Identifying, Finding, and Eliminating Power Line and Other Man Made Noise Sources

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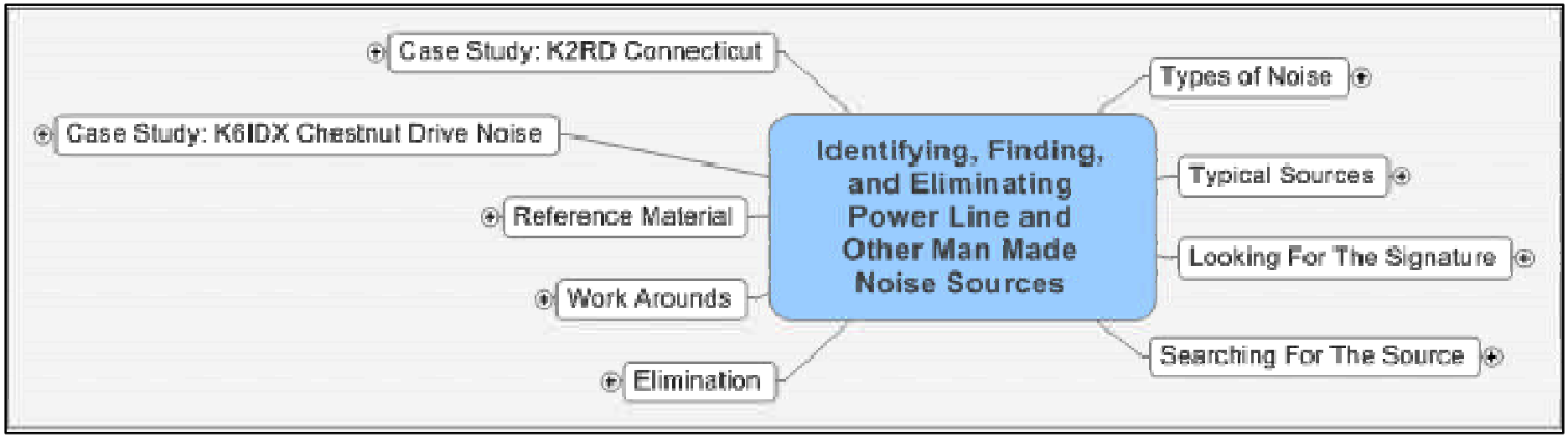
NCCC – April 10, 2006

Outline


Identifying, Finding, and Eliminating Power Line and Other Man Made Noise Sources
Case Study: K2RD Connecticut
Case Study: K6IDX Chestnut Drive Noise
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Work Arounds
Elimination
Types of Noise
Typical Sources
Looking For The Signature
Searching For The Source

Types of Noise

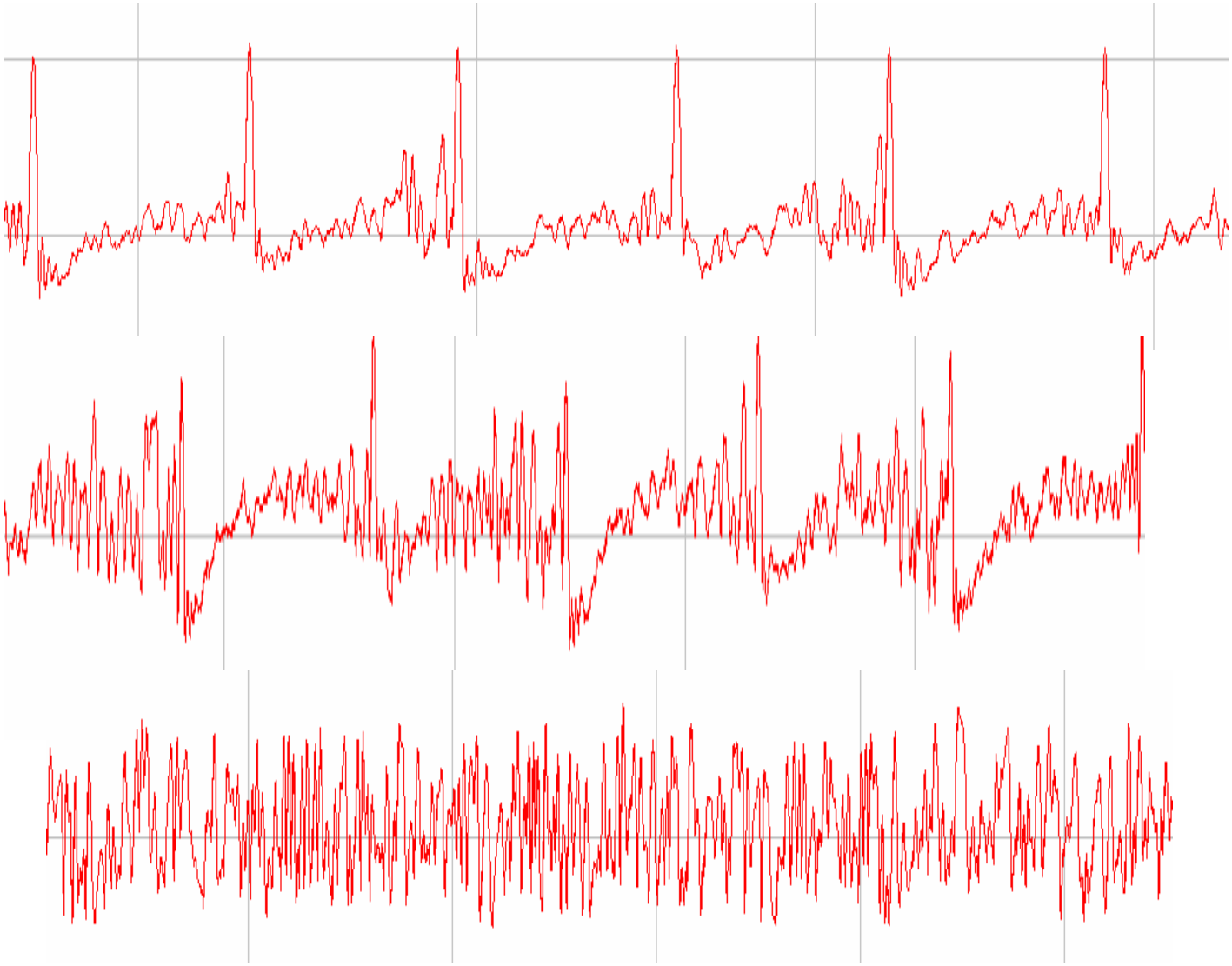
- What Does It Sound Like?
  - Hum, buzz, hiss, pulse.
  - On all the time? Periodic? Sporadic?

Typical Sources

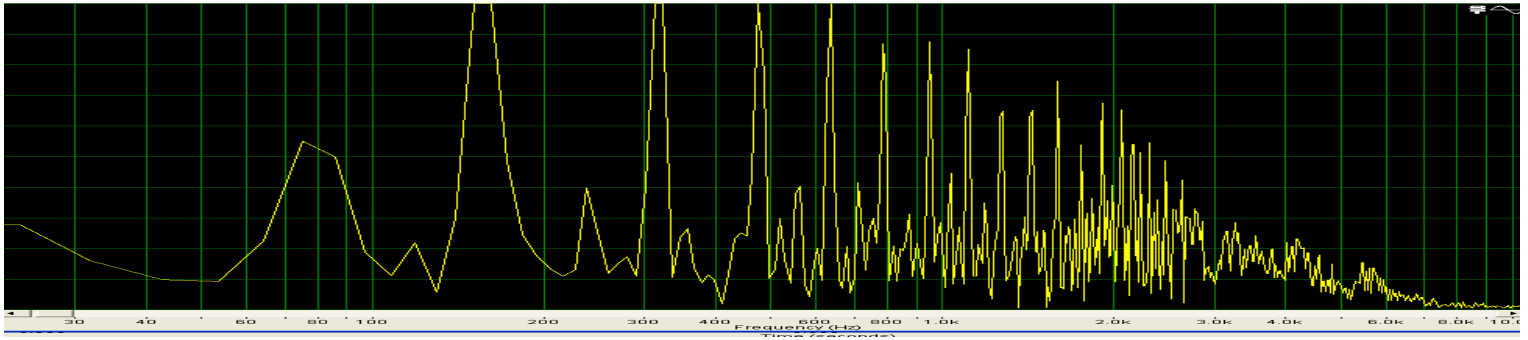
- Mains
  - Anything in or near a power line can be a suspect.
  - Some examples:
- Appliances
  - Motors, timers, contactors.
    - K2RD-10m-motor.wav
    - K2RD-160m-wide.wav
  - Digital Devices
    - K2RD-40m-broadband.wav

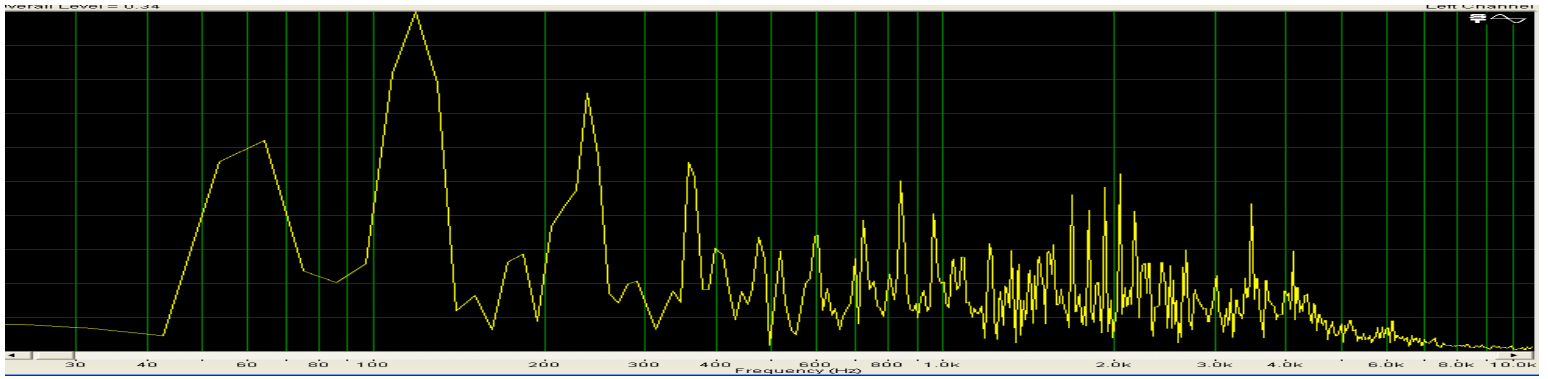
Looking For The Signature

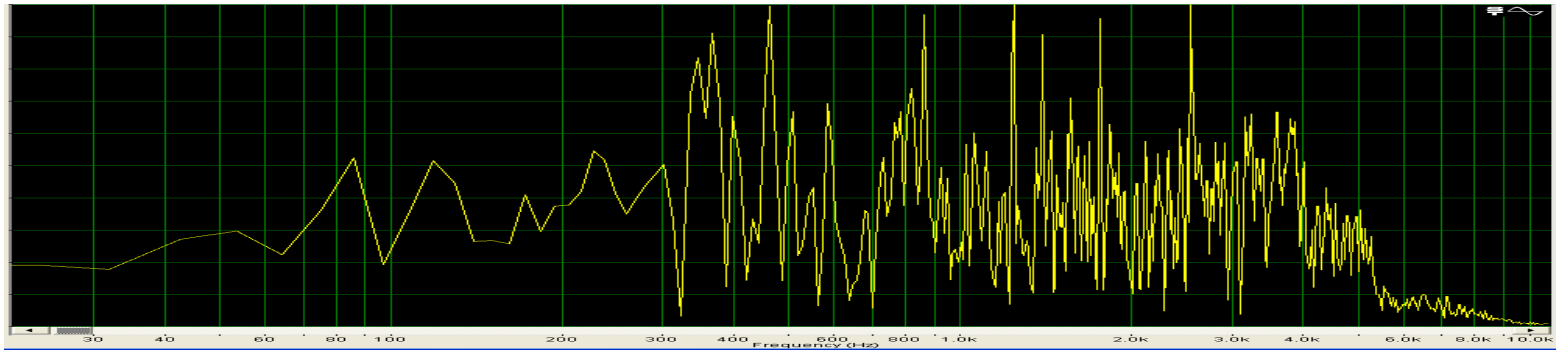
The Signatures



The Signatures







Why?

- So that you find the actual offending source in the field.

Quantifying The Sound

You can tell a lot from the signature!

Tools

- Receiver(s)
- Antennas
- Audio Spectrum Analyzer
  - A Big and $$ Box
  - PC S/W and Sound card

Receiver

- Listen on AM
- Turn AGC off if possible otherwise lower RF gain so noise doesn't move S-meter.
- Use maximum attenuation

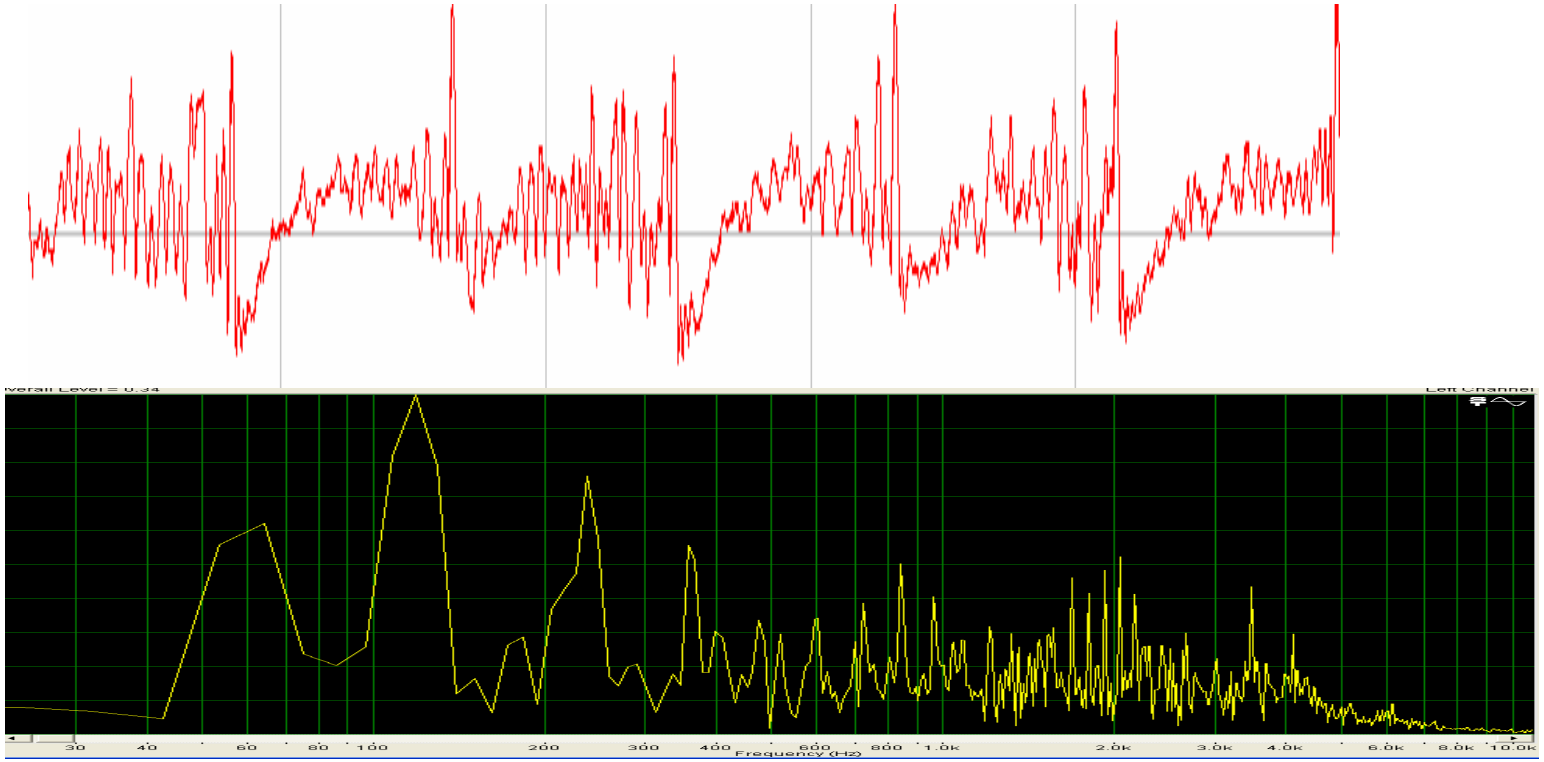
Scope

- Frequency Info
  - Helps determine source
- Time scale - noise waveform
  - May further refine suspected source

Signature

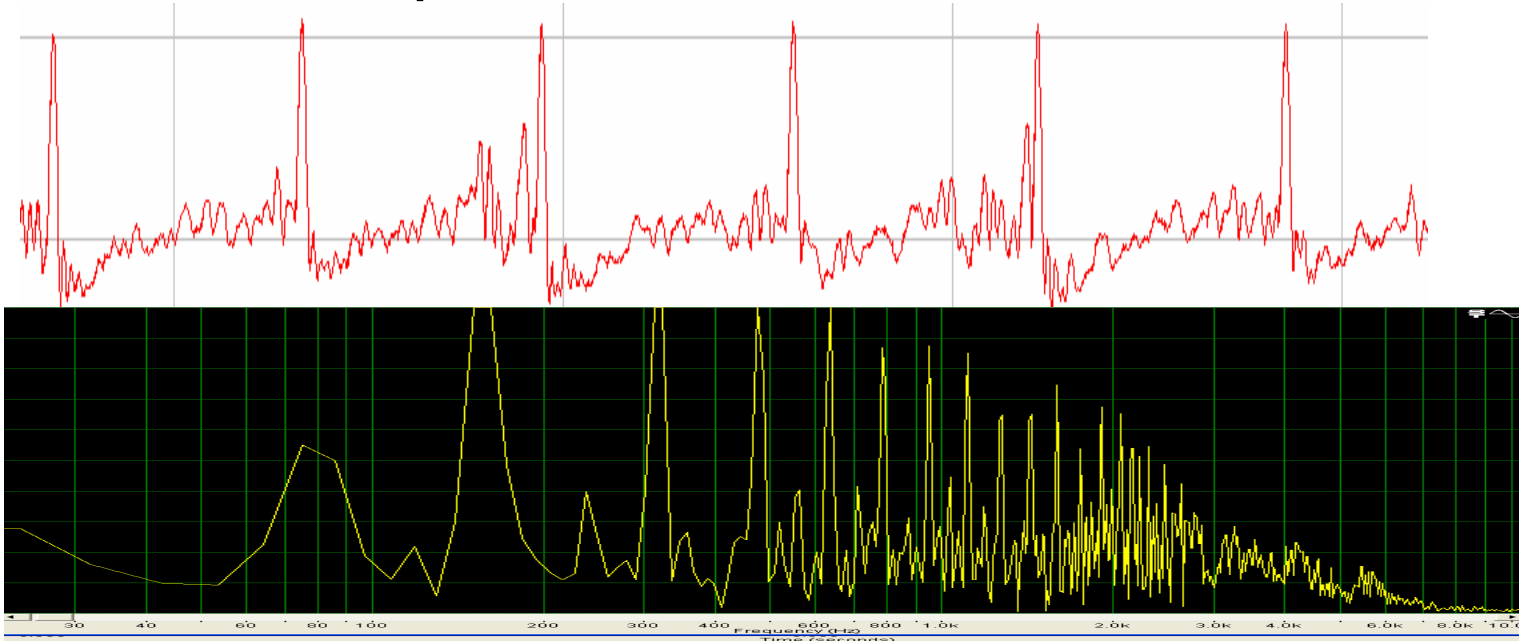
Mains Sourced

- Usually 120hz and its harmonics



Appliances

- Likely have varying base frequency
- Often sporadic
  - Example: K6IDX restaurant spray painter - resonant power cord



Digital Devices

- Usually broadband noise with some varying components
- Birdies

Searching For The Source

Use Your Station's Directional Antennas

Hand-held Receivers

- Examples
  - FT-817
  - VX1R
- Try a small beam on 2m and 432
- Specialty loop rx

Mobile Rigs

- multi-band antennas useful

Frequencies

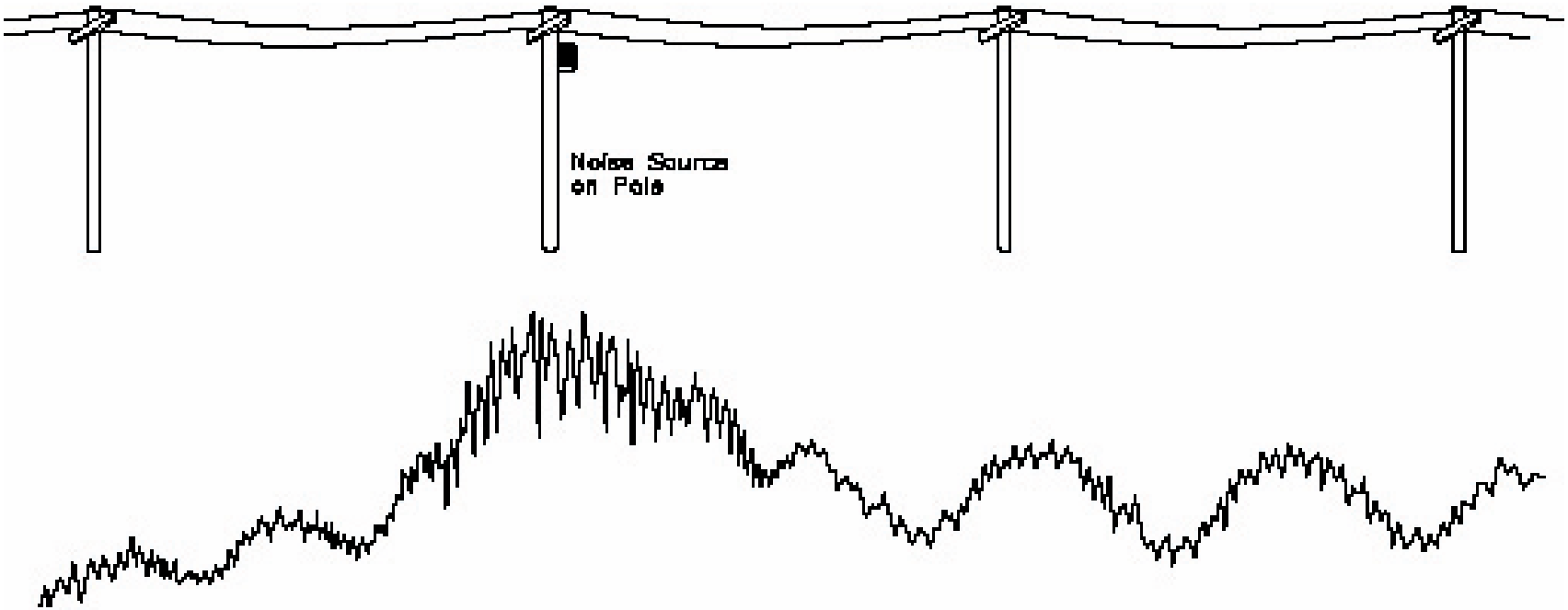
Arching-based noise sources will likely be rich in harmonics

- Higher frequencies are weaker (usually).
  - K6IDX 15M Power Pole Ground Shield

Search for noise on progressively higher frequencies as you get closer

- HF noise can often be heard for miles
- 6m noise within a mile
- 2m noise a few hundred feet
- 432 noise under 100 ft

It’s Easy To Be Fooled



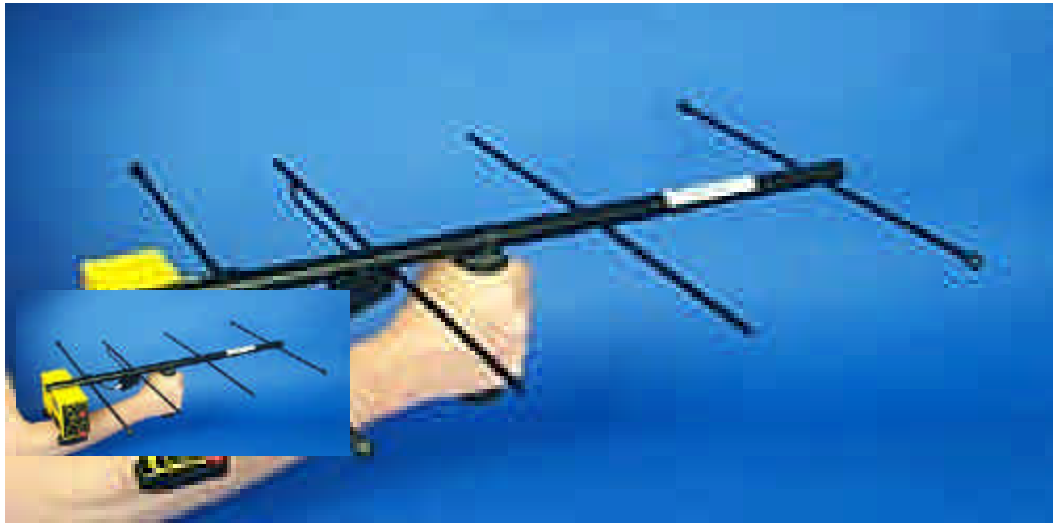
Listen for the arc - ultrasonic dish receiver

- Source must be open
- Won't hear concealed sources like inside an insulator or lightening arrestor.
- Power company usually has one

K2RD Toolset

- 160m-70cm mobile station
- 144/432 5 el yagi with FT817
- WB6BYU 80m loop
- Ultrasound Dish (coming soon)
- Laptop PC w/Soundcard
- Audio Spectrum Analyzer Software

K3RFI with 300 mhz Rx



The Radar Engineers Model M330 is a professional grade Mini RFI Locator

K3RFI with Ultrasound Dish Rx

http://www.rfiservices.com/

Radar Engineers Model 250 Parabolic Pinpointer

What He Was Looking At

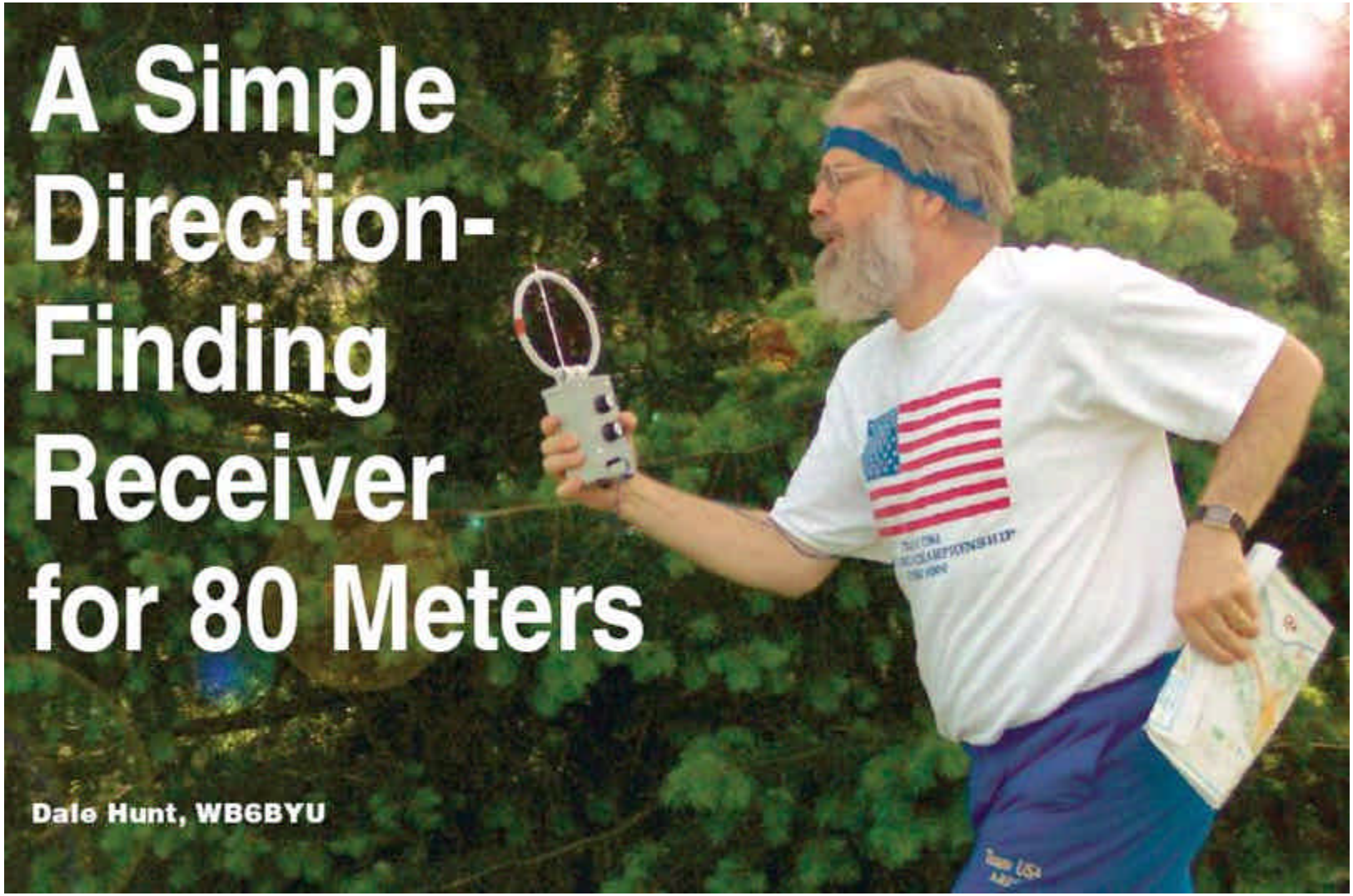
April 2006 QST

A Home-made Ultrasonic Power Line Arc Detector

The device described in this article can help you track down power line noise sources to help utility crews more quickly resolve problems.

James T. Hanson, W1TRC

Sept 2005 QST



Bang The Pole Slowly ... and Carefully

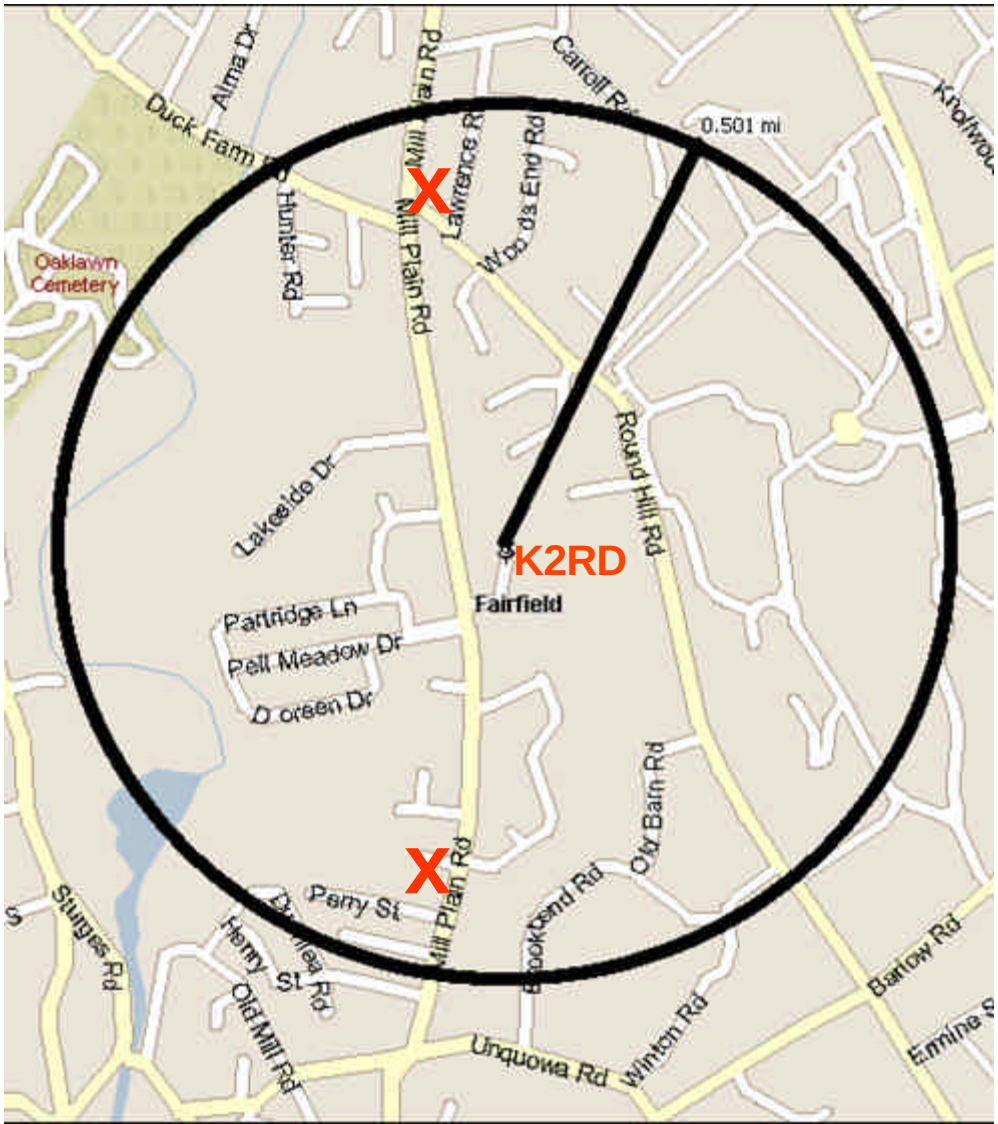
- Shake the guy wires if there are any.

Check your own house first.

- Listen at the breaker panel with handheld rx
  - Turn off breakers one at a time

BEWARE: You may have MULTIPLE sources

K2RD Connecticut Mystery



Elimination

- Turn stuff off while listening
- Get Power Company help
  - Best done if you have narrowed source location
  - Be persistent
- Neighbors
  - FUD and Diplomacy

Work Arounds

Noise Blankers

Noise Cancellers

- MFJ 1026
  - Requires Noise Optimized Antenna

Use your beam - it may be more directional on local noise than rx/tx signals - use its nulls

Case Study: K6IDX Chestnut Drive Noise

- All HF Bands
- Seemed to be coming from JA direction
- Present continuously for long periods
- Localized by mobile search and hand-held 432mhz confirmation to top of pole half a mile away
- Rusty rings power company
  - They respond really quickly
  - But.. can't fix problem that day
- Must be present when power company work crew is working
- Took several trips by power company crew to fix because we weren't there with them

Another K6IDX Problem on 15M

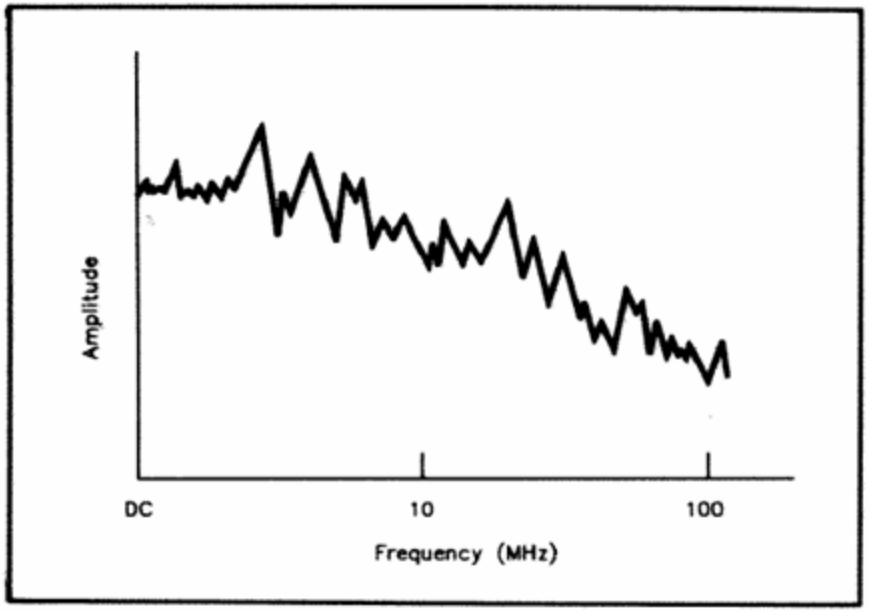


Fig 1—Spark-generated interference generally decreases in strength with rising frequency. The text describes how this characteristic can help you localize an interference source.

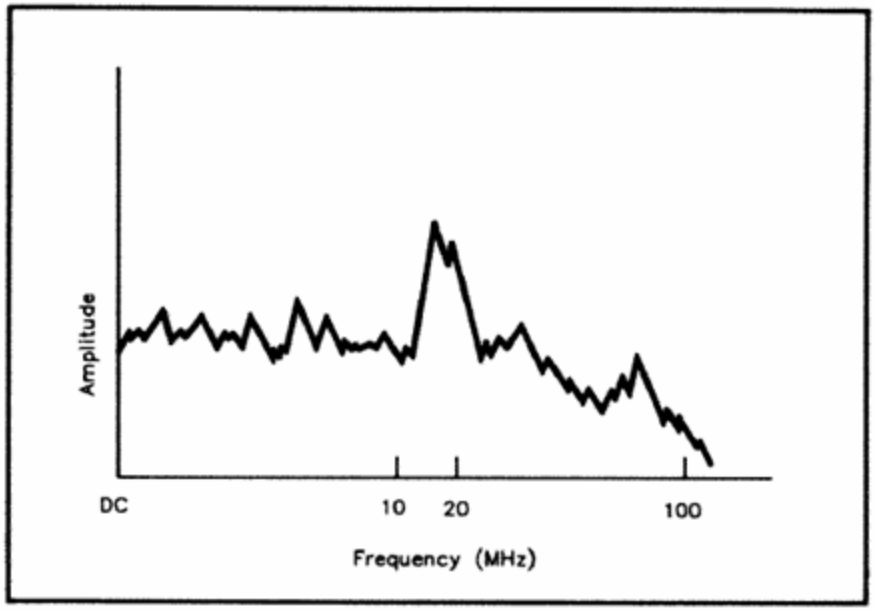


Fig 2—Spark-generated interference may not generally decrease in strength with rising frequency when power lines associated with the noise source resonate and peak the noise at one or more frequencies.

Basic Steps Toward Tracing and Eliminating Power-Line Interference
QST November 1991, pp. 43-46

Case Study: K2RD Connecticut

Dumb and lazy at power company

Confounding sources

Very expensive (for K2RD) to resolve

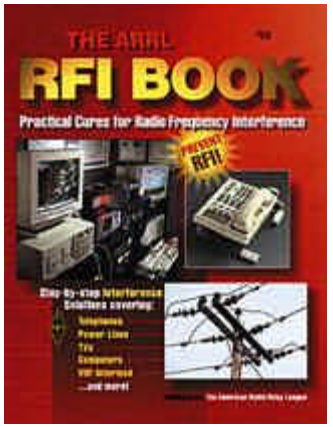
K3RFI - $$$

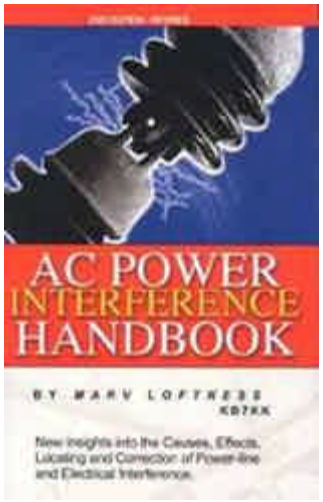
- Worth it except...
  - Suddenly couldn't work everything I could hear (80/160)

Did finally mobilize power company (and train them!!!)

Reference Material

- **The ARRL RFI Book**
  - W1RFI, etc
- **AC Power Interference Handbook**
  -- by Marv Loftness, KB7KK
- Contesting.Com RFI Reflector
- ARRL Web site
  - POWER-LINE NOISE MITIGATION HANDBOOK FOR NAVAL AND OTHER RECEIVING SITES – PDF on ARRL web site
- Google
- www.rfiservices.com





Thank You

- Good Hunting!