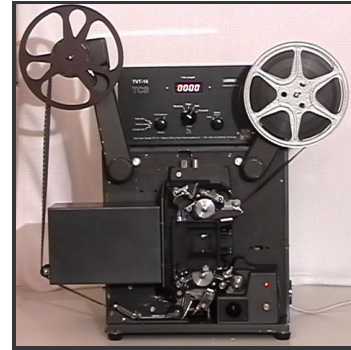


TVT-16 Tobin Video Transfer

Basic Operation

Turn on the power with the switch on the right rear of the TVT-16. Check that the left-hand switch is in the “Peak Auto” position, the knob to the right of it is in the upper “Auto” position.

Switch the unit to “Still” and note that there are no hairs or lint visible in the picture on the underscanned video monitor. (Because of the enlargement they may look like logs or trees.) If there are any, swing open the film gate (being careful to not contact the blades of the small cooling fan) and brush or blow out the hairs. Switch back to “Stop” and close the film gate.



If the film has an optical sound track on it, turn the Sound Lamp switch to On. If the film is silent, you can turn the switch Off to extend the life of the sound lamp, and eliminate extraneous noises from being heard in the audio.

The badge of the Control Box indicates the actual speeds to be obtained in the Silent and Sound positions of the “Speed” switch. Machines sold in North America have two speeds, 15 FPS* Silent speed for old home movies or historical film, and 24 FPS Sound speed for modern commercial film. Machines sold overseas have 16-2/3 Silent and 25 FPS Sound speeds available. If the film needs to be transferred at Sound speed, this does not necessarily imply that it actually has a sound track. Film that needs to be transferred at Silent speed will normally never have a sound track.

Additional “NTSC” and “PAL” designations on the badge show the video standard for which the machine is made. NTSC is used in the USA, PAL is used in Europe.

* These displayed speeds are rounded for convenience. The actual North American speeds are governed by the NTSC video rate and are 14.985 and 23.976 FPS respectively. (FPS = Frames Per Second.)

Place the full reel of film on the right-hand “Supply Reel” spindle, matching up the square side of the reel center hole with the square inner portion of the reel spindle. If the reel is correctly prepared, the perforations (sprocket holes) in the film will be towards you, with the emulsion side (the side with the picture) usually facing to the right, while the film is hanging down from the right-hand side of the reel. There should be about 6 feet (2 m) of leader before the first picture. If any of this is not the case, return the film reel to the preparation department for correction. (A film print or duplicate may have the emulsion facing to the left instead.)

If the leading edge of the film has not yet been trimmed, use the Film Trimmer ② on the right side of the sound lamp cover. If it is excessively bent or curled, flatten it.

Push the Autoload lever ③ towards the right until it locks into position.

Start the TVT running Forward. Insert the film leader into the film channel ④ until it engages the sprocket.

After about 3 feet (1 m) of leader has passed completely through the mechanism, turn to Stop. Pull on the leading end of the leader until you hear a “click” and the Autoload lever ③ jumps back to its left position.

An empty takeup reel of the appropriate size must be installed on the Takeup reel spindle. A 200' (5" diameter) reel can be installed with the takeup arm horizontal. Larger reels, up to 2300' (15" diameter) capacity, must be installed with the takeup arm in the raised position.

Attach the film to the takeup reel, turning the reel clockwise a couple of turns.

If there is any doubt about proper threading, turn the Manual Advance knob counter-clockwise a few turns to ensure that the film advances intermittently through the film gate.

Switch to "Forward" to preview the film. It should be right way up (people's heads and the sky at the top). The frameline (the dividing line between pictures on the film) should not be visible; if it is, adjust the "Framer" lever while running, until it is not seen. Movement of action on the screen should appear to be at a natural rate, and the sound (if any) should be with normal pitch and pacing. If not, try the other speed.

If the film is double perforated (sprocket holes on both edges) it will of course not have a sound track. If it is original home movie film, the emulsion side will be to the right. If it is a duplicate or film print, the emulsion side could be facing either way and be correct. If you are unsure, look to see if writing on signs or titles reads correctly, and which side of a shirt or coat has buttons on the usual side (right for men, left for women.) If the film needs to be flopped, the safest thing is to return it to the rewind bench for correction, rather than running with a twist, which will overstress the splices or cracked film edges and perhaps cause them to fail or tear.

Switch to "Reverse" and run until the picture is all back on the supply reel and there is about 2 feet (.6 m) of leader film between the supply reel and the film gate, then switch to "Stop." Push the "Reset" button to zero the footage counter. Note that in Reverse the image will have jitter and ghosting; this is normal as the shutter is correctly synchronized only in Forward.

Start the video recorder. Switch the TVT-16 to "Forward" and you will be recording the film on video.

The film should be inspected, repaired and cleaned before it comes to you for transfer. In case a bad splice or more than two damaged perforations in a row causes loss of the film loops, this will cause the automatic loop restorer to trip and reset the film loops to normal. (The automatic loop restorer does not function when running in reverse.) If this doesn't work, press the Systems Restorer bar firmly for at least one second, to re-establish the normal threading. As a last resort, turn to "Stop" and also stop the video recorder. Unthread the film and repair this section. Then resume the transfer. For a high grade transfer, running the repaired film should resume from an earlier scene change in the film, doing a video "assembly edit" using a video recorder with a flying erase head. Note that it may take a few feet for the picture to become steady, with the film pulldown synchronized to the shutter and with the sound clear and free from startup flutter, so back up the film to a few feet before the start of the desired scene.

If the film misthreads and fails to enter the film gate, or a splice breaks at the upper sprocket, the film leading edge will pass upwards through a trap door just to the left of the upper sprocket, instead of jamming and buckling in the mechanism and suffering damage. If this happens, stop the machine, correct the problem, and resume.

If old film is badly shrunken and becomes too tight at the sound drum and sounds noisy on the sprocket teeth, open the lower sprocket guard on the bottom sprocket, and tease the film off the sprocket teeth allowing it to jump one tooth to the right. Close the sprocket guard.

At the end of the film, switch to "Stop" and stop the recorder. Record the film length count for billing purposes, if your company charges by the foot or meter.

If taking up on a 200' reel, raise the rear arm to the upper position for rewinding. Attach

the end of the film straight across to the supply reel, without going through the sprockets and gate, and turn the empty reel a couple of turns counter-clockwise. Switch to Reverse, and push down the Rewind button to engage faster running. When the film is fully rewound turn to Stop. Remove the supply reel after it stops turning, and you are now ready to transfer the next reel.

Installation

Connect the TVT-16 machine to a suitable video recorder. This is often a Mini-DV (digital video) or else DVD (digital video/versatile disc) recorder, or less commonly these days a VHS (video home system) machine. There are two video output jacks on the back of the camera housing. Both can be used at the same time if desired:

- The S-Video (“Separate”-video) Y/C output may give a cleaner video signal in many cases, as the luminance (brightness or Y) and chrominance (color or C) signals are sent through separate wires and will not interfere with each other, and thus not cause odd artifacts to appear in the picture. This preferred connection is with the Mini-DIN 4-pin cable.

- The conventional video output is used in case the recorder lacks an S-Video input. The jack is a professional BNC type, so use the BNC cable to connect to commercial video equipment. Use the BNC to RCA phono type cable, to connect to consumer equipment.

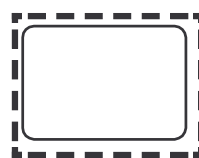
There are two audio output jacks. The upper one is a 3-pin XLR and has an electronically balanced signal for connecting to professional and broadcast equipment. The lower one is an RCA type “phono” jack primarily for connecting to consumer and duplicating equipment. Both are at line level. Since film audio is monaural, if sending to a stereo capable recorder, use the furnished Y-cord to feed the audio into both channels.

Plug the TVT-16 into a source of 100 to 240 volts AC (alternating current) at 50 or 60 Hz (Hertz, or cycles per second.) For safety the third wire should be grounded (earthed.) Turning on the unit will cause the footage counter to light up, and for video black to be output.

Monitoring

A color video monitor should be used to help you best oversee the transfer operation. We recommend that the picture monitor be connected to the output of the recorder, so the tape or disc playback can be spot-checked for quality. We also suggest the use of an “Underscan Monitor” which enables the entire video signal to be seen by the operator. Such a monitor can be recognized by an Underscan-Normal switch. (In the underscan position, the active video area is bordered with black.)

This is because ordinary monitors and TV sets have varying degrees of “overscan.” The picture is larger than the picture tube, so the edges are cut off. The amount of underscan is not well standardized, may not be centered, may be out of adjustment, and may hide defects that could be seen on a different TV set. For example, the film may be out of frame so that the frameline is visible on some receivers but not others. Or, a piece of lint may be lodged on the edge of the aperture and working its way into the frame. To guarantee that the frameline or



Conventional TV
or Monitor Cuts
Off Picture



Underscanned
Monitor Shows
All The Video So
No Surprises

hairs will not be visible to anyone, no matter how their TV set may be adjusted, the transfer process should be watched with an underscan monitor so the entire video signal can be seen. There can be small artifacts on the extreme edges, such as dirt specks stuck to the aperture, which will not be a problem as the customer will not see the entire video frame on his TV set.

When demonstrating the process or results to the public, the monitor should be switched back to the Normal position to prevent misunderstandings or long explanations.

If an Underscan monitor is not available, you can manage with one having Pulse Cross (Pulse Delay.) This puts the corners of the picture in the middle of the screen. It is possible to use this function to check for framing and hairs although it is less convenient.

It is also possible to use a device called a Line Doubler, and a conventional SVGA computer monitor with size adjustments, to accomplish a similar underscanned result instead of buying a more expensive underscanning video monitor. This may give a slightly better picture, with less operator fatigue. However, there will not be a single button for switching between the underscan position and normal, and the left or right edge of the picture may be missing some of the area that would be visible on a true underscanned monitor.

Other Needs

Film will be received from the public in various states of disrepair, with bad splices, winding turned over on the reel, being mounted on the wrong type reel or the wrong way out, no leaders, etc. and a facility must be provided for making the footage ready for transfer. This requires at the minimum a pair of film rewinds, a supply of film leader and empty reels, a film splicer, and a way of cleaning excess dirt off the film. Ideally there will be a light box for looking through the film, and a light above the editing bench to reflect light off the film.

Refer to the first section of these instructions for a description of how the film should be wound on the reel. There should be 6 feet of leader on the start for proper threading of the TVT-16, and enough leader on the end to thread the film cleaning device. Torn film sprocket holes and crooked splices should be removed to prevent transfer problems.

Small rolls should be spliced together for efficient transfer. A properly made cement splice, using fresh cement, is preferred. The smoothest transit of splices occurs when you have made a beveled splice using an (unfortunately discontinued) Agfa or Bolex splicer, where the total thickness at the splice is about the same as unspliced film. When making tape splices, ensure that the sprocket holes are not covered up and the tape is on straight, on both sides of the film.

We suggest using 400 foot (122 meter) reels, and cans or 7" size white boxes. Usually if 8 small 50' rolls of 16mm magazine film, or 4 small 100' rolls of spool-loaded film, is wound on each reel, this will just fill the reel. At Sound speed, 5 of the 400' reels or at Silent speed 3 of the 400' reels should fit on each 1 hour tape or disc with minimum waste and no need for time-consuming tape editing or overlaps. Mark the leader on the head (beginning) of the reel with the customer's name or job number, and the reel number, to avoid mixups. Leader with a matte finish can be written on with pencil, while shiny leader can be marked with a Sharpie or India ink. Ensure that that the cleaning step does not remove the reel identification. Storage cans should be ventilated for slight air circulation, to prevent film deterioration from "vinegar syndrome." Advise the customer to keep his film in a cool, dry, dark place to prevent fungus growth. You want the film to be in good condition so you can transfer it again when the next

super generation of video equipment formats makes the present transfer obsolete. :-)

If the film is double perforated, you should splice on double perforated leader, unless you are sure you know which edge is which. If the reel contains any single perf film, the leader must likewise be single perf, on the same edge, to prevent damage that would occur if the film were to be threaded up with the “wrong” perf edge using double perf leader.

After each reel is spliced and repaired, it is rewound through the film cleaner device on to the proper reel, which restores the reel to being heads out instead of tails (foot or end) out, and sent to the transfer room. Note: When using a liquid cleaner, view the rewinding film by reflected light to make sure it is dry again before it is wound up, or else the film may dry with “shoreline” marks on it. You can wind quite fast if not using an excessive amount of solvent.

The cleaning fluid should have a small amount of wax dissolved in it to provide lubrication for smooth transport through the TVT-16 or through the customer’s projector. A suggested amount is a lump of candle wax or beeswax the size of a pea ground up and dissolved in a pint (half litre) of solvent. Cleaning solvents that are widely used include methyl chloroform (*toxic fumes*), perchloroethylene (dry cleaning fluid) (*toxic fumes*), Freon TF (*ozone depleting*), or 91% or higher isopropanol (isopropyl alcohol) (*flammable*). There are also commercially mixed film cleaners with lubricant. Cleaning must take place in a ventilated area.

Exposure Correction

The automatic correction uses your choice of Peak or Center-Weighted Averaging sensing, for optimum results from a variety of original moderate over- and under-exposure conditions. This is selected with the Peak - Manual - Average switch to the left of the rotary Auto - Manual knob. Peak sensing is recommended for reasonably well-composed film, maintaining the mood of the film. Average sensing is used for film that is strongly backlit (shooting into the sun) or that is dark and also has a light source (movie light or bright window) near the edge of the screen, or that is very badly overexposed. A minimum brightness level can be set with the Manual knob, to prevent over-reacting to flashbulbs going off and the like.

For transferring a professionally exposure timed and color corrected release print, the exposure should be set manually and usually will not need to be adjusted during the reel. This will avoid unpleasant effects when the picture has fades to and from black.

Theory of Operation

The **conventional (i.e., not TVT-16)** means of film to video transfer uses a projector with a specific number of shutter blades, attached to the mechanism and rotating with it. One blade is used to obscure the film while it is being quickly pulled down to the next frame; additional equal blades are used to get the desired interruption rate, which must be a whole multiple of the video field rate. The blade complement might be either 2, 3, 4 or 5, depending on speed and video standard. That is, for 24 FPS (frame per second) transfers to NTSC (USA type) video the projector will have 5 blades. For running at 15 FPS you would need 4 blades. This type machine will usually give more or less flickerless results at only one speed. Some old equipment requires that the operator frequently tune the speed to minimize flicker and complaints. Usually the running speed is quite inaccurate compared to the original amateur filming rate, leading to complaints. Lamps for the picture are expensive and can be hard to find, and frequently burn out. The unit has no, or a poorly performing, exposure correction ability,

leading to complaints.

In the **TVT-16** however the shutter is separate from the mechanism, permitting a selection of running speeds to be offered. These fixed speeds are crystal controlled, eliminating any need for an operator speed adjustment that can drift. Scanning is Frame By Frame in real time, so film frames are not blended together on any video field, and no computer is needed.

16mm amateur and historical film was mostly shot at 15-16 FPS, while semi-professional users might have filmed at 24 or 25 FPS. All of these films can be run at close to the correct speed.

NTSC (USA video) TVT-16 machines run at 15 FPS in Silent speed, and 24 FPS at Sound speed. (See note * on page 1 for precise speeds.) In effect, the shuttering is 4 blade at 15, and 2-1/2 blade at 24 FPS with the professional 2-3 pulldown cycle as on expensive scanners.

PAL (European video) TVT-16 machines run at a precise 16-2/3 FPS in Silent speed, and 25 FPS at Sound speed. In effect, the shuttering is 3 blade at 16-2/3 and 2 blade at 25 FPS.

It does take a few seconds for the mechanism and the shutter to lock together, primarily at Silent speed, so there can be jitter or travel ghosting until it stabilizes. Having a few feet of leader before the picture starts will prevent startup jitter from being visible. Jitter and ghosting may be seen when running in Reverse as the shutter and mechanism are then not properly phased. Their synchronization is optimized for running Forward only.

The light source is a special wide-spectrum white LED (light emitting diode) array that should last for years. The output is of all wavelengths of visible light, and there is little or no IR (infrared) or UV (ultraviolet) radiation present to heat, fade or burn the film. Its brightness is controlled to even out badly exposed film. (There is however no hope for the very worst film you will see!) A cooling fan keeps the array operating at maximum efficiency.

Other Information

The TVT-16 has a “Mechanism Hours” timer to measure how long the drive motor and the mechanism have been running. This advances in Forward and Reverse. The count is remembered without need for batteries when the unit is turned off. A time interval for servicing the drive motor and mechanism has not yet been established.

Sound Lamp replacement: Turn the power off. Loosen the thumb screw holding the lamp cover in place. Pull the cover straight out and note the alignment pins. Swing the lamp lock lever counter-clockwise to release the lamp, and rotate the lamp so it will lift off.

Scrape the center contact of the new lamp lightly with a screwdriver or knife to remove any oxidation. Clean any dust or fingerprints off the glass bulb. Place the lamp over the guide pins, which are unevenly spaced so the lamp will only fit one way. Turn it clockwise to the stop. Rotate the lock lever clockwise to clamp the lamp in position. Replace cover.

The TVT-16 uses a type **BAK** (which ANSI code fully specifies a 4 volt .75 amp T-5 single contact prefocus C-6 filament Krypton gas filled lamp.) It is also possible to use the type **BRS** which is almost the same but without the gas filling so it will not last as long. These are the same as used in most Bell & Howell 16mm Filmosound projectors.

Service adjustments:

- After long use, the white balance of the LED and camera module could change. To reset the white balance, turn

to “Still” and “Auto” without film but with an 0.7ND neutral filter in the light path and observe the output signal with an oscilloscope or waveform monitor. Adjust the R and B (red and blue) pots in the camera module, for minimum chroma carrier, preferably from the S-video “C” output. Be very careful with the tiny pots as they are easily damaged or torn loose from the circuit board.

- Automatic exposure setting should be quite stable. Current optimum factory setting is .90 volts p-p with no film in the gate. Average film will then reach about 100 IRE while “all white” overexposed film will peak around 85 IRE. The “Average” setting is for .65 volts with no film. Voltage readings are peak to peak, and will be double if measuring an unterminated output.
- In case of replacing the timing belt, it will be necessary to reset the “Shutter Phase” selection jumpers. While running film Forward, try changing the jumper positions one at a time in sequence. Pick the phase number that gives the best safety margin against the jitter and ghosting of other positions. The bottom set of jumper pins is for Silent speed, the middle is for Sound speed, and the top set is reserved.
- Focus, centering, magnification and all camera module settings are factory set and locked in place, and should not be disturbed. Camera setup switch settings for NTSC are normally: 1, 2, 3, 4 on and the rest off.
- In case of odd symptoms, first check the output voltage of the switching power supply modules. These should be +5, +12, -12 and +24 volts DC, $\pm 5\%$. The voltage should change little no matter what settings are made to the operating controls. The 24 volt supply may sag momentarily while the drive motor starts running.
- If dust accumulates on the optics it should be removed with a clean camel’s hair brush or air blower. Fingerprints must be removed immediately with lens cleaner and lens tissue, following the instructions included with them. There should be no need to dismantle the light source module.
- Sound gain adjustment: With the sound lamp on, and no film threaded, adjust the pot on the Preamp Board for +0.5 volts at the center terminal of the pot. From a normal track this will give a Balanced output of 8.8 volts p-p and an Unbalanced output of 2 volts p-p, maximum signal. These correspond to levels of +4 dBu and -10 dBv.

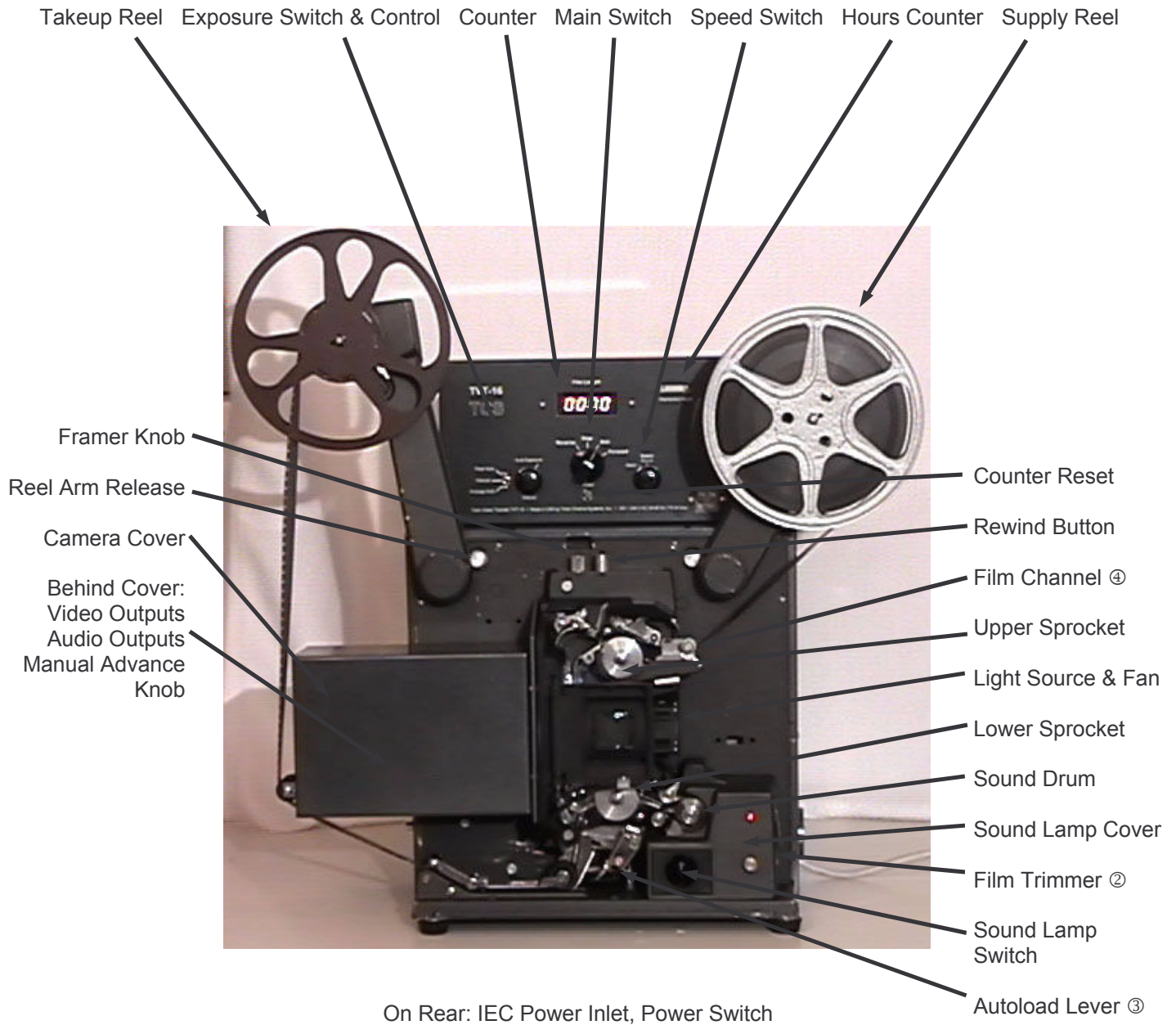
Suggested Sources of Supplies

16mm 400' reels in boxes of 128 pieces, also large reels to 2300' in quantity only:
Tayloreel Corp. www.tayloreel.com 770-503-1612

Kodak White Movie Leader in 1000' rolls on core: Double perforated # 800 1901, Single perforated # 821 0445
(For the above you might want to buy a 1200' split reel or two for safe handling.)
Kodak Professional Film Cement 16 oz: # 195 6176, 1 gallon: # 195 6150, both plus \$20 hazardous shipping fee,
also adhesive Presstapes are still available but the splicers must be obtained elsewhere.
Kodak ordering toll-free number: 1-800-621-3456 (1-800-621-FILM)

Christy’s (equipment, leader, reels in small quantity) 800-468-6391
Neumade (manufacturer of rewinds, leader) 203-270-1100
MPE (equipment, leader, reels in small quantity) 212-245-0969
Starex (leader) 201-997-1555
FCA (leader) 818-845-7651

ECCO makes a film cleaning device that is mounted between a pair of rewinds. These are sold by several dealers. Film cleaning fluid is made by several companies or else you can use Freon TF, 99+% isopropyl alcohol, etc. with a small amount of wax dissolved in it for lubrication. See the previous Preparation section.



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