

# **Small Gauge Projection and the Art of Projector Maintenance and Repair**

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This workshop was sponsored jointly by the Small Gauge Amateur Film Committee and the Projection and Technical Presentation Committee.



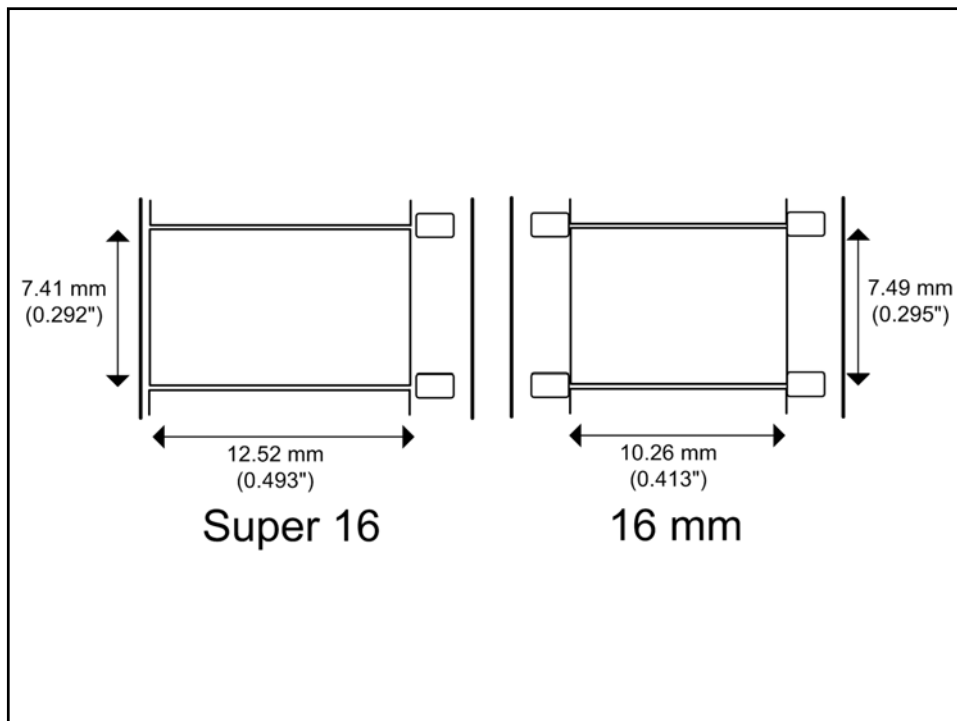
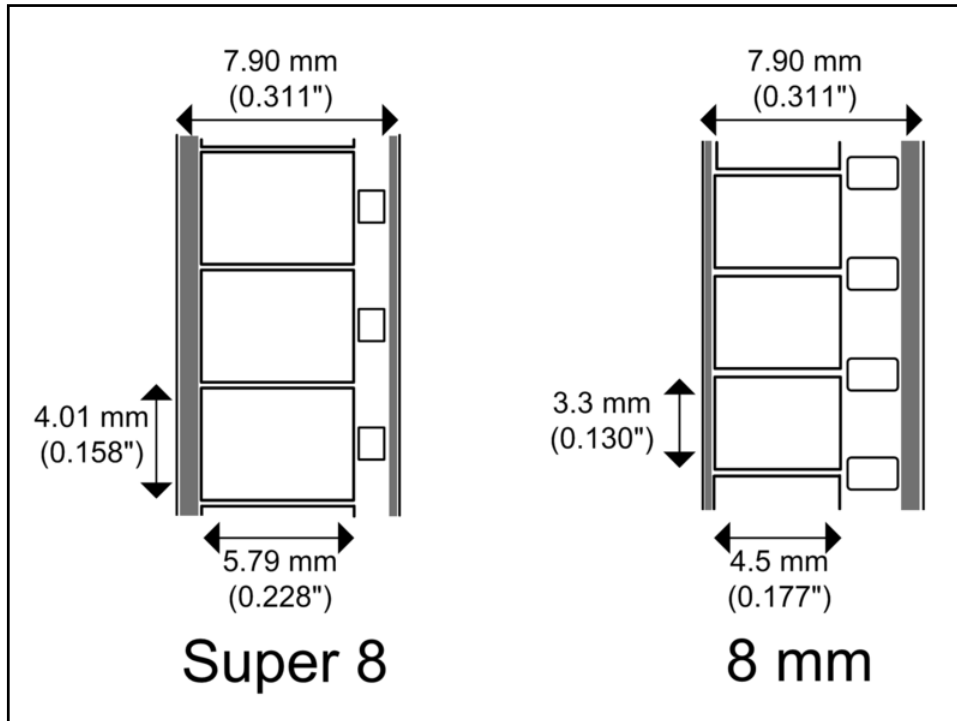
# Small Gauge Projection and the Art of Projector Maintenance and Repair

**Presented by the Small Gauge Amateur Film  
Committee and  
The Projection and Presentation Committee**



## Projecting 8mm & 16mm Formats

- Formats
- Aspect Ratios
- Equipment and Set-up
- Prepping films and projector
- Optical and Magnetic sound
- Demo



## Projector Setup

- Aspect ratio: the proportion of width to height in a projected image (w/h)
  - 4:3
- Throw: the distance between the projector and the screen
- Ensure films are presented in their correct screen shape
  - Run lamp without film to see projection area
  - Check for stray dirt or hair in gate

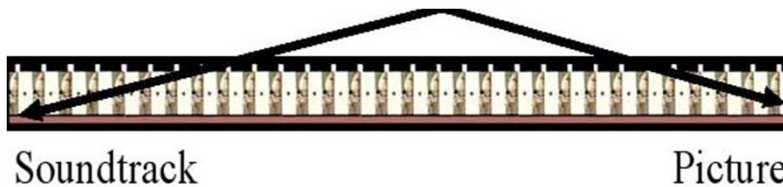
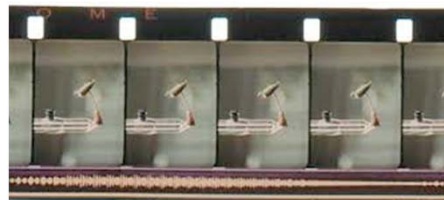
## Prepping Films and Projector

- Inspect films
  - Replace or add leader if needed
  - Repair old splices
- Claw movements can damage film, especially if it has shrunk
  - AD strips
  - Shrinkage Gauge
- Small gauge film is particularly susceptible to dirt attraction and damage – projection room and equipment cleanliness is critical
- Cleaning film path
  - Self-threading projectors may cause scratching
  - Film path must always be kept clean
- Rewinding
  - Careful attention must be paid to having correct and appropriate handling equipment
  - Bench/work station must be kept clean

## Equipment and Set-up

- Do not use unserviceable equipment
- Used equipment should be fully vetted (ex. Running black leader thru)
- Xenon light bulbs preferred (including for portable machines); halogen lamps suitable for small screens up to c. 9ft. Some portable projectors have 300W mercury arc (MARC) lamps permitting a larger screen size
- Workspace with extra leader, splicer, tape, and rewinds

## Optical & Magnetic Sound



## Projection Demonstration

- Threading
- Focus
- Clean projector between screenings
- Learn to service your own equipment!  
(Hint: Come for Day 2!)



## **Elmo 16 – CL or KODAK CT1000**

### **Basic maintenance**

- 1 – Clean gate and pressure pad after each reel, or at least each show
- 2 – Use small brush or swab to clean under sound optics
- 3 – Take off lower sound control cover plate and clean out debris.
- 4 – Take off back cover and clean out dust and debris
- 5 – Check fuses – most notorious one to blow is the amplifier fuse which also controls rewind motor.
- 6 – Keep rollers clean, and regularly check for rubber deterioration
- 7 – Check for dried lubrication inside reel arms, if not already change take up to the sturdier notched belt system.
- 8 – Make sure slot-in roller turns freely

### **Film scratching**

Usual cause would be the slot in roller is stuck in place and not turning which will scratch the film.

### **Changing the rubber rollers**

The most notorious parts of the Elmo 16-CL are the rubber rollers. Thankfully due to the popularity of the projector a number of places offer replacements such as

Larry Urbanski at [urbanskifilm.com](http://urbanskifilm.com)  
Richard C Patchett at [rcsclassic16mm.com](http://rcsclassic16mm.com)

The best thing to do when acquiring a new Elmo is to touch all of the rollers and make sure none of the rubber comes off in your hand or leaves an indentation from where you touched it. If it does they need replacing, otherwise the rubber can get all over the machine and any films you run through it, and then the cleaning is a much more difficult procedure.



- 1 – Remove face plate and sound knobs depending on model.
- 2 – Change Brake roller by removing small nut and washer
- 3 – Change spring Brake roller by popping off the E-Ring
- 4 – To reach the next 2 pad rollers you need to make sure that the entire face plate has been removed.
- 5 – First remove the E-ring that holds the two shafts together and slip it off so you have access to both rollers.
- 6 – Next remove each E-ring to slide rollers off.
- 7 – replace all parts in reverse order of removal.

**Change out the takeup gear to the retrofitted toothed gear.**



## **SUPER 8 SOUND PROJECTOR**



Leon Norris 215-439-1228

- 1 – Keep machine well oiled – but make sure not to get any on rubber parts.
- 2 – Can rough u the rubber wheels with light sandpaper if needed.
- 3 – Make sure plastic guide doesn't catch on 1200 foot reels
- 4 – Check main drive and rewind belts and replace if necessary (many options online (ebay) to purchase belts)  
---If you have to change the belts you will probably have to use an entire box of q-tips cleaning all of the old black rubber goo from all inside the machine. Time consuming but necessary.
- 5 – Regularly exercise all buttons related to sound operation as oxide will build up and interrupt the sound.
- 6 – Check takeup arm - sometimes lubricant on the gear may have gotten into the (clutch) assembly and may be resolved by loosening the allen key and removing the gear and metal collar for cleaning and adjustment. If this is the clutch assembly then there should be a compression washer or material between the teflon gear and the metal collar that should be cleaned and then recompressed (the stronger the compression, the stronger the takeup torque). Just not too tight the takeup reel/spindle needs to slip or it can break the film at a splice or a brittle area."
- 7 - Switch the speed control back and forth between 18 – 24 while motor is not running to make sure things are switching smoothly

Alcohol on the pinch roller

<http://www.electrolube.com/docs/lubricantmain.asp?id=70>

molylube

### JITTERY IMAGE

- 1 –Can be dry film, which can be rectified with lubrications such as Filmguard

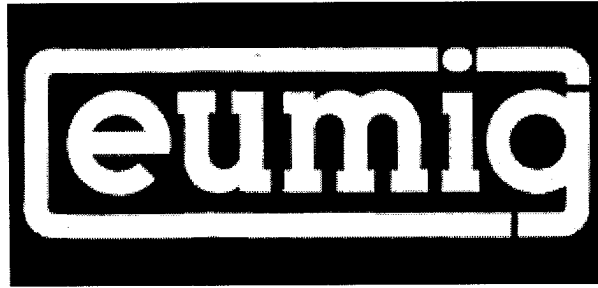
2 – Could be the metal guides either side of the back plate in film path. One is spring loaded and the other fixed. In time these guides get worn and grooves do appear in them, which can affect different thicknesses of film, acetate and polyester. One might project better than the other. There are two small screws to each plate, remove them, and unclip the spring on the other one. On examination you might find little notches have been worn into the metal, these can be rubbed out either on a fine oil stone or some fine carbide paper. After they have been rubbed, give them a quick polish on a piece of cloth and re install them. You may have to adjust the outer plate until it just frames your picture and doesn't have the sprocket hole in frame.

3 - Have a look at the snubber roller located below the sound deck, when the machine is running, if the roller dips and the film starts to jump it might be the tension needs adjusting on the spring which is easily done by just loosening the screw and a slight pull on the clip holding the spring then retighten screw.

#### SCRATCHING FILM

1 – Check the small plastic rollers on the top of the first sprocket wheel and always make sure they are free of flat spaces and turn freely. If it has silver rollers take the rollers off and clean them well with Alcohol. Also clean inside the rollers where the shaft/screw goes and clean the screws. I have found they run much better without grease being applied to the screw shafts. It's this grease that attracts the dirt which then stops the rollers from turning which in turn causes flats on the rollers with eventual scratching.

2 – Try to NEVER play the film in reverse. Elmo's tend to lose the loop and rub the film against any number of surfaces.



### **Basic Service**

- 1 – NEVER thread machine with cover plate on, ALWAYS watch film entering path
- 2 – Clean Gate pieces with alcohol after every use (best if after every reel)  
Remember to turn the inching knob on back so that the red dot is facing 12 o'clock, and remove lens before removing gate pieces.
- 3 – Keep all points lubricated in accordance with manufacturer's lubrication chart
- 4 – If sound model regularly exercise record button and spray all jacks and inputs with contact cleaner such as radio shack
- 5 – Check and replace as needed – 2.5 amp cartridge fuse

### **Specific Maintenance Issues**

#### **EUMIG sound head**

**METHOD 1:** (for a quick clean). The sound head is located right underneath the Bulb. It has a white cable coming out of it, which plugs into a receptacle on the chassis. For a real quick clean, take a can of air duster and blast air down into the Teflon film chute at the front of the sound head assembly. This will blow out any loose oxide particles in the sound head. This process is recommended after every couple of reels, to keep oxide from building up inside the head assembly.

**METHOD 2:** (FOR A THOROUGH CLEAN, THIS PROCEDURE TAKES ABOUT 30 MINUTES, AND REQUIRES DISSASSEMBLY OF THE SOUND HEAD).

1. Set the control knob to the Forward position then pull off the black control knob at the side of the projector. Remove the lamp housing cover.
2. Pull off the volume control knob and the mixing control knob.
3. Undo the screw located between the volume control knob and the mixing knob, and pull the side panel forward and out to expose the inside of the projector.
4. Unplug the sound head, then undo the single screw which bolts the sound head to the chassis wall.
5. Remove the sound head.
6. Look at the sound head. There are a total of 6 screws in view. Do NOT touch the four innermost screws, they are used for the critical elevation and azimuth alignment of the sound head to the magnetic tracks on the film. Undo the 2 outer screws to remove only the MU-METAL magnetic shield, and the pressure pad assembly. You now have total access to the heads and pressure pads for a thorough cleaning with alcohol. Be very gentle in wiping the head areas. You may wish to de-magnetize the heads while you are at it, using a Radio Shack tape- head demagnetizing probe. Also polish the film channel and pressure pads with Pledge or Favor furniture polish.
7. After cleaning, reassemble the metal shield and pressure pad assembly to the head, and tighten down the 2 outermost screws.
8. Align locating hole on the sound head with the pin in the chassis, and bolt back

into place with the single screw. Plug the sound head back into the wall connector.  
9. Reassemble the side panel, audio knobs, and Main control knob. Return the control knob to the OFF position.

#### SPEED

Alcohol & very light sandpaper to roughen the rubber wheels. ---Obviously this will only work so many times before the pads are done..

#### SCRATCHING FILM

There are mainly 2 spots where scratches are caused on a EUMIG 800 series.

1. Remove lamp house cover.

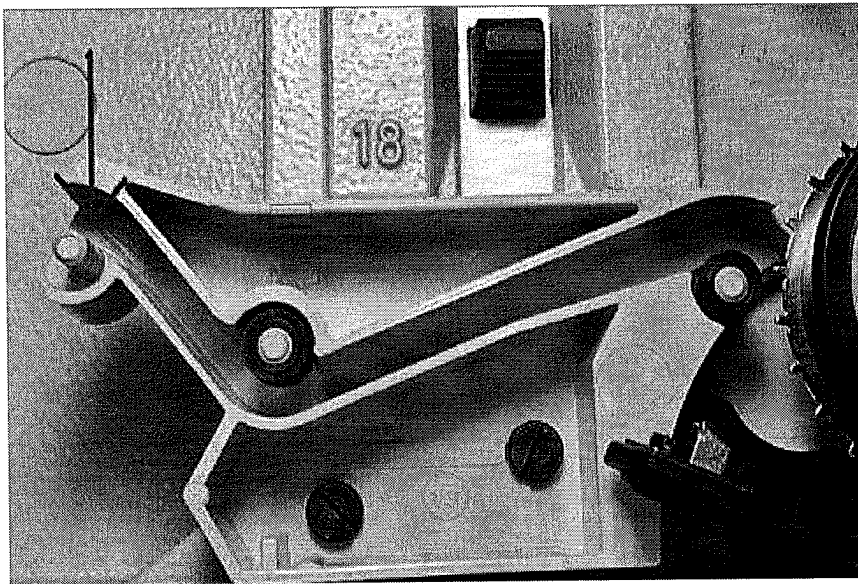
Take both parts of film guide/aperture plate out of projector and clean film path with alcohol and tissue or ear sticks.

Refer to user manual, otherwise you might destroy claw-pin when taking out parts!!  
(costly repair)

2. Lamp house cover still removed.

Now take off grey plastic cover (snap on fix) at rear exit of film -directly before take up reel- and look for film guide rollers in 3 or 4 places. Each roller consists of two halves.

Often one half or both halves are missing and film scratches on roller axle and / or housing.



# Suggested Eiki RT/NT/ST Service Protocol

## Basic Service (recommended annually)

- Replace all belts except the main (toothed) drive belt (because this is an expensive one, costing approx. £20), unless the main drive belt is an original Eiki factory natural rubber one, in which case replace it with a synthetic (polyurethane or nitrile) one. In the case of the final generation NT-series machines with serial numbers above 50000, inspect and advise on the motor belt, too, as this is also an expensive and difficult-to-source item.
- If the main drive belt in place is an aftermarket synthetic one, inspect and repair if signs of wear are found.
- Clean all pulleys with isopropanol during belt replacement.
- Lubricate all points in accordance with manufacturer's lubrication chart.
- For ST series models, inspect the cork liner in the take-up clutch while replacing the belt in the take-up arm, and replace if signs of wear are evident. If it looks OK, test by running a 1,600 foot film and checking for even take-up. Replace cork liner if take-up is not even.
- Inspect exciter lamp and replace if carbon deposits can be seen on the inside of the envelope.
- Replace the projection lamp and lacing lamp, or supply spares, if requested.
- Remove and disassemble gate assembly, captive sprocket assemblies and film path components around the sound pickup, and clean thoroughly. In other words, clean all surfaces on and in proximity to the film path that can't be cleaned without unscrewing something.
- Check operation of automatic lacing mechanism if the projector has one, and adjust tensions as necessary.

## Full-Scale Service / Refurbishment

### All the above, except:

- Replace all lamps, drive belts and the cork liner on spec rather than inspect and make a decision according to the amount of wear present.

### Plus:

- Disassemble camtank module, clean out original manufacturer's molybdenum grease and replace with new lithium grease. Adjust or replace camtank spring as necessary.
- Adjust claw position and protrusion in accordance with service manual.
- Inspect all bearings for wear. If any are found to be significantly worn, attempt to source replacements and buy them if the owner agrees to the cost involved. However, these are now very difficult to find, and it'll be a case of discussing options with the owner. Regrease all bearings.
- Adjust focus and azimuth of optical sound pickup in accordance with the service manual.
- Clean and degauss magnetic sound pickup if the projector has one.
- Remove amplifier module, lubricate potentiometers and inspect for worn solder joints and other signs of wear. Repair if necessary.
- Disassemble lens elements and clean.
- Adjust alignment of lamp and lens holder for optimal light output.
- Check focus knob for firm operation, and replace focus barrel sheath with one made from 4mm plastic sheathing (e.g. screenwash piping from Halfords) if it's loose.

**Please Note:** The manufacturer's authorised spare parts have not been available for these machines since the early 1990s. While it's still possible to get replacements for most limited-life parts (either new ones made for other purposes, or old stock that occasionally surfaces), some can be difficult and/or expensive to obtain. A particular problem at the moment seems to be type BRK exciter bulbs (up from a going rate of around £5 a few years ago to £15-20 now, as they are only made in small quantities and for use in medical ultrasound equipment) and the toothed motor belts for the final generation of NT series projectors, with serial numbers above 50000. Where problematic and/or expensive parts are found to need replacing, I will discuss options with the owner before going ahead with anything.

## Manual Cleaning ½ Inch VHS Deck

Items you need:

1. Screwdriver
2. Cotton swabs
3. Lint-free cloth
4. Isopropylene (99%)
5. Can of Compressed Gas

Instructions:

**Step 1** Make sure the deck is turned OFF.

**Step 2** Remove the screws from the back of the top cover. You may need a small screwdriver.

**Step 3** Carefully lift up the top cover, sliding it out horizontally from the rear, and lift any electronics covering to reveal the head assembly and tape path.

**Step 4** With the can of compressed gas, blow away any dust in the tape path. Make sure you keep the can of compressed gas vertical to prevent it from blowing out liquid.

**Step 5** Soak the lint-free cloth with alcohol and gently place on the video head drum. Carefully spin the head to completely clean the entire surface.

**Step 6** Find a good light source so you can see what you are doing and clean the tape guidepath. Clean all the stationery tape guides and surfaces which the tape might come in contact with. You can rub fairly hard on the surfaces of metal pins and the eraser/rec heads.

