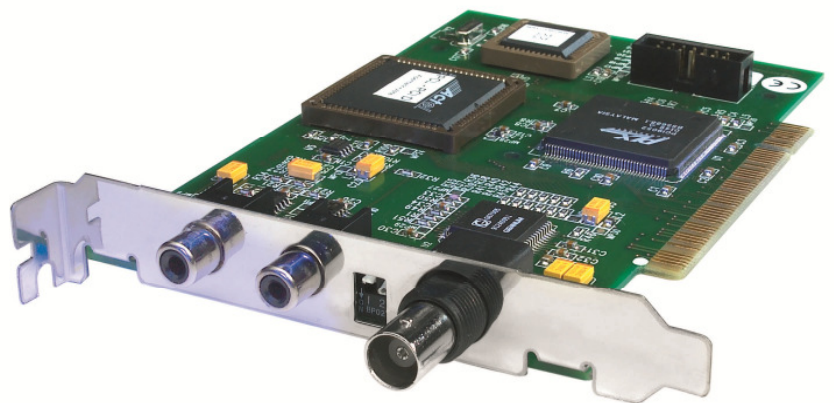
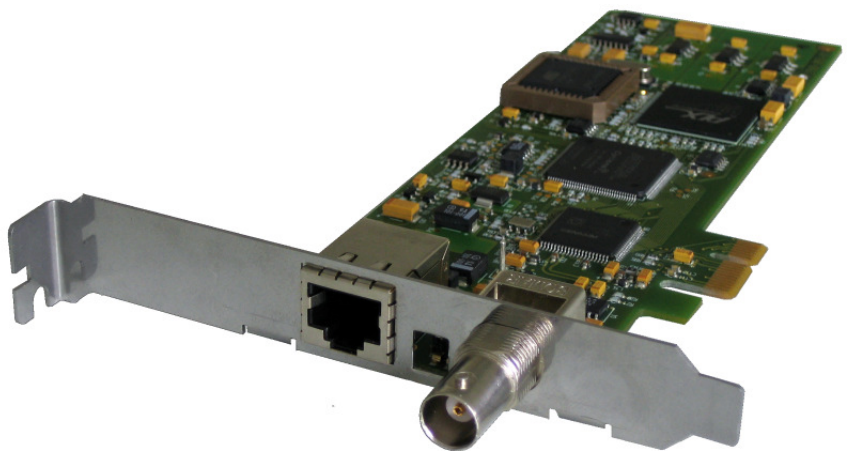


Real-Time Synchronization for Windows

# PCI TS / PCIe TS



PCI TS



PCIe TS  
(similar to original product)



## A1 Copyright

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The naming of other companies' products in this operating manual is for informational purposes only and no violation of trade mark law.

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## A2 CE - Declaration of Conformity

We,

### ***Alpermann+Velte***

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declare under our sole responsibility that the

### **PCI TS / PCIe TS**

to which this declaration relates are in conformity with the following standards:

1. EN 55022, Class B
2. IEC 801-2
3. IEC 801-3 / ENV 50140
4. EN 61000-4-4

## A3 General Hints for Safe Operation

- General hints:** Please only use the equipment in dry rooms and according to the corresponding instructions in the operation manual of our equipment.
- Transportation damages:** In case of obvious damage caused during transportation, please inform the responsible forwarding agency. Please also get directly in touch with your dealer.
- Repairs:** As electronic state-of-the-art components have been used, no maintenance is required. The board does not contain any parts which might be repaired by yourself. **For this reason, any intervention should only be performed by an authorised service partner.**
- EMC** The EMC regulations are observed only under the following condition: use high quality shielded cables at data inputs and outputs.
- Please note:** In these operating instructions, we tried to make use of the standard English terms used by Windows. The screenshots will provide an additional help for users in other countries.

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## B1 Introduction

PCI TS / PCIe TS are designed to synchronize the system clock of PCs running under Windows to a real-time coupled LTC signal. PCI TS / PCIe TS consist of the following two components:

- PCI TS / PCIe TS board with LTC reader
- “AV TimeSys“, a Windows program

The PCI TS / PCIe TS board reads the LTC and makes it available to the Windows program. The program consists of the following two components:

- The system service “AV TimeSys” which ensures adjustment even if the user is not logged on.
- A monitor program which monitors the functioning of the “AV TimeSys” service.

The real-time coupled LTC is generated e.g. by an Alpermann+Velte time code generator Rubidium GT. The generator receives the time information from a DCF or GPS receiver. The real time information is encoded in the LTC time; date, information about the local time zone (CET, CEST, UTC) as well as status information on the reception status and an impending switch-over for daylight saving time are optionally encoded in the LTC user bits.

An adjusting algorithm of “AV TimeSys” accelerates or moderates, respectively the system time to ensure maximum synchronization to the LTC real time reference. Seconds differences (caused e.g. by leap seconds, please see below) may be adjusted by a hard set of the system time, as required.

Moreover, it is possible to determine that larger differences - which will not occur during normal operation - for several minutes or even hours shall be ignored by the “AV TimeSys” service. This does not apply to the switch-over for daylight saving time. The “AV TimeSys” service operates with UTC (Universal Time Coordinated), as used inside Windows, and not with local time. UTC is a continuously counting time without time zones. Time jumps will only be produced in case of leap seconds, to adapt the time count to the earth rotation. For the daylight saving time change-over only the time zone, i.e. the difference between the internal UTC and the local time, needs to be adapted.

## B2 Installation

### System Requirements

- Windows from XP and Server 2003 respectively
- Pentium PC with one free PCI or PCIe x1 slot
- CD-ROM drive or internet access
- Real-time coupled LTC generator, e.g. Alpermann+Velte Rubidium GT

Additionally to the real-time coupled time of the LTC, it is possible to use the date and/or the receiving state of the real-time receiver.

### Mounting of PCI or PCIe Board

SW1 of the PCI TS / PCIe TS boards serves to determine whether the LTC will be connected balanced (off) or unbalanced (on). For details please refer to chapter "PCI TS / PCIe TS board".

Shut down Windows, switch off the PC and build in the PCI TS / PCIe TS board to a free PCI or PCIe slot. Connect the real-time coupled LTC, then switch on the PC again.

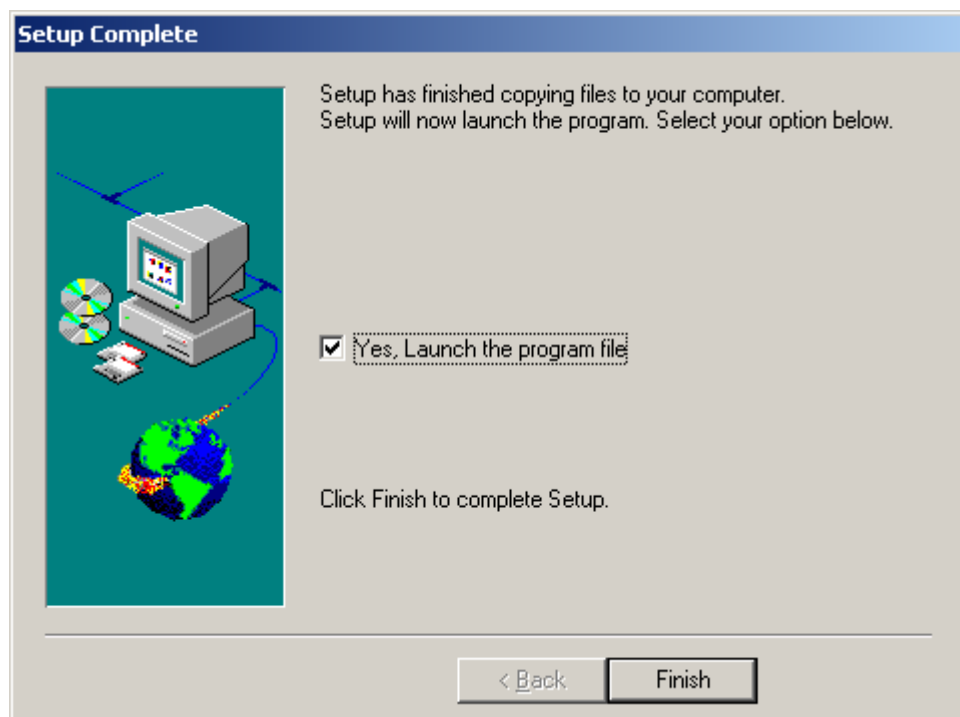
### Installing the Device Driver

The PCI TS / PCIe TS board will be detected by the operating system at startup. First log on as the administrator thereafter Windows will request a driver disk. Insert the supplied CD and specify it as the source for the device driver installation. Please install the "PCI TS" device driver. To finish driver installation please start with double click the file "Install Driver.bat" in the \Driver\PCI directory of the CD.

## Installing the Program

### Windows 32-Bit

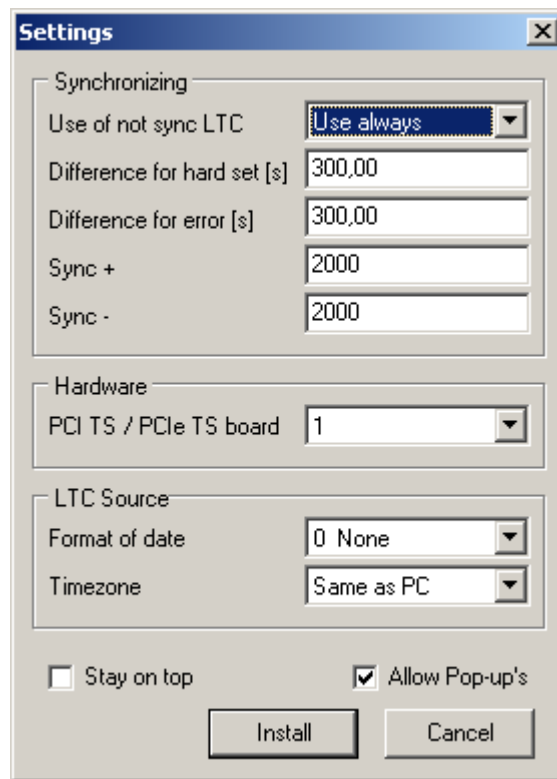
Log on as administrator, then insert CD shipped with the card and execute from the folder “\Software\PCI TS” the ”setup” program. The InstallShield assistant will be activated, which guides you through the installation. At the end of the installation, InstallShield will ask you to start the program (“Yes, Launch the program file”). Please confirm by clicking on this box , then click on ”Finish” to finish the installation:



Instead, "AV TimeSys Install" may be started with "Start / Programs / Alpermann+Velte PCI TS" at a later time.

# Operating Instructions PCI TS / PCIe TS

Then the following dialogue will be displayed:



The PCI TS / PCIe TS board has been detected and configured automatically. If more than one PCL card is installed, the PCI TS / PCIe TS can be selected with “Hardware / LTC board base address”. If the PCI TS / PCIe TS is the only PCL card installed, this parameter is always 1. The other parameters may be set at a later time, for details please refer to the next chapter.

Click on “Install”, and the “AV TimeSys” service will be installed. The service is running immediately, without rebooting Windows.

## Windows 64-Bit

Log on as administrator, then insert CD shipped with the card and open with double click the file “PCI TS.msi” from the folder “\Software\PCI TS”. This starts the installation that runs without user interaction (beside a windows security dialog).

Open the “computer management console” from “control panel / management” and go to the devices section. Start the service “AV TimeSys Service”.

Open “AV TimeSys Monitor” from “Start / Programs / Alpermann+Velte PCI TS” and check the settings. Details can be found in chapter B3.

## Time Zone and Daylight Saving Time Changes

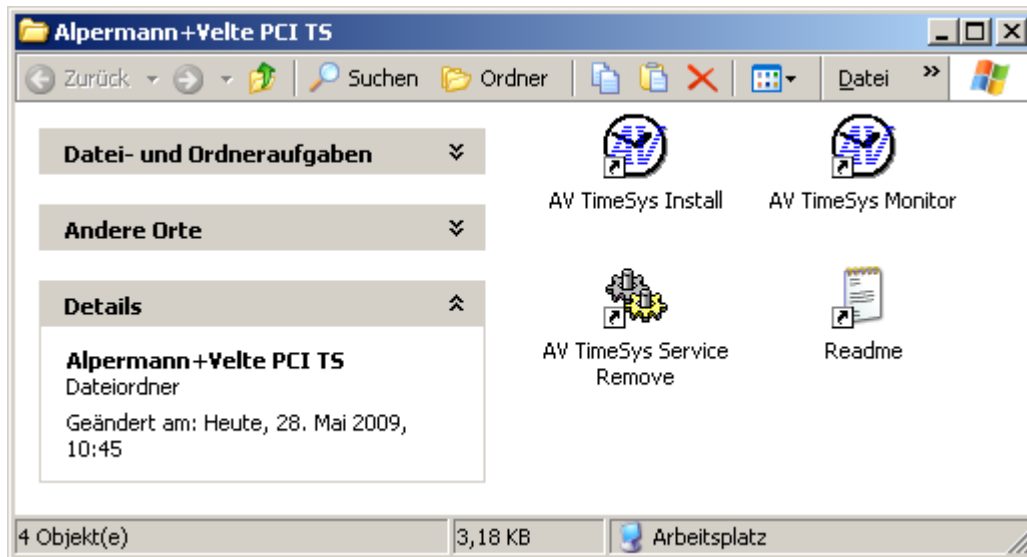
The internal time of Windows runs in UTC. To have the local time displayed, ensure that the time zone is set correctly and that the change-over of daylight saving time is working. "AV TimeSys" modifies neither the time zone nor the information for daylight saving time, since this is managed by Windows itself. To ensure that these functions are working with regard to the location of the PC, open "Properties of date/time" by double-clicking on the clock at the task bar. Then click on "Time zone":



Adjust the correct time zone, then tick box to select automatically change-over of daylight saving time.

## Starting the Program

The “AV TimeSys” service is now integrated in Windows. It will be started automatically every time Windows starts, irrelevant whether you are logged on or not. Additionally, a program group “Start / Programs / Alpermann+Velte PCI TS ” is made available:



- “AV TimeSys Monitor” starts the monitor program which serves to monitor the “AV TimeSys” service. To run the service, it is not necessary to restart the program.
- “AV TimeSys Install” installs the “AV TimeSys” service. This is normally executed during the program installation with the option “Yes, Launch the program file”. Only in case this option has not been marked, this proceeding has to be made manually.
- “AV TimeSys Service Remove” will remove the “AV TimeSys” service. For details please refer to chapter “Uninstalling the program”.
- “Readme” shows additional information about “AV TimeSys” which are not yet included in this operating instruction.

## Update

If you get a new version of the program, you have to de-activate the “AV TimeSys” service before you install it. Start “AV TimeSys Service Remove” from “Start / Programs / Alpermann+Velte PCI TS”. Then the new program can be installed as described above.

## Uninstalling the Program

To uninstall the program, execute the following steps:

- Quit the “AV TimeSys” monitor program.
- Start “AV TimeSys Service Remove” from “Start / Programs / Alpermann+Velte PCI TS”. Now the “AV TimeSys” service will be disabled and removed.
- Start “Software” from “Start / Settings / Control Panel”, double-click on “AV TimeSys” and then click on “Add/Remove”. Respond to the inquiry whether you wish to remove this application by clicking on “Yes”. Now the monitor program and the program group will be removed. Then close the “Software” window.

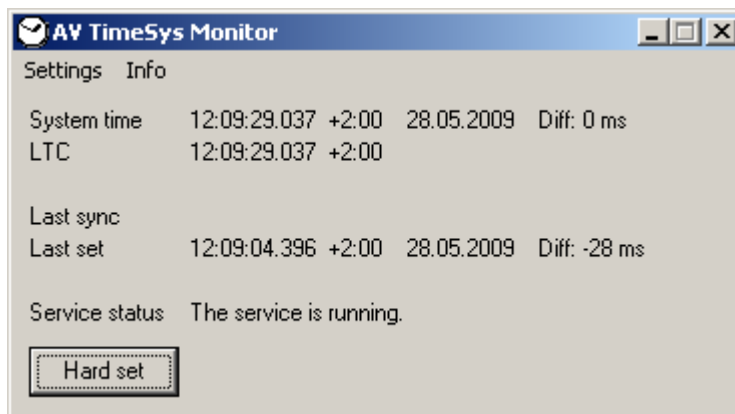
“AV TimeSys” is now no longer active under Windows.

## B3 Monitor Program

The monitor program serves to monitor the “AV TimeSys” service and to adapt this service to the individual requirements.

### Starting the Program

Start the monitor program with “Start / Programs / Alpermann+Velte PCI TS / AV TimeSys Monitor”. The monitor window opens:

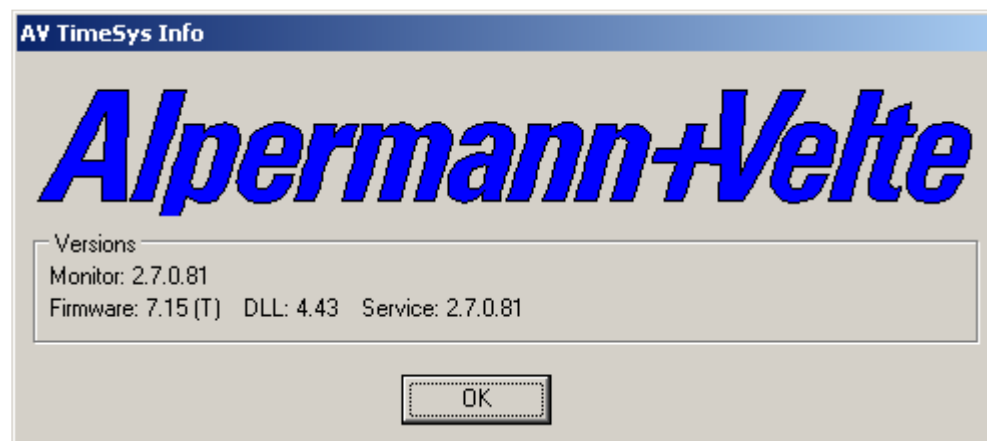


The following information will be displayed:

- “System time”: The current system time of Windows. Time, difference to UTC in hours, date and the difference to LTC in milliseconds are displayed. The display refreshes every second.
- “LTC”: Readout LTC. Time, the difference to UTC in hours, date and the sync status (“Sync” or “Not sync”). The display refreshes every second. Some information’s may be not displayed if they are not provided by the LTC source.
- “Last sync”: The point of time at which the LTC has last supplied the status “synchronous”. Time, difference to UTC in hours and date are displayed. Depending on the LTC source, it may e.g. be seen whether a connected DCF or GPS receiver receives a valid antenna signal. If this time stands still, the status “synchronous” has not been detected since the displayed time. This display refreshes about every 3 seconds.
- “Last set”: The last point of time at which the Windows system time was hard set . The following data are displayed: Time, difference to UTC in hours, date and the difference to LTC in milliseconds, which had been readjusted by this hard set.
- “Service status”: The status of the “AV TimeSys” service. “The service is running” indicates that the “AV TimeSys” service was started correctly and is now running in the background. Other messages will supply indications of possible errors in the communication between the monitor program and the “AV TimeSys” service.

## Operation

- “Hard set” sets the Windows system time hard on the LTC. This may be useful if LTC and system time differ quite considerably, so the system time needs to be synchronized once with the LTC. If the LTC source is providing date information, the system date will be set beside the time.  
The Windows system produces a difference of 70ms approx. between the system time and the LTC following a hard setting. This difference is then readjusted by the adjusting algorithm.  
The time between clicking on the button and the return from the “AV TimeSys” service may last up to 10 seconds.
- “Info” shows the revision of program and PCI TS / PCIe TS board:

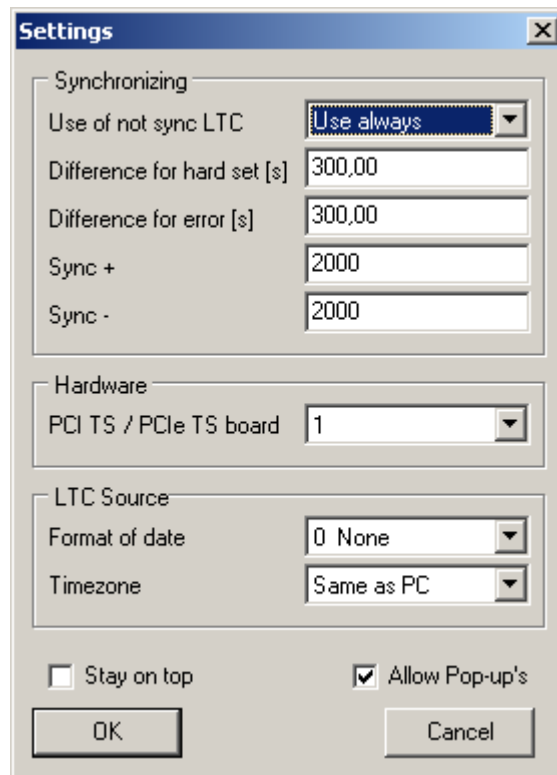


The following revision numbers will be displayed:

- “Monitor”: The revision of the monitor program.
- “Firmware”: The revision of the firmware ROM of the PCI TS / PCIe TS board.
- “DLL”: The revision of the kernel mode driver which carries out the communication with the PCI TS / PCIe TS board.
- “Service”: The revision of the “AV TimeSys” service.

## Settings

“Settings” provides a dialog box to configure the “AV TimeSys” service and the monitor program:



- “Use of not sync LTC”: How to use an LTC which has not been marked by the generator as being synchronous to the real time, or if there is no information about that available. There are three ways for the “AV TimeSys” service to react:
  - “Use always” accepts the LTC at all events, irrespective of having been marked as being synchronous or not.
  - “Use if once sync” waits from the start of the system until the LTC will be once marked as being synchronous. Then, the LTC will always be accepted, even if it was marked occasionally as being not synchronous, e.g. due to reception problems. Having selected this setting, the LTC generator is expected to be more stable than the system time even in the free run mode.
  - “Use never” accepts the LTC only if it was marked as being synchronous. If not, no readjustment will be made for a while.
- “Difference for hard set”: The difference between system time and LTC which will produce a hard set on the LTC. This value can be entered with an accuracy of 1/100 seconds. Any difference below this value will be readjusted by moderating or accelerating, respectively the system time. By setting this value 0,00 no hard set will be made, any differences will then be readjusted.

Such setting is of special importance in the event of leap seconds. If such differences shall be readjusted, the value has to be set 0,00 or to 1,20 minimum; shall they produce a hard set of the system time, select a value within 0,50 and 0,80.

Please note: Do not set values less than 0,5 seconds. If the system time is hard set, a difference of some ms occurs, which will then be readjusted. This difference is produced by the Windows system. If the selected value is too low, this difference might cause a hard set, which will cause another hard set, etc.

- “Difference for error”: The difference between the system time and the LTC in seconds, from which on the LTC will be rejected as not plausible. If system time and LTC have been synchronized once (e.g. with the “Hard set” button), no considerable differences between these two times will occur during continuous operation. If the PC is switched off, the system time will continue counting battery-powered with an accuracy of  $10^{-5}$  to  $10^{-4}$  approx. This way a difference will accumulate, up to a maximum of 9 seconds per day, depending on the circumstances. Please take this into consideration when setting the difference. Differences above this setting may hint at a faulty LTC. Hence, this setting serves to detect such faults. If every readout LTC shall be accepted, this error detection may be disabled by setting 0,00.
- “Sync +”, “Sync –”: The adjusting speed to accelerate (Sync +) or moderate (Sync -) the system clock. A setting of 2000 effects an adjustment of approximately 20ms per second. A difference of one second (1000ms) will be readjusted within  $1000\text{ms} / 20\text{ms} = 50$  seconds. The higher the values, the faster the system clock will catch up with the LTC.
- “LTC board base address”: If more than one PCL card is installed, the PCI TS / PCIe TS card can be selected here. If the PCI TS / PCIe TS is the only PCL card installed, this parameter is always 1.
- “Format of date”: Beside the time, date information from the LTC can be used. To do this, the format of the date has to be defined:

Format	User bits	Date	State	Time zone
0 None	Not used			
1 TTT	MTD	×	×	×
2 Date	User = XX DD MM YY	×		
3 Status	User = SS DD MM YY	×	×	×
4 EBU I29	User = EBU Tech. I29-1995 (BBC)	×		
5 Date-2	User = DD MM YYYY	×		
6 Date-3	User = YY MM DD XX	×		
7 Date-4	User = XX YY MM DD	×		
8 Date-5	User = X YY MM DD X	×		
9 Date-6	User = DD MM YY XX	×		

Meaning of the symbols: SS = state, DD = day, MM = month, YY two digit year, YYYY = four digit year, X = unused. The format number is the same as the user mode of the Alpermann+Velte LTC generator G30TM/GM-TTT/Rub GT.

- “Timezone”: The LTC source does not necessary has been generated in the same time zone the PC is running in. It is possible to have the PC running in Central Europe Time (CET, with daylight saving time switching), but the LTC running in UTC. The setting “Timezone” specifies how to handle time zones:
  - “From LTC Status”: The time zone information is read from the LTC. This is only possible in date formats 1 and 3.
  - “Same as PC”: The LTC is running in the same time zone as the PC. That means that the LTC does the same daylight switching as the PC.
  - “UTC”: The LTC is running in UTC.

After changing this setting, it is possible that for some seconds some error messages are generated by the “AV TimeSys” service.

- “Stay on top”: Selection whether the monitor program shall appear in front of the other windows or be covered by them.
- Allow Pop-up’s: As default, messages of the “AV TimeSys” service are displayed in Pop-up windows. If you disable this option, no more Pop-up’s are shown. In this case, messages are only written to the event log, see chapter “B5 Messages”.

“OK” will transfer the new settings to the “AV TimeSys” service. It may take up to 10 seconds time until a new setting becomes effective. “Cancel” will close the window without storing any changes.

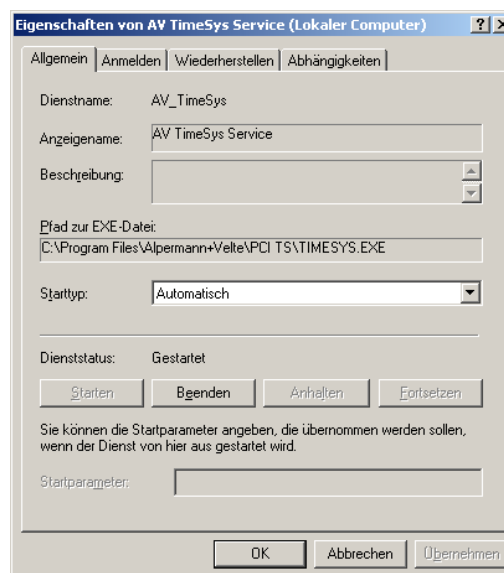
## B4 “AV TimeSys” Service

The “AV TimeSys” service is installed by the setup program, i.e. that the service will be started automatically with every system start. This setting may be changed with the Services Manager of Windows. You’ll find it under “Start / Settings / Control Panel / Management / Computer Management / Services and Applications / Services”:



Here, e.g. click on “Stop” to manually disable the “AV TimeSys” service “AV TimeSys Service”.

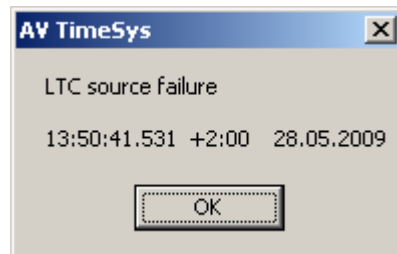
With double-click to the service name the properties can be opened where the “Startup Type” can be set to determine whether the “AV TimeSys” service shall be started with every system setup automatically:



The preset selection is “Automatic”. With selection “Manual”, the “AV TimeSys” service has to be started manually via the Services Manager after every system start. For detailed information on the service management please refer to your Windows documentation.

## B5 Messages

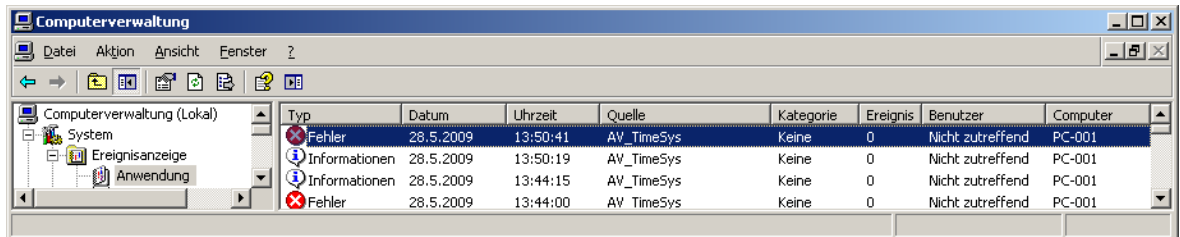
The messages of the “AV TimeSys” service are displayed as follows:



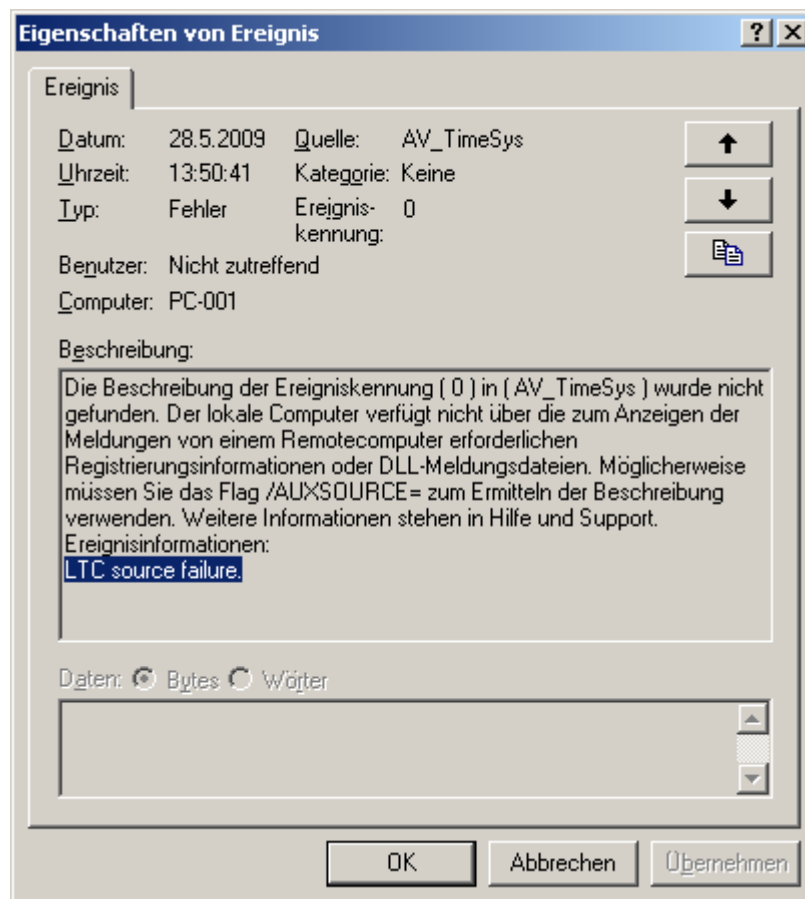
The following messages may occur:

- “System Time is hard set”: The system time was hard set, either by using the “Hard set” button in the monitor program, or because the difference between the system time and the LTC exceeded the value (in seconds) set in “Settings / Difference for hard set”. The displayed time (in milliseconds) was compensated.
- “LTC is out of limits”: The LTC was rejected as being invalid, because the difference between system time and the LTC exceeded the value (in seconds) set in “Settings / Difference for hard set” in seconds. As soon as this difference falls below the limit, the “AV TimeSys” service automatically starts the readjustment. The other possibility is to have the system time hard set by pressing the “Hard set” button.
- “LTC source failure”: The PCI TS / PCIe TS board fails to read a valid LTC. An LTC generated at normal play speed is required. Please check the connections and the position set at SW3.4, which serves to switch between balanced and unbalanced LTC.
- “LTC user data format error”: The user bits of the LTC fail to contain valid status information. To have the system time readjusted by the “AV TimeSys” service, the settings “Format of date” and “Timezone” have to accord with the format of the connected LTC source.
- “Can’t open AV TimeSys service”: The monitor program was started but failed to open the “AV TimeSys” service. To eliminate this fault, the service may be re-installed with “AV TimeSys Install” from “Start / Programs / Alpermann+Velte PCI TS”.
- “Hardware not found”: No PCI TS / PCIe TS board was found at the given base address. Possible reasons can be a wrong address or overlaps with other boards. Please check SW1 of the PCI TS / PCIe TS board and “Settings / LTC board base address” in the monitor program.

These messages will be recorded in the application protocol. They may be displayed with the “Event Log Settings”. You’ll find it under “Start / Settings / Control Panel / Management / Computer Management / Event Log / Application”:



The messages can be displayed by double-clicking on the event:



In the example given above the LTC source has failed (LTC source failure). For details on the event log settings please refer to the Windows documentation.

## B6 PCI TS / PCIe TS Boards

### PCI TS

PCI TS is a PCI board for the 32 bit/33 MHz (3,3V/5V) PCI bus.  
It is equipped with a LTC time code reader.

#### Inputs

Input	Connector	Signal Description
LTC-1 LTC-2	2 x RCA jack	LTC input, balanced or unbalanced 100 mV <sub>pp</sub> to 5 V <sub>pp</sub> , impedance 47 k Frame rates: 25/30/30Drop, auto-detect Frequency: nominal "play" speed ± 1% Direction, time addresses: "forward", time information has to be up-counting without discontinuities.

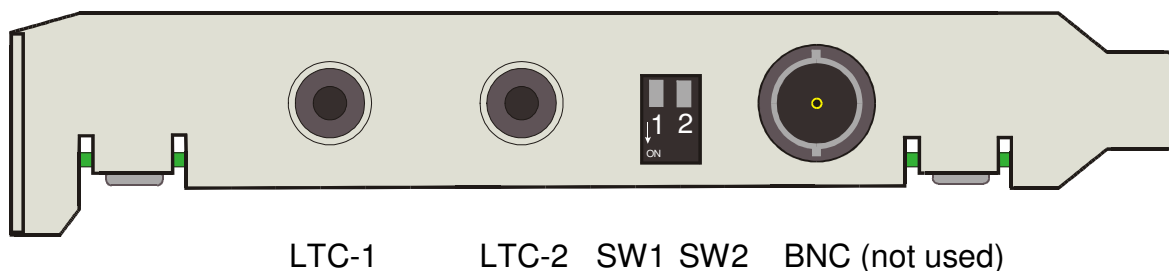
#### Switches

<b>SW1</b>	<b>LTC Input</b>
ON	Unbalanced LTC input at LTC-2
OFF	Balanced LTC input at LTC-1 and LTC-2
<b>SW2</b>	<b>Not used</b>

#### Others

Dimensions over all (Length x Height x Width)	141 x 120 x 22 mm
Weight	≈ 110 g
Operating voltage	3.3 VDC and 5 VDC
Power consumption	2 W
Ambient temperature	5 – 40 °C
Relative humidity	35 – 85 %

#### Connections



## PCIe TS

PCIe TS is a PCI Express board for PCIe x1 bus.  
It is equipped with a LTC time code reader.

### Inputs

Pin	Signal
3	LTC Input LTC-1
6	LTC Input LTC-2
4	LTC GND

Connector: RJ45

Signal Description
LTC input, balanced or unbalanced 100 mV <sub>pp</sub> to 5 V <sub>pp</sub> , impedance 47 k Frame rates: 25/30/30Drop, auto-detect Frequency: nominal "play" speed ± 1% Direction, time addresses: "forward", time information has to be up-counting without discontinuities.

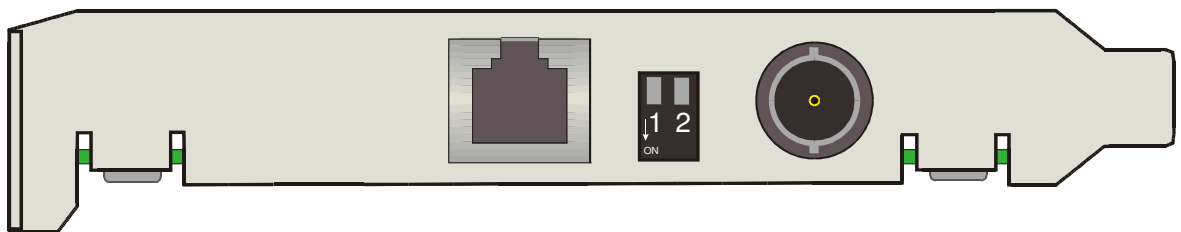
### Switches

<b>SW1</b>	<b>LTC Input</b>
ON	Unbalanced LTC input at LTC-2
OFF	Balanced LTC input at LTC-1 and LTC-2
<b>SW2</b>	<b>Not used</b>

### Others

Dimensions over all (Length x Height x Width)	191 x 120 x 22 mm (standard profile slot) 191 x 80 x 22 mm (low profile slot)
Weight	≈ 80 g
Operating voltage	3.3 VDC and 12 VDC
Power consumption	3 W
Ambient temperature	5 – 40 °C
Relative humidity	35 – 85 %

### Connections



LTC SW1 SW2 BNC (not used)