

The logo for iCLOCK, featuring a stylized lowercase 'i' in blue and orange, followed by the word 'CLOCK' in a large, blue, outlined, sans-serif font.The logo for iCLOCKdp features the word "iCLOCK" in a large, blue, outlined sans-serif font. The lowercase "i" is solid blue with a small yellow square above it. The word "dp" is in a smaller, solid blue sans-serif font, with a yellow outline around the "d".

REDUNDANT MULTIPLE CLOCK SYNTHESIZER AND VIDEO REFERENCE GENERATOR VERSION 2.10/2.14



DSD
Direct Stream Digital

DXD
igital eXtreme Defi

Direct Stream Digital Digital eXtreme Definition

Digital eXtreme Definition



WWW.MUTEF-NET.DE

SAFETY INSTRUCTIONS

General instructions

To reduce the risk of fire or electrical shock, do not expose this appliance to rain or moisture, direct sunlight or excessive heat from sources such as radiators or spotlights. No user serviceable parts are inside. Repair and maintenance must be carried out by qualified personnel authorized by MUTECH 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 MUTECH 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!



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



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

Declaration of Conformity

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

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

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



WARRANTY REGULATIONS

§1 Warranty

MUTECH 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, MUTECH 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 MUTECH GmbH within Germany. Outside Germany, the product will be returned with the additional international freight charges payable by the customer. Warranty claims other than those indicated above are expressly excluded.

§2 Warranty transferability

This warranty is extended exclusively to the original buyer who bought the product from a MUTECH 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 MUTECH 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 MUTECH 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 MUTECH 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 MUTECH 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 MUTECH GmbH in advance.

§5 Repairs

To obtain warranty service, the buyer must call or write to MUTECH 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 MUTECH 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:

MUTECH Gesellschaft fuer Systementwicklung und Komponentenvertrieb mbH

Siekeweg 6/8 • 12309 Berlin • Germany • Fon 030-746880-0 • Fax 030-746880-99 • Tecsupport@MUTECH-net.de • www.MUTECH-net.de

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INTRODUCTION

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

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 MUTECH 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 MUTECH, 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 continuous clock supply for all connected devices is guaranteed during any operation mode.

For today's 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 < 1ps (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.

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

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

Synchronizable references

- HD tri-level syncs
- SD bi-level syncs
- Word Clock + Word Clock x256 (so called Super Clock for ProTools™ systems)
- DSD 64, DSD 128 + DXD
- AES3 + AES11
- AES3 id + AES11 id
- S/PDIF
- GPS
- Telecom
- DCF77
- MSF60
- Internal SD video reference generator
- Further references through option cards or custom designed-programming

Generatable references

- SD bi-level as Black & Burst or composite sync
- Word Clock + Word Clock x256 (so called Super Clock for ProTools™ systems)
- DSD64, DSD128 + DXD
- Film and video frame + field rates
- AES11
- S/PDIF
- Further clock signals through option cards



Differences between Software V2.10 and V2.11

Both versions include the preset management as new functionality, which was inquired by several professional MUTEK 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 <1ps (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.
- 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 $\pm 20\%$.
- Supports all pull up/pull down rates for film, audio and video transfers.
- Follows external references up to $\pm 20\%$ (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
- Failure securing in clock distribution systems
- Film, video and audio transfers
- Synchronization of pilot tone resolvers, timecode generators, film projectors
- Coupling of HD/SD based multi-format video systems

Optional Products

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

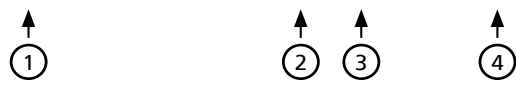


CONTROL ELEMENTS

iCLOCK + iCLOCK dp Front Panel



iCLOCK and iCLOCK dp front panels look equal



1 DISPLAY

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

2 + 3 STATUS Indicators

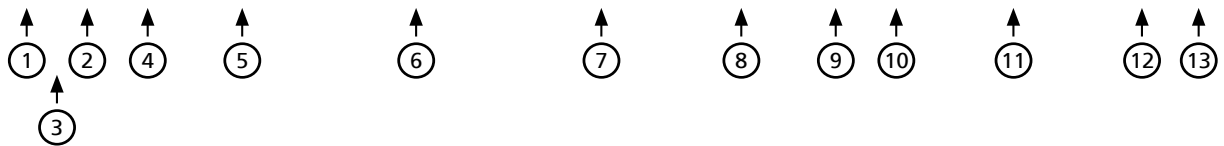
The three blue indicators show the lock status of the currently active clock source. The five red indicators show important system statuses of iCLOCK.

4 CURSOR Buttons

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

Refer to the OPERATIONS chapter for more information.

iCLOCK Rear Panel



iCLOCK dp Rear Panel



1 + 2 INPUT1, INPUT2

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

3 ALARM OUT

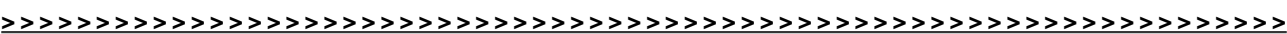
The iC-ALARM output is optionally available (item no. 8005-065). Refer to the EXTENSIONS chapter for a short overview.

4 INPUT3 (AES/EBU)

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

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

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



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

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/PDIF OUT

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

10 RS485

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

11 OPTION

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

12 MAINS IN 90–260V, Power Switch

This is the main switch for switching the device on and off. Be sure to make all connections (especially the supplied power cable) properly before turning on the switch. Heed the SAFETY INSTRUCTIONS at the beginning of this manual.

13 MAINS IN 90–260V, Power Inlet

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

14 iCLOCK dp MAINS IN 90–260V, Power Inlets

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

iCLOCK dp does not consist of a power switch!

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/iCLOCKdp
- 1 x Power cable, 2 x power cables for iCLOCKdp
- 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 280mm/11.02 for iCLOCKdp. Another 60 mm/2.4" should be added for the required cables.

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

Wiring the Word Clock and Video Interfaces

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

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

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

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

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



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!



Clock Cable Lengths

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

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

We recommend using high-grade cables with a good shielding for your clock signal leads, in particular, if you need to transmit Word Clockx256 (so-called Super Clock) signals over greater distances. In any case, a length of max. 10 meters (approx. 30 feet) should never be exceeded!



Cables for High Clock Rates

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

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

Wiring the AES/EBU and S/PDIF 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).

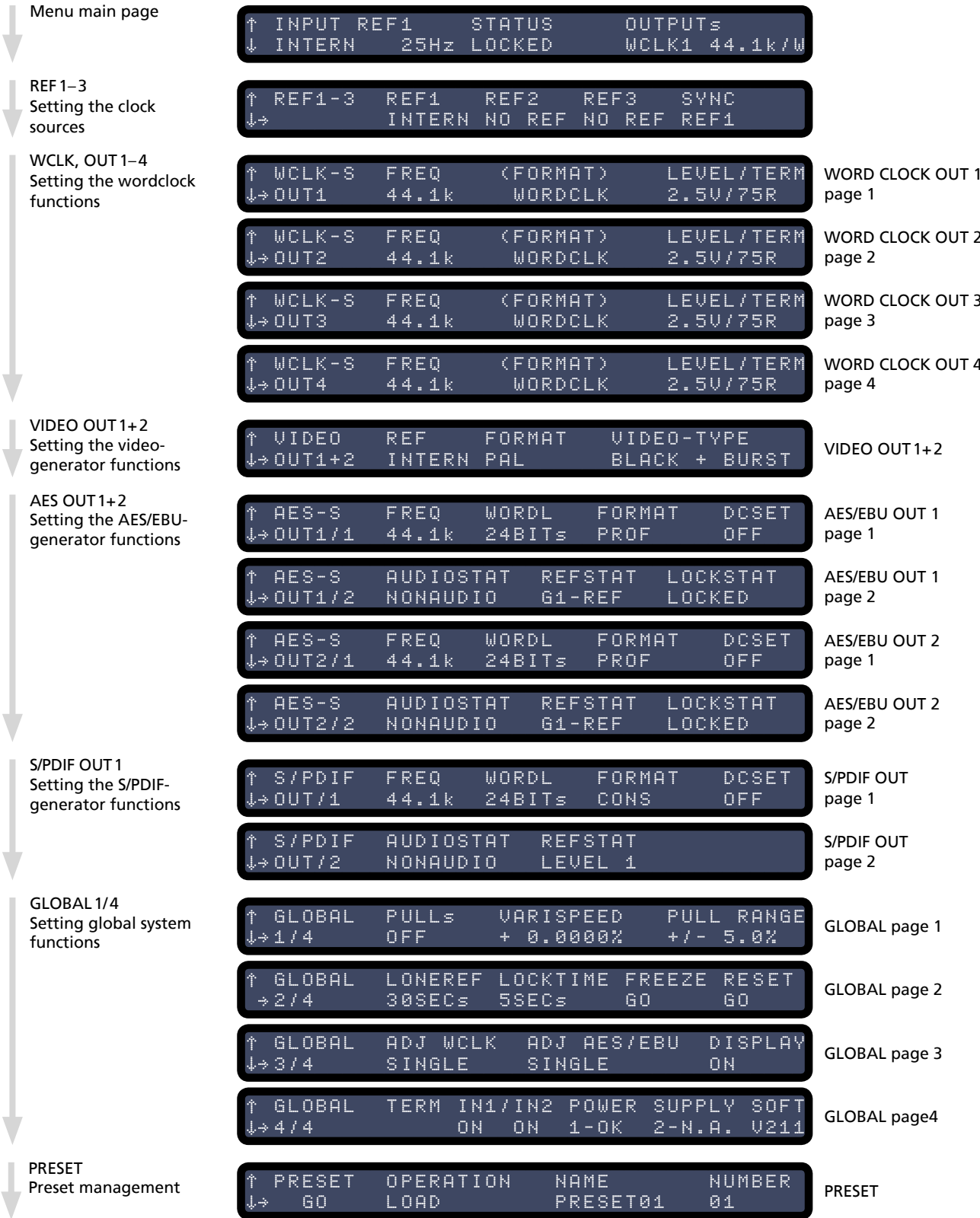
Connect the coaxial S/PDIF interface with the help of unbalanced electrical cables equipped with cinch connectors on both ends. The specifications stipulate a specific cable resistance of 75Ω (ask your retailer for a confirmation of this value when purchasing the cables).



GENERAL OPERATION

Menu Structure

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





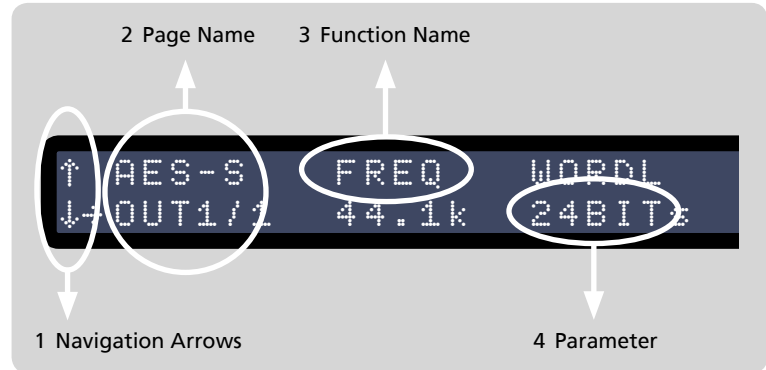
Safety Instructions

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

Selecting Menu Pages and setting Functions

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

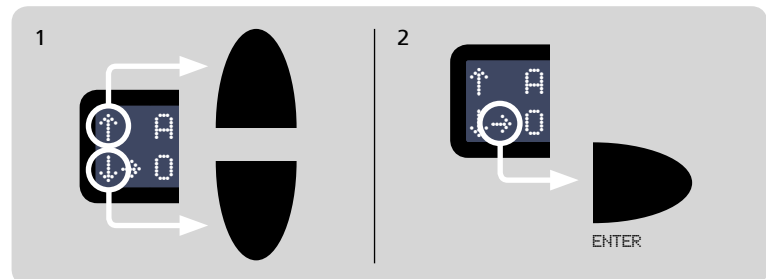
- 1 Arrows on the left display side for simplifying navigation
- 2 Appropriate page name on the left display side next to the arrows
- 3 The upper display line shows the function name
- 4 The lower display line shows the associated adjustable parameter



Display operating structure

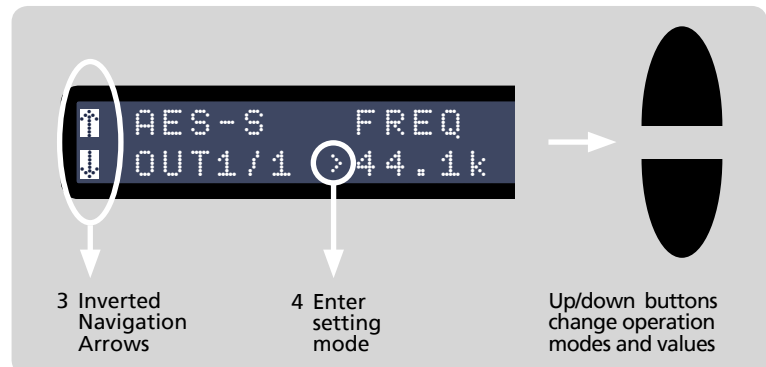
The arrow orientations refer to the respective cursor buttons.

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



Display arrow orientations

- 3 During this procedure, the two vertical arrows will be inverted, meaning that the up and down buttons are now used for changing parameter values and not for moving between menu pages.
- 4 When the horizontal arrow has been positioned in front of the parameter to be changed, pressing the up/down buttons will first change to the setting mode (the arrow will change its shape). Subsequent pressing the ENTER button will confirm the changes, the arrow will return to its original shape. Pressing the ENTER key again will then move the arrow to the next parameter.

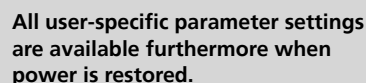


Setting modes and parameters

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.



10



INPUT REFERENCE shows

k = kilohertz

M - megahertz

Shows the current sy

LOCKED indicates that the

FREQUENCY CHANGE indicates

HOLD indicates that an

CYCLE SYNCHRONIZATION indic

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

LOCKSTAT (function)

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/PDIF Outputs

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

S/PDIF outputs, page 1

S/PDIF outputs, page 2

S/PDIF OUT/1, -/2 (page name)

The page names refer to the respective S/PDIF menu page (see above figures).

Functions and settings on the first S/PDIF output page:

FREQ (function)

FREQUENCY Sets the clock rate of the S/PDIF outputs. A so-called S/PDIF 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/PDIF or AES3-11 signal to the S/PDIF 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/PDIF pair will not be accessible; the parameters and functions can only be accessed after the internal S/PDIF generator has been enabled by selecting a different clock rate.

In this mode, the synthesizer synchronizes to the input S/PDIF 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/PDIF clear-frame signal.
The factory default is 24BITS.

16BITS, 18BITS, 20BITS, 24BITS (setting)

One of four word lengths between 16 and 24Bits are available for selection.

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

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

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

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.

↑ GLOBAL	PULLs	VARISPEED	PULL RANGE
↓→ 1/4	OFF	+ 0.0000%	+/- 5.0%

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

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.

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

VARISPEED 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 $\pm 20.0\%$ 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.

Entering varispeed values and moving the cursor

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.

RESET (function)

GO, SURE? (setting)

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



ADJ WCLK (function)

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

SINGLE (setting)

SINGLE allows for editing the wordclock outputs individually.

LINKED (setting)

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

ADJ AES/EBU (function)

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

SINGLE (setting)

SINGLE allows for editing the AES/EBU outputs individually.

LINKED (setting)

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

DISPLAY (function)

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

ON (setting)

ON lets the backlight LEDs light permanently.

AUTO (setting)

AUTOMATICALLY turns the backlight LEDs after a period of 5 minutes off. Pressing one of the four buttons on the front panel reactivates the back-light LEDs.

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.

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

↑ GLOBAL	TERM	IN1/IN2	POWER	SUPPLY	SOFT
↓ 4/4		ON ON	1-OK	2-N.A.	V211

GLOBAL 4/4

GLOBAL 4/4

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

TERM IN1/IN2

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

ON = internal termination enabled

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 standard version:	1-ON 1-OFF	(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).

SDFT

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

U211 (setting)

These letters and numbers represent the currently installed software version of iCLOCK or iCLOCKdp:

V = Version

211 = 2.11

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!

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

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

These are the factory default names.

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.

These numbers represent the available preset numbers.

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.

- Select the **SAVE** item from the **OPERATION** menu.

Quit the OPERATION function by pressing the ENTER key, then change to the NAME function.

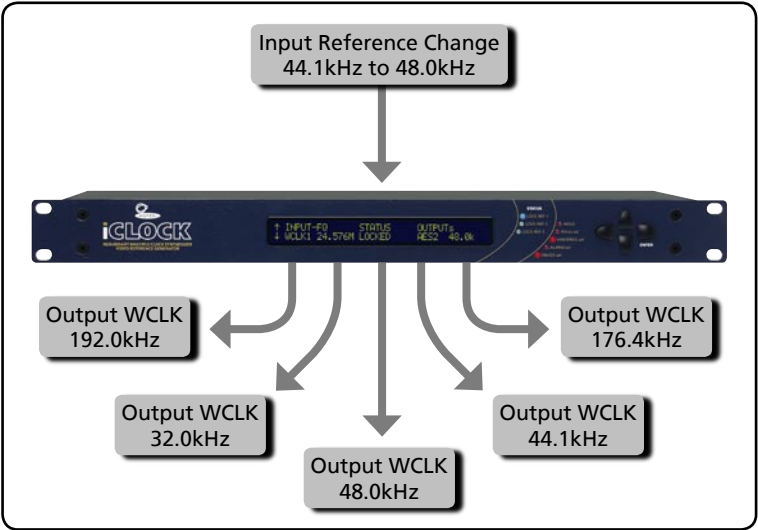
- Select one of the PRESET01-08 memories using the up/down keys and confirm by pressing the ENTER key.
- Pressing one of the up/down keys followed by the ENTER key will enable the edit mode. The first character on the left will start flashing. If no user input occurs, the operation will be canceled after 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.



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.



Functional principle during input reference change

Example

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

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

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

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

SoftReLock

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

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

Example

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

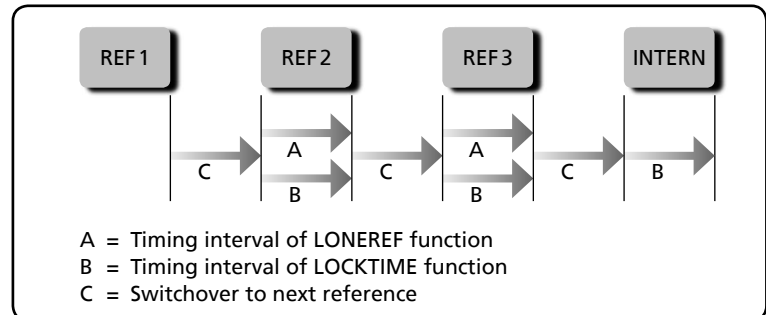
Note!

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

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

Sequence Synchronization

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



Sequence Synchronization with three external references

Example

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

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

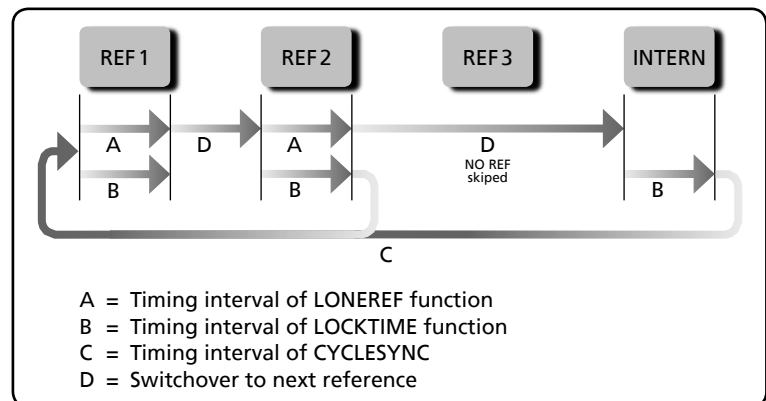
Note!

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

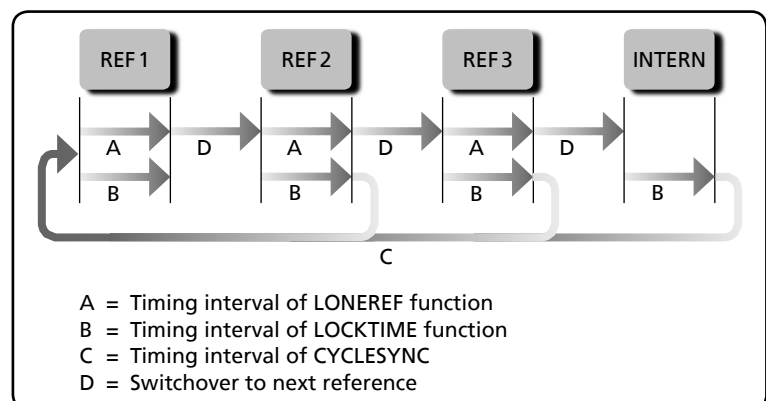
As the clock source selected as REF1 has always the highest priority for synthesizer synchronization, the CYCLESYNC function will always try to synchronize to REF1 first, then to REF2, to REF3 and finally to the internal video reference generator.

Cycle Synchronization

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



Cycle Synchronization with two external references, REF3 = NO REF



Cycle Synchronization with three external references



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 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 iCLOCKdp
- ALARM OUT 3: Loss of the internal reference oscillator

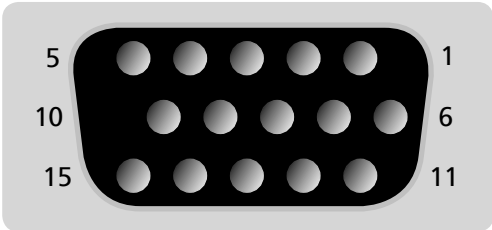
Every of the above mentioned operating conditions activate also the red front panel LED »ALARM set«.

The relays are normalled when the described operating conditions work faultlessly. If a disturbance occurs, the according relay faills instantly. The output contacts supply a max. switching power of 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>).

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



Pin numbering of high-density D-Sub connector

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

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



APPENDIX

AES11 CLOCK RATES

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

*) Generatable only, not synchronizable!

S/PDIF CLOCK RATES

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

*) Generatable only, not synchronizable!

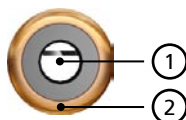
Pin Assignment of the Connectors

Mains



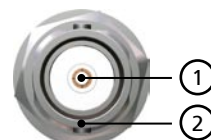
- 1 Neutral (blue; USA: white)
- 2 Protective earth (green/yellow; USA: green)
- 3 Live, phase (brown; USA: black)

S/PDIF Cinch Input/Output



- 1 Audio signal
- 2 Audio ground

Universal Inputs, WCLK + Video Outputs



- 1 Signal
- 2 Ground

AES/EBU XLR Output



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

AES/EBU XLR Input



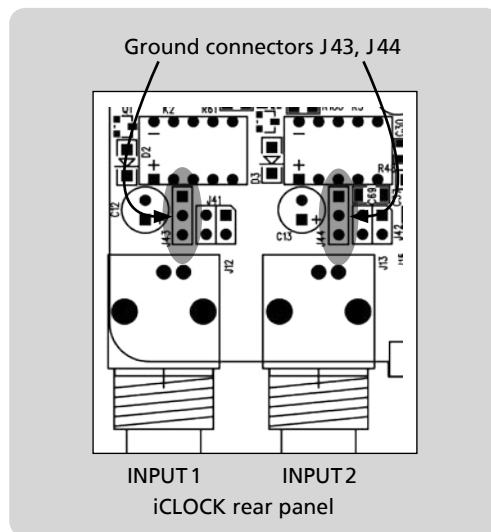
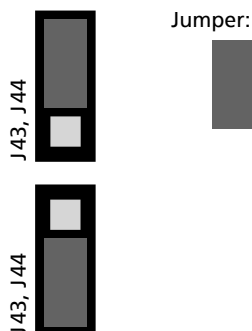
- 1 Audio ground
- 2 a conductor (hot / +)
- 3 b conductor (cold / -)

Connecting the universal Clock Inputs to Ground

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

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

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



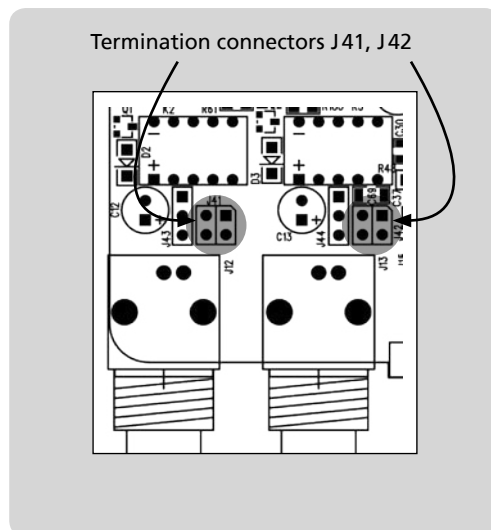
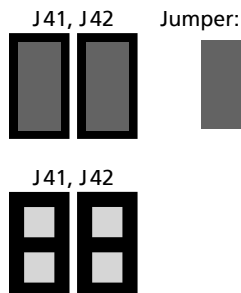
Switching-off the Termination of the universal Clock Inputs

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

When iCLOCK is shipped, the BNC-based universal inputs are terminated internally with 75Ω. Two Jumpers are put on two 2-pin sockets, J41 for INPUT 1 and J42 for INPUT2.

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

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



Splitting-up the Video Outputs for dual Video Generator Operation

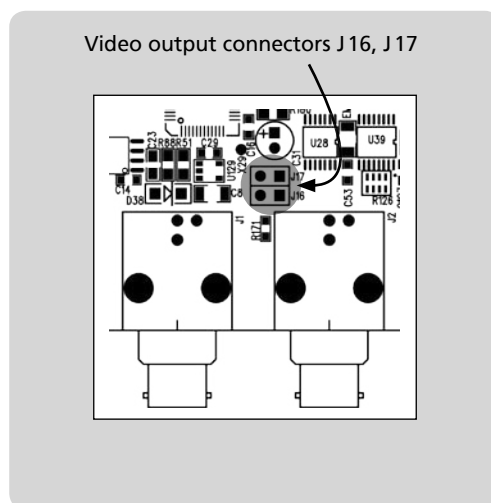
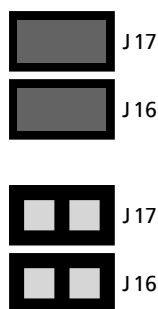
CAUTION! Disconnect the unit from the mains before opening!
Remount the steel-plate cover thoroughly before you attempt to operate the unit!

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, J16 and J17.

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

VIDEO 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!



[illegible]

FREQUENCY SYNTHESIS PROCESSING	
Reference frequency synthesis	Direct Digital Synthesis (DDS), 172.8MHz internal clock rate, 48bits frequency resolution
Varispeed synthesis	±20% from nominal clock rate, 0.000% (1ppm) lowest adjustable increment
Pull up/pull down synthesis	+0.1%, −0.1%, +4.166%, −4.0%
VIDEO GENERATOR SPECIFICATIONS	
Generated video formats	PAL 25 fps, 625 lines, Black + Burst or composite video sync
	NTSC 29,97fps, 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 (WxHxD), steel sheet 1mm, black
Front panel size/material	483 x 44 x 3mm (WxHxD), 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 <±0.1ppm



WWW.MUTEC-NET.DE
FON 0049-(0)30-74 6880-0
FAX 0049-(0)30-74 6880-99