This workshop would not have been possible without the participation of our dedicated students and our selfless partners.

Organized by

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Laura Rooney
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Rebecca Lyon
Julian Antos

Guest Speakers

Chapin Cutler
Diane Carol-Yacoby
Peter Flynn

Boston Light and Sound
Kodak
Emerson College

Canyon Cinema
Kinora Audio Visual Systems
Texas Archive of the Moving Image
Northwest Chicago Film Society
Northwest Chicago Film Society

Alamo Drafthouse Cinema
AMIA
American Genre Film Archive
AMIA
Cardinal Rules and Adherence to Archival Industry Standards

Where does the projectionist fit in to the preservation workflow?

What is Preservation?
Preservation is the full continuum of activities necessary to protect a film and share its’ content with the public.

Conservation Duplication Restoration and .....
Cardinal Rules

and Adherence to Archival Industry Standards

• Do No Harm
• The Print, Before the Show
• Be Present

• The film prints you’re handling are rare, possibly irreplaceable objects - always handle with extra care!

Antonella = Captain Obvious

Labs + Lectures

- Lab 1 – Projector maintenance - Care calibration, maintenance, archival best practices.
- Lab 2 – Projector maintenance - Care calibration, maintenance, archival best practices.
- Lab 3 – Inspection for Projection, Presentation and change over operation
- Lab 4 – Shipping (learn it, love it), Splicing and Repair, Base ID and Deterioration
- Lab 5* - Splicer maintenance workshop (everyone together)

- Lectures - Adherence to Archival Industry Standards, Review supplies, shipping, leaders and changeover operation, Sound and image format identification, Uncommon formats and Silent Film Projection.

- Special guest lectures
- Chapin Cutler, Boston Light and Sound
- Diane Carroll-Yacoby, Kodak
- Peter Flynn, director The Dying of the Light
Workshop Recap

- Best Practices and Guiding Principles
- Venue Reports and Lending Policies
- Shipping
- Inspection Forms
- Supplies for the Booth and the Inspection Bench
- Countdown Leaders + Changeover Cues
- Checking for & Adding Cues
- Aspect Ratio Identification, Lenses and Aperture Plates
- Sound Format Identification
- Uncommon Formats
- Silent Film Projection
- Print Handling and Inspection
- Inspection Bench Etiquette
- Splicing, General and Advanced Repair
- Splicer Maintenance
- Base Identification and Deterioration
- Inspection Best Practices; Good & Bad Habits
- Determining Orientation
- Demonstration of Techniques for Examining and Winding Prints
Workshop Recap

• Projector Preventative Maintenance and Use
  • Film Path, Rollers, Guides, and Sprockets
  • Gate Pressure
  • Evaluating Picture Steadiness
  • Projector Mechanism
  • Optical System Components
  • Xenon Lamp Alignment
  • Illumination Intensity, Evenness and Quality
  • Shutter Synchronization
  • Image Sharpness
  • Aspect Ratio, Lenses and Aperture Plates
  • Variable Speed Operation and Flicker
  • Change Over

Projection Booth
Organization and Adherence to Archival Industry Standards

• Twin projector changeover installation
  ▶ Long play devices such as platter, mutts or reels longer than 2000ft is considered poor practice.
• Projectionists should be trained to handle archival film prints and operate changeover projectors.
  ▶ Particular emphasis should be placed on proper inspection and handling.
• The projection booth must be clean, organized and well-equipped.
  ▶ No dust or debris.
  ▶ Adequate supply of film handling equipment.
  ▶ Good splicer and rewind table.
• Hire reputable and experienced service technician.
  ▶ Have the projection and sound equipment serviced regularly.
  ▶ Between shows, projectors should be meticulously cleaned.
• The projection booth should be kept cool and dry 68º-70ºF/20º-25ºC
  ▶ 50-60% RH.
Project Booth
Organization and Adherence to Archival Industry Standards

• An archive friendly cinema should be properly resourced and ALL staff should understand that prints are rare, could be unique or irreplaceable, and often fragile.
• It costs very little to handle and screen prints well.
  ▶ Replacing a damaged print can be EXTREMELY costly.
• Please review the AMIA Theatre Presentation Guidelines.

Venue Reports and Lending Policies

Lending Policies
• Varies among institutions, but mostly require the following:
  ▶ Prints must be screened on multi-projector (changeover) systems.
  ▶ Archive prints may NOT be shown on platter projection systems or made up into reels over 2000’ in length.
  ▶ Borrowers are entirely responsible for shipping and return costs, as well as insurance.
    • return the print to the archive immediately using a reputable courier.
    • Usually a FedEx account is required and ground shipping is forbidden).
  ▶ Borrowers assume full responsibility for replacement or repair of damaged, lost, or stolen prints.
  ▶ Requests must be made 4-6 weeks in advance (institutions set varying deadlines).
  ▶ Evidence of copyright clearance.
  ▶ Loan agreement required.

NB- Review the FIAF Code of Ethics
Venue Reports and Lending Policies - continued

- Example Venue Reports:
  - Academy Film Archive
  - George Eastman House

- Tips!
  - Archives want reassurance that prints will return to them as they were sent (same condition, same packaging).
  - If something goes wrong that it doesn’t turn into a complete disaster (cutting out too many frames, in case of loss that there is no coverage to replace prints, etc…)
  - Trained, careful projectionists are handling the prints.
  - That films are presented correctly - honoring the artistic intention and craftsmanship of the filmmaker.
  - Ask the archive questions (they like it).

Familiarize yourself with archive lending policies. The archives will appreciate the time and effort you take to educate yourself, and this will go a long way to being allowed to borrow prints. This list will get you started.

- Academy Film Archive
- George Eastman Museum
- American Genre Film Archive
- UCLA Film & Television Archive
- Museum of Modern Art
- Harvard Film Archive
- Anthology Film Archives

Other lending institutions:
- North Carolina School for the Arts
- Pacific Film Archive
- Library of Congress
- Janus Films
- FIAF Archives
Shipping - Packing

- Check loan agreement to see if there are any special instructions on how and where to return films.
- **MAKE SURE THAT THE FILMS ARE WOUND CORRECTLY.**
- No proud edges, smooth, even and tight pack.
- Always **tape down** the film ends.
- Snugly packed.
- NO FIBROUS materials or Styrofoam please!
- Seal boxes, shipping cases and Goldbergs well.

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Shipping - Packing, Labeling, Insurance, International

**tips!**

- **Prints are their most vulnerable when they are in transit.**

- Take every precaution to minimize risk. Be diligent about smooth winds, taping down film ends with a reasonable amount of tape, pack the films snugly in an appropriately sized box, shipping case or Goldbergs.

- Never use Styrofoam or fibrous materials for packing - it gets over everything!
Shipping - Packing

Don’t just tape the top of the box!
Shipping - Packing

From:
Frank Capra
Alamo Drafthouse Cinema
1120 S Lamar Blvd.
Austin, TX 78704

To: Tim Wagner
George Eastman House
900 East Avenue
Rochester, NY 14607

TRACKING # 7751 8934 8732

Affix a “back-up” address label with tracking information to the package in addition to the waybill. Enclose a Packing Slip.

Shipping - Insurance, International

• Check loan agreement to see if there are any special instructions on how and where to return films.

• Read your insurance policy carefully! Does it include coverage during shipping? If not, consult the archive and insure the print for transit via the courier.

• International shipments require Pro Forma Invoices, consult the archive regarding declared value of the print, and declaration statement.
It's good practice to have a standard inspection form. Helps with presentation and accountability. Especially useful if there are multiple projectionists working in the same venue. Music Box Theatre- very good example. Note overall condition.

Inspection Forms

ATTENTION PROJECTIONIST!!
The Academy Film Archive has taken much time and care in preparing this film for your screening. Please treat this print with the same respect as we do.

* This is an archival print, it must be run reel to reel – please do not remove head or tail leaders, and please do not build up or "planatarize": even if the print has previously been built up.
* Do not scribble or punch holes for cue marks, please use only grease pencil. After projection, remove any marks made.
* Do not reinforce cement splits with tape unless you detect an actual weakness upon inspection.
* Upon return, please be sure to tape the ends of the film down securely with at least 6 inches of new tape.
* Cutting frames is not allowed. In the event that the film cannot be projected, please contact us.

* If you find that the print has arrived damaged or have any other questions, contact us immediately: 310.247.3016 ext. 332.

Thank you very much for your cooperation.
Supplies

- Rewind Bench and Light Table
  - Loupe
  - Splicer & Splicing Tape
  - Frame Counter (Film Synchronizer)
  - Markers (acid free preferred)
  - Artist Tape (PH neutral)
  - Grease pencils
- Exact-o Knife, Straight Razors, Small Scissors, Tweezers
- 2000ft Split Reels (2 minimum)
- 2000ft House Reels (Cast Aluminum aka Goldberg) (12 minimum)
- Soft White Lint-free Cotton Gloves
- 99% Isopropyl Alcohol
- Canned air

• Miscellaneous
- Flashlight, Lightbox, Zip Ties and Shipping Supplies, Supplies for cleaning inspection surfaces (91% Isopropyl Alcohol, paper towel, Soft Lint-free cotton cloth).

Supplies - continued

• Projector and General Cleaning Supplies
  - Camel Hair Brush
  - Soft Lint-free Cotton Cloth
  - Canned air
  - More Canned Air
  - Medical Grade Lint-free Wooden Cotton Swabs
  - 99% Isopropyl Alcohol
  - Trichloroethane Equivalent
  - Caikleen RBR

• Lens Cleaning Supplies
  - Optical Grade Lens Cleaning Fluid for Coated Optics
  - Lens Tissue for Coated Optics (Class 5 preferred)

• Miscellaneous
  - Binoculars or Spotting Scope
  - Flashlight or Head Lamp
  - SMPTE RP-40/PA35, SMPTE Buzz Track, and Dolby CAT 69T (minimum)
Changeover Cues

Show clip reel from
Paul Clipson

Countdown Leaders and Changeover Cues

- Determining difference (SMPTE, Academy, other), and their purpose.
- Changeover cues.
- Sound speed (aka sound pull-up), and the separation between picture and sound.
Countdown Leaders and Changeover Cues

SMPTE Leader counts seconds

*tips!*

S is for SMPTE and Seconds

24 frames per second

Academy Leader counts feet

*tip!*

16 frames per foot

Both SMPTE and Academy leaders are

12 ft = 8 seconds = 192 frames

from beginning of the countdown to the first image

Changeover Cues

• SMPTE - 55 (SMPTE Universal Leader) pre-2005 standard.
  • 4 frames of Motor Start Cue ➔ 168 frames ➔ 4 frames of Changeover Cue ➔ 24 frames (last image) = total 200 frames

• SMPTE - 301 (SMPTE Projection Leader) post-2005 standard
  • 4 frames of Motor Start Cue ➔ 172 frames ➔ 4 frames of Changeover Cue ➔ 18 frames (last image) = total 198 frames

• Use inspection forms to note motor start and changeover cue location

• Be flexible! Don’t re-cue, adapt.

• If there are no cues, use grease pencil on the base - use SMPTE 301 specs.

• Always remove any markings you make before returning the print to the archive!
Leaders, Cues and Sound Speed

• Sound speed - 24fps
• Separation between picture and sound
• MAGNETIC - Degaussing to be performed by qualified cinema or sound service engineer only!
  • If done incorrectly this can permanently damage the projector and print!

<table>
<thead>
<tr>
<th>TABLE 2. NUMBER OF FRAMES USUALLY SEPARATING SOUND AND IMAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic track</td>
</tr>
<tr>
<td>Optic track</td>
</tr>
<tr>
<td>Optical track</td>
</tr>
</tbody>
</table>

* 35mm mag and some early 35mm optical tracks follow the picture instead of preceding it.

Identifying Aspect Ratios

Definition:
The proportion of width to height in a projected image

Common Aspect Ratios
1.33:1 (Full Frame Silent)
1.37:1 (Academy)
1.66:1
1.85:1
2.39:1 (anamorphic)
Identifying Aspect Ratios

1.33:1 (aka Full Frame Silent)

1.37:1 (aka Academy)

Identifying Aspect Ratios

1.85:1

Hard Mask

1.85:1

no Mask
Identifying Aspect Ratios

1.85:1
Hard Mask

1.66:1
Hard Mask

2.39:1
(aka Scope or Anamorphic)
Lenses and Aperture Plates, Brightness and Magnification

You need a separate aperture plate and appropriate lenses per projector for each ratio your theatre will exhibit.

**Brightness**
Reflector, lamp, shutter, lens, port glass and screen all affect the brightness of the image.

**Screen Luminance**
For motion picture projection, is measured in foot-lamberts (fl). The SMPTE specification is **16fl-1** with uniform illumination across the projected area, without film in the projector (open gate).
Identifying Sound Format

Silent
Mono variable density
Mono variable area

Dolby A or Dolby SR?
Identifying Sound Format

Dolby SR - D (Dolby Digital)

High Magenta

Cyan Dye

SDDS

DTS

Special Considerations
• Red LED
• White Light / Tungsten
• Laser

Uncommon Formats - you’ll be glad one day you learned about

1.19:1 (aka Movietone)

B&H Perfs, Nitrate!

Tech IB

Cinemascope with foxhole perf, 4 track magnetic
Silent Film Projection

- 1.33:1 (full aperture) plates and lens are required
- It can be tricky to determine the orientation of a silent, full aperture print!
- Tip! 35mm projection prints are almost always A-wind (reading correctly through the emulsion). Proper orientation for projection is HEADS OUT, EMULSION OUT
  - NB - B-wind reads correctly through the base, B is for Base.

- There is no standard speed for silent era films. Films can be shown at a speed as low as 16 fps.
- Reducing the speed of the projector from 24fps increases flicker. This can be minimized by installing a three-blade shutter

The Shutter

- 2 blade shutter most common in theatrical use.
- Primary blade caps the light during film pull down. Second blade caps the light during projection to lessen flicker.
- Shutter rotates once per frame.
  - Each frame is projected twice.
- 3 blade shutter will help reduce flicker when projector speed is reduced beyond 24 fps.
- The shutter must be synchronized with the intermittent or ghosting will appear.
Thanks & Resources

Resources:

The Film Preservation Guide
The Basics for Archives, Libraries, and Museums
by National Film Preservation Foundation

The Advanced Projection Manual
by Torkell Sætervadet
International Federation of Film Archives

Lead Instructors
Antonella Bonfanti, Director
Canyon Cinema Foundation
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Justin Dennis, Principal Engineer
Kinora
Justin@kinora.com

Images and examples provided by:
http://instagram.com/benitotucker
Dan Wagner, Academy Film Archive
Paul Clipson, FESPIL
Afteer Nomal, Texas Archive of the Moving Image
Projector Maintenance 1
Robert Cejka
TOOLS FOR THE BOOTH

Screwdrivers – various lengths and styles (Philips/ straight – wide and narrow)
Channellock / Slip joint / tongue and groove pliers
Needle nose pliers – Diagonal cutters
Vice Grips
Box Wrenches – Various – Standard and Metric, ¼’’ & 3/8’’
Ratchet Wrenches – Standard and Metric
Crescent Wrenches – large, Medium & Small
Retaining Ring Removal Pliers (1 inside tip and 1 outside tip or a convertible set with multiple tips)
Magnet on a telescoping stick
Allen keys – various styles - screwdriver set, L key style/ all with Ball Ends – Bondhus makes a great set – Metric and Standard
Alligator Clip Test Cables – Various colors for troubleshooting
Multimeter – for measuring voltages, current and continuity. Fluke makes great units. Example that is accurate but doesn’t break the bank - Fluke Model: 114/EFSP [http://www.testequipmentdepot.com](http://www.testequipmentdepot.com) has good prices and sometimes refurbished ones.
Flashlight with magnet to hold it in position in weird spots and/or head worn lamp
Rubber mallet – Hammer
Pry bar
Torpedo Level
Safety Glasses - Safety Face Shield – Ballistic Vest and Gloves = for lamp changes
Crocus Cloth (3M) and Emery Cloth (3M) – for sanding down burrs on metal reels or platter decks, shafts etc.
Good set of metal files – for heavy burrs and for aperture plate filing. Aperture files should be rectangular and smooth on the narrow sides
Wire Strippers – Wire Crimpers
Good Vacuum cleaner, cheap 1” paint brush for dusting and cleaning fan grills and other spots.
99.9% Pure Isopropyl Alcohol
Micro fiber cloth set (Christie Digital has a nice 3 piece set each one a different color and size for function)

Robert Cejka

Boston Light & Sound, Inc.  www.blsi.com  rob_c@blsi.com
Check List for Projector and Booth

Roof Fan Units – Is the fan unit covered and secured with proper screws? Is the belt or chain checked for proper tension? Is the belt dry, clean and crack free? Is the chain rust free and greased?

Use CFM Meter to check the air flow on the fan to see if it meets the minimum needed for lamps (Note Digital and Film may need different CFM ratings)

Did rain come down the roof exhaust duct into the lamp house? (Note: This should not be possible, if it is have duct redesigned)

Did critters such as birds and squirrels come in and make nests in lamp house or ducts?

Did any critters get into the booth or electrical closet and chew thru wires leaving them exposed and touching any metal parts?

Do you have a LOCK OUT – TAG OUT kit to block your electrical panel before doing any work on any gear? Grainger and McMaster Carr are 2 of the many companies that sell the kits.

Walk around the entire projector and power supply area to verify all connectors are secure and tight and do not contain any dry rot or showing any cracks.

Check all fan intakes and exhaust ports for any dust bunnies that could accumulate and block air flow on any gear.

Check the reflector for any peeling, pitting or cracks. Clean reflector using a micro fiber cloth.

Check the lamp for hours vs. warranty, check it for any dark spots or grey in the bulb envelope. Lamp should be crystal clear – if any dark spots are showing it could be aged or not focused correctly – if entire lamp is grey in color and is no longer translucent there is probably a leak in the envelope and bulb needs to be replaced immediately.

Check alignment of film path from top roller down thru all penthouses thru the top pad rollers of the projector, thru the gate area, thru the intermittent sprocket area, thru the sound head and down to take up reel or lower reel arm thru to the platter. ** Rule of Thumb we talked about in class– Right Down the Middle of any film path item.

Check all pad rollers for proper distance between roller and sprocket – While on the pad rollers check them for smoothness and if they are displaying any chipped or broken edges/sides. Replace if needed.

Check all sprockets for hooked sprocket teeth

Clean all gates and traps and check all tension bands for proper spring tension and cleanliness

If any band shows burrs or has no spring tension then it is time to replace it.

Check intermittent oil levels for all projectors

Check oil gaskets if your projector has them

Check sound head dashpot fluid levels (damper arm)

Check that the operator side of the projector is clean and dry and oil free on all surfaces before lacing up any film

Check smoothness of the scanning drum surface and that it spins freely

Check that all flywheels are securely in place. Never run film without flywheels in place

Check that all covers are securely in place – covers for motor belts, gears, flywheels, shutter blades, projector drive train (may be door in place of cover)
Check the proper lens is installed for proper film aspect ratio being shown.

Check the proper aperture plate is also installed.

Clean all lenses using lens tissue and Rosco lens cleaner – do not apply fluid directly to the lens – the fluid is applied to the lens tissue.

Whenever a lamp is changed it must be properly aligned for the X, Y and Z to have even illumination and achieve the proper foot lamberts on Screen. If a lamp is not aligned properly you will have hot spots of light on screen and could damage the reflector, lens and print very quickly.

Check that all belts from the projector motor to the soundhead or projector are properly tensioned and have plenty of belt material in thickness. If the belt is cracked, dried up, frayed or very thin it is time to replace the belt(s).

Check felt clutch pads on both upper and lower reel arms.

Check all reels before use to make sure they are not squashed together pressing on the film or showing any signs of metal burrs which will scratch the print or nick its edges.

Things to test the projector image with are RP-40 Test alignment film (shown by Rob and Justin) and scratch test film as demo’d by Justin.

Is the port glass clean and free of finger and nose prints, dust and smudges? Never use Windex on port glass only use 99.9% alcohol and a micro fiber cloth.

Check your screen for candy and spit balls or Coke stains. Check for dust build up in sound perforations. Do not try to clean a screen yourself – ESPECIALLY a Silver Screen. It is very easy to make a small mark into a big mess. Hire a professional screen cleaner that knows what they are doing and has insurance.

Windex can be used on platter deck surfaces, projector lamp house or console surfaces. DO NOT use Windex or other general cleaner on the port glass, projection lenses or reflector.

Remember to always have the lamp house dowser closed when striking a lamp for the following:

- If lamp explodes on strike the flying glass debris is mostly contained in the lamp house and not thru the shutter blades and into the film path
- If the dowser on the lamp house is open the light will melt shutter blades, changeover plates, crack heat filter glass (if installed), melt film and may crack the lens

Check the lamp house dowser handle and entire mechanism (chain/spring etc.) for secure locking to hold the dowser in place tight. Review damage mentioned above about what unchecked light can do to the projector parts.

Remember never to touch the glass of the xenon lamp with your fingers. If you should get a finger print on it, use 99.9% alcohol on lens tissue to remove the finger print

Check that heat filter (if equipped) is installed clean and damage free.

Robert Cejka

Boston Light & Sound, Inc.

www.blsi.com  rob@blsi.com
General Supplies

White gloves for film handling – BL&S
Various projector oils – BL&S
Century projector gear grease – BL&S
99.9% isopropyl alcohol – can get online or some drug stores.
Micro fiber cloths for cleaning – can get most anywhere.
RP-40 alignment film – BL&S
Lens tissue and lens cleaner – BL&S
Neumade 35mm film tape cutting blades for splicers – BL&S
35mm splicing tape – BL&S
Grease Pencils, sharpie markers
White paper tape – for use on film make up / break down
Paper Towels – shop rags - Q Tips for general cleaning.
Toothbrush for sprocket cleaning.
Canned air – BL&S or a compressor with long hose (compressor lives in closet away from port window to keep noise down)
Windex for surface cleaning of gear (never on port glass or projector lens)
Stick-a-poos for platter use – BL&S
Spare drive wheels and motor cards for platters (if your unit has them) – BL&S
Framing lamps for the projector.

“Would be nice” Items but not needed for daily operation:

RP-40 image alignment film – BL&S
Pink noise film that identifies screen channels - BL&S
Light Meter to measure screen luminance and even out hot spots
Kit to measure pink noise level in the theatre (B Chain)
Real time audio analyzer and oscilloscope for correcting sound head on the projector (A Chain)
CFM meter for checking air flow rate in the exhaust duct
Multimeter for measuring AC + DC Volts, current, resistance etc.

(BL&S = Boston Light & Sound can supply these items.)
Film base identification and decomposition

Anatomy of motion picture film

Emulsion: layers of dyes suspended in gelatin
Binder: Adheres the emulsion to the base
Base: A type of flexible plastic that is used as a foundation for the emulsion.

Three types of film bases:

1) Cellulose Nitrate, introduced in 1889 and discontinued in 1951, made with cotton linters combined with a mixture of nitric and sulfuric acids, dissolved in solvents and then cast, producing the thin, flexible plastic like film base.
2) Cellulose Acetate, started use in film prints in 1930s mostly in 16mm and 8mm formats. Made by combining wood fibers with acetic compounds, and sulfuric acid then adding other solvents to create the plastic base.
3) Polyester, developed in the 1940s but used mostly for still photo bases beginning in the 1950s. Was not widely used for motion pictures until the mid 1990s when it became the standard base for distribution prints because of its ability to stand up to the brutality of daily projection. Made by combining ethylene glycol and terephthalic acid.

Post Script: In my lab, I had an inaccurate and incomplete description of the film base manufacturing process. After talking to Diane I learned more about how film bases are cast and then found this article describing the manufacture process: http://www.democratandchronicle.com/story/money/2015/03/14/kodak­makes­film­rochester/70299168/

Base Identification

Nitrate:

1) Date: Discontinued in 1951, although some films released in 1952 may have used nitrate. Films produced after 1952 will not be nitrate.
2) Visual Inspection: Often has the word “NITRATE” printed on the edge of the film. There is the possibility of misidentification as this edge printing may transfer when the film was re-printed on newer stock.
3) Format: 16mm film was never made with nitrate stock.

Acetate

1) Date: Developed in the 1920s and started manufacture in the 1930s
2) Visual inspection: Often has the words “SAFETY FILM” printed on the edge of the film.
3) Visual Inspection: If you hold reel up to the light and look through the side of the reel, light will not pass through the reel (it will look dark)
4) Physical test: Tears easily.

Polyester

1) Date: Use mainly for film prints in distribution in the 1990s. No polyester before 1955.
2) Physical test: Extremely durable, hard to tear.
3) Visual inspection: If you hold reel up to the light and look through the side, light will pass through, it will not look dark like acetate.
4) Visual inspection: There is a way to verify a polyester base using polarized lenses. Tear apart one of those now ubiquitous polarized 3D glasses and put a piece of the film between the polarized lenses and put it over a light box. Be sure to have the polarized lenses crossing each other (you should not be able to see through them). Tilt this film sandwich back and forth and if you see some red and green hues like you would see on a soap bubble (called interference color or ), it is a polyester print. Acetate will not create this effect.

Decomposition

The majority of the information/images for this section of the lab came from: https://www.filmcare.org/about_film

Nitrate decay
1) Nitrate film base is extremely unstable and has been known to self combust.
2) Once the decomposition process starts, it gets worse exponentially.
3) Basic problem: Moisture and heat react with the nitrogen in the film base and create nitric acid which corrodes the emulsions and eventually the nitrate plastic base.
4) Five stages of nitrate decay:
   a) Image fading, brownish discoloration of emulsion, faint noxious odor.
   b) Sticky emulsion, faint noxious odor
   c) Emulsion softens and blisters with gas bubbles. More pungent odor.
   d) Film congeals into a solid mass. Strong noxious odor.
   e) Film disintegrates into brownish powder.
5) What to do: Best storage for nitrate film is in a freezer with low relative humidity.
6) Nitrate film, especially as it becomes more and more unstable during decomposition, is a hazardous material.

Vinegar Syndrome/Acetate decay
1) Heat, water, high humidity cause the acetic acid within the film base to break down and escape. Acetic acid is in vinegar, and so produces that distinctive vinegar smell.
2) The smell of vinegar is the beginning of the decomposition of acetate film.
3) Stages of acetate decay can be described as follows:
a) Film begins to smell like vinegar
b) Film begins to shrink and warp
c) Film loses flexibility (becomes brittle)
d) Emulsion cracks or flakes off the base. Also called “delamination” - as the base shrinks, the binder bunches and separates from the base.

4) Acetate film does not need to be stored in a freezer like nitrate, but it should be kept in a cool environment with low relative humidity and a stable temperature.

5) Move any reels exhibiting signs of vinegar syndrome away from other prints/reels.

Shrinkage
1) As the acetate film base decays, the distance between perforations shrinks.
2) Small gauge films have a harder time with shrinkage because of the smaller frame size
3) 16mm and 8mm film beyond 0.8% and 35mm beyond 1% shrinkage can be damaged by projection equipment.
4) Can check for the level of shrinkage using a shrinkage gauge. There is a film shrinkage meter for ipad.

Warping and Curling
1) Warping and curling happens as a result of uneven shrinkage across a film’s dimensions.
2) Film can warp or curl without substantial shrinking, but the resulting warping and curling can still make projection difficult/impossible without causing further damage to the film.
3) If this process goes too far, it can be impossible to scan or duplicate for preservation.

Color/Dye Fade
1) All film is susceptible to dye fade, it just happens at different rates and different colors for different types of film stocks. But over time, the organic compounds used to create color in film will fade.
2) High temperatures and humidity affect the rate of dye fade. While light can affect dye fade rate, a lot of dye fade happens in the dark.
3) Kodacolor film stock from the 1940s to 1950s have poor dye stability and exhibit yellow/orange staining
4) Eastmancolor 35mm negatives and prints from 1950 onwards also have poor stability.
5) Probably the most commonly understood form of fade is referred to as when a film goes “pink.” This is what Eastmancolor is famous for doing. I have not seen an Eastman color film from any time period that is not faded and pink.
6) A couple of different types of fade, one is the color (different color dyes will fade and change the color of the image) but also the contrast within an image can be lost with color/dye fade.
7) Fuji rot - Specific to Fuji film stock, dots appear in the image, color can shift towards purple/blue
8) The only thing that can be done to help slow dye fade is proper storage in cool environments with low humidity. It will happen with time, there’s really nothing that can be done other than preservation before the fading becomes too bad.

Redox Blemishes
1) These are small pin orange, or yellow spots in the image that may look brown when viewed with reflected light.
2) Common in black and white film, as the metallic silver that is in the gelatin binder oxidizes.
3) Moisture in the air is the most important contributor to this type of damage, controlled relative humidity between 20 - 50% helps to prevent this from happening.

Plasticiser Exudation
1) Plasticisers are common ingredients in acetate film bases (phthalate and triphenyl phosphate are two common ones)
2) As acetate film decays, the base loses its ability to hold the plasticisers and they can move to the surface of the film causes crystals or bubbles

https://twitter.com/AfsheenNomai/status/672844265353965568

Mold
1) The gelatin binder in film provides food for mold spores, so they are prone to develop mold if stored in high relative humidity environments, particularly above 65%.
2) Mold can first be detected on the edges of film reels, but can also burrow into the gelatin layer, looking like dull spots in the film.
3) Mold should not be handled without precaution, and is best handled by a professional. Once mold has eaten into the gelatin, there is nothing that can be done.
4) A cold and dry environment is best for preventing mold from forming.

Other Resources:
http://www.filmpreservation.org/preservation-basics/the-film-preservation-guide
https://www.nedcc.org/assets/media/documents/05PH_01FilmBaseGuide.pdf
http://cool.conservation-us.org/byauth/fischer/fischer1.html
https://en.wikipedia.org/wiki/Film_base
http://www.loc.gov/preservation/care/film.html
Projection Best Practices
Rebecca Lyon
Julian Antos
Treat every print like it’s the last copy in existence of that film (because it might be). All prints are created equal (from archives, private collectors or large distributors). But keep in mind that archives ALWAYS check prints upon return and will do detailed inspection after your screenings. Know your archive, follow any specific instructions they may have. If you want to run film at your venue, you must have a good reputation with the archives or the prints will stop coming. You’re not just a projectionist anymore, you’re a custodian!

Film damage can be divided into three main categories: Damage incurred in shipping, inspection, and projection. In ALL cases, film damage is AVOIDABLE. The idea that scratches and splices are normal and part of the "look" of film is false, and a modern polyester print on well maintained projectors should be able to make several hundred runs through a projector without any significant signs of wear. That said, a well worn print deserves just as much love, care, and attention as a pristine one, from both the audience and the projectionist.
Print Arrival:
- Open cans as soon as prints arrive: count reels, check for dts discs, make sure it's the right film etc.) Look for broken shipping reels, leader loose in can etc.
- **Cores:** Take extra care with prints coming on cores. If they are loose always place something under them when moving them from the cans to the split reel etc. (think about it like handing a pizza. You don’t want the middle to fall out.)
- Let the archive know right away if the print has been damaged in transit

Inspection supplies:
(You can get many of these things at: [http://www.store.christys.net/](http://www.store.christys.net/))

- split reel (2000 ft)
- goldberg reels (2000 ft, at least 12) DO NOT PROJECT ONTO SHIPPING REELS
- Light box. If your rewind table doesn’t have one built in we find these light pads work well: [Logan Portable Light Pad](http://www.store.christys.net/)
- razor blades
- small flashlight
- loupe
- white archival tape (often called artist’s tape) PH neutral/acid free
- small scissors
- splicer (clean and well maintained)
- frame counter or frame ruler
- china marker/grease pencil (black or white only!)
- sharpie (acid free for any permanent labels)
- lint free cotton gloves (for when you are handling anything other than the edges of the print)
- replacement countdowns or leader to make your own
- lint free cloths
- Kodak date code chart
- inspection report

- Supplies NOT to use: scratch cue markers, yellow splicing tape (any splicing tape OTHER than clear, silver cue marking tape, shoe polish (THROW IT OUT), Film Guard (not on archival prints).

Inspection:
- we do this both for liability reasons (so you can tell the archive what condition the print was in when you received it) and for proper presentation/exhibition.
- Especially important if your print inspection person is not the person running the show. Help the person projecting but providing them as much detail as possible.
- Don’t trust your memory of whether or not a print had damage if an archive has questions after print is returned! Use your report!
- There are many different looking types of reports, find out what works best for your venue. Single page ones are best, but you can also keep more detailed notes elsewhere and transfer them to the single page later.
- some print lenders ask for an inspection report, though it’s not required. Put a legible version of your report in the can upon return shipment. It helps the lender (or possibly the next venue to receive the print) and it shows that you’re an attentive and responsible lendee.

What we look for when inspecting a print:
- Orientation: 35mm A wind (emulsion out (facing upward to the sky). B Wind (emulsion in towards the center of the reel). Keep an eye out for prints that come reverse wind, i.e NOT correct for projection. When heads out a correctly wound 35mm print (coming off the reel counterclockwise) will be soundtrack towards you, picture upside down and emulsion facing out. When threaded in the projector the emulsion side will be facing in towards the lamphouse, base side will be facing towards the screen. Some prints will arrive tails out, emulsion out, which is NOT CORRECT for projection. You’ll have to wind over/over or under/under to correct the wind.
- base/emulsion: Know the difference so you can identify where the damage is, how it will look on screen. Emulsion scratches tend to be more visible to the audience. The base side will look shinier, the emulsion side more matte and you can often see the raised edges within the frame where the emulsion is thickest. Use your flashlight, move the film back and forth and observe how the light reflects off the surface. Some prints will be easier than others to tell which side is which.
- Acetate vs Polyester base (Estar): Knowing what type of film base you’re dealing with is important - It can help you date the print, and the two types have different qualities. They have different thicknesses which can affect your focus if you go from an acetate to poly print or vice versa.
- Acetate: Older acetate prints tend to be more brittle and prone to warping as they lose moisture. Acetate is thicker and tends to break when stressed, and it can suffer from vinegar syndrome if not stored properly.
- Polyester: is slightly thinner and tends to stretch rather than just snapping. Polyester stock began being used for 35mm prints in the early 90s (it was used for 16mm much earlier). Post mid 90s basically everything is polyester (often referred to as Estar base which is the Kodak trade name). They say when acetate snaps it’ll break the print, when poly snaps (or stretches) it’ll break your projector!
- [here’s a guide](http://example.com) to making your own film viewer for easy identification of polyester or acetate bases.
- Older polarized 3D glasses work great for this if you can find some. Real-D glasses do NOT work.
- Film stocks/dates: If you want to know the date of the print use the [Kodak Edge Code Chart](http://example.com). There are some film stocks (like Agfa) that don’t have date codes. Remember that the date print was made is NOT always the date that the film was released but it’s helpful to know if you have a vintage print on your hands.

**Damage:** Learn your terms: scratching vs. abrasion, embossing, cinching, warping, etc. If you’re not sure, just describe the damage as best you can. It’s ok to just describe the damage even if you’re not sure what caused it. [Kodak Film Damage](http://example.com) site is great for learning the terminology.

- Scratches/abrasion:
  - scratches on the base show up as black lines as the light shining through the base of the film is refracted by the scratch.
  - scratches on the emulsion side (of color film) may show up as yellow or green, or white, depending on how many layers of the emulsion they have gone through.
-horizontal, repeated, or cycling scratches (platter marks) on image or optical track. “Platter marks” usually refer to repeated horizontal scratches that occur when the film rubs against the platter. Abrasion is usually caused by rubbing, accumulated dirt etc. worn or stalled pad rollers.

-Splices: We do not count head/tail splices on our inspection reports, just note whether or not the print is cut or uncut. A splice is defined as a point where the print has been cut and rejoined, either with tape or cement. Ultrasonic splices are considered permanent and are usually done at the lab. A repaired film break can be considered a splice, you can note whether or not there are missing frames. Splice count policies may vary from venue to venue. The important thing is that you are clear about it. (Cement splices are acetate only, Ultrasonic are polyester only).

- check all splices to make sure they are correct. If you don’t splice together full frames (i.e 4 perfs) you’ll come up out of frame during projection.

- Use your nose: Sometimes it’s hard to tell the difference between a print going vinegar and a weird smelling cleaning solution. Strong vinegar smell and warping or shrinkage can mean deterioration. If it just smells odd but otherwise looks fine it might just be from a cleaning solution or Film Guard. Vinegar syndrome can spread to other acetate prints so make sure to deep clean your projector after running a vinegared print. Tangent: Venue is NOT responsible and generally prohibited from applying cleaning solutions to prints. this falls under the category of not doing things you can’t reverse to a print. Archive prints should never be cleaned by the venue.

Aspect Ratio/Sound Formats: Don’t always trust what it says on the cans for AR/Sound. Especially with handwritten labels. You should be able to identify the aspect ratio at the inspection bench. If you are really unsure you can run a reel and try different lenses/plates. Always use multiple sources of info, ie. IMDB can be really helpful, but it’s not always correct so have a second source to back it up. The Advanced Projection Manual has a great section on aspect ratios and sound formats.

-soundtrack inspection, SR-D inspection test your DTS discs! Look for scratches on your soundtrack. On an optical track a severe scratch will cause an audible buzz, on an SRD track a severe scratch will cause the track to fail. If you did not see any scratching on the Optical or SRD track and are experiencing these problems, it means the film is not tracking properly and the A-chain needs to be adjusted. Look for scratching on DTS tracks if applicable, really the only thing that will cause them to fail is a severe emulsion scratch, which is very rare but does pop up from time to time.

-Dolby A vs. Dolby SR noise reduction. First, use the year of the release. Dolby A was used from 1975 up until the early 90s, Dolby SR was first used in 1986. Visually there is no way to tell the difference between the two, so if you get a print where the film was made in those overlap years you may have to listen to it to be sure. You can also check the end credits of the film, if you see the”Dolby Stereo Spectral Recording” logo it’s SR. If you really can’t decide, it’s better to play back an SR print as A type in your sound processor than it is to run an A type print as SR.

Making labels (for non-archival prints. archival prints should always be returned as they arrived, if you add a label in the booth, it must be removed before shipping out. Don’t put tape over the lab/archive label because when you remove it the original label may be damaged): a print should have as little tape on it as possible (not including the tape used for shipping). If there is a label already on the print with
the name and reel # and aspect ratio/sound format (if you’re lucky) that’s great. DON’T add another label just because you want some kind of evidence that it’s been in your booth. I often take off labels if there are multiples and it doesn’t leave any tape residue. If a print is totally unlabeled it’s ok to make one yourself just keep it short and put it on Reel 1. Make sure the information is correct! If you aren’t 100% sure about the aspect ratio, don’t write it on there. Use archival tape and acid free markers for the label.

Cues:
  - **Countdown:** SMPTE countdown is measured in seconds. Academy countdown is measured in feet. Both types should be 12 feet in length.

24 frames in a second
16 frames in a foot
So 12 feet = 192 frames = 8 seconds
  - **Making Cues:** First, determine if you need to make them. If there are already cues use a frame counter to see which ones are correct. Always start from the end of the reel and count backwards from last image. If it’s a fade out, be careful to check where the fadeout ends and the footer begins. Only make cues if you HAVE TO (i.e there aren’t any or the existing ones are really far off). Better the audience see a frame of black than marking up a print with more cues. Archival prints will almost always come with cues. Grease cues must be removed from archive prints upon return (but most archive prints come cued anyway...)

End of picture → count 18 frames → mark 4 frames of C/O → count 172 frames (or 10 feet + 12 frames) → mark 4 frames of M/C (this is SMPTE spec for cues).
Total number of frames = 198

- WEAR GLOVES and ALWAYS MARK THE BASE SIDE. Mark your changeover and motor cues over 4 frames. Because you have the film running tails to heads on the rewind and you’ll be marking the base side you will have to flip the film over (just a loose twist) and mark the cues on the side opposite the soundtrack on the top of the frame. Just a short dash from the corner in towards the center a few centimeters will do. As small as you can while still being able to see it.
  - There are 10 feet and 12 frames between your motor cue and your changeover cue (total is 172 frames or about 7 seconds). Countdown should be 12 feet (or 8 seconds) There is 8 (or 7 or 9) feet from the number you thread on (6 for SMPTE leader and 8 for Academy) to the first frame of picture. That extra footage is to account for the time it takes for the motor to ramp up. Some projector motors are slower in which case you might thread to a lower number to make up for that. If a film has been previously cued but say the changeover cue has been spliced off, you may want to count back less than 18 frames to avoid clipping anymore of the film than you have to. I would say 12 at the minimum to avoid having a pretty bad changeover.
  - **Making cues on a fade out:** If there’s no splice to help you, look for when the audio ends and use your best judgement. There should be a lab splice or a splice from the negative that you can count back 172 frames from. If you’re comfortable you can do a changeover on a fadeout with just the motor cue, use your ears for the change over cue!
Repair Work

-When is it ok? This depends on the distributor or archive but always assume the answer is never and CHECK WITH THEM FIRST before doing repairs. Check to see if the print came with any special instructions, or if you received any when you booked the print.
- In general most places will allow VERY MINOR repair: putting splicing tape over a frame of broken perfs, replacing bad splices etc. Just do the minimum you need to avoid any further damage during projection. As a projectionist and not an archivist, it’s not your job to repair a print, but it is your job to make sure it doesn’t get damaged further during your show.
- if there is major damage, such as several feet of broken perfs that need to be repaired you MUST notify the archive before doing anything and you can NEVER cut the print or remove frames without notifying the archive.
- notching, don’t do it! This is when you cut a notch mark where there is a broken perf so that it doesn’t snag in the projector. The broken perf needs to be repaired instead.

Cleaning: It’s not your job. If you get a print will really filthy or oily leader I sometimes just wipe that down with a clean cloth or cotton glove, but never the print itself.
- PTR rollers: Only use them if they are very well maintained and clean and you know what you are doing. Dirty PTR rollers can do more damage than good. PTR rollers are very good at keeping a perfectly clean print dust free, but the benefits of running a very dirty print through PTR rollers are negligible at best. This goes for all types of cleaning mechanisms, you can do a lot of damage if they are not correctly maintained so it’s best just not to use them. In general cleaning equipment in a booth is there because prints were run many times at the same venue (say 100s of times on a platter system). When you’re projecting archival prints chances are you are only running it a few times and there should be no need to clean it. It’s good to be aware that you may have certain types of equipment in your booth that was really designed for films with extensive runs and NOT for prints that you run once or twice.

Storage:
- if you’re storing a print on house reels for any length of time they should be kept in reel bins to protect them from dirt and dust. If you don’t have these or don’t have enough space for more than one print, just store them tails out in their cans until you’re ready for the show.

Rewind:

-Keep it Clean: your rewind table is not your desk. We know booths can be very small, but keep your rewind table tidy and free of dust, and give yourself room to work.
-Tension: check your tension, change it depending on film gauge, size of reel etc.
-check the pads often on the kelmar rewind arm, if they get worn down they need to be replaced. Do not get oil on the pads! The same goes for the kelmar arms on your projector.
-having trouble getting a warped film to wind? Trying winding it over/over or under/under. Make sure it’s not rubbing against the side of the reel. Anyone working with 70mm which often comes on bent shipping reels knows this can be really difficult. Do your best!
-Check for bent spindles. Can be straightened out by a machinist, or you can buy new ones. Bouncing can mean the bearings are going bad or you need to replace the pad.
-Speed: generally not past 40%, slower is better!
-rewinding onto reels that are out of round/not true (slowly but surely...)
-hand crank rewinds, good for delicate prints if you have one

- Auto Stop: It can “sometimes” help to get a tighter wind on warped prints, make sure the roller is clean if you use it. Never leave rewind bench unattended while film is rewinding.

- Common problems: “telescoping” and “cinching” on loosely wound prints, proud edges (when some edges are raised or sticking out of the reel). Never ship a print with proud edges on the reel, they can be crushed easily and cause edge damage. Be very careful when winding film that is loosely wound onto another reel, if too much tension is put on the film it will become cinched. THIS DAMAGE IS IRREVERSIBLE as dirt is embedded into the emulsion.

- Tension winds: Learn how to do a tension wind (i.e wind the film onto the core of the reel WITHOUT putting the end of the film into the slots. NEVER tape the film to the reel or core. Use a tension wind for the take up reels on your projectors as well.

Projection/cleaning supplies:
- electronics grade alcohol (99.9% only),
- lint free Q-tips
- Toothbrush (dip in alcohol, run the motor and use the brush to clean the sprockets as they turn)
- clean rags (lint free)
- canned air
- roesco lens cleaner, lens tissue (optics grade only!)
- port glass cleaner (windex or ½ distilled water and ½ vinegar)
- paper towels
- razor blades
- binoculars or spotting scope (a must!)
- flashlight (headlamps are great)
- film test materials (RP-40, buzz track, CAT 69)
- projector manuals, threading guides

Cleaning:

- Projector: Deep clean before every show (if you’re running shows close together at least clean the gate and trap and wipe down the rollers). Deep cleaning is a great time to check for any stalled rollers or broken or worn sprocket teeth. Between reels wipe down the gate and trap and rollers. Pull the aperture plate out and clean it so dirt doesn’t accumulate there. Use the canned air last as it tends to blow the dirt deep into the projector.

- Lenses: Clean monthly. Use only optics grade lens cleaner and lens wipes (no Kimwipes!). Wipe very gently, using a circular motion. Use this time to check for any cracked or fogged lenses.

Port glass- clean your port glass on a regular basis! (windex or ½ distilled water and ½ vinegar) - careful with Windex, you have to rub to get rid of the streaks and that can damage the coating on your port glass. If you can see the action of the film reflected on the port glass IT’S TIME TO CLEAN IT.

Test Reels/basic maintenance:
(these are just the very basics, issues you should be looking for routinely)
- **Test your equipment:** If your venue does not run film often, equipment should be tested routinely! Have a test reel (such as a reel of trailers) that you can run for this purpose, get to know this reel and what it looks and sounds like under optimum conditions. You can buy newer trailers on ebay for this purpose if your venue doesn’t already have some. Check your equipment well in advance of a show.

- **Test reels:** If you want to run a test reel of the actual print, just make sure it’s ok with the archive (some venues are very specific that you only run a print ONCE), but usually it’s fine. **Do not stop the reel on image!** I.e you must let the reel run out. If you are concerned about time just choose the shortest reel, close the douser and mute the sound when you are done with your test, but let the reel run out. You can scratch the print if you stop it while it’s running.

- **Know your projectors:** Check your loops, count the perfs so you know how big your loops should be. Check your feed and take-up tension routinely.

- **Changeover Timing:** Run a test reel, check the timing of your motors so you’ll know how to properly make cues and what number to thread to in the countdown.

- **Check your reels:** no bent reels or worn out keys. 2k metal goldberg reels only. SHIPPING REELS ARE FOR SHIPPING ONLY. Reels can be trued at a machine shop.

- **Scratch tests:** runs these routinely, especially after making any changes or replacing any parts in your projector.

- **FOCUS:** Focus your binoculars on the screen perfs with the theater lights on. Run frame and focus (use RP-40 test film or another test film) and focus on the test film with your eyes. Then use binoculars. You should focus AGAIN during your screening, but running test film will get you close especially when switching between aspect ratios. Don’t be afraid to run frame and focus for a few seconds even if there are some people in the audience.

- **Intermittent oil:** check routinely (how you do this will depend on what type of projector you have). After adding old run the motor for a minute or two so excess oil doesn’t get on the print.

- **Jitter:** check gate tension or loop size. If you change your get tension for a specific print (because maybe it’s slightly shrunken or warped) make sure you return it to it’s neutral setting before you run anything else. Printed in jitter is rare but it happens. It will drive you insane. If you are suspicious the jitter you see on screen is actually printed in and not an issue with the projector, you can pull the aperture plate out and look for steady perfs (depending on the projector). Jittery subtitles can also be a clue. If they appear to move with the image the jitter is most likely caused by the projector.

- **Weave:** check lateral guide rollers and make sure they are turning freely.

- **Sound Drum:** You should run film through your projector at least once a month to exercise the bearings, especially those in the sound drum. The drum should turn freely and quietly. Run scratch tests frequently to make sure the drum is not scratching film.

**Presentation:**

- **Be Present!** We can’t stress this enough. When running archival shows, one projectionist per screen! The projectionist running an archival show should not have to deal with multiple screens, and they should never run two film shows simultaneously. One reason changeover is great is that it requires your undivided attention. Have your desk/chair in a place where you can see the projectors!

- **Your ears are just as important as your eyes.** Don’t wear headphones, don’t have the booth monitor up so loud you can’t hear the noise of the projector.
-Focus on just running your show, not other booth work (rewinding, other inspection, etc). We don’t encourage the use changeover timers, it just encourages you to not pay attention. But if you are using them in your venue don’t let them be an excuse to not be focused the screening.

-Starting a show: lights, curtain, masking! Act like you have an audience (you do). Try to time the lower and raising of the curtains (if you have them) and lights as to not shock the audience in and out of the movie. Have the lights on a fade if possible.

-breathe. If you’re running a shorts program, or have to change lenses and plates between reels, don’t rush. It’s better the audience sit in the dark for a few seconds while you take account of what you need to change. It’s not about speed, it’s about having things come up on screen looking and sounding correct. If someone is breathing down your neck and rushing you, calmly tell them you need space to do your work! Rushing only causes more problems.

-Be Gentle with your projector! Slamming reels onto the feed shaft or slamming the dowser down can cause damage, push your projector out of alignment etc.

 Threading: gathering the leader so it doesn’t touch the floor, use your tension wind to get the film onto the take-up reel. ALWAYS advance the intermittent to a neutral position and reset your framing knob to its proper position before threading. After you thread, advancing in the gate is a must either by hand or with the motor if you have enough leader.

 Motor Start: Never start a projector cold! Meaning, you should have run a test reel or test film at some point before your screening. When you start a show that should not be the first time you’ve run the motor that day. If you have enough leader at the start of your reel, thread up early in that leader and pulse the motor until you get close to enough to the countdown to advance manually to the number you thread to.

-Framing: triple check! AGAIN, always put the intermittent in its neutral position before threading the projector. Moving the framing knob affects your loops and the number of frames between sound and picture. Changing the framing substantially while the film is running can increase the chances these loops may start slapping against a part of the projector and cause scratches! You have more wiggle room with certain projectors than others, i.e Kinotons have a lot, Centurys have very little.

-Focus: should be checked constantly throughout the reel, but especially at lab splices where stock may change slightly. You will have to ride focus and adjust gate tension with warped prints. USE BINOCULARS and don’t be afraid to rack focus at the start of the reel (i.e go all the way out of focus in either direction before settling on the correct focus). Focus on the grain of the film if you can.

-During the Show: As you start each reel, do a quick check of focus and framing, listen to the projector for any unusual noises (first sign of potential damage), observe the film path and check the film as it enters and exits the projector with a flashlight. Most damage occurs below the gate, so you can check for scratches with a flashlight as the film exits the projector just above the take-up reel (obviously this only works for prints that are new and without scratches). Once it has been determined that the film is running OK, double check focus and framing and fine tune as necessary. Listen to the film through the booth monitor, if there is a problem with the sound there is likely a problem with your threading. Is there wow & flutter (film too tight or not tight enough around the sound drum)? Buzz (not seated properly, lateral guide roller out of adjustment)? If there is an SR-D track in good condition, is it dropping out?
- **Emergencies**: stopping film as it’s running: don’t do it unless the print is in danger of being damaged. Stopping the motor with film in the gate can cause scratching. Some projectors are worse than others.

**Shipping (basics tips):**
- All reels must have a tight and even wind. If shipping reels arrived cracked or otherwise broken, replace if possible.
- All reels must have at least 8” of artists tape. Tape EVENLY, that is 4” on the tail taped to 4” of the rest of the film. Make sure the ends of the tape are secured or they will come loose in shipping. Don’t fold over the end of the tape!
- Do not ship with redundant or worse, incorrect, information written on the tape.
- If for some reason you added extra tape to make the countdown easier to see, remove it.
- Erase any grease cues made for projection if requested by the archive. If not, you can leave them.
- Remove old shipping labels from the can before adding new ones.
- Enclose a second copy of each label INSIDE the can.
- Zip tie each can shut.
- Write the tracking number somewhere on the can or box in case the label falls off.
- Return prints in a timely fashion, one or two business days after the last show, and forward tracking information.
- Use bubble wrap (not newspaper or anything else acidic) for cores in cans. 90% of the time you’ll receive film on cores in cans with no padding, but this really shouldn’t be the case....
- You can include a copy of your inspection report in the can if you like though it’s not required. Just make sure it’s clean and legible. Some archives (such as Universal and Warner Brothers) request that you include an inspection report.
Example of what happens in transit when you don’t tape the leader down
Check for these in the credits if you’re checking whether something is A type or SR. “Spectral recording” is definitely SR. If it just says “Dolby Stereo” it’s most likely A Type, but there’s still a chance it’s SR so listen to it if you need to.
Example of a “variable density” optical track. Most mono optical tracks are “variable area” tracks. This will play back through your processor as mono, you don’t need to do anything differently, but it’s good to know what it looks like!
A nice example of various sound formats. Looking from left to right, SDDS along both right and left edges of the film, Dolby Digital (SRD) between the perfs, optical Dolby SR, and a DTS timecode along the side of the image.
Smpte countdown: measured in seconds and Academy countdown: measured in feet. Both will be 12 feet long.
Examples of different types of cues: technicolor lab and scratch cue, punched cue, scratched cue
A scratch cue maker: We love this thing but don’t use it on archival prints!
Bad grease cues! - everything is wrong with these, marked on the emulsion side, way too big (right through Clark Gable’s face) and put right next to lab cues that are already totally acceptable (14 frames from the end). Don’t do this.
A close up of an ultra-sonic splice
Some specific instructions you’ll see on film cans from archives.

This print may only be exhibited on a dual projector system. Using 20 minute reels.

Heads & Tails cannot be removed.

Universal Pictures
THE FILM PRAYER

I AM FILM, not steel; O user, have mercy. I front dangers whenever I travel the whirling wheels of mechanism. Over the sprocket wheels, held tight by the idlers, I am forced by the motor’s magic might. If a careless hand mistreads me, I have no alternative but to go to my death. If the pull on the takeup reel is too violent, I am torn to shreds. If dirt collects in the aperture, my film of beauty is streaked and marred, and I must face my beholders — a thing ashamed and bespoiled. Please, if I break, NEVER fasten me with pins which lacerate the fingers of my inspectors.

I travel many miles in tin cans. I am tossed on heavy trucks, sideways and upside down. Please see that my first few coils do not slip loose in my shipping case, and become bruised and wounded beyond power to heal. Put me in my own can. Scrape off all old labels on my shipping case so I will not go astray.

Speed me on my way. Others are waiting to see me. THE NEXT DAY IS THE LAST DAY I SHOULD BE HELD. Have a heart for the other fellow who is waiting, and for my owner who will get the blame.

I am a delicate ribbon of film — misuse me and I disappoint thousands; cherish me, and I delight and instruct the world.

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Appendix A: Relevant Links

Organizations

Association of Moving Image Archivists [http://www.amianet.org]
Art House Convergence [http://www.arthouseconvergence.org/]
British Kinematograph, Film and Television Society [https://www.bksts.com/]
    BKSTS Technical wallcharts here
    [https://www.bksts.com/secure/merchandise.asp]
FIAF - International Federation of Film Archives [http://www.fiafnet.org/]
Film Advocacy Task Force [http://www.filmadvocacy.org/]
Film on Film Foundation [http://www.filmonfilm.org/]
National Film Preservation Foundation [http://www.nfpf.org]
Northwest Chicago Film Society [http://www.northwestchicagofilmsociety.org/]
SMPTE (Society of Motion Picture & Television Engineers) [https://www.smpte.org/]
Sprocket School [http://www.sprocketschool.org]
    http://www.sprocketschool.org/wiki/List_of_analog_film_exhibitors
    (list of fellow venues running film)
The 16mm Directory [http://16mmdirectory.org/]

Online Technical and Film Handling resources

Film-Tech (technical forums, manuals) [http://www.film-tech.com/]
Kodak list of damage terms/print handling
Kodak proper film handling and inspection (from Film-Tech) [http://www.film-tech.com/warehouse/manuals/H5002.pdf]
*All the Kodak Film Notes are a great resource for projection troubleshooting, print handling and inspection, basic projector functions etc. and can be found here
    [http://www.film-tech.com/warehouse/index.php?category=2#Eastman%20Kodak %20Film%20Notes]*
Identifying film stocks (this is for 16mm, but many are applicable to 35mm as well)
The American Widescreen Museum [http://www.widescreenmuseum.com] (aspect ratios etc.)
The Mad Cornish Projectionist [http://www.madcornishprojectionist.co.uk/]


Home Preservation Guide [http://www.centerforhomemovies.org/filmforever/]
(film preservation at home, storage)

Glossary of technical terms (from FIAF) [http://www.fiafnet.org/pages/texte/GlossaryOfTechnicalTerms.html]

in70mm.com [http://www.in70mm.com/]


Supplies:

Boston Light and Sound [BLSI.com] (test films, many other supplies and equipment)
The Boston Connection [http://www.cutfilm.com/] (Leader, splicers)
Christy's Editorial [http://www.christys.net/] (inspection supplies, splicers, frame counters, splicing tape, reels, gloves, frame rulers, etc.)
CE+S [http://www.cinemaequip.com/contact-us/] (splymar tape, not on the website—call them)
Costruzione Incollatrici Rapide (CIR) [http://www.cir-srl.com/] (CIR splicers)
Film-tech forum for used supplies [http://www.film-tech.com/ubb/f2.html]
Goldberg Brothers [http://goldbergbrothers.com/movie-theater-products/] (cast aluminum reels, split reels, shipping reels, must be purchased through a dealer)
Jack Roe [http://cinemapurchasing.com/] (various equipment and supplies)
Kelmar Systems [http://www.kelmarsystems.com/] (rewind tables, kelmar arms)
McMaster-Carr [http://www.mcmaster.com/] (general hardware)
Schneider Optics [https://www.schneideroptics.com/] (lenses and test films)
Tokyo Seiki [http://www.tokyoseiki.com/] (Splycemar splicers, tape)
Tuscan [http://www.tuscancorp.com/] (film cans and reels)
Urbanski Film Supplies [http://urbanskifilm.com/supplies.html] (reels, leader, splicers etc)

Kinoton [http://www.kinoton.de/home.html] (must be purchased through a dealer, limited parts supply)

Da-lite [http://www.da-lite.com/] (portable screens, portable projector stands)

Making a film viewer [https://www.nps.gov/museum/coldstorage/pdf/2.3.1b.pdf] (to identify poly or acetate film base)

Print resources:

The Advanced Projection Manual, FIAF/Norsk Filminstitutt. Torkell Sætervadet, 2005. (Get this one if you can!)

The Book of Film Care, Eastman Kodak Company. Edited by Paul L. Gordon, 1983.

Motion-Picture Projection and Theatre Presentation Manual, SMPTE. Edited by Don V. Kloepfel, 1969.


Fun & Miscellaneous:

http://www.northwestchicagofilmsociety.org/projects/leaderladies/


http://mediahistoryproject.org/technical/ Issues of International Projectionist and The Motion Picture Projectionist

http://www.wecanstillshowfilm.co.uk/cat_venue/venues/ (list of venues running film in the UK)

https://archive.org/details/Murderon1958 (Murder on the Screen)

http://www.savefilm.org/ (nice list of news articles on the digital transition etc)
http://www.lostleaders.ca/ (Lost Leaders: Countdowns and the Metadata of Film)
http://www.richardnicholson.com/projects/the-projectionists/
http://zauberklang.ch/filmcolors/ (Timeline of Historical Film Colors)
https://vimeo.com/academyfilmarchive/review/111148197/cfee5f3e89 (Tour of the Academy film archive)
https://vimeo.com/8972758 (Facts About Projection by Temujin Doran)
http://www.semafilms.com/portfolio/jamesbond/ (James Bond: The Projectionist Behind the Lens)
**INSPECTION REPORT**

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**DAMAGE**

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- **EMULSION SCRATCHES**
- **BASE SCRATCHES**
- **EDGE DAMAGE**
- **PERF DAMAGE**
- **OIL, DIRT, RESIDUE**
- **COLOR SHIFT/FADING**
- **WARPING/SHRINKAGE**

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**NOTES/OVERALL CONDITION:**

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