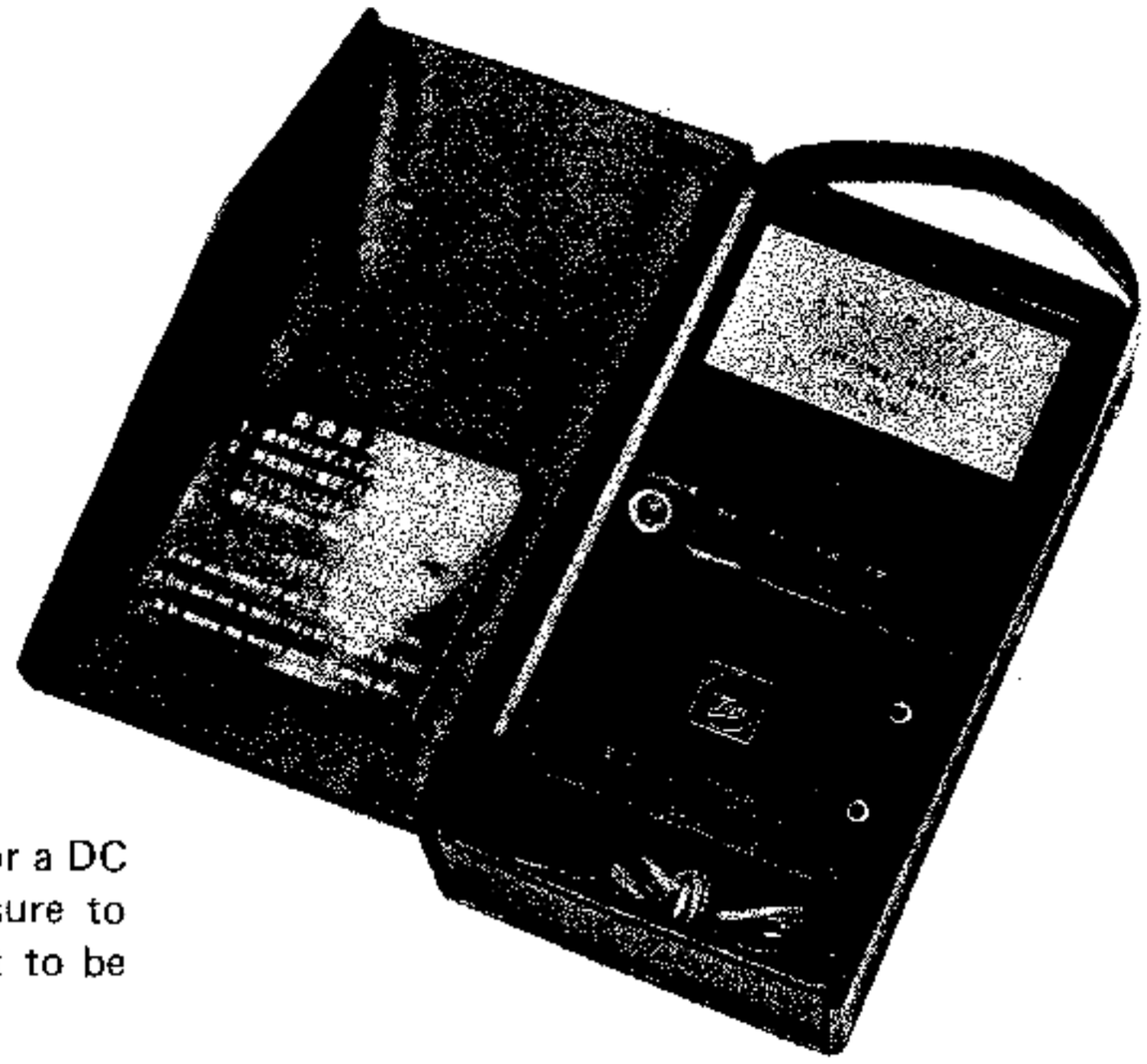
SERVICE MANUAL

No.833-71-870-50

IMPEDANCE METER

ZM-104



1. CAUTIONS ON USE

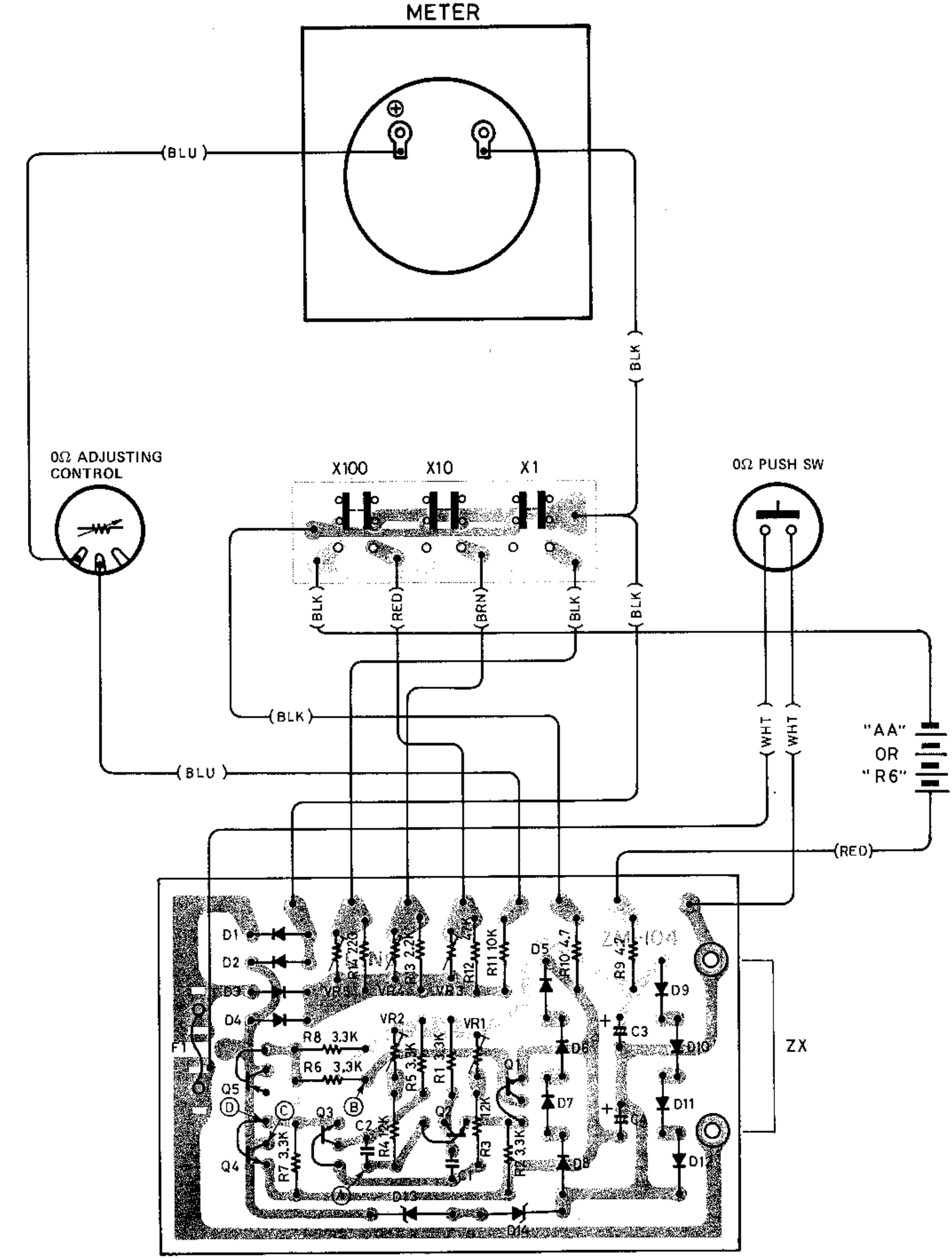
1. If the ZM-104's leads are connected with an AC or a DC live circuit, the ZM-104 may break down. Be sure to confirm that no voltage is present in the circuit to be measured.
2. On battery replacement, take care for the orientation of batteries.
   Misplacement may cause a trouble.
3. When the ZM-104 is not used, do not fail to push the "OFF" button to turn power off. With any range button (x1, x10, x100) pushed, batteries are being consumed since power is on.

2. SPECIFICATIONS

Type	Portable
Reading	Direct (indicated ohms on meter)
Measurement Range	x1 range : 5 – 1000 ohms x10 range : 50 – 10,000 ohms x100 range: 500 – 100,000 ohms
Accuracy	±10%
Oscillation Frequency	1000Hz ±10%
Power Requirement	Four AA or R6 batteries (6 volts)
Service Life on Continuous Use	x1 range : 30 hours x10 range, x100 range: 60 hours
Dimensions (without case)	115 x 186 x 55mm 4.53 x 7.32 x 2.17 in.
Weight (with batteries)	950g (2.09 lbs.)

TOA ELECTRIC CO., LTD.
KOBE, JAPAN
Printed in Japan GJHO-08401500E

3. WIRING and MOUNTING DIAGRAM



See page 4 for the waveforms at the points A to D.

= +B

= GND

= Signal

■ Parts List

Designator	Part Code	Description
	Transistors	
Q1 – 4	111-02-070-60	2SC945Q
Q5	111-01-044-00	2SA733Q
	Diodes	
D1 – 12	111-03-005-30	SR1K-2
D13, 14	711-03-001-50	Zener; BZ-061
	Potentiometers	
VR1, 2	112-06-018-30	50 kohms; KVSF-10-7NB
VR3	112-06-019-00	100 kohms; KVSF-10-7NB

Ref. No.	Part Code	Description
VR4	112-06-035-60	10 kohms; KVSF-10-7NB
VR5	712-04-003-10	1 kohms; KVSF-10-7NB
	Capacitors	
C1, 2	113-13-207-40	0.022μF, 35V, tantalum
C3, 4	113-02-007-60	330μF, 6.3V, elec.
F1	715-40-003-40	Fuse, miniature, 0.1A
	715-03-001-10	PC board w/o parts
	716-10-002-70	PC board assembly

Note: All resistors are listed below.

CARBON RESISTORS (1/4 watt, ±5% tolerance)

Ω	Part Code	Ω	Part Code	Ω	Part Code	Ω	Part Code	Ω	Part Code	Ω	Part Code
1.0	112-31-160-30	18	112-31-023-30	240	112-31-050-10	3.3 k	112-31-077-80	43 k	112-31-104-10	560 k	112-31-131-10
1.2	112-31-161-40	20	112-31-024-00	270	112-31-051-20	3.6 k	112-31-078-30	47 k	112-31-105-00	620 k	112-31-132-40
1.5	112-31-162-70	22	112-31-025-90	300	112-31-052-50	3.9 k	112-31-079-00	51 k	112-31-106-10	680 k	112-31-133-90
1.8	112-31-163-20	24	112-31-026-00	330	112-31-053-00	4.3 k	112-31-080-60	56 k	112-31-107-40	750 k	112-31-134-60
2.0	112-31-164-90	27	112-31-027-30	360	112-31-054-70	4.7 k	112-31-081-70	62 k	112-31-108-90	820 k	112-31-135-50
2.2	112-31-001-70	30	112-31-028-80	390	112-31-055-60	5.1 k	112-31-082-00	68 k	112-31-109-60	910 k	112-31-136-60
2.4	112-31-002-00	33	112-31-029-50	430	112-31-056-70	5.6 k	112-31-083-50	75 k	112-31-110-80	1.0 M	112-31-137-90
2.7	112-31-003-50	36	112-31-030-10	470	112-31-057-00	6.2 k	112-31-084-20	82 k	112-31-111-90	1.2 M	112-31-138-40
3.0	112-31-004-20	39	112-31-031-20	510	112-31-058-50	6.8 k	112-31-085-10	91 k	112-31-112-20	1.3 M	112-31-139-10
3.3	112-31-005-10	43	112-31-032-50	560	112-31-059-20	7.5 k	112-31-086-20	100 k	112-31-113-70	1.5 M	112-31-140-90
3.6	112-31-006-20	47	112-31-033-00	620	112-31-060-40	8.2 k	112-31-087-50	110 k	112-31-114-40	1.8 M	112-31-141-00
3.9	112-31-007-50	51	112-31-034-70	680	112-31-061-50	9.1 k	112-31-088-00	120 k	112-31-115-30	2.0 M	112-31-142-30
4.3	112-31-008-00	56	112-31-035-60	750	112-31-062-80	10 k	112-31-089-70	130 k	112-31-116-40	2.2 M	112-31-143-80
4.7	112-31-009-70	62	112-31-036-70	820	112-31-063-30	11 k	112-31-090-50	150 k	112-31-117-70	2.7 M	112-31-145-40
5.1	112-31-010-90	68	112-31-037-00	910	112-31-064-00	12 k	112-31-091-60	160 k	112-31-118-20	4.7 M	112-31-153-90
5.6	112-31-011-00	75	112-31-038-50	1.0 k	112-31-065-90	13 k	112-31-092-90	180 k	112-31-119-90		
6.2	112-31-012-30	82	112-31-039-20	1.1 k	112-31-066-00	15 k	112-31-093-40	200 k	112-31-120-30		
6.8	112-31-013-80	91	112-31-040-00	1.2 k	112-31-067-30	16 k	112-31-094-10	220 k	112-31-121-40		
7.5	112-31-014-50	100	112-31-041-10	1.3 k	112-31-068-80	18 k	112-31-095-00	240 k	112-31-122-70		
8.2	112-31-015-40	110	112-31-042-40	1.5 k	112-31-069-50	20 k	112-31-096-10	270 k	112-31-123-20		
9.1	112-31-016-50	120	112-31-043-90	1.6 k	112-31-070-90	22 k	112-31-097-40	300 k	112-31-124-90		
10	112-31-017-80	130	112-31-044-60	1.8 k	112-31-071-00	24 k	112-31-098-90	330 k	112-31-125-80		
11	112-31-018-30	150	112-31-045-50	2.0 k	112-31-072-30	27 k	112-31-099-60	360 k	112-31-126-90		
12	112-31-019-00	160	112-31-046-60	2.2 k	112-31-073-80	30 k	112-31-100-50	390 k	112-31-127-20		
13	112-31-020-40	180	112-31-047-90	2.4 k	112-31-074-50	33 k	112-31-101-60	430 k	112-31-128-70		
15	112-31-021-50	200	112-31-048-40	2.7 k	112-31-075-40	36 k	112-31-102-90	470 k	112-31-129-40		
16	112-31-022-80	220	112-31-049-10	3.0 k	112-31-076-50	39 k	112-31-103-40	510 k	112-31-130-00		

4. ADJUSTMENTS

■ **Oscillation Signal Waveform**

Adjust the potentiometers VR1 and VR2 to obtain a symmetrical waveform of 1000 ±5Hz at the output.

■ **Range Adjustments**

Step 1 Push the switch "*1 X1".

Step 2 Turn the 0Ω adjusting control to bring the meter reading to 0Ω pushing the 0Ω switch.

Step 3 Connect a *2 100-ohm resistor (within ±5% tolerance) across the measuring terminals ZX.

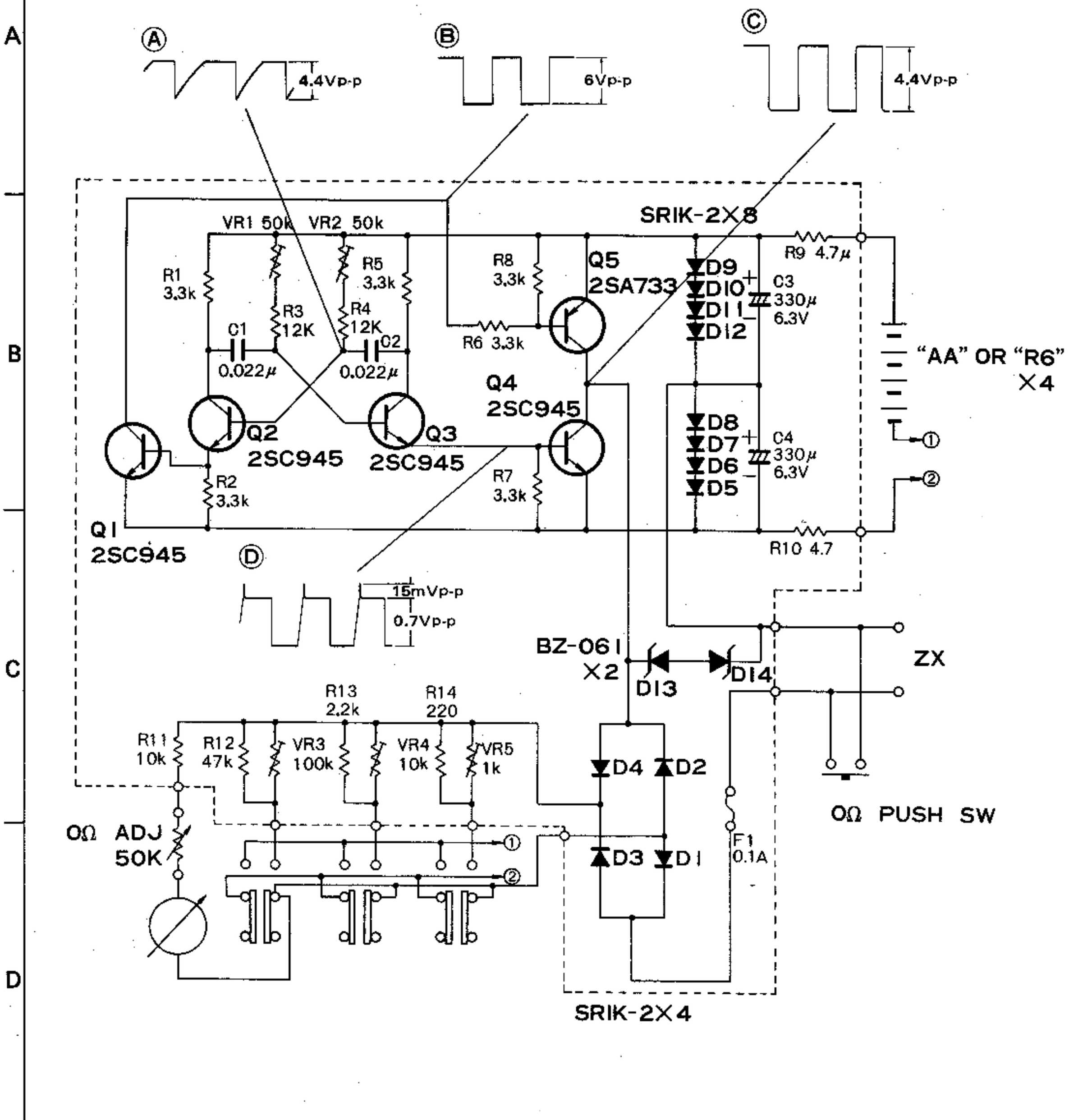
Step 4 Adjust the potentiometer *3 VR5 for a meter reading of 100Ω.

Step 5 Repeat alternately steps 2 and 3 twice.

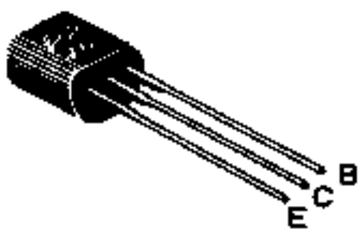
In the same manner, make the "X10" and "X100" range adjustments replacing the asterisks (*) with those in the table below

Range	*1	*2	*3
X10	X10	1-kohm	VR4
X100	X100	10-kohm	VR3

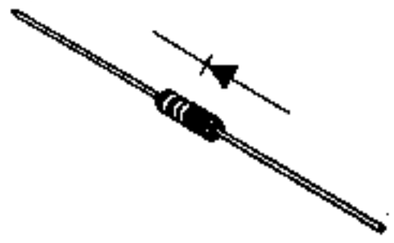
5. SCHEMATIC DIAGRAM



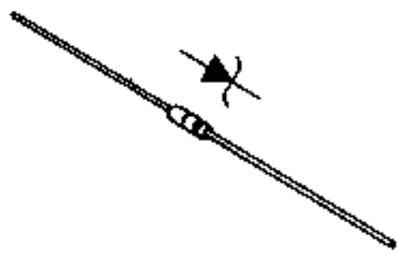
■ **Semiconductors**



• 2SC945Q (Q1 – 4)
• 2SA733Q (Q5)

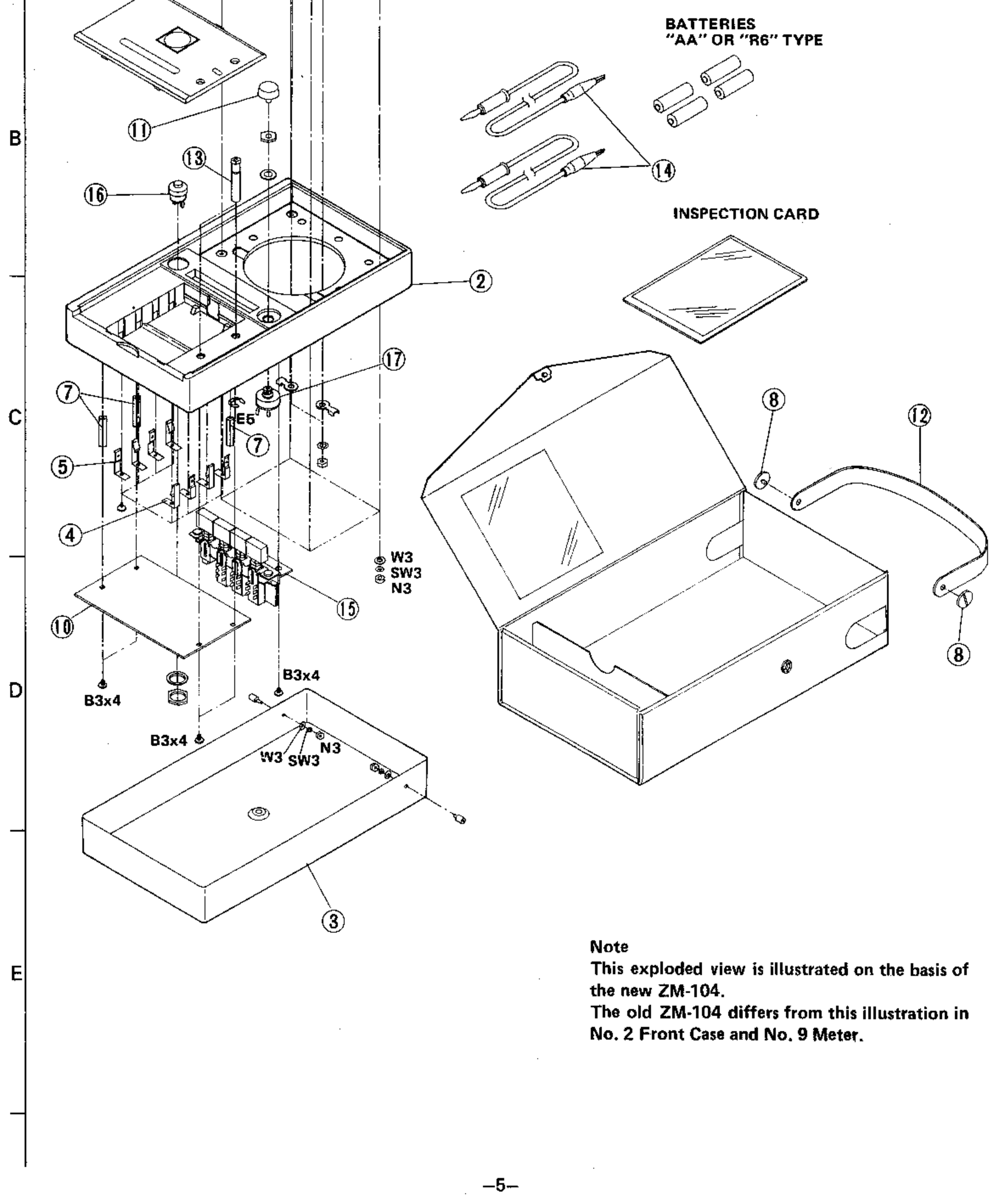


• SR1K-2 (D1 – 12)



• BZ-061 (D13, 14)

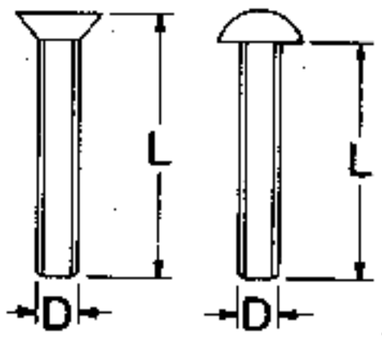
6. EXPLODED VIEW



Note
This exploded view is illustrated on the basis of the new ZM-104.
The old ZM-104 differs from this illustration in No. 2 Front Case and No. 9 Meter.

■ Assembling Hardware Coding List

BTA 3 x 6
- 3 x 6: L: Length in mm; D: Diameter in mm
- BTA: Nomenclature



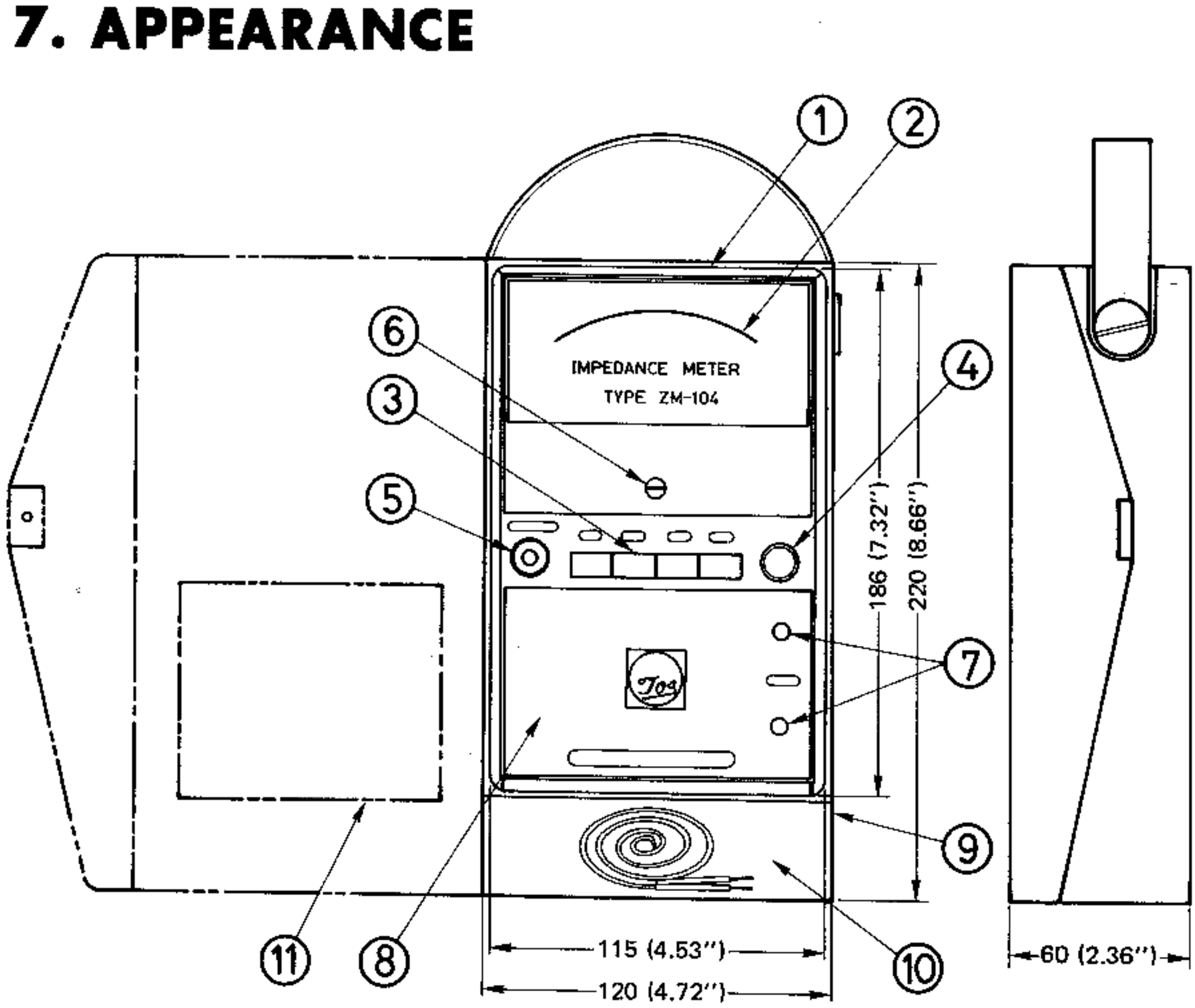
Type	Code	Name	Shape
MACHINE SCREW	B	Binding Head Screw	
NUT	N	Hexagon Nut .	
WASHER	W	Flat Washer	
	SW	Spring Washer	
	E	E-Ring	

■ Parts List

Ref. No.	Part Code	Description
1	701-02-002-20	Lid, battery case
2	701-02-005-30	Case, front (new)
	701-02-003-70	Case, front (old)
3	701-07-001-40	Case, bottom
4	702-11-016-80	Battery contact point (+)
5	702-11-017-10	Battery contact point (—)
6	702-16-001-50	Carrying case
7	706-51-015-30	Threaded spacer, PCB
8	706-51-016-40	Screw, strap
9	715-41-005-10	Meter; HIOKI (new)
	715-41-002-00	Meter; MK-100 (old)

Ref. No.	Part Code	Description
10	716-10-002-70	PC board assembly
11	721-01-007-80	Knob, potentiometer
12	721-05-001-40	Strap, case
13	724-02-015-90	Threaded spacer w/terminal
14	725-31-002-40	a pair of test leads
15	715-14-005-50	Push switch assembly
16	115-14-073-60	Push switch; MS-016
17	712-04-004-80	Potentiometer, 50 kohms (B)

7. APPEARANCE



1. Main body
2. Meter
3. Range selector
4. 0(zero)-ohm adjusting control
5. 0(zero)-ohm switch
6. Calibrator
7. Measuring terminals
8. Lid for battery compartment
9. Case
10. Measuring leads
11. Caution mark