The background features a dark grid with glowing blue and white lines. Scattered throughout are various numbers in white and grey, some appearing to float or be part of a data stream. In the upper right corner, there is a bright red and orange bokeh light effect, resembling a sun or a starburst. The overall aesthetic is futuristic and technical.

Optimizing HF Reception using Digital Signal Processing

**How to Use Your
HF Radio's DSP Functions
To Dramatically Improve
Readability**

QUESTION: Which of the following types of noise can often be reduced with a digital signal processing (DSP) noise filter? (E4E02)

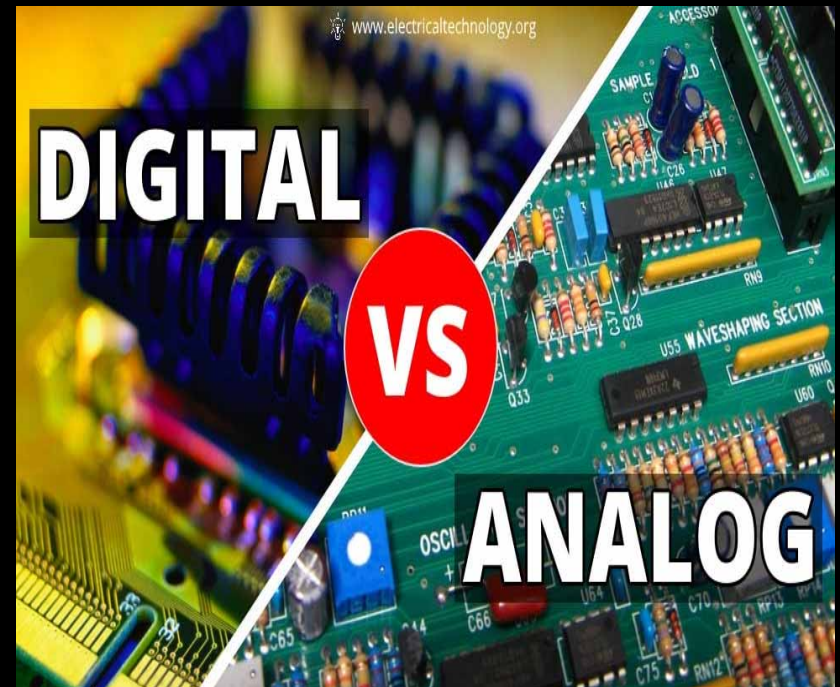
- **Broadband white noise**
- **Ignition noise**
- **Power line noise**

ANSWER: All these choices are correct

The History of DSP



By the early 90's advances in digital technology finally supported REAL TIME audio DSP



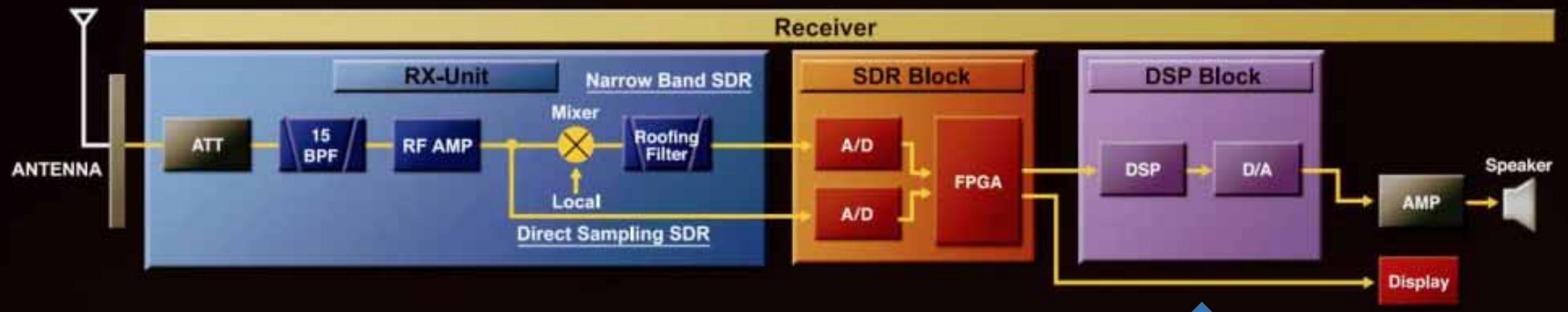
Analog hardware filtering circuits were replaced by digital chips/software

**In the October 1991 edition of QST, an
article by *K1ZZ indicated:**

**“It is pretty clear that the next major
development to hit our ham shacks will
be Digital Signal Processing”**

* K1ZZ is ARRL CEO David Sumner, retired 2016

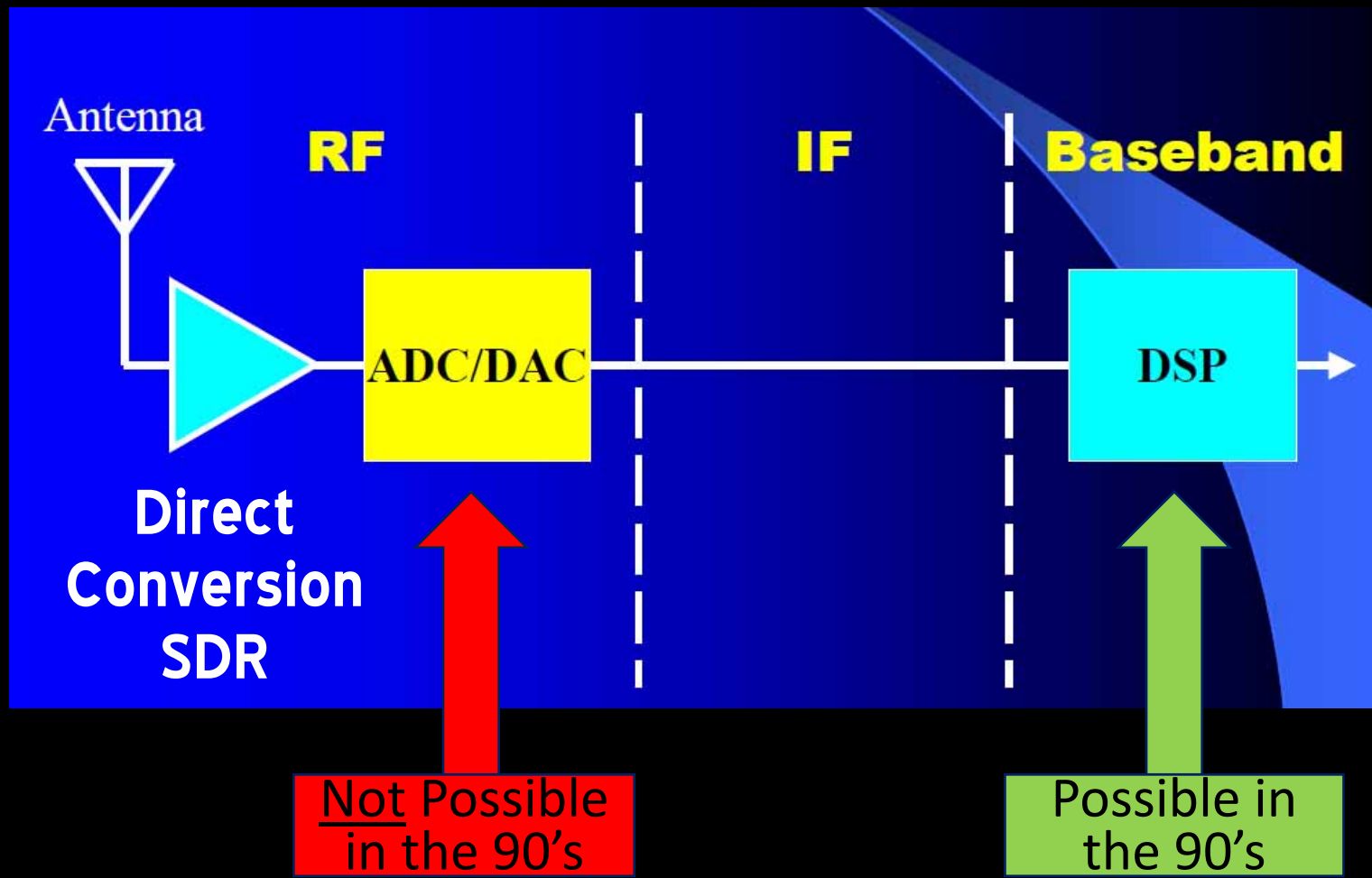
**Today, nearly all of our radios use
some form of DSP**



Baseband Processing



Some radios are now entirely implemented in software





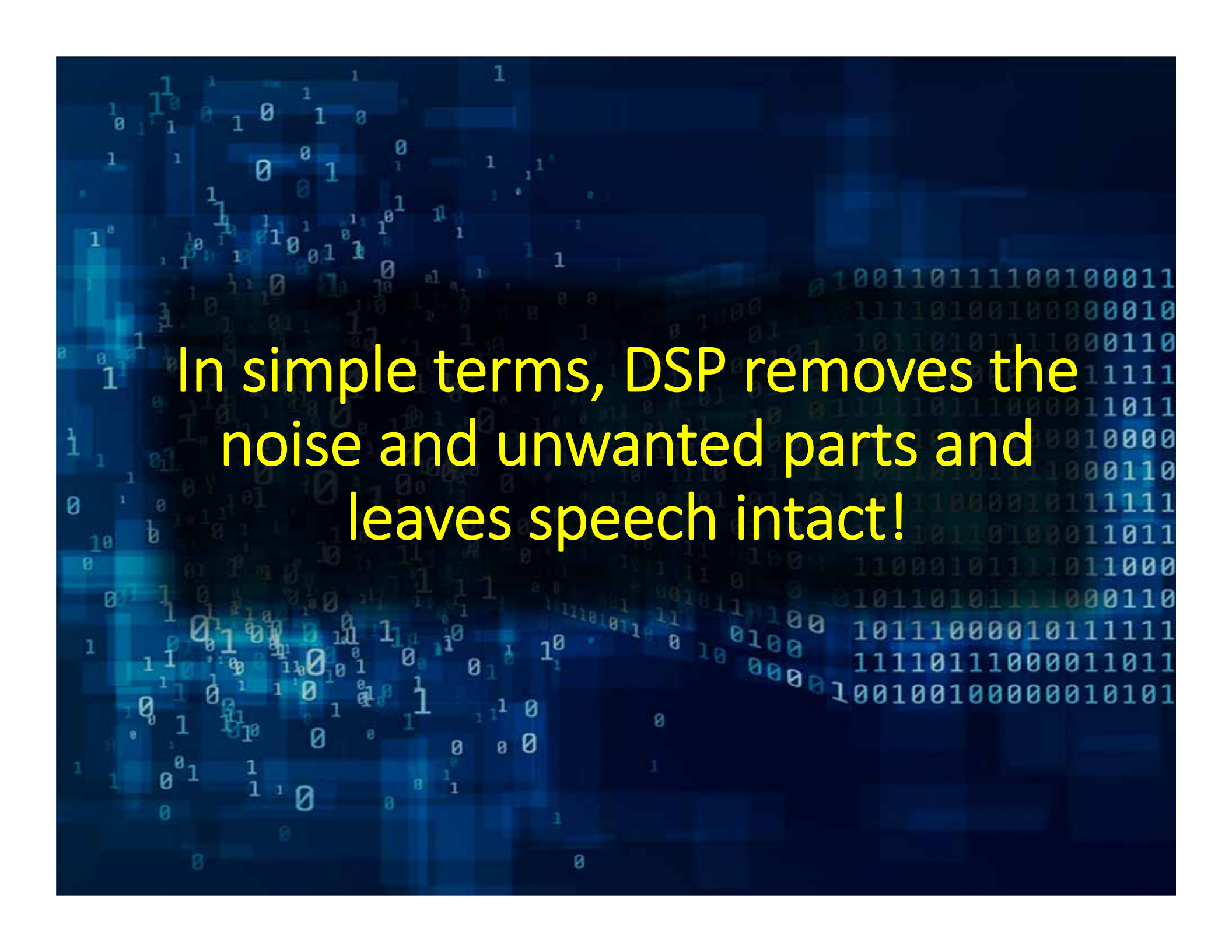
Effectively using your radio's DSP expands your contesting capabilities





- *Your radio's default DSP settings are not necessarily ideal!*
- *Many DSP features are NOT enabled by default*

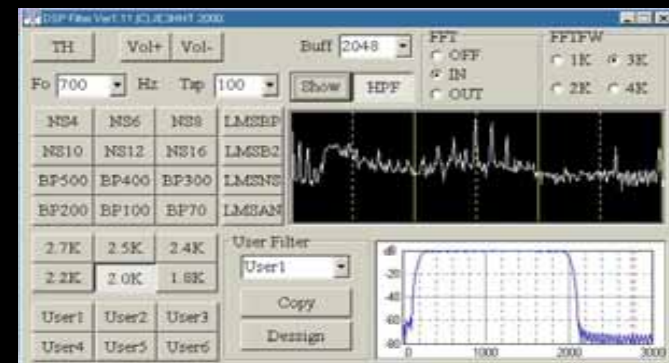
What is DSP?



In simple terms, DSP removes the noise and unwanted parts and leaves speech intact!

How is DSP Implemented?

- **Integrated within a radio** (i.e. FTDX101D)
- **External as an accessory** (i.e. TimeWave DSP599zx)
- **Software** (i.e. HamSoft DSP Filter)





**Our focus today is on integrated DSP
& leveraging its capabilities to
maximize HF signal quality**

Digital Noise Reduction (DNR)

Digital Noise Reduction (DNR)

- DNR suppresses ambient noise on HF signals
- It is ESPECIALLY effective during SSB operation
- Multiple levels of DNR are typically available



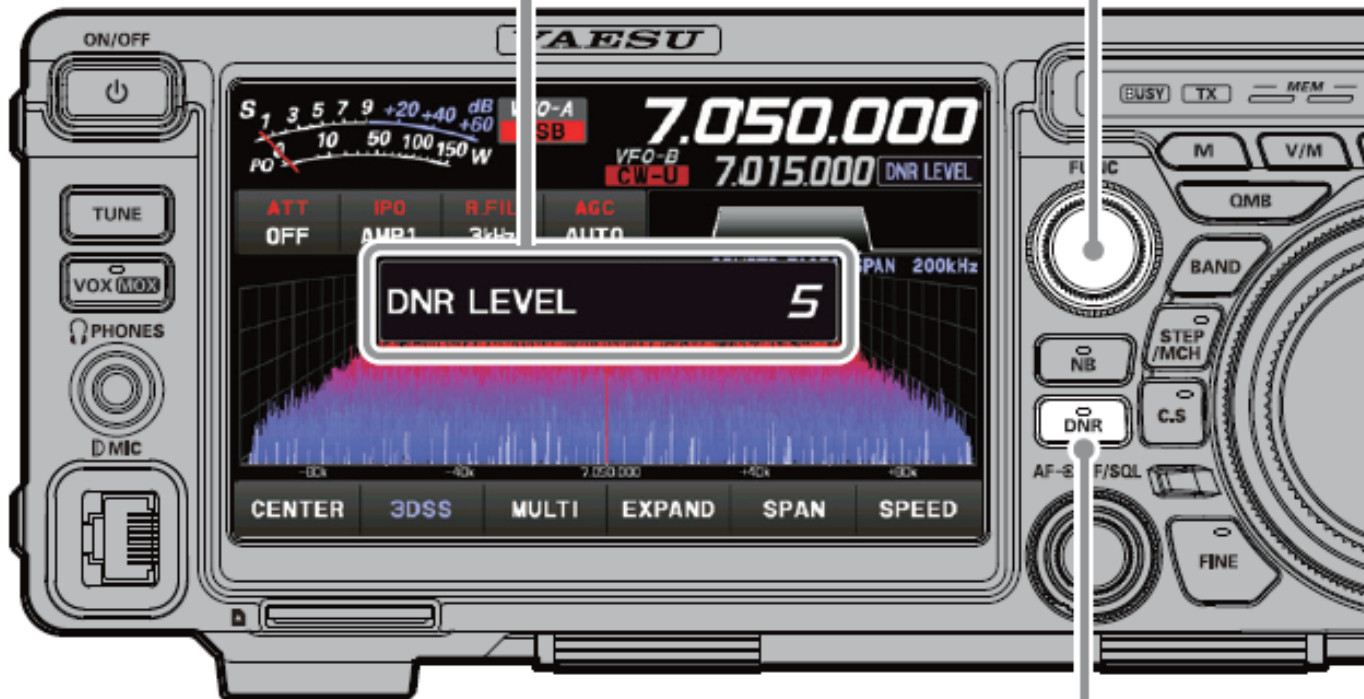
By removing the noise, the improved audio makes it MUCH easier to understand distant and weak contacts.

Yaesu FT-DX10 DNR

Multi-Algorithm
DNR

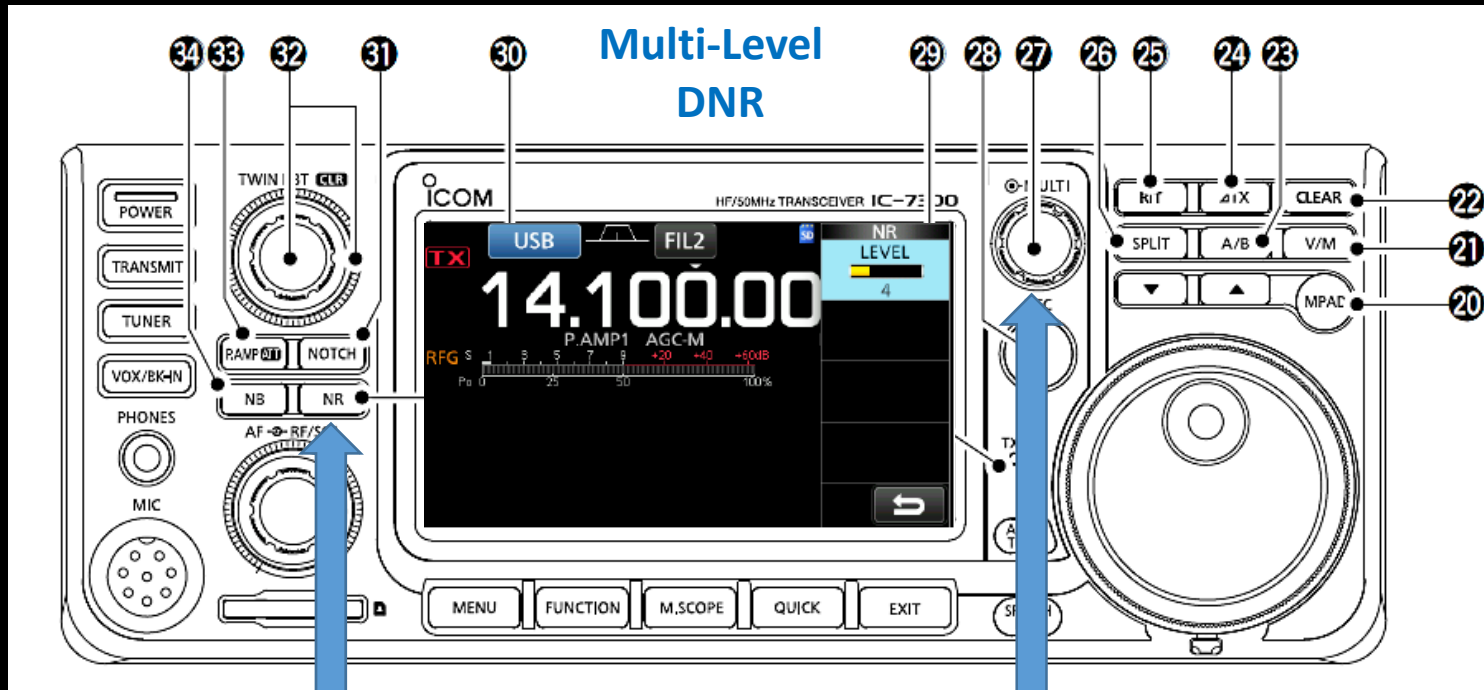
DNR Level

② Turn the [FUNC] knob to adjust the DNR Level.



① Press and hold the [DNR] key to display the DNR level.

ICOM IC-7300 DNR



Press & hold the
NR button to
open the NR
menu

Push & rotate
MULTI to
adjust NR from
1 to 15

Yaesu FT-DX10 DNR



Digital Noise Reduction (DNR) Demo on SSB

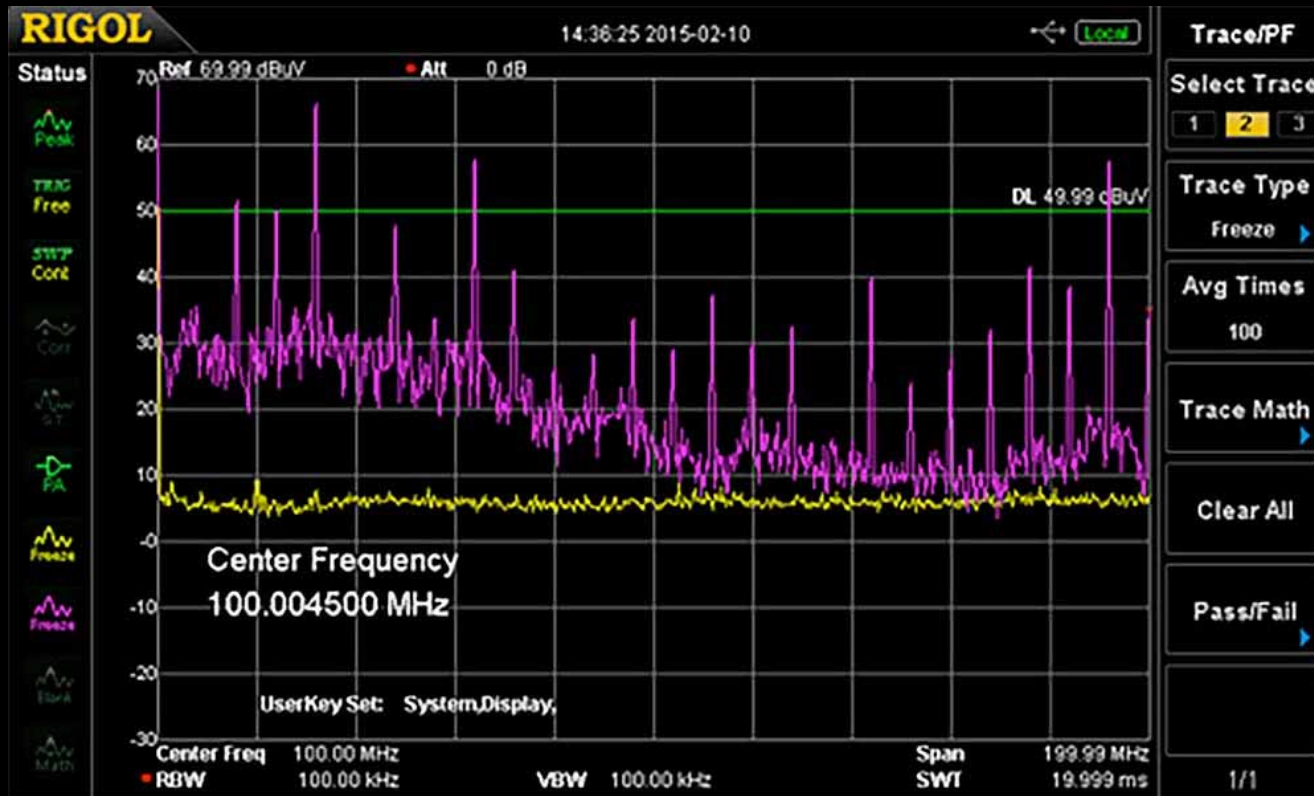


Sample 1



Sample 2

Digital Noise Blanker (DNB)

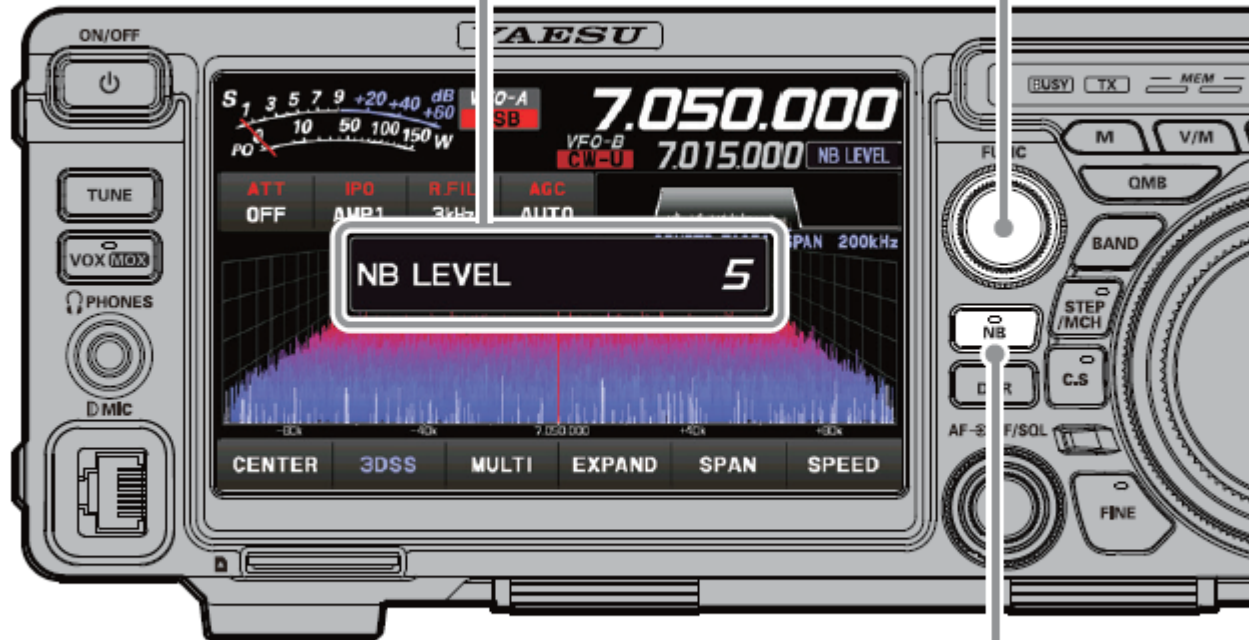


DNB suppresses impulse noise such as power line or ignition noise

Yaesu FT-DX10 DNB

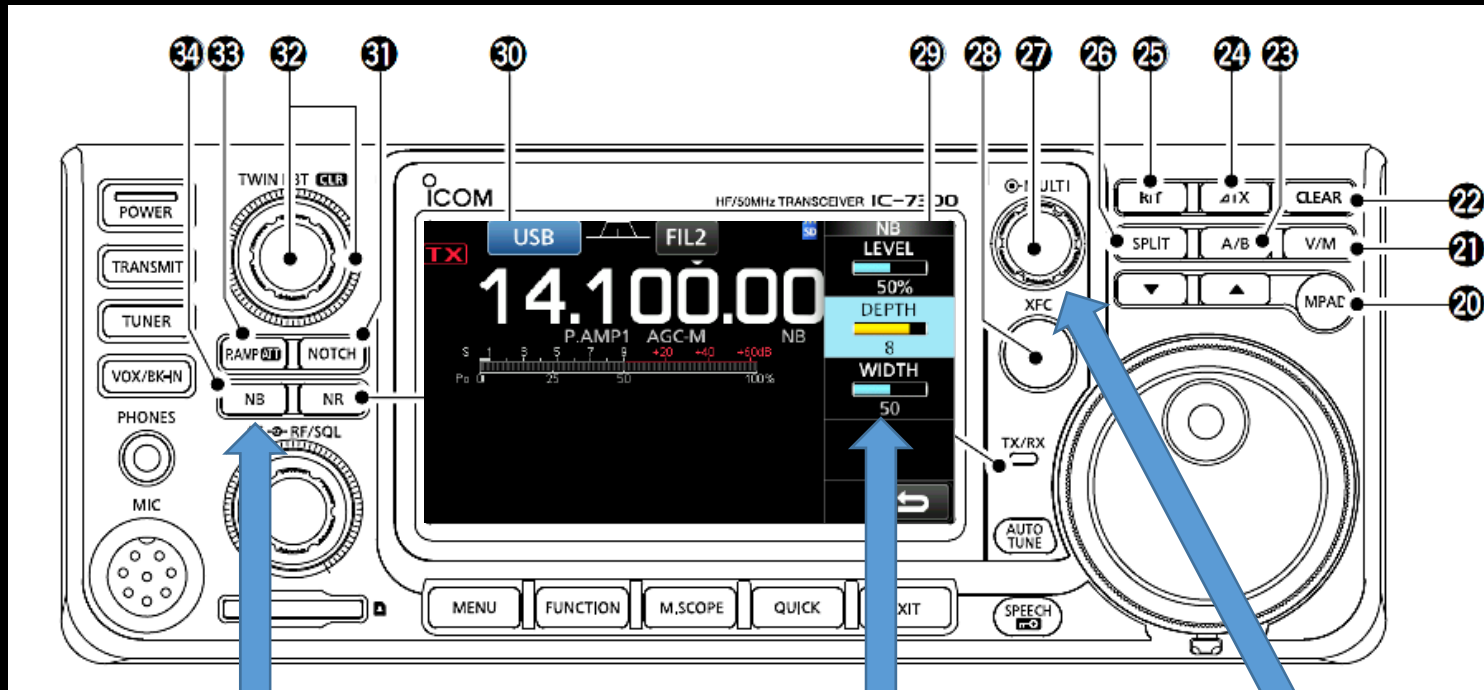
NB Level

② Turn the [FUNC] knob to adjust the NB Level.



① Press and hold the [NB] key to display the NB level.

ICOM IC-7300 DNB



Press & hold
the **NB** button
to open the NR
menu

Touch item to
adjust: Level,
Depth, Width

Push & rotate
MULTI to
adjust

Elecraft K3 Noise Blanker (Power Line Noise)



Yaesu FT-DX10 DNB



Digital Noise Blanker (DNR) Demo on SSB



Icom 7300 Noise Blanker (Impulse Noise)



TimeWave DSP CW Cleanup



- **Audio Peak Filtering (APF) automatically centers CW to the PITCH frequency**
- **Very narrow filtering is employed**

Noise Blanker Settings can be Tweaked to Optimize Effectiveness

Yaesu FT-DX10



NB REJECTION

10dB 30dB 40dB
(Default 30dB)

NB WIDTH

Select milliseconds
(Default 3mS)

Icom IC-7300



NB ATTENUATION DEPTH

1 to 100
(Default 8)

NB WIDTH

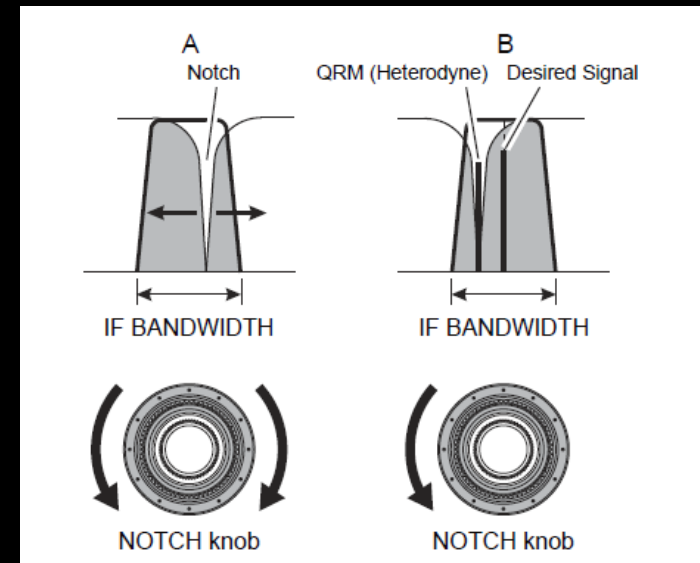
1 to 100
(Default 50)

NB ACTIVATION LEVEL

0% to 100%
(Default 50%)

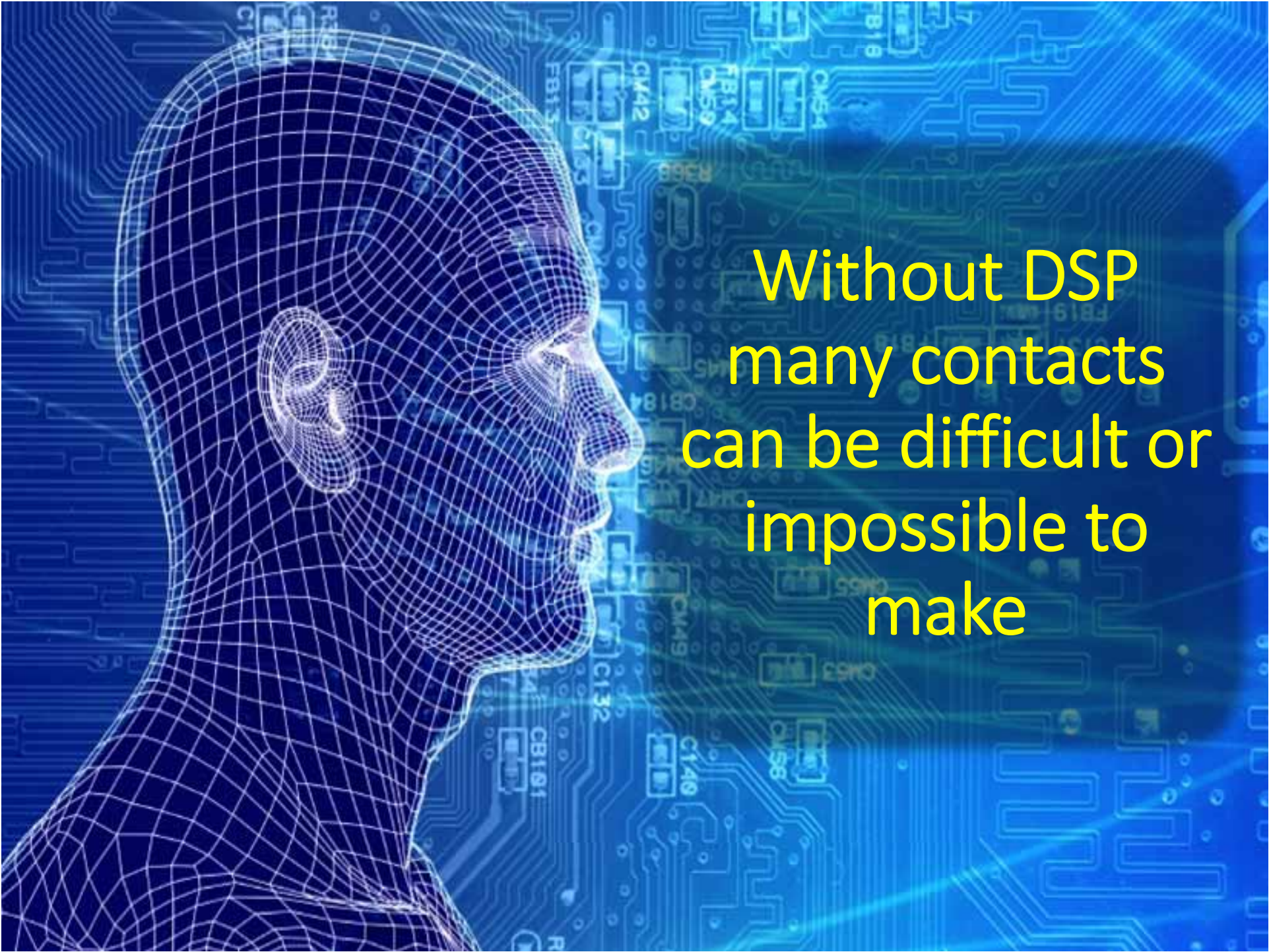
Notch Filter

- **Removes a slice of audio frequencies**
- **Eliminates heterodyne of nearby carrier**
- **Improves readability**



WB9LIB uses 15dB suppression at 650 Hz





Without DSP
many contacts
can be difficult or
impossible to
make



Thank You