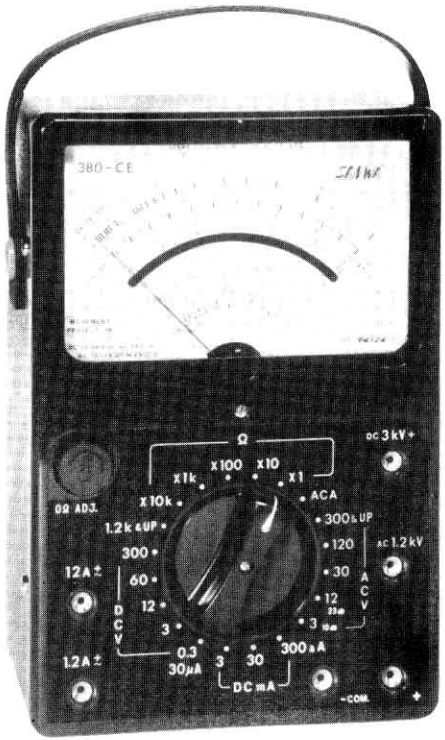

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GENERAL DESCRIPTION

1 Introduction.

The 380-CE is a high-grade, high-sensitivity circuit tester equipped with a meter movement of 30 microamperes. Its rugged construction along with double meter movement protection device withstands the wear and tear of heavy duty service.

The high imput impedance of 33.3k ohms per volt obtains accuracy measurement minimizing the current loss of the circuit being checked, and the resistance range covers up to 20 megohms powered by the internal batteries, the midscale reading 200k ohms.

Besides the wide range of measurement of DC current from 30 microamperes to 12 amperes, the 380-CE is provided with AC current ranges of 1.2 and 12 amperes. The unique circuit design uses the shunts in common with DC current measurements obtaining uniform scale characteristic with good temperature and frequency characteristics.

The clear mirrored scale obtains accurate reading, and the large-size selector knob rotates the range switch smoothly to set it to a prescribed position securely.

2 Specifications

1) Measurement ranges available.

DC voltage: 0.3V 3V 12V 60V 300V (33.3kΩ/V) 1.2kV 3kV (16.6kΩ/V)

AC voltage: 3V 12V 30V 120V 300V 1.2kV (5kΩ/V)

DC current: 30μA 3mA 30mA 300mA 1.2A 12A (300mV)

AC current: 1.2A 12A

Resistance:

Range	-	×1	×10	×100	×1k	×10k
Maximum-	2kΩ	20kΩ	200kΩ	2MΩ	20MΩ	
Midscale	-	20Ω	200Ω	2kΩ	20kΩ	200kΩ

Volume level: −20~+23dB up to +63dB

2) Batteries. One 1.5V (UM-2) and four 1.5V (UM-3) dry cells.

3) Size & weight. 185×128×74mm & 1170gr

4) Accuracy.
DC voltage: ±2% f.s.d.
AC voltage: ±3% f.s.d. for 12V & up.
±4% f.s.d. for 3V & under.
DC current: ±2% f.s.d.
AC current: ±4% f.s.d.
Resistance: ±2% of full scale length.

Battery equivalents.

JIS	EVEREADY	RCA	BEREC	PERTRIX
UM-2	935	VS035	U11	234
UM-3	915	VS034	U12	251

GENERAL PRECAUTIONS.

1 Despite the meter movement protection, be very careful not to overload the meter. See DOUBLE MOVEMENT PROTECTION (pp 15).

2 Avoid allowing the meter to receive severe shock or vibration. Do not leave it where there is high temperature or moisture.

3 The selector switch must not be rotated leaving the test leads connected to power while measuring: the meter movement or the internal components could be damaged.

4 When the meter is long laid away, the batteries had better be removed; electrolyte might leak to corrode the internal components.

OPERATION

1 Zero Correction.

Before making measurements, the pointer position is confirmed if it exactly falls over zero of the scale. If it is off the position, adjust it to zero by slowly turning to the right or left the corrector screw below the scale window.

2 DC Voltage Measurements.

Mostly DC voltage ranges are used to check batteries, DC power voltages of radio/TV receivers and communication equipments, and terminal voltages of electron tubes and transistors.

1) The selector switch can be rotated to any one of the seven DC voltage positions prescribed. When in doubt as to the approximate voltage present, always start with the highest range. After the first reading, the switch can be reset to a lower range for a more accurate reading. For maximum accuracy, use a range which will allow the pointer to fall within the right hand half of the scale.

2) The red lead is connected to the jack marked "+" and the black lead to the jack marked "−COM". For 3kV, the red lead is connected to the "DC 3kV+" jack on the top instead of the "+" jack setting the selector switch to the "1.2k & UP" position.

3) The probes of the test leads connected to the meter are applied across the voltage to be measured, the red lead going to the plus and the black lead to the minus potential of the load. In most cases, minus side is grounded or connected to the chassis, and, when measuring, the black lead can be fixed to the chassis or earth line and voltage is checked by the red lead

Take note of the polarity when testing voltage drop, negative voltage of an oscillating circuit and transistor circuit. The high input impedance of 33.3k ohms/volt efficiently checks high impedance load and transistor circuits. For pnp transistor circuits, the battery plus is grounded, and the connections of the test leads are reversed.

4) Use the black scale third from the top marked "DCV & mA•A" for all DC voltage measurements reading it as follows;

Switch position	Scale to read	Multiplied by
DCV 0.3	0 - 30	0.01
〃 3	0 - 30	0.1
〃 12	0 - 12	1
〃 60	0 - 60	1
〃 300	0 - 30	10
〃 1.2k	0 - 12	{ 100 for V or { 0.1 for kV
〃 1.2k (for 30kV)	0 - 30	{ 100 for V or { 0.1 for kV

CAUTION. For maximum safety, be very careful of handling the meter and the test leads when they are connected to a high voltage.

3 AC Voltage Measurements.

Mostly AC voltage ranges are used to check AC mains, the secondary voltages of a power transformers for radio/TV and communication apparatuses.

The germanium diode rectifier can cover frequency response up to 100kHz for the ranges below 30 volts without any trouble.

1) The selector switch can be rotated to any one of the six AC voltage positions prescribed. When in doubt as to the approximate voltage present, always start with the highest range. After the first reading, the switch can be reset to a lower range for a more accurate reading. For maximum accuracy, use a range which will allow the pointer to fall within the right hand half of the scale.

2) The red lead is connected to the "+" jack and the black lead to the "−COM" jack. For 1.2k volts, the red lead is connected to the jack marked "AC 1.2kV" setting the selector switch to the "300&UP" position.

3) The test leads connected to the meter are applied across the voltage to be measured. Since alternating current is being checked, readings are correct to which side of the load the test leads are applied.

5) Use the red scale second from the top marked "AC 12V UP" for measurements of 12 volts and upward reading the figures below the arc in common with DC voltage measurements.

Switch position	Scale to read	Multiplied by
ACV 12	0 - 12	1
〃 30	0 - 30	1
〃 120	0 - 12	10
〃 300&UP for 300V	0 - 30	10
〃 300&UP for 1.2kV	0 - 12	{ 100 for V or 0.1 for kV

For 3 volts alone, use the red scale right below the mirror marked "AC 3V ONLY" reading the figures along the line directly.

4 DC Current Measurements.

1) The selector switch can be rotated to any one of the four current positions. When in doubt as to the approximate current present, always start with the highest range. After the first reading, the switch can be reset to a lower range for a more accurate reading. For maximum accuracy, use a range which will allow the pointer to fall within the right hand half of the scale.

2) The red lead is connected to the "+" jack and the black lead to the "−COM" jack.

For 1.2 and 12 amperes, the red lead is connected to the "1.2A±" jack for 1.2 amperes and to the "12A±" jack for 12 amperes.

3) Before taking a measurement, the circuit to be checked is opened and the meter is connected in series to the load by way of the test leads, the red lead going to the plus and the black lead to the minus potential of the circuit.

4) Use the black scale third from the top marked "DCV&mA·A" in common with DC voltage measurements reading the figures below as follows:

Switch position	Scale to read	Multiplied by
30μA	0 - 30	1
DCmA 3	0 - 30	0.1
〃 30	0 - 30	1
〃 300	0 - 30	10
〃 300&UP for 1.2A	0 - 12	0.1
〃 300&UP for 12A	0 - 12	1

5) The DC 30μA range uses the meter as a galvanometer to check efficiently the minute inverse current of semiconductors.

5 AC Current Measurements.

The shunts for the DC 1.2 and 12 ampere ranges are used in common for the AC 1.2 and 12 ampere current ranges. This is a notable feature of the 380-CE to obtain uniform scale characteristic with good temperature and frequency characteristics. These AC current ranges are available to check the AC current of electrical home appliances. The 12 ampere range is fully capable of measuring power current of up to 1 kilowatt for 100 volt mains.

1) The selector switch is rotated to the ACA position.

2) Since alternating current is being measured, the polarity of the circuit can be neglected, but as a common practice, the black lead is connected to the "−COM" jack and the red lead is connected to the "1.2A±" on the left corner for 1.2 amperes and to the "12A±" jack above for 12 amperes.

3) The circuit to be checked is opened and the meter is connected in series with the load by way of the test leads.

4) The red scale second from the bottom is used exclusively for AC current measurements reading the figures along the line directly for 12 amperes and multiplied by 0.1 for 1.2 amperes.

6 Resistance Measurements.

Besides measuring resistor values, resistance ranges are used to test line continuity, DC resistance of transformer coils and the quality of capacitors.

1) The selector switch can be rotated to any one of the five resistance (Ω) positions. For maximum accuracy, use a range which will allow the pointer to fall around in the middle of the ohm scale.

2) The "+" and "−COM" jacks are used for test lead connections.

3) Zero ohm ajustment. Before making a measurement, the probes of the test leads connected to the meter are shorted together. As the pointer deflects towards right, it is adjusted to be exactly over zero of the ohm scale by turning the zero ohm adjuster (0Ω ADJ). Do not force it beyond its stop position.

If the adjustment is impossible for the ×10k range, the 1.5 volt penlight cells must be replaced. If it is for the ×1 range, the larger 1.5 volt cell must be replaced. For replacement, refer to Fig. 1.

The overall imput impedance for the AC voltage range of the 380-CE being 5k ohms per volt, it is 15k ohms for +10dB, and the measurement loss of a 600-ohm line is quite negligible.

As a rule, the impedances of the input and output circuits of an audio amplifier are indefinite: they are not always uniform. Therefore, the decibels of the coupled circuit measured by a tester are nothing but AC votages read on a decibel scale of the meter. However, if the relative deviation of the output voltages is compared by converting them into decibel values, they can be directly read on the meter doing away with troublesome calculation.

1) Any AC voltage range can be used for volume level measurement. Instead of reading the scale for AC voltage measurements, a pair of bottom black scales marked "dB" is used. Read the lower scale for the AC 3 volt range and the upper scale for the AC 12 volt range.

2) For higher output above +23 decibels unreadable on the 12 volt range, higher ranges are used, when the figures of the ADD dB table in the lower right corner are added to the value obtained on each range used.

DOUBLE METER MOVEMENT PROTECTION

1 Sharp pulsed voltages are sporadic here and there in TV and some electronic equipment. When they are checked inadvertently, they will impress the moving coil of the meter through switch capacity. Though the pointer may not bump against the extremity, the inductive moving coil will be directly hit by a high voltage suffering damage. 100 volts thus applied will burn out the coil in an instant.

This overcurrnt is absorbed by the zener effect of the silicon diode placed in parallel with the coil circuit to safeguard the moving coil from getting damaged. Without the protection diode, it would be subject to a momentary voltage of 50 volts against 100 volts impressed, which the diode suppresses as low as about 0.8 volts.

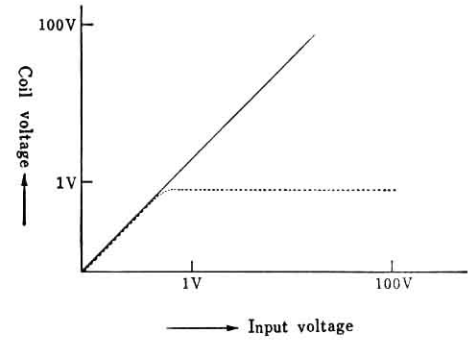


Fig. 2 - Effect of the protection diode.

The dotted line of Fig. 2 shows how a high vol tage is held down by the protection diode. The oblique full line shows the voltage that a coil may otherwise be impressed with.

Despite the protection device, a shunt or resistor will be burnt out by an accidental overvoltage. A burnt shunt or resistor can easily be replaced, and the meter is readily restored to its normal performance. The table along with Fig. 3 of the following page shows the shunts and resistors to be replaced when they are burnt on each range. Replacement resistors must be of 1% precision.

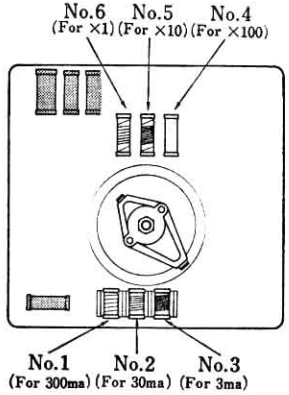


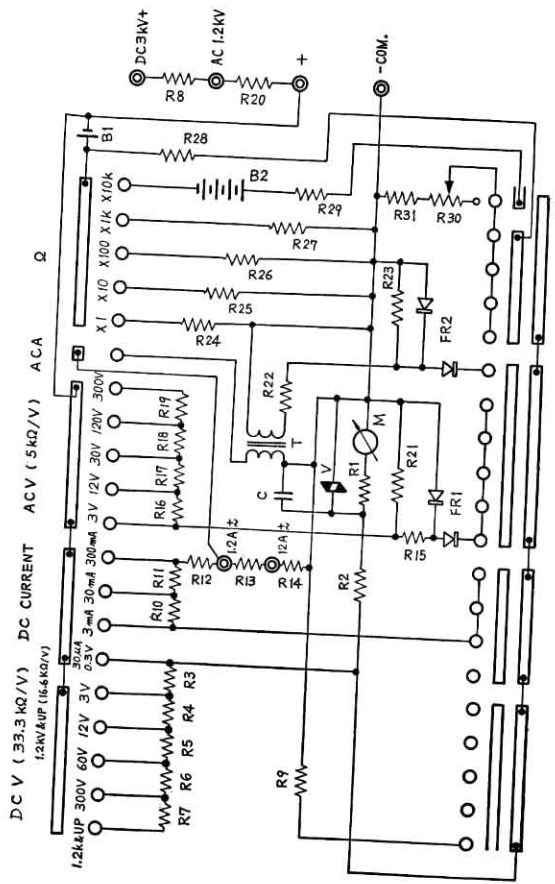
Fig. 3 – Resistance liable to burn on account of high current.

No.	Range	Resistor
1	300mA	0.75Ω
2	30mA	9Ω
3	3mA	90Ω
4	×100	1.8kΩ
5	×10	170Ω
6	×1	18Ω

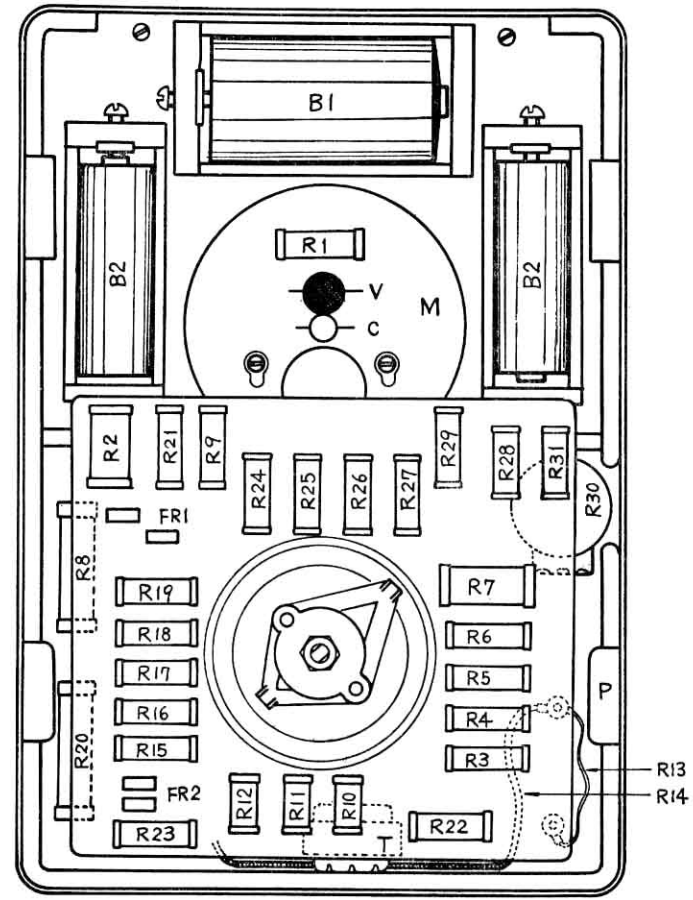
2 A shock or vibration is apt to cause sticky movement of a pointer if the moving coil is supported by ordinary bearings. In order to keep the supporting moment constant against such momentary shock, the moving element of the 380-CE is held in place by spring-backed jewel bearings.

SUPPLEMENTARY DATA

1 Schematic Diagram.



2 Arrangement of Parts.



3 List of Parts.

Part No.	Description	R.S.
CER01	Resistor (2kΩ~2.5Ω, film) for mV calibration	R1
CER02	Resistor (6kΩ, film) series	R2
CER03	Resistor (90kΩ, film) DC 3V multiplier	R3
CER04	Resistor (300kΩ, film) DC 12V multiplier	R4
CER05	Resistor (1.6MΩ, film) DC 60V multiplier	R5
CER06	Resistor (8MΩ, film) DC 300V multiplier	R6
CER07	Resistor (10MΩ, film) DC 1.2kV multiplier	R7
CER08	Resistor (25.5MΩ, film) DC 3kV multiplier	R8
CER09	Resistor (10kΩ, film) shunt	R9
CER10	Resistor (90Ω, wirewound) DC 3mA shunt	R10
CER11	Resistor (9Ω, wirewound) DC 30mA shunt	R11
CER12	Resistor (0.75Ω, wirewound) DC 300mA shunt	R12
CER13	Resistor (0.225Ω, wire) DC & AC 1.2A shunt	R13
CER14	Resistor (0.025Ω, wire) DC & AC 12A shunt	R14
CER15	Resistor (30kΩ, film) AC 3V multiplier	R15
CER16	Resistor (45kΩ, film) AC 12V multiplier	R16
CER17	Resistor (90kΩ, film) AC 30V multiplier	R17
CER18	Resistor (450kΩ, film) AC 120V multiplier	R18
CER19	Resistor (900kΩ, film) AC 300V multiplier	R19
CER20	Resistor (4.5MΩ, film) AC 1.2kV multiplier	R20
CER21	Resistor (24kΩ, film) shunt	R21
CER22	Resistor (21.5kΩ, film) for ACA	R22
CER23	Resistor (40kΩ, film) shunt	R23
CER24	Resistor (18Ω, wirewound) ohm ×1 shunt	R24
CER25	Resistor (170Ω, wirewound) ohm ×10 shunt	R25

CER26	Resistor (1.8kΩ, film) ohm ×100 shunt	R26
CER27	Resistor (35kΩ, film) ohm ×1k shumt	R27
CER28	Resistor (27kΩ, film) series	R28
CER29	Resistor (163kΩ, film) ohm ×10k series	R29
CER30	Resistor (30kΩ, potentiometer) for 0Ω adjuster	R30
CER31	Resistor (10kΩ, film) shunt	R31
FR05	Germanium diode, 2 repuired	F R 1
FR05	Germanium diode, 2 required	F R 2
V001	Varister	V
M010	Meter movemeut (30μA)	M
B002	Dry cell (1.5V UM-2 type)	B 1
B003	Dry cell (1.5V UM-3 type), 4 required	B 2
B015	Meter movement base	
CP38	Front panel (380-C_E type)	P
CN02	Scale plate	
X010	Rear case, iron	
V003	Rear case bolt (3φ), 4 required	
CSW1	Range selector switch	
K010	Range selector switch knob	
K005	Zero ohm adjuster knob	
BA01	Carrying strap with fitting metals	
L002	Test leads, pair	
T001	Pin-type jack, 6 required	
TR03	Transformer (TK 10E type)	
C050	Capacitor (0.05μF)	C

R.S. Reference symbol