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All Service Articles in this issue were prepared by Larry Lyells unless noted.

DISPLAY AD RATES:

FULL PAGE	$200
HALF PAGE	$100
QUARTER PAGE	$60

CLASSIFIED AD RATES:

$.10 PER WORD

MINOLTA X-700

Similar models: X-570 (XC models similar in wind mechanism and shutter)

Batteries: 2ea S-76 (negative ground)

Fig. 1—top cover removed

Fig. 2—bottom cover removed

Fig. 3—front view, covers removed

Fig. 4—top-cover wiring

Fig. 5—top view, rewind side

Fig. 6—back view, SPC PC board

Fig. 7—bottom view, motor-drive circuit board

Fig. 8—bottom view, battery plate removed

Fig. 9—top view, flex circuit removed

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Fig. 11—back view, mirror-box/ shutter assembly

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Fig. 13—mirror box, bottom view

Fig. 14—mirror box, wind side

Fig. 15—wind mechanism, bottom view of camera body

Fig. 16—wind mechanism, top view of camera body

Fig. 17—IC6 wiring (early model) and schematic

Fig. 18—PC board wiring (some flex circuits)

Fig. 19—IC1, pin voltages

Fig. 20—IC2, pin voltages

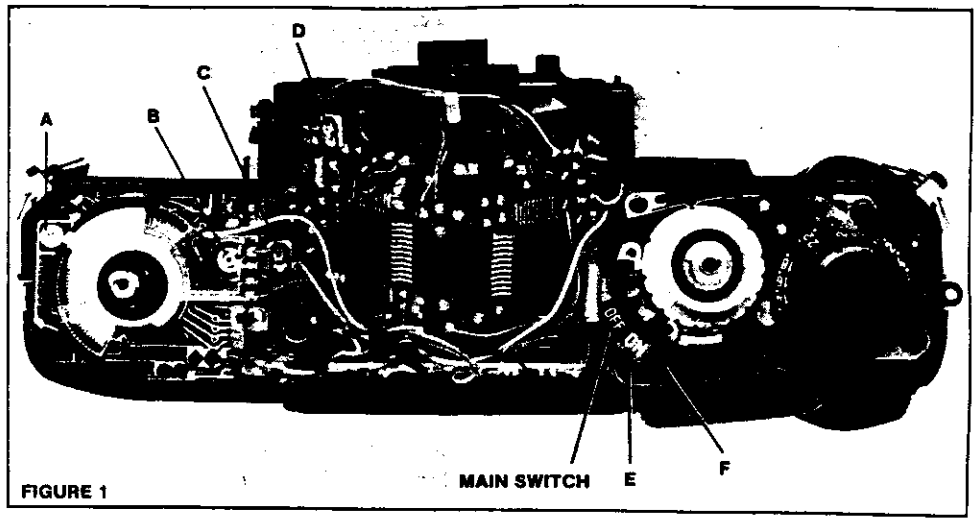

FIGURE 1

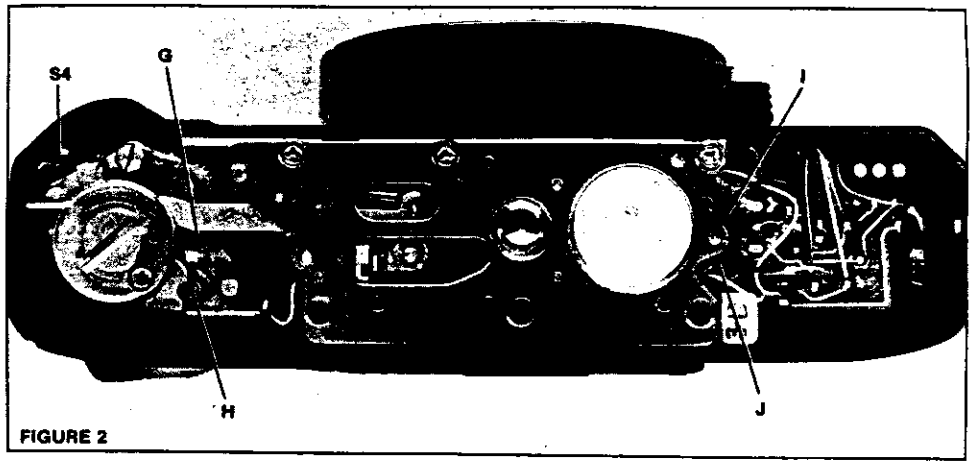

FIGURE 2

Fig. 21—wiring pictorial

Fig. 22—schematic

ADJUSTMENT LOCATIONS:

LED—display alignment	A*
Strobe level	B**
EV	C
ASA inclination	D**
LED readout	E
Manual speeds	F
Wind overtravel	G
Overrun	H
Travel time, second curtain	I
Travel time, first curtain	J
Timing switch (1/1000)	K
MD switch	L

*adjust by loosening screws and shifting LED PC board
**normally not necessary to adjust

Adjustments not indicated in illustrations:

1. Focusing screen — 3 setscrews, accessible from top (2 on rewind side, 1 on wind side).
2. Mirror angle — mirror stop, inside mirror box on rewind side (accessible with lens removed).

ADJUSTMENT VALUES:

Curtain-travel time: 11 ± 0.3ms (34mm distance)

Flange-focal distance:43.72 + 0.01, — 0.02mm (flange to pressure-plate rails)

K-factor: 1.2

Sprocket timing: sprocket teeth should point directly to back of camera

Inclination level voltage: 360 ± 4mv

Release-lock voltage: 2.10 ± 0.15V (shutter should not release with lower voltage)

LED-off voltage: 2.40 ± 0.15V (LEDs should not turn on with lower applied voltage)

High shutter-speed limit: 0.69 — 1.38ms

Low shutter-speed limit: within 5 seconds

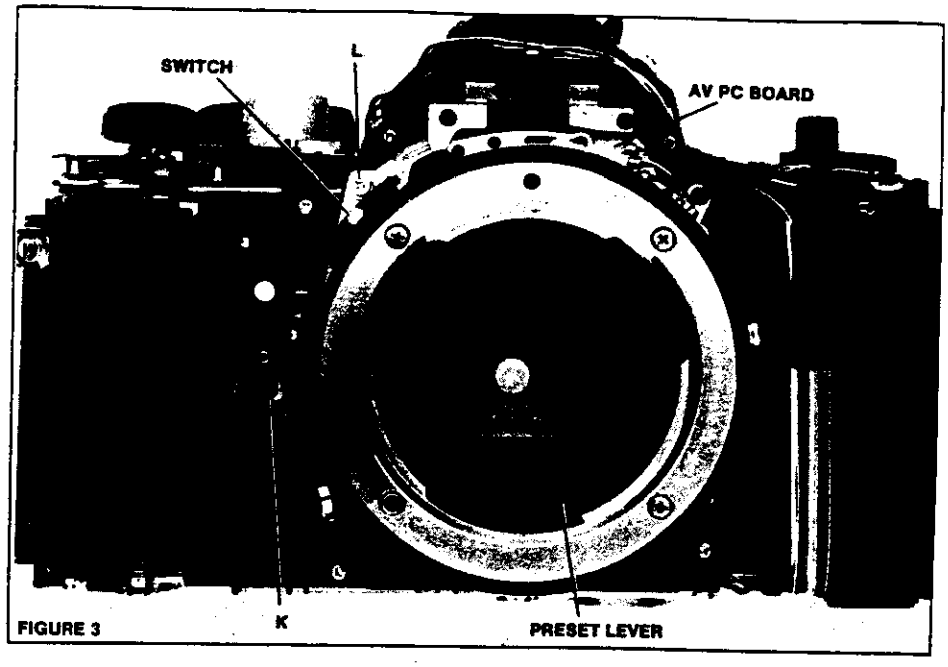

FIGURE 3

ADJUSTMENT PROCEDURES, EXPOSURE:

Note: It helps to make a temporary top cover that allows you to conveniently set ASA 100. Leave the wires connected in the temporary top cover for testing flash operation. Cut away the wind side of the temporary top cover to clear the speed knob. Drill holes to provide access to the auto-exposure and strobe-level variable resistors (B and C, Fig. 1). Attach a stop across the slot (the slot for the tab on the SV brush) to note ASA 100. Then, when you turn the film-speed brush until the tab is against the stop, you've set ASA 100.

1. Auto exposure. Set ASA 100, A, f/5.6 Check at EV11. Adjust C for 0 EV error (or for a shutter speed of 15.6ms). Also check at EV 15 and EV 5. Tolerance: ± 0.4 EV.
2. Check for proper exposure at the P setting.
3. Adjust the LED readout. Set f/5.6, A, ASA 100. Adjust E so the display reads 1/30 at EV 10 and 1/1000 at EV 14.
4. Set manual 1/60. Adjust F for an exposure time of 15.6ms. Then check 1/1000.

Adjust with timing-switch eccentric (remove small section of leather at front of camera, wind side, to reach clearance hole). If you adjust the timing switch for the fast speeds, recheck the auto exposure.

OTHER ADJUSTMENTS:

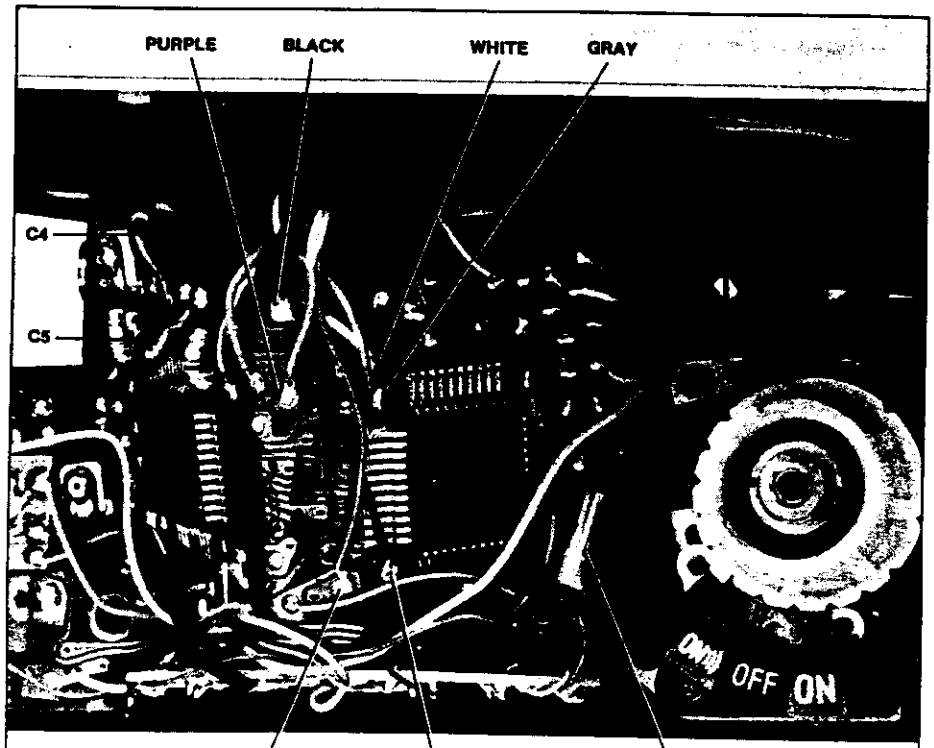

FIGURE 4

1. ASA inclination

Measure the voltage between the brown and orange wires to the SV board, Fig. 5. Adjust D for a reading of 360 ± 4mv.

2. Strobe level

Variable resistor B controls the shut-off point of the flash unit. Normally, you should not disturb the adjustment. If you replace the SV board, the variable resistor is pre-adjusted at the factory. However, if the customer complains of improper flash exposure, you can adjust as follows:

a. Mount the camera on a tripod at a distance of 2m from a neutral-gray reflecting surface. Position the camera so that the center of the reflecting surface is at the center of the focusing screen. Mount the 280PX flash unit to the hot shoe.

b. Attach an 18% neutral-gray test card in the focal-plane aperture to simulate the film's reflectance.
c. Set the P mode, ASA 100, and the Hi setting on the flash. Fire the shutter and measure the reflected light with an integrating flash meter at the camera's position. Adjust variable resistor B for a reading of f/5.6.
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3. MD lever

Adjust the position of the AV PC board to center the MD brush on the proper pattern. With no lens, the brush should be on the first pattern; here it connects the green wire to ground (to IC4 for the flickering P indication). With the MD lens set to minimum aperture, the brush should center on the second pattern with the f/16 lens. The brush should center on the space between the second and third pattern with the f/22 lens. And the brush should center on the third pattern with the f/32 lens. To check, you can measure the voltage between the pattern wires, Fig. 3 and ground:

	green wire	yellow wire	red wire
No lens	0V	800mv	800mv
f/16 lens	800mv	0V	800mv
f/22 lens	800mv	800mv	800mv
f/32 lens	800mv	800mv	0V

4. Wind overtravel

Loosen the shoulder screw, Fig. 2. You can then shift the intermediate gear toward the front of the camera to disengage it from the shutter gear. Rotate the shutter-charge gear to change the wind overtravel — clockwise to increase the overtravel and counterclockwise to decrease the overtravel. Check by advancing the wind lever. The wind lever should come to a solid stop at the end of the wind stroke. A spongy feel at the end of the wind stroke indicates excessive overtravel. If the shutter doesn't cock fully — or if the mirror fails to return — the overtravel is insufficient. Use the eccentric, Fig. 15, as a fine adjustment if needed.

5. Overrun

The overrun-prevention lever, Fig. 15, drops into engagement with one of three lobes on the sprocket shaft at the end of the wind stroke. Now the sprocket stops with one pair of teeth pointing directly to the back of the camera for proper registration. To adjust, hold the wind lever fully advanced. The overrun-prevention lever should now be engaged. Turn the eccentric in the direction that moves the overrun-prevention lever toward the sprocket shaft. The overrun-prevention lever should now come against the lobe and push the sprocket shaft toward the center of the camera. Turn the eccentric until the sprocket shaft is against the wall of the bushing, Fig. 15. Next allow the wind lever to return far enough to disengage the overrun-prevention lever. And advance the wind lever again. This time, because of your previous adjustment, the overrun-prevention lever should catch the corner of one lobe (rather than dropping into full engagement). Use your finger to push the sprocket shaft toward the center of the camera (away from the overrun-prevention lever). And turn the eccentric until the overrun-prevention lever just drops into engagement with the sprocket-shaft cam.

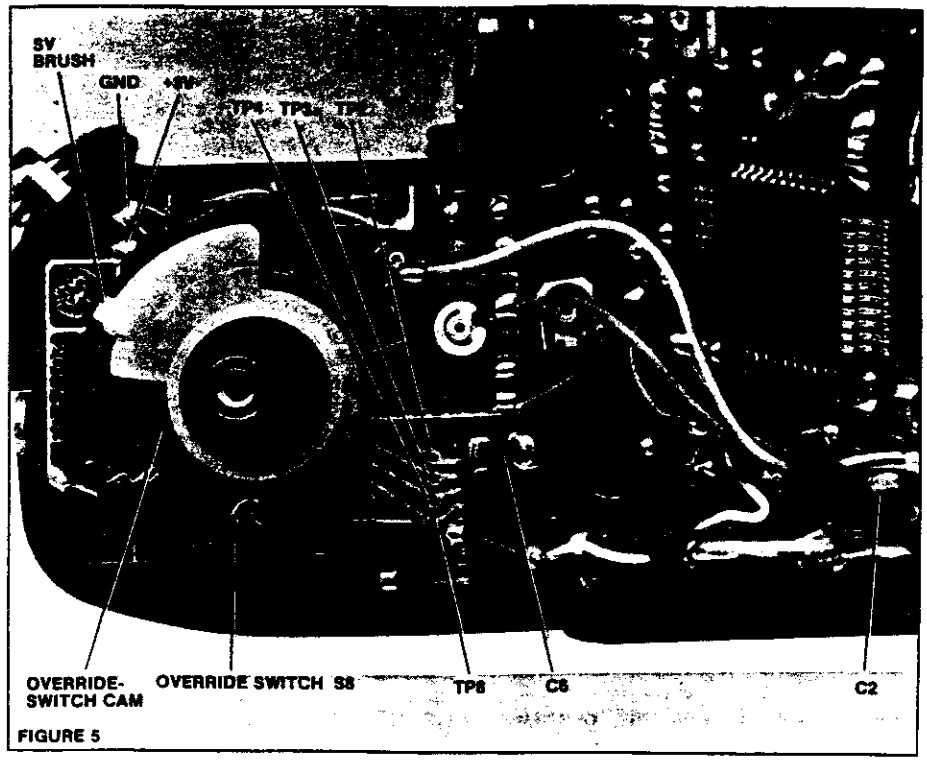


FIGURE 5

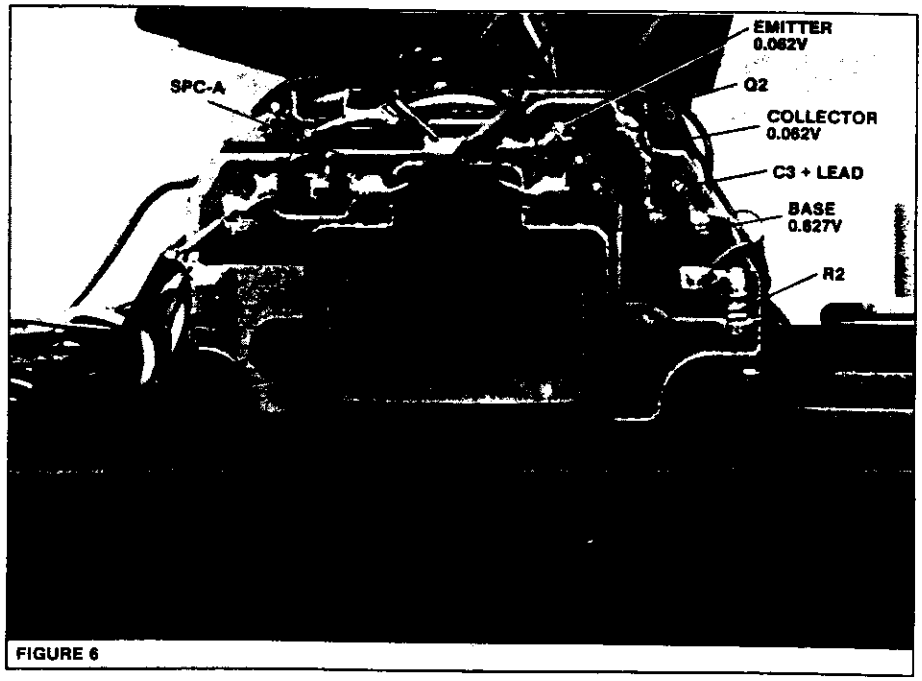


FIGURE 6

5. Overrun

The overrun-prevention lever, Fig. 15, drops into engagement with one of three lobes on the sprocket shaft at the end of the wind stroke. Now the sprocket stops with one pair of teeth pointing directly to the back of the camera for proper registration. To adjust, hold the wind lever fully advanced. The overrun-prevention lever should now be engaged. Turn the eccentric in the direction that moves the overrun-prevention lever toward the sprocket shaft. The overrun-prevention lever should now come against the lobe and push the sprocket shaft toward the center of the camera. Turn the eccentric until the sprocket shaft is against the wall of the bushing, Fig. 15. Next allow the wind lever to return far enough to disengage the overrun-prevention lever. And advance the wind lever again. This time, because of your previous adjustment, the overrun-prevention lever should catch the corner of one lobe (rather than dropping into full engagement). Use your finger to push the sprocket shaft toward the center of the camera (away from the overrun-prevention lever). And turn the eccentric until the overrun-prevention lever just drops into engagement with the sprocket-shaft cam lobe.

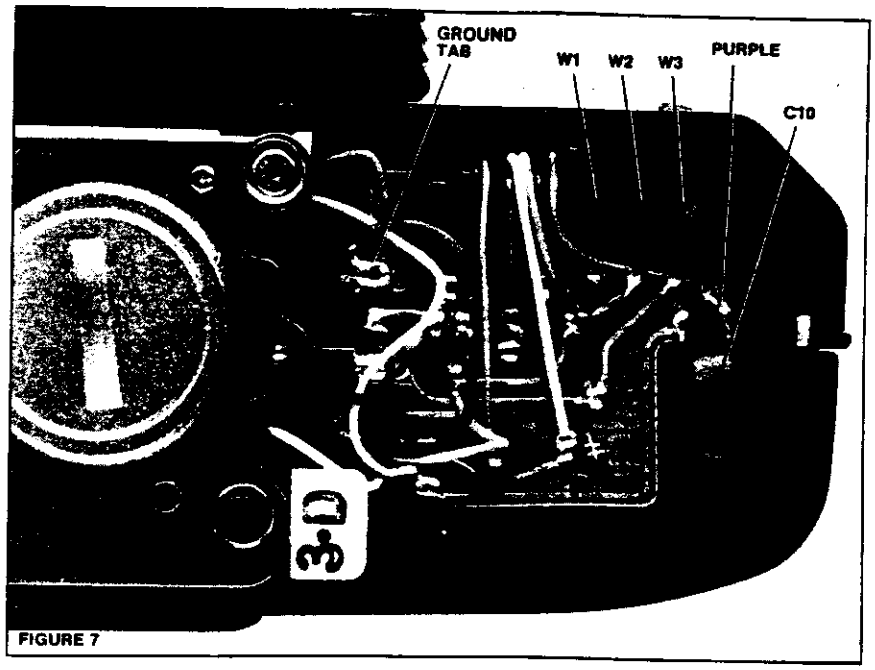


FIGURE 7

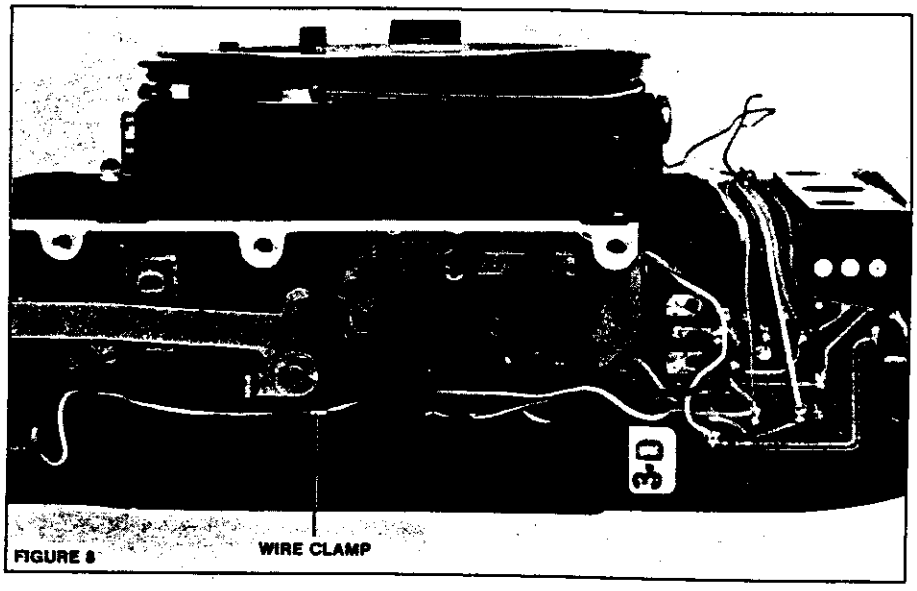


FIGURE 8

FEATURES AND OPERATING INSTRUCTIONS:

1. The main switch (by the speed knob) has three positions — off and two on settings. At one on setting ("on" followed by three curved lines), the piezo crystal beeps as a slow-speed warning for low-light conditions. The other on setting turns off the piezo beeper.
2. Turn on the LED display by touching the top of the release button (touch switch S0) or by pushing the release button part way (metering switch S1). The LEDs stay on for around 15 seconds after you remove your finger. In the P and A modes, the shutter-speed LEDs indicate what shutter speed the camera will automatically program. In the M mode, the LEDs indicate the proper shutter speed for the light conditions.
3. In the P (program) mode, the P LED turns on at the top of the display. The lens must also be set for program — to the smallest f/stop. A lug on the diaphragm-setting ring then positions the MD switch. If you set the speed knob to P, but don't set the lens to the smallest aperture, the P LED flickers rather than glowing steadily.
4. The A mode provides automatic shutter-speed control (aperture-preferred). For the M mode, set one of the manual shutter speeds. The speed knob latches at the P and A settings; push down the auto latch at the front of the speed knob to disengage the latch.
5. Setting an exposure compensation on the film-speed dial causes the plus/minus LED at the bottom of the display to flicker. Depress the lock button near the film speed dial to set an exposure compensation. Lift and turn the film-speed dial to set the film speed.
6. The viewfinder LEDs provide the battery-test feature. If the battery voltage is below 2.4V, the LEDs will not turn on.
7. The ST/AEL switch at the front of the camera (wind side) provides both the self-timer and memory-hold functions. Push down the switch for the memory hold; the LED display turns on and locks

the reading as long as you hold down the switch. Lift the switch for the self-timer delay. The LED at the front of the camera flickers slowly at the start of the delay, then flickers at a faster rate, and finally glows steadily just before the shutter releases.

8. With the Auto Electroflash 280PX, the camera provides both dedicated operation and automatic flash duration through the lens (in P and A modes). The camera has two silicon photodiodes — SPC-A (above the eyelens) measures available light, and SPC-B (on the rewind side of the mirror box) measures flash. As the mirror rises, a sliding door opens in front of SPC-B. SPC-B then measures the flash output reflected from the film.
9. When the flash charges, the 60 LED in the finder flickers. Also, the mode LED (P, A, or M) turns off. If you release the shutter before the flash has fully charged, you get a proper available-light exposure. With the 280PX flash, both silicon photodiodes affect the exposure — SPC-B shuts off the flash for the proper flash exposure, and SPC-A controls the available-light exposure (shutter speed) for the background conditions. After the flash exposure, the 60 LED flickers rapidly if the subject distance permitted a proper flash exposure.

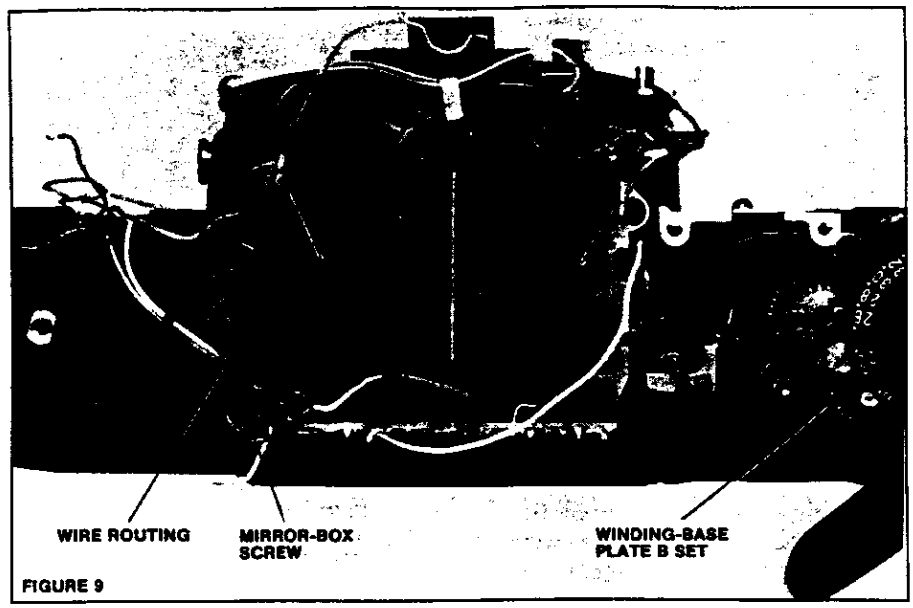


FIGURE 9

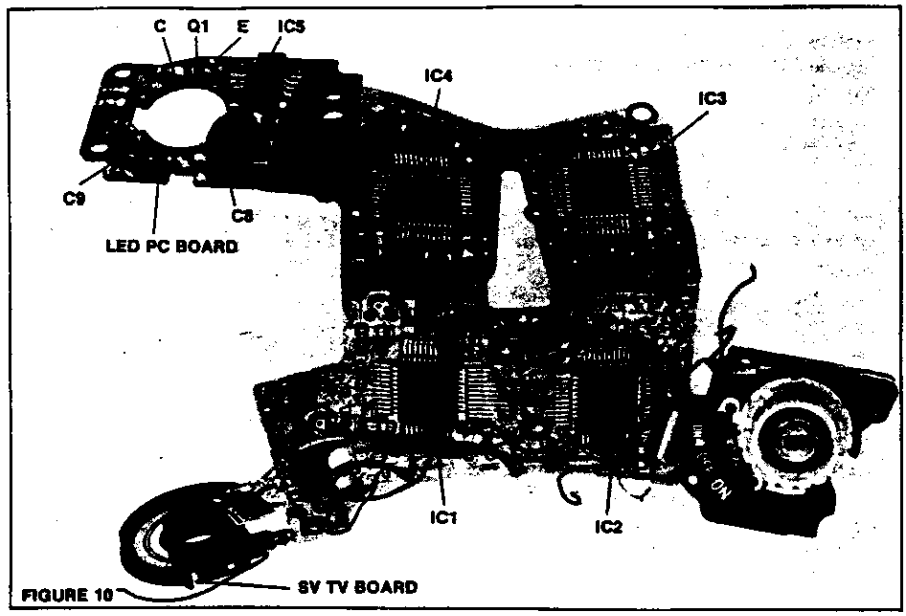


FIGURE 10

DISASSEMBLY HIGHLIGHTS:

Settings: P, ASA 200, main switch on (for reference)

Sequence:

1. bottom cover (4 screws — 2 screws toward center are shorter) and top cover —
   a. wind lever, wind-lever return spring, top-cover retainer around wind shaft
   b. speed knob, release button
   c. rewind knob (screw at top of knob)
   d. film-speed dial (retaining ring) — spring washer and mylar washer under dial
   e. Minolta nameplate (2 machine screws)
   f. 2 long self-tapping screws at back of top cover, short screw at rewind end
   g. place piece of tape over auto-lock button to hold button in place
   h. lift aside top cover, Fig. 4 (override-switch cam, SV brush, and eyelens frame are loose)
2. unsolder 6 top-cover wires from flex, Fig. 4 —
   a. black and red (piezo beeper)
   b. white and gray (dedicated-flash contact pins)
   c. purple (sync contacts)
   d. black (hot-shoe ground)
3. wind-side front cover
   a. peel back leather, end of palm grip
   b. remove 2 screws
   c. remove small section of leather, front
   d. remove small screw
   e. remove wind-strap connector from strap lug, wind side
4. rewind-side front cover
   a. peel back leather, end of cover
   b. remove 2 screws
   c. remove rewind-side strap lug (1 screw)
5. front plate (the plate around the lens-mounting ring) — 2 screws

Note: Spread the top section of the front plate to clear the lens-mounting ring.

6. flex circuit

Note: You can remove the flex together with the front-plate/mirror-box assembly. To remove the flex and mirror box as a unit, unsolder wires in steps a through c. Then proceed to k.

a. remove tape from front of camera, rewind side
b. unsolder wires from front of LED PC board — red, green, orange, violet, black
c. unsolder remaining wires that connect to motor-drive circuit board from rewind side of flex — yellow, brown, blue, white, gray
d. unsolder yellow wire to self-timer plate and second gray wire at rewind side of flex
e. unsolder the wires going to the AV PC board from the flex (top and wind side) — green, yellow, red, brown, orange, blue
f. unsolder black S3 wire from ground land, top front of flex
g. unsolder the wires at the wind side of the flex — black, white, blue, 2 red, orange
h. unsolder the wires at the back of the flex, rewind side — yellow, brown, blue, white, yellow
i. unsolder the purple wire at the top of the flex
j. unsolder the wires from the SPC circuit board — small purple, 2 wires inside the black tube for the SPC-A connection, green, orange, black, gray (small wires)
k. unscrew the slotted screw that passes through the speed-selector (auto) latch
l. remove the speed-selector detent screw
m. remove the small screw to the back of the speed-selector plate
n. remove 2 screws at end of LED PC board (1 screw in later models)
o. remove screw with washer at rewind side of flex

7. battery plate
   a. solder red positive-battery wire from motor-drive circuit board
   b. unsolder 2 battery-box tabs (ground tab and power-winder tab)
   c. remove 6 screws

Note: The charge-lever spring will come disconnected from the charge lever as you lift out the battery plate. The spring stays with the battery plate.

8. unsolder wires from motor-drive circuit board —
   — green and white (release magnet)
   — yellow and black (reset switch)
   — black and gray (data-back pins)
   — black and brown (aperture magnet)

Note: In later models, the aperture magnet has only one wire (black). The brown wire has been eliminated, relying on circuit ground for the second magnet terminal.

9. free the black and yellow reset-switch wires from the wire clamp, Fig. 8
10. remove the screw holding the top of the mirror box, rewind side, Fig. 9
11. remove 4 front-plate screws
12. lift out the front-plate/mirror-box assembly

Note: The fork in the charge lever, Fig. 11, fits over a roller on the charge cam, Fig. 15. If you remove the motor-drive coupler, the roller will be loose.

13. unsolder purple sync wire from shutter block, Fig. 11
14. remove 3 shutter-retaining screws (small screws) at front of front plate
15. separate shutter block from mirror box

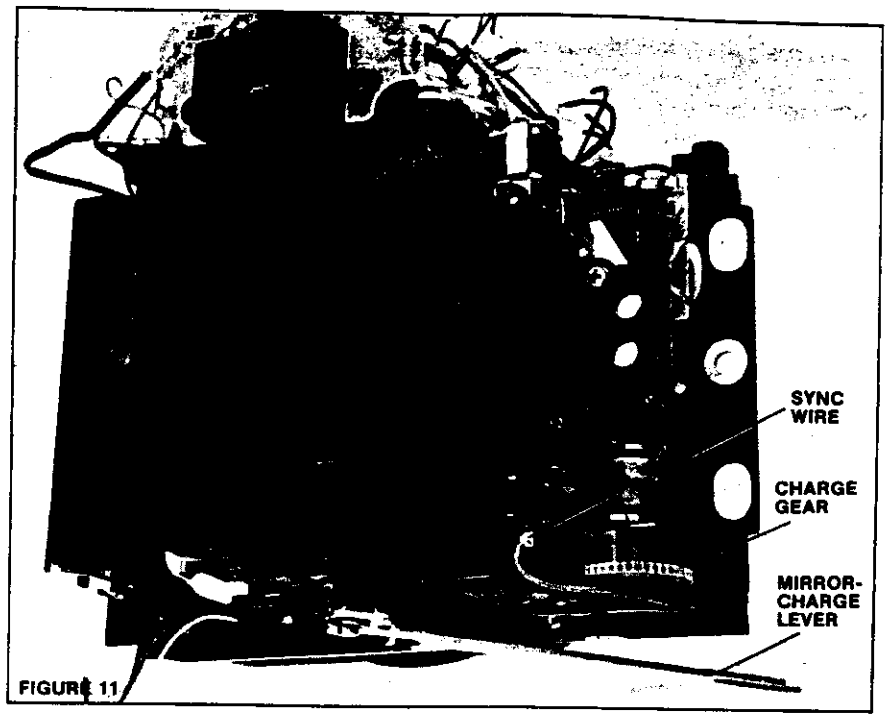


FIGURE 11

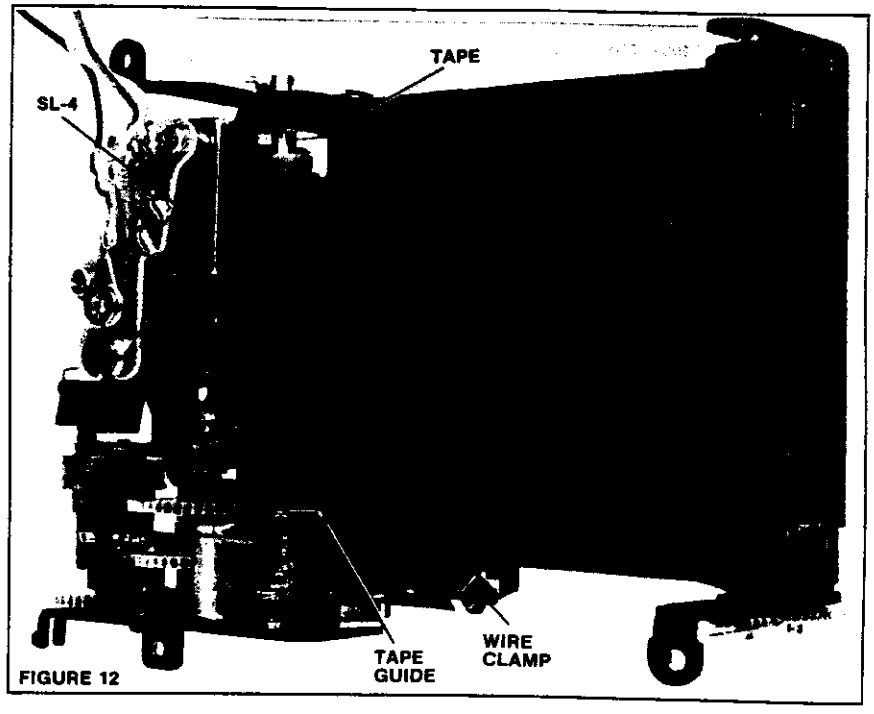


FIGURE 12

Other disassembly:

1. You can remove the assembly containing the release magnet and aperture magnet without separating the mirror box from the front plate. Push the armature away from the release magnet, Fig. 13; you can then reach both screws holding the assembly. On reassembly, hold the preset lever toward the rewind side of the mirror box.
2. To separate the mirror box from the front plate, remove the lens-mounting ring, the AV (f-value) ring, the plate above the AV PC board, the MD switch, and the AV PC board. You can then take out the four screws from the front that hold the mirror box. A light shield behind the front plate will be loose.
3. The disassembly of the wind mechanism is similar to that in XG models. However, the X-700 adds the overrun-prevention lever to assure proper film registration. Remove the wind stopper, Fig. 15, by taking out the screw at the back of the focal-plane aperture. Also remove the charge cam (one screw), the shutter-charge gear, and the return spring (one end of the return spring is bent away from the coils — this end faces the shutter-charge gear). When you remove the plate at the bottom of the camera, note the two spacers — one at the bottom of the take-up spool and one at the bottom of the sprocket. To remove the upper wind plate, first remove the counter dial and lift off the film-load signal lever (red lever) with its spring. Also lift off the brass bushing that has the spring for the winding-operation lever (pawl). Before removing the winding base plate, check to see if there's a timing mark on the winding-gear idler, Fig. 16. If not, scribe the tooth that aligns with a punch mark on the winding gear.

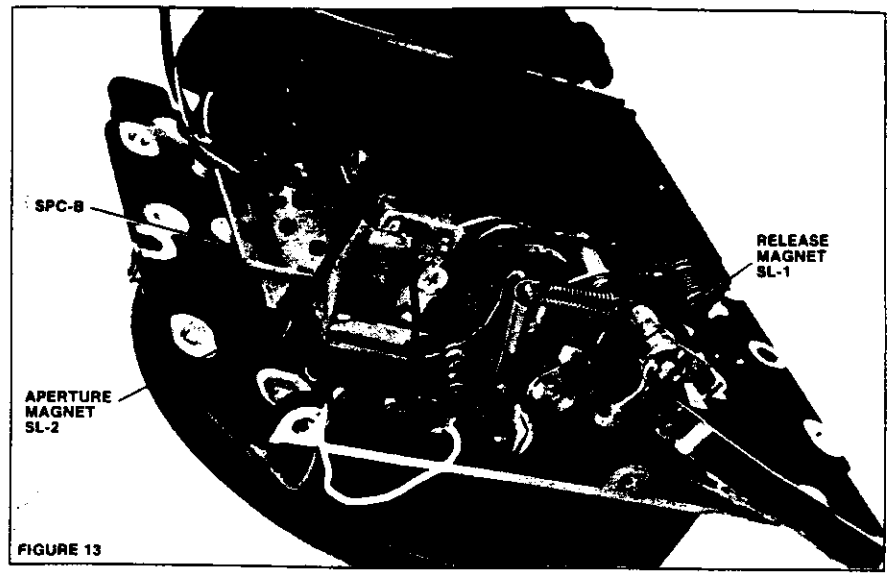


FIGURE 13

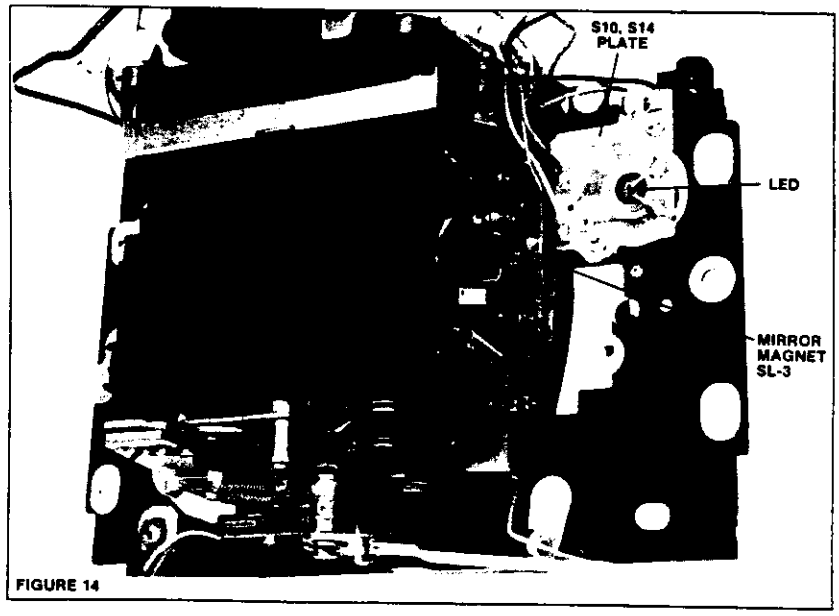


FIGURE 14

Timing procedures, transport:

1. The sprocket shaft has three lobes on the lower end. After the wind stroke, the overrun-prevention lever drops into engagement with one of these lobes to prevent the sprocket from traveling beyond the proper registration position. When you replace the sprocket and the sprocket shaft, note the following:
   a. Seat the sprocket with a pair of teeth pointing directly to the back of the camera.
   b. Seat the sprocket shaft so that the slot in its top end runs parallel to the back of the camera.
   c. Check the position of the lobes at the lower end of the sprocket shaft — the tip of one lobe should be pointing to the back of the camera (so that the flat side of the lobe is in position to be engaged by the overrun-prevention lever). If not, rotate the sprocket shaft 180 degrees.
2. Before replacing the winding base plate, Fig. 16, time the winding-gear idler — the timed mark on the winding-gear idler should point to the small hole in the winding base plate (the hole under the winding gear, at the position of the punch mark pointed out in Fig. 16). Time the sprocket gear, Fig. 16, so that its flat sides are parallel to the back of the camera (the flat that fits into the top of the sprocket shaft). One tooth on the sprocket gear should now be centered in the timing hole, Fig. 16.
3. Place the coil spring on top of the sprocket shaft. Then seat the timed winding base plate.

Replace the winding gear with one of its punch marks aligned with the marked tooth on the winding-gear idler.

4. Replace the wind shaft in the position shown, Fig. 16. When you replace the shutter-charge gear at the bottom of the wind shaft, hook its slot over the upper end of the return spring. Then rotate the shutter-charge gear clockwise, tensioning the return spring, until the eccentric is in the position shown in Fig. 15. The shutter-charge gear hooks against a stop, holding the tension on the return spring.
5. As you replace the winding base plate B set (the upper winding plate), time the counter-operation gear (the white plastic gear that drives the counter dial). The notch in the counter-operation gear should face the brass rivet for the spring.
6. When you replace the brass bushing with the spring for the winding-operation lever, hook the downward-projecting ends of the spring — the ends should cross over one another and hook to the notches in the winding-operation lever (pawl).
7. Check the adjustment of the overrun-prevention lever after you complete the reassembly of the wind mechanism (see "Other Adjustments").

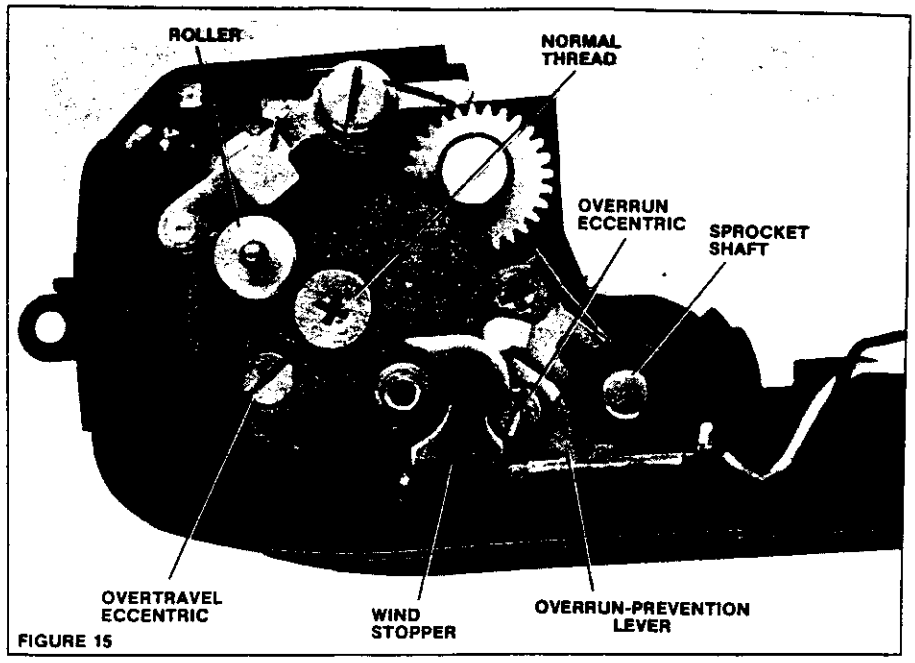


FIGURE 15

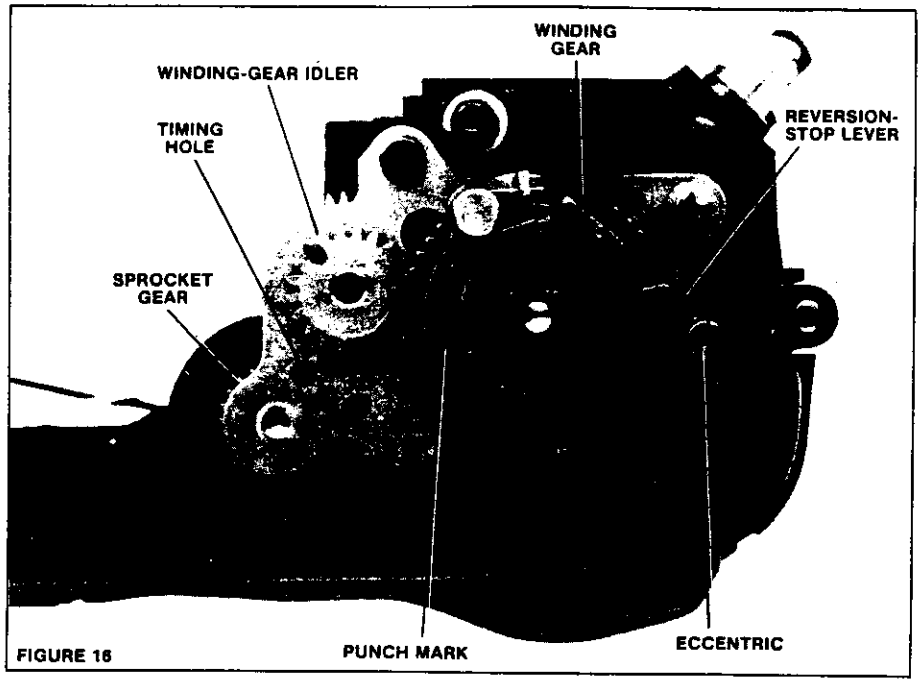


FIGURE 16

Reassembly highlights:

1. When you replace the shutter on the mirror box, the shutter should be in the cocked position and the mirror should be in the released position (mirror down).

Note: To cock the shutter, rotate the charge gear, Fig. 11, in a counterclockwise direction (as seen from the top). Charge the mirror box by pushing the mirror-charge lever, Fig. 11, from right to left. To release the mirror, connect 1.5 — 2V between the green mirror-magnet wire (negative) and ground. Disengage the mirror latch to return the mirror.

2. After replacing the shutter block, route the purple sync wire as shown in Fig. 11.
3. Release the shutter before replacing the front-plate/mirror-box assembly (charge the mirror — then apply 1.5V between the green mirror-magnet wire and ground). As you seat the assembly in the camera body, feed the forked end of the charge lever over the roller on the charge cam.
4. Align the timing mark on the charge gear, Fig. 11, pointing to the center of the rivet for the intermediate gear, as you seat the front-plate/mirror-box assembly. Alternately, you can adjust the wind overtravel after installing the mirror box (see "Other Adjustments").
5. Slide the front-plate assembly toward the wind-lever end of the camera before replacing and tightening the front-plate screws.
6. Route the reset-switch wires (black and yellow) through the wire clip, Fig. 8. Solder all the wires to the motor-drive circuit board before replacing the battery plate. Route the wires as shown in Fig. 8 to provide clearance for the battery box.

Note: When soldering the wires to the motor-drive circuit board, distinguish between the three black wires — the black wire from the aperture magnet SL-2 does not go to ground. The brown SL-2 wire (if used) goes to the

ground connection; the black SL-2 wire connects to the same land that has the orange wire.

7. Connect the charge-lever spring to the charge lever — then seat the battery plate. The white battery-plate screws go to the front of the camera. Of the black battery-plate screws, the long screw goes near the tripod socket.
8. Before replacing the flex, route the purple (2), blue, brown, yellow, and white wires under the plate at the top of the camera, Fig. 9 (between the mirror box and the post on the camera body).
9. Pass the top of the flex circuit under capacitor C2 on the LED PC board, Fig. 5.

Caution: Don't overtighten the screw that has the washer, rewind side of flex, Fig. 5 — excessive pressure could damage the flex.

10. Wire-routing is very critical. Before replacing the top cover, make sure wires are routed as shown in Fig. 1.
11. To replace the top cover, first set the override-switch cam so that its notch allows the override switch to open. Then turn the SV (film speed) brush until its tab aligns with the tab on the override-switch cam — that's ASA 200. Also set the film-speed dial to ASA 200; the notches in the film-speed dial now align. Set the main switch to the on position, Fig. 1, and turn the main-switch control in the top cover fully clockwise (as seen from the top). Solder the top-cover wires as shown in Fig. 4.
12. To replace the wind lever, first hook the lower end of the wind-lever spring. Some of the wind-lever springs have smaller-diameter coils at the upper end (end that hooks to wind lever); others have the same diameter at both ends, and it then makes no difference which end goes up. Hook the wind-lever slot to the upper end of the spring. Then turn the wind lever counter-clockwise until it seats over the shaft.

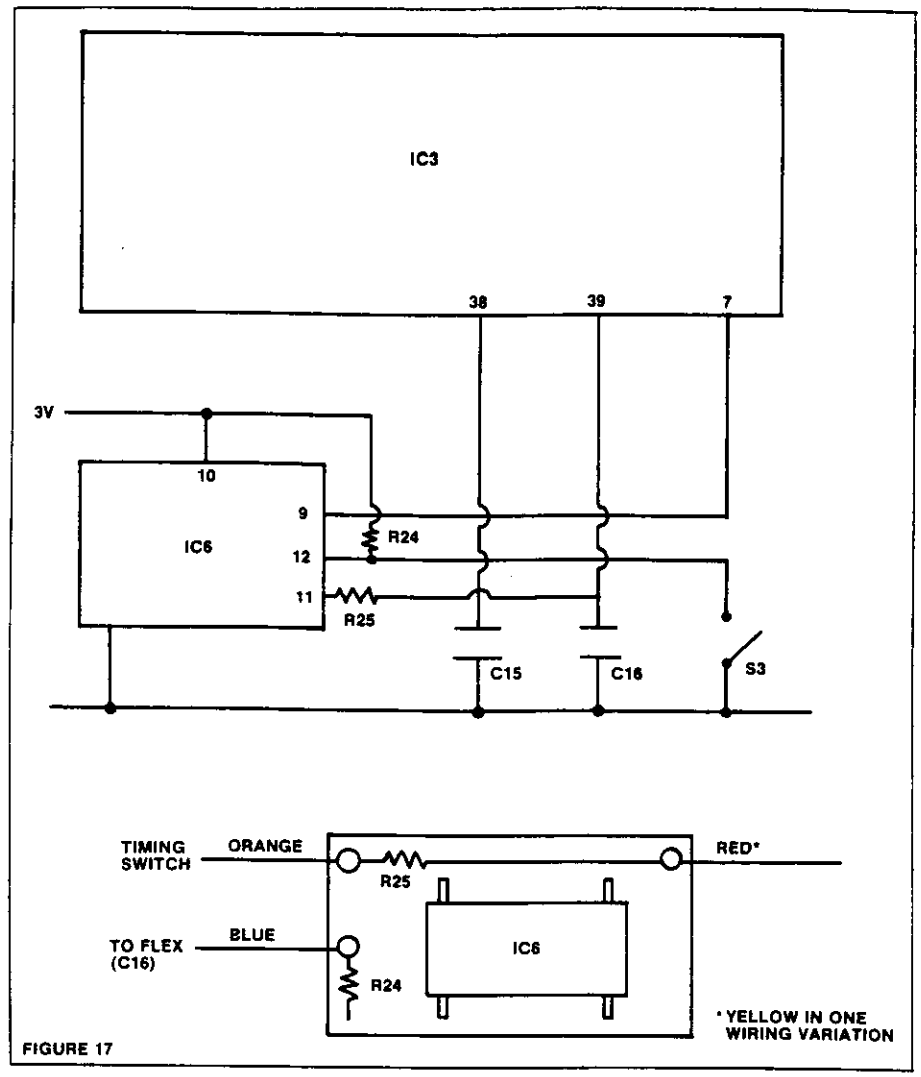


FIGURE 17

LOCATIONS AND FUNCTIONS OF SWITCHES:

S0. Touch switch. Touching the top of the release button turns on the metering circuit (same as closing S1).

S1. Metering switch. Closes when you push the release button part way. Connects pin 42 of IC3 to ground, turning on the metering circuit.

S2. Release switch. Closes when you fully depress the release button the release the shutter. Applies low signal to pin 2 of IC3.

Note: You can reach S1 and S2 by lifting aside the speed-selector assembly. The green wire is ground, the brown wire is to S1, and the gray wire is to S2.

S3. Timing switch on shutter. Closes with the shutter cocked (between black and orange wires), opens when the first curtain starts to travel. Opening S3 starts the shutter-timing cycle.

S4. Reset switch, Fig. 2 (black and yellow wires). Closed with the shutter released to reset the circuit (connecting pin 3 of IC3 to ground). Opens with the shutter cocked.

S5. Mode switch. Under the speed selector. Selects the P, A, and M modes.

S6. Main switch. Under the speed selector. Selects the off, on, and on with piezo beeper functions. When on, S6 connects IC3 to positive battery. IC3 then provides the 32KHz timing signal.

S7. MD (minimum aperture) switch on AV PC board, Fig. 3. Moves to one of three positions when the MD lens is set to the minimum aperture. Sets the circuit according to the minimum aperture of the lens for the P mode.

S8. Override switch. At the rewind end of the camera, Fig. 5. Closes when you turn the film-speed dial to an exposure-compensation setting. The plus/minus LED at the bottom of the scale then flickers.

S10. Self-timer switch at the back of the front-plate assembly, Fig. 14. At the self-timer setting, S10 connects the blue wire (pin 17 of IC3) to ground.

S13. Cable (accessory) release

switch. Front of camera, rewind side. Connects in parallel with S2.

S14. AE lock switch. At the back of the front-plate assembly, Fig. 14. Closes when you push down the AE lock lever, connecting the yellow wire (to pin 11 of IC3) to ground. S14 turns on the metering system and holds the information in memory.

BASIC CIRCUIT OPERATION:

1. The circuit uses five IC's —
   IC1 — top of flex, rewind side. Provides the MOSFET amplifier for the silicon photodiode SPC-A. The metering signal (varying with light level, film speed, and f/stop) appears at pin 14 of IC2. IC1 controls the charge across shutter-speed memory capacitor C5 with the voltage at pin 6; the voltage varies with light level and film-speed setting. IC1 also contains the second-curtain control circuit for the shutter magnet, the self-timer drive circuit, and the charging circuit for timing capacitor C6.
   IC2 — top of flex, wind side. Contains the switches for the memory circuits, the charging circuits for the memory capacitors, the aperture-control circuit that automatically sets the f/stop in the P mode, and the mode-discriminating circuit that selects the P, A, or M modes.
   IC3 — side of flex that folds on top of pentaprism, wind side. Provides the 32KHz crystal-controlled clock that sequences the timing functions, the 8 Hz signal for the LED indication, the signal that shuts off the LEDs when the shutter releases, and the signals that drive IC5 to turn on the LEDs, disengage the release magnet, and disengage the mirror magnet.
   IC4 — driver for the LEDs, side of flex that folds on top of pentaprism, rewind side.
   IC5 — inverter IC that operates the aperture, release, and mirror magnets. Also turns on transistor Q1 to provide power to the circuit.
2. The four magnets are sequenced by timing signals from IC3. When the release switch S2 closes, the release magnet SL-1 separates. The preset lever, Fig. 3, then moves from right to left (as seen from the front of the camera),

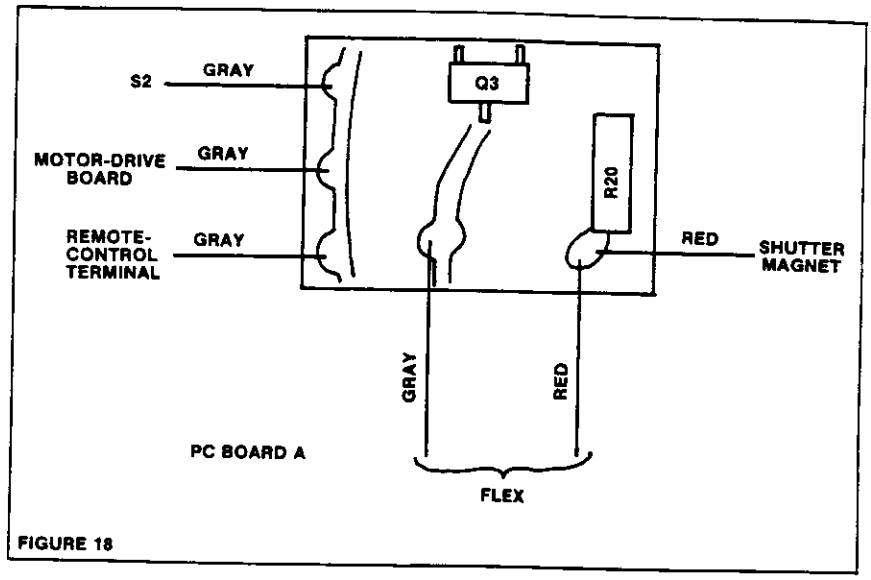


FIGURE 18

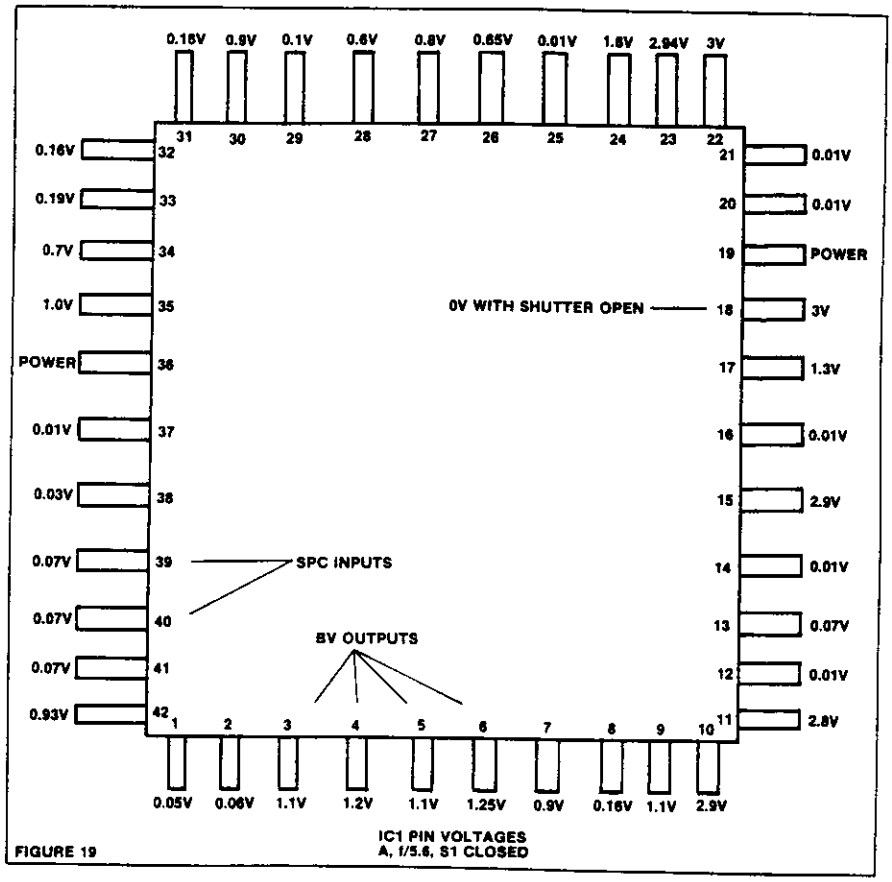


FIGURE 19
IC1 PIN VOLTAGES
A, f/5.6, S1 CLOSED

allowing the diaphragm to close. After a time delay of 60ms, the timing circuit sends a signal to the mirror magnet SL-3. The mirror magnet releases the mirror, and the mirror mechanically releases the shutter. In the P mode, the aperture magnet SL-2 determines how far the diaphragm can close. When the aperture magnet receives the release signal from IC2, it stops the movement of the preset lever. The shutter magnet SL-4 holds the second curtain for the length of the shutter speed.

3. The timing and memory circuits are analog systems, controlled by capacitors. Capacitor C3 is the memory capacitor for the aperture information; capacitor C5 is the memory capacitor for the shutter-speed information. The memory switches are inside IC2 — A3 is the memory switch for the aperture value, and A4 is

the memory switch for the shutter speed.

4. In the P mode, the voltage across C3 controls the diaphragm setting (when the aperture magnet separates). As the diaphragm closes, the voltage at pin 6 of IC1 decreases because SPC-A sees less light. In turn, the voltage across shutter-speed memory capacitor C5 decreases. In the P Mode, IC2 compares the fixed voltage on C3 (AV memory) to the decreasing voltage on C5 (shutter-speed memory). When the two voltages are equal, the comparator switches and the aperture magnet stops the diaphragm.
5. The actual shutter speed depends on the charge across C5, regardless of the mode. When you close S1, IC2 charges C5 according to the light level and the film speed. The initial charge across C5 then decreases as the diaphragm closes. When the mirror magnet releases, a switch inside IC1 (A1) opens to lock the charge on C5.
6. At the manual speeds, the IC1 switch remains open. The charge across C5 does not decrease as the diaphragm closes. Here, the C5 charge is determined by the setting of the TV (shutter speed) resistor. As you set faster speeds, the charge across C5 increases.
7. When the first curtain releases, it opens the timing switch S3. The timing capacitor C6 now charges; the faster C6 charges, the sooner the shutter magnet releases the second curtain. C5 controls the charge rate of C6.
8. After the second curtain releases and ends the exposure, reset switch S4 closes. Closing S4 resets the circuit in preparation for the next exposure. When you cock the shutter, S4 opens.
9. The circuit uses two silicon photodiodes — SPC-A for available light and SPC-B for flash. The output at pin 6 of IC1 varies according to the light level and the film-speed setting. At the input to IC2 (pin 14), the voltage varies according to the light level, film speed, and diaphragm setting (AV resistor). IC2 then processes the information and applies the input to IC4 for the LED indication.
10. Power to the circuit is supplied by transistor Q1 when S0 or S1 closes. Closing S1 switches pin 42 of IC3 to ground. Pin 5 of IC3 then goes high. The high signal is applied to pin 8 of IC5. IC5 inverts the signal, applying a low signal to the base of Q1. When Q1 turns on, it supplies 3V to IC1, IC2, and IC4. IC5 always has 3V at pin 12. IC3 has 3V at pins 16 and 37 with the main switch in the on position.
11. The release signal, provided by closing S2, causes pin 35 of IC3 to switch high. IC5 inverts the signal and applies a low signal to C10. C10 discharges through the coil of the hybrid release magnet SL-1. When SL-1 separates, the diaphragm starts closing. Simultaneously, pin 13 of IC3 switches low to shut off the LED display.
12. After a time delay of 10ms, pin 26 of IC3 switches low. This signal, appearing at pin 33 of IC2, turns off the memory switches A3 and A4.
13. After a 60ms time delay, IC3 switches pin 33 high. IC5 inverts the signal at its pin 11. C9 now discharges through the coil of the mirror magnet to release the mirror. Simultaneously, IC3 switches its pin 23 low. This signal, appearing at pin 18 of IC1, causes the shutter magnet SI-4 to hold the second curtain.
14. When the mirror magnet releases, pin 23 of IC3 switches low to shut off transistor Q2. Q2 then stops the current through SPC-A. The output of SPC-A then has no further effect on the exposure.
15. To select the shutter speed, the second-curtain control circuit considers three values — the charge across C6 (timing capacitor), the high-speed limitation signal, and the slow-speed limitation signal. The slow-speed limitation signal prevents the shutter speed from going slower than 5 seconds.

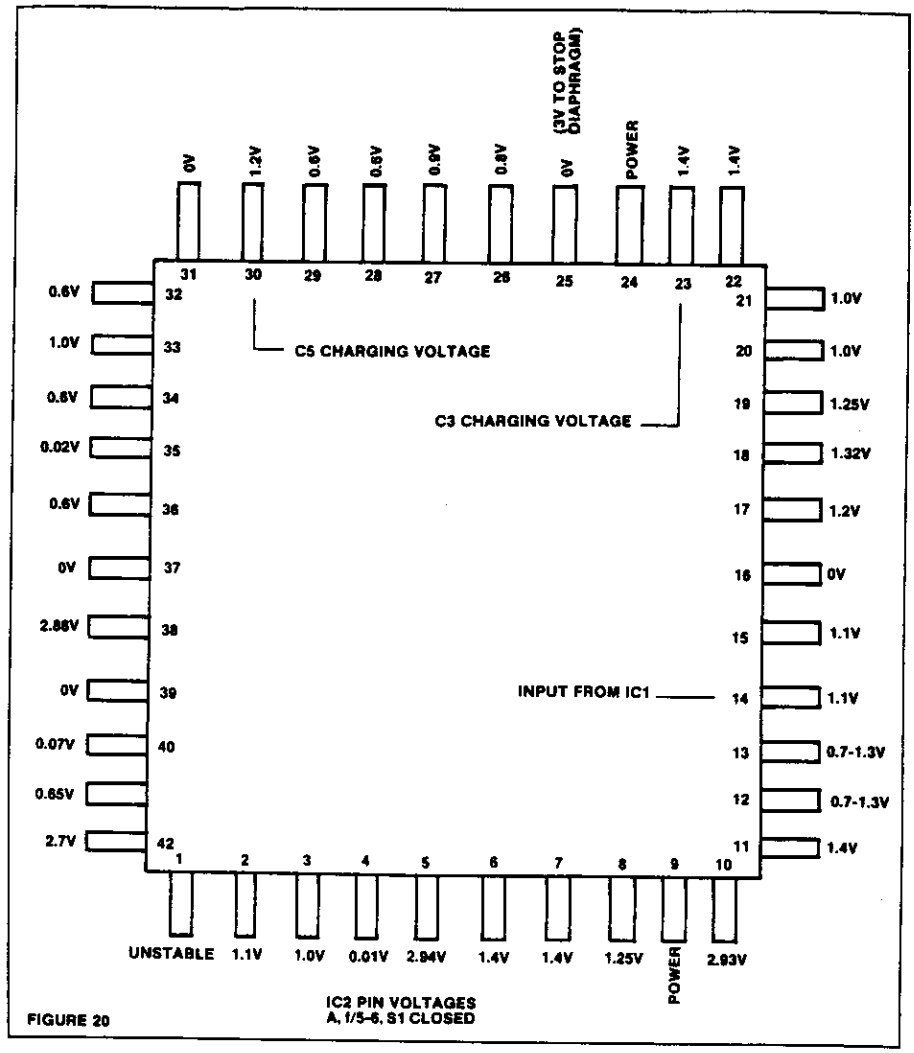


FIGURE 20

TROUBLESHOOTING:

Behavior without batteries: shutter won't release

(FROM MINOLTA MANUAL)

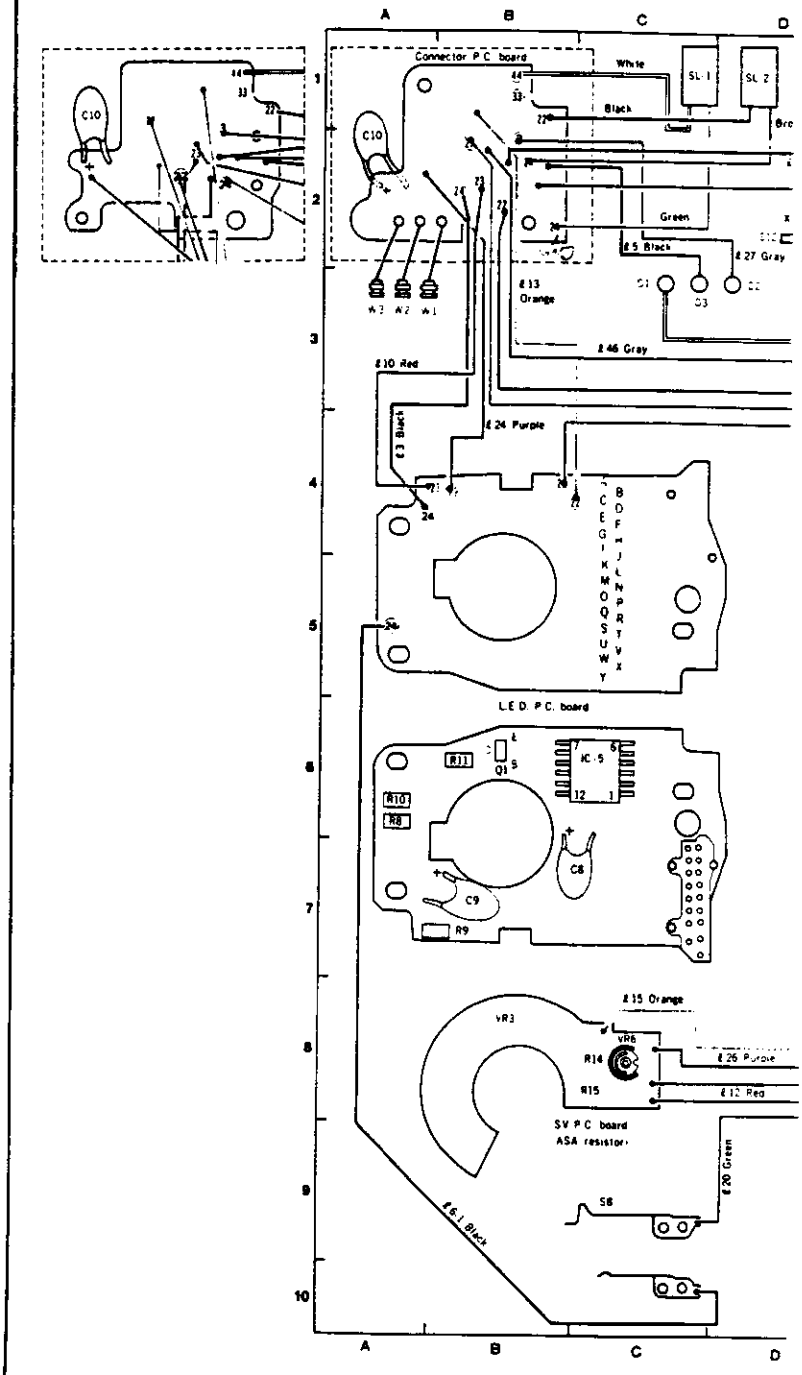
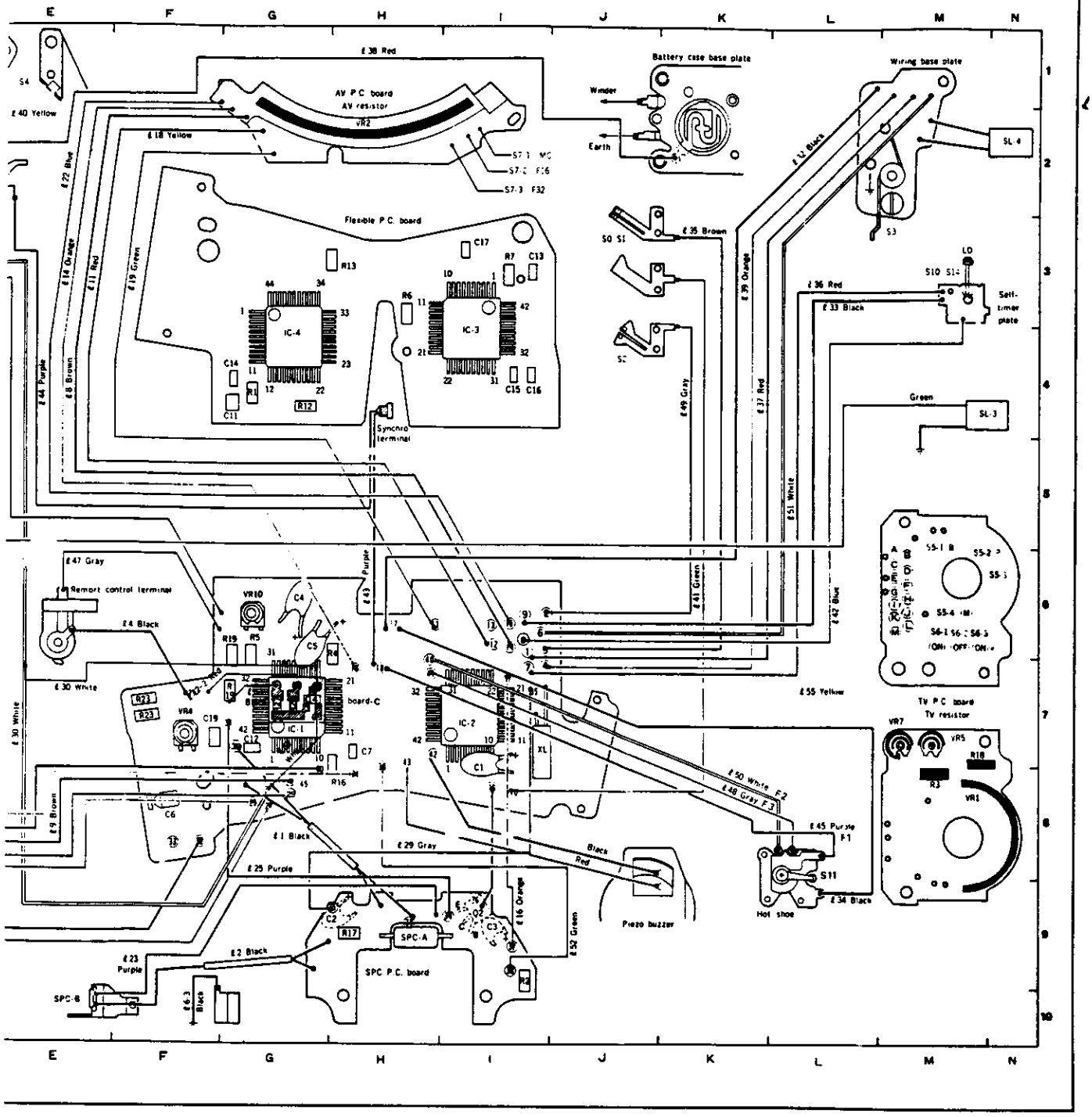


FIGURE 21

D **X-700** **CODE No.2017** (2017-0401-34, 2017-0401-35)



Behavior without lens: "P" LED flickers at P mode

Current draw (3V applied):

- — main switch in off position (leakage current) — less than 2 microamps
- — main switch in on position — less than 10 microamps
- — S0 or S1 closed (LEDs on) — 10-12ma
- — shutter open — 24ma

Tips for troubleshooting without disassembly:

1. For complaints of battery drain, check the leakage current (main switch off). If the current exceeds 2 microamps, the problem is probably C10, C8, C9, or IC5 (see troubleshooting step #15 to isolate the problem). If the current draw is o.k. with the main switch off, but exceeds 10 microamps with the main switch on, the problem is probably IC3.
2. Check for flash-speed change-over by applying 2V to the dedicated flash pin (the hot-shoe pin closer to the rewind side). Connect the negative power-supply lead to ground; touch the positive lead to the hot-shoe pin. When you close S0, the 60 LED should glow steadily. When you release the shutter, the shutter should stay open. The shutter should close when you disconnect the power supply.
3. If the shutter won't release, try shorting across the accessory-release socket (front of camera, rewind side). If the shutter then releases, the circuit is o.k. Check S2 and the wiring to S2.
4. Check the operation at the motor-drive terminals by shorting pin W1, Fig. 7, to ground — the LEDs should turn on. When you short W2 to ground, the shutter should release. Check the motor-drive switching action at W3 with an ohmmeter. With the shutter cocked, you should measure infinite resistance. With the shutter released, you should measure around 500 ohms (if not, try reversing the ohmmeter leads).
5. If the diaphragm won't stop down, the problem could be in the release magnet (not releasing) or the aperture magnet (not holding). Set the camera to A or a manual speed. Then watch the preset lever, Fig. 3, as you release the shutter. If the preset lever doesn't move at all, the problem is probably the release magnet. If the preset lever moves slightly, the problem is probably the aperture magnet. If the preset lever moves the full distance — but the shutter won't release — the problem is probably the mirror magnet. The normal repair is to clean the core/armature interface of the magnet.
6. If the shutter always sets a 5-second exposure on A and P — and the underrange LED always flickers (triangle LED at bottom of display) — the problem is in the light-metering portion of the circuit. Check the SPC PC board and IC1.
7. If the camera is jammed with the mirror up, check from the back to see if the curtains have cleared the aperture. If you can see the curtain bars, push the curtains in the release direction until the mirror returns. Then check the operation. If the camera operates properly, the problem was probably that the owner interfered with the curtain travel (possibly while loading film). The curtains then failed to clear the brake and return the mirror.
8. In early cameras, interfering with the curtain travel could also cause the lower curtain tape to come off the roller (as in XG cameras). The tape then becomes tangled with the shutter gears. You can identify the problem from the back of the aperture — one curtain won't be straight. Minolta later added a tape guide to prevent the problem (see "Revised Parts").

IC's, general troubleshooting:

You can check the pin voltages to IC1 and IC2 from the top of the camera, Fig. 19 and Fig. 20. Check the voltages with respect to ground (black wire at top front of flex or battery-box plate). However, IC3 and IC4 are on the side of the flex that folds on top of the pentaprism, and IC5 is on the underside of the LED PC board. You can check these IC's at other points in the circuit.

IC3

IC3 provides the timing circuit that sequences the circuit operations. Signals are H (high) or L (low). A high signal is close to 3V, and a low signal is close to ground potential (around 0.6V).

1. Check the oscillator signal with the main switch turned on. With a scope at either leg of the quartz crystal, Fig. 4, you should get a 32KHz sine-wave signal.
2. Check the signal at test-point #8, Fig. 5. The signal should switch H when you close S1.
3. Check the signals at the test-points 2 and 3, Fig. 5. Each signal should switch H when you release the shutter by closing S2.
4. Check the signal at pin 33 of IC2. The signal should switch L when you release the shutter.
5. Check the signal at pin 11 of IC1. The signal should switch L when you release the shutter.
6. Check the signal at pin 12 of IC1. The signal should switch H when you release the shutter.
7. Check the signal at pin 42 of IC2. The signal should switch L when you release the shutter.

IC4

IC4 is the driver for the LEDs. If there's a problem in the LED readout, it's usually caused before the signal reached IC4.

1. Check the indication input signal at pin 8 of IC2 (the signal that tells IC4 what SS LED to turn on. The signal should change as you change the light level, film-speed setting, or diaphragm setting (around 1.25V at A, ASA 100, f/5.6, room lighting). If not, the problem is prior to CI4.
2. Check the voltage at pin 6 of IC2. The voltage should be around 1.4V. If not, the problem is prior to IC4.
3. IC4 also selects the mode indication (M, A, P) according to H or L signals from the mode-selector switch S5. But you can check the signals into the mode-discriminating circuit at IC2. Pin 3 of IC2 — L for program, H for auto and manual. Pin 4 of IC2 — L for auto, H for Program and manual. If not, the problem is probably in the mode-selector switch S5.

IC5

IC5 is an inverter IC that drives the aperture, release, and mirror magnets. It also turns on transistor Q1 when it receives a signal from IC3 that S1 has closed. A problem with

any of these operations could be either in IC5 or in IC3. You can check the inputs to IC5 at the test points shown in Fig. 5.

1. If the LEDs do not turn on when you close S1, check test-point #8. The signal should switch H when you depress the release button part way. If it does, IC3 is o.k. The problem could be in IC5 or in Q1.
2. If the shutter won't release, short test-point #2 to positive battery (the red wire at the front of the LED PC board). If the shutter then releases, IC5 is o.k. If not, the problem could be IC5 or the mirror magnet.
3. If the preset lever doesn't move when you release the shutter (diaphragm always fully open), short test-point #3 to positive battery. The release magnet should separate, and the preset lever should move. If so, IC5 is o.k. If not, the problem could be IC5 or the release magnet.
4. If the diaphragm doesn't change in the P mode, short test-point #3 to positive battery. The preset lever should then move. Next short test-point #4 to positive battery. You should hear a click as the aperture magnet separates. If so, IC5 is o.k. If not, the problem could be IC5 or the aperture magnet.

Troubleshooting steps for specific problems:

1. Shutter won't release, no LEDs

   Battery voltage to flex

   Check for 3V at the red wire to the LED PC board, Fig. 5. No voltage — check red-wire connections to positive battery and battery-box ground tab connection. Also check connections of black wire to LED PC board.

   Main switch

   Check for 3V at the red wires, wind side of flex, with the main switch in the on position. No voltage — poor contact in main switch.

   IC5

   Check pin connections (12 and 1).
2. Shutter won't release, LEDs work properly

   Release switch S2

   Check by shorting gray release-switch wire (wind-side of flex) to ground. If the shutter releases, the circuit is o.k. Check S2 and the gray-wire connections.

   Mirror magnet SL-3

   Disconnect the green mirror-magnet wire, front of LED PC board. Connect a power supply (1.5-2V) between the green wire (negative) and ground. If the mirror magnet is o.k., the shutter will release.

   IC3

   Check the signal at test-point #2, Fig. 5. The signal should go high when you fully depress the release button. If not, check solder connections of IC3 (2 and 33) and IC5 (2 and 11).

   IC5

   Check by shorting test-point #2, Fig. 5, to positive battery. If the shutter then releases, IC5 is o.k. If not, check IC5 pin 2 connection. Also check connections of C9, Fig. 10.

   Reset switch S4

   Turn the main switch off and then on again. If the shutter will now release, check the S4 contacts and solder connections (black wire and yellow wire). You should measure direct contact across S4, Fig. 2, with the shutter released and no contact with the shutter cocked.

   Timing switch S3 (LEDs go out when you fully depress release button)

   Check by shorting the orange timing-switch wire (front, wind-side of flex) to ground. If the shutter will now release, check the timing switch and the solder connections (orange wire and black wire) to the flex and to the shutter circuit board.
3. Shutter releases, but there's a noticeable delay between the release of the diaphragm and the release of the shutter.

   Quartz crystal or IC3

   Check the clock signal at either lead of the quartz crystal, Fig. 4. With a scope, you should see the 32KHz sine-wave signal. If not, check the quartz crystal XL for disconnected leads. Also check IC3 solder connections (38 and 39)
4. Shutter stays open (around 5 seconds), all modes

   C4 or C5, defective or poor solder to flex, Fig. 4

   C6, shorted, Fig. 5

   Timing switch S3, not opening or shorted to ground (orange wire)

   Check S3 if the shutter stays open for 5 seconds if you keep the release button depressed, but closes before 5 seconds if you let up the release button.

   IC1, poor solder to pin 17 or 21

   IC2, poor solder to pin 30
5. Shutter delivers fast speed only, overrange LED flickers, diaphragm stops down fully in P mode

   SV (film speed) brush, poor contact, or connections to SV PC board

   Check the voltage at pin 6 of IC1. The voltage varies with film speed and light level, but should be around 1.25V. If the voltage is over 2V, check for poor contact in the SV resistor. Also check IC1 pin 5 connection, solder connections to the brown wire at the SV board, solder connections to the red wire at the SV board. If the voltage at pin 6 is less than 2V, check the solder connections of the orange wire that connects to the AV PC board.
6. Shutter delivers no opening (both curtains travel together), LEDs o.k.

   Shutter magnet SL-4, open or dirty interface

   Check by shorting the white shutter-magnet wire to ground as you release the shutter. The shutter should stay open. If not, the shutter magnet is not holding the second curtain. Approximate coil resistance (white wire to red wire) — 280 ohms.

   Wind overtravel, insufficient

   IC6 defective (early version of flex)

   IC3

   Check the signal at pin 11 of IC1. The signal should switch low when you release the shutter. If not, check solder connections — IC3 (23) and IC1 (11).

   TV resistor or mode switch S6

   Check the voltage at pin 11 or IC2. Should be around 1.4V. If not remove the speed selector and clean the contacts (S6 and TV resistor VR1). If you get around 1.4V, yet the curtains still travel together, check IC1 (11, 18, 19, 20), IC2 (18), and IC3 (23, 24).

THE SOCIETY OF PHOTO-TECHNOLOGISTS

SERVICE NOTES

ROLLEI 35 — Photocell replacement

When the cell goes bad, instead of ordering the whole meter replacement, use a Minolta SRT cell. Take off the black plastic light limiting cap from the bad cell and replace it on the SRT cell. I found that with the unmarked SRT cell the meter falls right in without adjusting.

Also: to remove some corrosion and clean up chrome covers so they sparkle, use Armor-all protectant.

Peter R. Smith
Lake Worth, FL

KEYSTONE 306 110 CAMERA

1. Using a thin palette knife, work off the front finder frame. It is held by 3 tabs along the top edge and 3 tabs along the bottom edge.
2. Remove the 2 screws visible in the bottom side.
3. Remove the battery door and batteries.
4. With a thin palette knife, free the top cover along the left (battery) end of the camera. Then open the film door and free the tab located above the film sensor lever opening. Now the top cover can be worked off.
5. The complete mechanism and flash unit may be lifted off the bottom cover at this point to gain access to the shutter mechanism. When reassembling, be sure to orient the release linkage so that the lower tip goes into a slot in the bottom cover.
6. This camera had the problem of intermittent flash failure. The flash contacts can be cleaned at this stage of disassembly. This did not cure the problem that I had. By reforming the blade operating lever very slightly to provide for longer engagement with the shutter blade, giving it more positive travel distance to make flash contact seemed to cure my problem. Possibly, by weakening the shutter blade return spring tension very slightly may also correct this problem of intermittent flash failure.

(If anyone has a better cure for this problem, I sure would like to know about it).

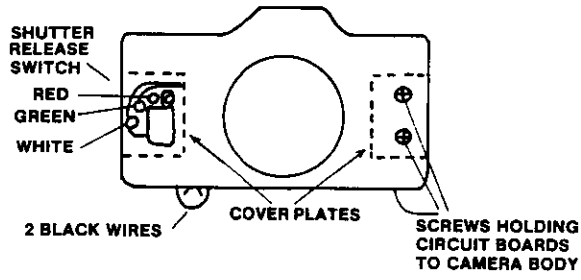
James V. Portuese
Lowell, MA

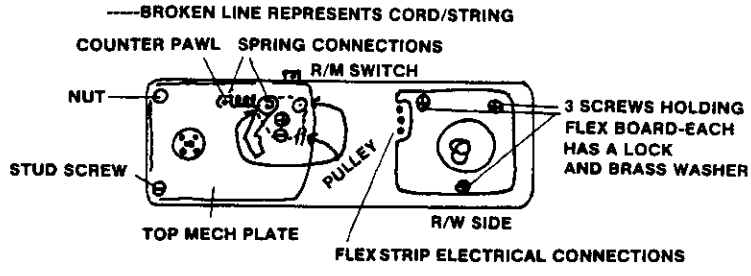
ROLLEIFLEX SL35E

Top cover removal:
Unscrew release button (it has a spring under it). Remove 'c' clip and brass spanner nut. Lift off speed dial — there is a flat steel spring in both the speed dial and ASA dial housing that can fly out. Unscrew top plate on wind lever and exposed nut.

Remove six visible screws in top cover and the three screws holding the eyepiece on (do not over tighten eyepiece screws on reassembly since they will crack eyepiece collar). Remove rewind knob in usual way and two exposed screws. Lift off ASA dial housing. Pull off top cover.

Mirror cage removal:
First remove top, bottom and side covers.





On the wind side, remove shutter speed resistor board by unsoldering jumper wires and removing screw on rim of resistor board; a glue like pliobond is used, so some lifting pressure is required (the resistor board can be moved without unsoldering wires by pushing release button down and flipping board to side of pentaprism). Remove top mech. plate by loosening stud that the cord/string is wrapped around and lifting cord up, about 1½ turns. Remove 'c' clip holding counter dial and return spring on and lift off counter dial and spring. Loosen metal sheet around R/M switch. Disconnect spring hooked to counter pawl and pulley. Remove the nut, stud screw, crosspoint screw between pulleys and screw holding the white teflon collar. Remove collar too. Pull mech. plate off.

On the rewind side, remove top 3 screws (watch for washers), 2 screws holding front circuit board and 2 screws holding circuit boards to bottom of camera. Unsolder 3 flex strip connections on top board and all wires connected to board. Remove 'c' clip on R/W collar post, pull off ISO washer/collar and lift up circuit board. Remove switch (battery check) by unscrewing single screw holding it down (this switch is visible after top c. board removed). Unsolder 3 wires on release switch and two black wires shown in drawing, on junction box on R/W side of pentaprism. Unsolder both blue wires, white wire, black wires and yellow wire to B-C switch. Use care around junction box since the pins that the wires are soldered to can break off.

Remove the 2 screws, one on each side of eyepiece — the screw on wind side goes into body (vertical), while the screw on rewind side goes in horizontal.

On bottom of camera, remove the screw holding mirror charge lever on and remove charge lever. Mirror cage will now pull out.

Joe Palmer
Pendleton, OR

PLASTIC WELDING CEMENT:

A liquid which I have found to be excellent for joining broken plastic parts is called PLASTRUCT PLASTIC WELD CEMENT. While it does not work on all plastics it has helped in many a camera. Available from PLASTRUCT, INC, 1020 S. Wallace Pl, City of Industry CA 91748, USA.

Ben Vang
Dubbo, NSW
Australia

OLYMPUS OM-1n

A common problem in re-assembly of the OM-1n is losing the timing of the cord coupling disc. This generally happens when replacing the lens mounting flange.

To aid in reassembly: cut out a section in the lower right rear portion of the cover plate #ZC108300 about 3mm wide under the foam damping pad. This allows room to insert a length of 7mm brass wire to hold the cord coupling disc at its timing mark. Replace the decorator cover plate, speed setting ring and lens flange. Check operation of the speed setting ring and replace foam damping pad.

G. W. Hartner
Jackson, WY

ZENIT-PENTAX INCOMPATIBILITY

I had an unfortunate experience recently using a Zenit body to check the focus of a Pentax full open metering, screw mount lens. The lens got stuck to the body, and I had to dissassemble the lens all over again to get it off. Here is what happens: the Zenit front lens flange is held by 3 or 4 screws (depending on the model) and the Pentax lens has a pin in the back that serves to prevent the auto-manual lever being set to manual if the lens is not attached to a body. This spring-activated pin catches in the recess for a flange screw and prevents the lens from being turned in any direction, if force is used, invariably the pin will get damaged — so Beware!

Centre Phototechnique de Montreal
Montreal, Canada

AUTO YASHINON-DX 50mm f/2 lens

Problem:

Loose rear mount

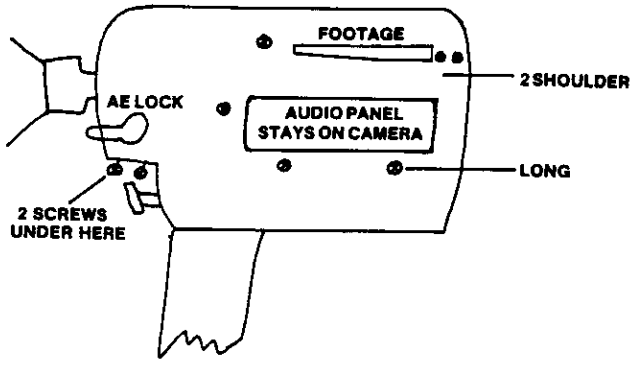
Disassembly procedure to tighten screws:

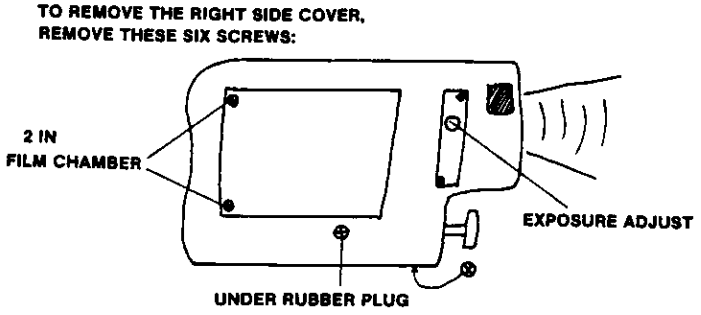
1. Unscrew the lens name ring together with the filter ring and remove them as a unit.
2. Remove the 3 screws holding the focusing ring in place and lift off the ring.
3. Remove the thin retaining ring which surrounds the front lens cone with the proper spanner points. Lift out the front lens group which also contains the diaphragm assembly.
4. Looking into the front, remove the 3 black slotted screws in the silver metal portion of the forward section. This will permit separating the complete focusing section and barrels from the rear half.
5. Now the screws that secure the rear sections together are visible and accessible for tightening.

James V. Portuese
Lowell, MA

CANON CANOSOUND 514 XL-5

To remove the left side cover: there are 9 screws of several types. The leather is very difficult. Remove name plate and 2 screws in upper front cover and remove it.





When replacing the right side cover, be sure to set the filter switch to sun position and push in the filter pin in the film chamber.

The exposure meter adjustment has a clearance hole in the right side cover, about 1/3 of the way down behind the leather.

Mike Harlei
Charleston, SC

MINOLTA AUTO FOCUS 2 PROJECTOR — ACCESS TO REPLACE FAN

This is a GAF product. The directions assume the lens is aimed to your right.

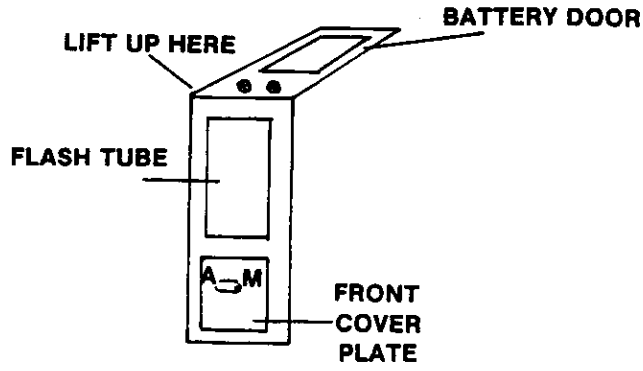
1. The see-through tray cover snaps off.
2. Black top cover snaps up from middle of tray area.
3. Pull up focus knob (might be tight).
4. Remove the hand control unit.
5. Remove the screw at each end of the tray the control unit lies in.
6. Top rim is held in by 4 long 3½" bolts with big spacer on each. Remove them.
7. Remove the two woodgrain sides and sliding black plastic doors.
8. Base tray for slide tray held in by 4 screws on bottom, and 2 nut-bolts at inside ends.
9. Front plastic trim around lens is loose.
10. Bulb reflector housing, bulb condenser housing can be removed.

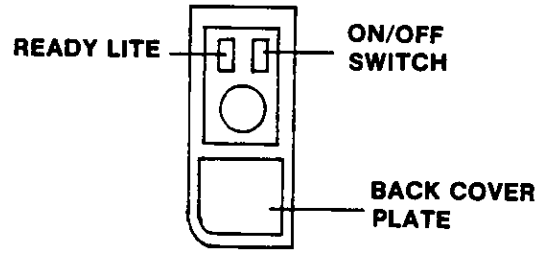
    (Move unit around so you can work on corner by motor.)
11. Side housing with on-off switch held down by two screws down inside by bulb socket.
12. Fan housing is held together by 3 long hair pins.
13. On top of slide housing is nut-bolt holding down tie down bracket with wires. Scribe registration marks on bracket and undo belt.
14. Motor, fan and half of fan housing are held to base by 2 screws at bottom and nut-bolt in upper corner.
15. Remove the long cardboard housing around fan.
16. Fan is normal GAF fan.

Arlan Blodgett
Salem, OR

PRINZ THYRISTOR COMPUTER BOUNCE
Electronic flash

Disassembly:





Remove battery door, front and back cover plates, 3 screws from top of flash and 3 screws revealed when back cover plate was removed. Remove hot shoe.

Lift up top front corner and pull both sides of housing apart. Film setting dial plate will now be loose. Caution should be used when replacing screws in housing since the screws go directly in the plastic and they are easily stripped.

Joe Palmer
Pendleton, OR

NIKON 50mm f/1.8 SERIES E LENS

Disassembly at front:

1. Remove name ring.
2. Remove three screws holding filter ring.
   A) On the old style lens, there are six screws, 3 holding front lens group.
   B) On the new style lens, there are three screws holding filter ring — you won't see the screws holding front lens group.
3. Remove the filter ring.
4. Remove the three screws holding front lens group. Note that this lens group is one unit — do not disassemble.
5. Scribe a mark for the diaphragm position.
6. Remove two chrome screws.
7. Lift out the diaphragm assembly.
8. Remove three screws.
9. Remove the c-ring (note new style has 0 ring).
10. Remove the focusing ring.
11. Remove three screws (chrome screws at side of lens).
12. Remove the depth of field-ring.

Dissassembly at rear:

1. Remove three screws.
2. Remove the bayonet.
3. Remove the diaphragm ring.
4. Remove the screws holding the helical keys (note new style has 2 keys).

This dissassembly procedure can also be used for Series E 28mm and 35mm lens.

Arlan Blodgett
Salem, OR

PETRI COLOR 35E

To remove the top cover:

1. Remove the rewind knob in the normal manner.
2. Unscrew the retaining nut around the rewind bushing. There is a washer glued to it but it need not be separated from the nut.
3. Lift the ASA dial and knob assembly.
4. Lift out a thin brass spacer washer.
5. Lift out 2 steel ball detents before they are lost.
6. Remove the screw at the right end of the top cover.
7. Lift off the top cover. The switch button in the left end will fall free.

If there is no battery continuity to meter, but the meter checks out to be "alive", check for broken or rotted wire under battery box. To replace the wire between the battery box and the circuit board under the front plate, it is necessary to pry out the center contact and insulator from inside the battery box. The insulator is cemented into the battery box. It is a good idea to remove the battery box also. If the wire was badly corroded, chances are that there is a build up of corrosion under the box. The screws holding the battery box are concealed by the center contact and insulator plate.

Remove the bottom plate held by 3 screws to expose wire routing.

Strip the leather from the front plate and remove the 4 screws exposed. Rotate the front plate around the shutter and lens assembly to provide access to the small board to which all the wires are routed.

Install new wire.

James V. Portuese
Lowell, MA

MAMIYA 645

Problem: The viewing mirror does not stay in the viewing position when the camera is pointed up or down.
Cause: A broken mirror tension spring, SLS 24361.

Remove wind side cover plates, wind knob and wind knob clutch. The top base plate is now visible. Remove (pull up and off) the wind knob clutch cam (note small detent in cam is on the side facing the camera's front). Remove the five screws holding the top base plate down and remove plate. (Unsoldering the wires to both top and bottom base plates is optional, since the plates can be flipped over the camera side to rest against the bottom of the camera). Remove the two screws holding the bottom base plate and lift plate up.

A broken mirror tension spring can now be seen and replaced. When replacing bottom base plate on camera, push the shutter release link plate toward the front of the camera.

Joe Palmer
Pendleton, OR

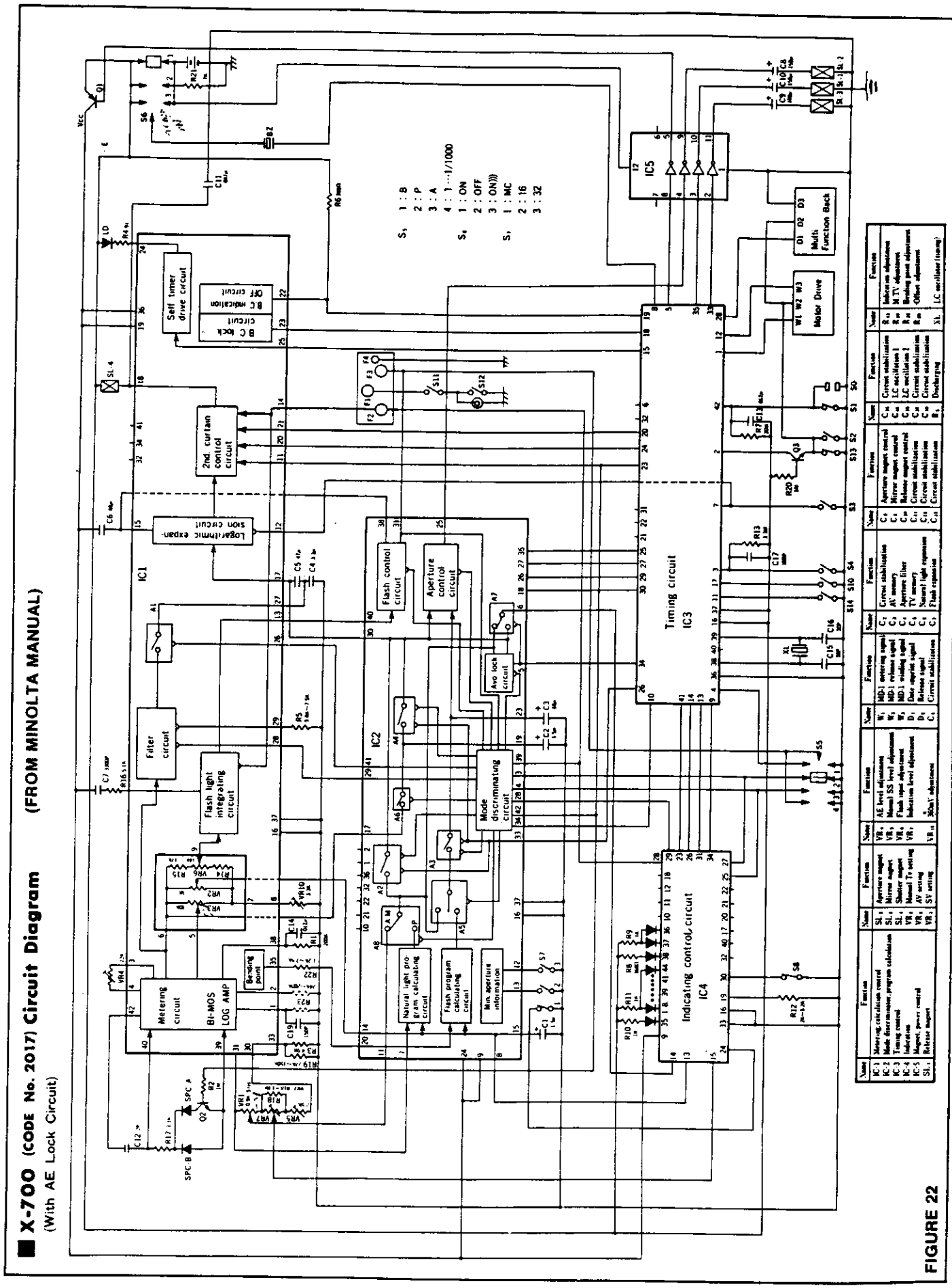

■ X-700 (CODE No. 2017) Circuit Diagram (FROM MINOLTA MANUAL)
(With AE Lock Circuit)
IC1
IC2
IC3
IC4
IC5
Timing circuit
Indicating control circuit
Metering circuit
Bi-MOS LOG AMP
Flash control circuit
Aperture control circuit
Mode discriminating circuit
Flash light integrating circuit
Filter circuit
Logarithmic expansion circuit
2nd. curtain control circuit
Self timer drive circuit
Motor Drive
Multi Function Back
Natural light program calculating circuit
Flash program calculating circuit
Min. aperture information
Avo lock circuit
Banding point
S1 : 1 : 8
2 : P
3 : A
4 : 1···1/1000
S2 1 : ON
2 : OFF
3 : ON)))
S3 1 : MC
2 : 16
3 : 32

FIGURE 22

7. Diaphragm fails to close, all modes — LEDs o.k.

Release magnet or C10

Check by shorting the positive side of C10 (violet wire) to ground. The preset lever should move from right to left, Fig. 3. If it does, C10 and the release magnet are o.k. Check the release-magnet coil between the white and green wires to the motor-drive circuit board, Fig. 7. Approximate coil resistance — 15 ohms.

IC5

Check by shorting test-point #3, Fig. 5, to positive battery (red wire at front of LED PC board). The preset lever should move from right to left, Fig. 3. If it does, IC5 is o.k. If not, check IC5 pin connections (3 and 10).

IC3

Check the signal to test-point #3, Fig. 5. The signal should switch high when you fully depress the release button. If it does, IC3 is o.k. If not, check IC3 pin connections (35 and 2).

Aperture magnet SL-2

If the aperture magnet fails to hold its armature magnetically, it will stop the diaphragm closure at the largest aperture (you'll then see the preset lever move slightly when you short the C10 violet wire to ground). If the preset lever moves slightly, clean the SL-2 interface or replace the magnetic release base plate (the complete assembly at the bottom of the mirror box that includes SL-2).

8. Diaphragm stops down fully in high light (P mode), remains fully open in low light

Aperture magnet SL-2

Disconnect the brown and black aperture-magnet wires from the motor-drive circuit board, Fig. 7. Disengage the release magnet by shorting the violet C10 wire, Fig. 7, to ground. Then apply around 2V across the aperture-magnet wires (negative to the black wire, positive to the brown wire). If the camera has just the black wire from the aperture magnet, connect the power supply between the black wire and ground (positive to ground). You should hear a click as the aperture magnet disengages.

IC5

Short test-point #3, Fig. 5, to positive battery. The release magnet should then separate, allowing the preset lever, Fig. 3, to move. Then short test-point #4 to positive battery. You should hear a click as the aperture magnet separates. If so, IC5 is o.k. If not, check IC5 pin connections (4 and 9).

IC2

Check the signal at pin 25 as you release the shutter in the P mode (or check at test-point #4, Fig. 5). The signal should momentarily switch high. (Note: Make sure film-speed SV resistor brush is making good contact; if not, the signal at pin 25 won't switch high.) If the signal does switch high, IC2 is o.k. If not, check the signal at pin 23 of IC2. With S1 closed, the voltage should go more positive as you increase the light level.

AV memory capacitor C3

Measure the voltage to the C3 lead shown in Fig. 6; with S1 closed, you should measure around 1.25V. If you measure the voltage, yet the diaphragm still behaves as described, check for poor solder connections at the small black wire to the SPC PC board. Also try retouching the solder connections of the SPC PC board (or replace the SPC PC board). If the voltage slowly leaks off C3, check for a short across C3. Also check IC2 pin connections (25, 27, 33) and IC3 pin connections (27, 33).

9. LEDs do not turn on — shutter releases, but delivers only fast speed

S1

Check by shorting the brown wire (wind side of flex toward front of camera) to ground. If the LEDs turn on, the circuit is o.k. Check S1 and the brown-wire solder connections.

IC3

Check the signal at the test-point #8, Fig. 5. The signal should go high with S1 closed. If not, check IC3 pin connections 5 and 42.

IC5

Pin 5 should switch to around 1.8V with S1 closed. You can check the signal at the base of transistor Q1 (underside of LED PC board, Fig. 10).

Q1

The collector of Q1, Fig. 10, should switch high with S1 closed. If the base switches to 1.8V, but the collector does not switch high, Q1 is defective.

10. Shutter stays open (5 seconds), A and P modes, underrange LED flickers

SPC PC board, solder connections.

Check the voltage at the Q2 collector, Fig. 6 — should be around 0.06V. If the voltage is around 0.4V, check the solder connections to the small purple wire and the solder at pin 39 of IC1. Also check the solder connections of the small green wire, the solder connections to resistor R2, and the solder connections to Q2, Fig. 6.

Transistor Q2 — open or base-to-emitter short

Fig. 6 shows the Q2 lead voltages. When you release the shutter, the base should switch low to shut off Q2. But with just S1 closed, the base should be around 0.6V more positive than the emitter. If not, the problem could be the small green wire or R2.

SPC-A connections

Check the SPC input voltages to IC1 (pins 39 and 40). Should be around 0.06V. If too high, check the solder connections for SPC-A and of the shield wire going to the SPC PC board.

IC1

Check the output voltages at pins 4, 5, and 6. At each pin, the voltage should go more positive as you increase the light level.

11. Underrange LED always on in A mode, shutter-speed indication won't change in P mode

Connection, IC1 to IC2

Check the voltage at pin 14 of IC2. The voltage should change as you change the light level, film speed, and diaphragm opening (this is the output of IC1 and the input to IC2). If not, check the solder connections of the blue wire connecting the AV board to the flex. Also, clean the AV resistor and improve the brush contact.

IC2

Check the output at pin 6 (around 1.4V) and at pin 8. The voltage at pin 8 should change as you change the light level, film speed, and diaphragm setting.

12. Shutter stays open (5 seconds) in M mode, LEDs o.k.

    TV resistor, poor contact

    IC2, pin 11, poor solder

13. Self-timer does not operate or operates all the time

    Switch S10 (self-timer switch)

    Check the voltage to the blue wire, wind side of flex (toward the front of the camera). You should measure close to battery voltage with S10 in the off position. When you lift the self-timer switch lever, you should measure 0V at the blue wire. If not, remove the mirror box and check the switch, Fig. 14. If the brush has come loose from the plastic pins, replace with revised brush assembly (see "Revised Parts"). An alternative test is to short the blue wire to ground and release the shutter — if the self-timer then operates, the circuit is o.k. and the switch is the problem.

    IC3

    Check the signal at pin 25 of IC1. Signal should normally be low. Then set the self-timer on and release the shutter. The signal should switch high and low during the self-timer delay. If not, check IC3 pins 17 and 15.

    IC1

    Check solder, pins 24 and 25.

14. AE lock inoperative — does not hold reading or reading does not change when

    AE lock is not used

    S14, poor contact or shorted to ground

    Check the voltage at the yellow wire near IC1. The voltage should switch low when you depress the AE-lock switch. If not, remove the mirror box and check the AE-lock switch, Fig. 14.

    IC3

    Check the solder connection at pin 11.

15. Battery drain — excessive leakage current (main switch in off position)

    Capacitor C10, leaking

    Disconnect the purple wire from C10, Fig. 7. If the leakage current then drops below 2 microamps, replace C10.

    Capacitor C8, leaking

    Disconnect the orange wire from the motor-drive circuit board, Fig. 7. If the leakage current then drops below 2 microamps, replace C8, Fig. 10.

    Capacitor C9, leaking

    Disconnect the green wire from the LED PC board (mirror-magnet wire). If the current then drops below 2 microamps, replace C9, Fig. 10.

    IC5, defective

    If the previous steps haven't stopped the current draw, replace IC5, Fig. 10.

REVISED SECTIONS:

1. The flex circuit (0401) has several revisions. The last two digits of the complete parts number are stamped on the top of the flex ("35" in fig. 1). The complete parts number for the flex in Fig. 1 is then 2017-0401-35.

   The original flex (style 81) has an additional IC (IC6) mounted on top of IC1. Fig. shows the wiring to IC6. Later flex circuits use a revised IC3 which includes the functions of IC6. If you replace IC3 in a flex that has IC6, eliminate IC6. Style 81 is not available as a replacement part. If you're replacing the complete flex, use style 32 (2017-0401-32).

   For replacing the other flex circuits, specify the type when ordering a replacement (2017-0401-number stamped on top of flex). The parts department can then supply a replacement that's compatible.

   Styles 81, 32, 33, and 82 has a PC board mounted to the front of the pentaprism (wind side of camera). Fig. 18 shows the wiring to the PC board. Styles 01, 02, and 03 eliminated the PC board. Interchangeability then requires rewiring.

   If you're replacing 01, 03, or 82, use style 02. If you're replacing 33 or 34, use style 35.

2. There are two types of motor-drive circuit boards (connector PC board 0425). 0425-01 is a thick board (0.6mm), and the new 0425-02 is a thin, flexible board. The earlier style (01) is held by two screws, and the motor-drive contact holder 2019-1066-02 is cemented over the motor-drive pins with a silicon cement for noise prevention. With the later style (02), there's only one screw; the screw also holds the new-style motor-drive contact holder (2024-0166-01).

3. An L-shaped piece of electrician's tape 2017-2212-01 has been added to the top of the shutter block, Fig. 12, to prevent light leaks. It's not necessary to make the modification unless there's a light-leak problem. Adding the tape requires removing the shutter block.

4. The brush assembly for the self-timer and the AV-lock switches has been improved. In the earlier style, the brush could break loose from the plastic pins (causing shorting or self-timer malfunctions). New style — self-timer switch set 2017-0418-02.

5. A tape guide 2017-2204-01 has been added to the shutter block to prevent the problem of the lower curtain tape coming off the roller. The problem occurs when the user inserts his finger into the focal-plane aperture and releases the shutter. The tape then comes off the roller and gets tangled with the shutter gears. To add the tape guide, remove the wire clamp at the bottom of the shutter block, Fig. 12. Insert the tape guide between the shutter block and the wire clamp. Because of the additional thickness, you need a longer screw (9612-1620-07).

6. The upper wind mechanism (winding base plate B set 2017-0341), Fig. 9, has a revision that affects the wind lever and wind lever screw. The difference is in the depth of the flat sides at the top of the shaft (the shaft that receives the wind lever). In the earlier style (0341-01), the depth is 1.7mm; the depth is 1.1mm in the later style (0341-02). With the earlier style, use wind lever 2017-0302-01 (the wind lever has two self-tapping screws on the underside) and wind lever screw 2017-1344-01. With the later style, use wind lever 2017-0302-

02 (the wind lever has one self-tapping screw on the underside) and wind lever screw 2017-1344-03.

ADDITIONAL PARTS NUMBERS:

1. Flex circuit — 2017-0401-number stamped on top of flex
2. top cover — 2017-0132-01
3. SPC PC board — 2017-0436-01
4. Battery case base plate set — 2024-0420-01
5. Aperture coupling ring set — 2017-0163-01
6. AV resistor set — 2017-0422-01
7. MD lever set — 2017-0432-01
8. Magnetic release base plate set (release and aperture magnets) — 2017-0534-81
9. AE lock switch set (brush for AE-lock and self-timer switches) — 2017-0419-01
10. Mirror magnet — 2017-0523-03
11. Take-up spool (gray section) — 2017-3041-31
12. Shutter block — 2017-0201-01
13. IC1 — 2017-4301-01
14. IC2 — 2017-4302-01
15. IC3 — 2017-4303-32
16. IC4 — 2017-4304-01
17. IC5 — 2017-4305-01

OTHER COMMENTS:

1. The flex circuit is supplied as a complete unit, or you can get individual components. The TV resistor assembly is supplied with the flex (not available individually). If you're going to replace the complete flex, check with Minolta regarding exchange policy.
2. You can drop out the focusing screen from inside the mirror box by disengaging the latch.
3. You can replace the shutter block as a complete unit, or you can get individual parts.
4. The release magnet and the aperture magnet are available only as a set.

MINOLTA AUTOPAK 450E

Similar models: 430E

Battery: lea 1.5V AA (negative ground)

Fig. 1—bottom decorator plate removed

Fig. 2—front bezel removed (shutter charged)

Fig. 3—top cover removed

Fig. 4—end view, covers removed

Fig. 5—bottom view, base plate removed

Fig. 6—front view, shutter block removed

Fig. 7—shutter block

Fig. 8—shutter block, back view with circuit board removed

Fig. 9—base plate

Fig. 10—focus scale

Fig. 11—wiring pictorial, flash circuit board

Fig. 12—wiring pictorial, meter board

Fig. 13—schematic, metering circuit

ADJUSTMENT LOCATIONS:

Focus	A
Low-light warning	B

ADJUSTMENT AND TEST VALUES:

Shutter speed: 1/200

Maximum diaphragm opening: f/3.5

Low-light warning: The low-light lamp should turn on at a light level of EV 11.64 or lower (ASA 80/100 cartridge installed, high-light position of exposure-control slide). To check, install the ASA 80/100 cartridge and set the high-light (sun) setting. At EV 11, the low-light lamp should turn on when you depress the release button part way. Then set the low-light position of the exposure-control slide. The low-light lamp should not turn on.

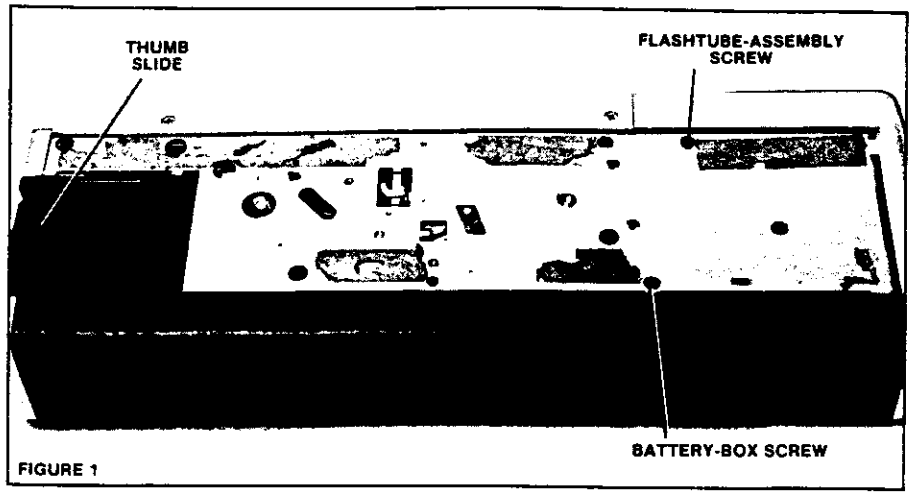


FIGURE 1

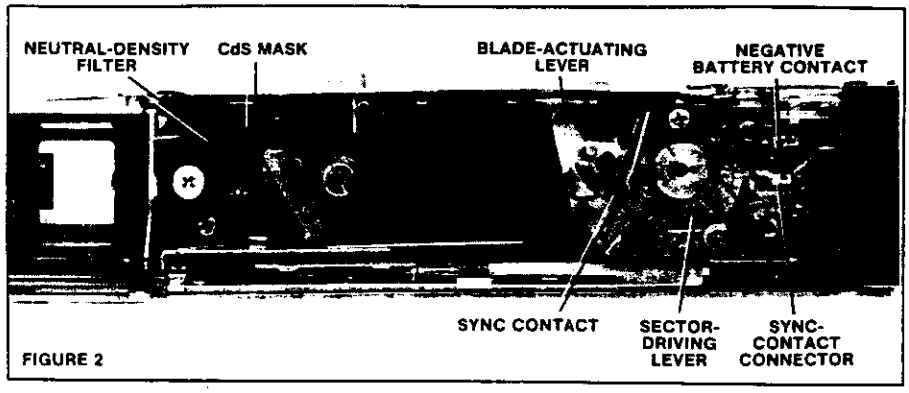


FIGURE 2

Focus: Fig. 10 shows the focus distances for the different positions of the focus slide. To check, cock the shutter. Then hold open the shutter by moving the blade-actuating lever, Fig. 2. You can reach the screw that holds the lens cell to the focus ring through the hole in the focus slide (A in Fig. 3) at the 3.5m setting.

Film-sensing lever: The film-sensing lever (perceiving lever) should extend 1.5mm from the back of the aperture with the shutter charged. The film-sensing lever should move completely within its slot with the shutter released.

OPERATION TESTS:

1. At low light levels, the low-light lamp should glow steadily when you depress the release button part way. The low-light lamp should turn off with the exposure-control slide in the flash-on position. When the flash charges, the low-light lamp should pulse on and off when

you push the release button part way. The neon ready lamp also pulses on and off to indicate the flash has charged.

2. In the low-light position of the exposure-control slide, the diaphragm should be fully open. The diaphragm should stop down to f/8 in the high-light position. Setting the high-light position stops down the diaphragm and moves the mask, Fig. 2, in front of the CdS.
3. In the flash-on position, the diaphragm opening should change according to the focus setting (f/8 at 2m).
4. With the cartridge installed (ASA 80/100), the diaphragm opens further. The cartridge pushes in the cartridge-sensing lever at the back of the aperture. The neutral-density filter, Fig. 2, then moves in front of the CdS.
5. Sliding the cover over the lens should lock the shutter release. A mask moves in front of the viewfinder.
6. Sliding the close-up lens over the taking lens changes the minimum focusing distance to 19" (at the 3' setting). A red arrow should move into the finder.
7. Advancing the thumb slide one time should cock the shutter and fully advance the film. The wind mechanism should latch with the shutter cocked. If you hold in the film-sensing lever, you should be able to continuously advance the thumb slide.

BASIC CIRCUIT OPERATION:

The meter circuit, Fig. 13, serves only to operate the lamp. The lamp provides a low-light warning and a flash-ready indication.

1. At a high light level, the low CdS resistance causes TR5 to conduct enough current through the VR to keep TR6 turned off. No current then flows through the lamp.
2. At a low light level, the high resistance of the CdS reduces the conduction of TR5. TR5 can no longer keep TR6 turned off, and TR6 conducts current through the base of TR7. TR7 now turns on, conducting current through the lamp.
3. With the flash unit on and charged, TR8 operates the lamp. The charged flash unit supplies a pulsating voltage to the base of TR9. TR9 then switches on and off. When TR9 switches on, it conducts base current for TR8. TR8 now turns on, routing current through the lamp.

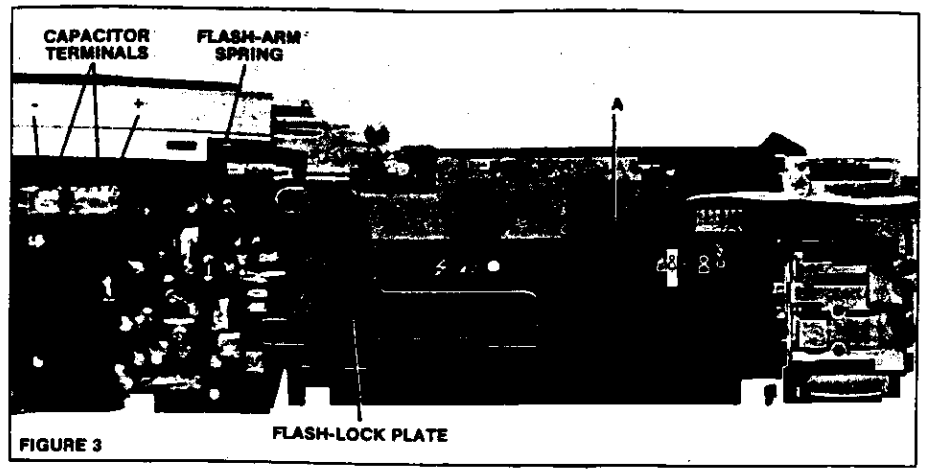


FIGURE 3

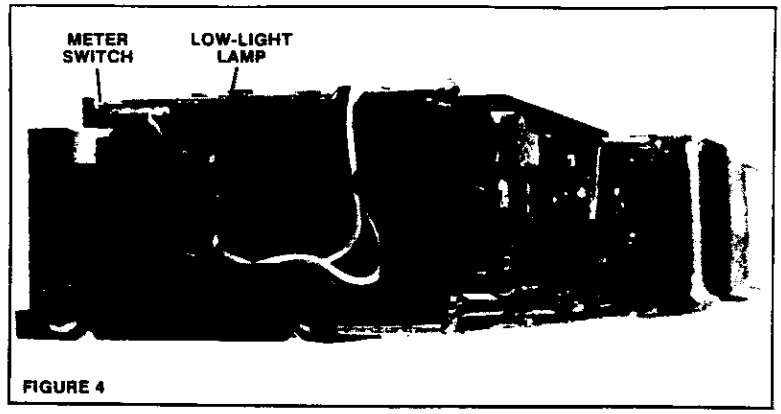


FIGURE 4

DISASSEMBLY HIGHLIGHTS:

Precautions:

1. After removing the top cover, discharge the flash capacitor between the two terminals shown in Fig. 3. The insulator on top of the flash-circuit board (not shown) indicates the capacitor terminals.
2. Be careful to avoid stripping plastic screw threads.

Sequence:

Note: You can remove the top cover without peeling off the bottom decorator plate; a clearance hole in the bottom decorator plate provides access to the flashtube-assembly screw, Fig. 1. Also, you can remove the flash assembly without taking off the winding base plate. To remove just the flash unit, delete steps 10-13. But take out the screws at the bottom of the winding base plate at the flash side.

1. peel off bottom decorator plate (held by double-sided tape)
2. remove end cover (wrist-strap end) — 2 screws
3. remove front bezel (2 screws at bottom, snaps at top)
4. remove 2 screws at flash end of camera
5. remove flashtube-assembly screw, Fig. 1, and slightly separate flashtube assembly from end of camera
6. open camera back and lift off top cover — exposure-setting slide is loose

Note: Lift the front edge of the top cover first. Then slide the top cover toward the back of the camera to disengage the snaps.

7. lift out eyepiece cover, back of camera
8. remove battery-box cover assembly (1 screw at bottom of camera, Fig. 1)

9. remove back cover
10. advance thumb slide and remove base-plate screw under thumb slide
11. remove thumb slide and thumb-slide housing

Note: In some models, there's no screw holding the thumb-slide housing. You can remove the thumb-slide housing after taking off the end cover.

12. remove base-plate assembly (remaining screws at bottom)

Note: Lift the front edge of the base plate. Then slide the base plate toward the front of the camera until the film-sensing lever clears the body slot.

13. remove the release-blocking lever, Fig. 5 (the lever that blocks the release button when the cover is over the lens)
14. disconnect and remove the flash-arm spring, Fig. 3
15. remove the flash-lock plate assembly, Fig. 3 (5 screws — longer screws go into flash-circuit board)
16. lift off lead-wire holder, top of flash-circuit board

Note: Some models do not use the lead-wire holder. The lead-wire holder is a plate with four notches; the notches fit over the wires connected to the flash-circuit board.

17. unsolder 4 wires at top of flash-circuit board (2 black, brown, white)
18. unsolder negative battery contact and sync-contact connector, front of shutter block, Fig. 2

Note: Some models have a white wire (rather than a contact tab) for the sync-contact connector.

19. remove flash/battery-box assembly

Note: To separate the flash unit from the battery box, remove the remaining screw at the top of the flash-circuit board.

20. remove 2 screws, front of shutter block
21. lift aside shutter block, Fig. 6
22. separate shutter block by removing 3 screws holding meter-circuit board. Fig. 7

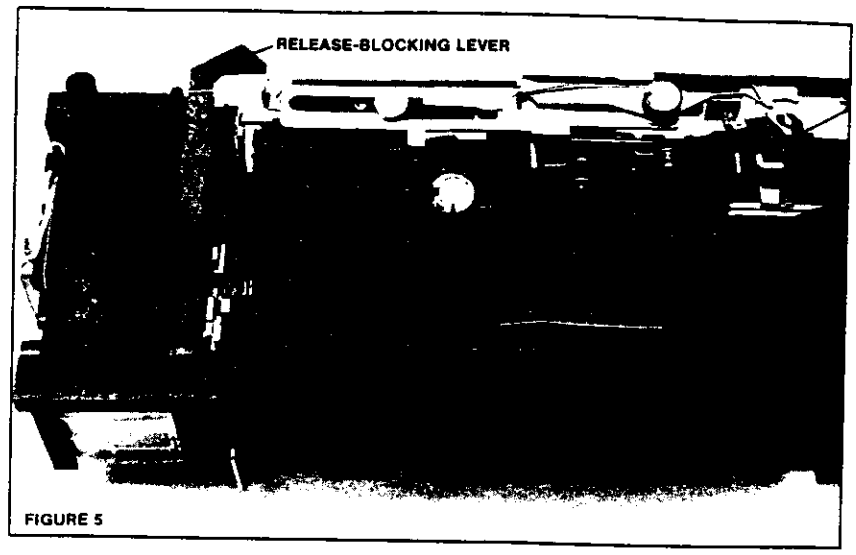


FIGURE 5

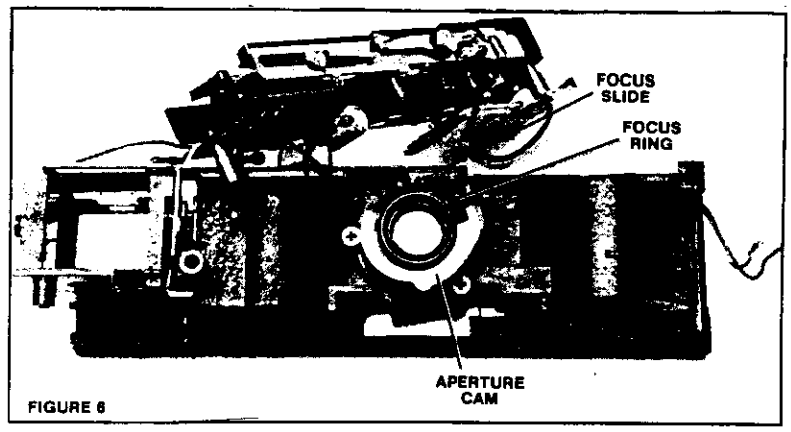


FIGURE 6

Reassembly highlights:

1. Charge the shutter before installing the shutter block.
2. As you install the shutter block, push the neutral-density filter against its spring tension. The neutral-density-filter arm sits on top of the cartridge-sensing lever.
3. As you seat the base plate, pass the film-sensing lever through the body slot. Then push the shutter-charge lever slightly toward the flash end of the camera until the base plate seats fully.

Note: You can remove the shutter blades for cleaning without taking out the shutter block. Disconnect the spring and remove the sector-driving lever, Fig. 2. Also disconnect the spring and remove the blade-actuating lever. You can now slide out the two blades toward the flash end of the camera. The bottom blade (the first blade to install) has its tab pointing to the top of the camera (the tab with the hole for the blade-actuating lever). The top blade has its tab pointing to the bottom of the camera. To remove the diaphragm blades for cleaning, take out the shutter block. Then remove the diaphragm-actuating lever, Fig. 8, and the plate at the back of the shutter block.

TROUBLESHOOTING:

Behavior without battery: no warning lamp or flash, but all other functions should test properly

Typical current draw (1.5V applied, warning lamp on) — 42ma

Procedures for checking modules:

1. Flash module. Connect 1.5V between the positive battery contact on the flash-circuit board and the contact for the white flash-switch wire, Fig. 11. The flash should charge. Fire the flash by shorting the white-wire contact, Fig. 11, to the sync-contact tab on the flash-circuit board.

2. Shutter module. With the shutter block still installed on the body unit, you can check for proper warning-lamp operation. Connect 1.3V between the brown wire (positive) and ground (a metal part of the shutter block). The warning lamp should turn on with the CdS covered and the release partially depressed to close the meter switch. With the winding base plate removed, you can reach the variable resistor from the bottom. To check, install the cartridge (ASA 80/100) and temporarily seat the front bezel assembly. Check for proper flash-signal operation by shorting the black wire, Fig. 12, to ground; the warning lamp should glow steadily when you close the meter switch.

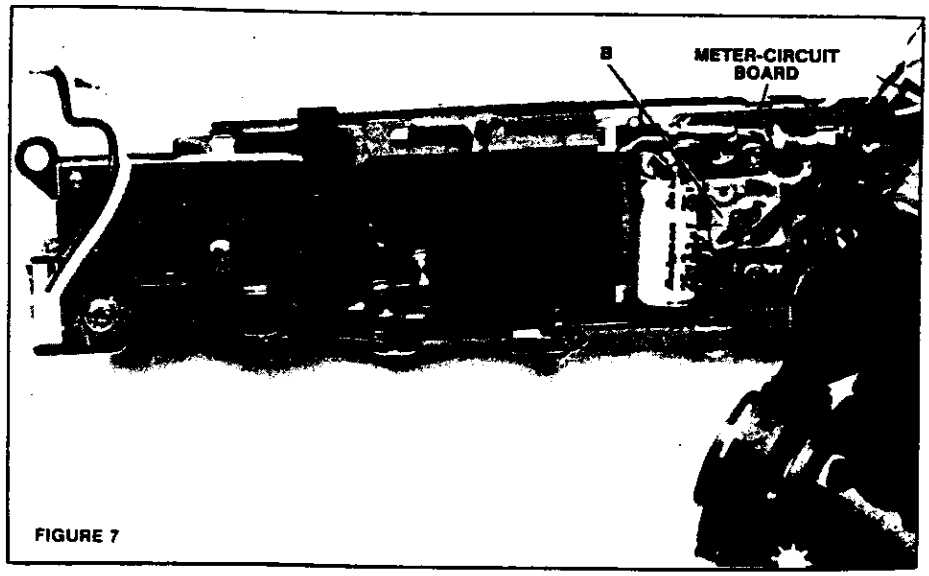


FIGURE 7

Procedures for checking switches:

1. Flash switch. If the flash won't charge in the flash-on position, check the flash switch, Fig. 11. In the flash-on position, you should measure direct contact between the white wire and ground. Alternately, connect a power supply to the positive battery tab. Touch the negative power-supply lead to the white-wire contact, Fig. 11. If the flash now charges, the problem is poor contact in the flash switch — not in the flash unit.
2. Low-light warning switch. Check the continuity between the white wire and the black wire, Fig. 11. You should measure direct contact except at the flash-on position of the exposure-control slide. At the flash-on position, you should measure no continuity.
3. Meter switch. If the warning lamp won't turn on with the CdS covered, check the meter switch, Fig. 4. Short between the red wire and the black wire. If the warning lamp now turns on, the problem is meter-switch contact. If the warning lamp still won't turn on, the problem is in the meter circuit, Fig. 13.

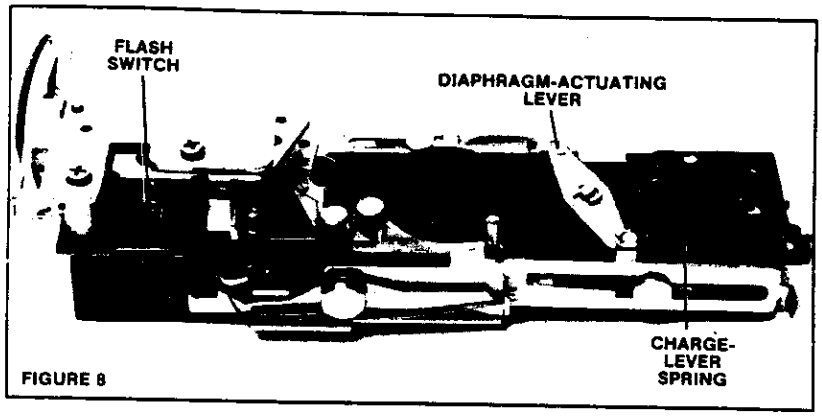


FIGURE 8

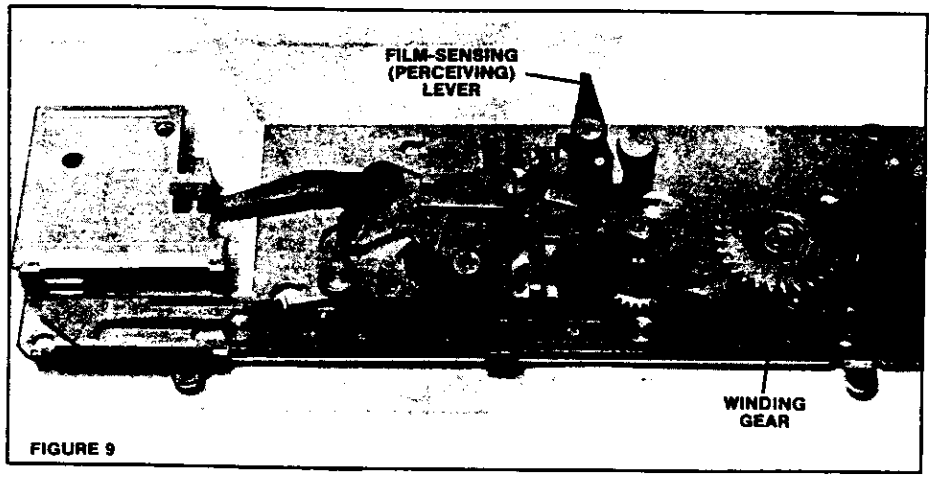


FIGURE 9

OTHER COMMENTS:

1. Product number for parts orders — 264 (450E); 266 (430E)
2. Complete flash-circuit assembly — 0421-01
   Individual components:
   main capacitor C4 — 4451-01
   trigger coil T2 — 4461-01
   flashtube — 4452-01
   power transistor — 9363-2632-02
   trigger capacitor C2 — 9548-2035.
3. Complete meter circuit (printed base plate A set) — 0241-01.
   Individual components:
   TR7 & TR8 — 9362-1633-04
   TR5, TR6 & TR9 — 9363-1632-04
   CdS — 4191-01
4. Winding base-plate assembly — 0308-01.
   Individual components:
   winding gear A set — 0306-01
   film-sensing lever (perceive lever) — 3016-04

5. Shutter parts are available individually:
Sector B (upper shutter blade) — 2003-07
Sector A (lower shutter blade) — 2002-07
Charge-lever spring (release moving plate spring) — 2030-01
Diaphragm blade B (upper blade) — 2110-02
Diaphragm blade A (lower blade) — 0219-01

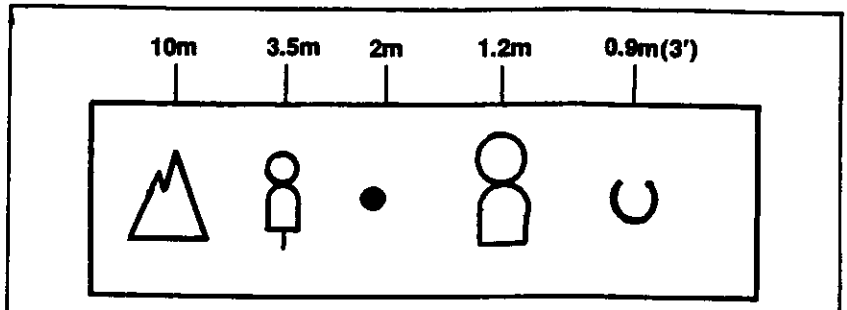


FIGURE 10

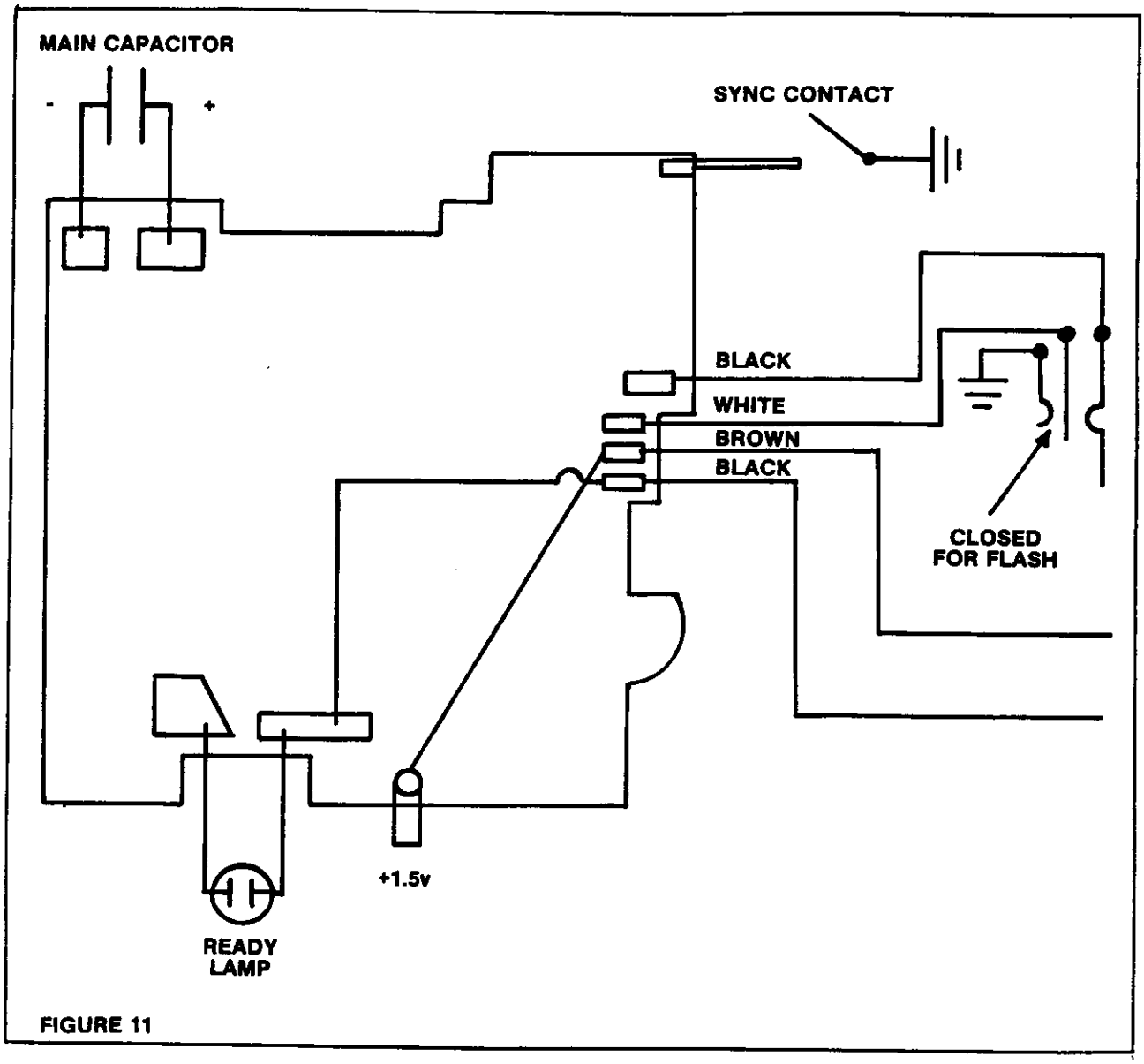


FIGURE 11

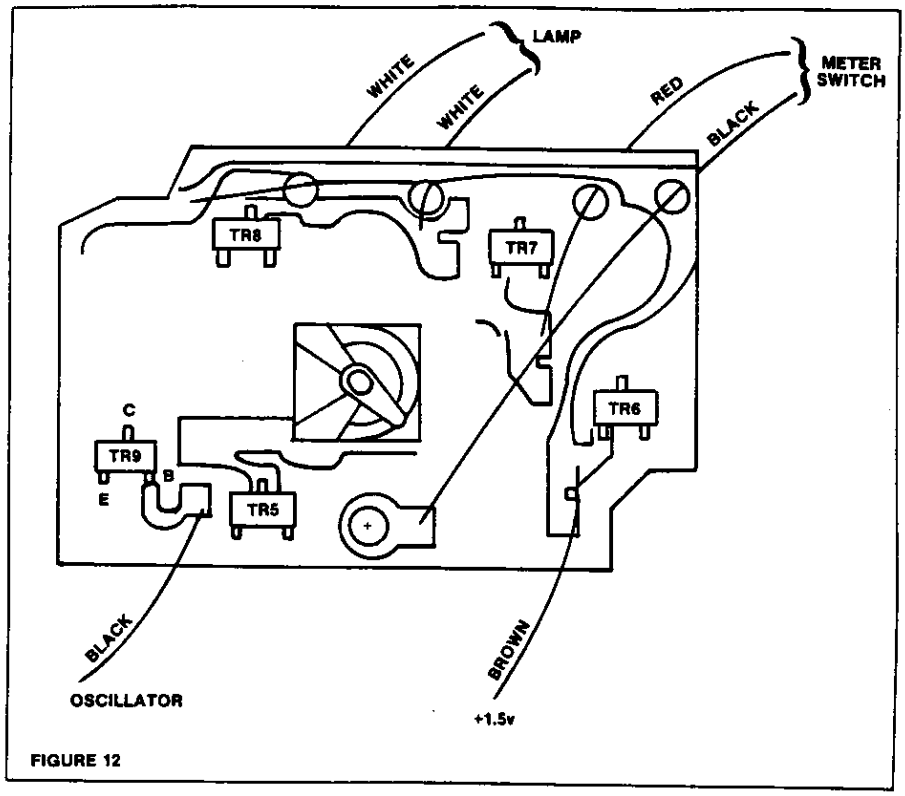


FIGURE 12

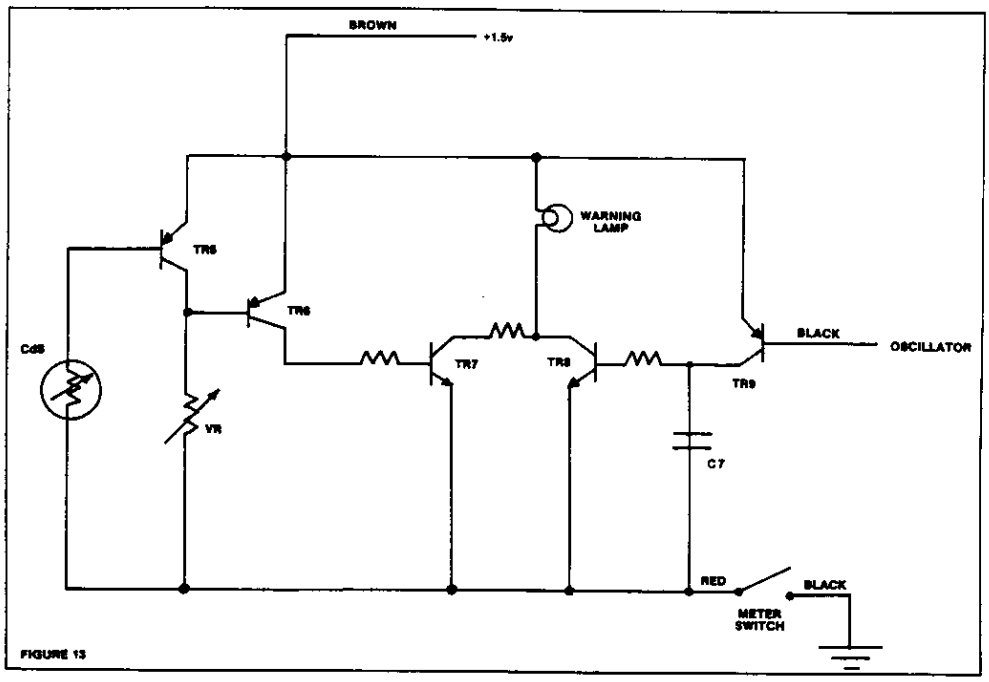


FIGURE 13

MINOLTA MD 50mm 1:2 LENS

(standard lens for Minolta X700)

Fig. 1—front view, filter ring removed

Fig. 2—front view, focus ring and lens groups removed

Fig. 3—back view, bayonet mounting ring removed

Fig. 4—side view, helicoid

ADJUSTMENT LOCATIONS:

Focus	A
Helical guide	B
Diaphragm-ring stop	C

DISASSEMBLY SEQUENCE:

1. unscrew nameplate ring
2. remove filter ring (3 screws at front, larger heads)
3. scribe rotational position of front lens cell
4. remove front lens cell (3 screws at front)
5. remove plate holding rear lens cell (3 screws at back)
6. scribe rotational position of rear lens cell
7. lift out rear lens cell
8. remove bayonet mounting ring (4 screws) — spacer ring loose at back
9. remove diaphragm-setting ring (1.2mm ball detent and compression spring loose)
10. remove focus ring (3 screws at front)
11. disconnect spring from post on diaphragm-control ring, Fig. 3
12. remove diaphragm cover plate, Fig. 2 (3 screws)
13. remove diaphragm leaves and diaphragm-control ring
14. remove helical guides, Fig. 3
15. unscrew helical rings

REASSEMBLY SEQUENCE, HELICOID:

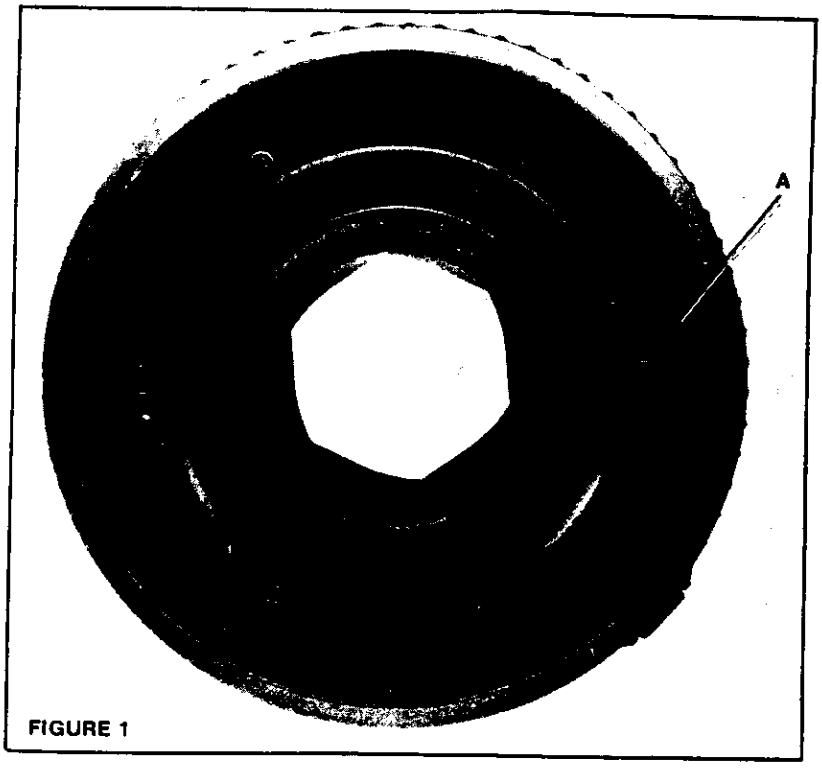


FIGURE 1

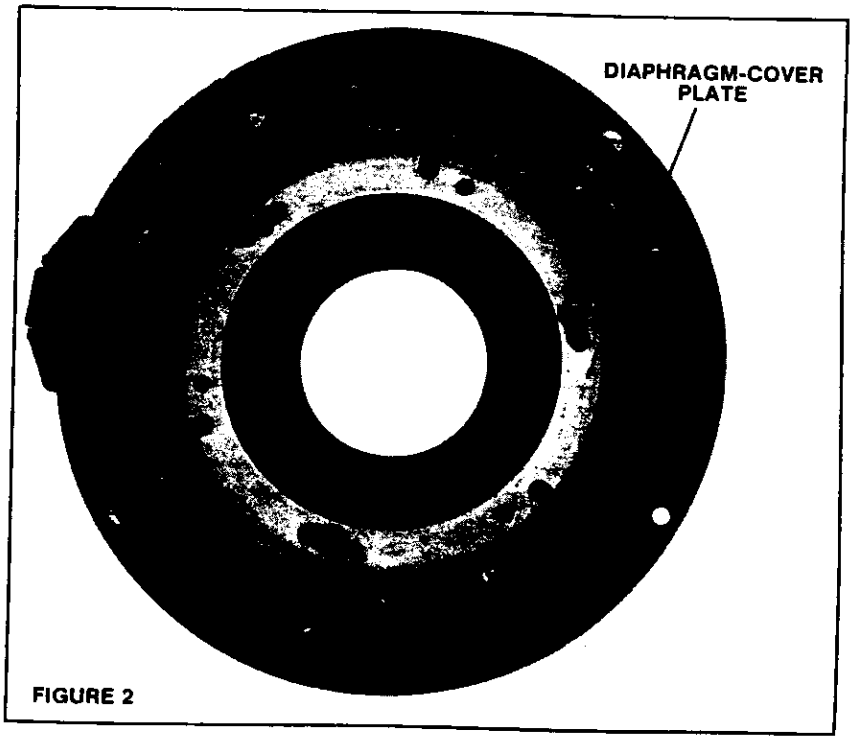


FIGURE 2

1. Screw in the outer helical ring, Fig. 4, fully clockwise. Then back out the ring 1¼ turns.
2. Screw in the inner helical ring fully counterclockwise. The helical-guide positions should now align as shown in Fig. 3. If not, change the starting thread.
3. Replace the helical guides. Shift the adjustable helical guide for free, even movement of the helicoid.

REASSEMBLY SEQUENCE, DIAPHRAGM:

1. It's easier to assemble the diaphragm leaves on the back of the diaphragm cover plate. Seat the diaphragm leaves in clockwise rotation (fully open positions).
2. Seat the diaphragm-control ring on top of the diaphragm leaves in the fully clockwise position (the ends of the slots at the outer edge of the diaphragm-control ring against the stop tabs on the diaphragm cover plate).
3. Turn the lens assembly upside down and seat the diaphragm assembly as a complete unit. Pass the two pins on the diaphragm-control ring through the slots in the lens assembly.
4. Rotate the diaphragm assembly until the three screw holes align. Replace the three screws and connect the spring to the diaphragm control ring. The spring opens the diaphragm.

OTHER COMMENTS:

1. After you replace the focus ring, leave two of the screws loose. Rotate the focus ring for best focus at infinity. Then loosen the one screw and rotate the focus ring to the infinity stop.
2. The tab at the end of the depth-of-field scale locks the diaphragm-setting ring at the f/22 setting (the position for using the camera in the program mode).

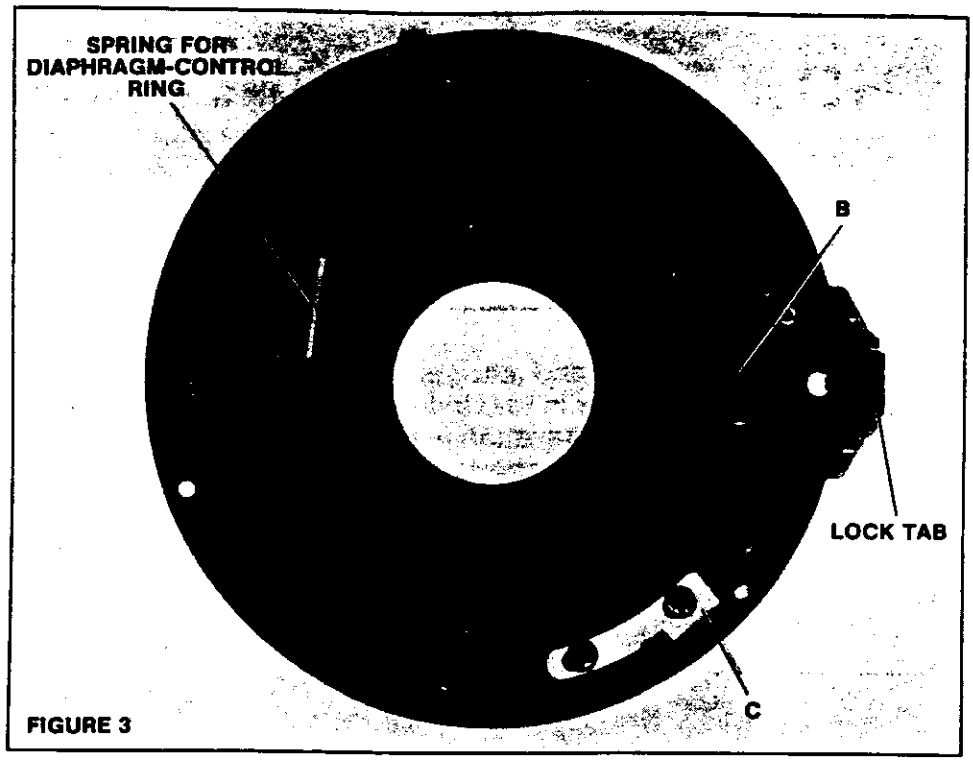


FIGURE 3

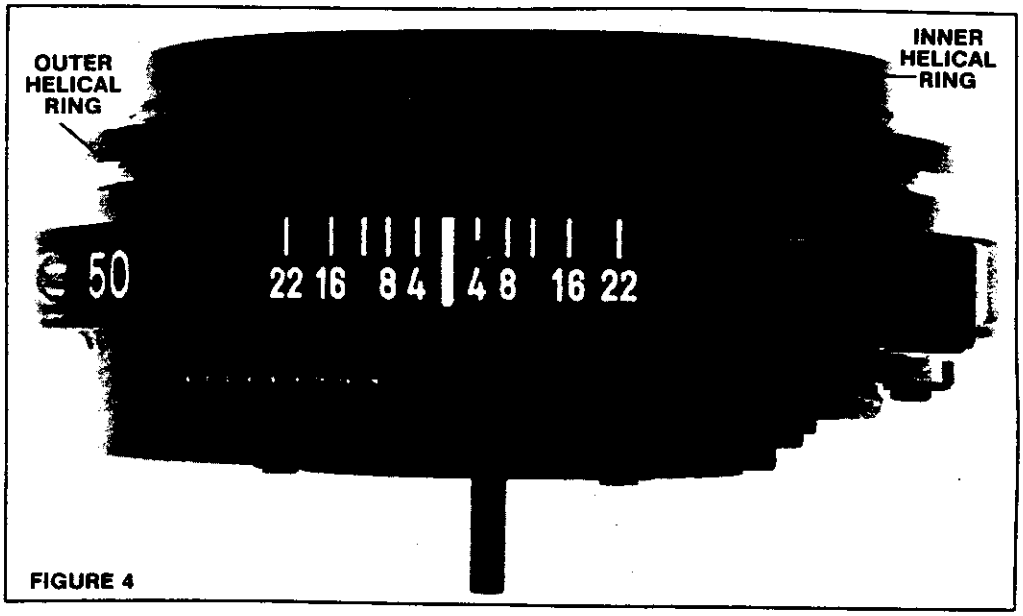


FIGURE 4