

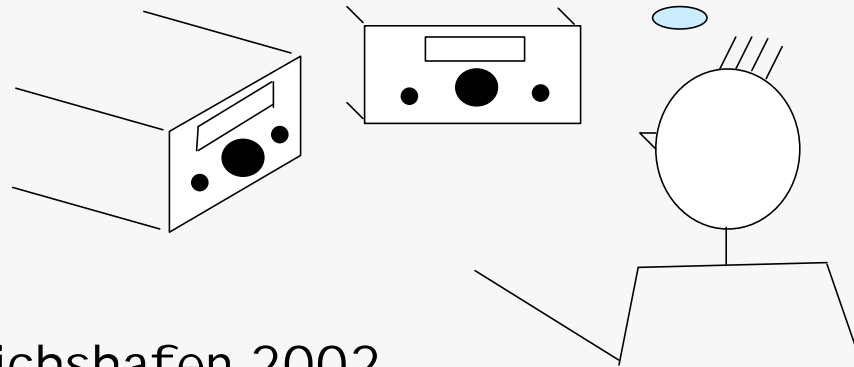
Single Operator 2 Radio (SO2R)

A true challenge in Contesting

Stefan v. Baltz, DL1IAO

<http://www.dl1iao.com>

Are TWO better
than ONE ?



Friedrichshafen 2002

Single-Op 2-Radio: What is it?

Definition:

Actively using a second radio to find and work additional stations while keeping to the 'only one signal at any time' rule.

A typical situation: CQ WW CW - 1st day 14:00z

- 15m open to NA
- You ´run´ at a last-10 rate of 80 on a clear frequency
- But your competition is running a *pileup* !

You consider switching into S&P mode, but your experience says...

...if you are not CQing,
you are LOSING !

(K2UA Dayton 2001)

Why should I use *two radios* ?

1) In this example:

- Plenty of time and energy to listen to another band
- Last-10 rate will jump up if you *occasionally* find and work s.o. on the 2nd radio!

Why should I use *two radios* ?

2) In general:

- Increases fun of operating, reduces fatigue
- Makes better use of your operating time and your physical resources

You can...

...watch propagation on other bands

...keep an eye on your competition

...find new multipliers and/or other needed stations

...find new CQ frequency on new band

...move multipliers to a clear frequency on the 2nd radio

--> Helps building your score!

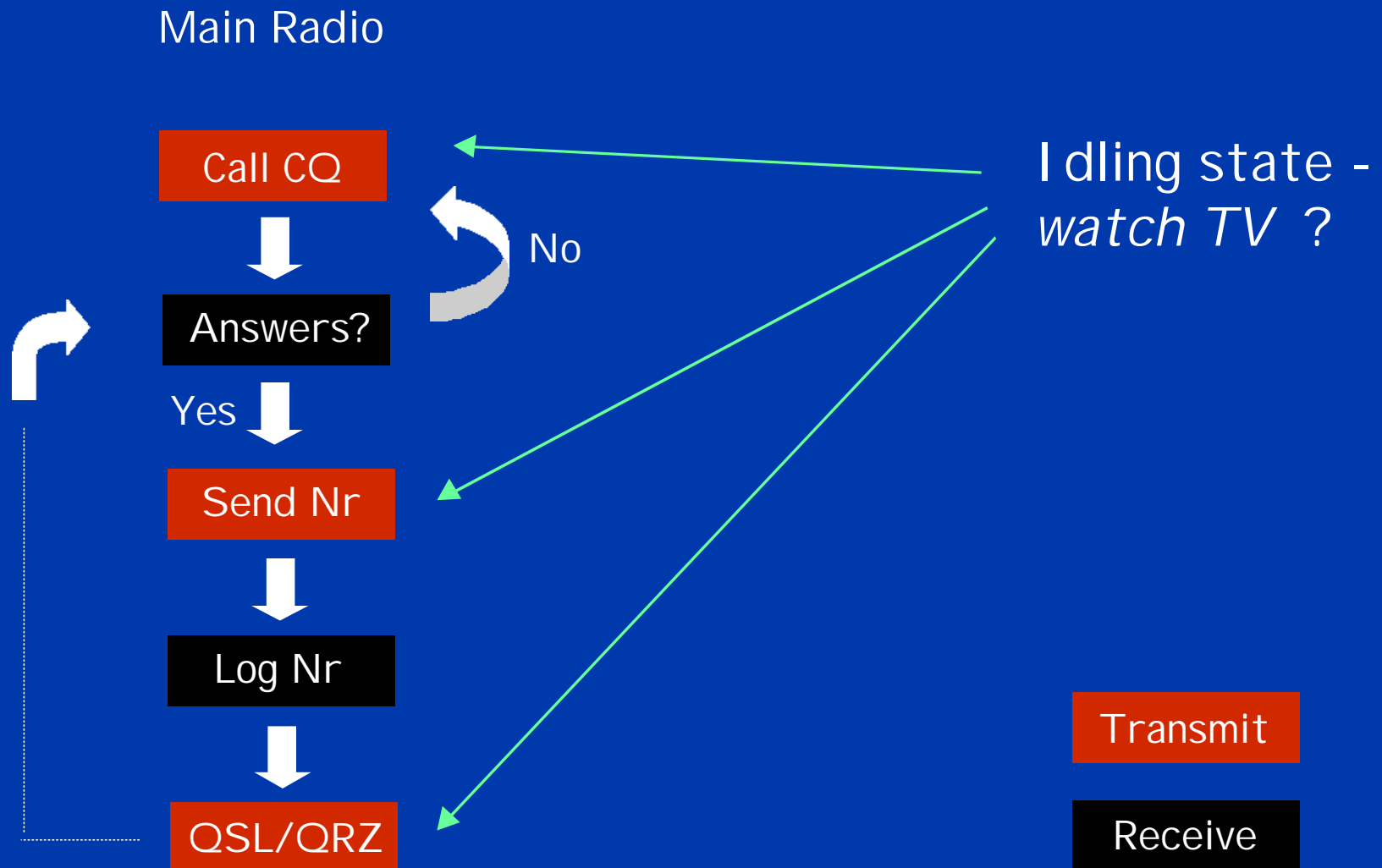
Historical tidbits

- First documented in 1952 by W4KFC
- 1970's: Some US contesters use 2 radios connected to one keyer (not allowed nowadays).
- 1993: DK3GI wins German XMAS Sprint with 100W and 2 radios
- CQ WW CW 1999: LY6M (LY1DS) sets new SOAB HP EU record

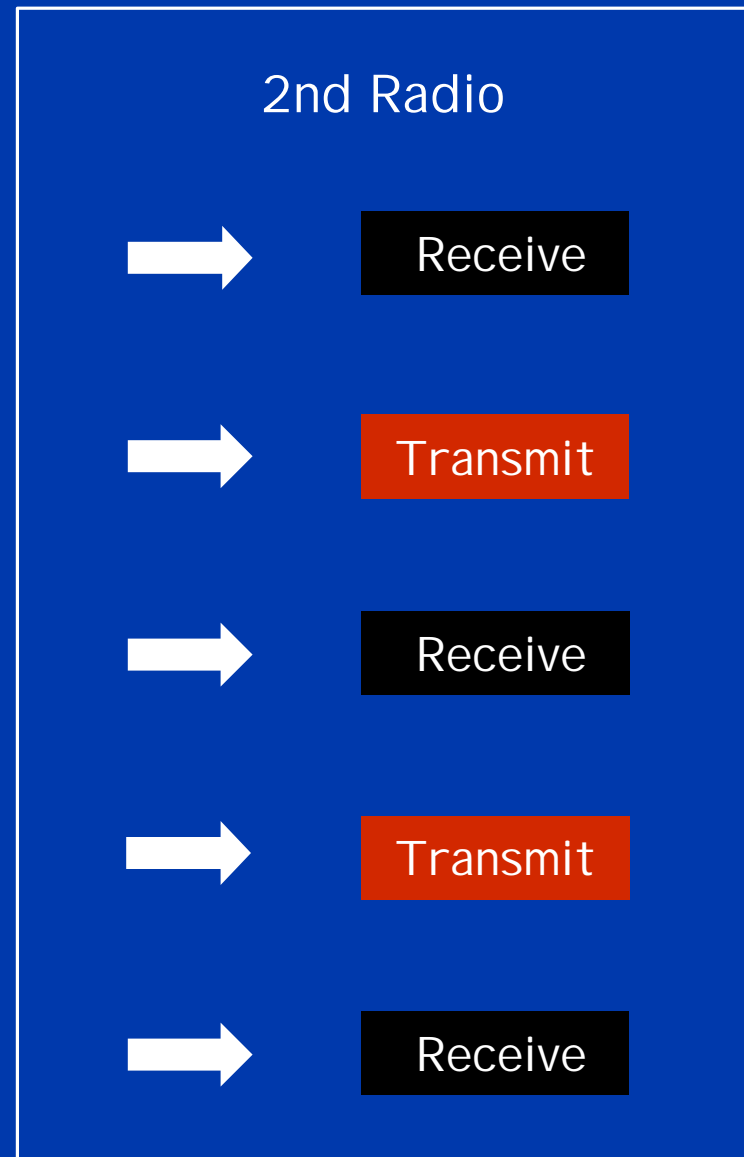
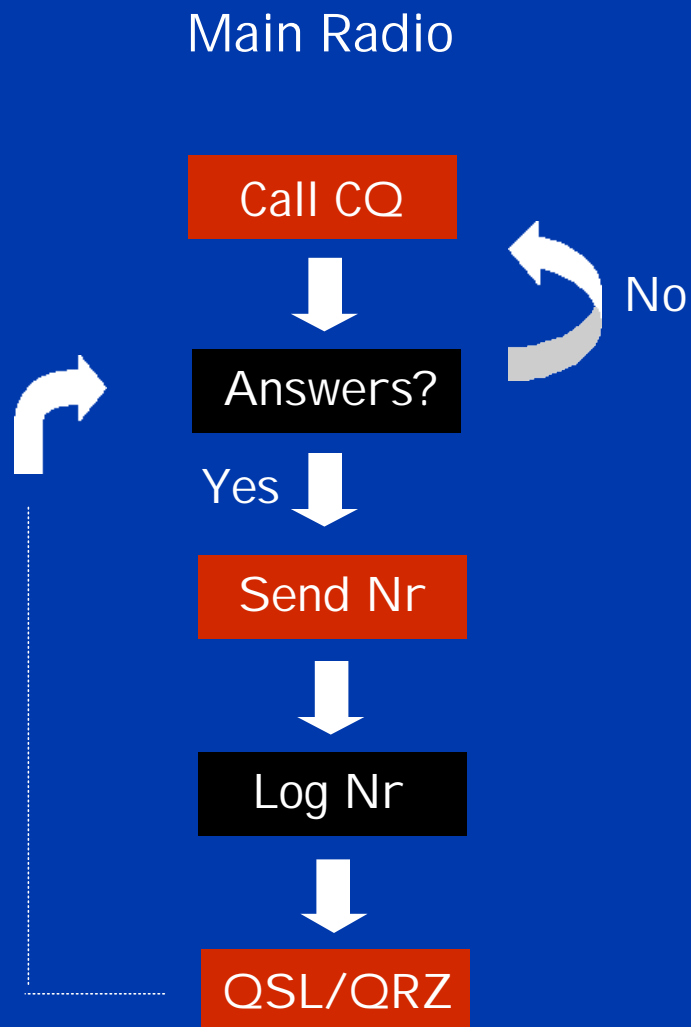
Today:

Many US-contesters do it - but only a few Europeans!

How does it work?

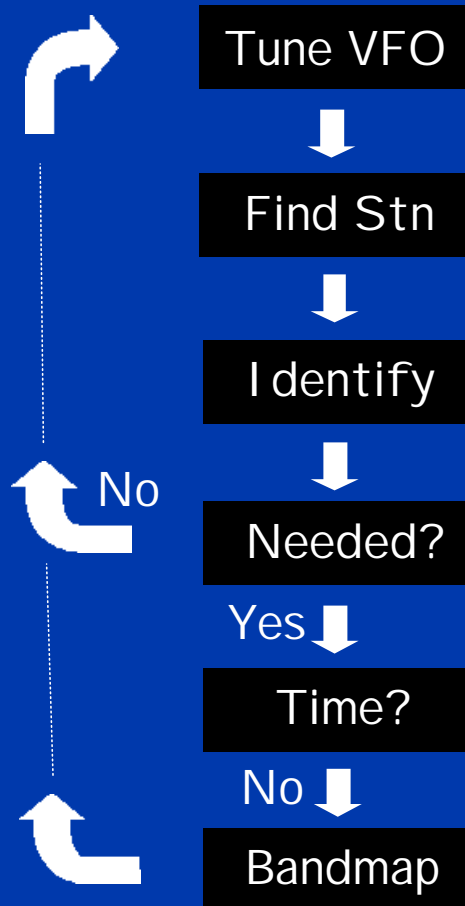


How does it work?

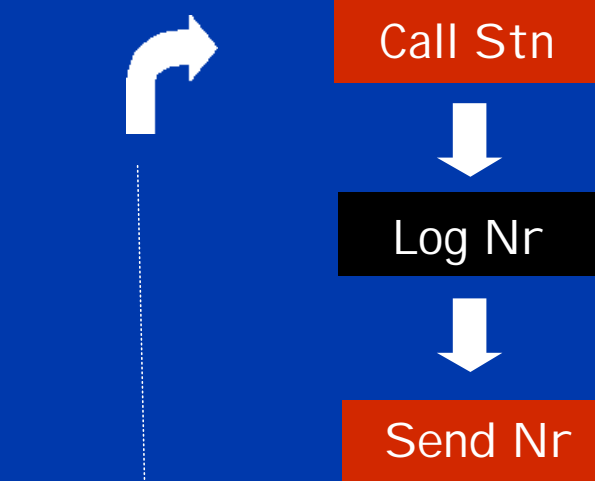


What am I doing on the 2nd radio?

1) Tune for stations



2) Work station



3) Spot station (optional)



Step by step: Tune for station while running

Main Radio

CQ TEST DL1IAO

K1TO

K1TO 5NN14

TU 5NN05

TU DL1IAO

2nd Radio

...K3NM 5NN08.. R UR..

8 sec

...TU V47!@# T...

4 sec

...47KP TEST...

3 sec

Step by step: Where are we?

1) Tune for stations

2) Work station

Tune VFO



Find Stn



Identify



Needed?

Yes ↓

Time?



Call Stn



Log Nr



Send Nr

Yes



Transmit

Receive

Step by step: Work station on 2nd radio

Option 1: Fully concentrate on 2nd radio QSO

Main Radio

2nd Radio

[Redacted]

DL1IAO

[Redacted]

10 sec

DL1IAO 5NN08

[Redacted]

TU 5NN14

CQ TEST DL1IAO

TU V47KP TES...

Step by step: Work station on 2nd radio

Option 2: Send a 'Dummy CQ' to hold run frequency

Main Radio

[Redacted]

CQ TEST DL1IAO

[Redacted]

CQ TEST DL1IAO

2nd Radio

DL1IAO

DL1IAO 5NN08

TU 5NN14

TU V47KP TES...



Step by step: Work station on 2nd radio

Attention: Someone might answer your 'Dummy CQ'!

Main Radio

[Redacted]

CQ TEST DL1IAO

WC4E

WC4E 5NN14 or '??'

!

2nd Radio

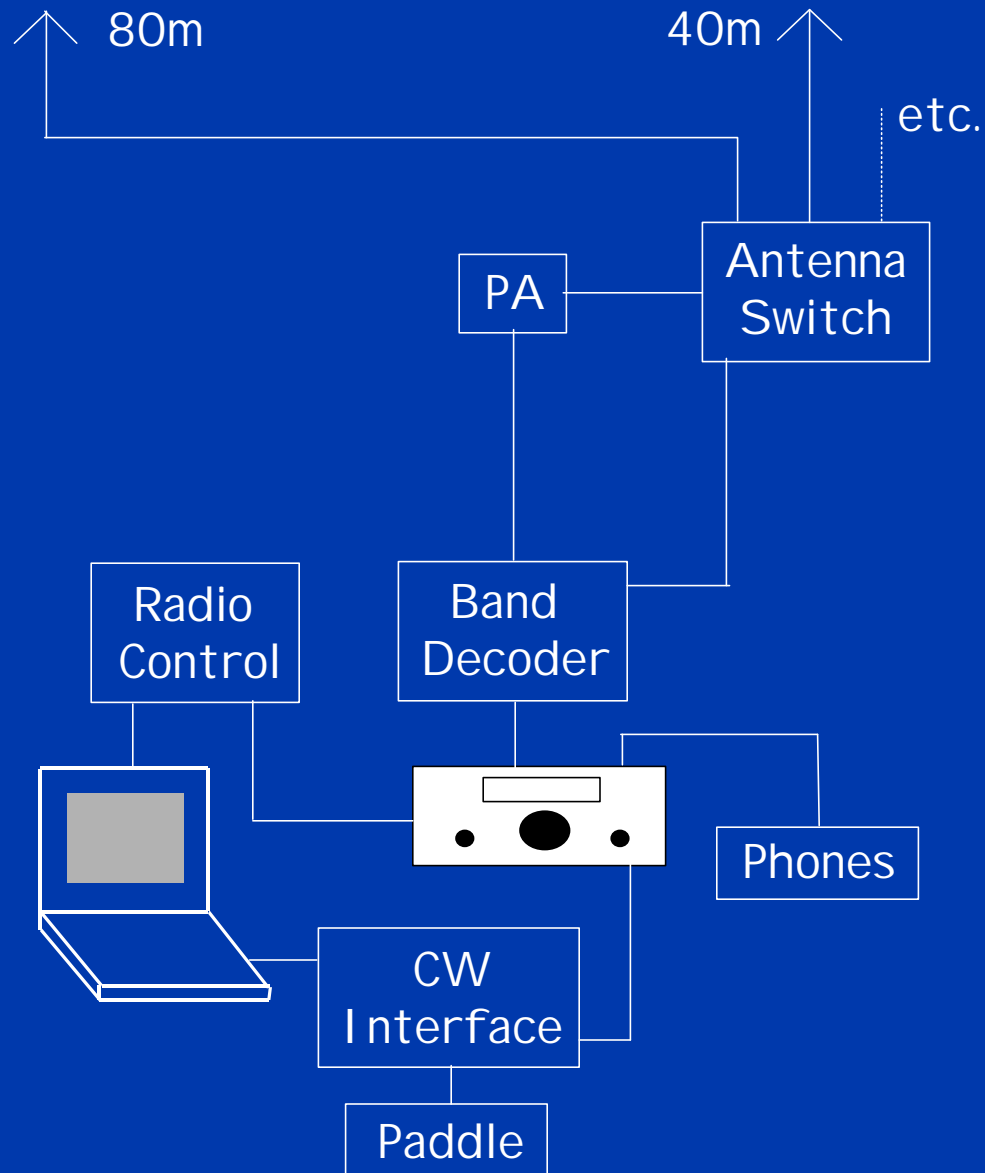
DL1IAO

DL1IAO 5NN08

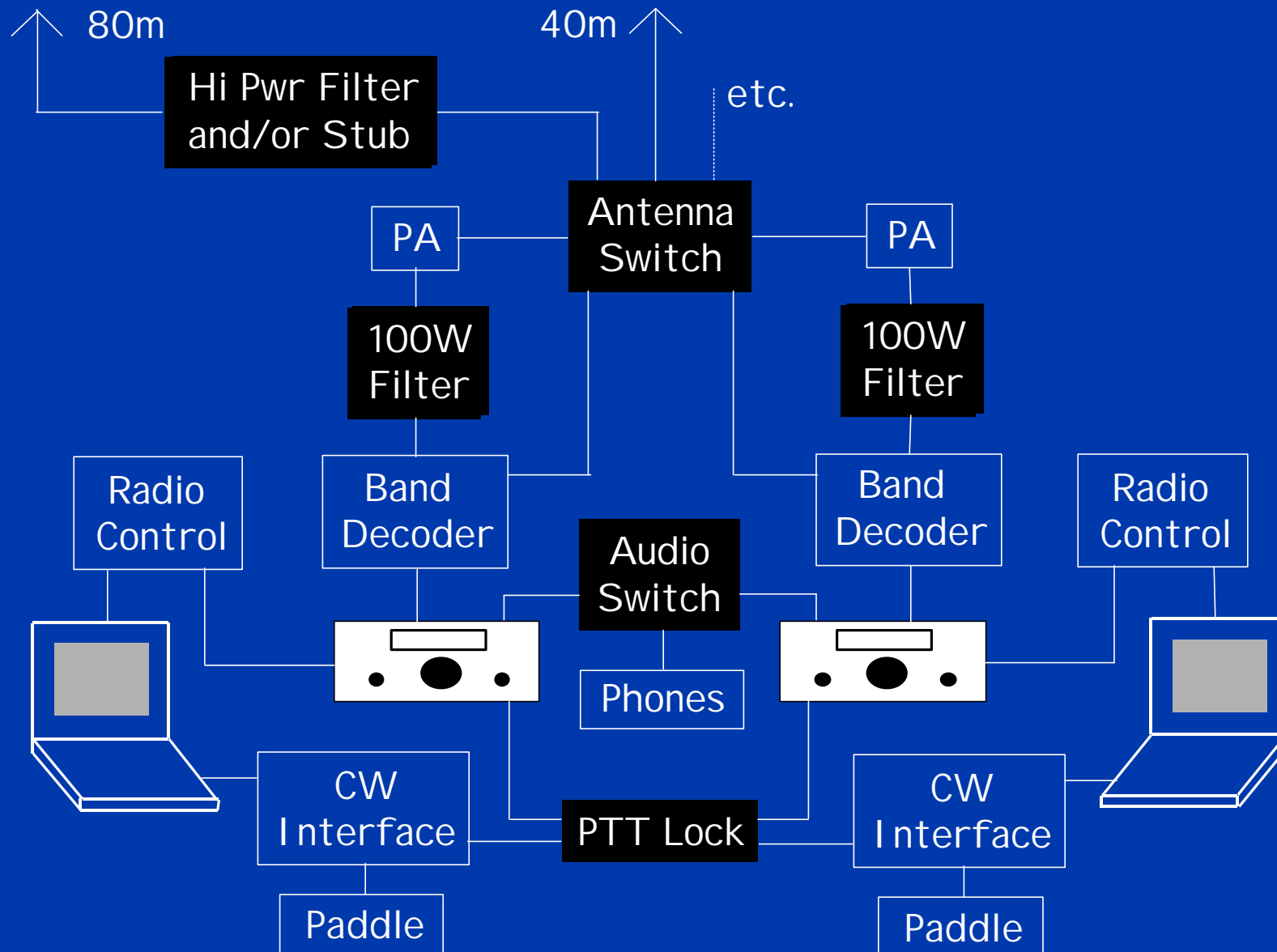
TU 5NN14

TU V47KP TES...

Typical 1-radio station setup

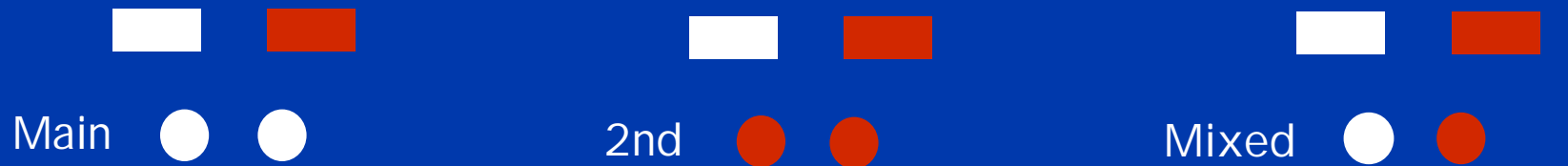


SO2R station components



Audio switching principles

1) Control receive audio by manual switching



 Main Radio

 2nd Radio

  Headphones

Audio switching principles

2) Use logging software or PTT-line for automatic control of receive audio

a) Typical



b) Low run rate



c) High run rate



Main Radio

2nd Radio

Headphones

Audio switching principles

3) 'Inverse' technique:

When in S&P mode, use 2nd radio to stray in a CQ from time to time high on another band.



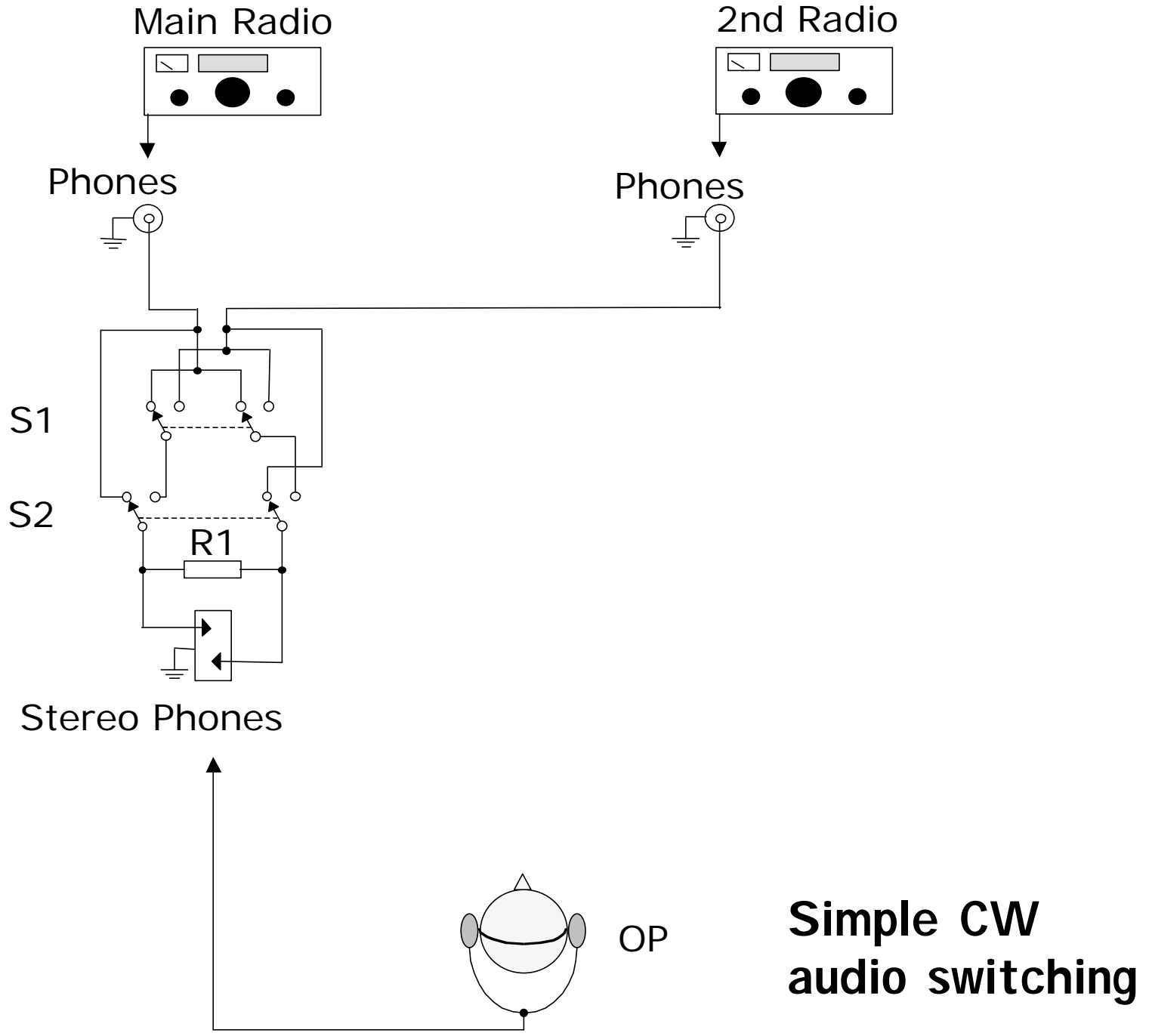
 Main Radio

 2nd Radio

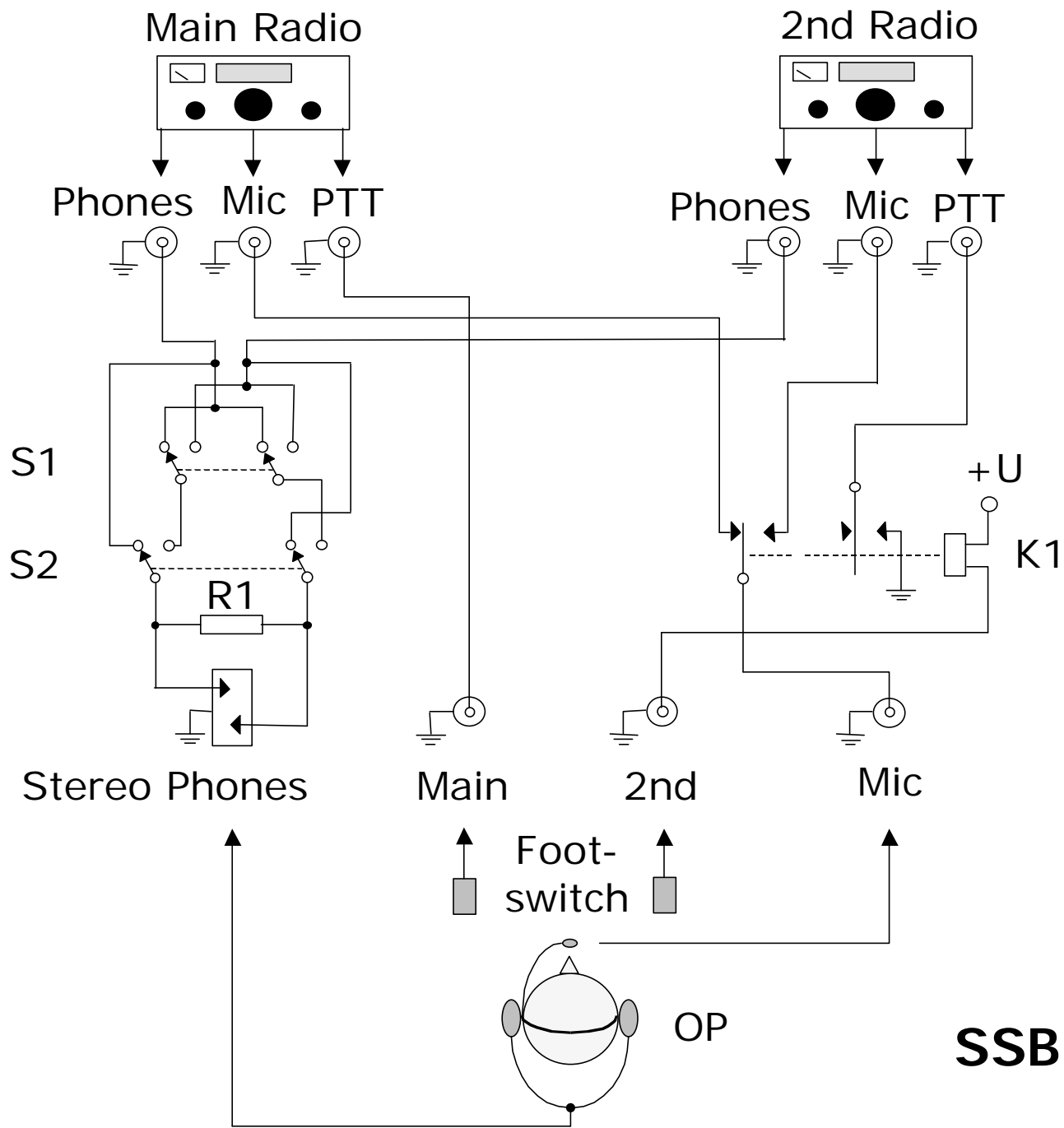
  Headphones

Hardware: Audio switching, Microphone & PTT-lines

- 1) Manual audio switch easy to homebrew
(only 1 or 2 toggle switches needed)
- 2) Software-controlled switching more complex, but can be done
- 3) Radios should lock each others PTT



**Simple CW
audio switching**



Commercial 2-radio controllers



Top Ten
`DX Doubler`

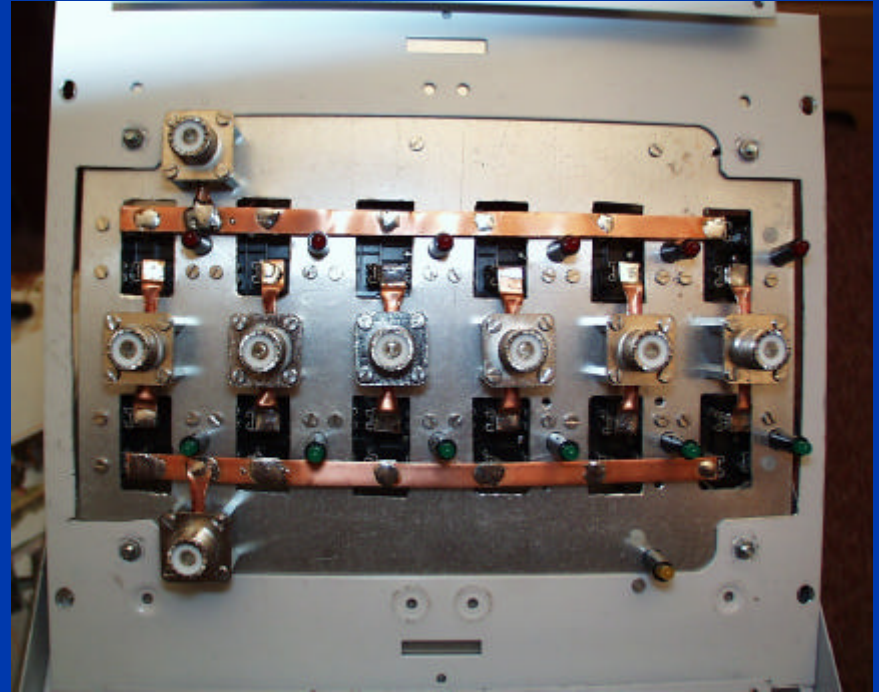
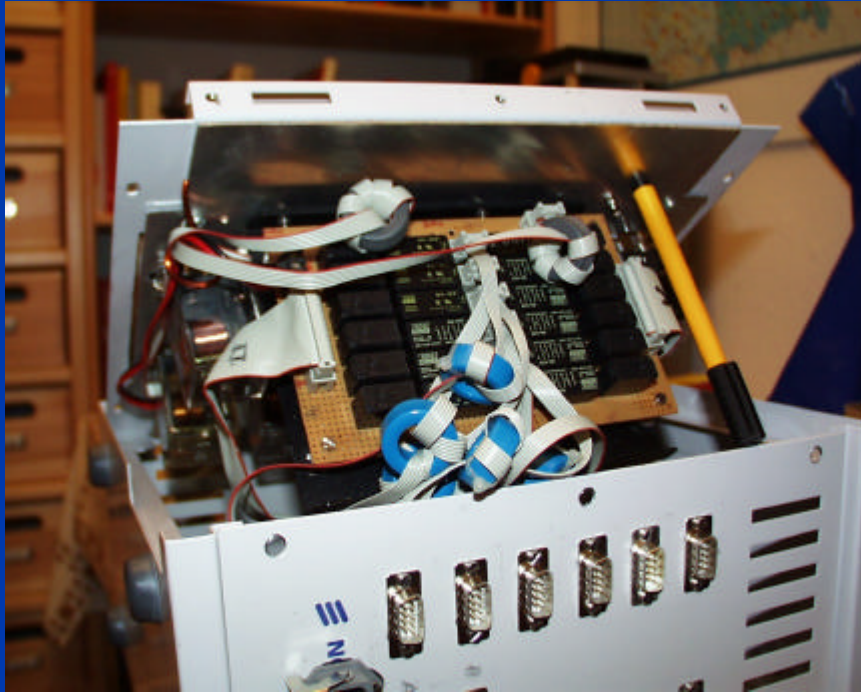
Array Solutions
`SO2R Master`



Hardware: Band decoders & antenna switching

- 1) High Power: Larger project: Appropriate parts (relays) needed, careful construction
- 2) Much easier for Low Power!
- 3) Alternative method: Use board with separate coax plugs for each band and radio - no band decoder & relays needed!

Band decoders & antenna switches

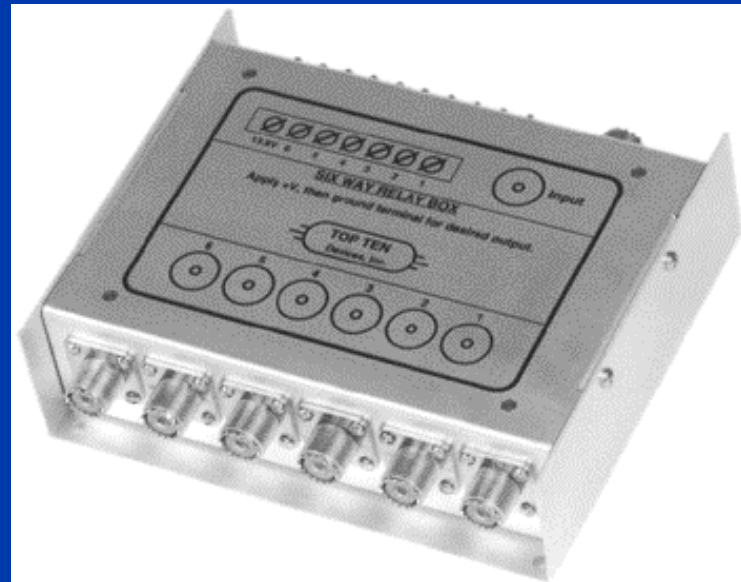


Homebrew 'Sixpak' w/ built-in band decoders at DL6RAI /DL2NBU

Commercial band decoders & antenna switches



Top Ten band decoder
& 6-way relay switching



Array Solutions 'Sixpak'



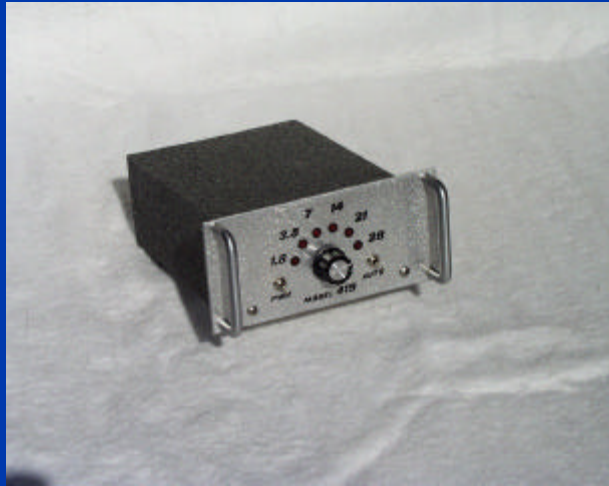
Hardware: Protecting your radio

- 1) Use bulbs or fuses at your RX input, some radios even have some built-in protection
- 2) First try with QRP and measure power coming from 2nd radio antenna
- 3) Test all possible band/antenna combinations
- 4) Station grounding

Hardware: Reducing interference

- 1) Wide spacing between antennas like at a MM is best
- 2) Bandpass filters:
 - 100W filters between radio and linear
 - High Power filters between linear and antennas (if needed)
 - Read W3NQN-article about the filters he sells!
- 3) Coax stubs
 - Cheap and easy to tune/build
 - but less effective

Commercial 100W bandpass filters



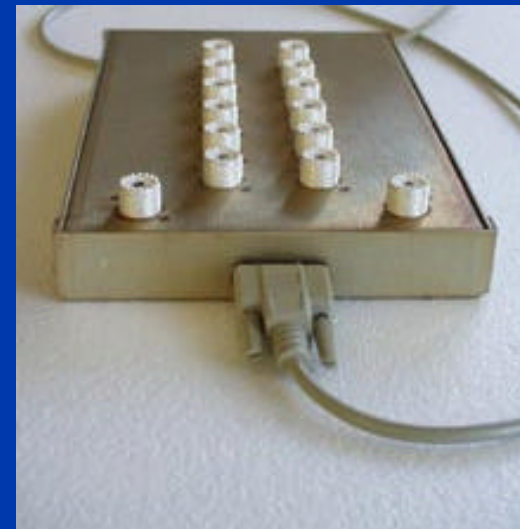
I.C.E



Dunestar



Array Solutions



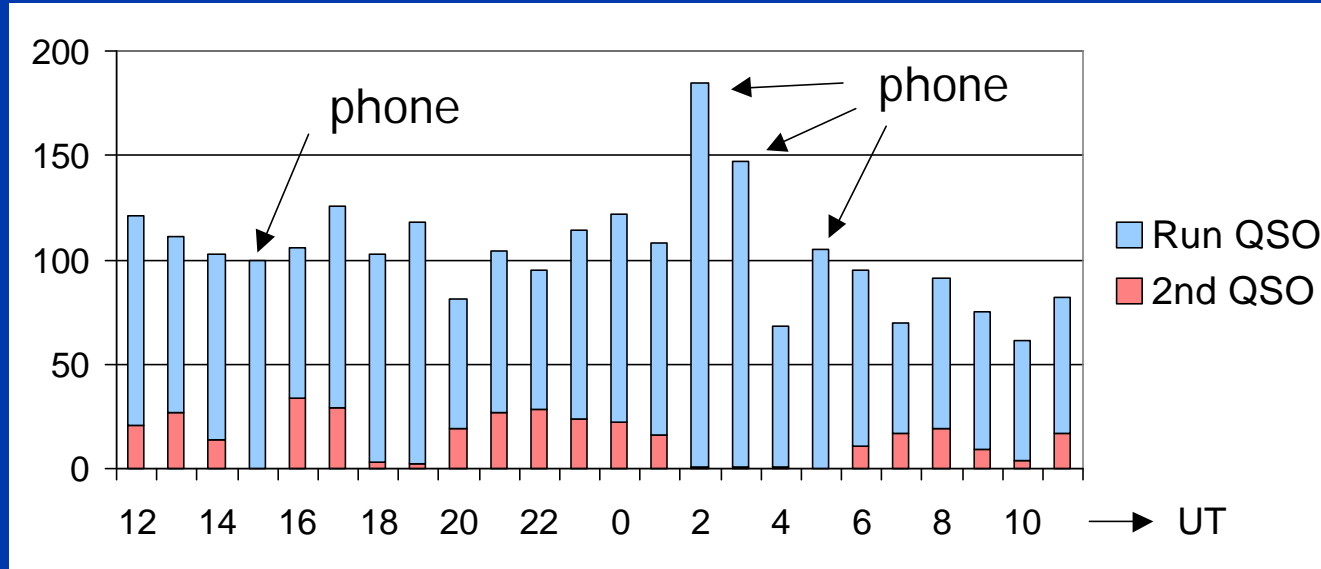
Software

- 1) CT, NA, TR Log, Writelog
- 2) All provide some 2-radio support:
A/B switching on LPT port, band information
- 3) TR Log & Writelog offer many 2-radio features
- 4) Use one PC to control both stations, or set up a 2-PC network
- 5) Network: You get 2 separate keyboards!
 - CT will work fine, like at a MS

2-radio hints & kinks

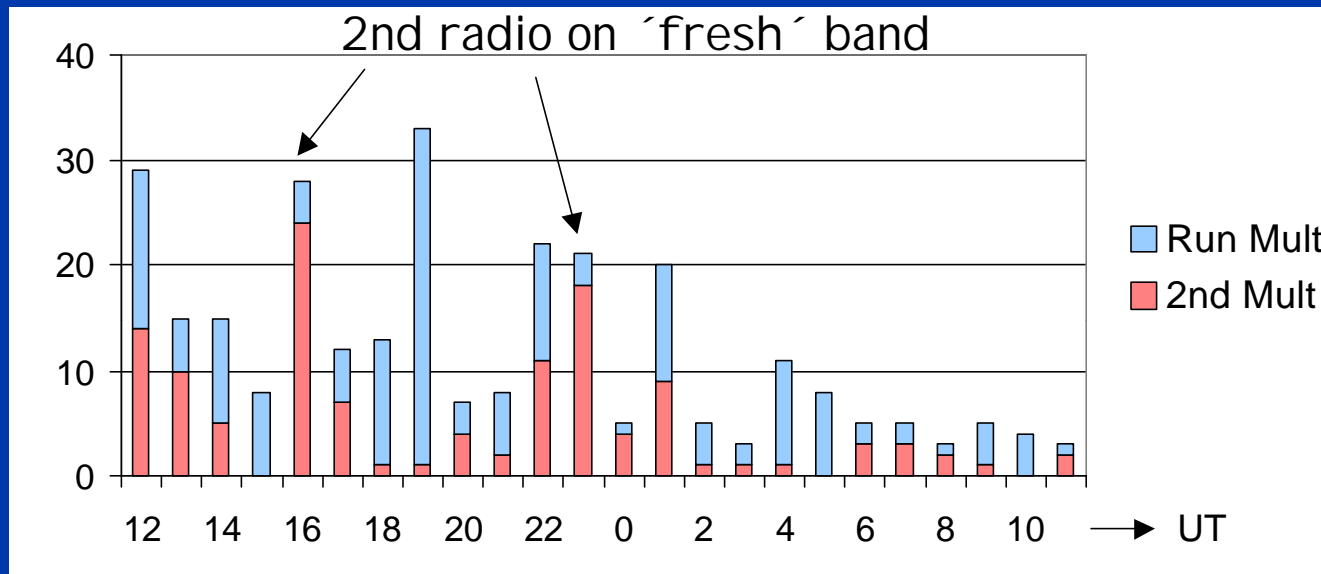
- 1) 2 radios most effective in typical DX contests
(multipliers count on each band):
 - CQ WW, WAEDC, IARU, WAG
- 2) Works fine in any other contest (10 min. rule?) when rate slows down:
 - CQ WPX, QSO Parties, EU/NA-Sprints
- 3) XMAS Sprint:
 - Useful around half time
- 4) Mixed category:
 - Very effective method: CQ on CW, S&P on phone!
- 5) LP/QRP:
 - Naturally lower run-rate

Results? - IARU HF 2001 DL1IAO SO Mixed



2491 total QSOs
 351 on 2nd radio
 (~ 14%)

Average rate
 boosted by
 ~ 15 QSOs / h



288 total Multipl.
 124 on 2nd radio
 (~ 43%) !

Every third 2nd-
 radio QSO was
 a multiplier

(Crowded) 2-radio setup DL1IAO @DL0WW



Coax board for
manual antenna switching
(not used any more)

Be efficient...

SO2R should boost your score:

- Your run frequency has priority!
- Timing is most important
- Avoid calling slow and weak stations

...and a good operator!

- Remember: Only one signal allowed!
- People should not notice you are doing SO2R
- Don't become a *2-RADIO LID*!

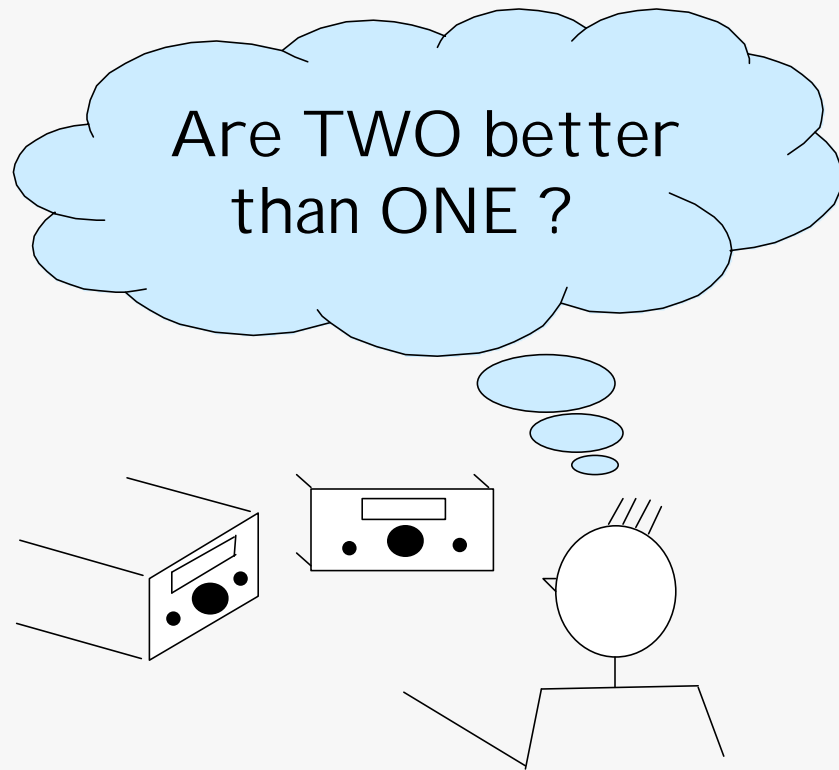
Where do you begin?

- Hook up some radio to some antenna as your 2nd station
- Homebrew a simple audio switch: Right, Left, Mixed

It is easy:

- Call CQ!
- Occasionally listen to 2nd radio during your transmit periods
- If 2nd radio slows you down, better concentrate on main rig!

Remember?



Yes - but you MUST
know what you´re
doing!

Stefan v. Baltz, DL1IAO
<http://www.dl1iao.com>

