MINOX

TC 35 Type 22091

Ersatzteile
Reparatur

Spare Parts
Repairs

Pièces de rechange
Réparation

Repuestos
Reparación

MINOX GmbH Optische und Feinmechanische Werke
Postfach 6020 D 63 Giessen 1
Tel. (0641) 61071

F

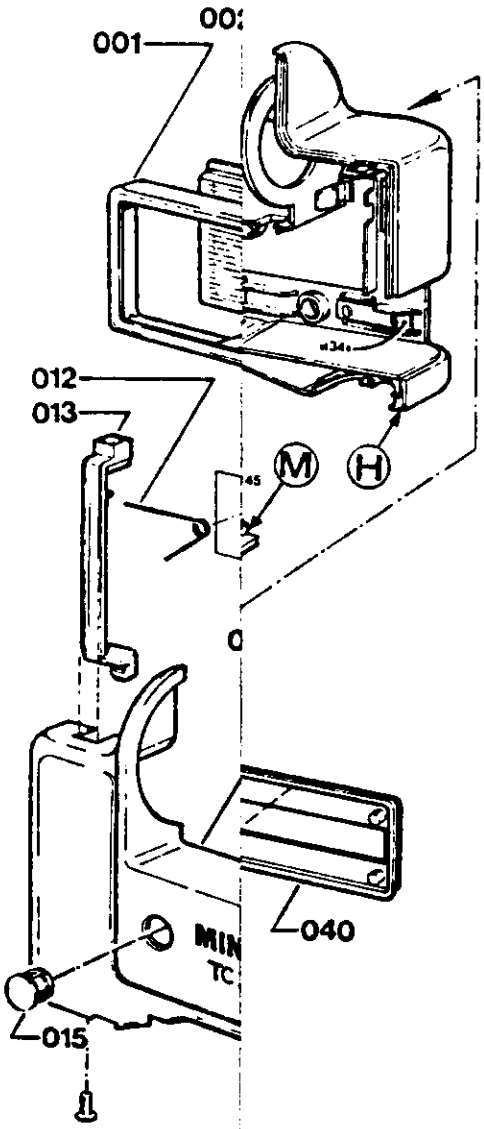
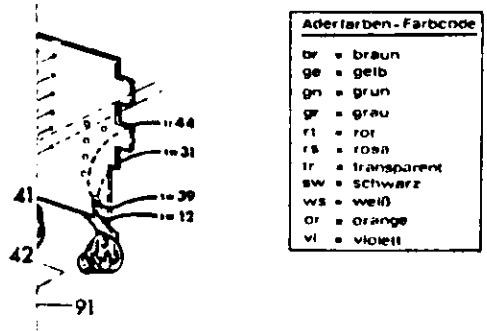

001
012
013
M
H
040
015

Bild-Nr Fig no	Stck. qty.	Teilebezeichnung / Part name Designation / Designacion		Teil-Nr. / Part no. / No. de piece / No de pieza
001	1	Reflector cap		22091 02315
002	2	Silicon ring for flash tube		22090 71721
003	1	Reflector, coated		22091 02317
004	1	Printed circuit I	A	22091 02303
005	1	Capacitor holder		22091 02318
006	1	Capacitor 500 µF		22091 01770
007	1	Reflector housing		22091 02313
008	3	Screw, countersunk machine Ø Bg 2.2 x 6.5 mm		22090 03072
009	1	Diffusor		22091 02316
010	1	Flash tube	F	22090 03033
011	1	Rubber buffer		22091 02000
012	1	Leg spring		22091 02326
013	1	Shutter release sliding switch		22091 02324
014	1	Cover for shutter release lever		22091 01219
015	1	Lens for photo-transistor		22091 02327
016	1	Body front		22091 02302
017	1	Photo-transistor		22090 01504
018	1	Printed circuit II	B	22091 02304
019	1	Printed circuit IV	E	22091 02309
020	1	Strip switch		22091 01283
021	1	Printed circuit III	D	22091 02305
022	1	Cap for strip switch		22091 02308
023	1	Stop spring I		22091 02322
024	1	Body back	H	22091 02301
025	1	Partition		22091 02329
026	4	Battery AAA Mallory MN 2400 Ucar E 92 Varta 4003		
027	2	Screw		10730 92051
028	1	Switch housing		22091 02319
029	1	Microswitch		22091 01640
030	1	Switch cap		22091 02311
031	1	Glow-discharge lamp window		22091 02328

Bild-Nr Fig no	Stck. qty.	Teilebezeichnung / Part name Designation / Designacion		Teil-Nr./Part no./ No. de piece / No de pieza
032	1	Centre contact shoe	M	22090 03355
033	1	Slide-in battery compartment		22091 02312
034	2	Conical spring		22091 01610
035	1	Battery cover, internal		22091 02314
036	1	Solder strap		22091 02323
037	1	Sliding lock		22091 02325
038	1	Stop spring II		22091 02330
039	1	Data slide		22091 02321
040	1	Data frame		22091 02320
149	1	Printed circuit	C	22091 02331


Aderfarben - Farbcode
br = braun
ge = gelb
gn = grun
gr = grau
rt = rot
rs = rosa
tr = transparent
sw = schwarz
ws = weiß
or = orange
vi = violett
41
42
91

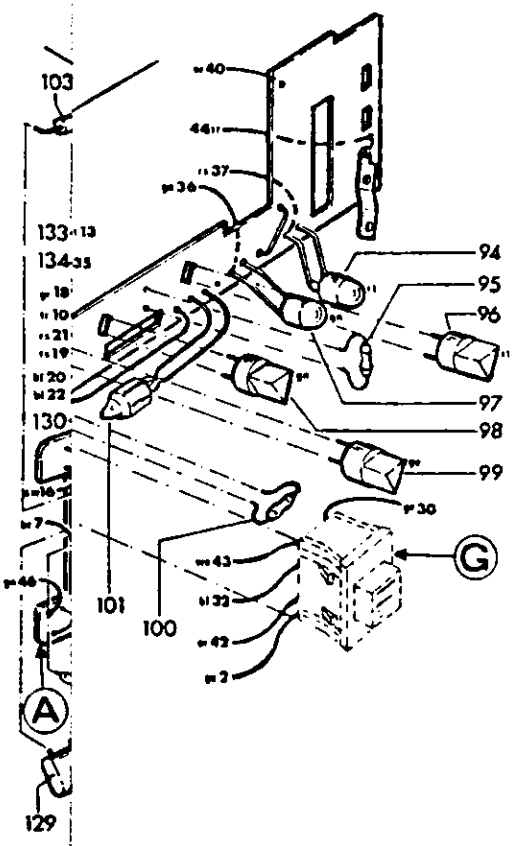
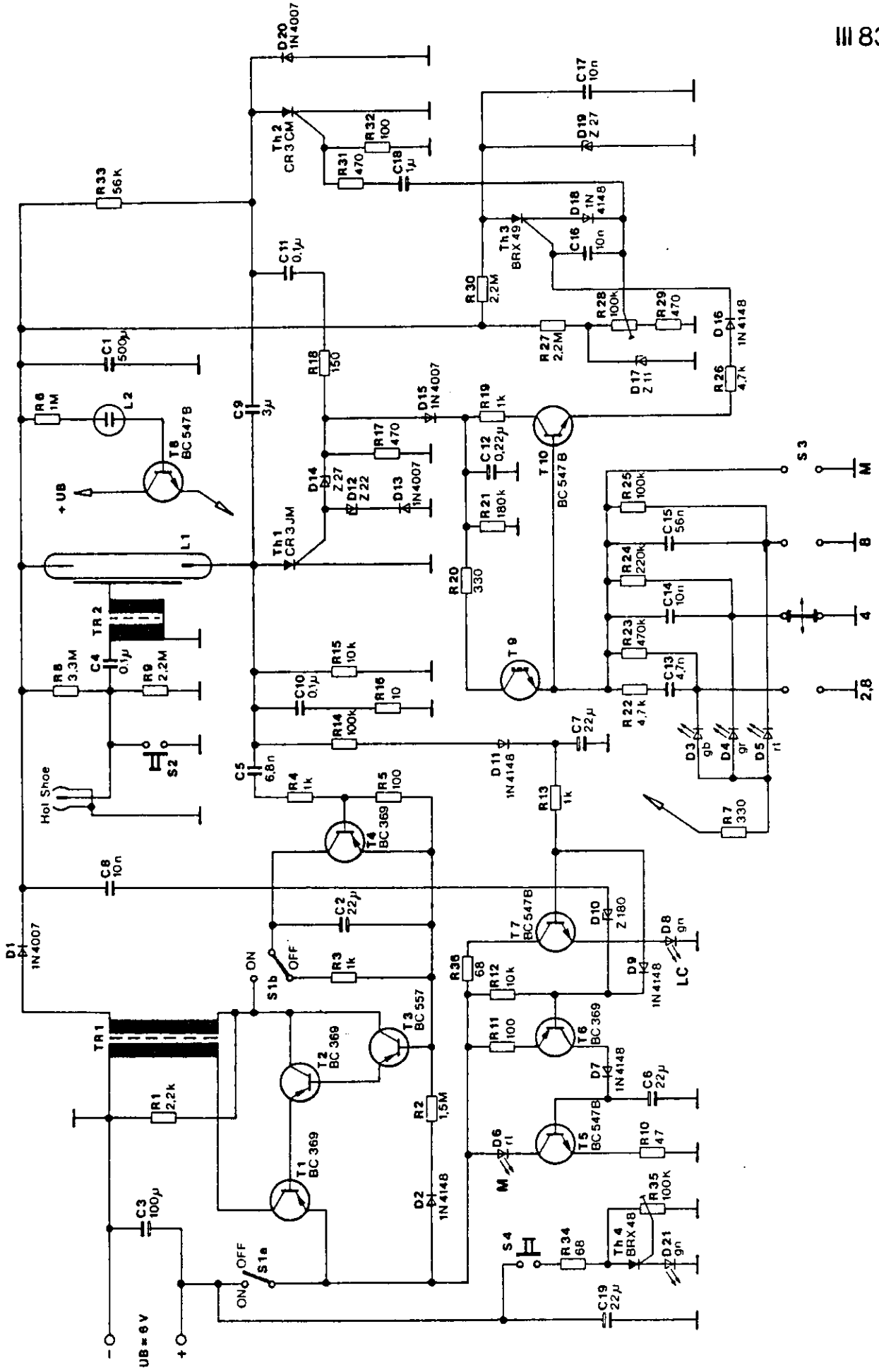

103
133
134
130
101
100
94
95
96
97
98
99
G
A
129

Bild-Nr Fig no	Stck. qty.	Teilebezeichnung / Part name Designation / Designacion		Teil-Nr./Part no./No. de piece/No de pieza
017	1	Photo-transistor, see Page 4	B	
41	1	Transformer	B	22091 01575
42	1	Resistor 2.2 kOhm	B	22090 02103
43	1	Transistor BC 369	B	22091 03514
44	1	Transistor BC 557	B	22091 03757
45	1	Resistor 1.5 MOhm	B	22091 03060
46	1	Diode 1 N 4148	B	22090 01552
47	1	Capacitor 100 µF/6.3 V	B	22091 02037
48	1	Diode 1 N 4148	B	22090 01552
49	1	Resistor 4.7 kOhm	B	22091 01783
51	1	Transistor BC 547	B	22091 03756
52	1	Resistor 4.7 kOhm	B	22091 01783
53	1	Resistor 300 - 330 Ohm	B	22091 02083
54	1	Capacitor 0.22 µF/35 V	B	22091 01214
55	1	Diode 1 N 4007	B	22090 01505
56	1	Resistor 180 kOhm	B	22091 01780
57	1	Transistor BC 369	B	22091 03514
58	1	Diode 1 N 4007	B	22090 01505
59	1	Resistor 68 Ohm	D	22091 01280
61	1	Transistor BC 547	C	22091 03756
62	1	Capacitor 22 µF/16 V	C	22091 01759
63	1	Capacitor 10 nF/250 V	C	22090 01720
64	1	Resistor 10 kOhm	C	22090 02102
65	1	Resistor 100 Ohm	C	22091 01787
66	1	Z diode ZPU 180	C	22091 01748
67	1	Capacitor 6.8 nF/100 V	C	22091 03633
69	1	Resistor 1 kOhm	C	10730 92084
70	1	Capacitor 22 µF/16 V	C	22091 01759
71	1	Transistor BC 369	C	22091 03514
72	1	Capacitor 22 µF/16 V	C	22091 01759
73	1	Transistor BC 547	C	22091 03756
74	1	Resistor 68 Ohm	C	22091 01280
75	1	Resistor 100 kOhm	C	10730 92101

Bild-Nr Fig no	Stck. qty.	Teilebezeichnung / Part name Designation / Designacion		Teil-Nr./Part no./No. de piece/No de pieza
76	1	Resistor 1 kOhm	C	10730 92084
77	1	Resistor 47 Ohm	C	22091 01789
78	1	Transistor BC 369	C	22091 03514
79	1	Diode 1 N 4148	C	22090 01552
80	1	Diode 1 N 4148	C	22090 01552
82	1	Diode 1 N 4148	C	22090 01552
83	1	Capacitor 22 µF/16 V	C	22091 01759
84	1	Resistor 1 kOhm	C	10730 92084
86	1	Resistor 4.7 kOhm	E	22091 01783
87	1	Capacitor 4.7 nF/50 V	E	22091 01771
88	1	Resistor 470 kOhm	E	22091 01781
89	1	Capacitor 10 nF/50 V	E	22091 01772
91	1	Resistor 100 kOhm	E	10730 92101
92	1	Capacitor 56 nF	E	22091 02033
93	1	Resistor 220 kOhm	E	22091 01782
94	1	LED, red, 3 mm dia.	G	22091 01744
95	1	Resistor 300 - 330 Ohm	G	22091 02083
96	1	LED, red, triangle	G	22091 01745
97	1	LED, green, 3 mm dia.	G	22091 01743
98	1	LED, green, triangle	G	22091 01746
99	1	LED, yellow, triangle	G	22091 01747
100	1	Resistor 1 MOhm	G	10730 92064
101	1	Glow-discharge lamp 4 x 10 mm	G	22091 01418
102	1	LED, green, 3 mm dia.	G	22091 01743
103	1	Diode 1 N 4007	A	22090 01505
104	1	Thyristor CR 3 JM	A	22091 01549
105	1	Thyristor CR 3 CM	A	22091 03512
106	1	Resistor 470 Ohm	A	10730 91777
107	1	Capacitor 1 µF/35 V	A	22091 01719
108	1	Capacitor 10 nF/100 V	A	22090 01507
109	1	Capacitor 10 nF/100 V	A	22090 01507
110	1	Z diode ZPY 27	A	22091 01751
111	1	Thyristor BRX 49	A	10730 93691

Bild-Nr Fig no	Stck qty.	Teilebezeichnung / Part name Designation / Designacion		Teil-Nr./Part no./ No. de piece/No de pieza
112	1	Diode 1 N 4148	A	22090 01552
113	1	Z diode ZPY 27	A	22091 01752
114	1	Z diode ZPD 11	A	22090 01550
115	1	Resistor 2.2 MOhm	A	22091 01778
116	1	Trim resistor 100 kOhm	A	22091 01775
117	1	Resistor 470 Ohm	A	10730 91777
118	1	Resistor 2.2 MOhm	A	22091 01778
119	1	Resistor 56 kOhm	A	22091 02036
120	1	Resistor 2.2 MOhm	A	22091 01778
121	1	Resistor 3.3 MOhm	A	22091 01779
122	1	Z Diode ZPY 22	A	22091 01753
123	1	Firing coil	A	22090 01521
124	1	Resistor 470 Ohm	A	10730 91777
125	1	Diode 1 N 4007	A	22090 01505
126	1	Resistor 150 Ohm	A	22091 01543
127	1	Capacitor 0.1 µF/250 V	A	22090 01555
128	1	Resistor 10 Ohm	A	22091 01788
129	1	Capacitor 0.1 µF/250 V	A	22090 01555
130	1	Capacitor 0.1 µF/250 V	A	22090 01555
131	1	Capacitor 1.5 µF	L	22091 01754
132	1	Capacitor 1.5 µF	K	22091 01754
133	1	Resistor 10 kOhm	A	22090 02102
134	1	Resistor 100 Ohm	A	22091 01787
135	1	Capacitor 10 nF/100 V	B	22090 01507
136	1	Thyristor BRX 48	C	22090 01551
137	1	Resistor 100 Ohm	C	22091 02038
138	1	Resistor 2.2 kOhm	E	22090 02103
139	1	Resistor 470 Ohm	E	10730 91777
140	1	Trim resistor 100 kOhm	D	22091 01775
141	1	Transistor BC 547	D	22091 03756



MINOX
TC 35

Schaltplan
Circuit diagram

Functional description

1. Voltage transformer 6 V - 360 V

The transformer system consists of transformer TR 1 and transistors T 1, T 2, T 3 and T 4. The system operates on the same principle as a switching regulator.

During the current flow phase, a magnetic field builds up in the primary winding of the transformer. Upon reaching the saturation limit, T 1 is immediately blocked, the magnetic field in the primary winding collapses and induces a very high voltage in the secondary side. This is rectified in D 1 and fed to the charging capacitor C 1. Once the induction phase is completed, the current flow phase commences anew. The transformer system oscillates at about 16 kHz.

In this circuit, we first assume that capacitor C 2 = 22 µF is discharged parallel to the E-C path of transistor T 4 (discharging transistor). Thereby transistor T 3 becomes conducting. In turn this switches transistor T 2 so that it conducts. Now the base of transistor T 1 is about at the base point of the secondary winding and is thus more negative than its emitter. The current flow phase commences.

After charging time T (R 2 = 1.5 M, C 2 = 22 µF), the base voltage at T 3 becomes positive and the entire transistor chain becomes non-conducting = AUTO OFF.

Whenever the ON/OFF switch is actuated (R 3 = 1 k is switched in parallel) or after flashing (discharge via T 4), this time up to AUTO OFF is set again.

If 275 Volt is exceeded during charging of charge capacitor C 1, glow-discharge lamp L 2 fires. This indicates that the unit is ready for flashing. Simultaneously with the firing of the glow-discharge lamp, the base voltage of transistor T 8 becomes positive. T 8 becomes conducting and current flows via R 7 = 330 and that triangle LED(D 3, D 4 or D 5) connected by the aperture switch to chassis earth. This LED lights up.

As the final voltage is greater than the glow-discharge lamp voltage (approx. 360 V), the selected triangle aperture display LED continues burning after the unit has been switched to the AUTO OFF condition and until the flash capacitor voltage has fallen below the holding threshold of the glow-discharge lamp so that it extinguishes.

2. LC - LIGHT CONTROL

This switching facility is provided as an aid to the user. Thereby knowledge of the following is important:

As the MINOX TC 35 electronic flash unit is a series thyristor 3 aperture telecomputer unit, flashing can be regarded as being computer-controlled if not all the energy stored in charge capacitor C 1 is used up, and a residual charge remains in the flash capacitor. The green LC - LED D 8 is provided as an indicator of this.

If, however, the entire energy of the flash capacitor is used up, or at least so much energy is used up that control of the flash is no longer possible, this is indicated by the red LC display diode D 6.

As energy consumption does not only depend on the distance from the subject being photographed, but also depends on its reflective characteristic, such indicators are considerably more precise than just a table.

The tapping points for both indicators are selected so that the correct function is automatically obtained.

Green indicator (LC):

The tapping point of the green indicator is the anode connection of thyristor Th 1. This point has a positive voltage if and only if thyristor Th 1 has been quenched by thyristor Th 2. This positive voltage is fed via resistor R 14 = 100 k and diode D 11 to capacitor C 7 = 22 µF, causing this to charge up. As long as capacitor C 7 dissipates charge to T 7. the green LED D 8 of the LC display lights up.

Red indicator (LC):

The tapping point for the red indicator is the positive point of flash capacitor C 1. During flashing, a negative voltage step occurs at the charge capacitor. This is fed via capacitor C 8 and Z diode D 10 to the base of T 6. If the negative pulse exceeds the Z voltage (180 V), the negative control voltage is generated at the base of T 6, which, in turn, causes T 6 to become conducting and thus light up the red LED D 6 of the LC indicator via the amplification and extension stages.

At the same points at which the green indicator is connected, the voltage pulse (negative for each flash) is taken for the discharge circuit of the AUTO OFF capacitor. (T 4 base).

3. Computer control

Assuming that the charge electrolytic capacitor C 1 has been charged up to a voltage which exceeds that for flash readiness, firing takes place by short-circuiting the voltage divider R 8 = 3.3 M and R 9 = 2.2 M at that point drawn in (button, pedal). A rapidly increasing current flows through the primary winding of the firing coil and the firing condenser C 4 = 0.1 µF. This current induces a high voltage of about 9 kV in the secondary winding. The electrical field generated in flash tube L 1 ionizes the xenon gas charge of the flash tube, thus rendering it conductive. The high-voltage pulse is fed via R 33 = 56 k, C 11 = 0.1 µF, R 18 = 150 Ohm and Z diode D 14 (Z 27) to the gate of thyristor Th 1 and fires this.

Now the discharge current of C 1 flows through flash tube L 1 and thyristor Th 1 to chassis earth. The flash tube lights up. If there were no regulation of the light quantity, or if the computer switch were set to "M" = manual, or if the limit range had been exceeded, discharge would continue until the current drops below the holding current of the flash tube, causing it to extinguish. The result would have been that

thyristor Th 1 would have returned to its blocking state. A residual voltage of about 50 - 60 Volt would then be measurable at the flash charge capacitor C 1.

If, however, the computer selection switch is still within the limit range in one of its three possible aperture positions, optical feedback takes place.

The light leaving the flash tube is reflected back by the photographic subject. This reflected light causes current to flow in photo-element T 9 (photo-transistor), which charges up the integration capacitor connected to chassis earth.

If now the emitter voltage at T 10, formed by the potentiometer setting plus 4 diode paths (diode D 18 to potentiometer R 28, gate cathode of Th 3, diode D 16 to emitter T 10 and finally the emitter base path of T 10 itself), is exceeded, then T 10 becomes conducting, thus firing Th 3. This, in turn, issues a voltage pulse via coupling capacitor C 18 and R 31 = 470 Ohm to the gate of Th 2. Th 2 also fires. Thereby the charge stored in extinguishing capacitor C 9 is discharged via Th 2 to chassis earth and from chassis earth via Th 1 back to C 9. This current, which flows in the opposite sense to that through the flash tube, cancels this out in Th 1 and causes it to extinguish. Thereby the current drops below the holding current of the flash tube, and this also extinguishes. At this instant - prior to the flash tube extinguishing, the positive voltage jump at the anode of Th 1 arises, which is used for the green LED display.

The operating voltage of T 9 and T 10 is taken at diode D 14 (Z 27). At the same instant at which Th 1 fires, the anode of the Z diode is at chassis earth potential with its cathode at 27 Volts, which is fed via D 15 to the filter capacitor C 12 = 0.22 µF.