

Installation and Use: TCS TXM-15 Crystal Control for Arri 16-BL Camera

Introduction

The Tobin Cinema Systems TXM-15 gives crystal speed control of Arri 16-BL cameras. 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-15 also has a socket for external speed control, such as with 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 without getting shutter bar.

Preparation for Installation

The preferred motor is the TCS "CHT" motor. This will give the smoothest and most efficient running, and the greatest selection of reliable running speeds. The TXM-15 also works with either of the Arri 16-BL Universal motors, type "EMP" or "BLE" if the motor is not damaged or defective. The old governor (reversing) "BL" motor, or any AC synchronous motor, is not suitable. The type of motor installed can be determined by removing the motor shroud and looking at the engraving on the motor. More easily, you can look through the clear plastic window on the back of the motor shroud and see if there is a reversing switch. (If the window is too scratched to see through, it is knurled to unscrew with your fingers.) The presence of a reversing switch on an original Arri motor means you need to find either a discontinued Arri EMP or BLE motor, or else the currently available TCS "CHT" motor. The CHT motor has a reversing switch but it works fine with the TXM-15.

There are two banks of 4 switches each, on the rear circuit board of the TXM-15 crystal control. These configure the unit for the type of motor in use, and the gear ratio that is installed. The upper bank of switches is for the gear ratio, and the lower bank selects whether the motor has an optical or magnetic pulse generator. There is also a jumper that is changed according to motor type.

NOTE: The TXM-15 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.

1. Arri EMP or BLE Motor.

In **all** cases with the original EMP or BLE motor, the **lower** bank of switches is set with 2 and 4 "ON" (up) and 1 and 3 "OFF" (down.) This prepares the TXM-15 to receive the 0.05 volt AC 120 cycle per turn tachometer signal from the motor. The **jumper** is set so it is connecting the two posts, as shown in the figure on page 2..

To get the correct running speeds with crystal control and with external speed control, it is necessary to determine which gear set is installed in the camera. If you open the film compartment, you will see two gears behind a clear plastic window. The most positive method 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 usual gear set in the U.S. for the universal motors is 24 and 50 teeth. Set the **upper** bank of switches with 2 and 4 "ON" (up) and 1 and 3 "OFF" (down.)

The usual gear set in Europe for the universal motors is 25 and 50 teeth. Set the **upper** bank of switches with 2 and 3 "ON" (up) and 1 and 4 "OFF" (down.)

You could encounter a universal motor, but with the old and normally incorrect U.S. reversing-

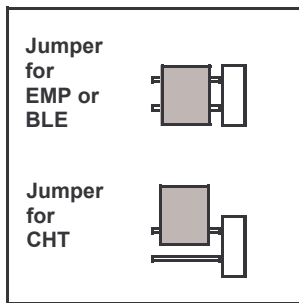
motor or synchronous-motor gear set, with 24 and 60 teeth. In this case, set the **upper** bank of switches with numbers 1 and 3 "ON" (up) and 2 and 4 "OFF" (down.) Note that the EMP or BLE motor used with this gear set may not be capable of turning fast enough to reach speeds above 40 FPS.

2. Use with the TCS "CHT" Motor.

Generally the CHT motor is used with the 24:60 gear set, as originally used with the old BL reversing (governor) motor. This permits all speeds to be used up through 50 FPS, unlike the case with the EMP or BLE motor. The motor is also quite happy using the other gear sets.

If a suitable gear set is not present, TCS can supply a newly manufactured set. The new gears must be installed as a pair; they will not mesh with any of the original gears.

In **all** cases, the **lower** bank of switches is set with 1 and 3 "ON" (up) and with 2 and 4 "OFF" (down.) This prepares the TXM-15 to receive the 5 volt p-p digital pulses generated optically in the CHT motor. The **jumper** is pulled off, and replaced so it is on only one post, so the two posts are not connected together.



Usually the **upper** bank of switches is set with 1 and 3 "ON" (up) and with 2 and 4 "OFF" (down.) This is for the 24:60 gear set and the 24 tooth chopper disc in the motor. If you are using a different gear set, follow the **upper** bank switch settings in section 1, above. If the chopper disc is not 24 teeth, instructions will be provided.

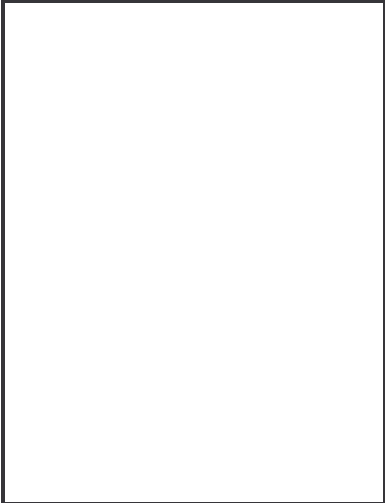
Installation

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 opposite) 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-15.

Install the 4 screws in the TXM-15 corner mounting holes. Place the unit in position and tighten the screws. The TXM-15 is a close fit and some wiggling may be needed to get it into position.

Insert the 9-pin Bendix/Amphenol plug coming from the TXM-15 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-15 and the camera is supplied through an industry standard "XLR" 4-pin male receptacle, with pin 1 negative (—)



- Upper switch bank
- Do not touch Y adjustment
- Test point V
- Jumper
- Test point S
- S adjustment
- Lower switch bank



and pin 4 positive (+). This connector is rugged, inexpensive and connects easily without tricky alignments.

To verify that the upper 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 29.97 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 well standardized.

Optional start-power adjustment:

The TXM-15 motor starting power is set to a compromise position that should give an acceptable starting time with most cameras. However, since it is possible to have many combinations of motor type and age, and gear ratio, it may be desirable to optimize this adjustment in order to reach crystal speed as rapidly as possible. The required tools are a slotted screwdriver to remove the TXM-15 panel, a jeweler's screwdriver with 2mm or .080" or less tip, and a high input resistance DVM (digital voltmeter) or VTVM (vacuum tube voltmeter) rated at 10 or 11 M Ω (megohms) or more.

Remove the TXM-15 while keeping the 9-pin cable connected. Position the panel with an insulating support of cardboard or plastic so the wiring or circuit board will not accidentally short out to the camera body. Connect the usual 12 volt power, and install a film magazine either loaded with scrap film or with the takeup stalled to simulate the normal running drag. This is important because usually the takeup side of the magazine requires more power than the rest of the camera. Run the camera at 24 or 25 FPS and measure the DC voltage at point "V" on the circuit board to ground (camera body metal part) after the camera is up to speed and the Sync Alarm light is out. Remember this voltage reading, which should be between 1.00 and 2.50 volts, typically 1.60. Adjust the "S" potentiometer, reached through a small access hole in the circuit board, for this exact same voltage at point "S" on the circuit board while running at the same speed. Do not disturb the "Y" adjustment for trimming the crystal frequency, it requires an ovenized and recently calibrated frequency counter for proper setting.

Operation

The camera is started and stopped as before.

Crystal speed is selected with the 16-position rotary switch. 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.

All of the speeds are available when you are using the TCS "CHT" motor. Because of magnetic crosstalk between the motor armature and the magnetic tachometer head that senses the teeth moving past it, your EMP or BLE motor may not work properly below 15 FPS. Some of the low speeds may work if you start running at 15 FPS or higher, then turn down to a lower speed. Speeds above 40 FPS may not be available if using the EMP or BLE motor with a 24:60 gear set.

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, 20, 17-1/7, 15, 12, 10 and 8 FPS. These speeds are labeled in **White** on the speed dial. Speeds that are **not** 60 Hz HMI safe are labeled in **Blue**.

☉ With **50 Hz** power, these are 50, 33-1/3, 25, 20, 16-2/3, 12-1/2 and 10 FPS.

These HMI speeds should meet the needs of most users. Additional HMI 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 at will, or the speeds of the traditional sequence of 48, 24, 16, 12 and 8 FPS which are also provided.

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. If the camera takes more than a second or two to get up to speed, you may wish to make the start-power adjustment described in the last section.

External Speed Control. The TXM-15 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 precision control of running speed in .001 FPS (or milliframe) increments over the entire range of about 8 to 50 FPS, or some 42,000 possible speeds. (With the EMP or BLE motor, the reliable range is about 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-15 dial.

For filming from a video or computer monitor, the speed of the external controller is set 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.) When you start filming the scene, 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 call "Action!"

A one pulse per frame output is provided for the use of an external footage counter, or as required by some deluxe model speed controllers. This pulse is digitally synthesized and does not correspond to any particular shutter position.

Arri does not recommend running above 50 FPS.

Connecting the external controller automatically changes over control without having to manually make any switch settings. However, to reach the externally selected speed most rapidly you should **also** set the approximate speed on the TXM-15 knob. 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, and to simplify operation, no standby switch is provided.

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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