NTi AUDIO

OPERATING MANUAL

DIGIRATOR DR2

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Inhalt

1. Digirator Basics

Introduction

Thank you for purchasing the Digirator. The Digirator DR2 is a reference grade digital audio generator with AES3, S/PDIF and ADAT outputs.

As an extension to the common stereo audio test signals, DR2 also supports surround sound sequences for setup and testing of professional Dolby Digital, Dolby E, ProLogic II and DTS installations. The stable internal clock generator can be synchronized to AES3, DARS, Word Clock as well as video signals. It further supports the measurements of channel transparency and I/O delay (latency) as well as clock frequencies.

Notes

Damage to equipment connected

The Digirator is a test generator and thus allows creating exceptional signals that do not appear in normal audio operations.

Such generated signals may damage or destroy systems and loudspeakers if not operated carefully.

Danger of electric shock

Never connect the instrument to a power output!

Non-compliance could result in injury to persons and/or damage to property that is not covered by the warranty guarantee.

Damage from moisture

Do not use the instrument in damp environments!

The instrument can be permanently damaged by penetration of water, moisture or any fluid.

Damage caused by opening the instrument

Never open the instrument.

The instrument can be damaged if the housing is opened and your warranty will be invalidated.

Items included in the package

• Digirator DR2
• Protective shock jacket
• Operating manual
• XLR - BNC adapter (Neutrik NA2MBNC)
• RCA - BNC adapter
• USB cable
• Hand strap

Register your instrument and download test signals here
https://my.nti-audio.com

Accessories

• Ever-ready Pouch   NTi Audio # 600 000 302
• System Case   NTi Audio # 600 000 020
• Mains Power Adapter   NTi Audio # 600 000 333
• Calibration Certificate NTi Audio # 600 000 010

The Manufacturer Calibration Certificate is available with the purchase of the new product.

You can find further additional information on the website www.nti-audio.com.

2. Overview of the Instrument

Connections

The Digirator provides the following connections:
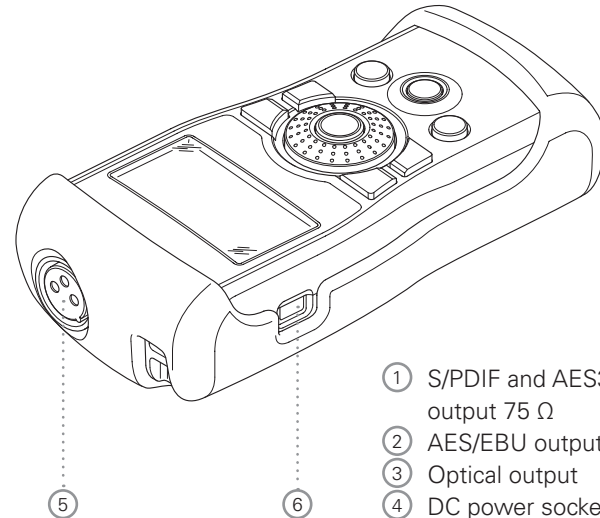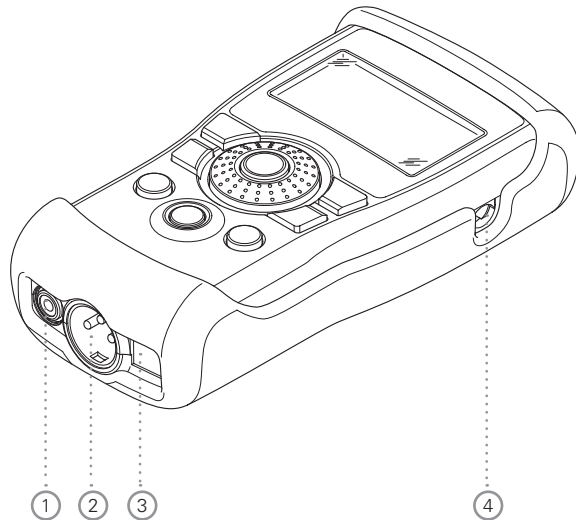
1. S/PDIF and AES3-id output 75 Ω
2. AES/EBU output 110 Ω
3. Optical output
4. DC power socket
5. SYNC input (AES3, Word Clock, Video)
6. USB connection

Buttons and operating elements
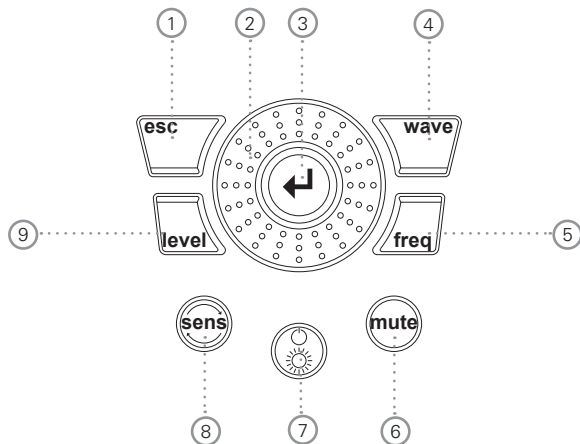
| ① | esc | Terminates an entry and jumps to the top menu level. |

| ② | Rotary wheel | Slow rotation: Precise setting of the value. Fast rotation: Setting the value in larger steps. |

| ③ | Enter | Confirming a selection. |

| ④ | wave | Selection of the test signal. |

| ⑤ | freq | Setting the output frequency. Also directly jumps to the „PARAM" menu with the „SWEEP" and „CHIRP" test signals; and to file selection with „FILE", „DOLBY" and „DTS". |

| ⑥ | mute | When pressed, it illuminates to indicate you have switched off (Muted) the output signal. The button also lights up during the cycle pauses of the „PNOISE" and „CHIRP" signal waveforms. |

| ⑦ | On / Off | Switches the instrument Power off if held down for one second. Also switches the back-lighting on and off with a shorter press. |

| ⑧ | sens | Changes the sensitivity of the frequency and level settings. |

| ⑨ | level | Setting the output level. You can set the output signal unit to dBF or %. |

The following signals have a fixed output level: DTS, DOLBY, TRANSPAR, I/O DELAY.

The screen display

The main menu

① ②

```
GENERATOR A+B CONFIG      [▭]

WAV SINEWAVE
LVL  0.00 dBF   ≠ 1.000 kHz

SYNC: INT   Hi-Z    48.0kHz ✠↕
PRO    LINEAR PCM     NO EMPH 2CHN
```

④ ③
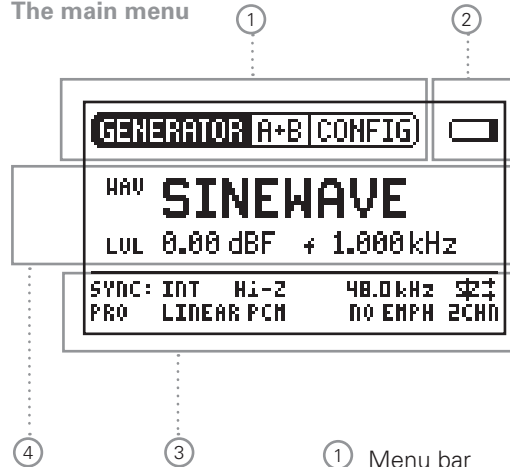
① Menu bar
② Battery symbol:
  If the battery symbol lights
  up the batteries are almost
  completely discharged and
  must be replaced.
③ Carrier signal interface set-
  tings
④ Audio signal generation set-
  tings.

Menu bar

① ②

```
GENERATOR A+B CONFIG
```

③
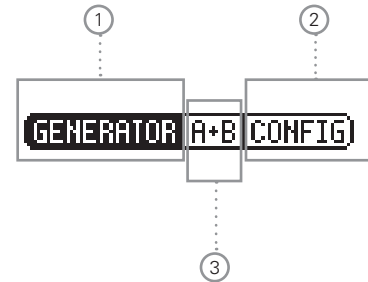
① Function selection

② Save and Recall instrument
  configurations

③ Select and configure output
  channels (individual mute or
  invert)

Settings for signal generation

① ② ③

```
WAV  SWEEP   PARAM
              ▶  ⇥     ④
LVL 0.00 dBF  ∮ 1.000 kHz
```

⑦ ⑥ ⑤
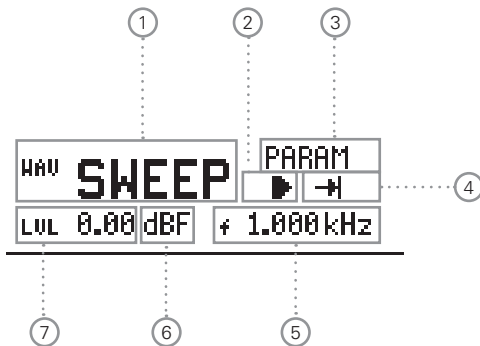
① Test signal
② Start / Stop for certain test signals
③ Parameters setup
④ Single / continuous mode for certain test signals
⑤ Output frequency
⑥ Units for the output level
⑦ Output level

Settings for interface carrier signal

① ②

```
SYNC: INT   Hi-Z    48.0 kHz  ⇄
PRO   LINEAR PCM    NO EMPH  2CHN
```

③
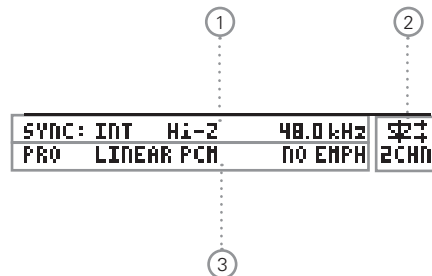
① Settings and display of sampling frequency and clock source

② Configuration and status display of the optical output

③ Channel status settings

Power supply

Battery operation
In order to be always able to use the Digirator flexibly, we recommend the use of batteries.

	Only use 3x AA, LR6 batteries.
	The battery consumption increases at higher levels and is based on the connected load.
	During operation, the battery temperature may increase noticeably. This is not a defect.
	The instrument can also be used with rechargeable batteries.

Operation using mains power supply
You can also connect the Digirator to mains power with a DC power supply unit. To do this, you will need the corresponding DC power supply accessory unit, which you can order from NTi Audio.

We recommend you use only the NTi Audio DC supply. But if you want to make use of a different DC power supply unit, you must observe the following:

Use an electrically-isolated, non-earthed linear DC power supply unit with 2.1 x 5.5 x 9.5 mm plug and connection + —⊙— −. Only use DC power supply units with a voltage from 5 to 8 volts and a current of at least 500 mA.

Unbalanced connections in combination with a switching power supply can lead to noise interference and an unpleasantly high interference level when plugging in and out.

Damage caused by using an inappropriate external DC supply is not covered by warranty.

Characteristics of the outputs

Electrical Outputs (AES3, S/PDIF)

The Digirator features two electrical outputs that are equipped with a shared high-quality transformer. Both outputs are earth-free and resistant to externally applied Phantom Power.

The outputs feature interface carrier levels with fixed levels:

AES3:   6.0 Vpp (open)   3.0 ±0.2 Vpp (into 110 Ω)
S/PDIF, AES3-id: 2.0 Vpp (open)   1.0 ±0.2 Vpp (into   75 Ω)

Digital Audio Transmitter

AES / EBU
XLR - 110 Ω

**AES3-id
S/PDIF**
RCA - 75 Ω

Do not use both outputs in parallel.

The concurrent use of both electrical outputs leads to reduced interface carrier levels that can lead to malfunction.

AES3id

For generating an AES3id compatible signal please use the supplied RCA to BNC adapter. The output signals meet the AES3-id standard and work well for S/PDIF signals.

Pin assignments of the XLR Output:

① PIN 1
② PIN 2
③ PIN 3

Optical output

The optical output may be used concurrently with one of the electrical outputs. It can be configured either for „2 Channel" or for „ADAT" format.

Characteristics of the SYNC input

The sampling frequency of the Digirator can be synchronized and locked to external devices. In order to do this, the sync signal is connected to the universal sync input circuitry via a female XLR connector to the DR2. An adaptor for connecting a BNC cable to the XLR input is also included as a standard accessory item with the DR2.

Supported sync / clock formats
The Digirator recognizes clock sources automatically as they are connected. There is no need for a manual selection of the sync format. The following formats are supported:

- AES3 / DARS   20 kHz to 216 kHz (continuous)
- Word Clock   32 kHz (+/- 100 ppm)
                        44.1, 48 kHz (x1, x2, x4) (+/- 100 ppm)
- Black Burst   PAL (25 Hz) and NTSC (29.97 Hz)
                        fs = 48 kHz

SYNC IN
XLR - 110 Ω,
75 Ω, High-Z
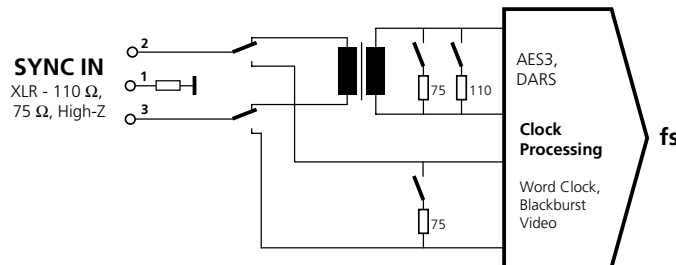
Input impedance
AES3 as well as Word Clock signals are separated by an electrically isolated transformer terminated with the nominal impedances of 110 ohm or 75 ohm. But Hi-Z mode is also supported, allowing trial operation of the DR2 in parallel with other devices.

Jitter suppression
The extracted sampling frequency is fed into a clock recovery stage with high jitter attenuation. This ensures stable and optimized signals at the DR2 output. With input sampling frequencies that deviate more than 100 ppm from the AES standard sampling frequencies, no clock recovery will be executed. Under special circumstances this might lead to suboptimal stability of the output signal.

DARS (Digital Audio Reference Signal)

... is an AES3 Signal, intended for synchronizing equipment. Its channel status data are marked accordingly by setting the DARS Bits.

3. Getting Started

Inserting the batteries

(i)	Only use AA, LR6 batteries. You will need 3 AA batteries. The batteries may significantly warm up during operation. This is not a malfunction. The Digirator can also be operated with rechargeable batteries. For best battery performance only use new batteries of the same type and manufacturer.

1. Open the battery cover.
2. Insert three AA, LR6 batteries with the same state of charge, paying attention to the +/- marking in the battery compartment.
3. Close the battery cover once the batteries have been inserted.
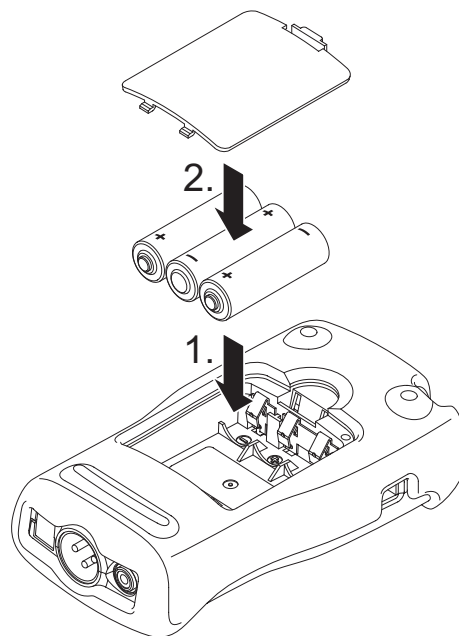
Fitting the protective shock jacket

The shock jacket protects the instrument against light impacts without impairing its easy operation. It is recommended to leave it mounted.

1. Push the lower end of your Digirator into the lower end of the protective shock jacket.
2. Push the upper end of the Digirator into the protective housing.
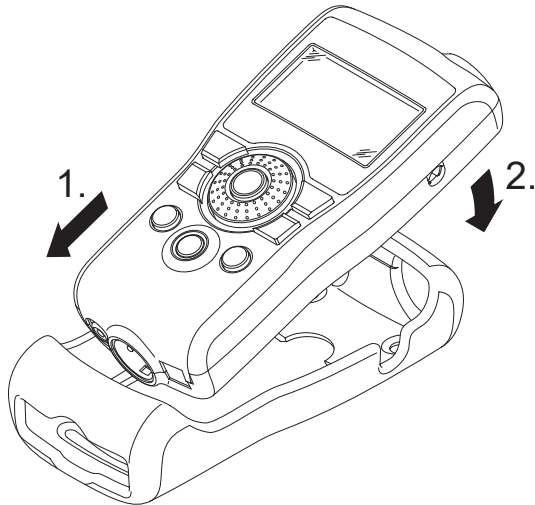
Damage through impacts / shocks

The protective shock jacket shields your Digirator against reasonable impacts that could occur in normal use.

You must further protect the instrument from extreme stress, exposure to liquids, and from extremes of heat or cold.

Please do not drop the instrument!

Damage caused by dropping or impact is not covered by warranty.

Attaching the hand strap

To prevent you from accidentally dropping the DR2, a hand strap is supplied with the instrument. You can also fit the hand strap when the protective shock jacket of the DR2 has been fitted.

1. Pull the hand strap through the opening.
2. Pull the rear part of the hand strap through the loop of the front part.
3. Pull the hand strap tight.
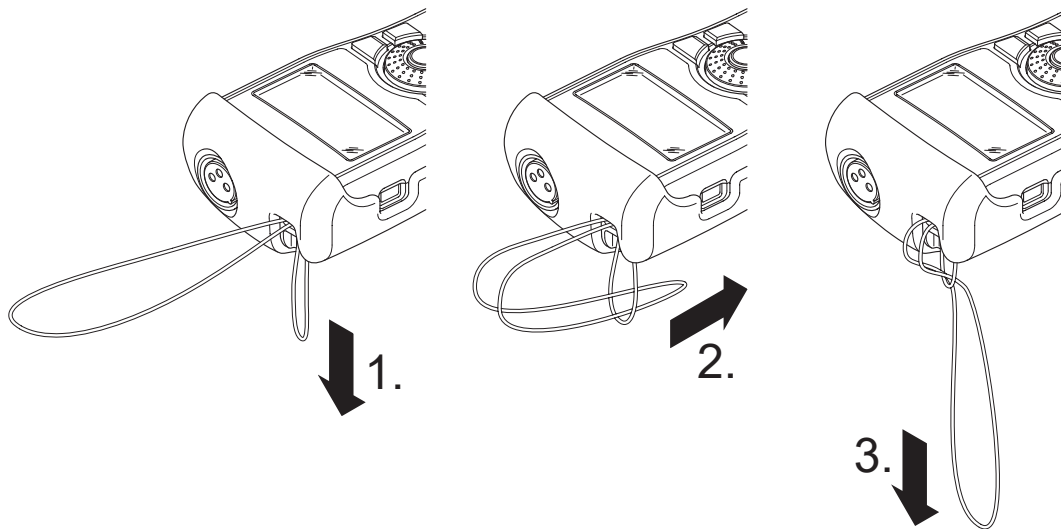
Connecting the Digirator

XLR-connection
Connect the Digirator to your digital audio device using an XLR cable. Note that the locking pin of the XLR connector will then be located on the lower side of the instrument!

RCA connection
Connect the Digirator to the digital input of the unit to be tested using a good quality RCA cable. Please note that not all RCA cables are suitable for digital audio use.

Optical connection
Connect the Digirator to the optical input of the unit to be tested using an optical TOSLINK cable. The cover flap of the output opens automatically with the insertion of the cable.
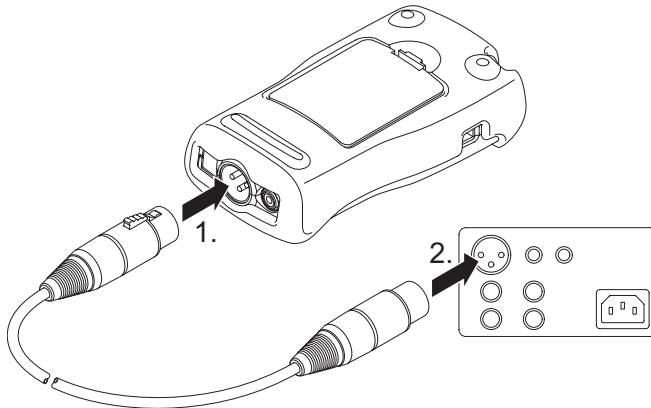
4. Operation

Switching Digirator on and off

Switching the Digirator on
To switch the Digirator on, press the "On/Off" button. The display lighting is switched on.

Switching the Digirator off
To switch the Digirator off, press the "On/Off" button and hold it down for one second.

Navigation in the menu bar

The menu bar is divided into three parts. On the left-hand side, you can choose between the Generator, Transparency-Test, I/O Delay (Latency) and System functions.

1. To do this, select the left side of the menu bar with the rotary wheel and confirm with "Enter".

👍 A selection window opens.

2. Select the desired function with the rotary wheel.
3. Confirm the selection with "Enter".

👍 You have now selected the desired function.

In the middle section of the menu bar you may mute or invert individual channels of the output signal. In the right-most menu you can save and recall configurations (see "Configurations").

Selecting a test signal

You have two choices for selecting test signals. You can use either the direct access buttons or the rotary wheel.

Signal selection using the direct access buttons
1. Ensure that GENERATOR ① is selected in the menu bar.
2. Press the "wave" button.

👆 A selection menu appears.

```
SINE    PNOISE    DOLBY
SWEEP   WNOISE    DTS
CHIRP   POLARITY
DELAY   FILE
```

3. Select the desired test signal with the rotary wheel.
4. Press "Enter".

👆 You have now selected the test signal.

Signal selection using the rotary wheel
1. Ensure that GENERATOR ① is selected in the menu bar.
2. Select "WAV" ② with the rotary wheel.
3. Press "Enter".

👆 A selection menu appears.
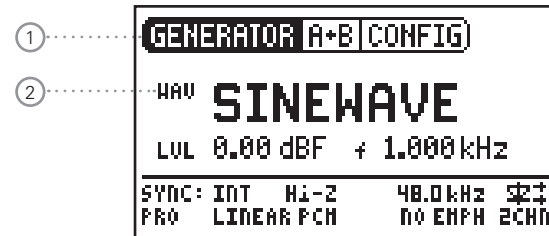
4. Select the desired test signal with the rotary wheel.
5. Press "Enter".

👆 You have now selected the test signal.

Setting the parameters

You have two possibilities for setting up the parameters of the test signals. Use either the direct buttons or the rotary wheel.

Setting parameters using the direct access buttons
1. Press the "level" or "freq" button.

👍 You have selected the desired parameter.

2. Turn the rotary wheel to set the parameter.
3. Confirm the setting with the "Enter" button.

👍 You have now set up the parameter.

Setting parameters using the rotary wheel
1. Turn the rotary wheel.

👍 The selected parameters will be marked with a black bar.
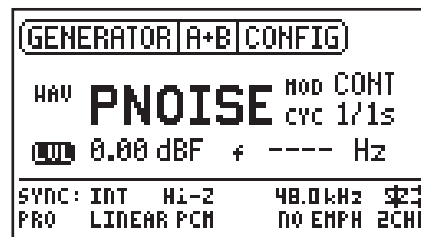
2. Confirm your choice with the "Enter" button.

👍 The parameter display flashes.

3. Turn the rotary wheel to set the parameter.
4. Confirm the setting with the "Enter" button.

👍 You have now set the parameter.

Setting the sensitivity of the rotary wheel
You can set up the sensitivity (step size) of the rotary wheel. To do this, proceed as follows:

1. Select Level **LVL** or Frequency 𝑓 with the rotary wheel.
2. Hold down the "sens" button.

👍 The current sensitivity of the rotary wheel will be displayed ①.

3. Turn the rotary wheel to set up the desired sensitivity.
4. Release the "Sens" button to accept the desired sensitivity.

👍 You have now changed the sensitivity of the rotary wheel.
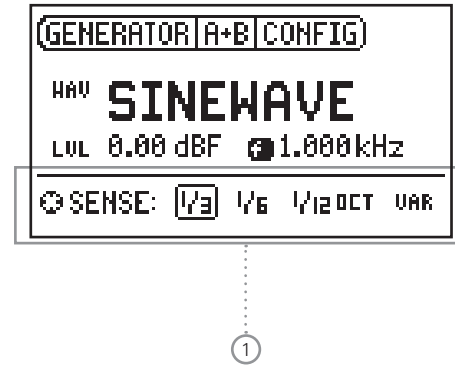
Setting the sampling frequency

Internal clock source

You may choose to have the Digirator DR2 either generate the sampling clock internally or be synchronized to an external clock source (see „Synchronizing to an external clock"). With no signal applied to the SNYC input you may choose among the internally generated clock frequencies:

1. Select from the available internal values with the rotary wheel and then press „Enter"

👆 The actual sampling frequency value is highlighted with a blinking bar.

```
SYNC: INT   Hi-Z      48.0kHz
PRO   LINEAR PCM      CCITT EM
```

2. Turn the wheel to alter the sampling frequency.
3. Confirm your selection by pressing „Enter".

👆 You have changed the sampling frequency.

> ℹ️ For non-linear PCM Signals (Dolby / DTS) as well as in the TRANSPAR mode the sampling frequency is fixed to 48 kHz.

Synchronization to an external clock

The SYNC input of the DR2 is continuously monitored and scanned for useable clock references (see „ Characteristics of the SYNC input"). In this mode the SYNC input is terminated with Hi-Z. As soon as a clock signal is detected a window for selecting the termination impedance appears:

```
INPUT IMPEDANCE
Hi-Z 75Ω 110Ω
```

Note also that there are different ways to route the independent reference clock to the two devices. If the reference clock source has multiple buffered outputs, separate cables may be connected to the SYNC input of the DR2, and to that of the device under test, in a "star" configuration. But if a single reference clock output must drive both the DR2 and the device under test, the first connected sync input would be placed in high impedance (Hi-Z) mode, and the second (or last) would be terminated.

1. Choose the desired impedance with the rotary wheel and press „Enter" to confirm.

The following termination impedances are available:

	75 Ω	110 Ω	Hi-Z
Video	•		•
Word Clock	•		•
AES3 / DARS	•	•	•

Setting the Channel Status

You can define the most important settings in the channel status data:

```
SYNC: INT   Hi-Z    48.0kHz ⇄
PRO   LINEAR PCM        NO EMPH  2CHN
       ①          ②              ③
```
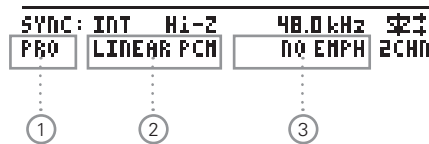
1. Choose the desired parameter ①, ② or ③ with the rotary wheel and press "ENTER" to change the value.

👍 You have changed the Channel Status data.

ⓘ	The settings are always applicable for both channels. All non-visible settings of the channel status information are automatically set by the DR2. Emphasis settings ③ do not have any influence on the signal generation.

Configuring the output channels

The output channels of the DR2 can be individually muted or inverted.

```
GENERATOR A+B CONFIG
A -
- B
INV
```
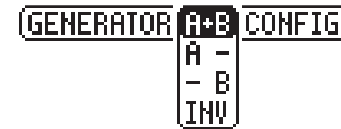
A+B	Both output channels are active
A -	Channel A is active, channel B is muted
- B	Channel A is muted, channel B is active
INV	Channel B has inverted polarity (-180°)

Optical output

There are three operation modes available for the optical output:

2 channel mode (AES)

ADAT mode (8 channels)
Channels 1, 3, 5, 7 are fed from channel A of the stereo signal , while channels 2, 4, 6, 8 contain the audio of channel B

Optical output is switched off

You may alter settings as follows:

1. Select the value under the LED icon with the rotary wheel:

2. Press "ENTER" to change the value.

👍 You have configured the optical output

The optical output can operate up to the following maximum sampling frequencies:

2 channel mode: 106 kHz
ADAT: 55 kHz

At any selected sampling frequency higher than the given limits the optical output is automatically disabled and the visual icon indicators behind the symbol will not be present:

System settings

You can adjust various system settings of your instrument. To do this, switch to System ① in the menu bar using the rotary wheel and confirm with "Enter".

The possible system settings are displayed:

```
┌─────────────────────────┐
│ SYSTEM    CONFIG         │  ◄····· ①
│                          │
│    Power Save:  10 MIN   │  ·····► ②
│    Backlight  :   AUTO   │  ·····► ③
│    Firmware   :  V1.00   │  ·····► ④
│  ───────────────────────│
│    S/N     G2D-DFAZN-A0  │  ·····► ⑤
└─────────────────────────┘
```
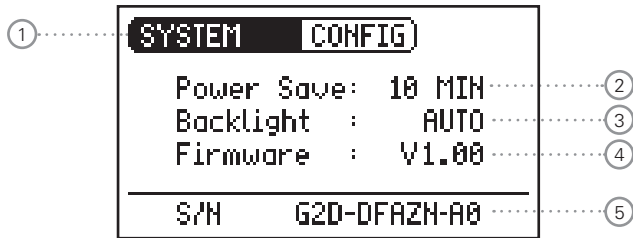
Power Save
The Power Save mode switches the instrument off if no button has been pressed within an adjustable time period.

1. Select the Power Save function ② using the rotary wheel.
2. Confirm the selection with the "Enter" button.

👍 The display starts to blink.

3. Turn the rotary wheel to set the desired time.
4. Confirm the entry with the "Enter" button.

👍 You have now changed the switch-on time of the Power-Save mode.

Backlight
AUTO:
The backlight will be switched on automatically during operation, and will be switched off again after a period of time.

MANUAL:
Press the "On/Off" button to switch the background lighting on and off.

You can choose between "Auto" and "Manual".
1. To do this, select the Backlight ③ function with the rotary wheel.
2. Press "Enter".

👍 The display now changes between "Auto" and "Manual".

Firmware

Displays the version number, with the possibility to carry out a firmware update for the DR2 ④ (see "Updating the Instrument").

Display of the serial number

You can read out the instrument's serial number ⑤ from the bottom line.

Setting the contrast

Changing the contrast of the screen display.
To do this, proceed as follows:

1. Hold down the "esc" button and turn the rotary wheel until the desired contrast is obtained.

👍 You have now changed the contrast of the screen display.
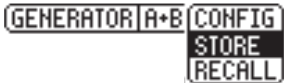
Configurations

With the DR2, you can store your current instrument settings as configurations, and recall these at a later date.

Storing configurations
10 configuration storage locations are available to you.

1. Using the rotary wheel, select CONFIG in the menu bar.
2. Confirm with "Enter".

👍 The following menu is opened: GENERATOR | A+B | CONFIG | STORE | RECALL

3. Select STORE and confirm with "Enter".

👍 The following selection menu is opened:

4. Select a memory location with the rotary wheel and store your configuration by confirming the selection with "En-ter".

✋ You have now stored the current instrument settings as a configuration.

Calling up configurations
1. Use the rotary wheel to select CONFIG in the menu bar.
2. Confirm with "Enter".

✋ The following menu is opened:

`GENERATOR A+B CONFIG`
`STORE`
`RECALL`

3. Select RECALL and confirm with "Enter".
4. Select the desired configuration in the Selection menu and confirm with "Enter".

✋ You have now loaded the desired configuration.

Transferring configurations to another device
You have the possibility of transferring stored configurations to another device.

1. Connect your DR2 to a computer via USB.

✋ A removable memory drive will be indicated on the computer.

2. Select the CONFIG sub-folder.

✋ You will see the stored configurations of your DR2.

3. Copy this data to your computer.
4. Connect another DR2 to the computer via USB.
5. Copy the previously copied data into the CONFIG sub-fold-er by overwriting the data therein.

✋ You have now transferred configurations from your DR2 to another DR2.

ⓘ	In order to easily remember configurations you may rename them. For altering the file names, connect the DR2 to a computer via USB and rename the files in the CONFIG folder. Only the first 10 configurations are shown in the display.

5. Linear PCM Test Signals

Signal generation

The Digirator DR2 flexibly generates linear PCM test signals such as sine, noise or even other arbitrary signals from 48 kHz wave (WAV) files. The match and lock of the selected sampling rate to the applied reference signal is handled by an internal sample rate converter.

This configuration ensures that the generated audio signal frequency is not dependent on the sampling rate but left unchanged. The sample rate converter, featuring a high dynamic range of 144 dB$_A$, does not affect the audio signal quality specification.

Audio frequency range
The generated audio signals feature a bandwidth of 24 kHz, sine signals can be synthesized up to 20 kHz. Settings violating the Nyquist theorem are not prohibited as the sample rate converter will simply attenuate these signals. (e.g. Sine signal with f = 20 kHz at a sampling rate of 32 kHz is attenuated because sampling rate should be at least twice the signal frequency).

DR2 internal signal flow for linear PCM test signals

fs = 48 kHz

fs = 20 - 216 kHz

INT — 32.0 kHz / 44.1 kHz (*2 , *4) / 48.0 kHz (*2 , *4)

EXT — Video (PAL, NTSC) / Word Clock / AES3, DARS

——— Audio signal
— — — Clock signal
——— not active

Sine

```
┌─────────────────────────────┐
│ GENERATOR A+B CONFIG        │
│                             │
│ WAV  SINEWAVE               │
│                             │
│ LVL 0.00 dBF  ∮ 1.000kHz    │
│                             │
│ SYNC: INT   Hi-Z    48.0kHz │
│ PRO   LINEAR PCM    NO EMPH 2CHN │
└─────────────────────────────┘
```
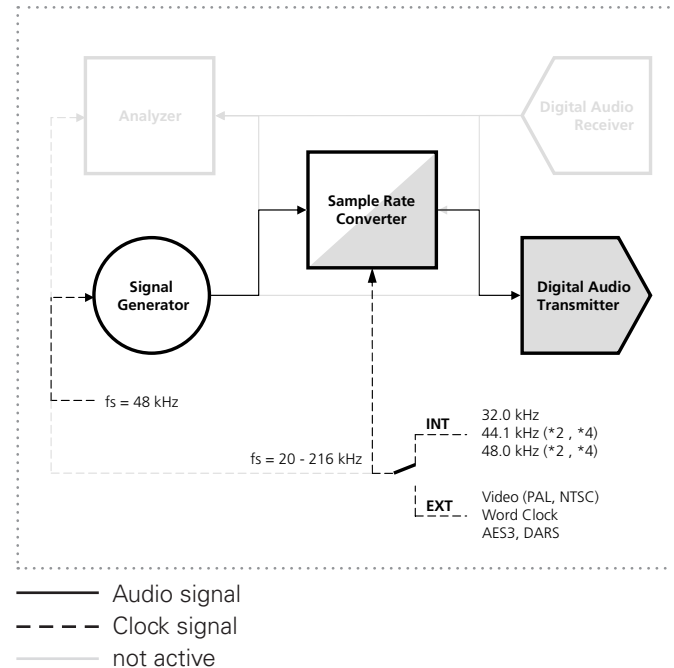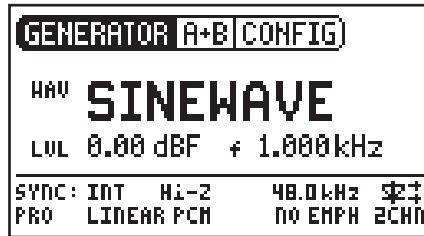
Characteristics and use

Pure sinusoidal signals are required for many standard audio measurements. The Digirator provides a wide and adjustable output level range and selectable output frequencies.

Parameter

You can define the following parameter for this test signal:

∮   Output frequency
LVL Output level

Sweep

```
┌─────────────────────────────┐
│ GENERATOR A+B CONFIG        │
│                             │
│ WAV  SWEEP        PARAM     │
│                   ▶ →│      │
│ LVL 0.00 dBF  ∮ 1.000kHz    │
│                             │
│ SYNC: INT   Hi-Z    48.0kHz │
│ PRO   LINEAR PCM    NO EMPH 2CHN │
└─────────────────────────────┘
```
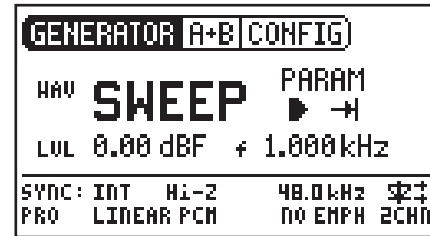
Characteristics and use

Stepped sweep signals with a resolution of up to 1/12 octave can be generated over a freely-selectable frequency range. An audio analyzer like the Minilyzer or Digilyzer from NTi Audio can automatically trigger to this signal sequence to measure the frequency response.

Starting the Sweep signal

1. Select the "START" symbol ▶ with the rotary wheel.

☞ You can interrupt a running sweep via the "STOP" ⬛ symbol.

Sweep Signal modes

Using the "MODE" symbol, you can run the test signal in the following modes:

Once-only ⊶:   Plays the test signal once
Continuous ⟳:   Repeats the test signal

Parameter

You can define the following parameter for this test signal:

LVL   Output level
ƒ   The frequency display is for information only. The current frequencies will be displayed here once the SWEEP test signal has been started.
PARAM   You can configure the signal sequence here.
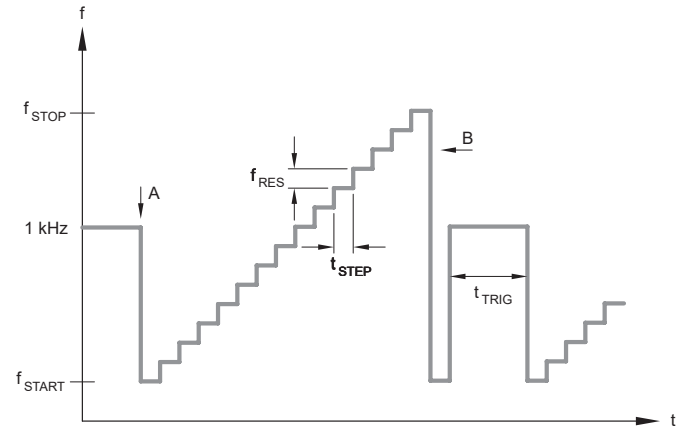
A   The sweep recording starts as soon as the frequency drops from 1 kHz to f_{START}.

B   The end of the sweep is signaled by a falling frequency.

Chirp

```
┌─────────────────────────┐
│ GENERATOR A+B CONFIG    │
│                         │
│ WAV         PARAM       │
│     CHIRP    ▶  ⊶       │
│ LVL 0.00 dBF  f ---- Hz │
│─────────────────────────│
│ SYNC: INT  Hi-Z  48.0kHz│
│ PRO  LINEAR PCM  NO EMPH 2CHN│
└─────────────────────────┘
```
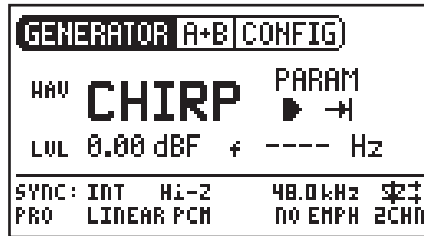
Characteristics and use

A Chirp is the name for a signal whose frequency continually changes over time (also known as continuous sweep). It is used for the recording of frequency responses, the measurement of impulse responses and the acoustic assessment of rooms.

Starting the Chirp signal

1. Select the START ▶ symbol with the rotary wheel.

☞ If this is activated, it turns into a STOP symbol ■, which will end the test signal when selected.

Chirp Signal modes

Using the "MODE" symbol, you can run the test signal in the following modes:

Once-only ⊶ : Plays the test signal once.
Continuous ♺ : Repeats the test signal after an adjustable pause (t_{PAUSE}).

Parameter

You can define the following parameters for this test signal:

LVL Output level
f The frequency display is purely for information only. The current frequencies will be displayed here after the start of the CHIRP test signal.
PARAM Configuration of the signal sequence.
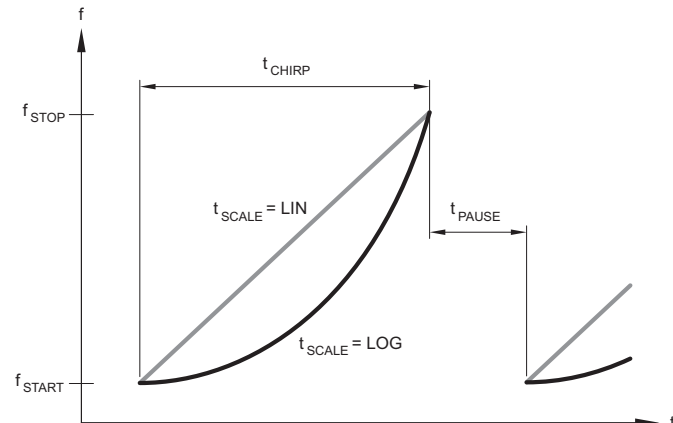
| | The normal fading in and out of any Chirp signal generates spurious frequency components, leading to ripple in the frequency response.

The Chirp sequences of the DR2 are optimized for ripple of ± 0.2 dB maximum.

Chirp parameter combinations which would result in higher ripple are automatically corrected during input. |
|---|---|

Delay Test

```
GENERATOR A+B CONFIG

WAV  DELAYTEST
LVL  0.00 dBF   ⨍ ---- Hz

SYNC: INT   Hi-2      48.0kHz
PRO    LINEAR PCM     NO EMPH 2CHN
```
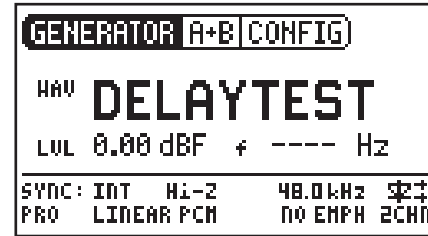
Characteristics and use
The Delay Test signal is a specially configured Chirp signal. In combination with the "Acoustilyzer AL1" or "XL2" from NTi Audio, it makes it possible to determine acoustic signal propagation delay times. You can find further information in the handbooks for the AL1 Acoustilyzer or XL2.

Parameter
You can define the following parameters for this test signal:

LVL   Output level

Pink Noise
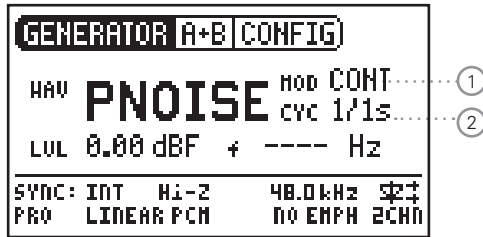
Characteristics and use

The Pink Noise test signal is characterized by flat amplitude response per octave band of frequency (or per any other constant percentage unit of bandwidth) up to its band limit; high spectral density, an infinite period (> 100 years) and 20 kHz bandwidth. Pink Noise is used as a reference signal for the setup of loudspeaker systems (PA systems), with a Real Time Analyzer (RTA) executing the required measurements.

When operated in the intermittent mode, Pink Noise also forms the basis for reverberation time measurements.

Operation

You can choose between the following test signal modes with the MOD setting ①:

CONT : generates a continuous test signal.

⎍⎍ : generates an intermittent test signal.

You can determine the cycle times of the intermittent signal with the CYC setting ②.

(3/3 = 3 seconds of signal and 3 seconds pause.)

These settings have no effect in the continuous mode.

Parameter

You can define the following parameters for this test signal:

LVL   Output level

White Noise

```
GENERATOR A+B CONFIG
WAV  WNOISE
LVL  0.00 dBF  ƒ ---- Hz
SYNC: INT   Hi-Z      48.0kHz ⚡⚊
PRO   LINEAR PCM      NO EMPH 2CHN
```
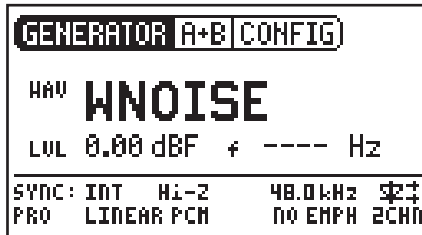
Characteristics and use

The White Noise test signal has a high spectral density, Gauss-ian amplitude distribution and a nearly infinite period (> 100 years). White Noise is used for all measurements with FFT analyzers or where a linear frequency scale is used, and has a constant signal power per Hertz and a 20 kHz bandwidth.

Parameter

You can define the following parameters for this test signal:

LVL   Output level

Polarity

```
GENERATOR A+B CONFIG
WAV  POLARITY
LVL  0.00 dBF  ƒ 20.00 Hz
SYNC: INT   Hi-Z      48.0kHz ⚡⚊
PRO   LINEAR PCM      NO EMPH 2CHN
```
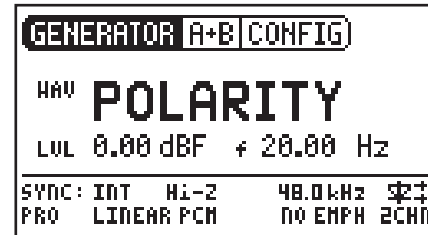
Characteristics and use

The saw-tooth test signal is ideally suited for checking the po-larity of loudspeakers. The "Minilyzer ML1", "Acoustilyzer AL1" and "XL2" instruments from NTi Audio detect this signal and use it to indicate polarity.

Parameter

You can define the following parameters for this test signal:

LVL   Output level
ƒ   The frequency display is for information only.
       The frequency cannot be adjusted.

Wave File Player

```
┌─────────────────────────────┐
│ GENERATOR A+B CONFIG        │
│                             │
│ WAV           📁MESSAGES ⋯⋯①│
│      FILE     ☑Optimize  ⋯⋯②│
│ LVL-20.0 dBF  ♪ ---- Hz     │
│─────────────────────────────│
│ SYNC: INT   Hi-Z   48.0kHz  │
│ PRO   LINEAR PCM   CCITT EM ADAT│
└─────────────────────────────┘
```
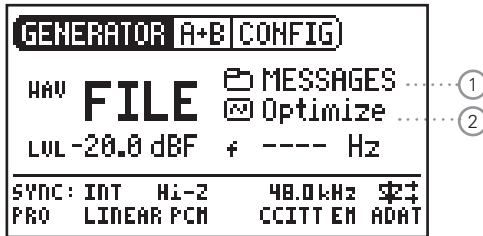
Characteristics and use

With the Digirator, you can play back your own test signals and sequences from wave (WAV) files. The test sequences will be seamlessly looped without pauses. For a better overview, wave files storage in the DR2 is organized using sub-folders.

The DR2 is already equipped with a series of demo sequences in the WAV file format. You can create a link to a computer at any time via the USB interface and can exchange existing WAV files or add new ones.

Parameter

You can define the following parameter for this test signal:

LVL   Output level
The output level of this test signal is adjusted in dBF (dB full scale) or %.

Possible applications

Possible applications include, for example:
• channel ID / line occupation „in-use" transmissions
• Musical signals for the assessment of PA systems
• Playing back complex test signals

Selecting a folder

1. Select the folder symbol ① with the rotary wheel.
2. Confirm with "Enter".
3. Select the desired folder with the rotary wheel.
4. Confirm with "Enter".

☞ You have now changed the current playback folder.

Selecting a wav-file
1. Use the rotary wheel to select the file symbol ②.
2. Confirm with "Enter".
3. Select the desired wav-file with the rotary wheel.
4. Confirm with "Enter".

👍 The wav-file will be played.

Loading your own wav-files
Wave files for the DR2 must conform to the following requirements:

• 48 kHz sampling frequency
• Mono or Stereo
• 16 - 24 bit definition

ⓘ	If a wave file does not meet the requirements, the playback stops and the "mute" button lights up continuously red.

ⓘ	To load WAV-files, you will need a computer with the following minimum specifications: • PC with Windows 98SE • Macintosh computer with OSX • Available USB port

1. Connect the DR2 to the computer via USB.

👍 The DR2 appears on your computer as a removable data storage medium.

2. Open the "WAVE" sub-folder on the removable medium

ⓘ	All the sub-folders in the "Wave" folder now appear in the folder selection ①. You may add additional sub-folders to this folder level as required.

- Signal1.wav
- Signal2.wav
- ...

- Signal1.wav
- Signal2.wav
- ...
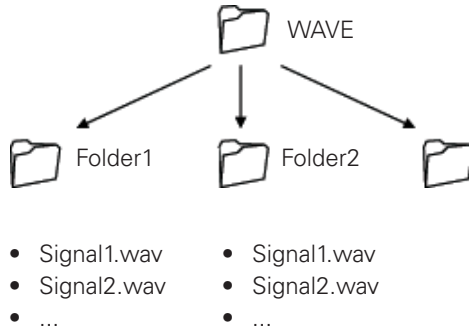
3. Open one of the sub-folders in the "WAVE" folder.

If necessary, you can make use of the other standard possibilities of a removable data medium. For example, you can copy WAV files from the DR2 onto your computer or delete unnecessary files.

4. Copy the desired files into the folder.

👍 You have now loaded your Wave files.

Copyright

NTi Audio delivers a set of demonstration wave files with the DR2. These wave files are licensed to you only for playback with an NTi Audio unit. Any further usage is forbidden.

6. Dolby / DTS Signals

Signal generation

Dolby and DTS signals are compressed, multi-channel audio signals. They are transmitted as non-linear PCM signals and need to be processed by a Dolby / DTS decoder before they can be used as multi-channel audio.

The available test signals have been externally encoded and are implemented as WAV files.

> All DOLBY and DTS signals stored in the DR2 have been encoded and recorded on DOLBY and DTS certified equipment.
>
> The sampling frequency is fixed to 48 kHz and may by synchronized to an external reference of 48 kHz within ±100 ppm accuracy.

The wave files are stored in the sub directories DOLBY and DTS. All files stored in these folders are treated as „Non-Linear PCM" signals and the channel status is automatically marked accordingly.

DR2 internal signal flow for Dolby / DTS test signals

Analyzer

Digital Audio Receiver

Sample Rate Converter

Signal Generator

Digital Audio Transmitter

fs = 48 kHz

fs ≈ 48 kHz

INT   32.0 kHz
44.1 kHz (*2 , *4)
48.0 kHz (*2 , *4)

EXT   Video (PAL, NTSC)
Word Clock
AES3, DARS

——— Audio signal
– – – Clock signal
——— not active
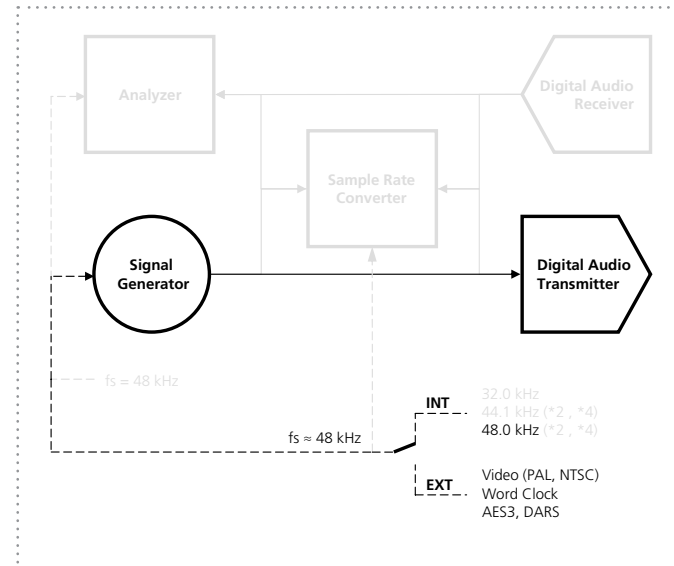
The handling of Dolby and DTS files is identical to wave files, described in the previous chapter.

```
┌─────────────────────────────────┐
│ GENERATOR      CONFIG            │
│                                  │
│       ┌──┐ D_51            ···①  │
│ WAV DLBY                         │
│       ☑ Ch_id_l           ···②  │
│                                  │
│ LVL  --- dBF   ƒ ---- Hz         │
│                                  │
│ SYNC: INT   Hi-Z    48.0kHz ⚡   │
│ PRO   NONLIN PCM    NO EMPH ADAT │
└─────────────────────────────────┘
```
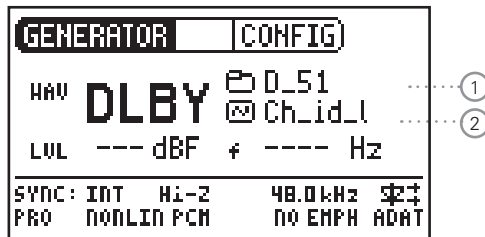
The test signals in the directories are sorted by non-linear format type.

Select the multi-channel format
1. Select the desired signal format (DLBY or DTS)
2. Use the rotary wheel to select the group symbol ①.
3. Confirm with Enter.
4. Select the desired format.
5. Confirm with Enter.

👍 You have changed the multi-channel format.

Select the signal
1. Select the file symbol ② with the rotary wheel.
2. Confirm with Enter.
3. Select the desired signal with the rotary wheel.
4. Confirm with Enter.

👍 The selected test signal is immediately played back.

Sequence of test signals
The order sequence of the files is sorted first by file extension (e.g. file.001) and secondarily by actual file name. This enables maximum flexibility in grouping similar test signals together.

ⓘ	In case the optical output is used for the Dolby / DTS signal, then set the instrument from ADAT to 2CH in the right bottom display corner.

Test signals and formats

Test signals

Name	Test signal	Length
CH_ID_L		0:25
CH_ID_C	On each of these channel ID files:	0:25
CH_ID_R	There is the spoken channel identification followed by a 400 Hz sine signal.	0:25
CH_ID_LS		0:25
CH_ID_RS		0:25
CH_I_LFE	Spoken channel identification with pulsed 80 Hz sine signal on LFE channel.	0:25
PNOISE	Pink Noise, -20 dBFS, L, C, R, LS, RS: 20 - 20'000 Hz, LFE: 20 - 120 Hz	0:30
PNOI_LFE	Pink Noise, -20 dBFS, 20 - 120 Hz	0:15
POLARITY	Polarity test signal	0:15
SINE_80	Sine 80 Hz, 0 dBFS, on all channels	0:15
SINE_400	Sine 400 Hz, 0 dBFS, on all channels	0:15
SINE_997	Sine 997 Hz, 0 dBFS, on all channels	0:15
SINE_1K	Sine 1.000 Hz, 0 dBFS, on all channels	0:15
SINE_10K	Sine 10.000 Hz, 0 dBFS, on all channels	0:15
VOICE	Reference voice announcement on all channels, -20 dBFS	0:21

Formats

Name	Format
D_20	Dolby Digital 2.0 @ 256 kbit/s
D_51	Dolby Digital 5.1 @ 448 kbit/s
E16_51	Dolby E 5.1 @ 16 Bit
E20_51	Dolby E 5.1 @ 20 Bit
E20_5120	Dolby E 5.1 + 2.0 @ 20 Bit
PROLOG2	Dolby ProLogic IIx @ PCM Lt/Rt (5:2:5)
755K_20	DTS 2.0 @ 754.5 kbit/s
755K_51	DTS 5.1 @ 754.5 kbit/s
1509K_51	DTS 5.1 @ 1509 kbit/s

Copyright

All Dolby and DTS signals stored in the DR2 are licensed to you, and must only be used and played back on the DR2. Any further use of these files is strictly forbidden.

Test Signals

Due to the huge size of the non-linear PCM signals, not all files will fit into the internal flash disc of the DR2 at the same time. You may download the non-linear PCM signals here https://my.nti-audio.com.

Dolby ProLogic II

The Dolby ProLogic II format is an uncompressed linear PCM format that codes the channel assignment in the L/R phase relation.

You will therefore find the ProLogic II files in the WAVE folders, not in the Dolby folder.

Levels

All announced levels of the non-linear signals refer to audio levels prior it's coding into the non-linear format. Minor level differences may occur due to the encoding process.

7. Measuring Functions DR2

Channel transparency testing

The channel transparency test verifies whether the audio and auxiliary data of a digital transmission channel are transparently transmitted. The transparent transmission is crucial for non-linear PCM formats such as surround sound. The verification always covers both audio channels.

① Result of the analysis
② Status of the validity bit of the input signal
③ Channels status information of the input signal
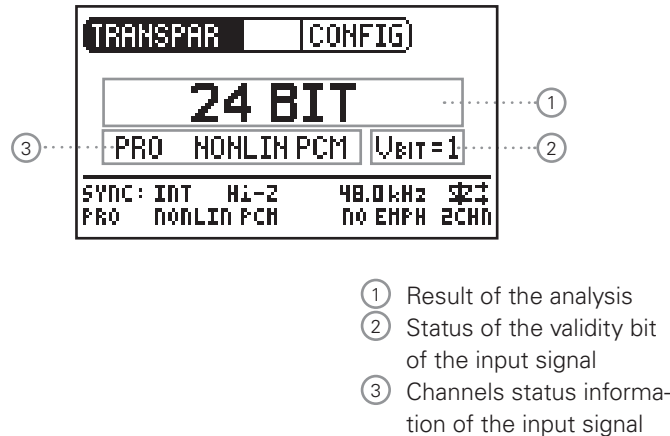
The displayed validity bit ② and channel status details ③ are for information only. They are not part of the transparency measurement.

Function
The test signal used in the DR2 is a short deterministic noise sequence. The signal stream applied to the SYNC input is monitored and verified for a 16, 20 or 24 bit correlation.

AES3 transmission format frames

Preamble	Auxiliary	LSB	Audio Data	MSB	V	U	C	P
0 3	4 7	8	11 12	27	28	29	30	31

<------- 16 Bit --------->
<------------- 20 Bit ------------->
<--------------------- 24 Bit --------------------->
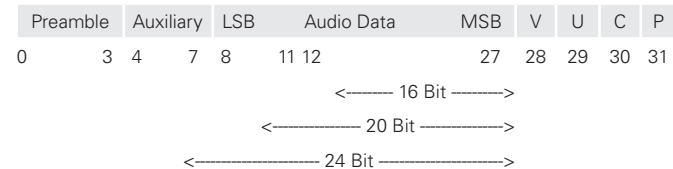
A nontransparent signal is indicated by the "DATA CHANGED" message. This means that the received bit pattern is different to the expected bit pattern. This could be caused by any changes in e.g. the gain setting or in the word length with added dither.

Sampling frequency, synchronization and clock source
The sampling frequency is fixed to 48 kHz but can be synchronized to an external reference with 48 kHz within ±100 ppm range. External-synchronization is very helpful for offline tests. e.g. to record the transparency test signal on a recording system and analyze as played back. Also, the test may also optionally be conducted using two DR2 units in different locations, with one acting as the signal source and the other as the analyzer.

With a word clock or video signal applied to the DR2, it automatically tries to synchronize after querying for the termination impedance choice. With a valid AES signal applied the user should determine whether the DR2 should Sync (slave mode) or continue to run from the internal clock (Master mode).

INPUT IMPEDANCE
Hi-Z 75Ω 110Ω

CLOCK SOURCE
INTERNAL SYNC INPUT

INTERNAL Synchronization
In this mode the DR2 acts as a clock master and the connected device or system is synchronizing its clock to the DR2. Select this mode if the device under test is unable to generate its own clock, or if the device under test automatically synchronizes to signals presented to its input.

SYNC INPUT (external synchronization)
In this mode the device under test is the clock master and the DR2 synchronizes to this connected device by selecting clock via "SYNC INPUT". Synchronization is necessary to prevent from losing samples through drop-outs or glitches.

With no valid clock applied to the SYNC input of the DR2, the internal sampling frequency starts to drift and the external synchronization aborts. With no Sync signal the DR2 switches back to its internal clock generation and transmits the test signal derived from its internal clock. As soon as this transmitted signal again reaches the SYNC input, the selector boxes for IMPEDANCE and CLOCK source will appear again.

Important
ⓘ An intermittent appearance of INPUT IMPEDANCE and CLOCK SOURCE is a strong indicator that the device or system under test does not create its own clock, but regenerates the input clock. To solve this loop-back problem switch back to CLOCK SOURCE INTERNAL.

Test procedure

For testing the transparency of a transmission channel you proceed as follows:

1. Connect the output of the DR2 to the input of the system under test.
2. Connect the output of the system under test with the SYNC input of the DR2.
3. Select the settings for clock source and termination.

☝ The result of the continuously measured transparency analysis is displayed.

Signal flow during transparency test

Audio signal
clock signal
not active
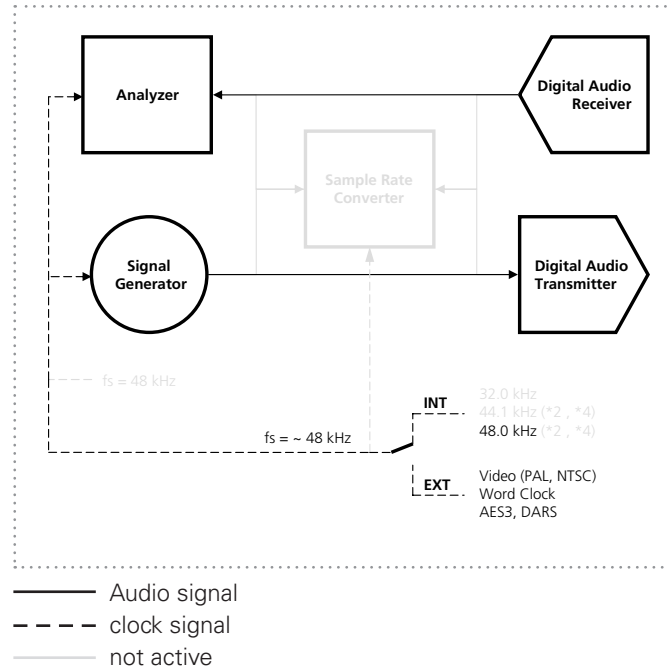
I/O Delay test (Latency)

The function I/O Delay (latency) test determines the exact time delay which a piece of equipment or an entire system is introducing. For this test, the SYNC input connector of the DR2 is used for receiving the delayed signal.
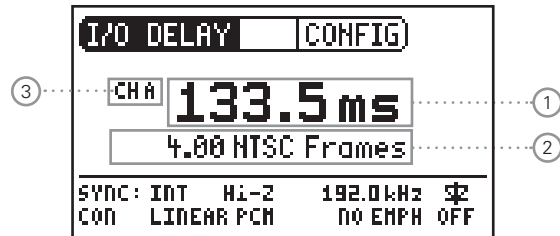
Function
DR2 generates a short test burst every 2 seconds. The SYNC input is continuously monitored and the delay calculated. Level adjustments and minor distortion do not affect the measurement result.

Sampling frequency, synchronization and clock source
The sampling frequency can be selected to be either 32, 44.1 or 48 kHz. These frequencies can also be used for external synchronization, provided the accuracy is within ±100 ppm.

The sampling frequency of the input signal may be non-synchronized and range anywhere from 20 - 216 kHz.

Right after the connection of a signal to the SYNC input, the DR2 queries for the desired termination impedance and after that whether the clock should be generated internally or synchronized to the external source.

Also refer to the synchronization details outlined in the section „Channel transparency testing".

Test sequence
For measuring the I/O delay (latency) of a device, please proceed as follows:
1. Connect the output of the DR2 with the input of the device under test.
2. Connect the AES3 output of the device with the SYNC input of the DR2.
3. Make the proper settings for termination impedance and clock source.

✋ The result of the I/O delay (latency) measurement is now continuously displayed.

PAL / NTSC settings

The measured I/O delay time (latency) is displayed in milliseconds ① as well as in video frames ②. To alter between PAL and NTSC settings, proceed as follows:

1. Navigate the cursor with the rotary wheel to the field displaying NTSC or PAL ②.
2. Press „ENTER" to alter between time and video frames.

☞ You have configured the units for the FRAME display.

Non-equal values for channel A and B

In case there is a non-equal delay value for channels A and B, the instrument will display the two different respective values in an alternating sequence. The channel display ③ follows the actual displayed channel.

DR2 internal signal flow for the I/O Delay measurement

| Audio signal |
| Clock signal |
| not active |
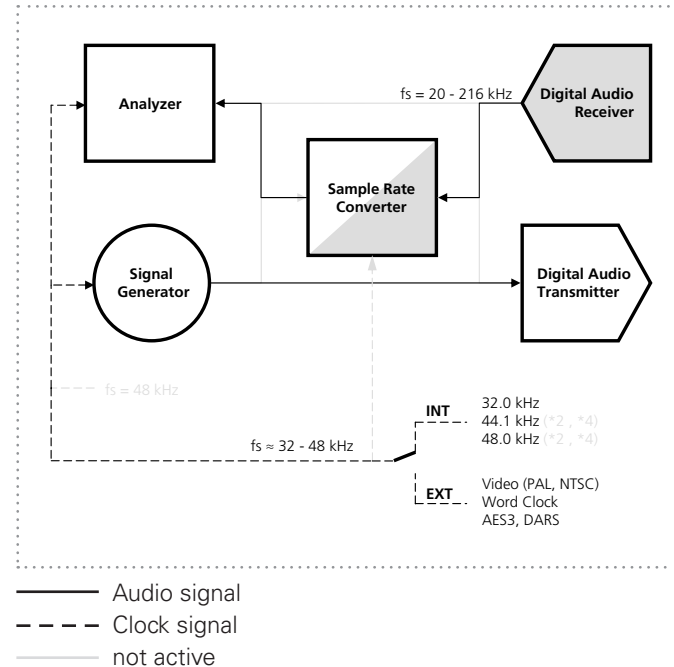
8. Updating the Instrument

Firmware update

You can find the firmware version of your instrument as follows:

1. Select "SYSTEM" in the menu bar.
2. Confirm the selection with the "Enter" button.

☝ The firmware version of the instrument is displayed.

Kindly register your instrument at https://my.nti-audio.com (for details see chapter "Further Information"). Upon registration you may access the support page, which offers
• detailed update instructions
• firmware revision history

Proceed as follows to update the firmware:

1. Select "SYSTEM" in the menu bar.
2. Click on Firmware and follow the instructions on the screen of the DR2.

☝ You have updated your DR2.

In order to update the firmware, you will need a computer with the following minimum specifications:

• PC with Microsoft® Windows 2000 or later
• an available USB port
• Internet access

9. Tips and Trouble Shooting

Faults and their correction

Fault	Fault finding	Cause	Remedy
no output signal	„mute" button flashes	You have switched the instrument to Mute.	Press the "mute" button.
	"mute" button lights up continuously	You have called up the "Pink Noise" (PNoise) test signal or you are in the Pause cycle of the Chirp test signal.	Wait until the pause has ended. Press the "Start" button.
		cable not plugged in correctly or mis-wired	Plug in the cable correctly and check pin wiring.
screen contrast poor		contrast needs to be adjusted	Press "esc" and operate the rotary switch to set the contrast.
Wave Files, DTS or Dolby Wave files are not played back	"mute" button lights up continuously	You have loaded a non-supported Wave format.	Load a supported Wave format (see page 36).

Fault	Fault finding	Cause	Remedy
INPUT IMPEDANCE and CLOCK SOURCE window appears intermittently.		You have selected SYNC INPUT but the device connected is not acting as a clock master.	Select clock source INTERNAL or disconnect the Sync cable. Configure the external device to act as clock master.

Resetting to the factory settings

If the Digirator reacts unexpectedly, a reset to the factory settings might solve the problem.

1. Switch the instrument off.
2. Hold down the "esc" button and simultaneously operate the "On/Off" button.

☝ The confirmation of the reset is displayed on the screen.

Reloading wav-files

You can reload the Wave, Dolby and DTS files of the DR2 that were installed at the factory. The files are available on the Test signal backup DVD.

10. Technical Data

Format	Consumer/Professional, up to 24 bit audio
Sampling Frequencies / Outputs	XLR, RCA: 32, 44.1, 48, 88.2, 96, 176.4, 192 kHz Optical: up to 96 kHz ADAT: up to 48 kHz Accuracy: ± 2.5 ppm
Outputs	• AES3 (110 ohms) XLR • S/PDIF (75 ohms) RCA • AES3id (75 ohms) with RCA to BNC adapter • TOSLINK: Stereo and ADAT
Inputs	XLR Sync. input for: • AES3, DARS • Video (NTSC, PAL) • Word Clock using BNC to XLR adapter
Linear PCM Signals	Sine, Polarity Test Signal, Delay Test Signal, Pink Noise (crest factor = 4.42), White Noise (crest factor = 3.47), Playback of Wave Files
Non-linear multichannel signals	A comprehensive library of pre-encoded surround sound signals is available in the following formats: • Dolby Digital • DTS • Dolby E • Dolby ProLogic II
Wave File Format	Sampling frequency: 48 kHz Resolution: 16, 20, 24 Bit, Mono + Stereo
Frequency Settings	Range: 10 Hz - 20 kHz Step width: min 1 digit steps Accuracy: 0.01 %

Stepped Sweep Function	Frequency range: selectable, 10 Hz - 20 kHz Step width: 1/1, 1/3, 1/6, 1/12 octave Sweep speed: selectable, 0.5 - 5 s / step
Gliding Sweep (Chirp) Function	Frequency range: selectable, 20 Hz - 20 kHz Increment: linear / logarithmic Chirp speed: 1.0 - 39 seconds per sweep
Level Units	dBFS, %
Output Level Range	-100 dBFS to 0 dBFS
Distortion THD+N	of the synthesized sine signal: -138 dB (22 Hz - 22 kHz, AVG, @ 1 kHz, typical)
USB Functionality	• for firmware update • mass storage device
Flash Memory	• 512 MByte • for storing wave files and configurations
Display	Graphical, with back illumination
Auto-Power-Off	10, 30, 60 minutes or OFF
Batteries	• 3 x AA Alkaline dry cells or rechargeable equivalents • Battery life typ. 10 hours (continuous)
Temperature Range	0° to 45° C (32° to 113° F)
Humidity	< 90 % rel. humidity, non-condensing
Protection Rating	IP51
Dimensions (LxWxH)	152 x 81 x 43 mm (incl. protective shock jacket)
Weight	310 g (11 oz.) incl. batteries

11. Further Information

Registration

Register as a customer with My NTi Audio and benefit from the following possibilities:

- Keep your products up-to-date
  Access free firmware and software updates.
- Activate options
  Enable additional functions for your products.
- Access premium content
  Access downloads, information and specific support for your products.
- Receive application and product news
  Subscribe to the NTi Audio Newsletter.
- Get fast worldwide support
  Register your products for fast support.
- Confirm your ownership
  Allows us to contact you with important product notifications and provides a product record in case of loss or theft.

How to Register
- Open the web page "https://my.nti-audio.com".
- You are prompted to login or create the My NTi Audio Account.
- The web page "My Products" opens.
- Select the product type and enter the serial number.
- Confirm with "Register".
- Now the product is listed in the table "My Products".

☞ Congratulations, your NTi Audio product is registered.

Warranty conditions

International warranty
NTi Audio guarantees the function of the DR2 and their individual components for a period of one year from the date of sale. During this period, defective instruments will be repaired free of charge, or will be replaced.

Limitations
Opening the unit case voids the guarantee. These guarantee provisions also do not cover accessories; nor damage caused by accidents, immersion in or exposure to water or other fluid, transportation; incorrect use, or carelessness, nor the installation of any parts that were not delivered with the instrument, the loss of parts, connection to any AC mains voltage; nor operation with non-specified input voltages, adapter types or incorrectly inserted or leaking batteries. In particular, NTi Audio accepts no responsibility for incidental or consequential damages of any kind. The guarantee will be voided if repairs or service work are carried out by any third parties who are not part of an approved NTi Audio Service Center.

Repair of the Digirator DR2
In the case of faulty functioning or damage please contact your local NTi Audio partner for assistance. If your instrument needs to be returned for service, kindly follow the service guidelines at www.nti-audio.com/service.

Calibration

The Digirator DR2 has been carefully tested during production and performs to the specifications listed in the "Technical Data" chapter.

NTi Audio recommends yearly calibrations of the instrument. For the calibration of your instrument kindly follow the service guidelines at www.nti-audio.com/service.

Declaration of Conformity

CE / FCC Compliance Statement

We, the manufacturer NTi Audio AG, Im alten Riet 102, 9494 Schaan, Liechtenstein, do hereby declare that the Digirator DR2 product, approved in 2007, complies with the following standards or other standard documents:

- EMC: 89/336, 92/31, 93/68
- Harmonized standards: EN 61326-1
- Explosive atmospheres (ATEX): 94/9/EG
- Directive 2011/65/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).
- Directive 2002/96/EC on waste electrical and electronic equipment (WEEE).

This declaration will become invalid if modifications to the instrument are carried out without the written approval of NTi Audio.

Date: 01.12.2007

M. Recher

Position: Technical Director

Information regarding disposal / recycling

	Dispose of the instrument in accordance with the legal environmental regulations in the country.

Regulations for the European Union and other European countries with corresponding laws:

The instrument must not be disposed of in the household garbage. At the end of its service life, bring the instrument to a collecting point for electrical recycling in accordance with the local legal regulations.

Other countries outside the European Union:

Contact the respective authorities for the valid environmental regulations in the country.