

# QRP

## What, Why & How



**Keith Price » WA5LPW**



**QRP**  
**How low can you go?**

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**Phil Salas – AD5X**

**<http://www.ad5x.com/>**



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# QRP Defined

- **QRP: Decrease Power**
- **Or, QRP?: Shall I decrease power?**
- **In Amateur Radio, it refers to low power operation.**



# Power Requirements

**Part 97.67(b)...Amateur stations shall use the minimum amount of transmitter power necessary to carry out the desired communication.**

**How often is this adhered to?**



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# History of QRP

- **1960: K6JSS started the QRP Amateur Radio Club**
- **Definitions:**
  - » **Low power: < 100 watts input (200 watts PEP)**
  - » **Medium power: 100-500 watts input**
  - » **High Power: > 500 watts input**



# Club Objectives

- Increase equipment & antenna efficiencies
- Careful impedance matching
- More efficient output coupling
- More effective antennas
- Improve operating proficiency
- Bands vs time-of-day
- Frequency vs desired distance



# Down, Down, Down

- Many formerly high-power hams dropped below 100 watts (input power), to the 5- and 10-watt levels and found they could do surprisingly well.
- In 1979, the QRP ARCI defined the QRP limit as 5 watts output power (after a big internal battle)



# QRP Levels

- 5 watts CW output
- 10 watts PEP SSB output
- QRPp: Milliwatters
  - » Less than one watt output power



# Motivation – Why do it?

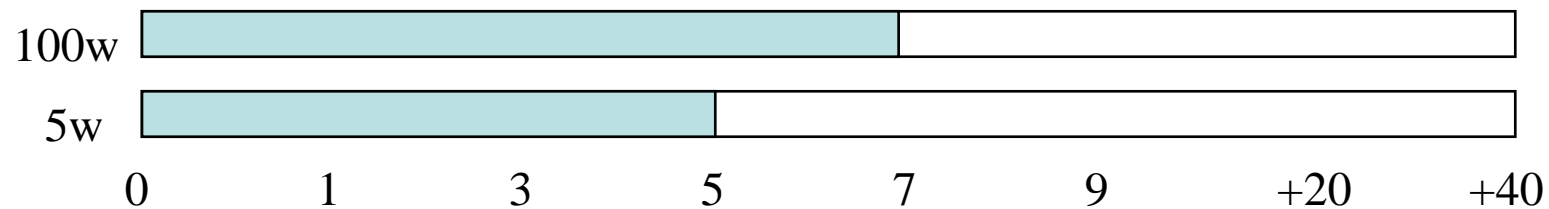
- Challenge of low power contacts
- 5 watts is 13 dB below 100 watts (two S-units)
- 5 watts is 23 dB below 1000 watts (four S-units)
- No interference to TV, stereo, intercom, telephone, etc.
- Simplicity of home-brew QRP equipment
- Learn to apply electronic theory
- Build low power emergency/portable equipment
- Low cost way to get on the air and get that code speed up!



# Signal Strength

## WHAT DOES THIS MEAN?

**Your 5 watt signal CAN be heard**



Source: Jim Larsen, AL7FS with John Hedricks, AL7OK



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# QRP Notebook

- “Make an effort to avoid technical complacency. Don’t rely on commercial equipment when assembling your amateur station. Experience the thrill of building transmitters and receivers, and gain valuable experience in the process.
- Half of the fun associated with our grand pastime is based on communicating with equipment we have built.”



# Rules for Success

- Listen, Listen, Listen
- Call strong stations
- If a weak station is QRO, he may not hear you
- It is better to answer a CQ
- Choose a very clear frequency when calling CQ
- Use an effective antenna
  - » Only a masochist uses a poor antenna with QRP
- Be prepared to listen (see first rule)



# Rules for Success *(continued)*

- Use the QRP calling frequencies
- Two watts on 20 meters is more effective than two watts on 40 meters
- Upgrade
- Believe it can be done!



# Why CW?

- Most (but not all) QRP QSOs are CW
- Thus, if you plan to try QRP...
  - » Learn code, practice code, use code, dream code, etc.
- So who does QRP SSB/digital?
  - » Lots of people
  - » An even bigger challenge than CW QRP

Source: Jim Larsen, AL7FS with John Hedricks, AL7OK



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# Bonus of CW?

- Bonus of using CW
  - » You can send CW late at night or during **nap** time without disturbing the house!
  - » If you have cold and can't speak, you can still send CW!
- 5 watts CW = 100 Watts SSB
  - » Source: NAQCC Club web-site.
  - » CW takes up about 100Hz of spectrum whereas SSB uses about 2000Hz. The average power density for CW, given the above values, is 1 Watt/Hz and for SSB .05 Watts/Hz. So if we compare the two modes we could say that gain in using CW over SSB is  $\text{Gain(dB)} = 10 * \log(1/.05)$  which is equal to 13dB What does this mean? It means that 5 Watts of CW is as efficient as 100 Watts of SSB. Just a little food for thought.



# Power Requirements for a Day

To run for **24 hours** - 10% xmit, 90% receive:

- Conventional, compact HF rig (IC-706, Yaesu FT-890)
  - » Receive - 2 amps...Xmit - 4 to 20 amps (avg. 10 amps)
  - » **TOTAL CONSUMPTION - 67.2 A-H (a car battery)**
- QRP-optimized rig
  - » Receive - 100 milliamps...Xmit - 500 milliamps
  - » **TOTAL CONSUMPTION - 3.36 A-H (a 3-lb. gel cell)**

Source: Jim Larsen, AL7FS with John Hedricks, AL7OK



# Calling Frequencies

	<b>CW</b>	<b>SSB</b>	<b>Novice</b>
160m	1810	-	-
80m	3560	3985	3710
40m	7040/7030	7285	7110
30m	10106	-	-
30m	10123	-	-
20m	14060	14285	-
17m	21060	21385	21110
15m	24900	24950	-
10m	28060	28360	28110
6m	50060	50885	-



# 30 meters!

## 30 Meters is a GREAT QRP Band

- Activity is friendly with little QRM
- DX is very good
- Maximum output power permitted is 250 watts
- Only CW and digital modes are permitted
- Basic antennas are the rule
- Dipoles
- Verticals



# How far can you go?

- You can work the world on 5 watts
- Can consistently work Europe, Japan,& Australia on 30 and 20 meter CW
- At the sunspot peak, you can do the same on 10 meter SSB with only 5-10 watts PEP



# QRP QSO de WA5LPW

Band	State	Their RST	My RST	Power	Miles	Antenna Used	Call Sign
20	MO	599	559	2.5	342	Hustler 20 meter	KC0JKD
20	VA	599	549	1	707	20 Meter dipole	KG4W
20	VT	599	559	2.5	1,120	Hustler 20 meter	WB2MIC
20	TX	589	569	2.5	424	Hustler 20 meter	WA5ICA
20	Canda	599	339	2.5	765	20 Meter dipole	VE3VG
20	NY	589	339	1	977	20 Meter dipole	N2KZ
20	IL	599	579	2.5	508	Hustler 20 meter	KC9IOZ
20	CT	579	529	2.5	1,020	20 Meter dipole	K1KUZ
20	NJ	579	559	2.5	950	NorCal Doublet	KB2APG
20	FL	599	599	1	598	20 Meter dipole	K4CMC
30	MN	589	559	5	709	Windom!	WI0S
30	MN	349	329	5	866	Windom!	WA0WNV
40	NC	589	569	2.5	515	Windom!	WA4BNO
40	GA	599	579	2.5	364	Windom!	WN4EEV
40	TN	599	599	2.5	335	Windom!	AG4FK
40	OH	599	579	5	445	Windom!	W8WY
40	TX	599	579	5	139	NorCal Doublet	W7TEG
40	MI	599	569	5	600	Windom!	W8FGU
40	IL	559	219	5	461	Windom!	NS9F
40	OH	599	569	2.5	624	Windom!	KA8GSA
40	OH	589	559	5	494	Alpha Delta DX EE	KC8BEQ
40	IN	599	579	2.5	402	Windom!	K9DGS
40	NE	579	449	5	649	Windom!	KD0AUN
40	TX	599	459	2.5	335	Windom!	WB5AZC
40	MN	599	579	1	709	Windom!	WI0S
40	WV	599	599	2.5	539	Windom!	AB8KS



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# Worldwide Beacon System

Northern California DX Foundation, Inc. on 14.100 Mhz.

Minute #	Callsign	Location
00	4U1UN/B	NY City (UN bldg)
01	W6WX/B	Palo Alto, CA (Stanford)
02	KH6O/B	Oahu, HI
03	JA2IGY	Ise City, Japan
04	4X6TU/B	Tel Aviv, Israel
05	OH2B	Espoo, Finland
06	CT3B	Funchal, Madeira Island
07	ZS6DN/B	Pretoria, South Africa
08	LU4AA	Buenos Aires, Argentina
09	No Transmission	



# QRP Organizations

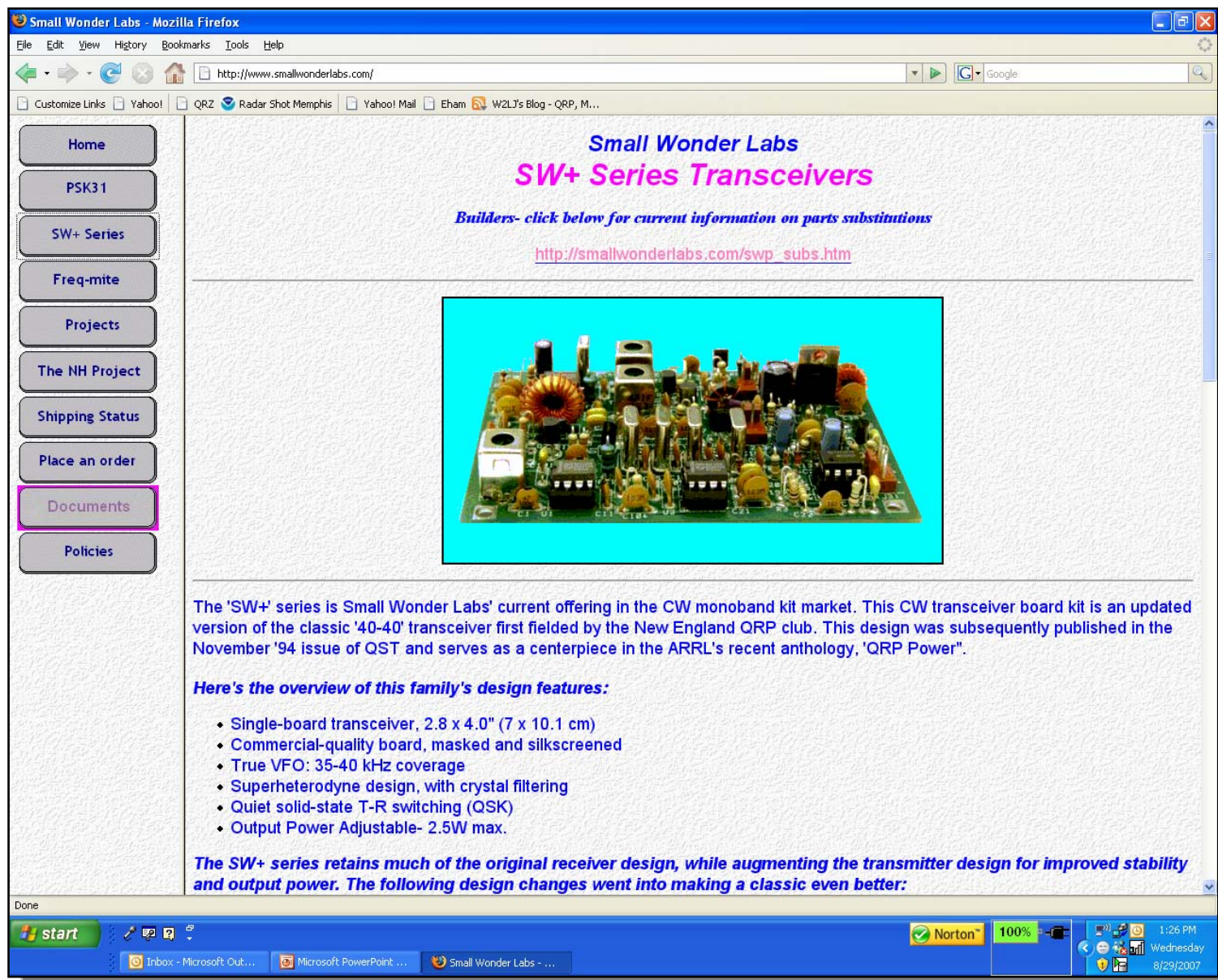
- G-QRP Club (SPRAT)
  - » <http://www.gqrp.com>
- NORCAL QRP Club (QRPp)
  - » [www.norcalqrp.org](http://www.norcalqrp.org)
- QRP ARCI (QRP Quarterly)
  - » [www.qrparci.org](http://www.qrparci.org)
- American QRP Club
  - » [www.amqrp.org](http://www.amqrp.org)
- New Jersey QRP
  - » [www.njqrp.org](http://www.njqrp.org)
- Flying Pigs QRP
  - » [www.gentzow.com/fpqrp](http://www.gentzow.com/fpqrp)
- North American QRP CW Club
  - » NAQCC for short
  - » <http://www.arm-tek.net/~yoel/index.html>



# What kind of equipment?

- Normal 100 watt rigs turned down to QRP levels
- New QRP Rigs
  - » SGC-2020
  - » MFJ-9xxx
  - » Yaesu FT-817ND
  - » Icom IC-703 Plus
  - » Ten Tec Argonaut V
- Kits
  - » Elecraft K1, KX1, K2 & K3
  - » Ten-Tec 1300 Series
  - » Wilderness Radio (<http://www.fix.net/~jparker/wild.html>)
  - » Small Wonders Labs (<http://www.smallwonderlabs.com/>)
  - » Hendriks QRP Kits (<http://www.qrpkits.com/>)





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# Great First Project!

## VE3DNL Marker Generator

### \$7.50!!!!

NorCal QRP Club - NorCal QRP VE3DNL Marker Generator - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.norcalqrp.org/VE3DNLmarkergenerator.htm

Customize Links Yahoo! QRZ Radar Shot Memphis Yahoo! Mail Eham W2LJ's Blog - QRP, M...

NorCal QRP Club - About The NorCal ... Tuna Tin 2 Kit

NorCal QRP Club - NorCal QRP VE3...

 NorCal QRP Club

Navigation

- Home
- About NorCal
- Membership
- Jim Cates Tribute
- NorCal Meetings
- NorCal Kits
- Limited/Special Run Kits
- Club Kits
- Online Order Desk
- NorCal Manuals
- Presentation Materials
- So You Want to be a Builder
- Members Projects
- Pacificon
- Links

NorCal Keyer Marker Generator Dummy Load FCC-1 FCC-2 Crystals TunerUpper NC2030 Partial Kit

[Print Friendly Version](#)



**Description**

The NorCal QRP Club is very pleased to be able to bring back one of our most popular kits, the [VE3DNL Marker Generator](#). Glen Leinweber, VE3DNL, designed this for the QRP community several years ago. It was kitted for several years by the Fort Smith QRP Group, and then by NorCal. We retired it a couple of years ago, and since then have had several requests to bring it back. Since it is such an easy kit to build, and such a useful tool when you finish, we brought it back. This kit is ideal for the first time builder, and is featured in the "So you want to be a builder series" that was written by Doug Hendricks, KI6DS several years ago. The best thing about this kit though is the price!! \$7.50 shipped in the US, \$10.00 shipped DX. Yes, \$7.50, and you get everything. All parts, a double sided, plated through pc board that is silkscreened and solder masked. Plus we even throw in the 9V connector. If you would like to take a look at the 10 page manual with step-by-step color pictures to help you build, press the manual download button. To order press the Paypal button below, or if you want to send us a check or money order in US funds only, see the address below.

Done

start

Inbox - Microsoft Out... Microsoft PowerPoint ... NorCal QRP Club - No...

Norton 100%

6:14 PM Wednesday 8/29/2007



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# Equipment (*Continued*)

- Older used rigs
  - » Heath HW7/8/9
  - » Ten-Tec Argonaut 505/509/515
  - » Yaesu FT-7
  - » Kenwood TS-120V & TS-130V
  - » Index Labs QRP+



# Equipment (*Continued*)

- Homebrew
- ARRL books
- QRPp, SPRAT, QRP Quarterly
- QST, CQ, 73, Communications Quarterly
  - » Printed Circuit Boards for most articles:
    - FAR Circuits, Dundee, IL
    - [www.cl.ais.net/farcir](http://www.cl.ais.net/farcir)



# Summary of QRP Benefits

- QRP challenge: Use the least power necessary to establish and maintain communications
- QRP reduces QRM, and re-introduces an element of adventure & challenge that was part of amateur radio's earliest days.
- QRP gear is compact and portable.
- QRP gear is great for the experimenter & homebrewer



# Examples of QRP Equipment

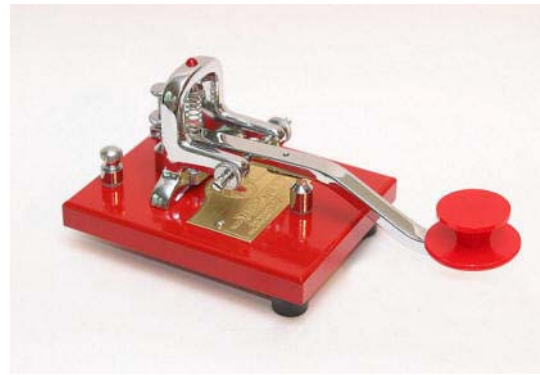


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# VIBROPLEX®

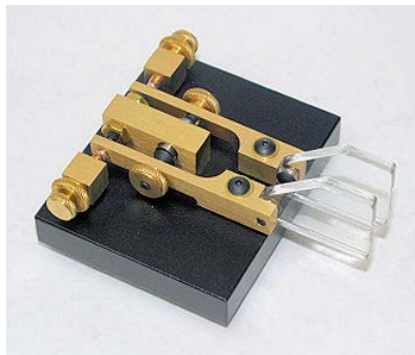
**Code  
Mite**



**KNOW CODE Key**



**Iambic Deluxe**



**Code Warrior Junior™**



**Vibrokeyer Deluxe**

**Square  
Racer  
Standard**



**Original Deluxe**

<http://www.vibroplex.com/>



## K1 Four or Two-Band HF Transceiver



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# ELECRAFT

## The K2 CW/SSB HF Transceiver



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## The KX1 CW HF Transceiver



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# SGC 2020



<http://www.sgeworld.com/2020ProductPage.html>



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# Yaesu FT-817ND



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# Icom IC-703



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# Ten-Tec Argonaut V



QRP for CW and SSB - \$895



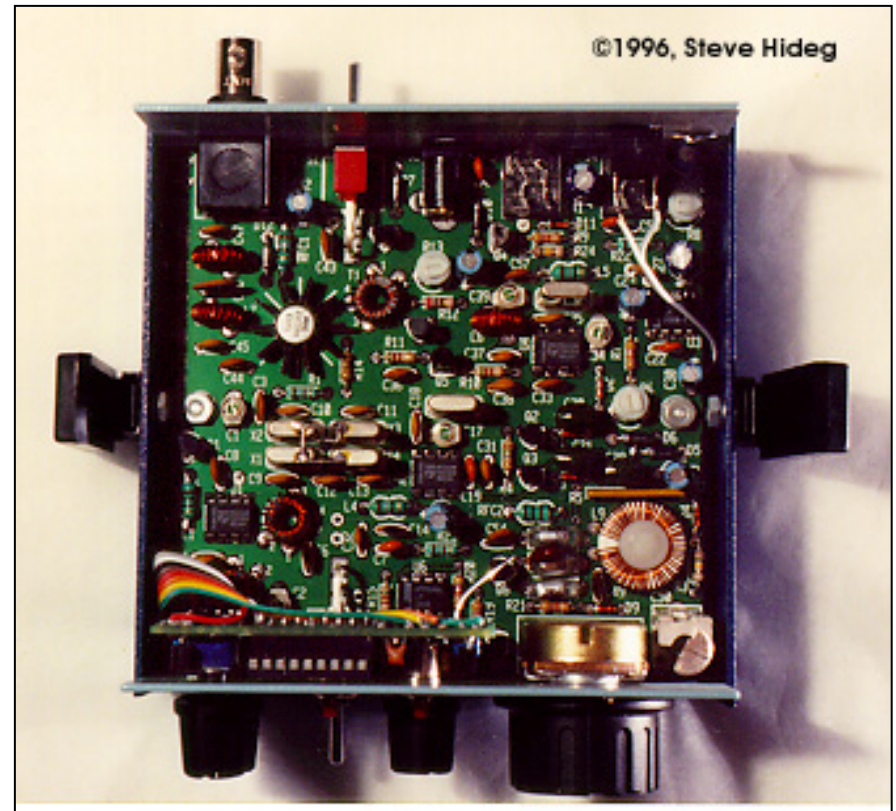
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# The NorCal 40A



- 40m 2W CW transceiver
- Grandfather deluxe



Source: Jim Larsen, AL7FS with John Hedricks, AL7OK

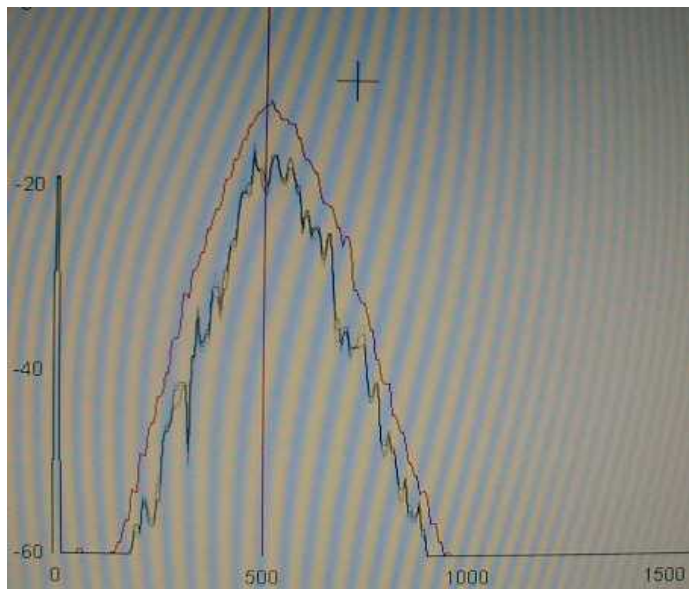


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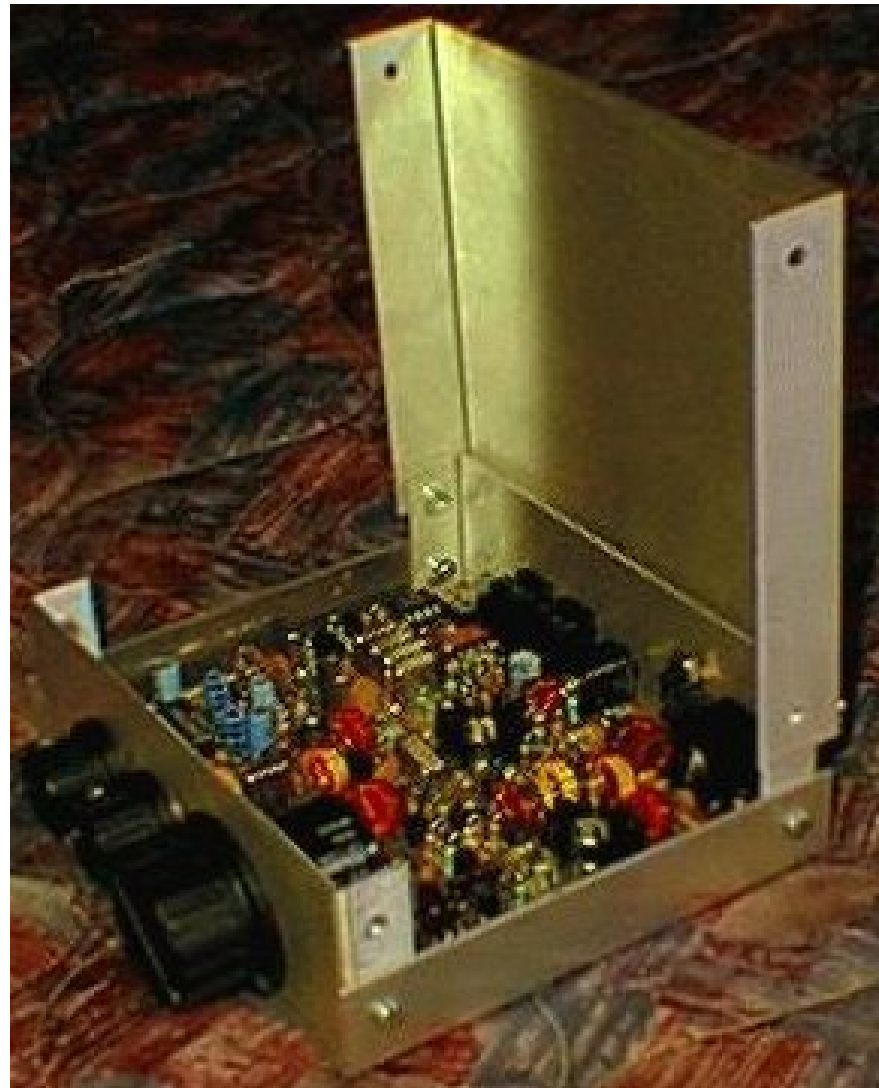
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# The NorCal 20

- 20m superhet CW
- Great front end
- Norcal kit for 3<sup>rd</sup> world countries



Source: Jim Larsen, AL7FS with John Hedricks, AL7OK

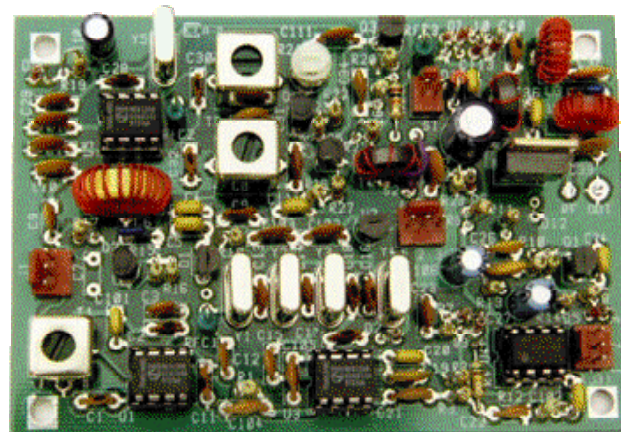


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# Small Wonder Labs' "SW40+"

Built by AL7FS



- 40m 2W CW transceiver
- Improved, simplified
- RIT add-on now available
- Educational Project

<http://www.qsl.net/kf4trd/faq.html>

Source: Jim Larsen, AL7FS with John Hedricks, AL7OK



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# Small Wonder Labs' "White Mountain 20m SSB"



- 20m 2W QRP SSB transceiver
- Solid design
- Easy construction

Source: Jim Larsen, AL7FS with John Hedricks, AL7OK



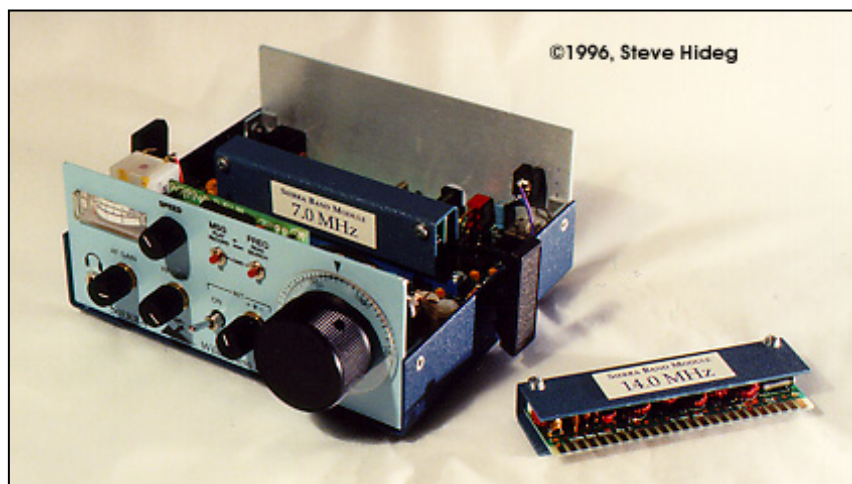
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# The “Sierra” by Wilderness Radio

- All band CW transceiver
- Superhet, VFO
- Dig display & key options
- Removable band modules
- Rivals quality of rigs 5x \$
- ARRL Hndbk cover '96



Source: Jim Larsen, AL7FS with John Hedricks, AL7OK



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# OHR – Oak Hills Research

- 5 band superhet CW rig
- 5 band + improved



Source: Jim Larsen, AL7FS with John Hedricks, AL7OK



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# Index Labs' "QRP Plus"



- Super stable QRP rig
- Great user interface



Source: Jim Larsen, AL7FS with John Hedricks, AL7OK



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# Heathkit HW-8

- 4 band direct conversion CW QRP rig



Source: Jim Larsen, AL7FS with John Hedricks, AL7OK



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# The “Tuna Tin 2”



- Simple Tx, less than 1W
- W1FB original design

Source: Jim Larsen, AL7FS with John Hedricks, AL7OK



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# Final Thoughts

- What can you do with QRP?
  - » Anything you have the skill, tenacity and patience to do!!
- Just remember:
  - » “Power is no substitute for skill” (QRP ARCI)
  - » “Use wits, not watts” (unknown)
  - » “It is vain to do with more, what can be done with less” (William of Occam, 1290-1350)
- 72 OM
  - » “Wishing you good QRP”
  - » Adopted by all QRP organizations

