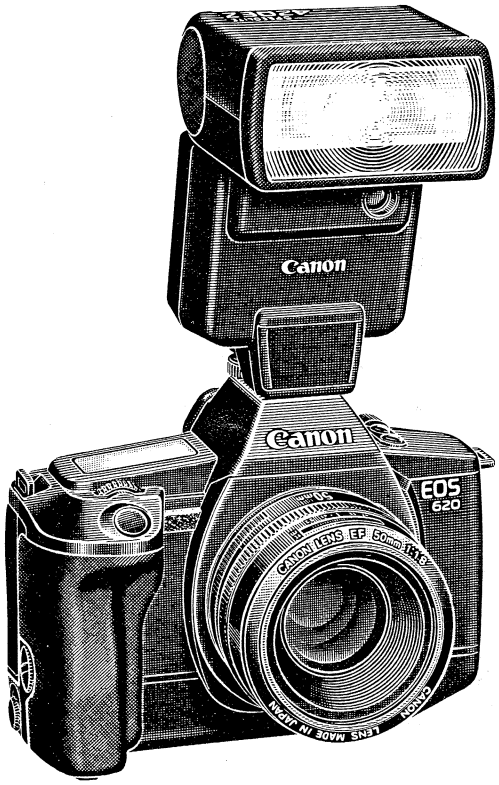
Canon

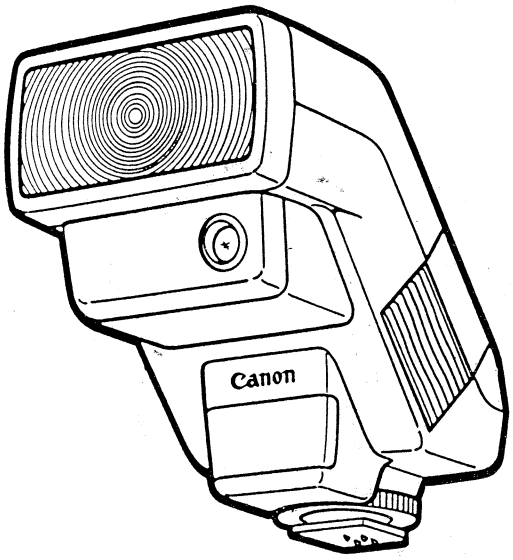
Service Manual

ENGLISH EDITION

SPEEDLITE **300EZ**

SPEEDLITE **420EZ**





This volume contains the Service Manuals for the SPEEDLITE 300EZ and 420EZ electronic flash units for the EOS cameras. The 300EZ is in the front of the volume.

CY8–2026–001–200

Canon SERVICE MANUAL

REPAIR INSTRUCTIONS

No. CY8-1226-104-300

Camera Technical Service Department, Canon Inc.

Date Feb. 20, 1987

SPEEDLITE 300EZ

TABLE OF CONTENTS

PRECAUTIONS

ALWAYS PERFORM THE FOLLOWING PROCEDURES BEFORE STARTING NORMAL REPAIR

1. CAUTION! HIGH VOLTAGE: Always discharge the pre-flash capacitor and main capacitor before commencing disassembly.

   See Disassembly, section III-6.

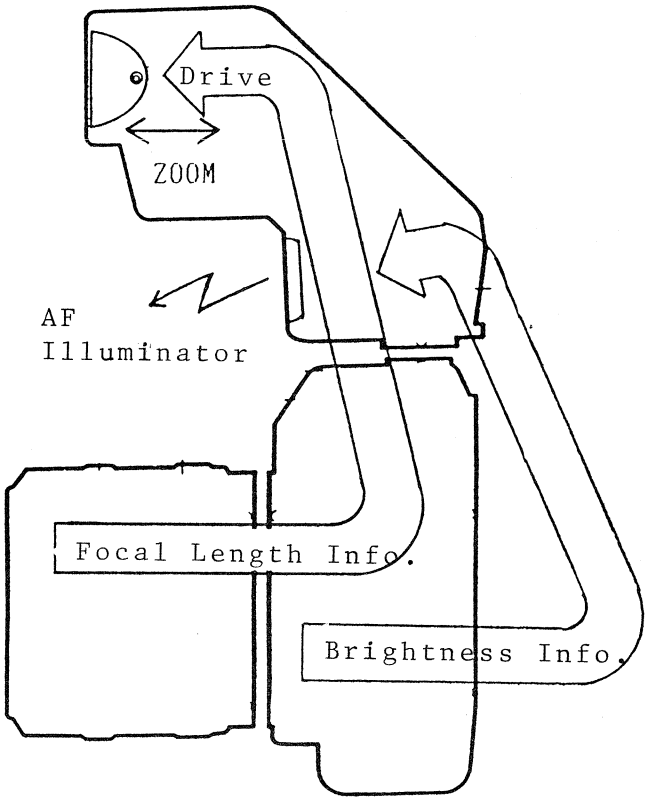
2. DO NOT turn the minus (-) screw next to the AF Illuminator Unit. This is the focus adjustment for the AF illuminator. It is adjusted at the factory. The service part (Y19-0395) is pre-adjusted at the factory.

   Note: Service adjustment methods are under study at this time.

I. New Features and Operations

1. Automatic Zooming

When the camera's release button is presses slightly, SW-1 is turned on initiating data exchange between the body and flash. Lens focal length information passes through the body to the flash. This information is then used, if necessary, to drive the motor which positions the flash for the correct coverage angle for the lens focal length in use.



2. AF Focusing Lamp

As with all passive autofocus systems, the EOS AF system does not function well at low light levels. These are the same situations where flash is called for, so a focusing lamp (actually an ultra-bright red LED) is included in the flash so focusing is possible even in the dark. The LED flashes until focus is determined, or ten times, whichever comes first.

This lamp is effective with subjects from 0.9 to 6 meters. The LED output is a stripped pattern so that it is effective even with low contrast subjects.

3. Low Voltage Flash (Quick Flash)

This new circuit allows the flash to fire at voltages lower than the 260 volts previously required to insure a stable trigger. It will fire when the main capacitor voltage is as low as 125 volts. This is accomplished by separating the trigger circuit from the main and preflash capacitor circuits.

II. Design Specifications

1. Type: Compact, hot-shoe mounting, automatic electronic flash dedicated to the Canon EOS system cameras. It features preflash to determine the aperture for A-TTL operation, lens focal length coupled automatic zooming and illuminator beam for automatic focusing in low light.

2. Usable on: EOS Cameras

3. Guide Number @ ISO 100, meters; (ISO 100, feet)

Zoom (mm) Position	Maximum Guide No	Low voltage Flash Guide No. Range
28	22(73)	5.5 to 15.5 (18 - 51)
35	25 (83)	6.2 to 17.7 (20 - 59)
50	28 (93)	7.0 to 19.8 (23 - 59)
70	30 (100)	7.5 to 21.2 (25 - 71)

4. Flashes per battery (set of 4 cells)

LR6 x 4	200 to 2,000
KR15/51 NiCd	65 to 650 per full charge

5. Recycling time

Battery	NormalFlash	Low-voltage Flash
LR6 x 4	0.3 to 8 sec.	0.3 to 1 sec.
KR15/51 NiCd	0.3 to 6 sec.	0.3 to 1 sec.

6. Flash Coverage: Four position zooming; 28, 35, 50 and 70mm (Initial:35) Internal reflector moves behind fixed fresnel lens to match coverage to lens focal length, with LCD indicator. Zooming time is 0.3 sec. or less, and the beam is depressed 3° at the 28mm setting for parallax correction.

7. Bounce Flash: N/A

8. Operation

8.1 Flash Modes

A. Normal mode
B. Low voltage mode (Quick flash)
C. Preflash to determine appropriate aperture
D. Open Flash (for testing)

8.2 Aperture Setting: In the shutter-priority mode, the flash aperture is determined by the ambient light reading. In the program AE mode it is determined by the smaller of the ambient light determined aperture or the preflash-determined aperture. In aperture-priority AE and man-

ual modes, the aperture set by the the electronic input dial is used.

8.3 Speed Setting — In the shutter-priority AE and manual modes, the shutter speed is automatically lowered to the X sync speed* when it is set higher. When it is set to a speed lower than the X sync speed it remains at that speed. In aperture-priority AE, the shutter speed varies between the maximum X sync speed and 30 seconds. In program AE, the shutter speed varies between the maximum X sync speed and 1/60 second.

*: Maximum X sync speed is 1/250 second for the EOS620 and 1/125 second for the EOS650.

8.4 Exposure Control Modes

A. Automatic camera modes: A-TTL
B. Manual camera mode: TTL automatic flash

8.5 Flash Duration Control — TTL - OTF reflected flash metering

8.6 Fill-in Flash — Automatic adjustment for syncro-sunlight flash

8.7 Flash Coupling Range @ 50mm f/1.8 and ISO100 film

1. A-TTT Normal Flash: 0.7 to 17 meters
2. A-TTL Low Voltage Flash: 0.7 to 3.9 [min.] or 12m [max.]

8.8 Coupling Range Warning — In the A-TTL mode, the shutter speed and aperture indicators in the viewfinder flash when the shutter button is pressed lightly if the subject exceeds the flash coupling range.

9. Indicators

9.1 Zoom position Indicator (LCD)

9.2 Ready Lamps (LEDs)

1. Normal ready lamp (Red) (Lights at -1EV)
2. Low voltage (QF) ready lamp (Yellow-green) (Lights at -4EV)

10. Sync Timing: Switchable, 1st or 2nd Curtain

11. Flash Duration: < 1ms

12. Color Temperature: Approx. daylight equivalent

13. Film Speeds: Determined by camera (ISO6 to 6,400), Coupling range is directly related to film speed.

14. AF Illumination Beam

14.1 Source: Ultra-bright red LED

14.2 Pattern: Vertical stripes (random spacing)

14.3 Effective Range: 1 to 5 meters in total darkness

14.4 Parallax compensation: -2.4°

15. Power Switch: Three position (OFF, ON and SE (energy saving)
In the SE position, the flash cuts off automatically five minutes after the last activity. It is automatically reactivated by any one of several signals from the camera, or the Technical Back's interval timer.

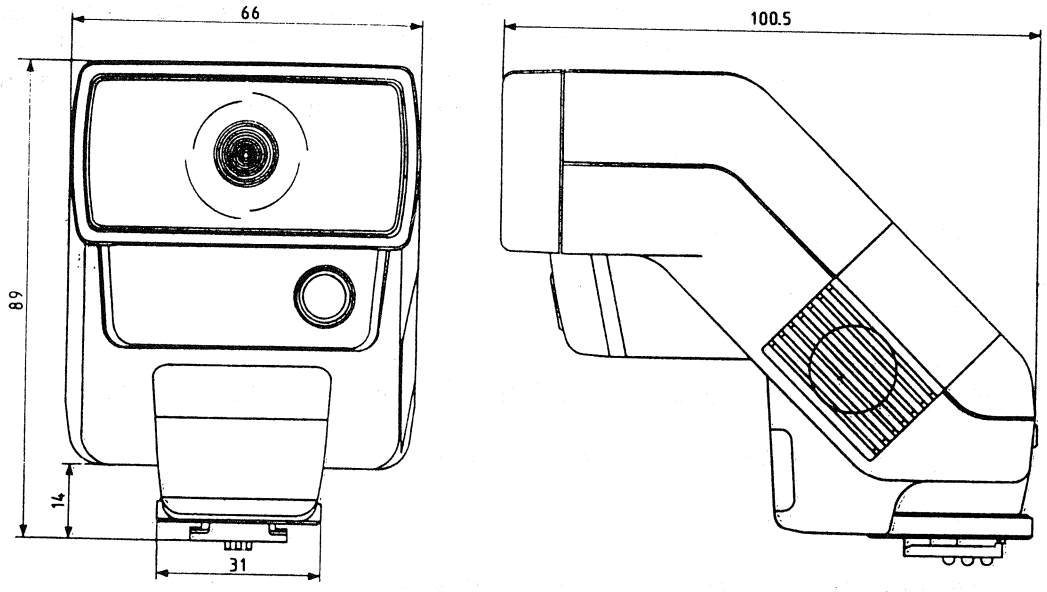
16. Power Supply: Four Size AA alkaline cells (LR6) or Size AA NiCd cells

17. Mounting: Dedicated hot-shoe mounting with X sync, ground, and four dedicated contacts.

18. Dimensions and Weight

Width	Height	Depth	Weight
66	x 89	x 100.5mm;	215g, (320g with four LR6 cells)

19. Case: Soft vinyl case



[3]-Table-3 Speedlite 300EZ automatic flash coupling range (A-TTL and TTL)

ISO 25	A-TTL	TTL

f/No	28mm	35mm	50mm	70mm
1.0	1.4-11	1.6-13	1.8-14	1.9-15
1.4	1.0-7.8	1.1-8.9	1.3-9.9	1.4-11
1.8	0.9-6.6	1.0-7.5	1.1-8.4	1.2-9.0
2.0	0.7-5.5	0.8-6.3	0.9-7.0	1.0-7.5
2.8	0.7-3.9	0.7-4.5	0.7-5.0	0.7-5.3
3.5	0.7-3.3	0.7-3.8	0.7-4.2	0.7-4.5
4.0	0.7-2.8	0.7-3.2	0.7-3.5	0.7-3.8
4.5	0.7-2.4	0.7-2.7	0.7-3.0	0.7-3.2
5.6	0.7-2.0	0.7-2.2	0.7-2.5	0.7-2.7
8.0	0.7-1.4	0.7-1.6	0.7-1.8	0.7-1.9
11	0.7-1.0	0.7-1.1	0.7-1.3	0.7-1.4
16	*	0.7-0.8	0.7-0.9	0.7-1.0
22	*	*	*	*
32	*	*	*	*

ISO 64	A-TTL	TTL

f/No	28mm	35mm	50mm	70mm
1.0	2.2-18	2.5-20	2.8-23	3.0-24
1.4	1.6-13	1.8-14	2.0-16	2.1-17
1.8	1.3-11	1.5-12	1.7-14	1.8-15
2.0	1.1-8.8	1.3-10	1.4-12	1.5-12
2.8	0.8-6.2	0.9-7.1	1.0-7.9	1.1-8.5
3.5	0.7-5.2	0.8-5.9	0.9-6.6	0.9-7.1
4.0	0.7-4.4	0.7-5.0	0.7-5.6	0.8-6.0
4.5	0.7-3.7	0.7-4.2	0.7-4.7	0.7-5.0
5.6	0.7-3.1	0.7-3.5	0.7-4.0	0.7-4.2
8.0	0.7-2.2	0.7-2.5	0.7-2.8	0.7-3.0
11	0.7-1.6	0.7-1.8	0.7-2.0	0.7-2.1
16	0.7-1.1	0.7-1.3	0.7-1.4	0.7-1.5
22	0.7-0.8	0.7-0.9	0.7-1.0	0.7-1.1
32	*	*	*	0.7-0.8

ISO 100	A-TTL	TTL

f/No	28mm	35mm	50mm	70mm
1.0	2.8-22	3.2-25	3.5-28	3.8-30
1.4	2.0-16	2.2-18	2.5-20	2.7-22
1.8	1.7-13	1.9-15	2.1-17	2.3-18
2.0	1.4-11	1.6-13	1.8-14	1.9-15
2.8	1.0-7.8	1.1-8.9	1.3-9.9	1.4-11
3.5	0.9-6.6	1.0-7.5	1.1-8.4	1.2-9.0
4.0	0.7-5.5	0.8-6.3	0.9-7.0	1.0-7.5
4.5	0.7-4.7	0.7-5.3	0.8-5.9	0.8-6.3
5.6	0.7-3.9	0.7-4.5	0.7-5.0	0.7-5.3
8.0	0.7-2.8	0.7-3.2	0.7-3.5	0.7-3.8
11	0.7-2.0	0.7-2.2	0.7-2.5	0.7-2.7
16	0.7-1.4	0.7-1.6	0.7-1.8	0.7-1.9
22	0.7-1.0	0.7-1.1	0.7-1.3	0.7-1.4
32	*	0.7-0.8	0.7-0.9	0.7-1.0

ISO 400	A-TTL	TTL

f/No	28mm	35mm	50mm	70mm
1.0	5.5-30▶	6.3-30▶	7.0-30▶	7.5-30▶
1.4	3.9-30▶	4.5-30▶	5.0-30▶	5.3-30▶
1.8	3.3-27	3.8-30	4.2-30▶	4.5-30▶
2.0	2.8-22	3.2-25	3.5-28	3.8-30
2.8	2.0-16	2.2-18	2.5-20	2.7-22
3.5	1.7-13	1.9-15	2.1-17	2.3-18
4.0	1.4-11	1.6-13	1.8-14	1.9-15
4.5	1.2-9.3	1.4-11	1.5-12	1.6-13
5.6	1.0-7.8	1.1-8.9	1.3-9.9	1.4-11
8.0	0.7-5.5	0.8-6.3	0.9-7.0	1.0-7.5
11	0.7-3.9	0.7-4.5	0.7-5.0	0.7-5.3
16	0.7-2.8	0.7-3.2	0.7-3.5	0.7-3.8
22	0.7-2.0	0.7-2.2	0.7-2.5	0.7-2.7
32	0.7-1.4	0.7-1.6	0.7-1.8	0.7-1.9

III. Disassembly, Assembly and Adjustments

1. Front & Top Cover Removal

1.1 Press down on the top cover in the [A] direction inserting fingernails to release the clips and twist off in the [B] direction.

1.2 Remove the two screws [C] .

1.3 Lift up on the top cover and remove in the [D] direction. (**Caution:** The cover is still connected by lead wires.)

1.4 The battery ~~box~~ Cover can now be removed or replaced.

1.5 To remove the top cover completely, unsolder the five leads to the LED (Fig. 2).

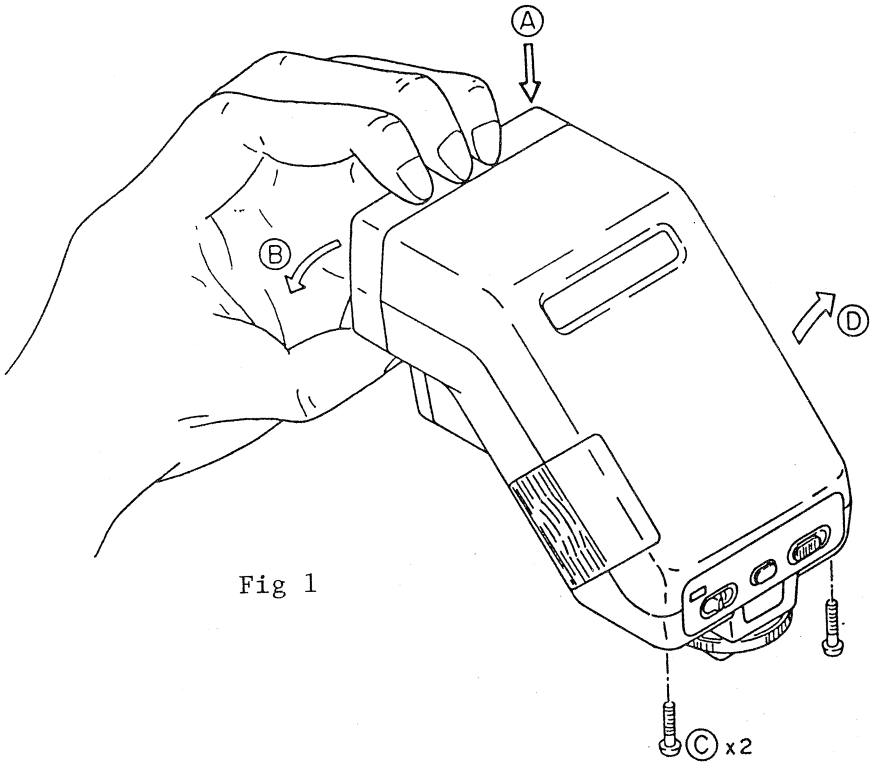


Fig 1

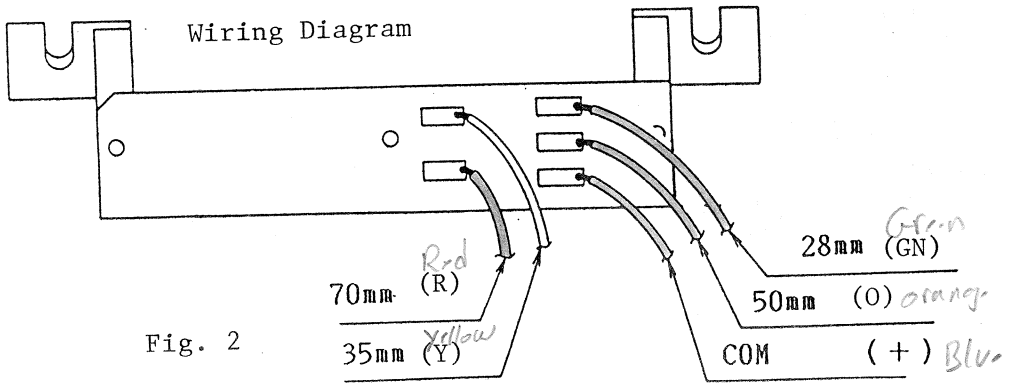


Fig. 2

2. Flash head Disassembly

2.1 Remove the two screws (Fig. 3) holding the outer shell of the flash head unit, separate into outer shell, flash head, and geartrain.

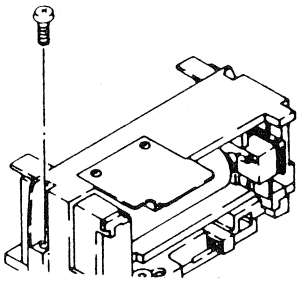


Fig. 3

2.2 Unsolder the four leads from the flash head unit on the C and M circuit board ends (Fig. 4 and 5).

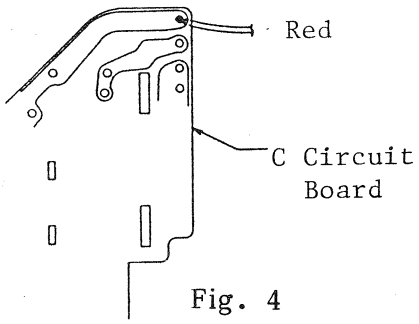


Fig. 4

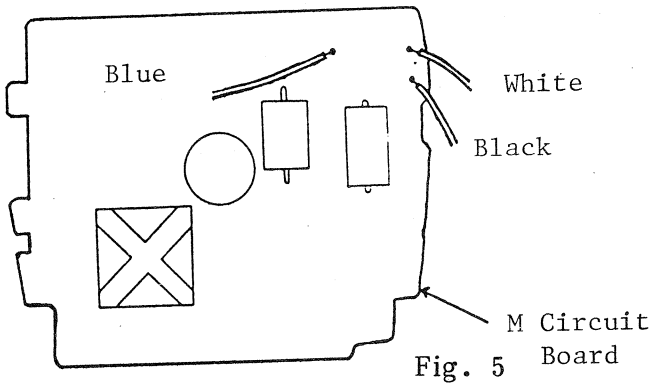


Fig. 5

CAUTION! Always use the correct silicone rubber type of leads. This is to insure smooth zooming of the flash head.

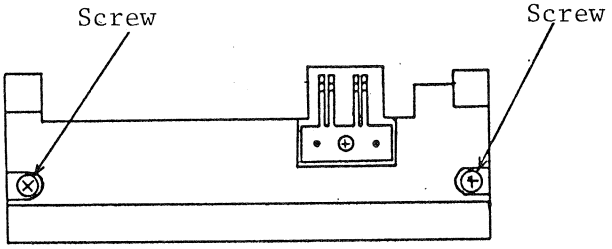


Fig. 6

2.3 Remove the two screws (Fig. 6) to remove the flash tube and associated parts.

MOTOR & GEARTRAIN

2.4 To remove the motor, unsolder the motor leads and remove the motor screws (Fig. 7).

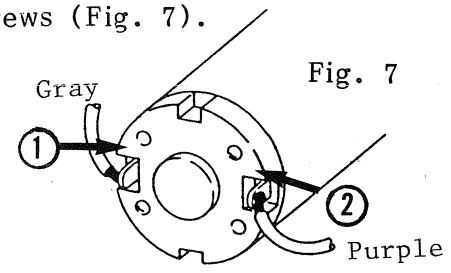


Fig. 7

2.5 To remove the geartrain, remove two screws (Fig. 8).

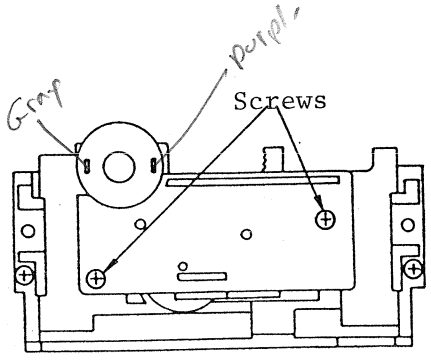


Fig. 8

3. Accessory Shoe Replacement

3.1 Lift the flash head unit and circuit boards to the extent allowed by the lead wires.

3.2 Unsolder the opposite end of the three leads from the preflash unit (Fig. 9).

3.3 Lift out the flash head and circuit board units in the [A] direction (Fig. 10).

CAUTION! Lead wires may break if pulled too hard.

Note: In this condition the red AF panel can be removed.

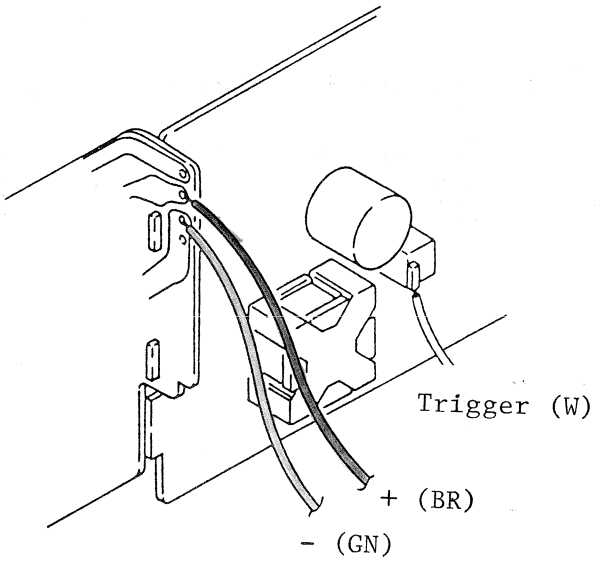


Fig. 9

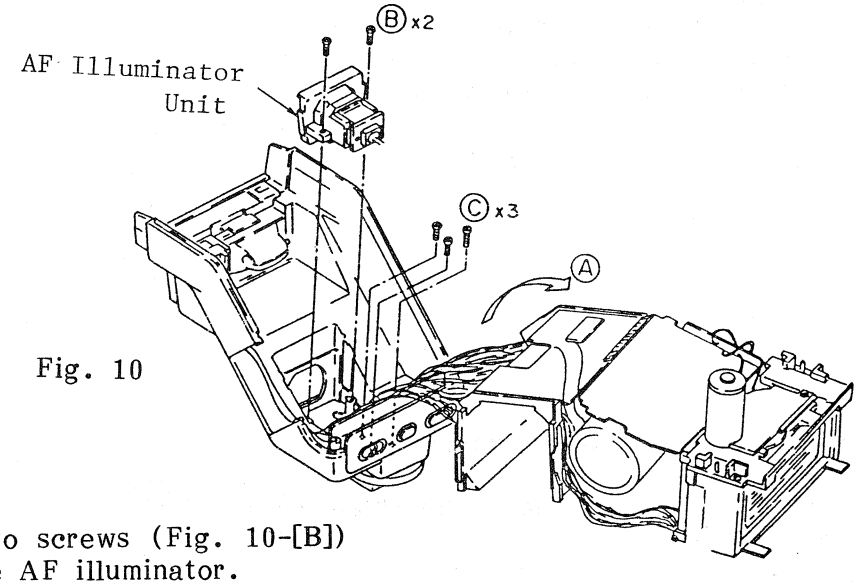


Fig. 10

3.4 Remove the two screws (Fig. 10-[B]) and lift out the AF illuminator.

3.5 Remove three screws (Fig. 10-[C]) and the shoe and tightening ring can be removed.

3.6. To replace the contacts or springs, the lead wires must be unsoldered (Fig. 11).

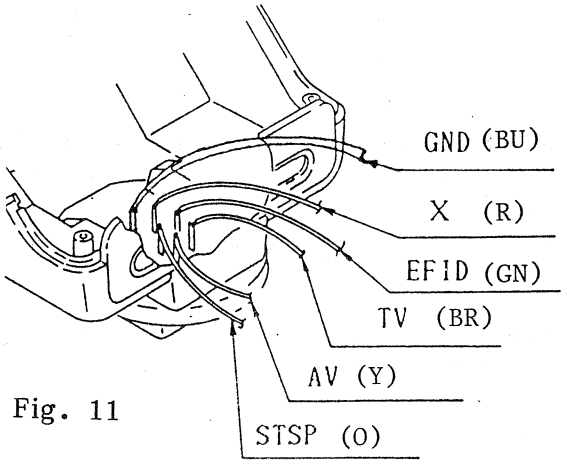


Fig. 11

4. Preflash Head Removal

4.1 Lift up gently on latch [A] (Fig. 12) and pull the preflash head backwards [B] .

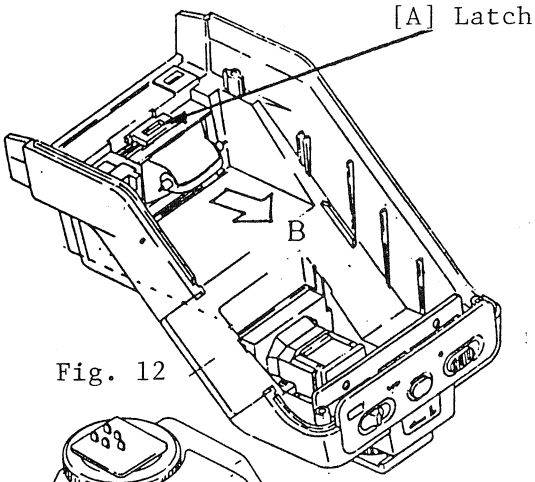


Fig. 12

4.2 To remove the preflash IR window (CA4-471), slip something thin in at [A] (Fig. 13) to release the claws and twist off in the [B] direction.

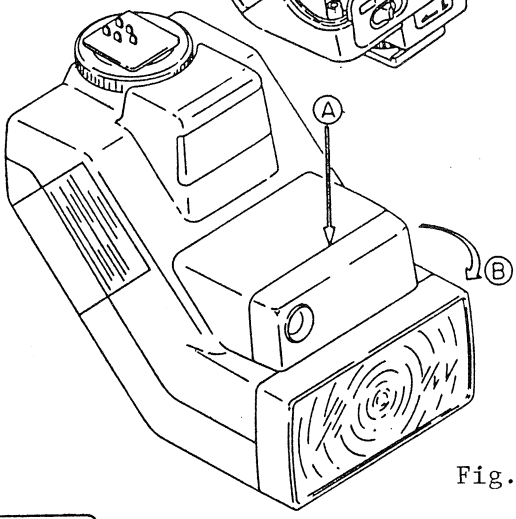


Fig. 13

5. Photoreceptor (PD) Removal

5.1 Unsolder the two leads (one shielded) (Fig. 14).

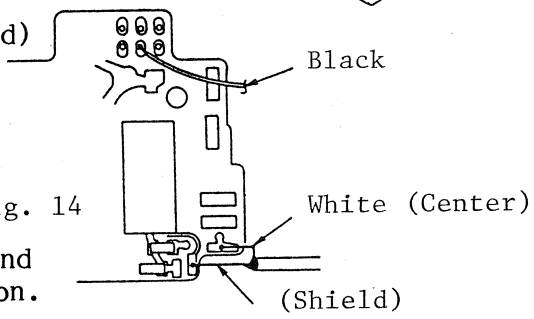


Fig. 14

5.2 Remove two screws [A] (Fig. 15) and remove the shield in the [B] direction.

5.3 To remove the lens (CF4-0643), remove screw [C] (Fig. 15)

5.4 Stick a No. 3 screwdriver in at [D] to remove the photoreceptor unit.

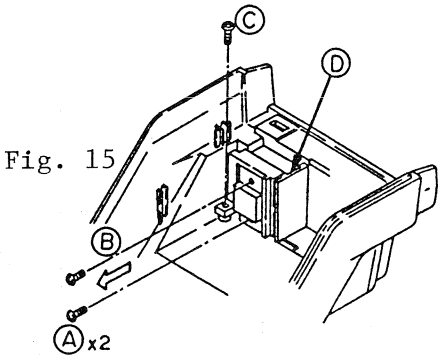


Fig. 15

ADJUSTMENTS

6. Introduction:

Make the adjustments indicated when the following parts are changed.

6.1 Adjust **Ready Lamp Voltage** if IC-1, IC C.B.-II, R28, R29, or R30 is changed. Check the adjustment if recycle times are longer than normal with a good battery, or if flashing immediately after ready lamp ignition is unstable.

6.2 Adjust FA (flash aperture) indicator if the photoreceptor (PD), IC-1, IC-2, IC C.B.-I, R42 or R48 is changed. (The FA aperture adjustment is in the camera body.)

6.3 Adjust **EFID Current** if IC-1, IC C.B.-I or R50 is changed.

ADJUSTING RESISTOR POSITIONS

FA Indication (R42, R48) / EFID Current

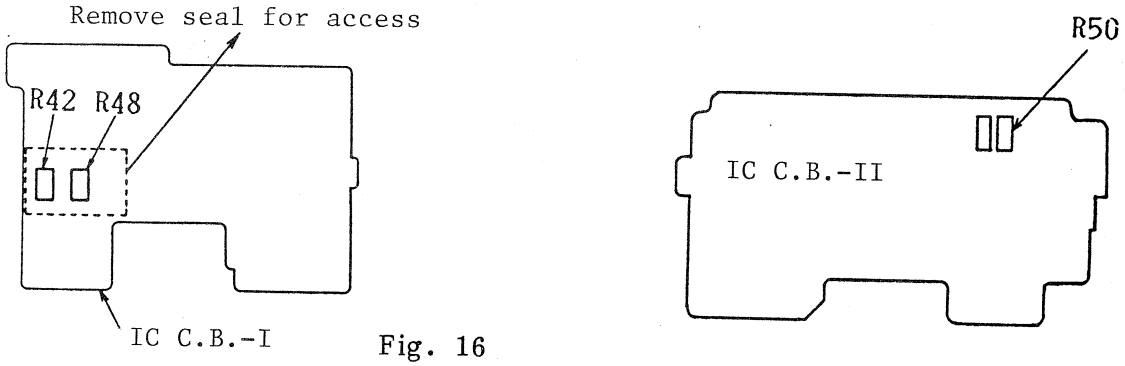


Fig. 16

Ready Lamp Voltage

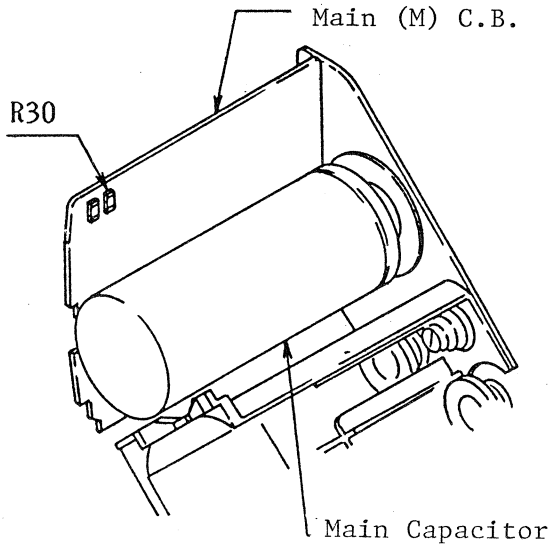


Fig. 17

7. Ready Lamp Voltage (Red LED)

7.1 Standard:Ignites at 260 ± 5VDC

7.2 Adjustment

A. (Fig. 18) Remove the top cover, and bleed the main and preflash capacitors. (Bleeder resistor: 500 Ohm, 10W or greater)

B. (Fig. 18) Connect analog voltmeter (500 volt range) to points [A] and [B].

C. (Fig. 19) Remove adjusting resistor R30 and substitute a 500K Ohm variable resistor.

D. Connect the LVPS, set to 6 volts, to the battery contacts. The test set-up is shown in figure 20.

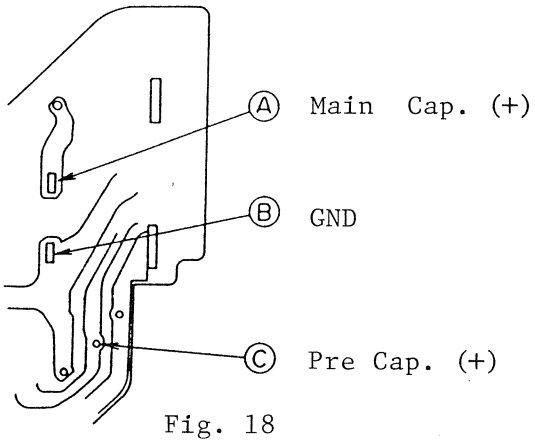
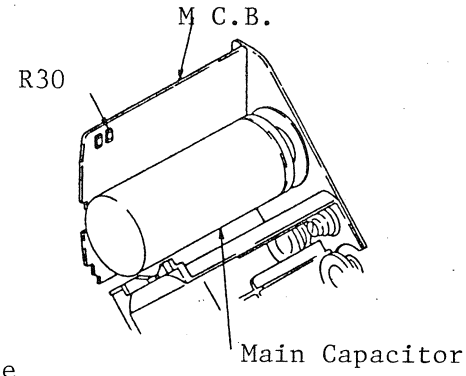


Fig. 18



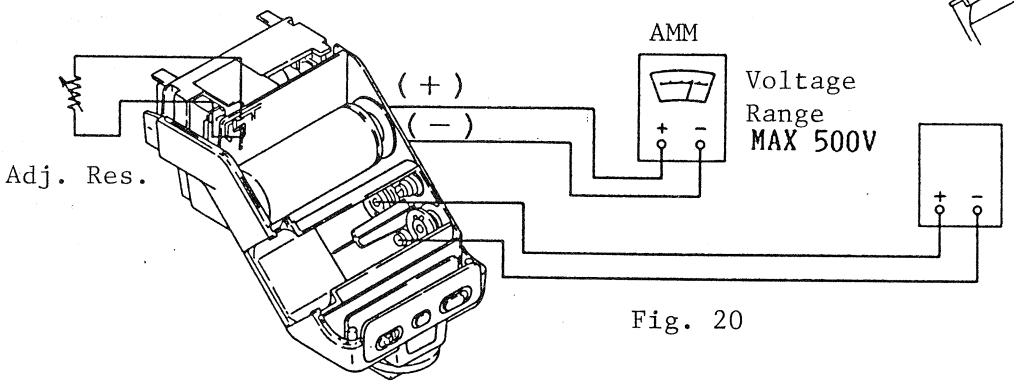


Fig. 20

E. Turn on the LVPS and main switch on and measure the ignition voltage of the neon lamp.

F. Adjust with variable until the ignition voltage is correct. A higher resistance reduces ignition voltage.

G. Remove and read the variable resistor. Install the nearest available fixed resistor in its place (R30).

Note: Setting the current control on the LVPS slows charging and makes accurate reading of the ignition point easier.

8. Aperture Control Voltage Adjustment

SIMPLE METHOD

This adjustment is for service facilities which do not have facilities for performing the official method listed in section 8.3. The official method should be used for serious claims.

ADJUSTMENTS

8.1 Standard:

A. The standard shall be the viewfinder aperture readings established for the test area as explained below.

B. The test area shall be an area, as shown in figure 21, which can be maintained in the same condition, with as few variables as possible. Especially, highly reflective, movable objects should no be in the test area. The reflecting surface should be a flat 18% gray surface of an area large enough the cover the field of the EF 50mm f/1.8 lens at four meters. (These are not absolute conditions. A white wall is acceptable, but conditions should remain as constant as possible.)

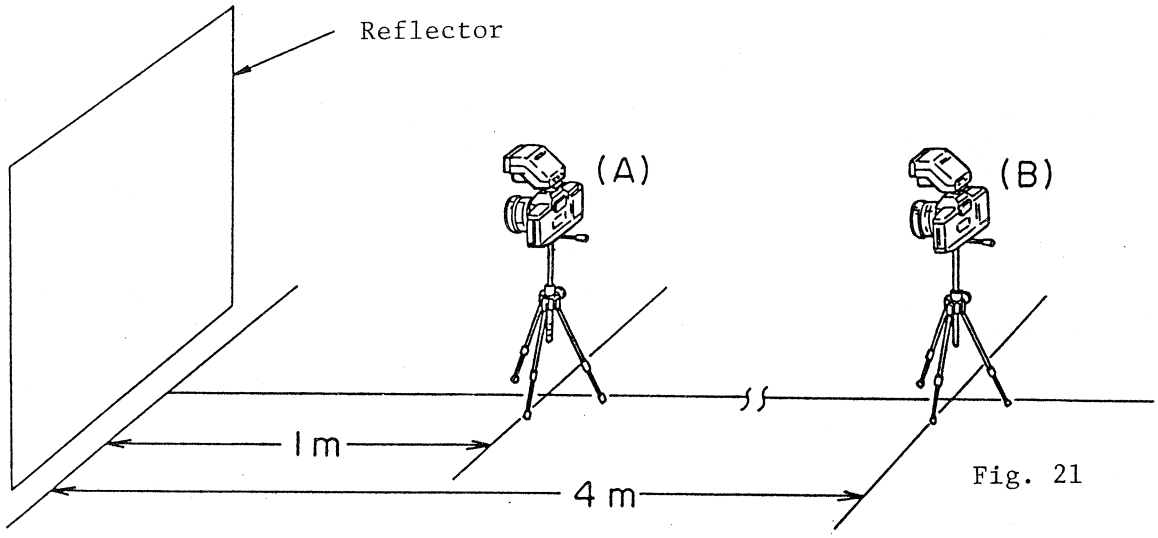


Fig. 21

C. Camera Parameters: Lens: EF50mm f/1.8
Mode: Program
ISO: 100/21°

D. Check several known-good examples at both distances. Record the flash aperture reading ten seconds after the red ready lamp lights, and determine the average.

8.2 Adjusting Method

A. (Fig. 22) Remove the front panel and top cover. Remove R42 (gain) and R48 (level) resistors.

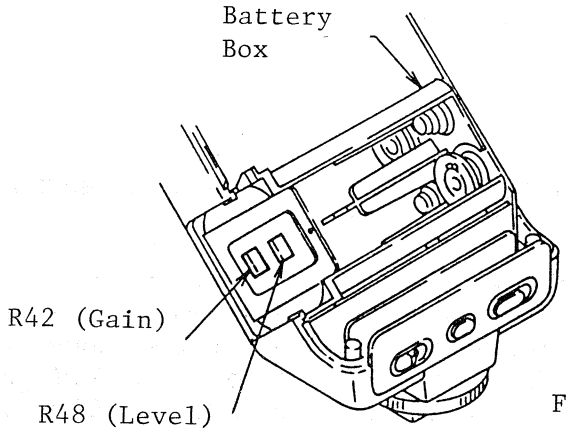


Fig. 22

B. Substitute a 200K Ohm variable, set to about 100K, for R42; and substitute a 3K Ohm variable, set to about 1K, for R48.

CAUTION! Use thin leads, since the battery cover must be reinstalled for the adjustment.

C. Temporarily replace the front panel and top cover. Install a set of cells and insert the battery cover.

D. Turn on the flash and camera and check the flash aperture indication ten seconds after the red ready lamp lights.

E. Adjust with variable resistors until the readings are correct.

F. Remove the top cover and front panel.

G. Remove and read the variable resistors. Install the nearest available fixed resistors in their places.

8. Aperture Control Voltage Adjustment(cont.)

8.3 OFFICIAL METHOD

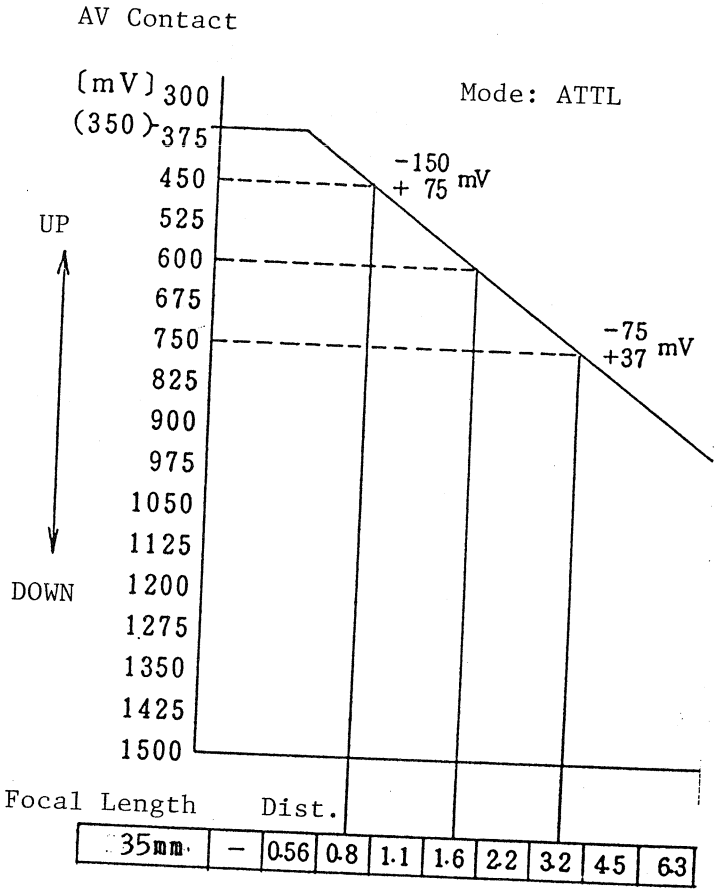
A. Standard: See graph.

Attach the flash to a T-90 body and push SW-1 (shutter button). This applies 1.2V EFID signal so the output is analog. (An EOS body would give a digital output, which would require special test equipment.)

Use an 18% gray target.

Allow the flash to charge fully (at least 20 seconds after the red ready lamp lights.

Use new batteries.



B. Adjustment Method

The adjustment is the same as the simple method, but the actual aperture control voltage is read rather than using the viewfinder indication. A test lead must be connected to the AVEF pin and a digital multimeter (DMM) used.

9. EFID Current Adjustment

9.1 Standard: With ready lamp lit: 200 uA ± 20uA

With main switch off: < 30uA

9.2 Adjustment Method

A. (Fig. 22) The method is the same as the aperture control voltage adjustment (8.2) except that resistor R50 is removed and replaced with a 1M Ohm variable, initially set to about 500K Ohm.

B. CAUTION! Use thin leads, since the battery cover must be reinstalled for the adjustment.

C. Temporarily replace the front panel and top cover. Install a set of cells and insert the battery cover.

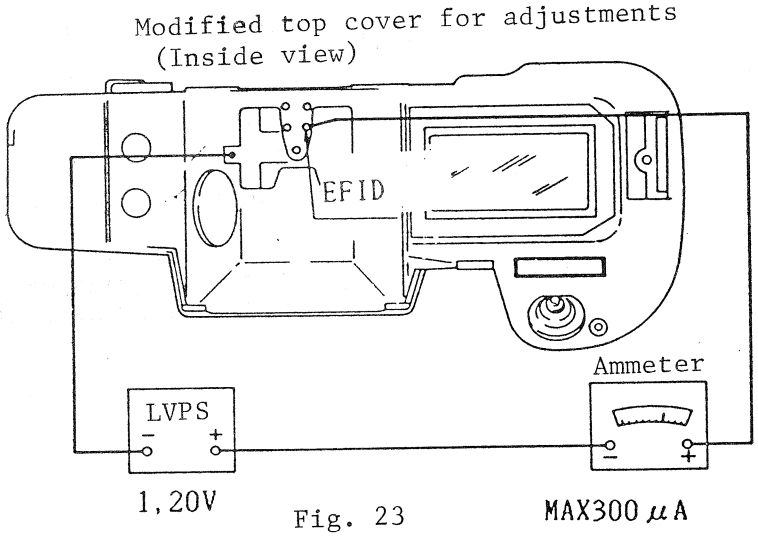


Fig. 23

D. Attach the flash to an EOS top covered wired to a LVPS and analog ammeter. Turn the flash on and read the ammeter.

E. Adjust the variable resistor until the reading is correct.

F. Remove the top cover and front panel.

G. Remove and read the variable resistor. Install the nearest available fixed resistor in their places.

10. Final Checklist

After repairs have been finished, check the following items.

10.1 Zoom Operation

Install a zoom lens and the flash on an EOS body. Zoom the lens and check that the flash head moves smoothly and that the zoom indicator changes with the flash head position.

Note: Operation occurs only when the camera's SW1 is on. If an EF zoom lens is not available, use different focal length EF lenses.

10.2 AF Illuminator Beam

Check that the AF illuminator beam operates at low light levels and that the coupling range warning appears when the subject is too far away.

Note: The beam is patterned so that even low- or no-contrast subjects can be measured.

10.3 Syncro Mode Selection

Check that the correct sync mode (1st curtain or 2nd curtain) is selected when SW2 is operated.

10.4 SE Mode (Energy-saving mode)

Turn the flash on and check that it goes off after five minutes of inactivity.

11. Service Tools List

11.1 Regulated low voltage power supply (LVPS)

11.2 Variable Resistors for Adjustments

R30 (Ready Lamp):	Approx. 500K Ohm
R42 (Gain):	Approx. 200K Ohm maximum
R48 (Level)	Approx. 3K Ohm maximum
R50 (EFID):	Approx. 1M Ohm maximum

11.3 Digital Multimeter (DMM)

11.4 Analog Multimeter

11.5 18% Gray Target

11.6 Shop-standard EOS body and EF 50mm f/1.8 lens

(A T-90 body is necessary for the official aperture control voltage adjustment.)

Basic Functions of Electrical Components

SWITCH LIST

Sw#	Name	Function
SW-1	Main SW	Power on
SW-2	Syncro SW	1/2 curtain sync
SW-3	Test SW	Open/test flash
SW-4	Zoom SW	Zoom position

IC LIST

IC#	Name (Function)
IC-1	Interface (I/O) IC
IC-2	Preflash Measure IC
IC-3	Zoom Control IC
IC-4	IC-5 initial reset IC
IC-5	MPU

Functions by Circuit Board (C.B.) (5 each)

Main C.B.: DC/DC Convertor, Capacitor charging, Flashing Circuits

Main Components	
IC-4	Initial reset for IC-5
SCR-1	DC/DC Convertor switch
Tr-3,4; T-1	DC/DC Convertor & charging coil
Tr-5	V_{CC} back-up transistor
Tr-7,8,RT-4, SCR-2	Low Voltage Flash Circuit
C-15, T-2	Preflash trigger coil and capacitor
SCR-3	Trigger SCR
R-30	Ready Lamp Adjusting Resistor

C C.B.: AF Illuminator Beam Control, pre & main capacitors, and rectifier

Main Components	
C-7, 8	Pre and main capacitors
L-1	Delay coil (for control timing)
RT-1, Tr1, 2	AF Illuminator Beam LED control and drivers

IC C.B.-I: Photo reflector and flash control circuits

Main Components	
IC-1	Interface IC
IC-2	Preflash measurement IC
IC-5	Mode Plate Unit IC

IC C.B.-II: Zooming Motor Control & Adjusting Resistors

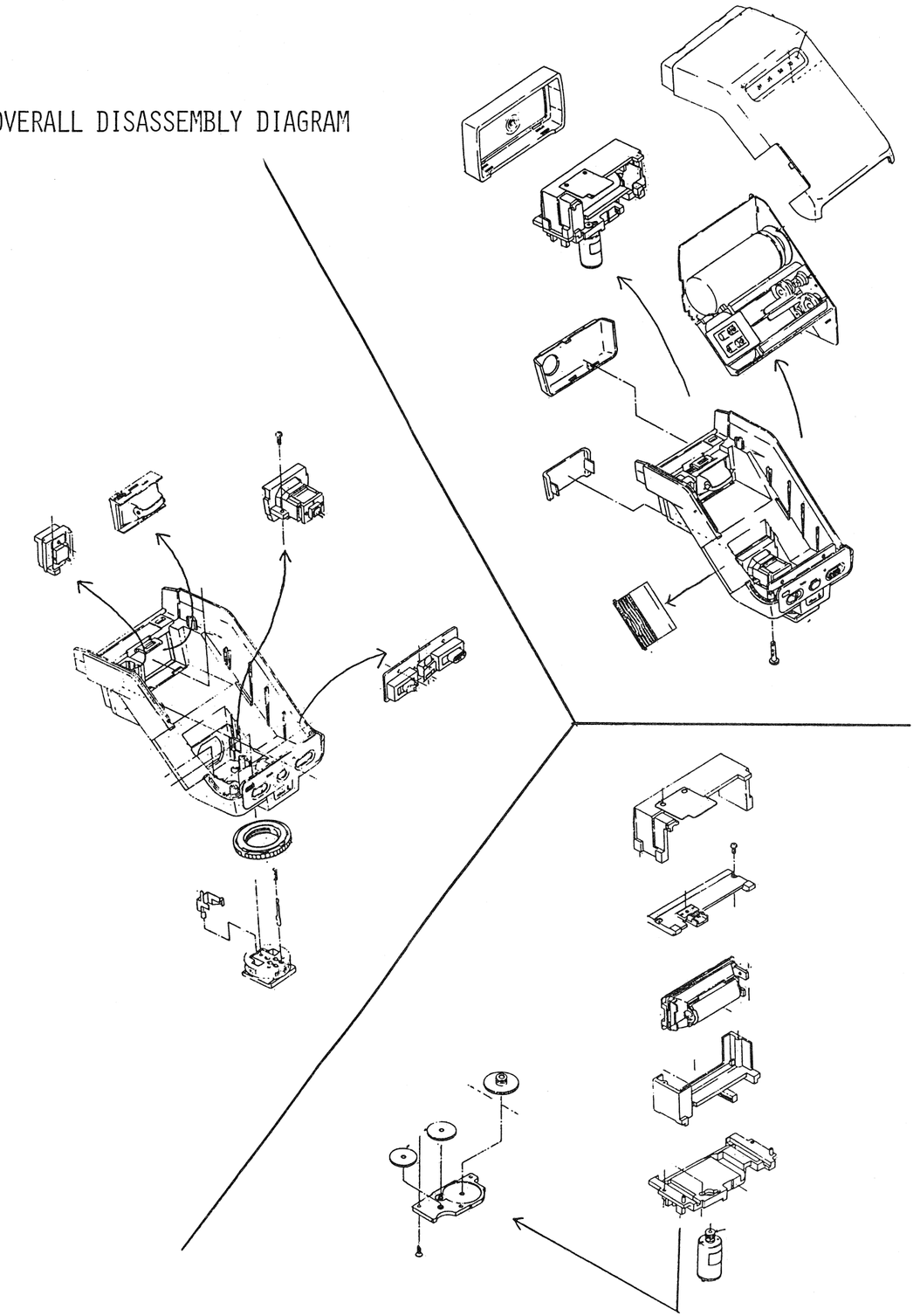
Main Components	
IC-3	Zoooming Motor IC
D-24, 25, 29	Zooming position code diodes
R-42, 48, 50	Adjusting Resistors

S C.B.: SW1, 2, & 3; and ready lamp (LED)

Xe C.B. Main trigger coil

Zoom C.B. Zoom position switch contact board

OVERALL DISASSEMBLY DIAGRAM



IV. Electronic Circuit Explanations

This guide is designed to provide the technician with sufficient knowledge of the CANON SPEEDLITE 300EZ electrical circuitry to effectively repair it. The explanation is divided into sections, detailing one operation.

By studying each section the technician will gain the knowledge necessary to repair the unit. In addition, the sections are organized so they can be used as a troubleshooting guide during actual repair. For example, the ready lamp does not light.

1. Go to operation #5, Ready Lamp Indication.

2. Next, read through the operation flow as indicated by the bold boxed letters, [A] ——> [B] ——> [C] ——> [D] .

3. Check the main capacitor voltage [A]. If the voltage is insufficient, return the operation # 3, Charging.

4. If main capacitor voltage [A] is OK, proceed to [B] and check input at IC1, pin 40. If no input, check the line between [A] and [B] .

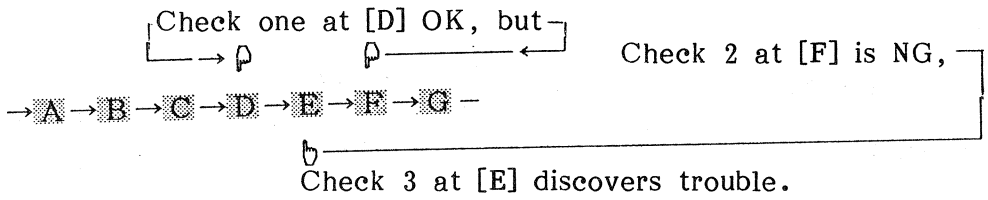
5. If [B] is correct go to [C] and check.

6. Check for a low at pin 45 or 46 of IC1, and if present, proceed to [D]. Check if V_{CC} is present at LED2.

7. If V_{CC} is OK, the trouble is LED2 or the lines between LED2 and IC1.

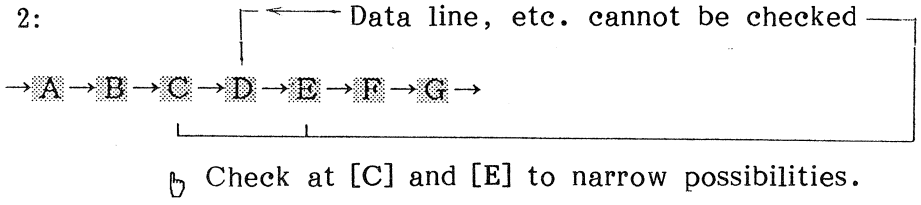
You can troubleshoot by going through the operational flow, but going straight through from A to Z is not always necessary. You can pick a central point, say [D] , and check it. In this way you can eliminate half the steps in one fell swoop. This is quicker if several steps are involved.

Example 1:



Some points cannot be checked, as in example 2. Since [D] cannot be checked, check [C] . If [C] is NG, the defect is prior to [C] , but if [C] is good and [D] cannot be checked directly, determine the correct output from [D] (for example, a High) and input it to [E] and check the steps after [E] . If they are good, then [D] is bad from process of elimination.

Example 2:



For checkpoints, see the checkpoint diagrams in the next section.

1. Description

The 300EZ is a dedicated electronic flash developed with and for the EOS camera series. In line with the increased capacities of the EOS camera, it has the following new features and function.

Digital microcomputer to control the multiple functions.

Autofocus LED (AF LED): When light is too low for ambient light autofocus function, the infrared AF LED lights to illuminate the subject.

Internal Auto Zoom: When the lens focal length is changed, the flash head inside the flash moves to adjust the illumination angle to the coverage of the lens. (Like internal focusing lenses, the external dimensions of the flash do not change during zooming.)

Low voltage flash [Quick Charge (QC)]: This feature allows a very short recycling time when maximum power is not necessary, which is a majority of the time. The first, yellow-green LED of the two-stage ready lamp lights after about one second.

With these new functions, data flow between the flash and camera is greatly increased so serial digital communication is used except for the analog TV signal.

Communications are as follows between the body and flash.

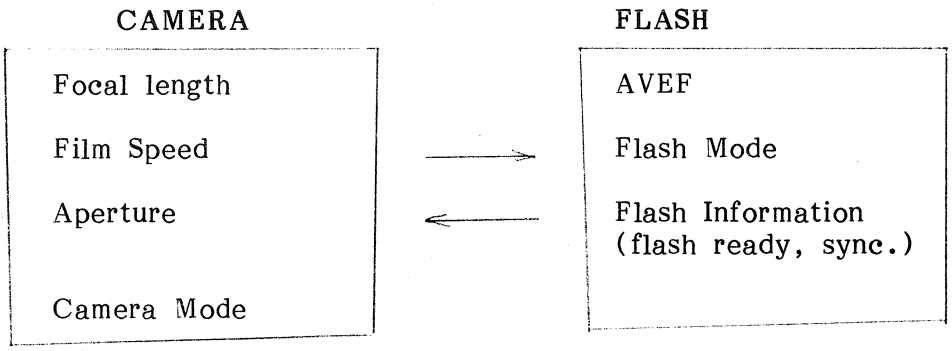
STSP (Camera ⟶ Flash) Serial clock

EFID (Camera ⟶ Flash) Data line , (Digital)

AVEF (Flash ⟷ Camera) Data line, (Digital)

TV (Camera ⟷ Flash) (Analog)

Data carried are:



2. VCC Generation

[A] When the main switch (SW1) is turned on VDD flows through D1 and R1 and into pin 17 of IC5.

[B] When VDD stabilizes at over 3 volts, a reset signal is issued from IC4 to reset IC5 through pin 13. When IC5 resets, the PB-2 (high) signal from IC5 pin 2 is issued.

[C] This high turns RT2 on sending Tr9 base low turning it on.

[D] With Tr9 on, VCC is supplied to IC-1, pins 33 and 60, IC2 pin 1, LED3, Oscillator SCR1, etc.,

If VCC goes too low, after a full power flash, continue.

[E] If IC1 sees that VCC is too low, pin 43 ALM (alarm) pin goes high.

[F] This turns on Tr6, which, in turn, turns Tr5 on.

[G] This allows the secondary of T1 to reinforce VCC.

Notes: C3 and C5 are used for voltage stabilization.

C1 serves, with R1 as a delay between VDD and IC1 to insure stable oscillation from IC5 before starting operation.

VCC Generation

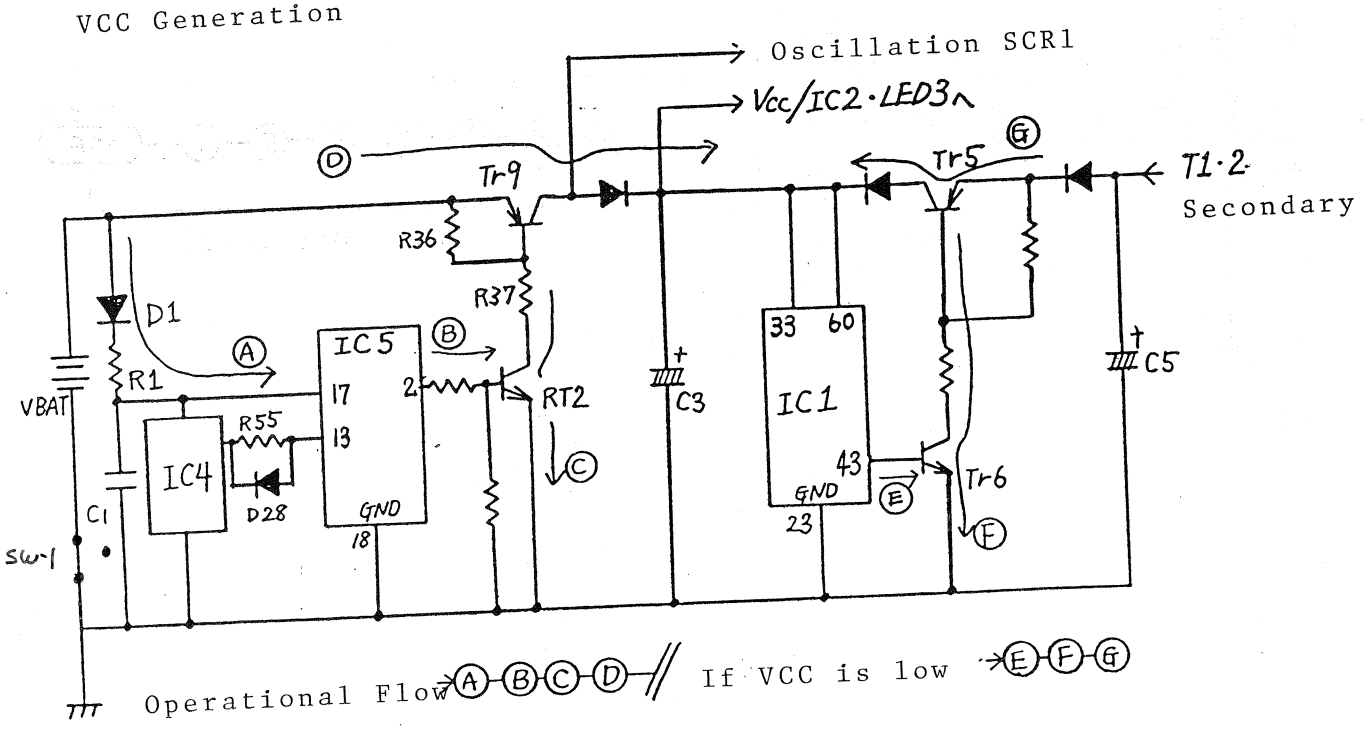


Fig. 1

3. Charging

[A] Operating the main switch closes SW1.

[B] V_{BAT} is applied to the bases of Tr3,4 (Tr3 and Tr4 are used in parallel to increase current capacity, instead of a single, larger transistor.)

[C] V_{CC} is applied to the gate of SCR1 (see section 2).

[D] This turns SCR1 on and the bases of Tr3,4 go low, turning them on.

[E] Current flows through the primary of T1.

[F] This induces a high voltage current in the secondary of T1.

[G] This induces a current in the feedback coil of T1 reverse-biasing SCR1 turning off Tr3,4. This condition is the same as [B], and the operation is repeated.

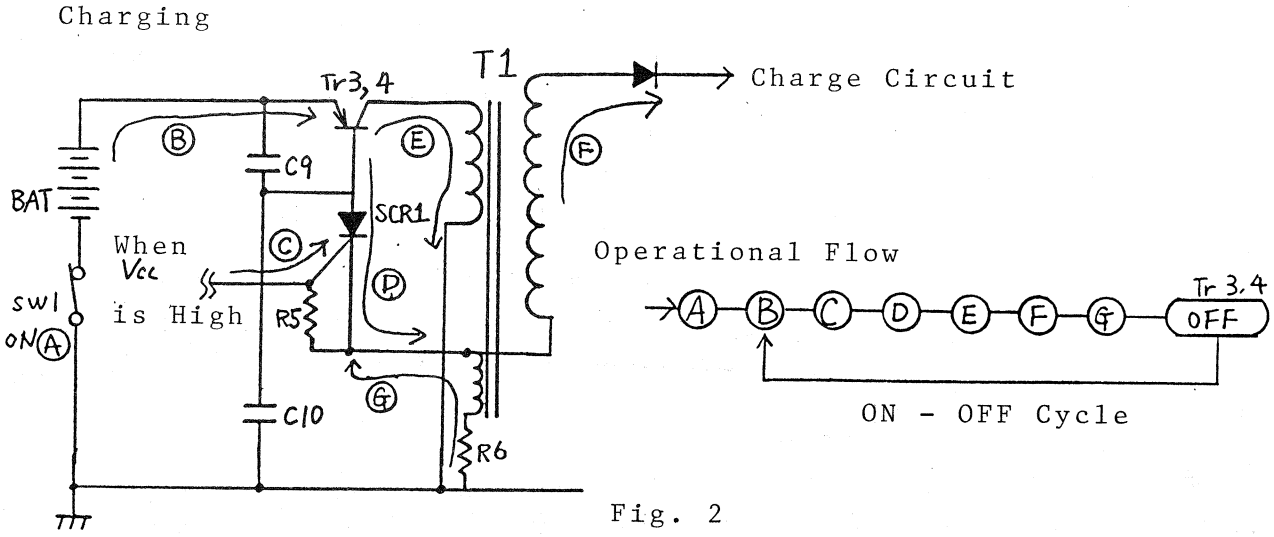


Fig. 2

4. Low Voltage Flash

Low Voltage Flash is a circuit which makes flash possible before the charge on the main capacitor reaches the normal flash threshold voltage (260V). With the new circuit flashing is possible when the main capacitor voltage is only 125V. This is accomplished by making the trigger circuit independent of the main preflash capacitors. The trigger capacitor is charged first to 250V and then the main and preflash capacitors start to charge. If trigger capacitor voltage drops too low, main capacitor charging stops and the trigger capacitor is recharged. In this manner the trigger circuit is always ready.

[A] The output of the blocking oscillator is applied to the trigger circuit capacitors through diodes D-10 and D-12.

[B] At the same time, C13 is charged.

[A'] Tr7 is turned on by a signal from PB2.

[S] At this point there is no gate voltage on SCR2 so it is off so the main capacitors are not being charged.

[C] When C13 and the other trigger circuit capacitors are charged to about 250V, a "high" is applied to the base of RT4 through ZD2, turning RT4 on.

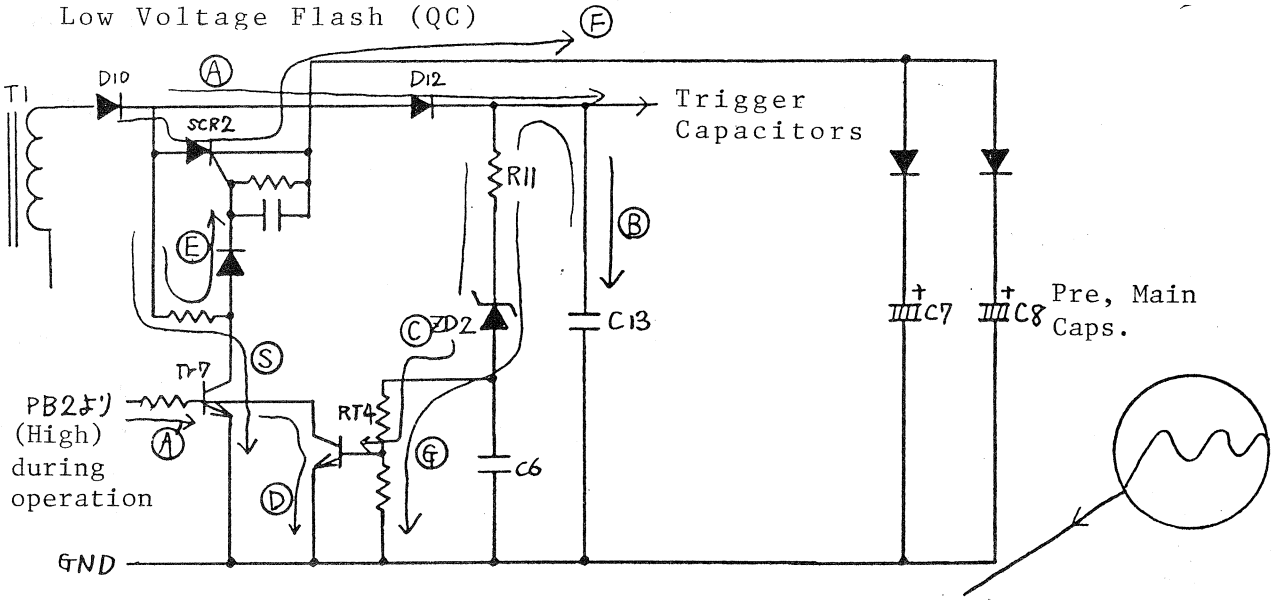
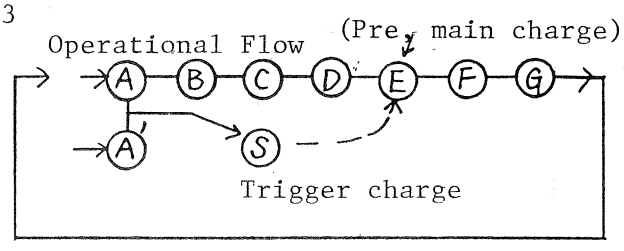


Fig.3



Full Charge Cycle

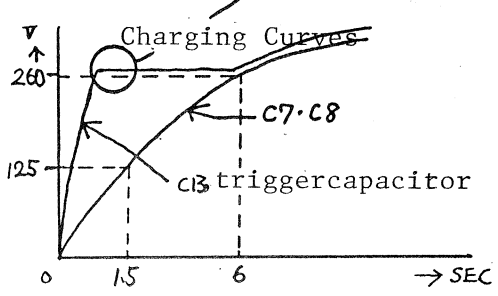


Fig. 4

[D] Turning RT4 on turns Tr7 off.

[E] With Tr7 off, voltage is applied to the gate of SCR2 turning it on.

[F] This opens the path for the main and preflash capacitors to start charging.

[G] When the main and preflash capacitors start to charge, C13 starts to discharge. (The charging of the capacitors pulls down the secondary voltage causing C-13 to start discharging.)

When C-13 discharges to a preset voltage (about 10V), RT4 goes off, turning Tr7 on. This turns off SCR2 and stops the charging of the main capacitors, and we are back to [A].

By repeating this process, the trigger circuit is maintained in the ready condition while the main capacitors are charging (Fig. 4)

5. Ready Lamps

[A] The main capacitor (C8) charges as described in 4.

[B] A voltage equivalent to the instantaneous voltage on C8 is applied through the voltage-divider network to pin 40 (MC1) of IC1.

[C] When pin 40 reaches about 1V (equivalent to 125V on C8), IC1 pin 45 goes low so that the V_{CC} voltage causes the yellow-green section of LED2 to emit. (Low voltage ready lamp).

[D] When the voltage reaches about 2V (equivalent to 260V on C8), pin 46 goes low lighting the red LED (normal ready lamp). This causes IC1 pin 45 to go high extinguishing the yellow-green LED.

R30 of the voltage divider network R28, R29, and R30 is the adjustment for setting the voltage on pin 40.

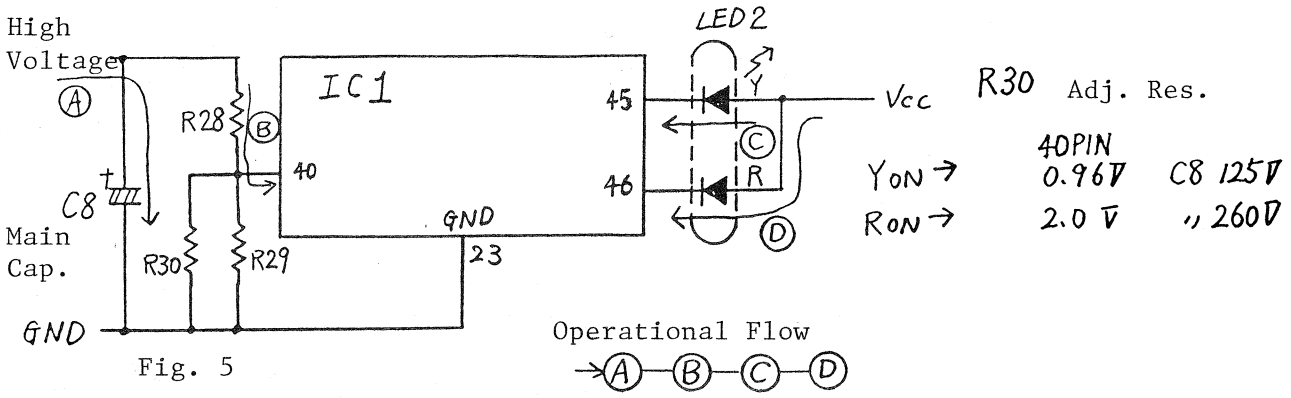


Fig. 5

6. Preflash

[A] When SW1 is turned on the TV signal is applied to pin 6 of IC1.

[B] Simultaneously the EFID signal indication camera mode information is applied to pin 9 of IC1. (If the camera is in the Manual mode, the computer determines that preflash is not necessary.)

[C] These two signals cause a high to appear at pin 37.

[D] This high turns SCR3 on causing C15 to discharge. (ZD8 is a voltage stabilizer for C15.)

[E] This induces a high voltage trigger pulse in the secondary of T2.

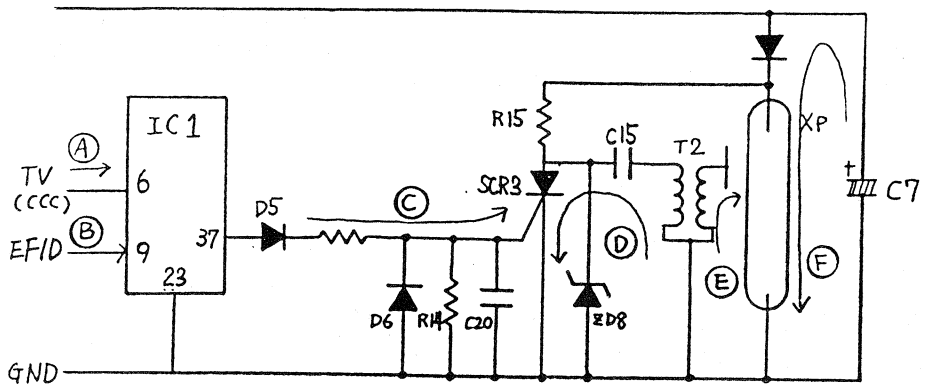
[F] The trigger pulse ionizes the preflash tube Xp and C7 discharges through it causing the preflash.

C20 is a noise filter to prevent accidental gating of SCR3.

R14 is the bleeder for C20.

D6 shorts the reverse EMF of at the start of the trigger signal.

Preflash



Operational Flow

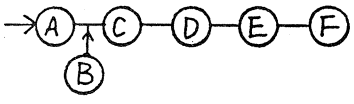


Fig. 6

7. Aperture setting (N^2 CAT)

[A] When the preflash lights, the GATE signal (High) is issued from IC1 pin 58 and applied to pin 3 of IC2.

[B] This starts the integrating capacitor C31 to start charging. The amount of charge is proportional to the light striking the photo diode. This is a measure of the reflectivity of the subject.

[C] The charge on C31 is amplified in IC2 and output from pin 8 (A-out) to IC1 pin 55 (A-in).

[D] From the EFID input on pin 9 of IC1, the computer determines whether the camera is a T90 or an EOS model.If the voltage is over 2.2 volts; the camera is an EOS.

[E] With this information from the preflash and EFID signal, the flash determines the correct aperture and the correct method for sending the information. If the camera is an EOS, digital communication is used. If it is a T90, analog communication is used.Theinformation is output from IC1, pin 7.

R42 and R48 are the aperture control voltage adjustment resistors. R42 is the gain adjustment, and R48 is the level adjustment.

The EOS cameras also use A-TTL so the actual aperture used depends on the existing light also.The smaller of the apertures determined by the preflash and existing light will be selected.

If the subject is too distant, or the charge is insufficient for the conditions, the aperture and shutter speed indications, both in the viewfinder and on the LCD will flash a warning.

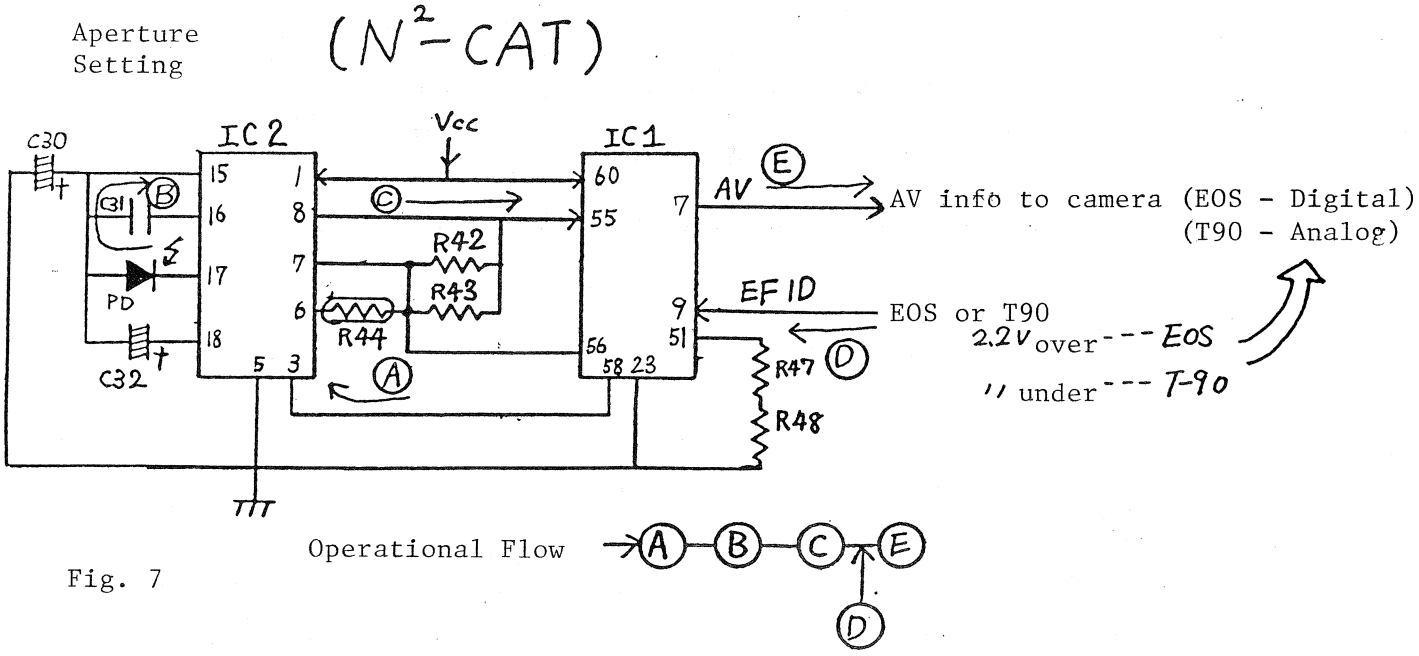


Fig. 7

8. Main Flash

[A] At shutter release, the STSP signal from the camera is applied to pin 8 of IC-1.

[B] Then the X synchronization signal is applied to pin 10 of IC-1.

[C] At this point the trigger signal (high) is output from pin 35 of IC-1.

[D] This signal gates SCR-4 on allowing C16 to discharge.

[E] As C16 discharges the current through the primary of T3 induces a much higher voltage in the secondary which is applied to the trigger electrode on the main flash tube, ionizing the gas allowing it to conduct. (When triggered, the impedance of the tube is only a few ohms.)

[F] SCR-5 (II) is turned on through the circuit shown in Fig. 9.

[G] This opens the path to ground allowing C8 to discharge through the main flash tube causing a brilliant flash of light from the tube. t the flash current flows through R-19, C-17, and R-20 as shown in Fig. 10. This causes the negative side of C-17 to have a negative potential increasing the effective voltage drop across the flash tube improving flash reliability (Fig. 11).

(The above explanation is for normal, first curtain synchronization. For second curtain synchronization, the order of the X and STSP signals is reversed.)

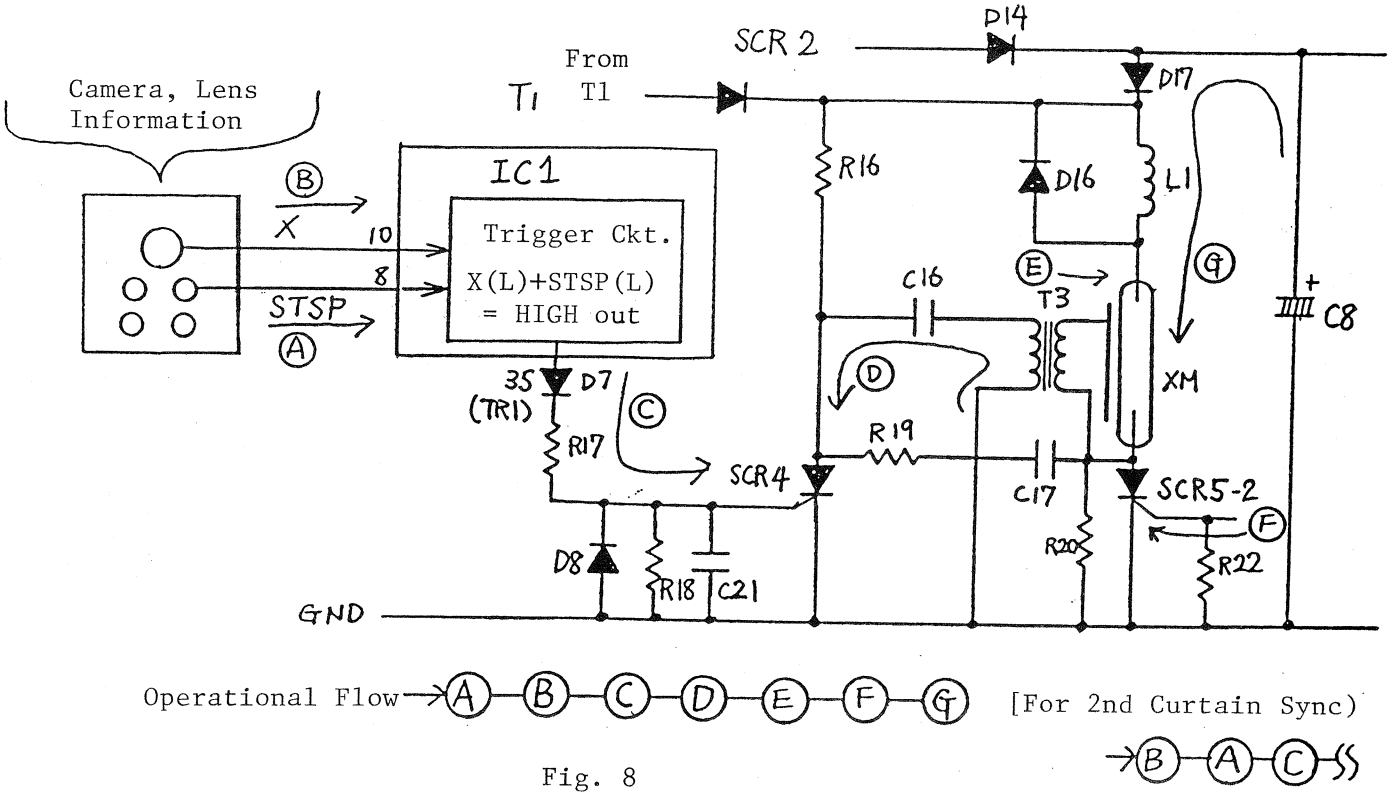


Fig. 8

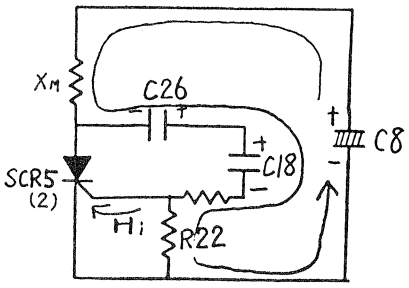


Fig. 9

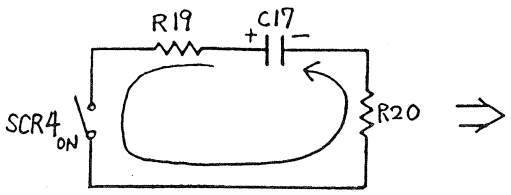


Fig. 10

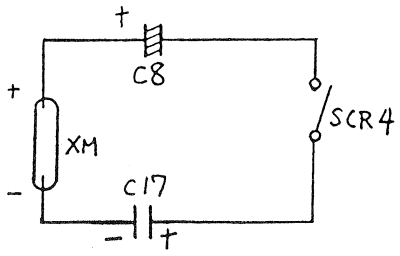


Fig. 11

9. Automatic Flash Termination

When the main flash starts the cameras TTL flash SPC, in the bottom of the mirror box, starts reading the light reflected from the subject.

[A] When the SPC circuit in the camera determined that the exposure is sufficient, the STSP signal is switched from low to high.

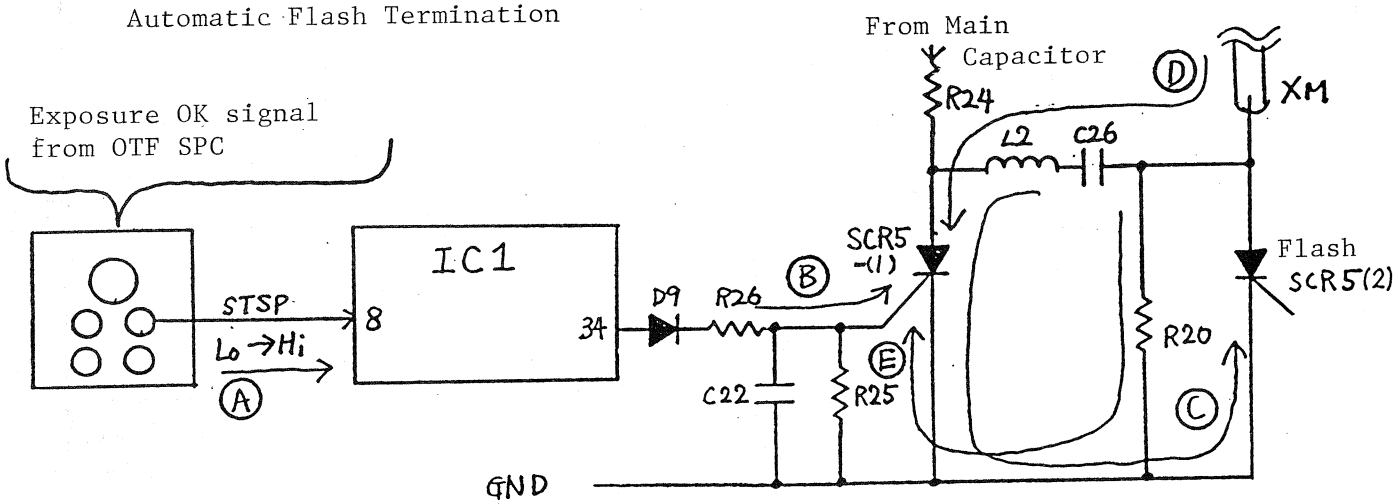
[B] This signal causes pin 34 of IC-1 to go high, gating on SCR-5 (I).

[C] This causes C-26 to discharge, applying reverse bias to SCR-5 (II) cutting off the currentflow,and flash.

[D] This causes the current to flow through the [D] line, charging C-26.

[E] With the flash terminated, C-26 discharges through R-20 applying reverse bias to SCR5 (I) turning it off.

Automatic Flash Termination



Operational Flow

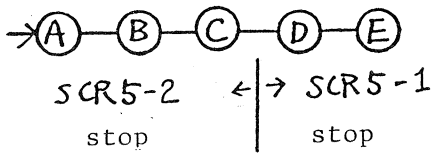


Fig. 12

10. Flash Zooming Operation (including Charging Interruption)

[A] When SW-1 is activated, focal length information is sent from the camera to the flash over the EFID line. If the lens has been changed or zoomed, the EFID information will indicate the fact to the lens.

[B] When IC-1 receives this information, it sends it to IC-5 over the data communications line.

[C] IC-5 compares the new focal length information to the focus zoom setting and determines if adjustment is necessary.

[D] This information is sent to the indication circuit which lights the correct focal length on LED array LED3 (One of the pins 8 through 11 goes low to light the corresponding LED).

[E] If zooming is necessary the control signal is output from pins 4 and 5.

[F] When IC-3 receives this signal, the appropriate output is sent to the motor through pins 11 and 20, driving the motor and geartrain to move the flash head to the correct position. As the flash head moves, the positioning contact moves with it.

[G] This feeds back position information to IC-3 through pin 3.

[H] If this signal determines that the correct position has yet to be reached, the control signal and zooming continue.

Charging Interruption

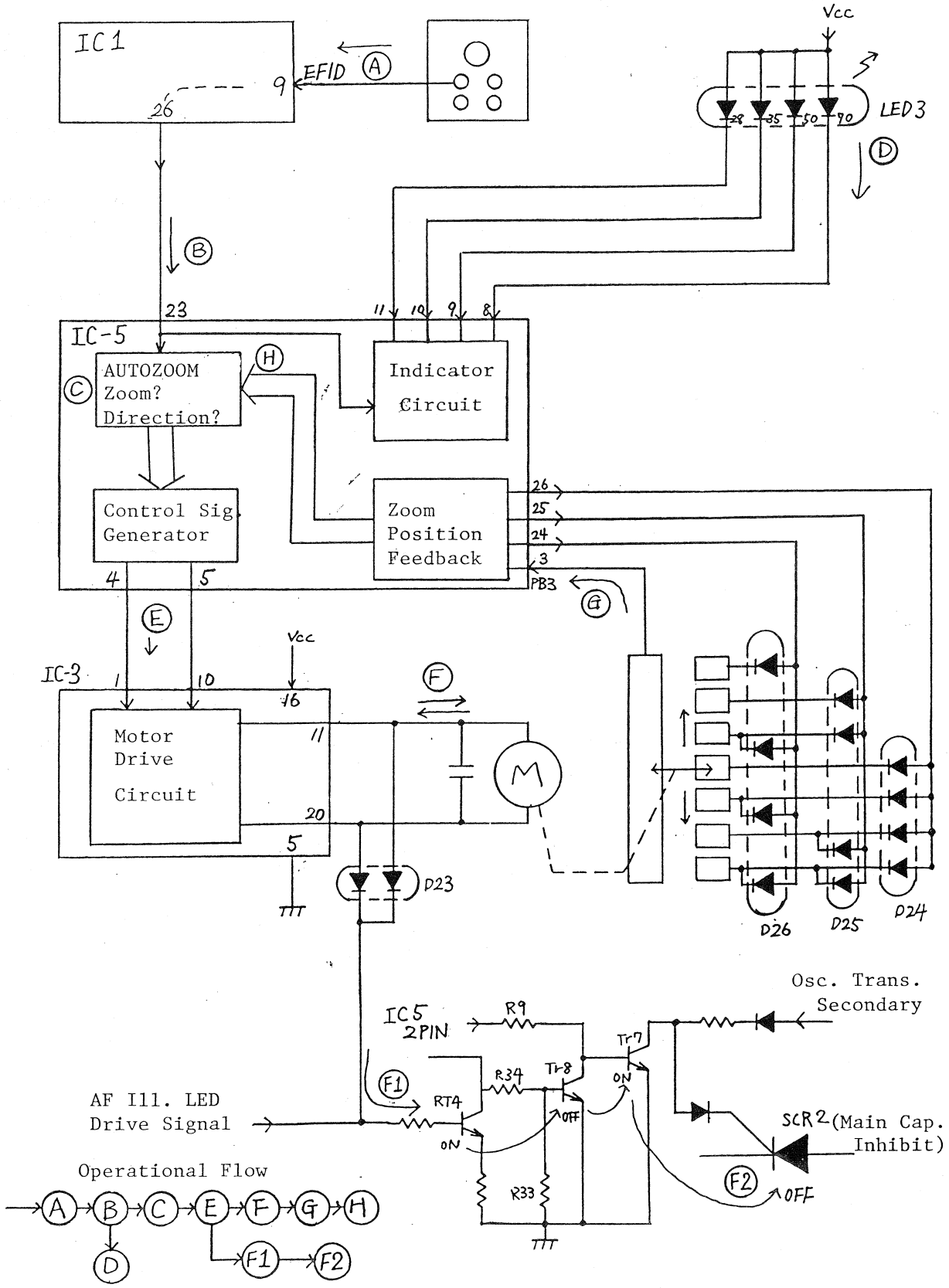
Since both zooming and flash capacitor charging require a substantial amount of power, a circuit is included to interrupt flash charging during flash head movement.

[F-1] The high signal from either pin 11 or 20 of IC-3 is applied through diode D23 to the base of RT4. With RT-4 on, Tr-8 is turned off and Tr-7 is turned on.

[F-2] This shorts the gate signal (high) on SCR2 to ground turning SCR-2 off and interrupting main capacitor charging.

(If the AF LED is lit, indicating autofocus in progress, the same circuit is employed to stop flash charging.

Autozoom Operation (and Charging Inhibit)



11. AF LED Operation (Focusing Lamp)

[A] When SW-1 is on, light is measured. If below a certain level, a high (5V) is sent on TV line to pin 6 of IC-1 (flash).

[B] When IC-1 receives this information, it sends a high pulse signal from IC-1, pin 44 to the base of RT-1.

[C] This turns RT-1 on which turns Tr-1 on. Tr-2 is a current stabilizer for Tr-1.

[D] With Tr-1 on, current flows through LED-1, the AF LED, causing it to light for the duration. (This cycles until ranging is over, or 10 cycles.)

[E] Flash charging is inturrupted during AF LED operation.

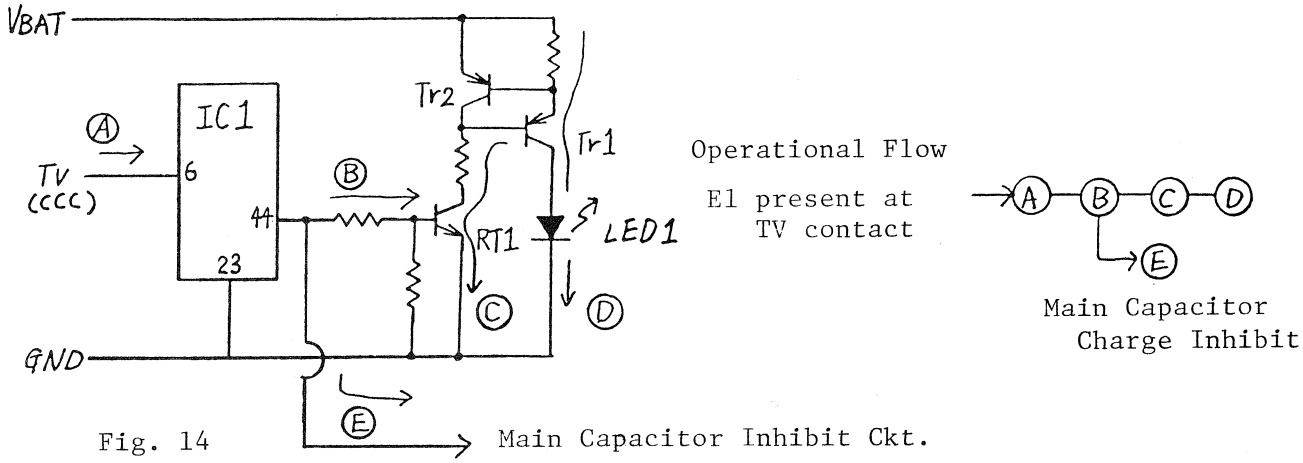


Fig. 14

12. Energy-saving (SE) Mode

[A] When SW-1 is activated, V_{DD} is applied to pin 17 of IC-5.

[B] When V_{DD} is applied, the reset signal from IC-4 is applied to pin 13 of IC-5. This resets the internal timer.

[C] After about five minutes, the internal timer causes pin 2 of IC-5 (PB2) to go low, stopping charging and other functions. If [D] [E] or [F] occurs during the five minute interval the internal timer is reset.

[D] The TEST button is pressed, [E] the flash is fired, or [F] if the TV or EFID signal is received from the camera.

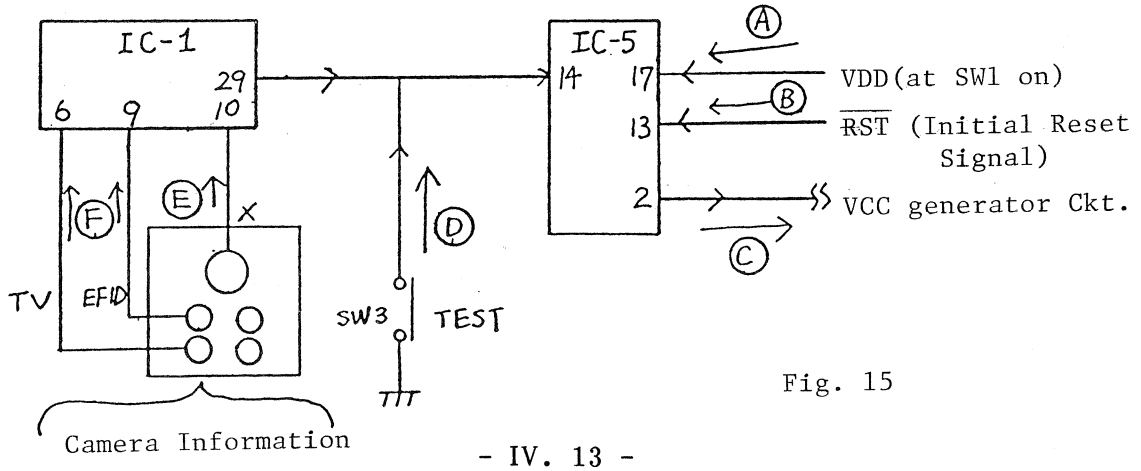


Fig. 15

13. Data Communications

1. BODY Pin #	<——>	SPEEDLITE IC-1 Pin #
Shutter Unit 5	Xsync(Analog) ---------->	IC-1 10 Flash sync (goes low when 1st Curtain opens.
IC-5 27	EFID(Digital) ---------->	9 A. >2.2V indicates EOS camera. B. Data from camera 1. Focal length information. 2. Film speed information 3. Aperture information (used in 420EZ to insure consistency with finder information. 4. Camera Mode information AE Mode: Program, Shutter Priority, Aperture Priority, D-O-F Priority, Manual Drive Mode: Single, Continuous, Self timer AF Mode: One-shot, servo, Manual Bulb Shutter: Yes or No 5. Auxiliary Modes: Interval Timer on?, "GOLD" - Yes, No.
29	AVEF(Digital) <----------	7 Data from flash 1. AVEF: Aperture determined by pre-flash (EOS: Digital) (Other: Analog) 2. Flash mode: Manual, ATTL, TTL-P, FELK, flash duration, fill ratio. 3. Auxiliary modes: Charge complete, Sync mode (1st or 2nd curtain) 4. Maximum flash power (G.No.)
28	TV[CCC](Analog) <---------->	6 Preflash (at V_{CC} level); Focus light (at E1 level)
	-----<-	4 250uA of current indicates 1st curtain sync to camera.
	-----<-	5 840uA of current indicates 2nd curtain sync to camera.
26	STSP(Digital) ---------->	8 A. System clock B. Flash enable - inhibit signal Low - enable (AND gate with X sync) High - inhibit

13. Data Communications (cont.)

2. SPEEDLITE IC-1 <——> SPEEDLITE IC-5 (MPU)

Sig.& Pin #			Pin #& Data Contents
Busy	12	<----------	1 Busy signal (high): cannot accept data from camera (IC-1 may also issue the busy signal when either flash is in progress or if STSP is faulty
S/N	14		44 Sync mode (1st or 2nd curtain) signal
C0	18	<----------	37 | - Focal length (aperture compensation for zooming), N^2CAT; (Preflash is not aperture dependent, but the main flash guide number is, so this information is necessary.)
C1	17	<----------	38 | - Mode
C2	16	<----------	39 | - A-TTL (to determine if preflash is necessary)
C3	15	<----------	40 | - TTL-M
D0	22	---------->	32 | - Data - Low or high voltage flash
D1	21	---------->	33 | - Pre, main flash firing OK?
D3	20	---------->	34 | - Bounce flash in use? (420EZ)
D4	19	---------->	35 | - Camera SW-1 on? (TV-2 high), AV output OK?, Clock OK?
R0	25	<----------	28 | - Data Request Code
R1	24	<----------	29 | - (request for D0 through D3 data)
S-out	26	---------->	23 EFID signal
S-in	27	<----------	22 AVEF signal
S-clk	28	---------->	21 STSP (system clock) signal
EXC	29	---------->	14 SE reset signal (initiated by TV or EFID)
		| ------->	43 " " " " " " " "

V. CHECKPOINT DIAGRAMS

Instructions

These **Checkpoint Diagrams** are used with the **Electronic Circuit Information** (Section IV). Together they comprise the troubleshooting charts for the Speedlite 300EZ. Each diagram has a table indication the section and checkpoint in the circuit information, the call-out number, and element to be checked.

The following example will explain how the circuit information and checkpoint diagrams are used in conjuction as troubleshooting charts.

EXAMPLE: You wish to check section 2, VCC generation

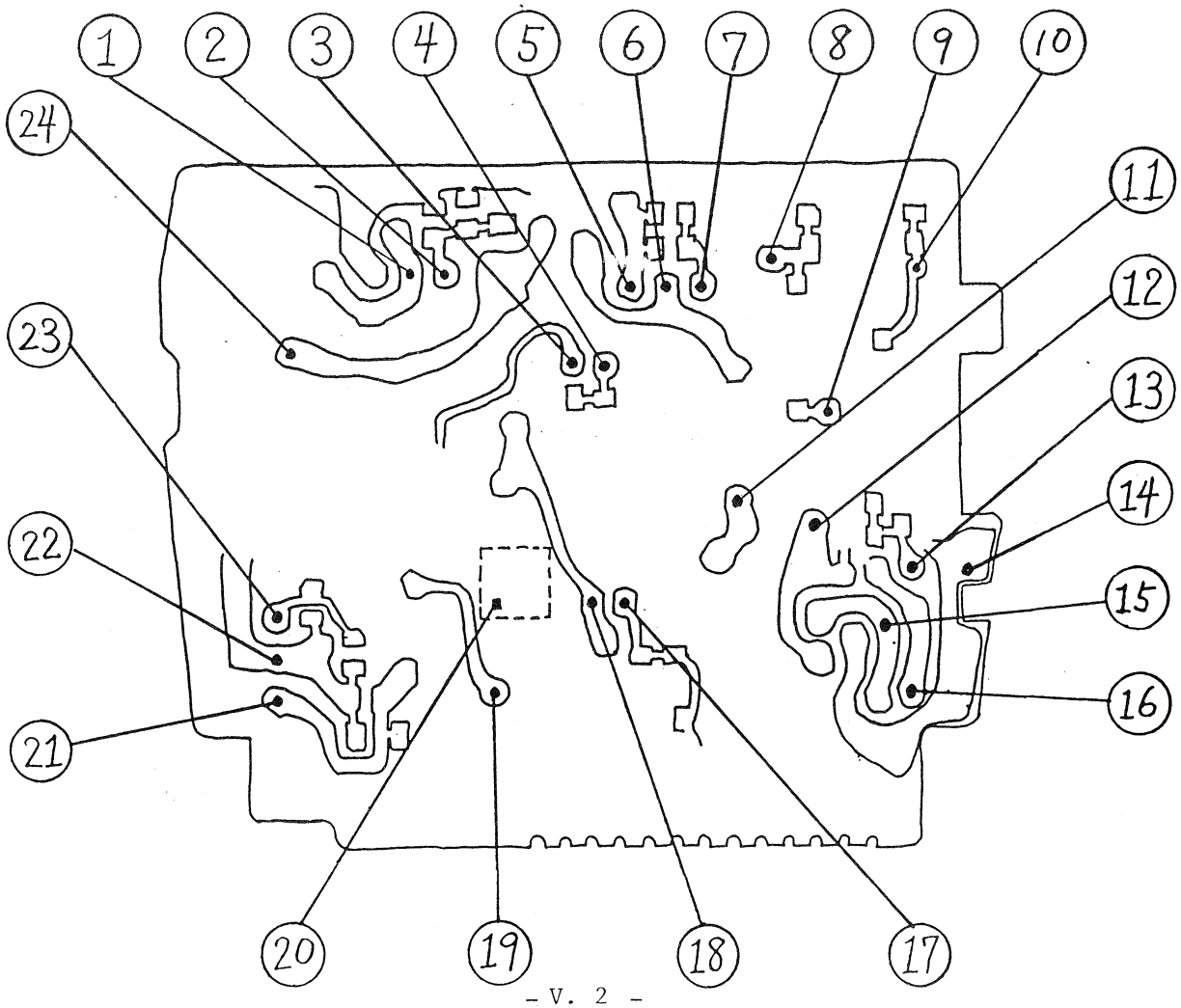
1. First, carefully read through section 2 from [A] to [G].
2. Determine which of the checkpoints [A] through [G] that you wish to check.
3. For example, you wish to check [C] to see if TR9 base is low as it should be.
4. Look through the checkpoint tables to find point 2 [C].
5. In this case, 2 [C] is on page 2.Thecall-out number is 10.
6. On the diagram, find number 10. This is the testpoint for 2 [C].
7. The correct signal at this point is a low.
8. From the results of this check, you will know whether it is necessary to go back, or forward, in the circuit to find the point of the trouble.

Notes:

1. Some signals have more than one checkpoint. These signals have inputs, outputs and intermediate checkpoints. To checks these points separately, it may be necessary to open the line between them.
2. The checkpoints are accessable by removing the top cover and lifting the circuit board unit, but servicing will be easier if longer jumper leads are used to the main capacitor and flash head. This makes it possible to lift the circuit board unit for better access to the checkpoints.

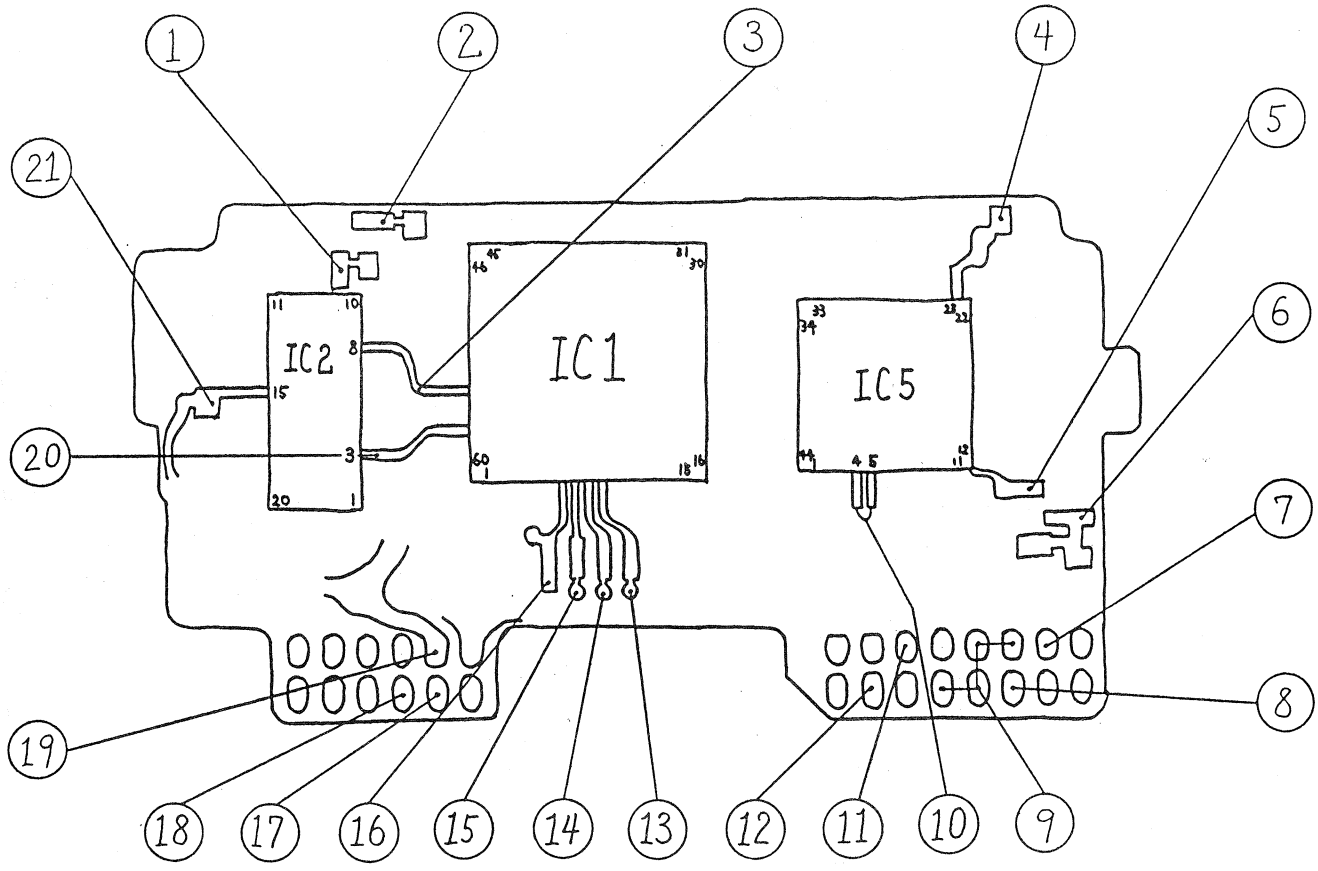
Main (M) Circuit Board (Pattern Side)

Section	No	Checkpoint	Section	No	Checkpoint	Section	No	Checkpoint
2C	10	Tr-9 B	4A	6	SCR-2 A	6C	17	SCR-3 G
2F	4	Tr-5 B	4A'	8	Tr-7 B	6D	18	SCR-3 A
2G	3	Tr-5, C	4B	24	C13 (+)	6E	20	T2 trigger
			4C	9	RT-4 B	8C	2	SCR-4 G
3B	14	Tr-3,4 E	4D	8	TR-7 B	8D	1	SCR-4 A
3C	13	SCR-1 G	4E	5	SCR-2 G	8F	21	SCR5-H G
3D	16	Tr-3,4 B	4F	7	SCR-2 K	9B	23	SCR5-I G
3E	15	Tr-3,4 C	4G	9	RT-4 B	9C	22	SCR5-2 K
3F	11	T-1	4S	5	SCR-2 G	9D	19	C19 (+)
3G	12	SCR-1 K				9E	22	SCR5-I K
						1 OF2	5	SCR-2 G



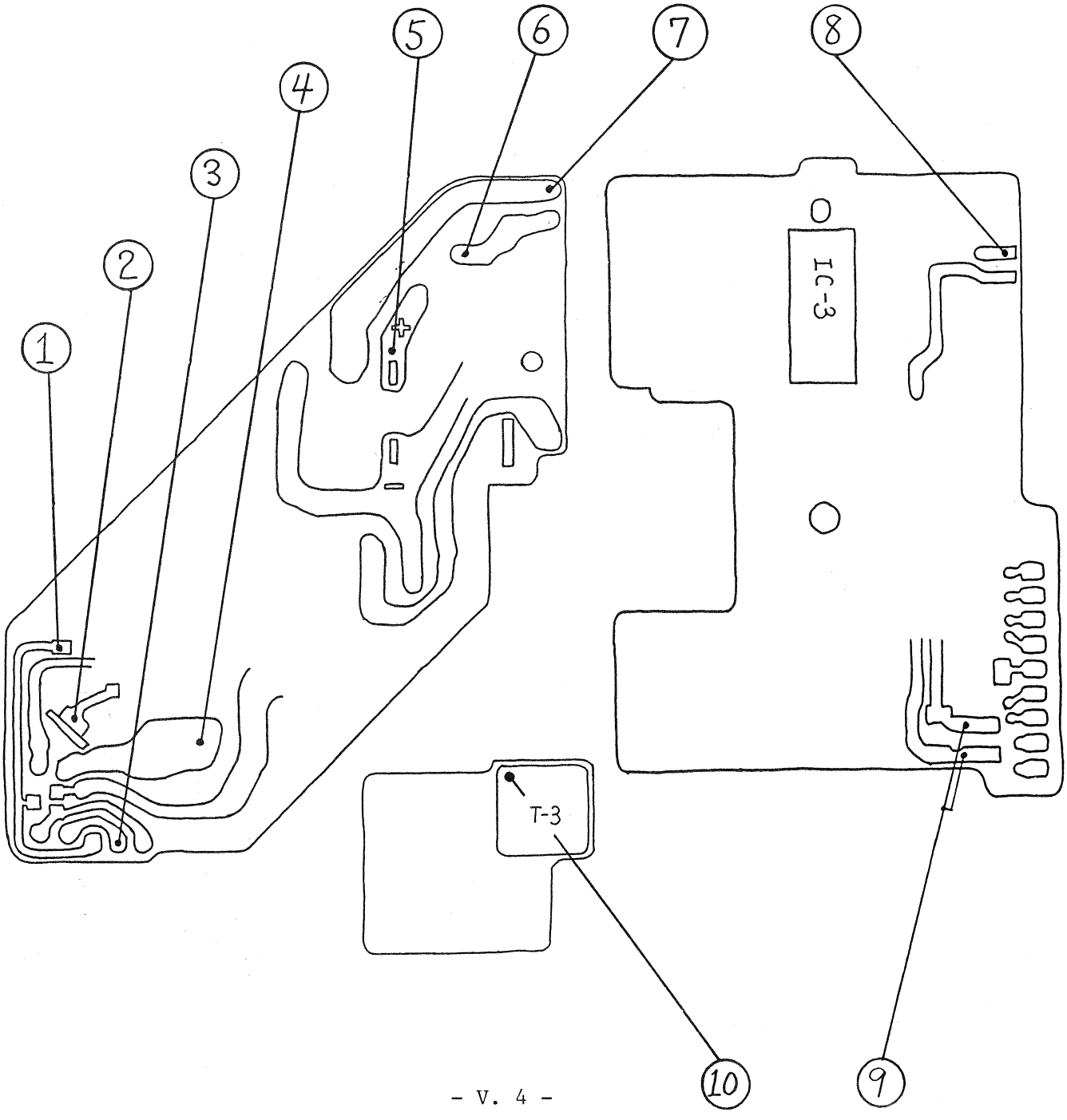
IC Ciecuit Board - I (Pattern Side)

Section	No	Checkpoint	Section	No	Checkpoint	Section	No	Checkpoint
2 A	7	IC-5 17p	7 A	2 0	IC-2 3p	10 D	9	IC-5 8~11p
2 B	1 2	IC-5 2p	7 B	2 1	IC-2 15p	10 E	1 0	IC-5 4,5p
2 D	1 9	V c c	7 C	3	IC-2 8p	10 G	1 1	IC-5 3p
2 E	1 7	Tr-6 B	7 D	1 3	E F I D	11 A	1 6	T V
			7 E	1 5	A V E F	12 A	7	IC-5 17p
5 B	1 8	IC-1 40p	8 A	1 4	S T S P	12 B	8	IC-5 13p
5 C	2	R 4 1	8 B	6	X Signal	12 C	1 2	IC-5 2p
5 D	1	R 4 0	9 A	1 4	S T S P	12 D	5	IC-5 14p
						12 E	6	X Signal
6 A	1 6	T V	10 A	1 3	E F I D	12 F	1 3	E F I D
6 B	1 3	E F I D	10 B	4	IC-5 23p		1 6	T V Sig.



C Circuit Board, IC Circuit Board-II, Xe Circuit Board

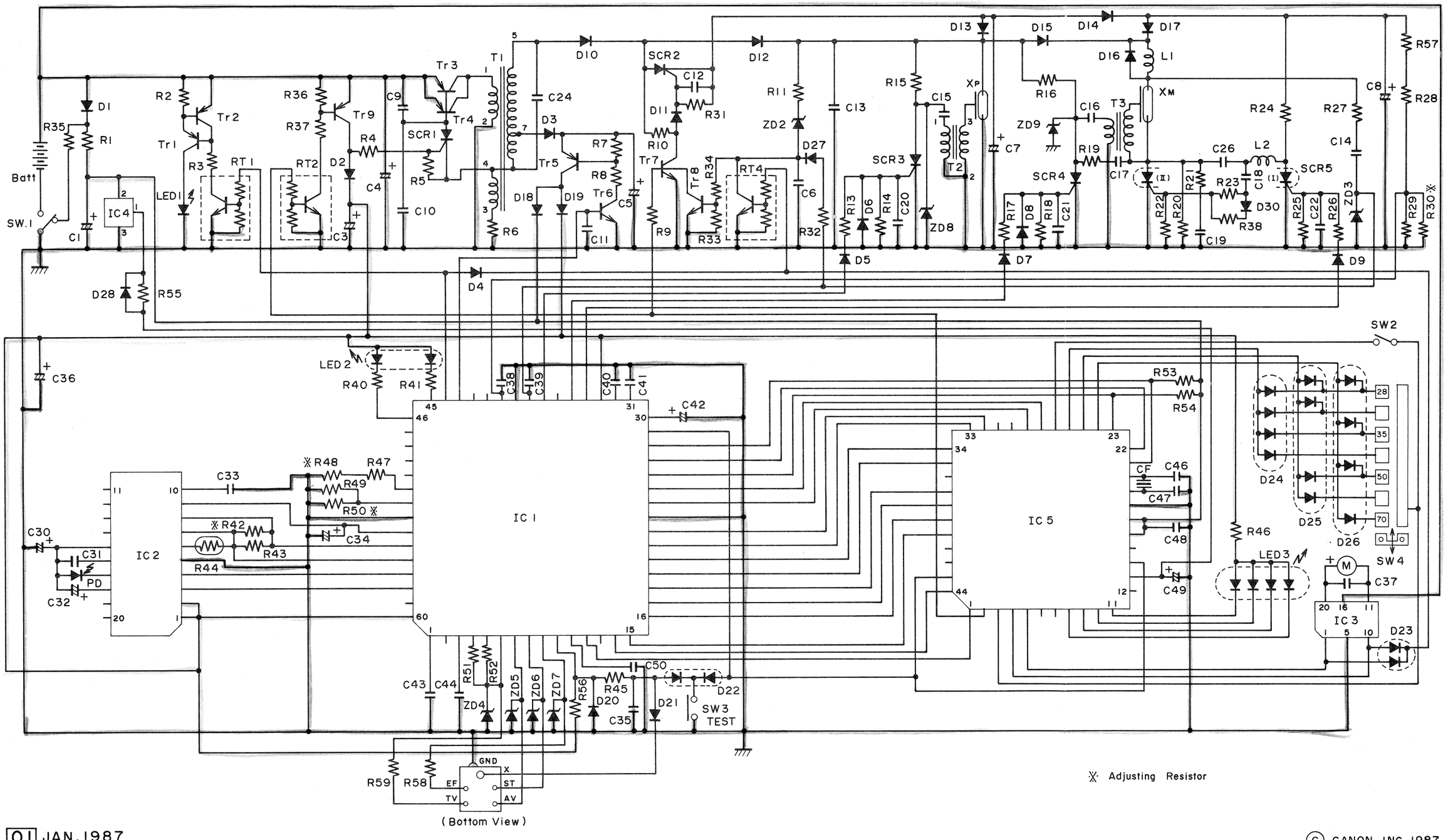
Section	No	Checkpoint	Section	No	Checkpoint	Section	No	Checkpoint
3 A	4	BAT (−)	8 E	1 0	T3 trigger	1 1 B	2	RT-1 (B)
5 A	5	C 8 (+)	8 G	7	X M (+)	1 1 C	1	Tr-1 (B)
6 F	6	D13 (K)	1 0 F	9	Motor ±	1 1 D	3	LED-1(A)
			10 F-1	8	RT-4 (B)	1 1 E	8	RT-4 (B)



REF. NO. C50-0561

CANON SPEEDLITE 300 EZ

SCHEMATIC DIAGRAM
CY8-1626-103-200



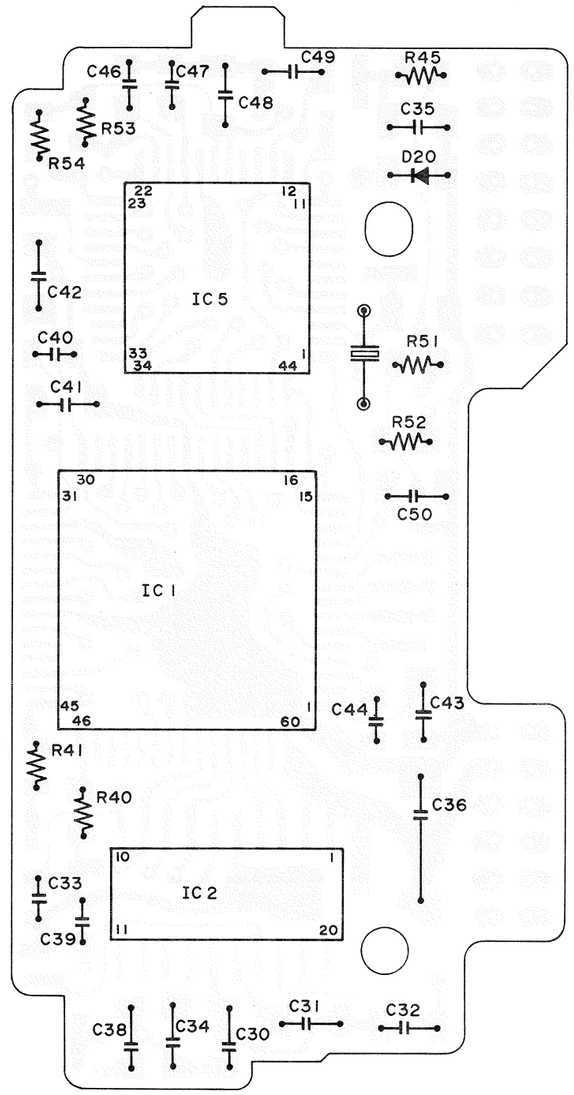
※ Adjusting Resistor

01 JAN, 1987

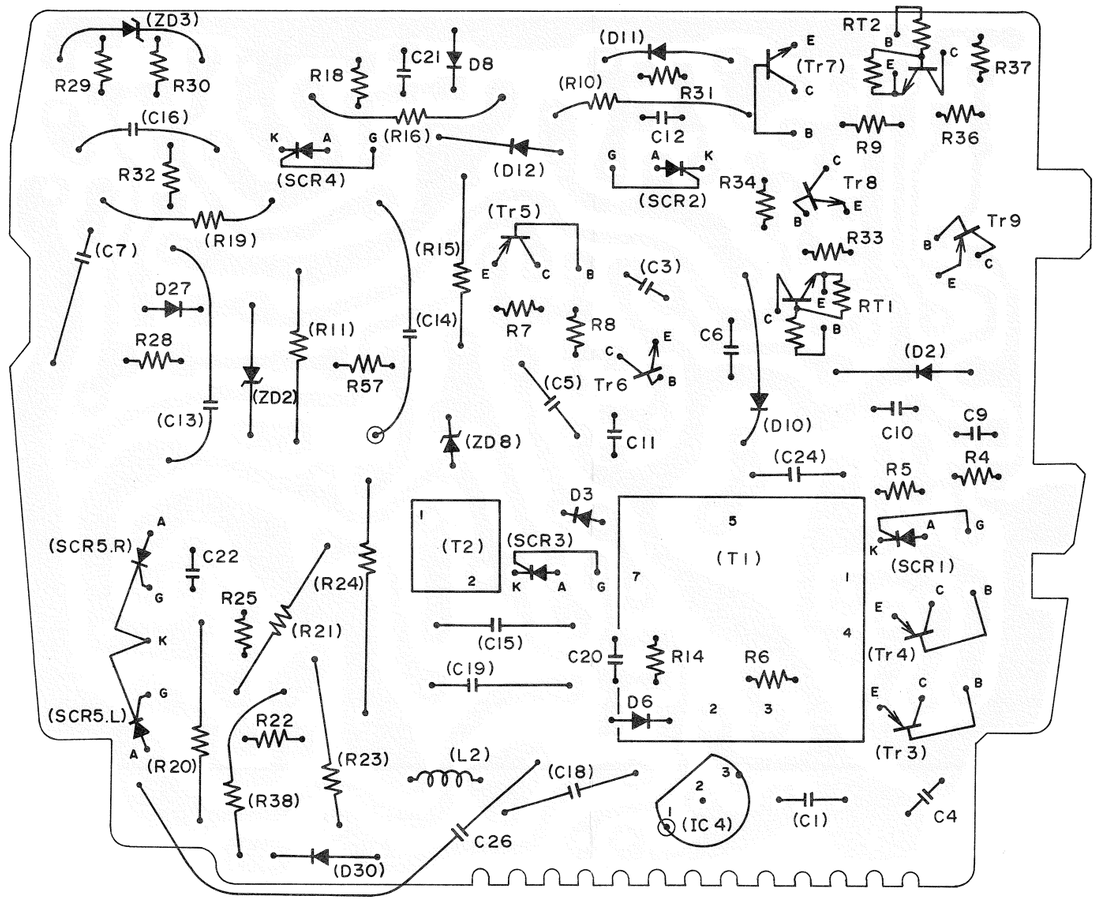
CANON SPEEDLITE 300EZ

ELECTRIC PARTS UNITS
CY8-1426-107-201

IC BOARD - II



M BOARD

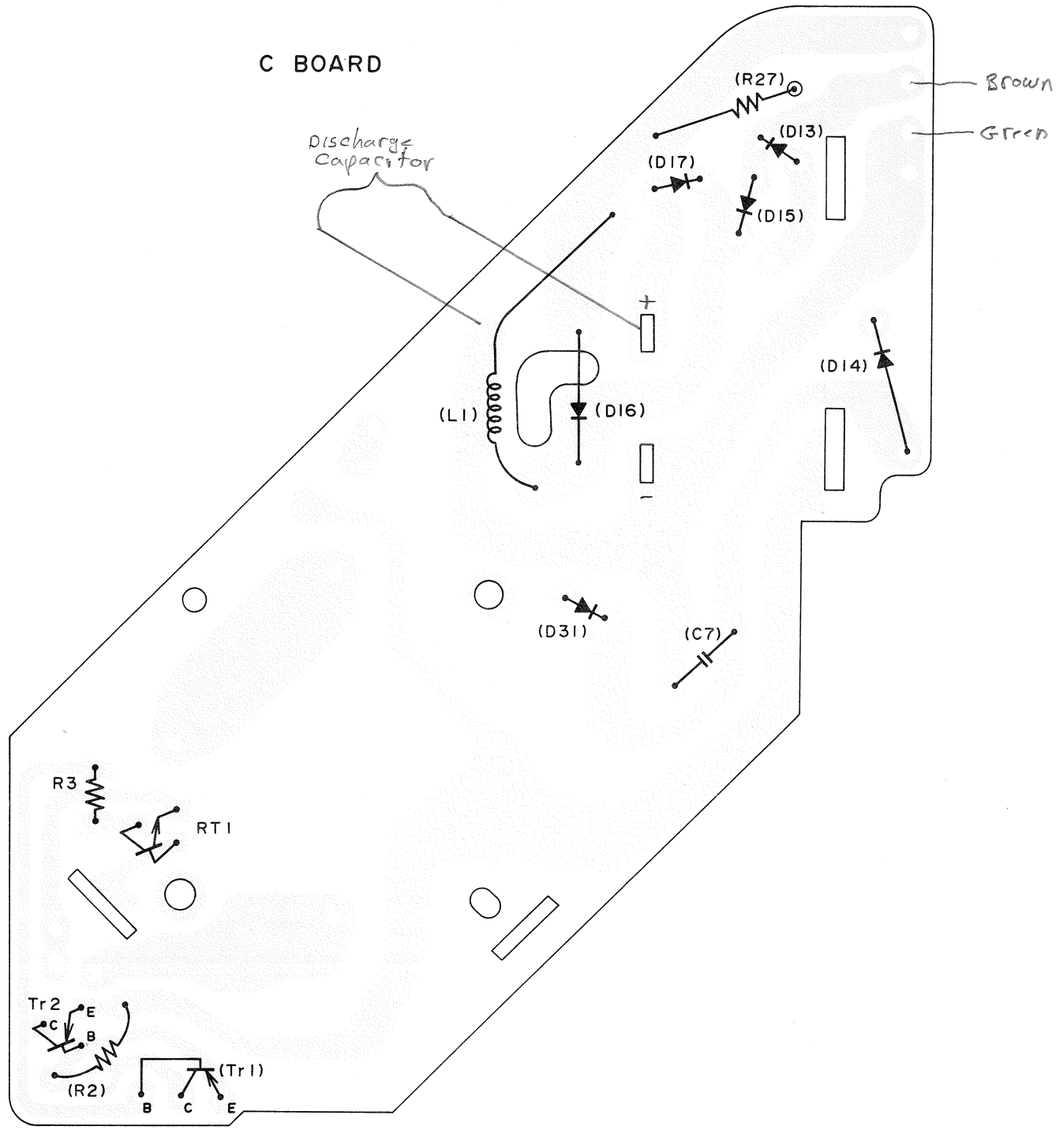


( ) : REVERSE SIDE

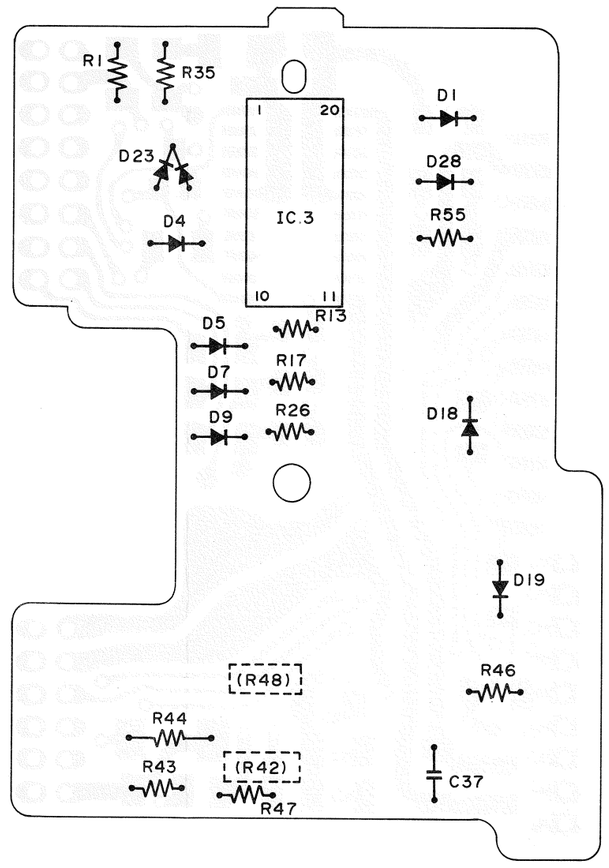
CANON SPEEDLITE 300EZ

ELECTRIC PARTS UNITS
CY8-1426-107-202

C BOARD



IC BOARD - I



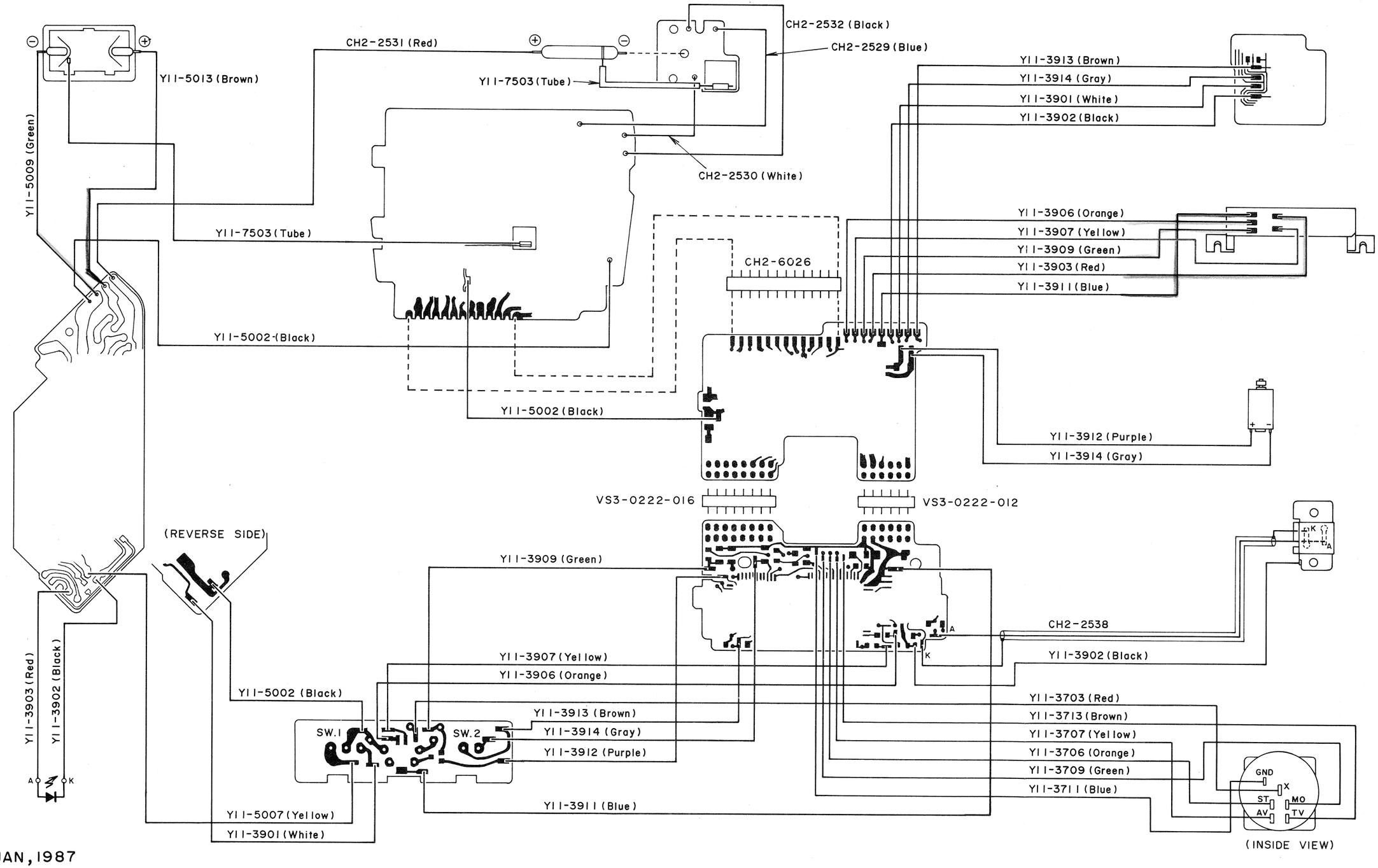
( ) : REVERSE SIDE

01 JAN, 1987

REF. NO. C50-0561

CANON SPEEDLITE 300EZ

WIRING DIAGRAM
CY8-1426-107-203



01 JAN, 1987

ELECTRIC PARTS SPECIFICATION LIST

SYMBOL	SPEC. OR MFG.
IC-1	T1715F
IC-2	SN28878
IC-3	LB1630M(F,P)
IC-4	S8052ALO
IC-5	MN1552
SCR-1	CRO2AM-8
SCR-2	〃
SCR-3	〃
SCR-4	〃
SCR-5	SA07
Tr-1	2SA1020Y
Tr-2	2SA1162Y
Tr-3	2SB873
Tr-4	〃
Tr-5	2SA562TMY
Tr-6	2SC2712Y
Tr-7	2SD135
Tr-8	2SC2712Y
Tr-9	2SA1162Y
RT-1	DTC124XK
RT-2	〃
RT-4	〃
ZD-2	1AZ200V
ZD-3	HZ3BC
ZD-4	RLZ8,2
ZD-5	〃
ZD-6	〃
ZD-7	〃
ZD-8	1AZ200V
D-1	RLS-71
D-2	1S1588
D-3	1S1585
D-4~9	RLS-71
D-10	ES01F
D-11,12	AM01
D-13~16	SR1FM-8
D-17	RM10B
D-18~20	RLS-71
D-21	AM01
D-22~23	1SS184
D-24~26	FMP-1
D-27~28	RLS-71
D-30	AM01

SYMBOL	SPEC. OR MFG.
C-1,3	220 μF 6,3V
C-4	100 μF 〃
C-5	100 μF 35V
C-6	0,033 μF
C-7	12μF 330V
C-8	635 μF 330V
C-9	6800PF
C-10	0,015 μF
C-11	1000PF
C-12	0,01μF
C-13~14	0,1 μF
C-15	0,022 μF
C-16~19	0,047 μF
C-20,21	0,01μF
C-22	3300PF
C-24	100PF 2KV
C-26	1,5 μF
C-30	1 μF
C-31	1000PF
C-32	1 μF
C-33	1000PF
C-34	1 μF
C-35	0,047 μF
C-36	33μF
C-37,38	0,047 μF
C-39	1000PF
C-40	0,01μF
C-41	0,022 μF
C-42	0,22μF
C-43	330PF
C-44	0,01μF
C-46,47	33PF
C-48	0,047 μF
C-49	1 μF
C-50	0,047PF
T-1	SX-13
T-2	KP-23C
T-3	KP-24

SYMBOL	SPEC. OR MEG.
R-1	10Ω 1/8 W
R-2	4,42Ω 1/5W
R-3	1KΩ 1/8W
R-4	4,7KΩ 〃
R-5	10K Ω 〃
R-6	6,8KΩ 1/16W
R-7	47K Ω 〃
R-8	2,2KΩ 〃
R-9	2,2KΩ 1/8W
R-10	100KΩ 1/2W
R-11	2,2MΩ 1/4W
R-13	470 Ω 1/16W
R-14	1KΩ 〃
R-15	2,2MΩ 1/4W
R-16	1MΩ 〃
R-17	470 Ω 1/16W
R-18	1KΩ 〃
R-19	22Ω 1/4W
R-20	10K Ω 1W
R-21	10Ω 1/16W
R-22	470 Ω 1/8W
R-23	1KΩ 1/4W
R-24	15K Ω 1W
R-25	1KΩ 1/16W
R-26	51Ω 〃
R-27	13Ω 1/4W
R-28	5,1MΩ 1/8W
R-29	100KΩ 〃
R-30	330KΩ 1/8W ※ADJ
R-31	47K Ω 1/16W
R-32	22K Ω 1/8W
R-33	47K Ω 1/16W
R-34	62K Ω 1/16W
R-35	680 Ω 1/8W
R-36	47K Ω 1/16W
R-37	4,7KΩ 1/16W
R-38	220 Ω 1/4W

SYMBOL	SPEC. OR MEG.
R-40	1,5KΩ 1/16W
R-41	510 Ω 〃
R-42	130KΩ 1/8W ※ADJ
R-43	12K Ω 1/8W
R-44	2KΩ 1/4W
R-45	220 Ω 1/16W
R-46	750 Ω 1/8W
R-47	12K Ω 〃
R-48	620 〃 ※ADJ
R-49	180KΩ 〃
R-50	510KΩ 〃 ※ADJ
R-51	2KΩ 1/16W
R-52	5,1KΩ 1/16W
R-53	10K Ω 1/16W
R-54	10K Ω 1/16W
R-55	47K Ω 1/8W
R-56	4,7KΩ 1/16W
R-57	5,1MΩ 1/8W
R-58	1MΩ 1/16W
R-59	1MΩ 1/16W

Canon SERVICE MANUAL

REPAIR INSTRUCTIONS

No. CY8-1226-105-300

Camera Technical Service Department, Canon Inc.

Date Feb. 14, 1987

SPEEDLITE 420EZ

TABLE OF CONTENTS

PRECAUTIONS

ALWAYS PERFORM THE FOLLOWING PROCEDURES

BEFORE STARTING NORMAL REPAIR

1. CAUTION! HIGH VOLTAGE: Always discharge the pre-flash capacitor and main capacitor before commencing disassembly.

   See section III, Disassembly, pg. III-1.

2. DO NOT turn the minus (-) screw next to the AF Illuminator Unit. This is the focus adjustment for the AF illuminator. It is adjusted at the factory. The service part (Y19-0395) is pre-adjusted at the factory.

   Note: Service adjustment methods are under study at this time.

3. In addition to the full battery voltage (6V), the 420EZ also has a center tap (3V) on the battery. When supplying power to the unit from an external power supply, a three volt input is necessary, in addition to the six volt input.

   See section III-9, Pilot Lamp Ignition Adjustment, pg. III-8, Fig.16.

4. IC-7 in the 420EZ is identical to IC-1 in the 300EZ. The data communications between the body and IC-7 are identical the the communications between the camera body and IC-1 in the 300EZ. The communications between IC-7 and IC-8 in the 420EZ are identical to those between IC-1 and IC-5 in the 300EZ.

   See section IV-13 in the 300EZ Repair Instructions.

I. Introduction

1. Features

The SPEEDLITE 420EZ is the more powerful and versatile of the two dedicated electronic flash units for the EOS cameras. It has the following new features.

Large illuminated LIQUID CRYSTAL DISPLAY (LCD)

Rapid-fire Flash capability (Low voltage flash)

Multiple flash (limited stroboscopic firing)

Patterned AF Illuminator

Internal automatic zooming

In addition to these new features, the 420EZ has fractional power manual flash down to 1/16 of full power, bounce flash, and second curtain synchronization.

2. Details

2.1 Digital Communication

Digital communication is used to handle the great amount of information that must be transmitted between the components of the EOS system. Only the shutter speed signal (TV) is transmitted in analog form.

Communications are as follows between the body and flash.

Signal (line)	Direction	Description
STSP	Camera to 420EZ	Serial Clock
EFID	Camera to 420EZ	Data line, (Digital)
AVEF	420EZ to Camera	Data line, (Digital)
TV	Camera to 420EZ	(Analog)

Data carried are:

CAMERA	FLASH
Focal length	AVEF
Film Speed	Flash Mode
Aperture	Flash Information (flash ready, sync.)
Camera Mode	

2.2 Large LCD Panel

The LCD displays all the information the user needs concerning the mode of operation. It is controlled by the MPU, IC-8.

When necessary, the panel can be illuminated by pressing the LIGHT button. This turns on the electroluminescent sheet behind the LCD for eight seconds.

2.3 Rapid-fire flash (low voltage flash)

This feature allows a very short recycling time when maximum power is not necessary, which is a majority of the time. The first, yellow-green LED of the two-stage ready lamp lights after about one second, at capacitor voltages as low as 125 volts. (Normally, the capacitor must be charged to about 260 volts or more before consistent firing is possible.

2.4 Multiple Flash

This function is a limited type of stroboscopic flash. Used with the fractional power manual settings and slow shutter speeds, the flash can fire up to five times per second, giving multiple images on a single frame of film.

2.5 AF Illuminator

The autofocus system used in EOS cameras is quite sensitive, and will operate in quite low light; but there is a level below which it cannot operate. Available light photography is difficult at these levels also and flash is normally used. A special illuminator, called an "ultra-bright LED" operates at low light levels by throwing a patterned beam onto the subject when the shutter button is presses halfway to allow the autofocus to work in darkness. The special pattern makes possible focusing on subjects with little or no contrast. The range of the AF illuminator (or AF auxiliary light) is from 0.9 to 8 meters. The LED is lit up to 10 times, or until focus is determined, whichever comes first.

2.6 Internal Automatic Zoom

The flash tube and reflector move inside the flash head to adjust the illumination angle to the angle of coverage (focal length) of the lens. Unlike some other zooming flash units, the external dimensions of the flash do not change during zooming.

When the shutter button is pressed halfway (SW-1 on), the lens focal length, or present focal length setting in the case of zoom lenses, is transmitted through the body to the flash. If the setting of the flash reflector is different than the called for for the lens focal length, the motor moves the flash tube and reflector to the correct position.

Speedlite 420EZ

1. Type

1-1 Type:

Direct-coupling clip-on type TTL automatic flash (with auxiliary preflash for AF, preflash for A-TTL, auto-zoom, and bounce mechanism).

1-2 Usable cameras: EOS620 and EOS650

2. Guide number (ISO 100-m):

Zoom position (mm)		24	28	35	50	70	80
Normal flash G No.		25 (83)	27 (90)	30 (100)	36 (120)	40 (133)	42 (140)
Low-voltage flash G No.		1/2 to 1/16 of that for manual					
Manual flash	1/1	25 (83)	27 (90)	30 (100)	36 (120)	40 (133)	42 (140)
	1/2	17.7 (59)	19.1 (63)	21.2 (70)	25.5 (85)	28.3 (94)	29.7 (99)
	1/4	12.5 (41)	13.5 (45)	15 (50)	18 (60)	20 (66)	21 (70)
	1/8	8.8 (29)	9.5 (31)	10.6 (35)	12.7 (42)	14.1 (47)	14.8 (49)
	1/16	6.3 (21)	6.8 (22)	7.5 (25)	9 (30)	10 (33)	10.5 (35)
	1/32	4.4 (14)	4.8 (16)	5.3 (17)	6.4 (21)	7.1 (23)	7.4 (24)

*Figures in parentheses above are ISO 100 -- ft. indication.

3. Number of flashes

Flash mode	Power supply: LR6 (AM-3)	Power supply: KR15/51 (Ni-Cd)
Normal flash	100 to 2000	45 to 300

*In the table above, the right figures show the number of flashes in the A-TTL mode, those on the left show the number of flashes for the manual (1/1) mode. Number of flashes for other manual settings increases in rough inverse proportion to the setting number (twice for 1/2, four times for 1/4, and so forth).

4. Recycling time:

Flash mode	Power supply: LR6 (AM-3)	Power supply: KR15/51 (Ni-Cd)
Normal	Ø.2 to 13 sec	Ø.2 to 6.5 sec
Low-voltage	0.2 to 1.5 sec	0.2 to 1.5 sec

*In the table above, the figures on the left show the recycling time for the A-TTL mode, and those on the right show the recycling time for the manual (1/1) mode.

5. Flash coverage

5-1 Alteration system:

Fixed concentrator lens with inner zoom (internal unit drive in the flash element)

5-2 Types of alteration:

(1) Auto: Zoom position is coupled to focal length information from the lens, and is automatically set when SW-1 on the camera goes ON.

(2) Manual: Zoom position is switched sequentially by pressing a switch on the flash.

5-3. Stopping positions:

Six positions - 24 mm, 28 mm, 35 mm, 50 mm, 70 mm, and 80 mm

When the main switch is ON, the initial setting of the zoom position is 35 mm. When using bounce flash in the auto mode (5-2(1)), the initial position is automatically set to 50 mm.

5-4 Zoom speed: Approx. 0.3 sec

5-5 Position setting indicator:

Numerical LCD display

5-6 Parallax compensation:

3° downward (at the 28 mm zoom position)

6. Bounce

6-1 Bounce direction:

Direction	Angle	Click stop positions
UP	0 - 90°	0°, 60°, 75°, 90°
Left	0 - 180°	0°, 60°, 75°, 90°, 120°, 150°, 180°
Right	0 - 90°	0°, 60°, 75°, 90°

6-2 Bounce lock:

Locks at the 0° position for the horizontal direction.

6-3 Preflash:

Flash head is used for preflash when using bounce.

7. Control system

7-1 Flash modes:

(1) Normal flash

(2) Low voltage flash

Flash system with a recycling time of about one sec [TD].

(3) Multiple flash

Multiple flashes at the rate of 1 to 5 Hz from the time charging is completed and the X contact goes ON to the time the X contact goes OFF or the charge is depleted.

(4) Preflash

Used for A-TTL ranging (uses a special flash element, except when using bounce flash as indicated in item 6-3).

(5) Test flash: Possible

7-2 Flash aperture setting:

Camera mode	AV setting	Camera's peripheral metering	Preflash
1. Shutter-priority AE	A: automatic	o	-
2. Aperture-priority AE	M: manual	-	-
3. Program AE	A: automatic	o	o
4. Manual	M: manual	-	-

(o: Setting factor)

7-3 Sync shutter speed setting:

Camera mode	Setting	Sync speed range
1. Shutter-priority AE	M: manual	Any setting below 250 (125)
2. Aperture-priority AE	A: automatic	250-30" (125-30")
3. Program AE	A: automatic	250-60 (125-60)
4. Manual	M: manual	Any setting below 250 (125)

Values in parentheses are for the EOS650; others are for the EOS620.

7-4 Exposure control modes:

(1) A-TTL automatic flash

(2) TTL automatic flash (when camera is in the manual mode)

(3) Manual

7-5 Flash control system:

TTL automatic control by metering light reflected from the film plane.

7-6 Flash level control:

Has automatic flash adjustment using fill-in flash (same as when using the T90 and 300TL in the A-TTL mode)

7-7 Flash coupling range (with 50 mm f/1.8 lens at ISO 100):

(1) With A-TTL normal flash:

0.7 - 21m (2.3 - 68.9 ft)

(2) With A-TTL low voltage flash:

0.7 - 5m (min) or 16 m (max.)

(1.64 - 16.4 or 52.4 ft.)

7-8 Out-of-coupling-range warning (only when subject is too far away):

In the A-TTL automatic flash mode, the out-of-coupling range warning indicator (TV-AV) in the viewfinder flashes when the shutter button is pressed to the first step.

8. Indicators

8-1 LCD indicators:

(1) Zoom position (not displayed with bounce flash)

(2) Zoom mode

(3) Flash aperture value

(4) Flash coupling range (TTL flash, manual)

(5) Control mode

(6) Multiple flash speed (Hz)

(7) Second curtain sync setting

(8) SE function operation (OFF) warning

(9) Bounce mark

8-2 Charge completion indicator

(1) Normal charge completion display:

Red pilot lamp (LED) lights (when flash is charged to within one step of full)

(2) Low voltage charge completion display:

Yellow-green pilot lamp (LED) lights (when flash is charged to within four steps of full)

8-3 Display illumination:

Uniform transmissive illumination (blue) of the entire LCD panel. Illumination goes on for about eight seconds when the illumination switch is pressed.

9. Sync timing: Selectable (first curtain or second curtain sync)

10. Flash duration: 1.5 ms or less

11. Color temperature: Daylight equivalent

12. Usable film speeds:

ISO 6 to 6400. Setting is controlled automatically according to camera settings. Flash coupling range

varies in direct proportion to film speed.

13. AF auxiliary:

13-1 Light source: Ultra-bright red LED

13-2 Pattern: Random stripe (vertical)

13-3 Effective range:

0.9 to 8m (3 to 26.2 ft) (in complete darkness)

13-4 Parallax compensation: 2° downward

14. Power switch:

Has main switch with SE (save-evergy function.

*Power automatically turns off if switch is left on more than five minutes. The LCD display starts flashing at 1 Hz 30 seconds before the SE function operates, then goes off. However, all mode settings are saved.

Flash unit is turned ON again when the camera's shutter button is pressed to the first step or the reset switch is pressed.

(Flash can be used together with the Technical Back's interval timer.)

15. Power supply:

6 V, provided by four AA-size LR6 (AM-3) alkaline dry cells. AA-size Ni-Cd batteries can also be used.

16. Camera contacts:

(1) Fixed contact: Screws onto the accessory

shoe.

(2) Sync terminal: six-pin direct-connection contact

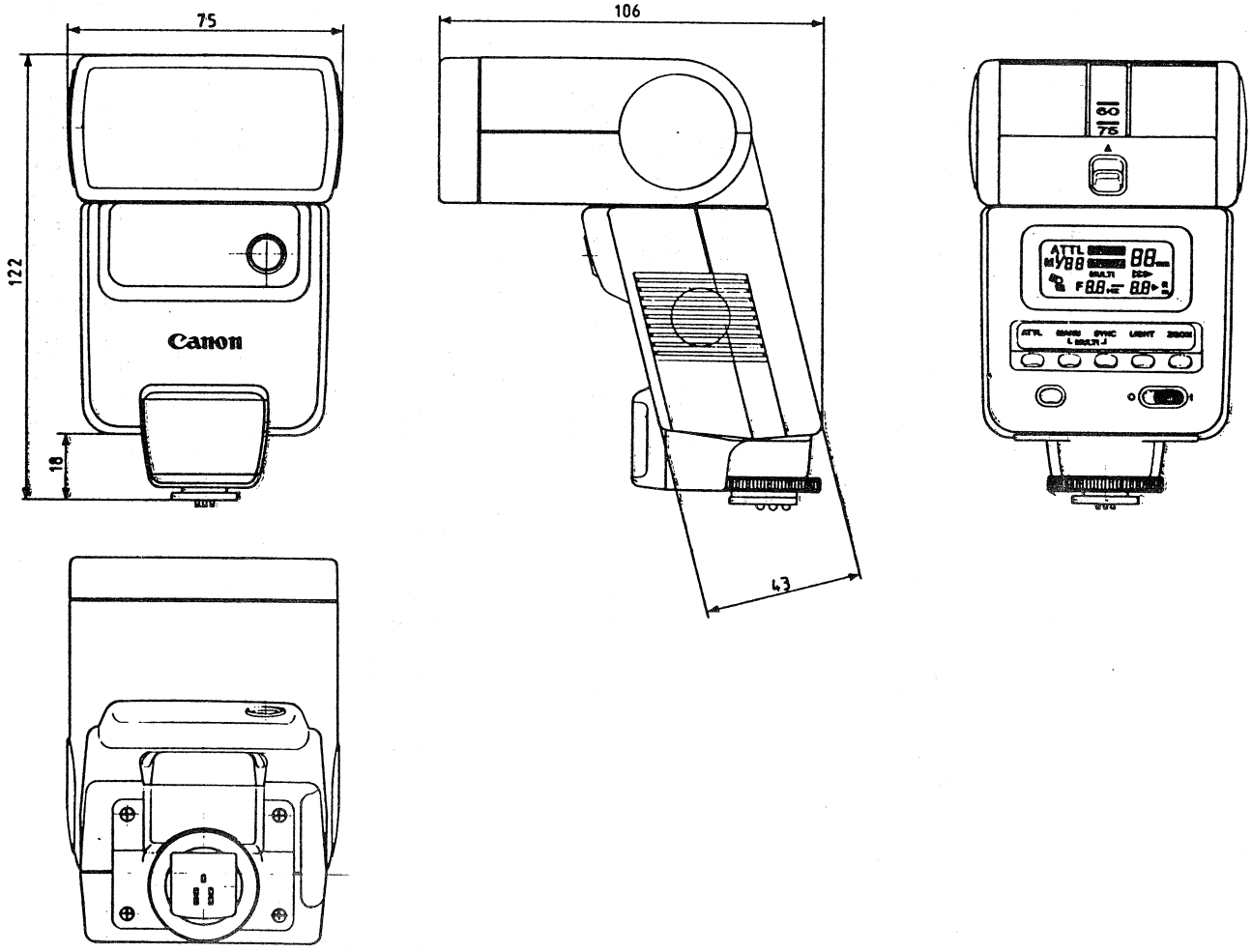
17. Dimensions: 75(W) x 122(H) x 106(D) mm
(2-15/16" x 4-13/16" x 4-3/16")

18. Weight: 370g without batteries (470g with LR6 batteries)

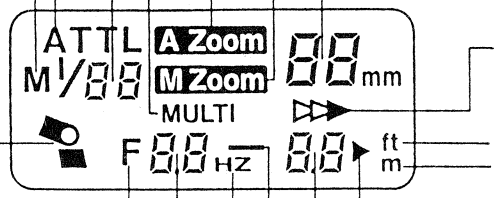
19. Principle new related products:

(1) Case

420EZ



* No mark: Always appears when the Speedlite 420EZ's main switch is ON.
* 1 mark: Appears when the Speedlite 420EZ's main switch is ON and the shutter button is pressed to the first step.



Numeric manual flash level indicator (1/1, 1/2, 1/4, 1/8, 1/16, 1/32)

Multiple flash mode indicator

Auto zoom mode indicator

Manual zoom mode indicator

Zoom setting (focal length) indcator (23, 28, 35, 50, 70, 80)
* displayed with bounce flash.

Automatic flash mode indicator
(1) A-TTL automatic flash
1 (2) TTL automatic flash

Manual (flash) mode indicator

Second curtain sync mode set indicator

Bounce set mark

1 ft mark

1 m mark

1 Aperture value mark

1 Long distance coupling range
Displayed when distance is over 30 m (99 ft)

1 Flash aperture value - Numeric indicator (1.0-32)
(1) A-TTL: Displays automatic aperture value setting.
(2) TTL: Displays aperture value (AVset) manually set on the camera.
(3) MANU: Displays aperture value (AVset manually set on the camera.

1 Automatic flash coupling range numeric indicator (0.5 - 30) *0.5 flashes when less than 0.5 m)
(1) TTL: Shows the coupling range for AVset.
(2) MANU: Shows the appropriate shooting distance for AVset.
*Coupling range is not displayed in the A-TTL mode.
*-- Displayed with bounce flash.

Multiple flash numeric Hz indicator (1, 2, 3, 4, 5)

1 Hyphen mark

Multiple flash "Hz" mark

* The TTL automatic flash mode is set automatically when the camera is set for manual and the flash auto.
* Either "m" or "ft" is displayed according to the country to which the flash is shipped. (This setting is made at the factory.)

[3]-Table-1 Speedlite 420EZ automatic flash coupling range (A-TTL and TTL)

ISO 25	A-TTL	TTL

[m]

f/No	24mm	28mm	35mm	50mm	70mm	80mm
1.0	1.3-13	1.4-14	1.5-15	1.8-18	2.0-20	2.1-21
1.4	0.9-8.9	1.0-9.6	1.1-11	1.3-13	1.5-15	1.5-15
1.8	0.8-7.5	0.8-8.1	0.9-9.0	1.1-11	1.2-12	1.3-13
2.0	0.7-6.3	0.7-6.8	0.8-7.5	0.9-8.8	1.0-10	1.1-11
2.8	0.5-4.5	0.5-4.8	0.6-5.3	0.7-6.2	0.7-7.1	0.8-7.5
3.5	0.5-3.8	0.5-4.1	0.6-4.5	0.7-5.2	0.7-6.0	0.7-6.3
4.0	0.5-3.2	0.5-3.4	0.6-3.8	0.7-4.4	0.7-5.0	0.7-5.3
4.5	0.5-2.7	0.5-2.9	0.6-3.2	0.7-3.7	0.7-4.2	0.7-4.5
5.6	0.5-2.2	0.5-2.4	0.6-2.7	0.7-3.1	0.7-3.6	0.7-3.8
8.0	0.5-1.6	0.5-1.7	0.6-1.9	0.7-2.2	0.7-2.5	0.7-2.7
11	0.5-1.1	0.5-1.2	0.6-1.4	0.7-1.6	0.7-1.8	0.7-1.9
16	0.5-0.8	0.5-0.9	0.6-1.0	0.7-1.1	0.7-1.3	0.7-1.4
22	0.5-0.6	0.5-0.6	0.6-0.7	0.7-0.8	0.7-0.9	0.7-1.0
32	÷	÷	÷	0.7	0.7	0.7

ISO 64	A-TTL	TTL

[m]

f/No	24mm	28mm	35mm	50mm	70mm	80mm
1.0	2.0-20	2.2-22	2.4-24	2.8-28	3.2-30▶	3.4-30▶
1.4	1.4-14	1.6-16	1.7-17	2.0-20	2.3-23	2.4-24
1.8	1.2-12	1.3-13	1.5-15	1.7-17	1.9-19	2.0-20
2.0	1.0-10	1.1-11	1.2-12	1.4-14	1.6-16	1.7-17
2.8	0.7-7.1	0.8-7.6	0.9-8.5	1.0-9.9	1.2-12	1.2-12
3.5	0.6-5.9	0.7-6.4	0.7-7.1	0.9-8.3	1.0-9.5	1.0-10
4.0	0.5-5.0	0.6-5.4	0.6-6.0	0.7-7.0	0.8-8.0	0.9-8.4
4.5	0.5-4.2	0.5-4.5	0.6-5.0	0.7-6.0	0.7-6.7	0.7-7.0
5.6	0.5-3.5	0.5-3.8	0.6-4.2	0.7-5.1	0.7-5.7	0.7-5.9
8.0	0.5-2.5	0.5-2.7	0.6-3.0	0.7-3.6	0.7-4.0	0.7-4.2
11	0.5-1.8	0.5-1.9	0.6-2.1	0.7-2.6	0.7-2.8	0.7-3.0
16	0.5-1.3	0.5-1.4	0.6-1.5	0.7-1.8	0.7-2.0	0.7-2.1
22	0.5-0.9	0.5-1.0	0.6-1.1	0.7-1.3	0.7-1.4	0.7-1.5
32	0.5-0.7	0.5-0.7	0.6-0.8	0.7-0.9	0.7-1.0	0.7-1.1

ISO 100	A-TTL	TTL

[■]

f/No	24■■	28■■	35■■	50■■	70■■	80■■
1.0	2.5-2 5	2.7-2 7	3.0-3 0	3.5-3 0▶	4.0-3 0▶	4.2-3 0▶
1.4	1.8-1 8	1.9-1 9	2.2-2 2	2.5-2 5	2.9-2 9	3.0-3 0
1.8	1.5-1 5	1.6-1 6	1.8-1 8	2.1-2 1	2.4-2 4	2.5-2 5
2.0	1.3-1 3	1.4-1 4	1.5-1 5	1.8-1 8	2.0-2 0	2.1-2 1
2.8	0.9-8.9	1.0-9.6	1.1-1 1	1.3-1 3	1.5-1.5	1.5-1 5
3.5	0.8-7.5	0.8-8.1	0.9-9.0	1.1-1 1	1.2-1 2	1.3-1 3
4.0	0.7-6.3	0.7-6.8	0.8-7.5	0.9-8.8	1.0-1 0	1.1-1 1
4.5	0.6-5.3	0.6-5.7	0.7-6.3	0.8-7.4	0.9-8.4	0.9-8.9
5.6	0.5-4.5	0.5-4.8	0.6-5.3	0.7-6.2	0.7-7.1	0.8-7.5
8.0	0.5-3.2	0.5-3.4	0.6-3.8	0.7-4.5	0.7-5.0	0.7-5.3
11	0.5-2.2	0.5-2.4	0.6-2.7	0.7-3.2	0.7-3.6	0.7-3.8
16	0.5-1.6	0.5-1.7	0.6-1.9	0.7-2.3	0.7-2.5	0.7-2.7
22	0.5-1.1	0.5-1.2	0.6-1.4	0.7-1.6	0.7-1.8	0.7-1.9
32	0.5-0.8	0.5-0.9	0.6-1.0	0.7-1.2	0.7-1.3	0.7-1.4

ISO 400	A-TTL	TTL

[■]

f/No	24■■	28■■	35■■	50■■	70■■	80■■
1.0	5.0-3 0▶	5.4-3 0▶	6.0-3 0▶	7.0-3 0▶	8.0-3 0▶	8.4-3 0▶
1.4	3.6-3 0▶	3.9-3 0▶	4.3-3 0▶	5.0-3 0▶	5.7-3 0▶	6.0-3 0▶
1.8	3.0-3 0	3.3-3 0▶	3.6-3 0▶	4.2-3 0▶	4.8-3 0▶	5.0-3 0▶
2.0	2.5-2 5	2.7-2 7	3.0-3 0▶	3.5-3 0▶	4.0-3 0▶	4.2-3 0▶
2.8	1.8-1 8	1.9-1 9	2.2-2 2	2.5-2 5	2.9-2 9	3.0-3 0
3.5	1.5-1 5	1.6-1 6	1.8-1 8	2.1-2 1	2.4-2 4	2.5-2 5
4.0	1.3-1 3	1.4-1 4	1.5-1 5	1.8-1 8	2.0-2 0	2.1-2 1
4.5	1.1-1 1	1.2-1 2	1.3-1 3	1.5-1 5	1.7-1 7	1.8-1 8
5.6	0.9-8.9	1.0-9.6	1.1-1 1	1.3-1 3	1.5-1 5	1.5-1 5
8.0	0.7-6.3	0.7-6.8	0.8-7.5	0.9-8.8	1.0-1 0	1.1-1 1
11	0.5-4.5	0.5-4.8	0.6-5.3	0.7-6.2	0.7-7.1	0.8-7.5
16	0.5-3.2	0.5-3.4	0.6-3.8	0.7-4.5	0.7-5.0	0.7-5.3
22	0.5-2.2	0.5-2.4	0.6-2.7	0.7-3.2	0.7-3.6	0.7-3.8
32	0.5-1.6	0.5-1.7	0.6-1.9	0.7-2.3	0.7-2.5	0.7-2.7

[3]-Table-2 Speedlite 420EZ appropriate shooting distance for manual photography

ISO 100	MANUAL 1/1

[m]

f/No	24mm	28mm	35mm	50mm	70mm	80mm
1.0	25	27	30	30►	30►	30►
1.4	18	19	22	25	29	30
1.8	15	16	18	21	24	25
2.0	13	14	15	18	20	21
2.8	8.9	9.6	11	13	15	15
3.5	7.5	8.1	9	11	12	13
4.0	6.3	6.8	7.5	8.8	10	10
4.5	5.3	5.7	6.3	7.4	8.4	8.9
5.6	4.5	4.8	5.3	6.2	7.1	7.5
8.0	3.2	3.4	3.8	4.4	5	5.3
11	2.2	2.4	2.7	3.1	3.6	3.8
16	1.6	1.7	1.9	2.2	2.5	2.7
22	1.1	1.2	1.4	1.6	1.8	1.9
32	0.8	0.9	1	1.1	1.3	1.4

ISO 100	MANUAL 1/2

[m]

f/No	24mm	28mm	35mm	50mm	70mm	80mm
1.0	18	19	22	25	29	30
1.4	13	14	15	18	20	21
1.8	11	12	13	15	17	18
2.0	8.9	9.6	11	13	15	15
2.8	6.3	6.8	7.5	8.8	10	10
3.5	5.3	5.7	6.3	7.4	8.4	8.9
4.0	4.5	4.8	5.3	6.2	7.1	7.5
4.5	3.8	4.1	4.5	5.2	6	6.3
5.6	3.2	3.4	3.8	4.4	5	5.3
8.0	2.2	2.4	2.7	3.1	3.6	3.8
11	1.6	1.7	1.9	2.2	2.5	2.7
16	1.1	1.2	1.4	1.6	1.8	1.9
22	0.8	0.9	1	1.1	1.3	1.4
32	0.6	0.6	0.7	0.8	0.9	1

ISO 100	MANUAL 1/4

[■]

f/No	24■■	28■■	35■■	50■■	70■■	80■■
1.0	13	14	15	18	20	21
1.4	8.9	9.6	11	13	15	15
1.8	7.5	8.1	9	11	12	13
2.0	6.3	6.8	7.5	8.8	10	10
2.8	4.5	4.8	5.3	6.2	7.1	7.5
3.5	3.8	4.1	4.5	5.2	6	6.3
4.0	3.2	3.4	3.8	4.4	5	5.3
4.5	2.7	2.9	3.2	3.7	4.2	4.5
5.6	2.2	2.4	2.7	3.1	3.6	3.8
8.0	1.6	1.7	1.9	2.2	2.5	2.7
11	1.1	1.2	1.4	1.6	1.8	1.9
16	0.8	0.9	1	1.1	1.3	1.4
22	0.6	0.6	0.7	0.8	0.9	1
32	0.5*	0.5*	0.6	0.7	0.7	0.7

注:0.5* は0.5点滅を示す。

ISO 100	MANUAL 1/8

[■]

f/No	24■■	28■■	35■■	50■■	70■■	80■■
1.0	8.9	9.6	11	13	15	15
1.4	6.3	6.8	7.5	8.8	10	10
1.8	5.3	5.7	6.3	7.4	8.4	8.9
2.0	4.5	4.8	5.3	6.2	7.1	7.5
2.8	3.2	3.4	3.8	4.4	5	5.3
3.5	2.7	2.9	3.2	3.7	4.2	4.5
4.0	2.2	2.4	2.7	3.1	3.6	3.8
4.5	1.9	2	2.3	2.6	3	3.2
5.6	1.6	1.7	1.9	2.2	2.5	2.7
8.0	1.1	1.2	1.4	1.6	1.8	1.9
11	0.8	0.9	1	1.2	1.3	1.4
16	0.6	0.6	0.7	0.8	0.9	1
22	0.5*	0.5*	0.6	0.7	0.7	0.7
32	0.5*	0.5*	0.6	0.7	0.7	0.7

ISO 100 | MANUAL 1/16

[■]

f/No	24■■	28■■	35■■	50■■	70■■	80■■
1.0	6.3	6.8	7.5	8.8	10	10
1.4	4.5	4.8	5.3	6.2	7.1	7.5
1.8	3.8	4.1	4.5	5.2	6	6.3
2.0	3.2	3.4	3.8	4.4	5	5.3
2.8	2.2	2.4	2.7	3.1	3.6	3.8
3.5	1.9	2	2.3	2.6	3	3.2
4.0	1.6	1.7	1.9	2.2	2.5	2.7
4.5	1.4	1.5	1.6	1.9	2.1	2.2
5.6	1.1	1.2	1.4	1.6	1.8	1.9
8.0	0.8	0.9	1	1.1	1.3	1.4
11	0.6	0.6	0.7	0.8	0.9	1
16	0.5≑	0.5≑	0.6	0.7	0.7	0.7
22	0.5≑	0.5≑	0.6	0.7	0.7	0.7
32	0.5≑	0.5≑	0.6	0.7	0.7	0.7

ISO 100 | MANUAL 1/32

[■]

f/No	24■■	28■■	35■■	50■■	70■■	80■■
1.0	4.5	4.8	5.3	6.2	7.1	7.5
1.4	3.2	3.4	3.8	4.4	5	5.3
1.8	2.7	2.9	3.2	3.7	4.2	4.5
2.0	2.2	2.4	2.7	3.1	3.6	3.8
2.8	1.6	1.7	1.9	2.2	2.5	2.7
3.5	1.4	1.5	1.6	1.9	2.1	2.2
4.0	1.1	1.2	1.4	1.6	1.8	1.9
4.5	1	1	1.2	1.3	1.5	1.6
5.6	0.8	0.9	1	1.1	1.3	1.4
8.0	0.6	0.6	0.7	0.8	0.9	1
11	0.5≑	0.5≑	0.5≑	0.7	0.7	0.7
16	0.5≑	0.5≑	0.5≑	0.7	0.7	0.7
22	0.5≑	0.5≑	0.5≑	0.7	0.7	0.7
32	0.5≑	0.5≑	0.5≑	0.7	0.7	0.7

III. Disassembly, Assembly and Adjustments

1. Discharging Pre and Main Flash Capacitors

ALWAYS DISCHARGE PRE FLASH AND MAIN FLASH CAPACITORS BEFORE STARTING ANY REPAIR!!

1.1 Remove the rubber cap (Y17-0486) from the left (battery cover) side of the flash head for access to the holes shown in figure 1.

1.2 Access hole "A" is the main capacitor plus (+) terminal and "B" is the pre-flash capacitor's + terminal.

1.3 Remove the batteries and TURN THE MAIN SWITCH ON. Short the capacitor + terminals to the the battery minus (-) terminal (the upper right terminal in the battery compartment) through a low resistance, high wattage resistor.

CAUTION! The main switch must be on. If not the battery terminal is not connected to the circuit.

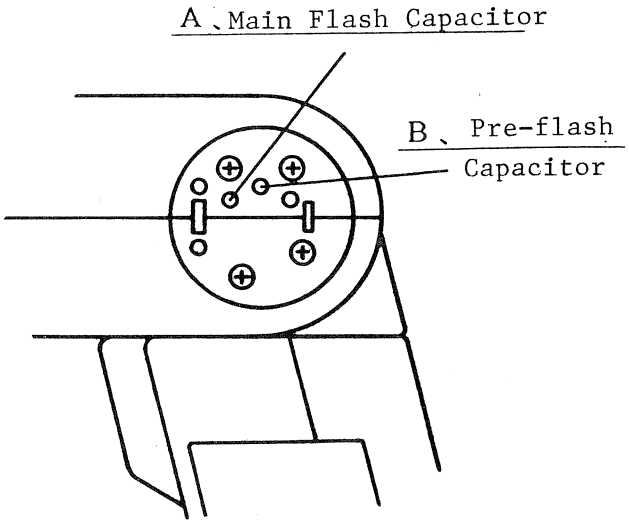


Fig. 1

Fig. 1

2. Accessory Shoe Unit Removal

2.1 Remove the four screws visible from the bottom of the unit.

2.2 Shift the shoe slightly to the rear and lift it a little.

2.3 Disconnect the two pin connectors and remove the shoe unit from the main body.

[[AF LED Unit Removal]]

2.4 Remove the two screws on each side of the AF LED unit and the unit can be lifted out.

[[Accessory Shoe Removal]]

2.5 After removing the AF LED unit, remove the three remaining screws and the shoe and contacts can be removed.

3. Front Cover Removal

3.1 After removing the shoe unit, turn the flash head as shown for access to the four screws at the top of the main body of the flash. (Fig. 2) Remove the screws.

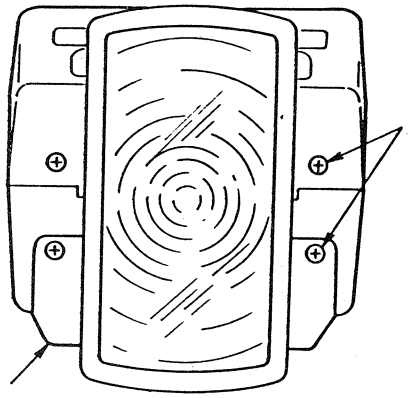


Fig. 2

3.2 Remove the black pre-flash cover, and the lens stopper and fresnel lens (Fig. 3).

3.3 Lift the pre-flash reflector slightly, twist and push it through the opening into the unit. (Pull the front cover slightly forward to make this operation easier.)

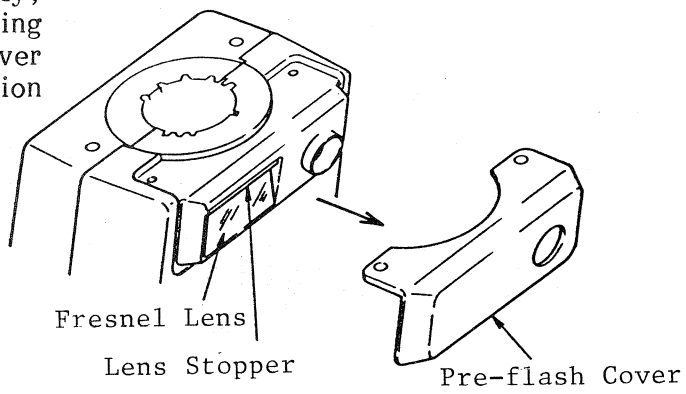


Fig. 3

3.4 Lift the front cover to gain access to two screws on the rear. Remove the photo diode (PD) and holder. Remove the front cover.

4. Rear Cover Removal

4.1 Remove the single screw [A] from the G circuit board, located below the battery chamber, and separate the interlocking parts (B). (Fig. 4)

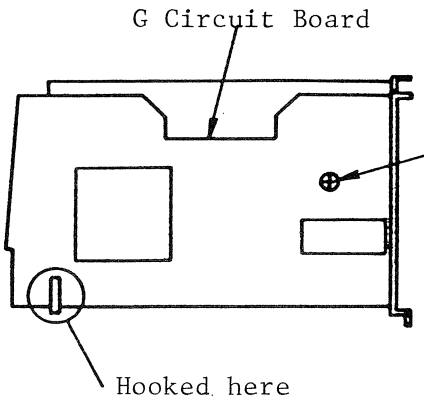


Fig. 4

4.2 Insert tweezers between the battery compartment and the G C.B. and disconnect the pin connectors (Fig. 5).

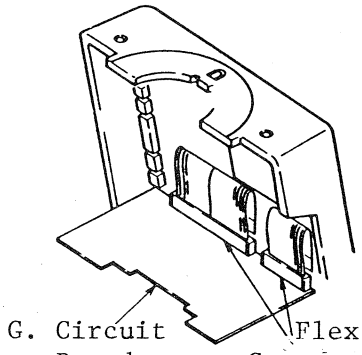


Fig. 5

4.3 After unsoldering the two leads from the photo coupler, the G C.B. can be removed (Fig. 6).

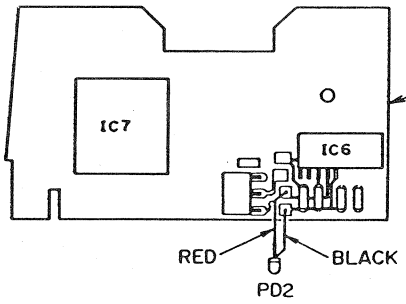


Fig. 6

4.4. Unhook the connectors from the F C.B. (Fig. 7).

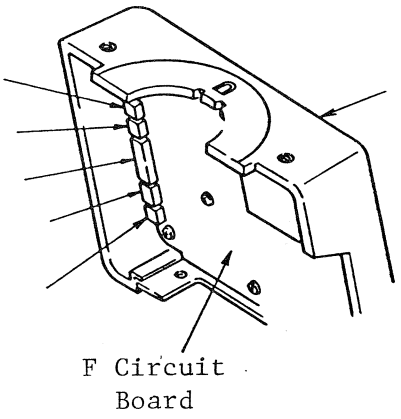


Fig. 7

4.5 Next, disconnect the connectors between the F C.B. and the D and E C.B.s. The rear cover, with the F C.B., can be separated from the battery box and the flash head.

4.6 By removing the seven screws holding the F C.B. in the rear cover, they can be separated and the Mode switch can be serviced.

5. D & E Circuit Board Removal

5.1 The D and E C.B. are attached to the battery box with screws.

5.2 Remove the indicated screws and the connectors and remove the circuit boards.

At this point the D and E circuit boards are still connected by the "L" connector. If it is necessary to separate them, unsloder the connection.

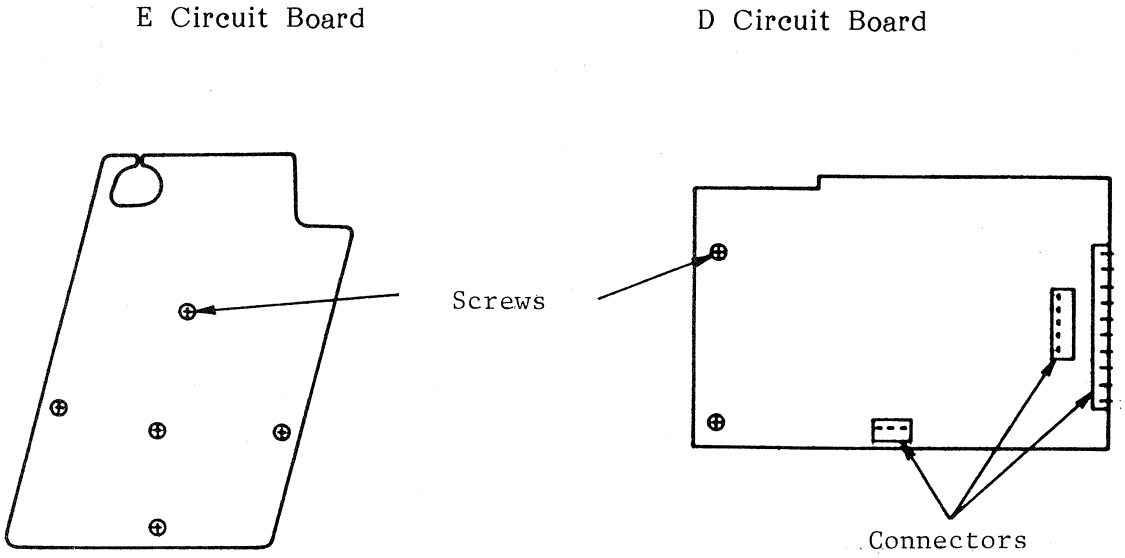


Fig. 8

6. Flash Head Disassembly

6.1 Remove the rubber cap from the right end of the flash head. (The left end was removed to discharge the capacitors.

6.2 Remove the frame from the front of the flash head. It is easier to remove if you push in on the sides of the frame and the top and bottom of the flash head covers at their junction with the frame. The frame is held by four clips. (Fig. 9)

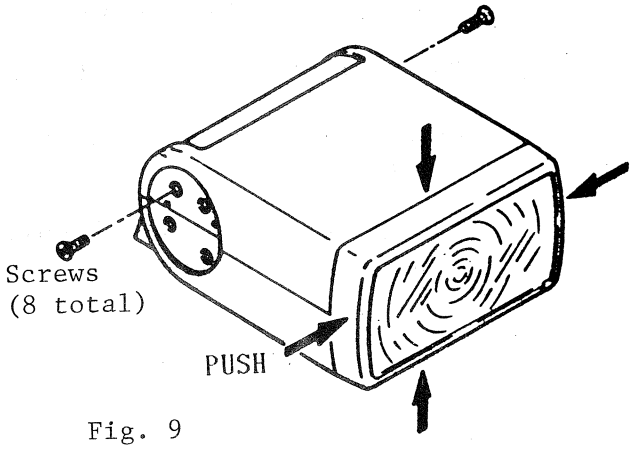


Fig. 9

6.3 Remove the eight screws in the sides of the covers and remove the bottom cover.

CAUTION! Take care with the click spring and ball on the left side.

6.4 Remove the two screws holding the zoom unit and it and the top cover can be removed (Fig. 10)

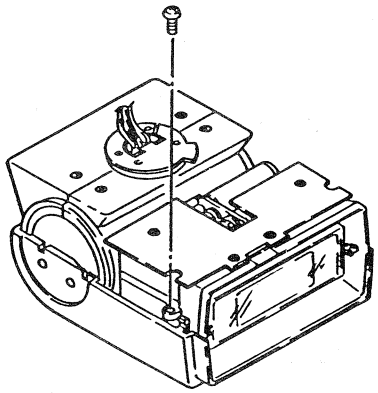


Fig. 10

MOTOR UNIT REMOVAL

6.5 Remove the four screws "A" holding the brush circuit board (Fig. 11).

6.6 Remove the zoom contact unit from the flash head. It can be removed by running a screwdriver under in and prying it off (Fig. 12). This gives access to the screws "B" holding the motor unit in place.

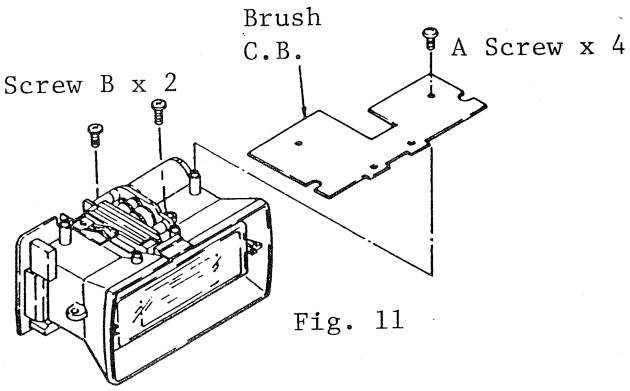


Fig. 11

6.7 Remove the two "B" screws and lift out the motor unit.

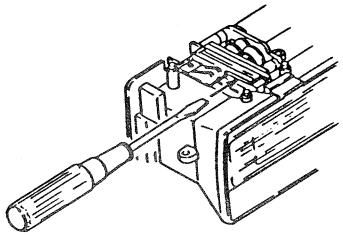


Fig. 12

7. Bounce Coupling Disassembly

7.1 Remove the five screws "A" holding the rotary joint parts. Take care with detent pins and springs. (Fig. 13).

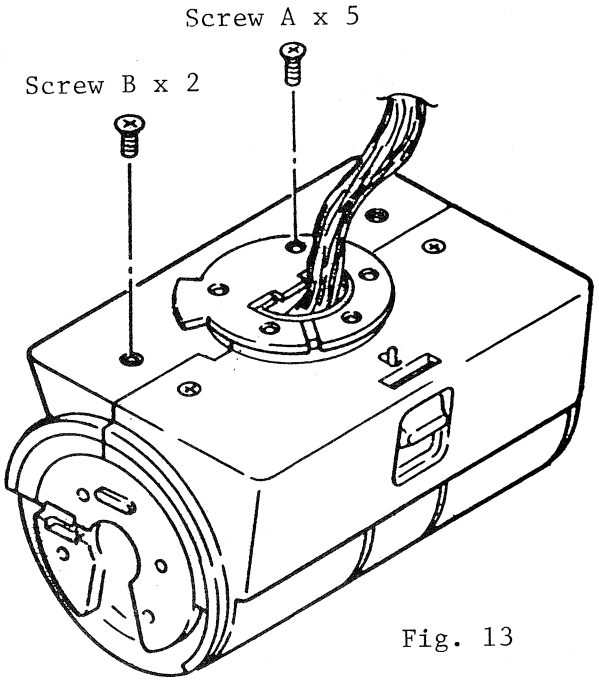


Fig. 13

7.2 Remove the two screws "B" and the cover can be removed (Fig. 13).

7.3 In this condition the main capacitor, C circuit board, bounce switch and related parts can be serviced.

CAUTION! Three Teflon insulating sheets are used in the bounce coupling section. When reassembling, be sure to install them properly as indicated is figure 14.

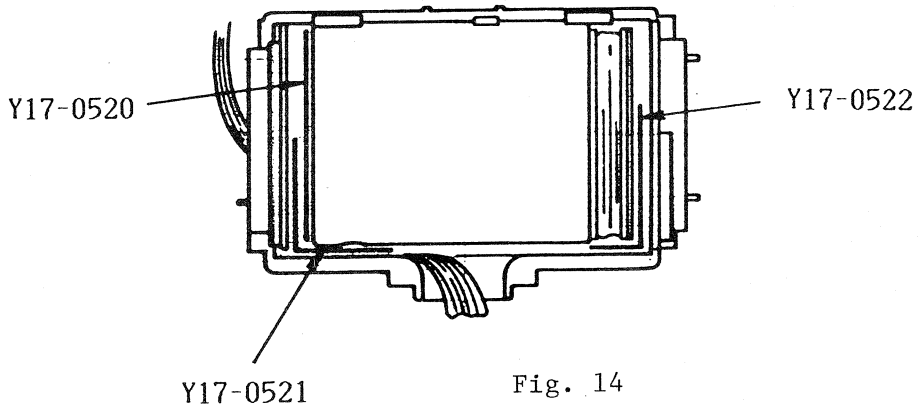


Fig. 14

ADJUSTMENTS

8. Necessary Adjustments

Make the following four adjustments indicated when the following parts are changed.

8.1 Adjust **Ready Lamp Voltage (VR-1)** if IC-7, or the G circuit board is changed.

8.2 Adjust **EFID Current (VR-2)** if IC-7 or the G circuit board is changed.

8.3 Adjust FA (flash aperture) indicator if IC-6, IC-7 or the G circuit board is changed.

35mm near limit ..... Adjust VR-3 (Level)

far limit ..... Adjust VR-4 (Gain)

Bounce and pre-flash AV Level .... Adjust VR-6
(Zoom: 50mm, preflashbymain flash tube)

8.4 Manual Lo Output Adjustment ..... Adjust VR-5 + ND filter
Adjust id PD-2, IC-6, IC-7, or G circuit board is changed.

Note: FA accuracy is adjusted within the camera body (TTL Flash).

CAUTION! Distance Unit Selection

By cutting a part of the pattern on the F circuit board, the distance indication on the LCD can be changed from feet to meters.

CAUTION! With the exception of VR-1, all the variable resistors are accessible on G circuit board when the accessory shoe unit screws are removed.

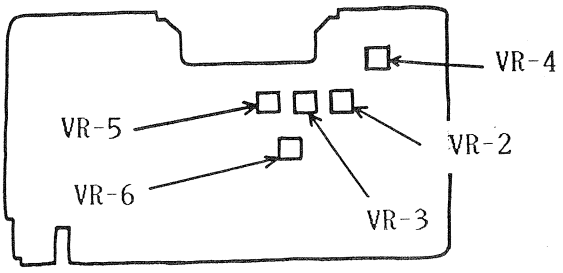


Fig. 15

ADJUSTMENTS

9. Ready Lamp (RED) Ignition

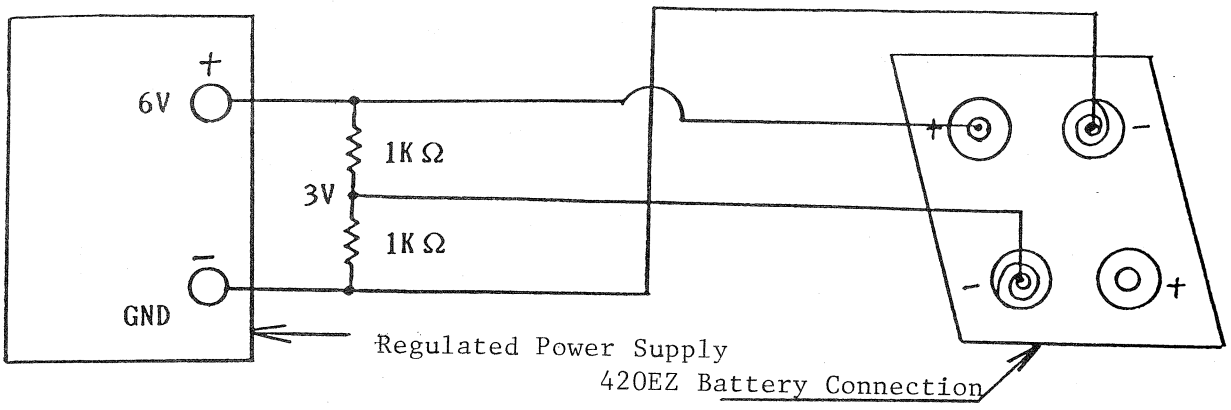
9.1 Standard:Ignites at 265 ± 2VDC

9.2 Adjustment

A. Remove the rubber capacitor from the left (battery cover) side of the flash head and bleed the main capacitor (see III-1).

B. Connect the regulated power supply (LVPS) to the unit as shown in figure 16.

CAUTION! The 420EZ must have the center tap (3V) input to operate. It will not operate with just the normal 6V input.



(Use two identical resistors between one and four KOHM for the voltage divider.)

Fig. 16

C. Turn the main switch on to start charging.

D. Read the point where the red ready lamp lights, and adjust the point to 265V ± 2V with VR-1.

CAUTION! The main capacitor voltage can be read through the same hole used to discharge the capacitor.(Pg. III-1, Fig. 1)

VR-1 can be reached by removing the mode nameplate on the rear of the unit.

10. EFID Current Adjustment

10.1 With 1.2V input at the EFID terminal:

Standard: With ready lamp lit: 200uA ± 20uA

Manual < 30uA

Main switch off: < 30uA

10.2 Adjustment Method

A. Attach the flash to an EOS top cover wired to a LVPS and analog ammeter, as shown in figure 17.

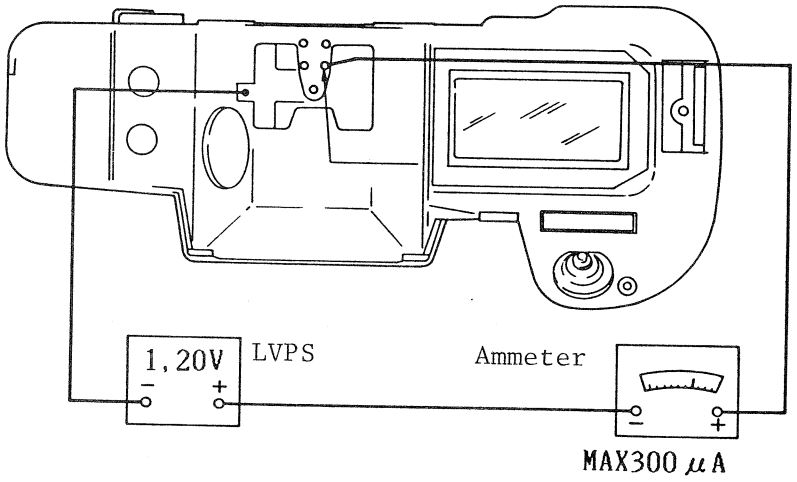


Fig. 17

B. Set the LVPS to 1.2V and then turn on the 420EZ main switch.

C. Read the current when the ready lamp lights.

D. Adjust variable resistor VR-2 until the reading is correct.

(VR-2 can be reached by removing the four screws holding the shoe in place.)

11. Aperture Control Voltage Adjustment

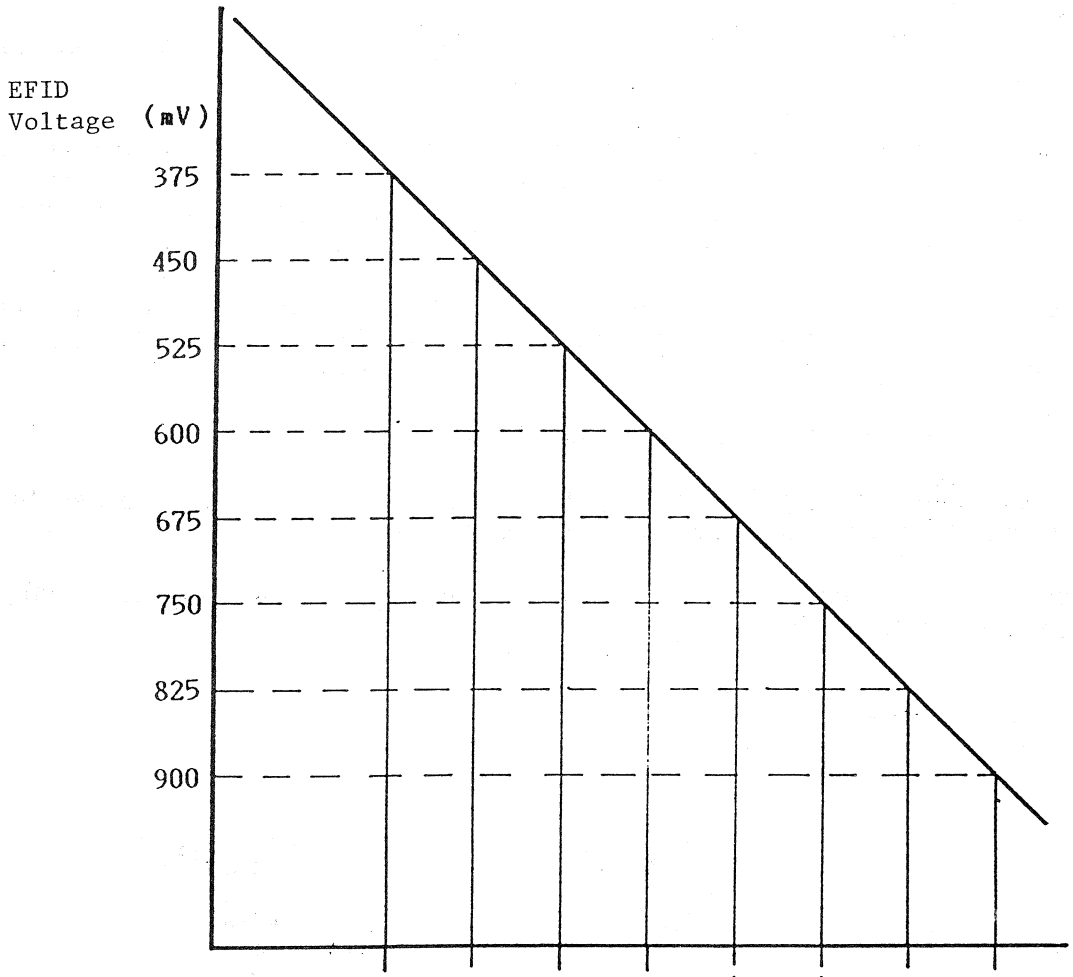
11.1 Standard: See graph.

Attach the flash to a T-90 body and push SW-1 (shutter button). This applies 1.2V EFID signal so the output is analog. (An EOS body would give a digital output, which would require special test equipment.)

Use an 18% gray target.

Allow the flash to charge fully (at least 20 seconds after the red ready lamp lights.

Use new batteries.



ZOOM Setting	Distance (M) ⇒							
35mm	0.66	0.9	1.3	1.9	2.7	3.8	5.3	7.5
50mm	0.8	1.1	1.6	2.2	3.2	4.5	6.3	8.9

⇑ Distance A ⇑ Distance B

11. Aperture Control Voltage Adjustment(cont.)

11.2 Adjusting Method

A. Connect a thin lead to the AV terminal in the flash and run it outside the flash.

B. Darken the test area, set up as shown in Fig. 18, to under EV9. The two sets of A and B distances, as indicated on the chart on the previous page should be marked.

C. In turn, at the A and B distances set the flash head to 35mm, turn the main switch on and wait for at least 20 seconds after the red ready lamp lights. Push the shutter button halfway (SW1 on) and read the AV voltage.

D. At the A distance adjust VR-3 (Level), and adjust VR-4 (Gain) at the B distance until the standards are met.

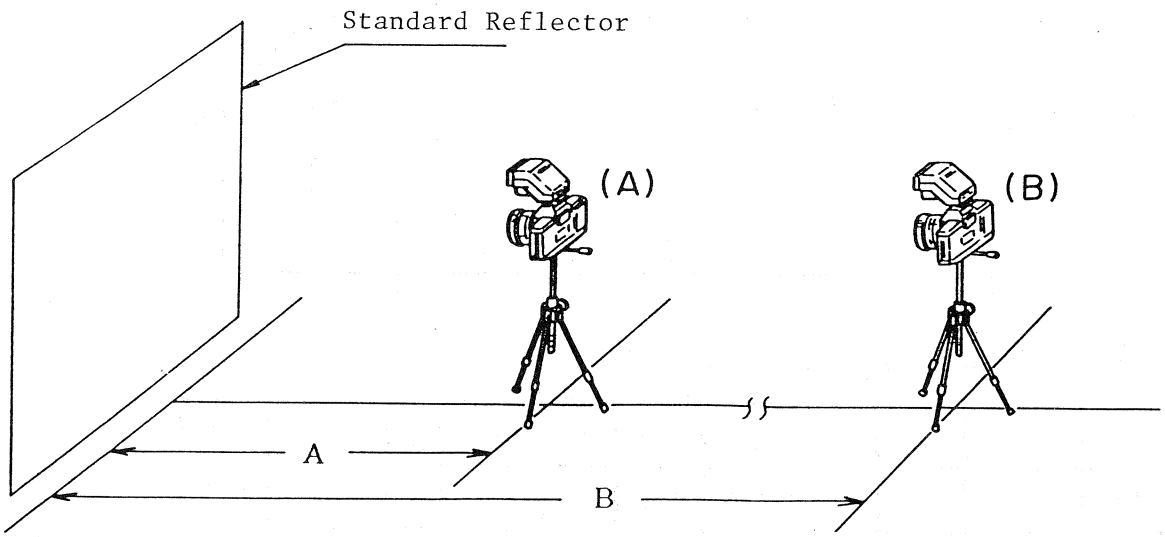
E. Leave the flash head in the normal position, but push the bounce knob up and hold it up. (This fools the flash into thinking that bounce is set and it sets the flash zoom to 50mm automatically, and main tube preflash.)

F. At the 50mm A and B distances, turn the main switch on and wait for at least 20 seconds after the red ready lamp lights. Push the shutter button halfway (SW1 on) and read the AV voltage.

G. Adjust VR-6 until the 50mm standards are met.

H. Check step "C" again, and if the standards are not met, repeat the entire adjustment until all items are within the limits.

Note: This is the standard method. For the simplified method, see the 300EZ repair instructions, page III-7.



Read distances from graph on previous page.

12. Manual Low Guide Number Adjustment

12.1 Standard: Guide No. 15 $\pm$ 0.5EV

Parameters: ISO 100, Zoom 35mm, M, LO $\frac{1}{4}$ Mode

Guide number can be checked with a flash meter if available, or with the EF500 camera tester.

12.2 Adjustment:
Parameters: Dark room

[[Flash Meter Method]]

A. Set the flash meter in front of the standard reflector.

B. Set the flash 2.7 meters from the reflector, fire it and read the aperture from the flash meter.

C. The meter should read f/5.6 $\pm$ 0.5EV. If necessary, adjust VR-5.

(GN15/2.7 = 5.6)

[[EF 500 Method]]

D. Set the EF 500 to ISO 100, K-12.5 and EV6, and cover the light window with black paper. Set the EF 500 near the 2.7m mark from the reflector.

E. Install the flash on an EOS camera set to manual mode and f/5.6. Put the light receptor of the EF 500 in the camera aperture.

F. After the flash is ready, release the shutter and read the EF 500. The reading should be 0 $\pm$ 0.5EV. If not, adjust VR-5.

Note: If adjustment is not possible with VR-5. Adjust the density of the ND filters in front of PD-2.

13. Final Checklist

After repairs have been finished, check the following items.

13.1 Zoom Operation

Install a zoom lens and the flash on an EOS body. Zoom the lens and check that the flash head moves smoothly and that the zoom indicator changes with the flash head position.

Check manual zooming also.

Note: Operation occurs only when the camera's SW1 is on. If an EF zoom lens is not available, use different focal length EF lenses.

13.2 AF Illuminator Beam

Check that the AF illuminator beam operates at low light levels and that the coupling range warning appears when the subject is too far away.

Note: The beam is patterned so that even low- or no-contrast subjects can be measured.

13.3 Sync Mode Selection

Check that the correct sync mode (1st curtain or 2nd curtain) is selected when SW2 is operated.

13.4 SE Mode (Energy-saving mode)

Turn the flash on and check that it goes off after five minutes of inactivity.

13.5 Check multi-flash operation and LCD panel illumination.

14. Service Tools List

14.1 Regulated low voltage power supply (LVPS)

14.2 Digital Multimeter (DMM)

14.3 Analog Multimeter

14.4 18% Gray Target

14.5 Shop-standard EOS body and EF 50mm f/1.8 lens

(A T-90 body is necessary for the official aperture control voltage adjustment.)

15. Basic Functions of Electrical Components

SWITCH LIST

Sw#	Name	Function
SW-1,1'	Main SW	Power on
SW-3	Bounce SW	Sets bounce mode
SW-4	Test SW	Open/test flash
SW-5	EL SW	Panel illumination
SW-6	Manual SW	Sets manual mode
SW-7	A-TTL SW	Switches A-TTL / TTL
SW-8	Sync SW	1st - 2nd curtain sync
SW-9	Zoom A/M SW	Switch between auto and manual zoom and sets manual zoom position
SW-10	Zoom SW	Zoom position sensing switch

IC LIST

IC#	Name (Function)
IC-1	Voltage stabilizer IC
IC-2	Voltage Sensor IC
IC-3	Low voltage flash IC
IC-4	Standard voltage source for IC-3
IC-5	Zoom Control IC
IC-6	Preflash & manual photosensor IC
IC-7	Interface (I/O) IC
IC-8	MPU

Functions by Circuit Board (C.B.)

A C.B.: Main flash Trigger Coil

C C.B.: Delay coil, Rectifier diode

D.C.B.: DC/DC Convertor, Capacitor charging, Preflash, Panel Illumination

Main Components

IC-1	Voltage stabilizer
IC-2	Voltage sensor
SCR-1	EL (panel illumination) discharge
Tr-1, Tr2	EL lighting
Tr-3, SCR-2	Oscillator
Tr-13, SCR-3	Low voltage flash control
T-1	Oscillator transformer
T-2, SCR-6	Preflash trigger coil, SCR
C-21	Trigger capacitor

E C.B.: VCC generator, Low Voltage Flash control, SE circuit

Main Components	
IC-3	Low voltage flash control IC
IC-4	Standard voltage source for IC-3
Tr-6	V Bat (Battery voltage) sensor
Tr-7, Tr-8	SE restart
RT-9, Tr-10, Tr-11	VCC generation
RT-12, Tr-4	Oscillation inhibit
RT-14, Tr-15	Main flash

B C.B.: Main Flash, Flash Duration Control (Automatic flash)

Main Components	
C-24	Initial Flash Capacitor
SCR-4, SCR-5	Main Flash SCRs
SCR-7	Initial Flash trigger SCR
SCR-9, Tr-16	Flash cut-off

F C.B.: Micro Processing Unit

Main Components	
IC-8	MPU
LED-2	Ready "Lamp"
RT-17	Safety circuit
RT-18	Bounce mode zoom control
VR-1	Ready Lamp Ignition adjustment

G C.B.: Flash and Flash control circuits

Main Components	
IC-6	Preflash & manual photosensor IC
IC-7	Interface (I/O) IC
VR-2	EFID adjusting resistor
VR-3, VR-4	FA adjusting resistor
VR-5	M LO adjusting resistor
VR-6	Bounce & Preflash FA level adjusting resistor
LED1	AF Illuminator
RT-19, Tr-20	AF Illuminator driver

Brush C.B.: Zoom position sensing, motor control

Main Components	
IC-5	Zoom Control IC
D-26 through 30	Zoom switch diodes

IV. Electrical Circuit Explanation

1. Oscillation (Generation of Vcc)

A. When SW-1 and SW-1′ would be turned on, V-BAT is applied to 2p of IC-1 through D4.

B. IC-1 which is voltage regulator IC, applied the V-BAT at 2p of IC-1, generates the regulated voltage of 5V at 3p of IC-1.

This voltage of 5V is applied to 2p of IC-2 and 33p of IC-8 (for VDD).

C. IC-2 is voltage detection IC. When the voltage of 3V or more would be applied to 2p of IC-2, 1p of IC-2 generates the same voltage as applied to 2p. (When the voltage of 2p is less than 3V, 1p is OV.)

The voltage applied from 1p of IC-2 is supplied to the emitter of Tr-9.

D. When VDD would be applied to 33p of IC-8, 55p of IC-8 turns to Lo. The signal of 55p drives the base of Tr-9.

E. By C and D above mentioned, Tr-9 is turned on. Then, Tr-11 and Tr-10 are turned on to charge C-14.

F. This line, called as Vcc line, is connected to each power terminal of 60p of IC-7, 1p of IC-6, 8p of IC-3 and D42.

G. When Vcc would rise up, Hi signal is applied to the gate of SCR-2 through D-12 and R27. Then SCR-2 turns on. SCR-2 which is used for oscillation, drives Tr-3 to execute oscillation with T-1.

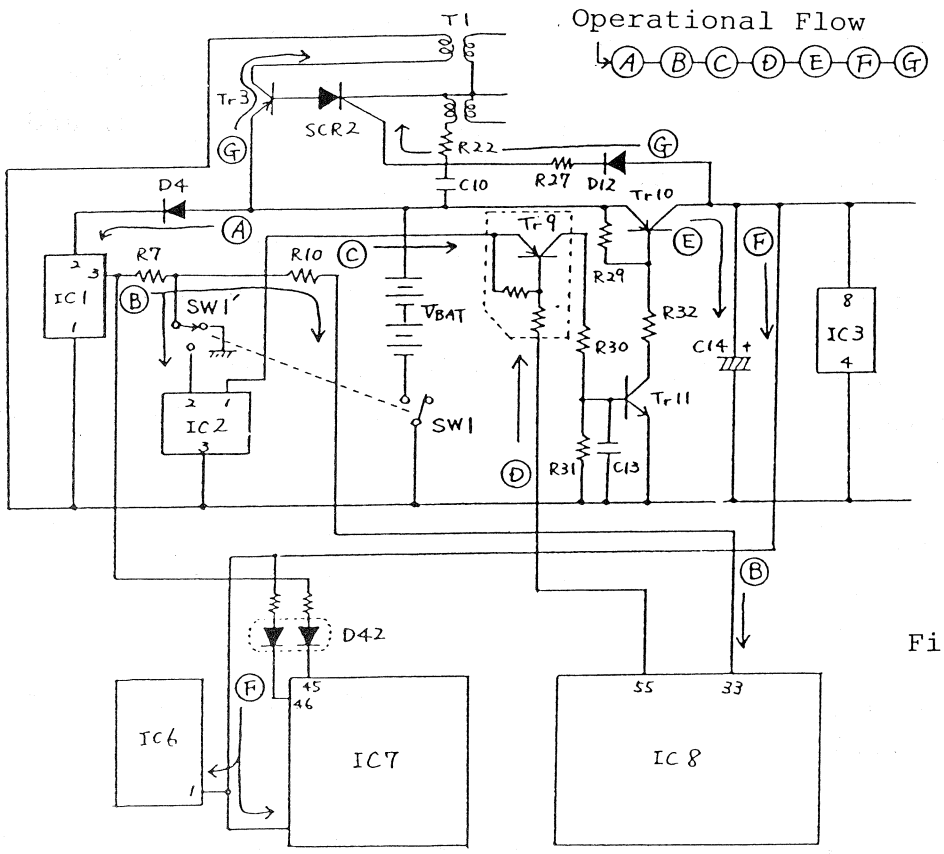


Fig. 1

2. Charge (Completion of Low Voltage Charging)

** The description on condenser's number and function is given in order to explain its operation.

Pre, trigger condenser ⇒ C-21
Pre, flash condenser ⇒ C-23
Main, trigger condenser ⇒ C-25
Main, initial flash condenser ⇒ C-24
Main, flash condenser ⇒ C-19

A. 420EZ uses a low voltage charging method. In this method, trigger condensers (C-21 and 25) are completely charged at 240V or more, then main and pre flash condensers (C-19 and 23) are charged.

B. It starts oscillation to initiate charging up C-24.

C. The charged voltage of C-24 is divided by R36, R37 and R38, then applied to 2p of IC-3.

D. When the voltage applied to 2p of IC-3 would be 3V or less (trigger line is 240V or less, and in the state of impossible to flash), 1p of IC-3 is Hi and Tr-13 is in on state.

E. In fact, the gate of SCR-3 is conducted to GND through D10 and Tr-3. SCR-3 is in off state.

F. In this case, circuits charged via SCR-3, pre and main condensers (C-23 and 19), are halted to be charged up.

G. When the voltage of C-24 would be risen up to 240V or more by charging trigger circuit, 1p of IC-3 turns to Lo then Tr-13 turns off.

H. Consequently, SCR-3 turns on to charge pre and main condensers.

I. The voltage of C-24 is slowly discharged via resistors of R36 ∿ 38 until main condenser is charged at the voltage more than that of C-24. (Charging of C-24 is halted, because the secondary voltage of T1 is dropped by the charging of main condenser.)

J. When the voltage of C-24 would be fallen under 3V by discharging of C-24, 1p of IC-3 turns to Hi to halt the charging of main condenser than initiate the charging of trigger line.

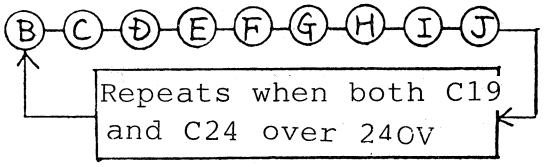
K. After the completion of charging to trigger line, it follows the operation of G and repeats same operations.

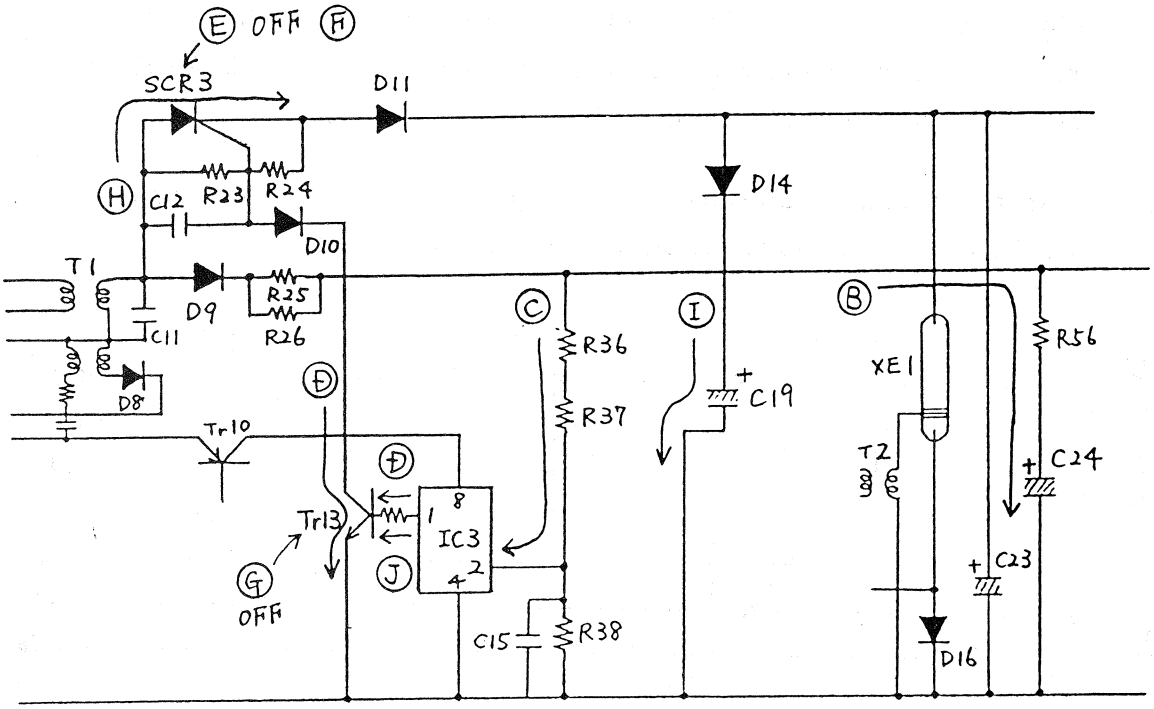
L. By the exchange of charging to trigger line above mentioned, the voltage of trigger line is kept at about 240V or more and main condenser is kept charging.

M. When the voltages of trigger line and main condenser would rise over 240V, SCR-3 does not exchange charging, and both condensers are charged simultaneously.

Charge

Operational Flow





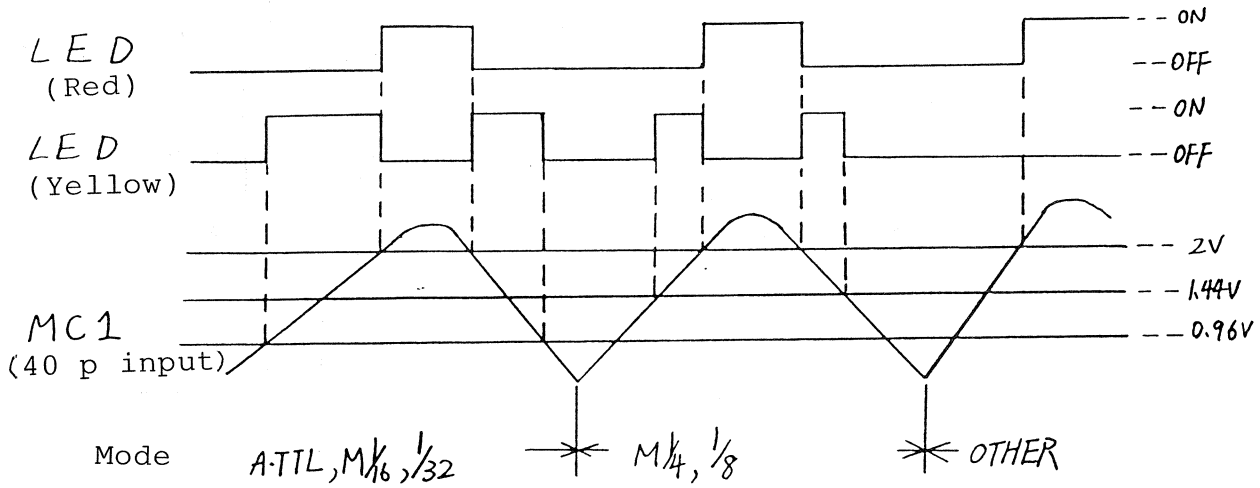
Fing. 2

3. Display of Charging

A. Charged quantity (voltage) of main condenser (C-19) is divided by R42 and VR-1 via D-14, then applied to 40p of IC-7.

B. When this voltage would rise over reference value, 45p (yellow) and 46p (red) of IC-7 turn to Lo. Then Either yellow or red of pilot lamp LED-2 lights up to indicate the completion of charging.

C. Light-up time (charging voltage of main condenser) varies as follows, depending on each mode.



* That is to say, charging quantity of lowest requirement varies in each mode.
(Example: M1/16 mode ⇒ In this mode, full flash is not done, it is previously known that flash of 1/16 power is complete.)

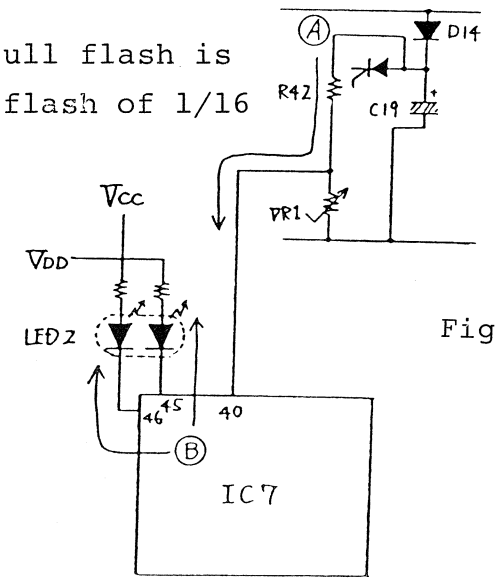


Fig. 3

4. Pre Flash and Aperture Value Setting

A. By pressing the SW-1 of camera, TV signal is applied to 6p of IC-7.

B. Simultaneously, signal (EFID signal) is applied from camera to 9p of IC-7 in order to inform of the mode of camera.

C. If the mode of camera would inform as M or the mode of speedlite would be other than A-TTL, pre flash is judged as unnecessary and following operations are not executed.

[Normal pre flash (Near infrared rays)]

When bouncing, see the bounce pre flash of next item.

D. Trigger signal (Hi) for pre flash is transferred from 37p of IC-7.

E. This signal is applied to the gate of SCR-6, then SCR-6 turns on to initiate the discharging of C21.

F. In this case, the voltage boosted by T-2 is applied to Xe-1 to initiate pre flash.
(C-23 is pre condenser.)

G. Light reflected from object by the pre flash is entered into PD-1, and transferred from 8p of IC-6 to 55p of IC-7.

* For the following steps, see the L in "Aperture Value Setting".

[Bounce pre flash (modicum flash of main part)]

H. In pre flash which follows bounce flash, main flashing part lights up in the same manner as 300TL.

I. When speedlite would be in the state of bounce (detected by SW-3), Hi signal is transferred from 35p of IC-7.

J. Consequently, SCR-7 turns on, C-25 discharge ⇒ trigger is applied to Xe-2 via T3 ⇒ Xe-2 executes modicum constant flash. (In this case, power is supplied by C-23, because SCR-4 is off, so that the power of C-19 (main condenser) can not be supplied.

K. Light reflected from object by pre flash is entered into PD-1 locating on the front of speedlite , then transferred to IC-7.

Aperture Value Setting

L. This data is informed to body as range data via AVEF line

M. Based on this data, AV value is determined by considering surrounding light, ISO and mode.

N. The AV value determined is displayed in view finder. Moreover, AV value is transferred to speedlite. via EFID line, and displayed in LCD display locating on back site.

NOTE: AVEF data is transferred digitally to EOS series camera and analogically to T90. (It is judged by the terminal voltage of EFID which camera, T-90 or EOS, is connected to speedlite. <EOS series could be judged when the voltage is over 1.5V.>)

Preflash & Aperture Setting

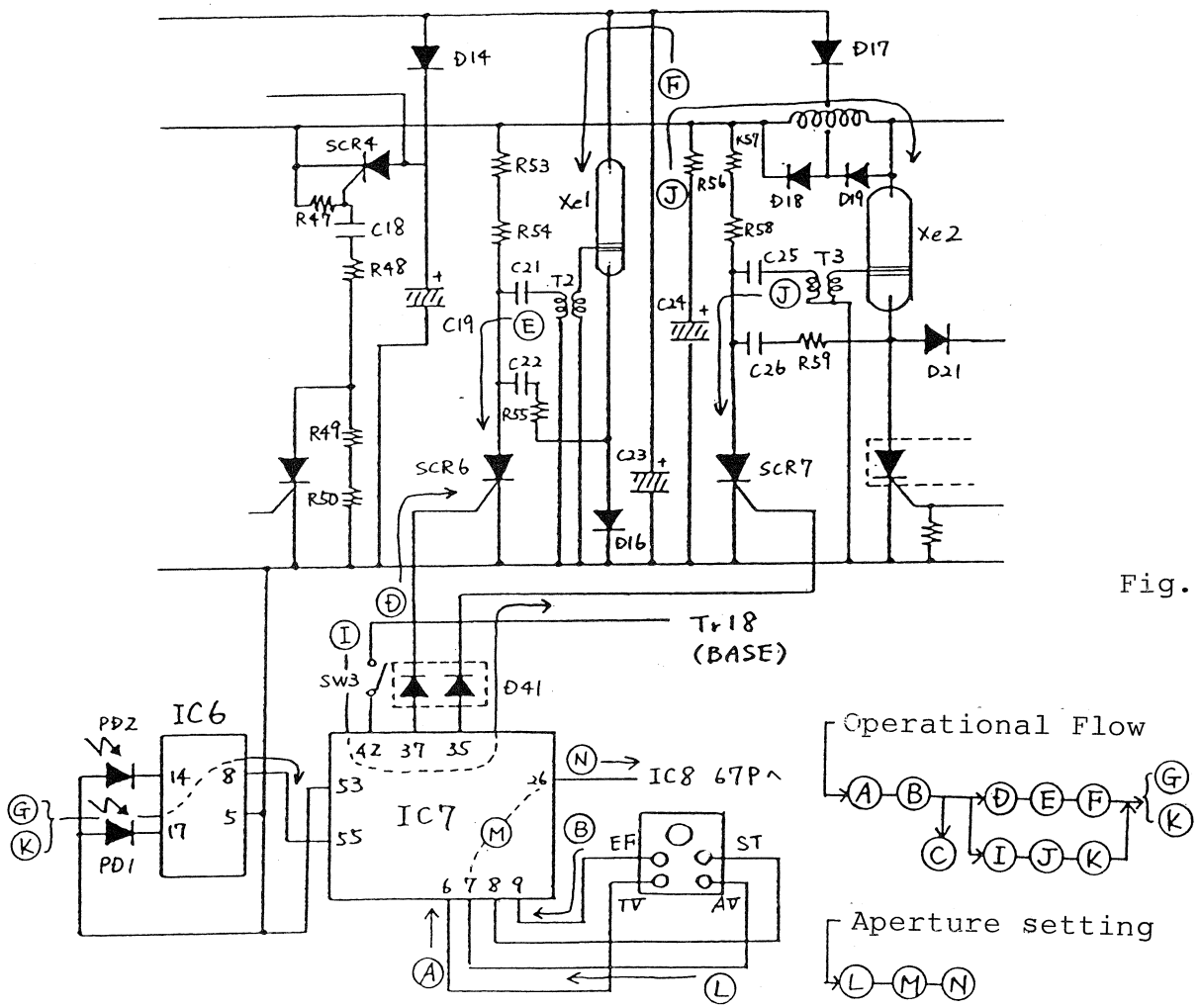


Fig. 4

5. Main Flash

A. At shutter release, the STSP signal from the camera is applied to pin 8 of IC-1.

B. When the first curtain completes its run, the X synchronization signal is applied to pin 10 of IC-1.

C. The AND signal (STSP + X) causes the trigger signal (high) to be output from pin 35 of IC-7 to start the initial flash and immediately another high is output from pin 36 for the main flash.

D. The high from pin 35 gates SCR-7 on, allowing C25 to discharge. As C25 discharges the current through the primary of T3 induces a much higher voltage in the secondary which is applied to the trigger electrode on the main flash tube, ionizing the gas allowing it to conduct. (When triggered, the impedance of the tube is only a few ohms.)

E. The high from pin 36 of IC-7 turns Tr-5 on. Current flow through Tr-5 turns RT-14 on and applies a high signal to SCR-5.

F. With SCR-5 gated on by the high, C18 discharges through R47, L, Xe-2, SCR-5, and R-48. (Since Xe-2 is ionized at this time its resistance is negligible.)

G. The discharging of C-18 gates SCR-4 on.

H. This allows the main capacitor C-19 to discharge through SCR-4 and the coil L and the main flash tube Xe-2 causing the main flash.

Note: The reason the main flash is divided into a small initial flash and the main flash is to slow the initial discharge allowing more accurate control of flash exposure at close distances.

Safety Circuit

If the flash termination signal (a high from pin 34 of IC-7) were generated by noise or some other abnormality after the main capacitor was charged, but flash was not actually under way, serious damaged could be caused to the line including R69 and SCR-9. This circuit prevents this from happening.

I. To prevent spurious signals from activating the flash termination signal, pin 34 of IC-7 is normally grounded (low). This holds Tr-16 off, which prevents SCR-9 from being gated on.

J. When a trigger signal is output from either pin 35 or 36 of IC-7, it is sent also to one of the bases of RT-17 turning it on.

K. With RT-17 on, pin 38 of IC-7 goes low.

L. This condition removes the ground from pin 34 of IC-7 so that the flash termination signal can be sent to the base of Tr-16 at the proper time. Since Xe-2 is flashing at this time, its resistance is quite low and the R69 / SCR-9 circuit will not be damaged when SCR-9 (II) is turned on and the flash is terminated.

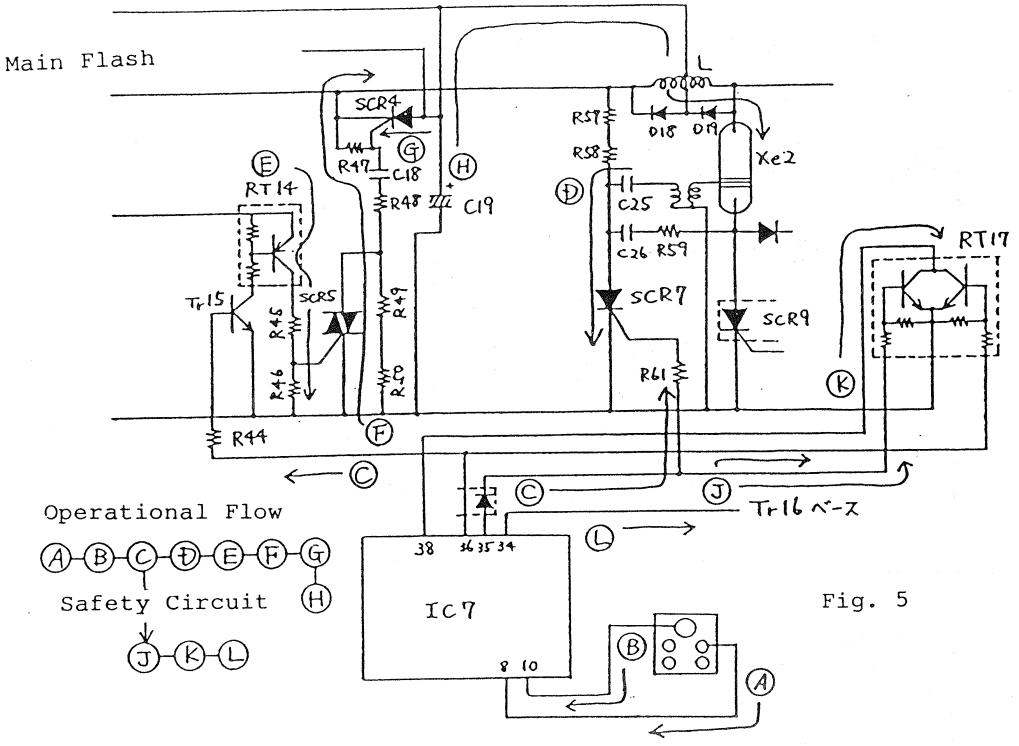


Fig. 5

6. Automatic Flash Termination

A. Light reflected from object by main flash is entered into SPC of camera.

B. When camera would judge an exposure as complete, STSP signal turns from Lo to Hi (flash stopping signal).

C. When 8p of IC-7 would receive this signal, it transfers Hi signal to 34p of IC-7.

D. Consequently, Tr-16 turns on, and SCR-9 (II) turns on.

E. When SCR-9 (II) turns on, C-28 (commutating condenser) is discharged to apply reverse voltage into SCR-9 (L).

F. Finally, SCR-9 (I) turns off to halt flash.

NOTE: Light adjusting level can be adjusted in body side, but existing speed light is different from it. (Because light adjusting level varies depending on the timing of STSP signal.)

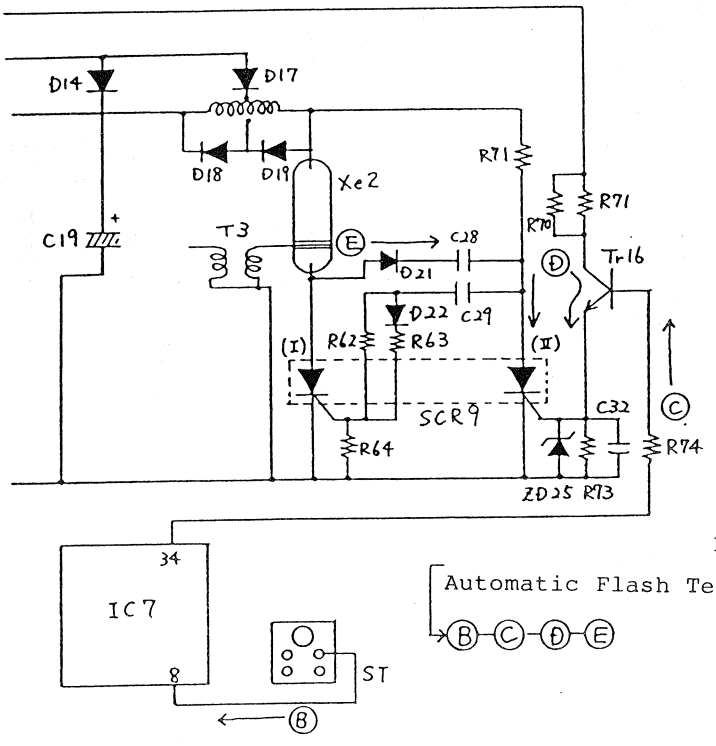


Fig. 6

7. AUTO ZOOM

A. When replacing lens, zooming and pressing the SW-1 locating on body side, the data of focus range is transferred from body to speedlite (9p of IC-7) via EFID line.

B. IC-7 transfers this data from 26p of IC-7 into 67p of IC-8.

C. Consequently, IC-8 judges whether AUTO ZOOM is required or not.

D. If focus range would be modified, IC-8 transfers signal to LCD display to indicate new focus range.

E. On the other hand, either 65p or 66p of IC-8 (determined by depending on ZOOM direction) transfers Hi signal in order to adjust an irradiation angle.

F. When this signal would be entered into 4p or 8p of IC-5, 15p and 17p of IC-5 turn to Hi and Lo respectively (vary depending on ZOOM direction), then motor rotates to move the flash unit.

G. The information on flash unit's movement is entered in 59p ~ 61p of IC-8 via SW-10.

H. The motor continues to rotate in order to set correct irradiation angle until the data of focus range from lens and the data of SW-10 accord with each other.

NOTE: In the case when the motor is rotating, IC-8 transfers signal from 65p and 66p of IC-8 into 3p of IC-3 via D-13 in order to forbid charging of main condenser.
(See the "charging interruption" of 10th item for further details.)

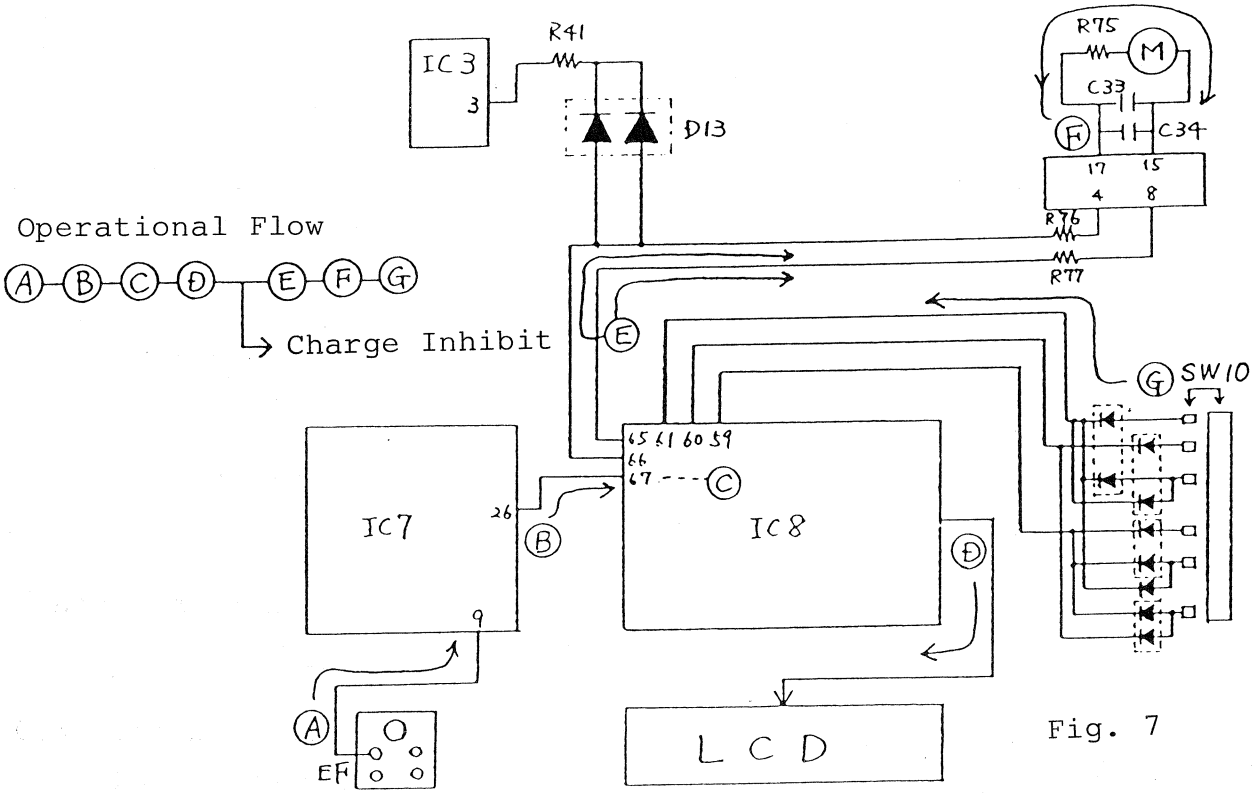

Operational Flow
A B C D E F G
Charge Inhibit
IC3
3
R41
D13
R75
M
C33
C34
F
17
15
4
8
R76
R77
E
G
SW10
65 61 60 59
66
67
C
IC7
26
B
IC8
D
9
A
O
EF
L C D

Fig. 7

8. AF LED Operation

A. When the luminance of object would be under reference value so that AF detection can not be executed, auxiliary flash (red LED) used for AF lights up as follows.

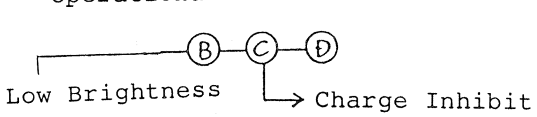
B. When AF auxiliary flash would be necessary for photographing, Hi signal of about 5V is generated in TV line.
(This signal is pulse waveform, and repeated up to 10 times until AF detection is completed.)

C. When 6p of IC-7 would receive this signal, 6p of IC-7 applies Hi signal into 44p of IC-7.

D. Consequently, RT-19 and RT-21 turn on to light up AF LED (LED-1).

* TR-20 regulates constantly the current flowing into LED.

NOTE: Hi signal is also transferred from 44p of IC-7 to 3p of IC-3 via D-45 in order to forbid the charging of main condenser during light-up of AF LED. (See the "charging interruption" of 10th item for further details.)



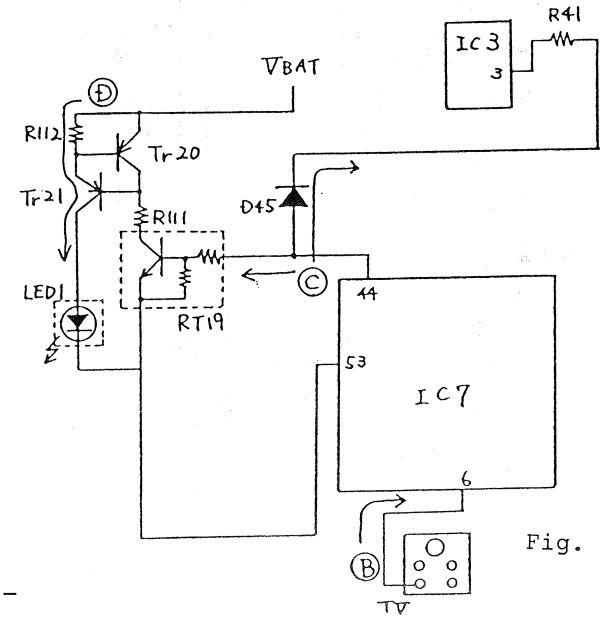


Fig. 8

9. Charging Interruption

A. Charging of main condenser (C-19) is temporaly forbidden by the following method in order to prevent error operation caused by the over load of battery (⇒ V-BAT falls down rapidly) when zoom motor is rotating or AF auxiliary flash is lighting up.

B. When zoom motor is rotating, Hi signal is transferred from 65p or 66p of IC-8 into 3p of IC-3 via D-13.

C. When AF auxiliary flash is lighting up, Hi signal is transferred from 44p of IC-7 into 3p of IC-3.

D. When these Hi signals would be entered in 3p of IC-3, 1p of IC-3 turns to Hi regardless of the input situation of IC-2 2p.

E. Consequently, Tr-13 turns on and SCR-3 turns off. Charging of main condenser is temporally forbidden to prevent error operation caused by rapidly dropping down of power supply.

NOTE: When charging of pre and main condensers (C-23, C-19) is forbidden, oscillation in executing.

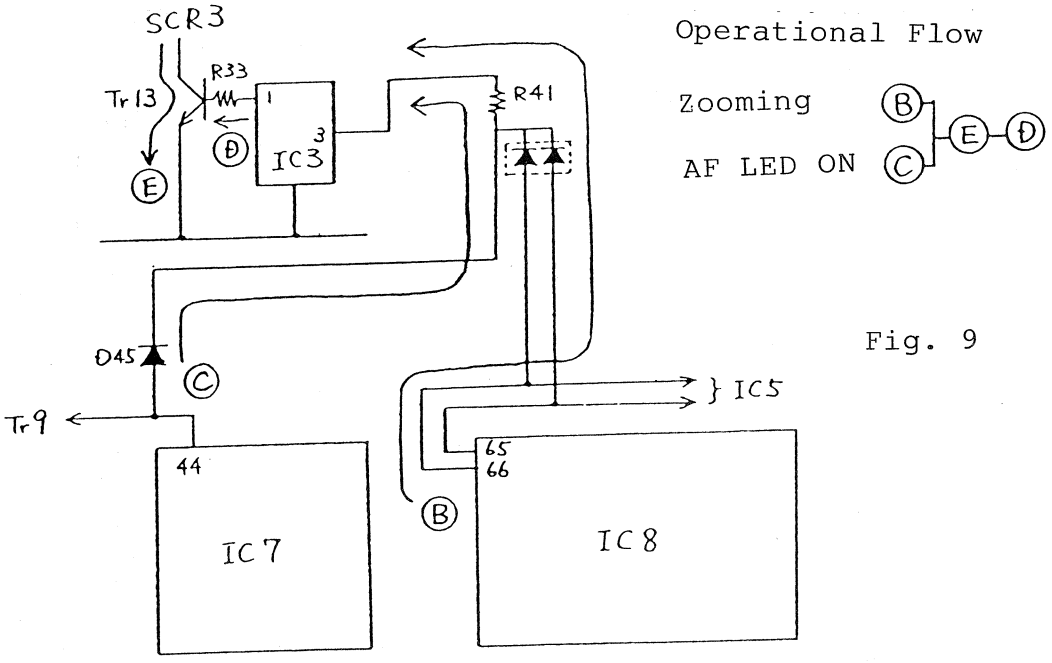


Fig. 9

10. (Panel Lighting) Operation

A. When pressing the light SW (SW-5) locating on rear operation panel, the signal of light SW is transferred to 74p of IC-8.

B. Then, pulse signal of Hi is repeatedly transferred to 56p of IC-8.
(Pulse signal is about 640 Hz and transferred for about 8 seconds after pressed the light SW.)

C. Hi signal is entered in the base of Tr-2 to turn on Tr-2 and Tr-1. SCR-1 remains in off state. Consequently, the voltage of about 240V or more is supplied to EL.

D. After that, the base of Tr-2 is turned to Lo by falling down of pulse signal, and Tr-2 and Tr-1 turn to off. SCR-1 is turned to on by electric charge stored in EL, and electric charge in EL is instantaneously discharged.

E. By repeated C and D operations, high voltage pules is repeatedly applied to EL. Consequently, EL lights up.

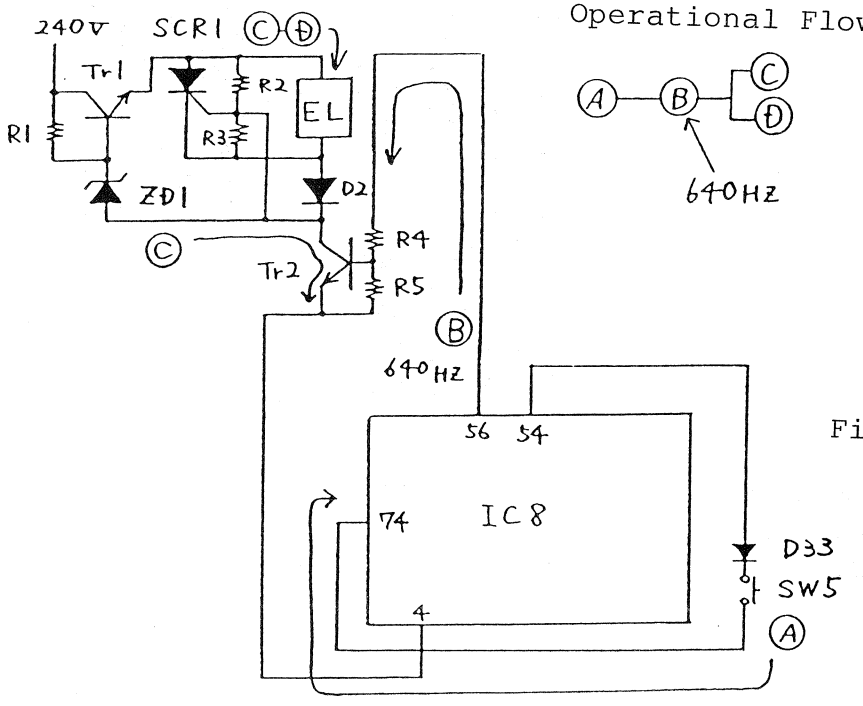


Fig. 10

11. SE Timer

A. After turned SW-1 on, when no operation would be continued for about 5 minutes, 55p of IC-8 turns from Lo to Hi and Tr-9 turns to off. Tr-11 and Tr-10 turn to off, and Vcc is not supplied to SCR-2 (SCR for controlling oscillation). SCR-2 turns to off, then stops oscillation.

B. Oscillation will be initiated again when the test button would be pressed or the signal (Hi signal from TV line) transferred from camera would change 29p of IC-7 into Lo state.

C. This signal turns on Tr-8, and Hi signal is transferred to 70p of IC-8 via Tr-7.

D. Consequently, 55p of IC-8 turns from Hi to Lo again, then oscillation is initiated again.

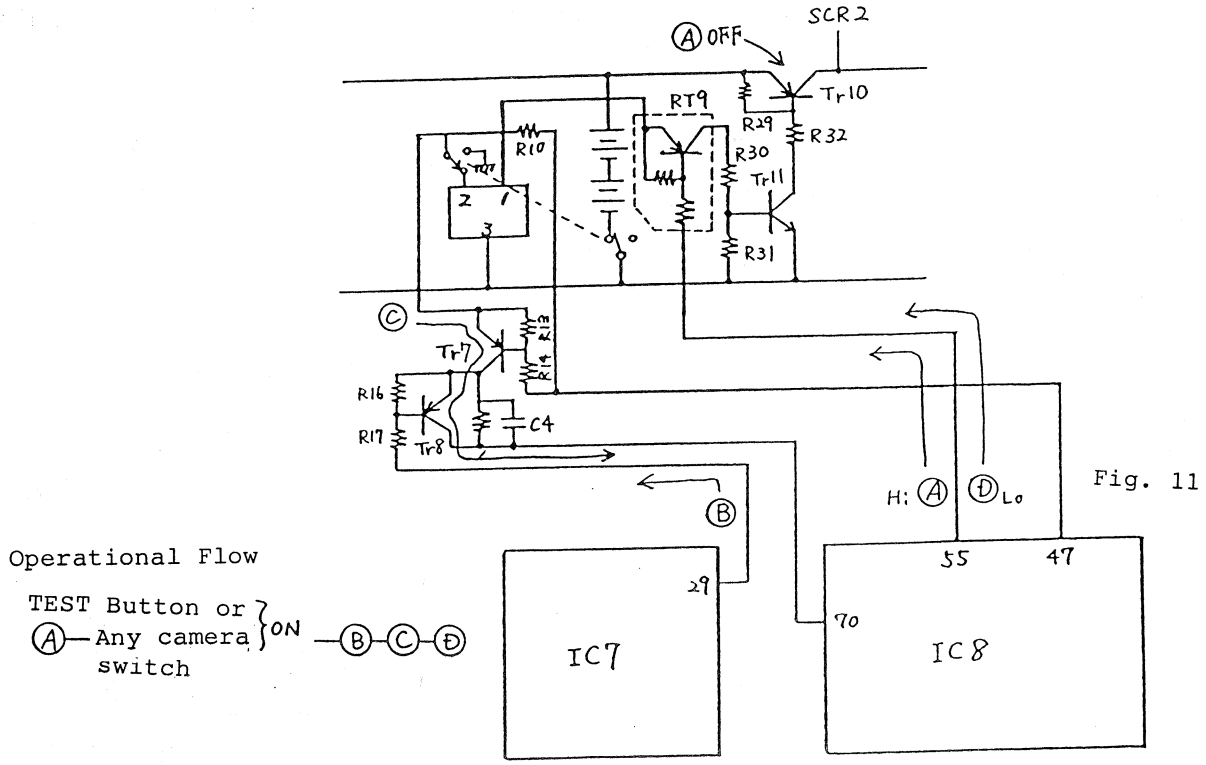


Fig. 11

12. Backup Storage of Mode

A. When you would replace battery with keeping the main SW and SW-1.1 in on mode, speedlite is turned to SE mode automatically as follows.

B. When battery would be removed, Tr-6 turns to off and the collector of Tr-6 becomes Hi state.

C. Then, Hi signal is applied to 47p of IC-8, and IC-8 turns its 55p from Lo into Hi state. Speedlite is turned to SE mode.

D. In this case, the voltage (VDD) of IC-1 3p is maintained for about 20 seconds by the electric energy charged in C-1. Consequently, the contents of mode can be stored within 20 seconds.

NOTE: All modes are reset to initial mode when the main SW would be turned from off to on.
(Differentiation circuit composed of C3 and R9 generates a reset pulse, and the reset pulse is entered into 48p of IC-8 in order to reset IC-8).

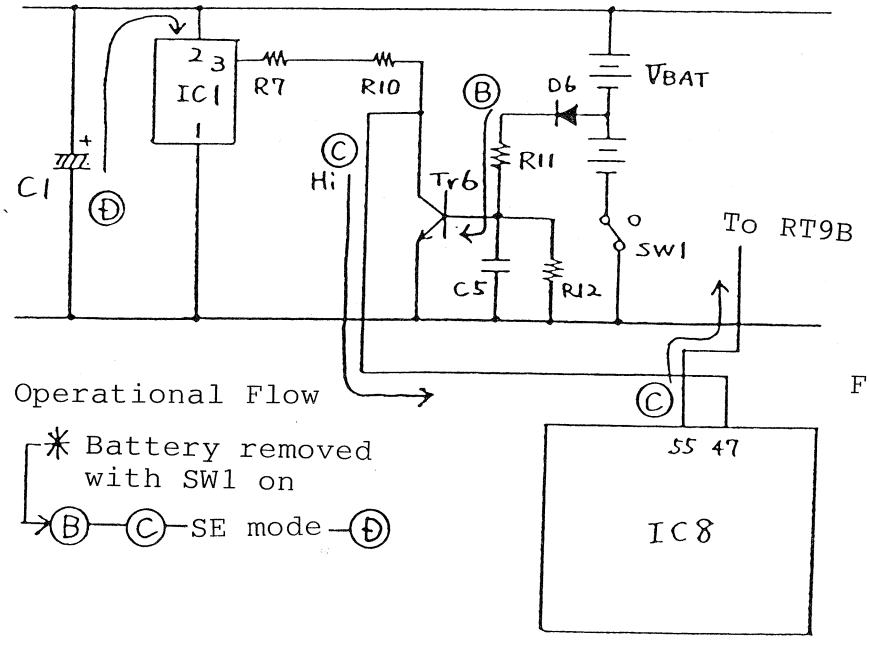


Fig. 12

13. Temporary Halt of Oscillation

A. 33p of IC-7 is sensing the voltage level of Vcc.

B. When the voltage level would fall under 3V, circuit operates as follows in order to prevent error operation caused by dropping of Vcc.

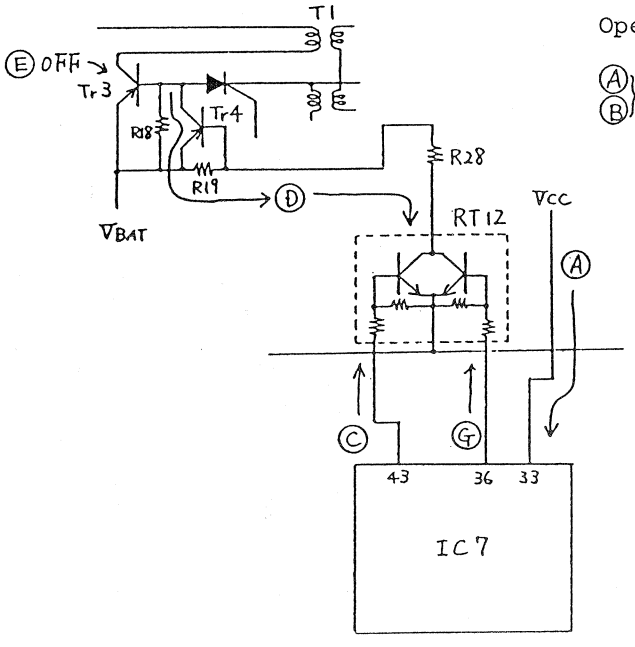
C. When Vcc falls under 3V, 43p of IC-7 turns to Hi.

D. Then, RT-12 and Tr-4 turn to on.

E. When Tr-4 would turn to on, Tr-3 turns to off, then oscillation is halted.

F. When Vcc would return over 3V, 43p of IC-7 turns to Lo again, then oscillation is initiated agian.

G. On the other hand, during main flash, 36p of IC-7 is temporaly held in Hi state to halt oscillation by the same method above mentioned in order to stabilize each operation (especially light adjustment level control) executed immediately after main flash. (Because fluctuation of Vcc level may influence to light adjustment level.)



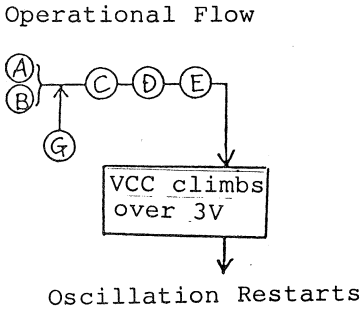


Fig. 13

14. Manual Lo flash

A. By pressed the SW-6, SW-6 informs IC-8 74p of manual Lo mode.
(It is changed from M1/1 to M1/32 by the pressed time of SW-6.)

B. This data on mode is transferred form IC-8 75 ∿ 78p to IC-7 15 ∿ 18p.

C. When IC-7 would receive this data, IC-7 directs 2p of IC-6 to use PD-2. (IC7 59p)

D. X and STSP signals are entered in 10p and 8p of IC-7 by releasing camera.

E. Trigger signal used for main flash is generated from 35p and 36p of IC-7 by X and STSP signals. Then, main flash is initiated. (See the "main flash" of 6th item for further details.)

F. Simultaneously, the quantity of flash is entered in PD-2.

G. The quantity of flash is transferred from 8p of IC-6 to 55p of IC-7.

H. IC-7, comparing with the quantity of flash and the set mode (from M1/1 to M1/32), transfers an appropriate flash halt signal from 34p of IC-7.

I. The flash halt signal activates flash halt circuit to stop flash.
(See the "Automatic Flash Termination" of 7th item for further details.)

Multi Flash

J. Multi flash is basically same operation as manual Lo flash above mentioned, but following items are added.

K. By pressed SW-6 and SW-8, multi flash mode is entered in 75p and 76p of IC-8, and the data on multi flash mode is also transferred to IC-7.

L. IC-7 recognizes multi mode.

M. In this mode, when flash signal (X, STSP) would be transferred from camera, trigger signal set for multi mode is repeatedly transferred from IC-7 in order to initiate multi flash.
(Flash can be halted by the same method as manual Lo operation.)

V. Troubleshooting

Troubleshooting of the 420EZ is complicated by the connectors used to connect the circuit boards. Use this chart to narrow down to one of the lettered charts following.

Checkpoint		Detail check	Chart
Main Switch On			
Oscillator Sound	No		A
Yes			
Ready Lamp Lights	No	No light	B
		Lights very slowly	C
Yes			
EFID Signal OK	No		D
Yes			
Preflash OK	No		E
Yes			
AVEF Signal OK	No		F
Yes			
TV Signal OK	No		G
Yes			
Main Flash Ok	No		H
Yes			
Flash Control OK	No	Full power flash	I
		Improper control	J
SE doesn't operate			K
Zoom Motor doesn't operate			L
AF Illuminator doesn't operate			M

Checkpoint		Indication		Suspect Parts
A.	Main switch Use LVPS	Charging sound Ok		SW or solder Battery bad, battery contact bad
		No Charging sound		
			Ammeter doesn't move	Battery contact poor soldering, Check IC-1
			Ammeter moves slightly LCD Indicates OK	T-1 open line Tr-3 open line Tr-4 shorted SCR-2 open line RT-9, Tr-10, 11 open
			LCD not OK	Tr-6, Tr-7 open Check IC-8
B.	Read main capacitor voltage	0 V		
			SCR-3 not operating	Check IC-3, IC-4 C-24 bad Tr-13 shorted SCR-3 open
			SCR-3 OK	C-19 & connections
		Somewhat under 250V		SCR-9 shorted C-28 shorted, leaky C-19, 23 " "
		Over 250V		
			Main flash flashes	Check IC-7 LED-2 bad
			Main flash NG	VR-1 Adj., poor soldering, Check IC-7
C.	Check Ready Lamp Ignition Voltage	At 260V, red doesn't light		VR-1 adj. bad
		Ignition voltage OK		Tr-3 bad

Checkpoint		Indication	Suspect Parts
D.	Check EFID current	Out-of-limit	VR-2 adj. improper
		No signal	IC7-, pin 9 poor soldering, check EFID contacts
E.	Momentarily short SCR-6 anode to cathode	Main flash OK	IC-7, pin 37 poor soldering, SCR-6 open line
		No main flash	Xe-1 bad, T-2 bad, SCR-6 shorted
F.	Check AVEF voltage	Out-of-limit	VR-3, VR-4 adj. bad
		No signal	Check IC-7 pins, Shoe wiring
G.	Check TV line current	No current change when ready lamp lights	Check IC-7 pins, Shoe wiring
H.	Momentarily short SCR-7 anode to cathode	Flash OK	SCR-9 open Tr-16 open Check IC-7, pin 34 Check IC7, pin 8 open line
		Weak flash	SCR-9 open C-28 open line
		No flash	Xe-2 / T-3 bad SCR-7 shorted C-25 bad
I.	Check SCR-9 operation	Doesn't operate	SCR-9 open Tr-16 open Check IC-7, pin 34 Check IC-7, pin 8 Check leads
		Operates	C-28 bad SCR-9 shorted

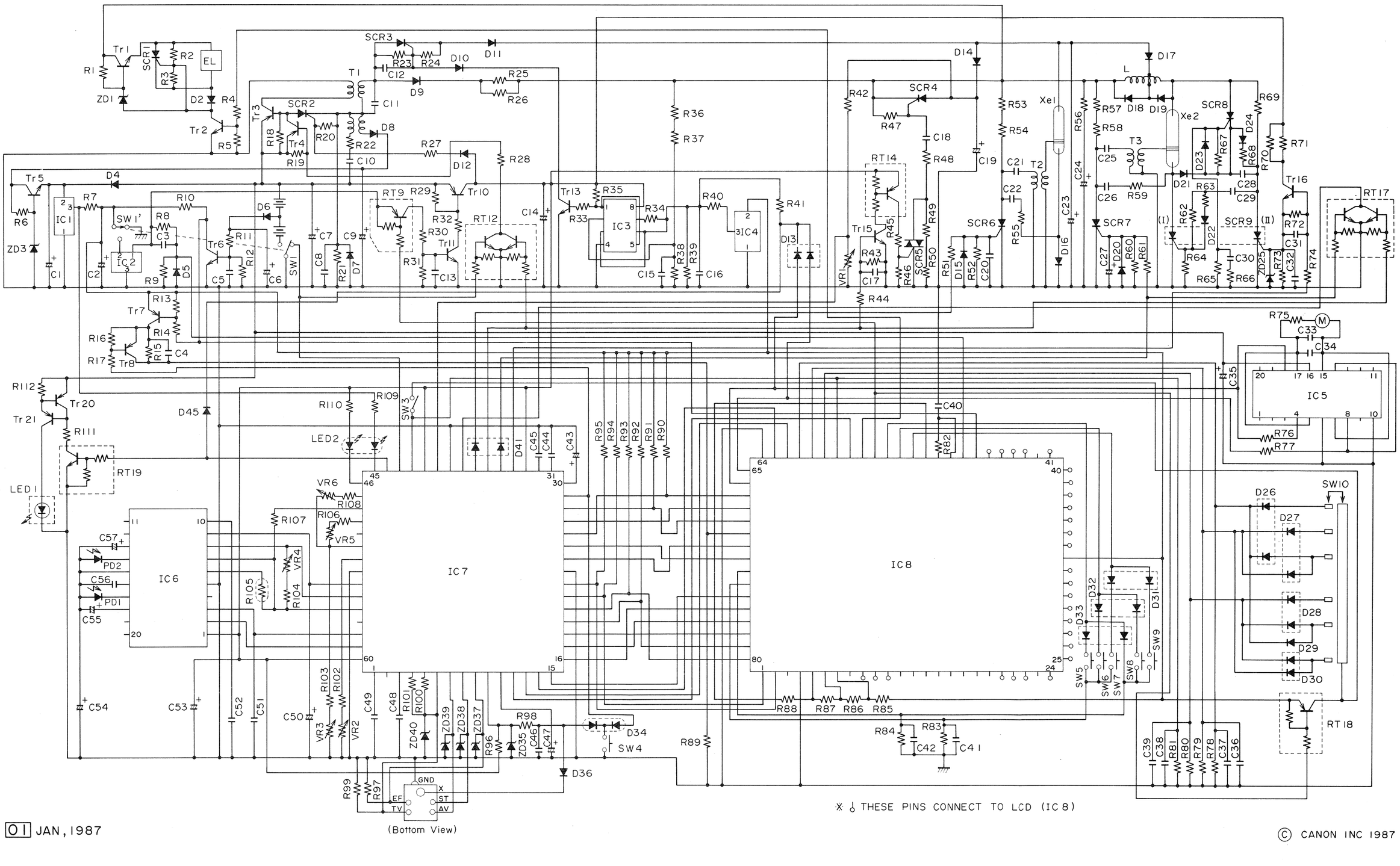
	Checkpoint	Indication	Suspect Parts
J.	Check aperture control		Check IC-6, pin 7
K.	Remove RT-9	Oscillation stops	RT-9 shorted Check IC-8, pin 55
		Oscillation doesn't stop	Tr-10, 11 shorted SCR-2 shorted
L.	Check signal at IC-8, pins 65, 66	No signal	Check Brush C.B. Check IC-8
		Signal OK	Check IC-5, motor
M.	Check output of IC-7		Check IC-7, LED-1, RT-19, Tr-20, Tr-21, Accessory shoe wiring

REF. NO. C50-0551

CANON SPEEDLITE 420EZ

SCHEMATIC DIAGRAM

CY8-1626-104-200



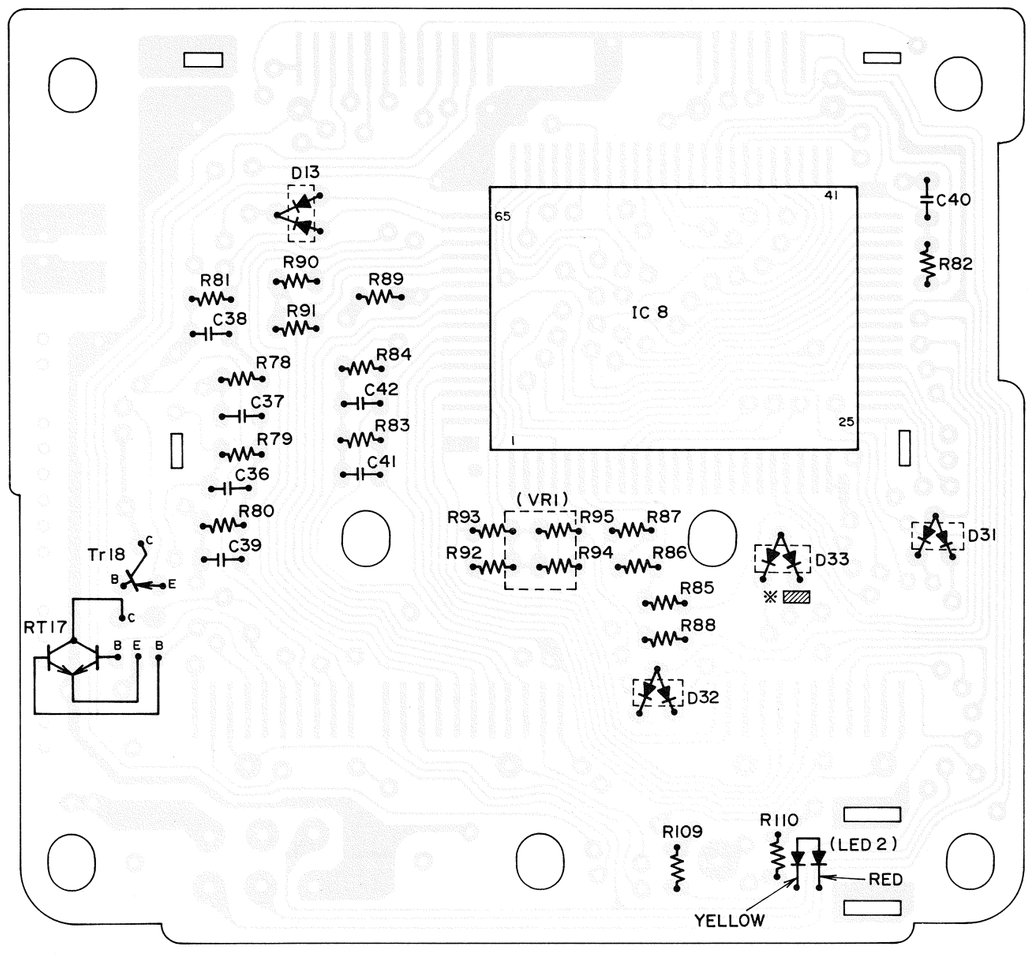
※ ↓ THESE PINS CONNECT TO LCD (IC8)

01 JAN, 1987

CANON SPEEDLITE 420EZ

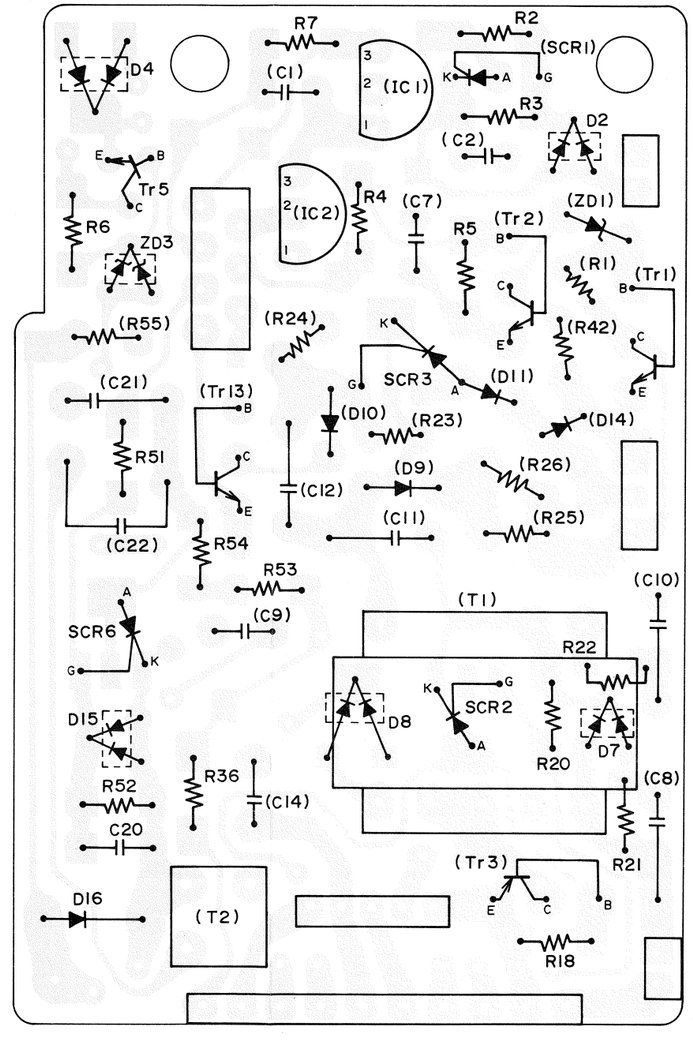
ELECTRIC PARTS UNITS
CY8-1426-108-201

F BOARD



※▨ CUT PATTERN HERE FOR "METER" DISPLAY

D BOARD



( ) : REVERSE SIDE

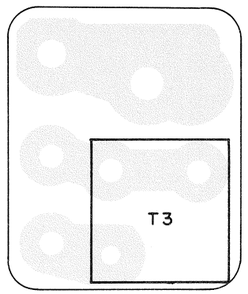
01 JAN, 1987

REF. NO. C50-0551

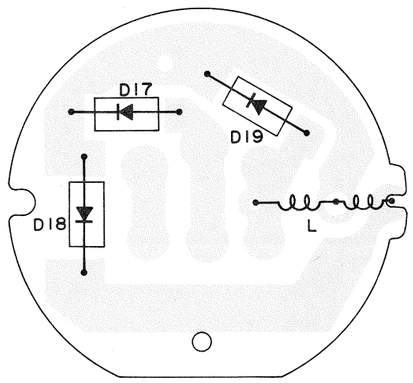
CANON SPEEDLITE 420EZ

ELECTRIC PARTS UNITS
CY8-1426-108-202

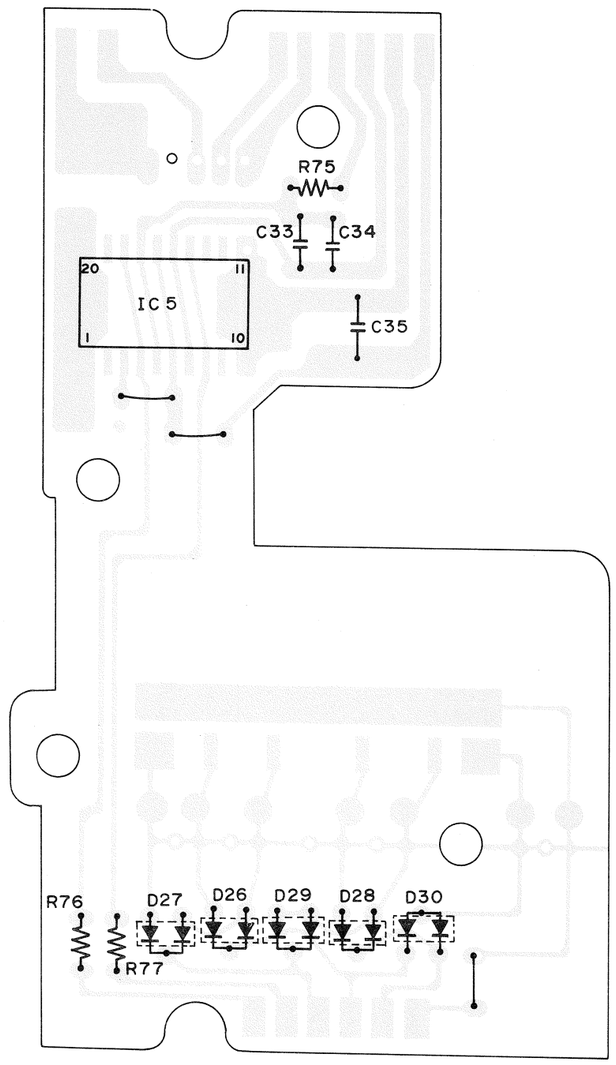
A BOARD



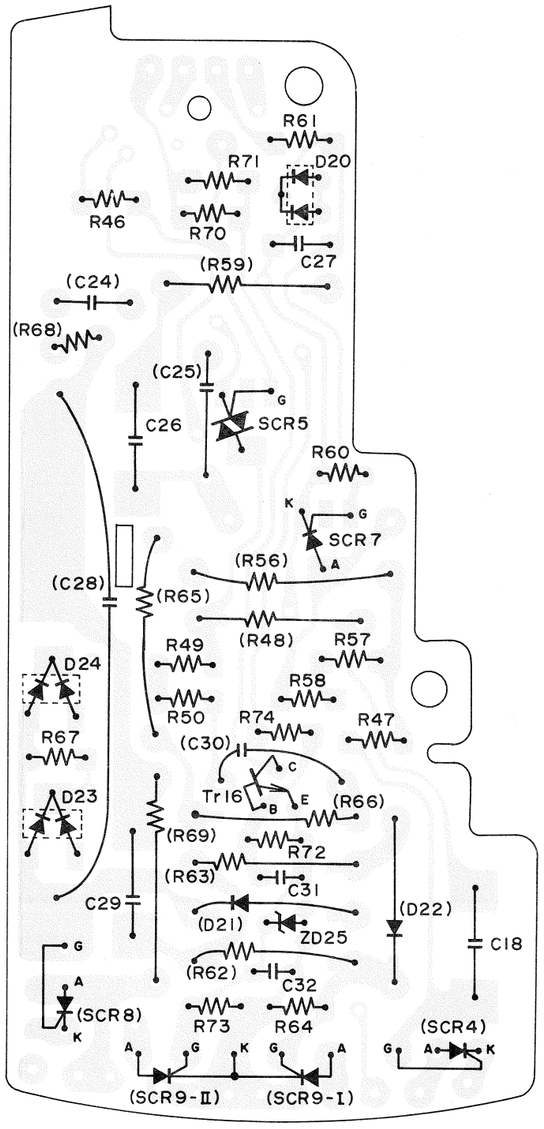
C BOARD



BRUSH BOARD



B BOARD



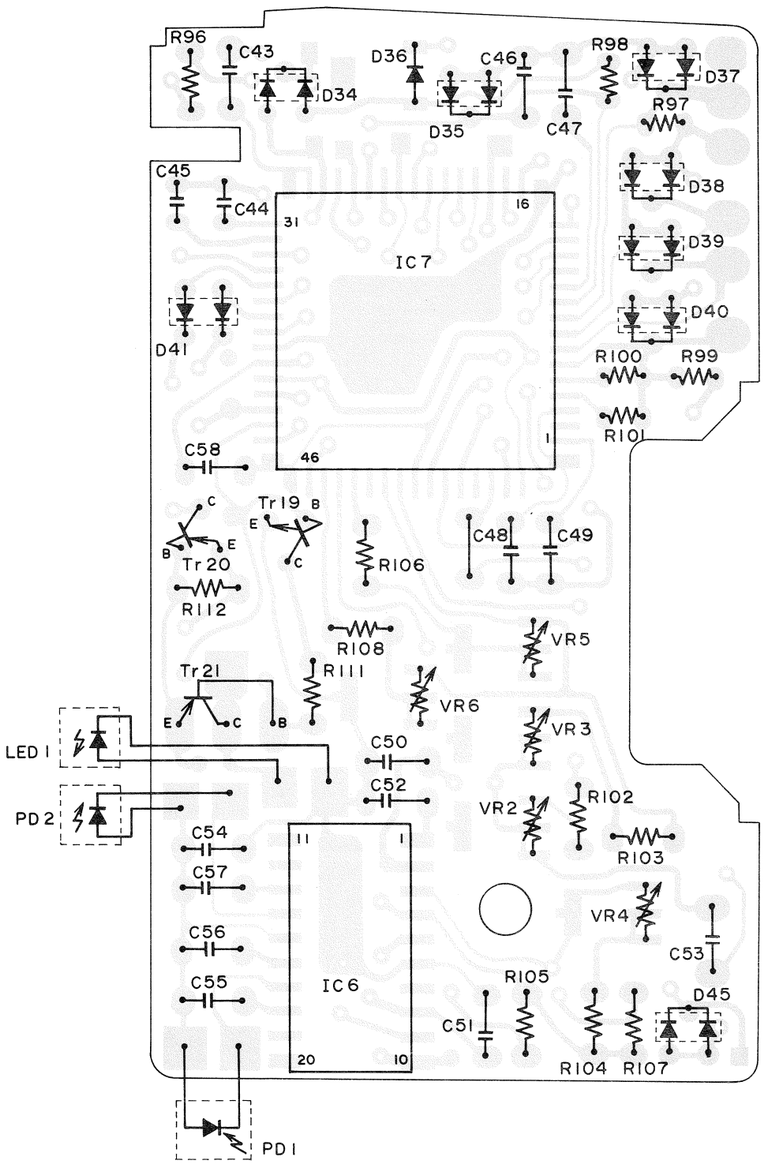
( ) : REVERSE SIDE.

01 JAN, 1987

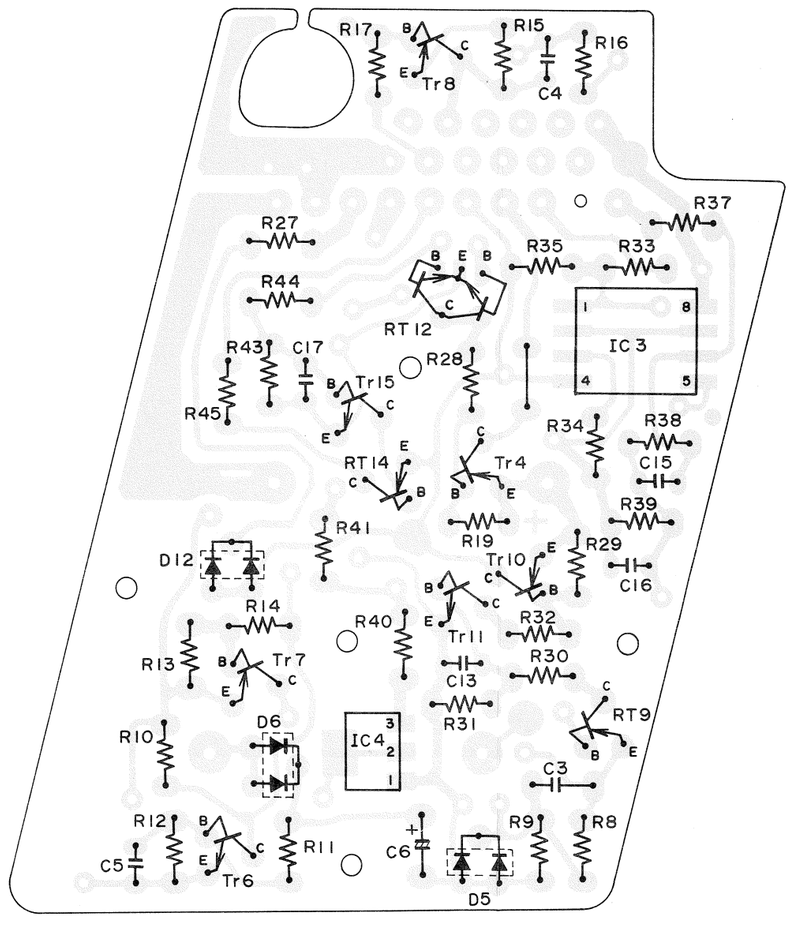
CANON SPEEDLITE 420EZ

ELECTRIC PARTS UNITS
CY8-1426-108-203

G BOARD



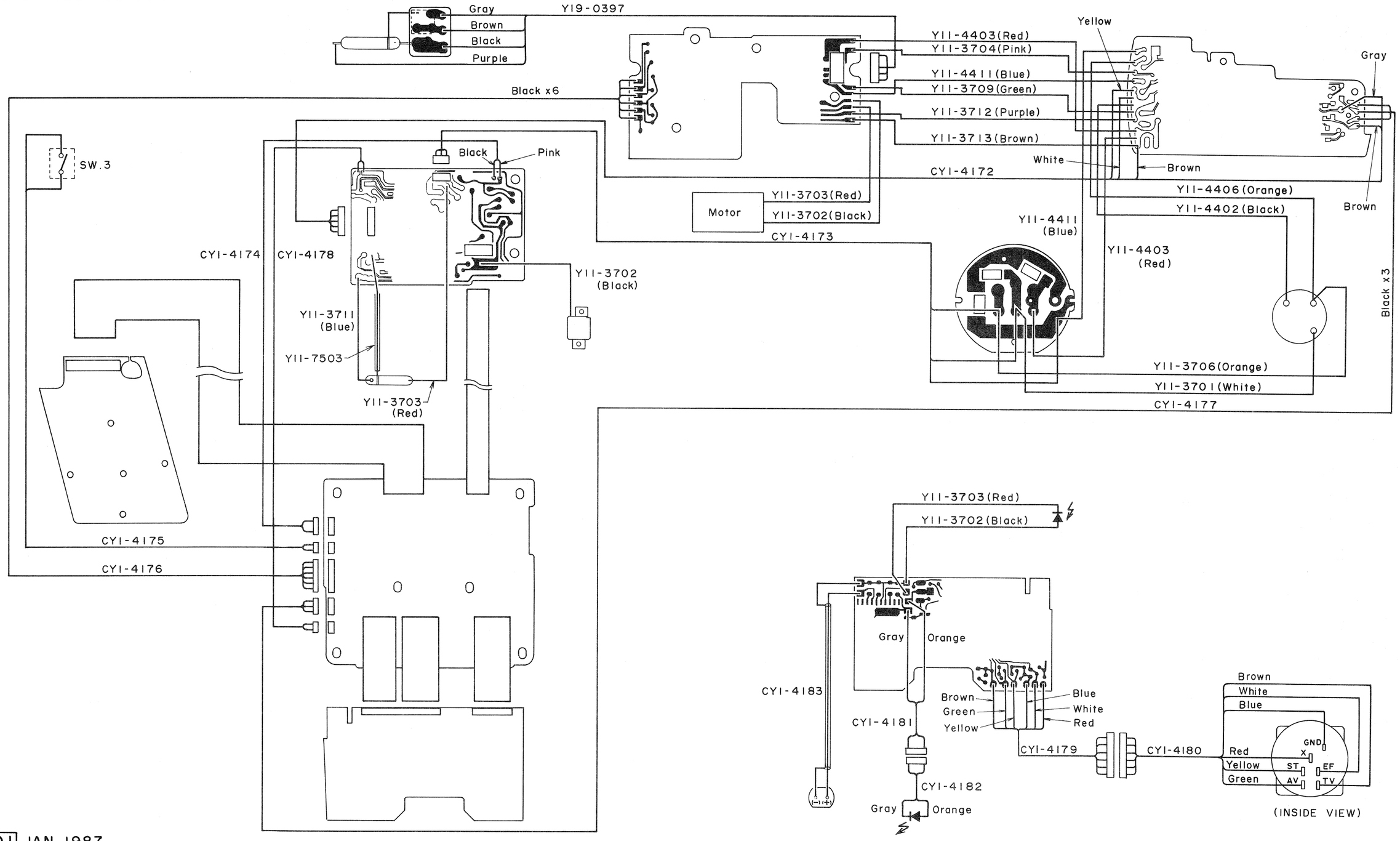
E BOARD



REF. NO. C50-0551

CANON SPEEDLITE 420EZ

WIRING DIAGRAM
CY8-1426-108-204



01 JAN,1987

ELECTRIC PARTS SPECIFICATION LIST

SYMBOL	SPEC. OR MFG.
Tr-3	2SB1148
Tr-21	2SB1050
Tr-1,2,13	2SD1385
Tr-5,16	2SD602
Tr-6,11,15	2SC2412K
Tr-10	2SA1036K
Tr-4,7,8,20	2SA1037K
RT-9,18	DAT114YK
RT-19	DTC114YK
RT-14	DTA143EK
RT-12,17	FMG2
D-8,23	E10DS1
D-24,36	E10DS8
D-41	MA159
D-33	MA151A
D-16	GL41K
D-14,21,22	11E4
D-9,10,11	DIR-20
D-17,18,19	10D8
D-2,5,7,12	MA151K
D-15,20,29,45	〃 〃
D-13,26~28,34	MA151WK
D-30,31,32,33	MA151WA
D-6	MA721
D-4	E10QS03
ZD-1	
ZD-25	MA3047
ZD-3,35,37~40	MA3091
PD-1	MI-2018C
PD-2	SP-101
LED-1	
LED-2	LN2162WAL3
IC-1	S-81250AG
IC-2	S-8053ALB
IC-3	μPC393G
IC-4	S-81230AG
IC-5	LB-1631
IC-6	
IC-7	
IC-8	μPD7514G
SCR-1	CR02AM-8
SCR-2,6,7	CR08AS-8
SCR-3	CR08AS-12
SCR-4	CR3CM-8
SCR-5	BCR08AS-8

SYMBOL	SPEC. OR MFG.
C-1	10μF 16V
C-2	100 μF 10V
C-3,20,33,34	0,047 μF 50V
C-46,58	〃 〃
C-4,13,15,16	0,01μF 50V
C-45,48,51	〃 〃
C-5,52	1000PF 25V
C-6	4,7 μF 6,3V
C-7,14	220 μF 10V
C-8	0,1 μF 50V
C-9	220 μF 25V
C-11	330PF 500V
C-12	2200PF 400V
C-17,31,32	3300PF 25V
C-36~39,41,42	〃 〃
C-18,22	0,047 μF
C-19,23	1000μF +30μF 330V (1pc)
C-21	0,018 μF
C-24	2,2 μF 350V
C-25,26,29	0,047 μF 350V
C-27	0,22μF 35V
C-28	3,3 μF 350V
C-30	0,1 μF
C-35,53	10μF 6,3V
C-40	33PF 6,3V
C-44	0,022 μF 50V
C-49	330PF 6,3V
C-50,54,55,57	1 μF 4V
C-56	470PF 25V
L	L-055
T-1	13C5
T-2	TS-50L50
T-3	TS-50P
VR-1	33K
VR-2	47K
VR-3	6,8K
VR-4	3,3K
VR-5	220K
VR-6	470K

SYMBOL	SPEC. OR MFG.
R-1	150KΩ 1/4W
R-2	820KΩ 1/8W
R-3,19	100KΩ 〃
R-4,5,18,30,41	10K Ω 〃
R-46,72	〃 〃
R-6	20K Ω 〃
R-7,47,64,67	47Ω 〃
R-8,15	1MΩ 〃
R-9	180KΩ 〃
R-10,14,17	330KΩ 〃
R-11,29,31	47K Ω 〃
R-12	270KΩ 〃
R-13,57,58	220KΩ 〃
R-16	120KΩ 〃
R-20,28,43,44,96	4,7K Ω 〃
R-21,27,35,52,73	1K Ω 〃
R-74,76,77,111	〃 〃
R-22,51,61,70,71	100Ω 〃
R-23	270KΩ 1/4W
R-24	56K Ω 〃
R-25,26	2,4KΩ 〃
R-32	5,6KΩ 1/8W
R-33	470 Ω 〃
R-34	470KΩ 〃
R-36,37	2,55M Ω 〃
R-38	13,3K Ω 〃
R-39	25,5K Ω 〃
R-40	100KΩ 〃
R-42	1,8MΩ 1/2W
R-45	56Ω 1/8W
R-48	820 Ω 1/4W
R-49,50,53,54	470KΩ 1/8W
R-55,59	22Ω 1/4W
R-56	15Ω 1W
R-60,109	680 Ω 1/10W
R-62	1KΩ 1/4W
R-63	100 Ω 〃
R-65	6,8KΩ 1W
R-66	220 Ω 1/4W
R-68	10K Ω 1W
R-69	8,2KΩ 1W
R-75	4,3 Ω 1/8W
R-78~81,83,84	47K Ω 1/10W
R-82	39K Ω 〃
R-85~87	20K Ω 〃
R-88,90,91	4,7KΩ 〃
R-89	470KΩ 〃
R-92~95	10K Ω 〃
R-97,99	820KΩ 〃
R-98	330 Ω 〃
R100	5,1KΩ 〃
R-101,110	2KΩ 〃
R-102	120KΩ 1/8W
R-103,108	10,2K Ω 〃
R-104	9,09K Ω 〃
R-105	2KΩ 〃
R-106	63,4K Ω 〃
R-107	2,4MΩ 〃
R-112	4,3 Ω 〃

Canon

Service Manual

ENGLISH EDITION

SPEEDLITE

430EZ

This Service Manual contains no "Repair Information" section. For assembly, disassembly, and adjustment information, see the SPEEDLITE 420EZ Service Manual.

CY8-1200-053

I. GENERAL INFORMATION

II. TECHNICAL INFORMATION

III. TROUBLESHOOTING CHART

IV. ADDITIONAL INFORMATION

V. ELECTRICAL INFORMATION

I. GENERAL INFORMATION

FEATURES

The Speedlite 430EZ uses the Speedlite 420EZ as a base, and improves on it by adding external power source capability and flash exposure level compensation to create a truly professional compact unit.

Function Improvements and Overall System Outline

	430EZ	420EZ
Guide number	43	42
External power source	Can use 3 types of external power source: a laminate battery (315V), C-size dry batteries (6), and the Ni-Cd Pack TP.	Not available
Automatic flash exposure level compensation	Exposure compensation possible over ±3 step range in 1/3 step increments	Not available
Stroboscopic flash	1 - 10 Hz	1 - 5 Hz
External display	Aperture value and distance indications in 1/2 steps, other indications in 1/3 steps. Automatically adjust for camera specifications.	1/2 step indications only.
Mode memory	Mode setting is memorized even when unit is switched off.	Mode setting is cleared when unit is switched off.
SE timer	90 sec.	300 sec.
Shoe lock pin	Provided	None

DESIGN SPECIFICATIONS

Note: This mark, [#], indicates specifications which are different from the Speedlite 420EZ.

1. Type: Compact, hot-shoe mounting, automatic electronic flash dedicated to the Canon EOS system cameras. It features preflash to determine the aperture for A-TTL operation, lens focal length coupled automatic zooming, illuminator beam for automatic focusing in low light, bounce and multiple flash capabilities.

2. Usable on: EOS Cameras

3. Guide Number @ ISO 100, meters

Zoom (mm) Position		24	28	35	50	70	80
Normal flash Guide No.		25	27	30	35	40	[#] 43
Low voltage flash G.No.		Varies between 1/16th and 1/2 manual flash guide numbers.					
Manual flash	1/1	25	27	30	35	40	[#] 43
	1/2	17.7	19.1	21.2	24.7	28.3	[#] 30.4
	1/4	12.5	13.5	15	17.5	20	[#] 21.5
	1/8	8.8	9.5	10.6	12.4	14.1	[#] 15.2
	1/16	6.3	6.8	7.5	8.8	10	[#] 10.8
	1/32	4.4	4.8	5.3	6.2	7.1	[#] 7.6

4. Flashes per battery

Power Source		Number of flashes	
		Manual	A-TTL
Internal power supply	LR6 x 4	100	100 to 700
	KR15/51 NiCd	45	45 to 650
[#]External power supply	Laminated battery pack	400	400 to 2,500
	Transistor Pack (LR14)	300	300 to 2,000
	Transistor Pack (NiCd)	250	250 to 1,500

The right-hand values are the number of flashes possible when the A-TTL flash mode is used, and the left-hand values are the number of flashes possible when the manual flash mode is used at full (1/1) power. The values for the number of flashes possible when the manual flash mode is used at 1/2, 1/4, 1/8, 1/16 and 1/32 power are equivalent to the fullpower values multiplies by 2, 4, 8, 10 and 12 respectively.

5. Recycle time (seconds)

Power source	Flash Mode	
	Low voltage flash	Normal flash
LR6 (AM-3)	0.2 - approx. 1.5	0.2-13
KR15/51 (NiCd)	0.2 - approx. 1.5	0.2-6.5
[#] Laminated battery pack	-	0.2-2
[#] Transistor pack (LR14/AM-2)	-	0.2-8
[#] Transistor pack (Ni-Cd Pack TP)	-	0.2-2

When an external power source is used, the low voltage flash function is not necessary.
Manual flash (1/1) recycle times are the longest time listed.

6. Flash coverage

6-1 Zoom system:
Fixed condenser lens; internal zoom operation (motor in flash head)

6-2 Zoom type:
(1) Auto
Zoom position is automatically set according to focal length data received from the lens when SW-1 on the camera) is switched on.
(2) Manual
Zoom position changes sequentially via manual operation of button of the flash unit.

6-3 Stop positions:
Six positions: 24 mm, 28 mm, 35 mm, 50 mm, 70 mm and 80 mm
During bounce flash photography, the zoom position is automatically set to 50 mm when the flash unit is set for auto zoom.

6-4 Zoom speed: Approx. 0.3 sec.

6-5 Setting position display:
LCD digital numeric display

7. Bounce

7-1 Bounce direction:

Direction	Angle range	Click-stop positions
Upward	0 - 90°	0°, 60°, 75°, 90°
Left	0 -180°	0°, 60°, 75°, 90°, 120°, 150°, 180°
Right	0 - 90°	0°, 60°, 75°, 90°

7-2 Bounce lock:
Locks at all 0° positions

7-3 Pre-flash related:
The main flash serves as pre-flash for bounce flash photography.

8. Control system

8-1 Flash mode:

(1) Normal flash
(2) Rapid-fire (Low voltage) flash
A flash system with a possible flash recycling time of approx.1.5 seconds when the flash unit's internal power source is used. Does not operate when the flash mode is set to manual, when an external power source is used, when the camera is set for continuous shooting, or during stroboscopic flash photography at a frequency of 6-10 Hz.
(3) Stroboscopic flash
[#]Stroboscopic flash at a frequency of 1-10 Hz (can be set is 10 steps at 1Hz intervals) is activated when the flash is fully charged and the X contact is switched on. The stroboscopic flash output is stopped when the X contact is switched off, the number of successive flash firing reaches 20, or the flash charging becomes depleted. When this mode is selected, the flash output power is initially set to 1/16, but can be changed by operating the up/down to 1/1 or 1/2 in this mode.
(4) Pre-flash
Used for detecting the distance required for A-TTL flash operation during bounce flash photography.
(Via the dedicated flash head during normal flash photography with the flash head in the straight-ahead position)
(5) Test flash Possible

8-2 Automatic aperture set function:

Camera shooting mode	Aperture setting
1. Shutter priority AE	A: Automatic (w/ peripheral metering)
2. Aperture priority AE	M: Manual
3. Program AE (all)	A: Automatic (w/ peripheral metering & pre-flash)
4. Manual	M: Manual

8-3 Shutter speed setting:

Camera mode	Setting	EOS-1, EOS 620	Other EOS Models
1. Shutter priority AE	M: Manual	Any speed up to 1/250	Any speed to 1/125
2. Aperture priority AE	A: Automatic	1/250 - 30s	1/125 - 30s
3. Program AE (all)	A: Automatic	1/250 - 1/60	1/125 - 1/60)
4. Manual	M: Manual	Any speed up to 1/250	Any speed to 1/125

8-4 Exposure control modes:

(1) A-TTL automatic flash
(2) TTL automatic flash (when the camera shooting mode is set to manual)
(3) Manual

8-5 Flash control system:
TTL-OTF automatic flash control reading light reflected from the film plane

8-6 Flash exposure level control:

(1) Auto
Automatic flash exposure level reduction control function provided for day-time fill-in flash.

[#](2) Manual
Flash exposure level can be manually compensated by up to +3 steps in 1/3-step increments.
(When the camera's shooting mode is set to a mode other than fully-automatic mode, the automatic flash exposure level is compensated.)

8-7 Flash coupling range:

(50/1.8: ISO 100)
(1) A-TTL normal flash : 0.7 - 19 m / 2.3 - 62.3 ft
(2) A-TTL rapid-fire flash : 0.7 - 5 m / 2.3 - 16.4 <——>
(minimum) - 14 m / 45.9 ft (maximum)

8-8 Out-of-coupling-range warning:
A-TTL automatic flash mode : When the shutter button is pressed to the first step (SW-1 On), the flash out-of-coupling-range warning is indicated by a blinking display (Tv-Av) in the camera's viewfinder.

9. Display

9-1 LCD display:
(1) Zoom position (not displayed when flash head is set for bounce flash)
(2) Zoom operation mode
(3) Flash aperture value
(4) TTL flash coupling distance range (displayed in feet on flash units shipped to North America ; displayed in meters elsewhere)
(5) Manual - proper distance (same as above)
(6) Control mode
(7) Stroboscopic flash frequency (Hz)
(8) Second-curtain sync setting
(9) Bounce mark
[#](10) Flash exposure level compensation value

9-2 Flash charge completion indication:
(1) Normal flash mode: Red ready lamp
(2) Rapid-fire (Low Voltage) flash mode: Green ready lamp

9-3 Display illumination:
Entire LCD display panel is uniformly illuminated by transmitted light (blue) for 8 seconds when the flash unit's illumination button is pressed.

10. Sync timing:
First- or second-curtain sync.

11. Flash duration : 1.5 ms or less

12. Flash color temperature : Equivalent to daylight

13. Film speed
ISO 6 - 6400 ; Film speed setting is controlled by camera. Flash coupling distance range increases according to the film speed.

14. AF auxiliary light:

14-1 Light source : Red, ultra-high brightness LED

14-2 Pattern: Random stripe (vertical)

14-3 [#]Effective distance:

0.9 - 10 m (in dark situations)

15. Power switch

Main switch with SE (Save Energy) function.
If the switch is left on, the power is automatically switched off after [#] approximately 90 seconds.
The LCD display is extinguished when the SW function is activated (the flash mode is stored in memory).
The power is switched on again when the camera's shutter button is pressed to the first step (SW-1 on) or when the test flash button is pressed (the SE function is designed to work together with the Technical Back E's interval timer function for interval flash photography).

16. Power source

(1) Internal power source
Four AA-size cells (alkaline LR6 or Ni-Cd KR15/51); 6V
(2) External power sources
[#] Laminated battery (0210 type, 315 V) (for Laminated Battery Pack E)
[#] Battery Magazine TP using six C-size alkaline cells, LR14; 9V
[#] Ni-Cd Pack TP (sealed pack of C-size NR-SC Ni-Cd cells)

External power source system

<table>
<tr><th colspan="2">Battery Pack</th><th>Battery</th><th>Related Accessories</th></tr>
<tr><td colspan="2">Laminated Battery Pack - E</td><td>315V Battery # 0210</td><td>Connecting Cord Case</td></tr>
<tr><td rowspan="2">Transistor Pack -E</td><td>Battery Magazine TP*</td><td>Size C cells LR14 x 6 (9V)</td><td rowspan="2">Connecting Cord Case NiCd Charger TP*</td></tr>
<tr><td>NiCd Pack TP*</td><td>NiCd "C" cells NR-SC x 6 (7.2V)</td></tr>
</table>

*: Parts of the Speedlite 533G and 577G system.

<!!> The internal battery is necessary for control purposes even when the external power source is used.

17. Connection

(1) Camera connection:
[a] Lock nut type accessory shoe connection, with [#]coupled lock pin
The lock pin protrudes 1.6mm via force of spring coupled to lock nut.
[b] Terminals: 6 directly coupled contacts

[#] (2) External power source connection:
Via dedicated 3-terminal socket

18. Dimensions

75 (W) x 127 (H) x 106 (D) mm

19. Weight

360g (without batteries), [Four LR6 batteries add 100g]

20. Other

[#](1) Mode memory
When the main switch is switched off, the control mode and zoom position settings which existed just before the main switch was turned off are memorized. When the main switch is switched off and the battery is removed for replacement, the settings remain memorized for approximately 1 minute.

(2) Use of commercially available slave units is possible.
Before purchasing a slave unit, however, it is a good idea to first confirm that the flash/slave unit combination works as expected.

21. Related products

21-1 New products:

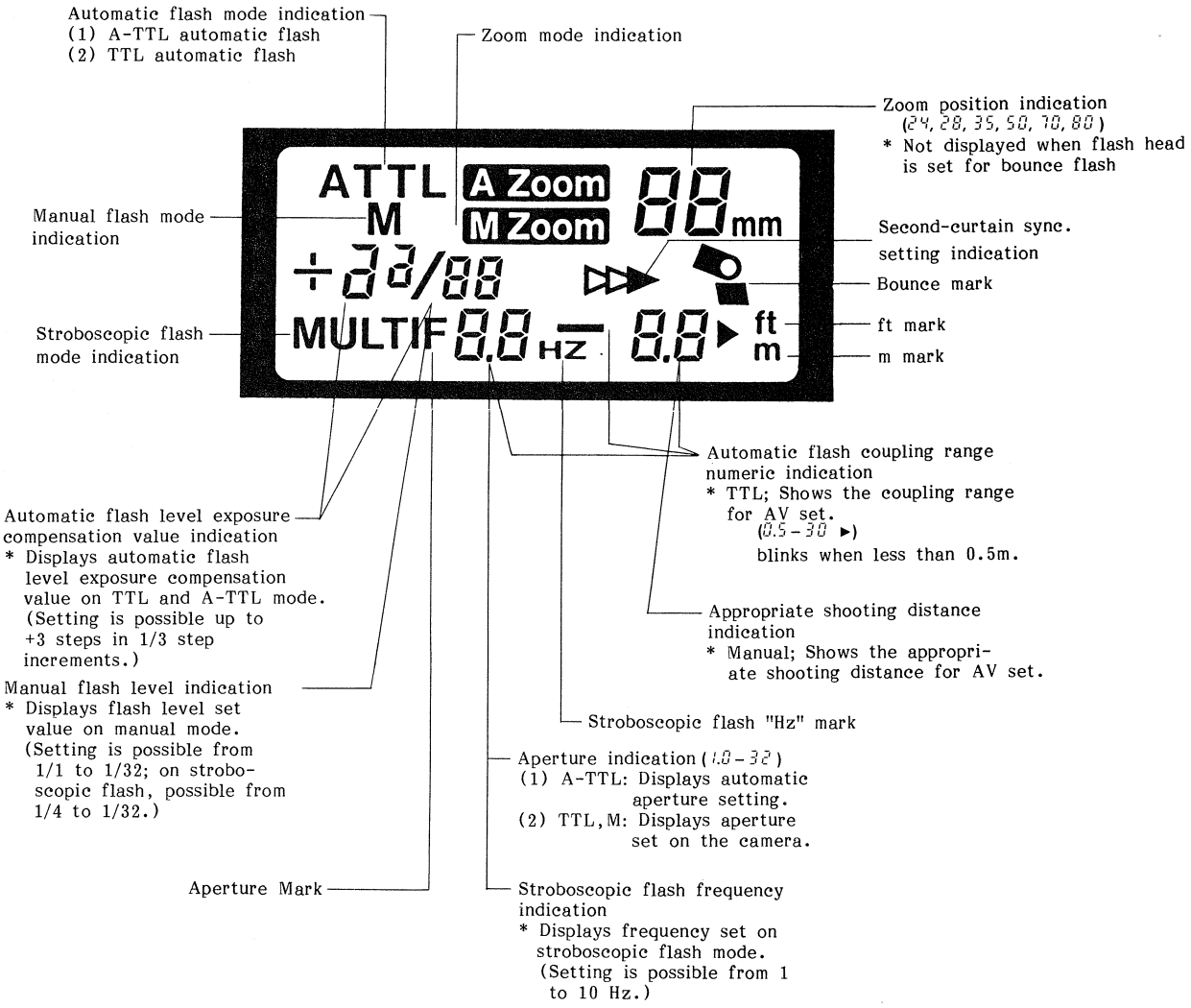
[#] (1) Soft case for 430EZ flash unit
[#] (2) Connection cord for Laminated Battery Pack E
[#] (3) Connection cord for Transistor Pack E
[#] (4) Laminated Battery Pack E external power source
(National PW-202 with changed name)
[#] (5) Case for Laminated Battery Pack E (same as above)
[#] (6) Transistor pack E main unit
[#] (7) Transistor pack E case

21-2 Applied existing products

[#] (1) Strap for Transistor Pack E (shoulder pad discontinued; applied with no modification)
[#] (2) Strap for Laminated Battery Pack E (same as above)
[#] (3) Battery Magazine TP for Transistor Pack E (applied with no modification)
[#] (4) Ni-Cd Pack E for Transistor Pack E (applied with no modification)
[#] (5) Ni-Cd Charger TP for Transistor Pack E (applied with no modification)

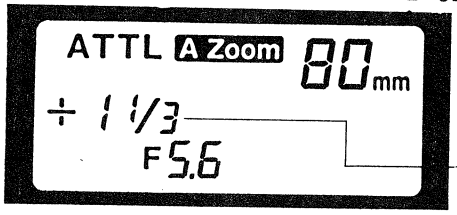
LCD PANEL INDICATIONS

* Mode setting is memorized even when unit is switched off.



Example

◦ Automatic flash level exposure compensation value indication (+1 1/3 step exposure compensation)
Display when SW-1 of EOS-1 or EOS 630 is switched on.

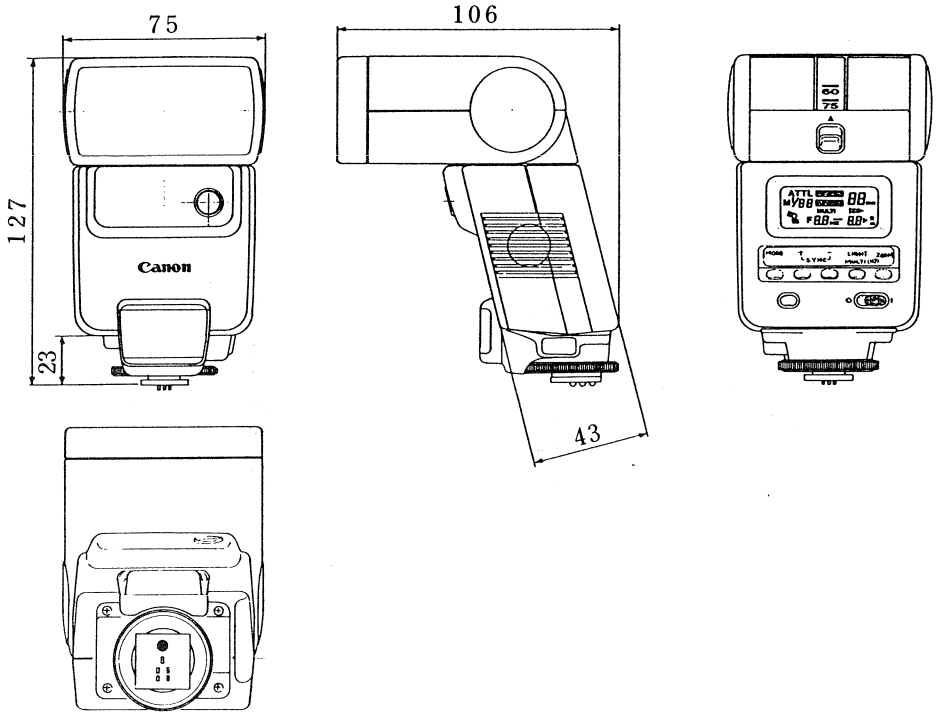


The output timing for STSP signal from camera is adjusted according to this compensation value.

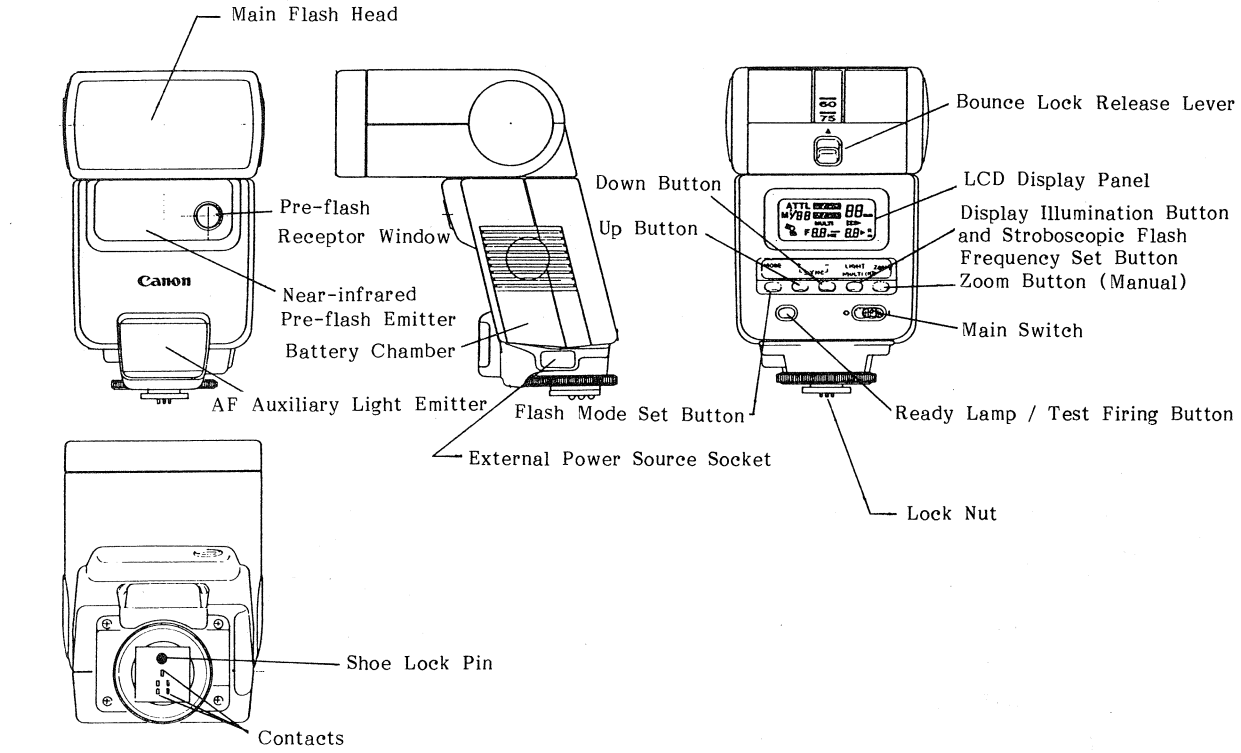
Operate with EOS-1, EOS 630 only.

EXTERNAL VIEWS & CONTROL NOMENCLATURE

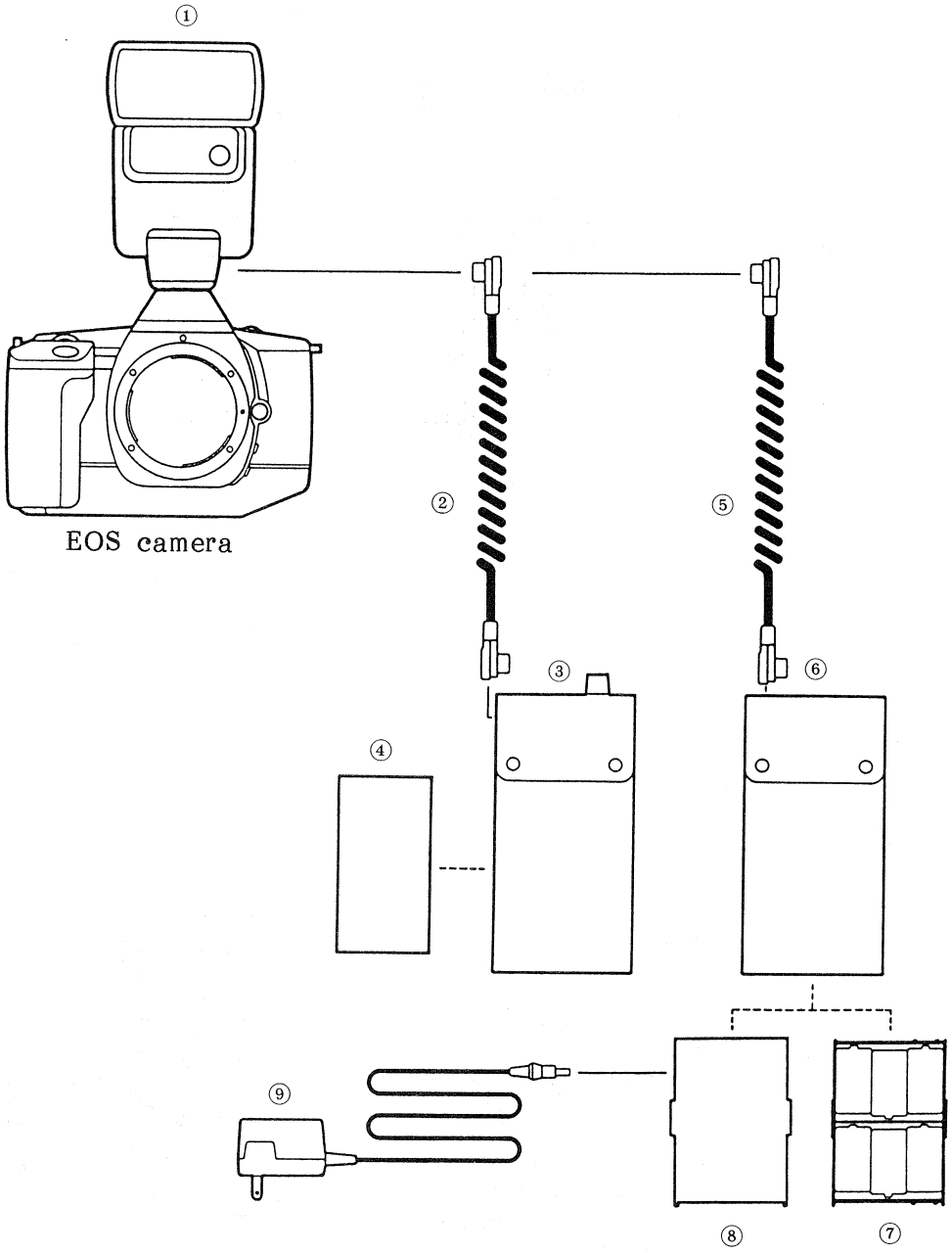
[Dimensions]



[Nomenclature]



SYSTEM COMPONENTS



① 430EZ flash unit

※② Connection cord for Laminated Battery Pack E (Y17-1100)

③ Laminated Battery Pack E (with case)

④ # 0210 Laminated Battery

※⑤ Connection cord for Transistor Pack E (Y17-1128)

※ Service Parts

⑥ Transistor pack E main unit (with case)

⑦ Battery Magazine TP

⑧ NiCd Pack TP

⑨ NiCd Charger TP

II. TECHNICAL INFORMATION

[Electronic Section]

SWITCH LIST

* = Control Switch

No.	Symbol	Name	Function
1	Main SW	Main Switch	Turns power on
*2	Bounce SW	Bounce Switch	Sets bounce mode
3	Test SW	Test Switch	Open/test flash
4	EL/Multi SW	EL/Multi Switch	Panel illumination
5	Exp (+)	Flash compensation (+)	To increase flash exposure up to 3EV in 1/3 stop intervals
6	Exp (-)	Flash compensation (-)	To reduce flash exposure up to 3EV in 1/3 stop intervals
7	Mode SW	Mode Switch	A-TTL / Manual Switch
8	Zoom A/M SW	Zoom set Switch	Switch between auto and manual zoom and set manual zoom
*9	Zoom SW	Zoom Switch	Zoom position sensing switch

IC LIST

IC-1 ..... Voltage stabilizer IC

IC-2 ..... Voltage Sensor IC

IC-3 ..... Standard voltage source for IC-4

IC-4 ..... Low voltage flash IC

IC-5 ..... Preflash & manual photosensor IC

IC-6 ..... Interface (I/O) IC

IC-7 ..... MPU (Control IC)

IC-8 ..... Zoom Control IC

ELECTRICAL PARTS EXPLANATIONS

- A Circuit Board

Symbol	Spec./Mfg.P#	Nomenclature/ Function
T3	TS-50AS	Main Trigger Coil

- B Circuit Board (Main Flash Control)

C24	0.22μF/25V	Initial Flash Capacitor
SCR4	CR3CM-8	Main Flash SCR
SCR9	BCR08AS-8	Main Flash SCR
SCR6	CR08AS-8	Initial Flash trigger SCR
SCR7	SA04	Flash Termination
Tr14	2SD602	Flash Termination
C15	0.047μF/350V	
C21	2.2μF/350V	
C22	0.047μF/M35-IID	
C23	0.047μF/350V	
C25	0.047μF/M35-IID	
C26	3.3μF/K35-IT	
C27	0.047μF/350V	
C28	3300PF/50V	
C29	3300PF/50V	
D17	MA151K	
D21	E10DS1	
D22	E10DS8	
D23	11E4	
D33	11E4	
R35	47Ω 1/8W	
R37	10KΩ 1/8W	
R38	820Ω 1/4W	
R39	470KΩ 1/8W	
R40	470KΩ 1/8W	
R47	15Ω 1W	
R48	220KΩ 1/8W	
R49	220KΩ 1/8W	
R50	22Ω 1/4W	
R51	680Ω 1/10W	
R52	100Ω 1/8W	
R53	47Ω 1/8W	
R54	6.8KΩ 1W	
R55	220Ω 1/4W	
R56	1KΩ 1/4W	
R57	100Ω 1/4W	
R58	47Ω 1/8W	
R59	10KΩ 1W	
R60	8.2KΩ 1W	
R61	100Ω 1/8W	
R62	100Ω 1/8W	
R63	10KΩ 1/8W	
R64	1KΩ 1/8W	
R65	1KΩ 1/8W	
SCR8	CR3EM-8	
ZD3	MA3047	

- C Circuit Board

D18	10D-8	Rectifier
D19	10D-8	Rectifier
D20	10D-8	Rectifier
L1	L-055	Delay coil

- D Circuit Board (Capacitor charging, Preflash, Panel Illumination)

IC-1	S81250AG	Voltage stabilizer
IC-2	S8053ALR	Voltage sensor
SCR1	CR08AS-8	Oscillator
SCR2	CR08AS-12	Low voltage flash control
SCR3	CR02AM-8	EL (panel illumination) discharge
SCR5	CR08AS-8	Preflash trigger coil, SCR
T1	1305	Oscillator transformer
T2	TS-50B	Preflash trigger coil, SCR
Tr3	2SB1148	Trigger capacitor
Tr9	2SD1385	Low voltage flash control
Tr10	2SD1385	EL lighting
Tr11	2SD1385	EL lighting
C19	0.033μF/M35-IID	Preflash trigger coil, SCR
C1	10μF/16V	
C2	100μF/6.3V	
C4	220μF/6.3V	
C5	220μF/35V	

Symbol	Spec./Mfg.P#	Nomenclature/ Function
C6	6800PF/25V	
C7	0.1μF/50V	
C8	300PF/500V	
C9	2200PF/400V	
C11	220μF/6.3V	
C17	0.047μF/50V	
C18	0.047μF/M35-IID	
CR1	EXE-D473M563	
D1	E10QS03	
D3	MA151K	
D4	E10DS1	
D6	DIR-150	
D7	DIR-150	
D8	DIR-150	
D9	MA151K	
D11	11E4	
D15	MA151K	
D16	GL41K-500Z	
R1	20KΩ 1/8W	
R2	47Ω 1/8W	
R5	10KΩ 1/8W	
R8	47KΩ 1/8W	
R9	100Ω 1/8W	
R10	270KΩ 1/2W	
R12	2.4Ω 1W	
R13	2.4Ω 1W	
R22	2.55MΩ 1/8W	
R29	680Ω 1/8W	
R30	100KΩ 1/8W	
R31	150KΩ 1/4W	
R32	10KΩ 1/8W	
R33	10KΩ 1/8W	
R41	1.8MΩ 1/2W	
R42	100Ω 1/8W	
R43	1KΩ 1/8W	
R44	470KΩ 1/8W	
R45	470KΩ 1/8W	
R46	22Ω 1/4W	
R99	1KΩ 1/8W	
Tr1	2SD602	
ZD1	MA3091	
ZD2	SC2190	

- E Circuit Board (VCC generator, Low Voltage Flash control, SE circuit)

IC-3	S-81230AG	IC-4 ref. voltage
IC-4	BA6993F	Low voltage flash control IC
TALY1	FMG8	Oscillation inhibit
Tr4	2SA1037K	Oscillation inhibit

Symbol	Spec./Mfg.P#	Nomenclature/ Function
Tr6	DTA114YK	VCC generation
Tr7	2SA1182	VCC generation
Tr8	2SC2412K	VCC generation
Tr12	2SC2412K	Main flash
Tr13	DTA143EK	Main flash
C10	0.01μF/50V	
C12	0.01μF/50V	
C13	0.01μF/50V	
C14	3300PF/50V	
D2	MA151K	
D5	MA151K	
R3	10KΩ 1/8W	
R6	100KΩ 1/8W	
R7	4.7KΩ 1/8W	
R11	4.7KΩ 1/8W	
R14	1KΩ 1/8W	
R15	47KΩ 1/8W	
R16	10KΩ 1/8W	
R17	47KΩ 1/8W	
R18	5.6KΩ 1/8W	
R19	470Ω 1/8W	
R20	820KΩ 1/8W	
R21	1KΩ 1/8W	
R23	2.55MΩ 1/8W	
R24	13.3KΩ 1/8W	
R25	25.5KΩ 1/8W	
R26	100KΩ 1/8W	
R27	10KΩ 1/8W	
R34	4.7KΩ 1/8W	
R36	56Ω 1/8W	

- F Circuit Board (Micro Processing Unit)

IC-7	μPD75308	MPU
LED1	LN2162WA23-(TR)	Ready "Lamp"
Tr5	DTA114YK	Bounce mode zoom control
VR1	30KΩ	Ready Lamp Ignition adjustment
OSC	CSAC4.19MGC-TC	
C3	1μF/10V	
C45	0.047μF/50V	
C47	0.01μF/50V	
C48	33PF/50V	
C49	33PF/50V	
C51	0.047μF/50V	
C52	220PF/50V	
C53	220PF/50V	
C54	220PF/50V	
C55	0.01μF/50V	

Symbol	Spec./Mfg.P#	Nomenclature/ Function
D10	MA151WK	
D25	MA159	
D34	MA151K	
Tr2	DTA114YK	
Tr18	DTA114YK	
R28	100KΩ 1/10W	
R75	1KΩ 1/10W	
R76	680Ω 1/10W	
R80	10KΩ 1/10W	
R81	4.7KΩ 1/10W	
R82	4.7KΩ 1/10W	
R83	20KΩ 1/10W	
R84	20KΩ 1/10W	
R85	20KΩ 1/10W	
R86	0Ω 1/10W	
R87	100KΩ 1/10W	
R88	100KΩ 1/10W	
R89	100KΩ 1/10W	
R90	100KΩ 1/10W	
R92	4.7KΩ 1/10W	
R95	47KΩ 1/10W	
R96	47KΩ 1/10W	
R97	47KΩ 1/10W	
R98	47KΩ 1/10W	
ZD9	MA3091	

- G Circuit Board (Flash firing & termination, AF illuminator control)

IC-5	SN28878	Preflash & manual photosensor IC
IC-6	T1571AF	Interface (I/O) IC
LED2		AF Illuminator
PD1	SP-101	M Lo adjusting resistor
PD2	MI-2018C	Preflash adjusting resistor
R74	143KΩ 1/10W	EFID adjusting resistor
TALY2	FMG8	Safety circuit
Tr16	2SA1037K	AF Illuminator driver
Tr17	DTC114YK	AF Illuminator driver
VR2	5KΩ	FA adjusting resistor
VR3	500KΩ	Bounce & Preflash FA level adjusting resistor
VR4	10KΩ	FA adjusting resistor
VR6	200KΩ	M Lo adjusting resistor
C30	1μF/35V	
C31	470PF/50V	

Symbol	Spec./Mfg.P#	Nomenclature/ Function
C32	1μF/10V	
C33	1μF/10V	
C34	1000PF/50V	
C35	10μF/6.3V	
C36	1μF/10V	
C37	330PF/50V	
C38	0.01μF/50V	
C39	0.1μF/35V	
C40	0.047μF/50V	
C41	0.01μF/50V	
C42	0.022μF/50V	
C43	0.1μF/35V	
C46	0.047μF/50V	
C50	0.01μF/50V	
D24	MA151K	
D26	E10DS8	
D27	MA151WK	
R66	4.3Ω 1/8W	
R67	1KΩ 1/8W	
R69	1.2MΩ 1/8W	
R70	8.25KΩ 1/8W	
R71	10.2KΩ 1/10W	
R72	9.09KΩ 1/10W	
R73	10.2KΩ 1/10W	
R77	820KΩ 1/10W	
R78	5.1KΩ 1/10W	
R79	330Ω 1/10W	
R93	820Ω 1/10W	
RTC	2KΩ 1/8W	
Tr15	2SB1050	
ZD4~8	MA3091	

- H Circuit Board

D12~14	DM1XN08	
R4	1.5KΩ 2W	

- Brush Circuit Board (Zoom position sensing, motor control)

IC-8	LB1631	Zoom motor control
D28~30	MA151WA	Zoom position sensing
D31	MA151A	Zoom position sensing
D32	MA151WK	Zoom position sensing
C44	0.047μF/50V	
R91	4.3Ω 1/8W	

CIRCUIT EXPLANATIONS

1. Charging (VCC Generation)

   A. When inserting the battery, V-BAT is applied to IC-1 p2 through D1.

   B. With this, IC-1 p3 outputs the regulated voltage of 5V. This voltage of 5V is applied to IC-2 p2 and IC-7 p54.

   C. IC-2 is voltage detecting IC. When the voltage applied to p2 is over 3V, the equivalent voltage is applied to p1. (When the voltage applied to p2 is under 3V, the output is 0V.) With this, the voltage is supplied to the emitter of Tr-6.

   D. When VDD is applied to IC-7 p54 and the main switch is turned on, p47 goes low and this low signal is input to Tr6.

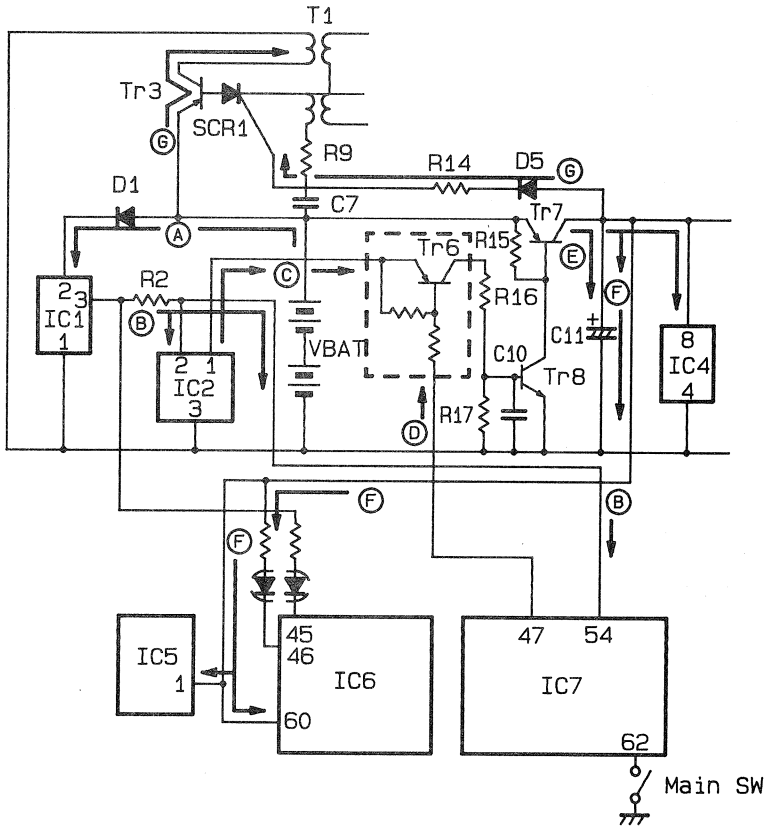
   E. With above C and D, Tr-6 is turned on. Consequently, Tr-8 and Tr-7 turns on charging C-14.

   F. This is called VCC line, which is connected to each power terminal for IC-6 p60, IC-5 p1, IC-4 p8 and LED1.

   G. With VCC generation, high is applied to the gate of SCR-1 through D-5 and R-14, turning SCR-1 on. SCR-1, which is used for charging, drives Tr-3 to execute charging with T-1.

Operational Flow

A ⟶ B ⟶ C ⟶ D ⟶ E ⟶ F ⟶ G



2. Low Voltage Flash

430EZ uses a low voltage flash circuit. With this circuit, the trigger capacitor is charged first to 240V and then the main and preflash capacitors start to charge.

Circuit Explanations

A. The output of the blocking oscillator is applied to the main and preflash trigger capacitors (C22, C19, C21).

B. The charged voltage of C22, C19 and C21 are divided by R22 through R24, then then applied to IC-4 p2.

C. When the voltage applied to IC-4 p2 is under 0.6V (C22, C19 and C21 charging voltage is under 240V), IC-4 p1 goes high while Tr-9 is kept turned on.

D. The gate of SCR-2 is grounded through D7 and Tr-9 so SCR-2 is turned off. (At this point, there is no gate voltage on SCR2, so the main and preflash capacitors are not being charged.)

E. When C22, C19 and C21 are charged to about 240V and the input for IC-4 p2 reaches to 0.6V, IC-4 p1 goes low, turning Tr9 off.

F. With this, SCR2 turns on and C16 and C20 (main & preflash capacitors) start charging.

G. When the main and preflash capacitors start to charge and reaches to 240V, C22, C19 and C21 start to discharge. (The charging of the capacitors pulls down the secondary voltage causing C22, C19 and C22 to start discharging.)

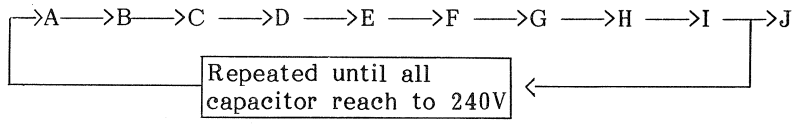
H. When C22, C19 and C21 discharge to 240V and the input voltage of IC-4 p2 falls below 0.6V, IC-4 p1 goes high.

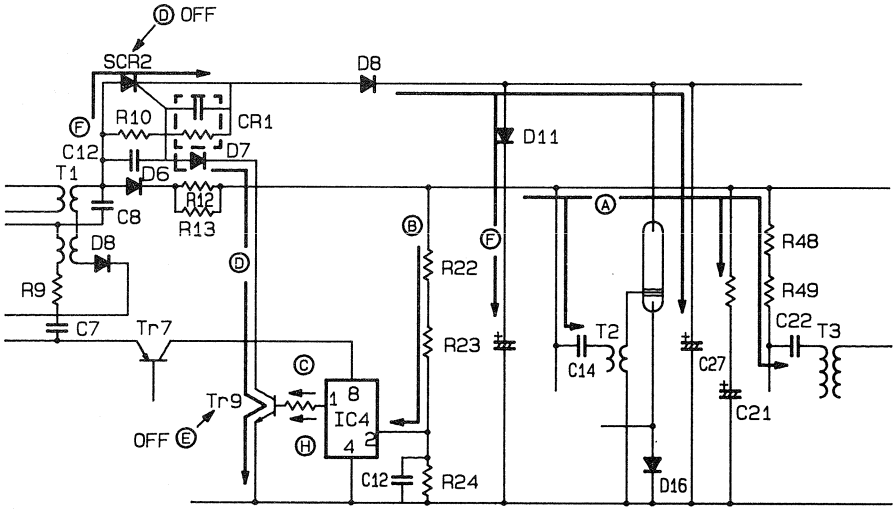
I. With this, the charging of the main and preflash capacitors stops and we are back to A.

By repeating this process, the trigger circuit is maintained in the ready condition while the main capacitors are charging.

J. When all capacitors reach to 240V, they are charged simultaneously.

Operational Flow





3. Ready Lamps

Ready Lamp lighting voltage

Ready Lamp (LED1) lighting voltage for each flash mode.

Flash mode	Ready lamp (LED) lighting voltage	
	Green	Red
ATTL, M1/16, M1/32	125V (0.96V)	265V (2V)
M1/4, M1/8	195V (1.44V)	265V (2V)
M1/2, M1/1 With External Power Source MULT1 (6Hz ~ 10 Hz)	–	265V (2V)

( ) = IC-6 p40 input voltage

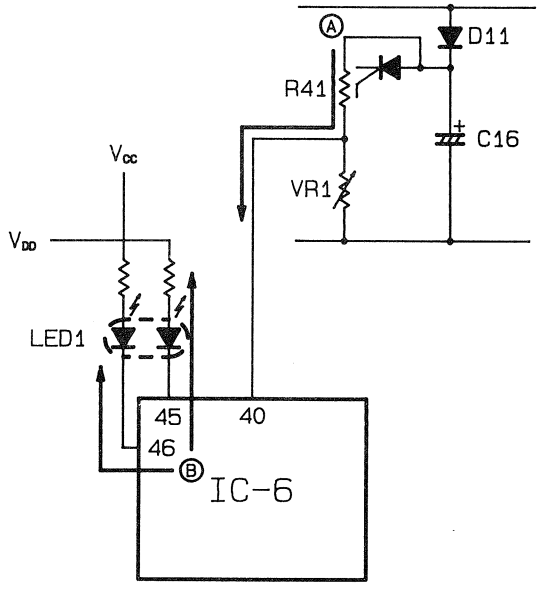
Circuit Explanations

A. The charged voltage of main capacitor (C-16) is divided by R41 and VR-1 through C-11, the applied to IC-6 p40.

B. When IC-6 p40 reaches to reference value, IC-6 p45 (yellow) and p46 (red) go low, lighting the yellow or red LED. (Ready lamp)

Operational Flow

A ——> B



4. Pre-flash and Aperture Setting (A-TTL mode)

Operation

In the A-TTL mode, with comparing the reflectivity of the subject on preflash and the AV value calculated by the camera, the flash determines the correct aperture.

Circuit Explanations

[Normal Pre-flash]

A. When SW1 is turned on, TV signal is applied to IC-6 p6.

B. Simultaneously, the EFID signal indicating camera mode information is applied to IC-6 p9.

If the camera is in the Manual Mode or if the flash is not A-TTL mode, the computer determineds that preflash is not necessary and following operations are not executed.

C. Trigger signal (high) for pre-flash is output from IC-6 p37.

D. This signal is applied to the gate of SCR-5, turning SCR-5 on causing C19 to discharge.

E. The voltage boosted by T-2 is applied to Xe-1 causing the pre-flash. (C-20 is precapacitor.)

F. Light reflected from object of the preflash is entered into PD2, and transferred from IC-5 p8 to IC6 p55.

[Aperture Setting]

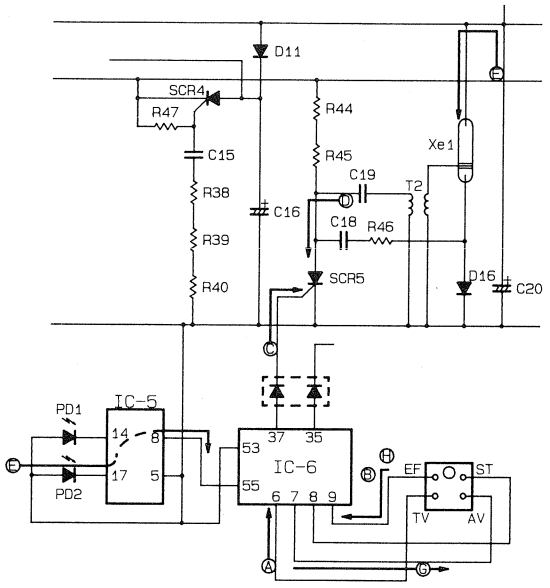
G. With this, IC-6 outputs the distance information from p7 (AVEF line) to the camera body. (Based on this information and, the camera determines the appropriate AV value.)

H. The AV value determined by the camera is informed to IC-6 p9 over EFID line. (Aperture setting)

If the camera is an EOS, digital communication is used. If it is a T90, analog communication is used. From the EFID input, the computer determines whether the camera is a T90 or an EOS model. (If the voltage is over 2.2V, the camera is an EOS.)

Operational Flow

A ⟶ B ⟶ C ⟶ D ⟶ F ⟶ G ⟶ H



[Bounce Pre-flash]

In pre-flash which follows bounce flash, main flashing part lights up in the same manner as 420EZ.

A. Same as Normal pre-flash [A] to [B] operations.

B. SW-2 (Bounce Switch) detects that the Speedlite is in bounce position, high is output from IC-6 p35.

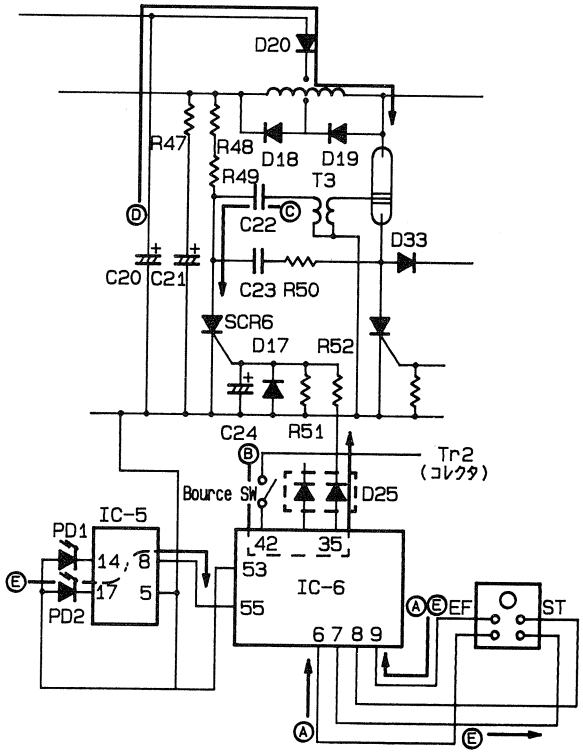
C. With this, SCR-6 turns on, causing C22 to discharge.

D. At this time, the trigger is applied to Xe-2 through T3, causing a low power flash from Xe-2. (At this time, SCR4 is turned off, so the charged voltage of C16 is not used.)

E. Same as Normal pre-flash [F] to [H] operations.

Operational Flow

A ⟶ B ⟶ C ⟶ D ⟶ E



5. Main Flash

Circuit Explanations

A. At shutter release, the STSP signal from the camera is applied to IC-6 p8.

B. When the first curtain completes its run, the X synchronization signal is applied to IC-6 p10.

C. The AND signal (STSP + X) causes the trigger signal (high) to be output from IC-6 p35 to start the initial flash and immediately another high is output from p36 for the main flash.

D. The high from p35 gates SCR-6 on, allowing C22 to discharge. As C22 discharges the current through the primary of T3 induces a much higher voltage in the secondary which is applied to the trigger electrode on the main flash tube, ionizing the gas allowing it to conduct. (When triggered, the impudence of the tube is only a few ohms).

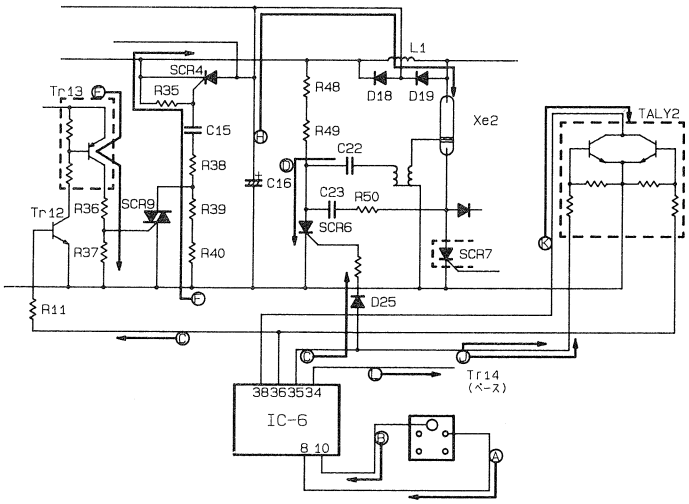
E. The high from IC-6 p36 turns Tr12 on. Current flowing through Tr12 turns Tr13 on and applies a high signal to SCR-9.

F. With SCR-9 gated on by the high, C15 discharges through R35, L, Xe-2, SCR-9 and R-35. (Since Xe-2 is ionized at this time its resistance is negligible.)

G. The discharging of C-18 gates SCR-4 on.

H. This allows the main capacitor C-16 to discharge through SCR-4 and the coil LCD and the main flash tube XE-2 causing the main flash.

Note: The reason why the main flash is divided into a small initial flash and the main flash is to slow the initial discharge allowing more accurate control of flash exposure.



Operational Flow

A——>B——>C——>D——>E——>F——>G——>H

└——>Safety Circuit J——>K——>L

[Safety Circuit]

This circuit prevents problems caused by noise or some other abnormality.

I. If the flash termination signal (a high from IC-6 p34) were generated by noise or some other abnormality after the main capacitor was charged, but flash was not actually under way, serious damage could be caused to the line including R60 and SCR7.

J. To prevent this, when a high signal is output from either p35 or p36 of IC-7, it is sent also to the base of Tr18.

K. With Tr18 on, IC-6 p38 goes low.

L. This condition removes the ground from IC-6 p34 so that the flash termination signal can be sent to the base of Tr18at the proper time. Since Xe-2 is flashing at this time, its resistance is quite low and the R60 / SCR7 circuit will not be damaged when SCR7 is turned on and the flash is terminated.

6. Automatic Flash Termination

Circuit Explanation

A. When the main flash starts, the camera TTL flash SPD, in the bottom of the mirror box, starts reading the light reflected from the subject.

B. When the circuit in the camera determined that the exposure is sufficient, the STSP signal is switched from low to high.

C. When IC-6 p8 receives this signal, high is output to IC-6 p34.

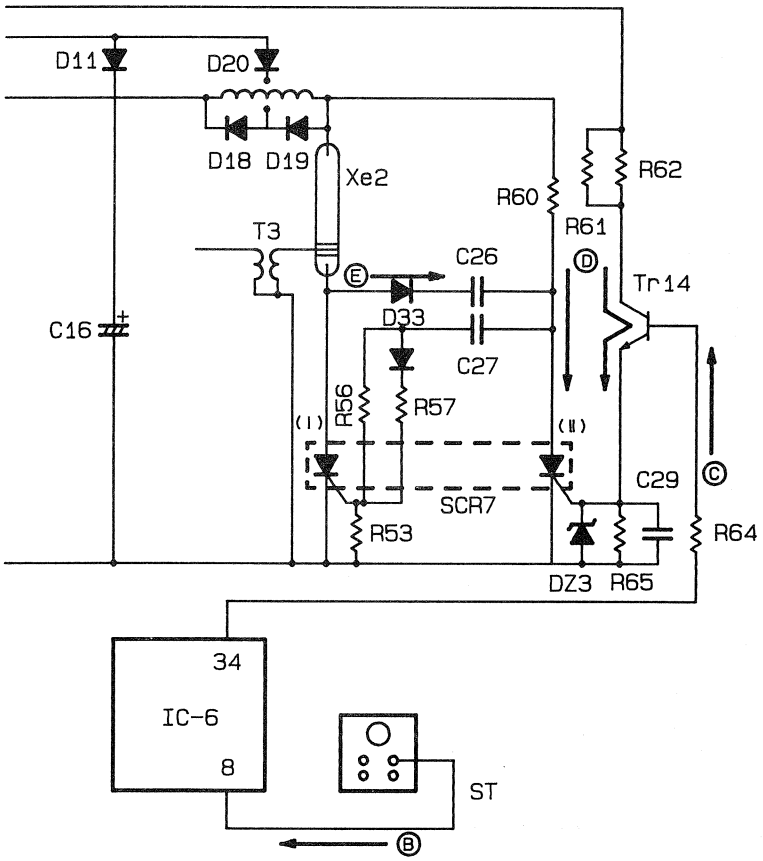
D. This turns Tr-14 on, gating SCR-7 (II) on.

E. This causes C-28 to discharge, applying reverse bias to SCR-7 (I).

F. This turns SCR-7 (II) off to halt flash.

Operational Flow

B ⟶ C ⟶ D ⟶ E



7. Auto Zoom

Circuit Explanation

A. When SW-1 is activated, focal length information is sent from the camera to the flash (IC-6 p9) over the EFID line. If the lens has been charged or zoomed, the EFID information will indicate the fact to the lens.

B. With receiving this information, IC-6 p26 sends it to IC-7 p41.

C. With this, IC-7 compares the new focal length information to the focus zoom setting and determines if adjustment is necessary.

D. This information is sent to the indication circuit which lights the correct focal length on LED.

E. If zooming is necessary, high signal is output from either IC-7 p60 or p61.

F. When IC-8 p4 or p8 receives this signal, the appropriate output is sent to the motor through p15 and p17, driving the motor and gear train to move the flash head to the correct position.

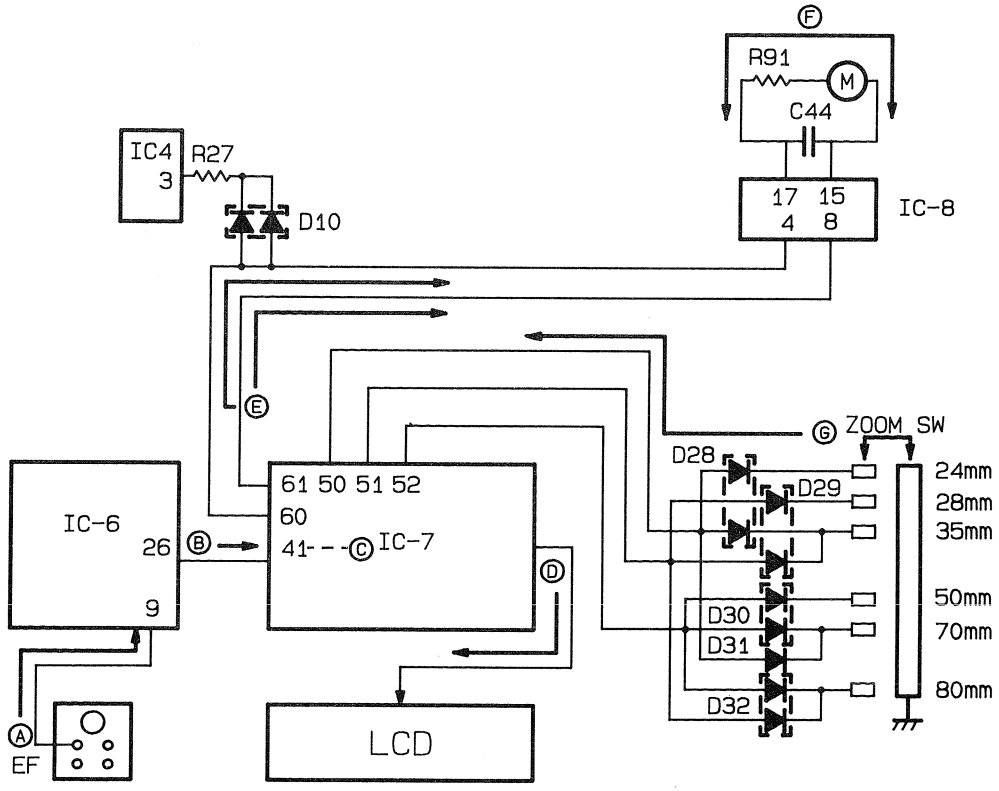
G. This information on flash unit's movement is entered in IC-7 p60 & p61 by Zoom SW.

H. The motor continues to rotate in order to set correct irradiation angle until the data of focus range from lens and the data of Zoom SW accord with each other.

NOTE: During zooming operation, the signals of IC-7 p60 and p61 are input to IC-4 p3 through D-10, which interrupts main capacitor charging.

Operational Flow

A ⟶ B ⟶ C ⟶ D ⟶ E ⟶ F ⟶ G
D ⟶ Charging Inhibit



8. AF LED Operation

When SW1 is on, light is measured. If the light below a certain level, AF LED (red) lights up as follows.

A. When the camera judges that AF LED is required, a high (5V) is sent on TV line. (This pulse input cycles until ranging is over, or 10 cycles.)

B. When IC-6 p6 receives this signal, it sends a high pulse signal to IC-6 p44.

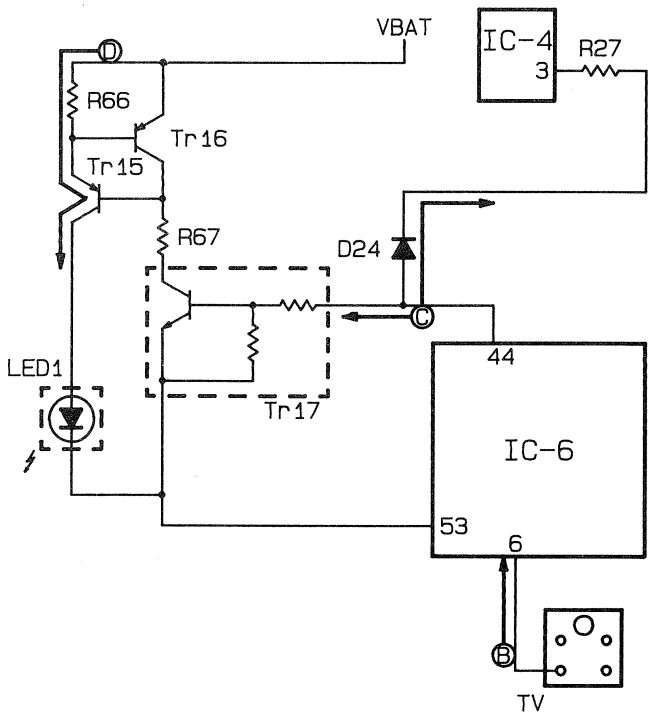
C. This turns Tr17 and Tr15 on, causing AF LED to light for the duration.

@ Tr16 is a current stabilizer for LED.

NOTE: The high signal of IC-6 p44 is also input to IC-4 p3 through D-24, which interrupts flash charging during AF LED operation. (See 9. Charging Interruption)

Operational Flow

A ——> B ——> C



9. Charging Interruption

Operation

Since both zooming and flash capacitor charging require a substantial amount of power, a circuit is included to interrupt flash charging during flash head movement.

A. During zooming operation, the high signal of IC-7 p65 and p66 are input to IC-4 p3 through D-10.

B. During AF LED operation, the high signal of IC-6 p44 is input to IC-4 p3.

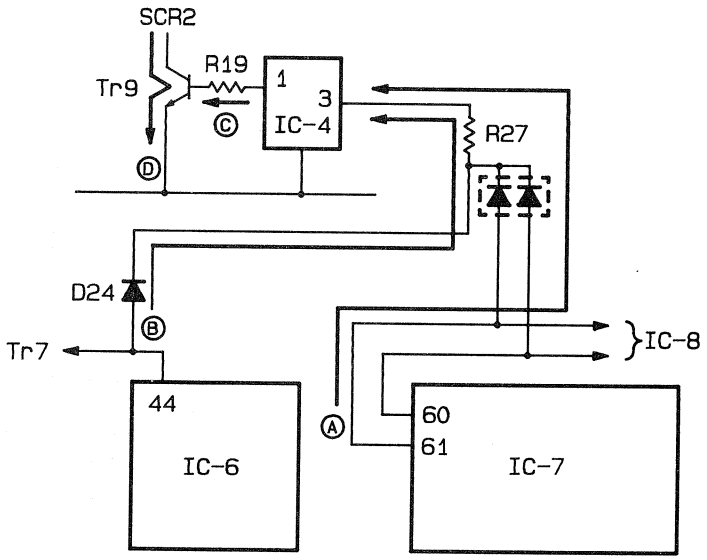
C. When receiving these high signals, IC-4 p3 goes high, regardless of IC-4 p2 input situation.

D. With this, Tr-9 turns on and SCR-2 turns off, interrupting main flash capacitor (C16) charging.

NOTE: At this time, charging operation is interrupted for only pre & main flash capacitor, while proceeding for other circuits.

Operational Flow

During Zoom Motor operation A
During AF LED ignition B
→ C → D



10. EL (Panel Lighting) Operation

A. When the EL SW locating on rear operation panel is activated, the signal is transferred to IC-7 p67.

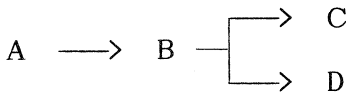
B. With this, a positive pulse is output repeatedly to IC-7 p46. (Pulse signal is about 624 Hz and output for about 8 seconds after the EL SW activated.)

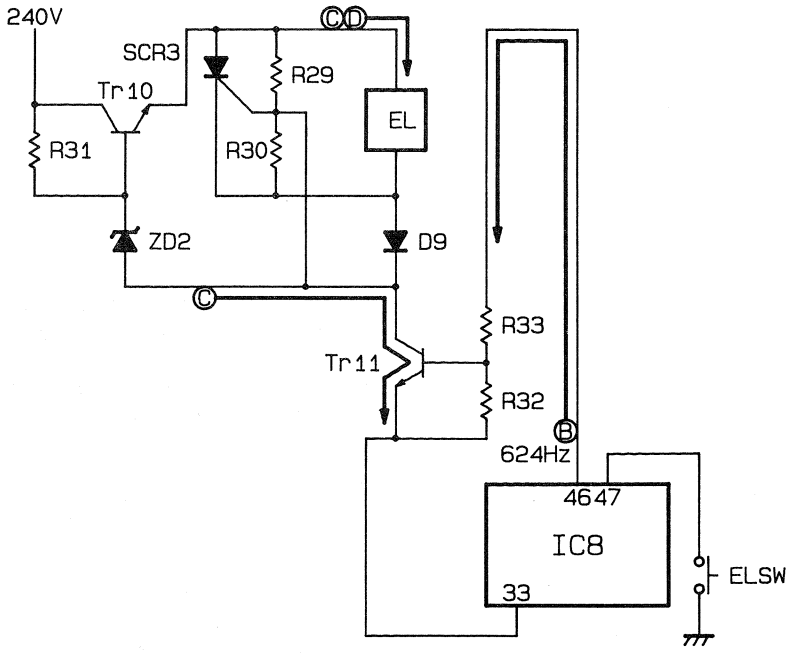
C. High signal is input to the base of Tr-11 turning Tr-2 and Tr-1 on. SCR-1 remains off. This causes the voltage of above 240V to be supplied to EL.

D. The trailing edge causes the base of Tr11 to go low, turning Tr11 and Tr10 off. SCR-3 is turned on by the charge stored in EL, and with this, EL discharges instantaneously.

E. By repeating above [C] and [D] operation, a high voltage pulse is applied to EL, firing it.

Operational Flow





11. SE Timer

Circuit Explanations

A. If no operation occurs for about 40 seconds after SW-1 is turned on, IC-7 p47 turns from low to high turning Tr-9 off. Tr-8 and Tr-7 turn off, cutting VCC supply. With this, SCR-1 turns off, stopping charging.

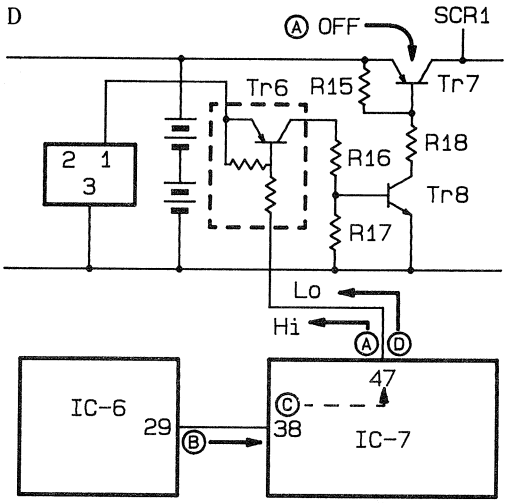
B. The flash is initiated when the test button is pressed or high signal is sent from camera, turning IC-7 p38 low.

C. With this, IC-7 p38 goes low.

D. With this, IC-7 p47 turns from high to low again, causing the charging to be initiated.

Operational Flow

A ——> B ——> C ——> D



12. Backup Storage of Mode

If the battery is replaced in the SE mode (Main SW off), the flash mode is stored automatically for 30 seconds.

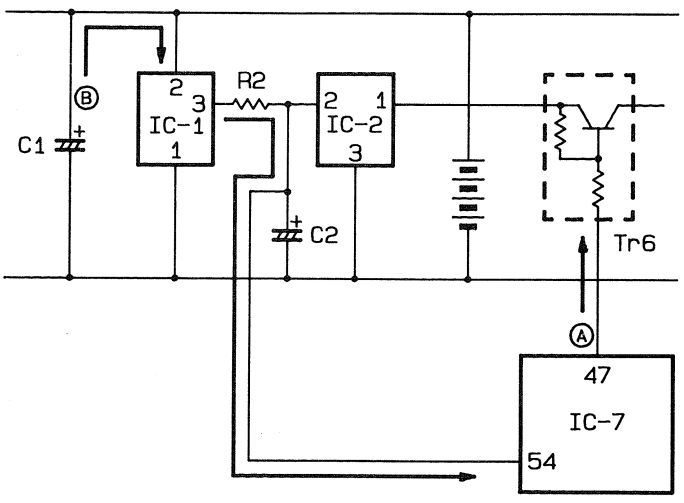
Circuit Explanations

A. When the flash turns to SE mode, IC-7 p47 goes high, turning Tr6 off. The voltage (VDD) of IC-1 p3 is not applied to flash control circuit but only to IC-7.

B. When the battery is removed in the SE mode, the voltage (VDD) is maintained for about 30 seconds by the electric energy charged in C-1. With this, the flash mode is stored for 30 seconds.

Operational Flow

A ——> B



13. Oscillation Temporary Halt

A. IC-6 p33 senses the voltage level of VCC.
(When the voltage level goes under 3V, circuit operates as follows in order to prevent error operation caused by dropping of VCC.)

B. When VCC falls under 3V, IC-6 p43 goes high.

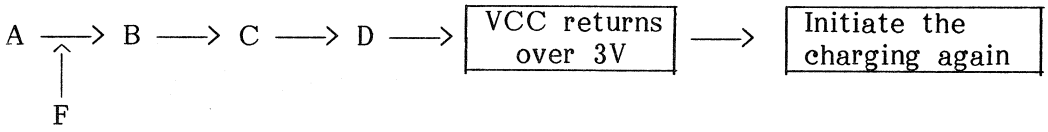
C. With this, TALY1 and Tr-4 turns on.

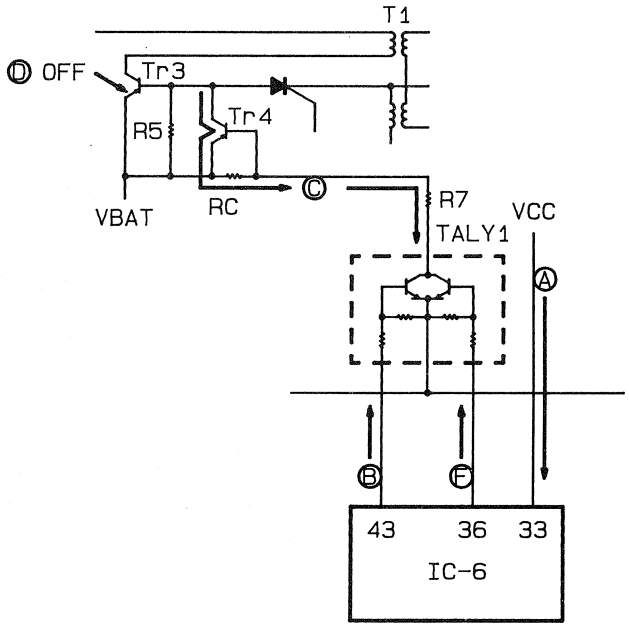
D. With Tr-4 turns on, Tr-3 turns off, causing the charging to stop.

E. When VCC returns over 3V, IC-6 p43 goes low again, initiating the charging again.

F. On the other hand, during main flash, IC-6 p36 temporary goes high to halt oscillation by the same way as above mentioned in order to stabilize each operation (especially light adjustment level control) executed immediately after main flash. (Because fluctuation of VCC level may influence to light adjustment level.)

Operational Flow





14. Manual Low Flash

A. With Mode SW pressed once, IC-7 p64 is informed of Manual Low Mode. (In this mode, the flash level is initially set to 1/1, which can be shifted to 1/32.)

B. This information is transferred from IC-7 p17 through p20 to IC-6 p15 through p18.

C. With receiving this data, IC-6 conducts IC-5 p2 to use PD1.

D. At shutter release, X and STSP signals are input to IC-6 p8 and p10.

E. With these signals, the trigger signal for main flash is generated from IC-6 p35 and p36, causing a brilliant flash of light. (See 5. Main Flash)

F. At this time, the quantity of flash light is entered in PD1.

G. This data is transferred from IC-5 p8 to IC-6 p55.

H. IC-6, comparing this data with set mode, outputs flash halt signal from IC-6 p34 when the quality of flash light comes to appropriate level.

I. This signal activates flash halt circuit, stopping flash firing. (See 6. " Flash Termination")

Multi Flash

Multi Flash is basically operated in the same way as manual low flash above mentioned, but following items are added.

J. With Mode SW pressed twice, IC-7 is informed of Multi flash mode, which is transferred to IC-6.

K. With this, IC-6 detects Multi Mode.

L. At this mode, with X and STSP signal sent from the camera, IC-6 outputs the trigger signal correspond to Multi Mode, causing the Multi flash. (Multi flash firing is halted in the same way as Manual Low flash.)

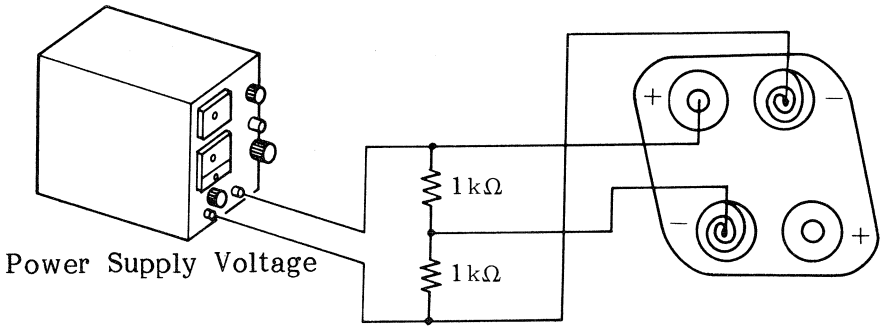
III. TROUBLESHOOTING CHART

SYMPTOM ANALYSIS

Symptom Analysis

Assemble a test lead as shown and attach to the power supply and the battery terminals. Run through the functions to determine which are functioning properly and which are not. While checking, note the readings of the voltage

After determining the function which is not operating correctly, locate it in the "Trouble Menu", which follows, and then proceed to the relevant Troubleshooting Chart.



Disassembly for Circuit Board Checks

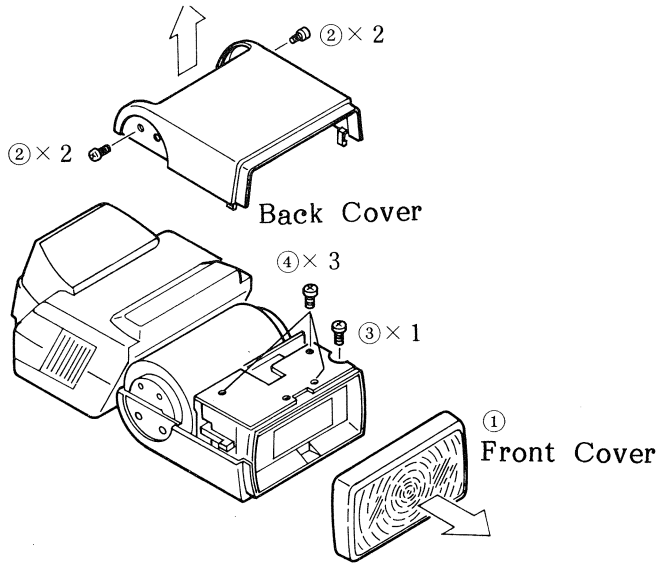
"B" and Brush Circuit Boards

1. Remove the front panel from the flash head.
2. Remove four screws on the sides of the lower flash head cover and remove the cover.
3. Remove the screw (3) holding the flash head and lift the flash head.

----- At this point the B circuit board checks are possible. -----

4. Remove the three screws (4) and lift the Brush Circuit Board.

----- Brush Circuit Board checks are now possible. -----



"D", "E", "F", & "G" Circuit Boards

1. Remove four screws (1) from the shoe.
2. Remove the two countersunk screws (2) from the rear cover
3. Remove the front cover.

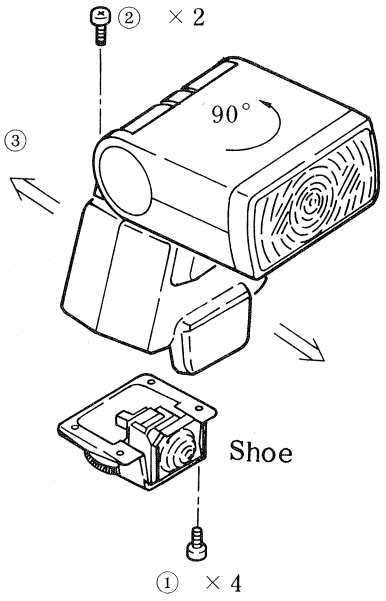
----- At this point the E & G circuit boards can be checked. -----

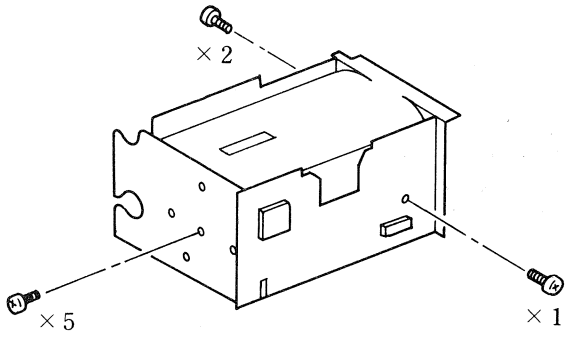
4. Remove the eight screws holding the circuit boards to the battery box (D C.B.: two screws; E C.B. five screws, G C.B. one screw) and remove the battery box.

<!!> If the D circuit board and battery box are taped together, cut the tape loose.

<!!> DO NOT bend the battery contacts when removing the battery box.

----- The D & F circuit boards can now be checked. -----



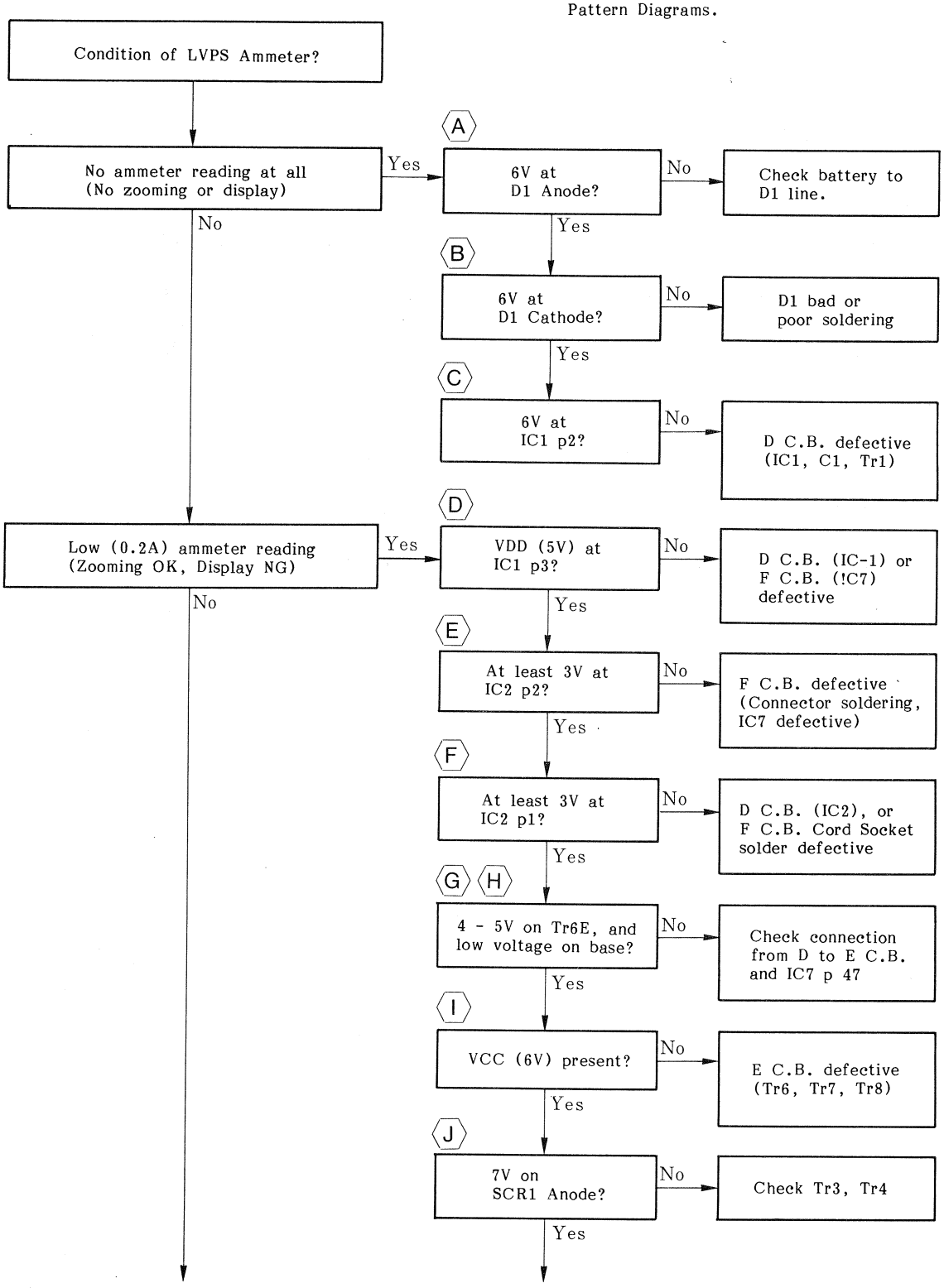


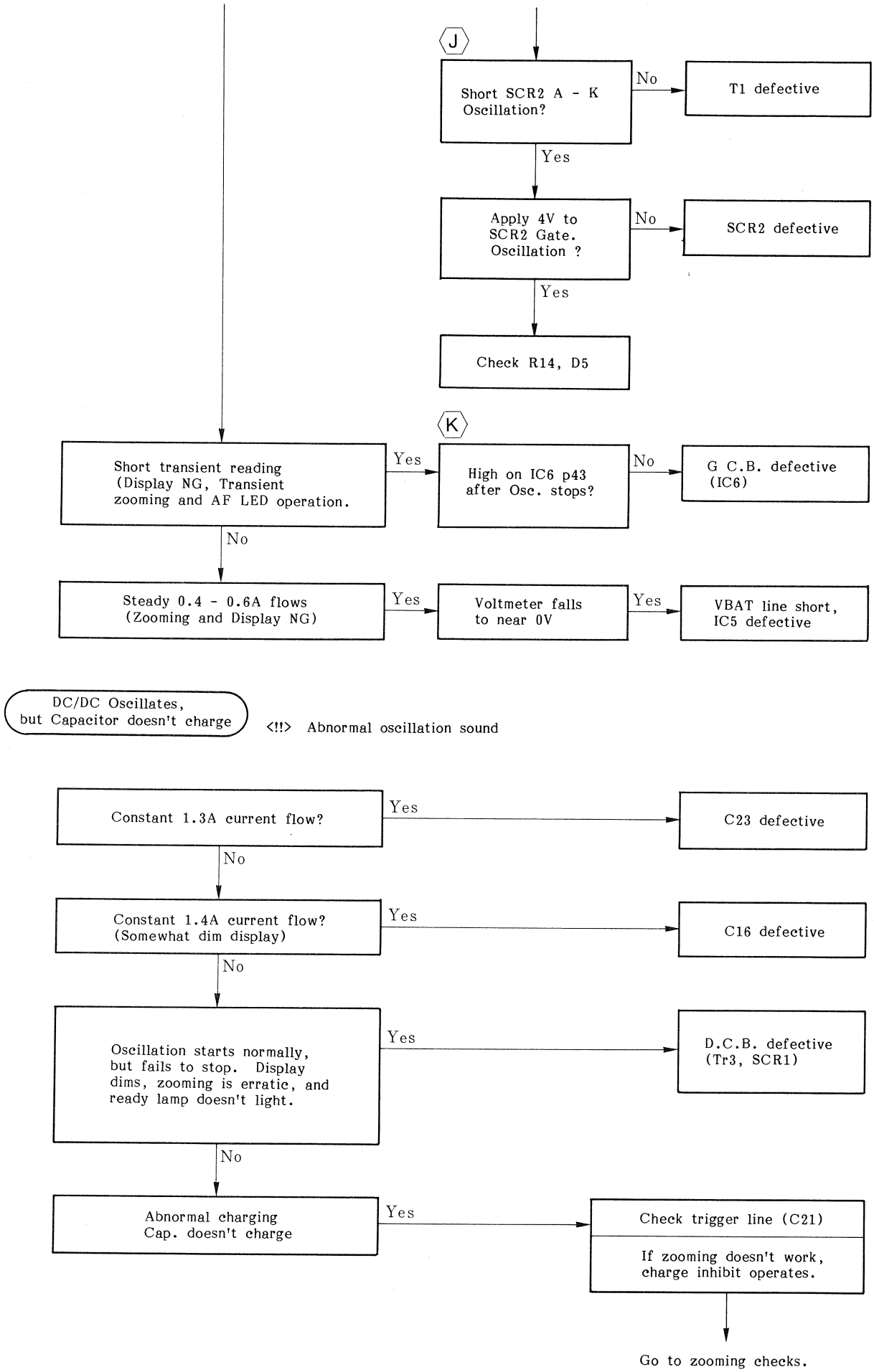
TROUBLE MENU

TROUBLESHOOTING CHARTS

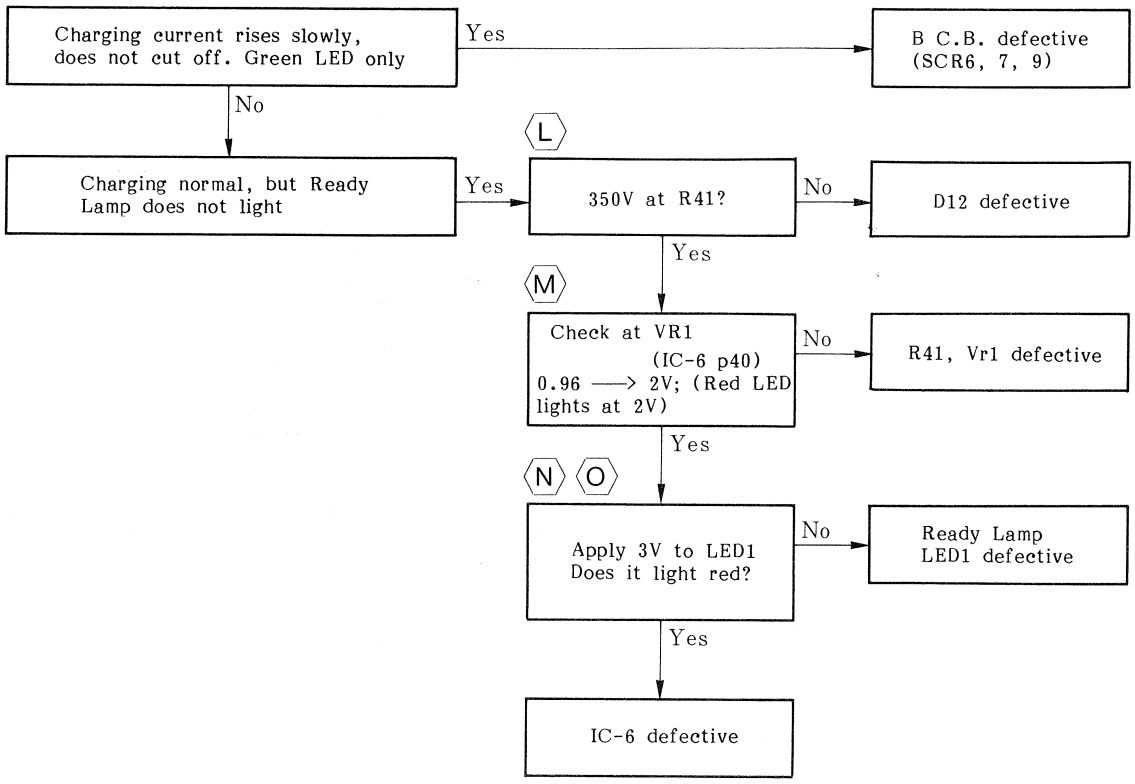
No DC/DC Oscillation

<!!>: Indicates checkpoints marked on the Pattern Diagrams.

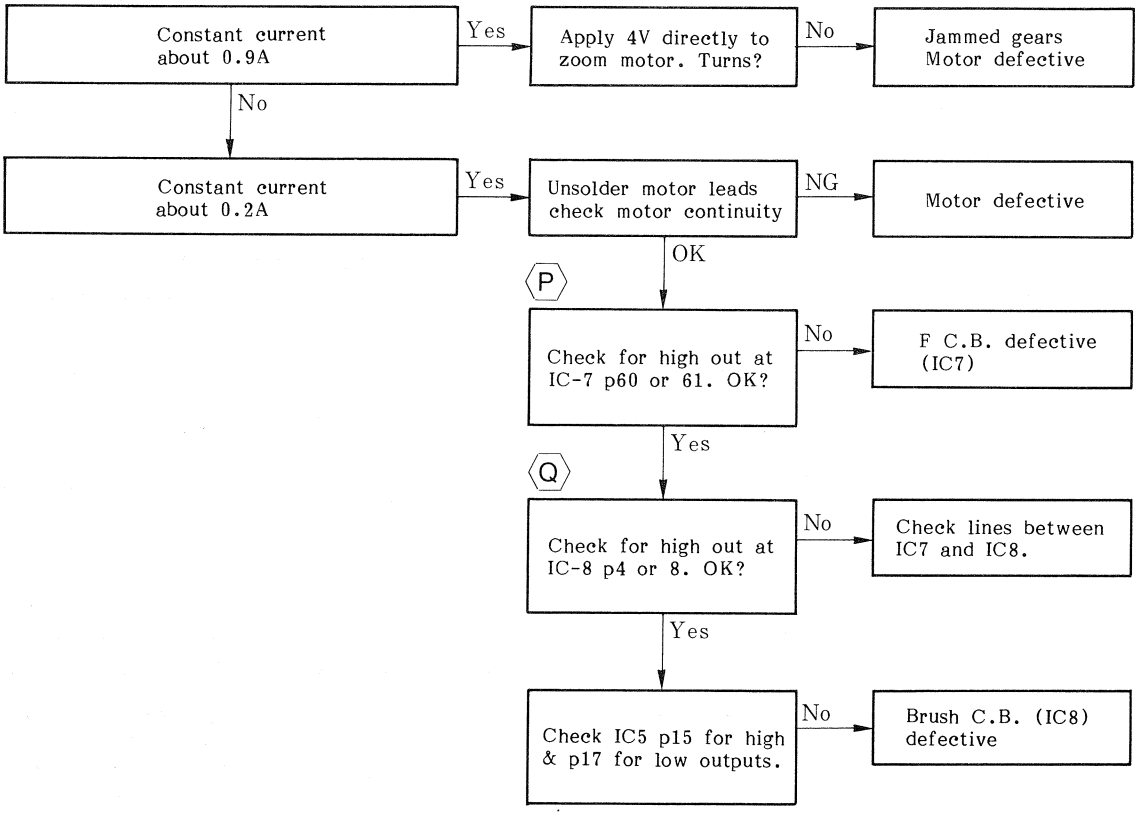



J
Short SCR2 A - K Oscillation?
No
T1 defective
Yes
Apply 4V to SCR2 Gate. Oscillation ?
No
SCR2 defective
Yes
Check R14, D5
K
Short transient reading (Display NG, Transient zooming and AF LED operation.
Yes
High on IC6 p43 after Osc. stops?
No
G C.B. defective (IC6)
No
Steady 0.4 - 0.6A flows (Zooming and Display NG)
Yes
Voltmeter falls to near 0V
Yes
VBAT line short, IC5 defective
DC/DC Oscillates, but Capacitor doesn't charge
<!!> Abnormal oscillation sound
Constant 1.3A current flow?
Yes
C23 defective
No
Constant 1.4A current flow? (Somewhat dim display)
Yes
C16 defective
No
Oscillation starts normally, but fails to stop. Display dims, zooming is erratic, and ready lamp doesn't light.
Yes
D.C.B. defective (Tr3, SCR1)
No
Abnormal charging Cap. doesn't charge
Yes
Check trigger line (C21)
If zooming doesn't work, charge inhibit operates.
Go to zooming checks.

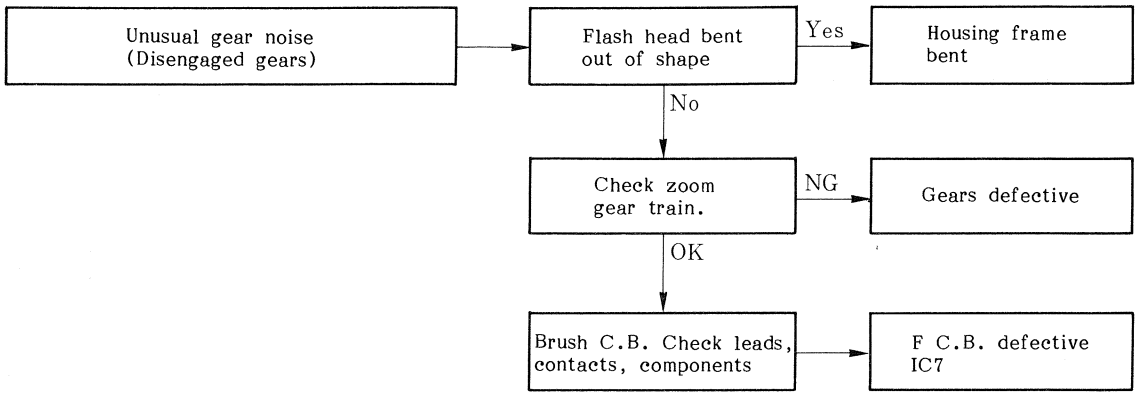
Slow charging, Ready lamp doesn't light



Flash Head doesn't zoom (Oscillation & Display OK)

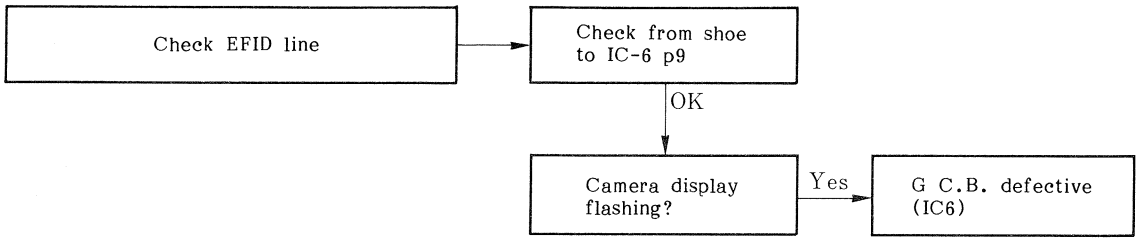


Zoom Motor runs constantly

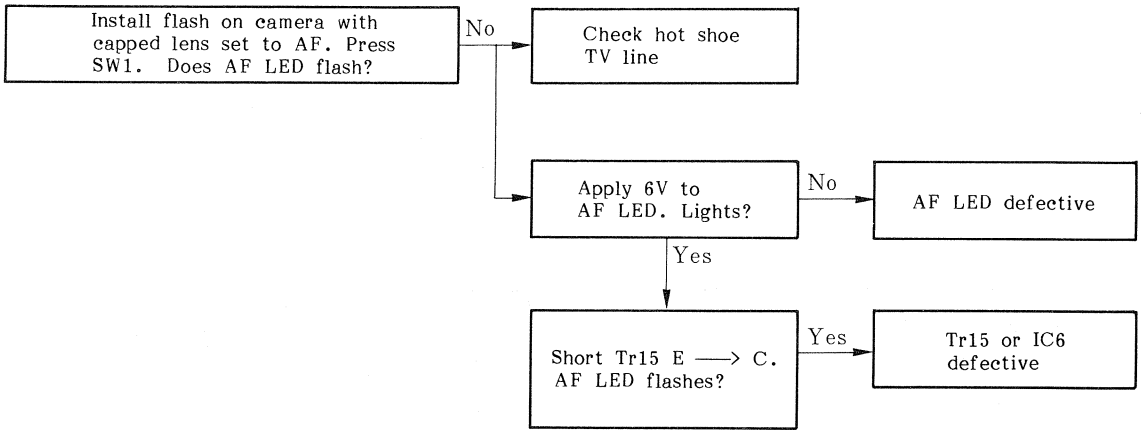


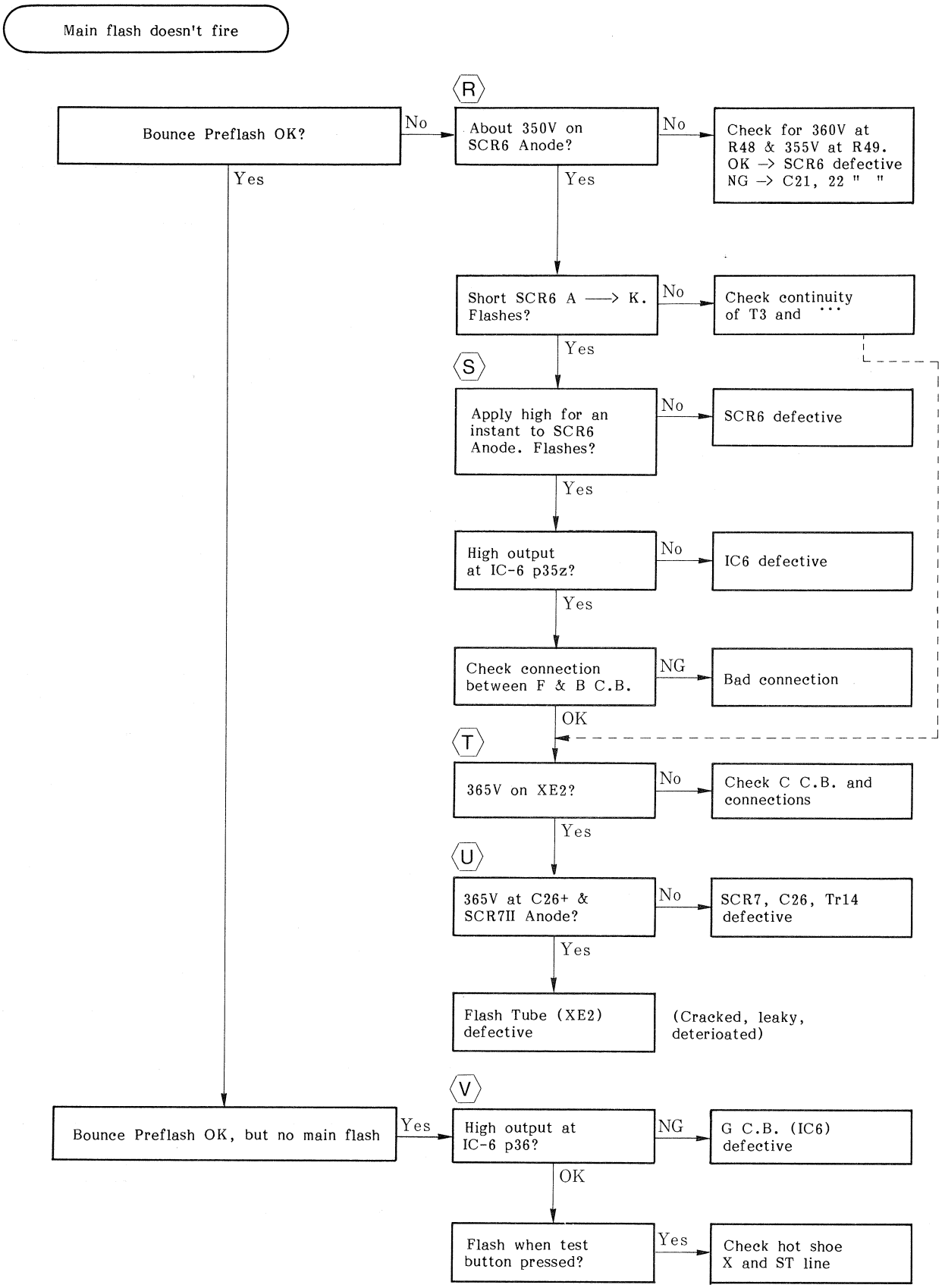
Flash zoom doesn't sync with lens zoom

※ (Manual zoom OK)

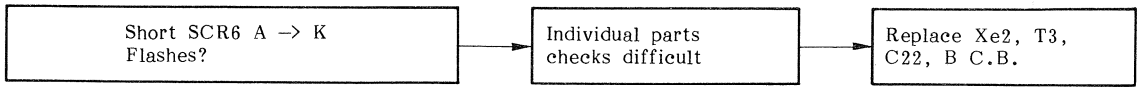


AF Illuminator (AF LED) doesn't fire

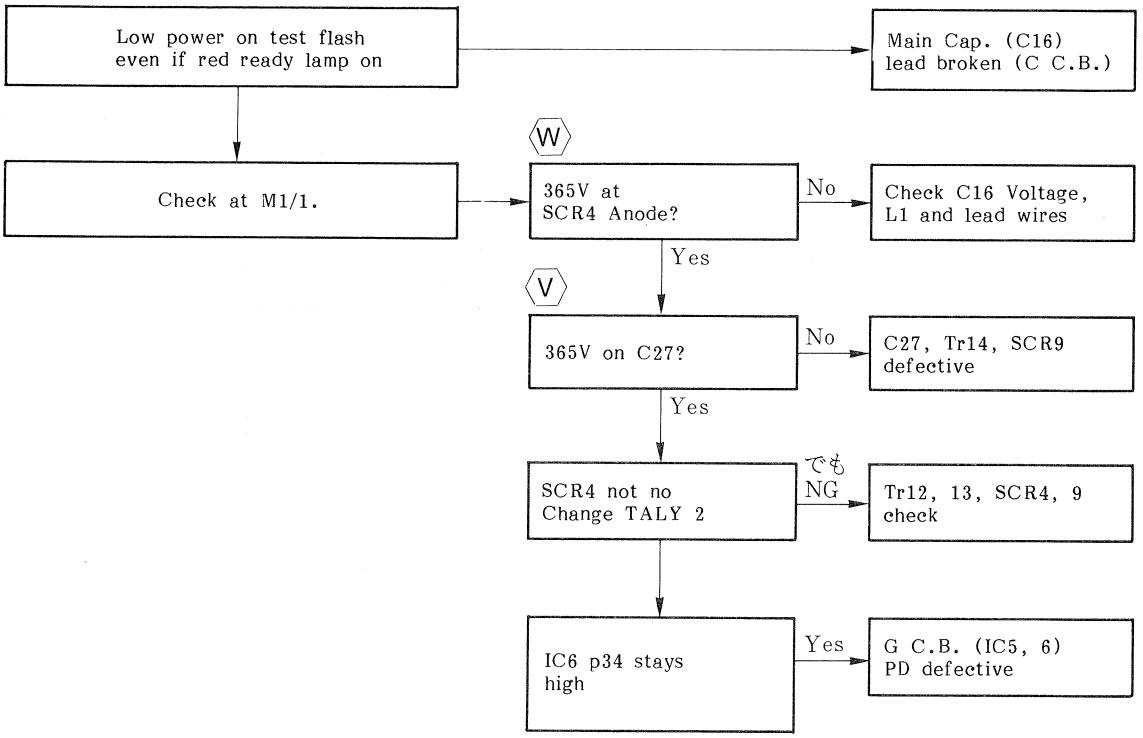



Main flash doesn't fire
Bounce Preflash OK?
No
Yes
R
About 350V on SCR6 Anode?
No
Check for 360V at R48 & 355V at R49. OK -> SCR6 defective NG -> C21, 22 " "
Yes
Short SCR6 A ——> K. Flashes?
No
Check continuity of T3 and ...
Yes
S
Apply high for an instant to SCR6 Anode. Flashes?
No
SCR6 defective
Yes
High output at IC-6 p35z?
No
IC6 defective
Yes
Check connection between F & B C.B.
NG
Bad connection
OK
T
365V on XE2?
No
Check C C.B. and connections
Yes
U
365V at C26+ & SCR7II Anode?
No
SCR7, C26, Tr14 defective
Yes
Flash Tube (XE2) defective
(Cracked, leaky, deterioated)
Bounce Preflash OK, but no main flash
Yes
V
High output at IC-6 p36?
NG
G C.B. (IC6) defective
OK
Flash when test button pressed?
Yes
Check hot shoe X and ST line

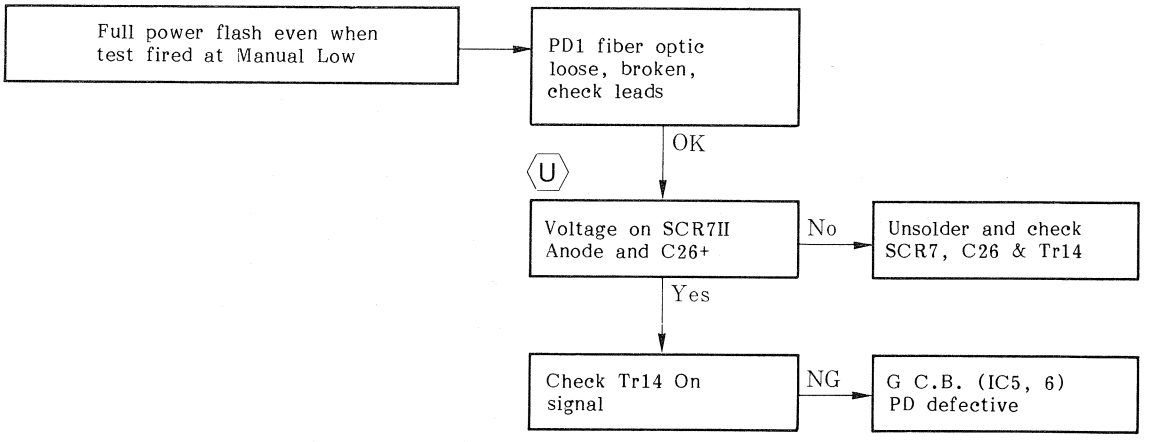
Intermittent Main Flash

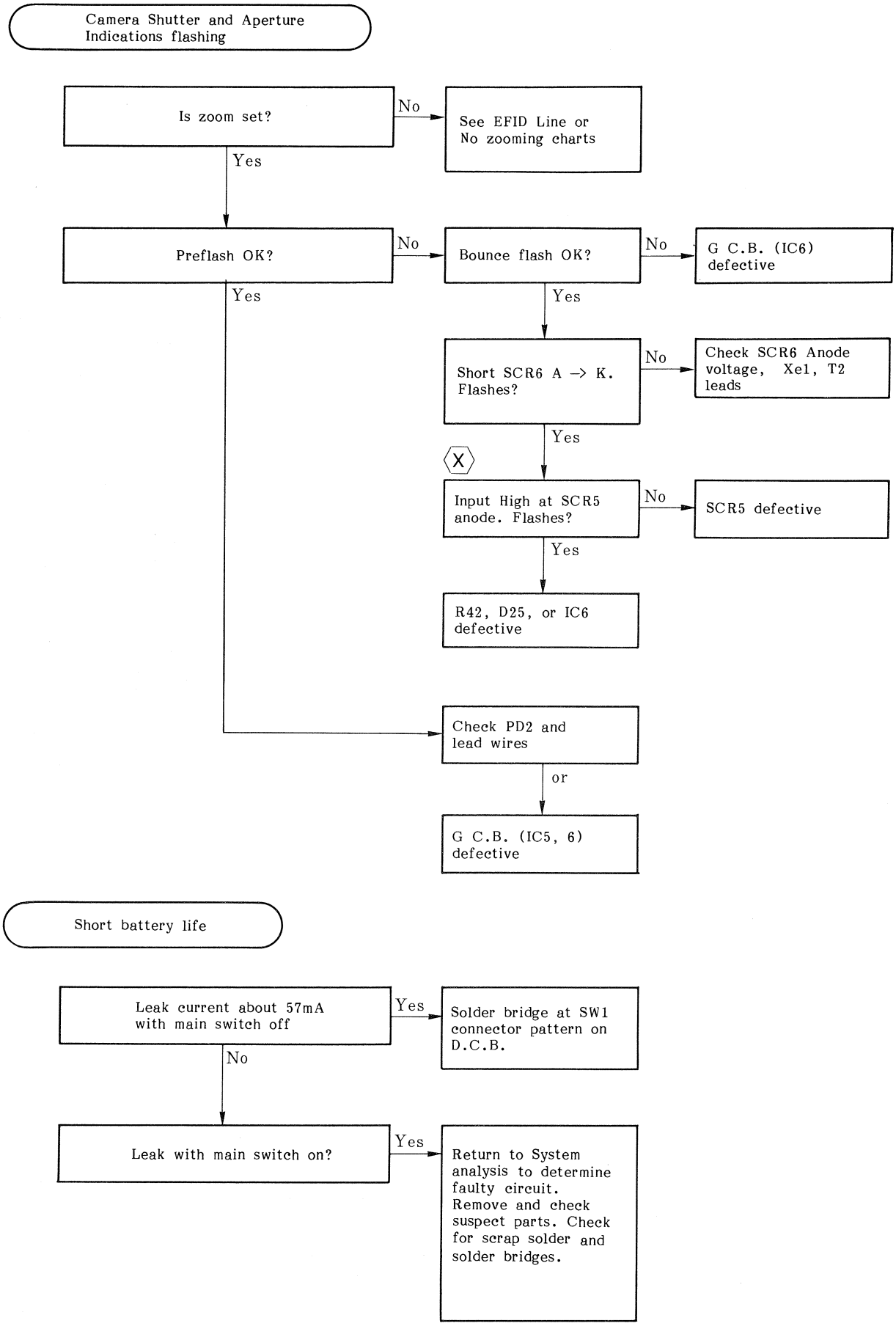


Main flash power too low



No automatic flash control (Always full power)




Camera Shutter and Aperture Indications flashing
Is zoom set?
No
See EFID Line or No zooming charts
Yes
Preflash OK?
No
Bounce flash OK?
No
G C.B. (IC6) defective
Yes
Yes
Short SCR6 A -> K. Flashes?
No
Check SCR6 Anode voltage, Xe1, T2 leads
Yes
X
Input High at SCR5 anode. Flashes?
No
SCR5 defective
Yes
R42, D25, or IC6 defective
Check PD2 and lead wires
or
G C.B. (IC5, 6) defective
Short battery life
Leak current about 57mA with main switch off
Yes
Solder bridge at SW1 connector pattern on D.C.B.
No
Leak with main switch on?
Yes
Return to System analysis to determine faulty circuit. Remove and check suspect parts. Check for scrap solder and solder bridges.

IV. ADDITIONAL INFORMATION

PRECAUTIONS

Speedlite 430EZ

Items not listed below are same as 420EZ.

Item/Contents	Reason/Remarks
1. When the 430EZ is used with the EOS 750, 750QD, or 850, the stroboscopic flash and manual flash modes cannot be used.	This is due to the fact that the only camera shooting mode detected by the flash is the fully automatic mode.
2. Automatic flash exposure compensation display on the camera.	(1) The "+/-" indication is not displayed on the EOS 630. (2) With the EOS-1, the "+/-" indication is displayed in the viewfinder, but not on the flash LCD.
3. Rapid-fire flash not usable: (1) Manual flash mode (2) With external power source (3) Camera is in continuous mode (4) Flash unit is in 6-10 Hz stroboscopic flash mode	Conditions (1) and (2) are assumed to be used with full (1/1) power flash, which prohibits the use of low voltage flash. Conditions (3) and (4) prohibit the use of low voltage flash because of difficulties in maintaining stable automatic flash control.

Laminated Battery Pack E

Item/Contents	Reason/Remarks
1. Precautions when handling the laminated battery (1) Use the battery without removing it from its plastic bag. (Make sure not to tear or damage the bag.)	Since the battery provides a high voltage of 315V, it is extremely dangerous to touch the battery's electrodes with bare hands. The contacts inside the pack are sharply pointed so they pierce the plastic bag and make contact.
(2) Do not touch the battery in the vicinity of the of the electrodes.	This is because the only insulation provided between you and the battery is the plastic bag. Handling the battery with wet hands should especially be avoided. The possibility of electric shock exists.
2. When the flash unit is not being used, the main switch on the flash unit as well as the power switch on the Laminated Battery Pack E should be turned off to avoid unnecessary power drain.	Even with the 430EZ main switch off, the Laminated Battery Pack E will continue to charge the main condenser of the 430EZ. This condition will cause the laminated battery to be drained in about four days.

Transistor Pack E

Item/Contents	Reason/Remarks
1. Precautions related to charging of the Ni-Cd Pack TP (1) Be sure to use the dedicated Ni-Cd Charger TP to recharge the Ni-Cd Pack TP.	If a charger other than the Ni-Cd Charger TP is used, damage to the battery caused by incomplete charging or over-charging may occur.
(2) The battery should always be charged for at least 15 hours. However, the battery should not be charged for more than 24 hours.	The Ni-Cd Pack TP is designed so that no problems will occur even if the battery is charge continuously for 500 hours. However, a charging period of 24 hours is more than sufficient to fully recharge the battery, and there is absolutely no reason to charge the battery for a longer period.
(3) The Ni-Cd Pack TP should be charge every two to three months.	Ni-Cd cells self-discharge and become hard to recharge if left in a discharged condition.
(4) Before using the Ni-Cd Pack TP, be sure that the battery is fully charged.	As above.
(5) The battery cannot be used to power the flash unit while it is charging.	The battery must be removed from the pack to recharge it.
(6) The pilot lamp does not indicate the level of charge.	The lamp indicates only that the battery is being charged.
2. The Ni-Cd Pack TP should not be used as the power source for any other device.	Company policy.
3. Caution should be taken not to allow foreign objects to enter the connector section.	Short circuits.
4. The Ni-Cd Pack TP should not be disassembled.	It's dangerous.

Ni-Cd Charger TP

Item/Contents	Reason/Remarks
1. The Ni-Cd Charger TP should not be used with any product except the Ni-Cd Pack TP.	Use with products other than the Ni-Cd Pack TP is not guaranteed.
2. Do not short-circuit the contacts of the charging plug while the charger is plugged into an AC outlet.	The charger may be damaged.
3. The charger should not be disassembled or modified.	Disassembling or modifying the charger is dangerous.
4. Unplug the charger from the AC outlet when it is not being used for charging the Ni-Cd Pack TP.	This is because the charger is not provided with a power switch. Also, when unplugging the charger from the AC outlet, do not pull the cord but grasp the charger's main unit and pull it directly away from the outlet.
5. Use the charge within a temperature range of 0°C-- 45°C.	This is according to the charger's design specifications.
6. Heat generated by the charger during charging.	This is not abnormal and is no cause for worry.

COMPATIBILITY WITH F-1, A&T SERIES SLR CAMERAS

1. X-sync shutter speed of AE SLR camera body is automatically set upon receiving the charge completion signal.

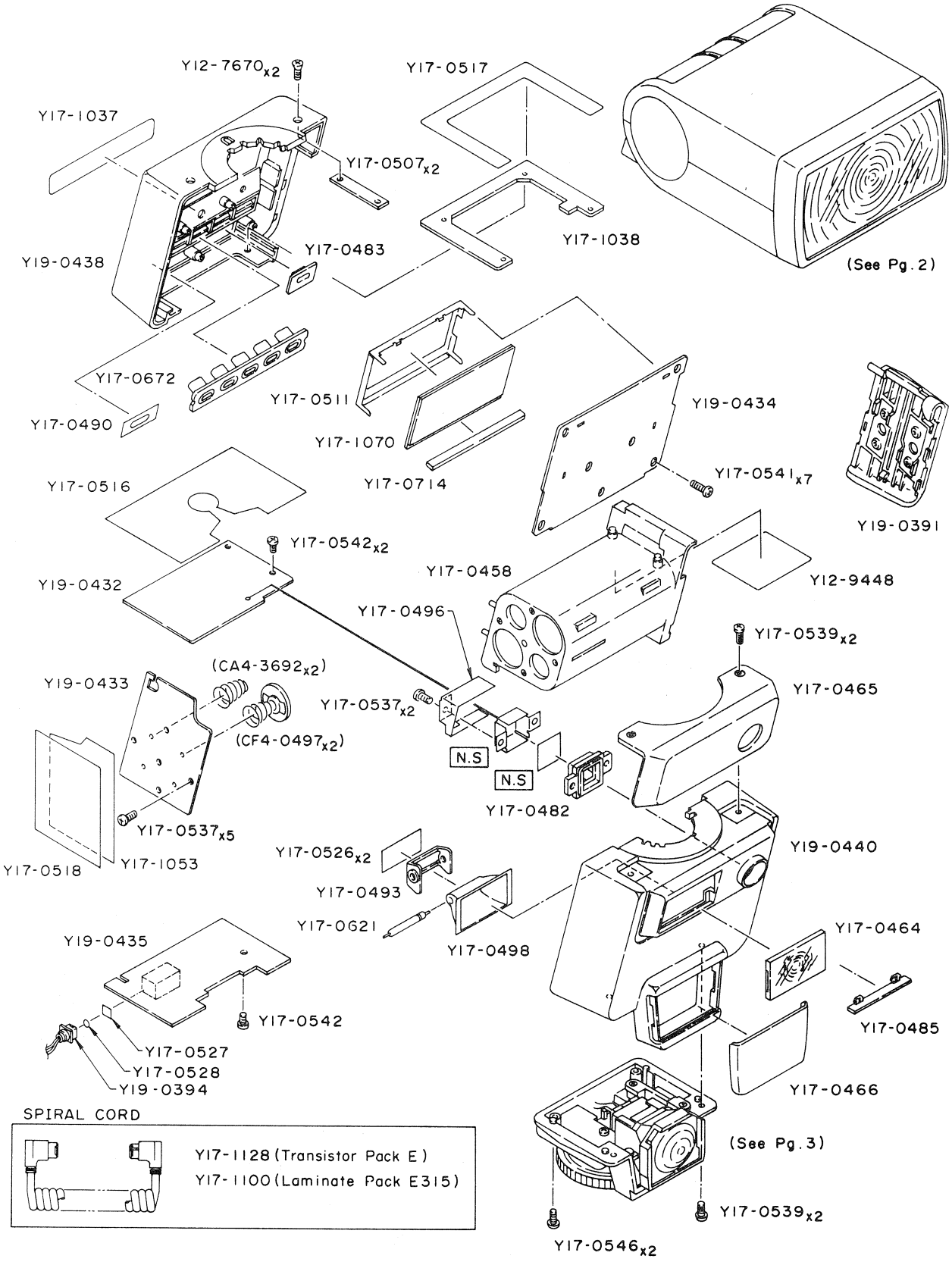
2. The 430EZ does not display auto-zoom, f/No. and range values.

3. Aperture settings are made as follows.

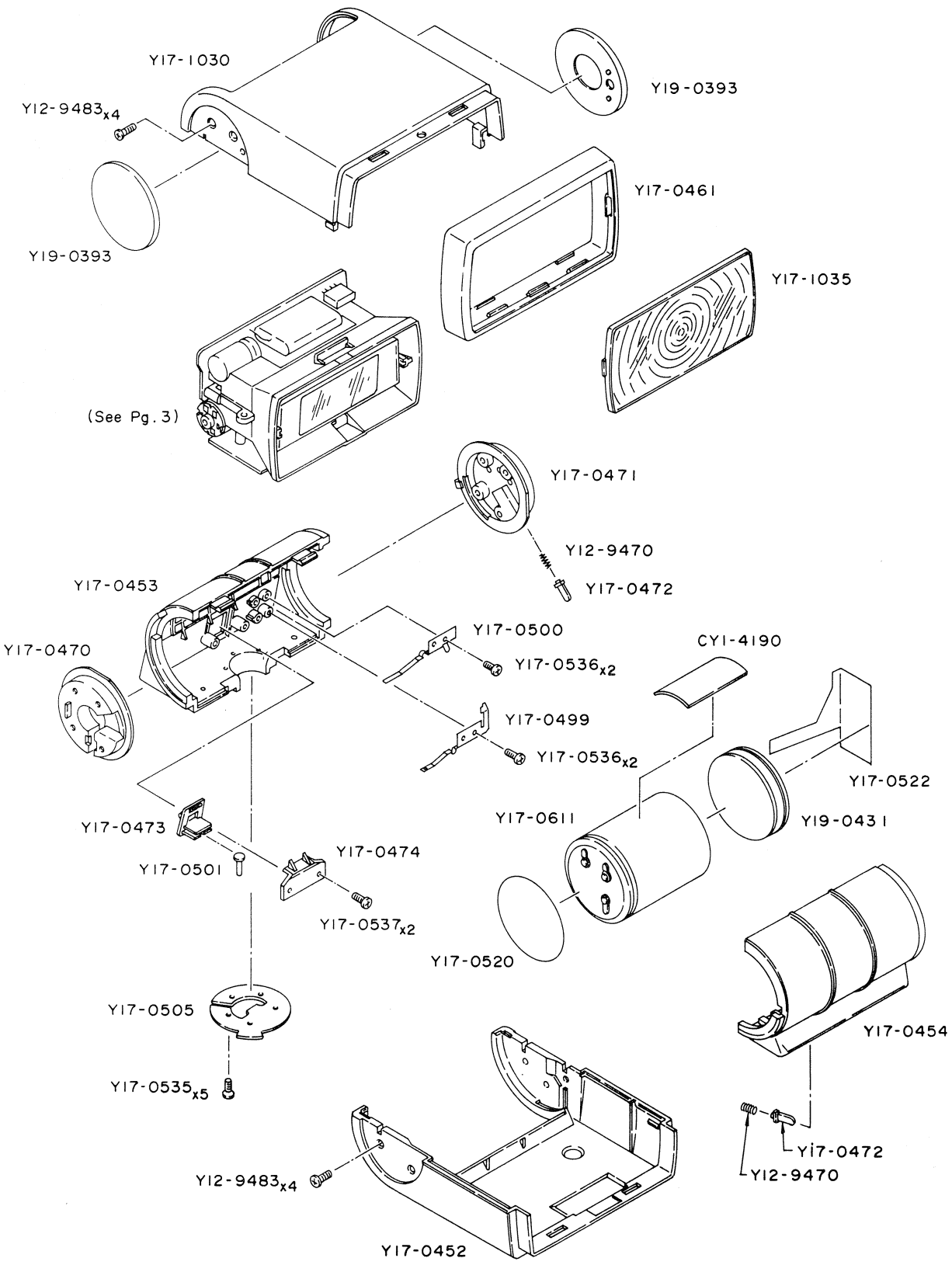
○ : Set automatically
△ : Set manually
× : Not usable

Body	Compatibility	Remarks
T90	○	Usable with A-TTL and TTL flash For TTL flash, set aperture ring manually.
T80 W/AC	×	Not usable because aperture cannot be set manually.
T70 T50 N F-1 AE-1P A-1 AE-1 AL-1 AV-1 F-1 FTb	△	Usable as manual flash only In the flash manual mode, manually set the aperture on the camera calculated from the guide number.

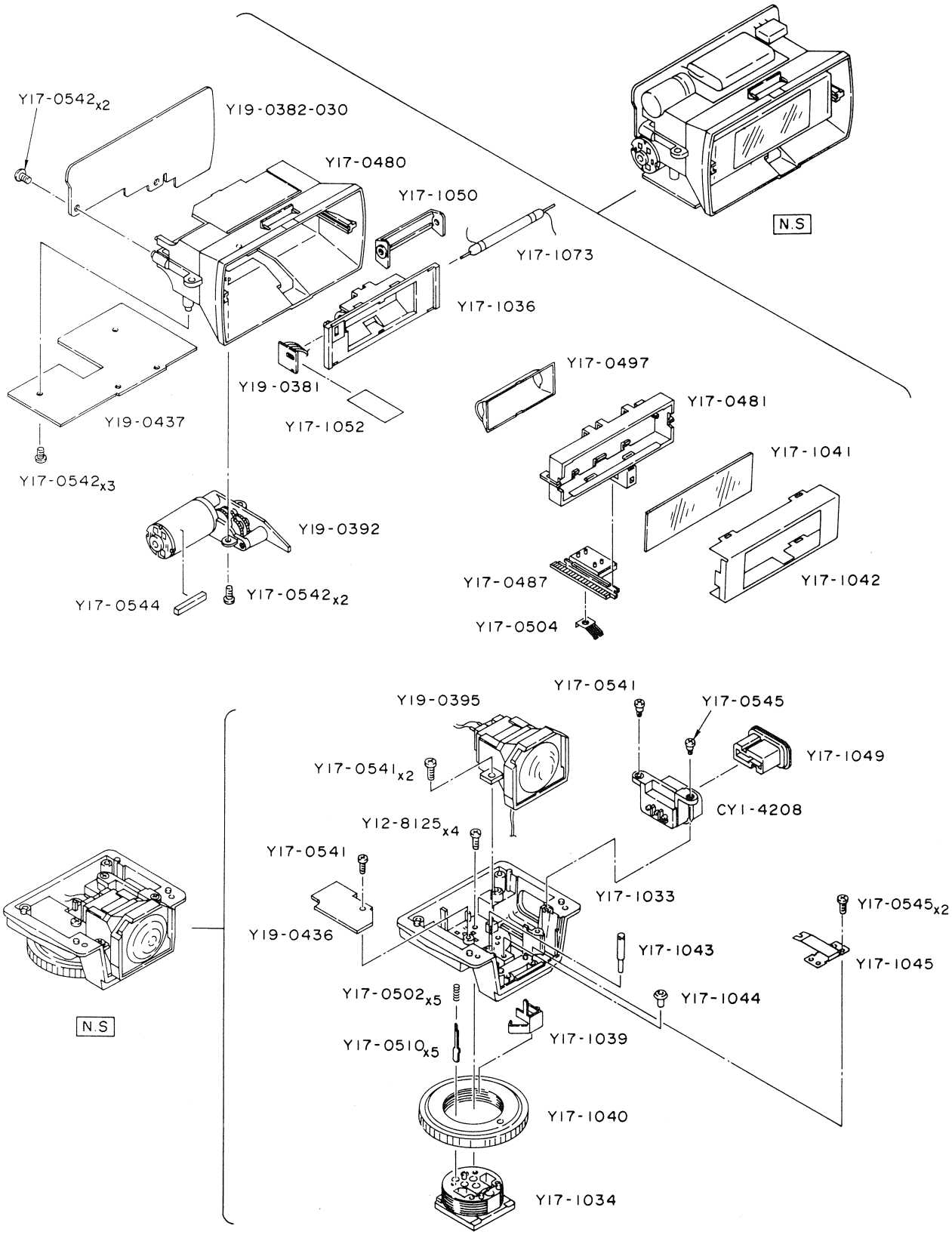
PARTS ILLUSTRATION



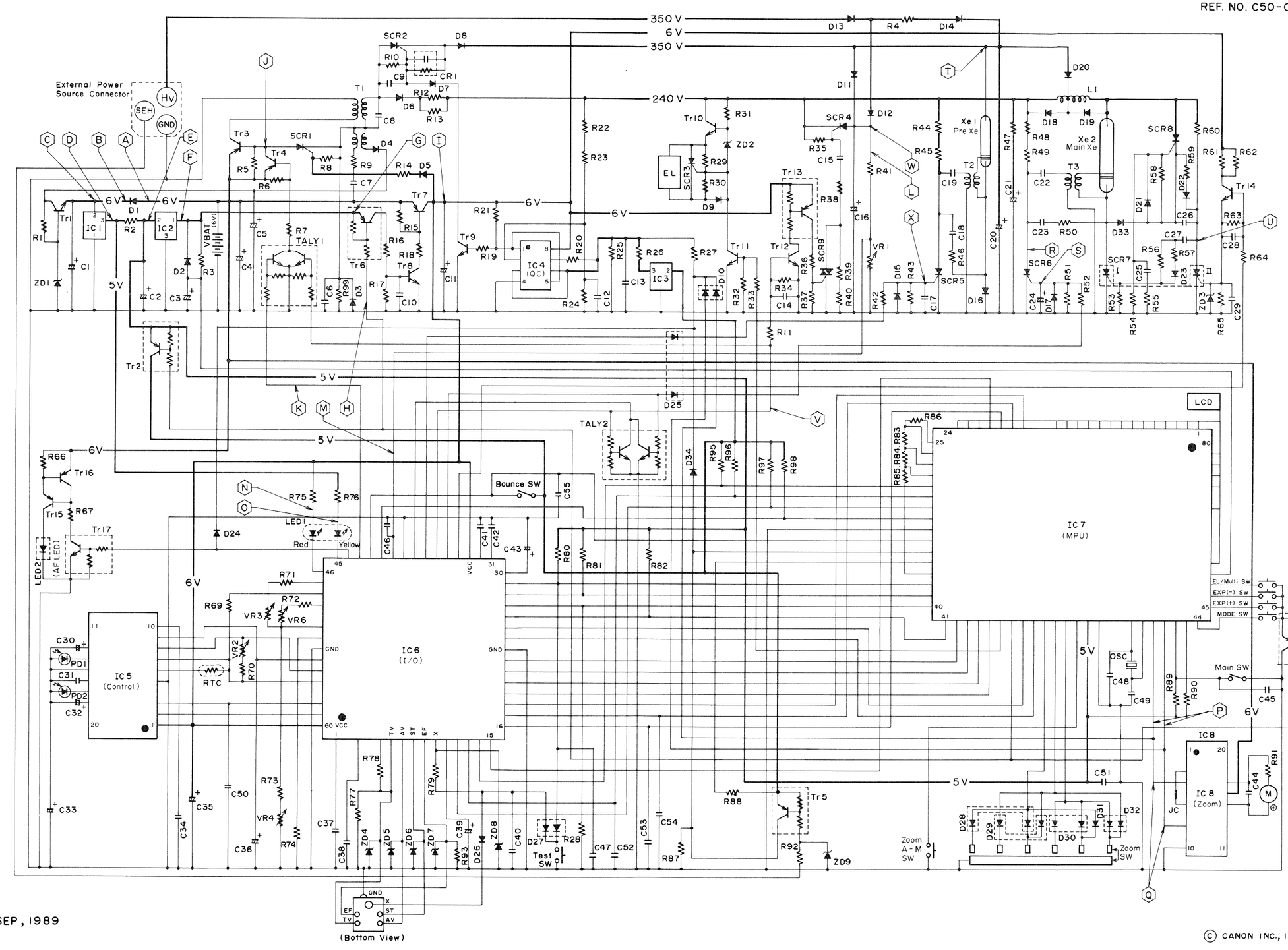
CANON SPEEDLITE 430EZ



CANON SPEEDLITE 430EZ



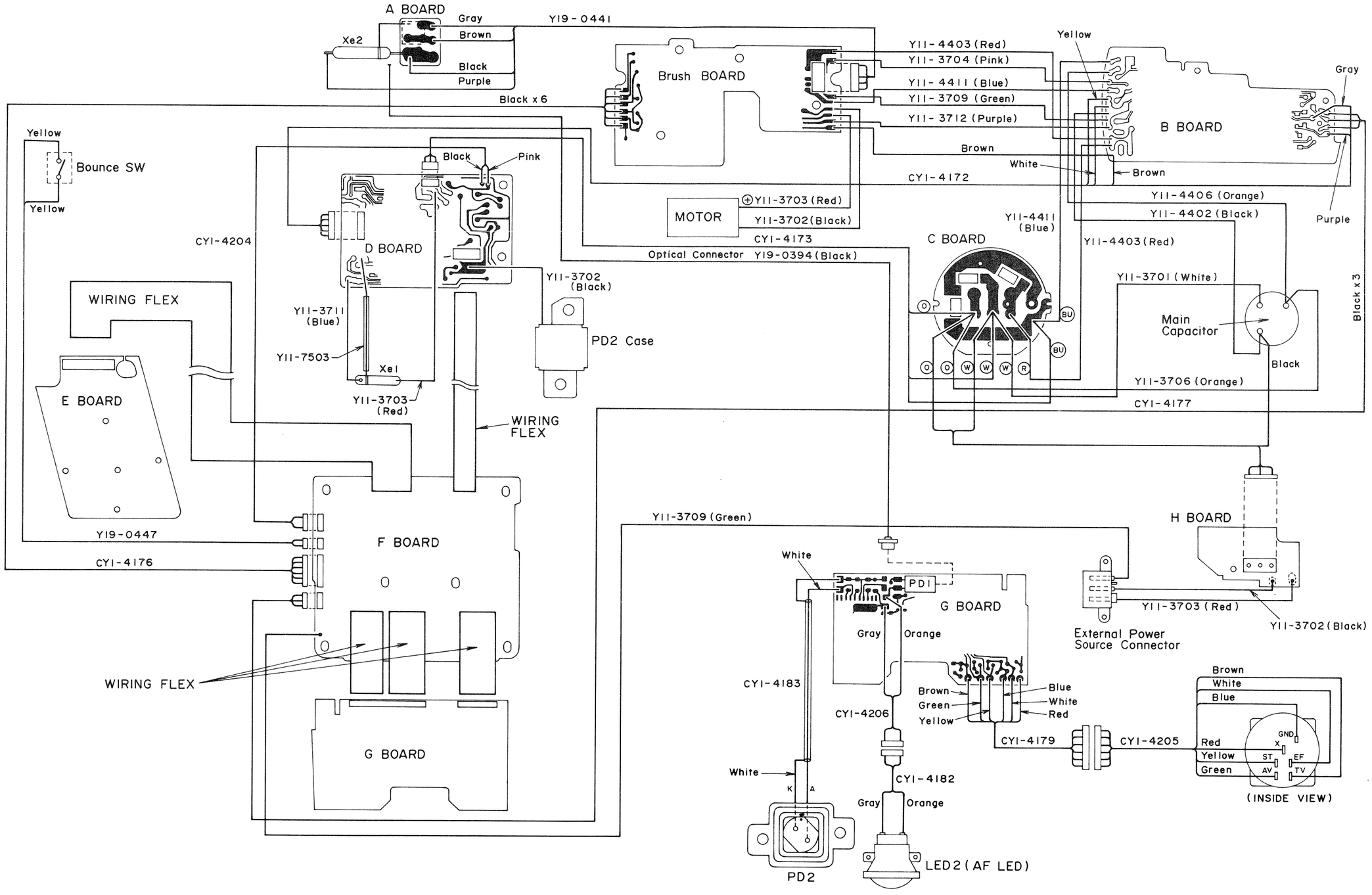
V. ELECTRICAL INFORMATION



01 SEP, 1989

WIRING DIAGRAM

SPEEDLITE 430EZ
REF. NO. C50-0611



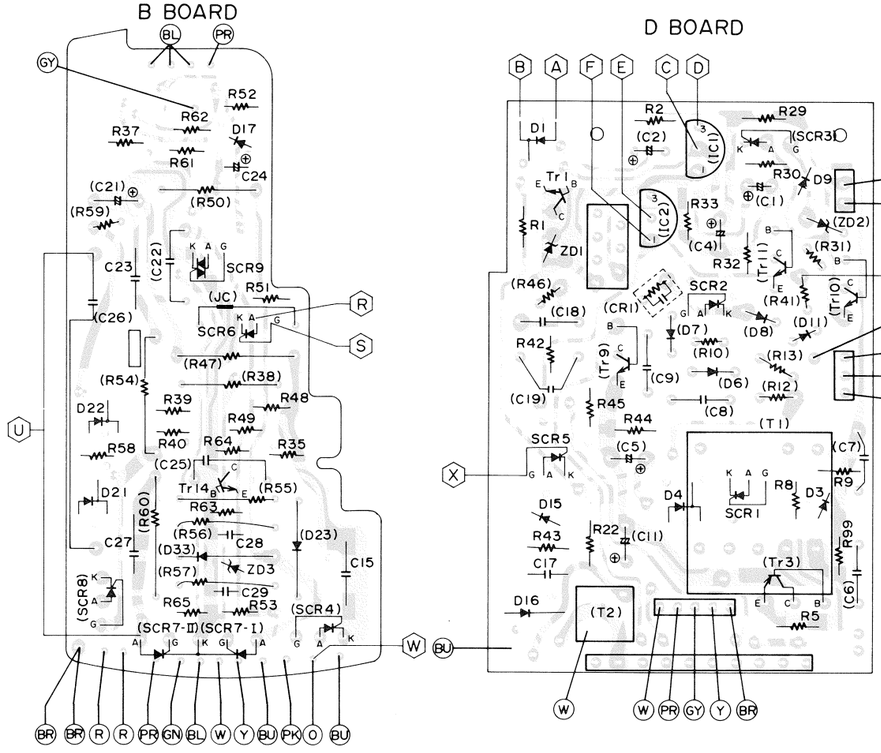
01 SEP, 1989

P.C.B. DIAGRAM

SPEEDLITE 430EZ
REF. NO. C50-0611

SYMBOL	COLOR	SYMBOL	COLOR	SYMBOL	COLOR
(W)	White	(O)	Orange	(BU)	Blue
(BL)	Black	(Y)	Yellow	(PR)	Purple
(R)	Red	(GN)	Green	(BR)	Brown
(PK)	Pink	(SB)	Sky Blue	(GY)	Gray

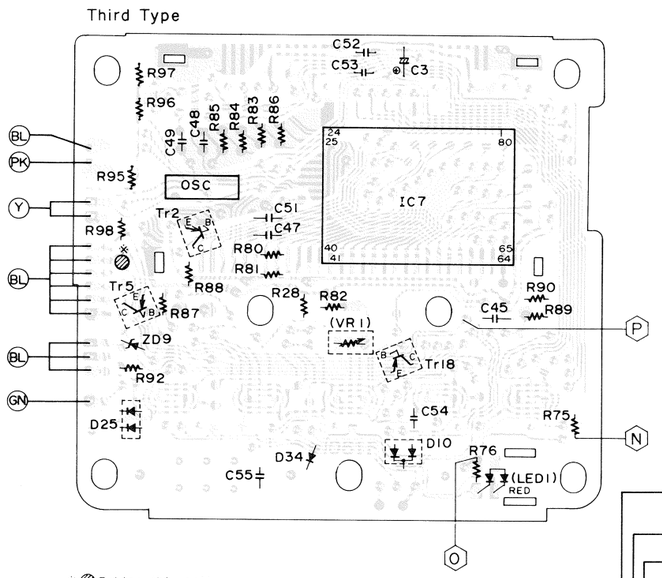
B BOARD



D BOARD

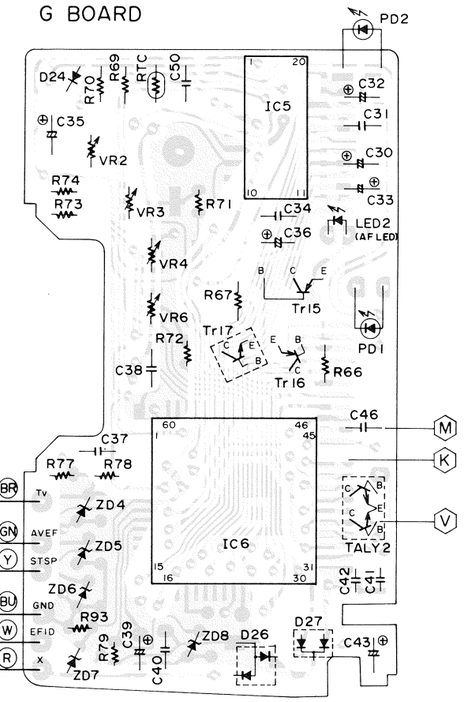
F BOARD

Third Type

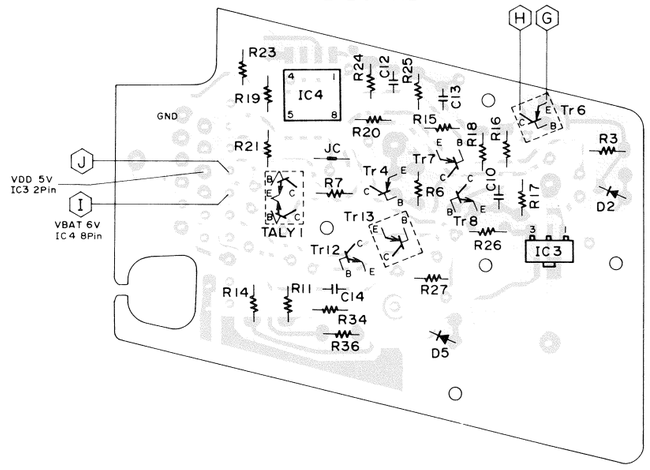


※ Bridge this pattern for "FEET" display.

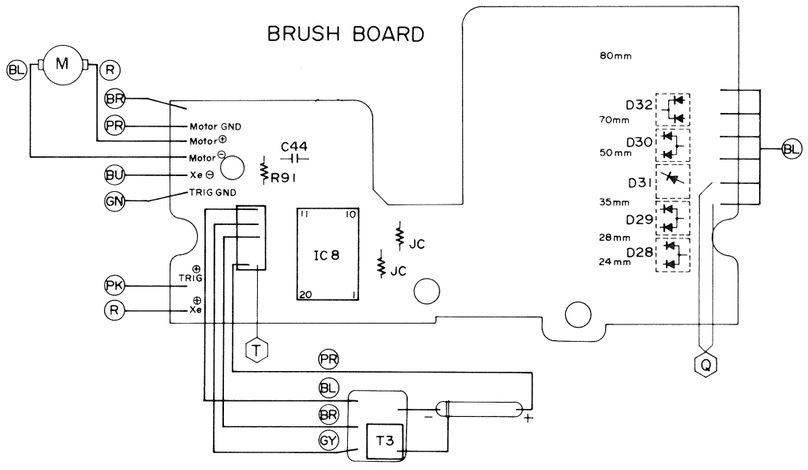
G BOARD



E BOARD

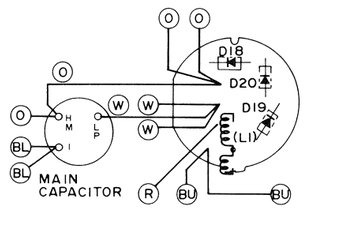


BRUSH BOARD

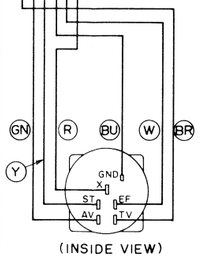


A BOARD

C BOARD



(INSIDE VIEW)



01 SEP, 1989