Interference location techniques for domestic interference

Domestic interference normally relates to interference to TV and broadcast reception though other services like Amateur, DX listening, Citizen Band, Public Radio Service, are also susceptible to interference.

Check the equipment and installation

Ensure that the affected receiving installation is configured satisfactorily, and working effectively. This is critical to ensure that it is immune as it can be to the presence of external interference.

- Faulty systems i.e. incorrect wiring, overloaded and or mismatched amplifiers, faulty distribution equipment, etc may create their own interference.
- Installers tend to use amplifiers that have excessive gain thinking that this will provide better system performance. High gain amplifiers are considerably more susceptible to interference. Use only the gain needed for the task – the lower the gain the lower the system susceptibility.

Trace the signal along the wiring

While unwanted signals will radiate directly from the source (RFI source) they will also travel considerable distances along wiring. It is thus possible to trace the noise along the lines. It is likely that radiation from these lines will also occur, at multiple points, hence a number of radiated signals will likely have to be dealt with.

Wiring attached to RFI sources frequently acts an aerial/s. The variable nature of this wiring provides for a multiplicity of radiated and conducted patterns of RF energy which will vary widely from one frequency to another.

Urban situations with underground power will also behave in this way though radiation will largely occur from wiring that emerges from the ground at street fuse boxes and at houses. The strength technique works best in this situation.

Watch for multiple interference noises and frequently check that you are chasing the correct one.

Locating Wide Band Interference

Techniques for locating the source of wideband interference are:

1. Level

The stronger the level the closer you are to the interference source (normally).

- Lower frequencies i.e. AM Broadcast (550 to 1605kHz) wave lengths are long and there will be standing waves. They will likely occur a great distance away from the source meaning the level will be strongest at this point.
- It is very easy to confuse the direction when tracing signals in the Low Frequency (300kHz) to High Frequency (30MHz) range. This is particularly so when following the conducted component where the long wave lengths and frequent connection of other power lines to the line you are following may create strong standing waves at these junction points. The measured level at the junction may exceed levels closer to the source.
- When following conducted noise along an uninterrupted power line each standing wave peak will be a little lesser than the previous. This is particularly noticeable at VHF and UHF frequencies. When close to the source the standing wave pattern changes into a continuous level of signal.

2. Frequency

The closer you get to the source the higher in frequency you will hear the interference. Due to shorter wave lengths at higher frequencies there is a tendency for more radiated signal closer to the source.

3. Direction of signal

Reflections from metallic surfaces will provide multiple signals and the reflections may be stronger.

4. Band fill (on spectrum analyser)

A fuller band will likely mean you are close

Additional tips to help you locate wideband interference:

- Suitable equipment will be needed for this tracing with at the very least a quality continuous tuning wide band receiver covering the range 550kHz to 3 GHz with a signal strength meter and attenuator. Efficient wide band antennas will also be required.
- When tracing TV interference a TV receiver is often useful where the interfering signal is contained within and thus masked by the TV signal.
- An understanding of the propagation of signals at low frequencies (AM band) as opposed to high frequencies (TV bands) is useful.
- The “T” intersection of power lines and telephone lines act like half or quarter wave length stubs (or multiples of, or parts of) and thus the noise will behave accordingly. These intersections are often the location of strong standing waves and radiation, and may be a long way from the interference source.
- An understanding of power reticulation is useful.
- Often, it is not possible to differentiate the noise as coming from one of two or more houses. In this instance door knocking and turning off the mains will help determine the suspect house.

o Turning off the power to a house may reduce the interference to your receiving equipment due to the proximity of your equipment to the house wiring. This may give you the incorrect impression that the source is located in that house. Always check back with the complainant at this point.

Alarm systems and other backed up equipment (battery and uninterruptible power supplies) will keep associated equipment active.

Typical interfering equipment (wide and narrow band)

1. Switch mode power supplies in TVs, Stereos, DVD players, satellite receivers, videos, computers, 12 volt lighting, energy saver bulbs and other lightning equipment, etc
2. Variable speed drives, water pumps, computers, lifts, etc
3. Motorised equipment like drills, food processors, model trains, vacuum cleaners, pumps, water blasters, etc
4. Microprocessor controlled equipment like computers, sowing machines, alarms, TVs, DVD players, heat pumps, etc etc..
5. Unstable mast head or distribution amplifiers, incorrectly installed distribution hardware, and faulty receiving equipment.
6. Transmitters like cordless phones/baby minders etc on wrong frequency, nearby communications systems e.g commercial RTs, Amateur Radio, Citizen Band, etc. (A video tape of the interference is often helpful here where any interfering signal may be seen and possibly decoded – i.e. DTMF tones).

Audio rectification

Audio rectification is usually from narrow band transmissions.

This is where strong RF signals are picked up by audio amplifying or computer equipment and are rectified by one or more of the many diodes and transistors in this equipment producing DC voltages that corrupt the operation of the equipment. At times these diodes and transistors will demodulate the RF signals and this may be heard over audio speakers attached to the system.

Please consult texts in the bibliography below for techniques to correct these cases.

Power line interference

Power line interference usually comes from broad band transmission.

This may be traced using the same techniques as for tracing interference from an appliance in a house. The interference is conducted along power lines and is also radiated in a similar manner. It is usually only noticed where power is reticulated via over head power lines and receiving aerials are relatively close to the lines.

It is a composite task tracing power line interference where a number of techniques will likely be required and the final analysis may still not lead to the source. Patience and intense concentration on the task over a period of time is often required.

The following comments will assist with the location process:

- Power line interference tends to affect a wider area and is often weather (moisture and wind) dependant. Due to the distance the interference is propagated band one TV signals are more susceptible to this type of interference. The nature of the interference is largely determined by the voltage of the power lines where the majority of interference occurs with 11 KV, 22 KV, and 33KV equipment.
- The location of interference on 22 KV and 33 KV equipment may be difficult where multiple sources are likely. They also tend to have a high level of ambient noise, where wooden structures are used, due to loose hardware (caused by shrinkage) and tracking between metal hardware. Corona discharge may also add to the ambient noise.
- At times the exact source hardware may be determined with the use of an ultrasonic detector, but only where an arc is present which is exhibiting ultrasonic noise. A set of binoculars is helpful in looking for faulty equipment as is a wooden maul for vibrating the poles to determine the presence of loose hardware.
- It may be necessary to employ the assistance of power authority staff to poke and prod hardware to determine the exact source. Wrong diagnosis will not be appreciated by the Power Authority given that remedial action may cost tens of thousands of dollars of work and lost revenue.