INTRODUCTION TO HAM RADIO SSTV

SASTAR

May 12, 2025

Jerry, VE6TL

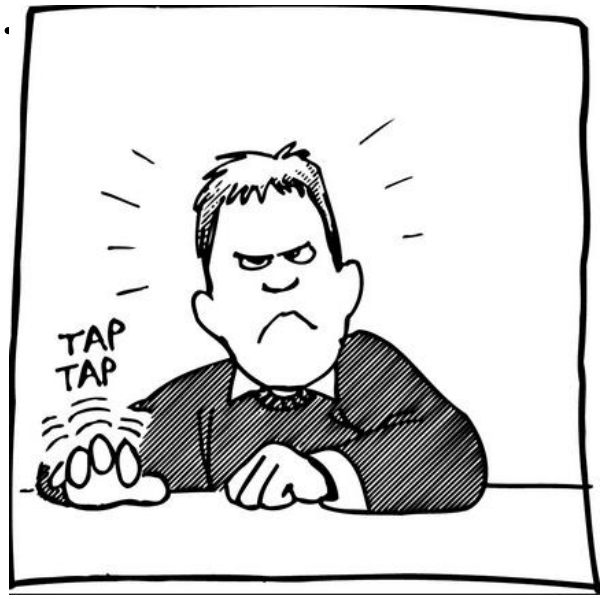
INTRODUCTION TO SLOW SCAN TELEVISION

Outline

- What is SSTV and why do we still do it?
- What is the history of SSTV?
- What are the different modes?
- Software
- Receiving SSTV
- Transmitting SSTV
- What Frequencies are “assigned” for SSTV?
- Tips for success

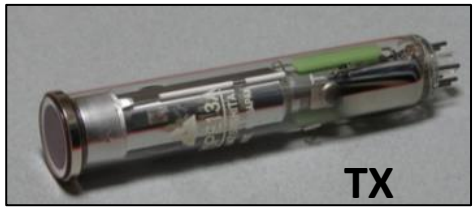
What is SSTV?

- Slow-scan television is a picture transmission method, used mainly by amateur radio operators to transmit and receive static pictures via radio in monochrome or in colour. SSTV uses a variable frequency audio signal to encode a picture and transmit it over the air.
- SSTV is also known as "narrowband television" (up to a maximum 3 kHz bandwidth).
- One image can take from 8 sec to 5 minutes to be sent or received, depending on the mode.
- We still do it because it is fun to watch pictures appear out of the "ether".



The History of SSTV

- Concept introduced by Copthorne MacDonald (W4ZII) in 1957-58. His prototype system used an electrostatic monitor and a Vidicon tube.
- The resolution was 120 lines by 120 pixels per line, black and white.
- He tested his system over a 3 kHz telephone line
- First live tests were performed on the 11 meter ham band, later given to CBers
- Early equipment consisted of a scanner or camera, a modem to generate the audio signal and a CRT from a surplus radar set (long persistence phosphorous).
- SSTV was used to transmit images from the far side of the Moon from Luna 3, a Soviet spacecraft launched in 1959.
- The FCC approved the use of SSTV for the Advanced level of radio amateur operators in 1968.
- Commercial systems started appearing in the US in 1970.
- Modern systems use PCs with dedicated applications that use a sound card, computer screen, a digital camera (optional), and an interface to a transceiver.

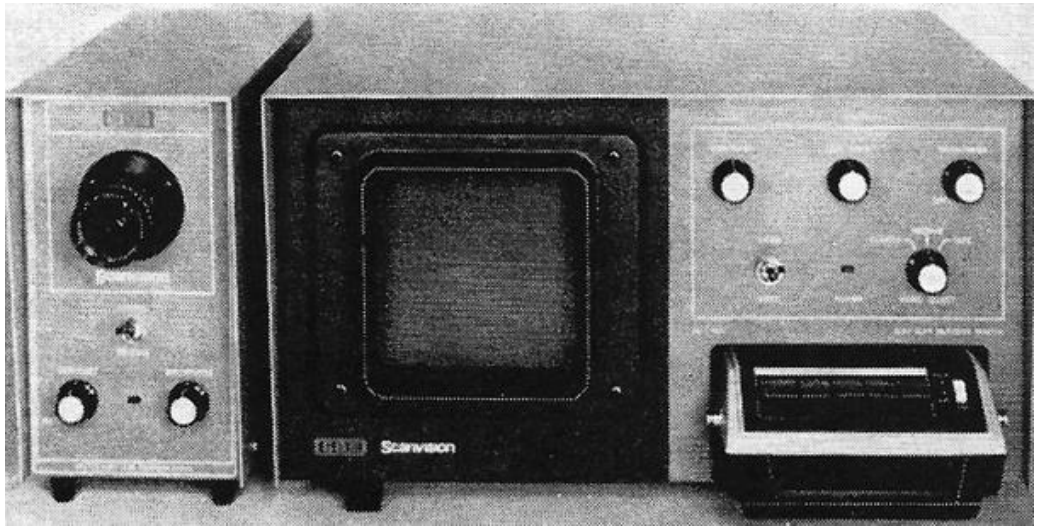


The History of SSTV

- MacDonald used the fax machine as the basis of SSTV. It would send a sync pulse every 8 seconds so that two machines could start at the same point – one transmitting and the other simultaneously receiving.
- The fax machine's sending signal was modulated by an electric current sent from a reflected, tiny beam of light in a photo-optic assembly. The darker the image, the greater the current flowed. On the other end, the signal was demodulated and converted to a DC voltage, where a special, electrolytic paper was used for printing. The greater the voltage from the stylus the darker "burned in" the image became.

The History of SSTV Cont'd

- After September 1958, development of SSTV continued on 10m and 20m
- It was determined that fading and interference from other stations severely degraded the pictures when using sub-carrier am (SCAM) modulation (2000 Hz subcarrier tone fed into speech amplifier circuits of conventional transmitter).
- Soon recognized the superiority of sub-carrier fm (SCFM) and a new standard was adopted in 1961. The frequency of the audio tone conveys the video information: 1500 Hz = black, 2300 Hz = white and intermediate shades of grey in between. 1200 Hz = ultrablack = vertical and horizontal sync pulses
- Most SSTV today is F5 (fed into audio circuit of SSB transmitter, max 3kHz BW)
- In the "old days", you could convert an oscilloscope to display the images – or buy a fancy system!



Robot SSTV System from Deutsche-Drache – Circa 1972

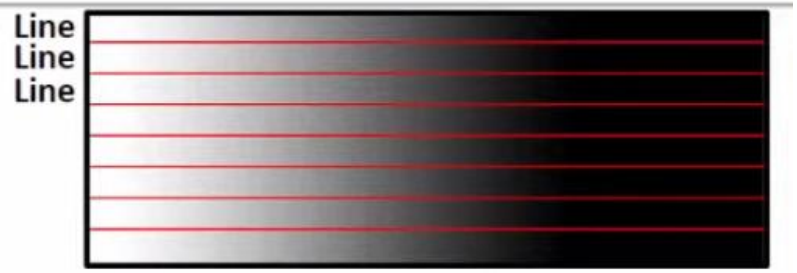
Amateur Slow-Scan Standards

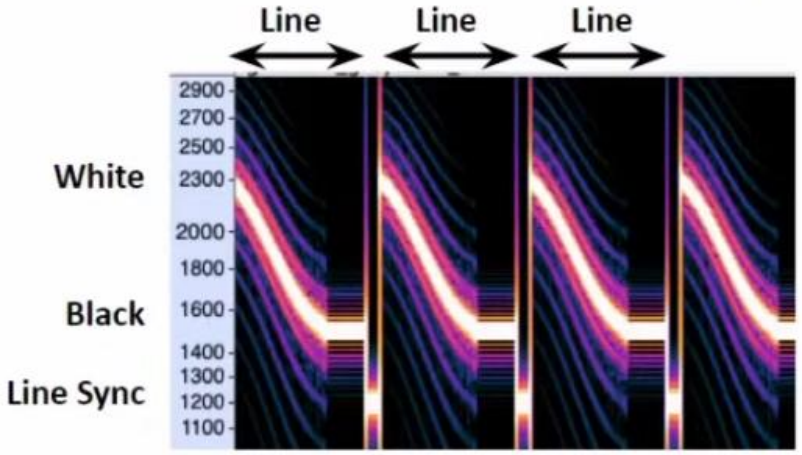
	60-Hz Areas	*50-Hz Areas*
Sweep Rates:		
Horizontal	15 Hz (60 Hz/4)	16 2/3 Hz (50 Hz/3)
Vertical	8 sec.	7.2 sec.
No. of Scanning Lines	120	120
Aspect Ratio	1:1	1:1
Direction of Scan:		
Horizontal	Left to Right	Left to Right
Vertical	Top to Bottom	Top to Bottom
Sync Pulse Duration:		
Horizontal	5 millisec.	5 millisec.
Vertical	30 millisec.	30 millisec.
Subcarrier Freq.:		
Sync	1200 Hz	1200 Hz
Black	1500 Hz	1500 Hz
White	2300 Hz	2300 Hz
Req. Trans. Bandwidth	1.0 to 2.5 kHz	1.0 to 2.5 kHz

The Radio Amateur's Handbook 1975

Recap of B&W Image Encoding

- **Each line of image encoded with varying frequency audio.**
  - Line Sync: 1200 Hz Pulse
  - Line Data: 1500 (Black) - 2300 (White) Hz
- **Line duration and number of lines vary with mode.**
- **Similar to image modulation in composite video - hence 'slow scan TV'**

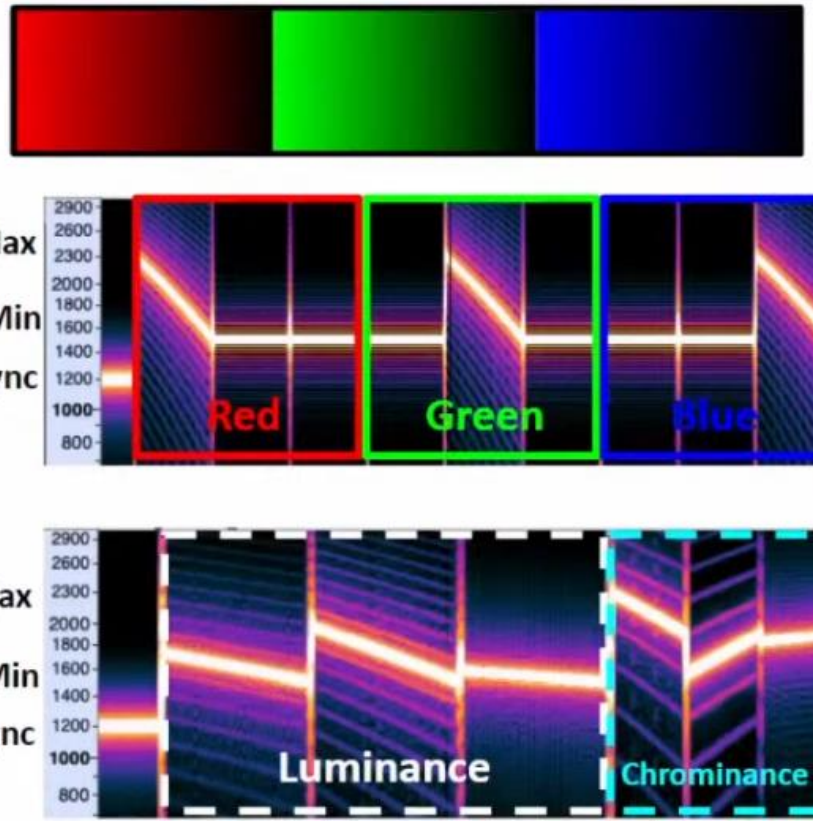




- **As scan goes from left to right, tone goes from high to low (white to black – 2300 to 1500 Hz)**

Colour Encoding

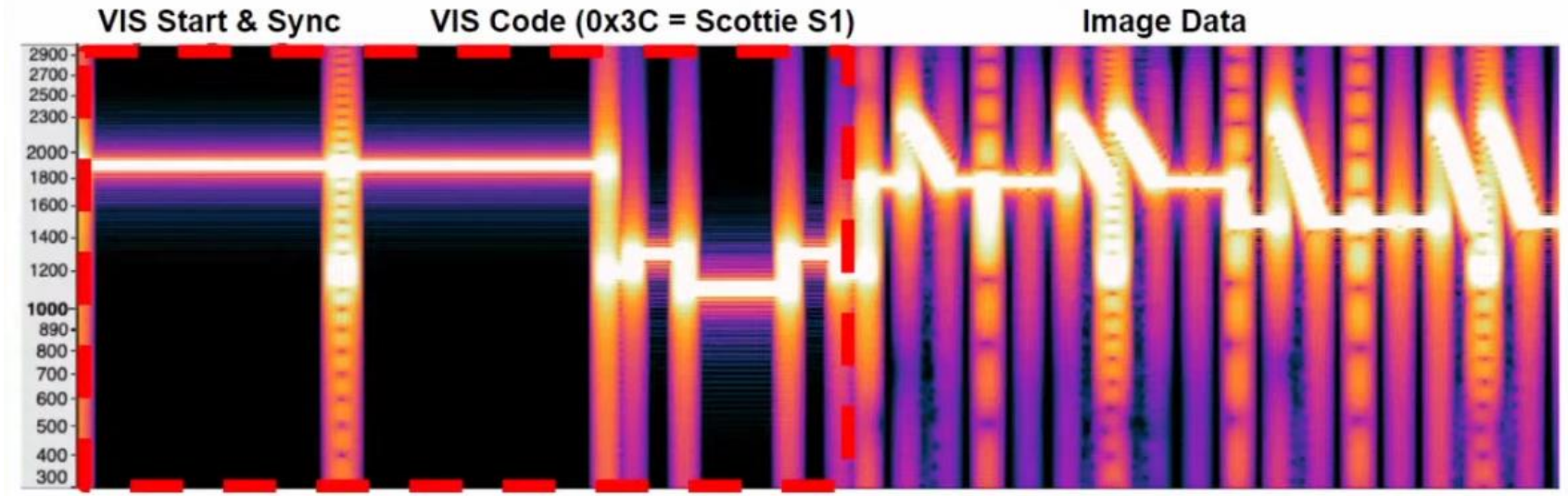
- Line sweep repeated multiple times for colour information.
- Some modes use Primary Colours (Martin, Scottie)
- Others use Luminance & Chrominance (Robot36, PD)



- When using RGB, each line is scanned and sent three times, once for each colour.

Standardization of Modes

- Most software includes a 'preamble' to help identify the mode automatically - "Vertical Interval Signal"



Source: http://www.barberdsp.com/downloads/Dayton%20Paper.pdf

300ms leader - 1900 Hz

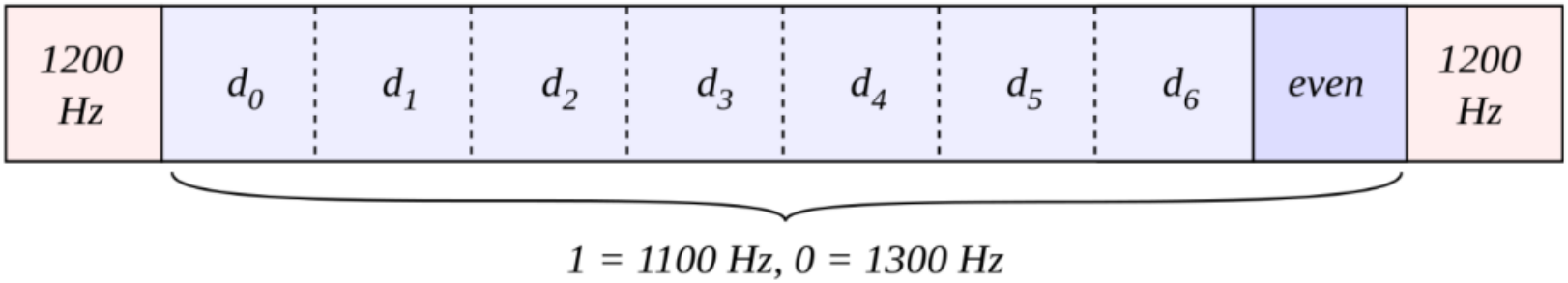
10ms break - 1200 Hz

Second 300ms leader - 1900 Hz

30ms VIS code identify mode

- **Each image starts with a sync pulse, followed by a VIS code that identifies the mode**

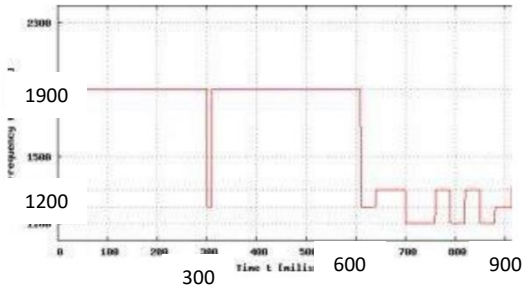
VIS Codes



Here are the VIS codes for Martin and Scottie modes. The data is arranged from the least significant bits to the most significant bits when transmitted.

	d6	d5	d4	d3	d2	d1	d0
Martin 1	0	1	0	1	1	0	0
Martin 2	0	1	0	1	0	0	0
Scottie 1	0	1	1	1	1	0	0
Scottie 2	0	1	1	1	0	0	0

d0/d1 indicate color composite video for Martin & Scottie modes
d2 denotes horizontal resolution: 0 = 160 px and 1 = 320 px
d3 is the vertical resolution: 0 = 128 lines and 1 = 256 lines
d4 to d6 collectively provide the added binary coding for the mode



Here is an example of the calibration header at 1900 Hz/1200 Hz/1900 Hz, followed by the 1200 Hz start bit, then d0 to d6 bits (0011010), the parity bit of 1, and a 1200 Hz stop bit for Martin 1.

Different Systems

- **Examples of the resolution and transmission time**

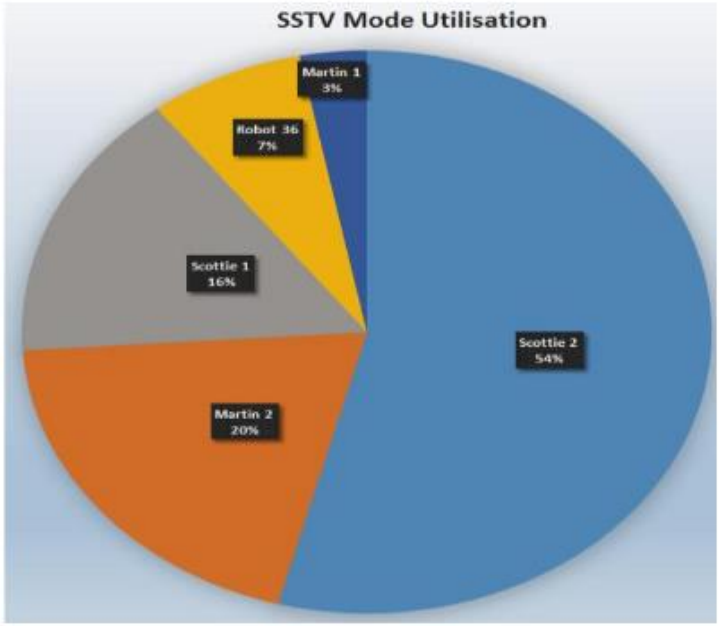
Mode name	Transfer time	Resolution
Scottie S1	110 s	320×256
Scottie S2	71 s	160×256
Scottie S3	55 s	320×128
Scottie S4	36 s	160×128
Scottie DX	269 s	320×256

Mode name	Transfer time	Resolution
Martin M1	114 s	320×256
Martin M2	58 s	160×256
Martin M3	57 s	320×128
Martin M4	29 s	160×128

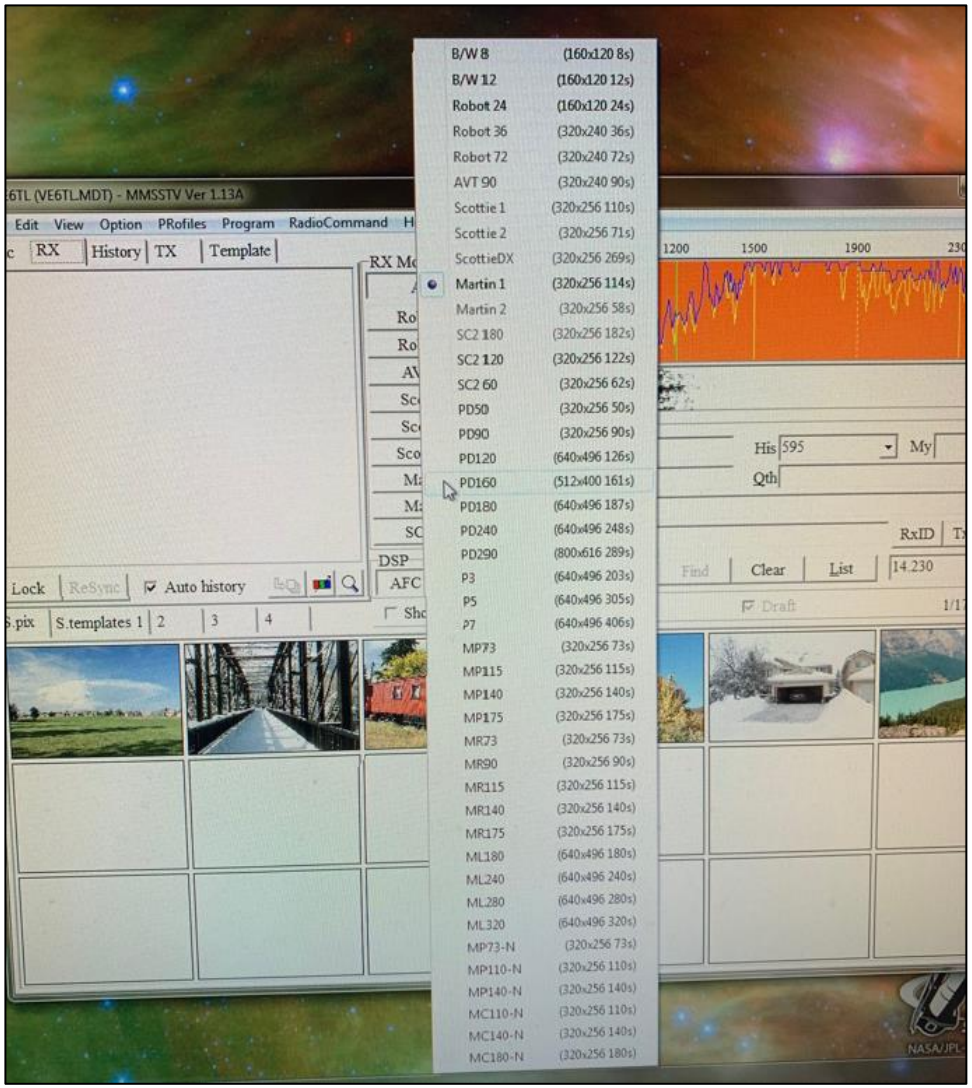
Red highlight = Found in MMSSTV

Most Common Modes

- Scottie 2: 52%
- Martin 2: 19%
- Scottie 1: 15%
- Robot 36: 7%
- Martin 1: 3%



Many More Modes!



- By right-clicking on any of the modes listed to the right of the image, a complete list of possible modes within MMSSTV pops up.
- This list supplies both resolution and time of transmission, so is very handy.

SSTV Hardware

- If you can do FT8 or PSK31, your radio is already talking to your PC
- You set up the software for SSTV in a similar way
- If your radio is not set up with your PC, you'll need some sort of interface with audio out to your PC's sound card and audio in via "data" or "mic" connection. Popular ones include Rigblaster and Signalink.

SSTV SOFTWARE

- **MMSSTV**

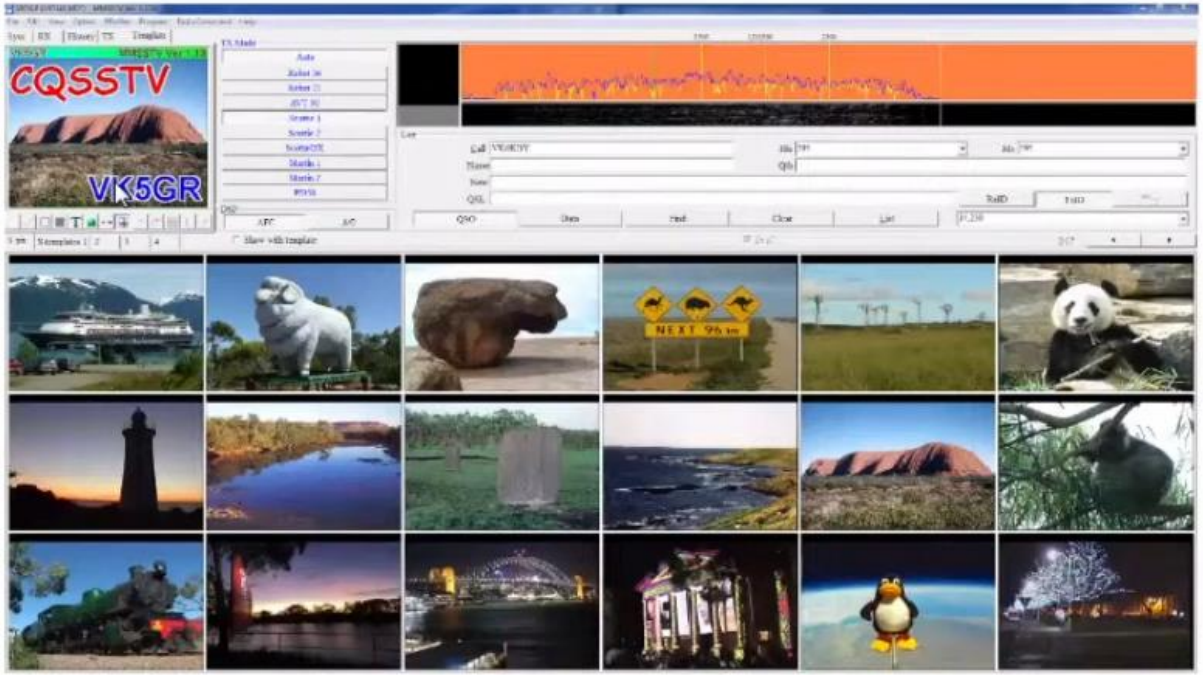
  Available from:

  Hamsoft.ca

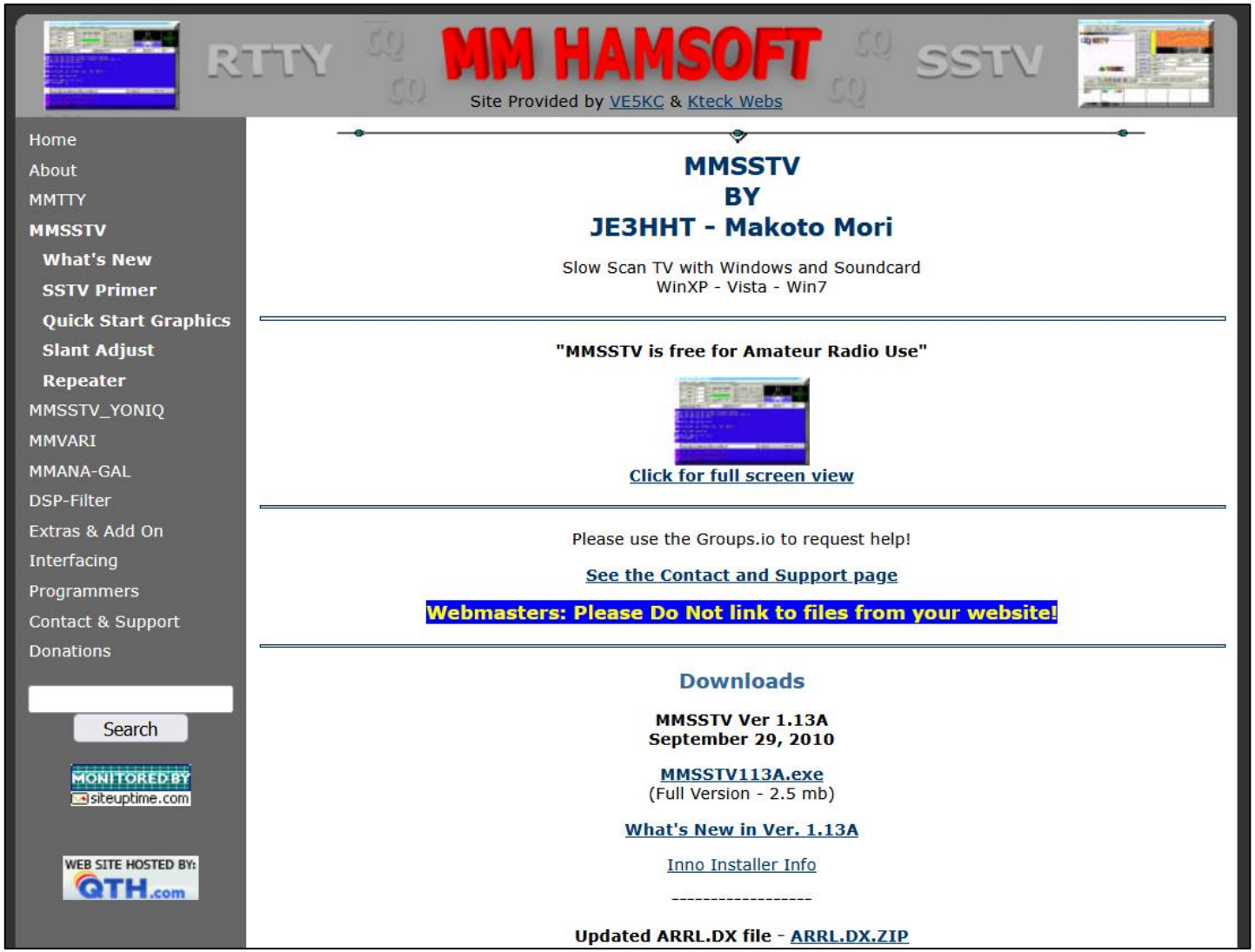
- **MixW (Paid?)**

- **DM780**
  (HamRadio Deluxe)

- **QSSTV (Linux)**



MMSSTV


RTTY
MM HAMSOFT
Site Provided by VE5KC & Kteck Webs
SSTV
Home
About
MMTTY
MMSSTV
What's New
SSTV Primer
Quick Start Graphics
Slant Adjust
Repeater
MMSSTV_YONIQ
MMVARI
MMANA-GAL
DSP-Filter
Extras & Add On
Interfacing
Programmers
Contact & Support
Donations
Search
MONITORED BY siteuptime.com
WEB SITE HOSTED BY: QTH.com
MMSSTV
BY
JE3HHT - Makoto Mori
Slow Scan TV with Windows and Soundcard
WinXP - Vista - Win7
"MMSSTV is free for Amateur Radio Use"
Click for full screen view
Please use the Groups.io to request help!
See the Contact and Support page
Webmasters: Please Do Not link to files from your website!
Downloads
MMSSTV Ver 1.13A
September 29, 2010
MMSSTV113A.exe
(Full Version - 2.5 mb)
What's New in Ver. 1.13A
Inno Installer Info

Updated ARRL.DX file - ARRL.DX.ZIP

MMSSTV - Configuration

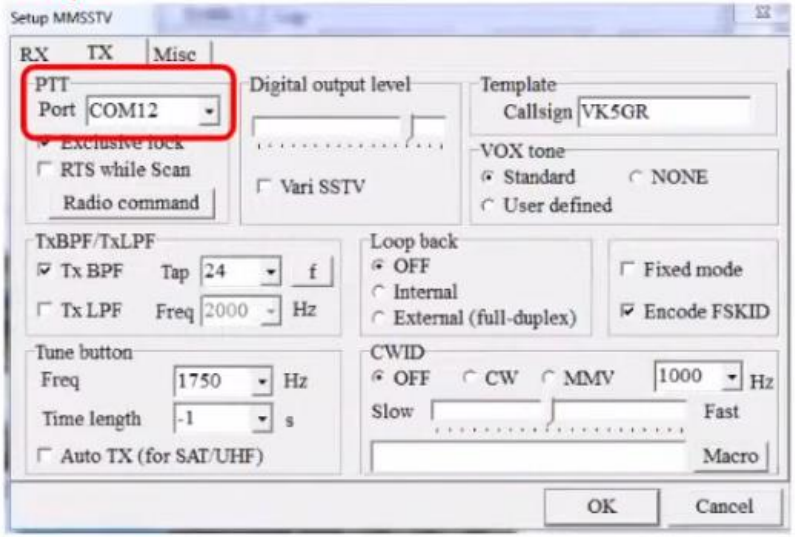
From main screen, select "Option" ➔ "Setup MMSSTV(O)"

- **Leave RX tab defaults**
- **Step 1: In TX tab select Port**
- **Step 2: Select "Radio command" button and set up CAT commands**

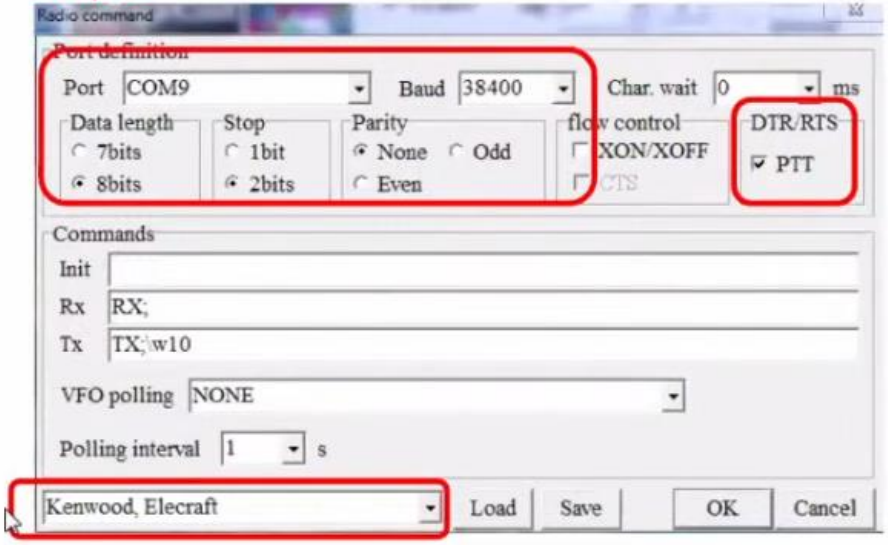
Connecting it to your radio

- **Step 1 - PTT**
- **Step 2 - Radio Command Control**

Step 1

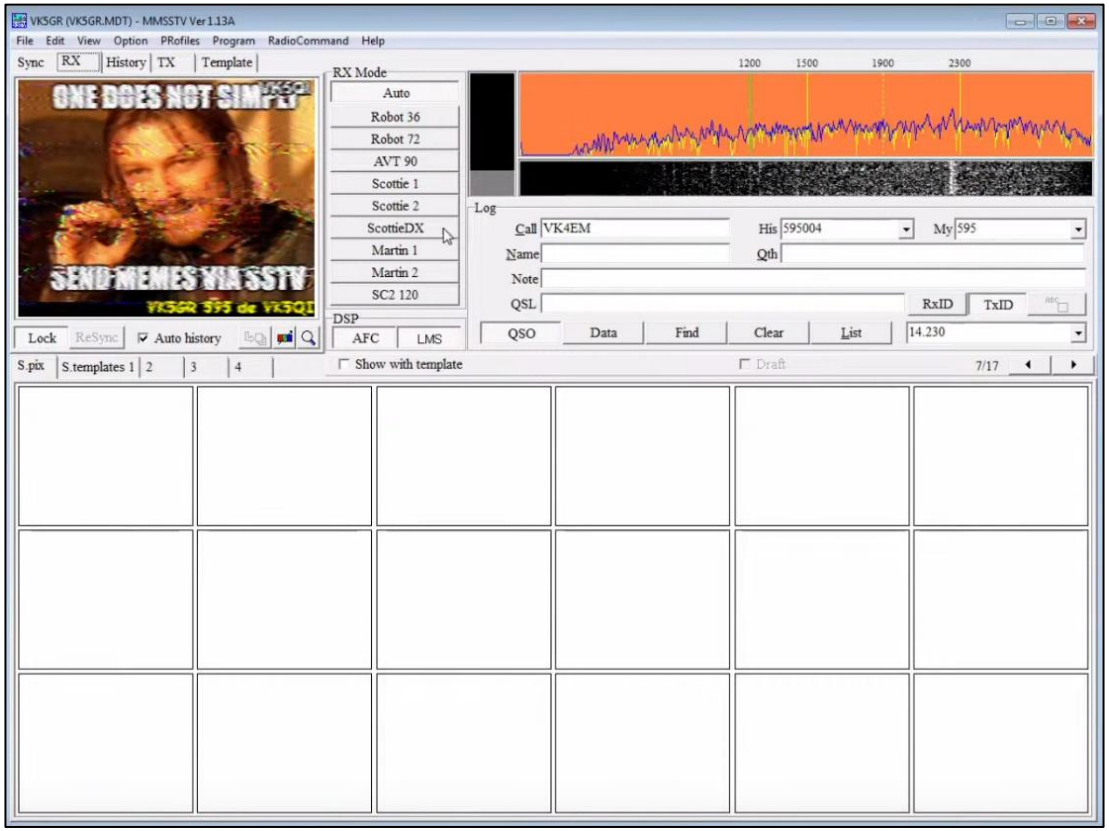


Step 2



- **Step 3: Select "Misc" tab and select input and output audio devices**

RECEIVING SSTV



- **Tune to 14.230 MHz (or other suitable SSTV frequency)**
- **Should start to see a picture decoding on your screen with mode automatically determined**
- **Note that SSTV follows SSB by band (USB above 40m, LSB 40m and below – might need to use “Data – Reverse” mode to set LSB on some radios)**
- **“History” Tab allows you to step back through previous pictures received**
- **At bottom of image window is a RGB icon with arrow. It allows editing to improve image.**

TRANSMITTING SSTV

Step 1: Select pictures from your own collection and import into MMSSTV

Step 2: Build templates for future use and store

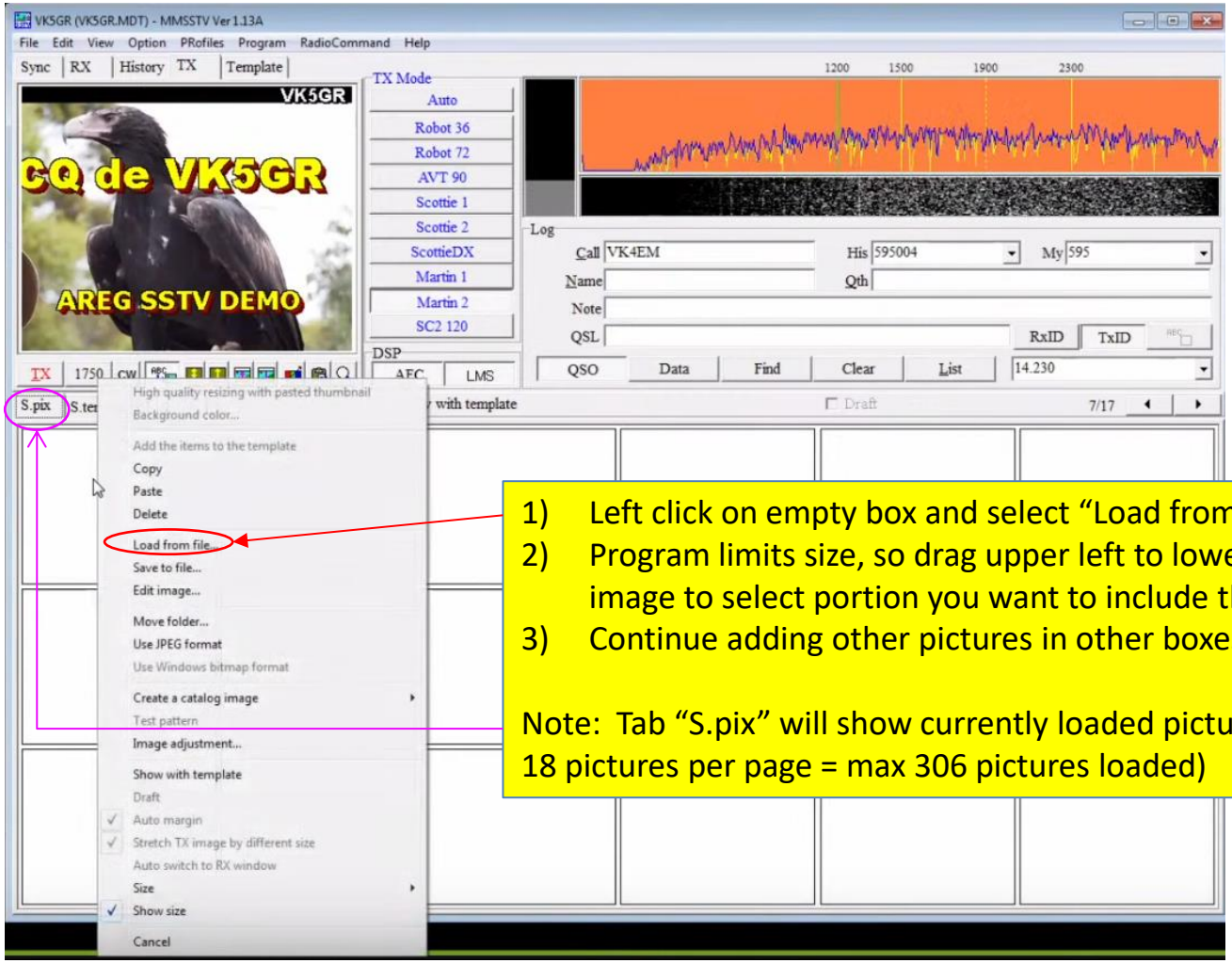
Step 3: Select photo and template for each picture sent

Step 4: Select “TX” button to send

Note: Because most transmissions take 1 minutes or more, you should run your rig at no more than 50% of full power. Many run low power (4-5W) into an amplifier and output 100W. DX mode takes about 5 minutes to transmit a single picture, so be careful.

TRANSMITTING SSTV – Step 1

Step 1: Select pictures from your own collection and import into MMSSTV

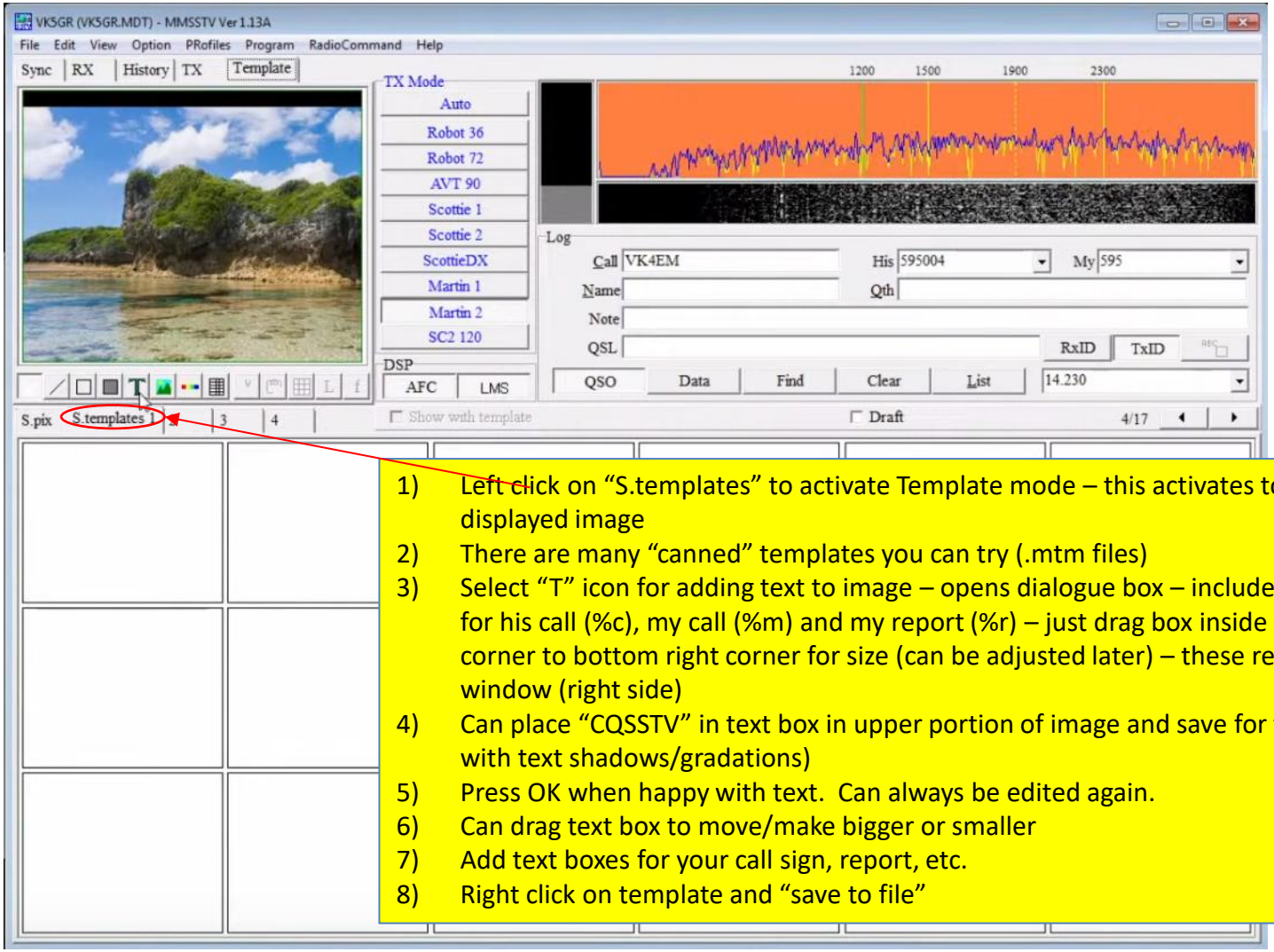


1) Left click on empty box and select “Load from file”
2) Program limits size, so drag upper left to lower right within image to select portion you want to include then “OK”
3) Continue adding other pictures in other boxes the same way

Note: Tab “S.pix” will show currently loaded pictures (17 pages of 18 pictures per page = max 306 pictures loaded)

TRANSMITTING SSTV – Step 2

Step 2: Build templates for future use and store



1) Left click on “S.templates” to activate Template mode – this activates toolbar below currently displayed image
2) There are many “canned” templates you can try (.mtm files)
3) Select “T” icon for adding text to image – opens dialogue box – includes macros (shortcuts) for his call (%c), my call (%m) and my report (%r) – just drag box inside image from top left corner to bottom right corner for size (can be adjusted later) – these relate to fields in logging window (right side)
4) Can place “CQSSTV” in text box in upper portion of image and save for future calling CQ (play with text shadows/gradations)
5) Press OK when happy with text. Can always be edited again.
6) Can drag text box to move/make bigger or smaller
7) Add text boxes for your call sign, report, etc.
8) Right click on template and “save to file”

TRANSMITTING SSTV – Step 3

Step 3: Select photo and template for each picture sent

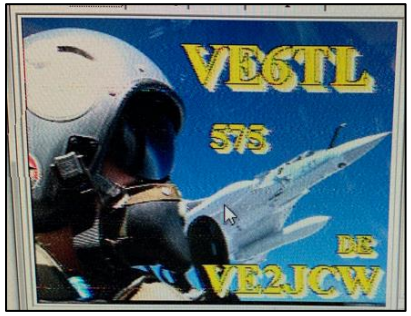
- When freq is clear, press "TX" button (Step 4) and send CQ
- Once finished sending, must press "RX" to see if getting response

Signal reports are "**RSQ**":
"**R**eadability 1-5, **S**ignal Strength 1-9, **Q**uality 1-5"

QSO Flow

- Select image 1
- Select template 1 (for calling CQ)
- Call CQ if frequency is clear

- Wait for Reply



- Fill out log section with his call, RSQ
- Select image 2 and template 2
- Send my reply (with copy of his image – optional)

- Wait for Reply - His “73”
- My option to send another image with my “73”
- Options include sending 73 de VE6TL by CW or acknowledge via voice (SSB)

What Frequencies are Used?

These are the most popular frequencies used:

3.845 MHz
3.857 MHz
7.171 MHz
14.230 MHz (very popular)
14.233 MHz (another good one)
21.340 MHz
28.680 MHz
145.500 MHz

Tips for Success

- Receive a lot of photos before transmitting, just to familiarize yourself with procedures and styles of photos
- Play around with the different fonts and character styles to see which ones show up best on different backgrounds (i.e. white vs black borders?)
- Try different modes when sending pictures to better understand tradeoff between quality and speed. I found Scottie 2 to be about the best compromise with transmission time 71 seconds and resolution 160x256 GBR
- If your transceiver/amplifier has a temperature readout, be sure not exceed the acceptable temperature range while sending.

References

- Anonymous, **"The Wonderful World of SSTV",** https://slowscantv.nl/images/SSTV_tutorial.pdf
  - Published April, 2014, Good basic information

- Grant, VK5GR & Mark, VK5QI, **"SSTV for Beginners"**, https://youtu.be/4UJSMfdajV4
  - Excellent video on getting started

- Ham Universe, **"Get a Fast Start With Slow Scan TV",** https://www.hamuniverse.com/sstv.html
  - A very brief outline of how to get started in SSTV

- Jeffrey, K8JTK, **"SSTV Images Via Radio"**, https://www.jeffreykopcak.com/drive/ham_radio/digital_modes/slow-scan_tv_images_via_radio/slow-scan_tv.html#/
  - Slide presentation

- Martin, OK2MNM, **"Image Communication on Short Waves,** https://sstv-handbook.com/
  - Very comprehensive and almost too much information – but great reference for digging deeper

- Larry, WB9KMW, **"SSTV Transmission Methodology"**, https://wa9tt.com/Research_SSTV/Transmission_process/tutorial_SSTV_transmission_methodology.pdf
  - An in-depth description of how SSTV works


THE
END