

Installing and Using the TCS TXM-21 Crystal Motor for Arri 2A, 2B, 2C

1. Installation. First detach the existing motor by removing the attaching screws and the idler gear, all of which will not be used with the TXM-21.

Place the motor on a table. Gently engage the 35-tooth gear on the camera bottom with the matching interior gear in the motor. (This gear is very flexible owing to a universal joint, and may need to be helped into position with a small stick.) Turn the inching knob slightly while gently jiggling the camera to enable it to slip fully into place. Pass the two long screws through the motor up into the camera, and tighten the two screws. Do not fully tighten the screws until you are sure the motor is flush against the camera and the inching knob turns without binding.



2. Powering. The TXM-21 requires **24 volts DC**. The 3-pin male XLR receptacle uses standard 24 volt “Arri” wiring, that is with pin 1 negative (—) and pin 2 positive (+). If you have two 12 volt batteries, you can make up a Y-cord, with the two batteries wired in series to total 24 volts DC. The motor will not run if polarity is reversed, but it should not be damaged.

A pair of banana jacks can be found on the Right side of the motor near the front. These supply 24 volts DC to accessories such as a zoom motor. They are protected by the 5 Amp fuse but the accessory could be damaged if reverse polarity DC is applied to the XLR receptacle. Do not connect any accessory if the motor will not run, as this may be a sign of reversed polarity.

3. Maximum & Minimum speeds. The highest speed included is 50 FPS (frames per second.) If your camera mechanism is worn and has play in the cam, however, you may not get a steady picture above 30 FPS (this is no fault of the motor.) We suggest not filming at speeds below 24 FPS for critical use as you may see some exposure non-uniformity. Run tests to determine your acceptable range.

4. Basic Operation. The camera is started and stopped with the “**RUN - STOP**” rocker switch. No current is drawn in STOP, except that a Milliframe Controller, if connected, will draw a small standby power and other accessories can draw their normal current.

a. The speed of the TXM-21 is selected with the six-position rotary switch. The available speeds are 12, 24, 25, 30, 40 and 50 FPS. If you change speed, remember to also change the lens aperture.

60 Hz HMI speeds are 12, 24, 30 and 40 FPS.

50 Hz HMI speeds are 25 and 50 FPS.

b. When illumination is daylight or high-amperage tungsten lights, you can film at any speeds you like. Also, there is no harm in changing speed while running.

c. If the camera stops running with the viewfinder dark, use the camera’s **inching knob** on the side. Turn it clockwise to restore the viewing position.

d. The “**Sync Alarm**” light will come on any time the motor is not running at the selected speed. It is normal for it to come on briefly at the beginning of a shot, and to flicker slightly when running below 24 FPS. An occasional slight flicker means the circuit is working hard to maintain sync, but has not actually lost sync. It is normal for a dim light to appear when using the Milliframe Controller.

5. External Speed Control. Connecting a TCS “**Milliframe Controller**” will automatically make it the reference for controlling the speed. Connection is by the RJ-12/RJ-45 socket on the Left side of the motor. The speed switch on the motor is totally inactive with an external reference, and can be left in any position. The “Sync Alarm” light on the motor will show whether the externally selected speed is being maintained. External speeds should be kept within the range of about 1 to preferably 50 FPS (60 FPS with a high speed movement camera, and at your risk.) As previously mentioned, the best results may be obtained in the vicinity of 24 to 30 FPS. The Sync Alarm light may give a constant or slightly flickering dim indication when using the Milliframe Controller, and this should be disregarded.

The TCS Milliframe Controller should receive power for a few seconds before the motor is started in order to stabilize its output. No standby switch is provided because of the small current drain of the Milliframe Controller, about 25-50 mA (.025-.050 Amp.)

The Run-Stop switch on the TMC or TMC² Milliframe Controller can be used for remote control of the camera. For this application, leave the motor Run switch turned on; when the Milliframe Controller is in the Stop position, the camera will be stopped and the Sync Alarm will light. (When stopped by remote control, the current drain is 75 to 100 mA (.075-.100 Amp.)) The TXM-21 has a digitally synthesized frame pulse output so it will actuate the footage counter in the TMC².

For filming from a video or computer monitor, the speed of the external controller is set so as to get a stationary shutter bar. 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 the director can call “Action!”

6. Filming In Reverse. A two-position rotary switch selects forward or reverse filming. (Note that the footage counter in the TMC² will still count “up” even while running in reverse. Make notes to avoid confusion.)

WARNING: Never change this position while running. It is likely to **permanently damage** the motor and camera, as well as burn out other components. This damage is not covered by warranty.

7. Application Notes for sound filming:

a. Your Arri 2A-B-C is not a self-blimped quiet camera, so for successful sync sound filming you may need: a directional microphone and sound-absorbing walls; to use a blimp or barney indoors; to film outdoors at a distance; or to film through a window. Of course, to shoot a music video etc. where the performers are miming to playback and no audio is being recorded, camera noise is not a problem.

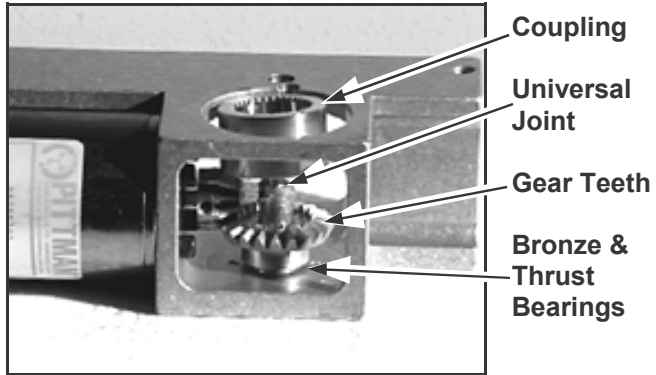
b. Choice of filming speeds:

Traditional sound speeds are **24** FPS used in North America, and **25** FPS in Europe and much of the world. The **30** FPS rate is popular for film that is to be transferred to U.S. HDTV video, as it eliminates “judder,” an irritating 12 Hz irregularity in the strobing of moving objects arising from the so-called “2-3 pulldown” for digitally converting 24 FPS film to 30 FPS video. The audio recorder such as a Nagra or cassette must be equipped with a crystal sync generator to record a pilot signal (a timing or speed reference) on the recorder’s pilot or spare audio track. (Suitable crystal sync generators are also manufactured by TCS.) This tape is then resolved (i.e., transferred in sync) to 35mm perforated magnetic film, at the same speed as the picture, for editing.

It is also possible to have the sound on DAT (digital audio tape,) CD (compact disk,) or on Hi-Fi video tape such as 8mm, Hi-8, VHS, etc. Since these formats automatically record a control track that is locked to the same crystal on playback, acceptable sync can usually be maintained by simply re-recording to magnetic film without any special equipment. The magnetic film recorder is run at the same speed as the filming rate (24, 25 or 30) preferably locked to a crystal rather than the power line (mains) frequency, which can vary somewhat. Since general purpose audio equipment is not adjusted as accurately as equipment intended for double system sound, the best sync will be obtained by playing the digital or Hi-Fi tape back on the **same piece** of equipment (not just the same model) as was used in the

field. The picture and sound rolls can then be edited to make film prints, or interlocked together for transfer to video.

8. Maintenance. The TXM-21 has metal gears that should be lubricated once in a while to minimize wear and noise. The moving parts can be reached by detaching the camera and removing the 6 screws that hold the lid in place. With care, it should be possible to lubricate the drive train without removing the motor & gear block. Disassembly is not recommended.



The **coupling** that engages the camera's drive gear can have its teeth brushed with a small amount of grease. This will reduce the chance of causing wear to the camera gear.

The **universal joint** should have a little grease packed into it; if it looks dry add some with a small stick.

The **gear teeth** should have a thin layer of grease painted on them with an "acid brush" or similar stiff brush. If the motor gear is hard to reach, greasing the vertical-shaft gear will suffice. Turn the coupling by hand so you can reach all of the teeth.

The **sintered bronze & thrust bearings** should have about one drop of SAE 30 oil added to the shim washer(s) underneath the vertical-shaft gear. Running the motor slowly should draw it into place as needed.

Use a rag to mop up any excess oil and grease inside the TXM-21 case. Replace the lid and screws.

9. In Case of Difficulty.

Fuse. The TXM-21 has a 5 Amp GMA (5 x 20 mm) 32 Volt or higher standard fuse. It should blow in case of a film jam or other gross fault. The operator should, however, be alert and ready to turn off the power instantly in case of a film jam. The fuse may not act rapidly enough in every conceivable situation to prevent all possible damage to the motor and camera.

Rough Running Without a Camera. The TXM-21 is designed to be run only with the camera attached. Without a camera, the motor will overshoot and take a while to reach crystal speed, and the flexible camera drive coupling will rattle, causing the out of sync light to flicker.

10. (for technicians) Milliframe Controller connections. An RJ-12 6-conductor cable is used to connect to the Milliframe Controller. Pin 1 is +12 to +24 volts depending on load current, pin 2 is open for internal crystal or ground for external reference, pin 3 is 100 pulse per frame input, pin 4 is ground, pin 5 is 5 volt frame pulse output, and pin 6 is ground.

Other accessories might use all 8 positions in the socket using an RJ-45 8-conductor cable. In this case, pin 1 is +5 volts low current, 2 is +12 to +24 volts, 3 is open for crystal or ground for external, 4 is 100 PPF input, 5 is ground, 6 is frame pulse, 7 is ground, 8 is direct 0~5 volt input to pulse width modulator for special uses. Ideally do not use an 8 conductor cable unless pin 8 is connected.

Tobin Cinema Systems, Inc.