

A decorative graphic on the left side of the slide, consisting of a light blue circuit board pattern with various lines and circular nodes.

# RADIO FREQUENCY INTERFERENCE (RFI)

POTENTIAL CAUSES AND POSSIBLE CURES

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# WHAT IS RFI ?

- Undesirable radio energy that interferes with a desired signal.
- It may be that something in your shack bothers something else

OR

- It may be caused by something else and interferes with your radio

# FORMS RFI MAY TAKE

- “CRASHES” – sudden, short duration, wide band (lightning!)
- White noise or Splatter – random noise that covers a wide range of frequencies
- Discrete – narrow band of noise at one frequency
- Harmonic – several spikes of noise at regular spacing across the radio band

ICOM

HF/50MHz TRANSCEIVER IC-7300

TUNE  
TX

LSB

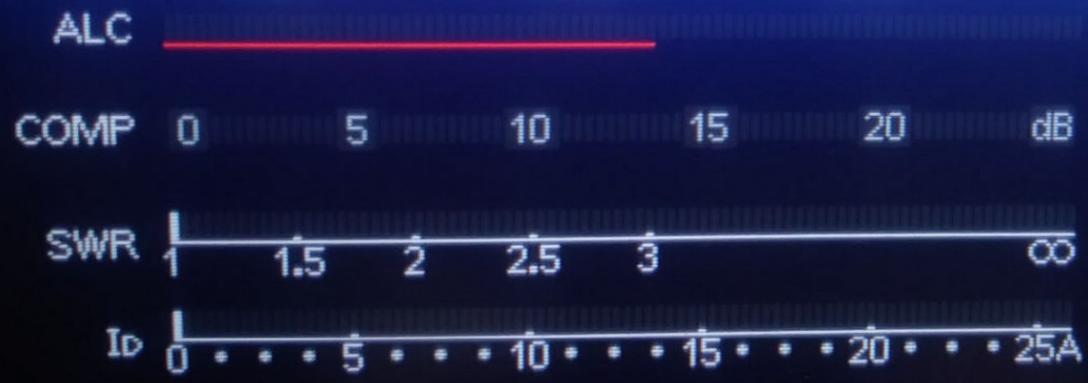


FIL1

13:05

MEMO 3

7.274.00



TX/RX

MENU FUNCTION M.SCOPE QUICK EXIT

# POSSIBLE SOURCES

- Atmospheric Conditions
- Coming in on the power lines
- Appliances (washer, fans, computer, TV, battery charger, etc)
- Street lights
- Door bells (yes... you heard right!)
- LED and florescent lights
- Wall mounted power supplies (phones, computers, small devices)

# FINDING THE SOURCE

- Is it in your house??
  - Turn off the power to your home at the master breaker and run your radio on battery.
    - If the noise goes away, the source is in your home
    - If the noise does not go away, it is coming from outside your home

# FINDING THE SOURCE

- If the source is in your home
  - turn off all breakers
  - turn on master breaker
  - turn on one breaker at a time until the noise comes back
  - find out what rooms that breaker powers and unplug everything.
  - plug each device in until the noise comes back

# FINDING THE SOURCE

- If the source is outside your home
  - Have your power company check for power line generated noise. Even if they do not find a source on the power lines, *SOME MAY* be able to tell you what area seems to be creating the noise.
  - If they don't give you an idea of the source, Walk or drive around your area with an *AM* receiver set to a random frequency.
  - Listen for noise and find where the noise is loudest. If the source is very strong, you may have to go 2 or 3 miles from home to find it.

# WHAT THE LAW SAYS ABOUT RFI

- The owner of a non-licensed device causing RFI is responsible to fix it
- If you own a device that is causing problems, you need to contact the manufacturer and request a remedy.
- All electronic and electrical devices sold in the USA must meet FCC specifications for consumer intentional and incidental radiators; FCC rules 47 CFR sections 15 and 18 define emissions limits for most consumer electronics (un-licensed devices)
- If the device does not meet regulations, turn them in to the FCC
- If the device is ok with the regulations, you just have to get anew device with better circuitry

# WHO IS RESPONSIBLE TO FIX IT

- YOU have a license, so you are protected from most RFI; FCC rules in 47 CFR sect 97 govern amateur radio
- If something is bothering you:
  - If it is from power lines, the power company is responsible
  - If it is from a street light, the city is responsible
  - If it is from a neighbor, they are responsible
  - If it is from your own house, you are responsible.

## WHO IS RESPONSIBLE TO FIX IT

- If you are bothering a neighbor (TV, intercom, speakers, etc.):
  - They do not have a license so the law says THEY are responsible.
  - BUT, be a good neighbor and see if you can make changes in your station to avoid causing problems
  - If it is only a wired speaker, they could add ferrite beads to the leads to reduce the noise.
  - If you cannot make any suitable changes, then advise them to contact a suitable repair technician or even the manufacturer of the device being bothered

# IF POWER COMPANY WILL NOT COOPERATE

- ARRL has a formal agreement with the FCC to assist in resolving power line noise problems
- ARRL has procedure in place to help identify the problem and for resolving it with the power company
- IF the ARRL cannot get the power company to work with them, then they get the FCC involved.
- All of this takes time..... Be patient.

# POSSIBLE CURES

- If the source is in your home:
  - Improve your ground connections
  - if it is a light... get a new type bulb or replace the fixture
  - Replace the item if it is hot, or the power cord is hot
  - Make a coil on the power cord or put several ferrite beads on the cord (coils helped on my washing machine)
  - If it is a major appliance talk to ARRL or a VENDOR technician

# POSSIBLE CURES

- IF YOU ARE CAUSING PROBLEMS IN YOUR HOME
  - Speakers/TV/Stereo
    - Coil the speaker wire
    - Use twisted pair/shielded speaker wire
    - Add ferrite beads to the speaker wire
    - Add capacitor across the speaker wire terminals





# POSSIBLE CURES

- IF YOU ARE CAUSING PROBLEMS IN YOUR HOME
  - Central air or alarm system
    - Use shielded cable
    - Add ferrite beads to the control cables
    - CONTACT THE VENDOR

# POSSIBLE CURES

- If the power company finds a problem with their gear, **THEY MUST** fix
- If it is from a neighbor, consider very carefully if it is worth the risk of a confrontation
  - Approach carefully and suggest the possibility of a fire hazard...then explain your reasoning (noisy gear is often defective and cause fires or damaged appliances)

# ARRL CASES

- ARRL lab has identified several bothersome devices and helped the manufacturer resolve issues:
  - GFI breakers tripping
  - GFI breakers creating RFI
  - Florescent lamps
  - Compact Florescent lamps (CFL, those cute curly ones)
  - LED lamps (including street lamps)

# POTENTIAL NEIGHBOR ISSUES

- Sometimes people hearing strange noises will call the police, the Home Owners Association, newspaper
- OR they may just call you names and be a real bother
- You can explain the law, have the ARRL explain the law, suggest remedies
- Sometimes all you can do is live with it and avoid confrontation.
- That is your decision to make ... is it worth the trouble
- If you are a CERT or ARES station, you have a vested interested in cleaning up the RFI

# GETTING HELP

- ARRL :
  - LOTS of printed material and videos at <http://www.arrl.org/radio-frequency-interference-rfi>
  - ARRL lab may have information about the problem device and can make suggestions
  - Articles and duties of FCC at <http://www.arrl.org/federal-rfi-preemption>
  - **Has attorneys in each call area that may be able to help**

# GETTING HELP

- POWER COMPANY – Jeff Hoke is the RFI detective for CenterPoint  
jeff.hoke@centerpointenergy.com
- A good web page of interesting RFI cases <http://www.on4ww.be/emi-rfi.html>
- **If you call CenterPoint ask for Jeff Hoke. Customer service does NOT understand.**
- **Do your tests and document with notes BEFORE you call Jeff.**

# CASE 1 SOLVED

- High pitched whine covering ALL bands
  - CAUSE - new front loading washing machine with variable speed motor.
  - REMEDIES –
    - made coil in power cord...cut whine and 80% of white noise
    - Avoid washing clothes during on air events

## CASE 2 SOLVED

- White noise with severe spikes on 20m and some on 40m bands
  - Power company found noise coming from a neighbor's house
  - I knew the adult son installed car stereo systems so I approached him about the noise
  - Before I could say anything more, he cut ALL the power to their house
  - We worked together until we found the room causing the problem
  - He found a phone charger that was so hot it had scorched the wall
  - He replace it and the noise was gone

## CASE 3 SOLVED

- A few weeks later the noise was back, but sounded a bit different
- I asked the neighbor if they had anything new at his house.... His sister had just come back home and was using a laptop
- He unplugged the computer power supply and the noise went away.
- I asked what he suggested as a remedy.... He had already stomped on the power supply and told her to buy a new one!

## CASES 4, 5, 6 SOLVED

- “Donald Duck” on our stereo speakers.... Coiled the wires right next to the speakers
- Voice on my son’s headphones and INTO HIS INTERNET GAME ! .... Added ferrite beads
- Bedroom lights blinking ... we have 2 touch on lamps in our bedroom. These work by sensing changes in capacitance. I tried coiling the power cords and replacing the control module .... not much help. Will try adding a ferrite bead. I turned off my lamp and avoid working when my wife is trying to nap. (her lamp will soon experience a control module failure and be converted to an old fashioned switch)

## CASE 7 IDENTIFIED

- Broad zones of noise at regular intervals on 20m and 40m, but only during late afternoon and early Saturday mornings
  - The source was identified as my back neighbor
  - That neighbor is not very friendly, but I learned from the son they have a new washer
  - I tried to talk to the neighbor so I could test the idea, but got no response
  - I just avoid operating during her laundry times. If we have an emergency, we will likely have no power so she will not be a problem

# Examples of several RFI Sources and Sounds

- Home Electric power meter
- Battery charger
- Compact Fluorescent light bulb
- Top loading washing machine
- Cable TV system

<https://www.rfiservices.com/sound.htm>

# ARRL Sound Files

- Utility company devices
- Computer devices
- Household items
- Emitters
- Miscellaneous
- other

<http://www.arrl.org/sounds-of-rfi>

# Neighborhood Sounds

- signs
- lights
- displays
- TVs
- Electric trains

<http://www.on4ww.be/emi-rfi.html>

# From the QTH

- washingmachine1.mp3 = front loading clothes washer in wash cycle
- fastspin2.mp3 = fast spin at the end of the wash cycle

