



Government
of Canada

Department of Communications

TRC-21

TELECOMMUNICATIONS REGULATION CIRCULAR

IDENTIFYING AND SUPPRESSING RADIO AND
TELEVISION INTERFERENCE

EFFECTIVE DATE: AUGUST 1, 1973

TELECOMMUNICATION REGULATORY SERVICE

IDENTIFYING AND SUPPRESSINGRADIO AND TELEVISION INTERFERENCE

Department of Communications Radio Inspectors endeavour to be of assistance in resolving interference problems to radio and television reception when such assistance is requested, subject to personnel limitations and prior commitments. Normally, Radio Inspectors are not available to perform preliminary tests which should be carried out by the person reporting the problem or by the technical staff of the radio station or organization experiencing the interference.

This circular is intended as a guide for locating and suppressing common interference problems and includes a list of symptoms, possible causes and suggested cures.

NOTE: All modifications to electrical and/or electronic equipment should be performed by a qualified serviceman or technician due to the danger of electrical shock.

A. ANALYZING THE INTERFERENCEAM RADIO

<u>Symptoms</u>	<u>Possible Interference Sources</u>	<u>What To Do</u>
a) Intermittent harsh buzz	<u>Thermostats</u> : Heating pads, electric blankets, ovens, hot water heaters, aquarium warmers, refrigerator butter conditioners, linotype lead pot, thermostats (for doorbell or chimes, electric fly catcher); etc.	<u>Qualified personnel only</u> : while listening to the interference on a portable receiver at the electrical fuse or breaker panel, try to isolate the "noise" to a particular circuit by momentarily interrupting the power to the individual circuits in turn. If the "noise" has not been interrupted after carefully repeating this test, it indicates the source is external to the home.
b) Intermittent hum	<u>Lights</u> : fluorescent, neon signs, mercury vapour or arc lights.	As above.
c) Steady hum	As above; also <u>Therapeutic and Germicidal lamps</u> : Ultra violet lamps, sun lamps, germicidal lamps in refrigerators and closets. Defective filter capacitor in receiver.	As above.

- d) Intermittent heavy crackling Electric Motors: Electrical appliances using some type of motor, such as electric razor, refrigerator, vacuum cleaner, water pump, fan, sewing machine, drill, food/drink mixers, and toys (electric trains and cars).
As above or advise hydro company if suspected to be on hydro-electric power line.
- Note: The motor is not necessarily the only potential interference source in motor operated equipment.
- Power Lines and Wiring: Insulators, circuit breakers, transformers, lightning arrestors, pole ground wire cut or poor contact, clamps, grounding by tree branches or foliage. Defective (broken) wiring, loose connections, high resistance, loose fuse, BX touching other metal.
- e) Intermittent crackling As above: also Switches and Contacts: relays, sign flashers, starters for fluorescent lamps, light blinkers. Ignition Systems: Internal combustion engines, ignitors for oil furnaces or heaters. Electrostatic Devices: Smoke precipitators, dust collectors (e.g. used in flour mills); static from machinery, belt static, anti-friction bearings, printing press static eliminators; electrically operated devices such as adding machines, calculators or cash registers, etc. As above.
- f) Steady crackling Same as c) and d); also, static from machinery, belt static, anti-friction bearings, printing press static eliminators, smoke precipitators, dust collectors. As above.
- g) Whistling Radiation: from other receivers; converters, or booster amplifiers. Spurious Response: The receiver itself may be at fault. Direct intermediate frequency pickup, image, front end overloading resulting in cross modulation; frequency multiplying; inadequate receiver selectivity, oscillator harmonic response; spurious oscillation originating in receiver including regeneration in I.F. stages; noisy or faulty receiver requiring servicing. Similar to above. Compare the operation of your set with one you know is in proper condition.

External Cross Modulation: Through non-linear rectification two or more strong radio frequency signals can mix together and re-radiate a new frequency which is determined by the sum and difference of the original frequencies with modulation from one or both of the initial signals. Non-linear rectification is commonly caused by poor connections (corroded joints) in antenna systems, guy wires, clothes-lines, eavestroughs, stucco wire mesh, BX sheathing, fencing, air ducts, etc.

TELEVISION

<u>Symptoms</u>	<u>Possible Interference Sources</u>	<u>What To Do</u>
h) AUDIO: Weak or fading. VIDEO: "Ghosting" (double or many images) "rolling" or "snowy".	<u>Propagation Conditions</u> : Interference from distant stations due to unusual propagation conditions; reflections appearing as ghosts on TV receivers, "airplane flutter" due to reflections from passing aircraft. <u>Antenna Installation</u> : Distant stations, poor antenna, faulty connections, antenna improperly oriented, reflected signals.	Identify station, check if within reasonable receiving range. Check antenna orientation and installation for defects.
i) AUDIO: Intermittent harsh buzz. VIDEO: Horizontal "bars" or "tearing".	Same as a); also: Switches and Contacts: relays, sign flashers, fluorescent lamp starters, light blinkers; set trouble, horizontal out of sync.	If interference is audible on portable AM receiver, follow instructions in AM Radio. If not, try to isolate circuit by using TV on other circuit outlets.
j) AUDIO: Intermittent or steady "hash". VIDEO: Horizontal "dotted" lines, varying in intensity.	Same as e).	Locate and suppress if practicable. If suspected of being on hydro-electric power line, advise local hydro company.
k) AUDIO: Intermittent "crackling". VIDEO: "Flashing" horizontal lines, noticeable on windy days.	Same as above; also includes: ultra-violet lamps, sun lamps, germicidal lamps in refrigerators and closets.	Same as above.

- 1) AUDIO: "Heavy" intermittent "roar" varying in intensity, lasting from several seconds to minutes.
VIDEO: 1 or 2 black "bars", severe herring-bone pattern.
- Medical Equipment: Diathermy, X-ray, etc. or Industrial: Radio frequency heaters, dielectric heating for plastics and glue drying; induction heating for metals.
- Note the times of operation and request assistance from one of our District Offices.
- m) AUDIO: Could be garbled.
VIDEO: Vertical lines or bars; picture distorted or displaced; wavy or herring-bone pattern; tearing.
- Radiation: from other receivers, converters or booster amplifiers; adjacent channel overlap.
CATV Cable System: A "leak" can develop in a cable system from such things as loose connectors, malfunctioning line amplifiers or use of unshielded wire by a subscriber; this "leak" of radio frequency energy can cause interference to nearby TV receivers.
- Try to isolate defective receiver; advise CATV company.
- n) AUDIO: Voices (sometimes garbled) or "dots" and "dashes" as used in morse code transmissions.
VIDEO: Cross-hatch (screen effect).
- Nearby operation of Radio Amateur, General Radio Service, or other radio transmitter.
- Attempt to identify and request DOC assistance.
- o) AUDIO: Erratic yet often rythmnic clicking or static type noise.
VIDEO: Horizontal "dotted" lines.
- Same as j); also: fluorescent lights, neon signs, mercury vapour or arc lights.
- As above; if suspected to be from Ignition Systems, have antenna leads shielded and/or install a hi-pass filter.

- p) Any "noise" or poor picture, either steady or intermittent, which "appears" as an external interference. Your receiver may be at fault, i.e. an internal defect. Compare the operation of your set with one you know is in proper condition.

B. GENERAL INFORMATION

1. The control of interference to radio and television reception in Canada is legislated for in the General Radio Regulations, Part I, Sections 17, 18, 19, 20 and 21 and the Radio Noise Limits Order. Copies of these publications are available through Information Canada.
2. All interference cannot be eliminated under all circumstances.
3. The strength of the signal being received in relationship to the strength of the interfering signal determines the degree of interference which may be tolerated.
4. Any interference that affects black and white television reception can affect colour reception, or vice versa.
5. An outside antenna is desirable to help reduce coupling between the antenna and electrical circuits and to provide maximum signal pickup.
6. Observing the "on-off" cycle of intermittent interference can often help in determining the cause.
7. The safest and most practical solution to interference caused by a defective thermostat in an electric pad or blanket is to replace the pad or blanket with a model which employs a non-interfering type of thermostat.
8. There are many potential sources of interference on hydro-electric transmission and distribution lines which may cause intermittent or continuous interference to television or radio reception. Weather conditions can affect both the type and severity of hydro line interference:
 - a) if a sporadic, spitting interference is present only during windy weather, then loose line hardware (clamps, etc.) may be suspect; or a guy wire may be making intermittent contact with a metal pin, bolt or bracket.
 - b) Contrary to common belief, more interfering "noise" is produced from hydro lines during dry weather than during damp weather when a good electrical path is provided by the moisture, whereas when dry, these "leaks" must arc across varying size gaps.

9. Interference can travel for many miles on power lines. The following factors determine how far a disturbance may be heard:
 - a) the voltage on line;
 - b) resonance of wires carrying the interference;
 - c) coupling between circuits;
 - d) the type of source.
10. Audio Circuit Rectification (in receivers and audio amplifiers): Through rectification a strong AM radio frequency signal can be converted to an audible signal in the audio stage of a radio receiver irrespective of the dial setting, or in audio reproduction devices such as tape recorders, turntables, hearing aids, amplifiers, electronic organs, intercoms, telephones, etc.

C. INTERFERENCE SUPPRESSION FILTERS

1. A suppressor filter should be installed as close to the source of the interference as practicable.
2. Two filters are sometimes required on sign flashers; one on the line side to suppress line radiation with another on the load side to suppress direct radiation from the sign.
3. When installing filter capacitors on motors or generators ensure that the ground return is connected to the frame.
4. The possibility of shock hazard from a large filter capacitor may be reduced by installing a small capacitor in the ground lead.
5. A hi-pass filter is designed to attenuate frequencies below a certain frequency (e.g. 50 MHz) while a low-pass filter is designed to attenuate frequencies above a certain frequency.
6. Interference from fluorescent lamps may be reduced to a satisfactory level or eliminated entirely by installing a suitable suppressor network across the line inside the fixture:

Three capacitors are normally required with the following optimum values:

#1 - .02 uF.; #2 - .002 uF.; #3 - .002 uF.

Install #1 across 110V line inside fixture.

Install #2 and #3 to fixture ground from each side of #1.

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