

Television Broadcasting

Equipment, Systems, and Operating Fundamentals

by
Harold E. Ennes

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Preface to the Second Edition

Just about everything in television broadcasting from the camera lens to the transmitting antenna has changed since the first edition of this book was published. Camera chains are either automatic or semi-automatic. Transmitters are usually remotely controlled from the studio. Electronic journalism (EJ), or electronic news gathering (ENG), involves new equipment and operating techniques and a large amount of the time in the operating day. This second edition has been written to provide an effective training background for all the new developments in television broadcasting.

In addition to those companies and organizations listed in the preface to the first edition, the following are hereby extended thanks for their interest in and contributions to the second edition: The Grass Valley Group, Inc.; Listec Television Equipment Corp.; Moseley Associates, Inc.; and Vital Industries, Inc.

Special thanks are extended to the following individuals: W. O. McClellan, AT&T; E. Charles (Chuck) Upton, WBBM-TV; Jim Hurley, WTAE-TV; Tom Miller, WKYC-TV; and D. J. Massa, Dana Pratt, and Rick Boyland, RCA.

HAROLD E. ENNES

Preface to the First Edition

The purpose of this book is twofold: to serve as a basic and practical course for new and prospective television broadcast technicians and operators, and to serve as a source of reference information for practicing technical personnel. It is assumed that the reader has had basic electronics training, and that he possesses solid-state knowledge at least equivalent to that contained in this writer's *Workshop in Solid State*.¹

Over the years, the technical aspect of telecasting has grown into a highly advanced and very broad field that involves ultrasophisticated equipment and operating techniques. Yet, organized training programs have been limited largely to a few schools and manufacturers' seminars on specific new equipment. The practical use of broadcast equipment is a highly specialized field. Hence, any treatment of this subject must be applied specifically to broadcast-system installations and techniques.

This book covers the fundamentals of the entire television broadcast system. Consequently, it cannot be expected to meet the complete needs of more advanced personnel in every specific department of telecasting. But the foundation for more specific and advanced study is firmly established. For example, the basics of NTSC color are presented in an exhaustive treatment in Chapter 2. This material is arranged and designed to serve as a practical foundation for the study of all advanced applications of color equipment. Because of the extreme importance of this material, Chapter 2 is followed by a longer and more detailed exercise section than is the case for the average chapter.

¹ Harold E. Ennes, *Workshop in Solid State* (Indianapolis: Howard W. Sams & Co., Inc., 1977).

PREFACE

Similarly, the coverage of camera chains, sync generators, television recording systems, and transmitters is more introductory than detailed or advanced. Sufficient coverage of cameras, switching systems, and transmitters is given to assure competent *operation* of the equipment. More highly specialized operations and maintenance of cameras and recording systems, interpretation of vertical-interval test (VIT) signals, and transmitter proof of performance must, of necessity, be assigned to more advanced volumes.

The author is indebted to the following manufacturers and stations for their cooperation in supplying information and photographs vital to this book: American Telephone and Telegraph Company; Ampex Corporation; Cohu Electronics, Inc.; D. B. Milliken Electro-Voice, Inc.; International Video Corporation; Kliegl Bros. Lighting; Mincom Division 3M Company; Philips Broadcast Equipment Corp.; RCA; RHG Electronics Laboratory; Shibaden Corp. of America; Shure Brothers, Inc.; Tektronix, Inc.; TeleMation, Inc.; Telesync Corp.; Visual Electronics Corporation; Westel Company; WBAL-TV; WBBM-TV; and WTAE-TV.

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Introduction to Television Broadcast Systems

This chapter is an elementary examination of the function performed by each basic piece of apparatus in the television system. This material should be studied by every reader who has not received basic training in television-broadcast theory. The more advanced reader will find it an excellent review to help clarify the overall picture of television broadcasting.

1-1. INTRODUCTION

We are about to study the major components that act on the video signal at a tv broadcast station. In practice, these various units are so interdependent that it is difficult to explain clearly the exact operation of any one unit without some mention of another unit. With this thought in mind, it is the purpose of this introductory section to give an overall view of the problems encountered, so that the content of the following sections may be understood more easily.

Fig. 1-1 is a simplified block diagram of all studio and transmitter units discussed in this chapter. It would be well for the reader to refer to this diagram often during the rest of the chapter so that the orientation of equipment may be seen clearly.

The pickup head and viewfinder constitute the television camera. The camera lens focuses the scene to be televised upon the photosensitive surface of the pickup tube, and the image imparts upon the surface a charge pattern that corresponds point-by-point with the light content of the picture.

Before we can "pick off" this charge pattern element by element, some means must be found to establish precisely the time at which

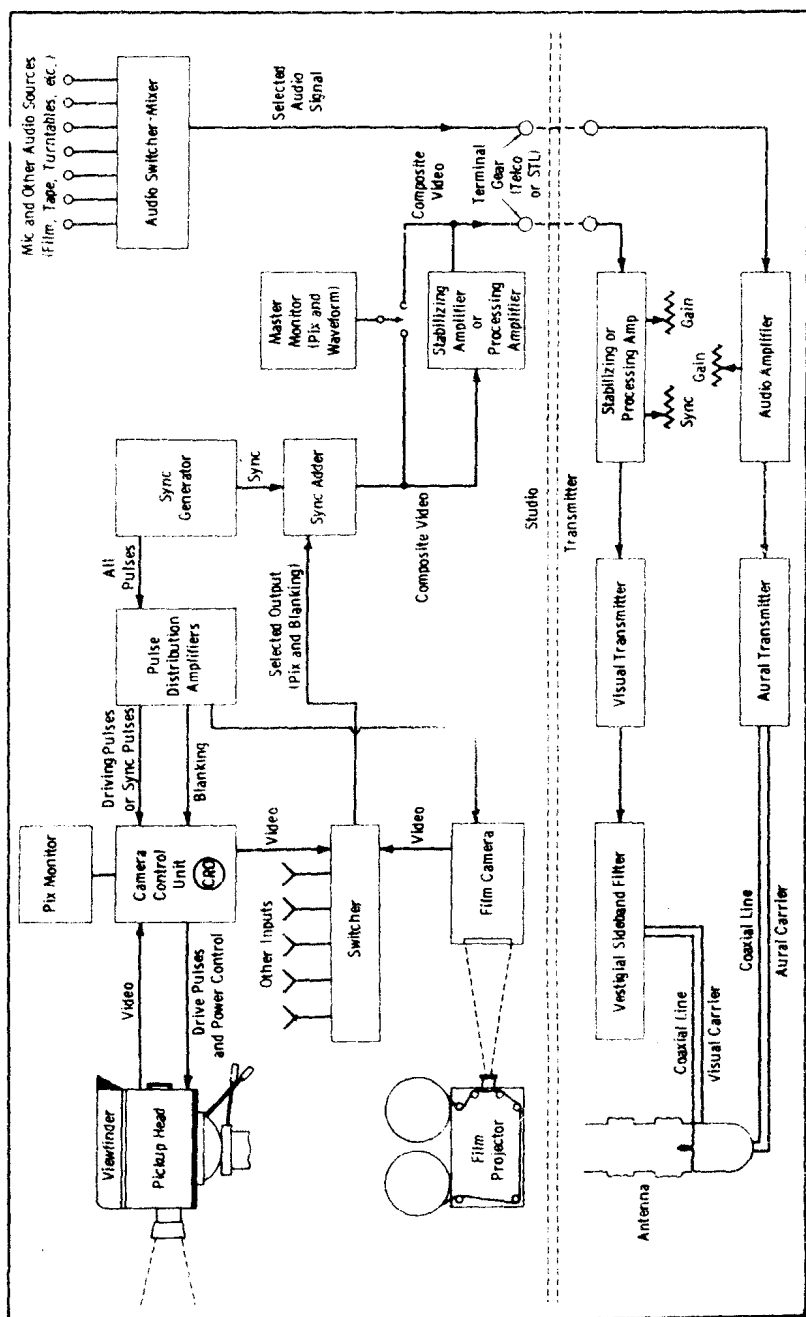


Fig. 1-1. Basic block diagram of tv broadcast installation.