

STORAGE CATHODE-RAY TUBES AND CIRCUITS

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Significant Contributions

by
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CIRCUIT CONCEPTS

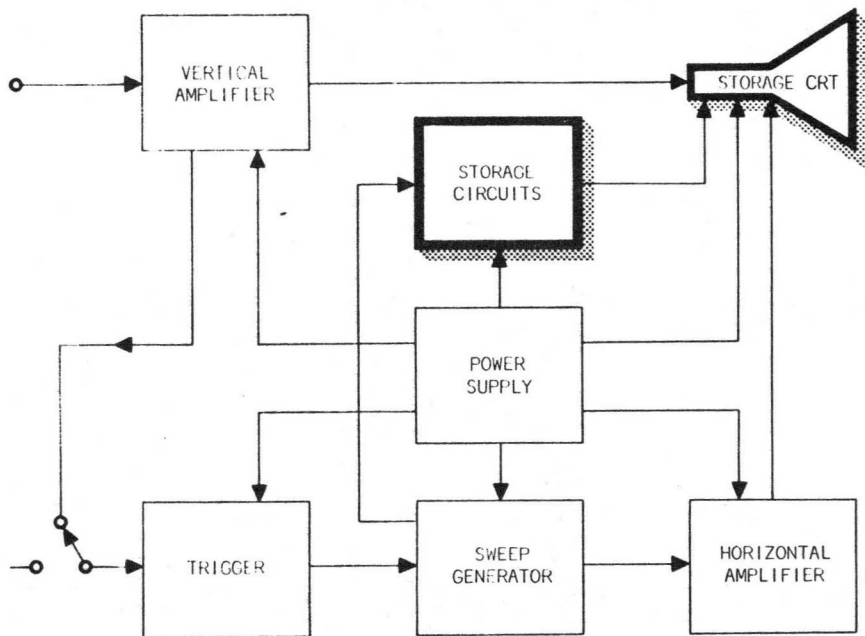


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CONTENTS

- 1 INTRODUCTION 4
 - 2 BASIC PRINCIPLES OF DIRECT-VIEWING STORAGE TUBES 3
 - 3 CHARGING AND BISTABILITY 11
 - 4 BISTABILITY IN MULTIPLE TARGETS AND DIELECTRIC TARGETS 23
 - 5 SIMPLIFIED BISTABLE STORAGE TUBES 29
 - 6 CHARACTERISTICS 35
 - 7 TRANSMISSION STORAGE TUBES 55
 - 8 BASIC STORAGE CIRCUITS 67
- INDEX 121



INTRODUCTION

An electrical event that occurs only once can be displayed on a conventional cathode-ray tube but the display is present only for a short period of time. This time may range from a few microseconds to several seconds. A storage cathode-ray tube allows a display to be retained for much longer periods of time (up to an hour or more).

The retention feature of a storage CRT is useful when displaying signals which occur only once or have low repetition rates. In the past many single-shot events required that the display be photographed. Storage offers a convenient alternative. Signals having low repetition rates often cause a flickering of the display which is distracting. Storage allows these signals to be displayed at a constant light level.

Storage cathode-ray tubes may be classified as either bistable or halftone tubes. The stored display on a bistable tube has one level of brightness. A halftone tube has the capacity of displaying a stored signal at different levels of brightness. The brightness of a halftone tube is dependent on beam current and the time the beam remains on a particular storage element. A bistable tube, as the name implies, will either store or not store an event. All stored events have the same brightness.

Storage cathode-ray tubes may also be classified as either direct-viewing or electrical-readout type tubes. An electrical-readout type tube has an electrical input and output. A direct-viewing type tube has a visual input but a visual output.

This book deals primarily with direct-viewing bistable storage tubes and associated circuit concepts. Basic direct-viewing storage tube principles develop in a step-by-step manner from a simple model to a functioning tube. Also covered: the characteristics of bistable tubes and associated typical circuitry.

2

BASIC PRINCIPLES OF DIRECT-VIEWING STORAGE TUBES

storage
target

bombarding
energy

A *storage target* is a surface having the ability to store information when bombarded by an electron beam. One of the key questions in analyzing storage target behavior is how much bombarding energy a beam of electrons has as it arrives at the storage target surface. The bombarding energy of an electron on a target is directly related to the potential difference between the voltage of the target and the voltage of the electron's source (usually a thermionic cathode). Consider Fig. 2-1 which shows a cathode, two accelerators, a decelerator and a target. Electrons are emitted from the heated cathode at zero volts, accelerated to +1000 V, decelerated to +500 V, accelerated to +3000 V and then bombard a target whose voltage is +200 V. The electron potential at the target is +200 V, because the high-speed electrons from the +3000 V field must pass through a decelerating field immediately surrounding the target.

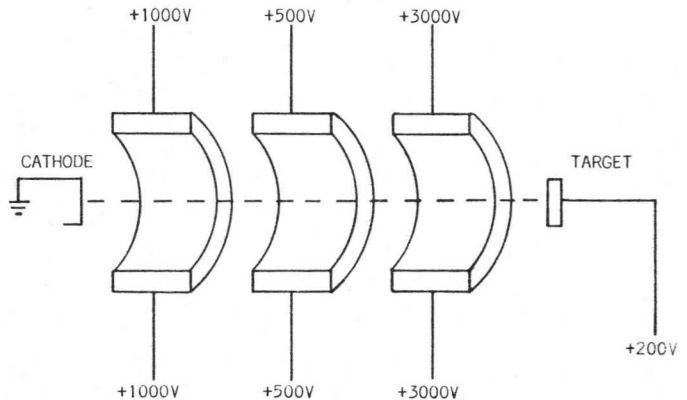


Fig. 2-1. Electron energy at the target is equal target voltage - cathode voltage.