A PRACTICAL APPROACH

ON DIGILYZER DL1

Digilyzer is the latest development in the Minstrument series. It is a comprehensive and complete digital analyzer that covers most measurements in the digital audio domain. Despite its amazing power it is battery operated and small enough to fit in the palm of your hand. The DL1 is a highly sophisticated stand alone digital audio analysis tool.

This guide will give you a closer look at the advantages and functions of the DL1. The operation is very straightforward and intuitive (average familiarization time is less than two minutes). A minimal knowledge of digital audio is all that is required to operate the unit.

Try it and see just how easy it is to get all the answers you need using the power of the Digilyzer DL1.

10 good reasons to use the Digilyzer every day!

1. Listen to the signal - With no signal there is not much to analyze.
2. Correct wiring - More mistakes are made than you think.
3. The engineers true audio rescue tool.
4. Listen to ADAT signal - No extensive wiring to listen to the tape.
5. Status analysis - a closed book?
6. Panic! Five minutes to air.
7. Why should I be interested in Bit statistics?
8. Event logging - A measure to rectify all unexpected errors.
9. Allowed loudness of broadcast material be? DL1 knows.
10. Why do I need an oscilloscope?

DISTRIBUTOR CONTACT:
CALTRON PTE LTD
email: caltron@caltron.sg
www.caltron.sg

1. Listen to the signal - with no signal there is not much to analyze.

DL1 Screenshot: Fast Access Setup

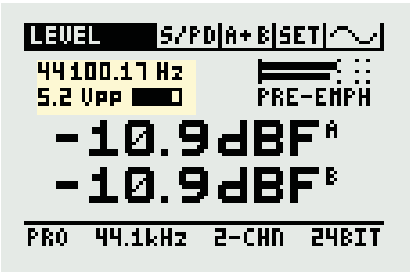
When it comes to digital audio one major drawback becomes obvious. Humans do not have digital ears and cannot listen to the incoming embedded audio signal. We can help! Simply connect an audio cable to the DL1 analyzer. Regardless of function selected, the digital signal is always converted to analog and fed to the internal loudspeaker and the stereo headphone output.

Hot Key combinations (e.g. ESC + LEFT) allow fast and easy access to the most used settings like volume, audio muting and automatic gain control setting. No matter which measurement function is selected the „Fast Access Setup" screen is displayed. Forgotten the key combinations? Just press ESC for one second and the screen, including a help for the shortcuts - is displayed.

The built in automatic gain control (which can easily be enabled/disabled) adjusts the level to suit the speaker or headphone output. Its tremendous dynamic range of 140dB enables to hear even the smallest disturbance to the signal and even on silent lines dithering may be detected. No other tool of this size will detect and tell you the type of dithering within 10 seconds.

If, by accident, an analog signal is connected to the DL1 it obviously will not provide any digital analysis but, and this is unique, it will make the signal audible by enabling an analog path to the internal speaker. This is a real boon when trying to identify cable connections.

2. Correct wiring - more mistakes are made than you might think.



DL1 Screenshot: Level Peak Screen

Sounds familiar? You are called to a digital set up where you have no idea who wired what. As usual it is a mix of analog and digital equipment some of which is pro gear and some domestic. There are no informations or identifications. How long are the cables? How is the interface between AES3 and S/PDIF made?

DL1 is the tool you need. Investigate and localize the problems. Connect the DL1 to a suspicious output or cable termination and you can look at the physical properties of the carrier signal. Regardless of what measurement function you have selected you will find displayed in the top left hand corner of the screen the physical properties of the carrier signal. Even in an unlocked mode the physical carrier level is measured. The level of the carrier is a good first guide to signal quality. The AES3 standard defines minimum signal acceptance which with reasonably short cables should be between 2V - 7Vpp. If there are impedance problems or longer cable runs the carrier level will drop to below 1V and the reliability is sacrificed.

The DL1 checks the digital signal and the protocol to recognize

DISTRIBUTOR CONTACT:
CALTRON PTE LTD
email: caltron@caltron.sg
www.caltron.sg

DL1 Screenshot: Carrier Information

errors. These errors can cause many audible effects and should ideally never occur. In case such an error occurs it is important to notice it and, for example, activate the "Event logger" for further analysis.

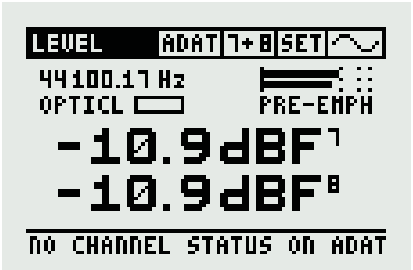
An error is indicated by filling the error indicator box black. When there is no error the filling of the box gets less until its white again (like a slow decay of a bar graph). In case such errors are indicated it would be necessary to follow the line and locate the mismatched format converter or impedance imbalance or indeed identify the overlong cable. You might be surprised at how often such mistakes occur.

3. The video engineer's true audio rescue tool.

Be honest, most video engineers give little consideration to audio and in the process create format compatibility and synchronization problems. This, despite the fact that most signal degradation becomes audible before visible effects appear. There is even less understanding of digital audio in the video domain.

That is why the Digilyzer becomes an irreplaceable aid to the video engineer. It effortlessly provides all the necessary information to complete the perfect job. The DL1 measures the sampling frequencies, formats, special status settings, audio content analysis and many more details. All this, in a handy, portable, inexpensive box.

4. Listen to ADAT signals without special wiring.



DL1 Screenshot: Channel Selection

Try to listen to the individual tracks of an ADAT multi track recorder or even the new HD24 hard disc recorder without first connecting all the channels through your mixing console. It just isn't possible as the recorder has no headphones output. The DL1 makes it possible. Simply connect it to the 8 channel optical ADAT output and select which channel or channel pair is routed to the speaker or headphone out on your DL1.

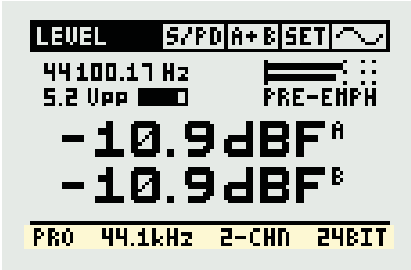
The Alesis 8 channel light pipe ADAT I + II interface is very widely used because of its ease of use and small connector size. This is especially so in semi pro/domestic applications and computer based hard disc recorders. The problem is that no measurement or monitoring equipment can directly handle the ADAT signals. DL1 changes that. It can accept and process ADAT signals through its optical TOS link input. As with any other digital signal DL1 offers the converted ADAT signal at the speaker or headphone output. The channel selector allows to quickly toggle through the four available channel pairs with a single up/down key press.

DISTRIBUTOR CONTACT:
CALTRON PTE LTD
email: caltron@caltron.sg
www.caltron.sg

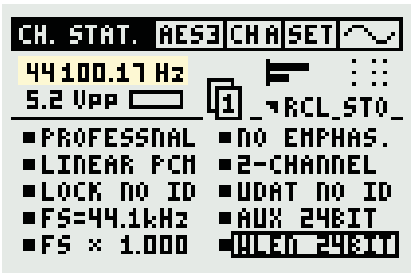
TASCAM TDIF signals can also be connected to the DL1 using a

commercially available TDIF/ADAT converter. The monitoring procedures are then identical to those outlined above.

5. Status analysis - a closed book?



DL1 Screenshot: Level Peak



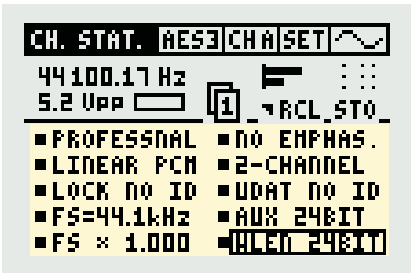
DL1 Screenshot: Channel Status

Most guides to the interpretation of digital audio channel status information starts with „...serial data is divided into 192 bit blocks lined up as bits, groups of bits, nibbles, bytes or words. Refer to the tables for interpretation." Make it easy for yourself. All you want is to get the essential data of the audio signal out of the bit stream. It is not important what the standard has reserved for future applications nor to which sub table you should refer to interpret the flags. The Digilyzer performs all this for you automatically.

In all measurement functions DL1 will display the essential details of channel status which could affect the signal quality: The format, sampling frequency, resolution and the signal purpose. An consistency check is constantly running as a background task and will highlight any parameter that shows inconsistency with the physical parameters e.g. sampling frequency claims to be 44.1 kHz but in reality is 32 kHz.

As soon as the channel status analysis is selected DL1 will interpret the incoming bit sequence in accordance with AES3 and IEC 60958 standards and display the results in blocks and groups. The display will also keep you informed of the carrier status, giving a feedback on what is connected and any error occurrence.

Professional channel status



DL1 Screenshot: Professional Format

Without even needing to understand the interpretation of channel status you can now, thanks to the DL1, e.g. questions like: What format is being transmitted? answer immediatelly: Professional without emphasis.

Channel A and B have their own independent channel status, although in 99% of cases they will be the same. The DL1 Screenshot shows the display for channel A (indicated by "CH A" on the top display line) and by quickly flying over the channel status screen it can be found that there is no difference between channels A and B. Otherwise the small square indicators in front of the changed label would turn into triangles and constantly toggle.

On the second page, The DL1 Screenshot of the channel status screen a difference in the channel source and destination data of the two channels is indicated.

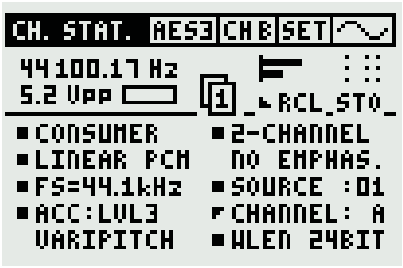
The DL1 Screenshot also shows that the consistency check, indicates an inconsistency in word length by outlining the label

DISTRIBUTOR CONTACT:
CALTRON PTE LTD
email: caltron@caltron.sg
www.caltron.sg

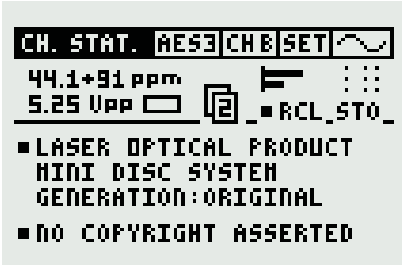
"WLEN 24 BIT". It reports to have a 24 bit resolution but in reality there are less than 24 bits active. A quick switch over to bits statistics would indicate the details of the resolution of the operational converter. It is not easy to cheat the DL1's eyes!

There is a great deal of channel status information being conveyed and so the DL1 is programmed to display it within two pages to make it easier to read and digest.

If you need to see if the channel status is changing in respect to the current status simply store the current status by accessing "STO". If any bit in the status is subsequently altered then the square flag in front of "RCL" will turn into a triangle and toggle indicating a discrepancy. Pressing and releasing "RCL" will cause the screen indicator to toggle between the actual and recalled status allowing you to find the difference at a glance. This procedure can be applied to all pages of the status information.



DL1 Screenshot: Consumer Format page 1



DL1 Screenshot: Consumer Format page 2

Consumer status

Whenever a consumer status is embedded in the bit stream DL1 automatically switches to transparent consumer format, again giving you all interpretation without the need for any tables.

Any difference between channel A and channel B will be indicated by the square bullet signs turning to triangles and toggling. As well any deviation to the stored status will be shown in the bullet sign in front of "RCL"

The Digilyzer also interprets the fairly complex nested category tables providing simple device category statements such as "LASER OPTICAL PRODUCT", "MINI DISC SYSTEM", etc.. So the DL1 will even indicate whether the material is original or once only copied material.

6. Panic! Five minutes to air.

We have all been there! Five minutes to air and the main guest arrives with his small mini disc system and the request to record the interview. Given time there would be no problem but with only five minutes to go?

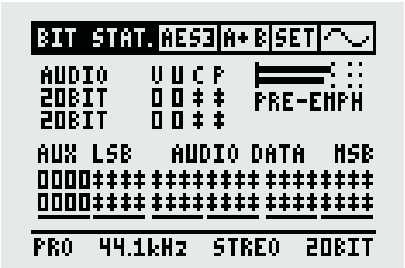
The problem is that in the available digital environment is no analog output. You need to wire the minidisk into the digital bus output. No problem with DL1. Connect it into the digital output and [illegible] to the DL1's headphone output. The Digilyzer is a full 24 bit 96 kHz D/A converter that meets the highest requirements for broadcast and live environments. A little word of warning: do not forget to disable the automatic gain control and activate a stereo function like vu ppm.

DISTRIBUTOR CONTACT:
CALTRON PTE LTD
email: caltron@caltron.sg
www.caltron.sg

It's best to prepare one of following cables:

- 3.5mm stereo jack to 3.5mm stereo jack cable
- 3.5mm stereo jack to 2x RCA
- 3.5mm stereo jack to 2x XLR

7. Why should I be interested in Bit Statistics?



DL1 Screenshot: Bit Statistics

Because it saves time and money!

Bit statistics provide a quick, easy to read, but detailed overview of the activity in the fairly complex serial bit stream of the two channels plus some important ancilliary information.

Any bit remaining at 0 or 1 in each sample is represented on the screen accordingly. However if it is active and therefore changing it will be displayed on screen with an up/down arrow sign. The example screen shown on the left displays the expressions AUX and AUDIO DATA (to clarify the bit weighting the LSB and MSB position of the AUDIO DATA is marked). The two lines below these signs represent the 32 bit audio word for both channels. Since the MSB is on the right side the right bits always have to be active. After the active bits the remaining (inactive) bits have to be zero. We can easily count the arrows from right to left to find the actual word width or binary resolution. The DL1 will count these constantly for you and displays the measured resolution in the top left corner of the screen, e.g. 20 bit in our example DL1 Screenshot.

On the bottom line you will see displayed the ‚claimed' resolution. Other digital tools only provide the status information and not the measured resolution. The DL1 measures both so you can ensure that a device claiming to be 22 bit and priced accordingly actually delivers on its promises.

Should you ever find steady 0 or 1 bits within the row of active bits you can assume that the transmitting audio codec is defective. In most cases hanging bits sound terrible but may, if they are close to the LSB, have only subtle audible effects. Investigations with the distortion function may enable rectification of the problems.

The Digilyzer DL1 is the only palm top unit that performs these detailed measurements!

DISTRIBUTOR CONTACT:
CALTRON PTE LTD
email: caltron@caltron.sg
www.caltron.sg

8. Event logging - A measure to rectify all unexpected errors.

DL1 Screenshot: Event Logger

Intermittency is probably the most annoying thing we ever encounter. Things happen just when you don't need them but refuse to happen when you try and investigate the cause. Such problems are fairly prominent in broadcast where video and audio data streams are mixed together, hopefully synchronized. How can you measure the quality of this synchronization? Activate the event logger at the DL1 and sit back.

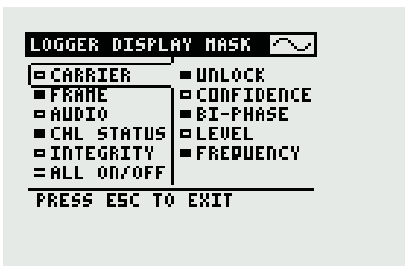
As soon as the event logger is active it records any irregularity of the digital signal such as:

- Unlock/lock carrier signal (e.g. physical disconnection)
- Receiver confidence errors (e.g. poor carrier signal quality, eye pattern out of specs)
- Parity errors (e.g. indicating a transmission error of at least one bit)
- Change in the status information (e.g. change of source)
- Invalid samples (e.g. conversion error of CD player)

The DL1 event logger records many different events (not only the common ones like lock/unlock, parity error, ...). Things like changes of sample frequency, changes of carrier level, consistency check results, audio signal clipping and many more are required.

To make navigation through such an enormous information flow simply to mechanism are included in DL1:

- Events are „bundled" in time clusters (intervals). These time intervals can be zoomed: zoom in to get more details, zoom out to get a better overview or to read out the events which occurred during the whole recording period. Using this facility you can use DL1 to listen to any CD or master and it will show you the number of errors of the CD. This is probably the best and most inexpensive way of ensuring that only top quality mastering or broadcast material is supplied.
- If e.g. a parity error fills up your screen you simply can „mask" this error from displaying. This mask is only active when you analyse the logged data - all events are recorded so you never miss one.



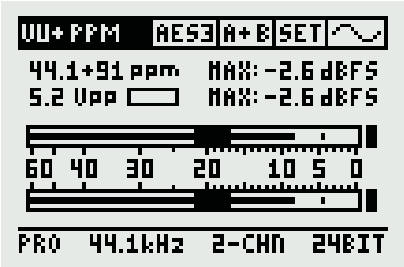
DL1 Screenshot: Logger Mask Screen

Identifying even those slips in synchronizers which seldomly occur becomes an easy task to perform reliably.

The DL1 provides sufficient log capacity to last for days or even weeks.

DISTRIBUTOR CONTACT:
CALTRON PTE LTD
email: caltron@caltron.sg
www.caltron.sg

9. How loud should broadcast material be? DL1 knows.



DL1 Screenshot: vu + PPM display

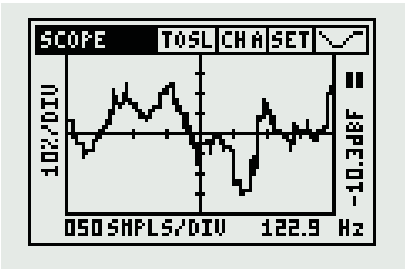
Broadcast levels are limited to maximum output levels to ensure that transmission lines are not overloaded. The standard defines a maximum RMS level. This is no longer relevant in the digital age. What is now important is the maximum peak level which must never be exceeded to avoid audible distortion.

Even though the maximum peak level is observed it is very noticeable when tuning through the radio stations that some channels appear louder than others. This is a result of compression of the signal, a trick, which is often used extensive to increase station identity awareness. The use of compression and other dynamic signal processing gives an apparent increase in loudness without exceeding the maximum peak level.

DL1 features both a peak level meter (ppm) and a volume unit meter (vu) in parallel. The ppm will indicate the peak levels whilst the vu-meter will give a first approximation of the perceived loudness of the signal and as such reflects the grade of compression being used.

Simply feed the broadcast signal into the DL1 and it will display, for both channels, the peak levels and also, as thickened bars, the vu levels. Max hold as well as the total max level are displayed in parallel. The closer the vu bar comes to the ppm level (centre bar) the higher the compression of the audio material.

10. Why do I need an oscilloscope?



DL1 Screenshot: Oscilloscope screen

Have you ever been able to look at dither and listen to it at the same time? DL1 makes it reality.

The DL1 scope is an ideal tool for educational purposes, helping to understand digital measurements and interpreting the results.

The oscilloscope function can be used with any digital audio material. It will display the waveform of the signal in the automatic scaling display. The amazing dynamic range of the Y-scale gives results from 25% of the signal per division right down to 0.1ppm per division. This allows to even see the LSB of 24 bit audio material and look at the dithering.

Check it out.

DISTRIBUTOR CONTACT:
CALTRON PTE LTD
email: caltron@caltron.sg
www.caltron.sg