

# **Automatic Volume Control**

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New Jersey Antique Radio Club

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# This is a Technical Presentation

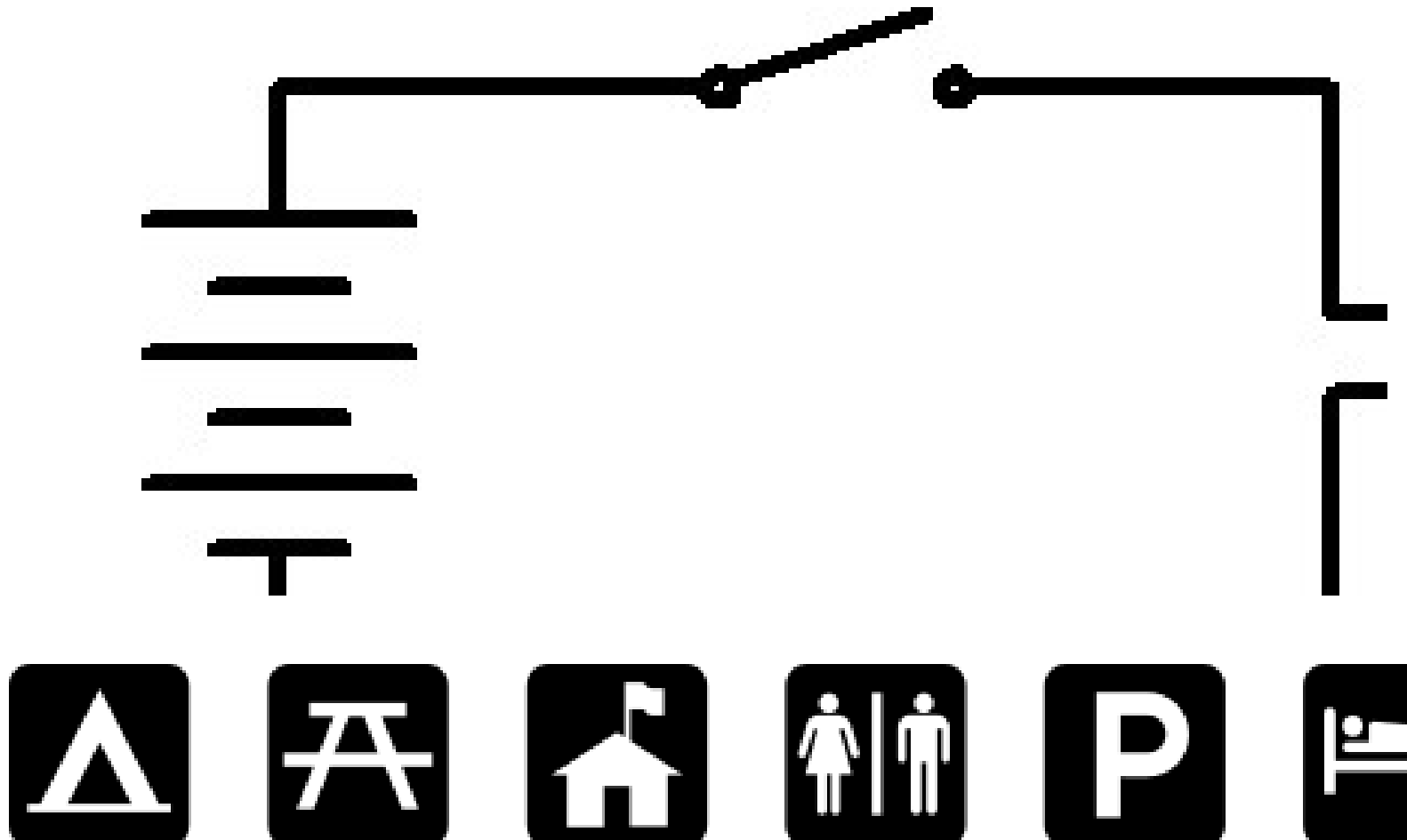


**DON'T PANIC**

(Marvin the Paranoid Android)

# Learn to Read Schematics!

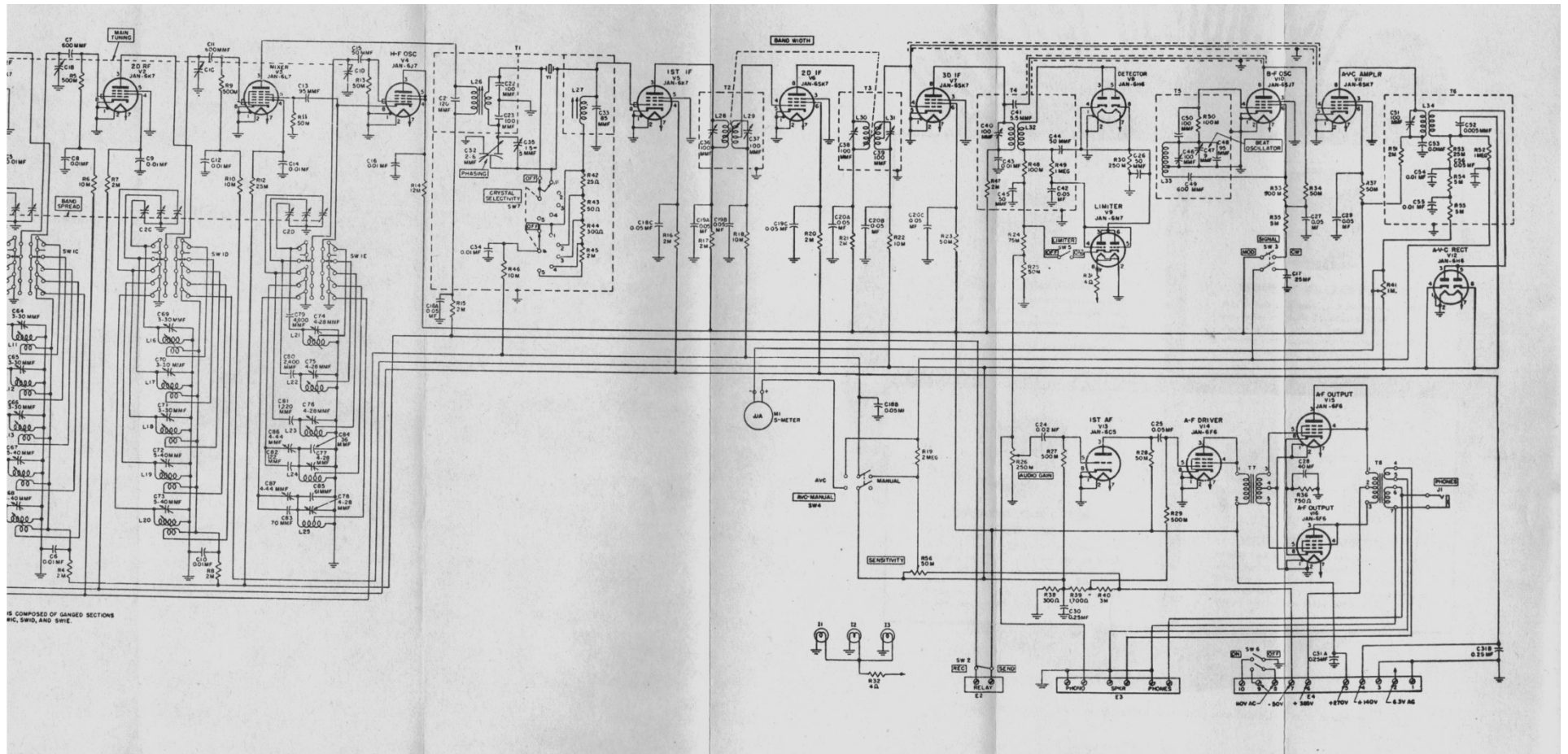
## Start with Dick and Jane



Symbols

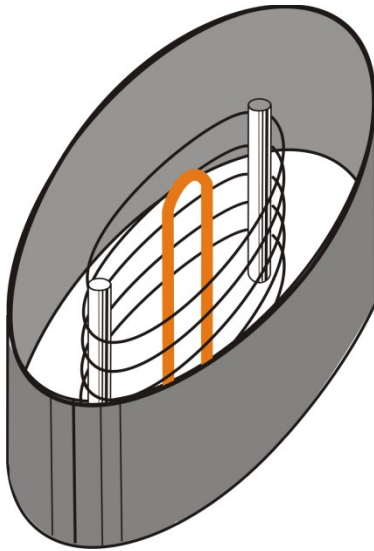
# Learn to Read Schematics!

## Work your way toward Moby Dick



# **First, A Brief Review**

# Vacuum-Tube Dynamic Characteristics



**C-BATTERY**

**A-BATTERY**

**B-BATTERY**

**STATIC:**

**$R = 5000$  ohms**

**GRID VOLTAGE = -10 volts**

**PLATE CURRENT = + 6.2 Ma**

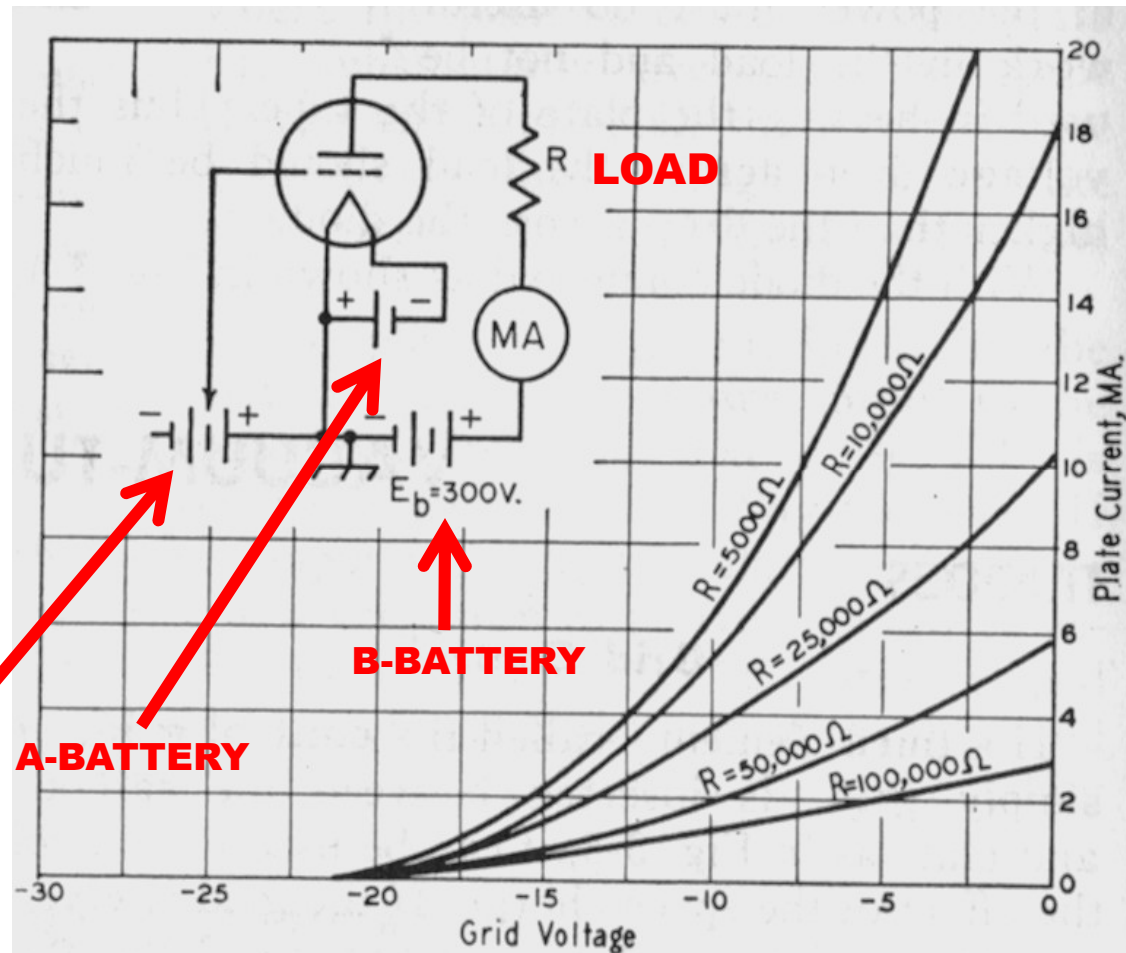
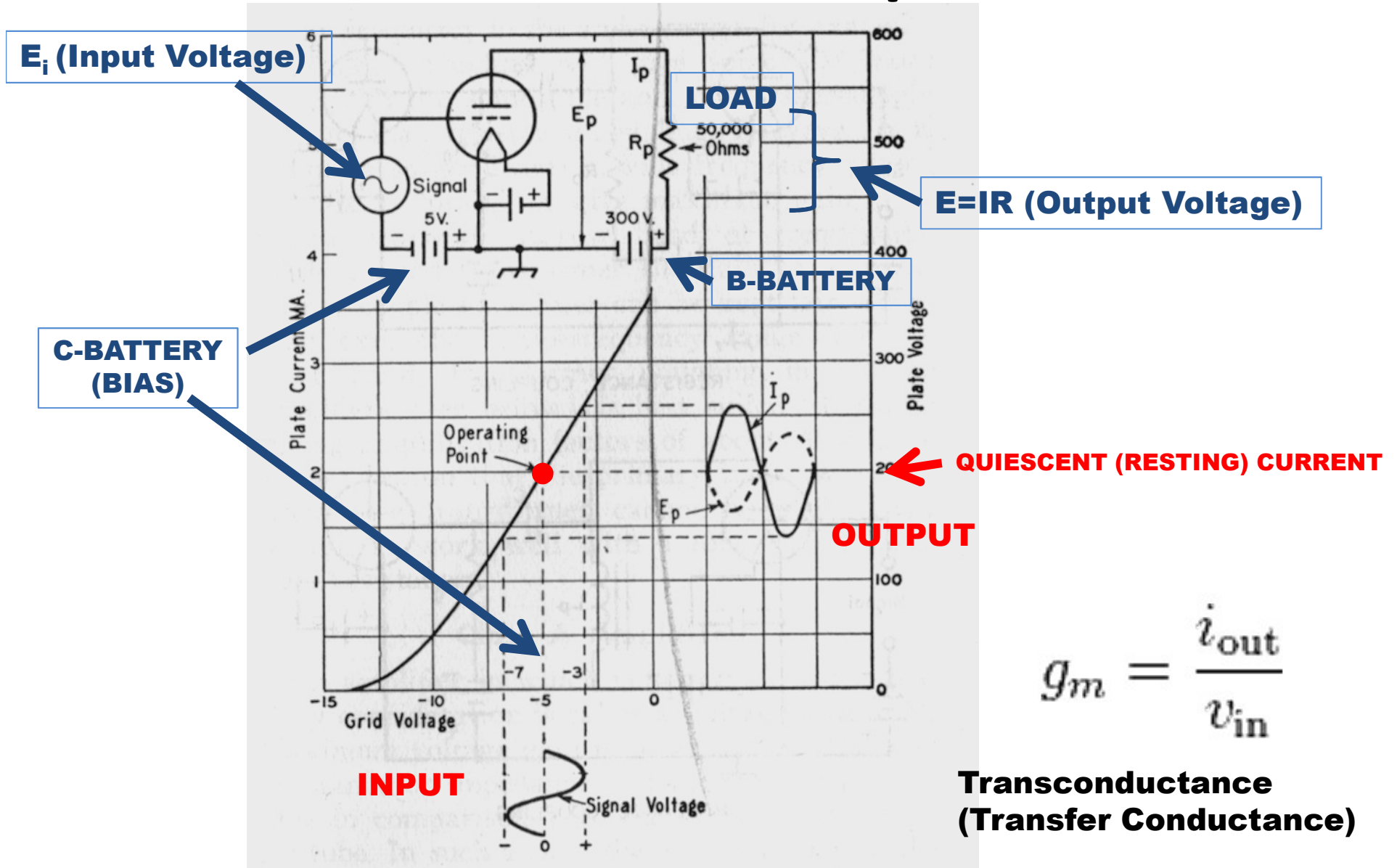


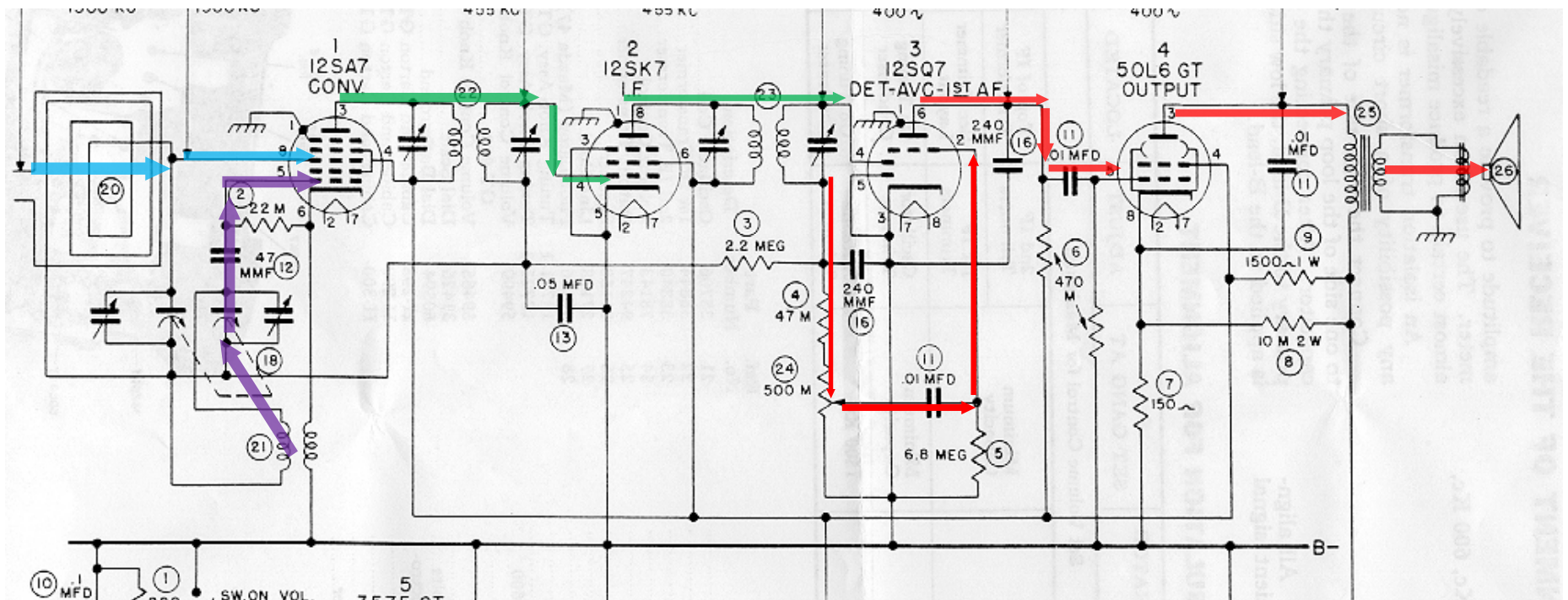
Fig. 3-7—Dynamic characteristics of a small triode with various load resistances from 5000 to 100,000 ohms.


# Common-Cathode Vacuum-Tube Amplifier





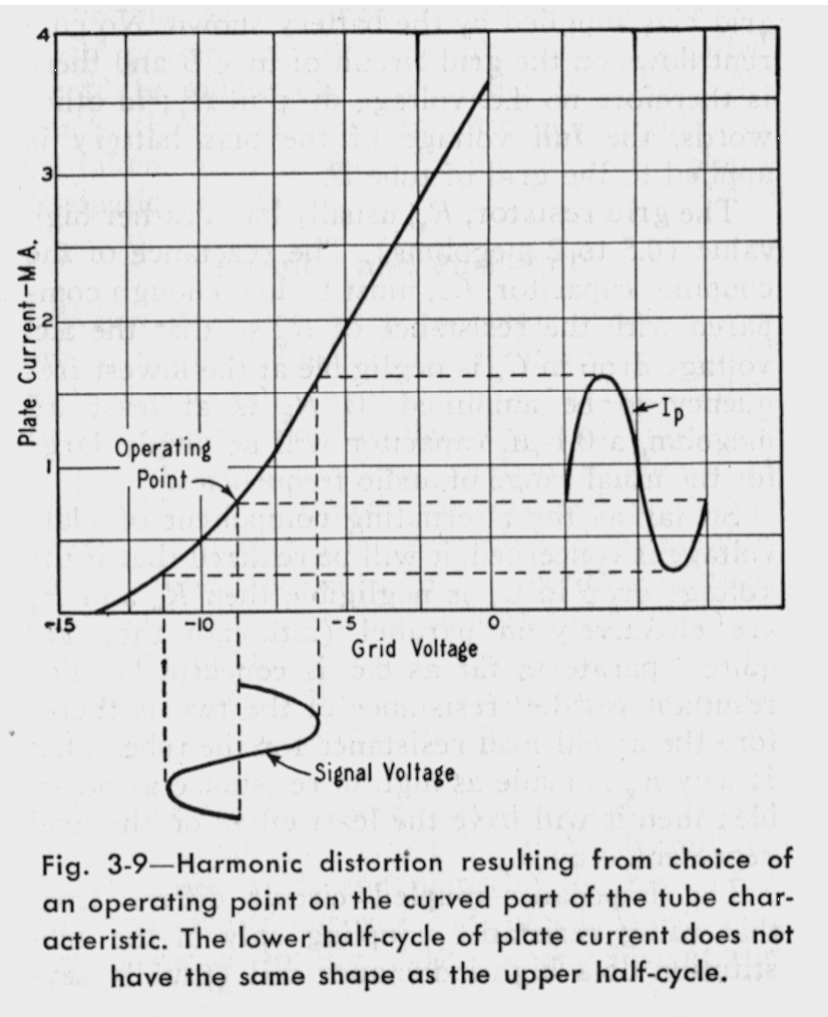
# Follow the Signal Flow



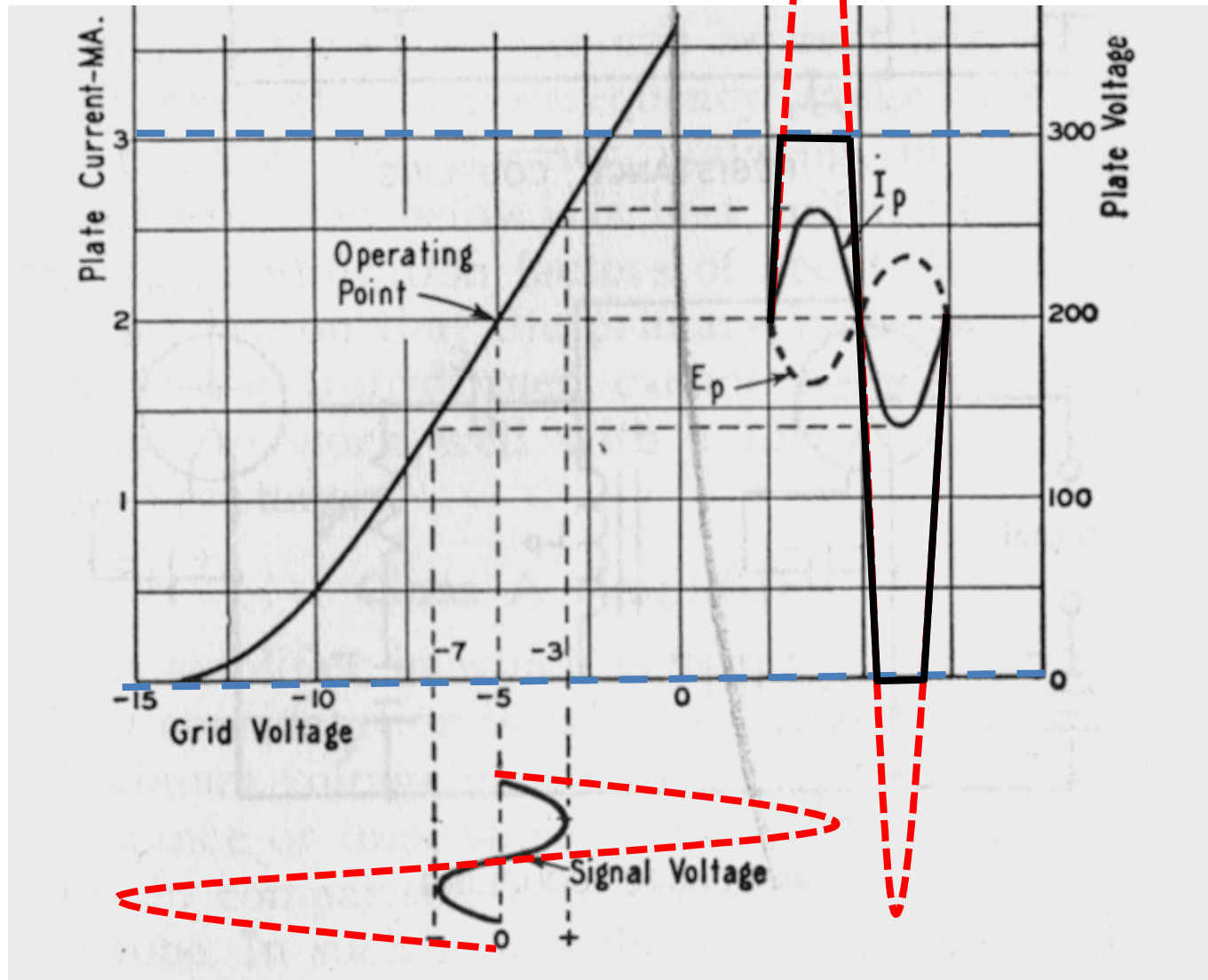
-  Radio Frequency
-  Local Oscillator
-  Intermediate Frequency
-  Audio Frequency



# Linear vs. Nonlinear



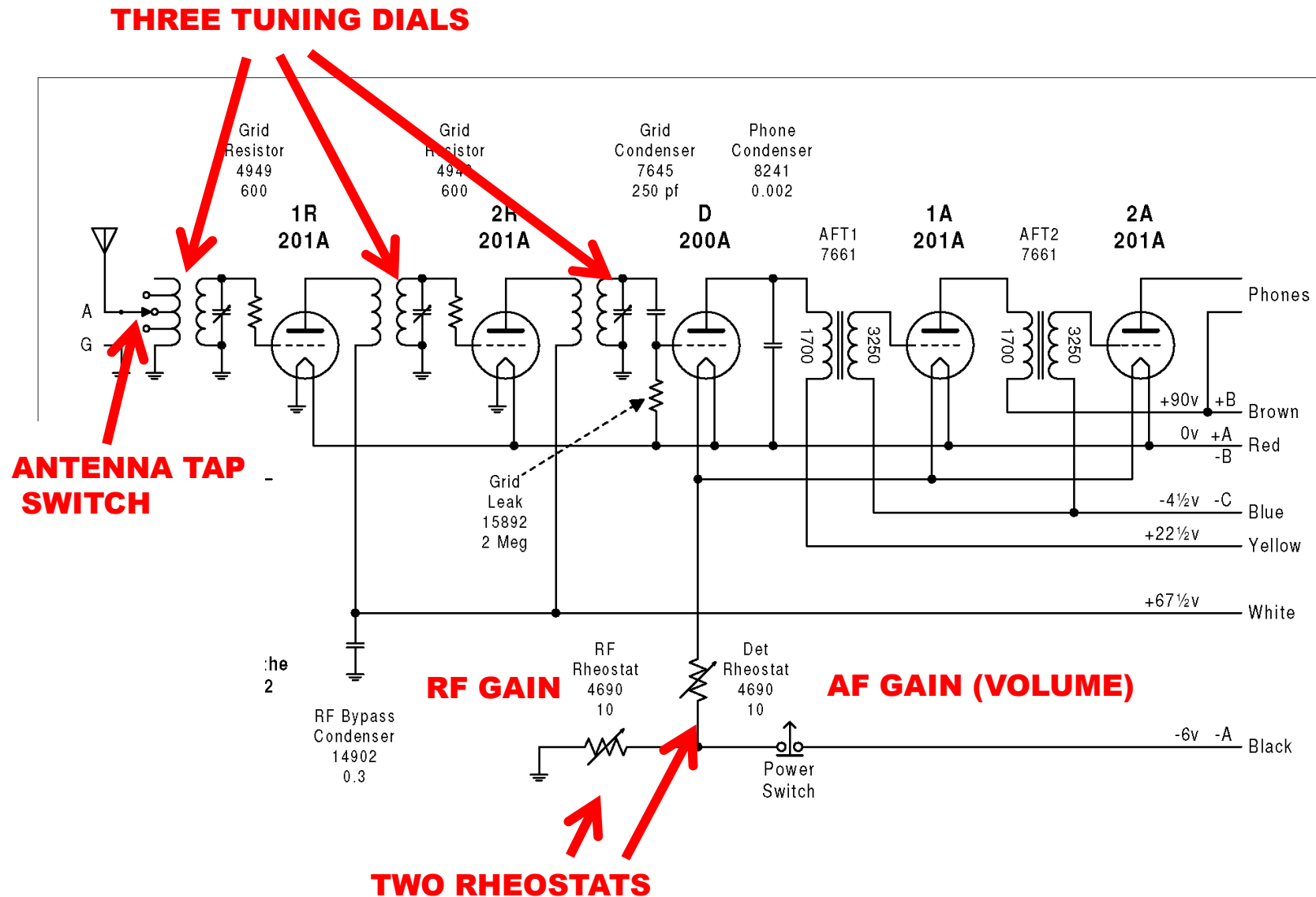
# Vacuum-Tube Amplifier Limitations



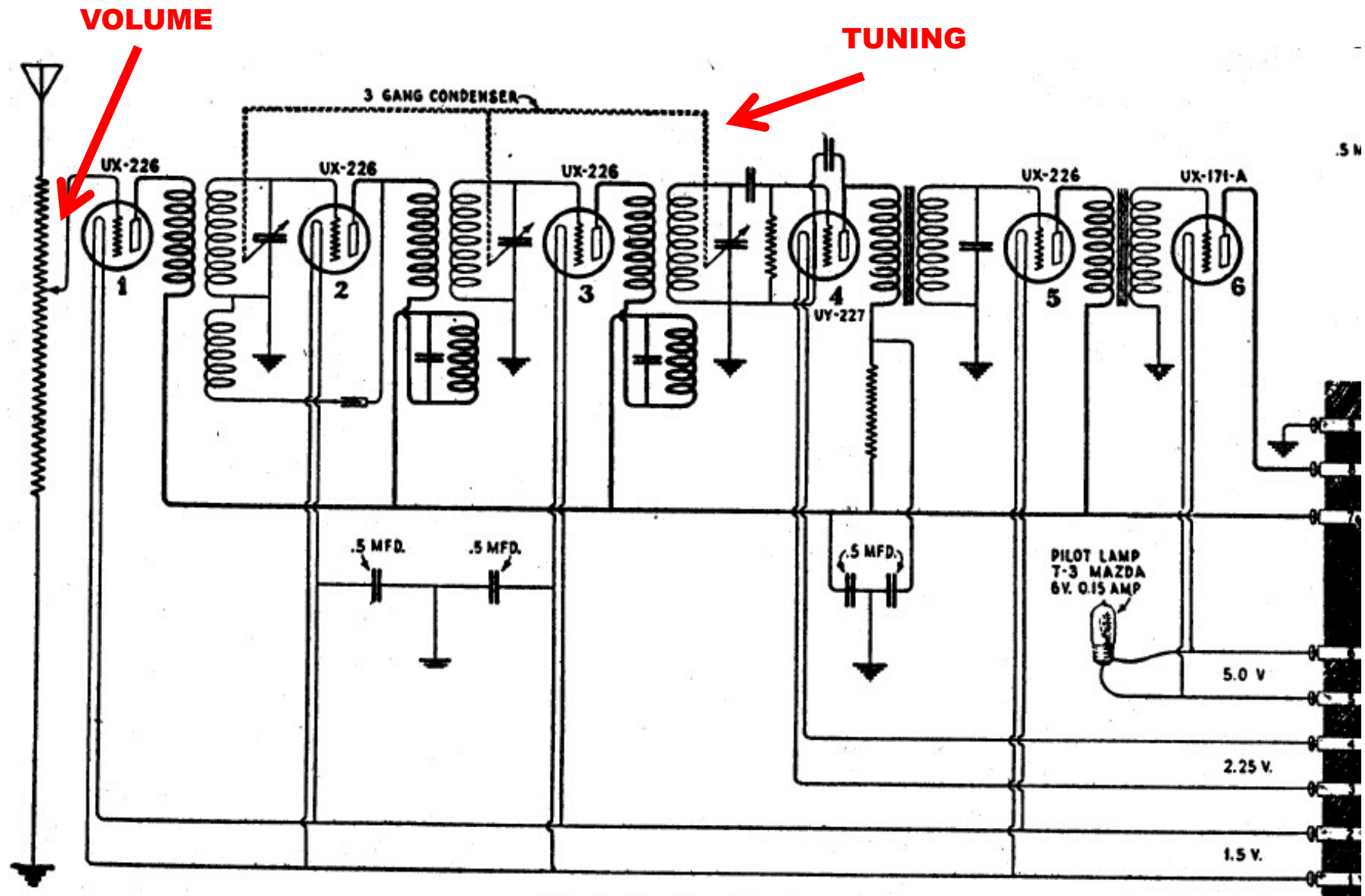
**OK, let's look at some radios.**

# Atwater Kent 20C

## Typical "Three-Dialer" TRF - 1924



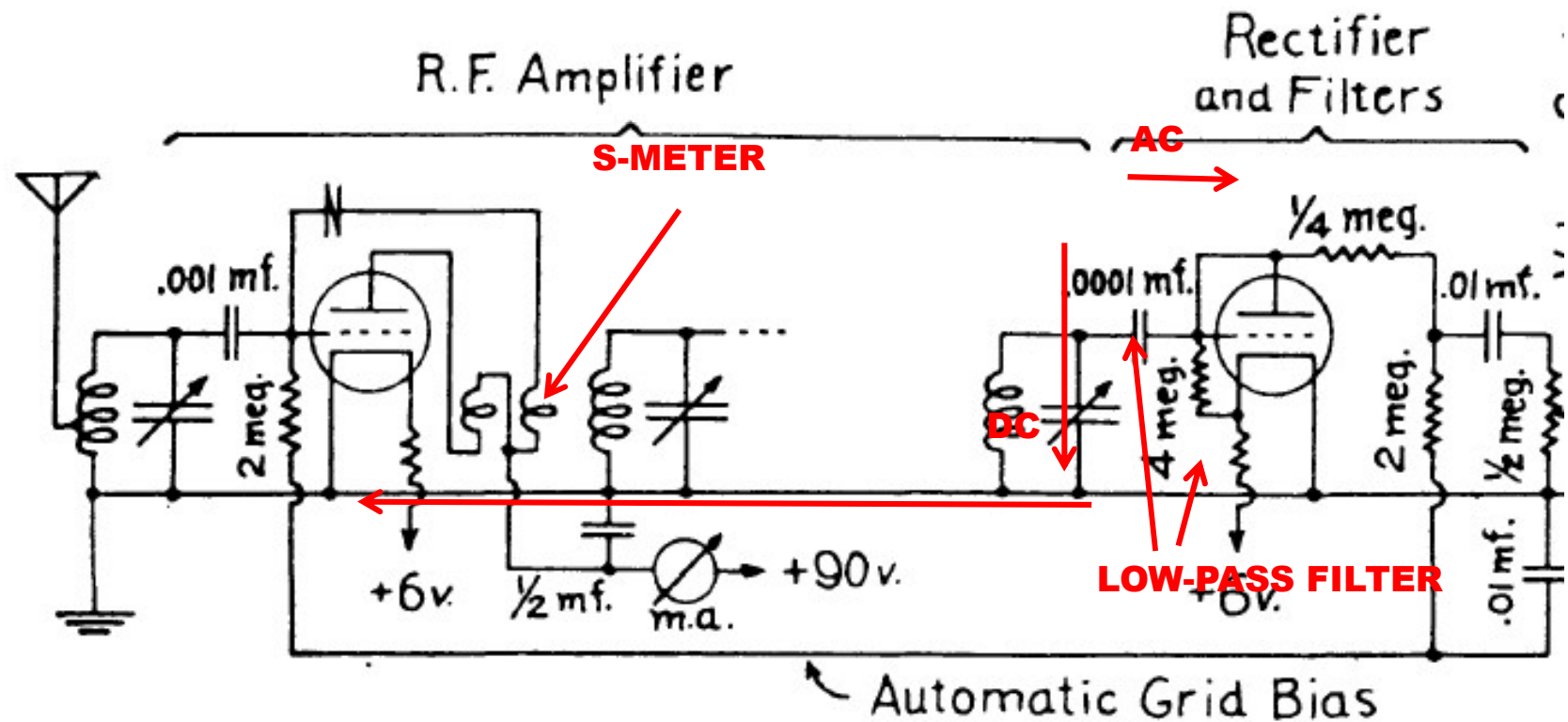
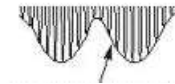
# RCA Radiola 18 - AC TRF CA. 1928



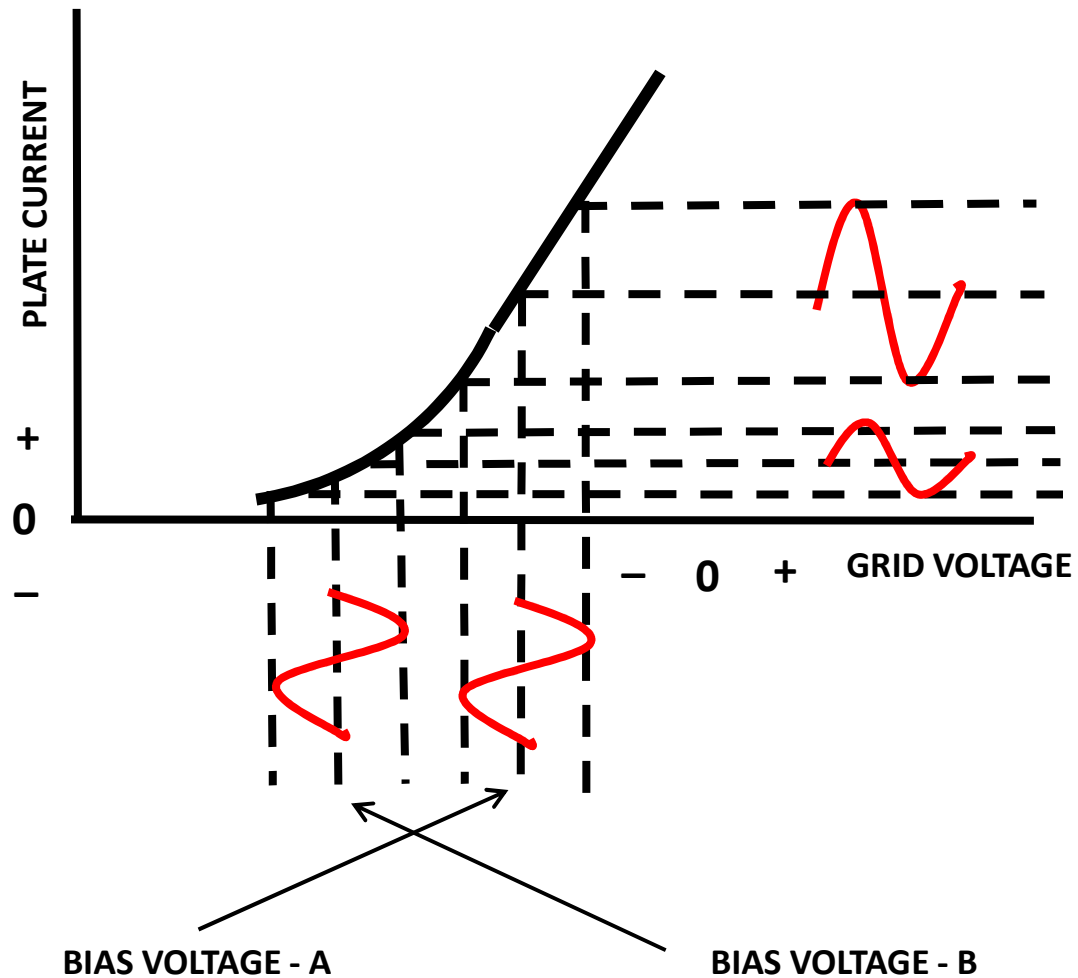


# Harold A. Wheeler – 1925

May 10, 1903 - April 25, 1996  
 Co-inventor of the Neutrodyne Circuit  
 Associate of Alan Hazeltine



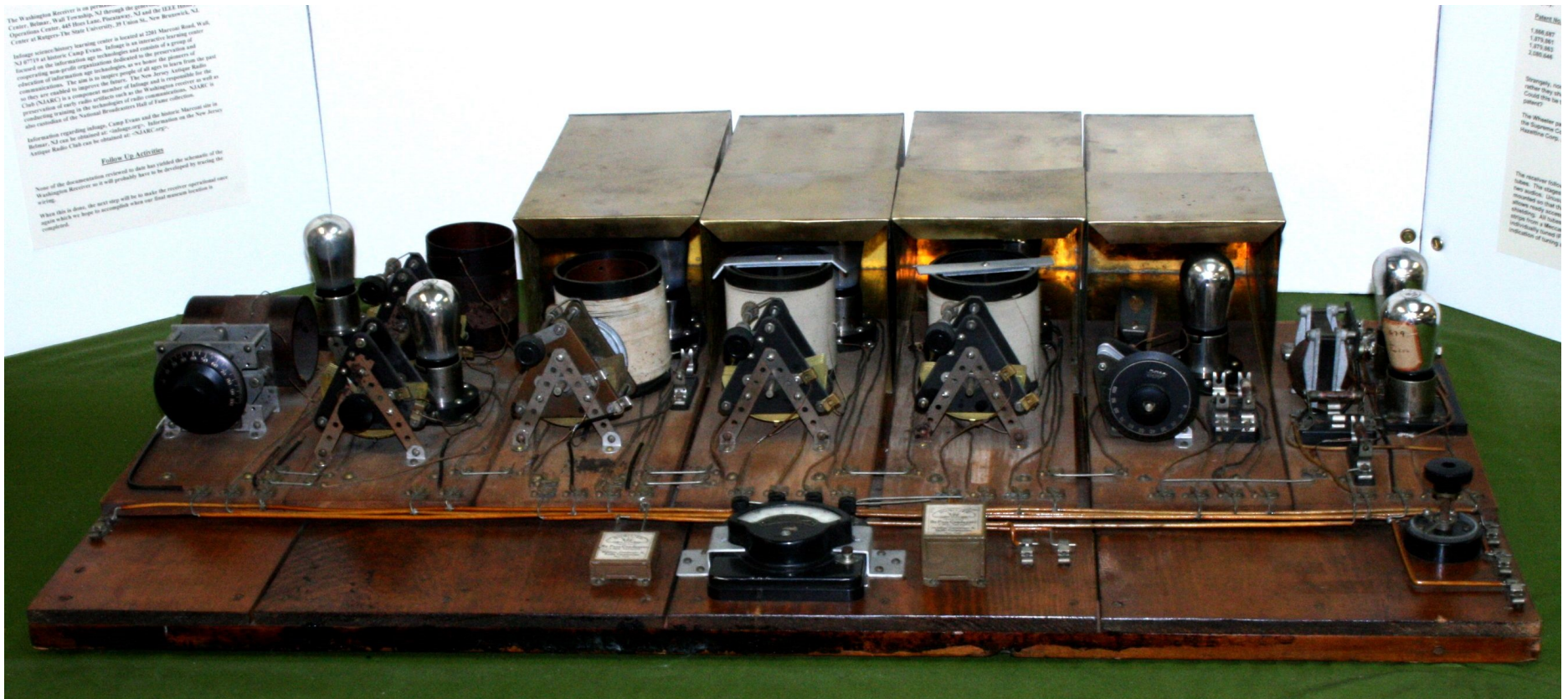
# Electronic Gain Control





# The “Washington” Receiver

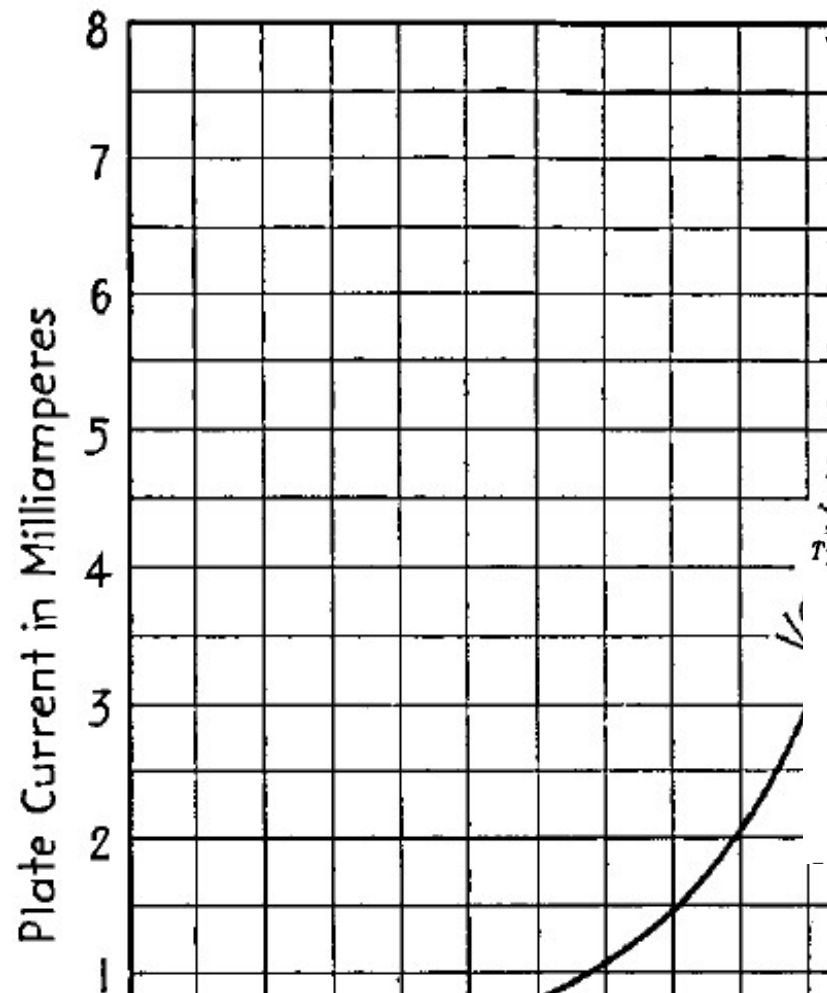
## One of the Treasures of the Radio Technology Museum



## The first commercial set with Wheeler (Hazeltine) AVC



# Remote Cut-off Tubes



## Variable-mu tube types

35/51 Super-Control RF Amplifier (Tetrode)

39/44 Super-Control RF Amplifier Pentode

58 Triple-Grid Super-Control Amplifier

6D6 Triple-Grid Super-Control Amplifier

6K7

6SK7

6BA6

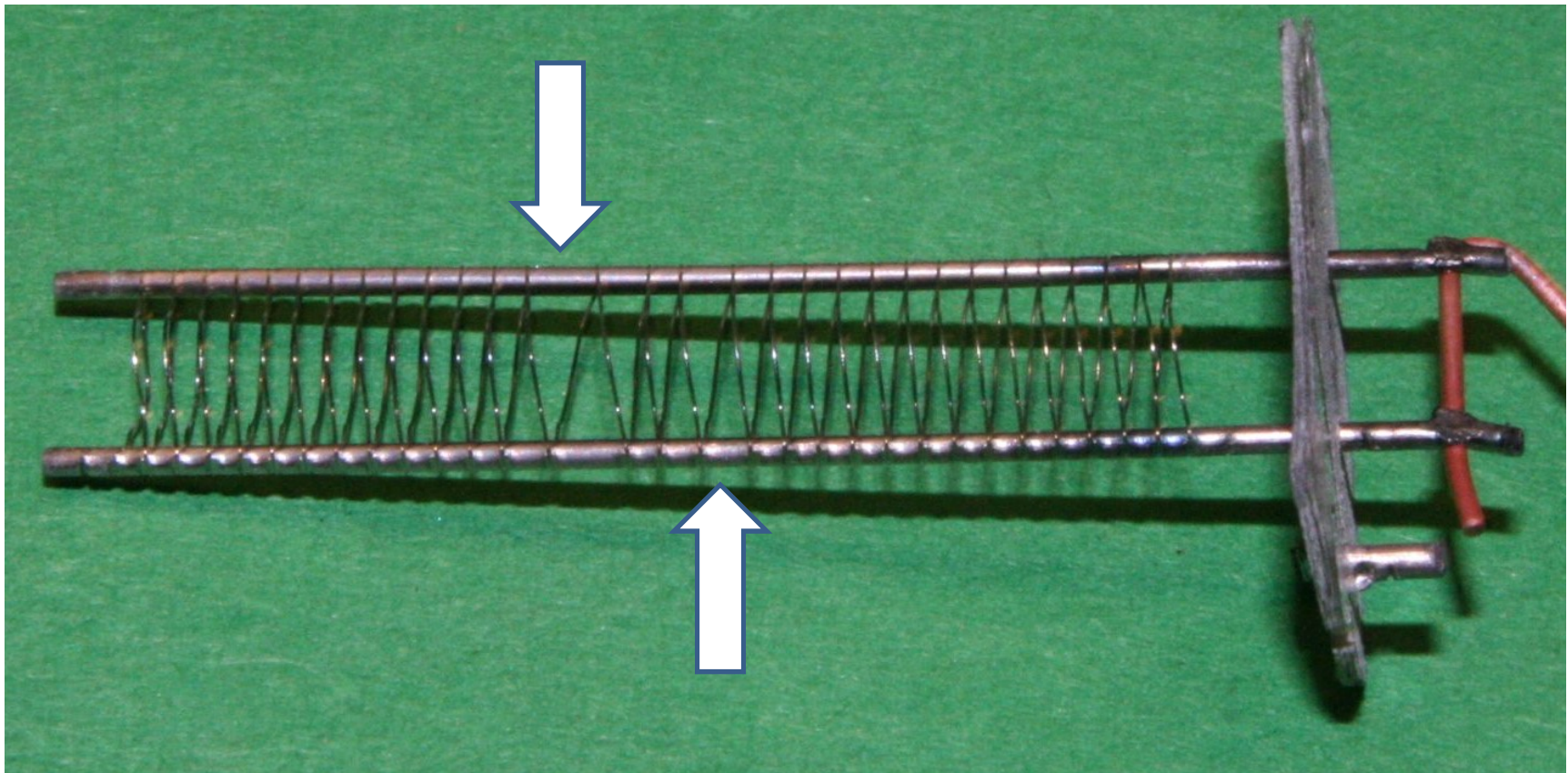
## Typical Operation and Characteristics - Class A<sub>1</sub> Amplifier:

Plate	100	250	volts
Screen	100	100	volts
Grid	-1	-3	volts
Suppressor	Connected to cathode at socket		
Plate Res.	0.12	0.8	approx. megohm
Transconc.	2350	2000	μmhos
Grid Bias for			
transcond. of 10 μmhos	-35	-35	volts
Plate Cur.	13	9.2	ma.
Screen Cur.	4.0	2.6	ma.

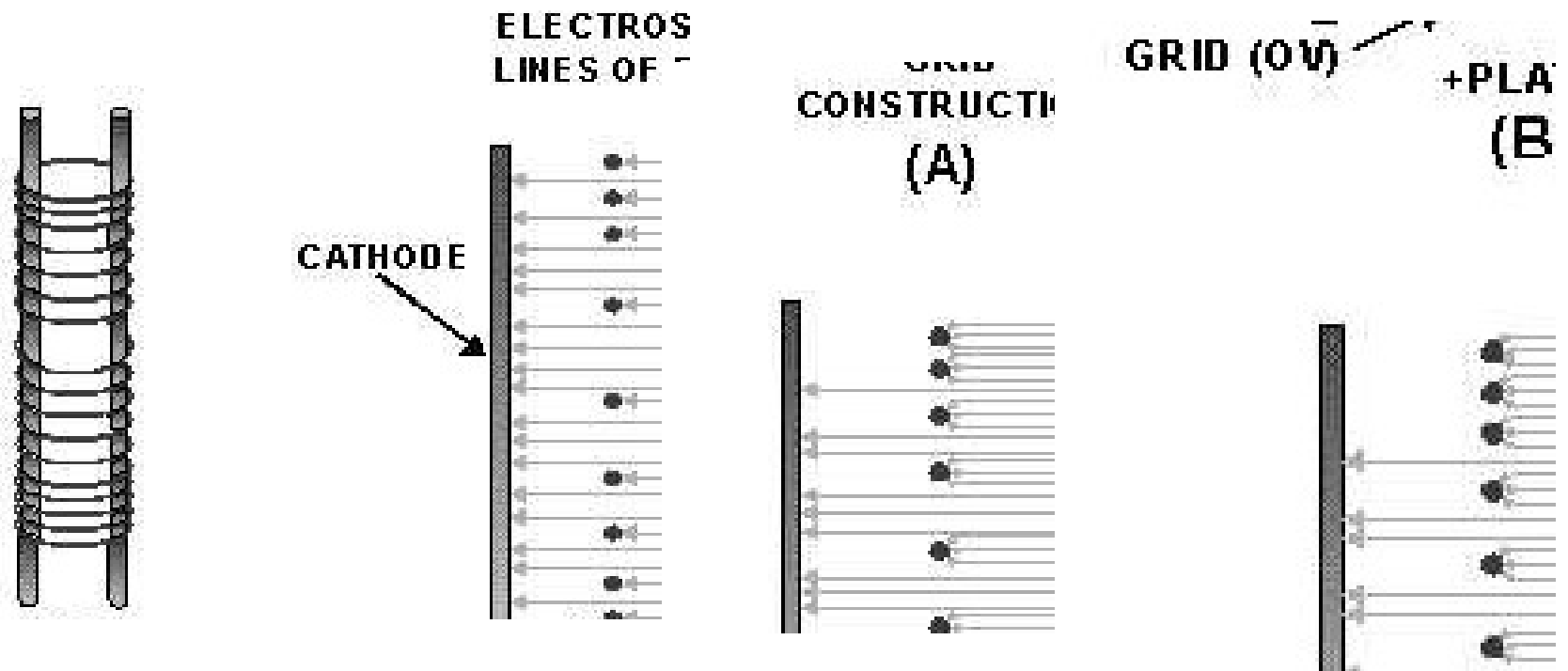


# 6K7 Control Grid

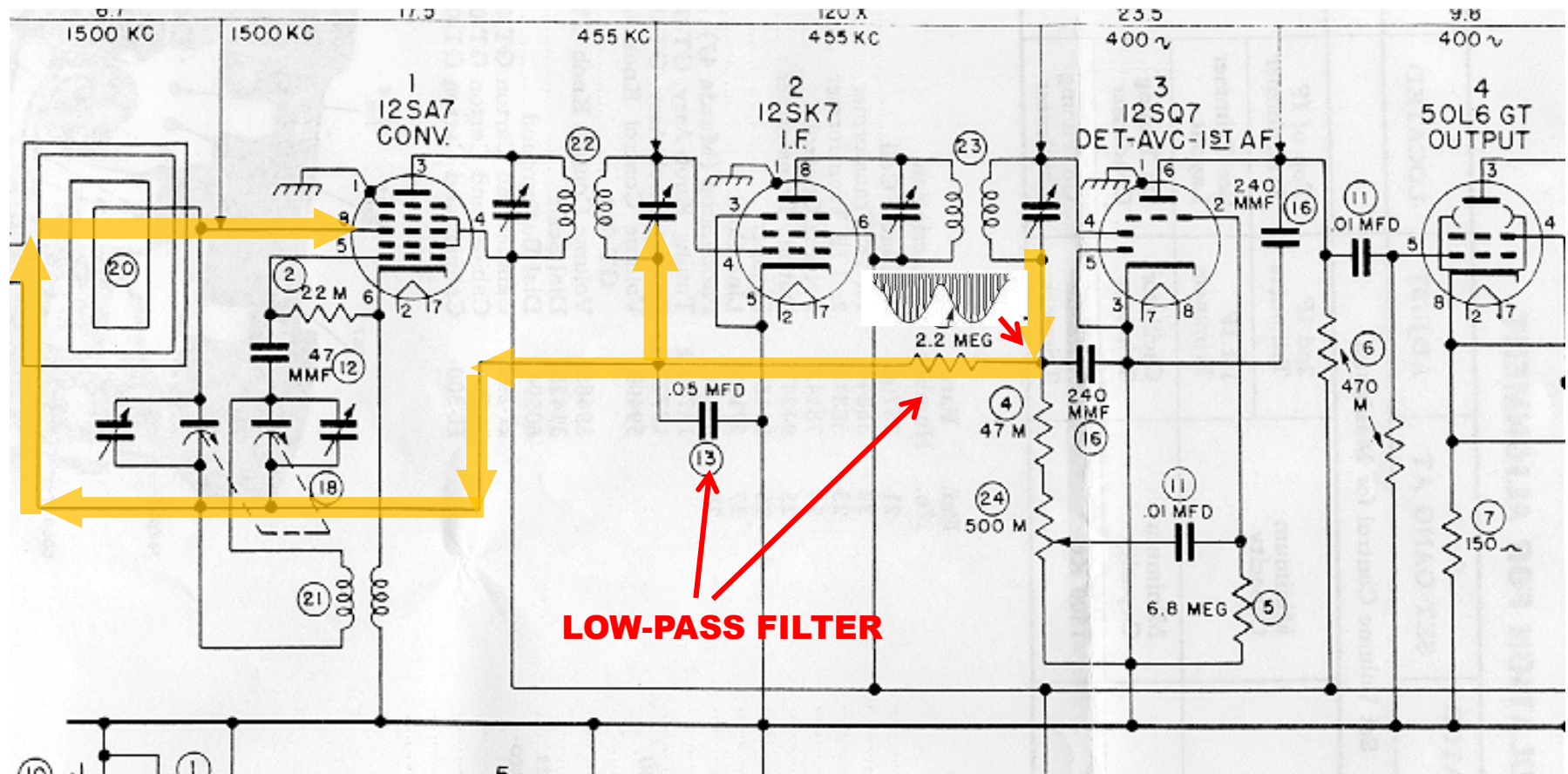
Achieving Remote Cut-off



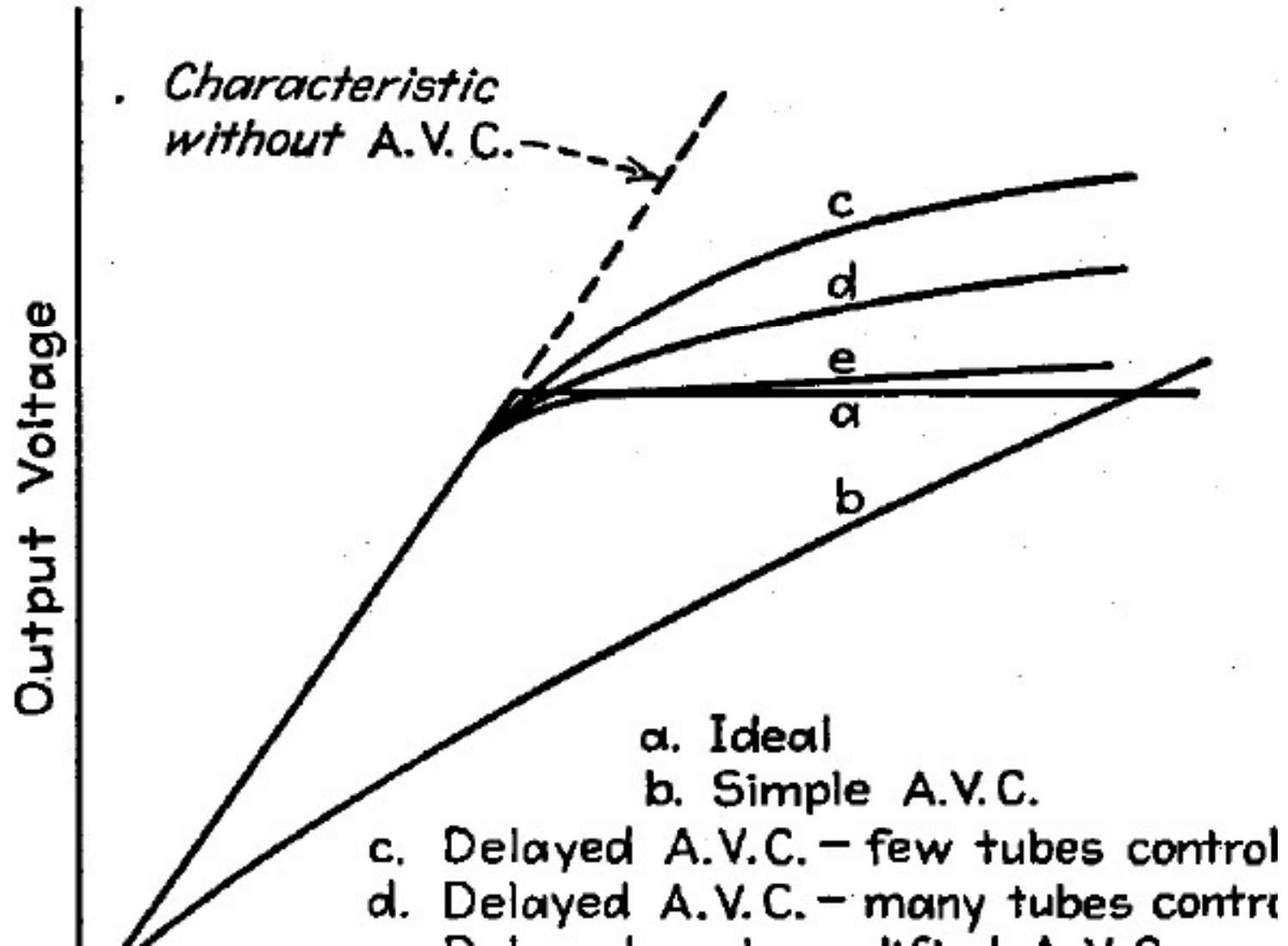
# What's Happening Inside?



# Simple AVC – AA5

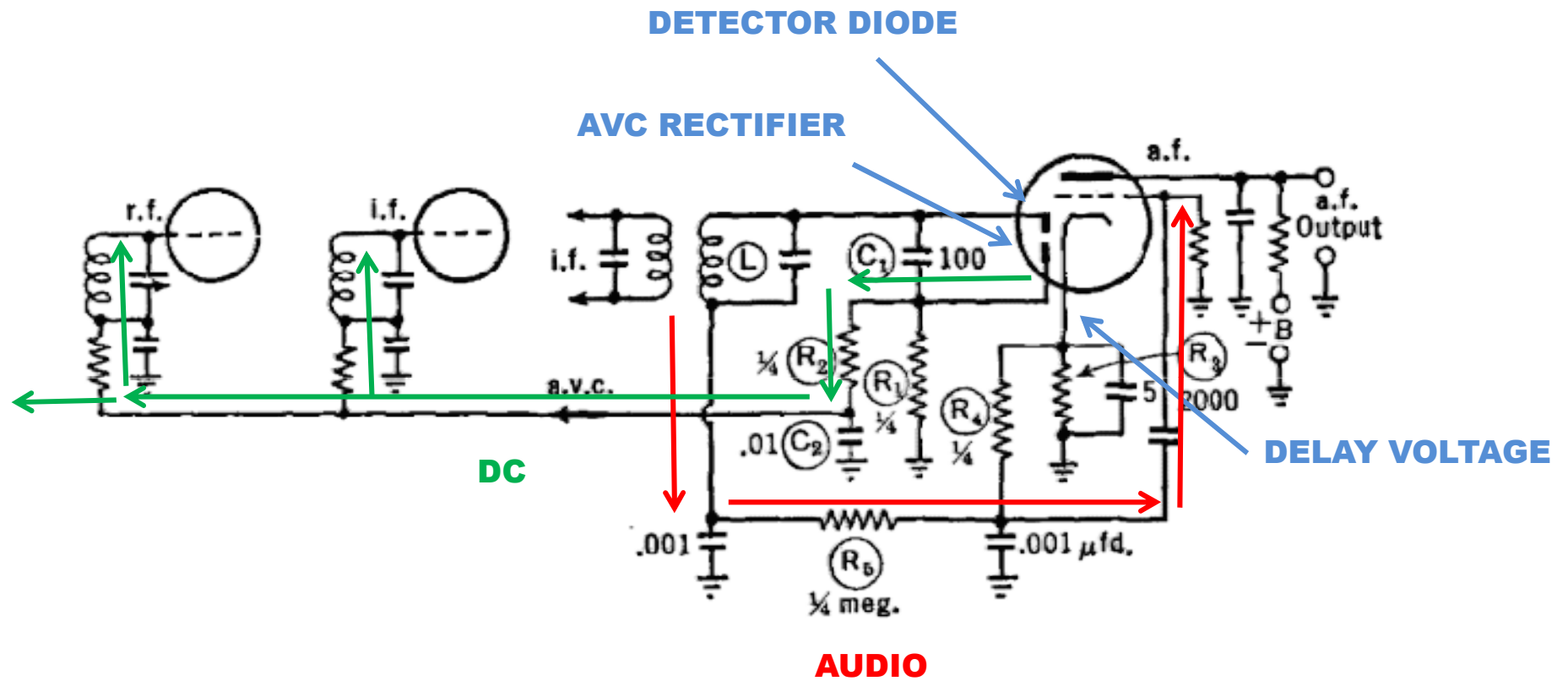


# Delayed AVC

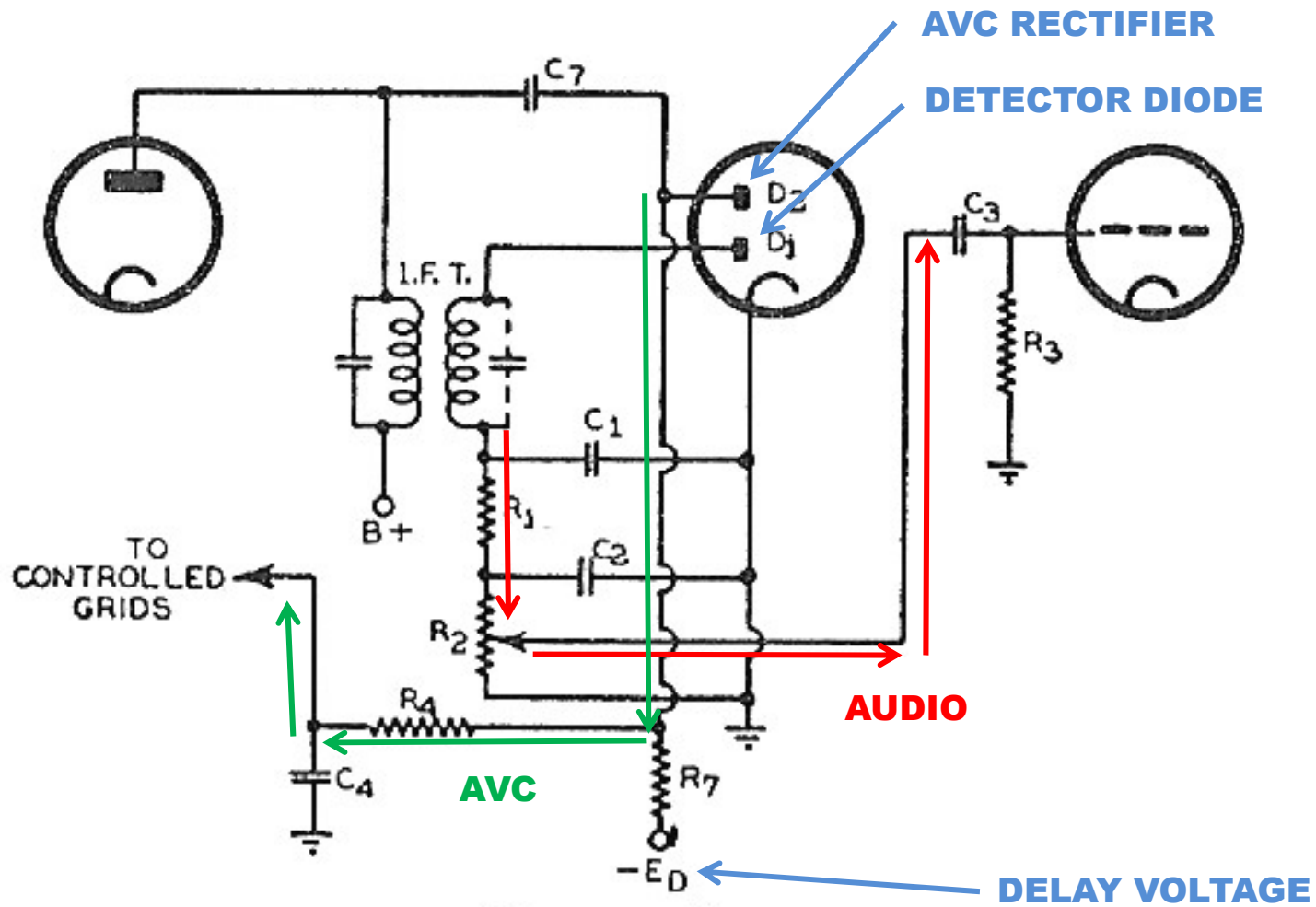




# Delayed AVC

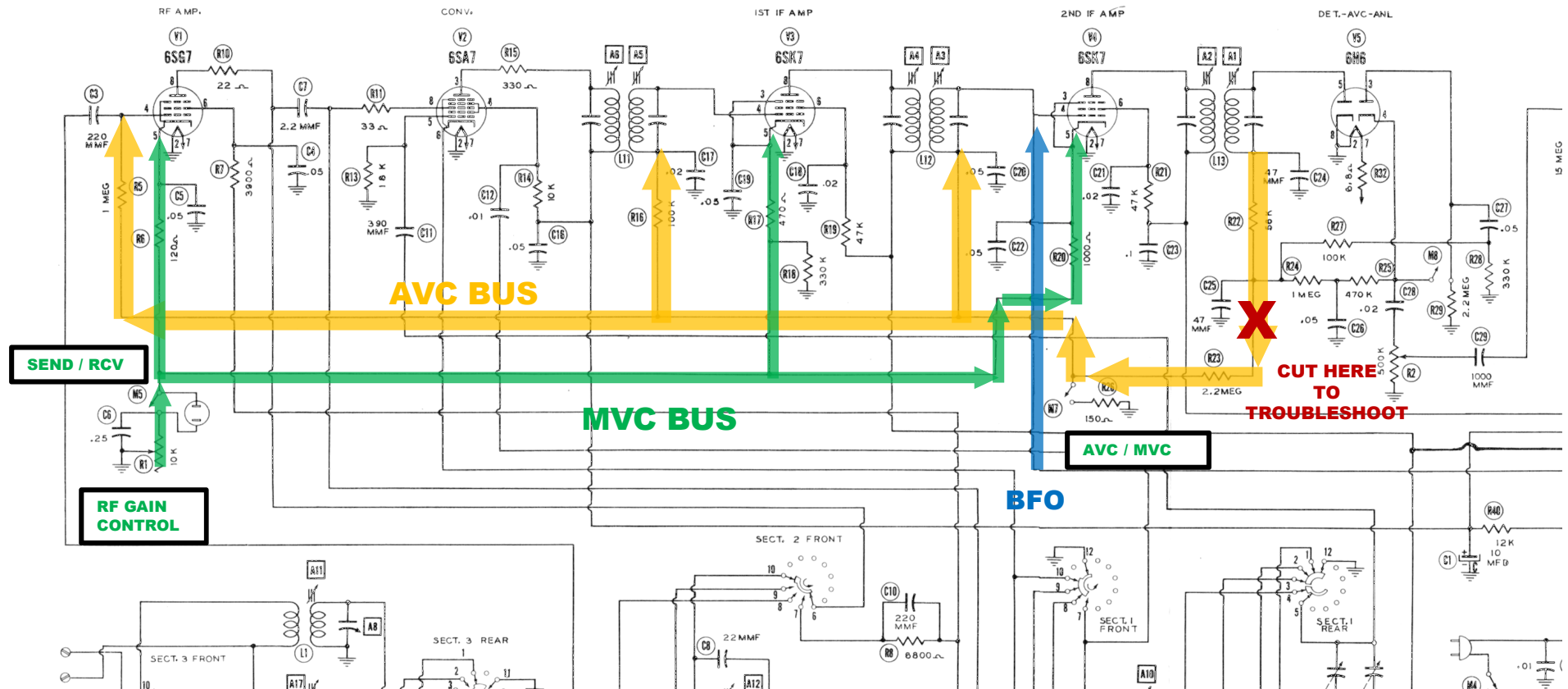


# Delayed AVC

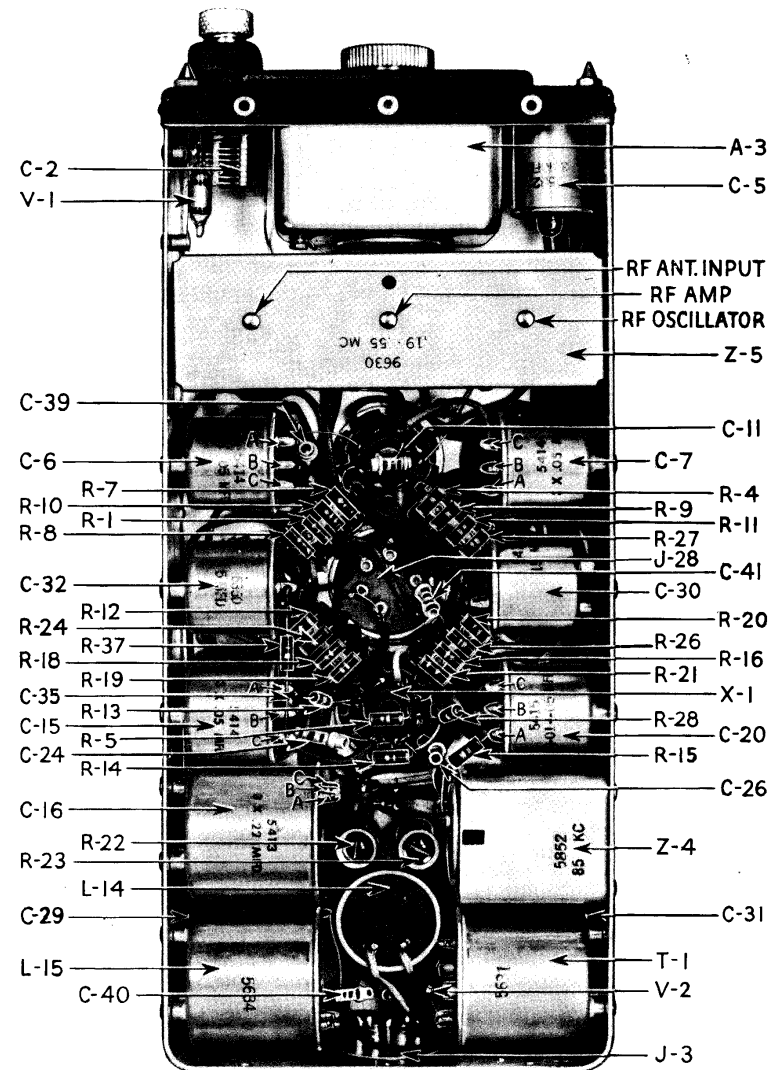


# AVC + MVC

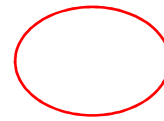
## Hallicrafters S-40 Communication Receiver



# Expedient Repairs



# Expedient Repairs



# Advanced Topics

- Practical AVC for CW and SSB
  - Audio derived AVC
  - “Hang” AVC
    - Fast attack
    - Slow release

# Introduction

## Automatic Volume Control:

It's really easy to become spoiled by modern (post 1930) radios. You tune across the band, and all the stations are there, and none are too loud. It wasn't always this way.

If you play with the Atwater Kent 20C, TRF three-dialer, in the Museum, you'll discover that you not only have to coordinate the three tuning dial, but you must constantly fiddle with the RF/detector filament rheostat to control amplification.

We'll take a look at the history of AVC, and study how it's actually implemented in your radio. The circuit is usually almost invisible on the schematic diagram. We'll also discuss trouble shooting and repair techniques.