SSTV - THE AVT SYSTEM SECRETS REVEALED

John Langer WB2OSZ

The world of SSTV standards is a tower of Babel. Robot, Microcraft, Suding, Wraase, Martin, Scottie, and all with different speeds.

With dozens of SSTV modes available do we really need more to add to the confusion? Do the newer modes really offer significant improvements over their predecessors, or are they just the result of the 'not invented here' syndrome.

COLOUR SSTV EVOLUTION

The early colour SSTV pictures used the Frame Sequential method, red, green and blue components were transmitted as separate black and white frames.

The next breakthrough was in the use of the Line Sequential method. By placing the RGB components of a line together, it was easier to maintain correct alignment, and the pictures could be seen in full colour as they were received.

The Robot modes added digital information to the vertical sync pulse, identifying the format of the following image. This allowed the receiving station to select the proper mode automatically.

The Martin and Scottie modes made a significant departure from the past. Rather than using horizontal sync pulses they relied on very accurate oscillators at both ends to keep everything lined up correctly. Once the two stations were synchronised interference could wipe out part of the picture, but the rest would be in the right place with the correct colours. If one oscillator is a little off in frequency the image is slanted. (The same problem arises when trying to store pictures using an audio tape recorder). There is still a very vulnerable time during picture transmission and synchronisation can only be achieved if the vertical sync (about 1/3 second) is received correctly. The AVT modes have a much longer sync signal (about 5 seconds) with a lot of redundant information, it is only necessary to obtain synchronisation.

SOME DETECTIVE WORK

After months os asking people on the air, writing letters and making phone calls, I was able to obtain only a small amount of information about the AVT modes. There are three basic formats with a couple of variations:

Lines	Pixels/Line	Time (secs)
128	128	24
240	256	90
200	320	94

The so-called 'QRM' mode is just another name for interlace; first the odd numbered lines are sent, then the even numbered lines. This prevents a burst of noise from destroying adjacent scan lines. In 'narrow mode', tones in the range of 1700 to 2100Hz are used instead of the usual 1500 to 2300Hz. This allows the use of a narrower pass-band on receive.

However, the above gleaned information was still not enough detail to actually implement it. The next step was to write a short program to capture the output of an SSTV demodulator and plot it on a dot-matrix printer - a hard copy oscilloscope.

A MYSTERY IS SOLVED

A picture is composed of two distinct parts:

1) the image

2) a header with digital information.

Figuring out the image encoding was easy by examining a signal with known vertical colour bars. Each line is sent in RGB order with no horizontal sync or other separation. Black and white are the usual 1500 and 2300Hz, except in narrow mode as mentioned earlier. In 90 second mode each group of 256 pixels took 125 milliseconds. This is a rate of 2048 pixels per second - a nice round number if you count in Binary! The same pixel rate is used for all the modes.

The digital header took much longer to figure out. It uses only the black and white range of frequencies, not 1200Hz as in earlier SSTV modes. The bit rate was exactly 1/20th of the rate calculated earlier. I arbitrarily called the black tone '0' and the white tone '1', and copied some of the bits to another piece of paper. Occasionally there was a medium grey bit which I initially thought was caused by noise. I wrote these as a question mark.

After rearranging the long string of bits into groups of various sizes a pattern emerged:

?1010000001011111

?1010000101011110

?1010001001011101

" " "

?1011111001000001

?1011111101000000

Each group had the pattern:

? mmm sssss mmm sssss

where:

mmm represents the mode

010 = 24 second

011 = 94 second

101 = 90 second

There does not seem to be any difference with 'QRM' mode turned on.

sssss is a sequence number varying from 00000 to 11111.

CONCLUSION

Whilst homebrewing an SSTV system my biggest problem was obtaining enough detailed information about the various transmission modes to implement them. I hope this short article will help other experimenters avoid some of the same frustration.

PLEASE NOTE: The information concerning the AVT system was not obtained by disassembling, or otherwise directly examining the AVT software from Black Belt Systems. I have never seen the program in operation. I do not have a copy of the AVT software. I do not have an Amiga computer. All I used was the publicly available information mentioned above and signals heard on the air.

If you have any information regarding SSTV systems, the latest state-of-the-art conversion systems or just plain SSTV news, please let me know. I am pleased to have been able to include some SSTV material in the last couple of magazines. I can only do so if you send it in! ..... Ed