# Installation and Use: TCS TXM-19 Crystal Control for Arri 16-BL Camera

## Introduction


The Tobin Cinema Systems TXM-19 gives crystal speed control of your Arri 16-BL camera if it is equipped with the Arri EMP or BLE "Universal" motor. Crystal speed control permits double-system sound filming with no connecting cable to the crystal-equipped sound recorder, and sound or silent filming without flicker under HMI or fluorescent lighting, or discharge-type street lights.

The TXM-19 also has a socket for external speed control, such as the TCS TMC-55Aa Milliframe Controller. This optional accessory permits camera speed to be set in .001 FPS (frame per second) increments for special uses such as for filming from a video or computer monitor with control of shutter bar. If all you need are the two video related speeds of 23.976 and 29.970 FPS and a phase button, this is available in the lower cost TVC Videoframe Controller.

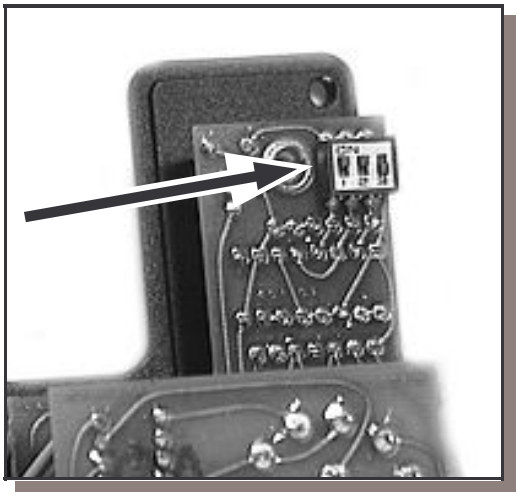
## Preparation for Installation

The required motor is the Arri BLE or EMP Universal motor. The TXM-19 will not work with the TCS "CHT" motor. (If you want to use this new high-performance motor, with faster response, lower current drain, lighter weight, forward and reverse running, and ability to run perfectly at 16 crystal speeds from 8 to 50 FPS, you must instead use the TXM-15 crystal.) The old governor (BL reversing) or AC synchronous motors cannot be crystal controlled by anything. The only motors that are compatible with the TXM-19 are those that run on DC power and do not have a reversing switch in the rear.

There is a triple switch on the rear of the TXM-19 crystal control. This configures the unit for the **gear ratio** that is installed in the motor and camera. This must be set properly to get correct running speeds.

**NOTE BEFORE PROCEEDING:** The TXM-19 has circuitry that can be damaged by the thousands of volts of static electricity that your body, or plastic wrapping materials, can generate by friction in cold or dry weather. Before handling the unit or making settings on the circuit board, ground yourself and the camera to prevent static charge accumulation. Static damage is not covered by your warranty.

To get the correct running speeds with crystal control and with external speed control, it is necessary to determine which gear set is present. If you open the film compartment, you will see two gears behind a clear plastic window. They have been marked in various ways over the years, so the most positive system is to actually count the gear teeth on each. The driving gear on the motor has 24 or 25 teeth; the driven gear has 50 or 60 teeth.



The motor and control can be used with any standard gear set, either **24:50, 25:50** or **24:60**. If a suitable gear set is not present, TCS can supply a newly manufactured 24:60 set. The new gears must be installed as a pair; they will not mesh with any of the original gears.

The **switches**, located at the very top rear of the crystal control, are set as follows according to the gear ratio that is present. Each switch is moved up for on, and down for off:

- For the normal U.S.A. 24:50 gear set, turn on switches 1 and 2 and turn off 3.
- For the normal European 25:50 gear set, turn on switch 3 and turn off 1 and 2.
- For the 24:60 gear set, turn on switch 1 and turn off 2 and 3.

# Installation

First, using a 1/4" or 6mm flat blade screwdriver, remove the 16-BL original bloop panel on the back of the camera. Do this by first loosening all 4 corner screws; then grasp two kitty-corner (diagonally oopposite) screws and pull out the panel. Remove the 4 screws the rest of the way by pulling outwards while turning with your fingers. Save these screws, they will be re-used for mounting the TXM-19.

Install the 4 screws in the TXM-19 corner mounting holes. Place the unit in position and tighten the screws.

Insert the 9-pin Bendix/Amphenol plug coming from the TXM-19 into the former power cable receptacle on the rear of the camera. Proper mating is achieved by lining up the tang on the plug with the slot on the receptacle, at the same time as lining up the two lugs on the plug with the two bayonet slots on the receptacle. Push the plug on while turning the coupling ring, until it seats fully and locks in place. We recommend leaving this plug connected at all times to prevent damage by hurried or inexperienced camera assistants, even if it means modifying the camera carrying case to fit.

Power for the TXM-19 and the camera is supplied through an industry standard "XLR" 4-pin male receptacle, with pin 1 negative (—) and pin 4 positive (+). This connector is rugged, inexpensive and connects easily without tricky alignments.

To verify that the gear ratio switches are correctly set, a television receiver can be used as a poor man's strobe. If you have European television, run the camera at 25 FPS and point it at the screen, while looking through the finder and preferably while tuning in a broadcast channel. A shutter bar should appear in the picture and be nearly stationary. If you have U.S. television, set the camera to 30 FPS and do the same thing. Because U.S. video is 29.970 FPS the shutter bar will drift through the picture in about 16 seconds. If you have access to a Milliframe Controller or Videoframe Controller, connect it and set it to 29.970 FPS and you should have a stationary shutter bar. Do not use a computer monitor as their scan rates are not standardized.

# Operation

The camera is started and stopped as before.

Crystal speed is selected with the 6-position rotary switch. One position, "MC," selects the external Milliframe Controller or equivalent. 24 FPS is generally used for sync-sound filming in the U.S., and 25 FPS in Europe. There is no harm in changing speeds while running, but remember that a speed change calls for a corresponding lens aperture change.

**HMI Speeds.** If you are filming under HMI or fluorescent lights, or discharge type street lights, it is necessary to use HMI compatible speeds to prevent flicker or pulsation in the film. This is because such lights actually flash 120 or 100 times per second, on 60 Hz or 50 Hz power respectively, and only a whole number of flashes per frame will give even exposure. Since the 16-BL shutter opening is fixed, there is a definite sequence of HMI compatible speeds, to wit:

☼ With **60 Hz** power, these are 40, 30, 24 and 20 FPS. These speeds are labeled in **Bold Face** on the speed dial. The speed that is not 60 Hz HMI safe, 25 FPS, is labeled in *Italic face.*

☼ With **50 Hz** power, these speeds are HMI safe: 25 and 20 FPS.

These speeds should meet the normal needs of many users. Additional faster, intermediate and slower speeds are available by connecting an external control such as the TCS TMC-55Aa.

**Daylight Speeds.** If you are filming in daylight or with high-amperage tungsten lights, you can use any of the above speeds, or any external speed within the system's capabilities, at will.

**Sync Alarm.** If the camera is not running at the selected speed, the red Sync Alarm light will show. It is normal for it to light or flicker each time you start the camera. Speeds between 20 and 30 FPS should lock into sync rapidly; those outside this range may take longer.

**External Speed Control.** The TXM-19 has a WPI (formerly Amphenol) 9-pin male "Tiny Tim" receptacle for connection of an Aaton-compatible speed control such as the TCS TMC-55Aa Milliframe Controller.

This optional accessory permits control of running speed in .001 FPS (or milliframe) increments over the entire range of perhaps 15 to 50 FPS, or some 35,000 possible speeds. Such precision control is required when filming at strange speeds from a video or computer monitor, for filming at 23.976 or 29.970 FPS for Rank or Bosch video transfer in conjunction with double-system audio on DAT (digital audio tape) or Hi-Fi video tape whose speed cannot be adjusted to match the video transfer rate, or just for filming at other desired speeds that do not appear on the TXM-19 dial.

To use the Milliframe Controller or other external signal, change the speed switch to the **"MC"** position. For filming from a video or computer monitor, the speed of the controller is set first, so as to get a stationary shutter bar. (Note that some cameras may have a black stripe on the rotating reflex mirror that will give an extra, false shutter bar in the finder but not on the film. Usually the narrower of the two is the true shutter bar. This should be established by test.) If the monitor scan rate is not known, such as with an unfamiliar computer, the camera can be run without film while the speed is being determined. When you start actual filming, push the controller's "Phase" button until the shutter bar is where you want it, such as at the bottom of the monitor's picture. Then the director can call "Action!"

A one pulse per frame output is provided for deluxe controllers that require it. This output is digitally synthesized and does not correspond to a particular shutter position.

Depending on your motor, the camera may not run smoothly below 20 FPS. If you are using the 24:60 gear set, the camera may not be able to run above 45 FPS. In any case, Arri does not recommend running the camera above 50 FPS. Speeds in the range of 20 to 30 FPS should be reached rapidly; higher or lower external speeds may take a little longer.

The external controller is supplied 12 volt power continuously as long as the battery cable is connected. Because the TCS TMC-55Aa Milliframe Controller draws such little power (30 mA), and to simplify operation, no standby switch is provided. Do not connect controllers that draw more than 100 mA (0.1 Amp) or this will overload and possibly damage the circuit board wiring.

If all you need are the video-compatible 23.976 and 29.970 FPS speeds, this is available at low cost with the TCS "TVC" Tobin Videoframe Controller.

# Tobin Cinema Systems, Inc.

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