OPERATING MANUAL

iCLOCK
iCLOCKdp

REDUNDANT MULTIPLE CLOCK SYNTHESIZER AND VIDEO REFERENCE GENERATOR VERSION 2.23

HD TV DSD Direct Stream Digital DXD Digital eXtreme Definition

MUTEC

WWW.MUTEC-NET.DE

SAFETY INSTRUCTIONS

General instructions
To reduce the risk of fire or electrical shock, do not expose this appliance to rain or moisture, direct sunlight or excessive heat from sources such as radiators or spotlights. No user serviceable parts are inside. Repair and maintenance must be carried out by qualified personnel authorized by MUTEC GmbH! The unit has been designed for operation in a standard domestic environment. Do NOT expose the unit and its accessories to rain, moisture, direct sunlight or excessive heat produced by such heat sources as radiators or spotlights! The free flow of air inside and around the unit must always be ensured.

Initial operation
Prior to the initial operation of the unit, the appliance, its accessories and packaging must be inspected for any signs of physical damage that may have occurred during transit. If the unit has been damaged mechanically or if liquids have been spilled inside the enclosure, the appliance may not be connected to the mains or must be disconnected from the mains immediately! If the unit is damaged, please do NOT return it to MUTEC GmbH, but notify your dealer and the shipping company immediately, otherwise claims for damage or replacement may not be granted.

If the device is left in a low-temperature environment for a long time and then is moved to a room-temperature environment, condensation may occur on the inside and the exterior. To avoid short-circuits and flashovers, be sure to wait one or two hours before putting the device into operation.

This symbol, a flash of lightning inside a triangle, alerts you to the presence of uninsulated dangerous voltage inside the enclosure - voltage that may be sufficient to constitute a risk of shock.

This symbol, an exclamation mark inside a triangle, alerts you to important operating or safety instructions in this manual.

Power supply
The device contains a self-adapting wide-range power supply supporting the majority of global standard line voltages within a range of 90…250 V, with no need for making adjustments. Make sure that your line-voltage source provides a supply voltage within the specified range. In addition, make sure that the device is properly grounded via the local electric installation.

Please use the enclosed power cord (see packaging) to connect the unit to the mains. Switch the unit off before you attempt to connect it to the mains. Connect the power cord to the unit, then to a standard 3-pin mains outlet. To draw the power cord, never pull on the cable but on the mains plug!

The unit must be grounded during operation!

For information on the power-inlet wiring, refer to the »Wiring of connectors« section in the appendix. Disconnect the device from the mains when not using it for an extended period!

Declaration of Conformity
We herewith confirm that the product complies with the European Commission's standards on electromagnetic compatibility.

Interference emission:	EN 55103-1:1996
Resistance to interference:	EN 55103-2:1996

Presupposed as operation condition is that all clock outputs are connected with high-quality and good shielded BNC 75 ohms cable.

WARRANTY REGULATIONS

§1 Warranty
MUTEC GmbH warrants the flawless performance of this product to the original buyer for a period of two (2) years from the date of purchase. If any failure occurs within the specified warranty period that is caused by defects in material and/or workmanship, MUTEC GmbH shall either repair or replace the product free of charge within 90 days. The purchaser is not entitled to claim an inspection of the device free of charge during the warranty period. If the warranty claim proves to be justified, the product will be returned freight prepaid by MUTEC GmbH within Germany. Outside Germany, the product will be returned with the additional international freight charges payable by the customer. Warranty claims other than those indicated above are expressly excluded.

§2 Warranty transferability
This warranty is extended exclusively to the original buyer who bought the product from a MUTEC GmbH specialized dealer or distributor, and is not transferable to anyone who may subsequently purchase this product. No other person (retail dealer, distributor, etc.) shall be entitled to give any warranty promise on behalf of MUTEC GmbH.

§3 Waranty regulations
The return of the completed registration card, or online registration on one of the websites specified below, is a condition of warranty. Failing to register the device before returning it for repair will void the extended warranty.

- The serial number on the returned device must match the one stated on the registration card or entered during online registration. Otherwise, the device will be returned to the sender at the sender's expense.
- Any returned device must be accompanied by a detailed error description and a copy of the original sales receipt issued by a MUTEC dealer or distributor.
- The device must be returned free of shipping expenses and in the original package, if possible; otherwise, the sender has to provide comparably protective packaging.
- The sender is fully responsible for any damage or loss of the product when shipping it to MUTEC GmbH.

§4 Limitation of warranty
Damages caused by the following conditions are not covered by this warranty:

- Damages caused by every kind of normal wear and tear (e.g. displays, LEDs, potentiometers, faders, switches, buttons, connecting elements, printed labels, cover glasses, cover prints, and similar parts).
- Functional failure of the product caused by improper installation (please observe CMOS components handling instructions!), neglect or misuse of the product, e.g. failure to operate the unit in compliance with the instructions given in the user or service manuals.
- Damage caused by any form of external mechanical impact or modification.
- Damage caused by the user's failure to connect and operate the unit in compliance with local safety regulations.
- Damage caused by force majeure (fire, explosion, flood, lightning, war, vandalism, etc.).
- Any consequential damages or defects in products from other manufacturers and any arising costs from impairment or loss of productions or any other forms of events.

Repairs carried out by personnel which is not authorized from MUTEC GmbH will void the warranty. Adaptations and modifications to the device made with regard to national, technical, or safety regulations in a country or of the customer do not constitute a warranty claim and must be set with MUTEC GmbH in advance.

§5 Repairs
To obtain warranty service, the buyer must call or write to MUTEC GmbH before returning the unit. All inquiries must be accompanied by a description of the problem and the original buyer's invoice. Devices shipped to MUTEC GmbH for repair without prior notice will be returned to the sender at the sender's expense. In case of a functional failure please contact:

MUTEC Gesellschaft fuer Systementwicklung und Komponentenvertrieb mbH
Siekeweg 6/8 • 12309 Berlin • Germany • Fon 030-746880-0 • Fax 030-746880-99 • Tecsupport@MUTEC-net.com • www.MUTEC-net.com

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INTRODUCTION

Thank you very much for purchasing iCLOCK or iCLOCK dp, Redundant Multiple Clock Synthesizer & Video Reference Generator, from MUTEC!

About this Manual

The whole manual is related to both versions in general, iCLOCK and iCLOCK dp. The individual differences are mentioned in the according sections and chapters.

The structure of this manual refers to the normal process of installing iCLOCK in a standard audio/video studio environment. Thus the chapters are ergonomically sorted to provide a fast set-up. Before first power-on we recommend to read the chapters INTRODUCTION and BRIEF INSTRUCTIONS to get to know the general functionality of iCLOCK and to reach a fast system integration.

The following chapters OPERATION and iCLOCK TECHNOLOGY describe individual functions which enable the adaption of iCLOCK to every studio environment. The chapters APPLICATION EXAMPLE and APPENDIX include descriptions of favorable studio set-ups as well as all technical information.

If there are any uncertainties when operating the units which can not be cleared up by the content of this manual, please feel free to contact your local dealer or MUTEC directly. All contact details are included in chapter WARRANTY REGULATIONS located at the beginning of the manual.

The grey boxes contain supplementary information for the corresponding sections in the text columns. The content of the individual box refers to the description in the text column beside the box.

Boxes which contain a triangle with an exclamation mark should be read carefully! These include additional information which are of major importance for the functional descriptions in the text column.

General Function Description

iCLOCK is a synchronizable, high-precision clock generator which is designed to be the reference in digital audio and video studios as well as broadcast and television stations. Based on a totally new concept of frequency generation, developed by MUTEC, the unit offers an unchallanged flexibility for synchronization of different devices to one house clock. On this occasion iCLOCK breaks traditional, unflexible forms of chaining input and output signals and allows for the first time their completely free combination and scaleability.

iCLOCK's philosophy is addressed to provide the highest possible failure safety for all outgoing clock signals which is needed especially for broadcast stations or centralized clock distribution systems. With regards to this functionality up to 3 independent external references can be auto-detected and locked in a user-defined sequence without any phase-jumps or interruptions in the outgoing signals. This applies also to external clock frequency changes, e.g. from 44.1kHz to 48.0kHz or reference clock changes, e.g. from video to GPS or AES11. Even if all external references are lost, iCLOCK synthesizes the outgoing clock signals based on the last incoming frequency constantly. If the absent reference clock returns the synthesizer will lock gradually again based on iCLOCK's SoftReLock functionality which ensures interruption-free adjustments of all outgoing clock signals. In this case a continous clock supply for all connected devices is guaranteed during any operation mode.

For todays audio/video productions a precision synchronisation of the used audio and video equipment is imperative. To reach the highest value of accuracy the involved clock signals need to be synchronized and converted without any phase drift. Therefore iCLOCK offers a unique, automatically working signal management which observes the phase relationships of all input and output signals and takes care of adjustments aligned to AES11-1997/2003 and EBU R83-1996.

Using DDS-coupled frequency generation and latest DSP-based filtering technologies in combination with an extremely low-jitter clock basis of < 10ps (RMS), iCLOCK eliminates the jitter of incoming reference signals completely. This ensures highest possible jitter attenuation for all outgoing clock signals. As a result the synchronization of connected devices is much more reliable and the sound quality of every AD/DA converter will be increased significantly.

Synchronizable references

- HD tri-level syncs
- SD bi-level syncs
- Word Clock + Word Clock x 256 (so called Super Clock for ProTools™ systems)
- DSD 64, DSD 128 + DXD
- AES3 + AES11
- AES3 id + AES11 id
- S/P-DIF
- GPS
- Telecom
- DCF77
- MSF60
- Internal SD video reference generator
- Further references through option cards or custom designed-programming

Generatable references

- SD bi-level as Black & Burst or composite sync
- Word Clock + Word Clock x 256 (so called Super Clock for ProTools™ systems)
- DSD64, DSD128 + DXD
- Film and video frame + field rates
- AES11
- S/P-DIF
- GPS
- Further clock signals through option cards

HD TV DSD Direct Stream Digital DXD Digital eXtreme Definition

Differences between Software V2.10 and V2.11

Both versions include the preset management as new functionality, which was inquired by several professonal MUTEC customers (see page 28). Using software V2.10 or V2.11 depends on the alarm interface you have already installed or you plan to install. Software V2.10 supports only the older interface iC-ALARM (ordering no. 8005-056), whereas software V2.11 supports only the new iC-ALARM/GPI (ordering no. 8005-066).

The iC-ALARM/GPI interface offers same basis functionality like the iC-ALARM, but the new iC-ALARM/GPI interface allows for switching over the different presets via its GPIO function (see page 31, 32).

Features

- **Synchronizable digital audio clock synthesizer with integrated SD bi-level (PAL / NTSC) + Word Clock + AES11 + S/PDIF sync generators.**
- **Locks nearly 20 different HD tri-level standards and frame rates**
- **Converts HD tri-level syncs into SD bi-level syncs**
- **High-accurate reference generation with an accuracy of <0.1ppm.**
- **Lowest jitter clock base with <10ps (RMS).**
- **Redundant (fail-safe) operation.**
- **DDS-based jitter elimination of incoming reference signals.**
- **Synchronizable SD bi-level, AES11 and S/PDIF generators.**
- **Synchronization and generation of 36 Word Clock rates.**
- **Generation of different PAL and NTSC pilot tones.**
- **Synchronization and generation of all AES3/-11 and S/PDIF clock rates up to 192.0kHz.**
- **DSD64, DSD128 + DXD clock rates standardly supported.**
- **High-accurate GPS or Atomic Clock references, like 10.0MHz and others, are synchronizable, distributable and generatable.**
- **No limitation of input assignment at the universal inputs.**
- **SoftReLock functionality for recurring reference signals.**
- **CYCLESYNC functionality for automatically re-synchronization.**
- **Drop out compensation of incoming reference signals.**
- **Generation of multiple clock rates at the same time.**
- **Free scalability of all output clock signals.**
- **Automatic signal management aligned to AES11 and EBU R83.**
- **Digital varispeed up to ±20%.**
- **Supports all pull up/pull down rates for film, audio and video transfers.**
- **Follows external references up to ±20% (reducible).**
- **Programming of additional clock rates between 1.0Hz–25.0MHz.**
- **Programming of additional lock ranges between 1.0kHz–30.0MHz.**
- **Eeasy and convenient operation through large display.**
- **Soft and hardware upgradeability and recalibratability.**

Applications

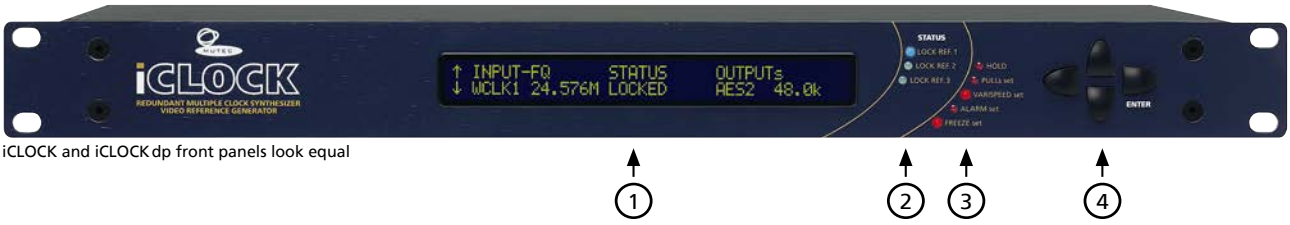
- **Audio and HD/SD video synchronization**
- **Jitter attenuation in clock signals**
- **Centralized + redundant A/V clock distribution**
- **Conversion between HD tri-level syncs, SD bi-level syncs, Word Clock, DSD, DXD, AES3/-11, AES3-/11id, S/PDIF, GPS, Telecom, DCF77, MFS60 and optional standards**
- **Synchronization, distribution and generation of high-accurate GPS or Atomic Clock references**
- **Failure securing in clock distribution systems**
- **Film, video and audio transfers**
- **Synchronization of pilot tone resolvers, timecode generators, film projectors**
- **Coupling of HD/SD based multi-format video systems**

Optional Products

- iCLOCK dp iCLOCK basis unit with two redundant power supplies
- P/NVSG-02 Second, synchronizable SD bi-level video sync generator
- iC-ALARM Relais-coupled alarm signal interface
- iC-ALARM/GPI Relais-coupled alarm signal and GPIO interface
- iC-WCO-4 4 x Word Clock output expansion
- iC-PROG Programming of additional clock rates and lock ranges
- iC-CAL0.1 Re-calibration of internal reference oscillator to <0.1ppm

CONTROL ELEMENTS

iCLOCK + iCLOCK dp Front Panel



iCLOCK and iCLOCK dp front panels look equal

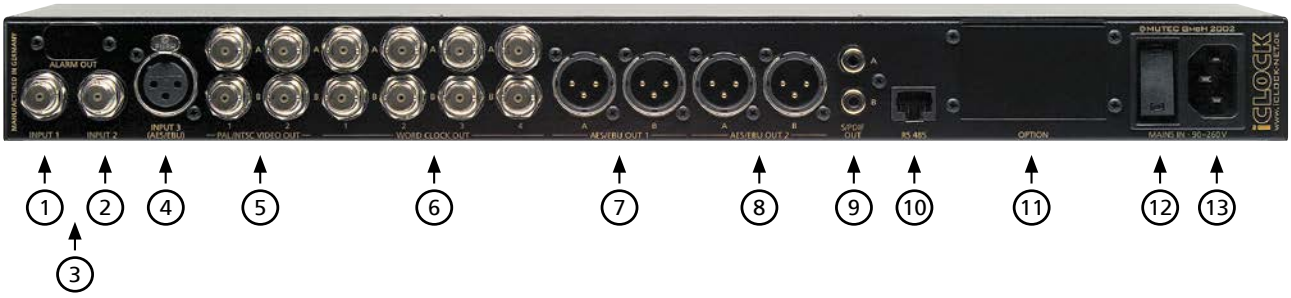
1 DISPLAY
All parameter and function settings are controlled using the display and the four cursor buttons.

2+3 STATUS Indicators
The three blue indicators show the lock status of the currently active clock source. The five red indicators show important system statuses of iCLOCK.

4 CURSOR Buttons
All parameter and function settings are controlled using the four cursor buttons and the display.

Refer to the OPERATIONS chapter for more information.

iCLOCK Rear Panel



iCLOCK dp Rear Panel

1+2 INPUT1, INPUT2
These universal input terminals allow for applying various external clock signals for synchronizing the internal clock synthesizer. All clock formats supported by the system can be received at any of these inputs. These two inputs and INPUT 3 can be synchronized by the synthesizer in a freely configurable sequence. The impedance of each input is 75Ω and can be switched off internally for chaining devices, see the »Switching-off the Termination of the universal Clock Inputs« section in the appendix.

3 ALARM OUT
The iC-ALARM output is optionally available (item no. 8005-065). Refer to the EXTENSIONS chapter for a short overview.

4 INPUT3 (AES/EBU)
A balanced digital AES/EBU signal can be applied to this input for synchronizing the internal clock synthesizer. The signal must comply with AES3–1992 (R1997) or AES11–1997.

Both input terminals are isolated from ground to avoid interference from the connected clock line. This applies to all clock references except video! Is a video signal selected as reference the corresponding input will be connected to ground automatically.

If this does not comply with the electrical studio purposes, the ground connections of both inputs could be linked permanently by setting jumpers on the mainboard. Refer to the »Connecting the universal Clock Inputs to Ground« section in the appendix for a short instruction.

5 PAL/NTSC VIDEO OUT
SD bi-level PAL and NTSC composite video sync signals are sent from these outputs. After installing the optional P/NVSG-02 video sync generator (item no. 8010-010), a separate video format can be assigned to each output pair. Associated output pairs are arranged on top of each other.
If a HD tri-level sync signal is applied to a reference input, the incoming reference can be distributed through the PAL/NTSC video outputs.
The individual BNC terminals of an output pair are marked as A and B; this allows, for example, for a simple documentation of the connected devices.

6 WORD CLOCK OUT
These outputs send Word Clock, Word Clock x 256 signals and film/video frame/field clock rates. Each of the output pairs can be assigned with a separate clock rate. Associated output pairs are arranged on top of each other.
The individual BNC terminals of an output pair are marked as A and B; this allows, for example, for a simple documentation of the connected devices.

Refer to the »Synchronizable and generatable Clock Rates« section in the APPENDIX for a full list of all Word Clock, AES/EBU and S/P-DIF clock rates that can be generated.

7+8 AES/EBU OUT1, AES/EBU OUT2
These outputs send a balanced digital AES/EBU audio or blank frame signal compliant with AES3 – 1992 (R1997) and AES11 – 1997. Each of the output pairs can be assigned with a separate clock rate, and the channel status bits can be edited individually. The rear-panel outputs are marked as AES OUT 1 and AES OUT 2, the individual output terminals as »A« and »B«; this allows, for example, for a simple documentation of the connected devices.

9 S/P-DIF OUT
These outputs send an unbalanced digital S/P-DIF audio or blank frame signal compliant with IEC 60958. The channel status bits can be edited. The individual output terminals are marked as A and B; this allows, for example, for a simple documentation of the connected devices.

10 RS485
This interface port is provided for programming the iCLOCK and updating the device firmware. A software for remotely controlling the device over LANs (Local-Area Networks) will be available in the future.

11 OPTION
This slot is provided for installing optional iCLOCK terminals. Refer to the iCLOCK EXTENSIONS chapter for a short description of extensions available currently or in the future.

12 MAINS IN 90–260V, Power Switch
This is the main switch for switching the device on and off. Be sure to make all connections (especially the supplied power cable) properly before turning on the switch. Heed the SAFETY INSTRUCTIONS at the beginning of this manual.

13 MAINS IN 90–260V, Power Inlet
Connect the supplied power cable here. Make sure that the power switch is turned off before connecting the power cable to this inlet and to the power outlet. Line voltages within the range of 90…260 V with a frequency of 50 or 60 Hz can be applied. The internal power supply will automatically make all necessary adjustments.

14 iCLOCK dp MAINS IN 90–260V, Power Inlets
Connect the supplied power cables here. It does not matter which power inlet is used when only one power cable will be connected. In general operation two power cables containing mains voltage can be connected simultaneously. Line voltages within the range of 90…260 V with a frequency of 50 or 60 Hz can be applied. The internal power supplies will automatically make all necessary adjustments.

For detailed specifications on all terminals, refer to the »Pin assignment of the Connectors« and »Technical Data« sections in the APPENDIX.

iCLOCK dp does not consist of a power switch!

INSTALLATION

Content of the Box

The unit was packed carefully. Nevertheless we recommend to check the content directly after opening the package:

1 x iCLOCK / iCLOCK dp
1 x Power cable, 2 x power cables for iCLOCK dp
4 x Rubber feet
1 x Manual
1 x Registration card

Before Powering Up

The condition of the packaging material and the device should be checked carefully additionally. If there are any damages please refer to SAFETY INSTRUCTIONS, Initial Operation, and WARRANTY REGULATIONS.

Before installing the unit the section SAFETY INSTRUCTIONS located at the beginning of this manual should be read carefully.

Never expose the device and accessories to rain, moisture, direct sunlight, or excessive heat produced by radiators, heaters, or spot lights! Sufficient air circulation in the environment of the device must be ensured!

Placing the Device

The unit should be set up as closely as possible to the devices to which it will be connected, so as to avoid excessive cable lengths. Use the 4 rubber feets enclosed with the appliance and stick them symmetrically on the bottom side of the unit to protect the enclosure and supporting surface from being damaged.

The device can be mounted into a standard 19" rack and will require 1 unit. In this case, the rubber feet cannot be attached. Install the device so that one unit of rack space is left free both above and below the device to allow for sufficient ventilation! The mounting depth including the terminals is 240 mm/9.45" for iCLOCK and 280mm/11.02 for iCLOCK dp. Another 60 mm/2.4" should be added for the required cables.

Additional slide-in rails on the rack inside are recommended for safe installation. This will also avoid long-term mechanical deformation of the housing.

Wiring the Word Clock and Video Interfaces

To allow for synchronization of signals, the interfaces of all devices involved must be properly connected to each other, so as to ensure a logical signal flow. Always be sure to connect the Word Clock outputs of iCLOCK to the according inputs of the devices you wish to synchronize! Cable lengths should be kept as short as possible to minimize signal losses and/or interference!

For the transmission of Word Clock or video signals electrical, asymmetrical cables with a resistance of 75Ω and BNC connectors on both ends are used. Typically, such cables are marked »RG-59U, RG59B/U«.

Additionally, you should make sure that the Word Clock or video inputs to be connected to iCLOCK's outputs have a 75Ω terminating resistor! Most Word Clock or video inputs allow for enabling/disabling the termination with a so-called »termination-switch«, which may be located on the outside or inside of the device.

For devices which have no termination of the Word Clock input, e.g. RME Hammerfall with Word Clock i/o or Alesis BRC, you can use an additional BNC-T piece to terminate the input. Plug the T piece with its center connector into the input of the receiving device. Then, connect the cable coming from iCLOCK to one of the lateral connectors, and the other connector of the BNC-T piece to a 75Ω resistor forming the BNC termination.

Basically, you should avoid »looping through« Word Clock leads by means of passive BNC-T pieces to preserve the signal quality, as level drops will be the result. If there is no other way to wire your set-up, please make sure that all Word Clock inputs (except for the last device in the chain) have their terminations disabled! In a serial Word Clock chain only the last clock input should have a termination! Never connect more than three devices in series to one output!

Clock Cable Lengths

It is imperative that the lengths of all cables connected are largely the same, as this is the only way to ensure that all devices will be synchronized in phase (exception: cable tolerances).

Please make sure that the cable used has a resistance of 75Ω, in compliance with the specifications! If a cable with a different resistance is used, a dramatic deterioration of the signal quality can be the result! In this case, the perfect synchronization of all devices involved could be impaired.

We recommend using high-grade cables with a good shielding for your clock signal leads, in particular, if you need to transmit Word Clock x 256 (so-called Super Clock) signals over greater distances. In any case, a length of max. 10 meters (approx. 30 feet) should never be exceeded!

Cables for High Clock Rates

Especially when working with high AES3/-11 clock rates well shielded clock lines are imperative to avoid increased radiation! Standard cables are nor-mally useable for clock rates up to 50.0kHz. Special shielded cable material should be used for transfer of higher clock rates.

Since some manufacturers offer optimized cables for the transmission of digital S/P-DIF and AES3/-11 signals, it will be a good idea to ask your retailer for specific cables.

Wiring the AES/EBU and S/P-DIF interfaces

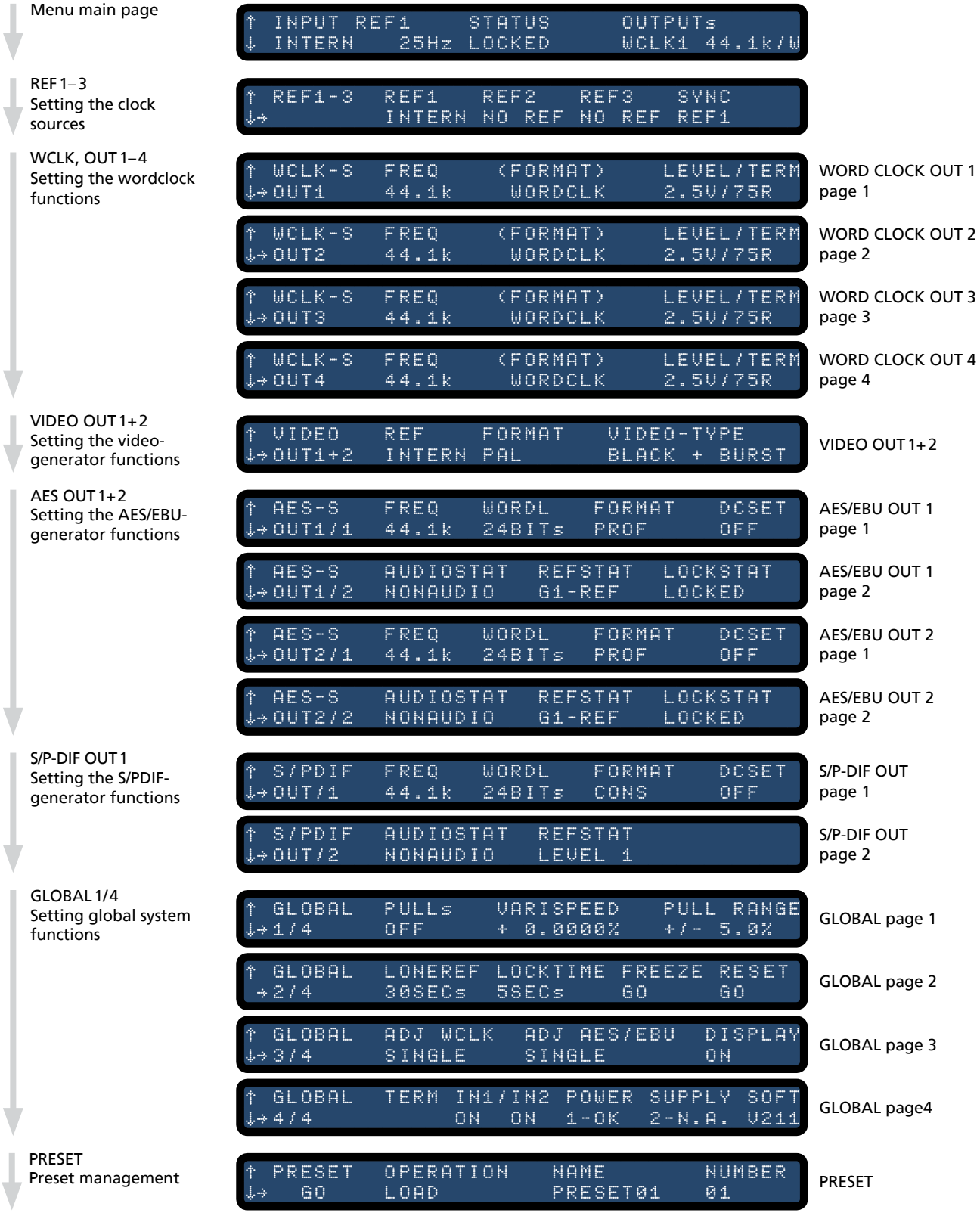
Connect the AES/EBU interfaces with the help of balanced electrical cables equipped with XLR connectors on both ends. The specifications stipulate a specific cable resistance of 110Ω (ask your retailer for a confirmation of this value when purchasing the cables).

Connect the coaxial S/P-DIF interface with the help of unbalanced electrical cables equipped with cinch connectors on both ends. The specifications stipulate a specific cable resistance of 75Ω (ask your retailer for a confirmation of this value when purchasing the cables).

GENERAL OPERATION

Menu Structure

The entire menu structure is based on the logical flow of events when deploying the iCLOCK in a standard audio/video-studio environment. Therefore, starting with the menu main page, the menu pages have an ergonomically structured sequence and can thus be called successively by repeatedly pressing the up button.



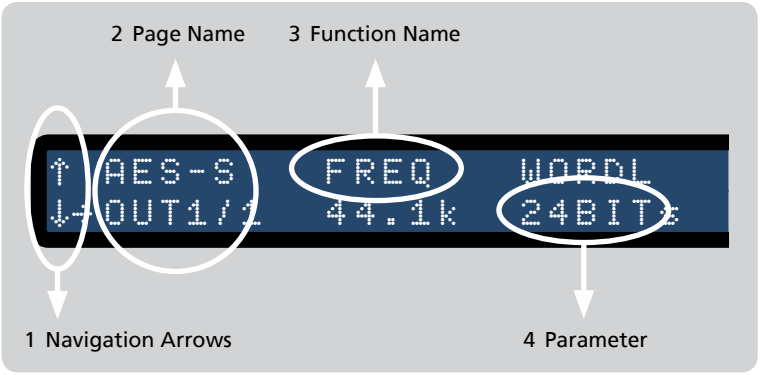
Safety Instructions

For safety reasons, be sure to read the SAFETY INSTRUCTIONS and INSTALLATION chapters before first powering-up!
We also recommend reading the CONTROL ELEMENTS chapter for information on how to connect iCLOCK!

Selecting Menu Pages and setting Functions

The device is fully operated using the display and the four cursor buttons on the front panel. All display screens have an identical operating structure:

1 Arrows on the left display side for simplifying navigation
2 Appropriate page name on the left display side next to the arrows
3 The upper display line shows the function name
4 The lower display line shows the associated adjustable parameter



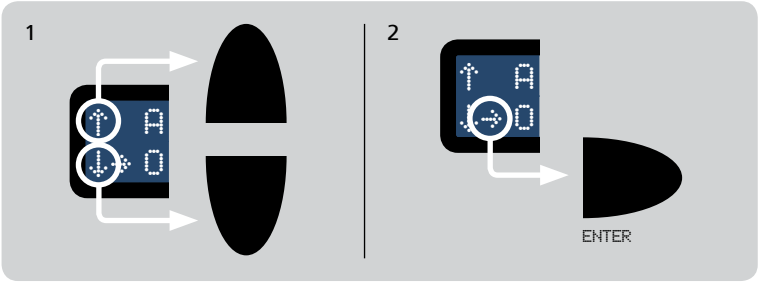
Display operating structure

The arrow orientations refer to the respective cursor buttons.

Selecting different display pages during operation will not affect the functionality of iCLOCK. Even changing output function settings will not impede the overall operation!

1 When the two vertical arrows are displayed as normal, pressing the up and down buttons will move between the individual menu pages.
2 When an arrow pointing to the right is displayed, pressing the right button (ENTER) will provide access to the adjustable parameter of the individual functions. With every press of the button, the arrow moves on to the next parameter of the next function.

Display pages not containing a horizontal arrow are provided for function-status indication only and cannot be edited.

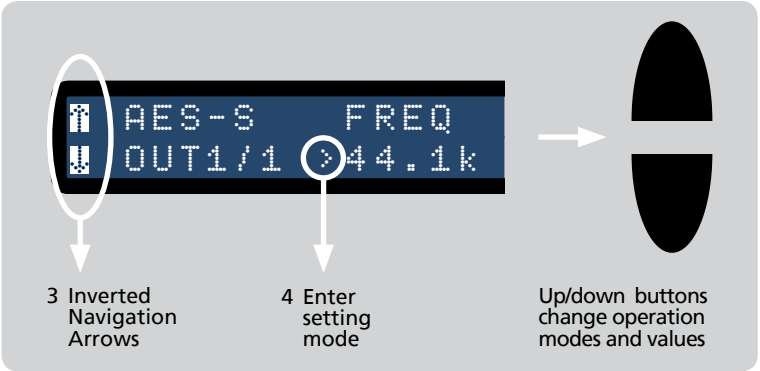


Display arrow orientations

3 During this procedure, the two vertical arrows will be inverted, meaning that the up and down buttons are now used for changing parameter values and not for moving between menu pages.

4 When the horizontal arrow has been positioned in front of the parameter to be changed, pressing the up/down buttons will first change to the setting mode (the arrow will change its shape). Subsequent pressing the ENTER button will confirm the changes, the arrow will return to its original shape. Pressing the ENTER key again will then move the arrow to the next parameter.

If no buttons are operated for approx. 30 seconds, the display will automatically return to the menu main page.

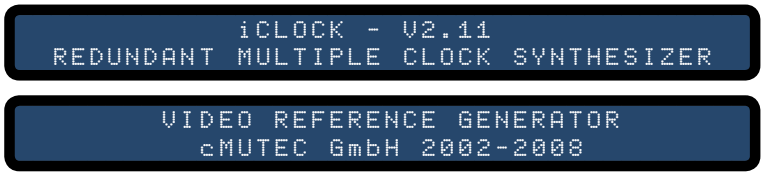


Setting modes and parameters

MENUS AND FUNCTIONS

Main Menu Page

When the device is switched on, a boot period of approximately seven seconds will occur. During this period, the display will show two pages in succession. The first of them provides information on the current firmware version.



Boot pages

After the boot period, the menu main page will be displayed. This page is always displayed during standard operation; in combination with the eight front panel indicators, it provides information on the basic device status.

Menu main page

INPUT REF1, -2, -3
INPUT REFERENCE, shows an abbreviation of the clock source currently selected incl. its reference slot and its actual rate as a realtime measurement. As display space is limited, the displayed value is automatically adapted with regard to the decimal places and the frequency unit as follows:

Hz = hertz
k = kilohertz
M = megahertz

Refer to the »Selecting Clock Sources« section in this chapter for information on individual sources.

STATUS (function)
Shows the current system status. STATUS provides information on the device synchronization and possible system errors. Major functionalities are indicated through eight LEDs on the right hand side of the display additionally.

LOCKED (status message)
LOCKED indicates that the system has synchronized to the internal video reference generator or an externally applied clock signal. At the same time, the blue LOCK indicator associated with the active clock input (INPUT 1 - 3) will light.

FQ CHANGE (status message)
FREQUENCY CHANGE indicates that a sync source change is occurring. This can be a change between two externally applied clock signals or an automatically or manually performed change from an external to an internal clock source (or vice versa). When the change occurs, the LOCK indicator of the last clock source used will go dark, and the red HOLD indicator will light. When the system has locked to the new source, the HOLD indicator will go dark, and the associated LOCK indicator will light.

HOLD (status message)
HOLD indicates that an externally applied clock signal has either drifted outside its permitted lock range (see the PULL RANGE parameter on the GLOBAL 1/4 page) or is completely lost. In this case, the system waits for a certain period for the signal to return before automatically changing to the next clock source. This waiting period specified by the LONEREF parameter on the GLOBAL 2/4 page.

CYCLESYNC (status message)
CYCLE SYNCHRONIZATION indicates that the system is currently performing an automatic resynchronization. This function can be disabled on the REF1–3 page or be enabled manually for individual clock source inputs.

All user-specific parameter settings are available furthermore when power is restored.

Status Displays

When iCLOCK is running in INTERN mode the first blue LED, LOCK REF 1, will light and confirm the synchronization of the synthesizer to the internal video reference generator.

After first switching on, the synthesizer needs approx. 30 seconds to achieve stable synchronization. This depends on the time the video reference generator needs for attuning all components of its video output signal.

During this process the system re-locks temporarily (the HOLD LED and the blue LOCKED REF 1 LED are lightening alternately). This has no relevance for system security. The output clocks are constantly available.

OSCI FAIL (status message)
OSCILLATOR FAILED, indicates that the internal reference clock oscillator has failed.

MAIN1LOST (status message)
MAIN 1 LOST indicates that the primary supply voltage or the primary internal power supply have failed. If this status message is indicated, contact the technician in charge immediately! The message is displayed only if the iCLOCK is equipped with a redundant power supply (iCLOCK dp version, item no. 8015-046).

MAIN2LOST (status message)
MAIN 2 LOST indicates that the secondary supply voltage or the secondary internal power supply have failed. If this status message is indicated, contact the technician in charge immediately! The message is displayed only if the iCLOCK is equipped with a redundant power supply (iCLOCK dp version, item no. 8015-046).

Error Messages

If one of the messages OSCI FAIL, MAIN1LOST or MAIN2LOST is displayed, safe operation is not guaranteed! Contact the technician in charge immediately!

OUTPUTs (function)
Here, the set clock rates of all outputs are displayed alternately as a »ticker«. This allows for checking the settings directly with no need for changing to the relevant menu pages.

The following clock signals or rates are factory defaults:

PAL/NTSC VIDEO OUT 1+2	=	PAL Black+Burst
WORD CLOCK OUT 1–4	=	44,1kHz
AES3/-11 OUT 1+2	=	44,1kHz
S/P-DIF OUT	=	44,1kHz

Selecting and activating Clock Sources

The REF1-3 page allows for selecting the clock source of the internal synthesizer. The clock formats supported by iCLOCK are listed in the adjacent table. The factory defaults are REF1 = INTERN, REF2 = NO REF, REF3 = NO REF.

If one of the synchronizable clock sources is selected, the respective signal format is marked with an index (1 + 2) referring to the two universal clock-source inputs INPUT 1 and INPUT 2. Thus, the input clock signals can be routed freely to these two system inputs. The AES format, however, is an exception as balanced AES/EBU signals can be received by INPUT 3 only.

When selecting clock sources, the system proceeds logically. For example, if the PAL1 source (PAL video on INPUT 1) has been selected under REF1, it will not be available anymore for REF2 and REF3. This means that only sources with an index of »2«, »AES«, »INTERN«, and »NO REF« can be configured. Likewise, a clock source programmed for REF2 will not be available for REF3 anymore.

If a clock source is routed to one of the REF slots it has to be activated for synthesizer synchronization. Therefore the last modified REF slot is displayed in the SYNC function menu automatically. Moving the cursor to this position and pressing the ENTER button will activate the synchronization process to the new clock source immediately.

Activating Clock Sources

After selecting a new clock source under REF1–3, it is imperative to move the cursor to the SYNC function and to press ENTER for activating the selected reference for synchronisation!

REF1-3 page

REF1, REF2, REF3 (function)
This function allows for selecting three clock sources supported by the system and for assigning them to a clock source slot. The sources will synchronize the system in their numeric sequence (REF1 → REF2 → REF3).

INTERN (setting)
INTERNAL Selecting the INTERN setting synchronizes the synthesizer to the internal video reference generator that supplies all audio clock signals in compliance with AES11 and EBU R83. As internal synchronization is the ultimately selected source, no other sources will be left afterwards. Therefore, when selecting INTERN for REF1, the REF2 and REF3 functions will automatically be assigned with the »NO REF« setting.

Setting REF1–3

The most important clock source in your studio environment should always be assigned to REF1! This is critical for proper completion of the CYCLE-SYNC setting. Afterwards, the other REF slots should be assigned with sources in a hierarchical order.

PAL1,-2 (setting)
PAL1, -2 allows for synchronizing the internal video reference generator to PAL or SECAM video signals with a frame rate of 25 fps, 625 lines, and a line frequency of 15.625kHz.

NTSC1,-2 (setting)
NTSC1, -2 allows for synchronizing the internal video reference generator to NTSC video signals with a frame rate of 29.97fps, 525 lines, and a line frequency of 15.73425kHz, or 30fps, 525 lines, and a line frequency of 15.750 kHz (black/white). The two NTSC formats are distinguished automatically.

WCLK1,-2 (setting)
The WLCK1, -2 setting allows for synchronizing the synthesizer to all audio-related Word Clock rates within a range of 8.0…24.576MHz. The applied clock rate is recognized automatically. Refer to the »Synchronizable and generatable Clock Rates« section in the appendix for a full list of all clock rates.

AES (setting)
AES allows for synchronizing the synthesizer to all audio-related AES3/-11 rates in a range of 32…192kHz. The applied clock rate is recognized automatically. Both AES 3 or AES 11 compliant signals can be applied. In addition, S/PDIF signals can be applied to this input and be used for synchronization. Refer to the »Synchronizable and Generatable Clock Rates« section in the appendix for a full list of all clock rates.

AESid1,-2 (setting)
AESid1, -2 allows for synchronizing the synthesizer to all audio-related AES3/-11 rates in a range of 32…192kHz. The applied clock rate is recognized automatically. Both AES 3id or AES 11id compliant signals can be applied. In addition, S/PDIF signals can be applied to this input and be used for synchronization. Refer to the »Synchronizable and Generatable Clock Rates« section in the appendix for a full list of all clock rates.

S/P-DIF1, -2 (setting)
S/P-DIF1, -2 allows for synchronizing the synthesizer to all audio-related S/P-DIF rates in a range of 32…192kHz. The applied clock rate is recognized automatically. Both S/P-DIF audio or S/P-DIF blank frame signals can be applied. Refer to the »Synchronizable and Generatable Clock Rates« section in the appendix for a full list of all clock rates.

GPS1,-2 (setting)
GPS1, -2 allows for synchronizing the synthesizer to all sources with standard GPS rates (1.0MHz, 2.5MHz, 5.0MHz, and 10.0MHz). The actual clock rate will be recognized automatically.

TELEC1,-2 (setting)
TELECOM1, -2 allows for synchronizing the synthesizer to sources providing the standard Telecom clock rates of 1.024MHz or 2.048MHz. The actual clock rate will be recognized automatically.

DCF771,-2 (setting)
DCF771, -2 allows for synchronizing the synthesizer to sources providing a DCF77 clock rate (77.5kHz). This reference is transmitted from Mainflingen/Germany with a range of approx. 2000kms.

MSF601,-2 (setting)
MSF601, -2 allows for synchronizing the synthesizer to sources providing a MSF60 clock rate (60.0kHz). This reference is transmitted from Rugby/UK with a range of approx. 1500kms. From April 1st, 2007, it will be transmitted from Anthorn.

HD-P-1,-2 (setting)
HD-P-1, -2 allows for synchronizing the synthesizer to HD tri-level sync sources with frame rates of 24Hz, 25Hz, 30Hz, 50Hz, 60Hz.

HD-N-1,-2 (setting)
HD-N-1, -2 allows for synchronizing the synthesizer to HD tri-level sync sources with frame rates of 23.98Hz, 29.97Hz, 59.94Hz.

NO REF (setting)
Selecting the NO REF setting disables the respective clock-source slot. If, for example, only two clock sources are connected to the device and REF1 and REF2 are configured accordingly, assign the NO REF setting to the REF3 slot in order to disable this slot for the automatic resynchronization function (see also CYCLESYNC).

New References

For special-purpose applications, the range or number of the sync-clock references can be extended by means of a software update. Practically any frequency or frequency range between 1.0 kHz and 30.0 MHz can be defined. The only precondition is that the new clock source can be connected to and processed by the BNC inputs (INPUT 1 and INPUT 2) according to their specifications.

For more information or a proposal, send an e-mail message to

tecsupport@iCLOCK-net.de

You may also call us or send a fax:

Phone 0049-(0)30-746880-0
Fax 0049-(0)30-746880-99

When applying Word Clock, GPS, Telecom, DCF77 or MFS60 sources, both pulse and sine signals will be accepted which allows for processing even heavily slurred signals.

If an option supporting new input clock formats is installed, these will automatically be implemented by the system and will be available for selection on the REF1–3 page.

Displaying HD tri-level References

When locking your iCLOCK or iCLOCKdp to HD tri-level references, their individual frame rates can not be displayed correctly under »STATUS«, as it is the case when locking SD bi-level references. This is due to system reasons. But your iCLOCK will be locked as it should be.

Refer to the »Synchronizable HD tri-level Standards and Frame Rates« section in the APPENDIX for a full list of all synchronizable and convertable HD tri-level standards and frame rates.

As the synthesizer is capable of continuously supplying the adjusted iCLOCK output signals, even a manual clock source change on an input (by replugging the clock lines) is supported during operation!

It is not important whether the change occurs, for example, from a PAL SD video signal to a Word Clock or GPS signal. The set output clock rates will not be altered; only the base rate will gradually be updated to match the new source using iCLOCK's SoftReLock functionality (see chapter iCLOCK TECHNOLOGY).

CYCLESYNC is not available when the LONEREF function is set to HOLD (see GLOBAL 2/4 menu page).

SYNC (function)
SYNCHRONIZATION This function allows for manual or automatic synchronization of the synthesizer to selected clock sources assigned to the REF1–3 slots.

SEQSYNC (setting)
SEQUENCE SYNCHRONIZATION This is the default setting when activating the REF1–3 menu page. It indicates the standard reference synchronization mode of iCLOCK.

REF1, REF2, REF3 (setting)
If one of the REF1, REF2, or REF3 parameters is selected and confirmed by pressing the ENTER button, the synthesizer will immediately synchronize the clock source assigned to the corresponding REF slot. The output signals are set or adapted to the new source within the period specified by the LOCKTIME parameter (see GLOBAL 2/4 page).

CYCLESYNC (setting)
CYCLE SYNCHRONIZATION With this setting, the input circuit querys the three inputs for clock source reestablishment by cycling from REF1 to REF2 to REF3 and to the internal video reference generator automatically until a source is available. The system's priority is programmed to the first reference slot (REF1).

Refer to »Sequence Synchronization and Cycle Synchronization« section in the iCLOCK TECHNOLOGY chapter for details about SEQSYNC and CYCLESYNC.

Configuring the internal Video Reference Generator

The settings of the internal video reference generator and the four video outputs available with iCLOCK standard version are configured on this page. Two output pairs comprising one top-row and one bottom-row BNC output each are available on the rear panel. These are numbered as PAL/NTSC VIDEO OUT 1 and 2.

VIDEO page

If the optional second video generator is installed, it is necessary to split up the video output pairs between the two generators. Therefore, two jumpers have to be removed from their socktes on the mainboard, see the »Splitting-up the Video Ouputs for dual Video Generator Operation« section in the APPENDIX.

VIDEO OUT1+2 (page name)
VIDEO OUT 1+2 indicates that the internal video reference generator sends its signals to both PAL/NTSC VIDEO OUT 1 and 2. This means also that only one video reference generator is installed.

If the optional second generator is installed, another menu page will automatically be added for it. The page names will change accordingly:

VIDEO OUT1 = internal video reference generator
VIDEO OUT2 = optional video generator

Locking the internal Video Reference Generator – 1

If PAL or NTSC SD video is selected as external reference, the internal video reference generator will be automa-tically gen-locked by the reference source and switches to the same video format! This guaranties correct phase relationships between the video source and iCLOCK's generated sync signals. A video format conversion is only possible using the optional video generator P/NVSG-02 (Order no. 8010-010) additionally.

With synchronization to PAL or NTSC SD bi-level video it is not possible to change the clock reference (REF) of the internal video reference generator!

REF (function)
REFERENCE This function allows for setting the clock source of the respective video generator and can also enable video signal routing. The factory default is INTERN.

INTERN (setting)
INTERNAL links the video generator to the internal reference clock oscillator. An extraordinary feature of iCLOCK is that the synthesizer can be synchronized to an external clock source independently of the simultaneously enabled video generator. Therefore, only the audio-related clock signals might be subject to any present clock source deviation while the video signals are output with the accuracy of the internal clock: In a way, the video generator acts as »independent autonomous generator« within iCLOCK.

EXTERN (setting)
EXTERNAL This setting synchronizes the video reference generator to the currently selected external clock source. Any signal or phase relations between the input clock signals and the selected video format will be recognized automatically and be routed internally in compliance with AES11 and EBU R83.

This function also ensures a redundant (failsafe) availability of the video output signals. If the external source fails temporarily or permanently, the video generator will continue generating its output signals based on the last recognized clock rate. If the external source returns to operation, any differences to the previous rate will gradually be corrected to maintain flawless on-air operation in e.g. broadcasting environments.

DIST (setting)
DISTRIBUTION This setting allows for forwarding the input video signal to the video outputs using a hardware bypass. The signal is refreshed by the video generator output amplifier to ensure a suitable output level; no other modifications are made to the signal. If the DIST setting has been selected for REF, the FORMAT and VIDEO TYPE functions cannot be selected anymore. This is because the video output format is determined by the input video reference signal.

In this mode, the synthesizer synchronizes to the input video signal to provide the output of phase locked audio clock signals.

Locking the internal Video Reference Generator – 2

When running the internal video reference generator in EXTERNAL mode, the external reference signal may not deviate more than ±30 ppm from its nominal clock frequency! Do not try to lock the video generator to pull up/down clock rates - its video signal would be destroyed!

DIST does not provide redundancy for the video outputs. If the external video reference source fails, the video outputs will fail, too!

FORMAT (function)
FORMAT This function allows for selecting the video format generated and output by the video generator. The factory default is PAL.

PAL (setting)
PAL With this setting, the video generator produces a PAL-B/G standard definition (SD) video signal compliant with the PAL/CCIR video standard (25 fps, 625 lines, 15,625.0 Hz line frequency). Depending on the REF and VIDEO TYPE settings, this signal can be output as Black + Burst or composite video sync. Even when a HD tri-level source is choosed as reference (HD-P-1/2), the PAL setting is possible. Thus the internal video reference generator directly converts incoming HD references with frame rates of 24Hz, 25Hz, 30Hz, 50Hz or 60Hz into PAL SD video using its unique cross-locking functionality.

NTSC (setting)
NTSC With this setting, the video generator produces an NTSC standard definition (SD) video signal (29.97 fps, 525 lines, 15,734.25 Hz line frequency). Depending on the REF and VIDEO TYPE setting, this signal can be output as Black + Burst or composite video sync.
Even when a HD tri-level source is choosed as reference (HD-N-1/2), the NTSC setting is possible. Thus the internal video reference generator directly converts incoming HD references with frame rates of 23.98Hz, 29.97Hz or 59.94Hz into NTSC SD video using its unique cross-locking functionality.

Refer to the »Synchronizable HD tri-level Standards and Frame Rates« section in the APPENDIX for a list of all convertable HD standards and frame rates.

Locking the internal Video Reference Generator – 3

When externally synchronizing the video reference generator, the lock and varispeed ranges of the synthesizer will be reduced to ± 30 ppm! Thus, enabling the pull-up/down and varispeed factors is not provided in this mode. If, however, these settings are made, the video generator will automatically enable internal synchronization.

When locking the synthesizer to the internal video reference generator or when locking the video reference generator to an external applied reference source, a synchronization time of approx. 30 seconds for attuning all components of the video output signal is required.

During this process the system re-locks temporarily (the HOLD LED and the blue LOCKED REF 1 LED are lightening alternately). This has no relevance for system security. The output clocks are constantly available.

VIDEO TYPE (function)
VIDEO TYPE This function allows for outputting the previously selected video format as Black + Burst or composite video sync signal. In addition, when selecting composite video sync, one of two different output levels can be set (see below). The factory default is BLACK + BURST.

BLACK + BURST (setting)
BLACK + BURST With this setting, the signal of the previously selected format will be output as Black + Burst signal. Refer to the »Technical Data« section in the APPENDIX.

COMPOSITE SYNC 0.3V (setting)
COMPOSITE 0.3V With this setting, the previously selected video format is output as composite video sync signal with a negative sync signal level of 300 mV (0.3 V).

COMPOSITE SYNC 2.0V (setting)
COMPOSITE 2.0V With this setting, the previously selected video format is output as composite video sync signal with a negative sync signal level of 2.0 V.

Due to the internal signal phase corrections the synthesizer can re-lock temporarily when switching Word Clock clock frequencies. This does not affect the output signals or functionality of iCLOCK.

Word Clock rates are set independently of externally applied clocks. Thus, iCLOCK provides Word Clock conversion from all supported input rates to all generatable output rates!

GPS / Atomic Clock + Audio Player References

As so-called GPS or atomic clock references, the iCLOCK and iCLOCKdp are able to lock and generate the following frequencies:

1.0Mhz, 2.5MHz, 5.0MHz, 10.0MHz

Furthermore, the iCLOCK and iCLOCKdp are able to generate the following basic clock rate used in e.g. CD players:

16.9344MHz

This clock signal can be used to replace a CD player's internal system clock with the 16.9344MHz clock signal generated by the iCLOCK or iCLOCKdp. Thus, a CD player can benefit from the iCLOCK's lowest-jitter clock generation which leads to an audible sound improvement of the CD player's DA converters!

Before replacing your CD player's internal basic clock, check carefully if the frequency of 16.9344MHz is the right one for your CD player!

Configuring the Word Clock Outputs

The WCLK OUT 1–4 display pages allow for configuring the eight wordclock outputs provided by the iCLOCK standard version . Four output pairs comprising one top-row and one bottom-row output each are available on the rear panel. These are numbered as WORD CLOCK OUT 1–4. The BNC terminals making up a pair are marked as »A« and »B«, thus allowing for a simple documentation of the connected devices.

WCLK page

WCLK-S, WCLK-L (page name)
WORD CLOCK – SINGLE, – LINKED, The »S« and »L« letters indicate the Single and Linked modes. Refer to the »ADJ-WCLK« parameter on the GLOBAL 3/4 page explained in the OPERATION chapter, »Setting System Functions« for more information. The factory default is Single mode (– S).

OUT1-4 (page name)
OUT1 – 4 is the Word Clock out pair that can be configured on the current page.

FREQ (function)
FREQUENCY sets the clock rate of the selected output pair. The factory default is 44.1 kHz.

24Hz...60Hz, 8.0kHz...24.576MHz (setting)
Altogether 36 different audio-related clock rates between 8.0 kHz and 24.576 MHz can be selected individually for each Word Clock output pair. Also 8 pilot tone clock rates from 24 Hz to 60 Hz are available for synchronizing pilot tone resolvers, timecode generators or film projectors and 5 different high-accurate clock references known from GPS receivers or atomic clock generators. The individual rates are shortly described under <FORMAT>. Refer to the »Synchronizable and Generatable Clock Rates« section in the appendix for a full list of all clock rates.

<FORMAT> (message)
FORMAT provides information on the output format of the currently selected Word Clock out pair. This parameter is provided for information purposes only (this is why it is displayed in brackets.) Setting is made against the setting of the FREQ parameter. The factory default is WORDCLK.

WORDCLK (setting)
WORD CLOCK This setting means that the rate is output as set.

SUPERCLK (setting)
The SUPER CLOCK function is available for Word Clock rates of 44.1 or 48 kHz only. It is used for a rate adaptation required for Digidesign Pro-Tools™ systems (not! ProTools HD™). Accordingly, the 44.1 kHz and 48 kHz rates are available twice for selection: for both the WORDCLK and the SUPERCLK, for ProTools™ systems, settings.

FILM FR (setting)
FILM FRAME RATE, 24 Hz

FILM FI (setting)
FILM FIELD RATE, 48 Hz

PAL FR (setting)
PAL VIDEO FRAME RATE, 25 Hz

PAL FI (setting)
PAL VIDEO FIELD RATE, 50 Hz

NTSC FRBW (setting)
NTSC VIDEO FRAME RATE, 30 Hz

NTSC FIBW (setting)
NTSC VIDEO FIELD RATE, 60 Hz

NTSC FRC (setting)
NTSC VIDEO FRAME RATE, 29.97 Hz

NTSC FIC (setting)
NTSC VIDEO FIELD RATE, 54.94 Hz

DSD64 (setting)
DSD clock rate, 2.8224 MHz

DSD128 (setting)
DSD double clock rate, 5.6448 MHz

DXD (setting)
DXD clock rate, 352.8 kHz

LEVEL/TERM (function)
LEVEL/TERMINATION This function allows for adjusting the Word Clock signal level of the selected output pair and for entirely disabling the output. The page always displays the output level and the corresponding internal termination of the output pair. The factory default is 2.6V/75R.

2.5V/75R (setting)
With this setting, the Word Clock signal is output with a level of 2.6V and an internal termination of 75Ω.

3.5V/22R (setting)
With this setting, the Word Clock signal is output with a level of 3.5V and an internal termination of 22Ω. This setting is recommended for Word Clock signals to be transmitted over great distances.

SC adapted (setting)
SUPER CLOCK adapted This is no adjustable setting but a status message used only for clock rates set to Super Clock. Here, the level cannot be modified but only be disabled if required (OFF).

OFF (setting)
OFF disables the selected Word Clock out pair.

More Clock Frequencies

For special-purpose applications, the range or number of the output clock frequencies can be extended by means of a software update. Practically any frequency or frequency range between 1.0Hz and 25.0MHz can be defined and can then be selected for all Word Clock outputs, providing the same functionality as the standard frequencies.

For more information or a proposal, send an e-mail message to

tecsupport@iCLOCK-net.de

You may also call us or send a fax:

Phone 0049-(0)30-746880-0
Fax 0049-(0)30-746880-99

Configuring the AES/EBU Outputs

The four AES/EBU outputs can be set to various clock rates by pairs. In addition, the channel-status bits can be modified individually.

When a certain Word Clock out pair is not required, disabling it can be reasonable, for example, to reduce extra device radiation, thus improving the EMC conditions in the studio.

(EMC = electromagnetic compatibility)

First AES/EBU output pair, page 1

First AES/EBU output pair, page 2

Second AES/EBU output pair, page 1

Second AES/EBU output pair, page 2

AES-S, AES-L (page name)
AES – SINGLE, – LINKED The »S« and »L« letters shown on each of the two AES/EBU menu pages indicate the Single and Linked modes. Refer to the ADJ-AES/EBU parameter on the GLOBAL 3/4 page explained in the SETTING SYSTEM FUNCTIONS chapter for more information. The factory default is Single mode (– S).

OUT1/1, -1/2, -2/1, -2/2 (page name)
The page name contains the selected AES/EBU-output pair (1 or 2) and the number of the currently displayed menu page. The pages AES OUT 1/1 and AES OUT 1/2 allow for configuring the first output pair while the pages AES OUT 2/1 and AES OUT 2/2 are used for the second output pair.

Due to the internal signal phase corrections the synthesizer can re-lock temporarily when switching AES/EBU clock frequencies. This does not affect the output signals or functionality of iCLOCK.

Functions and settings on the first page of each AES/EBU output pair:

FREQ (function)
FREQUENCY Sets the clock rate of the selected AES/EBU output pair. A so-called AES11 clear-frame signal (compliant to AES11-1997/2003) is generated. The factory default is 44.1kHz.

16.0...192.0kHz (setting)
Altogether twelve different clock rates between 16.0...192.0kHz can be individually selected for each AES/EBU-out pair. Refer to the »Synchronizable and Generatable Clock Rates« section in the appendix for a full list of all clock rates.

AES3/-11 clock rates are set independently of externally applied clocks. Thus, iCLOCK provides AES3/-11 clock conversion from all supported input rates to all generatable output rates!

DIST does not provide redundancy for the AES/EBU outputs. If the external AES/EBU or S/P-DIF clock source fails, the associated AES/EBU-output pair will fail, too!

DIST (setting)
DISTRIBUTION This setting allows for forwarding an input AES3 or S/P-DIF signal to the selected AES/EBU output pair using a hardware bypass. As no adjustments can be made in this mode, the other functions and parameters will be hidden, and the second menu page of the AES/EBU pair will not be accessible; the parameters and functions can only be accessed after the internal AES11 generator has been enabled by selecting a different clock rate.

In this mode, the synthesizer synchronizes to the input AES3 or S/P-DIF signal; thus, the video and audio clock signals provided at the other outputs are linked with phase lock to the input signal.

If the consumer format is selected, the physical parameters of the output terminals (balanced operation, level, and impedance) will remain unchanged!

The functions and settings displayed on the AES menu pages are automatically adapted with regard to the channel-status bits of the consumer format.

WORDL (function)
WORD LENGTH This function allows for changing the word length stored in the channel status bits (byte 2, bits 3, 4 and 5) of the clear-frame signal of the selected AES/EBU output pair. The factory default is 24BITs.

16BITs, 18BITs, 20BITs, 24BITs (setting)
One of four word lengths between 16 and 24Bits are available for selection.

FORMAT (function)
FORMAT This function allows for altering the AES format stored in the channel status bits (byte 0, bit 0) of the blank frame signal of the selected AES/EBU output pair. The factory default is PROF.

PROF, CONS (setting)
PROF, CONS This setting allows for toggling the AES11 blank frame signal between consumer (CONS) and professional (PROF) formats.

Example

There are AES3/-11 receiver circuits causing problems when synchronizing to AES11 blank frame signals. This usually results in increased jitter and signal instabilities. Enabling a DC-offset level in the AES11 blank frame signal will allow for synchronizing any AES3/-11 input stage. This level can normally be processed without problems by the concerning AES3/-11 input stages, thus ensuring reliable synchronization.

DCSET (function)
DC OFFSET This function allows for applying a DC-offset signal level of approx. 200 mV to the output AES11 blank frame signal.

ON, OFF (setting)
This will enable (ON) or disable (OFF) the DC-offset signal level in the AES/EBU blank frame signal.

Functions and settings on the second page of each AES/EBU output pair:

AUDIOSTAT (function)
AUDIOSTATUS This function allows for setting the audio status stored in the channel status bits (byte 0, bit 1) of the blank frame signal of the selected AES/EBU output pair. The factory default is NONAUDIO.

NORMAUDIO, NONAUDIO (setting)
These settings allows for selecting the norm-audio or non-audio statuses.

REFSTAT (function)
REFERENCE STATUS, This function allows for changing the reference status stored in the channel status bits (byte 4, bits 0, 1) of the blank frame signal of the selected AES/EBU output pair. The factory default is G1-REF.

G1-REF (setting)
GRADE 1 REFERENCE With this setting (grade 1 reference), the AES11 blank frame signal is output in compliance with AES11, Grade 1.

G2-REF (setting)
GRADE 2 REFERENCE With this setting (grade 2 reference), the AES11 blank frame signal is output in compliance with AES11, Grade 2.

NO REF (setting)
NO REFERENCE This setting indicates that the AES11 blank frame signal is not a reference signal compliant to AES11.

LOCKSTAT (function)
LOCK STATUS This function allows for changing the synchronization status stored in the channel status bits (byte 0, bit 5) of the clear-frame signal of the selected AES/EBU output pair. The factory default is LOCKED.

If the selected AES/EBU output pair is operated in consumer mode, this parameter is not available due to the modified structure of the channel-status bits!

LOCKED, UNLOCKED (Parameter)
LOCKED, UNLOCKED These settings allow for toggling between the locked and unlocked statuses.

Configuring the S/P-DIF Outputs

A clock rate can be set for both S/P-DIF outputs similarly. The channel-status bits can be modified, too.

S/PDIF outputs, page 1

S/PDIF outputs, page 2

S/PDIF OUT/1, -/2 (page name)
The page names refer to the respective S/P-DIF menu page (see above figures).

Functions and settings on the first S/P-DIF output page:

FREQ (function)
FREQUENCY Sets the clock rate of the S/P-DIF outputs. A so-called S/P-DIF clear frame signal (in compliance with AES11) is generated. This signal does not contain any audio information (data bits). The factory default is 44.1kHz.

16.0...192.0kHz (setting)
Altogether twelve different clock rates between 16.0 kHz and 192.0 kHz can be selected. Refer to the »Synchronizable and Generatable Clock Rates« section in the appendix for a full list of all clock rates.

DIST (setting)
DISTRIBUTION This setting allows for forwarding an input S/P-DIF or AES3/-11 signal to the S/P-DIF output pair using a hardware bypass. As no adjustments can be made in this mode, the other functions and parameters will be hidden, and the second menu page of the S/P-DIF pair will not be accessible; the parameters and functions can only be accessed after the internal S/P-DIF generator has been enabled by selecting a different clock rate.

In this mode, the synthesizer synchronizes to the input S/P-DIF or AES3/-11 signal; thus, the video and audio clock signals provided at the other outputs are linked with phase lock to the input signal.

WORDL (function)
WORD LENGTH This function allows for changing the word length stored in the channel status bits of the S/P-DIF clear-frame signal.
The factory default is 24BITs.

16BITs, 18BITs, 20BITs, 24BITs (setting)
One of four word lengths between 16 and 24Bits are available for selection.

Due to the internal signal phase corrections the synthesizer can re-lock temporarily when switching S/P-DIF clock frequencies. This does not affect the output signals or functionality of iCLOCK.

S/P-DIF clock rates are set independently of externally applied clocks. Thus, iCLOCK provides S/P-DIF clock conversion from all supported input rates to all generatable output rates!

DIST does not provide redundancy for the S/P-DIF outputs. If the external S/P-DIF or AES3/-11 signal source fails, the S/P-DIF output pair will fail, too!

If the professional format is selected, the physical parameters of the output terminals (unbalanced operation, level, and impedance) will remain unchanged!

The functions and settings displayed on the S/P-DIF menu pages are automatically adapted with regard to the channel-status bits of the professional format.

Example

There are S/P-DIF receiver circuits causing problems when synchronizing to S/P-DIF blank frame signals. This usually results in increased jitter and signal instabilities. Enabling a DC-offset level in the S/P-DIF blank frame signal will allow for synchronizing any S/P-DIF input stage. This level can normally be processed without problems by the concerning S/P-DIF input stages, thus ensuring reliable synchronization.

FORMAT (function)
FORMAT This function allows for altering the S/P-DIF format stored in the channel status bits (byte 0, bit 0) of the S/P-DIF blank frame signal. The factory default is CONS.

PROF, CONS (setting)
PROF, CONS This setting allows for toggling the S/P-DIF blank frame signal between consumer (CONS) and professional (PROF) formats.

DCSET (function)
DC-OFFSET This function allows for applying a DC-offset signal level of approx. 200 mV to the output S/P-DIF blank frame signal. The factory default is OFF.

ON, OFF (setting)
This will enable (ON) or disable (OFF) the DC-offset signal level in the S/P-DIF blank frame signal.

Functions and settings on the second S/P-DIF output page:

AUDIOSTAT (function)
AUDIOSTATUS This function allows for setting the audio status stored in the channel status bits (byte 0, bit 1) of the S/P-DIF blank frame signal. The factory default is NONAUDIO.

NORMAUDIO, NONAUDIO (setting)
These settings allows for selecting the norm-audio or non-audio statuses.

REFSTAT (function)
REFERENCE STATUS This function allows for changing the reference status stored in the channel status bits (byte 3, bits 4, 5) of the clear-frame signal of the selected S/P-DIF output pair. The factory default is LEVEL 3.

LEVEL 3 (setting)
With the LEVEL 3 (variable) setting, the S/P-DIF blank frame signal is output with no information on clock accuracy.

LEVEL 2 (setting)
With the LEVEL 2 setting, the S/P-DIF blank frame signal is output with a clock accuracy of ±1000 ppm.

LEVEL 1 (setting)
With the LEVEL 2 setting, the S/P-DIF blank frame signal is output with a clock accuracy of ±50 ppm.

Setting System Functions

System parameters allow for setting functions that affect no specific output clock formats but all output signals or the global device functionality of iCLOCK. Four menu pages named GLOBAL 1/4 to GLOBAL 4/4 are provided by iCLOCK standard version.

Functions and settings on the GLOBAL 1/4 menu page:

GLOBAL 1/4

GLOBAL 1/4, 2/4, 3/4, 4/4 (page name)
Specifies the name of the currently selected GLOBAL page.

PULLs (function)
With iCLOCK standard version, four different pull-up/down corrective factors can be set for film–video–audio transfers. These settings only affect audio clock signals but not video generator signals. The factory default is OFF.

OFF (setting)
OFF With this setting, all audio clock signal rates will be output unchanged.

+0.1% (setting)
+0,1 % This setting will increase all audio clock output rates by 0.1 %. This factor is required for transferring NTSC video to film.

-0.1% (setting)
-0,1 % This setting will decrease all audio clock output rates by 0.1 %. This factor is required for transferring film to NTSC video.

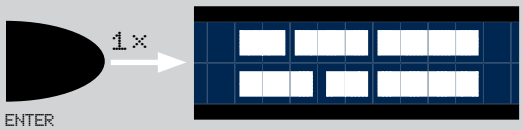
+4.16% (setting)
+4,16 % This setting will increase all audio clock output rates by 4.1666 %. This factor is required for copying film to PAL video.

-4.0% (setting)
-4,0 % This setting will decrease all audio clock output rates by 4.0 %. This factor is required for transferring PAL video to film.

VARISPEED (function)
VARISPEED This function allows for detuning the synthesizer in steps of 0.0001 % in relation to the selected nominal rate (e.g. 44.1 kHz, 96.0 kHz, etc.). The maximum setting range of the varispeed function is ±20.0 % but may be limited by settings such as the pull-up/down factors or the pull range as well as by instabilities of the synthesizer signal caused by clock source deviation.

Enable the varispeed function by pressing the up/down cursor buttons one time. (The cursor automatically jumps to the rightmost digit)

Move the cursor to the desired digit (e.g. 0.1%) using the left cursor button. Select the desired value with the up/down cursor buttons (e.g. 1x +0.1%)



Confirm the setting by pressing the ENTER button.

Entering varispeed values and moving the cursor

Setting Pulls and Varispeed

PULL and VARISPEED settings will be not stored when switching-off the device!

Unlike conventional clock generators, iCLOCK is capable of synthesizing pull-up/down factors and varispeed in every mode of operation. This is regardless of whether the synthesizer is synchronized internally or by an external source!

More Pull-Up/Down Factors

For special-purpose applications, new pull-up/down factors can be implemented into the system by means of a software update. Practically any factor or algorithm can be applied. The synthesizing accuracy is in the µHz range.

For more information or a proposal, send an e-mail message to

tecsupport@iCLOCK-net.de

You may also call us or send a fax:

Phone 0049-(0)30-746880-0
Fax 0049-(0)30-746880-99

Example

The synthesizer is synchronized to an external source with a detuning of –5%. In addition, a varispeed of –16% has been configured. In this case, the synthesizer would correct its output rate only to an amount of –15% of the set varispeed as the total detuning of the input source and the varispeed are –21%, which exceeds the permitted range by 1%.

Varispeed values are set using the up/down cursor buttons. Note that the change will be applied as the button is pressed. Pressing ENTER will confirm the selected value.

+0.0000% (setting)
The varispeed factor can be set here in miniature steps of 0.0001 %. The step width can be changed by moving the cursor (see figure at page 25). The factory default is + 0.0000 %.

PULL RANGE (function)
PULL RANGE refers to the limit for the synthesizer to follow the deviation of its clock source. This is regardless of whether the deviation is caused by the source itself or by pull-up/down or varispeed settings. The pull range includes positive and negative differences of up to ±20.0% of the nominal clock source rate.

+/-1.0% ... +/-20.0% (setting)
The pull range can be set here in steps of 1.0 %.

Example

The synthesizer is synchronized to an external source with a detuning of +2%. A pull range setting of ±5.0% is selected, and an extra varispeed of –10% has been configured. In this case, the synthesizer would correct its output rate only to an amount of –7% of its current setting +2%. The detuning of the input source and the set pull range are added to define the maximum rate change. The factory default is +/-5.0%.

Functions and settings on the GLOBAL 2/4 menu page:

GLOBAL 2/4

Setting LONEREF + LOTIME

The time constants selected for the LONEREF function are always greater than the LOTIME values. The system automatically corrects equal or smaller LONEREF values to avoid conflicts during the synchronization flow!

HOLD is not available when the system synchronization function SYNC (see REF1–3 menu page) is set to CYCLESYNC!

LONEREF (function)
LOCK NEXT REFERENCE The function allows for setting a period of time that the synthesizer will wait after a clock-source failure before automatically selecting the next source according to the REF1–3 settings. During this time, all output signals are still available according to their respective setting. If the failed source returns to operation within the time defined here, the synthesizer will resynchronize to it. The factory default is 1 MIN.

30SECs, 1MIN, 10MINs, 30MINs, 60MINs (setting)
One of five time settings between 30 seconds and 60 minutes can be selected here.

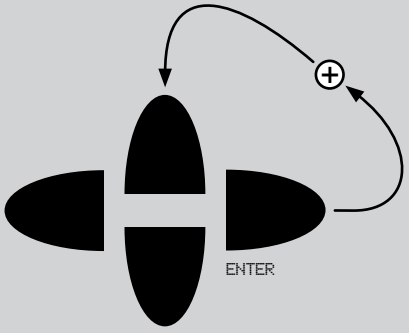
HOLD (setting)
With this setting, the synthesizer will enter a mode of operation where it waits until the previously lost clock source returns. The output rate is set based on the last recognized clock rate.

LOTIME (function)
LOCK TIME The Lock Time function sets a period required by the synthesizer to update its clock rate from the previously selected source to a subsequently selected source. The factory default is 5 SECs.

5SECs, 30SECs, 1MIN, 10MINs, 30MINs (setting)
One of five time settings between 5 seconds and 30 minutes for updating rate differences between the original and a subsequently selected clock source can be selected here.

FREEZE (function)
FREEZE This function allows for blocking the four cursor buttons. This is convenient for protecting the iCLOCK from unauthorized access. FREEZE can be canceled by pressing the ENTER and up buttons simultaneously.

GO, SURE? (setting)
GO enables the FREEZE function. When the ENTER button has been pressed, a confirmation request (SURE ?) will be displayed. If this request is confirmed by pressing the ENTER button again, the display automatically jumps to the menu main page. From that moment, the four cursor buttons are out of operation until the FREEZE function is canceled by using the key combination mentioned on the left.



1) Press the ENTER button and hold.
2) Press the up button additionally.

Canceling the FREEZE function

RESET (function)
RESET This function allows for resetting all function and parameter changes to their respective factory defaults, i.e. to the settings of the iCLOCK when it is switched on for the first time.

GO, SURE? (setting)
GO enables the RESET function. When the ENTER button has been pressed, a confirmation request (SURE?) will be displayed. If this request is confirmed by pressing the ENTER button again, all current settings will irreversibly be reset to their defaults, and the display will change to the menu main page.

Functions and settings on the GLOBAL 3/4 menu page:

GLOBAL 3/4

ADJ WCLK (function)
ADJUST WORD CLOCK This function allows for editing the four wordclock outputs in common. If a function is edited on any wordclock menu page, any changes will be applied to the same function on all other wordclock menu pages or outputs. This also applies to the outputs of an installed wordclock expansion. The factory default is SINGLE.

SINGLE (setting)
SINGLE allows for editing the wordclock outputs individually.

LINKED (setting)
LINKED allows for editing the four Word Clock outputs together by making settings on any Word Clock menu page.

Example

If a studio is to be synchronized with an equal clock rate, setting the Word Clock and AES/EBU outputs to LINKED is reasonable in order to avoid unnecessary editing on multiple menu pages.

ADJ AES/EBU (function)
ADJUST AES/EBU This function allows for editing the two AES/EBU outputs in common. If a function is edited on any AES menu page, any changes will be applied to the same function on the other AES menu page or output. The factory default is SINGLE.

SINGLE (setting)
SINGLE allows for editing the AES/EBU outputs individually.

LINKED (setting)
LINKED allows for editing the two AES/EBU outputs together by making settings on any AES menu page.

DISPLAY (function)
DISPLAY This function allows for choosing whether the backlight LEDs light permanently or whether they will be switched off automatically after a defined period of time. The factory default is ON.

ON (setting)
ON lets the backlight LEDs light permanently.

AUTO (setting)
AUTOMATICALLY turns the backlight LEDs after a period of 5 minutes off. Pressing one of the four buttons on the front panel reactivates the backlight LEDs.

Recommendation

Setting the display to the AUTO mode helps saving energy and keeps the lifetime of the backlight LEDs.
Furthermore, it will not disturb a reduced illuminated studio environment.

Functions and settings on the GLOBAL 4/4 menu page:

GLOBAL 4/4

This menu page provides information in internal system statuses and cannot be edited.

TERM IN1/IN2
TERMINATION - INPUT1/INPUT2 This informs on the internal termination status of the two universal clock-source inputs INPUT1 and INPUT2. The factory default is ON for both inputs.

ON = internal termination enabled
OFF = internal termination disabled

Refer to the »Configuring the Terminations« section in the appendix.

Failure Messages

If one of the statuses 1-FAIL or 2-FAIL is indicated (iCLOCK dp only), safe operation is not guaranteed! Contact the technician in charge immediately!

POWER SUPPLY
POWER SUPPLY This informs on the status of the internal power supplies and shows how many of them are active. The iCLOCK standard version is shipped with one power supply while the iCLOCK dp version contains two power supplies to ensure redundant (failsafe) operation.
The factory defaults are:

iCLOCK standard version:	1-ON	2-N.A.	(one active power supply)
iCLOCK dp:	1-ON	2-ON	(two active power supplies)

OK (setting)
The respective power supply is active.

N.A. (setting)
NOT AVALABLE This message shows that the respective power supply is not available (only when using the iCLOCK basic version).

LOST (setting)
LOST indicates that a power supply has failed or that the external mains voltage is not available (iCLOCK dp only).

SOFT
SOFTWARE VERSION This informs on the currently installed operating system of your iCLOCK or iCLOCKdp.

V220 (setting)
These letters and numbers represent the currently installed software version of iCLOCK or iCLOCKdp:

V = Version
220 = 2.20

Preset Management

This functionality is available from software versions, V2.10 and V2.11, or higher. Does your iCLOCK or iCLOCKdp not include one of these software versions, please contact your local MUTEC dealer or distributor for an update.

Software V2.11 offers in combination with the new optional iC-ALARM/GPI interface the possibility to switch over different presets externally via GPIO control. If you are working with software V2.10, you need to switch over the presets on the PRESET page.

PRESET

The preset management enables to store eight different set-ups of all function settings which have been set within the whole iCLOCK system menu, as so-called ‚Presets'. When switching over the presets, all individual function settings will be switched at one time. Additionally, the preset management stores intermediately the whole current system status permanently in a so-called ‚System-Preset'. This system-preset works fail-safe, which provides an automatic function-setting-recovery after, e.g., a mains failure!

When switching on your iCLOCK or iCOCKdp for the first time, all presets contain of the same factory default settings as described in the previous chapters of this manual. This system condition is equal to this one after a software-reset.

After normal switching on the unit, the last system status stored in the system-preset will be loaded. If this is different compared to the settings of the last active preset, the selected setting under the function OPERATION will be marked with a (*). If you want to work with the current system status, you have to store it in one of the eight available presets. If you prefer to work with that preset, which was active before last switching off/on the unit, you have to load this preset separately.

But if the GPIO preset control is active, your iCLOCK or iCLOCKdp starts using the preset which was previously active, no matter if the system-preset consists of different settings, which are due to changes before switching of the unit.

PRESET (function)
PRESET Within this function menu you can confirm and activate the settings you have choosed within the function menus OPERATION and NAME. Only after this step, the choosed setting will be activated.

GO, SURE? (setting)
GO enables the setting which is choosed within the function menus OPERATION and NAME. When the ENTER button has been pressed, a confirmation request (SURE?) will be displayed. If this request is confirmed by pressing the ENTER button again, the choosed setting is active.

OPERATION (function)
OPERATION Here you can store and load presets as well as reload the system's default preset.

When a setting within this function menu is marked with a (*), the last preset settings are changed, but have not been stored!

SAVE (setting)
SAVE stores all current system settings under one of the available eight preset numbers (01 – 08). The previously stored settings of this preset will be deleted.

LOAD (setting)
LOAD loads and activates the choosed preset (number).

SET DEF (setting)
SET DEFAULT reloads the factory default settings for the active preset.

Entering the Preset Page

Starting from the main page, press the button pointing downwards for one time to reach the PRESET page immediately.

Software Reset

If a software-reset has been executed with help of the RESET function on GLOBAL 2/4 page, all presets will be deleted and the factory default settings are loaded again.

GPICNTRL (setting)
GPIO CONTROL activates the preset selection via the first three GPIO inputs of the iC-ALARM/GPI interface (encoded binarily).

NAME (function)
NAME Here you can assign individual names for the presets. One name can consist of a maximum of eight letters.

PRESET01 - 08 (setting)
These are the factory default names.

NUMBER
NUMBER This informs on the currently active preset number, 01 – 08. This is a status menu and does not allow any settings by the user.

01 - 08 (setting)
These numbers represent the available preset numbers.

The following is a description of the menu items used for various operations. Two options are available for storing your current settings:

1) To store a preset without naming it:

- Select the SAVE item from the OPERATION menu.
- Quit the OPERATION function by pressing the ENTER key, then change to the NAME function.
- Select one of the PRESET01-08 memories using the up/down keys (vertical-arrow keys) and confirm by pressing the ENTER key.
- Press the ENTER key twice to position the cursor right in front of the GO parameter of the PRESET function.
- Enable the selected preset by pressing the up-arrow key and the ENTER key in succession. SHURE? will be displayed. Pressing the ENTER key once more will load the selected preset and reboot the system. The number of the selected preset (01-08) will be displayed under NUMBER, and the GO parameter will appear.

If no user input occurs while SHURE? is displayed, the operation will be canceled after a short time.

Switching Presets

The switching over of presets will cause a short interruption in all outgoing clock signals!

2) To store and name a preset:

- Select the SAVE item from the OPERATION menu.

  Quit the OPERATION function by pressing the ENTER key, then change to the NAME function.
- Select one of the PRESET01-08 memories using the up/down keys and confirm by pressing the ENTER key.
- Pressing one of the up/down keys followed by the ENTER key will enable the edit mode. The first character on the left will start flashing. If no user input occurs, the operation will be canceled after a short time.
- Letters, numerals, and special characters can be selected using the up/down keys. Pressing the ENTER key will proceed to the next character. A maximum of eight characters can be entered for naming a preset.
- When the new preset name is complete, press the ENTER key twice to switch to the PRESET function. Press any up/down key and the ENTER key in succession. SHURE? will be displayed. Press the ENTER key again to store and enable the preset you have just edited. If no user input occurs, the operation will be canceled after a short time. The preset number will be displayed under NUMBER.

Loading and restoring the factory default preset

1) To load a preset:

- Select the LOAD item from the OPERATION menu.
- Quit the OPERATION function by pressing the ENTER key, then change to the NAME function.
- Select one of the PRESET01-08 memories by their preset number or name using the up/down keys and confirm by pressing the ENTER key.
- Press the ENTER key twice to switch to the PRESET function. Press any up/down key and the ENTER key in succession. SHURE? will be displayed. Press the ENTER key again to enable the selected preset. If no user input occurs, the operation will be canceled after a short time.

2) To restore the factory default preset:

- Select the SET DEF item from the OPERATION menu.
- Quit the OPERATION function by pressing the ENTER key, then change to the NAME function.
- Select one of the PRESET01-08 memories by their preset number or name using the up/down keys and confirm by pressing the ENTER key.
- Press the ENTER key twice to switch to the PRESET function. Press any up/down key and the ENTER key in succession. SHURE? will be displayed. Press the ENTER key again to set all settings stored as part of the selected preset to their defaults. If no user input occurs, the operation will be canceled after a short time.
  (Note that changes to the preset name will be retained!)

External Control Using GPIO - to select presets using GPIO:

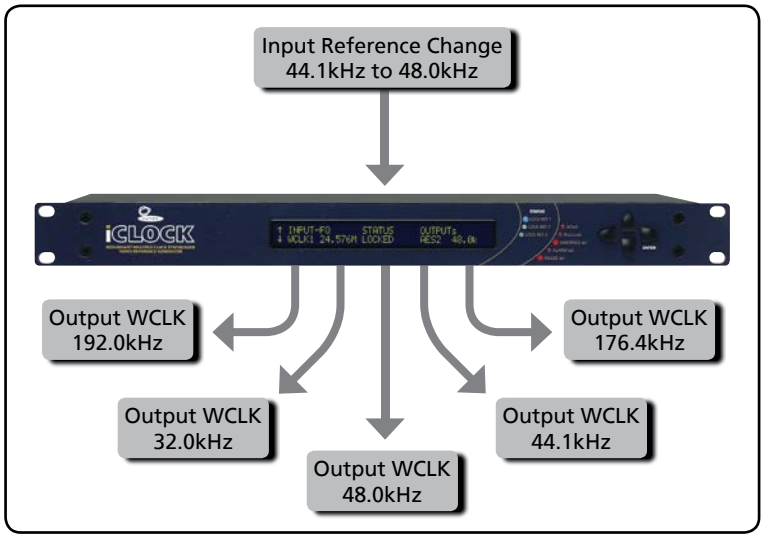
If the iC-ALARM/GPI option (p/n 8005-066) is installed, a GPICNTRL is available in the OPERATION menu. If this parameter is enabled, the first three GPI inputs of the interface can be used for selecting the presets. GPI3, 2, 1 = 000 = PRESET01, = 001 = PRESET02, etc.

If preset control using GPIO is enabled, the most recent preset is loaded when booting the iCLOCK or iCLOCKdp. This will overwrite any changes to the preset that might have existed from previous use.

iCLOCK TECHNOLOGY

Functional Principle

iCLOCK's principle operation is completely different to conventional products. The customer, as a matter of priority, defines the clock rates and formates which are constantly available at the outputs – not depending on the incoming reference signals! Limitations regarding defined combinations of input and output clock signals do not exist for iCLOCK. All inputs and outputs can be routed and combined freely.



Functional principle during input reference change

Furthermore, unlike standard clock generators, iCLOCK's unique concept enables to set all system functions during any operation mode. This is regardless of whether the synthesizer is synchronized internally or by an external source. Doing this, the powerful synthesis process enables additionally, as an outstanding feature, the use of the pull up/down and varispeed functions simultaneously! Thus any conceivable adaption of the outgoing basic clock rates is possible with iCLOCK.

During this process the system detects automatically useful phase relationships between the reference input and generated output signals. Adjustments aligned to AES11-1997/2003 and EBU R83-1996 will be executed in realtime independently.

Example

iCLOCK is synchronized by an external Word Clock reference with 44.1kHz. The outputs are adjusted to different clock rates (see adjacent diagramm). If the external reference changes to 48.0kHz, the predefined outgoing clock rates will remain unchanged!

The reason is that iCLOCK's intelligent synthesis process synchronizes every reference signal phase-locked and converts it simultaneously into the adjusted output clock rates. Thus the typical signal distribution effect, »a change of input clock rate changes all output clock rates«, is prevented in general. The adjusted output clock rates are permanently available, not depending on the frequency or format of the incoming reference!

SoftReLock

SoftReLock is a special system routine executed by the synthesizer in every operation mode of reference change or reference resynchronization. Especially in cases of the later described SEQSYNC or CYCLESYNC functions, SoftReLock guarantees a gradual and seamless synchronization update of the internal signal generators, or all iCLOCK output signals respectively, to the basic clock rate of a new or reestablished reference source. Also if complete different reference types of unequal sources are synchronized in succession, e.g. NTSC video after pulled down 48.0kHz AES11, the SoftReLock routine ensures interruption-free and gently adjustment of iCLOCK's output signals to the new reference.

SoftReLock represents one of the most important functions to support the system's ability providing continous clock supply under all imaginable operation modes.

Example

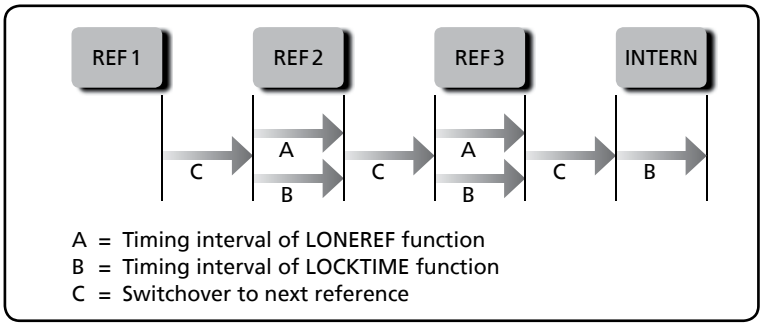
If the first source (REF1) has failed, the synthesizer tries automatically to synchronize the next source (REF2). When no reference is available the system waits until the timing interval of the LONEREF function (A) has elapsed to synchronize the next reference. Is a clock source present, the synthesizer starts to synchronize this under consideration of the LOCKTIME timing interval (B). If this reference also fails the system checks for the third source (REF3) in same procedure.

Note!
If a reference slot is set to »NO REF« the system skips this slot and synchronizes the next activated slot or the internal video reference generator.

The system will be locked as long as a clock source is available at the respective reference slot. But after synchronizing the next further reference it will not try to resynchronize the previous one if this has returned. If no utilizable signal is present on the three slots, the synthesizer will synchronize the internal video reference generator as the final clock source. After this a returned external source will be not synchronized any more.

Sequence Synchronization

Sequence Synchronization (SEQSYNC) represents the default setting when activating the REF1–3 menu page. It indicates the standard reference synchronization function of iCLOCK. The timing of this process is aligned to the parameter adjustments of the LONEREF (Lock Next Reference) and LOCKTIME (Lock Time) functions (see GLOBAL 2/4 page).



Sequence Synchronization with three external references

Example

If the first source (REF1) has failed, the synthesizer tries to synchronize the next source (REF2) after passing the LONEREF timing interval (A). When a second source is available and synchronized finally (after passing the LOCKTIME timing interval, B), 10 seconds later the system starts querying REF1 for source reestablishment again. If the system finds a utilizable source signal within the defined LONEREF period, it will resynchronize to the REF1 signal.

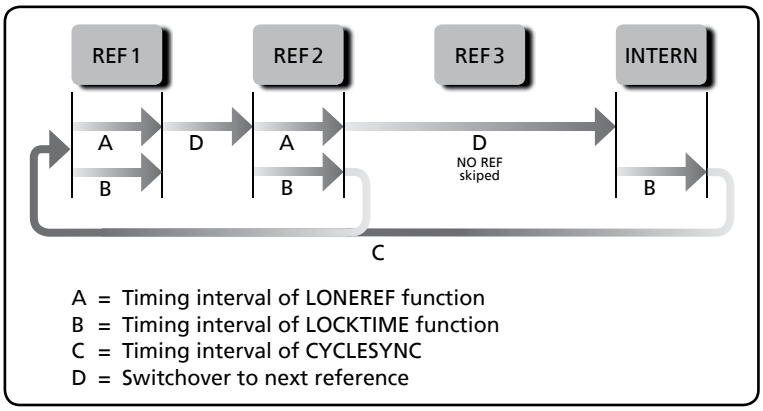
When no reference is available at REF2 the system waits until the timing interval of the LONEREF function (A) has elapsed and starts to check REF3 for a clock source. If REF3 is set to »NO REF« the system skips this reference slot and synchronizes the internal video reference generator under consideration of the LOCKTIME timing interval (B).

Note!
Reference slots marked with »NO REF« will be not recognized by CYCLESYNC.

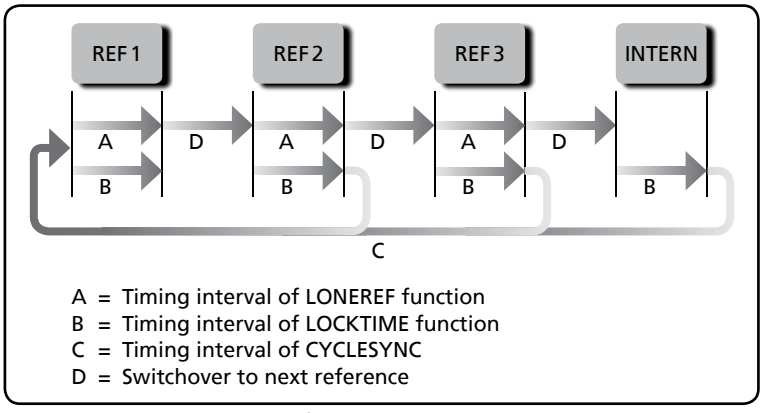
As the clock source selected as REF1 has always the highest priority for synthesizer synchronization, the CYCLESYNC function will always try to synchronize to REF1 first, then to REF2, to REF3 and finally to the internal video reference generator.

Cycle Synchronization

With Cycle Synchronization (CYCLESYNC) iCLOCK supports an outstanding feature for automated synchronization of different external clock sources.



Cycle Synchronization with two external references, REF3 = NO REF



Cycle Synchronization with three external references

iCLOCK EXTENSIONS

iC-ALARM up to operating system V2.10

The optional iC-ALARM interface (ordering no. 8005-065) is only suitable for iCLOCK software versions up to V2.10. From V2.11 you must (!) use the iC-ALARM/GPI interface, see below.

The iC-ALARM interface enables to trans-fer signals depending on three different critical operating conditions. Each of the potential-free alarm outputs is directly coupled to a floating change-over relay and is designed as an individual pin of the 15pins high-density D-Sub connector. Thus all three alarm signals can be transfered simul-taneously. The relays change their states instantly when the following operating conditions are present:

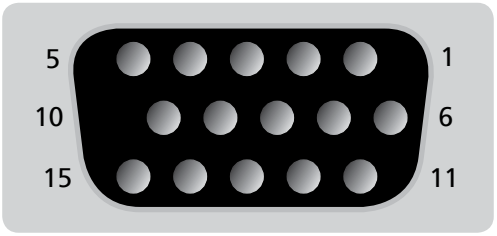
ALARM OUT 1: Loss of clock reference at the currently active input
ALARM OUT 2: Loss of Main1 or Main2 (or circuit), only iCLOCK dp
ALARM OUT 3: Loss of the internal reference oscillator

Every of the above mentioned operating conditions activate also the red front panel LED »ALARM set«.

The relays are normalled when the described operating conditions work faultlessly. If a disturbance occurs, the according relay faills instantly. The output contacts supply a max. switching power of 30 W with 30 V / 1A DC / AC peak. The type of the used relays is called TQ2-5V from NAIS / Matsushita (http://www.nais-e.com/relay/index.html).

iC-ALARM Pin assignment of 15pins high-density D-Sub connector	
D-Sub Pin no.	Description
1	ALARM OUT 1 relay, COM contact
2	ALARM OUT 1 relay, NO contact
3	ALARM OUT 2 relay, NC contact
4	ALARM OUT 3 relay, COM contact
5	Signal ground
6	ALARM OUT 1 relay, NC contact
7	ALARM OUT 2 relay, COM contact
8	ALARM OUT 2 relay, NO contact
9	ALARM OUT 3 relay, NC contact
19	GND
11	Reserved for future applications
12	GND
13	Reserved for future applications
14	GND

NO = normally open; NC = normally closed; COM = common



Pin numbering of high-density D-Sub connector

iC-ALARM/GPI from operating system V2.11 or higher

The optional iC-ALARM/GPI interface (ordering no. 8005-066) is only suitable for iCLOCK software version V2.11 or higher.

The iC-ALARM/GPI interface offers same basis functionality like the previously described iC-ALARM. New to the iC-ALARM/GPI interface is its GPIO function (see page 31).

General Function Description

The iC-ALARM/GPI interface enables to transfer signals depending on three different critical operating conditions. Each of the potential-free alarm outputs can be individually set as closing or opening contact by using different jumper settings on the interface's PCB. Furthermore, every output is directly coupled to a floating change-over relay and is designed as an individual pin of the 15pins high-density D-Sub connector. Thus, all three alarm signals can be transfered simultaneously. The relays change their states instantly when the following operating conditions are present:

ALARM OUT 1: Loss of clock reference at the currently active input
ALARM OUT 2: Loss of Main1 or Main2 (or circuit), only iCLOCKdp
ALARM OUT 3: Loss of the internal reference oscillator

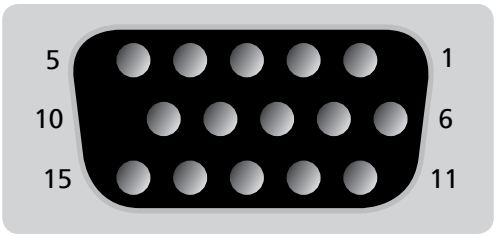
Every of the above mentioned operating conditions activate also the red front panel LED »ALARM set«.

The relays are normalled when the described operating conditions work faultlessly. If a disturbance occurs, the according relay faills instantly. The output contacts supply a max. switching power of 30 W with 30 V / 1A DC / AC peak. The type of the used relays is called TQ2-5V from NAIS / Matsushita (http://www.nais-e.com/relay/index.html).

Furthermore, when running system V2.11 or higher in your iCLOCK or iCLOCKdp, you can take advantage of the interface's new GPIO functionality. This enables to switch over the 8 user presets from remote work spaces or central control rooms.

Features

- **Three independent potential-free alarm outputs simultaneously avalable.**
- **All alarm outputs individually coupled to floating change-over relays.**
- **Helps to observe reliably critical operation conditions.**
- **New GPIO functionality enables to switch over user presets**



Pin numbering of high-density D-Sub connector

iC-ALARM/GPI Pin assignment of 15pins high-density D-Sub connector	
D-Sub Pin no.	Description
1	ALARM OUT 1 relay, COM contact, potential-free
2	ALARM OUT 2 relay, COM contact, potential-free
3	ALARM OUT 3 relay, COM contact, potential-free
4	switch input contact for GPIO 1
5	Supply voltage for GPIO 1 and GPIO 2
6	ALARM OUT 1 relay, NO [1] or NC contact
7	ALARM OUT 2 relay, NO [1] or NC contact
8	ALARM OUT 3 relay, NO [1] or NC contact
9	switch input contact for GPIO 2
10	Supply voltage for GPIO 3 and GPIO 4
11	GND
12	not connected
13	switch input contact for GPIO 3
14	switch input contact for GPIO 4

NO = normally open; NC = normally closed; COM = common
[1] default jumper setting
[2] not recommended for longer cable runs

APPENDIX

Synchronizable HD tri-level Standards and Frame Rates

HD tri-level 24/25/30/50/60Hz – REF: HD-P-1/2	
Resolution	**Frame Rate**
1280 x 720p	50Hz
1280 x 720p	60Hz
1920 x 1080p	24Hz
1920 x 1080p	25Hz
1920 x 1080p	30Hz
1920 x 1080p	50Hz
1920 x 1080p	60Hz
1920 x 1080i/PsF	24Hz
1920 x 1080i/PsF	25Hz
1920 x 1080i/PsF	30Hz
1920 x 1080i/PsF	50Hz
1920 x 1080i/PsF	60Hz

The above mentioned HD tri-level standards and frame rates can be converted into PAL standard definition 25Hz when the internal video reference generator's format is set to »PAL«.

HD tri-level 23.98/29.97/59.94Hz – REF: HD-N-1/2	
Resolution	**Frame Rate**
1280 x 720p	59.94Hz
1920 x 1080p	23.98Hz
1920 x 1080p	29.97Hz
1920 x 1080p	59.94Hz
1920 x 1080i/PsF	23.98Hz
1920 x 1080i/PsF	29.97Hz
1920 x 1080i/PsF	59.94Hz

The above mentioned HD tri-level standards and frame rates can be converted into NTSC standard definition 29.97Hz when the internal video reference generator's format is set to »NTSC«.

When locking your iCLOCK or iCLOCKdp to HD tri-level references, their individual frame rates can not be displayed correctly under »STATUS«, as it is the case when locking SD bi-level references. This is due to system reasons. But your iCLOCK will be locked as it should be.

Synchronizable and generatable Clock Rates

WORD CLOCK RATES			
Dividers/Factors	**Basic Clock: 32.0 kHz**	**Basic Clock: 44.1 kHz**	**Basic Clock: 48.0 kHz**
/4	8.0	11.025	12.0
/2	16.0	22.05	24.0
x1	32.0	44.1	48.0
x2	64.0	88.2	96.0
x4	128.0	176.4	192.0
x8	256.0	352.8	384.0
x16	512.0	705.6	768.0
x32	1024.0	1411.2	1536.0
x64	2048.0	2822.4	3072.0
x128	4096.0	5644.8	6144.0
x256	8192.0	11289.6	12288.0
x512	16384.0	22579.2	24576.0

PILOT TONE CLOCK RATES			
Type	**PAL/SECAM (Hz)**	**NTSC (Hz)**	**Film (Hz)**
Color Frame Rate	25	29.97	24
Color Field Rate	50	59.94	48
Black+White Frame Rate	–	30	–
Black+White Field Rate	–	60	–

All clock rates are generatable only, not synchronizable!

GPS/ATOMIC CLOCK RATES + AUDIO PLAYER BASIC CLOCK	
Type	**(MHz)**
GPS/ATOMIC CLOCK	1.0
GPS/ATOMIC CLOCK	2.5
GPS/ATOMIC CLOCK	5.0
GPS/ATOMIC CLOCK	10.0
AUDIO PLAYER BASIC CLOCK *	16.9344

**) This clock rates is generatable only, not synchronizable!*

AES11 CLOCK RATES			
Dividers/Factors	Basic Clock: 32.0 kHz	Basic Clock: 44.1 kHz	Basic Clock: 48.0 kHz
/2	16.0*	22.05*	24.0*
x1	32.0	44.1	48.0
x2	64.0	88.2	96.0
x4	128.0	176.4	192.0

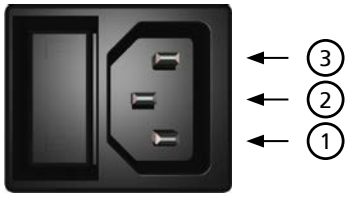
**) Generatable only, not synchronizable!*

S/P-DIF CLOCK RATES			
Dividers/Factors	Basic Clock: 32.0 kHz	Basic Clock: 44.1 kHz	Basic Clock: 48.0 kHz
/2	16.0*	22.05*	24.0*
x1	32.0	44.1	48.0
x2	64.0	88.2	96.0
x4	128.0	176.4	192.0

**) Generatable only, not synchronizable!*

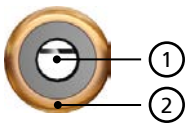
Pin Assignment of the Connectors

Mains



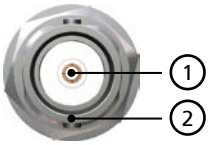
1 Neutral (blue; USA: white)
2 Protective earth (green/yellow; USA: green)
3 Live, phase (brown; USA: black)

S/P-DIF Cinch Input/Output



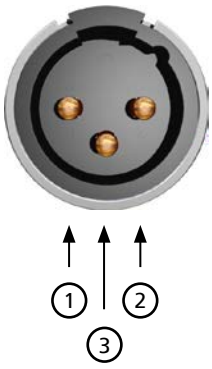
1 Audio signal
2 Audio ground

Universal Inputs,
WCLK + Video Outputs



1 Signal
2 Ground

AES/EBU XLR Output



1 Audio ground
2 a conductor (hot / +)
3 b conductor (cold / -)

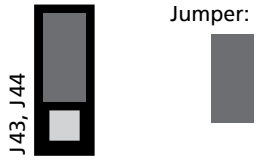
AES/EBU XLR Input

1 Audio ground
2 a conductor (hot / +)
3 b conductor (cold / -)

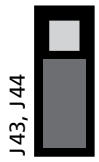
Connecting the universal Clock Inputs to Ground

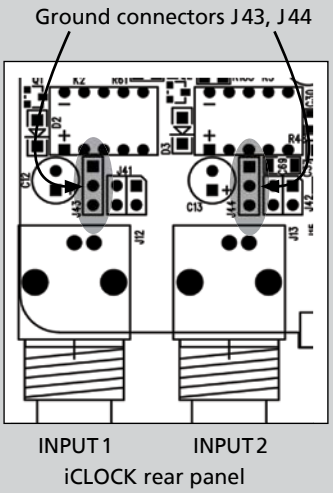
CAUTION! Disconnect the unit from the mains before opening!
Remount the steel-plate cover thoroughly before you attempt to operate the unit!

When iCLOCK is shipped, the BNC-based universal inputs are isolated from ground.



Setting the jumper one pin forward in direction to the housing's backside will connect the according BNC input connector to ground. Both inputs can be set independently.

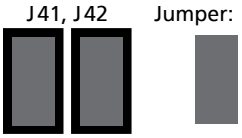




Switching-off the Termination of the universal Clock Inputs

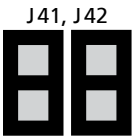
CAUTION! Disconnect the unit from the mains before opening!
Remount the steel-plate cover thoroughly before you attempt to operate the unit!

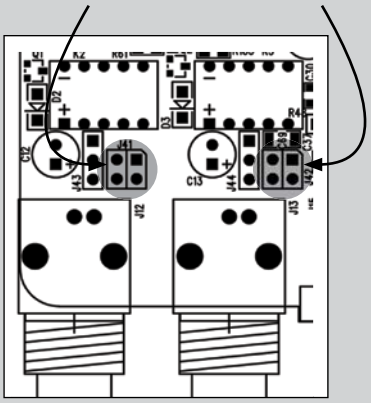
When iCLOCK is shipped, the BNC-based universal inputs are terminated internally with 75Ω. Two Jumpers are put on two 2-pin sockets, J41 for INPUT1 and J42 for INPUT2.



Removing the jumpers from the two 2-pin sockets will switch off the 75Ω termination for the according universal BNC input connector.

We recommend to keep the jumpers to be able to reactivate the termination for other applications!

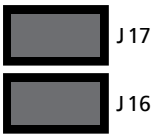




Splitting-up the Video Ouputs for dual Video Generator Operation

CAUTION! Disconnect the unit from the mains before opening!
Remount the steel-plate cover thoroughly before you attempt to operate the unit!

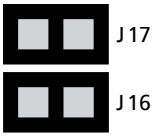
When iCLOCK is shipped, the two BNC-based video output pairs are transfering the video signal of the internal video reference generator simultaneously. Two Jumpers are put on two 2-pin sockets, J16 and J17.

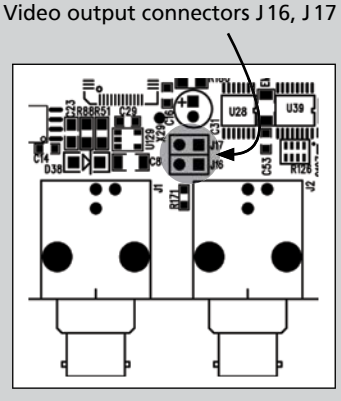


Removing the jumpers from the 2-pin sockets will split up the dual video BNC output connectors for two video generators as follows.

VIDEO OUT1 = internal video reference generator
VIDEO OUT2 = optional video generator

We recommend to keep the jumpers to be able to reactivate the termination for other applications!





Technical Data

UNIVERSAL SYNC INPUTS	
Interfaces	2 x BNC female, unbalanced, isolated from earth, 200mV-5.0V, input impedance 75Ω (switchable)
Synchronizable references	HD tri-level sync
	SD bi-level sync (PAL/SECAM + NTSC)
	Word Clock, every audio clock rate from 8.0kHz to 24.576MHz, incl. Word Clock x 256 for ProTools™ systems
	DSD64, DSD128 + DXD
	AES3, AES11, AES3id, AES11id, every audio clock rate from 32.0kHz to 192.0kHz
	S/P-DIF, every audio clock rate from 32.0kHz to 192.0kHz
	GPS/atomic clock, 1.0MHz, 2.5MHz, 5.0MHz, 10.0MHz
	Telecom, 1.024 MHz, 2.048MHz
	DCF77, 77.5kHz
	MFS60, 60.0kHz
AES/EBU SYNC INPUT	
Interface	1 x XLR female, transformer balanced, input impedance 110Ω, 200 mV-7.0 V
Formats	AES3-1992/2003 + AES11-1997/2003
Resolution	16 – 24bits
Lock range	Every audio clock rate from 32.0kHz to 192.0kHz
VIDEO SYNC OUTPUTS	
Interface	4 x BNC female, unbalanced, output impedance 75Ω, individually buffered, adjustable in pairs
Output levels	300 mV (p-p) burst level @ 75 Ω
	300 mV (p-p) H/V sync level @ 75Ω
	2.0 V (p-p) H/V sync level @ 75Ω, only composite sync
Video sync formats	PAL or NTSC Black + Burst or composite sync
WORD CLOCK SYNC OUTPUTS	
Interface	8 x BNC female, unbalanced, individually buffered, adjustable in pairs
Output levels	2.5 V (p-p) @ 75Ω, output impedance 75Ω
	3.5 V (p-p) @ 75Ω, output impedance 22Ω
Generatable clock rates	36 audio clock rates, 2 DSD clock rates, 6 pilot tone clock rates, 4 GPS/atomic clock rates,
	1 audio player basic clock rate
AES/EBU SYNC OUTPUTS	
Interface	4 x XLR male, transformer balanced, 4.0V (p-p) @ 110Ω, output impedance 110Ω, individually buffered, adjustable in pairs
Format	AES11-1997/2003 in generator mode; AES3-1992/2003 + AES11-1997/2003 in distribution mode
Format adjustments	Professional/consumer, audio status, reference status, lock status, DC offset -90dBFs
Resolution adjustments	16bits, 18bits, 20bits or 24bits
Generatable clock rates	Every audio clock rate from 16.0kHz to 192.0kHz
S/P-DIF SYNC OUTPUTS	
Interface	2 x Coaxial (Cinch/RCA female), unbalanced, 0.5V (p-p) @ 75Ω, output impedance 75Ω, individually buffered, adjustable in pairs
Format	IEC 60958 blank frame
Format adjustments	Consumer/professional, audio status, reference status, DC offset -90dBFs
Resolution adjustments	16bits, 18bits, 20bits or 24bits
Generatable clock rates	Every audio clock rate from 16.0kHz to 192.0kHz
INTERNAL REFERENCE OSCILLATOR SPECIFICATIONS	
Oscillator type	TCXO, temprature compensated crystal oscillator, burned-in and pre-aged
Clock accuracy (shipped)	< ±0.1ppm
Clock stability versus temperature	< ±0.5ppm
Clock jitter	< 10ps (RMS), measure bandwidth: 20.0Hz – 100.0kHz
Operating temperature	-10°C to +60°C

FREQUENCY SYNTHESIS PROCESSING	
Reference frequency synthesis	Direct Digital Synthesis (DDS), 172.8MHz internal clock rate, 48bits frequency resolution
Varispeed synthesis	±20% from nominal clock rate, 0.000% (1ppm) lowest adjustable increment
Pull up/pull down synthesis	+0.1%, –0.1%, +4.166%, –4.0%
VIDEO GENERATOR SPECIFICATIONS	
Generated video formats	PAL 25 fps, 625 lines, Black + Burst or composite video sync
	NTSC 29,97 fps, 525 lines, Black + Burst or composite video sync
	300mV (p-p) ± 7mV H/V sync level @ 75Ω
	2.0V (p-p) ± 40mV H/V sync level @ 75Ω, only composite video sync
Operation modes	Synchronized to every external reference, synchronized to internal reference, video signal distribution
EXTERNAL CONTROL	
Interface	RJ45 shielded jack, 8pin
Format	RS 485
Functions	Remote controlling of whole system (none standard), software updating, programming
POWER SUPPLY	
Type	Internal, switching power supply
Input voltage	90 V – 260V (automatic adjustment), 47Hz – 440Hz
Power consumption	max. 20W
SYSTEM UNIT COVER	
Cover size/material/color	440 x 44 x 200mm without connectors (W x H x D), steel sheet 1mm, black
Front panel size/material	483 x 44 x 3mm (W x H x D), aluminium
Weight: iCLOCK	~ 3000g
Weight: iCLOCK dp	~ 3100g
OPTIONS	
iCLOCK dp	iCLOCK with double power supplies and double power inputs for redundant working
P/NVSG-02	Second synchronizable SD bi-level sync (PAL + NTSC) video generator
iC – ALARM	Relay-coupled alarm signal output expansion, only up to software V2.10
iC – ALARM/GPI	Relay-coupled alarm signal output expansion and GPIO interface, only software V2.11 an higher
iC – WCO4	4 x Word Clock output expansion
iC – PROG	Custom-designed programming of the iCLOCK system software
iC – CAL0.1	Calibration service for internal reference oscillator to < ± 0.1 ppm

>>>