Technician License Course
The Basic Transceiver
The Basic Transceiver

• Combination of “transmitter” and “receiver”
The Basic Transceiver

• Combination of “transmitter” and “receiver”
• Abbreviated “XCVR”
  (X = trans)
The Basic Transceiver

• Combination of "transmitter" and "receiver"
• Abbreviated "XCVR" (X = trans)
• Antenna switched between transmitter and receiver by the TR switch
Transmit/Receive (TR) Switch
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• TR switch allows a single antenna to be switched to the transmitter when sending and to the receiver when receiving.
Transmit/Receive (TR) Switch

- TR switch allows a single antenna to be switched to the transmitter when sending and to the receiver when receiving.
  - In a transceiver, the TR switch is inside the unit and operates automatically.
Transmit/Receive (TR) Switch

- TR switch allows a single antenna to be switched to the transmitter when sending and to the receiver when receiving.
  - In a transceiver, the TR switch is inside the unit and operates automatically.
  - Transceivers cannot transmit and receive at the same time like a repeater.
The Basic Repeater
The Basic Repeater

- Relays signals from low-power stations over a wide area
The Basic Repeater

- Relays signals from low-power stations over a wide area
- Simultaneously re-transmits received signal on the same band
The Basic Repeater

• Relays signals from low-power stations over a wide area
• Simultaneously re-transmits received signal on the same band
• TR switch replaced with duplexer which allows antenna to be shared without switching
What Happens During Radio Communication? (Review)
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- Transmitting (sending a signal):
What Happens During Radio Communication? (Review)

• Transmitting (sending a signal):
  – Information (voice, data, video, commands, etc.) is converted to electronic form.
What Happens During Radio Communication? (Review)

- Transmitting (sending a signal):
  - Information (voice, data, video, commands, etc.) is converted to electronic form.
  - The information in electronic form is added to a radio wave.
What Happens During Radio Communication? (Review)

• Transmitting (sending a signal):
  – Information (voice, data, video, commands, etc.) is converted to electronic form.
  – The information in electronic form is added to a radio wave.
  – The radio wave carrying the information is sent from the station antenna into space.
What Happens During Radio Communication? (Review)

• Receiving:
What Happens During Radio Communication? (Review)

- Receiving:
  - The radio wave carrying the information is intercepted by the receiving station’s antenna.
What Happens During Radio Communication? (Review)

- Receiving:
  - The radio wave carrying the information is intercepted by the receiving station’s antenna.
  - The receiver extracts the information from the received wave.
What Happens During Radio Communication? (Review)

• Receiving:
  – The radio wave carrying the information is intercepted by the receiving station’s antenna.
  – The receiver extracts the information from the received wave.
  – The information is then presented to the user in a format that can be understood (sound, picture, words on a computer screen, response to a command, etc.).
What Happens During Radio Communication? (Review)

- Adding and extracting the information can be simple or complex.
What Happens During Radio Communication? (Review)

- Adding and extracting the information can be simple or complex.
- This makes ham radio fun...learning all about how radios work.
What Happens During Radio Communication? (Review)

• Adding and extracting the information can be simple or complex.
• This makes ham radio fun...learning all about how radios work.
• Don’t be intimidated. You will be required to only know the basics, but you can learn as much about the “art and science” of radio as you want.
Filters
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• Circuits that act on signals differently according to their frequency.
Filters

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• Filters can reject, enhance, or modify signals.
Types of Filters
Adding Information - Modulation

• When we add some information to the radio wave (the carrier), we modulate the wave.
Adding Information - Modulation

- When we add some information to the radio wave (the *carrier*), we *modulate* the wave.
- Morse code (CW), speech, data
Adding Information - Modulation

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- Different modulation techniques vary different properties of the wave to add the information:
Adding Information - Modulation

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• Morse code (CW), speech, data
• Different modulation techniques vary different properties of the wave to add the information:
  • Amplitude, frequency, or phase
Adding Information - Modulation

- Modulator and demodulator circuits
Adding Information - Modulation

- Modulator and demodulator circuits
- Modulators add information to an RF signal, demodulators recover the information
Changing Frequency - Mixers
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- Signal frequencies can be changed by combining with another signal, called *mixing*
Changing Frequency - Mixers

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- Also referred to as *heterodyning*
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  - Shifts frequency by adding or subtracting
- Different than a *multiplier* which multiplies a signal’s frequency by some integer, usually 2 or 3
Sensitivity and Selectivity
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- Two essential tasks for a receiver:
Sensitivity and Selectivity

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  - Hear a signal and hear only one signal
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  - Sensitivity is a measure of how well the receiver can detect weak signals
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  • Selectivity is a measure of the receiver’s ability to discriminate between signals
Sensitivity and Selectivity

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  - Hear a signal and hear only one signal
- **Sensitivity** is a measure of how well the receiver can detect weak signals
- **Selectivity** is a measure of the receiver’s ability to discriminate between signals
- **Preamplifiers** make a receiver more sensitive
Sensitivity and Selectivity

- Two essential tasks for a receiver:
  - Hear a signal and hear only one signal
  - *Sensitivity* is a measure of how well the receiver can detect weak signals
  - *Selectivity* is a measure of the receiver’s ability to discriminate between signals
- *Preamplifiers* make a receiver more sensitive
  - Preamplifiers added between antenna and receiver
Transverter
Transverter

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  - HF SSB/CW at 28 MHz converted to/from 222 MHz
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  - External mixers shift frequency
- Typical examples
  - HF SSB/CW at 28 MHz converted to/from 222 MHz
  - VHF SSB/CW at 144 MHz converted to/from 10 GHz
Practice Questions
What type of amateur station simultaneously retransmits the signal of another amateur station on a different channel or channels?
What type of amateur station simultaneously retransmits the signal of another amateur station on a different channel or channels?

Repeater station
Which term describes the ability of a receiver to detect the presence of a signal?
Which term describes the ability of a receiver to detect the presence of a signal?

Sensitivity
What is a transceiver?
What is a transceiver?

A unit combining the functions of a transmitter and a receiver.
Which of the following is used to convert a radio signal from one frequency to another?
Which of the following is used to convert a radio signal from one frequency to another?

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

Selectivity
What is the name of a circuit that generates a signal of a desired frequency?
What is the name of a circuit that generates a signal of a desired frequency?

Oscillator
What device takes the output of a low-powered 28 MHz SSB exciter and produces a 222 MHz output signal?
What device takes the output of a low-powered 28 MHz SSB exciter and produces a 222 MHz output signal?

Transverter
Which of the following describes combining speech with an RF carrier signal?
Which of the following describes combining speech with an RF carrier signal?

Modulation
What device increases the low-power output from a handheld transceiver?
What device increases the low-power output from a handheld transceiver?

An RF power amplifier
Where is an RF preamplifier installed?
Where is an RF preamplifier installed?

Between the antenna and receiver
End of Module 7