



# NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION

## DTV Converter Box Coupon Program Information Sheet for Manufacturers

**NTIA welcomes and relies on the voluntary participation of the digital-to-analog converter box manufacturers to ensure the success of the coupon program. NTIA's Final Rule adopts technical specifications and features to which manufacturers must adhere in order for a converter box to be eligible for the coupon program.**

### Notice of Intent

Manufacturers wishing to participate in the program must submit a notice of intent to NTIA at least three months prior to submitting test results and sample models of converter boxes per the process outlined in the Final Rule, §301.5. There is no fee for manufacturers to participate in the coupon program.

### Coupon-eligible converter boxes

- Manufacturers of coupon-eligible converter boxes will need to build devices that include specific features and meet certain performance specifications set forth in Technical Appendix 1 of the Final Rule.
- Each model proposed also may include “permitted” features as described in Technical Appendix 2. Examples of permitted features include a smart antenna interface connector and a program guide.
- These technical specifications should provide consumers with an affordable converter box containing state-of-the-art technology available today from manufacturers within the timeframe required by Congress.
- “Disqualifying” features also are described in Technical Appendix 2. Video recording or playback capability, for example, is an impermissible feature of a coupon-eligible converter box.
- Manufacturers are free to market converter boxes not compliant with the performance specifications identified in the Final Rule. Such boxes would not be eligible for the coupon program.

### Technical approval process

- In its notice of intent, a manufacturer should provide to the address below full contact information for an individual responsible for the manufacturer's submission.
- The notice also should include a brief description of the converter box to be submitted, including required and permitted features and the date when the potential coupon-eligible converter box will be available for testing.
- NTIA shall treat the notices of intent received as business confidential and proprietary information.
- Manufacturers are required to supply two production sample converter boxes and test results for the proposed converter box, including a certification from the manufacturer's testing supervisor of their authenticity, completeness, and accuracy. The Federal Communications Commission (FCC) may test converter boxes at the request of NTIA.
- NTIA will provide prompt notification of whether the model meets NTIA's specifications and is, or is not, eligible for the coupon program. NTIA will make its approval decision upon its consultation with the FCC.
- NTIA's specifications do not change manufacturers' other compliance requirements, such as those required by the FCC.

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## Post approval process

- NTIA will maintain and make available to the general public and retailers the make and model number of coupon-eligible converter boxes via a Web site.
- Coupon-eligible converter boxes should generally work with antennas consumers already use in their homes for analog over-the-air broadcasts.
- Manufacturers are responsible for resolving any performance or product defect issue with consumers and retailers.
- NTIA shall not warrant the performance, suitability, or usefulness of any coupon-eligible converter box for any use.

**In the [Digital Television Transition and Public Safety Act of 2005](#), Congress defines the term **digital-to-analog converter box** as a:**

***Stand-alone device that does not contain features or functions except those necessary to enable a consumer to convert any channel broadcast in the digital television service into a format that the consumer can display on television receivers designed to receive and display signals only in the analog television service. but may also include a remote control device.***

**Notices of intent should be sent to:**

**DTV Converter Box Coupon Program  
National Telecommunications and Information Administration  
U.S. Department of Commerce  
1401 Constitution Avenue, NW  
Room 4812  
Washington DC 20230**

**Fax Number: 202-482-4626**

**Phone Number: 202-482-6266**

# TECHNICAL APPENDIX 1

## NTIA COUPON-ELIGIBLE CONVERTER BOX (CECB) Required Minimum Performance Specifications and Features

### REFERENCE DOCUMENTS

- ATSC A/74, Receiver Performance Guidelines, June 2004
- ATSC A/53E, ATSC Digital Television Standard, Revision E with Amendments No. 1 and No. 2, September 2006
- ATSC A/65C, Program and System Information Protocol for Terrestrial Broadcast and Cable (Revision C) With Amendment No. 1, May 2006
- Recommendation ITU-R BT.500-11, Methodology for the subjective assessment of the quality of television pictures
- ATSC A/69, PSIP Implementation Guidelines for Broadcasters, June 2002

### ELIGIBLE CONVERTER BOXES SHALL COMPLY WITH THE FOLLOWING MINIMUM PERFORMANCE SPECIFICATIONS AND FEATURES:

#### 1. Decoder

Equipment shall be capable of receiving and presenting for display program material that has been encoded in any and all of the video formats contained in Table A3 of ATSC A/53E. The image presented for display need not preserve the original spatial resolution or frame rate of the transmitted video format.

#### 2. Output Formats

Equipment shall support 4:3 center cut-out of 16:9 transmitted image, letterbox output of 16:9 letterbox transmitted image, and a full or partially zoomed output of unknown transmitted image.

#### 3. PSIP Processing

Equipment shall process and display ATSC A/65C Program and System Information Protocol (PSIP) data to provide the user with tuned channel and program information. See ATSC A/69 for further guidance.

#### 4. Tuning Range

Equipment shall be capable of receiving RF channels 2 through 69 inclusive.

#### 5. RF Input

Equipment shall include a female 75 ohm F Type connector for VHF/UHF antenna input.

#### 6. RF Output

Equipment shall include a female 75 ohm F Type connector with user-selectable channel 3 or 4 NTSC RF output.

#### 7. Composite Output

Equipment shall include female RCA connectors for stereo left and right audio (white and red) and a female RCA connector for composite video (yellow). Output shall produce video with ITU-R BT.500- 11 quality scale of Grade 4 or higher.

#### 8. RF Dynamic Range (Sensitivity)

Equipment shall achieve a bit error rate (BER) in the transport stream of no worse than  $3 \times 10^{-6}$  for input RF signal levels directly to the tuner from -83 dBm to -5 dBm over the tuning range. Subjective video/audio assessment methodologies could be used to comply with the bit error rate requirement.<sup>1</sup> Test conditions are for a single RF channel input with no noise or channel impairment. Refer to ATSC A/74 Section 4.1 for further guidance. (Note the upper limit specified here is different than that in A/74 4.1).

<sup>1</sup> Subjective evaluation methodologies use the human visual and auditory systems as the primary measuring "instrument." These methods may incorporate viewing active video and audio segments to evaluate the performance as perceived by a human observer. For subjective measurement, the use of an expert viewer is recommended. The viewer shall observe the video and listen to the audio for at least 20 seconds in order to determine Threshold of Visibility (TOV) and Threshold of Audibility (TOA). Subjective evaluation of TOV should correspond with achievement of transport stream error rate not greater than a BER of  $3 \times 10^{-6}$ . If there is disagreement over TOV performance evaluation, it will be resolved with a measurement of actual BER.

## 9. Phase Noise

Equipment shall achieve a bit error rate in the transport stream of no worse than  $3 \times 10^{-6}$  for a single channel RF input signal with phase noise of -80 dBc/Hz at 20 kHz offset. The input signal level shall be -28 dBm. Subjective video/audio assessment methodologies described above could be used to comply with the bit error rate requirement. Refer to ATSC A/74 Section 4.3 for further guidance.

## 10. Co-Channel Rejection

The receiver shall not exceed the thresholds indicated in **Table 1** for rejection of co-channel interference at the given desired signal levels. Refer to ATSC A/74 Section 4.4.1 for further guidance.

**Table 1- Co-Channel Rejection Thresholds**

Type of Interference	Co-Channel D/U Ratio (dB)	
	Weak Desired (-68 dBm)	Moderate Desired (-53 dBm)
DTV interference into DTV	+15.5	+15.5
NTSC interference into DTV	+2.5	+2.5

### Notes:

NTSC split 75% color bars with pluge bars and picture to sound ratio of 7 dB should be used for video source.

ATSC high definition moving video should be used for video source.

All NTSC values are peak power; all DTV values are average power.

## 11. First Adjacent Channel Rejection

The receiver shall not exceed the thresholds indicated in **Table 2** for rejection of adjacent channel interference at the given desired signal levels. Refer to ATSC A/74 Section 4.4.2 for further guidance.

**Table 2- Adjacent Channel Rejection Thresholds**

Type of Interference	Adjacent Channel D/U Ratio (dB)		
	Weak Desired (-68 dBm)	Moderate Desired (-53 dBm)	Strong Desired (-28 dBm)
Lower DTV interference into DTV	$\geq -33$	-33	-20
Upper DTV interference into DTV	$\geq -33$	-33	-20
Lower NTSC interference into DTV	$\geq -40$	-35	-26
Upper NTSC interference into DTV	$\geq -40$	-35	-26

### Notes:

NTSC split 75% color bars with pluge bars and picture to sound ratio of 7 dB should be used for video source.

ATSC high definition moving video should be used for video source.

All NTSC values are peak power; all DTV values are average power.

## 12. Taboo Channel Rejection

The receiver shall not exceed the thresholds indicated in **Table 3** for rejection of taboo channel interference at the given DTV desired and undesired signal levels. Refer to ATSC A/74 Section 4.4.3 for further guidance.

**Table 3- Taboo Channel Rejection Thresholds for DTV Interference into DTV**

Channel	Taboo Channel D/U Ratio (dB)		
	Weak Desired (-68 dBm)	Moderate Desired (-53 dBm)	Strong Desired (-28 dBm)
N+/- 2	≥-44	-40	-20
N+/- 3	≥-48	-40	-20
N+/-4	≥-52	-40	-20
N+/- 5	≥-56	-42	-20
N+/- 6 to N+/- 13	≥-57	-45	-20
N +/- 14 and N+/- 15	≥-46	-45	-20

### Notes:

ATSC high definition moving video should be used for video source. All DTV values are average power.

## 13. Burst Noise

Equipment shall tolerate a noise burst of at least 165  $\mu$ s duration at a 10 Hz repetition rate without visible errors. The noise burst shall be generated by gating a white noise source with average power -5 dB, measured in the 6 MHz channel under test, referenced to the average power of the DTV signal. The input DTV signal level shall be -28 dBm. Refer to ATSC A/74 Section 4.4.4 for further guidance

## 14. Field Ensembles

Equipment shall demonstrate that it can successfully demodulate, with two or fewer errors, 30 of the 50 field ensembles available from ATSC in conjunction with ATSC A/74. Error counts are not expected to include inherent errors associated with the start and end or looping of field ensembles for playback. Refer to ATSC A/74 Section 4.5.2 for further guidance.

## 15. Single Static Echo

Equipment shall comply with either CRITERIA A or CRITERIA B, below.

### **CRITERIA A:**

Equipment shall tolerate a single static echo with the magnitude, relative to a desired DTV signal power of -28 dBm, and delay defined in **Table 4**.

### **CRITERIA B:**

Equipment may demonstrate compliance by tolerating a single static echo with the magnitude, relative to a desired DTV signal power of -28 dBm, and delay defined in **Table 5**, if the equipment also demonstrates that it can receive 37 of the 50 field ensembles. See **Field Ensembles** requirement.

### **CRITERIA A:**

**Table 4- Maximum Single Static Echo Delay**

Echo Delay	Desired to Echo Ratio
-50 $\mu$ s	16 dB
-40 $\mu$ s	12 dB
-20 $\mu$ s	6 dB
-10 $\mu$ s	5 dB
-5 $\mu$ s	2 dB
0 $\mu$ s	1 dB
10 $\mu$ s	2 dB
20 $\mu$ s	3 dB
40 $\mu$ s	10 dB
50 $\mu$ s	16 dB

### **CRITERIA B:**

**Table 5- Minimum Single Static Echo Delay**

Echo Delay	Desired to Echo Ratio
-50 $\mu$ s	16 dB
-40 $\mu$ s	16 dB
-20 $\mu$ s	7.5 dB
-10 $\mu$ s	5 dB
-5 $\mu$ s	2 dB
0 $\mu$ s	1 dB
10 $\mu$ s	2 dB
20 $\mu$ s	3 dB
40 $\mu$ s	16 dB
50 $\mu$ s	16 dB

## 16. Channel Display

Equipment must display all channels, including multicast channels, broadcast by a digital television station that can be displayed on an analog TV receiver.

## 17. Closed Captioning, Emergency Alert System (EAS) and Parental Controls (V-Chip)

Equipment must display (1) EAS message broadcast pursuant to 47CFR11.117 of the FCC Rules.; (2) parental control information as required by the FCC's Rules in 47CFR15.120 and incorporate the EIA/CEA-766-A standard; and (3) Close Captioning information as required by the FCC's Rules in 47CFR15.122 and incorporate the CEA 708/608 standard.

## 18. Remote Control

A remote control to operate the equipment shall be provided with batteries. Standard codes will be used and provided so the consumer can program an existing remote control to, at a minimum, change channels and turn on and off the converter box and the consumer's existing analog television receiver.

## 19. Audio Outputs

The RF output must be modulated with associated audio program information; the RCA audio connectors must provide stereo left/right, when broadcast.

## **20. Energy Standards**

The equipment shall use no more than two watts of electricity in the "Sleep" state. Sleep state power shall be measured in accordance with industry standard CEA-2013-A. Eligible equipment shall provide the capability to automatically switch from the On state to the Sleep state after a period of time without user input. This capability shall be enabled at the factory as the default setting for the device. The default period of inactivity before the equipment automatically switches to the Sleep state shall be four hours. Eligible equipment may allow the current program to complete before switching to the Sleep state. The default energy related settings shall not be altered during the initial user set-up process and shall persist unless the user chooses at a later date to manually: (a) disable the "automatic switching to Sleep state" capability, or (b) adjust the default time period from 4 hours to some other value.

## **21. Owner's manual**

An owner's manual shall include information regarding the remote control codes used to permit the consumer to program a universal remote control. The owner's manual will include information regarding the availability of the main audio channel and other associated audio channels on the RF and left/right audio outputs.

## **22. LED Indicator**

The equipment shall contain an LED to indicate when the unit is turned on.

## **23. RF Cable**

The equipment will include at least one RF cable to connect the unit with its associated analog television receiver.

## **24. Signal Quality Indicator**

The equipment will display on the television receiver signal quality indications such as signal strength per ATSC A/74, Section 4.7.

# TECHNICAL APPENDIX 2

## NTIA COUPON-ELIGIBLE CONVERTER BOX (CECB)

### Permitted and Disqualifying Features

Feature	Permitted Feature	Disqualifying Feature
<b>General Requirements</b>		<p>Any device or capability which provides for more than simply converting a digital over-the-air television signal (ATSC) for display on an analog television receiver (NTSC), including, but not limited to:</p> <ul style="list-style-type: none"> <li>• Integrated video display;</li> <li>• Video or Audio recording or playback capability such as VCR, DVD, HDDVD, Blue Ray, etc.</li> </ul>
<b>Antenna Inputs</b>	<p>Smart Antenna interface connector (CEA 909 Smart Antenna Control Interface standard)</p> <p>The manufacturer may supply a 300 ohm connector or a matching transformer to connect 300 ohm ribbon leads to the required RF antenna input.</p>	
<b>Antenna Pass-Through</b>	<p>Equipment may pass through a NTSC analog signal from the antenna to the TV receiver</p> <p>By-pass switch to permit NTSC pass-through</p>	
<b>Bundling Antenna and Converter Box</b>	<p>Equipment and Smart Antenna may be sold together at promotional prices</p>	<p>Equipment cannot be sold conditioned on the purchase of a Smart Antenna or other equipment.</p>
<b>Outputs (General)</b>	<p>S-Video</p>	<ul style="list-style-type: none"> <li>• Digital Video Interface (DVI);</li> <li>• Component video (YPbPr);</li> <li>• High-Definition Multimedia Interface (HDMI);</li> <li>• Computer video (VGA);</li> <li>• USB IEEE-1394 (iLink or Firewire)</li> <li>• Ethernet (IEEE-802.3)</li> <li>• Wireless (IEEE802.11)</li> </ul>
<b>Outputs (Audio)</b>	<p>Equipment may process associated audio services described in Section 6.6 of A/54</p> <p>RF output may provide monaural audio for the selected audio channel.</p> <p>RF output may provide BTSC stereo for the selected audio channels.</p>	
<b>Automatic Software Repair/Upgrade</b>	<p>Equipment is able to receive and process software pursuant to ATSC A-97.</p>	
<b>Program Information</b>	<p>Equipment may contain software and hardware modifications necessary to display other program information as determined by the manufacturer.</p>	



Feature	Permitted Feature	Disqualifying Feature
<b>Remote Control</b>	<p>Manufacturers may include a programmable universal remote control to operate the equipment and other existing video and audio equipment.</p> <p>Remote control may have dedicated keys to provide direct access to closed captioning and descriptive video functions.</p>	
<b>Other Features</b>	<p>The equipment may be operated on battery power as well as external AC/DC power.</p> <p>The manufacturer may supply additional cables, such as a cable with 3 female RCA connectors for composite video (yellow connector) &amp; stereo left and right audio (white and red connectors)</p> <p>The equipment may display on the television receiver additional signal quality information as determined by the manufacturer.</p>	
<b>Energy Standards</b>	<p>Equipment may comply with standards established by the EPA Energy Star program or state regulatory authorities.</p>	