

Television Production Handbook

7th Edition



Suranaree University of Technology



31051000601951



Zettl

Contents

| | |
|------------------|-------|
| Photo Credits | xxi |
| About the Author | xxiii |
| Preface | xxiv |

CHAPTER 1 The Television Production Process 2

Section 1.1 What Television Production Is All About 4

THE BASIC TELEVISION SYSTEM 4

THE EXPANDED STUDIO AND ELECTRONIC FIELD PRODUCTION SYSTEMS 5

| | |
|--------------------------------------|---|
| System Elements of Studio Production | 5 |
| The Studio System in Action | 7 |
| System Elements of Field Production | 7 |

PRODUCTION ELEMENTS 6

| | |
|------------------------|----|
| The Camera | 8 |
| Lighting | 10 |
| Audio | 11 |
| Videotape Recording | 13 |
| The Switcher | 14 |
| Postproduction Editing | 14 |
| Special Effects | 15 |

Section 1.2 Studios, Master Control, and Support Areas 17

THE TELEVISION STUDIO 17

| | |
|---------------------|----|
| Physical Layout | 17 |
| Major Installations | 18 |

THE STUDIO CONTROL ROOM 19

| | |
|------------------|----|
| Program Control | 20 |
| Image Control | 21 |
| Audio Control | 21 |
| Lighting Control | 21 |

MASTER CONTROL 22

| | |
|-------------------|----|
| Program Input | 22 |
| Program Storage | 23 |
| Program Retrieval | 23 |

STUDIO SUPPORT AREAS 23

| | |
|---------------------------|----|
| Scenery and Properties | 23 |
| Makeup and Dressing Rooms | 24 |

CHAPTER 2 Analog and Digital Television **26**

Section 2.1 Analog and Digital Television **28**

- BASIC IMAGE CREATION** **29**
- BASIC COLORS OF THE VIDEO DISPLAY** **30**
- WHAT DIGITAL IS ALL ABOUT** **30**
 - Why Digital? 30
 - The Difference Between Analog and Digital 30
 - The Process of Digitization 30
- BENEFITS OF DIGITAL TELEVISION** **32**
 - Quality 32
 - Computer Compatibility and Flexibility 33
 - Signal Transport 33
 - Compression 33
- ASPECT RATIO** **34**
 - The 4 x 3 Aspect Ratio 34
 - The 16 x 9 Aspect Ratio 34

Section 2.2 DTV Scanning Systems **36**

- PROGRESSIVE AND INTERLACED SCANNING** **36**
 - The Progressive Scanning System 36
 - The Interlaced Scanning System 37
- DTV SYSTEMS** **37**
 - The 480p System 38
 - The 720p System 38
 - The 1080i System 38
- FLAT-PANEL DISPLAYS** **38**
 - Plasma Display Panel 38
 - Liquid Crystal Display 38

CHAPTER 3 The Television Camera **40**

Section 3.1 How Television Cameras Work **42**

- PARTS OF THE CAMERA** **42**
- FROM LIGHT TO VIDEO SIGNAL** **43**
 - The Beam Splitter 44
 - The Imaging Device 44
- THE CAMERA CHAIN** **45**
 - The Camera Control Unit 45
 - The Sync Generator and Power Supply 46
- TYPES OF CAMERAS** **46**
 - Analog and Digital Cameras 46
 - Studio Cameras 47
 - ENG/EFP Cameras and Camcorders 48
 - Consumer Camcorders 49

ELECTRONIC CHARACTERISTICS 50

- Aspect Ratio 50
- Resolution 50
- Light Sensitivity and Operating Light Level 52
- Gain 53
- Video Noise and Signal-to-Noise Ratio 54
- Image Blur and Electronic Shutter 54
- Smear and Moiré 54
- Contrast 54

OPERATIONAL CHARACTERISTICS 55

- Operational Items and Controls: Studio Cameras 55
- Operational Items: ENG/EFP Cameras and Camcorders 57
- Operational Controls: ENG/EFP Cameras and Camcorders 59

Section 2.2 From Light to Video Image 61**THE CCD PROCESS 61****THE NATURE OF COLOR 62**

- Color Attributes 62
- Color Mixing 62

CHROMINANCE AND LUMINANCE CHANNELS 62

- Chrominance Channel 62
- Luminance Channel 63
- The Encoder 63

CHAPTER 4 Lenses 64**Section 4.1 What Lenses Are 66****TYPES OF ZOOM LENSES 66**

- Studio and Field Lenses 66
- Zoom Range 66
- Lens Format 68

OPTICAL CHARACTERISTICS OF LENSES 69

- Focal Length 69
- Focus 70
- Light Transmission: Iris and *f*-stop 71
- Depth of Field 73

OPERATIONAL CONTROLS 74

- Zoom Control 75
- Digital Zoom Lens 76
- Focus Control 76

Section 4.2 What Lenses See 78**HOW LENSES SEE THE WORLD 78**

- The Wide-Angle Lens 78
- The Normal Lens 81
- The Narrow-Angle, or Telephoto, Lens 82

CHAPTER 5 Camera Mounting Equipment 86

Section 5.1 Standard Camera Mounts and Movements 88

BASIC CAMERA MOUNTS 88

The Handheld and Shoulder-Mounted Camera 88

The Monopod and Tripod 89

The Studio Pedestal 90

CAMERA MOUNTING (PAN-AND-TILT) HEADS 92

Fluid Heads 92

Cam Heads 93

Plate and Wedge Mount 93

CAMERA MOVEMENTS 94

Section 5.2 Special Camera Mounts 97

SPECIAL MOUNTING DEVICES 97

High Hat 97

Bean Bag 97

Steadicam 98

Short and Long Jibs 98

Studio Crane 99

ROBOT PEDESTALS AND MOUNTING HEADS 100

CHAPTER 6 Camera Operation and Picture Composition 102

Section 6.1 Working the Camera 104

WORKING THE CAMCORDER AND EFP CAMERA 104

Some Basic Camera "Don'ts" 105

Before the Shoot 105

During the Shoot 106

After the Shoot 109

WORKING THE STUDIO CAMERA 109

Before the Show 110

During the Show 110

After the Show 112

Section 6.2 Framing Effective Shots 113

SCREEN SIZE AND FIELD OF VIEW 113

Screen Size 114

Field of View 114

| | |
|-------------------------------|------------|
| FRAMING A SHOT | 115 |
| Dealing With Height and Width | 115 |
| Close-ups | 117 |
| Headroom | 118 |
| Noseroom and Leadroom | 118 |
| Closure | 119 |
| DEPTH | 122 |
| SCREEN MOTION | 123 |

CHAPTER 7 Lighting **126**

Section 7.1 Lighting Instruments and Lighting Controls **128**

| | |
|--|------------|
| STUDIO LIGHTING INSTRUMENTS | 128 |
| Spotlights | 128 |
| Floodlights | 131 |
| FIELD LIGHTING INSTRUMENTS | 134 |
| Spotlights | 134 |
| Floodlights | 137 |
| Handheld Lights | 138 |
| LIGHTING CONTROL EQUIPMENT | 139 |
| Mounting Devices | 139 |
| Directional Controls | 143 |
| Intensity Controls: Diffusers and Reflectors | 144 |
| Intensity Controls: Electronic Dimmers | 145 |
| COLOR TEMPERATURE | 148 |
| How to Control Color Temperature | 149 |

Section 7.2 Light Intensity, Lamps, and Color Media **151**

| | |
|---|------------|
| LIGHT INTENSITY | 151 |
| Lux and Foot-candles | 151 |
| Incident Light | 152 |
| Reflected Light | 152 |
| CALCULATING LIGHT INTENSITY | 153 |
| OPERATING LIGHT LEVEL: BASELIGHT | 153 |
| Baselight Levels | 154 |
| TYPES OF LAMPS | 154 |
| Incandescent | 155 |
| Quartz, or Tungsten-Halogen | 155 |
| HMI | 155 |
| Fluorescent | 155 |
| COLOR MEDIA | 155 |
| How to Use Color Media | 155 |
| Mixing Color Gels | 155 |

CHAPTER 8 Techniques of Television Lighting 158**Section 8.1 Lighting in the Studio 160****TYPES OF LIGHT 160****MAIN LIGHT SOURCES 161**

- Types of Lighting Instruments 161
- Functions of Main Light Sources 161

THE PHOTOGRAPHIC PRINCIPLE, OR TRIANGLE LIGHTING 165**SPECIFIC LIGHTING TECHNIQUES 166**

- Continuous-Action Lighting 166
- Large-Area Lighting 168
- Cameo Lighting 168
- Silhouette Lighting 169
- Chroma-Key Area Lighting 169
- Controlling Eye and Boom Shadows 170

CONTRAST 172

- Contrast Ratio 172
- Shading 172
- Auto-Iris 173
- Measuring Contrast 173
- Limiting Contrast 173

BALANCING INTENSITIES 173

- Key-to-Back-Light Ratio 174
- Key-to-Fill-Light Ratio 174

THE LIGHT PLOT 175**OPERATION OF STUDIO LIGHTS 176**

- Safety 176
- Preserving Lamps and Power 176
- Using a Studio Monitor 176

Section 8.2 Lighting in the Field 178**ENG LIGHTING 178**

- Shooting in Outdoor Light 179
- Shooting at Night 180
- Shooting in Indoor Light 181

EFP LIGHTING 183

- Safety 184
- Power Supply 184
- Location Survey 184
- Lighting Setup 186

CHAPTER 9 Audio: Sound Pickup 190

Section 9.1 How Microphones Hear 192

ELECTRONIC CHARACTERISTICS OF MICROPHONES 192

- Sound-Generating Element 192
- Pickup Patterns 193
- Special Microphone Features 195

OPERATIONAL CHARACTERISTICS OF MICROPHONES 195

- Lavaliere Microphones 195
- Hand Microphones 198
- Boom Microphones 200
- Headset Microphones 204
- Wireless Microphones 204
- Desk Microphones 206
- Stand Microphones 208
- Hanging Microphones 209
- Hidden Microphones 210
- Long-distance Microphones 211

Section 9.2 How Microphones Work 213

SOUND-GENERATING ELEMENTS 213

- Dynamic Microphones 213
- Condenser Microphones 214
- Ribbon Microphones 214
- Sound Quality 214

SPECIAL MICROPHONE FEATURES 214

- Impedance 214
- Frequency Response 218
- Balanced and Unbalanced Mics and Cables, and Audio Connectors 218

MIC SETUPS FOR MUSIC PICKUP 218

- Microphone Setup for Singer and Acoustic Guitar 218
- Microphone Setup for Singer and Piano 219
- Microphone Setup for Small Rock Group and Direct Insertion 219

MICROPHONE USE SPECIFIC TO ENG/EP 219

MICROPHONE USE SPECIFIC TO THE STUDIO 221

CHAPTER 10 Audio: Sound Control 224

Section 10.1 Sound Controls and How to Use Them 226

AUDIO CONTROL AREAS: STUDIO 226

- Audio Control Booth 226
- Audio Production Room 227

AUDIO PRODUCTION EQUIPMENT: STUDIO 228

- Audio Console 228
- Patchbay 232
- Audio Recording Systems 234
- Analog Recording Systems 234

Digital Recording Systems 235
 Audio/Video Postproduction 238

AUDIO PRODUCTION EQUIPMENT: FIELD 239
 Mixer 239

Section 10.2 Mixing and Sound Aesthetics 241

BASIC AUDIO OPERATION 241
 Volume Control 241

LIVE AND POSTPRODUCTION MIXING 243
 Live Studio Mixing 243
 Live Mixing in ENG/EFP 244
 Postproduction Mixing 245
 Controlling Sound Quality 245

AESTHETIC FACTORS 246
 Environment 246
 Figure-ground 246
 Perspective 246
 Continuity 247
 Energy 247
 Surround Sound 247

CHAPTER 11 Switching, or Instantaneous Editing 250

Section 11.1 How Switchers Work 252

BASIC SWITCHER FUNCTIONS 252

SIMPLE SWITCHER LAYOUT 253
 Program Bus 253
 Mix Buses 253
 Preview Bus 254
 Effects Buses 254
 Multifunction Switchers 254

BASIC SWITCHER OPERATION 256
 Cut or Take 256
 Dissolve 258
 Super 259
 Fade 259
 Additional Special-Effects Controls 259

Section 11.2 What Switchers Do 262

SWITCHER TYPES AND FUNCTIONS 262
 Production Switchers 262
 Postproduction Switchers 263
 Master Control Switchers 263
 Routing Switchers 264

ELECTRONIC DESIGNS 264
 Composite and Component Switchers 264
 Analog and Digital Switchers 264
 Audio-Follow-Video Switchers 265

CHAPTER 12 Video-Recording and Storage Systems 266

Section 12.1 How Video Recording Works 268

TAPE- AND DISK-BASED RECORDING SYSTEMS 268

- Analog and Digital Systems 268
- Linear and Nonlinear Systems 269
- Composite and Component Systems 269
- Compression 270

TAPE-BASED RECORDING AND STORAGE SYSTEMS 271

- How Videotape Recording Works 271
- Operational Controls and Electronic Features 273
- Major Analog Videotape Recorders 275
- Major Digital Videotape Recorders 277

DISK-BASED RECORDING AND STORAGE SYSTEMS 280

- Hard Disk Systems 280
- Read/Write Optical Discs 281
- Data Transfer 281

Section 12.2 How Video Recording Is Done 283

USES OF VIDEO RECORDING AND STORAGE 283

- Building a Show 283
- Time Delay 284
- Program Duplication and Distribution 284
- Record Protection and Reference 284

OPERATIONAL VIDEO-RECORDING SYSTEMS 284

- Quality Choice 284
- Operational Video Recorder Systems 284

VIDEO-RECORDING PRODUCTION FACTORS 286

- Preproduction 286
- Production 288

CHAPTER 13 Postproduction Editing 294

Section 13.1 How Postproduction Editing Works 296

EDITING MODES: OFF- AND ON-LINE 297

BASIC EDITING SYSTEMS 297

- Linear Systems 297
- Nonlinear Systems 297
- Editing Principle 298

LINEAR EDITING SYSTEMS 298

- Single-Source System 298
- Expanded Single-Source System 299
- Multiple-Source Systems 301

LINEAR EDITING FEATURES AND TECHNIQUES 302

- Assemble and Insert Editing 302

CONTROL TRACK AND TIME CODE EDITING 303

- Control Track, or Pulse-Count, Editing 304
- Time Code Editing 305

AB ROLLING AND AB-ROLL EDITING 306

- AB Rolling 306
- AB-Roll Editing 307

NONLINEAR EDITING SYSTEMS 308

NONLINEAR EDITING FEATURES AND TECHNIQUES 309

- Digitizing Information 309
- Compression 309
- Storing Information 309
- Juxtaposing and Rearranging Video and Audio Files 309

PREEDITING PHASES 310

- Shooting Phase 310
- Review Phase 311
- Decision-Making Phase 314
- Operational Phase 315

Section 13.2 Making Editing Decisions 318

EDITING FUNCTIONS 318

- Combine 318
- Trim 319
- Correct 319
- Build 319

BASIC TRANSITION DEVICES 319

- The Cut 319
- The Dissolve 320
- The Wipe 320
- The Fade 320

MAJOR EDITING PRINCIPLES 320

- Continuity Editing 322
- Complexity Editing 328
- Context 328
- Ethics 329

CHAPTER 14 Visual Effects

Section 14.1 Electronic Effects and How to Use Them 334

STANDARD ANALOG VIDEO EFFECTS 334

- Superimposition 334
- Key 335
- Chroma Key 337
- Wipe 339

DIGITAL VIDEO EFFECTS 341

- Computer-Manipulated Effects 341
- Image Size, Shape, Light, and Color 342
- Motion 344
- Multi-Images 346
- Computer-Generated Effects 347

Section 14.2 **Nonelectronic Effects and How to Use Them** 349**OPTICAL EFFECTS 350**

- Television Gobos 350
- Reflections 350
- Star Filter 351
- Diffusion Filters 351
- Defocus 352

MECHANICAL EFFECTS 352

- Rain 352
- Snow 352
- Fog 352
- Wind 352
- Smoke 353
- Fire 353
- Lightning 353
- Explosions 353

CHAPTER 15 Design 354**Section 15.1** **Designing and Using Television Graphics** 356**SPECIFICATIONS OF TELEVISION GRAPHICS 356**

- Aspect Ratio 357
- Scanning and Essential Areas 357
- Out-of-Aspect-Ratio Graphics and Moving Images 358
- Information Density and Readability 361
- Color 362
- Style 365

GRAPHICS EQUIPMENT 365

- Character Generator 365
- Graphics Generator 366

Section 15.2 **Scenery and Props** 370**TELEVISION SCENERY 370**

- Standard Set Units 370
- Hanging Units 372
- Platforms and Wagons 373
- Set Pieces 374

PROPERTIES AND SET DRESSINGS 375

- Stage Props 375
- Set Dressings 375
- Hand Properties 376
- Prop List 376

ELEMENTS OF SCENE DESIGN 376

- The Floor Plan 377
- Set Backgrounds and Platforms 379
- Studio Floor Treatments 379

CHAPTER 16 Production People

382

Section 16.1 What Production People Do 384

PRODUCTION (NONTECHNICAL) PERSONNEL 384

TECHNICAL PERSONNEL AND CREW 386

NEWS PRODUCTION PERSONNEL 387

TELEVISION TALENT 389

PERFORMANCE TECHNIQUES 389

- Performer and Camera 390
- Performer and Audio 391
- Performer and Timing 382
- Performer and Postproduction 392
- Floor Manager's Cues 392
- Prompting Devices 397

ACTING TECHNIQUES 399

- Audience 399
- Blocking 400
- Memorizing Lines 400
- Timing 400
- The Actor and Postproduction 400
- The Director/Actor Relationship 401

AUDITIONS 401

Section 16.2 How to Do Makeup and What to Wear 403

MAKEUP 403

- Technical Requirements 404
- Materials 404
- Techniques 405

CLOTHING AND COSTUMING 405

- Clothing 405
- Costuming 406

CHAPTER 17 Producing

408

Section 17.1 What Producing Is All About 410

PREPRODUCTION PLANNING: FROM IDEA TO SCRIPT 410

- Program Ideas 411
- Production Models 412
- Writing the Program Proposal 413
- Preparing a Budget 415
- Presenting the Proposal 419
- Writing the Script 419

PREPRODUCTION PLANNING: COORDINATION 419

- People 419
- Facilities Request 420
- Schedules 421
- Permits and Clearances 421
- Publicity and Promotion 421

PRODUCTION: HOST AND CRITICAL OBSERVATION 422

- Playing Host 422
- Watching the Production Flow 422
- Evaluating the Production 422

POSTPRODUCTION ACTIVITIES 422

- Postproduction Editing 422
- Evaluation and Feedback 422
- Recordkeeping 423

Section 17.2 Dealing With Schedules, Legal Matters, and Ratings 424**PRODUCTION SCHEDULE 424****INFORMATION RESOURCES 425****PROGRAM TYPES 426****UNIONS AND LEGAL MATTERS 426**

- Unions 426
- Copyrights and Clearances 426
- Other Legal Considerations 427

AUDIENCE AND RATINGS 427

- Target Audience 427
- Ratings and Share 428

CHAPTER 18 The Director in Preproduction 430**Section 18.1 How a Director Prepares 432****THE DIRECTOR'S ROLES 432**

- Director as Artist 432
- Director as Psychologist 433
- Director as Technical Adviser 433
- Director as Coordinator 433

PREPRODUCTION ACTIVITIES 433

- Process Message 434
- Production Method 434
- Production Team and Communication 434
- Scheduling 434
- Script Formats 434
- Script Marking 436
- Floor Plan and Location Sketch 445
- Facilities Request 446

SUPPORT STAFF 446

- Floor Manager 446
- Assistant, or Associate, Director 448
- Production Assistant 449

Section 18.2 Moving from Script to Screen 450

| | |
|---|------------|
| VISUALIZATION AND SEQUENCING | 450 |
| Formulating the Process Message | 451 |
| Medium Requirements | 451 |
| Interpreting the Floor Plan and Location Sketch | 457 |
| SCRIPT ANALYSIS | 459 |
| Locking-In Point and Translation | 459 |
| The Storyboard | 460 |

CHAPTER 19 The Director in Production and Postproduction 464

Section 19.1 Multicamera Studio Directing 466

| | |
|-------------------------------------|------------|
| THE DIRECTOR'S TERMINOLOGY | 466 |
| MULTICAMERA STUDIO DIRECTING | 467 |
| Directing from the Control Room | 470 |
| Rehearsals | 473 |
| Time Line | 478 |
| Directing the Show | 480 |
| CONTROLLING CLOCK TIME | 482 |
| Schedule Time and Running Time | 483 |
| Clock Back-Timing and Front-Timing | 483 |
| Converting Frames into Clock Time | 484 |
| CONTROLLING SUBJECTIVE TIME | 484 |
| STUDIO INTERCOM SYSTEMS | 484 |

Section 19.2 Single-Camera Directing 487

| | |
|---|------------|
| SINGLE-CAMERA DIRECTING PROCEDURES | 487 |
| Visualization | 487 |
| Script Breakdown | 488 |
| Rehearsals | 488 |
| Videotaping | 488 |
| POSTPRODUCTION ACTIVITIES | 490 |

CHAPTER 20 Field Production and Big Remotes 492

Section 20.1 ENG, EFP, and Big Remotes 494

| | |
|----------------------------------|------------|
| ELECTRONIC NEWS GATHERING | 495 |
| ENG Production Features | 495 |
| SNG Production Features | 496 |

ELECTRONIC FIELD PRODUCTION 496

- Preproduction 497
- Production: Equipment Check 497
- Production: Setup 499
- Production: Rehearsals 499
- Production: Videotaping 500
- Production: Strike and Equipment Check 500
- Postproduction 500

BIG REMOTES 500

- Preproduction: The Remote Survey 501
- Production: Equipment Setup and Operation 503
- Production: Floor Manager and Talent Procedures 508

Section 20.2 ~~Section 20.2~~ Covering Major Events 511**SPORTS REMOTES 511****LOCATION SKETCH AND REMOTE SETUPS 518**

- Reading Location Sketches 518
- Production Requirements for Public Hearing (Indoor Remote) 521
- Production Requirements for Parade (Outdoor Remote) 521

COMMUNICATION SYSTEMS 522

- ENG Communication Systems 524
- EFP Communication Systems 524
- Big-Remote Communication Systems 524

SIGNAL TRANSPORT 524

- Microwave Transmission 524
- Communication Satellites: Frequencies, Uplinks, and Downlinks 526
- Cable Distribution 527

Epilogue 530

Glossary 531

Selected Reading 554

Index 556