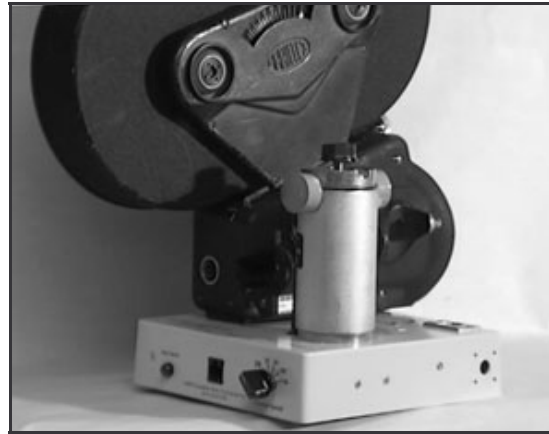


Installing and Using the TCS TXM-21Ab Crystal Motor for Arri® 2A, 2B, 2C

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-21Ab. Place the camera and motor on a pillow or cushion with the camera and motor fronts facing up. Gently engage the 35-tooth gear on the camera bottom with the matching internal-tooth gear sleeve in the motor. This sleeve is very flexible owing to a universal joint, and may need to be helped into position. Turn the inching knob slightly while gently jiggling the camera to enable it to slip fully into place. Start the two captive screws going through the motor top plate up into the camera, and tighten them gently.

Do not fully tighten the two screws until you are sure the motor is flush against the camera, and the inching knob on top of the motor turns without binding.



2. Powering. The TXM-21Ab requires **24 volts DC**. The 3-pin male XLR receptacle uses Arri standard wiring, that is with pin 1 negative (—) and pin 2 positive (+). **Do not apply reversed polarity, such as with a cable wired for use with Panavision cameras.** This can cause damage to the motor and to connected accessories even with the run-stop switch turned off. Reverse polarity or overvoltage damage is not covered by your warranty.

☞ If the “Polarity” light shows **GREEN** the battery wiring is correct.

☞ If the “Polarity” light shows **RED**, the battery connections are reversed. Do **NOT** try to run the camera, and do **NOT** connect any accessories, as damage will likely result.

☞ If the “Breaker” light is lit when you connect an accessory or try to run the camera, this means that an overload condition (film jam, reversed battery) has tripped the internal circuit breaker. Correct the fault, unplug the power cable for a few minutes, and the breaker will automatically reset.

If using **line-operated power supplies**, be aware that often the earth ground is connected to the negative DC output pin, if the power cord has a 3-wire grounding type plug. This is not normally a problem and will drain off any static electricity.

Do not apply **overvoltage** or extreme **undervoltage** as it will cause excess heating and component damage.

A **Fischer 11-pin** socket may be found on the **front** as an optional extra. This supplies 12 volts DC for an accessory such as a zoom motor. This is not equipped for speed control.

An additional **Fischer 11-pin** socket might be found on the **operator side**. This is an optional extra; this socket and an added circuit board accepts Fischer plug external speed controls, instead of using the RJ-12 socket normally found on the rear panel. Maximum total drain from the two Fischer sockets is 0.5 amp.

The TXM-21Ab has pre-drilled and tapped holes for mounting one or two **Rosettes** for handgrips or other accessories. These attach with #4-40 flat head machine screws.

3. Maximum speed. The highest speed included is 50 FPS (frames per second.) If your camera mechanism is worn and has play in the cam, and the standard pressure plate is installed, you may not get a steady picture around 30 FPS. This is no fault of the motor. Steadiness at high speeds may improve if you install the High Speed pressure plate. Run tests to determine your personally acceptable speeds.

4. Basic Operation. The camera is started and stopped with the **rocker switch** at the front of the left side. If the camera stops with the viewfinder dark, turn the **threading knob** on top of the motor counter-clockwise to advance the mechanism and re-open the finder. You will find that the top knob is much easier to turn than the one on the

side of the camera.

A **Milliframe Controller**, if connected, will draw a small standby power and other accessories can draw their normal current. The optional Fischer speed control sockets will draw a small current with nothing plugged in.

The motor **brush holders** are protected from normal handling by plastic covers, but do not strike and thereby damage them. Avoid subjecting the TXM-21Ab to dirt, salt spray, fumes or moisture.

The **speed** is selected with the rotary switch at the rear. The available speeds are 12, 24, 25, 30, 40 and 50 FPS. If you change speed, remember to also change the lens aperture accordingly.

- **60 Hz HMI** speeds are 12, 24, 30 and 40 FPS.
- **50 Hz HMI** speeds are 25 and 50 FPS.

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

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.

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 rear of the motor. The speed switch on the motor is totally inactive with an external reference, and it can be left in any position. With the optional side Fischer socket installed, plug the speed control into this instead.

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 12 to 50 FPS.

The TCS Milliframe Controller should receive power for at least 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 is usable for remote control of the camera when using the **RJ-12 socket**, but this is not recommended as the motor will take a relatively long time to get up to speed. For this application, leave the motor rocker switch turned on; when the Milliframe Controller is in the Stop position, the camera will stop and the Sync Alarm may light.

The TXM-21Ab has a digitally synthesized frame pulse output so it will actuate the footage counter in the TMC². If an excessive speed is called for, which lights the Sync Alarm, the footage count will be greater than the film length actually used.

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!" Note that if your camera's rotating mirror has a black stripe on it, there will be an additional false shutter bar seen in the finder that will not actually appear on the film. Run tests to determine which is which.

Note that the Arri Model 2A camera has a narrower shutter opening than the other models and will, therefore, give a wide and dark shutter bar on the film where you see a wide and light shutter bar in the finder.

6. 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 one or more of: a directional microphone and sound-absorbing walls; to use a blimp or barney; 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 such a problem.

b. Choice of filming speeds: Traditional sound speeds are **24 FPS** used in North America and for theatrical filming worldwide, and **25 FPS** in Europe and much of the world for television filming. The **30 FPS** rate is also used for film commercials that are to be transferred to U.S. 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. However, be very careful about selecting this speed for theatrical length material, as many video standards conversion schemes assume that film is always shot at 24 FPS, so 30 FPS film may give odd

artifacts. Theater projectors generally run only at 24 FPS.

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,) MiniDisc, 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 in the short term. 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.

If the magnetic film recorder is omitted and the film and audio are transferred directly to video or to a computer file for editing, be aware that NTSC film scanners actually run at 23.976 FPS and this difference must be taken into account to keep picture and audio in sync. The lowest cost solution, if your audio will be on DAT, CD, MiniDisc or Hi-Fi video tape, may be to actually film at 23.976 FPS, which eliminates special sampling rate and time code frequencies while recording, as no "speed pulldown" of the audio is then required. However, 23.976 is not a fully HMI safe filming speed, though it should be acceptable with a square wave or high frequency HMI ballast, or of course with daylight or with high-wattage tungsten lights. 23.976 FPS can be achieved by connecting the TCS Milliframe Controller, or the lower cost Videoframe Controller.

7. Maintenance. The TXM-21Ab has permanently lubricated (in theory) porous bronze and ball bearings. Re-oiling may however be appropriate after long and heavy use. The actual motor's ball bearings will not need lubricating unless they start to squeak, which could take years.

The **gear sleeve** that engages the camera's 35-tooth drive gear can have its teeth brushed with a small amount of grease. This will reduce the chance of causing wear to the camera's gear. This requires removal of the camera.

The **bronze bearing** inside the gear sleeve should have about one drop of turbine or SAE 30 oil added to the shaft inside the gear sleeve, which you can see with the camera removed. Oil the ball bearing on the top end of the motor only if it is squeaking. Do not over-oil the top motor bearing as this can contaminate the brushes.

Remove 8 screws and the motor bottom plate to reach the following:

The **timing pulleys and timing belt** could perhaps benefit from applying a light amount of a friction-reducing Teflon®-containing spray lubricant, sprayed on to a cotton ball, and the moistened cotton then rubbed on the teeth. Turn the threading knob by hand so you can reach all of the teeth.

The lower end of the motor ball bearing can benefit from a drop of oil, only if it is squeaking.

Note: Do not run the motor with the bottom plate removed as this creates the risk of getting your fingers or hair caught in the belt and pulleys, with consequent personal injury.

Use a rag to mop up any excess oil and grease. Replace the bottom plate and screws.

The motor brushes, or the motor, may need replacement after an estimated 10,000,000 feet of film.

8. In Case of Difficulty.

Fuse. The TXM-21Ab does not have a fuse; instead it has a self-resetting 6 amp PTC (positive temperature coefficient) circuit breaker-like device. If the "Breaker" light is lit when you connect an accessory or try to run the camera, this means that an overload condition (film jam, reversed battery) has tripped the internal circuit breaker. Correct the fault, unplug the power cable for a few minutes, and the breaker will automatically reset.

9. (for technicians)

Milliframe Controller standard connections: An **RJ-12** 6-conductor cable is used to connect to the Milliframe Controller. Pin 1 is positive unregulated supply voltage (12 to 24 depending on loading), pin 2 is open

for internal crystal or grounded for external reference, pin 3 is 5 volt 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 positive, 3 is open for crystal or grounded 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 speed control circuit for factory calibration and special uses. Ideally do not use an 8 conductor cable unless pin 8 actually needs to be connected, or the running speed can become erratic.

Fischer connections for optional front socket: Pin 11 is 12V positive and pin 9 is negative. The other pins are not connected on the front socket. This socket is used for a lens accessory and not for a high current load.

Fischer connections for optional side socket: Pin 11 is 12V positive, pins 1 and 9 are negative, pin 8 is 3200 pulse per frame 5 volt signal, pin 7 is remote run, pin 5 is open for internal crystal or grounded to enable external control, pin 2 is 1 pulse per frame 5 volt synthesized pulse for the footage counter. This socket is used for speed control and not for a high current load. Maximum total current drain from the two Fischer sockets is 0.5 amp.

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TXM-21Ab Instructions.pub rev 2004/01/20