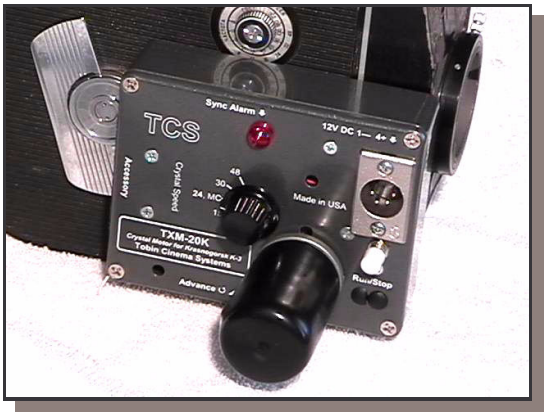
Using the TCS TXM-20K Crystal Drive with your Krasnogorsk K-3 Camera

1. Installation.



Installation of the TXM-20K requires camera disassembly and modification, as the K-3 was not designed to accept motor drive. TCS does not offer installation. We do supply suggested instructions for this on request.

NOTE: Do not remove the four cover corner screws as this will disconnect the motor from the mechanism, requiring partial camera disassembly and re-installation.

2. Operation

Power is supplied through the 4-pin XLR connector. 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 causing a jam, and could cause damage. 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-20B 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, 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 pushbutton 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. The switch is alternate action, that is, push for on and push again for off.

If the camera stops with the viewfinder dark, turn the **Manual Advance** knob to restore viewing. This is a knurled knob, inside the bottom of the motor case, accessed with your fingertip through a slot in the case. Do not touch this knob while filming, to prevent possible injury. Do not permit direct sunlight to enter this bottom slot as this may disturb the running speed of the camera.

A **sync alarm** light is provided. It will light up whenever the chosen speed (internal or external) is not being maintained. It may flicker slightly if the camera is running a bit roughly, especially at low speeds. This does not necessarily indicate the speed is incorrect as the sync alarm circuit is very sensitive.

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 and with a dark Sync Alarm with 12 volt power connected, switch to Stop and unplug any accessories. Normal operation should resume in a few minutes.

Your Krasnogorsk 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), minidisk, 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 3. 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-20K 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-20B** Euroframe Controller. The **TMC2** Milliframe Controller can also be used, however the TXM-20K does not have a frame pulse output and will not advance the footage counter in that model.

Set the speed dial of the TXM-20K 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-20B** Euroframe Controller replaces the existing 12, 24 and 48 speeds on the TXM-20K speed dial with the European 12.5, 25 and 50 FPS speeds. The 15, 30 and 60 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 (16-18-32 FPS), that are not provided on the camera's speed dial. In addition, it permits keeping much closer sync when filming, say, a music video with DAT (digital audio tape) or CD playback. This is because the filming rate can be set to equal the Rank or Bosch NTSC video transfer rate of 23.976 or 29.970 FPS and eliminate sync drift on long takes of 20 or more seconds.

3A. Special considerations for filming from video or computers

Your eye is not fast enough to see it, but the image on a video monitor or TV is actually composed of a spot of light that scans across the face of the picture tube from left to right, and from top to bottom, to paint the rectangular "raster" area that your eye sees as a picture because of the eye's slow response time.

To conserve video bandwidth and increase the number of available TV channels, video employs "interlaced scan" which means that it writes the odd-numbered lines and then goes back and fills in the spaces with all the even-numbered lines. Each set of odd or even lines is known as a "field" of which there are 59.94 per second; a full set of lines is a "frame" and there are half as many, namely 29.97 per second. This works well when viewing the TV at a distance, but close-up your eye can see that the illuminated lines are alternating back and forth and this appears as "line crawl" so it looks like the lines are moving up or down. There are incidentally 525 nominal lines per frame, or 262½ lines per field, 15,734¼ lines per second. (European video in PAL or SECAM has 50 fields, 25 frames, 625 lines per frame, 15,625 lines per second.)

A regular cine camera has a shutter that is open half of the time or less, 24 times per second, and only part of each video frame is illuminated during that time. So, just pointing an ordinary camera at a TV set will yield alternating light and dark bands in a different place in each film frame, an irritating effect known as "shutter bar."

How Other Cameras Do It

High-end professional cameras are able to include a regular video monitor in the shot by virtue of filming at 29.970 or 14.985 FPS (frames per second) with a 180° shutter opening, giving an exposure time equal to one field or one video frame respectively. The slight remaining shutter bar can be seen in the mirror reflex finder and moved, with the speed controller's "phase" button, to the bottom of the monitor's picture, where it will remain for the duration of the shot. People with unlimited budgets use instead special rented 24 FPS video equipment so they can film from it at 24 FPS.

Kinescope cameras used for video-to-film transfers solve this problem by instead employing a special fast-pulldown movement and about a 288.289° shutter opening, which is also in front of the lens so it is out of focus and is also very smoothly driven, to record 2 fields out of every 2½ without shutter bar, converting 29.97 FPS video to 24 FPS film.

How Your Krasnogorsk Can Do It

Your camera does not have a 180° shutter opening, so you most likely can not film at 29.970 or 14.985 FPS because the resulting shutter bar will be very wide, though stationary. The best you can perhaps do is film at an FPS rate, suited to your shutter opening, so that your exposure time is exactly 1/29.97 or 1/59.94 of a second per frame. This will give an optical splice that is in a different place in each frame, but it may not be too visible if conditions are right. You will be using "odd" filming rates so double-system sound filming is probably not feasible.

In the following formula, you can calculate the FPS rate if you know your camera's exact shutter opening, and the video frame rate which is 29.970 in the U.S., 25 in Europe.

$$\text{Filming Rate (FPS)} = \frac{\text{Video Frame Rate} \times \text{Shutter Opening}}{360}$$

Thus, in the U.S., if your shutter is exactly 150° you would film at 10.000 or 20.000 FPS. Use the lower speed if the monitor is large in the film frame; you could get away with using the higher speed if the monitor is small in the film frame and the audience may not notice the absence of every second scanning line. These speeds are theoretical calculations and should be verified by test.

For filming from a computer monitor you need to find out the frame rate, generally 56 to 75 on non-interlaced monitors and 30 to 37.5 on interlaced ones, to enter into the above formula. You can establish the frame rate by running the camera without film while looking through the finder. 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 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, the shell is ground, the 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 amplitude, and about 100Ω or less source resistance.

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. Adjust trimmer capacitor for 6.144000 MHz ± 20 Hz. This is an adjustment for a qualified installer only since accessing the parts mentioned will require re-installation of the motor.