KENWOOD

NOISE METER

VT-172

INSTRUCTION MANUAL

KENWOOD CORPORATION

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1. GENERAL

The Noisemeter is an high-sensitive electronic voltmeter having a maximum sensitivity of 10 μV fullscale. Its wide frequency range covers from 10Hz to 500kHz(1mV ~300V) and the five types of weighting are selectable. In addition, DIN or CCIR quasi-peak or average detection with RMS display is selectable, making possible S/N and noise measurements in accordance with JIS-A, DIN NOISE, DIN AUDIO, CCIR and CCIR/ARM standards.

The units are also provided with an overload indicator, a 10dB range relative reference adjustment and AC and DC outputs.

2. FEATURES

a. 10 μV fullscale maximum sensitivity with 0.2 μV graduated scale for measurements down to −120dB.
b. Button selection of JIS-A, DIN NOISE, DIN AUDIO, CCIR and CCIR/ARM weighting filters make possible noise measurements and S/N measurements in accordance with a variety of standards.
c. In addition to average detection and RMS display, DIN and CCIR semi-peak detection with RMS display is available for measurements in accordance with those standards.
d. AC OUT and DC OUT terminals are provided to facilitate waveform observation, recording of measured values or use of the unit as an amplifier.
e. A relative reference adjustment from 0~−10dB makes possible relative measurements of signals with respect to an arbitrarily set reference level, particularly useful in S/N measurement.
f. An overload indication prevents measurement errors caused by distortion not detected by the operator by viewing the meter level for use with the weighting filters.

3. SPECIFICATIONS

[Voltmeter Section]

Voltage ranges : 10μV～300V (10μV/30μV/100μV/300μV/1mV/3mV/10mV/30mV/100mV/300mV/1V/3V/10V/30V/100V/300V) fullscale

dB : −120～+50dB (0dB=1V)

dBm : −120～+52dBm (0dBm=1mW/600Ω)

Display accuracy : With average detection in FLAT mode:
10μV and 30μV ranges: within ±5% of fullscale
100μV～300V ranges: within ±3% of fullscale
With quasi-peak detection and DIN NOISE, DIN AUDIO or CCIR weighting filter:
10μV range: within ±7% of fullscale
30μV～300V ranges: within ±5% of fullscale

Frequency response : With average detection and RMS display
10μV range: 20Hz～10kHz ±5%
10Hz～30kHz ±10%
30μV～300μV ranges:
20Hz～20kHz ±5%
10Hz～100kHz ±10%
1mV～300V ranges:
20Hz～100kHz ±3%
15Hz～300kHz ±5%
10Hz～500kHz ±10%
With quasi-peak detection and RMS display
10μV range: 30Hz～15kHz ±5%
20Hz～20kHz ±10%
10Hz～30kHz ±20%
30μV～300V ranges:
30Hz～20kHz ±5%
20Hz～50kHz ±10%
10Hz～100kHz ±20%

Input impedance : 1MΩ ±5%
Parallel capacitance: 50pF or less

Overload voltage level : 10μV～300μV ranges:
AC 10Vrms, DC 500V
1mV～300mV ranges:
AC 80Vrms
500V(DC+ACpeak)
1V～300V ranges:
500V(DC+ACpeak)

Relative reference adjustment :
0～approx. −12dB

Over level : Lights up or flickers when a signal of more than +15dB for maximum value is applied. This indicates that there is a possibility of erroneous indication due to over input when a level weighting filter is used.

Residual noise : Average detection :
10μV range input shorted, Input equality value
Below 1.5μVrms(1.0μVrms TYP.)
30μV range, input shorted, Input equality value
Below 5μV s(3.0μVrms TYP.)
Peak detection :
10μV range input shorted, Input equality value
Below 2.0μVrms(1.0μVrms TYP.)
30μV range input shorted, Input equality value
Below 5μVrms(3.0μVrms TYP.)

Stability : Within ±0.5% of fullscale for ±10% line voltage fluctuation.

[Amplifier Section]

AC AMPLIFIER :

Gain : Approx. 100dB

Output voltage : 1Vrms ± 10%

Output resistance : 600Ω ± 10%

Distortion : Below 1% of fullscale at 1kHz
This distortion is determined by the S/N for the ranges 10μV～300μV

S/N : With respect to fullscale:
1mV～300V ranges: 40dB minimum
300μV range: 30dB minimum
100μV range: 25dB minimum
30μV range: 20dB minimum
[illegible]V range: 16.5dB minimum

Frequency response : 1mV～300V ranges:
10Hz～500kHz within ±3dB
30μV～300μV ranges:
10Hz～150kHz within ±3dB
10μV range:
10Hz～30kHz within ±3dB

DC OUTPUT AMPLIFER :

Output voltage : 1V±10% for fullscale

Output resistance : 600Ω ±10%

Frequency response : Approx the same as the meter indication.

[Environmental]

coefficient : 0.08%/℃ or less
(at 1mV range or more)

Operating temperature and humidity for within specification : 15～35℃, 80% RH maximum.

Full operating range : 0～50℃, 80% RH maximum.

[Power Supply Section]

Supply voltage : 100/117/220/240VAC±10%
(Max. 250VAC) 50/60Hz

Power consumption : Approx. 15W

[Dimensions] Width 128mm, Height 190(214)mm
Depth 285(315)mm
( ) dimensions include protrusions from the basic case.

[Weight] 4.6 kg

[Accessories]

Power card 1
Input cable(CA-41) 1
Instruction manual 1

4. CONTROLS AND INDICATORS

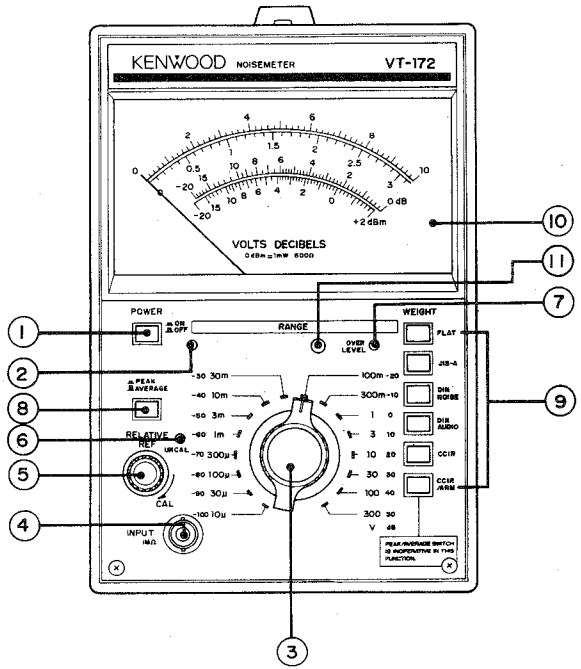

Fig. 1 Front panel view

FRONT PANEL

① POWER (ON ▬ /OFF ▬) Switch
AC power switch.

② Power Lamp
Indicates the VT-172 is powered up. Lights when POWER is depressed.

③ RANGE Selector Switch
Attenuator selector switch. 16 positions in 10dB steps. To prevent excessive inputs, this switch is started in the highest, 300V range and gradually worked down range to provide an easily readable meter deflection.

④ INPUT Juck
BNC signal input connector.

⑤ RELATIVE REF Control and ⑥ UNCAL Lamp
Sensitivity adjustment and uncalibrated annunciator. More than 10dB of adjustment is possible. When the controlis turned fully clockwise, the set range is calibrated. This control can be used to adjust the meter to an appropriate level for relative measurements. When not set at fully clockwise the UNCAL lamp lights to warn the operator.

⑦ OVERLEVEL Lamp

When using weighting filters the effect of the filter is to mask from the operator the presence of an excessively high input level. Thus distortion and the resulting errors can occur without the operator being aware of this condition. To prevent this the OVERLEVEL warning lamp alerts the operator when the input level goes +15dB above the full scal level (0dB).

⑧ AVERAGE/PEAK Switch

This switch is used to select the detection method. In the released position average detection and RMS display are in effect. Depressing the switch selects either DIN or CCIR quasi-peak detection and RMS display of the signal level. When CCIR/ARM is selected the detection method is automatically switched to average detection and RMS display regardless of the position of this switch.

⑨ WEIGHT Switch group

This six position selection switch group allows selection of one of FLAT or JIS-A, DIN NOISE, DIN AUDIO, CCIR or CCIR/ARM weighted response. Selection of the FLAT position turns the unit into a wideband AC voltmeter. If no button is depressed, the mode is automatically CCIR/ARM.

JIS-A :

Used for noise level measurements in accordance with JIS C1502A, JIS C5551A, IEC-A, and IHF-A standards.

DIN NOISE :

Used for noise level measurements in accordance with DIN standard 45405.

DIN AUDIO :

Used for 10Hz~20kHz audio level measurements in accordance with DIN standard 45405.

CCIR :

Used for measurements of noise level in accordance with CCIR standards.

CCIR/ARM :

Used for noise level measurements in accordance with CCIR/ARM standards.

This measuring equipment is recommended by Dolby Laboratorie.

When the CCIR/ARM filter is used, average detection is used regardless of the AVERAGE/PEAK switch.

The appropriate AVERAGE/PEAK switch settings for the various filters are :

Filter :	AVERAGE	PEAK
JIS-A	O	–
DIN NOISE	–	O
DIN AUDIO	O	O
CCIR	–	O
CCIR/ARM	O	–

⑩ METER

⑪ METER Zero-adjust Trimmer

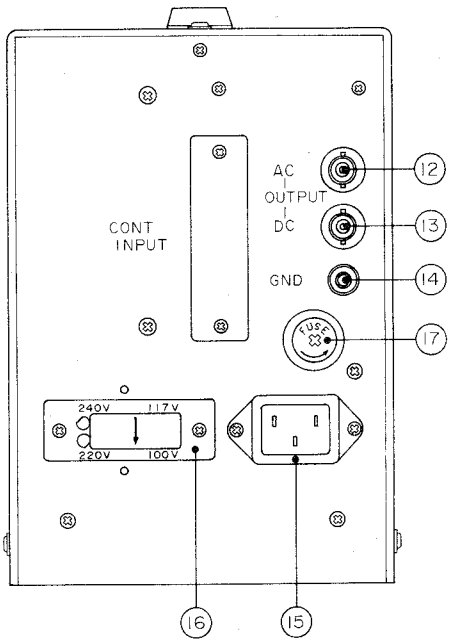

Fig. 2 Rear panel view

REAR PANEL

⑫ AC OUTPUT Juck

This output is used for waveform observation or for used of the VT-172 as an amplifier.

⑬ DC OUTPUT Juck

This output is used for recording off-line measured values.

⑭ GND Terminal

Ground connection.

⑮ AC POWER Connector

This is AC power input connector. Use the power cord provided with the unit.

⑯ AC LINE VOLTAGE Selector

Set the plug of this selector to the local line voltage (100/117/220/240V AC).

⑰ FUSE Holder

Use a screwdriver to open this holder for replacement of the fuse of specified rating.

For 100 or 117V : 0.5A

For 220 or 240V : 0.3A

5. OPERATION

1. Check the mechanical zeroing of the meter.
2. Connect the signal cable to INPUT ④
3. Set the RANGE switch ③ to the 300V range.
4. Connect the power cord and press the POWER ① switch to turn the unit ON. The red LED ② should light indicating the unit is ready for use.
5. Input the signal to be measured and if necessary gradually switch to lower (more sensitive) ranges until an easy to read meter deflection is obtained.

USING RELATIVE REF

To make measurements with respect to some arbitrary reference level, input the signal to be used as the reference level and use RELATIVE REF ⑤ to obtain a 0dB meter deflection without changing the RELATIVE REF setting measurement of other signals can be made and read directly off the dB scale in dB with respect to the reference level.

The adjustment range of the RELATIVE REF control is from 0 to −12dB (negative only) so to set 0dB for signal under 0dB switching down range must be done.

READING THE METER SCALES (See Fig. 3)

(1) VOLTAGE SCALES

Thesc scales consist of a 0~10 and 0~3 scale which are used to read ranges which are multiples of 10 and 3 respectively. The range setting always refers to the meter fullscale deflection. The ranges are designed to overlap to allow values on the lower portion of one range to be more accurately read on the upper portion of the next more sensitive range.

(2) dBm SCALES

A level of 1 mW into a 600Ω resistance is take as 0dBm (0.775V) and readings are made in 0dBm with respect to this standard reference level.

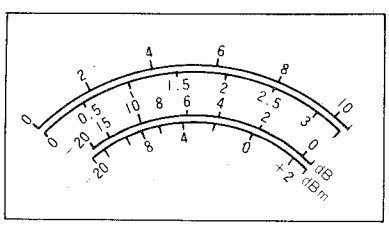

Fig. 3

6. PRECAUTIONS

1. To assure accurate measurements allow a five minute warming up period before actual measurements are begin. Note that switching between 1V and 300mV and between 1mV and 300μV and 10μV upon powering the unit up may result in the deflection of the meter.
2. To preserve the high sensitivity of this unit, be sure to use either the input signal cable provided or another low capacitance shielded cable. Use of single conductors or other unshielded cables or high impedance signal sources can result in noise being introduced into the measurement circuit.
3. Be sure to take care not to exceed the maximum allowable input levels :

10μV~300μV ranges:	AC :	10Vrms
	DC :	500V
1mV~300mV ranges:	AC :	80Vrms
		500V(DC+ACpeak)
1V~300V ranges :		500V(DC+ACpeak)

For excessively high inputs in the 10μV to 300μV ranges the input impedance drops to approximately 100Ω.

4. Please note that this unit OVERLEVEL LED lights when the input exceeds 15dB above the fullscale reading for use with weighting filters to warn against distortion due to highly excessive signal levels. It also normally lights when switching between the 300V and 1V or between the 300μV and 1mV ranges, but this is normal and not an indication of excessive signal level.
5. The dynamic range of the units is 40~80dB making it impossible to measure the internal weighing filter's frequency response while they are installed in the unit.
6. A signal or DC voltage should never be placed between the instrument case and ground.
7. When this instrument is used in a location where the AC line has pulse noise of a level higher than the internal filter can handle, performance may be affected. Consideration should be given to providing a clean power source in such a situation.
8. Temperature coefficient is 0.1%/℃ TYP. with 10μV~300μV ranges.

7. MAINTENANCE

Removing the CASE

Using a screwdriver, remove the two screw each on the left side, right side and top of the instrument. Open the bottom of the receptacle shaped case to remove the cover.

Removal of the four screws retaining the bottom cover will expose the shield.

Replacing the fuse (see Figure 4)

REPLACING FUSE

When a fuse goes out, the device is no longer operable. If gone out, check for a trouble cause, remedy it, remove the cap of the fuse holder on the rear panel using a screw driver and take it out and replace the fuse with a new one.

When replacing fuse, be sure to check the capacity of a new fuse for a specified value as follows:

AC 100V, 120V : 0.5A

AC 220V, 240V : 0.3A

CHANGEOVER OF VOLTAGE IN SWITCHING REGULATOR (LINE VOLTAGE SELECTOR)

Remove the ~~fuse holder~~ on the rear side of the device set, using a minus surew driver, adjust your preferred voltage indication with ↓ mark and plug the holder in. For changing 100V or 117V to 220V or 240V, change the fuse of 0.5A to that of 0.3A.

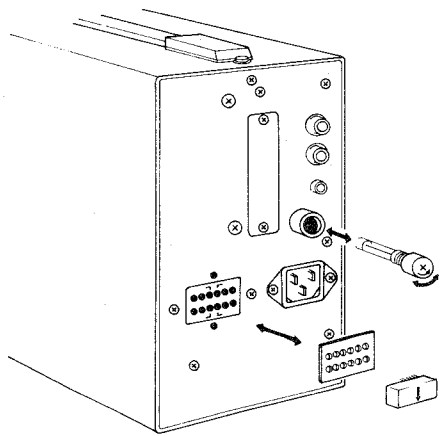

Fig. 4

8. ADJUSTMENT

Although this instrument is shipped in a calibrated and adjusted state, should recalibration be necessary, perform the procedures outlined below using calibrated instruments after verifying that the line voltage setting is correct.

Meter accuracy adjustment

1. Remove the case and bottom cover.
2. Without applying power mechanically zero the meter using the zero adjustment screw.
3. Using a meter calibrator apply either a 400Hz or 1kHz signal to the INPUT ④ of this instrument.
4. Set the AVERAGE/PEAK switch ⑧ to AVERAGE and the WEIGHT switch ⑨ to FLAT.
5. Set the meter calibrator output to 10mV and the meter RANGE switch ③ to 10mV. Adjust VR2 of the Output Unit (X73-1390-00) for a fullscale deflection of 10mV.
6. Set the meter calibrator output level to 30mV and the meter range switch to 30mV. Adjust VR4 on the Input Unit (X73-1380-00) (bottom side) for a

fullscale deflection.
Next set the meter calibrator output level to 1V and themeter range switch to the 1V range.
Adjust VR1 of the Input Unit for a fullscale deflection.

7. For adjustment of the 10μV to 300μV ranges use a calibrated resistive attenuator to obtain an output of 100μV. Set the meter range to 100μV and adjust VR2 of the Input Unit for a fullscale deflection.
8. To adjust the 10μV range of the VT-172, set the calibrator output to 10μV and set the meter range switch to the 10μV position. Adjust VR201 of the Input Unit for a fullscale deflection.
9. Depress the AVERAGE/PEAK switch and leave the WEIGHT switches in the FLAT condition. As was done in step 5, adjust VR7 of the Output Unit for a fullscale deflection.
10. Remove the calibrator and connect a wideband oscillator to the INPUT. Set the oscillator frequency to 1kHz and the meter range switch to 1V. Adjust the oscillator output level for a fullscale deflection in this condition.
11. Shift the oscillator frequency to 100kHz and use the TC1 on the Input Unit to adjust the meter for fullscale deflection.
12. Repeat the above procedure.

AC-DC OUT adjustment

Depress the AVERAGE/PEAK switch on the panel and leave the WEIGHT switches in the FLAT condition.

1) AC-OUT adjustment
   Apply a signal so that the meter reads for fullscale. Adjust VR8 so that the AC OUT is 1Vrms.
2) DC-OUT adjustment
   Short circuit the input and adjust VR10 so that the DC OUT is OV. Apply a signal so that the meter reads for fullscale.
   Adjust VR9 so that the DC OUT is 1V. Repeat above procedure until the specified value is obtained.

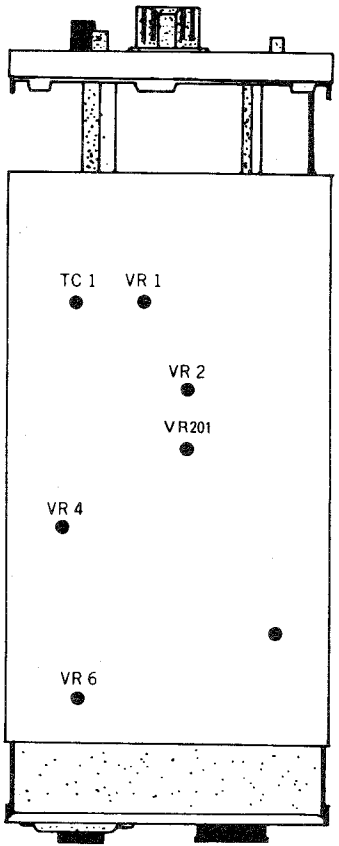

Fig. 5 Input Unit Adjust ts (Bottom View)

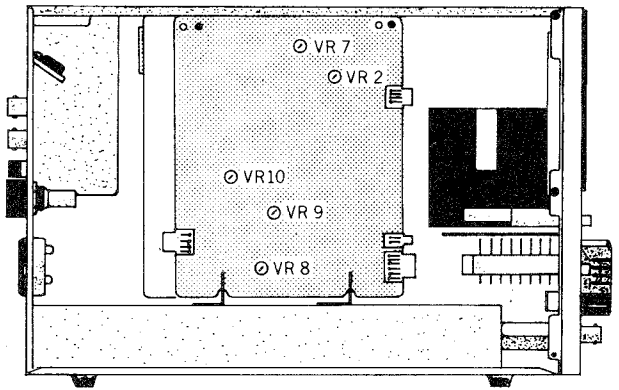

Fig. 6 Output Unit Adjustments (Left Side View)

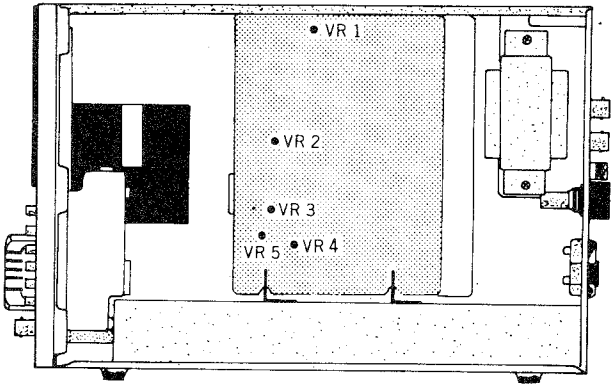

Fig. 7 Filter Ur Adjustments (Right Side View)

9. APPENDIX

Adjustment of Weighting Filter Reference Level.

The reference level of each filter is adjusted so that this level (the 0dB level on the weighting curve) yields the same measured value as the FLAT conditon. Use a frequency counter to accurately set the frequency of the oscillator for this adjustment.

Weighting	Filter Unit Control	Oscillator frequency	Adjust For:
JIS-A	VR1	1kHz	0dB indication
DIN NOISE	VR2	1kHz	0dB indication
DIN AUDIO	VR3	1kHz	0dB indication
CCIR	VR4	6.3kHz	12.2dB indication
CCIR/ARM	VR5	6.3kHz	6.6dB indication

Table 1

With regard to CCIR recommendations and DIN 45405 standards for semi-peak detection of noise levels,the following characteristics are specified.

1. One tone burst is to be input and the measured value to be verified to be within the limits summarized below. The tone burst is to be sine wave of 5kHz frequency. The duration times are listed in the table below.

Tone burst duration (ms)		1	2	5	10	20	50	100	200	∞
Measured value(%)		17.0	26.6	40	48	52	59	68	80	100
Allowable range(%)	Lower limit	13.5	22.4	34	41	44	50	58	68	–
	Upper limit	21.4	31.6	46	55	60	68	78	92	–

Table 2

2. Input a tone burst signal as shown below and verify a response within the limits shown below. The tone burst frequency is 5kHz.

Tone burst repetition frequency(Hz)		2	10	100
Measured value (%)		48	77	97
Allowable range(%)	Lower limit(%)	43	72	94
	Upper limit(%)	53	82	100

Table 3

1) Noise Measurement Filter JIS C1502A, JIS C5551A IEC-A, IHF-A

Frequancy (Hz)	Response (dB)	Responsed tolerance (dB)
25	−44.6	± 2.0
31.5	−39.2	± 2.0
40	−34.5	± 2.0
50	−30.2	± 2.0
63	−26.1	± 2.0
80	−22.3	± 2.0
100	−19.1	± 1.0
125	−16.1	± 1.0
160	−13.2	± 1.0
200	−10.8	± 1.0
250	− 8.6	± 1.0
315	− 6.5	± 1.0
400	− 4.8	± 1.0
500	− 3.2	± 1.0
630	− 1.9	± 1.0
800	− 0.8	± 1.0
1000	0	0
1250	+0.6	± 1.0
1600	+1.0	± 1.0
2000	+1.2	± 1.0
2500	+1.2	± 1.0
3150	+1.2	± 1.0
4000	+1.0	± 1.0
5000	+0.5	± 1.0
6300	−0.1	± 1.0
8000	−1.1	± 1.0
10000	−2.4	± 1.0
12500	−4.2	± 2.0
16000	−6.5	± 2.0

Table 4

2) Noise Measurement Filter DIN 45405 (NOISE)

Frequancy (Hz)	Response (dB)	Responsed tolerance (dB)
≦ 20	< −40	
≦ 31.5	< −38	
63	−31.6	± 1.5
100	−26.1	± 1.5
200	−17.3	± 1.5
400	− 8.8	± 1.5
800	− 1.9	± 1.5
1000	0	± 0.5
2000	+ 5.3	± 1.5
4000	+ 8.2	± 1.5
5000	+ 8.4	± 0.5
6300	+ 8.0	± 1.5
7100	+ 7.1	± 1.5
8000	+ 5.1	± 2.0
9000	− 0.3	+ 3、−2
10000	− 9.7	+ 3、−2
16000	< −21	
20000	< −23	
31500	< −30	

Table 5

3) Noise Measurement Filter DIN 45405 (AUDIO)

Frequancy (Hz)	Response (dB)	Responsed tolerance (dB)
4	≦ −20	
10	≦ − 5	
31.5	0	± 0.5
1000	0	± 0.5
20000	0	± 0.5
25000	≦ − 3	
50000	≦ −40	

Table 6

4) Noise Measurement Filter (CCIR standard), (Rec. 468-2)

Frequancy (Hz)	Response (dB)	Responsed tolerance (dB)
31.5	−29.9	± 2.0
63	−23.9	± 1.4
100	−19.8	± 1.0
200	−13.8	± 0.85
400	− 7.8	± 0.7
800	− 1.9	± 0.55
1000	0	± 0.5
2000	+ 5.6	± 0.5
3150	+ 9.0	± 0.5
4000	+10.5	± 0.5
5000	+11.7	± 0.5
6300	+12.2	0
7100	+12.0	± 0.2
8000	+11.4	± 0.4
9000	+10.1	± 0.6
10000	+ 8.1	± 0.8
12500	0	± 1.2
14000	− 5.3	± 1.4
16000	−11.7	± 1.65
20000	−22.2	± 2.0
31500	−42.7	± 2.8 − ∞

Table 7

5) Noise Measurement Filter (CCIR/ARM standard)

Frequancy (Hz)	Response (dB)	Responsed tolerance (dB)
31.5	−35.5	± 2.0
63	−29.5	± 1.4
100	−25.4	± 1.0
200	−19.4	± 0.85
400	−13.4	± 0.7
800	− 7.5	± 0.55
1000	− 5.6	± 0.5
2000	0	± 0.5
3150	+ 3.4	± 0.5
4000	+ 4.9	± 0.5
5000	+ 6.1	± 0.5
6300	+ 6.6	0
7100	+ 6.4	± 0.2
8000	+ 5.8	± 0.4
9000	+ 4.5	± 0.6
10000	+ 2.5	± 0.8
12500	− 5.6	± 1.2
14000	−10.9	± 1.4
16000	−17.3	± 1.65
20000	−27.8	± 2
31500	−48.3	± 2.8、∞

Table 8

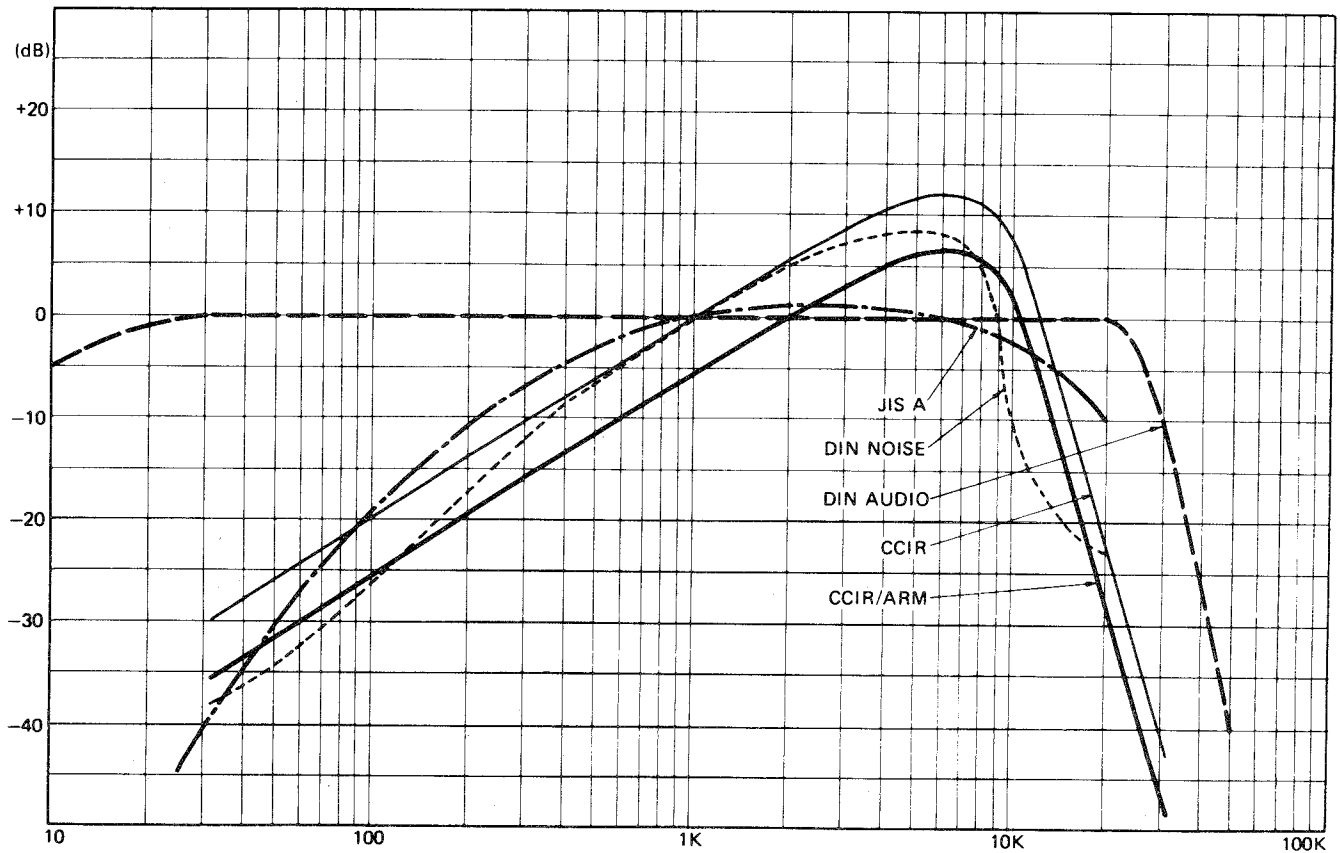

Table 9 **Noise Weighting Characteristics**

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