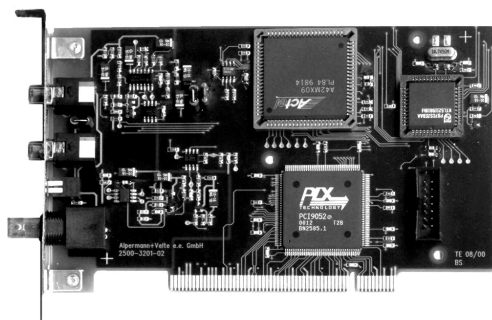


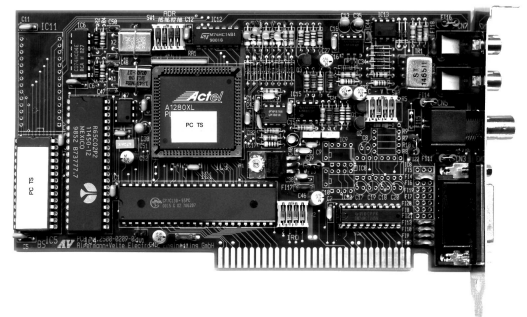
Real-time synchronization of Windows NT/2000 and XP

AV-PC TS

PCI



ISA



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,

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declare under our sole responsibility that the

AV-PC TS

to which this declaration relates is 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

The following conditions have to be fulfilled:

Only shielded cables have been connected.

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.**
- Please note:** In these operating instructions, we tried to make use of the standard English terms used by Windows NT. The screenshots will provide an additional help for users in other countries.

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B1 Introduction

AV-PC TS is designed to synchronize the system clock of PCs running under Windows NT and 2000/XP to a real-time coupled LTC signal. Two variants are available:

- “AV-PC TS (ISA)” designed for the ISA bus
- “AV-PC TS (PCI)” designed for the PCI bus

AV-PC TS consists of the following two components:

- A PC board with LTC reader (ISA: “PCL-5 TS“ or PCI: “PCL PCI TS”)
- “TimeSys“, a Windows NT program

The PC board, a special version of the “PCL-5” respectively “PCL PCI”, reads the LTC and makes it available to the Windows program. The program consists of the following two components:

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

The real-time coupled LTC is generated e.g. by an Alpermann+Velte time code generator G30TM. 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 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 TimeSys service. This does not apply to the switch-over for daylight saving time. The TimeSys service operates with UTC, similar to Windows NT and 2000/XP, and not with local time. UTC (Universal Time Coordinated) 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 NT 4.0 (i386, server or workstation) or Windows 2000/XP
- Pentium PC with one vacant ISA or PCI slot
- 3,5" disk drive
- Real-time coupled LTC generator, e.g. Alpermann+Velte G30TM

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 PC Board

ISA

PCL-5 TS requires a block of 32 I/O addresses, for which the base address is set with SW1. The preset 0x240 (SW1 = on - off - on - on) is normally not assigned and may therefore remain set. To find a free I/O address space, please refer to the program NT diagnosis, which can be found under "Start / Programs / Common Administration", that shows a list of the assigned I/O addresses under "Resources / I/O port".

The TimeSys service makes no use of interrupt's, i.e. the SW2 switches remain set off. SW3.4 (marked L) serves to determine whether the LTC will be connected balanced (off) or unbalanced (on). For details please refer to chapter "PCL-5 TS". Now shut down Windows, switch off the PC and build in the PCL-5 TS board in a vacant ISA slot. Connect the real-time coupled LTC, then switch on the PC again.

PCI

PCL PCI TS requires four automatically adjusted blocks in the address space of the PC.

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

Now shut down Windows, switch off the PC and build in the PCL PCI TS board in a vacant PCI slot. Connect the real-time coupled LTC, then switch on the PC again.

Installing the Device Driver

ISA

The device driver will be installed in conjunction with the program, as described in the next paragraph.

PCI

With Windows NT, the device driver will be installed in conjunction with the program, as described in the next paragraph.

With Windows 2000/XP, the PCL PCI TS board will be detected by the operating system at startup. First log in as the administrator thereafter Windows 2000/XP will request a driver disk. Insert the supplied disk and specify it as the source for the device driver installation. Please install the "PCL PCI" device driver.

Installing the Program

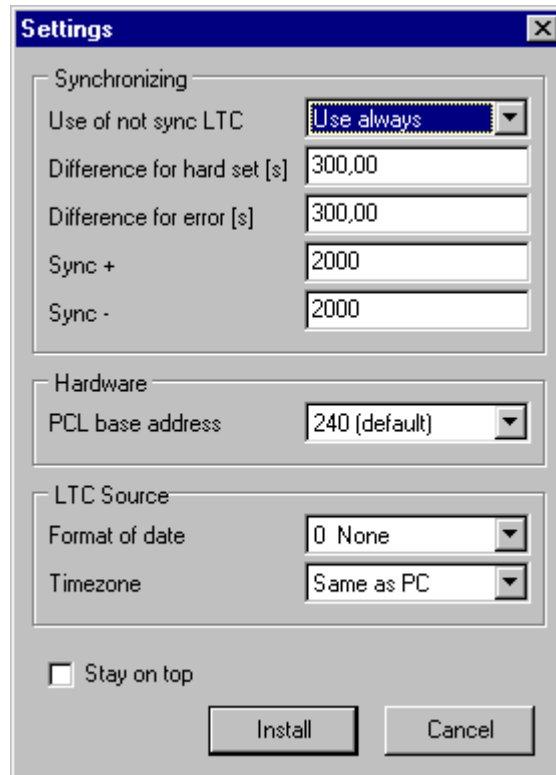
Log in as administrator, then insert the AV TimeSys disk and execute the "setup" program. The InstallShield assistant will be activated, which guides you through the installation. At the end of the installation, InstallShield will ask you to start the program. Please confirm by clicking on this box, then click on "Beenden" to finish the installation:



Instead, "AV TimeSys Install" may be started with "Start / Programs / AV TimeSys" at a later time.

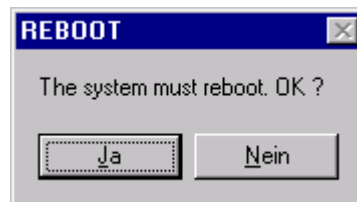
ISA

The PCL-5 TS device driver will be installed automatically. Then the following dialogue will be displayed:



Use “Hardware / PCL base address” to set the I/O address as already set at SW1 of PCL-5 TS. The other parameters may be set at a later time, for details please refer to the next chapter.

Click on “Install”, and the TimeSys service will be installed. To activate the device driver and the service, Windows has to be rebooted:



Confirm by clicking on “Yes” to reboot Windows with a delay of 15 seconds approx., or reboot Windows at a later time with “Start / Quit... / Reboot”.

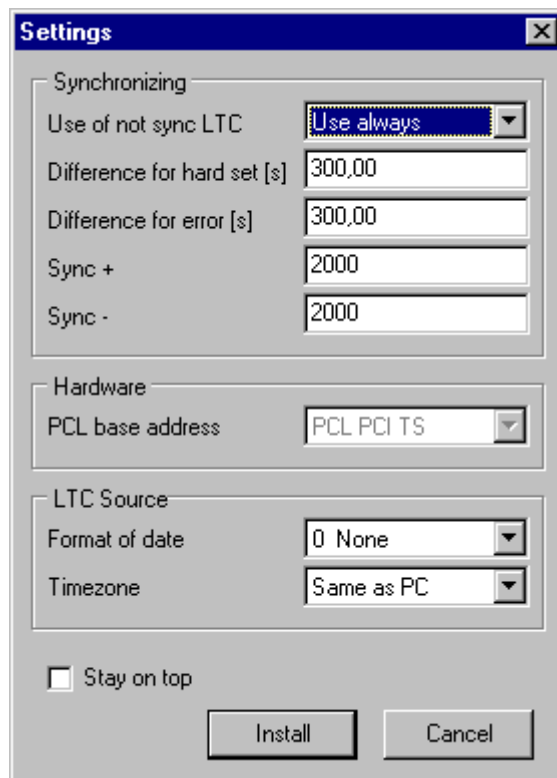
Operating Instructions AV-PC TS

PCI

With Windows NT, first the device driver for the PCL PCI TS will be installed. The following message box will appear:



This message confirms, that the device driver has been installed successfully. With Windows 2000/XP this step will be skipped, because the device driver has already been installed by Windows 2000/XP. Then the following dialogue will be displayed:



Nothing has to be entered in “Hardware / PCL base address” as shown above the PCL PCI TS board has been detected and configured automatically. The other parameters may be set at a later time, for details please refer to the next chapter. Click on “Install”, and the TimeSys service will be installed. The service is running immediately, without rebooting Windows.

Time zone and switch-over of daylight saving time

The internal time of Windows NT/2000 and XP runs in UTC. To have the local time displayed, ensure that the time zone is set correctly and that the switch-over of daylight saving time is working. 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 switch-over of daylight saving time.

Starting the program

The 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 / AV TimeSys” is made available:



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

Update

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

Uninstalling the program

To uninstall the program, execute the following steps:

- Quit the TimeSys monitor program if required.
- Start "AV TimeSys Service Remove" from "Start / Programs / AV TimeSys". Now the 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.

ISA

- Start "Devices" from "Start / Settings / Control Panel", click on "AvPcINT" and then on "Quit". Respond to the inquiry whether you wish to disable the device by clicking on "Yes". Click on "Startup Type", then on "Disabled" and confirm with "OK". The driver of the PCL-5 TS board has now been disabled. Now close the device manager.

TimeSys is now no longer active under Windows. The only hint left is an entry (without effect) in the device manager. If you know how to use the registration editor, you can remove the key "My computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\AvPcINT" from the registration data base and delete the files "\winnt\system32\avpcl32.dll" and "\winnt\system32\drivers\avpclnt.sys" on your hard disk.

PCI

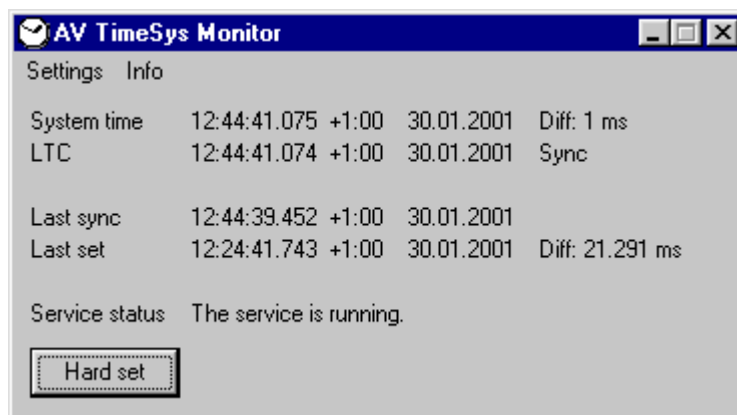
TimeSys is now no longer active under Windows. There are two files remaining in the Windows system directory. With the Windows Explorer you may delete the files "\winnt\system32\avpcl32.dll" and "\winnt\system32\drivers\avpclnt.sys".

B3 Monitor program

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

Starting the program

Start the monitor program with "Start / Programs / AV TimeSys / AV TimeSys Monitor". The monitor window opens:



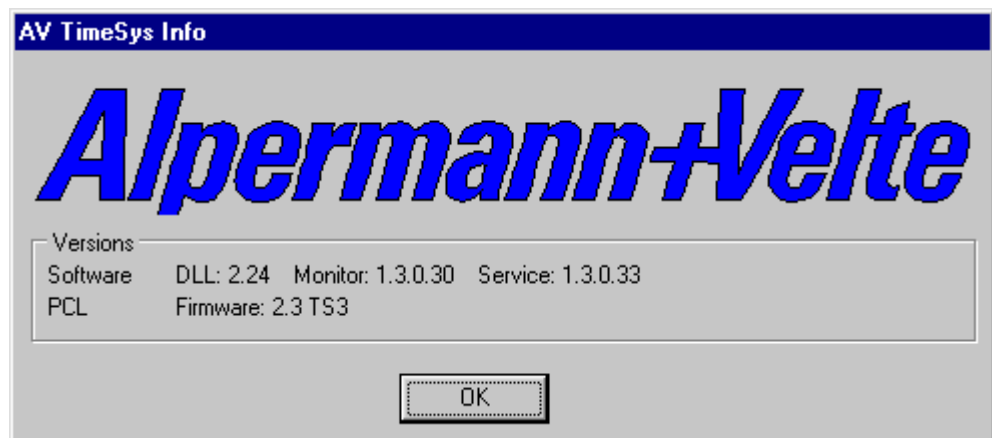
The following pieces of information are displayed:

- "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 TimeSys service. "The service is running" indicates that the 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 TimeSys service.

Operation

- “Hard set” sets the Windows NT 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 a 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 TimeSys service may last up to 10 seconds.
- “Info” shows the revision of program and PCL board:

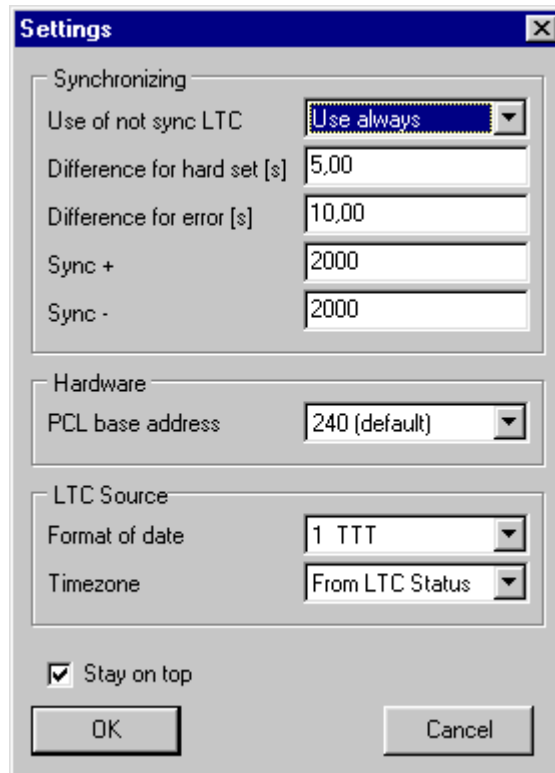


The following revision numbers will be displayed:

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

Settings

“Settings” provides a dialog box to configure the 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 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 inputted 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/XP 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.
- “PCL base address”: The base address of the PCL-5 TS board. If you wish to change this address, insert the new address here. This change will only become effective after the next start of Windows NT. There is no setting needed with the PCL PCI TS board.
- “Format of date”: Beside the time, a 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	×		

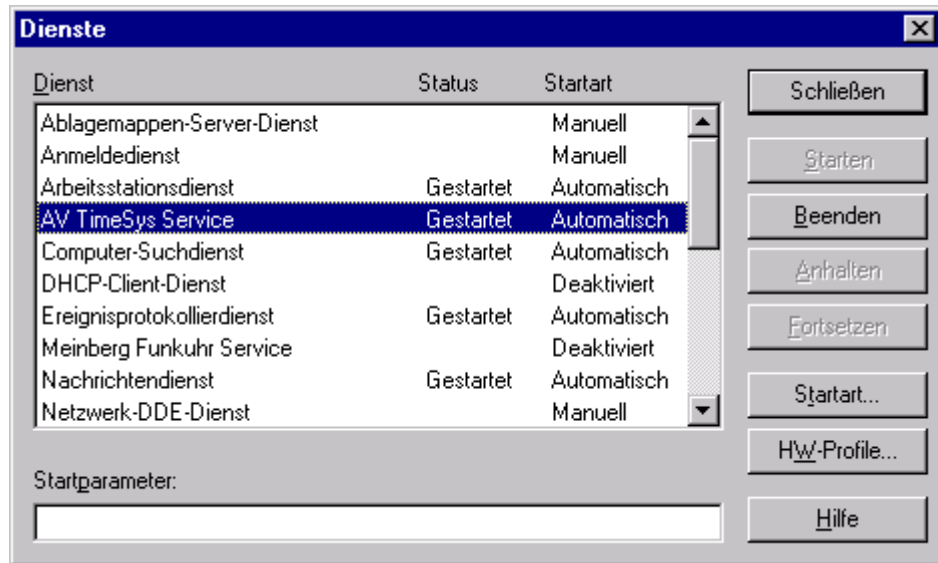
Meaning of the symbols: SS = state, DD = day, MM = month, YY two digit year, YYYY = four digit year, X = unused. The format number is the same as the user mode of the Alpermann+Velte LTC generator G30TM.

- “Timezone”: The LTC source does not necessary have been generated in the same time zone a 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 TimeSys service.
- “Stay on top”: Selection whether the monitor program shall appear in front of the other windows or be covered by them.

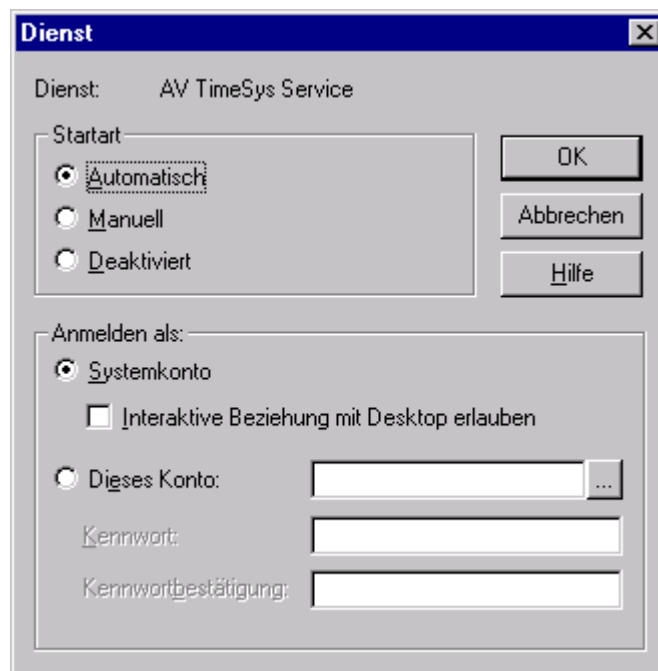
“OK” will transfer the new settings to the TimeSys service. It may take up to 10 seconds time until a new setting becomes effective. “Cancel” will close the window without storing any changes.

B4 TimeSys service

The 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. Start “Start / Settings / Control Panel” and then “Services”:



Here, click on “Quit” to manually disable the TimeSys service “AV TimeSys Service”, or on the button “Startup Type” to determine whether the TimeSys service shall be started with every system setup automatically:



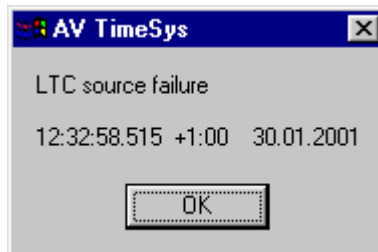
Operating Instructions AV-PC TS

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The preset selection is “Automatic”. With selection “Manual”, the 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 TimeSys service are displayed as follows:

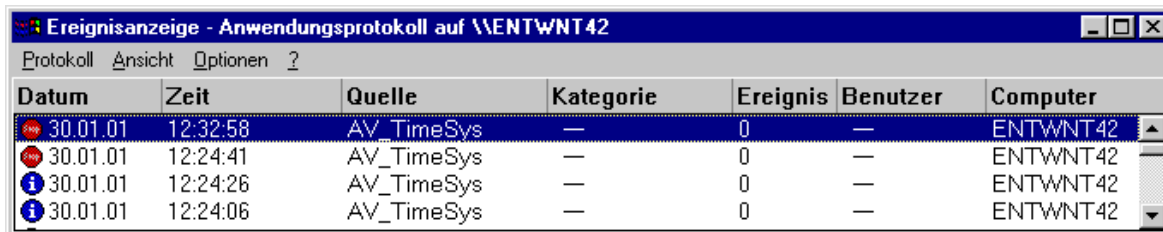


The following messages may occur:

- “System Time is hard set. Diff:”: 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 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 PCL 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 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 TimeSys service. To eliminate this fault, the service may be re-installed with “AV TimeSys Install” from “Start / Programs / AV TimeSys”.
- “Hardware not found”: No PCL 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 PCL board and “Settings / PCL base address” in the monitor program.

Operating Instructions AV-PC TS

These messages will be recorded in the application protocol. They may be displayed with the “Event Log Settings” in “Start / Programs / Common Administration”. Now change to “Log / Application”:



Datum	Zeit	Quelle	Kategorie	Ereignis	Benutzer	Computer
30.01.01	12:32:58	AV_TimeSys	—	0	—	ENTWNT42
30.01.01	12:24:41	AV_TimeSys	—	0	—	ENTWNT42
30.01.01	12:24:26	AV_TimeSys	—	0	—	ENTWNT42
30.01.01	12:24:06	AV_TimeSys	—	0	—	ENTWNT42

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 PCL-5 TS

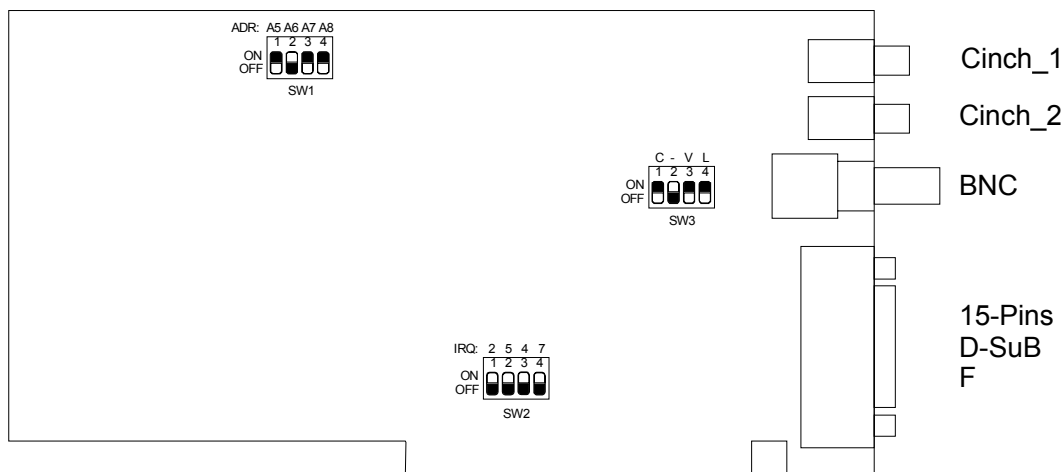
ISA

PCL-5 TS is a PC board for the ISA 8-bit bus with an LTC time code reader. 32 I/O addresses are allocated, which permit to access 256 bytes of a dual-ported RAM. Data are exchanged via polling.

Specifications

Format	ISA 8-bit; PC bus driver logic: 74 HCTxx
Power supply	+5V \pm 5% / 12V \pm 5%
Power consumption	250 mA (5V) approx. / 25 mA (+12V) approx.
Operating temperature	5° - 40° C
LTC reader	Input level: 30 mV - 5V Input impedance: 47 K Frame rate = 25, 30 or 30 drop, automatic detection Frequency: nominal (play) speed \pm 1% Direction: "forward" Time values: up counting, no jumps

Connections



Operating Instructions AV-PC TS

LTC input balanced: **SW3.4 = off**, signals at Cinch_1 and Cinch_2 or at pins 14 and 15 of DSUB15F (pin 13 = GND)
LTC input unbalanced: **SW3.4 = on**, signals at Cinch_2 or at pin 14 of DSUB15F (pin 13 = GND)

Select input mode (SW3)

- 1 = C: reserved for PCL-6
- 2: not connected
- 3 = V: reserved
- 4 = L: LTC input
 - ON unbalanced LTC input at Cinch_2
 - OFF balanced LTC input at Cinch_1/_2 or pins 14/15 DSUB15F

Addressing (SW1)

The board is designed to fit in the 8-bit PC slot. 32 I/O addresses of the PC are used. The base address of the card can be set with the SW1 switch. Please take care to avoid overlaps with other boards.

Switch SW1				Base address (I/O)	
1 = A5	2 = A6	3 = A7	4 = A8	hex	decimal
on	on	on	on	\$200	512
off	on	on	on	\$220	544
on	off	on	on	\$240	576
off	off	on	on	\$260	608
on	on	off	on	\$280	640
off	on	off	on	\$2A0	672
on	off	off	on	\$2C0	704
off	off	off	on	\$2E0	736
on	on	on	off	\$300	768
off	on	on	off	\$320	800
on	off	on	off	\$340	832
off	off	on	off	\$360	864
on	on	off	off	\$380	896
off	on	off	off	\$3A0	928
on	off	off	off	\$3C0	960
off	off	off	off	\$3E0	992

We recommend \$240 or \$340. The factory setting is \$240.

Interrupt selection (SW2)

The PC card will not produce any interrupt's, so all switches of SW2 have to be set "OFF".

Data access

This chapter explains the access to the PCL-5 TS on a hardware level. As long as one is using the TS software the following information is unnecessary.

The dual-ported RAM of 256 bytes controls the data exchange between the PCL-5 board and the PC. The RAM is divided into 16 registers with 16 bytes each. To enable access to a certain byte, the register address has to be transferred to the address register (to base address + \$10) first, then 16 bytes may be accessed transparently via base address + low nibble of the register.

Register	Description
\$0	reserved
\$1	reserved
\$2	reserved
\$3	reserved
\$4	reserved
\$5	reserved
\$6	reserved
\$7	reserved
\$8	reserved
\$9	reserved
\$A	reserved
\$B	identification
\$C	reserved
\$D	reserved
\$E	reserved
\$F	command register

Two steps are executed to access (read/write) a certain byte:

1. Writing : Data = address of the register,
 Address = base address + \$10.
2. Reading/writing: Data = read or write data,
 Address = base address + byte address (within the register).

Example : Read byte \$B of register \$1, with basic address set \$240:
 1. Write data = \$1 to I/O address \$250.
 2. Read data of I/O address \$24B.

Step 1 may be skipped if the same register is addressed again.

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Commands to PCL-5 may be transferred via register \$F as follows :

- If the command shall transfer additional data, they have to be written into bytes \$0..\$7 of the register \$F (see attachment).
- Write the command byte (see attachment) into byte \$F of register \$F.
- PCL-5 processes the command and sets command byte \$F in register \$F back to zero. In the event of resulting data they will be stored by PCL-5 in bytes \$0..\$7 of register \$F.

Register description

Register	Byte	PC read/write	Description
\$B	\$A	r	\$54 ('T')
	\$B	r	\$53 ('S')
	\$C	r	Version number
\$F	\$0	r	Data 0 of command
	\$1	r	Data 1 of command
	\$2	r	Data 2 of command
	\$3	r	Data 3 of command
	\$4	r	Data 4 of command
	\$5	r	Data 5 of command
	\$6	r	Data 6 of command
	\$7	r	Data 7 of command
	\$8	r	Data 8 of command
	\$9	r	Data 9 of command
	\$A	r	Data 10 of command
	\$B		
	\$C		
	\$D		
	\$E		
	\$F	w/r	command

Command description

Command	Data
\$15 read real-time LTC	<p>\$00 = hours, BCD \$01 = minutes, BCD \$02 = seconds, BCD \$03 = frames, BCD \$04 = timer, low \$05 = timer, high</p> <p>The timer shows the time passed within the frame. Every counting step equals 9,08µs. With offset suppression, the counter will be set to \$0025 in the event of a frame change, i.e. no smaller value can be read. The value range lies between 0x0025 and 0x11FF, i.e. 0,336ms up to 41,832ms. Values higher or equal 0x1200 indicate that the LTC could not be read. In this case all other data fields are invalid. If the LTC frequency does not lie within the reading range, the MSB (\$8000) is set. Accuracy of ± 100µs.</p>

Command		Data
		<p>\$06 = Status data Bit 0: synchronous to real time if = 1 Bit 2/1: time zone 0/0 = UTC 0/1 = CET 1/0 = CEST</p> <p>\$07 = day, BCD \$08 = month, BCD \$09 = year, BCD \$0A = valid date if = 0</p> <p>The data show - within the accuracy of $\pm 100\mu\text{s}$ - the point of time at which PCL-5 TS sets the command byte to zero.</p>
\$1F	Set date format	<p>\$00 = Index (like the user mode of G30 TM-TTT)</p> <p>0: No Date, no state 1: LTC (MTD), Date and state 2: Date in user = XX DD MM YY, no state 3: Date and state in user = SS DD MM YY 4: Date according to EBU Tech. I29-1995, no state 5: Date in user = DD MM YYYY, no state 6: Date in user = YY MM DD XX, no state 7: Date in user = XX YY MM DD, no state 8: Date in user = X YY MM DD X, no state 9: Date in user = DD MM YY XX, no state</p> <p>SS = state, DD = day, MM = month, YY = two digit year, YYYY = four digit year, XX = unused</p>

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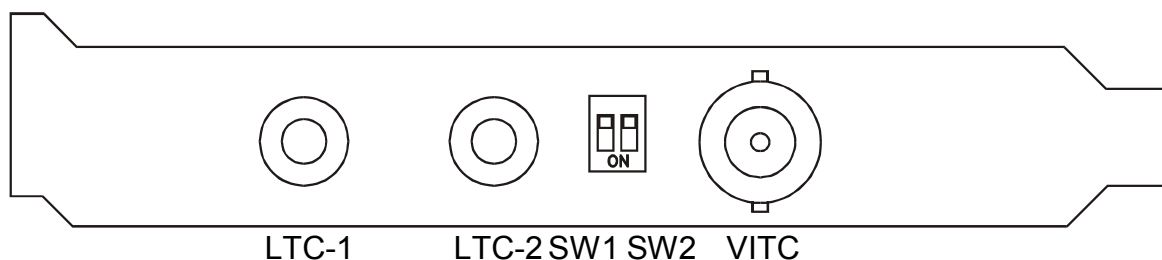
B7 PCL PCI TS

PCL PCI TS is a PC board for the PCI 32-bit / 5V bus with an LTC time code reader.

Specifications

Format	PCI 32-bit / 5V
Power supply	+5V \pm 5%
Power consumption	2W approx.
Operating temperature	5° - 40° C
LTC reader	Input level: 200 mV - 5V Input impedance: 47 K Frame rate = 25, 30 or 30 drop, automatic detection Frequency: nominal (play) speed \pm 1% Direction: "forward" Time values: up counting, no jumps

Connections



Input Mode

SW1	LTC Input
ON	Unbalanced LTC input to LTC-2
OFF	Balanced LTC input to LTC-1 and LTC-2

Data access

This chapter explains the access to the PCL PCI TS on a hardware level. As long as one is using the TS software the following information is unnecessary.

Memory vs. I/O access

There are four blocks inserted in the memory respectively. I/O address space by the PCL PCI TS:

Block	Memory or I/O	Size	Description
BAR0	Memory	0x80	Local configuration register
BAR1	I/O	0x80	Local configuration register
BAR2	Memory	0x100	PCL PCI TS register set
BAR3	I/O	0x100	PCL PCI TS register set

The local configuration registers are used to configure the PCI interface chips. They should not be modified.

The PCL PCI TS register set is identical mapped in memory and I/O address space. Both registers are the same.

Register set

Only the least significant byte of all the 64 long words is used. Therefore only addresses, which can be divided by four, can be accessed with one byte cycles. This results in a maximum of 64 bytes, but presently only 20 bytes are used.

The PCL PCI TS register set is defined as following:

PCL PCI TS		Register	Description
Offset	r/w		
0x00	r	DATA0	Data from PCL PCI TS
0x04	r	DATA1	"
0x08	r	DATA2	"
0x0C	r	DATA3	"
0x10	r	DATA4	"
0x14	r	DATA5	"
0x18	r	DATA6	"
0x1C	r	DATA7	"
0x20	r	DATA8	"
0x24	r	DATA9	"
0x28	r	DATAA	"
0x2C	r	INTFLG	Interrupt flags
0x30	r	CMDR	Command response

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PCL PCI TS			
0x34	r	ACK	Acknowledge from PCL
0x38	w	CMD	Command to PCL
0x3C	w	CMDD0	Data to PCL PCI TS
0x40	w	CMDD1	"
0x44	w	CFG	PCL configuration
0x4C	w	INTACK	Interrupt acknowledge
0x7C	r	VERSION	PCL PCI TS chip version

Every register permits data transfer only in one direction, either reading or writing. A read only register must not be written to, a write only register must not be read from.

Register

The registers in particular:

DATA0 to DATAA

The commands will return data via this registers.

INTFLG

Reserved for interrupt processing.

CMDR

After servicing the command, PCL PCI TS returns the command number into this register. With that it can be verified, that the last command has been executed correctly. With the command response it is possible to decide how the data in DATA0 to DATAA have to be interpreted.

If an unknown command has been detected, 0xFF will be written to this register.

ACK

After executing any command, this register will be incremented = acknowledge.

CMD

To send a command to the PCL PCI TS, the command number has to be written to this register.

CMDD0 and CMDD1

With this register command data can be transferred.

CFG

This register serves diagnostic purposes only. It should not be written to.

INTACK

Reserved for interrupt processing.

VERSION

The chip version of the PCL PCI TS can be retrieved from this register. The chip type is coded in the high nibble (presently 0xA), the version number in the low nibble (presently 0x1). The chip type provides information's about the type of PCL PCI TS, i.e. it has a LTC and/or a VITC reader. The version number will increment in future chip versions of the PCL PCI TS.

Commands

Almost every access to the PCL PCI TS are handled by commands. These are instructions to the PCL PCI TS, like setting a parameter or reading Time Code. A command is sent to the PCL PCI TS, explained below:

- If needed for the command, write command data to CMDD0 and CMDD1.
- Read ACK.
- Write command number to CMD.
- Wait, until ACK has changed. If this doesn't happen within 40ms, a timeout error has occurred.
- Verify if CMDR is equal to the command number. If not, a command error has occurred.
- If defined to the command, read the result of the command from DATA0 to DATAA.

Command description

Command		Data
\$15	read real-time LTC	<p>\$00 = hours, BCD \$01 = minutes, BCD \$02 = seconds, BCD \$03 = frames, BCD \$04 = timer, low \$05 = timer, high</p> <p>The timer shows the time passed within the frame. Every counting step equals 9,08µs. With offset suppression, the counter will be set to \$0025 in the event of a frame change, i.e. no smaller value can be read. The value range lies between 0x0025 and 0x11FF, i.e. 0,336ms up to 41,832ms. Values higher or equal 0x1200 indicate that the LTC could not be read. In this case all other data fields are invalid. If the LTC frequency does not lie within the reading range, the MSB (\$8000) is set. Accuracy of ± 100µs.</p> <p>\$06 = Status data Bit 0: synchronous to real time if = 1 Bit 2/1: time zone 0/0 = UTC 0/1 = CET 1/0 = CEST</p> <p>\$07 = day, BCD \$08 = month, BCD</p>

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Command		Data
		<p>\$09 = year, BCD \$0A = valid date if = 0</p> <p>The data show - within the accuracy of $\pm 100\mu\text{s}$ - the point of time at which PCL PCI TS sets the command byte to zero.</p>
\$1F	Set date format	<p>\$00 = Index (like the user mode of G30 TM-TTT)</p> <ul style="list-style-type: none">0: No Date, no state1: LTC (MTD), Date and state2: Date in user = XX DD MM YY, no state3: Date and state in user = SS DD MM YY4: Date according to EBU Tech. I29-1995, no state5: Date in user = DD MM YYYY, no state6: Date in user = YY MM DD XX, no state7: Date in user = XX YY MM DD, no state8: Date in user = X YY MM DD X, no state9: Date in user = DD MM YY XX, no state <p>SS = state, DD = day, MM = month, YY = two digit year, YYYY = four digit year, XX = unused</p>