



Chapter 8

Modulation, Protocols and Modes

Greg Wolfe KIØKK

Amateur Television

Section 8-3

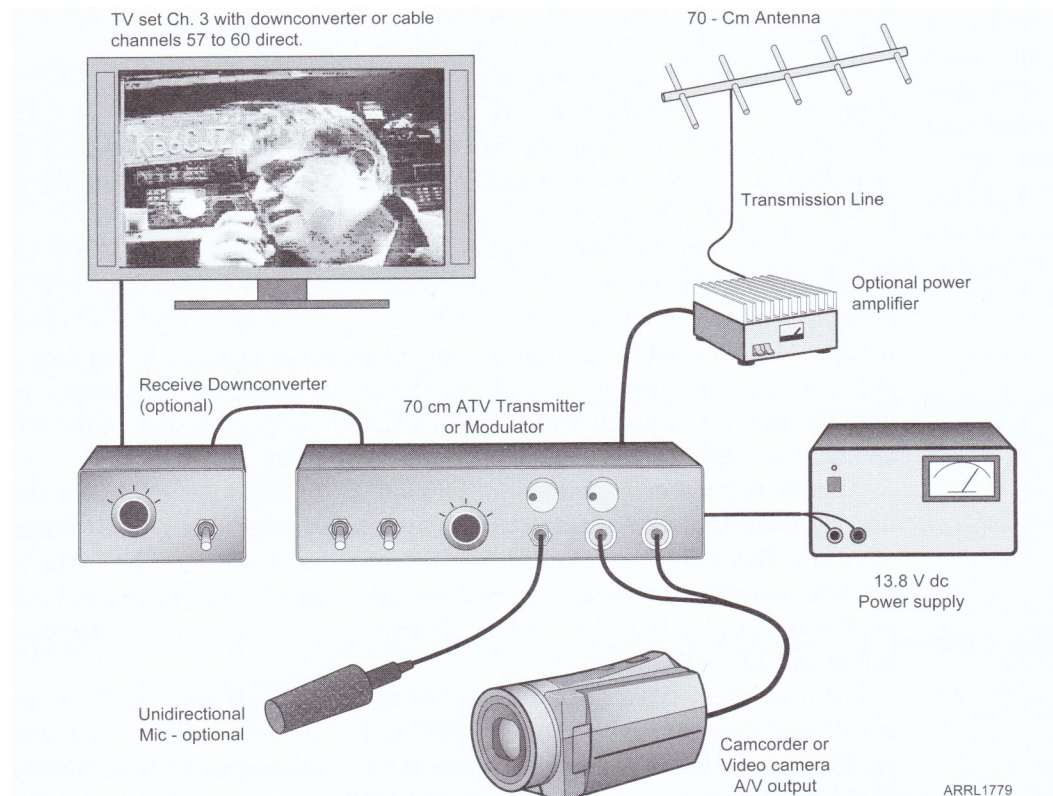
Digital Amateur TV (DATV)

Pg 8-21

- * Amateur Digital TV currently uses DVB-T.
- * Transmits compressed digital audio and video.
- * Receiving DVB-T requires a QAM and QPSK decoder
[E2B07]
- * Coding rate of $\frac{3}{4}$ means that $\frac{1}{4}$ of the transmitted data is for FEC [E2B01]

Fast Scan TV Components

Pg 8-20



Fast Scan Television

Pg 8-21

- * It looks like regular TV
 - Modern TVs are digital and require a converter to shift the signal to an unused cable TV channel [E2B08]
- * Image Signal Definitions:
 - US Amateurs use the **NTSC** signal standard (National Standards Television Committee)
 - A **Frame** is made up of **525 horizontal lines** [E2B02]
 - 30 Frames are generated each second
 - Each Frame consists of two fields, each with 252 ½ lines.
 - One field contains even numbered lines and the next field contains the odd numbered lines in a NTCS signal. [E2B03]
 - Analog video signal is defined by ANSI RS-170

Interlaced Scanning

Pg 8-22



E2B03

Odd numbered lines

Field 1
262 ½ lines

Even numbered lines

Field 2
262 ½ lines

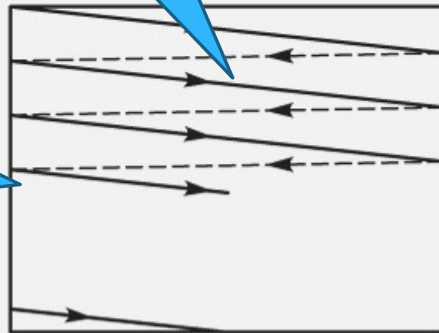
525 total lines

Beam

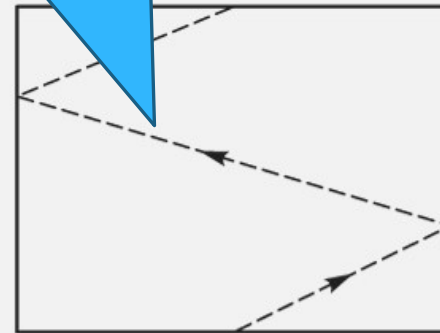
The dashed line means the beam is turned off.

Retrace from Field 1 to Field 2

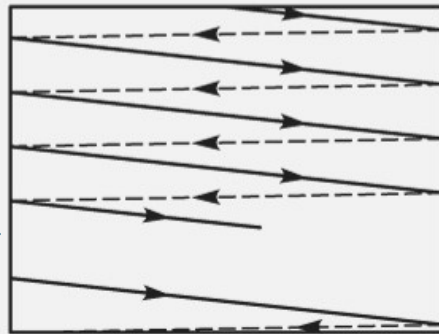
Retrace from Field 2 to Field 1



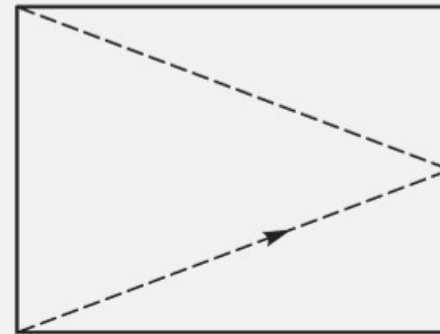
(A)



(B)



(C)



(D)

ARRL0321

Fig 8-7

Fields and Blanking

Pg 8-22

- * At the end of the line, the beam is turned off, or blanked, and returns to the left side to start the next trace.
- * It is also blanked as it goes from bottom to top.
- * These timing periods are called **horizontal** and **vertical blanking intervals**

The Signal that Produces a Single Line

Pg 8-22

Time Domain

Institute of Radio
Engineers

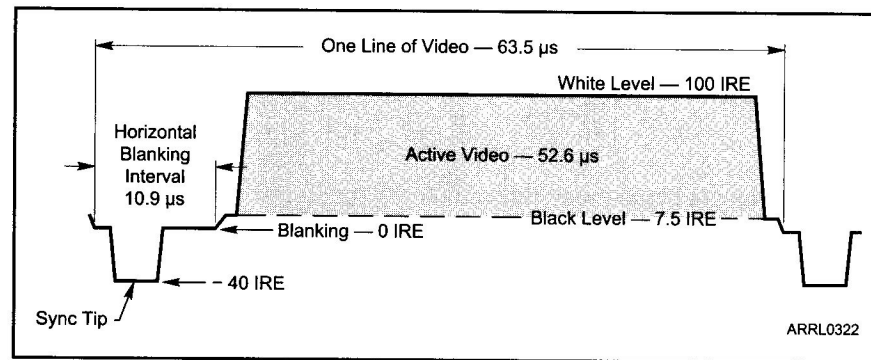


Figure 8-6 — RS-170 monochrome waveform for one video line. A full NTSC video frame consists of 525 video lines organized as two interlaced fields. Each field takes 1/60th of a second to transmit, so that 30 frames are transmitted every second. IRE units are used to measure the relative amplitude of the different parts of the video signal



Let's Add Some Color

Pg 8-23

**The color
is called
chroma**

**The chroma
burst helps
synchronize
the color
circuitry
3.5789 MHz**

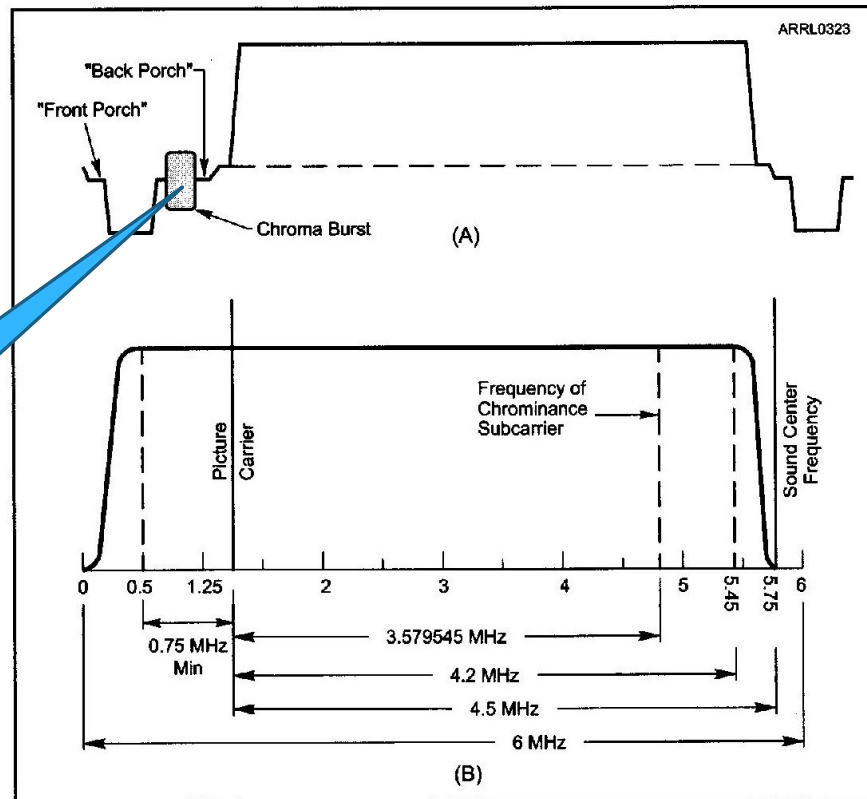
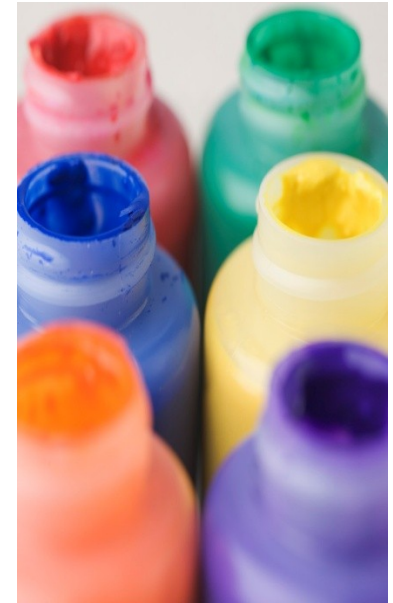


Figure 8-7 — Composite video (A) adds the color burst at the start of each line to synchronize the chroma circuits. (B) shows the spectrum of a standard broadcast TV signal. ATV may or may not use the FM subcarrier for sound.



Vestigial Sideband (VSB)

Pg 8-23

VSB is somewhat like SSB (USB), a portion of the other sideband (LSB) is also transmitted [E2B06].

VSB uses less bandwidth, but can still be demodulated by simple video detectors [E2B05]

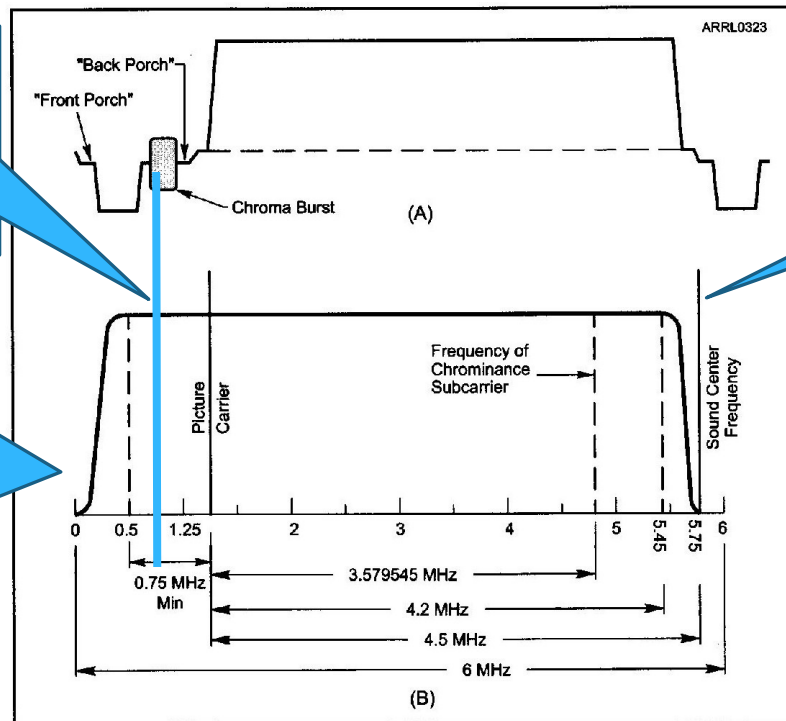


Figure 8-7 — Composite video (A) adds the color burst at the start of each line to synchronize the chroma circuits. (B) shows the spectrum of a standard broadcast TV signal. ATV may or may not use the FM subcarrier for sound.

Slow Scan TV (SSTV)

Pg 8-24

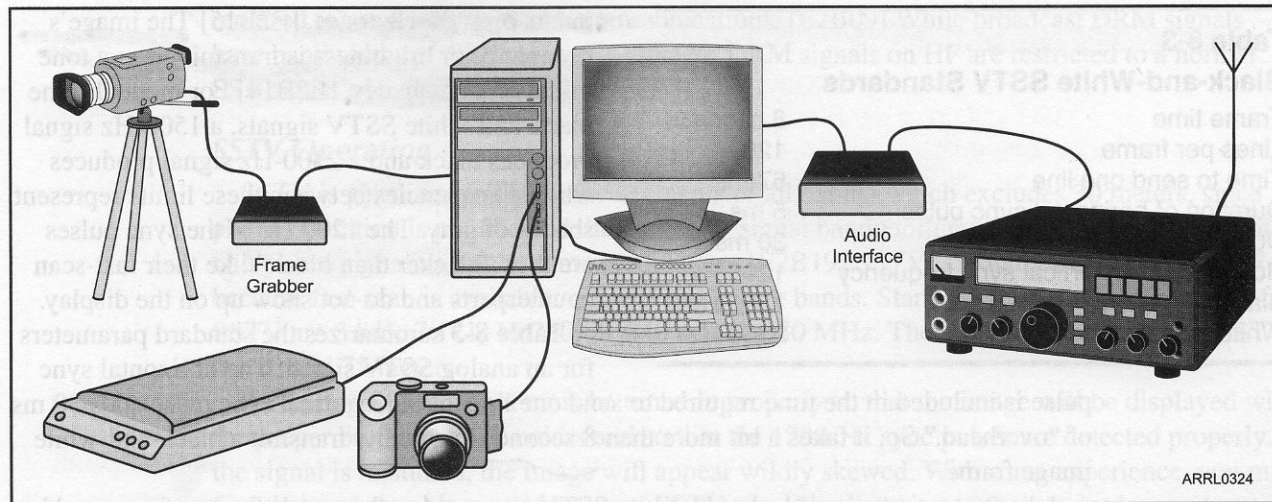


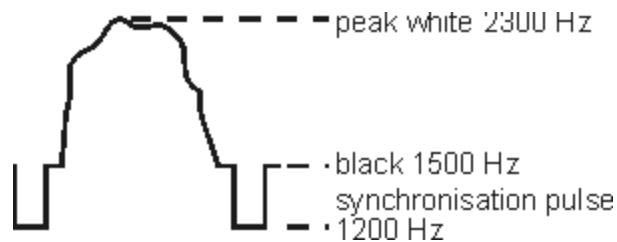
Figure 8-8 — The most common SSTV station uses a video or digital camera, or an image scanner, to generate still images. Software then processes the image and converts it to audio tones that are input to an SSB transmitter.

- * Uses **100% transmitter duty cycle**
- * Limit bandwidth to that of a phone signal using the same modulation
- * SSTV HF Frequencies: 3.845, 7.171, 14.230, 21.340 and 28.680 MHz
- * Most popular bands for SSTV are 20 and 75 meters

Slow Scan TV (SSTV)

Black and White (Monochrome)

Pg. 8-25



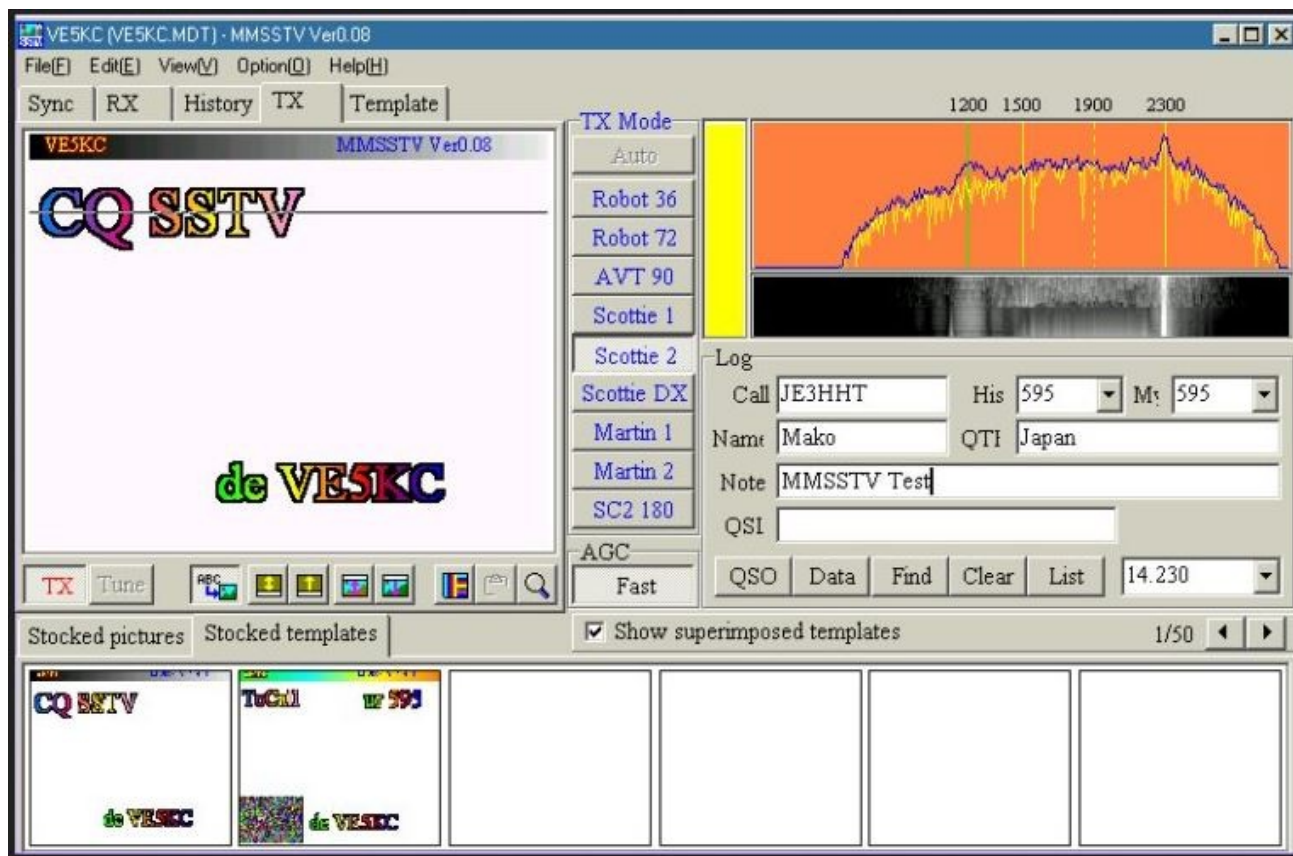
- * One still image at a time
- * **Varying) audio frequencies are transmitted represent the luminance or brightness level [E2B10]**
 - Black – 1500Hz
 - White – 2300 Hz
- * Sync Pulses are 1200 Hz tone bursts [E2B12]
- * 8 Seconds to send one image in 120 lines
- * Takes about 2 kHz bandwidth

Color - SSTV

Pg. 8-23

- * Scan Line Modes:
- * 120, 128, 240 or 256 (128 and 256 are the most popular)
- * Colors are transmitted as sequential lines showing the image in red, green and blue [**E2B04**]
- * Images can take from 12 seconds to > 4 minutes
- * Vertical Interval Signaling (VIS) to indicate the scan-line mode
 - Sent during the vertical sync pulse
 - Operator selects the mode of transmission to use [**E2B11**]

SSTV Software - MMSTV



SSTV [Audio](#)

SSTV Frequencies (MHz)

3.845

7.171

14.230

14.233

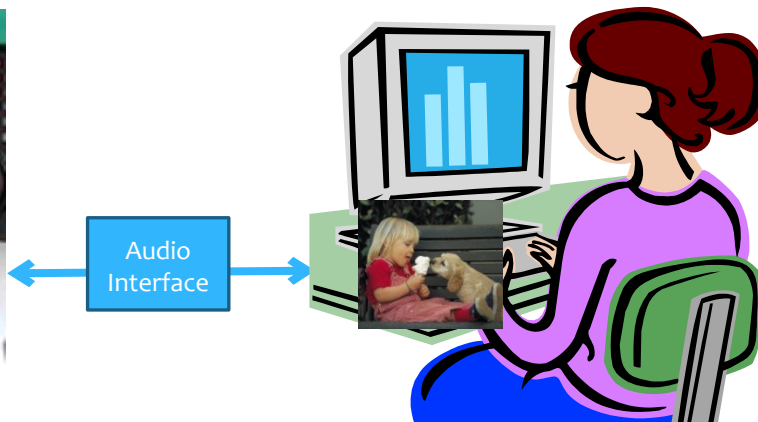
21.340

28.680

Digital SSTV

Pg. 8-25

- * DRM (Digital Radio Mondiale)
 - Developed by commercial SW broadcasters
 - Adapted the file transfer capability to use for digitized SSTV images
- * Only DRM software on a PC is required to use DRM SSTV [**E2B09**]
- * DRM is restricted to 3 KHz bandwidth on HF [**E1B02**].
- * Uses SSB [**E2B09**]



Amateur Television

Section 8-3

Questions

How many horizontal lines make up a fast-scan (NTSC) television frame ?

[E2B02]

- A. 30
- B. 60
- C. 525
- D. 1080

How many horizontal lines make up a fast-scan (NTSC) television frame ?

[E2B02]

- A. 30
- B. 60
- C. 525
- D. 1080

What aspect of an analog slow-scan television signal encodes the brightness of a picture ?

[E2B10]

- A. Tone frequency
- B. Tone amplitude
- C. Sync amplitude
- D. Sync frequency

What aspect of an analog slow-scan television signal encodes the brightness of a picture ?

[E2B10]

- A. Tone frequency
- B. Tone amplitude
- C. Sync amplitude
- D. Sync frequency

Next Week – Chapter 9

* Antennas and Feed Lines

- Practical Antennas
- Antenna Systems
- Transmission Lines
- Antenna Design