

## TIME CODE & CAPTION BOARDS FOR PCI-BUS COMPUTERS

Through hard work, customer support, and continuing improvements since 1988, we are presently by far the world leader in Vertical Interval Time Code (VITC) and Longitudinal Time Code (LTC) reader and generator boards for personal computers. Our universal PCI-bus boards also have the ability to read NTSC line 21 caption, text, V-chip, and clock data, plus the ability to display time code data on video monitors (window burns).

As you can see from the attached ordering guide (4 pages), we offer a wide variety of these boards, ranging from the PCI-LTC/RDR simple LTC reader only board, up to our top of the line PCI-21VL/RG1 combination LTC/VITC reader/generator board with line 21 data reader and with the OSD (on-screen display) and SERIAL (RS232/RS422 serial port) options installed.

Because these boards reside in your computer, you don't have to buy expensive external time code boxes with serial interfaces, plus extra serial ports for your computer. Your program development is easier, and system response is much faster too, since there are no serial data link delays.

Typical applications include captioning, titling, machine control, editing, PC clock jamming, testing of time code equipment and signals, tape logging, and system automation.

Attached you will find several sheets of information to aid you in selecting the right PCI-TC board to meet your needs. Please call us at 1-800-782-2321, or at the number above, if you have any questions. We look forward to hearing from you.

Sincerely,



Tracey Ruesch, President

P.S. - All boards come with a free program which can be used to jam your computer's time-of-day clock(s) to match an incoming LTC/VITC reference signal.

Adrienne, AEC, USB-TC, USB-IRIG, USB-LTC, USB-VITC, USB-VLTC, PCI-21, PCI-TC, PCI-LTC, PCI-VITC, PCI-VLTC, PC-LTC, PC-VITC, PC-VLTC, and AEC-BOX are trademarks of Adrienne Electronics Corporation. SMPTE is a registered trademark of the Society of Motion Picture and Television Engineers, Inc. IBM and IBM PC are registered trademarks of International Business Machines Corporation.

## WHAT IS TIME CODE ?

Time Code assigns to each video frame (picture) a unique number, having the format Hours:Minutes:Seconds:Frames. This number may then be used for editing and/or control purposes. Time code standards have been around for many years, and are sponsored by both SMPTE (for NTSC) and the EBU (for PAL).

Vertical Interval Time Code (VITC) is encoded in the vertical interval (non visible portion) of a video signal. Longitudinal Time Code (LTC) is a specialized audio signal which is usually recorded on an audio track of a video tape, next to its associated video signal, but may also be used in an audio only environment.

Use of VITC frees up one audio track for other purposes, such as stereo audio. It also allows time code to be read at very low (including still) tape speeds, where fine positioning is important. However VITC cannot usually be read at tape speeds much above play speed.

LTC is commonly used because it is usually lower cost than VITC, can be added to a video tape after the initial video recording, and it can be read during high shuttle speeds (fast forward and rewind). However, due to record/playback limitations of tape machines, LTC cannot be read reliably at very low tape speeds.

In many cases LTC and VITC will be used at the same time, because of the advantages each has to offer.

## WHAT IS NTSC LINE 21 DATA ?

NTSC Line 21 Data includes the customary closed caption data for the hearing impaired, plus text, V-chip, clock, and other data services. This is a specially encoded signal, similar to VITC in some respects, which carries 2 bytes of useful information per video field, even in the presence of noise and severe bandwidth limiting (like VHS VCR's). All of our PCI-21 boards can read this data from properly encoded NTSC video signals.

## PCI-TC TERMINOLOGY

We use the generic term "PCI-TC" to refer to all members of our PCI-21, PCI-LTC, PCI-VITC, and PCI-VLTC board families. In fact, all of these boards use the very same bare "PCI-TC" printed circuit board, but with different components and software as needed.

## COMPUTER REQUIREMENTS

In theory, any PC which has one or more 5.0V or 3.3V PCI bus slots available will work just fine, although our bootable test, demo, and support diskette is designed to work only in the IBM PC compatible world. Our diskette has its own demo operating system.

## BOARD SOFTWARE DESCRIPTION

Each PCI-TC board comes with an CD file/driver disk which contains board test and demo software, a PDF format instruction manual for the board, plus software examples to assist you in your application development. We support DOS, Windows 9x, Windows NT, Windows 2000, Windows XP+ with drivers, example programs, and free telephone support if needed.

Depending on which board version you have, the test and demo software checks out all major functions on the board, including reading and/or generating time codes, or reading line 21 data, and displays the results on your computer screen. This is especially useful when you are developing your own application software, because then you will know for sure that the board and its LTC, VITC, and/or video sources are operating correctly.

## BOARD HARDWARE DESCRIPTION

All PCI-TC boards include a coprocessor chip, a field programmable gate array (FPGA), plus (as applicable) a video input amplifier, VITC reader and/or generator circuits, and LTC reader and/or generator circuits. In addition, some boards have an optional UART, with buffers for serial communications.

Because these boards contain a coprocessor, they can operate independently, without slowing down the host computer. The FPGA circuitry includes PCI-bus interface logic, plus a Dual Port RAM (DPRAM) which provides the communication link between the coprocessor and the host processor on the system board. These "smart" boards can generate an interrupt whenever a preset time code is reached, when an error occurs, can do data preprocessing, and are easy to customize when needed.

These boards are I/O mapped, which means that your computer can read from and write to the board just like any other I/O port in your computer. No address jumpers are needed, because the PCI-bus hardware and software automatically select a base I/O address for you. Up to 60 of these boards can be installed in one computer, provided that you have enough slots for them. To communicate with one of our boards, your software can either poll the board (read memory locations and wait for changes), or you may use interrupts. No interrupt jumpers are required, because the PCI bus shares interrupt request lines among multiple boards.

The on-board software, as well as most of the on-board hardware, can be updated in-system if an upgrade is ever needed. We just e-mail you the appropriate upgrade program, you start it running, and your board is updated within 1 minute, without having to remove all the cables, open up the box, remove the board, change the EPROM, and so forth. You will also find that our boards are clean, well built, good looking, and reliable. Our PCI-TC boards have passed CE-Mark testing for electromagnetic immunity, both for use in Europe and for increased durability and reliability.

## TIME CODE READERS - GENERAL CHARACTERISTICS

Our LTC and VITC reader boards can automatically read both SMPTE and EBU format time codes - no hardware or software changes are required. All of the time bits, user bits, and embedded bits are available for inspection every time code frame.

Standard time code reader features include indicators for tape direction (FWD/REV), drop frame (DF/NDF) status, color frame (CF) status, code format (SMPTE/EBU/FILM), and other reader status bits.

All of our boards automatically begin reading time code when the power is first turned on. In addition, they may be used as a time code comparator, and they also work with our free PC clock jamming software (on the diskette).

### VITC & LINE 21 READER NOTES

Our VITC and Line 21 readers use a portion of the FPGA to read VITC and Line 21 data from the incoming video signal. It is assumed that the horizontal scanning frequency of the incoming video signal differs from nominal values by no more than  $\pm 5\%$ . This generally applies for tape speeds from -1x to STILL to +3x. The VITC reader software automatically selects the VITC line numbers to read, or you may specify the line numbers to be used (via your software). The CRC byte is checked every field.

The video/VITC input connector is a ground isolated BNC. This input is 75ohm terminated, and uses a high quality differential video amplifier to eliminate hum and other noise sources. A looping video output (BNC) signal is also provided. Video signals which have been severely low pass filtered or otherwise distorted may not be readable, due to the short pulses (high frequencies) used to encode the VITC data.

### LTC READER NOTES

The wideband LTC reader uses a portion of the FPGA to read time bits and user bits simultaneously at speeds from 1/30x to 80x. It reads valid SMPTE and EBU and FILM LTC signals in both the forward and reverse directions, with LTC input signal levels ranging from 50mVpp to 20Vpp. The differential LTC input amplifier cancels out common mode noise signals such as "hum". The standard input connector is an RCA phono jack, but may be replaced by either an optional BNC connector or by an optional Mini-XLR connector.

### PCI-VLTC/RDR COMBINATION LTC/VITC READER NOTES

By default, the board automatically selects LTC or VITC data for you (whichever is best quality). For cases where LTC and VITC carry two different time codes, your software can tell the board to read and store both signals simultaneously in the DPRAM.

## TIME CODE GENERATORS - GENERAL CHARACTERISTICS

All time code generator functions are under full software control, including time bits, user bits, embedded bits (like the DF flag), VITC line selection, etc.. Time bits are automatically incremented every frame without slowing down the host computer. Reader data can be transferred to the generator data (jam sync). All bits may be changed every frame if desired. The generator may also be stopped and started under software control, and automatically switches between SMPTE/NTSC and EBU/PAL, depending on what type of signal is present at the video reference input.

Status outputs include the current time bits, video field identification (no color framing capability), and the status of the sync source (LTC or video), if any. The on-board time code comparator may be used to generate an interrupt whenever the generator count reaches a predetermined value (controlled by software).

### VITC GENERATOR NOTES

The VITC generator circuitry uses a portion of the FPGA to key VITC over the video signal which is currently being looped through the board. Our PCI-TC boards can read and write VITC at the same time, and are capable of writing over an incoming VITC signal. The CRC byte and video field ID bit, along with the time bits, are updated automatically every video field.

Our ISA-bus boards added VITC onto blank video lines only. The PCI-bus boards incorporate video keyer circuitry, which writes over the desired video lines, irrespective of what was there previously. Also note that VITC cannot be added to the video signal on an existing video tape. It must be keyed over the video during original recording or while dubbing to another tape.

### LTC GENERATOR NOTES

The LTC generator can either freerun or use the incoming LTC or video signal as a phase and frequency reference. The phase of the LTC output may be determined to within one tenth frame. PCI-LTC boards which have no video reference input present use the video standard (NTSC or PAL) which was last applied to that input. This default selection can be overridden by software if needed.

Whenever an LTC or video input reference signal is present, the board software automatically calibrates itself to that exact frequency. Should the reference signal disappear, the board will continue to generate LTC at that same frequency, with a maximum drift of only 5 frames per hour, until the reference signal reappears. The board hardware automatically changes the LTC output rise time to be either 25us (for SMPTE) or 50us (for EBU and FILM). No component changes or jumpers are needed to switch between these three different LTC standards.

## TIME CODE COMPARATOR

The time code comparator software, which is included on all PCI-TC boards, can be set to send an interrupt to your computer when a preset reader or generator time code is reached. This frees up the host computer for more important tasks.

## ON-SCREEN DISPLAY OPTION

The on-screen display (OSD) option can be used to display time code information on a video monitor. The data displayed can be either reader or generator data. The block characters we use come in two different sizes, can be positioned anywhere on the video screen, and can be black, gray, or white. To provide good visual contrast, a background is also generated around the display characters which is either black, gray, white, semi-transparent, or fully transparent (i.e. no background at all). All of these functions are software controlled. Please note that the OSD option requires "VITC generator" hardware on the board, so if your board doesn't already have a VITC generator on it, you will not be able to add the OSD option at a later date. If there is any chance that you will need the OSD option in the future, it is best to be safe and order it with the board. This is a great deal at only \$100 extra per board.

## SERIAL INTERFACE OPTION

The serial interface option provides both RS232 and RS422 drivers and receivers. The data rate can be programmed to be from 2400 to 38400 baud, and you can set the UART for 7 or 8 data bits and odd/even parity. Typical applications for the serial interface include communications with other time code devices, and machine control. All serial input and output lines are protected against static discharges (sparks), nearby lightning strikes, and other electrical transients covered by the CE-Mark test procedures.

The serial interface on these boards is not compatible with, but also does not interfere with, the standard COM1 and COM2 serial ports on your computer. Because the UART is controlled by the on-board coprocessor, the host computer does not get slowed down by I/O routines, buffers, etc. Transmit and receive data buffers are built in to our board software, along with break character and powerful character string transmission routines.

The SERIAL option must be ordered with the board, because the extra parts it requires cannot be added later.

**PCI-21, PCI-LTC, PCI-VITC, AND PCI-VLTC ORDERING GUIDE**

All boards include a high performance on-board processor, advanced diagnostics, in-system electronic software updates, plug and play installation (no jumpers), software drivers, full FCC and CE-Mark approval, and auto SMPTE/NTSC and EBU/PAL and FILM operations. Each board comes with a CD test/demo/support disk, including SDK, a PDF format manual (on the disk), and our 2 year warranty.

Model	Description	(US\$) Price
=====		
PCI-LTC/RDR	LTC Reader ..... Reads 1/30x to 80x, bi-directional, DF/NDF, simultaneous time and user bits.	335
PCI-LTC/GEN	LTC Generator ..... Can sync to video or freerun with very high precision.	395
PCI-LTC/RG1	LTC Reader/Generator ..... Combines PCI-LTC/RDR and PCI-LTC/GEN boards. Can sync to video or LTC or freerun with very high precision. Can read and generate LTC simultaneously.	500
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PCI-VITC/RDR	VITC Reader ..... Reads time and user bits, bi-directional, DF/NDF, -1x to STILL to +3x tape speed, automatic or programmable line selection.	375
PCI-VITC/GEN	VITC Generator ..... Keys VITC onto user selected video lines.	395
PCI-VITC/RG1	VITC Reader/Generator ..... Combines PCI-VITC/RDR and PCI-VITC/GEN boards. Can read and generate VITC simultaneously.	500
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Model	Description	(US\$) Price
PCI-VLTC/RDR	LTC/VITC Reader ..... Combines all features of PCI-LTC/RDR and PCI-VITC/RDR boards, plus automatic or controlled selection of LTC vs. VITC.	480
PCI-VLTC/GEN	LTC/VITC Generator ..... Combines PCI-LTC/GEN and PCI-VITC/GEN boards. Generates both LTC and VITC simultaneously.	500
PCI-VLTC/RG3	LTC-to-VITC Translator and VITC Reader ..... Similar to PCI-VLTC/RDR, plus has VITC generator and LTC-to-VITC translator modes.	610
PCI-VLTC/RG2	VITC-to-LTC Translator and LTC Reader ..... Similar to PCI-VLTC/RDR, plus has LTC generator and VITC-to-LTC translator modes.	610
PCI-VLTC/RG1	LTC/VITC Reader/Generator/Translator ..... Combines PCI-VLTC/RDR and PCI-VLTC/GEN boards.	715

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Model	Description	(US\$) Price
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PCI-21/RDR	NTSC Line 21 Data Reader ..... Reads caption, text, V-chip, and clock data (no OSD option available for this board only).	335
PCI-21L/RDR	LTC Reader and NTSC Line 21 Data Reader ..... Combines PCI-21/RDR and PCI-LTC/RDR boards.	410
PCI-21L/RG1	LTC Reader/Generator and NTSC Line 21 Data Reader ..... Combines PCI-21/RDR and PCI-LTC/RG1 boards.	535
PCI-21V/RDR	VITC Reader and NTSC Line 21 Data Reader ..... Combines PCI-21/RDR and PCI-VITC/RDR boards.	410
PCI-21V/RG1	VITC Reader/Generator and NTSC Line 21 Data Reader ..... Combines PCI-21/RDR and PCI-VITC/RG1 boards.	535
PCI-21VL/RDR	VITC/LTC Reader and NTSC Line 21 Data Reader ..... Combines PCI-21/RDR and PCI-VLTC/RDR boards.	515
PCI-21VL/RG1	VITC/LTC Reader/Generator and NTSC Line 21 Data Reader ..... Combines PCI-21/RDR and PCI-VLTC/RG1 boards.	750
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## PCI-21, PCI-LTC, PCI-VITC, AND PCI-VLTC ORDERING GUIDE

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All boards include a high performance on-board processor, advanced diagnostics, in-system electronic software updates, plug and play installation (no jumpers), software drivers, full FCC and CE-Mark approval, and auto SMPTE/NTSC and EBU/PAL and FILM operations. Each board comes with a CD test/demo/support disk, including SDK, a PDF format manual (on the disk), and our 2 year warranty.

Model	Description	(US\$) Price
PCI-CUSTOM	Custom PCI-TC Board ..... These boards are powerful and fairly versatile. Contact factory with your large order requirements.	TBD

### Options:

OSD	On-Screen Display of Time Code Numbers .....	100
SERIAL	RS232/RS422 Serial Interface .....	80
BNC2	Use BNC Connector for LTC Input .....	5.75
BNC3	Use BNC Connector for LTC Output .....	5.75
XLR2	Use Mini-XLR Connector for LTC Input (mate included) .....	23.50
XLR3	Use Mini-XLR Connector for LTC Output (mate included) .....	23.50

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Made in U.S.A.

To order, call TOLL FREE 1-800-782-2321, or send order to:

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