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INSTALLATION INSTRUCTIONS
and OPERATING MANUAL

BRENKERT BX-60

MOTION PICTURE PROJECTOR MECHANISM

Distributed by RCA Theatre Equipment Supply Dealers

Theatre Equipment
RADIO CORPORATION OF AMERICA
Engineering Products Department, Camden, N. J., U. S. A.

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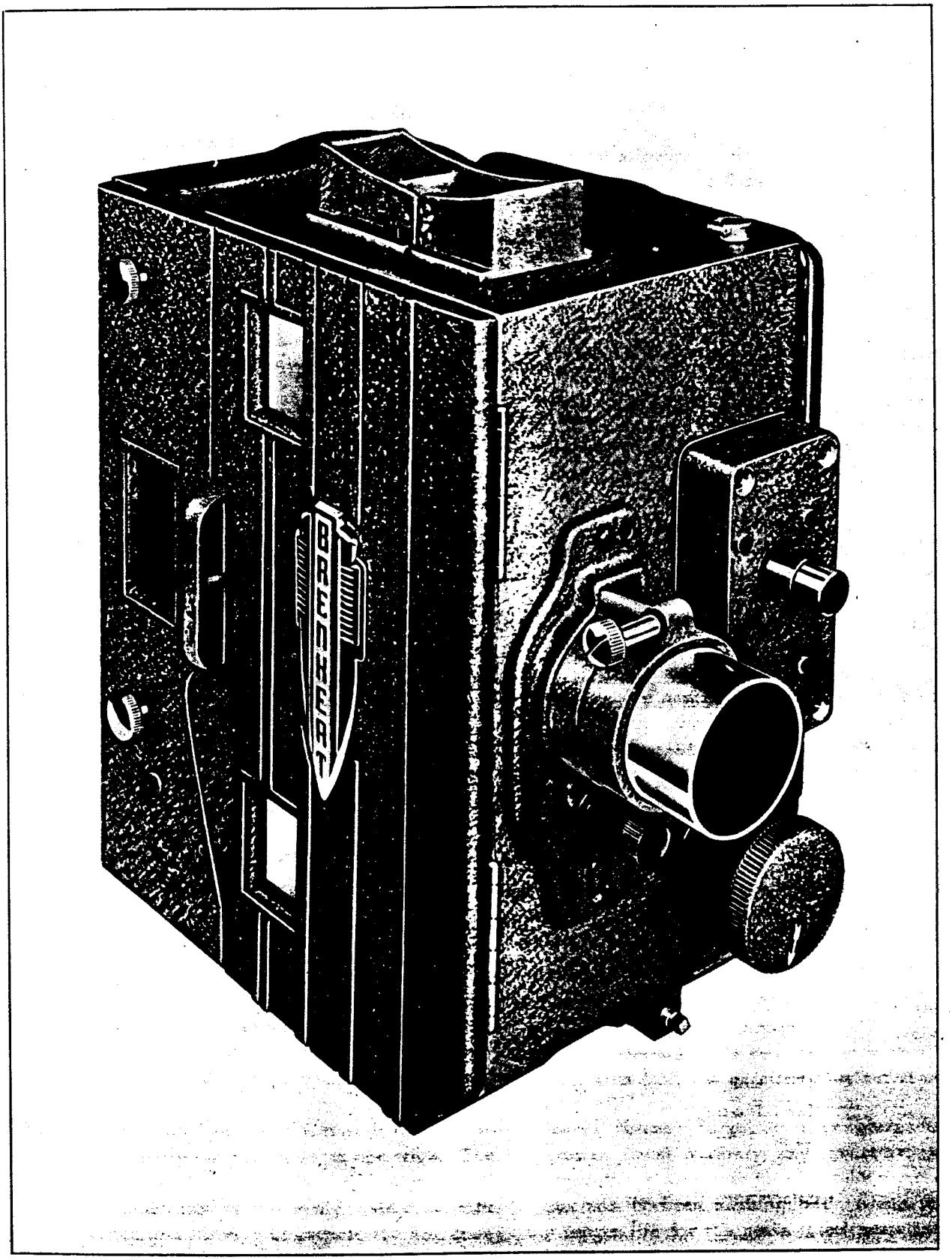
CHALLENGER

TECHNICAL SUMMARY

Overall Dimensions and Weights	Uncrated BX-60	Uncrated BX-62	Crated BX 60/62
Length (inches)	17½	19⅞	25
Width (inches)	12½	13¼	17½
Height (inches)	16	16	26½
Weight (pounds)	72	77	127

Electrical Requirements

Electric changeover (*) (sold as extra accessory) ..... 110 volts, 60 cycles
Pilot light (stock No. P-1087) ..... 110 volts

Adaptability

The Brenkert BX-60 can be used with all standard types of soundheads, arc lamps, pedestals, and film magazines.

Projection Lens Accommodation

All standard types and makes of projection lenses are readily installed in the BX-60 lens mount. Adaptors for the installation of Series I lenses are available at all RCA Theatre Equipment Dealer Stores.

Projectors for Screening Rooms

Projector mechanisms with three-bladed shutters and other modifications required for optimum results in screening rooms and film laboratories are available on special order.

* Changeovers are also available on special order for operation on 110 volt DC, 110 volt 25 cycle, and 110 volt 50 cycle power supplies.

All Brenkert Projector Mechanisms have been approved by Underwriters Laboratories.

BRENKERT BX-60
PROJECTOR MECHANISM

DESCRIPTION

General

The Brenkert BX-60 motion-picture projector is designed to meet adequately the most exacting requirements for high-quality projection in all types and sizes of theatres where 35mm motion-picture film is used.

Mechanical standards for adaptability already established in the motion-picture industry have been incorporated in the design of this projector mechanism so that all standard types of projector bases, soundheads, film magazines and projection lenses may be attached without any field modification.

A heavy, rugged, one-piece metal casting smartly styled, provides a housing and a main frame for the entire mechanism. This casting has been especially heat-treated to prevent warping, so that the accuracy of the precision machine work will be maintained for the life of the mechanism. This rugged non-warp main frame supports all of the working parts in the projector mechanism on accurately machined surfaces, thereby assuring correct alignment of all shafts and gears. Unpainted metal surfaces have been heavily plated to protect them against rust; all screws have been hardened and finished.

Unit construction is used wherever practical to facilitate easy, quick, and accurate servicing. All units are doweled to the main frame for correct alignment of all parts, thereby maintaining constantly the original accuracy built into the mechanism. The accessability for repair has been stressed beyond anything known in past practice, with the result that repairs can be made quickly and accurately by the projectionist, enabling him to maintain his mechanisms in peak operating condition at all times.

The film side of the projector mechanism is enclosed with a large door which, when open, exposes the entire film compartment; this door is adequately ribbed to prevent warping. Two glass-covered openings are provided in the door so that the film loops above and below the film trap can be observed while the mechanism is in operation. The film compartment is finished in light beige enamel so that the film may be seen easily against the light background and for ease in keeping the film compartment clean. Plenty of space is provided in the film compartment between all operating parts to facilitate ease in threading the film quickly and accurately; cleaning and making operational adjustments can be accomplished in a minimum of time, thereby allowing more time to the projectionist for the many other duties he must perform in the projection room. Quick access to the light shutter blades and rear of the film trap is accomplished by the removal of the rear panel on the film side, which is held in place by two thumb screws. A ruby glass is provided in this panel for viewing the light on the aperture.

The gear side of the mechanism is completely enclosed by a quickly removable cover. An oil-resistant neoprene gasket is attached to the rim of this cover, making the gear compartment absolutely dust tight as well as oil tight. A hardened glass in the cover permits viewing the gear train without removing the cover. All parts used in making up the gear train are of generous dimensions and high-precision manufacture; the entire gear train is maintained clean and free from dirt and grit, and is lubricated by a shower of filtered oil continuously, resulting in negligible wear of all moving parts and bearings even after many years of operation.

The many new principles of design and features of operation incorporated in the new BX-60 projector mechanism were possible only because of its completely new design to fit into present-day requirements; such great advantages cannot be obtained by modifying an existing projector mechanism which was originally designed many years ago to meet requirements which were much less stringent than those existing today. The text which follows describes in detail the main components making up the BX-60 projector mechanism and explains some of its features.

Gear Train

All gears are of large diameter with a ⅜-inch wide gear face; the gear teeth are cut at an angle that will produce quiet operation and minimum lateral thrust. Large diameter gears result in greater radial accuracy and therefore smoother operation; a wide gear face provides a greater contact area between meshing teeth, which results in a longer life for the gears. Steel gears are mated with phenolic gears wherever necessary to increase the life of the gears and reduce noise to a low level.

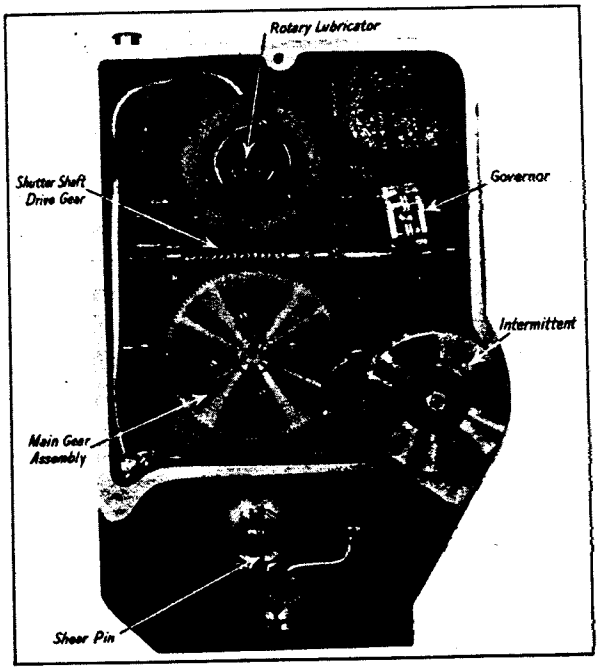

Figure 1—Gear Side of Brenkert BX-60 and BX-62 Projector Mechanism

Large diameter, high-grade steel shafts and long bearings are used throughout so as to maintain the original accuracy of gear alignment.

The light shutters are rotated by a long, large-diameter steel shaft, driven by a large-diameter phenolic gear. The accuracy of the shaft alignment is maintained in its bearings by a long, massive cast iron bracket. Automatic lubrication provides an abundant flow of filtered oil continuously over the entire length of the shutter shaft assembly; openings in the bearings allow the oil to flow freely and continuously between the shafts and bearing surfaces assuring adequate lubrication and at the same time keeping all parts of the shafts and bearing surfaces at a low temperature. Figure 1 shows the BX-60 with the gear cover removed and some of the units in the gear train identified.

The governor unit is the same type as used with the DeLuxe Brenkert BX-80 projector mechanism; it is designed to work with equal accuracy at all projection angles. The design is the loaded flyball type, working in a horizontal plane; it operates against the weight of the fire shutter and associated linkage by means of a push rod. The governor unit is simple in design, ruggedly constructed, and continuously lubricated.

A mechanical fuse or shear pin located on the outside gear face of the main projector drive gear assembly, at the bottom of the gear train, safeguards the entire gear train in case film breakage results in a film pile-up on any of the sprockets. In the event of such a film pile-up, the pin will shear and the mechanism will stop before any part of it becomes damaged. The shear pin is then easily replaced with a new one in less than a minute's time.

Intermittent Mechanism

The *intermittent unit* used in the Brenkert BX-60 motion-picture projector mechanism is identical with the intermittent used in the BX-80 projector. This is the most vital part of any projector mechanism and is commonly and correctly termed "the heart of the mechanism." The accuracy of engineering and design, and the precision of manufacture of this unit govern the original quality of projection, length of service, and upkeep cost. The importance of good engineering in its design and the adherence to close tolerances in its manufacture can be realized quickly when one considers the function performed by this unit.

The intermittent must move the film a distance of one frame, or approximately ¾ inch, in 1/96th part of a second. This means that the film moved by the intermittent has an average speed of 360 feet per minute compared with a film speed of 90 feet per minute in other parts of the mechanism. However, the intermittent must start moving the film from complete rest and return it to a state of complete rest after it has been moved a distance of one frame. To accomplish this in 1/96th part of a second, the film speed must reach a maximum velocity of almost 900 feet per minute in approximately 1/200th part of a second.

Each succeeding frame in the film moved by the intermittent must occupy exactly the same relative position in the film aperture. Any variation in the location of succeeding frames will show up as unsteady projection on the motion-picture screen. As an example, a variation of .001 inch in the location of succeeding frames in the film aperture with a projected picture 20 feet in width will result in the picture jumping or weaving approximately ¼ inch. High quality projection over a long period of time therefore depends on a high degree of precision and accuracy in the manufacture of the parts making up this unit, and the design must be such that this accuracy is maintained.

The Brenkert intermittent shown in Figure 2 is designed and manufactured so that the original accuracy is maintained over a period of many years. The star wheel, cam and cam pin are of large diameter with long bronze bearing surfaces; the use of large parts facilitates greater accuracy in manufacture and provides larger wearing surfaces, which in turn result in greater accuracy of operation and longer wear. The intermittent cam is

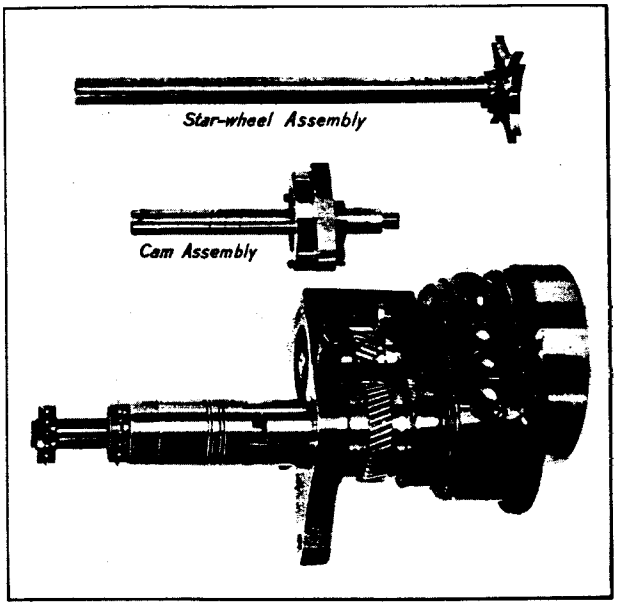

Figure 2—Brenkert Intermittent Unit

driven by an external gear fitted to its mating gear with absolutely no backlash; the index pin on the cam is fitted with a hardened steel roller so as to eliminate the possibility of wear and development of flat spots. Each moving part in the intermittent is made of hardened steel, ground and fitted together so precisely that specially-designed gages are necessary for making measurements and checking the microscopic tolerances adhered to.

The star-wheel shaft in the Brenkert intermittent is 6⅝ inches long and 7/16 inch in diameter. It is supported by two long bronze bushings, one close to the star wheel and the other close to the film sprocket. The sprocket and star wheel, therefore, are both held rigidly and accurately in position, resulting in perfect film motion and quiet operation. Because of the large dimensions of this shaft and its two bronze bushings, wear is negligible and the original accuracy built into this unit is maintained over a long period of time.

The high-quality bronze bushings used for both the intermittent star wheel and cam shafts are manufactured with extreme precision. Bronze bushings can be manufactured much more accurately and will last considerably longer than a cast iron bearing of the same length and bore. The brilliant engineering used in the design of the BX-60 projector mechanism lends itself to the use of bronze bearings in the intermittent unit, because of the abundance of filtered oil flowing continuously over all its parts, thoroughly lubricating them and maintaining them at a low temperature. Without this type of lubrication, bronze bushings are not practical in an intermittent because the heat generated and held by the oil confined in the intermittent case would result in uneven expansion between the bronze bushings and steel shafts, which in turn would result in rapid wear and probably bind-ups.

An exclusive feature of this intermittent is the method used for attaching the intermittent sprocket. The sprocket can be removed for reversal or replacement in less than one minute; it is not necessary to remove the intermittent from the projector or dismantle it to replace the sprocket. This means quick, safe and inexpensive sprocket replacement for maintaining the high-quality projection standards inherent in this projector mechanism.

The complete intermittent mechanism can be removed and replaced as a complete unit easily, quickly, and safely in less time than is required for the running of an average reel of film.

Automatic Lubrication

A positive method of continuous lubrication is used in the BX-60 projector mechanism to provide the right kind and the correct amount of lubrication in the right place, thus assuring lasting high-quality performance, longer wearing of all parts and low upkeep cost. It is the same method of lubrication used so successfully in the Brenkert DeLuxe BX-80 mechanism and which contributed so greatly in the tremendous acceptance of this projector mechanism by the motion-picture industry. Lubrication is continuous and completely automatic; no hand oiling is required. Fundamentally it is the same method of lubrication which has been used in automobiles for many years; today manufacturers of high-quality machine tools use this method of lubrication in their products wherever the highest precision of manufacture is required.

The lubrication in the BX-60 projector mechanism is supplied from a reservoir in the base of the mechanism which holds approximately one pint of oil. A geared pump inside the housing delivers a continuous flow of filtered oil through a copper tube from the oil reservoir up to a rotary lubricator at the top of the gear train. This rotary lubricator is perforated at longitudinal spacings in such a manner that the various holes are in line with the plane of each gear and bearing in the gear train. Thus in operation oil is pumped from the reservoir to the rotary lubricator and then showered over all parts in the gear compartment, providing lubrication at the right places continuously.

With this method of lubrication, oil is circulated throughout the entire gear side of the projector mechanism several times a minute, and is filtered every time it passes through the intermittent unit and the oil pump. Not only is automatic lubrica-

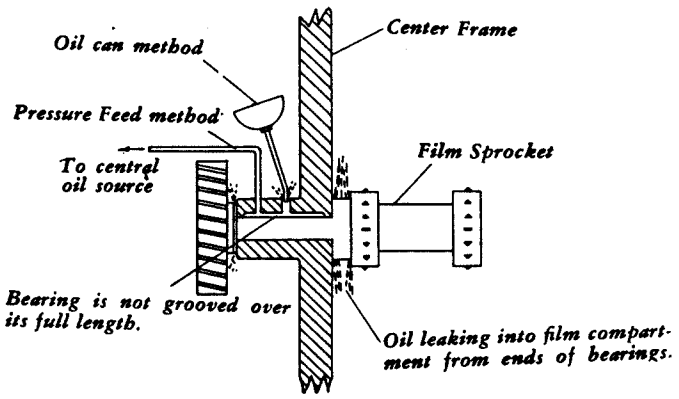

Figure 3—Conventional Manual Method of Lubrication

tion provided continuously, but the flow of oil over the entire gear train maintains all parts at nearly the same low temperature. The heat generated in the intermittent is carried away by the circulating oil instead of remaining confined in the intermittent case. This automatic lubricating system thus also acts as an overall cooling system in distributing any local heat in the gear train throughout the whole mechanism; the overall operating temperature is thus kept at a very low value.

This method of lubrication is far superior to conventional manual methods such as the hand-oiled system, or the pressure system fed from a common point, illustrated in Figure 3. Using either of the latter two methods, oil is forced into the oil hole and is distributed over the surface of the bearing by the groove in the shaft. The groove, however, does not usually extend over the entire length of the bearing, otherwise the oil would soon flow from the ends of the bearings and the bearing would then have insufficient oil for safe lubrication. The shafts, therefore, are usually grooved up to within a short distance from each end of its bearing in an effort to keep oil inside the bearing for as long a time as possible. As a result, the ends of the bearings usually do not receive sufficient lubrication and soon start to wear rapidly. As soon as this wear occurs, oil flows readily from the ends of the bearings into the film compartment where it can become deposited on the film and cause inferior projection, or drop into the soundhead where it will eventually result in inferior sound. With the hand oil or one-shot pressure method of lubrication, even when the projector mechanism is new, the leakage of oil from the ends of the bearings is exactly equal to the amount of oil forced into each oil hole every time the mechanism is oiled; eventually every bit of this oil will find its way into the film compartment, the soundhead, or deposited in the base of the projector mechanism.

All shafts and bearings in the BX-60 projector mechanism are designed so that they are lubricated continuously over their entire length without any oil leaking from the gear compartment, as shown in Figure 4. The oil which is showered throughout the gear compartment by the rotary lubricator flows over every part, and into all the oil holes provided in each bearing. The shaft in each bearing is grooved over its entire length so that oil can flow continuously through these grooves and out at each end of the bearing, thereby providing at all times an abundance of oil to wash, cool, and lubricate correctly, the entire length of the bearing. Carefully designed oil baffles and oil slingers on the shafts which protrude out of the gear compartment prevent the oil which flows from the ends of the bearings, from getting outside of the gear com-

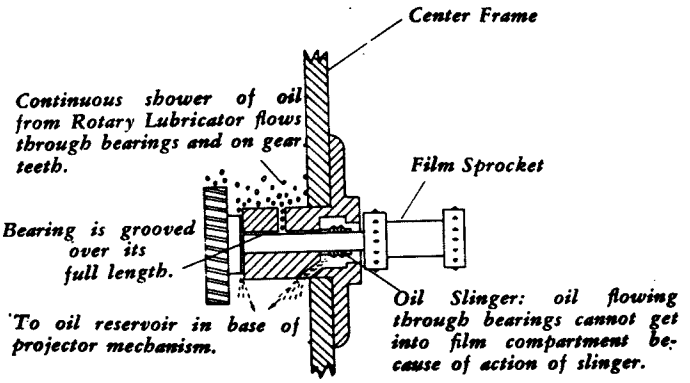

Figure 4—Brenkert Method of Automatic Lubrication

partment or into the film side of the mechanism. This method of lubrication is reliable because it is automatic and starts instantly when the projector mechanism is started; it is complete because all parts are showered continuously with clean, cool, filtered oil; it is best for a motion-picture projector mechanism because it is the most dependable; it results in longer wearing of all parts; and the original accuracy built into the projector mechanism is maintained over a longer period of time, resulting in lasting high-quality projection at low upkeep cost.

The Film Side of the Mechanism

The film side of the Brenkert BX-60 is shown in Figure 5. The design and location of all components in the film compartment of the BX-60 projector mechanism is such that plenty of space is provided between all units to facilitate rapid and accurate threading of the film, ease in making operational adjustments, and ease in keeping the film

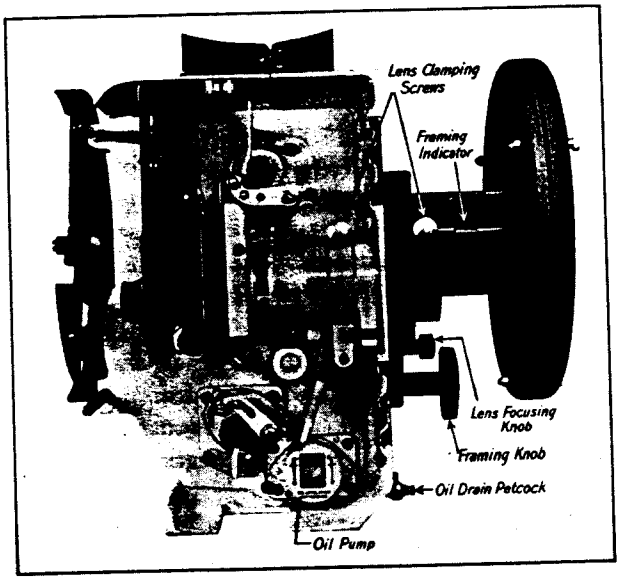

Figure 5—Film Side of Brenkert BX-60 and BX-62 Projector Mechanism

compartment neat and clean. All parts can be removed as complete assemblies for ease of servicing.

Oiling is not required on the film side of the mechanism because of the complete and automatic method of lubrication used as described above. Surplus oil, therefore, cannot get on the film and the projection lens, resulting in inferior projection; or drop into the soundhead, resulting in poor sound or possible sound outage. Considerable time is also saved for the projectionist because without surplus oil in the projector mechanism and soundhead, less time is required to keep the mechanism neat and clean.

All sprockets are hardened and then precision ground for smooth, quiet, and accurate running of all types of film. The sprockets are identical with those used in the Brenkert BX-80 projector mechanism. Dimensional standards established and recommended by the leading motion-picture engineering societies have been closely adhered to in the manufacture of the film sprockets used in the mechanism.

The intermittent sprocket as well as the upper and lower feed sprockets, can be removed and replaced in less than one minute by simply removing one screw and pulling the sprocket off of its shaft. If desired, the sprocket may be reversed to obtain double wear. The cost and the time required to replace sprockets is negligible; in addition, there is no danger of damaging or disrupting the adjustment of the various parts in the intermittent when replacing the sprocket, such as exists in many other types of intermittents where it is necessary to disassemble them to replace the sprockets. Because of the ease, simplicity, and low cost to replace sprockets, there will be less hesitancy on the part of the projectionist and theatre owner to replace or reverse the sprockets before excessive wear takes place, thereby maintaining the original high quality of projection.

Double pad rollers are used in both the upper- and lower-feed sprockets. These pad rollers are held in accurate alignment with the sprocket by a ruggedly constructed bracket which provides a bearing surface at each end of the pad roller. These pad rollers may be removed easily for cleaning or the complete pad roller assembly can be taken out as a unit simply by the removal of one screw. The film strippers are of a new and special design so as to prevent the film from wrapping around the sprocket in the event of film breakage.

The film trap is constructed on a heavy one-piece iron casting specially heat-treated to prevent warping. It can be removed easily between reels for cleaning and inspection; replacement can be made quickly and accurately, as the entire unit is doweled to the main frame to insure perfect alignment with the intermittent sprocket and the optical axis. The film trap is completely interchangeable with replacement units. The film is guided the full length of the film trap so as to prevent film side sway. The film tracks and the film guides are made of highly polished steel, hardened and precision ground. The film tracks are interchangeable from one side of the trap to the other so that if wear does eventually take place, the tracks can be interchanged and the opposite sides of them used, thereby obtaining double wear.

Standard removable film apertures .825 x .600 are available with either square or with round corners. In addition, removable apertures .800 x .600 are also available for use where a high-projection angle exists, so that the sides of the aperture can be filed to compensate for keystoning. The picture aperture can be instantly removed for cleaning even while the picture is being projected. The entire film aperture is cooled by the fan action of the rear shutter. Adequate cooling is provided so that even when high-powered arc lamps are used, the picture aperture will remain well within a safe operating temperature.

A framing aperture is built into the film trap exactly five picture frames above the picture aperture. The framing aperture is brightly illuminated by a framing lamp and is clearly visible even with the film gate in its closed position. This framing aperture facilitates accurate and rapid threading of the film.

Both the automatic fire shutter and the picture changeover dowser operate outside the film trap casting. The automatic fire shutter is operated through a linkage system by a push rod connected to the governor. The picture changeover dowser is operated by an electric changeover mechanism attached to the top of the main case.

The film gate is mounted on an accurately ground sub-base and operates on two large diameter guide rods, one at the top and one at the bottom of the gate, thereby holding the film gate in accurate alignment with the aperture plate at all times. The gate is held rigidly and accurately to its mounting surface by means of two locating pins and a locating screw so that after it is removed it can be replaced quickly and accurately. The gate opening is adequate to provide plenty of room when threading the film in the mechanism and for inspecting the film trap shoes and gate pressure pads.

In its closed position the gate is positively locked, thereby insuring against its accidental opening during operation. The gate is opened by means of a conveniently located gate operating lever; it is closed by pushing the back of it toward the film trap.

Two sets of hardened, polished steel pressure pads are provided on the gate to insure steady motion of the film through the gate, and to hold the film firmly and accurately against the aperture plate when the picture is being projected. The tension on all of the film pressure pads is obtained through oil-tempered springs which are adjusted simultaneously by a single adjusting screw; differences in tension pad requirements are taken care of by the size of springs used. The tension on the pads is applied centrally and distributed equally along both sides of the film which is thus held absolutely steady, even when film patches are passing through the gate.

The intermittent sprocket pressure pad is located on the lower part of the film gate. It is designed so that it fits exactly the contour of the sprocket, thereby holding the film firmly against the periphery of the sprocket. An adjustable thumb nut is provided on this pressure pad so that the tension can be adjusted for the quietest running of film.

Framing

The framing knob on the Brenkert BX-60 mechanism is located at the front of the projector directly below the lens mount where it is easily accessible from either side of the projector mechanism. With the framing knob at the front of the projector, it can be reached easily by the projectionist from a position close to the observation port so that framing can be done accurately and quickly.

Framing the picture at the aperture is accomplished by swiveling the intermittent so that the sprocket is always in the same relative position with respect to the picture aperture regardless of the position of the framing knob. This is the most desirable method to use for framing because the film is always supported in the film trap directly to the sprocket, eliminating any possibility of film flutter and unsteady projection. One other advantage of this method of framing is that wear on the sprocket teeth is more uniform than if the framing was accomplished by moving the intermittent sprocket up and down with respect to the film trap. When the latter method is used for framing, the same four pair of sprocket teeth (90° apart) always do the maximum amount of work in pulling the film down, thereby resulting in rapid wear and excessive hooking of these teeth. The framing method used in the BX-60 projector results in longer life for the intermittent sprocket because the sprocket teeth wear uniformly.

Lens Mount and Focusing Device

The projector lens mount is designed to accommodate all standard types and sizes of projection lenses; lens adaptors are available at the RCA Theatre Equipment Supply dealers for Series I and special types of lenses. The lens is held rigidly and firmly in both the front and the rear of the lens mount so that the lens is always maintained in perfect optical alignment. The projection lens is easily removed for cleaning by simply loosening two knurled thumb screws.

A focusing knob on front of the lens mount is easily accessible for adjustment from both sides of the projector mechanism. No backlash exists in this adjusting screw so that once the projection lens is focused the adjustment will be held accurately.

The lens mount is easily removed as a complete unit for ease in servicing and inspection.

Light Shutters

The Brenkert BX-60 projector mechanism is available with either one rear shutter or one rear and one front shutter. The chief advantage of using two light shutters instead of one is that over 20% more light is transmitted to the screen, flicker is reduced, and picture definition improved.

The rear light shutter on the BX-60 mechanism is designed so as to provide adequate cooling to the film aperture and maintain it at a low temperature.

Adjustments for increasing the width of the shutter blades are not necessary and are therefore not provided on the light shutters used with this mechanism. The reason such adjustments are not necessary in the Brenkert BX-60 is that wear and backlash in the gear train are negligible even after many years of operation because of the large-sized gears used for driving the shutters, and the automatic and continuous lubrication used. It is extremely easy to time the shutters on the BX-60 mechanism. This adjustment can be made accurately without the use of any special tools. Vernier changes in the adjustment of the shutters can be made when the mechanism is operating by means of a micrometer adjusting screw located conveniently at the front of the projector.

An adjustable indicator is provided on the shutter shaft so that the projectionist can easily determine when the intermittent is in its locked position before threading.

The BX-60's automatic lubrication, heavy duty gearing and rugged intermittent are the same outstanding features which brought the Brenkert BX-80 worldwide recognition as the best theatre projector. Designed to bring rock-steady projection to theatres operating on conservative budgets, the BX-60 is a worthy companion to the BX-80.

INSTALLATION

The Brenkert BX-60 projector mechanisms are packed in a specially-designed wooden box and enclosed in a moisture-proof bag and corrugated fibre board carton; the mechanism is adequately braced and padded for protection; excelsior and other loose packing material is not used. All projector mechanisms are carefully tested and adjusted before shipment from the factory; unnecessary rough handling must be avoided when unpacking so as to prevent damage to any of the parts.

Unpacking

Caution must be used in handling the projector mechanism during the unpacking operation so as not to damage it or lose any of the accessories. The unpacking should be done as closely as possible to the point where the installation is to be made so as to prevent excessive handling after the projector mechanism has been removed from its packing case. To remove the projector from its packing case follow the procedure outlined below:

BX-60 Single-Shutter Projector Mechanisms

1. Remove the top lid from the wooden box.
2. Remove the corrugated fibre board bracing.
3. Lay the wooden box on one of its long sides and pull out the complete corrugated carton.
4. Set the corrugated carton in an upright position and open the top.
5. Remove the box of accessories found inside the carton; set this box in a safe place until ready to assemble the mechanism on the soundhead.
6. Lay the projector carton on one of its long sides.
7. Open the bottom of the carton and turn the flaps against the sides.
8. Turn the complete carton on one of its adjacent short sides or ends; make sure that all bottom flaps are turned out.
9. Set the carton in its upright position and then pull it from around the projector.
10. Remove the moisture-proof bag.
11. Remove the wooden boards from the top and bottom of the projector.

BX-62 Double-Shutter Projector Mechanism

1. Remove the top lid from the wooden box.
2. Remove the two wooden cross braces which hold the small accessory carton in position. These braces can be removed by pulling out the nails from the side of the wooden box with a nail puller or by knocking off the side of the case.
3. Remove the accessory carton and put in a safe place until ready to assemble the mechanism on the soundhead.
4. Remove the cross brace from the top of the mechanism. This brace is held by two wood screws on each side of the shipping case.
5. Lift the mechanism from the packing box.
6. Remove the moisture-proof bag from around the mechanism.
7. Remove the wooden brace from the bottom of the projector.

Projector Parts and Accessories

The following items are shipped with each projector mechanism and will be found packed in the wooden case with the mechanism:

1—Pint Brenkert oil (stock No. X-2437).

1—Upper film valve complete with mounting screws.

1—Flexible metal cable for framing light.

2—Upper magazine screws and washers.

2—Anti-short bushings.

2—Projector-drive X-1729 shear pins.

1—Shutter timing adjusting tool.

1—Instruction book (one book furnished with each pair of projectors).

1—BX-30S changeover (when ordered). MI-14313

1—BX-20S footswitch (when ordered).

Attaching the Projector to the Soundhead

Before setting the projector on the soundhead determine if the location of the oil drain petcock is correct. The petcock must be in the hole provided in the base at the front of the projector for standard theatre operation where a down tilt exists, and at the rear of the projector for drive-in theatre operation where an up tilt exists. Refer to the maintenance section page 18, covering instructions on removing and changing the location of the petcock.

The Brenkert BX-60 projector mechanism can be attached to any standard soundhead and projector base without any field modifications. Three mounting holes are provided in the bottom of the projector mechanism main frame for attaching it to the soundhead or projector mounting plate. The two mounting holes under the gear side of the mechanism are blind-threaded holes ½ inch deep. The third mounting hole is located directly under the oil pump on the film side of the projector. All three mounting holes are threaded for a standard ⅜-16 screw.

When the projector mechanism is to be attached to early types of soundheads it may not be possible to use the third mounting hole in the base of the projector. Clamping brackets are available in such cases for attaching the projector to the film side of these types of soundheads; these brackets can be obtained from the RCA Theatre Equipment Supply dealer. The projector must always be attached to the soundhead at three points so as to insure absolute rigidity and freedom from vibration. Modern types of soundheads such as the RCA MI-9030 and MI-9050 are provided with projector mounting plates complete with projector attaching screws.

Projector drive gears are available for driving the Brenkert projector mechanism from all standard types of soundheads. Table No. 1 shows the type of projector main drive gear and other accessories required for operating the Brenkert projector mechanism with several of the more common types of soundheads.

When the projector is to be attached to a soundhead equipped with a projector mounting plate, attach the plate securely to the base of the projector using the screws provided with the mounting plate; set the projector on the soundhead and attach the mounting plate to it with the screws provided but do not tighten them until after the main drive gear has been adjusted. Attach the projector drive gear assembly and tighten the P-1301 screw against the flat on the shaft. The P-1301 screw is located at the rear of the projector and is shown in Diagram 1. Before tightening this screw against the flat on the shaft, however, make sure that at least .005 inch end thrust exists between the projector main drive gear and the projector main case. Move the projector mechanism forward and backward by means of the eccentric screw in the back of the projector mounting plate until the projector drive gear is meshed with the teeth of its mating soundhead gear, with .005 inch backlash between the gear teeth. When this condition has been attained tighten the four Allen screws attaching the projector mounting plate to the soundhead and then check the backlash in the projector drive gear again to make sure that it did not change when the mounting plate screws were tightened. Accurate gear and sprocket alignment is taken care of automatically when the projector mechanism is attached to a modern soundhead with a projector mounting plate.

To attach the projector mechanism directly to a soundhead which does not have a projector mounting plate, care must be taken to make sure that the projector is set on the soundhead so that the sprockets in both the soundhead and projector mechanism are in exactly the same vertical plane. If these units are not aligned accurately the film may not register correctly on the sprocket teeth, resulting in film noise and possibly film damage. Care must also be taken to make sure that the projector main drive gear is meshed correctly with the gear on the soundhead with approximately .005 inch backlash between meshing teeth. In some cases it may be necessary to use shims between the projector mechanism and the top of the soundhead to attain proper backlash between the projector drive gear and the soundhead gear. Whenever shims are used they should be made from standard brass shim stock and placed as closely as possible to the projector mounting screws, extending from the gear side edge of the projector mechanism base to the film side; one shim placed in front of the front mounting screw, and another in back of the rear mounting screw.

It is essential that the mounting screws for attaching the projector mechanism to the soundhead at the two holes directly under the gear compartment do not protrude more than ½ inch from the top of the soundhead casting. Longer screws MUST NOT be used as they will "bottom" in the mounting holes in the base of the projector mechanism

Table 1.—Parts and Accessories Required for Installing Brenkert Projectors on Soundheads Originally Modified for Use With Other Makes of Projector Mechanisms.

Soundhead	Simplex E-7 Super Simplex Std. Simplex	Motio AA	Motio K	Motio H-U	Century	Powers	Kaplan Superior Wenzel
RCA—PS-22A	B-2741S	B-2741S	B-2741S	B-2741S	B-2741S	.....	B-2741S
RCA—PS-24	B-3741SM	B-3741SM	B-3741SM	.....	B-3741SM	.....	B-3741SM
RCA—PS-26	.....	.....	.....	B-3741SM 1-27470	.....	.....	.....
RCA—MI-1040/1050	MI-9129A 1-X-4401	MI-9129A 1-X-4401	MI-9129A 1-X-4401	MI-9129A 1-X-4401	MI-9129A 1-X-4401	B-5741P	MI-9129A 1-X-4401
RCA—MI-9001	MI-9129A 1-X-4401	MI-9129A 1-X-4401	MI-9129A 1-X-4401	.....	MI-9129A 1-X-4401	MI-9129A 1-26604	MI-9129A 1-X-4401
RCA—MI-9030	MI-9129A (See Note 3)	MI-9129A (See Note 3)	MI-9174 MI-9129A	MI-9161A MI-9129A	MI-9129A (See Note 3)	MI-9161A MI-9129A	MI-9129A (See Note 3)
RCA—MI-9050	MI-9129A (See Note 3)	MI-9129A (See Note 3)	MI-9174 MI-9129A	MI-9174 MI-9129A 1-27926	MI-9129A (See Note 3)	.....	MI-9129A (See Note 3)
WE—Universal Base	1-29369	1-29369	1-29369	(See Note 4)	1-29369	(See Note 4)	1-29369
WE—206A Repro.	1-29370 1-X-4406	1-29370 1-X-4406	1-29370 1-X-4406	.....	1-29370 1-X-4406	.....	1-29370 1-X-4406
WE—208A Repro.	1-29371 1-X-4406	1-29371 1-X-4406	1-29371 1-X-4406	.....	1-29371 1-X-4406	.....	1-29371 1-X-4406
WE—209/211 Repro.	1-X-4400	1-X-4400	1-X-4400	.....	1-X-4400	.....	1-X-4400
WE—TA-7400 Repro.	(See Note 1)	(See Note 1)	(See Note 1)	.....	(See Note 1)	.....	(See Note 1)
Motio—7500 Repro.	(See Note 1)	(See Note 1)	(See Note 1)	.....	(See Note 1)	.....	(See Note 1)
Motio—MK	(See Note 1-2)	(See Note 1-2)	(See Note 1-2)	.....	(See Note 1-2)	.....	(See Note 1-2)
Century—Std. & DeLuxe	(See Note 1)	(See Note 1)	(See Note 1)	.....	(See Note 1)	.....	(See Note 1)
Simplex Four Star	MI-9129A (See Note 5)	MI-9129A (See Note 5)	MI-9129A (See Note 5)	.....	MI-9129A (See Note 5)	.....	MI-9129A (See Note 5)
Ballantyne	(See Note 6)	(See Note 6)	(See Note 6)	.....	(See Note 6)	(See Note 7)	(See Note 6)

Notes:

1. The existing 17-tooth spiral pinion gear may be used by relieving the hub to the depth of the gear teeth a distance of $1\frac{1}{16}$ inches from the gear face. In many cases it will be found that the existing pinion has already been modified.
2. A take-up pulley is not provided in the Motiograph MK soundhead. The hub of the soundhead flywheel will have to be grooved for a $\frac{3}{8}$-inch diameter leather belt and new X-2439 shafts and X-2440 bushings ordered from the RCA Theatre Equipment Supply Dealer.
3. The existing projector mounting plate does not have a hole for the third mounting screw. This hole can be drilled on the job or a new MI-9174 mounting plate can be obtained from the RCA Theatre Equipment Supply Dealer.
4. The following list of parts are required and can be obtained from the RCA Theatre Equipment Supply Dealer:
   1—WE adapter plate (700A) 29775
   1—Helical gear (P-220755) 29533
   1—Steel pinion 29369
   1—WE drive (712) 29524
5. Replace the textolite gear on the MI-9129A with the rubber composition gear removed from the four-star main drive gear assembly.
6. The existing projector drive gear may be used without any change.
7. Obtain following parts from the RCA Theatre Equipment Supply Dealer:
   1—RSM-64 Projector Drive Gear
   1—RSM-65 Projector Drive Pinion
   1—RSM-66 Drive Attach. Shaft
   1—RSM-67 Shaft Oiler Washer
   1—RSM-68 Shaft Oiler Tube
   1—RSM-74 Gear Guard
   1—RSM Motor Support Casting

and prevent it from being pulled tightly and rigidly against the soundhead; the inside bosses which support these threads may also be damaged.

Before attaching the upper magazine to the projector check the P-1013 screws in the X-1016 magazine sub plate to make sure that it is screwed tightly to the projector. Two 3/8-16 x 3/4-inch fillister head screws are supplied with the projector for attaching the upper magazine. These screws can be found in a cloth bag packed in the fibre carton which accompanied the projector mechanism. Do not use a screw which extends beyond the magazine mounting bracket more than 5/16 inch, or the screw will "bottom" on the top of the projector mechanism and prevent the magazine from being drawn down tightly and rigidly. If it is found that the mounting screws protrude too far through the hole in the magazine bracket, the flat washers which are supplied with these screws should be used between the head of the screw and the magazine mounting bracket.

When BX-30S electric changeovers are ordered with the projector mechanisms, they will be found packed in the accessory carton. Each changeover is complete with three six-foot lengths of wire leads in flexible metallic cable, long enough to reach a junction box located inside the projector base. To attach the changeover to the projector main case, refer to diagram No. 14A, and proceed as follows:

1. Remove the changeover dowser from the end of the flexible shaft with the No. 6 Allen wrench provided with the changeover.
2. Attach the changeover mechanism to the BN-19 mounting bracket with the two screws and washers provided, but leave them loose enough so that the changeover mechanism can be moved on the bracket easily.
3. Insert the flexible shaft guide tube through the opening at the top of the projector main case and position the changeover assembly so that the holes in the mounting bracket are directly over the mounting holes in the top of the projector main case.
4. Attach the mounting bracket to the main case with the 1/4-20 x 5/8 round head screws and flat washers supplied with the changeover.
5. Tighten the two screws attaching the changeover mechanism to its mounting bracket.
6. Slide the light dowser into the rear chute in the film trap with the attaching boss toward the rear of the projector mechanism.
7. Insert the flexible steel shaft into the hole at the top of the attaching boss and adjust the shutter on the shaft so that when the changeover is in its open position, the aperture is not obstructed by the shutter, and when in its closed position, the shutter completely covers the aperture.
8. Tighten the No. 6 Allen set screw in the boss firmly against the flexible shaft.
9. Tighten the adjusting screw on the top of the changeover until the shutter will not open when the footswitch is operated. Then loosen the adjusting screw slowly so that the shutter will open when the footswitch is operated. Do not loosen the screw enough so that the shutter opens with such force that it hits the top of the film trap casting, rebounds and partially closes the aperture. Figures 6 and 7 show the wiring and connections to the changeover units for two and three projector operation.

MI-14313

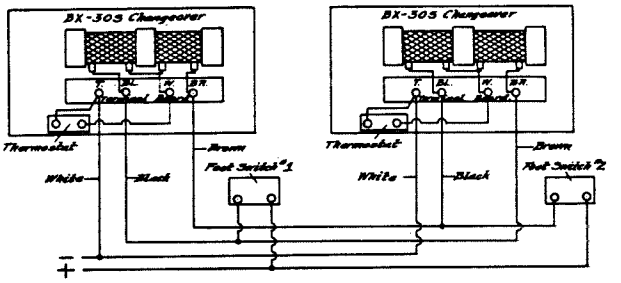

Figure 6—Picture Changeover Wiring Diagram for Two Projector Operation

A piece of flexible metallic cable approximately 65 inches in length is packed in the accessory carton and is to be used for covering the two wire leads to the framing light junction box assembly. Care should be taken when covering the wires with the Greenfield cable so as to prevent damage to the insulation. The two red anti-short bushings provided in the cloth bag packed in the accessory carton should be used, one at each end of the cable. Connect the two wire leads to a 110 volt power source.

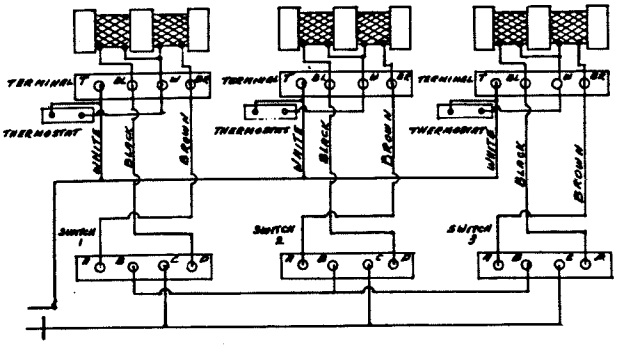

Figure 7—Picture Changeover Wiring Diagram for Three Projector Operation

The height of the optical axis in the projector mechanism from the mounting surface of the soundhead, and the distance from the picture aperture to the projector mounting holes conform with accepted and established standards. Standard arc lamps, therefore, can be mounted on the projector base and the proper working distance obtained without the necessity of any modifications. Care should be taken, however, to make sure that a clearance of approximately $\frac{1}{16}$ inch exists between the shutter guard and the end of the lamphouse cone. Also make sure that the optical axis of the arc lamp and projector mechanism are in perfect coaxial alignment by using the Brenkert MI-10001 aligning tool; this aligning tool is available at all RCA Theatre Equipment Supply dealer stores. When the projector and lamphouse are in correct alignment, tighten the screws attaching both of these units securely to the soundhead and projector base respectively so that even though a very steep projection angle exists there will be no danger of either unit moving out of alignment.

All of the oil was thoroughly drained from each projector mechanism before it was packed for shipment; the shafts and bearings in the gear train and intermittent therefore may be dry and completely free of lubricating oil when the projector mechanism is received at the theatre for installation. It is important, therefore, before running the projector to apply Brenkert oil generously to all parts of the gear train and intermittent. This can be done using a clean Plews oil can, or any pressure type of oil can, filled with Brenkert projector oil. A can of Brenkert projector oil is packed in the projector accessory carton. This can is sealed to prevent any possibility of foreign matter getting into the oil; this seal should be either punched or pried out of the can. The best method to use in applying oil to the gear train is to remove the gear cover so that all parts of the gear train are exposed and easily accessible. If a Plews oil can with a flexible nozzle can be obtained it will simply be necessary to insert the nozzle of the oil can in the large oil cup at the top of the gear cover and direct the oil to all parts of the gear train. Turn the projector over manually several times to make sure that the oil reaches all parts of the shafts and bushings. After the oil has been applied to all parts of the gear train and intermittent, pour enough additional oil into the gear side of the mechanism until the oil level, as shown in the indicator on the oil pump in the bottom of the film compartment, reaches a point between the two lines indicated on the cover of the pump. The oil cups on the projector main drive gears should then be lubricated with Brenkert oil. These oil cups should receive one or two drops of oil daily.

CAUTION: Before putting oil in the projector, make sure that the oil-drain petcock is closed.

Brenkert projector oil can be obtained from all RCA Theatre Equipment Supply dealers. For best operation only genuine Brenkert oil should be used in Brenkert projector mechanisms. This oil was perfected only after extensive research in developing an oil that had all of the characteristics necessary for optimum performance.

Before turning on the soundhead drive motor turn the projector mechanism over several times manually to make sure that it turns freely and without binding. After this has been checked, turn the soundhead motor on and allow the projector to run for several minutes until operating temperature has been reached.

Install the projection lens in the lens mount and hold in position by tightening one of the X-8703 lens clamping screws. The lens mount is designed to take a standard Series No. 2 projection lens with an extension tube: Series No. 1 lenses may be used if provided with the proper type of adaptor; these adaptors are available at all RCA Theatre Equipment Supply dealers. Adjust the lens focusing knob so that it is in the middle of its excursion. The projector lens can be adjusted for approximate focus by running the projector mechanism with the arc lamp on and projecting a light on the screen; loosen the clamping screw in the projection lens mount and slide the projection lens in the lens mount until a sharp focus of the aperture opening is obtained on the screen. Be careful when doing this on a BX-62 double shutter projector mechanism so that the front shutter blade does not strike the projection lens. After the approximate focus has been obtained lock the projection lens in the lens mount by tightening both of the X-8703 lens clamping screws. (See Diagram 11.) Align the projected image on the screen by means of the lateral and tilting adjustments provided on the projector base. If a lateral adjustment is not provided on the projector base, it will be necessary to move the complete base to align the projector image laterally on the screen.

A motion-picture film may now be threaded in the projector; it is extremely important that the film be threaded accurately and correctly for proper operation. If the film does not engage correctly with the sprocket teeth and film gate, damage may result to the film. Care should be taken to make sure that the proper size loops exist both above and

below the gate. When setting the loop above the gate it should be made so that the loop extends above the top of the gate approximately the width of two fingers. The loop between the intermittent sprocket and the lower take-up sprocket should be seven frames in length. See the film threading instructions in the operating section of this book for full details in threading film in the projector.

Brenkert projector mechanisms are designed so that threading can be done easily, quickly and accurately; this will become apparent after the projectionist has become accustomed to them.

Before turning on the soundhead motor, turn the projector over manually a few times and check the threading so as to make sure that the sprocket teeth are engaged correctly in the film sprocket holes. Turn on the soundhead motor and watch the motion of the film through the projector mechanism to make sure that it is running properly through the gate and around the sprockets. Strike the arc and project the picture on the screen. Adjust the projection lens by means of the focusing knob for sharpest focus.

OPERATING INSTRUCTIONS

Lubrication

Once every 600 operating hours or after six months' use, whichever comes first, the oil inside the projector mechanism should be completely drained from the oil-drain petcock and replaced with new Brenkert projector oil. The oil level must be maintained between the indicating lines on the oil pump at all times. The oil level should not be checked when the projector mechanism is operating because most of the oil is then circulating throughout the gear compartment and the oil level at the pump is below the sight glass in the pump cover.

When replacing the oil in the projector drain the old oil by attaching a piece of medical hose to the oil-drain petcock so that the oil can be directed easily to a container placed on the projection room floor. Allow the oil to drain from the projector for a minute or two after the oil level has dropped below the sight glass in the oil pump cover. The oil filter screen in the oil gage retaining housing should also be cleaned each time the oil is changed. To remove the oil filter screen simply remove the cover from the oil pump and the screen will be readily accessible; clean it thoroughly before replacing. When replacing the cover on the oil pump make sure that the round neoprene gasket is in good condition and set properly in place on the cover, otherwise an oil leak may develop. Before adding the new oil remove the rubber tubing from the oil-drain petcock and make sure that it is turned to its closed position. The new oil should be poured into the large oil cup on top of the gear-side cover.

The oil cups for the drive gears between the soundhead and projector mechanism should receive one or two drops of oil each day; use Brenkert projector oil for lubricating these parts.

CAUTION: When replacing the oil in the Brenkert projector mechanism use only genuine Brenkert projector oil. This is a special oil containing all characteristics necessary for optimum performance of the projector mechanism. Other types of oil may result in hard starting and possible damage to the mechanism.

Threading

Good projection and assurance against film damage depends on correct and accurate threading of the film through the mechanism. The BX-60 is so designed that threading can be done easily, quickly and accurately. Until the projectionist has become familiar with the threading, however, ample time and care should be used to make sure that it is done correctly.

Before threading the film through the mechanism open the film gate; move the upper and lower pad rollers away from their sprockets; turn on the framing light, and then turn the projector mechanism over manually until the intermittent sprocket is in its locked position. When the intermittent sprocket does not turn with the rest of the mechanism it is in its locked position. An X-7617 knob with a white indicating line is attached to the front of the shutter shaft as shown in Figure 5. This knob is used to indicate when the intermittent is on lock while turning the mechanism over manually. Adjust this knob on the shaft so that the white line faces the operating side when the intermittent is in its locked position.

Pull the film down through the film trap until the starting mark on the film is directly opposite and completely covers the framing aperture located above the film gate. When the film is framed correctly in this aperture it will automatically be in frame at the picture aperture. Make sure that the film is wrapped snugly around the intermittent sprocket and then close the gate by pulling it to its closed position with the thumb of the right hand.

The loop of film above the film gate must be approximately the width of two fingers. The distance between the center of the picture aperture and the

sound take-off must be 14½ inches or 19 picture frames; the loop between the intermittent sprocket and the lower take-up sprocket must be seven picture frames in length. Extreme care should be used in forming the film loops between the intermittent sprocket and the sound take-off to assure minimum film noise and correct synchronization between the sound and the picture.

Wrap the film snugly around the upper and lower sprockets before closing the pad rollers against the film sprockets. Unless the sprocket teeth are engaged properly in the film-sprocket holes, damage may result to the film. Do not turn on the drive motor until the threading of the film has been checked carefully.

After the projectionist has threaded the film through the projector mechanism several times, the ease and simplicity of threading will become more apparent. In the beginning, however, the projectionist will be rewarded by taking extra time and care to make sure that this part of the operation is executed properly.

The picture framing knob is located at the front of the projector mechanism and is easily and conveniently reached from either side. Turning the framing knob from one extreme to the other will move the film slightly more than the length of one full frame with respect to the picture aperture.

The lens focusing knob is located at the front of the lens mount and is easily accessible from both sides of the projector mechanism. During normal operation this adjusting knob should be set midway between the extremes of its full excursion so that ample latitude is available for moving the projection lens in either direction.

The film gate is designed so that an even and constant pressure is exerted on the film along the full length of the film gate. The amount of pressure against the film is controlled by adjusting the X-1941 knurled thumb screw on the back of the gate; changing the adjustment of this screw changes the pressure on all film tension pads simultaneously. The adjusting screw should be set for the minimum amount of tension on the film pads which will maintain a steady picture on the screen; keeping the tension on the pressure pads at a minimum will result in less wear on the intermittent sprocket teeth as well as on the film guides and shoes.

The only time that the tension on the film pressure pads may require readjusting is when running a new film which has not been properly processed or when running a very old film. In either case the tension on the film pads should be adjusted to obtain the quietest operation consistent with a steady picture on the screen.

The adjusting screw for the film pressure pads is designed so that the tension on the film pads can be varied only within a pre-determined range. The tension cannot be increased nor decreased beyond the limits where film damage might occur.

The tension on the intermittent sprocket pad should be adjusted for minimum film noise. This adjustment is set at the factory for average film conditions; readjustment in the field will be necessary only when unusual film conditions are encountered.

Cleaning

Keeping the projector mechanism clean is one of the best ways of assuring highest quality projection. The interior of the film compartment of the Brenkert BX-60 is large and roomy; ample space is provided between all units to facilitate rapid and thorough cleaning of all parts. The light enameled interior of the main case aids in observing quickly dirt and other foreign matter, thereby making it easy for the projectionist to keep it clean.

The projectionist should cultivate the habit of cleaning all parts of the projector mechanism daily before the show starts. A clean rag and a small brush is all that is required to do a good cleaning job. The sprockets should be brushed around their entire periphery to remove all deposits of dirt and film emulsion; the pad rollers should also be brushed and then wiped clean with a rag; the film strippers should be checked and all dirt and emulsion deposits removed.

The most important unit in the film compartment to keep clean is the film trap and gate assembly. The film gate should be removed daily and thoroughly cleaned with a clean rag. The film shoes and guides on the aperture plate should be thoroughly cleaned with a clean rag making sure that all deposits of dirt and film emulsion are removed. Care should be taken when cleaning between the film guide rollers and the film trap main casting to remove all dirt and foreign matter which may prevent their operating freely. Failure of the inner roller to turn when film is passing through the film trap may result in it becoming cut by the edges of the film. Once these rollers have been cut it will be difficult to keep them turning and the only solution will be to replace them with new ones. The removable film aperture should be inspected daily and kept scrupulously clean. The film aperture is easily and quickly removed for cleaning. After the individual units in the film compartment are cleaned the entire interior of the

film compartment should be wiped clean with a clean, dry rag.

CAUTION: The mechanism should not be cleaned when it is running. Failure to adhere to this procedure may result in damage to the mechanism by getting the cleaning rag caught between the gears or tangled between the shutters and the shutter housing.

The projection lens is easily and quickly removed for cleaning; it should be removed and cleaned daily so as to maintain maximum efficiency of light transmission and highest quality projection. Care should be used when cleaning the glass lenses so as to prevent scratching, or coating them with a thin film of oil or grease. To guard against this use only lens tissue or a clean, soft rag for cleaning purposes.

Shear Pin

If abnormal strain such as a film pile-up is developed in the projector mechanism, the X-1729 shear pin shown in Figure 1 will break and the projector mechanism will be mechanically uncoupled from the soundhead drive. In such a case, it is only necessary to correct the cause of the abnormal strain and replace the broken parts of the shear pin with a new one. To remove the broken parts of the shear pin, remove the X-1930 screw and pry out the broken parts of the pin with a screwdriver. The new shear pin will fit snugly into place and should be driven in its slot with the end of a screwdriver or a small hammer. Tighten the X-1930 screw against it.

MAINTENANCE

The successful and efficient operation of any precision built equipment such as a motion-picture projector mechanism, depends on correctness of design, and the care it is given during operation. If given only a reasonable amount of care, the Brenkert BX-60 projector will perform over a period of many years with the same degree of accuracy as when new. It will actually run smoother and quieter after it has been run in for a few months than it did when it was new.

Instructions for servicing the complete mechanism are given below; it is suggested that the instructions covering any work to be done be read carefully, and thoroughly understood before proceeding with the work. All service work should be done carefully and accurately, and in a good workman-like manner; it will pay dividends in the long run.

Housing Unit
(See diagram No. 1)

There are only a few parts on the main case that will ever require adjustment or replacement, such as the glass parts in the doors and covers, and the gasket on the gear cover.

To replace the X-1003 neoprene gasket on the gear cover proceed as follows:—

1. Remove the gear cover from the main case and pull the old gasket off the cover.
2. Clean the mounting surface of main case and the edge of the gear cover carefully; make sure that there is no foreign matter or burrs on either surface, otherwise oil leaks may develop.
3. Attach the new gasket to the gear cover, making sure that the edges of the gasket are in their normal position, and insert the three mounting screws in the gear cover.
4. Attach the gear cover to the main case, drawing all three screws up evenly and simultaneously. Do not tighten one screw all the way before drawing up the other two because it will then be difficult to draw the cover up evenly all around, and oil leaks may develop.

The X-7015 glass window in the gear cover is specially heat treated and is about ten times harder to break than regular window glass. This glass window is held in position with three metal clamps. To replace it, loosen the X-1022 metal clamps, remove the old glass and install the new one in its place. Check the X-7022 gasket to make sure that it is in good condition before installing the new glass. The glass in the door and quarter panel is held in place with metal clips; it can be easily and quickly replaced.

Oil-Drain Petcock

The X-7026 oil-drain petcock is attached to the front of the main case for standard theatre operation; for drive-in theatre operation, where an upward tilt exists, it should be attached to the rear of the projector. To remove the X-7026 petcock, proceed as follows:—

1. Drain all of the oil from the projector mechanism.
2. Remove the petcock using a small adjustable end wrench.
3. If the petcock is to be moved to the rear of the main case for drive-in theatre operation,

use the P-1225 brass plug removed from the rear of the main case to plug up the hole from which the petcock was removed.

4. When replacing the brass plug and the petcock, cover the threads with a thin layer of "Titeseal" to prevent oil leaks.

The X-2231 and X-2232 film valve rollers in the X-3000 film valve must be kept clean and free from dirt so that they will turn freely at all times. If these rollers become clogged with dirt and stop rolling, flat spots will wear on them and film damage may result.

These rollers can be removed for replacement or cleaning without removing the upper magazine by following the procedure outlined below:—

1. Insert a small diameter drift-pin punch in the hole at the center of the roller.
2. Remove the X-2233 roller pivot screw.
3. The roller may now be lifted out of its housing.

X-3701 Intermittent Unit
(See diagram No. 2)

A complete and detailed description of the Brenkert intermittent is given in the description section of this book; it was pointed out in this section that tolerances of less than a half of one ten-thousandth of an inch are held on most of the parts used in this unit. It is, therefore, extremely difficult to make major adjustments on this unit in the field; special tools and test equipment as well as experienced handling are essential. Listed below are the only adjustments that should be attempted in the field. Where any other work is required, obtain a loaner intermittent from the RCA Theatre Equipment Supply dealer and return the theatre's intermittent to the dealer for shipment back to the Brenkert factory.

Removal of Intermittent Sprocket

The intermittent sprocket can be replaced easily, accurately, and in less than one minute with no tools other than a large screwdriver. To remove the sprocket, proceed as follows:—

1. Remove the X-1005 quarter panel.
2. Bend the X-1959 film stripper away from the sprocket.
3. Turn the projector over manually to make sure that the intermittent is in its locked position.
4. Back out the X1-1109 *left hand threaded* retaining screw about a quarter of an inch *by turning it to the right.*
5. Place the middle and the forefinger of the right hand on opposite sides of the sprocket hub behind the outer flange, and the thumb against the X1-1109 sprocket retaining screw. By pulling on the sprocket with the fingers and pushing inward on the head of the screw with the thumb, the sprocket will loosen from the shaft and come out as far as the screw.
6. Remove the X1-1109 screw and pull the sprocket from the shaft.

Before replacing the sprocket, make sure that the P-1054 screws are tightened firmly against the X1-1108A intermittent sprocket drive plate. When the sprocket is replaced on the shaft, make sure that the dogs in the X1-1108A drive plate engage in the slots in the end of the sprocket shaft. Replace the X1-1109 retaining screw and make sure that it is pulled up tightly against the sprocket.

To reverse the intermittent sprocket, remove the X1-1108A drive plate and attach it to the opposite end of the sprocket.

In every case make sure that the P-1054 screws are tight against the X1-1108A drive plate and that the X1-1109 retaining screw is pulled up tightly against the face of the sprocket, otherwise the intermittent will operate noisily.

REMEMBER; the X1-1109 sprocket retaining screw has a left hand thread; turn it to the right to loosen it.

Removing Complete Intermittent

1. Remove the intermittent sprocket. (See above.)
2. Remove the X-7173 gear cover.
3. Loosen the P-154 lock nut and back off the X1-1112 screw releasing the X1-1111 steel clamp which locks the intermittent in position. (See diagram No. 3).
4. Lift the X1-1111 steel clamp out of its casting with the left hand; using the right hand, pry the intermittent loose with a screwdriver placed so that it is resting on the main gear assembly shaft with the blade pushing the intermittent out.
5. When the intermittent is loose in its holding casting, swing it clockwise so that the lower casting clears the main frame and then pull it directly out.

Replacing Complete Intermittent

1. Lift the X1-1111 steel clamp upward out of its casting.
2. Insert the sprocket shaft housing in the intermittent holding casting; make sure that the hole in the X-1114B yoke arm engages with the X-8009 intermittent aligning pin.
3. Press the intermittent into its casting until the main casting of the intermittent unit is directly against its holding casting.
4. Press the X1-1111 steel clamp downward so that it drops into the retaining slot in the intermittent sleeve.
5. Tighten the X1-1112 screw in the steel clamp and lock in place with the P-154 nut.
6. Replace gear side cover and gasket. Make sure that both the gasket and the surface on the main case are wiped free of all dirt and oil.
7. Replace the intermittent sprocket and bend the X-1959 film stripper back into proper position.
8. Retime the light shutters. (See section covering light shutters).
9. Replace the quarter panel.

Radius Adjustment

The adjustment of the star wheel with relation to the cam is referred to as the radius adjustment. It is set very carefully and accurately at the factory and adjustment in the field should rarely be necessary. If this adjustment is not made correctly, the intermittent may operate noisily.

Before attributing noisy operation of the intermittent unit to an incorrect radius adjustment, check the P-1054 and the X1-1109 screws on the sprocket locking plate to make sure that they are tight. Also check the inner edge of the sprocket to make sure that dirt has not built up between the sprocket and the main casting, thereby loading it and causing heavy indexing between the cam pin and the star wheel slots. Both of these conditions will result in excessive noise.

The radius adjustment can be checked very easily by quickly striking the periphery of the sprocket tangentially in the direction of its rotation with the side of the forefinger of the right hand while the projector is running without film. This should be done with the framing knob set at several different positions, ranging from one extreme to the other. The adjustment is correct when a slight clatter is heard each time the intermittent sprocket is struck with one's finger as described above.

The adjustment is too tight when a sharp clicking sound is heard continuously even when the projector is running with the film gate open and without film; no additional noise will be heard in this case when the periphery of the sprocket is struck with one's finger as described above. The radius adjustment is too loose when a pronounced clatter is heard each time the periphery of the sprocket is struck with one's finger. Under this condition, the intermittent will usually be noisy also when running both with and without film.

If the radius adjustment must be altered, refer to diagram No. 2 and proceed as follows:—

1. Remove the gear cover.
2. Loosen the P-155 nut with a thin $\frac{3}{8}$-inch end wrench. The thickness of the end wrench must be $\frac{1}{8}$-inch or less to fit into the recess where the nut is located.
3. Insert a $\frac{1}{16}$-inch drift-pin punch in one of the holes around the shoulder on the X1-1127 cam bushing; the bushing should be rotated toward the star wheel shaft to tighten the adjustment, and away from the star-wheel shaft to loosen it. Do not turn the bushing more than $\frac{1}{16}$-inch at the periphery before checking the adjustment again with the mechanism running. If the cam bushing is tight and cannot be rotated as described above, place the end of the punch against the edge of one of the holes in the shoulder of the bushing and tap the punch sharply with a small machinist's hammer. Make sure that the bushing is not rotated more than $\frac{1}{16}$-inch before checking the adjustment.
4. Tighten the P-155 lock nut and replace the gear cover.
5. Check the operation again by listening to the intermittent and by striking the periphery of the sprocket with the forefinger as described above.

If further adjustment is necessary the above procedure must be followed.

If the noise cannot be eliminated by changing the radius adjustment, arrangements should be made with the local RCA Theatre Equipment Supply dealer to have it repaired at the Brenkert factory; the RCA dealer will furnish a loaner intermittent while these repairs are being made.

Adjusting Sprocket Shaft End-Thrust

Excessive end thrust in the star wheel and sprocket can be eliminated by following the procedure outlined below:—

1. Remove the intermittent from the projector mechanism.
2. Remove the X-3106A oil scoop assembly.
3. Loosen the X1-1138 Allen screw in the X1-1136A star wheel shaft thrust collar. This collar can be reached by inserting a $\frac{3}{32}$-inch Allen wrench through the round hole in the X1-1103B intermittent sprocket sleeve.
4. Hold the star wheel tightly against the face of its bushing while at the same time pressing the X1-1136A thrust collar against the face of its bushing. The thrust collar can be pressed tightly against the face of its bushing by inserting the short end of a $\frac{1}{8}$-inch Allen wrench in the elongated hole in the X1-1103B sprocket shaft sleeve so that the end of the wrench can be pressed against the collar.
5. Tighten the X1-1138 Allen screw in the thrust bearing.
6. Replace the intermittent in the mechanism and retime the shutters.

Adjusting Cam Shaft End-Thrust

There should be no perceptible end thrust in the cam shaft. To remove excessive end play, proceed as follows:—

1. Remove the intermittent unit from the mechanism.
2. Loosen the two P-1195 Allen head screws attaching the steel gear to the cam shaft.
3. Set the intermittent unit on its flywheel and tap the face of the gear snugly against its thrust bearing using a drift punch.
4. Tighten the two P-1195 Allen set screws attaching the steel gear to the cam shaft.
5. Turn the intermittent over manually several times to make sure that there is no binding; also check the end thrust in the cam shaft to make sure that all excess motion has been removed.
6. Replace the intermittent and retime the light shutters.
7. After the above adjustment has been made it is always a good idea to run the projector mechanism with the arc lamp operating for about fifteen minutes and then check the mechanism by turning it over manually to make sure there is no binding or tight spots.
8. If there is any binding or tight spots evident, remove the intermittent and tap the gear end of the cam shaft lightly with a small machinist's hammer to allow a small amount of clearance between the face of the gear and the face of its bearing.

X-8170 Framing and Compensator Assembly (See diagram No. 3)

The removal of the framing and compensator assembly should not be attempted unless one complete set of new taper pins consisting of one P-1325 and two P-1081 are on hand; the original pins may be lost or so badly mutilated after they are removed that they will be unusable again.

This unit can be removed and replaced easily by following carefully the instructions outlined below; the tools necessary for doing this work are a small machinist's hammer, a pair of pliers, a $\frac{1}{16}$-inch drift-pin punch with the drift cut down to about $\frac{1}{2}$-inch in length, and No. 6, $\frac{1}{8}$-inch and $\frac{1}{4}$-inch Allen set screw wrenches

1. Remove the gear cover.
2. Remove the intermittent unit.
3. Remove the P-1215 screw and X-7212 collar from the end of the X-7201 shaft holding the X-7370 gear cluster assembly and then slide the gear assembly off its shaft. (See diagram No. 7).
4. Remove the P-1015 Allen set screw which clamps the X-7202 shaft. This set screw can be reached from the film side of the mechanism (see diagram No. 1). Pull the X-7375 intermediate drive gear and its shaft completely out of its mounting hole in the main frame. Difficulty may be experienced when removing this gear and shaft because of the close tolerances maintained between the shaft and its mounting boss. If it cannot be pulled or forced out from the gear side it may be necessary to punch a hole through the P-1319 Welch plug and the X-7019 neoprene gasket and drive the shaft out with a drift. Be careful that the X-7211 flat steel thrust washer does not fall into the oil sump when removing the gear and shaft.
5. Remove the X-7211 steel thrust washer.

6. Remove the P-1188 and the X-1204A screw and collar from the X-7807 timing adjusting screw.

7. Using a $\frac{1}{16}$-inch drift as described above, drive the taper pins from the X-8007 collar, the X-7804 and X-8003 worms. When driving these pins out make sure that they are driven from the small end; remove one pin completely before starting to drive out the next one. A sharp, quick blow with a small machinist's hammer is usually sufficient to loosen the pins.

   When removing the taper pin from the X-8007 collar and the X-8003 worm the framing shaft must be positioned so that the pin is as near vertical as possible; otherwise the large end of the pin will hit the main casting when the pin is driven out. After the pin has been started, turn the framing knob so that the large end of the pin is accessible to be pulled out with pliers. If it is still too tight to be pulled out with pliers, turn the framing knob back to its original position and drive the pin out a little more and then try again to pull it out with pliers.

   When driving the pin from the X-7804 worm make sure that it is not driven out too far or it will interfere with the X-7801 bracket and lock the framing shaft. If this does happen, drive the pin out as far as possible and then turn the framing shaft counterclockwise. This will shear off the portion of the pin protruding from the worm. Turn the framing shaft back to its original position and drive out the remainder of the pin.

8. Pull the framing knob and shaft out from the front of the projector. It will be difficult to pull this shaft directly out because of the friction from the oil seals on each end of the case. In most cases it will help to turn the framing knob first in one direction and then in the other while at the same time pulling it directly out; after it is once started it will slide out easily.

9. Remove the X-7804 and the X-8003 worms, the X-7801 bracket and the X-8007 collar as the shaft is pulled out.

10. Remove the X-7809 washer from the X-7807 shutter adjusting screw to prevent its dropping in the oil sump.

Adjusting X-7803 Drive Pin

To replace or readjust the X-7803 compensator worm drive pin the complete X-8170 framing and compensator assembly must be removed as outlined above. It is important that this pin be adjusted properly or the mechanism will operate noisily; if back lash or end thrust is present at this point, travel ghost may show upon the screen. The adjustment of this drive pin is made in the following manner:—

1. Loosen the P-1193 set screw and then loosen the P-1321 Allen set screw, allowing the X-7803 drive pin to drop lower into its casting.

2. Place the X-7804 compensator worm in the X-7801 bracket so that the worm engages with the X-7803 drive pin.

3. Slide the X-8006 framing shaft through the X-7801 bracket and the X-7804 gear.

4. Attach the worm gear to its shaft with a P-1081 taper pin.

5. Tighten the P-1321 set screw against the X-7803 drive pin so as to obtain a close mesh between the drive pin and the worm gear. This drive pin should mesh snugly with the worm gear and there should be absolutely no end play or back lash allowed. The most satisfactory method to use in obtaining the right adjustment is to move the drive pin against the worm gear until it binds slightly when the framing shaft is turned. When this condition has been obtained, back off the P-1321 set screw only very slightly until the framing shaft can be rotated freely but with absolutely no presence of back lash or end thrust.

6. Tighten the P-1193 Allen set screw.

Replacing and Adjusting the X-8170 Framing and Compensator Assembly

When replacing the framing and compensator assembly, instructions outlined below must be followed carefully:—

1. Check the X-8006 framing shaft to locate the large end of the holes for the three taper pins. The large end of the holes must be in alignment with the slot in the X-8008 split collar adjacent to the framing knob; see Figure 8.

   If they are not in alignment, loosen the P-1215 Allen set screw in the X-8008 collar and turn the collar so that its slot will align as described above.

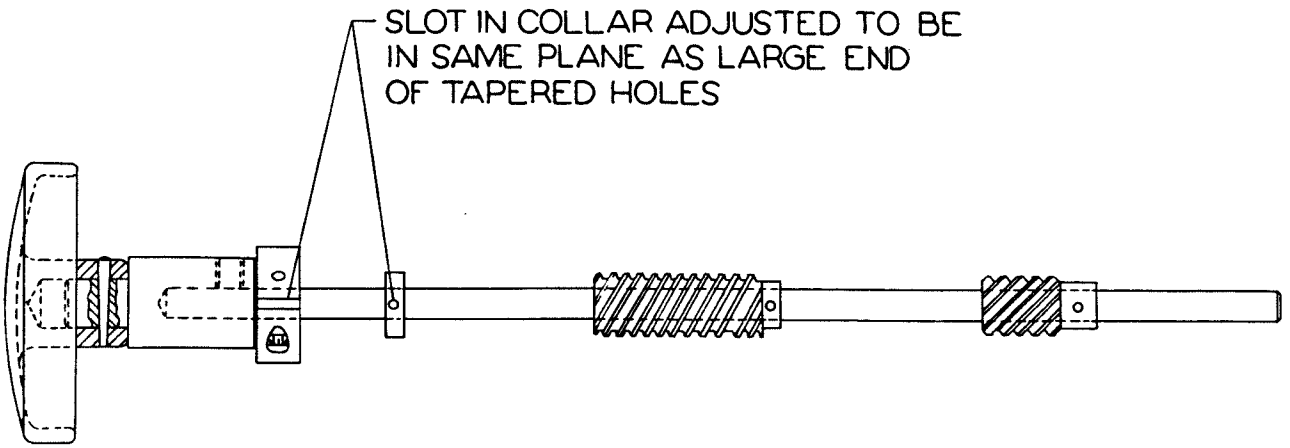

Figure 8—Position of Slot in Collar with Respect to Tapered Holes

2. Replace the X-7809 washer on the X-7807 shutter adjusting screw.
3. Insert the X-8006 framing shaft into the front bearing in the main case and push the framing shaft through the bearing until the end of the shaft protrudes inside the gear case.
4. Slide the X-8007 collar on the shaft.
5. Set the X-7801 bracket into position so that it is engaged with the X-7807 shutter adjusting screw.
6. Push the X-8006 framing shaft until it engages with the front bearing in the X-7801 bracket.
7. Set the X-7804 worm in the X-7801 bracket so that the X-7803 compensator worm drive pin engages with the worm. The X-7804 worm must be positioned as far as possible toward the rear bearing in the bracket; the large hole for the taper pin must be toward the gear cover.
8. Press the X-8006 framing shaft further into the main case until it is approximately 1½ inches from its rear bearing. Slide the X-8003 worm on the shaft and press the X-8006 framing shaft into the main frame as far as it will go, making sure that it slides into its rear bearing properly.
9. Turn the framing shaft until the slot in the X-8008 split collar is toward the gear cover; the large end of the taper pin holes in the framing shaft will then be in the same plane.
10. Align the X-8007 collar with the hole in the framing shaft and lock in place with a P-1325 taper pin. Tap the pin in all the way so that it does not extend beyond the collar from either end of the hole, otherwise the pin may strike the main frame casting when the framing shaft is turned.
11. Align the holes in the X-7804 worm and the framing shaft and fasten them with one of the P-1081 taper pins. Make sure that the taper pin fits snugly and tightly and that neither of its ends extends beyond the edge of the hole in the worm.
12. Swing the X-8172 intermittent framing arm and gear sector to its maximum clockwise position so that the end of the X-8001 framing sector is against the stop pin.
13. Align the holes in the X-8003 gear and the framing shaft. In doing this it will be necessary to engage the worm with the framing sector. It may be necessary to mesh the sector with several different teeth in the worm before finding the correct mesh that will align the holes up correctly.
14. Attach the X-8003 gear to the X-8006 shaft with one of the P-1081 pins. Make sure that neither end of the pin protrudes beyond the edge of the hole in the worm.
15. Replace the X-1204A collar and screw on the X-7807 shutter timing adjusting stud. The X-7801 must be held firmly between the X-7809 washer and the X-1204A collar without any noticeable end play, otherwise noise may develop when the mechanism is running. Tighten the P-1188 Allen screw in the X-7802 timing yoke (see diagram No. 6) so that the X-7807 timing adjusting screw is grasped snugly by its threads and will not turn while the mechanism is in operation.
16. Turn the framing knob from one extreme to the other to make sure that the X-8172 fram-

ing arm and gear sector assembly travels from one stop pin to the other. If the X-8172 framing arm and gear sector assembly cannot be moved from one stop pin to the other it will be necessary to remove it and mesh it at a different point with the X-8003 worm. Refer to *adjusting X-8172 framing arm and gear sector* instructions covering the adjustment of this assembly if it is necessary to change the gear mesh.

17. Replace the X-7211 steel thrust washer and the X-7375 drive gear and shaft. Lock the shaft in position with a P-1015 Allen set screw. If the P-1319 Welch plug and the X-1719 neoprene gasket were punctured when the X-7375 gear and the X-7202 shaft were removed, it will be necessary to install a new Welch plug and gasket to eliminate any possibility of oil leaking at that point. These may be installed at a later date if they are not on hand when the above work is being done.
18. Replace the X-7370 gear cluster and the intermittent unit.
19. Replace the gear cover and time the shutters.

Adjusting X-8172 Framing Arm and Gear Sector

The X-8001 gear framing sector must be meshed with the X-8003 framing worm so that the gear sector can be moved from one of its stop pins to the other. If this adjustment is not made correctly, it will be impossible to move the film one full frame when framing the picture at the aperture. To obtain the correct setting between the X-8001 gear sector and the X-8003 gear, proceed as follows:—

1. Remove the X-1180 retaining ring from the X-8002 framing arm casting.
2. Pull the X-8172 framing arm and gear sector assembly from its casting until it disengages with the X-8003 framing gear.
3. Turn the framing knob counterclockwise until the X-1204A collar on the timing screw is about ⅛-inch from the main housing casting.
4. Swing the X-8172 framing arm and gear sector clockwise until it hits the stop pin closest to the front of the mechanism.
5. Mesh the framing gear sector with the framing worm gear, making sure that the gear sector is kept as close as possible to the pin.
6. Attach the X-1180 retaining ring to the X-8002 framing arm casting.
7. Turn the framing knob to make sure that the X-8172 framing arm assembly can be moved from one stop pin to the other. Make sure that this assembly hits the stop pin at each end of its excursion and that when the framing knob is turned to its maximum counterclockwise position, the X-1204A collar is approximately ⅛-inch from the front of the main frame casting.

Lower Film Sprocket Unit X-3203A (See diagram No. 4)

Before removing the lower sprocket assembly obtain a small tube of "Titeseal" for applying to the mounting surfaces of the assembly and the main frame when the unit is being replaced. The entire assembly can be removed very easily by referring to diagram No. 4 and following the procedure outlined below:—

1. Remove the X-1219 film stripper and X-1221 locking spring.
2. Remove the three P-1000 mounting screws which hold the X-3203A assembly to the main frame.
3. Grasp the under side of the X-1207 sprocket and X-1215 pad roller bracket and exert alternately an up, down and sideward pressure so as to free the assembly from the main frame.
4. Pull the assembly from the main frame.

Replacing Lower Sprocket Assembly

1. Clean the mounting surface on the center frame of the main case and the sprocket assembly and apply a thin film of "Titeseal" to both of these surfaces. The purpose of this "Titeseal" is to prevent oil leaks from around this unit.
2. Insert the gear end of the assembly into the locating hole in the center frame so that the drive gears mesh properly.
3. Align the three mounting holes in the sprocket assembly with the three tapped mounting holes in the center frame and press the assembly firmly into position.
4. Apply a thin film of "Titeseal" to the threads of the three P-1000 mounting screws and then screw them evenly and firmly into their holes.
5. Replace the X-1219 film stripper and X-1221 spring.

Removing the X-3204 Pad Roller Bracket Assembly

The X-3204 lower pad roller bracket assembly can be removed as a complete unit simply by removing the X-1217 retaining screw and pulling the bracket assembly off of its mounting stud.

The X-1222 pad rollers and the pad roller shafts can be removed by removing the P-63 screw, turning the X-3206 shaft assembly in a counterclockwise direction and pulling it out of the bracket; the X-1223 shaft can then be pulled out of the bracket.

Pad Roller Adjustment

The distance between the pad rollers and the periphery of the sprocket can be adjusted in the following manner:—

1. Loosen the P-155 nut on the pad roller bracket.
2. Move the pad roller bracket to its open position and wrap three thicknesses of film around the sprocket so that the sprocket teeth engage correctly with the sprocket holes in the film.
3. Close the pad roller bracket against the periphery of the sprocket and adjust the P-107 screw on the pad roller bracket until the pad rollers barely come in contact with the film. The pad rollers should be far enough away from the periphery of the sprocket so that they do not touch two thicknesses of film but just barely touch the film when three thicknesses are used.
4. Tighten the P-155 nut.

Removing Lower Feed Sprocket

1. Move the X-1219 film stripper away from the sprocket by removing the front P-1035 screw and loosening the rear P-1035 screw.
2. Move the pad roller bracket to its open position.
3. Remove the X-1231 sprocket retaining screw. This screw has a left-hand thread and must be turned to the right to remove it.
4. Pull the sprocket off of its shaft.

Upper Film Sprocket Unit X-7570 (See diagram No. 5)

To remove the upper film sprocket from the main frame, proceed as outlined below:—

1. Remove the cover from the gear side of the projector.
2. Remove the X-7405 oil distributor from the X-7403 upper sprocket drive gear.
3. Remove the X-7574 upper sprocket drive gear assembly by loosening the two P-1227 Allen set screws which attach it to the sprocket shaft.
4. Remove the screw and clamp which attaches X-9102 oil tube to the main casting. Take care not to drop these small parts into the oil reservoir.
5. Remove the X-1220 film stripper on the film side of the mechanism by removing the two P-1035 screws.
6. Remove the three P-1000 mounting screws which hold the sprocket assembly to the main frame.
7. Grasp the under side of the sprocket and pad roller bracket and exert an alternate upward and sideward pressure to free the assembly from the main frame.
8. Pull the unit out of the main frame.

Before replacing this unit make sure that the mounting surface on the center frame as well as the mounting surface on the sprocket assembly have been cleaned thoroughly. After these surfaces have been thoroughly cleaned spread a thin film of "Tite-seal" over both of these surfaces. Coat the threads of the three P-1000 mounting screws with "Tite-seal" also before they are replaced. It is necessary that this precaution be taken to prevent oil leaks.

Removing the X-3304 Pad Roller Bracket

The X-3304 upper pad roller bracket assembly can be removed as a complete unit by removing the X-1217 retaining screw and pulling the bracket assembly off its mounting stud.

The X-1222 pad rollers and the pad roller shafts can be removed from the bracket by removing the P-63 screw, turning the X-1224 shaft in a clockwise direction and then pulling it from the bracket; the X-1223 shaft can then be pulled out of the bracket and the X-1222 pad rollers will then be free from the bracket.

Pad Roller Adjustment

The distance between the pad rollers and the periphery of the sprocket is adjusted in the following manner:—

1. Loosen the P-155 nut on the pad roller bracket.

2. Open the pad roller bracket by swinging it away from the periphery of the sprocket and wrap three thicknesses of film around the sprocket so that the sprocket teeth engage correctly with the sprocket holes in the film.

3. Close the pad roller bracket against the periphery of the sprocket and adjust the P-107 screw on the pad roller bracket until the pad rollers barely come in contact with the film. The pad rollers should be far enough away from the periphery of the sprocket so that they cannot touch two thicknesses of film but just barely touch the film when three thicknesses are used.

Removal of Upper Film Sprocket

1. Loosen the two P-1035 screws which hold the X-1220 film stripper in place.

2. Swing the pad roller bracket downward and away from the sprocket.

3. Remove the X-1231 sprocket retaining screw. This is a left-hand thread and must be turned to the right to remove it.

4. Hold the X-1220 film stripper away from the periphery of the sprocket and pull the sprocket off of its shaft.

Shutter Shaft Assemblies X-7770 (See diagram No. 6)

Removal of complete shutter shaft assembly:—

1. Remove gear cover, intermittent and X-7370 gear cluster assembly.

2. Remove the X-7405 oil distributor and X-7574 upper sprocket drive gear assembly.

3. Remove front and rear shutter blade assemblies.

4. Loosen the P-1215 Allen set screw in the X-7609 split collar.

5. Drive out the P-1327 taper pin which attaches the X-8501 governor drive gear to the shutter shaft. Be careful so that this pin does not drop into the oil sump.

6. Remove the X-7011 shutter oil slinger housing, the X-7611 oil slinger and the X-7023 gasket. When removing the P-416 screws which attach the P-7011 oil slinger housing to the main case, remove the X-7010 oil baffle and trough which is held in place with P-156 hex nut. (Refer to both diagrams No. 1 and No. 6 to locate these parts.)

7. Pull the X-7603 shutter shaft out from the front of the mechanism until the X-7606 Woodruff key is clear of the shutter drive worm; turn the X-7603 shaft until the X-7606 key is in the same plane as the slot in the X-7609 thrust collar and then pull the shaft completely out of the mechanism. Be sure to catch the X-8501 governor drive gear and the X-7609 split collar before they drop into the oil sump.

8. Remove the X-7607 shutter shaft gear.

9. Remove the X-1204A collar from the hand timing adjusting screw and turn the framing knob to the left as far as it will turn so that the X-7801 bracket is as close as possible to the front of the main case. (See diagram No. 3.)

10. Remove the four P-1000 screws which attach the X-7601 shutter shaft main casting to the main frame and pull the complete casting from its dowel pins and out of the machine.

Replacing the X-7770 Shutter Shaft Assembly

1. Clean the mounting surfaces on the center wall of the main case and the X-7601 main casting.

2. Set the X-7601 main casting on its dowels and attach with the four P-1000 screws. Make sure that the screw threads are covered with "Titeseal" to prevent oil leaks.

3. Slide the shutter shaft into its front bearing. As it protrudes from the inner end of this bearing, slide the X-7609 split collar on the shaft.

4. Set the X-7607 shutter drive gear on the yoke of the X-7802 hand timing casting; make sure that the shaft is turned so that the Woodruff key and the key slot in the shutter shaft gear is in the same plane and then push the shutter shaft through the gear.

5. Continue to push the shaft through the worm; as the shaft comes from the rear end of the worm, slide on the X-8501 governor drive gear with the gear hub toward the rear of the projector.

6. Push the shaft through into its rear bearing.

7. Align the taper pin hole in the shutter shaft with the taper pin hole in the X-8501 governor gear hub and then tap the P-1327 taper pin firmly in place.

8. Push the front end of the X-7603 shutter shaft so that the face of the X-8501 governor drive gear hub is firmly against the end of the rear shutter shaft bearing, while at the same time holding the X-7609 split collar against the end of the front bearing; tighten the P-1215 Allen set screw in the split collar.
9. Turn the shutter shaft manually; if it turns hard or binds at different spots, tap the rear end of the shutter shaft lightly with a small machinist's hammer until the shaft can be rotated freely but without end play. End thrust in the shutter shaft will result in noise when the mechanism is in operation.
10. Tighten the P-1215 Allen screw in the X-7609 collar firmly.
11. Replace the X-1204A collar on the shutter timing screw. Make sure that the X-7801 bracket is held firmly between the X-7809 thrust washer and the X-1204A collar and then tighten the P-1188 Allen set screw. Any backlash at this point will result in noise when the mechanism is in operation. (See diagram No. 3.)
12. Replace the X-7023 gasket, the X-7611 oil slinger, and the X-7011 housing over the rear end of the shutter shaft. When attaching the X-7011 housing, also attach the X-7010 oil chute to the upper mounting screws and then clamp in place with the P-156 hex nut.
13. Replace the shutter blade assemblies.
14. Check the end thrust between the two X-7608 thrust collars on the shutter shaft drive gear. There should not be any noticeable end thrust at this point. To remove excessive end thrust, loosen the P-1227 Allen set screw in the rear collar, press the two collars together against the timing yoke casting, and then tighten the P-1227 Allen set screw firmly. Turn the shutter shaft over manually; if it does not rotate as freely as before, loosen the P-1227 set screw in the rear collar again and allow a little more clearance between the collars and the framing yoke. Do not allow too much end thrust at tnis point or it may develop noise when the projector is running.
15. Replace the X-7370 gear cluster assembly.
16. Replace the intermittent.
17. Replace the gear cover and time the light shutters.
18. Run the mechanism for 15 to 20 minutes, preferably with the arc lamp on, to make sure that the shutter shaft does not tighten up under the heat from the arc, and then turn the mechanism over manually to make sure it is free. If the mechanism tightened up when running under the heat from the arc lamp, tap the rear end of the shutter shaft with a small machinist's hammer to open up the end thrust tolerance slightly and allow the shaft to rotate more freely. It is better to have the mechanism operate a little stiff because it will gradually wear in and then run freely and quietly; if too much backlash is allowed in the shutter shaft, however, it may develop noise while the mechanism is running.

Converting Single-Shutter BX-60 to Double-Shutter BX-62 Projection

A single rear shutter BX-60 projector mechanism can be converted to a double front and rear shutter BX-62 projector easily and quickly and without removing the projector mechanism from the pedestal. To make the conversion, proceed as follows:—(Refer to diagrams No. 1 and No. 6 to locate parts.)

1. Obtain an X-7181 BX-62 front shutter kit from the local RCA Theatre Equipment and Supply dealer.
2. Remove the X-7618 rear shutter blade and replace it with the new X-7610 blade furnished with the kit of parts.
3. Remove X-7616 shutter position indicator and the three P-1309 dot plug buttons. These parts will no longer be needed.
4. Connect the X-7604 front shutter shaft to the main shaft so that the screw hole in the X-7604 extension shaft is opposite the hole in the main shaft and then lock them together with the X-7612 set screw.
5. Attach the X-7018 front shutter housing spacer casting to the main frame using the three P-419 ¼-20 x ⅜" screws furnished with the kit. These screws go in the holes previously covered by the P-1309 dot plug buttons.
6. Attach the X-7003 rear half of the shutter housing to the spacer casting using the three P-93 10-32 x ⅜" screws furnished with the kit.
7. Attach the X-7779 front shutter assembly to the extension shaft and lock in place with the X-1429 set screw. Make sure that the X-1429 set screw is directly over its seat in the extension shaft.

8. Time the shutters. (See instruction under *Timing Shutters* for the correct procedure.)
9. Attach the X-7004 front half of the housing and lock in place with the three X-7012 knurled nuts furnished with the kit.
10. Set the X-7617 shutter position indicator as desired.

Timing Shutter (Single Shutter)

To time the light shutter on a BX-60 projector mechanism, proceed as outlined below:—

1. Remove the X-7175 quarter panel and the X-7174 rear shutter blade housing. (See diagram No. 1.)
2. Remove the P-1307 brass plug from X-7007 front shutter support casting, and using the special X-7971 manual shutter timing tool, set the X-7807 hand timing screw at the center of its travel. (See diagram No. 3.)
3. Release the shutter blade in its flange by loosening P-1035 screws so that the shutter blade can be turned in its flange.
4. Turn the projector over slowly by hand until the intermittent sprocket just starts to move. This can be determined quite accurately by wedging one's thumb lightly between the upper part of the sprocket and the lower edge of the film trap while turning the mechanism over slowly. It may be necessary to turn the mechanism past the point where the sprocket just starts to turn several times before being able to stop the mechanism exactly at that point.
5. Move the rear shutter in its flange, ***being extremely careful not to turn the shutter shaft,*** until the upper edge of the shutter blade cuts the upper right corner of the picture aperture when looking across the edge of the shutter from the rear of the mechanism. Hold the automatic fire shutter in its upward position when setting the blade. It may be necessary to sight across the edge of the shutter blade from inside the lamphouse in order to obtain an accurate setting.
6. Tighten the P-1035 screws in the shutter blade flange and replace the shutter guard and quarter panel.
7. Project a picture on the screen, preferably one with titles, and check carefully for any trace of travel ghost. If a slight amount of travel ghost is noticed on the bottom of the picture, turn the X-7971 shutter timing tool to the left; if noticed at the top, turn the screw to the right until the travel ghost disappears. If the travel ghost cannot be eliminated using the hand timing tool, it will be necessary to retime the shutters again.
8. Remove the X-7971 tool and replace the P-1307 plug in the front shutter shaft support casting.

Timing Shutters (Double Shutters)

To time the shutters on a BX-62 projector mechanism, proceed as outlined below:—

1. Remove the X-7175 quarter panel, the X-7174 rear shutter blade housing, and the X-7004 front shutter housing. (See diagram No. 1.)
2. Remove the P-1307 brass plug from the X-7007 front shutter support casting, and using the special X-7971 manual shutter timing tool, set the X-7807 hand timing screw at the center of its travel.
3. Release the shutter blades in their flanges by loosening the P-1035 screws so that each shutter blade can be turned in its flange without the shutter shaft turning.
4. Turn the projector over slowly by hand until the intermittent sprocket just starts to move. This can be determined quite accurately by wedging one's thumb lightly between the upper part of the sprocket and the lower edge of the film trap while turning the mechanism over slowly. It may be necessary to turn the mechanism past the point where the sprocket just starts to turn, several times before being able to stop the mechanism exactly at that point.
5. Move the front and rear shutters in their flanges, being extremely careful not to turn the shutter shaft, until the upper edge of the rear and front blades exactly cut across the center of the picture aperture and projection lens respectively.
6. Tighten the P-1035 screws in the shutter blade flanges. Be careful that the shutter blade does not move in its flange or the shutter shaft turn when tightening these screws.
7. Replace the front and rear shutter guards and the quarter panel.
8. Project a picture on the screen, preferably one with titles, and check carefully for any trace

of travel ghost. If a slight amount of travel ghost is noticed on top of the picture, turn the X-7971 hand timing adjusting tool to the right; if noticed on the bottom, turn the screw to the left until the travel ghost disappears. If the travel ghost cannot be eliminated by adjusting the X-7971 hand timing tool, it will be necessary to retime the shutters again.

9. Remove the X-7971 tool and replace the P-1307 plug in the front shutter shaft support casting.

Intermediate Drive Gear Assemblies (See diagram No. 7)

For instructions on the removal of the X-7370 and X-7375 intermediate drive gear assemblies, refer to paragraphs 3 and 4 under "Framing and Compensator Assembly," page 21.

Governor Assembly X-8670 (See diagram No. 8)

The complete governor and gear assembly can be removed as one unit by removing the two P-1195 Allen set screws which attach the X-8507 clamp to the main frame. To remove these set screws, it is necessary to use a ⅛-inch Allen wrench which has had its short end ground down sufficiently to fit in between the main case casting and the two P-1195 Allen set screws.

The X-3700 governor head assembly is removed by loosening the P-1026 Allen screw in the X-1514 governor head casting and pulling the governor head directly off the governor gear hub. When replacing the head, press it all the way up to the shoulder on the gear hub and then tighten the P-1026 Allen screw firmly.

The individual governor weight assemblies are attached to the main castings by the X-1504 governor weight holding pins. To remove the individual weights, remove the X-1533 springs and the X-1504 pin.

To replace the X-8505 governor push rod, remove the complete X-3700 governor head assembly and the push rod can then be pulled directly out. When replacing the head assembly both of the X-1520 weight and sleeve levers should rest against the knob on the end of the X-8505 push rod. If any appreciable clearance exists between the push rod knob and one of the levers, noise may develop when the mechanism is in operation; the only way to correct this condition is to remove the lever that does rest against the push rod knob and stone it down until both levers rest against the knob evenly.

Main Drive Gear Unit X-3907 (See diagram No. 9)

The X-3907 main drive gear unit couples the gear train in the projector mechanism to the soundhead. To remove this complete drive assembly, proceed as follows:—

1. Drain the oil from the projector mechanism.
2. Remove the oil cover.
3. Remove the intermittent unit.
4. Remove the X-7370 gear cluster.
5. Remove the X-7375 intermediate drive gear and shaft. (Refer to page 21 for proper procedure in removing this gear.)
6. Rotate the X-3907 drive gear assembly until the small end of the X-1759 taper pin is pointing upward and then drive it out. (It is important to definitely determine the small end of the pin before attempting to drive it out.)
7. Pull out the X-1705 main drive shaft and the X-1703 gear. The X-1704 gear will then be free and can be removed.
8. To remove the X-1706 bronze bearing, remove the three P-1025 screws and pry the bushing loose.

Before replacing the new X-3907 main drive gear assembly, clean all the Permatex or "Titeseal" from the mounting surfaces and make sure that they are clean.

To replace the X-3907 gear assembly, proceed as follows:—

1. Mount the X-1706 bronze bearing in its mounting hole so that the three recesses along the periphery of the bushing align with the screw holes in the projector main casting. Before pressing this bearing all the way in, place the X-1705 shaft through the bearing and into the X-1707A rear bearing so that it will act as a guide in correctly aligning the bearings concentrically as the X-1706 bearing is being pressed into place.
2. Replace the three P-1025 screws.
3. Hold the X-1704 gear in position and replace the X-1705 shaft and X-1703 gear.
4. Correctly align the tapered holes in the X-1705 shaft and the X-1704 gear and replace the X-1759 tapered pin; tap this pin in firmly with a sharp blow using a drift punch and a

small machinist's hammer. Rotate the gear assembly to make sure it turns freely and without binding.

5. Replace the X-7375 gear and the X-7370 gear cluster.
6. Replace the intermittent and the gear cover.
7. Time the shutters.
8. Turn the mechanism over manually to make sure that it turns freely and without any binding.

X-3913A Idler Gear Assembly

To remove the X-3913A idler gear assembly, loosen the P-1009 screw at the rear of the projector main frame case and pull the assembly out.

Oil Pump X-3811 (See diagram No. 10)

One pint of Brenkert approved lubricating oil is required to fill the oil sump in the BX-60 projector mechanism. When replacing oil in the projector a small funnel should be used to eliminate the possibility of spilling any oil over the gear cover. The oil should be removed and replaced with fresh oil after approximately 600 hours of operation. To drain the oil slip a short length of gas or medical hose over the nozzle of the oil drain petcock so that the old oil can be directed easily to a container placed on the projection room floor.

Whenever the oil is changed the X-1621A oil filter screen in the X-1608 gage retaining housing should be removed and cleaned. This can be accomplished in the following manner:—

1. Remove the X-1608 cover from the oil pump by first removing the P-82 screws.
2. Remove the X-1621A bronze screen from the bottom of the pump and clean thoroughly with kerosene or with fresh Brenkert oil.
3. Insert the X-1621A screen in its housing in the X-1608 cover and replace the cover on the oil pump.
4. Make sure that the X-1617 gasket is in good condition and attached properly to the cover when it is replaced; otherwise an oil leak may develop. If this gasket is stretched and does not fit snugly around the edge of the cover, a new gasket should be used.

Removing Oil Pump from Main Frame

1. Drain the oil from the projector.
2. Remove the four P-1000 mounting screws.
3. Grasp the X-1608 gage retaining cover and exert a slight alternate up and down pressure until the pump is free from the main frame.
4. Pull the pump away from the projector main frame as far as the X-1622 neoprene hose allows.
5. The neoprene hose may now be removed from the pump by loosening the screw in the P-1109 clamp and pulling the hose from the copper tubing on the pump.

Before replacing the pump examine the X-1625 gasket carefully and if it is broken at any point replace it with a new gasket. Proceed as follows when replacing the pump in the main frame:—

1. Clean the mounting surfaces on the main frame and the oil pump and then set the X-1625 gasket on the dowel locators in the main frame.
2. Attach the neoprene hose to the copper tubing on the pump and tighten the screw in the P-1109 clamp.
3. Mount the oil pump in the main frame so that it is seated on its dowel locators and press firmly against the mounting surfaces of the main frame. Make sure that the oil pump gear is meshed correctly with its drive gear and that the X-1625 gasket is held in its correct position.
4. Cover the threads of the four P-1000 mounting screws with a thin film of "Titeseal" and then screw them into the mounting holes of the pump and draw them up evenly and tightly.
5. Turn the projector over manually several times to make sure that it turns freely and without any binding.
6. *CLOSE THE OIL DRAIN PETCOCK.* Pour fresh oil into the projector.

Projection Lens Mount (See diagram No. 11)

Removal of Lens Mount

1. Remove the X-8703 lens clamping screw in the film compartment.
2. Remove the four P-1000 and P-1271 screws which attach the lens mount to the front of the main frame.
3. Remove the lens mount by lifting it through its mounting hole in the front of the main frame.

Friction Adjustment on Focusing Screw

The friction on the focusing screw is adjusted by means of the P-1034 clamping screw. Tighten this screw until the desired tension is obtained when turning the focusing knob.

Adjustment for Eliminating Radial Motion in the Lens Mount

Radial motion between the lens carriage and the lens holding casting is removed by adjusting the P-1313 screw. This screw should be tightened until no radial movement exists between the lens carriage and the lens holding casting. Caution must be used when tightening this screw because if it is too tight erratic movement of the lens carriage will result when turning the focusing knob.

Elimination of End Motion Between Lens Carriage and Support Casting

There should not be any noticeable end motion between the lens carriage and the lens holding casting. To remove any excess motion at this point follow the procedure outlined below:—

1. Turn the focusing knob to the left as far as possible.
2. Loosen the P-1193 set screw in the focusing knob.
3. Push the focusing knob toward the projector as far as possible and tighten the P-1193 set screw.

Film Trap Assembly X-8450 (See diagram No. 12)

The complete film trap assembly can be removed as a single unit by following the procedure outlined below:—

1. Remove the X-8241 screw which attaches the X-8235 operating link to the film gate subbase and disengage the operating link from the gate. (See diagram No. 13A.)
2. Remove the quarter panel and rear shutter guard.
3. Bend the X-1959 intermittent sprocket stripper away from the sprocket.
4. Loosen the upper X-8218 attaching screw by inserting the screwdriver from the rear of the light shield.
5. Loosen the lower X-8218 attaching screw and then lift the complete film trap and gate assembly from its dowel pins on the main frame.

Replacing Film Slide Strips

1. Remove the film trap from the main frame.
2. Remove the eight screws which attach the X-1904A and the X-1907A slide strips and film guides to the film trap casting.
3. Install the new X-1904A film slide strips (or the original strips may be reversed if they are worn) and the X-1907A film guides; snug up the attaching screws only but do not tighten them.
4. Press the inner film guide firmly against the P-1059 locating pins and tighten all four attaching screws evenly, making sure that the film guide does not move away from the P-1059 locating pins.
5. Insert the X-1993 film guide adjusting gage between the film guides.
6. Press the outer X-1907A film guide snugly against the side of the gage and then tighten all four attaching screws evenly.

Lateral Guide Roller Assembly X-4107

The X-4107 lateral film guide roller assembly can be removed easily without removing the complete film trap assembly from the main frame, by following the procedure outlined below:

1. Remove the quarter panel and shutter guard.
2. Loosen the P-1018 screw which clamps the X-1958 guide roller center pin and pull the X-1958 center pin out of its bearing.
3. Remove the X-4107 guide roller assembly from the film trap casting.

When replacing and adjusting the X-4107 lateral guide roller assembly proceed as follows:

1. Replace the guide roller assembly in the film trap casting; make sure that the tension spring is toward the inside of the film trap casting.
2. Replace the outer X-1958 center pin into its bearing.
3. Position the lateral guide roller assembly so that it is supported at its centers by the inner and outer X-1958 center pins.
4. Loosen the P-1018 screw which clamps the inner X-1958 pin; place a piece of film in the trap and then move the entire lateral guide roller assembly toward the outer edge of the film trap until the outer lateral guide roller is close to but does not touch the edge of the film. Instead of using a piece of film, any

straight edge such as a 6-inch steel scale may be used by placing it in the film trap and holding it firmly against the outer film guide with one end adjacent to the outer lateral guide roller.

Adjustment of Fire Shutter Linkage

1. Remove the quarter panel.
2. Observe the position of the fire shutter in the X-8202 fire shutter casting; this opening should be completely closed by the fire shutter.
3. Start the machine and observe the position of the X-8231 shutter manual operating handle. This handle should not rise high enough to come in contact with either the top of the main frame or the top of the slot in the light shield. To prevent the fire shutter manual operating handle from striking the top of the main frame or light shield, tap the X-1922 fire shutter angle link with a screwdriver halfway between the operating button and the attaching screw until the fire shutter manual operating handle rises up to within ⅛-inch from the top of the main frame casting when the mechanism is running.
4. If the fire shutter fails to rise high enough to clear the light beam it can be adjusted by tapping the button on the end of the X-1922 fire shutter angle link so as to bend it in slightly toward the governor push rod.

Removal of Picture Aperture

The X-1908B picture aperture plate can be removed by pulling it toward the rear of the projector and then straight out of its housing. When replacing this aperture it will simply be necessary to move the light shield toward the rear of the mechanism and simply slide the picture aperture into position.

Film Gate
(See diagram No. 13)

The film gate can be removed by loosening the X-8211 screw and pulling the gate from its mounting base. When replacing the gate, position it on its mounting base so that the dowel pins in the gate engage with the holes in the sub-base; tighten the X-8211 holding screw.

Adjustment of Film Pressure Pads

The film pressure pads should be adjusted for the minimum amount of tension on the film consistent with a steady picture on the screen. When projecting new film that has not been properly processed, or very old film, it may be necessary to change the tension on these pressure pads. Loosen the X-1941 adjusting screw as far as possible and then slowly tighten it until steady projection is obtained.

Adjustment of X-1964A Sprocket Pad

Adjust the X-1935A split cap nut on the intermittent sprocket pad for the quietest running of film. The normal adjustment for this pad is to screw the X-1935A split cap nut on the threaded stud until the top of the nut is flush with the end of the stud. It should not be necessary to change this adjustment after it is once set.

Adjustment of X-4114 Film Pad Tension Springs

1. Remove the film gate from the projector mechanism.
2. Remove the two X-1986 screws which attach the X-8207 film pressure retaining plate tp the gate and then lift the plate from the gate casting.
3. Bend the X-4114 tension springs so that they are all in the same horizontal plane when resting against the edge of the gate casting, as shown in Figure 9. These springs should all be adjusted so that when they are resting against the edge of the gate casting, the X-1952 pad adjusting arm is approximately 3/16-inch from the edge of the gate casting.

Removing X-8208 Tension Spring Holding Shaft

1. Remove the X-8207 film pressure pad retaining plate.
2. Remove the four P-1054 screws which attach the X-4114 springs to the X-8208 shaft.
3. Drive out the P-191 pin which attaches the X-1952 arm to the shaft.
4. Drive out the P-297 pin which holds the X-8208 shaft in the gate casting.
5. When replacing the shaft, make sure that it revolves freely in its mounting holes.

Adjusting X-8463 Gate Operating Link and Locking Cam
(See diagram No. 13A)

1. Remove lens mount assembly.
2. Move the gate to its open position.

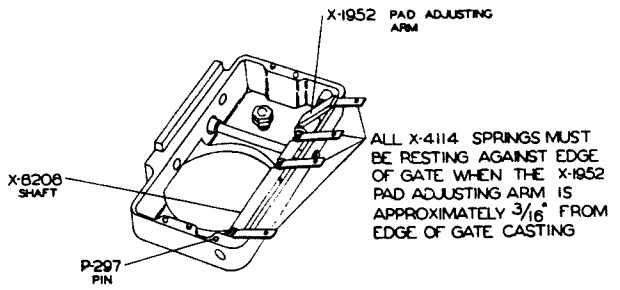

Figure 9—Correct Position of Tension Springs with Respect to Pad Adjusting Arm

3. Loosen the two P-65 screws which attach X-8237 locking cam to the gate operating link.
4. Force the X-8237 locking cam to its extreme forward position toward the front of the main case.
5. Snug up the two P-65 screws which attach the X-8237 locking cam to the X-8235 gate operating link.
6. Close the gate and tap the locking cam and operating link to its extreme downward position.
7. Tighten the two P-65 screws.
8. Replace lens mount.

Framing and Pilot Light Assembly (See diagram No. 14)

To replace the P-1337 framing light switch, proceed as outlined below:

1. Remove film trap unit complete.
2. Remove framing lamp.
3. Remove the X-8902 cover plate.
4. Remove the lock nuts from the switch and from the BX-angle connector.
5. Pull the P-1088 angle connector away from the box so as to expose three or four inches of the wires.
6. Pull the switch out of the housing so that the leads to the switch are accessible.

To replace the P-1089 pilot light socket proceed as follows:

1. Remove the film trap unit complete.
2. Remove the framing lamp.
3. Remove the X-8902 cover plate.
4. Remove the P-1302 nut at the rear of the housing which holds the socket in place.
5. Remove the socket and disconnect the wire leads.

REPLACEMENT PARTS

EDWARD H. WOLK, INC.
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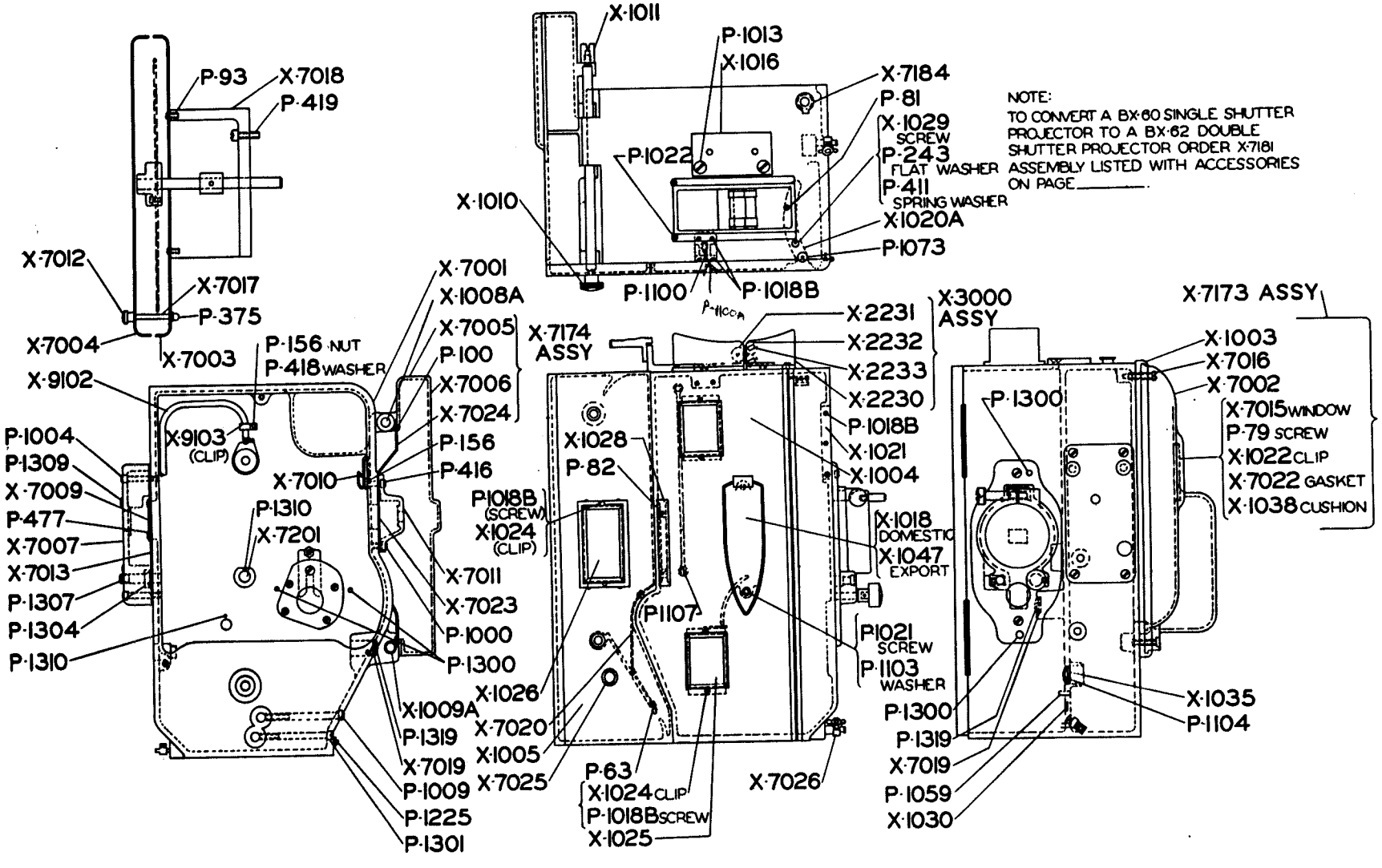


DIAGRAM NO. 1

HOUSING UNIT

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.	
X-1003	Gasket; gear compartment cover to housing
X-1004	Door; mechanism housing (also sold with assembly X-3002)
X-1005	Quarter panel (also sold with assembly X-7175)
X-1008A	Upper shaft; shutter housing
X-1009A	Lower shaft; shutter housing
X-1010	Stud nut; quarter panel side
X-1011	Stud nut; left side shutter guard
X-1016	Sub-plate; upper magazine
X-1018	Emblem; domestic
X-1020A	Door stop
X-1021	Door hinge
X-1022	Clip; gear cover window retaining
X-1024	Retaining clip; door and quarter panel window
X-1025	Window; film side door
X-1026	Window; quarter panel
X-1028	Handle; film side door
X-1029	Shouder screw; door stop
X-1030	Plug; idler gear bearing
X-1035	Gasket; oil seal
X-1038	Cushion
X-1047	Emblem; export
X-2230	Casting; upper film valve (also sold with assembly X-3000)
X-2231	Roller; large upper film valve roller
X-2232	Roller; small upper film valve roller
X-2233	Screw; roller pivot
X-7001	Main housing casting
X-7002	Gear cover housing (also sold with assembly X-7173)
X-7003	Shutter housing; front inner
X-7004	Shutter housing; front outer
X-7005	Shutter housing; rear inner (also sold with assembly X-7174)
X-7006	Shutter housing; rear outer (also sold with assembly X-7174)
X-7007	Housing; shutter shaft front
X-7009	Plate; oil baffle, front shutter
X-7010	Oil baffle
X-7011	Housing; oil slinger, rear shutter
X-7012	Cap screw; front shutter blade housing
X-7013	Gasket; front shutter shaft housing
X-7015	Window; gear housing cover
X-7016	Screw; gear housing cover retainer
X-7017	Spacer stud; front shutter housing
X-7018	Spacer casting; front shutter housing
X-7019	Oil seal gasket
X-7020	Ventilation baffle; quarter panel
X-7022	Gasket; gear cover window
X-7023	Gasket; oil slinger housing
X-7024	Baffle plate
X-7025	Dot plug button; quarter panel
X-7026	Oil drain petcock
X-7184	Oil cup assembly
X-7201	Shaft
X-9102	Oil line copper tubing
X-9103	Clip; oil line

WASHERS—PINS—SCREWS

Part No.	
P-63	Screw; 6-32 x 3/16", binder head
P-79	Screw; 8-32 x 3/8", round head
P-81	Screw; 8-32 x 1/2", fil. hd.
P-82	Screw; 8-32 x 3/8", fil. hd.
P-93	Screw; 10-32 x 3/8", rd. hd.
P-100	Screw; 10-24 x 1/4", rd. hd.
P-156	Nut; 1/4-20, hex
P-243	Flat washer
P-375	Nut; acorn head
P-411	Spring washer
P-416	Screw; 1/4-20 x 3/4", fil. hd.
P-418	Washer
P-419	Screw; 1/4-20 x 1/2", rd. hd.
P-477	Screw; 8-32 x 3/8", binder hd.
P-1000	Screw; 1/4-20 x 3/8", fil. hd.
P-1004	Screw; 1/4-20 x 1 1/4", fil. hd.
P-1009	Screw; 1/4-20 x 3 1/2", fil. hd.
P-1013	Screw; main housing to upper magazine sub-plate, 1/4-20 x 5/8", flat hd.
P-1018B	Screw; 6-32 x 1/4", fil. hd.
P-1021	Screw; 6-32 x 1/4", french hd.
P-1022	Screw; 6-32 x 3/8", fil. hd.
P-1059	Dowel pin; 3/16" x 1/2"
P-1073	Pin; 5/32" x 13/32", groove
P-1100	Door latch
P-1103	Washer; nameplate
P-1104	Welch plug; 7/8" dia.
P-1107	Door bumper; rubber
P-1225	Brass plug; 1/8" x 27 NPT
P-1300	Dowel pin; 1/4" x 3/4"
P-1301	Screw; 1/4-20 x 3" fil. hd.
P-1304	Oil seal; 5/16" x 3/4"
P-1307	Pipe plug; 1/4" NPT, slotted
P-1309	Dot plug button for front shutter shaft housing
P-1310	Pin; 1/16" x 1/4", groove
P-1319	Welch plug; 11/16" dia.
P-1100A	DOOR STRIKE

MINOR ASSEMBLIES

Assy. No.	
X-3000	Film valve assembly; includes parts X-2230A, X-2231, X-2232, X-2233, P-1022, P-81, assembled
X-3002	Door assembly; includes parts X-1004A, P-1018B, X-1021, X-1018 (X-1047 for export), P-1021, P-1103, P-1107, X-1025, X-1024, X-1028A, P-82, assembled
X-7173	Gear cover assembly; includes parts X-1003, X-7016, X-7002, X-7015, P-79, X-1022, X-7022, X-1038, assembled.
X-7174	Rear shutter housing assembly; includes parts X-7005, X-7006, P-100, X-7024, assembled.
X-7175	Quarter panel; includes parts X-1005A, X-7025, X-7020, X-1026, P-63, X-1024, P-1018B, assembled

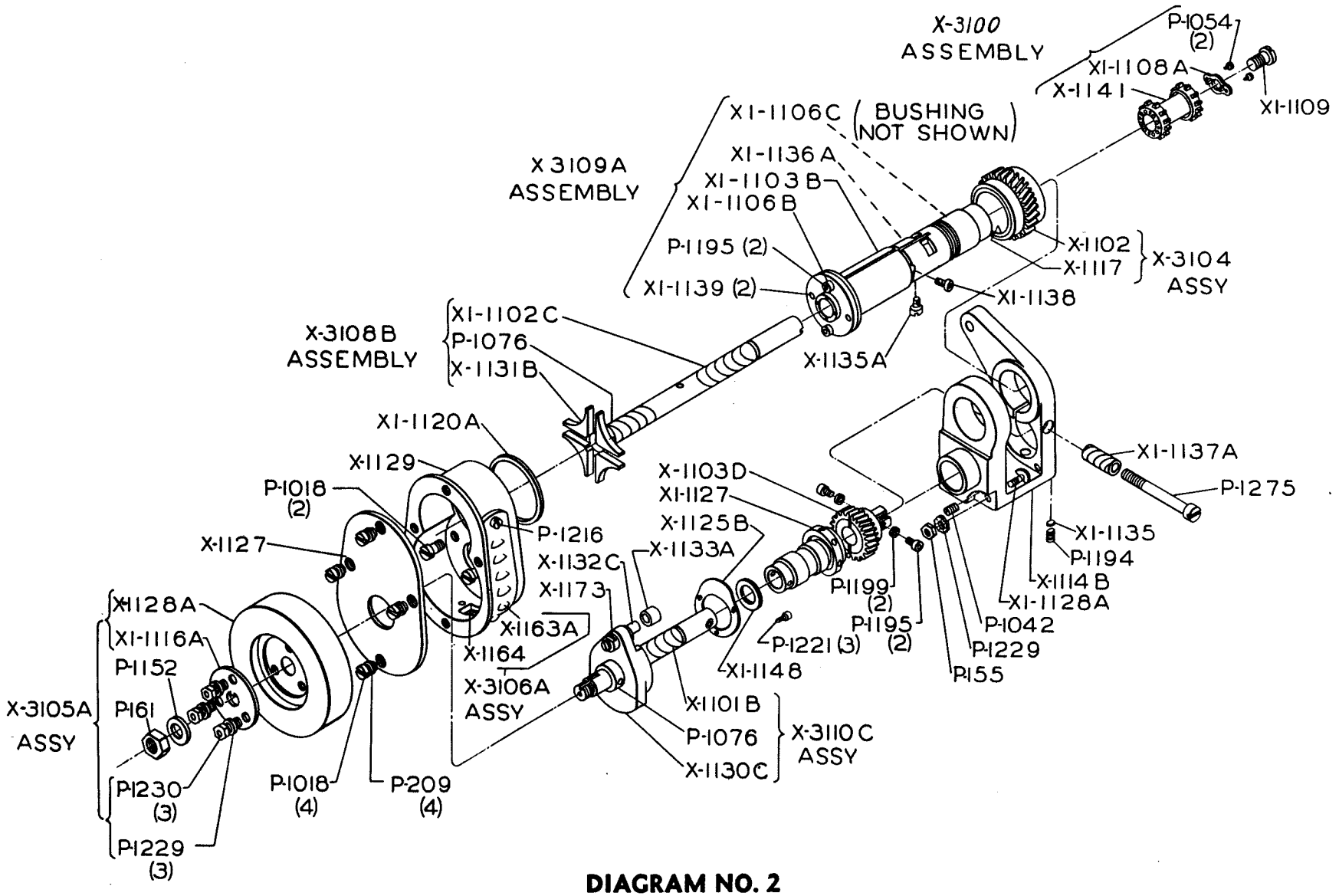


DIAGRAM NO. 2

INTERMITTENT UNIT

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.	
X-1101B	Cam shaft (not sold separately; available only with assembly X-3110C)
X-1102	Gear (not sold separately; available only with assembly X-3104)
X-1103D	Cam shaft gear
X-1114B	Main frame casting
X-1117	Intermittent gear bushing (not sold separately; available only with assembly X-3104)
X-1125B	Cover; cam pin roller retainer
X-1127	Oil box cover
X-1128A	Flywheel (also sold as assembly X-3105A)
X-1129	Intermittent oil box
X-1130C	Intermittent cam (not sold separately; available only with assembly X-3110C)
X-1131B	Intermittent star (not sold separately; available only with assembly X-3108B)
X-1132C	Cam pin (not sold separately; available only with assembly X-3112)
X-1133A	Roller; cam pin (not sold separately; available only with assembly X-3112)
X-1135A	Sleeve locating screw
X-1141	Intermittent sprocket; (also sold as assembly X-3100)
X-1163A	Oil scoop (not sold separately; available only with assembly X-3106A)
X-1164	Oil scoop screen (not sold separately; available only with assembly X-3106A)
X-1173	Cam pin nut
X1-1102C	Intermittent star shaft (not sold separately; available only with assembly X-3108B)
X1-1103B	Intermittent outer sleeve (not sold separately; available only with assembly X-3109A)
X1-1106B	Intermittent shaft bushing, rear
X1-1106C	Intermittent shaft bushing, front
X1-1108A	Intermittent sprocket drive plate
X1-1109	Intermittent sprocket lock nut
X1-1116A	Flywheel washer
X1-1120A	Gasket; sleeve to oil box
X1-1127	Cam shaft bearing
X1-1128A	Lock pin; cam shaft bearing
X1-1135	Brass plug for swivel lock screw
X1-1136A	Thrust collar for star shaft
X1-1137A	Pressure spring for swivel screw
X1-1138	Lock screw for star shaft thrust collar
X1-1139	Pin; rear bearing to sleeve
X1-1148	Thrust washer

WASHERS—PINS—SCREWS

DETAIL PARTS

Part. No.	
P-155	Nut; 10-24 hex
P-161	Nut; 5/16-24
P-209	Washer; No. 2, lock
P-1018	Screw; 6-32 x 1/4"
P-1042	Screw; 10-32 x 1/4"
P-1054	Screw; 2-56 x 1/8"
P-1076	Pin; 4/0 x 3/8"
P-1152	Washer; 5/16 shakeproof
P-1194	Screw; 10-32 x 3/8"
P-1195	Screw; 8-32 x 1/4"
P-1199	Washer; No. 8, lock
P-1216	Screw; 6-32 x 1/8"
P-1221	Screw; 2-56 x 1/8"
P-1229	Washer; Shakeproof
P-1230	Screw; 10-32 x 3/8"
P-1275	Screw; 1/4 x 28 x 2 1/2"

MINOR ASSEMBLIES

Assy. No.	
X-3100	Intermittent sprocket; includes parts X-1141, X1-1108A, P-1054, assembled
X-3104	Idler gear and bushing assembly; includes parts X-1102, X-1117 assembled
X-3105A	Flywheel assembly complete; includes parts X-1128A, X1-1116A, P-1229, P-1230, P-1152, P-161, assembled
X-3106A	Oil scoop and screen; includes parts X-1164, X-1163A assembled
X-3107	Intermittent unit complete; includes all parts shown in Diagram No. 2, assembled
X-3108B	Star wheel and shaft; includes parts X-1131B, P-1076, X1-1102C, assembled
X-3109A	Quill and bushing; includes parts X1-1103B, X1-1106C, X1-1106B, P-1195, X1-1139, X1-1136A, X1-1138, X-1135A assembled
X-3110C	Cam and shaft; includes parts X-1101B, X-1130C, P-1076, assembled
X-3112	Cam pin and roller assembly; includes parts X-1133A, X-1132C, X-1173 assembled

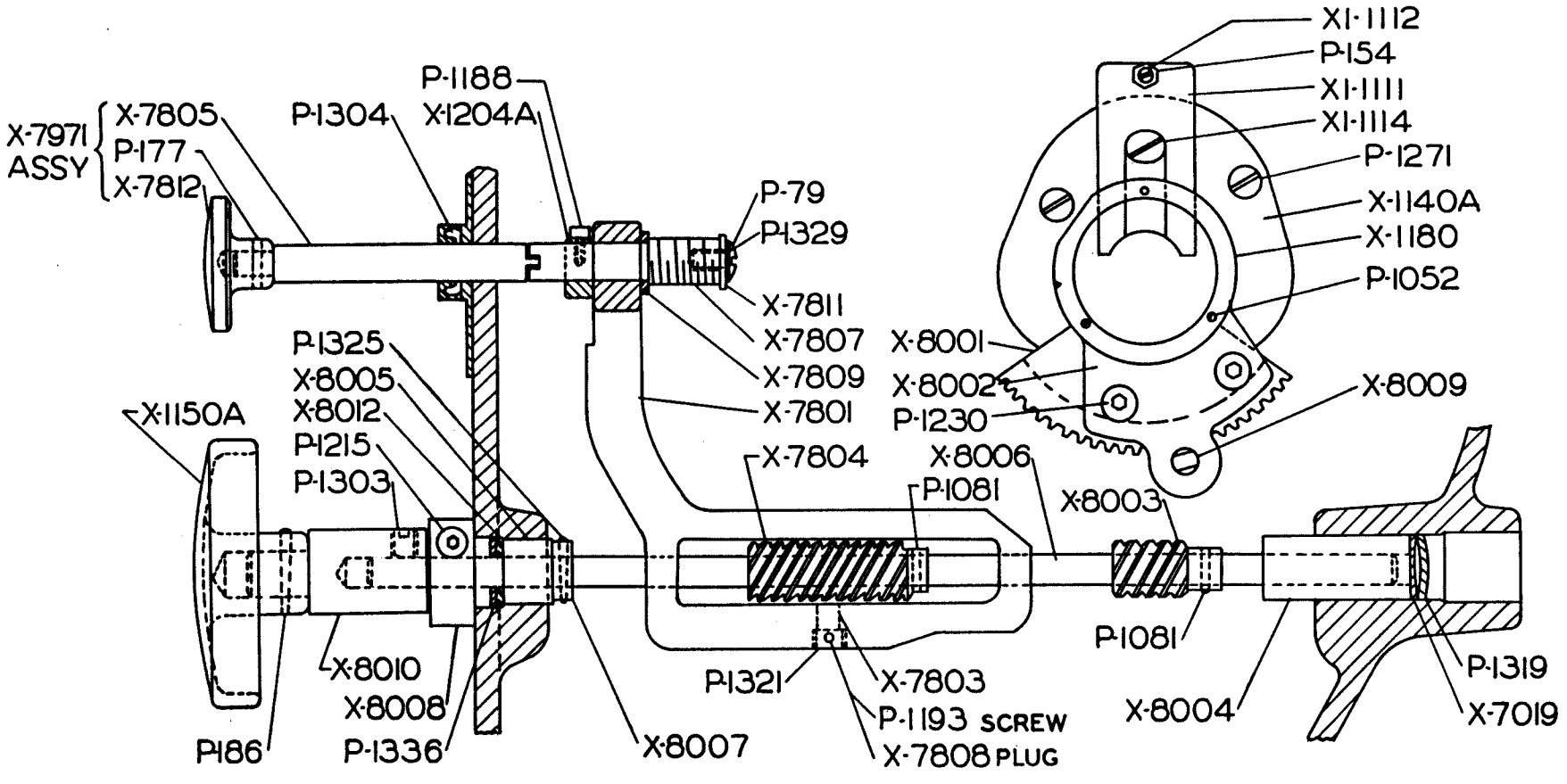


DIAGRAM NO. 3

FRAMING AND COMPENSATOR WORMS AND SHAFT ASSEMBLY

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.	
X-1140A	Intermittent to main frame holding casting
X-1150A	Knob. Not sold separately; available only with assembly X-8173
X-1180	Washer; framing sector retaining
X-1204A	Collar; hand timing
X-7019	Gasket; Welsh plug
X-7801	Bracket; compensator worm pin
X-7803	Pin; compensator worm drive
X-7804	Worm; compensator
X-7805	Shaft; timing adjusting. Not sold separately; available only with assembly X-7971.
X-7807	Screw; adjusting
X-7808	Brass plug
X-7809	Washer; thrust
X-7811	Washer
X-7812	Knob. Not sold separately; available only with assembly X-7971
X-8001	Sector; framing. Available also with assembly X-8172
X-8002	Arm; framing. Available also with assembly X-8172
X-8003	Worm; framing
X-8004	Bearing; shaft—rear
X-8005	Bearing; shaft—front
X-8006	Shaft; framing. Not sold separately; available only with assembly X-8171
X-8007	Collar; framing shaft inner thrust
X-8008	Collar; external thrust
X-8009	Pin; intermittent retaining
X-8010	Bushing. Not sold separately; available only with assembly X-8173
X-8012	Gasket; oil seal
X1-1111	Intermittent clamp plate. Available also with assembly X-4300
X1-1112	Clamp screw
X1-1114	Clamp pivot screw

WASHERS—PINS—SCREWS

Part No.	
P-79	Screw; 8-32 x 3/8", rd. hd.
P-154	Lock nut; (10-32)
P-177	Pin; #1 groove, 3/32" x 1/2"
P-186	Pin; groove—1/8" x 7/8"
P-1052	Screw; 2-56 x 3/16", flat head
P-1081	Pin; taper, 5/0 x 1/2"
P-1188	Screw; 8-32 x 3/8", socket head
P-1193	Screw; 6-40 x 1/8"
P-1215	Screw; 8-32 x 1/2", socket head cap
P-1230	Screw; 10-32 x 3/8", socket head cap
P-1271	Screw; 1/4-20 x 3/4", fil. head
P-1303	Screw; 1/4-20 x 5/16", socket set cup point
P-1304	Oil seal
P-1319	Welsh plug
P-1321	Screw; 5/16-24 x 3/16"
P-1325	Pin; taper, 5/0 x 3/4"
P-1329	Washer; shakeproof
P-1336	Washer

MINOR ASSEMBLIES

Assy. No.	
X-4300	Intermittent locking clamp; includes parts X1-1111, X1-1112, P-154 assembled
X-7971	Knob and shaft assembly for hand timing; includes parts X-7805, X-7812, P-177 assembled
X-8170	Framing and compensator worms and shaft assembly complete; includes all parts shown in diagram No. 3 assembled, except X-8172 framing gear sector and intermittent holding casting assembly
X-8171	Framing shaft worms and collar assembly; includes parts X-8003, X-8006, X-8007, X-7804, P-1081, P-1325 assembled
X-8172	Intermittent framing arm and gear sector assembly; includes parts X-8001, X-8002, X-8009, P-1230 assembled
X-8173	Handle assembly; includes parts X-1150A, X-8010, P-186 assembled

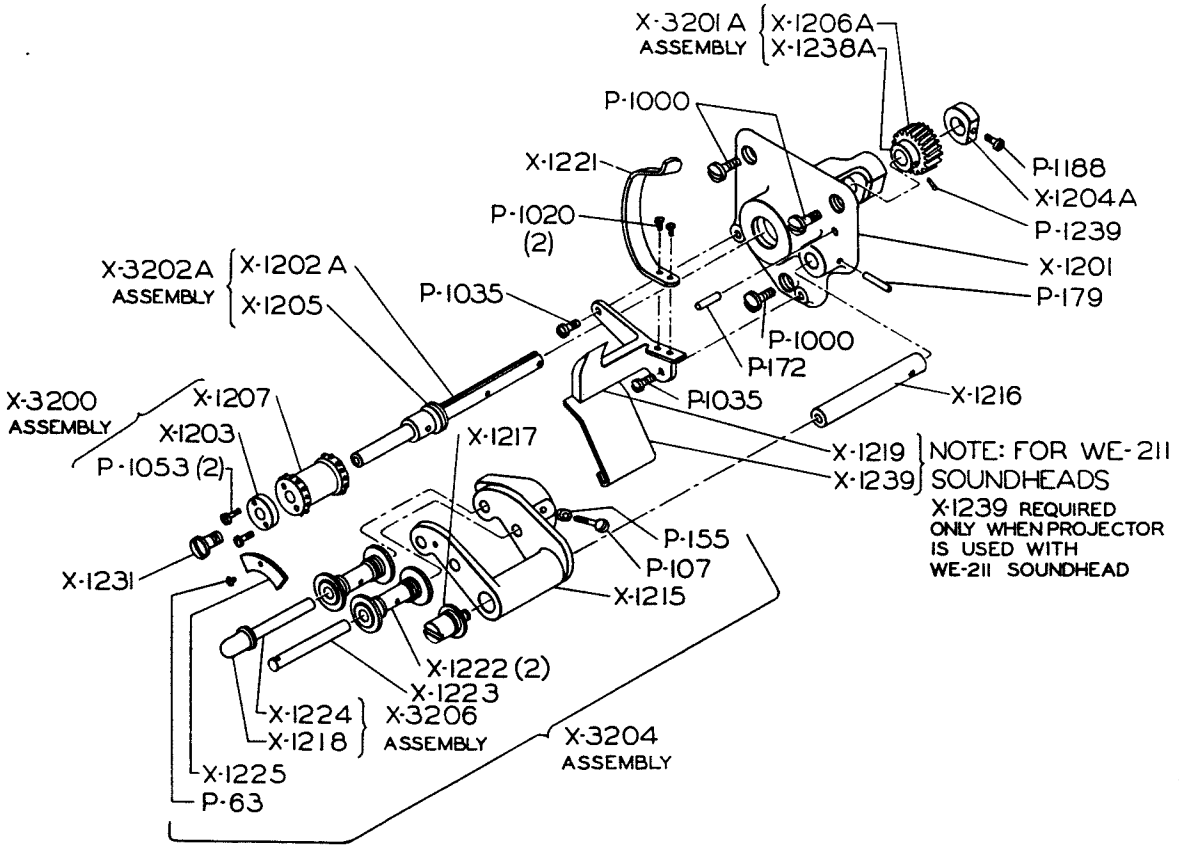


DIAGRAM NO. 4

LOWER FILM SPROCKET UNIT

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.	
X-1201	Main casting
X-1202A	Lower sprocket shaft (not sold separately; available only with assembly X-3202A)
X-1203	Sprocket driving plate
X-1204A	Sprocket shaft collar
X-1205	Oil slinger (not sold separately; available only with assembly X-3202A)
X-1206A	Gear; (not sold separately; available only with assembly X-3201A)
X-1207	Sprocket (also available with assembly X-3200)
X-1215	Bracket (also available with assembly X-3204)
X-1216	Shaft for pad roller bracket
X-1217	Retaining stud for pad roller bracket
X-1218	Stud nut for pad roller shaft (not sold separately; available only with assemblies X-3206 and X-3204)
X-1219	Film stripper
X-1221	Locking spring
X-1222	Pad roller
X-1223	Pad roller shaft (rear)
X-1224	Pad roller shaft (front), (not sold separately; available only with assemblies X-3206 and X-3204)
X-1225	Retaining plate for pad roller shafts
X-1231	Sprocket retaining screw
X-1238A	Hub for sprocket drive gear (not sold separately; available only with assembly X-3201A)
X-1239	Stripper; lower film, for WE-211 soundhead only

WASHERS—PINS—SCREWS

Part No.	
P-63	Screw (6-32 x 3/16" oval head)
P-107	Screw (10-24 x 3/4", rd. head)
P-155	Nut (10-24, hex head)
P-172	Pin (3/16 x 7/8")
P-179	Pin (3/32 x 3/4")
P-1000	Screw (1/4-20 x 3/8", fil. hd.)
P-1020	Screw (6-32 x 3/16", fil. hd.)
P-1035	Screw (10-24 x 3/8", fil. hd.)
P-1053	Screw (2-56 x 1/4", fil. hd.)
P-1188	Screw; 8-32 x 3/8", socket head cap
P-1239	Pin, 3/0 x 5/8", taper

MINOR ASSEMBLIES

Assy. No.	
X-3200	Lower film sprocket and drive plate assembly, includes parts X-1207, X-1203, P-1053, assembled
X-3201A	Sprocket drive gear assembly; includes parts X-1206A, X-1238A, assembled
X-3202A	Sprocket shaft assembly; includes parts X-1202A, X-1205, assembled
X-3203A	Lower sprocket unit complete; includes all parts shown in Diagram No. 4 assembled
X-3204	Pad roller bracket assembly complete; includes X-1218, P-63, X-1225, X-1224, X-1223, X-1222, X-1215, P-107, P-155, assembled
X-3206	Front pad roller shaft assembly; includes parts X-1224, X-1218, assembled

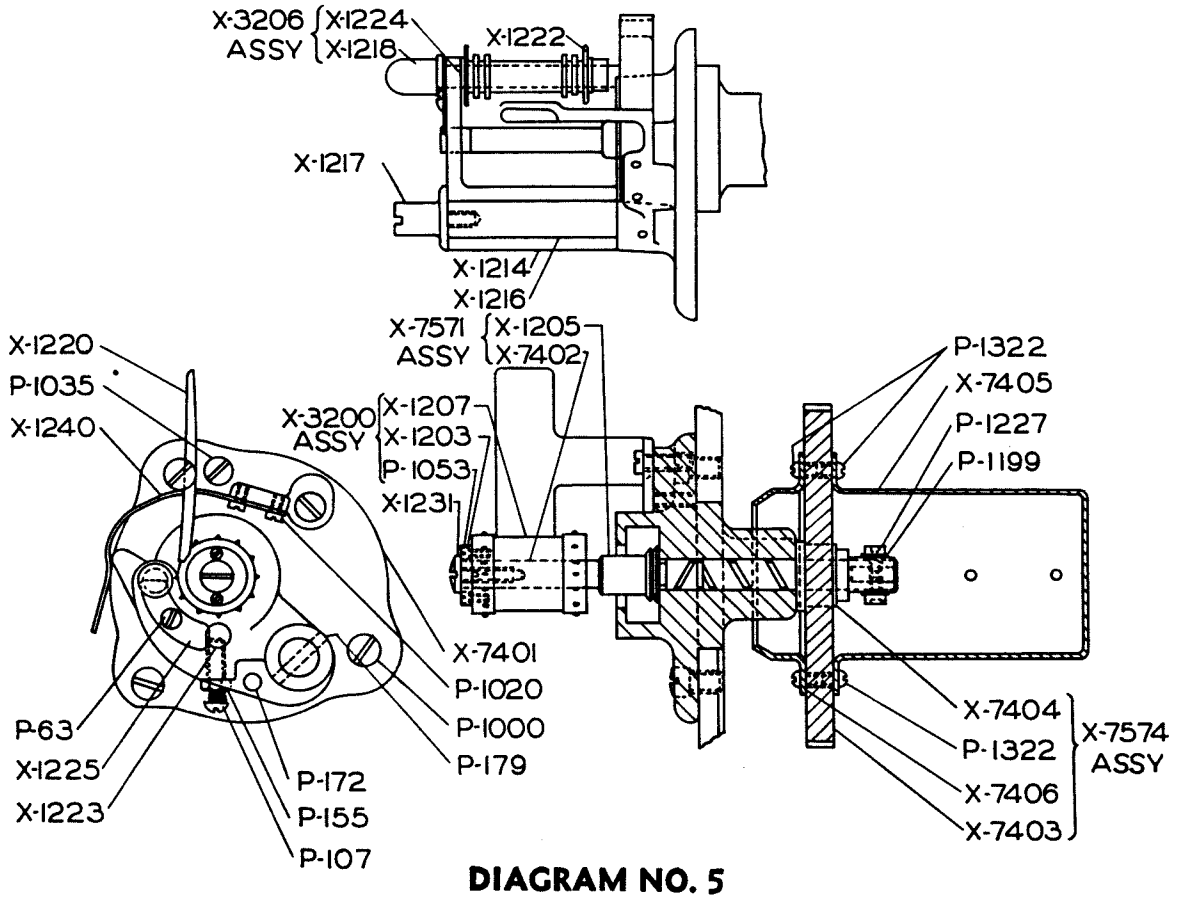


DIAGRAM NO. 5
UPPER SPROCKET ASSEMBLY
BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

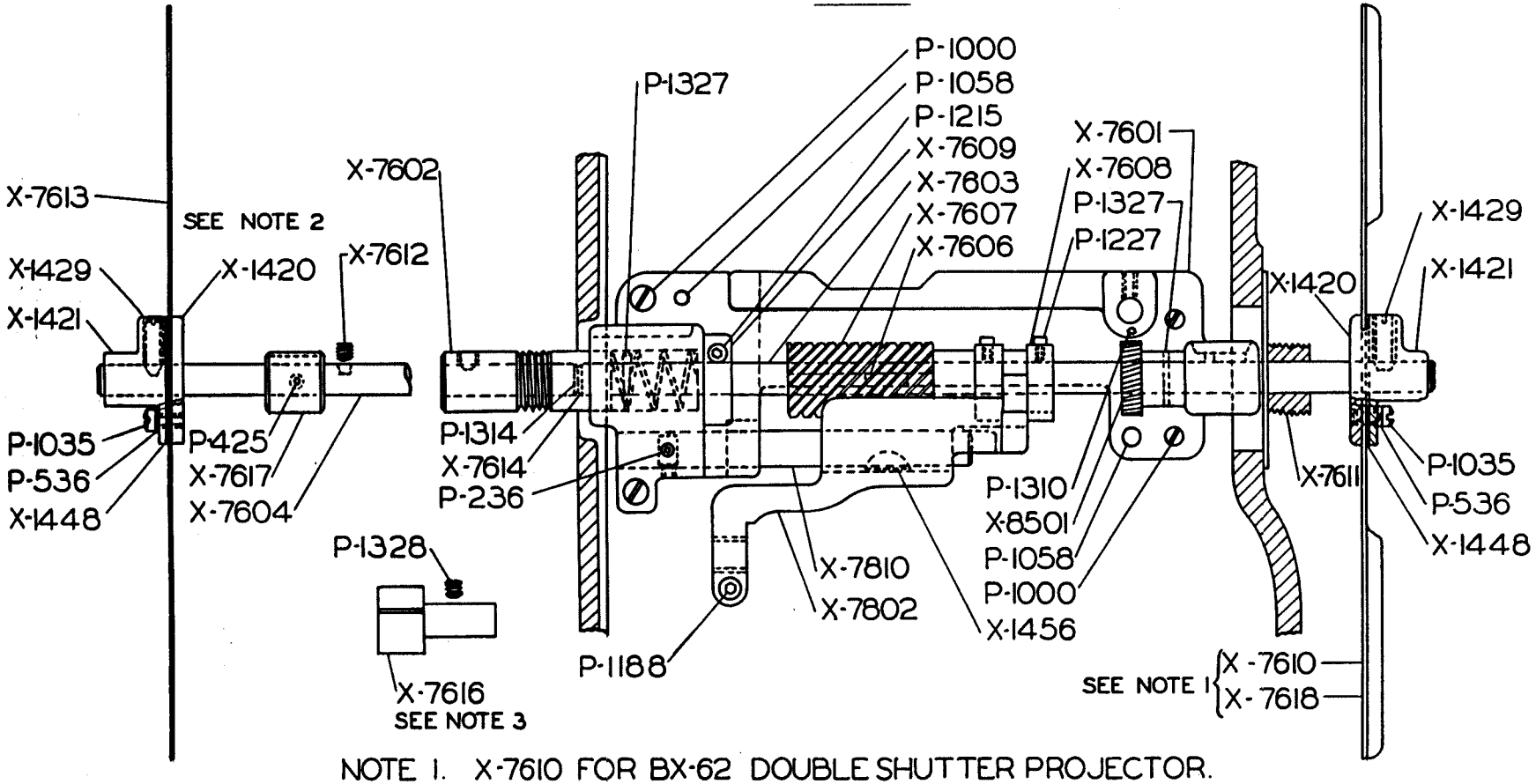
Part No.	
X-1203	Plate; sprocket driving
X-1205	Oil slinger; sprocket shaft. (Not sold separately; available only with assembly X-7571)
X-1207	Sprocket. (Available also with assembly X-3200 assembled)
X-1214	Bracket; upper pad roller. (Available also with assembly X-3304A)
X-1216	Shaft; pad roller bracket. (Available also with assembly X-7573)
X-1217	Screw; roller bracket retaining
X-1218	Knob; pad roller operating. (Not sold separately; available only with assembly X-3206A)
X-1220	Stripper; upper
X-1222	Pad roller
X-1223	Shaft; pad roller rear
X-1224	Shaft; pad roller front. (Not sold separately; available only with assembly X-3206A)
X-1225	Plate; pad roller shaft retaining
X-1231	Screw; sprocket retaining
X-1240	Spring; pad roller
X-7401	Casting; upper sprocket housing. (Not sold separately; available only with assembly X-7573)
X-7402	Shaft; upper sprocket. (Not sold separately; available only with assembly X-7571)
X-7403	Gear; upper sprocket drive. (Not sold separately; available only with assembly X-7574 assembled)
X-7404	Hub; upper sprocket drive gear. (Not sold separately; available only with assembly X-7574 assembled)
X-7405	Oil distributor
X-7406	Oil retainer

WASHERS—PINS—SCREWS

Part No.	
P-63	Screw; 6-32 x 3/16", oval head
P-107	Screw; 10-24 x 3/4", rd. hd.
P-155	Nut; 10-24 hex
P-172	Pin; #1 groove
P-179	Pin; #1 groove
P-1000	Screw; 1/4-20 x 3/8", fil. head
P-1020	Screw; 6-32 x 3/8", fil. head
P-1035	Screw; 20-24 x 3/8", fil. head
P-1053	Screw; 2-56 x 1/4", fil. head
P-1199	Washer, LOCK
P-1227	Screw; 8-32 x 3/16", socket head cap
P-1322	Screw; 6-32 x 3/16", rd. hd.

MINOR ASSEMBLIES

Assy No.	
X-3200	Sprocket and drive plate assembly; includes parts X-1207, X-1203, P-1053 assembled
X-3206	Pad roller operating stud and shaft assembly; includes parts X-1224, X-1218 assembled
X-3304	Pad roller bracket assembly complete; includes parts X-1214, X-1222, X-1223, X-1225, X-1224, X-1218, P-63, P-107, P-155 assembled
X-7571	Sprocket shaft assembly; includes parts X-1205, X-7402 assembled
X-7573	Main casting; upper sprocket assembly; includes parts X-1216, X-7401, P-172, P-179 assembled
X-7574	Sprocket gear and hub complete with oil retainer; includes parts X-7406, X-7403, X-7404, P-1322 assembled
X-7570	Upper sprocket assembly complete; includes all parts shown in Diagram No. 5



NOTE 1. X-7610 FOR BX-62 DOUBLE SHUTTER PROJECTOR.
X-7618 FOR BX-60 SINGLE SHUTTER PROJECTOR.

NOTE 2. THESE PARTS REQUIRED FOR BX-62 DOUBLE SHUTTER PROJECTOR ONLY.

NOTE 3 THE X-7616 INDICATOR REQUIRED FOR BX-60 SINGLE SHUTTER PROJECTOR ONLY.

DIAGRAM NO. 6

SHUTTER SHAFT ASSEMBLY FOR SINGLE AND DOUBLE SHUTTER MECHANISMS

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.

X-1420 Washer; retainer, front shutter blade
X-1421 Flange; shutter blade holding
X-1429 Screw; cone point, set
X-1448 Gasket; shutter blade
X-1456 Key; woodruff #7
X-7601 Casting; shutter shaft
X-7602 Sleeve; double shutter. Not sold separately; available only with assembly X-7772
X-7603 Shutter shaft. Not sold separately; available only with assembly X-7772
X-7604 Shaft; shutter, front
X-7606 Key; shutter shaft, gear
X-7607 Gear; shutter shaft
X-7608 Collar; gear, thrust
X-7609 Collar; shutter shaft, thrust
X-7610 Shutter blade; rear. (BX-62 double shutter mechanism)
X-7611 Oil slinger
X-7612 Screw; cone point, set
X-7613 Shutter blade; front. (BX-62 double shutter mechanism)
X-7614 Gasket
X-7616 Frame indicator. (BX-60 single shutter)
X-7617 Frame indicator. (BX-62 double shutter)
X-7618 Shutter blade; rear. (BX-60 single shutter mechanism)
X-7802 Yoke; hand timing
X-7810 Guide shaft; hand timing yoke
X-8501 Gear; governor drive. Available also with assembly X-7772

WASHERS—PINS—SCREWS

Part No.

P-236 Screw; 10-24 x ¼", cup point set.
P-425 Screw; 8-32 x ¼", Allen set, cup point.
P-536 Lock washer.
P-1000 Screw; ¼-20 x ⅜", fil. hd. cap.
P-1035 Screw; 10-24 x ⅜", fil hd.
P-1058 Dowel pin; ¼ x ½".
P-1188 Screw; 8-32 x ⅜", socket head cap.
P-1215 Screw; 8-32 x ½", socket head cap.
P-1227 Screw; 8-32 x 3/16", socket head cap.
P-1310 Pin.
P-1314 Welsh plug.
P-1327 Pin; 2/0 taper.
P-1328 Screw; cone point set.

MINOR ASSEMBLIES

Assy. No.

X-7181 Shutter kit for converting single shutter mechanism to double shutter mechanism; includes parts X-7613, X-1421, X-1429, X-1420, X-7604, X-7617, P-425, X-1448, P-536, P-1035, X-7610, and the following parts shown on Diagram No. 1: X-7012, X-7004, X-7003, P-375, X-7017, P-93, X-7018, P-419.
X-7770 Shutter shaft assembly complete for BX-62 double shutter projector mechanism; includes all parts shown in Diagram No. 6 assembled
X-7771 Shutter shaft assembly complete for BX-60 single shutter projector mechanism; includes all parts shown in Diagram No. 6 except those indicated in notes 1, 2 and 3
X-7772 Shutter shaft assembly only for BX-60 and BX-62 single and double shutter projectors; includes parts X-7602, X-7603, X-7614, X-8501, P-1314, P-1327 assembled
X-7778 Rear shutter assembly for BX-60; includes parts X-1420, X-1421, X-1448, X-1429, P-1035, P-536, X-7618 assembled
X-7779 Front shutter assembly for BX-62; includes parts X-7613, X-1429, X-1421, P-1035, P-536, X-1448, X-1420 assembled
X-7780 Rear shutter assembly for BX-62; includes parts X-7610, X-1420, X-1421, X-1448, X-1429, P-1035, P-536 assembled

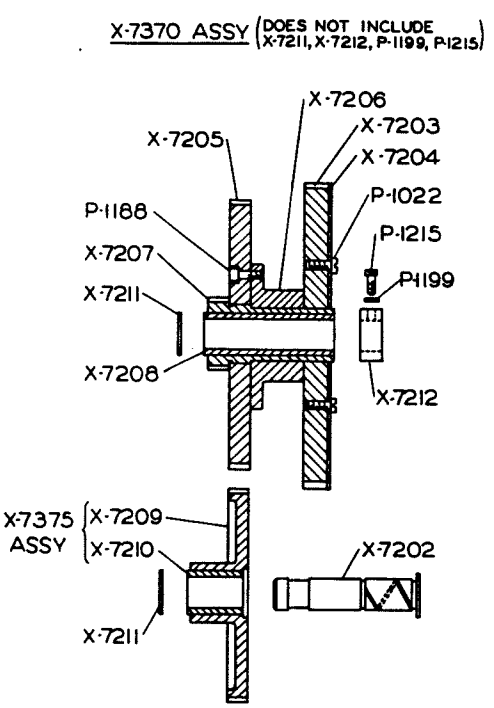


DIAGRAM NO. 7

INTERMEDIATE GEAR ASSEMBLY

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.

X-7202 Shaft; idler gear, intermediate drive
X-7203 Gear. Not sold separately; available only with assembly X-7370
X-7204 Shroud; intermediate drive gear. Not sold separately; available only with assembly X-7370
X-7205 Gear; shutter drive. Not sold separately; available only with assembly X-7370
X-7206 Spacer. Not sold separately; available only with assembly X-7370
X-7207 Gear; intermediate drive gear. Not sold separately; available only with assembly X-7370
X-7208 Bushing; intermediate gear hub. Not sold separately; available only with assembly X-7370
X-7209 Gear; intermediate idler. Not sold separately; available only with assembly X-7375
X-7210 Bushing; intermediate idler gear. Not sold separately; available only with assembly X-7375
X-7211 Washer; gear thrust
X-7212 Collar; thrust

WASHERS—PINS—SCREWS

Part No.

P-1022 Screw; 6-32 x 3/8", fil. hd.
P-1188 Screw; 8-32 x 3/8", socket head
P-1199 Washer
P-1215 Screw; 8-32 x 1/2", socket head

MINOR ASSEMBLIES

Assy. No.

X-7370 Intermediate drive gear assembly; includes parts X-7208, X-7207, P-1188, X-7205, X-7206, X-7203, X-7204, P-1022 assembled
X-7375 Intermediate drive gear; includes parts X-7209, X-7210 assembled

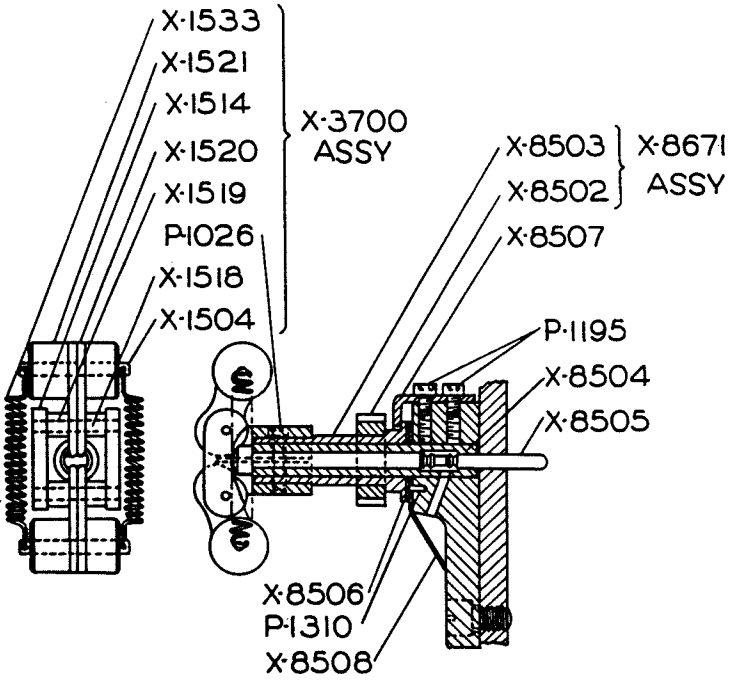


DIAGRAM NO. 8

GOVERNOR UNIT ASSEMBLY

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.

X-1504 Pin; governor weight holding. (Not sold separately; available only with assembly X-3705)
X-1514 Governor head
X-1518 Shaft; ball and lever
X-1519 Sleeve; weight swivel. (Not sold separately; available only with assembly X-3705)
X-1520 Weight and sleeve lever. (Not sold separately; available only with assembly X-3705)
X-1521 Weight. (Not sold separately; available only with assembly X-3705)
X-1533 Spring
X-8502 Gear. (Not sold separately; available only with assembly X-8671)
X-8503 Gear shroud. (Not sold separately; available only with assembly X-8671
X-8504 Shaft; bronze, stationary
X-8505 Push rod
X-8506 Thrust washer; drive gear
X-8507 Thrust arm
X-8508 Oil shield

WASHERS—PINS—SCREWS

Part No.

P-1026 Screw; 6-40 x 1/2", socket head
P-1195 Screw; 8-32 x 1/2", socket head
P-1310 Pin; 1/16" x 1/4", groove

MINOR ASSEMBLIES

Assy. No.

X-3700 Governor head unit complete; includes parts X-1514, X-1521, X-1504, X-1520, X-1533, X-1518, X-1519, P-1026, assembled
X-3705 Weight and sleeve lever assembly; includes parts X-1504, X-1520, X-1519, X-1521, assembled
X-8671 Gear and shroud assembly; includes parts X-8502, X-8503, assembled

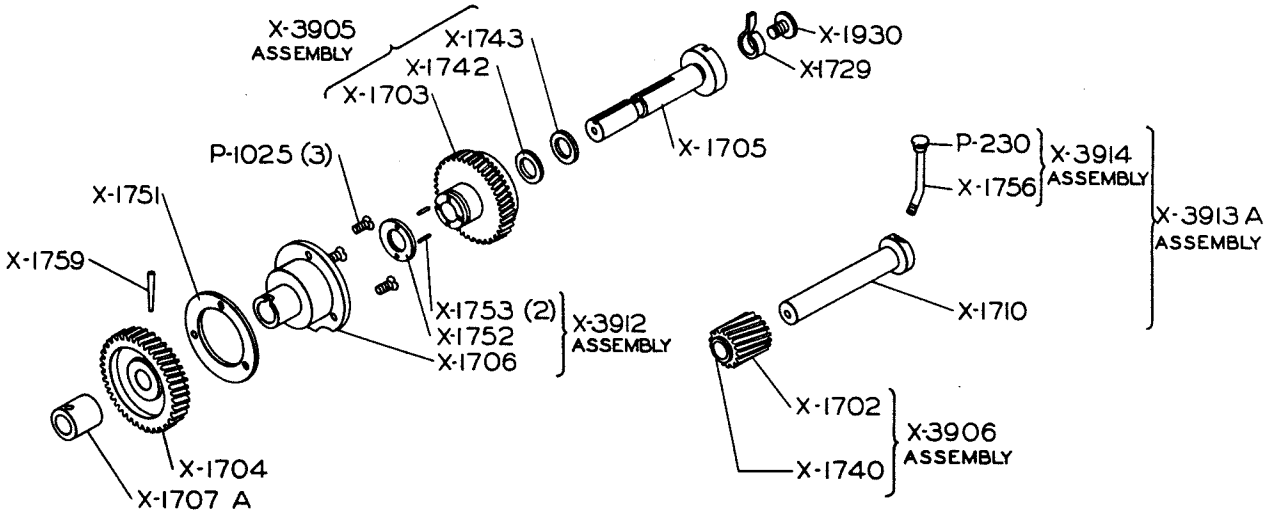


DIAGRAM NO. 9

MAIN DRIVE GEAR UNIT

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.	
X-1702	Gear; double faced idler. (Not sold separately; available only with assembly X-3906)
X-1703	Gear; main drive, external. (Not sold separately; available only with assemblies X-3905 and X-3907)
X-1704	Gear; main drive, internal. (Also available with assembly X-3907)
X-1705	Shaft; main drive. (Also available with assembly X-3907)
X-1706	Bearing; drive shaft external. (Not sold separately; available only with assemblies X-3912 and X-3907)
X-1707A	Bearing; drive shaft, internal
X-1710	Shaft; double face idler gear mounting. (Not sold separately; available only with assembly X-3913A)
X-1729	Safety shear pin
X-1740	Bushing; double faced idler gear. (Not sold separately; available only with assembly X-3906)
X-1742	Washer; oil stop
X-1743	Washer; oil stop retainer
X-1751	Oil retainer washer
X-1752	Washer; main bearing thrust
X-1753	Pin; main bearing thrust washer
X-1756	Oil tube. (Not sold separately; available only with assembly X-3914)
X-1759	Pin; drive gear to shaft
X-1930	Screw; safety key locking

WASHERS—PINS—SCREWS

Part No.	
P-230	Oil cup. (Not sold separately; available only with assembly X-3914)
P-1025	Screw; 4-40 x 3/8", flat head

MINOR ASSEMBLIES

Assy. No.	
X-3905	Main drive gear (external); includes parts X-1703, X-1742, X-1743, assembled
X-3906	Idler gear and bushing, double face; includes parts X-1702, X-1740, assembled
X-3907	Main drive gear assembly complete but less idler gear and shaft. Includes parts X-1751, P-1025, X-1704, X-1759, X-1705, X-1707A, X-1753, X-1752, X-1706, X-1930, X-1743, X-1742, X-1703, X-1729, assembled
X-3912	Drive shaft bearing assembly; includes parts X-1706, X-1752, X-1753, P-1025, assembled
X-3913A	Double faced idler gear shaft assembly; includes parts X-1710, X-1756, P-230, assembled
X-3914	Oil tube complete; includes parts X-1756 and P-230, assembled

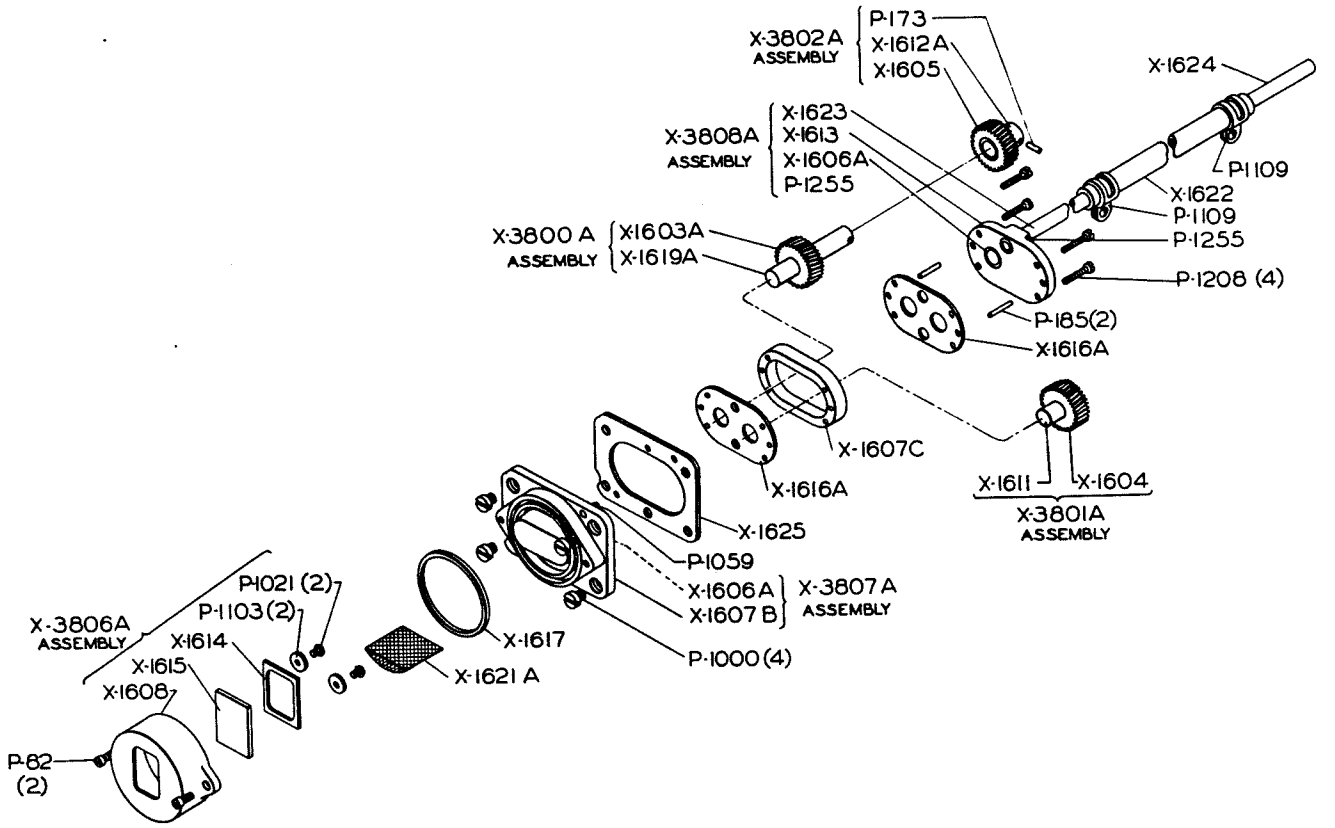


DIAGRAM NO. 10

OIL PUMP UNIT

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.	
X-1603A	Main shaft gear. (Not sold separately; available only with assembly X-3800A)
X-1604	Gear. (Not sold separately; available only with assembly X-3801A)
X-1605	Drive gear (Phenolic). (Not sold separately; available only with assembly X-3802A)
X-1606A	Bushings. (Not sold separately; available only with assemblies X-3803A and X-3807A)
X-1607B	Main pump casting. (Not sold separately; available only with assembly X-3807A)
X-1607C	Spacer
X-1608	Cover (external). (Also sold with assembly X-3806A)
X-1611	Shaft. (Not sold separately; available only with assembly X-3801A)
X-1612A	Hub for drive gear. (Not sold separately; available only with assembly X-3802A)
X-1613	Cover (internal). (Not sold separately; available only with assembly X-3808A)
X-1614	Gasket for sight glass
X-1615	Oil gauge sight glass
X-1616A	Gear, thrust plate
X-1617	Gasket for front cover
X-1619A	Main drive shaft. (Not sold separately; available only with assembly X-3800A)
X-1621A	Oil filter screen
X-1622	Hose for oil feed
X-1623	Lower oil tube section
X-1624	Upper oil tube section
X-1625	Gasket; pump to main frame

WASHERS—PINS—SCREWS

Part No.	
P-82	Screw; 8-32 x 3/8", fil. hd.
P-173	Pin; 5/32" x 1/2"
P-185	Pin; 1/8" x 3/4"
P-1000	Screw; 1/4-20 x 3/8", fil. hd.
P-1021	Screw; 6-32 x 1/4", French hd.
P-1059	Dowel; 3/16" x 1/2"
P-1103	Washer
P-1109	Hose clamp
P-1208	Screw; 6-32 x 7/8", fil. hd.
P-1255	Screw; 4-36 x 3/16", rd. hd.

MINOR ASSEMBLIES

Assy. No.	
X-3800A	Main shaft and gear; includes parts X-1619A, X-1603A, assembled
X-3801A	Second pump gear; includes parts X-1611, X-1604, assembled
X-3802A	Drive gear; includes parts X-1605, X-1612A, P-173
X-3806A	Front cover and sight glass; includes parts X-1608, X-1615, X-1614, P-1103, P-1021, assembled
X-3807A	Pump main body complete; includes parts X-1607B, X-1606A, assembled
X-3808A	Pump internal cover; includes parts X-1623, X-1613, X-1606A, P-1255, assembled
X-3811	Oil pump complete; includes all parts shown in Diagram No. 10

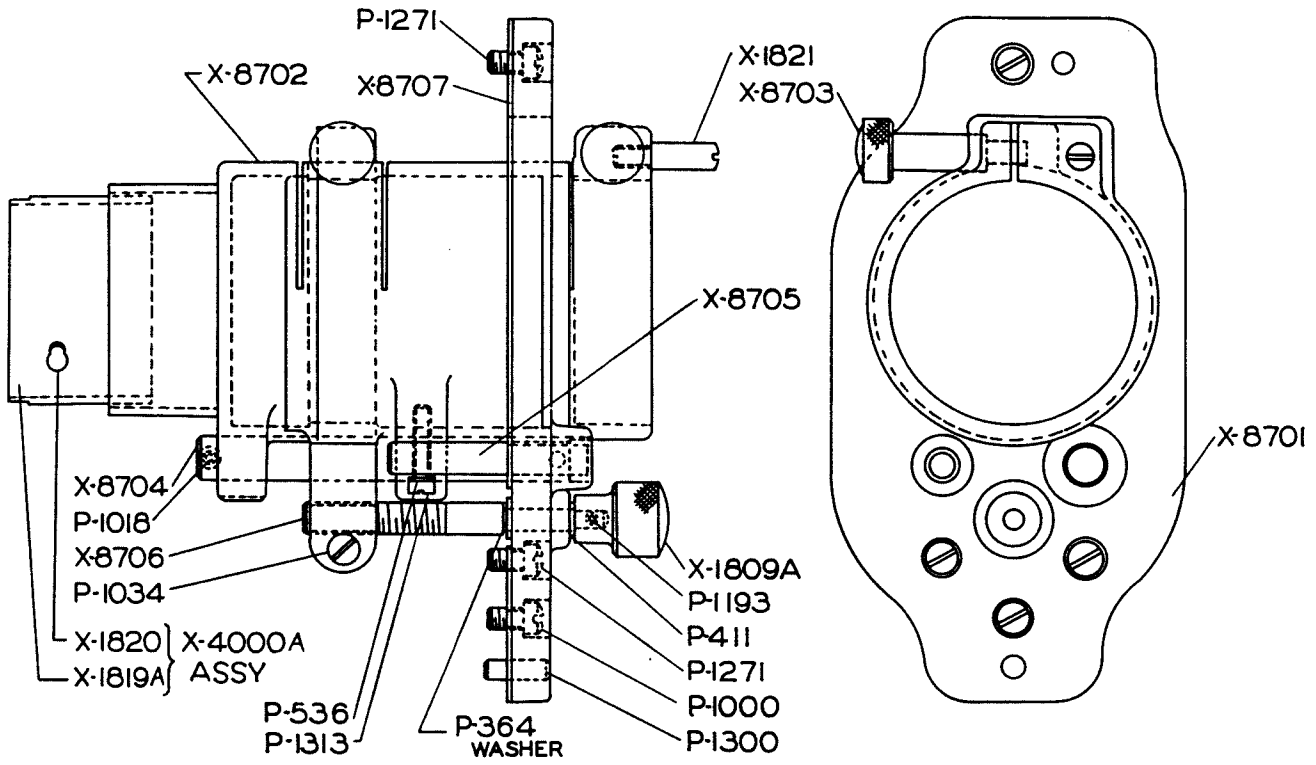


DIAGRAM NO. 11

LENS MOUNT ASSEMBLY

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.	
X-1809A	Knob; lens focusing.
X-1819A	Light sleeve. (Not sold separately; available only with assembly X-4000A)
X-1820	Knob; light sleeve. (Not sold separately; available only with assembly X-4000A)
X-1821	Pin; lens locating.
X-8701	Casting; lens mount support. (Not sold separately; available only with assembly X-8871)
X-8702	Lens mount sleeve casting.
X-8703	Screw; lens holding.
X-8704	Guide shaft, long. (Not sold separately; available only with assembly X-8871)
X-8705	Guide shaft, short. (Not sold separately; available only with assembly X-8871)
X-8706	Shaft; threaded focusing.
X-8707	Baffle; Massachusetts fire safety. (Required only in Massachusetts)

WASHERS—PINS—SCREWS

Part No.	
P-364	Washer.
P-411	Washer.
P-536	Lockwasher.
P-1000	Screw; ¼-20 x ⅜", fil. hd.
P-1018	Screw; 6-32 x ¼", fil. hd.
P-1034	Screw; 10-24 x ⅜", fil. hd.
P-1193	Screw; 6-40 x ⅛", set.
P-1271	Screw; ¼-20 x ⅝".
P-1300	Dowel pin.
P-1313	Screw; 10-24 x ⅞", fil. hd.

MINOR ASSEMBLIES

Assy. No.	
X-4000A	Split sleeve assembly for lens mount; complete with X-1819A and X-1820, assembled.
X-8870	Lens mount complete; includes all parts shown in Diagram No. 11.
X-8871	Lens mount support casting; complete with parts X-8701, X-8704 and X-8705, assembled.

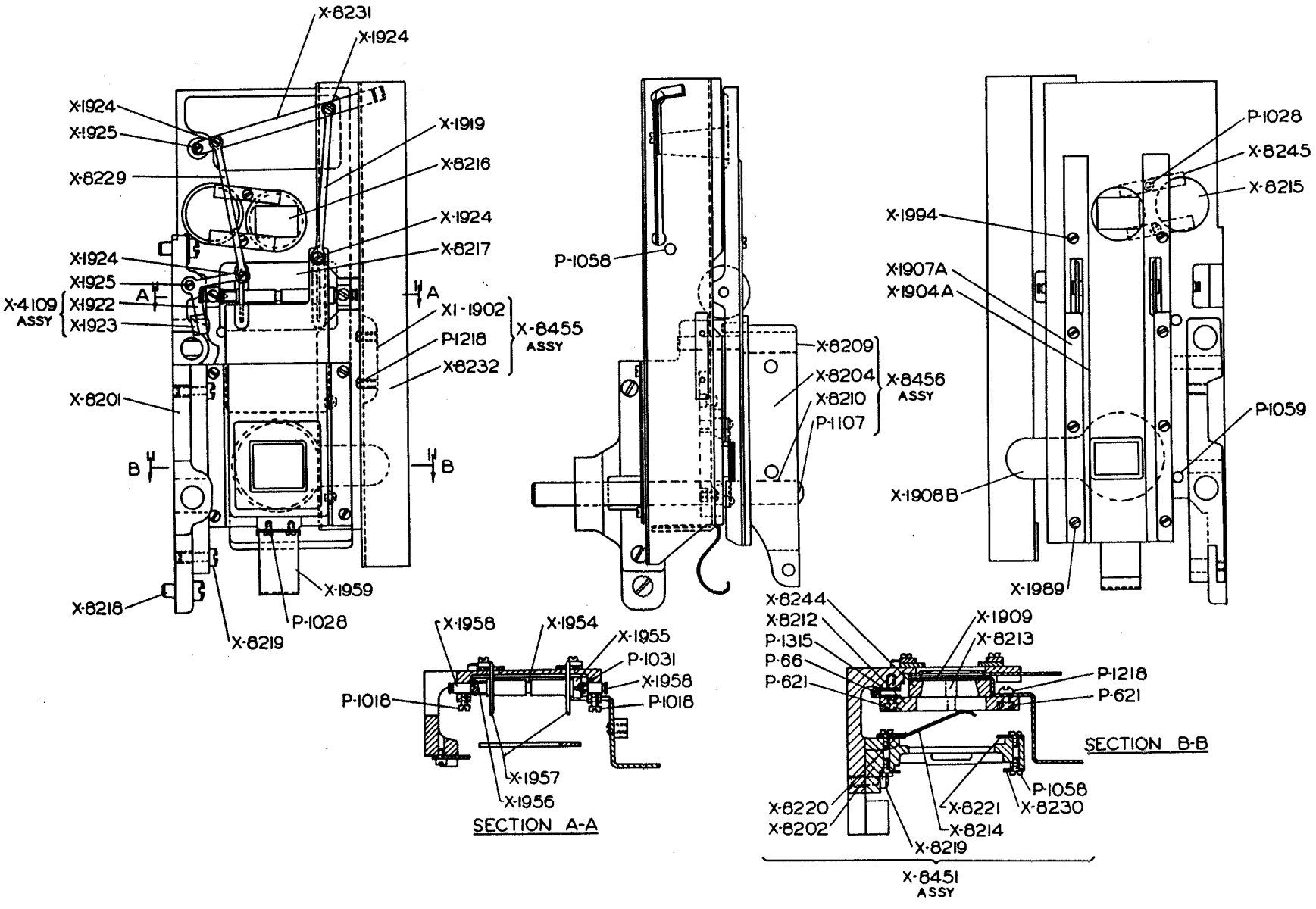


DIAGRAM NO. 12

FILM TRAP ASSEMBLY

BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.	
X-1904A	Film slide strip
X-1907A	Film guide strip
X-1908B	Aperture plate; removable
X-1909	Aperture plate; secondary. (Not sold separately; available only with assembly X-8460)
X-1919	Link; fire shutter
X-1922	Link; fire shutter angle. (Not sold separately; available only with assembly X-4109)
X-1923	Button; fire shutter angle link. (Not sold separately; available only with assembly X-4109)
X-1924	Screw; link connecting
X-1925	Screw; pivot
X-1954	Shaft; adjustable guide roller. (Available also with assembly X-4107)
X-1955	Collar; adjustable guide roller locating. (Available also with assembly X-4107)
X-1956	Spring; guide roller tension. (Available also with assembly X-4107)
X-1957	Roller; adjustable film guide. (Available also with assembly X-4107)
X-1958	Pin; lateral guide roller shaft pivot
X-1959	Film stripper
X-1989	Screw; film guide and track strip
X-1994	Screw; film guide strip
X1-1902	Handle; light shield. (Available also with assembly X-8455)
X-8201	Casting; film track. (Not sold separately; available only with assembly X-8457)
X-8202	Casting; fire shutter guide. (Available also with assembly X-8451)
X-8204	Casting; gate support. (Not sold separately; available only with assembly X-8456)
X-8209	Shaft; gate support, short. (Not sold separately; available only with assembly X-8456)
X-8210	Shaft; gate support, long. (Not sold separately; available only with assembly X-8456)
X-8212	Plate; aperture insulating, large. (Not sold separately; available only with assembly X-8460)
X-8213	Pin. (Not sold separately; available only with assembly X-8460)
X-8214	Spring
X-8215	Glass; pilot light
X-8216	Glass; framing aperture
X-8217	Fire shutter
X-8218	Screw; fire trap fastening
X-8219	Fastening screw
X-8220	Guide plate; fire shutter, L.H.
X-8221	Guide plate; fire shutter, R.H.
X-8229	Link; fire shutter lifting
X-8230	Guide strips; changeover shutter holding
X-8231	Link; intermediate
X-8232	Light shield. (Available also with assembly X-8455)
X-8244	Plate; aperture insulating, small. (Not sold separately; available only with assembly X-8460)
X-8245	Retainer; pilot light glass

WASHERS—PINS—SCREWS

Part No.	
P-66	Screw; 6-32 x ¼", flat head, machine
P-621	Nut; 6-32 x ¼", hex
P-1018	Screw; 6-32 x ¼", fil. hd., cap
P-1028	Screw; 4-40 x ¼", flat head
P-1031	Screw; 4-48 x ⅛", flat point set
P-1058	Dowel pin; ¼" x "½
P-1059	Dowel pin
P-1107	Bumper
P-1218	Screw; 6-32 x ¼", round head
P-1315	Hinge

MINOR ASSEMBLIES

Assy. No.	
X-4107	Lateral film guide roller assembly; includes parts X-1954, X-1955, X-1956, X-1957, P-1031, assembled
X-4109	Angle link assembly; includes parts X-1922, X-1923, assembled
X-8450	Film trap and casting assembly complete; includes all parts shown in Diagram No. 12 assembled, except X-8456 assembly
X-8451	Fire shutter housing assembly; includes parts X-1959, X-8202, X-8214, X-8219, X-8220, X-8221, X-8230, P-1028, assembled
X-8455	Light shield assembly; includes parts X1-1902, X-8232, P-1218, assembled
X-8456	Casting; gate support assembly; includes parts X-8204, X-8209, X-8210, P-1107, assembled
X-8457	Film trap casting complete; includes parts X-8201, X-8215, X-8216, X-8218, X-8229, X-8231, X-8245, X-4107, X-4109, X-1904A, X-1907A, X-1908B, X-1919, X-1924, X-1925, X-1958, X-1989, X-1994, P-66, P-1018, P-1059, assembled
X-8460	Aperture insulator; secondary aperture assembly; includes parts X-8212, X-8244, X-1909, X8213, assembled

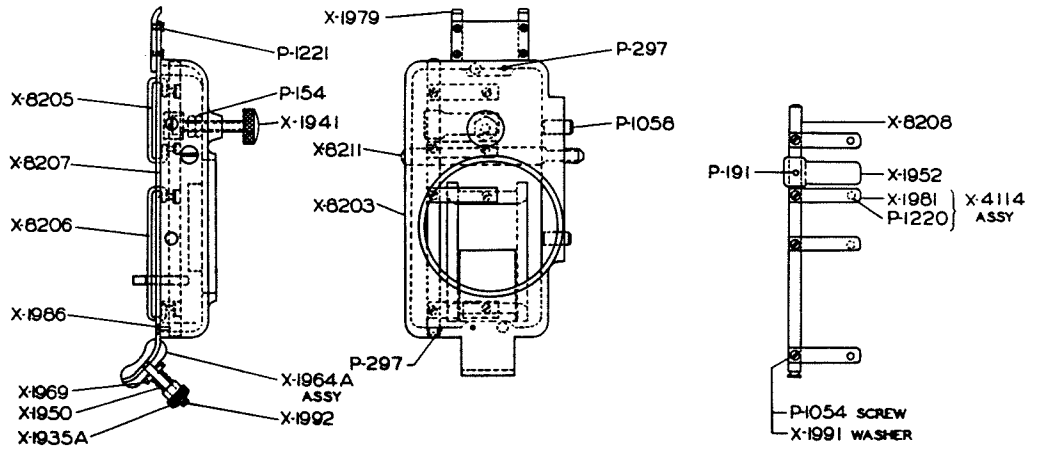


DIAGRAM NO. 13 GATE ASSEMBLY BRENKERT BX-60 AND BX-62 PROJECTORS

DETAIL PARTS

Part No.	
X-1935A	Nut; tension pad adjusting
X-1941	Screw; pad spring adjusting
X-1950	Spring; sprocket pad tension
X-1952	Pad; adjusting arm
X-1964A	Film pad; lower
X-1969	Washer; spring seat
X-1979	Guide; film pad
X-1981	Spring; film pad tension. (Not sold separately; available only with assembly X-4114)
X-1986	Screw; 6-32 x ¼, FILLISTER HEAD
X-1991	Spring washer
X-1992	Stud; intermittent film pad. (Not sold separately; available only with assembly X-8461)
X-8203	Gate casting. (Not sold separately; available only with assembly X-8453)
X-8205	Pad; film tension, upper
X-8206	Pad; film tension, lower
X-8207	Gate shoe. (Not sold separately; available only with assembly X-8461)
X-8208	Shaft; pad adjusting. (Available also with assembly X-8454)
X-8211	Screw; gate mounting

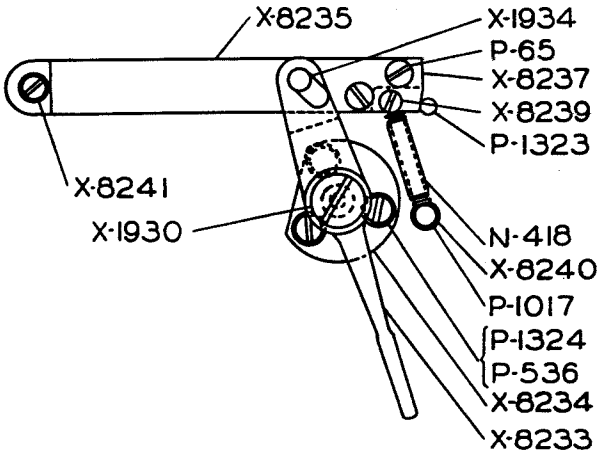
WASHERS—PINS—SCREWS

Part No.	
P-154	Check nut; 10-32
P-191	Groove pin; 1/16 x 3/8
P-297	Groove pin; 3/32 x 3/8
P-1054	Screw; 2-56 x 1/8, fil. hd.
P-1058	Pin; dowel
P-1220	Rivet
P-1221	Screw; 2-56 x 3/16, fil. hd.

MINOR ASSEMBLIES

Assy. No.	
X-4114	Spring assembly; includes part X-1981, P-1220, assembled
X-8452	Gate assembly complete; includes all parts shown in Diagram No. 13
X-8453	Gate casting with pressure screws, springs, and shaft assembly; includes parts X-8203, X-8211, X-1941, X-8454, P-1058, P-154, P-297, assembled
X-8454	Pressure spring and shaft assembly; includes parts X-8208, X-1952, X-4114, X-1991, P-191, P-1054, assembled
X-8461	Gate shoe stud assembly; includes parts X-8207, X-1992, assembled

DIAGRAM NO. 13A GATE LOCKING ASSEMBLY BRENKERT BX-60 AND BX-62 PROJECTORS



DETAIL PARTS

Part No.	
N-418	Spring
X-1930	Screw; gate lever retaining
X-1934	Screw; toggle link
X-8233	Gate lever
X-8234	Stud; gate operating lever
X-8235	Link; gate opening
X-8237	Plate; gate locking
X-8239	Screw; gate opening spring
X-8240	Bushing; gate opening spring
X-8241	Screw gate opening

WASHERS—PINS—SCREWS

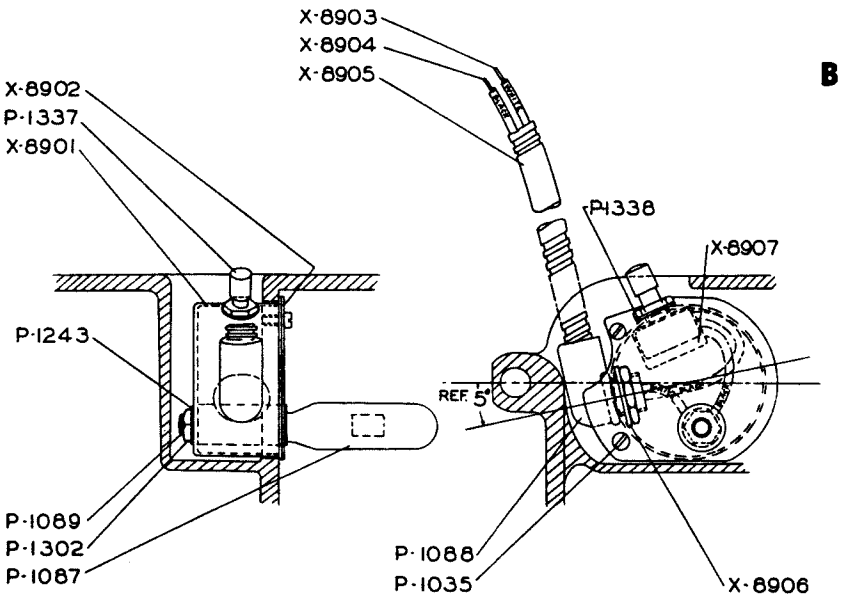
Part No.	
P-65	Screw; 6-32 x ¼, oval head
P-536	Washer, LOCK
P-1017	Screw; 6-32 x ⅜, binder head
P-1323	Pin; 3/16 x ¾, dowel
P-1324	Screw; 10-32 x ¾, socket head cap

MINOR ASSEMBLIES

Assy. No.	
X-8463	Gate locking assembly; includes all parts listed in Diagram No. 13A, assembled

DIAGRAM NO. 14

PILOT LIGHT ASSEMBLY
BRENKERT BX-60 AND BX-62 PROJECTORS



DETAIL PARTS

Part No.	
X-8901	Pilot light housing
X-8902	Housing cover
X-8903	Wire; white
X-8904	Wire; black
X-8905	Conduit; flexible
X-8906	Washer
X-8907	Insulator

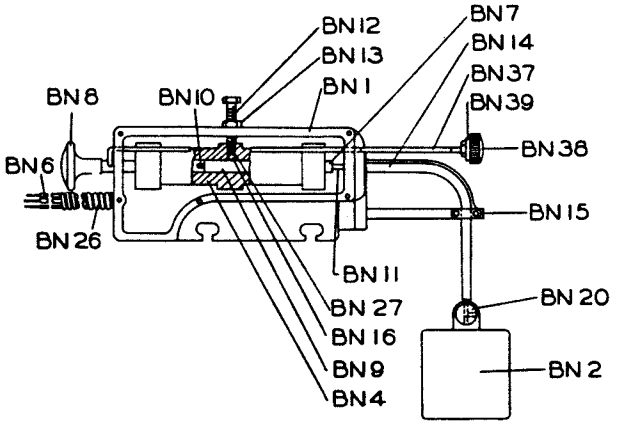
WASHERS—PINS—SCREWS

Part No.	
P-1035	Screw; 10-24 x ⅜", fil. hd.
P-1087	Pilot light, 15 WATT
P-1088	Connector, BX, ANGLE
P-1089	Socket; Bryant No. 328
P-1243	Washer, 5/16", shakeproof
P-1302	Nut; 5/16" x 27
P-1337	Switch
P-1338	Washer; ½" shakeproof

MI-14313

DIAGRAM NO. 14A

BX-30S PICTURE CHANGEOVER
BRENKERT BX-60 AND BX-62 PROJECTORS



DETAIL PARTS

Part No.	
BN-1	Main casting
BN-2	Shutter
BN4-60	60 cycle coil
BN4-50	50 cycle coil
BN4-25	25 cycle coil
BN-5	D. C. coil
BN-6	Three wire cable in conduit
BN-7	Armature complete with flexible shaft and knob
BN-8	Armature knob
BN-9	Steel armature section
BN-10	Brass armature section
BN-11	Flexible shaft with connector
BN-12	Armature speed adjustment screw
BN-13	Armature speed adjustment screw nut
BN-14	Flexible shaft tube
BN-15	Flexible shaft tube clamp
BN-16	Armature speed adjustment screw ball
BN-19	Mounting bracket (not illustrated)
BN-19a	Inside bracket (not illustrated)
BN-20	Shutter pivot with set screws
BN-21	Name plate (not illustrated)
BN-26	Conduit only
BN-27	Armature speed adjustment screw spring
BN-36	Thermostat (not illustrated)
BN-37	Right hand, hand rod
BN-38	Right hand, hand rod knob
BN-39	Nut; hand rod knob locking

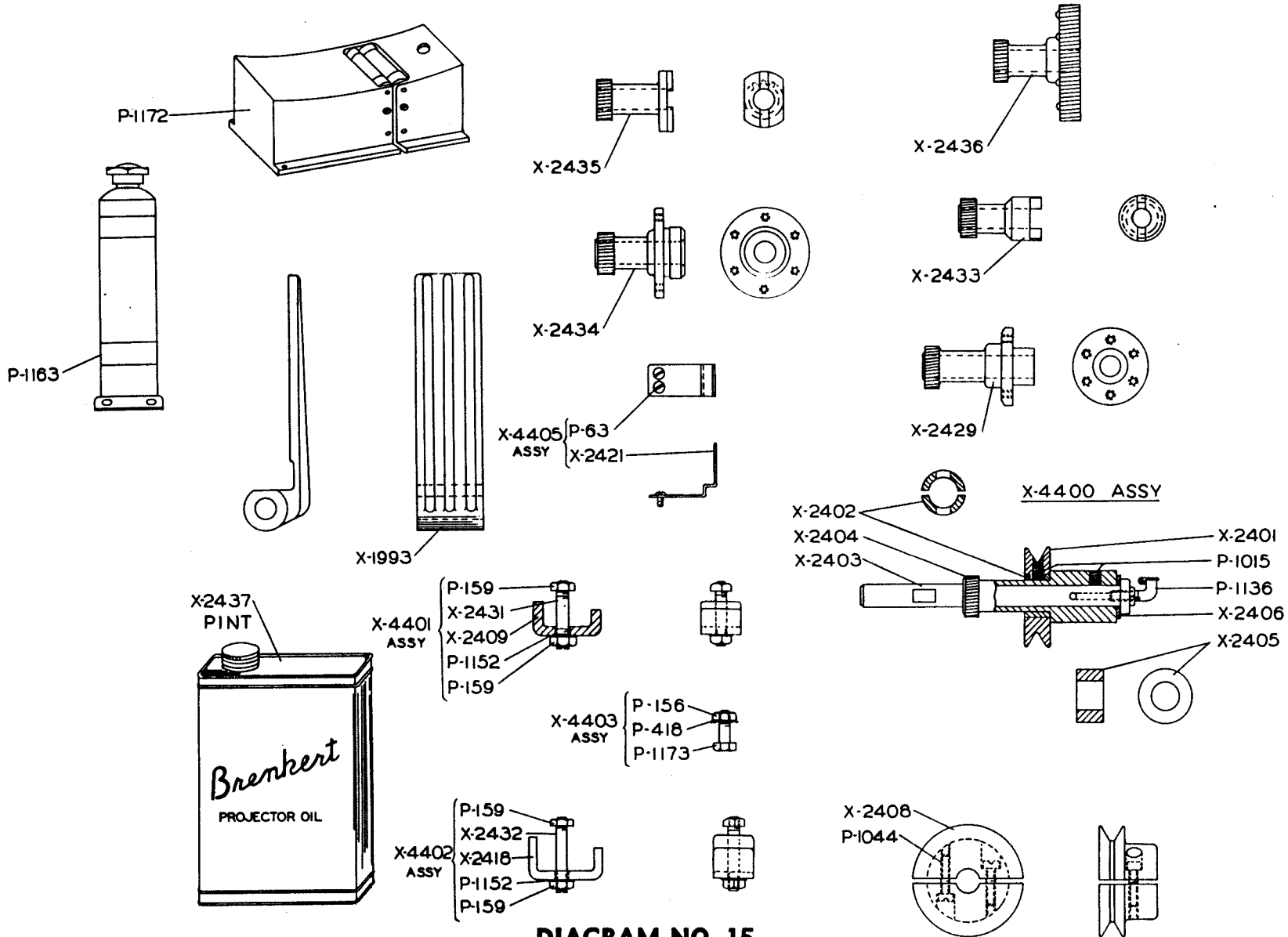


DIAGRAM NO. 15

MISCELLANEOUS ACCESSORIES

BRENKERT BX-60 AND BX-62 PROJECTORS

17-TOOTH DRIVE GEARS FOR RCA AND ERPI SOUNDHEADS

Part No.	
X-2404	WE-209, WE-211 soundheads. (Also available from RCA as stock No. 29368)
X-2434	RCA soundheads PS-22, PS-24, MI-1040, MI-1050, MI-9001, MI-9030, MI-9050. (Also available from RCA as stock No. 28666)
X-2429	WE-7400 soundhead
X-2433	WE Universal soundhead. (Also available from RCA as stock No. 29369)
X-2435	WE-208A soundhead. (Also available from RCA as stock No. 29371)
X-2436	WE-206A soundhead. (Also available from RCA as stock No. 29370)

PULLEYS REQUIRED ON WE-206A, 208A SOUNDHEADS FOR DRIVING TAKEUP REEL WHEN USED WITH BRENKERT PROJECTORS

Part No.	
X-2408	Split pulley
P-1044	Clamp screw

ASSEMBLY

Part No.	
X-4406	Pulleys and screws complete, includes parts X-2408 and P-1044 assembled.

DRIVE GEAR AND TAKEUP PULLEY FOR WE-209/211 SOUNDHEADS

Part No.	
X-2401	Pulley; takeup reel drive
X-2402	Pulley bushing
X-2403	Shaft for drive gear
X-2404	17-tooth gear with long hub. (Also available from RCA as stock No. 29368)
X-2405	Spacing collar for lower magazine shaft
X-2406	Thrust washer
P-1015	Set screw; headless $\frac{5}{16}$ x 20
P-1136	Oil cup

ASSEMBLY

Part No.	
X-4400	Drive gear, shaft, pulley, and spacer assembly required on WE-209, WE-211 soundheads when used with Brenkert projectors; includes all parts listed above

THIRD POINT MOUNTING ATTACHMENTS

RCA SOUNDHEADS MI-1040, MI-1050, MI-9001

Part No.	
X-2409	Clamp
X-2431	Bolt
P-159	Nut
P-1152	Lockwasher

ASSEMBLY

Part No.	
X-4401	Clamp and bolt assembly for third point mounting attachment for above types of soundheads

RCA SOUNDHEADS PS-24

Part No.	
X-2418	Clamp
X-2432	Bolt
P-159	Nut
P-1152	Lockwasher

ASSEMBLY

Part No.	
X-4402	Clamp and bolt assembly for third point mounting attachment for RCA PS-24 soundhead

RCA SOUNDHEADS MI-9030/9050

Part No.	
P-156	Nut
P-418	Lockwasher
P-1173	Bolt; $\frac{1}{4}$ x $\frac{3}{4}$

ASSEMBLIES

Part No.	
X-4403	Bolt and nut for third point mounting attachment for RCA MI-9030/9050 types of soundheads

KIT TO CONVERT FROM BX-60 SINGLE-SHUTTER TO BX-62 DOUBLE-SHUTTER PROJECTION

Part No.	
X-7181	Double shutter conversion kit; includes parts X-7004, X-7012, X-7003, P-375, X-7017, P-419, X-7018, P-93, X-7613, X-1429, X-1421, P-1035, P-536, X-1448, P-425, X-7617, X-7604, X-7610. These parts shown in diagrams No. 1 and No. 6

TOOLS AND OPERATING SUPPLIES

Part No.	
X-1993	Tool for aligning film guide strips of trap unit
X-2437	Lubricating oil for Brenkert projectors (1 pint)
P-1163	Sealing compound for sealing assemblies to main frame

MASSACHUSETTS REQUIREMENTS

Part No.	
P-63	Screw, OVAL HEAD, 6-32 x $\frac{3}{16}$"
P-1172	Film valve assembly
X-2421	Cover for slot of film valve
X-8707	Lens mount fire safety baffle; shown in diagram No. 11

ASSEMBLY

Part No.	
X-4405	Cover for slot of film valve and attaching screws; includes parts X-2421, P-63

THEATRE PROJECTOR AND LAMP PARTS
(Brenkert Type)

CROSS REFERENCE GUIDE

FROM OLD PART NUMBERS TO NEW RCA STOCK NUMBERS WHICH WOLK WILL MAINTAIN

IMPORTANT: This cross reference provides a means for determining the new RCA stock numbers currently used to replace old part numbers having alphabetical prefixes. To expedite the servicing of your orders ALWAYS USE THE NEW RCA STOCK NUMBER and description as shown in the following listings. Parts that are not furnished separately are so indicated by "NFS" in the description column.

OLD PART NUMBER	NEW RCA STOCK NUMBER	DESCRIPTION
A811	200701	HOLDER
A830	200711	INSULATOR
A833	200360	INSULATOR
A867	200726	ROLLER
A875	200727	JAW
A891	200728	GEAR & SHAFT
A899-2	200730	STRIP DISCONTINUED
A899-3	200732	BLOCK
A903	200734	GEAR
A905	200735	BEARING
A1047	200797	PLATE
A1063	200816	ROLLER
A1064	200818	ROLLER
A1072	200822	STRIP DISCONTINUED
A1073	201693	PLATE
A1074	200825	STRIP
A1079	200830	WASHER
A1086	200834	SCREW
A1101	200841	GEAR
A1106	200850	POTENTIOMETR DISCONTINUED
A1180	200884	BRACKET USE 201931 CLAMP A2310
A1190	200889	PLATE
A1468	201637	PLUG DISCONTINUED
A2024	201847	BUSS
A2025	201849	USE 201859 A2039 BAFFLE ASSEM
A2030	201850	STUD
A2031	201851	BAFFLE
A2032	201853	SHAFT
A2033	201854	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
A2034	201855	ROLLER
A2035	201856	COVER
A2037	201857	ASSEM DISC ORDER FOLLOWING COMPONENTS AS REQUIRED 201921 A 2278 JAW 201922 A 2279 RIBBON 201923 A 2280 PLATE 200338 SCREW
A2038	201858	BRACKET
A2039	201859	SHIELD
A2046	201862	SHAFT
A2059	201864	ASSEM DISC REFER TO INSTRUCTION BOOK TO ORDER INDIVIDUAL PARTS
A2073	201866	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
A2133	201867	BOLT
A2134	201868	COLLAR
A2153	201869	MONOGRAM
A2160	201870	MIRROR
A2161	201871	RING
A2169	201875	SWITCH
A2200	201876	SHAFT
A2203	201877	STUD
A2207	201878	GEAR
A2210	201879	SHAFT NFS AVAILABLE ONLY WITH 201851 BAFFLE ASSEM A2031
A2211	201880	SHAFT
A2212	201881	PIN
A2214	201882	WASHER
A2216	201883	SCREW
A2217	201884	SHAFT
A2218	201885	ROLLER
A2221	201886	CAM
A2222	201887	CAM
A2225	201322	PLATE NFS AVAILABLE ONLY WITH 201851 BAFFLE ASSEM A2031
A2226	201888	STUD
A2230	201889	INSULATOR
A2233	201892	COVER
A2235	201894	FRAME PRICE ON REQUEST
A2241	201895	RETAINER
A2243	201896	LEVER
A2246	201897	SPRING
A2248	201898	SPACER
A2249	201899	ROLLER
A2250	201900	GEAR
A2251	201901	GEAR
A2252	201902	INSULATOR
A2253	201903	SHAFT
A2254	201904	GEAR
A2255	201905	GEAR
A2256	201906	GEAR
A2257	201907	SCREW
A2259	201908	SCREEN
A2260	201909	SEAT
A2261	201910	INSULATOR
A2262	201911	PLATE
A2263	201912	CLUTCH
A2264	201913	WASHER
A2265	201914	INSULATOR
A2267	201915	KEY
A2273	201916	BLOCK
A2274	201917	INSULATOR
A2275	201918	WASHER
A2276	201919	KNOB NFS AVAILABLE ONLY WITH 200594 KNOB ASSEM N391
A2277	201920	BUSHING NFS AVAILABLE ONLY WITH 200594 KNOB ASSEM N391
A2278	201921	JAW
A2279	201922	RIBBON
A2280	201923	WASHER
A2281	201924	SHIELD
A2300	201925	INSULATOR
A2301	201926	NUT
A2302	201927	BUSHING
A2304	201928	PIN
A2305	201929	ROLLER
A2309	201930	SCREW
A2310	201931	CLAMP
A2311	201932	NUT
A2312	201933	BLOCK
A2313	201386	RIBBON
A2314	201934	INSULATOR
A2315	201935	RIBBON
A2316	201936	RIBBON
A2317	201937	INSULATOR
A2318	201938	INSULATOR
A2319	201939	WRENCH
A2320	201940	GUARD
A2321	201941	JAW
A2325	201942	SCREW
A2326	201943	CASTING
A2327	201944	CASTING
A2328	201945	GEAR
A2333	201946	COVER
A2334	201947	PIN NFS AVAILABLE ONLY WITH 201862 SHAFT ASSEM A2046
A2336	201948	SCREW
A2337	201949	SPACER
A2339	201950	WASHER
A2343	201951	PLATE
A2346	201952	SCREW
A2347	201953	SHIELD
A2424	201961	RETAINER
A2427	201962	HOLDER
A2429	201963	DOWSER
A2501	201968	MOTOR
A2502	201969	MOTOR
A2516	201970	PIN
A2519	201971	SHAFT
A2533	201972	LEVER
A2540	201973	LINK
A2545	201974	CABLE
A2546	201975	CABLE
A2557	201976	GEAR
A2560	201977	CLUTCH
A2562	201978	COLLAR
A2563	201979	SLEEVE
A2565	201980	CLUTCH
A2566	201981	CAM
A2568	201982	SPRING
A2569	201983	SPRING
A2570	201984	WORM
A2573	201985	PIN
A2579	201986	PIN NFS AVAILABLE ONLY WITH 200594 KNOB ASSEM N391
A2581	201987	KNOB NFS AVAILABLE ONLY WITH 200594 KNOB ASSEM N391
A2624	201988	GEAR
F727	200674	MIRROR
H1726	201691	LENS
H1801	201711	POTENTIOMETR DISCONTINU
H1802	201713	POTENTIOMETR DISCONTINU
H1820	201726	ROTOR DISCONTINUED
N200	200200	FRAME
N201	200059	MOTOR
N202	200230	GEAR
N203	200237	SHAFT
N204	200208	BUSHING
N205	200219	WASHER
N206	200215	GEAR
N207	200501	GEAR
N208	200502	SLEEVE
N209	200067	WASHER
N210	200212	SPRING
N211	200211	COLLAR
N212	200217	CLUTCH
N213	200210	SHAFT
N214	200213	COLLAR
N216	200073	DISC
N217	200201	ROLLER
N218	200075	SHAFT
N219	200229	BUSHING
N220	200214	LEVER
N221	200218	PIN
N222B	200203	SPRING
N223	200226	OSCILLATOR
N224	200236	WEDGE
N225	200233	ROLLER

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OLD PART NUMBER	NEW RCA STOCK NUMBER	DESCRIPTION
N226	200234	SCREW
N227	200235	STUD
N229	200225	WASHER
N230	200227	WASHER
N231	200228	SPRING
N233	200220	SPRING
N234	200224	SLEEVE
N234A	200084	SLEEVE NFS AVAILABLE ONLY WITH 200224 SLEEVE ASSEM N234
N234B	200085	BUSHING NFS AVAILABLE ONLY WITH 200224 SLEEVE ASSEM N234
N235	200223	DISC
N236	200222	FACING
N237	200221	GEAR
N239	200231	SCREW
N286	200216	ASSEM DISC ORDER FOLLOWING COMPONENTS AS REQUIRED 200501 N 207 GEAR 200502 N 208 SLEEVE 201373 SCREW
N290	200202	ROLLER
N291	200171	WHEEL
N292	200097	KNOB
N293	200099	DISCONTINUED
N294	200238	END BELL
N295	200206	MOTOR AND CONN BLK ASSEM DISCONTINUED USE 200059 MOTOR ONLY N201
N297	200239	MOTOR
N300	200158	BASE
N303	200167	COLLAR
N305	200566	SCREW
N305A	200168	SCREW
N305B	200161	SCREW
N306	200169	SPRING
N308	200164	SPRING
N311	200187	FRAME
N324	200570	WHEEL
N333	200173	GEAR
N335	200179	BUSHING
N338	200189	SCREW
N339	200177	BASE
N340	200185	INSULATOR
N341	200572	TUBING
N342	200183	WASHER
N345	200176	SPRING
N346	200181	JAW
N347	200182	CLAMP
N348	200157	PIN
N349	200180	GUIDE
N350	200178	INSULATOR
N351	200575	SCREW NFS AVAILABLE ONLY WITH 200154 SCREW ASSEM N392
N352	200576	KNOB NFS AVAILABLE ONLY WITH 200154 SCREW ASSEM N392
N353A	200578	HUB NFS AVAILABLE ONLY WITH 200154 SCREW ASSEM N392
N355	200151	SCALE
N358	200156	SWIVEL
N361	200464	PLATE
N362	200152	COLLAR
N364	200184	INSULATOR
N372	200584	SCREW NFS AVAILABLE ONLY WITH 200168 SCREW ASSEM N305A
N373	200586	SCREW NFS AVAILABLE ONLY WITH 200161 SCREW ASSEM N305B
N374	200587	BUSHING NFS AVAILABLE ONLY WITH 200161 SCREW ASSEM N305B OR 200168 SCREW ASSEM N305A
N391	200594	KNOB
N392	200154	SCREW
N394	200595	JAW
N397	200188	JAW
N400	200596	BASE
N401	200316	LEVER
N402	200309	SPRING
N402A	200257	SPRING
N403	200317	SHAFT
N404	200318	HANDLE
N405	200602	ARROW
N408	200251	SCREW
N409	200606	SHAFT
N410	200311	SUPPORT
N411	200315	PIN
N415	200322	PLATE
N418	200310	SPRING
N420	200314	SWIVEL
N421	200301	JAW
N422	200320	INSULATOR
N425	200300	CLAMP
N426	200302	ROD
N427	200303	WEDGE
N428	200319	SCREW NFS AVAILABLE ONLY WITH 200624 KNOB AND SCREW ASSEM N490
N429	200611	KNOB NFS AVAILABLE ONLY WITH 200304 KNOB ASSEM
N430	200612	HUB NFS AVAILABLE ONLY WITH 200304 KNOB ASSEM
N433	200332	SUPPORT USE 200613 SUPPORT N433
N434	200614	ROD
N436	200328	INSULATOR
N439	200345	BASE
N443	200263	HANDLE
N445	200616	FORK
N446	200617	PIN
N448	200252	COLLAR
N449	200256	SLEEVE
N450	200619	SPRING
N450A	200620	SPRING
N452	200255	BUSHING
N490	200624	KNOB
N491	200323	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
N492	200625	BASE
N493	200326	GUIDE
N494	200325	GUIDE
N495	200327	GUIDE
N496	200626	FORK
N500	200350	MIRROR
N500A	200351	MIRROR
N500B	200627	MIRROR
N502	200384	SPRING
N507	200386	CLIP
N508	200391	SCREW
N510	200389	SPRING
N511	200388	BOLT
N513	200628	SHAFT
N515	200629	BUSHING
N519	200631	NUT
N591	200650	HANDLE
N601	200381	DOWSER
N604	200375	PIN
N607	200373	LEVER
N616	200370	ROD
N621	200363	ARM
N622	200361	ARM
N624	200357	WASHER
N627	200362	TUBE
N631	200364	SHIELD
N632	200372	STUD
N633	200380	SPRING
N634	200355	SPRING
N637	200253	WASHER
N638	200359	USE 200364 N 631
N690	200395	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
N691	200396	SHIELD DISCONTINUED
N705	200666	PIN
N706	200111	CLIP
N707	200667	PIN
N712A	200109	GLASS
N713	200108	FRAME
N714	200101	LATCH
N716	200668	KNOB
N717	200103	HANDLE
N718	200100	STUD
N719	200104	NUT
N720	200669	CHIMNEY
N721	200670	DAMPER
N722	200671	SHAFT
N724	200672	HANDLE
N725	200564	GLASS
N726	200673	RING
N728	200675	CASTING
N730	200676	PIN
N734	200677	CASTING
N735	200678	SCREW
N736	200679	SPACER
N737	200680	SPRING
N750	200682	KNOB
N751	200683	BUSHING
N753	200462	PLATE
N755	200463	SCREW
N760	200684	COVER
N761	200685	TRAY
N774	200686	BLOCK
N777	200687	HOLDER
N778	200688	STUD
N779	200689	SCREW
N781	200690	DISC
N782	200691	RING
N795	200692	CASTING
N796	200693	NUT
N797	200694	CONE AND SCREWS DISCONTINUED USE 201212 CONE ONLY N7860
N798	200695	CONE
N801	200696	BUSHING
N802	200697	NUT
N809	200699	DISCONTINUED
N810	200700	TERMINAL
N812	200207	MICA
N815	200702	PLATE
N817	200704	POST
N818A	200705	POST
N818B	200706	POST
N821	200707	SOCKET
N822	200708	WIRE
N823	200709	SWITCH
N824	200710	PLATE USE 200124 STOP N1007
N830	200469	CABLE
N830A	200712	LUG NFS AVAILABLE ONLY WITH 200715 CABLE ASSEM N832C OR 200717 CABLE ASSEM N833
N832	200713	CABLE
N832B	200714	WIRE NFS AVAILABLE ONLY WITH 200715 CABLE ASSEM N832C
N832C	200715	CABLE
N833	200717	CABLE
N833A	200716	CABLE NFS AVAILABLE ONLY WITH 200717 CABLE ASSEM N833
N833B	200718	CABLE
N834	200452	USE 13535
N835	200451	METER
N836	200719	SHUNT
N837	200450	INSULATOR
N840	200312	CLIP
N856A	200721	CORE NFS AVAILABLE ONLY WITH 200474 MAGNET ASSEM N858
N858	200474	MAGNET
N859	200722	INSULATOR NFS AVAILABLE ONLY WITH 200474 MAGNET ASSEM N858
N861	200723	CORE
N892	200729	WIRE
N893	200455	RESISTOR
N1007	200124	STOP
N1008	200126	STOP
N7360	201185	TUBE
N7860	201212	NOSE
N7860A	201213	NOSE
N7900	200121	DOOR
N7961	201214	KNOB
N7971	201215	HOLDER
N7980	201217	FRAME
N7981	201218	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
N7990	201219	VISOR
P60	202106	SCREW
P63	202111	SCREW
P65	202145	SCREW
P66	200000	SCREW
P68	200001	SCREW
P70	200002	SCREW
P72	200003	SCREW
P73	202171	SCREW
P74	200004	SCREW
P75	200005	SCREW
P77	202173	SCREW
P78	200006	SCREW
P79	202167	SCREW
P80	202136	SCREW
P81	200007	SCREW
P82	200008	SCREW
P83	200009	SCREW
P84	200010	SCREW
P85	200011	SCREW
P86	200012	SCREW
P87	200013	SCREW
P88	202120	SCREW
P94	202176	SCREW
P95	200014	SCREW
P97	202133	SCREW
P100	200016	SCREW
P102	202137	SCREW
P106	202157	SCREW
P107	202110	SCREW
P108	201381	SCREW
P110	200025	SCREW

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OLD PART NUMBER	NEW RCA STOCK NUMBER	DESCRIPTION
P112	202151	SCREW
P117	202117	SCREW
P118	200033	SCREW
P120	202156	SCREW
P125	200035	SCREW
P131	200040	SCREW
P133	200041	SCREW
P134	202158	SCREW
P135	202102	SCREW
P138	202149	SCREW
P139	200042	SCREW
P152	202141	NUT
P153	202170	NUT
P154	202130	NUT
P155	202116	NUT
P156	202148	NUT
P157	202178	NUT
P158	200049	NUT
P159	200159	NUT
P160	200050	NUT
P161	202174	NUT
P162	202180	NUT
P168	200052	NUT
P170	202168	PIN
P172	202163	PIN
P173	200053	PIN
P176	202121	PIN
P177	200054	PIN
P179	202175	PIN
P180	202125	PIN
P181	202181	PIN
P182	200055	PIN
P184	202152	PIN
P185	202105	PIN
P186	202100	PIN
P188	200056	PIN
P189	202112	PIN
P190	202128	PIN
P191	200057	PIN
P192	200058	PIN
P207	200066	WASHER
P209	200068	WASHER
P212	200070	BALL
P215	200071	WASHER
P216	202132	WASHER
P217	200074	WASHER
P218	200076	TUBING
P219	202109	BUSHING
P220	202154	BUSHING
P222	200079	TUBING
P228	202122	OILER
P230	200082	OILER
P231	202118	OILER
P235	200313	SCREW
P236	202177	SCREW
P243	202153	WASHER
P244	202108	WASHER
P246	200086	WASHER
P247	200087	WASHER
P257	200088	LENS
P258	200089	LENS
P264	202114	PIN
P271	202179	PIN
P284	200093	NUT
P287	202134	BUSHING
P292	200098	BRUSH
P297	200565	PIN
P319	200568	SCREW
P323	200569	CONTACT
P333	200571	RETAINER
P344	200573	SCREW
P345	202107	SCREW
P346	202129	WASHER
P347	200574	WASHER
P352	200577	SCREW
P353	202123	WASHER
P354	200579	SCREW
P356	200581	WASHER
P357	202155	WASHER
P364	200582	WASHER
P365	200583	WASHER
P369	202135	FUSE
P371	202147	SCREW
P372	200585	SCREW
P376	200589	NUT
P379	200591	NUT
P381	200592	SCREW
P400	202182	COIL
P403	202185	END BELL
P404	200600	COVER
P405	202186	BRUSH
P406	202187	BRUSH
P407	202188	CUP
P408	202189	ARMATURE
P408A	200605	ARMATURE
P411	202124	WASHER
P416	200607	SCREW
P419	201385	SCREW
P434	200615	NUT
P449	200618	DECAL
P450	200621	SCREW
P469	202160	WASHER
P477	202169	SCREW
P483	200623	NUT
P515	200630	RESISTOR
P519	200632	SWITCH
P530	200637	RIVET NFS
P536	200638	LOCK WASHER
P550	200641	WIRE NFS
P558	200643	LENS
P559	200644	LENS
P568	200645	SCREW
P574	200646	CATCH
P575	200648	CATCH
P588	200649	SCREW
P593	200651	BRUSH
P603	202140	INSULATOR
P604	200655	CONNECTOR
P614	200658	PIN
P618	200659	BALL
P619	200660	BRUSH
P621	200661	NUT
P625	200731	SCREW
P630	200663	BRUSH
P1000	200736	SCREW
P1002	200737	SCREW
P1003	200738	SCREW DISCONTINUED
P1004	200740	SCREW
P1005	200742	SCREW
P1006	200744	SCREW
P1007	200746	SCREW
P1008	200748	SCREW
P1009	200749	SCREW
P1010	200750	SCREW
P1011	200752	SCREW
P1012	200754	SCREW
P1013	200756	SCREW
P1015	202166	SCREW
P1017	200758	SCREW
P1018	200760	SCREW
P1020	200761	SCREW
P1021	200764	SCREW
P1022	200766	SCREW
P1023	200768	SCREW
P1024	200769	SCREW
P1025	200771	SCREW
P1026	200773	SCREW
P1027	200775	SCREW
P1028	200777	SCREW
P1029	200779	SCREW
P1030	200781	SCREW
P1031	200783	SCREW
P1032	200784	SCREW
P1033	200786	SCREW
P1034	200787	SCREW
P1035	200788	SCREW
P1036	200790	SCREW
P1038	200792	SCREW
P1040	200794	SCREW
P1041	200795	SCREW
P1042	200796	SCREW
P1052	200800	SCREW
P1053	200802	SCREW
P1054	201379	SCREW
P1055	200805	SCREW
P1058	200808	PIN
P1059	200810	PIN
P1060	200812	PIN
P1061	200813	PIN
P1067	200820	PIN
P1071	200821	PIN
P1072	200823	PIN
P1073	200824	PIN
P1075	200826	USE 201710 X 1759
P1076	200827	PIN
P1077	200828	PIN
P1078	200829	PIN
P1080	200831	KEY
P1081	200832	PIN
P1082	200833	WASHER
P1087	200835	BULB
P1088	200836	CONNECTOR
P1089	200837	SOCKET
P1091	200838	SWITCH
P1100	200839	CATCH
P1100A	200840	CATCH
P1102	200844	OIL CUP
P1103	200846	WASHER
P1104	200849	PLUG
P1106	200851	STOP
P1107	200852	BUMPER
P1109	200853	CLAMP
P1116	200855	WASHER
P1120	200857	BALL
P1126	200859	ANTISHORT DISCONTINUED
P1152	200871	WASHER
P1154	200872	SCREW
P1160	200874	PIN
P1163	200875	SEALER
P1166	200876	DISCONTINUED
P1172	200879	VALVE
P1173	200880	SCREW
P1188	200888	SCREW
P1193	200890	SCREW
P1194	200891	SCREW
P1195	200893	SCREW
P1199	200896	WASHER
P1207	200922	WASHER
P1208	200924	SCREW
P1215	200928	SCREW
P1216	200930	SCREW
P1218	200933	SCREW
P1220	200936	PIN
P1221	200938	SCREW
P1225	200943	PLUG
P1229	200946	WASHER
P1230	200947	SCREW
P1239	200952	PIN
P1241	200955	PIN
P1244	200956	SCREW
P1249	200958	SEAL
P1250	200959	CHANGEOVER
P1251	200960	SWITCH
P1255	200961	SCREW
P1262	200962	SWITCH
P1271	200963	SCREW
P1272	200964	RIVET NFS
P1273	200965	WASHER
P1275	200966	SCREW
P1286	200967	WASHER
P1289	200968	CONNECTOR
P1290	200969	SCREW
P1295	200970	SCREW
P1296	200971	PIN
P1301	200972	SCREW
P1304	200973	SEAL
P1307	200974	PLUG
P1308	200975	FERRULE
P1309	200976	BUTTON
P1312	200977	CUP
P1313	200978	SCREW
P1314	200979	PLUG
P1315	200980	HINGE
P1316	200981	SCREW
P1319	200982	PLUG
P1323	200983	PIN
P1324	200984	SCREW
P1325	200985	PIN
P1327	200986	PIN
P1328	200987	SCREW
P1335	202190	BEARING
P1337	200988	SWITCH
P1339	200989	CONDUIT DISCONTINUED
P1341	200990	SCREW
P1344	200991	BULB
R105	200285	CUP
R203A	200337	JAW
R211A	200335	PIN
R282	200090	ROD ASSY
R285	200096	JAW
R326	200113	MIRROR
R356	200112	HOLDER
R357	200114	RETAINER
R388	200593	LENS SYSTEM DISCONTINUED
S283	200092	CLAMP
S401	200598	REFLECTOR
X1003	200739	GASKET
X1004	200741	DOOR
X1005	200743	PANEL
X1006	200745	HOUSING
X1007	200747	HOUSING
X1010	200751	NUT
X1011	200753	NUT

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OLD PART NUMBER	NEW RCA STOCK NUMBER	DESCRIPTION
X1012	200755	BAFFLE
X1016	200757	PLATE
X1017	200759	NUT
X1020	200762	LINK
X1020A	200763	LINK
X1021	200765	HINGE
X1022	200767	CLIP
X1024	200770	CLIP
X1025	200772	GLASS
X1026	200774	GLASS
X1027	200776	LENS
X1028	200778	HANDLE
X1029	200780	SCREW
X1030	200782	PLUG
X1032	200785	GASKET
X1035	200789	GASKET
X1036	200791	GASKET
X1038	200793	CUSHION
X1051	200799	WINDOW
X1052A	200801	GLASS
X1053A	200803	GLASS USE 95971
X1054	200804	COVER
X1055	200806	DOOR
X1056	200807	COVER
X1058	200809	NUT
X1059	200811	BOLT
X1061	200814	GASKET
X1062	200815	HINGE
X1063	200817	GASKET
X1064	200819	BRACKET
X1101B	200842	SHAFT NFS AVAILABLE ONLY WITH 201067 CAM AND SHAFT ASSEM X3110C
X1102	200845	GEAR NFS AVAILABLE ONLY WITH 201994 GEAR ASSEM X3104
X1103D	200847	GEAR
X1114B	200854	FRAME
X1117	200856	BUSHING NFS AVAILABLE ONLY WITH 201994 GEAR ASSEM X3104
X1125B	200858	WASHER
X1127	200860	COVER
X1128A	200861	FLYWHEEL
X1129	200862	OIL BOX
X1130C	200863	CAM NFS AVAILABLE ONLY WITH 201067 CAM AND SHAFT ASSEM X3110C
X1131B	200864	STAR NFS AVAILABLE ONLY WITH 201998 STAR AND SHAFT ASSEM X3108B
X1135A	200865	SCREW
X1140A	200866	FRAME
X1141	200867	USE 202192 SPROCKET
X1142	200869	LINK
X1150	200870	KNOB
X1158	200873	SHAFT
X1169A	200877	ARM NFS AVAILABLE ONLY WITH 201083 ARM ASSEM X3401
X1170	200878	LINK
X1173	200881	NUT
X1175	200882	CHAIN
X1176	200883	SPROCKET
X1180	200885	WASHER
X1181	200886	GASKET
X1185A	200887	SCREW
X1194A	200892	SPROCKET
X1197	200894	WASHER
X1198	200895	GASKET
X1203	200919	USE 202194 PLATE AND SCREWS
X1204A	200920	COLLAR
X1206A	200921	GEAR NFS AVAILABLE ONLY WITH 201071 GEAR ASSEM X3201A
X1207	200923	SPROCKET NFS AVAILABLE ONLY WITH 202191 SPROCKET ASSEM
X1208	200925	HOUSING
X1210	200926	COLLAR
X1214	200927	BRACKET
X1215	200929	BRACKET
X1216	200931	SHAFT
X1217	200932	STUD
X1218	200934	NUT NFS AVAILABLE ONLY WITH 201075 SHAFT AND NUT ASSEM X3206
X1219	200935	STRIPPER
X1220	200937	STRIPPER
X1221	200939	SPRING
X1222	200940	ROLLER
X1223	200941	SHAFT
X1224	200942	SHAFT NFS AVAILABLE ONLY WITH 201075 SHAFT AND NUT ASSEM X3206
X1225	200944	PLATE
X1228A	200945	DISTRIBUTOR
X1231	200948	SCREW
X1236	200949	CLIP
X1237	200950	DISTRIBUTOR
X1238A	200951	HUB NFS AVAILABLE ONLY WITH 201071 GEAR ASSEM X3201A
X1239	200953	STRIPPER
X1240	200954	SPRING
X1245	200957	ROLLER
X1401	200993	CASTING
X1402	200994	CASTING
X1403A	200995	GEAR NFS AVAILABLE ONLY WITH 201092 GEAR ASSEM X3603A
X1403B	200996	GEAR NFS AVAILABLE ONLY WITH 201094 GEAR ASSEM X3603C
X1404	200997	GEAR
X1404A	200998	GEAR
X1405A	200999	GEAR
X1405B	201873	GEAR
X1406A	201607	GEAR
X1407E	201608	WASHER
X1408A	201609	WASHER
X1410A	201610	COLLAR
X1413A	201611	AVAILABLE ONLY WITH 201092 X 3603A OR 201094 X 3603C GEAR AND SHAFT ASSEM
X1415B	201612	COLLAR
X1418	201613	FLANGE
X1419	201614	SLINGER
X1420	201615	FLANGE
X1421	201616	FLANGE
X1424	201617	BUSHING
X1428B	201618	COLLAR
X1429	201619	SCREW
X1431B	201620	COLLAR
X1432	201621	YOKE
X1433B	201622	SHAFT
X1434	201623	RETAINER
X1437	201624	SHAFT
X1447	201625	GASKET
X1448	201626	GASKET
X1450A	201627	BLADE
X1450B	201628	BLADE
X1450C	201629	BLADE
X1450D	201630	BLADE
X1450E	201631	BLADE
X1450F	201632	BLADE
X1450G	201633	BLADE
X1450H	201634	BLADE
X1450J	201635	BLADE
X1456	201636	KEY
X1501	201638	FAN
X1504	201639	PIN NFS AVAILABLE ONLY WITH 201104 WEIGHT ASSEM X3705
X1510	201640	WASHER
X1512A	201641	CASTING
X1514	201642	HEAD
X1515A	201643	SHAFT
X1518	201644	SHAFT
X1519	201645	SLEEVE NFS AVAILABLE ONLY WITH 201104 WEIGHT ASSEM X3705
X1520	201646	LEVER NFS AVAILABLE ONLY WITH 201104 WEIGHT ASSEM X3705
X1522	201647	ROD NFS AVAILABLE ONLY WITH 201101 ROD ASSEM X3702
X1523	201648	BUTTON NFS AVAILABLE ONLY WITH 201101 ROD ASSEM X3702
X1527	201649	BEARING NFS AVAILABLE ONLY WITH 201100 SHAFT ASSEM X3701
X1533	201650	SPRING
X1603A	201651	GEAR NFS AVAILABLE ONLY WITH 201106 GEAR ASSEM X3800A
X1604	201652	GEAR NFS AVAILABLE ONLY WITH 201107 GEAR ASSEM X3801A
X1606A	201653	BUSHING NFS AVAILABLE ONLY WITH 201110 BODY ASSEM X3807A
X1607B	201654	CASTING NFS AVAILABLE ONLY WITH 201110 BODY ASSEM X3807A
X1607C	201655	SPACER
X1608	201656	COVER
X1613	201657	COVER NFS AVAILABLE ONLY WITH 201111 COVER ASSEM X3808A
X1613A	201658	COVER NFS AVAILABLE ONLY WITH 201111 COVER ASSEM X3808A
X1614	201659	GASKET
X1615	201660	GLASS
X1616A	201661	SPACER
X1617	201662	GASKET
X1619A	201663	AVAILABLE ONLY WITH 201106 X 3800A GEAR AND SHAFT ASSEM
X1621A	201664	SCREEN
X1622	201665	HOSE
X1623	201666	OIL TUBE
X1624	201667	OIL TUBE
X1625	201668	GASKET
X1702	201669	GEAR NFS AVAILABLE ONLY WITH 201119 GEAR ASSEM X3906
X1703	201670	GEAR NFS AVAILABLE ONLY WITH 201118 GEAR ASSEM X3905
X1704	201671	GEAR
X1705	201672	SHAFT
X1706	201673	BEARING NFS AVAILABLE ONLY WITH 201122 BEARING ASSEM X3912
X1707A	201674	BEARING
X1709	201675	BUSHING NFS AVAILABLE ONLY WITH 201116 GEAR ASSEM X3902
X1711A	201676	GEAR NFS AVAILABLE ONLY WITH 201116 GEAR ASSEM X3902
X1711AR	201677	GEAR NFS AVAILABLE ONLY WITH 201116 GEAR ASSEM X3902
X1712	201678	SHAFT
X1713A	201679	AVAILABLE ONLY WITH 201114 X 3900A GEAR ASSY
X1713B	201680	GEAR NFS AVAILABLE ONLY WITH 201114 GEAR ASSEM X3900A
X1714A	201681	GEAR NFS AVAILABLE ONLY WITH 201114 GEAR ASSEM X3900A
X1715A	201682	SHAFT
X1716A	201683	BUSHING NFS AVAILABLE ONLY WITH 201114 GEAR ASSEM X3900A
X1717A	201684	SHAFT
X1718A	201685	GEAR NFS AVAILABLE ONLY WITH 201115 GEAR ASSEM X3901A
X1719A	201686	GEAR
X1720A	201687	AVAILABLE ONLY WITH 201115 X 3901A GEAR ASSY
X1721	201688	NUT
X1722	201689	NUT
X1723	201690	HOUSING
X1726	201692	SLEEVE
X1727	201694	GEAR BLANK USE 201116 GEAR X3902
X1729	201695	PIN
X1730	201696	ARM
X1731	201697	WASHER
X1732	201698	KEY
X1734	201699	PIN
X1735A	201700	SHROUD NFS AVAILABLE ONLY WITH 201114 GEAR ASSEM X3900A
X1740	201701	BUSHING NFS AVAILABLE ONLY WITH 201119 GEAR ASSEM X3906
X1742	201702	WASHER
X1743	201703	WASHER
X1751	201704	GASKET
X1752	201705	WASHER
X1753	201706	PIN
X1754	201707	SCREW
X1755	201708	PLUG
X1756	201709	TUBE NFS AVAILABLE ONLY WITH 201124 OIL TUBE ASSEM X3914
X1759	201710	PIN
X1801	201712	HOUSING
X1802A	201714	SLEEVE DISCONTINUED
X1806A	201715	SHAFT
X1807	201716	CAM
X1808	201717	SPRING
X1809A	201718	KNOB
X1811	201719	SHAFT
X1812	201720	PIN
X1815	201721	LEVER
X1816A	201722	SHAFT
X1818	201723	COLLAR

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OLD PART NUMBER	NEW RCA STOCK NUMBER	DESCRIPTION
X1819	201724	SLEEVE NFS AVAILABLE ONLY WITH 201126 SHIELD ASSEM X4000
X1819A	201725	SLEEVE NFS AVAILABLE ONLY WITH 201127 SHIELD ASSEM X4000B
X1820	201727	KNOB
X1821	201728	PIN
X1830	201729	ADAPTER
X1832	201730	SUPPORT NFS AVAILABLE ONLY WITH 201130 SUPPORT ASSEM X4006
X1833A	201731	PLATE
X1836	201732	WASHER
X1839	201733	LENS
X1841	201734	SHIELD
X1843	201735	SHAFT NFS AVAILABLE ONLY WITH 201130 SUPPORT ASSEM X4006
X1844	201736	SHAFT NFS AVAILABLE ONLY WITH 201130 SUPPORT ASSEM X4006
X1845	201737	SCREW
X1849	201738	NUT
X1850	201739	PLATE
X1901	201740	CASTING
X1901A	201741	CASTING
X1902	201742	PLATE
X1902A	201743	PLATE
X1902B	201744	PLATE
X1903	201745	HOUSING
X1904A	201746	TRACK
X1907A	201747	GUIDE
X1908	201025	APERTURE
X1908A	201026	APERTURE
X1908B	201005	APERTURE
X1908C	201006	APERTURE
X1908D	201007	APERTURE
X1908E	201008	APERTURE
X1908F	201009	APERTURE
X1908G	201027	APERTURE
X1908H	201028	APERTURE
X1908J	201029	APERTURE
X1908K	201030	APERTURE
X1909	201748	APERTURE
X1909A	201749	APERTURE
X1909B	201750	APERTURE
X1909C	201751	APERTURE
X1909D	201752	APERTURE
X1910	201753	COLLAR
X1911	201754	SHAFT
X1911A	201755	SHAFT
X1912	201756	GATE
X1913	201757	BASE
X1914	201758	BASE
X1914A	201759	BASE
X1915	201760	SPRING
X1916	201761	LEVER
X1917	201762	SHUTTER
X1918	201763	SHAFT
X1919	201764	LINK
X1920	201765	LINK
X1921	201766	LINK
X1921A	201767	LINK
X1923	201768	LINK NFS AVAILABLE ONLY WITH 201144 LINK ASSEM X4109
X1924	201769	SCREW
X1925	201770	SCREW
X1926	201771	SCREW
X1927	201772	COLLAR
X1929	201773	STUD
X1930	201774	SCREW
X1932	201775	STUD NFS AVAILABLE ONLY WITH 201000 PAD ASSEM X1964A
X1933	201776	SCREW
X1934	201777	SCREW
X1935	201778	NUT
X1939	201779	SHAFT
X1940	201780	NUT
X1941	201781	SCREW
X1942	201782	SCREW
X1943	201783	SCREW
X1944	201784	LINK
X1945	201785	SHAFT
X1946	201786	PAD
X1947	201787	PAD
X1948	201788	YOKE NFS AVAILABLE ONLY WITH 201000 PAD ASSEM X1964A
X1950	201789	SPRING
X1952	201790	ARM
X1953	201791	SHAFT
X1954	201792	SHAFT
X1955	201793	COLLAR
X1956	201794	SPRING
X1958	201795	PIN
X1959	201796	STRIPPER
X1960	201797	PLATE
X1961	201798	NUT
X1962	201799	INSULATOR
X1964A	201000	PAD
X1965	201800	SCREW
X1968	201801	ROD NFS AVAILABLE ONLY WITH 201145 PUSH ROD ASSEM X4110C
X1969	201802	SEAT
X1971	201803	INSERT NFS AVAILABLE ONLY WITH 201145 PUSH ROD ASSEM X4110C
X1976	201804	BUMPER
X1978	201805	SPRING
X1979	201806	GUIDE
X1981	201807	SPRING NFS AVAILABLE ONLY WITH 201151 SPRING ASSEM X4114
X1982	201808	CLIP
X1983	201809	STRIP
X1983A1	201810	STRIP
X1983A2	201811	STRIP
X1984	201812	STOP
X1984A	201872	STOP
X1985A	201813	STOP
X1986	201814	SCREW
X1987	201815	SCREW
X1989	201816	SCREW
X1991	201817	WASHER
X1992	201818	STUD
X1993	201819	GAUGE USE 201314
X1994	201820	SCREW
X2001	201836	BRACKET
X2005	201837	PIN
X2007	201838	COVER
X2009	201839	FORK
X2010	201840	CRANK
X2011	201841	CRANK
X2012	201842	BUSHING
X2013	201843	SHUTTER
X2014	201844	SPRING
X2016	201845	SHAFT
X2019	201846	ROD
X2024	201848	BUMPER
X2031	201852	INSULATOR
X2058	201863	BRACKET
X2060	201865	PLATE
X2231	201890	ROLLER
X2232	201891	ROLLER
X2233	201893	SCREW
X2402	201954	BUSHING
X2403	201955	SHAFT
X2404	201956	GEAR
X2405	201957	COLLAR
X2409	201958	CLAMP
X2418	201959	CLAMP
X2421	201960	COVER
X2429	201964	GEAR
X2431	201965	BOLT
X2432	201966	BOLT
X2437	201967	OIL
X3000	201989	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3001	201990	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3003	201991	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3012	201992	DOOR ASSY
X3100	201993	ASSEM DISC ORDER 202192 SPROCKET ONLY
X3104	201994	GEAR
X3105A	201995	USE 200861 X 1128A FLY WHEEL ONLY
X3106A	201996	SCOOP
X3107C	201997	INTERMITTENT
X3108B	201998	STAR & SHAFT
X3109A	201999	QUILL
X3110C	201067	CAM & SHAFT
X3112	201068	CAM & PIN
X3114	201069	CAM ASSY
X3200	201070	USE 202191 SPROCKET ONLY
X3201A	201071	GEAR
X3202A	201072	SHAFT
X3203A	201073	ASSEM DISC REFER TO INSTRUCTION BOOK TO ORDER INDIVIDUAL PARTS
X3204	201074	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3206	201075	SHAFT ASSY
X3207	201076	ASSEM DISC REFER TO INSTRUCTION BOOK TO ORDER INDIVIDUAL PARTS
X3301	201077	SHAFT
X3302A	201078	GEAR ASSY
X3304	201079	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3305	201080	ASSEM DISC REFER TO INSTRUCTION BOOK TO ORDER INDIVIDUAL PARTS
X3307	201081	GEAR ASSEM DISCONTINUED REFER TO INSTRUCTION BOOK TO ORDER INDIVIDUAL PARTS
X3309	201082	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3401	201083	ARM
X3404A	201084	ASSEM DISC REFER TO INSTRUCTION BOOK TO ORDER INDIVIDUAL PARTS
X3501	201085	ASSEM DISCONTINUED REFER TO INSTRUCTION BOOK TO ORDER INDIVIDUAL PARTS
X3509	201086	SHAFT
X3515	201087	ASSEM DISC ORDER FOLLOWING COMPONENTS AS REQUIRED 201622 X 1433B MAIN SHAFT 201624 X 1437 SHAFT EXTENSION
X3600C	201088	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3600D	201089	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3601	201090	ASSEM DISCONTINUED REFER TO INSTRUCTION BOOK TO ORDER INDIVIDUAL PARTS
X3602	201091	ASSEM DISC ORDER FOLLOWING COMPONENTS AS REQUIRED 201628 BLADE X 1450B 201615 RETAINER X1420 201616 FLANGE X 1421 201619 SCREW X 1429 TWO EACH OF FOLLOWING 201626 GASKET X 1448 200788 SCREW P 1035 200638 WASHER P 536
X3603A	201092	GEAR
X3603C	201094	GEAR
X3606	201096	SHAFT ASSY
X3609	201097	ASSEM DISC ORDER FOLLOWING COMPONENTS AS REQUIRED 201092 X 3603A GEAR AND SHAFT 201612 X 1415B COLLAR 201636 X 1456 KEY 200928 P 1215 SCREW 200896 P 1199 WASHER
X3609A	201098	ASSEM DISC ORDER FOLLOWING COMPONENTS AS REQUIRED 201094 X 3603C GEAR AND SHAFT 201612 X 1415B COLLAR 201636 X 1456 KEY 200928 P 1215 SCREW 200896 P 1199 WASHER
X3700	201099	ASSEM DISC ORDER FOLLOWING COMPONENTS AS REQUIRED 201642 X 1514 GOVERNOR HEAD 211104 X 3705 WEIGHT AND SLEEVE ASSEM 201644 X 1518 BALL AND LEVER SHAFT 201650 X 1533 SPRING 200773 P 1026 SCREW
X3701	201100	SHAFT ASSY
X3702	201101	ROD ASSY
X3703	201102	GEAR
X3704	201103	GEAR
X3705	201104	WEIGHT ASSY
X3706	201105	ASSEM DISC REFER TO INSTRUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3800A	201106	GEAR

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OLD PART NUMBER	NEW RCA STOCK NUMBER	DESCRIPTION
X3801A	201107	GEAR
X3802A	201108	GEAR
X3806A	201109	COVER ASSY
X3807A	201110	BODY
X3808A	201111	COVER
X3810A	201112	PUMP
X3811	201113	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3900A	201114	GEAR
X3901A	201115	GEAR
X3902	201116	GEAR
X3903B	201117	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3905	201118	GEAR
X3906	201119	GEAR
X3907	201120	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X3908	201121	GEAR NFS AVAILABLE ONLY WITH 201114 GEAR ASSEM X3900A
X3912	201122	BEARING
X3913A	201123	SHAFT
X3914	201124	OIL TUBE
X4000	201126	SHIELD
X4000B	201127	SHIELD
X4001A	201128	ASSEM DISC ORDER FOLLOW ING COMPONENTS AS REQUIRED 201715 SHAFT X1806A 201718 KNOB X1809A 200890 SCREW P1193
X4003A	201129	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4006	201130	SUPPORT
X4007	201131	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4011	201132	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4100	201133	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4100A	201134	GATE
X4101	201135	SPRING ASSY
X4102	201136	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4102A	201137	PLATE
X4103	201138	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4103A	201139	GATE
X4105	201140	SUB PLATE
X4106	201141	SUB PLATE
X4107	201142	ROLLER ASSY
X4108	201143	RETAINER
X4109	201144	LINK
X4110C	201145	PUSH ROD
X4111D	201146	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4112	201147	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4113	201148	SHOE
X4113A1	201149	SHOE
X4113A2	201150	SHOE
X4114	201151	SPRING ASSY
X4115	201152	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4115A	201153	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4117	201154	DISCONTINUED
X4119	201155	AIR DIST
X4120C	201156	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4123	201157	STRIP
X4124	201158	STRIP
X4125	201159	STRIP
X4126	201160	STRIP
X4128	201161	DISCONTINUED
X4200	201162	USE 201839 X2009 FORK ONLY
X4201	201163	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4205	201164	PILOT
X4207	201165	PILOT
X4300	201166	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X4303	201167	CLAMP
X4400	201168	GEAR
X4401	201169	CLAMP ASSY
X4402	201170	CLAMP ASSY
X4406	201171	PULLEY ASSY
X7002	201172	COVER
X7006	201382	COVER
X7007	201173	HOUSING
X7010	201174	BAFFLE
X7013	201175	GASKET
X7015	201176	WINDOW
X7016	201177	COVER
X7019	201178	DISCONTINUED
X7022	201179	GASKET
X7023	201180	GASKET
X7026	201181	COCK
X7202	201182	SHAFT
X7211	201183	WASHER
X7212	201184	COLLAR
X7370	201186	GEAR
X7375	201187	GEAR
X7401	201188	CASTING NFS AVAILABLE ONLY WITH 201192 HOUSING ASSEM X7573
X7405	201189	DISTRIBUTOR
X7406	201190	RETAINER
X7571	201380	SHAFT
X7572	201191	GEAR
X7573	201192	HOUSING
X7574	201193	GEAR
X7606	201194	KEY
X7607	201195	GEAR
X7608	201377	COLLAR
X7610	201196	BLADE
X7611	201378	SLINGER
X7612	201197	SCREW
X7613	201198	BLADE
X7614	201199	GASKET
X7616	201200	INDICATOR
X7617	201201	INDICATOR
X7618	201202	BLADE
X7772	201203	SHAFT
X7778	201204	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X7801	201205	BRACKET
X7802	201206	DISCONTINUED
X7803	201207	PIN
X7804	201208	WORM
X7805	201209	SHAFT
X7807	201383	SCREW
X7808	201210	PLUG
X7809	201384	WASHER
X7812	201211	KNOB
X7971	201216	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X8003	201387	WORM
X8007	201220	COLLAR
X8009	201221	PIN
X8010	201222	BUSHING NFS AVAILABLE ONLY WITH 201224 KNOB ASSEM X8173
X8012	201223	GASKET
X8173	201224	KNOB
X8201	201225	CASTING
X8202	201226	GUIDE PRICE ON REQUEST
X8203	201227	HOUSING
X8204	201228	CASTING NFS AVAILABLE ONLY WITH 201265 GATE ASSEM X8456
X8205	201229	PAD
X8206	201230	PAD
X8208	201231	SHAFT
X8209	201232	GATE NFS AVAILABLE ONLY WITH 201265 GATE ASSEM X8456
X8210	201233	GATE NFS AVAILABLE ONLY WITH 201265 GATE ASSEM X8456
X8211	201234	SCREW
X8212	201235	PLATE NFS AVAILABLE ONLY WITH 201268 APERTURE ASSEM X8460
X8213	201236	PIN NFS AVAILABLE ONLY WITH 201268 APERTURE ASSEM X8460
X8214	201237	SPRING
X8215	201238	LENS
X8216	201239	GLASS
X8217	201240	SHUTTER
X8218	201241	SCREW
X8219	201242	SCREW
X8220	201243	GUIDE L H
X8221	201244	GUIDE R H
X8229	201245	LINK
X8230	201246	GUIDE
X8231	201247	LINK
X8232	201248	SHIELD
X8233	201249	LEVER
X8234	201250	STUD
X8235	201251	LINK
X8237	201252	PLATE
X8239	201253	SCREW
X8240	201254	BUSHING
X8241	201255	SCREW
X8244	201256	PLATE NFS AVAILABLE ONLY WITH 201268 APERTURE ASSEM X8460
X8245	201257	RETAINER
X8249	201258	SPACER NFS
X8450	201259	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X8451	201260	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X8452	201261	GATE
X8453	201262	GATE
X8454	201263	SPRING ASSY
X8455	201264	SHIELD
X8456	201265	GATE
X8457	201266	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X8459	201267	ASSEM DISC REFER TO INST RUCTION BOOK FOR ORDERING INDIVIDUAL COMPONENTS
X8460	201268	INSULATOR
X8461	201269	SHOE
X8463	201270	GATE
X8501	201271	GEAR
X8502	201272	GEAR NFS AVAILABLE ONLY WITH 201279 GEAR ASSEM X8671
X8503	201273	SHROUD NFS AVAILABLE ONLY WITH 201279 GEAR ASSEM X8671
X8504	201274	SHAFT
X8505	201275	ROD
X8506	201276	WASHER
X8507	201277	ARM
X8508	201278	SHIELD
X8671	201279	GEAR
X8701	201280	CASTING NFS AVAILABLE ONLY WITH 201288 SUPPORT ASSEM X8871
X8702	201281	SLEEVE
X8703	201282	SCREW
X8704	201283	SHAFT NFS AVAILABLE ONLY WITH 201288 SUPPORT ASSEM X8871
X8705	201284	SHAFT NFS AVAILABLE ONLY WITH 201288 SUPPORT ASSEM X8871
X8706	201285	SHAFT
X8707	201286	BAFFLE
X8870	201287	LENS MOUNT
X8871	201288	SUPPORT
X8905	201289	DISCONTINUED
X8907	201290	INSULATOR
X9103	201291	CLIP
X1-1102C	200897	SHAFT
X1-1103B	200898	QUILL NFS AVAILABLE ONLY WITH 201999 QUILL ASSEM X3109A
X1-1106B	200899	BUSHING NFS AVAILABLE ONLY WITH 201999 QUILL ASSEM X3109A
X1-1106C	200900	BUSHING NFS AVAILABLE ONLY WITH 201999 QUILL ASSEM X3109A
X1-1108A	200901	PLATE
X1-1109	200902	SCREW
X1-1111	200903	CLAMP
X1-1112	200904	SCREW
X1-1114A	200905	SCREW
X1-1116A	200906	WASHER
X1-1120A	200907	GASKET
X1-1127	200908	BEARING
X1-1127R	200909	BEARING NFS AVAILABLE ONLY WITH 200908 FINISHED BEARING
X1-1128A	200910	PIN
X1-1135A	200911	PLUG
X1-1136A	200912	COLLAR
X1-1137A	200913	SPRING
X1-1138A	200914	SCREW
X1-1139	200915	PIN NFS AVAILABLE ONLY WITH 201999 QUILL ASSEM X3109A
X1-1147	200916	USE 200227 SPACER N230
X1-1148	200917	WASHER
X1-1901	201821	SHIELD
X1-1908	201823	PLATE
X1-1910A	201824	PLATE
X1-1911	201825	PLATE
X1-1924	201831	HANDLE
X1-1927	201833	LEVER
X1-1930	201835	LINK

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