

INSTRUCTION MANUAL FOR

AUDIO TESTER

MODEL 651

KIKUSUI ELECTRONICS CORPORATION

Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly.

(Revision should be applied to items indicated by a check mark)

Input voltage

The input voltage of this product is _____ VAC,
and the voltage range is _____ to _____ VAC. Use the product within this range only.

Input fuse

The rating of this product's input fuse is _____ A, _____ VAC, and _____.

WARNING

- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

AC power cable

The product is provided with AC power cables described below. If the cable has no power plug, attach a power plug or crimp-style terminals to the cable in accordance with the wire colors specified in the drawing.

WARNING

- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.



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1. GENERAL

1.1 GENERAL DESCRIPTION

Kikusui Model 651 Audio Tester has an oscillator, an AC voltmeter, and a distortion meter housed in a single case. This portable instrument is most suitable for adjustment and repair of audio equipment by service technicians and audio enthusiasts.

1.2 FEATURES

- (1) The oscillator is a Wien bridge RC oscillator constructed with IC's. It provides a stable low-distortion signal covering a wide range of 20 Hz ~ 20 kHz (in 11 ranges).
- (2) The AC voltmeter is a high-sensitivity transistor voltmeter with a high input impedance of 1 M Ω and indicates an average value of the input voltage. The scale is graduated in r.m.s. value.
- (3) The distortion meter is a 3-spot type (100 Hz, 1 kHz, and 10 kHz) which eliminates the requirement of frequency or balance adjustment and provides a convenient measuring means.
- (4) Two dummy resistors (8 Ω , 4 Ω , with a center tap, non-inductive type) are provide for R (right) and L (left) being housed in a single case. It can be connected to the main unit with a connector. Selection between 8 Ω and 4 Ω can be made with a switch, providing a means for measurements of various types of audio equipment.
- (5) The AC line voltage for the audio tester is easily selectable for 100/117/220 V.
- (6) The audio tester is compact, light, and provided with a shoulder bag for easy carrying.

2. SPECIFICATIONS

Name: Audio Tester

Model No.: 651

(1) Oscillator

Oscillating frequency: 20, 40, 100, 400, 1k, 2.5k, 5k, 7.5k, 10k, 15k and 20k (11 spots), sine wave

Frequency accuracy: Within $\pm(2\% + 1 \text{ Hz})$

Output impedance: $600\Omega \pm 20\%$, single-ended

Output level: 0 dBm or over (600 Ω load)

Output characteristics: Within $\pm 0.5 \text{ dB}$ for 20 Hz ~ 20 kHz
(with 1 kHz as reference)

Output control:

Stepwise control 0, -20, and -40 dB (3 steps)

Continuously-variable control range Approx. 22 dB

Distortion factor:

100 Hz ~ 20 kHz 0.1% or less

20 Hz, 40 Hz 0.2% or less

Frequency stability: Within $\pm 1\%$ for $\pm 10\%$ variation of AC line voltage

Output level stability: Within $\pm 0.5 \text{ dB}$ for $\pm 10\%$ variation of AC line voltage

Output terminals: Two terminals of R (right) and L (left) are provided.

Selectable for R, R + L, and L.

(2) AC Voltmeter

Measuring range: 3 mV ~ 100 V F.S., 1-3 sequence, 10 points

Accuracy: Within $\pm 3\%$ of full scale (at 1 kHz)

Frequency response: Within $\pm 3\%$ at 20 Hz ~ 200 kHz (with 1 kHz as reference)

Input impedance: 1 M Ω

Stability: Within $\pm 0.5\%$ of full scale for $\pm 10\%$ variation of AC line voltage

Input terminals: Two terminals of R and L are provided. Selectable between R and L with switch.

Scale: Sine wave r.m.s. value, and 1 mV 600 Ω reference, dBm value

(3) Distortion Meter

Measuring frequencies: 100, 1k, and 10 kHz ($\pm 2\%$), 3 spots, no CR balance, adjustmentless type

Measuring range: 0.1% ~ 10%

Measuring sub-ranges: 0.3%, 1%, 3%, 10%, and SET (5 ranges)

Measuring level range: 300 mV ~ 100 V, $\pm 3\%$

Accuracy: Within $\pm 10\%$ of full scale

Input impedance: 100 k Ω (single-ended)

Input control:
 Stepwise control 0, -20, and -40 dB (3 steps)
 Continuously-variable control range Approx. 22 dB

- (4) Power requirements: 100/117/220 V AC (selectable), approx. 9 VA
- (5) Ambient temperature: 0°C to +40°C
- (6) Dimensions and weight: 300 (W) x 210 (H) x 230 (D) mm, approx. 5.7 kg, (shoulder bag)

(7) Accessories:

Dummy resistor (8 Ω , 4 Ω , 40 W, non-inductive type)	1
Measuring cords (pair plug and pin jack, pair plug and alligator clip)	2
Power cord (AC cord with connector)	1
Fuse, 0.5 A	2
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3. OPERATING PROCEDURE

3.1 DESCRIPTION OF THE FRONT PANEL (Refer to Fig. 3-1.)

- (1) POWER: Pushbutton switch for AC power ON-OFF control. When it is depressed and locked, the power is turned ON and the pilot lamp lights. When it is depressed again, the power is turned OFF.
- (2) (3) OSC OUTPUT:
(LEFT, RIGHT) These terminals provide the internal oscillator output. The GND terminal (white) is connected to the chassis through a 10 Ω resistor.
- (4) (5) OSC OUTPUT:
(L, R) These pin-jack terminals are connected in parallel with terminals (2) and (3), respectively.
- (6) OSC OUTPUT SWITCH: Selects oscillator output to be delivered to the L, L + R, or R terminal.
- (7) (8) OUTPUT CONT: For control of the oscillator output. (8) is for coarse control and (7) for fine control.
- (9) FREQUENCY (Hz): For selection of oscillating frequency.
- (10) RANGE: This switch is for measurement of AC voltage range (dBm, mV, V) and distortion factor (%).
- (11) INDICATION: This switch selects measuring items as below.
- o OSC VOLT: The internal oscillator output is directly connected to the voltage measuring circuit without requiring any external connection.
 - o VOLT: For measurement of AC voltage applied to the INPUT terminal.

- o DIST, DIST SET: For measurement of distortion factor of the measured signal connected to the INPUT terminal.
- (12) DIST FREQ: For selection of frequency (100 Hz, 1 kHz, and 10 kHz) at which the distortion factor is to be measured.
- (13) (14) INPUT:
(LEFT, RIGHT) The signal to be measured is applied to these terminals. The GND terminal (black) is directly connected to the chassis.
- (15) (16) INPUT:
(L, R) These pin-jack terminals are connected in parallel with terminals (13) and (14), respectively.
- (17) INPUT SELECTOR: Selects the input signal between LEFT and RIGHT for separate measurement.
- (18) (19) DIST SET: For distortion factor measurement, these controls are used to make the input level the full scale when switch (11) set in the DIST SET state. (19) is coarse control and (18) is fine control.
- (20) DUMMY LOAD: These terminals are for connection of dummy resistors. The right-hand three terminals are connected parallel to the R INPUT terminals and the left-hand three terminals are connected parallel to the L INPUT terminals.
- (21) DUMMY LOAD SWITCH: For selection of dummy load resistors.

3.2 DESCRIPTION OF THE SIDE PANEL (Refer to Fig. 3-2.)

- (22) POWER CORD: The power cord has a connector. In connecting, ensure that the inserting direction of the connector is correct.
- (23) FUSE: Fuse holder of the AC power line. The fuse is a conventional glass tubular type (0.5 A).
- (24) AC LINE VOLTAGE SELECTOR: AC line voltage is selectable by changing the inserting direction of this selector plug. So insert the plug that the required voltage is visible at the indent of the plug.

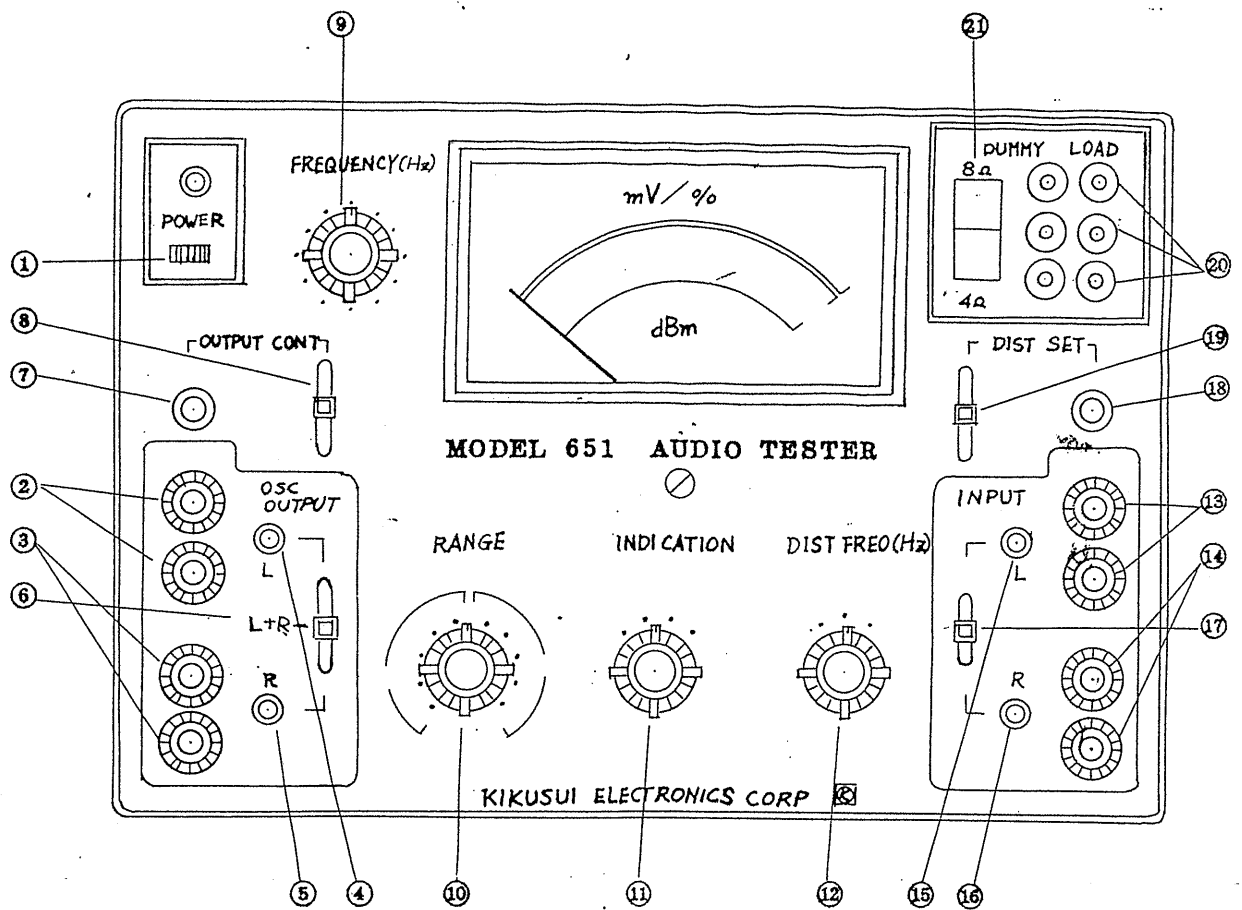


Fig. 3-1 The front panel of Audio Tester

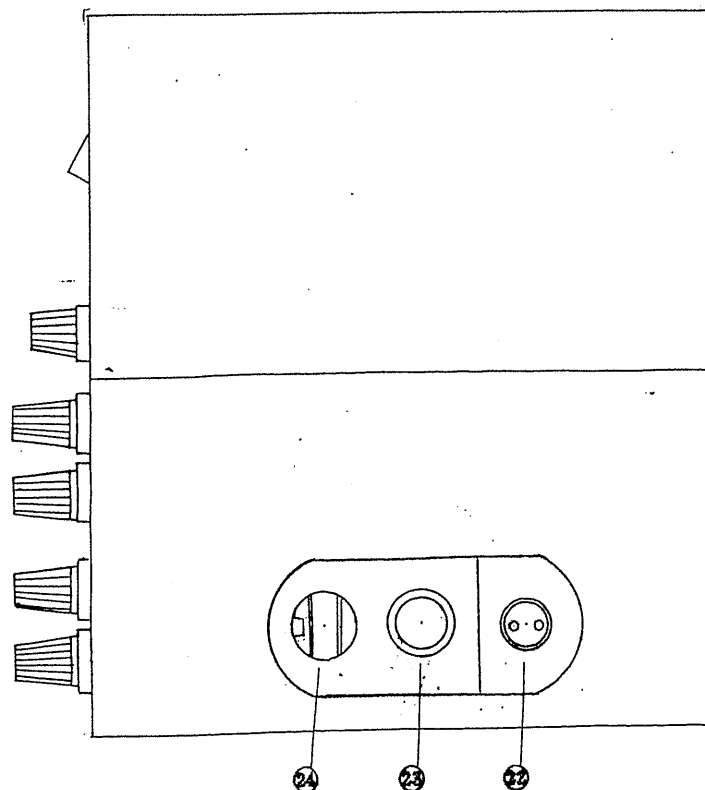


Fig. 3-2 The side panel of Audio Tester

3.3 PREPARATIONS FOR MEASUREMENT

- (1) Ensure that the AC line voltage selector plug on the side panel of the Audio Tester is set in the correct direction in conformity with the AC line voltage.
- (2) Set the POWER pushbutton switch on the front panel in the OFF state. Connect with the power cord between the AC power input connector on the side panel and the AC line receptacle.
- (3) After ensuring that the RANGE switch is set such a low sensitivity position that the meter pointer is not deflected off the scale, turn ON the POWER switch. The meter pointer may deflect at random for approximately 10 seconds after the power is turned on.
- (4) When the pointer is stabilized, the Audio Meter is ready to be used for measurement.

3.4 OPERATING PROCEDURE

- (1) Oscillator
 - (a) Setting of the oscillating frequency is made with the FREQUENCY switch (9).
 - (b) Setting of the output voltage is made by adjusting the OUTPUT CONT (7) and (8) observing the indicating meter under the state that the INDICATION (11) switch is set in the OSC VOLT position.
- (2) AC Voltmeter
 - (a) The AC voltmeter indicates the r.m.s. value of the sine wave signal applied to the INPUT terminal under the state that the INDICATION switch (11) is set in the VOLT position.

- (b) To measure the signal in the dBm value referenced to 1 mV and 600Ω, read the indication on the dBm scale which is common for all ranges and determine the value as follows: The 0 (zero) position of the dBm scale (red) represents the level of the corresponding range. The value of the measured signal can be known by adding the scale reading to the dBm value of the corresponding range.

Example: At the -20 dBm (100 mV) range, the meter reading was 1 dBm.

$$1 + (-20) = 1 - 20 = -19 \text{ dBm}$$

Other than the above, the AC voltmeter can also be used as AC ammeter or output meter.

(3) Distortion Meter

- (a) FREQUENCY (Hz) (9): One point of 100, 1k, or 10 kHz
(b) RANGE (10): SET position of % range (blue)
(c) INDICATION (11): DIST SET
(d) DIST FREQ (Hz) (12): The same frequency with (a) above.

The above setting of (a) through (d) may be made in other order than mentioned above. Pay attention so that the meter pointer is not deflected off the scale.

- (e) By means of the DIST SET (18) and (19) controls, adjust the meter pointer to 1.0 of the % scale.
(f) INDICATION (11): Turn to the DIST position.
(g) Turn the RANGE switch sequentially from the SET position to the 10%, 3%, and so forth, and read the meter indication on the % scale.

4. BLOCK DIAGRAM

A block diagram of the Model 651 Audio Tester is shown in Fig. 4-1.

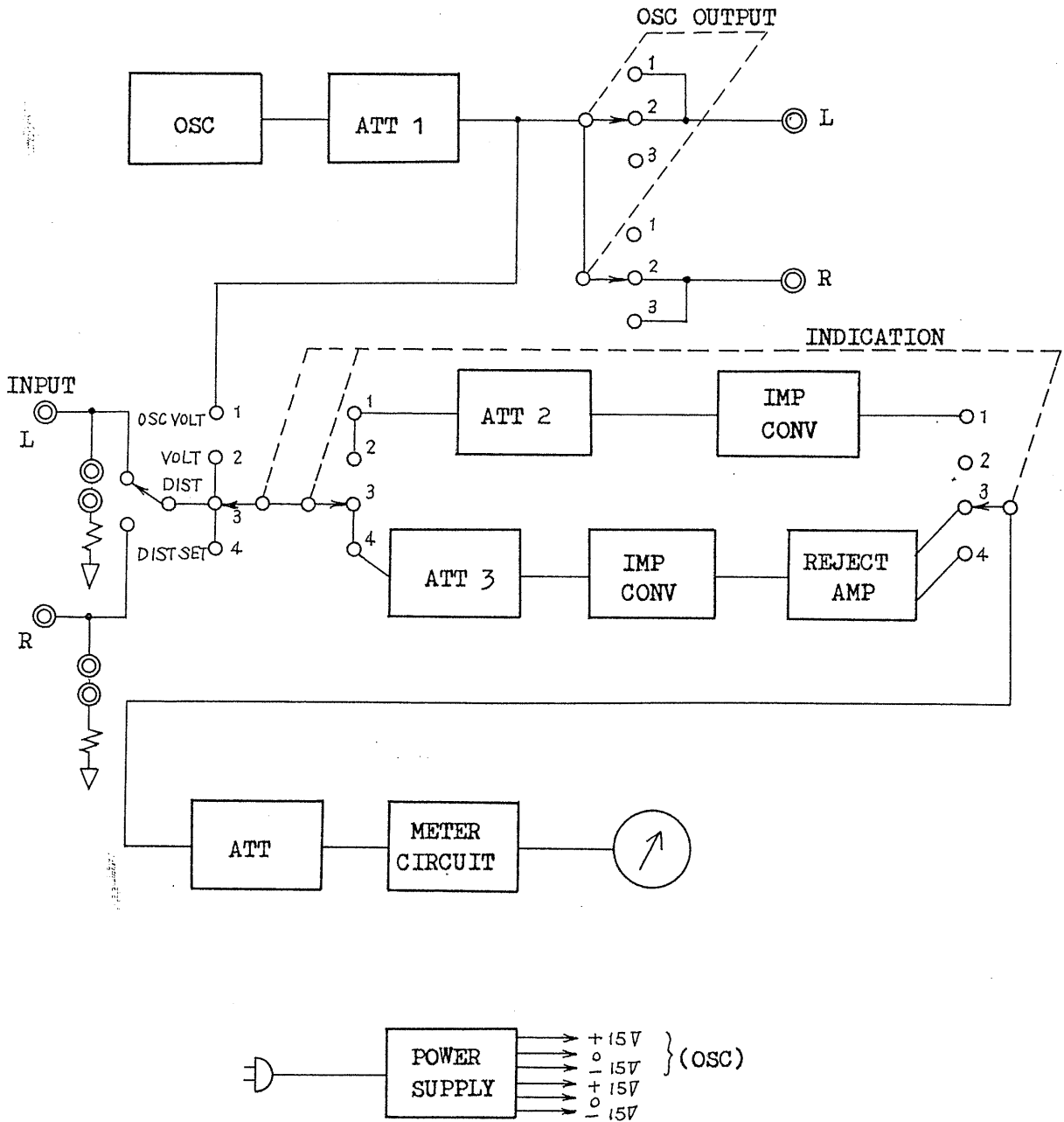


Fig. 4-1 Block diagram of the Audio Tester

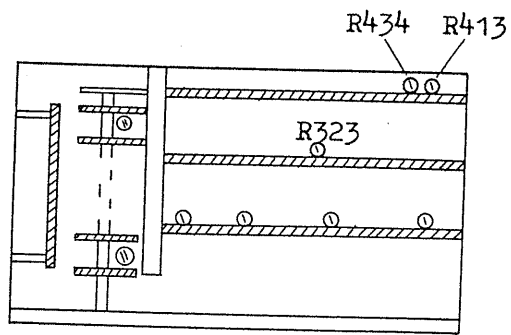
5. PRECAUTIONS

- (1) The output impedance of the oscillator is constant at 600Ω irrespective of setting of the OUTPUT CONTROLS (7) and (8). The indicated values of the OUTPUT CONTROL (8) have been adjusted for a load of 600Ω connected to the output terminal. When the load is other than 600Ω , a slight error may be introduced.
- (2) The DUMMY LOAD (20) is constantly connected in parallel with the INPUT terminals (13), (14), (15) and (16). To measure the signal of a source having a large output impedance, disconnect the dummy resistor.
- (3) Precautions in distortion measurement:
 - (a) When measurement is made with the dummy resistor connected to the Audio Tester, the dummy resistor generate substantial heat if the power is higher than 10 watts. Pay attention to overheating of the dummy resistor when measurement is made for a long period at a power higher than 10 watts.
 - (b) When measurement is made with the dummy load disconnected from the Audio Tester, note that internal components may be damaged if a voltage of higher than 100 V is applied to the INPUT terminal.
 - (c) When distortion factor is measured with an external oscillator other than the Audio Tester, measurement should be made at an oscillating frequency of within $\pm 2\%$ of 100 Hz, 1 kHz, or 10 kHz.
- (4) Pay attention to protect the Audio Tester against unreasonably large mechanical vibration or shock especially when carrying the tester.

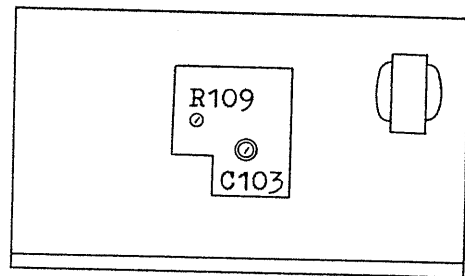
6. MAINTENANCE

The Audio Tester is shipped being accurately adjusted and inspected at the factory. However, when the tester has become not to satisfy the performance specification after it has been used for a long period or repaired, the tester must be adjusted and calibrated referring to the schematic circuit diagram and the control location diagram (Fig. 6-1). To gain access to the internal components, take out the tester from the carrying bag and remove the top and bottom panels after undoing the eleven clamping-screws of the panels.

- R434: Variable resistor for simultaneous adjustment of the +15V and -15V supplies for oscillator.
- R413: Variable resistor for simultaneous adjustment of the +15V and -15V supplies for other circuits (printed boards A-1, A-2, and A-3) than oscillator.
- R323: Variable resistor to control the full scale of the indicating meter by varying the feedback rate.
- R109: Variable resistor for adjustment of the meter as follows: Apply a calibration signal of 3 mV 400 Hz to the input terminal. With the RANGE switch set in the 3mV position, adjust the meter deflection to the full scale by means of R323. Set the RANGE switch and the calibration signal to 1 V, and adjust the meter deflection to the full scale by means of R109.
- C103: Trimmer capacitor for adjustment of frequency response of the meter indicating circuit.



Top panel



Top panel

Fig. 6-1 Locations of controls