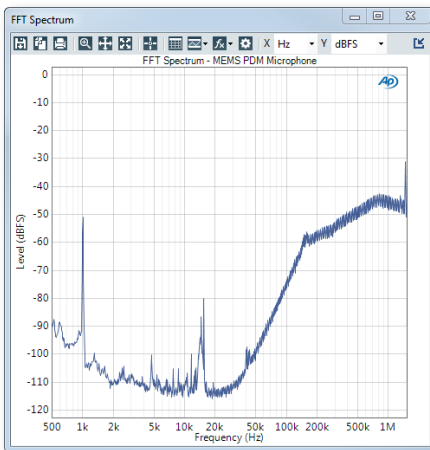


## KEY FEATURES

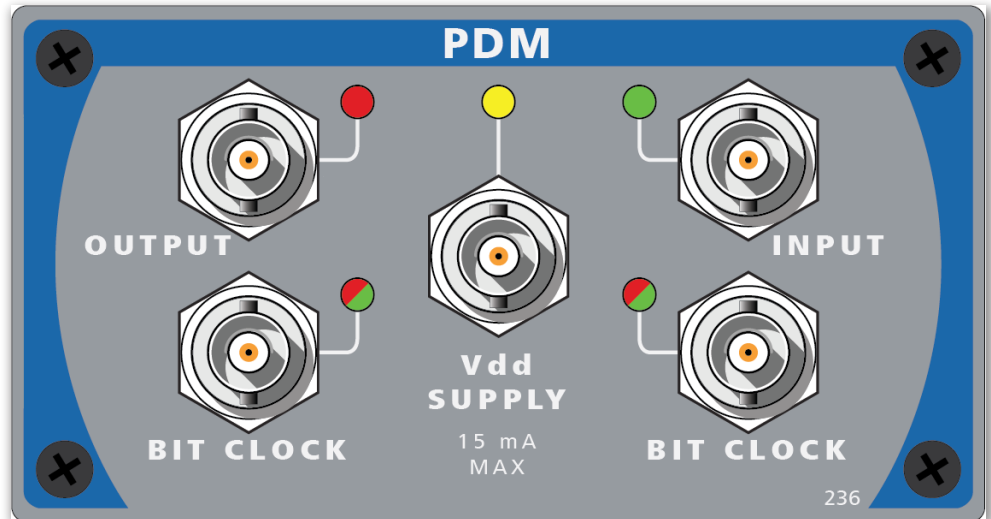
- Direct connectivity to any device with a PDM input or output
- Support of independent audio channels on rising and falling edges
- Selectable clock direction for both input and output
- Undecimated bitstream analysis for diagnostics
- Jitter generation and analysis capability when paired with the Advanced Master Clock (AMC) option
- Flexible interpolation and decimation ratios
- PDM data control code I/O
- 0.8 to 3.3 V logic levels
- 0.0 to 3.6 V Vdd supply
- Power Supply Rejection measurements with PSR Frequency Sweeps
- Compatible with APx555, AP52x and APx58x series



Output of actual MEMS PDM microphone captured by an APx analyzer, showing a 1 kHz test tone and the effects of noise shaping above the passband.

## PDM I/O OPTION for APx

A complete solution for PDM device and mobile product testing



### The APx PDM option

**PDM** (pulse density modulation) is a one-bit, high clock rate data stream used with MEMS (Micro-Electro-Mechanical System) digital microphones, class D amplifiers, and digital signal processors used extensively in mobile products such as smart phones, tablets, notebook PCs, and wearable devices. The PDM option allows APx500 series audio analyzers to connect directly to any device with a PDM input or output, enabling comprehensive testing of audio for the fast-moving mobile electronics industry.

In addition to all the standard audio measurements, the PDM interface provides jitter impairments and jitter measurements\*, a variable logic level down to 0.8 V, a variable Vdd DC supply voltage for MEMS device testing, variable sample rates, and a PSR measurement to test the device's full operating parameters. PDM (mono or stereo) can be selected for both the analyzer inputs and outputs simultaneously; alternatively, PDM as an input or output can be complemented with other available I/O formats. A special PDM bitstream mode permits analysis of the entire spectrum, bypassing the decimator.

### Designed with PDM amplifiers and MEMS microphones in mind

MEMS microphone designers can connect their device output directly to the PDM input, taking advantage of both an integral clock and device DC power availability. A special suite of acoustic response measurements makes MEMS transducer testing fast, easy, and efficient, even in non-anechoic environments.

Until recently, semiconductor R&D engineers working on new PDM class D amplifiers and decimators have had no PDMA reference signal solution. Now they can immediately put the APx PDM to work, generating modulated PDM bitstreams and sending them directly to their devices with no further conversion or hardware.

The built-in generator and jitter analyzer simplify jitter tolerance testing without external analysis equipment.

\*Requires Advanced Master Clock (AMC) option

## A Flexible PDM Modulator and Decimator

The APx PDM modulator provides a reference quality signal, embedding pristine audio from the APx generator. The flexible PDM input decimator simplifies direct audio measurements on PDM bitstreams.

### Bitstream Analysis

PDM-to-PCM converters can decimate the embedded audio for testing, but the PDM option also makes the raw bitstream available for FFT analysis, an invaluable diagnostic tool.

### PSR and PSR vs. Frequency

The MEMS device Vdd supply can be modulated with a sine wave or the standard GSM 217 Hz square wave. The APx software includes both PSR and PSR frequency sweep measurements; these can be used with analog MEMS microphones as well. A couple of clicks and you have PSR results.

### Jitter Tolerance Testing

The jitter generator and jitter analyzer provided with the Advance Master Clock option supports full PDM device jitter tolerance testing. Sweeps of jitter level and frequency may be performed to confirm proper device jitter tolerance for reliable use in circuits intended for noisy RF environments common to mobile phones and tablets.

### Additional PDM Options

Also available for PDM and MEMS mic array testing is the APx PDM 16 acquisition module. PDM 16 provides 16 acquisition channels and delivers simultaneous analysis of all 16 channels on a single screen. PDM 16 uses a remote pod and 2, 5, or 10 meter cables to support the acoustic test of mic arrays in anechoic chambers. For situations where both input and output PDM capability is needed, the PDM module can be used in conjunction with the PDM 16 to provide two channels of PDM output and up to 16 channels of PDM input.

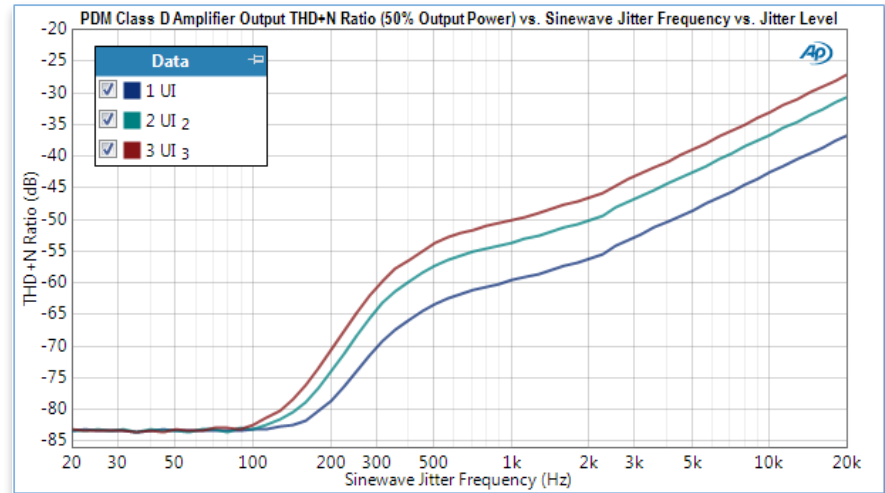


APx525 analyzer with PDM module, PDM 16 acquisition module, PDM 16 remote interface pod and 10-meter cable.

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APx525 2-channel analyzer shown with digital I/O, digital serial, PDM and Bluetooth options.



A test engineer measures the jitter tolerance of a PDM class D amplifier. If desired, the result can be added to a larger automated sequence of measurements and then output to a formatted MS Word document or a database.

## KEY SPECIFICATIONS

### AUDIO PERFORMANCE

- SNR**  
129 dB (1 kHz, BW, unwt'd, 256x oversampling, 4th order modulator)
- THD+N**  
-130 dB (1 kHz, BW, unwt'd, 256x oversampling, 4th order modulator)
- Dynamic Range**  
137 dB (AES 17, CCIR-RMS, 256x oversampling, 4th order modulator)
- Flatness**  
±0.001 dB (20 Hz to 20 kHz)
- Connectors**  
Output data, output clock, input data, input clock, external power (all via BNC)

### INTERFACE

- Sample rate range**  
4 kHz to 216 kHz
- Bit clock range**  
128 kHz to 24.576 MHz
- Oversampling Rate**  
32, 64, 128, 256
- Interface Logic Levels**  
0.8-3.3 V
- Edge Modes**  
Rising edge, 1 channel; Falling edge, 1 channel; Stereo (Both edges), 2 channels
- Vdd Output**  
0.0-3.6 V, 15 mA max

### JITTER PERFORMANCE

- Jitter Generator Waveforms**  
Sine, Square, White Noise
- Jitter Generator Frequency Range (FJ)**  
2 Hz to 200 kHz
- Jitter Generator Amplitude Range**  
0 to 1591 ns peak for FJ ≤ 20 kHz (Sine)  
0 to 40 ns peak (Square & Noise)
- System Residual Jitter**  
1.0 ns
- Jitter Measurement Range**  
0.0 to 650 ns, 50 Hz to 150 kHz
- Jitter Measurement Detection**  
RMS, Peak, or Average

- Modulator maximum input level**  
-0 dBFS
- Interpolation Ratios**  
33 ratios from x16 to x800
- Decimation Ratios**  
45 ratios from x1 to x800



Accredited by A2LA under ISO/IEC: 17025 for equipment calibration