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

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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 lightning 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
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
A Simple Direction-Finding Receiver for 80 Meters

Dale Hunt, WB6BYU
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!