The Radio Receiver

There are 8 basic components in a radio receiver:

1) Antenna
2) Low-noise Amplifier (LNA)
3) Preselection Filter
4) Local Oscillator/Mixer
5) Intermediate Frequency (IF) Amplifier
6) IF Filter
7) Detector/Demodulator
8) The recovered signal $\hat{a}(t)$
Let's examine each component:

1) **Antenna** - **Couples** the incoming e.m. propagating wave into the receiver.

2) **Low-Noise Amplifier** - **Boosts** the power of the initial signal above the receiver noise.

3) **Preselector Filter** - Allows only the frequency band of interest to pass into the receiver (e.g., for FM radio 88-108 MHz).

4) **Local Oscillator/Mixer** - Translates the signal from its propagation frequency to a lower, fixed intermediate frequency (IF).

5) **IF Amplifier** - A high-gain amplifier that greatly increases signal power (i.e., to a detectable level).

6) **IF Filter** - Allows only the signal of interest to pass. Bandwidth is typically that of the desired signal. (e.g., 200 kHz for FM radio, 20 kHz for AM radio).

7) **Detector/Demodulator** - Extracts the signal information (or, at least tries to!) from the IF signal.

8) **The Recovered Signal** $\hat{a}(t)$ - The receiver's "**guess**" at what the original signal was. Ideally, $\hat{a}(t)=a(t)$, but channel propagation "uncertainties" and noise make **perfect** reproduction impossible!
The Basic Radio Receiver

A "Super Heterodyne"

The "recovered" signal $q(t)$

Detector/Demodulator /

IF filter

Mixer

Preselector

Filter

Local oscillator

LNA

Antenna