

CONTENTS

CHAPTER I

Introduction

CHAPTER 2

The Concept of Noise Factor

2·1. The basic principles, p. 3. **2·2.** Source temperature, p. 4. **2·3.** Non-linearity in the receiver, p. 7. **2·4.** The concept of available power, p. 8. **2·5.** Voltage squared versus available power, p. 9. **2·6.** Definition of noise factor, p. 11. **2·7.** Perception factor, p. 12. **2·7·1.** *Integration*, p. 15. **2·8.** Energy band-width, p. 16. **2·9.** Input matching, p. 17. **2·10.** Partial noise factors, p. 18.

CHAPTER 3

The Theory and Practice of Amplifier Design for Minimum Noise Factor

3·1. Introduction, p. 20. **3·2.** General principles, p. 20. **3·3.** Equivalent circuit for first stage with no feed-back, p. 22. **3·4.** Analysis of equivalent circuit with no feed-back, p. 24. **3·5.** Input loss and temperature of input impedance, p. 25. **3·6.** The effect of feed-back, p. 28. **3·6·1.** *The radio-frequency pentode*, p. 29. **3·6·2.** *Use of feed-back to improve the noise factor of pentodes*, p. 33. **3·7.** Triode radio-frequency amplifier, p. 34. **3·7·1.** *The grounded-grid triode*, p. 34. **3·7·2.** *The grounded-anode triode*, p. 39. **3·7·3.** *The neutralized triode*, p. 40. **3·8.** Noise factor with very wide band-width, p. 42. **3·8·1.** *Lower limit of noise factor*, p. 43. **3·8·2.** *Upper limit of band-width for satisfying the optimum conditions*, p. 44. **3·8·3.** *Variation of noise factor over the i.f. band-width*, p. 44. **3·9.** Equivalent noise resistance of the valve, p. 45. **3·10.** Summary of practical experience, p. 46. **3·10·1.** *Comparison of theory and practice in the case of pentodes*, p. 47. **3·10·2.** *Results obtained with grounded-grid triodes*, p. 48. **3·10·3.** *Triodes on pressed-glass bases*, p. 50. **3·10·4.** *The neutralized triode in practice*, p. 51. **3·10·5.** *Microwave radio-frequency amplification*, p. 53.

CHAPTER 4

The Noise Factor of Mixers

4·1. Thermionic mixers, p. 54. **4·2.** The overall noise-factor of a diode mixer followed by an amplifier, p. 56. **4·3.** Conversion gain, p. 57. **4·4.** Practical crystal mixers, p. 64. **4·5.** Local oscillator noise, p. 68.

CHAPTER 5

The Measurement of Noise Factor

5·1. Continuous-wave methods, p. 73. 5·2. The noise diode, p. 74. 5·3. The upper frequency limit for the noise diode, p. 77. 5·4. Hot-wire noise source, p. 79. 5·5. Measurement of aerial noise temperature, p. 79. 5·6. Sources of noise at micro-wave-lengths, p. 80. 5·6·1. *The double mixing method of noise-factor measurement*, p. 80. 5·7. Measurement of conversion gain and noise-temperature ratio, p. 83.

CHAPTER 6

Intermediate-Frequency Amplifiers

6·1. General, p. 84. 6·2. The product of gain and band-width, p. 84. 6·2·1. *Coupled Circuits*, p. 85. 6·2·2. *Staggered pairs of circuits*, p. 86. 6·2·3. *Coupled circuits with unilateral loading*, p. 86. 6·2·4. *Greater-than-critical coupling*, p. 87. 6·2·5. *Multiple staggering*, p. 87. 6·2·6. *Single-tuned circuits tuned to the same frequency*, p. 91. 6·2·7. *Intermediate-frequency amplifiers with negative feed-back*, p. 91. 6·3. Some practical designs of wide-band amplifier, p. 93. 6·4. Distortion in intermediate-frequency amplifiers, p. 95. 6·4·1. *Effect of a linear amplifier on pulse shape*, p. 95. 6·4·2. *Time delay*, p. 97. 6·4·3. *Number of cycles per pulse*, p. 98. 6·4·4. *Non-linearity in the amplifier*, p. 99. 6·5. Overloading and paralysis, p. 101. 6·6. Feed-back in intermediate-frequency amplifiers, p. 103. 6·7. Choosing the intermediate frequency, p. 104.

CHAPTER 7

Trends in Practical Receiver Design

7·1. Broadcast receivers, p. 107. 7·1·1. *General*, p. 107. 7·1·2. *Improvements in short-wave reception*, p. 111. 7·1·2·1. *Signal-to-noise ratio*, p. 111. 7·1·2·2. *Image rejection*, p. 112. 7·1·2·3. *Short-wave band-spreading and reduction of frequency drift*, p. 115. 7·1·3. *New methods of radio production*, p. 119. 7·2. Communication receivers, p. 120. 7·2·1. *Band-spreading and frequency drift*, p. 121. 7·2·2. *Noise factor*, p. 122. 7·2·3. *Selectivity*, p. 122. 7·2·4. *Automatic gain-control*, p. 124. 7·2·5. *Noise limiters*, p. 124. 7·2·6. *'Specialized' communication receivers*, p. 125. 7·2·7. *Future possibilities*, p. 126. 7·3. Television receivers, p. 126. 7·3·1. *General*, p. 126. 7·3·2. *Frame synchronizing*, p. 127. 7·3·3. *The supply of E.H.T. Voltage*, p. 128.

CHAPTER 8

Some New Kinds of Receiver

8·1. Radar receivers, p. 132. 8·1·1. *General*, p. 132. 8·1·2. *Common aerial working*, p. 133. 8·1·3. *The clutter problem—swept gain and I.A.G.C.*, p. 135. 8·1·4. *Automatic-frequency control*, p. 136. 8·1·5. *Automatic-gain control*, p. 140. 8·2. Panoramic receivers, p. 140. 8·3. The crystal-video receiver, p. 142. 8·4. Receiver for measurement of thermal radiation, p. 146. 8·5. The Synchrodyne, p. 148.

CHAPTER 9

Some New Circuit Tricks

9.1. Differentiating circuits, p. 152. **9.2.** Amplitude limitation in video amplifiers, p. 153. **9.3.** Cathode followers of very low output impedance, p. 154. **9.4.** Automatic gain equalization of two receiving channels, p. 155. **9.5.** Reduction of cross-modulation in communication receivers, p. 157. **9.6.** Reduction of selective fading, p. 158. **9.7.** Some new frequency-modulation detectors, p. 161. **9.8.** Logarithmic receivers, p. 166.

APPENDIX

Design Formulae for Intermediate Frequency Amplifiers

1. The variation of amplitude and phase with frequency and the time delay, for pairs of similar circuits, p. 169. **2.** Coupled pairs with loading on one side only, p. 170. **3.** Calculation of '3 db. down' band-width for pairs of circuits, p. 171. **4.** The amplitude of humps produced by over-coupling or over-staggering, p. 172. **5.** Time delay, p. 172. **6.** Response when the ratio $\omega_0/2\pi B_t$ is small, p. 172. **7.** Triple-staggered circuits, p. 174. **8.** Maximum gain of amplifier having single circuits all tuned to the same frequency, p. 177.

INDEX