technical manual

Procedure for DAM Testing

24 Hour Energy Star DAM Power Consumption test procedure
Version 1.1, 2 February 2010

1. Change History

Version	Date	Notes
V1.0	2009-12-15	First public release
V1.1	2010-02-02	Add data info and schedule, and applicability advisory about other DAM functions.

2. Introduction

This is Rovi Corporation's method for acceptance testing, relative to Data Acquisition Mode (DAM) for both versions 4.0 and 5.0 of the Energy Star Program Requirements specification, for products incorporating a Rovi EPG.

This test procedure and the accompanying test feed are only designed to be used for testing Televisions that:
1) **Incorporate a Rovi EPG.**
2) **Do not contain other features/functions that use DAM and that depend on other data which may not be present in the test feed.**

See Section 5. Description of Test Recording for test file details and special considerations if any other functions need to be tested in the same device.

3. Definitions

DAM – Data Acquisition Mode. One of three states of a DUT as defined by the Energy Star specification. The DUT turns on circuitry to receive EPG data, but the audio and video display circuits are off.

DAMPowerMaxWattHours – The Maximum Allowable Energy in DAM as defined in Table 3: DAM Energy Requirements of the Energy Star specification, currently 80 watt-hours**.**

DUT – Device Under Test

Energy Star specification – Document titled Energy Star® Program Requirements for Televisions - `http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/television/Final_Version%204_5_TV_Program_Requirements.pdf`

EPG – Electronic Program Guide.

EPG Uninitialized – This is the first state of the EPG. This state is the virgin state of the unit and is also entered when the unit is factory reset. There is no configuration data for the EPG.

EPG Setup State – This is the second state of the EPG. This state is entered after the user has setup the EPG with ZIP Code and TV Service (Cable or OTA) information from the DUT menu system. At this time the unit has no information about the physical channel that carries Rovi configuration data,

including time zone, channel lineup related to the user's TV Service, time, data download schedule, and other Rovi Proprietary data.

EPG Steady State – This is the EPG state where the EPG has received all initial Rovi configuration data required to operate normally. At this point the EPG has received a data download schedule consisting of the various data download types and start times as part of the Rovi configuration data. The DUT in this state will change from Sleep Mode to DAM to receive Rovi data downloads according to the times in the data download schedule, and back to Sleep Mode when the data downloads have been received. The DUT will receive a new data download schedule each day, which is typically similar to the download schedule for the previous day.

EstimatedDAMDurationHours – Estimated number of hours the DUT will spend in DAM during the 24-hour period under test. For Rovi EPG DAM usage, the estimate is currently about 2.5 hours.

ON Mode – One of three states of a DUT as defined by the Energy Star specification.

Sleep Mode - One of three states of a DUT as defined by the Energy Star specification.

SleepModePowerMaxWatts – Maximum sleep mode power allowed as defined by Energy Star specification, currently 1 watt.

24-Hour Measured Usage - The measured power usage of the DUT in the 24-hour period will include both Sleep Mode and DAM power usage. Overall measured power usage in watt-hours must be less than DAMPowerMaxWattHours + ((24 hours – EstimatedDAMDurationHours) * SleepModePowerMaxWatts).

4. Description of Rovi data

Rovi data consists of several components that are sent out on different repetition schedules. An encoder at a station transmits setup data throughout the day in small bursts, and other data in bulk during scheduled windows spread over the day. Once a Rovi EPG is set up and in Steady State mode, the daily download periods are distributed in separately identified blocks, which may be contiguous, of approximately 30 to 60 minutes, with several repetitions during a 24 hour period. An EPG will attempt to receive at least three of these blocks at times when the TV is not in ON mode. Depending on the EPG user's viewing schedule, the reception attempts may happen at any time from around 1 am to 5:30 pm local time.

The Rovi encoder generates three parallel data broadcast streams. The maximum total variable rate of our data broadcast streams will not exceed 125 kbps.

Data pipes 1 and 2 support viewers with ATSC-capable Guides. The SCTE 127 VBI data stream allows Rovi to support pre-existing analog-only devices where the analog signal is no longer broadcast. Refer to the table below for a summary of the data streams. The PID numbers for the streams are specified by the station. The EPG determines the appropriate PID to receive for each stream by scanning the PMT to locate the relevant descriptors, as identified in the table below.

PID / Data Stream	Purpose	Data rate	Stream type	Required Descriptors
SCTE 127 (VBI data)	Legacy Rovi EPG data service	45 kbps	0x06	VBI Data Descriptor
Guide Datapipes				Registration Descriptor
Datapipe 1	Digital Rovi EPG data service	variable max 28.8 kbps	0x05	*format identifier value: 0x54564731 / TVG1 (ASCII)*
Datapipe 2		variable max 45 kbps		*format identifier value: 0x54564732 / TVG2 (ASCII)*

5.   Description of Test Recording

The recording contains 51 hours of programming from a Rovi digital EPG host TV station. The data included with this programming are representative of Rovi's proprietary data stream throughout North America.

1. The first two hours contain only setup data which is the normal payload for the time of the recording.
2. The next 48 hours contain two days of normal scheduled data.
3. The second day's data are optional; the test can be completed in 26 hours with the setup and first day's recording.
4. The last hour is provided to maintain a stable signal around the endpoint of the optional second day.

As noted above, in actual practice the PID numbers for the streams are specified by and vary by individual broadcast stations. For the purposes of this test stream, the SCTE-127 data is using PID 0x110, Datapipe 1 is using PID 0x111, and Datapipe 2 is using PID 0x112.

The file consumes 446 gigabytes and will typically require a 750 GB disk (HDD) for distribution using the NTFS file system. The file name is "EPA_WBZHD_51hr_v1.trp".

If the DUT requires other non-Rovi data to be present which could increase DAM power usage, then the tester must combine the provided Rovi transport stream with any other data required for DAM testing of the device. If needed, Rovi can provide technical information about the Rovi transport stream to assist creation of a suitable test stream.

6.   Test Preparation

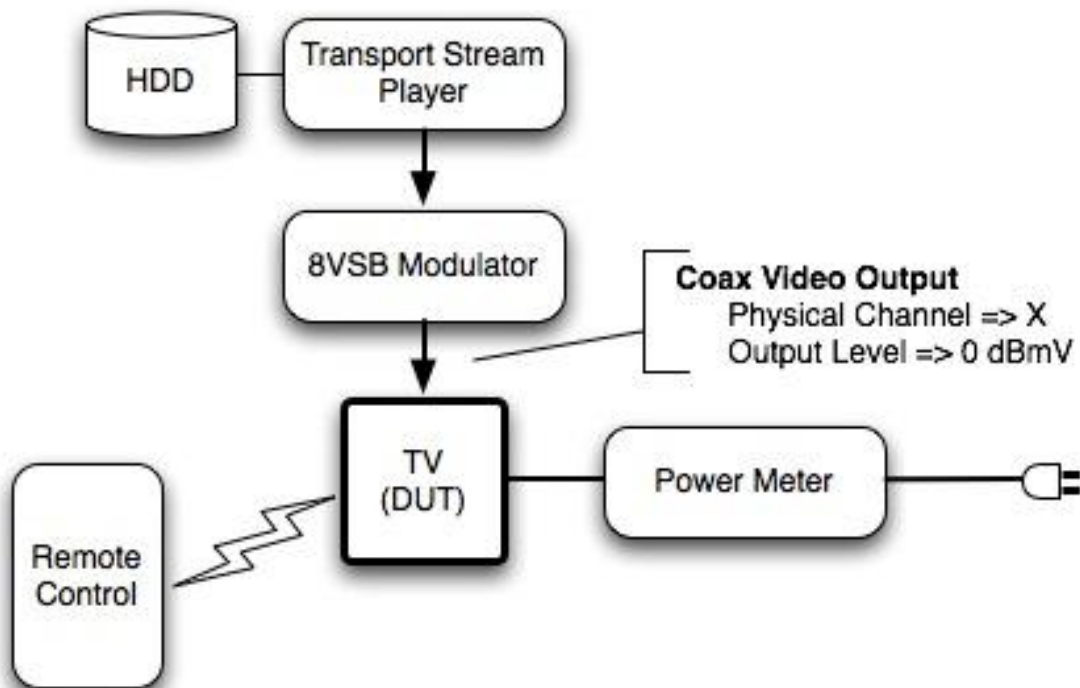See Section 8 Connection Diagram below for an illustration.

1. The recording will be played out from a stream player, such as the Sencore DMS3503B, modulated onto an ATSC-compliant 8VSB carrier.
2. The native carrier is broadcast channel 30 (centered at 569 MHz) which is the over-the-air channel of the Boston station. If that channel is not available from the player, any North America broadcast channel may be used, because tuning is by virtual channel.
3. There should not be any other RF sources on the cable to the DUT.
4. The RF output from the player should be within the normal range for a consumer product antenna input, typically 0 dBmV.
5. The DUT power cord is plugged into an approved power meter.
6. Verify that the DUT power source and environment meet the various voltage, frequency, distortion, temperature, and humidity specifications as defined in the Energy Star Specification.

7.   Test Procedure

1. Start the transport stream playback.

2. Configure the DUT using its documented setup procedure, and start the host channel scan.

3. Parameters to be entered include:
     - ZIP Code: 01730
     - Service: Air (not Cable)
     - Data Reception Method: Tuner (not Internet)

4. The TV must be configured with default settings for other parameters, so, for example, automatic updates may be enabled, which could appear in the power profile.

5. At this point, the EPG will be in EPG Setup State. The DUT must then be turned off to allow the EPG to search for and receive Rovi configuration data and enter EPG Steady state mode. The EPG will take a variable amount of time to search for and receive configuration data, but it only looks at the one station found during host channel scan, so this will typically be no more than 2 hours.

6. During this time, you can quickly check the EPG for status, but leave it in the off state when done. Also, watch the power meter for a drop to Sleep mode power level. This will be an indication that the DUT has completed search and is in EPG Steady State mode and ready for the test. If the search takes more than 2 hours, wait up to 24 hours, as needed, before starting the test. The recording is long enough and you should be able to complete the test during the playback.

7. When the DUT is in EPG Steady State mode, start the 24 hour clock and begin power measurements. Do not turn on the DUT for the remainder of the test. If there are multiple products with a similar remote in use in your lab, cover the IR sensor on the DUT.

8. 24 hours after starting the clock, stop the clock and check the power total in watt-hours.
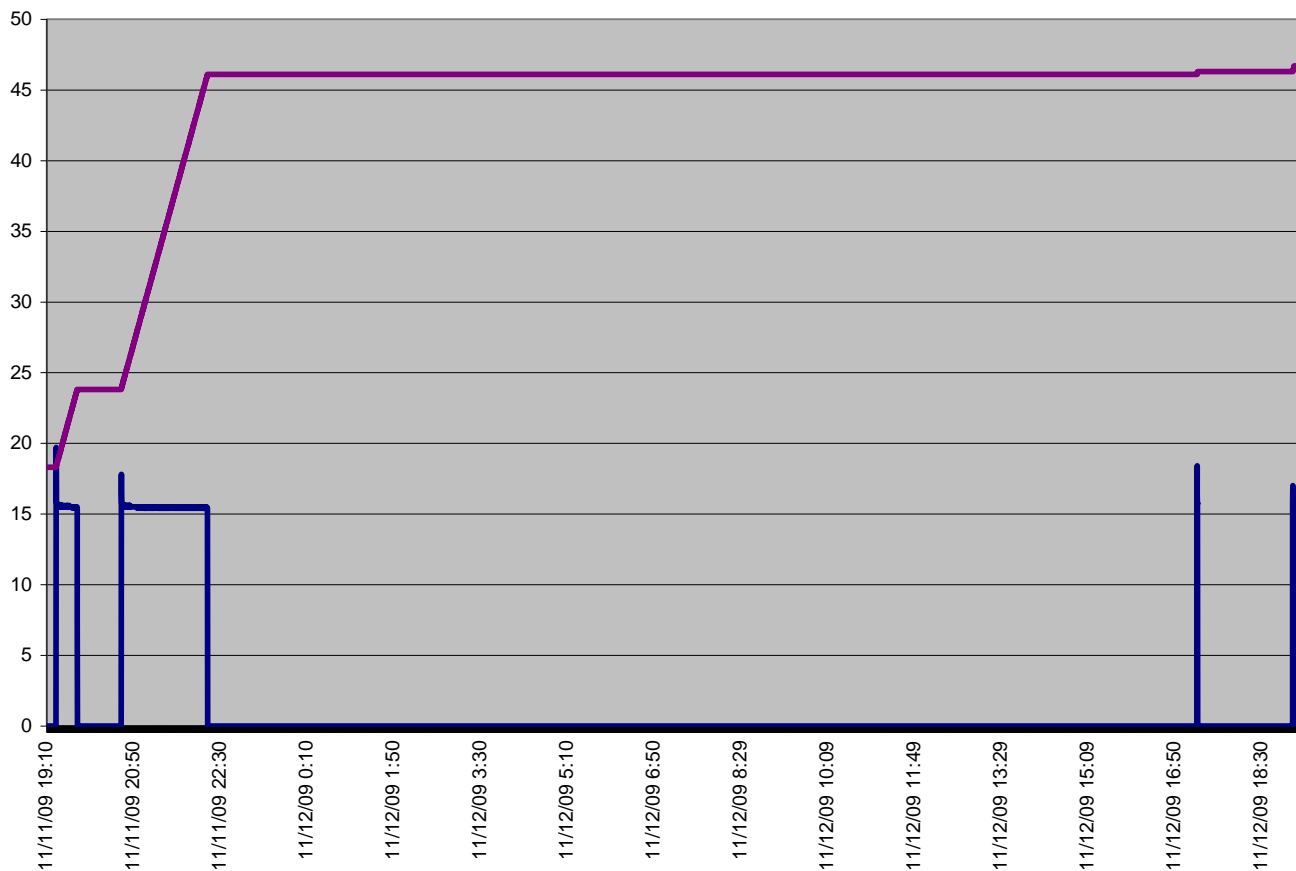
9. Note that about 15 minutes before the end of the 24 hour period, the EPG spends a few minutes in DAM mode, then sleeps again, in preparation for the next daily download.

10. Optionally, if there is enough time left in the playback, note the 24 hour watt-hours, keep the clock running, and monitor for a repeat of the power profile over the next day.

11. You must reset the DUT before restarting the playback. Otherwise, the DUT will ignore what looks like old data.

8.   Connection Diagram

9.   Sample 24 Hour DAM Power Use Profile

This graph shows the power consumption of an example product as tested in our lab. The test loop was started, and the TV was set up, two hours earlier. At the start of the graph, the TV is in sleep mode. It switches between DAM and sleep mode, returns to DAM for a longer period, returns to sleep mode for many hours, and returns to DAM for a few minutes about two hours before, and again shortly before the end of the 24 hour period. The DAM event at 17:15 is an internal activity of the TV host processor, unrelated to the EPG's operations, and its consumption should be subtracted if EPG usage is the focus of the test. The lines represent Watts and WattHours. Note that the WattHour reading was not reset after setup in this example, so the cumulative DAM WattHours are the highest reading minus the initial value $(46.7 - 18.3 = 28.4)$.

10.   Contact Information

For assistance with this test procedure, or to arrange for a copy of the test recording, please call or write to your representative at Rovi. If you do not have a current contact, send email to `epa_dam_test_support@rovicorp.com` to start the process.

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