Portable One
Audio Precision Quality in a Portable Test Set

Unmatched Portable Performance
Portable One: Unparalled Precision in a Portable Package

The Portable One family of audio test instruments—at home on the bench or rugged in the field.

With thousands of units sold, you’ll find the Portable One family of audio analyzers in operation around the world in maintenance, engineering and production facilities. Whether in broadcast, communications, bench or production use, Portable One offers a complete easy-to-use audio test set housed in a rugged case ready for almost anything. With twelve different measurement functions selectable at the push of a button, Portable One is comprehensive while remaining user-friendly. Its popularity is no less due to its outstanding performance specifications; yet Portable One is as affordable as lower-performing test sets.

Analog Only or full Dual Domain—Analog and Digital

The Portable One Plus Access

Portable One Plus Access includes comprehensive analog generation and measurement, with two outputs and two inputs. Easy-to-set-up sweep capability produces graphs of frequency response, distortion vs. frequency and even amplitude sweeps. Non-volatile storage of up to 30 tests allows easy one-button recall of your favorite test setup. Connect Portable One to a compatible printer and produce reports incorporating high-resolution graphs. If you work with digital audio, the Portable One Dual Domain® model adds AES3/SPDIF audio and interface measurement capabilities to the comprehensive analog capabilities of the Portable One family.

Unparalled Precision

| Low Distortion | Analog System THD+N 80 kHz BW \(-92\) dB
| Digital Distortion THD+N \(-140\) dB
| High Analog Bandwidth | Signal Generation to 120 kHz
| Low Noise | 22 Hz–22 kHz \(-114\) dBu
| A-weighted \(-118\) dBu
| Wide Input Voltage Range | Input Range 80 mV–250 V in 10 dB steps
| Flat Response | 20 Hz–20 kHz \(\pm 0.05\) dB
| Low Crosstalk | Input \(-120\) dB
| Output \(-110\) dB
| Low Jitter | Generator \(< 0.8\) ns
| Analyzer \(< 1.6\) ns

Analog+Digital+AES3/SPDIF: the Portable One Dual Domain

Portable One Dual Domain® is a comprehensive audio test set for both analog and digital audio, as well as for generation and measurement of AES3/SPDIF digital interface characteristics such as jitter. Like our 2700 Series family of instruments, Portable One Dual Domain features true dual domain architecture. Digital signals are generated and measured purely in the digital domain, resulting in the extremely low distortion and noise residuals necessary for making useful digital audio measurements.
Performance, Measurement Power, and Ease-of-Use

Easy to Use
Measurement functions are simply selected from the front panel. Just press a button and make the measurement. Selection of analog and digital inputs is clearly indicated on the front panel with LED legends. Portable One makes graphs of swept measurements in real time on the high contrast back-lit LCD display, including both frequency and amplitude sweeps. Hard copy high-resolution graphs, compact screen-sized graphs or tabular data listings can be made from your Portable One to laser or ink jet printers at the touch of a button. Bargraphs can display measurements ranging from AC mains power line distortion to digital interface error rate ... and nearly everything in between. Separate buttons and knobs provide independent control of frequency and amplitude. The buttons provide large and medium steps (decade and 1/3 octave steps for frequency, 10 dB and 1 dB for amplitude), with knobs for finer resolution. When not otherwise used, the setting knobs and buttons also provide a convenient human interface for scrolling display cursors and for entry of other settings and data.

Stereo:
Portable One Dual Domain is a true two channel instrument. Both analog and digital level functions measure both inputs simultaneously. Phase and level ratio measurements are also available.

Full Range of Analog & Digital Testing Facilities:
Portable One Dual Domain provides complete and parallel measurement capabilities for both analog and digital audio signals. Measurements common to both domains include: Amplitude, Noise, Level (2 channels simultaneously), Frequency, Phase, THD+N, SMPTE/DIN, IMD, Crosstalk and Level Ratio. Standard A-weighting, CCIR 468, and LP/HP filters are included in both domains. RMS and quasi-peak (CCIR 468) detectors are available in both domains.

Analog Performance:
The low distortion transformer-coupled analog generator supplies a full 30.17 dBu (+29.6 dBm into 600 Ω) at selectable (40 Ω, 150 Ω or 600 Ω) source impedances. Extremely low analyzer noise and residual distortion support measurement of high performance digital devices.

Analog Convenience Functions:
In addition to the above measurements, the analog GEN LOAD function measures the input resistance of your device at any frequency you choose and makes swept impedance measurements (including loudspeakers). AC MAINS CHECK measures the voltage, frequency and distortion of the power line without hazardous direct connections. BARGRAPH display in AC MAINS CHECK function provides a visible history of maximum and minimum mains voltage excursions.

The dBg unit (dB referred to the present analog generator amplitude) is useful for compression threshold measurements or rapid response sweeps at several different absolute levels, as well as for input to output gain/loss measurements.

600 Ω Analog Input Terminations are individually switchable for each channel of the analog analyzer.
Comprehensive Analog and Digital Functions

Digital Performance:
Portable One Dual Domain uses a true DSP-implemented analyzer for digital measurements, which results in -130 dB residual THD+N, 0.01 dB flatness, and -140 dBFS residual noise. Other mixed-signal test sets in the same price range have no digital analyzer, but use a D/A converter and an analog analyzer. These architectures “bottom out” at -70 dB to -84 dB residual THD+N (12–14 bit effective performance), and 0.1 dB flatness. With today’s best A/D converters measuring -108 dB to -112 dB THD+N, their real performance is invisible to these mixed signal analyzers ...buried under the analyzer’s noise and distortion floor.

Separate & Independent Analog & Digital Generators:
Often necessary for dual domain testing. You may, for example, drive the inputs of an A/D converter with the low-distortion analog sine while simultaneously driving the converter’s digital reference (house sync) input with the digital generator. Then, add jitter or vary the sample rate to see the effect on THD+N, IMD, or noise. Competitive units can drive only one domain at a time or use their analog generator to create the digital jitter, and thus can’t make this measurement at all.

Separate Digital Inputs & Outputs:
Three I/O formats: XLR, BNC, and optical (Toslink®). All are completely separate from the analog audio XLR connectors, permitting both digital and analog generators to operate simultaneously. No cable changes required to go from A/D to D/A to D/D to A/A testing of a digital tape machine, for example.

Digital & Analog Monitors:
Listen to all measurements in the digital and analog domains over the internal loudspeaker or a pair of headphones. In the analog domain, monitor signals or distortion. In the digital domain, the incoming signal, distortion, or jitter can all be monitored.

Jitter Meter:
Portable One Dual Domain includes jitter measurement in nanoseconds or in Unit Intervals. Two filter selections are provided for the jitter meter: a 700 Hz high-pass filter used for residual jitter measurements according to AES standards, and a 50 Hz high-pass filter for jitter response measurements.

Other Interface Signal Measurements:
Portable One Dual Domain measures key digital I/O interface parameters in addition to jitter, including sample rate, AES signal voltage, frame delay through the device under test, and delay of the input signal relative to a house sync reference (frame or block).

Flexible Interface Impairment Simulation:
Flexible digital interface testing is vital for troubleshooting and verifying performance of digital audio at the systems level. Portable One Dual Domain allows simulation of real world transmission and interface problems.

A competitive instrument lacking a DSP analyzer produces false THD+N readings (red trace) from a popular A/D converter; but both the Portable One Dual Domain and the Audio Precision 2700 Series graph the true performance of the converter (from 5 dB to 28 dB lower), as shown by the blue trace.
Injected jitter frequency can be set from 10 Hz to 38.8 kHz, not just to a fixed frequency. Adjust output signal amplitude continuously from zero to 5.12 Volts in 5 mV increments, not just at a few steps. Only the Portable One Dual Domain provides this flexibility in a portable analyzer.

Independent Interface I/O Word Lengths:
Word length (resolution) of digital input and output are independently set from 16 to 24 bits. Output resolution is set to match the device under test to assure proper dither. Input resolution must be set to exclude signal in the AUX bits or other low-level bit activity meaningless to the desired measurement.

Independent Input & Output Sample Rates:
Lets you test sample rate converters. Measurement of the incoming embedded audio signal can be referred to the incoming sample rate, status byte indication of rate, or the outgoing generator rate.

Data Error Testing Capability for Digital Audio Signals:
Stimulate the test device with random data and display current or totaled error measurements on both channels. The signal and analysis techniques are compatible with the BITTEST feature of our System products, so you can test a transmission link end-to-end with a Portable One Dual Domain at one end and a System Two, Cascade or 2700 Series dual domain instrument at the other.

Other Digital Convenience Functions:
Digital Status bytes are displayed and set in high-level English.

Digital Dither:
Portable One Dual Domain includes a full complement of dither selections—triangular and rectangular probability distribution functions; white or shaped spectrum.

Dither amplitude is automatically set to the proper value for the output word length and the selected probability function.

Sample & Frame Sync:
Synchronize Portable One Dual Domain sample and frame sync to the digital reference (house sync) input.

Digital Pass Mode:
Sends the input digital audio content to the output while modifying status bytes, validity bit, etc. Portable One Dual Domain can thus be used as a problem-solver between incompatible equipment.

Signal Monitoring Outputs:
A digital signal appropriate for syncing an external oscilloscope may be derived from the input sample rate, output sample rate, input block rate, output block rate, digital audio waveform, jitter signal, or the detected interface errors. A buffered version of the balanced AES3 signal from the XLR input is also available, which coupled with the high input impedance of the XLR in bridging mode allows non-intrusive digital line measurements with conventional ground-referenced oscilloscopes.
Save your test setups—with measured data and print reports

**Save & Recall Tests:**
Save 30 instrument setups, including sweep results data, time-stamped from the internal clock calendar. Use for repeatable, easy bench and production testing or when in the field, for storing test data to be printed or analyzed later. Each saved test includes all settings for the entire instrument, a default description or your own title for the test, the date and time, and the last test sweep result data.

**Print Graphs And Test Results:**
Portable One prints graphs, panel setups and measured data either to laser (PCL compatible) or inkjet printers. Front panel keys select two sizes of graph output (including cursor data), tabular sweep data, bargraphs and front panels for printing.

For a quick print, a compact graph provides a direct replication of the LCD screen. A larger graph printout covering approximately half a page (360x280 pixels with grid lines) allows finer detail to be shown. Both graphs show key instrument setup parameters as well. Tabular data values for all swept points may be printed in order to preserve exact reading values.

The bargraph displays, with their useful minimum/maximum indicators print just as they are seen on the display, as do any desired instrument panels. Various printouts may be combined on one page, to include graphs, bargraphs and numeric data.

**INTERNAL CLOCK/CALENDAR:**
An internal clock/calendar automatically stamps the time and date on setups and data as they are saved.

<table>
<thead>
<tr>
<th>PRINTER</th>
<th>97 10 18</th>
<th>FREQ</th>
<th>1.0000 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCL GRAPH</td>
<td>INVERT DISPLAY</td>
<td>AMPL STEP</td>
<td></td>
</tr>
<tr>
<td>00:22</td>
<td>97:10:17:22</td>
<td>100.0 mV</td>
<td></td>
</tr>
</tbody>
</table>

You can view or set the clock/calendar from the Setup panel.

**GPIB Control:**
An IEEE-488 Interface is built in to allow control of the instrument in an automatic test environment. National Instruments LabWindows/CVI and LabVIEW drivers are available. A LabWindows/CVI soft front panel program is provided with a Windows user interface for real-time instrument control through the GPIB interface. The LabVIEW driver is provided with a Getting Started VI and sample VIs.
**ANALOG SIGNAL OUTPUTS**

**Low Distortion Sine Wave**

- Frequency Range: 10 Hz to 120 kHz
- Frequency Accuracy: ±0.05 %
- Amplitude Range
  - Balanced: +20 dB to 30 kHz
  - Unbalanced: +20 dB to 30 kHz
- Amplitude Accuracy: ±0.2 dB at 1 kHz
- Frequency Resolution: 0.01 dB

**Square Wave**

- Frequency Range: 20–30 kHz
- Duty Cycle: 50%, 75%, 90%, 100%
- Amplitude: ±100 mV to ±10 V
- Rise/Fall Time: Typical 2.5–3.0 µs

**SMpte (or DIN) Test Signals with option “P1-IMD”**

- LF Tone: 50, 70, 100, or 250 Hz
- HF Tone: 20 Hz to 120 kHz
- Accuracy: ±0.0025 % ±2.5 µV

**DIGITAL SIGNAL GENERATOR**

**DIGITAL OUTPUT CHARACTERISTICS**

- Output Formats
  - AES/EBU (per AES-392-1992)
  - SPDIF–EIAJ: Optical
- Sample Rates
  - 28.8 kHz to 99.9999 kHz
- Sample Rate Accuracy: ±0.002 % ±20 ppm
- Distortion Ratio: ≤0.001 %

**Sine Wave**

- Frequency Range: 10 Hz to 70 kHz
- Accuracy: ±100 mV to ±10 V
- Flatness: ±0.05 dB at 1 kHz

**SINE/DIN IMD Waveform with option “P1-IMD”**

- Upper Frequency Range: Choice of 7 kHz or 8 kHz
- Lower Frequency Range: Choice of 60 Hz, 60 Hz, 1 kHz, 1 kHz
- Clock Stability: 0.00001 % ±1 dB
- Random Generator waveform

**AES/EBU INTERFACE GENERATION**

- Interface Signal
- Amplitude Range: Balanced (differential)
- Channel Status Bits
- Validity Flag
- AES/EBU Impairments
- Induced Jitter
- Jitter Amplitude
- Jitter Phase
- Jitter Jitter
- Jitter Pattern
- REFERENCE INPUT CHARACTERISTICS

**DIGITAL ANALYZER**

**DIGITAL INPUT CHARACTERISTICS**

- Input Formats
  - AES/EBU (per AES-392-1992)
  - SPDIF–EIAJ: Optical
- Sample Rates
  - 28.8 kHz to 99.9999 kHz

**WAVEFORMER**

- Waveform Compatible with Audio Precision BITTEST
- Other (all waveforms)
  - Probability Distribution
  - Spectral distribution
  - Flatness
  - Amplitude

**AES/EBU IMPAIRMENTS**

- Lower Tone Range: Choice of 50 Hz, 60 Hz, 70 Hz, or 250 Hz
- Upper Tone Range: Choice of 7 kHz or 8 kHz
- Residual Distortion: ±0.00001 % ±140 dB

**SMpte (or DIN) Function with option “P1-IMD”**

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An extra pocket stores documentation and cables.

Portable One Dual Domain Block Diagram

**Analog Performance:** Does the instrument have an analog hardware analyzer? Some competitive units (at twice the price of Portable One Dual Domain) use DSP techniques for all analog and digital signals, not just jitter rejection. Without independent, real-time (DSP-implemented) digital do-

**True Dual Domain:** True Dual Domain analyzers, you can measure jitter generation and analysis, so analog and digital signals, not just digital-to-analog (DAC) converters inside audio devices.

**Digital Architecture and Features:**

- **12-bit digital audio around to measure THD+N:** –0.2 dB—inadequate for most modern audio devices.
- **24-bit digital audio:** Only provide analog or digital output at any one time, you can test a full range of analysis capabilities in both analog and digital domains. Even (Intermodulation Distortion), Phase, and Crosstalk are available for both analog and digital domains.
- **224-bit (Intermodulation Distortion), Phase, and Crosstalk are available for both analog and digital domains.