

TECHNICAL MANUAL
CP-16R AND CP-16R/A
SOUND CAMERAS

SERVICING AND MAINTENANCE PROCEDURES
REPLACEMENT PARTS LISTS
ILLUSTRATED ASSEMBLY DRAWINGS

CINEMA PRODUCTS CORP.

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Technology in the Service of Creativity

1947-1948

1948-1949

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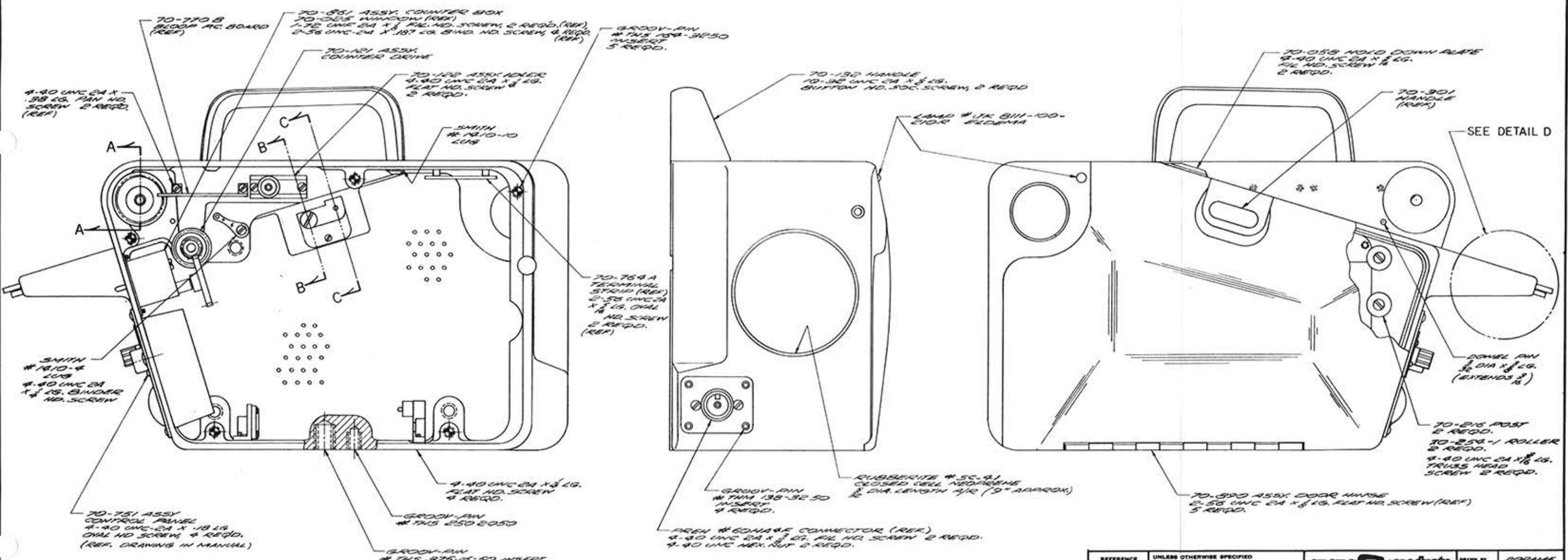
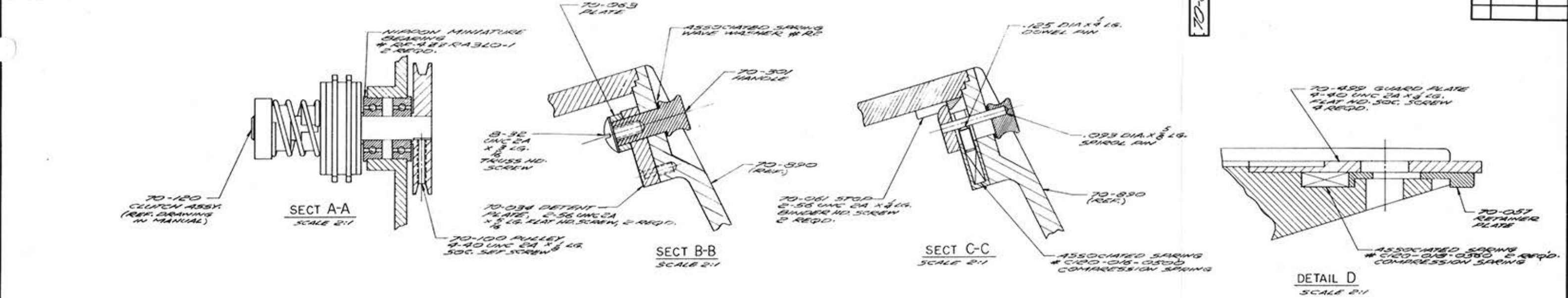
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 September 18, 1975

Editors Note: This manual is for professional technicians only. Camera owners who lack the necessary tools, are requested not to attempt repairs outlined in this book.

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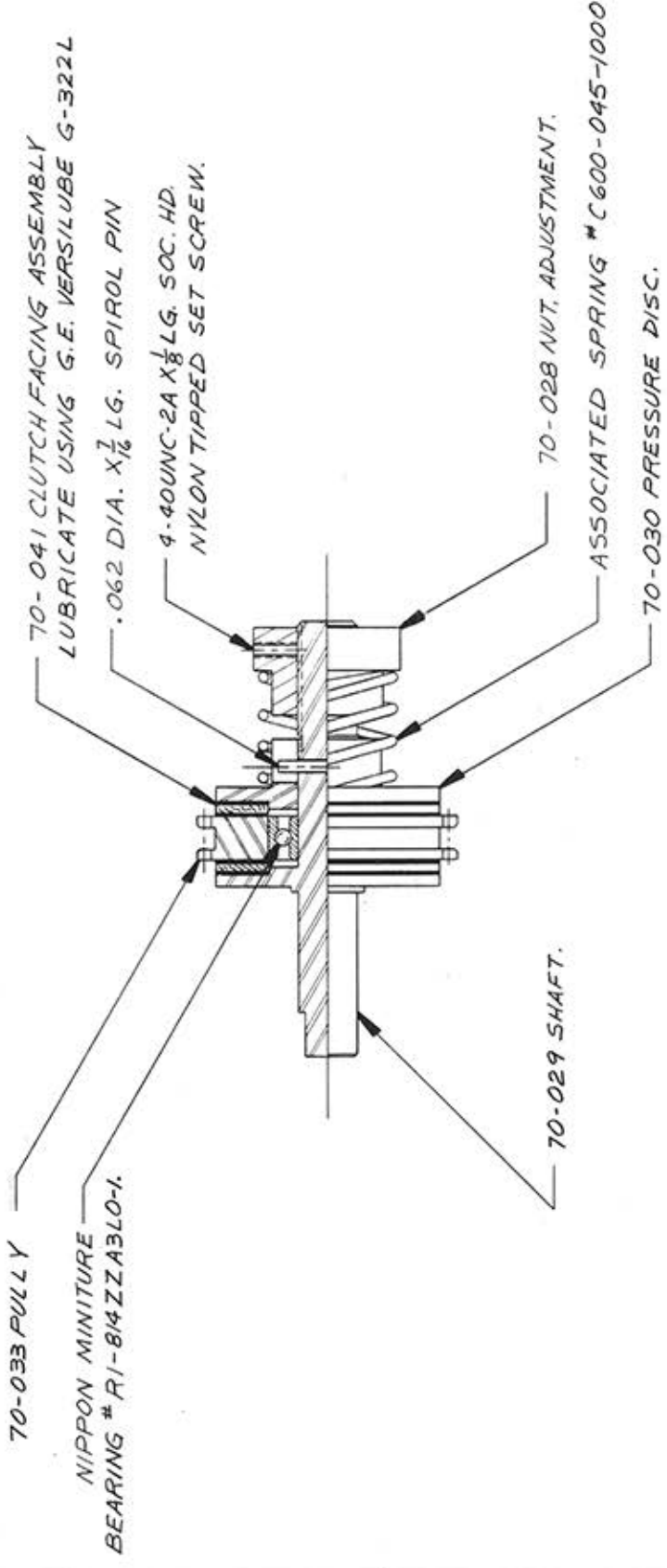
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REPAIR INFORMATION FOR CP-16R
AND CP-16R/A CAMERAS

Introduction

The following information is a basic disassembly manual for the CP-16R camera.

It includes specific trouble shooting information and general recommended maintenance procedures.

As always - Do not hesitate to contact:

Service Manager
Cinema Products Corp.

Part I

Part I is composed of the following Sections:

Section I - This section lists those areas that can be repaired without substantially dismantling the camera. For example, the front handle on/off switch can be repaired or replaced by removing the (4) screws holding the switch housing to the body.

Section II - This section explains the general procedural order of disassembly to dismantle a camera. For example, it is necessary to remove the battery,

the side cover or amplifier and the entire crystal drive system, to service the crystal drive P.C. board.

Section III - This section explains the specific procedural order of disassembly to dismantle a camera completely. Carefully read through the entire section before starting any work.

Section IV and V - These sections explain how to replace a mirror shutter and how to correctly collimate the ground glass and mirror shutter focal distances.

Section VI, VII and VIII - These sections explain mid-rib and viewing optics re-assembly procedures.

Section I

It is not necessary to completely dismantle a camera to repair or replace the following assemblies:

1. The viewfinder; the viewing optics
2. To replace the ground glass (for ground glass alignment procedures see Section V); mirror shutter.
3. To adjust the clutch tension
4. To replace or clean the pressure plate
5. To replace or clean the magazine quick release mechanism
6. The front handle and on/off switch housing

7. The door latch assembly
8. The footage counter
9. The film guide rollers
10. The control panel

In each case (listed above) remove or loosen only the necessary mounting hardware.

Section II

This is a general camera disassembly procedural outline only. It will help you determine roughly how much work is entailed in trouble shooting a particular area of the camera.

To repair the following:

Remove these corresponding assemblies in order of listing:

| | |
|---|--|
| To repair battery | Remove battery |
| To repair side cover/amplifier, top handle or to install mike/light bracket | Remove side cover/amplifier |
| To repair crystal drive system, motor only, or crystal drive board assembly | Remove entire motor drive system |
| To repair large drive gear | Remove large drive gear |
| *To repair viewfinder and viewing system | *Remove viewfinder and/or viewing optics |
| *To repair lens lock ring assembly | *Remove lens lock ring assembly |

To repair mirror shutter/
gearbox assembly, film trans-
port mechanism, body wiring,
and to re-align ground glass

Remove mid-rib (camera movement
plate assembly)

*Note: It is not necessary to remove side cover/amplifier and crystal drive system to remove viewfinder and viewing optics or lens lock ring assembly, but you must remove side cover/amplifier, crystal drive system, all viewing optics and lens lock ring assembly to remove mid-rib assembly.

Section III

This is a specific, step by step camera disassembly procedure outline. Read it thoroughly and follow the instructions carefully when disassembling a camera. Reference Drawings 70-887; 888; 604; 889.

REMOVAL OF MID-RIB FROM CAMERA BODY

REFERENCE the Battery Pack

1. Remove the battery pack.

REFERENCE the Viewfinder: Drawing 70-791.

2. Unscrew nut holding viewfinder and remove viewfinder from body of camera.
3. Remove the two (2) #6-32x $\frac{1}{2}$ socket head cap screws holding viewfinder mounting barrel to body and pull barrel out from its mounting hole in body sufficiently to expose screw holding bracket with light emitting diode wired into it.

4. Remove the screw and lift the bracket and diode up to free it from the opening in the barrel adjacent to the prism cover. Complete removal of barrel.

REFERENCE the Crystal Drive Assembly: Drawing 70-88

5. Remove Auxiliary Side Cover or Crystasound Amplifier by removing the five (5) #8-32 screws. Disconnect cables from connectors at lower section of camera body.
6. Remove choke from crossbrace. Disconnect ground strap from motor assembly.

Remove the three (3) #8-32 screws holding motor assembly and remove motor assembly from the three mounting bosses. (Do not disconnect wires.)

7. Remove "toothed" belt from small pulley on main drive shaft.
8. Remove the two (2) #6-32 screws and spacers holding servo amplifier circuit board to sprocket shaft support bar.
9. Remove the four (4) #6-32 screws holding crossbrace to mid-rib and carefully remove.
10. Remove servo-amplifier circuit board after removing top mounting screw and disconnecting plugs.

REFERENCE Large Gear: Drawing 80-887

11. Rotate shaft clockwise by hand until front edge of small blade is pointing at center of shaft supporting large driven gear. Mark a line on large gear along edge of

small blade as a reference mark for re-assembly in same rotational relationship (use sharp pencil or scriber).

12. Rotate shaft until small blade is clear of large gear.
13. Carefully remove large gear and "blue" cog belt (counter and take-up drive belt).

REFERENCE Lens Lock Ring Assembly: Drawings 70-604; 70-619.

14. Remove camera lens lock not "stop" post.
15. Remove camera lens lock nut.

REFERENCE Mid-Rib Assembly

17. Remove the three large mid-rib mounting screws.
18. Remove the two rollers and roller shafts mounted on camera body just below film opening for magazine.
19. Pull the upper portion of the mid-rib toward the door opening and then turn rear end of mid-rib toward opening. Pull assembly with twisting motion toward control panel end of camera until mirror housing is free of front end of camera body and remove mid-rib from body.

Section IV: Reference Drawing 70-604

REPLACEMENT OF MIRROR SHUTTER

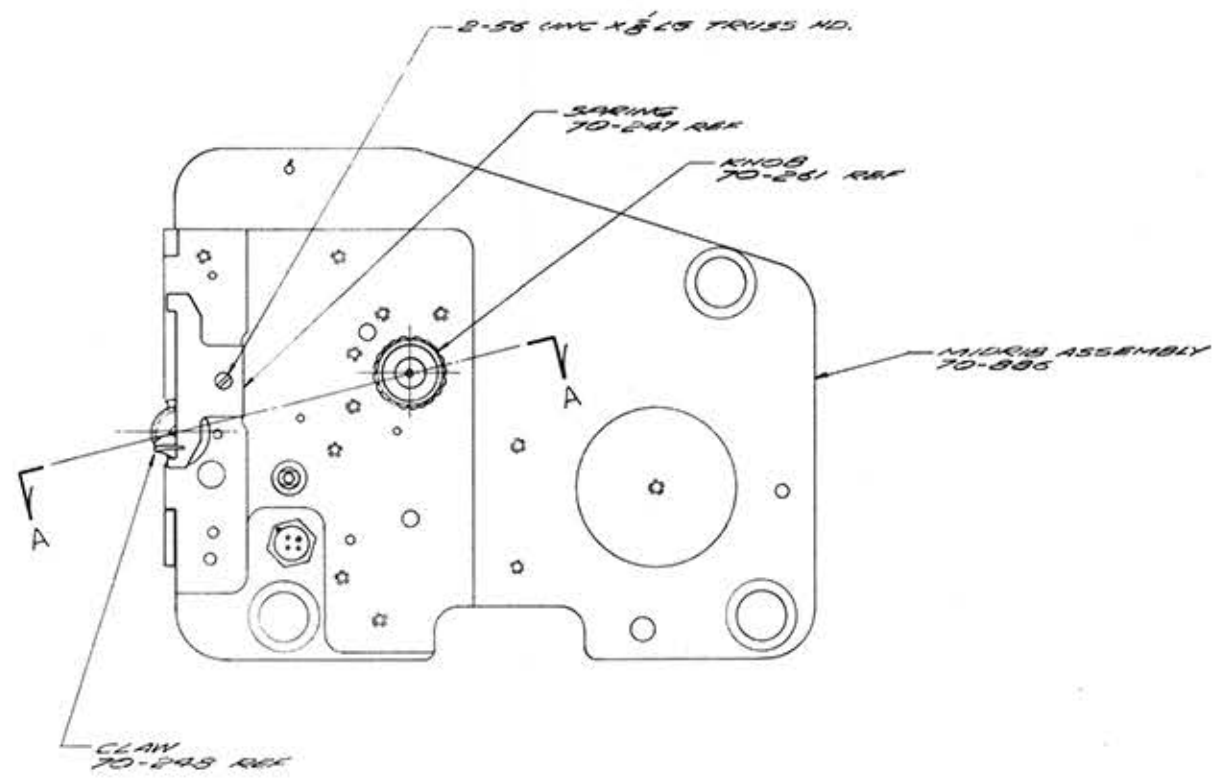
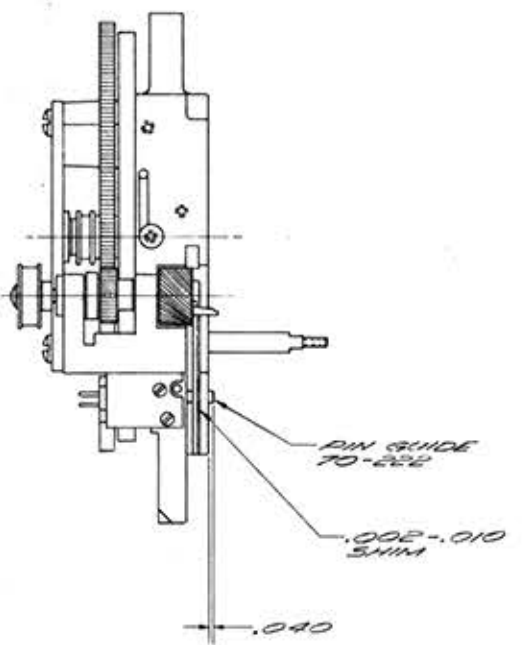
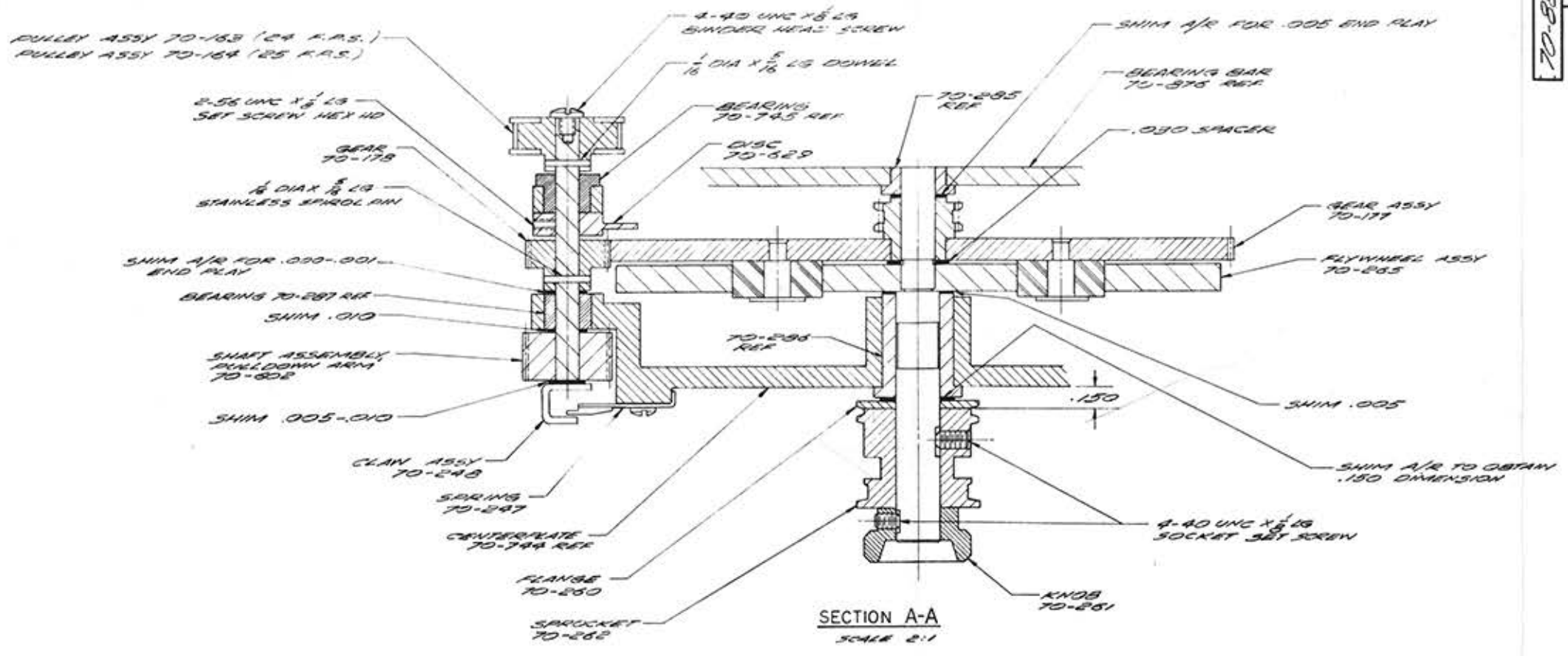
1. Remove the four (4) #0-80 screws holding mirror to hub of mirror shaft and remove mirror from hub.

Note: To collimate installed mirror shutter, disassemble camera as outlined in Section III.

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70-887

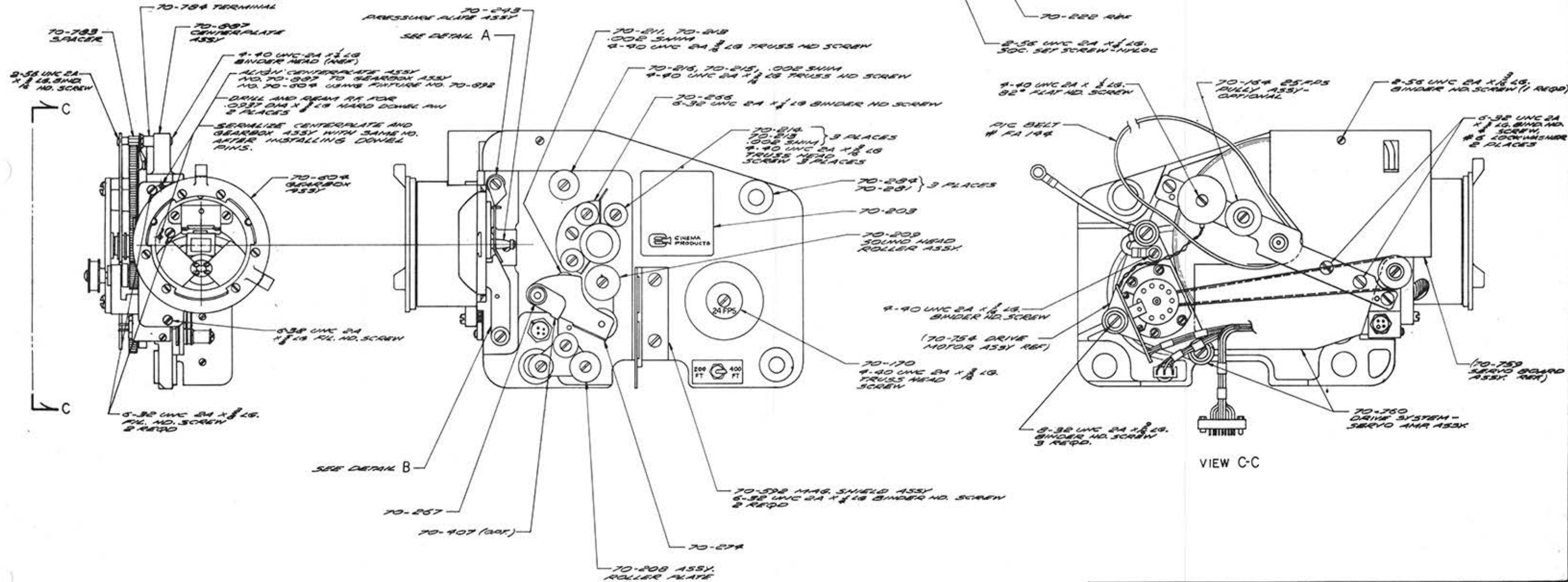
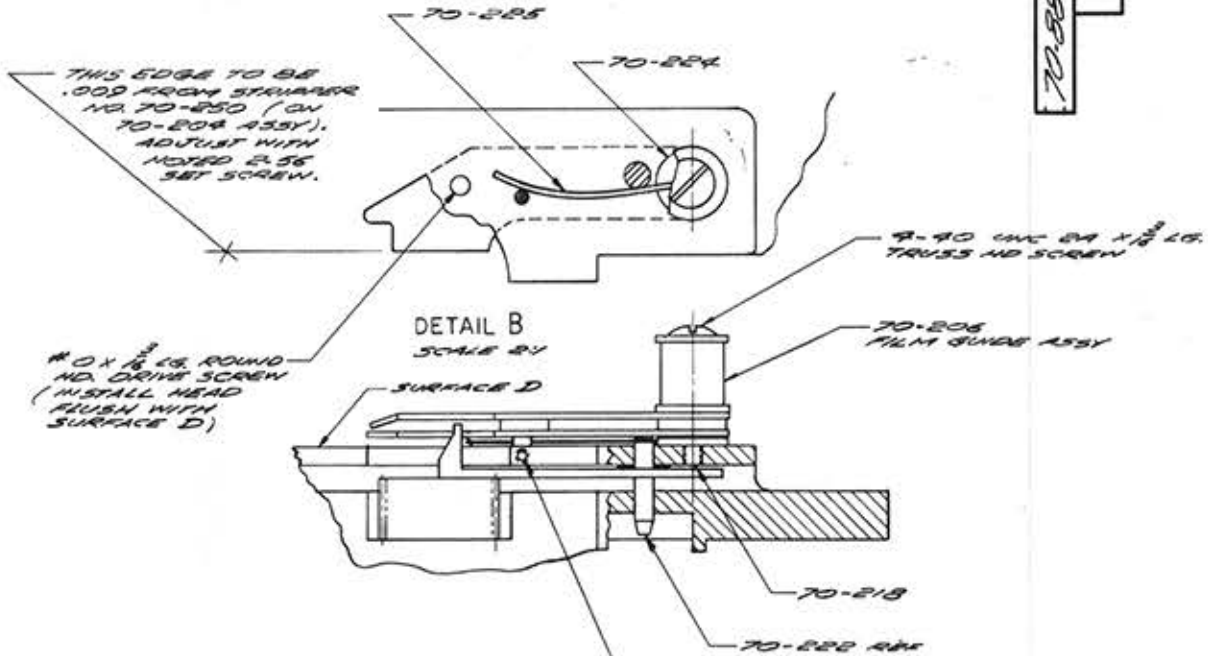
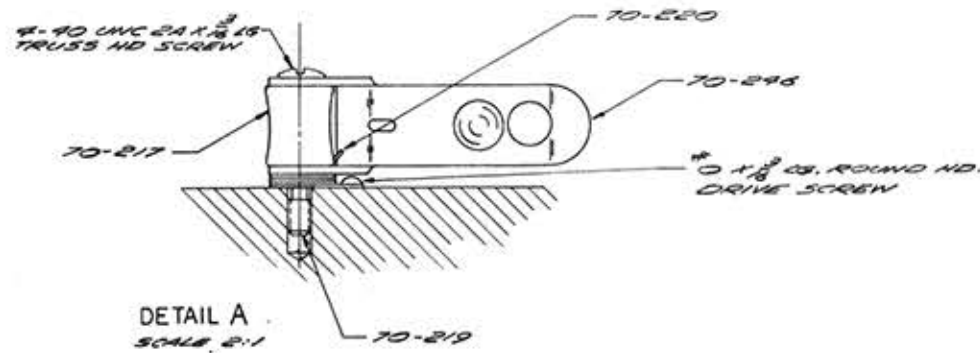


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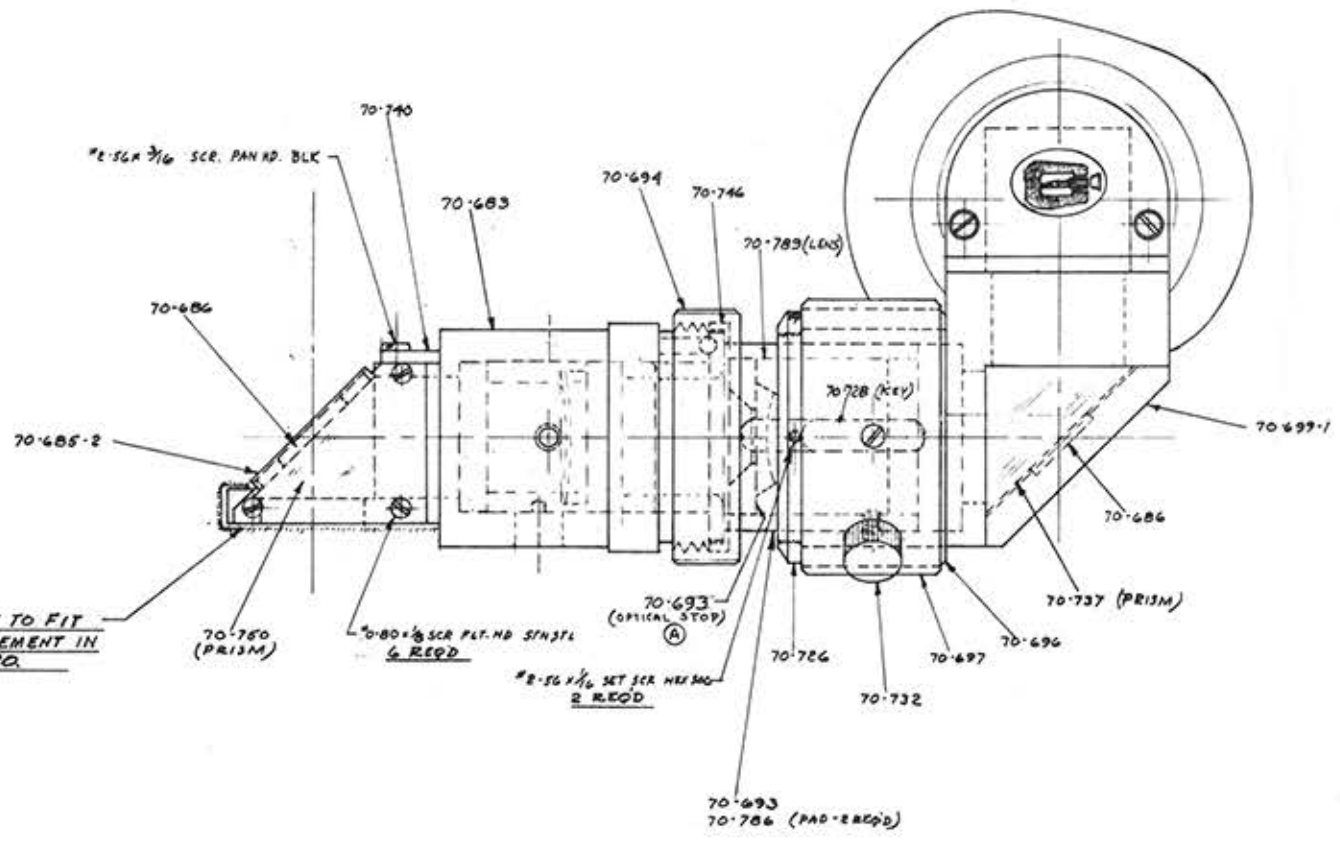
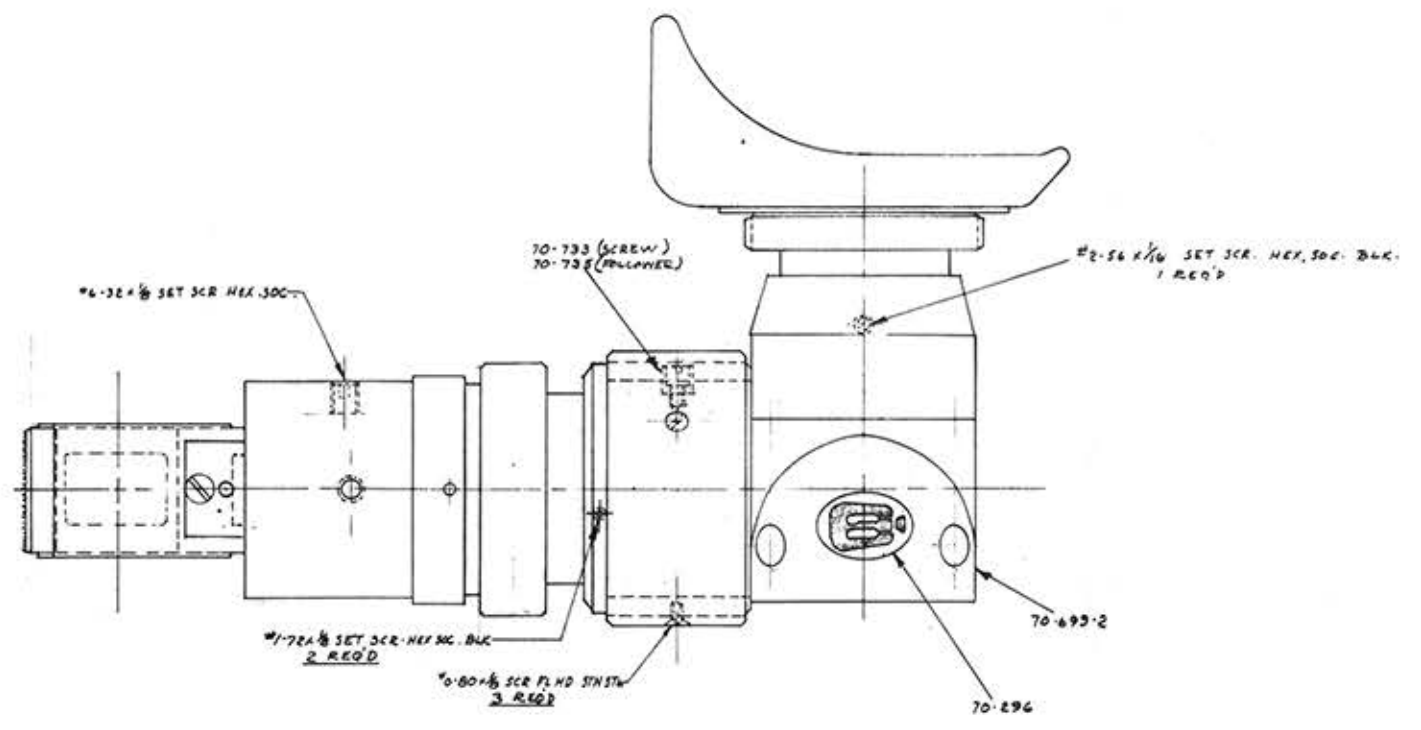
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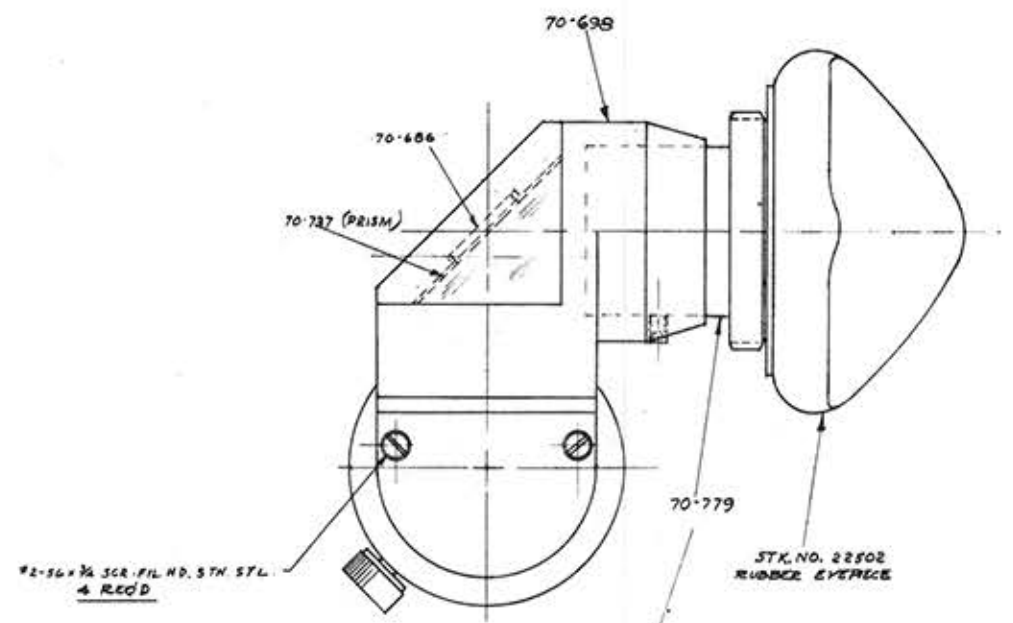
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70-791
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BLK-VELVETEEN CUT TO FIT AT ASSEMBLY - CEMENT IN PLACE WITH VELCRO.



USE 70-727 TUBE AND 70-736 LENS UNTIL 70-779 PARTS ARE AVAILABLE.

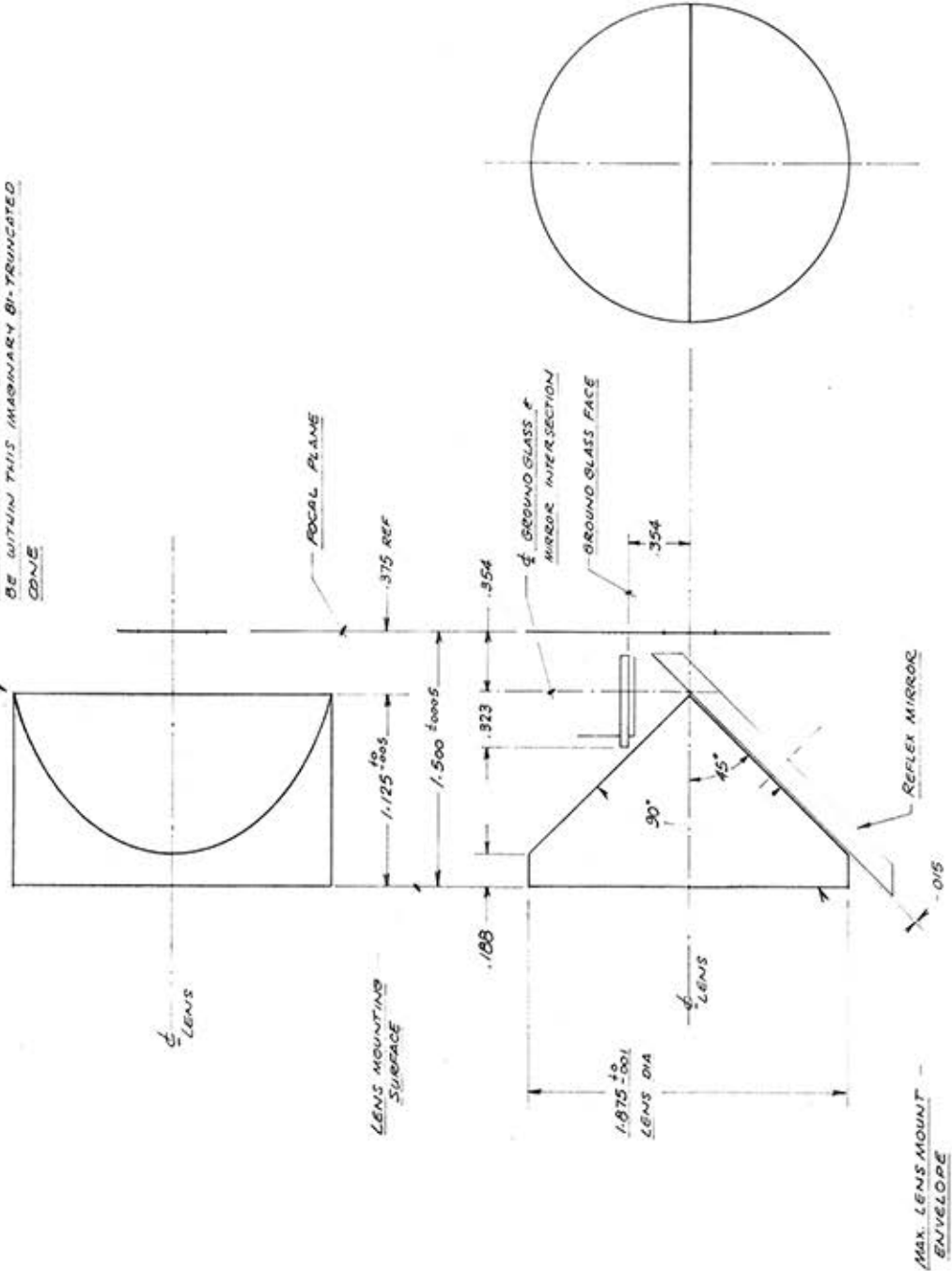
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NOTE
 FOR A LENS TO FIT ON THE CP-1GR,
 ALL OF ITS REAR COMPONENTS MUST
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REAR VIEW

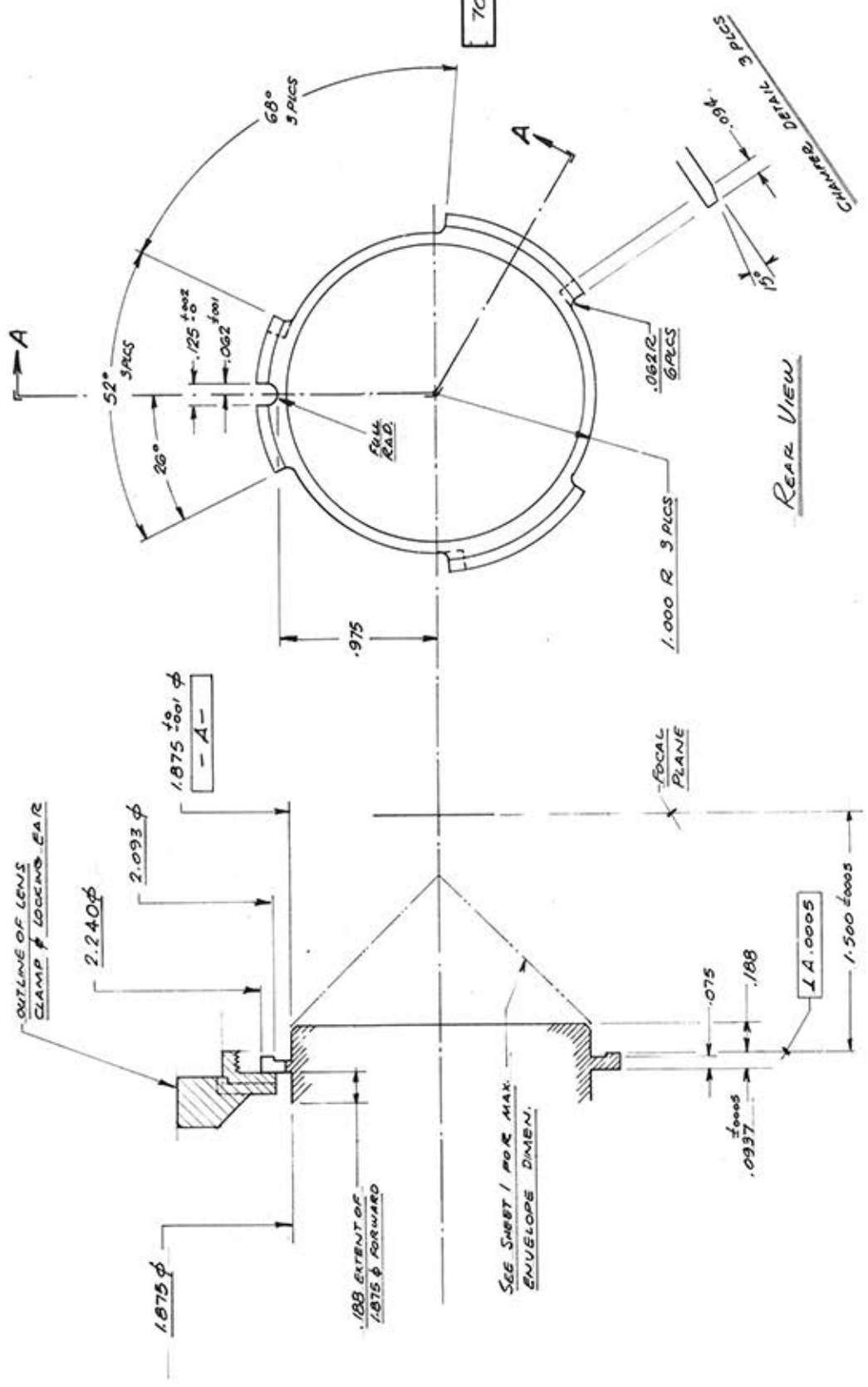
SIDE VIEW

SEE SHEET 2 FOR LENS MOUNT DETAIL

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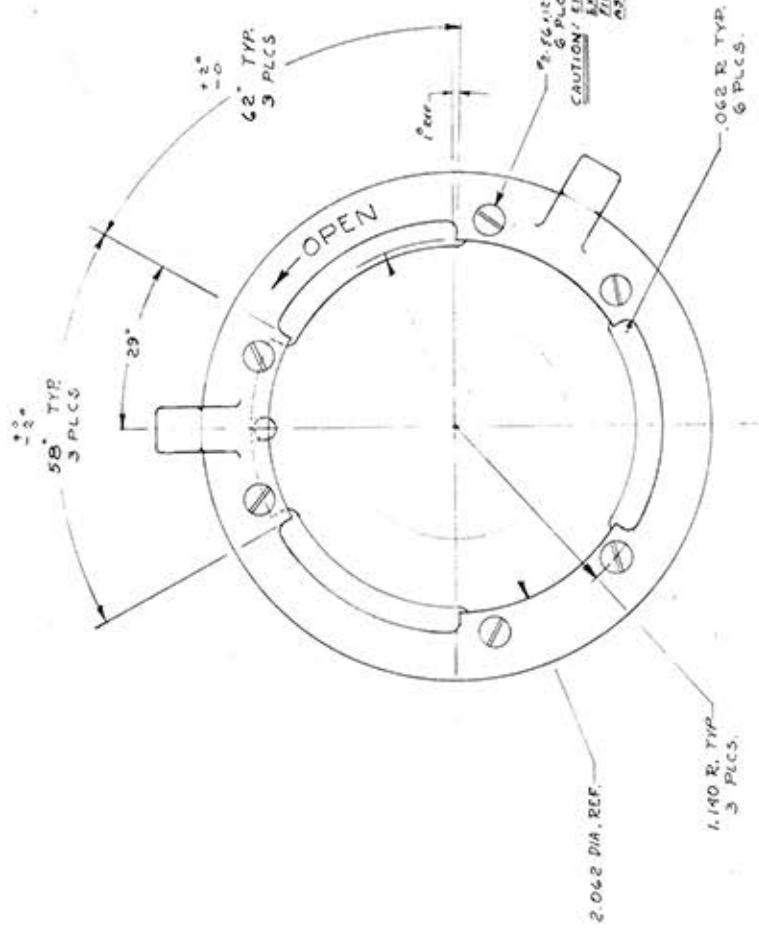
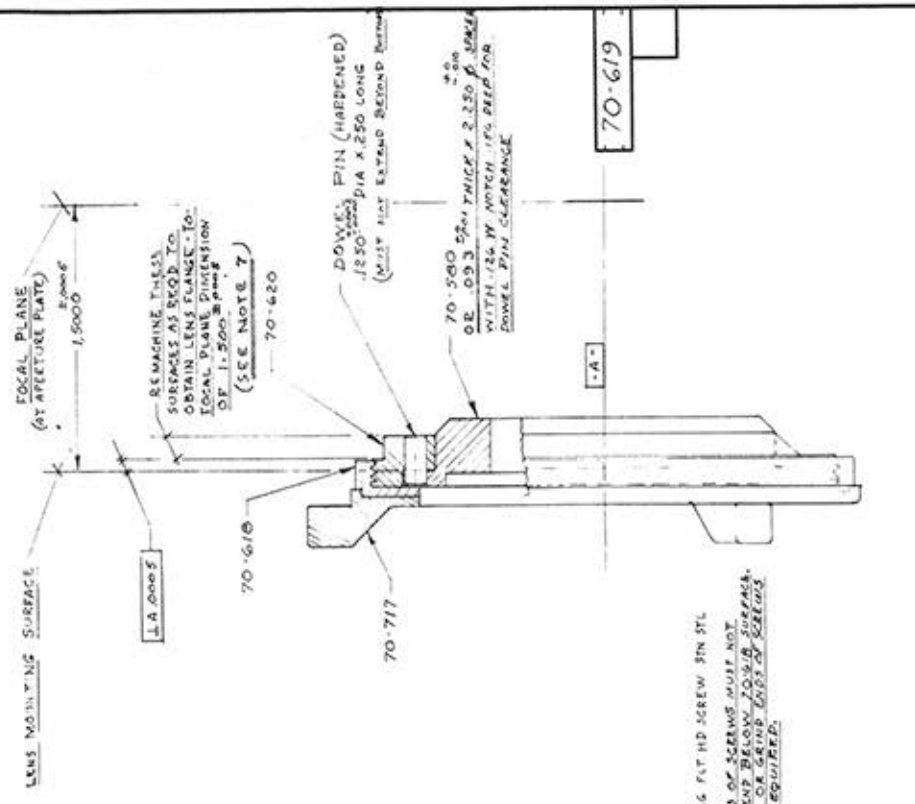
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| B | REVISION | 5/4/54 |
| C | REVISION | 5/4/54 |



- ASSEMBLE TO 70-403 GEARBOX WITH COMPLETED APERTURE PLATE ATTACHED.
 - MEASURE FLANGE DEPTH AND RE-MACHINE SURFACES INDICATED ON LENS MOUNT RING 70-620 TO GIVE FLANGE DEPTH DIMENSION OF 1.5000.
 - ASSEMBLE PARTS AS SHOWN USING CARE TO TIGHTEN LOCK RING 70-618 TO SECURELY SEAT LENS FLANGE 70-580 IN LENS RING 70-620.
 - PLATE HANDLE 70-717 ON LOCK RING 70-618 AS SHOWN. MATCH DRILL AND TAP LOCK RING FOR 2-56 FLT. HD. SCREWS. ATTACH HANDLE TO LOCK RING. REMOVE FROM 70-620 & FINISH MACHINING 70-618. STOCK ASSEMBLY (LESS 70-580) AS A SET. DO NOT REMOVE DOVEL PIN. (NUMBER EACH PART OF SET WITH LAYOUT BLUE, DELIVER ON JIGGED SIDE)
 - FINISH NUMBER SETS CONSECUTIVELY
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 - MACHINED FILLETS .003-.005 R.
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| cinema products CORPORATION Los Angeles, Calif. 90008 | | | TITLE LENS RING & LOCK RING A.S.B.Y. C.P. 16 54742 | | |
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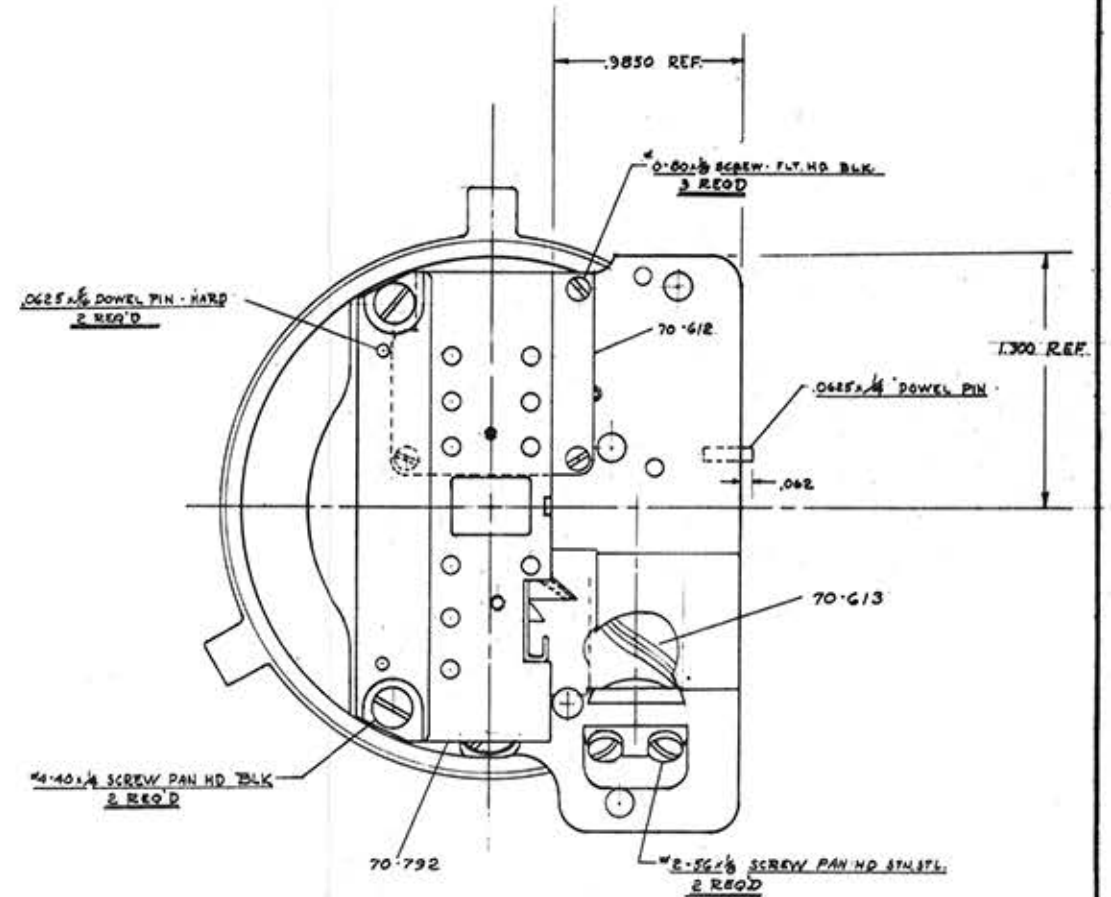
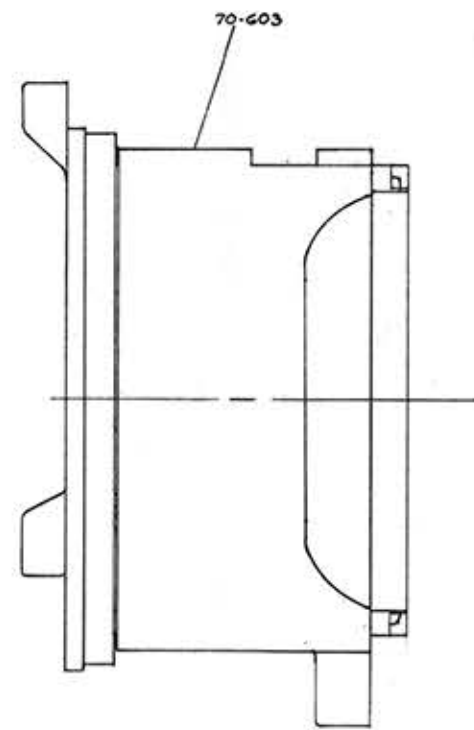
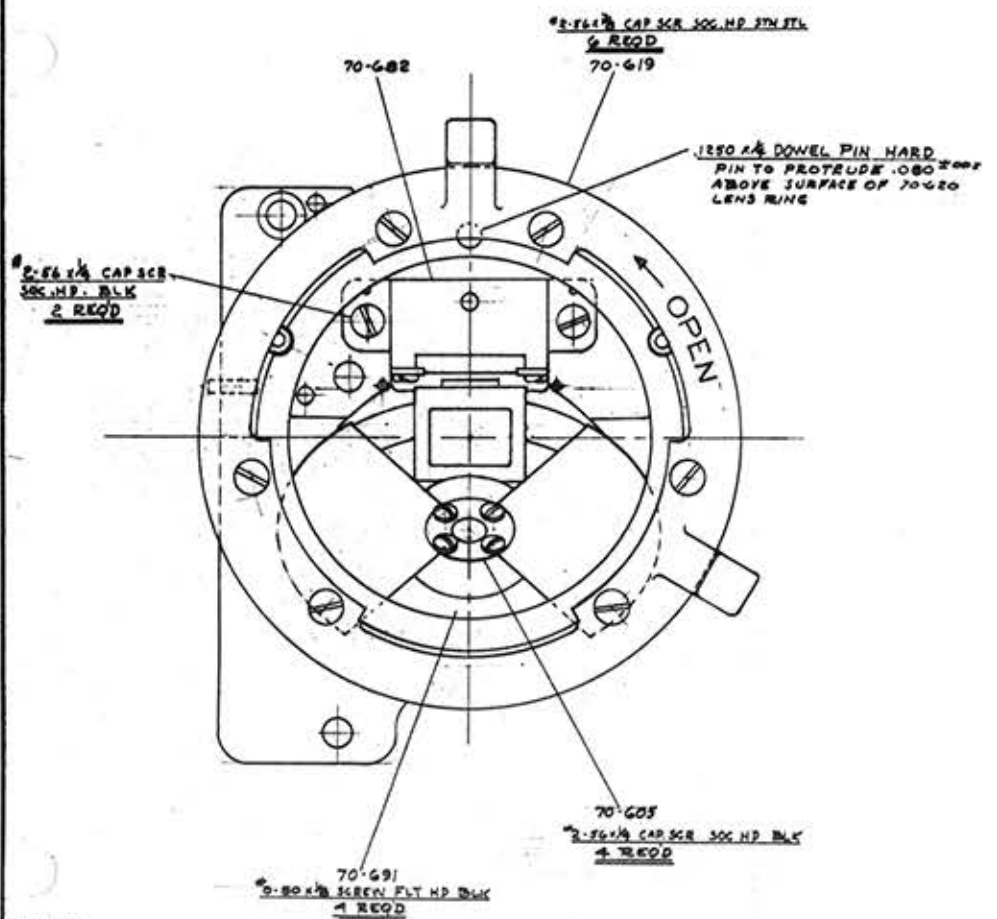
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70-604

ASSEMBLY INSTRUCTIONS

1. INSTALL 70-612 REAR COVER ON 70-603 GEARBOX.
2. INSTALL 70-620 LENS RING (OF 70-619) TEMPORARILY ON GEARBOX.
3. PLACE APERTURE PLATE LOCATING FIXTURE ON LENS RING WITH RECTANGULAR TIP EXTENDING TOWARD REAR.
4. PLACE 70-792 APERTURE PLATE ON REAR OF GEARBOX WITH RECTANGULAR TIP OF FIXTURE EXTENDING THRU APERTURE OPENING AND INSTALL THE MOUNTING SCREWS LIGHTLY. INDICATE FILM GUIDING EDGE OF APERTURE PLATE AND ADJUST UNTIL IT IS PARALLEL WITH LONG MACHINED EDGE OF GEAR BOX WITHIN .0005 TIR.
5. TIGHTEN MOUNTING SCREWS AND RECHECK FOR PARALLELISM.
6. DRILL THRU DOWEL PIN PILOT HOLES INTO GEAR BOX USING #30 DRILL (#395)
7. FINISH REAM TO .0620 ϕ AND PRESS IN THE TWO .0625 \times $\frac{1}{4}$ DOWEL PINS
8. REMOVE 70-620 LENS RING
9. INSTALL IN FOLLOWING ORDER:
 - a. 70-613 IDLER GEAR ASSEMBLY
 - b. 70-605 MIRROR SHAFT ASSY - LESS MIRROR
 - c. 70-691 COVER
 - d. 70-682 GROUND GLASS MOUNT
 - e. 70-620 LENS RING
10. USING SPECIAL "FEDERAL" DEPTH GAUGE (1.500 RANGE) CHECK DEPTH FROM LENS FLANGE MOUNTING SURFACE OF LENS RING TO FILM PLANE OF APERTURE PLATE. REQUIRED DEPTH IS 1.5000 \pm .0005 (INITIAL MEASUREMENT SHOULD BE 1.5000 TO 1.5020)
11. PLACE ASSEMBLY ON SPECIAL SUPPORTING FIXTURE (WITH APERTURE PLATE FACING UP, USING SURFACE GRINDER, GRIND BALLS IN APERTURE PLATE UNTIL 1.5000 \pm .0005 FLANGE DEPTH IS OBTAINED
12. PRESS IN .1250 \times $\frac{1}{4}$ AND .0625 \times $\frac{1}{4}$ DOWEL PINS AS SHOWN.



5. FINISH:
 4. HEAT TREAT:
 3. MATERIAL:
 2. CONCENTRICITY .004 T.I.R.
 1. BREAK SHARP EDGES .005-.010.
 MACHINED FILLETS .003-.005 R.
 NOTES: UNLESS OTHERWISE SPECIFIED.

| REFERENCE DOCUMENTS | UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: 3 PL. DECIMALS \pm .01 2 PL. DECIMALS \pm .005 | FRACTIONAL \pm 1/64 ANGLES \pm 30' MACH. FINISH #3 | cinema E products CORPORATION Los Angeles, Calif. 90008 | DRAWN BY G.H. 1008 |
|---------------------|--|--|--|----------------------------|
| | | | | CHECKED BY |
| | | | TITLE GEARBOX ASSY | APPROVED BY |
| 1 | | DATE 26 FEB 74 | | D SIZE SHEET 1 OF 1 SHEETS |
| REQD | NEXT ASSY. | SCALE 2 X | | 70-604 |

2. Inspect hub and mounting surface of new mirror to make sure they are both clean.
3. Grasp new mirror at outside edges and place on hub with the four screw holes in line with the tapped holes in the hub.
4. Replace the four screws and gradually tighten screws alternately until all four are tight.

Section V

COLLIMATE GROUND GLASS AND MIRROR TO APERTURE POSITION

1. Rotate mirror in gearbox until blades are in horizontal position.
2. Carefully reinstall lens mount ring temporarily.
3. Remove ground glass from its mount in gear box and insert the mirror (CP Code Number 1Y1306 - same size as ground glass) with reflective surface facing downward.
4. Using suitable lens with collimator, check collimation of ground glass (via substituted mirror) with regard to aperture position (using the larger mirror - CP Code Number 1Y1307 - in film position at aperture opening).
5. If ground glass mount requires repositioning, insert positioning tool (CP Code Number 1Y1308) through opening in top of gear box with threaded hole in small block facing toward hole in center part of ground glass mount.

6. Thread the (#2-56x7/16 long) screw through hole in ground glass mount into threaded hole in small adjusting block (which is at end of shaft opposite knob).
7. Fasten top plate to top of gear box using (#2-56x5/16) screw.
8. Loosen slightly the two screws holding ground glass mount to gear box.
9. Using knob at end of adjusting tool adjust vertical position of ground glass mount until ground glass (via substituted mirror) is collimated with respect to mirror at film position at aperture.
10. Tighten ground glass mount screws.
11. Remove adjusting tool.
12. Reinstall ground glass.
13. Remove lens mount ring from gear box.

Section VI

REASSEMBLY OF MID-RIB

1. Reassemble mid-rib into camera body in reverse order from Section III.
2. Reassemble components to mid-rib.

Caution: Make sure small blade on drive shaft at front of mid-rib assembly is realigned with respect to mark made on large gear in step 11 of Sec-

tion III. This blade chops light for phototransistor control of position of rotating mirror to ensure reflex viewing when motor power is off.

Section VII

REASSEMBLY OF VIEWFINDER

1. Reassemble viewing optics and viewfinder in reverse order of removal from Section IV except do not attach the eyepiece portion of the viewfinder until completing Section VIII.

Section VIII: Reference Drawings 70-604; 70-791.

ALIGNMENT OF GROUND GLASS TO APERTURE

1. Remove film pressure plate.
2. Using a strip of cardboard, or other stiff material, prop pressure plate mounting arm up away from proximity to aperture opening.
3. Position a piece of white or light colored cardboard upright inside camera in line of sight of aperture and away from aperture opening sufficiently as to permit cardboard to be well lighted.
4. With camera setting so that the mirror and aperture opening may be viewed from the normal lens mount position, turn on

camera power and observe mirror and aperture with a 4 to 6 power viewing loupe or other suitable magnifier, maintaining line of sight as near as possible on the optical axis. The image of the lines of the ground glass will appear superimposed on the aperture opening.

5. If the image of the ground glass appears centered vertically with the aperture no adjustment is required.
6. If the image appears low, loosen slightly the #1-72 set screw (using the small set screw wrench provided) which is located about $\frac{1}{4}$ inch above the aperture opening on the film side of the aperture plate and in line with the rear edge of the ground glass. (To loosen turn wrench counter-clockwise.) Press ground glass in toward front end of set screw to remove clearance caused by turning screw with wrench.
7. Turn on camera power and recheck for proper alignment of ground glass image with aperture. Repeat step 6 if necessary.
8. If ground glass image is high with respect to aperture, turn set screw clockwise to cause image to lower and become aligned with aperture.
9. After completing ground glass alignment remove cardboard; replace film pressure plate and complete assembly of viewfinder to camera.

Introduction to Part II

The following information is a comprehensive circuit description of the CP-16R Crystal Drive System.

Part II

Part II is composed of the following sections:

Section I - This section describes the power supply system for the camera.

Section II - This section details the Crystal Drive Circuit. Refer to schematic 70-765 B to graphically follow our electronic logic.

Section III - This section details the circuitry for the Low Film Indicator, which is an optional feature.

Section IV - This section details the circuitry for the "Auto-Slating System", which is an optional feature.

Section V - This section describes the circuitry for the Exposure Control system which is an optional feature.

Section VI - This section describes the circuitry for the J-5 Zoom Control system which is an optional feature.

CIRCUIT DESCRIPTION OF THE CP-16 REFLEX CAMERA

Section I

POWER SUPPLY

REFERENCE the Battery

The NC-4 Battery is a 16 cell, rechargeable Nicad battery with a capacity of 550 ma/hr. The voltage range is from 17 to 23 volts. The charge rate is approximately 55ma. This battery uses a piece of copper wire 28 AWG x 1.5 inch (.330mm x 38.1mm) as internal overload protection.

REFERENCE Battery Power Distribution

The negative side of the battery is connected to the main chassis ground through a fuse. This fuse is a 30 AWG x .75 inches (.254mm x 19mm) or longer copper wire. The positive side of the battery is wired directly to pin 4 of the 5 pin PREH connector. Chassis ground is also brought to this connector at pin 3. On the control panel side, the "+20" power is distributed to the drive system connector (14 pin Winchester), the handgrip power switch connector (4 pin PREH), and the pilot/clap connector (4 pin PREH). Battery power is also brought to the control panel power switch. Power from this switch is known as "switched +20" and is distributed to the same connectors as "+20".

REFERENCE "Battery Test" and "Battery Low Lamp" circuit

The D13V1 (3 lead I.C.) allows the meter to have an expanded scale, giving a range of 14 to 23 volts, instead of from 0 to 23 volts. This gives better resolution of the Battery charge level.

The meter circuit is normally connected to the "switched +20" line, but can be momentarily connected to the "+20" line by pressing the "Battery Test" switch, to check the battery charge level while the camera is not running.

Q26 (2N5086) in conjunction with the 5.6K ohm resistor which is in series with the meter circuit, senses meter current. Meter current is directly proportional to the battery charge level. The "Battery Low" circuit is designed to turn on the L.E.D. at approximately 17 volts (a "Yellow-Green" indication). As long as the voltage is above 17 volts, the current through the 5.6K ohm resistor will keep Q26 (2N5086) biased on. This in turn keeps Q27 (2N4403, the L.E.D. drive) off. As the battery level drops below 17 volts, Q26 shuts off and Q27 along with the "Battery Low" L.E.D. turn on.

REFERENCE Charging the Battery

The model NC-4 Battery Pack is charge by using model NCC-5 Battery Charger which is supplied with each

camera. Also available are model NCC-4 AC/DC Power Supply and Battery Charger which requires an additional Battery Charger Cable, and model MBC-6 Multi Charger (capable of charging six batteries simultaneously) which requires one Battery Charger Cable for each battery on charge. Required for each mode of charge is an AC Power Source, either 110 or 220 V.

REFERENCE AC Operation

Insert the Dummy Battery in the battery compartment. Connect the NCC-4 Power Supply. The camera will operate from a 110 V or 220 V AC main

Connect the aforementioned Battery Charger Cable to the Dummy Battery to charge an NC-4 Battery Pack while the camera is operational from an AC main.

Section II

Reference Drawings 70-765;

THE DRIVE SYSTEM

REFERENCE Drive System Power

The Drive System utilizes three sources of power; "+20", "Switched +20" and an internally generated "+10" volts. "+10" is fed from the drive board through pin "E" (14 pin Winchester) as "Pilot/Slate" P.C. board power.

"+10" is generated by one of two ways; (1) by a MFC-6030A which must be trimmed to 10 volts, any time it is replaced. This is done by placing resistors in

parallel with the 2.2K ohm resistor which is near the MFC6030, or (2) by a F78L12AC which does not need calibration. Both I.C.'s have current limiting protection. The MFC-6030A limits at approximately 70 ma., and the F78L12AC at 120 ma. Power for the "+10" passes through the L.E.D.'s D7 and D8 before being distributed to the drive P.C. board. These L.E.D.'s are infra-red light sources for the "Optical Tachometer" and "Shutter Position" sensing circuits.

REFERENCE Drive Motor

This permanent magnet DC motor has a direct current armature winding resistance of 8 ohms. The motor operates at 3600 revolutions per minute (at 24 F.P.S.) with a torque output of more than 1.2 inch-ounces per 500 ma. With no load, the motor has an idle current of approximately 10 ma. Across the motor is D9 (1N4001) which acts as inductive kickback suppression to protect the "Drive Amplifier".

REFERENCE Drive Amplifier

Q14 (2N4400) and Q15 (D45C6) form a complimentary Darlington Power Amplifier. The circuit acts basically as an electronic switch between the motor and ground, turning on and off according to the signals at the base of Q14.

REFERENCE Motor Drive Modulator

The electronic switch is designed to turn on and off 38 thousand times per second. How long it stays on determines the amount of power to be delivered by the motor. This pulse-width modulation is accomplished by mixing a 38KHz, 2 volt P-P "sawtooth" waveform and "Controlled DC Level" inside a differential amplifier. A 5MV difference between the input lines will drive the output either to saturation or cutoff depending upon the polarity of the input. The sawtooth (pin 5 of Q13) is centered around a 5 volt DC level.

The "Controlled DC Level" (pin 6 of Q13) comes from the reference amplifier (pin 1 of Q13). It is a slowly changing voltage that determines how long the drive amp pulses are to be on. Example: assume that the "Controlled DC Level" is 4.5 volts. This means that one input of the differential amplifier is fixed at 4.5 volts. The other input will swing from 4 volts to 6 volts at the 38KHz sawtooth rate. Since the amplifier needs only a maximum of 5MV difference between the two signals, the output will be at cutoff during the time the sawtooth is swinging higher than 4.5 volts and in saturation while the sawtooth is below 4.5 volts. Notice that because of the shape of the sawtooth, the differential amplifier output will be

on 25% of the time and off 75%. The motor would be receiving one fourth of its total average power.

REFERENCE Frequency Generation Circuitry

The primary frequency generator is a temperature compensated crystal oscillator, operating at 4.91520MHz. It is divided by two to make 2.4576MHz before leaving the oscillator board, to further divided by Q12 (CD4020). The resulting frequencies are; 38.4KHz (pin 4) for the sawtooth generator (consisting of a 47K ohm resistor and a 500 picofarad cap), 600Hz (pin 1) as the reference for 24 F.P.S. operation and 300Hz (pin 2) which is sent to the pilot/clap board via pin "D" (14 pin Winchester). There is a secondary oscillator (Q17 pins 1 through 6) that generates 60Hz during camera shutdown. A stepped variable oscillator (Q16 pins 8 through 13) generates the reference frequencies for all the non-sync camera speeds. Frequencies are; 300Hz (12 F.P.S.), 400Hz (16 F.P.S.), 500Hz (20 F.P.S.), 700Hz (28 F.P.S.), 800Hz (32 F.P.S.), 900Hz (36 F.P.S.). The remaining signal sources are generated by the interruption of light beams to photo transistors. The first is the optical tachometer that generates 10 pulses for each revolution of the drive motor. The other is the shutter position sensor. It generates one pulse every time the shutter closes. This signal is fed to the

shut-down circuitry, low film indicator and to the light meter via pin "R" (14 pin Grayhill).

The basic active components in the primary and secondary oscillators are two COS/MOS type NAND gates looped to create positive feedback. Timing is achieved by the alternate charging and discharging of an RC network.

The crystal oscillator works in a similar manner, but it is not recommended to initiate repairs to the oscillator in the event of failure as this may effect the accuracy as a reference for 24 F.P.S.

The camera speed selection logic uses the control panel "Speed Select" switch, all of Q16 and pins 4-6 of Q20.

With the "Speed Select" switch in the 24 F.P.S. "Sync" position, the switch wiper arm is held electrically to +10v. This voltage level is fed to Q16 pins 12 and 13 via pin "L" (14 pin Winchester). With Q16 pins 12 and 13 TRUE, the output pin 11 will be FALSE. This FALSE output is felt at Q16 pins 8 and 9 and back-biases D13. With Q16 pins 8 and 9 FALSE, the TRUE at pin 10 is passed on to Q16 pin 1 enabling the gate at Q16 pins 2 and 3. Any signal on pin 2 can now pass through. With D13 back-biased, any residual charge on the .05 microfarad cap (pins 5 and 6 of Q20) will be drained off by the 220K

ohm resistor to ground. When the charge level decreases below 5 volts, the gate at Q20 pins 5 and 6 will see this as FALSE and switch the output (pin 4) TRUE. This in turn enables the gate at Q16 pins 5 and 6. The primary frequency of 600Hz at Q16 pin 6 will be inverted and passed out pin 4 on to the gate at Q16 pins 2 and 3. This gate already enabled, allows the 600Hz to be re-inverted and brought out pin 3 to be presented to Q17 pin 9 of the "Shut-Down" circuitry.

Changing the "Speed Select" switch to one of the "wild" speeds, converts the two gates at Q16 pins 8 through 13 into a multivibrator oscillator. The "Speed Select" switch along with the 9.53K ohm resistor and 1K ohm potentiometer form the resistive portion of an RC network that determines the oscillators operating frequency. The .039 microfarad cap, along with its two trim capacitors, form the capacitive portion of the RC timing network. The multivibrator begins oscillation. This produces a signal at Q16 pin 1 and at D13. The first positive swing at Q16 pin 11, will quickly charge the capacitive network at Q20 pins 5 and 6 to a TRUE state making the output pin 4 FALSE. This gate will remain set as long as the multivibrator Q16 pins 8 through 13 oscillates. The FALSE output of Q20 pin 4

disables the gate at Q16 pins 5 and 6 preventing the 600Hz primary frequency from passing. With a FALSE at Q16 pin 5, the output, pin 4, must go TRUE enabling the gate at Q16 pins 1 and 3. Now the multivibrator output (Q16 pin 10) is inverted and passed out Q16 pin 3 to be presented to Q17 pin 9 of the "Shut Down" circuitry.

The "Shut Down" 60Hz multivibrator and its associative logic (all of Q17) allow the camera to seek at a relatively slow speed for a closed shutter. Pin 8 and pin 1 of Q17 sense when the "switched +20" line is FALSE. Q17 pin 8 will disable the gate at Q17 pins 8 and 9, preventing the signal at pin 9 from passing. This also makes the output (pin 10) TRUE, enabling the gate at Q17 pins 12 and 13. Q17 pin 1 goes TRUE because of gate Q7 pin 8 and 9. With Q17 pin 1 TRUE, the 60Hz multivibrator formed by Q17 pins 1 through 6 will oscillate. This signal is inverted and passed through the gate at Q17 pins 12 and 13. When the "switched +20" is TRUE, the 60Hz multivibrator is disabled, and the two gates Q17 pins 8 and 9 and Q17 pins 12 and 13 are enabled. This allows the signal at Q17 pin 9 to pass to the output Q17 pin 11.

REFERENCE Optical Tachometer Circuitry

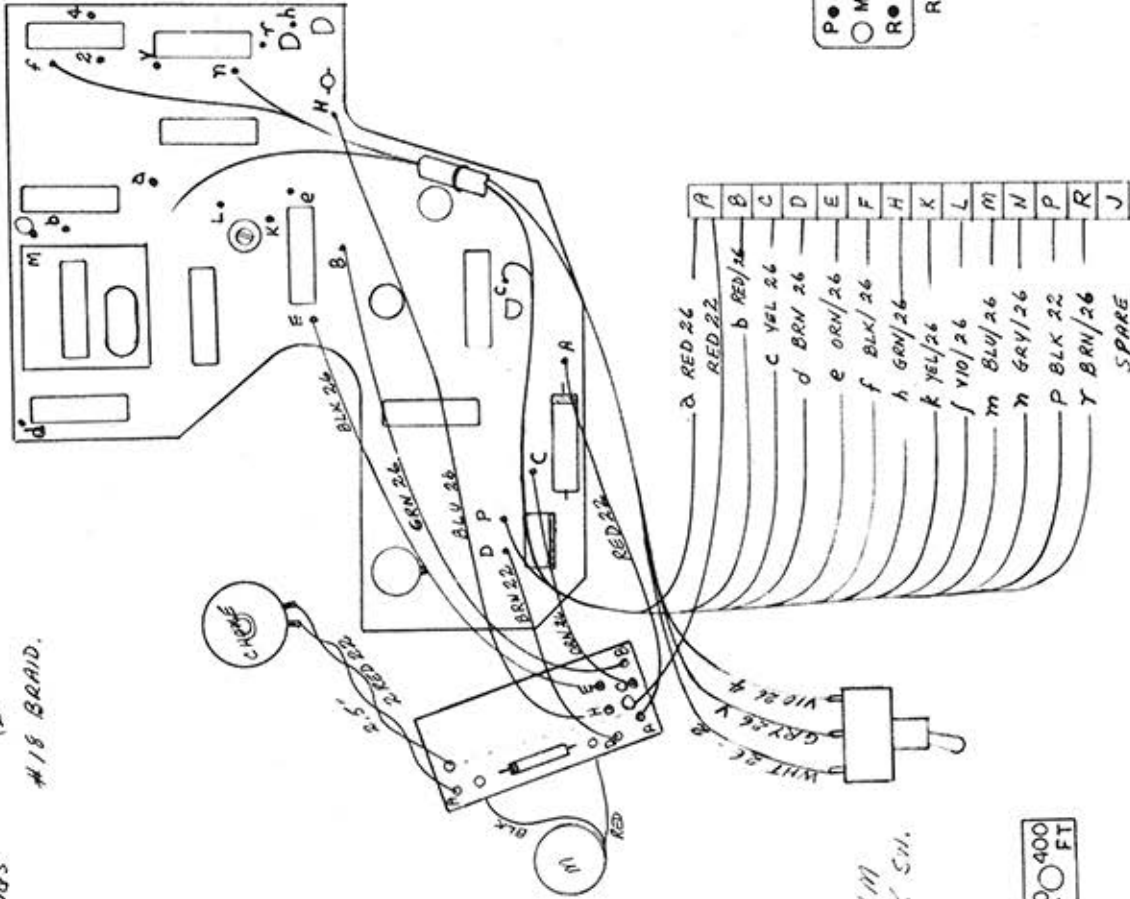
The interrupted light beam produced by the motor tach-disc is sensed by the photo-transistor Q19



R4122S LUG

② R4104S LUGS

#18 BRAID.

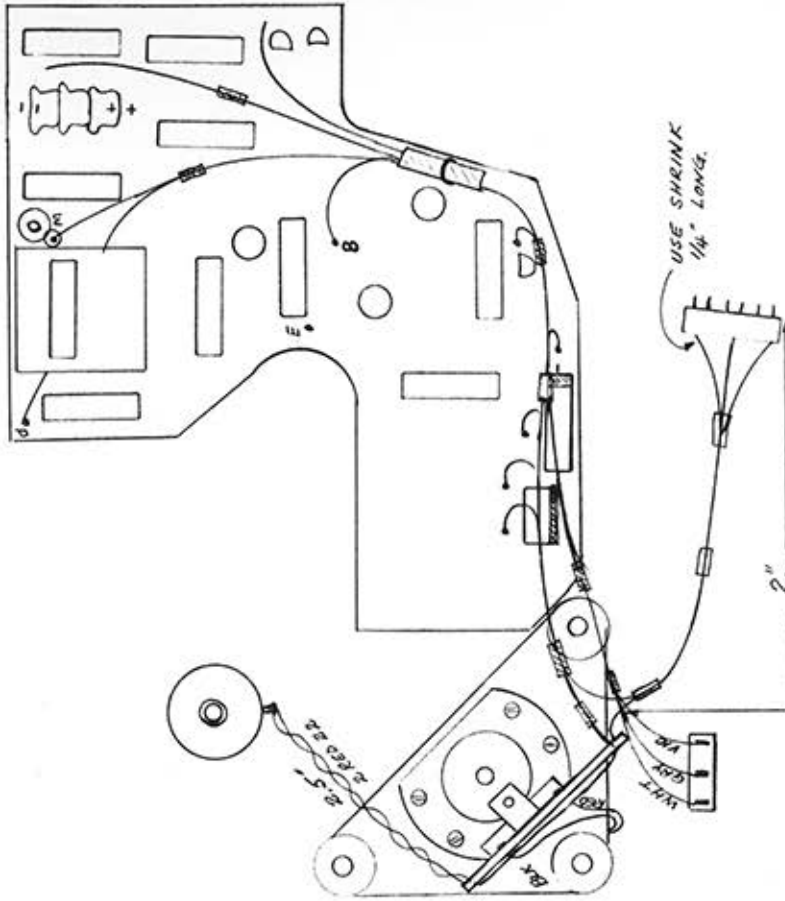


- REAR VIEW
- P ● L ● H ● D ● A ●
 - M ● J ● E ● B ● ○
 - R ● N ● K ● F ● C ●

- | | |
|---|----------|
| A | RED 26 |
| B | RED 22 |
| C | b RED/26 |
| D | C YEL 26 |
| E | d BRN 26 |
| F | e ORN/26 |
| G | f BLK/26 |
| H | h GRN/26 |
| I | k YEL/26 |
| J | f YIO/26 |
| K | m BLU/26 |
| L | n GRV/26 |
| M | P BLK 22 |
| N | Y BRN/26 |
| O | SPARE |
| P | |
| Q | |
| R | |
| S | |
| T | |
| U | |
| V | |
| W | |
| X | |
| Y | |
| Z | |

T101M
C+K SH.

200 400
FT ○ FT



XTAL DRIVE SYSTEM

CP16 R

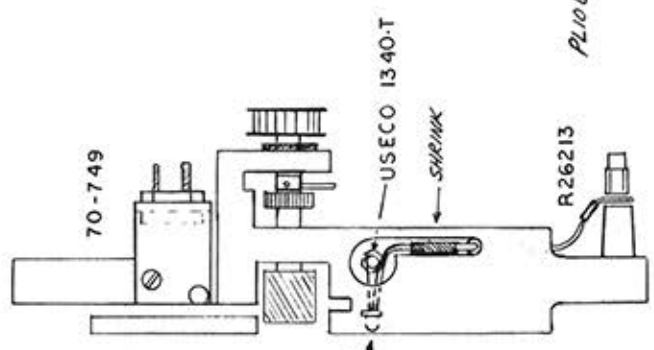
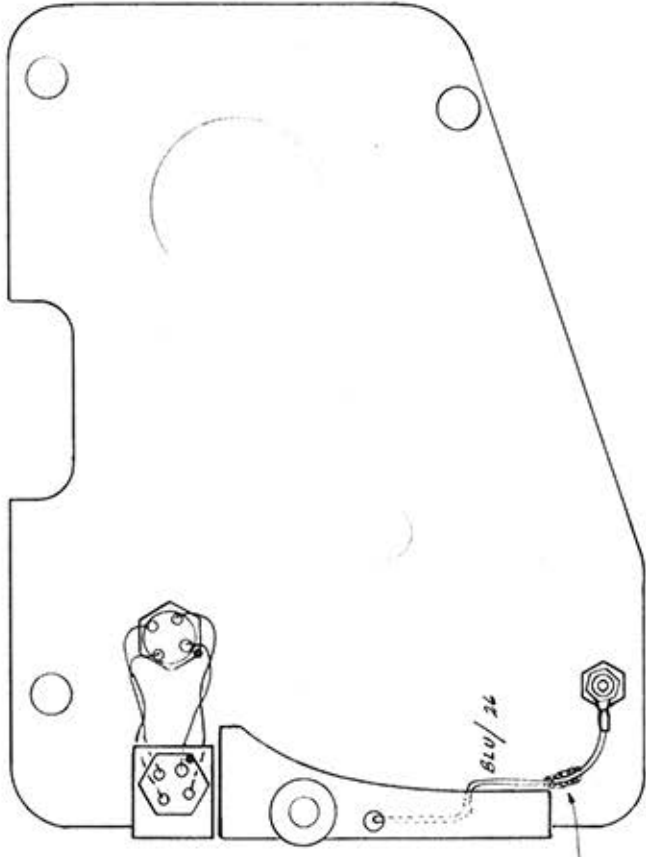
DEC 73 B 70-760

J.O. 6510



| | |
|--------|-----|
| BRN 26 | |
| A | B |
| RED | ORN |
| C | YEL |
| D | |

M4P-N M4S-N

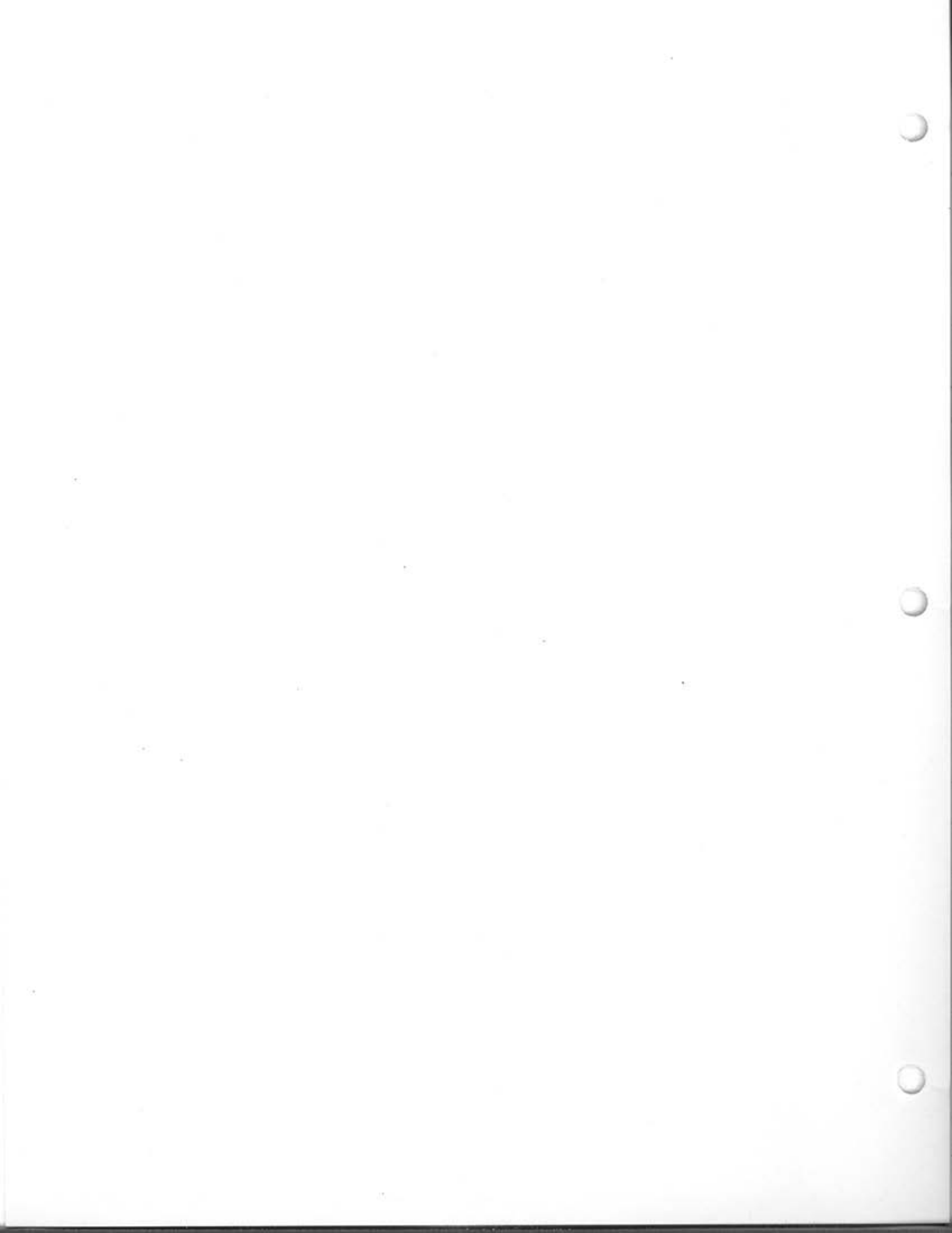


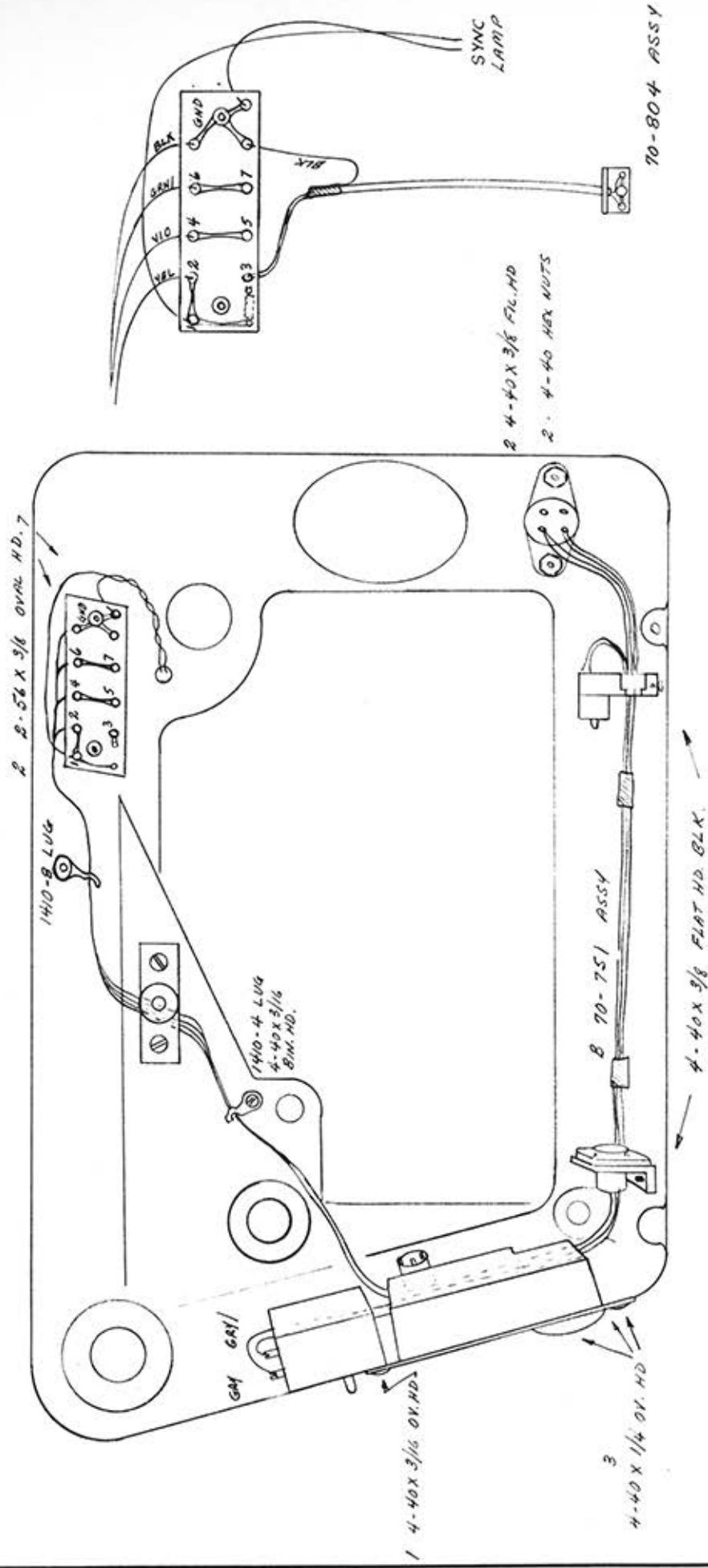
LED. SSL-212 C G.E.
JUST BELOW SURFACE →

SILVER TO GND.
GOLD
26 17NHIL

WINCH 853 70-783 SPACER

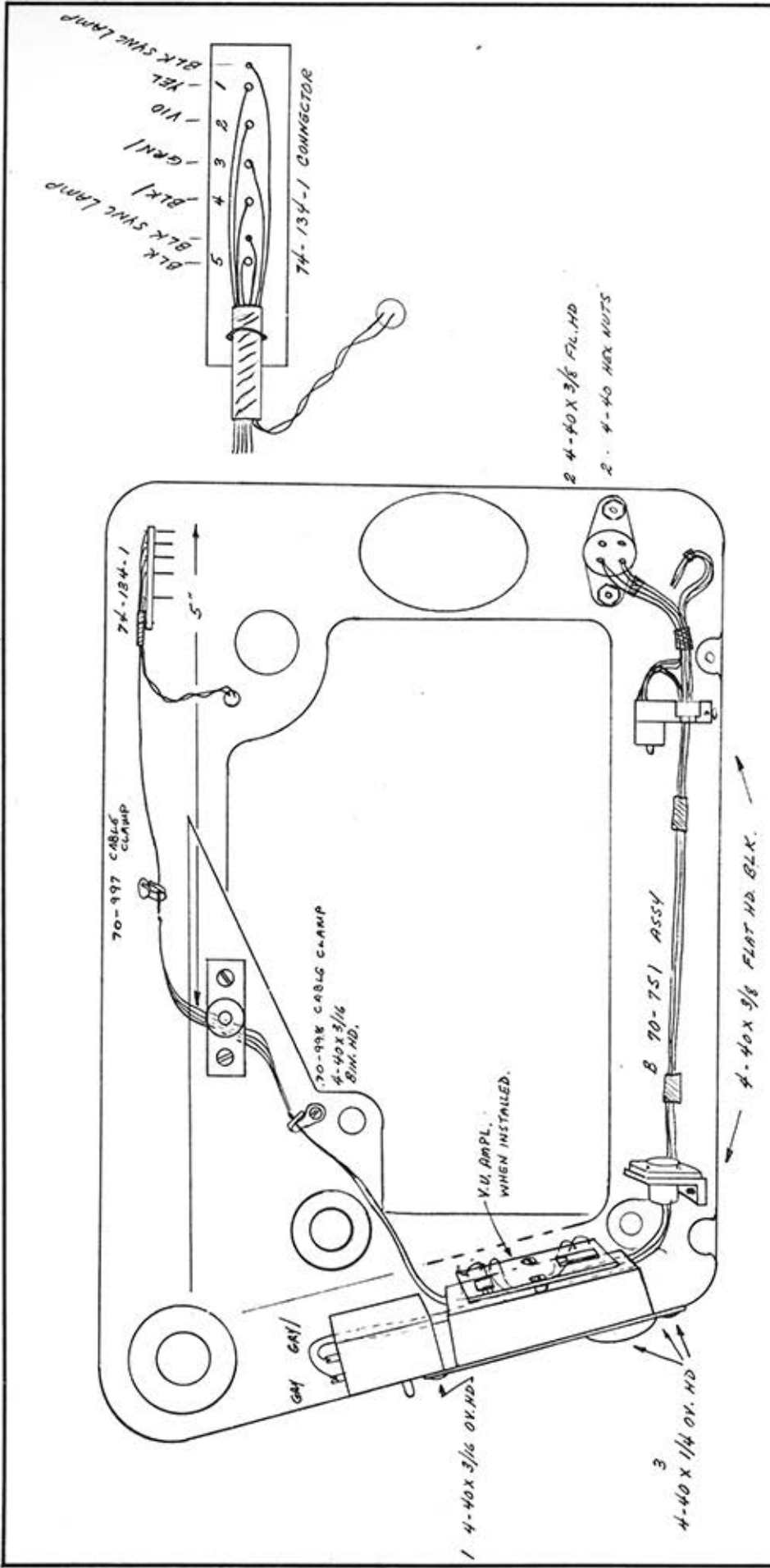
| | |
|----------------|----------|
| MID-RIB WIRING | |
| CP-16 R | |
| 5-74 | B 70-802 |





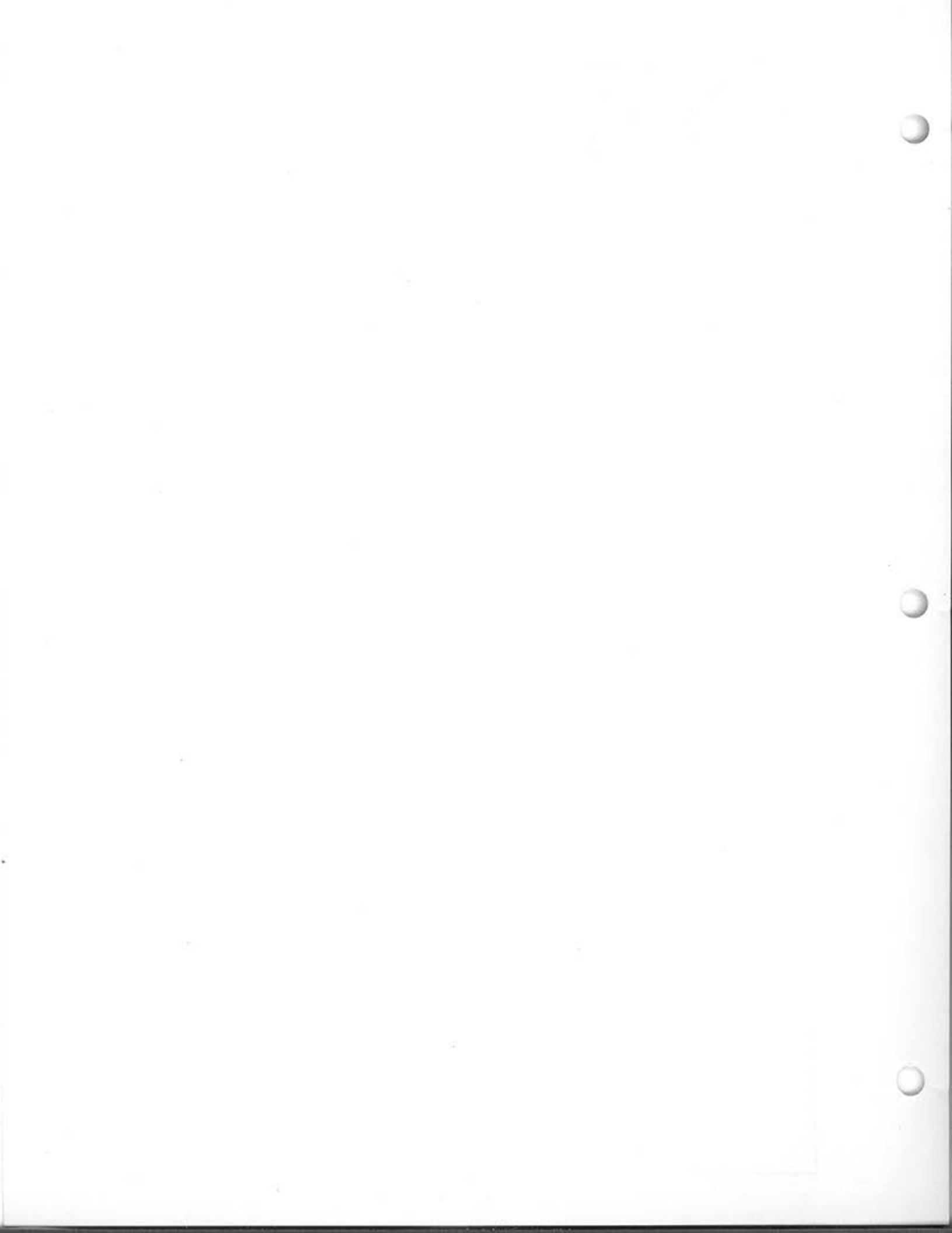
| | | | |
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| CINEMA PRODUCTS | | DRAWN BY J H | |
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| DATE: 5-74 | BODY WIRING CPI6R | | |
| B 70-805 | | | |





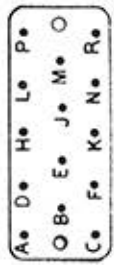
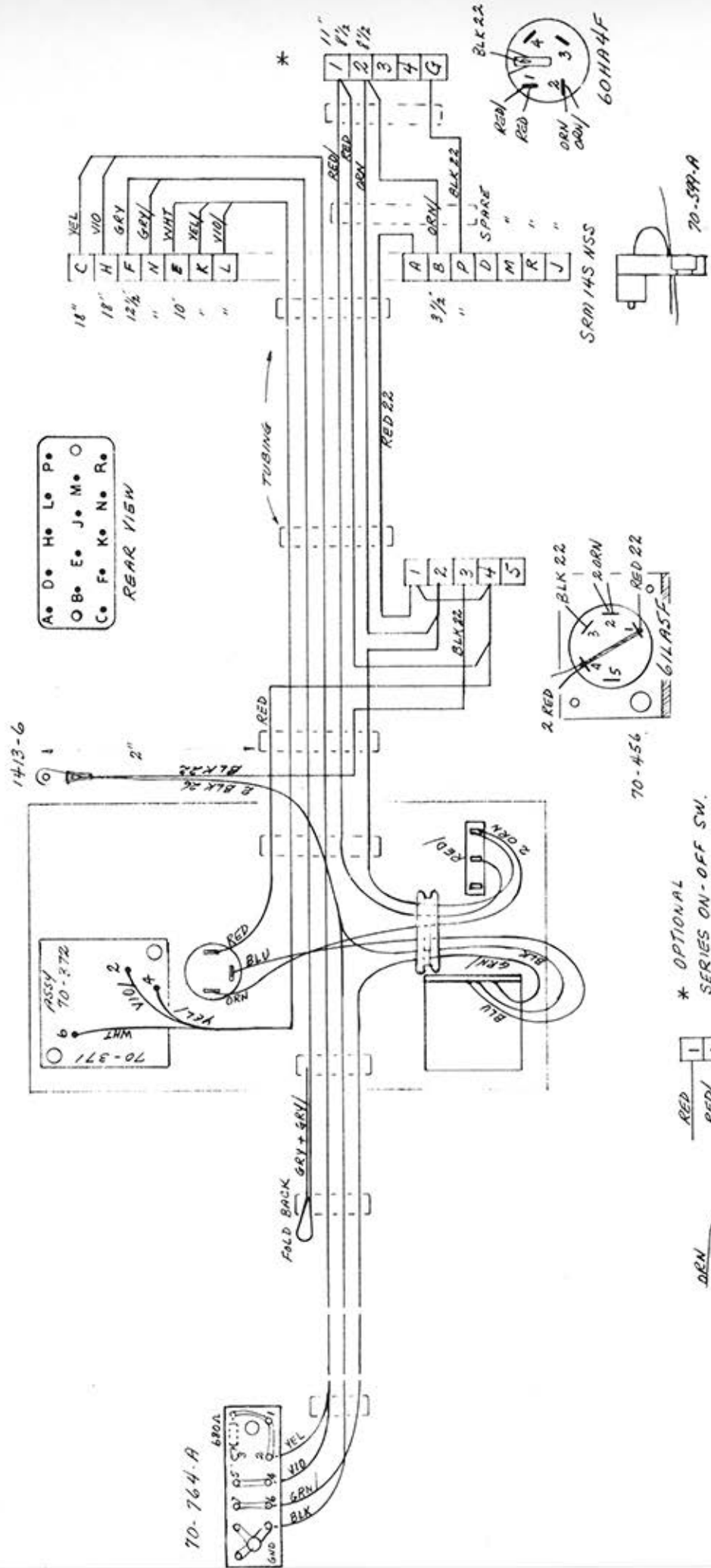
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CINEMA PRODUCTS

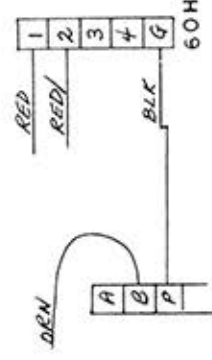


- ① PLUG 14 PIN CONNECTOR ONTO J14 AND WIRE FIRST
- ② MOUNT ON BRACKET 70-599-A, FASTEN IN PLACE.
- ③ WIRE 60HA4F HEAT, THEN GLASS F

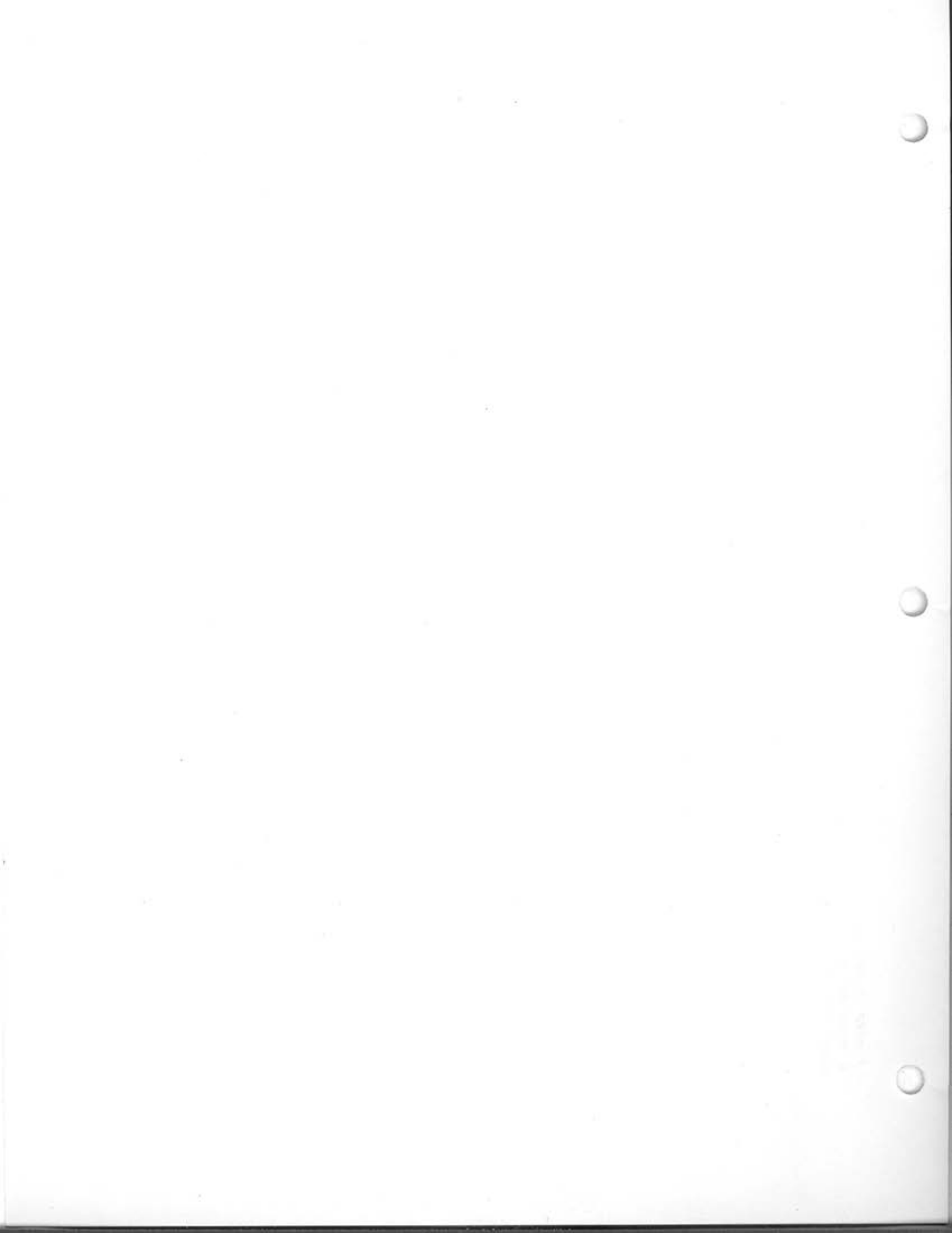
- 1 WIRE IS RED 22
- 2 WIRES ARE BLK 22
- REMAINDER ARE 26 GA.

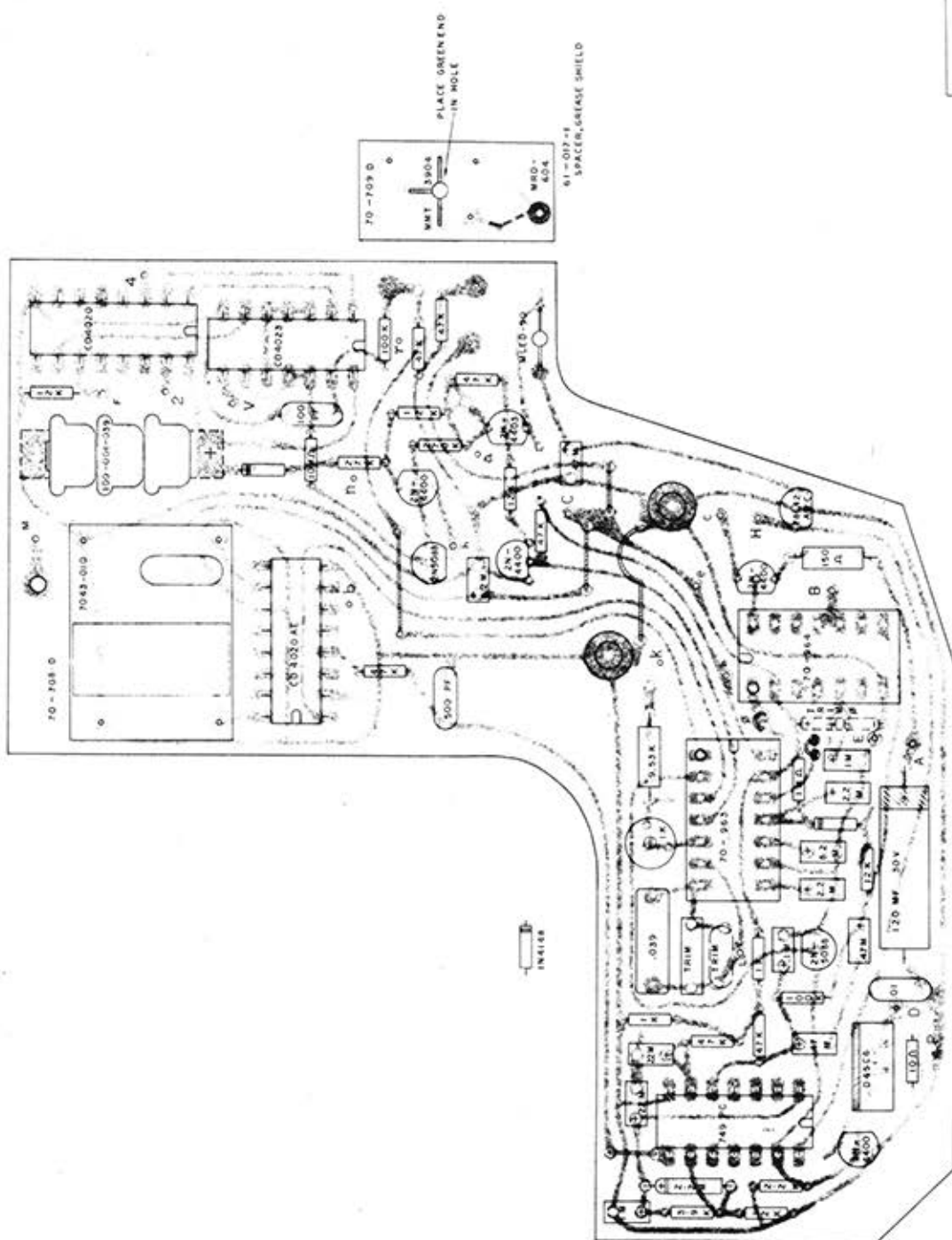


* OPTIONAL SERIES ON-OFF SW.
 OMIT ORN/
 ORN TO B. 14S
 RED TO PIN 2



| | |
|---------------------|----------|
| CONTROL PANEL ASSY. | |
| CP 16 R | |
| DEC 73 B | 70 - 751 |







(MRD604). Q19 presents the electrical impulses to the gate at Q20 pins 12 and 13. All the COS/MOS type NAND gates in this circuit are being used as high gain amplifiers. The gate at Q20 pins 12 and 13 amplifies the electrical impulses to decrease the rise and fall times. The output from pin 11 is fed through a low pass filter to remove unwanted noise. The gates at Q20 pins 1 and 2 and Q20 pins 8 and 9 are used to further decrease the rise and fall times.

REFERENCE Phase-Compare and Sync-Alarm Circuitry

The square wave outputs from the reference oscillator (Q17 pin 11) and optical tachometer (Q20 pin 10) are fed into trigger forming networks. These networks consist of a 500 picofarad capacitor and a 12K ohm resistor to +10 volts. This results in 9 volt, negative going triggers that are referenced to +10 volts.

If the two triggers are coincident, the output from the "Phase-Compare" circuit (the line between the two 47K ohm resistors located at pins 3 and 10 of Q21) will be two very narrow pulses, one going positive, the other going negative from a 5 volt level. If the reference trigger starts to lead the optical tach trigger (ie. when the motor feels an increasing load) the positive going pulse becomes wider and the negative going pulse

disappears. The width of the positive going pulse is directly proportional to the number of degrees of phase error (the distance between two triggers is 360 degrees). If the optical tach triggers begin to lead the reference triggers, then the negative pulses become wider and the positive pulses disappear. This output is not normally seen because the leading filter network (100K ohm resistor, .1 microfarad cap and two .47 microfarad caps) integrates the pulses resulting in a varying D.C. level with a slight serration. The D.C. level will become greater than 5 volts with an increasing motor load, and less than 5 volts with a decreasing motor load.

The "Phase-Compare" circuit is basically two cross coupled latches consisting of Q21 pins 8 through 13 and Q21 pins 1 through 6. Delayed cross coupling is achieved by Q22 pins 1 through 10. Refer to the timing chart for the detailed analysis of the "Phase-Compare" circuit when the optical tachometer is lagging behind the reference by 10% (36 degrees).

The "out of sync" alarm senses the width of the pulse at the Test Point. The pulse width determines how much the 1 microfarad cap at Q22 pins 12 and 13 is discharged. The wider the pulse the greater will be the discharge. When the capacitor is discharged down to approximately

6 volts, the gate at Q22 pins 12 and 13 changes state turning on the emitter-follower Q18. Q18 drives two "Sync" lamps and D3 of the Pilot/Slate board via pin "C" (14 pin Winchester). The alarm is trimmed to trip at approximately a 40% pulse width.

REFERENCE Amplifier

A reference voltage of 5 volts, created by the two series 1K ohm resistors between +10 volts and ground, is fed to pin 3 of Q13. Q13 pins 2 and 3 form a differential amplification. Q13 pin 2 receives the leading filter network output and the difference between this signal and the reference is amplified. The duration of the difference primarily determines the maximum excursion of the output. This output becomes the "DC Level" for the Motor Drive Modulator.

REFERENCE Acceleration Control Circuit

The circuit consists of D10, D12, 12K ohm and 1 Meg resistors, along with the 2.2 microfarad cap. During initial start-up, the 2.2 microfarad capacitor receives most of its charging current from the "Phase Compare Output" line through D12 and the 12K ohm resistor. This forces the motor's acceleration rate to conform to the charging time constant of the 2.2 microfarad and 12K ohm combination. Once sync speed is achieved, the cap

continues to charge through the 1 Meg ohm resistor to back bias D12 to prevent any inadvertent loading during normal operation. The "Shut Down" logic will discharge the acceleration circuit through D10 any time "switched +20" is low and the "Shutter Position Detector" senses a closed shutter. This makes seeking a closed shutter smoother.

REFERENCE Shutter Position Detector

A paddle mounted on the film movement drive shaft, is adjusted to block the light to Q5 (MRD 604) whenever the shutter is closed. The emitter of Q5 drives Q6 (MMT 3904) an emitter follower. Signals from both of these transistors feed the "Shut Down" logic, low film indicator and, via pin "R" (14 pin Winchester), as a strobing pulse for the light meter circuit.

REFERENCE Shut Down Circuit

The "Shut Down" logic consists of Q7 and Q17. Q17 is the 60Hz oscillator and switching logic that has been covered in the section on "Frequency Generation Circuits". Q7 along with its associative circuitry provides the "Shut Down" sequence. It must provide control power during shut down, stop the drive motor when the shutter is closed, and turn off the control power to keep from discharging the battery. The whole sequence is initiated

by turning off the "switched +20". The "Shut Down" logic provides the board power during normal operation through Q9 (4403). D6 provides power only during start up until Q9 can take over. Q9 and Q8 are held on by a FALSE at Q7 pins 5 and 6. This FALSE is the inversion of the "switched +20" through the NOR gate Q7 pins 12 and 13. When the "switched +20" goes off, the output remains FALSE by Q5 keeping pin 13 TRUE. Pin 13 goes FALSE when the shutter closes making the output pin 11 TRUE. The gate at Q7 pins 1 and 2 now discharges the "Acceleration Control Circuit" and aids in keeping Q7 pin 13 FALSE. Also, the output Q7 pin 11 inables Q10 which turns off the motor. The gate at Q7 pins 5 and 6 is a two second time delay. If, after two seconds the above situation has not changed, it will turn off the power to the control circuits. The 8.2 microfarad cap that has been charged by the +10 volts will briefly supply power to Q7 through D3 after the +10 volts turns off. D4 and D5 help keep any spurious signals from restarting the "Shut Down" circuit during the discharge of the 8.2 microfarad cap. The only battery load remaining, is the low current draw for charging the low film indicator's 3.75 volt battery supply.

Section III

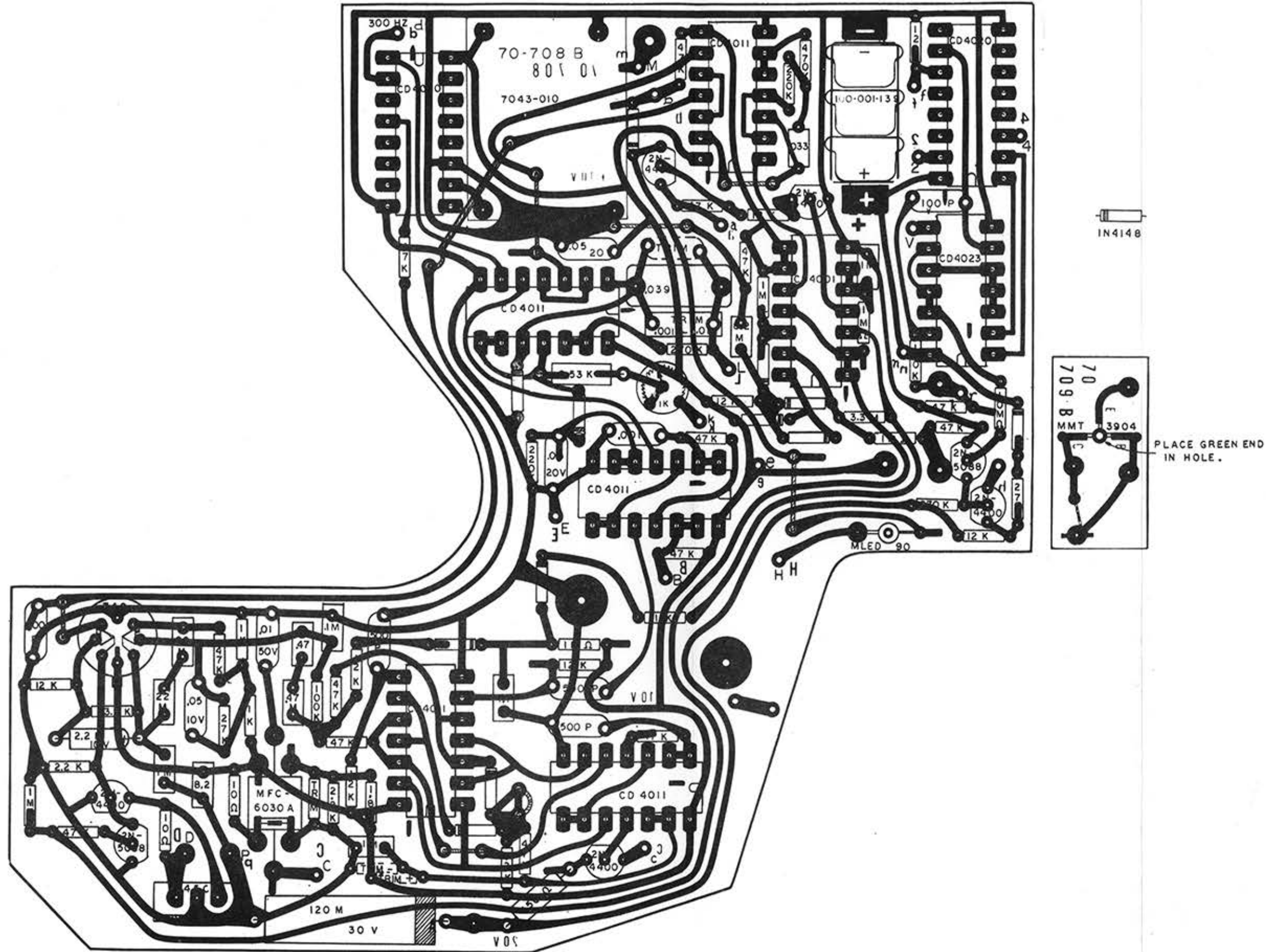
LOW FILM INDICATOR

REFERENCE Counter Power Supply

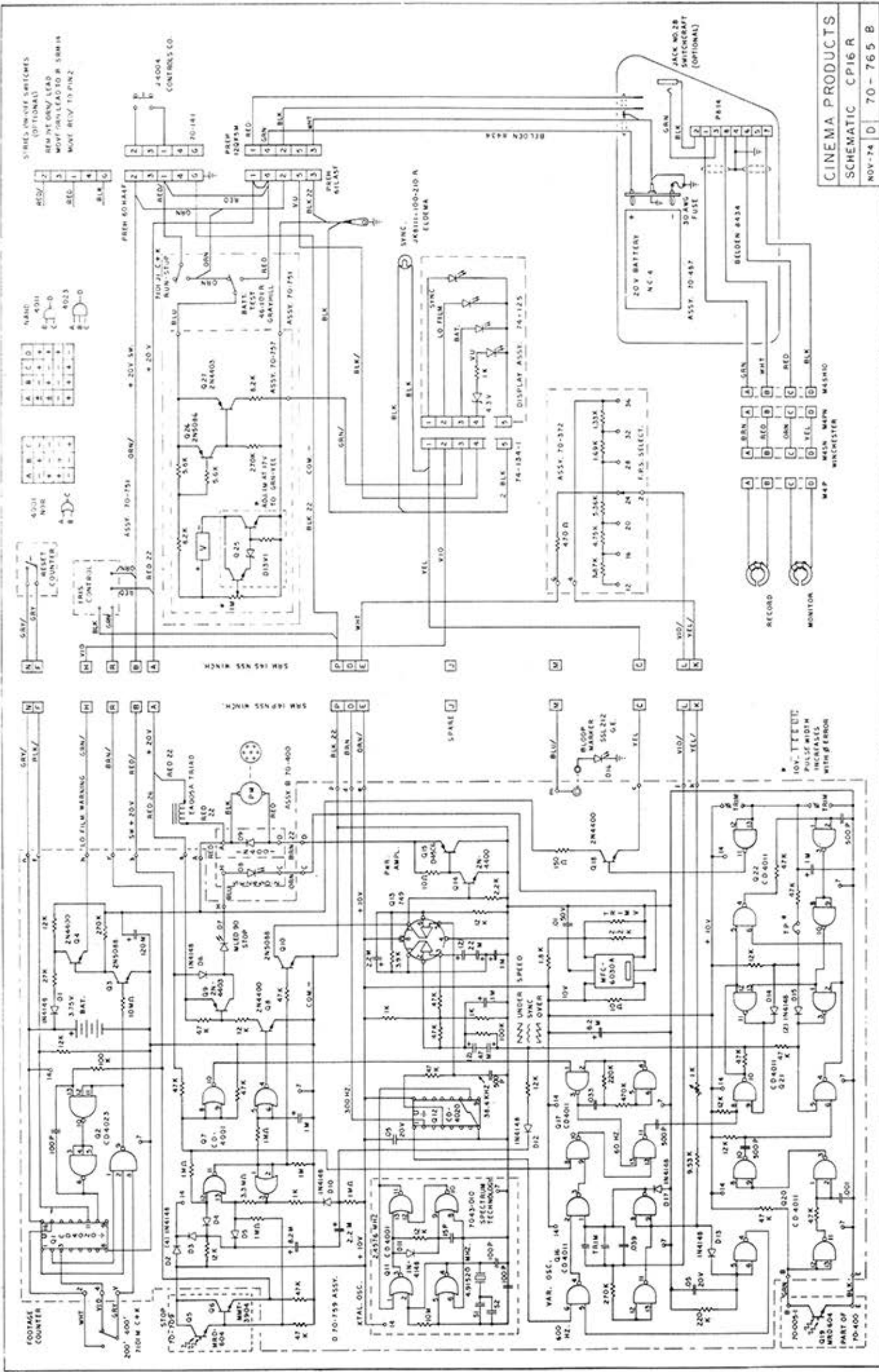
This circuit receives its power from a rechargeable 3.75 Nicad battery. The battery is recharged anytime the NC-4 battery is plugged into the camera. This battery alone will keep the circuit operating for well over one year.

REFERENCE Counter Operation

The Low Film Indicator is reset any time the mechanical counter is cleared. When reset, the outputs Q1 pins 1,2,3, and 15 are low. The NAND gate (Q2 pins 1,2,8, and 9) receives these low outputs and in turn enables the gate at Q2 pins 10 through 13. Pulses from the "Shutter Position Detector" can now be received by the counter. During the count, the inputs (Q1 pins 1,2, and 8) will be going TRUE at various times. When all three inputs are TRUE at the same time, the output pin 9 will disable the gate at Q2 pins 11 through 13 and turn on the "Low Film" lamp. The counter can be set for 200 feet (7,168 frames) or 400 feet (14,336 frames) by selecting which of the three outputs from Q1 will be summed at the NAND gate Q2 pins 1,2,8, and 9.



| | | |
|------------------|---|----------|
| P.C. BOARD ASSY. | | |
| CP-16R | | |
| MAR 73 | D | 70-759-A |



5 SYNC. IN OFF SWITCHES (OPTIONAL)
 REMOTE ONLY LEAD
 MUST BE LEAD TO B. 5MM14
 MUST BE LEAD TO PIN 2

4021
 NIB
 A B C D
 1 2 3 4
 5 6 7 8
 9 10 11 12

4023
 A B C D
 1 2 3 4
 5 6 7 8
 9 10 11 12

4023
 A B C D
 1 2 3 4
 5 6 7 8
 9 10 11 12

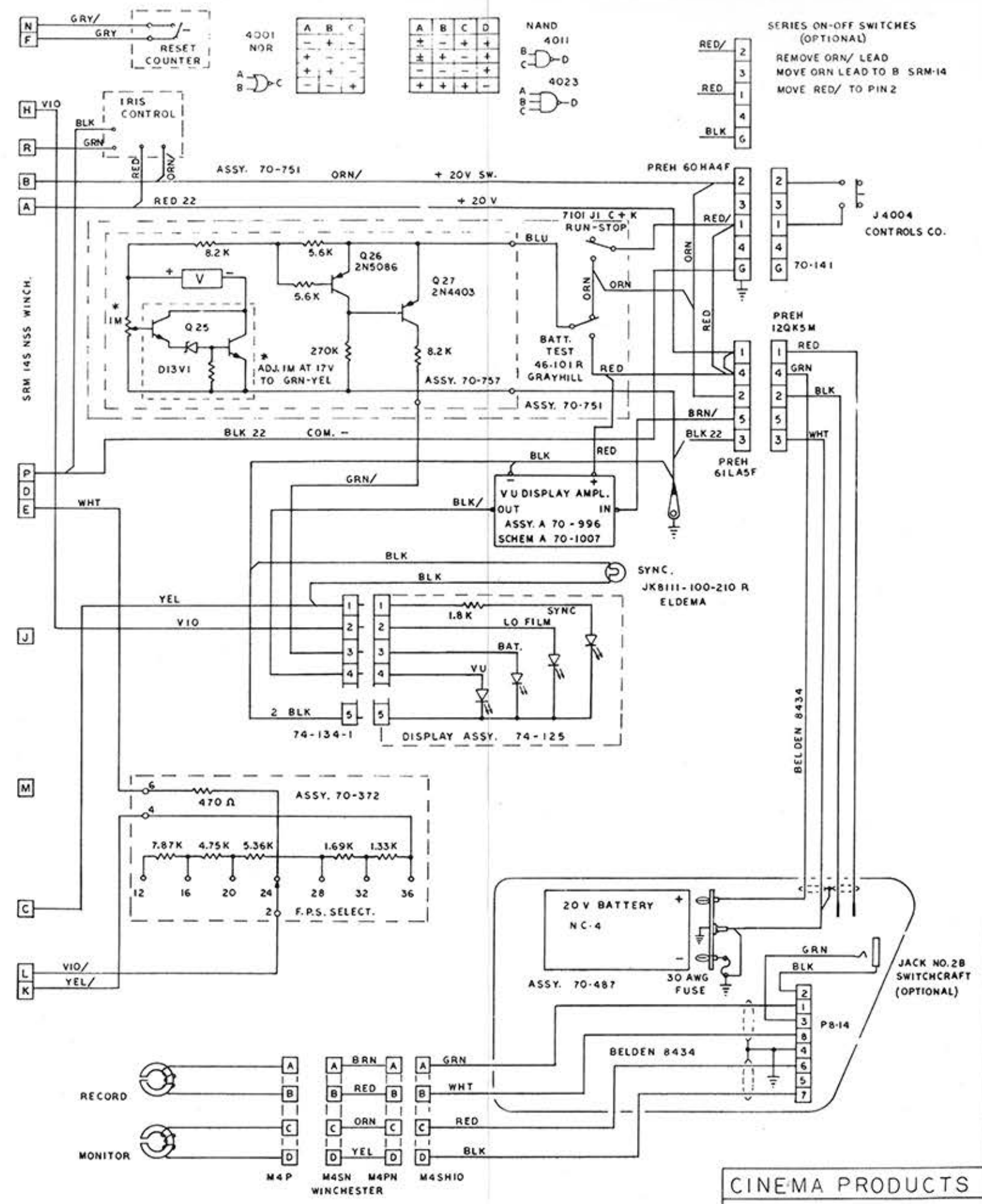
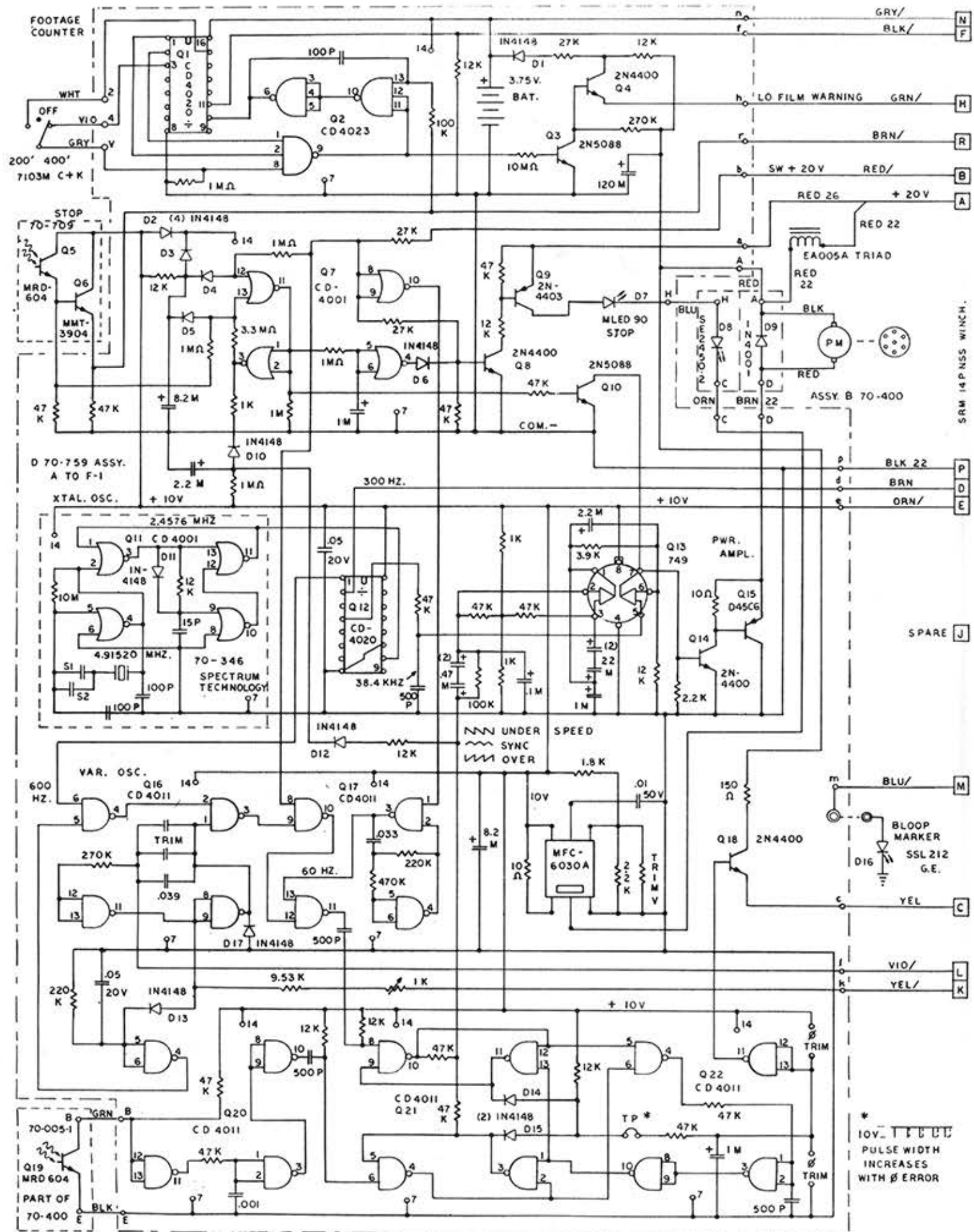
4023
 A B C D
 1 2 3 4
 5 6 7 8
 9 10 11 12

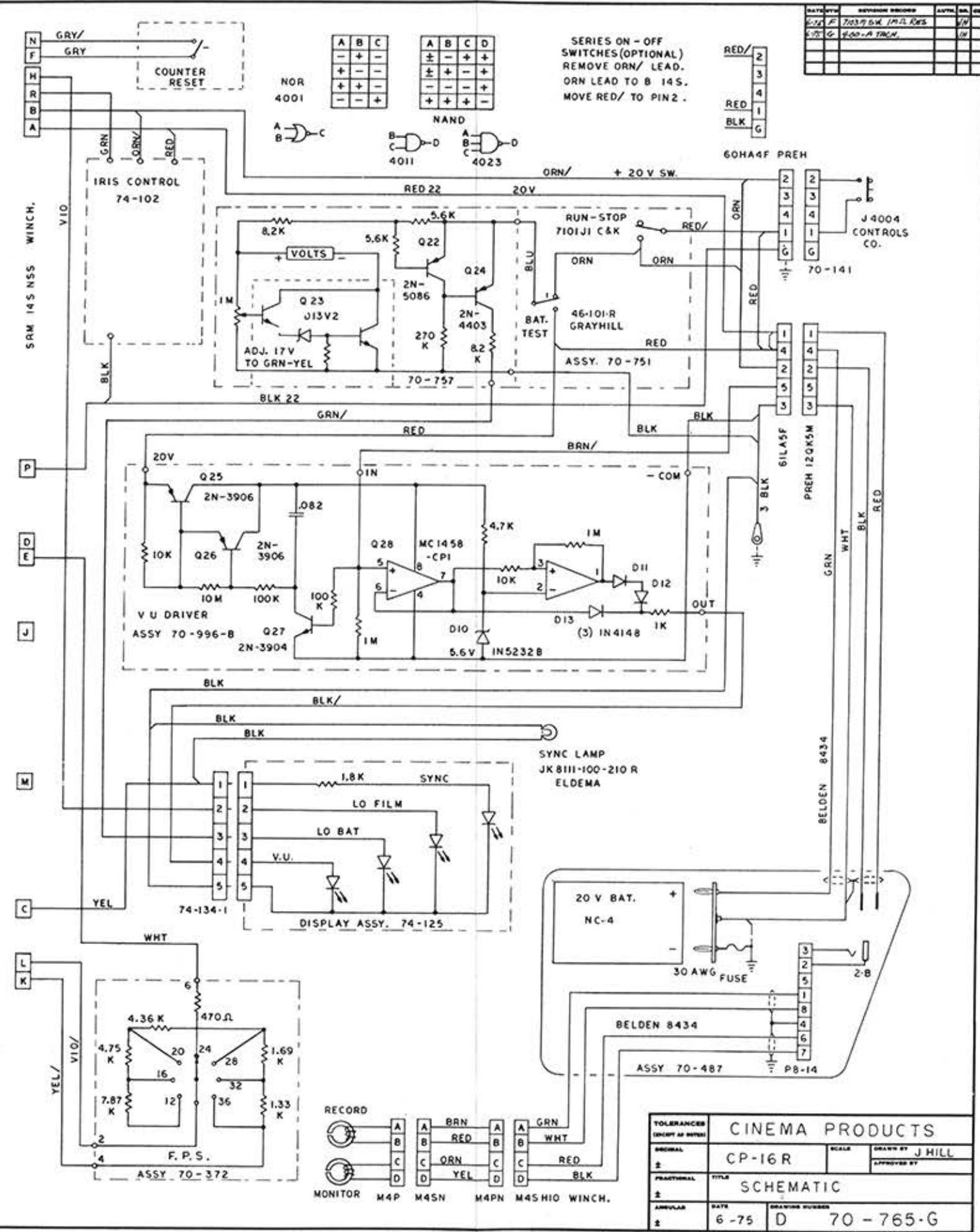
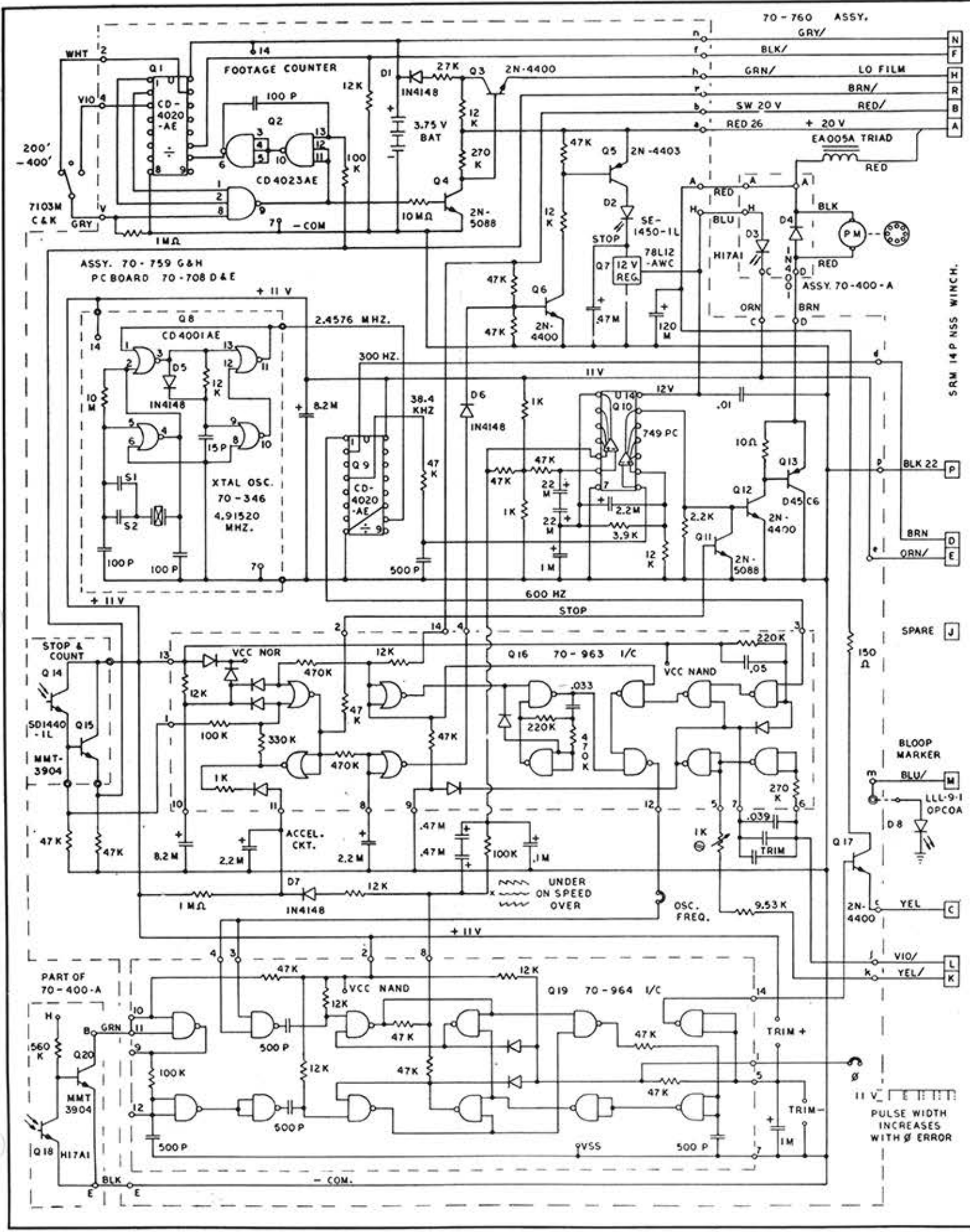
4023
 A B C D
 1 2 3 4
 5 6 7 8
 9 10 11 12

4023
 A B C D
 1 2 3 4
 5 6 7 8
 9 10 11 12

4023
 A B C D
 1 2 3 4
 5 6 7 8
 9 10 11 12

4023
 A B C D
 1 2 3 4
 5 6 7 8
 9 10 11 12





| REV | DATE | BY | CHK | APP | DES |
|-----|------|----|-----|-----|-----|
| 1 | 6-75 | JH | | | |
| 2 | 6-75 | JH | | | |

| TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | CINEMA PRODUCTS | |
|---|-------|-----------------|-----------------|
| RESISTORS | ±1% | CP-16R | SCALE |
| CAPACITORS | ±5% | TITLE | DRAWN BY J HILL |
| INDUCTORS | ±5% | SCHEMATIC | APPROVED BY |
| MEASUREMENTS | ±0.5% | DATE | 6-75 |
| | | DRAWING NUMBER | D 70-765-G |

| RECORD | MONITOR | M4P | M45N | M4PN | M45HIO WINCH. |
|--------|---------|-----|------|------|---------------|
| A | B | C | D | A | B |
| BRN | RED | GRN | WHT | RED | BLK |

Section IV

SLATING SYSTEM

REFERENCE Pilot/Clap Circuit

This circuit provides any peripheral equipment such as a recorder or transmitter with "+20" volts "switched +20" volts, ground, 50 or 60Hz pilot signal and "Start/Stop Clap" or Start Clap" only.

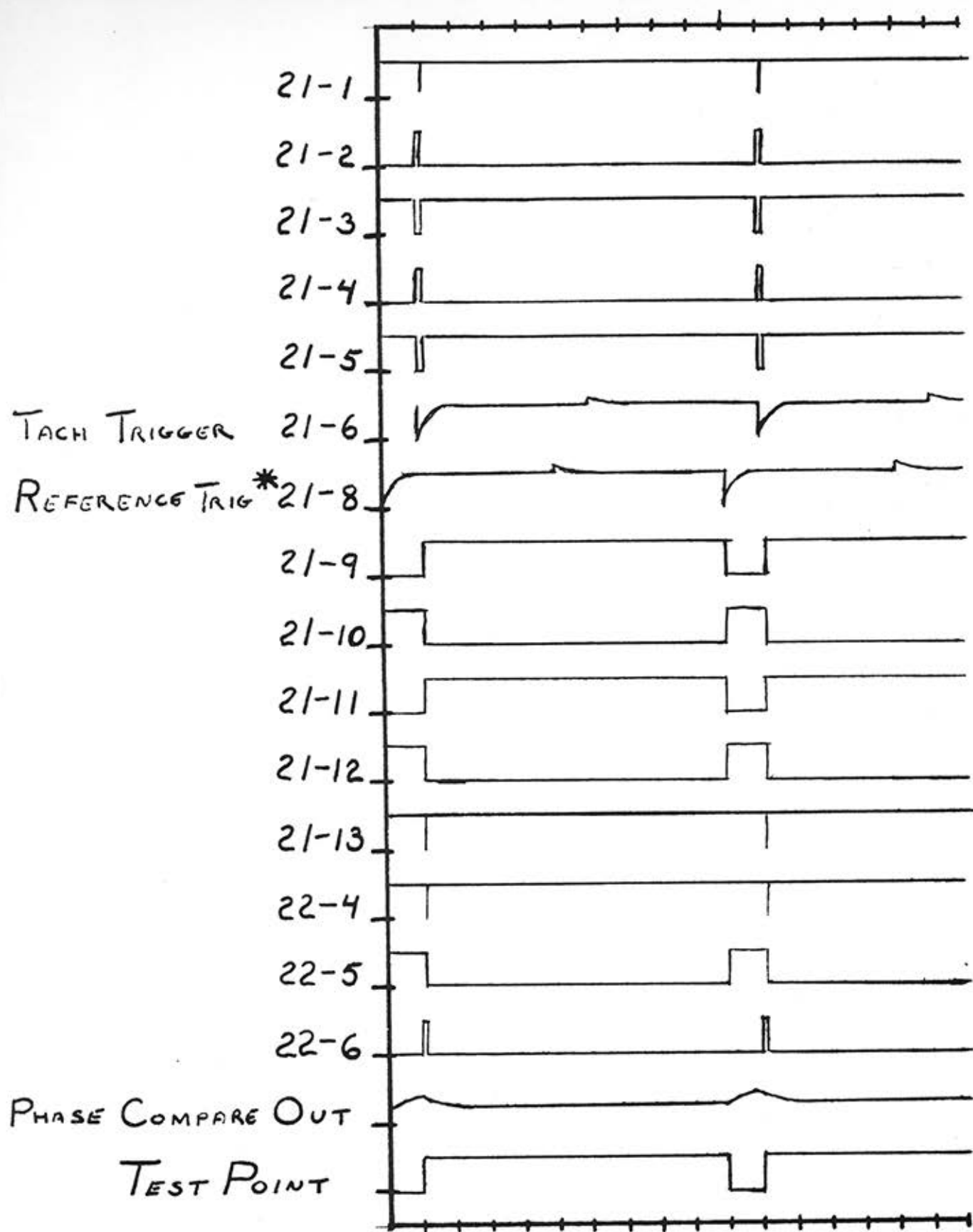
"Clap" occurs anytime the "Out of Sync" lamp is on. A positive voltage from the lamp passes through D3 to set the NAND gate Q29 pins 1 through 3 and turn on Q31. The clap output is now high. When the lamp turns off, "Clap" is held high until the .027 capacitor on Q29 pin 1 discharges below 5 volts. This delay insures the camera is running in sync. The "Clap" output also goes to the "Bloop" film marker.

The "Pilot" signal comes from dividing 300Hz (pin "D" 14 pin Winchester) by 5 (60Hz) or by 6 (50Hz). Q28 is a programable decade divider. Feeding back an output or combination of outputs to the reset line (Q28 pin 1) determines what number it will divide the frequency (300Hz) coming in pin 14. In the 50Hz position, the output from pin 6 feeds directly to the "Pilot" output driver. The 50Hz is a symmetrical or 50% square wave that is easily

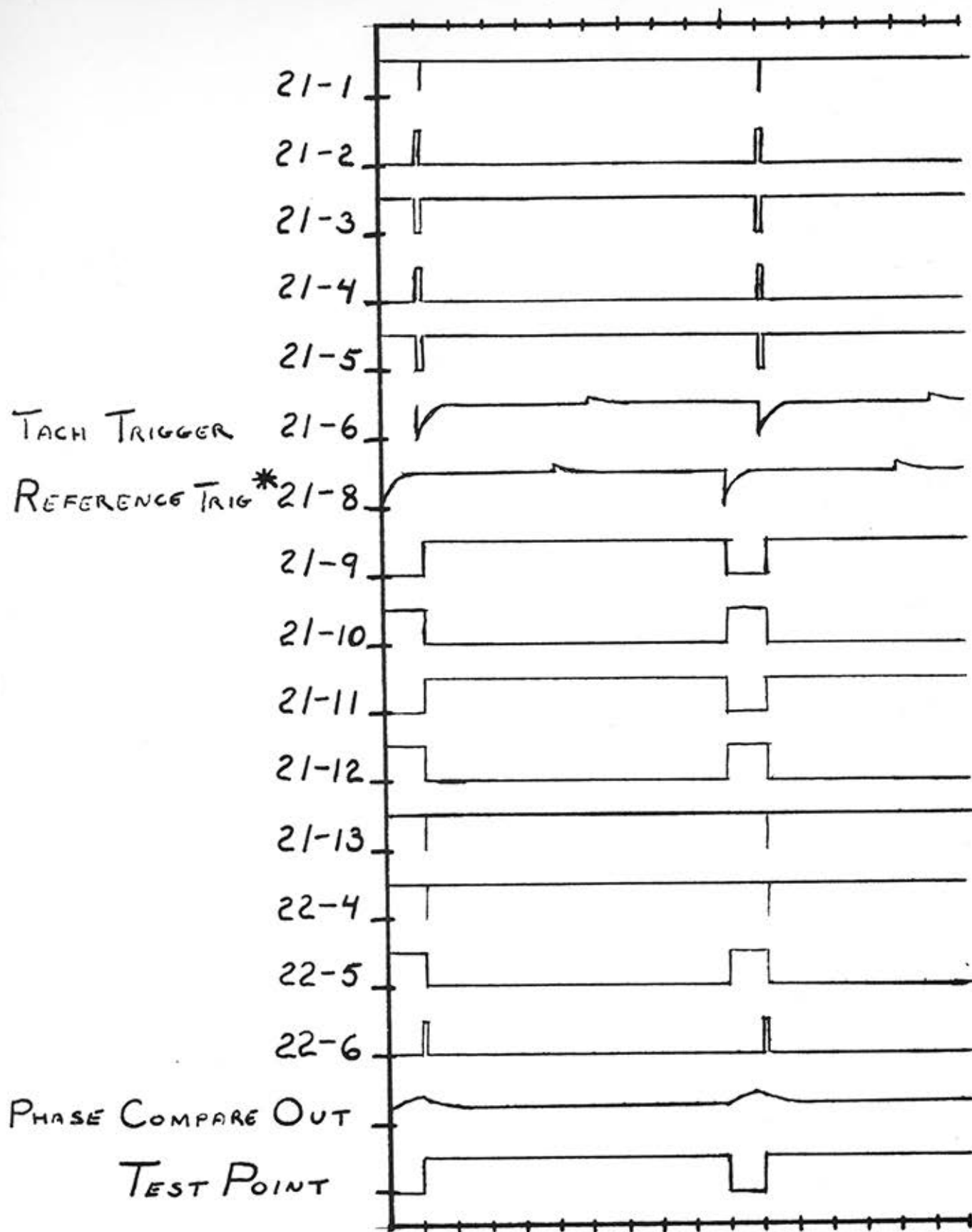
filtered into a sinewave.

In the 60Hz position the output from Q28 will not be symmetrical, therefore, timing logic is necessary to achieve a symmetrical square wave. Q29 pins 4 through 13 consist of three NAND gates. Pins 5,6, and 9 receive the normal outputs from Q28 so that a divide by 5 operation is performed. Pin 8 of Q29 mixes a portion of 300Hz with the divide by 5 output to achieve symmetry.

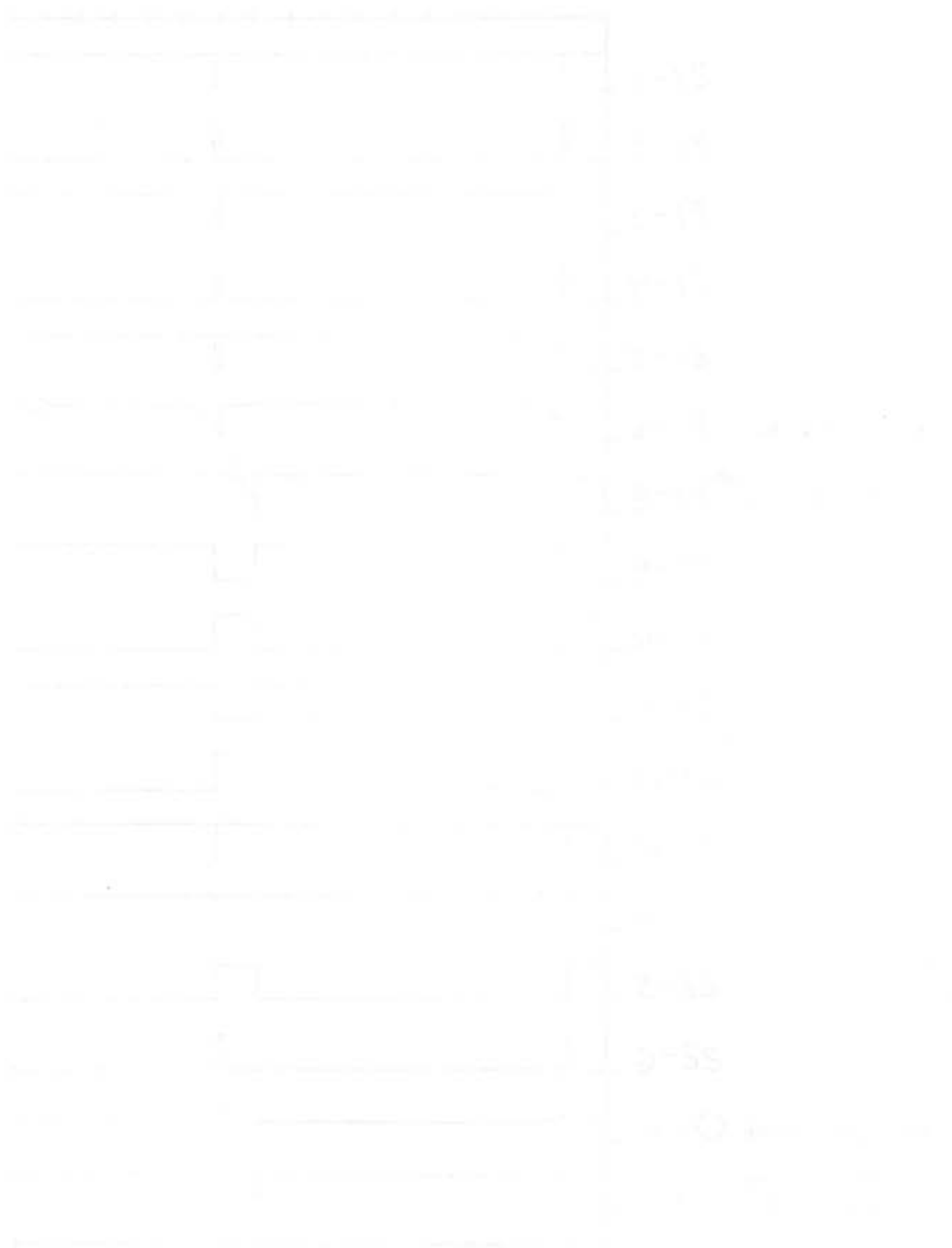
The square wave is buffered and filtered to produce a slow rise and fall square wave output.



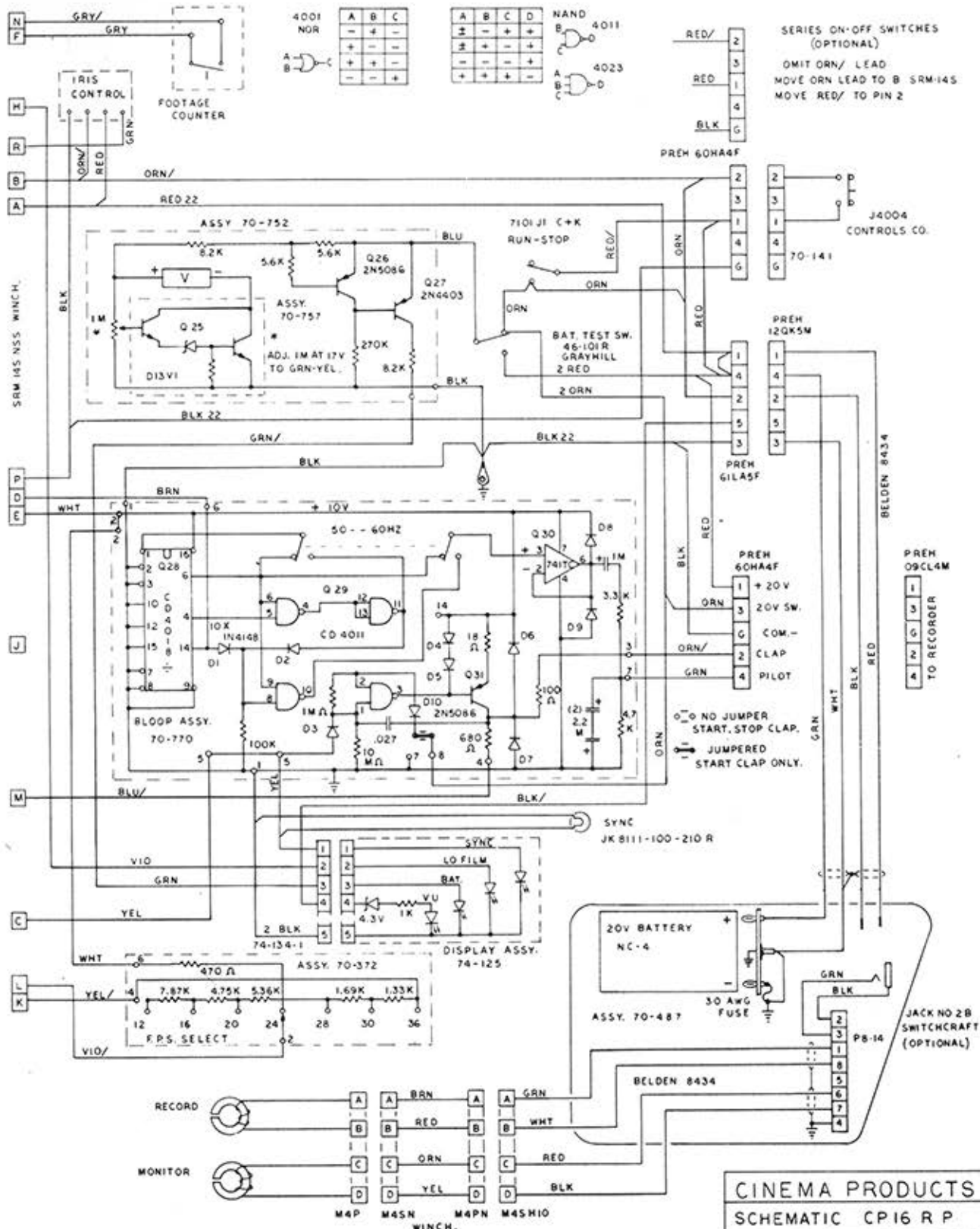
* SYNC THE OSCILLOSCOPE TO THIS TRIGGER.



* SYNC THE OSCILLOSCOPE TO THIS TRIGGER.



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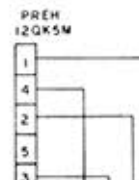
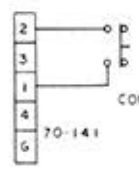
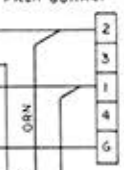
4001 NOR

| A | B | C |
|---|---|---|
| - | + | - |
| + | - | - |
| + | + | - |
| - | - | + |
| + | + | + |

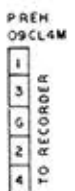
4011 NAND

| A | B | C | D |
|---|---|---|---|
| + | - | + | + |
| - | + | - | + |
| - | + | + | + |
| + | - | - | + |
| + | + | - | - |
| + | + | + | - |
| - | - | + | - |

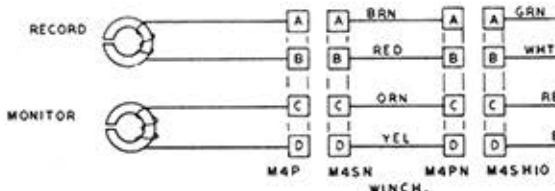
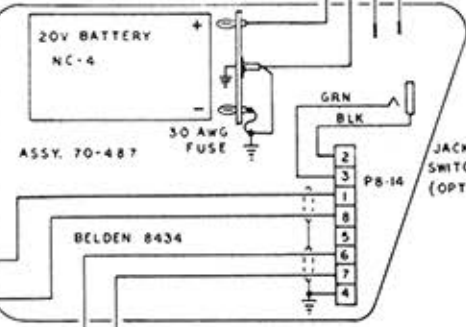
SERIES ON-OFF SWITCHES (OPTIONAL)
 OMIT ORN/ LEAD
 MOVE ORN LEAD TO B SRM-145
 MOVE RED/ TO PIN 2



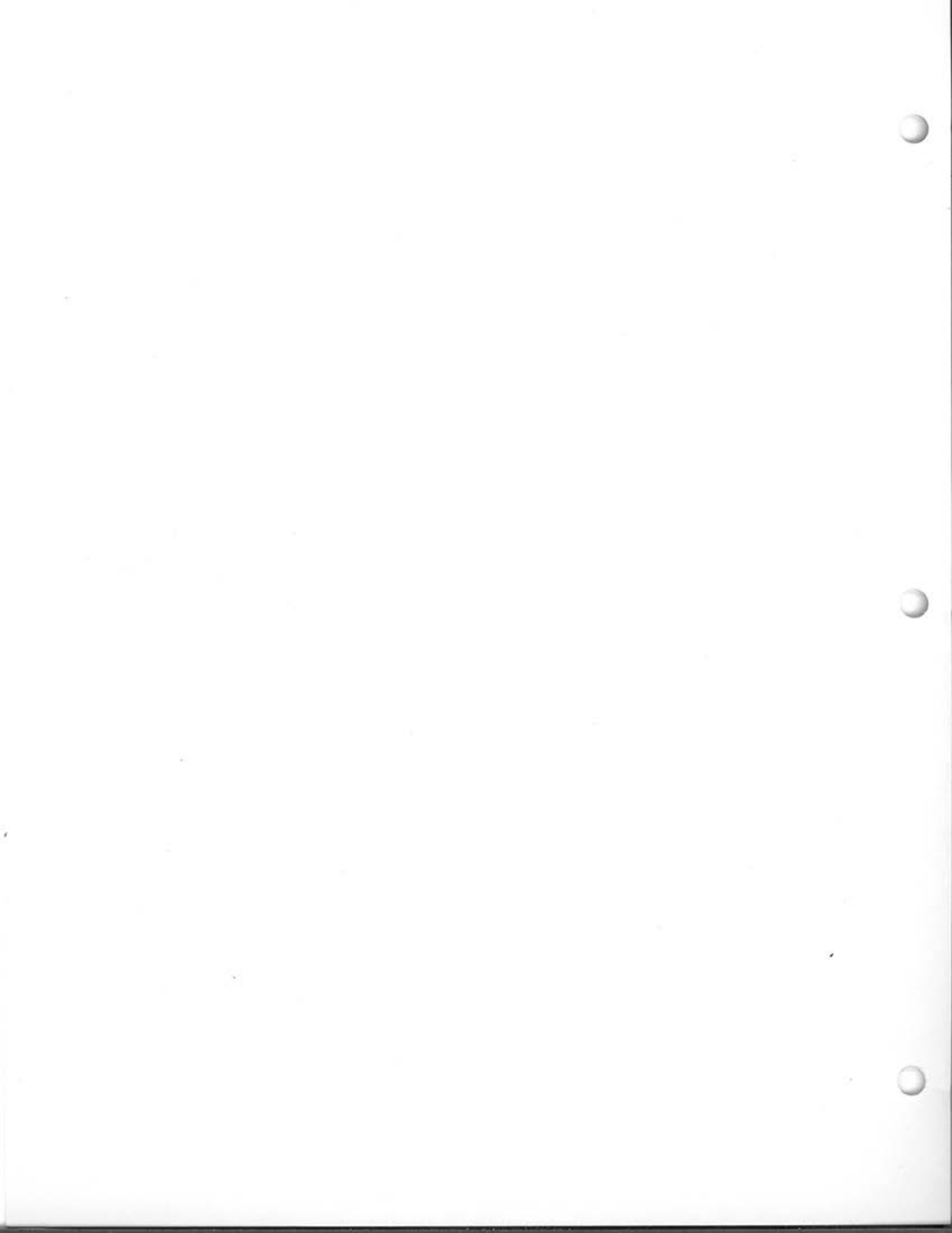
BELDEN 8434

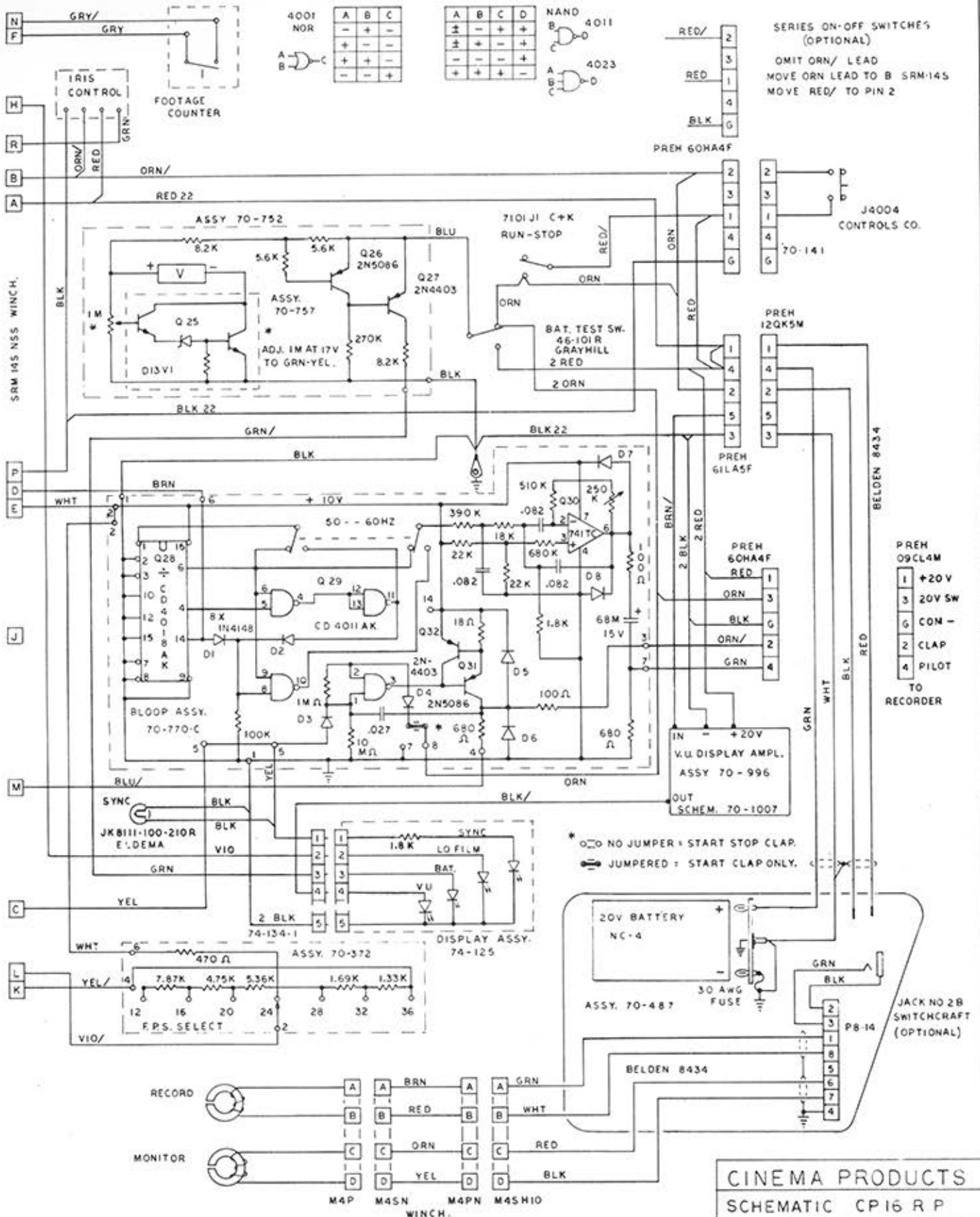


NO JUMPER START, STOP CLAP.
 JUMPERED START CLAP ONLY.

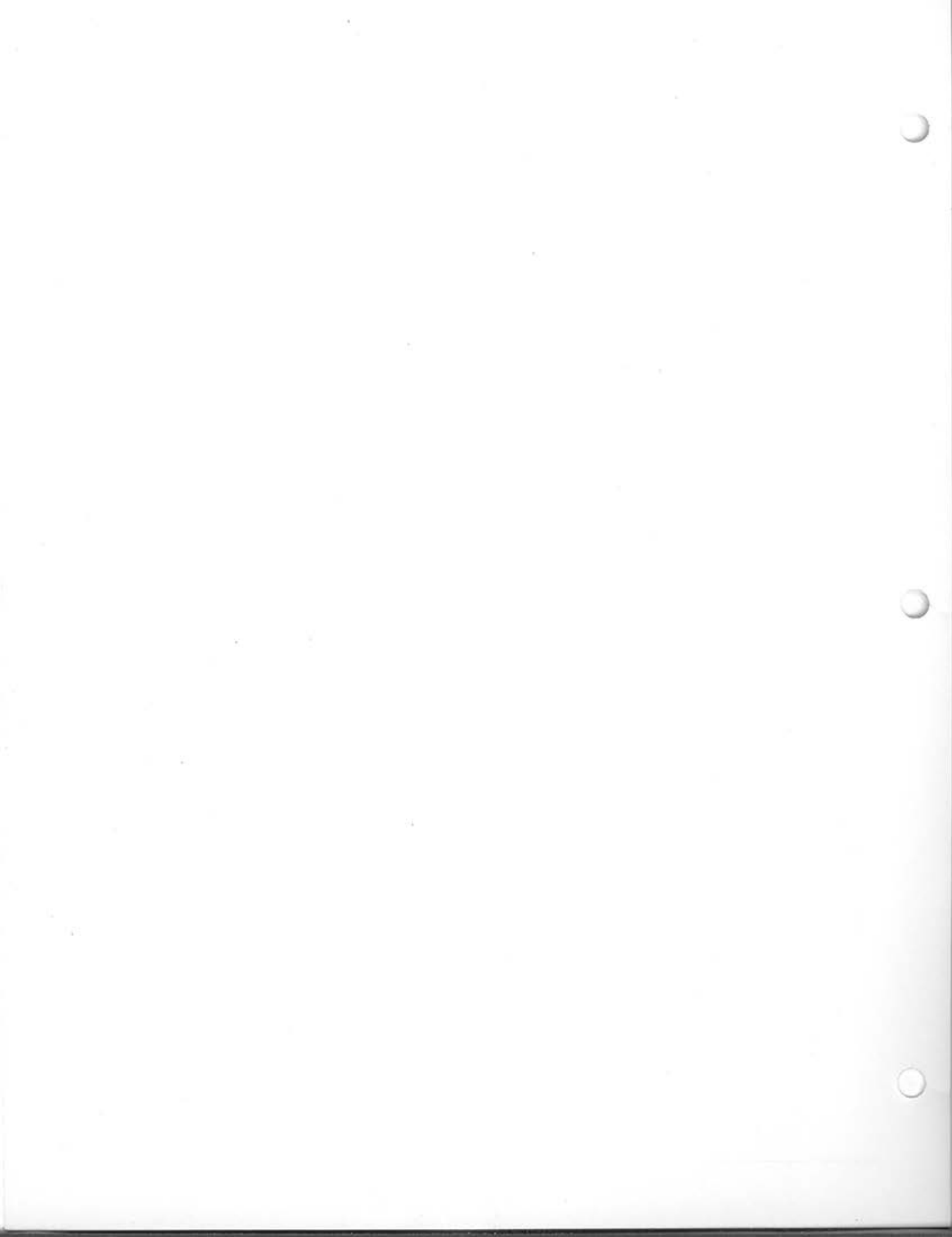


CINEMA PRODUCTS
 SCHEMATIC CPI6 R P
 NOV-74 D 70-766 B





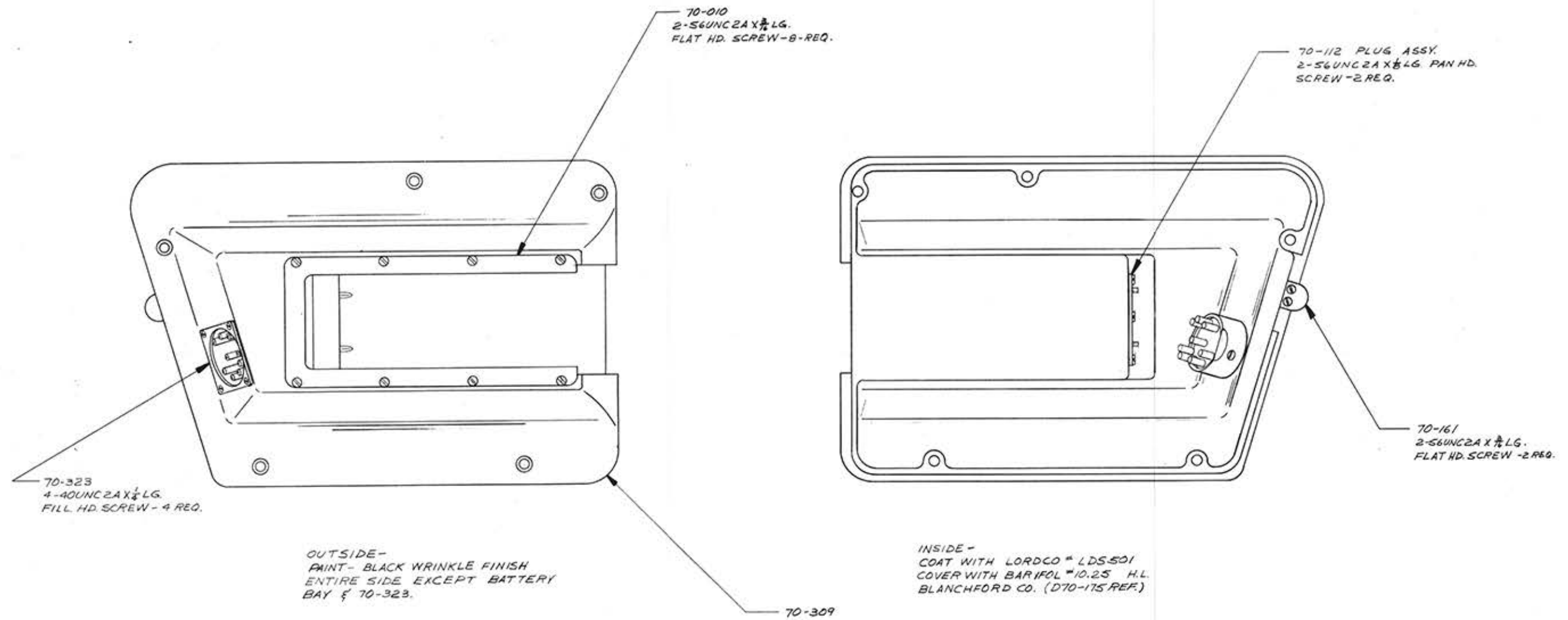
CINEMA PRODUCTS
SCHEMATIC CP16 RP
 3-75 D 70-766-D



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| LET. | CHANGE | DATE |
|------|--------|------|
| | | |
| | | |
| | | |

70-01



5. FINISH:
4. HEAT TREAT:
3. MATERIAL:
2. CONCENTRICITY .004 T.I.R.
1. BREAK SHARP EDGES .005-.010.
MACHINED FILLETS .003-.005 R.
NOTES: UNLESS OTHERWISE SPECIFIED.

| REFERENCE DOCUMENTS | UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES | cinema products | DRAWN BY |
|---------------------|--|---|----------------------------|
| | TOLERANCES - FRACTIONAL 2/164 2 PL. DECIMALS ± .01 ANGLES ± 30' 3 PL. DECIMALS ± .005 MACH. FINISH 63 <td>Los Angeles, Calif. 90008 <td>R SAM </td></td> | Los Angeles, Calif. 90008 <td>R SAM </td> | R SAM |
| | | TITLE | CHECKED BY |
| | | ASSEMBLY REAR DOOR | APPROVED BY |
| | | CPI6 | D SIZE SHEET 1 OF 2 SHEETS |
| | | | 70-487 |
| | | | |

EXPOSURE CONTROL SYSTEM

REFERENCE DRAWING: C74-203

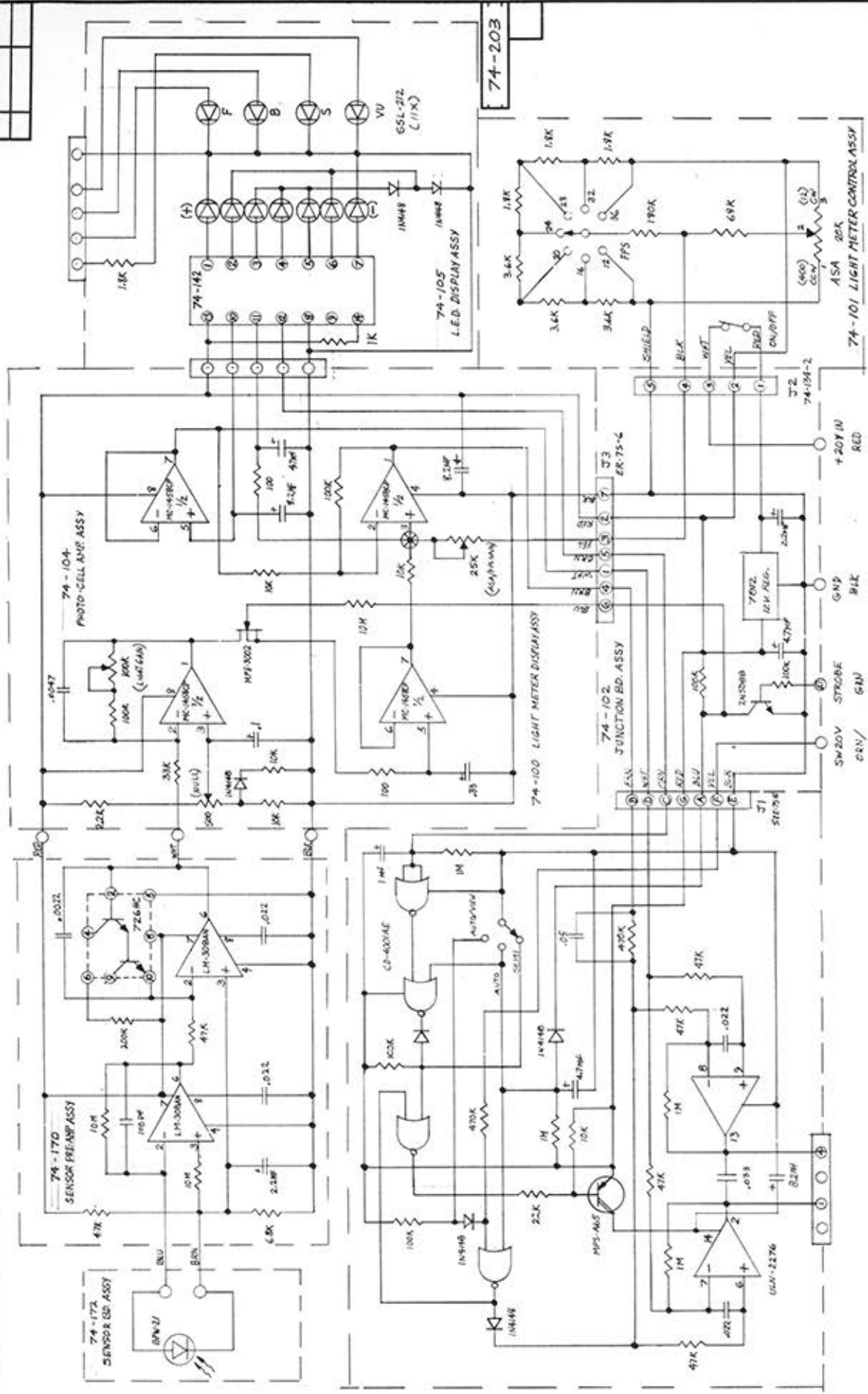
The exposure control is a behind-the-lens system utilizing a silicon light sensor for fast response at low light levels. The sensor is located on the fibre optic plate assy and shares light with the viewing optics. This is accomplished by a cube beam splitter located directly above the fibre optic plate. Approximately 20% of the light is directed to the sensor. No light is directed from the film.

The output of the sensor is linear over 6 decades of illumination. This output is amplified and processed through a temperature compensated log converter to give a DC step function directly proportional to light level. It is then amplified and fed to a sample and hold circuit that is strobed by the shutter signal. The output of this circuit is a DC level proportional to light, regardless of the output of the ASA/FPS controls and fed to the logic circuit which drives the L.E.D. Display.

The L.E. D. Display consists of 7 light emitting diodes located along the bottom edge of the fibre optic plate as seen through the viewfinder. The center diode displays a "0" which indicates system null or correct exposure. To the right of "0" are "+.5", "+1", and "+", which are $\frac{1}{2}$ stop increments. To the left are "-.5", "-1", and "-". The "+" and "-" serve as out of range indicators, i.e. "+" equals $1\frac{1}{2}$ stops or more overexposed; "-" equals $1\frac{1}{2}$ stops or more underexposed. The accuracy or deadband of null indication is

± 1/8 stop. The 1/8 stop is indicated when either "-.5" or "+.5" is illuminated simultaneously with "0".

| LET. | CHANGE | DATE |
|------|--------|------|
| | | |
| | | |
| | | |



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| | |
|---|-------------------------------------|
| DESIGNED BY | J. Lacey |
| CHECKED BY | |
| APPROVED BY | C. Rize |
| SHEET OF SHEETS | 74-203 |
| TITLE | SCHEMATIC - EXPOSURE CONTROL CP-16R |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES | FRACTIONAL 1/164 |
| DECIMALS 0.01 | 0.01 |
| PL. DECIMALS 0.005 | MACH. FINISH .03 |
| DATE | 12.20.73 |
| SCALE | |
| NEED | NEED ASBY. |

5. FINISH:
 4. HEAT TREAT:
 3. MATERIAL:
 2. CONCENTRICITY .004 T.I.R.
 1. BREAK SHARP EDGES .003-.000. MACHINED FILLETS .003-.000 R.
 NOTES: UNLESS OTHERWISE SPECIFIED.



SECTION VI

CIRCUIT DESCRIPTION FOR J-5 ZOOM CONTROL

REFERENCE DRAWING: C70-111

This is a constant-on system. Any time a battery is in the camera the J-5 is drawing power. Without touching the zoom control, the circuit draws a nominal 6 ma (a fully charged battery would take four days to discharge at this rate). Zoom direction is controled electronically. No micro-switches to go out of adjustment. Also, this gives remarkably smooth control. The whole system (excluding motor) fits inside the camera hand grip. The small size and it's simplicity make it a very rugged accessory.

Circuit Description

The J-5 is basicly a simple complimentry drive amplifier with a single ended input control. An "off" dead band is accomplished with the silicon diode inserted between the two 56K resistors of the reference voltage divider. When the control line moves from the null point by the movement of the slide pot (zoom knob) either Q1 or Q2 turns on and in turn, it's respective complimentry set of drive transistors. Servo feedback is accomplished by a DC tach on the back of the zoom motor. This signal is mixed resistively to oppose the voltage derived from the slide pot to give a net voltage result at the control line to drive the motor at a steady rate.

CONFIDENTIAL - SECURITY INFORMATION

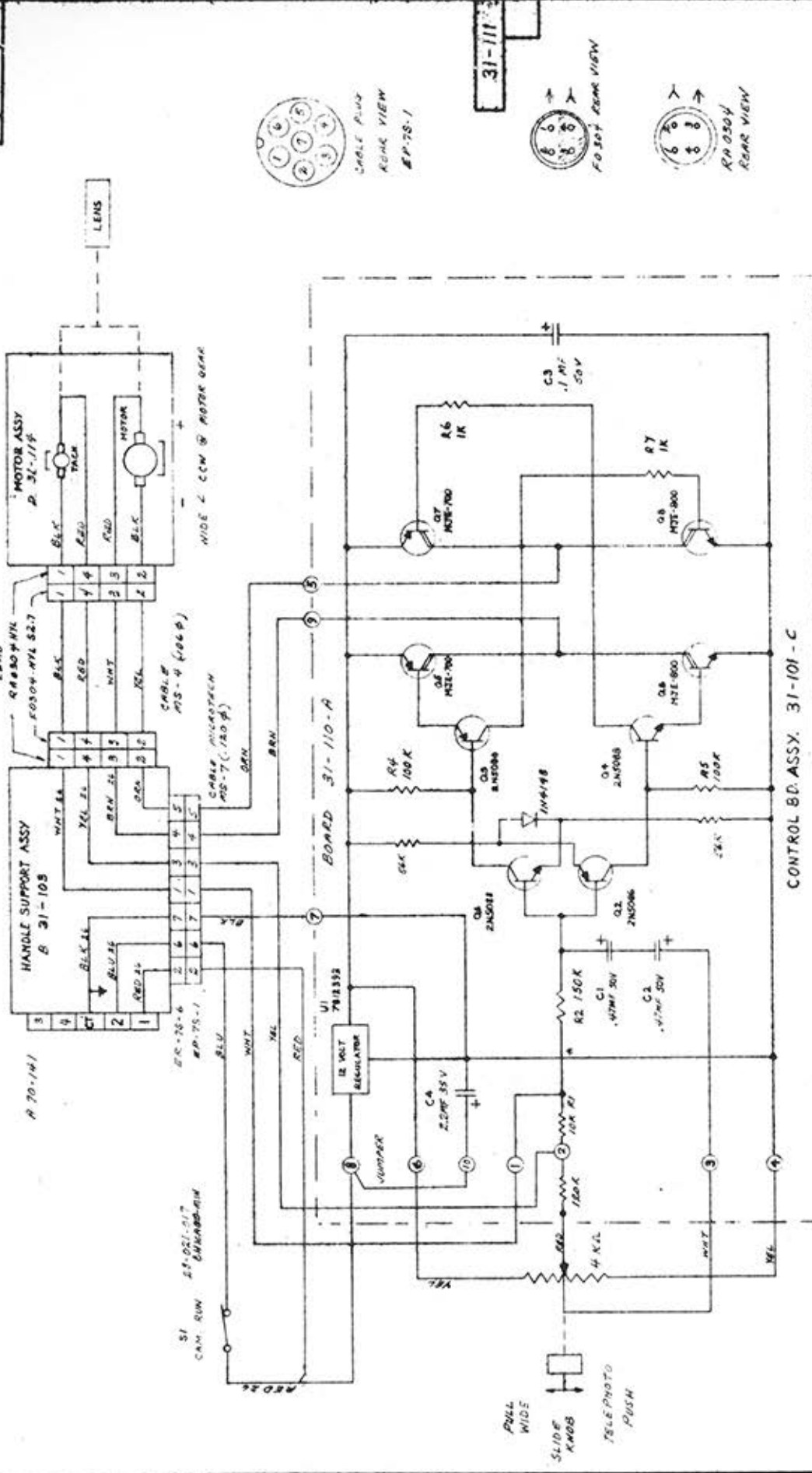
11-11-77

The following information was obtained from the files of the [redacted] and is being provided to you for your information. This information is being provided to you on a confidential basis and is not to be disseminated to any other personnel without the express written consent of the [redacted].

The information contained in this report is based on the [redacted] and is not to be used for any other purpose. This information is being provided to you on a confidential basis and is not to be disseminated to any other personnel without the express written consent of the [redacted].

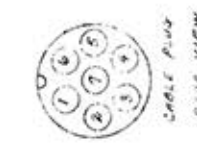
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| | | |
|------|----------|-------|
| REV. | CHANGE | DATE |
| 1 | INITIALS | 11-74 |



CONTROL BD. ASSY. 31-101-C

J5 ZOOM HANDLE ASSY. 31-101-100



CABLE PLUG REAR VIEW EP-75-1



F-5004 ZOOM VIEW



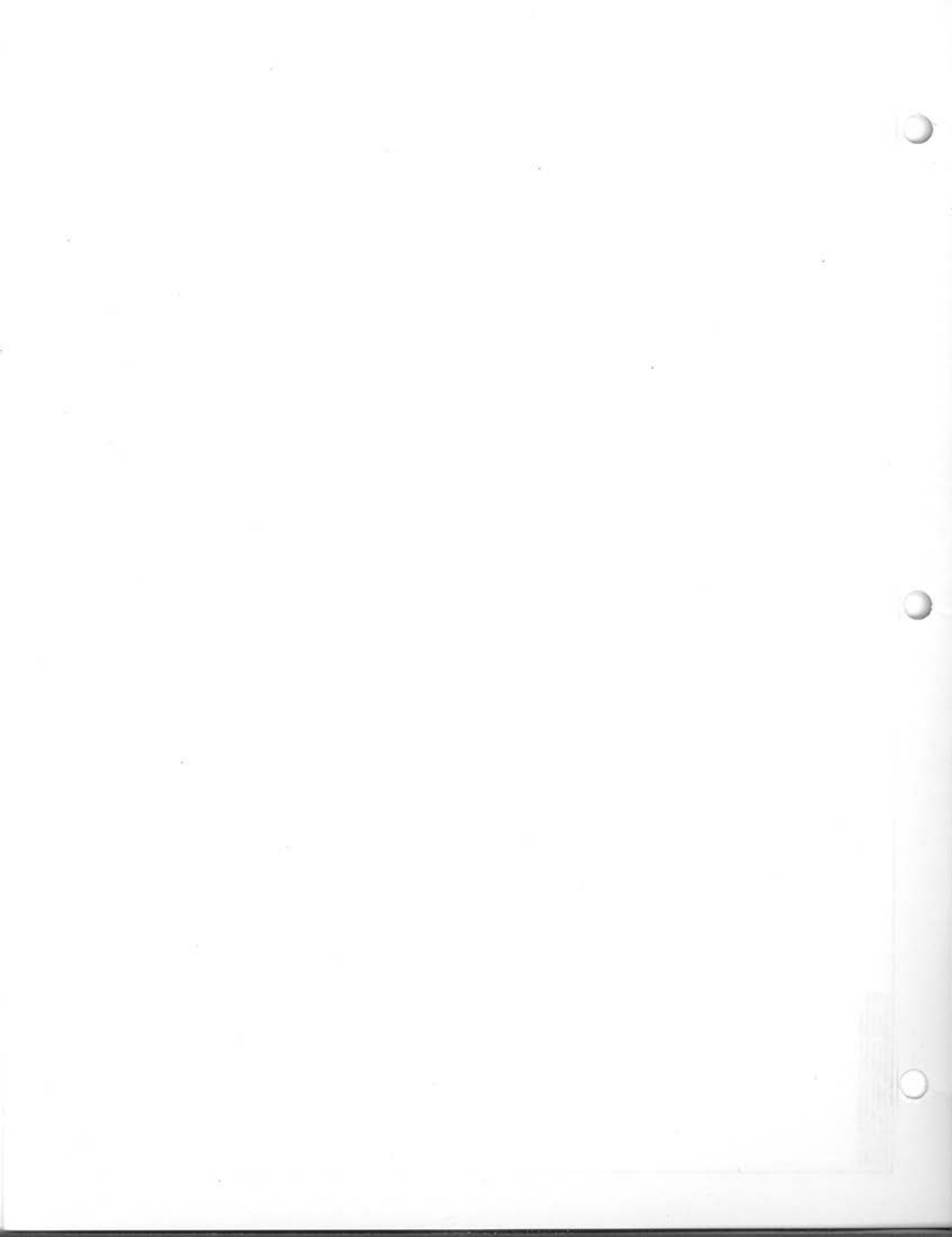
R-8504 REAR VIEW

31-111

Hold For Ref.

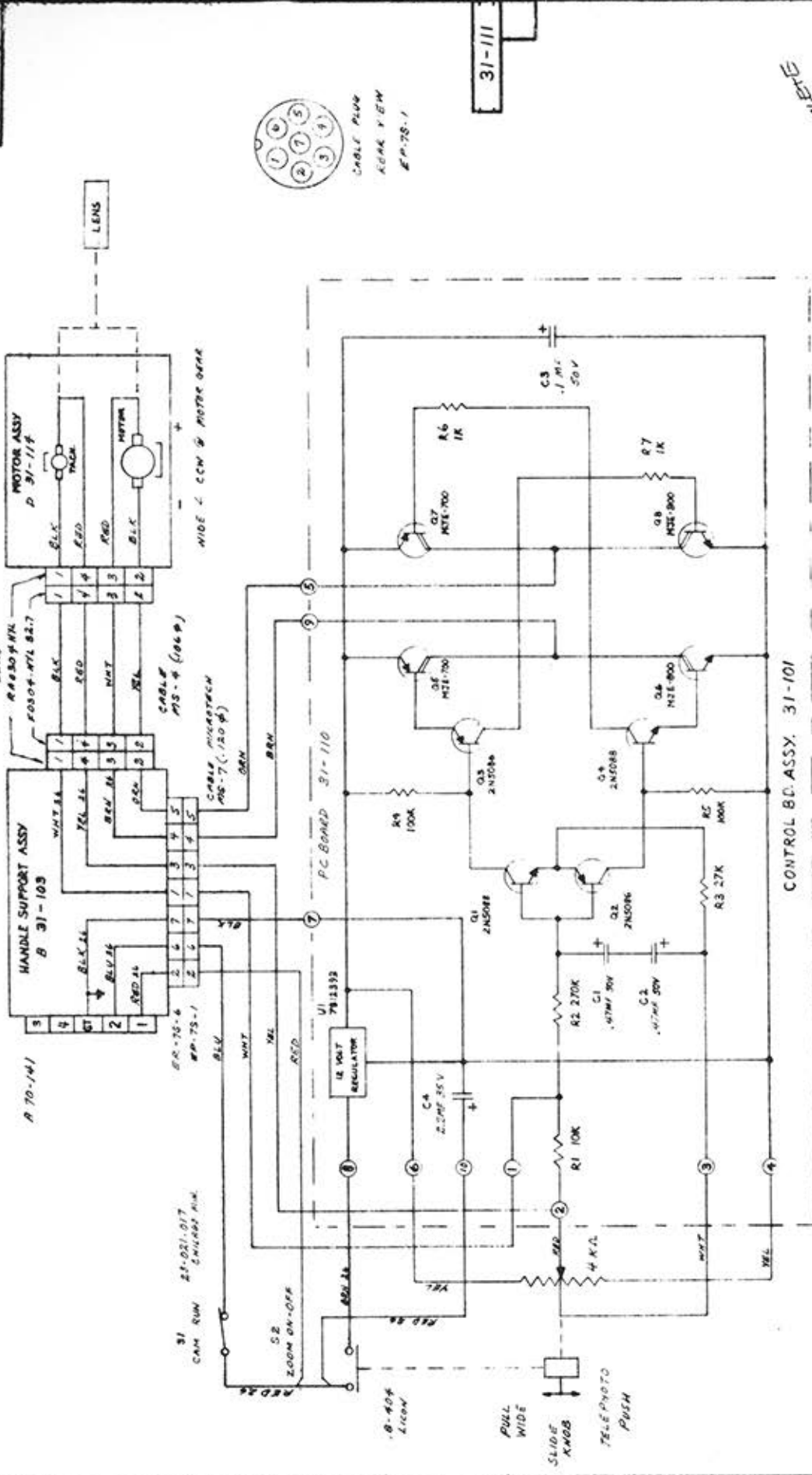
| | |
|--|---|
| DESIGNED BY | J. Lowy |
| CHECKED BY | |
| APPROVED BY | C |
| DATE | 11-1-74 |
| TITLE | SCHEMATIC - J5 ZOOM CONTROL |
| UNLESS OTHERWISE SPECIFIED TOLERANCES ARE: | 1. DIMENSIONS 5.000-5.999 FRACTIONAL 5.000 2. 1/16" - 1.999 FRACTIONAL 1/16" 3. 1/8" - 4.999 DECIMALS 1/32" 4. 5.000-9.999 DECIMALS 1/100" 5. 10.000-24.999 DECIMALS .001" 6. 25.000-99.999 DECIMALS .002" 7. 100.000-999.999 DECIMALS .005" 8. 1000.000-9999.999 DECIMALS .010" 9. 10000.000-99999.999 DECIMALS .030" 10. 100000.000-999999.999 DECIMALS .050" 11. 1000000.000-9999999.999 DECIMALS .075" 12. ALL OTHERS .100" |
| FORM | HEAT TREAT. SCALE |
| DATE | 7 MAR 75 |
| SCALE | |

6. ALL RESISTORS ARE 1/8W 5%
 7. FINISH
 8. HEAT TREAT.
 9. MATERIAL
 10. CONCENTRICITY .004 T.Y.R.
 11. BREAK SHARP EDGES .000-.002 MACHINED FILLETS .003-.008 R. NOTES: UNLESS OTHERWISE SPECIFIED.



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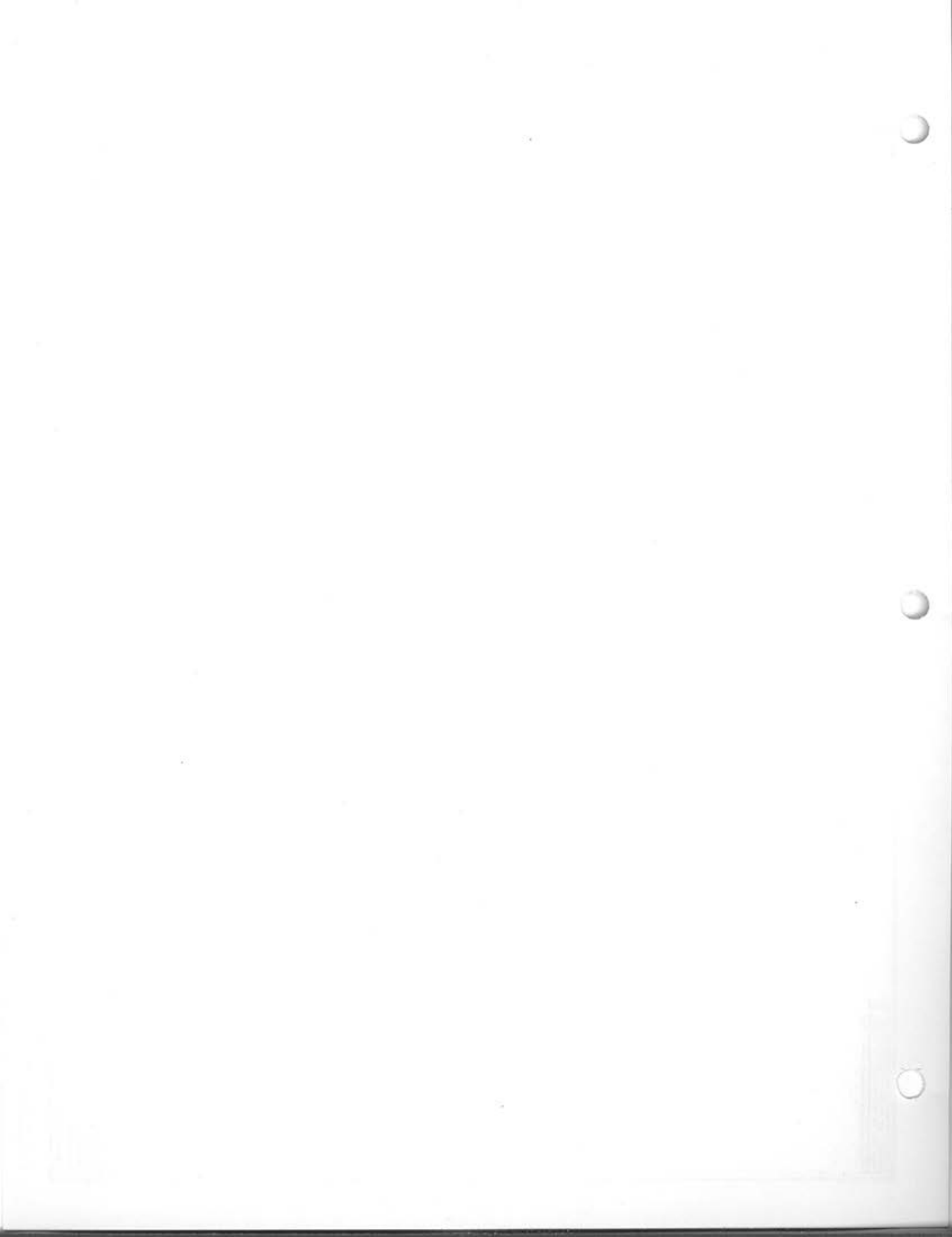
| | |
|------|------|
| REV. | DATE |
| | |
| | |
| | |



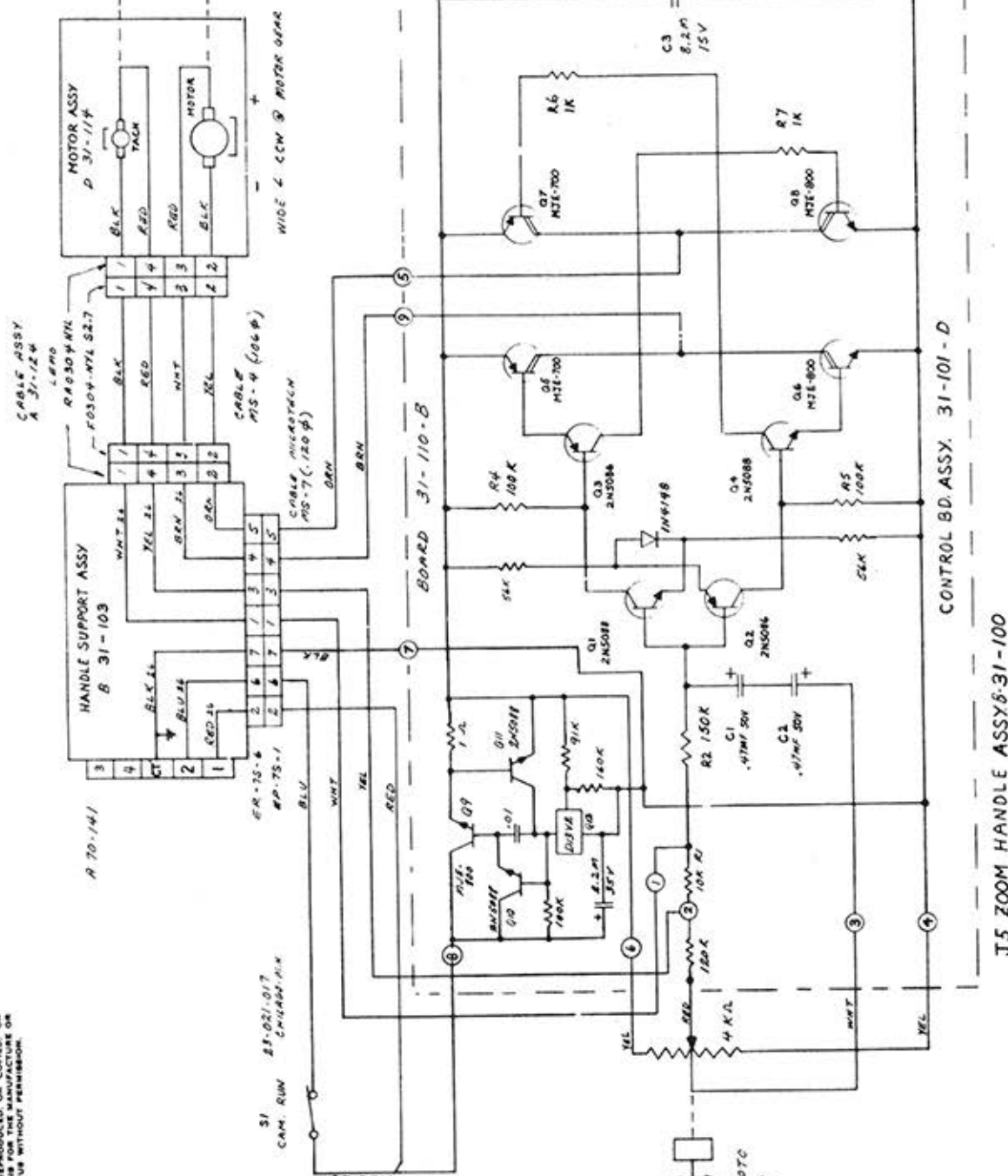
082428E

| | |
|---|-----------------|
| DESIGNED BY | J. Leary |
| CHECKED BY | |
| APPROVED BY | C |
| DATE | 31-111 |
| TITLE | |
| SCHEMATIC - | |
| J5 ZOOM CONTROL | |
| REFERENCE DOCUMENTS | |
| VALUES OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES | FRACTIONAL 1/16 |
| 1/8 PL. DECIMALS 1/32 | ANGLES 1/4 |
| 3/16 PL. DECIMALS 1/64 | MIN. PERIOD 60 |
| DATE | 7 MAR 73 |
| SCALE | |

6. ALL RESISTORS ARE 1/8W 5%
7. FINISH
8. HEAT TREAT
9. MATERIAL
10. ORIENTATION .004 T.I.R.
11. BUSHING FILLETS .008-.008 R.
12. DIMENSIONS UNLESS OTHERWISE SPECIFIED.



| REV. | CHANGE | DATE |
|------|------------------------|-------|
| A | 31-101-B -R 8/24/74 | 11-74 |
| B | | |
| C | - 8/24/74 | 3-75 |



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| | |
|---|-----------------------------|
| DESIGN BY | J. Levy |
| CHECKED BY | |
| APPROVED BY | C |
| DATE | 31-111-C |
| TITLE | SCHEMATIC - J5 ZOOM CONTROL |
| UNLESS OTHERWISE SPECIFIED TOLERANCES: 1. FRACTIONAL 2. 1/48 3. PL. DECIMALS 1. 01 2. MACH. FINISH .05 3. PL. DECIMALS 1. 009 | |
| REFERENCE DOCUMENTS | |
| REVISION | DATE 7 APR 73 |
| HEET AMT. | SCALE |
| HEET | 31-111-C |
| SHEET 1 OF 1 SHEETS | |

- 6. ALL RESISTORS ARE 1/8W 5%
- 5. FINISH: 4. HEAT TREAT; 3. MATERIAL; 2. CONCENTRICITY .004 T.I.R.; 1. BREAK SHARP EDGES .003-.005 R. MACHINED FILLETS .003-.005 R.
- NOTES: UNLESS OTHERWISE SPECIFIED.



CIRCUIT DESCRIPTION FOR CRYSTASOUND AMPLIFIER

Reference Drawing #D70-468 and D70-460

Power Supply

The NC-4 battery supplies 20 volts to pins #3 and 4 of the 12QK5M connector, which feeds the 20 volts to the camera control panel.

When the amplifier is switched on, 20 volts B is received through pin #1 of the 12QK5M connector (from the camera control panel) to the voltage regulator I.C. Q8. The voltage regulator Q8 supplies a regulated 12 volts to the amplifier B line. The relay K1 is only energized when the camera is switched on. The switchable 20 volts to relay K1 is received from pin #2 of the 12QK5M connector, via the amplifier on/off switch. The switchable 20 volts is also supplied to the amplifier bias circuit via the bias on/off switch.

Bias Oscillator

The bias oscillator circuit is composed of a toroidal transformer and a pair of transistors Q4 and Q12 (Q4 and Q12 are 2N5191s or in later models MFE800s). The drive voltage is supplied by a MFC-6030A voltage regulator whose output is controlled by transistor Q5.

Pin #7 of the toroidal transformer is connected to a bias test point. The bias test point should read approximately 70 millivolts, and is adjustable via the 50K ohm bias potentiometer.

Microphone Amplifiers

There are two 150 ohm balanced line mic inputs, which are fed to each half of I.C. Q2 respectively. Q2 is a LM1303N I.C. which is two amplifiers in one package, the gain of which is controlled by two 25K ohm controls (mic 1 and 2) respectively and are located on the control panel. The outputs of Q2 are at pins #1 and 3 respectively and are fed through the int/mixer switch to Q3 I.C. pin #6.

Record Amplifier

The record amplifier is a LM380N I.C. Q3, the input of which is pin #6. The input source to Q3 is via the internal/mixer switch. The internal switch position is the summing point for the two outputs from Q2 and a 600 ohm line input. (The level of the 600 ohm line input is controlled by a 25K ohm control located on the control panel). The mixer position is connected to pin B of the mixer connector. The mixer switch position is also bypassed by a 22 K ohm resistor to enable the operation of our Sennheiser Pre-Amp with the switch in the internal position so that the standard mic inputs can be used at the same time. The output of Q3 is at pin #8 and is fed through a equalizing network to the record head. The output of Q3 at pin #8 is also fed to the A.G.C. circuit Q1 and the earphone amplifier Q6. The earphone amplifier input is pin #8 of Q6 and its gain is controlled by a 25K ohm control marked "phone vol" located on the control panel.

DEPARTMENT OF CHEMISTRY

1

REPORT OF THE COMMITTEE ON THE PROGRESS OF CHEMISTRY

The progress of chemistry in the United States during the past year has been marked by several important discoveries and advances in various fields. The most notable of these are the discovery of the element Rutherfordium, the synthesis of the first superconductor, and the development of the first laser.

The discovery of Rutherfordium, a new element with atomic number 104, was made by a team of scientists at the Lawrence Berkeley Laboratory. This discovery is significant because it completes the first row of the periodic table and provides a new opportunity to study the properties of heavy elements.

The synthesis of the first superconductor, a ceramic material that conducts electricity without resistance at low temperatures, was achieved by a team of scientists at the IBM Research Center. This discovery has important implications for the development of new materials and devices.

The development of the first laser, a device that produces a beam of light of a single wavelength, was made by a team of scientists at the Bell Telephone Laboratories. This discovery has led to the development of many important technologies, including the laser printer and the laser light show.

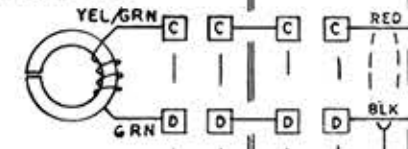
In addition to these major discoveries, there have been many other important advances in chemistry during the past year. These include the discovery of new materials, the development of new analytical techniques, and the discovery of new chemical reactions.

The progress of chemistry in the United States during the past year has been remarkable. These discoveries and advances have not only expanded our knowledge of the natural world but also have led to the development of many important technologies. We look forward to continued progress in the future.

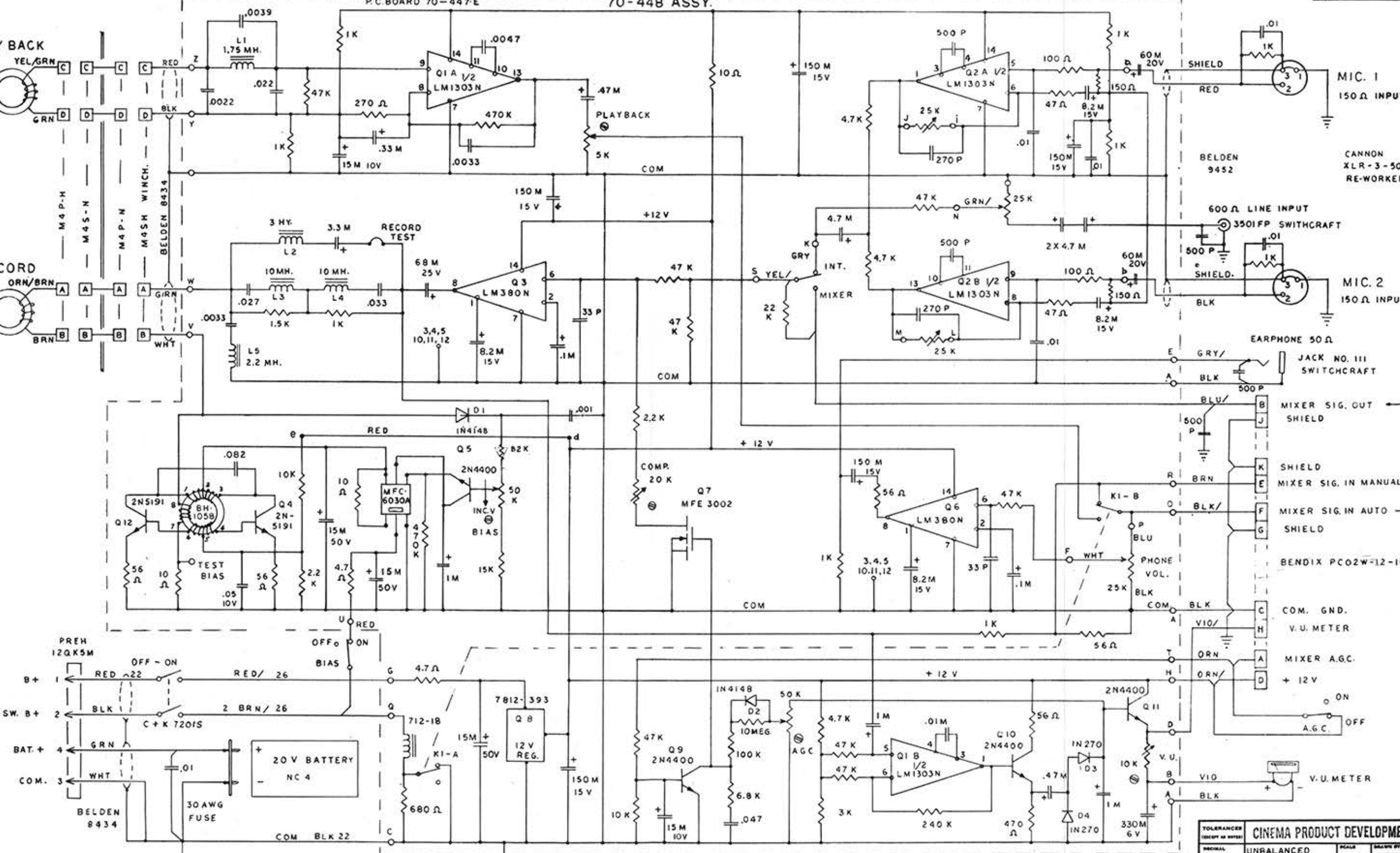
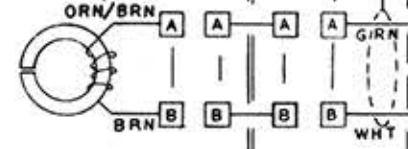
| | | | |
|------|-----|----------------------|------|
| DATE | REV | BY | CHKD |
| | A | CHOKES ADDED | |
| | B | MIC. INPUTS MODIFIED | |
| | C | 60V CAP. = 150V 50V | |

P.C. BOARD 70-447 E 70-448 ASSY.

PLAY BACK

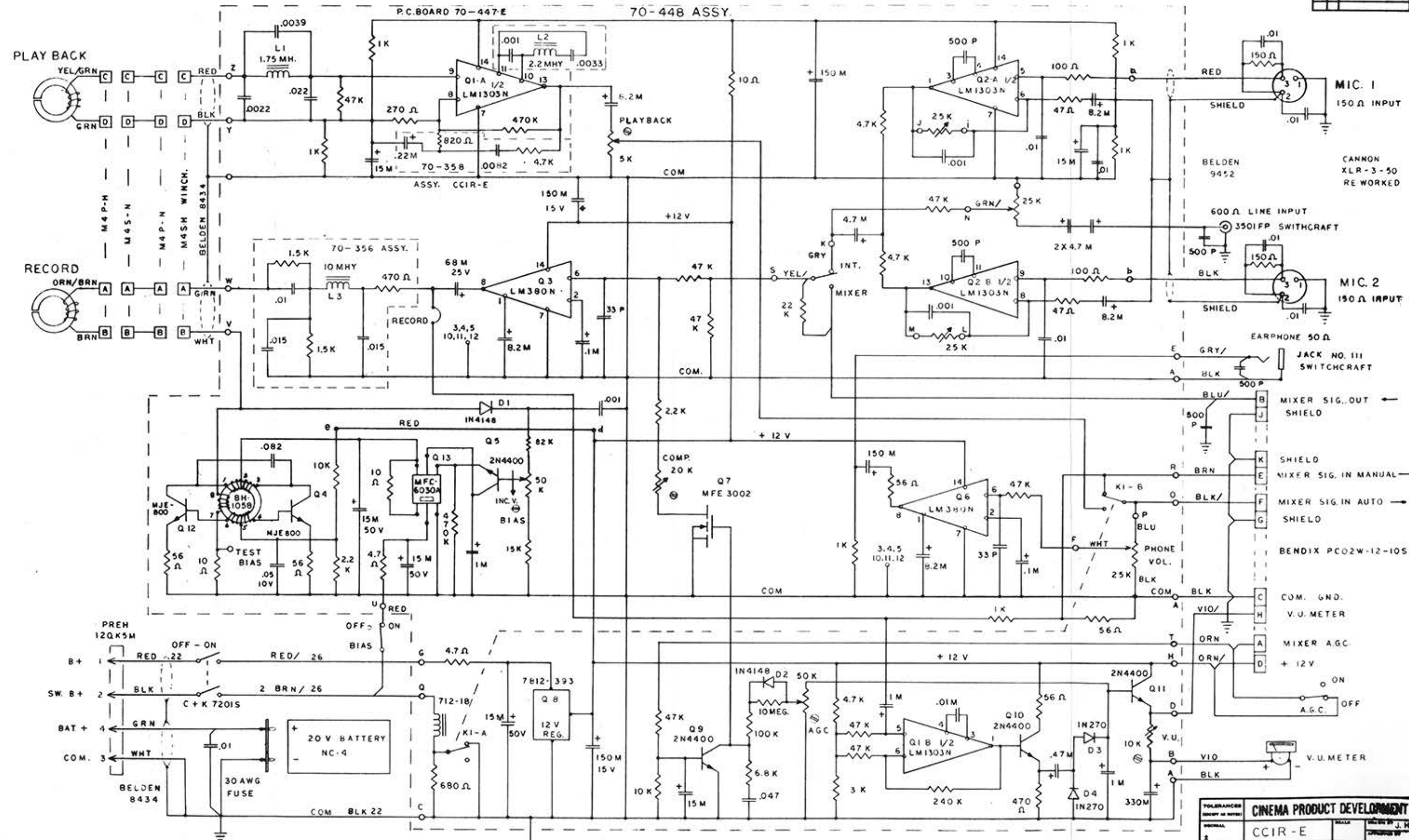


RECORD



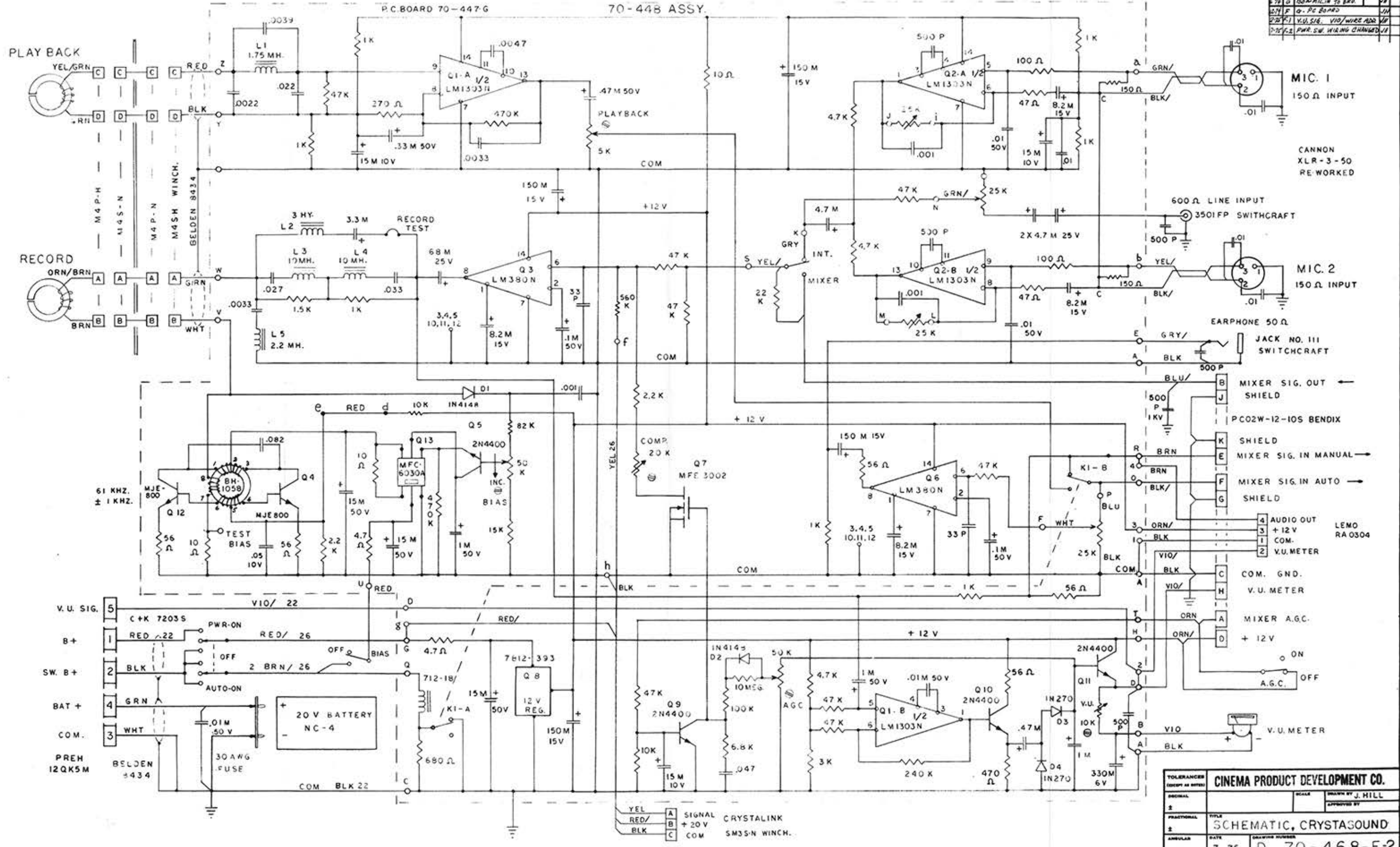
| | | | |
|------------------------------|------------------------|--------------|------------------|
| TOLERANCES (EXCEPT AS NOTED) | | | |
| RESISTORS | UNBALANCED INPUT | SCALE | DRAWN BY J. HILL |
| FRACTIONAL | TITLE | DATE | APPROVED BY |
| ANGULAR | SCHEMATIC, CRYSTASOUND | FEB 73 | |
| ± | DRAWING NUMBER | D 70-468-1-C | |

| | | |
|------|-------------|------------|
| DATE | DESIGNED BY | CHECKED BY |
| | | |



| | | |
|---|--------------------------------|---------------------|
| TOLERANCES (UNLESS OTHERWISE SPECIFIED) | | |
| RESISTORS | CINEMA PRODUCT DEVELOPMENT CO. | |
| CAPACITORS | CCIR - E | DESIGNED BY J. HILL |
| SCHEMATIC, CRYSTASOUND | | |
| DATE | REVISED BY | |
| JUL 73 | D 70-468-2 | |

| DATE | REVISION | BY | APP. NO. |
|------|----------|----|----------|
| 7-75 | A | JH | |
| 7-75 | B | JH | |
| 7-75 | C | JH | |
| 7-75 | D | JH | |
| 7-75 | E | JH | |
| 7-75 | F | JH | |
| 7-75 | G | JH | |
| 7-75 | H | JH | |
| 7-75 | I | JH | |
| 7-75 | J | JH | |



| | | |
|-------------------------------|--------------------------------|------------------|
| TOLERANCES UNLESS AS NOTED | CINEMA PRODUCT DEVELOPMENT CO. | |
| DECIMAL | SCALE | DRAWN BY J. HILL |
| FRACTIONAL | TITLE | APPROVED BY |
| ANGULAR | DATE | |
| | DRAWING NUMBER | |
| | 7-75 | D 70-468-F2 |

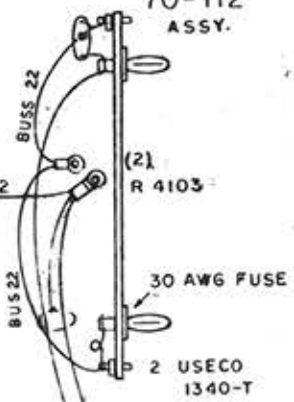
70-448 ASSY
70-447-6 P.C. BOARD.

1 PWR SWITCH CHANGED TO PWR ON-OFF WITH ON

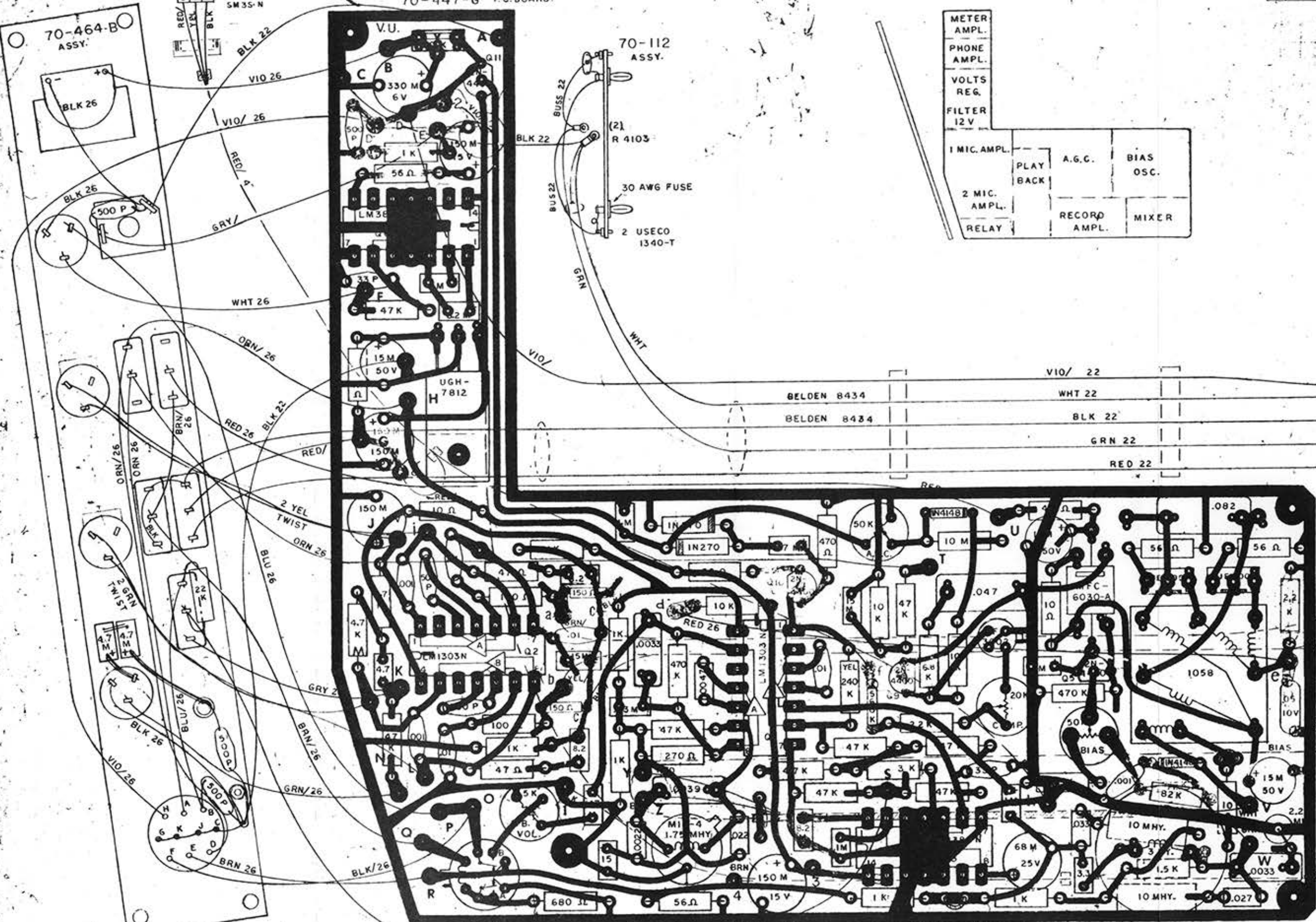
70-464-B ASSY.



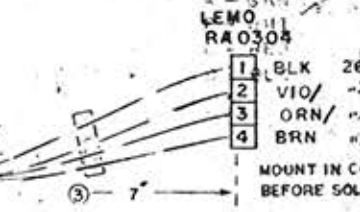
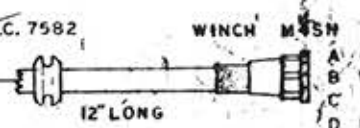
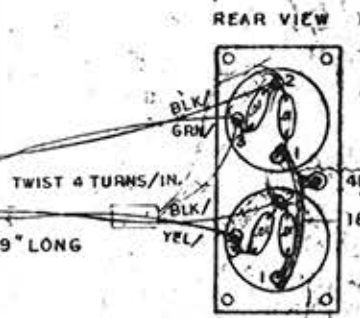
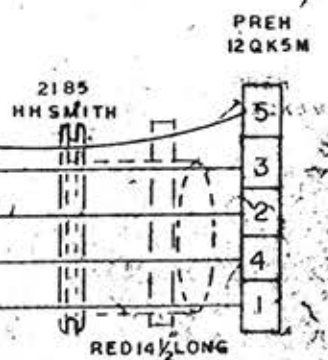
70-112 ASSY.



| | | |
|--------------|--------------|-----------|
| METER AMPL. | | |
| PHONE AMPL. | | |
| VOLTS REG. | | |
| FILTER 12V | | |
| 1 MIC. AMPL. | PLAY BACK | A.G.C. |
| 2 MIC. AMPL. | RECORD AMPL. | BIAS OSC. |
| RELAY | | MIXER |



COMPONENTS OTHER SIDE



CRYSTASOUND
RECORDING AMPLIFIER
7-75 D 70-460-1

Playback Amplifier

The output from the playback head is fed through a low pass filter and bias trap to pins #8 and 9 of I.C. LM1303N Q1. The output of Q3 is at pin #13 and goes to the playback pot located on the P.C. board. The output from the playback pot is fed to pin #6 of Q6 via K1-B relay contacts and through a 25K ohm "phone vol" control located on the control panel. The output of Q6 is at pin #8 and goes to the earphone jack (50 ohm impedance).

AGC Circuit and VU Meter Circuit

Q1 is a LM1303N and one half of it is the AGC and VU meter amplifier. The output from the record amplifier Q3 pin #8 is fed to the input of Q1 at pin #5. (AGC and VU meter amplifier). The output of Q1 is at pin #1 and is buffered by a transistor Q10. The coupling capacitor and the two 1N270 diodes rectify the output of Q10 and the signal is filtered by the capacitor on the base of Q11. Q11 buffers the DC signal to drive the VU meter. The rectified DC signal at the base of Q11 goes to the 50K ohm AGC pot. The resistor diode network on the arm of the pot sets the attack and release time of the AGC circuit. This DC signal controls the FET Q7 which acts as a voltage control resistor, shunting the input of Q3 pin #6. The 20K ohm compression pot sets the dynamic range of the AGC circuit in the AGC off switch position. Q9 and its associated circuitry clamps the FET Q7 off.

CRYSTASOUND AMPLIFIER TROUBLE SHOOTING

A. Will not record, yet monitors ok with camera off.

This condition will be caused by the absence of Bias current which could be caused by the following:

1. Bad record/play back head assmebly. This can be proved by changing the head assembly.
2. Bias switch open circuit. Check for 20 volts on both sides of bias switch.
3. 4.7 ohm resistor open circuit between point "U" and MFC-6030A.
4. No B+ output from MFC-6030A to pin 2 of BH 1058 transformer.
5. Open circuit BH 1058 transformer. Continuaty check with record/playback head disconnected.
6. Bad Q4, 5 or 12.
7. Open circuit cable or connector between points "W" or "V" on P.C. Board to record/playback head.
8. Bad capacitor .082 MFD between points 1 and 3 on BH 1058 transformer.

CRYSTASOUND AMPLIFIER TROUBLE SHOOTING

- B. Will not record and no monitor with camera off or on also V.U. meter does not register.
1. First check that this condition exists in the line input as well as both mic inputs. If ok through the line input yet will not work with mics see "C" below.
 2. Check that the int/mixer switch is in the internal position.
 3. Open circuit int/mixer switch (check for continuity between points "K" and "S" on P.C. Board).
- C. Will not record through one or both mic inputs yet is ok through the line input.
1. First make sure that the mics being used are balanced line mics as unbalanced line mics will not work unless an adaptor patch cord is used.
 2. Check that mic is ok by substituting mic.
 3. Bad I.C. Q2. (Check with a scope at pins 1 and/or 13 for output with a mic or oscillator connected at the mic inputs).
- D. Amplifier is completely dead yet camera runs ok.
1. With the amplifier power on/off switch in the on position check continuity through switch with a meter.
 2. 4.7 ohm resistor open circuit. (Check for continuity from on/off switch to the voltage regulator Q8 7812).
 3. Bad voltage regulator Q8. (Check with a meter for 12 volts B+ at point "D" or "E" on P.C. Board).
- E. Play back monitor level is low yet monitor level is good with camera off.
1. Adjust playback level potentiometer so that the playback level is the same as the monitor level when the camera is off. (The Bias control should be peaked out before this adjustment is made).
 2. Bad playback head. (Substitute record/playback head assembly should be installed and step 1 above repeated).
- F. No playback monitor level yet recorded film is good.
1. Bad playback head. (Substitute record/playback head assembly should be tried and E.1 above repeated).

CRYSTASOUND AMPLIFIER TROUBLE SHOOTING

2. Bad I.C. Q1. (With a scope check for output at pin 13 of Q1).
3. Open circuit K1-B relay contacts. (Check for continuity with a meter).

G. No earphone output in playback or monitor mode.

1. Check head set by substitution.
2. Bad I.C. Q6. (Check input pin 6 and output pin 8 with a scope).
3. Open circuit between points "F" and "P" to phone volume control.

H. No A.G.C. or V.U. Meter indication.

1. Bad I.C. Q1. (Check with a scope input and output at pins 5 and 1).
2. Bad transistor Q10 or Q11 (check with scope.)

Effective Date: May 1, 1975

CP-16R AND CP-16R/A Cameras

REPLACEMENT PARTS AND COMPONENT MECHANICAL ASSEMBLIES

| <u>Order Code</u> | <u>Part Number for Reference only</u> | <u>Description</u> | <u>List Price</u> |
|------------------------------|---------------------------------------|---|-------------------|
| <u>Reference Camera Body</u> | | | |
| 1Y100 | 70-142 | Front on/off switch housing Assembly & front handle | \$175.00 |
| 1Y101 | 70-136 | Front Handle Only | 60.00 |
| 1Y102 | 70-324 | Front on/off Switch Housing Assembly | 120.00 |
| 1Y103 | 70-139 | Handle Lock Nut | 5.00 |
| 1Y125 | 70-301 | Handle, Door Latch Assembly | 12.00 |
| 1Y126 | 70-063 | Plate | 8.50 |
| 1Y127 | 70-034 | Detent Plate | 15.00 |
| 1Y130 | 70-061 | Stop | 8.50 |
| 1Y136 | 70-254-1 | Film Guide Roller | 6.65 |
| 1Y137 | 70-216 | Film Guide Post | 8.60 |
| 1Y140 | 70-499 | Magazine Latch Cover Plate | 14.00 |
| 1Y141 | 70-057 | Retainer Plate | 20.00 |
| 1Y142 | 70-058 | Magazine Hold Down Plate | 8.50 |
| 1Y146 | 70-132 | Camera Handle (Top) | 12.00 |
| 1Y150 | 70-120 | Clutch Assembly | 120.00 |
| 1Y148 | RF-4ZZRA | Clutch Bearing (Body) | 4.00 |
| 1Y152 | 70 -100 | Magazine Take-Up Pulley | 12.00 |
| 1Y158 | 1600-045-100 | Clutch, Spring | .80 |
| 1Y162 | FA-144 (70-192) | Clutch Belt | 11.75 |
| 1Y155 | 70-041 | Facing Assembly | .75 |
| 1Y164 | 70-122 | Idler Assembly | 32.00 |
| 1Y170 | 70-121 | Counter Drive Assembly | 36.00 |
| 1Y1328 | 70-861 | Transmitting Counter | 60.00 |
| 1Y175 | 70-125 | Counter Box Assembly | 46.00 |
| 1Y176 | 70-016 | Gear, Counter | 15.00 |
| 1Y177 | 70-026 | Counter | 12.00 |
| 1Y179 | 70-027 | Reset Button | 1.00 |

Reference Control Panel Assembly - Drawing 70-751

1Y1240 70-751 Control Panel Assembly includes:
Control Panel Plate; Gasket;
Escutcheon; Rate Switch
Assembly; Battery Test Switch

CP-16R AND CP-R/A CAMERAS

| Order Code | Part Number for Reference Only | Description | List Price |
|--|--------------------------------|--|------------|
| 1Y1240 | 70-751 | (cont.) and Meter Assembly; On/Off Switch Assembly; Centerplate, Side Cover/Crystasound Connectors and Mounting Brackets; Front Switch Connector; Miscellaneous Hardware and Wiring Harness. | \$250.00 |
| 1Y1245 | 70-752 | Control Panel Ass'y (CP-16RP) | 300.00 |
| 1Y1351 | 70-725 | Plate, Control Panel | 10.00 |
| 1Y1352 | 70-772 | Gasket | 1.00 |
| 1Y1359 | 70-723 | Escutcheon (F.P.S.) | 2.60 |
| 1Y1362 | 70-724 | Knob, Speed Switch Assembly | 1.00 |
| 1Y1365 | C24C-02-038 | Spring | .50 |
| 1Y1231 | 30-808-050 | Speed (F.P.S.) Switch | 8.50 |
| 1Y1243 | 70-372 | P.C.-Board Assembly, Speed Switch | 30.00 |
| 1Y1241 | 70-757 | Battery Test Meter, Calibrated Assembly | 20.00 |
| 1Y437 | 84 | Meter | 6.00 |
| 1Y439 | 70-031 | Bracket, Battery Test Meter | 5.80 |
| 1Y428 | 46-101-R | Battery Test Switch | 3.60 |
| 1Y429 | 70-147 | Guard, Battery Test Switch | 3.80 |
| 1Y430 | 7101J-1 | On/Off Switch | 4.60 |
| 1Y432 | 7101J-1/7645-3 | On/Off Switch and Bezel | 6.00 |
| 1Y433 | 70-157 | Guard, On/Off Switch | 2.60 |
| 1Y1211 | SRM-14S-NSS | Connector, Control Panel Assembly to Crystal Drive System | 10.00 |
| 1Y426 | 60 HA 4F | Connector, Camera to Front Handgrip | 3.40 |
| 1Y421 | 61 LA 5F | Connector, Camera to Side Cover or Crystasound | 4.20 |
| 1Y1244 | 70-764-A | Terminal Board | 8.00 |
| <u>Reference Centerplate (Mid-Rib) Assembly-Drawing 70-887</u> | | | |
| 1Y226 | 70-262 | Sound Sprocket | 66.00 |
| 1Y227 | 70-261 | Knob Sound Sprocket | 12.00 |
| 1Y228 | 70-260 | Flange, Sound Sprocket | 6.00 |
| 1Y229 | 70-265/70-263 | Flywheel/Sprocket Shaft Assembly | 80.00 |
| 1Y231 | 70-286 | Bushing | 7.60 |
| 1Y232 | 70-285 | Bushing | 7.60 |
| 1Y230 | 70-177 | Sprocket Drive Gear (Large Gear) | 95.00 |
| 1Y1402 | 70-876 | Bearing Bar (Ref.) | (Ref.) |

To order: Reference the designated order code, description and unit price.

Prices and specifications subject to change without notice. Prices F.O.B. our plant Los Angeles, California.

CP-16R AND CP-16R/A CAMERAS

| <u>Order Code</u> | <u>Part Number for Reference Only</u> | <u>Description</u> | <u>List Price</u> |
|--|---------------------------------------|--|-------------------|
| 1Y237 | 70-178 | Gear | \$24.00 |
| 1Y1404 | 70-629 | Disc | 6.00 |
| 1Y1407 | 70-745 | Bearing, Oilite | 7.60 |
| 1Y239 | 70-287 | Bearing, Oilite | 7.60 |
| 1Y1409 | 70-602 | Shaft Assembly, Pulldown Arm | 45.00 |
| 1Y243 | 70-248 | Transport Claw Assembly (Pulldown Arm and Pin) | 64.00 |
| 1Y245 | 70-222 | Guide Pin (Transport Claw Assembly) | 5.00 |
| 1Y264 | 70-247 | Edge Guide Spring | 4.00 |
| <u>Reference Mid-Rib (Centerplate) Assembly-Drawing 70-888</u> | | | |
| 1Y260 | 70-206 | Film Guide Assembly | 38.00 |
| 1Y261 | 70-218 | Post Film Guide | 7.00 |
| 1Y263 | 70-225 | Spring, Film Guide Assembly | 1.40 |
| 1Y266 | 70-243 | Pressure Plate Assembly | 42.00 |
| 1Y267 | 70-246 | Lever, Pressure Plate Assembly | 5.50 |
| 1Y269 | 70-217 | Roller, Pressure Plate Lever | 1.00 |
| 1Y268 | 70-220 | Spring, Pressure Plate Lever | 3.20 |
| 1Y270 | 70-219 | Post, Pressure Plate Lever | 1.00 |
| 1Y264 | 70-247 | Film Edge Guide Spring | 4.00 |
| 1Y293 | 70-267 | Knob, Sound Head, Dummy Roller | 6.40 |
| 1Y299 | 70-407 | Retractor Clip, Sound Head | 3.00 |
| 1Y295 | 70-209 | Dummy Sound Head Roller Assembly | 60.00 |
| 1Y296 | 70-274 | Retractor Clip, Dummy Roller | 3.50 |
| 1Y302 | 70-456 | Bracket, Connector Mount | 7.00 |
| 1Y290 | 70-208 | Roller Plate Assembly | 36.00 |
| 1Y305 | 70-214 | Post, Flangeless Roller | 8.75 |
| 1Y306 | 70-213 | Roller, Flangeless | 8.60 |
| 1Y307 | 70-216 | Post, Flanged Guide Roller | 8.60 |
| 1Y308 | 70-215 | Flanged Guide Roller | 8.20 |
| 1Y309 | 70-266 | Stripper Plate | 6.00 |
| 1Y321 | 70-203 | Film Threading Instruction Plate | 1.25 |
| 1Y322 | 70-170 | Frame Rate Indicator | 1.75 |
| 1Y1418 | 70-965 | Magnetic Shield Assembly | 14.00 |
| 1Y1417 | 70-809 | Spacer for Gel Filter Holders | 2.00 |
| 1Y325 | 70-284 | Grommet | .35 |
| 1Y326 | 70-281 | Screw, Centerplate Mounting | 6.40 |

CP-16R AND CP-16R/A CAMERAS

| <u>Order Code</u> | <u>Part Number For Reference Only</u> | <u>Description</u> | <u>List Price</u> |
|--|---------------------------------------|---|-------------------|
| 1Y1415 | 70-783 | Spacer | \$ 1.50 |
| 1Y1416 | 70-784 | Terminal | 1.50 |
| 1Y225 | 139T x 1/8 | Drive Belt | 4.50 |
| <u>Reference Gearbox Assembly-Drawing 70-604</u> | | | |
| 1Y1420 | 70-741 | Mirror Shutter | 280.00 |
| 1Y1422 | 70-605 | Mirror Shaft Assembly (with mirror) | 385.00 |
| 1Y1438 | | Mirror Shaft Assembly (without mirror) | 200.00 |
| 1Y1434 | 70-743 | Gear Assembly | 140.00 |
| 1Y1421 | 70-606 | Bushing Shaft | 32.00 |
| 1Y1429 | 70-610 | Screw | 3.00 |
| 1Y1431 | 70-736 | Thrust Washer | 2.00 |
| 1Y1432 | W0 242 006S | Spring Washer | .50 |
| 1Y1425 | 70-613 | Idler Gear Assembly | 100.00 |
| 1Y1427 | 70-616 | Gear | 48.00 |
| 1Y1428 | 70-617 | Shaft | 60.00 |
| 1Y1429 | 70-610 | Screw | 3.00 |
| 1Y1431 | 70-736 | Thrust Washer | 2.00 |
| 1Y1432 | W0 242 006S | Spring Washer | .50 |
| 1Y1430 | 70-612 | Rear Cover, Ground Glass | 18.00 |
| 1Y1433 | 70-682 | Ground Glass Mount Assembly | 90.00 |
| 1Y1436 | 70-792 | Aperture Plate Assembly | (Ref.) |
| <u>Reference Lens Lock Ring Assembly-Drawing 70-619</u> | | | |
| 1Y1475 | 70-619 | Lens Lock Ring Assembly | 200.00 |
| 1Y1476 | 70-717 | Handle | 28.00 |
| 1Y1477 | 70-620 | Lens Ring | (Ref.) |
| 1Y1478 | 70-618 | Lock Ring | (Ref.) |
| <u>Reference Standard Viewer Assembly-Drawing 70-791</u> | | | |
| 1Y1503 | 70-683 | Prism Mount | 280.00 |
| 1Y1504 | 70-689 | Lens | 25.00 |
| 1Y1507 | 70-740 | Bracket, LED Mounting | inquire |
| 1Y1508 | 70-685-2 | Retainer, Prism | 4.50 |
| 1Y1509 | 70-686 | Pad, Prism Retainer | 1.00 |
| 1Y1512 | 70-694 | Mounting Nut | 24.00 |
| 1Y1513 | 70-746 | Washer, Mounting Nut | 1.00 |
| 1Y1516 | 70-789 | Lens Assembly | 100.00 |
| 1Y1517 | 70-693 | Tube Mounting-Optical Stop | 130.00 |
| 1Y1518 | 70-786 | Pad, Optical Stop | 2.00 |

To order: Reference the designated order code, description and Unit price.

Prices and specifications subject to change without notice.
Prices F.O.B. our plant Los Angeles, California.

CP-16R AND CP-16R/A CAMERAS

Reference Standard Viewer Assembly-Drawing 70-791 (Cont'd)

| <u>Order Code</u> | <u>Part Number For Reference Only</u> | <u>Description</u> | <u>List Price</u> |
|-------------------|---------------------------------------|--|-------------------|
| 1Y1520 | 70-733 | Screw | \$ 3.00 |
| 1Y1521 | 70-735 | Follower | 5.00 |
| 1Y1522 | 70-728 | Key | 5.00 |
| 1Y1524 | 70-726 | Lock Ring | 20.00 |
| 1Y1525 | 70-732 | Knob, Focus Adjust | 3.00 |
| 1Y1528 | 70-737 | Prism | 32.00 |
| 1Y1531 | 70-699-1 | Prism Retainer (lower) | 50.00 |
| 1Y1532 | 70-699-2 | Prism Retainer (upper) | 50.00 |
| 1Y1537 | 70-779 | Backlight Shutter Assembly (Dowser) | 180.00 |
| | 70-696 | Helix Sleeve | 60.00 |
| 1R236 | 70-623-2 | Fiber Optics Viewing Screen (Ground Glass) | 80.00 |
| 1Y1539 | 70-698 | Prism Housing | 130.00 |
| 1Y1311 | 70-849 | 1.500" Gage | 125.00 |
| 1Y1312 | 70-956 | 1.500" Master Block | 75.00 |
| 1Y1306 | 70-878 | Ground Glass Mirror | 15.00 |
| 1Y1307 | 70-879 | Aperture Mirror | 20.00 |
| 1Y1308 | 70-884 | Ground Glass Positioner | 75.00 |
| 1Y1315 | 70-817-4 | "Go/No Go" Lens Gage | 100.00 |
| 1Y1320 | NPN | Tool Kit | 12.00 |
| 1Y1321 | 41-039 | "C" Mount to "CP" Mount Adapter for Collimator | 125.00 |
| 1Y1322 | 61-014 | Flange Depth Gauge Fixture (1.875 Gage) | 100.00 |
| 1Y1323 | PT-102 | 1.875 Gage Contact Point | 5.00* |
| 1Y1324 | 70-1028 | 1.875 Master Block | 75.00 |
| 1Y1325 | 70-1006 | Aperture Flat Plate | 20.00 |

* There is no charge when 1Y1311 is ordered

Drive Motor Assemblies and Components - Drawing 70-760

| | | | |
|--------|--------|---|--------|
| 1Y1101 | 70-760 | <u>Crystal Drive System</u> includes: Servo Drive Board Assembly; Choke; Connector; Lugs; Motor Assembly; Optical Tach Assembly. | 875.00 |
| 1Y361 | 70-311 | <u>Drive Motor Assembly</u> includes: C28775 Motor; Pulse Disc/Motor Pulley Assembly; Motor Plate Assembly. | 125.00 |

To order: Reference the designated order code, description and unit price.

Prices and specifications subject to change without notice.
Prices F.O.B. our plant Los Angeles, California.

CP-16R AND CP-16R/A CAMERAS

Drive Motor Assemblies and Components - Drawing 70-760 (Cont'd)

| <u>Order Code</u> | <u>Part Number For Reference Only</u> | <u>Description</u> | <u>List Price</u> |
|-------------------|---------------------------------------|---|-------------------|
| 1Y361 | 70-311 | Drive Motor Assembly includes: C28775 Motor; Pulse Disc/Motor Pulley Assembly; Motor Plate; Wiring Harness. | 125.00 |
| 1Y386 | 7043-010 | Crystal Oscillator Assembly | 150.00 |
| 1Y363 | 70-005-1/SE2450-2 | LED Assembly | 8.00 |
| 1Y362 | 70-005-1/MRD-604 | Photo Transistor | 8.00 |

Capacitors

| | | | |
|--------|------------|-------------------|------|
| 1Y115 | DD101 | 110P | .75 |
| 1Y372 | DD102 | .001M-50V | .75 |
| 1Y371 | DD501 | 500P | .75 |
| 1Y379 | UK50-103 | .01M-50V | 1.40 |
| 1Y381 | UK20-503 | .05M-20V | 1.50 |
| 1Y380 | UK10-503 | .05M-10V | 1.40 |
| 1Y373 | KR1W-50K | .1M-50V | 2.25 |
| 1Y374 | KR47W-50K | .47M-50V | 2.50 |
| 1Y375 | K1W-50K | 1M-50V | 2.25 |
| 1Y376 | K8R2W15K | 8.2M-15V | 2.25 |
| 1Y377 | K22W6K | 22M-6V | 2.25 |
| 1Y531 | K4R7W25K | 4.7M-25V | 2.25 |
| 1Y539 | CK05BX333K | .033M | 1.80 |
| 1Y382 | MTP127M030 | 120M-30V | 8.25 |
| 1Y383 | TAC225K010 | 2.2M-10V | 2.25 |
| 1Y1608 | CK05BX273K | Capacitor .027mf | 1.40 |
| 1Y1609 | CK05BX823K | Capacitor .082 mf | 1.40 |
| 1YL233 | K2R2W50K | Capacitor 2.2 mf | 2.50 |
| 1Y533 | K68E25K | Capacitor 68 mf | 4.25 |

Integrated Circuit

| | | | |
|--------|----------|--------------------|-------|
| 1Y1151 | 749PC | I.C. | 10.00 |
| 1Y391 | CD4020AE | I.C. | 23.75 |
| 1Y1152 | CD4001AE | I.C. | 3.60 |
| 1Y392 | CD4011AE | I.C. | 3.85 |
| 1Y1153 | CD4023AE | I.C. | 3.80 |
| 1Y1154 | D13V1 | I.C. | 1.80 |
| 1Y1610 | CD4011AK | Integrated Circuit | 12.00 |
| 1Y1611 | CD4018AK | Integrated Circuit | 26.00 |
| 1Y1601 | MC1458CF | Integrated Circuit | 3.00 |
| 1Y1602 | 741TC | Integrated Circuit | 4.00 |
| 1Y1563 | 70-963 | Hybrid Circuit | 35.00 |
| 1Y1564 | 70-964 | Hybrid Circuit | 30.00 |

To order: Reference the designated order code, description and unit price.

Prices and specifications subject to change without notice.
Prices F.O.B. our plant Los Angeles, California.

CP-16R AND CP-16R/A CAMERA

Transistor

| <u>Order Code</u> | <u>Part Number For Reference Only</u> | <u>Description</u> | <u>List Price</u> |
|-------------------|---------------------------------------|--------------------|-------------------|
| 1Y1166 | 2N4400 | Transistor | \$ 1.80 |
| 1Y397 | 2N4403 | Transistor | 3.25 |
| 1Y1167 | 2N5088 | Transistor | 2.20 |
| 1Y1168 | 2N5086 | Transistor | 2.00 |
| 1Y1169 | MTT3904 | Transistor | 3.00 |
| 1Y1171 | MRD-604 | Transistor | 5.00 |
| 1Y395 | D45C6 | Transistor | 3.60 |

Potentiometers

| | | | |
|--------|--------|----------------|------|
| 1Y1186 | 62PR1K | Potentiometers | 6.00 |
| 1Y1187 | E086BC | Potentiometers | 6.00 |

Diodes

| | | | |
|--------|---------|---------------------|------|
| 1Y404 | 1N4148 | Diodes | 1.00 |
| 1Y1196 | MLED90 | Diodes | 9.00 |
| 1Y405 | 1N4001 | Diodes | 1.60 |
| 1Y560 | 1N270 | Diodes | 1.85 |
| 1Y1603 | SSL-212 | LED Visible | 2.00 |
| 1Y1604 | MV-50 | LED Visible | 1.75 |
| 1Y1613 | LLL9A-1 | LED Visible (Bloop) | 2.00 |

Choke

| | | | |
|-------|---------|-------|-------|
| 1Y408 | EA-005A | Choke | 20.00 |
|-------|---------|-------|-------|

Voltage Regulator

| | | | |
|-------|------------|-------------------|------|
| 1Y412 | MFC-6030-A | Voltage Regulator | 4.85 |
|-------|------------|-------------------|------|

Connectors

| | | | |
|--------|---------------------|--|-------|
| 1Y1211 | SRM-14S-NSS | Control Panel Assembly to Motor Drive System | 10.00 |
| 1Y1213 | SRM-14PNSS | Control Panel | 9.00 |
| 1Y426 | 60 HA 4F | Camera to Front Handgrip | 3.40 |
| 1Y421 | 61LA5F | Camera to Side Cover/ Amplifier | 4.20 |
| 1Y447 | SM3SN | Crystalink Connector (in amp) | 8.50 |
| 1Y370 | 60 HA 4F (modified) | Pilot Tone Connector | 5.50 |

Switches

| | | | |
|--------|----------------|----------------------------------|------|
| 1Y1231 | NPN 30-808-050 | FPS Rate (Control Panel) | 8.50 |
| 1Y430 | 7101J-1 | On/Off (Control Panel) | 4.60 |
| 1Y432 | 7101J-1/7465-3 | On/Off and Bezel (Control Panel) | 6.00 |

CP-16R AND CP-16R/A CAMERA

Switches (Cont'd)

| <u>Order Code</u> | <u>Part Number For Reference Only</u> | <u>Description</u> | <u>List Price</u> |
|-------------------|---------------------------------------|------------------------------------|-------------------|
| 1Y433 | 70-157 | Guard On/Off (Control Panel) | 2.60 |
| 1Y428 | 46-101-R | Battery Test (Control Panel) | 3.60 |
| 1Y429 | 70-147 | Guard Battery Test (Control Panel) | 3.80 |
| 1Y434 | J4004 | On/Off Front | 12.50 |
| 1Y1607 | 23-021-125 | Switch, 50-60 HZ | 6.00 |

Meter

| | | | |
|--------|--------|----------------------------|-------|
| 1Y1241 | 70-757 | Meter Calibration Assembly | 20.00 |
| 1Y437 | 84 | Battery Test Meter | 6.00 |
| 1Y439 | 70-031 | Bracket, Battery Meter | 5.80 |

Hardware

| | | | |
|--------|----------|----------------------------|------|
| 1Y1256 | 70-764-A | Terminal Board (Sync Lamp) | 8.00 |
| 1Y882 | 1413-6 | Lug | |
| 1Y580 | 2185 | Grommet | .40 |

Battery

| | | | |
|--------|--------------|--------------------------|-------|
| 1Y1271 | 1100-001-139 | Battery, Footage Counter | 18.00 |
|--------|--------------|--------------------------|-------|

Capacitors

| | | | |
|-------|------------|----------|------|
| 1Y373 | KR1W50K | .1m-50V | 2.25 |
| 1Y529 | KR33W50K | .33M-50V | 1.05 |
| 1Y374 | KR47W50K | .47M-50V | 2.50 |
| 1Y375 | K1W50K | 1M-50V | 2.25 |
| 1Y530 | K3R3W25K | 3.3M-25V | 4.50 |
| 1Y531 | K4R7W25K | 4.7M-25V | 2.25 |
| 1Y376 | K8R2W15K | 8.2M-15V | 2.25 |
| 1Y532 | K15W10K | 15M-10V | 2.25 |
| 1Y378 | K15E50K | 15M-60V | 4.25 |
| 1Y533 | K68E25K | 68M-25V | 4.25 |
| 1Y534 | K150E15K | 150M-15V | 4.25 |
| 1Y535 | K330E6K | 330M-6V | 4.00 |
| 1Y525 | 65F10AA332 | .0033M | 1.60 |
| 1Y370 | 65F10AA392 | .0039M | 1.50 |
| 1Y526 | 65F12AA473 | .047M | 2.65 |
| 1Y527 | 65F13AC823 | .082M | 1.80 |
| 1Y538 | CK05BX222K | .0022M | 1.20 |
| 1Y540 | CK05BX472K | .0047M | 2.20 |
| 1Y536 | CK05BX223K | .022M | 1.80 |
| 1Y537 | CK05BX272K | .027M | 2.40 |
| 1Y539 | CK05BX333K | .033M | 1.80 |
| 1Y528 | DD 330 | 33P | 1.80 |

CP-16R AND CP-16R/A CAMERA

| <u>Order Code</u> | <u>Part Number For Reference Only</u> | <u>Description</u> | <u>List Price</u> |
|----------------------------|---------------------------------------|------------------------------------|-------------------|
| 1Y371 | DD 500 | 500P | .75 |
| 1Y372 | DD 102 | .001M | .75 |
| 1Y379 | UK50103 | .01M-50V | 1.40 |
| 1Y380 | UK10503 | .05M-10V | 1.40 |
| <u>Integrated Circuits</u> | | | |
| 1Y544 | LMT303N | I.C. | 8.50 |
| 1Y545 | LM380N | I.C. | 8.50 |
| <u>Transistors</u> | | | |
| 1Y548 | MJE800 | Transistor | 4.65 |
| 1Y396 | 2N4400 | Transistor | 2.00 |
| 1Y549 | MFE-3002 | Transistor | |
| <u>Potentiometers</u> | | | |
| 1Y400 | 53-1-1-503 | 50 ohm Pot. | 4.00 |
| 1Y552 | 53-1-1-502 | 50 ohm Pot. | |
| 1Y553 | 53-1-1-203 | 20 ohm Pot. | 6.00 |
| 1Y554 | E086BC/10K | 10 ohm Pot. | 1.20 |
| 1Y556 | 25K ohm | Potentiometer Rework (70-442-2) | 4.00 |
| <u>Diodes</u> | | | |
| 1Y560 | 1N270 | Diode | 1.85 |
| 1Y404 | 1N4148 | Diode | 1.00 |
| <u>Voltage Regulators</u> | | | |
| 1Y412 | MFC-6030A | V.R. | 4.85 |
| 1Y569 | UGH-7812 393 | V.R. | |
| <u>Relay</u> | | | |
| 1Y570 | 712-18 | Relay | 4.00 |
| <u>Transformer</u> | | | |
| 1Y573 | BH1058 | Transformer | 18.00 |
| <u>Hardware</u> | | | |
| 1Y576 | 1340T | Terminal Standoff | .30 |
| 1Y579 | 7582 | Grommet | .40 |
| 1Y580 | 2185 | Grommet | .40 |
| 1Y583 | 9452 | Cable (nine inches) | 1.00 |
| 1Y585 | R4103 | Lug | .20 |
| 1Y578 | S 048-4 | Bristol Key | |
| <u>Connectors</u> | | | |
| 1Y590 | 3501FP | Phono Connector | .60 |
| 1Y591 | 111 | Jack | .60 |
| 1Y592 | 70-454-1 | Connector | 12.00 |
| 1Y593 | 70-459 | Microphone Connector Assembly | 28.00 |
| 1Y594 | 70-112 | Battery Plug Assembly | 3.60 |

CP-16R AND CP-16R/A CAMERA

| <u>Order Code</u> | <u>Part Number For Reference Only</u> | <u>Description</u> | <u>List Price</u> |
|---|---------------------------------------|------------------------------|-------------------|
| <u>Switches</u> | | | |
| 1Y597 | 7101M | Switch (Bias; Mode) | 4.40 |
| 1Y598 | 7101S | Switch (AGC) | 4.40 |
| 1Y599 | 7201S | Switch (Amplifier on/off) | 5.00 |
| <u>Mechanical Parts</u> | | | |
| 1Y477 | 70-161 | Guard | 3.00 |
| 1Y478 | 70-010 | Cover, Battery Compartment | 6.25 |
| 1Y483 | 70-309 | Cover | (Ref.) |
| 1Y603 | 70-431 | Bracket Mount; VU Meter | 6.00 |
| 1Y606 | 70-446 | Shield | 24.00 |
| 1Y610 | 70-457 | Knob | 6.20 |
| 1Y611 | 70-433 | Plate | 12.80 |
| 1Y612 | 70-458 | Stud, Panel Mount | 2.40 |
| 1Y613 | 70-444 | Plate, Light Trap | 2.65 |
| 1Y614 | 70-426 | Face Panel | 7.25 |
| 1Y616 | 70-363 | Shield Bias Oscillator | 3.20 |
| <u>Replacement Parts Auxiliary Side Cover</u> | | | |
| 1Y475 | 70-323 | Connector, Modification | 4.00 |
| 1Y476 | 70-112 | Plug Assembly | 3.60 |
| 1Y477 | 80-161 | Guard | 3.00 |
| 1Y478 | 70-010 | Cover Battery | 6.25 |
| 1Y479 | M4SH | Connector; To Record System | 4.50 |
| 1Y480 | 120K5M | Connector; Power to Body | 2.00 |
| 1Y481 | 8434 | Cable | 1.00 |
| 1Y482 | R4142SF | Lug, Red | .30 |
| 1Y483 | 70-309 | Cover (Reference Only) | (Ref.) |
| <u>PLC-4 Magazine</u> | | | |
| 1Y751 | 88-011 | Light Trap | 6.50 |
| 1Y750 | 88-024 | Toe | 3.00 |
| 1Y757 | 88-006 | Knob | 1.25 |
| 1Y762 | 88-012 | Hub | 24.00 |
| 1Y761 | 88-018 | Roller Plate | 12.50 |
| 1Y753 | 88-021 | Shaft | 4.40 |
| 1Y754 | 83-181 | Screw | .40 |
| 1Y760 | 88-022 | Spring Roller | 9.00 |
| 1Y759 | 88-023 | Fixed Roller | 6.00 |
| 1Y756 | 88-020 | Guide Roller | 3.00 |
| 1Y752 | 88-001 | Pulley | 7.35 |
| 1G190 | 70-055 | Stud | 2.50 |
| 1G192 | 88-052 | Core Adapters | 9.00 |
| 1Y770 | 88-064 | Housing, assembled | 78.00 |
| 1Y771 | 88-059(-1 Front -2 Rear) | Door Assembly, Less hinge | 42.00 |
| 1Y772 | 88-027 | Hinge | 35.00 |
| 1Y769 | NPN | Update Kit for PLC-4 Latches | N/C |

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