Spectrum Management

Broadcasting Equipment Technical Standard

Technical Standards and Requirements for Radio Apparatus Capable of Receiving Television Broadcasting
Purpose

This document establishes the technical standards and requirements for radio apparatus capable of receiving television broadcasting, such as TV and satellite receivers, VCR's, etc., that are intended and used for the purpose of home entertainment.

Equipment manufactured or imported solely for re-export, prototyping, demonstration, exhibition or testing purposes does not have to comply with the technical standards and requirements in this document.
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1. General

Radio apparatus of a class of apparatus that is capable of receiving television broadcasting, such as TV and satellite receivers, VCR's, etc., that is intended and used for the purpose of home entertainment must conform to the technical standards and requirements established in this document.

2. Testing and Labelling

(1) Before offering for sale for use in Canada any radio apparatus of the class described in section 1 above, the manufacturer or importer shall ensure that the apparatus or a production sample or other representative unit of that type of apparatus is tested to determine whether or not it conforms to the applicable technical standards and requirements established in this document.

(2) Every manufacturer or importer referred to in subsection (1) shall

(a) forward to the Director General, Spectrum Engineering Branch of the Department, the type number and manufacturer's specifications for each type of apparatus tested as required by subsection (1) and offered for sale for use in Canada; and

(b) keep and make available to the Minister on demand for a period of five years a copy of all test data obtained as a result of the tests carried out as required by subsection (1).

(3) Every manufacturer or importer referred to in subsection (1) shall ensure that each unit of a type that they offer for sale pursuant to that subsection, whether or not the unit is equipped with inputs and outputs for connecting auxiliary equipment or apparatus, bears, in a location convenient for inspection, a permanent label or marking containing (in French and English), the following statement:

(a) where paragraph 3.2(1)(a) of BETS-7, Issue 1, is applicable to the unit, the statement:
"Standard Television Apparatus - Téléviseur ordinaire, Canada"; or

(b) where paragraph 3.2(1)(b) of BETS-7, Issue 1, is applicable to the unit, the statement:
"Cable Compatible Television Apparatus - Télévision câblocompatible, Canada"; or

(c) where paragraph 3.2(1)(c) of BETS-7, Issue 1, is applicable to the unit, the statement:
"Cable Converting Television Apparatus - Câbloconvertisseur, Canada; or
(d) where paragraph 3.2(1)(d) of BETS-7, Issue 1, is applicable to the unit, the statement:

"Supplementary Television Broadcasting Receiving Apparatus - Appareils supplémentaires de réception de télévision, Canada.

(4) Any remaining stock of existing labels may be used up before having to conform to the labelling requirements of subsection (3).

(5) For the purpose of this section, "type" means a unit that, as one of many similar units, has been manufactured in accordance with a particular electronic design and physical pattern, subject to such improvements or minor changes as, while not degrading performance, may be necessary to satisfy marketing requirements.

3. Technical Standards and Requirements

3.1 Definitions

"conversion gain" means the gain obtainable when an RF signal of one frequency is converted to an RF signal of another frequency, and is expressed in decibels as the ratio of the output signal level to the input signal level; (gain de conversion)

"manual selection" means the adjustment of a radio apparatus to obtain reception of a channel by use of an easily accessible and continuously variable control or a device that can be adjusted without the aid of a tool; (sélection manuelle)

"mid-band channels" means the nine channels, commonly identified by the alphabetical designators, A, B, C, D, E, F, G, H and I, that are used in the frequency band 120 MHz to 174 MHz; (canaux de la bande moyenne)

"noise figure" means the ratio, expressed in decibels, of

(a) the total noise power delivered to the output termination of a radio apparatus when the noise temperature of its termination is 290 degrees Kelvin, to

(b) the portion thereof engendered by the input termination; (facteur de bruit)

"preset selection" means the adjustment of a radio apparatus to obtain, automatically, reception of a channel by use of discrete positions, digital systems or other mechanical or electronic devices; (sélection préréglée)

"signal level" means the RMS voltage over an RF cycle during the transmission of the synchronizing pulse of a television signal expressed

(a) in microvolts, with respect to an impedance of 75 ohms, or

(b) in dBmV, with 0 dBmV corresponding to one millivolt across 75 ohms; (niveau du signal)
"super-band channels" means the 14 channels, commonly identified by the alphabetical designators J, K, L, M, N, O, P, Q, R, S, T, U, V and W, that are used in the frequency band 216 MHz to 300 MHz; (canaux de la bande supérieure)

"ultra high frequency channels" or 'UHF' means the 56 channels identified by the numerical designators 14 to 69 that are used in the frequency band 470 MHz to 806 MHz; (canaux à ondes décimétriques ou UHF)

"very high frequency channels" or 'VHF' means the 12 channels, commonly identified by the numerical designators 2 to 13, that are used in the frequency bands 54 MHz to 72 MHz, 76 MHz to 88 MHz and 174 MHz to 216 MHz; (canaux à ondes métriques ou VHF)

3.2 Channel Requirements

(1) Every radio apparatus of the class of radio apparatus that is capable of receiving television broadcasting shall, in addition to conforming to the applicable technical requirements set out in sections 3.3 to 3.6, be capable of and intended for receiving television broadcasting:

(a) only on all very high frequency channels and all ultra high frequency channels from both a broadcasting transmitting undertaking and a broadcasting receiving undertaking;

(b) at least on all very high frequency channels and all ultra high frequency channels from both a broadcasting transmitting undertaking and a broadcasting receiving undertaking, and on all mid-band channels and all super-band channels from a broadcasting receiving undertaking;

(c) at least on all very high frequency channels, all mid-band channels and nine super-band channels from a broadcasting receiving undertaking for the purpose of augmenting the channel capacity of a radio apparatus that conforms to paragraph (a); or

(d) on one or more channels in any frequency band.

(2) A radio apparatus of the class described in paragraph (1)(a) shall be deemed to conform to the requirements of that paragraph even though it may have an inherent capability of receiving channels in the mid-band or the super-band.

3.3 Additional Technical Standards and Requirements Applying to Standard Television Apparatus

(1) Every radio apparatus that conforms to the requirements of paragraph 3.2(1)(a) shall, in addition to those requirements, conform to the following technical requirements:

(a) the noise figure for the radio apparatus shall,
(i) for channel numbers 2 to 13, not exceed 10 dB, and

(ii) for channel numbers 14 to 69, not exceed 12 dB

(b) the radio apparatus shall be equipped with a channel selection system in which the UHF and VHF tuning controls and channel identifications are comparable with respect to size, location, accessibility, readability and ease of operation;

(c) without limiting the generality of paragraph (a), a channel selection system described in that paragraph may be:

(i) a single or dual knob channel selection system

(A) that has a clearly legible numerical display, or a combination of clearly legible numerical and alphabetical channel markings, to easily identify each VHF and UHF channel, and

(B) that can be used to automatically change, or manually change by using a clearly labelled switch, from the reception of VHF channels to the reception of UHF channels and vice versa; or

(ii) a push button or other type of preset channel selection system

(A) that has

(I) at least 12 positions, each of which can be preset using manual selection to receive any VHF or UHF channel, or

(II) 12 positions that are preset for the selection of VHF channels and at least six additional positions that can be preset using manual selection to receive any UHF channel,

(B) that has the capability of selecting each VHF and UHF channel at its designated preset position without the need for routine fine tuning, and

(C) that has a means whereby the channel selected for reception can be clearly and easily identified;

(d) where a radio apparatus is capable of receiving television broadcasting on mid-band channels or super-band channels, subparagraph 3.4(a)(viii) is applicable; and

(e) every radio apparatus that is equipped with a VHF antenna shall:

(i) if the antenna is affixed to the apparatus and connected to the VHF antenna terminals, be equipped with a UHF antenna that is
(A) affixed to the apparatus by connection to the UHF antenna terminals or otherwise,
(B) connected to the UHF antenna terminals, and
(C) designed for the reception of all UHF channels,

(ii) if the VHF antenna is not affixed to the apparatus, be equipped with a UHF antenna that is
(A) capable of being connected to the UHF antenna terminals, and
(B) designed for the reception of all UHF channels, or

(iii) if the antennas specified in subparagraph (i) or (ii) are combined in a common VHF-UHF antenna, that antenna shall be designed for the reception of all VHF and UHF channels.

(2) In this section, "dual knob" means two concentric or separate knobs, one of which controls the VHF channel selector or tuning mechanism and the other the UHF channel selector or tuning mechanism.

3.4 Additional Technical Standards and Requirements Applying to Cable Compatible Television Apparatus

Every radio apparatus that conforms to the requirements of paragraph 3.2(1)(b) shall, in addition to those requirements, conform to the following technical requirements:

(a) when the apparatus is adjusted to receive signals from a broadcasting receiving undertaking, it shall be equipped and have characteristics as follows:

(i) the channel selection system

(A) shall have at least 18 positions, each of which can be preset without the use of tools to receive any VHF, mid-band or super-band channel, and manual selection for any channel that has not been preselected, or

(B) shall be capable of tuning any VHF, mid-band or super-band channel without the use of tools,

(ii) the fine tuning control or automatic frequency control shall provide sufficient adjustment of the apparatus over a range of frequencies to ensure
(A) for the very high frequency channels, reception of input signals whose visual carrier frequencies are offset by up to ±0.55 MHz from their nominal visual carrier frequencies, and

(B) for the mid-band channels and super-band channels, reception of input signals whose visual carrier frequencies are offset by up to -1.31 MHz from their nominal visual carrier frequencies,

(iii) the noise figure for any channel shall not exceed 10 dB except that, where the circuitry or configuration of the apparatus involves a double conversion of input signals, the noise figure may exceed 10 dB but shall not exceed 13 dB,

(iv) the apparatus shall be so shielded that there is no noticeable evidence of interference when

(A) the apparatus is in the field of a co-channel synchronous television signal having a measured field strength of 100 millivolts per metre, and

(B) the signal level of the desired input signal is adjusted to 1 millivolt (0 dBmV) at the input terminals of the apparatus,

(v) the signal input shall be through a 75 ohm impedance coaxial connector,

(vi) there shall be no overloading of the apparatus at any signal level below 5 millivolts (14 dBmV),

(vii) the image rejection shall be at least 60 dB for any image frequency below 300 MHz

(viii) the level of any local oscillator signal and of any signal of an undesired or spurious nature, generated within the apparatus and arriving at the cable input terminals of the apparatus,

(A) in the frequency range above 5 MHz and below 54 MHz, shall not exceed -50 dBmV,

(B) in the frequency range 54 MHz to 300 MHz, shall not exceed -26 dBmV, and

(C) in the frequency range above 300 MHz and below 1000 MHz, shall not exceed -10 dBmV; and
(b) when the apparatus is adjusted to receive signals from a broadcasting transmitting undertaking it shall conform to the requirements set out in section 3.3 except that the noise figure for channel numbers 2 to 13 shall not exceed 10 dB unless the circuitry or configuration of the apparatus involves a double conversion of input signals in which case the noise figure may exceed 10 dB but shall not exceed 13 dB.

### 3.5 Additional Technical Standards and Requirements Applying to Cable Converting Television Apparatus

(1) Every radio apparatus that conforms to the requirements of paragraph 3.2(1)(c) shall, in addition to those requirements, conform to the following technical requirements:

(a) every converter that converts the received television broadcasting signals to a particular output channel in the very high frequency band for delivery of signals to a radio apparatus that conforms to the requirements of paragraph 3.2(1)(a) shall be equipped with

(i) a channel selection system providing preset selection for at least eighteen channels and manual selection for any channel that has not been preselected, and

(ii) a fine tuning control, an automatic frequency control, or an internally adjustable control for each channel received or any combination of such controls that will provide sufficient adjustment of the converter over a range of frequencies to ensure,

(A) for the very high frequency channels, the reception of input signals whose visual carrier frequencies are offset by up to ±0.55 MHz from their nominal visual carrier frequencies, and

(B) for the mid-band channels and super-band channels, the reception of input signals whose visual carrier frequencies are offset by up to -1.31 MHz from their nominal visual carrier frequencies;

(b) every converter that converts the received television broadcasting signals as a block of input channels to an equivalent number of output channels for delivery of signals to a radio apparatus that conforms to the requirements of paragraph 3.2(1)(a) shall be equipped with a means whereby

(i) the output channels can be shifted sufficiently to avoid interference from local television stations, and

(ii) the received signals on channel numbers 5 and 6 in the very high frequency band can be bypassed around the conversion circuits for direct delivery to the apparatus; and
(c) every converter to which paragraph (a) or (b) is applicable shall have the following characteristics:

(i) the frequency stability obtained with any line voltage in the range from 104 to 127 volts and measured, after twelve hours of warm-up operation, over a period of three hours shall be such that the visual carrier frequency of signals received via any input channel, converted and delivered to a radio apparatus that conforms to the requirements of paragraph 3.2(1)(a) via an output channel will,

(A) if the converter is equipped with a fine tuning control, be maintained within 450 kHz of the nominal carrier frequency for the output channel, or

(B) if the converter is not equipped with a fine tuning control, be maintained within 250 kHz of the nominal carrier frequency for the output channel,

(ii) the gain characteristics shall be such that,

(A) for a converter having automatic gain control circuitry, the output signal levels are not less than 1 millivolt (0 dBmV) and not more than 5 millivolts (14 dBmV), or

(B) for a converter not having automatic gain control circuitry, the conversion gain is not less than 0 dB nor more than 7 dB,

(iii) the noise figure for any channel shall not exceed 13 dB,

(iv) when the converter is exposed to a radiation field having a measured field strength of 100 mV/m at any frequency in the range from 1.6 MHz to 300 MHz, the shielding shall be sufficient to ensure that no voltage attributable to the field exceeds 10 microvolts (-40 dBmV) as measured at the output terminals of the converter,

(v) the signal input shall be through a 75 ohm impedance coaxial connector,

(vi) with no input signal present, the level of any local oscillator signal and of any signal of an undesired or spurious nature generated within the converter and arriving at the cable input terminals of the converter,

(A) in the frequency range above 5 MHz and below 30 MHz, shall not exceed -50 dBmV,
(B) in the frequency range from 30 MHz to below 54 MHz, shall not exceed -35 dBmV,

(C) in the frequency range from 54 MHz to 300 MHz, shall not exceed -31 dBmV, and

(D) in the frequency range above 300 MHz and below 1000 MHz, shall not exceed -10 dBmV,

(vii) with input signals present, any spurious signal generated within the converter and appearing at the input terminals shall be at least 25 dB below input signal levels,

(viii) the field strength of any emission emanating from the converter shall not exceed

(A) 20 \( \mu \text{V/m} \) at a distance of 10 metres in the frequency range above 5 MHz and below 54 MHz,

(B) 20 \( \mu \text{V/m} \) at a distance of 3 metres in the frequency range from 54 MHz to below 108 MHz,

(C) 10 \( \mu \text{V/m} \) at a distance of 3 metres in the frequency range from 108 MHz to below 174 MHz,

(D) 20 \( \mu \text{V/m} \) at a distance of 3 metres in the frequency range from 174 MHz to below 216 MHz,

(E) 20 \( \mu \text{V/m} \) at a distance of 10 metres in the frequency range from 216 MHz to below 300 MHz, and

(F) 220 \( \mu \text{V/m} \) at a distance of 10 metres in the frequency range from 300 MHz to 1000 MHz, and

(ix) the level of any spurious signal produced by the converter and falling within the pass-band of any output channel shall not, in the worst case, be less than 50 dB below the signal level of the output visual carrier, as measured separately for each input channel where signals at the same level in the range from, 1 millivolt (0 dBmV) to 5 millivolts (14 dBmV) are supplied to all inputs except the one under test.

(2) In this section, "converter" means a cable converting television apparatus.
3.6 Additional Technical Standards and Requirements Applying to Supplementary Television Broadcasting Receiving Apparatus

Every radio apparatus that conforms to the requirements of paragraph 3.2(1)(d) shall, in addition to those requirements, when the apparatus is adjusted to receive signals, conform to the following technical requirements:

(a) with no input signal present, the level of any local oscillator signal and of any signal of an undesired or spurious nature, generated within the apparatus and arriving at the input terminals of the apparatus, shall not exceed

(i) -40 dBmV, in the frequency range from 5 MHz to below 54 MHz,
(ii) -27 dBmV, in the frequency range from 54 MHz to below 500 MHz, and
(iii) -10 dBmV, in the frequency range from 500 MHz to below 1000 MHz;

and

(b) the field intensity of radio noise produced by the apparatus at a distance of 3 metres shall not exceed

(i) 40 dBμV/m, in the frequency range from 5 MHz to below 88 MHz,
(ii) 44 dBμV/m, in the frequency range from 88 MHz to below 216 MHz,
(iii) 46 dBμV/m, in the frequency range from 216 MHz to below 1000 MHz,
(iv) 56 dBμV/m, in the frequency range from 1000 MHz to below 5 GHz, and
(v) 66 dBμV/m, in the frequency range from 5 GHz to 13 GHz.