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.

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!

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 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 Warranty 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:

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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.

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 unchallenged 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.
Differences between Software V2.10 and V2.11

Both versions include the preset management as new functionality, which was inquired by several professional 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.
- Easy 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
- PNVS-G-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

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

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

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

iCLOCK Rear Panel

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.

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

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.
CONTROL ELEMENTS

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.

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 RS 485
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.
iCLOCK.dp does not consist of a power switch!

Refer to the »Synchronizable and generateable 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.

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

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 feet 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 280 mm/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, RGS9B/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.

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!

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!
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).

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 not usually usable 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.
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.

Menu main page

REF1–3
Setting the clock sources

WCLK, OUT1–4
Setting the wordclock functions

VIDEO OUT1+2
Setting the video-generator functions

AES OUT1+2
Setting the AES/EBU-generator functions

S/P-DIF OUT1
Setting the S/PDIF-generator functions

GLOBAL 1/4
Setting global system functions

PRESET
Preset management
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

The arrow orientations refer to the respective cursor buttons.

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.
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.

Display operating structure

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

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

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

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!
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.
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).

**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!

**Output**

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!

**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.

**OSC1 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).

**OUTPUT**

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, 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.
PAL1, -2 (setting)
PAL1, -2 allows for synchronizing the internal video reference generator to PAL or SECAM video signals with a frame rate of 25fps, 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 15.75kHz (black/white). The two NTSC formats are distinguished automatically.

WCLK1, -2 (setting)
The WCLK1, -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.

RES (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 synchroniza-
tion. Refer to the »Synchronizable and generatable Clock Rates« section in the appendix for a full list of all clock rates.

RESid1, -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.

TELECOM1, -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 1.0kHz and 30.0MHz can be defined. The only pre-condition 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:
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When applying Word Clock, GPS, Telecom, DCF77 or MSF60 sources, both pulse and sinus 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 convertible 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 re-plugging 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).

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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 sockets on the mainboard, see the »Splitting-up the Video Outputs for dual Video Generator Operation« section in the APPENDIX.

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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.

<table>
<thead>
<tr>
<th>VIDEO REF FORMAT VIDEO TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT1+2</td>
</tr>
</tbody>
</table>

VIDEO page

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 queries 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 SEQSSYNC and CYCLESYNC.

> 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 automatically gen-locked by the reference source and switches to the same video format! This guarantees 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!

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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!

<table>
<thead>
<tr>
<th>REF (function)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYNCHRONIZATION This function allows for manual or automatic synchronization of the synthesizer to selected clock sources assigned to the REF1–3 slots.</td>
</tr>
</tbody>
</table>

SEQSSYNC (setting)

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

REF 1, REF 2, REF 3 (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).

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

Videos

SYNCH (function)

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

SEQSSYNC (setting)

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

REF 1, REF 2, REF 3 (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).

> 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 automatically gen-locked by the reference source and switches to the same video format! This guarantees 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!
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.

**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 chosen as reference (HD-P-1/2 or HD-N-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 chosen 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 23.98 Hz, 29.97 Hz or 59.94 Hz 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 convertible HD standards and frame rates.

**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.

OUT 1 – 4

OUT 1 – 4 is the Word Clock out pair that can be configured on the current page.

FREQ

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

24Hz...60Hz, 8.0kHz...24.576MHz

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

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

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

SUPERCLK

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 ProTools™ 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.

PAL FR

PAL VIDEO FRAME RATE, 25Hz

PAL FI

PAL VIDEO FIELD RATE, 50Hz

NTSC FRBW

NTSC VIDEO FRAME RATE, 30Hz

NTSC FIBW

NTSC VIDEO FIELD RATE, 60Hz

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!

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!

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.
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).

OUT 1/1, -1/2, -2/1, -2/2

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.

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.

LEVEL / TERM (function)

LEVEL/TERRMINATION 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.

2.5U/75R (setting)

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

3.5U/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 1.0 Hz and 25.0 MHz 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
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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)

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.

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!
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.

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.

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!

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.

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.

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

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.
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.

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.

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.

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, 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)
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)
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)
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)
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.

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:
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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.
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%.

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!

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.
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.

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.

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:

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.

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.
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.

**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 AVAILABLE 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.

- **U220** (setting) These letters and numbers represent the currently installed software version of iCLOCK or iCLOCKdp:
  - **V** = Version
  - **220** = 2.20

---

Failure Messages
![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!
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.

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 iCLOCKdp 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 chosen within the function menus OPERATION and NAME. Only after this step, the chosen setting will be activated.

GO, SURE ? (setting)
GO enables the setting which is chosen 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 chosen 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 chosen preset (number).

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

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.

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

Example

iCLOCK is synchronized by an external Word Clock reference with 44.1kHz. The outputs are adjusted to different clock rates (see adjacent diagram). 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!

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 vari-speed 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.

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 continuous 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. If 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.

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.

Sequence Synchronization
Sequence Synchronization (SEQSYNC) represents the default setting when activating the REFl–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).

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

The output contacts supply a max. switching power of 30W with 30V/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).

<table>
<thead>
<tr>
<th>iC-ALARM Pin assignment of 15pins high-density D-Sub connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Sub Pin no.</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
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<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>14</td>
</tr>
</tbody>
</table>

NO = normally open; NC = normally closed; COM = common
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 fails instantly.

The output contacts supply a max. switching power of 30W with 30V/1A DC/AC peak. The type of the used relays is called TQ2-5V from NAI5/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 available.
- 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.

### iC-ALARM/GPI Pin assignment of 15pins high-density D-Sub connector

<table>
<thead>
<tr>
<th>D-Sub Pin no.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ALARM OUT 1 relay, COM contact, potential-free</td>
</tr>
<tr>
<td>2</td>
<td>ALARM OUT 2 relay, COM contact, potential-free</td>
</tr>
<tr>
<td>3</td>
<td>ALARM OUT 3 relay, COM contact, potential-free</td>
</tr>
<tr>
<td>4</td>
<td>switch input contact for GPIO 1</td>
</tr>
<tr>
<td>5</td>
<td>Supply voltage for GPIO 1 and GPIO 2</td>
</tr>
<tr>
<td>6</td>
<td>ALARM OUT 1 relay, NO (^1) or NC contact</td>
</tr>
<tr>
<td>7</td>
<td>ALARM OUT 2 relay, NO (^1) or NC contact</td>
</tr>
<tr>
<td>8</td>
<td>ALARM OUT 3 relay, NO (^1) or NC contact</td>
</tr>
<tr>
<td>9</td>
<td>switch input contact for GPIO 2</td>
</tr>
<tr>
<td>10</td>
<td>Supply voltage for GPIO 3 and GPIO 4</td>
</tr>
<tr>
<td>11</td>
<td>GND</td>
</tr>
<tr>
<td>12</td>
<td>not connected</td>
</tr>
<tr>
<td>13</td>
<td>switch input contact for GPIO 3</td>
</tr>
<tr>
<td>14</td>
<td>switch input contact for GPIO 4</td>
</tr>
</tbody>
</table>

\(^1\) default jumper setting

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

Pin numbering of high-density D-Sub connector
### APPENDIX

#### Synchronizable HD tri-level Standards and Frame Rates

<table>
<thead>
<tr>
<th>HD tri-level 24 / 25 / 30 / 50 / 60Hz – REF: HD-P-1 / 2</th>
<th>HD tri-level 23.98 / 29.97 / 59.94Hz – REF: HD-N-1 / 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resolution</strong></td>
<td><strong>Frame Rate</strong></td>
</tr>
<tr>
<td>1280 x 720p</td>
<td>50Hz</td>
</tr>
<tr>
<td>1920 x 1080p</td>
<td>24Hz</td>
</tr>
<tr>
<td>1920 x 1080p</td>
<td>25Hz</td>
</tr>
<tr>
<td>20 x 1080i / PsF</td>
<td>30Hz</td>
</tr>
<tr>
<td>1920 x 1080p</td>
<td>50Hz</td>
</tr>
<tr>
<td>1920 x 1080p</td>
<td>60Hz</td>
</tr>
<tr>
<td>1920 x 1080i / PsF</td>
<td>24Hz</td>
</tr>
<tr>
<td>1920 x 1080i / PsF</td>
<td>25Hz</td>
</tr>
</tbody>
</table>

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«.

#### Synchronizable and generatable Clock Rates

**WORD CLOCK RATES**

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

**PILOT TONE CLOCK RATES**

<table>
<thead>
<tr>
<th>Type</th>
<th>PAL/SECAM (Hz)</th>
<th>NTSC (Hz)</th>
<th>Film (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color Frame Rate</td>
<td>25</td>
<td>29.97</td>
<td>24</td>
</tr>
<tr>
<td>Color Field Rate</td>
<td>50</td>
<td>59.94</td>
<td>48</td>
</tr>
<tr>
<td>Black + White Frame Rate</td>
<td>–</td>
<td>30</td>
<td>–</td>
</tr>
<tr>
<td>Black + White Field Rate</td>
<td>–</td>
<td>60</td>
<td>–</td>
</tr>
</tbody>
</table>

All clock rates are generatable only, not synchronizable!

**GPS/ ATOMIC CLOCK RATES + AUDIO PLAYER BASIC CLOCK**

<table>
<thead>
<tr>
<th>Type</th>
<th>(MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS/ ATOMIC CLOCK</td>
<td>1.0</td>
</tr>
<tr>
<td>GPS/ ATOMIC CLOCK</td>
<td>2.5</td>
</tr>
<tr>
<td>GPS/ ATOMIC CLOCK</td>
<td>5.0</td>
</tr>
<tr>
<td>GPS/ ATOMIC CLOCK</td>
<td>10.0</td>
</tr>
<tr>
<td>AUDIO PLAYER BASIC CLOCK *</td>
<td>16.9344</td>
</tr>
</tbody>
</table>

*) This clock rates is generatable only, not synchronizable!
Pin Assignment of the Connectors

**Mains**

![Mains Connector Diagram](image)

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

**AES/EBU XLR Output**

![AES/EBU XLR Output Diagram](image)

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

**AES/EBU XLR Input**

![AES/EBU XLR Input Diagram](image)

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

**S/P-DIF Cinch Input/Output**

![S/P-DIF Cinch Input/Output Diagram](image)

1. Audio signal
2. Audio ground

**Universal Inputs, WCLK + Video Outputs**

![Universal Inputs Diagram](image)

1. Signal
2. Ground
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, J 41 for INPUT 1 and J 42 for INPUT 2.

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 Outputs 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 transferring the video signal of the internal video reference generator simultaneously. Two Jumpers are put on two 2-pin sockets, J 16 and J 17.

Removing the jumpers from the 2-pin sockets will split up the dual video BNC output connectors for two video generators as follows.
VIDEO OUT 1 = internal video reference generator
VIDEO OUT 2 = optional video generator
We recommend to keep the jumpers to be able to reactivate the termination for other applications!
### Technical Data

<table>
<thead>
<tr>
<th><strong>UNIVERSAL SYNC INPUTS</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interfaces</td>
<td>2 x BNC female, unbalanced, isolated from earth, 200mV-5.0V, input impedance 75Ω (switchable)</td>
</tr>
<tr>
<td>Synchronizable references</td>
<td>HD tri-level sync</td>
</tr>
<tr>
<td></td>
<td>SD bi-level sync (PAL/SECAM + NTSC)</td>
</tr>
<tr>
<td></td>
<td>Word Clock, every audio clock rate from 8.0kHz to 24.576MHz, incl. Word Clock x 256 for ProTools™ systems</td>
</tr>
<tr>
<td></td>
<td>DSD64, DSD128 + DXD</td>
</tr>
<tr>
<td></td>
<td>AES3, AES11, AES3id, AES11id, every audio clock rate from 32.0kHz to 192.0kHz</td>
</tr>
<tr>
<td></td>
<td>S/P-DIF, every audio clock rate from 32.0kHz to 192.0kHz</td>
</tr>
<tr>
<td></td>
<td>GPS/atomic clock, 1.0MHz, 2.5MHz, 5.0MHz, 10.0MHz</td>
</tr>
<tr>
<td></td>
<td>Telecom, 1.024MHz, 2.048MHz</td>
</tr>
<tr>
<td></td>
<td>DCF77, 77.5kHz</td>
</tr>
<tr>
<td></td>
<td>MFS60, 60.0kHz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>AES/EBU SYNC INPUT</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>1 x XLR female, transformer balanced, input impedance 110Ω, 200 mV-7.0 V</td>
</tr>
<tr>
<td>Resolution</td>
<td>16–24bits</td>
</tr>
<tr>
<td>Lock range</td>
<td>Every audio clock rate from 32.0kHz to 192.0kHz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>VIDEO SYNC OUTPUTS</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>4 x BNC female, unbalanced, output impedance 75Ω, individually buffered, adjustable in pairs</td>
</tr>
<tr>
<td>Output levels</td>
<td>300 mV (p-p) burst level @ 75Ω</td>
</tr>
<tr>
<td></td>
<td>300 mV (p-p) H/V sync level @ 75Ω</td>
</tr>
<tr>
<td></td>
<td>2.0V (p-p) H/V sync level @ 75Ω, only composite sync</td>
</tr>
<tr>
<td>Video sync formats</td>
<td>PAL or NTSC Black+ Burst or composite sync</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>WORD CLOCK SYNC OUTPUTS</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>8 x BNC female, unbalanced, individually buffered, adjustable in pairs</td>
</tr>
<tr>
<td>Output levels</td>
<td>2.5V (p-p) @ 75Ω, output impedance 75Ω</td>
</tr>
<tr>
<td></td>
<td>3.5V (p-p) @ 75Ω, output impedance 22Ω</td>
</tr>
<tr>
<td>Generatable clock rates</td>
<td>36 audio clock rates, 2 DSD clock rates, 6 pilot tone clock rates, 4 GPS/atomic clock rates, 1 audio player basic clock rate</td>
</tr>
</tbody>
</table>

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<tr>
<th><strong>AES/EBU SYNC OUTPUTS</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>4 x XLR male, transformer balanced, 4.0V (p-p) @ 110Ω, output impedance 110Ω, individually buffered, adjustable in pairs</td>
</tr>
<tr>
<td>Format adjustments</td>
<td>Professional/consumer, audio status, reference status, lock status, DC offset -90dBFs</td>
</tr>
<tr>
<td>Resolution adjustments</td>
<td>16bits, 18bits, 20bits or 24bits</td>
</tr>
<tr>
<td>Generatable clock rates</td>
<td>Every audio clock rate from 16.0kHz to 192.0kHz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>S/P-DIF SYNC OUTPUTS</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>2 x Coaxial (Cinch/RCA female), unbalanced, 0.5V (p-p) @ 75Ω, output impedance 75Ω, individually buffered, adjustable in pairs</td>
</tr>
<tr>
<td>Format</td>
<td>IEC 60958 blank frame</td>
</tr>
<tr>
<td>Format adjustments</td>
<td>Consumer/professional, audio status, reference status, DC offset -90dBFs</td>
</tr>
<tr>
<td>Resolution adjustments</td>
<td>16bits, 18bits, 20bits or 24bits</td>
</tr>
<tr>
<td>Generatable clock rates</td>
<td>Every audio clock rate from 16.0kHz to 192.0kHz</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>INTERNAL REFERENCE OSCILLATOR SPECIFICATIONS</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oscillator type</td>
<td>TCXO, temperature compensated crystal oscillator, burned-in and pre-aged</td>
</tr>
<tr>
<td>Clock accuracy (shipped)</td>
<td>&lt; ±0.1ppm</td>
</tr>
<tr>
<td>Clock stability versus temperature</td>
<td>&lt; ± 0.5ppm</td>
</tr>
<tr>
<td>Clock jitter</td>
<td>&lt; 10ps (RMS), measure bandwidth: 20.0Hz – 100.0kHz</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-10°C to +60°C</td>
</tr>
</tbody>
</table>
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 25fps, 625 lines, Black + Burst or composite video sync
NTSC 29,97fps, 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
RS485

Functions
Remote controlling of whole system (none standard), software updating, programming

POWER SUPPLY

Type
Internal, switching power supply

Input voltage
90V – 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