

INSTRUCTION MANUAL FOR
FREQUENCY RESPONSE CHECKER
MODEL 681

KIKUSUI ELECTRONICS CORPORATION

Notes: The text and drawings in this instruction manual are for instruments which employ standard plug-in frequency units. Note that Fig. 2 and circuit constants slightly differ for instruments which employ plug-in frequency units other than the standard ones.

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1. GENERAL

The Model 681 Frequency Response Checker is designed for quick test of frequency response characteristics of tape recorders, stereo amplifiers, and other audio equipment. The check operation (to test whether the frequency response is within the specification range or not) can be instantaneously made with 400 Hz or 1 kHz as a reference signal, without being affected by gain variation of the checked equipment.

The Checker has seven check spot frequencies, ranging from 40 Hz to 20 kHz. Frequency is changed by replacing plug-in units.

2. CONSTRUCTION

The Checker consists of two major blocks -- transmitter and receiver. At the transmitter, the outputs of oscillators are mixed at equal voltage levels, the resultant compound signal is conditioned to a certain voltage level and, then, the signal is fed through an attenuator to the output terminal.

The output terminal of the Checker is connected to the input terminal of the tested equipment and its output terminal is connected to the input terminal of the Checker.

The receiver can be operated either in a manual or an AGC mode of measurement. For manual measurement, the input signal is manually adjusted to an appropriate voltage by the input potentiometer and, then, the signal is applied to the input circuit and individual band pass filters (BPF's).

The BPF output voltage is compared with a preset voltage, by a voltage comparator. The compared result is indicated with the GO lamp (within specification -- green) or the NO GO lamp (out of specification -- red). At the same time the BPF output is applied to an indicator circuit and is indicated by an indicating meter (edgewise meter).

In the case the measured equipment has very large variation characteristics at the reference frequency (such as a tone control circuit or an equalizer circuit of a stereo amplifier), the gain of the indicating meter circuit can be switched to -10 dB, +10 dB, or +20 dB, thereby expanding the effective measuring range of the indicating meter.

The output voltage of the standard-frequency BPF is used as the control signal of the AGC circuit.

A block diagram of the Checker is shown in Fig. 1.

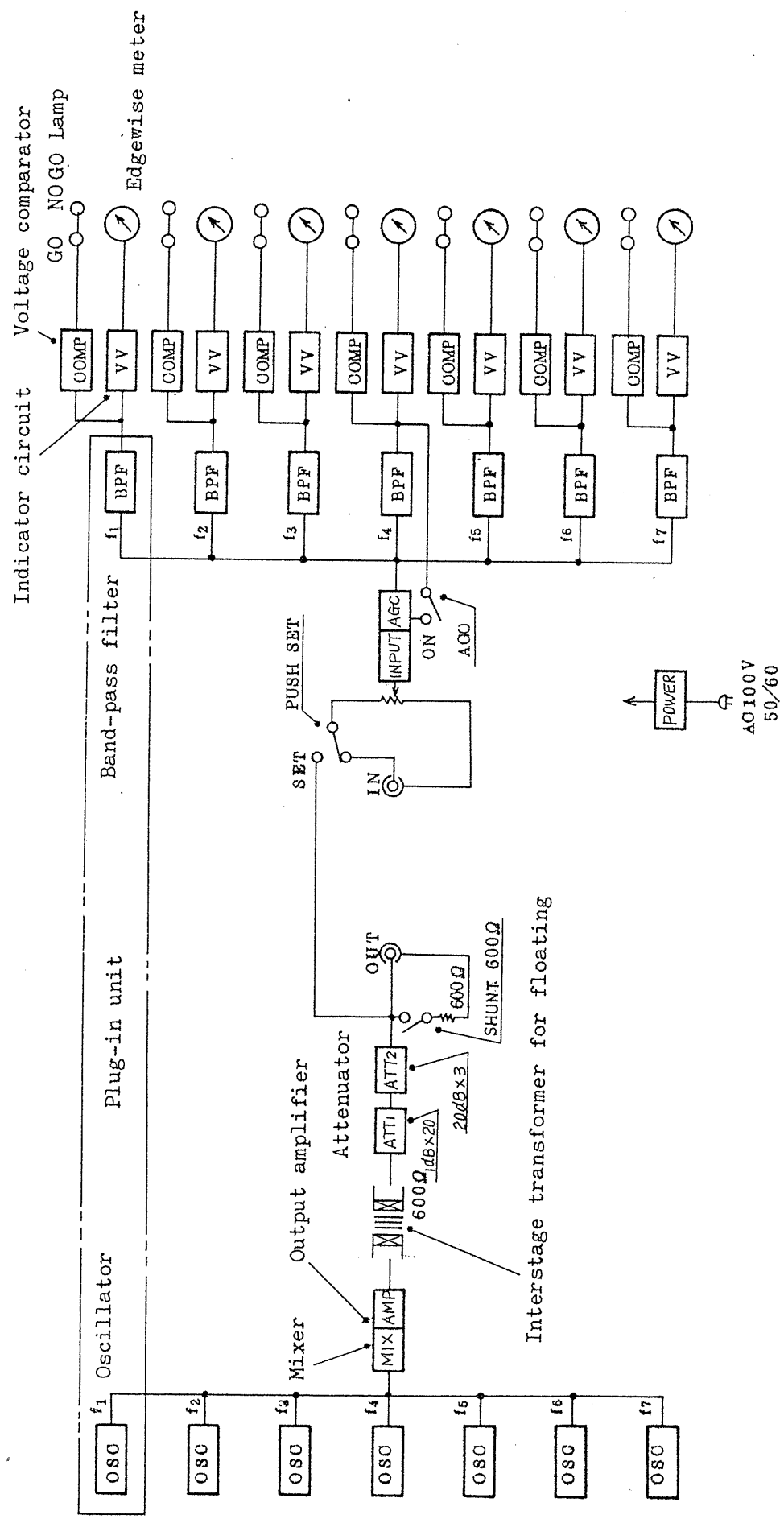


Fig. 1 MODEL 681 Block diagram

3. SPECIFICATION

Transmitter

Oscillation frequencies: 40 Hz - 20 kHz, selection of maximum seven points in plug-in system.
(standard: 40, 100, 400, 1 k, 5 k, 10 k, and 20 kHz)

Accuracy: Better than $\pm 3\%$

Stability: Better than $\pm 2\%$

Mixing ratio (1 kHz as reference): Within ± 1 dB (for each frequency)

Output voltage (maximum): $0.245 \times \sqrt{n}$ V_{rms}/600 Ω
(n: the number of plug-in units)

Impedance: 600 Ω $\pm 20\%$, single-ended, floating

Stability: Better than ± 0.5 dB

Attenuator: 0 dB to -80 dB, 1-dB steps
(1 dB x 20) + (20 dB x 3)

Terminals: Binding posts and BNC connector

Receiver

Input voltage: 20 mVp-p to 20 Vp-p

Impedance: 100 k Ω $\pm 20\%$, single-ended

AGC operation range: ± 10 dB or over
(level shift: not larger than ± 0.5 dB)

Band pass filter characteristics

Center frequency: The same with oscillator frequency

Selectivity: Within ± 1 dB at $\pm 5\%$ of nominal frequency.
35 dB or over at one-octave-deviated frequency

Frequency stability: Better than $\pm 2\%$

Indicating meter: Edgewise meter (JIS CLASS 2.5)

Indication range: +5 dB ~ -15 dB (meter scale)

Indication level change: Indication level (meter scale 0 dB) can be changed to +20 dB, +10 dB, and -10 dB, except at medium frequency range (1 kHz standard)

Measurable range: +25 dB ~ -25 dB

Accuracy: Better than $\pm 3\%$

GO/NO-GO indication (for each frequency)

Indication setting range: Full meter scale range for both UPPER and LOWER setting

Indication: GO -- green lamp; NO GO -- red lamp

Input terminal: Binding posts and BNC connector

Power requirements: 100 V AC, 50/60 Hz, approx. 27 VA

Stability: The above specifications are satisfied at 100 V $\pm 10\%$, 50/60 Hz AC.

Dimensions: 430 (W) x 160 (H) x 275 (D) mm

At maximum sections: 445 (W) x 175 (H) x 305 (D) mm

Weight: Approx. 10 kg (net)

Instruction manual 1 copy

Accessories:

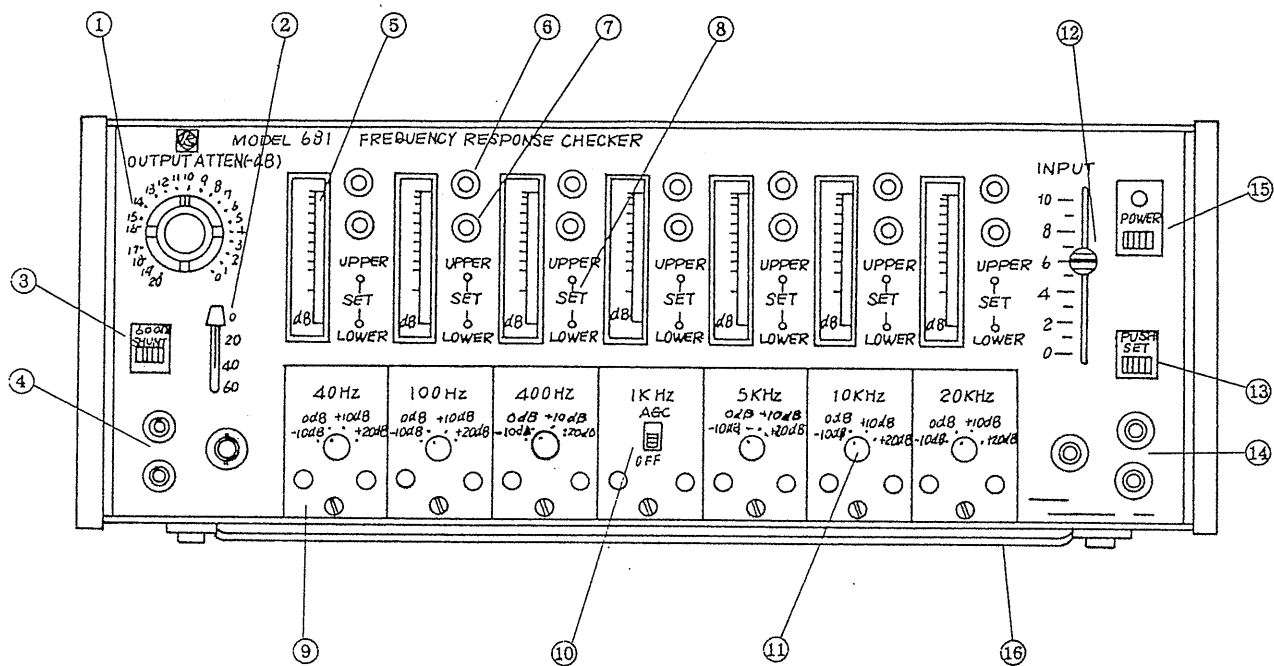


Fig. 2 Front panel

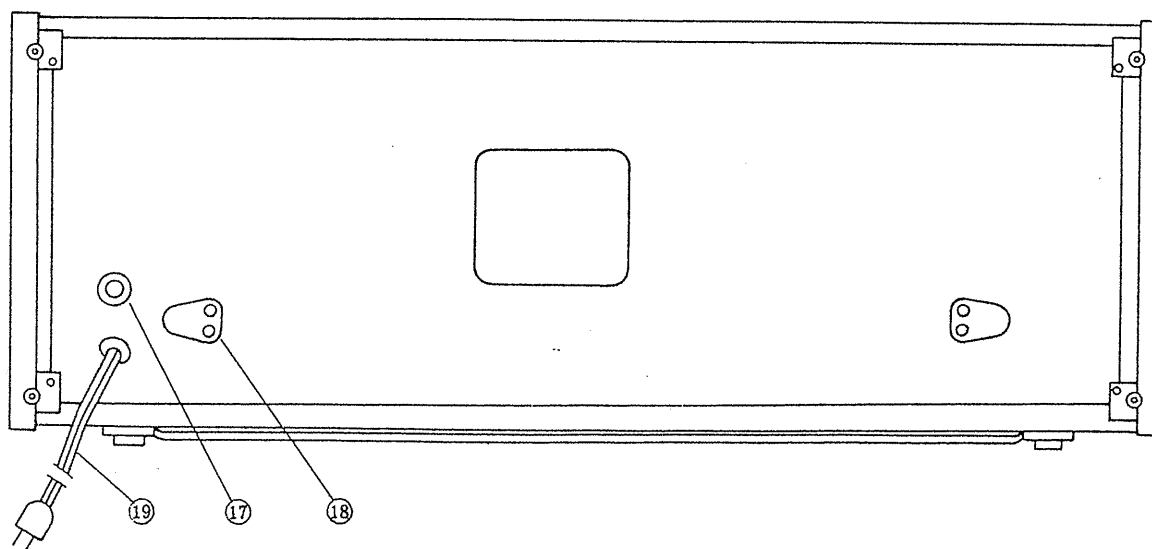


Fig. 3 Rear panel

4. EXPLANATION OF PANEL ITEMS

Refer to Fig. 2.

(1) OUTPUT ATTEN (-dB)

This is a 600-ohm attenuator for attenuation of the output signal at 1 dB step x 20. As used in conjunction with (2) ATTENUATOR, a 600 ohm attenuator of 80 dB in 1-dB steps can be obtained.

(2) ATTENUATOR

This is a 600-ohm attenuator which attenuates the output signal at 20-dB x 3.

(3) 600 Ω SHUNT

As the operator depresses this button, the output is terminated with a resistor of 600 Ω , 1%, 1/2 W.

(4) OUTPUT

This is the output terminal of the Checker. A set of 3/4-inch pair plugs or a BNC connector can be connected to this terminal. The BNC connector and the pair plugs are connected in parallel.

(5) METER

This is an edgewise meter which indicates frequency response for a range of +5 dB to -10 dB.

(6) GO LAMP (GREEN)

This lamp lights when the meter pointer is within the range which has been set as Item (8) below, to indicate that the condition is GO.

(7) NO-GO LAMP (RED)

This lamp lights when the meter pointer is out of the range which has been set as Item (8) below, to indicate that the condition is NO-GO.

(8) SET (UPPER, LOWER)

This potentiometer sets the upper limit or lower limit for GO/NO-GO limit level. The GO range is made narrower from an upper position of the meter by the UPPER potentiometer and it is made narrower from a lower position of the meter by the LOWER potentiometer.

(9) PLUG-IN UNIT

This unit comprises a spot frequency oscillator and a band pass filter. The oscillating frequency of the oscillator and the center frequency of the band pass filter are the same for each plug-in unit.

(10) AGC (ON-OFF) SWITCH

This switch is for on-off control of the AGC function. The AGC function covers ± 10 dB with respect to the 0 dB position of the meter.

(11) LEVEL SHIFT

This switch is for meter level shift. When it is thrown to the $+10$ dB position, the 0 dB position of the meter becomes to indicate a value of $+10$ dB.

(12) INPUT LEVEL

This control is for continuously variable attenuation of the input. The scale indicates a relative quantity of the input signal.

(13) PUSH SET

This switch is used to connect the output directly to the input. (This switch is used for GO/NO-GO preset.)

(14) INPUT

These are the input terminals of the Checker. The BNC connector and the pair plugs are connected parallel.

(15) POWER

This is the main power switch of the Checker.

(16) STAND

The stand may be used to get a better reading angle of for the meter.

(17) FUSE

The fuse holder, which contains 1-ampere fuse, is connected in the AC input circuit.

(18) CORD TAKE-UP

The power cord can be wound and taken up.

(19) POWER CORD

Connected to a receptacle of 100 V, 50/60 Hz power line.

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5. OPERATING PROCEDURE

1. Before starting operating the Checker, set the controls as below. Allow approximately 10 minutes of stabilization period after turning-on the instrument power.

OUTPUT ATTEN:	0 dB
600Ω SHUNT:	Depressed state
INPUT VR:	Scale "5"
PUSH SET:	Depressed state
AGC:	Off

2. After the stabilization period, turn the INPUT VR and check that the level is variable for a range of from +5 dB to -10 dB. Then, so adjust that the meter indicates 0 dB. Perform this operation for all meters.
3. Set the OUTPUT ATTEN in the 10 dB position. (Each meter will indicate the -10 dB position.)
4. Turn-on the AGC switch. (Each meter will indicate 0 dB again.)
5. Set the AGC switch in the OFF position and the OUTPUT ATTEN in the 0 dB position.
6. Set the range for GO and NO-GO. (For example, a range of +3 ~ -3 dB is set as the GO range and all other ranges as NO-GO range.)
7. By turning the INPUT VR, move the meter pointer to the upper limit point (in the above example, to the +3 dB scale position).

8. Turn the SET--UPPER VR to the position where the GO/NO-GO lamps are switched, using a slim screwdriver (-). (upper limit setting)
9. By turning the INPUT VR, move the meter pointer to the lower limit point (in the above example, to the -3 dB scale position).
10. Turn the SET--LOWER VR to the position where the GO/NO-GO lamps are just switched, using a slim screwdriver (-). (lower limit setting)

Note: Setting for GO/NO-GO judgement can be made for a range of approximately -20 dB from the meter full-scale. When the below condition is not met, the red lamp alone lights. When the meter pointer is lower than -20 dB, both red and blue lamps go off.

UPPER setpoint > LOWER setpoint > -20 dB

11. Set the PUSH SET button in the unpressed state and adjust the OUTPUT ATTEN at 80 dB. (Set the 1-dB-step attenuator at 20 dB and the 20-dB-step attenuator at 60 dB.
12. Set the INPUT VR at scale 0 (zero) position.
13. Connect the output of the Checker to the input of the measured equipment.
14. Connect the input of the Checker to the output of the measured equipment.
15. By adjusting the OUTPUT ATTENUATOR, apply an appropriate input signal to the measured equipment.

16. Gradually turn the INPUT VR until the level is made 0 dB at a certain frequency (arbitrary one of the seven spot frequencies). Read on each meter the relative level difference at each frequency.
17. Turn-on the AGC. Read relative level difference at each frequency, with respect to 0 dB of the frequency of the plug-in unit for which the AGC function is affected.
18. If the frequency response characteristics of the measured equipment is flat for a range of 40 Hz to 20 kHz, all blue lamps light indicating that the state is GO.

If there are peaks higher than +3 dB or dips lower than -3 dB, the red lamp of the corresponding frequency lights indicating that the state is NO-GO.

By the above procedure, the test operation with the Checker is complete.

6. PRECAUTIONS IN OPERATING THE CHECKER

- 6-1. A certain stabilization period for signal levels is required. Allow certain warm up time after turning-on the instrument power, and check the instrument condition.
- 6-2. Do not insert or remove the plug-in unit while the power switch is kept turned on.
- 6-3. Output voltage:

The output voltage of the Checker is -10 dBm (=0.245 Vrms) as terminated with 600 Ω (the attenuator is at 0 dB). When an "n" number of plug-in units are used, the rms-value output voltage can be expressed as below.

$$V_o \text{ rms} = 0.245 \times \sqrt{n} \text{ V rms} / 600 \Omega$$

The output voltages of all plug-in units are mixed at equal levels. Therefore, the peak-to-peak output voltage can be expressed as below.

$$V_o \text{ p-p} = 0.693 \times n \text{ Vp-p} / 600 \Omega$$

Note: Note that, in the case the output levels are of two or more waves, indication difference may result if measured with a millivoltmeter of a mean-of a mean-value-indication effective-value-scale type.

- 6-4. Selection of plug-in frequency:

Normally, either 400 Hz or 1 kHz is used as a reference frequency for audio equipment.

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6-5. Selection of plug-in frequency:

The frequencies of the plug-in units are selectable at any frequencies other than the standard frequencies. In such a case, however, attention must be paid so that two mutually adjoining frequencies are not closer than 1.5 times or 1/1.5 times in frequency ratio. This is because indication errors will become large if frequencies are selected closer than this.

When an equipment which has large modulation distortions is tested, frequency ratio should not be made 2 times or 3 times in order to prevent large indication errors, especially at the lower frequency range.

- 6-6. Note that, when two or more plug-in units which have the AGC feature are used, the Checker will not operate normally if two or more AGC switches are turned-on at the same time.

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7. MAINTENANCE

7-1. Inspection of Checker Inside

To gain access to the inside of the instrument, remove the clamping-screws of the two black studs at right and left of the instrument rear and, then, remove the side, top, and bottom panels.

7-2. Adjustment of Output Voltage

The output voltage is adjustable with potentiometer VR201 on printed board A-2 (the output amplifier which is located close to the left-hand panel and has a connector). For adjustment, set at first the items as below.

600 Ω SHUNT:	Depressed state
Attenuator:	0 dB
Plug-in unit:	Either 400 Hz or 1 kHz (insert one unit only)

Connect a millivoltmeter to the output terminal.
So adjust VR201 that the meter reads 0.245 Vrms (= -10 dBm)

7-3. Adjustment of Input Level

The input level is adjustable with potentiometer VR302 on the printed board A-3 (INPUT AGC = located close to the right-hand panel and has a connector).

7-4. Adjustment of AGC Level

The AGC level is adjustable with potentiometer VR301 on printed board A-3.

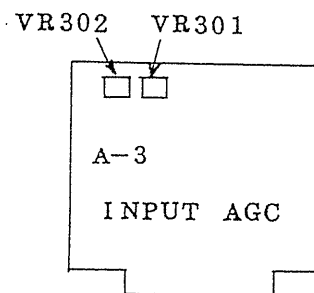
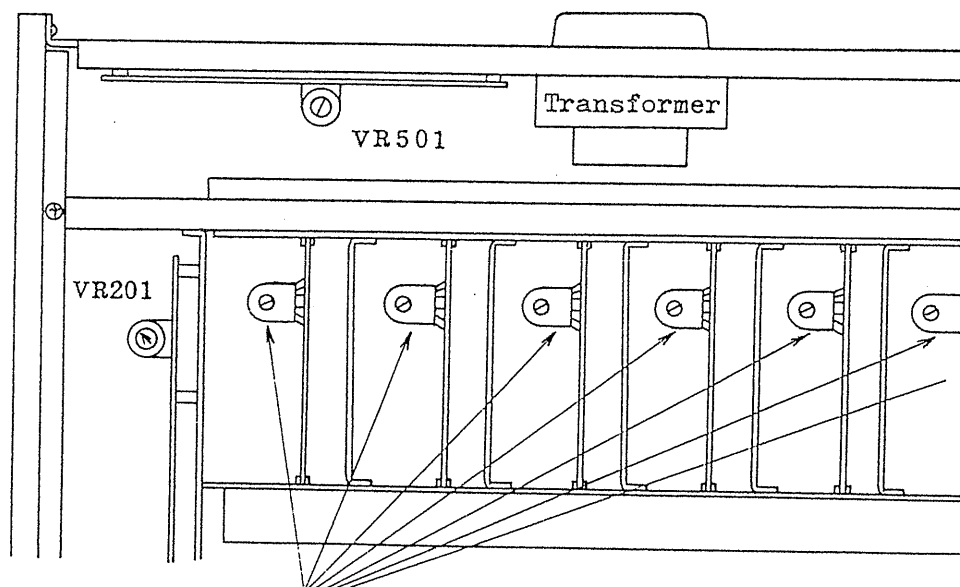


Fig. 4

7-5. Making Equal the Levels of All Meters

Remove the top panel and adjust the seven potentiometers (VR401) of the V. V. COMP circuits.



All of seven potentiometers are VR401.

Fig. 6

Note: Never disturb the semi-fixed potentiometers other than the above. Those semi-fixed potentiometers have been critically adjusted at the manufacturer's factory.

If the customer should have any further questions, the customer is requested to contact our representative in the customer's area.