

OPERATING INSTRUCTIONS

THE RCA MODEL 400

16 mm Motion Picture Equipment



RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DEPARTMENT CAMDEN, N. J.

I M P O R T A N T

Be sure to fill in and MAIL the attached REGISTRATION CARD.

THIS WILL:

1. Allow our Service Company to register your projector in the RCA Customer Service Plan.
2. Record your equipment in case of loss by theft
3. Enable our Service Company to cooperate with you more quickly and more accurately.
4. Bring you new and informative literature concerning the utilization of 16 mm sound-film equipment.



C U S T O M E R S W A R R A N T Y

Should any parts (except tubes, photo cells and lamps which carry the separate warranty of their supplier) be found defective in material or workmanship within ninety (90) days from the date of sale by the Dealer, the Dealer will promptly make the necessary repairs or replacements.

This warranty applies only to new equipment. It does not apply to any equipment which has been repaired or altered in any way so as to affect its stability or reliability; nor which has been subject to misuse, negligence, or accident; nor which has the serial number altered, effaced, or removed.

If this equipment does not perform satisfactorily, contact the Dealer from whom you purchased it.

RADIO CORPORATION OF AMERICA
RCA VICTOR DIVISION
CAMDEN, NEW JERSEY



**ENGINEERING PRODUCTS
DEPARTMENT**

Dear Friend:

Congratulations on your wise decision to own an RCA model "400" 16mm sound motion picture projector.

Our many years of engineering and manufacturing "know-how" coupled with the finest precision tools and facilities in the hands of experienced quality minded personnel have collectively brought you the finest 16mm sound motion picture projector it is possible to produce.

The enclosed registration card is made available to you for your protection. It registers you as the owner of this fine instrument. It enables us to keep in touch with you and to pass on to you hints and ideas which will help to make your projection hours more enjoyable. Finally, it will enable our Service Company to give you expert service in the event it is required. It is for your benefit - mail it today.

Remember, this is the finest instrument of its kind. Take reasonable care of this equipment and it will in return give you many many hours of trouble-free, true to life, sound projection entertainment.

Very truly yours,

O. V. Swisher
O. V. Swisher, Manager
Visual Products Division

/bp

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INSTRUCTIONS FOR RCA 400 SENIOR

This equipment, consisting of an MI-1305-1 16 mm Projector Amplifier and an MI-1306-1 Loudspeaker, is identical in operation and performance with the equipment described in this instruction book. The maintenance requirements are the same. The instructions as a whole apply to this equipment except as follows:

1. Refer to figure 1, on this page, for a view of the loudspeaker case with the equipment accessories packed in place.

2. The part of the right-hand column on page 8 under the following titles should read:

Packing Up after the Show

When the show is over, put away the equipment in the two carrying cases. Take off the two reels and the two reel arms. Push the two spring belts into the projector case and turn the latches to keep them in place. Turn the tilting control clockwise as far as it will go. Replace the front cover on the projector. Put the two reel arms in the speaker

case as shown in figure 1. Coil the speaker cable and the power cord and put them in the case. Put the empty reel against the speaker magnet so that it will be held there securely by the magnetism.

Public Address and Record Playing

When it is desired to use either a microphone or a phonograph pickup, a shielded cable and a shielded standard telephone plug will be required for connecting either device. Assemble the cable and plug and connect the cable to the microphone or phonograph pickup. Insert the telephone plug in the jack marked MIC. Set the amplifier switch in the AMPL position. Adjust the TONE and VOLUME controls on the amplifier panel to obtain the desired tone balance and volume of sound.

For suitable microphone, phonograph, pickup, cable and telephone plugs consult your dealer. The following types of shielded-two-conductor plugs, or any plug similar to them, may be used: Carter #PG-52, Switchcraft #70 or Mallory #75N.

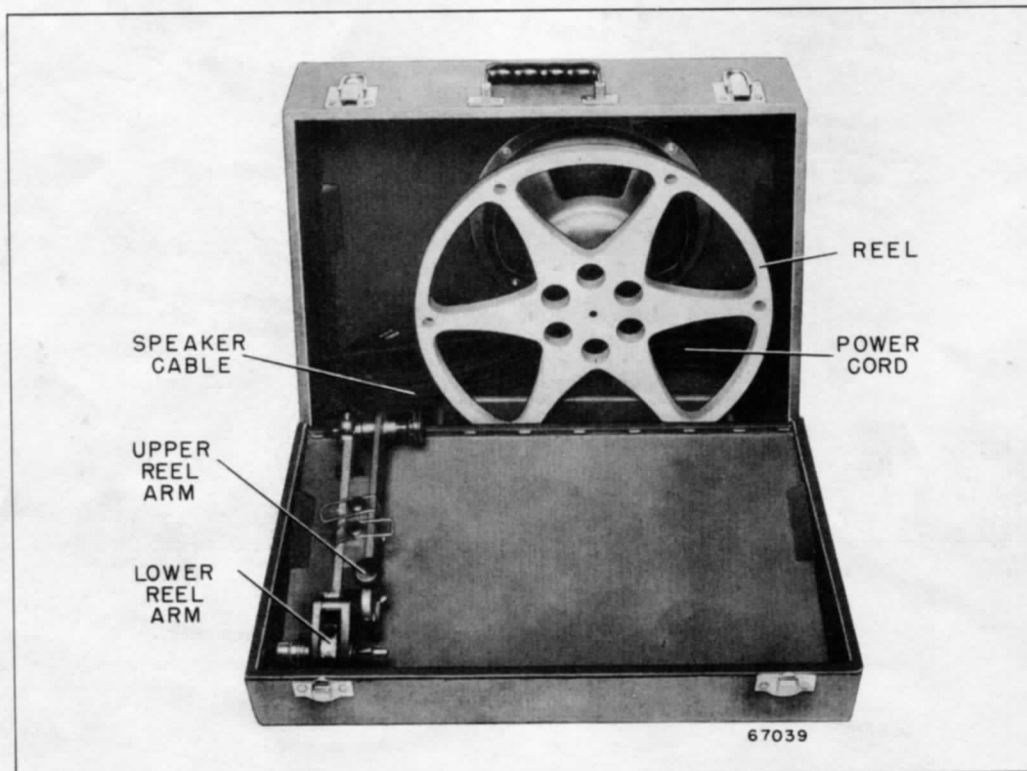


Figure 1—Loudspeaker with Accessories in Place

INSTRUCTIONS FOR RCA 400 JUNIOR

This equipment, MI-1313, is similar in operation and performance to the equipment described in this instruction book. The maintenance requirements are the same. The instructions as a whole apply to this equipment except as follows:

1. The part of the right-hand column on page 8 under the following titles should read:

Packing Up after the Show

When the show is over, in order to put away the equipment proceed as follows: Take off the two reels and the two reel arms. Push the two spring belts into the projector case and turn the latches to keep them in place. Turn the tilting control clockwise as far as it will go. Refer to figure 1A for a view of the cover with accessories in place. The illustration shows the position in which the reel arms, reel and cables must be placed so that all of the accessories can be packed into the

cover. Place the reel arms, reel and cables in the cover in the positions shown in the illustration and replace the cover on the projector.

Public Address and Record Playing

When it is desired to use either a microphone or a phonograph pickup, a shielded cable and a shielded standard telephone plug will be required for connecting either device. Assemble the cable and plug and connect the cable to the microphone or phonograph pickup. Insert the telephone plug in the jack marked MIC. Set the amplifier switch in the AMPL position. Adjust the TONE and VOLUME controls on the amplifier panel to obtain the desired tone balance and volume of sound.

For suitable microphone, phonograph, pickup, cable and telephone plugs consult your dealer. The following type of shielded-two-conductor plugs, or any plug similar to them, may be used: Carter #PG-52, Switchcraft #70 or Mallory #75N.

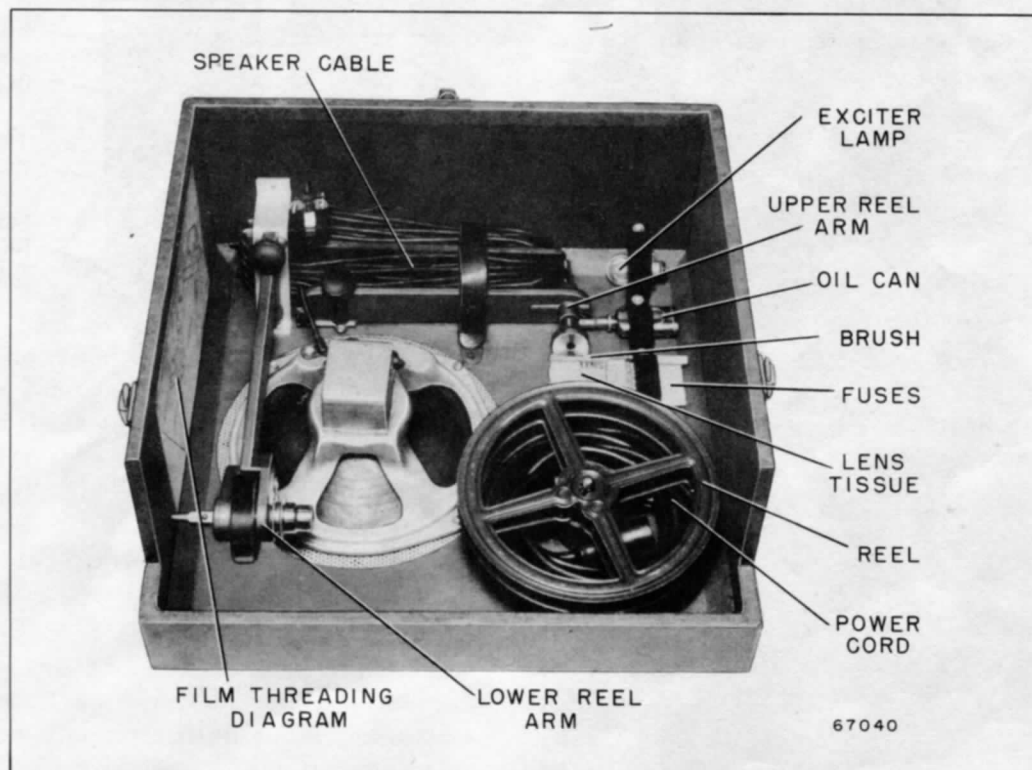


Figure 1A—Cover with Accessories in Place

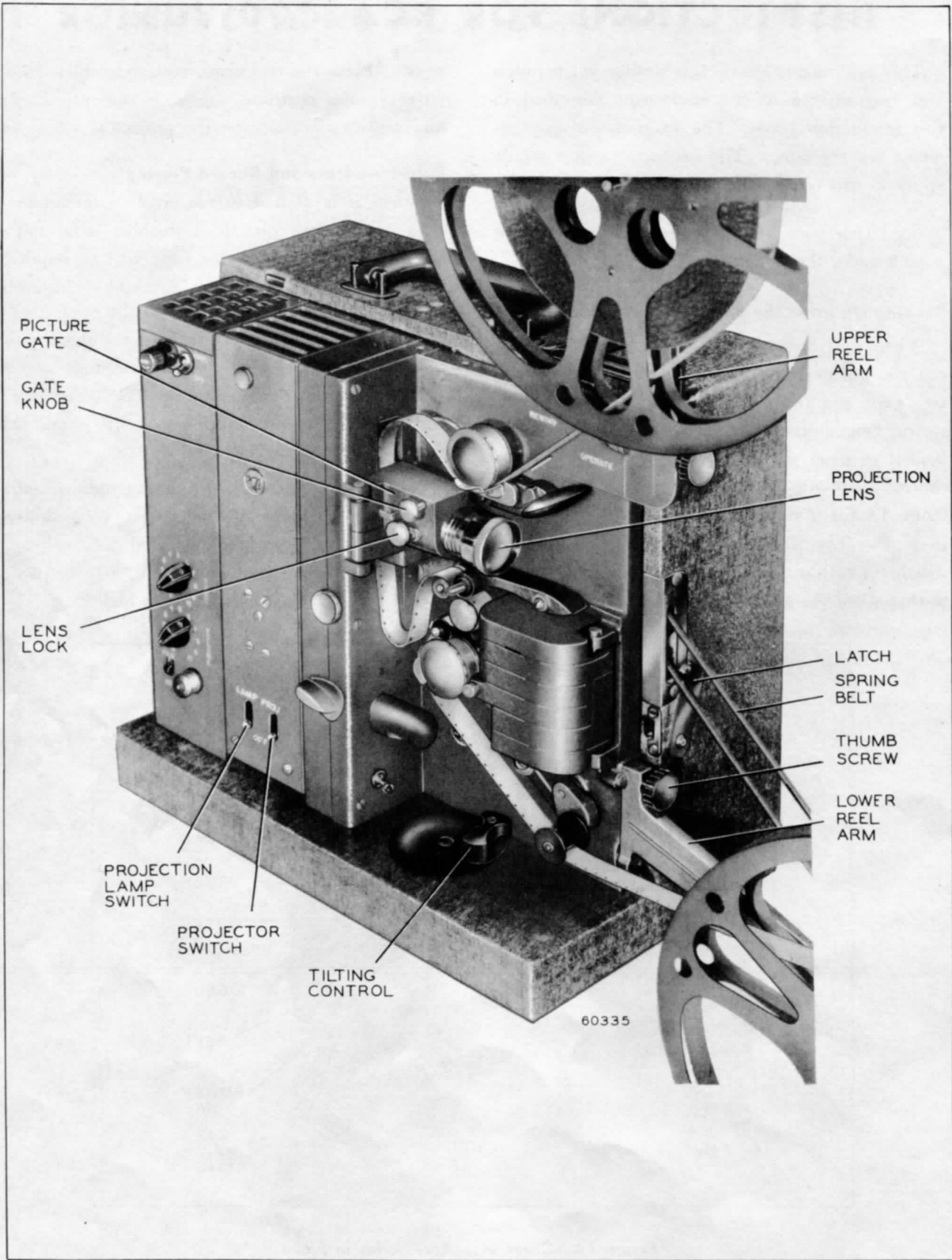


Figure 2—Setting Up

OPERATING INSTRUCTIONS

THE RCA MODEL 400

16 mm Motion Picture Equipment

INTRODUCTION

Application

The RCA Model 400 Projector-Amplifier is a portable de luxe equipment designed for high quality presentation of 16 mm sound and silent motion pictures to medium-size audiences. It can be set up for operation in any suitable location where power of the requisite frequency and voltage is available. (See nameplate.)

This equipment can be used with a microphone or a phonograph for public address, either simultaneously with silent pictures or independently of projection. It is also designed to give excellent quality reproduction of full color motion pictures.

OPERATION

Setting Up

Arrange the equipment as follows:

a. Place the projector on a sturdy table or stand (fig. 2) so that the distance from the front edge of the table to the projection screen is about five times the width of the screen. (This ratio holds for a 2-inch projection lens such as is furnished with the equipment.) Put the projector on the table, near its forward edge to allow the lower reel to operate freely.

b. Remove the front cover of the projector, but keep it within reach for reference to the operating chart contained therein.

c. Remove the accessories contained in the speaker case (fig. 3) and leave them near the projection table. Then carry the speaker to the projection screen and place it on a chair below the screen, with the grille side of the speaker facing the audience.

d. Run the speaker cable to the projector in the most convenient manner, preferably around the

edge of the room, where it will be out of the way of the audience. (See section on Projection Practice.)

Mounting Reel Arms

Attach the reel arms to the projector and put the spring belts on their pulleys as follows:

a. Fasten the lower reel arm (fig. 2) with the thumbscrew. Release the latch, pull out the spring belt, and put it over the pulley at the end of the reel arm.

b. Similarly, attach the upper reel arm and put on its spring belt.

Insert the speaker cable plug into its receptacle on the back of the projector. Plug the power cable into its receptacle on the back of the projector and into the nearest power outlet having the voltage and frequency specified on the projector nameplate.

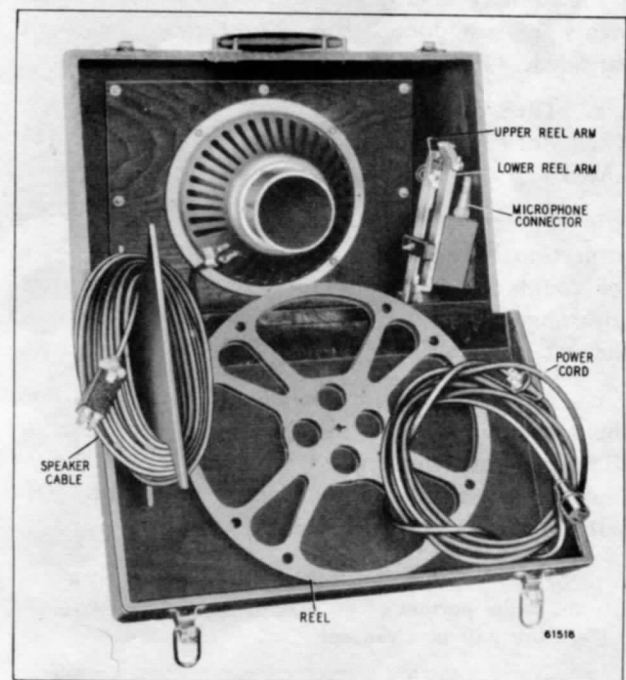


Figure 3—Loudspeaker and Carrying Case

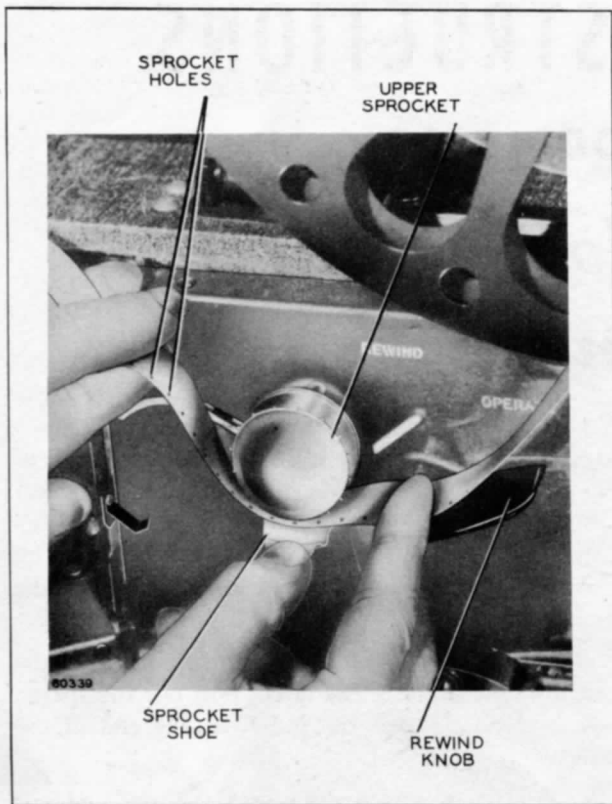


Figure 4—Threading the Upper Sprocket

Initial Adjustments

Preliminary focusing and certain other adjustments are best done before the projector has been threaded. (Fig. 2.)

a. Turn on the projector switch (to PROJ.). Then turn on the projection lamp switch (to LAMP).

b. Loosen the lens lock. Focus by moving the projection lens back and forth in the picture gate for rough adjustment and by rotating it for fine adjustment until the outline of the lighted area on the screen is well defined. Tighten the lens lock.

c. Adjust the distance between the projector and the screen until the width of the lighted area is slightly greater than the width of the white portion of the screen, and then center the light vertically with the tilting control.

NOTE: When the picture is slightly larger than the white portion of the screen, the edges of the picture will be clean cut.

d. Turn OFF the projection lamp switch. Then turn OFF the projector switch.

Threading

Thread as follows:

a. Place an empty reel on the lower reel arm and a reel of film on the upper.

b. Unwind the film until the picture or title frames are reached and examine the film to see whether it is ready for threading. To do this, consider yourself in the position of the projection lamp and look through the film toward a light. With the end of the film downward, the pictures or titles should be upside down and reversed, and the sprocket holes (on sound film) should be toward the right. If these conditions are met, the film is ready for threading.

c. Make sure the rewind lever (fig. 4) is in the OPERATE position.

d. Hold the film as shown, about four feet from the end, and press down on the sprocket shoe with the right-hand thumb.

e. Slide the film under the sprocket. Make sure that the sprocket teeth engage the sprocket holes. Release the sprocket shoe.

f. Open the picture gate by pulling the gate knob and place the film flat on the aperture plate as shown in figures 5 and 2. Form the upper loop of film above the aperture plate so that the film follows the white guide line on the projector frame. Close the picture gate with your thumbs.

g. Form the lower loop of film below the picture gate as indicated by the white guide line and finger stop (fig. 6).

h. Run the film over the guide roller, under the pressure roller, around and to the right of the sound drum, and over the sprung idler.

i. Thread the film to the left of and under the lower sprocket.

j. Next run the film under the snubber roller to the lower reel.

k. Insert the end of the film in the slot in the hub of the lower reel, or, preferably, attach it to the hub with a piece of film tape.

l. Rotate the reel clockwise by hand to take up slack film. Lift the reel slightly to equalize belt tension. This will prevent the reel from rolling backwards when it is released.

Operating

Sound Pictures. When sound pictures are to be projected, proceed as follows (see figure 7):

a. Turn the microphone switch to the FILM position.

b. Turn the amplifier switch to the AMPL position.

NOTE: The sound lamp lights within a few seconds after the amplifier switch has been turned on.

c. Set the volume control to "0" and the tone control to "5".

d. Turn the speed selector to SOUND (down).

e. Turn off the lights in the room.

f. Turn the projector switch to PROJ. and the projection lamp switch to LAMP, in that order.

g. Focus by rotating the projection lens until the picture is clear and distinct. (Titles or other

printed portions of the picture make excellent subjects on which to focus.)

h. Turn the volume control clockwise until the desired volume is obtained.

i. Frame the picture, if necessary, by turning the framing knob until one complete picture shows on the screen.

j. Adjust the tone control until the sound has the quality desired.

k. When the last picture has appeared on the screen, and before all the film has passed through the projector, turn the projector lamp switch OFF.

l. Turn the amplifier volume control to "0" as soon as the sound ends.

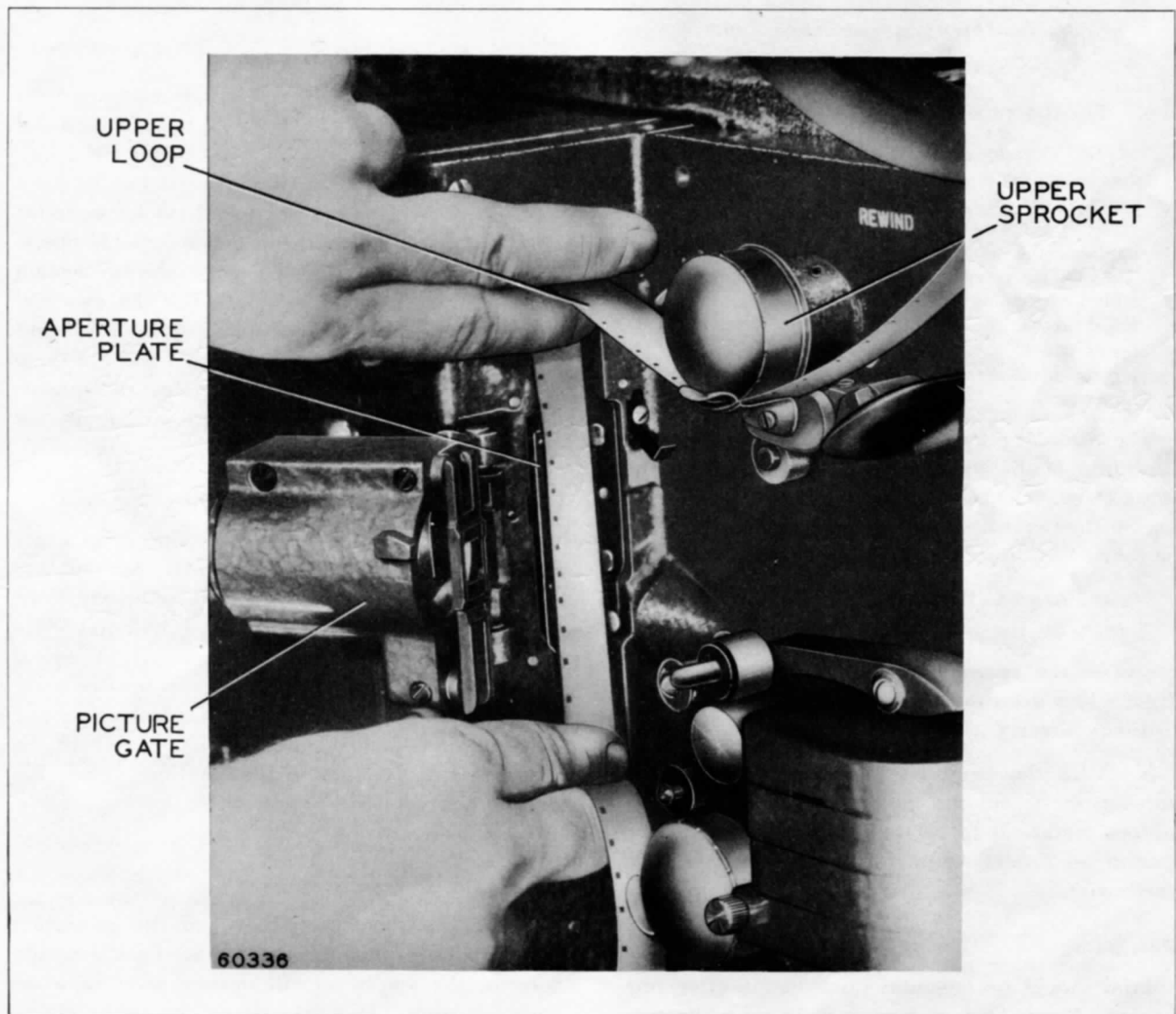


Figure 5—Placing Film on Aperture Plate

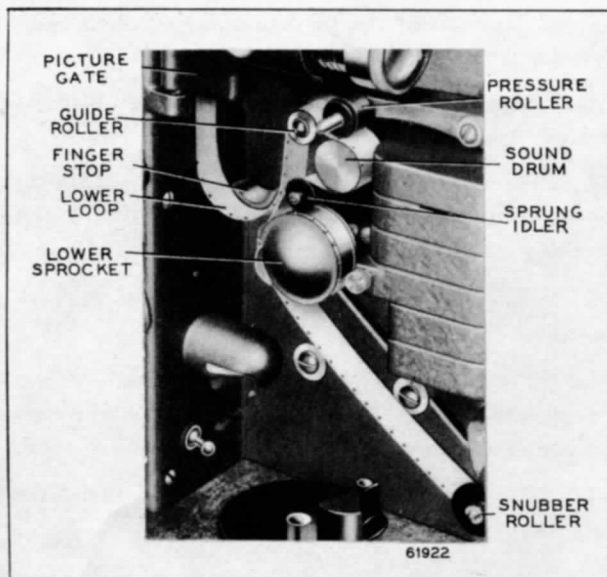


Figure 6—Threading the Sound Drum

m. Finally, turn OFF the projector switch.

NOTE: Occasionally, damaged film may prevent the intermittent pull-down claw from properly engaging the sprocket holes in the film. This may result in the loss of the lower loop. When this happens, the picture on the screen is blurred. The difficulty can be remedied immediately, without stopping the machine, by placing a finger above the film as it emerges from the lower end of the picture gate and quickly pulling down on the film until the finger strikes the finger stop.

The threading lamp can be turned on with the threading lamp switch when light is needed during a show, thus eliminating the necessity of turning on the room lights. The cover of this lamp can be rotated to direct the light where required.

Silent Pictures. Proceed as for showing a sound picture, with the following exceptions:

a. Set the speed selector (fig. 7) to SILENT (up). This decreases the speed to that appropriate to silent pictures.

b. Turn the amplifier switch OFF. Omit any adjustment of volume or tone, unless the public address feature is to be used. If it is, consult the section on Public Address and Record Playing in this manual.

Rewinding

Film should be rewound immediately after projection. Rewinding is done quickly with the projector as follows:

a. Bring the end of the film from the lower reel directly to the hub of the upper reel, without twisting the film, and attach it. Give the upper reel a few turns counterclockwise by hand to take up film slack.

b. Turn the rewind lever to REWIND.

c. Turn the speed selector to SOUND.

d. Turn on the projector switch and let the projector run until the film is rewound.

When two or more reels are shown, it may be desirable to postpone rewinding until all the reels have been shown, since this shortens the delays between successive reels. As a result, the question may arise as to whether or not a reel has been rewound. This may be easily determined by examining the film as explained in the section on Threading, paragraph b. If the film is *not* in the position specified there, it requires rewinding.

Packing Up after Show

When the show is over, put away the equipment in the two carrying cases. Take off the two reels and the two reel arms. Push the two spring belts into the projector case and turn the latches to keep them in. Turn the tilting control clockwise as far as it will go. Put on the front cover. (If operation has been on direct current, refer to section Operation on Direct Current.) Put the two reel arms in the speaker case as shown in figure 3. Coil the speaker cable and the power cord and put them in the case. Put the empty reel against the speaker field magnet so that it is held there securely by the magnetism.

Public Address and Record Playing

When the public address connection is used, the microphone switch is set in the MIC position and the amplifier switch in the AMPL position. Tone and volume are adjusted with the TONE and VOLUME controls on the amplifier panel. Either a microphone or a phonograph pickup may be used. The cable of each of these devices must be provided with a microphone connector (fig. 3) which fits the connector (fig. 7) on the amplifier panel. For suitable microphone, phonograph, pickup, cable, and connectors, consult the dealer.

Operation on Direct Current

While the projector motor and the projection lamp will operate on either direct or alternating current, the amplifier will operate only on alternating current. This necessitates the use of an inverter to supply a-c power to the amplifier when

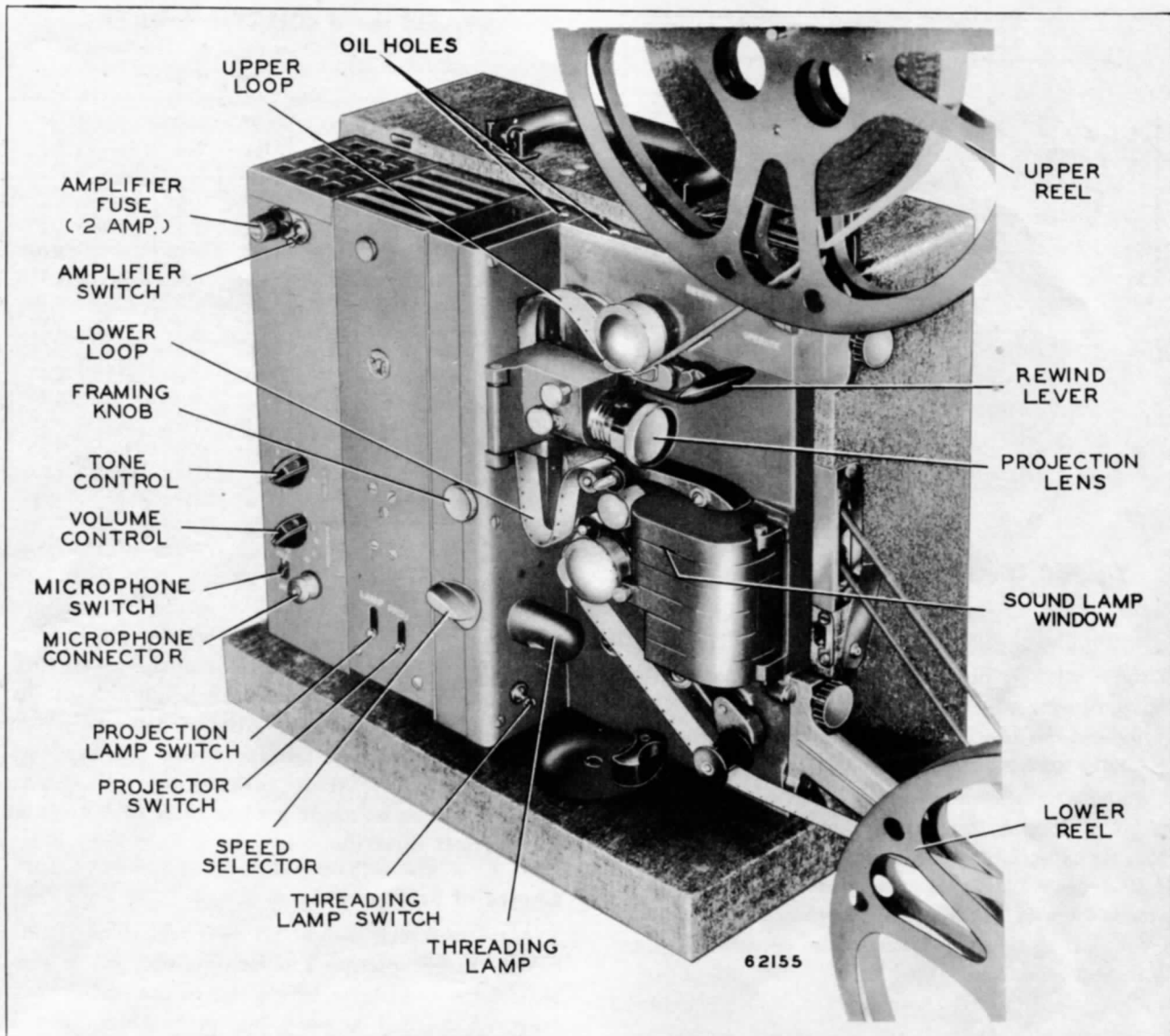


Figure 7—Operating Controls

the source of power is direct current. Figure 8 shows how to make the connections. The power input plug (D.C.) of the inverter is plugged into the power receptacle on the back of the projector-amplifier and the power input plug (A.C.) of the amplifier is plugged into the output receptacle of the inverter. An extension cord may be required. For choice of inverter, consult the dealer.

In packing up after operation on d.c., the normal a-c connection on the back of the projector-amplifier should be restored (fig. 9).

PROJECTION PRACTICE

Choice of Focal Length of Lens

The focal length of the lens supplied with the

RCA Model 400 projector is 2 inches. This is a value which meets average projection conditions. However, in some instances, lenses of different focal lengths may be required. For example, it may be required to project a picture of given size from different distances, as shown in figure 10. Table I gives the relationship between picture size and projection distance for lenses of six different focal lengths.

Placement of Equipment and Spectators

If all the spectators in the room are to have an unobstructed view of the screen, both the screen and the projector should be raised above the heads of the audience. The top of the table upon which the projector stands should be at least $4\frac{1}{2}$ feet high

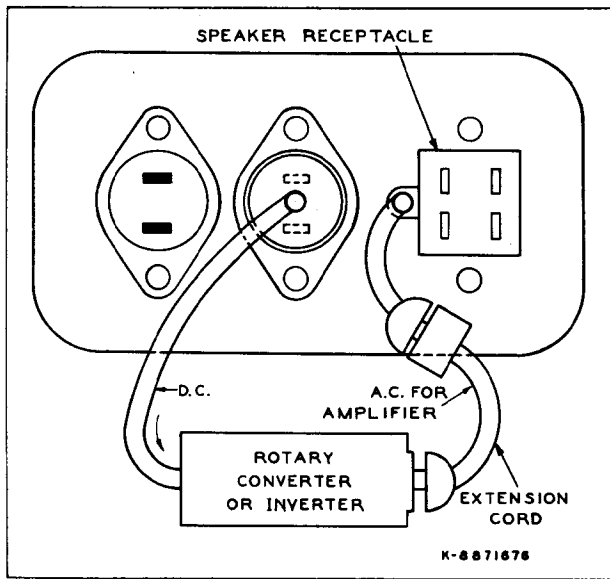


Figure 8—Connections for D-C Operation

so that the beam of light will pass above the heads of those who sit directly in front of the projector, and the lower edge of the screen should be at least as high as the heads of those persons who sit nearest to the screen.

When a matte screen is used, no one should sit closer to it than two screen widths, nor farther from it than six screen widths, nor outside an angle of 30 degrees from the center line. The most satisfactory view of the picture is obtained in this area. Beyond an angle of 40 degrees the picture becomes noticeably distorted.

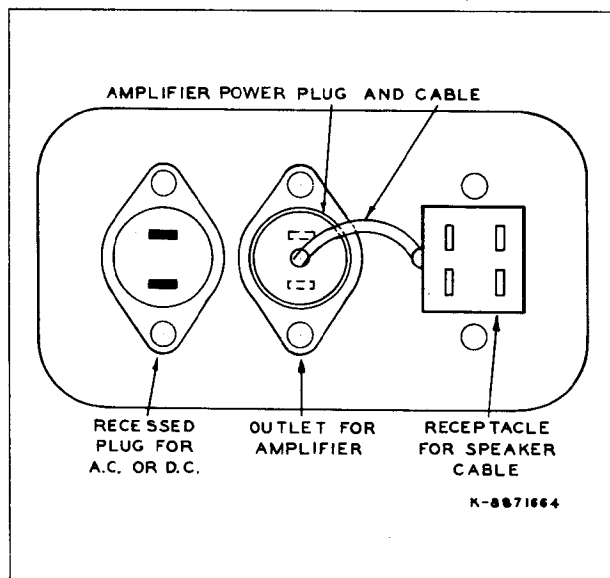


Figure 9—Normal Connection for A-C Operation

TABLE I. PROJECTION DATA

Projection Distance Feet	Picture Width					
	1" lens	1½" lens	2" lens	2½" lens	3" lens	4" lens
10	3'9"	2'6"	1'10"	1'6"	1'3"	....
15	5'8"	3'10"	2'10"	2'3"	1'10"	1'4"
20	7'6"	5'0"	3'9"	3'0"	2'6"	1'10"
25	9'4"	6'3"	4'8"	3'9"	3'1"	2'4"
30	11'6"	7'8"	5'8"	4'6"	3'9"	2'10"
35	13'2"	8'9"	6'6"	5'3"	4'4"	3'3"
40	15'11"	10'0"	7'6"	6'0"	5'0"	3'9"
50	....	12'6"	9'4"	7'6"	6'3"	4'8"
60	....	15'0"	11'3"	9'0"	7'6"	5'7"
75	....	....	14'1"	11'3"	9'4"	7'0"
100	....	....	....	15'0"	12'6"	9'4"

NOTE: Picture height is ¾ of picture width.

When a beaded screen is used, no one should sit closer to the screen than 2½ screen widths, nor farther from it than six screen widths, nor outside an angle of 20 degrees either side of the center line. Beyond the 20-degree angle the brightness of the screen falls off rapidly. Also, a beaded screen should not be raised too far above the heads of the spectators, for those sitting closest to it may then view it at an angle greater than 20 degrees in the vertical direction.

Choice of Screens

A matte screen should be used whenever a sufficiently bright picture can be obtained, for it presents a more uniform brightness to the entire audience. A beaded screen appears brighter than a matte screen along the line from the center of the screen to the projector, but its brightness falls off rapidly as the observer moves away from this line.

The screen recommendations given in Table II are based on the use of the RCA 2-inch, f/1.6 coated projection lens.

TABLE II. PROJECTION LAMP WATTAGE VS SCREEN TYPE AND SIZE

(Values are for a reasonably darkened room)

Lamp Watts	Life Hours	Recommended Picture Matte Screen	Width in Feet Beaded Screen
300	25	2-3	3-5
500	25	2½-3½	4-6
750	25	3½-4½	6-8
1000	10	4-6	8-10

Improvement in Projection Technique

In order to avoid interruptions and disturbances of sound and picture during a show, the observance of the following details is worthwhile.

a. *Securing Cables.* The power and speaker cables should be secured so that they cannot become disconnected accidentally by persons stumbling over them. They may, for example, be tied to, or wrapped around, a leg of the projection table. Where they lie on the floor, they should be covered or otherwise protected.

b. *Replacements.* Interruptions caused by burn-out of the projection lamp, the sound lamp, and the amplifier fuse are occasionally unavoidable, but the resulting delays need not be protracted if the operator always keeps within easy reach a tested set of spares for immediate substitution. For details of replacement, refer to Maintenance.

c. *Previewing Pictures.* An experienced operator will preview films he plans to show in order to acquaint himself with their peculiarities and thus be ready to make changes in volume, tone, and focus whenever they are required.

Care of Film

Film should be handled carefully lest it be

scratched or broken. Film is easily scratched by winding it too tightly on the reel so that adjacent turns of film grind against each other. Scratches on film are very noticeable on the screen and they cannot be removed from the film. Film should be handled by the edges as much as possible, and touching the picture area should be avoided. Occasionally, film should be inspected for broken sprocket holes and other defects. Necessary repairs should be performed promptly.

When film is dirty it should be cleaned by passing it between folds of lint-free cloth moistened with carbon tetrachloride, or some other cleaner suggested by the dealer. Consult the dealer for a humidifier for storing film when it is not in use.

Running Time

The running time of reels of given length of 16 mm film depends on whether the film is sound or silent, for sound film runs 24 frames per second and silent film only 16 frames. Exact knowledge of the running time of various films will help the operator in planning a show. Table III gives the running time in minutes of 16 mm films of various footages.

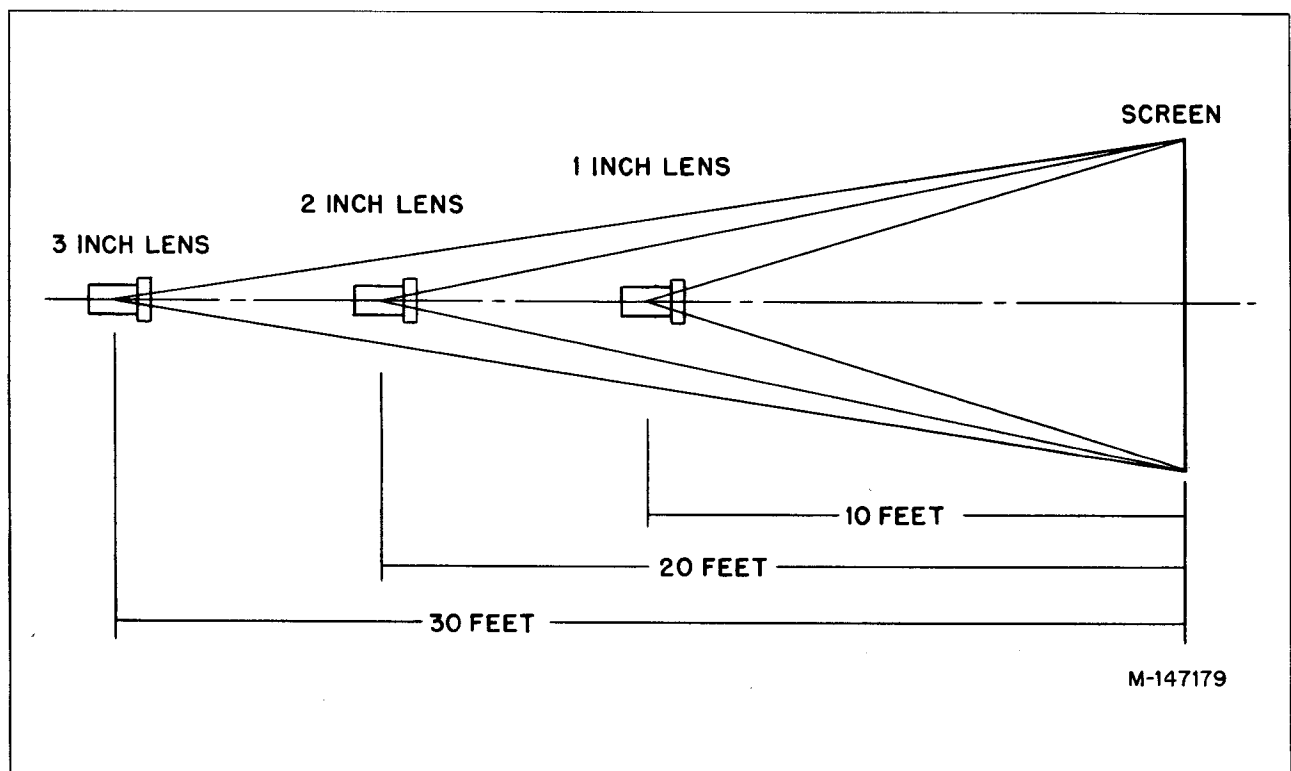


Figure 10—Relations of Focal Length and Projection Distance

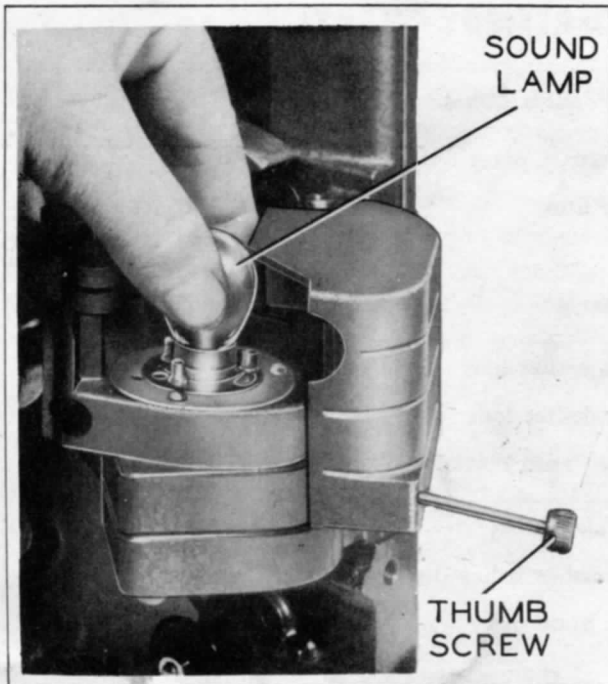


Figure 12—Replacement of Sound Lamp

forefinger. Cleaning the back edge of the sound drum from the left side minimizes the chance of disturbing the optical mirror behind the drum.

Replacements

The amplifier fuse, the projection lamp, and the sound lamp are the most likely components to require replacements during a show.

a. *The fuse (fig. 7)*, which is mounted at the top of the amplifier panel, can be replaced without removing the amplifier cover. Unscrew the red cap (a dime may be used), put in a 2-ampere fuse *only*, and replace the holder.

b. *The projection lamp (fig. 11)*. If the lamp burns out during a show, turn OFF the projector and the lamp switches. Remove the lamp as was explained under Cleaning, paragraph b (1), but do not attempt to remove the lamp with the bare fingers. To install a new lamp, line up the wide and narrow flanges on the base of the lamp with the socket slots and insert the lamp. Press down and turn to the right until it "clicks" into place. Avoid getting fingerprints on the clear portions of the lamp. Turn the projector switch to PROJ., the lamp switch to LAMP, and resume the show.

c. *The sound lamp (fig. 12)*. Open the sound optical bracket. Grasp the sound lamp with the

TECHNICAL DATA

PROJECTOR

Power Required

1025 watts (with 750 w. lamp)
1275 watts (with 1000 w. lamp)
105 to 125 volts
50/60 cycles (MI-1305)

Projection Lamp

750-watt, T12P, 115 volts

Sound Lamp

3/4-ampere, 4-volt, prefocused, S-8, double contact

AMPLIFIER (ONLY)

Power Required

105 to 125 volts, 100 watts
50/60 cycles

D. C. (Use a 150 watt inverter for D. C. operation)

For further technical information, consult your dealer.

Tube Complement

Phototube	RCA-921
Input	RCA-6J7
Voltage Amplifier	RCA-6J5
Amplifier-Phase Inverter	RCA-6SN7-GT
Output (two tubes)	RCA-6V6-GT
Oscillator	RCA-6V6-GT
Rectifier	RCA-5Y3-GT

Amplifier Fuse

2 ampere

WEIGHTS AND DIMENSIONS

Dimensions, Overall

	Proj.-Ampl. (MI-1305)	Loud- speaker (MI-1306)
Length, carrying case	15 3/8 inches	19 3/8 inches
Height, carrying case	15 1/4 inches	15 3/8 inches
Width, carrying case	9 1/8 inches	9 inches

Weight

Shipping	45 lbs.	34 1/2 lbs.
Equipment	39 lbs.	27 lbs.

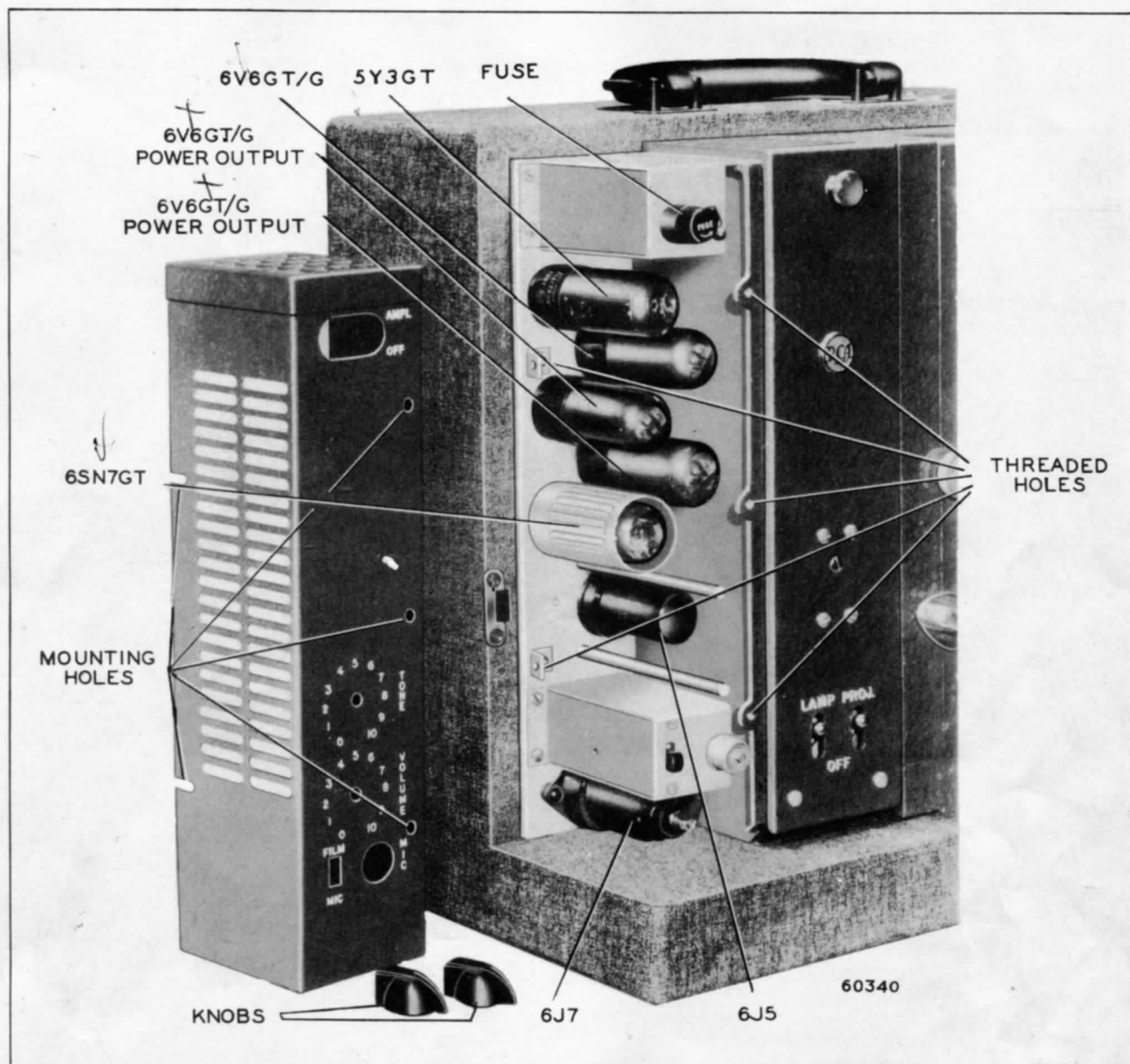


Figure 13—Removing Amplifier Cover for Tube Replacement

left hand as shown, lift it slightly, and turn it to the left. In putting the new lamp in, line up the notch in the lamp flange with the hole in the socket. Push it down against the socket base and turn it to the right until it snaps into place.

Should any of the tubes require replacement, they can be reached by removing the cover of the amplifier as shown in figure 13.

Service Adjustments

If the equipment requires more thorough servicing than that discussed above, it should be taken to an RCA 16 mm Motion Picture Equipment Dealer, who will have complete factory servicing facilities at his disposal. The dealer should also be consulted for supplies and accessories.



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