathering for television, 183–186
production, radio, 183
production, television, 186–189
Remote pickup units, 101, 183, 192
Remote sources, 101, 125
Remote truck, 187
Repeaters, 8, 279–280
Resolution
computer screen, 56
digital audio, 48
picture, 55
video, 54, 250, 251
Reverberation, 77, 86, 120
RF. See Radio frequency
RGB (red, green, blue) signal(s), 40, 41, 44
Router(s)
audio, 110–111
computer network, 69–70
video, 161
RPUs. See Remote pickup units
S
SAC. See Supplementary audio channel
SACD. See Super audio compact disc
Sampling
digital audio, 46–47
digital video, 52–53
rate, 46
SAP. See Separate audio program
Satellite digital audio radio service, 8
Satellite link, 80, 101, 194–195
Satellite news gathering, 195
Satellite radio, 8–9
WorldSpace, 8–9
XM and Sirius, 8
Satellite television, 11–12
digital satellite broadcasting, 12
DirecTV, 12
Dish Network, 12
in Japan, 12
medium- and low-power services, 11
Satellites, geostationary, 8, 12, 195
Saturation, 20
SAV. See Start of active video
S-band, 8, 26
SBR. See Spectral band replication
SCA. See Subsidiary communications authorization
Scanning, 34
Scrims, 122
SD. See Standard definition
SDARS. See Satellite digital audio radio service
SDI. See Serial digital interfaces, SMPTE
SECAM. See Sequential Couleur avec Mémoire
Secondary colors, 20
Security, computer, 70
Separate audio program, 226
Sequential Couleur avec Mémoire, 9, 43, 73
Serial bitstream, 48
Serial digital interfaces, SMPTE, 60
Server(s), 64–65
audio, 93–94
bitstream, 179
file, 65
video, 153

SHF. See Super high frequency
Shortwave, 6, 7
Shot-box, 96, 134
Shutter, rotating, 35
Sidebands, 31, 203, 205, 207, 216, 218, 224, 233
Signal
audio, 18
chain, 22
distribution, radio, 109–111
distribution, television, 124, 159–162
quality, 72–73
video, 21
Signal-to-noise ratio, 100, 207
Sine wave, 18
Sirius satellite radio, 8
Skywave, 26, 217, 274, 284–285, 286
Slow motion, 143, 156
Slow motion cameras, 189

SMPTE. See Society of Motion Picture and Television Engineers
SNG. See Satellite news gathering
Society of Motion Picture and Television Engineers
serial digital interfaces, 60
SMPTE 259M, 60, 155
SMPTE 292M, 60, 155
SMPTE 310M, 179
timecode, 153–154, 166, 173
Soft light, 121
Solid-state device, 267–268
Solid-state recorder, 96–97, 151–152, 157
Solid-state storage, 67–68
Sony/Philips Digital Interface, 51
Sound and audio, 17–19
mono, stereo, and surround sound, 19
waves, sound, 17–18
Sound and vision, 17–22
baseband, 22
light and video, 20–22

Sound stage, 120
Sound waves, 17–18
amplitude, 17
cycles per second, 17
distortion, 19
frequency, 17
frequency range, 18–19
noise, 19
signal chain, 19
sine wave, 18
Spatial resolution, 250, 251
Spectral band replication, 249
Spectrum, 23
Spectrum, radio, 31
SPG. See Synchronizing pulse(s)
generator
Splatter, 205
Spotlight, 121–122
Squeezeback, 171
Standard definition and high definition video, 52–60, 123–124
A/D and D/A converters, 59
aspect ratio, 58
bit rates, 58–59
components and color subsampling, digital, 53
formats, 54–55
frame rate, 56–57
interlacing, 57
lines and pixels, 55–56
multicasting, 253
SMPTE serial digital interfaces, 60
Standard definition DTV, 10, 54, 253
Standard definition videotape recorder, 59
Standards converter, 168–169
Start of active video, 60
Statistical multiplexing, 253
Stereo, 19
coding, 208–211
generator, 209, 263, 264
pilot, 210–211
radio studio and, 81
signal generation, 209–211
surround sound versus, 125
Stereo (stereophonic) system, 19
Storage, data, 65–68
disk drivers, 66
files and folders, 65–66
optical disks, 67
solid-state, 67–68
tape, 66–67
units for, 63
STL. See Studio-transmitter link
Streaming, Internet. See Internet streaming
Streaming technologies, 14
considerations for providing, 14–15
Internet. See Internet streaming as major force in program distribution, 15
Studio(s)
computers in, 64
control room(s), 77–78, 112–113, 120, 122–123
lighting, 121–122
radio. See Radio studios
system, 82–83, 125–127
television. See Television studios
Studio complex, 1
Studio-transmitter link(s), 1, 82, 114, 176, 196–199, 261, 262, 263, 264, 280
Studios and production facilities, 75–200
Studios for IBOC, 113–114
Subcarrier(s), 27, 203
analog radio, 211–212
audio, 226
color, 40, 225
definition, 211
for IBOC digital radio, 215
Subsidiary communication authorization, 211, 263
Subwoofer, 90, 245
Super audio compact disc, 91
Super high frequency, 25, 26, 193
Supplementary audio channel, 220
Surround sound, 10, 19, 51, 114, 125, 164, 220, 245–246, 248
S-VHS, 145
Switches, computer network, 69
Symbol, digital, 30, 233
Sync pulses. See Synchronizing pulse(s)
Synchronizing pulse(s), 38–39, 40
generator, 162
horizontal, 39, 41
vertical, 39
System considerations
radio, 81–83
television, 123–125
T
T1 line, 193, 197
Talkback, 112, 167
Tape
delay, 173
format, 140–141
hiss, 51, 100
storage, 66–67
TBC. See Timebase corrector
TCP/IP. See Transmission control protocol/Internet protocol
Telecine, 138–139
Telephone hybrids, 100–101
Telephone line, 191–192, 197
Teleprompter, 132
Television. See Analog television;
Cable television; Digital television; Internet radio and television; Satellite television
Television networks, major, 13
Television news gathering, 183–186
Television propagation, 290
Television receiver, 21, 27, 41, 231
Television remote production, 186–189
Television studios, 117–180
analog versus digital, 124
analog videotape recorders, 144–145
ancillary systems, 166–167
ATSC encoding, 174–176
audio, 163–166
automation, 173–174
bitstream distribution and splicing, 178–180
cameras, 126, 132–137
closed captioning equipment, 177
control rooms, 122–123
data broadcasting equipment, 178
digital videotape recorders, 145–149
electronic newsroom, 159
film in television, 137–140
high definition digital videotape recorders, 149–151
ingest and conversion, 167–169
Internet Streaming, 180
lighting, 121–122
master control, 169–173
multicasting operations, 176
network block diagram, 118
nonlinear editing, 156–157
operations, station and network, 117–119
optical, solid-state, and hard disk recorders, 151–152
picture and waveform monitoring, 130–132
PSIP generator, 177–178
signal distribution, 124, 159–162
SMPTe timecode, 153–154
standard versus high definition, 123–124
system, 125–127
system considerations, 123–125, 160
system interconnections, 160
types, 119–121
video block diagram, 126
video editing, 152–153
video servers, 154–156
video switchers and effects units, 127–130
video timing, 162–163
videotape recorders, 140–143
Temporal resolution, 250, 251
Terrestrial broadcasting, 10–11, 13–14
Time delay, 172–173
Timebase corrector, 142–143
Timecode, 140, 142, 145, 152
burnt-in, 153, 154
longitudinal, 153
SMPTe, 153–154, 166, 173
vertical interval, 153
Timer, digital, 111–112, 166
Tower(s), 261, 278–279
antennas and, 278
guyed, 278
lights, 279, 281
markings, 279
self-supporting, 278
types, 278
wind loading and icing, 279
Traffic system, 96, 174, 177
Translators, 279–280
Transmission control protocol/Internet protocol, 68, 69
Transmission line, 261, 269–270
Transmission standards and systems, 201–291
Transmitter site facilities, 261–281
amplitude modulation antenna systems, 261, 271–275
diagram, block, 262
directors, 261, 263, 264–266
directors and television antennas, 275–278
incoming feeds, 262–263
power amplifiers, 261, 266–269
processing equipment, 263–264
remote control, transmitter, 113, 280–281
towers, 278–279
translators and repeaters, 279–280
transmission lines and other equipment, 269–271
Transport stream, 174, 176, 235, 249–250
Trilevel sync, 44
Tripod, camera, 137
Turntable, 98–99
<table>
<thead>
<tr>
<th>Term</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tweeter, 90</td>
<td></td>
</tr>
<tr>
<td>Twisted pair cable, 50, 109</td>
<td></td>
</tr>
<tr>
<td>Type C, 144</td>
<td></td>
</tr>
</tbody>
</table>

**U**

<table>
<thead>
<tr>
<th>Term</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>UHF. See Ultra high frequency</td>
<td></td>
</tr>
<tr>
<td>Ultra high frequency, 9, 25, 26, 193, 290</td>
<td></td>
</tr>
<tr>
<td>U-Matic, 144</td>
<td></td>
</tr>
<tr>
<td>Unicast, Internet streaming, 72</td>
<td></td>
</tr>
<tr>
<td>Upconversion, 168</td>
<td></td>
</tr>
<tr>
<td>Uplink, 195</td>
<td></td>
</tr>
</tbody>
</table>

**V**

<table>
<thead>
<tr>
<th>Term</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBI. See Vertical blanking interval</td>
<td></td>
</tr>
<tr>
<td>VC-1, 245</td>
<td></td>
</tr>
<tr>
<td>VCT. See Virtual channel table</td>
<td></td>
</tr>
<tr>
<td>Vectorscope, 132</td>
<td></td>
</tr>
<tr>
<td>Vertical blanking interval, 36, 37-38, 56</td>
<td></td>
</tr>
<tr>
<td>analog television data broadcasting, 228</td>
<td></td>
</tr>
<tr>
<td>ancillary information, 227</td>
<td></td>
</tr>
<tr>
<td>closed captioning and, 177, 253</td>
<td></td>
</tr>
<tr>
<td>data, discarding unneeded, 238</td>
<td></td>
</tr>
<tr>
<td>Vertical interval timecode, 153</td>
<td></td>
</tr>
<tr>
<td>Very high frequency, 5, 25, 207, 290</td>
<td></td>
</tr>
<tr>
<td>Vestigial sideband, 224, 233</td>
<td></td>
</tr>
<tr>
<td>VHF. See Very high frequency</td>
<td></td>
</tr>
<tr>
<td>VHS. See Video Home System</td>
<td></td>
</tr>
<tr>
<td>Video, 21-22</td>
<td></td>
</tr>
<tr>
<td>active lines, 36</td>
<td></td>
</tr>
<tr>
<td>analog, 22</td>
<td></td>
</tr>
<tr>
<td>ATSC formats, 236-238</td>
<td></td>
</tr>
<tr>
<td>bit rates, 237-238</td>
<td></td>
</tr>
<tr>
<td>carrier, 224-225</td>
<td></td>
</tr>
<tr>
<td>composite, 40</td>
<td></td>
</tr>
<tr>
<td>compression, 146-147</td>
<td></td>
</tr>
<tr>
<td>converters, analog to digital and digital to analog, 59</td>
<td></td>
</tr>
<tr>
<td>distribution amplifier, 161</td>
<td></td>
</tr>
<tr>
<td>editing, 152-153, 163</td>
<td></td>
</tr>
<tr>
<td>high definition analog, 43-44</td>
<td></td>
</tr>
<tr>
<td>keying, 127, 128</td>
<td></td>
</tr>
<tr>
<td>noise, 22, 251</td>
<td></td>
</tr>
<tr>
<td>over IF, 167</td>
<td></td>
</tr>
<tr>
<td>patch panel, 160-161</td>
<td></td>
</tr>
<tr>
<td>proxy, 159</td>
<td></td>
</tr>
<tr>
<td>quality, 250-251</td>
<td></td>
</tr>
<tr>
<td>routing switcher, 161</td>
<td></td>
</tr>
<tr>
<td>signal chain, 22</td>
<td></td>
</tr>
<tr>
<td>standards, 73</td>
<td></td>
</tr>
<tr>
<td>switcher, 123, 126, 127-130</td>
<td></td>
</tr>
<tr>
<td>timing, 162-163</td>
<td></td>
</tr>
<tr>
<td>waveform, 39-40</td>
<td></td>
</tr>
<tr>
<td>Video Home System, 144-145</td>
<td></td>
</tr>
<tr>
<td>Video servers, 125, 126, 127, 153, 154-156</td>
<td></td>
</tr>
<tr>
<td>archiving, 155</td>
<td></td>
</tr>
<tr>
<td>file interchange and MXF, 156</td>
<td></td>
</tr>
<tr>
<td>recording formats and interfaces, 154-155</td>
<td></td>
</tr>
<tr>
<td>slow and fast motion, 156</td>
<td></td>
</tr>
<tr>
<td>Video8, 145, 149</td>
<td></td>
</tr>
<tr>
<td>Videotape recorders, 140-143</td>
<td></td>
</tr>
<tr>
<td>analog. See Analog videotape recorders</td>
<td></td>
</tr>
<tr>
<td>audio editing and, 164</td>
<td></td>
</tr>
<tr>
<td>digital. See Digital videotape recorders</td>
<td></td>
</tr>
<tr>
<td>helical scan, 141-142</td>
<td></td>
</tr>
<tr>
<td>magnetic recording, 141</td>
<td></td>
</tr>
<tr>
<td>slow and fast motion, 143</td>
<td></td>
</tr>
<tr>
<td>timebase correctors, 142-143</td>
<td></td>
</tr>
<tr>
<td>Viewfinder, 132</td>
<td></td>
</tr>
<tr>
<td>Virtual channel table, 255</td>
<td></td>
</tr>
<tr>
<td>Vision control room or area, 122</td>
<td></td>
</tr>
<tr>
<td>engineer, 122</td>
<td></td>
</tr>
<tr>
<td>mixer, 127</td>
<td></td>
</tr>
<tr>
<td>Visually impaired service, 247</td>
<td></td>
</tr>
<tr>
<td>VITC. See Vertical interval timecode</td>
<td></td>
</tr>
<tr>
<td>Voice-over, 87, 171-172, 247, 248</td>
<td></td>
</tr>
<tr>
<td>Voice-tracking, 79</td>
<td></td>
</tr>
<tr>
<td>Voltage, 18</td>
<td></td>
</tr>
<tr>
<td>Volume unit meter, 86</td>
<td></td>
</tr>
<tr>
<td>VTR. See Videotape recorders</td>
<td></td>
</tr>
<tr>
<td>VTR editor, 152</td>
<td></td>
</tr>
<tr>
<td>VU meter. See Volume unit meter</td>
<td></td>
</tr>
</tbody>
</table>

**W**

<table>
<thead>
<tr>
<th>Term</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAN. See Wide area network</td>
<td></td>
</tr>
</tbody>
</table>
Waveform
  analog, 45
  audio, 18
  monitor, 40, 122, 131–132
  video, 39–40
Waveguide, 270
Wavelength, 24, 25–26, 271, 272
Wide area network, 68, 69, 155, 193, 196
Wind load, 279
Windows Media, 70, 71, 73
Wipes, 127, 171
Wireless microphone, 163

Woofer, 90
WorldSpace satellite radio, 8–9

X
XDCAM, 151, 184
XM satellite radio, 8

Y
YPbPr components, 44

Z
Zenith system, 209