Time Base – Operation Manual

Operation Manual by D. Popow

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Preface

Congratulations on your purchase of Nuendo Time Base!

The Time Base offers perfect solutions for sample-accurate synchronization of digital audio production systems like Nuendo via House Sync (Blackburst), AES/EBU – VST System Link, LTC or VITC with analog or digital audio and video tape recorders, mixing desks, sequencers etc.

Time Base combines the functional domains Word Clock (AES/EBU – VST System Link), Time Code, Machine Control and Virtual Machine.

It reads and generates the standard Time Code formats LTC, VITC, MTC and 9-pin. Generated Time Code is in sync with the video sync signal.

A built-in Video Inserter lets you visually insert Time Code into the video picture or add VITC to the video signal.

An integrated 9-pin interface lets you control external 9-pin compatible devices, e.g. a Betacam video recorder, Tascam DA88, DA98, MMR8 or Doremi V1.

Time Base can also be used as a Virtual Machine. This lets you, for instance, remote control Nuendo from 9-pin Edit Controllers, and mixing desks that provide 9-pin machine control (SSL, NEVE…). The GPI/O socket on the Time Base provides the possibility to realize Red light ("on air") control.

Time Base provides a two-line display and four ergonomically positioned buttons. These can be used to call up various display pages and set individual parameters. Settings can also be made from within Nuendo, provided that the corresponding application is connected to the Time Base via USB. When you load a Project, all relevant Project settings are automatically transferred to the Time Base.

We are sure that using Time Base will simplify your studio work and will help you to become even more productive.
We hope that you have fun using Time Base!

For their continuous support during the development of Time Base, we would particularly like to thank:

Achim Kruse, Burkhard Bürgerhoff – C-Lab

The Steinberg team

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Package Contents and Installation

Package Contents

- Time Base
- Power Cable
- User Manual
- Driver CD
- Warranty Card

Installation – Connections – Getting Started

Time Base is designed to be mounted in a 19“ rack. It should either be installed in a 19” rack or placed on a stable surface, as it can fall down and be damaged. Proximity to heating or cooling equipment should be avoided (operational temperature range 15-35 degrees Celsius).

The power connector should only be connected to an earthed power socket using an earthed power cable delivering 110-240V.

All signal connections should be made with shielded cables! All connections, except LTC in/out (analog audio), should be made with cables of the correct impedance, suitable plugs and termination, if necessary (see page 82).

❒ **For some System setup examples see page 17.**

Important Safety Instructions

- Do not leave the power cable where people walk, in order to avoid any accidental interruption of power. If an extension block is used, then care should also be taken that all the connected devices do not together exceed the maximum safe current draw.
- Disconnect the power before cleaning.
- Take care that no foreign objects get inside the machine. They could come into contact with current-conducting components or cause a short circuit, which in turn could cause a fire or an electric shock. Under no circumstances should liquids be allowed to get inside Time Base.
- When the cover of Time Base is removed, it is possible that dangerous current-carrying parts will be exposed to human contact. Therefore, all service operations should be carried out only by authorized service personnel.
- Time Base should under no circumstances ever be used in proximity to water.

Driver Software Installation

Windows PC Drivers

When you connect Time Base to your computer for the first time, Windows will recognize the new hardware component and start its “Add New Hardware Wizard”.

- Insert the Driver CD into your CD-ROM drive and follow the instructions displayed on your computer screen.
  The necessary driver software – a Firmware Loader and the actual Time Base driver – will now be installed during two separate installation processes.

❒ **You can safely ignore alert messages like “Digital signature not found”, “Do not install driver”, “Driver not certified”. Simply continue with the installation.**

- Restart your computer when the installation procedure has been completed.

Mac OS X Drivers

When you have connected the hardware for the first time and started the computer, you can install the driver software from the Driver CD-ROM.

1. Start driver installation by double clicking on the Time Base Driver icon.

2. Follow the instructions on the screen and restart your computer when the procedure has been completed.

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Features and Basic Settings

Time Base – Brief Overview

Time Base is a universal synchronization and control device for digital audio and video in all fields of studio production.

Time Base combines the following four functional domains in one compact device:

- Time code
- Word-Clock (AES/EBU digital zero or AES/EBU for VST System Link)
- Machine Control (MMC and P2 protocol/9-pin-control)
- Virtual Machine (emulated 9-pin/P2 machine)

Time Base offers the following functions:

- Reads and writes all standard Time Code formats: LTC, VITC, MTC and 9-pin (serial Time Code).
  The Time Code generator is in sync with the video sync signal.
- Synchronizes digital audio systems to House Sync (Blackburst, video), AES/EBU (digital audio), LTC ("Longitudinal Time Code", e.g. coming from an analog 24 track tape recorder).
- Supports all sample rates between 16 and 192 kHz including pull-up/pull-down (NTSC).
- Includes a synchronous digital Varispeed engine.
- Converts MMC to 9-pin machine control.
  The built-in 9-pin bus can e.g. control Betacam VCR, Tascam DA88, DA98, MMR8, Doremi V1 etc.
- Can be used as a Virtual Machine. This lets you remote control several hard disk recording systems from various points without having to switch the "remote control". The Virtual 9-pin machine functions make it possible to control Nuendo from 9-pin edit controllers and from mixing desks that are equipped with a 9-pin machine controller (e.g. SSL, NEVE).
- Can display (insert) Time Code in(to) video frames in two sizes and four display modes. The Time Code can be freely positioned within the frame.

Basic Settings

Before each session, the following basic settings should be made or checked. Both of the following settings would normally be set according to the standard settings used in the respective country:

Time Base Display Page	Parameter	Explanation	Options
P.5	SYS-VIDEO	Video frame rate	E.g. 25 frames in Europe (PAL) or 29 frames in USA/Canada (NTSC).
P.1	FRM	Time code frame rate	25 frame (PAL), 29, or 29D (drop) frames (NTSC).

If the Time Base is being driven by video sync, the Time Code frame rate will be automatically set to the video frame rate.

❒ **The frame rate of the connected devices must be set to the same value!**

Time Base Display Page	Parameter	Explanation	Options
P.1	SR	Sample rate	The Sample Rate should be set to the desired value for the project, and should be maintained unchanged throughout the whole project (e.g. 44.1 for CD, 48 for Video/Film, 192 for DVD Audio).

❒ **The Sample of synchronized devices must be set to the same value! When you make the settings for a new Project in Time Base, Nuendo will automatically recognize them. When you load a Project in Nuendo, Time Base will automatically be set to the same settings.**

In the case of incoming pre-produced material, all three parameters should be set to match, or the delivered material should be converted to the “house” standard (if the latter, please do so while synchronized!).

Time Base Display Page	Parameter	Explanation	Options
P.3	VARSP=OFF	Varispeed	In this case, this parameter should be set to OFF.

- **When you install and check out Time Base for the first time, it is a good idea to start out with one of the Time Base presets (see page 65). The individual Time Base parameters are described in detail on page 37.**

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Typical Setup Examples

Basics

A few words of introduction to the technical problems which can occur in synchronization in an all-digital or hybrid analog/digital studio setup:

Basically, there are two different synchronization procedures.

One of the available audio or video machines becomes the master.

But the type of Time Code often used, LTC, contains two information streams:

- The visible time information (hh:mm:ss:ff).
- The invisible tempo information (Clock).

The LTC is thus used as position and Word Clock reference! It is this which may cause the problem, that errors in the Master Clock, i.e. in the Time Code (jitter, dropouts, wow & flutter in the master device) are passed on to all connected slave devices. Time Base is conceived in such a way that such problems are contained as much as is technically possible.

The signal used for synchronization in this case is referred to as “self-clocking”, because the principal aim is to transmit a clock signal (speed, Word Clock) in which the other data (Time Code numbers in LTC, digital audio in AES/EBU) happens to be included. Precisely because of this unavoidable passing on to slave machines of errors caused in part by the system itself, special care should be taken that the Time Code is error-free.

The more reliable procedure is this:

One Master Clock is used to synchronize all devices (data streams) in the studio. The Master Clock is the only device that generates a sync signal (e.g. Blackburst or Word Clock). When using Blackburst, Time Base uses this to generate the Digital Audio Clock. All connected audio and video devices there run from the same pace and use this as a speed reference. This avoids the error described above.

This procedure only works with devices that can be synchronized externally. This includes not just audio and video devices, but also Time Code generators as in Time Base). This means that when the Time Code generator has clocked another second, a digital audio signal with a 48 kHz sampling frequency for example should have played back exactly 48,000 samples). This procedure also means that tempo information is derived from a precise and stable source, which drives everything!

Time Base contains just such a clock.

Computer Connection

Time Base must be connected to the computer via its USB port which is located on the rear panel. USB is used to transfer control and configuration data.

VST System Link is used for synchronization. All time-related data is therefore transferred via VST System Link.

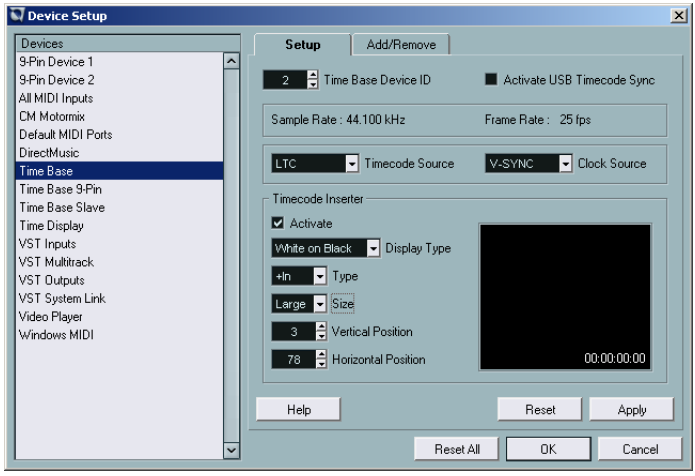
Synchronization via USB-Serial-TC is also possible, if necessary.

Settings in Nuendo

❒ **A detailed description of the Time Base Setup windows in Nuendo can be found in the documentation and Online Help systems of the corresponding – Time Base supporting – program versions.**

1. Switch on Time Base, then start Nuendo.
   Various setup parameter sets are available in Nuendo's Devices Setup dialog for the different Time Base setup options.
2. You can open this dialog by selecting "Device Setup…" on the Devices menu.
3. First, use the "ADD/Remove" tab in the dialog to add the respective Device Class, if necessary or select one in the Devices list on the left side of the dialog.
   Several Device Classes are available for Time Base. Click on the "Setup" tab, to make the corresponding settings.

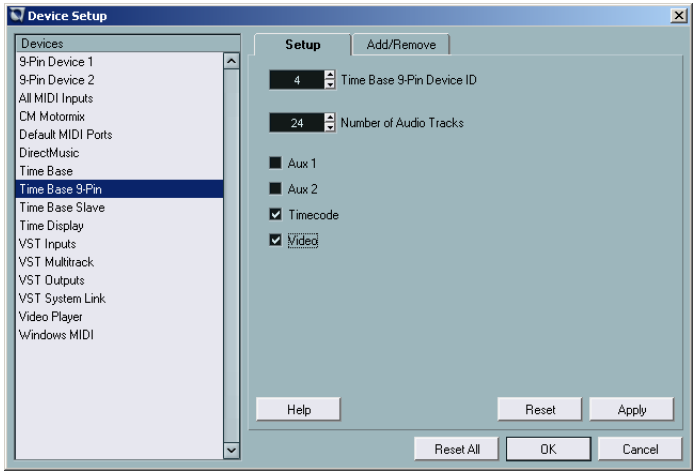
Time Base



Here you can make basic settings.

Parameter	Options	Effect
Time Base Device ID	0 - 126 ID 2 is preset	Device identification number. Must be set correctly to make sure the data arrives in the device.
Activate USB Timecode Sync	Ticked = On No tick= Off	If this option is activated, the Time Code synchronization with the computer takes place via the USB port. If the option is set to Off, synchronization with the computer takes place via the VST System Link connections between Time Base and computer.
The parameters Sample Rate and Frame Rate are read only.		
Timecode Source	LTC, VITC, MTC, M.V (MIDI), M.A (9-Pin)	Depending on which Time Code source you select, different options are available in the Clock Source pop-up menu.
Clock Source	Internal, V-SYNC, LTC-Norm, LTC-Hold	The available Clock source options.
Timecode Inserter	Ticked = On No tick= Off	When this option is activated, Time Base will insert the Time Code into the video frames (“Burn-in window).
Display Type	White on Black, Black on White, White Contour, Black Contour	Display options for the inserted Time Code.
Type	+In, +TC9	Lets you select the Time Code type displayed by the inserter (see page 35).
Size	Small, Large	Display options for the inserted Time Code.
Vertical Position, Horizontal Position	0 - 127	Lets you numerically position the inserted Time Code.
Timecode Positioning field	Manually by dragging	Here you can define the position of the inserted Time Code within the video frame by manually dragging it with the mouse. Note: The real size of the displayed Time Code is not shown in this positioning field!

Setting up the Time Base 9-Pin Device Control Panel



Here you make the settings for 9-pin device control (see below). Make sure, that the corresponding function is available in the 9-pin device that you use.

Parameter	Options	Effect
Timebase 9-Pin-Device ID	0 - 126	Lets you set the 9-pin device ID. The Nuendo/Time Base standard value is 4
The following parameters are used to set up track remote control for the connected machine.		
Number of Audio Tracks	2 - 64	Lets you define the number of digital audio tracks available in the connected 9-pin device, which thereby become visible and can be controlled from the 9-pin device control panel.
Aux 1, Aux 2	Activate (tick) / Deactivate (no tick)	When you activate these parameters, the (analog) audio tracks appears in the 9-pin device control panel.
Timecode	Activate (tick) / Deactivate (no tick)	Most 9-pin devices provide special time code tracks. If you activate this parameter, the time code track of your 9-pin device appears in the 9-pin device control panel.
Video	Activate (tick) / Deactivate (no tick)	If the connected 9-pin device processes video, you can use this parameter to make the corresponding Arm Track control visible in the 9-pin device control panel.
All tracks available in your 9-pin device should be included in the 9-pin device control panel. This will give you a better overview and you are always informed about the current track status.		

Time Base 9-Pin Device Control Panel

Open this control panel by selecting “Time Base 9-Pin” on the Devices menu. It can be used to remote control a 9-pin device that you have connected to the Time Base from Nuendo and to arm its tracks.

❒ **Which functions are available on this control panel depends on which functions are available in the connected 9-pin device and also on the settings that you have made in the Time Base 9-pin view of the Device Setup dialog, see previous page.**

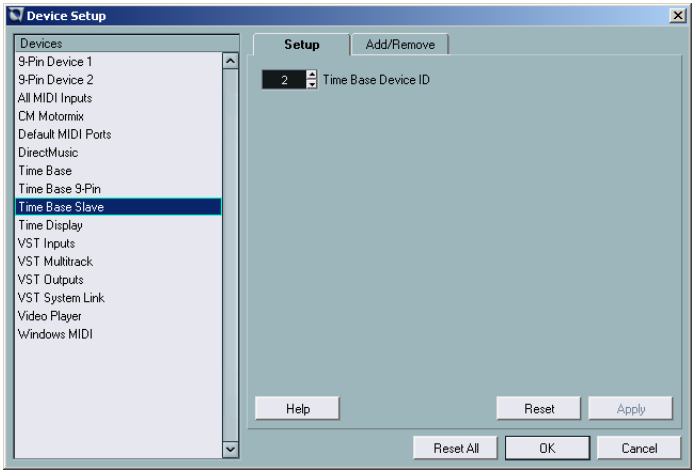
Depending on your settings, the following elements (from left to right) may be visible in the control panel:

- The set up number of audio tracks. These can be armed with a mouse click.
- The Aux 1 and 2 tracks, which some devices make available separately or which may also be “hidden”, as well as the time code and video tracks. These can be armed here, too.
- The transport controls control playback and recording functions of the 9-pin device.
- The Online switch must be activated. If it isn’t, remote control is disabled.
- In the upper section of the control panel, the current time code position, the Time Base status as well as the connected 9-Pin device are displayed.
- To the left of the 9-pin device indicator, the following error messages may become visible:

<Local>	Remote control is deactivated in the external 9-pin device.
<NoTape>	This “error” message is shown when there’s no tape on the connected 9-pin tape recorder.

Time Base Slave

Here you can activate remote control of Nuendo by using the combination of Nuendo and Time Base as a virtual machine. Which functions are actually available for the virtual 9-pin machine depends mainly on the options available in the external controller unit.



Time Base Slave dialog view in the Device Setup dialog.

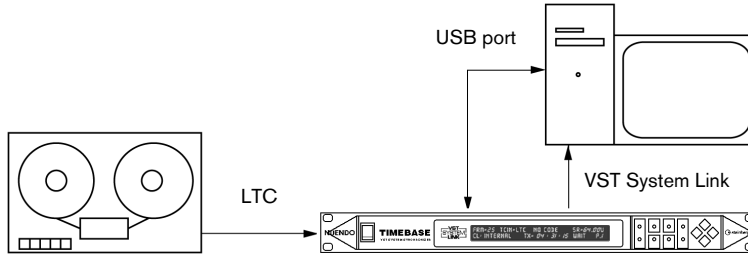
The only parameter that you can set here is the Time Base Device ID. It is preset to its (Nuendo) standard value 2.

Setup Examples

LTC as the Master

This procedure is particularly favoured in music productions. The hard disk recorder (i.e. Nuendo) is “slaved” to the analog machine (e.g. a 24 track recorder).

Time Base settings: TCIN=LTC, CL: LTC-HOLD
Connections:



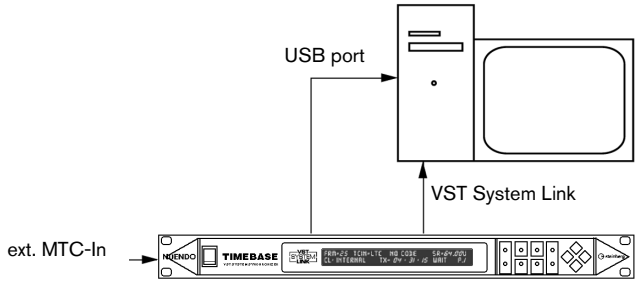
MTC as the Master

Normally in professional situations, this should only be seen as a last resort emergency procedure, i.e. to save a production which otherwise would be lost. The reason for this lies in the often technically inadequate implementation of MIDI Time Code, causing MTC to be saddled with high jitter from external sources. It is impossible to pass on a stable, jitter-free Word Clock from such an MTC-signal.

However, as it is sometimes necessary to perform this conversion (to continue with a production begun in semi-professional circumstances), Time Base generates the clean Word Clock necessary for sonic quality by taking an average value from the incoming MTC. If the jitter in the incoming MTC were allowed to affect the Word Clock, the connected digital devices would all have their audio quality compromised by locking to such a reference clock, provided that would be possible at all.

Time Base expects MTC input via its 15-pin MIDI|GPI/O socket on its rear panel. The socket wiring is described on page 80. Examples for 15-pin connector wiring can be found on page 80.

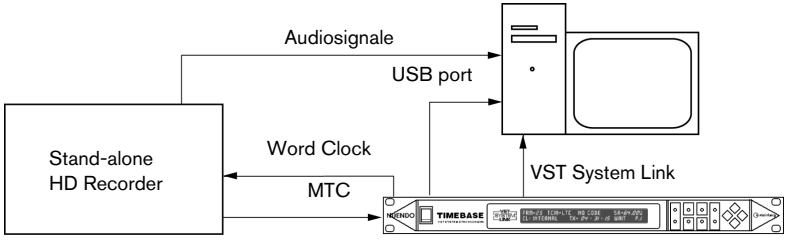
Time Base settings: TCIN=MTC, CL: MTC-HOLD
Connections:



If you should find yourself in such a situation, you can sometimes chose the following:

If your MTC source is a stand-alone Hard Disk Recorder with a digital input which can be externally synchronized, you should switch the Word Clock source of the recorder to “digital in”, having connected it to a Word Clock output on the Time Base. If you now use the MTC produced by the recorder as a positional reference, your entire system will follow the external device.

Time Base setting: CL:INTERNAL (V-SYNC)/ TCIN=MTC
Connections: stand-alone« HD-Recorder and Nuendo



As an alternative, the MTC produced by Time Base can be used as a position reference by the external device. In this case the external device follows the system.

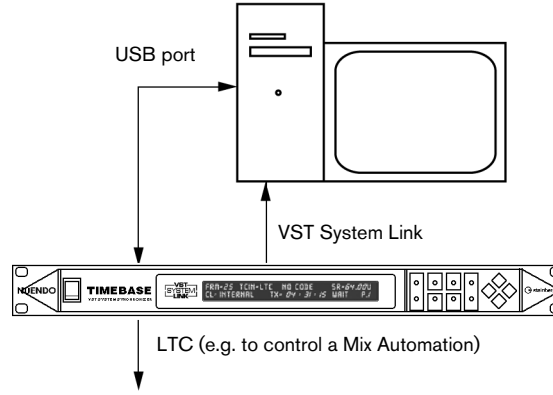
Internal Clock as the Master

A technically perfect procedure: Time Base generates the Word Clock and VST System Link signals for all the digital devices running in the entire studio. As all devices run in sync, data transfer without interruptions is also possible. Increased jitter (and associated loss of quality in synchronized audio signals) is thereby prevented.

❒ **To prevent misunderstandings, Time Base is always the Timing Master, but not necessarily the Positional Master. A hard disk recorder, that is synchronized to Word Clock and has a MIDI Time Code output (which must of course be synchronized to Word Clock) can e.g. control a digital mixer that is also locked to Word Clock. The user has the impression that the hard disk recorder is the Master while it is in fact only the Positional Master, but not the Word Clock Master.**

Settings: CL:INTERNAL
If required, the Time Code functions of Time Base can be used to convert the Time Code format. The technically best solution is to use the Virtual MIDI Machine the generate a clock synchronized Time Code.

Connections:



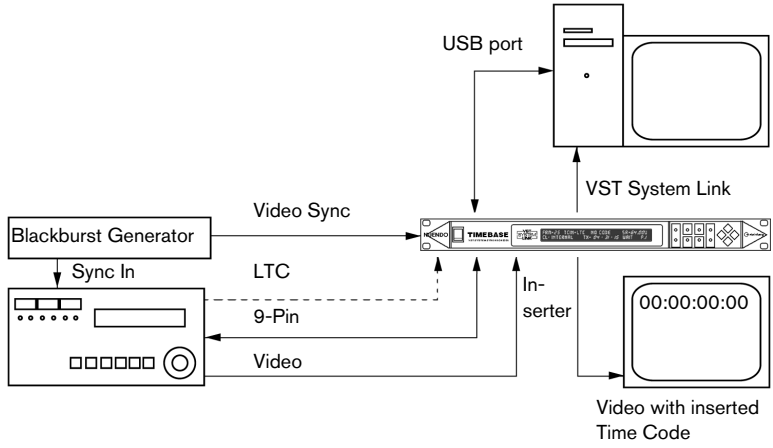
House Sync (Blackburst) as the Master

A second technically perfect procedure: Time Base is connected to a house sync generator (Blackburst) via the Video Sync In. All the advantages listed in the section "Internal Clock as the Master" on page 27 are retained. In addition, the Time Code generator is synchronized to video. This procedure should be used, whenever audio is being edited in sync with video picture.

If several studios are housed in the same building, they can be linked together via the house clock, and can work in sync, without having to live with the restrictions of Word Clock connection.

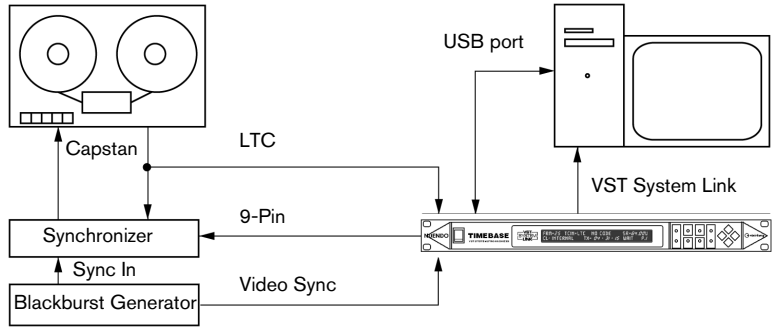
❒ **With Word Clock connection, the entire studio would have to work at the same sample rate.**

Settings: CL:VIDEO/TCIN=LTC, VITC or 9-Pin
Connections: Blackburst as the Master in a system with a VTR.

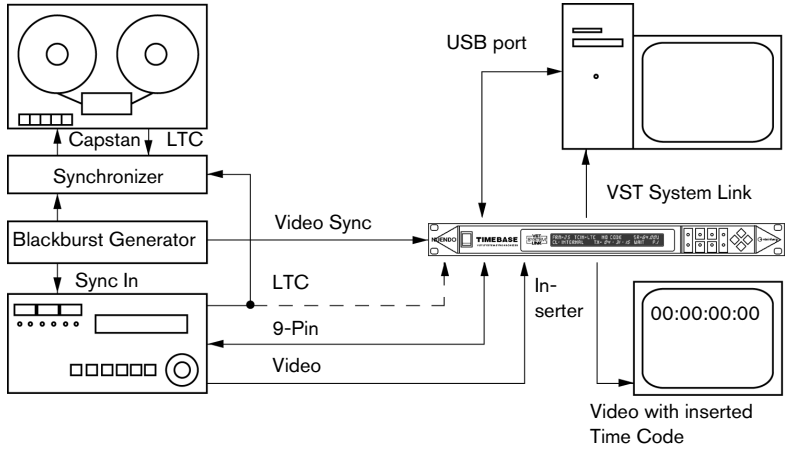


Connections: Blackburst as the Master with an analog tape machine
The analog tape machine is synchronized to the house clock using a tape machine synchronizes with video-resolve capability (e.g. Adams-Smith ZETA, see illustration).

Both the analogue tape machine and the hard disk recorder get their timing information from the (quartz stable) controlling blackburst generator. This prevents that jitter is passed on and increased. Another technically perfect solution.



Connections: Blackburst as the Master with both video and analog tape machine
Everything as in the above example, but now with video as well.



Machine Control

Time Base will convert MMC (MIDI Machine Control) commands into 9-pin (RS422/P2) commands. A machine linked via a 9-pin Remote connector (e.g. Sony Betacam) can thus also be directly controlled from a sequencer.

Time Base can also read the Time Code that comes in via the 9-pin connection.
Settings: TCIN=M.A
If the display shows NO CODE, the machine is either not active or doesn't send 9-pin Time Code.

- **Some machines do not send 9-pin Time Code.**

❒ **If the sequencer plays a Loop (Cycle), it is useful to set a Preroll time for the VTR, so that a sufficient run up time is available for proper sequencer synchronization.**

There are three different ways of handling Preroll (see page 54).
Settings e.g.: Pre-Loc= - 06:00 (6 seconds - 00 frames, see page 54).

It is better to enter this setting on Time Base than in the sequencer, so that the sequencer will cycle normally when the tape machine is not hooked up.

- **If 9-pin control and 9-pin Time Code are both used, the 9-pin machine and Time Base must both use the same video sync signal.**

  On its machine page M.A (see page 68), Time Base offers the option to fully or partly block the 9-pin machine record remote control.

- **It is possible for instance that you block arming the picture and Time Code tracks (which thus remain protected), whilst audio tracks can be armed.**

  You can also arm tracks from Nuendo. STOP, FF and REWIND commands can be converted into STILL (pause) or shuttle commands respectively.

  The 9-pin control settings can be checked on the M.A. page (see page 68).

Virtual Machine VTM

Time Base can also be used as a Virtual Machine.
In the display, change TCIN= to VTM=M.V MIDI.

The Virtual Machine emulates a machine, including controllable “shuttle speed” and switchable Instant Locate (IL) – tapeless mode.
LTC, VITC, MTC and VST System Link are output simultaneously.

The generated Time Code can be used to control mix automation and LTC/VITC-capable slave devices.

If Time Base is referenced to video, the Time Code is locked to the video signal.

It makes your job easier that MMC commands from Nuendo and from an MMC-capable mixer can be routed via a MIDI Merger in semi-parallel form.

❒ **You can control (i.e. start, stop, wind etc.) the system from each “remote-capable” device without having to pay attention to the slave or master status of devices and without the need to switch the Remote Control.**

Virtual 9-Pin Machine

The Virtual 9-pin Machine option VTM-9 contains all the functions of the Virtual MIDI Machine. In addition, a 9-pin machine is emulated.

Four emulations are available: BVW-75, DVW-A500, PCM3348 and VTM9 (Sony 9-pin).

The Virtual 9-pin Machine, connected to a 9-pin control system, makes a video-linked Time Code Generator available. LTC, VITC, MTC and VST System Link output are simultaneously available.

Time Base (with Nuendo connected) will e.g. appear as a 9-pin machine on an SSL digital or SSL 9000 mixing console. The Track Ready function of the mixer is supported by Time Base. Track Ready commands are translated into MMC commands, so that Nuendo can be controlled via the control system. When emulating the Virtual 9-pin Machine VTM-9, Time Base lets you arm 64 tracks in Nuendo (version 2.1 or higher).

The Virtual 9-pin Machine can be slaved.

The Virtual 9-pin Machine can also be controlled via MMC (corresponding to “LOCAL” use). Local and Remote are therefore both simultaneously active. “LOCAL” use is only useful, if the Virtual 9-pin Machine runs as the master.

❒ **Not all 9-pin Controllers do react correctly when a machine is used in "LOCAL" mode. You must test this to find out if it does.**

The 9-pin interface must be switched to M.A:P2x ("DEVICE") mode whenever Time Base is used as a Virtual 9-pin Machine. P2x: Tx and Rx connections are crossed (inverted) within Time Base. Therefore, no special cable is required.

Output to a non-controllable machine

Using Time Base, you can also send Time Code locked output (LTC plus VITC!) from a non-linear video editing system to a (VHS) VTR which can not be controlled via 9-pin.

Most linear video editing systems require 9-pin controllable VTRs (betacam) for output including Time Code.

Complex Systems

❒ **When putting together more Complex systems, a few rules need to be observed, so that the operational reliability and quality of the sync are preserved.**

Sync signals (Clocks and Time Code) must be distributed in parallel.

Clock

If Word Clock is “daisy-chained” from one device to the next, the Clock is regenerated in each device, in other words fed through a PLL circuit. If this happens in almost every case the error rate (Jitter) goes up.

You should therefore first use all four Word Clock outputs of the Time Base before you start to create Word Clock daisy-chains.

Exception: Some high end devices have an additional Word Clock Through. This just passes the incoming Word Clock on a hard-wired high impedance connection.

In this case a signal chain can be established without loss. On the final device of such a chain, you must plug in a 75Ω terminator. To check if this is working properly, switch off a device in the middle of the chain and see if the subsequent devices remain locked.

Time Code

LTC can be connected to several inputs just like audio signals, but should at some point be fed through an amplifier. In this case make sure that you use hard-wired balanced connections free of ground loops.

▪ **Problems often occur in the incoming Time Code, which compromise further connections. Check the quality of the Time Code by listening to it *at low volume*. Like this you will hear if any dropouts or ground loop hum occur.**

MTC

When connecting MTC to multiple units, special problems may occur. Most MIDI Patchbays pass MIDI data (including MTC) through a microprocessor. This causes a delay of several milliseconds which is also variable (i.e. it causes Time Code jitter!). You should therefore only use a passive MIDI patchbay/router which passes on the MIDI data without putting it through a processor.

❒ **To enable control from several locations, MIDI Machine Control signals that are fed into Time Base can be combined by using a MIDI Merger.**

Video functions

In addition to the Video Sync In (see page 28), two pairs of Video IN/OUT connectors are available on Time Base: BNCs for composite video and S-VHS for Y/C (separated or component video). The required pair of connectors can be activated by setting VIDEO: to BNC or S-VHS.

The signal coming from the video recorder will be passed on to the monitor or projector by Time Base and you can additionally insert the Time Code in the picture.

Check the illustration on page 28 for an overview of the connections.

The following functions are available:

VITC Reader

If a VITC signal is encoded in the picture (not visible), it will be read out. Settings: TCIN=VITC

The VITC lines are usually automatically recognized, VITC RL=AUTO but this can also be set up manually.

The advantage of VITC lies in the fact that it can also be read from a paused picture, allowing the exact positional information to be read from the frame currently visible.

VITC-Generator

The video signal being passed through will have VITC added to it. Settings: VITC=ON WL= 19 21 (lines 19 and 21 just as an example) The VITC signal is always encoded in two lines between lines 6 and 36 (PAL) or lines 10 and 40 (NTSC).

- **Depending on the setting of the video monitor, VITC is visible at the top edge of the TV picture from about line 24. As VITC forms part of the picture, it can be recorded only together with the picture. If you have a video tape without VITC, but you want to work using VITC, then you have to make a copy in which the video signal has been fed through Time Base to add the VITC lines.**
- **Depending on the video system/recorder used, different lines do or don't work for VITC. For example. if you use a Low Band Umatic System, try lines 21 and 23 first, then experiment! For post production sound editing it is easiest if you order the tapes from the copying studio with VITC already inserted on the required lines, as well as LTC.**

Time Code Inserter

The Time Code Inserter inserts the read Time Code into the video picture as visible numbers (known as a Burn-in Window).

Settings: INS: ON, +IN or +TC9

POS V, POS H and VIEW to suit yourself.

POS defines the vertical (V) and horizontal (H) position, VIEW the appearance.

With a setting of +IN, when Time Base finds no master Time Code available it automatically switches to the unchecked Time Code being directly read in.

With a setting of +TC9 and a connected 9-pin (RS422 or the SONY protocol) machine, when the Master Time Code is not available, the Inserter automatically switches over to the Time Code being read from the 9-pin connector.

❒ **When using VITC, Time Base has the advantage that tapes can be ordered without a burnt-in Time Code window (which always carries the risk of hiding an important part of the picture). What's more, a run-through without the annoyance of visible Time Code is far more aesthetically pleasing (especially when it is for client approval).**

▪ **The Time Code Inserter can also be set up and activated in Nuendo's Device Setup dialog.**

Digital Varispeed

We know Varispeed from analog tape machines. Time Base now enables Varispeed for digital audio devices. This function should only be brought into play in exceptional cases, principally in two areas:

Music

- A difficult-to-tune instrument needs to be accommodated by a few cents; or the singer needs the track a semitone lower for recording.

  The same advantages and disadvantages occur as when using an analog tape machine, i.e. if playback is a tone lower, the track runs slower.

  In such cases the MIDI instruments must be recorded first (as a rough mix), as their pitch doesn't alter!

Film/Video

- 'After the fact' sound-to-picture synchronization, i.e. correction of sync errors which have crept in during earlier stages in the work process.

  A “manually synchronized” copy must be made, before further work can be done.

  The Varispeed is referenced to the selected Master Clock, and not just to the internal crystal as on cheaper machines.

- **The Varispeed range of digital audio devices is much narrower than on analog tape machines. Some digital audio devices allow no Varispeed whatsoever.**

5

Reference

Basics

If you switch on Time Base, the self-diagnosis mode which tests all functions is automatically started. It memorizes all current settings and saved parameter values. Presets are immediately available thanks to the buffered internal memory.

Time Base shows when it is ready for use by displaying the state it was in before it was switched off.

❒ **If you connect Time Base to Nuendo via its USB port and load the respective program/project, the relevant project settings will automatically be transferred to Time Base.**

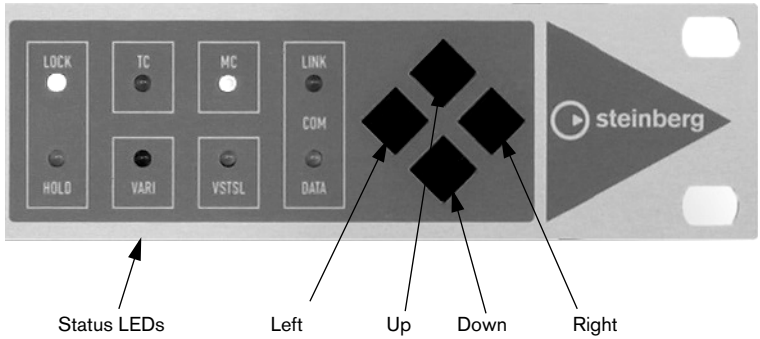
The following section explains the Time Base functions and options and the utilization of its Text Display and Function buttons.

Settings can also be made in Nuendo, provided that the corresponding program is connected to Time Base via the USB port. As mentioned above, all relevant settings of a project are transferred to the Time Base when you load it.

The ten Display Pages (seven user pages, two Service pages and one Machine page) allow all functions and values to be inspected quickly and set if necessary.

The four diamond shaped buttons can be used to navigate in the display, access all functions and alter parameter values:

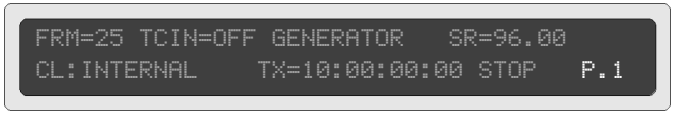
Left/Right button	Press the left or right key to step through the functions shown in the display one after another. A blinking cursor shows the currently selected position. If the cursor is located below the page indicator (P.x), pressing the left and right buttons simultaneously lets you switch between the User and Service/Machine Pages.
Up/Down button	The value of the function that is currently selected by the cursor can be increased or decreased by pressing the Up or Down button.



The functions of the eight Status LEDs:

Status LED	**Function**
LOCK (blue)	If this is constantly lit, the Digital Clock outputs are in sync.
HOLD (yellow)	If this is constantly lit, Time Base holds the last received synchronous Clock.
TC (green)	This is constantly lit when Time Base reads Time Code. The LED blinks if the Time Code has the wrong frame rate.
VARI (red)	This LED blinks when Varispeed is set to ON and not to zero.
MC (green)	This LED lights up when the connected machine responds to 9-pin Machine Control commands. In Virtual 9-pin Machine mode, the LED indicates that commands are received.
VSTSL (yellow)	This LED is constantly lit when VST System Link is active.
LINK (green)	This LED is constantly lit when the Time Base parameter USBPORT is set to “ON” and it goes out when data is transferred. On the other hand, if USBPORT is set to “OFF”, the LED will light up when data is transferred.
DATA (yellow)	This lights up when Time Base receives data via its MIDI or USB port.

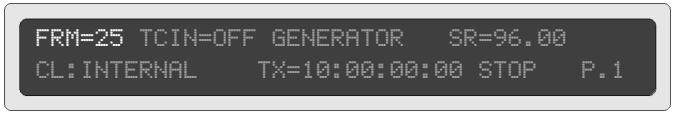
Selecting Pages in the Display



Parameter	Explanation
P.1:	Page 1. The menu structure of Time Base is organized in pages. This cursor position lets you “turn” the individual pages (Page 1 to Page 5 - P.A/P.V).

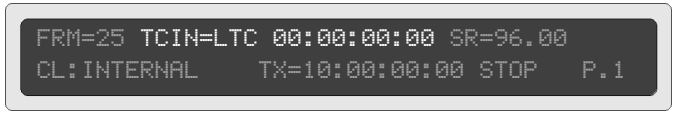
The operational state of Time Base is unaffected by whichever page is currently selected, all selected functions are always active and carried out, regardless which page is currently displayed.

The Main Page – Display page P.1



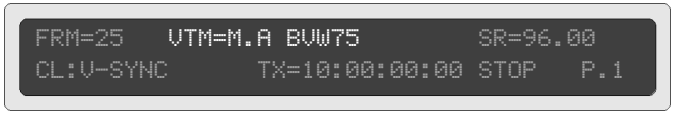
Parameter	Time Code Frame rate	Description
FRM=24	24 frames per second	Cinematic film frame rate
FRM=25	25 frames per second	PAL video frame rate, European standard
FRM=29	29,97 frames per second	
FRM=29D	29,97D frames per second drop frame Time Code	Drop frame Time Code, NTSC video, US and Japanese standard
FRM=30	30 frames per second	Sony 1610/1630 CD Mastering system
FRM=30D	30D frames per second drop frame Time Code	Drop frame Time Code

- **The frame rate can only be switched if Time Base is in Generator Mode! When synchronized to an external Video Signal, Time Base is always set to the frame rate of the video signal.**



Parameter	Explanation
TCIN=	Time Code Input This is where you select a Time Code mode.
TCIN=OFF	All TC inputs are switched OFF. The Time Code Generator is available. The TC display shows: GENERATOR.
TCIN=LTC	Time Base uses the Time Code coming into the LTC input.
TCIN=MTC	Time Base uses the Time Code coming into the MIDI input.
TCIN=USB	Enables MIDI Time Code synchronization via the USB port.
TCIN=VITC	Time Base uses the Time Code coming into the Video input.
TCIN=M.A	Time Base uses the Time Code coming in from a 9-pin machine A (RS422/P2), e.g. Betacam, DOREMI or 3348. Reading 9-pin-Time Code is only possible in connection with video sync.

- **If Time Code is received, it will be shown in the display.**
  If the speed of the incoming Time Code falls within the "Playspeed" range, the incoming Time Code will be regenerated and sent out and the green TC-LED will be lit.
  If no valid Time Code signal is being received, the display shows: NO CODE.
  Whenever the incoming Time Code has a frame rate different from the one set on Time Base, the TC LED will blink quickly, the received frame rate will be shown and all outputs will be cut off!
  If LTC or MTC are selected as Clock Source, TCIN cannot be changed. In this case you must first select a different Clock Source. 9-pin Time Code is only possible in conjunction with video synchronization, i.e. the Word Clock is set to video sync: CL:V-SYNC.

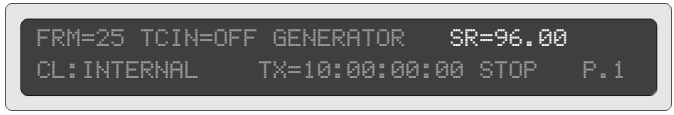


Parameter	Explanation
VTM=_____	Time Base has been switched to Virtual Time Machine Mode - The parameter TCIN= changes to VTM=.
VTM=M.V MIDI	Virtual MIDI Machine. Time Base behaves like a tape machine, that is controlled by MMC commands. The LTC, MTC, VITC and VST System Link Generator is active, and can e.g. be used for synchronization of VST System Link host applications like Nuendo, LTC and VITC slaves. Virtual MIDI Machine: If you set CL: to V-SYNC, all Time Code outputs are in sync to video!
M.A BVW75	Time Base emulates a BVW75 on the 9-pin-interface A.
M.A DVW-A500	Time Base emulates a DVW-A500 on the 9-pin-interface A.
M.A PCM-3348	Time Base emulates a 3348 on the 9-pin-interface A.
M.A: -VTM9-	Time Base emulates a 64 track audio machine on the 9-pin-interface A.

- **The virtual 9-pin Machine can also be controlled by MMC commands.**

❒ **MMC control corresponds to direct operation (9-pin LOCAL + REMOTE are active). This means, that all connected systems can simultaneously be controlled from any of them, as long as the connected systems allow for this. The difference between the various 9-pin emulations lies mainly in different methods used for track selection and machine recognition. Operation with most 9-pin Controllers (editing systems) is therefore possible.**

- **The 9-pin emulation only works with Video-Sync.**



The SR parameter is used to select the desired sample rate. The options:

Parameter	Sample rate	Application
SR=16.00	16 kHz	Multimedia
SR=22.05	22.05 kHz	Multimedia
SR=24.00	24 kHz	Multimedia
SR=32.00	32 kHz	Originally provided for Digital Radio
SR=44.10	44.1 kHz	CD
SR=48.00	48 kHz	Film and TV
SR=64.00	64 kHz	Multimedia
SR=88.20	88.2 kHz	Double CD sample rate
SR=96.00	96 kHz	DVD-Audio
SR=176.4	176.4 kHz	Four times CD sample rate
SR=192.0	192 kHz	DVD-Audio

For each frequency there are the additional positions:

SR=48.00U U (Up) = increase by ~0,1%

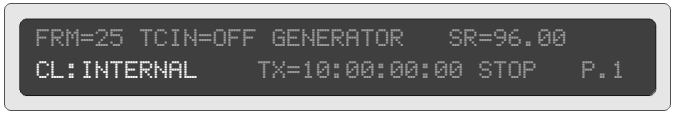
SR=48.00D D (Down) = decrease by ~0,1%

This generates the difference needed to precisely offset 29.97 (NTSC) frames to 30 frames.

If Varispeed is switched on, a v appears after the sample rate in the display:

SR= 48.00 v

- **The sample rates of Time Base and the synchronized devices must be set to the same value!**

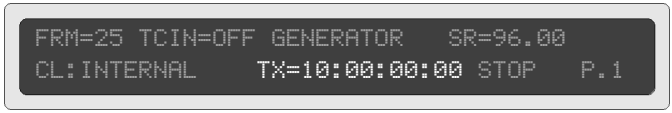


Parameter	Explanation
CL:	Clock – This is where you select the signal source which serves as the basis for generating the sampling frequency.
INTERNAL	The internal quartz (oscillator) is the Clock Master.
V_SYNC	The House Clock (Blackburst) connected to the Video Sync In is the Clock Master.
AES/EBU	An externally connected AES/EBU signal is the Clock Master. A sync conversion from 44.1 to 48 kHz is thereby possible. The frequency of the external Word Clock or AES/EBU signal will be automatically recognized to within ± 3% of the nearest standard sample rate and converted to the selected sample rate. Can be used to create sample rate converted dubbing copies. Not used during normal operation.

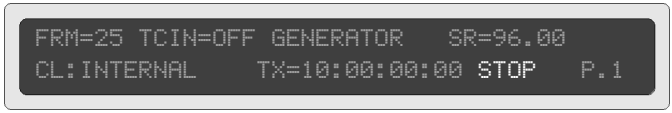
- **The following Clock Sources can only be selected, whenever the corresponding Time Code is selected in the TCIN field:**

Parameter	Explanation
LTC–HOLD	LTC is the Clock Master, whenever there is no LTC at the input, the Word Clock that was generated from the most recent valid Time Code is held.
LTC–NORM	LTC is the Clock Master, whenever there is no LTC at the input, the normal preselected sample rate is used. This functions can only be selected if TCIN is set to LTC.
MTC–HOLD	MTC is the Clock Master, whenever there is no MTC at the input, the most recent Word Clock will be held. This function can only be selected when TCIN is set to MTC.

- **Please note that these three signals are not constantly available. If one of these signals are interrupted, Time Base switches into Word Clock Hold mode and indicates this with its yellow HOLD-LED. When one of these clock modes is selected, Time Base first analyses the characteristics of the incoming Time Code. The blue LED blinks during analysis (ca. 20 seconds). When Time Code starts a second time, the blue LED will be lit constantly after the lock phase.**
- **MIDI Time Code should only be used as a Word Clock Source in special cases (to save a production).**
- **Whenever Time Base is synchronized to one of the signals described above, this status is verified by the blue LOCK-LED.**



Parameter	Explanation
TX=	Transmit – The transmitted Playspeed Time Code value is shown.
TXo+=	The transmitted Playspeed Time Code value as modified by the Offset is shown. This function is not available during Generator operation.

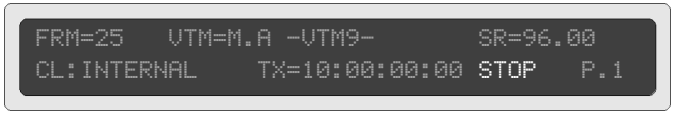


This shows and lets you select a Time Code Generator status.

Parameter	Explanation
WAIT:	Waiting for Time Code Input. During JAM-SYNC this is where the Generator is started from.
RUN:	Incoming Time Code will be regenerated.

The following functions are only available in Generator Mode:

STOP:	Generator is stopped.
START:	Generator is running.
RESET:	By pressing the Left or Right button on the Time Base, the Generator is reset to zero.
EDIT:	This function makes it possible to set any Start position by changing the numbers in the TX field.
PRESET:	By changing the numbers in the TX field a Start position (Preset) can be set, which is retained when you leave the PRESET field. Very often tapes are “striped” with a Time Code Start of 09:58:00:00 (with a picture start of 10:00:00:00). The Generator Start position thus only needs to be input once.
STARTP:	Start Preset. Pressing the Left or Right button causes the Generator to start from the Preset position.



If Time Base is used as a Virtual Machine (VTM), this field serves as a status display and to set the start position (begin of tape).

Parameter	Explanation
Stop	Status display of the (virtual) “transport“.
Still	Status Still (pause, “still frame”).
Play	Status Play.
Rec	Status Record.
FstFw	Status Fast Forward.
Rwnd	Status Rewind.
ShtFw	Status Shuttle Forward.
ShtRv	Status Shuttle Reverse.
JogFw	Status Jog Forward – variable, frame by frame Forward.
JogRv	Status Jog Reverse – variable, frame by frame Rewind.
VarFw	Status Variable Play Forward.
VarRv	Status Variable Play Reverse.
LOCAL	When the cursor is placed in this field, the VTM is in LOCAL Mode.

❒ **In Local Mode, the VTM can not be controlled remotely!**

The virtual “begin of tape” of the VTM can only be set in LOCAL mode:

Parameter	Explanation
RESET	Pressing the Left or Right button resets the Start point to zero.
EDIT	This lets you set any desired Start position by changing the numbers in the TX field.
PRESET	By changing the numbers in the TX field, a Start position (Preset) can be set, which is retained when you leave the PRESET field. The Start position thus only needs to be input once.
SETPRE	Set Preset. Pressing the Left or Right button sets the VTM to the Preset position.

- **Whenever the Start point is being set, the cursor must be moved away from this field, otherwise the VTM remains in LOCAL mode, and remote control is not possible.**

VITC and Time Code Inserter – Display page P.2

Parameter	Explanation
VIDEO:	This is where the input and output for the VITC Reader/Generator and the Time Code Inserter are selected.
BNC:	The BNC input/output is active (Composite Video).
SVHS:	The S-VHS input/output is active (Y/C or Component Video).

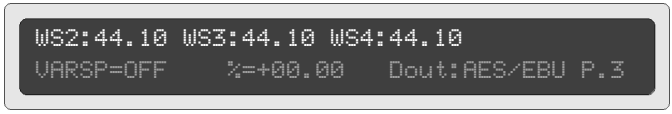
Parameter	Explanation
VITC	Vertical Interval Time Code. The Time Code is in the Video picture in 2 Lines above the visible picture (blanking interval).
RL=	Readlines (Lines, that contain VITC).
AUTO	Time Base automatically finds both VITC lines.
xx xx	In special cases, both readlines can be manually set in the range from 10 to 40 (NTSC) or 6 to 36 (PAL).

Parameter	Explanation
WL=	“Write Lines” for VITC.
OFF	The VITC Generator is switched off.
ON	The VITC Generator is active in the “Playspeed” range.
STAN	The VITC-Generator is always active, even during Stop or FF/Rew, and is always producing code even when stationary or winding. A few non-linear video systems need this type of synchronization.
xx xx	The two lines, in which the VITC is written.

Parameter	Explanation
INS:	Time Code Inserter – This inserts a visible Time Code read-out in the video picture. The entire lower line of this Page is used to control the Inserter.
INS: OFF	Inserter off.
INS: ON	Inserter active – In the “Playspeed” range the displays. shows the Time Code, during Stop or FF/Rew the last valid Time Code value is shown.
INS: +IN	The Inserter shows the input Time Code, as soon as this is readable.
INS: +TC9	If no LTC/VITC is read, the Inserter display is generated from 9-pin Time Code. On suitable (9-pin) Video machines this works in all machine states even during rewind.
POS V	Vertical Position.
POS H	Horizontal Position. Using V and H you can freely move the inserted Time Code within the picture.
VIEW=	Time Code Display type.
VIEW= WH/BL	White character/black background.
VIEW=BL/WH	Black character/white background.
VIEW=WH/BG	White character/no background.
VIEW=BL/BG	Black character/no background.
VIEW=xx/xx/SM	Small burn-in window.
VIEW=xx/xx/LG	Large burn-in window.

❒ **The Time Code Inserter can also be activated and set up in the Device Setup dialog of Nuendo.**

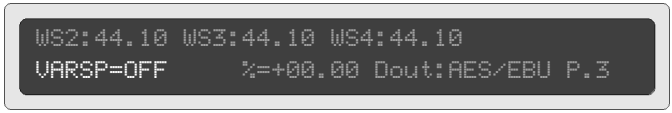
Varispeed, Word Clock 2, 3, 4 and AES/EBU Output – Display page P.3



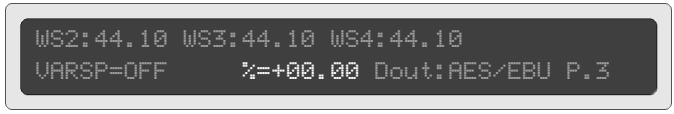
Setting the Word Clock2 Output:

Parameter	Explanation
WS2: 44.10 (48.00)	44,10 kHz (48 kHz) – Corresponds to the basic Clock set on the Time Base Display page P.1.
88.20 (96.00)	88,20 kHz (96 kHz) – Doubled basic Clock.
176.4 (192.0)	176,0 kHz (192 kHz) – Four times the basic Clock.
WS3:	Same as for WS2.
WS4:	Same as for WS2.

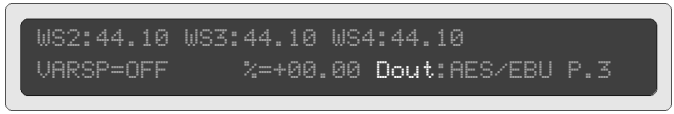
- **The outputs WS2, 3, 4 always follow the basic Clock set on the Time Base Display page P.1. That means, if SR is set to 44.10 (or 22.05, 88.20, 176.4) on P.1, the outputs WS2, WS3 and WS4 will output 44.1, 88.1 or 176.4 kHz. If you have set SR to 48.00 on P.1 (or to 16.00, 24.00, 32.00,64.00, 96.00, 128.0, 192.0), WS2, WS3 and WS4 will deliver 48.00 kHz and the respective multiples.**



Parameter	Explanation
VARSP=OFF	Varispeed is switched off.
VARSP=CLK	Varispeed is switched on.



Parameter	Explanation
% = +xx.yy	The Varispeed value is set in percent.
HTONE=+xx.xx	The Varispeed value is set in semitone steps and cents.



Parameter	Explanation
Dout:	Digital Out – Used to set the data format for the VST System Link (AES/EBU) output.
Dout: AES/EBU	Professional format, digital zero – see below.
Dout: S/P-DIF	Consumer format, Format, digital zero – see below. The Audio content of the data stream is digital zero (silence).
Dout: AES-VST	The output sends additional VST System Link data.
Dout: S/P-VST	The output sends additional VST System Link data.

Time Code Test and Offset – Display page P.4

Parameter	Explanation
TC OUT	Output of regenerated Time Code…
TC OUT=Direct	…as soon as its validity has been established (TCVAL).
TC OUT=OnLock	…after validity check and successful system lock. This ensures, that a sequencer/HD Recorder is only started if the Word Clock is in phase.
TC OUT=JamStart	…after validity check the internal Time Code Generator can be started in sync with incoming Time Code (when the cursor is under WAIT and switched to RUN/ P:1) and runs until set back to WAIT.

Parameter	Explanation
OFFSET=xx:xx:xx	The time value entered here is added to the incoming value during the Time Code Regeneration. In Time Code Generator Mode the Offset is ignored.

Parameter	Explanation
MTC STD	Sets which MIDI Time Code data will be sent.
MTC STD=Standard	Only MTC Running Data (Quarter Frame Messages) are sent.
MTC STD=FF Loc	Full Frame Message, for example VITC Slow Motion or TC9 are additionally sent. The transport position is always precisely displayed even during SloMo and FF/Rew in Nuendo, or a HD Recorder and/or Digital mixer.

- **Tape machines, mixers and HD Recorders must support this function!**

Parameter	Explanation
TCVAL=xxF	Time Code Validity – The time for which a valid, continuous Time Code must be connected to the input, before this will be validated by Time Base (e.g. to allow analog tape machines to get up to their proper speed before there is any attempt to sync to them). The time is set in Frames.

Parameter	Explanation
DROP=xxF	Dropout compensation – The regenerated Time Code continues for the time set in Frames, so that short Time Code dropouts can be bridged over. This time should be set as short as possible, so that Time Code errors on tapes can be recognized early in the project.

❒ **As dropout compensation has now been taken over by Time Base, Nuendo should also be set to a short dropout compensation time.**

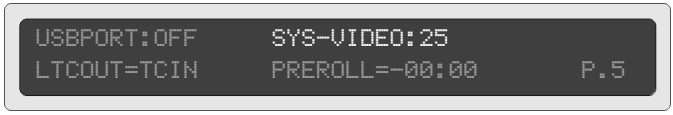
LTC output, Preroll, USB port and System Video settings – Display page P.5

Parameter	Explanation
USBPORT: OFF	The USB port is switched off.
USBPORT: ON	The USB port is switched on.

Parameter	Explanation
LTCOUT=TCIN	The LTC output sends the Time Code selected in P.1 under TC IN (+ Offset).
LTCOUT=Standing	The LTC Generator is always active, even during Stop or FF/Rew, when it generates standing or winding code.
LTCOUT=LocBurst	In addition to normal Time Code, on receipt of a Locate command, a short burst of Time Code with a Locate address minus Preroll will be sent. This allows you to use a LTC-Slave Machine (e.g. DA88) together with a 9-pin Video Machine.

❒ **The described LTC Slave mode is of limited use, as no return messages can be interpreted from the LTC Slave.**

Parameter	Explanation
PRE-=±xx:xx	PREROLL (Seconds: Frames). The Preroll time is deducted from the Locate position; therefore a Video Machine will locate to a position before the Locate position. The run-up time of the machine until play speed is reached thus lies before the actual starting point.
PRE-EDT=±xx:xx	Preroll is only used in EDIT or ADR mode. In normal operation, Preroll is inactive. EDIT and ADR mode are activated in Nuendo.
PRE-ON=±xx:xx	On receipt of a Locate command, the Preroll amount set here will be used, so that the video/tape machine starts for example 6 seconds before the actual Locate Point. This allows you to set the Locate Points for a Cycle in Nuendo according to musical criteria, and the machine will start playback at the right time before the Cycle. The Sequencer will lock securely. The Preroll is input as a negative value.
PRE-LOC=±xx:xx	The Preroll will only be used in conjunction with a Locate Play Command (Cycle). With a normal Locate no Preroll will happen and a frame-accurate positioning will be possible with a Sequencer/HD Recorder.
PRE-PLY=±xx:xx	On receipt of a Play command, first a Preroll will be set, then the Machine goes into Play. With a normal Locate, there will be no Preroll.



Here you can set the video standard that Time Base should use.

Parameter	Frames per Second	Application
SYS-VIDEO=25	25	PAL Video frame rate, European standard.
SYS-VIDEO=29.97	29,97	Drop Frame Time Code (frame rate NTSC Video, standard in the USA, Japan etc.).

❒ **This is the most important basic Time Base setting. It should be the first setting you make. Generally, you will use the video standard of the country you are in.**
This parameter is protected, i.e. you must hold the Up or Down button for at least one second before the parameter value can be changed.

Selecting tracks and switching Track Selection pages – 9-Pin-Machine A – Display page P.A

If you use Nuendo version 2.1 or higher the tracks of the 9-pin Machine A can be armed from within the software. In such an environment these Display pages will therefore mainly be used for system setup and test.

Analog Tracks

Display and selection of the 9-pin Machine A tracks that are activated for recording. Time Base automatically detects a connected 9-pin Machine (Autosetup) and displays it correspondingly on the Display page P.A. The Display page P.A in the illustration above shows the Track remote of a BVW-40 (-75).

❒ **To be able to switch tracks directly on or via Time Base, you must activate the REC function (see page 71).**

Parameter	Explanation
INS	Insert – The Machine is in Insert Mode (tally).
ASM	Assemble – Machine is in Assemble Mode (tally).
V	Video track – If activated, an additional r > rV appears.
TC	Time Code track: – If activated, an additional r > rTC appears.
AUX1 (2)	Aux tracks (analog audio) – If activated, an additional r > rAUX1 appears.

Digital Tracks

Display example with a connected Tascam DA88.

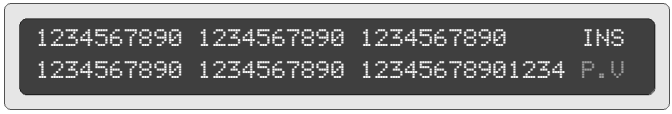
Parameter	Explanation
123r5678	Digital Audio tracks 1-8 – If a track is armed, its number is replaced by a small r (in this case Track 4).
TC	Time Code track – if activated, an additional r, thus rTC, will appear.

❒ **What's shown on the Display page P.A depends on the connected machine that is detected by Time Base's Autodetect function.**

Track Selection Virtual Machine – Display page P.V

You can switch the display to show the record tracks of individual Machines. To do this, position the cursor below the Machine letter and press the Up or Down button.

P.A = Machine A, P.V = Virtual Machine (Workstation control).
The Display page P.A (V) is thus a page with submenus.



Display and selection of the Virtual Machine tracks that can be armed for recording is done on the Display page P.V. This page show the Track-Ready controls of the first 64 tracks in Nuendo. If the host application is set up correctly, bidirectional track selection and confirmation (Remote Track Ready) are possible.

When the Virtual 9-pin Machine is used, the 9-Pin Machine tracks are connected through to the host application (M.V.).

❒ **If you use the virtual BVW-75, AUX1 controls Track 1 and AUX2 controls Track 2.**

Parameter	Explanation
INS	Insert – Machine is constantly in Insert mode.
12345...	Digital audio tracks – Upper row: Tracks 1-30, lower row: Tracks 31-64. If a track is armed, its number will be replaced by a small r.

6

Service and Machine Pages

Calling up the Service and Machine Pages

As an aid to installation, to set up special parameters and to check communication with all connected devices, there are additional Service and Machine Pages: “SPx” and “M.x”

To bring up the Service Pages position the cursor under the Page name in the display (P.x), then simultaneously press the Left and Right buttons.

The Page display changes from P.x to M.A. To get to Service page 1 (SP1), press the Down button. By pressing the Down button again you can get to Service page 2 (SP2).

Scrolling any further up or down takes you back to the main pages.

Virtual Machine and MMC settings – Display page SP1

Parameter	Explanation
VTM:	Virtual Time Base mode – Selection of the virtual machine types.
WS:	Wind Speed – Maximum wind speed of the VTM.
x8	(x2, x4) two, four or eight times playback speed.
SF	Second in a Frame – 25 (30) playback speed.
---/+IL	+Instant Locate – Locates are carried out as direct jump to position, “Tapeless Mode”.

Parameter	Explanation
MMCRx:xxx	MIDI Machine Control Receive ID – The Time Base Receive ID (Rx) can be set to a value between 000 and 127. The MMC ID of the controlling devices must be set to the MMCRx ID of the Time Base. Time Base has standard MMCRx-ID setting 002, just like Nuendo.

- **Nuendo must be set to the same MMC-ID as Time Base.**
- **When connecting Mixing consoles with MIDI Remote, please note that some manufacturers use an ID range between 001 and 128. In this case, add 1 when setting the Mixer's MMC-ID in Time Base!**

Parameter	Explanation
Tx=Rx	Tx (Transmit ID) – The MMC-ID Time Base uses when sending. When you use Nuendo, this is usually the same ID as the Rx ID (Receive ID). In Nuendo this is the default setting. If MIDI feedback (MIDI data overflow) occurs when you use other applications with active track remote, this can often be solved by separating the Rx and Tx IDs.
Tx=+1	The MMCTx ID is equal to the Rx ID +1.

Parameter	Explanation
Rexit	Record Exit – Here you can define the Record exit command.
Rexit=RE	Time Base sends “MMC Record Exit” as its Record exit command. In Nuendo, this is the default command to stop recording.
Rexit=RS	For use with the applications of other manufacturers, Time Base sends a “MMC Record Strobe” command to stop recording.

- **MMC Record Strobe is usually used as record start command. Using it to stop recording is permitted by the MMC-Standard, but can lead to errors in more complex setups. MMC Record Exit should be used as default.**

Parameter	Explanation
REM=	Remote – The input at which MMC commands are accepted.
REM=MIDI	MMC commands only via MIDI In.
REM=USB	MMC commands only via USB port In.
REM=PAR	MMC commands are accepted simultaneously at both inputs.

Presets, Time Code level, Red light and SYSEX handling, Initialization after a Software Update – Display page SP2

To ensure the simplest possible studio installation, Time Base provides non-editable default presets. Additionally four preset slots (load and save) are available for user presets.

Parameter	Explanation
PRE:	Preset – The Presets are combinations of the following three items in the display (see the Preset tables on page 72). You can also save and load a user preset.
25f	25 frame video and 25 frame Time Code (Standard in Europe).
29f	29.97 frame video and 29.97 frame TC (music standard in Japan and USA).
29d	29.97 frame video and 29.97 drop-frame TC (standard in Japan and USA).
INT	Clock source: internal.
VID	Clock source: external video sync.
LTC	Clock source: external LTC.
VTM	Virtual 9-pin Machine. -VTM9-
Nuendo	Functions preset for Steinberg Nuendo
USER1–4	User-presets – Memory slots for self-defined settings.
LOAD	First select the desired preset combination or a USER preset, then position the cursor below LOAD. To actually load the preset, you must press the UP button for approx. 1 second. LOAD will then be replaced by DONE.
SAVE	Saving is only possible in the user slots 1-4. To activate SAVE you must also press the UP button for approx. 1 second. DONE confirms the process.

- **During a software update, Time Base must be initialized by selecting and loading a Preset, otherwise you can not leave the SP2 page.**

The parameter values of the standard presets are listed in a table at the end of this chapter (see page 72).

Parameter	Explanation
TCLEV:	Time Code Output Level: -10dB, -7dB, -4dB, -1dB, +2dB, +5dB, +8dB

Parameter	Explanation
SYSEX=OFF	All SYSEX data, that can alter Time Base parameters, is ignored.

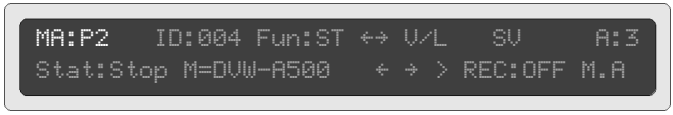
Parameter	Explanation
AR=OFF	Auto Response OFF.
AR=ON	Auto Response ON – Enables precise status reports to the connected Nuendo system, e.g. the track arm status of the connected 9-pin Machine. When you use Nuendo version 2.1 or higher, the default setting for this parameter is ON.

- **Auto Response ON may only be used with specially adapted Sequencers/ HD Recorders.**

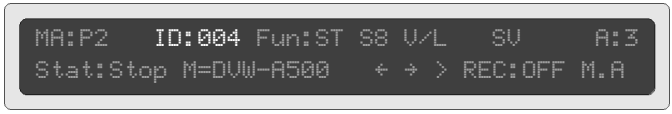
These parameters control the red light output (which may e.g. be used to drive “on air” indicator). The red light output is part of the GPI/O | MIDI port. Red light control is available from three different sources.

Parameter	Explanation
RED:C-OFF	Red light remote control is off.
RED:C102	Red light remote control via Controller 102 (103 -119 also possible) In Nuendo (starting with version 2.1) C102 has been defined as default Controller for this purpose.
9-PIN	Red light remote control via connected 9-pin machines. With 9-pin machines red light only occurs, when the Machine really is in Record or Edit mode. Nuendo-Standard.
VTM	Red light remote control by Virtual Machine.
9P+VTM	9-Pin- and/or MMC commands activate red light.

Test and Setup Machine A



Parameter	Explanation
MA:	Swaps the Send and Receive connections of 9-pin Machine A.
MA:P2	9-pin Master: Time Base is the controlling device.
MA:P2x	9-pin-Slave – Time Base is the controlled device (virtual 9-pin Machine).

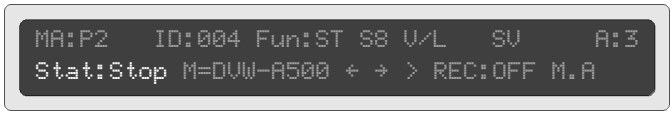


Parameter	Explanation
ID:004	MMC-ID of the 9-pin Machine. An individual ID is necessary for each machine to enable track arming both from Nuendo and 9-pin machines. In Nuendo and in Time Base the standard ID for Machine A is 004.

Parameter	Explanation
Fun:	Function – A few user-definable Machine parameter commands.
ST	Stop command is sent as such to the 9-pin Machine.
SL	Stop command is sent as Still command (Pause) to the 9-pin Machine.
S1	Same as “SL” above. In addition, a Still command is sent after each Locate command. This is for older machines that do not show an image after a Locate.

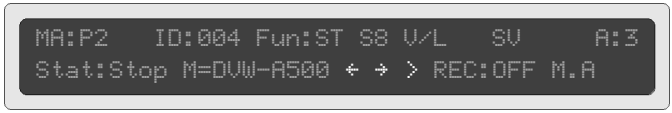
- **Some Video machines do not show an image in Stop mode. This problem can be solved by sending a Still command.**

Parameter	Explanation
↔	FF/REW commands are sent as FF/REW 9-pin commands.
S4	FF/REW commands are sent as Shuttle 4-fold 9-pin commands.
S8	FF/REW commands are sent as Shuttle 8-fold 9-pin commands.
V/L	Automatically read Time Code from 9-pin.
LTC	Read LTC from 9-pin.
VITC	Read VITC from 9-pin.
SV	Servo detection active (standard setting).
S0	Servo detection Off – (use only if the machine makes it necessary!).
A:3	Edit Advance parameter.



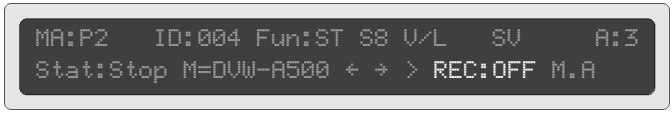
Parameter	Explanation
Stat:	Status – Transport status of the Machine (Stop, Play, Rew…).
Local	The Machine is not set to react to remote control.
NoTap	No Tape.

Parameter	Explanation
M=	Type of connected 9-pin Machine. Hex code is displayed for machines that are not implemented.
V=	Virtual 9-pin Machine is active (VTM9 function).
VTM9	Virtual Time Base – Virtual 9-pin Machine with 64 track control.
BVW-75	Virtual BVW-75 (2 audio tracks).
DVWA500	Virtual DVW-A500 (4 audio tracks).
PCM-3348	Virtual PCM-3348 (48 audio tracks).



9-pin Machine function test: Select the parameter with the cursor. Pressing the UP button starts the function, pressing the DOWN button results in a Stop (Still) command.

Parameter	Explanation
←	REW (Shuttle Reverse if selected in FUN)
→	FF (Shuttle Forward if selected in FUN)
>	Play



Parameter	Explanation
REC:	Barring or releasing the Record functions.
REC:OFF	9-pin record control via Time Base is barred.
REC:AUD	Insert: Only audio tracks can be activated.
REC:+TC	Insert: Audio tracks as well as Time Code track can be activated.
REC:+V	Insert: Audio tracks as well as video track can be activated.
REC:+VT	Insert: Audio tracks, Time Code track and video track can be activated.
REC:ASM	Machine is in Assemble mode. All tracks are active.

❒ **When the Machine was activated as a virtual 9-pin, only Insert mode will be available.**

Preset Tables

Time Code and Video Standard Presets

Page	Parameter	25f	29f	29d
P.1	FRM=	25	29	29D
P.2	VIDEO:	BNC	BNC	BNC
	VITC RL=	AUTO	AUTO	AUTO
	WL=	OFF 19 21	OFF 19 21	OFF 19 21
	INS:	+IN	+IN	+IN
	POS V	119	119	119
	H	014	014	014
	VIEW CO.	WH/BL	WH/BL	WH/BL
	VIEW sz.	SM	SM	SM
P.5	SYS-VIDEO:	25	29.97	29.97

Basic Time Base functions

Page	Parameter	INT	VID	LTC	VTM (VTM 9 function)
P.1	TCIN=(VTM=)	LTC	M.A	LTC	M.A VTM9
	SR=	44.1	48	44.1	48
	CL:	INTERNAL	V-SYNC	LTC-HOLD	V-SYNC
	TX PRESET	00:00:00:00	09:58:00:00	00:00:00:00	00:00:00:00
P.3	WS2:	44.1	48	44.1	48
	WS3:	44.1	48	44.1	48
	WS4:	44.1	48	44.	48
	VARSP=	Off%+00.00	Off%+00.00	Off%+00.00	Off%+00.00
P.4	TC OUT=	OnLock	OnLock	OnLock	OnLock
	OFFSET=	00:00:00:00	00:00:00:00	00:00:00:00	00:00:00:00
	TCVAL=	08F	08F	08F	08F
	DROP=	06F	06F	06F	06F
P.5	LTCOUT=	TCIN	TCIN	TCIN	TCIN
	PREROLL=	+00:00	+00:00	+00:00	+00:00
SP2	TCLVL:	+2dB	+2dB	+2dB	+2dB
M.A	MA:	P2	P2	P2	P2x
	ID:	004	004	004	004
	FUN:	SL S8 V/L SV	SL S8 V/L SV	SL S8 V/L SV	SL ←→ V/L SV
	M(V):	M=	M=	M=	V= VTM9
	REC:	OFF	OFF	OFF	AUD

Nuendo Presets

Page	Parameter	Nuendo
P.3	Dout	AES-VST
P.4	MTC STD=	FF Loc
P.5	USBPORT:	ON
SP.1	VTM: WS:	x8+IL
	MMCRx	002
	Tx=	Rx
	Rexit	RE
	REM	PAR
SP.2	SYSEX=	OFF
	AR=	ON
	RED:	C-102 9-PIN

User Presets

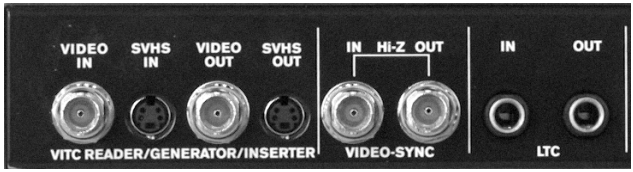
Page	Parameter	User 1	User 2	User 3	User 4
P.1	FRM=				
	TCIN=				
	SR=				
	CL:				
	TX PRESET:				
P.2	VIDEO:				
	VITC RL=				
	WL=				
	INS:				
	POS V				
	H				
	VIEW co.				
	VIEW sz.				
	WS2				
	WS3				
	WS4				
	VARSP=				
	Dout				
P.4	TC OUT=				
	OFFSET=				
	MTC STD=				
	TCVAL=				
	DROP=				
P.5	USBPORT:				
	SYS-VIDEO:				
	LTCOUT=				
	PREROL=				

Page	Parameter	User 1	User 2	User 3	User 4
SP1	VTM WS:				
	MMCRx:				
	Tx=				
	Rexit=				
	REM=				
SP2	TCLEV:				
	SYSEX=				
	AR=				
	RED:				
M.A	MA:				
	ID:				
	FUN:				
	V(M):				
	REC:				

7

Connections

Connections on the rear panel



Rear panel connectors (detail)

VITC-Reader/Generator/Inserter

Video in / out (BNC) or S-VHS in / out

Only the BNC or S-VHS connections can be active at any point. Switching between them is done on Display page 2 (see page 48).

These connections are used to read VITC, burn the visible Time Code into the picture and to insert VITC into the video signal (which lets you create VITC encoded video copies).

Video Sync In/Out

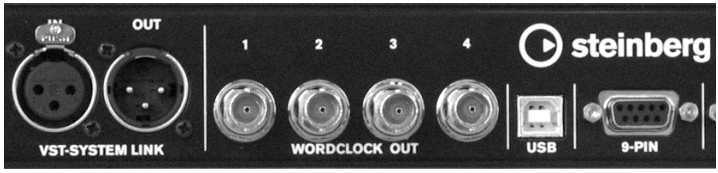
These high-impedance thru-put sockets (BNC) are provided for the Video Sync signal (House Sync, Blackburst).

❒ **Warning: The sync chain must be 75Ω terminated at the end of the cable), if Time Base is the only or last sync device in the chain. Use a 75Ω terminator!**

LTC – Longitudinal Time Code

In – 1/4" TRS Jack/6.3mm stereo socket, balanced input.

Out – 1/4" TRS Jack/6.3mm stereo socket, balanced input.



Rear panel connectors (detail)

VST System Link

In: (XLR female) – AES-EBU Synchronization input, balanced, transformer-coupled.

Out: (XLR male) – AES-EBU output, balanced, transformer-coupled.

The AES/EBU input contains the VST System Link data.

Word Clock OUT 1-4

BNC Word Clock Output – 75Ω

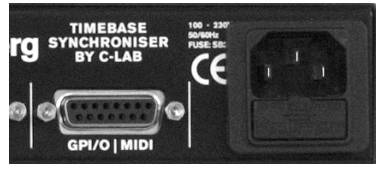
USB

This is a USB version 1.1 port. You can find the necessary drivers on the Driver CD that came with Time Base.

You can find the necessary driver updates on the Steinberg web site (www.steinberg.net).

9-Pin

SubD 9-pin female: Connector for 9-pin remote controllable machines e.g. Sony Betacam etc. RS422 Format (not ADAT!). The 9-pin connector can automatically cross the send and receive lines, therefore using "crossed" cables is unnecessary. This is important when Time Base is used as virtual 9-pin Machine.



Rear panel connectors (detail)

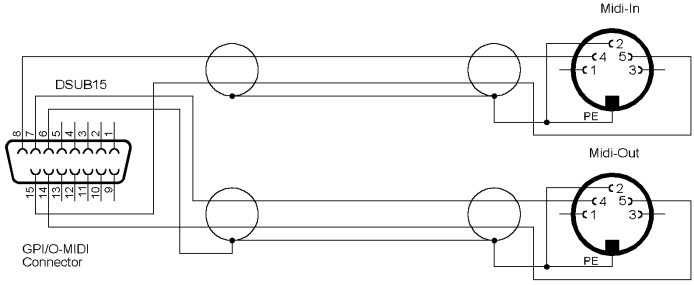
GPI/O | MIDI

15-pin D-SUB socket:

PIN	Signal
1	Gnd (0V) GPI/O Gnd
2	GPI/O 7
3	GPI/O 5 GPO: Red light
4	GPI/O 3
5	GPI/O 1
6	Gnd, screen
	MIDI out screen (DIN-out pin 2 and case)
7	MIDI OUT+ MIDI out (DIN-out pin 4)
8	MIDI IN+ MIDI in (DIN-in pin 4)
9	GPI/O 8
10	GPI/O 6
11	GPI/O 4
12	GPI/O 2
13	Supply I/O as output: ~4.4V max. 100mA
14	MIDI OUT– MIDI out (DIN-out pin 5)
15	MIDI IN– MIDI in (DIN-in pin 5)
Housing	Ground

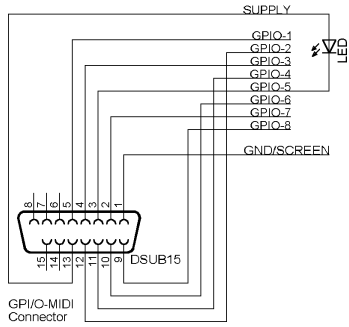
Wiring Examples – GPI/O

MIDI input and output

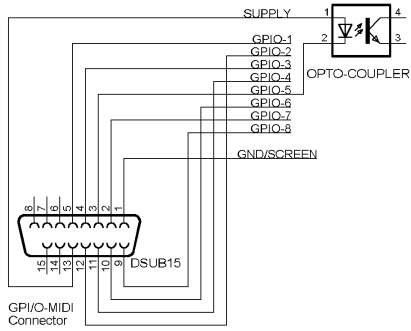


The screen of the MIDI input is isolated within the Sub-D connector case.

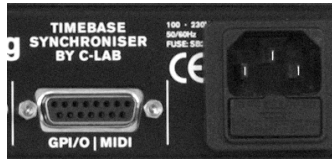
Red light – Only use screened cables for wiring



Example for a simple setup with only one LED



An opto-coupler is used as galvanic separator: e.g opto-coupler input in the studio red light control.



Rear panel connectors (detail)

Power and Protection Circuit

IEC Power Connector 100 - 240V (automatic switching). The fuse is located directly under the IEC power connector.

Type: 5 x 20 mm 2AT 250 V.

For continuous protection use only the specified type.

Technical Data

LTC input	Balanced stereo jack (TRS) -10 to +16 dBu
LTC output	Balanced stereo jack (TRS) -10 to + 8 dBu
VITC Read	2 Lines, Line 10-40 (6-36) or AUTO
VITC Write	2 Lines, Line 10-40 (6-36) or OFF
TC Video Inserter	Can be freely positioned, 2 sizes, 4 display styles
MTC Read/Write	MIDI standard, Full Frame switchable
Time Code Standard	24, 25, 29,97 drop/non-drop, 30 drop/non-drop Fps
VST System Link – AES/EBU input for external AES/EBU synchronization	Auto Detect 32 to 96kHz
VST System Link – AES-EBU digital audio output	32 to 96kHz 4V p-p an 110 Ohm XLR balanced
Switchable output format	AES zero or S/P-DIF zero This signal contains VST System Link data
Video Sync Thru	BNC – High Impedance PAL/NTSC format – switchable
VITC Inserter In/Out	PAL/NTSC format, BNC/SVHS switchable, 75Ω
Word Clock Out 1	BNC, TTL level, 75Ω
Nominal Word Clock frequencies	16, 24, 32, 44,1, 48, 64, 88,2, 96, 128, 176,4, 192kHz
Word Clock Out 2-4	BNC, TTL level, 75Ω
Word Clock frequencies	Basic clock x1, x2, x4 + Pull-Up, Pull-Down (NTSC equivalent).
Varispeed	Digital Clock +/- 12,5%
USB	USB-B bus
9-pin In/Out (female)	RS 422-Machine control, 38,4kBit
Built-in power supply	100 to 240V, 50/60Hz, power consumption max. 40VA
Dimensions	19”, 1U (Width 483 mm x Height 45 mm x Depth 265mm)
Weight	3.0 kgs

8

VST System Link

What is VST System Link?

The company that brought you technological breakthroughs such as VST, LTB and ASIO, Steinberg, has developed another groundbreaking technology standard: VST System Link.

VST System Link is a system for networking computers using Steinberg Virtual Studio Technology (VST) software and Audio Stream Input Output (ASIO) hardware.

VST System Link enables the transfer of synchronization, transport, and audio data between two or more workstations equipped with compatible software and hardware over standard digital audio cabling systems such as ADAT, TDIF, AES/EBU, S/ PDIF etc. And because it uses the audio stream itself, synchronization is completely sample accurate, even across multiple workstation configurations!

VST System Link is featured in the current versions of Nuendo, Cubase SX/SL, V-STACK and Cubase VST 5.2 (Public Beta).

When you set up a VST System Link network, the OS question (Windows PC or Macintosh computer) doesn't play a dominant role anymore. The network is freely expandable. You can therefore also use your older computers in a VST System Link setup and build an extremely powerful system that greatly expands your possibilities.

VST System Link features:

- Sample accurate synchronization of VST System Link compatible software that runs on the connected computers. The system lock time is defined by the added latency times of the individual computers.
- MIDI data is also transferred between the connected computers with sample accuracy. You can manage the MIDI tracks of a Cubase or Nuendo project on one computer and run VST instruments and effects on other computers. The additional computers add up to the total power of your system and free the computer that runs your sequencer from some of its workload.
- You can load all Project and audio data from the computers on the network into one computer and either save it in one place or the respective computers.

How does VST System Link work?

If you use two computers, these are bidirectionally connected. Three or more computers are connected as a daisy-chain ring.

Time Base must be connected to the main work computer in this ring.

❒ **When you use Time Base in a VST System Link setup, it automatically becomes the Clock Master for the whole system.**

Data transfer is accomplished via standard digital cables. The “Patchbay” of the Master software that runs on the first computer takes care of data distribution. All VST System Link compatible applications work together seamlessly. It is for instance possible to use both Cubase and Nuendo together and in sync within the same system setup.

Each computer must be equipped with an ASIO-compatible sound card. This must at least have one digital audio socket – e.g. ADAT or S/P-DIF.

VST System Link uses a single bit on a single channel of the audio stream as a carrier for sample accurate synchronization of all computers, transport command and MIDI data transfer of up to 16 MIDI channels. For instance, if you use an ADAT bus for this, you can use seven of the eight audio channels for audio data transfer with full bandwidth. The eighth channel can of course also be used normally for audio data transfer. Its maximum available bandwidth of 24 bit has only been reduced to 23 bit, which in reality doesn’t cause audible problems.

If you wish to use more than 16 MIDI channels, you can optionally use other bits of the audio stream. But even then the loss is minimal. If you reserve just one more bit for MIDI transfer, you can use it to transfer approx. 140 additional MIDI channels. If you sacrifice one complete digital audio channel, this can be used to transfer all necessary VST System Link data, such as sync and transport data, *and* up to 1000 MIDI channels. This should be sufficient for even the most complex applications.

When transferring MIDI data via VST System Link no timing and bandwidth problems occur. MIDI timing is very stable.

VST System Link – Troubleshooting

- Always use the latest versions of Cubase SX/SL/VST5.2 or Nuendo!
- It is very important, that the Audio Clock of the different systems is synchronized. One computer (or better: the Time Base connected to it) is used as the Clock Master, all others must be set up correctly for Clock Slave operation.
- Within the system and the project, only one sample rate may be used!
- The first and most important step is to make sure, that all linked computers "see" each other on the network and that no errors like e.g. cryptic names occur. The key to error-free operation lies in correct synchronization of the Audio Clock signals, as described above.
- If you wish to use S/P-DIF, make sure that you use the proper S/P-DIF cables which are suitable for digital transfer. These cables have a nominal impedance of 75 Ω.
- Common analog audio cables (Cinch) will not work correctly.
- VST System Link can only function properly if 100% data integrity is given. No bit in the data stream may therefore be modified. Hardware or Driver software, that do this are not suitable in VST System Link setup. For instance, if ASIO Control panel functions such as volume control or stereo panning have a negative impact on data integrity, they must be set to neutral settings (e.g. in RME's HDSP TotalMixer).
- System Link requires 32-bit ASIO-Drivers! In this environment, 16-bit Drivers do not work properly. Depending on the buffer size, some ASIO Drivers utilize different bit rates. As an example, RME's Digi96/8PST should be used with an ASIO setting of 256Kb (6ms) or 1024Kb (23ms) in a VST System Link setup.
- Channels that carry VST System Link data must be suitable for bit-accurate data transfer, otherwise the data transfer quality will suffer. For example, if your sound card/software offers Dithering, this must be deactivated for the corresponding channel(s) to assure correct VST System Link data transfer. By the way, copy bits on VST System Link channels can cause similar trouble.

9

Glossary

This glossary contains explanations of the most significant terms used in this manual.

Address	SMPTE/EBU Time Code Address – also called Time Code value – is the precise address in the Time Code data stream.
AES-3	A method of synchronization using an AES standard.
AES/EBU	Professional standard for transmission of 2 channels of Digital Audio data as well as controller data, developed by the Audio Engineering Society (AES) and the European Broadcast Union (EBU).
Analog Audio	A way of recording and playing back audio by using electrical current changes to represent audio waveforms.
ATR	Audio Tape Recorder.
Bandwidth	The range of frequencies present in an signal.
Binary Numerical System	System, which only uses 0 and 1 to represent numerical values. The Binary system is used for Digital Audio, SMPTE, MIDI and computer-based data formats.
Biphase Encoding (Biphase-Mark)	Encoding of LTC-SMPTE/EBU Time Code. The binary numerical values 0 and 1 are provided with extra clock information and set in a frequency range which allows them to be recorded on analog audio tape.
BIT	Abbreviation for Binary Digit – set to a value of either 1 or 0.
BNC	Bayonet Nut Coupler – Standard connection for transferring video and high frequency clock signals.
Byte	A group of 8 Bits.
CL	Clock Reference or Clock Source or Reference Source describes the signal used to specify the reference rate at which Time Code and the Clock Generator operate. This can be seen as the system's time base. The Reference source can be an internal crystal, an external video clock, external Word Clock, an AES/EBU signal or the Time Code reader.
DAW	Digital Audio Workstation – Computer based hard disk recording and editing system
Decibel (dB)	Unit of measurement and display of amplitude – relative and logarithmic.
DF (D)	Abbreviation for Drop Frame.
Differential Output	Output amplifier designed to produce two totally identical, yet phase inverted signals – "electronically balanced".

Digital Audio	An analog audio signal, which has been converted in a binary data stream (via an A/D-Converter) for transfer and storage in a digital medium.
Drop Frame	DF is one of two SMPTE Time Code formats. It is used in connection with the NTSC color TV standard. To make the Time Code compatible to the video, 108 frames are dropped during each hour of playback.
Drop out	A gap or interruption in an audio signal, e.g. incoming Time Code usually caused by flaws in magnetic tape coating resulting in loss of magnetic particles from the tape or any other recording medium.
EBU	European Broadcast Union – EBU Time Code runs at 25 Frames per Second (25 fps).
EXT VID	External Video Sync signal (house sync) that Time Base can use as its Timing Reference. Can be found as Composite Sync, Blackburst or Composite Video.
Frame	Individual frame of Film, or full TV frame made up of two half frames, a complete Time Code word.
Frame rate	Number of (full-) frames, which pass in a second of audio, film or video (frames per second - fps). Film and various video systems have different Frame Rates, for example: 30 — 30 fps — US Monochrome TV NTSC — 29.97 fps — US Color Video, TV PAL — 25 fps — European TV, B/W and Color Film — 24 fps — Cinematic Film
Frequency	The number of wave cycles that occur in one second. The unit of measurement is Hertz (Hz).
Generate	Running the system Time Code Generator, so that Time Code is available at the LTC connector.
Generator	Time Code Generator. This generator receives its speed reference from an internal or external source.
HDR	Hard Disk Recorder – Computer based recording system.
HH:MM:SS:FF	Hours:Minutes:Seconds:Frames. A Time Code address (value).
Hold	The ability of Time Base to continue generating Word Clock at the same frequency as the incoming Word Clock if this is interrupted.
House sync	Central Clock for all devices within a studio compound (House Sync).
Initialize	Clears the Time Base RAM completely. Occurs only as a result of a technical fault (i.e. battery empty).

INT	Internal speed reference produces by the internal crystal oscillator in Time Base. This is selected, if no external reference (video or Word Clock) is needed.
Jam Sync	A technique that is used to start the Time Code Generator from (externally) running Time Code. Can be used to ”extend“ existing Time Code on a partly striped tape.
Jitter	Unwanted (and often unnoticed) variation in the frequency of an output Word Clock, usually caused by poor design or inferior components, which in turn causes a deterioration in the quality of any digital audio signals that are synchronized to it. The deterioration increases with the amount of variation.
LCD	Abbreviation for Liquid Crystal Display – Time Base uses this type.
LED	Abbreviation for Light Emitting Diode.
Lock	Time Base is locked to the selected system reference (CL:).
LTC	Longitudinal Time Code – Time Code information, biphase encoded, so that it can be recorded on an audio track of a VTR or ATR.
Machine Control	This term stands for a complex range of transport control commands. from basic motion commands, synchronization to more complex editing functions like electronic video editing.
Machine	Machine refers to an audio or video tape record/playback system.
MIDI	Musical Instrument Digital Interface – A serial data protocol used by electronic instruments, signal processors and sequencers. It is used to transfer information like e.g. pitch, rhythm, and other data. Special data sets are reserved for MIDI TIME CODE and machine control. The MIDI transmission speed is 31,25 kbits per second.
MIDI Time Code	MTC – MIDI TIME CODE – A MIDI message used to define a fixed address for an exact point in time. “Running” MTC needs eight quarter-frames or two frames to send a complete address. Furthermore special formats for MTC transfer have been developed.
MMC	Abbreviation for “MIDI Machine Control”.
Motion Controls	The basic set of machine control functions (Play, Stop, Record, Rewind and Fast Forward) see SP1, page 62.
MTC	See MIDI Time Code
Multitrack	Analog or digital tape machine, with more than two tracks.
Non Drop Frame	NDF or ND is one of two SMPTE Time Code standards and it was used in connection with the U.S. black & white television standard. NDF counts each frame in the time code in real time.

Non-contiguous	Not a continuous, predictable sequence, i.e. 1,2,3,4,6,8,9. The counting method DF-TC is such a sequence.
NTSC	A system of coding color information for television. Mainly used in the USA and Japan. Named after the National Television System Committee.
Offset	Offset is the difference between two Time Codes. Offsets are frame accurate and are displayed in HH:MM:SS:FF format. Time Base, set to offset, delivers the offset Time Code on all Time Code outputs.
PAL	Phase Alternate Line – A system of coding color information for television. Mainly used in Europe, many parts of Africa and Asia.
Post Production	Activities that take place after the raw footage has been shot for a motion picture or video program. Includes editing and audio processes like ADR, Foley and Mixing.
Pre-Roll	Is the amount of time which Time Base subtracts from a Locate Address, to start a connected device playing early so that when the actual Locate Point is reached, all devices are sure to be running in proper sync.
RAM	Random Access Memory – Here: The battery buffered storage of Time Base. Setups are recalled from here at power up.
S/P-DIF	Sony-Philips Digital Interface – The consumer standard similar to AES/EBU for digital audio data. Jointly developed by Sony and Philips.
Sample rate	Sample frequency, defined through the Word Clock.
Sequencer	A device or program that can record/playback performance data for electronic instruments. Mainly MIDI is used as communication protocol.
Setup	Definition of all Time Base parameters. Stored in various fixed presets and 4 user definable presets.
SMPTE	Society of Motion Picture and Television Engineers. An industry standards committee. Responsible for developing the SMPTE Time Code.
Sony 9-pin	A machine control bus, originally developed by Sony and included in Sony video devices. Currently part of many other professional devices.
Speed	Speed, Frame Rate and Rate are synonymous. Time Code speed is counted frames per second (fps)
SR	The abbreviation Time Base uses for Sample Rate.

Sync Word	A Sync Word is the 16-bit “Sync” data word at the end of each 80-bit LTC Time Code frame. It indicates speed, direction and frame end and indicates the end of each Time Code word.
Time Code format	Defines the type and frame rate used. Example: 30NDF is a Frame rate of 30fps and non drop frame.
Track Select **Track Arming**	Procedure to enable (arm) a specific track of a tape machine for recording.
TRS	Abbreviation for Tip-Ring-Sleeve. A 1/4” balanced wired jack. T= inphase, R= outphase, S= screen
USB	Abbreviation for Universal Serial Bus – Fast serial bus on computers.
Varispeed	Here: The playback speed of digital audio devices is sped up or slowed down by varying the frequency of the Word Clock.
Video Inserter	Allows visible Time Code to be inserted into the video picture.
Video Sync	A reference video signal, generated by an extremely stable source. (SPG – sync pulse generator/blackburst generator/house sync). Can be used to control the speed of video machines and Time Base.
VITC	Vertical Interval Time Code. An alternative to the LTC/SMPTE format. It is recorded above the visible picture onto two lines in the blanking (invisible) part of the video signal.
VST System Link	A method for sample-accurate synchronization and control of digital audio workstations, developed by Steinberg.
VTM	Virtual Time Base Machine – Emulation of a machine that can be controlled via MMC.
VTM-9	Virtual Time Base Machine 9-Pin – Emulation of a 9-pin Machine (Sony protocol).
VTR	Abbreviation for Video Tape Recorder.
Word Clock	An extremely stable sync signal source that is used to define the speed at which digital audio data is converted and transmitted.