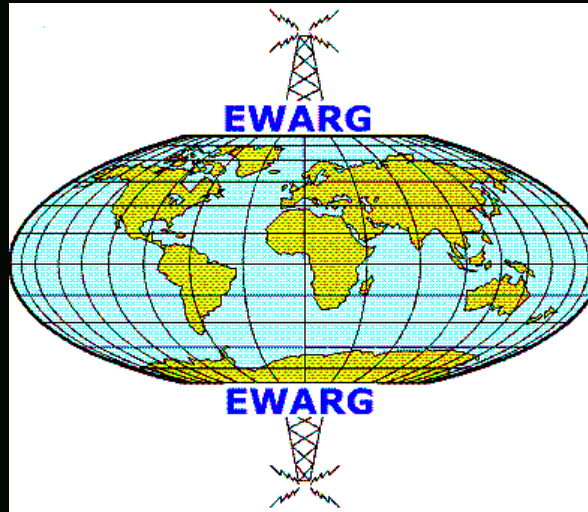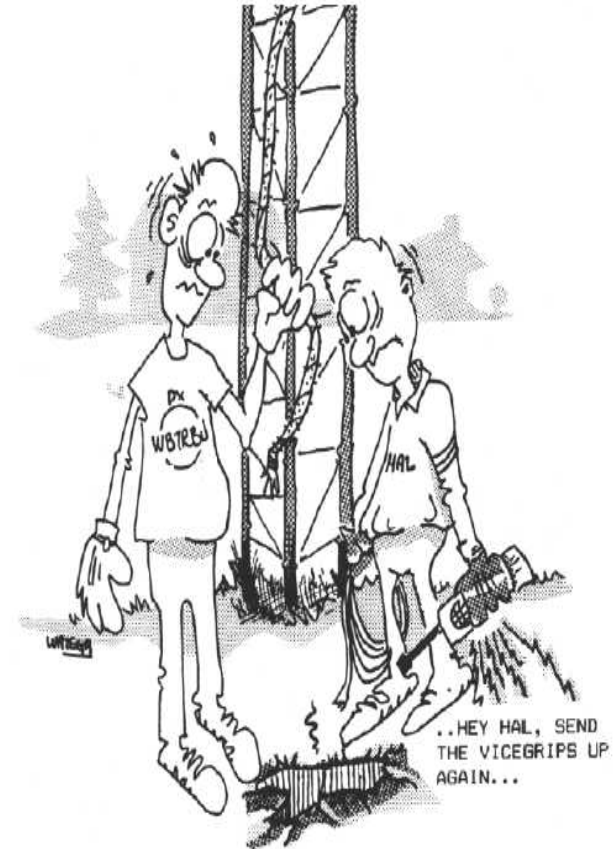# RTTY Introduction

Spokane County ARES / RACES

Jay Townsend, WS7I July 2009

Good operators improve through planning, learning, working and practicing. They also have fun. Good RTTY Operators are made not born.

RTTY Introduction

Outline of topics

Basics

Hardware

Interface

Dxing

Contesting

Classic RTTY Setup

WAØRMH -- Dec, 1971 Model 28-ASR TTY, Collins 75A4 rcvr, URA-8A T.U., Hallicrafters HT-37 transmitter (with VFO modified for FSK), homebrew amp, test equipment.

Modern RTTY Setup

Don, AA5AU New Orleans, LA

RTTY Basics

- Basic concepts and terms
  - RTTY Activity on the Bands
  - Mark and Space
  - AFSK and FSK
  - Letters and Figures
  - Tuning Aids

RTTY Activity on the Bands

- 10 : 28080-28100 KHz, during contests 28060-28150 KHz
- 15 : 21080-21100 KHz, during contests 21060-21150 KHz
- 20 : 14080-14100 KHz, during contests 14060-14140 KHz
- 40 : 7025-7050 and 7080-7100 KHz, contests 7025-7100 KHz
- 80 : 3580-3600 KHz, during contests 3570 (or lower)-3600 KHz
- 160 : 1.820-1.850, No RTTY contesting
- Avoid 14.100 plus minus 500 Hz.

Mark and Space

- RTTY transmission is a continuous carrier which shifts frequency between two distinct frequencies
  - The lower RF frequency is known as the SPACE
  - The upper RF frequency is known as the MARK
  - The difference between the two is known as the SHIFT
  - Mark   14090 KHz
  - Space 14089.830 KHz
  - Shift is 170 Hz
- Characters sent at 45 baud   "LSMFT"
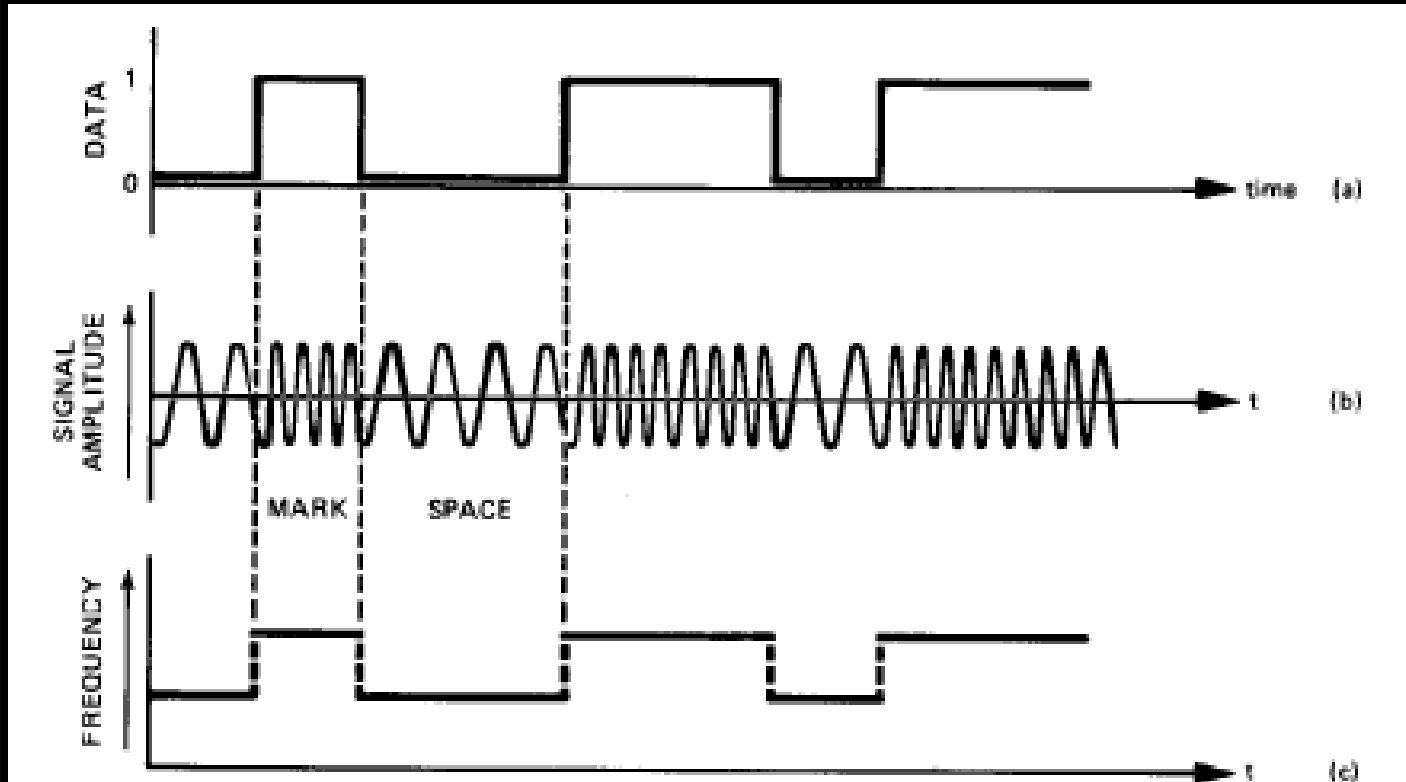
Mark and Space

Figure 1. FSK modulation. Binary data (a) frequency modulates the carrier to produce the FSK signal (b) which has the frequency characteristic (c).

RTTY - Letters and Figures

- RTTY uses the 5-bit baudot code
  - 5 bits means only 32 characters can be represented
  - To get around this there are two "sets", Letters and Figures
- Letters mode
  - "A" through "Z" (26 CAPITAL letters)
  - Ltrs shift, Figs shift, null, space, carriage return, line feed
- Figures mode
  - "0" through "9", various punctuation (26 characters)
  - Ltrs shift, Figs shift, null, space, carriage return, line feed

RTTY Tip

- If numbers are sent in Letters mode you can translate
    - "TOO" is "599", "PPQ" is "001" (note that "-" is "A")
- In some programs a "right-click" will translate the word

RTTY -Tuning Aids

- Accurate frequency tuning is important
    - Listen to the audio signal to help yourself tune
    - Listen to the audio to detect transmission starts and stops
    - Use FSK and a 500 Hz filter (when using AFSK some radios only allow you to use the wide SSB filters
    - Initially, turn off distractions like AFC and NET in your software
- If you are having trouble tuning then let others come to you
- Many Xcvr's – you need to set radio menu setting "reverse" so that your RTTY signal is really "normal"

RTTY -Tuning Aids

- Visual indicators
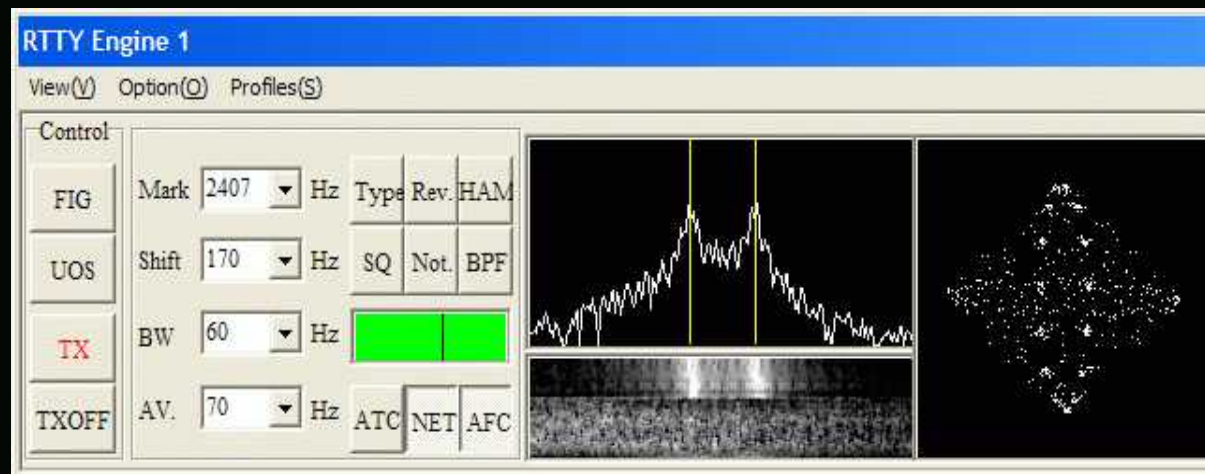
RTTY - Macros

- Macros
  - CQ Call
  - CQ Exchange
  - CQ Close
  - S&P Call
  - S&P Exchange

WriteLog Function Keys

RTTY Setup
Cable Schematic Example
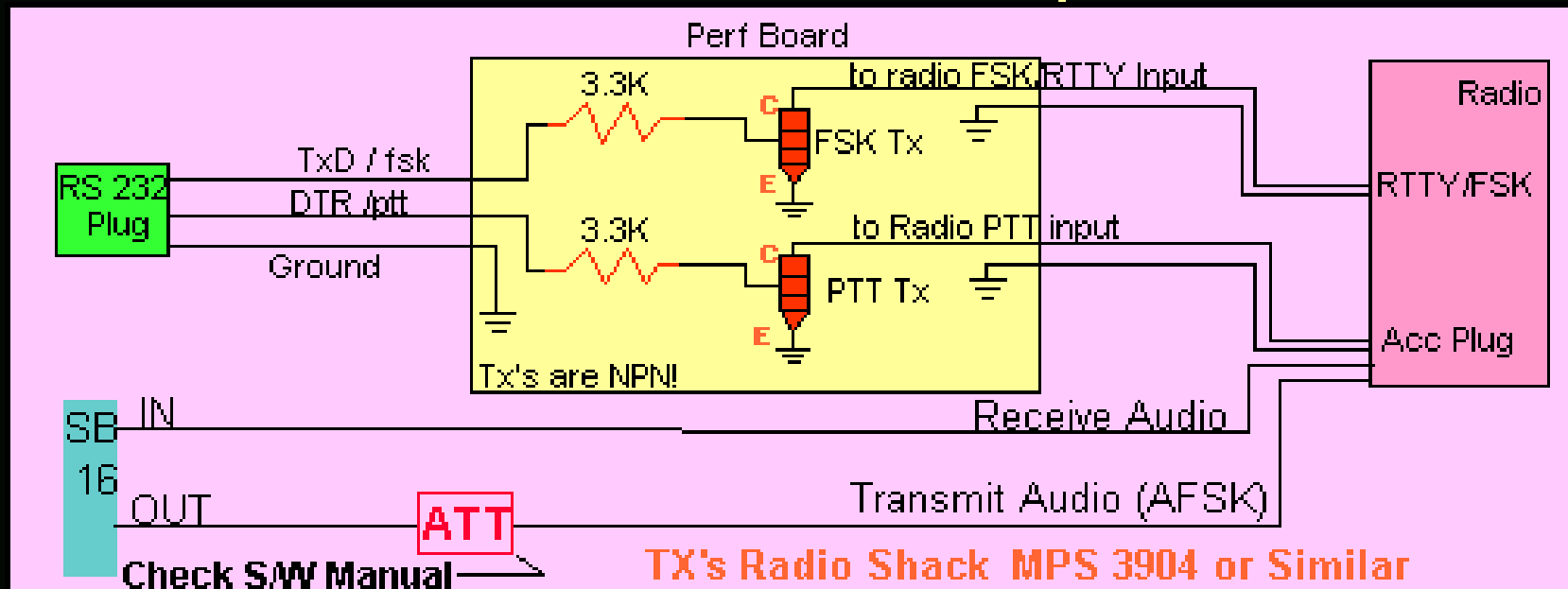
- Isolation transformers to remove ground loops
- DTR/RTS for PTT could use opto-isolator

RTTY Setup
Potential Issues

- Transmit signal is reversed (upside down) from received signals
  - Solutions differ for AFSK and FSK
  - Adjust with rig menu command or software
  - See MMTTY help manual (troubleshooting section)
- Frequency offset
  - Frequency display does not match DX spots or frequency of the op you are working
  - Usually requires setting adjustment on rig or in logging software
- RTTY polarity
  - No common FSK input polarity standard by rig manufacturers across product lines
  - Adjust with rig menu command, interface, or software

RTTY Setup
Potential Issues

- TX signal problems with AFSK
  - RF, ground loops: isolation transformers
  - Turn OFF speech compression
  - Check sound card audio levels, mute unnecessary channels
  - Watch MIC gain, ALC
- Complex interactions among diverse system components
  - Make sure settings across all components are consistent
    - MMTTY
    - Logging software
    - Computer/soundcard
    - Interface

RTTY Introduction - Getting Started

- Depending on your station setup, experience with digital modes, and persistence, getting your hardware and software configured for RTTY operating can take anywhere from 15 minutes to infinity.
  - If you have trouble getting started, it may be worthwhile to take a step back and follow the sequence below
- Recommended sequence for getting started
  - Install and setup MMTTY on stand-alone basis (i.e. without contest logger such as Writelog or N1MM)
    - Get MMTTY receiving signals properly
      - If you have a complex computer interface (e.g. microHAM), it may be worthwhile to get MMTTY receiving properly with just a direct audio connection from radio to soundcard
    - Next step is to get MMTTY working properly on transmit
      - Some ops prefer to start with FSK but I prefer AFSK since I operated PSK-31 prior to RTTY
      - In either case, make sure that PTT is working properly
        - With AFSK, you can often use VOX initially to simplify the setup (make sure you attenuate the sound card signal if you use your radio's microphone input)

RTTY Operations

Software

Selecting the software is the first decision
There are three inter-dependant choices

An Operating System

A DIGITAL Decoder

A DX and/or Contest Logger

RTTY Introduction

Operating System

Best choice today
  Windows XP Pro or Home Edition

Second best choice
  Windows Vista

Last best choice
  Windows 2000 or DOS

RTTY Introduction

DIGITAL Decoder

The most popular decoder -- Sound Card

    MMTTY   JE3HHT (Makoto Mori)

Other soundcard decoders

    MixW   UT1UZ & UU9JDR

    Digital Master 780   HB9DRV (Ham Radio Deluxe)

    HAL DXP38, PK232, KAM --   Hardware based

RTTY Introduction

A DX and/or Contest Logger

Top two choices

N1MM Logger

WriteLog

Casual Dxing

Ham Radio Deluxe (DM780)

MMTTY

RTTY Contesting & DXing
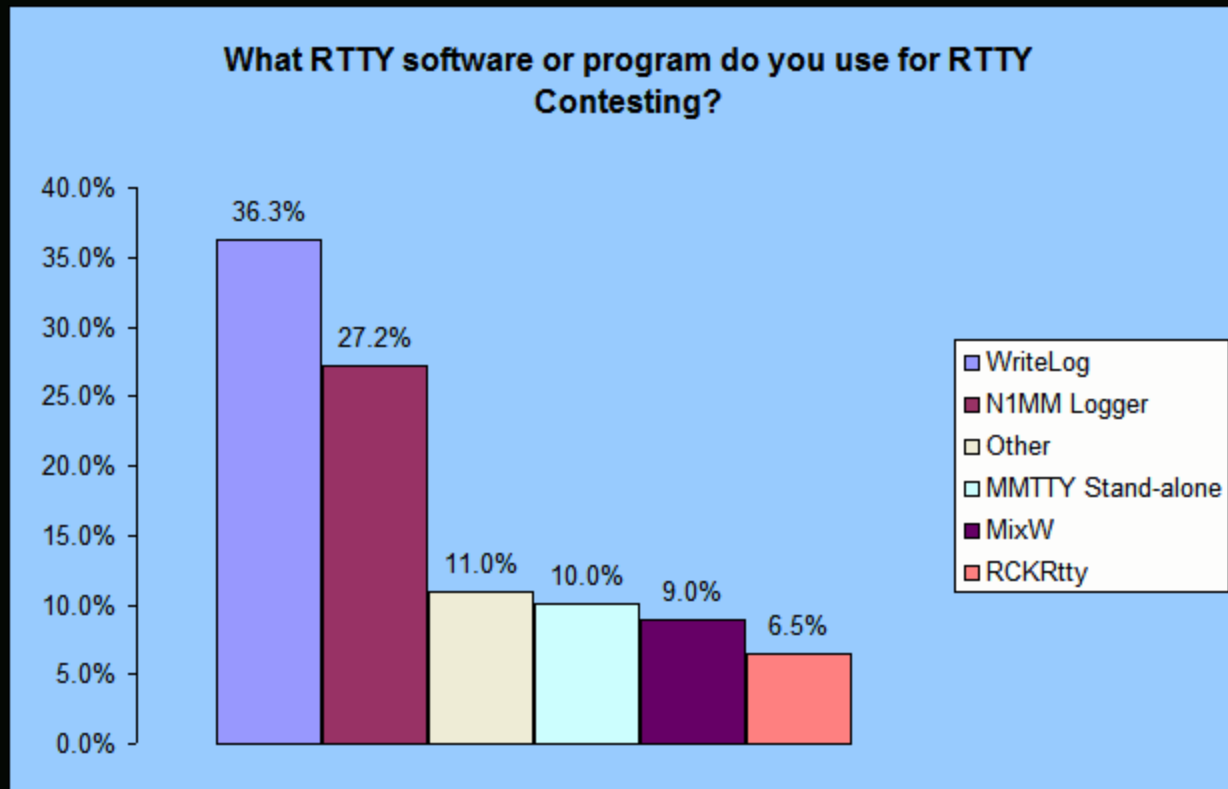
RTTY Introduction

Hardware

PC system. Seems everyone has several computers in the ham shack these days.

Search on eBay or visit your local computer resellers!

RTTY Introduction

Digital Interface
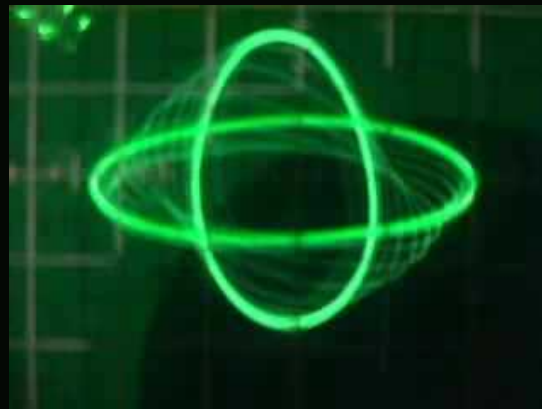
FSK or AFSK ? ? ?

RTTY Introduction

Type of Interface

RTTY Introduction

__Interface__

FSK - pros

    Basic on/off keying, no TX adjustments required

    Simple single transistor keyer can be homebrewed

    Narrow CW filters are typically available in FSK mode

    Narrow filtering is a requisite for serious DIGITAL contesting

FSK - cons

    Not all transceivers have an FSK mode

    Does not support PSK31, SSTV, or some other modes

    Manufacturers have not standardized the keying polarity

RTTY Introduction

Interface

Connections
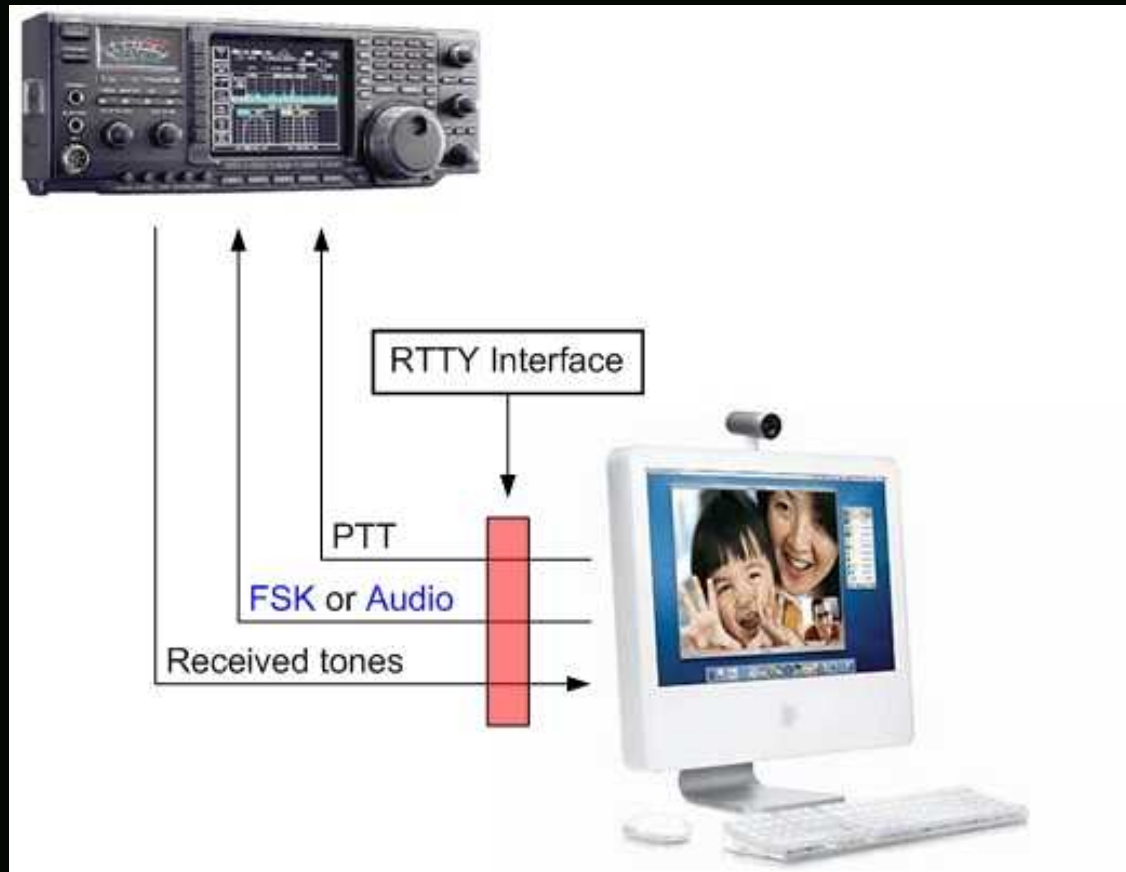
RTTY Introduction

Interface

AFSK - pros

    The PC soundcard generates two audio tones

    Provides DIGITAL mode for transceivers without FSK mode

    PSK31, SSTV and other modes are 'ready to go'

    Wideband receiving mode is possible (simultaneous RX)

AFSK - cons

    Narrow filters might not be selectable in LSB mode

    Requires attention to details for a quality TX signal

    Windows and applications sounds can TX over the air

RTTY Introduction

Interface

A simple homebrew FSK keyer for most transceivers.
Same circuit for PTT, CW, FSK. Pins 7, 4, 3, on DB9.
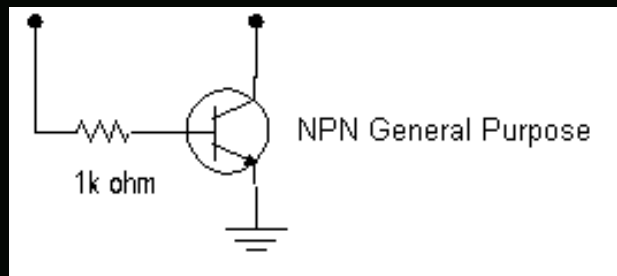
RTTY Introduction

__Interface__

A simple homebrew FSK keyer for older transceivers
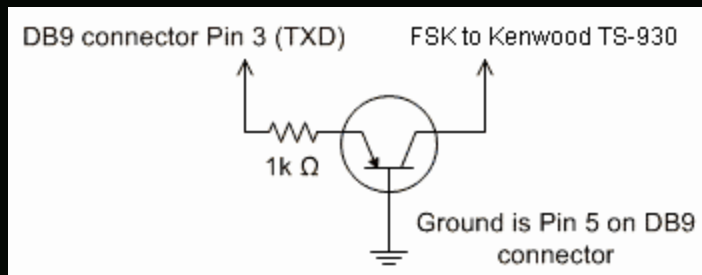
RTTY Introduction

Interface

A basic Serial homebrew FSK & PTT & CW keyer
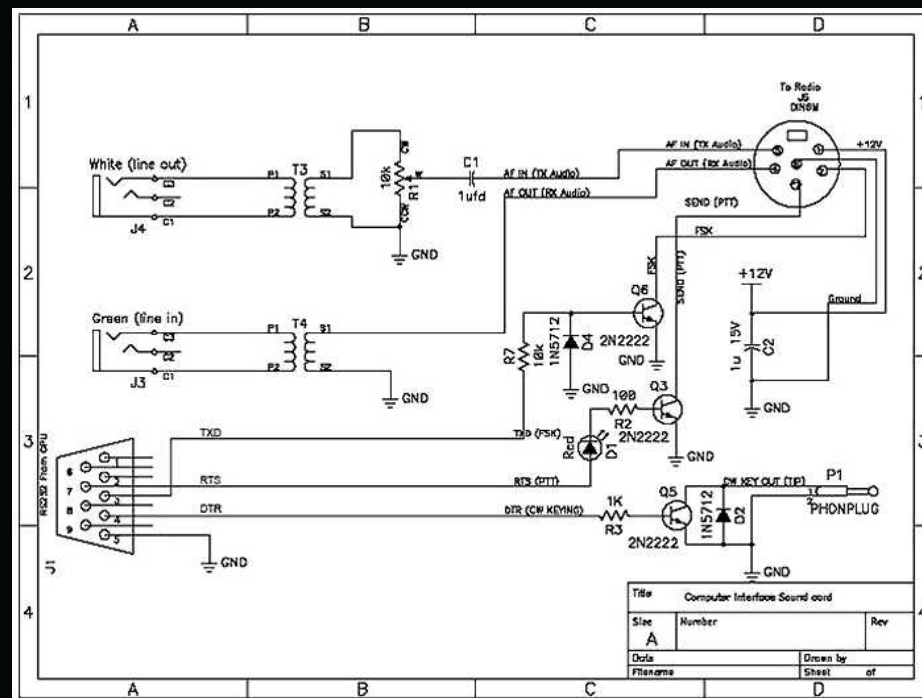
RTTY Introduction

Interface

There are many commercial interfaces with many options

       Buxcomm – Rascal

       MicroHAM – USB Interface II

       RigExpert – Navigator

       Tigertronics – Signal Link USB   **** Will do Winmore $99

       West Mountain Radio – RigBlaster
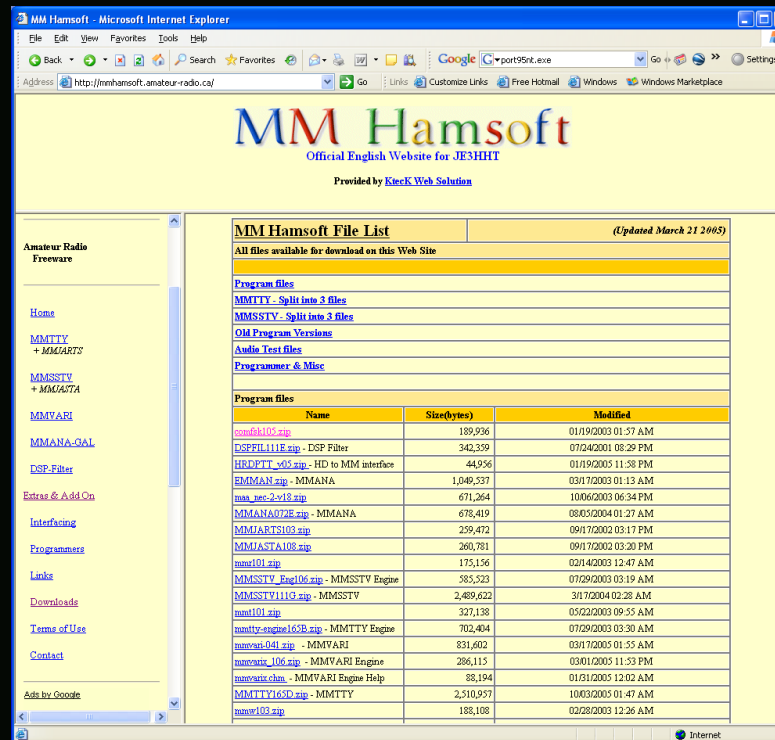
Full Interface Isolation Xformers and Opto-Isolators

RTTY MMTTY

Setup

Go to *http://mmhamsoft.amateur-radio.ca*

RTTY MMTTY

Setup

DIGITAL Receiving

Download MMTTY166G.ZIP (2.51 Mb) and extract the files

Execute the MMTTY166G.EXE program

Accept the license agreement

Accept the program default values

RTTY MMTTY

Setup

RTTY MMTTY

Setup

DIGITAL Receiving

The MMTTY application will launch

Register your callsign

(This creates a log file and puts your callsign into the default macros)

Connect an RX audio cable

(The transceiver audio output goes to the computer soundcard line input)

MMTTY is now ready to receive DIGITAL!

RTTY MMTTY

Setup

RTTY Dxing

RTTY Operations

Setup

DIGITAL Receiving

Receiver tuning

Select a low tuning rate - 1 ~ 5 KHz per knob revolution

Receiver AGC

Set to FAST to follow signal fading

Receiver bandwidth

500 Hz is just fine, 250 Hz is better for contesting

Cascaded filters are best

filters are ideal

Receiver audio processing

External audio filters or DSP provide <u>minimal</u> RX benefit

RTTY Introduction

__Digital__

DIGITAL Really stresses your hardware!

- DIGITAL is 100% duty cycle
- Verify the duty cycle of your
  - Power Supplies
  - Transceiver
  - Amplifier
  - Antenna and Baluns
  - Tuner and Feedlines
- Consider using auxillary cooling fans
  - For your transceiver and amplifier
  - For your room!

RTTY Introduction

Contesting

DIGITAL Station considerations

AFSK mode

Turn off audio compression	**Off** 🔊	**On**	🔊
Beware of a live microphone		**On**	🔊
Beware of Windows system sounds		**On**	🔊
Beware of applications sounds		**On**	🔊

RTTY Introduction

DXing

DIGITAL Station considerations

- FSK and AFSK mode
  - Be aware of potential RFI issues, especially when running HP
    - Erratic operation of mouse or keyboard
    - A latching TX - the PTT won't release
    - Your computer hangs or reboots
  - Directional antennas
    - Remember ERP is higher in front of a yagi
    - Consider RF exposure levels
- Enlist another operator to check your tones, shift, and polarity
- Monitor your TX signal

RTTY Introduction

DXing

DIGITAL Macro recommendations

Keep them short!

Change them to match band conditions

Start a new line in each macro

End each line with a space

End your CQ macro with 'CQ'

cq dx cq dx de ws7i ws7i <sp>

Receive for 3 to 5 seconds then CQ again

Use hyphens between numbers to increase speed

tu aa5au 599 WA ws7i<sp>

Visit *www.rttycontesting.com* for additional tips

RTTY Introduction

DXing

RTTY DXing

RTTY Dxing

RTTY Dxing

RTTY Introduction

Contesting

DIGITAL Contest calander

January	**ARRL DIGITAL Roundup**
February	CQ WPX, NA QSO Party
March	NA Sprint, BARTG HF
April	EA (Spain), SP (Poland)
May	ARI (Italy), Volta (Italy)
June	Ukranian
July	NA QSO Party
August	SARTG (Scandinavian), SCC (Slovenia)
September	**CQWW DX DIGITAL**
October	TARA, Makrothen, NA Sprint, JARTS (Japan)
November	WAEDC (QTCs)
December	TARA

RTTY Introduction

__Contesting__

DIGITAL ARRL RTTY Roundup

 A very popular DX DIGITAL contest

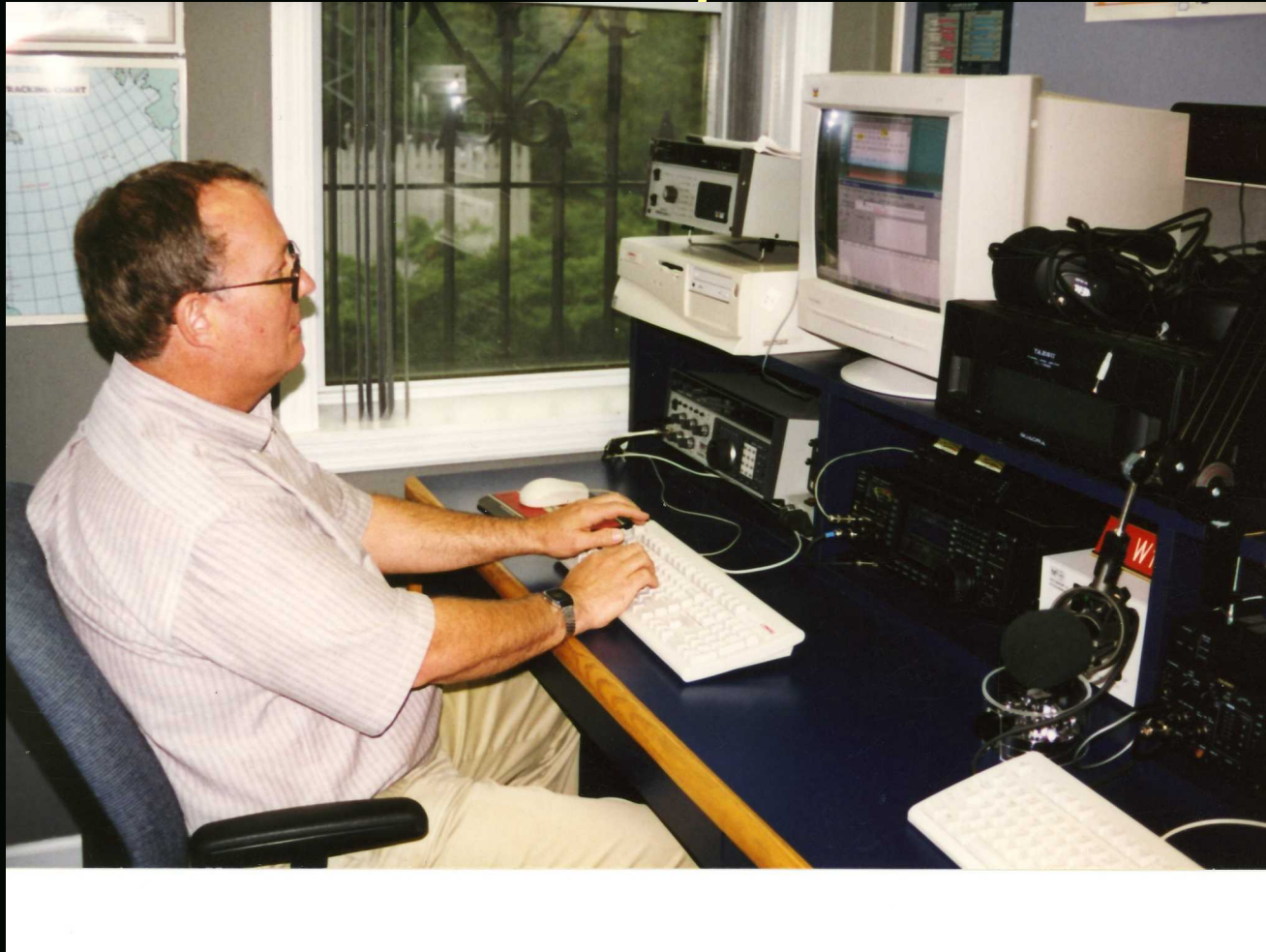 In 2009 EWARG placed **2nd** in the world club category!

 The 30-hour contest begins at **1800Z on Saturday**

 The exchange is RST + State/Prov **599 WA**

 There are separate categories for Single Op and Single Op Assisted

 Set a personal goal - 100 contacts, WAS, WAC, DXCC, ???

RTTY Contesting

RTTY Introduction

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Material by WS7I, K0RC,
K4CZ