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

1. Installation

TCS does not offer an installation service for the TXM-20 crystal drive. A qualified dealer/installer should be contacted for mounting the TXM-20 on your camera. This entails disassembly of the camera, drilling and tapping holes, and fabrication of mechanical parts.

When properly installed, it should be possible to turn the manual inching knob on the TXM-20 counter-clockwise to advance the mechanism, without tightness or binding. The knob should turn freely.

2. Operation

Power is supplied to the camera and crystal drive by the 4-pin XLR connector on the rear. 12 volts DC is required. Pin 1 is negative (—) and pin 4 is positive (+). **Do not apply reversed DC polarity** as this will blow the fuse and could damage the motor. 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 12.6 volts.

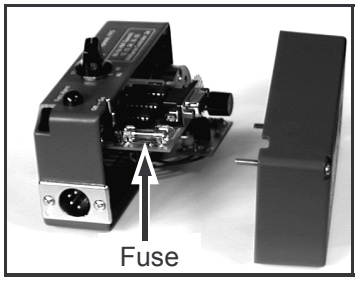
Running **speed** is selected by the rotary 6-position switch on the top. The available speeds are 12, 15, 24, 30, 48 and 60 FPS (Frames Per Second.) 24 FPS is the normal speed in North America for sound filming and projection. 12 FPS will make action appear twice as fast when projected at normal speed. 48 FPS will give slow motion, where action appears half as fast when projected at normal speed. 30 FPS is sometimes used for footage that will be transferred to video and not shown on a regular projector.

All but one of the speeds are 60 Hz **HMI compatible**. These speeds, 12, 15, 24, 30 and 60 FPS, will give flickerless film footage under pulsating lights such as HMI's, fluorescents, discharge type street lights, etc. provided they are powered by an accurate 60 Hz line (mains) frequency. The speeds provided are all not compatible with 50 Hz powered lights. For filming under 50 Hz pulsating lights, you can connect our optional Milliframe Controller to select a 50 Hz HMI compatible speed. If you are filming under **daylight** or high-amperage **incandescent** light any of the speeds can be used at will anywhere in the world.

No harm will be done by changing speeds while running; the new speed should lock in almost instantly. Remember however that a speed change calls for a corresponding lens aperture change.

Running is controlled with the **power switch**. In case the camera has a film jam, be ready to stop the camera immediately to prevent blowing the fuse 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. The internal **fuse**, a 3 ampere GMA (5 x 20mm) 32 volt type, should never blow in normal operation. It protects all circuits from gross faults that could melt or burn the wiring. To replace it, first disconnect the power and remove the two screws holding the outer shell.



At the end of a shot the camera is likely to stop with the shutter open, so you are unable to see through the lens. To reopen the finder for viewing, turn the manual **inching knob** counter-clockwise so the line on the knob is at the top. If you are transporting the camera with film threaded, it is safest to first make sure you are in the viewing position. This keeps the pulldown claw engaged with the film to prevent loop loss owing to

vibration in transit.

Since the spring motor is disconnected when the crystal drive is installed, it can no longer be used, for either continuous run or single frame exposures.

Sound Filming:

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. Camera noise is usually not a factor when filming music videos etc. where the talent is lip-syncing to playback and ambient sound is not being recorded.

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 or TX-9. (The normal condition in North America is 24 FPS with a 60 Hz pilot; in Europe the standard is 25 FPS with a 50 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. 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-20 has a 9-pin D-Subminiature female DE-9 connector for external speed control. This permits running at some 55,000 speeds between about 5 and 60 FPS. This will fit the TCS TMC Milliframe Controller, the TCS TVC Videoframe Controller, and possibly other brands of precision speed control. **The TXM-20 speed dial must be set to "24 FPS"** for correct speeds to be obtained.

The socket provides 12 V as long as the battery cable is connected, giving the required standby power to the controller. The TMC 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.

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 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.

The TXM-20 has +12 volts on pin 6, requires 100 pulses per frame 5 volt digital square wave on pin 3, and negative ground is on pins 5 and 9 and the metal shell. There is no frame pulse output so the footage counter in the TMC^2 Milliframe Controller will not work with this motor.

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.

To conserve video bandwidth and increase the number of available TV channels, video also 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.) 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, again with a 180° shutter opening.

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 Krasnogorsk does not have a 180° shutter opening, so you probably can not successfully film at 29.970 or 14.985 FPS because the resulting shutter bar will be very wide. Also, the Krasnogorsk shutter is very close to the film plane at the bottom of the picture, traveling horizontally, which will give greater difficulty with shutter bar owing to the small penumbra of the shutter edge. The shutter is also driven through multiple gear meshes so there may be increased random variation in shutter timing from one frame to the next.

The best you can do may be to 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. Using the optical splice system, the Milliframe Controller’s “phase” button is not used.

In the following formula, you can calculate the FPS rate if you know your camera’s exact shutter opening, equivalent to about 149º and the video frame rate which is 29.970 in the U.S., 25 in Europe.

$$\text{Filming Rate (FPS)} = \frac{\text{Video Frame Rate} \times 149}{360}$$

Thus, in the U.S., if your shutter is 149° you would film at 12.404 or 24.808 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 scan lines are not too visible.

For filming from a computer monitor you would need to find out the frame rate, generally 60 to 75 on non-interlaced monitors and 30 to 37.5 on interlaced ones, to enter into the above formula. You can establish a frame rate by running the camera without film while looking through the viewfinder in the normal way. Vary the speed to get a stationary shutter bar. This computer frame rate is then entered into the above formula to calculate the optical-splice method filming rate.