

**TCD200**

**SMPTE - IRIG**

**TIME CODE**

**CLOCK - DATE – COUNTER**

**DISPLAY**



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## **DISCLAIMER**

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See important *limited warranty* information at the end of this document.

## **TCD200 TIME CODE DISPLAY**

### **Introduction**

The TCD200 is a versatile, multi-featured time code driven clock display. This unit decodes and displays SMPTE 24,25, & 30 fps NDF (Non Drop Frame) linear, IRIG-B time codes.

SMPTE decoding supports 30 fps (non-drop frame), 25 fps and 24 fps. IRIG-B decoding supports the 1kHz modulated format (B1) and the unmodulated format (B). Other features include:

- +12 to -11 hour time zone offsets
- Half hour offsets
- US/Canada daylight savings time adjustments
- Retains time during loss of power and/or time code
- Automatic level adjustment to incoming time code signals
- Automatic detection of time code type and date encoding availability
- Programmable time and date when time code not present
- Programmable up/down timer/counter functions

### **Operation**

#### **Operating Environment**

The TCD200 is not water or moisture proof. Treat it as you would any other delicate electronic device and do not expose it to water, excessive heat or physical abuse.

#### **Accessing the PC Board**

In order to gain access to the switches and jumpers it is necessary to remove the case from the TCD200. This is accomplished as follows:

First disconnect the power cable from the unit. Even though the highest voltage inside the TCD200 is 28 VDC (which is generally not dangerous to touch), accidentally shorting a trace or wire inside the unit with power-on could destroy or damage any one of the extremely sensitive electronic modules. **Accidentally shorting a wire or trace or subjecting the unit to a static discharge, even for a very small fraction of a second, can destroy these modules. Such damage is not covered by the warranty.**

Remove the two outside Phillips screws in the rear panel (this is the end with the power socket and DB-9 connector). Holding the case of the unit in one hand, slide the rear panel assembly outward from the rear. The entire rear panel assembly and PC board will slide out.

As was mentioned above, the PC board is sensitive to any electrical signal including static discharge. Do not touch the PC board with any external wiring and, whenever possible, handle the unit by the rear panel or on the edge of the PC board as you would a Compact Disk. When not changing the settings always keep the PC board installed in the case.

When reassembling the unit take care that the PC board is properly fitted into the slots in the base of the chassis. When properly inserted, the PC board and rear panel assembly will slide easily into the case, no force is necessary. The warranty does not cover damage caused to the unit while removing or reassembling the PC board.

### **Configuration**

Basic operation of the TCD200 is configured via the **SW1** and **SW2** switch banks accessible inside the enclosure. See "Accessing the PC Board".

The **SW1** switches configure fundamental operation mode:

Function	SW1-1	SW1-2
Time display	OFF	OFF
Date display	OFF	ON
Timer/counter	ON	OFF

Note: Fundamental operation mode cannot be switched during clock operation. A power on/off cycle is required to change these modes.

The **SW2** switches configure modifiers to fundamental mode of operation:

SW2 switches 1-4 configure the time zone (hour) offset:

Hour offset	SW2-1	SW2-2	SW2-3	SW2-4
0 hour offset	OFF	OFF	OFF	OFF
1 hour offset	ON	OFF	OFF	OFF
2 hour offset	OFF	ON	OFF	OFF
3 hour offset	ON	ON	OFF	OFF
4 hour offset	OFF	OFF	ON	OFF
5 hour offset	ON	OFF	ON	OFF
6 hour offset	OFF	ON	ON	OFF
7 hour offset	ON	ON	ON	OFF
8 hour offset	OFF	OFF	OFF	ON
9 hour offset	ON	OFF	OFF	ON
10 hour offset	OFF	ON	OFF	ON
11 hour offset	ON	ON	OFF	ON
12 hour offset	OFF	OFF	ON	ON

SW2 switch 6 ON- applies an additional ½ hour to the offset specified by switch positions 1-4.

Function	SW2-6
No ½ hour offset	OFF
Enable ½ hour offset	ON

SW2 switch 5 configures positive/negative time zone (as set with SW2 switch positions 1-4 & 6).

Function	SW2-5
Time offset is positive	OFF
Time offset is negative	ON

SW2 switch 7 configures daylight savings time adjustment option. (See *Daylight Savings Time*)

Function	SW2-7
DST adjustment disabled	OFF
DST adjustment enabled	ON

SW2 switches 8 and 9 configure brightness intensity of the clock display.

Level	SW2-8	SW2-9
Brightest	OFF	OFF
Intermediate (brighter)	ON	OFF
Intermediate (dimmer)	OFF	ON
Dimmest	ON	ON

SW2 switch 10 configures time display format.

Format	SW2-10
24-hour	OFF
12-hour	ON

SW2 switch 11 configures date display format.

Format	SW2-11
US (MM/DD/YY)	OFF
European (DD/MM/YY)	ON

SW2 switch 12 enables/disables the real time clock (RTC) With the RTC disabled the TCD200 will display all dashes upon startup and upon loss of time code.

Function	SW2-12
RTC enabled	OFF
RTC disabled	ON

Note: All SW2 switch functions may be changed dynamically during clock operation.

### **Default Configuration**

The TCD200 ships from the factory with all SW1 and SW2 switches in the OFF position. This configuration results in the time displayed as: no time zone offset, no daylight saving time adjustment, and 24 hour display format.

### **Operation As A Time/Date Display**

Insert the power adaptor into an appropriate AC source.

After application of power the TCD200 will go through an internal checkout. Time from the real-time clock backup will then be displayed until a time code signal is acquired. If time code has never been applied to the clock dashed lines will be displayed until time code is acquired or a time is programmed by the operator.

Connect a source of SMPTE, IRIG-B time code to the input connector. The time should appear on the display within 120 seconds of application of time code. If the time code signal is lost or disconnected the TCD200 will continue to display time based on its internal reference until the time code signal is returned. If the clock is unable to achieve a time code lock see the section entitled *Troubleshooting Tips*.

The colons of the clock display will flash when the time or date displayed is not locked to time code. When time code is present and decoding properly the colons will remain steady-on. When operating in time/date display mode the operator may program time and date information into the clock at any time. However, when time and/or date information is available from the time code source it will always override any operator-programmed information. In some situations time code may be providing time but not date information. Under these circumstances the operator may still program time/date. Any programmed time will be ignored but programmed date will be retained. This feature facilitates use of the clock's daylight savings time function even when date information is not provided by time code.

If the TCD is configured for a 12-hour time display mode an AM/PM indicator will appear in the bottom right corner of the display during the PM hours.

### **Daylight Savings Time**

When enabled the TCD200 will apply an extra hour of offset to the incoming time code during US/Canadian-defined daylight savings time. *(Note: The default daylight savings time definition is U.S./Canada. The TCD200 with firmware version 1.7 or later uses the 2007 US/Canada DST standard., where daylight time begins on the second Sunday of March, at 2:00AM and ends on the first Sunday of November at 2:00AM.)*

**IMPORTANT:** The incoming time code must have a date encoded in a format recognized by the TCD200, or the correct date must be programmed into the TCD, for daylight savings time adjustments to be performed. For best reliability Masterclock, Inc. recommends a time code source that encodes full date information, such as the Masterclock GPS-200 master clock.

For SMPTE time codes date must be encoded to the Leitch specification. These specifications are also supported by Masterclock, Inc. master clock systems. IRIG-B date support is not currently implemented. The TCD200 will auto detect a recognized date encoding format in time code.

If your time code source is already making adjustments for daylight savings time do not enable this feature in the TCD.

### **Operation As A Timer/Counter**

Pin jumpers are available internally for using the TCD200 as a timer/counter when integrating the unit into a console or other enclosure, customer must supply wiring. The functions can also be accessed through the rear panel DB-9. Masterclock does not supply a remote control panel, dry contacts must be wired by the customer.

Refer to the switch configuration table and set SW 1 for timer/counter mode. Insert the power supply into an appropriate AC source.

After application of power the TCD200 will go through an internal checkout. A time value which represents either the start or end of a timer/counter sequence will then be displayed. If the clock has never before been used as a timer/counter a default time of 00:00:00 will be displayed and the clock will be in a count-down mode.

The count up/count down feature of the timer/counter mode is programmed by the operator. See the section entitled *Programming The Timer/Counter* for more information.

When programmed as a count-up timer/counter the end time will be displayed until the start event is detected. Upon start, the clock will revert to 00:00:00 then begin counting up to the programmed end time. When the end time is reached the display will flash twice then revert to the end time count waiting for the next start event.

When programmed as a count-down timer/counter the start time will be displayed until the start event is detected. Upon start, the clock will begin counting down to 00:00:00. When 00:00:00 is reached the display will flash twice then revert to zero and wait for the next start event.

A start event is defined as providing a logic low to pin 1 of the DB-9 connector located on the back panel of the clock. This can be achieved by a momentary switch or relay closure to connect pin 1 to pin 5 (ground) of the DB-9 connector). The duration of the start closure should be at least 100ms and not more than 1000ms.

### **Programming The TCD**

Programming the time and date is accomplished via the MODE, UP, and DOWN header pins located on the internal PC board. To actuate the functions use a spare jumper to close the pins momentarily. closing and holding the UP or DOWN jumpers in configuration mode will incrementally increase the speed of the directional adjustment. The user may also wire momentary switches to the DB9 connector on the back panel for ease of use or to set and trigger the count up/down timer function. Pinouts for the pin headers are shown in figure A.

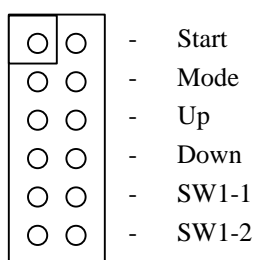


Figure A. (P4)

### **DB9 Pinouts**

Pin 1 – Counter Start  
Pin 2 – Serial receive  
Pin 3 – Serial transmit  
Pin 4 – N/C  
Pin 5 - Ground  
Pin 6 - Mode  
Pin 7 - Up  
Pin 8 - Down  
Pin 9 – N/C

### **Programming - Time/Date Display**

When the clock is in time/date display mode the first closure of the MODE contacts will enter configuration mode.

The first stage of configuration is for the date. The portion of the date currently available to be adjusted will be flashing. *The orW2-11*). The UP and DOWNder of the month and day values displayed in configuration mode will depend upon the date presentation format switch (S contacts will increment and decrement the flashing value. When the operator is done programming the currently selected value, or does not wish to change it, closing the MODE contacts again will move on to the next value. When closing the MODE contacts on the third value (year) configuration will switch to stage 2.

The second stage of configuration is for the time. The portion of the time currently available to be adjusted will be flashing. Time is programmed in the same manner as date. When closing the MODE contacts on the third value (seconds) the programmed date/time values will “take” and the clock will resume ticking forward. Remember that time and/or date information in time code, when available, will always override operator-programmed information.

### **Programming - Timer/Counter Function**

When the clock is in timer/counter mode the first closure of the MODE contacts will enter configuration mode.

The first stage of configuration is for the timer/counter direction. Only *uP* (up) or *dn* (down) may be selected. When closing the MODE contacts again the configuration will switch to stage 2.

The second stage of configuration is for the time. If programming a count-up timer/counter you are programming the end time for the count sequence. If programming a count-down timer/counter you are programming the start time for the count sequence. The UP and DOWN contacts will increment and decrement the flashing value. When the operator is done programming the currently selected value, or does not wish to change it, closing the MODE contacts again will move on to the next value. When closing the MODE contacts on the third value (seconds) the programmed time will be stored then displayed and the timer/counter will then wait for the start event to begin.

Any time between 00:00:00 and 23:59:59 may be programmed. Date is not supported in timer/counter mode and therefore count up/down sequences may not span more than a 24-hour period.

### **Troubleshooting Tips**

**Problem:** Clock is unable to “lock” to time code after 2 minutes.

#### **Possible reasons/solutions:**

1. Clock is not currently connected to time code source. Verify that all cables are properly connected.
2. There is a problem with the cabling between the clock and the time code source. Verify that all cables and connectors are working, in good condition, and that proper pinout connections have been observed.
3. There is a ground loop or other type of interference between the clock and the time code source. Verify that a common ground exists between the clock and the time code source. If the cabling distance between the time code source and clock is large you may want to consider inserting an audio distribution amplifier between the devices.
4. The signal level of the incoming time code is out of the range of the time code decoder’s circuitry. See the clock specification section for acceptable signal level ranges.
5. The signal level of the incoming time code is fluctuating. The signal level must be stable for the TCD to detect and decode the time code.
6. The time code being fed to the TCD is not a recognized format. Verify that your time code source is providing one of the time code formats that the TCD can decode.

**Problem:** Clock is not displaying the correct local time or date.

#### **Possible reasons/solutions:**

1. The time code source is not referenced to your local time zone. Possibly it is referenced to UTC (GMT) or another time zone. Determine the time zone reference of your time code source then set the clock’s time zone offset accordingly to arrive at a correct displayed local time/date.
2. Your time code source is not providing the time/date that you expect. Contact the individual responsible for the time code source for more information.

**Problem:** Clock did not properly negotiate the daylight time to standard time (or vice-versa) transition.

#### **Possible reasons/solutions:**

1. Your time code source is not providing date information and a valid date was never programmed into the TCD. Valid date information is required to provide the daylight savings time adjustment feature.
2. Your time code source provides the daylight savings time adjustment. The daylight savings time adjustment feature in the TCD should be disabled.

***If these troubleshooting tips do not solve your problem contact technical support.***

## **SPECIFICATIONS**

### **INPUT**

Format - SMPTE –24 – 25 or 30fps, NDF (non-drop frame), IRIG-B(1), IRIG(B)  
Date (SMPTE):..... Included in user bits per Leitch specification  
Date/Year (IRIG-B):..... Included in control functions (CF) per IEEE 1344 specification

Level - Approx. –1.25 Vpp(0db/600Ω)  
Impedance - Approx. >10 K ohm)  
Connector - BNC female  
Control Port Connector - DB9 male

### **LED CHARACTERS AND SIZE**

6 each, .56 in – 1.42 cm

### **WEIGHT**

14.4 oz.. – .41 kg

### **INPUT POWER**

DC Input Voltage – 9 – 28 VDC  
DC Input Connector – 2.1 mm male jack  
Power Consumption < 1 Watt

### **POWER SUPPLY CHARACTERISTICS**

Approvals - UL, CSA

### **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)

### **TIME CODE INPUT CONNECTOR**

BNC, ungrounded shield

### **CONTROL PORT CONNECTOR**

DB-9 – male  
6X2 .1” pin header

### **OPTIONS – SPECIAL ORDER**

Green or Amber LED's – special order  
19” rack mount  
Slave/Stopwatch Firmware



## **LIMITED WARRANTY**

This Masterclock, Inc. (hereinafter MC) product warranty extends to the original purchaser.

MC warrants the TCD200 against defects in materials and workmanship for a period of one year from date of sale. If C&A receives notice of such defects during the warranty period, MC will, at its option, either repair or replace products which prove to be defective.

Should MC be unable to repair or replace the product within a reasonable amount of time, the customer's alternate remedy shall be a refund of the purchase price upon return of the product to MC. This warranty gives the customer specific legal rights. Other rights, which vary from state to state or province to province, may be available.

### **Exclusions**

The above warranty shall not apply to defects resulting from improper or inadequate installation or maintenance by the customer, customer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product or improper site preparation and maintenance (if applicable).

### **Warranty Limitations**

MC MAKES NO OTHER WARRANTY, EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO THIS PRODUCT. MC SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

In any state or province which does not allow the foregoing disclaimer, any implied warranty of merchantability or fitness for a particular purpose imposed by law in those states or provinces is limited to the one-year duration of the written warranty.

### **Exclusive Remedies**

THE REMEDIES PROVIDED HEREIN ARE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MC BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

In any state or province which does not allow the foregoing exclusion or limitation of incidental or consequential damages, the customer may have other remedies.

### **Hardware Service**

You may return your TCD200 to MC for repair service. Please contact the factory for return authorization before returning the unit.