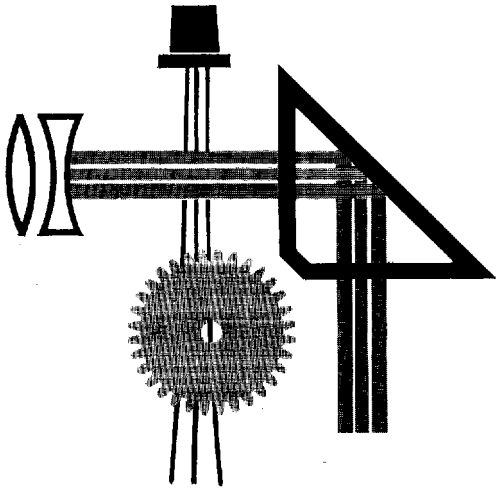


PANORAMIC STEREOVIEWER

Serial No. 586082-1

Prepared for [redacted] STATINTL

[redacted] STATINTL

PANORAMIC STEREOVIEWER

STATINTL [redacted] Serial No. 586082-1

Reference Manual

Prepared

For

[redacted] STATINTL

[redacted] STATINTL

May 1966

TABLE OF CONTENTS

for

PANORAMIC STEREOVIEWER

REFERENCE MANUAL

I. INTRODUCTION AND DESCRIPTION OF INSTRUMENT

1.1 Introduction

The Panoramic Stereoviewer is a direct viewing instrument for stereoscopic examination of 70mm to 9½ inch roll film. It is capable of viewing vertical, convergent and oblique frame type photography and vertical and convergent panoramic photography. The viewing magnification is variable continuously from 2.5X to 38X with a scale matching ratio of 3 to 1.

A unique design feature of the instrument is the cylindrical glass stages for supporting the film for viewing. A field flattener in the optical system compensates for the curved object plane. The film is tensioned over the cylindrical stage to keep it in contact with the stage for viewing. When the film is translated in X, the cylindrical stage rotates with the film, thereby avoiding any sliding contact between the stage and the film. Also, since the film is always in contact with the stage, it may be viewed in critical focus while being translated. The glass stage, film and film drive are on one carriage and are translated as a unit beneath the stationary optical system to scan the film in Y.

The cylindrical stages may be driven independently or coupled together for scanning. Since the stages are on opposite sides of the instrument and have separate film drives, the

two exposures forming the stero pair must be on separate rolls of film. If the exposures to be viewed are on the same roll of negative film, duplicate positive film transparencies of the roll are required.

Both manual and motor drives are provided for transporting film. Maximum film speed is in excess of 200 feet per minute. Two types of illumination are provided. One is a high intensity system for use when viewing through the optical system and the other a general background illumination for direct viewing of the film on the cylindrical stages.

1.2 Description of Component Parts

The instrument is mounted on lockable caster type wheels. For the purposes of description, the instrument is subdivided as follows: Cabinet and supporting structure, cylindrical film stages, illumination system, optical viewing system, film transport, X-Y counters, operating controls, and electrical chassis.

1.2.1 Cabinet and Supporting Structure

The base for the instrument is a deeply ribbed cast aluminum surface plate. A vertical channel type weldment is bolted to the center of the surface plate and supports the optical system, high intensity illumination systems, blower assemblies and manual handwheel controls. Also attached to the surface

plate are two pairs of Y rails for two carriage assemblies. The carriages support the glass cylindrical stages, the film drives, and the film spool supports.

The instrument is enclosed with sheet steel panels attached to a welded steel framework. Panels are removable from the rear of the instrument to facilitate servicing. Both the left and right ends are hinged and provide access for loading film. Most of the electronic components associated with the film drives are housed in compartments in the lower front of the instrument. Access is obtained through hinged doors.

Four 4 inch lockable casters are attached to the base of the instrument to permit the viewer to be moved easily from one location to another. Cooling air from the high intensity light sources is exhausted through ports on the rear of the instrument. Two rubber bumpers are attached to the rear of the housing to prevent the blocking of the exhaust ports.

1.2.2 Cylindrical Film Stages

The cylindrical film stages are 10.75 inches long, have an outside diameter of 11.867 inches and a wall thickness of approximately 0.3 inches. They are made of Pyrex glass. Rubber O rings separate the stages from their end support bearings. This mounting allows the bearings to expand

without stressing the glass stages and provides vibration dampening for the film stages.

The free aperture between the end supports of the mounted cylindrical stages is approximately 9.75 inches which permits the illumination of the full width of 9.5 inch film.

1.2.3 Illumination System

Two types of illumination are provided on the instrument. One is a general background illumination for the direct viewing of film on the stages. The other is a high intensity condenser type system for illuminating the area being viewed through the optical system.

A twelve inch 8 watt fluorescent tube is mounted inside each of the cylindrical glass stages and provides general back illumination of the film on the stage. Shields, attached to the tubes, permit the unused portion of the tubes to be masked off when films of less than $9\frac{1}{2}$ inches are being viewed. Since the stages are transparent, the exposed portion of the tube would otherwise be objectionable. Rotating the shield on the tube provides the necessary occlusion of the unused portion of the tube.

The light sources for the high intensity illumination systems are 300 watt incandescent type projection lamps. Each unit consists of a lamphouse, refractive type condenser system,

45° BalCOLD® mirror with heat sink, a blue diffuser, and a positive anamorphic lens assembly. The lamphouse, condenser, and 45° mirror are mounted on a stationary horizontal bracket attached to the center support column of the instrument. The bracket is enveloped by the cylindrical glass stage on the Y carriage. The anamorphic lens and blue diffuser combination move below the stage on rods attached to the stage mount. They are coupled to the lamphouse assembly by a spring type linkage to permit the Y carriage to travel a short distance after the anamorphic lens unit has reached the limit of its travel behind the stage. The purpose of the positive anamorphic lens in the condenser system is to counteract the affect on the illumination of the negative anamorphic lens unit of the field flattener.

The projection lamps are accessible through hinged covers in the top of the lamp houses. The Y carriage should be in its extreme outboard position to provide necessary clearance for opening the cover to the lamphouse. A tandem blower unit exhausts the air from the lamphouses through a pair of screened ports on the rear of the instrument.

Silicon controlled rectifier (SCR) type dimming circuits mounted behind the control panels on the front of the instrument provide continuous dimming of the projection lamps. In addition, iris diaphragms are provided in the collimated portion of the optical path to vary the illumination inde-

pendently from 100% to approximately 5% without changing the color temperature of the lamps. The blue diffusers in the condensing system serve this purpose to a lesser degree when using the SCR dimming circuit.

1.2.4 Optical Viewing System

The viewing magnification of the optical system is variable continuously from 2.5X to 38X with a scale matching ratio of 3 to 1. It consists basically of a pair of focusable eyepieces, two 3 to 1 zoom systems, a pair of rotating (Pechan) prisms, two sets of three interchangeable relay lenses, a pair of objective lenses, a pair of cylindrical lenses to correct for the curved object plane (cylindrical film stages) and a pair of iris diaphragms.

The eyepieces have a power of approximately 10X. They are individually focusable through a range of $\pm$4 diopters and have an interpupillary adjustment of 55mm to 72mm. The eye relief is 25mm which provides adequate clearance for persons wearing corrective eye glasses. An adjustable head rest is provided to assist the operator in holding his head in the proper position for viewing. Two dissimilar reference reticles are installed in the eyepiece focal planes for use with the X-Y counters. An open cross is included in the right optical path and a circle in the left. The reticles are dissimilar to readily identify them with a

particular stage when viewing through the binocular system.

The three to one zoom systems are directly behind the eyepieces. They may be zoomed separately for scale matching or coupled and zoomed as a unit.

Following the zoom systems are housings containing three interchangeable relay lenses. Selection of a particular relay lens offers one of the following magnification ranges: 2.5X to 8X, 6X to 19X or 12X to 38X. Selector knobs are positioned on the right and left sides of the relay housing. They are engraved 2.5, 6 and 12 to indicate which relay lens is in the optical path.

In a collimated light path following the relay lenses, rotating (Pechan) prisms provide continuous $\pm 180°$ rotation of the imagery. Engraved rings on these assemblies indicate the $0°$, $\pm 45°$, $\pm 90°$, $\pm 135°$ and $\pm 180°$ rotation positions. Iris diaphragms on these assemblies provide illumination variation from 100% to approximately 5%. Objective assemblies at the opposite end of the collimated light paths contained in addition to the objective lens, a 45° first surface mirror and a field flattener. The 45° mirror redirects the horizontal optical axis normal to the axis of the cylindrical stage. Since the horizontal portion of the optical path is collimated the distance between centers of observation is adjustable. The field flattener is a negative

cylindrical lens in close proximity to the film plane. It is mounted in a bearing with a lever mechanism which permits it to be lowered to within a few thousandths of the film for viewing. A micro-switch safety interlock prevents the film from being driven in X motor drive when the field flattener is in the down position.

1.2.5 Film Transport

The optical viewing system is stationary. To view film it is necessary that it be positioned under the optical system. The two film drives and the cylindrical supporting stages are mounted on carriages which have a linear travel of $\pm$4.5 inches. This permits scanning across films (Y motion) up to nine inches wide. To scan along the length of the film, the film is driven from one spool to another over the cylindrical stage. Since the stage rotates with the film there is no sliding motion of the film relative to the stage which could damage the film.

Two opposite acting D.C. torque motors coupled to the spools tension the film over the cylindrical stages and provide a motor drive for the film in the X direction. The speed is variable continuously from 0 to 200 feet per minute.

For manual drive, rubber coated rollers which contact the film are driven through a pair of hand wheels on the center support column. The D.C. torque motors tension the film

and keep it wound on the spools. A second rubber coated roller contacts both the drive roller and the drum. This roller drives the cylindrical stage at the same surface velocity as the film and thereby assures no relative slippage between the film and stage. In motor drive the film drives the rollers and in turn the stage which assures that the stage moves at the same surface velocity as the film.

A telescoping shaft links the rubber coated drive rollers of each of the X film drives. A magnetic clutch on the shaft couples the two together when desired and assures that the film on both sides will be driven at the same speed whether one or both X motor controls are activated. The right X handwheel drives both films in the coupled mode; the left handwheel is deactivated.

The carriages are driven in Y by means of lead screws. Through a combination of magnetic clutches a single motor drives both carriages. The carriages may be driven together or separately by coupling or uncoupling the clutches. Handwheels on either side of the center support column provide manual drive for each of the carriages through the same lead screws used for motor drive. Limit switches prevent overruns of the Y drives.

1.2.6 X-Y Counters

Two sets of counters are mounted on top of the instrument. The counters have a least reading of one (1) millimeter and

are resettable to zero for any position of the carriages. The intended purpose of the counters is to obtain reference coordinates for images being viewed to identify their location for recovery at a later date.

The counters are gear connected to the film drives and have a maximum range of 999 millimeters in the direction the film is spooled (X) and across the film (Y). Since the measuring range in X is limited to only a small segment of the film length and the high speed slew range of the film might damage the X counters, the counters are automaticly uncoupled from the drive when the X motor drive is activated. Therefore, the X counters will only meter film in X manual drive. When the X drives are coupled, only the right X counter records the X coordinate.

Since the Y drive is limited to the width of nine inch film (approximately 230mm) and the motor drive has only a single slow speed, the Y counters are activated in both manual and motor drive. Also, both counters remain engaged in the Y couple mode.

Four flexible cable type drives couple the counters to their respective drives; therefore the counters may be mounted in a stationary location even though the drive which they are metering is displaced. Each flexible cable drive is connected to a pair of opposite acting counters. One counter records correct coordinates when driving in a positive

direction and the other when driving in a negative direction Half silvered (one way) mirrors are placed in front of the counters. The counter which is recording the coordinate in the direction being driven is illuminated and therefore is visible through the one way mirror. The other counter which would be running backward from zero is not illuminated and is not visible through the one way mirror. When the counter is driven through zero the lamp illuminating one counter is deactivated and the other lamp is turned on automatically.

1.2.7 Operation Controls

All operating controls are conveniently within reach of the operator when seated in front of the instrument. It is necessary that the operator stand only when loading or unloading film. From the operators seated position both films may be viewed through the optical system or directly on the glass stages.

Three switches are mounted vertically on the center support columns above the operators desk area. The lower switch is the main power on-off switch. When it is activated all other electrical control switches on the instrument are back illuminated. Their function is engraved on clear plastic cover plates over the illuminated switches to facilitate their identification with a low ambient light level. Above the main power switch are the "X couple" and the "Y couple" switches which couple the X and Y drives

for the cylindrical glass stages.

Mounted on the sheet metal housing in front of each of the glass stages are panels with four switches, a rotary knob and a control lever for activating the X and Y motor drives for each of the stages. The cylindrical stage moves or rotates in the direction the control lever is moved. The four switches serve the following functions: one activates the torque motors which tension the film on the stage, one turns on the flourescent lamp inside the cylindrical stage to provide general background illumination for viewing the film directly, one activates the high intensity light source for optical viewing of the film and the last switch indexes both the X and Y counters to zero. The rotary knob controls a silicon controled Rectifier (SCR) Circuit that provide dimming for the high intensity light source.

On the counter housing are four red buttoms. Each of the buttons electrically resets the pair of counters adjoining it to zero. Therefore, the X and Y counters may be indexed to zero individually or both the X and Y counters on one side of the instrument may be indexed to zero as a unit with the appropriate switch on the panel in front of the cylindrical stage or the buttons next to the counters.

Above the desk surface on either side of the center support column are four handwheels, two on the left side and two on the right side. The upper left and right handwheels

drive the film manually in X. The lower left and right handwheels drive the film in Y.

At the objective ends of the optical system is a field flatteners to compensate for the curved film planes. The field flattener may be lowered in close proximity to the film by means of a two position lever at the end of the optical viewing system. An electrical safety interlock provides that the field flattener may not be in the lower position when the film is being driven in X motor drive.

On the main optical housing behind the eyepieces are three sets of controls: A pair of graduated knurled rings permit the optical rotation of each of the images being viewed. Two knobs with a horizontal connecting shaft on top of the housing provide for the interchange of three sets of relays for a choice of three different magnification ranges. Directly behind the eyepieces is a second pair of knobs with a connecting shaft to drive the optical zoom systems. The connecting shaft may be uncoupled to drive the zoom systems separately. Below the eyepieces is a lever to set the interpupilary distance.

1.2.8 Electronic Chassis

The electronic chassis for controling the operation of the instrument are housed in enclosures in the right and left lower front side of the instrument. All chassis are easily

accessible through hinged full width doors on the enclosures. Each door has two slotted catch assemblies which require a screwdriver or coin to open.

The left compartment houses the left motor control chassis and the relay chassis for the instrument. The right compartment contains the right motor control chassis, the power supply chassis and the fuse panel.

Above the electronic chassis in both the left and right compartments are time delay circuit chassis for activating magnetic clutches in the X counter and X manual drives for the instrument. The chassis are accessible by removing sheet metal covers from the vertical inside face of the compartment enclosures.

II. OPERATION

As indicated in Section 1.2.7 the operating controls are conveniently positioned such that the instrument may be operated entirely from a seated position in front of the instrument. It is only necessary to stand when loading or unloading film.

The following sections describe the operation of the instrument.

2.1 Film Orientation

When placing rolls of duplicate positive photography on the instrument either roll may be placed on either side of the instrument. The only precaution which should be taken is to have the films oriented the same across the stages. With optical image rotation provided in the viewing system it is necessary only that the films be positioned with the emulsion surfaces in the same orientation, however, if film images are not similarly oriented, it is not possible to scan the films in the coupled mode.

With twin camera photography, such as forward and reverse looking convergent frame or convergent panoramic, either roll may be placed on the left or the right side of the instrument. The images are rotated optically, if necessary, to view with the 'base in'. They should have the emulsions in the same orientation on the stage, however; and to scan in the coupled mode, imagery should be similarly oriented on the two stages.

Positive film transparencies should be viewed with the emulsion up. Negative transparencies should be viewed with the emulsion down. For maximum stereoscopic perception film should be viewed with the eye base parallel with the airbase. With either vertical or convergent frame, it is necessary that the images be rotated optically 90 degrees to align the eye base with the airbase. With the 90° rotation the controls for the X and Y drives appear to be reversed when viewing through the optical system. Panoramic photography does not require a 90° rotation; and, therefore, the controls appear to respond correctly when viewing through the optical system.

2.1.1 Film Loading

The following procedure should be followed in loading film on the instrument:

1. Place the diameter sensor retract lever, shown in Figure 7, in the retract position.

2. Release clamp for each of the film spool supports and pull assembly out as far as it will go.

3. Rotate the knob on the end of each support arm to its limit in the direction indicated by the arrow. This releases the arm and permits it to rotate into a horizontal position and provide clearance for loading

large spools on the instrument.

4. Place an empty spool of the size required on one of the two driving hubs, being sure to engage the key on the driving hub in the slot in the film spool. The spools should have a minimum core diameter of 2 inches.

5. While holding the film spool with one hand swing the support arm back into a vertical position and rotate the knob which clamps it to the limit of its travel, opposite to the direction of the Release Arrow on the knob.

6. Push the film spool support in until the vertical arm engages the film spool with no end play. Tighten clamping lever for the spool support.

7. Repeat steps 4, 5 and 6 with the spool containing the film to be viewed. Normally the spool should be positioned on the driving hub such that the film comes off the inboard side of the spool as shown in Figure 5 and 6. This would be the case for positive film spooled with the emulsion in and to be viewed with the emulsion up on the cylindrical stage.

8. The film is threaded over the cylindrical stage and the friction drive rollers and under the idler rollers as indicated in Figure 6 for normal operation. If it is required to wind the film opposite to that shown on

either or both spools, the toggle switches on the wall above the spools (shown in Figure 8) should be placed in the REVERSE position setting for the spools involved.

9. Place the diameter sensor retract lever in the OPERATE position and activate the film tension button on the control panel. The film drive is then ready to operate.

2.1.2 Unloading Film

The following procedure should be followed in unloading film from the instrument.

1. Drive all the film off the stage and onto one film spool.

2. Deactivate the film tension by depressing the 'film tension button' on the control panel in front of the film stage.

3. Place the diameter sensor retract lever (as shown in Figure 7) in the retract position.

4. Release the clamping lever for the spool support. Holding the film spool with one hand, pull the spool support assembly out as far as it will go.

5. Rotate the knob on the end of the support arm to its limit in the direction indicated by the arrow on the knob. This permits the vertical support arm to swing into a horizontal position and provide clearance for unloading large film spools.

2.2 Optical Viewing System

The eyepiece tubes are parallel and depressed approximately 15 degrees from the horizontal to provide comfortable viewing by the operator seated erect in front of the instrument. The eye point is not adjustable vertically. To accommodate for various height operators, the operators' chair should be adjustable through a vertical range of $\pm$ 2 inches from a nominal height of 17 inches. The eye relief of the eyepieces is approximately 25mm to provide clearance for operators wearing corrective lenses. If the operator normally wears prescription glasses they should be worn when viewing through the optical system, particularly if they correct for an astigmatism and/or phoria. An adjustable head rest holds the operators' head in the correct orientation for viewing.

A lever below the eyepieces permits the separation of eyepieces between 55 and 72mm in order to match the interpupillary separation of the operators eyes. A scale adjoining the lever allows the operator to set in the correct value, if known.

The eyepieces are provided with $\pm$ 4 diopters of focusable range. The outer sleeve on the eyepiece is rotated to focus. The diopter setting is indicated on the eyepiece tube. To properly focus the eyepieces the zoom control should be at the low end of its range. When focused at the low end of zoom range the image should remain in sharp focus throughout the zoom range.

Selection of the magnification range must be the same for both sides of the optical system; however, the zoom may be varied independently to provide a scale matching ratio of 3:1 between the two optical systems. The relay selector consists of two knobs, see Figure 1, with a horizontal connecting shaft, mounted on top of the relay housing. The knobs are engraved with setting 2.5, 6 and 12 to indicate which relay lens is in the optical path. To reduce wear on the relay lens interchange system it is recommended that both hands be used to turn the knobs when changing the relay setting.

The zoom controls are immediately behind the eyepieces and consist of two coupled knurled knobs. A disk type button is mounted concentric with the right knob. Pulling the button out a short distance disengages the couple between the knobs and permits the optical systems to be zoomed separately. To recouple, the zoom knobs should both be driven to the lower end of their zoom range and the button depressed to engage drives.

For viewing panoramic or strip camera photography the rotating prisms, mounted to the sides of the relay housings, should both be set at zero. To view frame photography one prism should be rotated to $+90^{o}$ and the other to -90^{o}. If a pseudoscopic image results the 90^{o} orientations of the prisms should be interchanged.

Field flatteners are mounted on the objective ends of the optical system to compensate for the curved viewing stages. A control lever, shown in Figure 4, lowers the field flattener into close proximity to the film. It will generally not be found necessary to lower the unit; however, for maximum correction and, therefore, maximum resolution throughout the field of view it should be used. It should be noted that a safety interlock prevents the instrument from operating in X motor drive when the field flattener is down.

2.3 Film Drive

Both the motor and manual film drives require the use of the opposite acting torque motors to tension the film on the cylindrical stages. The motor drives are intended for the general viewing, rapid scan and slewing the film in separate and in coupled modes. The manual drives are intended for fine positioning, scanning at high magnifying power, and establishing rough identification coordinates for selected points on the films.

2.3.1 Motor Drive

Before the film may be driven in X motor drive it is necessary that the 'Film Tension' button on the control panel in front of the stage be activated. To drive the film in 'X' the control lever on the panel in front of the stage is moved forward or back. The film and stage rotates in the same

direction as the control lever and the speed is proportional to angular displacement of the lever. The control lever will return the center 'off' position automatically if released; however, it is recommended that it be returned smoothly by hand since a sudden deceleration may cause the film to slip on the stage. If the film does not move when the control lever is displaced in 'X', check if the field flattener lever, shown in Figure 4, is in the down position since this will disengage the 'X' motor drive. It should be noted that the X counters do not operate in X motor drive.

The displacement of the control lever to the left or right drives the film stage in the Y direction. The stage moves in the direction in which the lever is deflected. The Y drive is provided with only one single speed motor; therefore, it is not possible to drive the two stages in opposite directions simultaneously. Limit switches at the ends of the Stage Travel disengage clutches in the drive linkage and prevent damage to the stage carriage, motor or drive linkage.

To couple the X or Y motor drives there are two switches above the main power switch on the center support column. In X couple, the friction drive rollers which contact the film are coupled together by a telescoping drive shaft. Though the two films may be driven with either control lever it is more satisfactory to use both control levers for smoother and faster responses. Since the drives are

connected, both films will move at the same velocity regardless of whether the control levers are deflected the same amount or not. For Y motor drive there is only one motor; therefore, when in the Y coupled mode, it does not matter whether one or both control levers are activated.

2.3.2 Manual Drive

Two pair of hand wheels mounted on the sides of the center support column above the operators desk surface provide for X and Y manual drive. The X handwheel drive is disengaged automatically when the control lever for the associated motor drive is moved off its center position. The X manual drive and the X counter are coupled together and this high speed motor drive in X would be too fast and too great a distance for the counter to record. Also, it would be undesirable for the X handwheel to rotate when in X motor drive. A time delay circuit in the X drive requires two to three seconds to re-engage the X manual drive after the control lever is returned to the center position. In Y the drive is much more limited ($\pm$ 4$\frac{1}{2}$ inches) and is slower; therefore, it is not necessary to disengage the counters. However, to avoid the Y handwheels turning when in motor drive, the handwheels are spring loaded to automatically disengage the drive to the handwheel when the operator's hand is removed from the control. With this arrangement, it is necessary to press in on the Y handwheels to engage the drive when rotating the handwheel to drive the film in the Y direction.

When the X couple is energized the right X handwheel drives both films and film stages together in the X direction. The left X handwheel and left X counters are disengaged in the coupled mode.

In the Y coupled mode either handwheel will drive the two film carriages in Y. Both sets of counters record the Y displacement of the carriages. As with the individual carriage drives it is necessary to press in on the handwheel to engage the drive linkage.

2.4 X - Y Coordinate Counters

The X-Y coordinate counters are intended for measuring rough coordinates relative to some arbitrary origin. They have a maximum measuring range of 999mm. The least reading of the counters is one millimeter. They may be indexed to zero at any point. Reference reticles are included in both eyepieces to assist in pointing for measuring coordinates.

The reference reticles are dissimilar. An open cross reticle is in the right eyepiece and an open circle in the left eyepiece. This arrangement allows easy identification as to which film exposure is being measured and avoids the tendency on the part of the operator to try to fuse the reticle images.

Coordinates are positive if they are to the right and above the arbitrary reference origin. Four red buttons on the counter housings index the associated counters to zero. Also, a button labeled "counter reset" on each of the control panels in front of the stages index the pair counters on that side of the instrument to zero.

The X coordinates may only be measured in manual drive. In the coupled mode, only the right set of X counters record the coordinates. The Y coordinates are recorded in both the manual and motor mode and both counters record the Y coordinates in the coupled mode.

To assure positive indexing of the counters to zero it is recommended as a general practice that the counter reset buttons be depressed twice. Normally one actuation of the reset button is sufficient; however, if the last digit wheel is perfectly centered on the fifth digit it may require a second actuation.

To use the coordinate measuring system the reticle is first placed on the reference origin and the counters indexed to zero. The film may then be driven to place the reticle on any other image point and the relative coordinates recorded. The coordinates are continuously accumulated in either the positive or negative direction; therefore, any number of coordinates may be obtained relative to an origin without resetting on the origin. The sign of the coordinates is indicated to the left of the reading.

2.5 Illumination

The illumination systems are activated by two switches on the control panels in front of each of the glass stages. One switch on each panel labeled 'background illumination' activates an 8 watt fluorescent tube mounted inside each drum. The fluorescent tube provides general illumination of the film on the stage. A second switch on the panel labeled 'high intensity illumination' controls a 300 watt projection lamp which illuminates the area within the field of view of the optical system. A rotatable control knob above the switches varies the intensity of the illumination. Rotating the knob clockwise increases the illumination.

Clipped to the fluorescent tubes are rotatable light shields. By proper rotated orientation the shield will occlude the portion of the tube not being used when films less than $9\frac{1}{2}$ inches in width are used on the instrument. For illuminating $9\frac{1}{2}$ inch wide film they should be rotated to the underside of the tube.

The 300 watt projection lamp is imaged into the optical system by a refractive type condensing system. Just below the cylindrical stage glass is an assembly consisting of an anamorphic lens and blue diffusing filter to provide an even distribution of illumination across the field of view of the optical system. The blue filter also maintains the color temperature of the illumination when the projection lamp is dimmed by rotating the knob above the switches.

The knob controls a silicon controlled rectifier (SCR) which varies the voltage to the lamp. In addition, iris diaphragms are mounted on the rotation prism assemblies for varying the illumination if desired.

A tandem blower unit exhausts the air from the Lamp house of the 300 watt lamps. The blower units is energized anytime the main power switch is on.

III. ROUTINE MAINTENANCE AND SERVICING

3.1 General

The primary consideration in the routine maintenance of the Panoramic Stereoviewer is to keep it clean. Dirt and grit are the worst enemies of a precision instrument. A dust cover has been furnished with the unit and it is recommended that the instrument be kept covered when not in use.

Particular care should be taken when cleaning and servicing that proper materials and procedures are used. Improper cleaning procedures can do more harm than good, particularly to optical components. Excessive amounts or the wrong type of lubricants may attract and hold dust and grit and tend to clog or restrict the motions they are intended to lubricate.

3.2 Lubrication

The frequency at which this instrument should be cleaned and lubricated is dependent on the environment in which it is operated and the amount of use it receives. In general it is recommended that the rear panels on the instrument and the cover on the back of the counter assembly should be removed once a year and the instrument thoroughly cleaned and relubricated. The optical

system will require cleaning at more frequent intervals. The mechanical components of the relay lens interchange and the zoom system have been factory lubricated for the life of the instrument. No attempt should be made to gain access to these housings or to disassemble the eyepieces or objective assemblies. They have been adjusted at the factory and should not be disturbed.

The bevel and spur gears in the manual drives, counter drives and the Y motor drive should be lubricated with a material such as Molykote(R). The upper end of the flexible drive shafts for the manual drives and the counters should be disconnected and lubricated with a lubricant such as powdered Graphitar(R). Where the cables for controlling the diameter sensing arms pass through the cable guides should be lubricated with Molykote(R) or a similar heavy type grease.

The supporting guide rods and the ball bushings for the Y carriage assemblies should be cleaned and relubricated with a light machine oil. Wipe off the excess oil to avoid attracting dust and grit to the rods. Clean and relubricate the drive spindles for the Y carriages.

All motors and the blower unit have sealed bearings which do not require lubrication.

The cylindrical glass stages are mounted between radial type ball bearings. The bearings were lubricated with a very light machine oil at the time of assembly. The bearings

should not require further lubrication; however, if the stages are replaced, the bearings should be inspected. If the bearing feels sticky or rough it should be cleaned by flushing and relubricated with a very light machine oil.

3.3 Cleaning the Film Stage

The glass stages and the rubber coated friction rollers associated with the film drive should be cleaned at frequent intervals. Access is obtained to the inner surface of the stage by driving the Y carriage to its outer most limit.

The recommended procedure for cleaning the glass surfaces is to saturate a clean cloth or lens tissue with isopropyl alcohol or a mild detergent solution and hold it lightly in contact with the stage while rotating the stage by hand. Do not press or rub hard on the surface of the stage until all grit type material has been removed since it will act as an abrasive and may scratch the surface. After cleaning, the surface should be wiped dry with a second cloth or other lens tissue.

The rubber coated friction and guide rollers should be wiped with a damp cloth to remove any grit or other foreign matter from their surface.

3.4 Lamp Replacement

To remove the fluorescent tube which is mounted inside the cylindrical glass stage, the Y carriage should be driven to its outermost position. The tube is then easily accessable through the end of the stage mount. Before removing the tube the light shield which clips to the tube should be removed by pulling it straight off. The tube is removed by rotating it one quarter of a turn. Caution is advised in rotating the tube, it will rotate more easily in one direction due to the configuration of the terminal contacts in the sockets. Forcing the tube to rotate in the wrong direction may break the plastic cover on the socket. As a general practice try rotating the tube in both directions with a small force before increasing the amount of force.

To replace the 300 watt projection lamp the Y carriage should be driven to its outermost position. This will expose the lamphouse for the high intensity illumination system outside the cylindrical glass stage and the vertical mounting plate for the stage. A hinged cover on top of the lamp housing may then be opened to provide access to the lamp. The lamp is mounted base down and may be removed by pulling straight out through the opening.

3.5 Cleaning Mirrors and Condensing Lenses

The only exposed mirror in the instrument is the 45° [redacted] mirror in the high intensity condensor type illumination system. This is a first surface mirror and extreme care should be taken in cleaning. Loose dust and grit should be removed first by dusting lightly with a camel hair brush. Oil and smoke film deposits along with fingerprints and stubborn grit may then be removed by lightly drawing lens tissues saturated with isopropyl alcohol or a mild detergent solution across the mirror surface. After all foreign material has been removed the mirror surface should be dried with clean dry lens tissues.

STATINTL

A similar procedure is recommended for cleaning the condensor elements and the blue filter in the system, with the exception that the extreme care specified for cleaning the mirrors may be relaxed somewhat. The elements in the condensor system may be removed for cleaning.

3.6 Care of the Optical Viewing System

Only exposed surfaces of the optical viewing system should be cleaned. No attempt should be made to remove any of the optical elements for cleaning. The optical system has been adjusted at the factory and should not be disturbed.

The exposed glass to air surfaces of the optical system have an antireflection coating deposited on them. The recommended porcedure for cleaning is to first blow all loose dust and grit from these surfaces with a syringe. Then any stubborn dust and grit should be removed by brushing lightly with a clean camel hair brush. Fingerprints and smoke and oil film deposits may then be removed with a Q-tip moistened lightly with isopropyl alcohol or Xylol.

3.7 Replacement of Cylindrical Film Stage

In the unlikely event that one of the glass stages has to be replaced, the following procedure is recommended:

Operate the joystick until the carriage containing the stage to be replaced is in its innermost position to the center of the instrument. Remove film from the carriage and de-energize the instrument.

First remove the fluorescent tube and loosen the two set screws which clamp the two anamorphic condenser lens guide rods. Next remove the four rod supports for the two friction rollers. In the case of the friction rollers, this requires removal of the bearing retainer rings and ball bearings.

The fluorescent tube wiring, including the outboard connector bracket, should now be disconnected from the

stage support casting in preparation for the removal of the casting from the main vertical support plate.

The four bolts which clamp the stage support casting may now be removed and the casting pulled from its locating dowel pins. During this operation, the glass stage must be supported and pulled with the casting to avoid damage.

Remove the drum from its 'O' ring mounting and replace with new drum. This may be facilitated by applying soap to the 'O' ring. Reverse the above procedure to replace the assembly.

To align the rollers after reassembly, use a 10 second spirit level and adjust each individual rod axis parallel to the stage by appropriate movement of the four rod end supports.

Check manually for slippage between the drive rollers and the glass stage after alignment. Light contact pressure only is required between these elements to prevent slippage.

Load film onto the instrument and operate. Note the film being wrapped on the take-up spool, and if the edge of the film tends to rub or ride up one spool flange, check the adjustment of the idler roller axes.

3.8 Electrical Maintenance

Operator maintenance of the instrument should be limited to the replacement of fuses which are located inside the front right electronic compartment. Malfunctions which occur that cannot be attributed to a blown fuse or to improper setting of the controls should be corrected by a qualified electronic technician or engineer. The operator is cautioned to disconnect the main power cord before opening the doors of the electronic compartments.

The following is a list of all fuses, their size, and function.

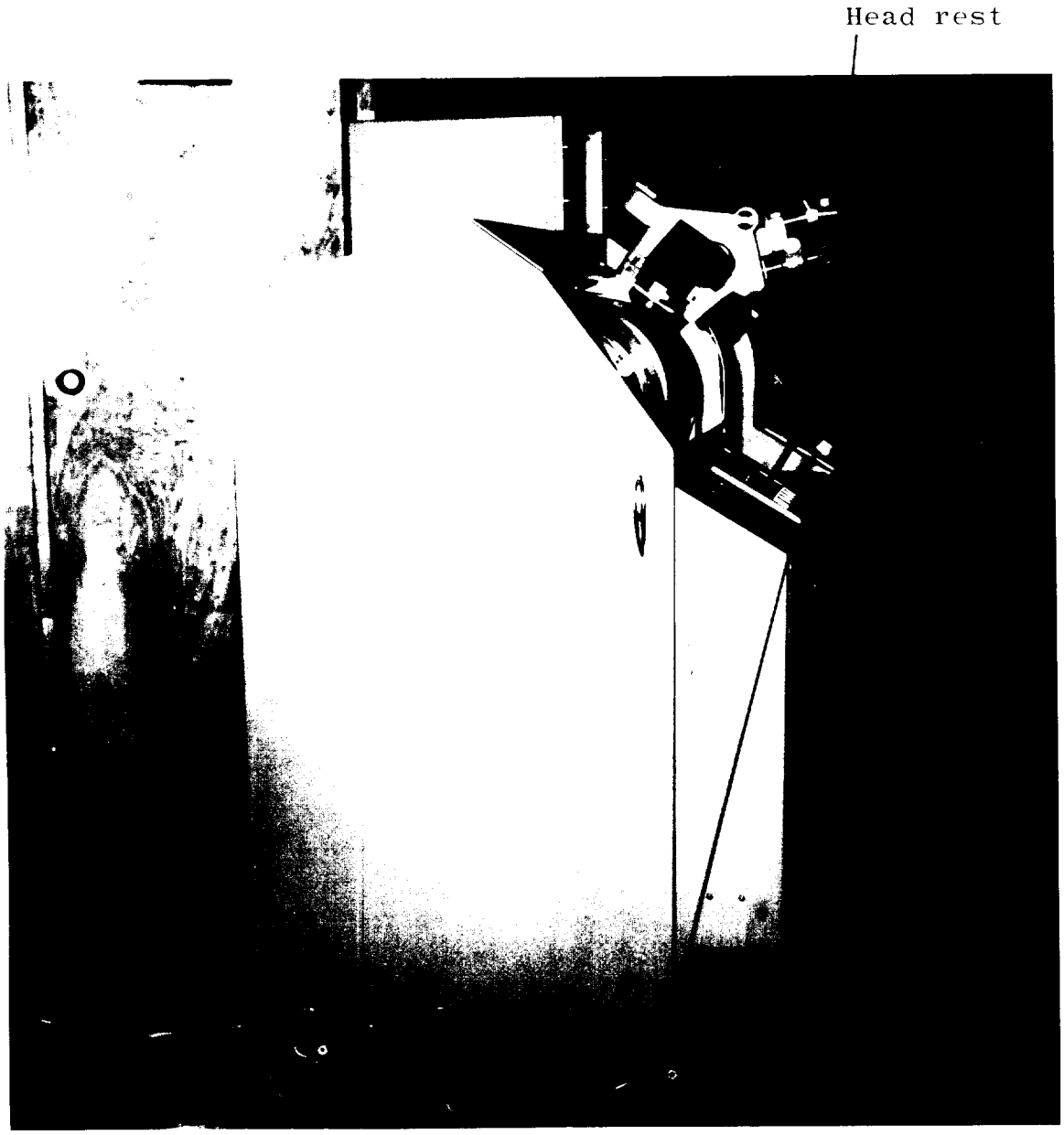
Fuse Ident. #	Size	Function
F1	250v 20A Cartridge	Main power
F2	AGC-10	-24v power supply -30v power supply
F3	3AG 1A 125v	Blower M-5
F4	AGC2	Fluorescent lamp FL-1 & FL-2
F5	AGC-10	Projection Lamp 1L-2
F6	MDL-4	Y-drive motor M-6
F7	AGC-10	Projection Lamp IL-1
F8	MDL-4	Power controls for motor M-1
F9	MDL4	Power controls for motor M-2
F10	MDL4	Power controls for motor M-4
F11	MDL4	Power controls for motor M-3
F12	AGC4	-90v power supply

An electrical schematic of the instrument is included in the pocket in the back of the manual to assist qualified personnel in trouble shooting the instrument. Also included is a tabulation of possible troubles, the cause and the remedy to assist in diagnosing troubles.

TROUBLE	POSSIBLE CAUSE	REMEDY
1. All controls inoperative and all lights out.	a. Line cord unplugged. b. Main fuse defective. c. Defective relay RL-22.	a. Connect plug. b. Replace fuse. c. Replace Relay RL-22.
2. Pilot light on main panel switch, S1, out-all other components normal.	Burned out bulb.	Replace bulb.
3. All pilot lights out but auxiliary lamps FL-1, FL-2, and projection lamps 1L-1, 1L-2 only operate.	a. Fuse F2 open. b. 24v DC supply defective.	a. Replace fuse. b. Replace or repair supply.
4. Projection lamp 1L-1 or 1L-2 not operating.	a. Lamp burned out. b. Fuse F5 or F7 open. c. Switch S2 or S5 defective. d. Dimmer control R11 or R13 defective. e. Dimmer control circuit defective.	a. Replace lamp. b. Replace F5 or F7 c. Replace S2 or S5. d. Replace R11 or R13. e. Check for defective component & replace
5. Cannot dim projection lamp 1L-1 or 1L-2 operating at full intensity.	Dimmer control circuit defective.	Check for defective Component and replace.
6. Auxiliary (Fluorescent) lamp FL-1 or FL-2 not operating.	a. Lamp FL-1 or FL-2 burned out. b. Fuse F4 open. c. Switch S3 or S5 defective.	a. Replace lamp FL-1 or FL-2. b. Replace F4. c. Replace S3 or S5.

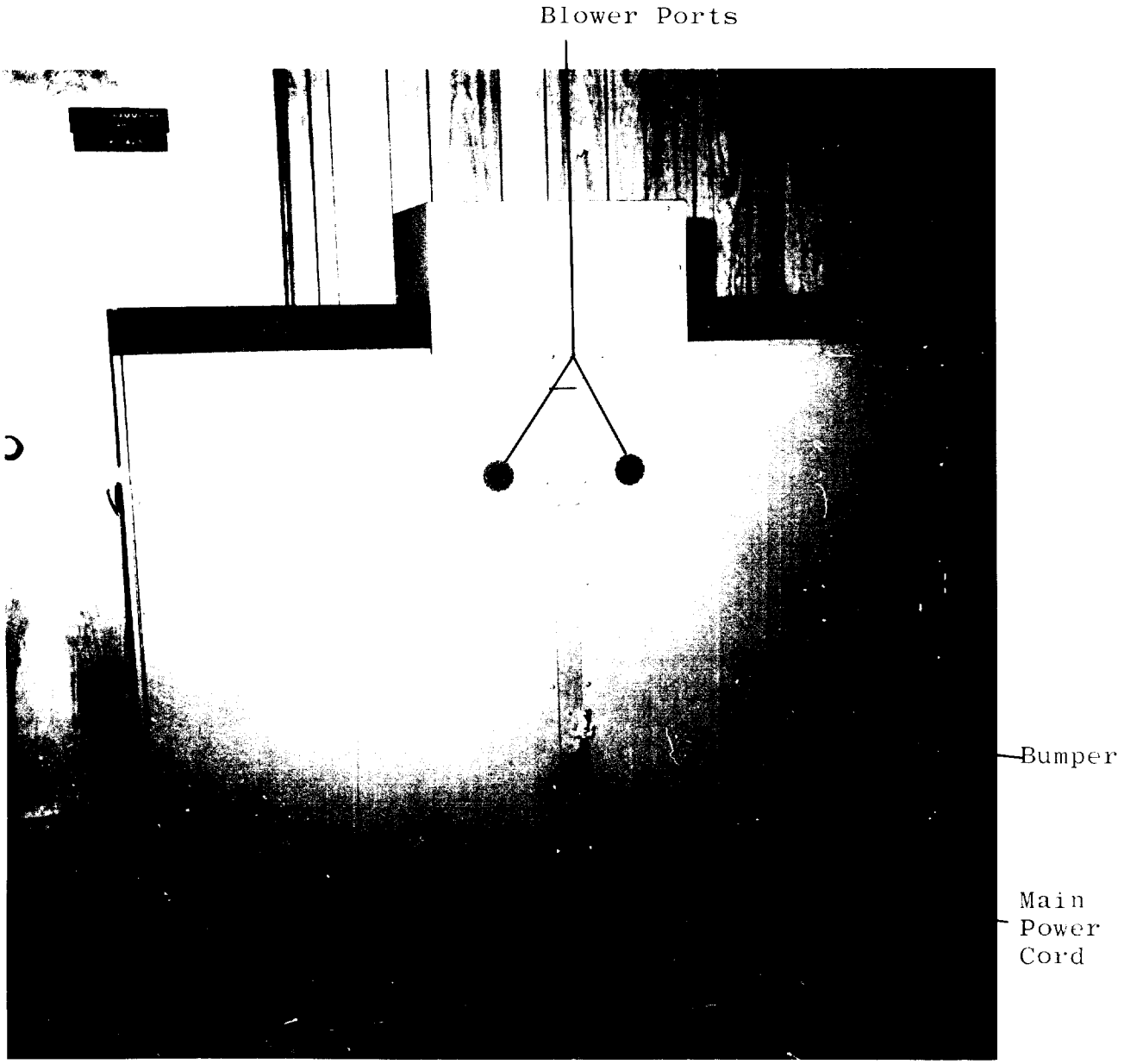
7. Cooling blower not operating at all times.	a. Fuse F3 open. b. Motor M-5 defective.	a. Replace F3 fuse. b. Replace M-5 motor.
8. X-drive left side not operative when joystick is moved up or down.	a. Film tension switch, S6, not pressed. b. Field flattener on left side lowered.	a. Press switch S6. b. Raise field flattener.
9. X-drive right side not operative when joystick is moved up or down.	a. Film tension switch, S9, not pressed. b. Field flattener on right side lowered.	a. Press switch S9. b. Raise field flattener.
10. X-drive left side drives in one direction only or X-drive right side drives in one direction only.	Defective motor controller, respectively.	Check for defective component & replace
11. X-drive left side drives in both directions but response is different in one direction; or X-drive right side drives in both directions but response is different in one direction.	Diameter sensor retracted.	Set diameter sensor to operate position.
12. X-drive left side drives with field flattener down when joystick is down; or X-drive right side drives with field flattener down when joystick is up.	Film tension not balanced due to improper adjusted R23 or R29; R49 or R65, respectively.	Adjust R23 or R39 with joystick down, or adjust R49 or R65 with joystick up.
13. X-manual handwheel on left side does not move film or X-manual handwheel on right side does not move film.	Film tension switch S6 or S9 respectively not activated.	Activate film tension switch S6 or S9 respectively.
14. Activation of X-manual clutch delayed too long after left joystick is released or activation of X-manual clutch delayed too long after right joystick is released.	Improper setting of time delay potentiometer R88 or R92 respectively.	Reset time delay potentiometer R88 or R92. Note these potentiometers are located behind panel on rear side of electronic compartment.

15. Film tension extremely high on left drive or film tension extremely high on right drive.	Potentiometer R26 or R36, potentiometer R52 or R56 respectively improperly adjusted.	Adjust R26 and/or R36, adjust R52 and/or R56 respectively
16. Film dumps off spool after loading on left drive or film dumps off spool after loading on right drive.	Drive reversing switches S16 and/or S17 in wrong position, S18 and/or S19 in wrong position respectively.	Set switches as indicated on switch plates & instructions for loading film.
17. Y-drive inoperative - left and right carriages do not move.	a. Fuse F6 open. b. Defective relay RL-16 or RL-17.	a. Replace F6 fuse. b. Replace RL-16 or RL-17.
18. Left side Y-drive inoperative - will not drive left.	a. Carriage at limit of travel. b. Defective relay RL-3. c. Defective clutch CL1.	a. Operate joystick to move carriage in opposite direction. b. Replace RL-3. c. Replace CL1.
19. Left side Y-drive inoperative - will not drive right.	a. Carriage at limit of travel. b. Defective relay RL-4. c. Defective clutch CL-1.	a. Operate joystick to move opposite direction. b. Replace RL-4. c. Replace CL-1.
20. Right side Y-drive inoperative - will not drive right.	a. Carriage at limit of travel. b. Defective relay RL-2. c. Defective clutch CL-3.	a. Operate joystick to move carriage in opposite direction. b. Replace RL-2. c. Replace CL-3.
21. Right side Y-drive inoperative - will not drive left.	a. Carriage at limit of travel. b. Defective relay RL-1. c. Defective clutch CL-3.	a. Operate joystick to move carriage in opposite direction. b. Replace RL-1. c. Replace CL-3.
22. Manual Y-drive on left side inoperative - will not drive right or left. Or manual Y-drive on right side inoperative - will not drive right or left.	Defective clutch CL-2 or CL-4, respectively.	Replace CL-2 or CL-4.



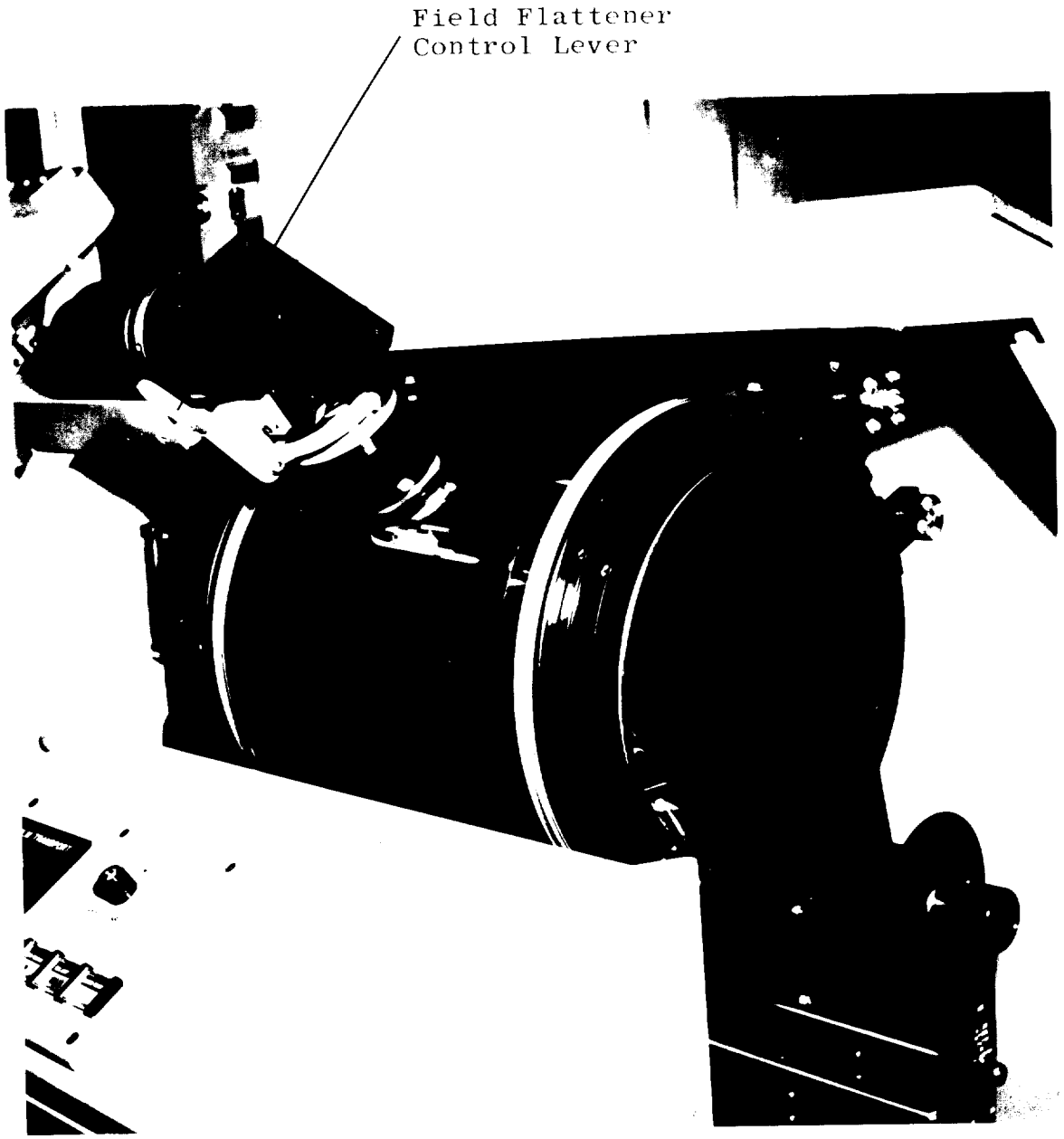
Side View of Instrument

FIGURE 2



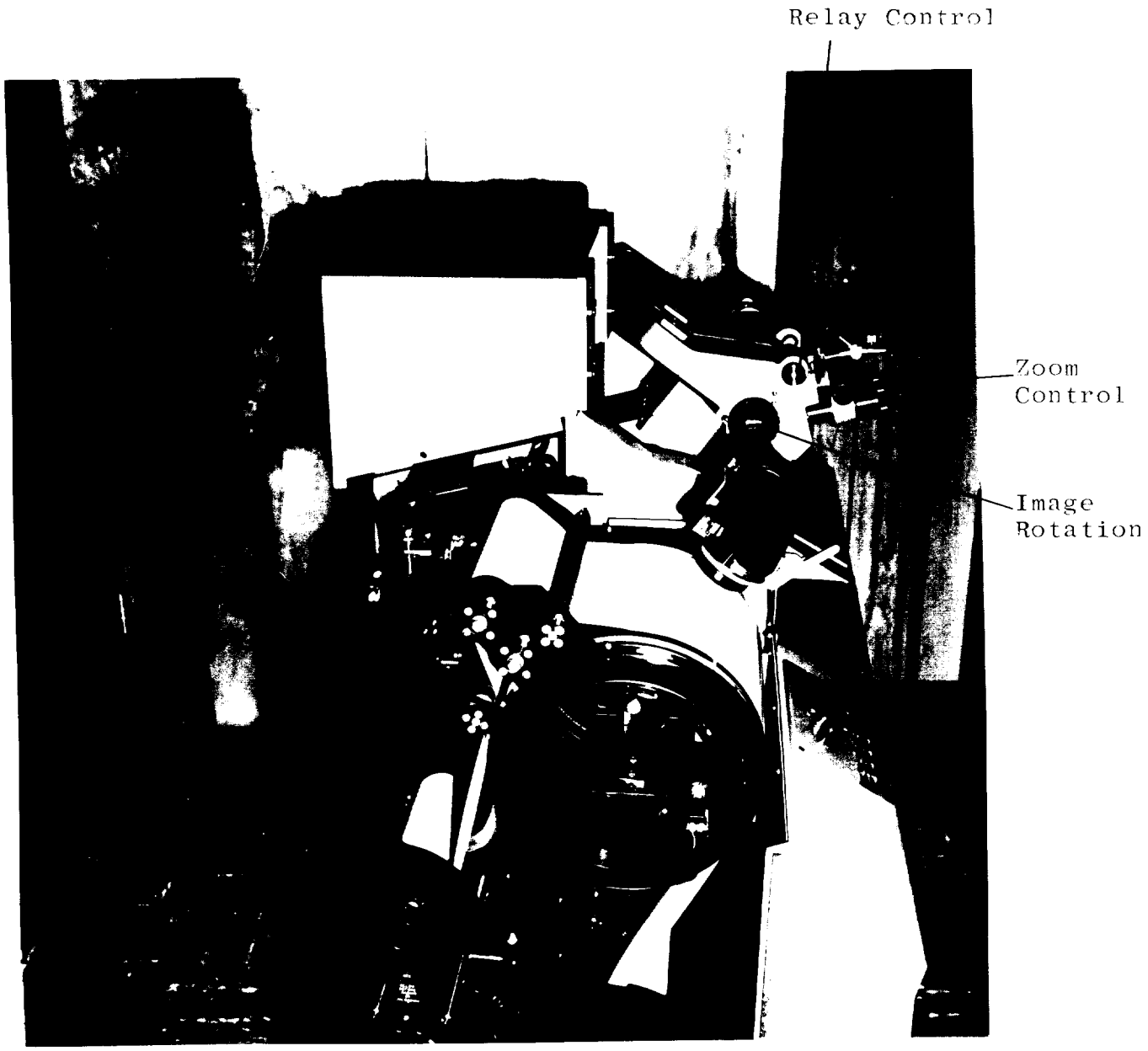
Rear View of Instrument

FIGURE 3



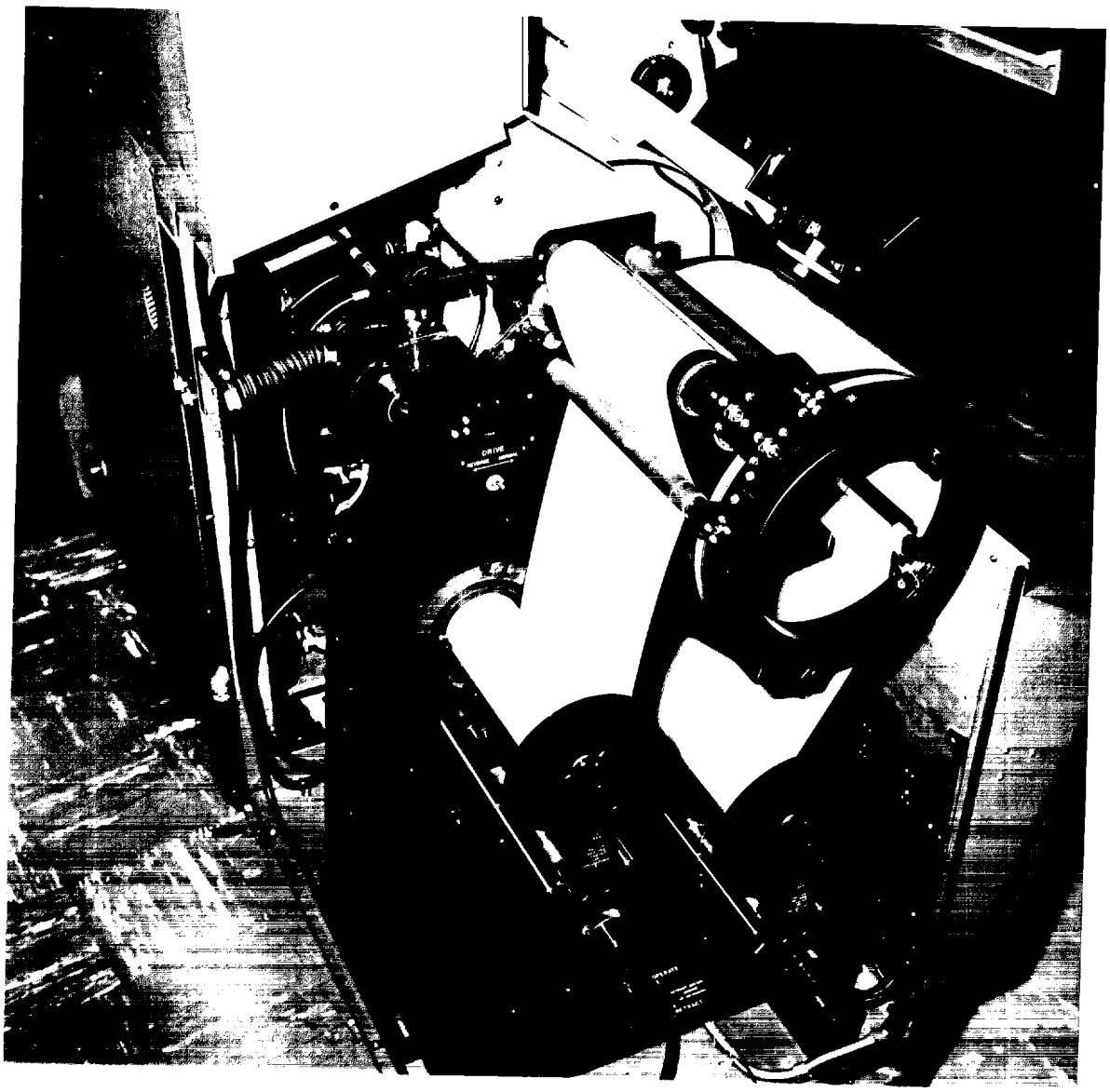
Right Film Stage and Objective Assembly

FIGURE 4



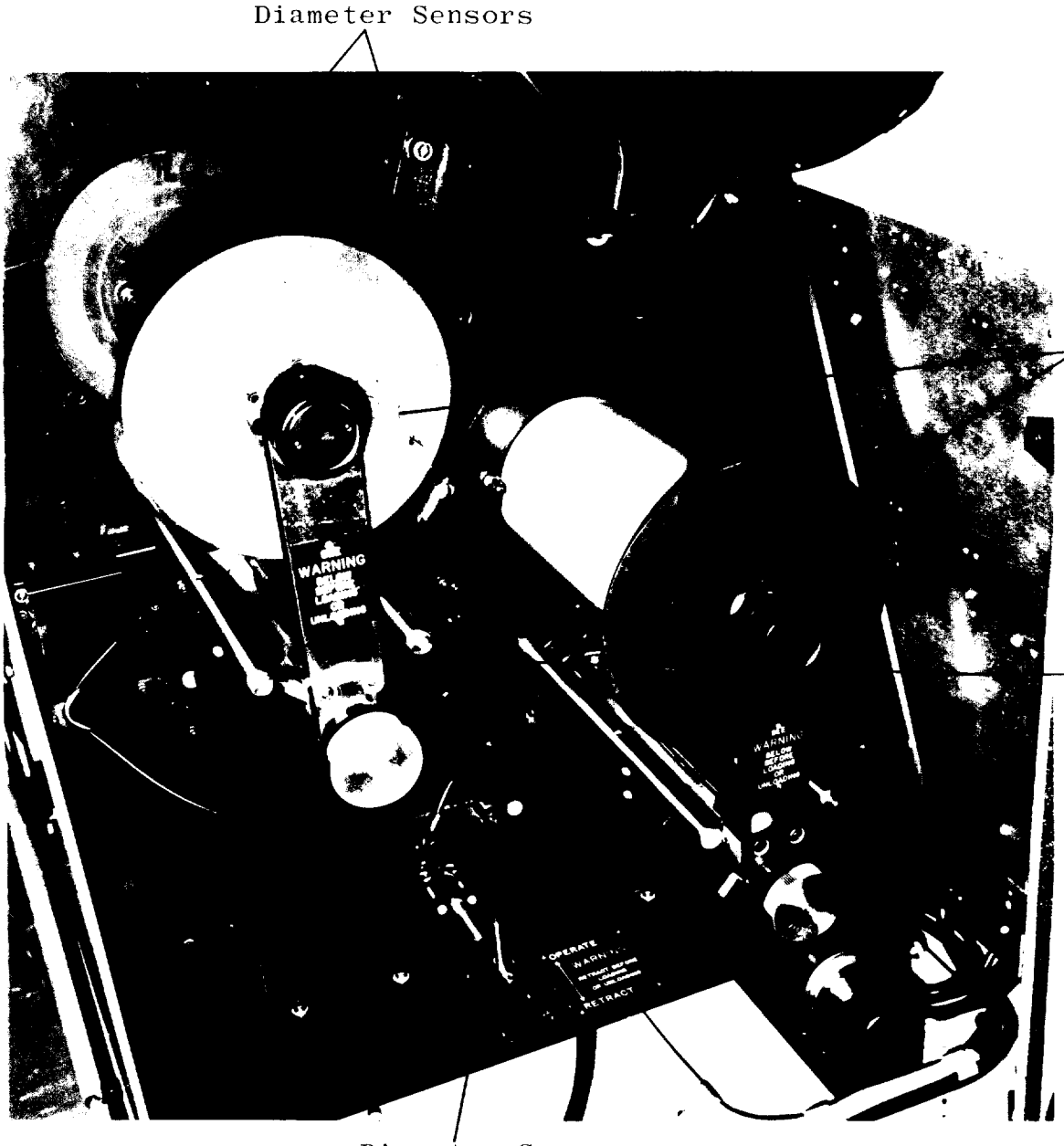
Left End with Covers Removed

FIGURE 5



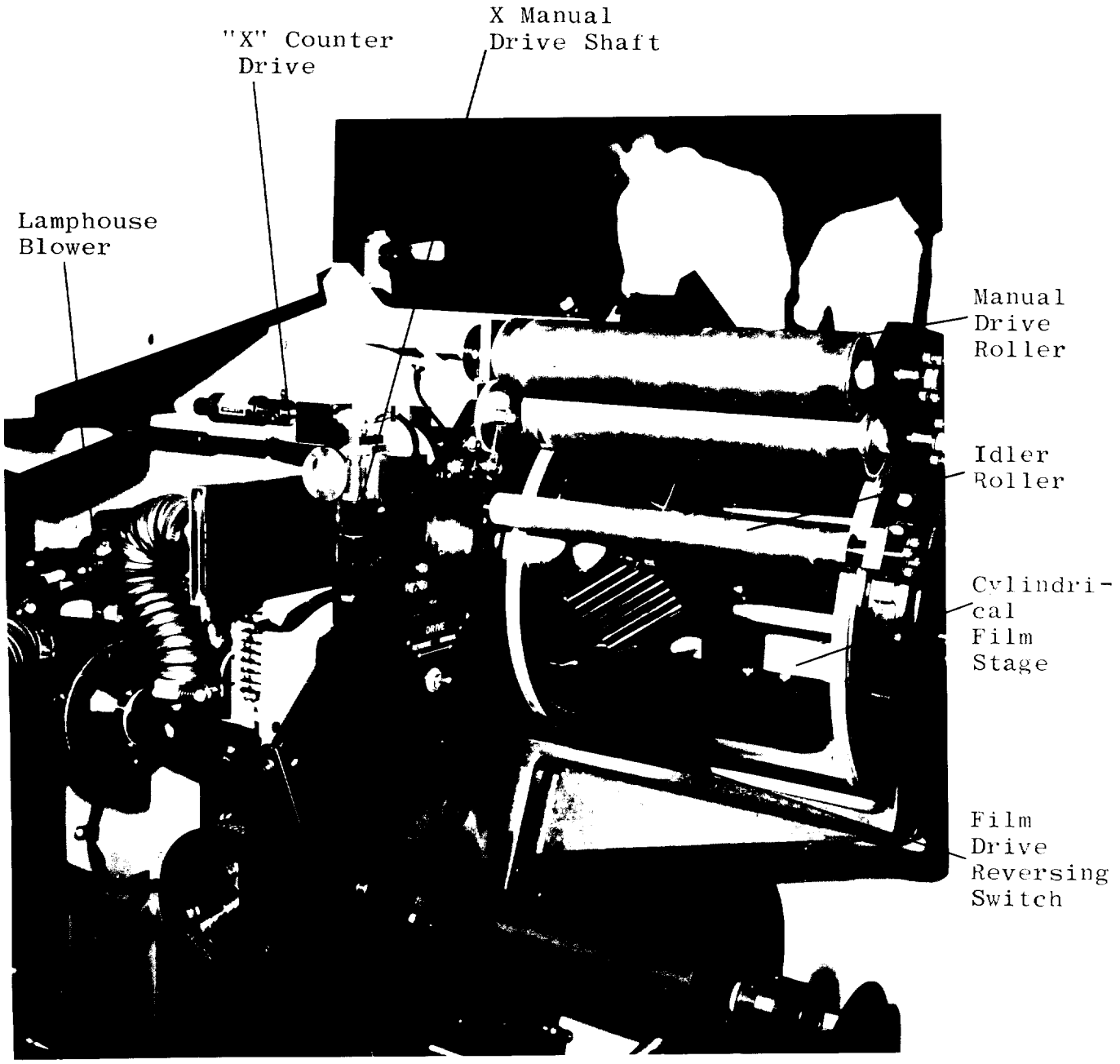
Left Film Carriage with Covers Removed

FIGURE 6



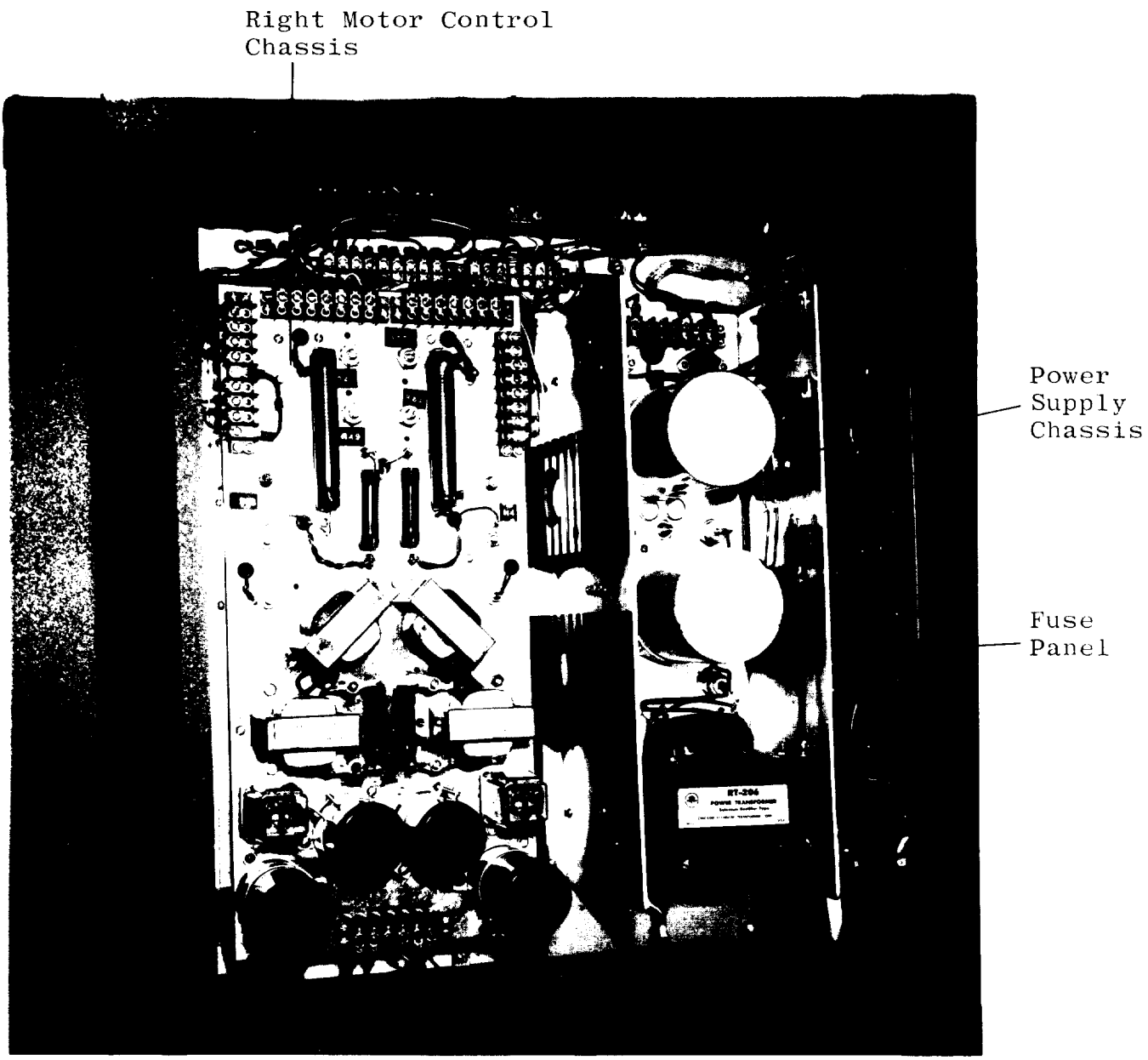
Left Film Drive

FIGURE 7



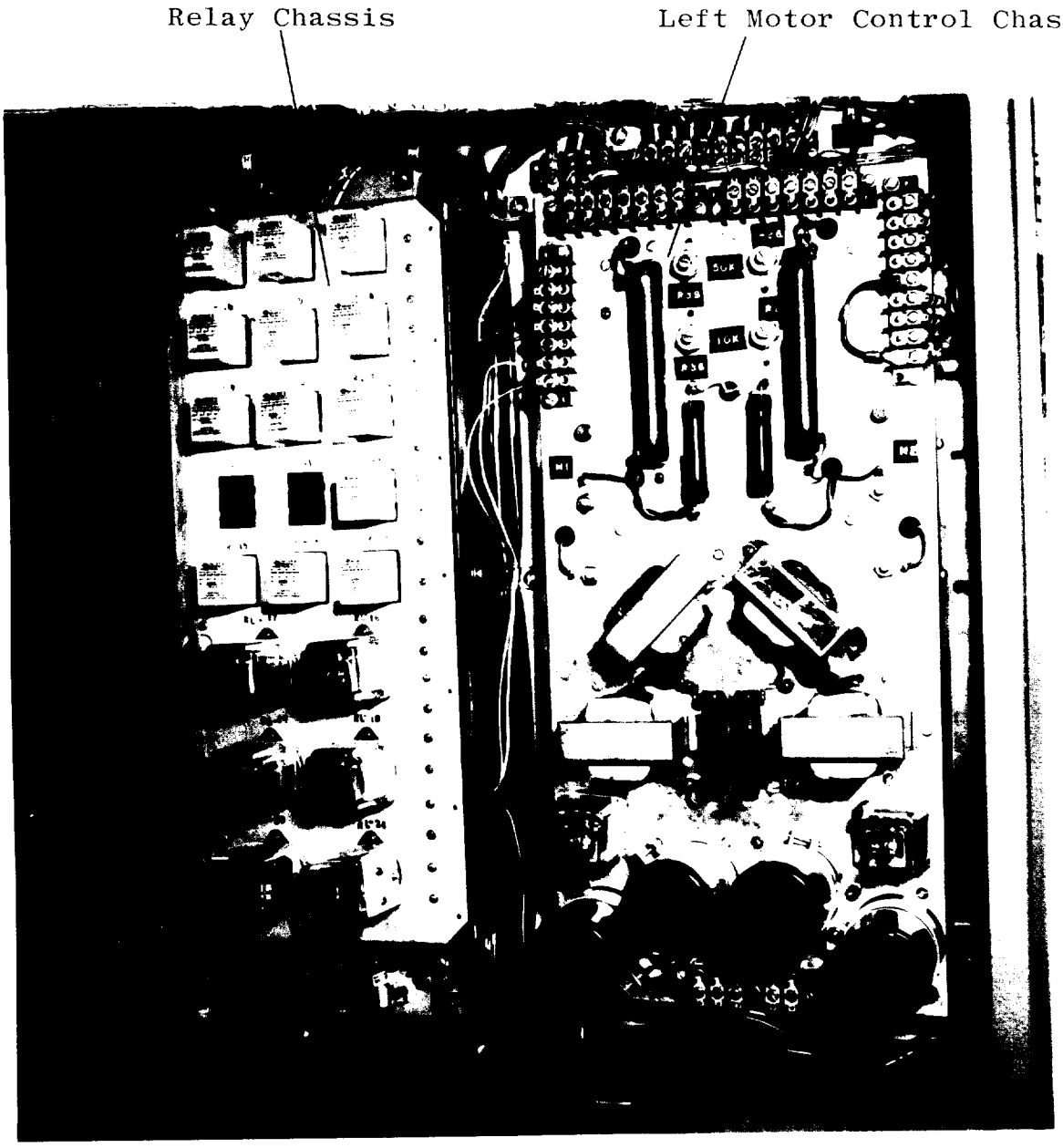
Left Drives with Covers Removed

FIGURE 8



Right Front Electronic Compartment

FIGURE 9



Left Front Electronic Compartment

FIGURE 10

Right Time Delay Chassis

Time Delay Chassis

FIGURE 11

Next 1 Page(s) In Document Exempt