

TRANSMISSION AND NOISE MEASURING SYSTEM PROJECTION METER, PROJECTOR, AND SCREEN DESCRIPTION AND MAINTENANCE

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and noise measuring system per SD-95900-01, transmission measuring systems per SD-59432-01 and SD-1G073-01, and noise measuring systems per SD-59433-01 and SD-1G074-01. The meter is housed in the meter compartment of a projector, and enlarged images of the scales and pointer are projected on a screen. This provides visibility along a line of testboard positions, voice-frequency patch bays, or other equipment bays. The basic arrangement is shown in Fig. 1.

1. GENERAL

1.01 This section covers description and maintenance of the projection meter, projector, and screen used in the combined transmission

1.02 The projection meter is associated with a J64001U amplifier-rectifier for transmission measurements and with a J64001W noise amplifier-rectifier for noise measurements.

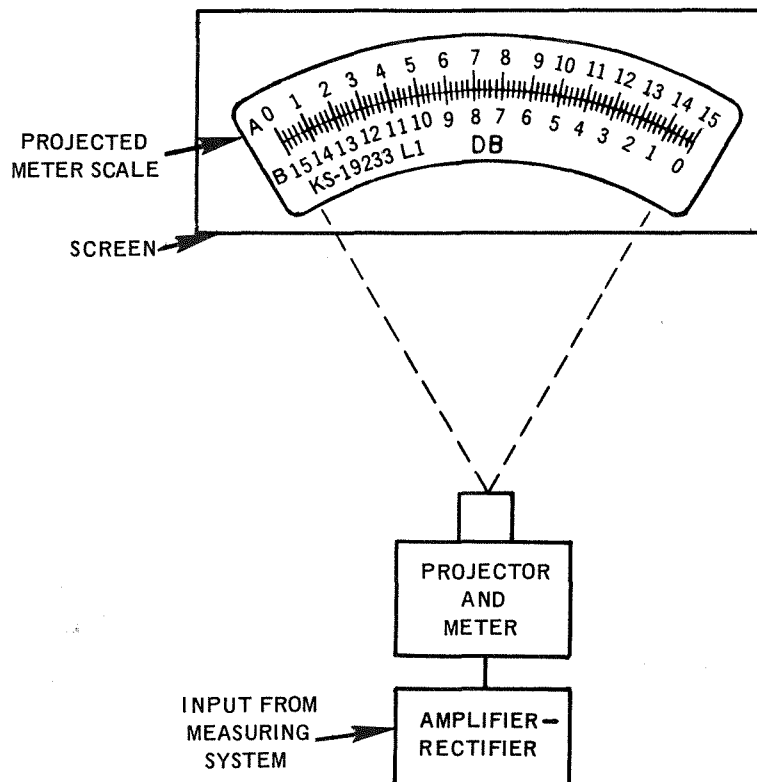


Fig. 1 – Basic Arrangement

2. PROJECTION METER

2.01 The projection meter is a 525-type milliammeter per KS-19233, L1. The KS-19233, L1 meter is interchangeable with the older KS-7907 meter. The case of the meter is equipped with metal fins to assist in dissipating heat from the projection lamp.

2.02 The meter has two 15 db scales, one the inverse of the other. Each scale has uniform db divisions and 0.2 db subdivisions. The A scale (usually red) is marked 0 through 15. It is used for measurements of gains or levels above a milliwatt and for noise measurements above reference noise. The B scale (black) is marked 15 through 0 and is used for measurements of losses or levels below a milliwatt. The markings on the meter scales are shown in Fig. 1. The scales, when projected on a screen, have a precision better than ± 0.15 db at any point in the scale range.

2.03 The sensitivity of the meter is such that full range of the scale is obtained with a change from 0.27 to 1.5 milliamperes. The resistance of the meter is 180 ohms $\pm 1\%$ at 75°F.

3. PROJECTOR

3.01 The KS-5646 List 3 projector consists of a lamp compartment, adjustable lampshelf and socket, mask for meter scale, condenser lens, meter compartment, objective lens, and motor-driven fan. Details are shown in Fig. 2. The List 3 projectors are slightly smaller than the KS-5646 List 1 (Fig. 3) and the earlier KS-5489 projectors. The List 3 projectors also have the improved features of an adjustable lampshelf, a larger objective lens cone, and an objective lens with a considerably larger lens opening. The List 3 projector does not have the reflector which was provided in the earlier types. Insofar as mounting is concerned, the KS-5646 List 3 projector and the KS-5646 List 1 and the earlier KS-5489 projector are interchangeable.

3.02 The KS-5646 List 3 projector includes a List 4 objective lens and a List 5 lens cone. The List 4 lens provides a more brilliant image, with less fadeout and distortion near the scale ends than the earlier KS-5646 objective lens and the KS-5646 List 2 replacement lens. The List 4 lens is also achromatic and is coated for better light transmission.

3.03 The KS-5646 List 3 projector replaces the KS-5646 List 1 projector. Where trouble is experienced with poor resolution or excessive extraneous light, the KS-5646 List 4 lens and the List 5 lens cone can be used on the KS-5646 List 1 projector to replace the original lens cone and lens or the replacement KS-5646 List 2 lens. For any subsequent replacement, only the List 4 lens would be required. Where trouble is encountered with the KS-5489 projector, it is recommended that it be replaced with the improved KS-5646 List 3 projector.

3.04 The projectors use a 250-watt or a 400-watt G30-type Edison base spotlight or floodlight type lamp. The wattage required depends on the amount of illumination necessary to provide a sufficiently brilliant image on the screen. However, the 250-watt lamp is preferable to minimize the effect of heating if the projector is located directly below switchboard or local cable forms, or if for some reason the fan motor is not operated. It should be recognized that, under these conditions, insufficient illumination of the screen may be experienced. Both types of lamps have a normal life of about 200 hours continuous duty. Access for lamp replacement is through a door on the back of the projector.

3.05 The fan is driven by a shaded pole ac 115-volt 60-cycle motor at an approximate speed of 1400 rpm. The air from the screened fan intake is used to cool the meter and the lamp compartment.

3.06 The lamp and the fan motor normally use 115V 60- or 50-cycle power. The power is fed from a convenience outlet through a plug and cord to a cabinet which mounts a starting relay. The relay, when operated by the measuring system, extends the ac supply over a cord to the projector lamp and to the fan motor.

Caution: *The power cord plug should be removed from the ac supply outlet prior to the start of work on the projector, the relay, or the power cords.*

3.07 The adjustable features of the projector include means for centering the image on the screen, for focusing the image, and for adjusting the position of the lamp. These adjustments are described more fully in Part 6. Dimensional data, and other information on the projector and screen mounting, are shown on Drawing ED-61369-01.

4. SCREEN

4.01 The screen provides a clear definition of both the pointer and the scale, when the projector is properly mounted and focused. The screen is a panel 48 by 17 inches, with a flat surface finished with bright aluminum lacquer enamel to provide an improved reflecting surface. The earlier screens were coated with sprayed aluminum finish and provided a somewhat inferior reflecting surface. Where difficulty is encountered with poor images which are due to this reflecting surface, it is recommended that the screen be replaced with the newer type. Drawing ED-61369-01 shows the screen.

5. OPERATION

5.01 When test connections are established, the associated measuring circuit relays operate to complete a noise or transmission measuring path from the circuit being measured to the projection meter. The operated relays also ground a start lead (ST) to operate the projection lamp relay (PL). The PL relay extends 115V ac power to light the projection lamp and start the fan motor. With the lighting of the lamp, the meter scale and pointer images are projected on the screen so that the results of the measurement can be read. Circuit details are covered on the SD- drawings listed in Part 7.

6. MAINTENANCE

6.01 Periodic removal of the projector from its mounting for cleaning is recommended in areas where the projector is subject to abnormal dirt accumulation or high room temperature. The power cords should be periodically inspected for deterioration.

Caution: *The power cord plug should be removed from the ac supply outlet before the projector is removed for maintenance or trouble work.*

6.02 The reflector, mounted on a door at the back of the KS-5646 List 1 and KS-5489 projectors, can be cleaned with a clean KS-14666 cloth slightly dampened with Guildcraft Lens Spray Cleaner. The cleaning should be followed by wiping with a clean, dry KS-14666 cloth.

6.03 The condenser lens and the objective lens can be cleaned with Lens Paper, Eimer and Amend No. 11-966 or equivalent (obtain

locally). Access to the condenser lens is through a door on the projector. The condenser lens may be removed for cleaning by grasping the front of the lens and twisting counterclockwise. Care should be taken, when replacing the lens, to ensure that all lugs are properly engaged. The objective lens is in a removable spiral mount. If the objective lens is found to be damaged, the lens or projector should be replaced. Replacements to provide improved performance are described in 3.02 and 3.03.

6.04 If the fan motor does not turn freely, the cause can be an excess accumulation of a foreign substance between the armature and the pole pieces. If after cleaning there is still a tendency for the motor to drag or for the bearings to seize, the condition may be corrected by applying to each bearing a drop of KS-16326, L1 oil on a toothpick.

6.05 Power cords which show deterioration of insulation or covering should be replaced. The cord and plug assembly between the supply outlet and the PL relay is a KS-7993 cord 3 feet long. In the List 1 projector, the heat-resistant cord from the PL relay to the lamp and motor is 14 gauge flexible twin-conductor heater cord, N.E.C. type HPD-3, which is connected to the lamp socket and extended to the motor. In the List 3 projector, HPN heater cord is connected to the motor. Sixteen-gauge stranded wire with Teflon insulation extends the ac power from the motor to the lamp socket. About 5 feet of HPD-3 or HPN cord is required for replacement. Strain relief should be provided and sufficient slack should remain to provide a 90° rotation of the lamp socket in either direction. Details are shown in Fig. 2 and 3.

6.06 When lamp replacement or lamp socket and lampshelf adjustments are required, the ac power should also be removed from the projector. When the lamp is cool enough to touch safely, it should be replaced with a new lamp of similar wattage. When the new lamp is tightened in the socket, the filament should be on the optical axis of the projector. The position of the filament hangers should be toward either side of the projector housing for best illumination. The position of the hangers can be changed by rotation of the lamp socket. An opening in the bottom of the projector provides access for loosening and tightening the lamp socket mounting

screw. The lampshelf should be adjusted vertically to get the lamp filament centered on the optical axis of the projector. The shelf is held in position by mounting screws which also provide the means for vertical adjustment.

6.07 After bench maintenance is completed, the projector should be returned to its mounting and connected to the measuring system. The following conditions should be met when the projector is connected for a measurement.

- (a) The projector lamp should light and the fan should be running.
- (b) The meter, with its pointer indicating downward and the pointer image upward, should be approximately centered in the meter compartment and clamped into position by the meter thumbscrew.
- (c) The image should be centered vertically on the screen by changing the tilt of the projector in its mounting. The adjustment is retained by the tightening of wing nuts on the sides of the projector.
- (d) The image should be centered horizontally on the screen by turning the mounting bracket of the projector. The adjustment is retained by the tightening of a screw or bolt associated with the mounting bracket. If the illumination of the image is not uniform, the meter position in (b) should be shifted slightly and centering adjustments (c) and (d) repeated.
- (e) The definition of the image of both the scale and the pointer should be clear. The objective lens mount should be rotated to produce best sharpness of image for all parts of the scale. The lens mount should be clamped

into its adjusted position by the lens thumb-screw. If the illumination of the image is not uniform or if color rings exist at the edges, the lamp adjustment in 6.06 should be checked and the projector refocused. If a clear and sharp image cannot be obtained, the objective lens or projector should be replaced. Replacements to provide improved performance are described in 3.02 and 3.03.

- (f) The lamp, subject to the wattage limitations in 3.04, should be capable of producing a sufficiently brilliant image.
- (g) The surface of the screen should be flat and free of blemishes and should provide a suitable reflecting surface.
- (h) The pointer of the meter should move freely.

6.08 If the projected image of the meter scale and pointer on the screen is unsatisfactory, the projector, meter, and screen should be investigated for trouble. Circuit and physical details are shown in the drawings listed in Part 7.

6.09 Lamp failure troubles should be handled in accordance with the procedures in 6.06.

7. LIST OF DRAWINGS (Not attached)

SD-59432-01	Transmission Measuring Circuit
SD-1G073-01	Transmission Measuring Circuit
SD-59433-01	Noise Measuring Circuit
SD-1G074-01	Noise Measuring Circuit
SD-95900-01	Transmission and Noise Measuring Circuit
ED-61369-01	Projector and Screen

NOTES:

- 1. THE WIRE SHALL BE 16 GA STRANDED WITH TEFLON INSULATION. ENOUGH SLACK SHALL BE PROVIDED FOR A 90° ROTATION OF THE LAMP SOCKET EITHER WAY.
- 2. KS MARKING ON LENS AND LENS CONE REQUIRED ONLY WHEN SOLD SEPARATELY. MARKING ON LENS CONE TO BE ON LOWER RIGHT QUADRANT OF FLANGE.

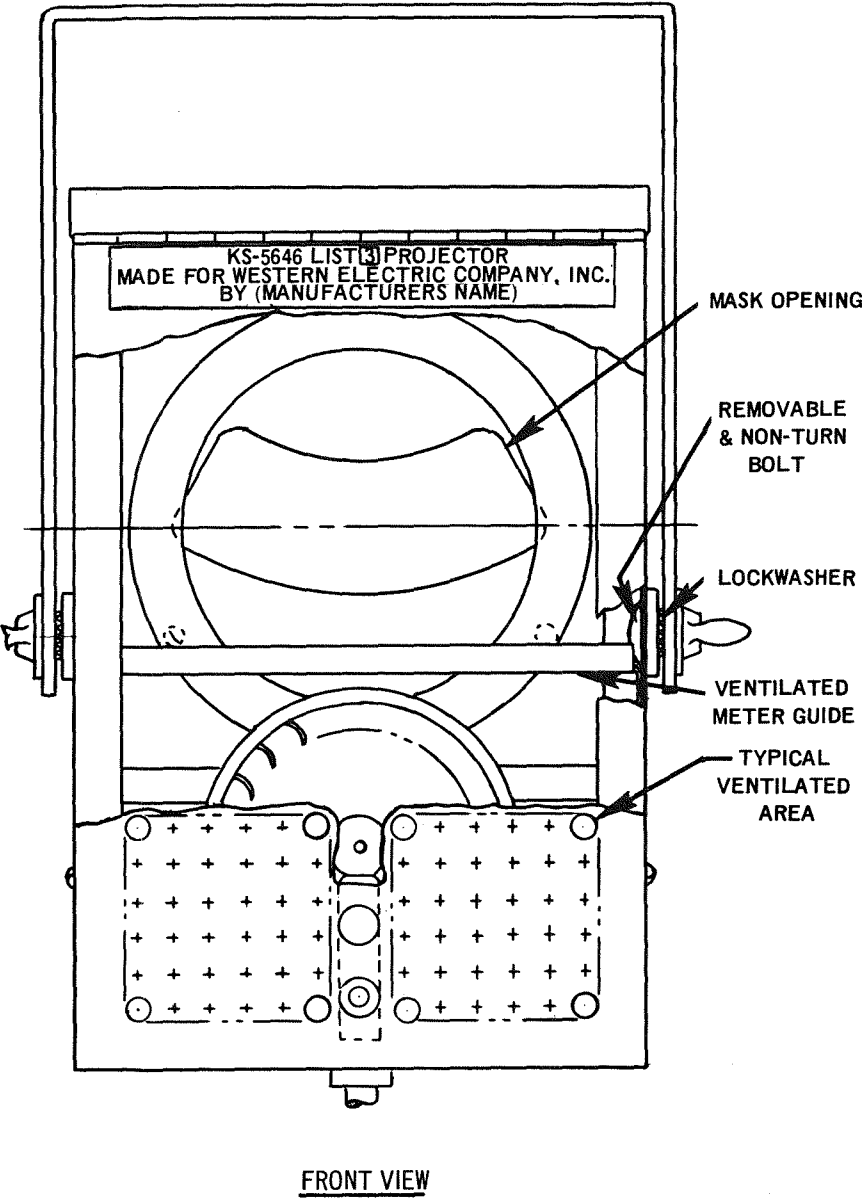
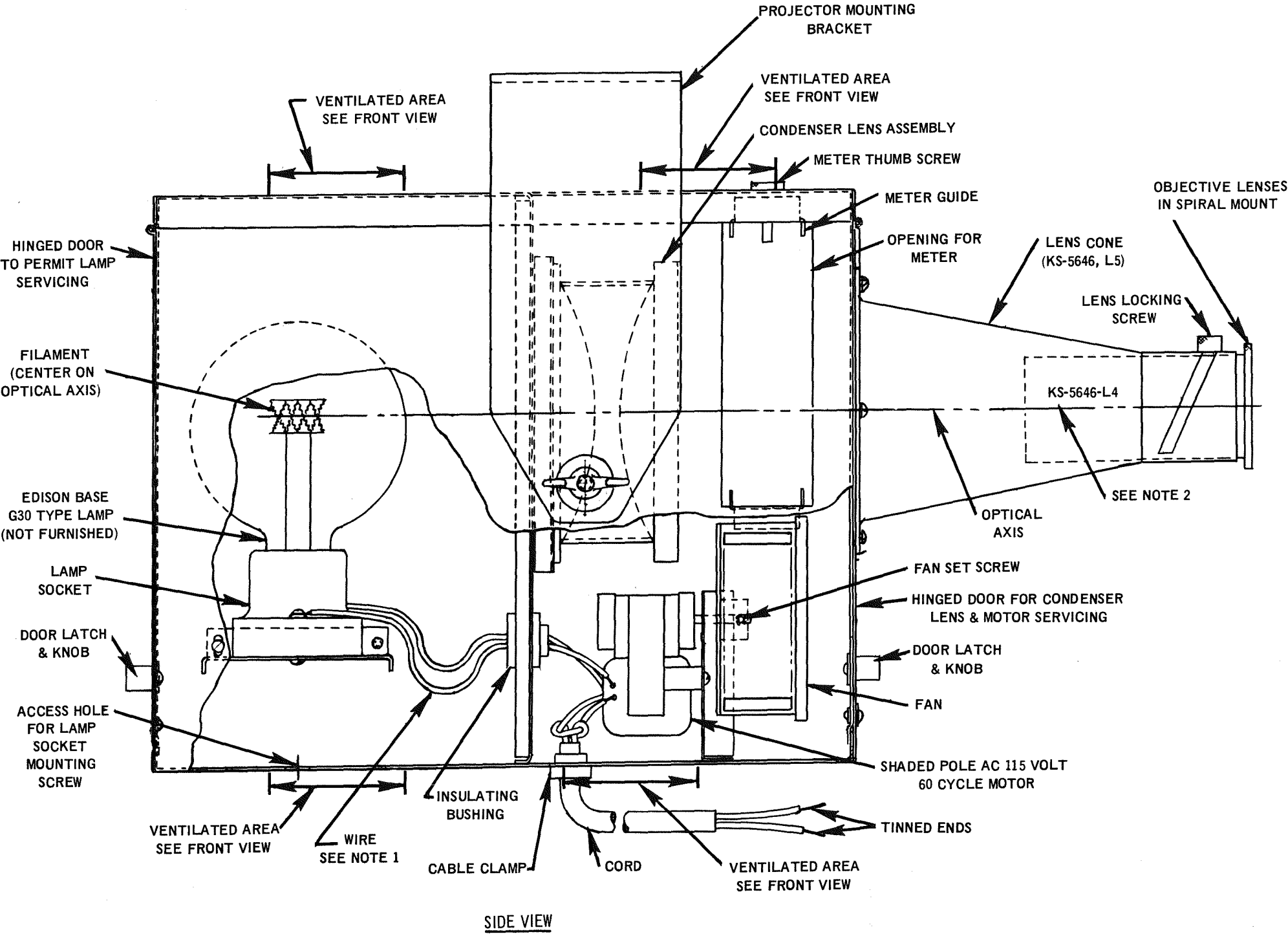


Fig. 2 – KS-5646 L3 Projector

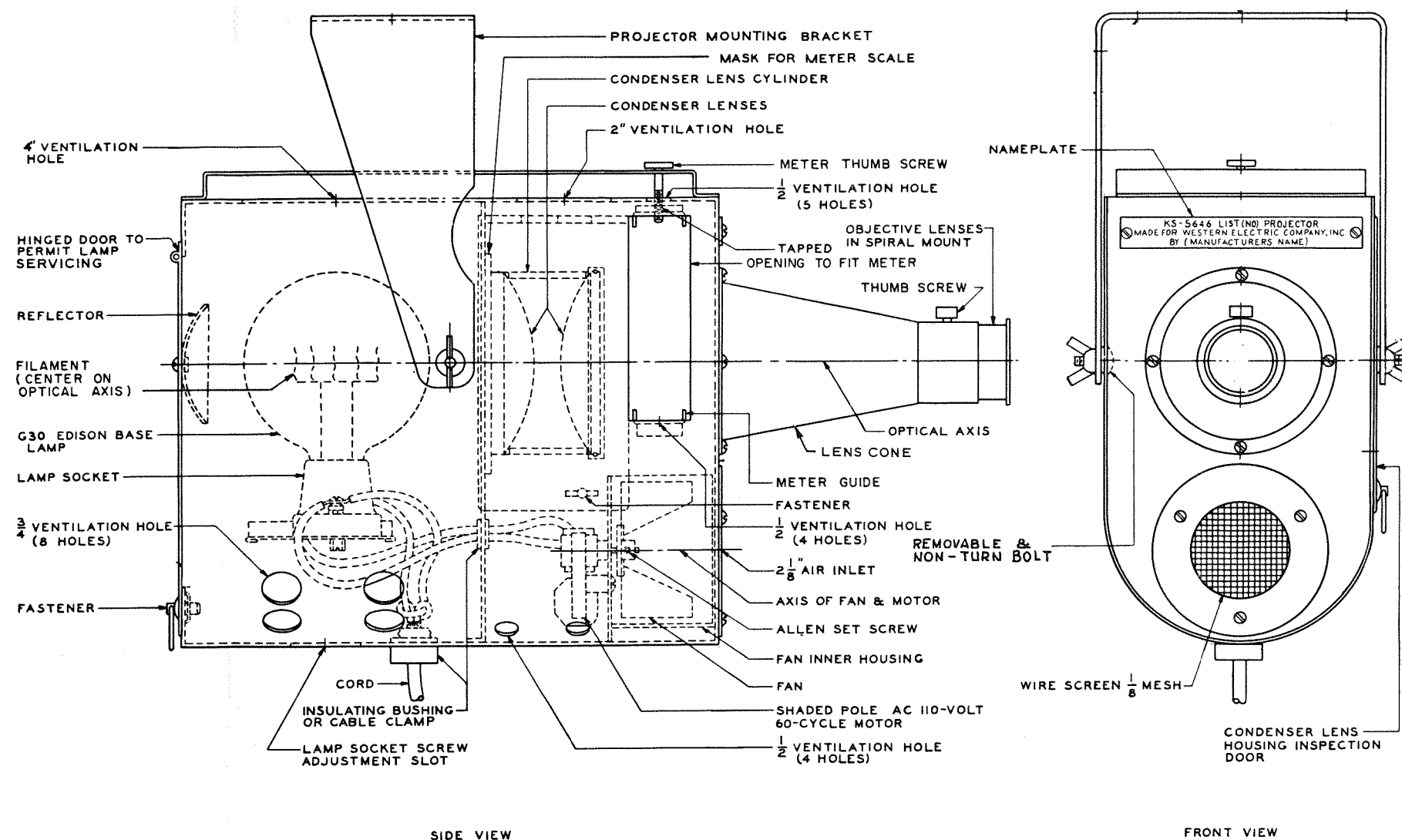


Fig. 3 - KS-5646 L1 Projector