

# test equipment

The BCD Jitterbug is an ingenious little AES signal tester, with a partnering AES signal generator called the Humbug. Hugh Robjohns MIBS checks out these intriguing devices.

**B**CD Audio introduced the Jitterbug to an ever-expanding collection of useful 'black boxes' four years ago. This remarkably compact unit provides a range of useful testing and debugging facilities to assist installers and maintenance engineers working with AES signals. Functions include displays of sampling frequency, AES voltage levels, jitter, status flags and error messages, and audio levels. It can be used in a stand-alone mode, or linked to a PC running bespoke configuration and measurement software.

Partnering the Jitterbug is the Humbug, a digital signal generator which can be used to produce a range of test tones, sweeps, test sequences and channel status information. Again, although it can be operated in a stand-alone mode, the Humbug becomes far more powerful and flexible when remotely controlled through the same software program as the Jitterbug.

## jitterbug

The extruded metal case measures 92x49x106mm (whd) and the plastic end collars afford some protection to the front panel push buttons and rear panel connectors. The rear panel carries an input XLR for balanced AES signals, plus a phono socket for S/PDIF or an external wordclock input (via a phono-BNC adapter). A 3.5mm socket provides a decoded audio output for headphones or an external monitor, and a coaxial socket accepts 8-30V DC power (a 12V 'wall wart' PSU is provided). Finally, a 9-pin D-sub connector provides an RS232 link to a PC, permitting remote control and



## DIGITAL AUDIO TESTING



displays using the supplied software. Although the phono socket is located very close to the power inlet, I didn't have any problems in practice, even when using the large Neutrik phono plugs.

The front panel is dominated by a centrally mounted green alphanumeric LED display, and the unit's operation is controlled through three pairs of coloured push buttons. The lower of the two red buttons on the left selects the input source (the XLR or phono socket for AES and S/PDIF, respectively), while the upper button switches the appropriate line termination across the input. When the termination state is changed the unit also measures and displays the source impedance of the connected line.

There are two grey buttons above the display and the first of these configures the audio monitoring between left channel, stereo, right channel or summed mono. The selected channel(s) are reproduced through an internal mono speaker, although this is disabled when stereo headphones are plugged into the 3.5mm socket on the rear

panel. This output can also be used to feed an oscilloscope or audio test set. The right hand grey button is labelled 'Menu Go' and is used to activate the currently displayed menu function - starting the selected test or toggling between different modes. The two yellow buttons to the right of the display operate as Up/Down buttons and are used to cycle through the various menu pages as well as to adjust the audio monitoring level (from -31 to 0dB).

The menu structure has eight pages, starting with the monitoring level and channel selection. Next is a sample frequency measurement page which displays the rate to four decimal places (anything between 2Hz and 7MHz, accurate to 2Hz), with automatic updates every five seconds. Pressing the Go button again forces a re-test of sample rate. The third menu is the Time/Jitter page in which the time interval between samples is measured and any variation displayed in nanoseconds. An alternative mode shows the actual elapsed time period between samples. The resolution here is 2ns and although the



figure doesn't translate directly to the jitter figures often published by product manufacturers, a smaller number still means a better interface!

The AC levels menu allows the peak-to-peak AES carrier voltage to be measured. If the XLR input is selected the common mode voltage can be measured too. The

0.1dB resolution is available using the software display. There is also an AES Status bits display, and the PC software can access all of these graphics, often with more detail or alternative views. For example, the Status bits can be shown as raw hexadecimal data or in a more human-readable form.

### Humbug

next menu page concerns an AES error log. Pressing the Go button starts the log which tests the signal for lock, confidence, parity and validity. The first error is displayed automatically, and if hooked up to a PC a full list can be studied, with each error event time-stamped.

Additional menu pages concern other aspects of the AES signal, including an active data display, a bar graph level meter (with a numeric readout as an alternative). The Jitterbug shows levels

The Humbug is packaged in the same type of extruded case, and features very similar front and rear panels. The connections comprise an AES output on XLR, the same coaxial DC power inlet, a 9-pin RS232 socket, and another phono socket. The last provides a local wordclock output when the unit is operating from its internal clock, and accepts an external wordclock reference can be connected via the 9-pin socket, if required.

The front panel is almost identical to the Jitterbug, but for the addition of a third grey button above the display window and a red LED display instead of a green one. The default display shows the output audio level, which output channels are active, and the audio frequency. The two red buttons to the left adjust the audio level between zero and -99dBfs (in 1dB steps), with a preset level at -18dBfs recalled by pressing both up/down level buttons together. The two yellow buttons on the right hand side adjust the audio frequency between 2Hz and 20kHz, with a preset at 1kHz (by pressing both frequency buttons together).

There are no menus to navigate, but the three grey buttons (plus the two yellow ones) are all dual function. The first two grey buttons mute the left and right audio channels by default. The third button

### Software Control

The Jitterbug and Humbug connect to a PC via the standard RS232 (serial) port - but two ports are obviously required if you want to control both devices remotely at the same time. This is becoming a problem as few modern laptops are fitted with serial ports anymore, but apparently BCD plans to replace the RS232 ports with USB interfaces in revised versions of both units intended for launch at IBC2006 in September.

The software is a little clunky and lacking in 'commercial gloss,' but it is a fully functional engineer's tool and surprisingly easy to use after a little familiarisation. The Jitterbug and Humbug sections can be displayed separately or together, and they can be tiled horizontally or vertically to suit your screen resolution and preferences. I found they worked best for me horizontally across a 1024 x 768 screen. When both panels are displayed there is also a handy cross-linking so that setting the channel status flags in the Humbug section automatically calls up the corresponding display window in the Jitterbug panel.

Both control windows are divided into tabbed subsections - although the tabs are at the bottom of the window instead of the more usual location at the top. The Jitterbug panel has five tabbed sections to show the channel and status data, the AC parameters, the audio signal parameters, and the time-stamped error log. The AC parameters window shows the sample rate, jitter, and carrier voltages, with three buttons to call up graphs of sample rate, jitter, or carrier voltage plotted against time.

A data bits window displays results in integer, fraction or 8.16 modes (which DSP programmers will find useful), and the channel status display shows the data in the default ASCII format or as interpreted values.

The signal section shows peak levels on bar graphs (with dBfs and dB-relative scales) and as numeric readings. There is also a graph of level against time, the scaling of which is adjustable to make specific tasks easier. The first option is from -14 to -21dBfs (in 1dB steps) for alignment level calibration, followed by three more typical scales ranging from zero to -14, -28, or -56dBfs - to suit the dynamic range of the test material. The following two modes are concerned with the bottom end of the dynamic range, and span -72 to -100dBfs and -96 to -124dBfs.

The Humbug control window is configured in a similar way, with three tabbed sections to set the channel status flags, the basic tone generator functions, or to program sweeps and other dynamic test and ident signals. The generator page has seven user-programmable preset buttons for various reference levels (anything from 0 to -100dBfs in 0.1dB increments), and a further seven for spot frequencies. Frequencies can be entered directly but the closest pre-programmed value will be generated (and the actual frequency displayed). An interesting alternative test signal is provided in the DC bit mode, in which any static 24 bit sample value can be generated.

The Sweep section provides a variety of preset test sweeps and idents - all of which can be edited if required and saved as user presets. Default settings include four different frequency sweeps, three level sweeps, various tone bursts and meter response tests, EBU and BBC (GLITS) stereo line up tones, and some weird and wonderful pulse test signals. Finally, the channel status section allows manual configuration of these flags, either by their interpreted values or as raw hex data.

provides a 'Shift' function to access three more configuration options through the other grey and yellow buttons.

In its 'shifted' mode the first grey button toggles between generating normal and clipped sinewaves, while the second toggles the validity flag on and off. Both modes are indicated in the display window. The yellow buttons double up to set the sample frequency, with the top one switching between internal rates of 48 and 96kHz, while the bottom selects external wordclock or AES reference inputs.

Again, everything can be controlled remotely via the PC interface, but this option also opens up a whole new range of possibilities, including the generation of some very sophisticated sweep and other test signals, and the direct manipulation of the channel status bits and data values.

### In Use

As stand alone units, the Jitterbug and Humbug are both very useful and usable, but when controlled from a PC these are seriously impressive devices indeed, with greatly expanded functionality - so much so that they rival some of the high-end digital audio measurement systems in terms of

their facilities and accuracy.

The Humbug's ability to generate programmed pulses and sweeps of known levels, frequencies and durations is extraordinarily useful. These make routine measurements very quick and easy, and I found it ideal for creating specific pulse levels and durations when I was investigating the ballistic responses of different kinds of digital PPMs. I was also able to use it to evaluate the subjective and practical effects of the timing of GLITS tones too.

Perhaps the most useful aspect of the Jitterbug is its ability to log errors. Leaving a temperamental device running overnight with the Jitterbug monitoring its output makes it easy to confirm an intermittent problem. The impedance measurement mode is also very handy for tracking down termination issues in equipment where the input load isn't made explicitly clear, and the jitter measurement is great for optimising system timing and wiring.

If you find yourself needing to test and fault-find digital installations, these handy little boxes make great problem solvers, and are highly cost effective. They are each useful devices in their own right, but the

combination of Humbug and Jitterbug is especially powerful. Highly recommended.

**jbs**



The Jitterbug and Humbug cost £400 each (ex VAT), and the PC software is free.

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