

# **POWER LINE INTERFERENCE**

**CAUSES, LOCATING, AND REMEDIATION**

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# How does power line noise affect our operating?

Can't work them if you can't hear them!

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Listening fatigue

Mental frustration



# How is the noise generated?

Arcing – Easily visible,  
usually one time.  
Usually associated with  
switches or relays.



Corona – Glowing, can be visible at night or  
low light levels. Associated with  
Transmission line voltages ( $\geq 45\text{KV}$ )



# Sparking

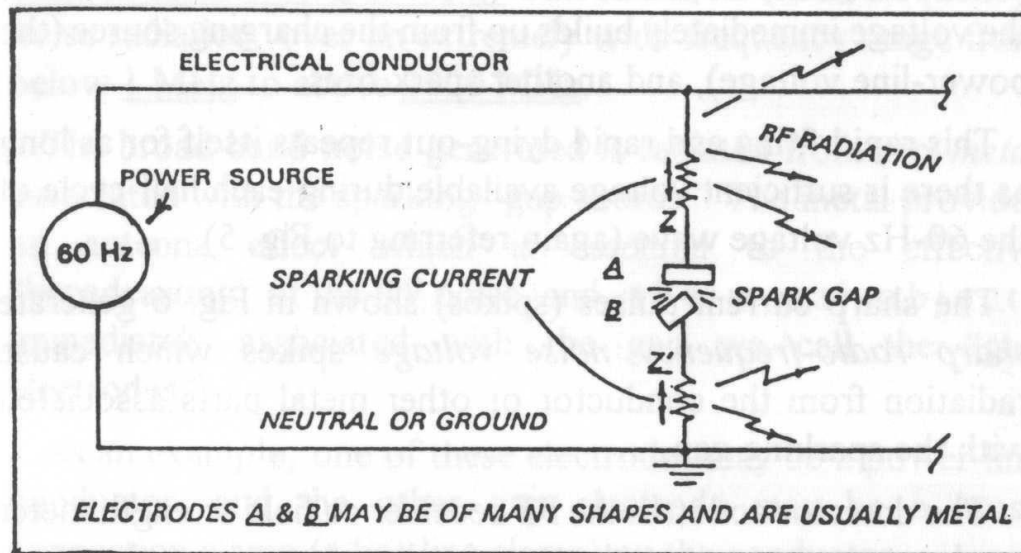
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Discharges across small gaps with differences in potential.

Rapid breakdown and repetition causing pulses or most often groups of pulses.

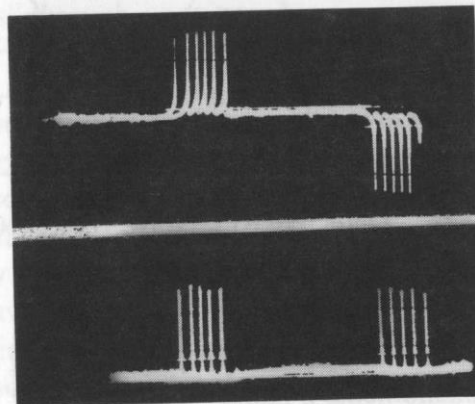
Typically found on distribution lines.

Most common source of interference from power lines.



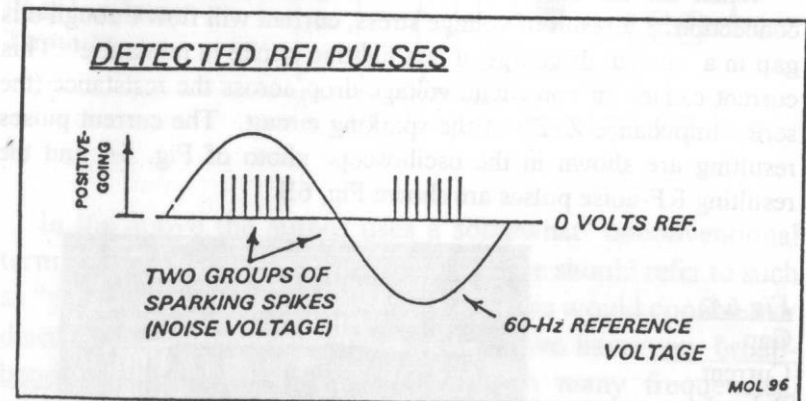
**Fig 6A.**

Gap  
Current  
Pulses\*



**Fig 6B.**

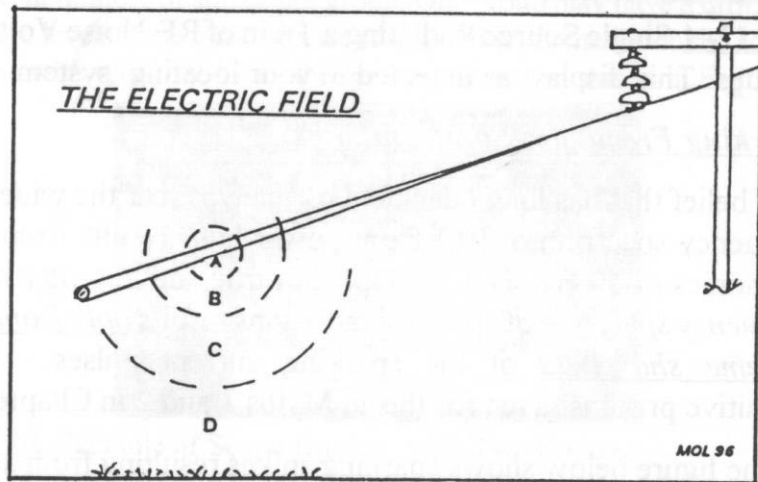
RF Noise-  
Voltage  
Pulses after  
Detection.



**Fig. 7.** Detected RFI Noise Spikes Caused by Sparking-Current Spikes. [NRECA Ref. 1].

\*The voltage drops across resistor *z'* (Fig. 5), seen as spikes on the oscilloscope, indicate current pulses, as in Fig. 6A.

# Induced Currents



**Fig. 12.** Electric Stress Lines Between Power-Line Conductor and Ground.



**Fig. 13.**  
RFI Source:  
Hardware Sparking  
in Electric Field.

The noise source of Fig. 13 is a fairly common one. Sparking is occurring at the loose nut-washer location, and its RFI is induced into and *reradiates* from the line conductor.

# Noise RF propagation

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At HF noise can often be heard for miles

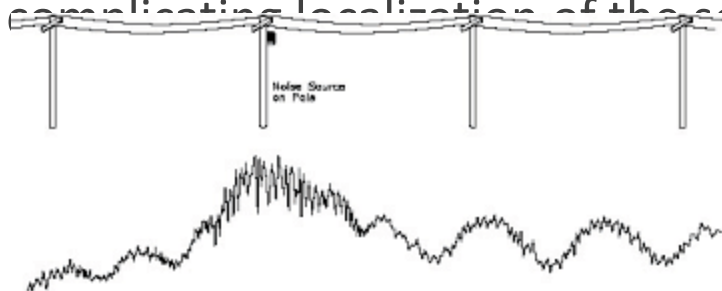
6m noise within a few miles

2m noise several hundred feet

432 noise under 100 ft

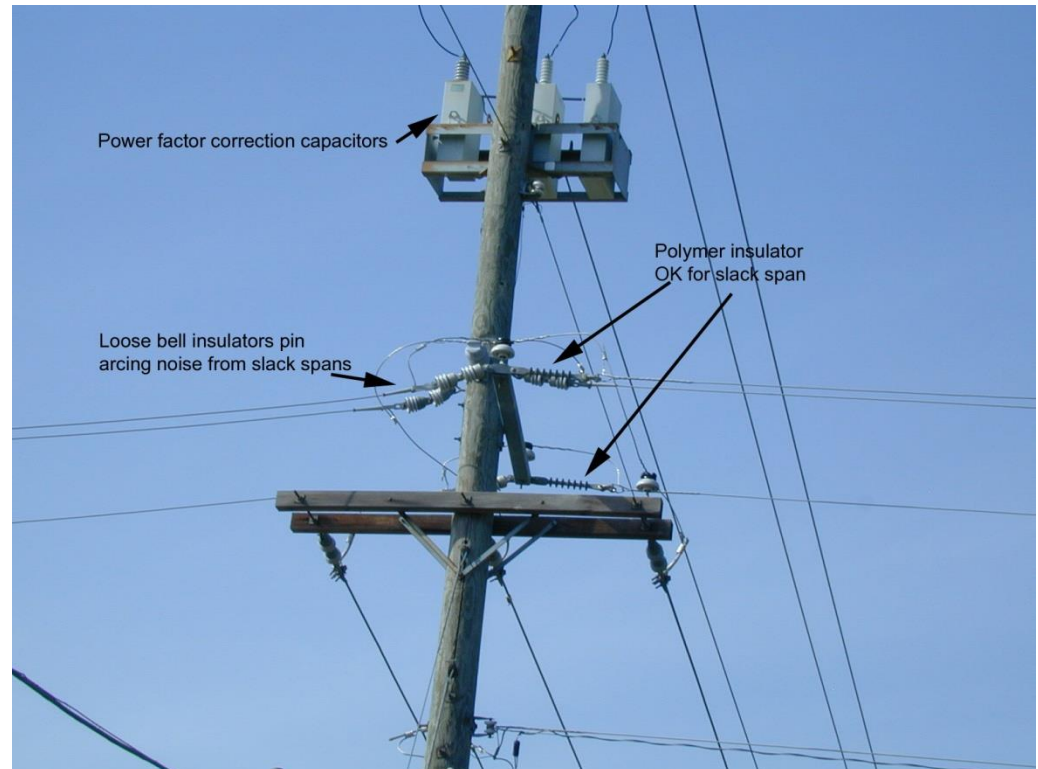
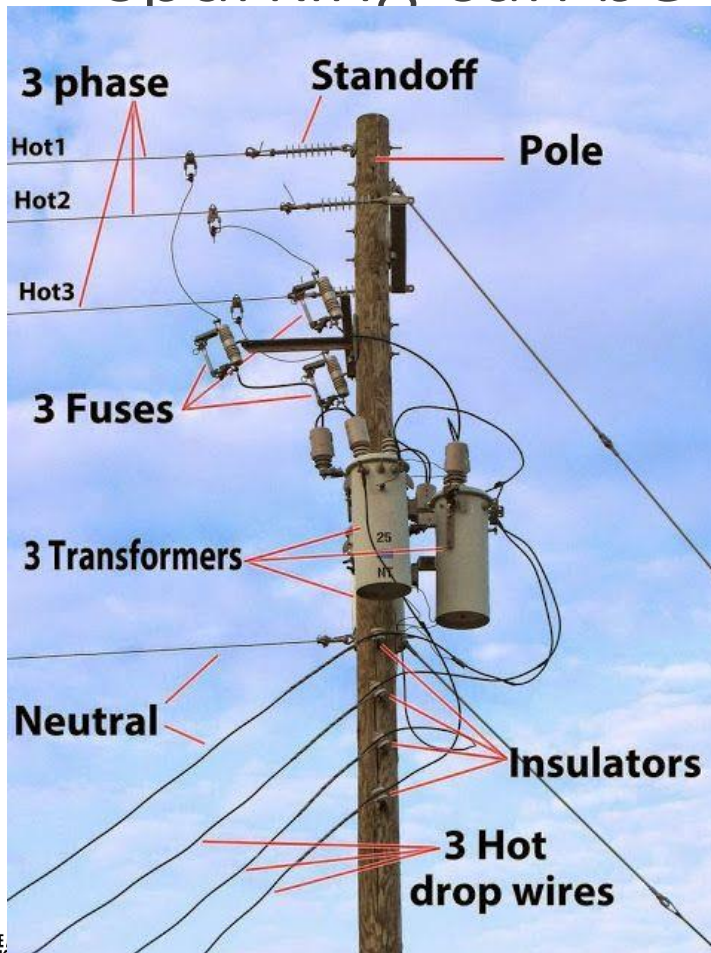
Ultrasound detection within 50 ft (Okay, not RF)

Noise can and often propagates on the power distribution line  
complicating localization of the source.





# Electrical Hardware where gaps for sparking can be found.





# Bell Insulators

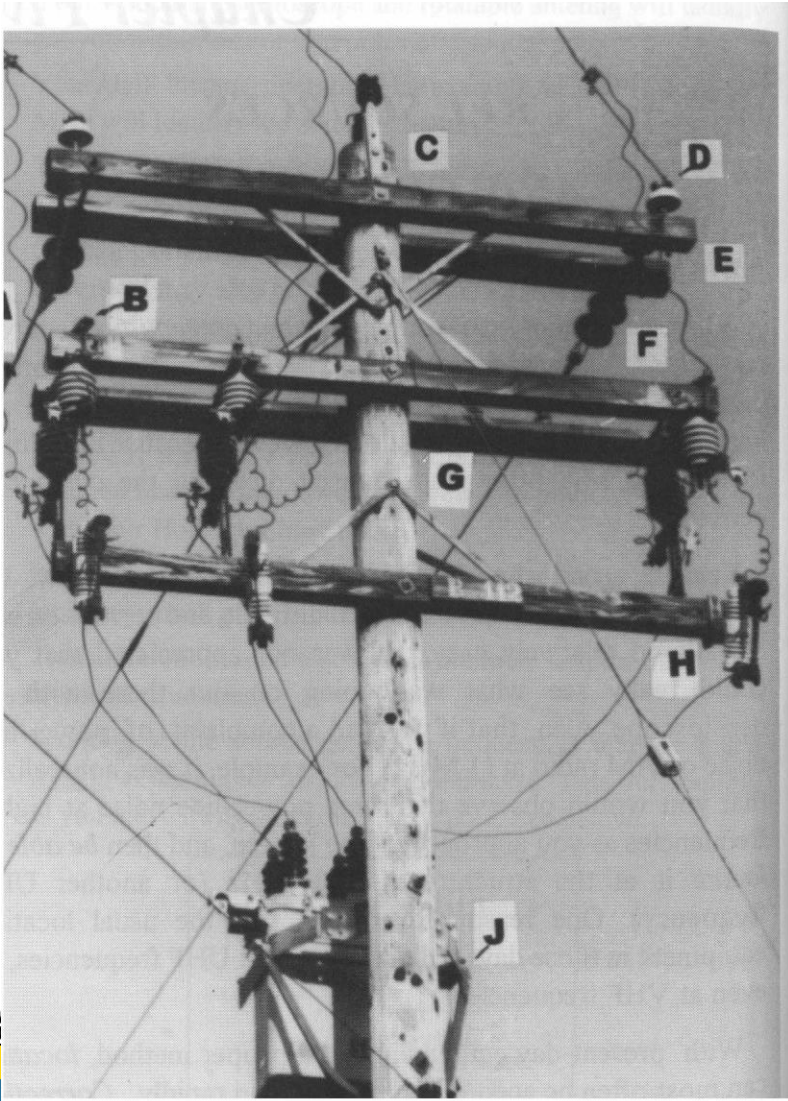
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# Some Sources and Remedies



- A. Loose or corroded hot-line clamp
- B. Loose switch or fuse mounting bracket
- C. Top unit pin-bracket loose on pole
- D. Insulator tie-wire loose on conductor
- E. Insulator pin-bolt nut and washer loose
- F. Dead-end insulator unit (bells) corroded or loose
- G. Cross-arm braces loose
- H. Guy line loose or corroded
- I. Loose or corroded transformer mounting bracket bolts
- J. Loose or corroded staples on ground wire.

# Locating Power Line Noise Sources

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## Equipment

Portable/mobile HF rig with AM (I use Kenwood TH-F6A handheld)

Portable/mobile 2M rig with AM and 3 or 4 element yagi ( I use MFJ-852 modified with bnc connector, can also use MFJ-856 with its own 3 element yagi)

Some suggest using 440MHz with AM instead of 2M

For pinpoint accuracy, ultrasonic detector such as MFJ-5008 is nice addition

Small sledge hammer.

A radio buddy to listen at your home station while you hunt.

# Locating Power Line Noise Sources

## Procedure

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Use Google maps to print out map(s) of varying scale for a radius of about 5 miles.

If possible start from home QTH using yagi on 10M or 6M AM to get general direction. Draw lines on maps.

Using mobile/portable HF on 7MHz AM will get you in the vicinity. Look for strongest signal when it appears there are multiple sources.

145MHz AM (2M or MFJ 852/856) will get you at least down to the pole or junction.

# Locating Power Line Noise Sources

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To confirm you have the right pole, have your radio buddy listening while you jiggle guy lines. Light pounding at the base of the pole with the sledge hammer may also affect the noise. Sometimes the noise will completely disappear. Fear not, if you have the right pole the noise will return! **Note: Don't do this in front of the power company employees.** They do frown on this activity, but it does confirm that you have the right pole.

If you have an ultrasonic detector you may be able to locate the exact problem area.

Write down the (nearest) pole number. It is on a metal plate attached to the side of the pole

Repeat process for next noise source

# Locating Power Line Noise Sources

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## Some Tips

Noise is usually at it worst in hot sunny weather. Power lines and hardware expand loosening up the connections. This will enlarge the gaps and increase the amplitude of the sparks.

Contrary to what the power company people think, rain water fills the gaps and corroded areas. Sparking decrease and often stops completely.

Noise comes and goes with time of day, weather, line loads, etc. Have patience. Go over the suspect areas often. It may take time to find the offending hardware.



# Working with the Power Company

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Now that you have identified the offending pole(s), it is time to call the power company.

Getting to the right person can take some time. When you do, tell them you have located rf noise sources on pole(s) xxxxx and yyyyyy.

Set a time to work with them. You will have to be there too and a buddy sitting on the radio while you are with the crew is a good idea.

Often I have made an appointment only to find that the noise is not active when they arrive. This is VERY frustrating. Naturally, it comes back shortly after the crew leaves.

# Working with the Power Company

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If the noise is active, they have their own detectors and will find the source. Once they have made the repair, make sure that they tighten ALL connections and that ALL the staples holding the ground wire are tight. Have your buddy confirm that the noise at your receiver has gone away.

If the noise is not active, and you are reasonable sure of the exact source, tell them. They won't always look at it, but they might. They don't want to come out again either.

# Conclusion

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Finding sources of power line noise is not difficult with the right equipment, a good knowledge of the causes, and lots of patience.

Your local power company will work with you but they can't invest the time or the manpower to track down sources.

Good DXing!



# Resources

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AC Power Interference Handbook by Marv Loftness, KB7KK (SK)

The ARRL RFI Book by Ed Hare, W1RFI

The ARRL members website

The RSGB Guide to EMC by G3JWI



Questions?

