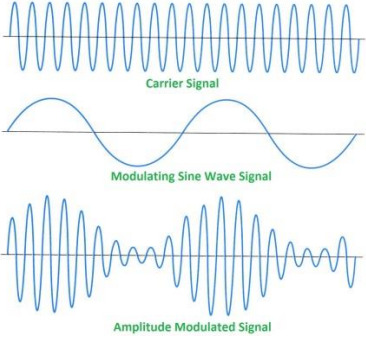
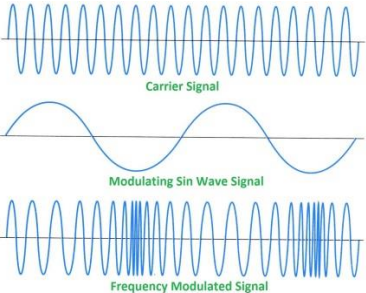
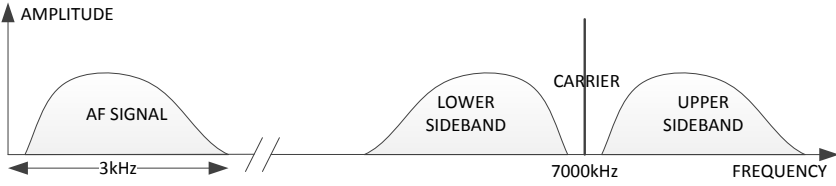


Amateur Radio Foundation Licence Study Guide by Julie VK3FOWL and Joe VK3YSP

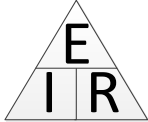






Term	Meaning	Examples
AF	Audio Frequency (Sound Waves)	20Hz-20kHz (via HiFi) 300Hz-3kHz (via Radio) AF Gain Control (Volume)
RF	Radio Frequency (Radio Waves)	30kHz and above HF=3MHz-30MHz VHF=30MHz-300MHz UHF=300MHz-3GHz RF Gain Control (Sensitivity)
AC	Alternating Current	AC Mains 240 Volts AC 50Hz
DC	Direct Current	DC Rig Power 13.8 Volts DC
EMC/RFI	Electromagnetic Compatibility and Radio Frequency Interference	RF from Mobile Phone does not normally interfere with TV set
Interference	Your signal effecting others... <ul style="list-style-type: none"> • Increases with <u>Power</u> • Increases and <u>Frequency</u> • Decreases with <u>Distance</u> • Affected by Modulation <u>Mode</u> • <u>Radiated</u> by antenna; or • <u>Conducted</u> over power cables 	Caused by: <ul style="list-style-type: none"> • Over Modulation • Mismatched Antenna • Antenna Placement • Defective equipment • Lack of station earth • Routing of cables
SWR	Standing Wave Ratio: It compares the Reflected Power from an antenna mismatch against the Forward Power from the transmitter.	1:1 = Perfect 50Ω match 1.5:1 = Need to investigate ∞:1 = Infinite (Do not use)
Modulation	The process of combining a lower-frequency AF signal with a higher-frequency RF Carrier signal to produce a modulated RF signal suitable for amplification and transmission over the air.	Modulation Modes: AM, SSB, USB, LSB, FM
AM	Amplitude Modulation	Includes: SSB, USB, LSB 

FM	Frequency Modulation	<p>Used on: 2m/70cm Repeaters</p>  <p>Carrier Signal</p> <p>Modulating Sin Wave Signal</p> <p>Frequency Modulated Signal</p>
CW	Continuous Wave	Morse Code
SSB	Single Sideband	<p>A modulation technique where an Audio Frequency Signal is used to Amplitude Modulate an RF Carrier Signal to produce an RF Carrier Signal with two Sidebands and then the RF Carrier Signal and one Sideband is suppressed to leave only one sideband with less than half of the bandwidth of the original AM signal.</p>  <p>AMPLITUDE</p> <p>AF SIGNAL</p> <p>3kHz</p> <p>LOWER SIDEBAND</p> <p>CARRIER</p> <p>7000kHz</p> <p>UPPER SIDEBAND</p> <p>FREQUENCY</p>
USB	Upper Sideband	Used above 10MHz
LSB	Lower Sideband	Used below 10Mhz
Transceiver	<p>A combined Transmitter and Receiver where the TX and RX frequency is set by a single VFO control and the antenna is automatically switched from the Receiver to the Transmitter when the Push To Talk (PTT) button is pressed.</p>	

SWR/Power Meter	<p>Measures Forward Power, Reverse (or Reflected) Power and calculates the Standing Wave Ratio (SWR)</p> <p>Three Types:</p> <ul style="list-style-type: none"> • <u>Single Meter</u> with FWD/REV Switch and Power Set Control. • <u>Dual Meter</u> with FWD and REV power meters. No FWD/REV Switch. Note REV power meter is calibrated in SWR not Watts. And a Power Set Control. • <u>Crossed Needle Meter</u> with FWD and REV power meters which cross over a SWR scale. No FWD/REV Switch or Power Set Control. <p>All types may have:</p> <ul style="list-style-type: none"> • Power Range Switch (20W/200W/2KW) • Average (AVG) or Peak Envelope Power (PEP) Switch. • Line Impedance (50Ω/75 Ω) Switch 	<p><u>Need to select the meter's power range and transmitter's power output level to get enough Forward Power indication to make an accurate SWR reading.</u></p> <p>Use the FWD/REV switch to first set the FWD power to 100% and then read the REV power (or SWR).</p> <p>Use the Power Set Control to adjust 100% on the FWD power meter before reading the SWR from the REV power Meter.</p> <p>Or, just read the SWR from the scale underneath where the needles cross.</p>
RF Choke	A loop of coax in air or wound around a ferrite rod or ferrite toroid placed in the coaxial feed line to the antenna. It stops the shield of the coax radiating interference.	Best placed up at the antenna, but can be at the transmitter.
Ferrite Core	Ferrite is an iron-based ceramic-like material.	A clip-on ferrite core can be placed on a power lead to stop conducted interference leaving a transmitter or entering a receiver. Place as close to the device as possible.
Antenna Tuning Unit	A device to match the Transmitter output impedance to the antenna feed-line impedance. When the impedance is matched the transmitter will deliver the maximum amount of power to the antenna.	Automatic ATUs have a Tune button. They make adjustments automatically. They even remember the adjustment required for different frequencies. Manual ATUs have a variable Transmitter, Inductor and Antenna control. These controls need to be adjusted repeatedly for minimum SWR Meter indication.
Band Control	Frequency Band Selector Switch	Use this control to change bands. E.g. 80m, 40m, 15m, 10m, 2m, 70cm
VFO Control	Variable Frequency Oscillator	Use this control to change frequency within a Band.

Mode Control	Modulation Mode Selector Switch	Use this control to select the modulation mode e.g. AM, FM, CW, USB, LSB
RF Power Control	Transmitter Power Output Control	Use this control to adjust the transmitter output power to 10 Watts
RF Gain Control	Receiver Sensitivity Control	Use this control to adjust the receiver sensitivity to maximum before listening on the air.
AF Gain Control	Receiver Sound Volume Control	Use this control to adjust a comfortable listening level.
Mic Gain Control	Transmitter Microphone Level Control	Use this control to adjust the microphone level. Do not set too high as it might cause interference.
Filter Control	Receiver Selectivity (Bandwidth) Control	Use this control to set the receiver bandwidth suitable for different modes. E.g. Wide (AM, 6kHz) , Medium (SSB, 3kHz), Narrow (CW, 500Hz)
Tune Control	Automatic Tuner Unit Start/Bypass Control	Use this control to start the Automatic Antenna Tuner (press and hold) or to bypass the ATU altogether (press). The ATU automatically matches the transmitter to the antenna creating a low SWR at the transmitter. Bypass the ATU to see what the antenna's actual SWR is.
Voltage Current Resistance Power Frequency	Volts (V) Amps (A) Ohms (Ω) Watts (W) Hertz (Hz)	12V 2A 50 Ω 100W 20Hz
Mega Kilo mili	Million Thousand Thousandths	5MV=5,000,000 Volts 5k Ω =5,000 Ohms 5mA=5/1,000 Amps 1MHz=1000kHz 1kHz=1000Hz
Protective Earth	Faults to Protective Earth trip Circuit Breakers, Safety Switches and blow fuses to safely disconnect the power.	Earth Wire is Yellow/Green. Only qualified electricians can connect or disconnect household mains wiring.
Station Earth	Conducts interference signals and lightning strikes safely to ground.	A 1.5m copper rod buried in the ground – Do not connect to gas pipes.
Sensitivity	Ability to receive weak signals	RF Gain Control

Selectivity	Ability to receive close signals	Filter Bandwidth Wide (AM, 6kHz) Medium (SSB, 3kHz) Narrow (CW, 500Hz)
Stability	Ability to stay on frequency	Frequency drift on SSB causes the tone of the operators voice to shift. Use RIT to correct.
Refraction	Type of ionospheric propagation	Bending in ionosphere
Reflection	Type of ionospheric propagation	Bouncing off ground/buildings
Diffraction	Type of ionospheric propagation	Scattering over a mountain
Ionospheric layers	Bands of ionized particles in ionosphere	D E F1 F2
Radio Waves	Electromagnetic Radiation	<ul style="list-style-type: none"> • Travel in <u>straight lines</u> unless refracted, reflected or diffracted. • Travel in <u>all directions</u> unless directed by the antenna, obstructions or propagation • <u>Decrease in power</u> as they travel.
Antenna Types	Antennas types can be <u>directional</u> or <u>omni-directional</u> with <u>vertical</u> or <u>horizontal</u> polarization. Directional antennas (e.g. Yagis) concentrate transmitter power in one direction.	Vertical (with Ground Plane) Folded Dipole Yagi Centre Fed End Fed
Repeaters	Radio re-transmission stations	<ul style="list-style-type: none"> • Repeaters are typically located on mountain peaks. • Repeaters extend your <u>Line-Of-Sight</u> range on VHF/UHF. • All stations transmit to a repeater on one frequency and receive on another. The frequency split is different for VHF and UHF. • Repeaters retransmit your signal to all stations listening. • Repeaters continue to transmit for a short period after you stop transmitting. • Always let the repeater drop out before you transmit.
DTMF	Repeater Linking Tones	Enter DTMF digits via keypad. These are audible telephone tones to dial up a remote repeater.
CTCSS	Repeater Access Tones	Set up CTCSS via a menu. These are sub-audible tones to access a local repeater.

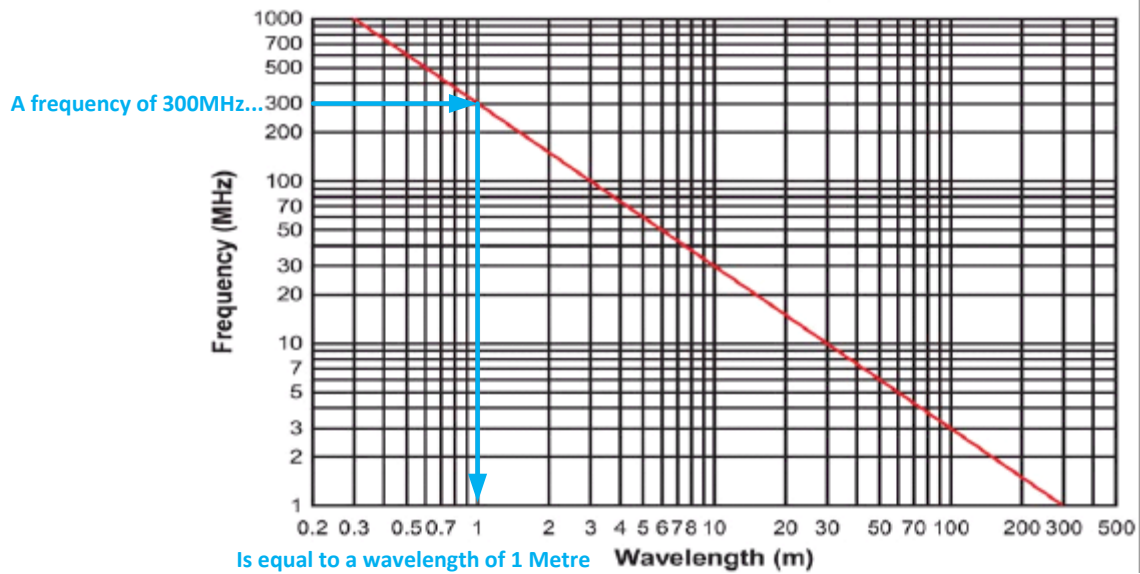
Ohms Law	Relationship between Voltage, Current and Resistance in a circuit.	 <p> $E = I \times R$ volts $I = E / R$ amps $R = E / I$ ohms </p>
N-Type Plug/Socket		
UHF Plug/Socket		
BNC Plug/Socket		
Safety	<p>Safety hazards:</p> <ul style="list-style-type: none"> • High voltages • High current • Electromagnetic Radiation • Batteries • Antennas • Feed lines • Cables • Headphones/Speakers 	<p>Can cause:</p> <ul style="list-style-type: none"> • Electric shock (Electrocution) • Burns and fire • Burns and cancer • Explosion, acid burns, high current • Falling down, touching power lines • Electric shock • Tripping hazard • Acoustic shock, hearing damage

Coaxial Cable Check:

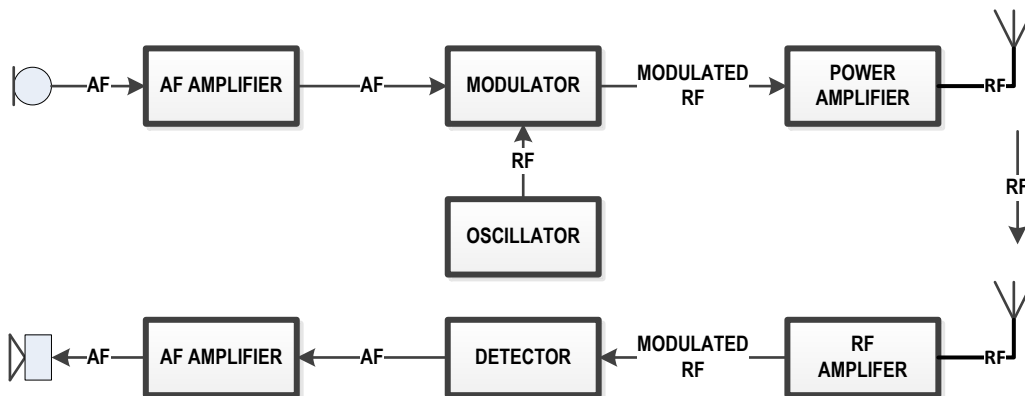
(Expect to test a bad cable with a disconnected centre or shield or a shorted centre to shield)



Calculating the wavelength of a frequency:

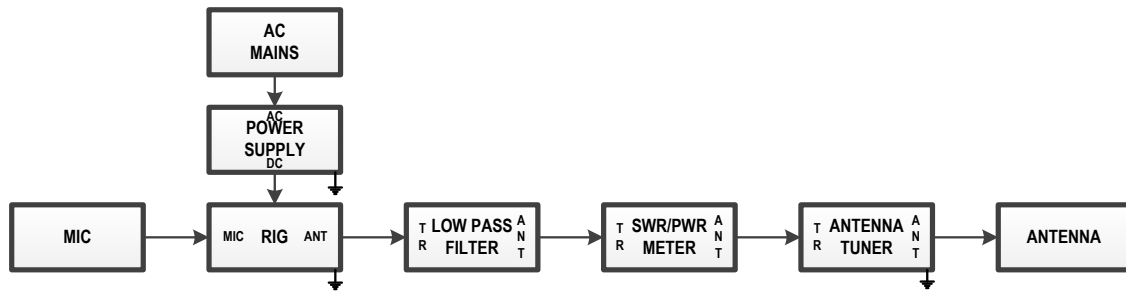


Transmitter/Receiver Block Diagrams:



HF Procedures:

1. Connect Rig (HF transceiver) as follows.



1. Note: Earth cables connected to Station Earth Rod (if available)
2. Turn on Power Supply and Rig.
3. Check LCD and WIA Band Plan for permitted frequencies and modes.
4. Select Band, Frequency, Mode (USB/LSB/AM), Filter (W, M, N).
5. Set RF Power (Minimum), RF Gain (Max Sensitivity) and AF Gain (comfortable Volume).
6. Set SWR Meter Power Range (e.g. 20 Watts Full Scale to read 10 Watts).
7. LISTEN to see if the frequency is in use.
8. If no Audio: Check Squelch. If no band noise: Check Antenna connection.
9. Auto ATU: Press Tune to auto-tune the antenna. Observe OK indication.
10. Manual ATU: Set Mode AM, press PTT, adjust controls repeatedly for minimum SWR
11. Set Mode LSB/USB, press PTT, whistle into mic, adjust RF Power for 10W.
12. Read SWR. Check antenna if SWR greater than 1.5:1.
13. If no modulation: Check Mic Gain.
14. TX: "This is VK3FABC is this frequency in use?" (3 times).
15. TX: "VK3XYZ VK3XYZ VK3XYZ this is VK3FABC VK3FABC VK3FABC."; or
16. TX: "CQ CQ CQ this is VK3FABC VK3FABC VK3FABC."; or
17. TX: "This is VK3FABC listening." on a VHF/UHF repeater.
18. Distress Call: TX: "MAYDAY, MAYDAY, MAYDAY this is VK3FABC, VK3FABC, VK3FABC"
19. Urgency Call: TX: "PAN, PAN, PAN this is VK3FABC, VK3FABC, VK3FABC"
20. Give other station's call sign first, then your own
21. Provide call signs at the start and end of a contact and at least every 10 minutes