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This handbook provides basic instructions for setting up, lubricating, and maintaining the Moviola "Series 20" Film Editing Machines.

Moviola "Series 20" Editing Machines are available in a number of models to meet the various requirements for film editing. Models are composed by assembling standard components from the following list:

**Picture Heads**
- 16mm without reel spindles
- 35mm without reel spindles
- 16mm with reel spindles
- 35mm with reel spindles

**Composite Sound Head**
- 16mm
- 35mm

**Sound System**
- optical
- magnetic
- optical and magnetic

**Separate Sound Head**
- 16mm without reel spindles
- 35mm without reel spindles
- 16mm with reel spindles
- 35mm with reel spindles

**Body and Cabinet**
- floor model
- table model for picture only

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**MODEL DESIGNATIONS**

(standard make-up by model number)

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<thead>
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<th>Composite Sound Head</th>
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**MAXIMUM REEL SIZE 35MM — PICTURE HEAD — 15" 16MM — 15" SOUND HEAD — 10"**
ASSEMBLY. Moviola Film Editing Machines are shipped with some parts removed and stowed separately within the crate to prevent damage. Reassembly is simple. Parts that could be installed incorrectly are tagged with installation instructions.

SWITCHES AND CONTROLS. (See figure 1.) The operator should familiarize himself with the location and function of each switch and control before attempting to edit film.

POWER SOURCE. Be certain the voltage and frequency of the power source correspond with that stamped on the nameplate of the machine. Before plugging in the power cable, electrically ground the machine by use of the ground clamp.

LUBRATION AND "RUN-IN" PERIOD. The operator should familiarize himself with all points of lubrication by reference to the Lubrication Section. The intermittent movement is factory lubricated and normally does not require added lubricant for six months or more. Lubricate the shaft bearings before operating the machine. Repeat shaft bearing lubrication frequently until the machine runs freely.

FILM THREADING. Place the supply reel on the lower spindle and thread the film in the machine as shown in the appropriate diagram. (See figures 2, 3, and 4.)

NOTE: The picture will be seen on the screen in the same orientation as in the gate.

If the composite sound head is not used, run the film as shown by the dotted line on the diagram.

1. Power Cable Receptacle
2. MASTER SWITCH
3. Nameplate
4. SOUND HEAD MOTOR FORWARD-REVERSE Switch
5. SOUND HEAD MOTOR ON-OFF Switch
6. Film Winding Flange
7. Picture Head Flywheel
8. PICTURE HEAD MOTOR FORWARD-REVERSE Switch
9. Composite Sound Head EXCITER LAMP Rheostat
10. VOLUME Control and Amplifier OFF Switch
11. Separate Sound Head EXCITER LAMP Rheostat
12. Projection LIGHT RHEOSTAT
13. Projection LIGHT ON-OFF Switch
14. Projection Lamp Cutoff Switch (Under Gate)
15. Picture Head Brake Handle
16. Motor Cutoff Switch (Inside Body - Brake Handle Controlled)
17. PICTURE Head MOTOR RHEOSTAT
18. PICTURE Head MOTOR ON-OFF Switch
19. MAG-OPT TONE (Magnetic-Optical Sound and Tone) Selector Switch
20. HEADPHONES Jack

Figure 1. Switches and Controls (Typical for 16mm and 35mm Machines)
IMPORTANT:

a. Check for adequate loop sizes between lower feed sprocket and gate, and between intermittent sprocket and upper feed sprocket. Film loop size must be large enough to prevent film tension but small enough to prevent film rubbing against machine.

b. Turn flywheel by hand to check movement of film and film loops.

c. Remove slack between jerk absorber rollers and reels.

PICTURE VIEWER (LIGHTING, FOCUSING, AND FRAMING).

Lighting - A LIGHT switch and RHEOSTAT provide projection lamp ON-OFF and light intensity control. The lamp is automatically turned off, when the gate is opened, by the button switch located under the gate.

Focusing (See figures 5 and 6) - Focus the picture on the screen by rotating the projection lens.

Framing (See figures 5 and 6) - Frame the picture on the screen by moving the framing lever.

OPTICAL SOUND OPERATION (See figure 7). If a separate sound head with a magnetic pickup is provided, but optical sound film is to be used, raise the magnetic head off the film using the knurled screw provided. This will prevent unnecessary wear.

Position the MAG-OPT TONE switch, shown in figure 1, for the type of film to be used.

Figure 2. Film Threading, 16mm Machine

Figure 3. Film Threading, 35mm Machine

VOLUME CONTROL (See figure 1).

Single Sound Head Machines - The center (VOLUME CONTROL) knob on the main body is the sound volume control. An amplifier OFF switch is integral with the VOLUME CONTROL.

Double Sound Head Machines - On machines incorporating two sound heads, the center (VOLUME CONTROL) knob controls the volume as for a single sound head; in addition, each EXCITER LAMP rheostat controls exciter lamp intensity of the nearest head giving independent control of each sound head. IMPORTANT: If only one optical sound head is in use, or if the magnetic sound head is in use, be certain that the EXCITER LAMP rheostats for non-operating optical sound units are in the off position.

Figure 4. Separate Sound Head Film Threading Diagram
MAGNETIC SOUND OPERATION AND ADJUSTMENTS
(See figure 7). Turn the MAG-OPT TONE switch (figure 1) to MAG (HI or LO, as desired). Lower the magnetic head onto the film by turning knurled screw. If necessary, loosen the transverse adjustment screw (4) to adjust the magnetic head transversely to the sound track.

If 17.5mm film is used on 35mm models, collapse all of the collapsible rollers to guide the narrower film. Mount the brass 17.5mm film guide (stowed as shown in figure 7) in place on the film slide using the screw hole provided in the slide. Tighten the screw just enough to hold the guide in place.

ELECTRIC MOTORS. One motor operates the picture head (and the composite sound head, if installed), while a separate motor operates the separate sound head. The direction of rotation of each motor is controlled at its FORWARD-REVERSE switch (see figure 1). For synchronous operation of the picture and sound heads, connect the two units at the drive shaft connector (7, figure 7). The two heads can be run by either motor at the option of the operator.

Picture Head Motor - This is a variable speed, reversible motor. Its maximum speed depends upon the total load. Speeds in excess of 30 frames per second are not recommended. The PICTURE MOTOR RHEOSTAT provides variable speed control.

Sound Head Motor - This is a constant speed, reversible, induction motor. It drives the sound head at approximately 24 frames per second (normal sound speed).

SYNCHRONIZING PICTURE AND SOUND. Place the film in the picture head with the starting mark in the gate aperture so that it can be viewed on the screen.
Place the sound film in the sound head so that the starting mark is at the optical unit or at the magnetic head, depending upon the type of film used. With the drive shafts connected (figure 7), the films will stay in synchronism when the machine is operated. The starting mark on either film can be adjusted independently after disconnecting the drive shaft connector.

FOOT CONTROLS.

Left Foot Control - Provides on-off control of the sound head constant speed motor.

Right Foot Control - This control, wired in series with the PICTURE MOTOR RHEOSTAT, provides foot controlled motor speed variation. NOTE: The PICTURE MOTOR RHEOSTAT must be set so that the film speed is not greater than 30 frames per second with the foot pedal fully depressed.

LUBRICATION

GENERAL (See figures 8 and 9). The following lubrication procedure should be accomplished at least after every 10,000 feet of film operation. However, during the machine "run-in" period more frequent lubrication (especially of all shaft bearings) is recommended. If the machine is inactive for more than a month, complete lubrication should be applied before operation. CAUTION: Always wipe excess or spilled oil from the machine. This is essential to keeping both machine and film clean.

Oil - At all points of lubrication, except the intermittent movement, apply a good quality light machine oil.

Intermittent Movement - The oil used in the intermittent movement is a special Movielu lubricant of No. 0 or less consistency, containing the following: Four to five percent calcium soap base and the balance of oil of 74 seconds SSU at 210°F. Pennzoil No. 307, or equivalent, is satisfactory for this application.

Self-Lubricating Bearings - Except for the felt rollers shown in figures 8 and 9, all rollers and idler pulleys run on self-lubricating Oilit type bearings. Additional lubrication is normally not required. However, if a roller or pulley becomes sticky or chatters, remove it from its shaft and lubricate its bearings with the light machine oil specified. Should lubrication fail to correct the fault, replacement of the bearings is necessary.

LUBRICATION INSTRUCTIONS.

Picture Head and Main Body -

Intermittent Movement: Remove either filler plug to check oil level. The case should be nearly full. If filling is required, remove the other filler plug (this allows one hole for air escapement). Fill to top with specified oil.

Film Gate Framing Area: Wipe surfaces with a clean, lightly oiled cloth to remove dirt and corrosion. Apply a very light oil film.

16mm Machines, Shaft Bearings: Oil fittings (10 places).

35mm Machines, Shaft Bearings: Oil fittings (9 places). NOTE: On units without reel spindles there are fewer oil fittings.

Composite Sound Head -

16mm and 35mm Machines, Shaft Bearings: Oil fittings (2 places).

Separate Sound Head -

Shaft for Felt Covered Rollers (One Roller Used On 16mm Machines): Apply a small amount of oil to shaft and work in.

16mm and 35mm Machines, Shaft Bearings: Oil fittings (6 places).

NOTE

One oil fitting is located on the separate sound head under the motor drive belt guard. As several of the oil fittings are not readily seen, it is important to count the number of fittings oiled and compare with the number mentioned above.

Reel Spindles -

16mm Machines: Lightly oil felt inside spindle drum.

35mm Machines: Apply oil into holes over spindle shafts (4 places).

General -

Hinge Points: Apply oil lightly to all hinge points; work in.

Casters: Apply oil to assure free rotation and swivel. Base should be turned upside-down for proper caster lubrication.
KEY TO FIGURE 8

1. Hinge Point (Typical)
2. Shaft Bearings Oil Fittings (Typical)
3. Spindle Drum Felt Liner (Typical)
4. Framing Slide Area
5. Intermittent Movement Filler Plugs
6. Felt Roller

KEY TO FIGURE 9

1. Hinge Point (Typical)
2. Shaft Bearings Oil Fittings (Typical)
3. Spindle Shaft Oil Holes (Typical)
4. Framing Slide Area
5. Intermittent Movement Filler Plugs
6. Felt Rollers
LAMP REPLACEMENT. Replace defective or weakened lamps with the following lamps, or their equivalents:

Projection Lamp - Lamp No. BMY, 100 watt single contact, bayonet base.

Exciter Lamp - Lamp No. BSS, single contact, pre-focused, 6 volt.

FILM TAKE-UP ADJUSTMENT (See figures 10 and 11). On both 16mm and 35mm machines, rotation of the reel spindles is actuated by an overriding clutch inside the pulley. The take-up reel spindle should start rotating immediately when it is meant to take up.

On 16mm machines, the outer drum on the supply reel spindle does not rotate when film is being fed.

On 35mm machines, the spindle for the supply reel does not rotate when film is being fed.

When the direction of the film is reversed, the action of the clutch is reversed.

16mm Machines - No adjustment is necessary. Take-up and hold-back friction are determined by the weight of the reels and film. Periodically, the spindle drive wheels and the felts on which they ride should be cleaned with solvent and re-oiled. If a felt has hardened or is glazed or gummy, it should be replaced.

35mm Machines - Take-up and hold-back torques are controlled by adjusting the pressures of the springs shown in figure 11. Increase spring pressure (to increase clutch friction) by turning the adjustment nuts.

The spring pressure should be at a minimum when a supplying reel is nearly empty so that no damage occurs to the film when feeding the last 2 or 3 wraps of film. At the same time, the spring pressure must be sufficient to enable a nearly full reel to take up film when it is functioning as such.

With a nearly empty reel on the spindle, adjust the spring pressure so that the film feeds off the reel without damage. Then, replace the reel with a full reel and increase the spring pressure slightly, if necessary, so that the reel will wind up the film when it is operating as a take-up reel.

After a few adjustments, the operator should readily get the "feel" of correct adjustment. It is recommended that reels with large diameter cores be used.

FILM CLAMPS ADJUSTMENT (See figures 12 and 13). Clearance between the film clamps and sprockets must be enough to permit two thicknesses of film to move smoothly between them.

16mm Machines (See figure 12) - To adjust film clearance, first loosen the 2 screws (3). Decrease the clearance between the film clamp and sprocket by loosening adjustment screw (4) slightly and tightening adjusting screw (5). Increase the clearance by reversing this procedure. Tighten screws (3) after adjustment is made.
MAINTENANCE ADJUSTMENTS

35mm Machines - Decrease or increase the clearance between the film clamp rollers and the feed sprockets by turning the adjustment screw shown in figure 13.

PRESSURE SHOES ADJUSTMENT (See figures 12 and 13). In addition to making the following adjustments, inspect each shoe occasionally for cleanliness and for sharp edges developed during use. Remove these sharp edges with fine emery cloth. Keep pressure shoes clean of all dirt to prevent film scratching.

Film Gate Pressure Shoe - This adjustment is the same for both 16mm and 35mm machines and is accomplished by turning the two screws in the upper side of the gate. Tightening the screws increases the pressure. Pressure should be just great enough to keep the projected picture steady. Excessive pressure will cause film trouble when running in reverse.

Sprocket Pressure Shoes - Pressure should be just enough to hold the film firmly on the sprocket. Too little pressure may permit the film to skip a sprocket tooth and cause damage. Heavy pressure may cause excessive wear of the sprocket shoe.

16mm Machines: The sprocket pressure shoe adjustment screw is located at the top of the gate as shown in figure 12. It is covered by a lock screw which must be completely removed to expose the adjusting screw. Be certain to reinstall the lock screw.

35mm Machines: Adjust pressure by turning the two screws at the top of the gate. Screw location is shown in figure 13.

PICTURE VIEWER.

Mirrors, Access and Cleaning - The reflecting mirrors in the picture viewer are factory set and adjustment is not usually necessary. Remove the two screws in the base of the viewer and remove the top half to gain access to the mirrors. Once a year, carefully clean the mirrors with a camel’s hair brush or loose cotton swabs.

35mm Machines - On 35mm machines, the picture viewer can be tilted out of the way for film marking. If the operator does not wish the tilting feature, he can fix the picture viewer in position by replacing the screw in the picture viewer that is painted red with the screw and spring provided.

OPTICAL SOUND SYSTEM ADJUSTMENT. The exciter lamp socket is pre-focused and normally should not require adjustment. If, however, the lamp is excessively off center, loss of volume will result and a ringing sound may be heard as the shadow of the filament vibrates through the optical system.

If necessary, adjust focus and azimuth of the lens as follows (see figure 14): Loosen the lens lock screw (1) and the focus eccentric setscrew (2) near the stamped "F". With the lamp installed, and while a focusing film is being run, turn the focus eccentric (3), in the back side of the lamp house, to raise or lower the light lens until
Shoe Replacement - If the magnetic head is worn out as evidenced by inspection of the gap or loss of high frequency response, replacement of the shoe is required. (The entire head must be replaced on early models without replaceable shoe.) Carefully pry off the old shoe and press in the new one. It may be necessary to adjust the angle of contact slightly to make good contact of gap with film. After shoe adjustment, place a drop of quick drying cement at each end of the shoe at point of insertion to permanently lock it in place. Perform adjustments required.

Demagnetizing - It is recommended that a demagnetizer be run over the magnetic head occasionally and especially after contacting any steel tools. This will guard against possible noise pickup or effect of magnetization of the head on the magnetic track.

SHUTTER ADJUSTMENT (See figure 15). Spring tension keeps the shutter blades closed parallel to the axis of their rotor at low speeds of picture head operation. As the speed is increased to approximately 20 frames per second, the centrifugal force generated in the blades causes them to overcome the spring tension, open outward, and interrupt the light beam.

Shutter Opening Adjustment - To adjust the blades to come into operation at the desired speed, turn the shutter opening adjustment screw shown in the illustration to increase or decrease spring tension. NOTE: If a blade is adjusted, check to see that both blades open simultaneously. If either blade spring requires replacement, both springs should be replaced.

Shutter Timing Adjustment - In the event the shutter does not eliminate the flicker at full operating speed,
MAINTENANCE ADJUSTMENTS
OPERATING PROBLEMS AND CAUSES

or darkens too much of the picture, it should be re-timed. Loosen the three shutter timing adjustment screws shown in the illustration. NOTE: Do not attempt adjustment without loosening these screws and do not loosen the setscrew holding shutter rotor to shaft. Rotate the flywheel by hand - note that there is a period during which the intermittent sprocket rotates and a period when it is not moving. Lightly mark one tooth with chalk to identify it and note the total distance it rotates during the moving interval. When the tooth has traveled one-half its normal distance, locate the shutter so that a blade when opened outward is directly

over the projection lamp. Tighten the three screws after adjustment.

INTERMITTENT MOVEMENT. The intermittent movement is factory adjusted and should not need adjustment. Excessive noise does not necessarily indicate a faulty movement. In the event the movement seems noisy, check the case for lubricant in accordance with the Lubrication Instructions. Many factors may exaggerate the normal intermittent movement sound - a loose flywheel pulley or excessive play in the gear train may accentuate the noise. Any corrections in the field should be performed by an expert in Geneva movements.

OPERATING PROBLEMS
AND CAUSES

GENERAL AND MECHANICAL

Machine dead:
1. Faulty power source.
2. MASTER SWITCH OFF or defective.
3. Open circuit due to broken wire in machine or power cable.

Sound head motor inoperative:
1. Defective hand or foot switch.
2. Defective FORWARD-REVERSE switch.
3. Defective starting mechanism in motor.
4. Defective brake switch.
5. Defective winding in motor.

Picture head motor inoperative:
1. Defective hand switch or foot control.
2. Defective RHEOSTAT.
3. Defective brake switch.
4. Defective FORWARD-REVERSE switch.
5. Defective armature or field coil.

Insufficient picture head motor speed variation with foot control:
1. Resistance unit out of adjustment.
2. Resistance unit worn out or broken.
3. Hand operated RHEOSTAT not open sufficiently.

Machine runs too slow:
1. Low line voltage.
2. Machine needs lubrication, a bearing may be nearly frozen.
3. Picture head motor brushes worn.
4. Picture head motor armature defective.
5. Motor drive V-belts slipping.
6. Defective RHEOSTAT.

Electric shocks from machine:
1. Power cable not properly grounded.
2. Carbon dust in brush holders in picture head motor.
3. Wiring circuit grounded.

PICTURE AND FILM

Film torn or scratched:
1. Film not threaded properly.
   a. Loops too small.
   b. Sprocket clamp left open.
   c. Film not properly engaged on sprockets.
2. Dirt accumulation between film slide and gate pressure shoe.
3. Excessive pressure on gate pressure shoe. (Check especially if film tears when running in reverse.)
4. Film clamps adjusted too closely and will not pass splices.
5. Film clamps adjusted too far away from from sprockets permitting film to climb off sprocket teeth.
6. Sprocket pressure shoe pressure too light. (Check especially if film tears when running in reverse only.)
7. Unwaxed film. (Will cause trouble especially when running in reverse.)
8. Film take-ups not adjusted properly.
9. Too much slack between feed sprockets and reels.
10. Worn or damaged sprockets.
11. Burrs on various rollers, slide areas, or sprocket pressure shoe.
12. Film is non-standard width or old film with excessive shrinkage.

Picture illumination poor:
1. LIGHT RHEOSTAT not advanced.
2. Weakened projection lamp.
3. Dirty projection lamp reflector.
4. Condenser lens dirty, remove if necessary to clean.
5. Projection lens or mirrors in picture viewer dirty.
Streaky picture:
1. Shutter out of adjustment.

Picture not steady:
1. Gate shoe pressure too light.

SOUND REPRODUCTION

Sound dead:
1. Defective tube in amplifier.
2. Exciter lamp burned out.
3. Defective speaker.
4. Burned out resistor or condenser in amplifier.
5. Cords not securely plugged in.
6. Broken lead at gate hinge.

Insufficient volume:
1. Weak 5Y3 or 6V6 tube.
2. Dirt in hole in slide, or on photocell.
3. Exciter lamp blackened.
4. Weak photocell.
5. Magnetic head worn out or improperly adjusted.

Lack of high frequencies (optical sound):
1. Optical unit out of focus.
2. Improper azimuth adjustment.

Lack of high frequencies (magnetic sound):
1. Magnetic head gap worn.
2. Improper azimuth adjustment.
3. Improper adjustment for contact of head with film.

Excessive hum:
1. Defective 5879 tube.
2. Defective filter condenser in amplifier.
3. Outside light reaching photocell through hole in slide.
4. Magnetic head lead grounded on supporting arm.

Excessive background noise:
1. Defective 5879 tube.
2. Defective photocell.
3. Defective cable or connector.
4. Defective resistor in amplifier.

Excessive noise in sound system when running picture head motor:
1. Brushes worn.
2. Commutator rough.
3. Amplifier not grounded.
4. Photocell cable too close to a-c cables.

Microphonic howl:
1. Microphonic tube in amplifier.
2. Microphonic photocell.
3. Exciter lamp mounting off center.

WIRING DIAGRAMS

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*Provided for Light Well (Optional Equipment) Connection

Figure 16. Cabinet Wiring Diagram
Figure 17. Sound Head Exciter Lamp Circuits
NOTICE

The Moviola Film Editing Machine is a custom-made product and many of the parts require fitting to each machine. Extensive repairs should be done by a mechanic experienced in motion picture equipment or other precision machinery.

Because of continual betterment of design, it is possible that the data in this manual may not fully apply to your machine. MAGNASYNC/MOVIOLA CORPORATION reserves the right to make changes without incurring any obligation.

Any correspondence concerning a Moviola Film Editing Machine should include Model and Serial Number of the unit concerned.