

EMI AND AMENDED CANADIAN RADIO INTERFERENCE REGULATIONS

U.S. and Canadian manufacturers should be aware of newly adopted Canadian EMI regulations.

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INTRODUCTION

The past ten years have seen a tremendous increase in the complexities and capabilities of microprocessor and microchip devices, with, at the same time, a considerable decrease in the size relative to complexity. This increase in technological capabilities has heralded the introduction of these micro-devices into almost every arena of life. They are now used in toys, typewriters, advertising aids, teaching aids, portable tools, portable measuring instruments, medical aids and many other products. In particular they have placed the ownership of complex, fast-operating, personal and portable computers within reach of the average family. The number of products using microchips and microprocessors is now in the millions.

This increase in complexity and quantity has led to a rapid increase in the magnitude of another problem — electromagnetic interference, known more simply as EMI. This is because these devices use electrical energy, switched on and off tens of thousands or tens of millions of times a second in order to perform their particular tasks. They use digital techniques and in so doing, generate and transmit through the atmosphere or hydro power lines, radio frequency signals. These signals, unintentionally generated, cause annoying and hazardous interference over an extremely wide frequency spectrum, covering many radio and television, public utility, aircraft and safety service frequency bands.

In order to limit or reduce the spread of these noise signals, several countries have introduced regulations setting limits on strength of transmissions from individual products, thus ensuring that product de-

velopment includes design to prevent or reduce incidental radio frequency emissions. The USA and West Germany are two such countries. Other countries are following, but most so far are encouraging voluntary limitation of emissions. These regulations have caused many North American, European and Third World manufacturers to send inferior, non-compliant products into Canada for sale. Many Canadian manufacturers would also be unable to comply.

In January of 1987, the Canadian Department of Communications (DOC) issued a notice in the Canada Gazette, stating its intention to regulate radio frequency noise emissions from digital devices. The date set at that time was, with a second issue in the Canada Gazette (September 1988) changed to January 31, 1989. All digital devices manufactured or imported after that date, for sale in Canada, must carry an indication that they have been tested and found to comply with the Canadian Radio Interference Regulations. All products will be of one of two groups, either Industrial (Class A) or Residential (Class B).

Residential products are those advertised or sold for use in private or residential areas, particularly personal computers and audio or video products that do not include a radio transmitter or receiver. Industrial products are those to be used in an industrial environment. Residential products are subject to tighter control (Class B), with lower noise emissions levels allowed than for industrial products (Class A). See Appendix A.

Groups and classes of products are identified in a manner very simi-

lar to that of the USA. There are also, as in the USA, a number of exemptions. These include digital devices used in systems listed below.

- Transportation vehicles
- Public utility or industrial plants
- Test equipment in industrial, commercial or medical environments
- Some medical devices/monitors
- Some central office telephone equipment
- Various motor-driven domestic appliances
- Systems using radio transmitters or receivers
- Some micro-power devices

COMPARISON WITH USA (FCC) REGULATIONS

The new Canadian Regulations themselves are almost identical to those of the USA, where the compliance authority is the FCC (Federal Communications Commission). The signal frequency range and amplitude/magnitude levels are the same as for the USA. The Class A and B groups are generally the same and the test procedure is very similar, but not identical.

- Some measurements require different distances of the product above the ground plane for a tabletop product.
- Canadian regulations require individual isolation of power cords for conducted emissions tests.
- The FCC is now much more spe-

cific in identifying configurations for radiated emissions testing.

One important stipulation by the DOC is that a product tested in accordance with the FCC regulations and found to be compliant need not be retested. The FCC report will be accepted as proof of compliance, providing that a note is attached indicating that the results are considered satisfactory proof of compliance with the Radio Interference Regulations of the Canadian Department of Communications.

The FCC requires a Class B product to be tested, a report to be sent to the FCC and probably the product also. The FCC will ultimately, if they consider the product to be compliant, issue an FCC identification number which must be clearly fixed to the product before it can be sold in the USA. There is also a certification fee to be paid.

The Canadian DOC does not wish to see any report or sample, but a report showing compliance must be kept on file for 5 years and an indication must be placed in the customer manual or in the packing box, for the customer to see, stating that the product complies with Class A or Class B Canadian Radio Interference Regulations.

Compliance will be verified if a complaint of interference is received, investigated and confirmed. The

product may be required to be switched off and made to comply before it is reused. Failure to comply may result in fines or imprisonment.

TESTING METHODS AND EQUIPMENT

Noise emissions from products are of two kinds — *radiated* into the atmosphere and *conducted* via the hydro power lines. Therefore two distinct kinds of tests are required and these tests require the use of special test areas and equipment in order to ensure reliability and accuracy.

Conducted emission tests are carried out in a shielded room, specially built to keep out normal radio and television transmitter signals (ambient signals), using a special device called an LISN (Line Impedance Stabilization Network) and a special EMI receiver.

Radiated emission tests are carried out on an *open area test site*, of specified dimensions and built well-distanced from radio/television transmitters. A special EMI test receiver is required here also. Programs are available to partially automate the required testing.

Test houses are equipped to perform tests to satisfy the various authorities. They also have their test teams, qualified and experienced engineers and technicians able to help their customers obtain compliance with both FCC (USA) and DOC (Canadian) regulations by carrying out faultfinding, troubleshooting and diagnostic work. A test carried out on a simple compliant product to prove its compliance with Canadian DOC Regulations, is usually completed within one working day.

Copies of the new regulation can be ordered (by referring to Radio Interference Regulations, amendment SOR/88-475) from the Canadian Government Publishing Centre, Department of Supply and Services, Ottawa, Ontario, K1A 0S9, Canada. The CSA Standard C108.8-M1983 referenced in the new regulation identifies the testing procedure. It can be ordered from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, M9W 1R3 Canada. ■

APPENDIX A

New Radio Interference Regulations Amendment (28/9/88 Canada Gazette Part II, Vol. 122, No. 20)

Registration
SOR/88-475 15 September, 1988

RADIO ACT

Radio Interference Regulations, amendment

P.C. 1988-2014 15 September, 1988

SCHEDULE

1. Section 2¹ of the *Radio Interference Regulations* is amended by adding thereto, in alphabetical order within the section, the following definitions:

“Class A digital apparatus” means a digital apparatus that is manufactured for use in a commercial, industrial, business or other non-residential environment and includes a business computer, a word processor and an industrial process control; (*appareil numérique de la classe A*)

“Class B digital apparatus” means a digital apparatus that is manufactured for use in a residential environment and includes an electronic game, a personal computer, and all calculators; (*appareil numérique de la classe B*)

“digital apparatus” means an electronic apparatus that generates and utilizes timing signals at a rate in excess of 10,000 pulses per second and that utilizes radio frequency energy for the purpose of performing functions including computations, operations, transformations, recording, filing, sorting, storage, retrieval and transfer, but does not include a radio apparatus or an I.S.M. radio frequency generator; (*appareil numérique*)”

2. The said Regulations are further amended by adding thereto, immediately after section 21 thereof, the following headings and sections:

“Limits for Radio Noise Emissions from Digital Apparatus

22. (1) Subject to subsections (2) and (3), sections 23 to 30 apply in respect of every digital apparatus that is manufactured or imported into Canada after January 31, 1989:

¹ SOR/78-727, 1978 Canada Gazette Part II, p. 3672

(2) Sections 23 to 30 do not apply in respect of a digital apparatus that is manufactured, modified or imported into Canada solely for export purposes.

(3) Sections 23 to 30 do not apply in respect of a digital apparatus that is used

(a) in a transportation vehicle;

(b) as an electronic control, either by a public utility or in an industrial plant;

(c) in a power system, either by a public utility or in an industrial plant;

(d) as test equipment, including an oscilloscope and a frequency counter, in an industrial, commercial or medical environment;

(e) as a medical computing device, under the direction of a licensed health care practitioner;

(f) in machinery, apparatus or equipment

(i) the primary function of which is to apply energy to a process or material through the action of an electric motor or a resistive heating element,

(ii) that draws a steady state current that does not exceed

(A) in the case of an electric motor, 20 A, or

(B) in the case of a resistive heating element, used either alone or in conjunction with an electric motor, 50 A,

(iii) that operates from an alternating current voltage supply that does not exceed 150 V to ground, and

(iv) where the machinery, apparatus or equipment is a portable tool and has an input power that does not exceed 2 kW; or

(g) in central office telephone equipment operated by a telecommunications common carrier in a central office.

23. Every manufacturer or importer of any digital apparatus shall ensure, at the time the digital apparatus is manufactured or imported into Canada, that

(a) a representative type or model of each digital apparatus is tested in accordance with these Regulations to determine whether it exceeds the limits for radio noise emissions referred to in sections 24 to 27; and

(b) each digital apparatus is accompanied by a notice stating that the digital apparatus does not exceed appropriate Class A or Class B limits set out in schedules V to VIII.

24. No person shall sell or use a Class A digital apparatus that radiates radio noise emissions of a field intensity that exceeds the limits set out in Schedule V as measured in accordance with section 29 over the range from 30 MHz to 1 000 MHz at a distance of 30 m from the digital apparatus.

25. No person shall sell or use a Class A digital apparatus where the radio noise emissions that are conducted along its power supply lines exceed the voltage limits set out in Schedule VI as measured in accordance with section 30 over the range from 0.450 MHz to 30 MHz.

26. No person shall sell or use a Class B digital apparatus that radiates radio noise emissions of a field intensity that

exceeds the limits set out in Schedule VII as measured in accordance with section 29 over the range from 30 MHz to 1 000 MHz at a distance of 3 m from the digital apparatus.

27. No person shall sell or use a Class B digital apparatus where the radio noise emissions that are conducted along its power supply lines exceed the voltage limits set out in Schedule VIII as measured in accordance with section 30 over the range from 0.450 MHz to 30 MHz.

28. Notwithstanding that a Class A or Class B digital apparatus does not exceed the limits for radio noise emissions prescribed by these Regulations, where the use of a digital apparatus causes interference to radio reception, the owner or operator of the digital apparatus shall forthwith restrict or suspend use of the digital apparatus until the digital apparatus has been suppressed.

Method of Measurement of Radiated Radio Noise Emissions

29. (1) The field intensity of radio noise emissions radiated by a digital apparatus shall be measured in accordance with Standard C108.8-M1983 of the Canadian Standards Association, except that section 1.5 of that Standard shall be considered to read as follows:

"1.5 *Reference Publications.* This Standard refers to the following publications and where such reference is made it shall be to the editions listed below as they read on January 1, 1988."

(2) The field intensity of radiated radio noise emissions may be measured at a distance other than that prescribed in sections 24 and 26, but in such case the measurement shall be adjusted in accordance with the Standard referred to in subsection (1).

Method of Measurement of Conducted Radio Noise Emissions

30. The radio noise emissions that are conducted along the power supply lines of a digital apparatus shall be measured in accordance with Standard C108.8-M1983 of the Canadian Standards Association, except that section 1.5 of that Standard shall be considered to read as follows:

"1.5 *Reference Publications.* This Standard refers to the following publications and where such reference is made it shall be to the editions listed below as they read on January 1, 1988."

3. The said Regulations are further amended by adding thereto the following schedules:

"SCHEDULE V

(Sections 23 and 24)

CLASS A LIMITS RADIATED RADIO NOISE EMISSIONS

Item	Column I	Column II
	Frequency Range MHz	Limits at 30 m, dB (reference 1 μ V/m)
1.	$\geq 30.000 \leq 88.000$	30
2.	$> 88.000 \leq 216.000$	34
3.	$> 216.000 \leq 1\,000.000$	37

REGULATORY IMPACT ANALYSIS STATEMENT

(This statement is not part of the Regulations.)

SCHEDULE VI

(Sections 23 and 25)

CLASS A LIMITS CONDUCTED RADIO NOISE EMISSIONS

Item	Column I Frequency Range MHz	Column II Limits, dB (reference 1 uV) Narrow Band Broad Band	
1.	$\geq 0.450 \leq 1.600$	60	73
2.	$> 1.600 \leq 30.000$	70	83

Description

Digital apparatus, such as business and personal computers, electronic games and microprocessor-based control systems, emits electromagnetic energy at frequencies used for radio-communications. This energy, referred to as radio noise, causes interference to radio services such as television broadcasting, satellite communication, radionavigation and other communications functions vital to Canada's economy, security and society.

The number of instances of such interference is increasing sharply because of the continuing rapid proliferation of digital apparatus throughout the domestic and business environment.

This problem is exacerbated by the implementation of controlling Regulations in the United States which has led to the shipment to Canada of digital equipment originally manufactured for the U.S. market, but which could not comply with the U.S. Regulations. As a result, a disproportionately high percentage of the digital apparatus being imported into Canada is that which has been prohibited for sale in the United States because of unacceptably high radio noise emission levels. This has led to a further acceleration of the deterioration of the Canadian noise environment.

Furthermore, some Canadian manufacturers, whose entire product line is designed to comply with the U.S. Regulations, so as to permit export to that market, are faced with competing in the Canadian market against sub-standard imported products, which are often discounted significantly to foster quick sale.

The regulatory amendment puts in place measures to limit the emission of radio noise from digital apparatus manufactured or imported for use in Canada, after June 30, 1988.

These measures are urgently required to reduce the incidence of interference to Canadian radio systems and prevent further erosion of the Canadian radio noise environment, particularly as a result of the importation of the huge stocks of substandard digital apparatus being rejected in the United States for failure to comply with the radio noise emission standards in force there.

Specifically, the regulatory amendments:

- (a) define and classify digital apparatus as Class A (commercial) or Class B (residential);
- (b) prescribe limits for conducted and radiated radio noise emissions for each class of apparatus;
- (c) specify Standard C108.8-M1983, developed and published by the Canadian Standards Association, as the source for the radio emission measurement methods;
- (d) require that manufacturers and importers test and confirm the compliance of their digital apparatus and provide an indication of this compliance with each unit sold; and
- (e) require that, even though a digital apparatus conforms to the limits, should it cause radio interference, the owner or operator of the apparatus shall restrict or suspend operation until the emissions have been suppressed.

SCHEDULE VII

(Sections 23 and 26)

CLASS B LIMITS RADIATED RADIO NOISE EMISSIONS

Item	Column I Frequency Range MHz	Column II Limits at 3 m, dB (reference 1 uV/m)
1.	$\geq 30.000 \leq 88.000$	40
2.	$> 88.000 \leq 216.000$	44
3.	$> 216.000 \leq 1\,000.000$	46

SCHEDULE VIII

(Sections 23 and 27)

CLASS B LIMITS CONDUCTED RADIO NOISE EMISSIONS

Item	Column I Frequency Range MHz	Column II Limits, dB (reference 1 uV) Narrow Band Broad Band	
1.	$\geq 0.450 \leq 30.000$	48	61"