WXOJ-LP Valley Free Radio
station flowchart

AUTOMATION/
PLAYBACK COMPUTER

WARD BECK CONSOLE

TELEPHONE INTERFACE

MONITOR
LEFT

MONITOR
RIGHT

audio

LIMITER

TURNTABLE

MICROPHONE

CD PLAYER

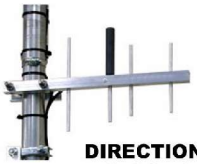
TAPE PLAYER

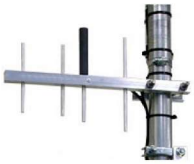
main studio

audio

ENCODER COMPUTER

digital audio


DIRECTIONAL ANTENNA,
(ROOF OF FLORENCE
COMMUNITY CENTER)


DIRECTIONAL
ANTENNA,
(TOWER AT
TRANMITTER
SITE)

RF

RF

RF

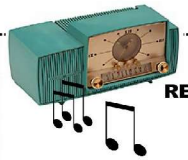
RF

studio-transmitter link

WIRELESS
BRIDGE

WIRELESS
BRIDGE

digital audio


RECEIVER

DECODER COMPUTER

transmitter site

analog audio

EAS DECODER

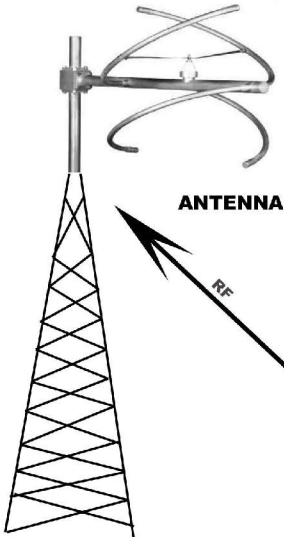
PROCESSOR

processed audio

TRANSMITTER

RF

RF


ANTENNA

production studio

ROCKWELL COLLINS CONSOLE

PRODUCTION
COMPUTER

TURNTABLE

CD PLAYER

TAPE PLAYER

MICROPHONE

Sarah Buckingham

And the Knee Bone's Connected to the...

(How the Valley Free station will work)

The first and most important part of every station (which is unfortunately not pictured in the diagram) is the DJ! Everything relies on a person in the On-Air studio to bring radios in people's homes to life. The DJ talks into a Microphone, hits play on the CD player or Tape Deck, puts a record on the Turntable, or plays back an MP3 on the computer - this generates the sound that then gets fed into the Console. There is a Telephone interface or hybrid that allows the DJ to put callers on the air. There may be extra inputs on the console to plug in extra devices - a Laptop or Minidisc player - so the DJ can bring in whatever material they may have recorded themselves.

A console is just a fancy mixer for the rest of us: it adjusts the levels and mixes the sounds together under the DJs control. The output of the console can go many places: back to a tape deck for recording, to Headphones, and to the Monitor Amplifier. The monitor amplifier powers the 'Monitors', or speakers. Sometimes the signal is split using a Distribution Amplifier, which allows for adjustment of the audio level going to the various output points. There is usually a Radio Receiver somewhere in the studio as well, with a switch that flips the audio the DJ hears in the headphones between the output of the console and the over the air signal. This is sometimes called a 'confidence check', and lets the DJ know that everything is A-Okay at the transmitter, and replicates what listeners out in Radioland hear.

The Production studio is very similar to the On-Air studio. The two studios are connected together with audio cables: from the output of the On-Air studio to the input of the Production studio, and from the output of the Production studio to the input of the On-Air studio. This allows for more flexibility in what can be put on air, such as a person reading the news in the production studio, or adding capacity if there is a large group for live performances. The Production studio does have one feature the On-Air studio doesn't have: a fast computer with audio recording and editing software on it. It can be used to edit together documentary or news pieces, station identifications, or whole shows for later playback.

The main output of the On-Air studio goes to a simple audio processor. An audio processor can change the sound of the audio going out, but the main purpose is to keep the peaks and loudest parts of the audio from overloading the next piece of equipment in the chain - the STL computer. The Studio Transmitter Link (STL) Encoder Computer takes the audio on the input of it's sound card and converts it into digital audio data. If the audio level overloads the input of the STL computer, the digital audio will become distorted and sound really bad. The STL computer sends the encoded audio data and sends it over a computer network to a Wireless networking access point - a regular WiFi network dealie for those that know the lingo. This WiFi access point converts the data into radio signals that are fed into a directional antenna on the roof of the Florence Community center. A directional antenna focuses the radio wave energy in a single direction, while reducing the energy in every other direction. This lessens the interference that other radio signals may have on the STL, and makes the link stronger. There is a directional antenna at the Transmitter Site that is receiving the signal sent out from the Florence Community center.

Once the Radio signal is received at the Transmitter site, it is converted back into digital data by another WiFi access point, and sent on its way to the Decoder Computer. The decoder computer takes the digital audio data and converts it back into an analog audio signal, which comes out of the sound card output in the computer. The audio has been sent from the studios to the transmitter site - a distance of about a mile! This audio signal is then passed through the Emergency Alert System (EAS) unit. The EAS unit is a special piece of hardware that relays signals from Federal, State and Local government officials in times of emergency. It can also be used to relay severe weather warnings and alerts. If there were such an alert, the EAS would cut off the audio from the studios, play back a message, and then resume the audio coming from the studios.

Once the audio passes through the EAS, it is sent to another audio processor. This processor is a bit different from the one that preceded the STL Encoder computer, but serves the same function. It protects the Transmitter from high audio levels that may still be present in the signal. This keeps the transmitter from over-modulating on the high audio levels - preventing the transmitter from generating signals outside of the station's allocated bandwidth (space) on the FM band. The Transmitter changes the audio signal into radio frequency energy, which is then sent out over a large, heavy cable to the Circularly Polarized antennas on the large tower. These antennas radiate the radio frequency energy out into the air, sending the radio signal through space and time to the listener's receiver. The receiver changes the FM audio back into sound waves that the listener can hear!