APP NOTE

Dolby® MS11 with APx500 Series

Dolby® MS11 Compliance Testing with APx500 Series Audio Analyzers

Every device that bears a Dolby® logo is required to go through a compliance test process to ensure that it meets Dolby technical requirements and, ultimately, delivers a quality audio experience. Depending on the specific technology licensed, certifying the compliance of a device can involve hundreds of individual measurements. These measurements verify the correct behavior of a decoder including features such as bass management, dialog normalization, and bit exactness, as well as fundamental audio performance characteristics. For each licensed technology, Dolby defines the compliance requirements any licensee's device must satisfy.

Compliance Testing Requirements for Dolby Licensees

The Dolby brand represents the utmost in audio quality, and ensuring such quality when integrating Dolby technology into consumer and professional audio systems requires extensive compliance testing and reporting. The documentation covering the test requirements for any particular technology are considerable, detailing hundreds or thousands of specific measurements and test parameters a product must meet to achieve Dolby certification. And while Dolby does not prescribe a specific instrument, make, or model for performing the requisite tests, there are explicit requirements for providing measurement data and completing test reports, all of which are submitted to Dolby when seeking product certification.

Common Challenges

- Interpretation, and application, of Dolby test requirements can be time intensive.
- With hundreds or thousands of individual measurements, compliance testing can be very time consuming.
- High potential for human error due to the large number of steps. (e.g., selecting an incorrect transport stream)
- Manual collection of data to support the reporting process is time consuming.

More Efficient Testing

- If there is a problem area, just run that test rather than going through the entire sequence each time.
- Automate as much of the test as possible to ensure repeatability, reduce testing time, and lessen the risk of human error.
- Check compliance early and often, so that any necessary changes can be incorporated into the design at the earliest possible stage.

Technology-specific Test Solutions from AP

Audio Precision is an official Dolby Test Partner, working with Dolby to provide tools to support the implementation of their technologies and reduce compliance testing time from days to hours. AP instruments are referenced throughout Dolby certification manuals, and SDK-specific test software solutions developed by Audio Precision are available to Dolby licensees via the Dolby Customer Portal: *www.dolbycustomer.com*.

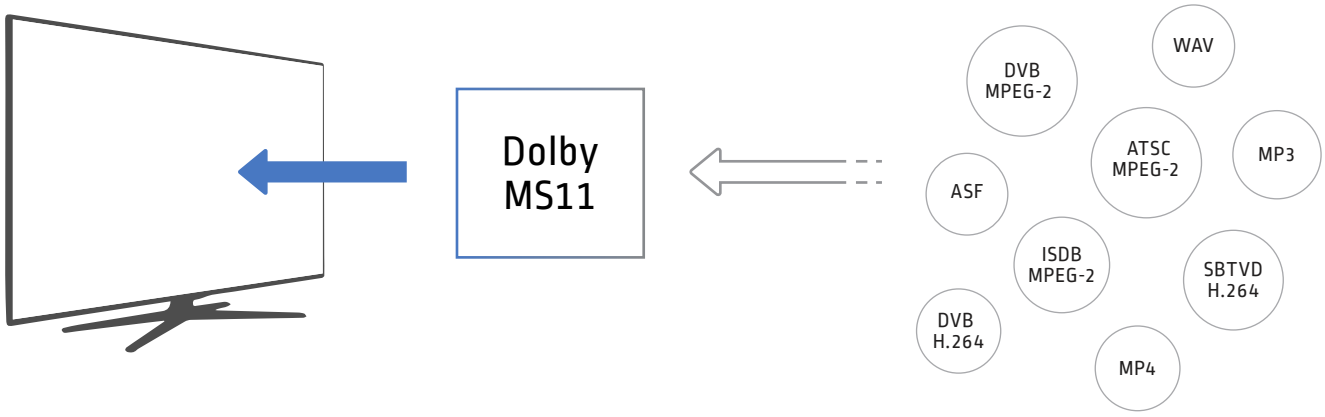
In collaboration with Dolby engineers, Audio Precision has developed APx-based test solutions, available to licensees as described above, to support both the Dolby Digital Plus™ Consumer Decoder SDK and the MS11 Multistream Decoder SDK. In the case of Dolby Digital Plus, compliance testing includes well over 1,200 individual measurements which, if performed manually, could easily take over a week.

The APx solution reduces that time to hours. More importantly, because APx generates the test sequence with all appropriate limits, there is no time wasted on recreating a test methodology or deciphering test requirements. Since Dolby MS11 also supports Dolby Digital Plus, this application note primarily focuses on the MS11 SDK test solution.

As noted above, Audio Precision's Dolby compliance test solutions are available exclusively from Dolby as part of the deliverables included in Dolby System Development Kits (SDKs) for specific technologies. These test packages are provided at no charge to Dolby licensees, but do require the appropriate APx Series audio analyzer to run (see list on page 6).

Dolby MS11 Multistream Decoder

As TVs and set-top boxes evolve into multipurpose digital media platforms, electronics manufacturers must navigate a wide variety of audio codecs while providing consumers a seamless entertainment experience. The Dolby MS11 Multistream Decoder is a comprehensive and cost-effective solution that reduces the complexity of integrating multiple audio technologies into new receivers and provides TV, set-top box, game console and TCP/IP-streaming device manufacturers with a single-package solution for decoding all premium broadcast audio formats.



MS11-compliant products can accept Dolby Digital Plus™, Dolby Digital, Dolby Pulse, and other AAC bitstreams as input. MS11 decodes the input bitstreams to produce PCM output and also transcodes or converts the input from its original format to the Dolby Digital format to support existing products that only contain the Dolby Digital decoders. The MS11 Decoder can pass through an encoded audio stream for decoding in other products, such as an audio/video receiver (AVR).

Products utilizing **Dolby MS11** technology can:

- Output surround-compatible, down-mixed pulse-code modulation (PCM)
- Feed a Dolby Digital stream to a downstream decoder
- Output multichannel PCM (direct or virtual)
- Support Audio Description (AD) services
- Playback multimedia files from local or remote file systems

Dolby MS11 also features Dolby Volume, so consumers enjoy consistent volume levels across programs and sources. Although Dolby metadata includes dialnorm parameters, many sources don't include Dolby metadata, so loudness levels may vary widely. Dolby Volume provides a solution that keeps viewers happy.

For more information on Dolby's MS11 Multistream Decoder, visit *www.dolby.com/us/en/professional/broadcast/products/dolby-ms11.html*

Audio Precision APx Software Controller and MS11 Test Solution

Detailed instructions for the installation, configuration, and use of the APx software controller and MS11 test solution are included in the files downloaded via Dolby's customer portal, but the remainder of this application note provides insight into AP's MS11 test solution for APx users and Dolby licensees (current or prospective).

Devices & Outputs Tested

Potential Devices Under Test (DUTs) include:

- Set-top boxes / DVRs
- Smart TVs
- Game consoles
- Media streamers / streaming platforms

Tested Outputs include:

- ARC
- S/PDIF
- HDMI
- Line
- Speaker
- Headphone

Downloadable Files

Dolby licensees have access to the following files to support the use of Audio Precision's MS11 test solution:

APx Controller & MS11 Test Solution

Listed on Dolby's SDK portal as *"MS11 Audio Precision Project Files for APx585 or APx525"*
(note: project files will also work on APx555, APx526, and APx586 audio analyzers)

Transport Streams

- ATSC MPEG-2 29.97 fps
  North America and South Korea
- DVB H.264 25 fps
  Europe
- DVB H.264 29.97 fps
  Cable and Satellite (South America)
- DVB MPEG-2 25 fps
  People's Republic of China and Hong Kong
- ISDB MPEG-2 29.97 fps
  Integrated Services Digital Broadcasting (Japan)
- SBTVD H.264 29.97 fps
  Brazilian Digital Television System (South America)

File-based Test Signals

- ASF
- MP3
- MP4
- WAV

Supported Instruments

For DUTs providing 5.1 or 7.1 analog outputs:

- APx585
  8 analog inputs
- APx586
  16 analog inputs

For DUTs providing only stereo analog outputs:

- APx555
  2 analog inputs
- APx525
  2 analog inputs
- APx526
  4 analog inputs

All of the audio analyzers listed above utilize a modular architecture that supports an optional HDMI module.

Digital I/O are standard for each of the above analyzers.

Requirements

APx Audio Analyzer	APx585, APx586, APx525, APx526, or APx555 audio analyzer [1, 2]
Light-to-Voltage Converter	Audio Precision LTV-1 Light-to-Voltage converter
APx500 Measurement Software	APx500 v4.0
Dolby System Development Kit	Dolby MS11 Multistream Decoder System Test Kit - Issue 4
Additional Equipment	Video monitor or TV for transport stream verification and test synchronization
Cables and Adapters	RCA phono plug to BNC cables or RCA-to-RCA cables with RCA-to-BNC adapters (qty. 6) Stereo phone plug split into two RCA's or BNCs (L&R) (qty. 1) HDMI cable (qty. 2) Optical cable (qty.1, optional) 8 Banana to DB25M (AP p/n CAB-DBXF, modified [3] – qty. 1, optional)

[1] The analyzer analog outputs (2 channels or 8 channels) are not used in this project.

[2] For DUTs that have Digital outputs, the DIO and/or HDMI hardware options are required. APx526 and APx585 instruments with a "Type M" chassis cannot be fitted with HDMI.

[3] The CAB-DBXF cable comes with XLR connectors. Remove the XLR connectors and replace with dual banana plugs.

Device Connections

Make a connection from the DUT output(s) to the APx analyzer input(s), using one of the methods described in the table below:

Connection Method	Cable	DUT Output	Analyzer Input / Signal Path
Digital Unbalanced	RCA-BNC	S/PDIF Out	Digital Unbalanced
Digital Optical	Optical	Digital Optical Out	Digital Optical
HDMI	HDMI	HDMI Out (or Source)	HDMI Sink
ARC	HDMI	ARC	ARC Rx
Analog Unbalanced (line level)	RCA-BNC	Analog Out [1]	Analog Unbalanced [1]
Analog Balanced (speaker level)	8-channel break-out cable, Banana to DB25 [2]	Speaker Out [1, 3]	Analog Balanced [1]
Headphones	Stereo phone plug split into two RCAs or BNCs	Headphone Out [1, 3]	Analog Unbalanced [1]

[1] See below for channel assignments.

[2] Some Broadcast Decoders only have a line level output for the LFE or Subwoofer. In this case, input 3 on the break-out cable should be terminated in an RCA connector and connected to the LFE or Subwoofer output.

[3] Connect dummy loads if instructed.

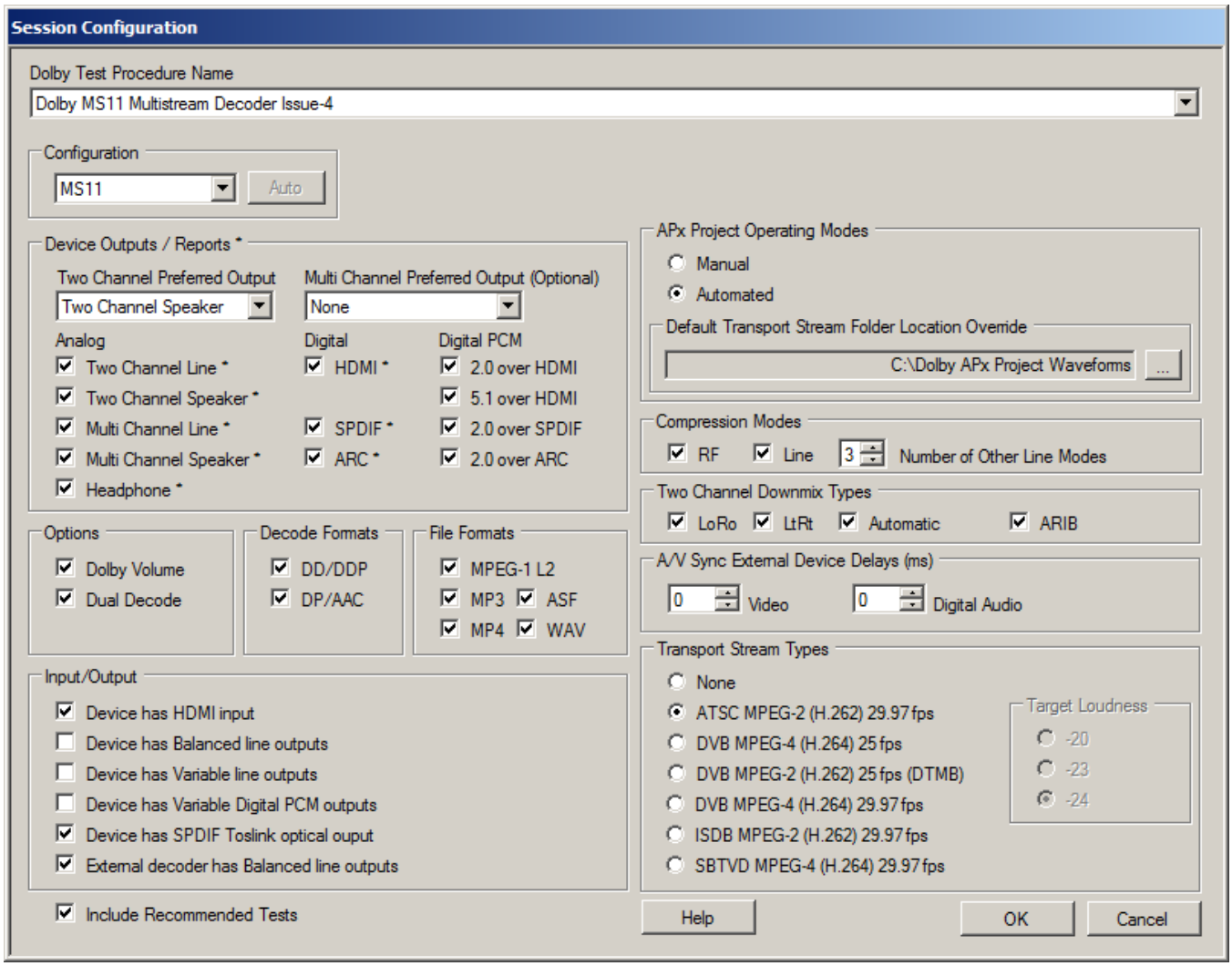
Channel Assignments

Input	1	2	3	4	5	6	7	8
Multistream Decoder Output	Left	Right	LFE	Center	Left Surround	Right Surround	Left Back	Right Back

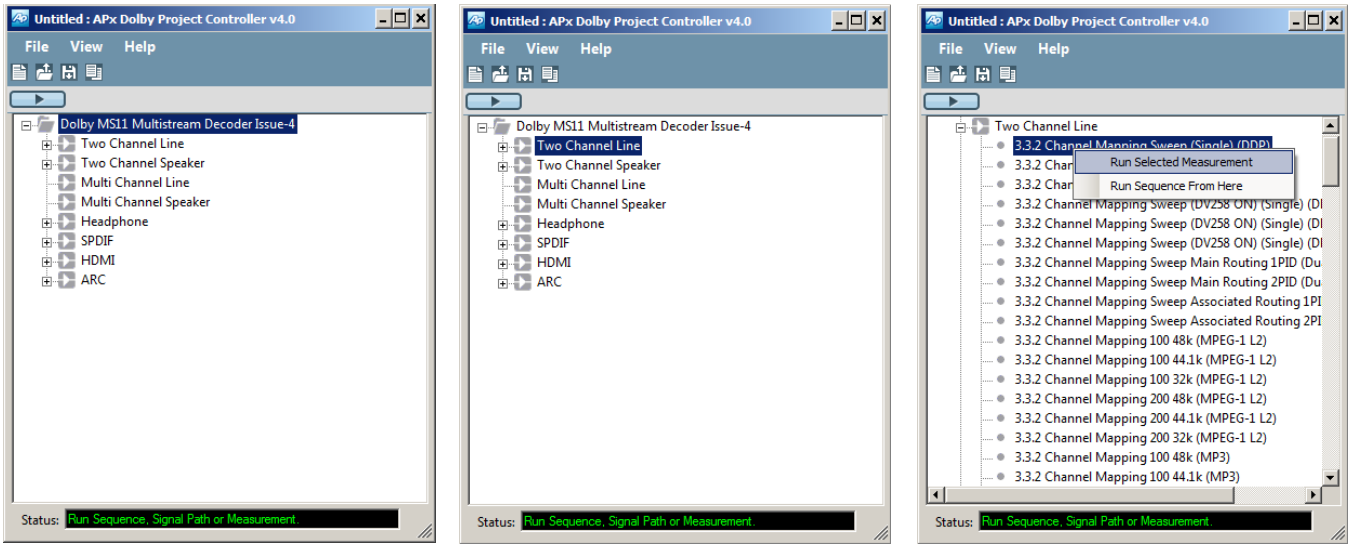
Configuration & Operation Overview

Once the requisite files have been downloaded, extracted and installed on the APx host PC, testing begins with double-clicking the APx4.0 Project Controller icon added to the PC desktop as part of the installation process. The test process, while potentially lengthy owing to the number of tests, is rather simple in its progression of *Create Session* → *Configure Session* → *Run Measurements*.

Upon selection of "New Session" from the controller's File menu, the user is presented with the Session Configuration window (shown below) and configures the settings to match the MS11 device's capabilities.



Once the desired configuration is set and acknowledged with ***OK***, the controller window will display a project tree, or navigator, populated with the required measurements, arranged by signal path (see left example below).

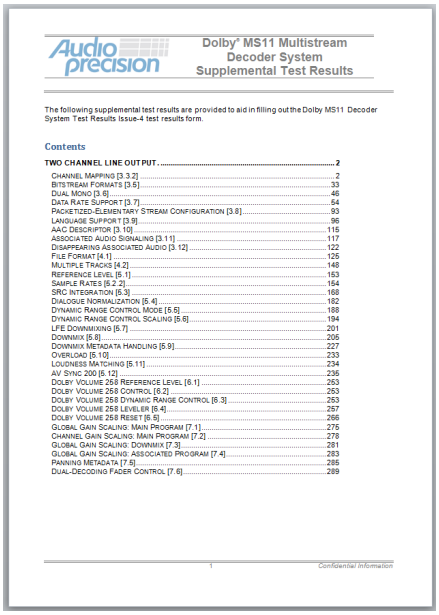


To run an entire test sequence, click the ***Start Sequence*** button (▶ symbol) located just above the navigator tree. To run a single section, such as "Two Channel Line," right click on the section name and choose ***Run Selected Signal Path*** in the navigator tree (see above middle). To run an individual measurement, right click on the measurement and choose ***Run Selected Measurement*** (see above right). You can also select Run Sequence From Here to start running measurements from the selected location. After selecting one of these options, the first measurement will begin and you will be presented with dialog prompts instructing you in the necessary steps to complete the measurement.

Reports

Reporting is an integral part of the Dolby certification process. The APx Controller & MS11 Test Solution includes templates for Dolby's reports and Supplemental Reports, with the former required when applying for certification and the latter providing the detailed measurement results used to complete Dolby's reports.

After making measurements, you can display Supplemental Reports (see examples below) at any time by selecting the appropriate report from the View/Supplemental menu or by clicking the View All Reports tool bar button in the navigator.



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Dolby® MS11 Multistream Decoder System Supplemental Test Results

The following supplemental test results are provided to aid in filling out the Dolby MS11 Decoder System Test Results Issue-4 test results form.

Contents

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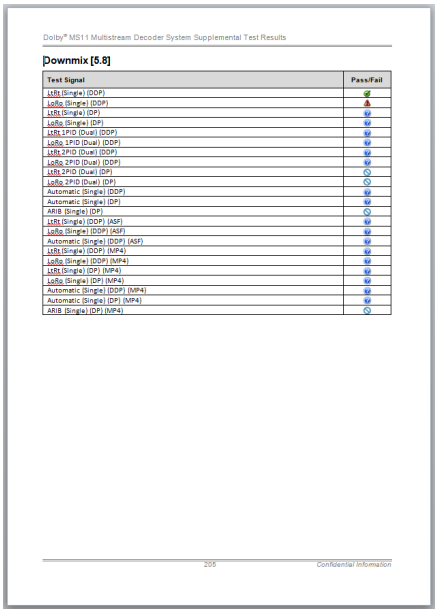

Dolby® MS11 Multistream Decoder System Supplemental Test Results

Downmix [5.8]

Test Signal	Pass/Fail
LtRt (Single) (DDP)	
LoRo (Single) (DDP)	
LtRt (Single) (DP)	
LoRo (Single) (DP)	
LtRt 1PID (Dual) (DDP)	
LoRo 1PID (Dual) (DDP)	
LtRt 2PID (Dual) (DDP)	
LoRo 2PID (Dual) (DDP)	
LtRt 2PID (Dual) (DP)	
LoRo 2PID (Dual) (DP)	
Automatic (Single) (DDP)	
Automatic (Single) (DP)	
ARIB (Single) (DP)	
LtRt (Single) (DDP) (ASF)	
LoRo (Single) (DDP) (ASF)	
Automatic (Single) (DDP) (ASF)	
LtRt (Single) (DDP) (MP4)	
LoRo (Single) (DDP) (MP4)	
LtRt (Single) (DP) (MP4)	
LoRo (Single) (DP) (MP4)	
Automatic (Single) (DDP) (MP4)	
Automatic (Single) (DP) (MP4)	
ARIB (Single) (DP) (MP4)	

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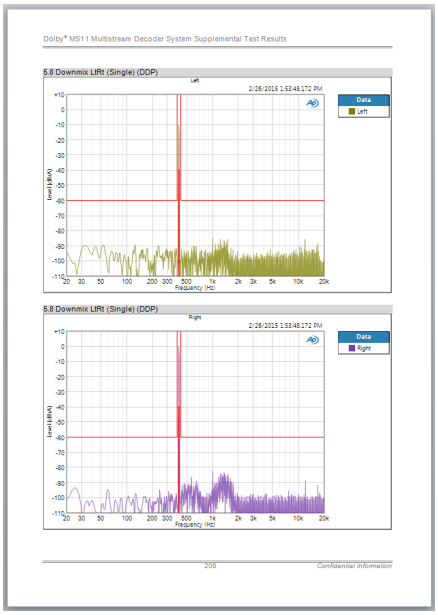

Dolby® MS11 Multistream Decoder System Supplemental Test Results

5.8 Downmix LtRt (Single) (DDP)

Left

2/26/2015 1:53:48.172 PM

Data

Left

(dBrA)

Frequency (Hz)

5.8 Downmix LtRt (Single) (DDP)

Right

2/26/2015 1:53:48.172 PM

Data

Right

(dBrA)

Frequency (Hz)

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Dolby reports are provided for convenience and can be displayed by selecting the appropriate report from the View/Dolby Reports menu selections. The Dolby reports do not contain any measurement results. Use data collected in the Supplemental Reports to fill in the information required in the Dolby reports.

The reports are created in Microsoft Word format and MS Word 2010 (or later) is required for report editing. For viewing the reports, a Word-compatible viewer is included as part of the APx controller and MS11 Test Solution installation.

Conclusion

Synonymous with highest-quality audio, the Dolby brand is valued by consumers, broadcasters, and equipment manufacturers worldwide. It therefore stands to reason that the compliance and certification of any product incorporating Dolby technology will require a rigorous process and detailed set of criteria. For MS11 Multistream Decoder compliance testing, Audio Precision has worked extensively with Dolby to develop a solution that supports the certification process while reducing testing time and complexity.

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