Technician License Course

Chapter 5

Section 5.2

Transmitters and Receivers (Transceivers)

Generalized Transceiver Categories

• Mobile	VHF/UHF FM
• Single Band	VHF or UHF FM
• Dual Band	VHF/UHF FM
• All Band	HF and VHF/UHF
• Multimode	VHF/UHF CW/SSB/FM
• Handheld (HT)	

Single-Band Mobile

- Single-band, 2 meter is a good starter radio.
- Operates from 13.8 volts dc, requires external power supply or car battery.
- Requires an external antenna.
- Can be operated mobile or as a base station.
- Limited to frequency modulation (FM) and usually either 2 meters or 70 cm bands.
- Up to approximately 50 watts output.

Dual-Band Mobile

- Same as the single-band transceiver but includes additional band(s).
- Most common are 2 meter and 70 cm bands.
- Could add 6 meters, 222 MHz or 1.2 GHz.
- Might have separate antenna connections for each band or a single connection for a dual-band antenna

Multimode Transceiver

- Nearly all HF rigs are multimode.
- VHF multimode operates on FM plus AM/SSB/CW modes.
- Required for “weak-signal” operation on VHF/UHF.
- More features add complexity and cost.
- More flexibility will allow you to explore new modes as you gain experience.

Multiband Transceiver

- Covers many bands – usually refers to coverage of HF + VHF/UHF.
- Also covers all modes.
- Frequently 100 watts on HF, some power limitations on high bands (25–50 watts).
- Larger units have internal power supplies, smaller units need external power supply.

Handheld (HT) Transceiver

- Small handheld FM units.
- Can be single band or dual band.
- Limited power (usually 5 watts or less).
- Includes power (battery) and antenna in one package.
- Often purchased as a starter rig but low power limits range.

Handheld (HT) Transceiver

- Single, dual and multiband versions (with increasing cost and complexity).
- Some can receive outside the ham bands, such as aircraft, commercial FM broadcast, etc.
- Very portable and self-contained.
- Internal microphone and speaker.
- Rubber duck antenna.
- Battery powered.

Handheld (HT) Transceiver

- Extra battery packs
  - AA cell pack useful in emergencies
- Drop-in, fast charger
- Extended antenna
- External microphone and speaker
- Headset

Side-by-Side

	Single Band	Dual Band	Multimode	Multiband	Handheld
Freq Agility	Limited	Medium	Medium	Full	Limited
Functionality	Limited	Limited	Full	Full	Limited
Ease of Use	Easy	Medium	Medium	Difficult	Easy
Programming	Easy	Easy	Medium	Challenging	Easy/Medium
Power	Low	Low	Medium	High	Low
Cost	Low	Modest	High	High	Low

Band and Frequency Selection

Band and Frequency Selection

- Fundamental to all amateur transceivers
- Can set by VFO (continuously variable) or by keypad “direct” entry
- Memories can generally store:
  - Frequency
  - Mode
  - Filter and similar settings
  - Alphanumeric labels

Transmitter Functions

Transmitter Functions

- Main tuning display (both TX and RX):
  - Controls the frequency selection via the variable frequency oscillator (VFO).
  - Frequency can be set with a knob or keypad or programmed channels.

Transmitter Functions

- Main tuning display (both TX and RX):
  - Variable frequency step size (tuning rate, resolution).
  - Rigs can usually store the information for two operating frequencies (VFO A and VFO B).

Transmitter Functions

- Mode selector (both TX and RX for multimode rigs).
  - AM/FM/SSB (LSB or USB)
  - CW
  - Data (RTTY or PSK)
- Could be automatic based on recognized band plan.

Transmitter Functions

- Microphone controls
  - Gain
    - Controls transmitter sensitivity to your voice
  - Speech Compressor or Speech Processor
    - Increases microphone gain at lower sound levels to increase overall signal strength or “punch”.

Transmitter Functions

- Too much gain or compression can cause problems
  - Splatter
  - Over-deviation
  - Over-modulation
- Speak more softly or pull the mic away

Transmitter Functions

- Automatic Level Control (ALC)
  - Automatically limits speech modulation, reducing transmitter over-drive
  - Causes some speech distortion
  - Do NOT use for data modes like PSK
- Prevents overdrive to external power amplifier

Transmitter Functions

- PTT (Push-To-Talk)
  - Button on microphone
  - Activates transmitter
- VOX (Voice-operated transmitter)
  - Voice activated transmitter
  - Don’t have to press the PTT

Transmitter Functions

- Straight Key
  - Manually form dots & dashes
  - “Hand keying”
- Electronic Keyer
  - Electronically creates dots & dashes
  - Usually interfaced with computer

Transmitter Functions

- Dummy Load
  - Test Device
  - Allows you to transmit without inter-ferring with others
  - Big resistor that dissipates the heat generated

Receiver Functions

Receiver Functions

- AF Gain or Volume
  - Controls the audio level to the speaker or headphones
- RF Gain
  - Controls the gain of the receiver's input amplifiers
- Attenuator
  - Reduces signal at the receiver input

Receiver Functions

- Receive Incremental Tuning (RIT)
  - Also called “Clarifier”
  - “Fine tuning”
  - Adjusts receive frequency independent of main VFO
  - Doesn’t vary the transmitted frequency
  - Transmitters have a similar function (XIT)

Receiver Functions

- Automatic Gain Control (AGC)
  - Automatically limits the incoming signals during signal (voice) peaks to maintain even volume
  - Keeps strong signals from blasting the listener
  - Different time response settings:
    - Fast setting for CW
    - Slow settings for SSB and AM
    - Not used in FM because amplitude is constant

Receiver Functions

- Squelch
  - Mutes audio to speaker when signal is not present
- Used in FM primarily
  - Open – allows very weak signals to pass through (along with noise)
  - Tight – allows only the strongest signals to pass

Receiver Functions

- Advance the squelch control until the noise just disappears
  - Also opened by MON (Monitor) control on handhelds

Receiver Functions

- Filters (can be electronic modules or DSP)
  - IF filter
    - Used to narrow the width of signal that is passed.
    - Can attenuate adjacent signals.
  - Notch filter
    - Very narrow filter that can be moved over an interfering signal to attenuate it.

Receiver Functions

- Noise blanker (NB)
  - Removes signal pulses that are frequently associated with random naturally generated noise
  - Can cause problems if strong signals are present
- Noise reduction (NR)
  - DSP function to remove noise from signal
- Noise limiter (NL)
  - Simply limits maximum volume of a noise pulse

Receiver Functions

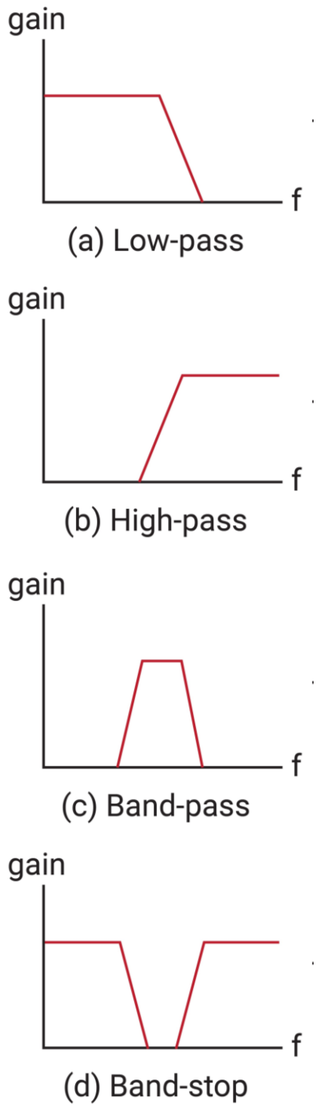
- Preamplifier
  - Increases sensitivity but can cause overload
- Reception and Transmission Meter
  - In transmit, indicates output power or ALC or other functions as selected by switch setting
  - In receive, indicates signal strength
    - In “S” units S1 through S9 – S9 is strongest
    - Above S9, meter is calibrated in dB (i.e. S9+10 dB)

Receiver Functions

- Selectivity & Sensitivity
  - Sensitivity – How well does a receiver hear signals. Minimum Detectable Signal (MDS) level (measured in uV)
  - Selectivity – How well receiver selects the signals you want and rejects the signal you do not want (measured in –db)

Receiver Functions

- Filtering & Tuning
  - Filters – Reject unwanted signals
  - They have Bandwidth
    - Narrow vs Wide
  - Types of filters
    - Low pass, high pass, bandpass, notch, etc ...



Receiver Functions

- Filtering & Tuning
  - SSB
    - Off frequency audio pitch will be higher or lower
  - FM/PM
    - Off frequency cause distortion

VHF/UHF RF Power Amplifiers

- Amplifiers boost your radios power output
- Multiples of the input signal
- Mode Specific
- Make sure
  - Feedline & Antenna can handle the power

Transverters

- Convert signal to another band
  - One main radio can be used on many bands
  - HF radio now can XMIT on 2 m
  - 10m to 1.25 cm (or 220 MHz)
  - 2 m to 1.2 GHz & beyond

Are there any questions?