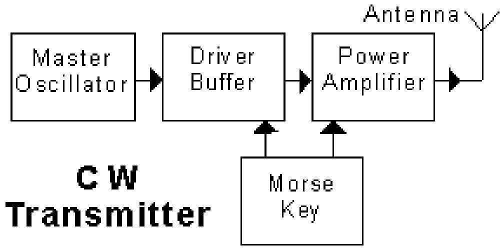
Transmitter Block Diagrams

How to draw block diagrams

This is a "block diagram" of a simple transmitter. Before the actual stages are discussed, consider the diagram itself. It is drawn to show the "signal flow" entirely from ***left to right,*** shown by the arrows.



The CW Transmitter

The simplest of all transmitters is one for sending Morse code - a CW (Continuous Wave) transmitter as shown in this diagram.

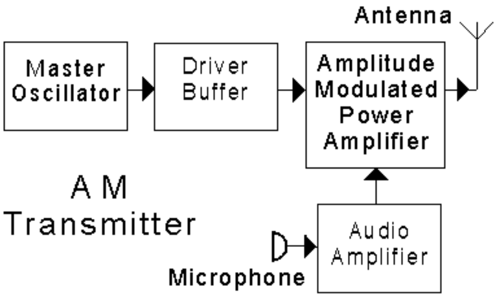
An oscillator generates the signal and it is then amplified to raise the power output to the desired level. A Morse key is used to chop the transmission up into the "dots" and "dashes" of Morse code.

The oscillator runs continuously. The Driver / Buffer are isolation stages, to isolate the oscillator from the sudden load-changes due to the keying of the amplifier. This minimises frequency "chirp" on the transmitted signal.

The oscillator is usually supplied with DC from a well-regulated voltage-regulated source to minimise chirp (slight changes in the output frequency) due to variations in the supply voltage.

Several driver and buffer stages may be used. The keying may be in the final amplifier alone - usually in the cathode or emitter lead - or may also be applied to the driver stage too.

A "keying relay" may be used to isolate the Morse key from the transmitter circuits, to keep high voltages away from the operator's Morse key. In the interests of operator safety, the moving bar of the Morse key is **ALWAYS** kept at earth potential.

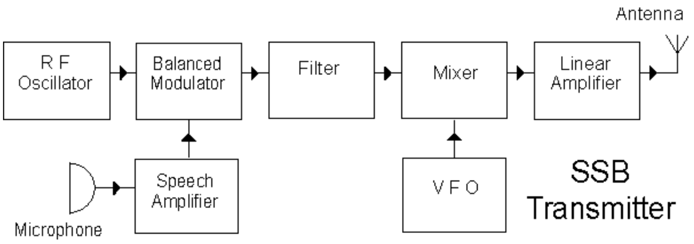


The A M Transmitter

This is a diagram of a typical Amplitude-Modulated transmitter. The principles of each block and the principles of Amplitude Modulation are treated elsewhere in this Guide.

The block diagram is derived from the CW transmitter.

The modulated stage is usually the final amplifier in the transmitter. This is known as "high-level" modulation. If a following amplifier is used to raise the output power level, it must be a ***linear*** amplifier.



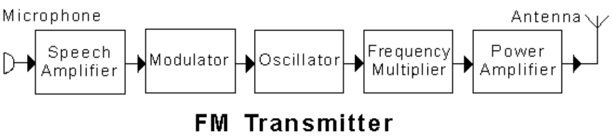
The SSB Transmitter

The generation of a SSB signal is treated in another part of this Guide. A transmitter takes the generated signal and first translates it with a mixer / VFO combination to the required output frequency then amplifies it to the required power output level using a ***linear*** amplifier. A linear amplifier is needed to preserve the signal waveform in all ways except to increase the output amplitude.

The F M transmitter

Again, the principles of each block have been treated elsewhere in this Guide.

The modulator can be one of several types. The simplest to understand is probably to consider the voltage-controlled oscillator.



Applying an audio signal to the varicap diodes in the circuit example given in the Oscillator paper in this Guide will change the frequency of the oscillator in accord with the modulation. This increases the frequency swing with increased audio loudness, and the rate of swing with increasing audio frequency - hence providing Frequency Modulation.

In VHF hand-held transceivers, the oscillator will be generated by a phase-locked-loop (PLL) to provide "channel switching" facilities. The frequency modulation may then be generated by applying the audio signal to the PLL.

Frequency Multiplier stages comprise an RF amplifier with a tuned output - the output tuned to a harmonic of the input signal.

The Power rating of a SSB linear amplifier

A power amplifier for SSB operation is required to be linear. This means that the waveform of the output signal must be a replica of the input waveform in all ways except amplitude - the output must be an amplified version of the input! The maximum power output before severe distortion takes place is the limit of successful linear amplifier operation.

The power output at the maximum level is the usual rating given for a linear amplifier. This is known as the "Peak Envelope Power", PEP.

The PEP is by definition, the average power output during one RF cycle at the crest of the modulating envelope.

The PEP rating and measurement are also sometimes used for amplifiers for other modes.

The RF output power from an amplifier is less than the total DC input power and signal input power to the amplifier. The difference is energy loss and appears as heat. Cooling facilities - fans etc. - are sometimes found on solid-state power amplifiers for protection from over-heating.