Easy Digi Easy RTTY

Presenting a Simple Unified Approach
to all of the Digital Modes

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Easy Digi Easy RTTY

Based on “Easy Digi Easy RTTY Workshop”

presented by KE4PT and N4IEW, 2012 August 18

Easy Digi in three easy steps:

1. Connect two simple cables (plus antenna)
2. Configure the radio and computer
3. Configure digital mode software (as many as you want)

Details at the end

Why “The Easy Way”?

Subject: [MMTTY] RigBlaster Advantage on FSK using MMTTY?
Date: Tue, 08 Jan 2013 mm:hh:ss -0000
From: rll## < W#2### @gmail.com>
Reply-To: MMTTY@yahoogroups.com
To: MMTTY@yahoogroups.com

“I have seen a lot of talk but few solutions... Is there anyone who has been successful in configuring the Rigblaster Advantage with MMTTY to generate FSK? If so, how did you do it? Please be specific.
(Rig = TS570 and Win 7 32 bit)”

Thanks, Rob, W#2###

Why Digital Modes?

- Almost all DXpeditions use at least RTTY
- Many DX stations now operate PSK31 and JT65, future will include JT9 modes
- DXCC counts all digital modes equally
- THERFORE: All digital-modes should be *equally* easy and convenient to operate

One Simple Cable Connects Computer and Sound Card

USB conducts a digital signal:

Computer does digital mode encode and decode

… (PSK, RTTY, SSTV, JT9, JT65 etc.)

Computer provides mode software and software defined filters

The computer passes DIGITIZED signals and 5 V DC power to the external Signalink-USB sound card

One Simple Cable Connects Sound Card and Radio

Sound card must RF and DC isolate radio and computer (important!)

Converts digitized signals from computer to analog for radio

Generates PTT and analog signal for transmission

One Simple Cable to Antenna

Radio ALWAYS in upper SSB or upper Digital mode [U-DIG]

Radio audio pass band is "last IF" for digital signals, radio IF filter is "roofing filter"

Computer is "software defined radio" inside the roofing filter (audio) pass band

Radio frequency dial is "zero Hertz" on the software "water fall" spectrum display

Works equally well for **All** digi-modes

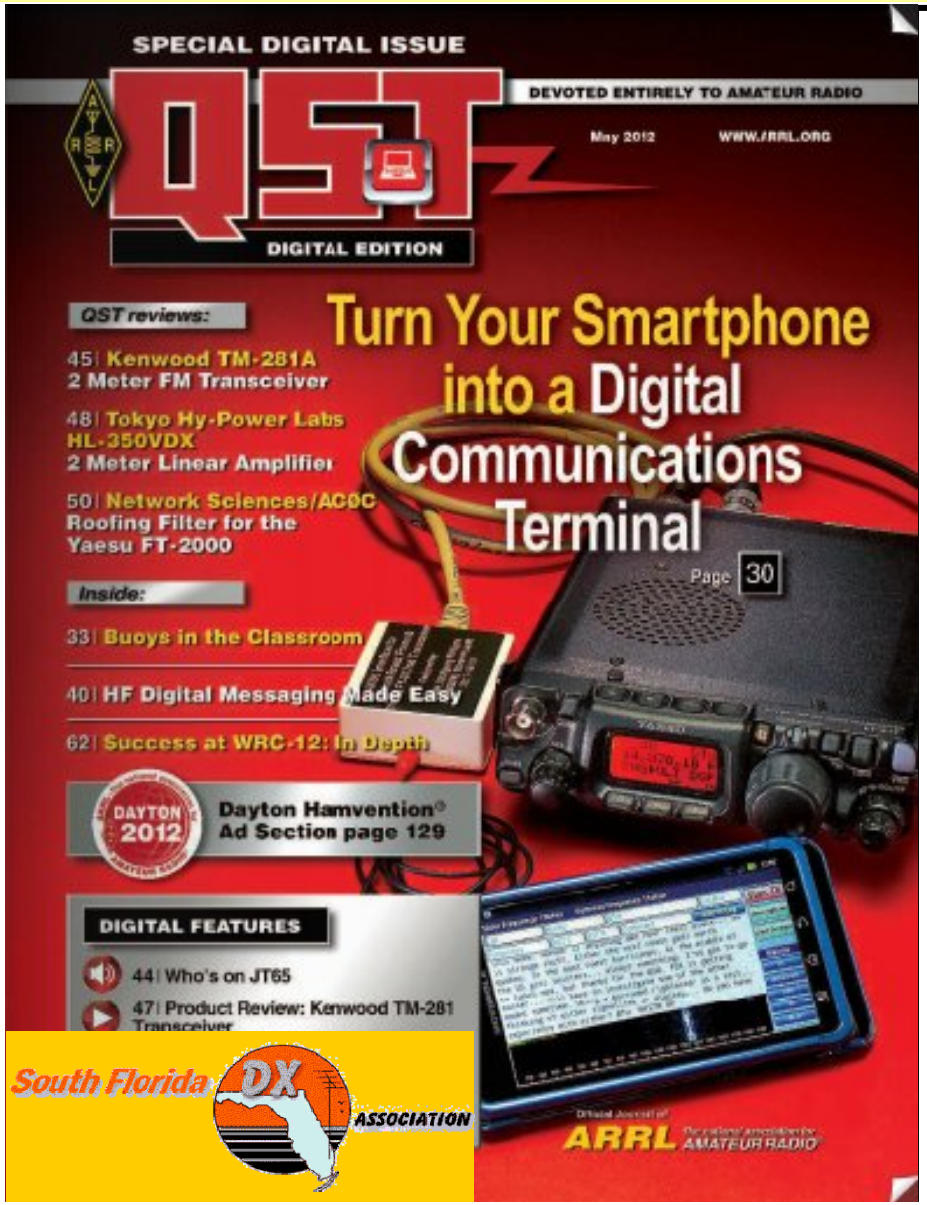
USB digital signal cable | **Analog signal cable** | **antenna**

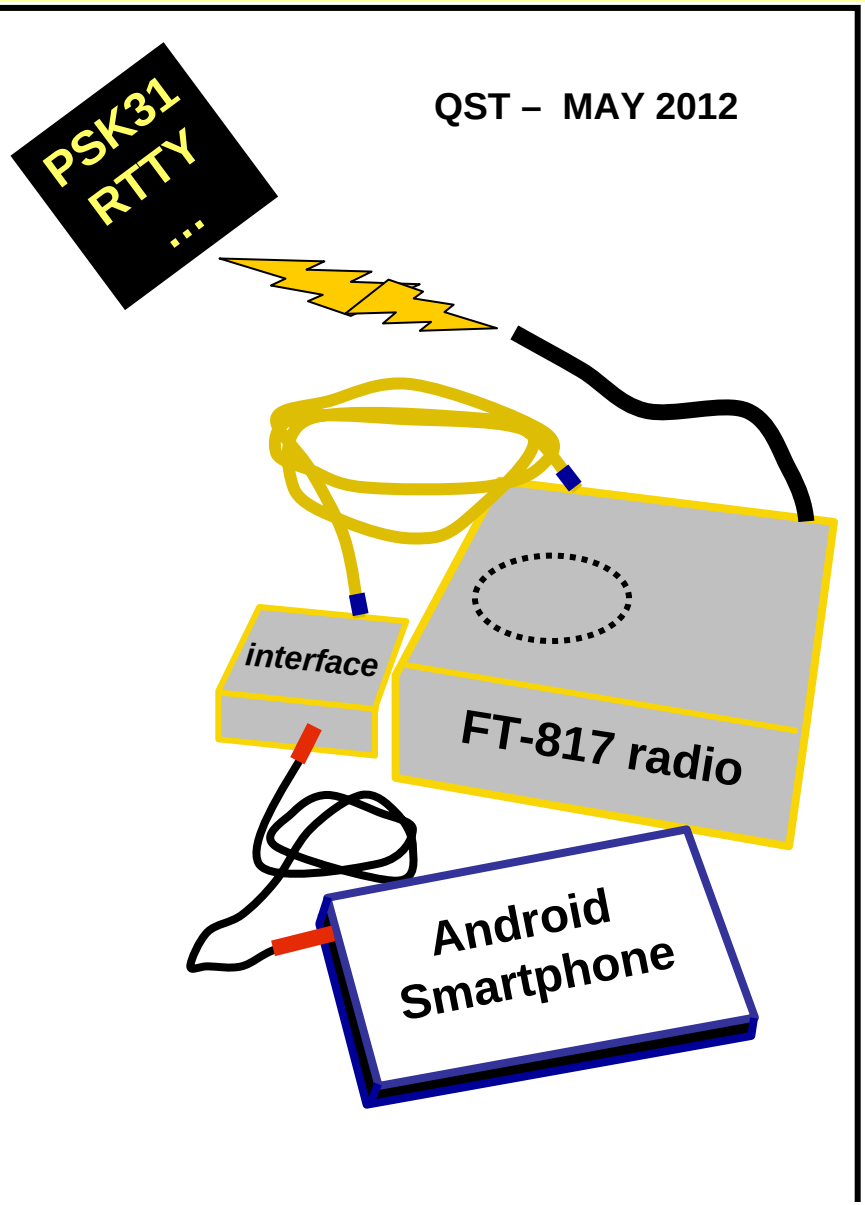
Computer:
- *Digipan*
- *MMTTY*
- *JT65-JT9*
- *SSTV, etc.*

Signalink-USB:
- *conditions signals*
- *isolates computer and radio: RF & DC*

Radio:
- *Upper Digi/SSB for all digi-modes*
- *"Last IF", tune with radio dial*

It’s so simple an Android can do it



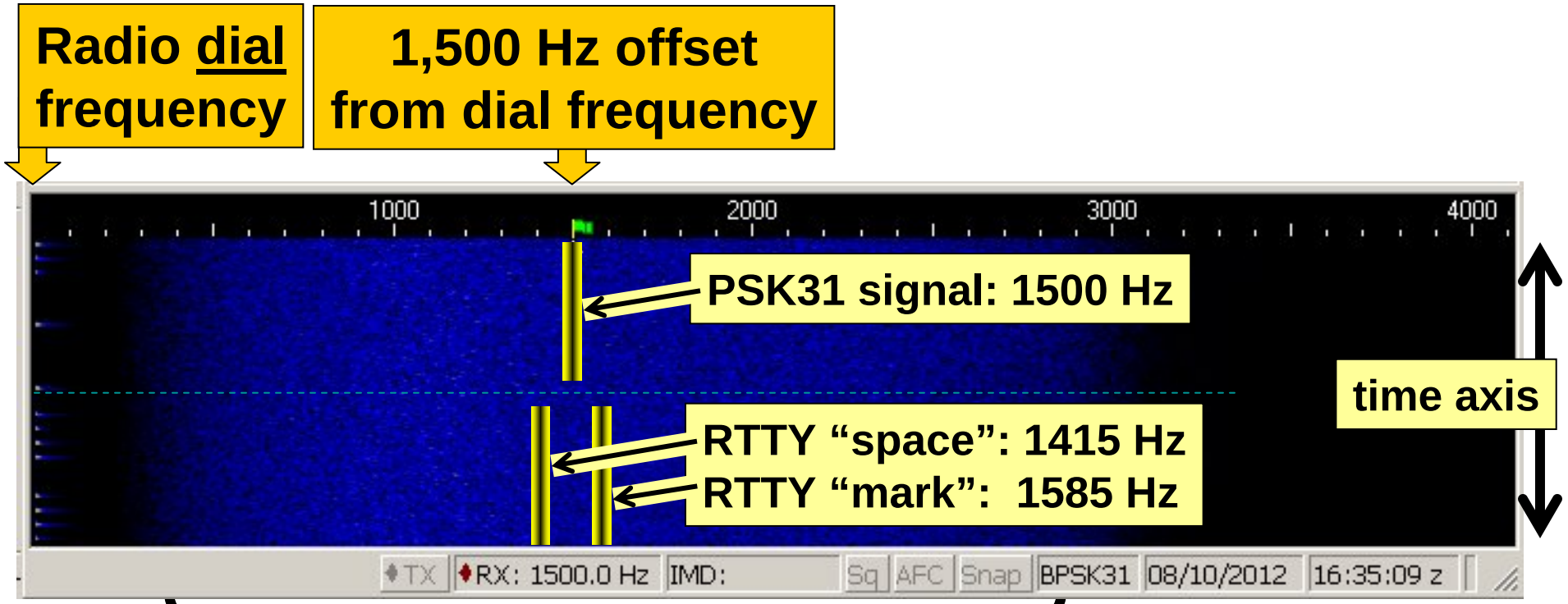


Just as Simple at *Any* Station

Your laptop computer

Cable to IC-756pro-III mic jack or to accessory jack

PSK31 and RTTY signals on 'The Waterfall'



SSB filter audio pass band: ~300 to ~2,800 Hz

Hint: You may select any filter your radio supports, then "IF-shift" to center on the signal

Additional Digital Modes

You can add as many digi modes as you want, just find the software:

- **JT65, JT9, WSJT-X**
- **SSTV**
- **PSK**
- **RTTY … etc.** …

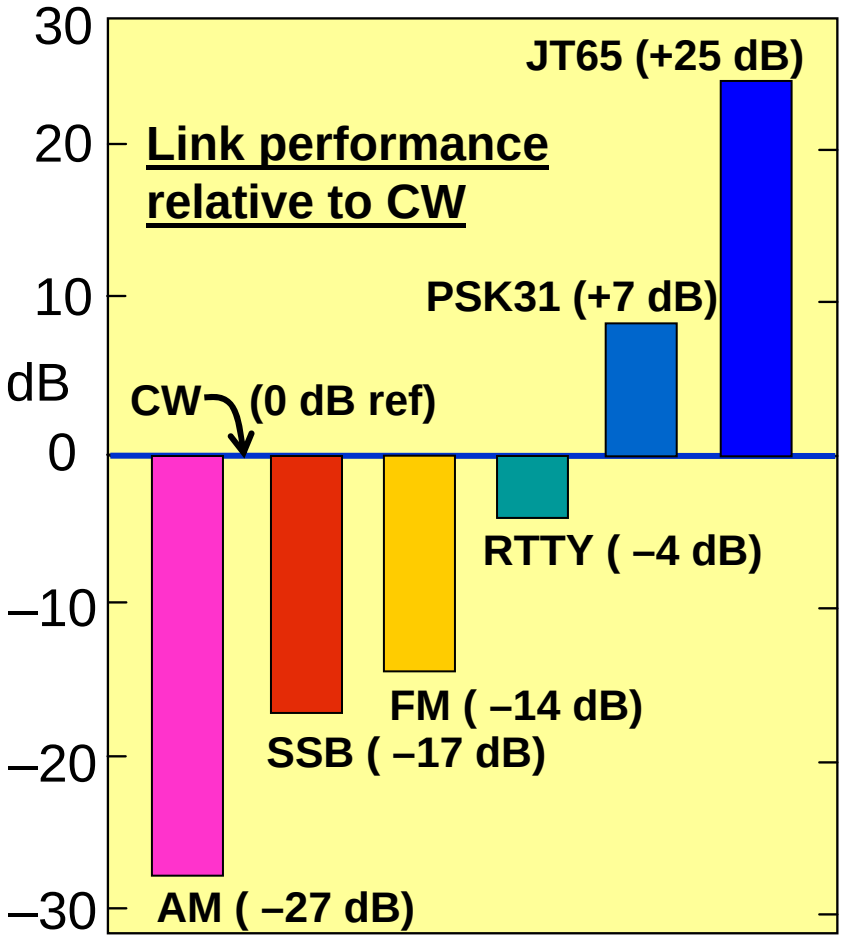
The radio-soundcard-computer together operate like a software defined radio

Why use Digi Modes?

During my quest for WAS Triple Play Award, I noticed that …

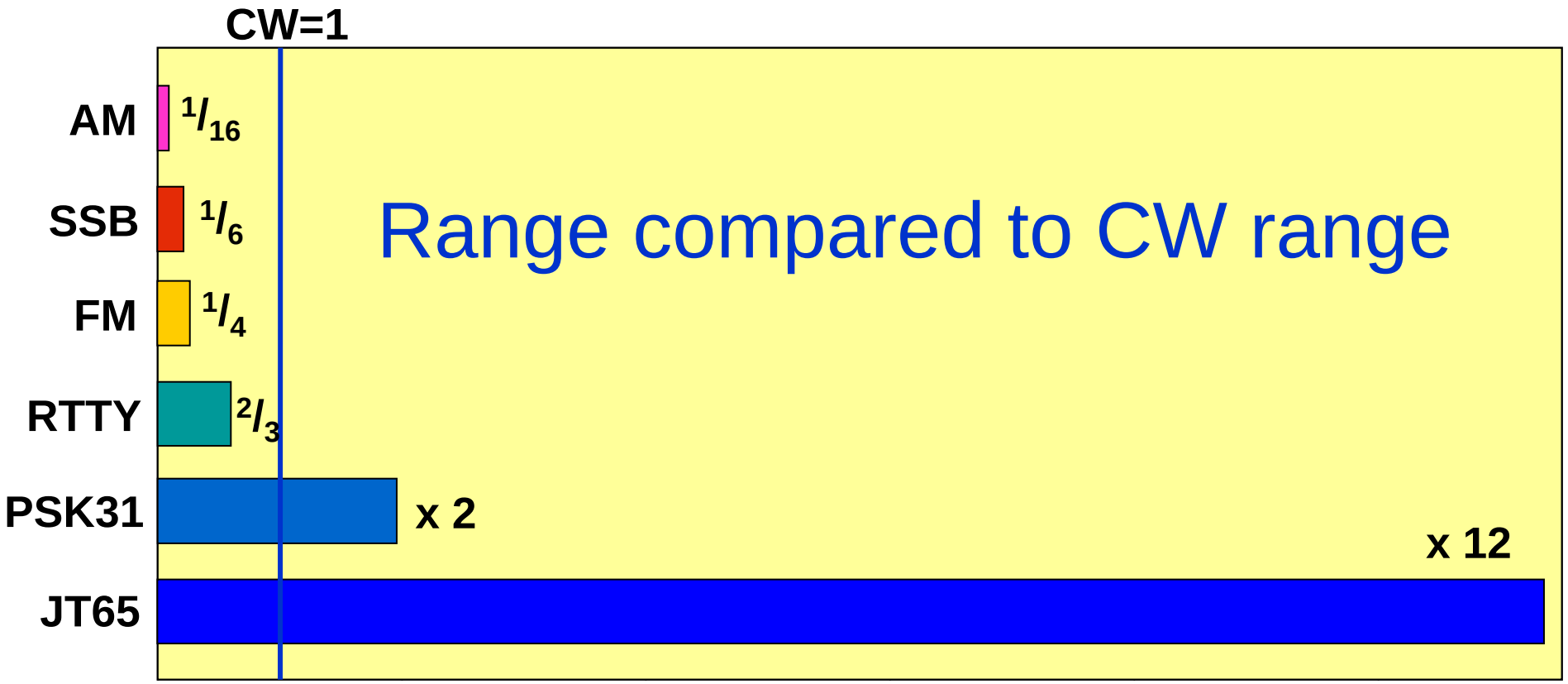
All HF digital modes outperform **SSB – *by a lot!***

Some HF digital modes outperform **CW – *by a lot!***



From: K. Siwiak, KE4PT and B. Pontius, N0ADL, *How much "punch" can you get from different operating modes?* (**QST Dec 2013 pp 30-32) [corrected here]**

Digi-modes have high link margin!



From: K. Siwiak, KE4PT and B. Pontius, N0ADL, *How much "punch" can you get from different operating modes?* (**QST Dec 2013 pp 30-32) [corrected here]**

The Future includes more Digital

- New modes springing up constantly
- DX stations adopting high performance digi modes
- **You don’t need to change any hardware or radio settings to adopt a new HF digital mode: it’s all software!**

Wrap Up

Thanks for your kind attention …

Latest Presentation at:

http://SFDXA/

– follow the presentations link

DETAILS FOLLOW

Configuring the Radio and Computer

- The radio is ALWAYS set to upper single sideband or upper digital mode [U-DIG], *but NOT native RTTY mode and NOT lower SSB*
  - Choose the dial frequency (displays the suppressed carrier upper SSB or U-DIG mode frequency)
  - All digi action is in audio pass band ~300 and 2800 Hz
- Configure Computer + external sound card
- Sound card connects to, and RF isolates, radio and computer
- IMPORTANT: *Set your transmitter power level to no more than 90–95% of maximum PEP!*

Setting up Digipan for PSK

Configure Digipan PSK31 Software First:

READ the Digipan and Signalink Guidelines!!!

1. Start the Digipan application
2. configure > personal data > call+name+QTH
3. configure > soundcard > “USB audio codec” for both TX and RX – IMPORTANT: read Signalink-USB Guide for sound card audio levels
4. configure > soundcard > sample rate 12000
5. [use macros as you like]

Done!! – tune to PSK frequencies and QSO

Setting up MMTTY for RTTY

Configure MMTTY software [READ the HELP files!]

1. Start MMTTY
2. MARK = 830 Hz (actually this is the SPACE tone)
3. Shift = 170 Hz, select type = “rev”
4. option > setup > demodulator > “reverse” “HAM default 830” and “170”, press HAM then OK
5. option > setup > decode 45.45 baud, 5-bit baudot
6. option > setup > soundcard > “USB audio codec” for each, TX and RX – IMPORTANT: read Signalink-USB Guide for sound card audio levels
7. option > setup > misc > sample rate 12000

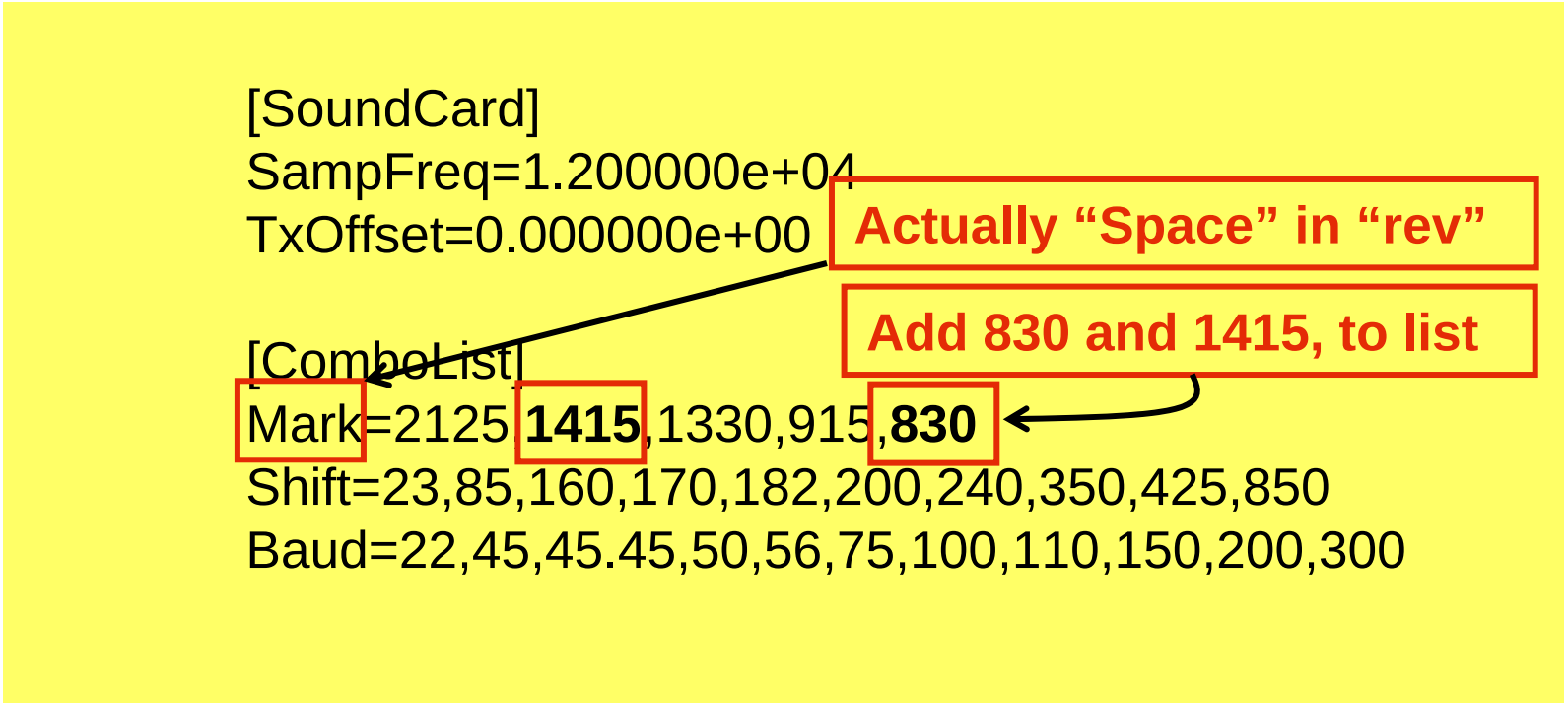
Done!! – tune to RTTY frequencies and QSO

Your “spot” frequency is radio dial + 170 + MARK

For “split” operation do same as you would for SSB!

Add new MARK / SPACE in MMTTY

The mmtty.ini file must be edited, using a TEXT editor:



This change allows SPACE=830 + MARK=1000,

… or for 60m band, select “1415” so Mark and Space at 1500 Hz ± 85 Hz as required by NTIA/FCC.

Operating on the 60m band

- Set the radio to 60 m band SSB suppressed carrier frequency (the same way you operate SSB) – (radio in U-DIG for FT-817)
- FCC and NTIA require digi modes operate at the center of the channel, and require ability to listen in upper SSB
  - PSK: launch Digipan and click waterfall at exactly 1500 Hz
  - RTTY: launch MMTTY; the ‘1415’ Hz tone places the Mark and Space at 1500 Hz ± 85 Hz above the channel SSB suppressed carrier frequency

The Harmonious Choice

- My personal choice for "tone" offset on other HF bands is "915" plus 170 Hz
- That way the two tones appear +/- 85 Hz either side of 1 kHz in upper SSB
- Easy to tune in RTTY stations using waterfall displays calibrated in kHz relative to the dial frequency
- 915 and 1085 Hz tones are musically very nearly 3 semi-tones apart so they intone a pleasant minor third interval – rather than the 2125/2295 Hz screech

$$2^{3/12} \times 915 = 1088$$

Tone Pair Choices

- **830/1000 Hz**
  - "Mark" equals dial frequency plus 1 kHz – easy spotting calculation
- **915/1085 Hz**
  - straddles 1 kHz, intones a *pleasant musical minor third interval*
- **1415/1585 Hz**
  - straddles 1.5 kHz – appropriate choice for 60 m band while operating in upper SSB or U-DIG. Note that many receivers center their digital filters at 1500 Hz in digital mode
- **1830/2000 Hz**
  - "Mark" equals dial plus 2 kHz – easy spotting calculation
- **2125/2295 Hz**
  - traditional, useful if your receiver uses antique decoding equipment with fixed analog audio tone filters based on 88 mH toroid coil

Caution: in transmit most radios use the default SSB filter bandwidth no matter what you select for the receiving filter. The second audio harmonic of your chosen tones should be *above* the upper cut-off frequency of the transmitter SSB filter!