

**TCD-26, TCD-26-14, TCD-46 and TCD-86**

**SMPTE - IRIG - ESE**

**TIME CODE**

**CLOCK - DATE – COUNTER**

**DISPLAY**



## **DISCLAIMER**

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

## **TCD TIME CODE DISPLAY**

### **Introduction**

The TCD is a series of versatile, multi-featured time code driven clock displays. These units decode and display all versions of SMPTE linear, IRIG-B, and ESE time codes.

SMPTE decoding supports 30 fps (including drop-frame), 25 fps and 24 fps. IRIG-B decoding supports the 1kHz modulated format (B1) and the unmodulated format (B). ESE time code decoding supports the TC76, TC89, and TC90 formats. 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 TCD series 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.

#### **Configuration**

Basic operation of the TCD series is configured via the **S1** and **S2** switch banks accessible on the back panel of the clock.

The **S1** switches configure fundamental operation mode:

<u>Function</u>	<u>S1-1</u>	<u>S1-2</u>
Time display	<i>OFF</i>	<i>OFF</i>
Date display	<i>OFF</i>	<i>ON</i>
Timer/counter	<i>ON</i>	<i>OFF</i>

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

The **S2** switches configure modifiers to fundamental mode of operation:

S2 switches 1-4 configure the time zone (hour) offset:

<u>Hour offset</u>	<u>S2-1</u>	<u>S2-2</u>	<u>S2-3</u>	<u>S2-4</u>
0 hour offset	<i>OFF</i>	<i>OFF</i>	<i>OFF</i>	<i>OFF</i>
1 hour offset	<i>ON</i>	<i>OFF</i>	<i>OFF</i>	<i>OFF</i>
2 hour offset	<i>OFF</i>	<i>ON</i>	<i>OFF</i>	<i>OFF</i>
3 hour offset	<i>ON</i>	<i>ON</i>	<i>OFF</i>	<i>OFF</i>
4 hour offset	<i>OFF</i>	<i>OFF</i>	<i>ON</i>	<i>OFF</i>
5 hour offset	<i>ON</i>	<i>OFF</i>	<i>ON</i>	<i>OFF</i>
6 hour offset	<i>OFF</i>	<i>ON</i>	<i>ON</i>	<i>OFF</i>
7 hour offset	<i>ON</i>	<i>ON</i>	<i>ON</i>	<i>OFF</i>
8 hour offset	<i>OFF</i>	<i>OFF</i>	<i>OFF</i>	<i>ON</i>
9 hour offset	<i>ON</i>	<i>OFF</i>	<i>OFF</i>	<i>ON</i>

10 hour offset	OFF	ON	OFF	ON
11 hour offset	ON	ON	OFF	ON
12 hour offset	OFF	OFF	ON	ON

S2 switch 6 ON- applies an additional ½ hour to the offset specified by switch positions 1-4.

<u>Function</u>	<u>S2-6</u>
No ½ hour offset	OFF
Enable ½ hour offset	ON

S2 switch 5 configures positive/negative time zone (as set with S2 switch positions 1-4 & 6).

<u>Function</u>	<u>S2-5</u>
Time offset is positive	OFF
Time offset is negative	ON

S2 switch 7 configures daylight savings time adjustment option. (See *Daylight Savings Time*)

<u>Function</u>	<u>S2-7</u>
DST adjustment disabled	OFF
DST adjustment enabled	ON

S2 switches 8 and 9 configure brightness intensity of the clock display.

<u>Level</u>	<u>S2-8</u>	<u>S2-9</u>
Brightest	OFF	OFF
Intermediate (brighter)	ON	OFF
Intermediate (dimmer)	OFF	ON
Dimmest	ON	ON

S2 switch 10 configures time display format.

<u>Format</u>	<u>S2-10</u>
24-hour	OFF
12-hour	ON

S2 switch 11 configures date display format.

<u>Format</u>	<u>S2-11</u>
US (MM/DD/YY)	OFF
European (DD/MM/YY)	ON

S2-12 is reserved.

Note: All S2 switch functions may be changed dynamically during clock operation.

### **Default Configuration**

A TCD ships from the factory with all S1 and S2 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 cord or power supply into an appropriate AC source.

After application of power the TCD 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, or ESE 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 TCD 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.

*(Note: as a special case, when the clock is decoding ESE time code format TC76, 24-hour mode, AM/PM in 12-hour mode, daylight savings time adjustment, and true time zone adjustment features are not available. ESE TC76 format time code does not differentiate between the AM and PM hours of the day.)*

### **Daylight Savings Time**

When enabled the TCD will apply an extra hour of offset to the incoming time code during US/Canadian-defined daylight savings time. Daylight savings time begins on the first Sunday of April at 2:00AM and ends on the last Sunday of October at 2:00AM. **IMPORTANT:** The incoming time code must have a date encoded in a format recognized by the TCD-xxx, 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, Inc. GPS-200 master clock.

For SMPTE time codes date must be encoded to the Leitch specification. The TCD recognizes the ESE TC90 date channel when encoded. These specifications are also supported by Masterclock, Inc. master clock systems. IRIG-B date decoding is supported for the IEEE 1344 standard. The TCD will automatically 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**

Insert the power cord or power supply into an appropriate AC source.

After application of power the TCD 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 01:00:00 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 buttons located on the back panel of the clock. To actuate the MODE button always press then release. Pressing and holding the UP or DOWN buttons 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 function. Pinouts for the DB9 are shown below.

## **DB9 Pin Connections**

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

A start event or mode up/down closure is defined as providing a logic low to the appropriate pin 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 the pin 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.

Brightness, offsets, TC identification, decoder status, real-time-clock status and other features are also controllable or programmable via the built in RS-232 port. See our webpage, [masterclock.com](http://masterclock.com), for details.

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

When the clock is in time/date display mode the first press of the MODE button 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 order of the month and day values displayed in configuration mode will depend upon the date presentation format switch (S2-11).* The UP and DOWN buttons will increment and decrement the flashing value. When the operator is done programming the currently selected value, or does not wish to change it, pressing the MODE button again will move on to the next value. When pressing the MODE button 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 pressing the MODE button 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 press of the MODE button 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 pressing the MODE button 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 buttons will increment and decrement the flashing value. When the operator is done programming the currently selected value, or does not wish to change it, pressing the MODE button again will move on to the next value. When pressing the MODE button 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 other 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 IRIG-B(1) - IRIG(B) ESE TC76, TC89 and TC90
Level.....	Approx. -1.25 Vpp(0db/600Ω)
Level Range.....	Nominal 1-16 Vpp
Impedance.....	Approx. >10 K ohm)
Connector.....	BNC female
Control Port Connector.....	DB9 male

### **Power Requirements**

AC Input Voltage.....	100 - 240 VAC
AC Input Frequency.....	47 - 63 Hz
AC Input Connector -TCD-26, 46, 86.....	IEC male jack
AC Input Connector -TCD-26-14.....	ITT Cannon - 3 pin "K"

(WK-C3-32SL)

DC Input Voltage.....	9 - 28 VDC
DC Input Connector.....	2.1 mm male panel mt jack
Use Switchcraft (S761K) screw-down, 2.1 mm female power plug.	
Power Consumption.....	< 10 Watts

### **Physical**

Chassis-TCD-26R - L-19.0"/48.26cm H -3.47"/8.8cm D-6"/15.25cm
Chassis-TCD-26 -14 - L-13.65"/34.7cm H -3.47"/8.8cm D-6"/15.25cm
Chassis-TCD-46 - L-25.25"/64.1cm H - 6.25"/15.9cm D-4.28"/10.9cm
Chassis-TCD-86 - L-46.5"/118.1cm H - 12.25"/31.1cm D-4.4"/11.1cm

LED Characters - 6 each  
TCD-26 - 2.25 in/5.7cm  
TCD-26-14 – 2.25 in/5.7c m  
TCD-46 – 4 in/10.2 cm  
TCD-86 – 7 in/17.8 cm  
WEIGHT  
TCD-26 - 4lbs./1.82 kg  
TCD-26-14 – 4lbs./1.82 kg  
TCD-46 – 7.7lbs./3.5kg  
TCD-86 – 26.3lbs./11.8kg

**Power Supply Characteristics**

Approvals - UL, CSA, IEC & VDE. Built in output power limiting, over voltage and short circuit protection. Input AC fuse protection – internal built in fuse designed to blow if a catastrophic failure occurs. Fuse does not blow on overload or short circuit

**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)

**OPTIONS – SPECIAL ORDER**

Green or Amber LED's – special order  
48 VDC operation – special order

## **LIMITED WARRANTY**

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

MC warrants the TCD-26R, TCD-26-14, TCD-46, and TCD-86 against defects in materials and workmanship for a period of one year from date of sale. If MC 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.

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