Installing & Using the TCS TXM-20Ba Crystal Drive on your Bolex H16, H8 Spring-Wind Camera

NOTE: This motor will only fit H16 and H8 cameras that have the added 1:1 drive shaft, beginning with s/n about 210,601 of 1965 and up, including the models Rex-4, Rex-5, SB, SBM, M4, M5, and S4.

If you are not sure, look at your I-T control; if it is a round chrome knurled knob then your camera has the 1:1 shaft. If however it is a lever in a recess, your H16 camera does not have the 1:1 shaft and you must instead use the TCS TXM-26B crystal motor.

1. Installation

   1A. **VERY IMPORTANT:** First prepare the camera for motor attachment:

   1. Turn the camera’s MOT lever down to O to disengage the clockwork spring motor.
   2. Remove the spring winding handle by folding it up as if to wind the spring, but turn it clockwise instead of counter-clockwise. It has a left-hand thread and will unscrew. If it is excessively tight use penetrating oil on the coupling point.
   3. Set the speed dial to 64 or higher, fully clockwise. This is required to prevent the camera’s mechanical governor, which is still connected, from fighting the crystal motor and causing overload and overheating.
   4. Lock the release slide in the left M (lock-run) position to permit the mechanism to operate and not stall the crystal motor.
   5. On Rex models with a variable shutter, remove the Rexofader if present, and lock the variable shutter in the top (fully open) 0 position. We recommend always locking it in the top (fully open) 0 position for the most pleasing picture quality. Whatever the setting, be sure it is locked in place to prevent random changes of the exposure while running, and especially when you start and stop.

   **Warning:** Failure to follow these above steps will result in motor or camera damage that is not covered by your warranty, and/or will result in inferior quality film. Be sure the settings are not accidentally bumped out of the above positions during use.

   1B. Attach the motor to the camera by following these steps:

   1. Lay the camera down on a cushion or other soft surface, with the lid side down.
   2. If the camera side still has the 3.5mm headless screws filling the motor mounting holes, two of these must be removed with a small screwdriver. (The ones in the upper left and lower right.)
   3. Line up the motor drive shaft with the camera’s 1:1 shaft. It is the one below and to the right of the other, 8:1 shaft. Turn the motor shaft with your fingertips until the drive slots line up with the corresponding wide and narrow drive lugs in the 1:1 shaft. Place the spring-loaded motor drive shaft on the camera’s shaft.
   4. Tighten the two motor mounting screws finger tight. It is not necessary to use tools. Run the camera at 12 FPS for a moment to seat the shaft, if it did not pop fully into place.

2. Operation

   **Power** is supplied through the 4-pin XLR connector. 12 or 12.6 volts DC is required. Pin 1 is negative (—) and pin 4 is positive (+). Reversed DC polarity will cause the camera to run at high speed backwards and could damage any connected accessories. If you are not sure your battery and all cables are correctly wired, do not use them until proper polarity is verified with a voltmeter. Do not apply more than 14.4 V as this may cause damage.

   Running **speed** is selected by the rotary switch. The speeds are 12, 15, 24, 30 and 48 FPS (frames per second.) All of these speeds except 48 are HMI safe for 60 Hz powering of the lights. This means that if you are filming under HMI or fluorescent lights, or discharge type street lights, you will get flickerless results when you film at any of these speeds except 48 FPS. None of the speeds are HMI safe for 50 Hz power; for these you connect the TEC-20 Euroframe Controller or TMC Milliframe Controller. If you are filming under daylight or high-amperage incandescent light, any speed can be used at will. No harm should be done by changing speeds while running. Remember that a speed change calls for a corresponding lens aperture change.
An additional unmarked position, clockwise from 48, might give 60 FPS. Operation is borderline and depends on the battery voltage and the amount of residual friction in your camera’s governor, so this speed is not guaranteed to be available. If the sync alarm is dark while running, then this speed is also 60 Hz HMI safe.

Running is controlled with the Run-Stop rocker switch. In case the camera has a film jam, be ready to stop the camera immediately to prevent tripping the breaker or causing camera or motor damage.

A sync alarm light is provided. It will light up whenever the chosen speed (internal or external) is not being maintained. Slight weak flickering at low speeds may be normal, depending on film friction, camera condition, etc.

The circuit breaker inside should never trip in normal operation. It protects from gross faults, such as a film jam. If it trips, indicated by running weakly or not at all with 12 volt power connected, turn to Stop and unplug any accessories. Normal operation should resume in about 5 or 10 minutes.

If you are using a Rex-5, M-5, or SBM with a 400' film magazine, plug the magazine takeup motor into one of the sockets on the top of the TXM-20Ba.

• Note that if using the MM takeup, you need to insert it as follows:
  • For filming at 12 through 24 FPS, plug it into the left socket.
  • For filming at 30 through 48 FPS, plug it into the right socket.

• If you are using the WM takeup motor, always plug it into the right hand socket, and set the approximate speed on the dial of the WM motor.

Note that the torque motor might not be able to turn fast enough, at the beginning of the roll, to safely run at speeds at or above 48 FPS using a standard 2" core. The solution is to use a 3" diameter core (available from your film lab) for takeup, or else do not film at high speeds for about the first 50 or 100 feet of the roll.

Your Bolex is not a self-blimped (quiet) studio camera. For sound filming, you must either use a blimp or barney indoors, or else film outdoors at a distance, or through a closed window. Alternatively, plan on dialog replacement via “looping.”

For double-system sound, you should use a film sound recorder such as a Nagra, or else a stereo cassette recorder that has been modified to record a crystal pilot signal on one track, such as from a TCS model TX-10. (The normal speed in North America is 24 FPS with a 60 Hz pilot.) At the beginning of each sound take, you need to use a clapstick that can be seen by the running camera and heard by the running recorder’s microphone, as a start mark. The crystal pilot is then used for resolving (transferring in sync) to 16mm perforated magnetic film that has the same number of holes per second as does the picture film. It may also be possible to use newer media such as DAT (digital audio tape), MiniDisc, Hi-Fi video tape, etc. Depending on how you are working, it may be necessary or desirable to film at 23.976 FPS instead of 24. There are essays on this subject on the Tobin website; see the site address at the bottom of page 4. Subsequent editing and mixing steps are beyond the scope of these instructions and we refer you to the books and courses on the subject.

3. Using External Speed Control

The TXM-20Ba has a 9-pin DE-9 connector for external speed control. This permits running at some 40,000 speeds between about 10 and 50 FPS. This will accept the TCS TMC Milliframe Controller as well as the TVCe Videoframe Controller and TEC-20 Euroframe Controller. The TMC2 Milliframe Controller can also be used, however the TXM-20Ba does not have a frame pulse output and will not advance the footage counter in that model.

Set the speed dial of the TXM-20Ba to the 24, MC position when using external speed control.

The TMC or TVCe draws very little current, and would take a week, 24 hours a day, to discharge the average battery, so to simplify operation no separate standby switch is provided.

The TEC-20 Euroframe Controller replaces the existing 12, 24 and 48 speeds on the TXM-20Ba speed dial with the European 12.5, 25 and 50 FPS speeds. The 15 and 30 speeds are not available while this Controller is connected.

External control permits “odd” speeds to be used, such as for filming when a video or computer monitor is in the scene, reducing shutter bar. It also permits the use of unusual HMI speeds, or traditional speeds, that are not provided on the camera’s speed dial. In addition, it permits keeping much closer sync when filming, say, a music
3. Special considerations for framing from video or computers

For video with DAT (digital audio tape) or CD (playback), this is because the framing rate can be set to equal the frame rate of both NTSC video monitor rate of 24.97 or 29.97 FPS and computer screen per long ticks of 24 or more.
through the running shutter. Vary the speed to get a stationary shutter bar. This computer frame rate is then entered into the above formula to calculate the filming rate.

4. For Technicians

The 24, MC position is normally used when connecting the Milliframe, Videoframe or Euroframe Controller.

The Milliframe Socket is numbered. Pin 6 is +12V, pin 3 is 100 PPF (pulses per frame) external reference of 5V CMOS logic, pins 5 and 9 are ground, shell is ground, other pins are not connected in this model. The external signal must be a 50% duty cycle symmetrical square wave with full 0 to +5 volt HC (High Speed CMOS) amplitude, and about 100Ω source resistance.

The Torque Motor sockets are for either an original Bolex 5.95mm x 2.1mm locking inverted power plug, or a standard 5.5mm x 2.1mm locking inverted power plug, preferably a Mouser 1710-2120. Center is positive, outside is negative.

If it is necessary to adjust the crystal frequency, use a counter of known accuracy and attach it to the TP test point and case ground. Adjust trimmer capacitor for 6.144000 MHz ± 20 Hz.

Tobin Cinema Systems, Inc.
http://www.tobincinema.com