

# Operating HF on a Shoestring Budget in an HOA

or

My first SDR radio



# RXTX Ensemble SDR \$89 kit from FIVEDASH.COM





# Modified PAC12 Antenna \$65



# Working Australia on 1 Watt Priceless!!!

**VK3EY**



Australia

**ROB PUISE**  
**P.O. BOX 6393**  
**SHEPPARTON, VICTORIA 3632**  
**Australia**

**QSL: BUREAU, LOTW,**  
**EQSL\_AG, DIRECT**



My last 15 QSO

| CALL  | DX     |  | TIME             | BAND | MODE | RSTs | RSTr |
|-------|--------|--|------------------|------|------|------|------|
| VK3EY | KM5HT  |  | 2014-08-27 09:32 | 20m  | JT65 | -22  | -17  |
| VK3EY | JA7FYU |  | 2014-08-26 11:52 | 20m  | JT65 | -03  | -19  |
| VK3EY | OE5HFM |  | 2014-08-26 09:16 | 20m  | JT65 | -17  | -13  |
| VK3EY | DL8FCK |  | 2014-08-26 09:09 | 20m  | JT65 | -13  | -13  |
| VK3EY | EI3DY  |  | 2014-08-26 09:01 | 20m  | JT65 | -14  | -09  |
| VK3EY | KL7YK  |  | 2014-08-26 08:53 | 20m  | JT65 | -07  | -13  |
| VK3EY | JE7JCX |  | 2014-08-25 09:33 | 20m  | JT65 | -07  | -06  |
| VK3EY | JE7HYK |  | 2014-08-25 08:59 | 20m  | JT65 | -14  | -14  |
| VK3EY | G1XOW  |  | 2014-08-25 07:30 | 20m  | SSB  | 59   | 59   |
| VK3EY | ON7AB  |  | 2014-08-25 07:22 | 20m  | SSB  | 59   | 59   |
| VK3EY | M0WYZ  |  | 2014-08-25 06:57 | 20m  | SSB  | 59   | 59   |
| VK3EY | M1AQO  |  | 2014-08-25 06:36 | 20m  | SSB  | 59   | 59   |
| VK3EY | OE6BMG |  | 2014-08-25 06:26 | 20m  | SSB  | 59   | 57   |
| VK3EY | TI2CC  |  | 2014-08-25 00:26 | 10m  | SSB  | 59   | 59   |
| VK3EY | UA0NL  |  | 2014-08-24 23:33 | 17m  | JT65 | -09  | -19  |

[Web Logbook \(HRDLOG.net\) by IW1QLH - click to open my online logbook](#)



# Today I will talk about

- How I got started building an RXTX Ensemble.
- What tangent projects sprouted from this.
- Some of the software available.
- Where am I now.
- Questions

# How I got started building an RXTX Ensemble SDR

- GROUP from Hurst Amateur Radio Club
- Me Too – Syndrome
- Great online instructions
  - <http://www.wb5rvz.org/>
- Videos from HamNation & Youtube
  - <http://twit.tv/show/ham-nation/70> - 82
  - <http://youtu.be/lauw0bSe-Cw>
  - <http://youtu.be/gu0v8lfLcKg>
- Help from Softrock 40 Newsgroup
- Had to learn to Solder Surface Mount 1206 (0.126" × 0.063")

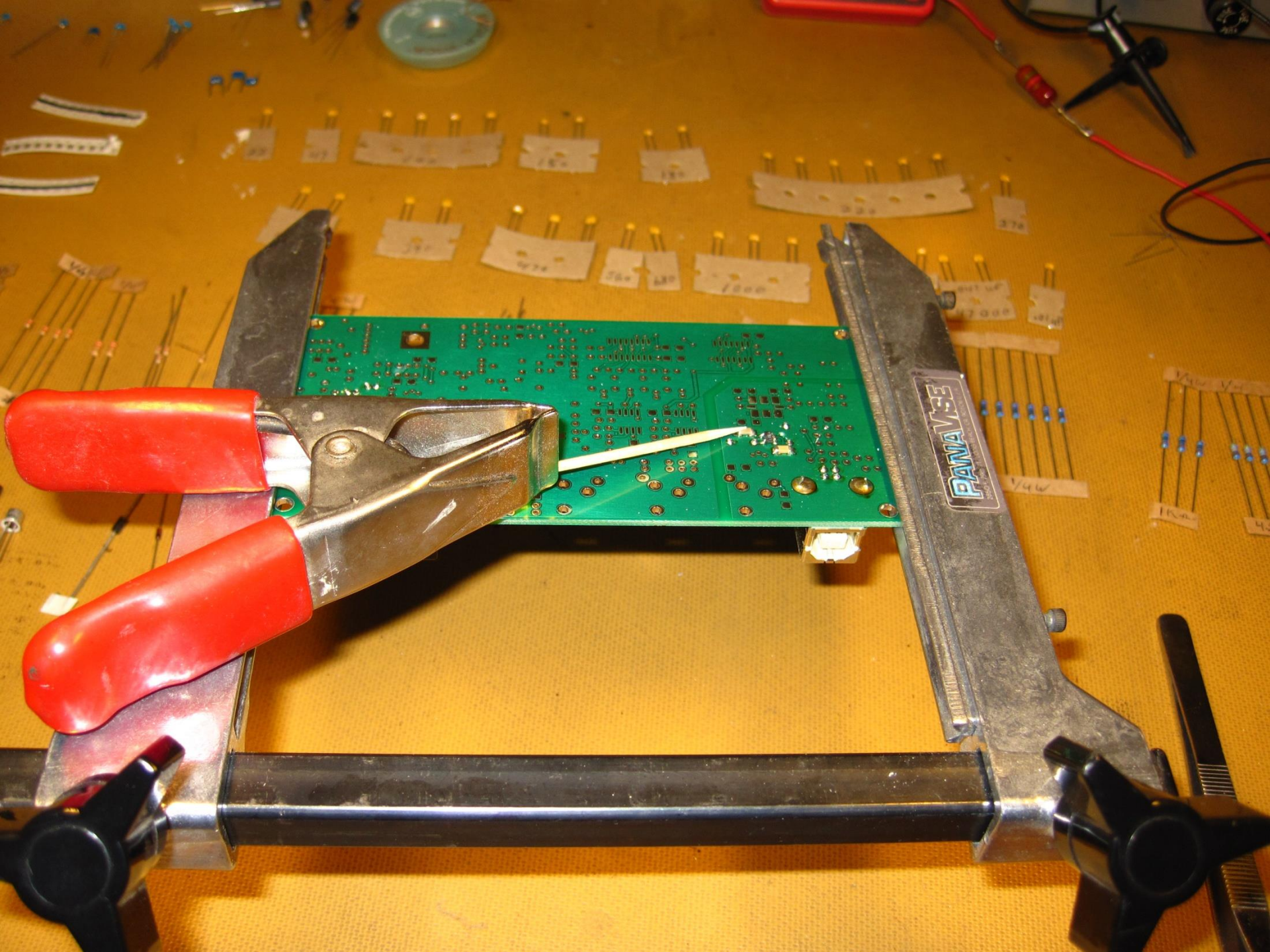




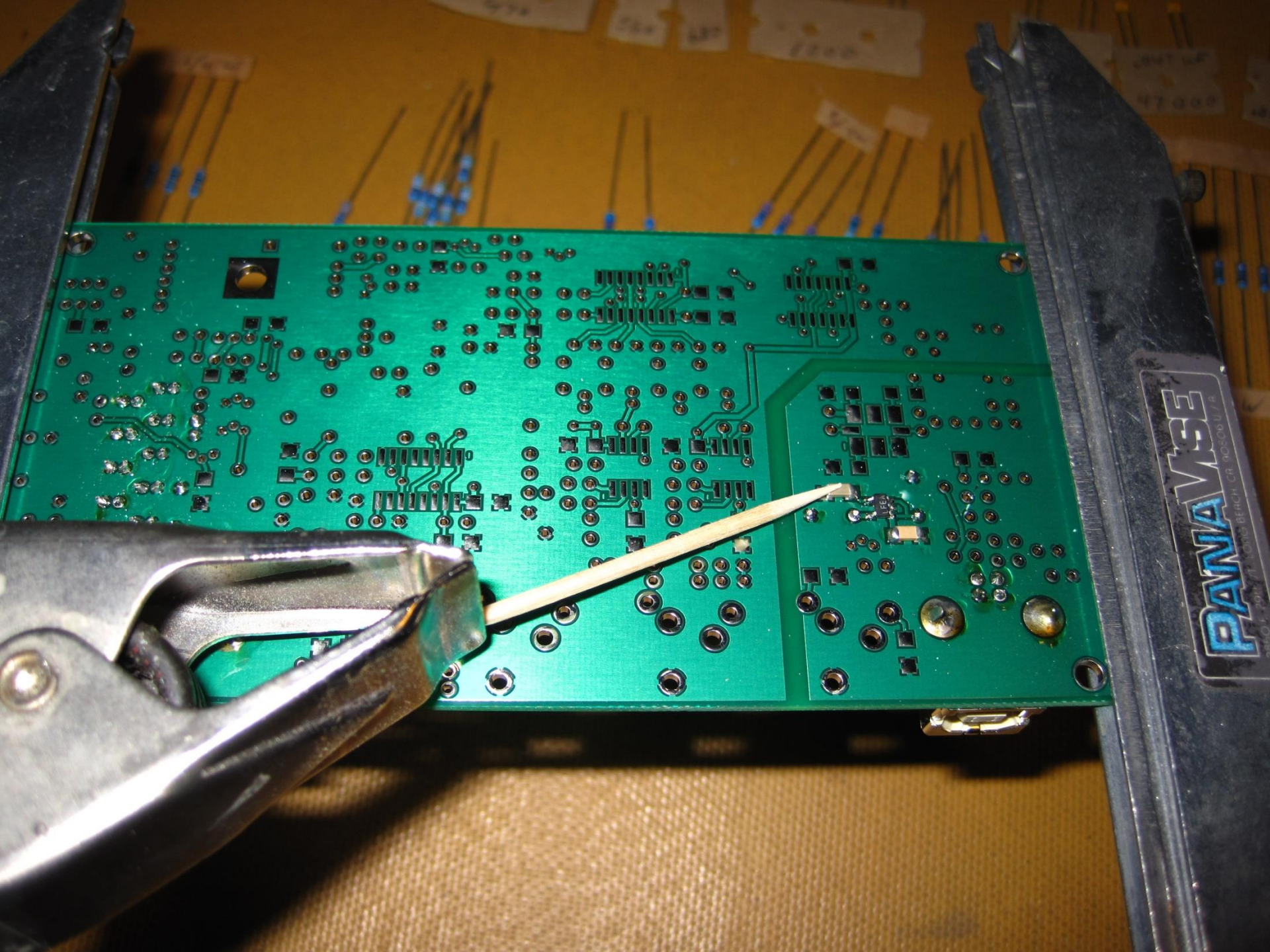






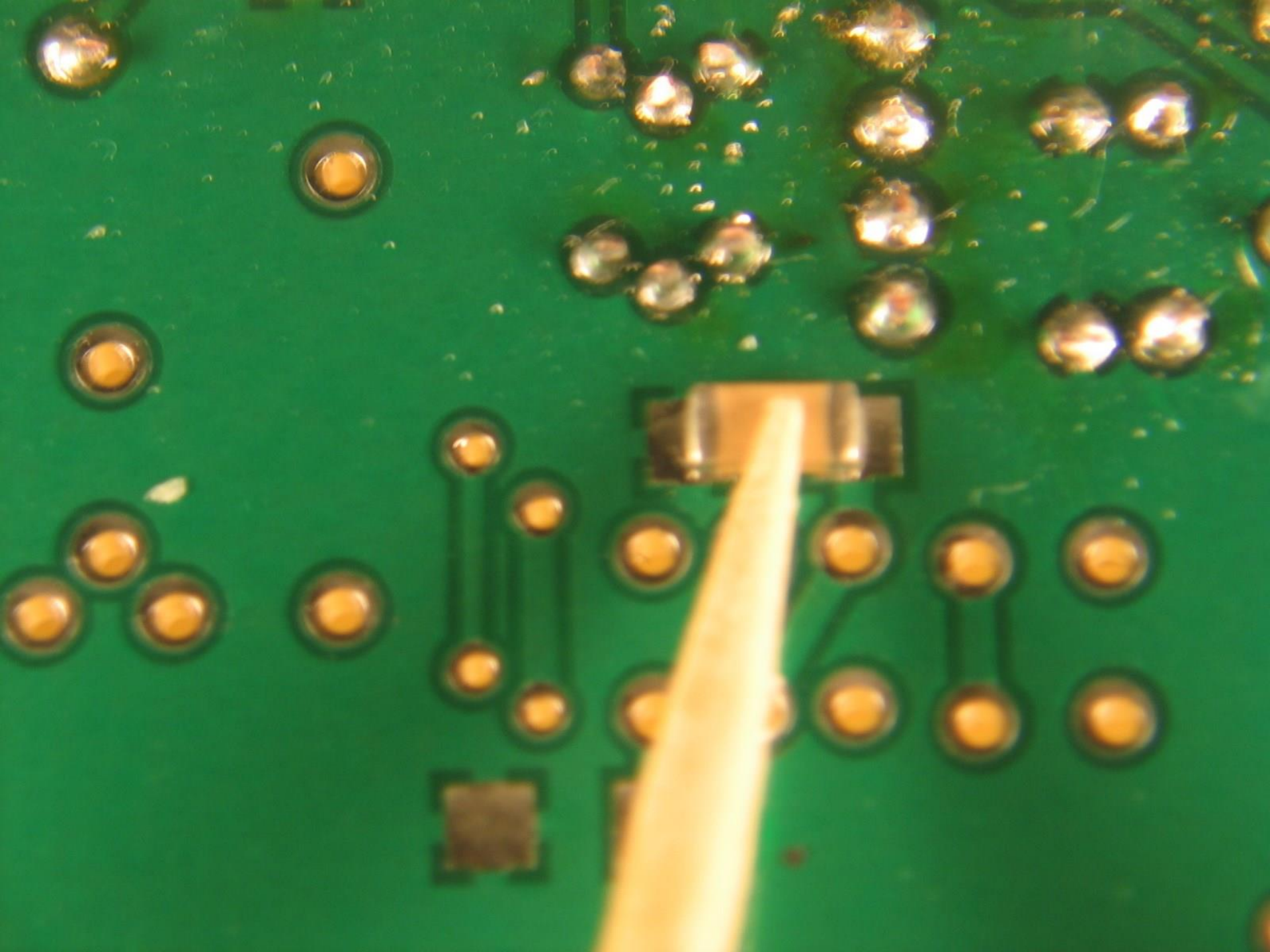




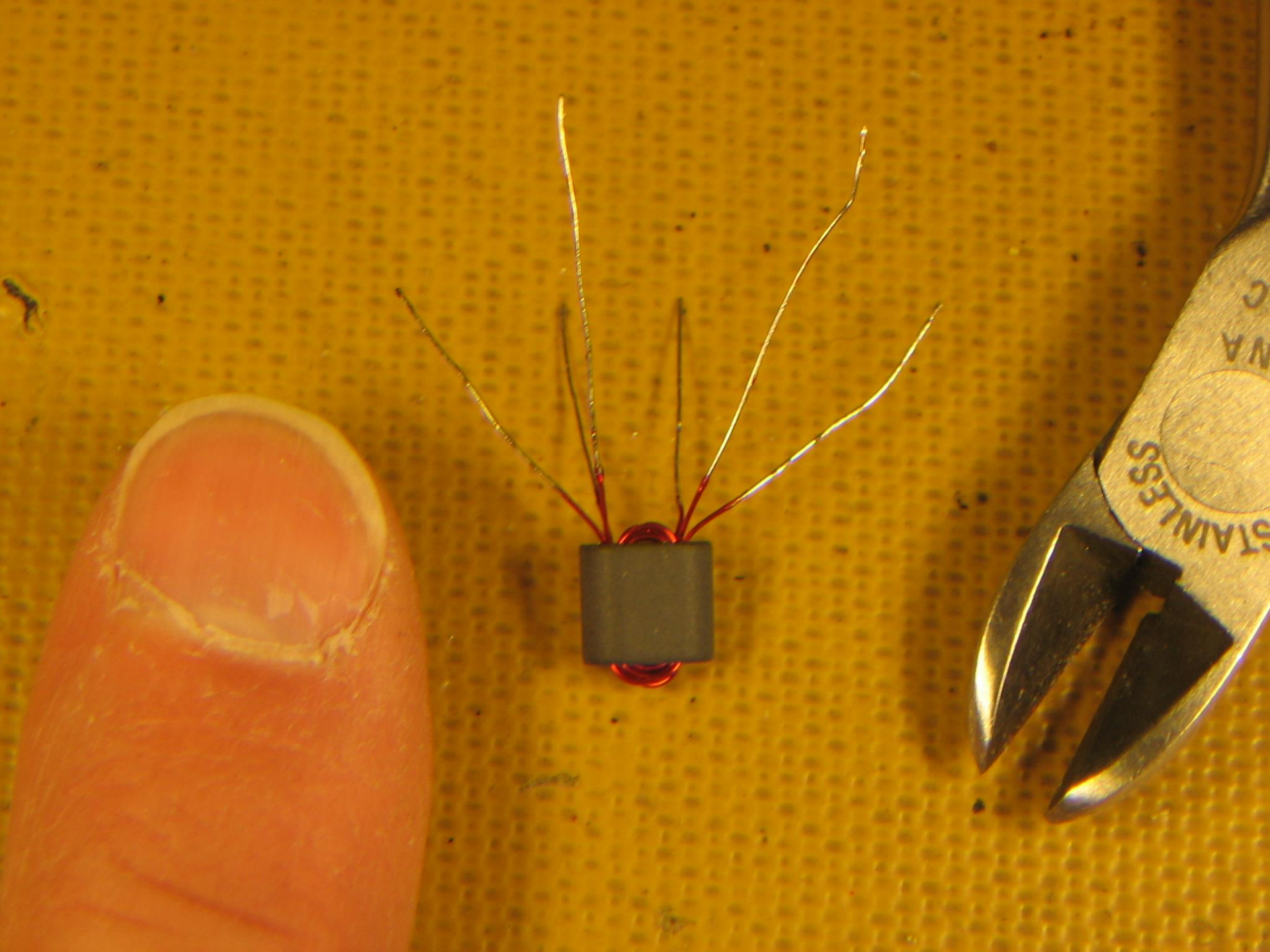


PANIA VISE  
LONG BEACH, CA 90801 U.S.A.

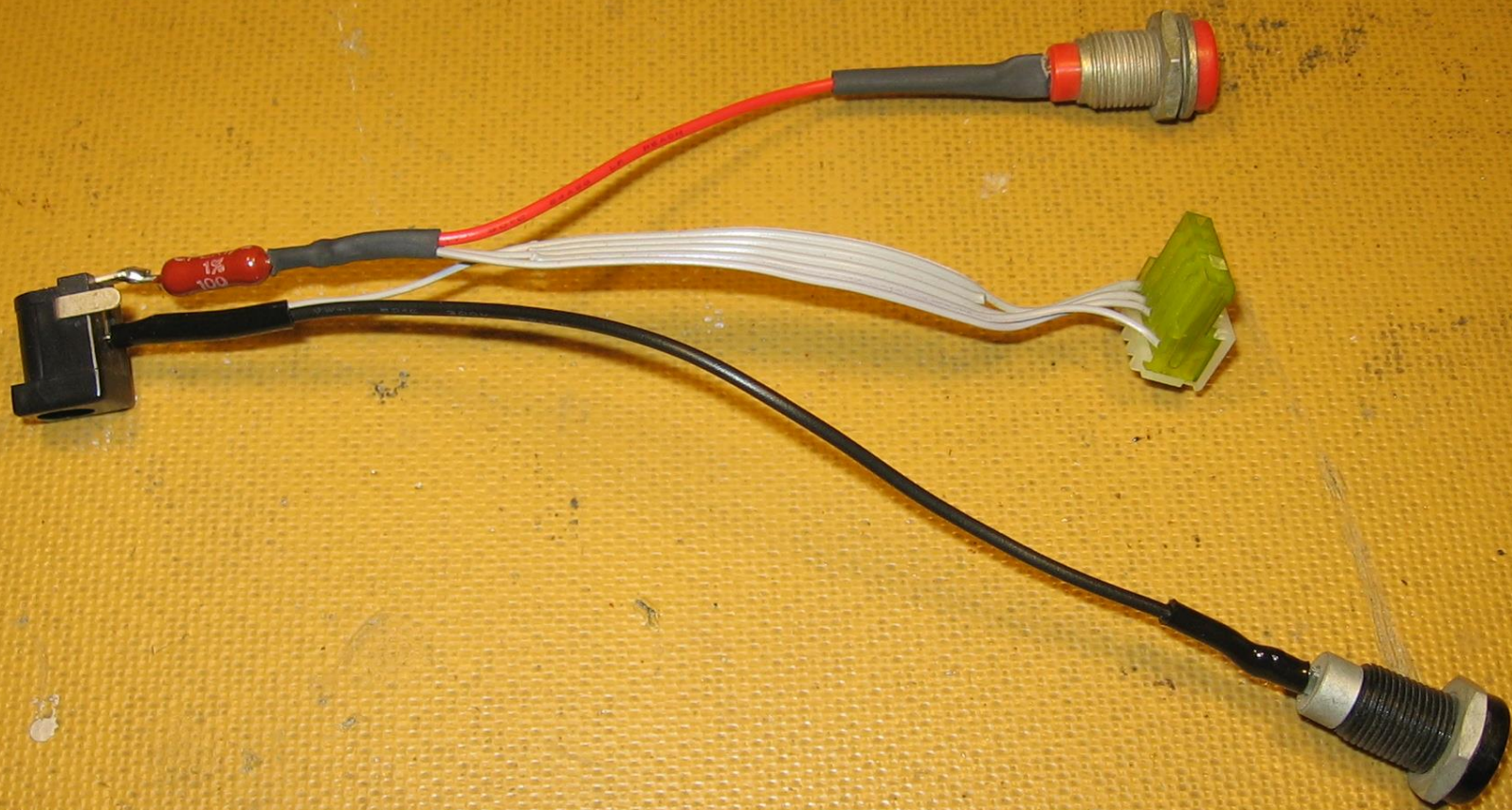




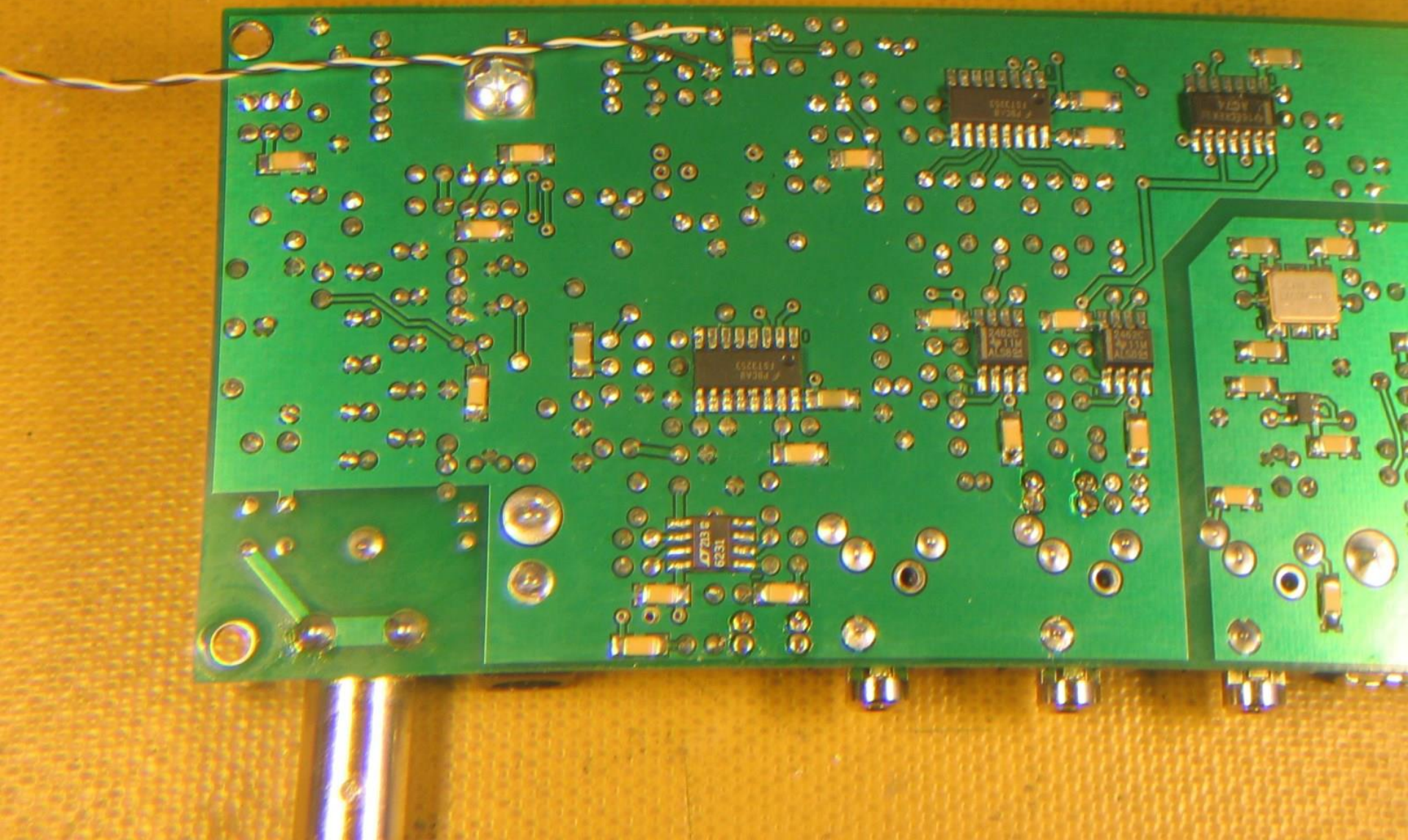




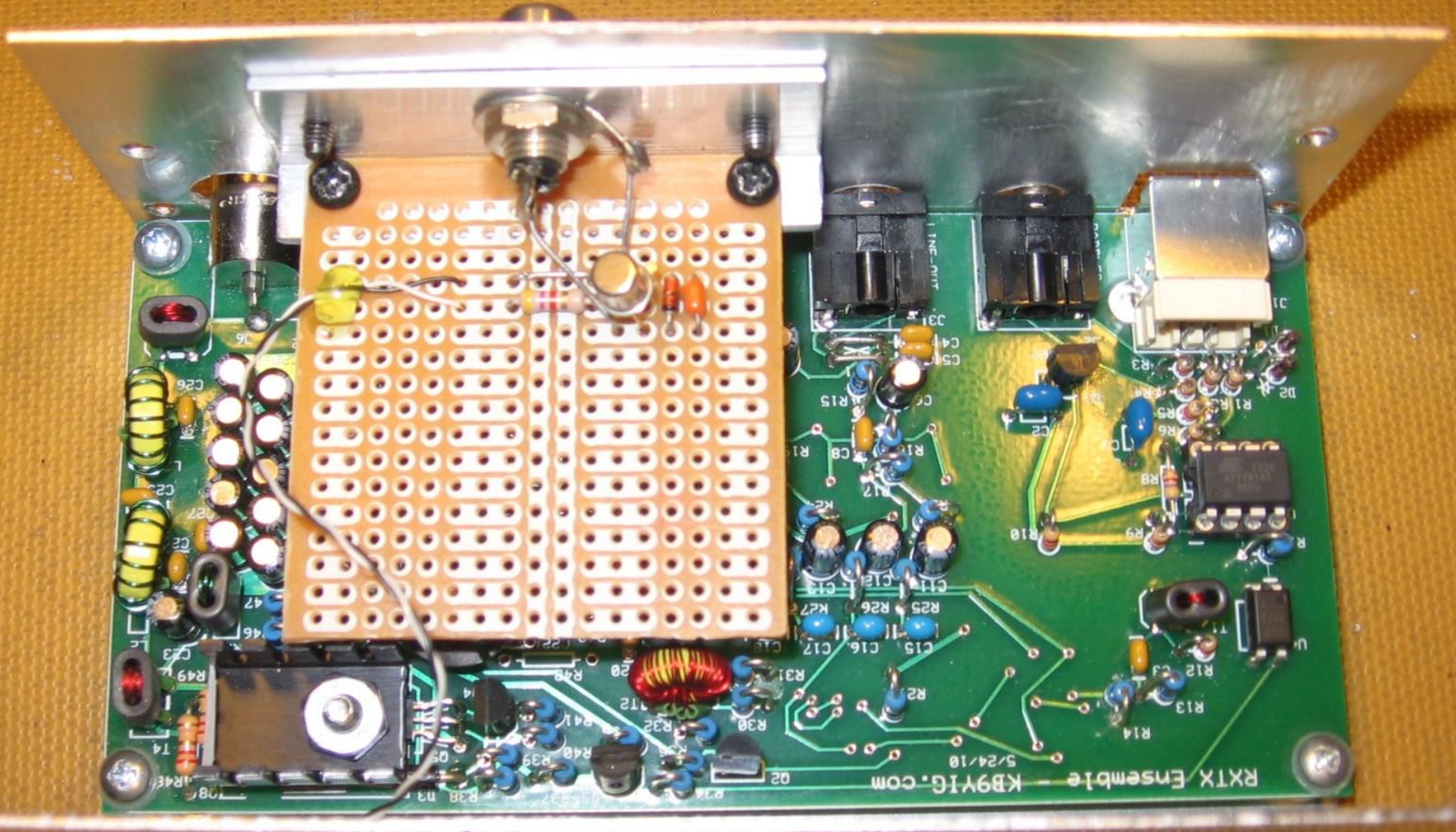
















USB B

Paddle

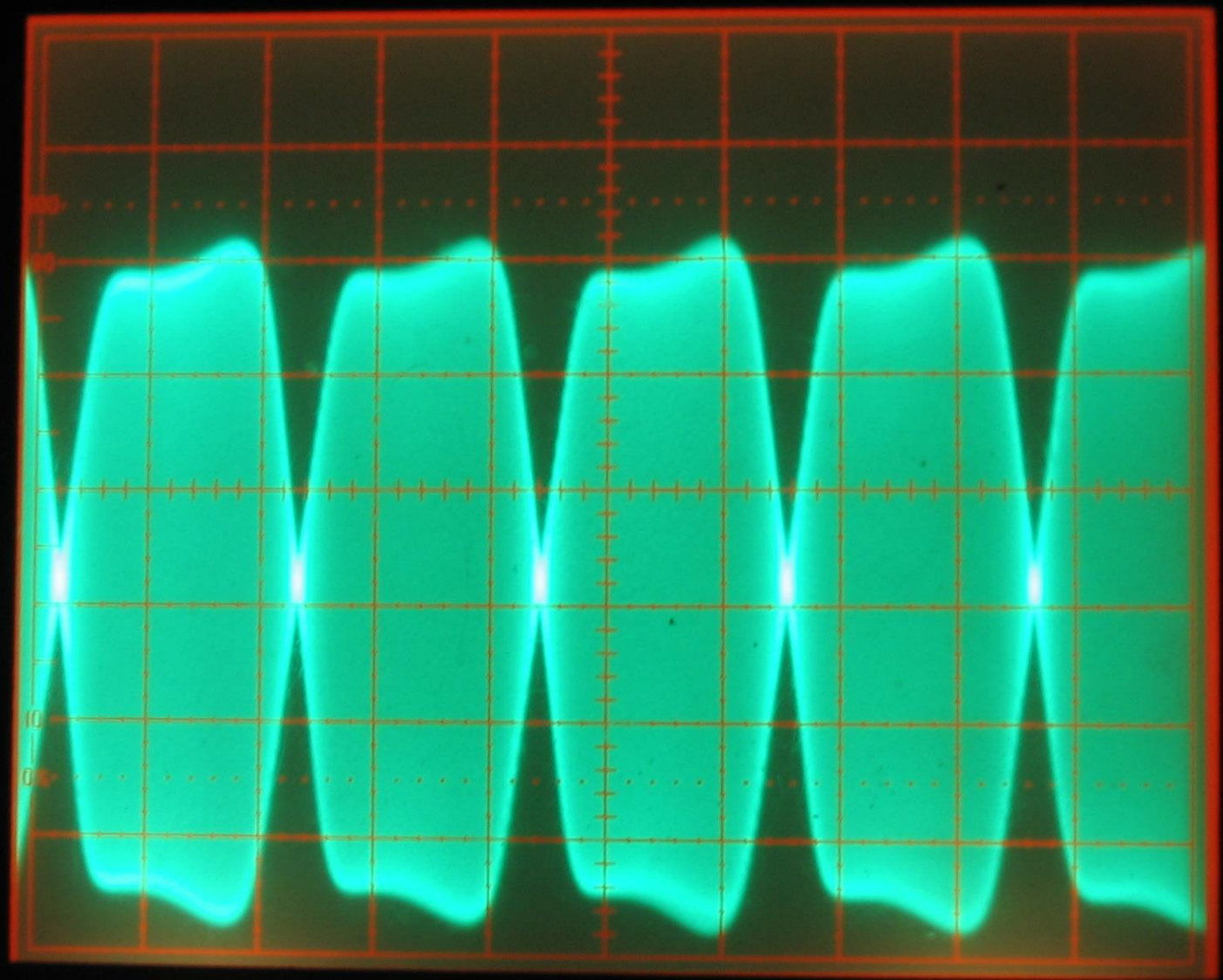
Line out

Line in

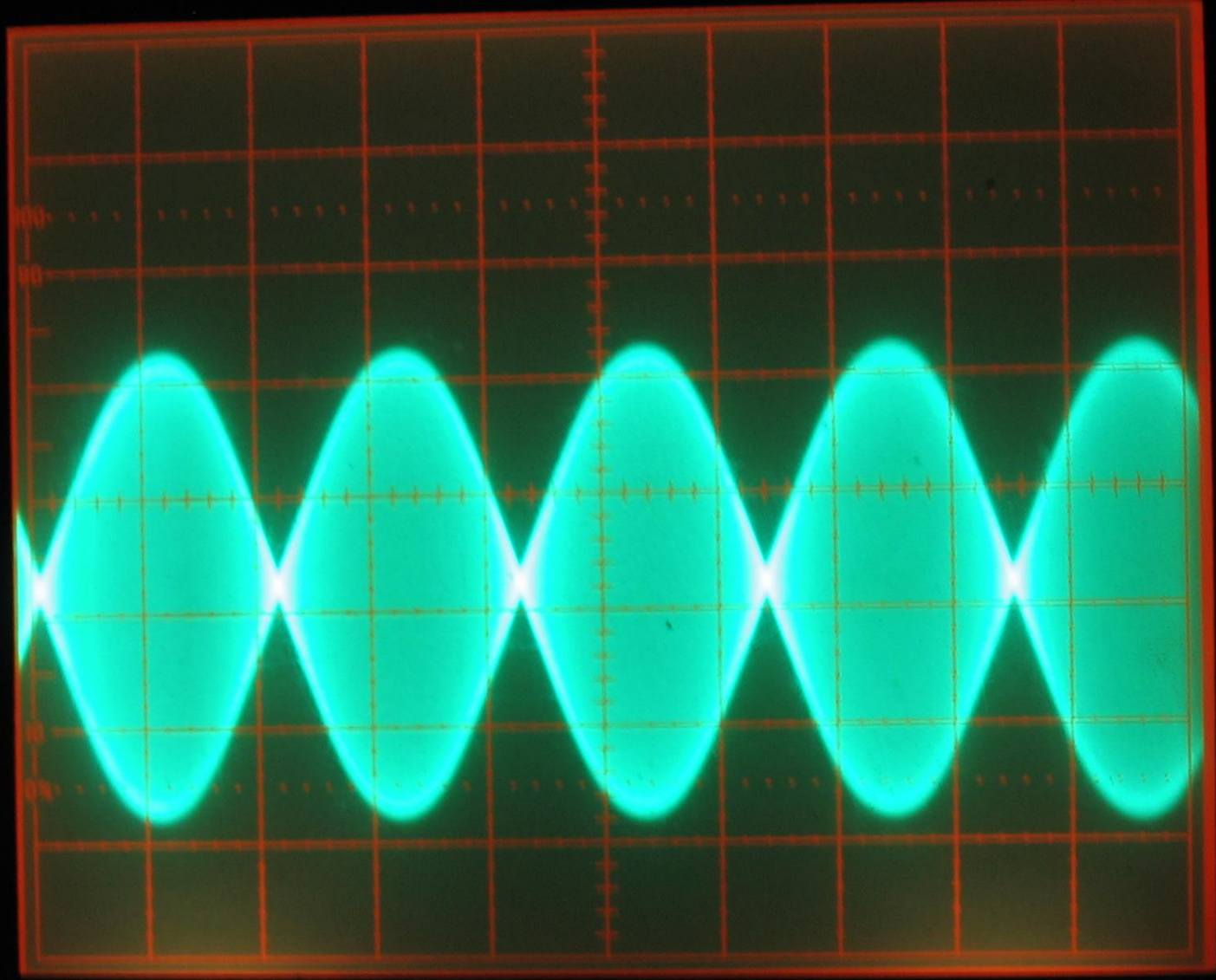
12V  
Power

50 Ohm  
Ant











# What tangent projects sprouted

- LC Meter – to test coils and caps.
  - <http://krypton2035.free.fr/LCR%20meters/lcr-marc.html>
- An RF probe for measuring power in the PA section
  - <http://www.n5ese.com/rfprobe2.htm>
- A QRP forward and reflected power meter
  - <http://www.nogaqrp.org/projects/nogawatt/kitinfo.html>
- A PAC12 Antenna to get on the air
  - <http://www.njqrp.org/pac-12/>
- Soldering Reflow Oven
  - <http://hobbybotics.com/projects/hobbybotics-reflow-controller-v8-03/>

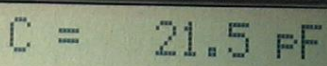
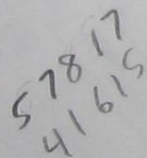


# LC Meter

<http://krypton2035.free.fr/LCR%20meters/lcr-marc.html>

- Measures Inductance and Capacitance
  - Capacitors - 0.0pF to about 0.1uF
  - Inductors - 0.0uH to somewhere over 10mH
- Modeled after one built by an Australian club
- Pic Based Processor 16F628
- Self Calibrating
- Mostly junk box parts I had
- Difficulty Medium
- Very Handy tool
- Versions can be bought already built





# Classic RF Probe

<http://www.n5ese.com/rfprobe2.htm>

- Made totally from Junk box parts
- Uses an old ink pen/highlighter case
- Plugs into Fluke DVM
- Measures RF power
- Easy to build
- Valuable tool
- Worthwhile project





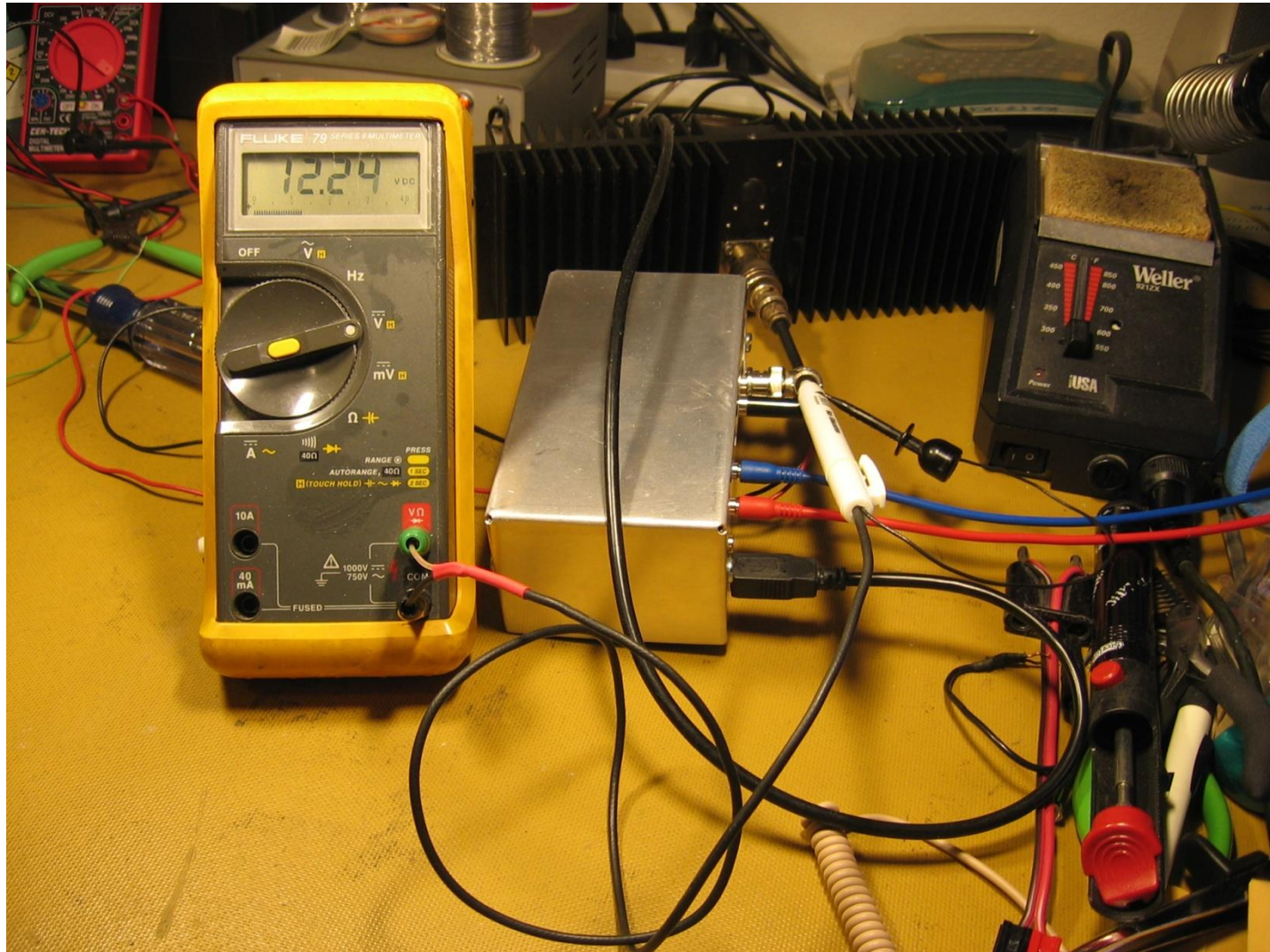






# RF Unit Converter

<http://www.eeweb.com/toolbox/rf-unit-converter>

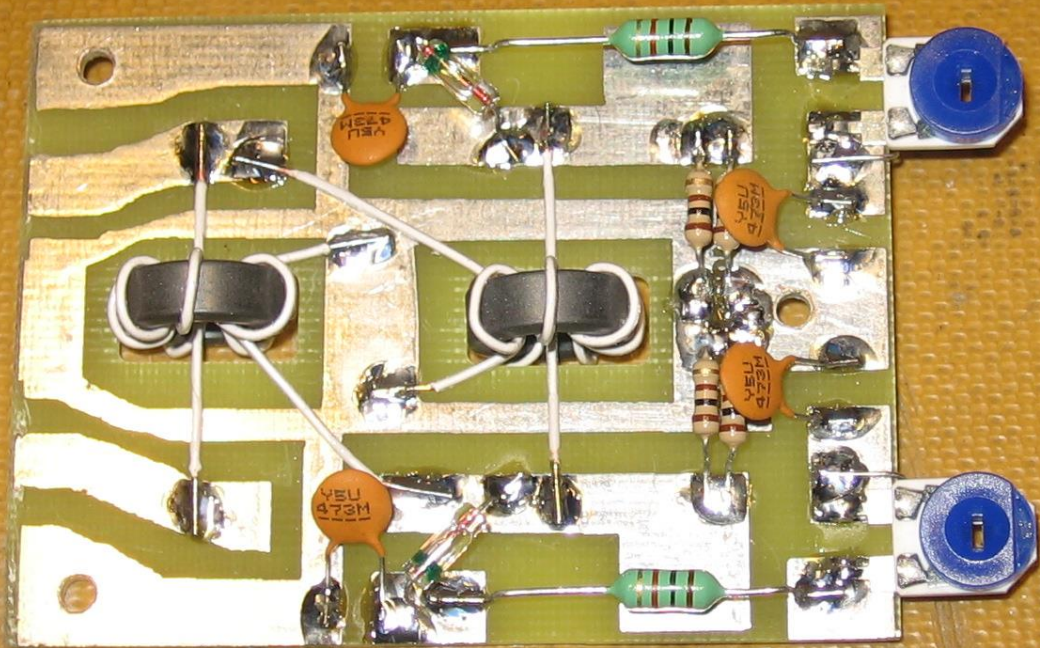


# QRP Forward / Reflected Power Meter

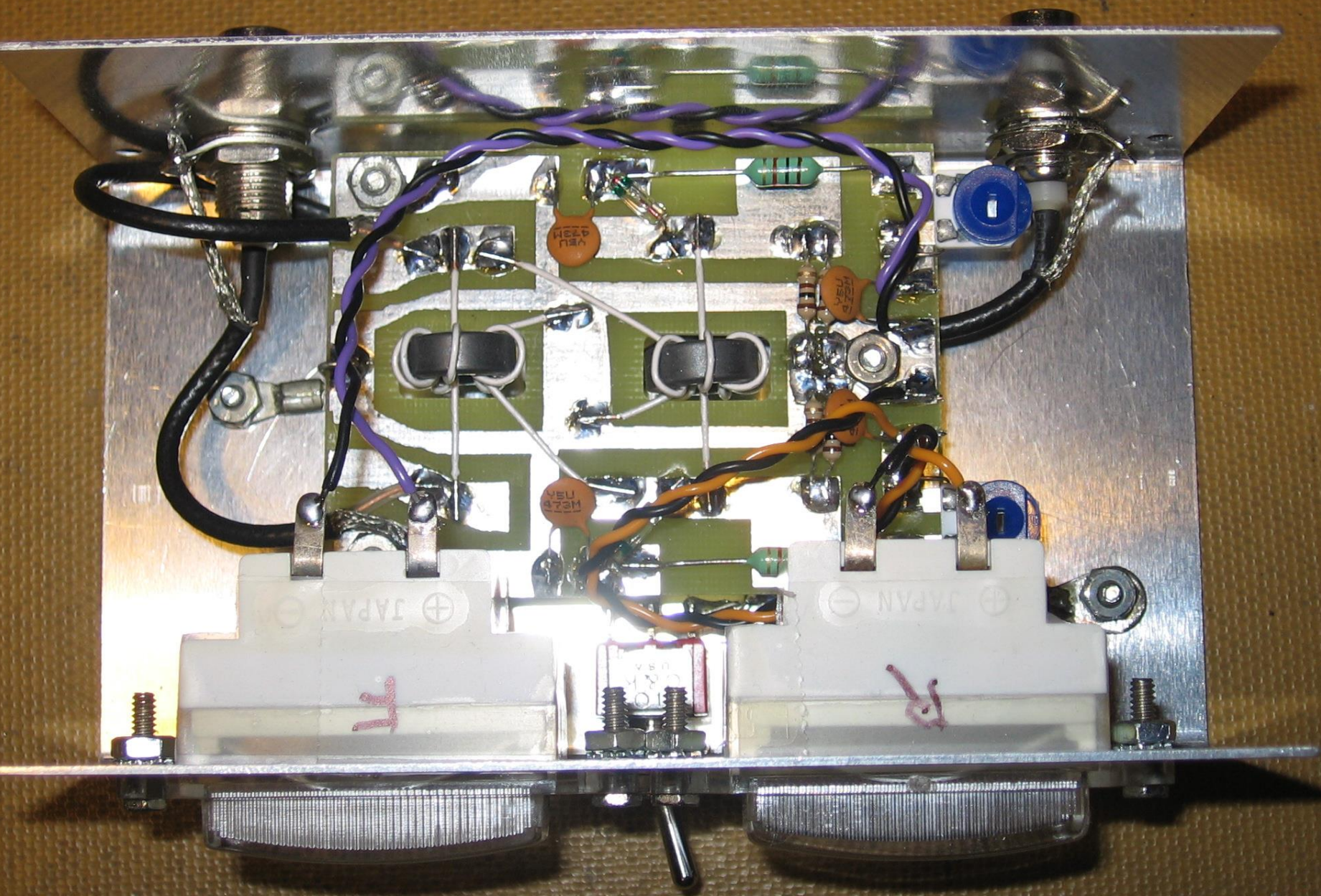
<http://www.nogaqrp.org/projects/nogawatt/kitinfo.html>

- A partial kit from Northern Georgia QRP Club
- You supply case, wire, coax, switch, BNC jacks
- Easy to build except for artwork on meters
- Machining the case takes some skill
- A valuable tool for the QRPer
- Manhattan style build
- Use it every day
- Inexpensive kit













DL



ANT

# A PAC12 Antenna to get on the air

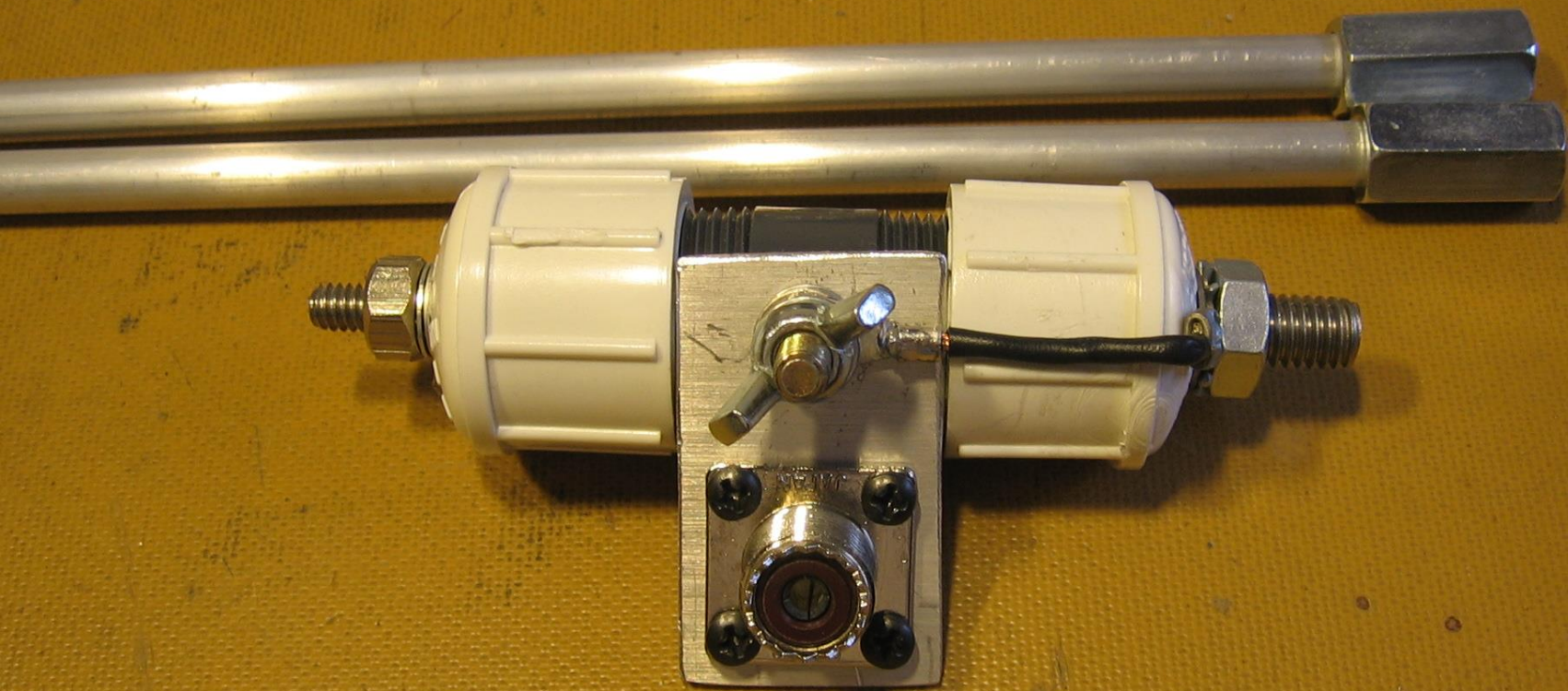
<http://www.njqr.org/pac-12/>

- Easy to build
- Commonly available supplies
- Built  $\frac{3}{4}$ " coils instead of  $\frac{1}{2}$ "
- Used  $\frac{3}{8}$ " rod for base
- Mid section was  $\frac{1}{4}$ " rod
- Ultra Lite Whip is available from Buddipole
- Performs much better than I expected









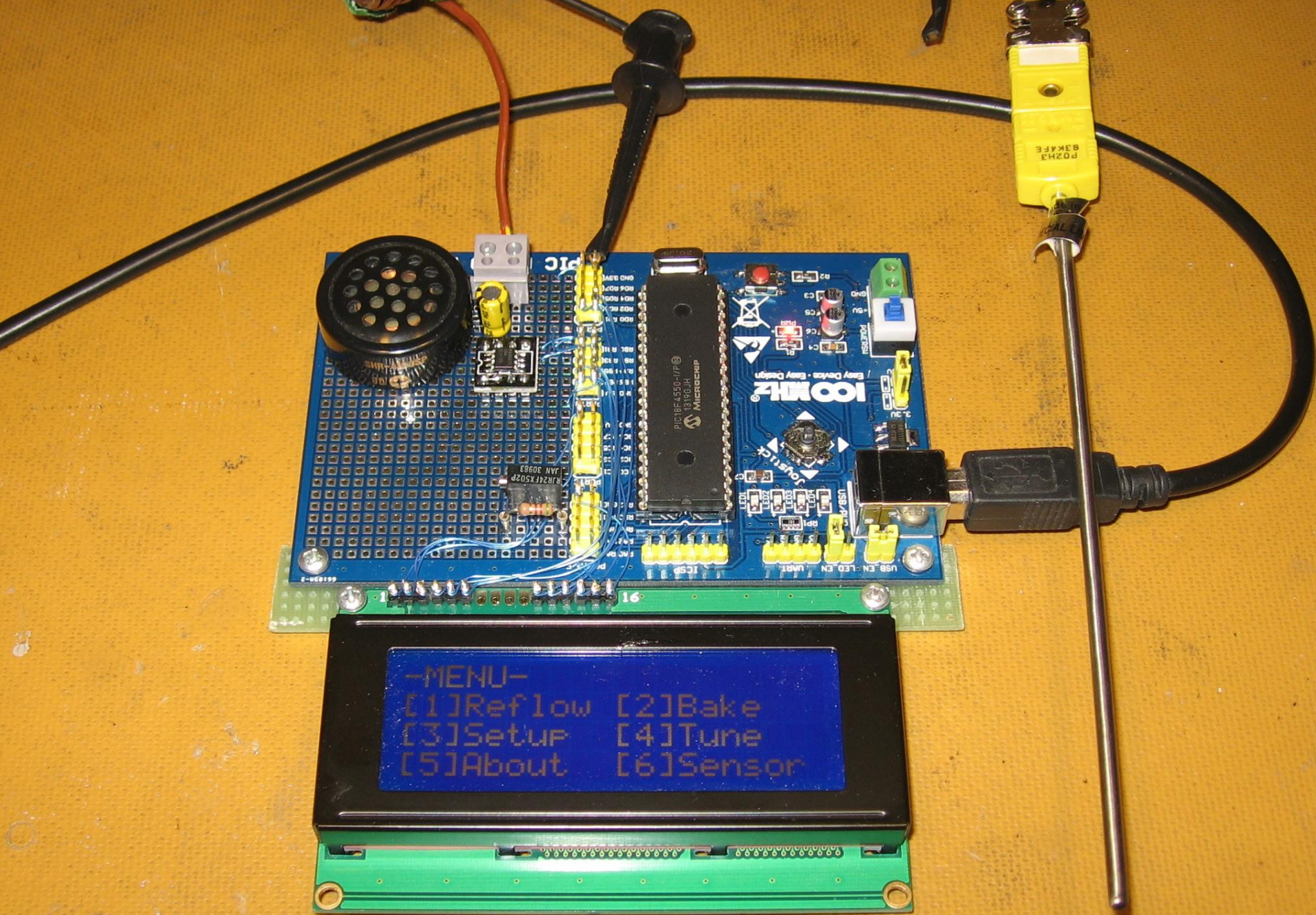


# Soldering Reflow Oven

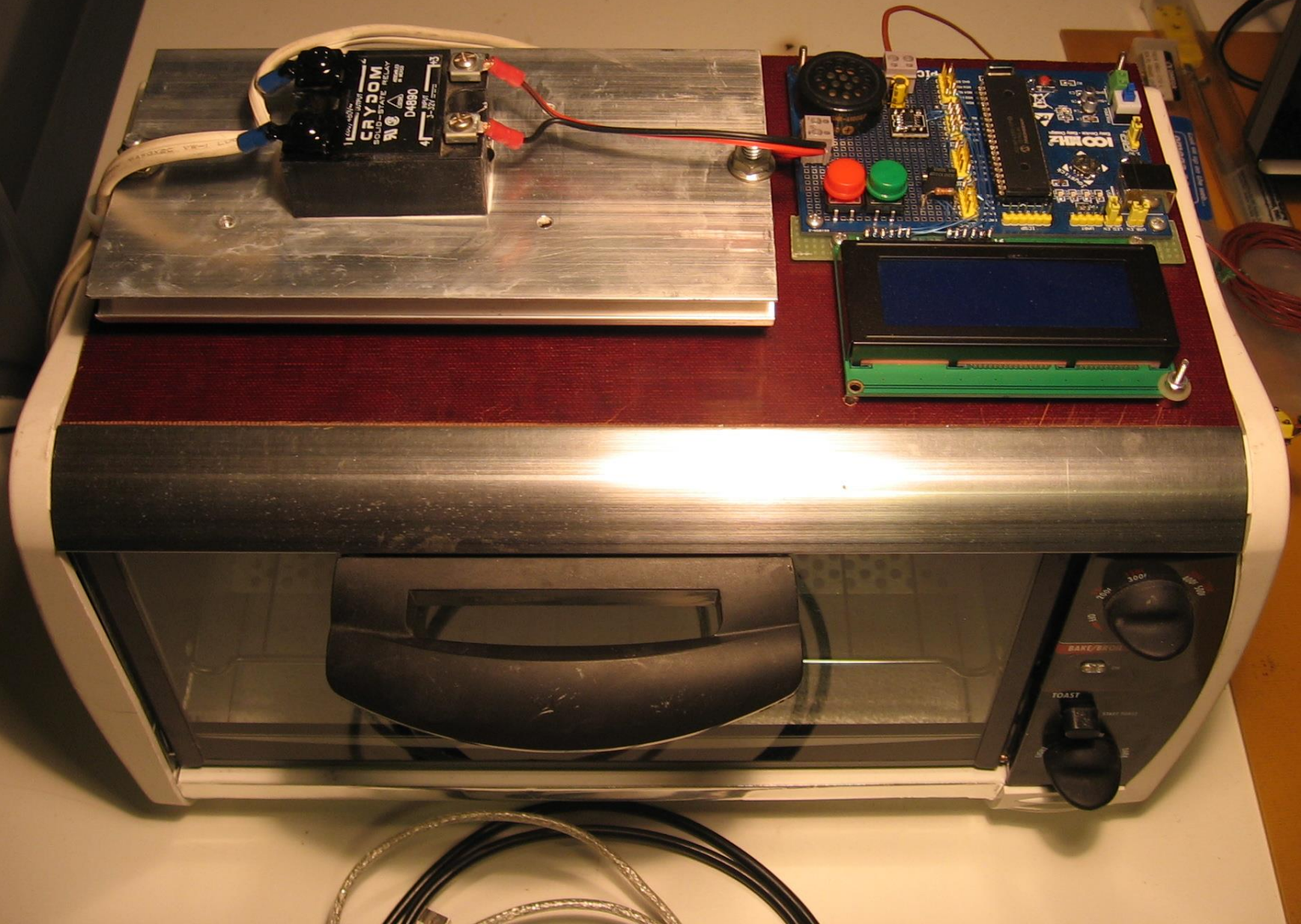
<http://hobbybotics.com/projects/hobbybotics-reflow-controller-v8-03/>

- Used for surface mount projects
- Solder all connections at once using solder paste
- Pic based processor 18F4550 with USB interface
- PID control algorithm (proportional-integral-derivative)
- Run Standalone or use PC application monitoring
- Maintains a controlled temperature profile
- Inexpensive to build
- Processor substitution and software mods made this a more difficult but a great learning project
- Very worthwhile and valuable tool

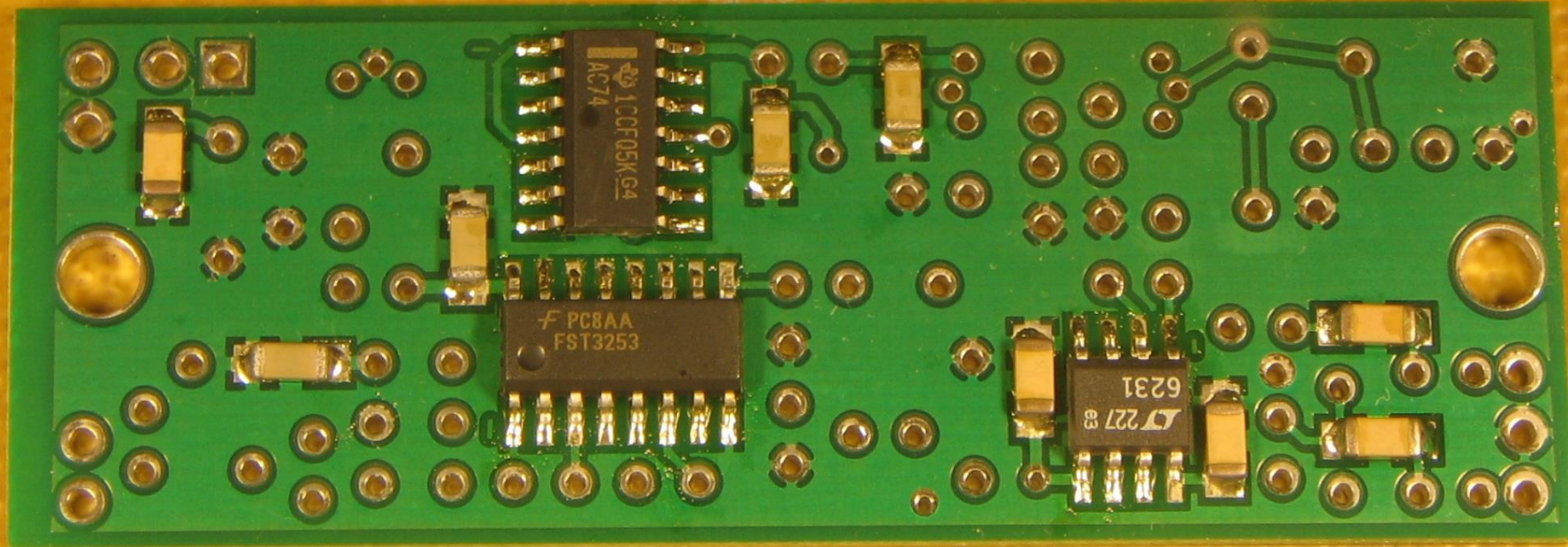








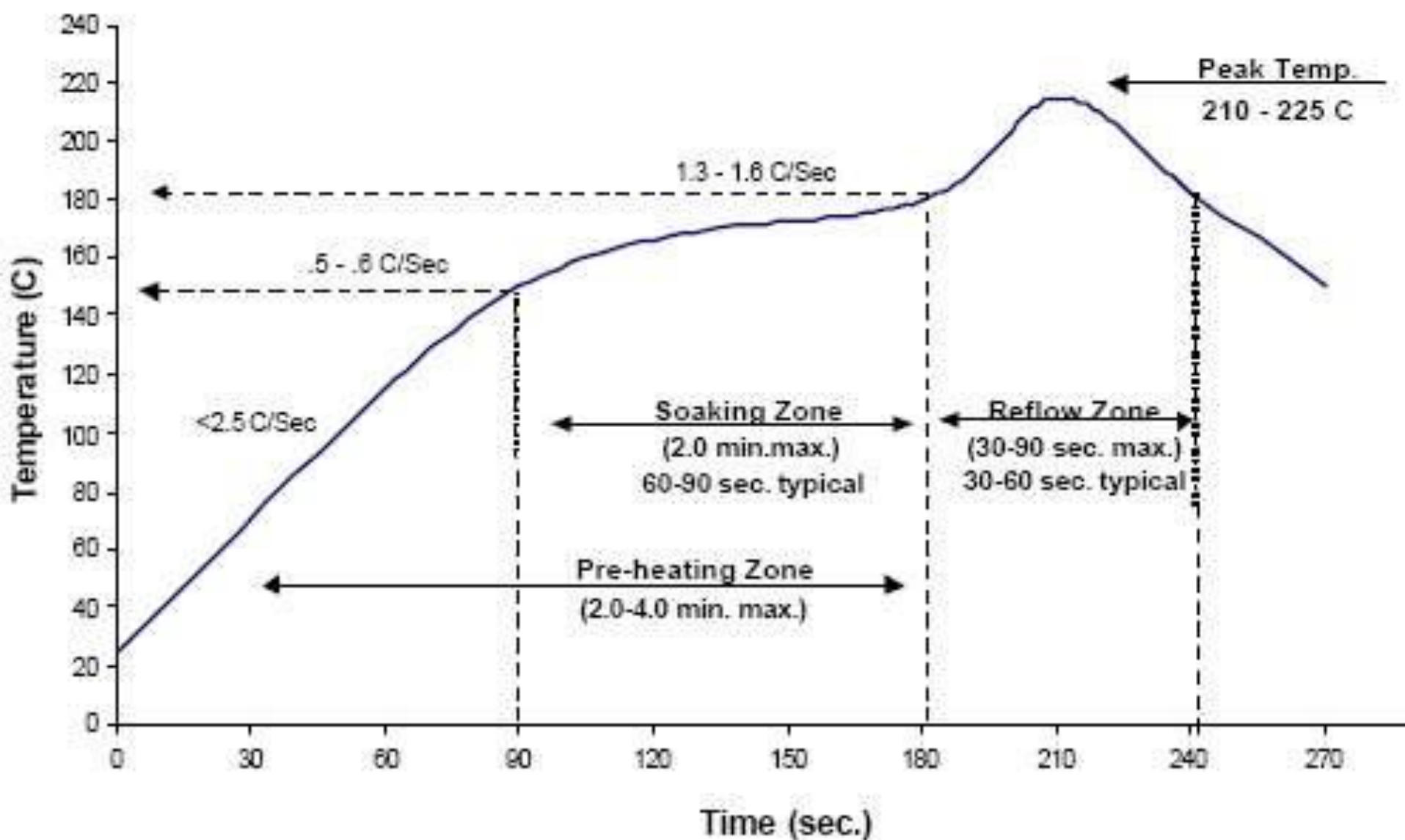






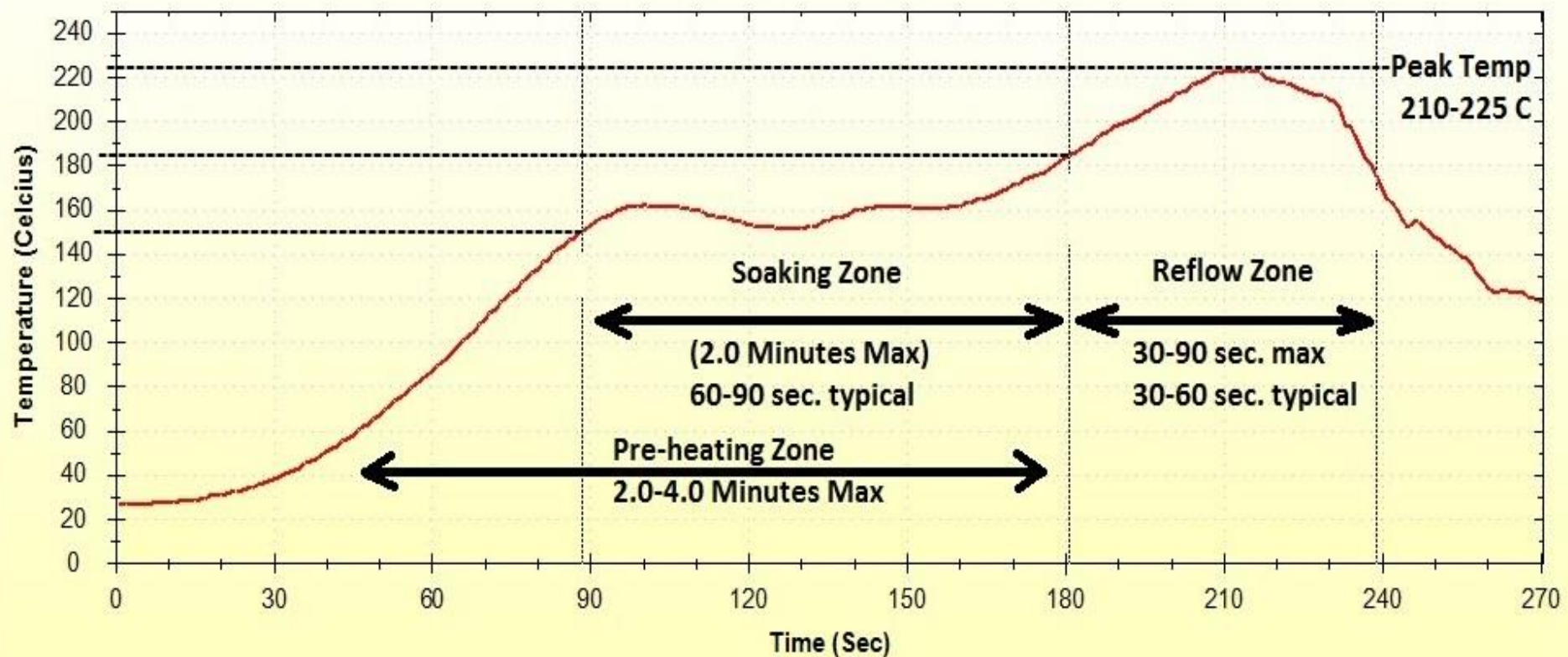
# Kester Reflow Profile

## Alloy: Sn63Pb37 or Sn62Pb36Ag02





# Temperature vs. Time



[Control]

Port:  Baud Rate:

☒ Enable Logging

Auxiliary Ports:

[Status]

Temperature (Deg/C):

Setpoint Temperature (Deg/C):

Stage (Sec)

Remaining Time:

Heater Fan:

60°C

0°C

N/A

OFF

Stage:

WAITING

Elapsed Time:

00:02:26

Heater:

OFF

Auxiliary:

OFF

Status: Connected to COM8 at 9600 baud Kp = 15 Ki = 3 Kd = 3 Cycle Time (Secs) = 2 pTerm = 120 iTerm = 2 dTerm = 255 Output = 125



# Some of the SDR software available

- CFGSR – SoftRock Configuration & Testing Tool
- ROCKY – SSB, CW
- SDR# - all modes
- PowerSDR – modified all mode app from Flex
- MRP40-SDR (native morse decoder)
- ***WSPR (weak signal propagation reporter)***
- ***HDSDR (all modes)***



# Paste Software for Digital Modes

- Virtual Audio Cables
  - Wave Clone
  - VAC
  - ***VB Cable***
- Virtual Serial Ports
  - Com0Com
  - Free Virtual Serial Ports
  - ***VSP Manager***
- Voice Shaper - speech pre-processor for SSB

# Just a few of the digital modes

- CW Get
- DigiPan (psk31)
- FLDigi (a plethora of modes)
- WSJT-X (JT65 & JT9)
- IZ8BLY Hellschreiber
- MixW (Multimode digital)
- Hamscope (PSK31, RTTY, ASCII, MFSK,CW)





## Server

| Server                  | Location                           | Protocol |
|-------------------------|------------------------------------|----------|
| time-b.timefreq.bldr... | US CO: NIST Boulder Laboratori...  | SNTP     |
| time-c.timefreq.bldr... | US CO: NIST Boulder Laboratori...  | SNTP     |
| time-d.timefreq.bldr... | US CO: NIST Boulder Laboratori...  | SNTP     |
| ntp2.usno.navy.mil      | US DC: U.S. Naval Observatory, ... | SNTP     |
| tick.usno.navy.mil      | US DC: U.S. Naval Observatory, ... | SNTP     |

Server: tick.usno.navy.mil

Add

Location: US DC: U.S. Naval Observatory, Washington, DC

Edit

Protocol: SNTP

Remove

Notes: Access Policy: open access  
Contact: Rich Schmidt (res@tuttle.usno.navy.mil)  
Synchronization: NTP V3 primary (USNO Master Clock 2,

OK

Cancel

Help

About

Exit

Advanced

## How Often

- ☒ Load Dimension 4 at startup  
☒ Once loaded, wait until online  
☐ Synchronize once, then exit  
☒ Every 15 minute(s)

## Correction

Time Zone

- ☒ Maximum correction

1 hour(s)

## Visibility

- ☒ Start minimized  
☒ Hide when minimized  
☒ Display icon in tray

Synchronized: -0.009s on 3/8/2014 @ 9:40 AM

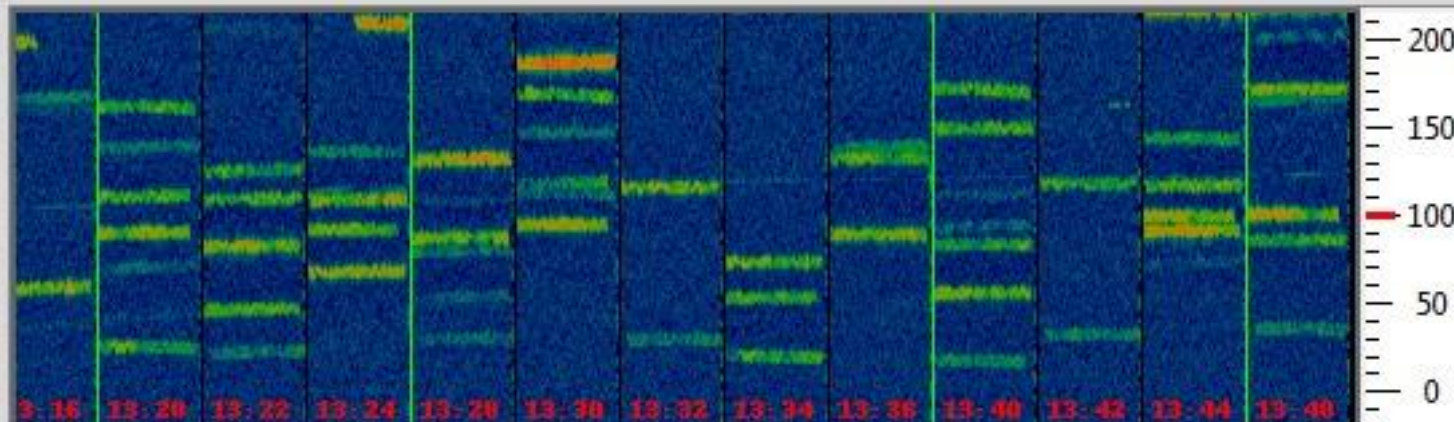
History

Current Status: Sleeping until 3/8/2014 @ 9:55 AM...

Server Status: Waiting to read request...



File Setup View Save Band Help



118 KB1VLS  
113 ON7KO  
96 W9RAN  
93 NOUE  
88 WA8KNE  
75 WA3DNM  
41 VE3RIA  
38 KB1CHU  
19 KE0N

☒ Upload spots

979 Hz

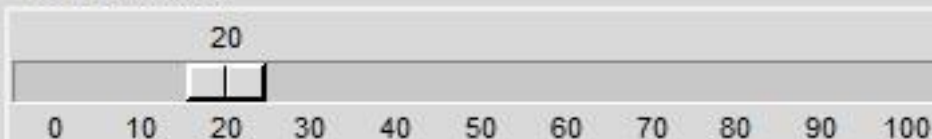
Band Map

Frequencies (MHz)

Dial: 14.095600

Tx: 14.097100

Tx fraction (%)



Special

☐ Idle

Tx Next

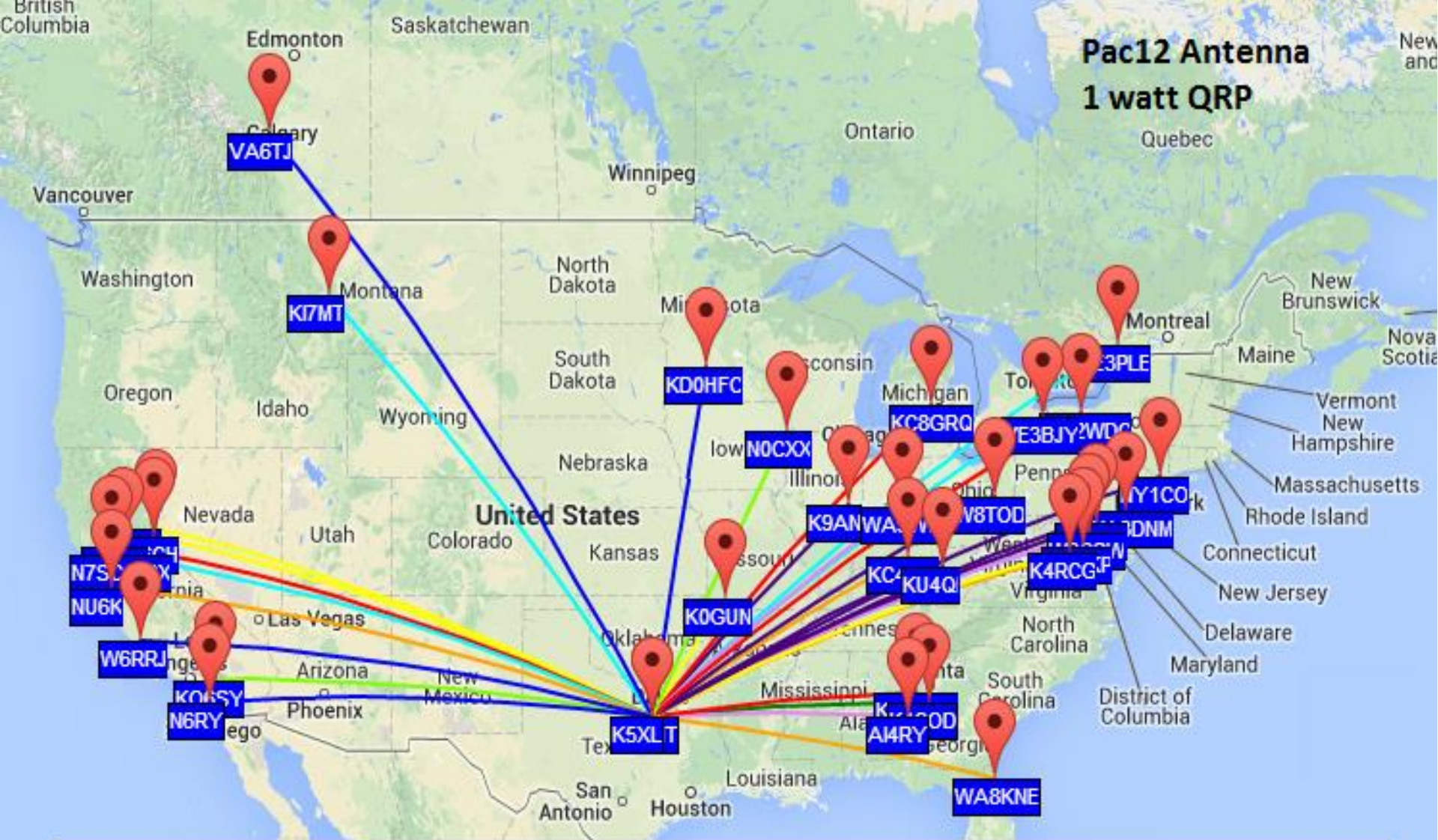
Tune

Erase

2014 Nov 03  
13:50:03

| UTC  | dB  | DT   | Freq      | Drift |                |
|------|-----|------|-----------|-------|----------------|
| 1340 | -24 | -1.0 | 14.097096 | 1     | W9RAN EN52 17  |
| 1340 | -27 | -0.5 | 14.097113 | 0     | ON7KO JO21 37  |
| 1340 | -11 | 0.3  | 14.097151 | 0     | KD6RF EM22 37  |
| 1342 | -11 | 0.0  | 14.097120 | 0     | W3GXT FM19 37  |
| 1344 | 1   | -1.8 | 14.097093 | 0     | NOUE EN34 30   |
| 1344 | -6  | 0.3  | 14.097118 | 0     | KB1VLS FN42 37 |
| 1344 | -14 | -1.0 | 14.097145 | -1    | VE3KCL FN03 27 |
| 1348 | -20 | 6.5  | 14.097038 | -1    | KB1CHU FN42 30 |
| 1348 | -12 | -0.5 | 14.097088 | 0     | WA8KNE EM90 37 |
| 1348 | -6  | -0.1 | 14.097173 | 0     | K5XL EM12 33   |



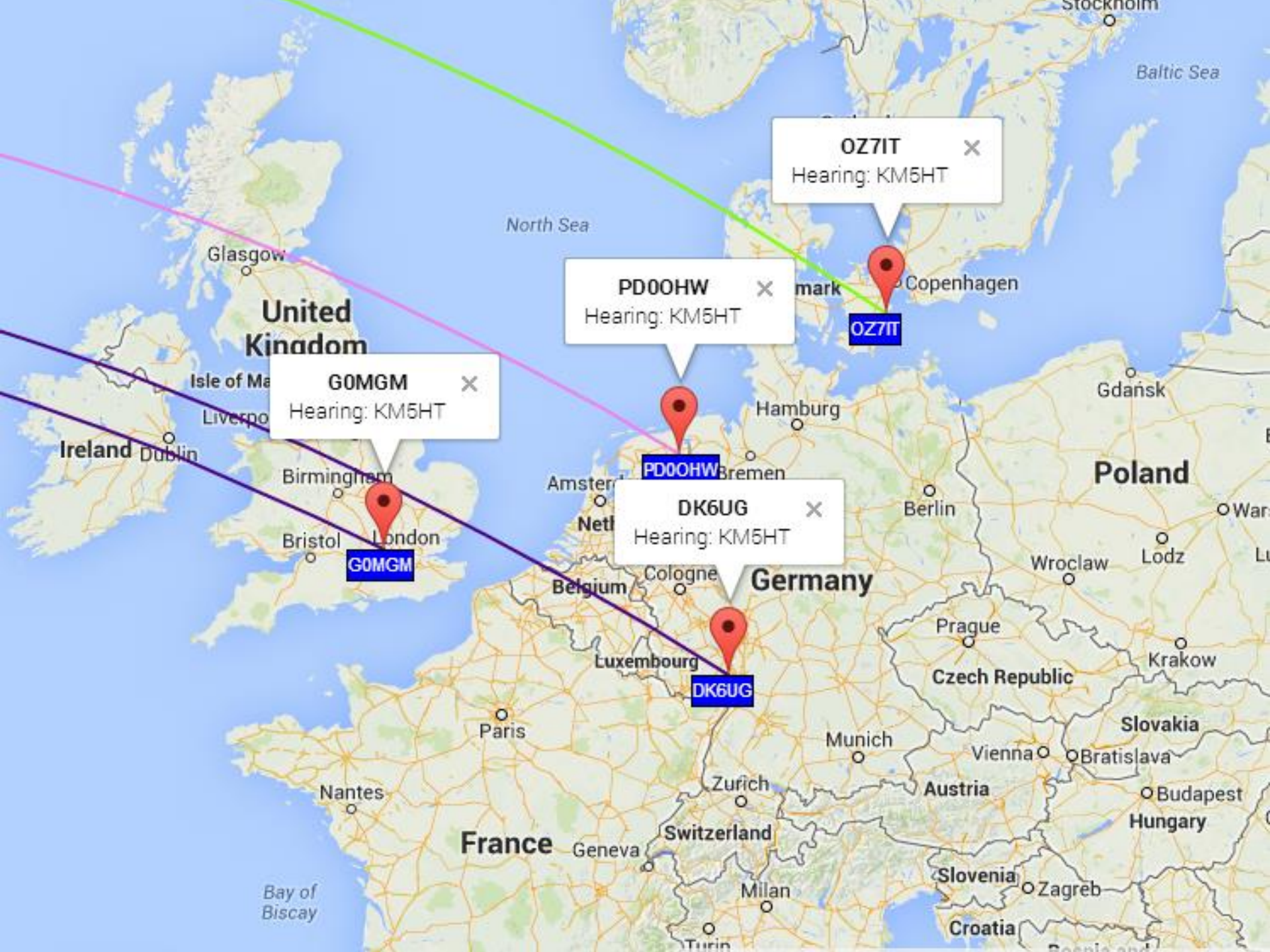


### KM5HT

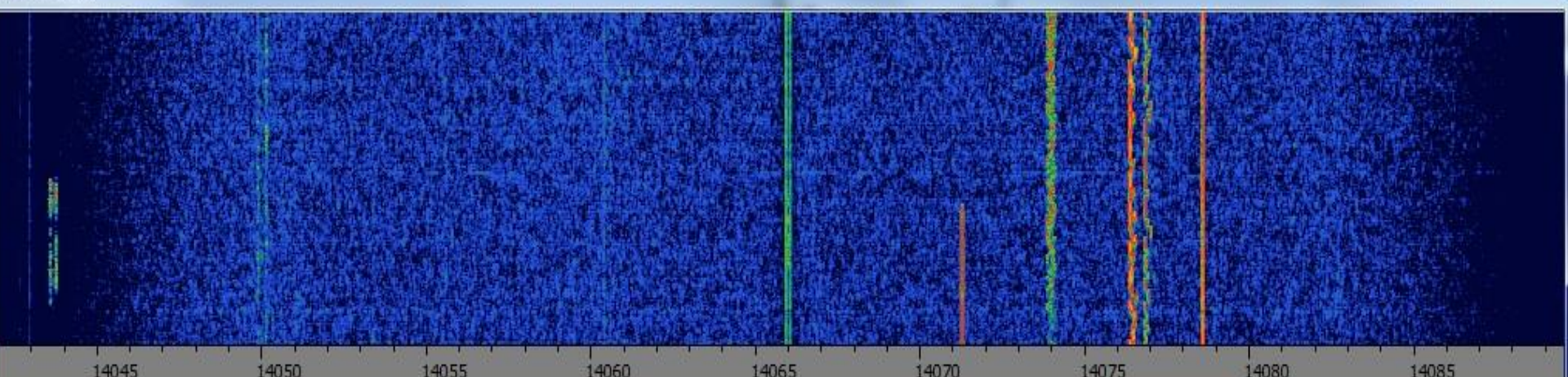
Hearing: AF6CH, K0GUN, K3GEN, K4COD, K4RCG, K5XL, KP4MD, N0CXX, NU6K, NY1CO, VE3PLE, W3GXT, W6RRJ, W9SKP, WA3DNM, WA8KNE, WA9JWL, WB2WDC

Heard by: AF6CH, AI4RY, K0GUN, K3GEN, K4COD, K4RCG, K9AN, KB1MVX, KC4IBV, KC8GRQ, KD0HFC, KI7CI, KI7MT, K06SY, KP4MD, KU4QI, N6RY, N7SCQ/RX, NY1CO, VA6TJ, VE3BJY, VE3PLE, W3CSW, W3GXT, W8TOD, W9SKP, WA3DNM, WA8KNE, WA9JWL, WB2WDC









AM ☐ ECSS ☐ FM ☐ LSB ☐ **USB ☒** CW ☐ DRM ☐

Waterfall Spectrum  RBW 23.4 Hz 2 Avg Speed

Zoom

LO **0014.066.000** FreqMgr

Tune **0014.076.000** ExtIO

Volume# AGC Thresh.

S-units Squelch

Soundcard [F5] Bandwidth [F6] Options [F7]

Help / Update [F4] Full Screen [F11]

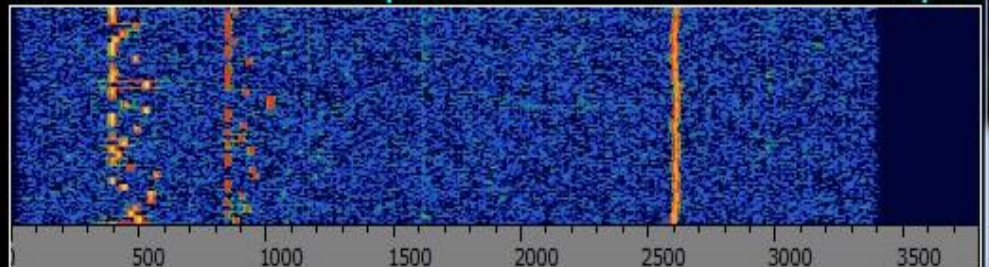
Stop [F2] Mute AGC Med Despread ATT

CW ZAP CW AFC CW Peak CWFullBw

10/8/2014 7:37:30 AM

CPU HDSDR: 5% CPU Total: 19%

TX



Waterfall Spectrum  RBW 5.9 Hz 1 Avg Speed

Zoom

Setup Rig Control Raw Decoder Transmit Log About JT65-HF

Audio Input Levels

☒ L3  
☐ R3

Optimum input level is 0 with only background noise present.

Digital Audio Gain

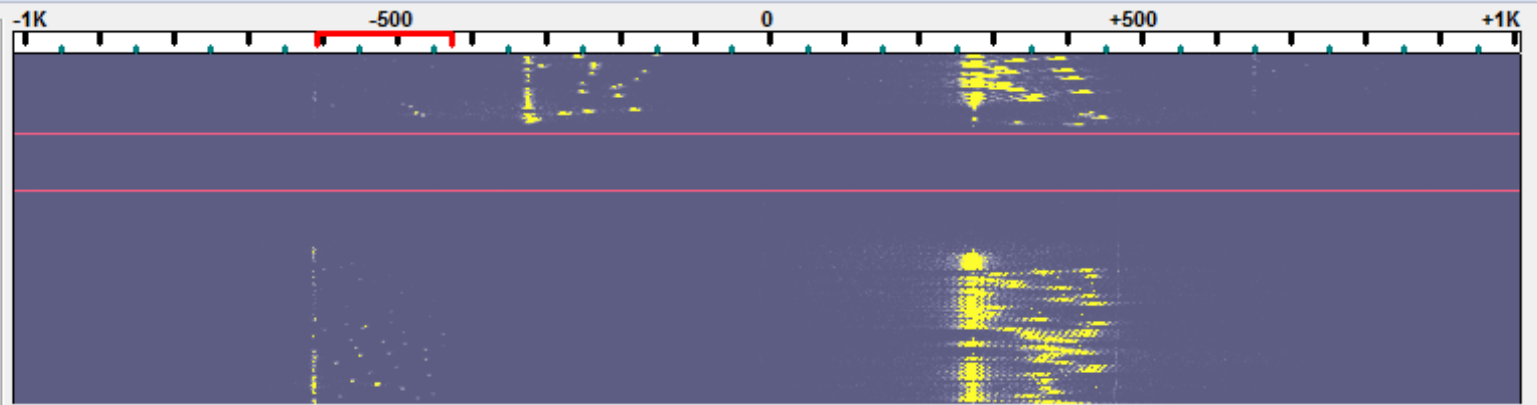
L: 0

R: 0

2014-Aug-03  
12:41:14

Dial QRG KHz

0



Current Operation: Receiving

Color-map Brightness Contrast Speed Gain

Blue    5  0 ☐ Smooth

Clear Decodes Decode Again 0 DT Offset Restore Defaults

Double click an entry in list to begin a QSO. Right click copies to clipboard.

| UTC   | Sync | dB  | DT   | DF   | Exchange             |
|-------|------|-----|------|------|----------------------|
| 12:39 | 6    | -7  | 0.9  | -608 | B KM5HT RRR 73       |
| 12:37 | 8    | -9  | 0.9  | -608 | B KM5HT CO2VE -21    |
| 12:35 | 8    | -15 | -0.5 | -27  | B OV1JL VA2PGB R-14  |
| 12:35 | 14   | -10 | 0.5  | -323 | B WA9THI K4LRP R-06  |
| 12:35 | 5    | -8  | 1.0  | -608 | B CQ CO2VE EL83      |
| 12:34 | 7    | -9  | -0.2 | -320 | B K4LRP WA9THI -11   |
| 12:33 | 2    | -2  | -0.6 | -102 | K WA9THI K4LRP EL98  |
| 12:33 | 5    | -7  | 0.9  | -568 | B JA1GWA JR1AQN R-13 |
| 12:32 | 7    | -11 | 0.1  | -334 | B CQ KK4OA FM17      |
| 12:31 | 3    | -10 | 0.1  | 234  | B CQ VA3LLZ FN03     |
| 12:31 | 17   | -4  | -1.0 | -102 | B W0QL NC4RB EM95    |

Message To TX: CO2VE KM5HT 73

☐ TX Text (13 Characters) **TX OFF**

Enable TX Halt TX

☒ TX Generated

☒ TX Even ☐ TX Odd

Call CQ and answer callers

Call CQ Answer Caller Send RRR

Answering CQ

Answer CQ Send Report

TX DF RX DF ☒ TX DF = RX DF TX to Call Sign Rpt (-#)

-608 -608 ☒ AFC CO2VE -09

Zero Zero ☒ Noise Blank

Single BW Multi BW ☒ Enable Multi

100 100 ☒ Enable RB ☒ Enable PSKR

Log QSO

RB/PSKR Counts 0 0

Sound In: 04-CABLE-A Output (VB-Audio Cable)

Sound Out: 07-CABLE-B Input (VB-Audio Cable B)



WSJT-X v1.3, r3673 by K1JT

FileSetupViewModeDecodeSaveHelp

Band Activity

| UTC   | dB  | DT  | Freq | Message                      |
|-------|-----|-----|------|------------------------------|
| 1223  | -7  | 0.8 | 2594 | @ KM5HT K7JNX 73             |
| 1223  | -20 | 0.6 | 523  | # M0WIT N2VWP R-15           |
| 1223  | -2  | 0.6 | 794  | # DE W1AW/4 73               |
| 1223  | -1  | 0.9 | 1612 | # KB3PD KK4HEG -06           |
| 1223  | -1  | 1.3 | 1721 | # CQ KC5YSN EN81 ~U.d States |
| ----- |     |     |      |                              |
| 1225  | -2  | 0.5 | 1724 | # KM5HT KC5YSN -04           |
| 1225  | -16 | 0.6 | 523  | # M0WIT N2VWP 73             |
| 1225  | -1  | 0.7 | 1612 | # 50W VER TU 73              |
| 1225  | 11  | 0.7 | 2595 | @ CQ K7JNX EM96 U.d States   |
| ----- |     |     |      |                              |
| 1227  | -6  | 0.9 | 1724 | # KM5HT KC5YSN RRR           |
| 1227  | -1  | 0.8 | 1613 | # CQ KK4HEG EM95 ~U.d States |
| 1227  | 7   | 0.6 | 2596 | @ CQ K7JNX EM96 U.d States   |

Rx Frequency

| UTC  | dB | DT  | Freq | Message             |
|------|----|-----|------|---------------------|
| 1216 | 1X |     | 2589 | @ K7JNX KM5HT EM12  |
| 1217 | 3  | 0.8 | 2592 | @ KM5HT K7JNX -09   |
| 1218 | Tx |     | 2592 | @ K7JNX KM5HT R+03  |
| 1219 | 14 | 0.7 | 2594 | @ KM5HT K7JNX RRR   |
| 1220 | Tx |     | 2592 | @ K7JNX KM5HT R+03  |
| 1221 | 13 | 0.7 | 2594 | @ KM5HT K7JNX RRR   |
| 1222 | Tx |     | 2592 | @ K7JNX KM5HT 73    |
| 1223 | 7  | 0.8 | 2594 | @ KM5HT K7JNX 73    |
| 1223 | -1 | 1.3 | 1721 | # CQ KC5YSN EN81    |
| 1224 | Tx |     | 1721 | # KC5YSN KM5HT EM12 |
| 1225 | -2 | 0.5 | 1724 | # KM5HT KC5YSN -04  |
| 1226 | Tx |     | 1724 | # KC5YSN KM5HT R-02 |
| 1227 | -6 | 0.9 | 1724 | # KM5HT KC5YSN RRR  |
| 1228 | Tx |     | 1724 | # KC5YSN KM5HT R-02 |

Log QSOStopMonitorEraseDecodeEnable TxHalt TxTune

20 m

14.076 000

+2 kHz

50403020100 dB

Dx Call

KC5YSN

Az: 48

Lookup

Dx Grid

EN81

992 mi

Add

Tx even

Tx JT65 #

Tx 1724 Hz

Rx 1724 Hz

Tx=RxRx=Tx

Lock Tx=Rx

Report -2

Generate Std Msgs

Next

Now

KC5YSN KM5HT EM12

KC5YSN KM5HT -02

KC5YSN KM5HT R-02

KC5YSN KM5HT RRR

1W PAC12 ANT

CQ KM5HT EM12

Tx 1

Tx 2

Tx 3

Tx 4

Tx 5

Tx 6

Pwr

Tx: KC5YSN KM5HT R-02

JT9+JT65

Last Tx: KC5YSN KM5HT R-02

JTAlert-X 2.4.20 - KM5HT on 20M [LOG4OM] [#1] (Updates!)

AlertsSettingsSound ON

KK4HEG - NC

KC5YSN - OH

K7JNX - B4

KC5YSN

Windham

Wakeman

United States

OH

4

8

NA

Q

First QSO

Name

QTH

Grid

Comments

PWR

Country Name

State

CQ

ITU

Cont.

QSL

Display Re...

Sent items...

HSDR

Wide Graph

WSJT-X

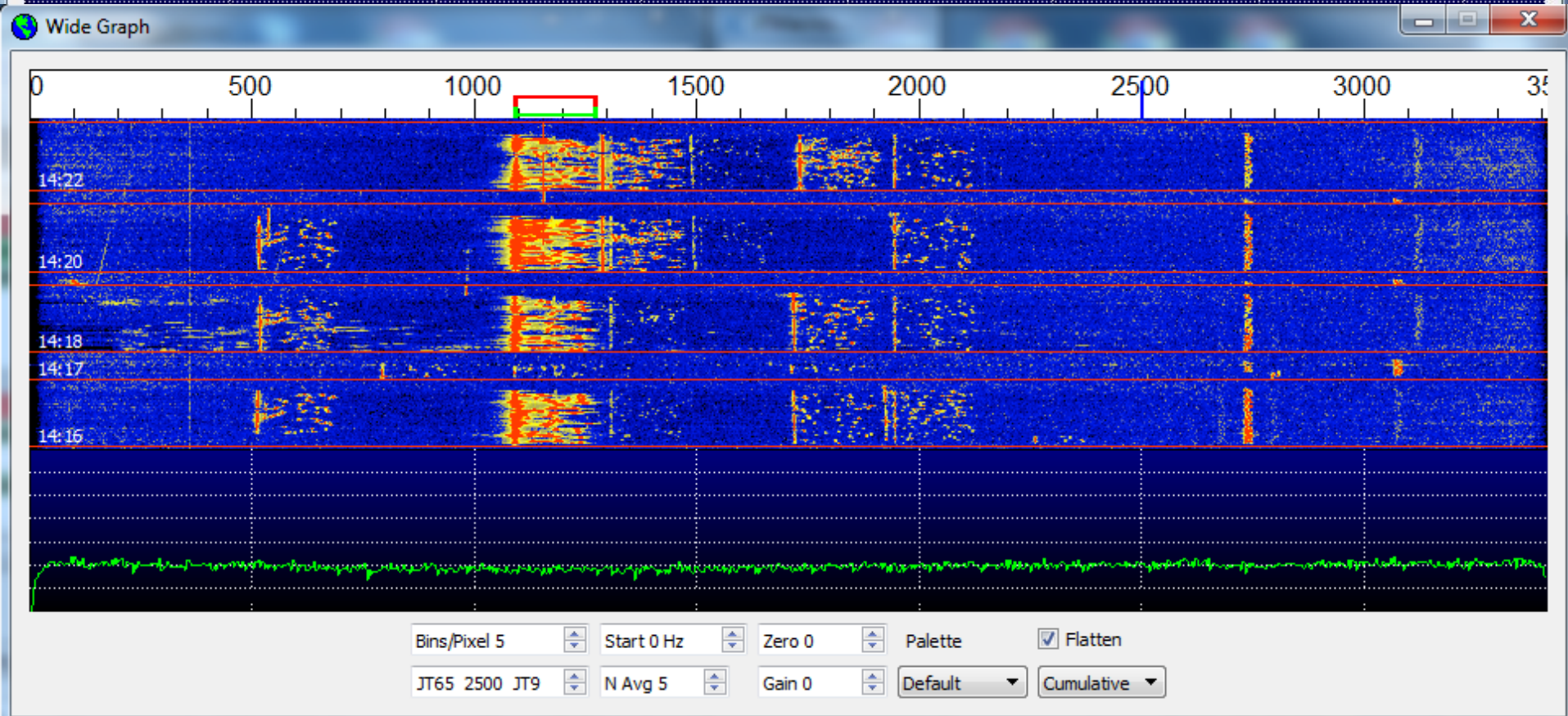
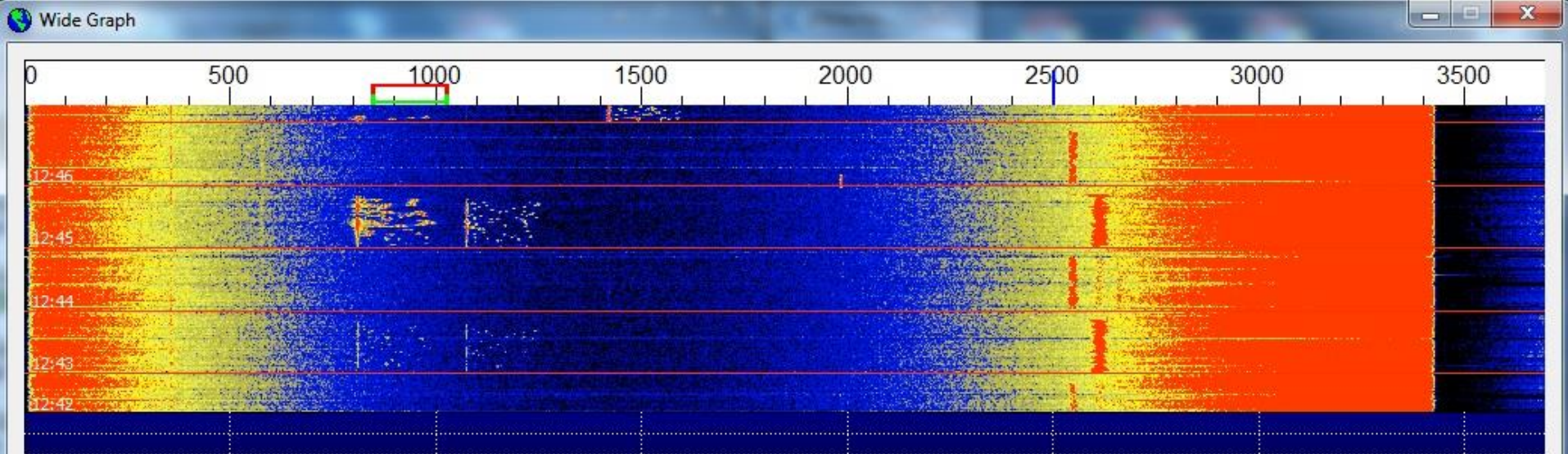
JTMacros...

JTAlert-X

Log4OM

Log4OM











On 20m , show signals sent/rcvd by the callsign KM5HT using all modes over the last 24 hours Go! [Display options](#)

Monitoring KM5HT (last heard 20 hrs ago). Automatic refresh in 4 minutes. Small markers are the 85 transmitters ([show logbook](#)) heard ([distance chart](#)) at KM5HT (44 reports, 7 countries last 24 hours; 154 reports, [14 countries](#) last week). There are [249 active monitors](#) on 20m. [Show all on all bands](#) [Legend](#)





# Where am I now

- I live in an HOA
- Radio - RXTX Ensemble running 1 watt
- Antenna – PAC12 mostly on 20 meters
- USB Sound card – Sound Blaster X-Fi SB1095
- Computer – HP G60-530US
  - Dual Core 2.1 Ghz
  - 4 Gb Memory
  - Solid State Drive
  - Windows 7 64 bit

- SDR program HDSDR
- VBCable – virtual audio cable A & B
- VSPmanager – virtual serial cable
- WSJT-X, JTAAlert, JTMacros – for JT65 & JT9
- FLDigi and DigiPan for other digital modes
- Log4OM → QRZ log, eQSL, Lotw
- PSK Reporter
- Read Softrock40 newgroup daily





# Questions?

