AM Receiver and Laser Displayed Spectrum

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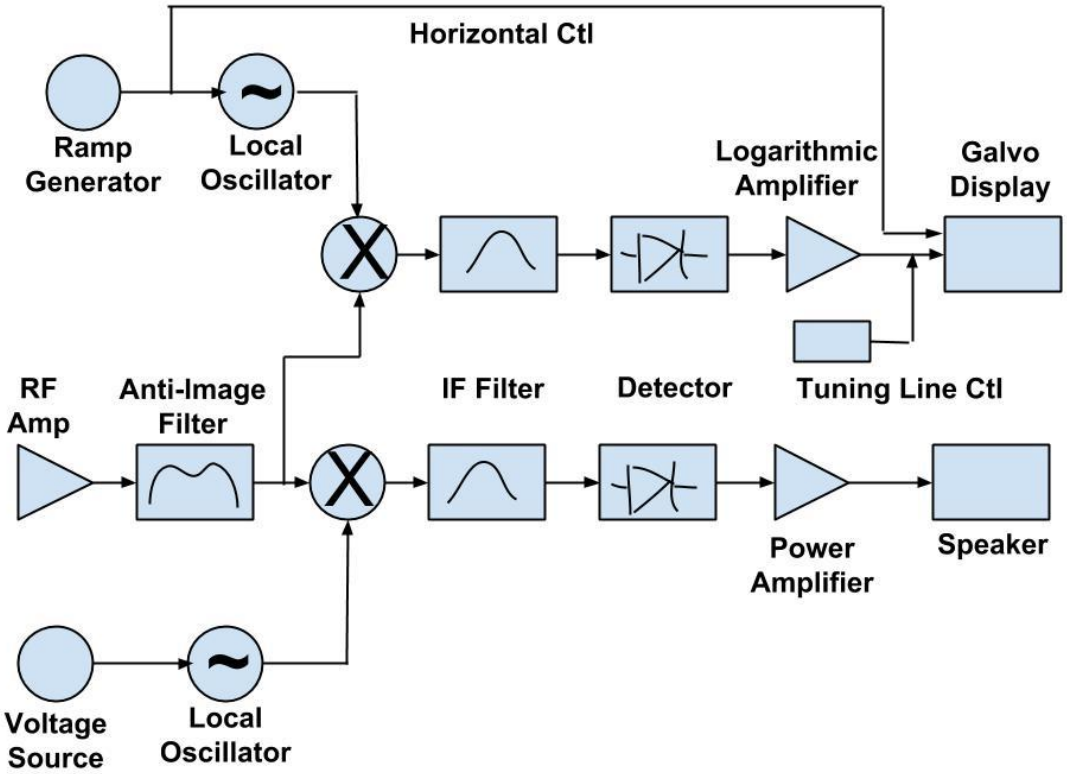
Project Overview

- Superheterodyne AM Receiver
- Laser Displayed Sweep across full AM bandwidth
- Spectrum power for entire bandwidth and line to display tuned channel
- Power Amplifier and Audio

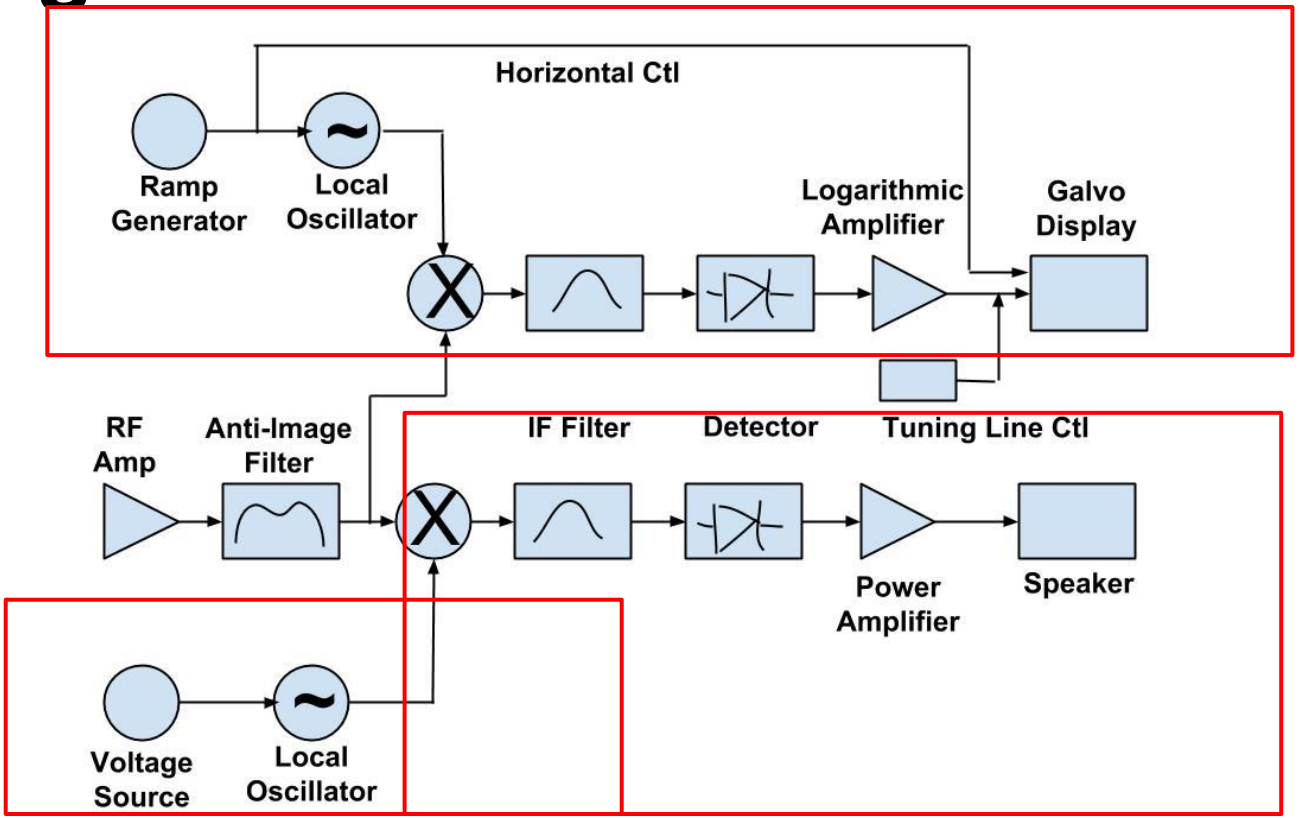
Block Diagram



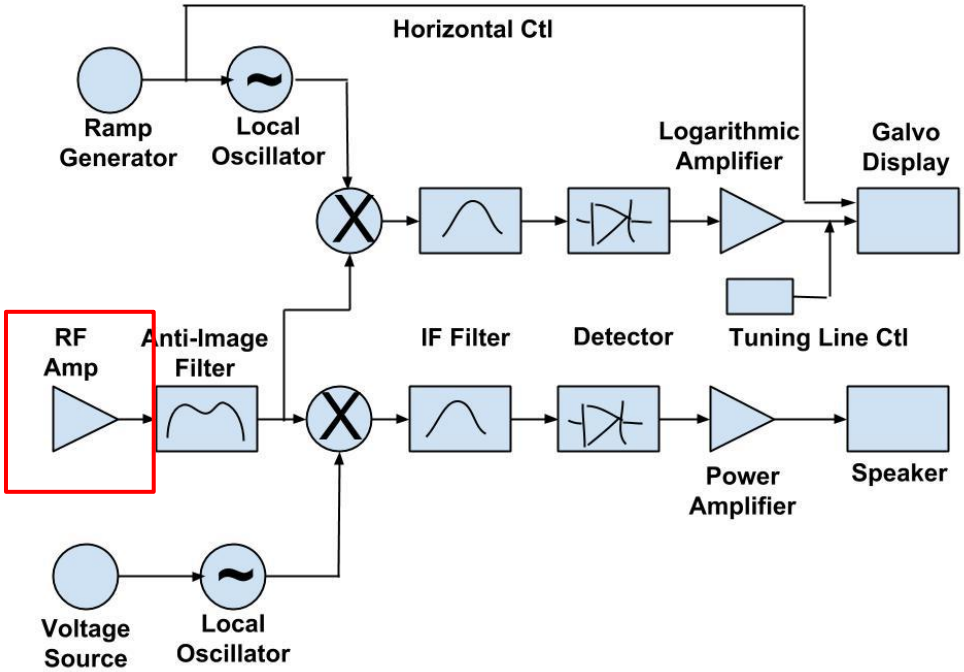
Block Diagram

AM Spectrum Analyzer

AM Receiver and Audio Player

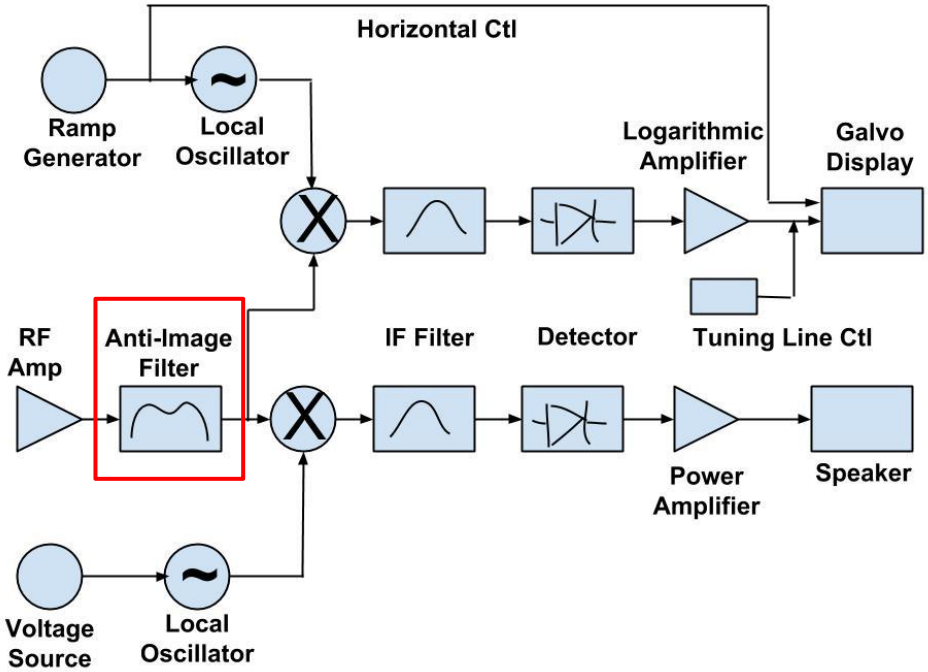


RF Amplifier



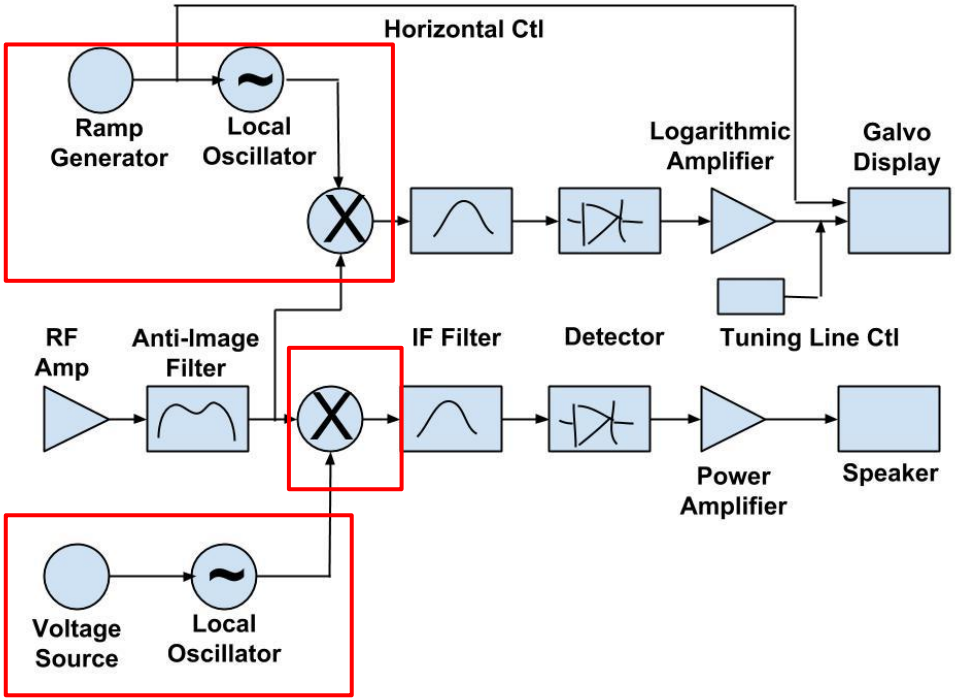
- LNA - Low Noise Amplifier. High bandwidth BJT amplifier to increase the output of antenna

Anti-Imaging Filter



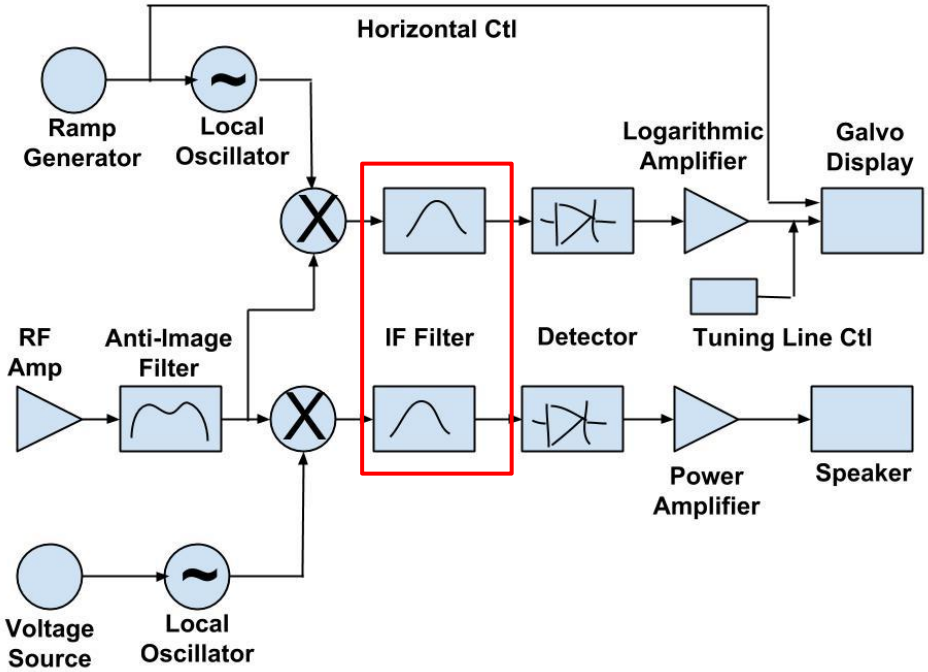
- Band pass filter to isolate only AM spectrum (spectrum of interest)

Mixer and Oscillators



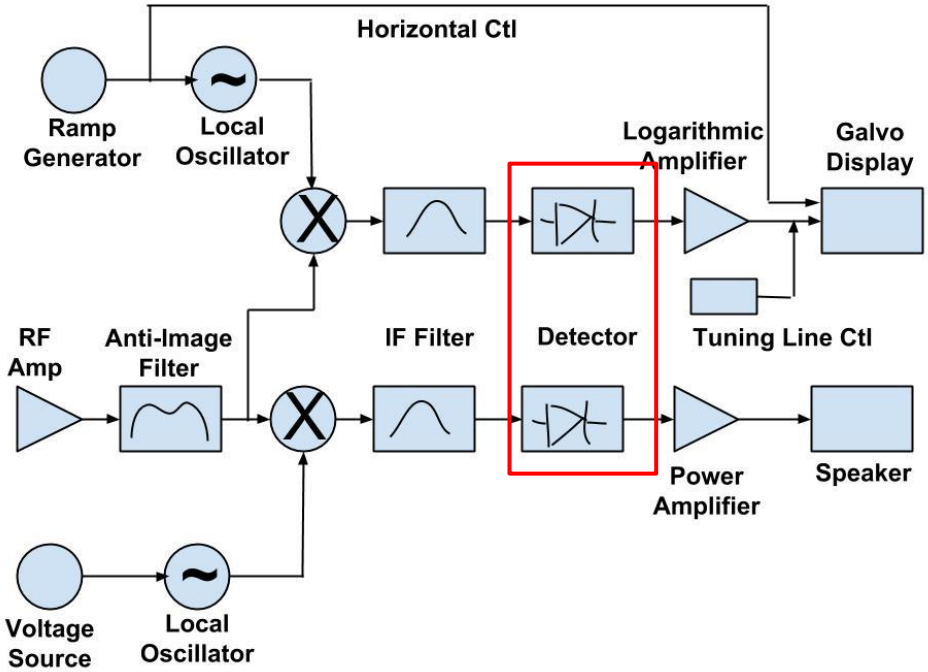
- Mixer - simple diode implementation
- Ramp Generator - fixed frequency sweep variant from lab 6
- Local Oscillator - Voltage controlled oscillator; varactor

IF Filter



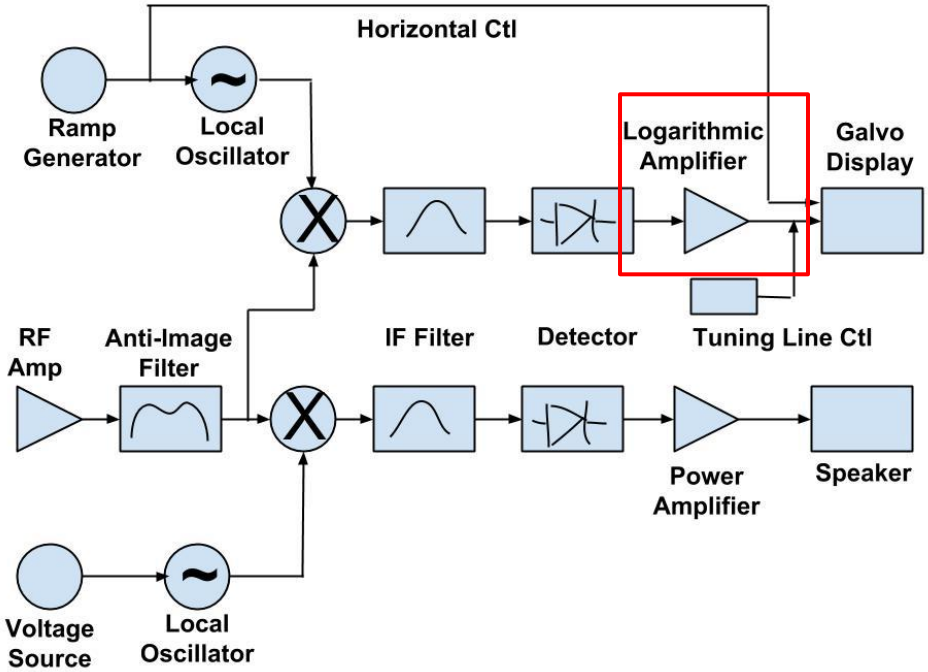
- Filter to isolate only the intermediate frequency (for band selectivity)
- Alternating tuned LC networks and amplifiers, isolated by IF transformers

Detector/Demodulator



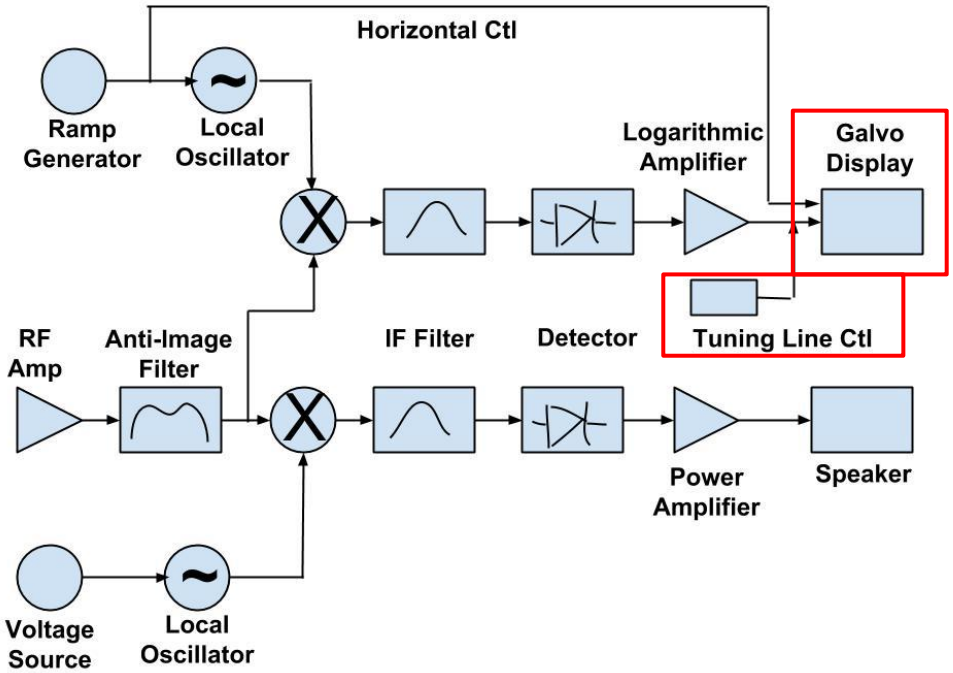
- Rectifier/LPF from lab 1
- Acts as an envelope detector

Logarithmic Amplifier



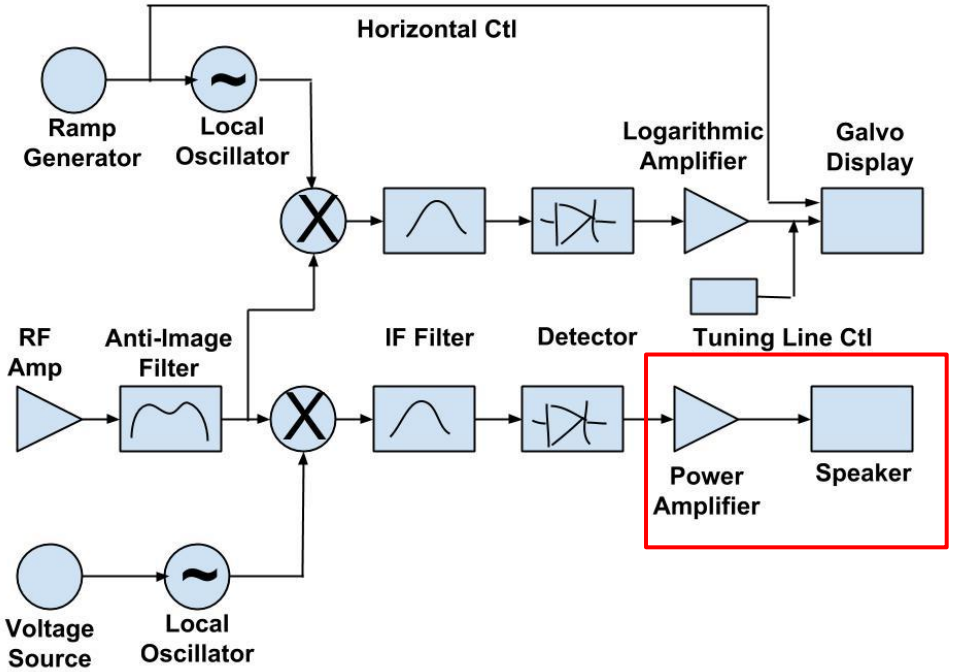
- Amplifier whose output is proportional to the log of the input
- Composed of either bjt/diode circuit or a cascade of identical soft-saturated amps (see HP 8552B)

Galvanometer Display and Tuner



- Two mirrors (X,Y) steer laser.
- X - horizontal sweep synchronized to ramp
- Y - amplitude of signal / pulse generator for current tuning.

Power Amplifier and Speaker



- To be able to hear sweet music
- Takes the demodulated signal and amplifies it with a push-pull to drive a speaker.

Challenges

- Creating two local oscillators that track each other (freq vs voltage curve are the same)
- Logarithmic amplifier that meets specs
- RF amplifier with low enough noise figure to retain AM signal at very low voltages

Timeline

- **Week of April 14th** - Project Design Finalized; Parts Ordered
- **Week of April 21st -** Project integration and debugging
- **Week of April 28th** - Project Debugged; fine tuning and adjustments.
- **Week of May 5th** - Project Checkoff