

NARROW GAUGE MOTION PICTURES

Part II—More on servicing 16-mm sound-film projectors—handling optical systems and mechanical elements—sources of business and film libraries

By RONALD A. LANE

THE first installment of this article described the general features of narrow-gauge motion picture apparatus, with the idea of giving the service technician a certain feeling of familiarity with it. This installment describes details and service methods. The audio amplifier and some of the magneto-optical switching arrangements of the equipment of Fig. 1 (Figs. 1 and 2 appear in the first part,

or other means of regulating the voltage fed to the arc, but no ripple filter. Figs. 3 and 4 show the electrical wiring of two different 16-mm projectors—both by Eastman Kodak, but not the same model. Fig. 3 is typical of standard practice. Fig. 4 is the most complex and elaborate 16-mm unit produced in this country, having no less than 5 interlocked driving motors (instead of the customary one motor).

Optical servicing usually involves nothing more than cleanliness. Dirt in the light path means a duller picture or lower volume sound (from an optical soundtrack); or dirty picture and noisy sound. The projection lamp, its associated mirror or condenser lens or both, the projection lens, the exciter lamp, the exciter light lens or mirror or optical tube as the case may be, and the surface of the photoelectric cell facing the exciter light, all must be kept clean. Lubricating oil is the principal form of soil.

In general, optical surfaces are cleaned with *dry* lens tissue. This is a special tissue paper that leaves no lint. Camera supply firms and motion picture theater supply firms have it; so do dealers in optical goods. The glass

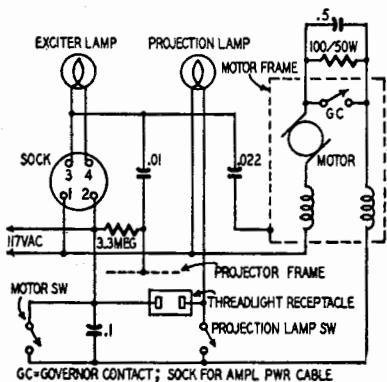


Fig. 3—Wiring of control switches and unit interconnections in Eastman Kodak 16-mm sound-film home projector.

in the April 1953 issue) are concealed behind the left panel. The microphone (for magnetic recording) is mounted on a desk stand, and the loudspeaker is in a separate carrying case.

Physical arrangements naturally vary as between different makes and models. In the projector shown in the photo the audio amplifier is underneath and not behind the mechanical and optical equipment. The projection lamp is inside the ribbed turret; the takeup reel is at the rear instead of at the front of the assembly. (In still other projectors the takeup or "lower" reel is actually at the top rear.)

A variation not pictured here is use of an arc lamp for projection light where the screen is large and an incandescent lamp may not provide enough illumination. Arc lamp powers range upward from 1 kw minimum, as a rule. Since the arc must be supplied with high-amperage, low-voltage d.c., a suitable rectifier is commonly added. This will use either Tungar tubes or selenium stacks, and a tapped transformer

Servicing 16-mm projectors

Servicing 16-mm equipment involves four kinds of requirements, two of which are highly familiar to radio repairmen, the other two perhaps slightly strange. Electrical and electronic servicing will involve no particu-

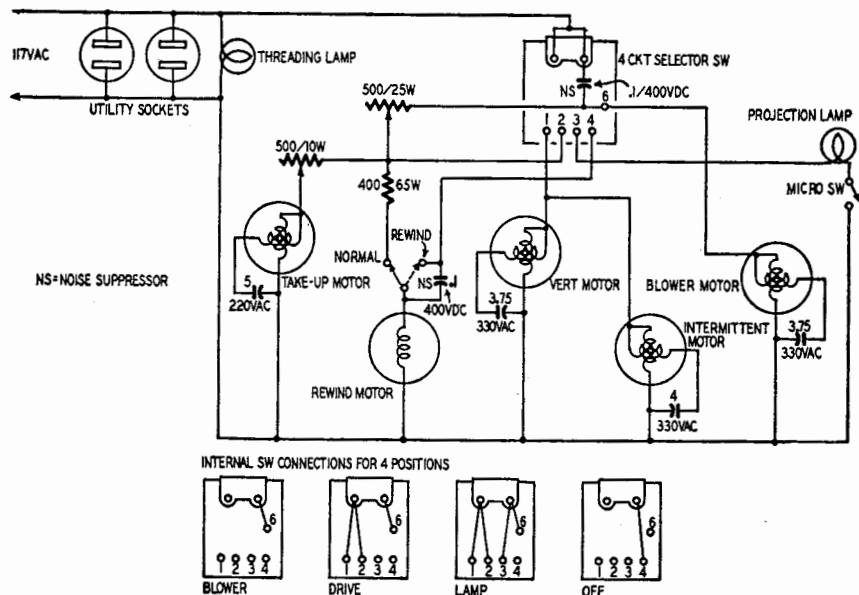
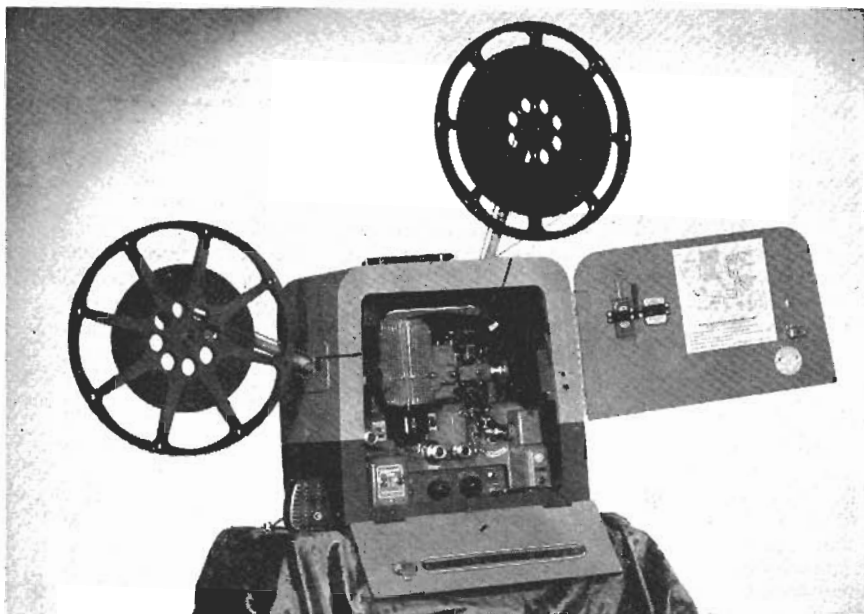


Fig. 4—Operating circuits and switching of Eastman Kodak professional model 16-mm sound-film projector. Individual motors are provided for every function.



Bell & Howell Filmosound 202 optical-magnetic sound-film recorder-projector.

surface to be cleaned is simply wiped off carefully with dry lens tissue.

In the case of the projection lens, however, the manufacturer's instruction book should be consulted, since most lenses used for projection nowadays have been given special surface coatings to a depth of only a few molecules to reduce surface reflection and improve light efficiency. Some of these coatings are impaired by cleaning. Check the instruction book.

Projection lenses always, and exciter lamp optics often, are compound—made of several lens elements suitably assembled. Avoid taking these apart for cleaning or any other purpose (at least, unless a spare is at hand). Many optical assemblies in common use cannot be reassembled accurately without factory jigs and fittings. In some, lens elements are cemented together with Canada balsam. Recementing these if they come apart involves special skill. Unless the radio repairman has had considerable skill and experience in optical work, it will be best to treat any optical assembly as a unit, replacing it as a unit if necessary. Optical elements, however, do not wear out; and unless dirt gets into them or lubricating oil seeps in, they should need no servicing except cleaning and repositioning.

Optical elements must be correctly positioned for efficiency and focus. Whenever a new projection lamp is installed, it must be so positioned and focused that the image of the filament does not show on the picture screen. Trial and error and the manufacturer's instruction book will soon teach this simple skill. The projection lens must be adjusted to bring the picture into the sharpest possible focus. If the picture does not fill the screen, or overlaps it, move projector and screen toward or away from each other until the picture fits, or substitute a projection lens of different focal length.

Positioning and focusing of optical

elements associated with the optical soundtrack vary in details in different makes of equipment. Details in each case will be found in the manufacturer's instruction book. In all cases, adjustment can be checked with test reels and a decibel meter. Suitable test reels are sold by the Society of Motion Picture and Television Engineers.

Mechanical servicing

Mechanical troubles are of two general kinds. Misadjustments need to be corrected and worn parts need to be replaced. Manufacturers' instruction books are a useful guide, although they differ in the thoroughness of the instructions.

A common example of wear is represented by undercut teeth in sprockets or driving claw. This results from frictional contact with the film despite the fact that the teeth are harder than the film—some are even jeweled. They wear eventually, and when undercut or hooked will tear film. Replacement is the remedy. Gear teeth also wear, and drive belts stretch.

A common example of misadjustment is in the tension of the friction clutch or other device that drives the take-up reel. At the start of a reel, the diameter of the film on the take-up hub is very small; as film keeps coming down and is taken up it forms a "hub" of ever-increasing diameter. Since the speed of the film is constant, the take-up reel must revolve at continually decreasing speed. A clutch-type drive of some sort is therefore needed at this point.

Misadjustments also are common in the pressure exerted on the film by the gate. Or a loose screw may permit a shutter or other rotating part to shift on its shaft.

A few of the commoner types of mechanical troubles, their causes and remedies, are discussed below.

Travel ghost is a vertical blurring of the picture. It is best observed in title

scenes—the letters appear to have tails either above or below. Cause is loss of synchronism between shutter and intermittent sprocket or claw. If the tail, or "ghost," is under the letter, the shutter is ahead of time; if above it, behind time. Remedy is to reset the shutter. Usually it can be rotated on its shaft.

Vertical unsteadiness—*picture jump*—may be caused by inadequate gate pressure, which needs readjusting; or by extensive wear throughout the mechanism for which the only good remedy is overhauling throughout; or by some specific mechanical mislinkage or slippage resulting in excessive vibration.

Horizontal unsteadiness—known as *picture weave*—may be the result of worn lateral guides in the gate. Replacement is the remedy.

A blurred picture can be caused by buckled film, for which there is no remedy except to get other film; by slippage in the focus of the projection lens; by projector or screen or both having been moved out of position; or by extreme vibration of a very badly worn-out projector. Remedies in each case are obvious.

Dim or unclear picture may result from blackening of the projector incandescent lamp with passage of time and use. Replacement is the remedy.

Mottled picture may be the result of over-lubrication or oil leakage, permitting oil to get on film.

Streaked picture may result from dirt in gate or elsewhere along film path, scratching film; or from film so scratched on a previous run. Cleanliness is essential in projection.

Weak sound may result from exciter lamp that has darkened with time; from misadjustment of exciting lamp optics; from oil on optics or exciting lamp or photoelectric cell; weakening of photoelectric cell; electronic faults in its circuit; or from mispositioning or misadjustment of magnetic track pickup magnet. Noisy sound is created by dirt with either optical or magnetic track. Magnet pickup heads show frictional wear in time, calling for readjustment or replacement.

Exceptionally noisy operation (mechanically) may result from neglect of lubrication, stretched chain or belt, excessively worn gears, loose part. Remedies are obvious.

Manufacturers' service policies

Manufacturers' policies with respect to supplying service information and replacement parts vary.

Ampro Corporation will supply service parts to anyone but recommend that they be bought through authorized Ampro dealers and service stations. All other buyers must pay full list price.

Bell & Howell assert that any servicing done by anyone other than their factory-trained representatives will void their lifetime guarantee.

De Vry Corporation, to the contrary, "will supply parts and service information to anyone." Equipment owners pay

full list price for parts; a "recognized repair man, whether he be one of our competitors or not," is granted a courtesy discount. De Vry's own dealers enjoy a regular dealer discount.

Eastman Kodak sells service parts only to a "few of the larger and better camera stores with photographic repair departments and Kodak audio-visual dealers who are specially qualified to render this service," and to Altec Service Corporation.

RCA sells repair parts through two channels: "RCA Tube Department distributors which sell all types of RCA renewal products, including tubes, batteries, and service parts for all RCA Victor Division products," and "RCA Visual Products Distributors."

Victor Animatograph, according to their service manager, William Kellogg, would not co-operate with radio technicians in servicing Victor equipment.

It does *not* follow, however, that the radio technician cannot service Victor or other non-co-operative products. For most electronic repairs he needs no co-operation. Moreover, there is nothing to prevent his entering into arrangement with the authorized local repair station. This is apt to be a photographic products dealer who never has any business dealings with electronic equipment except when called on to repair 16-mm and 8-mm projectors, and who may be very glad to contract with a competent radio repairman to take that headache off his hands.

Business opportunities

Servicing 16-mm equipment, however, is not the only way the radio repairman can benefit from this fast-growing field of activity. Schools, business firms, churches, do not always own projectors, or at least may not own enough of them to meet peak demands. Families often wish to rent a projector for an evening, to entertain guests, or perhaps for a children's party. Thus a rather substantial rental market exists, to serve which profitably nothing more is needed than to buy and own one or more projectors.

Allied to this form of business is that of rental agent for 16-mm film. An enormous stock-pile of such films exists. Surprisingly, vast numbers of films can be borrowed *free*. These include service films made by government or educational or social agencies, and "institutional" advertising films that show how a product is made or an industry functions, but carry no direct sales message. And some public libraries now circulate films as they do books. Other prints, however, must be rented, leased, or bought, and the prices and terms vary greatly. For sources, see below.

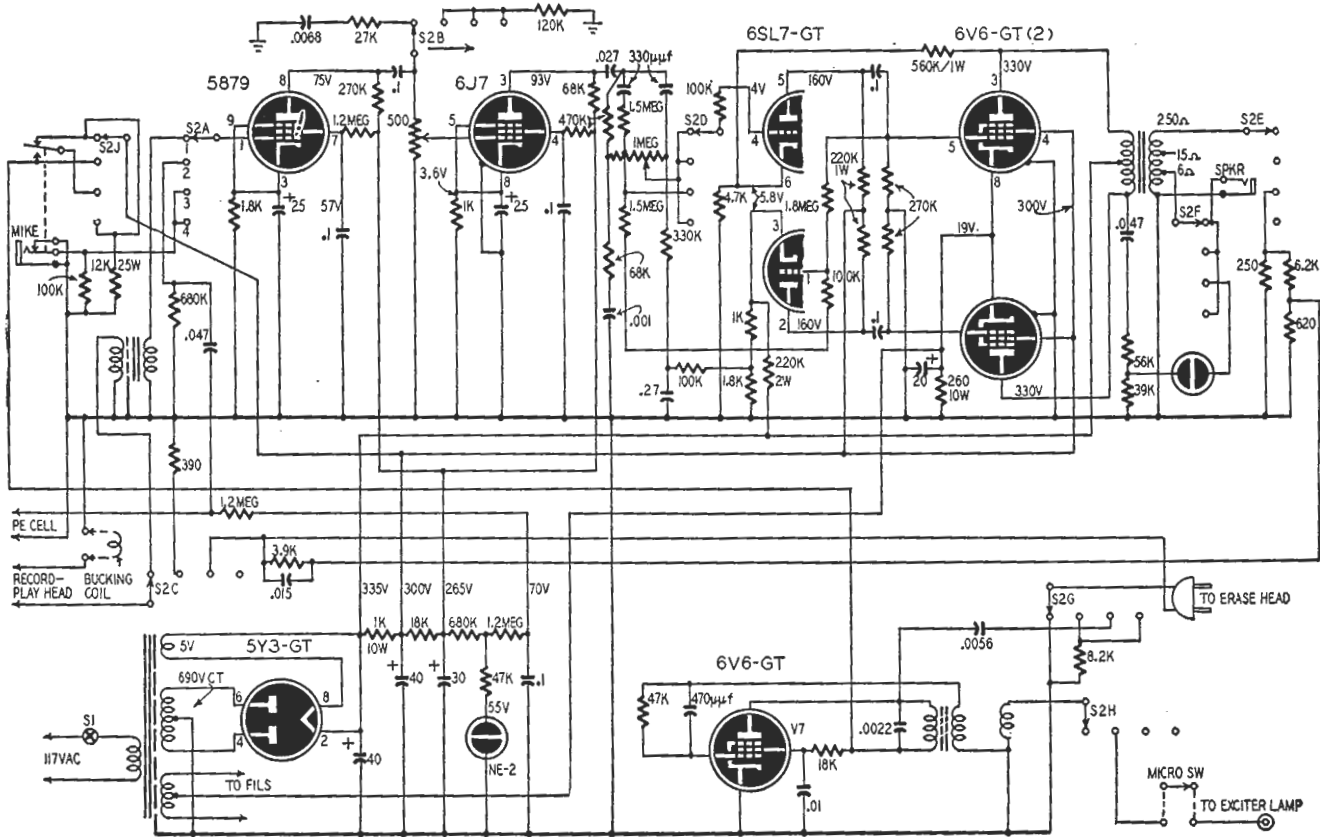
The leading 16-mm sound projector manufacturers are: Ampro Corporation, 2835 N. Western Ave., Chicago 18. Bell & Howell Company, 7100 McCormick Road, Chicago 45. De Vry Corporation, 1111 Armitage Ave., Chicago 14. Eastman Kodak Company, Rochester 4, N. Y. General Precision

Laboratory, Pleasantville, N. Y. Radio Corporation of America, Engineering Products Department, Camden, N. J. Victor Animatograph Corporation, Davenport, Iowa.

Sources of 16-mm sound film offered free, for rent, for lease, or for sale, include the following:

British Information Services, 30 Rockefeller Plaza, New York 20. Encyclopedia Britannica Films, Inc., 150 Willmette Ave., Willmette, Ill. Government Printing Office, Washington 25, D. C. McGraw-Hill Book Company, Text-Film Department, 330 W. 42nd St., New York 36. National Association of Manufacturers, 14 W. 49 St., New York 20. Religious Film Association, 220 Fifth Ave., New York 1. UAW-American Federation of Labor, 492 W. Michigan Ave., Milwaukee, Wis. United Nations Film and Visual Information Division, United Nations, New York. U.S. Air Force, Public Information Officer, nearest Air Materiel Area Headquarters. U.S. Army Pictorial Service Division, Washington, D. C. U.S. Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa. U.S. Forest Service, Washington 25, D. C. U.S. Navy Motion Picture Section, Washington 25, D. C.

This list is far from complete. Additional sources can be found in Educational Film Guide, published by H. W. Wilson Company and available at your public library, or at \$5.00 from the Wilson Company at 950 University Ave., New York 52. END



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Fig. 5—Magnetic-recording and optical-magnetic playback circuits of the RCA model 400 home-type 16-mm projector.