CP-16R Reflex OPERATION & MAINTENANCE MANUAL

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Technology In The Service Of Creativity

CP-16R Reflex
16mm Sound Camera System

OPERATION & MAINTENANCE MANUAL

INTRODUCTION

The CP-16R Operation & Maintenance Manual is designed for CP-16R *camera operators*. It provides complete descriptions of all CP-16R reflex camera models and accessories, as well as the Crystasound amplifier and related sound system accessories. The periodic adjustment and maintenance procedures described in this manual are relatively simple and easy to carry out, even under field conditions. For more complex servicing, see your authorized CP-16 service center, or contact the *Service Department* at the factory.

Authorized Service Centers.

Authorized CP-16 service centers are located throughout the U. S. A. and abroad. These service centers are well stocked with critical replacement parts, and are staffed by factory trained technicians fully qualified to service all CP-16 and CP-16R camera models. *Warranty-covered* repairs should be made only through authorized CP-16 service centers. Contact Cinema Products' *Sales Department* for an up-to-date listing of authorized service centers.

Maintenance Training Seminars.

Cinema Products conducts annual CP-16 Maintenance Training Seminars which are usually held at the factory in Los Angeles. These two-day seminar/workshops, conducted by Cinema Products factory personnel, provide in-depth information and demonstrations on the care and maintenance of CP-16 and CP-16R camera systems, with emphasis on preventive care and effective trouble shooting in the field. We recommend that all CP-16R camera operators (and maintenance technicians who service CP-16R cameras) attend these seminar/workshops. Contact the CP-16 Maintenance Training *Seminar Coordinator* for application forms and detailed information on the next scheduled seminar.

Something to remember!

If you have any further questions concerning the operation and maintenance of your CP-16R camera, do not hesitate to call the factory *Service Department* directly. We'll do our best to help you.

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2037 Granville Avenue, Los Angeles, California 90025
Telephone: (213) 478-0711 ■ Telex: 69-1339 ■ Cable: Cinedevco

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CP-16R, CP-16R/A & CP-16R/DS Reflex Camera Models

CP-16R, CP-16R/A & CP-16R/DS REFLEX CAMERA MODELS

DESCRIPTION

GENERAL

Cinema Products' CP-16R (Fig. 1) is a lightweight professional 16mm motion picture camera, designed for either single or double system sound recording. The CP-16R/A model camera (Fig. 1A) is equipped with the Crystasound built-in amplifier. A version of the CP-16R, designated the CP-16R/DS (Fig. 7A), is available for double system operation *only*.

CP-16R type cameras feature: through-the-lens reflex viewing, information display, positive locking CP lens mount, interchangeable lenses, plug-in nicad battery packs, interchangeable film magazines, and a highly accurate crystal controlled DC servo drive motor system (which meets the critical tolerances required for *cordless* double system sound recording).

FIGURE 1   FIGURE 1A

SPECIFICATIONS

Film Size: 16mm single or double perforated daylight loading or lab pack; "B" wind

Film Capacity: 400 ft. or 1200 ft. magazines (120m or 360m)

Dimensions: CP-16R or CP-16R/DS (camera head *only*)
                    9¾" long x 6" high x 6" wide (24.8 cm x 15.2 cm x 15.2 cm)
                    Note: The CP-16R/A camera head is 1/2" (1.2 cm) *wider.*

Weight: CP-16R camera head with NC-4 battery pack: 11 lbs. 4 oz. (5.1 kg)

                    CP-16R/A camera head with NC-4 battery pack: 12 lbs. 5 oz. (5.6 kg)

                    CP-16R/DS camera head with NC-4 battery pack: 11 lbs. 1 oz. (5.0 kg)

                    CP-16R camera and battery, loaded with 400 ft. PLC-4 magazine, film,
                    and 10-150mm Angenieux zoom lens: 16 lbs. 14 oz. (7.7 kg)

                    CP-16R/A camera and battery, loaded with 400 ft. PLC-4 magazine,
                    film, and 10-150mm Angenieux zoom lens: 17 lbs. 15 oz. (8.1 kg)

                    CP-16R/DS camera and battery, loaded with 400 ft. PLC-4 magazine,
                    film, and 10-150mm Angenieux zoom lens: 16 lbs. 11 oz. (7.6 kg)

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Camera Speed:	The CP-16R may be ordered with sync speeds of either 24 or 25 fps.
	When sync speed is 24 fps, the *corresponding* variable speeds are: 12, 16, 20, 28, 32 and 36 fps.
	When sync speed is 25 fps, the *corresponding* variable speeds are: 12.5, 16.5, 21.0, 29.0, 33.5 and 37.5 fps.
Sync Speed Accuracy:	±8 ppm at 70°F (21.1°C); ±15 ppm from 0° to 140°F (—18° to +60°C)
Aperture Opening:	0.294" x 0.410" (7.46mm x 10.41mm)
Rotating Mirror Shutter:	Set at 45° angle; stops automatically in viewing position
Shutter Opening:	156°
Shutter Speed:	1/55th second @ 24 fps (1/57th second @ 25 fps)
Filter Slot:	Behind-the-lens
Handgrip:	Adjustable angle, removable
Magazine Latch:	Quick-release

CAMERA HEAD

The CP-16R camera head (Fig. 2) is an assembly consisting of the body (Fig. 2-7), side cover with battery mount (Fig. 2-1), loading door (Fig. 2-2), film transport movement, tape hook (Fig. 2-5), mount for the magazine (Fig. 2-12), magazine latch (Fig. 2-11), reflex viewfinder (Fig. 2-3), lens mount (Fig. 2-4), carrying handle (Fig. 2-10), control panel (Fig. 2-8), film counter (Fig. 2-9) lens cavity cap (Fig. 2-14), and handgrip (Fig. 2-6).

FIGURE 2 (Rear View)

FIGURE 2 (Front View)
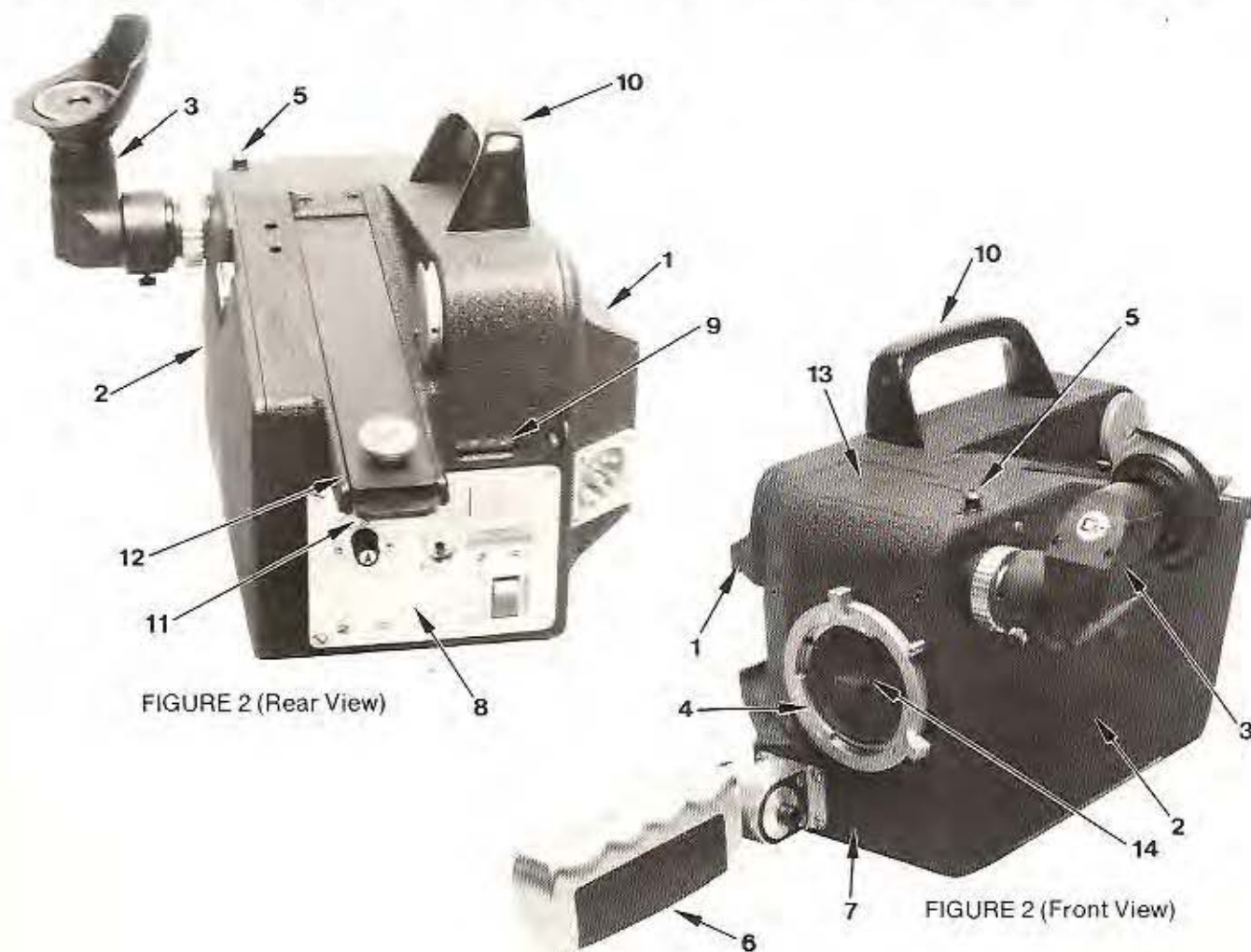
(con't.)

FRONT

The front of the CP-16R camera holds the lens mount (Fig. 3-1) with lens lock ring (Fig. 3-2) and locating pin. There are two cut-outs in the camera for incorporating either the semi-automatic (Fig. 3-3) or fully automatic exposure (Fig. 3-4) control as options. The front also incorporates the handgrip mount (Fig. 3-5) which is removable and contains a push-on/push-off trigger button switch (Fig. 3-6). The handgrip (Fig. 3-7) is adjustable and provides a wide range of holding angles to suit individual preferences. The handgrip may be removed and replaced with either a remote power cable or the J-5 power zoom handgrip control (described in the Camera Options & Accessories section).
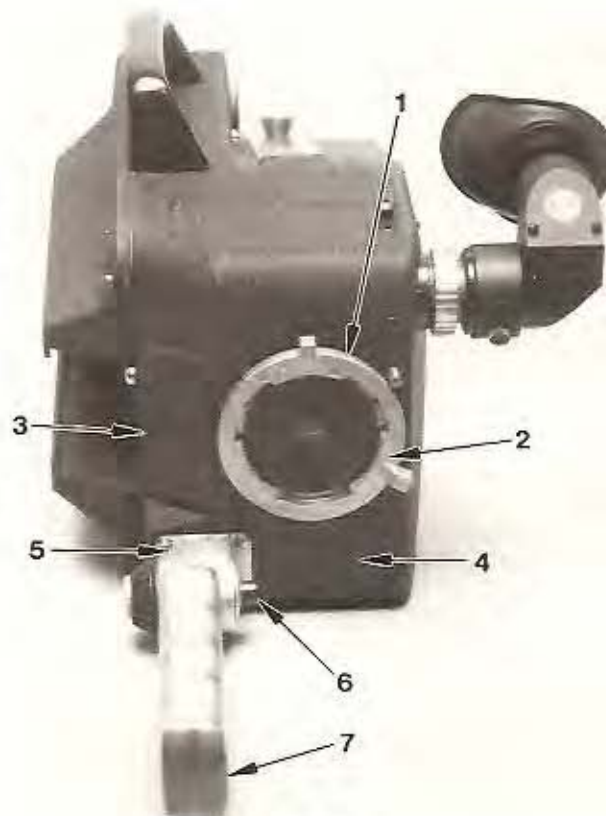
FIGURE 3

LOADING DOOR

The loading door (Fig. 4-1) is covered on the inside with sound-proofing material, and is attached to the camera housing with a sturdy hinge (Fig. 4-2). It is retained near its top edge by an oblong latch knob (Fig. 4-3). To open the door, move the viewfinder to its most upright position, and push the front of the knob down. The door opens to expose the film transport mechanism and threading instruction plate, and *end-of-film* warning select switch — plus identification plate with camera serial number. The loading door includes a rubber bumper to insure filter retention, and seals with a triple step light trap.
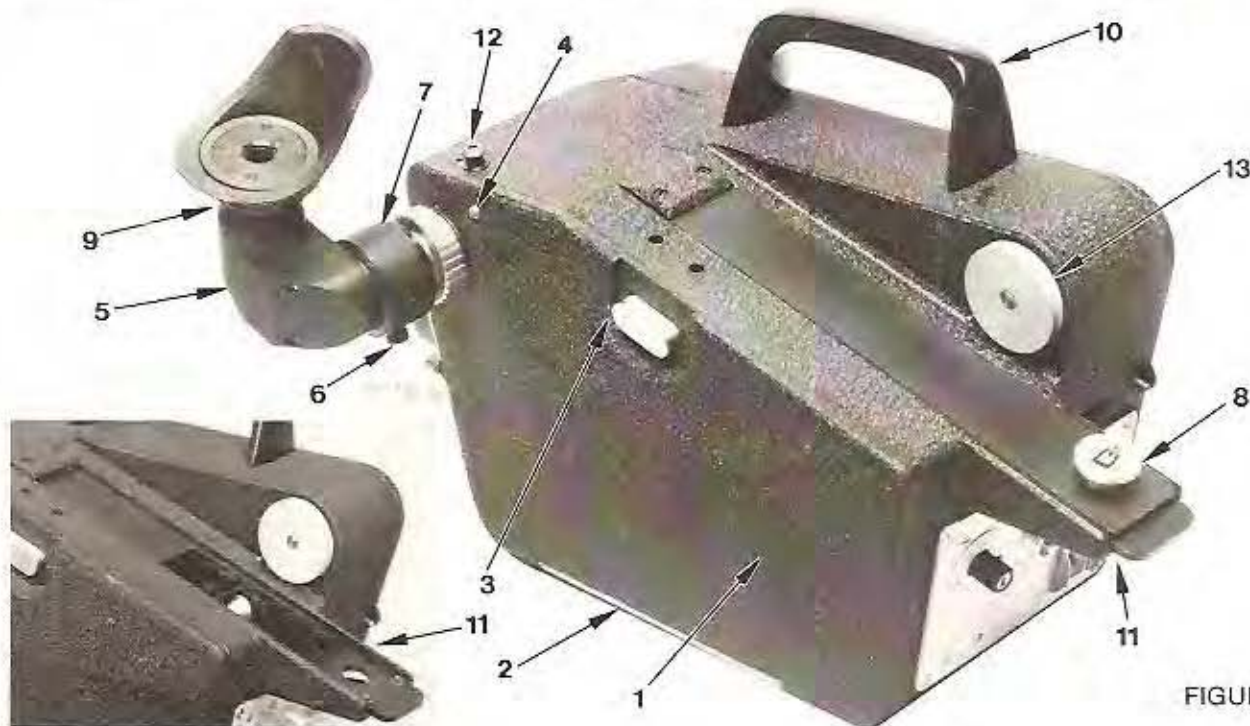
FIGURE 4

OUT-OF-SYNC WARNING LIGHT

On the door side of the camera body, in the upper left corner, is a small red lamp (Fig. 4-4) which only lights up when the camera is running "out-of-sync" (under or over speed) — that is, other than the frame rate selected.

> Note: When the camera is first started, the out-of-sync warning light goes on momentarily until the camera is up to speed. Similarly when the camera is turned off, the out-of-sync warning light also goes on momentarily.

REFLEX VIEWFINDER

The standard reflex viewfinder (Fig. 4-5), supplied with all CP-16R models, includes:

a) *eyepiece* (located one inch back from the film plane), with eyepiece backlight shutter ("dowser") open/close ring control (Fig. 4-9).

b) *diopter* (adjustable). The diopter adjustment (±5 diopters) is accomplished by loosening the thumb screw (Fig. 4-6) and turning the adjustment barrel (Fig. 4-7) until the frame lines on the fiber optics viewing screen (focusing plate) are sharp. Retighten the thumb screw to prevent accidental changing of the setting.

The *information display* (Fig. 4A), utilizing light emitting diodes (LED's), is visible in the reflex viewfinder (standard or orientable).

Top Line (Fig. 4A-1)*

VU = audio modulation level indicator (functions when camera is supplied
    with Crystasound amplifier)
S = out-of-sync warning
B = low battery warning
F = low film warning (20 ft. remaining with 200 ft. film load, or 40 ft. remaining
    with 400 ft. film load)

Bottom Line (Fig. 4A-2)**

Exposure indicators (function when camera is supplied with either semi-automatic or fully automatic exposure control)

Note: Also visible in the reflex viewfinder are the frame markings plated onto the fiber optics viewing screen showing 16mm projector aperture and TV safe action area, plus markings for 35mm blow-up (1.85:1).
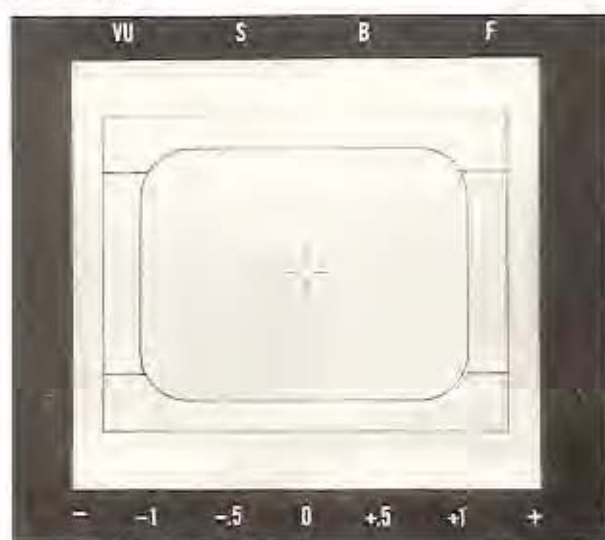
*Note: For further information, see pages 66-67.

FIGURE 4A

**Note: For further information, see pages 52-53.

TOP

The top of the camera body incorporates the carrying handle (Fig. 4-10), the magazine well with the quick release latch (Fig. 4-11), a tape hook (Fig. 4-12), and the magazine drive pulley (Fig. 4-13). An optional mike/lite bracket attaches to the bottom of the carrying handle. There is a cutout (Fig. 2-13) on the top for the addition of the optional Cinevid-16 video-assist camera system. This cutout also provides access to the information display.

BOTTOM

The bottom of the camera has tripod sockets for both 3/8" — 16 and 1/4" — 20 screws (conforming to ASA standard PH3.7-1952).

CAMERA HEAD (con't.)

REAR

The control panel, film counter, and counter reset button are located at the rear of the camera (Fig. 5).

Control Panel — contains a run/stop switch (Fig. 5-6) connected in parallel to the front handle trigger switch. This means that with the run/stop switch on stop, the camera will still operate from the trigger switch. Also on the control panel is a battery test button (Fig. 5-4) and battery test meter (Fig. 5-5). To check for battery condition, press the battery test button and observe the battery condition meter. With a fully charged battery the needle will move to the end of the green area. The meter reads continuously when the camera is running. A meter reading in the yellow area indicates enough power remaining to complete a short take. The information display indicates low battery when the meter reading is on the yellow/green line. In addition, there is a speed selector knob (Fig. 5-3) for sync speed (24 or 25 fps) and corresponding frame rates. (Note: To change speeds — press in speed selector knob and turn.)

Film Counter and Reset Button — the film counter (Fig. 5-1) is located immediately above the control panel, with reset button at the right (Fig. 5-2), protected by a guard. The reset button resets both the film counter and the information display.* The film counter is available reading in either feet or meters. When the Crystaslate system option is installed, the pilotone connector is added to the rear panel (see Camera Options & Accessories section).

*The *low film warning* ("F") on the information display goes on when there is 10% of the film remaining — with switchable control for 20 ft. warning at 200 ft. or 40 ft. warning at 400 ft. (Fig. 7-1).
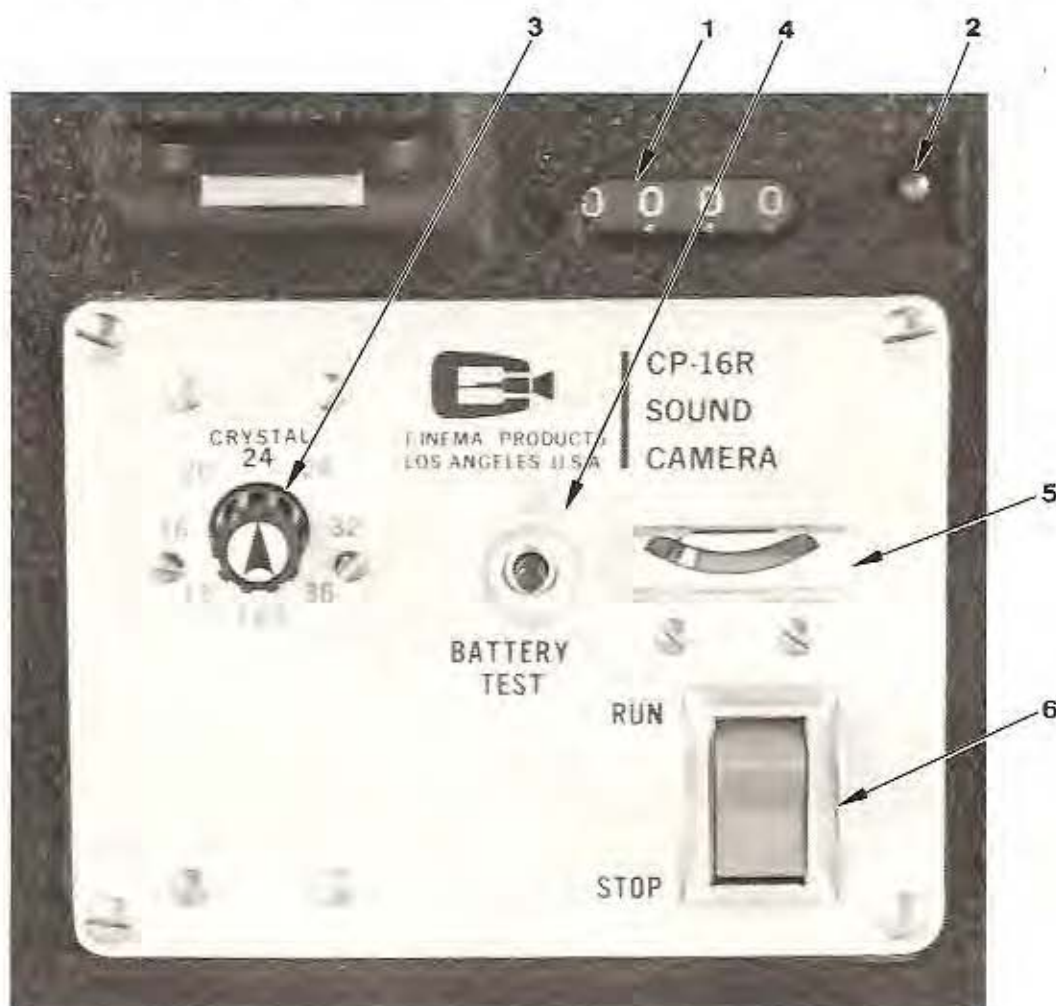
FIGURE 5

SIDE COVER

The CP-16R (Fig. 6) is supplied with an auxiliary side cover which acts as a protective cover for the camera. The auxiliary side cover includes a channel for insertion of the NC-4 battery pack. At the extreme right end of the channel is a release latch (Fig. 6-1)* which must be depressed to insert or remove the battery pack. Upon insertion, the battery automatically makes electrical connection to the camera. The auxiliary side cover also houses an 8-pin connector (Fig. 6-2) for the sound cable when using external MA-11 type amplifiers. (Note: CP-16R/DS model cameras are equipped with auxiliary side covers which do not have 8-pin connectors.)

The CP-16R/A (Fig. 6A) is supplied with the Crystasound amplifier. The amplifier provides the same protection and battery channel as the auxiliary side cover. (The functions and operation of the Crystasound amplifier are described in the Crystasound Amplifier section.)

*Located on the camera body.

FIGURE 6

FIGURE 6A

FILM TRANSPORT

Two versions of film transport mechanism are available. The CP-16R or CP-16R/A version (Fig. 7) is for either single or double system operation. The CP-16R/DS version is for double system operation *only* (Fig. 7A).

The film transport mechanism is shock-mounted inside the camera head. It is of semi-modular construction, with the drive system comprised of the motor, control electronics, and wiring harness — all installed as a pre-assembled unit.

The film transport mechanism is assembled on a base plate, called the *mid-rib* (Fig. 7-2), which supports and positions the intermittent and loop drives, the shutter, shutter housing/lens mount, the film gate, the drive motor system, and the wiring for the magnetic sound recording system.

Note: CP-16R and CP-16R/A camera models are supplied with a "dummy" sound head (Fig. 7-3), to be replaced with a 3XL-type magnetic recording head when recording single system sound (Fig. 8).

FIGURE 7

FIGURE 7A
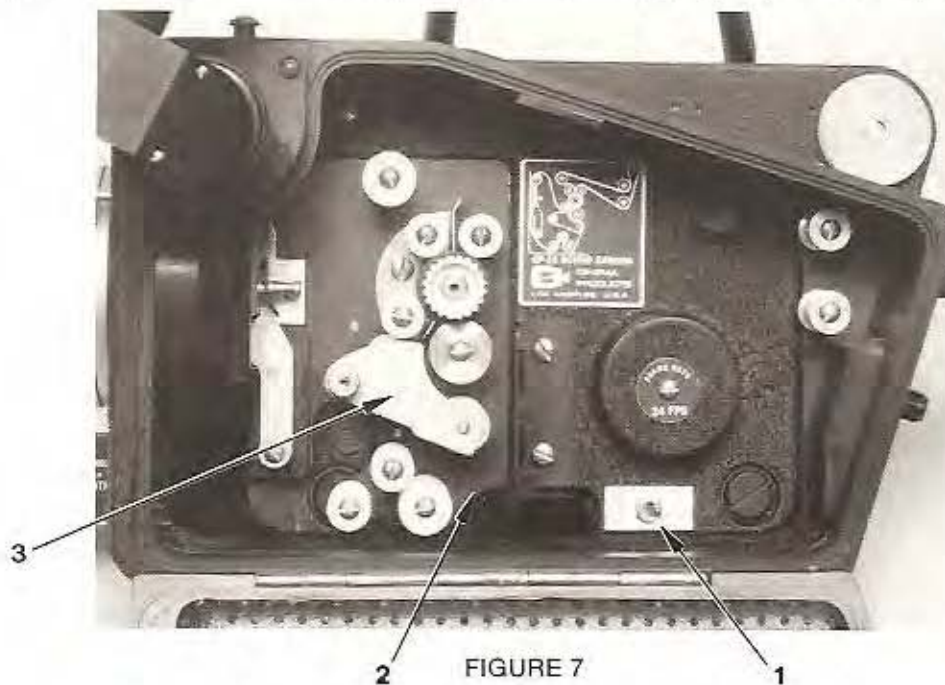
FILTER SLOT — FILTER HOLDERS

The aperture plate assembly has a filter slot (Fig. 8-1) incorporated, which accepts a 1.130" x 0.500" (28.70mm x 12.70mm) CP-16R gelatin filter holder.

Two spare filter holders (Fig. 8-2) are shown inserted in the filter holder receptacle (located in the magnetic shield.)

Note: Two filter holders are supplied with each CP-16R, CP-16R/A or CP-16R/DS camera.
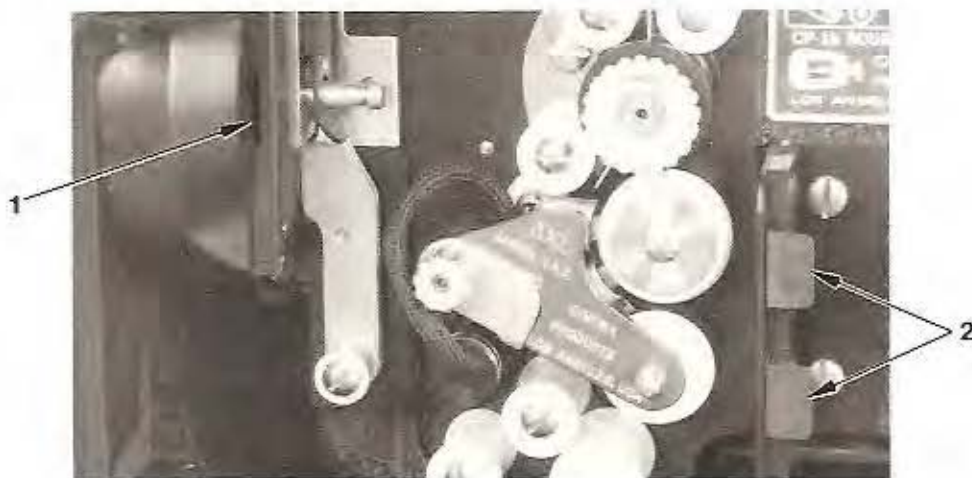
FIGURE 8

LENS MOUNT — LENSES

The positive locking CP lens mount (Fig. 9) is attached to the mid-rib to assure perfect alignment with the film transport. The lock ring (Fig. 9-1) provides positive locking against the lens flange (Fig. 9-2) so that there is no possibility of lens movement, and eliminates lens flange wear since there is no twisting or torquing motion required. To prevent accidental rotation of the lens, there is a special locating pin (Fig. 9-3) installed on the top of the lens mount. Many lenses may be either converted or adapted to fit the CP lens mount (Fig. 9A).*
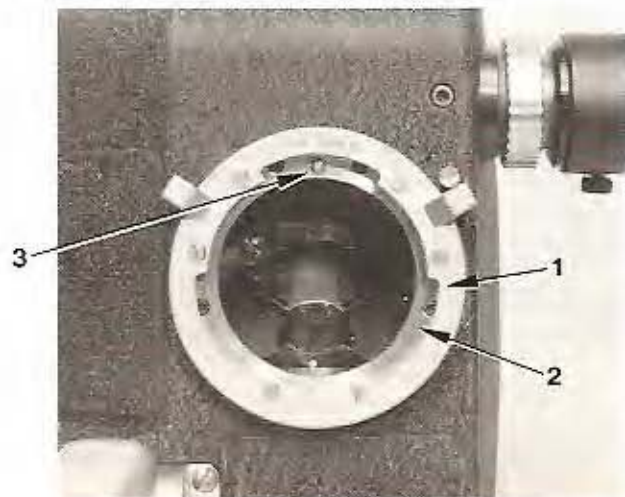
FIGURE 9

FIGURE 9A

*Note: Also available is a special CP lens mount adapter for most Nikon-mounted lenses (where the CP lens mount locking ring is removed and replaced by this special lens adapter).

Important: Check all lenses for proper mirror clearance.

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MAGAZINES

Two sizes of magazines are available from Cinema Products for CP-16R type cameras: the 400 ft. PLC-4 or Mitchell-type magazines, and 1200 ft. Mitchell-type magazines. All are equipped with a special lock mount stud (Fig. 10-1) at the rear of the magazine base. A spring loaded sliding latch (Fig. 10A-1) on the camera body engages this stud to provide instant magazine latching. Lock mount studs may be put on any existing Mitchell-type magazines by screwing a lock mount stud (left hand threads) into the threaded hole on the magazine base.

Note: A magazine drive belt and four lock mount studs are supplied with each CP-16R type camera.

FIGURE 10

CINEMA PRODUCTS
PLC-4 MAGAZINE
(Made from rugged, high-impact
glass-filled Lexan.®)

LOCK
MOUNT
STUD

MAGAZINE
DRIVE
PULLEY

FIGURE 10A

NC-4 BATTERY PACK

The ultra-compact and lightweight NC-4 nicad battery (Fig. 11A) weighs only 16 oz. (454 gr.) and measures 5" long x 1¼" high x 2⅛" wide (12.7 cm x 3.2 cm x 5.5 cm). A fully charged spare NC-4 will easily fit into a shirt pocket. A single NC-4 battery pack supplies all the required power for camera operation . . . as well as powering the Crystasound recording system.

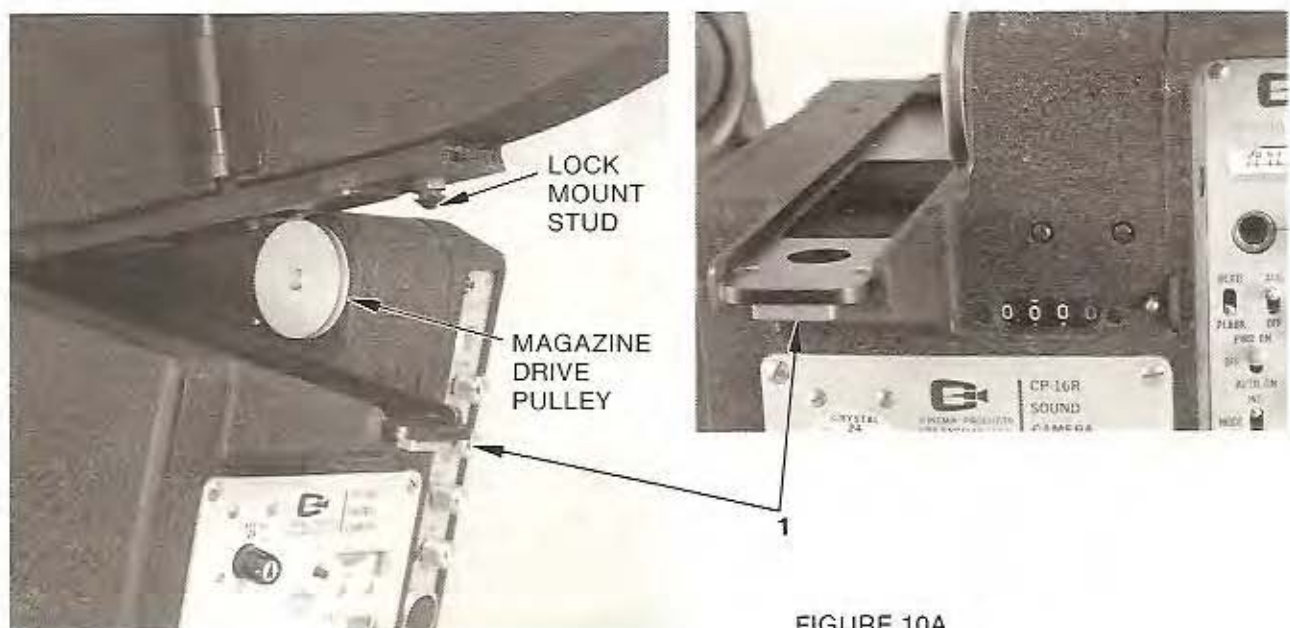The NC-4 battery pack automatically makes electrical connection to the camera upon insertion in the battery channel, located on the side of CP-16R type cameras. It is easily and almost instantly clicked into or out of its position in the camera battery channel.

The NC-4 casing is made from rugged, high-impact glass-filled Lexan.®

The NC-4 battery contains a 30 amp fuse to prevent damage or injury in case of a short circuit. The Crystasound amplifier and auxiliary side cover contain a 20 amp fuse adjacent to the nicad battery channel connection. The 20 amp fuse is designed to blow before the internal battery fuse (see Fuse section).

Battery rating: 20 volt, 550 mah.

Battery capacity: drives approximately 2000 ft. (600m approx.) 16mm film on a single full charge.*

*Note: Battery capacities vary depending on temperature extremes. Amount of film driven on a single full charge will also vary, depending on the number of different accessories being powered by the same battery.

FIGURE 11A

NCC-6 BATTERY CHARGER

The NCC-6 battery charger (Fig. 11B) charges individual NC-4 battery packs. The NCC-6 features a charging status indicator light* and current regulation. Input voltage switchable from 95-130 VAC range to 190-260 VAC range (60 or 50 Hz. single-phase supply). The NCC-6 fully charges an NC-4 battery in approximately 14 hours.

* The NCC-6 charging status indicator light signals that the charger is connected to the battery and is operating correctly. It does not indicate the charge status in the NC-4 battery pack.

FIGURE 11B

Note: Two NC-4 nicad battery packs and two NCC-6 battery chargers are supplied as standard equipment with each CP-16R, CP-16R/A or CP-16R/DS camera model.

(con't.)

POWER SUPPLIES (con't.)

NCC-4 AC POWER SUPPLY/BATTERY CHARGER

The NCC-4 (Fig. 11C) permits operating CP-16R type cameras directly from standard AC mains. It also serves, independently, as an NC-4 nicad battery pack charger. The NCC-4 operates, with switch selection, from 115 to 230 VAC, 60 or 50 Hz., single-phase supply. To operate CP-16R type cameras from AC mains, the NCC-4 power supply/battery charger plugs into the AC/DC power adapter ("dummy battery"), located in the camera battery channel (Fig. 11D). (In this mode of operation, one or two NC-4 nicad battery packs may also be charged *simultaneously.)*

FIGURE 11C

FIGURE 11D

AC/DC POWER ADAPTER ("DUMMY" BATTERY)

The AC/DC power adapter ("dummy battery") automatically makes electrical connection to the camera upon insertion into the battery channel, located on the side of CP-16R type cameras (Fig.11E). For use in conjunction with AC power supply/battery charger or with remote-operation battery cable (Fig. 11D and Fig. 11H).

FIGURE 11E

MBC-6 MULTIPLE BATTERY CHARGER

Charges up to six NC-4 nicad battery packs simultaneously. The MBC-6 multiple battery charger (Fig. 11F) operates, with switch selection, from 115 to 230 VAC, 60 or 50 Hz., single-phase supply.

FIGURE 11F

BATTERY CHARGER CABLE

For use with *multiple battery charger (model MBC-6), AC power supply/battery charger (model NCC-4)* and *AC/DC power adapter ("dummy battery")* when charging NC-4 nicad batteries (Fig. 11G).

FIGURE 11G

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REMOTE-OPERATION BATTERY CABLE

Permits removal of the NC-4 nicad battery pack from CP-16R type cameras for placement in the cameraman's pocket (or some other protected area) when filming in extreme cold (Fig. 11H).

Note: When filming in extreme cold while in an airplane, it is possible to connect the remote-operation battery cable (by changing the battery plug) to operate from the typical 24 volt DC power sources available on aircraft (up to a maximum of 28 volts, DC) . . . and to drive the CP-16R type camera from this auxiliary power source. (Other 24 volt DC power sources such as dry cells, lantern batteries, etc., may also be used in a similar manner.)

Caution: When operating in this mode, it is extremely important to observe correct polarity.

Remote-Operation Battery Cable shown in use connecting an NC-4 Nicad Battery Pack to an AC/DC Power Adaptor ("Dummy Battery") located in the battery channel on the side of the CP-16R/A camera.
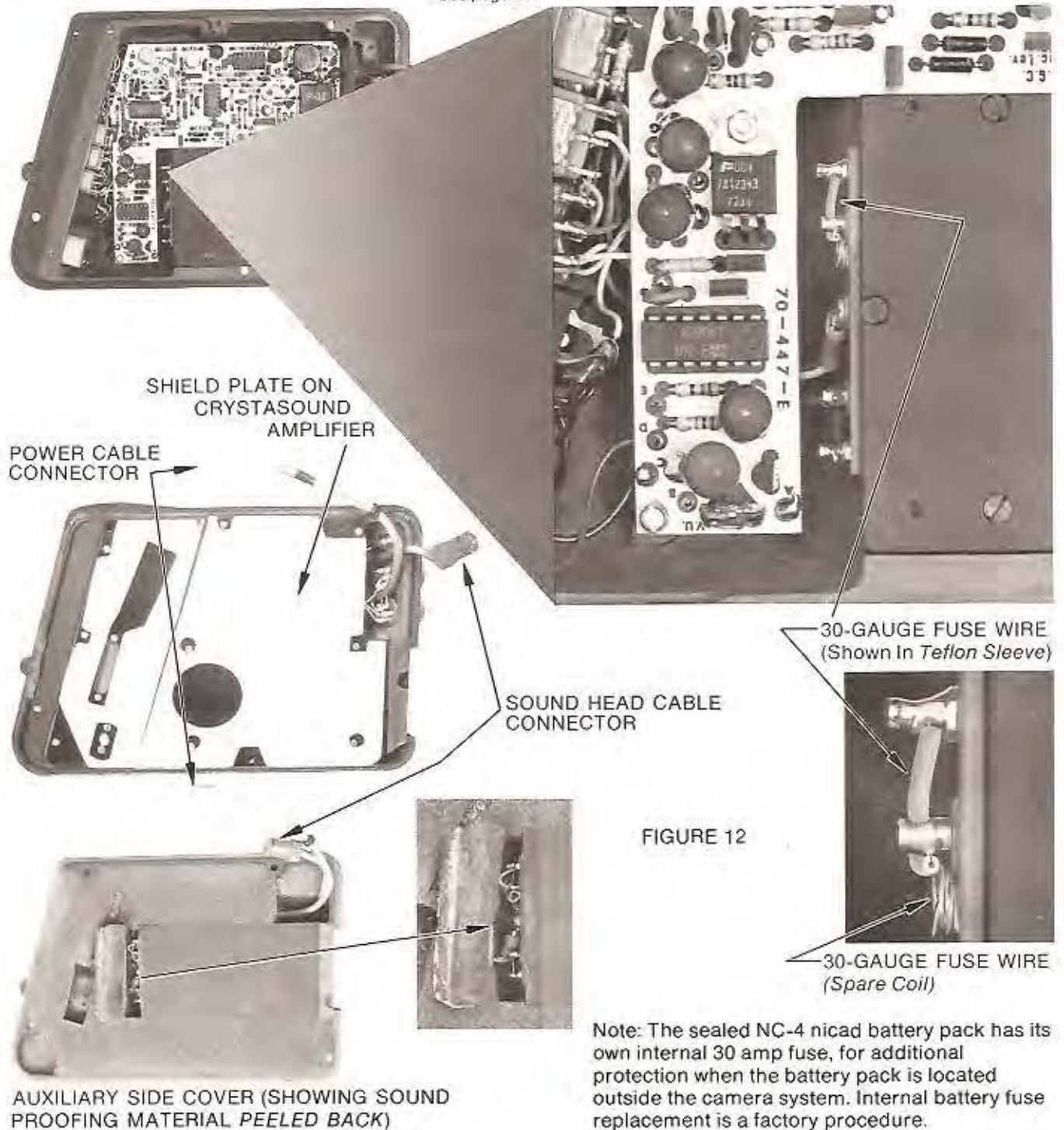
FIGURE 11H

NOTES:

1) To prevent *accidental power drain* of NC-4 battery (when not filming), insert NC-4 battery into battery channel in *reverse position* — with battery identification plate facing inwards and contact points facing front of the camera. The battery will click into position as usual.

FUSE

The 20 amp fuse (Fig. 12) consists of 30-gauge fuse wire soldered onto two pins, and located inside the Crystasound amplifier (see picture below), or inside the auxiliary side cover — and adjacent to the nicad battery connection. In case the camera system does not operate after all normal checks have been made, remove the amplifier or auxiliary side cover (depending on camera model) from the camera body.*

Remove the shield plate from the Crystasound amplifier. If using the auxiliary side cover, peel back the sound proofing material. Check if the 30-gauge 20 amp fuse wire is blown. If so, check if any abnormal operating conditions would account for the blown fuse and attempt to correct the condition. Use the spare fuse wire coil to re-solder a replacement 30-gauge fuse wire to the two fuse wire pins, using approximately the same length (3/4") of fuse wire as the original wire. Before re-soldering, thread the replacement wire through the transparent Teflon sleeve.

* See page 21.

SHIELD PLATE ON CRYSTASOUND AMPLIFIER

POWER CABLE CONNECTOR

SOUND HEAD CABLE CONNECTOR

30-GAUGE FUSE WIRE (Shown In *Teflon Sleeve*)

FIGURE 12

30-GAUGE FUSE WIRE (*Spare Coil*)

AUXILIARY SIDE COVER (SHOWING SOUND PROOFING MATERIAL *PEELED BACK*)

Note: The sealed NC-4 nicad battery pack has its own internal 30 amp fuse, for additional protection when the battery pack is located outside the camera system. Internal battery fuse replacement is a factory procedure.

OPERATION

INTRODUCTION

This section is directed to the *camera operator* of CP-16R, CP-16R/A and CP-16R/DS camera models. If this section does not answer all questions regarding operation of the camera, please contact the dealer or factory for further information.

RECEIVING THE CAMERA

The factory has shipped the camera after thorough inspection and testing. A test film demonstrating camera movement steadiness and a full checkout report is provided with each camera. In addition, each camera is supplied with two NC-4 nicad battery packs; two NCC-6 battery chargers; two gelatin filter holders; four magazine lock mount studs; one magazine take-up belt; one magazine well cover plate; one lens cavity cap; one handgrip connector cover plate; and, for CP-16R/A models, three protective caps (for mic inputs and mixer input).

Packing is done with care, and shipping effected according to customer's instructions. The camera should be carefully unpacked and thoroughly inspected as soon as it is received. (Be sure to remove any loose bits of packing materials that may cling to various parts of the camera.) If any damage is found, file a claim directly with the transportation company and notify your dealer or the factory.

CAMERA CHECKOUT

After inspection, insert a fully charged NC-4 battery pack into the battery channel on the auxiliary side cover or Crystasound amplifier, push the battery test button on the control panel, and check the battery test meter reading. A fully charged battery pack will move the pointer on the meter almost to the end of the green area. Operate the on-off switch on the control panel, or the trigger button switch on the front handgrip. With camera running, inspect mechanism for claw action, examine film loop sprocket and take-up pulley for rotation. Note: the red out-of-sync warning lamp lights up briefly each time the camera starts up from rest.

ON-OFF SWITCHES: The front trigger on-off button and rear panel on-off switch are connected *in parallel* (unless ordered otherwise). Both switches must be in the "off" position in order to stop the camera. Also note that the switch in the "on" position will override the other switch in the "off" position. (Note: CP-16R type camera models can be optionally ordered with both switches connected *in series*. When connected in series, the rear panel on-off switch must be in the "on" position before the front on-off trigger button will control the camera.)

If any problems are experienced, reference should be made to the appropriate maintenance section of this manual.

LOADING MAGAZINES

The CP-16R, CP-16R/A and CP-16R/DS camera models use the 400 ft. PLC-4 magazine, or Mitchell-type 400 ft. and 1200 ft. magazines. (Mitchell-type magazines must be equipped with the CP lock mount stud.)


FIGURE 13

LOADING MAGAZINES (con't.)

The PLC-4 magazine (Fig. 13) is loaded in the following manner:

a) Open magazine doors. The PLC-4 magazine has two doors (Fig. 13-1), each secured by two latches (Fig. 13-2). If daylight loading film is used, remove the darkroom core adapter, and place it on the storage pin located on the corner of each film compartment (Fig. 13A-1).

b) Put roll of "B" wind film in left chamber, pass film through light trap and back into the right chamber, thus forming an external loop. The emulsion side of the film must be on the outside of the loop (Fig. 13A-3).

c) Secure film to a removable film core, which is placed on the take-up spindle (Fig. 13A-4). Rotate core counter-clockwise with external pulley to build up 2 or 3 wraps of film. (Emulsion remains on the outside.)

d) Close magazine doors. Magazine latches have a detent, and must be depressed and turned 90° to fully seat. There should be no red band showing if properly seated (Fig. 13A-2).

FIGURE 13A
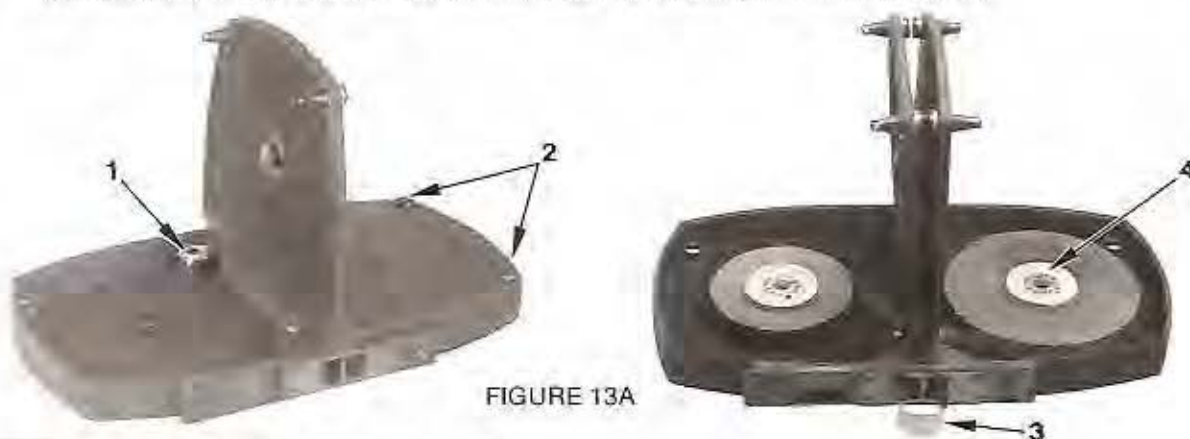
INSTALLATION OF MAGAZINE

The following procedure is used to install magazines on the camera:

a) Remove magazine well cover plate (Fig. 4-8) by releasing latch and lifting plate off.

b) Open camera door by pressing down front of latch knob.

c) Install magazine take-up belt on take-up pulley (Fig. 10-2).

d) Slide front lip of magazine base under shoe on front of camera magazine well. Slip loop of film through magazine well into camera, and press magazine down into well until the retaining latch engages with a clicking sound. Make sure that film loop is not pinched between magazine and camera body.

e) Install correct length take-up drive belt over magazine take-up pulley (Fig. 10-2) and drive pulley (Fig. 4-13). For 400 ft. magazine, use short drive belt; for 1200 ft. magazine, use long drive belt.

THREADING FILM

With the loaded magazine installed on the camera head, pull a 2 ft. loop of film into the camera body and thread through the film transport mechanism following the path shown on the threading diagram attached to the camera mid-rib. It is necessary to lift the pressure plate by pulling up the stud (Fig. 13B-1) to pass film through the gate. Be sure film is correctly seated in the gate and engaged on the loop control sprocket (Fig. 13B-2). The size of the lower loop is critical. The low point of the loop should be just above the floor of the film transport chamber. Turn threading knob (Fig. 13B-3) counter-clockwise and check for smooth flow of film. Correct threading if necessary.

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Set information display *low film warning* switch to 200 ft. (60m), 400 ft. (120m), or OFF* (Fig. 13B-4). Set film counter to zero by pushing the counter reset button. Operate camera for several seconds to verify correct operation and take up any slack film.

Camera door closes securely with an audible click.

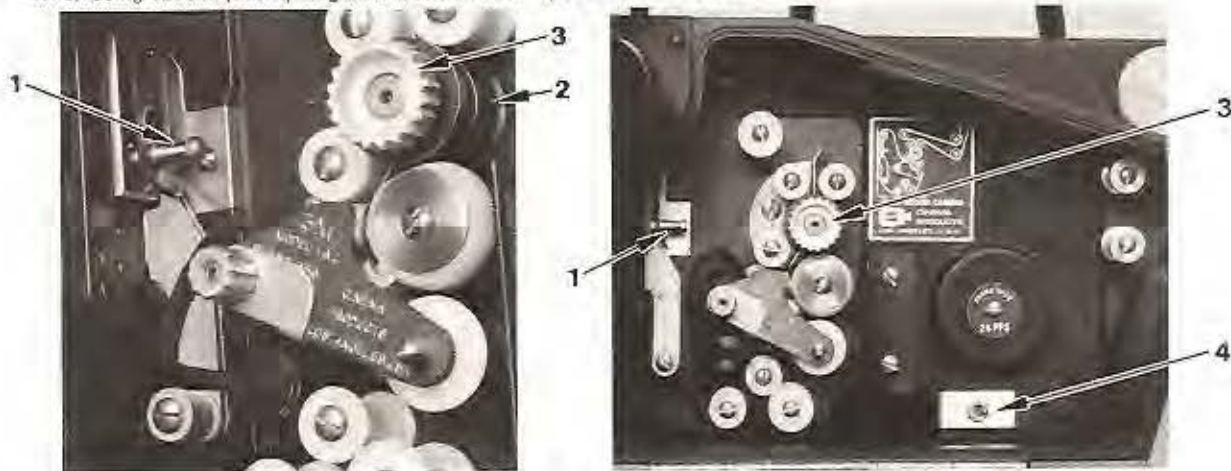*When using 1200 ft. (360m) magazines, switch to OFF position to avoid confusion.

FIGURE 13B

INSTALLATION OF LENSES

The CP-16R has a positive locking CP lens mount which can accept a wide range of CP-mounted lenses.

To prevent accidental rotation of the lens, there is a special locating pin (Fig. 9-3) installed on the top of the lens mount.

Position the lens in the mount, locating the pin key to the top, and tighten the lens lock ring in a clockwise direction until firmly engaged. DO NOT OVER-TIGHTEN.

Note: The lens cavity cap should always be in position in the CP lens mount (when not using a lens) to protect camera from dust, etc.

IMPORTANT FEATURES TO CHECK BEFORE FILMING

a) Check battery pack. A fully charged NC-4 battery pack can drive approximately 2000 ft. of film. Accessories and/or extreme cold will reduce this footage. (Note: It is a good practice to put the used battery pack on charge *as soon as possible* after filming.)

b) Check switches. Operate the camera using both the front trigger switch and the rear run/stop switch.

c) Check magazine seating. Lock mount stud must be firmly engaged.

d) Check lens installation. Lens must be seated snugly.

e) If sound system is fitted, check control settings and auxiliary equipment carefully (e.g., microphones, headsets, etc.).

f) Check film flow with a short burst of a few feet of film. Make sure loading door is securely locked.

g) Set film counter to zero.

REMOVAL OF MAGAZINE

To remove magazine, take off belt from magazine pulley; press quick-release latch and lift off magazine. If new magazine is not immediately installed, replace well cover plate (Fig. 4-8) on camera to keep out dust.

MAINTENANCE

GENERAL

The following section outlines maintenance procedures for CP-16R type cameras. They include cleaning, adjustment and/or replacement of electrical components, replacement of drive motor system, and adjustment of the take up clutch. A reminder: Any servicing beyond the recommended maintenance practices outlined in this manual should be done at your dealer/service center or at the factory.

CLEANING

Open the loading door, remove the pressure plate (Fig. 14-1) by holding it down with left thumb while lifting lever (Fig. 14-2) with right hand. Hold lever up, and lift the pressure plate out, lowering it gently. Do not allow lever to spring back against the aperture plate.

Clean pressure plate (with alcohol) if necessary, and put aside. Brush out inside of camera away from mid-rib. (CAUTION: do not use compressed air or pressurized canned air.) The film gate in the CP-16R camera is equipped with ball-type film guide surfaces which will not collect emulsion in normal use. The balls may be cleaned with a wooden toothpick, but never with a metal scraper, wire brush, or pencil point. Some emulsion dust will settle under the film pull-down claw. This dust is loose particles of emulsion from around the perforations which are dislodged when the film is run through the camera. As the claw pulls the film down, these loose particles of emulsion settle at the bottom of the camera. They may be removed by using a small, soft brush or a vacuum cleaner with a small nozzle. Use only alcohol on gate and film guide rollers if emulsion build-up resists other methods.

Reinstall pressure plate carefully by lifting lever and sliding pressure plate into film gate. Then gently lower the lever until pin and stud of the pressure plate are securely engaged.
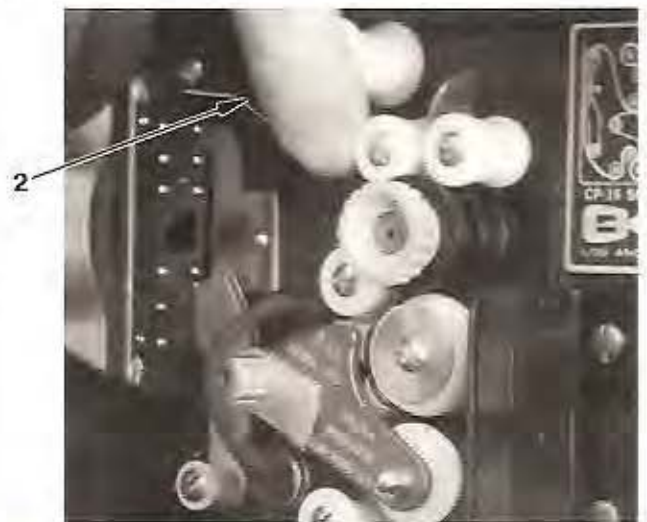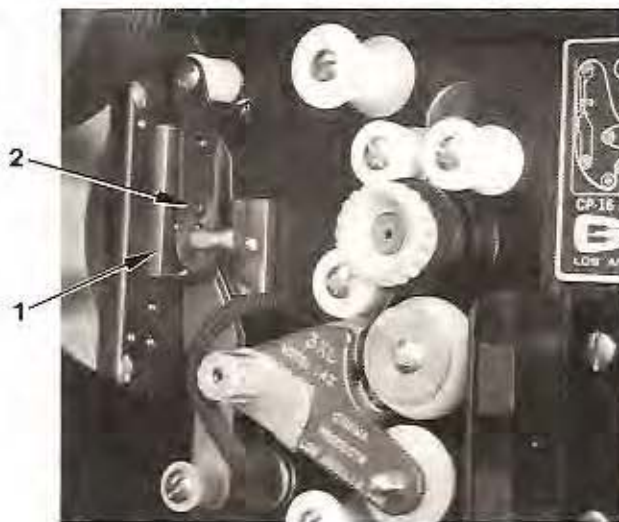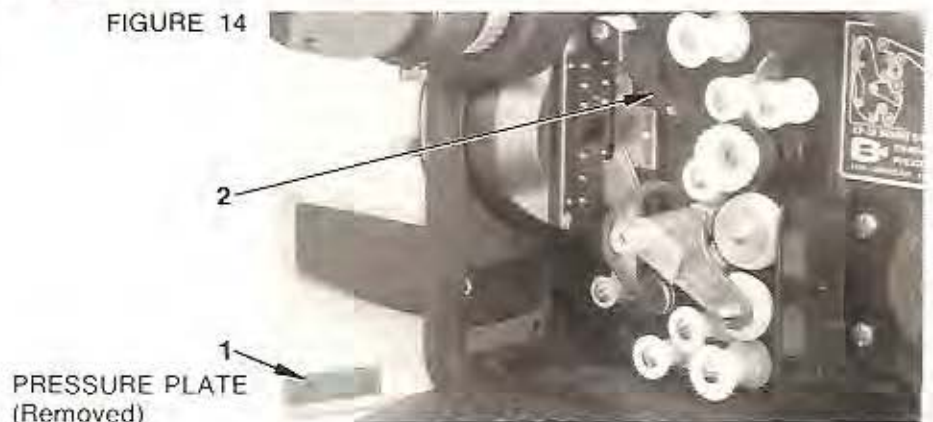

FIGURE 14

PRESSURE PLATE
(Removed)

20

The mirror and fiber optics viewing screen may be cleaned by carefully swabbing with alcohol on a cotton swab. The fiber optics viewing screen must be removed from the camera for cleaning.

To remove the fiber optics viewing screen:

1. Loosen the two screws (Fig. 15-1) holding the retainer (Fig. 15-2) until it can be raised clear of the fiber optics viewing screen. (On early model cameras there is no retainer.) Temporarily tighten the screws to hold the retainer.

2. Take a piece of masking tape and using the adhesive side on the bottom of the fiber optics viewing screen, pull the viewing screen out of its holder.

3. Clean the fiber optics viewing screen with alcohol and cotton swab.

4. Replace the fiber optics viewing screen in its holder. (Because of the special properties of fiber optics, the viewing screen may be replaced with the frame line markings facing either up or down without affecting focusing accuracy. It is important, however, that the fiber optics viewing screen is inserted into the holder with the frame line markings offset towards the edge first entering the holder.)

5. Loosen the two screws holding the retainer and position it to cover the fiber optics viewing screen. Tighten the two screws.

CP-16R models which do not use a retainer (described above) employ a spring clip over the viewing screen. To release the spring clip, press its right end towards the camera, then down. Swivel spring clip to the left and out of the way to clear viewing screen. To remove and replace viewing screen, follow the procedure described above. To replace spring clip in position, press right end forward and upward until spring latch engages post (Fig. 15A-1).
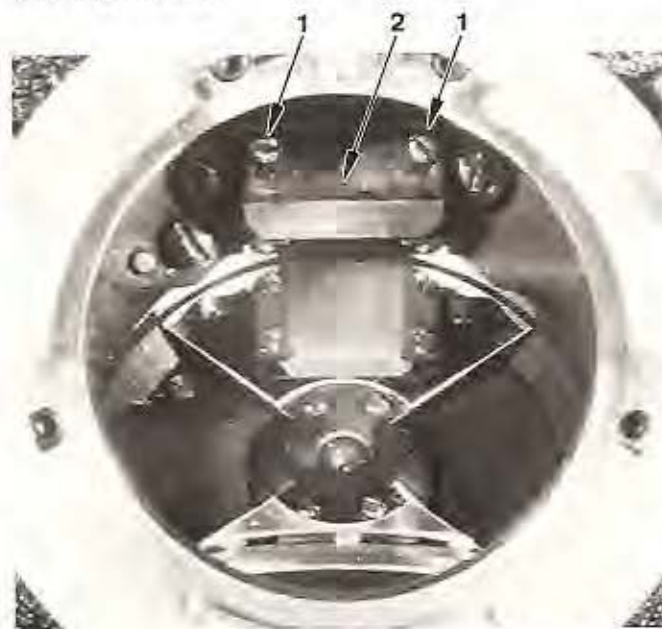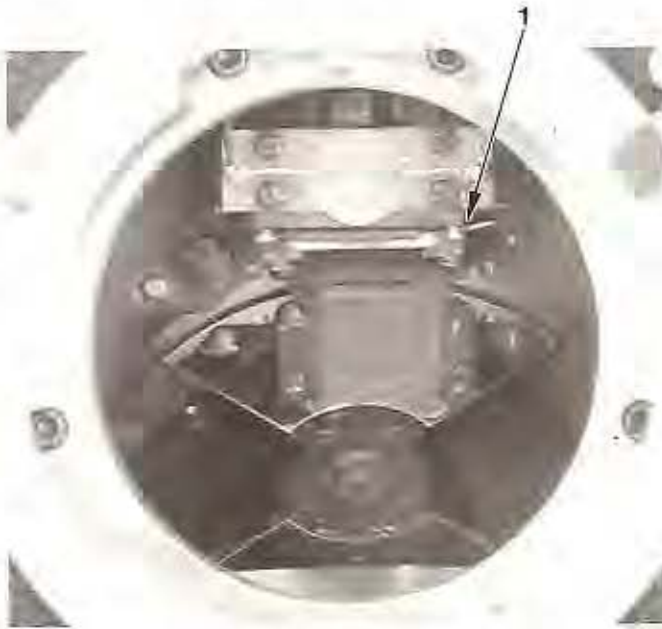

FIGURE 15   FIGURE 15A

REMOVAL OF SIDE COVER

The side cover (auxiliary side cover or Crystasound amplifier) of the CP-16R camera protects the mechanism and incorporates the receptacle for the NC-4 battery pack. It is necessary to remove the side cover for the maintenance of the camera mechanism.

REMOVAL — Depress the battery latch and remove the battery from its channel. The battery latch and spring are retained by the cover. (Note: when removing the side cover, be careful to hold the spring mounted battery latch in place so that it does not fly out.) Remove the five (5) screws, and lift the side cover off the camera. The side cover may be difficult to remove due to the light-tight gasket used. Gently pull away from camera body. As the side cover is removed, unplug cable connected to sound head connector, then unplug grey power cable from body wiring.   Note: For additional information, see pages 9 and 16.

REPLACEMENT — Reverse removal procedure. CAUTION: the sound head connector plug must be oriented correctly to prevent damaging it.

CAMERA DRIVE BELTS

There are two drive belts located inside the CP-16R camera: the drive motor belt and the clutch drive belt.

Note: When camera drive belts need replacing, be sure to use only factory approved replacement belts supplied by Cinema Products.

DRIVE MOTOR BELT

The drive motor belt (Fig. 16-1) effects a reduction of motor speed and turns the movement main shaft at 1440 rpm (when using the 24 fps pulley) or at 1500 rpm (when using the optional 25 fps pulley). The tension of this belt is adjustable at the motor end.

REPLACEMENT — To replace the drive motor belt, remove the two small screws securing the tachometer board (Fig. 16-2) and gently withdraw assembly exposing all of timing wheel (Fig. 16-3). Unhook belt from movement main shaft pulley (Fig. 16-4). Do not force belt over timing wheel! The timing wheel is a precision assembly and must not be disturbed or abused. Install new belt by reversing above procedure and reinstall tachometer board.

ADJUSTMENT — Loosen the four screws retaining motor mounting plate (Fig. 16-5), slide motor to establish correct tension in belt. Proper tension is indicated by gently squeezing the two runs together and being barely able to touch at mid-span. Retighten screws, recheck tension. Extreme tension must be avoided as it results in premature wear on bearings, harsh running and increased noise.
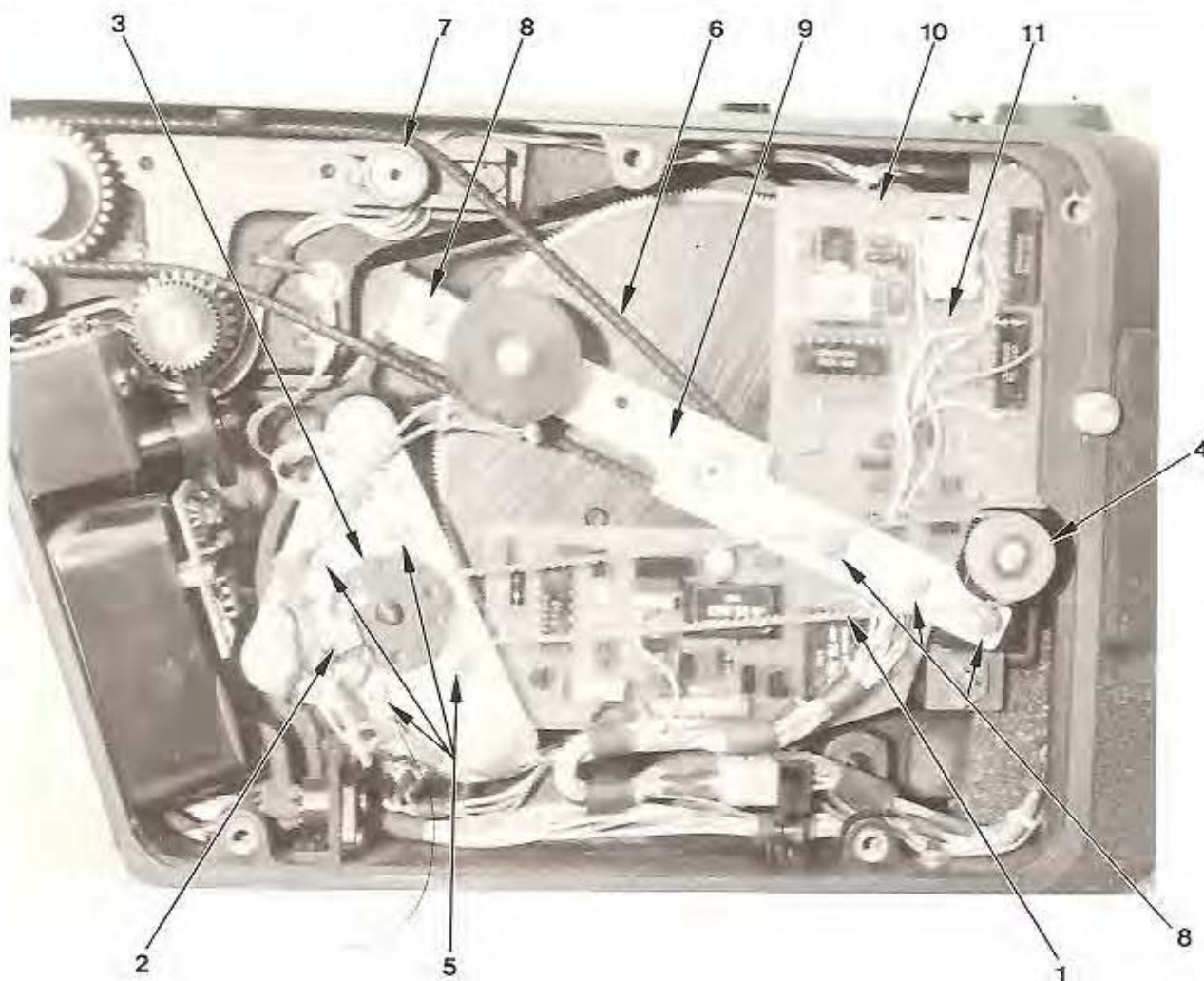

FIGURE 16

CLUTCH DRIVE BELT

The clutch drive belt (Fig. 16-6) also drives the film counter and is adjustable by means of the movable idler pulley (Fig. 16-7).

REPLACEMENT — To replace the clutch drive belt, unhook the drive motor belt from the main shaft pulley, but do not remove. Remove the four binder head screws with lock washers (Fig. 16-8), securing the bearing cross-brace (Fig. 16-9) to the mid-rib and printed circuit board (Fig. 16-11); lift crossbrace carefully, keeping it parallel to the mid-ribe face.*

The installed belt can now be taken off; if necessary, loosen belt tension at idler pulley. The new belt may now be placed. Reverse above procedures for reassembly. Ensure circuit board is correctly located in motor support pillar notch before refitting securing screws. Make certain that the screw securing the top of the printed circuit board (Fig. 16-10) is tight.

*Note location of shims, since they must be replaced in the identical position upon reassembly.

ADJUSTMENT — Loosen the #4 hex socket set screw located in center of movable idler pulley shaft (with .050 Allen wrench). Slide the pulley along track to give tension to belt. Retighten set screw. Tension is correct when belt is slightly stretched out in straight runs between pulleys. Avoid excess tension. Too much or too little tension may increase "wow and flutter" of sound system.

CHANGING CAMERA SPEED

On cameras supplied with timing pulleys for *both* 24 and 25 fps, speed changes are effected as follows:

a) Remove the side cover,* unhook drive motor belt from main shaft pulley. Remove truss head screw retaining pulley, and slide pulley from shaft. The alternative pulley (Fig. 17-1) is retained on the cross-brace by a #6 screw. Interchange pulleys, and replace retaining screws. Tighten securely.

   The pulleys are color-coded as follows:
   24 fps pulley . . . . black color
   25 fps pulley . . . . red color

b) Inside the film chamber, on the mid-rib motor hub, an identification plate is installed; color-coded black on one side (marked 24 fps), red on the other (marked 25 fps). Correct the orientation of plate (Fig. 17A-1) to match operating pulley.

c) Remove fps indicator dial on rear panel and turn over for correct sync speed. It has variable speeds corresponding to 24 fps on one side and to 25 fps on the other (Fig. 17A-2).

d) Replace drive motor belt. Adjust drive motor belt as previously described. Replace side cover.*

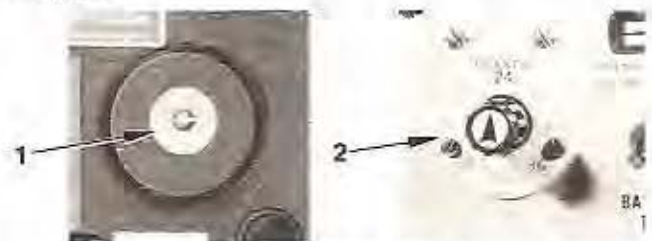The camera runs in crystal sync at either speed.   * See page 21

FIGURE 17

FIGURE 17A

DRIVE MOTOR SYSTEM

The drive motor system of CP-16R type camera models is regulated by a crystal oscillator. This is to ensure that the accuracy of the running speed of the camera is compatible with cordless double-system sound recording. In the event of any problems, the entire system is readily exchanged for a spare unit (Fig. 18A). No electrical maintenance is necessary.

REMOVAL — To exchange the drive motor system, first remove the camera side cover. Turn the mirror shutter to the fully open position. Unhook the drive motor belt (Fig. 18-1), but do not remove. Remove the choke (Fig. 18-2) from the crossbrace (Fig. 18-3). Unscrew ground strap (Fig. 18-4) from the motor shock mount. Unscrew four binder head screws (Fig. 18-5) with lock washers, and remove the crossbrace, lifting it carefully and keeping parallel to mid-rib at all times.* Remove the screw (Fig. 18-6) securing circuit board to stand-off. Remove nut from low film warning select switch (located in the film transport chamber as seen in Fig. 18B-1), and loosen switch from camera.** Remove three screws retaining the shock-mounted motor assembly (Fig. 18-7). Remove connecting harness (Fig. 18-8) from camera body.

*Note location of shims, they must be replaced in the identical position upon reassembly.

** Note: When replacing switch, be sure to maintain correct orientation by matching to the color codes.

REPLACEMENT — Install new drive motor system by reversing before-mentioned procedures. Carefully dress connecting harness into position and connect ground straps. Adjust drive motor belt tension.

When replacing the three motor assembly retaining screws, make sure that the shock mounts and flanged spacers are assembled as shown (Fig. 18-7).
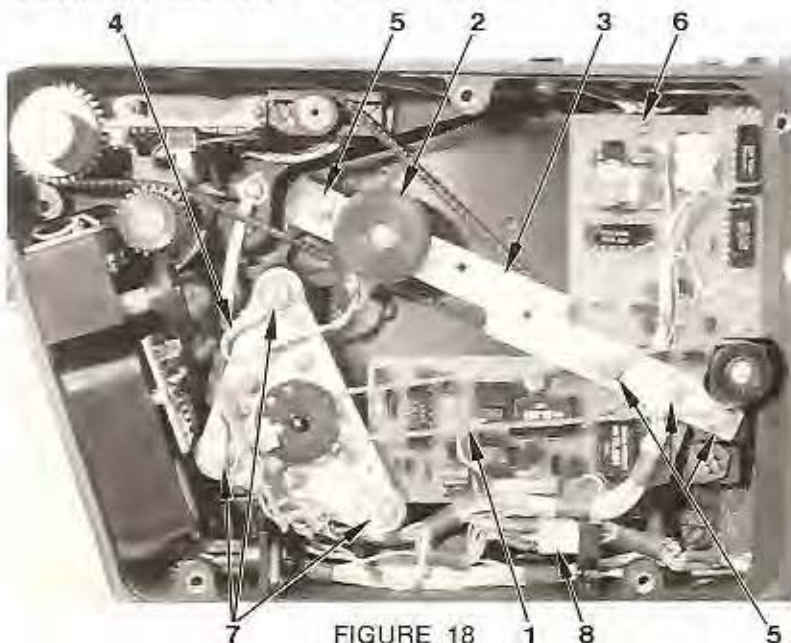

FIGURE 18

FIGURE 18A

FIGURE 18B

TAKE-UP CLUTCH ADJUSTMENT

Generally, this clutch will not need adjustment, because inadequate film tension on the take-up reel can usually be corrected by replacing the magazine drive belt. If this does not correct the problem, the drive clutch can be adjusted by increasing the clutch spring pressure.

This is accomplished by loosening the #4 set screw in the clutch adjustment nut and screwing the nut clockwise 1/2 to 1½ turns. Retighten set screw. If take-up tension is still not adequate, replace clutch spring. Note that excessive tension on the take-up will result in excessive "wow and flutter."

LUBRICATION

CP-16R cameras should be lubricated *at least* once a year. Lubrication service should be carried out only at authorized service centers or at the factory. (Caution: Special lubricants are required to ensure the proper functioning of CP-16R cameras, especially when filming in extreme temperatures.)

24
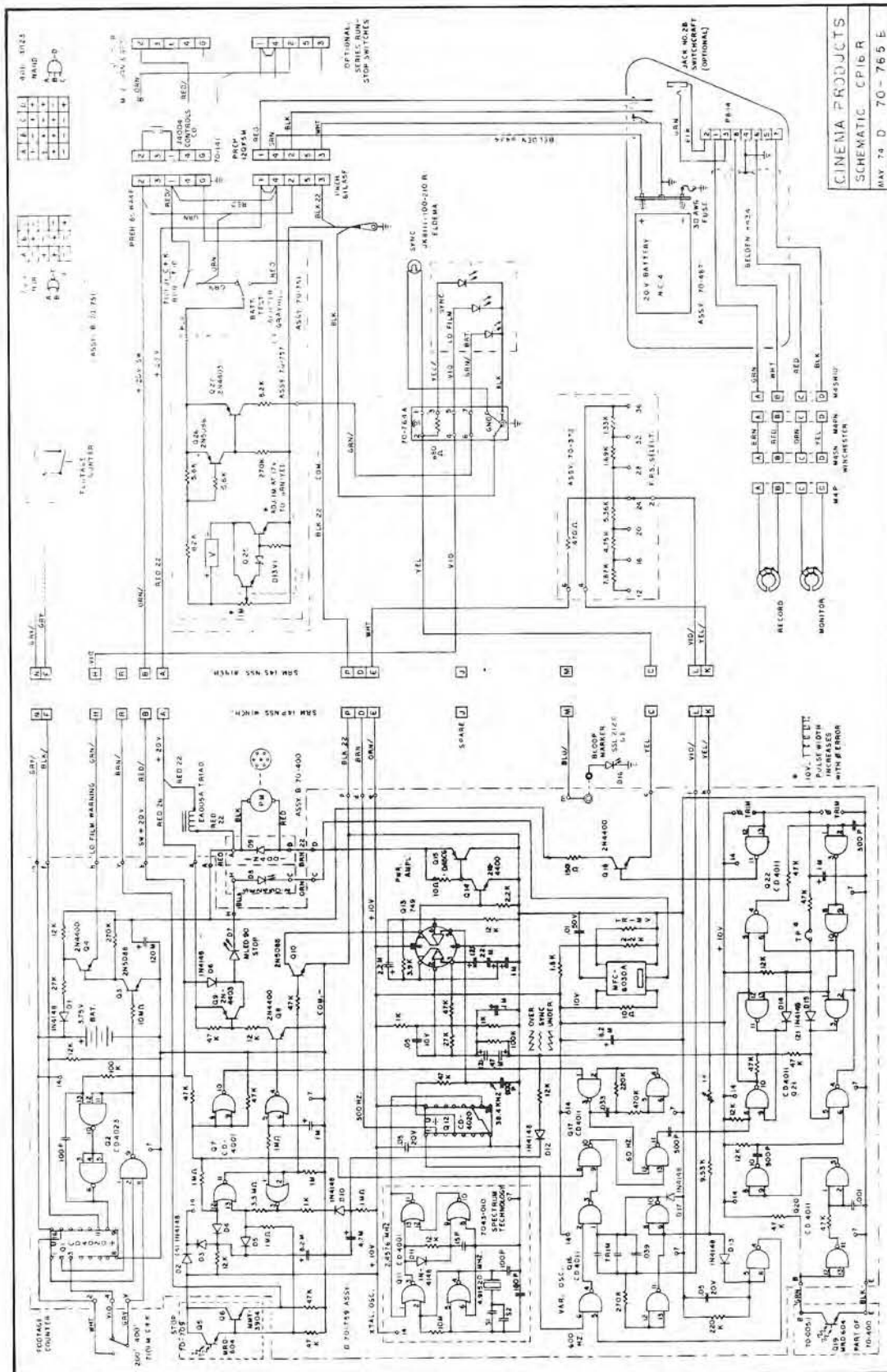
FIGURE 19

(schematics con't.)

FIGURE 20

FIGURE 21

FIGURE 22

FIGURE 23

28
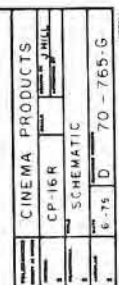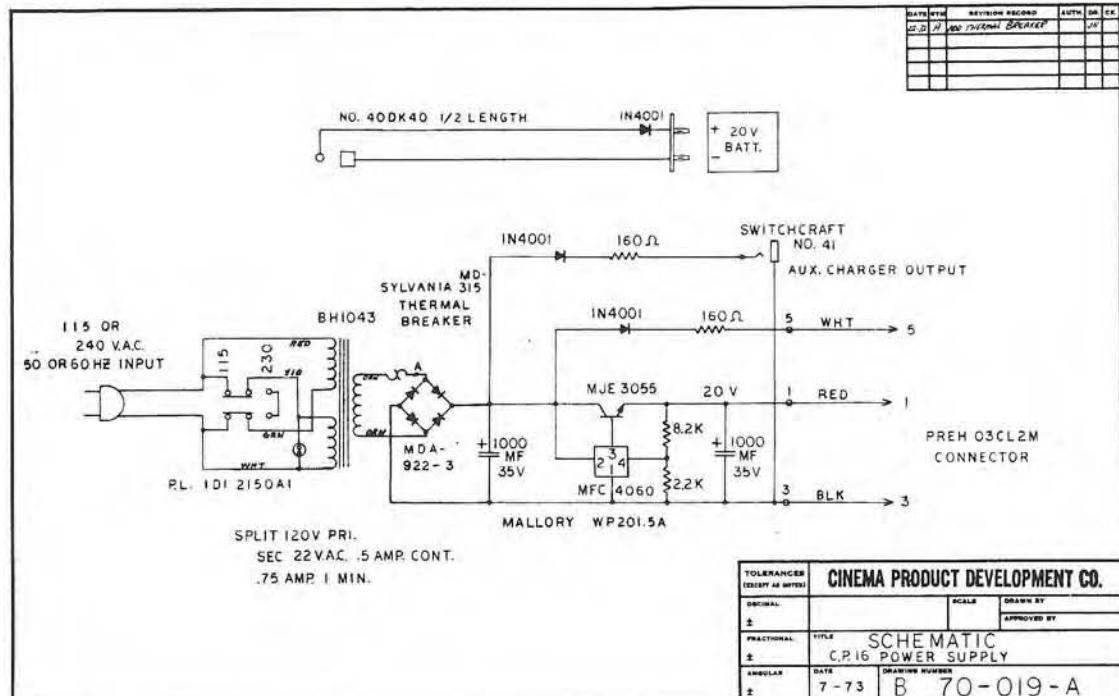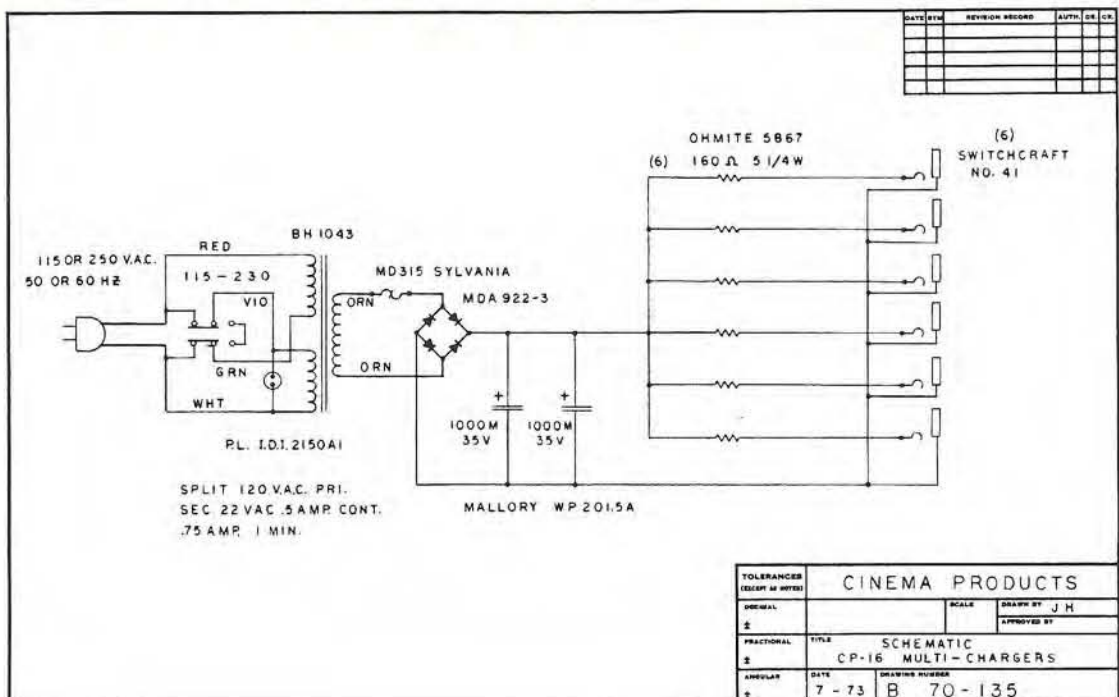
CRYSTASOUND AMPLIFIER

GENERAL

The Crystasound amplifier is a modular unit of the CP-16R/A 16mm camera. It is designed to be used with Crystasound 3XL-type mag heads, or Auricon-type mag heads.

The Crystasound amplifier is equipped with two low impedance microphone channels and a line input channel. Two internal cables connect the magnetic head and camera power to the amplifier. The mic input connectors (Fig. 26D-1) and a 4-pin accessory connector (Fig. 26D-2) are located at the front of the amplifier. The rear panel (Fig. 24-1) contains all other connectors and controls.

FIGURE 24

29

SPECIFICATIONS

RECORD CHANNELS

Microphone Inputs: 150 ohms input impedance.

  Frequency Response: ±2 dB from 50 Hz to 8000 Hz. Speech roll-off to -15 dB @ 50 Hz (see Fig. 24A).

  Signal-to-Noise Ratio: -54 dB (Test made with ASA "A" weighting filter).

  Input Sensitivity: 50 microvolts to 15 millivolts for nominal record level @ 1000 Hz.

  Total Harmonic Distortion: 3% @ 1000 Hz and 100% modulation.

Line Input: 600 ohms input impedance.

  Frequency Response: ±2 dB from 50 Hz to 8000 Hz (see Fig. 24A).

  Signal-to-Noise Ratio: -64 dB (Test made with ASA "A" weighting filter).

Wow-and-Flutter: 0.45% maximum total.

Bias Frequency: 61 kHz. ±1 kHz.

Bias Current: 7 ma nominal.

VU Meter: Standard VU meter w/8 dB lead.

FIGURE 24A

RECORD CHANNEL — FREQUENCY RESPONSE   NOMINAL RECORD LEVEL—3XL HEAD
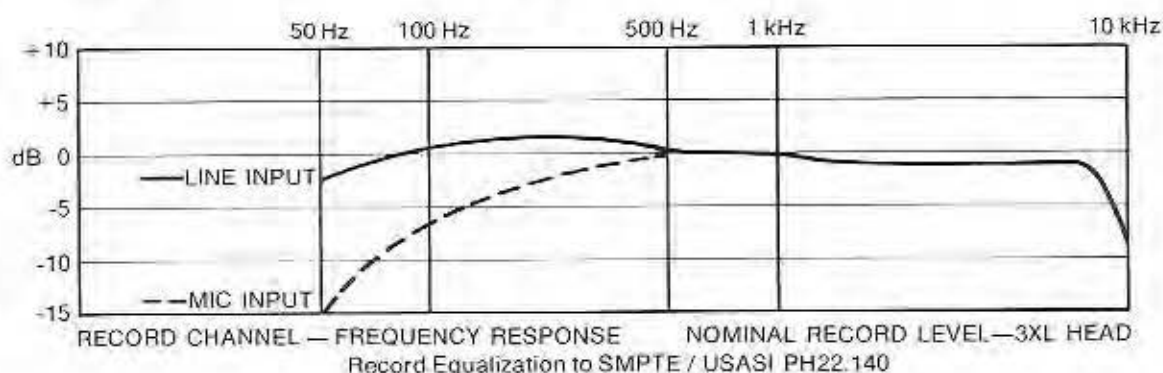Record Equalization to SMPTE / USASI PH22.140

Note: Record and playback equalization to CCIR standard is available as a field installation kit or as a factory installed option.

PLAYBACK CHANNEL

  Frequency Response: ±1.5 dB from 50 Hz to 8000 Hz (see Fig. 24B).

  AGC & Compression
  Amplifier: 20 dB/10 dB.   Attack time = 10 ms.
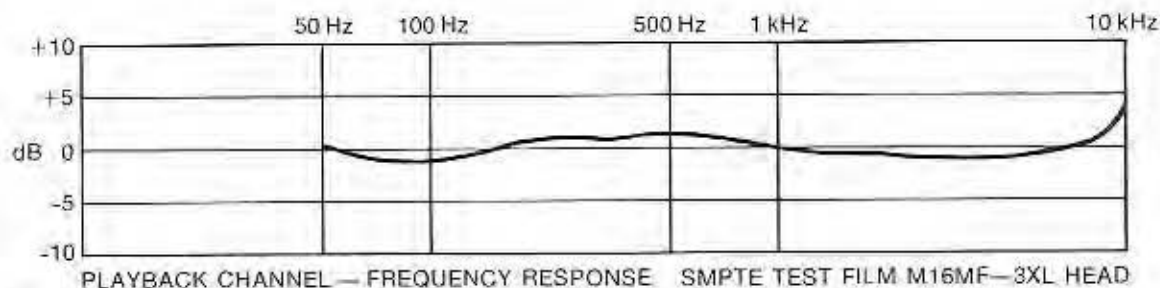   Release time = 450 ms.

FIGURE 24B

PLAYBACK CHANNEL — FREQUENCY RESPONSE   SMPTE TEST FILM M16MF—3XL HEAD

OPERATION

INPUTS & CONTROLS

RECORD CHANNELS

Mic 1 — Standard XLR audio connector (located at front of amplifier). 150 ohm input impedance, balanced pins 2 and 3, shield pin 1. Note: Pins 2 and 3 must *not* be grounded, as they operate at a +6 volt DC potential.

Mic 2 — Same as Mic 1.

Line Input — RCA phono jack on control panel 600 ohm input impedance.

PLAYBACK CHANNEL

Phone jack for headset 50 ohm impedance.

Playback channel has automatic switchover which permits operator to monitor recorded signal while camera is running or the program source when the camera is off.

Mixer Plug — Bendix PCO2W-12-10S connector for use with Crystasound 6C auxiliary mixer and other accessory items.

Power On/Off—Auto On Switch* — Applies battery power to amplifier. In "Auto On" position, power is applied only when camera is operating.

Record/Playback Switch* — Applies bias to record head.
Note: Record/Playback switch must be on "RCRD" when recording.

AGC On/Off Switch — Energizes automatic gain control circuit if desired. Set gain as follows: AGC off. Volume set to an average of 0 dB. Turn volume control 30° clockwise. Turn AGC on.

Int/Mixer Mode Switch — Must be in "Int" position for normal operation. Mixer position is for use with auxiliary sound mixer only.

Volume Controls — Separate volume controls for Mic's 1 and 2, phone, and line input.

Recording Meter — Standard VU meter with 8 dB lead.

*Note: On the previous version of the Crystasound amplifier control panel, the power switch was a *two position* "On/Off" switch and the record/playback designation was "Bias On/Off" (Fig. 26C).
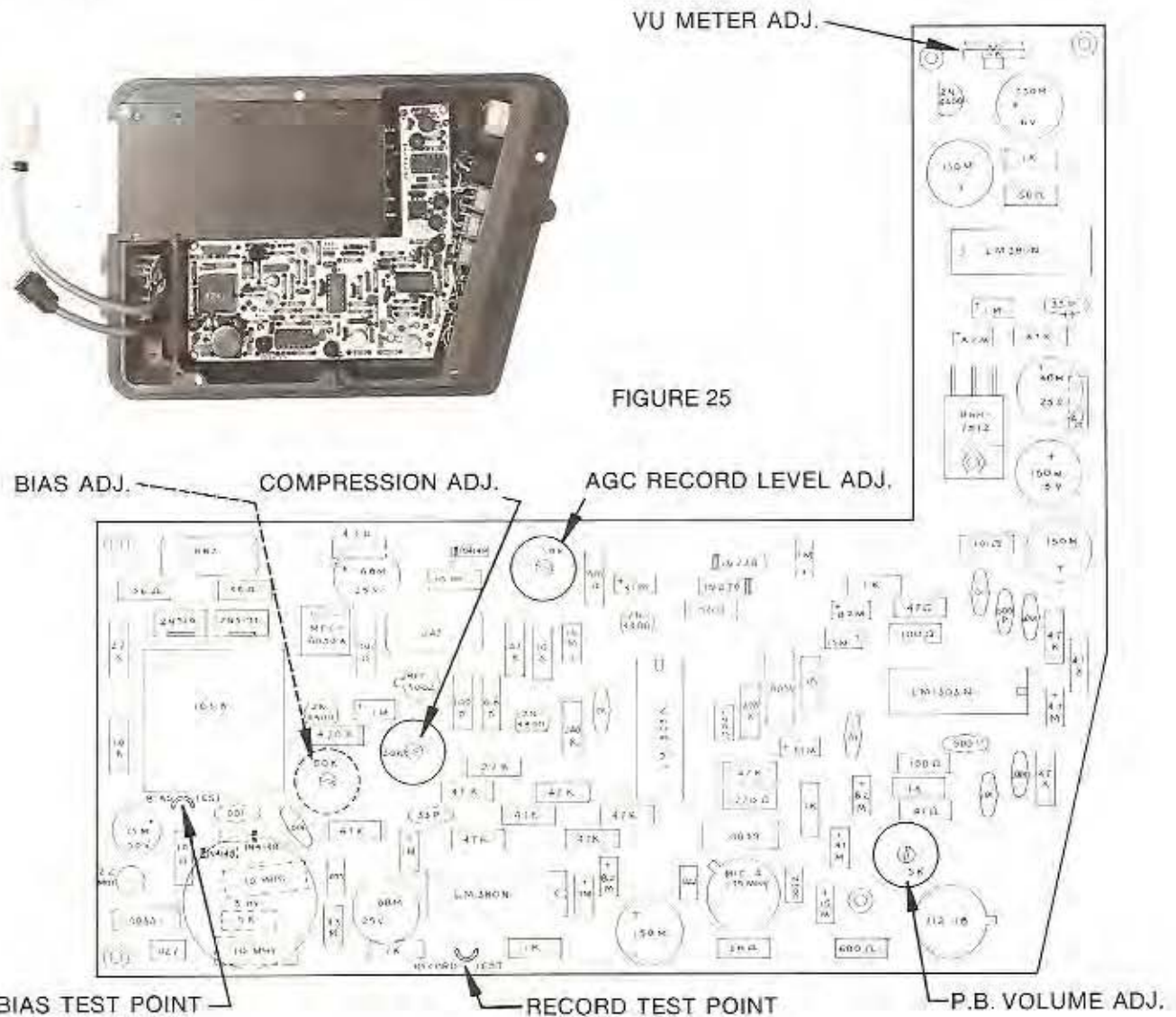
AUDIO OUTPUT JACK

The Crystasound amplifier accepts the Cinema Products audio output jack (an accessory which permits the recording of the sound signal on a regular tape recorder, for use as an extra sound track for radio broadcast purposes). The RCA-type audio output jack is plugged into the Crystasound amplifier mixer socket (Fig. 24C).

FIGURE 24C

CALIBRATION PROCEDURE

CP-16R/A Crystasound systems are thoroughly checked out and pre-adjusted for proper operation before leaving the factory. If, for any reason, the indicated norms are not reached when checking out the Crystasound system the following correctional procedures are indicated: (Refer to Fig. 25 for location of test points and adjustments.)

VU METER ADJ.

FIGURE 25

BIAS ADJ.   COMPRESSION ADJ.   AGC RECORD LEVEL ADJ.

BIAS TEST POINT   RECORD TEST POINT   P.B. VOLUME ADJ.

INITIAL SET-UP

Unscrew five screws and remove amplifier from camera. Set amplifier in horizontal position next to camera to allow access to the printed circuit board assembly.

See that the two internal cable connections are still intact and install magnetic sound head in camera. Set panel controls as follows:

Power Switch	"On"
AGC Switch	"Off"
Mode Switch	"Int"
Record/Playback Switch*	"RCRD"
Mic 1 & 2 Switch	Min. (CCW)
Phone Volume	Max. (CW)

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Connect headset to phone jack. Some background noise should be audible in headset. A change in background noise intensity should be heard when individually increasing and decreasing Mic 1 and Mic 2 volume controls. This will confirm amplifier is operational.

*Note: On previous model Crystasound amplifier control panels, set to "Bias" position (Fig. 26C).

BIAS ADJUSTMENT

Adjusting the bias control is accomplished by using Cinema Products' 3 kHz oscillator accessory (tone generator).

Note: Bias should be adjusted every time a different record/playback head is installed.

Step 1) Load the camera with mag striped film.

Step 2) Plug the headset into the phone jack.

Step 3) Plug the 3 kHz oscillator accessory into the Crystasound amplifier *mixer socket* (Fig. 26). Note: The amplifier mode switch must be in the "mixer" position.

Step 4) Adjust tone quality for comfortable listening level and start the camera. Slowly adjust the bias control pot for *maximum playback* volume. This adjustment is accomplished by placing a small screw driver into the bias control access hole (3/16" dia.), located on the side of the Crystasound amplifier *housing,* near the microphone connectors (Fig. 26A-1). In earlier models, the bias adjustment control is located on the printed circuit board (see Fig. 25).
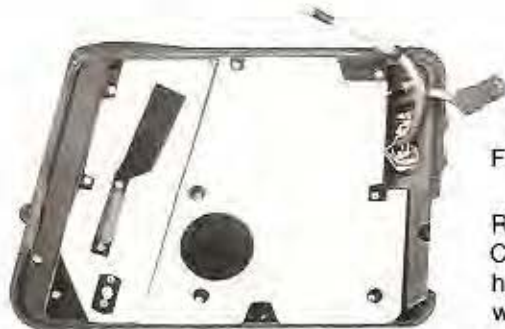

FIGURE 26

FIGURE 26A

FIGURE 26B

Reverse side of
Crystasound amplifier
housing, showing
wiring cover plate.

Note: To aid in self-servicing the Crystasound amplifier unit, a special Bristol knob wrench has been placed in the plastic slide (located inside the amplifier — near the microphone connectors). Remove the Crystasound amplifier unit from the CP-16R/A camera body. Remove the Mu metal shield (by loosening the screws) and *raise* the plastic slide (located inside the amplifier — near the microphone connectors) to release the Bristol knob wrench (Fig. 26B).

AGC ADJUSTMENT

Step 1) Connect 3 kHz. tone generator to line input of amplifier. Connect audio voltmeter to "record test point" (+) and case ground (—). Set compression pot to maximum clockwise position.

Step 2) Turn power switch to "on" (AGC switch must be "off"). Adjust line input volume and/or generator output for 1 volt rms meter reading.

Step 3) Turn AGC switch to "on" and adjust AGC record level pot for .35 volts rms meter reading.

Step 4) Adjust compression to mid-range of pot. Turn AGC and power switches to "off" position. Remove voltmeter from circuit.

CRYSTASOUND AMPLIFIER REAR CONTROL PANEL

FIGURE 26C

VU METER ADJUSTMENT

Adjust input (3 kHz.) for 0.28 volts at record test point. Adjust VU meter calibration pot for 0 dB on meter.

PLAYBACK ADJUSTMENT

Step 1) Thread camera with magnetic striped film.

Step 2*) Turn record/playback switch to "RCRD" and turn power switches to "on" position. Adjust 3 kHz. tone level for 0 dB on VU meter.

Step 3) Turn camera on. Recorded tone should be heard in headset. Turn camera on and off and adjust P.B. volume pot until headset volume is the same for the camera "on" and camera "off" positions.

Step 4) Turn power off and disconnect tone generator. Reinstall amplifier on camera. Unit is now ready for operation.

   *On previous model Crystasound amplifier control panels, set to "Bias" position (Fig. 26C).

FIGURE 26D
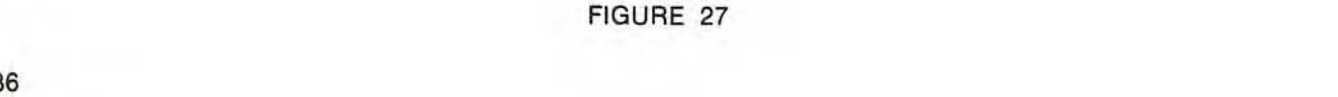
35

FIGURE 27

FIGURE 28

FIGURE 29

38
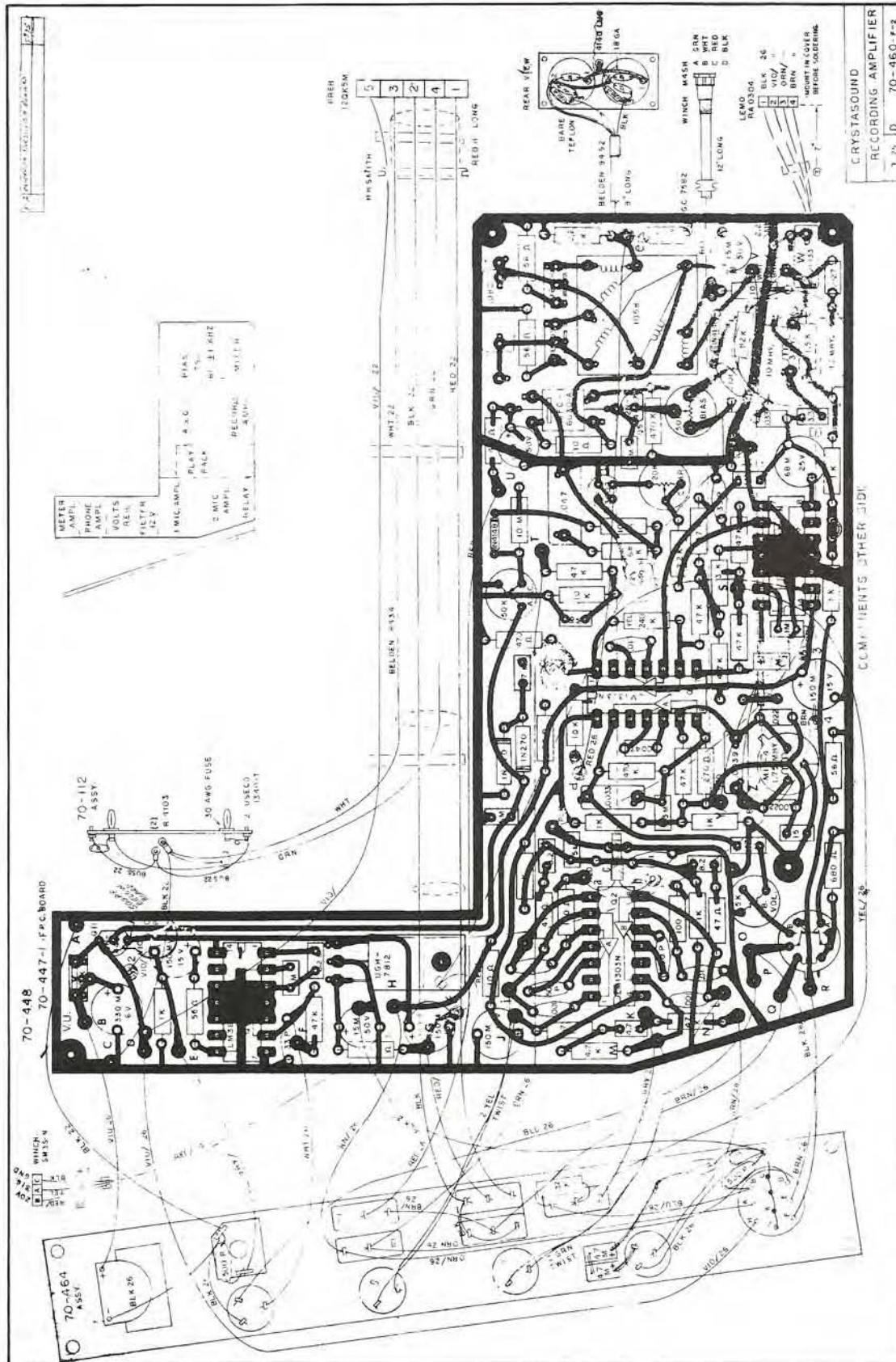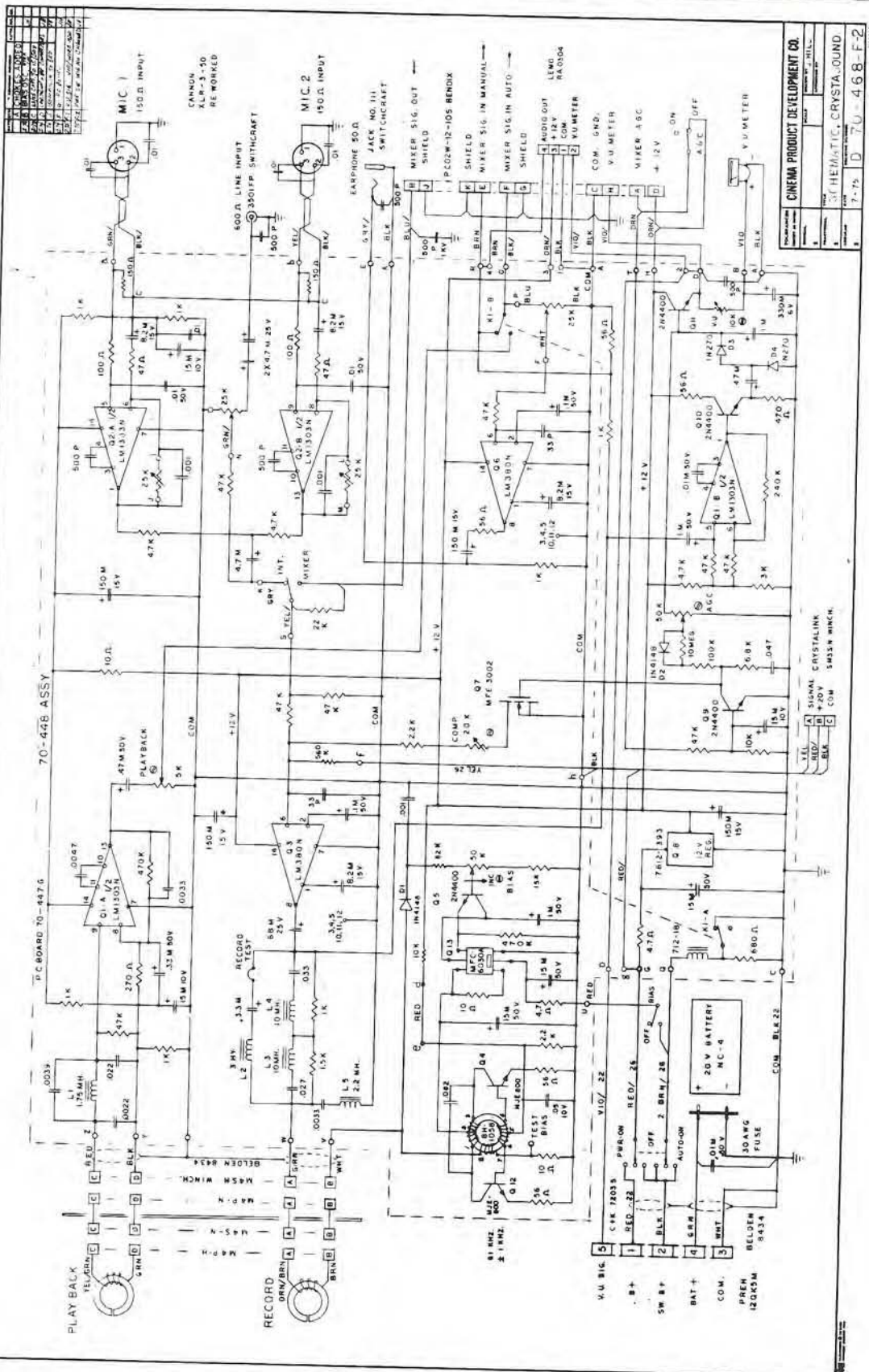
FIGURE 30
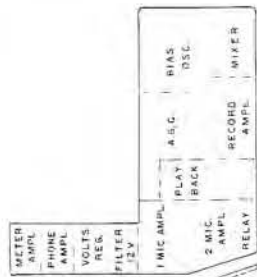
CRYSTASOUND SYSTEM
OPTIONS & ACCESSORIES

CRYSTASOUND MAGNETIC HEAD

GENERAL

Crystasound magnetic heads are built with a special hard alloy which provides extra long wearing time. The 3XL-IAZ magnetic head is azimuth adjustable (at the factory) for *both* record and playback heads individually. The 3XL-AZ model is also azimuth adjustable (at the factory), with the record and playback heads mounted on a common pivot arm providing a *single* adjustment for both heads.

> Crystasound 3XL-type magnetic heads are compatible for use with all 16mm single system sound cameras which accept Auricon-type magnetic heads.

INSTALLATION

Each CP-16R sound camera is supplied with a "dummy" sound head which remains in position when the camera is used for double-system operation.

When filming in a single-system mode:

a) Remove the "dummy" magnetic head (Fig. 31-1).
   1. Unscrew and remove the knob (Fig. 31-2).
   2. Lift "dummy" head off post and remove from camera.

b) Install the Crystasound magnetic head.

1. Place magnetic head (Fig. 32-1) on post from which the "dummy" head was removed.

2. Place clip (Fig. 32-2) on post and rotate clockwise until it secures the magnetic head.

3. Install knob (Fig. 32-3) on post and tighten.

4. Plug magnetic record/playback head connector into head connector, located in mid-rib (Fig. 32-4). Maintain correct pin orientation by matching to color codes.
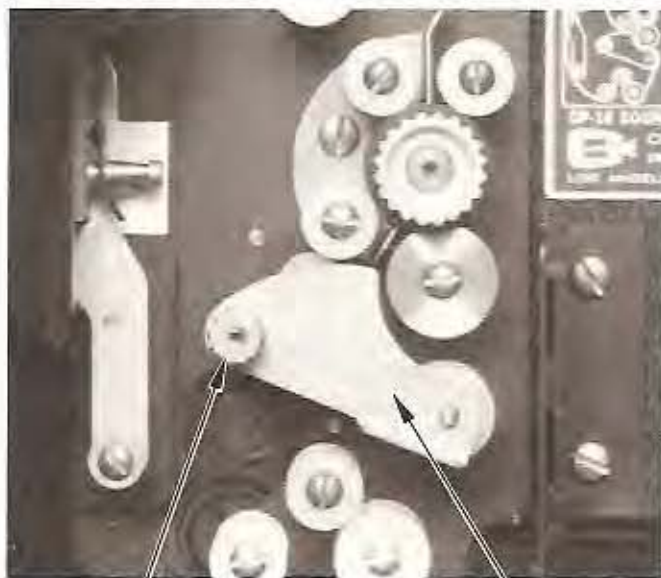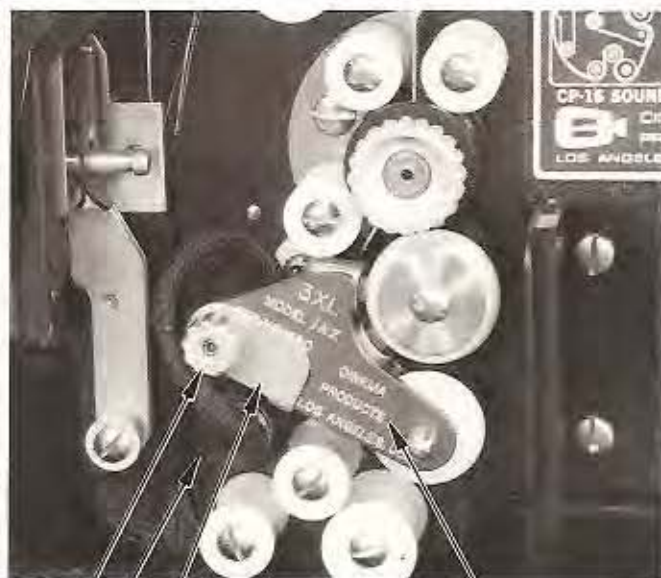

2   FIGURE 31   1   3 4 2   FIGURE 32   1

CRYSTASOUND AUXILIARY MIXER (MODEL 6C)

GENERAL

The Crystasound auxiliary mixer (Fig. 33), available as an option, features four low impedance dynamic microphone inputs, one condenser mike input, switchable for use with either Sennheiser 804 or 805 series* condenser microphones (powered directly from the auxiliary mixer) and one 600 ohm line input. The auxiliary mixer also features individual and master volume controls, VU meter, as well as switchable AGC. The 6C auxiliary mixer is powered from the same nicad battery pack that powers the camera.

*As well as similar type condenser microphones.

WEIGHT & DIMENSIONS

Weight: 3 lbs. 1 oz. (1.4 kg)
Dimensions: 6½" long x 2½" high x 6" wide
          (16.5 cm x 6.4 cm x 15.2 cm)

FIGURE 33
(Front and Rear Views)

OPERATION

Connect the auxiliary mixer to the Crystasound amplifier with supplied connecting cable (mixer connector on Crystasound amplifier *to* power connector on auxiliary mixer).

The power switch on the Crystasound amplifier should be set to "on," the AGC switch to "AGC," the record/playback switch to "RCRD," and the mode switch to "mixer."

Connect microphones and line inputs as required. Turn down all unused inputs to minimize noise.

Plug in 50 ohm earphone into the auxiliary mixer. Balance inputs for a recording level of 0 dB.

The headphone amplifier in the auxiliary mixer will be switched automatically from input to playback if the auxiliary mixer playback switch is in the "Auto" position. If switched to "Source," the headphone amplifier remains connected to the input.

The AGC switch on the Crystasound amplifier must be set to "on" to allow the AGC switch on the mixer to function.

The line output jack provides a 600 ohm unbalanced output which may be connected to an external recording system.

Note: To aid in self-servicing, a Bristol knob wrench has been placed in the Crystasound auxiliary mixer, attached to the inside of the bottom cover. Loosen the 4 screws on the bottom cover plate. A clip attached to the inside of the bottom cover plate holds the Bristol knob wrench in position.

41

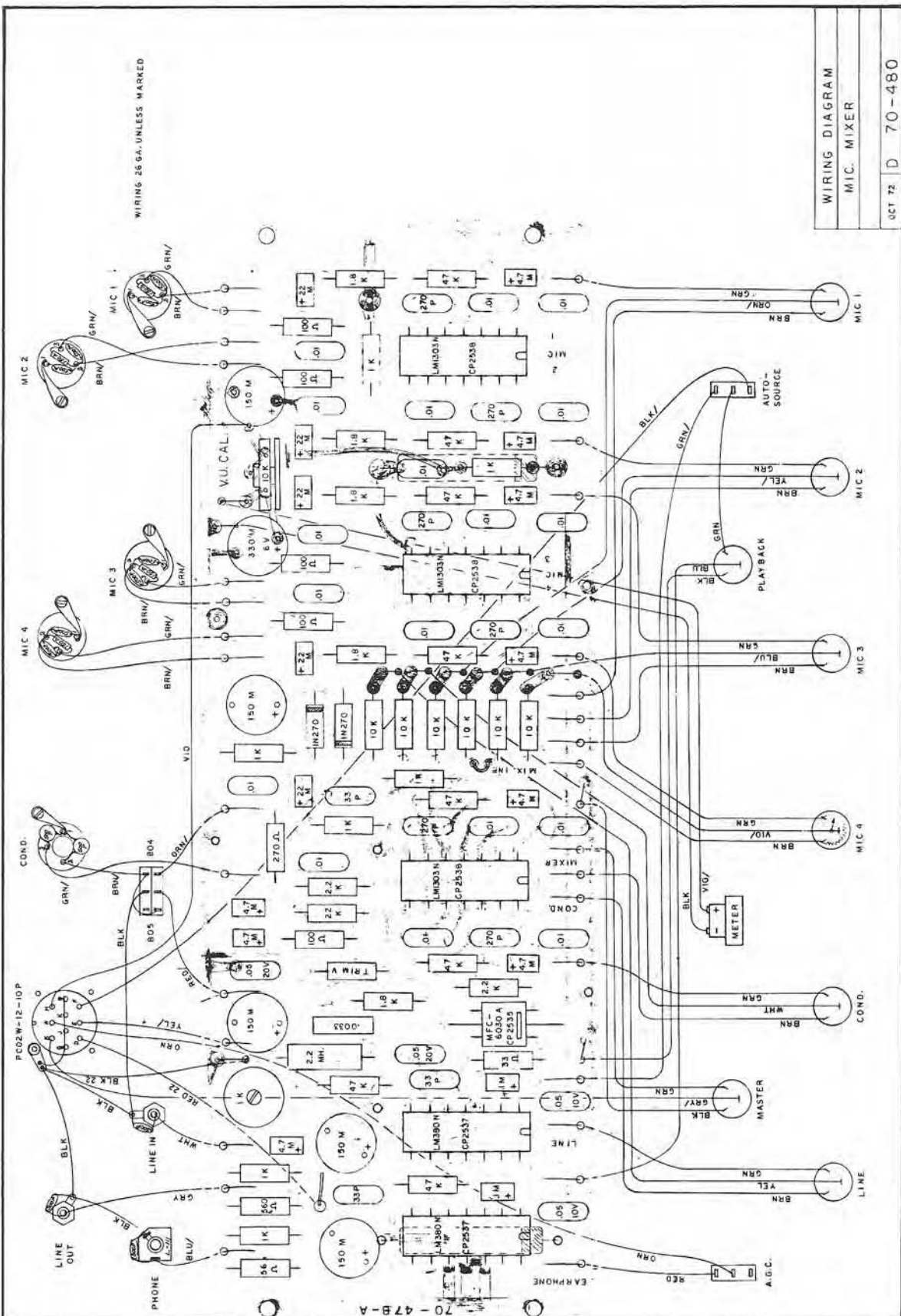**FIGURE 34**

FIGURE 35

43
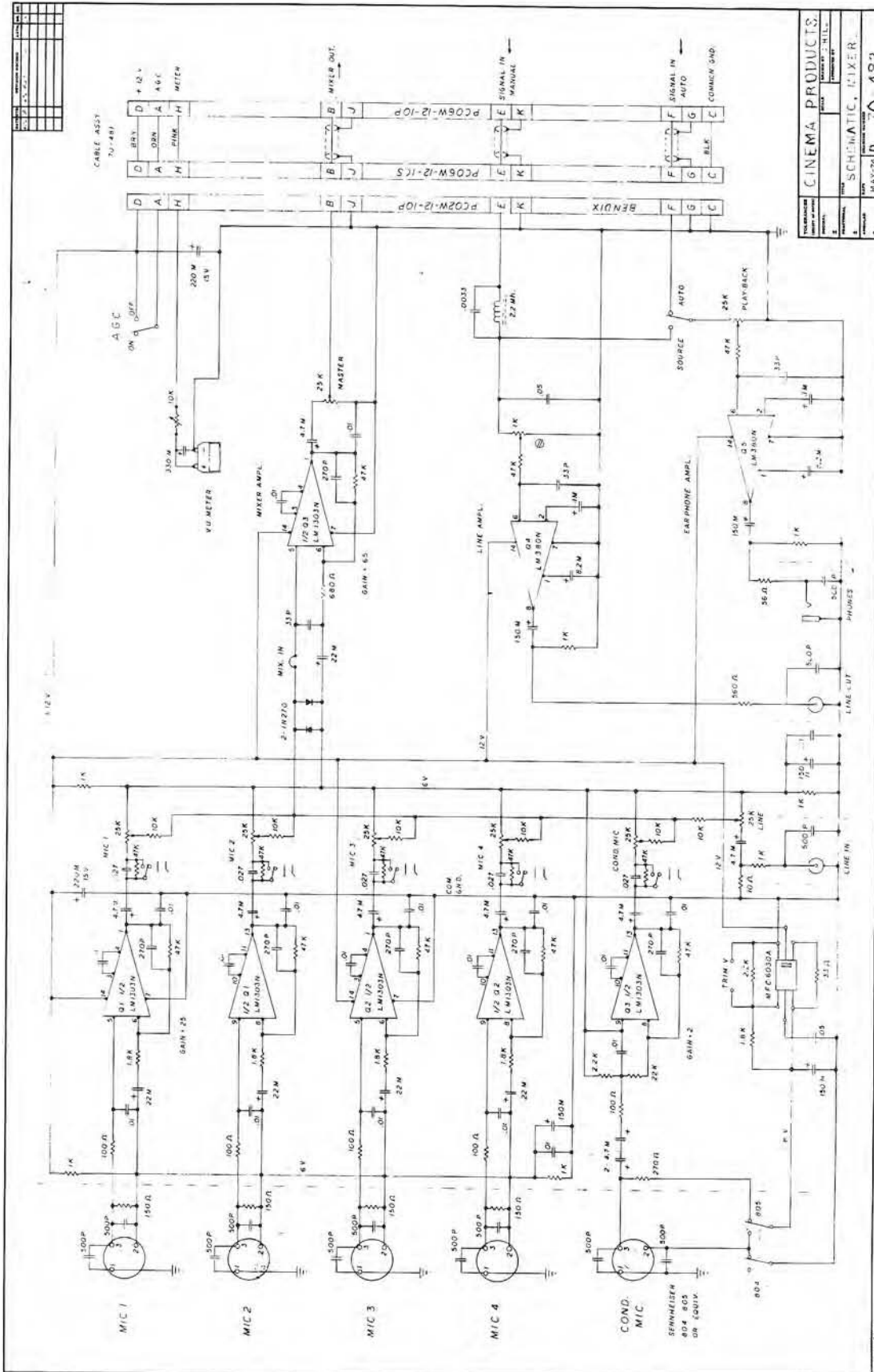
CRYSTASOUND PRE-AMPLIFIER (MODEL CM-1)

GENERAL

The Crystasound pre-amplifier (Fig. 36) accessory unit is designed to accept Sennheiser condenser microphones and permits operation directly through the Crystasound amplifier, without requiring the use of the 6C auxiliary mixer. This means that the Crystasound built-in amplifier can, with the use of the pre-amplifier unit, accept a Sennheiser condenser microphone in *addition* to two low impedance microphones and one line input.

The pre-amplifier optional accessory is provided with a volume control and a switch for flat response and speech equalization. All power is supplied by the same NC-4 nicad battery pack powering the entire CP-16R/A camera system.

The pre-amplifier unit is mounted on the camera through the use of a dovetail system. One half of the dovetail is supplied with the pre-amplifier unit. The other half of the dovetail, which is attached to the camera body, (Fig. 36A-1), may be ordered as a factory-installed option, or it may be ordered separately for field installation (in which case, special mounting instructions are supplied with the unit).

OPERATION

1) Plug the pre-amplifier connector into the "Mixer" socket of the Crystasound amplifier.

2) Amplifier operation mode should be in the "Int" position for all normal condenser microphone recording requirements.

3) If, for some special reasons, a very high condenser microphone gain level is required, switch the amplifier operation mode to the "Mixer" position (which automatically disconnects all other microphone channels in the amplifier and increases the condenser microphone gain ten times the normal level).

FIGURE 36

FIGURE 36A

Sennheiser condenser microphones are of two different designs. The early 404, 804 series and the later 405, 415, 815 series. The Cinema Products auxiliary mixer and the Nagra 4 condenser microphone inputs are pin-for-pin compatible. A switch is provided on the 6C mixer to select the class of microphone being used. Sennheiser supplies two types of connectors, Tuchel and Cannon 3-pin XLR. Some users have modified their 415, 815 XLR microphones to be used with the Nagra IV without special adapter cable. A chart is provided to aid in making the proper cable connections.

Nagra 4 & CP Mixer Model 6C Input Pins	405, 415, 815 XLR modified for Nagra 4	405, 415, 815 XLR as supplied by Sennheiser	405, 415, 815 Tuchel as supplied by Sennheiser	404, 804 Tuchel as supplied by Sennheiser
PIN 1	1	1	2	3
PIN 2	2	3	3	2
PIN 3	3	2	1	1

CRYSTASLATE SYSTEM

Crystaslate is a *modification* of the CP-16R sound camera that adds an auto-slate frame marking lamp/bloop tone signal/sync pulse output signal (60 or 50 Hz sine wave).

Note: Cameras supplied with the Crystaslate *modification* (Fig. 37) are designated: CP-16RP

Crystaslate provides:

1. Auto-Slate Frame Marking — A lamp located in the aperture area goes on when the camera is turned on and remains on for three to five frames after the camera is running in sync. The CP-16R with Crystaslate is delivered with start marking capability but can be modified to provide start/stop marking by cutting the jumper shown in Fig. 39. The duration of the stop mark is from when the camera is switched off until the mirror stops in the viewing position. Crystaslate is available with edge marking or full frame marking.

2. Bloop Tone Signal ("Clapper") — The Crystaslate modification adds circuitry that provides a +10V DC signal through the pilotone cable connector (Fig. 37-1) that activates the bloop tone oscillator in Nagra 3 or 4 or Tandberg tape recorders. The duration of the bloop tone is identical to the duration of the auto-slate frame marking exposure.

3. Sync Pulse Output Signal (60 or 50 Hz Sine Wave) — Crystaslate provides a pilotone signal to Nagra 3 or 4 or Tandberg tape recorders. A switch (Fig. 38-1), located on P.C. board #70-770 (Fig. 38-2), permits switching from 60 Hz to 50 Hz.

4. 20V Power — Crystaslate provides 20V power for use with wireless systems. Continuous 20V power is provided for operating a wireless transmitter to transmit the signal that activates the bloop tone oscillator in Nagra 3 or 4 or Tandberg tape recorders. Switched 20V power is provided for operating a remote start/stop signal.*

*Note: Recorders must be equipped to operate with remote transmissions.

FIGURE 37   FIGURE 38

SCHEMATIC
CP-16RP REFLEX CAMERA
(CRYSTASLATE MODIFICATION, WITH EDGE MARKING)

FIGURE 39

SEE PAGE 27
FIG. 21

BAT. TEST

RED   + 20 V

2 RED

RED

70-752

SEE PAGE 46
FIG. 39

MJE-800

GRN/   4

680 Ω

m   BLU/   [M]   [M]   BLU/

WHT

70-759   NO. 557

70-770

CINEMA PRODUCTS		
FULL FRAME MARKING, MODIFICATION,		
12-75	A	70-1154

FIGURE 40

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CRYSTALINK WIRELESS SYSTEM

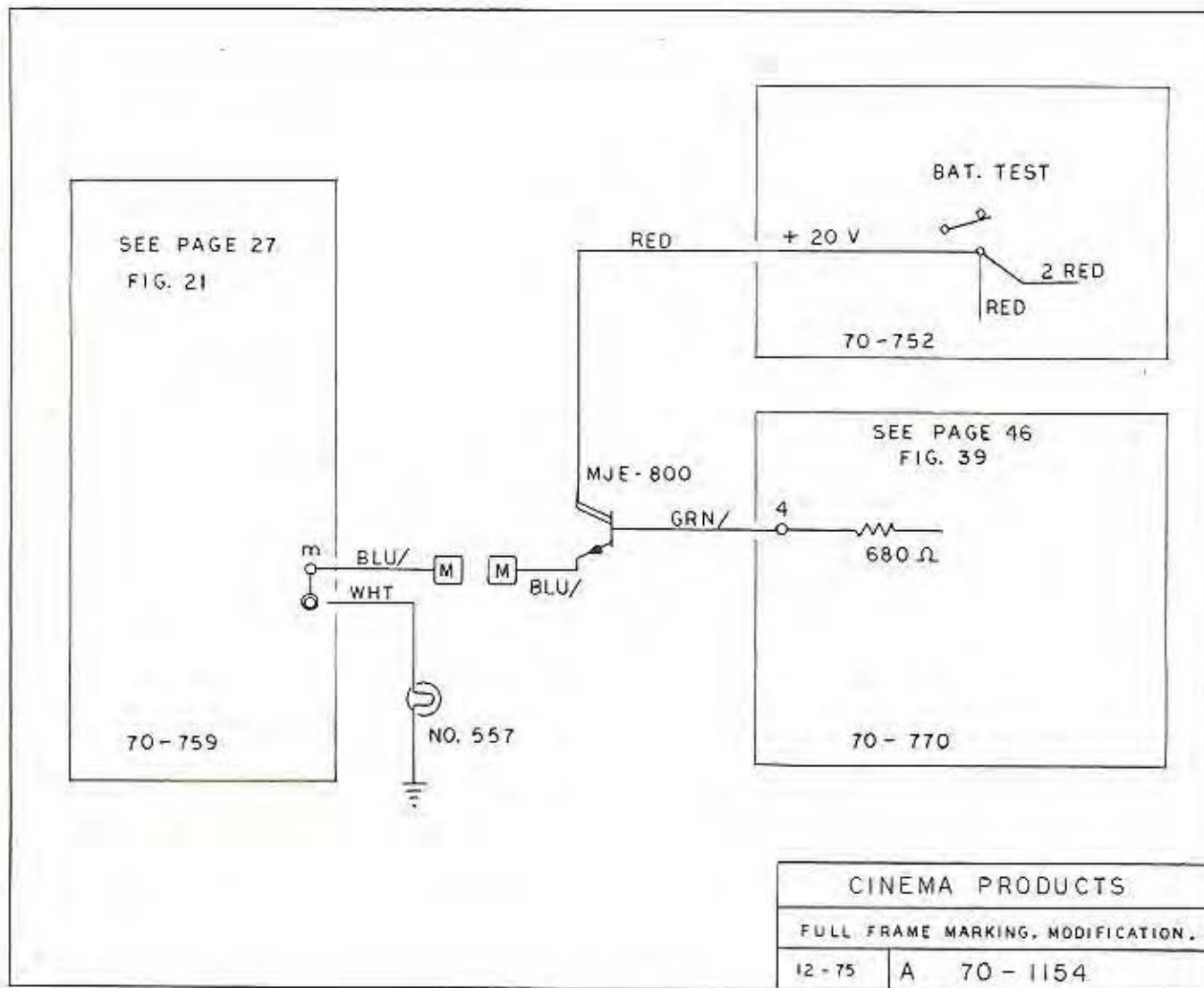Crystalink is a wireless FM transmitter and receiver system, available in two models. Both Crystalink CL-1 and CL-2 models are available in a wide range of frequencies which must be specified when ordering.

MODEL CL-1

The Crystalink CL-1 wireless receiver (Fig. 41-1) "sandwiches" between the CP-16R/A camera body and the Crystasound amplifier. The control panel is on the rear and contains an on/off switch and RF level meter that monitors the quality of the transmission. The CL-1 is supplied with a whip antenna that connects to the top of the receiver. The Crystalink CL-1 has line-of-sight range and is powered by the NC-4 battery pack in the Crystasound amplifier. The CL-1 receiver is supplied with either the Vega model 54 microphone/transmitter or the Vega model 55 transmitter.

The Crystalink model CL-1 is installed as follows:

1. Remove the Crystasound amplifier from the camera body. (See page 21 for removal instructions.)

2. Place Crystalink CL-1 in position between the camera body and Crystasound amplifier. Feed the Crystasound amplifier sound head cable (Fig. 41A-1) and grey power cable (Fig. 41A-2) through the access hole (Fig. 41A-3) in the Crystalink CL-1.

3. Connect the grey 3-pin Winchester male connector on the Crystalink CL-1 (Fig. 41A-4) to the mating 3-pin Winchester connector on the Crystasound amplifier (Fig. 41A-5). Connect the sound head cable and grey power cable to the camera body wiring.

   NOTE: Early Crystasound amplifiers do not have the 3-pin Winchester connector and must be modified. A modification kit may be factory installed or ordered for field installation (in which case detailed instructions are supplied with the kit).

4. With the longer screws provided with the Crystalink CL-1, secure the Crystasound amplifier and Crystalink CL-1 onto the camera body.

5. Connect the whip antenna (Fig. 41-2) to the top of the Crystalink CL-1 receiver.
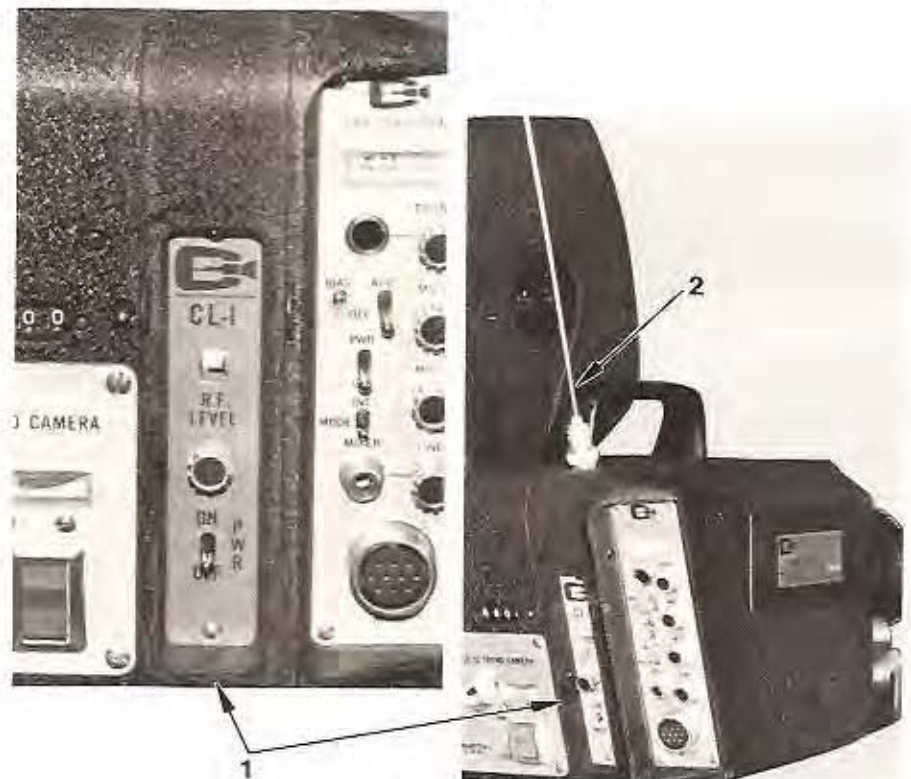

FIGURE 41A

FIGURE 41

MODEL CL-2

The Crystalink CL-2 wireless receiver (Fig. 42-1) attaches to the exterior of the Crystasound amplifier through the use of a dovetail system. *

The control panel is located on the rear and contains:

1. On/Off & Volume Control (Fig. 43-1)
2. Weak Signal Indicator Light (Fig. 43-2)
3. Useable Signal Indicator Light (Fig. 43-3)
4. Low Battery Signal Indicator Light (Fig. 43-4)
5. 12V Input and Audio Output Connector (Fig. 43-5)
6. Earphone Jack (Fig. 43-6)
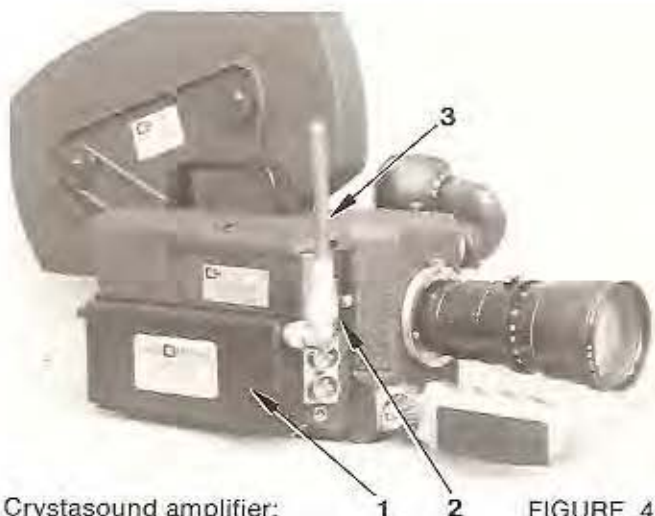7. 3-Pin Audio Output Connector (Fig. 43-7)

FIGURE 42

To connect the Crystalink model CL-2 to the CP-16R/A Crystasound amplifier:

1. Plug in adapter (Fig. 43-8) to mixer connector on Crystasound amplifier.
2. Connect cable (Fig. 43-9) to adapter and 12V input/audio output connector on CL-2 control panel.
3. Connect antenna (Fig. 42-3) into front of Crystalink CL-2 receiver (Fig. 42-2).

The 3-pin audio output connector (Fig. 43-7), operating at microphone or line level, is for use with *external* amplifiers (such as MA-11), when filming with the CP-16R camera.

The CL-2 is supplied with either a whip antenna or a short spiral antenna that attaches to the front of the receiver. The CL-2 is powered by the NC-4 battery pack located in the Crystasound amplifier. The CL-2 can also be removed from the CP-16R/A camera, and operated by a separate NC-4 battery pack located in an optional accessory battery holder (with dovetail) to which the CL-2 receiver can be mounted. The model CL-2 receiver is supplied with a model CL-2 transmitter.
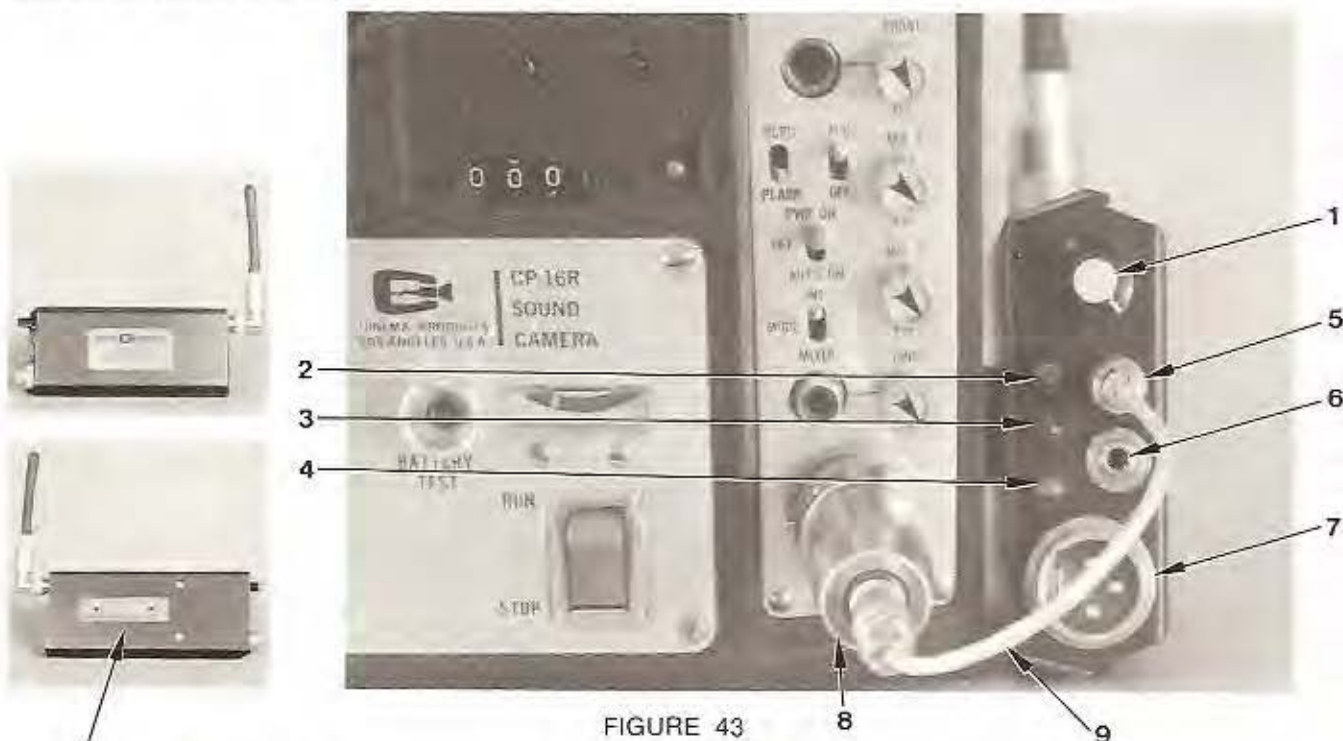

FIGURE 43

*Note: The Crystalink CL-2 receiver is mounted on CP-16R or CP-16R/A cameras through the use of a dovetail system. One half of the dovetail is supplied with the CL-2 receiver unit. The other half of the dovetail, which is attached to the Crystasound amplifier body, may be ordered as a factory-installed option. It may also be ordered separately for field installation (in which case, special mounting instructions are supplied with the unit).

CP-16R CAMERA ACCESSORIES
# & OPTIONS

ORIENTABLE VIEWFINDER

The Cinema Products orientable viewfinder (Fig. 44) was designed with a unique optical path in which the optics fold forward so that the eyepiece is approximately 1" (25mm) behind the film plane as it is in the standard CP-16R viewfinder. The CP erect image orientable viewfinder permits *left eye viewing* without requiring any additional accessory.

FIGURE 44
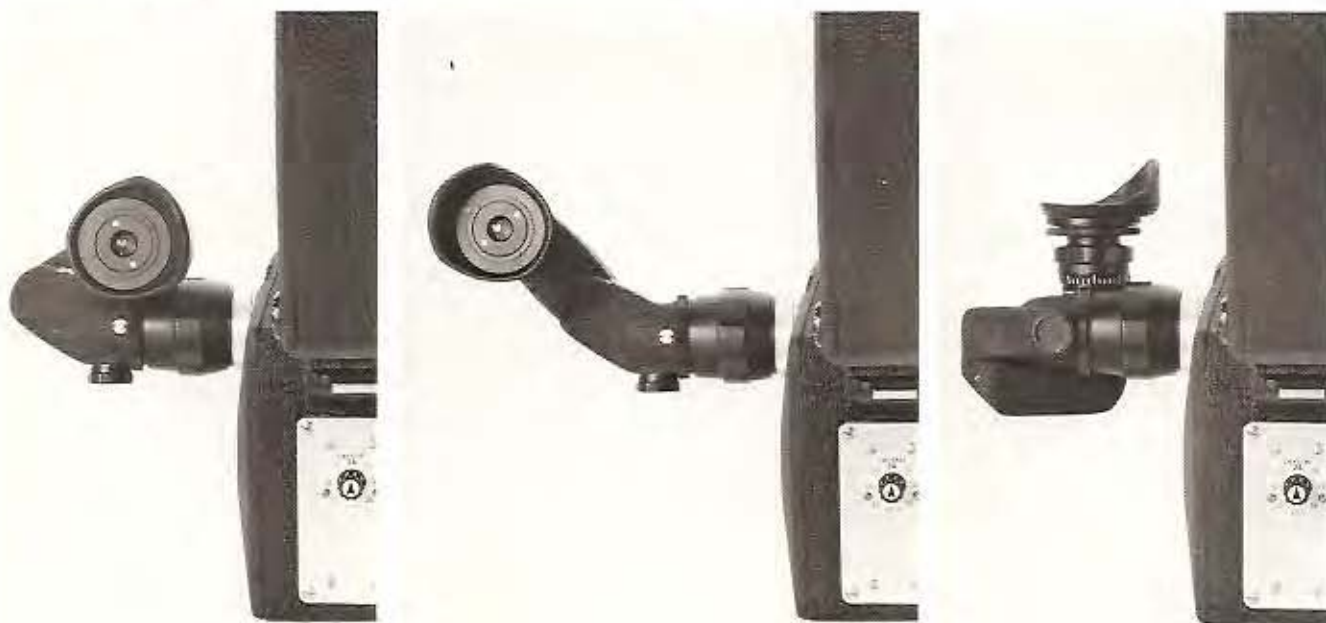
There are four controls on the orientable viewfinder; the erect image lock (Fig. 44-1) and the image orientation lock (Fig. 44-2), in addition to the eyepiece diopter adjustment ring (Fig. 44-3)* and eyepiece "dowser" open/close control ring (Fig. 44-4).

Releasing the erect image lock allows rotation of the viewfinder through a full 360° while the orientation of the image in the eyepiece remains constant.

Releasing the image orientation lock allows the image to tumble as the viewfinder is rotated. This permits the image to be orientated to the operator's viewing position. (The operator may view from the front of the camera and still see the image in a convenient viewing orientation.)

* ±5 diopters

EXTENSION TUBE ASSEMBLY

The eyepiece of the orientable viewfinder may be removed and an extension tube assembly (Fig. 45-1) inserted between the viewfinder body and eyepiece.* The extension tube assembly moves the eyepiece approximately 7" (178 mm) behind the film plane for more convenient viewing when the camera is mounted on a tripod or dolly (Fig. 46-1).

* Note: The eyepiece simply unscrews from the body of the orientable viewfinder and screws onto the extension tube assembly. When the extension tube assembly is placed on the orientable viewfinder, the image is *automatically* rotated 180°. To reverse this image orientation, loosen the image orientation lock, and rotate the finder 180°. Tighten the lock and rotate to viewing position.
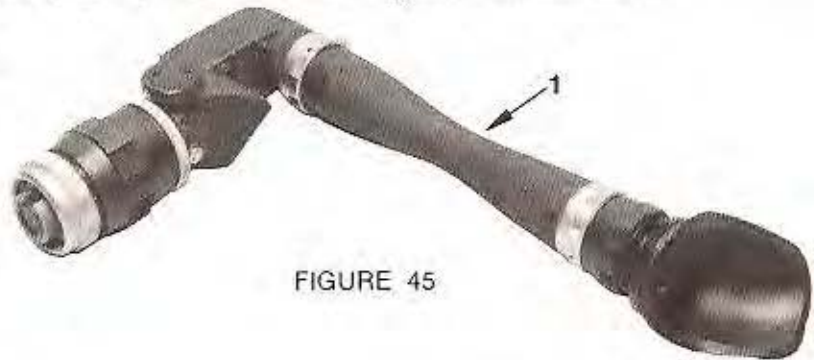
FIGURE 45

FIGURE 46

SEMI-AUTOMATIC EXPOSURE CONTROL

GENERAL

The CP-16R semi-automatic exposure control is a through-the-lens system utilizing a silicon light sensor for fast response at low light levels. The silicon sensor is oriented to form an ellipse across the film frame (heavily center-weighted in the vertical direction). Light values across this ellipse take precedence over light values above the ellipse. This makes the sensor less responsive to sun, bright skies, and overhead lighting across the upper portion of the film frame.

The sensor (Fig. 48-4) is located on the fiber optics plate *assembly,* and shares light with the reflex viewing optics. This is accomplished by a cube beam splitter located directly above the fiber optics plate. A relatively small amount of light is directed to the sensor. At no time is any light diverted from the film.

The sensor output is amplified and processed through a proportional DC circuit summed against the control settings and fed to a logic circuit which drives the exposure control information display.

The exposure control LED indicators appear along the bottom of the information display (Fig. 47-1) as seen through the viewfinder eyepiece.

The center display is a "0," which indicates correct exposure. To the right are "+.5," "+1," and "+," and to the left are "-.5," "-1," and "-." These are half stop increments, "+" and "-" being out of range indicators, *i.e.* "+" equals 1½ stops or more over exposed. To correct over or under exposure, the lens iris control ring must be rotated until the exposure control information display reads "0."
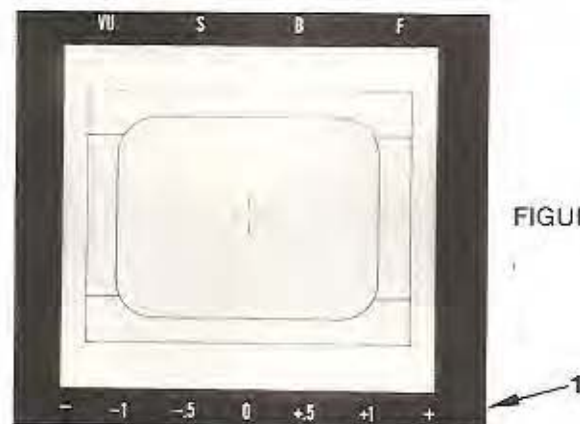
FIGURE 47

CONTROLS

FPS — Adjusts to correspond to the frame rate the camera is set to operate at (Fig. 48-1).

ASA — Adjusts to correspond to the ASA of the film being used (Fig. 48-2).

Off/On — Activates and deactivates the system (Fig. 48-3).

FIGURE 48

FULLY AUTOMATIC EXPOSURE CONTROL

GENERAL

The fully automatic exposure control takes the output of the semi-automatic exposure control and compares it to a reference, which in turn feeds a dual servo amplifier circuit controlling the exposure control motor direction. This motor (Fig. 49-4) is attached to the lens by bracketry (Fig. 49-5) and meshes with a lens gear that drives the iris control ring.*

*Note: Mounting instructions (relating to a specified lens) are supplied directly with each exposure control bracketry/gear set.
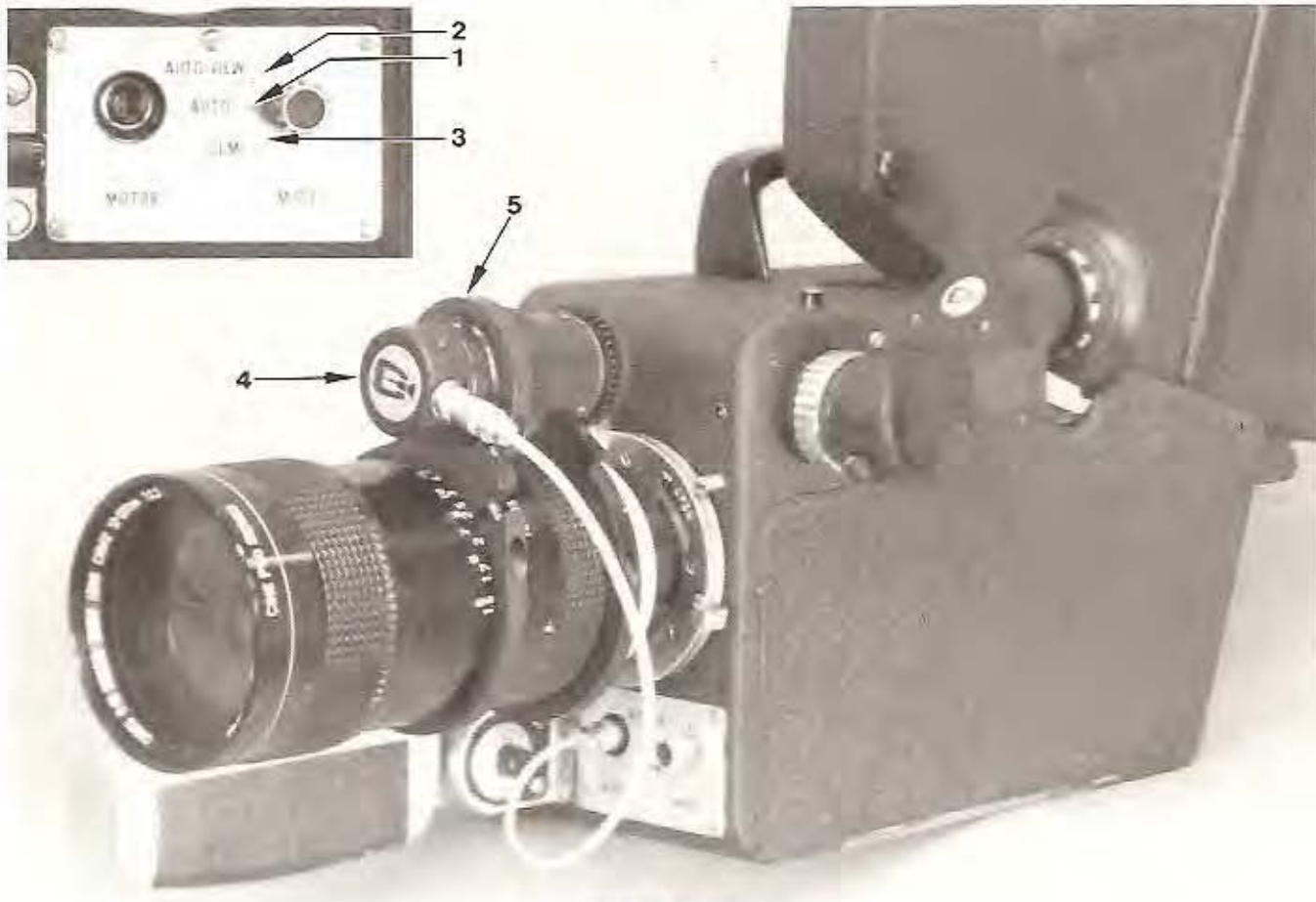

FIGURE 49

CONTROLS

Note: All controls required for semi-automatic exposure control (see above) are *also* required in the fully automatic mode.

In addition, the following mode select controls are added:

Auto Mode — Automatically adjusts exposure while exposure control switch is on and camera is operating (Fig. 49-1). When the camera is turned off, the exposure control remains active and continues to operate.

Auto View Mode — Automatically adjusts exposure while exposure control switch is on and camera is operating (Fig. 49-2). When the camera is turned off, the exposure control drives the lens aperture to fully open — and then becomes inactive.

Manual Mode — Operates as a semi-automatic exposure control (Fig. 49-3). Permits camera operator to *override* the fully automatic exposure control motor.

J-5 ZOOM CONTROL SYSTEM

GENERAL

The J-5 zoom control system (Fig. 50) is designed for use with all CP-16R camera models. The J-5 zoom control system consists of a silent servo zoom motor and a specially designed J-5 camera handgrip control (which replaces the *standard* CP-16R camera handgrip and handgrip mount), plus appropriate zoom lens gear and motor support bracketry. Special gear and bracketry sets are required when using the J-5 zoom control *in conjunction with* a CP-16R type camera equipped with fully automatic exposure control.

OPERATION

The J-5 servo feedback system circuitry, and thumb activated direction/proportional speed control (Fig. 50-1) are all compactly packaged inside the J-5 camera handgrip. The J-5 handgrip also contains the CP-16R camera on/off switch (Fig. 50-2).

The silent servo zoom motor (Fig. 50-3) delivers full maximum torque at all speeds. The J-5 zoom motor is available in two models: the slow speed version for a full zoom at maximum speed in 4½ seconds and a fast speed version for a full zoom at maximum speed in 2½ seconds — with both versions providing variable speeds up to their respective maximum speed ratings.

Plug in one end of the J-5 cable into the J-5 zoom motor (Fig. 50A-1) and plug the other end into the J-5 handgrip control (Fig. 50A-2).

The zoom motor attaches to the motor support bracket through an eccentric which allows for adjusting the lens gear mesh for optimum operation.

J-5 lens gear (Fig. 50A-3) and zoom motor support bracketry (Fig. 50A-4) sets are available (as specified) for the wide range of zoom lenses which can be used with the CP-16R reflex camera system. (Detailed mounting instructions are supplied with each J-5 gear and bracketry set.) Also available as an option is an extension cable for remote operation.
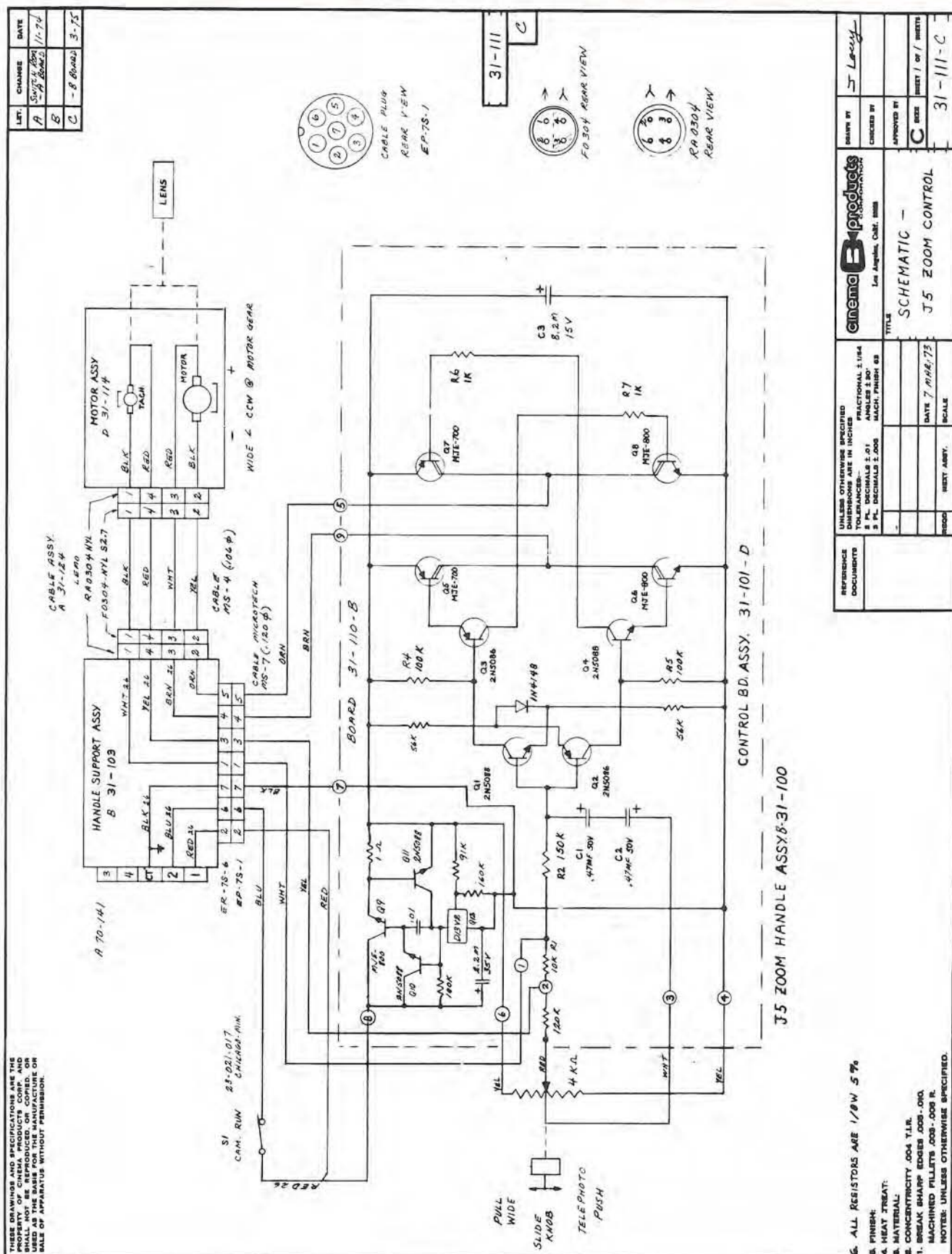

FIGURE 50   FIGURE 50A

54

FIGURE 51

MIKE/LITE BRACKET

The Cinema Products mike/lite bracket (Fig. 52-1) for mounting microphones and lighting fixtures has been designed with a special locking pivot arm on the bracket to permit maximum flexibility in positioning the microphone and light fixture in relation to each other. The mike/lite bracket is supplied with interchangeable 1/2" and 5/8" fixture mounting studs. The mike/lite bracket is easily mounted on CP-16R type cameras.

To install the mike/lite bracket:

1. Remove the auxiliary side cover or Crystasound amplifier.
2. Remove the two screws holding the camera carrying handle.
3. Position the mike/lite bracket between the camera body and carrying handle.
4. Replace the two screws holding the camera carrying handle.
5. Replace the auxiliary side cover or Crystasound amplifier.

FIGURE 52

SNAP-LATCH CAMERA MOUNTING SYSTEM

The snap-latch quick-release camera mounting system employs a camera baseplate (Fig. 53-1) which snaps into either the snap-latch shoulder pod (Fig. 53-2) or tripod baseplate (Fig. 53-3).

Mount the camera baseplate to the camera. The pin goes into the 1/4" tripod socket and the screw fits the 3/8"-16 socket.

The shoulder pod mechanism is spring loaded. To attach the shoulder pod to the camera simply place the camera baseplate into the shoulder pod dovetail (Fig. 53-4) until it seats. Spring tension will hold the shoulder pod in place.

The tripod baseplate mechanism attaches to the camera baseplate as follows:

1) Move the quick-release lever to "open" (Fig. 53-5).
2) Place the camera baseplate into position in the tripod baseplate.
3) Secure the camera baseplate by closing the quick-release lever.

FIGURE 53

CARRYING CASES

A variety of specially designed and fitted carrying cases to accommodate CP-16R type cameras, magazines and camera accessories are available from Cinema Products (Fig. 54).

FIGURE 54

CINEVID-16 VIDEO-ASSIST CAMERA SYSTEM

GENERAL

The Cinevid-16 video-assist camera (Fig. 55-1)* picks up the image directly from the CP-16R reflex fiber optics viewing screen and transmits it to any number of commercially available remote monitors (with no loss of light to the CP-16R reflex viewing system). The image can also be recorded on a video tape recorder to provide "instant dailies." (See Fig.58A.)   *Note: Please specify 525 line format or 625 line format when ordering.

WEIGHT & DIMENSIONS

The compact and lightweight Cinevid-16 video-assist camera weighs only 1 lb., 13 oz. (822 gr.) and measures: 2¼" x 3¾" x 5" (5.7 cm x 9.5 cm x 12.7 cm)... permitting easy hand-held filming with the lightweight CP-16R.
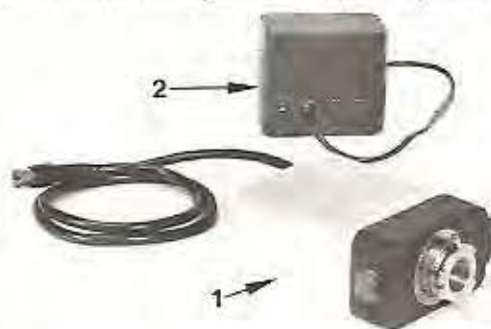
FIGURE 55

OPERATION

The Cinevid-16 video-assist camera attaches to the CP-16R via a video mount adapter (which replaces the adapter *cover plate* as seen in Fig. 2-13). The video mount adapter (Fig. 55-3), which includes the relay optics, contains three control rings:

1) Bayonet mount locking ring (Fig. 56-5) — for attaching the Cinevid-16 video-assist camera.
2) Iris Control (Fig. 56-3) — adjusts for the ASA rating of the film being used.
3) Focusing Ring (Fig. 56-4) — focuses video-assist camera to frame line markings on fiber optics viewing screen

The Cinevid-16 video-assist camera system is supplied with a power supply unit (Fig. 55-2) permitting DC operation with a 12V battery* or 120-240V operation from AC mains.

Optional Cinevid-16 system accessories include a video control console (with three monitors, plus dissolve and wipe controls as seen in Fig. 57), a crystal controlled video sync generator (Fig. 57A), etc.

Note: Complete operating instructions are supplied with all optional Cinevid-16 accessory units.

FIGURE 57

FIGURE 56

FIGURE 57A

*Note: Another DC mode of operation (through the use of a *specially modified* auxiliary side cover or a *specially modified* Crystasound amplifier) permits drawing power from the same NC-4 battery pack directly powering the CP-16R camera; or (through use of an accessory battery holder with dovetail) using a separate NC-4 battery pack as the power source.

CP-16R "STUDIO RIG"

GENERAL

The CP-16R reflex with "Studio Rig" . . . the ideal 16mm production camera system for studio-type features, television specials, documentaries and television commercials.

Sound readings taken in Cinema Products' sound test room (at an ambient of 18 dB on the weighted "A" scale) establish that the CP-16R (when equipped with the "Studio Rig" seen in Fig. 58) reads 28 ± 1dB when measured 3 ft. from the front of the optical flat in the matte box — while the CP-16R camera is pulling film.

The CP-16R camera attaches to a riser block (Fig. 58-1) through a snap-latch camera baseplate (Fig. 58-2). The riser block is attached to a tripod or dolly via a mounting plate (Fig. 58-3) that has a series of mounting holes so the system can be mounted at the optimum balance point (Fig. 58-7). Two matte box support rods hold the matte box system (Fig. 58-4), follow focus unit (Fig. 58-5) and the optional J-4 zoom motor (Fig. 58-6).

FIGURE 58

The follow focus unit can be adjusted along the support rods to engage either fixed focal length or zoom lenses. The follow focus gear is adjustable to accommodate varying diameter lenses.

The matte box first stage accepts a 4" square filter (a friction lock is provided so the filter can be secured either vertically or horizontally). Behind this stage is a second stage with the capability of accepting 4½" round filters.

The J-4 zoom motor mounts on the matte box support rods. The J-4 motor drives the zoom lens through a rubber timing belt, which offers flexibility and quiet operation (Fig. 58-14).

It is recommended that the Cinema Products orientable viewfinder, together with extension tube assembly, be used with the CP-16R and "Studio Rig" for convenience in tripod operation (Fig. 58-15).

Note: The "Studio Rig" weighs approximately 11 lbs. (5 kg). The CP-16R Reflex camera and "Studio Rig" combination should be mounted on tripod units able to support a minimum of 30 lbs. (13.6 kg) weight.

FIGURE 58

(con't.)

59

OPERATION

The "Studio Rig" is prepared for operation as follows:

PREPARING THE LENS

1) Remove the lens from the camera.
2) Slip the focus gear (Fig. 58-8) over the back end (camera end) of the lens with the hub facing the front of the lens (push it on to the focusing barrel as far as it will go).
3) Tighten the three set screws UNIFORMLY (to avoid distortion).
4) Slip the zoom pulley (Fig. 58-9) into position on the zoom barrel with the hub facing the rear of the lens. (Push it as far forward as it will go — but do NOT tighten the set screws.)
5) Place the lens donut (Fig. 58-13) on the focusing panel and position the light shield ring (Fig. 58-10) over the focusing barrel from the front of the lens.
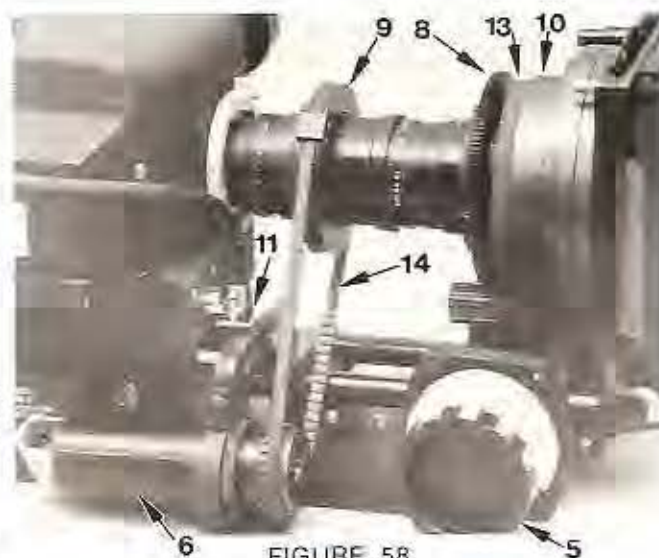6) Place a filter or flat in one of the filter cells.

Note: Final positioning of the light shield ring and zoom pulley will be accomplished after the camera is mounted.

PREPARING THE CAMERA

1) Remove the handgrip and handgrip mount (this is accomplished by removing the four screws holding it on the camera).
2) Replace the handgrip mount with the handgrip connector cover plate using the same four screws.
3) Plug in the connector end of the remote starting switch (Fig. 58-11) into the camera connector.
4) Remove the camera baseplate from the riser block.
5) Attach the camera baseplate to the camera base. (The pin goes into the 1/4" tripod socket and the screw fits the 3/8"-16 socket).

Note: The camera baseplate, riser block and tripod baseplate are shipped assembled.

MOUNTING THE CAMERA

1) Move quick release lever of the riser block to "open."
2) Slip the front end of the lens with the light shield ring into the light shield.
3) Place the camera baseplate into position in the riser block.
4) Secure the camera by placing the quick-release lever in the closed position.
5) Place the tripod baseplate on the tripod and attach it.

FINAL ADJUSTMENT

1) Loosen all clamp screws on the support rods.
2) Set matte box so that ends of rods are flush with surface of support plate and tighten clamp screw.
3) Turn focusing barrel so that lens is fully extended and adjust follow focus mechanism so that plastic gear fully engages focus gear on lens (not backlash adjustment).
4) Adjust focus mechanism backlash by loosening thumbscrew holding gear assembly. Pivot gear assembly for minimum backlash and maximum smoothness throughout focus range, then tighten thumbscrew.
5) Adjust light shield ring so that it is within the light shield throughout the range of focusing.
6) Adjust J-4 zoom motor so that the toothed motor pulley lines up with the zoom pulley. This is done by adjusting the accessory bracket (Fig. 58-12) along the rods or moving the zoom motor longitudinally in its bracket. Tighten the clamp screw in the accessory bracket.
7) Adjust orientation of zoom pulley so that a straight pull is available on the belt at both extremes of zoom; then tighten three set screws uniformly in zoom pulley.
8) Adjust belt tension by moving the J-4 motor bracket in the slot. Additional tension adjustment is available in eccentric motor clamp. Belt tension should not be great enough to cause lens misalignment. Use just enough tension to eliminate slack.
9) Plug in the connector end of the J-4 zoom control box into the zoom motor connector.

FIGURE 58

FILTER ARRANGEMENT

Supporting the sunshade is a cell that will accept rectangular filters (of any height) placed vertically. A button, with an engraved line, is located at the rear (camera side) of the matte box. The line starts at the edge of the button, bends slightly at the center and ends before reaching the edge again. Thus the line consists of a long and short segment. When the short segment is vertical, filters will pass freely through in a vertical direction, being guided on both sides. When the long segment is vertical, the button must be depressed in order to slide the filter: the filter being secured when the button is released. Orientation of the line can be accomplished by depressing the button and rotating.
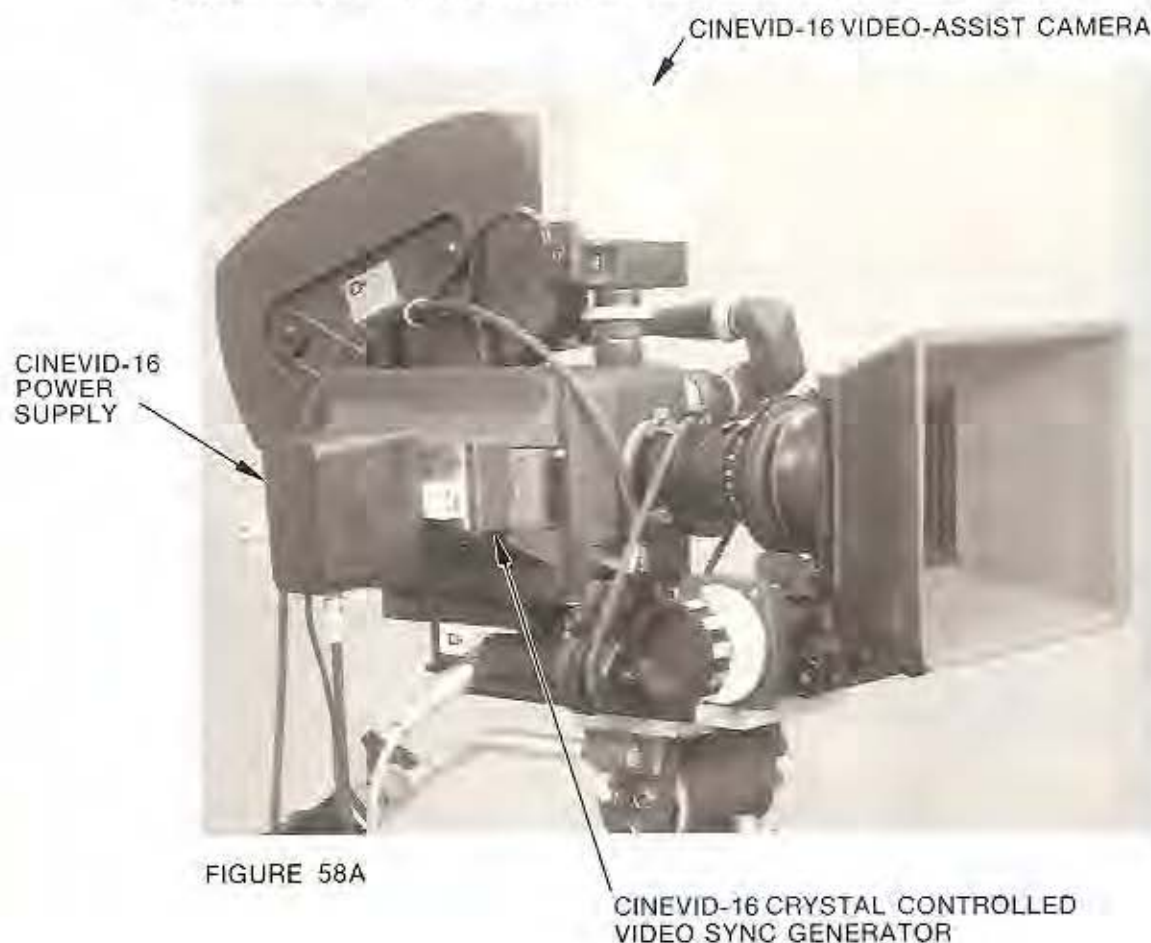
A similar arrangement can be had in a horizontal orientation. To do this, align the short segment vertically. Pull the stainless steel plunger in the upper right corner to disengage the slide filter adapter and lift out the adapter by lifting the tab in the center. Rotate the brake button making the short line segment horizontal and below the center of the button. Slide the slide filter adapter into the left opening with the plunger entering the slot just below the brake button. Pull the plunger out, let it fall back into the counter bore as a latch. The same rule applies for clamping and nonclamping as was described for vertical orientation. In this configuration a variable diffusion screen can be used and the variation can be accomplished while zooming.

Square filters may be used if a slide filter is not required. Remove the slide filter adapter as described, place the short line segment in vertical alignment, put a 4" square filter in the square filter holder and slip it into the matte box from the top.

To load a round filter in the round stage, the matte box must be removed from the rods. This may be done by loosening the clamp screw and gently pulling. Loosen the thumb screw on the light shield to the point that it can be tilted, then remove it by disengaging the pin from the groove in the filter ring. The light shield ring can carry a round filter. The 4½" round filter should be pushed past the three wire springs seen inside the ring. The filter ring can be removed from the matte box in the same manner and another 4½" diameter filter can be added.*

*Note: Another matte box model is available which accepts 138mm round filters.

CP-16R SHOWN WITH "STUDIO RIG" AND CINEVID-16 VIDEO-ASSIST SYSTEM

CINEVID-16 VIDEO-ASSIST CAMERA

CINEVID-16 POWER SUPPLY

FIGURE 58A

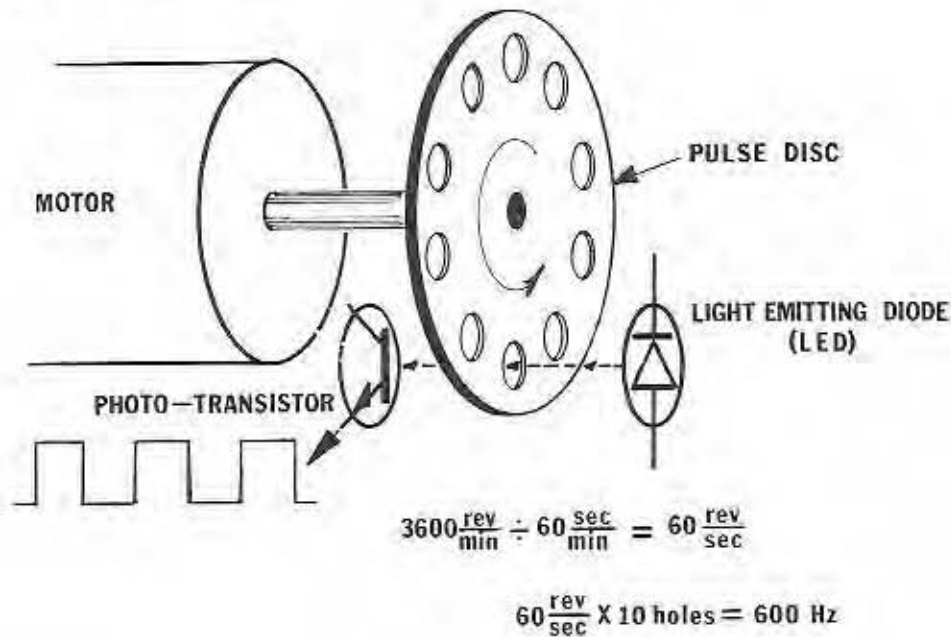CINEVID-16 CRYSTAL CONTROLLED VIDEO SYNC GENERATOR

BLOCK DIAGRAMS

Note: Shaded areas in the Block Diagrams represent *de-energized circuits.*
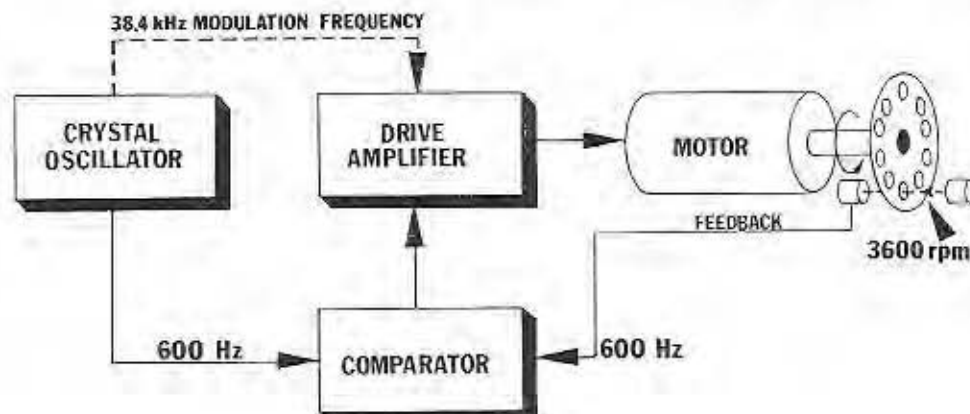
OPTICAL TACHOMETER

The "Optical Tachometer" diagram shows how a 600 Hz waveform may be generated by infra-red light from a light-emitting-diode (LED) passing through 10 holes in a disc rotating at 3600 rpm, and striking a light sensitive transistor. The 600 Hz "feedback" from the motor is sometimes called the "optical tachometer."

Note: The crystal oscillator in the CP-16R yields a stable frequency output which can be electronically divided to do a number of different jobs simultaneously. The basic output frequency is 600 Hz (cycles-per-second) which maintains the frame rate at a perfect 24 or 25 fps. Crystal controlled cameras and tape recorders need no connecting ("sync-pulse") cable to maintain perfect lip sync.

PULSE DISC

MOTOR

LIGHT EMITTING DIODE
(LED)

PHOTO—TRANSISTOR

$$3600\frac{rev}{min} \div 60\frac{sec}{min} = 60\frac{rev}{sec}$$

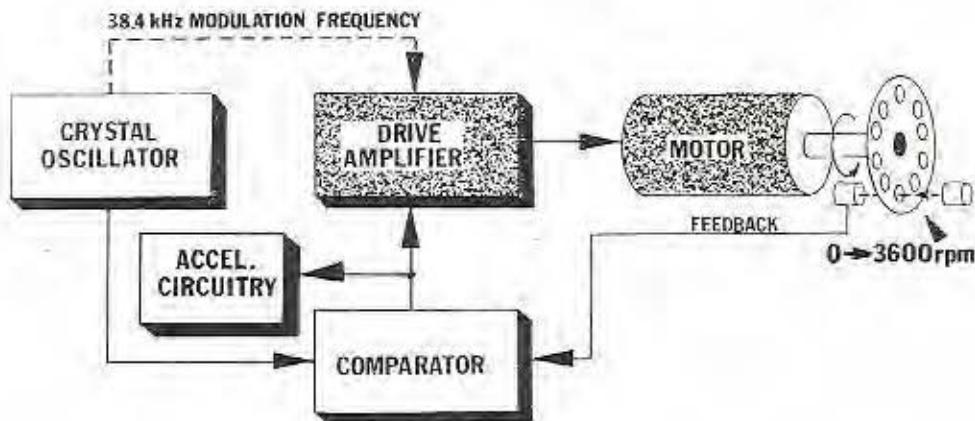$$60\frac{rev}{sec} \times 10 \text{ holes} = 600 \text{ Hz}$$

BASIC CRYSTAL DRIVE

"Basic Crystal Drive" depicts how the 600 Hz from the crystal and the 600 Hz from the "optical tachometer" are evaluated in the *comparator* and then fed to the *drive amplifier* with the proper corrective signal. This speed corrective signal is modulated or mixed with another type of signal from the crystal, and is converted into a series of variable width pulses which are then fed to the motor. Thus, the closed control (or servo loop) is complete.

38.4 kHz MODULATION FREQUENCY

CRYSTAL OSCILLATOR

DRIVE AMPLIFIER

MOTOR

FEEDBACK

3600 rpm

600 Hz

COMPARATOR
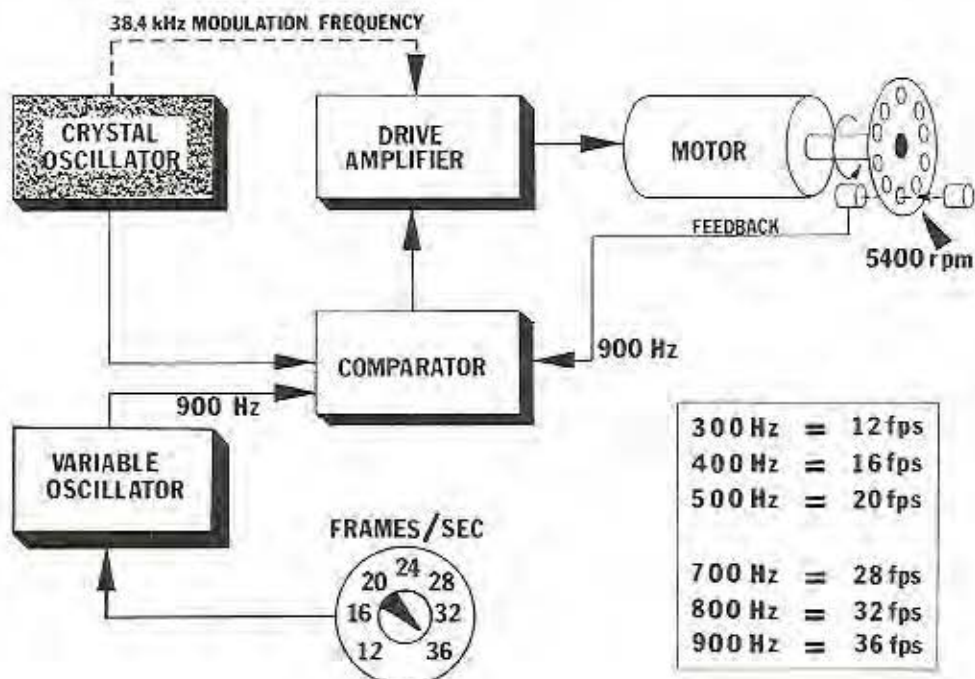
600 Hz

ACCELERATION CIRCUIT

"The Acceleration Circuit" is the key to the smooth speed-up of CP-16R type cameras. The comparator's output signal is acted upon by the acceleration circuit to allow a gradual increase in speed until sync speed is achieved.

38.4 kHz MODULATION FREQUENCY

CRYSTAL OSCILLATOR

DRIVE AMPLIFIER

MOTOR

ACCEL. CIRCUITRY

COMPARATOR

FEEDBACK

0➔3600rpm

NON-CRYSTAL SPEEDS

When frame rates other than 24 fps crystal sync speed are called for, the *variable oscillator* is called upon to deliver 300, 400, 500, 700, 800 or 900 Hz as selected by the control panel switch. These frequencies are then matched by feedback from the tachometer and cause the motor to deliver frame rates of 12, 16, 20, 28, 32 or 36 fps respectively.* The 600 Hz from the crystal is de-energized as the shading in the "Non-Crystal Speeds" diagram indicates.

*Note: Using a 25 fps pulley, the corresponding variable frame rates would be 12.5, 16.5, 21, 29, 33.5 and 37.5 fps respectively.

38.4 kHz MODULATION FREQUENCY

CRYSTAL OSCILLATOR

DRIVE AMPLIFIER

MOTOR

FEEDBACK

5400 rpm

COMPARATOR

900 Hz

900 Hz

VARIABLE OSCILLATOR

FRAMES/SEC

20 24 28
16   32
12   36

|		
300 Hz	=	12 fps
400 Hz	=	16 fps
500 Hz	=	20 fps
700 Hz	=	28 fps
800 Hz	=	32 fps
900 Hz	=	36 fps

MIRROR POSITIONING

The "Mirror Positioning" diagram shows how the drive system slows down to a 60 Hz (2.4 fps) rate by de-energizing both the crystal and the variable oscillators to cause the shutter to go slowly enough for the mirror to stop in the viewing position. The de-energizing of these circuits takes place when stopping the camera by using either the handgrip push-button switch or "Stop-Run" switch located on the control panel at the rear of the camera.
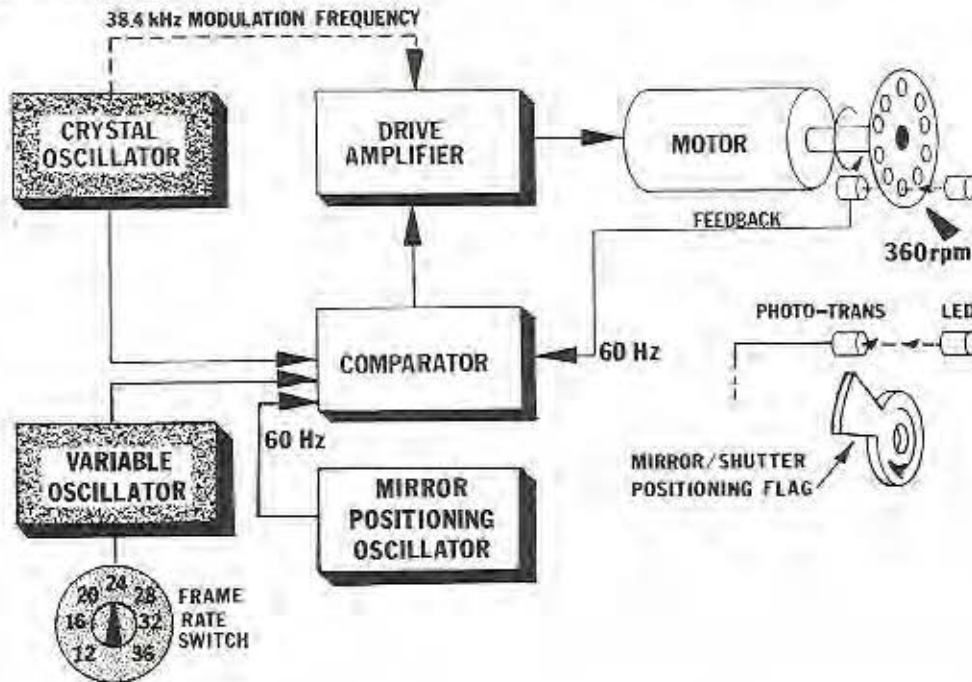

STOPPING CIRCUIT

The "Stopping Circuit" completes shutting off the entire camera once the mirror is in the viewing position. A light sensitive transistor and LED accomplish this by sensing a dark flag that blocks this particular LED's infra-red light when the mirror shutter reaches the viewing position.


64
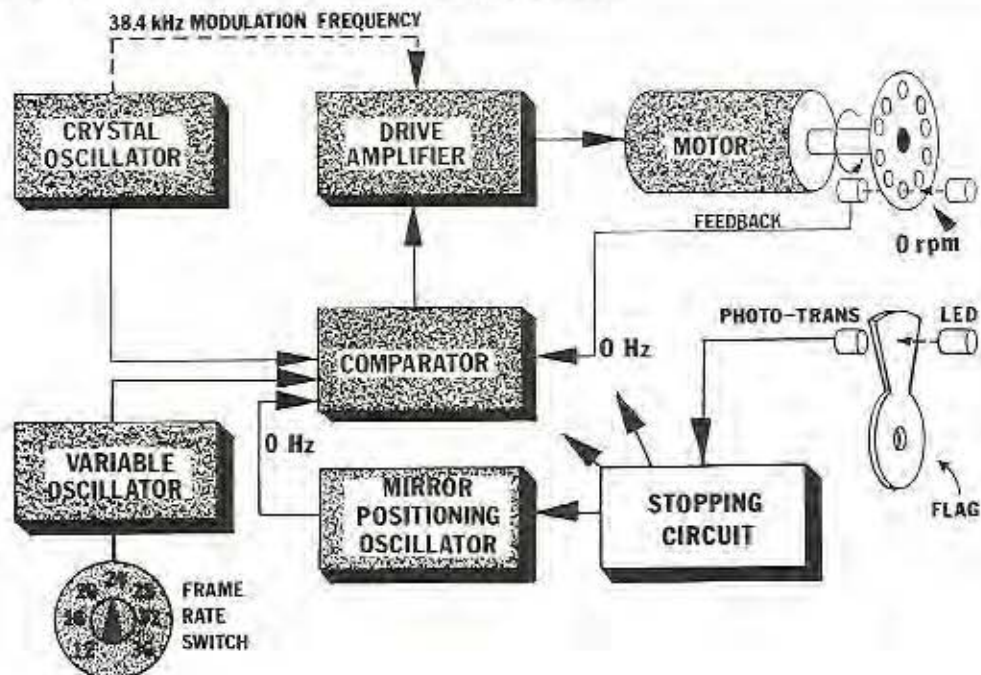
CRYSTASOUND AMPLIFIER

The "Crystasound Amplifier" diagram indicates (and highlights) the *basic* "roadmap" of the Crystasound amplifier. The diagram shows how the various inputs can be mixed and then fed to the record amplifier, which is then acted upon by the AGC (if so desired), and the bias circuit. The control associated with the bias circuit (accessed by a hole in the side of the amplifier) must be adjusted periodically to compensate for head wear and emulsion differences. This control is "peaked" (i.e., maximized) by recording a 3kHz (or similar) tone while simultaneously listening through the headphones (AGC switch must be in "OFF" position), and adjusting the control slowly for the loudest possible tone. The playback portion of the amplifier is provided for making a quality check of the recorded track at the time of recording. By switching the *bias switch* to "OFF," a soundtrack may be played back without disturbing the original recording. When either of the camera run switches are engaged, the headphone circuit automatically switches to play back the recorded soundtrack.
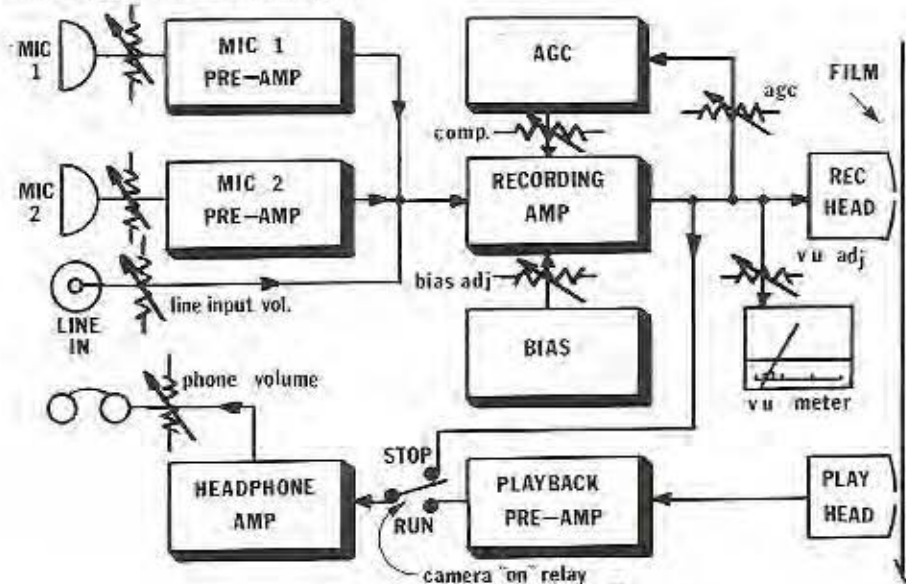
CRYSTASLATE OPTION

The "Crystaslate Option" will provide a 50 or 60 Hz pilotone signal and a 10V bloop tone signal ("audio clapstick") to tape recorders so equipped to receive these signals. In addition, a frame marking slate * for the film that perfectly synchronizes with the "audio clapstick" is provided. The frame marker may be a "start only" or "start and stop" device depending on the user's needs. The pilotone connector also features a 20V unswitched and a 20V switched outlet for possible remote control applications.
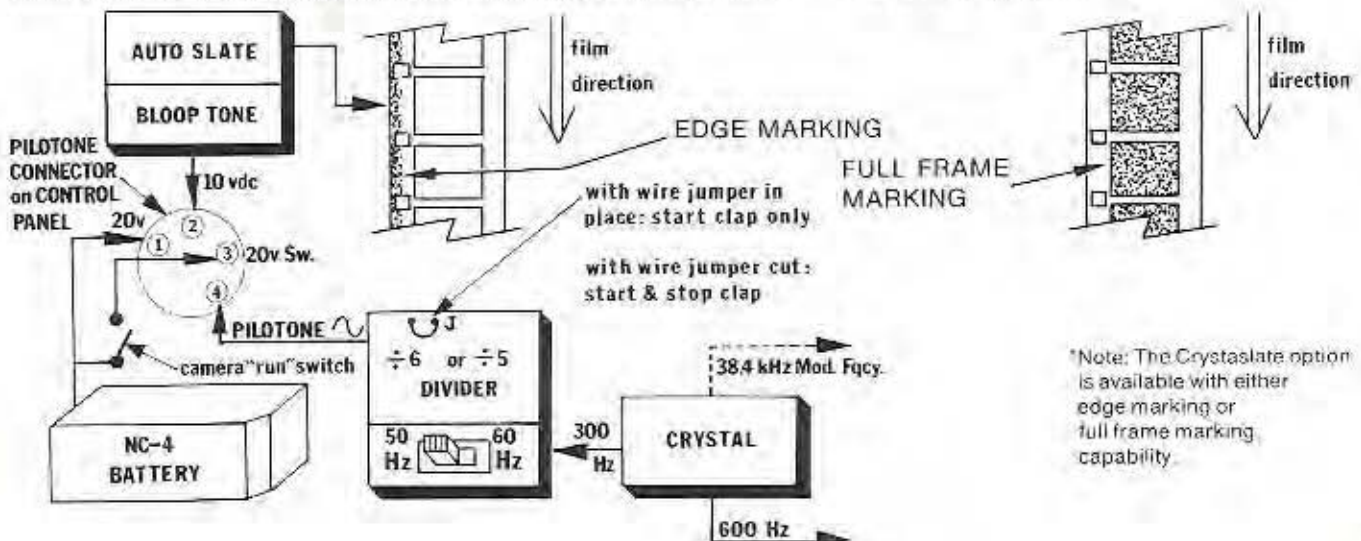
*Note: The Crystaslate option is available with either edge marking or full frame marking capability.
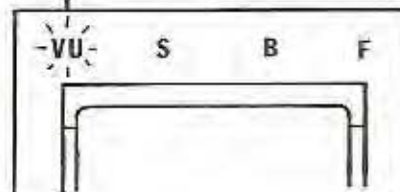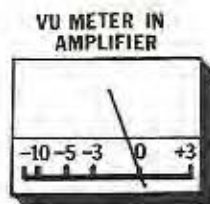
INFORMATION DISPLAY

The *information display* is a visual readout of vital camera functions. It is seen by the camera operator through the viewfinder, but does not in any way distract the operator by blocking any of the image. The four block diagrams which immediately follow illustrate the four control functions as they appear on the top line of the *information display*.

Note: The bottom line of the *information display* relates to exposure control information (see Semi-Automatic Exposure Control section for a detailed description).

RECORD LEVEL WARNING

The "Record Level Warning" information display indicator provides a brightness signal proportional to the actual record level shown on the VU meter of the Crystasound amplifier. However, when a record level that could cause distortion occurs, the indicator brightness jumps much higher than normal to alert the operator. The circuitry used to energize the indicator is located behind the control panel of the camera.

| "METER"		"LIGHT"
–10	=	-VU-
–5	=	-VU-
–3	=	-VU-
0	=	-VU-
+3	=	-VU-

OUT-OF-SYNC WARNING

The "Out-of-Sync Warning" information display indicator operates together with the red lamp on the outside of the camera to tell the operator that the camera is not operating at the speed that has been selected. The signal for this function is derived from the comparator. It is normal to see the "out-of-sync" warning come on for a brief moment as the camera is stopped or started.
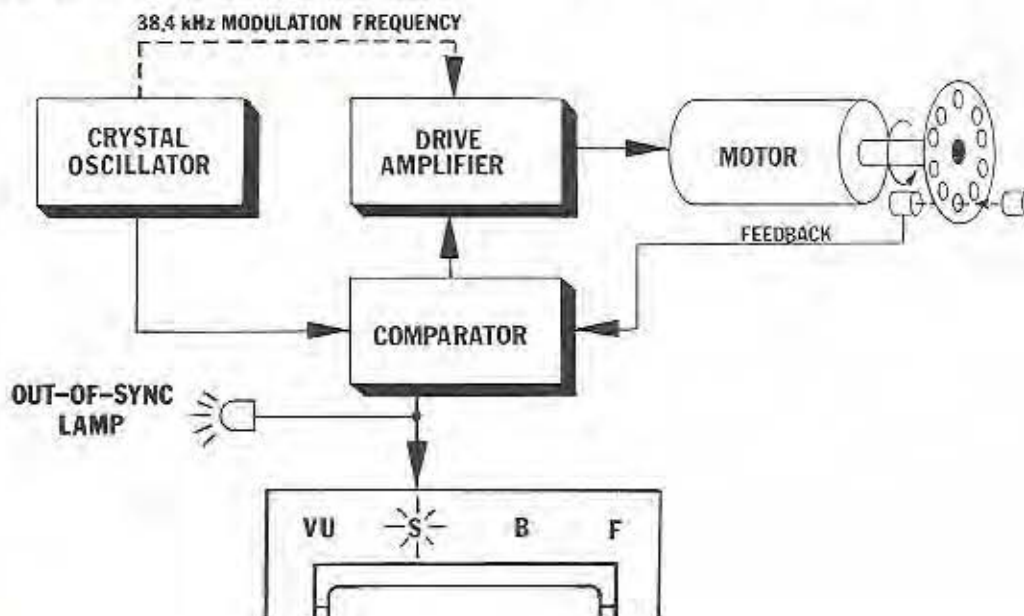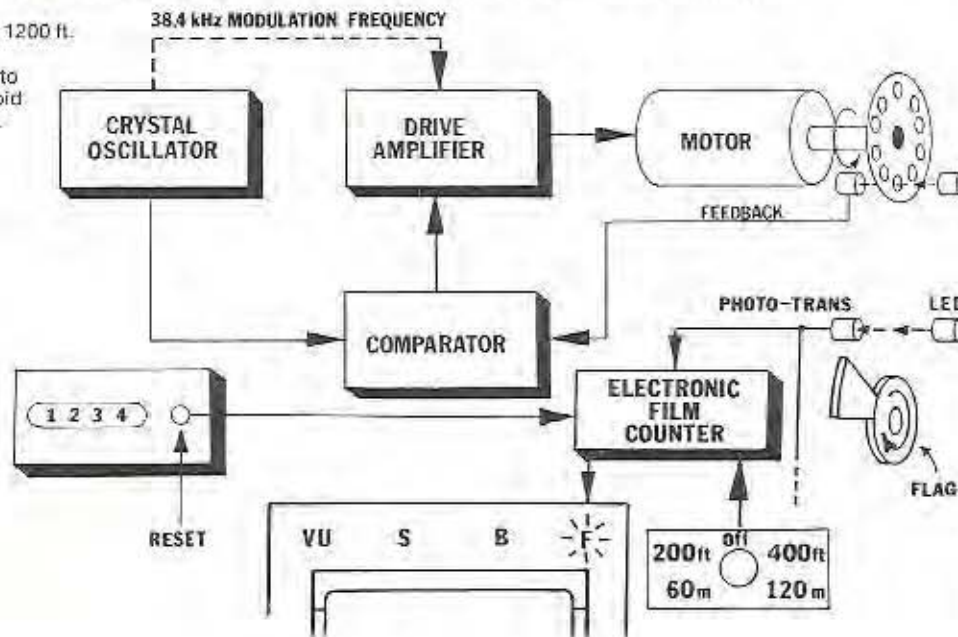
LOW BATTERY WARNING

The "Low Battery Warning" information display indicator operates in conjunction with the battery meter on the control panel. The indicator in the viewfinder is designed to come on when the indicator in the battery meter reaches the yellow-green line. The yellow-green line indicates enough battery charge to finish a short take, but the battery should be changed (or recharged) before a new long take is attempted.
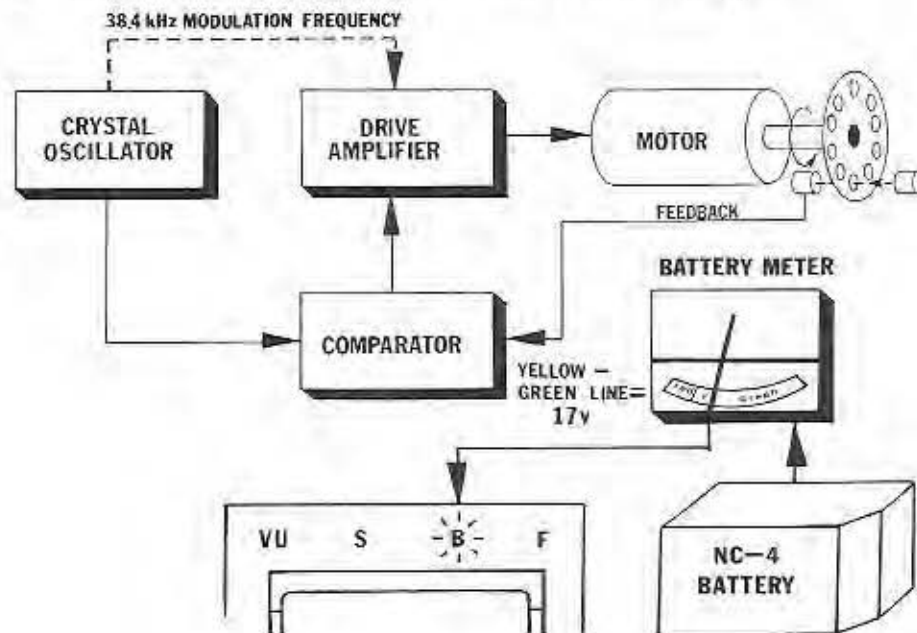
LOW FILM WARNING

The "Low Film Warning" information display indicator comes on to warn the operator that ten percent of the original film load is unexposed. The "Low Film" system features a long term memory that functions even when the NC-4 camera battery is removed, so the film count is not lost until the counter is reset to zero by resetting the mechanical film counter above the control panel. The count originates from the same flag that causes the mirror to stop in the viewing position. The electronic film counter is "programmed" by setting the 200 ft. — OFF—400 ft. switch (depending on actual film load*) when loading the magazine onto the camera for the first time. The switch is located in the film transport chamber of the camera. The "Low Film Warning" information display indicator will remain on as long as the camera battery is in the camera.

CP-16R
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OPERATION &
MAINTENANCE
MANUAL

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