

KONICA FS-1

Similar models: FC-1 (FC-1 does not have built-in power winder)

Batteries: 4 ea. AA-size (negative ground)

Fig. 1—front view, adjustments

Fig. 2—bottom cover removed

Fig. 3—top cover removed

Fig. 4—top view — AE amplifier

Fig. 5—top view — motor-drive amplifier

Fig. 6—front view — lens-mounting ring removed

Fig. 7—top view — LED display and flex connector

Fig. 8—top view — AE amplifier removed

Fig. 9—mirror box and shutter — back view

Fig. 10—mirror box — rewind side

Fig. 11—shutter removed

Fig. 12—mirror box, wind side

Fig. 13—mirror box, bottom view with mirror motor removed

Fig. 14—mirror motor, bottom view

Fig. 15—mirror motor, side view

Fig. 16—top-cover circuit board removed

Fig. 17—AE amplifier flex

Fig. 18—diaphragm-driving gears, timing

Fig. 19—old-style hybrid IC

Fig. 20—new-style hybrid IC

Fig. 21—wiring pictorial, AE amplifier

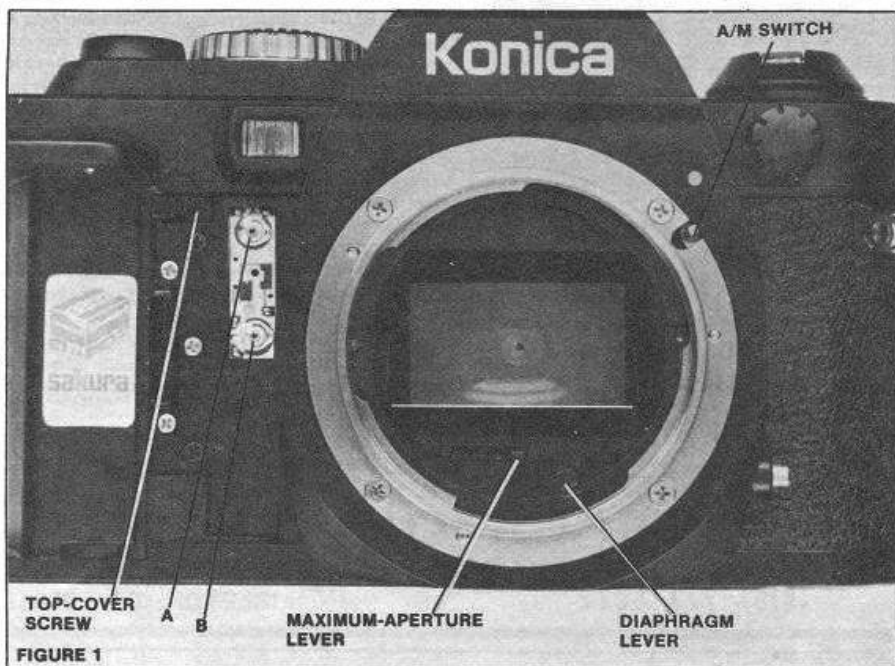


FIGURE 1

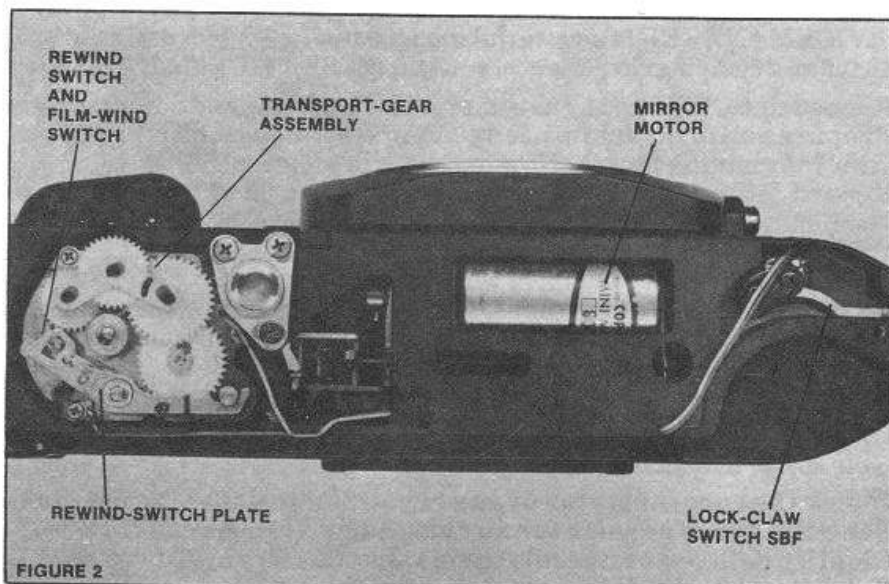


FIGURE 2

Fig. 22—wiring pictorial, motor-drive amplifier

Fig. 23—wiring pictorial, connecting flex

Fig. 24—top-cover circuit-board terminals

Fig. 25—timing, film-wind switch

ADJUSTMENT LOCATIONS:
 Constant voltage (V02): A
 Auto exposure B
 A/D converter, slope C*
 A/D converter, start voltage D*
 Travel time, first curtain E
 Travel time, second curtain F
 Maximum-aperture resistor G

*Do not disturb.

Note: Some cameras have a third variable resistor on the resistor board (between A and B, Fig. 1). This resistor has no connection in the circuit.

ADJUSTMENT VALUES:

Curtain-travel time: 5.85-6ms (20mm distance) — Copal EM-575 shutter
 Flange-focal distance: 40.66 ± 0.02 mm (flange to pressure-plate rails)

Finder focus: 40.54 ± 0.02 mm
 Flash speed: 1/100
 V02 constant voltage: 2.795 - 2.805V

ADJUSTMENT SEQUENCE:

1. Set the V02 constant voltage by measuring the voltage between ground and the wiper of A, Fig. 1, with the release button partially depressed. Adjust for 2.795 - 2.805V.
2. Check the EV at three light-level/shutter-speed combinations:

EV	Shutter-speed setting	Diaphragm readout
9	1/60	f/2.8
12	1/125	f/5.6
15	1/250	f/11

Adjust B, Fig. 1, for 0 EV error; there is no separate adjustment for the LED readout. If the diaphragm does not track properly (nonlinear) at different light levels, check the diaphragm ring, Fig. 6, for freedom of movement.

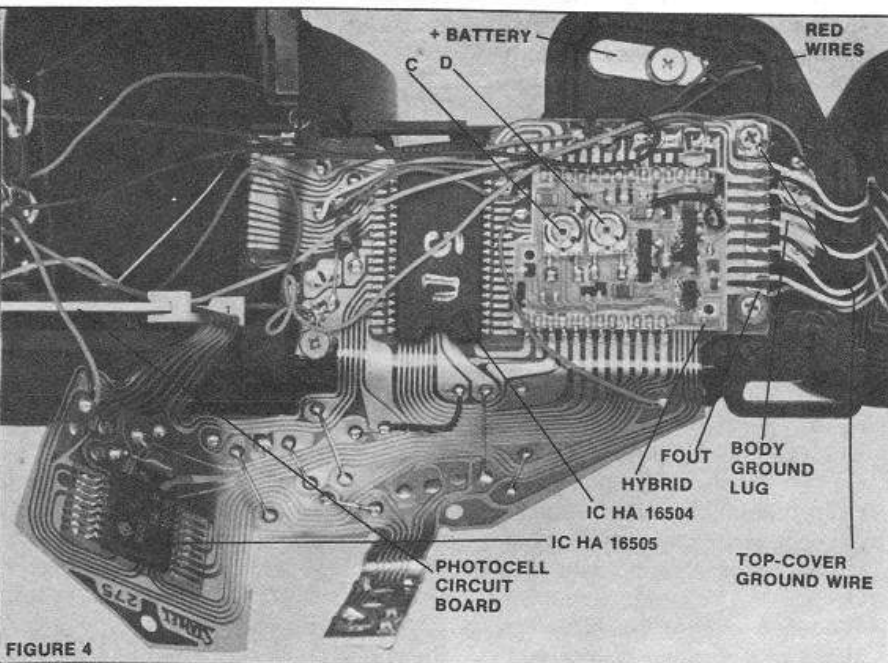
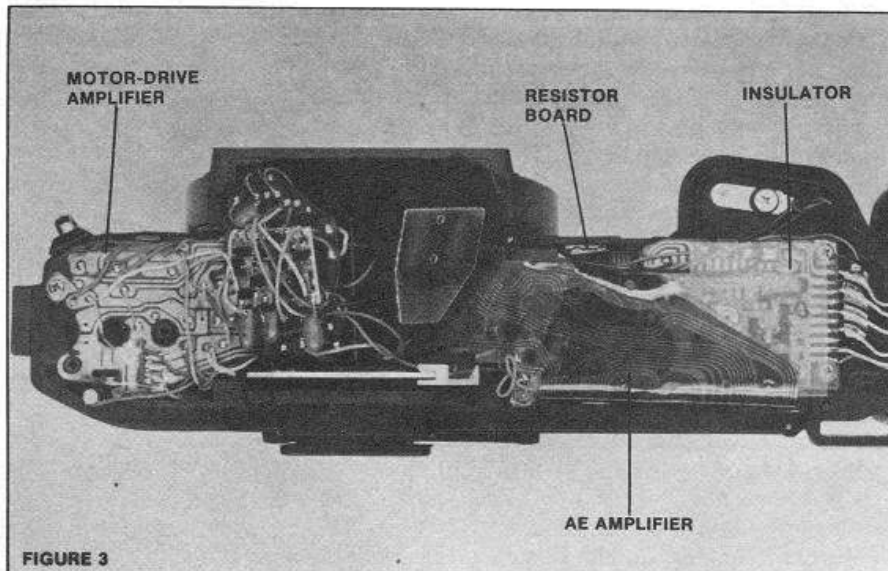
ADJUSTMENTS NOT NORMALLY REQUIRED:

Maximum-aperture resistor. Check the adjustment if you replace the part. Improper adjustment causes inaccurate diaphragm openings and incorrect diaphragm readout with different lenses. To adjust, connect a 2.85V DC power supply between the violet wire of the maximum-aperture resistor, Fig. 13, and ground. Then measure the voltage between the pink wire and ground. Set the variable resistor for a voltage drop of $1V \pm 10$ mv.

OPERATION, GENERAL:

Auto Exposure

1. The camera automatically controls the diaphragm opening (shutter-speed priority) at the AE setting of the lens. When you depress the release button part way, switch S1 (in the top cover) closes to turn on the LED display.



2. When S2 closes, the circuit energizes the release magnet, Fig. 10, which repels its armature. The armature withdraws a lock pin from the diaphragm ring, Fig. 6; now the lens diaphragm starts turning the diaphragm ring in a clockwise direction. Also, the release-magnet armature strikes the mirror-release lever, Fig. 10. The mirror sector gear, Fig. 10, rotates clockwise and drives the mirror to the raised position.
3. As the diaphragm ring rotates,

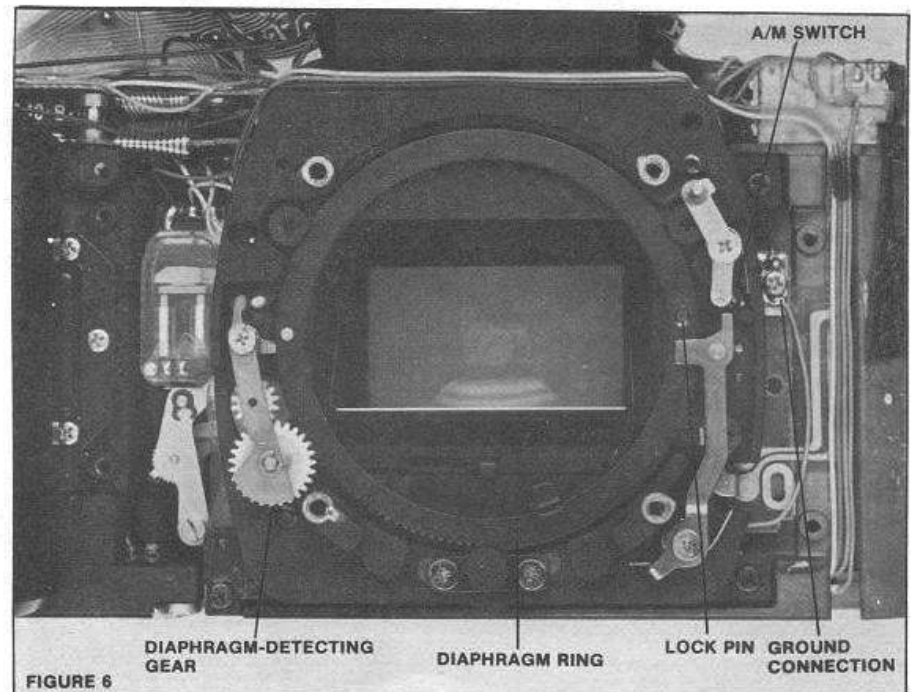
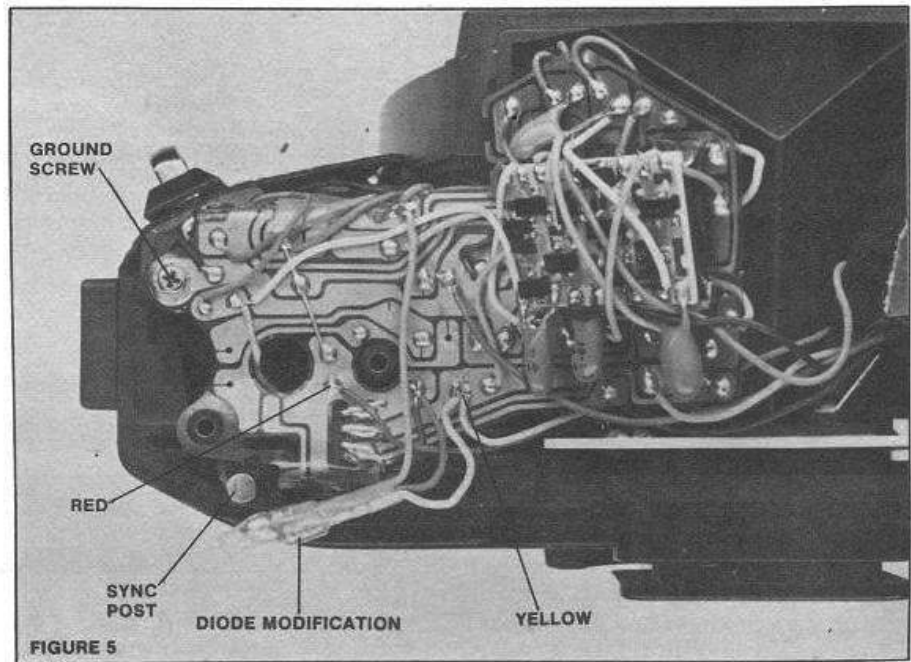
- it drives the diaphragm-detecting gear, Fig. 6. The diaphragm-detecting gear controls the F-sensor, Fig. 12. In the F-sensor, a disc with a series of openings rotates between a light-emitting diode and a phototransistor. When an opening in the disc uncovers the LED, the phototransistor provides an on pulse. The digital pulse train from the phototransistor tells the circuit how far the diaphragm has closed.
4. When the diaphragm reaches the proper aperture, the circuit shuts off the aperture-stop magnet, Fig. 12. The aperture-stop mag-

net releases its armature, allowing the stop pawl to arrest the stop gear, Fig. 12. Now the diaphragm ring stops at the proper aperture.

5. The magnets on the shutter, Fig. 11, control the two curtains. Turning on the first-curtain magnet releases the first curtain. The shutter remains open until the circuit turns on the second-curtain magnet to release the second curtain. When the second curtain completes the exposure, its lug closes the rear-blade information switch SMM1, Fig. 12.
6. Closing SMM1 turns on the mirror motor, Fig. 10. The mirror motor now drives the diaphragm ring counterclockwise to the starting position; the black gear on the mirror motor, Fig. 14, moves up and engages the diaphragm-detecting gear to return the diaphragm ring. Also, the mirror motor charges the shutter and the mirror; the mirror-charge gear, Fig. 10, drives the mirror gear sector counterclockwise to charge the mirror, and the charge lever in the mirror-motor assembly actuates the shutter-cocking lever. With the shutter cocked, the rear-blade information switch opens. But the mirror motor runs as long as the mirror-motor switch SMM2, Fig. 15, remains closed. SMM2, controlled by a cam inside the motor assembly, and SMM1 connect in parallel — the mirror motor runs when either switch is closed.

7. The AE amplifier, Fig. 4, determines the proper f/stop and controls the magnets and LEDs. The circuit uses three ICs and a hybrid:

- HA 16506 — amplifier for the gallium photodiode located on the photocell circuit board, Fig. 14; if defective, replace the complete AE amplifier flex.
- HA 16505 — receives the signal from the photocell amplifier and provides the Fout (f/stop information out) signal to the CPU; if defective, you can replace either the IC or the complete AE amplifier flex.
- HA 16504 — amplifier for the gallium photodiode located on the photocell circuit board,

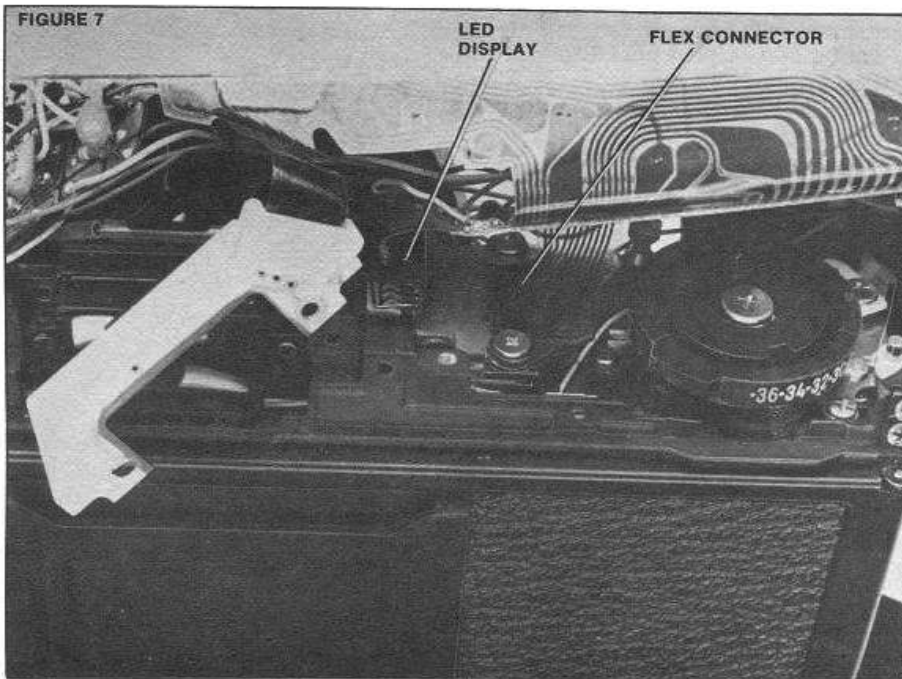


- Fig. 4; if defective, replace the complete AE amplifier flex.
- Hybrid IC — provides the switching transistors and out-board capacitors, Fig. 4; if defective, replace the complete AE amplifier flex (although you can make repairs to the hybrid by using discrete components as described under, "Repairing the Hybrid").

Film Advance

1. The film-transport motor MF is in the take-up chamber; the outer shell of the transport motor serves as the take-up spool. After the mirror returns, a relay mounted to the motor-drive amplifier, Fig. 3, turns on the transport motor. The transport motor then drives the sprocket through the gear train at the bottom of the camera, Fig. 2. The film-wind switch, Fig. 2, shuts off the relay after one frame has been advanced.

2. The auto load automatically threads the leader when you close the camera back. Opening the camera back causes the back latch, Fig. 2, to open the lock-claw switch SBF to keep the transport motor from running. When you close the back, SBF closes and turns on the transport motor. The transport motor now runs until the counter dial reaches the "1" position. A cam surface on the counter dial then allows the counter switch SC, Fig. 8, to open and shut off the transport motor. The transport motor remains off until you depress the release button.
3. Pushing the rewind button to rewind the film actuates the rewind-switch plate, Fig. 2. The rewind switch now prevents the transport motor from running when the counter dial again closes the counter switch.



DISASSEMBLY HIGHLIGHTS:

Settings for disassembly: unimportant

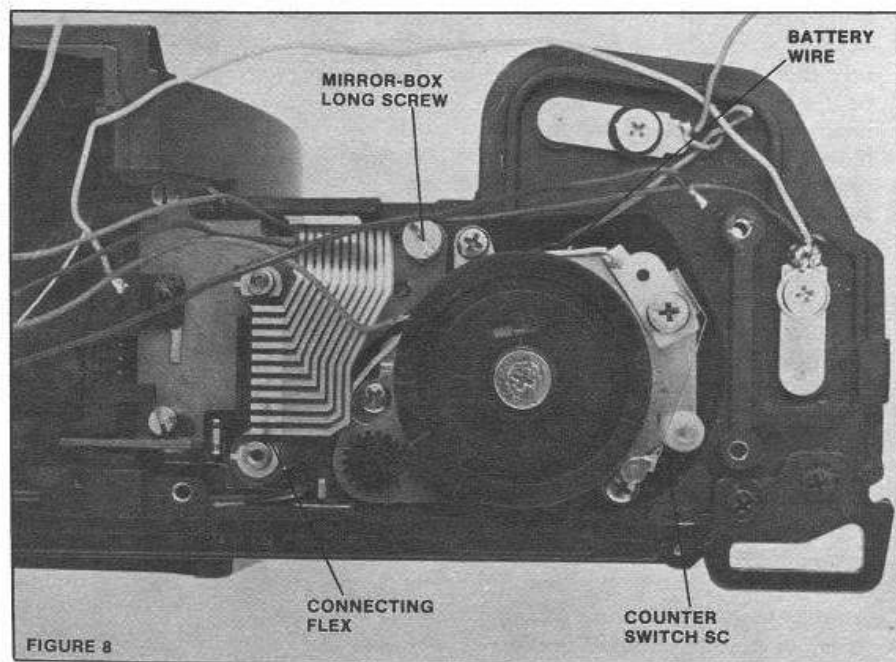
Precautions:

1. Remove battery box before unsoldering wires.
2. Do not overtighten the screws holding the photocell circuit board, Fig. 4; the board may crack.

Sequence:

1. battery box (2 latches, back of camera)
2. bottom cover
3. front leatherette at wind side
4. top-cover screw at front, Fig. 1
5. top cover — rewind knob, rewind-shaft bushing (2 screws — rewind shaft, washer, and compression spring loose), 2 remaining top-cover screws

Note: Unless you're replacing the top cover or the AE amplifier, do not unsolder the top-cover wires, Fig. 3. Handle the top cover carefully to avoid breaking the wires. If you do have to unsolder the wires, reassemble by matching the terminal connections on the top-cover board to those on the AE amplifier — for example, connect the S1' top-cover terminal, Fig. 24, to the S1' terminal of the AE amplifier, Fig. 21.



6. remove screw at upper left-hand corner of front cover, Fig. 1 (1 of 4 screws holding front cover)
7. push out corner of front cover for clearance and lift out section of flex containing resistor board, Fig. 4
8. unfold sections of AE amplifier flex and remove plastic insulator from between sections, Fig. 4

Note: You can now replace the battery box to check operation and make voltage tests. But remove the battery box before unsoldering wires.
9. unsolder wires from AE amplifier, Fig. 21 —
 - orange, black, and red from front of flex
 - blue from Vp land
 - gray and red from ground land
10. eyepiece frame (2 screws)
11. 2 screws with insulating washers holding photocell board
12. lift photocell board free of eyepiece
13. 3 screws holding AE amplifier flex, wind side (note insulating washer under screw near Fout terminal), Fig. 4

14. spring clip holding LED display, Fig. 7
15. separate LED display from mirror box
16. 2 screws holding flex-connector bar, Fig. 7 (note washer under screw toward front of camera)
17. lift flex connector of AE amplifier free of posts — watch for loose contact plate between flex connectors

Note: Be careful to prevent the contact plate from getting dirty — dirt will cause poor contact between the two flex connectors.

18. remove AE amplifier flex together with top cover

Note: If the black top-cover ground wire is connected to the body-ground lug, Fig. 4, unsolder the wire to free the top cover.

19. right front leatherette
20. front cover (4 screws — 1 removed earlier to free resistor board)
21. unsolder blue wire from sync post, Fig. 5
22. unsolder red and yellow wires from motor-drive amplifier (yellow goes to mirror-motor switch SMM2, red goes to mirror motor, Fig. 5)
23. unsolder 2 ground wires from section of motor-drive amplifier at front of camera, Fig. 6 (2 gray or 1 gray and 1 black)
24. 3 mirror-box screws at front
25. 2 mirror-box screws at top (long brass screw on wind side, Fig. 8, and crosspoint screw under motor-drive amplifier)
26. lift our mirror-box/shutter assembly, Fig. 9

Reassembly highlights:

1. There is no timing between the mirror box and the camera body. Just be careful to avoid pinching wires when you replace the mirror box.
2. Make sure the black wire is to the front of the long mirror-box screw, Fig. 8; the long screw prevents the wire from interfering with the counter dial.
3. Center the contact plate between the flex-connector posts, Fig. 8, before attaching the AE amplifier.
4. Solder the top-cover ground wire to the body-ground lug, Fig. 4, rather than to the ground

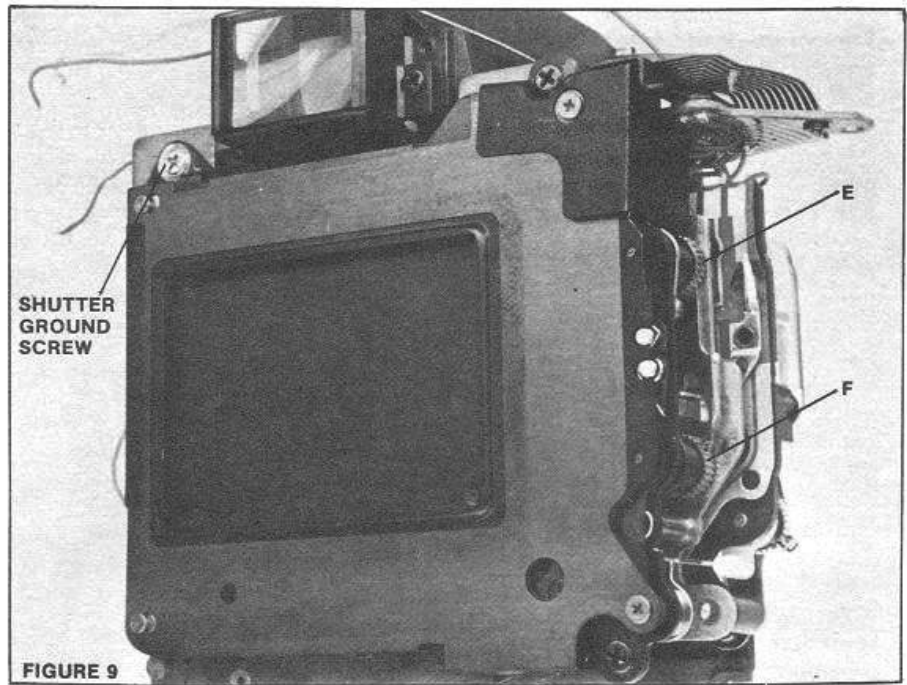


FIGURE 9

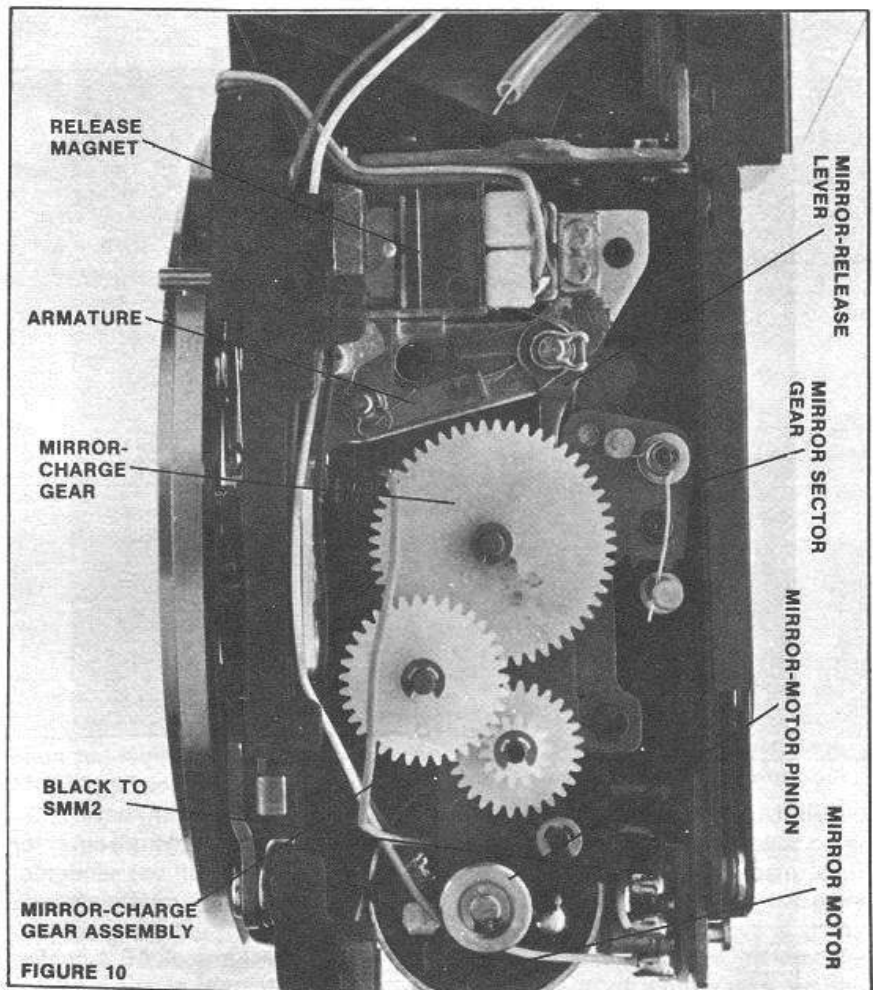


FIGURE 10

terminal of the AE amplifier (better ground connection).

screws, Fig. 9

3. lift aside shutter assembly
4. unsolder 3 shutter-magnet wires (red, white, yellow) from connector flex, Fig. 11 and Fig. 23

Sequence to remove shutter:

1. remove E-clip holding charge lever to shutter-cocking lever
2. remove 3 shutter-retaining

Reassembly highlights:

1. Make sure the surface between the ground screw and the ground lug of the shutter is clean, Fig. 9.
2. Cock the shutter before installing it on the mirror box.

Sequence to remove mirror motor:

1. mirror-motor pinion, Fig. 10 (loosen setscrew on brass collar)
2. mirror-charge gear assembly, Fig. 10 (2 screws)
3. unsolder black wire from mirror-motor switch SMM2, Fig. 10
4. 2 motor-retaining screws (through clearance holes at bottom of motor bracket)
5. slide motor assembly toward back of mirror box to free keyed locating post
6. lift out mirror-motor assembly, Fig. 14

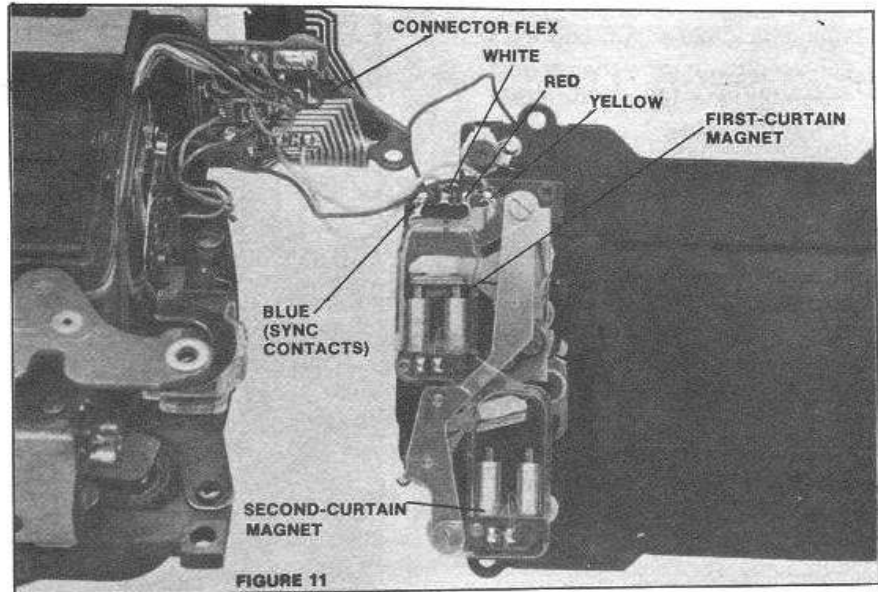


FIGURE 11

Reassembly highlights:

1. Check the maximum-aperture resistor, Fig. 13, before you replace the mirror motor. You should measure 5-7K between the pink and violet wires.
2. Make sure the spring-loaded gear lever on the mirror-motor assembly, Fig. 15, moves freely (if it doesn't, the diaphragm ring won't return). When you replace the mirror motor, the gear lever must pass into the forked lever, Fig. 13.
3. If you've removed the diaphragm-ring driving gears, Fig. 14, time the gears according to the position of the motor armature (rotor). Looking from the end of the mirror motor (the end from which you removed the mirror-motor pinion), rotate the armature in a clockwise direction until the mirror-motor switch opens (you'll hear a click when the switch opens). The armature is now at the proper starting point for timing the gears. The gear timing depends on whether the camera has the new-style motor (marked "Copal") or the old-style motor (unmarked).
 - a. Timing with new-style motor: After the mirror-motor switch opens, rotate the armature an additional $4\frac{1}{2}$ turns (use the screw at the other end of the armature as a reference). Now install the diaphragm-ring driving gear and the diaphragm-ring sector gear as shown in

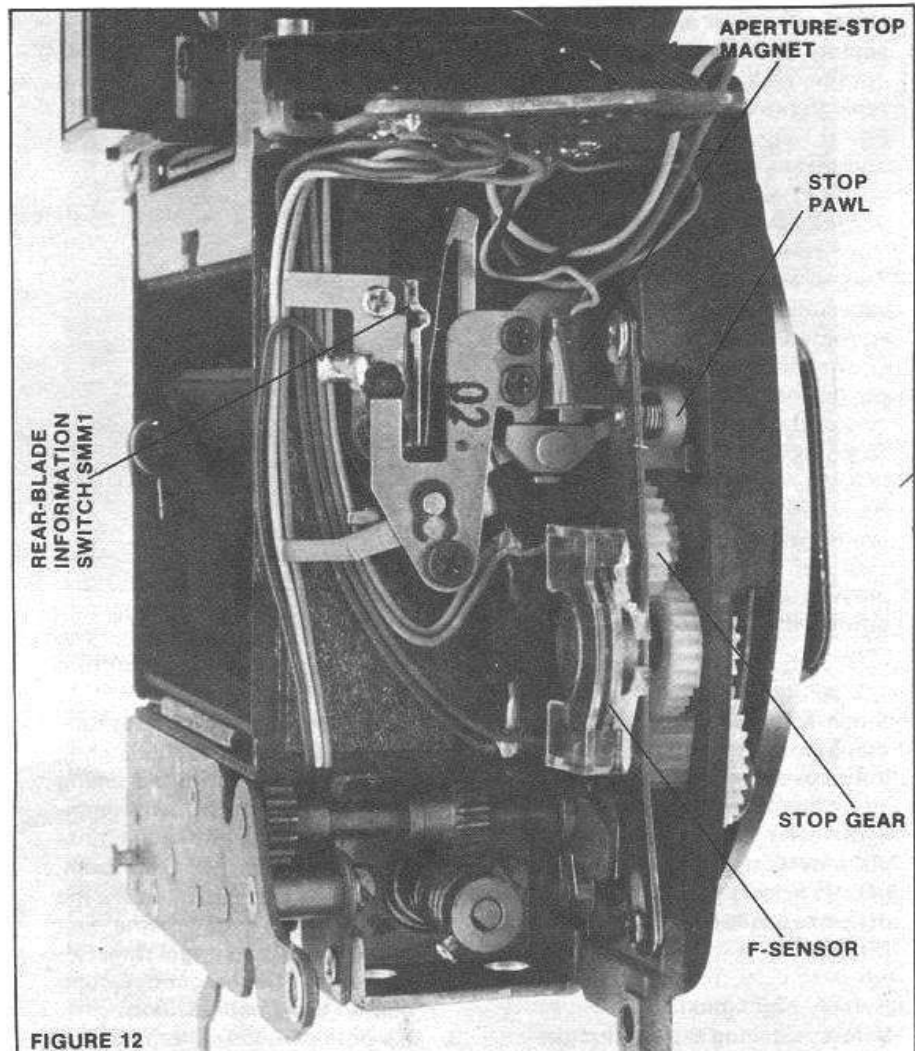


FIGURE 12

Fig. 14 and Fig. 18 — the first tooth of the diaphragm-ring sector gear engages the diaphragm-ring driving gear. After engaging the gears and

replacing the E-clips, rotate the armature $3\frac{1}{2}$ more turns. The armature is now in the proper position for replacing the mirror motor. Do not tighten the motor-

retaining screws until you have replaced the mirror-charge gear assembly and the mirror-motor pinion.

Note: If you did not remove the diaphragm-ring drive gears, Fig. 14, you can time the armature after installing the mirror motor — and before replacing the mirror-motor pinion, Fig. 10. Rotate the armature clockwise until the mirror-motor switch opens. Then rotate the armature 8 full turns before you replace the mirror-motor pinion.

b. Timing with old-style motor: After the mirror-motor switch opens, rotate the armature an additional 4½ turns. Now install the diaphragm-ring driving gear and the diaphragm-ring sector gear as shown in Fig. 18 — the 5th tooth of the diaphragm-ring sector gear engages the diaphragm-ring driving gear. Then replace the motor.

4. Before replacing the mirror-charge gear assembly, rotate the mirror-charge gear, Fig. 10, so that its timing mark points down (to the bottom of the mirror box). Then seat the mirror-charge gear assembly.
5. Replace the mirror-motor pinion. Leave a small space gap between the bottom of the pinion and the motor to assure free movement. Now tighten the two screws holding the mirror motor.
6. Before replacing the mirror box, route the red wire and the yellow wire as shown in Fig. 10, to prevent the wires from interfering with the gears.

Sequence to reach diaphragm ring and diaphragm-detecting gear:

1. front cover
2. lens-mounting ring (4 screws)
3. light seal
4. plate over diaphragm-detecting gear (1 screw, E-clip)
5. diaphragm-detecting gear (E-clip)

Reassembly highlights:

1. Before installing the diaphragm-detecting gear, check the diaphragm ring for freedom of movement. Push up the armature of the release magnet, Fig. 10, to withdraw the pin from the diaphragm ring; you should then be

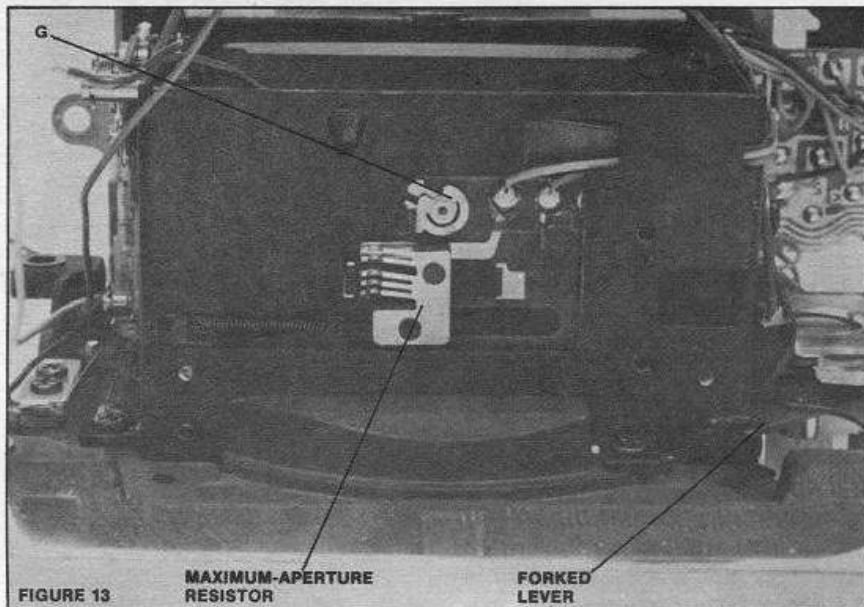


FIGURE 13

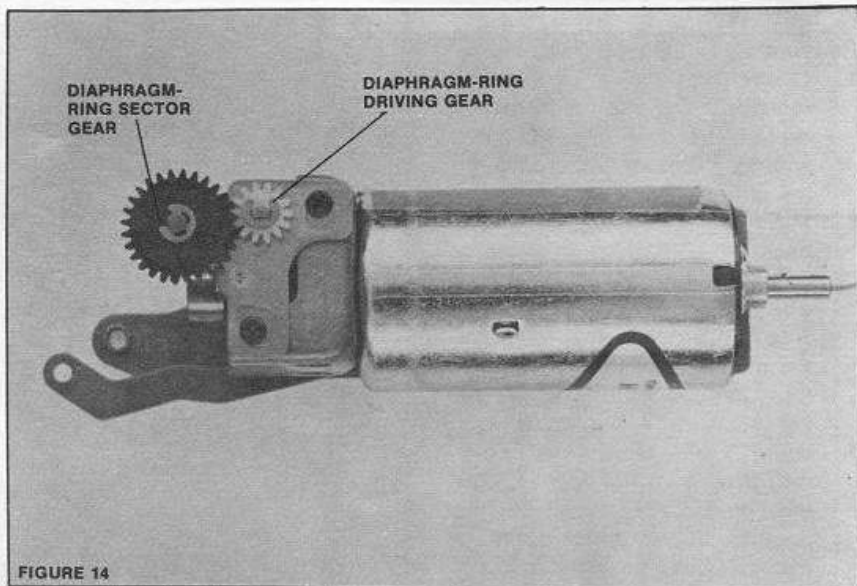


FIGURE 14

able to rotate the diaphragm ring in a clockwise direction. The diaphragm ring should turn freely and smoothly.

2. Rotate the diaphragm ring fully counterclockwise to the latched position. Now locate the timing mark at the top of the diaphragm-detecting gear — a rectangular cutout between two gear teeth. The tooth slot indicated by the timing mark engages the first tooth of the diaphragm ring. Replace the diaphragm-detecting gear in the timed position.
3. It's not necessary to replace the spring above the diaphragm-detecting gear. Konica recommends that you remove and throw away the spring.
4. Replace the light seal after you install the lens-mounting ring.

That way, you can't trap the light seal between the lens-mounting ring and the camera body.

Other disassembly notes:

1. To remove the top-cover circuit board, take out the clip holding the self-timer LED (inside the top cover). Remove the speed knob from the top, and take out the three circuit-board screws. Flex the top cover away from the self-timer LED for clearance as you lift out the circuit board, Fig. 16.
2. To remove the transport motor, take out the counter-dial assembly and the motor-contact plate at the top of the camera. Then remove the three screws holding the transport-gear assembly, Fig. 2. Lift out the gear assembly together with the

transport motor. Separate the transport motor from the gear assembly by removing the pinion at the end of the motor armature (setscrew).

3. If you disassemble the transport gears at the bottom of the camera, Fig. 2, refer to Fig. 25 for the timing of the film-wind switch. With the switch-operating lever centered on the cam as shown, the timing mark on the gear should align with the timing mark on the cam.

REVISED PARTS:

1. There are four versions of the AE amplifier, Fig. 4, but all will interchange. You can identify version 1 by the shape of the hybrid IC, Fig. 19. Fig. 20 shows version 4 of the hybrid; versions 2 and 3 do not have transistors TR141 and TR142. Also, the location of the Fout (f/stop information out) terminal is different in the first version. Versions 2, 3, and 4 have the Fout terminal at the end of the AE amplifier, Fig. 21; the screw next to the Fout terminal then has an insulating washer, Fig. 4. In version 1, a wire runs from the top cover to the Fout terminal on the top section of the flex.
 - a. Check the value of the capacitor labeled, "4.7 MF," Fig. 21. If the value is other than 4.7 MF (or unmarked), replace the capacitor with the 4.7 MF capacitor; note the proper polarity.
 - b. Install the 1 MF capacitor as shown in Fig. 21 (do not install if there's already a component or wire connected to the lands
2. One capacitor has been added and another changed in value for stabilization of the AE amplifier. Also, a pair of diodes has been added across the two motors to prevent damage from the counter EMF. You can modify the later versions of the AE amplifier with the capacitors, but do not make the capacitor modification to version 1. It's desirable to add the diodes to all models. To modify, order the modification kit containing the two capacitors and the diode pair. Or, if the camera already has the diode modification, you can use standard tantalum capacitors to make the capacitor update. Modification procedures:
 - a. Check the value of the capacitor labeled, "4.7 MF," Fig. 21. If the value is other than 4.7 MF (or unmarked), replace the capacitor with the 4.7 MF capacitor; note the proper polarity.
 - b. Install the 1 MF capacitor as shown in Fig. 21 (do not install if there's already a component or wire connected to the lands

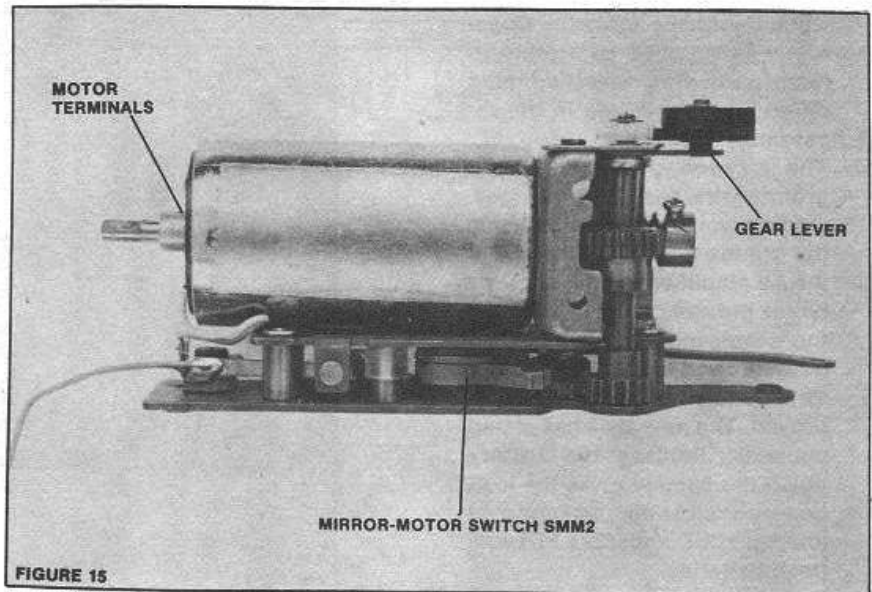


FIGURE 15

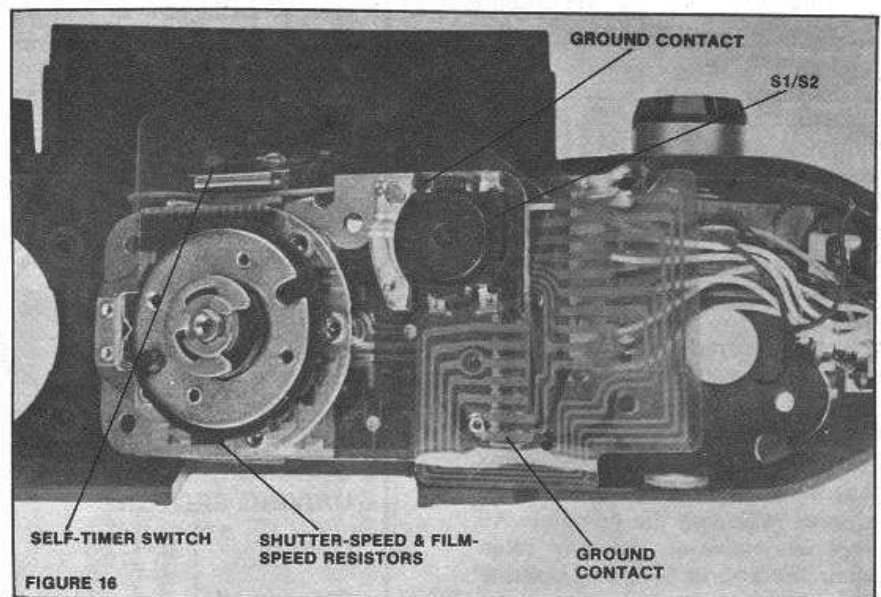


FIGURE 16

shown other than C101.) Connect a wire from the positive capacitor lead to the black-wire land of the AE amplifier, Fig. 21. Also, lift the long lead of C101 so that it doesn't touch the land to which you've soldered the 1 MF capacitor (if there's no modification capacitor, it doesn't matter if C101 touches the land).

- c. Solder the three leads of the diode pair to the motor-drive amplifier, Fig. 5; match the color codes of the diode wires to the color codes of the wires already connected to the motor-drive amplifier (yellow to yellow, orange to orange, and red to red). Then tuck the diode package under the flex at the

rewind side.

3. The motor-drive amplifier has been revised but will interchange. The new-style does not have the section of flex that extends to the front of the camera, Fig. 22. But you can put the new style in a camera that originally had the old style. Cut off the section of the old-style flex that mounts to the front of the camera, Fig. 22. Leave this section mounted to the camera to serve as a ground connection for the two ground wires.
4. The mirror motor has been improved. Current cameras use the Copal motor, Fig. 2; the motor in earlier versions has no brand-name identification. The motors

will interchange (only the Copal motor is supplied as a replacement part). But note the timing differences described in the re-assembly highlights.

5. The location of the top-cover ground wire has been changed. Originally, the wire connected to the ground terminal at the end of the AE amplifier flex, Fig. 4. For a better ground connection to the top cover, move the wire to the body-ground lug, Fig. 4.
6. The battery box has been improved. The new style has plated contacts. Replace the battery box if the camera gives the low-battery indication (flickering of low-light LED and f/22 LED) with fresh batteries.
7. The upper mirror-box screw, wind side, has been changed to a long, brass screw, Fig. 8. The long screw prevents the ground wire from interfering with the counter dial.

TROUBLESHOOTING:

Behavior without batteries: shutter won't release, no LEDs

Behavior without lens: "M" LED always turns on, top of finder scale

Maximum dark current (6V supplied): 150 microamps (without depressing release)

Maximum current draw while transporting film: 600ma

Repairing the hybrid:

The hybrid IC, Fig. 4, is not available separately; replacing the hybrid requires replacing the complete AE amplifier. However, you can often repair the hybrid by using discrete components. Normal symptoms of a defective hybrid:

1. viewfinder LEDs or self-timer LED always on
2. battery drain
3. camera releases by itself
4. no change in shutter speed

Tests and repair procedures according to malfunction:

1. Viewfinder LEDs turn on with S1 open

Note: For complaints of battery drain, check to see if the LEDs stay on. If not, let the camera sit for a few hours with fresh batteries. Leakage in the hybrid may cause the LEDs to eventually turn on.

a. The problem could be in the

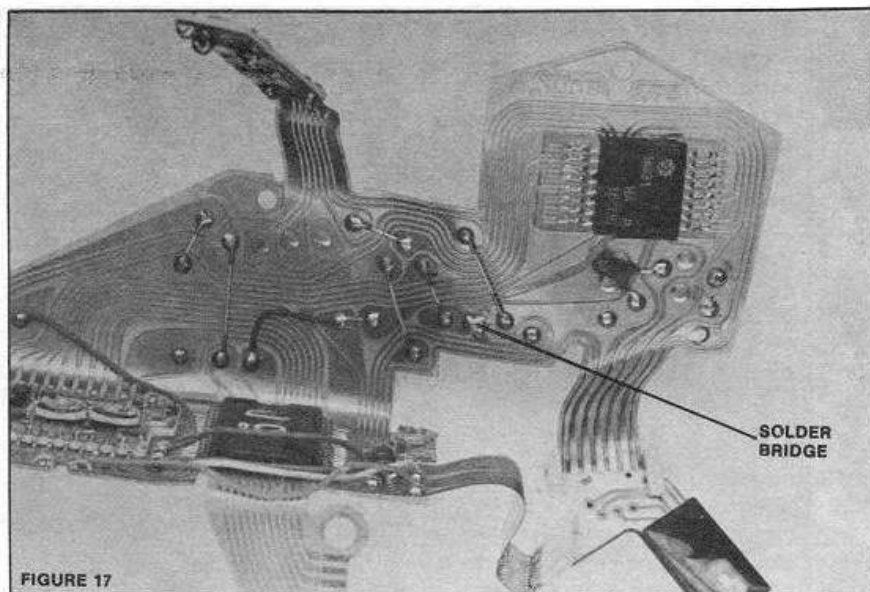


FIGURE 17

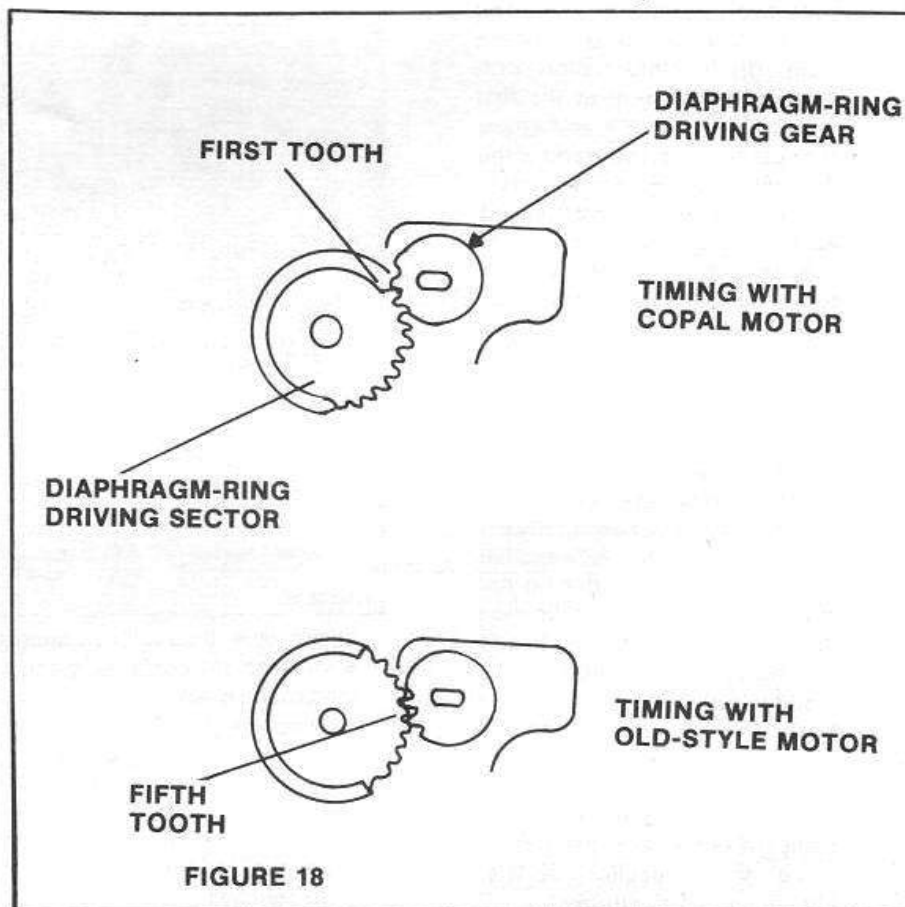


FIGURE 18

metering switch S1, in the hybrid, or in IC HA 16504, Fig. 4. To check, disconnect the S1' top-cover wire from the AE amplifier, Fig. 21. If the viewfinder LEDs remain on, the problem is not in the top cover. But if disconnecting the wire turns off the LEDs, the problem is in S1 or in the top-cover board.

b. If the LEDs remain on even though you've disconnected the top-cover wire, disconnect pin 36 of HA 16504 from the flex. If the LEDs now turn off, the problem is a shorted capacitor C106 on the hybrid, Fig. 20. Remove C106 from the hybrid and replace with a 0.1 microfarad tantalum capacitor (note polarity); you

can use the 0.1 capacitor from the modification kit.

c. If the LEDs remain on with pin 36 disconnected, disconnect pin 1 of HA 16504 from the flex. If the LEDs now turn off, the problem is in the bias path of TR 101, Fig. 20 (the transistor that supplies the operating voltage VP when S1 closes). To repair, cut pin VQ of the hybrid to break the connection, Fig. 20. Then solder a 10K resistor between the base of TR 101 and the pad of the flex where the hybrid pin had been connected (or directly to pin 1 of HA 16504). Cut across resistor R109 on the hybrid, Fig. 20, to break its connection (the 10K discrete resistor replaces R109).

Note: If you have to replace C106, you'll probably also have to make the repair on the TR 101 bias path; the two defects may occur together.

d. If the LEDs remain on with pins 1 and 36 disconnected, replace HA 16504.

2. Self-timer LED always on

a. The problem could be in the self-timer switch in the top cover or in the hybrid. Disconnect the ST wire from the AE amplifier, Fig. 21. If the self-timer LED remains on, the problem is not in the top cover.

b. Cut the SL pin of the hybrid, Fig. 20, to break the connection. Then connect a 5K resistor between the base of TR 103, Fig. 20, and the pad on the flex from which you disconnected the hybrid pin (or directly to pin 34 of HA 16504). Cut across R114 on the hybrid to remove the resistor from the circuit.

3. Battery drain

Check to see if the viewfinder LEDs or the self-timer LED turn on without the metering switch S1 or the self-timer switch ST being closed. Also check the voltage at pin 2 of HA 16504; you should measure no more than 15mv with S1 open. If you measure a higher voltage at pin 2, suspect leakage in the hybrid IC. Make the repair to TR 101 as described in step 1c.

4. Shutter releases on its own

Connect a 10K resistor between the base and emitter of TR 101, Fig. 20. The resistor holds TR 101 turned off until S1 closes.

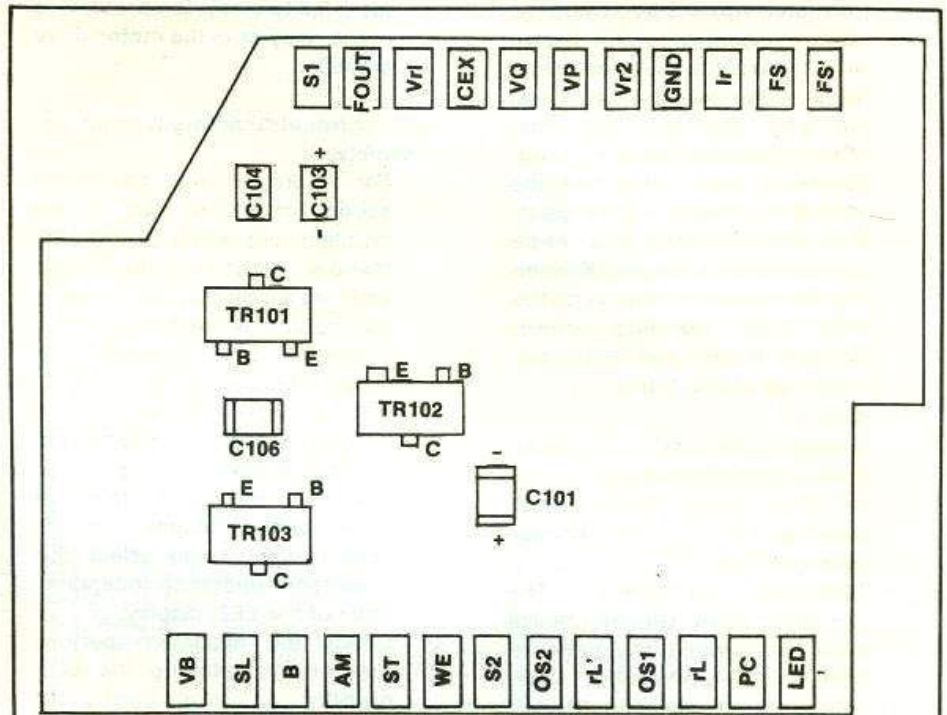


FIGURE 19

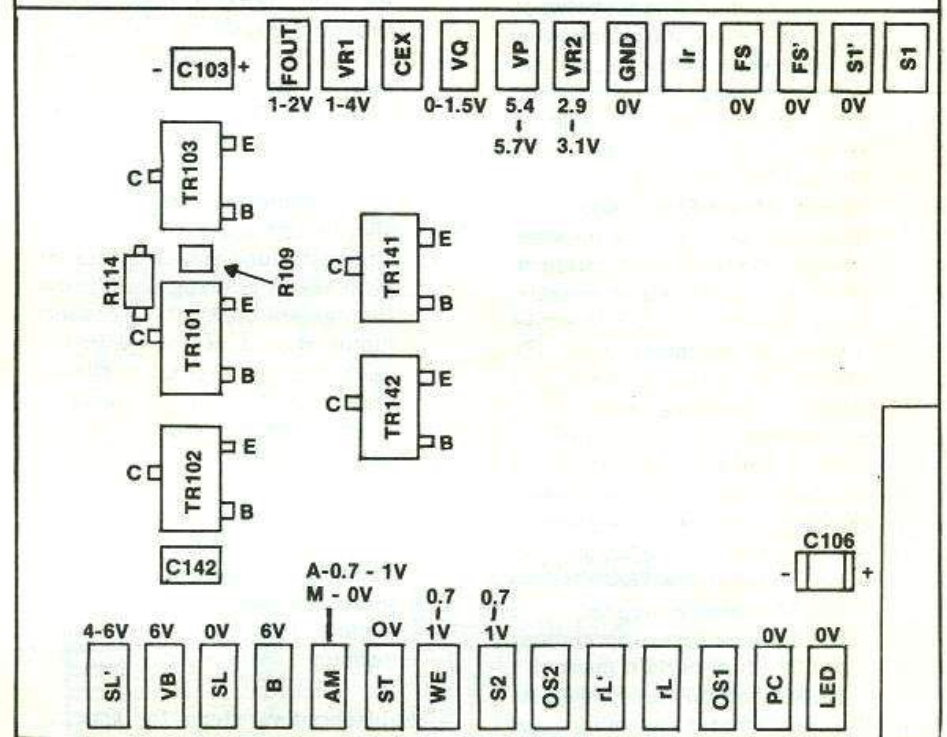


FIGURE 20

5. No change in shutter speeds

The problem normally indicates a defective timing capacitor C103, Fig. 20 (the capacitor that connects between ground and pin CEX of the hybrid). Remove C103 and replace with a 0.1 microfarad tantalum capacitor (note polarity); you can use the 0.1 capacitor from the modification kit.

Testing of major components:

1. F-sensor

Check the F-sensor, Fig. 12, if the diaphragm always stops down fully on AE. Disconnect the four F-sensor wires from the connector flex, Fig. 23. The green wire and one of the two brown wires go to the F-sensor LED; the gray wire and the other brown wire go to the photo-

transistor. Apply 2.8V across the LED — positive to the brown wire, negative to the green wire. Measure the resistance between the gray wire and the other brown wire (across the photo-transistor). As you rotate the gear to turn the disc, the resistance should change. The resistance should be below 1K when the disc pattern uncovers the LED. When the disc pattern covers the LED, the resistance should be above 100K.

2. Shutter

Charge the shutter. Then connect the positive lead of a 5V power supply to the red shutter wire, Fig. 11. Touch the negative lead to the yellow wire — the first curtain should release. The second curtain should release when you touch the negative lead to the white wire. Alternately, you can measure the coil resistance of each magnet. Check the first-curtain magnet between the red wire and the yellow wire; check the second-curtain magnet between the red wire and the white wire. Approximate resistance of each coil — 200 ohms.

3. IC HA 16504 and magnets

If one of the magnets (release, aperture-stop, first-curtain, second-curtain) fails to operate, the problem could be a defective magnet or a defective IC HA 16504. You can check by shorting the appropriate IC pin to ground. If the magnet connected to that pin then operates, the problem is the IC; if the magnet still fails to operate, the problem is the magnet. Magnet pin connections to HA 16504:

- pin 30—release magnet
- pin 31—aperture-stop magnet
- pin 32—first-curtain magnet
- pin 33—second-curtain magnet

4. Transport motor and relay

The transport motor that drives the film wind and sprocket turns on when the relay closes. To check, short between the two relay terminals at the front of the motor-drive amplifier, Fig. 22 (the terminal with the black wire is ground). The transport motor should run. If the transport motor fails to run — yet the relay contacts close — the problem is in the motor. If the relay con-

tacts fail to close, the problem is in the relay or in the motor-drive amplifier.

Tips for troubleshooting without disassembly:

1. For improper auto-diaphragm action, check to see if the problem also exists in the LED readout. If both the diaphragm and the LED display malfunction, the problem is electronic (either in the AE amplifier or in the top cover). However, if the LED display works properly, the problem is probably mechanical (in the diaphragm ring or its associated parts). A defective aperture-stop magnet or F-sensor would also affect the diaphragm operation independently of the LED display.
2. Check the maximum-aperture resistor by watching the LED display as you push the maximum-aperture lever, Fig. 1. As the maximum-aperture resistor moves from right to left in Fig. 1, the LED indication should step down smoothly.
3. Check the A/M switch by pushing the lever, Fig. 1, toward the lens opening as you watch the LED display. The "M" LED should turn out.
4. Check the lock-claw and counter switches by opening and closing the camera back. The transport motor should not run with the back open; if it does, the lock-claw switch, Fig. 2, remains closed. When you close the camera back, the transport motor should run until the "1" calibration on the counter dial reaches the index. If the transport motor fails to run, either the lock-claw switch or the counter switch fails to make good contact.

Troubleshooting steps for specific problems:

1. Shutter won't release, no LEDs
Battery voltage to flex
Check for battery voltage (6V) between ground and the red wires, Fig. 4, of the battery terminals. No voltage — battery-box terminals or terminal wiring. You should also measure the battery voltage at pin VB of the hybrid, Fig. 20, and at pin 35 of HA 16504, Fig. 21.

S1/S2 switches in top cover

Check the switches with an ohmmeter. You should get direct contact between the S1 terminal, Fig. 21, and ground when you push the release button part way to close S1. You should get direct contact between the S2 terminal and ground when you fully depress the release button to close S2.

Hybrid IC

Check the voltage at pin 2 of HA 16504, Fig. 21, with the release button partially depressed; you should measure close to the battery voltage. No voltage — PNP transistor TR 101, Fig. 20, or bias path open.

2. Only the f/1.0 and f/22 LEDs will turn on (flickering)

Poor ground connection to top cover

Move the black top-cover ground wire from the AE amplifier to the body ground lug, Fig. 4.

Fout terminal shorted to ground

Check to see if the screw holding the AE amplifier board touches the Fout terminal, Fig. 4; there should be an insulator under the screw to prevent contact.

Film-speed resistor, open

Check the resistance between the wire connected to the S terminal of the AE amplifier (disconnected) and ground. You should measure around 3.2K at ASA 3200 and around 2.5K at ASA 25.

Poor ground connection at top-cover circuit board

Check to see if the ground connection, Fig. 16, has pulled loose (between the board and the flex). If so, you may have to replace the complete top cover.

Maximum-aperture resistor, poor contact

Check the resistance between the pink and violet wires, Fig. 13. You should measure 5-7K.

Contact plate

The contact plate between the flex connectors, Fig. 7, may be dirty or out of position.

AE amplifier (HA 16504)

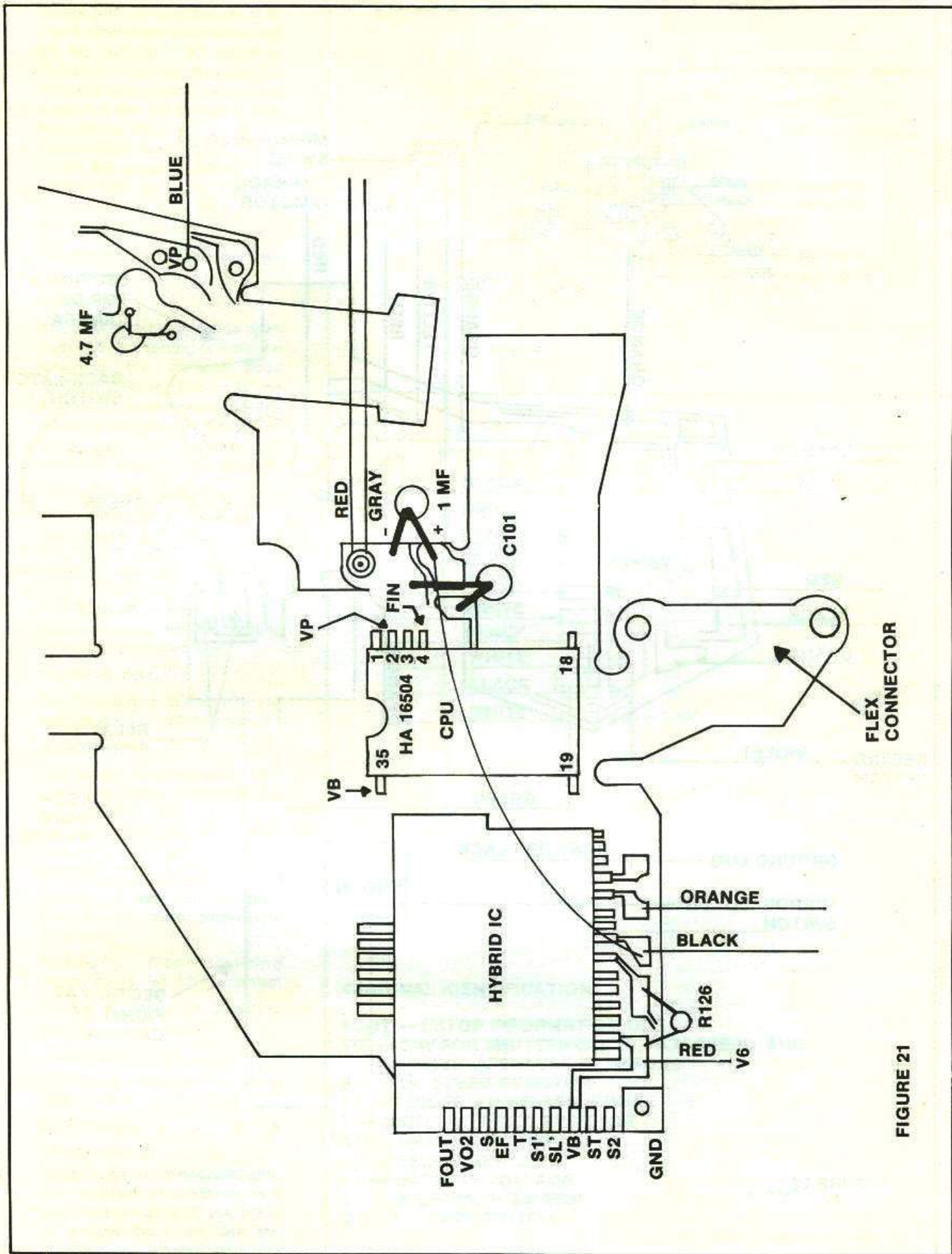


FIGURE 21

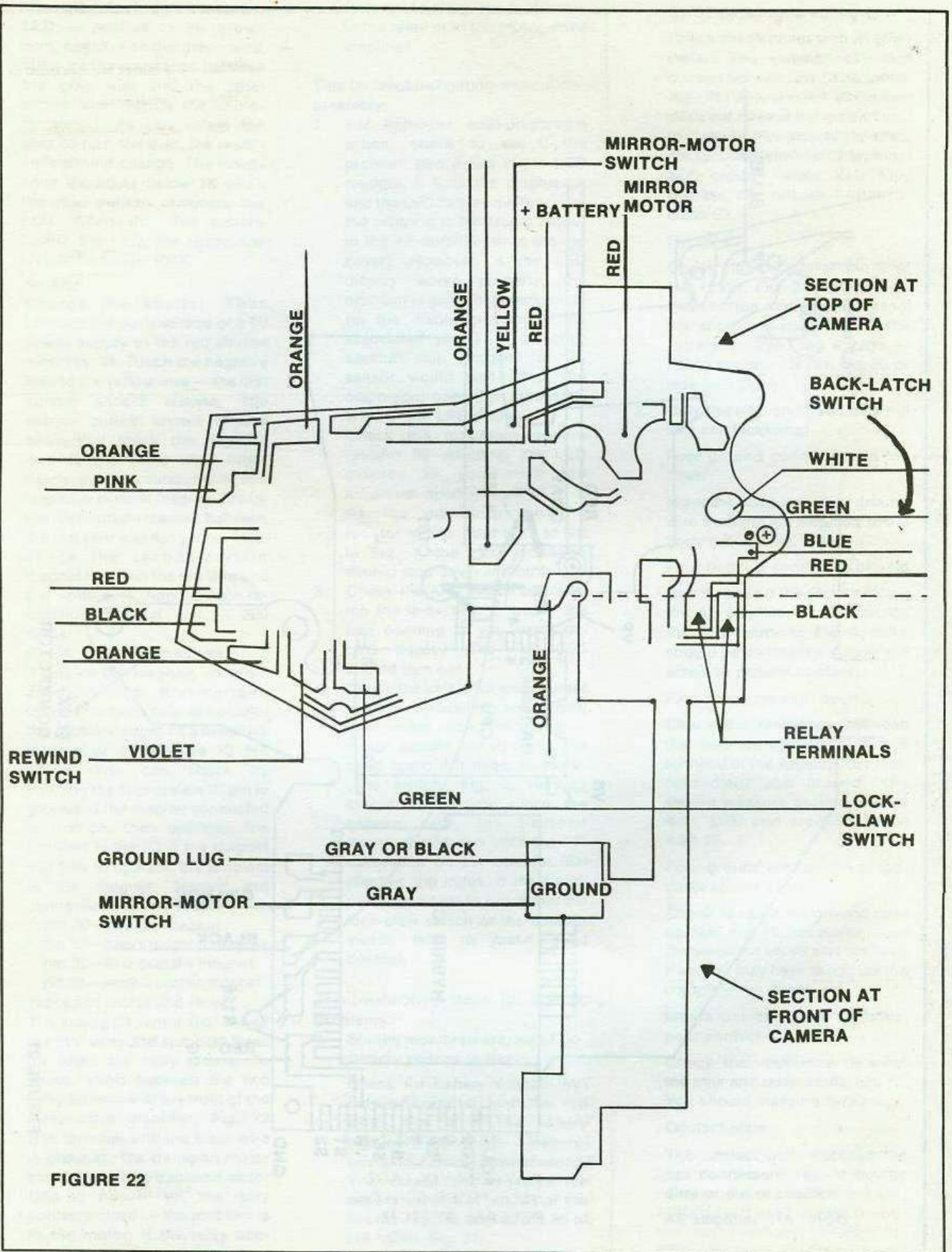


FIGURE 22

Check for 2.8V at the wiper of A, Fig. 1, or at the V02 terminal, Fig. 21. No voltage — AE amplifier defective. You can also test HA 16504 by disconnecting pin 4 and supplying the Fin voltage (f/stop information in) directly to the IC (between pin 4 and ground). With 1.36-1.45V applied, the f/4 LED should turn on. If not, you can replace either HA 16504 or the complete AE amplifier.

- Diaphragm always stops down fully on AE

A/M switch

The A/M switch may fail to open at the AE lens setting or it may be touching the camera body (ground). When you hold the A/M switch lever toward the lens opening, you should measure infinite resistance between the black wire, Fig. 23, and ground.

Contact plate

The contact plate between the flex connectors, Fig. 7, may be dirty or out of position.

Stop pawl or stop gear, Fig. 12 — broken

F-sensor, defective (see "Testing of major components")

HA 16504, defective

- Diaphragm ring fails to return to latched position after exposure

Gear lever, Fig. 15 — binding

You can see the black gear on the gear lever after removing the front cover. After the exposure, the black gear should move up and engage the diaphragm-detecting gear.

Diaphragm-ring driving gear, Fig. 14 — broken or center hole deformed

Timing of diaphragm-ring driving gears, Fig. 14 — incorrect

Timing of diaphragm-detecting gear, Fig. 6 — incorrect

Diaphragm ring binding

- Diaphragm always remains fully open on AE

Aperture-stop magnet or HA 16504

Check to see if the aperture-stop magnet holds its armature when you short pin 31 of IC HA 16504 to ground (you can see the aperture-stop magnet after you

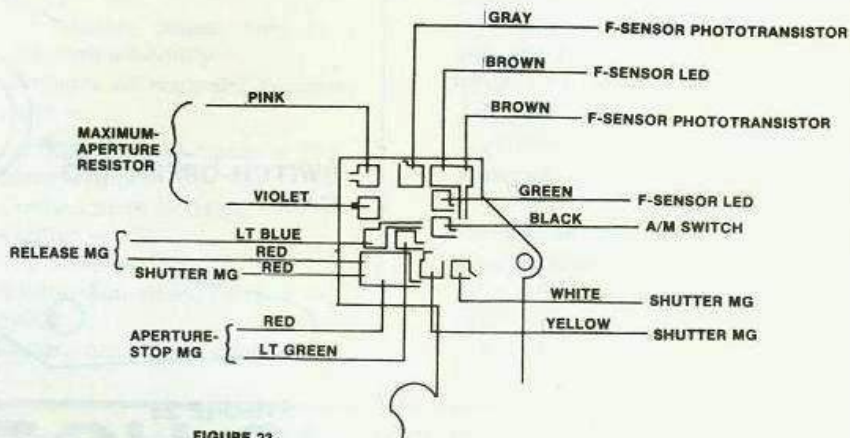
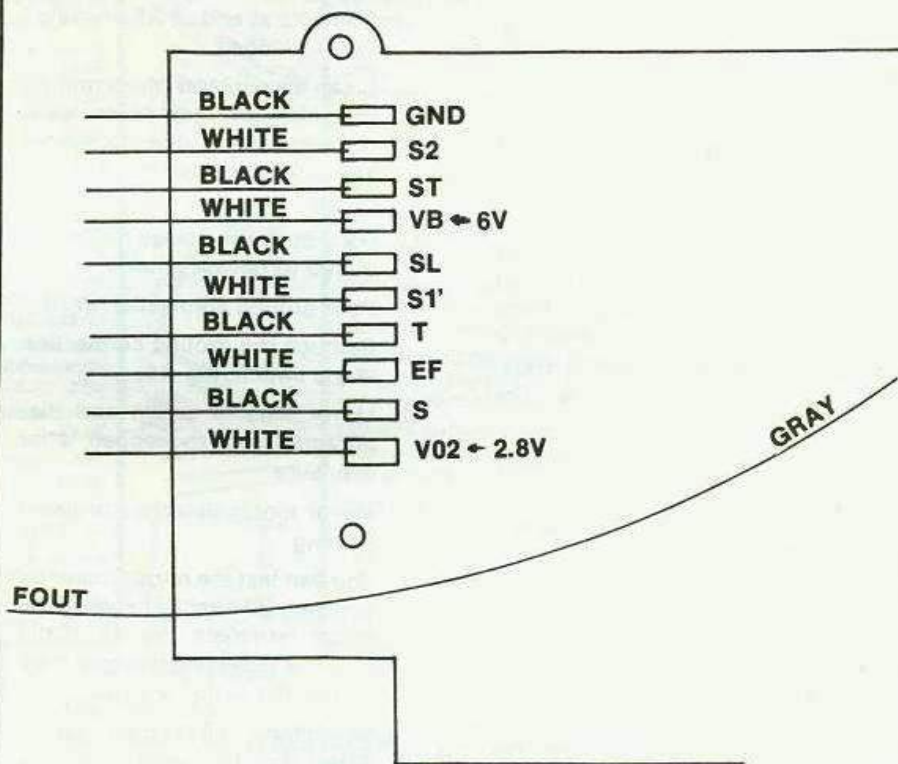


FIGURE 23



TERMINAL IDENTIFICATION:

- FOUT — f/STOP INFORMATION OUT
- V02 — 2.8V FOR SHUTTER-SPEED, FILM-SPEED, AND MAXIMUM-APERTURE RESISTORS
- S — FILM-SPEED RESISTOR
- EF — ELECTRONIC-FLASH SIGNAL
- T — SHUTTER-SPEED RESISTOR
- S1' — METERING SWITCH
- SL' — SELF-TIMER LED
- VB — BATTERY VOLTAGE
- ST — SELF-TIMER SWITCH
- S2 — RELEASE SWITCH

FIGURE 24

remove the front cover). If so, the problem is HA 16504; if not, the problem is the aperture-stop magnet. Check the aperture-stop-magnet coil by measuring the resistance between the red and green wires, Fig. 23. Approximate coil resistance — 300 ohms.

6. Battery drain

For a direct short across the battery terminals, check to see if the red battery wire, Fig. 8, is touching the camera body (ground). For slow battery drain, check the dark current (no more than 150 microamps drawn with S1 open). If excessive, check the hybrid (see "Repairing the hybrid").

7. All LEDs light at once

Ground screw loose, AE amplifier

HA 16504

8. Mirror does not rise, but shutter still releases

HA 16504

Check by shorting pin 30 to ground. If the release magnet then operates, the mirror will rise — HA 16504 is the problem. If the release magnet doesn't operate, the release magnet is the problem.

Release magnet, dirty interface or open coil

Clean the interface between the magnet core and armature. Check the coil resistance between the red wire and the blue wire, Fig. 23. Approximate coil resistance — 200 ohms.

Contact plate

The contact plate between the flex connectors, Fig. 7, may be dirty or out of position.

9. Shutter fails to open or hangs open, even though mirror operates

Shutter magnets

See, "Testing of major components."

Poor ground contact to shutter

Check for a loose ground screw, Fig. 9, or for poor contact between the ground screw and the shutter.

10. Camera fires when you push

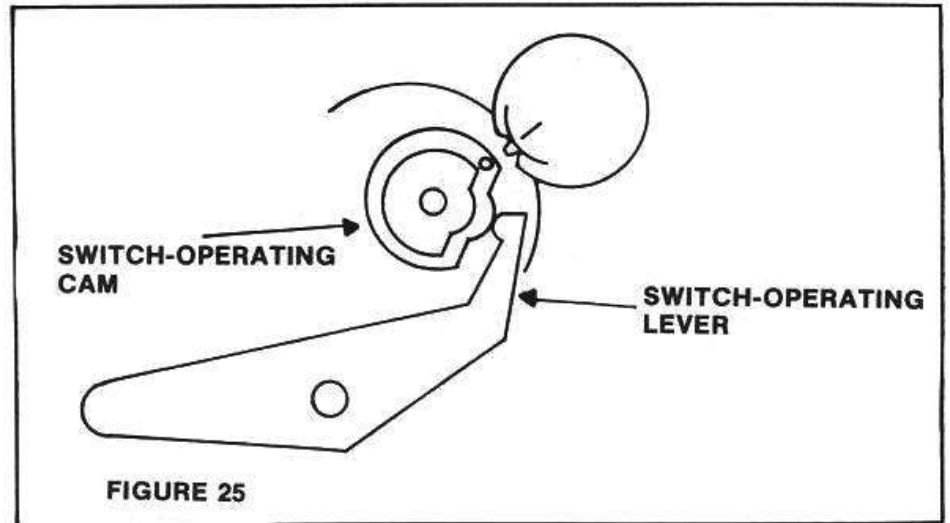


FIGURE 25

release button part way to close S1

Contacts at end of AE amplifier, Fig. 4, bridged

Clean the contacts (the terminals to which the top-cover wires connect) with acetone to remove any flux which may be causing a bridge.

11. Hard push on release button required to release shutter

Poor ground connection at S2

Retouch the ground connection at the switch, Fig. 16.

12. Mirror fails to return and diaphragm fails to reopen after exposure

Mirror motor defective or gears binding

You can test the mirror motor by applying 2V directly between the motor terminals, Fig. 15. If the motor is good and the gear train is free, the motor will run.

Rear-blade information switch SMM1, Fig. 12 — poor contact or contacts too far apart

Mechanical bind

Check the mirror-charge gears and the diaphragm ring for free movement.

13. Mirror motor starts running before second curtain completely crosses aperture

Contacts of SMM1, Fig. 12 — too close together

14. Mirror motor continues running after mirror has returned

Contacts of SMM1, Fig. 12 — always closed

15. LEDs in viewfinder too dim

LED display out of position or LED prism defective

Shift the LED display by forming the retaining spring, Fig. 7. If you can't correct the problem, replace the complete pentaprism seat (includes the LED prism).

16. Mirror motor runs even through release hasn't been depressed

Poor ground at motor-drive amplifier

Check the ground screw, Fig. 5, and the black-wire solder connections.

17. Mirror hangs in aperture, cutting off part of picture

Low batteries

Mechanical bind in mirror-charge gears

18. Diaphragm fails to stop down the first time you release, but then stops down properly

Diaphragm-detecting gear, defective

19. Camera jammed with mirror up

Mirror motor, defective

Low batteries

Bind in mirror-charge gears

20. Film frames overlap

Damaged transport gears, Fig. 2

21. Shutter delivers bulb at all settings

Shutter-speed resistor open

Disconnect the top-cover wire from the T terminal, Fig. 21. Then check the resistance between the disconnected wire and ground.

Approximate resistance values
— 10.9K at 2 seconds, 11.8K at
1/1000.

OTHER COMMENTS:

1. A replacement top cover comes complete with the top-cover circuit board. However, you can obtain the shutter/film-speed resistor separately.
2. If you replace the AE amplifier, make the solder bridge on the new flex as shown in Fig. 17.
3. To remove a defective IC HA 16504 from the flex, first use

side cutters to clip off each of the pins. Then unsolder the pins from the flex.

4. The shutter comes only as a complete assembly.
5. Numbers of normally replaced parts —

Transport (wind) motor — 201
Mirror motor — 551
Contact plate — 04105
Shutter — 402
Top cover — 511
Shutter/film-speed resistor — 08002
Battery case (new style) — 835

AE amplifier — 08001
Motor-drive amplifier — 08003
Diaphragm-detecting gear — 05307
Mirror-charge gear assembly — 530
Release magnet — 05540
Aperture-stop (diaphragm) magnet — 05550
F-sensor — 533
Maximum-aperture (f-value) resistor — 08004
Diaphragm-ring driving gear — 05488

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