CANON AE-1 PROGRAM

Similar models: other A-series Canons

Battery: 6V PX28 or 544 (negative ground)

Fig. 1—top cover removed, rewind side

Fig. 2—top cover removed, wind side

Fig. 3—bottom cover removed

Fig. 4—front view, covers removed

Fig. 5—top view, IC4 lifted out

Fig. 6—top view, piezo beeper removed

Fig. 7—mirror box, bottom view

Fig. 8—mirror box, rewind side — S.AVE contact

Fig. 9—mirror box, top view — LED display board

Fig. 10—front view, mirror box removed

Fig. 11—back of AE control unit — maximum-aperture resistor

Fig. 12—top view, counter-mechanism plate removed

Fig. 13—wiring pictorial, top of flex

Fig. 14—sprocket timing

Fig. 15—top of flex, fixed-resistor adjustment locations

Fig. 16—IC4, pin voltages with SW1 closed

Fig. 17—IC1, pin voltages with SW1 closed

Fig. 18—IC2, pin voltages with SW1 closed

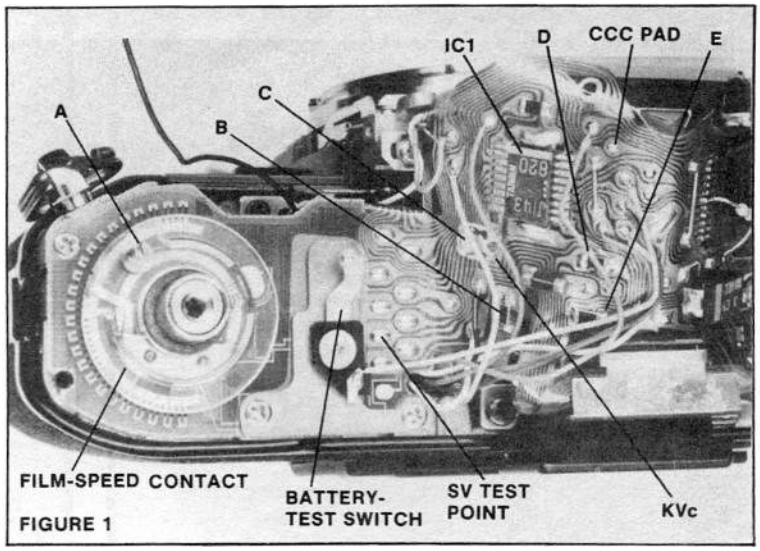


FIGURE 1

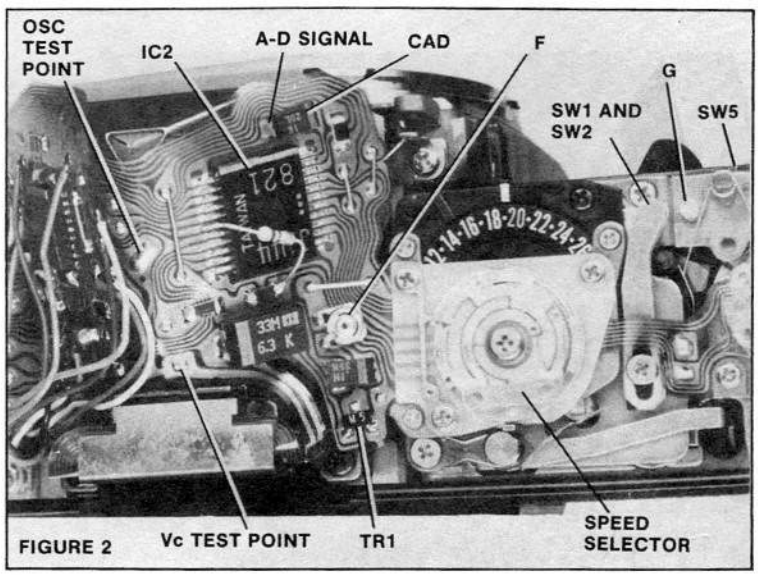


FIGURE 2

Fig. 19—IC3, pin voltages with SW1 closed

ADJUSTMENT LOCATIONS:

Film-speed contact	A
Auto exposure, gain	B
Auto exposure, level	C
Offset	D
Oscillator clock frequency	E
Manual 1/1000	F
SW5	G
Wind overtravel	H
Connecting-lever arm	I
Travel time, second curtain	J
Travel time, first curtain	K
Maximum-aperture pin	L
Auto aperture	M
Auto aperture and readout	N
Brake, second curtain	O
Brake, first curtain	P

Note: Of the electronic adjustments, you normally only have to adjust the manual speeds (F) and the auto speeds (C).

ADJUSTMENT AND TEST VALUES: Curtain-travel time: 10.5ms (34mm distance), 9.9ms (32mm distance)

Flange-focal distance: 42.14mm (flange to pressure-plate rails), 41.9mm (flange to film-guide rails)

Clock frequency: 30,117 - 34,134 Hz (measured at OSC test point, Fig. 2)

Frequency of oscillator that drives piezo beeper: 4,096 Hz (measured at pin 10 of IC2 or at yellow wire to piezo beeper)

Battery test: With 4.8V applied to the battery terminals, the piezo beeper should beep at the fastest speed (6.5 Hz). The frequency decreases as you decrease the applied voltage. With 3.5V applied, the piezo should beep at the slowest speed (1 Hz). The piezo should not beep with 3.3V applied. 2.5V P-P signal.

Self-timer: 10 second delay. Piezo should beep at 2 Hz for first 8 seconds and 8 Hz for final 2 seconds. 5V P-P signal.

Vc voltage: 1.3V (measured at Vc test point, Fig. 2)

KVc voltage: 1.6V (measured at variable resistor C, Fig. 1)

Wind overtravel: With the shutter cocked, the second-curtain latch (MG3 armature) should engage the notch in the second-curtain cam with no space gap (minus latch). Check by pulling the second-curtain latch out of engagement with the second-curtain cam. Then allow the second-curtain latch to spring back into engagement. The second-curtain latch should again fully engage the notch in the second-curtain cam. To adjust, loosen the two setscrews and rotate the second-curtain cam.

Wind sequence: Check by slowly advancing the wind lever. Near the end of the wind stroke, the first-curtain latch should engage the first-curtain gear (you can hear the "click" as the connecting lever moves a slight distance toward the charge cam, Fig. 3). Next the second-curtain latch should drop into engagement with the second-curtain cam. Finally the transport latch should engage the wind shaft and SW5, Fig. 2, should open.

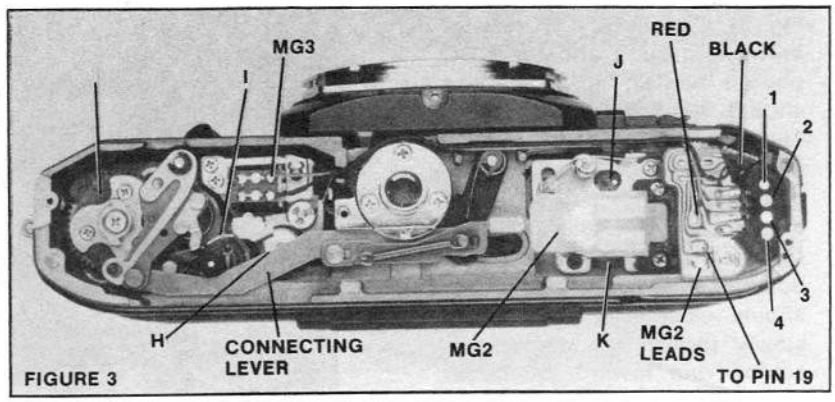


FIGURE 3

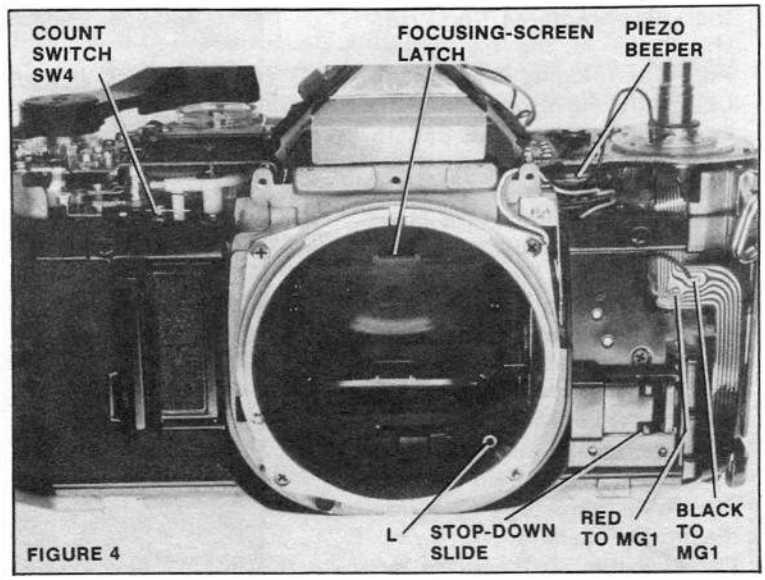


FIGURE 4

Connecting-lever arm: The connecting-lever arm holds the second-curtain latch disengaged from the second-curtain cam until the connecting lever returns following the wind stroke. Check by advancing the wind lever until the charge cam pushes the connecting lever the maximum distance toward the rewind end of the camera. There should now be a space gap of 0.2 - 0.4mm between the edge of the second-curtain cam and the second-curtain latch. Adjust by bending the connecting-lever arm.

Switch SW5: SW5 opens at the end of the cocking cycle as the transport latch drops into engagement with the wind shaft. As long as SW5 remains closed, the shutter won't release. Check by slowly advancing the wind lever. Stop the moment the second-curtain latch drops into engagement with the second-curtain cam. At this point, SW5 should still be closed and the shutter should not release when you close SW2. As you complete the wind stroke, SW5 should open. To adjust, slowly advance the wind lever until the second-curtain latch just drops into engagement with the second-curtain cam. Then turn the SW5 eccentric pin counterclockwise until it touches the SW5 contact wire. From this point, turn the eccentric pin slightly further in a counterclockwise direction — a distance equal to the width of the screwdriver slot in the eccentric. Now complete the wind stroke. SW5 should open, and there should be a space gap of at least 0.15mm between the wire contact and the eccentric pin.

ADJUSTMENT SEQUENCE, EXPOSURE:

1. Manual speeds. Adjust at 1/1000 with variable resistor F, Fig. 2. If necessary, you can also bend the count (trigger) switch SW4 to adjust 1/1000. If SW4 opens sooner, you get a faster speed.
2. Auto aperture (normally not necessary unless you've

replaced the AE pattern board, Fig. 8). Connect a 4.7K resistor between ground and the CCC pad on the flex, Fig. 1. The lens should now program the f/4 aperture. To check, release the shutter. Then turn the diaphragm-setting ring off the auto position to f/16. Push in the stop-down slide, Fig. 4, to stop down the lens; the diaphragm should close to f/4. Verify by slowly turning the diaphragm-setting ring toward the larger apertures; note when the diaphragm leaves start to open. When the leaves start to open, the diaphragm-setting ring should be at the f/4 setting. Adjust by bridging lands on the LED board, Fig. 9, or by breaking connections on the AE pattern board, Fig. 8. Procedures:

a. Underexposure. To increase the size of the aperture 1/8 stop, bridge the A1 land to the land directly above it, Fig. 9 (you can reach the lands from the front of the camera without lifting aside the SV base plate). To increase the aperture 1/4 stop, bridge both the A1 land and the A2 land to their adjacent lands. This adjustment affects both the LED readout and the actual diaphragm opening.

b. Overexposure. To decrease the size of the aperture 1/8 stop, bridge the A2 land to the land directly above it, Fig. 9. For a larger reduction in the aperture size, cut the lands of the AE pattern board as shown in Fig. 8. Cutting at "a" reduces the aperture size 1/8 stop. Cutting at "b" reduces the aperture size 1/4 stop. Cutting at "c" reduces the aperture size 3/8 stop. Cutting at "d" reduces the aperture size 1/2 stop. Cutting the patterns on the AE pattern board changes the diaphragm opening without affecting the LED readout.

3. Auto exposure. Check at ASA 100, light levels EV 9 through EV 15, K-factor 12.50. At either program or auto f/stop, the exposure error should not vary by more than 1 EV. Adjust for 0 EV error with variable resistor C, Fig. 1. For a larger exposure variation, you can replace the fixed gain resistor (B in Fig. 1). Install a 10K variable resistor in place of the gain resistor. Adjust the 10K resistor until you have the same amount of EV error at EV 9 and EV 15. Then adjust the level resistor to correct the error at EV 12. Remove the variable 10K resistor, measure its resistance, and replace with a fixed resistor of the same value.

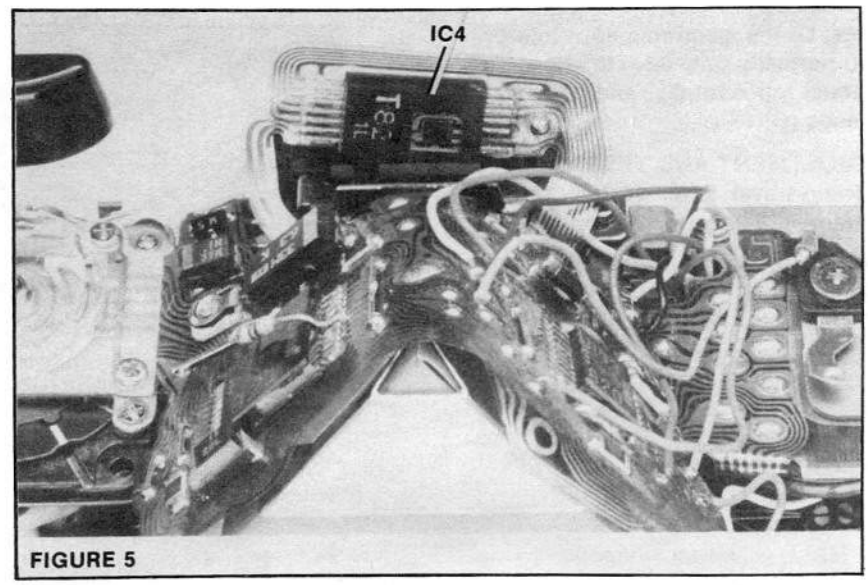


FIGURE 5

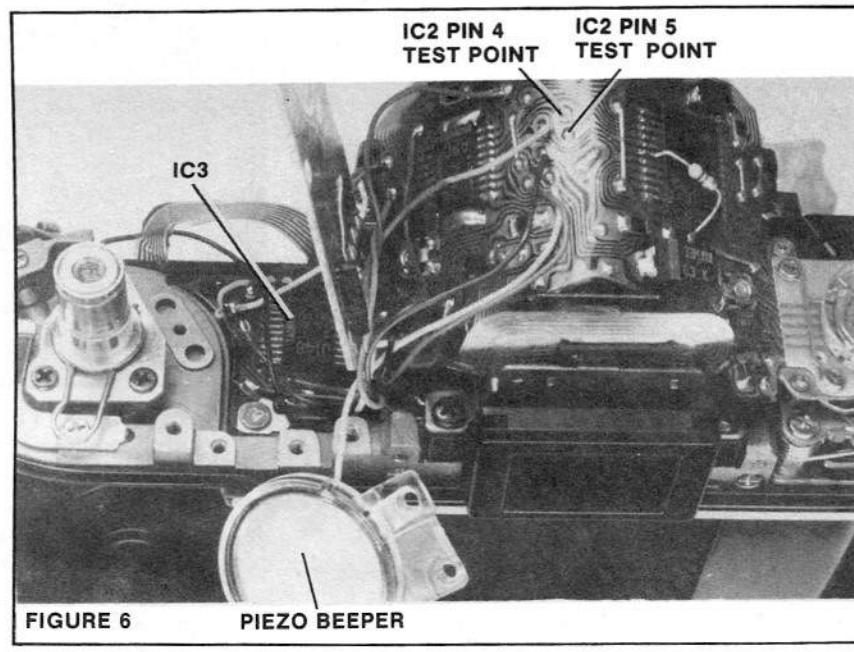


FIGURE 6

ADJUSTMENTS NOT NORMALLY REQUIRED:

1. Clock frequency. Check if you replace IC1 or if you can't bring in the shutter speeds. Measure with a scope or frequency counter at the OSC test point, Fig. 2. Adjust by changing resistor R2 (E in Fig. 1) for a frequency of 30,117 - 34, 134 Hz (a smaller resistance value increases the frequency). You can find the proper resistance by installing a 200K variable resistor in place of the fixed resistor; adjust for the proper frequency and then install a fixed resistor of the same value. Alternate methods of measuring the frequency:
   a. Measure the shutter speed at 1/2 second. If the shutter speed is 476 to 525ms, the frequency is correct.
   b. Time the self-timer delay. Adjust the frequency for a delay of 10 seconds.
2. Offset. Check if you replace IC4.

Unsolder one end of resistor R5, Fig. 15. Short pin 11 of IC4 to pin 9 (output shorted to input). Now measure the voltage between pin 10 of IC4 and ground. Also measure the voltage from pin 11 of IC4 to ground. The second reading should be the same as (or not more than 5mv less than) the first reading. To adjust, remove the offset resistors (R3 and R4 positions, Fig. 15 — there may be only one offset resistor installed, or both positions may be open). Install a 200K variable resistor in the R4 position. Adjust until the voltage at pin 11 equals or is no more than 5mv less than the voltage at pin 10. Then install a fixed resistor of the same value. If you can't bring in the offset adjustment with the variable resistor at the R4 position, use the R3 position.

3. Maximum-aperture pin. Check if you replace the maximum-aperture resistor, Fig. 11. You can make the adjustment with the mirror box removed or installed. Procedure:

a. The white wire and the black wire to the maximum-aperture resistor, Fig. 13, connect across fixed resistor R108. First find the value of R108 — disconnect the white and black wires and measure the resistance between them. Standard value — 1.5K.

b. If R108 measures 1.5K, install the f/1.4 lens. Alternately, use a depth gage set to 8.10mm to depress the maximum-aperture pin. Now measure the resistance between the white wire and ground. You should measure 9.32K.

c. If R108 measures some value other than 1.5K, calculate a correction factor. Divide the actual resistance by 1.5K. Multiply 9.32K by the correction factor to find the value of the maximum-aperture resistor with the f/1.4 lens installed.

d. Also check the resistance between the white wire and ground with the maximum-aperture pin depressed 5.7mm; you should measure 4.16K (times the correction factor). With the maximum-aperture pin depressed 8.38mm, you should measure 11.03K (times the correction factor).

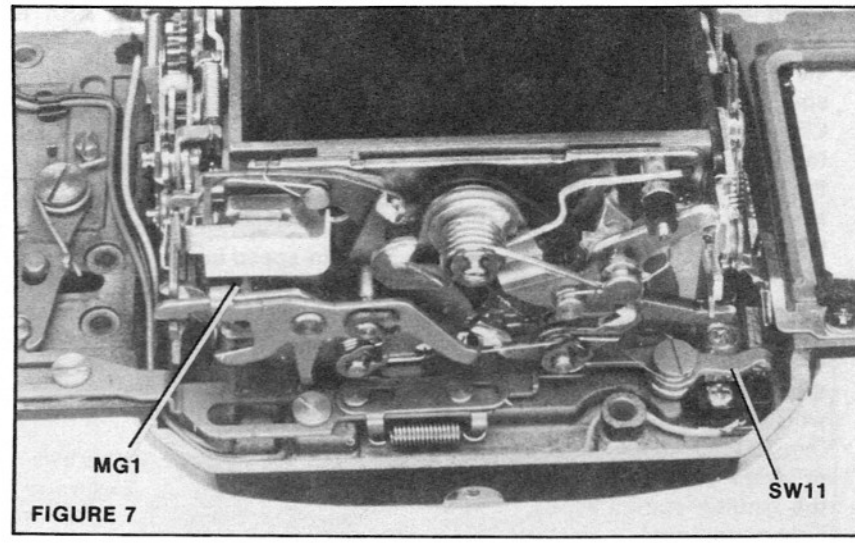


FIGURE 7

e. Adjust so all three readings are within 5% of the specifications by turning the setscrew inside the maximum-aperture pin (loosen the cement with M.E.K.). Turning the setscrew clockwise increases the resistance.

4. Film-speed contact. Check if you replace the film-speed contact, base plate, or top cover. Adjust the eccentric (A in Fig. 1) so the film-speed contact touches only the correct land. To check, temporarily connect wires to the SV test point, Fig. 1, and to ground (you can use one of the ground tabs on IC1 for one of the wires). Install the top cover and connect a DVOM between the two wires. The DVOM should read between 2.5K and 4.5K (if it reads lower than 1K, reverse the ohmmeter leads).

a. Rotate the film-speed contact until the brush near the eccentric pin is on the ASA 3200 land of the film-speed base plate (the last land, placing the eccentric pin at the back of the camera). Record the resistance reading.

b. Rotate the film-speed contact clockwise until the brush is on the ASA 12 land (the first land, placing the eccentric pin to the front of the camera). Record the resistance reading.

c. Temporarily replace the top cover and the film-speed dial. Set ASA 3200. The resistance reading should match that in "a." Set ASA 12. The resistance reading should match that in "b."

d. Lock the film-speed dial at ASA 100 and note the resistance reading. Without disengaging the lock, rotate the film-speed dial as far as it will go in both a clockwise and a counterclockwise direction to take up the play. The resistance reading should not change. Also assure that you can't change the resistance reading at the ASA 3200 position by taking up the play in the film-speed dial.

BASIC USER'S OPERATION:

1. At the program setting and with the lens at auto, the camera automatically sets the diaphragm opening and the shutter speed (2 seconds — 1/1000). The "P" (program) LED at the top of the viewfinder display turns on

when you depress the release button part way. When the camera must program a shutter speed of 1/30 or slower, the "P" LED blinks. The "16" LED blinks to indicate overexposure, and the LED indicating the maximum aperture of the lens blinks to indicate underexposure.

2. At the manual shutter-speed settings with the lens at auto, the camera automatically sets the diaphragm opening. The LED display shows the aperture which will be automatically set. If the LED blinks, the camera can't program a proper aperture for the shutter-speed setting and light conditions.
3. At the manual f/stop settings, the "M" LED turns on at the top of the display.
4. The dedicated flash automatically sets the shutter speed to 1/60, regardless of the speed-knob settings (except "B"). When the flash charges, the flash LED at the bottom of the display turns on. The f/stop LEDs show the f/stop which the dedicated flash will program. After the flash exposure, the flash LED blinks for two seconds if the shooting distance provided proper exposure with the 188A flash (as long as you keep the release button partially depressed).
5. Pushing the battery-test button causes the piezo beeper to beep at a frequency according to the actual battery voltage; the frequency decreases as the battery voltage decreases. The battery-test button also serves as a cancel button for the self-timer. Set the self-timer with the switch under the wind lever.
6. The preview button on the front standard closes SW1' (the same as pushing the release button part way to close SW1). The AE lock button (above the preview button) locks in the exposure information. As long as you keep the release button partially depressed, the exposure information remains in memory; it's not necessary to hold in the AE lock button.

DISASSEMBLY HIGHLIGHTS:

Locations of left-hand threads: screws holding pinions on tops of winding rollers, Fig. 12

Settings for disassembly: ASA 100, Program (for reference)

Precautions:

1. Be careful to avoid turning the film-speed brush after you remove the film-speed dial at ASA 100. Once you remove the top cover, note the position of the film-speed brush, Fig. 1. You can then set ASA 100 for adjustments with the top cover removed.
2. Remove the battery before unsoldering wires.

Sequence:

1. bottom cover (3 screws in chrome models, 2 screws in black models)
2. front cover (4 screws)

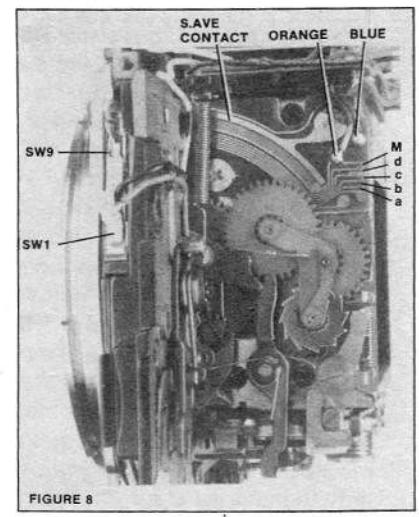


FIGURE 8

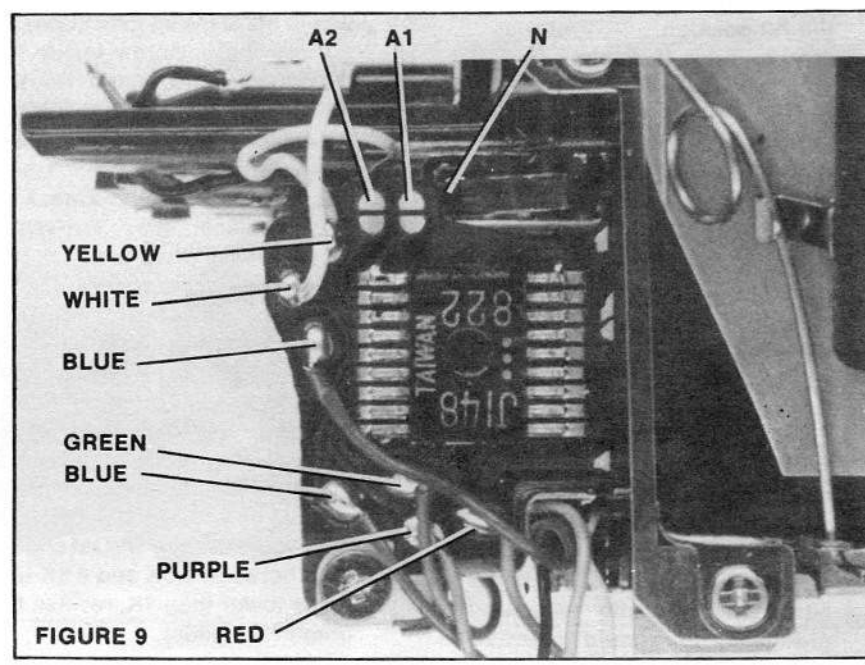


FIGURE 9

3. top cover (cable-release pin inside release button will be loose) —
   —rewind knob and film-speed dial (snap ring)
   —cemented insert above wind lever
   —release-button decorator plate (2 screws)
   —wind lever (unscrew retainer—2 loose washers)
   —on/off/self-timer lever (snap ring)
   —top-cover screws
4. unsolder black wire from P.C. terminal
5. unsolder white and green top-cover wires from flex

Reassembly highlights:

1. After resoldering the top-cover wires, slip the black X-sync wire under the piezo beeper, Fig. 4. Route the green and white wires so they don't interfere with the film-speed contact or the battery-test switch.
2. Set the speed selector to the program position (slot pointing to front of camera) before seating the top cover, Fig. 2.

Sequence to remove mirror box:

1. right and left front leatherette
2. remove cover plate, rewind side of body (3 screws) — spacers for back latch loose

3. unfold section of flex covering MG1 wires, Fig. 4
4. unsolder black and red MG1 wires from flex
5. unsolder wires from top of flex
   —violet to SW1'
   —white and black to maximum-aperture resistor
   —orange to S.AVE (diaphragm) contact
   —blue, green, violet, and red to LED display board
   —yellow to piezo beeper
   —gray to battery-test switch
6. remove film-speed brush (snap ring)
7. remove battery-test ground plate with switch (2 screws)
8. remove screw holding film-speed base plate, Fig. 1
9. lift up film-speed base plate to reach piezo beeper
10. remove piezo beeper (3 screws — long screw goes to front of camera)
11. remove 2 upper mirror-box screws, back of camera
12. remove 5 front-plate screws
13. remove front-plate/mirror-box assembly

Note: It's possible to remove the front-plate/mirror-box assembly without taking out the piezo beeper. However, it's much easier to remove and replace the assembly with the beeper removed. Also, removing the beeper prevents chance of damage to the LED display board, Fig. 9.

Reassembly highlights:

1. Replace the front-plate/mirror-box assembly with the shutter and mirror released, mirror down. The MG2 armature must also be in the released position (away from the magnet).
2. Route the wires to the back of the flex, Fig. 1, as you install the front-plate/mirror-box assembly.
3. After installing the front-plate/mirror-box assembly, test by cocking the shutter; make sure you can't continue to advance the wind lever after the cocking stroke. Release the mirror by pushing the MG2 armature away from the magnet, Fig. 3. The shutter should release and the mirror should return to the down position.
4. Install the two locating (shoulder) front-plate screws first.
5. Route the section of flex that extends to the bottom of the camera between the piezo beeper and the film-speed base plate, Fig. 4.

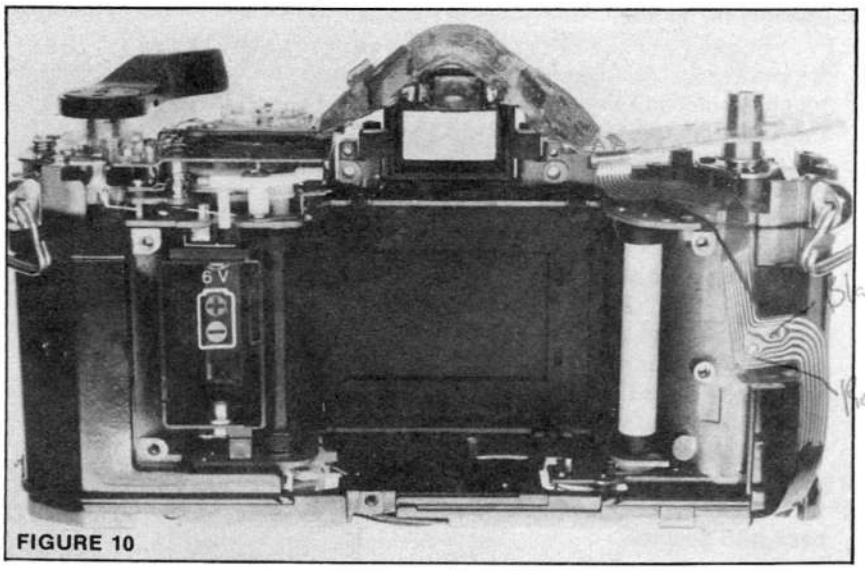


FIGURE 10

Sequence to remove flex circuit (mirror box does not have to be removed):

1. unsolder all wires from flex, Fig. 13, Fig. 3, and Fig. 4
2. unsolder red battery wire from on/off switch
3. remove film-speed brush (snap ring)
4. remove batter-test ground plate with switch (2 screws)
5. remove insulator tape, bottom of flex, Fig. 3
6. remove ground screw and washer, bottom of flex, Fig. 3
7. unsolder bottom section of flex from MG2 (2 connections) and from power-winder terminal block (4 connections)
8. remove brass clip at top of eyelens
9. Ifit IC4 from the SPD fresnel-lens frame
10. shutter-speed board

Note: If you're replacing the flex, remove the three screws holding the shutter-speed board to the counter-mechanism assembly. However, if you're removing the flex to reach the shutter, you can take out the shutter-speed board and the counter-mechanism plate together. Remove the two screws holding the counter-mechanism plate to the camera body.

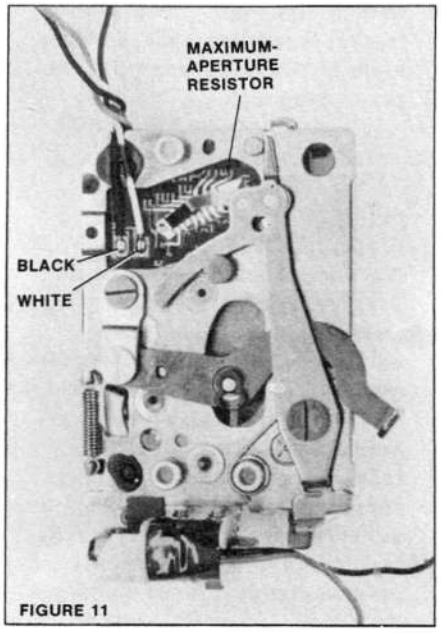


FIGURE 11

11. lift off the on/off/self-timer brush (hold aside detent)
12. remove 3 screws holding on/off/self-timer switch board
13. unsolder flex from SW1 and SW2 (2 connections)

Note: If you're removing the counter-mechanism plate with the flex, you don't have to unsolder the SW1/SW2 connections.

14. unsolder SW5 from flex and remove the SW5 contact wire, Fig. 2
15. unsolder SW4 from front of flex, Fig. 4
16. remove flex-circuit assembly

Reassembly highlights:

1. If you removed the counter-mechanism plate with the flex, the counter-advance gear, Fig. 12, will be loose. Push the first-curtain brake lever against its spring pressure to lift out the counter-advance gear. Avoid grasping the upper notched end of the counter-advance gear with your tweezers. If you scratch this end, the counter dial may advance two positions during the cocking cycle. On reassembly, seat the counter-advance gear in its bearing hole as shown. Then push the first-curtain brake lever back into position.
2. When you replace the section of flex above the eyelens, slip IC4 behind the tab on the SPD fresnel-lens frame. Make sure the ends of IC4 fit between the two positioning lugs.

Sequence to remove shutter:

1. mirror box
2. tripod socket (3 screws)
3. disconnect and remove spring from rewind end of connecting lever, Fig. 3
4. connecting lever (snap ring at one end, E-clip at other end) — bushing on underside of connecting lever will be loose
5. remove screw holding charge cam and charge gear, Fig. 3 (screw is cemented — use M.E.K. or acetone to soften cement)
6. remove charge cam and charge gear
7. flex circuit

   Note: It's not necessary to disconnect the bottom section of the flex. Just follow the flex-removal sequence to lift aside the top section. Remove the counter-mechanism plate together with the flex. Also remove the piezo beeper (if you did not remove the beeper to pull the mirror box).
8. winding unit at top of camera (3 screws)

   Note: Lift the winding unit straight up to avoid dislodging the springs and rollers of the one-way clutch, Fig. 12.
9. wind shaft (push up from bottom of camera)
10. remove 4 shutter-assembly screws (2 at wind side, 1 at rewind side, locating screw at bottom)
11. shutter assembly

    Note: The black X-sync wire is cemented above the shutter. Cut loose the cement from the body as you remove the shutter assembly. Use the battery box as a "handle" to lift out and replace the shutter.

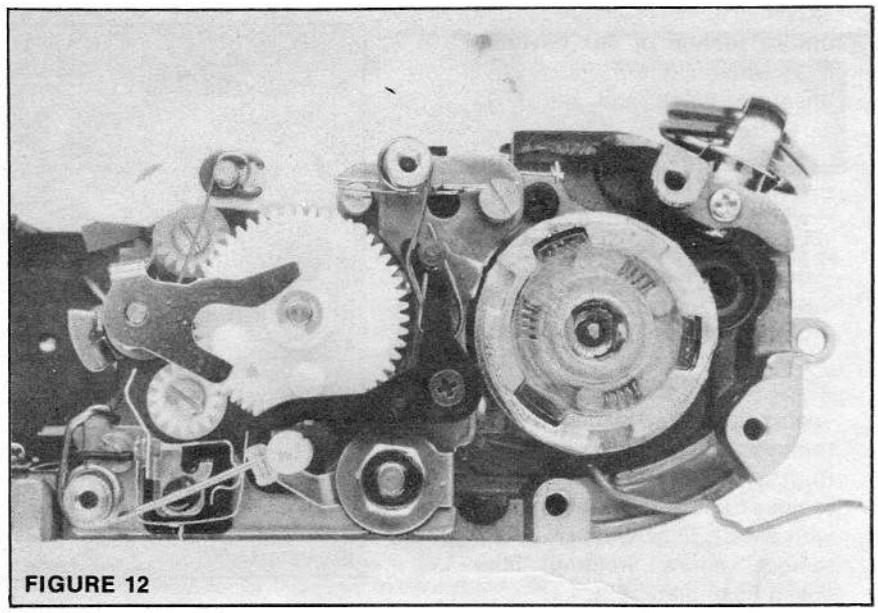


FIGURE 12

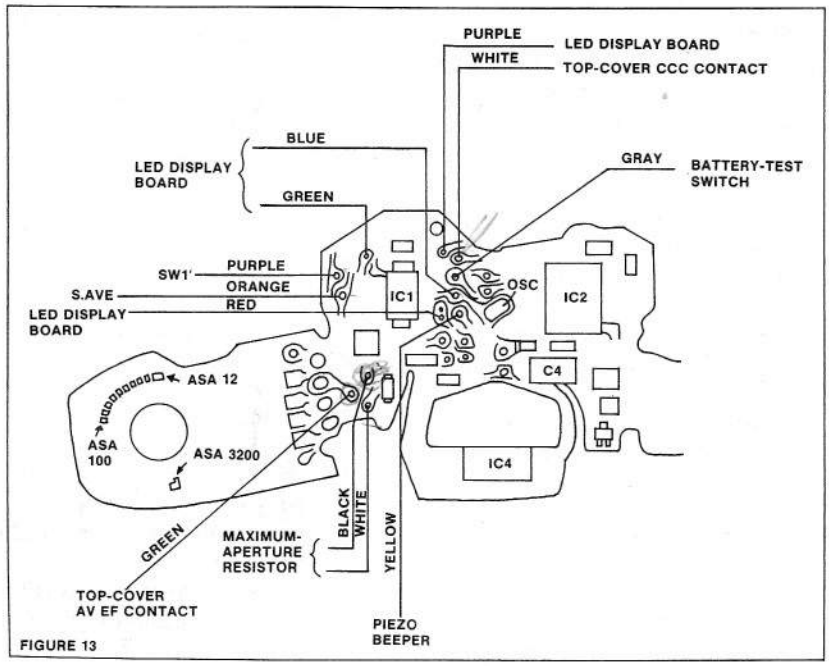


FIGURE 13

Reassembly highlights:

1. As you replace the wind shaft, make sure one of its three lugs passes into the gap in the idler gear, Fig. 12.
2. Before replacing the winding unit, turn the clutch cam (center of one-way clutch) clockwise to the position shown in Fig. 12.
3. Before replacing the charge gear, rotate the sprocket to the timed position, Fig. 14.
4. Seat the charge gear so that one of the three gaps between charge-cam lobes faces the center of the camera, Fig. 3. Pull aside the spring-loaded levers by the rewind button to allow the charge gear to seat fully.

SWITCH FUNCTIONS:

Note: Switch numbering corre sponds to other A-series Canons.

SW0. Battery (on/off) switch. Turning SW0 to the "on" position connects the positive side of the battery to the emitter of TR1, Fig. 2.

SW1, SW1'. Metering switch. Closing either SW1 (by pushing the release button part way) or SW1' (by pushing the button on the front standard) turns on TR1 to supply the E1 voltage to the circuit. The E1 voltage appears at the magnets and at the IC's only with TR1 turned on.

SW2. Release switch (under SW1). Closing SW2 connects pin 17 of IC2 to ground to release the shutter.

SW4. Count switch, Fig. 4. Closed with the shutter cocked, open when the first curtain starts to run. When SW4 opens, the circuit starts counting clock pulses to determine the shutter speed.

SW5. Power-winder switch, Fig. 2. With the shutter cocked, SW5 closes and connects power-winder pin #2, Fig. 3, to ground. SW5 also connects pin 19 of IC2 to ground to prevent the shutter from releasing. With the shutter fully cocked, SW5 opens and disconnects the power-winder pin and pin 19 of IC2 from ground.

SW7. Self-timer switch. Setting the self-timer position connects pin 16 of IC2 to ground.

SW8. Battery-test switch. Closing SW8 connects pin 6 of IC2 to ground to turn on the piezo-drive oscillator.

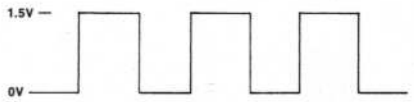
SW9. Memory switch, Fig. 8. Closing SW9 connects pin 4 of IC3 to ground to hold the exposure data in memory.

SW11. Auto/manual switch, Fig. 7. Setting the lens to a manual f/stop connects pin 3 of IC3 to ground.

SW12. TV switch controlled by the shutter-speed brush. Setting the shutter speed connects the proper pins of IC2 (12, 13, 14, or 15) to ground to program the shutter speed.

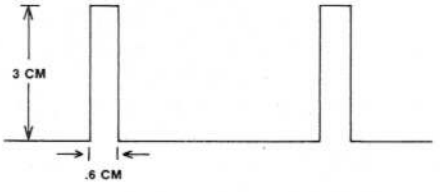
OSCILLOSCOPE TESTS:

1. Oscillator (clock). Set auto sweep and adjust the vertical position so that the trace is on the center (0V) line. Close SW1 and check the oscillator between the OSC test point and ground, Fig. 2. Scope settings: 10 microseconds sweep time, .5 or 1 v/cm. The square wave should rise above the 0V line as shown (if the square wave rides a positive voltage rather than 0V, disconnect the blue wire that goes to the LED display board, Fig. 13 — if the trace then appears normal, IC3 is defective). No clock trace — troubleshoot IC1.

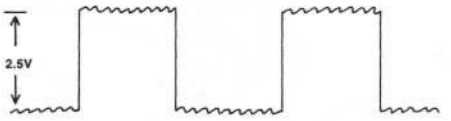


2. A-D signal. Check the analog-to-digital conversion at pin 1 of IC2 or at the lead of the CAD capacitor that connects to pin 1, Fig. 2. Scope settings: .05 v/cm, 2ms sweep time. When you close SW1, you should get the A-D trace. The slope of one side of the trace should change as you change the light level on IC4, Fig. 5. No change in trace — troubleshoot IC4, IC1, and IC2.

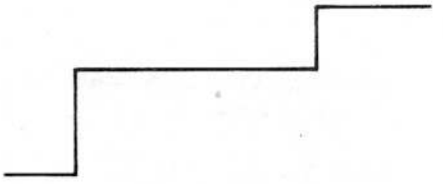
3. Output bus. Check between pin 20 of IC2 and ground. Scope settings: 50 microseconds sweep time, .5 v/cm. When you close SW1, you should get the trace shown. The output signal appearing between these two pips should vary as you change the light level or film-speed setting. No output signal — troubleshoot IC2. No change in output signal — troubleshoot IC4, IC1, and IC2.



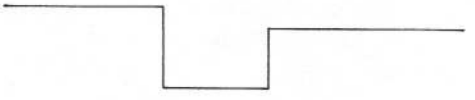
4. Oscillator that drives piezo beeper. Check at pin 10 of IC2 or at the yellow-wire land (the yellow wire going to the piezo beeper). Scope settings: 50 microseconds sweep time, .5 v/cm. You should get the trace shown when you close the battery-test switch; the trace should pulse on and off at a frequency depending on the applied voltage. No trace — troubleshoot IC2.



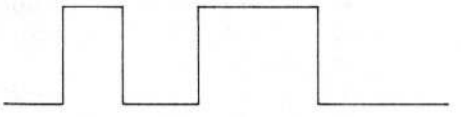
5. SV signal. Check at the SV (film-speed) test point, Fig. 1, or at pin 7 of IC1. Scope settings: 2ms, .1 v/cm. The drawing shows the approximate trace at ASA 100 with SW1 closed. Changing the film-speed setting should change the trace. No change — check film-speed contact.



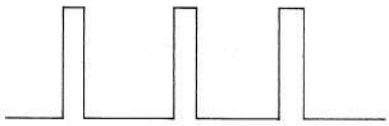
6. IC1 metering output. Check the output signal at pin 5. Scope settings: .5 v/cm, 2ms sweep. The trace should change as you change the light level. No change — troubleshoot IC4 and IC1.



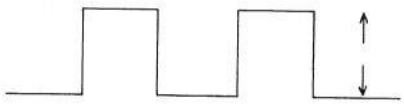
7. IC2 metering output. Check the output signal at pin 4 of IC2. Scope settings: 5ms sweep, .5 v/cm. The trace should change as you change the light level. No signal — troubleshoot IC2. No change in signal — troubleshoot IC4, IC1, IC2. The trace should also change when you connect a 4.7K resistor between the CCC contact (white-wire connection) and ground. No change — IC2.



8. S.AVE (segmented aperture-value electrode). Check at pin 22 of IC2, shutter cocked and SW1 closed. Scope settings: .1ms sweep, .5 v/cm. Each time the S.AVE brush touches a contact as the diaphragm closes, it shorts the pin 22 signal to ground.



9. Timing signal. Check at pin 5 of IC2. Scope settings: .5 v/cm, 5ms sweep. No signal — replace IC2.



IC FUNCTIONS AND TEST PROCEDURES:

Note: Transistor TR1, Fig. 15, turns on when you close SW1 to supply the E1 voltage (around 6V) to all four ICs. Before troubleshooting the ICs, check for the E1 voltage at the TR1 collector with SW1 closed. No E1 voltage — proceed to "Troubleshooting" section.

1. IC4. Analog amplifier for SPD, Fig. 5. Also supplies the Vc constant voltage. To check:

a. Check for E1 at pin 6. No voltage —check solder at pin 6 and ground pin 1. Also check continuity between pin 6 and collector of TR1.

b. Check for Vc voltage at pin 7; you should measure approximately 1.3V with SW1 closed. No voltage or incorrect voltage — replace IC4.

c. Check the output of the SPD amplifier at pin 11. The voltage should go more positive as you change the light striking the SPD. No change — replace IC4.

d. Check the AR5 output at pin 4. The voltage should go more positive as you decrease the light striking the SPD. No change — replace IC4.

e. Check the maximum-aperture correction signal at pin 2. You should measure 1.8V without a lens on the camera. When you push in the maximum-aperture pin, Fig. 4, you should measure around 1.5V. No change — check the maximum-aperture resistor by measuring the resistance between the white wire, Fig. 13, and ground. The resistance should go from 4K to around 11 K as you push in the maximum-aperture pin. If the maximum-aperture resistor checks properly, but you don't get the voltage change at pin 2, replace IC4.

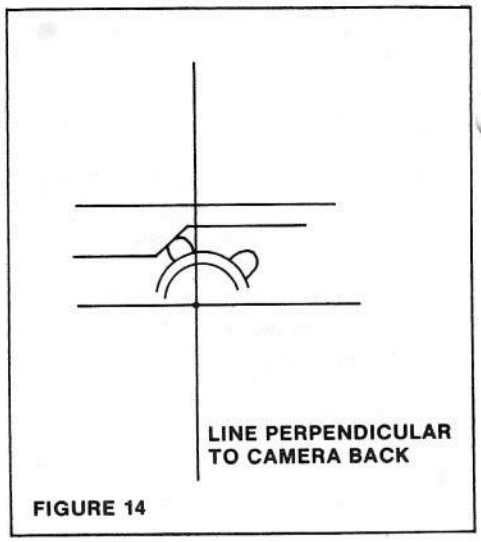


FIGURE 14

2. IC1. Analog and digital IC that drives the magnets, provides the oscillator clock signal, provides the KVc adjustment voltage, and supplies the metering signal to the CPU IC2. To check:

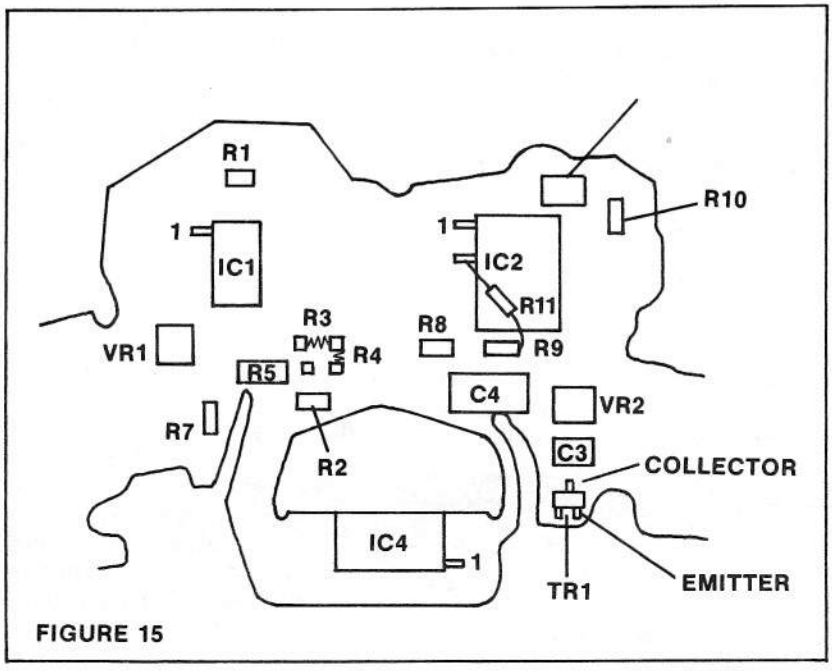


FIGURE 15

a. Check for E1 at pin 17. No voltage — check solder at pin 17 and continuity between pin 17 and the collector of TR1.

b. Check for Vc at pin 11. No voltage — troubleshoot IC4 and check for continuity between pin 11 and pin 7 of IC4.

c. Check for KVc voltage at pin 9; you should measure around 1.6V. No voltage or incorrect voltage — replace IC1.

d. Check the oscillator clock signal at pin 13 ("Oscilloscope Tests," #1). No signal — replace IC1.

e. Check the metering input at pin 6. The voltage should change as you change the light level. No change — troubleshoot IC4.

f. Check the output metering signal at pin 5 ("Oscilloscope Tests," #5). No change in signal — replace IC1.

3. IC2. CPU digital IC that supplies the timing and mode signals to IC1 and the readout signal to IC3. Also provides the oscillator that drives the piezo beeper. To check:

a. Check for E1 at pin 3. No voltage —check the solder at pin 3 and ground pin 11 and the continuity between pin 3 and the collector of TR1.

b. Check for Vc voltage at pin 9. No voltage — troubleshoot IC4 and check for continuity between pin 9 of IC2 and pin 7 of IC4.

c. Check for the oscillator clock signal at pin 8. No signal — troubleshoot IC1 and check for continuity between pin 8 of IC2 and pin 13 of IC1.

d. Check the A-D signal at pin 1 ("Oscilloscope Tests," #2). No change in signal with light-level changes — check the output of IC1 at pin 5 ("Oscilloscope Tests, #6). If the voltage signal at pin 5 of IC1 does change with light-level changes, but the A-D voltage doesn't change, replace IC2.

e. Check the output bus signal at pin 20 ("Oscilloscope Tests," #3). No signal — replace IC2.

Note: The following symptoms also indicate a defective IC2 —
(1) The f/stop indication does not change to f/4 when you connect a 4.7K resistor between the CCC contact (white-wire land, Fig. 1) and ground.
(2) The shutter releases when you close SW1 or the battery-test switch.
(3) The battery-test signal is a continuous tone rather than a beep.
(4) The camera delivers auto with the lens set to a manual f/stop.

4. IC3. Decoder/driver for LED display, Fig. 6. Since IC3 is on the LED display board, it's difficult to reach for troubleshooting. However, you can check input signals at the IC3 connecting wires to the top of the flex, Fig. 13. Also, you can check pin voltages by lifting aside the film-speed base plate and removing the piezo beeper, Fig. 6. Jumper the ground land on the film-speed base plate to the camera body. To check:

a. Check for the E1 voltage at the red wire, Fig. 13, or to pin 9. No voltage — check the red-wire solder connections and continuity to the collector of TR1.

b. Check for the clock signal at the blue wire, Fig. 13, or to pin 6. If the clock signal rides on a positive voltage rather than on 0V, IC3 is probably bad.

c. Check for the input signal at the purple wire or at pin 7. The signal should be the same as at pin 20 of IC2. If you get the input signal, but the LED display doesn't operate, IC3 is probably bad.

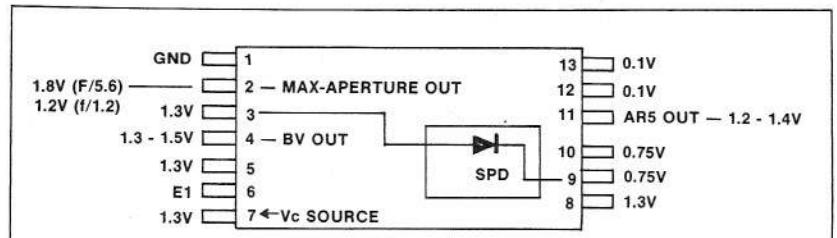


FIGURE 16 IC4 (SW1 CLOSED)

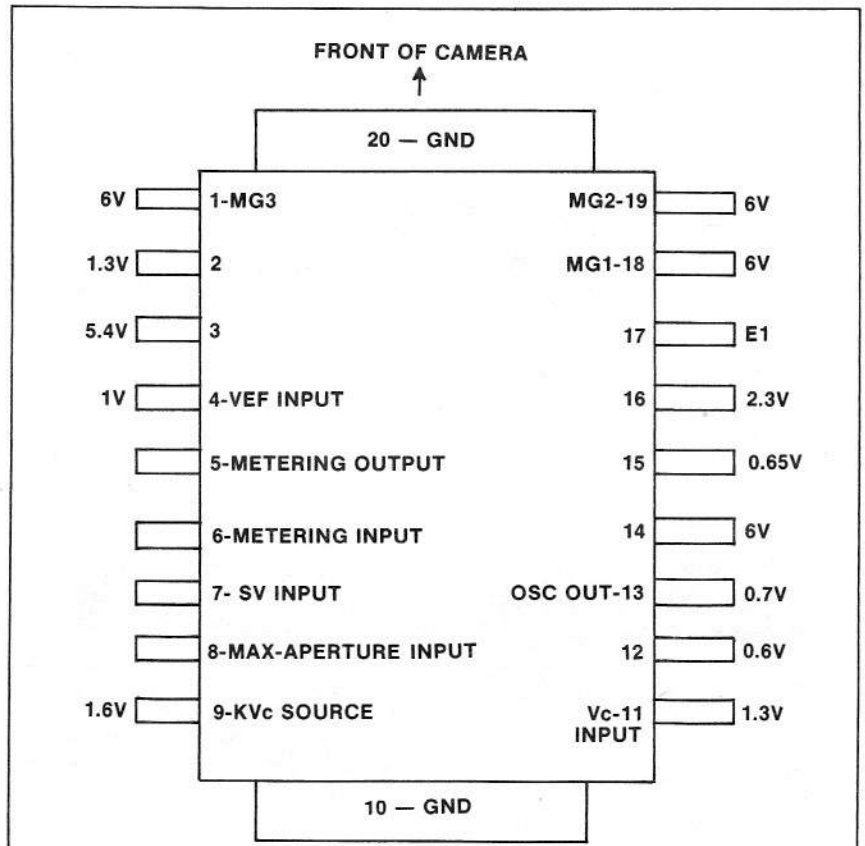


FIGURE 17 IC1 (SW1 CLOSED)

TROUBLESHOOTING:

Behavior without battery: shutter won't release

Behavior without lens: only "M" (manual) LED in finder, f/stop indication won't go larger than f/5.6

Typical current draw (6V supplied): 35ma with shutter open

Troubleshooting steps for specific problems:

1. Shutter won't release, no LEDs

Battery voltage to flex

Check for battery voltage (6V) at the red wire to the on/off switch. No voltage — battery box or wiring.

Ground screw loose

Check the ground screw at the bottom of the flex, Fig. 3, and the ground screw holding the plate under the battery-test switch, Fig. 1.

On/off switch, poor contact

Check for battery voltage at the emitter of TR1, Fig. 15, without closing SW1. No voltage — poor contact of on/off switch or break in flex between TR1 emitter and on/off switch.

No voltage to base of TR1

Check for approximately 6V at the base of TR1, Fig. 15. No voltage — break in flex between TR1 base and R9/R10 junction or poor solder.

TR1 open or poor SW1 contact

Measure the voltage between ground and the collector of TR1, Fig. 15. You should measure the E1 voltage (close to 6V) when you close SW1. No voltage — TR1 open or poor solder to SW1. You can also check TR1 by shorting between the emitter and collector leads. If the transistor is the problem, the viewfinder LEDs will turn on.

Oscillator

Check for the clock signal at the OSC test point, Fig. 2 (see "Oscilloscope Tests," #1). If you don't have a scope, measure the voltage — a voltage of around 0.7V at the OSC test point indicates that the oscillator is working. No signal — troubleshoot IC1 ("IC Functions and Test Procedures").

IC2 defective

Troubleshoot IC2 ("IC Functions and Test Procedures").

2. Shutter will not release, LEDs work

MG2, oil contamination or open coil

To check, close SW1 and short between ground and the MG2 lead that goes to pin 19 of IC1, Fig. 3. The shutter should release. If not, check MG2 for an open coil or dirty magnet interface. Approximate coil resistance — 90 ohms.

No continuity between MG2 and IC1

Check by closing SW1 and shorting pin 19 of IC1 to ground. The shutter should release. If not, check for poor solder at pin 19 or an open between pin 19 and MG2.

MG3, open coil

Check the MG3 coil between the red and black leads, Fig. 3. Approximate coil resistance (one lead disconnected) — 200 ohms.

MG1, open coil

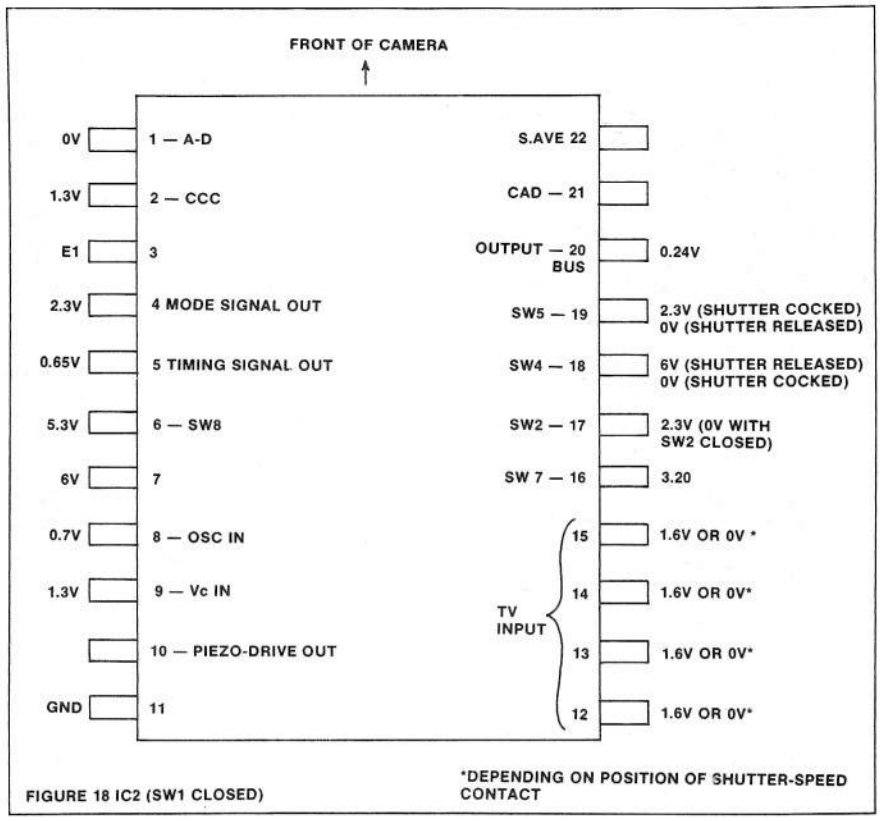


FIGURE 18 IC2 (SW1 CLOSED)

Check the MG2 coil between the red and black wires, Fig. 4. Approximate coil resistance (one lead disconnected) — 330 ohms.

SW5, not opening or shorted to ground

Check the adjustment on SW5 ("Adjustment and Test Values"). Also check to make sure the red insulator is on the switch-operating pin, Fig. 2. If not, the wire contact will short to ground.

Count (trigger) switch SW4, poor contact

SW4 should be closed with the shutter cocked. Try shorting the wire contact of SW4 to ground; if you can then release the shutter, the problem is poor contact in SW4.

IC2, solder connections
Check the solder connections at pins 19, 18, and 17.

SW2, poor contact or solder

Close SW1 and short pin 17 of IC2 to ground. The shutter should release and time out. If so, IC1 and IC2 are good. The problem is SW2 or the continuity between pin 17 of IC2 and SW2.

IC1 or IC2

Check the voltage at pin 7 of IC2. The voltage should drop to 0V when you close SW2. If it does, the problem is probably IC1; if it doesn't, the problem is probably IC2. Check IC1 and IC2 ("IC Functions and Test Procedures").

3. No LEDs in finder, shutter operates

IC2 or IC3

Check for the output bus signal at pin 20 of IC2 ("Oscilloscope Tests," #3). If you don't have a scope, check the voltage at pin 20; a voltage of around 0.24V indicates the presence of the output signal. No output signal — troubleshoot IC2. Output signal present — troubleshoot IC3.

4. Viewfinder LED indication does not change with change in light level or film-speed setting

Film-speed contact

Check the film-speed signal at the SV test point, Fig. 1 ("Oscilloscope Tests," #5). You should get a change in the signal as you change the film-speed setting. No change — check the contact of the film-speed brush.

Alternately, check the resistance between the SV test point and ground. The resistance should vary between 2.5K and 4.5K as you turn the film-speed brush.

IC4

Check for a changing voltage at the lead of resistor R7 (the lead closer to the back of the camera that connects to IC4 pin 4, Fig. 15). The voltage should go more positive as you decrease the light level. No change — troubleshoot IC4 ("IC Functions and Test Procedures").

IC1

Check for the KVc voltage at pin 9 (around 1.6V) and the 1.3V Vc voltage at pin 11. If you get the Vc voltage but not the KVc voltage, replace IC1. If you get both voltages, check the output at pin 5 ("Oscilloscope Tests," #6). No change in output signal — replace IC1.

IC2

Check the A-D signal ("Oscilloscope Tests," #2). If you don't get a change in signal with a change in light level, but you do get the change at pin 5 of IC1, replace IC2.

Note: If you aren't certain whether IC1 or IC2 is at fault, try connecting a 4.7K resistor betwen the CCC contact (white-wire land, Fig. 1) and ground. The display should change to f/4, and the flash LED should turn on. If the display does not change to f/4, IC2 is the problem. If the display does change, IC1 is probably the problem.

5. Auto diaphragm opening too small or erratic

   Oil contamination, MG1

   Remove the mirror box to clean the MG1 interface.

   S.AVE contact (diaphragm contact), dirty or out of adjustment

6. 1/1000 too slow or erratic

   Oil contamination, MG3

   1/1000 variable-resistor adjustment

   Count switch SW4, adjustment

7. Viewfinder LEDs always on TR1, shorted

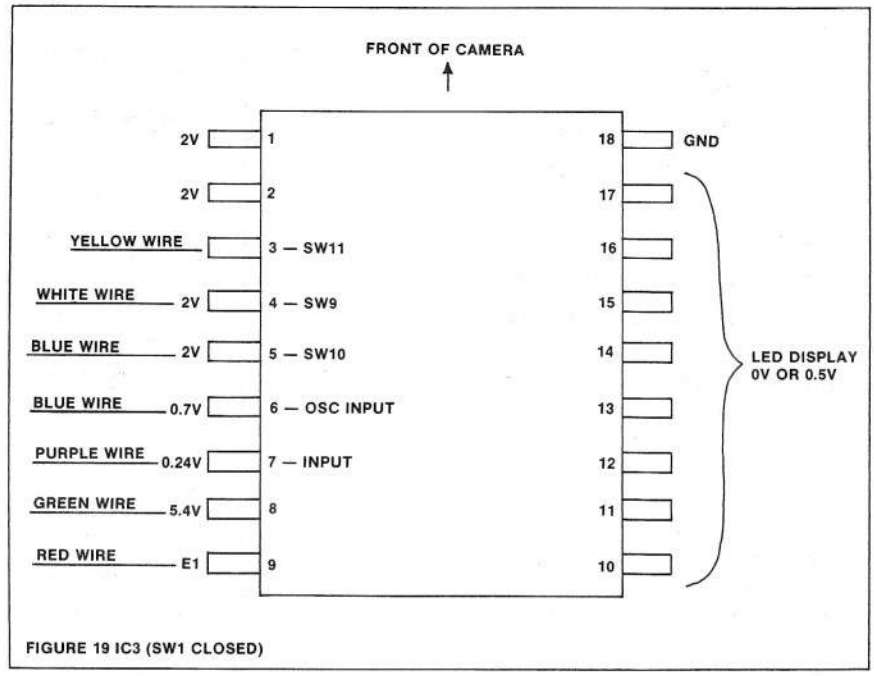


FIGURE 19 IC3 (SW1 CLOSED)

SW1 or SW1', shorted or leak current through insulators

8. Piezo does not beep when you close battery-test switch

   Battery-test switch

   Short pin 6 of IC2 to ground. The piezo beeper should beep. If it does, check the battery-test switch and the continuity between the gray wire and pin 6 of IC2.

   IC2

   Close the battery-test switch and check for the oscillator output at pin 10 ("Oscilloscope Tests," #4). No signal — replace IC2. If you do get the signal, the problem is a defective piezo beeper or the yellow-wire solder connections.

9. Viewfinder LEDs won't display an aperture larger than f/5.6, regardless of the maximum aperture of the lens installed

   Maximum-aperture resistor, open or poor contact

   Disconnect the white wire of the maximum-aperture resistor from the flex, Fig. 13. Measure the resistance between the white wire and ground as you push in the maximum-aperture pin. The resistance should go from around 4K to around 11K.

   IC4

   Check the voltage at pin 2. The voltage should go from around 1.8V to around 1.4V as you push in the maximum-aperture pin. If the voltage remains at 1.8V, replace IC4.

10. Diaphragm always stops down fully or always sets largest aperture

    S.AVE contact or IC2

    Check the signal at pin 22 of IC2 ("Oscilloscope Tests," #8). Cock the shutter and push in the stop-down slide, Fig. 4. You can now move down the diaphragm-control lever. Each time the S.AVE brush touches a contact, it grounds out the signal at pin 22. If the signal appears constantly — regardless of the position of the S.AVE brush — check for poor brush contact, Fig. 8, or for poor solder at the orange wire, Fig. 13. If you never get the signal at pin 22, replace IC2. Alternately, check the resistance between the orange wire and ground as you move down the diaphragm-control lever. Each time the S.AVE brush touches a contact, you should get direct continuity (no resistance).

11. Incorrect shutter speeds, or only fastest speed and largest aperture

TV (shutter-speed) contact, dirty or poor contact

12. No self-timer

    Self-timer switch, poor contact

    IC2 or poor solder to pin 16

13. Shutter always delivers 2-second exposure

    Film-speed brush, poor contact

14. Shutter always delivers bulb action

    Count switch SW4, always closed or shorted to ground

OTHER COMMENTS:

1. You can replace the flex as a complete unit (electric parts unit CG1-0124-000) or you can replace individual components (by component number).
2. Operation with an off-brand flash unit having a high-voltage trigger could damage IC2.
3. You can drop out the focusing screen inside the mirror box for cleaning. Disengage the latch at the top of the mirror box, Fig. 4.