Technician Licensing Class

Multi-Mode Radio Excitement

Presented by

Amateur Radio Technician Class
Element 2 Course Presentation

ELEMENT 2 SUB-ELEMENTS
(Groupings)

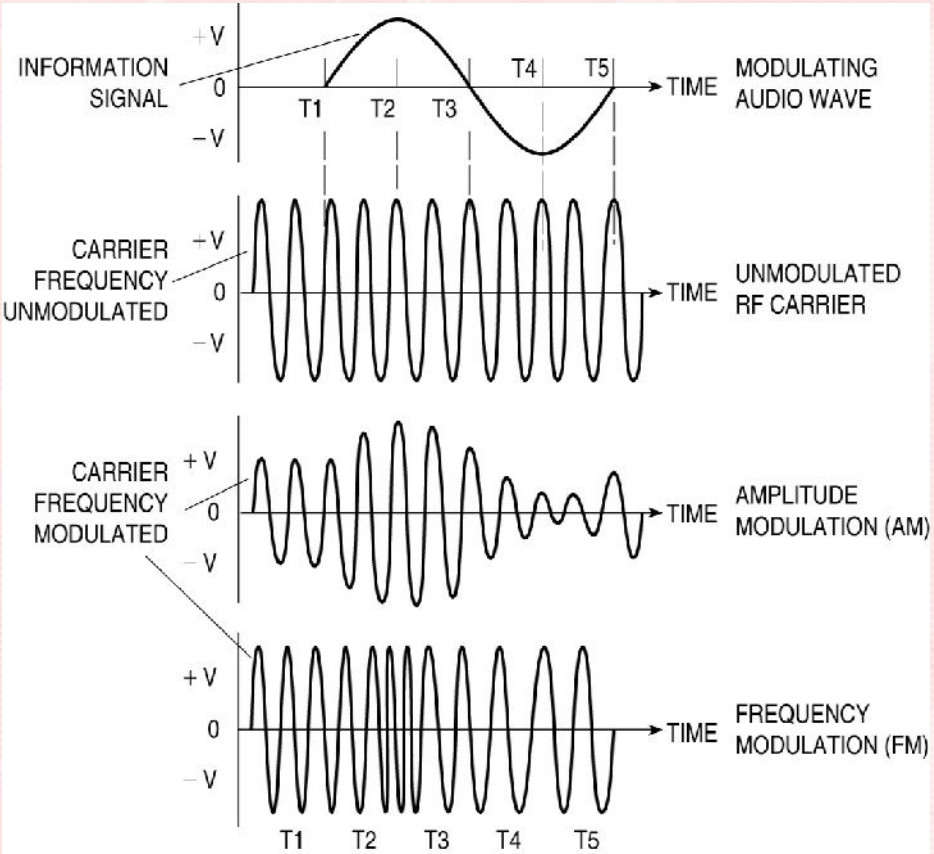
- **About Ham Radio**
- **Call Signs**
- **Control**
- **Mind the Rules**
- **Tech Frequencies**
- **Your First Radio**
- **Going On The Air!**
- **Repeaters**
- **Emergency!**
- **Weak Signal Propagation**

Amateur Radio Technician Class
Element 2 Course Presentation

- **ELEMENT 2 SUB-ELEMENTS (Groupings)**
  - **Talk to Outer Space!**
  - **Your Computer Goes Ham Digital!**
  - **Multi-Mode Radio Excitement**
  - **Run Some Interference Protection**
  - **Electrons – Go With the Flow!**
  - **It's the Law, per Mr. Ohm!**
  - **Go Picture These!**
  - **Antennas**
  - **Feed Me with Some Good Coax!**
  - **Safety First!**

Multi-Mode Radio Excitement

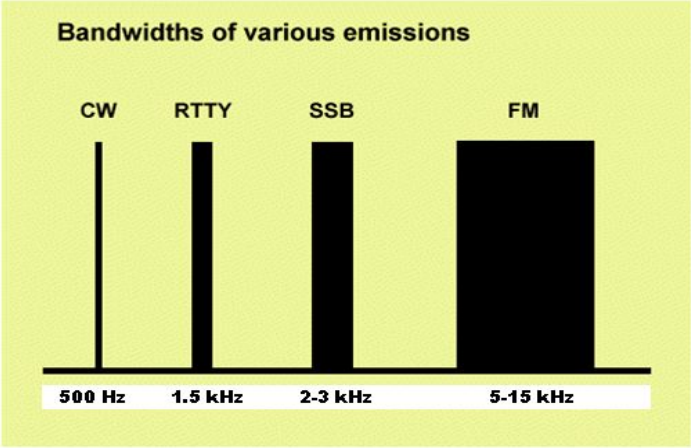
- T7A9 A multi-mode VHF transceiver is most useful for VHF weak-signal communication.



Multi-mode VHF/UHF transceiver

Multi-Mode Radio Excitement

- T8A5 CW is the type of emission that has the narrowest bandwidth.
- T8A11 150 Hz is the approximate maximum bandwidth required to transmit a CW signal.



CW Signal	**500 Hz wide**
SSB Signal	**2 - 3 kHz wide**
FM Signal	**5 - 15 kHz wide**
UHF Fast-Scan TV	**~ 6 MHz**

Multi-Mode Radio Excitement

- T7A5 The function of block 1, if figure T4 is a simple CW transmitter is an oscillator.

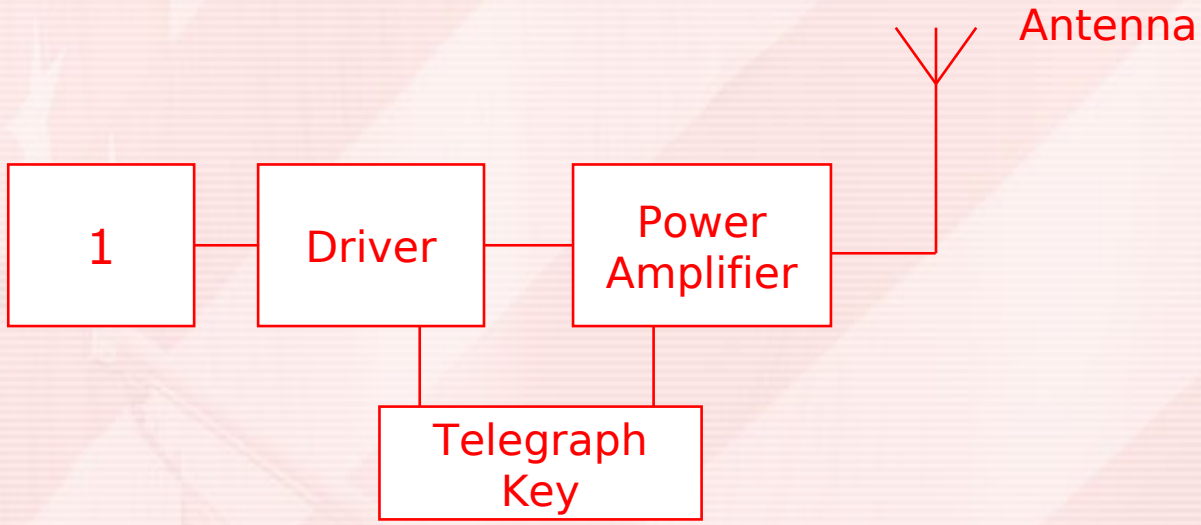


Figure T4

Multi-Mode Radio Excitement

- T4B10 500 Hz is an appropriate receive filter to select in order to minimize noise and interference for CW reception.
  - Bandwidth filters vary for the mode being received.
- T7A2 The type of receiver shown in Figure T6 is a single-conversion superheterodyne.

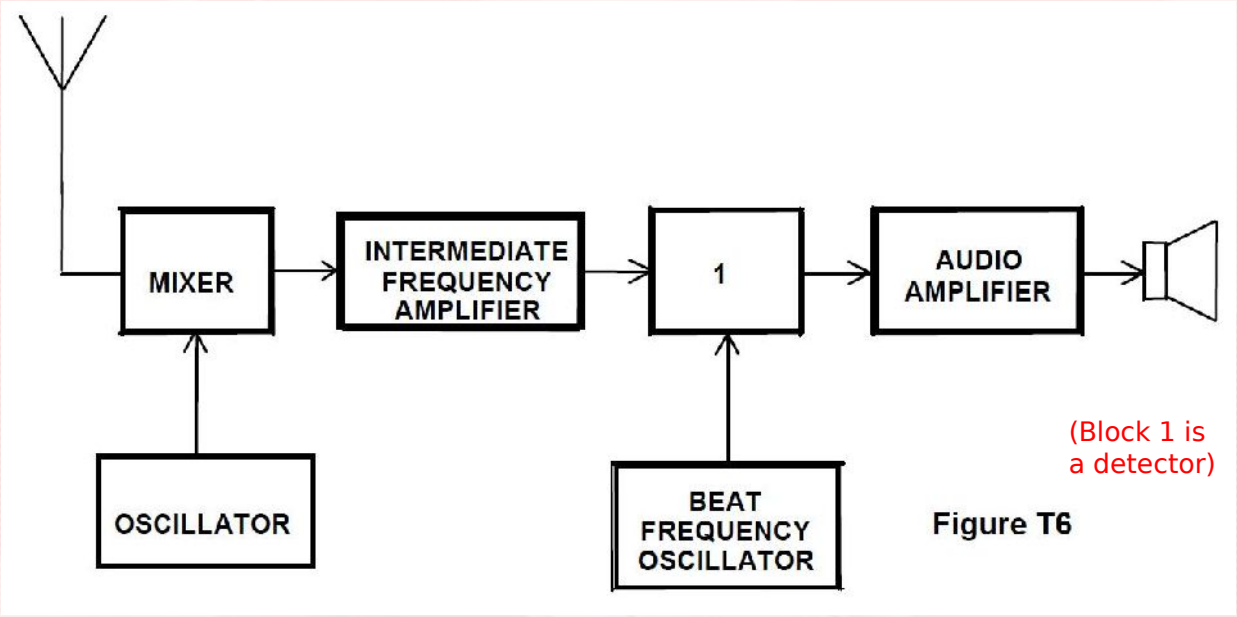


Figure T6

- Single-conversion superhet has only one IF amplifier.

Multi-Mode Radio Excitement

- T7A1 The function of a product detector is to detect CW and SSB signals.
  - Block 1 as a product detector will detect CW and SSB

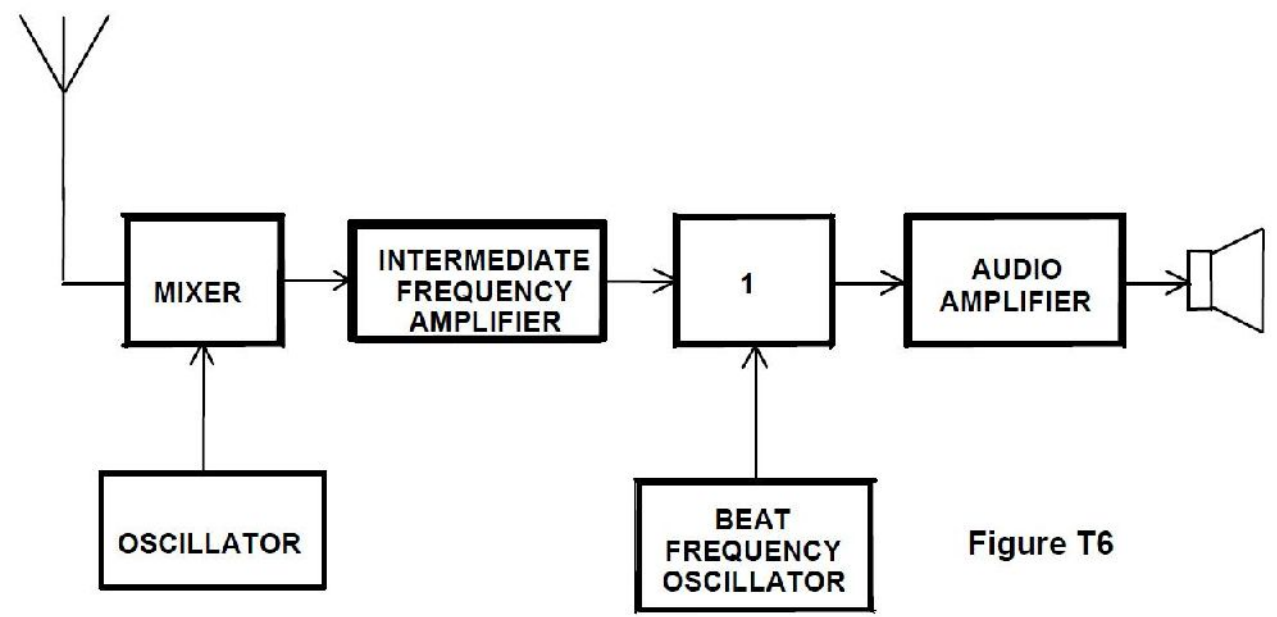
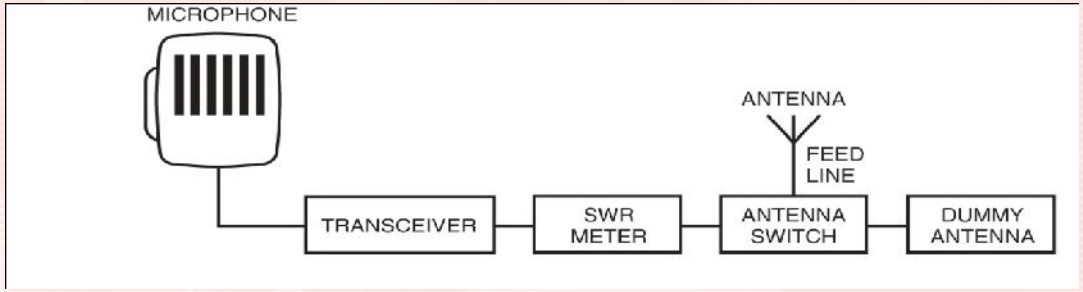


Figure T6

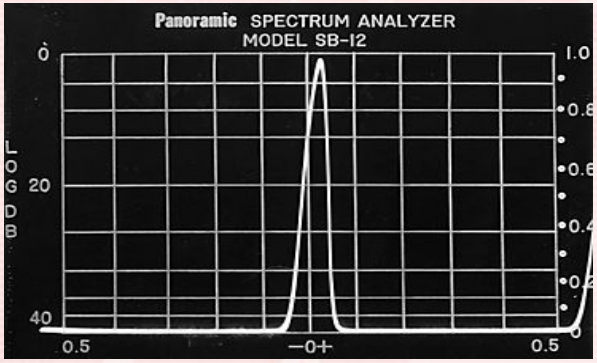
  - A Product detector is necessary in a simple Morse code (CW) and single-sideband (SSB) receiver.

Multi-Mode Radio Excitement

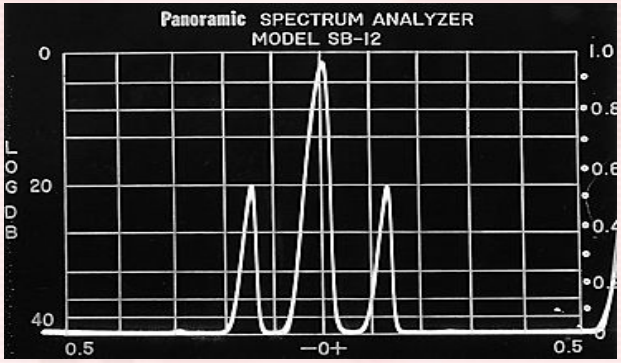
- T8A1 Single sideband is a form of amplitude modulation.



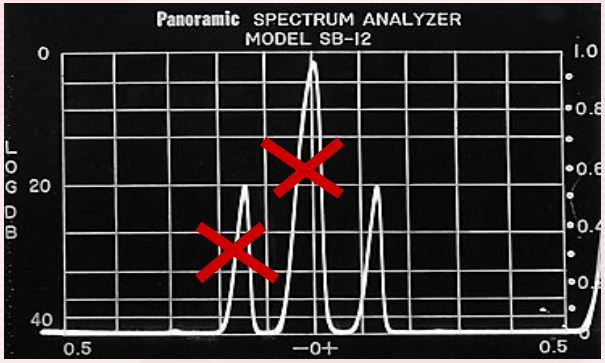
Voice or Phone Station



Carrier only CW



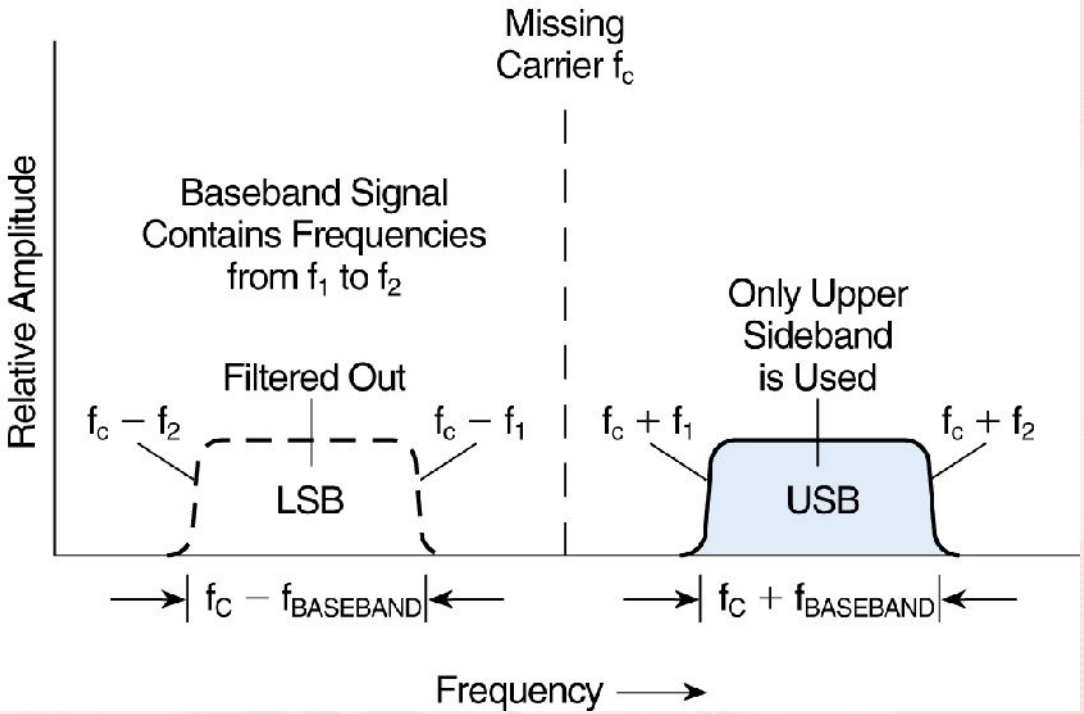
Tones produce both side bands or AM



Remove one sideband and suppress carrier becomes SSB

Multi-Mode Radio Excitement

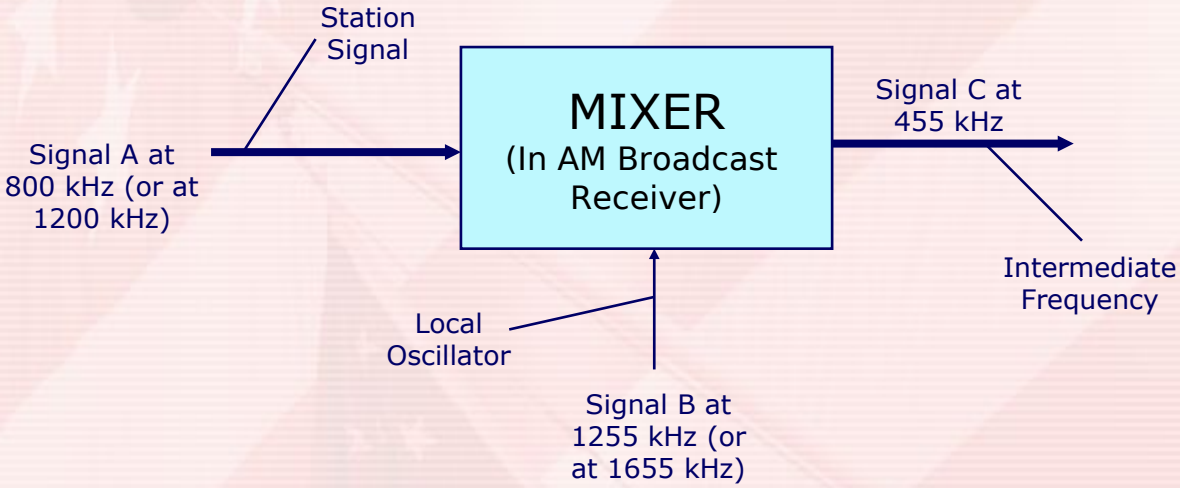
- T8A8 3 kHz is the approximate bandwidth of a single sideband voice signal.



SSB signals are Amplitude Modulated (AM) with the carrier and one sideband suppressed.

Multi-Mode Radio Excitement

- T7A8 A circuit that combines a speech signal and an RF carrier is a modulator.
- T7A3 The function of a mixer in a superheterodyne receiver is to shift the incoming signal to an intermediate frequency.



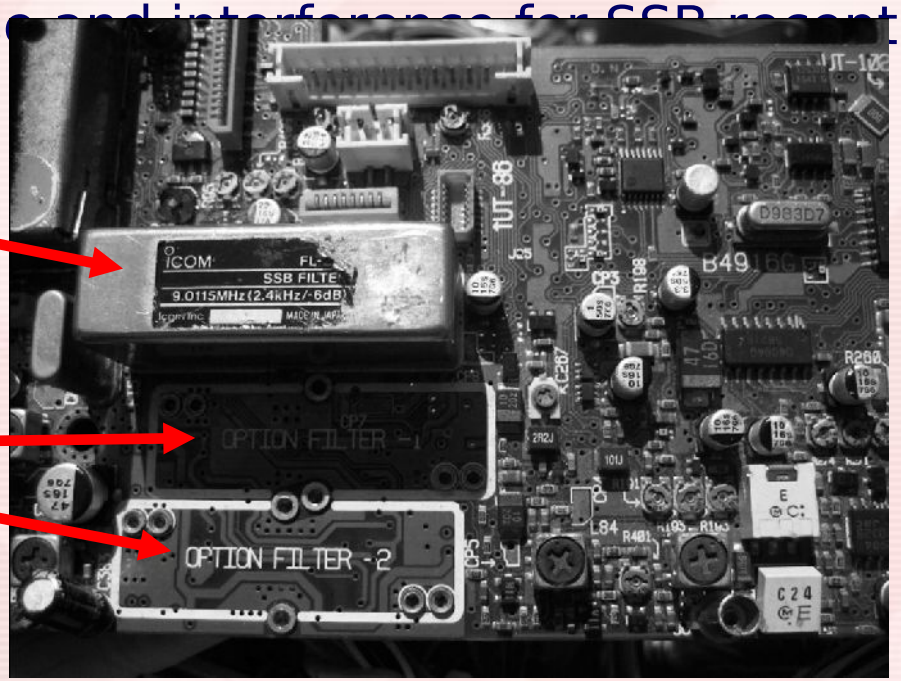
Block Diagram of an AM Broadcast Receiver Mixer

Multi-Mode Radio Excitement

- T4B8 The advantage of having multiple receive bandwidth choices on a multimode transceiver will permit noise or interference reduction by selecting a bandwidth matching the mode.
- T4B9 2400 Hz is an appropriate receive filter to select in order to minimize noise and interference for SSB reception.

SSB Filter

Slots for optional filters



Receiver section in a communications transceiver

Multi-Mode Radio Excitement

- T4B6 The receiver RIT or clarifier controls could be used if the voice pitch of a single-sideband signal seems too high or low.
- T4B7 The term "RIT" means **R**eceiver **I**ncremental **T**uning.

Set knob to neutral, press RIT button to turn on function, and then adjust slightly for proper SSB voice reception

RIT adjusts voice pitch, not the frequency of received station.

Multi-Mode Radio Excitement

- T7A13 An RF preamplifier is installed between the antenna and receiver.
- T7B2 In reference to a receiver, interference by very strong signals causes fundamental overload.

Good TV reception.

Front end overloaded TV reception

- T7A12 Selectivity is the term that describes the ability of a receiver to discriminate between multiple signals

Multi-Mode Radio Excitement

- T2B5 The amplitude of the modulating signal determines the amount of deviation of an FM signal.
- T2B6 When the deviation of an FM transmitter is increased its signal occupies more bandwidth.
- T7A4 The circuit pictured in Figure T7, if block 1 is a frequency discriminator, is an FM receiver.

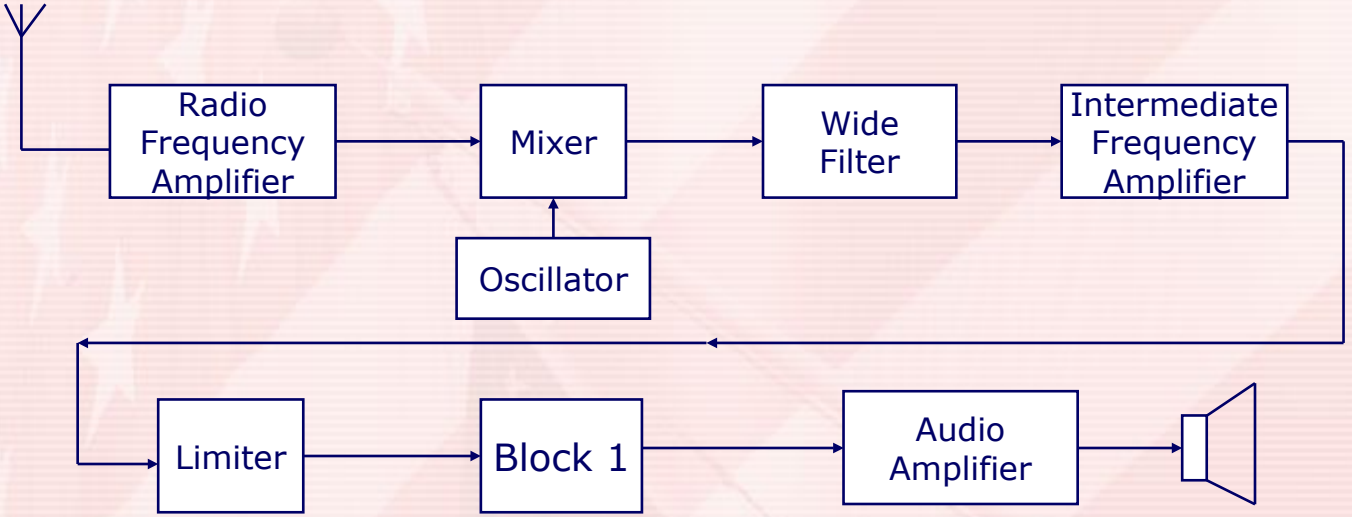
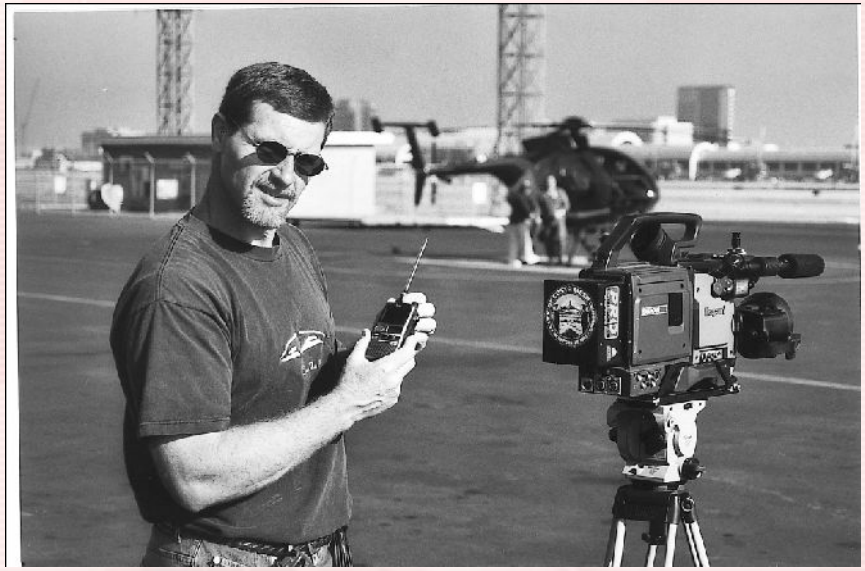


Figure T7

Multi-Mode Radio Excitement

- T7A11 A discriminator demodulates FM signals.
- T8A10 The typical bandwidth of analog fast-scan TV transmissions on the 70 cm band about 6 MHz.



Amateur TV signals can be received on a variety of equipment – even a small hand-held monitor.

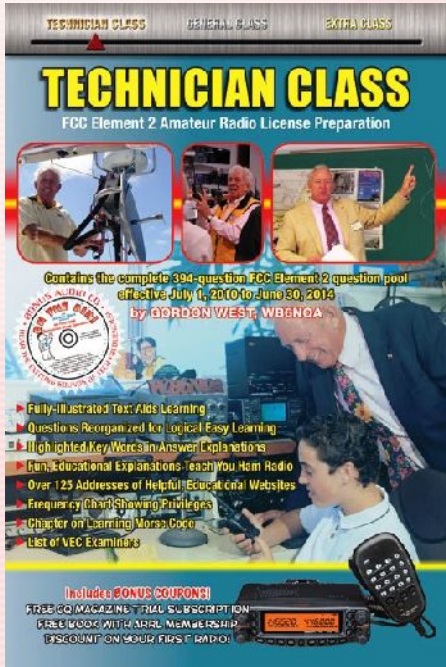
Element 2 Technician Class Question Pool

Multi-Mode Radio Excitement

Valid July 1, 2010

Through

June 30, 2014



T7A09 Which of the following devices is most useful for VHF weak-signal communication?

A. A quarter-wave vertical antenna
B. A multi-mode VHF transceiver
C. An omni-directional antenna
D. A mobile VHF FM transceiver

T8A05 Which of the following types of emission has the narrowest bandwidth?

A. FM voice
B. SSB voice
C. CW
D. Slow-scan TV

T8A11 What is the approximate maximum bandwidth required to transmit a CW signal?

A. 2.4 kHz
B. 150 Hz
C. 1000 Hz
D. 15 kHz

T7A05 What is the function of block 1 if figure T4 is a simple CW transmitter?

A. Reactance modulator
B. Product detector
C. Low-pass filter
D. Oscillator

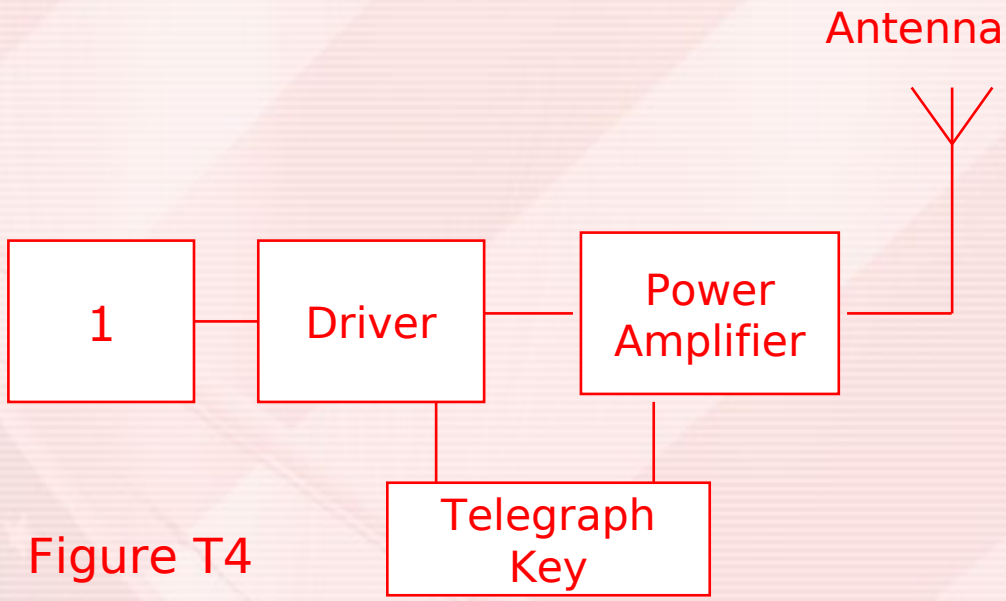


Figure T4

T4B10

receive

Which of the following is an appropriate filter to select in order to minimize noise and interference for CW reception?

A. 500 Hz
B. 1000 Hz
C. 2400 Hz
D. 5000 Hz

T7A02 What type of receiver is shown in Figure T6?

A. Direct conversion
B. Super-regenerative
C. Single-conversion superheterodyne
D. Dual-conversion superheterodyne

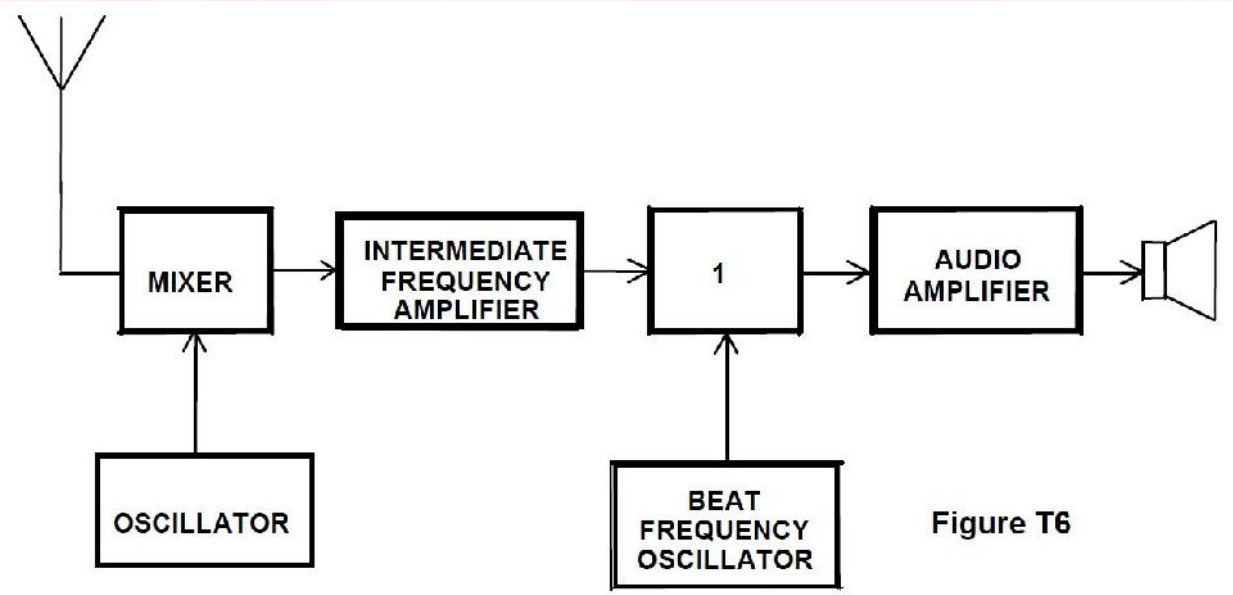


Figure T6

T7A01 What is the function of a product detector?

A. Detect phase modulated signals
B. Demodulate FM signals
C. Detect CW and SSB signals
D. Combine speech and RF signals

T8A01 Which of the following is a form of amplitude modulation?

A. Spread-spectrum
B. Packet radio
C. Single sideband
D. Phase shift keying

T8A08 What is the approximate bandwidth of a single sideband voice signal?

A. 1 kHz
B. 3 kHz
C. 6 kHz
D. 15 kHz

T7A08 Which of the following circuits combines a speech signal and an RF carrier?

A. Beat frequency oscillator
B. Discriminator
C. Modulator
D. Noise blanker

T7A03 What is the function of a mixer in a superheterodyne receiver?

A. To reject signals outside of the desired passband
B. To combine signals from several stations together
C. To shift the incoming signal to an intermediate frequency
D. To connect the receiver with an auxiliary device, such as a TNC

T4B08 What is the advantage of having multiple receive bandwidth choices on a multimode transceiver?

A. Permits monitoring several modes at once
B. Permits noise or interference reduction by selecting a bandwidth matching the mode
C. Increases the number of frequencies that can be stored in memory
D. Increases the amount of offset between receive and transmit frequencies

T4B09

receive

Which of the following is an appropriate filter to select in order to minimize noise and interference for SSB reception?

A. 500 Hz
B. 1000 Hz
C. 2400 Hz
D. 5000 Hz

T4B06 Which of the following controls could be used if the voice pitch of a single-sideband signal seems too high or low?

A. The AGC or limiter
B. The bandwidth selection
C. The tone squelch
D. The receiver RIT or clarifier

T4B07 What does the term "RIT" mean?

A. Receiver Input Tone
B. Receiver Incremental Tuning
C. Rectifier Inverter Test
D. Remote Input Transmitter

T7A12 Which term describes the ability of a receiver to discriminate between multiple signals?

A. Tuning rate
B. Sensitivity
C. Selectivity
D. Noise floor

T7B02 What is meant by fundamental overload in reference to a receiver?

A. Too much voltage from the power supply
B. Too much current from the power supply
C. Interference caused by very strong signals
D. Interference caused by turning the volume up too high

T7A13 Where is an RF preamplifier installed?

A. Between the antenna and receiver
B. At the output of the transmitter's power amplifier
C. Between a transmitter and antenna tuner
D. At the receiver's audio output

T2B05 What determines the amount of deviation of an FM signal?

A. Both the frequency and amplitude of the modulating signal
B. The frequency of the modulating signal
C. The amplitude of the modulating signal
D. The relative phase of the modulating signal and the carrier

T2B06 What happens when the deviation of an FM transmitter is increased?

A. Its signal occupies more bandwidth
B. Its output power increases
C. Its output power and bandwidth increases
D. Asymmetric modulation occurs

T7A04 What circuit is pictured in Figure T7, if block 1 is a frequency discriminator?

A. A double-conversion receiver
B. A regenerative receiver
C. A superheterodyne receiver
D. An FM receiver

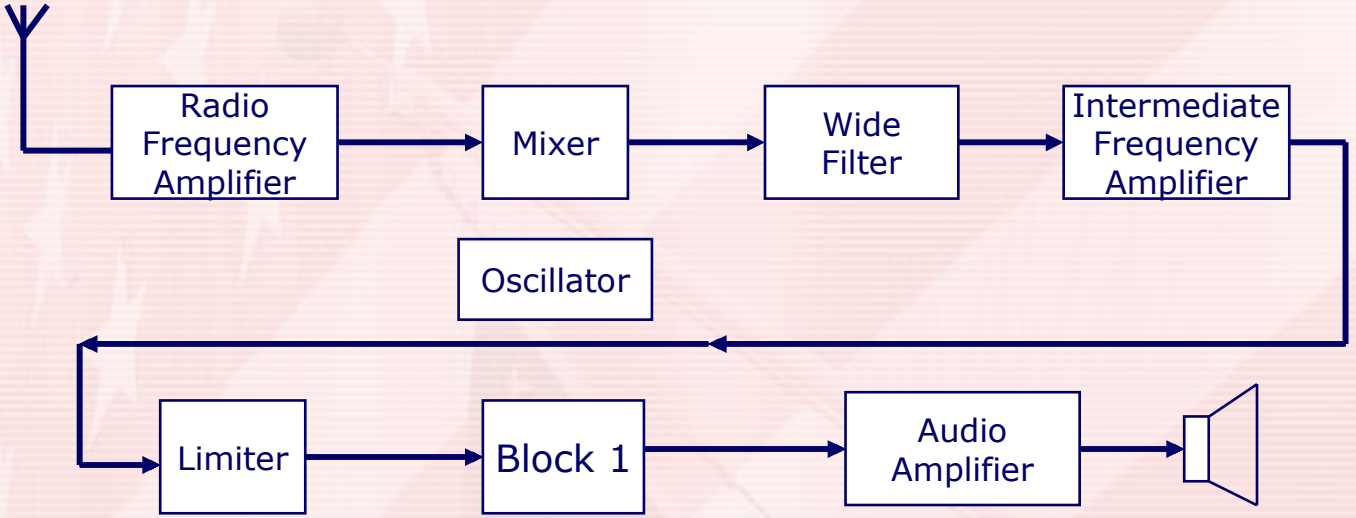


Figure T7

T7A11 Which of the following circuits demodulates FM signals?

A. Limiter
B. Discriminator
C. Product detector
D. Phase inverter

T8A10 What is the typical bandwidth of analog fast-scan TV transmissions on the 70 cm band?

A. More than 10 MHz
B. About 6 MHz
C. About 3 MHz
D. About 1 MHz