

**TCR500-PCI**

**SMPTE - EBU & IRIG – B1**

**TIME CODE READER**

**FOR PCs**



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## **INTRODUCTION**

The TCR500-PCI is a time code reader plug-in cards for standard 5V, 32 bit PCI bus, on IBM-PC's and compatible computer systems. The card can be used to synchronize time in a PC or Server to a master time code. In addition, it can be used as a SMPTE or IRIG-B(1) linear time code reader, under software control. The reader is compatible with 24/25/30 fps NDF (Non Drop Frame) SMPTE linear time code. The reader is also compatible with the IRIG-B(1) 1 kHz amplitude modulated time code format.

This instruction book covers installation and operation of the card using linear SMPTE and also IRIG-B(1) TC (Time Code). In some cases references are made to 24, 25 or 30 frames. It should be understood that the reference to 24, 25 or 30 frames per second only applies to the SMPTE TC.

Masterclock, Inc. provides the following on the CD which ships with the TCR card:

- Card drivers for the following operating systems: Windows 95, 98, 98SE, Me (Millennium), NT 3.51/4.0, 2000 & XP.
  - TCRSync-PRO – An advanced time synchronization software package providing time zone offset capabilities, automatic daylight savings time handling, unobtrusive background operation functionality, and many other high-end features.
- Time Code Viewer – A time code display/diagnostic utility.
- An API (application programming interface) library with documentation and example code.

Available for separate purchase is:

- TCRSync-NTP – Integrates with TCRSync-Pro for provide enterprise-level network time synchronization utilizing the open standard NTP (network time protocol). Available for Windows 2000/XP.

## **HARDWARE DETAILS**

### **INPUT CONNECTIONS**

The TC input is balanced; as such the input polarity is not critical to operation of the TCR card. However, for systems distributing single ended or unbalanced TC signal to multiple drops (multiple TC devices), it is suggested that the signal distribution method be consistent.

An insulated BNC female connector is provided as a standard connector for 2-wire time code input. By convention, Masterclock systems utilizing a BNC connector and coaxial cable to distribute time code reserve the center conductor of the BNC as the Time Code signal and the outer BNC conductor as the Time Code Reference/Signal GND

### **INPUT LEVEL**

The input level is controlled via an automatic gain control circuit. The TCR firmware will automatically determine the appropriate gain control setting for your incoming time code dB level.

The TCR cannot adjust for time code signal levels outside the range of -15 and +20dB. The card requires up to 30 seconds to complete automatic gain control when decoding SMPTE and (in the worst

case) up to three minutes when decoding IRIG-B(1). When proper gain control has been achieved the incoming time code should be read and displayed on the screen without any hesitations or jumps, and the LED on the card will light steady-on.

#### INPUT IMPEDANCE

The input impedance for the Masterclock TCR circuit is considered to be relatively high at approximately >100kOhm. This high input impedance allows for connecting multiple Masterclock TCR load devices without loading and/or distorting the time code input signal.

#### TIME CODE INPUT SELECT

All TCR500-PCI cards require a jumper configuration to set which type of time code will be decoded - SMPTE or IRIG-B(1). The jumper is J1 on the TCR500-PCI. The jumper should be placed in the off (open) position for SMPTE decoding (factory default setting), and the on (closed) position for IRIG-B(1) decoding.

#### PLUG AND PLAY

The TCR500-PCI is fully plug and play compatible. Windows (with the exception of NT) will detect this card on the next system boot, automatically configure appropriate I/O port and interrupt settings, then prompt for the driver.

#### SOFTWARE

The CD that ships with your TCR card includes a set of software tool programs for use with the TCR card on the Windows 95/98/ME/NT/2000/XP platforms. Please refer to the TCR500-PCI Installation Guide located in the documentation directory on the CD for information on installing the drivers and software tools.

#### TCRSYNC-PRO

TCRSync-PRO is specifically designed for the TCR500 card to synchronize time in a PC Workstation, or Server to a master time code input. TCRSync-PRO consists of the following:

- TCRSync Service
- TCRSync Configuration Utility
- TCRSync Monitor Application

#### Time Synchronization Service for Windows 95, 98, and Me (Millennium)

All three platforms are fully supported by the TCRSync service [Sync95.exe] which is run as a service.

#### Time Synchronization Service for Windows NT/2000/XP

Both the Windows NT 3.51 and 4.0 operating systems are fully supported and the software installation procedures for both are identical. For the remainder of this manual both operating system versions will be referred to as "Windows NT".

#### Differences between Windows 2000 and Windows NT

Windows 2000 is the next generation of Microsoft's Windows NT (New Technology) platform. Where appropriate, this manual will discuss installation issues specific to users of the Windows 2000 or Windows NT platform.

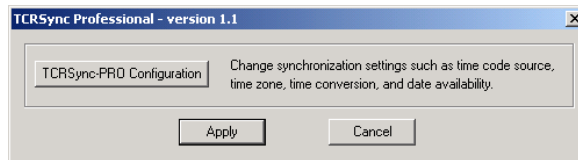
A new feature to Windows 2000/XP networking is the Win32 Time (“W32Time”) native computer-to-computer time synchronization mechanism. For TCRSync to operate properly W32Time must be configured in specific ways depending on the network environment. A more detailed discussion of this topic is found in the section entitled Windows 2000 and W32Time Services. TCRSync-Pro installation will assist you in configuring W32Time services appropriately.

### TCRSync Configuration Utility

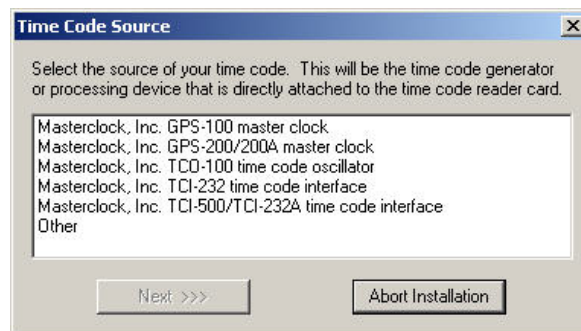
A TCRSync Configuration applet is installed into the Control Panel by TCRSync installation utility, or the utility can be accessed from the Masterclock\TCR500 program group by using the start menu button.

The TCRSync Configuration Utility should be run to configure your TCR card and software parameters for your source of time code input and your system setting. This configuration utility prompts you for information regarding your source of time code and various clock synchronization operating parameters. When configuration is changed, you may be prompted to restart the Windows system for the changes to take effect. Always restart when prompted.

If an error made during installation and is not discovered until after installation has completed, the installation program does not have to be re-run to change the configuration. Run the *TCRSync* Utility to reconfigure for the correct parameters.



Select your time code source from the available options and follow the on screen display.



### Time Code Source

- *Masterclock, Inc. GPS100 master clock* - choose this option if your time code source is the GPS100 master clock. When you choose this time code source options normally presented in the Incoming Time Code Configuration dialog are automatically determined.
- *Masterclock, Inc. GPS200/200A master clock* - choose this option if your time code is being applied to the computer by one of these master clocks.
- *Masterclock, Inc. TCO100 Time Code Oscillator* - choose this option if your time code is being applied to the computer by one of these master clocks.
- *Masterclock, Inc. TCI232* - choose this option if your time code is being applied to the computer by one this MC time code converter product.
- *Masterclock, Inc. TCI232A/TCI500* - choose this option if your time code is being applied to the computer by one of these MC time code converter products.
- *Other* - choose this option if your time code source is not listed.

### GPS100/200/200A Time Code Options



This dialog appears only if you have selected the GPS100/200/200A as your time code source.

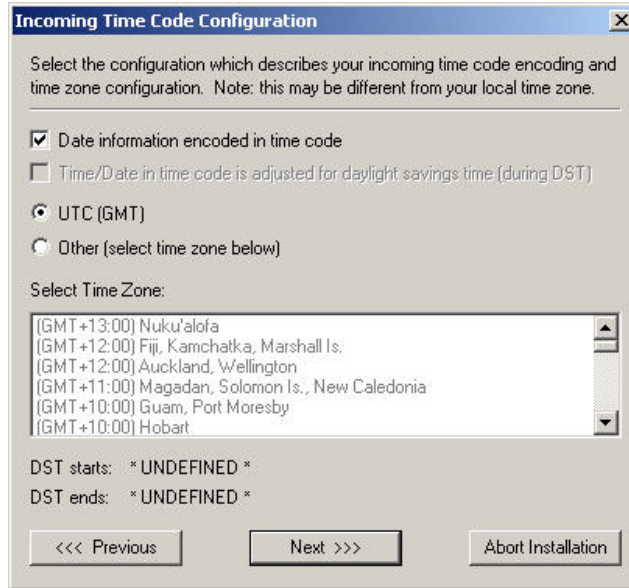
- *Allow time synchronization during freewheeling* - check this option if you want to allow time synchronization if the GPS100/200 is “freewheel” generating time code. See the GPS100/200 manual for more information on freewheel time code generation.
- *Display warning during freewheeling* - check this option if you want a message to be logged when the GPS100/200 enters and leaves freewheel time code generation mode.



Next, set your incoming time code configuration.

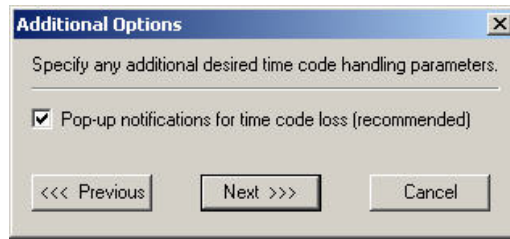
### Incoming Time Code Configuration

This dialog appears unless you select the GPS100 as your time code source.

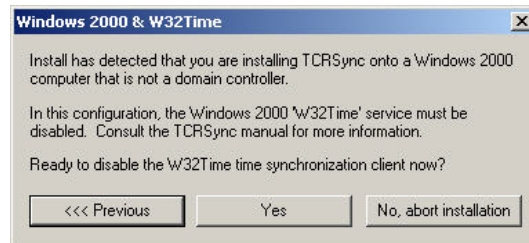


- *Date information encoded in time code* - check this option if the time code source encodes date information. For SMPTE-type time codes, the date must be encoded to the Leitch™ specification. For IRIG-B time code, the date must be encoded within the IEEE 1344 specification. [Note: date support for IRIG-B under IEEE 1344 requires TCR500 time code reader firmware version 1.6 or later, or TCR500-PCI card. Consult TCR500 manual for information on determining firmware version.]
- *Time/Date in time code is adjusted for daylight savings time (during DST)* - check this option if your time code time/date information is adjusted for daylight savings time (during DST) to some time zone standard. This option is available only if the selected time zone reference defines daylight savings time and the *Date information encoded in time code* option is checked.
- *Select time zone* - check *UTC* if your incoming time code is referenced to UTC/GMT, select *Other* if it is not. If *Other* is selected a time zone must be chosen from the time zone list box. Select the time zone that matches the reference of your time code source. This is not necessarily your local time zone. If the selected time zone defines daylight savings time, the start and end of daylight savings time will be displayed below the time zone selection list box. You may select a time zone that defines daylight savings time even if your time code source does not adjust for daylight savings time.

After selecting and configuring your time code input information, you can select an additional pop-up notification to indicated time code loss in excess of 3 minutes.



Windows 32Time service will be disabled automatically.



### **Regarding Windows 2000 AND W32Time Services**

W32Time is a time synchronization service, which is installed and operational by default on Windows 2000 computers. Depending on the network role for a Windows 2000 computer, which is running TCRSyncPro, it may be necessary to reconfigure the W32Time service. There are two primary scenarios of interest:

#### **Windows 2000 Workstation/Server**

In this environment W32Time will act as a client and attempt to synchronize time to a Windows 2000 domain controller, if one is available. When TCRSyncPro is installed in this environment it will not be able to keep time synchronized properly if W32Time is also attempting to synchronize time. In this scenario, W32Time must be disabled. TCRSyncPro installation will prompt to disable W32Time during installation.

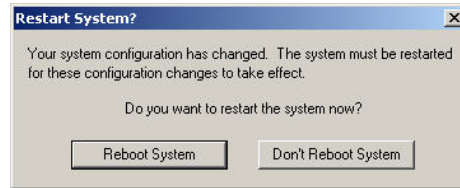
#### **Windows 2000 Domain Controller**

By default, W32Time acts as a time “master” when operating on a Windows 2000 server in the role of domain controller. In this scenario it is OK to disable the W32Time service but it is recommended that that W32Time be reconfigured such that the time on the domain controller is “trusted time”. The time is trusted because it is being provided by TCRSync from a stable and accurate external time code reference. TCRSyncPro installation will offer to reconfigure W32Time on a domain controller so that it can then offer this trusted time to other computers on the network.

#### **More W32Time Information**

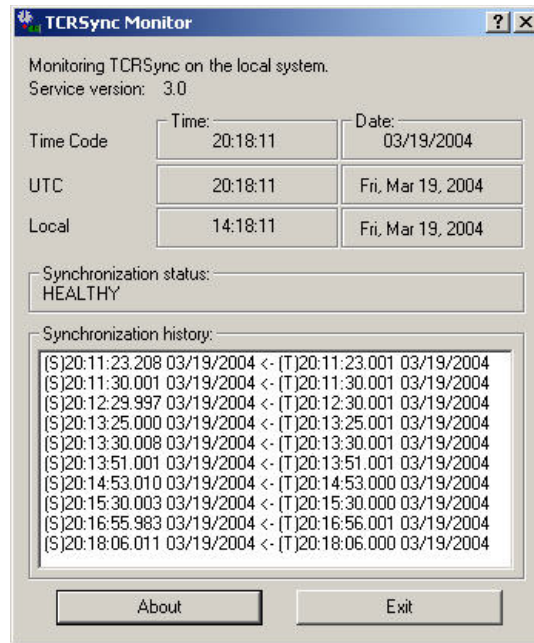
The following Microsoft knowledge base articles discuss various configuration options and behavioral aspects of the W32Time time synchronization mechanism: Q223184, Q245129, Q216734, Q240365, Q224799, and Q232209.

Follow the prompts to complete the configuration and reboot your system.



### TCRSync Monitor Utility

The *TCRSync Monitor* program is provided to help troubleshoot a TCRSync installation as well as display general information about time synchronization activity.



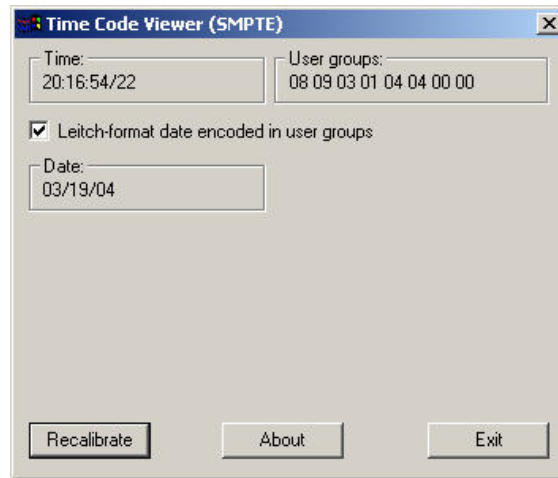
When executed *TCRSync Monitor* will, by default, attempt to establish communication with TCRSync time synchronization on the local computer. If Monitor cannot communicate with a local installation of TCRSync you will be prompted to specify a remote computer on which TCRSync time synchronization has been installed. See the troubleshooting tips section if Monitor is unexpectedly failing to communicate with a local installation of TCRSync. [Note: Monitor may only remotely monitor a TCRSync installation if that installation is running on Windows 2000/XP.]

By clicking the ? icon on the Monitor title bar then clicking on an item in the dialog you can obtain on-line help information about a particular item in the dialog.

## TIME CODE VIEWER

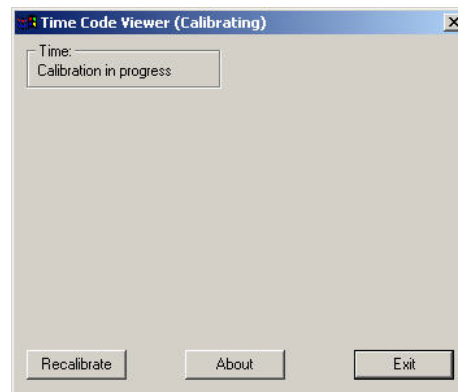
Time Code Viewer is a time code display and diagnostic utility. It can be used to view time code (when decoding is active) and determine other operational characteristics of the TCR card such as signal calibration.

*Time Code Viewer* displays raw time as decoded by your TCR card. You can use this program to easily determine if SMPTE time code contains the date encoded to the Leitch™ specification by checking the Leitch Date Decode option. If a valid date appears in the date decode box then you have date information available that TCRSync can use to synchronize your Windows system.



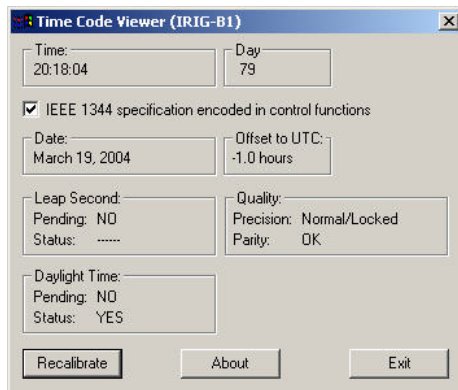
*Time Code Viewer* might display one of the following indications instead of time code:

- No Time Code – Time code is not available (but was available at some previous time).
- Calibration In Progress – Time code has not been available since the computer was started and the card is currently searching for it. You will also receive this message temporarily if the “Recalibrate” option is selected during normal operation.



Either of the above statuses indicates that there is a problem with the time code source. Refer to the [TCR500 troubleshooting guide](#) for problems with the time code source.

*Time Code Viewer* can also display IRIG-B1 time code if TCRSync has been installed to decode that type of time code. If your IRIG-B1 time code source implements IEEE 1344 encoding extensions this information can also be displayed by checking the appropriate box. Note: do not use this function to attempt to empirically determine if your IRIG-B1 contains IEEE 1344 encoding. This is not reliable due to the composition of the standard. Instead, refer to documentation for your IRIG-B1 master clock system.



*Time Code Viewer* cannot run if the TCR device driver failed to load. *Time Code Viewer* utility does not monitor time synchronization. Use *TCR Sync Monitor* for that task.

### TCR SDK FOR CUSTOM PROGRAMMING

The TCR SDK contains an application programming interface (API) to the TCR DLL. It runs on all the Windows platforms. The API can be linked to and called from custom Windows applications to provide specialized handling of time code, and for integration into OEM-level applications. The API includes programmer's documentation, libraries, and sample applications for MS Visual C++. To install the TCR SDK, select the *Custom* option when installing (See the installation guide). Note: Support for custom applications, OEM, and software development with the TCR is not provided by Masterclock. Information, libraries, and sample code is provided as-is.

### TCR DYNAMIC LINK LIBRARY

The TCR Dynamic Link Library (DLL) is a library that is used by Windows programs to access the TCR500 driver.

## SPECIFICATIONS

### TIME CODE INPUT

Type..... Longitudinal Time Code (LTC), forward running

SMPTE/EBU/Film..... 24/25/30 fps, NDF (Non Drop Frame)

Date encoding (User Bits) ..... to Leitch/Masterclock Encoding

NOTE: The use of this device with time code generators providing SMPTE drop frame (DF) time code may cause undesirable operation when using the TCRSync service for setting the computer date/time. Use only (NDF) linear/longitudinal time code.

NOTE: The use of this device with time code generators providing date encoding or other data in the user bit fields, other than to the Leitch/Masterclock date encoding standard, may cause undesirable operation.

### IRIG-B1 (Amplitude Modulated, 1kHz)

B120 .....BCD, CF to IEEE-1344 or zero filled, No SBS or zero filled

B121 .....BCD, CF to IEEE-1344, No SBS (zero filled)

B122 .....BCD, No CF (zero filled), No SBS (zero filled)

B123 .....BCD, No CF (zero filled), No SBS or zero filled

NOTE: This unit does not read the optional SBS information, this information will be ignored/treated as zero filled.

NOTE: This unit does not read CF, except to IEEE-1344 specification for date/year encoding. (See tcr500.sdk for details)

NOTE: The use of this device with time code generators providing CF information that is not to IEEE-1344, or using SBS information may cause undesirable operation when using the TCRSync service for setting computer date/time.

Connector (Standard)..... BNC (P2), isolated

Input Impedance ..... High, >100 kOhm

### PCI BUS

Voltage ..... 5V

Speed ..... 33 MHz (66MHz bus with reduced speed)

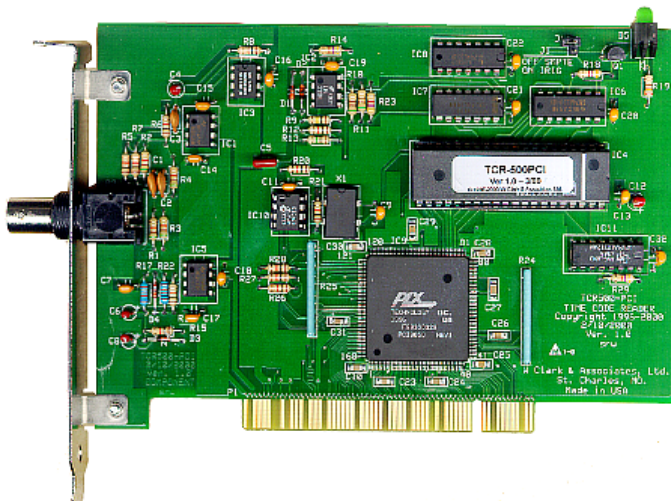
Width ..... 32 bit,

### PHYSICAL

Height ..... 4.5"/114.3 mm

Length ..... 6.6"/167.6 mm

PCI Bracket(s) ..... Full height bracket provided



**NOTE:** Not actual size

OPERATING/STORAGE TEMPERATURE & HUMIDITY

- Operating Temperature ..... 0 to +40°C
- Relative Humidity ..... Up to 90% (non condensing @ 25°C)
- Storage Temperature ..... -40 to +70° C
- Relative Humidity ..... Up to 90% (non condensing @ 25°C)

COMPLIANCE

Radiated Emissions ..... Class A, FCC Part 15, digital device

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