

DISTORTION METER

# HM-250

## SERVICE MANUAL

KENWOOD CORPORATION

KENWOOD



# WARNING

The following instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than contained in the operating instructions unless you are qualified to do so.

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## ADJUSTMENT

To obtain the best performance, periodically calibrate the unit. Sometimes, only one mode need be calibrated, while at other times, all modes should be calibrated. When one mode is calibrated, it must be noted that the other modes may be affected. When calibrating all modes, perform the calibration in the specified sequence.

The following calibration required an accurate measuring instrument and an insulated adjusting flat blade screwdriver. If they are not available, contact your dealer. For optimum adjustment, turn the power on and warm up the unit sufficiently (more than 30 minutes) before starting.

Before calibrating the unit, check the power supply voltage.

### TEST EQUIPMENT REQUIRED

The following instrument or their equivalent should be used for making adjustment.

Test Equipment	Model	Minimum Specification
Calibrator (Fluke)	5101B	<ul style="list-style-type: none"> <li>● 400 Hz or 1 kHz</li> <li>● 3 mV to 3 V <math>\pm 0.2\%</math></li> </ul>
Oscillator (Tektronix)	SG505	<ul style="list-style-type: none"> <li>● 10 Hz to 200 kHz</li> <li>● 3 mV to 3.2 V</li> <li>● Frequency response: <math>\pm 0.1</math> dB</li> <li>● Distortion: 20 Hz to 20 kHz <math>\leq 0.005\%</math></li> </ul>
Counter (KENWOOD)	FC-758	<ul style="list-style-type: none"> <li>● 20 Hz to 20 kHz <math>\leq 0.1\%</math></li> </ul>
Oscilloscope (KENWOOD)	CS-4025	<ul style="list-style-type: none"> <li>● 10 MHz, 10 mV/DIV</li> </ul>

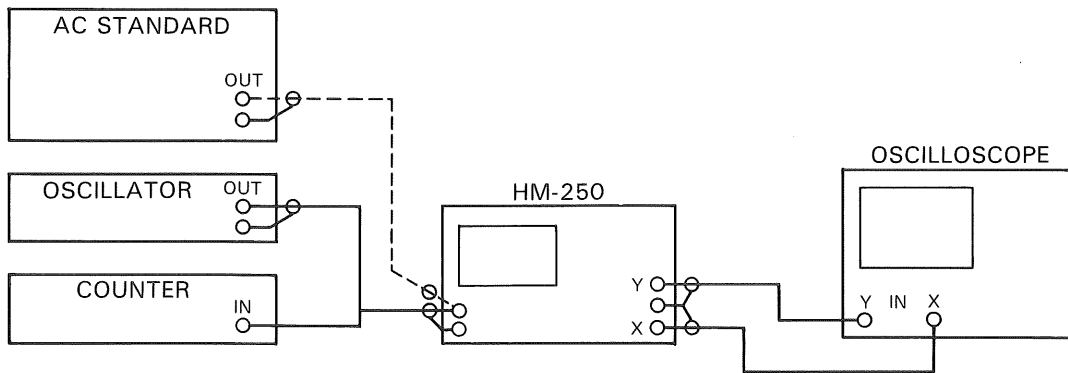


Fig. 1 Connection Diagram

# ADJUSTMENT

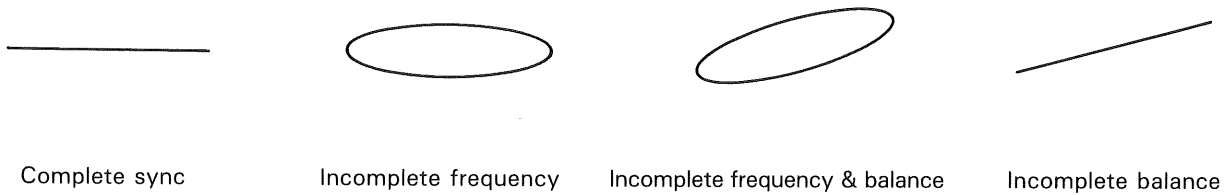
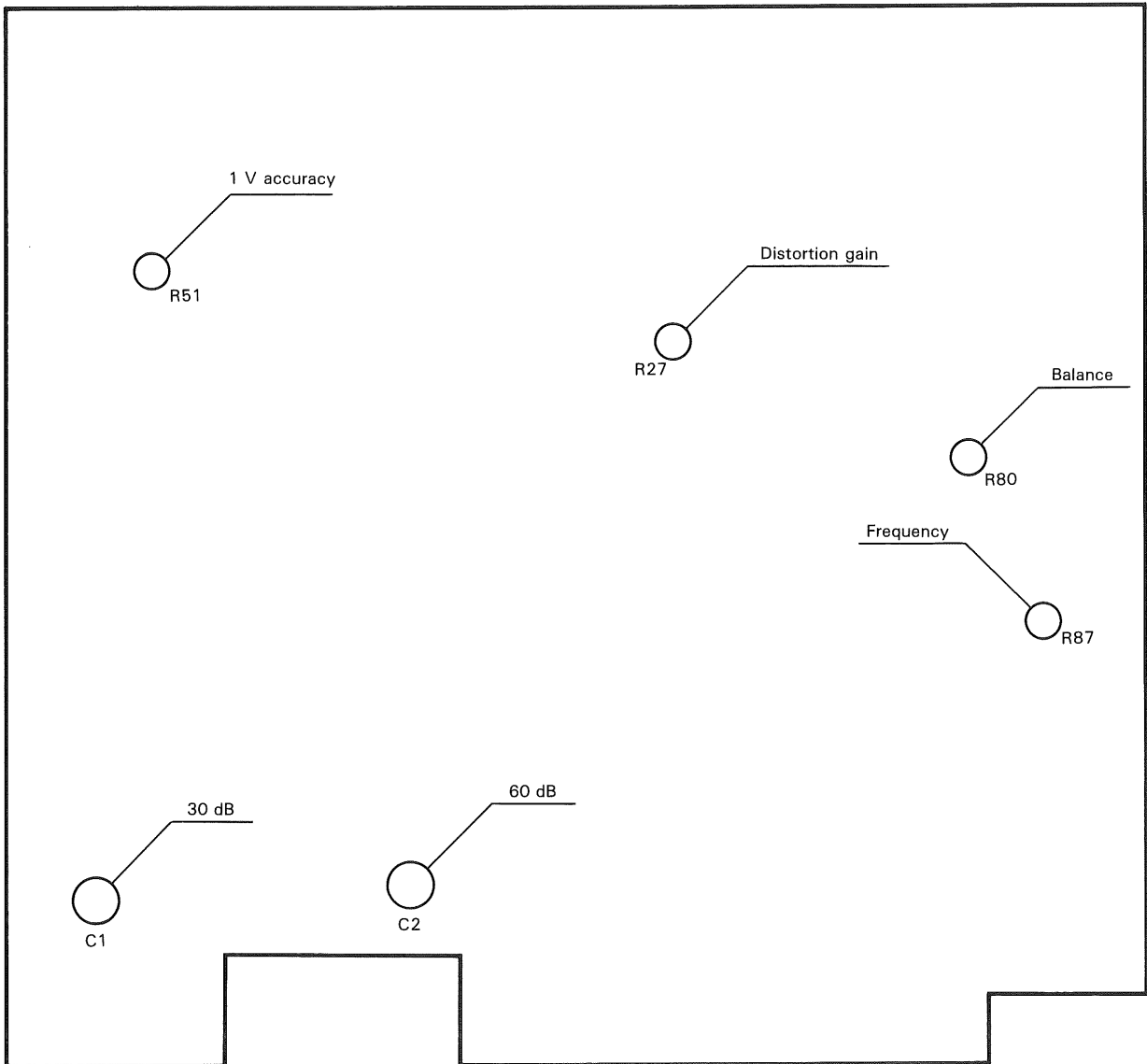


Fig. 2 Lissajou's waveform

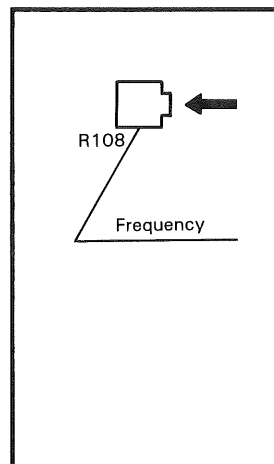
Item	Adjustment R (C)	Test Equipment	Procedure
VM meter 1 V accuracy	R51	Standard AC voltage generator 400 Hz or 1 kHz, 1 V $\pm$ 0.2%.	<ul style="list-style-type: none"> <li>● FUNCTION: VM</li> <li>● ATT: 30 dB</li> <li>● RANGE: 1 V</li> <li>● Adjust R51 so that the meter reads 1 V (100%).</li> </ul>
VM meter frequency characteristic	C1	Oscillator 1 kHz, 200 kHz 0.1 V	<ul style="list-style-type: none"> <li>● ATT: 30 dB</li> <li>● RANGE: 0.1 V</li> <li>● With 1 kHz, 100 mV input, fine-adjust the oscillator level so that the meter reads 100 mV (100%).</li> <li>● With 200 kHz input, adjust C1 so that the meter reads 97 mV (97% = -0.3 dB).</li> </ul>
VM meter frequency characteristic	C2	Oscillator 1 kHz, 200 kHz 3.2 V	<ul style="list-style-type: none"> <li>● ATT: 60 dB</li> <li>● RANGE: 3 V</li> <li>● With 1 kHz, 3.2 V input, fine-adjust the oscillator level so that the meter reads 3.16 V (100%).</li> <li>● With 200 kHz input, adjust C2 so that the meter reads 3.07 V (97% = -0.3 dB).</li> </ul>
DM meter CAL/DM gain	R27	Oscillator 1 kHz, 0.1 V	<ul style="list-style-type: none"> <li>● ATT: 0 dB</li> <li>● Adjust CAL and SENSITIVITY so that the meter reads 100%.</li> <li>● FUNCTION: DM, Dial: 2, MULTI: 100, RANGE: 100%</li> <li>● Adjust R27 so that the meter reads 100%.</li> </ul> <p>Switch CAL and DM alternately and check that the readings are the same.</p>
DM meter frequency	R87	Oscillator 1 kHz $\pm$ 0.1%, 0.1 V Counter	<ul style="list-style-type: none"> <li>● ATT: 0 dB</li> <li>● Adjust CAL and SENSITIVITY so that the meter reads 100%.</li> <li>● FUNCTION: DM, Dial: 20, FINE: Center, MULTI: 100, RANGE: 100%</li> <li>● Adjust R87 to minimize the meter reading (<math>\leq</math>5%).</li> </ul> <p>Ensure that the Lissajou's waveform is closed. Small inclination is acceptable.</p>
DM meter frequency	R108	Oscillator 200 Hz $\pm$ 0.1%, 0.1 V Counter	<ul style="list-style-type: none"> <li>● ATT: 0 dB</li> <li>● Adjust CAL and SENSITIVITY so that the meter reads 100%.</li> <li>● FUNCTION: DM, Dial: 2, FINE: CW, MULTI: 100, RANGE: 100%</li> <li>● Adjust R108 to minimize the meter reading (<math>\leq</math>5%).</li> </ul> <p>Ensure that the Lissajou's waveform is closed. Small inclination is acceptable.</p>
DM meter balance	R80	Oscillator 2 kHz, 0.1 V	<ul style="list-style-type: none"> <li>● ATT: 0 dB</li> <li>● Adjust CAL and SENSITIVITY so that the meter reads 100%.</li> <li>● FUNCTION: DM, Dial: 2, MULTI: 1k, RANGE: 100%</li> <li>● Adjust FINE so that the meter reads 10% or less, and set RANGE to 0.1%.</li> <li>● Adjust R80 to make the Lissajou's waveform flat.</li> <li>● Then, return R80 in the clockwise direction slightly (by about one trimmer scale).</li> </ul>

# ADJUSTMENT

MAIN UNIT (W02-2081-08)

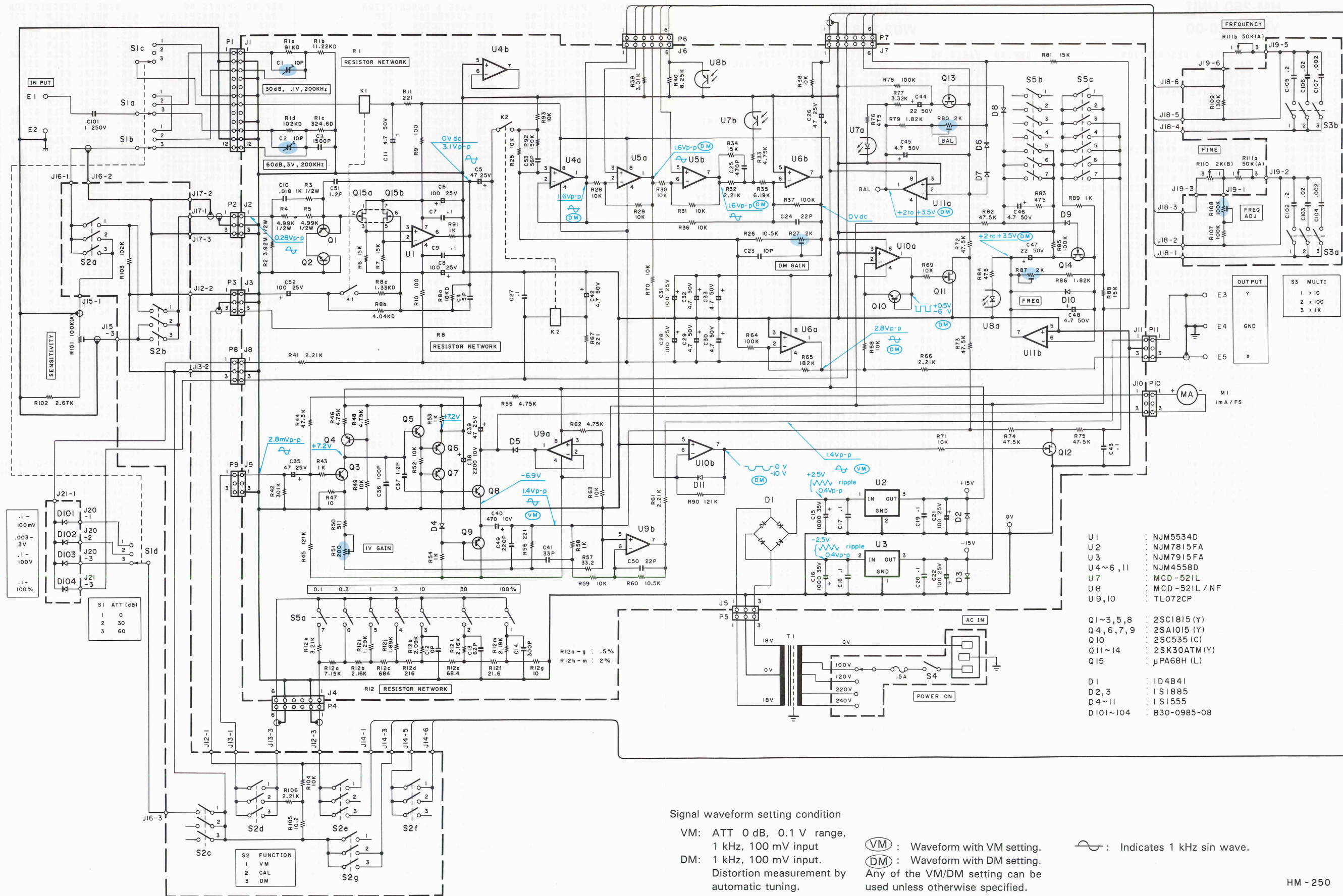


FRONT





# SCHEMATIC DIAGRAM



- |             |                  |
|-------------|------------------|
| U1          | : NJM5534D       |
| U2          | : NJM7815FA      |
| U3          | : NJM7915FA      |
| U4~6, 11    | : NJM4558D       |
| U7          | : MCD-521L       |
| U8          | : MCD-521L/NF    |
| U9, 10      | : TL072CP        |
| Q1~3, 5, 8  | : 2SC1815(Y)     |
| Q4, 6, 7, 9 | : 2SA1015(Y)     |
| Q10         | : 2SC535(C)      |
| Q11~14      | : 2SK30ATM(Y)    |
| Q15         | : $\mu$ PA68H(L) |
| D1          | : 1D4B41         |
| D2, 3       | : 1S1885         |
| D4~11       | : 1S1555         |
| D101~104    | : B30-0985-08    |

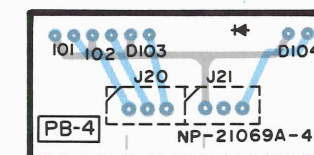
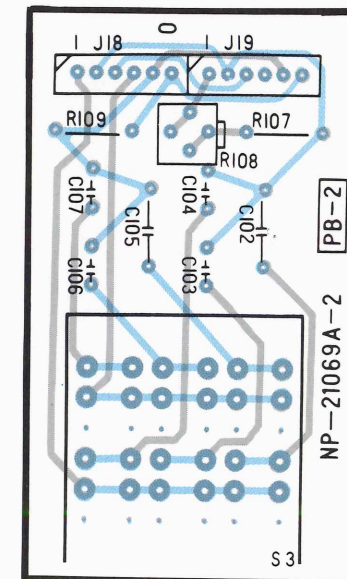
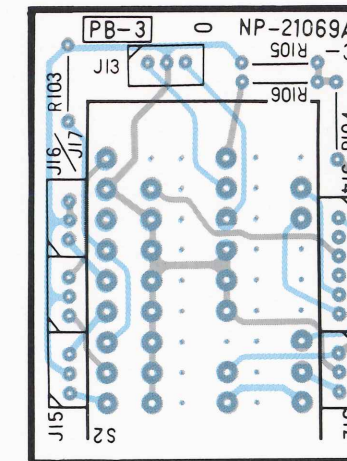
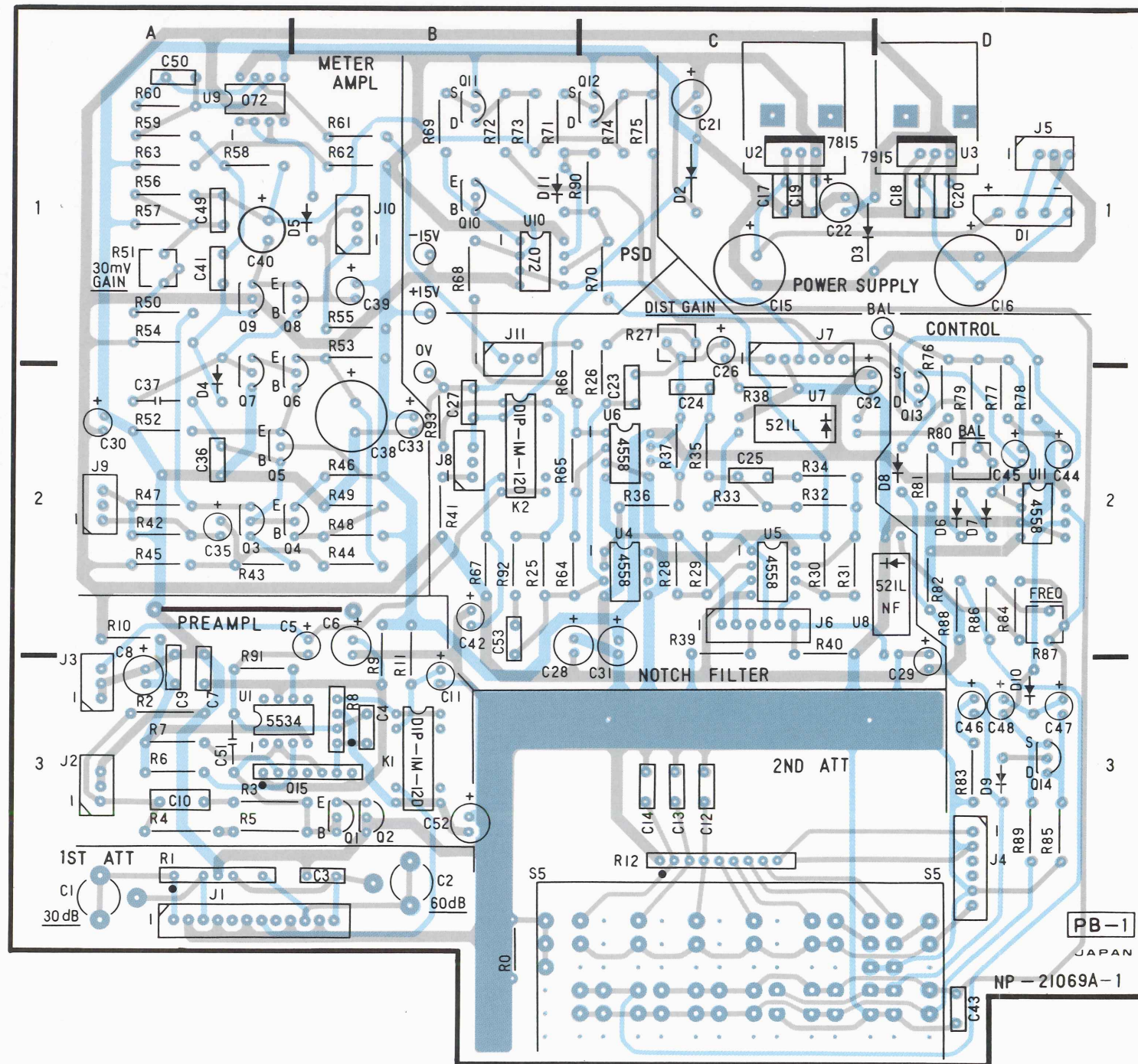
Signal waveform setting condition  
 VM: ATT 0 dB, 0.1 V range, 1 kHz, 100 mV input  
 DM: 1 kHz, 100 mV input.  
 Distortion measurement by automatic tuning.

VM : Waveform with VM setting.  
 DM : Waveform with DM setting.  
 Any of the VM/DM setting can be used unless otherwise specified.

⌚ : Indicates 1 kHz sin wave.

# P.C. BOARD

MAIN UNIT (W02-2081-08)



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A product of  
**KENWOOD CORPORATION**  
17-5, 2-chome, Shibuya, Shibuya-ku, Tokyo 150, Japan

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