SERVICING FILM PRINTS

by Gary A. Hoselton

INTRODUCTION

I am a private collector of 16mm prints. I service each newly-acquired print prior to projection. The idea is to

1. Do no harm to the print,

2. Restore it to as close to original condition and content as possible,

3. Have every screening free of chatter and other irritants, and

4. Preserve the print for future generations to enjoy and learn from.

I have no formal training in film preservation, having learned by listening and doing. I am very fussy. I am always seeking better ways to perform this work.

I gratefully acknowledge the invaluable help of: Bert Dotson, of Eugene, Oregon, who gave me training and direction in the 1950's; and Larry Urbanski, of Orland Park, Illinois, who has been a willing source of preservation information and supplies.

I will describe My Setup, Receiving the Print, Servicing the Print, and Storing the Print.

MY SETUP:

The receiving bench

The receiving bench has separate bins for newspaper stuffing, Styrofoam pellets, and cardboard, so all can be recycled. Wastebasket. Good light overhead. Pair of rewinds for inspecting print. An electric rewind is a nice addition.

The servicing bench

The minimal servicing bench should have a pair of rewinds, a tape splicer, a perforation repair machine, film cleaning fluid, wastebasket, and excellent overhead light. To increase capability, add a film viewer, a cement splicer, a footage counter, a little fan to disperse solvent vapor, and a small light table to aid in matching parallel or butting strips of film.

Equipment on the servicing bench

1. Pair of rewinds: any will do. Braking is very nice to have but not mandatory as the hand riding the feed reel will do. (Best to wear a leather glove when braking plastic reels, as "flash" on their edges can cut the skin.) The classics are the Neumade "Dynamic" rewinds, and they may still be purchased new.

For servicing film, I prefer my older Bell & Howell two speed rewinds. The gear shift is useful for quickly moving through a reel at high speed and creeping through viewer at low speed.

2. Tape splicer: any well-built and well-maintained unit will do. I avoid Kodak presstapes, for they sometimes fog, overlap the frame lines, and can be difficult to remove. I use Dr. Catozzo's guillotine splicer. Use only Neumade splicing tape, and disassemble, clean, and lubricate splicer about every five rolls of tape. Keep a large paper clip handy, unwound a quarter turn, for popping accumulated sprocket punchings out of dies before they fall on the bench and stick to film.

3. Cement splicer: the fancy ones are best, however a hot splicer carries with it a learning curve. The classic is the Griswold splicer, made of tractor iron but can produce consistently good splices. The cheap splicers don't do as well, and the Bell & Howell diagonal splicer produces an unpleasant visual result when screened. I use a Griswold splicer. Dip a piece of felt in a jar of water to soften emulsion, and use a single edge razor blade to scrape emulsion. Dry film end and splicer prior to applying splicing cement.

4. Perforation repair machine: several were made, PerfFix perhaps the most capable. I use a PerfFix machine. I use only clear PerfFix tape, as the white tape seems to very slightly narrow the frame, especially with a scope print.

5. Viewer: lots of good ones were made, all need considerable cleaning and limbering prior to use. I use an older B&H, with Craig as backup. The viewer is not for viewing the entire film (that is the job of projectors, which are much gentler on the film), but for looking at individual frames and short segments, reading titles, analyzing color, etc.

6. Bench: I prefer standup height, with dead smooth (no texture) white plastic laminate surface. (My bench surface is 1950's ezeye light green, so I have to keep a sheet of white paper under film as I crank it across the rewinds to be able to see through the film.) Stool appropriate to bench height.

7. Lighting: overhead, more is better. I have two 2x4' 3-tube fluorescent troffers in grid ceiling, using 3500 degree Kelvin T-8 lamps.

8. Nice to have:

a) Pair of strong rewinds for obtaining tight winds, especially with warped Technicolor prints. Examples are Neumade dynamic or electric rewinds.

b) Dimmer for overhead lamps and the lamp in editor, overhead to obtain best light balance and in editor to lengthen lamp life.

c) second pair of portable rewinds to place in front of main rewinds, for synchronizing two prints of same film in order to combine them into one best and one worst print, or for comparing tail of one reel with head of next reel to determine optimum break point.

d) Split reel, for safely moving film from a core to a reel.

Hand tools on the servicing bench

1. Regular scissors, for cutting film.

2. Smoothing tool, for bedding splicing tape and PerfFix tape. I use a little tool from the copper tooling trade; it has a polished rubbing shape at one end and a blunt point at the other. The rubbing end is for bedding tape, the point for popping residue from sprocket holes.

3. Putty knife with 1 inch wide thin blade, for picking off tape splices and scraping labels and adhesive. I bought mine at a paint store about 1965, it does better each year. You might have to round the edges of a new blade prior to use.

4. Exacto knife with curved blade, for disassembling cement splices and cutting PerfFix tape.

5. Slender sharp-point scissors, such as are used to cut off gauze bandaging, for cutting bits of splicing tape, cutting errant PerfFix tape, and other little jobs.

6. Automotive gasket scraping tool, it's like a big screwdriver, for removing labels from reels. Putty knife, being flexible, can too easily slip and cut a finger

7. Parallel jaw pliers, such as Channel-Lock, 1 inch or greater throat, for straightening bends in metal reels.

Supplies for the servicing bench:

1. Jug of solvent for cleaning dirt and adhesive residue from film. I prefer Larry Urbanski's Filmrenew because it has preservative properties, however cleaning solvent will do. I keep a gallon of Filmrenew on floor at my right foot, lid always on except when sloshing a cleaning towel.

2. Bounty or Hefty paper roll towels, for spot-cleaning. Use nothing cheaper, they fall apart.

3. White flannel cloths for bulk cleaning and wiping. I purchase remnants at fabric store, and cut to about 18x24 inches. If you have a way to hem them, they will stand up a lot better in the clothes washer. White is best, so when you pick up the cloth you can see the part you have already used.

4. Solvent-resistant gloves. Best are from paint or chemical or safety supply store; latex are short-lived. Soft leather gloves, such as deerhide, if you plan to brake quite a few plastic reels by hand in rewinds.

5. Three one-gallon plastic ziplock bags, stacked flat near the bench. The top bag is for a fresh paper towel folded in quarters and wet with solvent, for film cleaning in the program area of the film. When somewhat dirty, the towel moves to the second bag, and is then used for cleaning the much dirtier heads and tails. When the towel becomes too dirty to touch film, I hang it over the edge of the wastebasket, and brush tools against it to wipe off bits of tape and scum.

The third bag is for a small flannel cloth, which can be dipped in solvent and applied to larger lengths of film. I store the right-hand solvent-resistant glove on top these bags, to remind me to put it on before extracting a towel or the rag.

6. Supply of leader and black (opaque) film. In the old days we used outdated unexposed film for leader, and over time and exposure to light it turned somewhat purplish. Now, leader is salvaged estar base film, painted one side in a variety of colors. It must be tape-spliced, for splicing cement is not a solvent for it. Some use green for the head leader and red for the tail leader. I prefer white at the head and yellow at the tail, as lettering on them is easier for me to read in dim light. Black leader is for correcting shortened countdown leaders and inserting at the end of program portion of film. Consumption is typically about 10 feet of both white and yellow leader for 2 feet of black.

7. Supply of permanent marking pens. Black, brown red, green, blue permanent marking pens, both fine and ultrafine points, for correcting scratches and missing emulsion and labeling leader.

8. Nice to have:

a) Small can of paint splatter and graffiti remover, such as Goof Off, Good-bye Splatter, etc. For removing hard adhesives and marking pen marks from metal reels. These contain powerful solvents including xylene, so don't get anywhere near film, plastics, or open flame. Stock this only if metal reel cleanup is important to you.

b) First aid kit, or at least Band-Aids and a tweezers.

c) Fire extinguisher rated for paper and the solvents you are using. Shake it every year so contents don't settle out.

Mounting Equipment

The workbench surface is a fluid entity. What makes sense one year is supplanted by something better the next. Film servicing is the issue one week, the next week a projector or toaster must be repaired. I mount nothing (except a vise and a magnifying bench lamp) to the bench. I attach things which must be mounted to 11 3/4" by approximately 40" by 3/4" white plastic laminate covered particle board. I carry these to the bench or to storage as needed. I obtain the board (actually shelving) from a store fixture distributor, who will cut a 48 inch piece to length without charge. It is better material than what is sold by the home improvement stores. Put a few strips of thin stickyback rubber weather-strip on the reverse to restrain skidding, or clamp to the bench with a C-clamp if necessary.

RECEIVING THE PRINT:

I make out a 4x6 inch inventory card for each print acquired. On the front is purchase information, and on the reverse goes the print's history while in my ownership. When a new print arrives, I fetch its card, then unpack the print at the receiving bench. I always encourage shippers to wrap open reels in a plastic bag, to protect them from dust and moisture encountered in transit, and to restrain any leader ends which might come loose so that film won't unwind and be crushed by the reel edges. If reels are received not in cans or bags, then usually quite a bit of brushing is needed to clean up the outside of the

film. I also sniff for vinegar odor, and note any in capital letters on the front and rear of the inventory card.

I mark the date received on the front of the inventory card. On the rear of the card I write the date followed by "Recd:". I tally the number of reels, their size, and the approximate amount of film on each. This gives an indication of any gross amount of missing footage. Then, with reel 1 on the rewinds, I determine film type and condition and note this, comparing it with sellers description on the front of the card. Then I crank into each reel, all the way if I have time or are worried, and inspect for condition and surprises. I note findings on reverse of card, and conclude with an estimate of servicing effort, such as "easy to service" or "will be a lot of work". The print then goes in the rack for servicing. In the rare instance that the print emits a vinegar odor, it goes in a special rack isolated from other prints, there to await disposition.

SERVICING THE PRINT:

First we will consider several common tasks: removing labels and masking tape, disassembling tape splices, disassembling cement splices, and removing television artifacts. Then, the process of servicing the print will be described. Servicing a 1600' reel of incoming used film never takes less than an hour, and a worn, difficult reel can take five to eight hours plus any overall cleaning needed. This is not a job for the impatient person.

Common tasks

1. Removing paper labels and masking tape. These are often found at the head of reels, and rarely out in a reel where masking tape was used over a break in the film. Over time the adhesives anchor well to the film, especially if applied to the emulsion side, and some adhesives become hard and gritty.

First try picking the label or tape off with the fingernails. If this fails, then with the film hard against the bench surface work the putty knife under one end of the label or tape and push in short strokes, tearing off residue as it accumulates. If out in the print on the emulsion side and emulsion scratches are to be avoided, perhaps better to soak the area in solvent for an hour (go for your sandwich) or overnight for stubborn cases. Dip it in solvent, in a lab can or tin can as appropriate, a wet rag is not enough. Cover the solvent with aluminum foil so it will not overly evaporate, probably best to not be breathing it.

Once the label is off, pliable adhesives can be scrubbed away with a paper towel folded in quarters and wetted with solvent. Scrub and scrub back and forth and circularly until the last lump of adhesive has dissolved. Keep film quite wet while scrubbing, so that emulsion isn't scratched, and change position on the towel often. Adhesive which has hardened can be carefully scraped off with a corner of the putty knife, keeping the area wet with solvent_this is touchy work on the emulsion side but can be nondestructively done with care.

2. Disassembling tape splices. This can be a chore, especially in some prints which have seen TV station use where several layers may be built up, some of questionable tape and even the brittle Scotch tape. Dislodge the tape with the putty knife, always slipping the knife sideways as you push under the tape. Slipping the knife to either side as you push is much less likely to scratch the emulsion or nick the

edge of the film, whereas a straight push will often do damage. Sometimes lubricating the knifeblade with solvent helps, but usually not.

Always start on the shiny side of the film, opposite the emulsion. Starting at sound track side, pick at both edges of tape with putty knife, working under tape until it can be grasped with fingers. Pull tape towards sprockets.

If tape comes loose without tearing, then you are in luck. Pull tape all the way to sprocket side and pull off. Then, hold the film with the remaining tape underneath, fold the film back at the cut ends, and begin peeling one end of the film from the tape. Peel the tape from the remaining end of film.

While peeling the tape from the emulsion side, watch the emulsion, and if some (usually the top layer) begins ripping off with the tape, then pull a different part of the film loose from the tape and hope the emulsion stays with the film. Work the removal around so that the least emulsion is lost; the damage can later be touched up with felt pens. This emulsion tearing is hard to predict, but if it happens early in servicing a reel, it will probably be a problem throughout the entire print. It can be avoided by soaking a loop of film containing the splice in a tin can filled with solvent, an hour usually is enough to loosen the tape, but one often hasn't the time available for this.

With some splicers, a continuous tape wraps over the sprocket side and across both sides of the film. Separate the tape from the shiny side of the film as above, fold it back, and begin peeling one end of the emulsion side of the film from the tape. Watch for emulsion peeling. Then peel the tape from the remaining film end.

If tape begins tearing into little bits, the job just got a lot harder. I prefer, at this point, cutting the splice in the guillotine splicer, and working on each film end separately. Again, remove from the shiny side first, then the emulsion side.

After the tape has been peeled or picked off the film, remove the adhesive residue with the cleanest paper towel folded in quarters and wet with solvent. Rub in several directions, keeping the film wrung to the bench top with wet solvent, and try to not snag the film end and bend or break it. Keep changing the rub area on the paper towel, so that you are working with an area with good friction and that is not loaded with adhesive or dirt. I've spent up to 15 careful minutes on a difficult splice. Also check for adhesive residue transfer to the layer of film above and below the splice, and clean those areas if needed.

If a bit of adhesive won't rub off, it may be a torn bit of earlier splicing tape. With the area wet with solvent, slide the putty knife blade slightly sideways as you push under the tape. Almost always the tape will come loose without the knife scratching the emulsion. An emulsion scratch is much more likely if the knife blade is pushed directly under the tape, whereas it is rare with the slight sliding motion. Keep the area wet with solvent, for it acts as a lubricant and prevents adhesive readhering to film or blade.

3. Disassembling cement splices. Cement splices are made to acetate and nitrate filmstocks, and involve using a solvent to slightly dissolve and bond together overlapping film ends under pressure.

Emulsion must be scraped off the contact area so the two bases touch without contamination. Cement splices cannot be used with newer estar based filmstocks, as film cement is not a solvent for them.

Nicest to disassemble are the non-frame overlap splices, often referred to as lab splices because the processing labs usually used these when assembling units of a longer film. These splices are identified by the emulsion-scraped area ending at the frame line. Cut these along the frame line with the guillotine splicer, and pick or scrape the clear overlap off one end with the Exacto knife.

Overlap splices double the area bonded, by having the frame of one film end protrude into the frame of the other cut end. These are produced by Griswold, Hollywood, Craig, Kodak, and other splicers. Often this splice can be peeled apart. Cut the ends at frame line with guillotine splicer. One film end will have a portion of the end frame's emulsion scraped off. If it is important to save that frame, such as to maintain continuity of motion or the sound track is active, then color the scraped area front and back with the best choice of permanent marking pen color and it won't show badly on the screen. Otherwise, sacrifice that frame by cutting back to the next frame line.

Diagonal splices are made with older B&H splicers, and are quite strong but unsettling to see flash by on the screen. If you don't like the look of them when projected, then you will have to sacrifice two frames to eliminate one of them.

4. Removing television artifacts. To prepare a print for television station use, various opaque tapes or coatings were applied to picture and sound track. Some remove easily, others are difficult especially when applied to the tender emulsion side of the film. Work with the putty knife and plenty of solvent, and have a lot of patience. Check the area for several feet each side of these applications for dirt and transferred adhesives, and remove them with solvent.

Hardest to remove is white typewriter correcting fluid, but it is slightly affected by Filmrenew so considerable scrubbing will eventually dissolve and remove it from emulsion, and the putty knife will remove it from sprocket area. I remove all of it possible, for if it flakes off the resulting hard grit can cause film dents and scratches.

A film in television service may have opaque tape applied over a lap splice, or clear tape applied to both sides of a failing lap splice, or both. This makes a thick and stiff lump, which evidently passed without problem through the specialized projectors used in television stations. I prefer removing all tapes from lapsplices, the redoing the splices if needed. I do this because the extra stiffness may put excessive stress on the sprocket hole each side of the splice, and because older projectors which collectors often encounter have tighter tolerances on film thickness, expecting nothing thicker than twice film thickness plus a few thousandths of an inch. Another layer of tape may jam things in a sprocket guard, causing damage to film.

Occasionally you will find that 50 or 100 feet of film have migrated from one reel to another, and the reel-break may have ended up in the middle of a scene. Check the tail of one reel against the head of the next, and transfer film if indicated when servicing the print.

PROCESS OF SERVICING THE PRINT

The process of servicing a print consists of:

1. Forward: Inspect print for defects, cleaning and repairing each as it is found, and replace tail leader. Clean or exchange reel.

2. Rewind: Wipe while rewinding, repairing any additional defects found, and replace head leader.

3. Additional cleaning if indicated.

Forward: inspection and repair

(I start with the full reel in the rewind on the right, as this is the direction my B&H viewer feeds for forward motion. So, as I am moving forward through the film, I am cranking the left rewind. The right rewind contains the feed reel, the left rewind holds the takeup reel, and film goes from top of the feed reel to top of the takeup reel.)

a. Clean the countdown leader completely. Remove all labels. Labels which won't peel can usually be eased off with putty knife. Really difficult labels can be soaked for an hour in Filmrenew to soften adhesive. For a typical used print, I hand-clean the entire countdown leader and the first 5 or 10 feet of title, till I reach reasonably clean film.

Commence cleaning by laying out two feet of film on the bench and scrubbing with the dirtier paper towel from the second ziplock bag. Turn film over and scrub that side. Excess solvent on the bench surface will wring the film to the surface, helping hold it in place. Keep moving the film along as you clean, forming a pile at one end of the bench or winding it onto a reel. When entering the program portion of the film, change to the cleaner paper towel, and keep it well moistened with solvent

Dry this film with a flannel cloth, and commence repairing defects. Tears on film edges can usually be repaired with splicing tape on the backside of the film only, but if a snag is still felt on the emulsion side then place splicing tape over it as well. For some tears, it is often advantageous to offset the splicing tape by one frame from one side of the film to the other. You can also hold both ends of the splicing tape and stick it on offset from the frame lines to span certain damage.

For tears or other damage which run along the film for multiple frames, place this area in the tape splicer, then cut off several inches of splicing tape and carefully apply it longitudinally to the film, justifying the tape to the sprocket edge of the film. Then punch the sprocket holes three at a time. When the tape is subsequently bedded with the rubbing tool, fingerprints in the adhesive will pretty well disappear.

A tear into a sprocket hole, or a notch made subsequent to such a tear to relieve stress, can be repaired either with PerfFix tape or splicing tape. Either tape must be applied to both sides of the film to be effective, and carefully bedded.

b. Inspect film. Now wind the countdown leader back onto the feed reel, and commence inspecting. Since I am cranking the left rewind, I inspect with my right hand held over the film (I am looking at the back of my hand). The heel of my right hand is gently rubbing the feed reel as a brake, with the film

edges passing between my thumb and second finger and the index finger steadying the film. In this way I maintain contact with both edges and the sprocket area, but do not touch the emulsion. Winding the film slowly, I can feel all splices, bad sprockets, tears, and other imperfections, and instantly stop and inspect each. With my right hand steadying the film I also look down through it at the white paper on the bench, to visually inspect the image and sound track.

Stop and inspect anything which doesn't seem to be smooth film or look right, and take appropriate action. Redo old tape splices which are unsound, cloudy, or have bleeding adhesive. Redo weak cement splices, usually changing to tape.Clean dirty areas. Touch up scratches with the felt pens, usually trying to match background color. Gaps in sound track can also be touched up with black felt pen.

c. Preparing the tail. The tail of the film and the last few feet of program material are often dirty and contain adhesive residue, so clean them until they are like new. Touch up scratches and inept countdown dots with the marking pens. I like to have about three feet of opaque film after the last program frame in a reel, so that the audience isn't startled by flashes of light and zaps in the sound if I am asleep at the switch. If there is already a splice after the program ends, I install additional opaque leader prior to the tail.

When the tail is ready, splice on about 5 feet of leader, enough to wrap around the reel plus a foot or so. With painted leader, I prefer the shiny side out, so that paint won't transfer to tape used to stick the leader end down and so that errors in marking the leader can be removed with solvent and corrected.

Everyone has their own labeling scheme. Using the black permanent marking pen, I label the tail leader as follows:

TAIL R. 2/4 "Hello Dolly"

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with the label ending about a foot from the end of the leader so it can be read when the reels are stacked. In this example, we have inspected reel 2 of a 4-reel film.

d. Inspect feed reel. Remove the feed reel and inspect for cleanliness and damage. Those who insist on clean reels can scrape off old tape and labels with the automotive gasket scraper. Don't use the putty knife on a reel, as its flexible blade easily slips and can cut the other hand. Clean adhesives using the dirtier paper towel from second ziplock bag and ample solvent. This paper towel will also clean off crayon marks and some marking pen marks. More permanent marks will usually succumb to graffiti removers; to do this wet a small scrap of paper towel and rub vigorously, and consider disposing of towel in toilet or outside as the vapors are not good ones. Be sure to wear the glove when handling graffiti removers.

Put the reel back on the right-hand rewind, turn the reel slowly and inspect for adequate film clearance and burrs on the periphery of the reel. Repair as follows:

Metal Reel: Bends in a metal reel can usually be corrected with waterpump (channel lock) pliers and the fingers. If an large area is pinching film, carefully bend appropriate side outwards, then check opposite portion of that side to see that bending one area out didn't force the opposite area in. Burrs which could snag film or cut a hand can be touched up with a file.

Plastic reel: If the plastic reel pinches film, cut a long strip of cardboard about 3/4" wide, wind around the periphery of the reel about a half inch in, and place in a 175 degree F oven for a half hour or so, or in the hot sun all day. If this doesn't relax the reel, that reel should be relegated to archival use or disposed of. Burrs can be touched up with a file or the Xacto knife_a file is best.

Rewind and wipe

The feed reel is now on the left rewind, and the takeup reel is at the right, and film goes from top of the feed reel to top of the takeup reel. Crank film from left to right. Film defects have been found and repaired, so it is safe to rub film with soft cloth without risk of damage to film.

a. Prepare to clean the film. I use a dry flannel cloth in my left hand, and draped up my arm. The palm of my left hand faces up. The film slides along a pocket of cloth made by the second, third, and forth fingers beyond the film, and the thumb and back of the fifth finger on the near side of the film. The sound track edge of the film must be towards the inside of the pocket. The back of the hand, with the flannel draped over it, brakes the feed reel.

When that pocket of the cloth picks up dirt, stop and move the cloth an inch over the end of the hand so that the pocket now contains clean cloth. Keep this up until there is a column of dirt stripes up the right side of the cloth. Then repeat down the center of the cloth, rotate the cloth and obtain a third and perhaps fourth column of dirt stripes. Then, turn the cloth over and repeat. Shake often.

b. Wiping the film. The tail tends to be dirtier than the body of the film, so start by wiping the last 50 or so feet of film, cloth in the left hand and cranking the right rewind. Stop and inspect cloth. If it is quite dirty, shift the cloth and continue wiping the film in 50 or 100 foot increments, shifting to clean cloth after each increment. If the cloth is only lightly dirty, wipe in 200 foot increments until near the head. As the head may be dirtier, make the last increment not over 100 feet.

c. Head leader. Unless the original leader is pristine and also suitable in appearance for your library, remove it and splice on about 5 feet of new leader. I move in about a foot from the beginning of the leader and label with the permanent black marking pen as follows:

HEAD R. 2/4 "Hello Dolly" svc 3-00

HEAD R. 2/4 "Hello Dolly" >Letterbox< svc 3-00

HEAD R. 2/4 "Hello Dolly" SCOPE svc 3-00

where svc 3-00 means print was serviced in March, 2000. If the print was cleaned with solvents, I would additionally write cln 3-00. A new date is entered each time these actions are performed.

The beginning of the leader must be cut precisely square if it is to be successfully introduced to some autoloading projectors, especially Bell & Howell.

d. Completion. The final touch is a new piece of half-inch wide masking tape, end folded lovingly, to hold down the head leader end.

If all the start and stop of wiping has resulted in a sloppy or loose wind, it is best to wind the film back to the left reel, then rewind to the right reel while applying a fair amount of braking pressure to the left reel.

Finally, on the reverse of that film's inventory card, I mark the date and **"service"**, and jot down a few lines indicating what I found and did to the print, and any work still needed.

3. Additional cleaning or coating if indicated.

Some film will seem "sticky", such that you may expect it to move through the projector with reluctance. Sprocket damage may occur, especially in the gate. Such a film can be a new and hungry print, a dirty print, or one which has had coatings applied and was then stored for many years. I prefer applying Filmrenew and then wiping with flannel cloth. Its petroleum base will address the stickiness and its waxes will lubricate the film. However, if tape repairs have just been made to the film, allow the adhesives 36 to 48 hours to "set up" prior to introducing them to an adhesive solvent such as Filmrenew. Otherwise, the tape repairs may loosen, shift in position or completely lose purchase. Subsequent instructions assume the use of Filmrenew.

Filmrenew can be applied in several ways:

a. By hand. Put glove on right hand, soak small flannel cloth from third ziplock bag in Filmrenew, and pinch around film as if to clean it, cranking with left hand. Watch film for adequate Filmrenew transfer, and move to new cloth position as needed, about every 50 to 100 feet. Crank slowly, so as to not fling Filmrenew about the room. It doesn't matter if the cloth becomes lightly dirty; the object is to uniformly coat the film with Filmrenew. When all the film in the reel is coated, stow the cloth in the ziplock bag, remove the glove, and crank the film back while wiping it with a clean flannel cloth in short increments, as done in Cleaning Film above. Several passes across rewinds, wiping all the while, may be needed; keep it up until film slips easily along the cloth and the cloth remains fairly clean. The film can now be immediately projected or stored in the open, but do not store in a can until all residual Filmrenew has evaporated.

b. By immersion. Immerse reel with film in a lab can containing sufficient Filmrenew to cover, and remove after several minutes. Drain liquid from core of reel and film as best as possible, quickly put on right rewind, and proceed to wipe as above. This method may be messier.

c. By machine. Apply Filmrenew with an application machine, such as the ECCO 202 Instant Anti-Static Film Cleaning and Conditioning System, or equivalent. It is placed between your rewinds. Then wipe as above.

After cleaning, I mark on the rear of the film's inventory card the date, the word "**cleaned**", and a line describing what was done and result. I also mark on each reel's head leader "**cln 3-00**" (showing that the work was performed in March 2000).

Hints and kinks

1. Tape adhesive. These are in the class of "label adhesives". They loose grip slightly upon prolonged exposure to air, and more quickly if dust or lint settles on them, so best to keep tight on roll if not to be used for an extended time. Also, best to keep unused rolls in a tight container.

The surface to which the tape is to be adhered must be clean and dry. Generally a wipe with flannel will suffice. New tape adhesive often does not adhere well to old adhesive, or eventually releases from it, so the old must be completely removed prior to application of the new tape.

Pressure must be applied to achieve the best bond. For splicing tape, this involves bedding the tape with the rubbing tool, especially at the corners and along edges including the gap between film ends. Bedding is not always necessary, but a well-bedded tape should never give trouble.

Tape adhesives require typically 24 to 36 hours to achieve a full strength bond. OK to project soon after application, but don't expose to great mechanical stress or solvents for several days. On the other hand, an errant tape application is most easily rectified soon after application.

2. Tape splices. These go through the projector best when the film ends actually butt together, or are separated by less than the film thickness. A greater gap allows too much flex, and the splice may break or the film whip and be scratched whilst moving through the projector.

When cutting an existing film splice in a guillotine splicer, place the end of the film you want to save on the pins in the splicer, then cut. If you place the other end on the pins and the splice has stretched or shrunk, registration of the film end you save may be off.

I prefer tape splices to cement splices. The tape splice can be disassembled and redone without loss of film, whereas one looses a frame each time a cement splice is redone. If one is patching a cartoon in and out of shows, cement splices gradually eat away at the title and ending.

A good tape splice, which cannot be seen on the screen and holds for many years, and yet can be easily disassembled, depends primarily on the tape. Use no cheap or inappropriate tape. Right now, Neumade tape seems to be the brand of choice. It also depends on a good splicer in a high state of maintenance, clean hands, and careful smoothing of the tape on the film to avoid entrapped air bubbles. Bedding the tape with the rubbing tool is not mandatory but is a final good touch.

3. Use of marking pens. When using permanent marking pens to cover emulsion flaws, you must almost always coat both sides of film to achieve proper density. First coat the shiny side of the film, then the emulsion side. Done in reverse order, it is difficult to find the flaw from the shinny side. The brown pen is a good choice for prints which have turned mahogany. Coat both sides for dark areas of the image such as the ground, and the shinny side only for light areas such as the sky. You may not be able to detect a carefully done repair when screening the print.

To avoid sound track clicks when there is a slight gap in a tape splice, use the ultrafine point black pen to color a variable width sound track on both sides of the splicing tape, leaving a gap in the sound track equal to the width of the clear track at the sides of the splice. More difficult for variable density sound tracks. Be sure the repair has dried before returning the film to the reel.

4. Tight winds. If film is wound loosely on a reel and stored for an extended time, it may take a set or even warp. Estar base film is least likely to do this, Technicolor film is most likely to get into trouble. The rule should be: start with clean film and wind tightly.

A tight wind is difficult to achieve with that tired old pair of Craig Master Rewinds, with worn-out bushings and broken crank arms. Robust rewinds do best. Clean film, tightly wound for storage, is almost as important to film preservation as environment.

5. Film warpage. Loosely wound Technicolor film often cups longitudinally, which makes focusing across a CinemaScope screen quite difficult. Cupping and set are worse at the outside of the reel. The first cure is to tightly reverse-wind the film, so that the head is in and the tail is out, and permanently store the print this way. Since the core of the reel is flat, the early portion of the film is forced flat against the core provided the wind is tight.

The second cure is to relax the filmstock a bit with solvent, all the while telling it where to go. Wind the film tightly head in and upside down on the reel, so that the sprockets are on the wrong side of the reel. This has the effect of "breaking the film's back". Then immerse the reel in Filmrenew for a week or two, remove, and air dry. When completely dry, which takes several days, twist and rewind the print and observe the improvement. This procedure may have to be repeated, and a difficult print may have to be broken into smaller segments to put more film near the core of the reel.

Prolonged soaking in Filmrenew will loosen all tape repairs. A print with lots of tape splices may come off the reel as a number of individual segments, but they should come off in order. While rewinding, remove each tape repair, clean adhesive residue from film, and replace.

Only a metal reel, not a plastic reel, should be soaked in Filmrenew. This is because plastic reels are made from petroleum-derived compounds, and overexposure to petroleum-based solvents can cause them to warp or worse. Also, try to keep Filmrenew away from spindle bearings in rewinds.

6. Tape-splicing shrunken film. Film which has shrunk longitudinally is not accommodated by the tape splicers, as they have sprocket pins which hold too great a length of film. Short of removing some sprocket pins from an expensive tape splicer, a solution is to carefully cut this film with guillotine blade of tape splicer, then place the film in an older cement splicer which has only two sprocket pins. Cut off a little more splicing tape than needed, apply across the film ends, and trim with scissors. Turn film over and repeat on the other side.

7. Perforation repair with PerfFix tape. A sound repair requires clean film, good tape, and intimate contact immediately after application of tape. A steady image on screen requires perfect alignment of the tape with the original location of the sprocket holes. If damage doesn't extend to side of film, tape on one side is sufficient, but if a split or chip has occurred, tape on both sides is required for strength.

First, prepare the film by going over bad perforations with the rubbing tool and Exacto knife, removing or smoothing all chips and distortions.

When repairing distorted perforations, apply the tape in the direction of the good side of perforations to obtain perfect registration. This might require turning the film over, and even reversing film direction every few inches if the damage was caused by a misthreaded projector being run forward and then reversed every so often. Again, always apply the first side tape in the direction of good perforations. This also applies to missing perforations; work against the good side of perforations each side of the gap. Also consider using splicing tape in this instance, and repunching the perforations.

After applying PerfFix tape to first side of film, lay film on top of PerfFix machine or on bench with other machines and run the rubbing tool lightly the length of the tape to insure its attachment to the film. Then go back over it, intimately bedding every bit of the tape to the film. If tape is needed on the other side of the film, apply it and rub in, taking care to firmly adhere the two tapes together where they bridge gaps in the film.

No matter what machine is used to apply PerFix tape to the sprocket edge of film, the tape may wander slightly at its beginning or end such that a bit overhangs the edge of the film. Similarly, a roll of PerfFix tape may be received which is slightly too wide and overhangs the edge of the film. Carefully trim any overhang with the small scissors, otherwise it will slightly displace the film horizontally in the projector's gate; this is noticeable on the screen.

8. Countdown leaders. Along the front edge of my servicing bench I mark, with permanent black marking pen, both types of countdown leader, from 0 to 11 and START for the Academy leader and 0 to 8 and START for the SMPTE leader. Then, synchronization can be checked by simply laying a film's countdown leader along the marks, and any patches needed can be measured in place and spliced in. When the marks wear due to solvent cleaning of film, I merely mark over them again.

STORING THE PRINT:

I have stored some Technicolor, Kodak, Dupont, Kodachrome, and Anscochrome in cans and some in the open since the 1950's, and none have developed vinegar syndrome. Still, being cautious, I am now storing reels on edge, in the open, in a dark, cool, and dry basement area.

I am using Larry Urbanski's open wire film racks. I mount 4 feet of rack on two 2"x2"x4' cleats (1"x2" for up to 1200' reels), held to the cleats with 5/8" washer head selftapping screws at each end of the rack and one in the middle. These are placed on particle board shelving in a steel frame knock-together rack obtained open-stock from a local store fixture distributor (costs little more than Gorilla shelving, and much sturdier and easier to assemble). At 32 or 53 reels per shelf (depending on wide or narrow reel spacing; wide spacing holds one plastic or metal reel, narrow spacing holds 2 metal reels) and 5 shelves in a 7' rack under an 8' ceiling, each rack holds 160 or 265 reels. This weight is best placed on a sturdy floor, and sway bracing should be considered in case of earthquake, such as tying racks together or to the ceiling or wall.

For dust covers, I drape an approximately 46 by 84 inch piece of gray flannel over each rack of film reels. It is easy to lift the front edge of the cloth, remove or insert a reel, and drop the cloth back.

From reading and experience, I think it is less important if film is in or out of cans or reels stored flat or on edge, but more important that the storage environment be constant and benign. One rule is 50-50, which means a constant 50 degrees Fahrenheit temperature and 50% relative humidity. Darker is better. The worst storage location would be next to the furnace, in the attic, or in the bathroom cabinet.

I think that the serious collector will build a wine cellar for film storage, with the proper mechanical unit maintaining the desired environment year around. Of course, there is nothing wrong with storing a few bottles of wine in the interstices between reels. If the film collection includes "The Days of Wine and Roses," then the collector will know to not lose track of the locations of the wine bottles.