

PORTABLE ONE DUAL DOMAIN

Audio
precision
PORTABLE ONE
Dual Domain TD

INPUT READING
ANALYZER SIGNAL
MONITORS

ANALOG DIGITAL
TRIGGER SIGNALS

REFERENCE
INPUT

BAL
DIGITAL OUTPUT

BAL
DIGITAL INPUT



True Dual Domain Audio Testing in a Portable Package

- Comprehensive analog audio analyzer
- True digital domain analyzer with -140 dB residual noise
- Independent analog & digital audio generators and analyzers
- Generate and measure interface jitter
- Digital interface analyzer
- View AES/EBU status bits
- Internal save and recall of 30 test setups
- Loudspeaker monitor for digital & analog audio signals

Audio
precision





ANALOG + DIGITAL + AES/EBU/IEC:

Portable One Dual Domain® is a comprehensive audio test set for both analog and digital audio, as well as for generation and measurement of AES/EBU/IEC digital characteristics such as jitter. Like our System One and System Two products, Portable One Dual Domain features true Dual Domain architecture. Digital signals are generated and measured purely in the digital domain, resulting in the -130 dB distortion and -140 dB noise residuals necessary for making useful digital audio measurements.

RUGGED, PROVEN TECHNOLOGY:

Portable One Dual Domain is designed for field or lab use. As the newest addition to the Portable One family it draws on packaging, performance and user interface technology proven in thousands of Portable One and Portable One Plus units, and digital measurement technology from thousands more System One and System Two units in use worldwide.

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 Dual Domain 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 are made from Portable One Dual Domain to laser,

ink jet or dot matrix printers at the touch of a button. Bargraphs can display measurements ranging from AC mains frequency 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 30.6 dBu (+30 dBm into 600 ohms) at selecta-

ble (40,150,600Ω) 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 ohm Analog Input Terminations are individually switchable for each channel of the analog analyzer.



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 to -84 dB residual THD + N (12-14 bit effective performance), and 0.1 dB flatness. With today's best A/D converters measuring -104 to -108 dB THD + N, their real performance is invisible to these mixed signal analyzers ... buried under the analyzer's noise and distortion floor.

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Save/Recall

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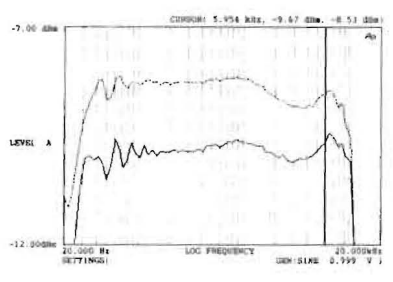
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2 YOUR TEST 970903 16:12
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Save/Recall Panel

SAVE & RECALL TESTS:
 Save 30 instrument setups, including 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 result data.

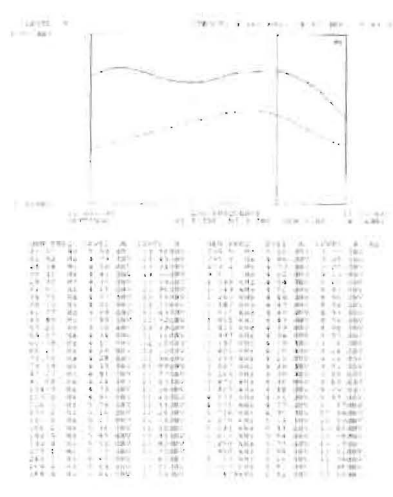


Portable One Dual Domain prints graphs, panel setups and measured data either to laser (PCL compatible), inkjet or dot matrix (PCL or IBM Graphics mode) printers. Front panel keys select two sizes of graph output (including cursor data), tabular sweep data, bargraphs and front panels for printing.

Ordering Information	
Description	Order number
Portable One Dual Domain	P1DD
Intermodulation Distortion Option	P1-IMD
Soft Carrying Case option	P-CAS
Additional Portable One Dual Domain User's Manual	MAN-P1DD
Set of four XLR male/female to RCA/BNC (unbal) cables	CAB-XBR
Set of two special AES/EBU cables for digital connections; available 2 or 4 meter lengths	CAB-AES2 CAB-AES4
Optional noise-weighting, band limiting and de-emphasis filters	See price list
Existing Portable One Plus units with serial numbers above 20,000 may be upgraded either to Access or Dual Domain versions. Please contact Audio Precision for Information.	
GPIB Interface (P1DD-48B) for Portable One Dual Domain is under development.	

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 time & date stamps saved setups & data.

The new **SAVE/RECALL, PRINTED OUTPUT** improvements, **INTERNAL CLOCK CALENDAR** and **600 ohm ANALOG INPUT TERMINATION** features are all also available in a new model analog-only Portable One, the **Portable One Plus Access**.

BUYING A PORTABLE ANALYZER FOR ANALOG AND DIGITAL AUDIO:

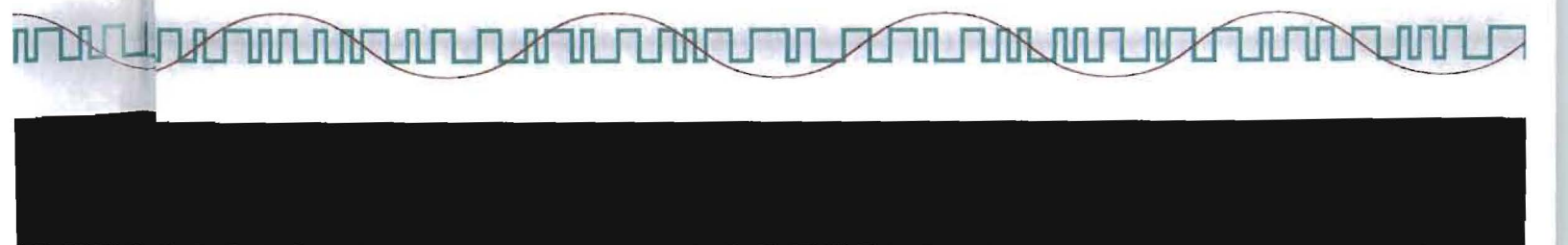
What to look for when evaluating competitive instruments

Digital Architecture and Features:
 Not all analyzers that accept a digital input signal are actually digital analyzers. Does the instrument have a real (DSP-implemented) digital domain analyzer, or just a D/A converter from the digital input connector to an analog hardware analyzer? This latter approach in a competitive unit yields distortion performance in the 12-14 bit range (-70 to -85 dB THD + N, for example). There's just not that much 12-bit digital audio around to measure anymore. Portable One Dual Domain's digital analyzer guarantees -130 dB residual distortion (nearly 22 bit performance), far in excess of the -105 to -108 dB actual linearity of today's best A/D converters.

Analog Performance: Does the instrument have an analog hardware generator and an analog hardware analyzer? Some competitive units (at twice the price of Portable One Dual Domain) use DSP techniques for all generation and analysis, so analog signals pass through converters inside the instrument. The result is THD + N as high as -79 dB, flatness as poor as -0.2 dB — inadequate for most modern audio devices.

Interface Testing: Does the instrument have independent analog, digital, and jitter generators? If it can only provide analog or digital output at any one time, you can't test a house-synchronized A/D converter for jitter rejection. Without independent, flexible digital audio and jitter generators, you can't measure jitter sensitivity of a D/A converter at various audio and jitter frequency combinations.

True Dual Domain: True Dual Domain hardware by definition guarantees a full range of analysis capabilities in both analog and digital domains. Everyone measures level and some measure THD + N (although implemented with extremely limited performance, as noted above). Be sure that other useful measurements such as IMD (Intermodulation Distortion), Phase, and Crosstalk are available for both analog and digital signals, not just analog.



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Extensive digital audio and interface facilities are represented on the panels at right. The digital domain generator panels shown at upper right control sample rate, digital audio and jitter generation.

D:RATE	BNC HiZ	DELAY
48000.0 Hz	0.69 Vpp	260.72 UI
D:GEN: SINE	-60.00 dB _{rms}	1.0001 kHz
REF: MEAS	INP: 24bit	OUT: BLOCK

Digital I/O Panel

SAMPLE RATE GENERATOR		
D:RATE	48000.0 Hz	5.00 Vpp 0 UI
SYNC: +REF		

Sample Rate Generator Panel

D:SEND: CONS	EMPH: NONE	SR: 32 kHz
D:INP: CONS	EMPH: NONE	SR: 32kHz
COPY: NO	NO ERRORS	
COPY: NO	VALID	

Status Bytes Display

DIGITAL AUDIO GENERATOR		
D:GEN: SINE	-60.00 dB _{rms}	1.0001 kHz
DITH: NONE OUT: 24bit		

Digital Generator Panel

D:JITTER G	BNC HiZ G	FREQ G
1.000 UI	4.00 Vpp	5.011 kHz
D:JIT: SINE	1.000 UI	5.011 kHz
RMS		HP: 700 Hz

Jitter Analyzer

D:LEVEL GB	LEVEL GA	FREQ GB
-3.00 dB _{rms}	-3.00 dB _{rms}	1.0001 kHz
-140.0 dB _{rms} 0.00 dB _{rms}		

Stereo Digital Level with Bargraph

JITTER GENERATOR		
D:JIT: SINE	1.000 UI	5.011 kHz

Digital Jitter Generator Panel

D:ERROR GA	ERROR GB	DATA GB
1567587T	1567266T	B71CD2hex
10T		1000000T

Data Error Display

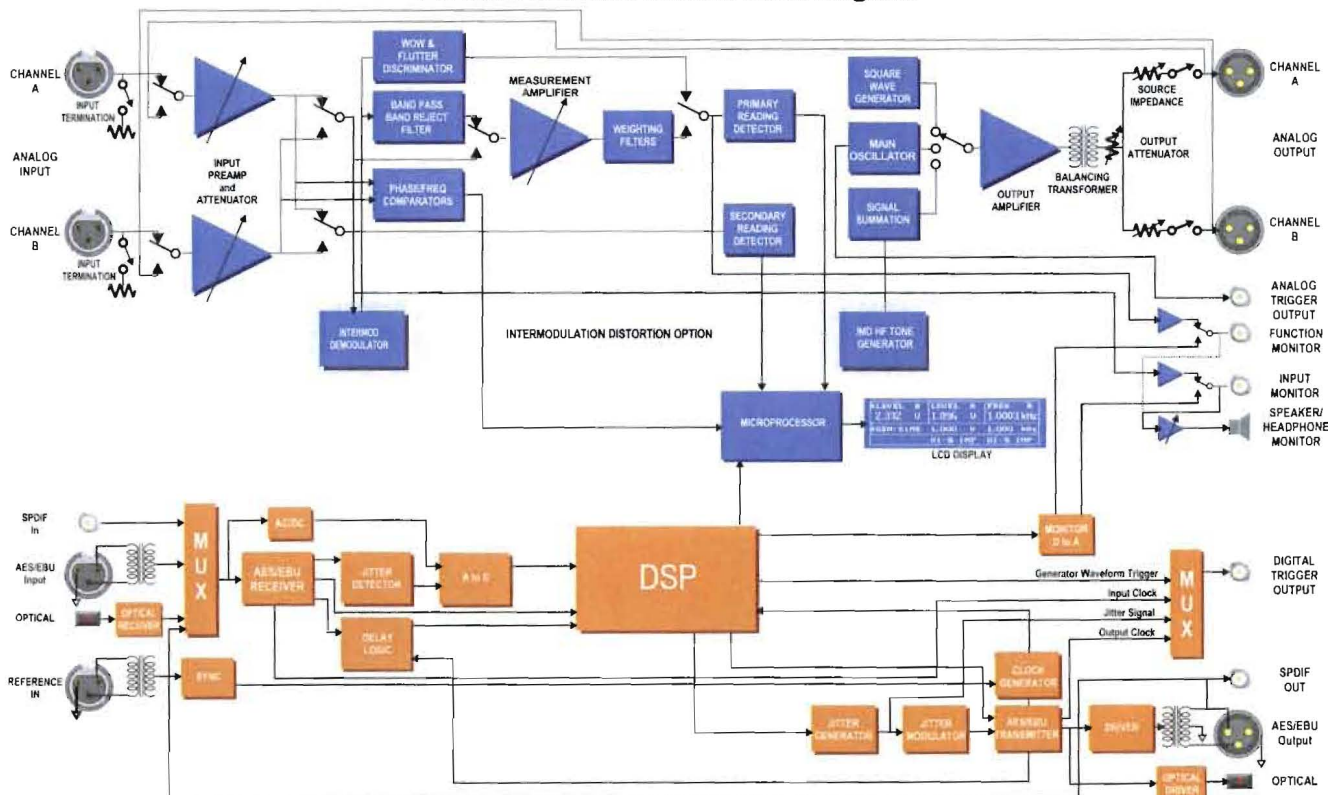
D:THD+N GB	LEVEL GB	AUTO-T GB
-131.4 dB	-3.00 dB _{rms}	1.0001 kHz
-160.0 dB -80.00 dB		

Digital THD + N

PRINTER	97 09 04	FREQ STEP
IBM GRAPH	11:02:44	ISO
D:TRIG OUT	INVERT	AMPL STEP
REF FRAME	DISPLAY	1dB/ISO

Setup Panel with Clock/Calendar

Portable One Dual Domain Block Diagram



incoming signal, distortion, or jitter can all be monitored.

JITTER METER: Portable One Dual Domain includes jitter measurement in nanoseconds or Unit Intervals and with a choice of 50Hz or 700 Hz high pass filters.

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:

Vary the digital output signal to test the acceptance range of your digital devices. Set sample rate anywhere from 28.8 to 52.8 kHz, not just at the three standard frequencies. Inject jitter amplitude from zero to 2.5 UI (415 nanoseconds at 48 kHz) in 0.01 UI (1.6 ns) steps or zero to 25.5 UI (4150 ns) in 0.1 UI (16 ns) steps. 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 Portable One Dual Domain provides this flexibility in a Portable analyzer.

INDEPENDENT INTERFACE I/O WORD WIDTHS: Word width of digital input & output are independently settable from 12 to 24 bits. Output width is set to match the device under test to assure proper dither. Input width 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.

D:ERROR	GA	ERROR	GB	DATA	GA
	0T		0T	B5394Bhex	
D-GEN: RAND					
24	16	8	ACTUALBIT		

Digital Data ✓ with actual bit display

The signal and analysis technique are compatible with the BITTEST feature of System One, so you can test a transmission link end-to-end with a Portable One Dual Domain at one end and a System One Dual Domain at the other.

OTHER DIGITAL CONVENIENCE FUNCTIONS

Digital Status bytes are displayed and set in high-level English.

Error flag displays for confidence, lock, coding, parity errors and the validity bit are included.

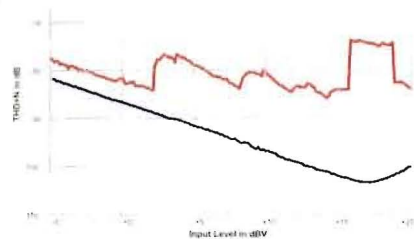
Additional active bit and actual bit displays on the panel help determine the word width of the incoming signal & detect stuck bits.

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 width 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 synchronizing 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 AES/EBU 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.



Competitive analyzer lacking DSP analyzer produces false THD + N readings (red trace) from a popular A/D converter. Both Portable One Dual Domain and System Two Dual Domain graph the true performance of the converter (from 5 dB to 28 dB lower), as represented by the trace in blue.

SEPARATE AND 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 MONITOR:

Listen to all measurements in the digital and analog domains over the internal loudspeaker or a pair of headphones. In analog domain, monitor signals or distortion. In digital domain, the

Extensive facilities a panels at generator right cont audio and

D:JITTER
1.000
D:JIT:SI
RMS

Jitter Analy

D:ERROR
156751

Data Error

CHANNEL A
INPUT TERMINA

ANALOG INPUT

CHANNEL B
INPUT TERMINA

SPDIF In

AES/EBU Input

OPTICAL

REFERENCE IN



