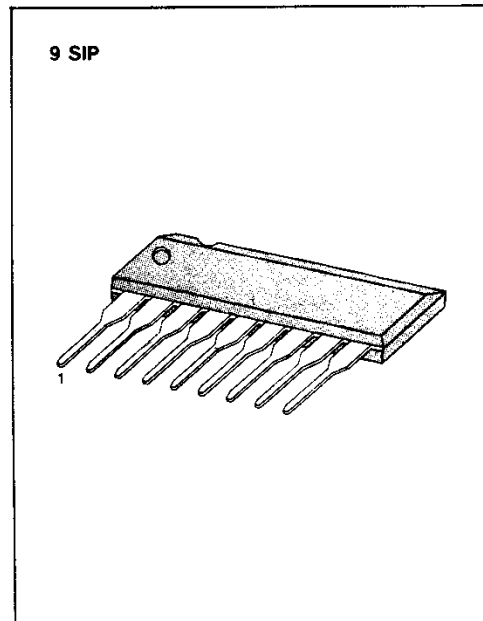


## EQUALIZER AMPLIFIER WITH ALC

The KA2220 is a monolithic integrated circuit consisting of a preamplifier and ALC circuit for cassette tape recorders

### FEATURES

- Low noise amplifier.
- Wide operating supply voltage range:  $V_{CC} = 3.5V \sim 14V$
- High output voltage.
- Low distortion.
- Wide ALC range.
- KA2220 ST: Good ALC pair characteristic for stereo tape recorders



### ORDERING INFORMATION

Device	Package	Operating Temperature
KA2220	9 SIP	-20°C ~ +70°C

### BLOCK DIAGRAM

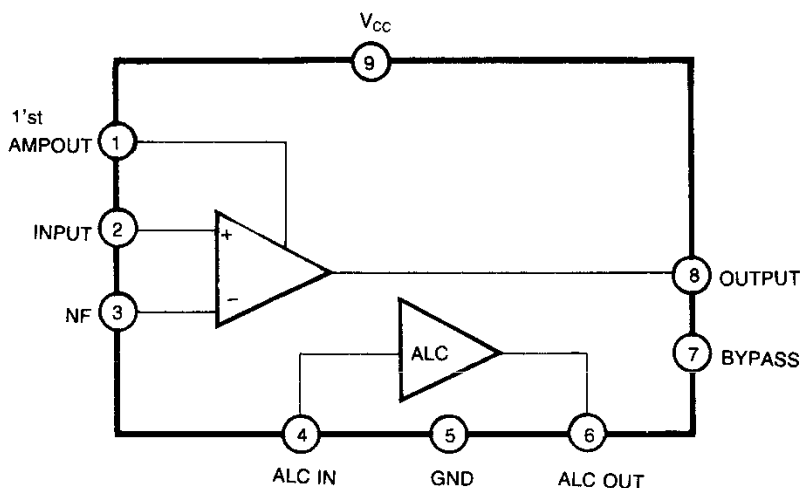


Fig. 1

## ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

Characteristic	Symbol	Value	Unit
Supply Voltage	$V_{CC}$	15	V
Power Dissipation	$P_D$	200	mW
Operating Temperature	$T_{OPR}$	-20 ~ +70	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-40 ~ +125	$^\circ\text{C}$

## ELECTRICAL CHARACTERISTICS

( $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$ ,  $R_L = 5.1\text{K}\Omega$ ,  $R_G = 600\Omega$ ,  $f = 1\text{KHz}$ , NAB, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Quiescent Circuit Current	$I_{CCQ}$	$V_I = 0$ , ALC OFF		1.4	2.0	mA
Open Loop Voltage Gain	$G_{VO}$		66	69		dB
Closed Loop Voltage Gain	$G_{VC}$	$V_O = 0.7\text{V}$	33	35	37	dB
Output Voltage	$V_O$	THD=1%	0.7	1.0		V
Total Harmonic Distortion	THD	$V_O = 0.2\text{V}$		0.1		%
Input Resistance	$R_I$		60	100		$\text{K}\Omega$
Equivalent Input Noise Voltage	$V_{NI}$	$R_G = 2.2\text{K}\Omega$ , NAB BW (-3dB) = 15Hz ~ 30KHz		1.0		$\mu\text{V}$
ALC Transistor Saturation Voltage	$V_{SAT}$			75	100	mV

## TEST CIRCUIT

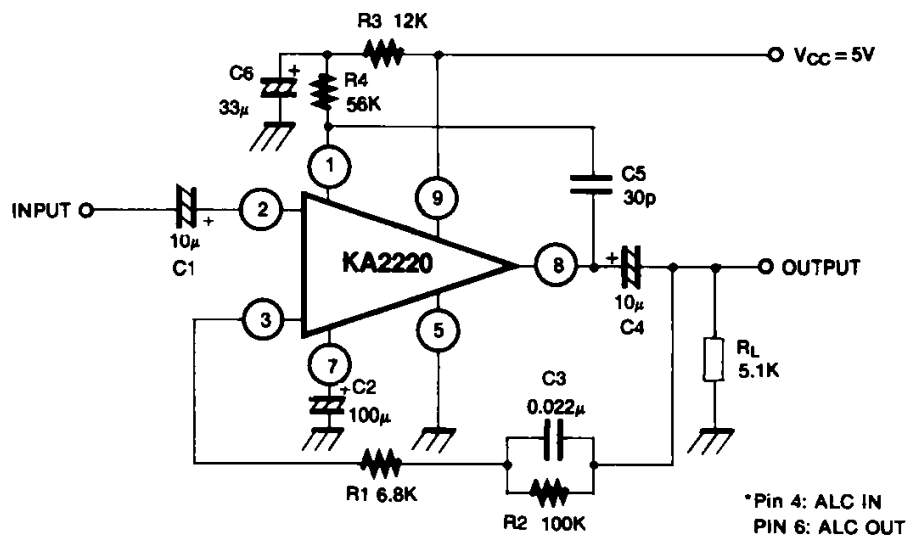
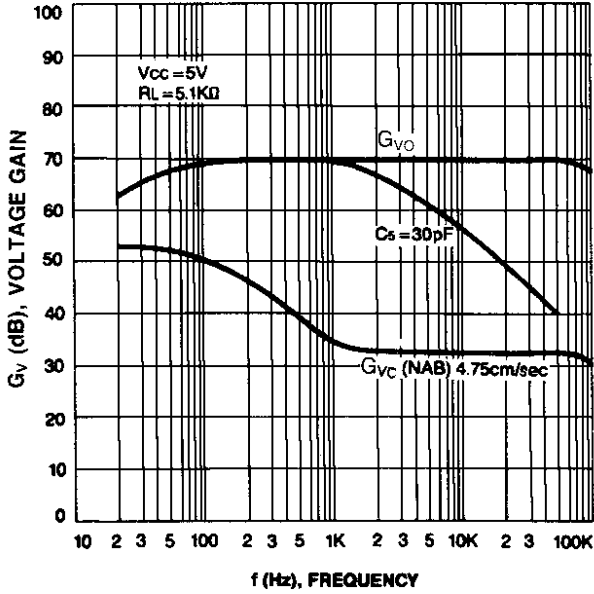
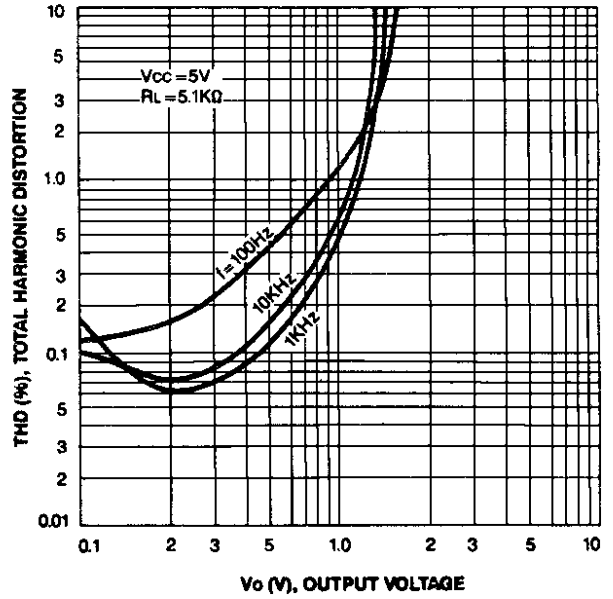


Fig. 2

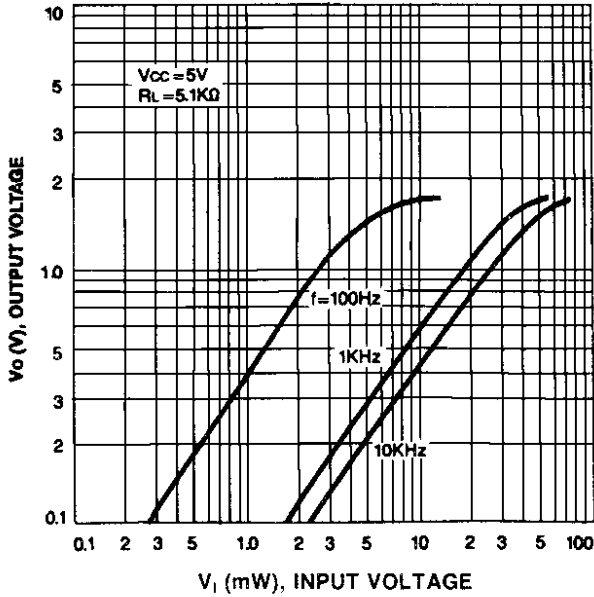
**VOLTAGE GAIN-FREQUENCY**



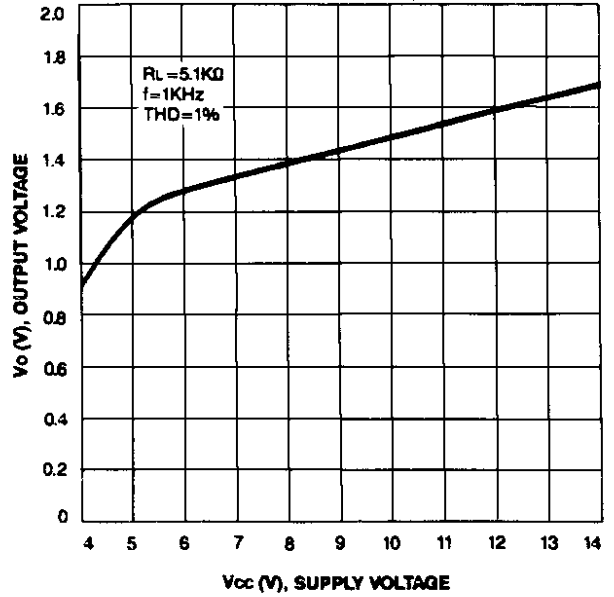
**TOTAL HARMONIC DISTORTION-OUTPUT VOLTAGE**



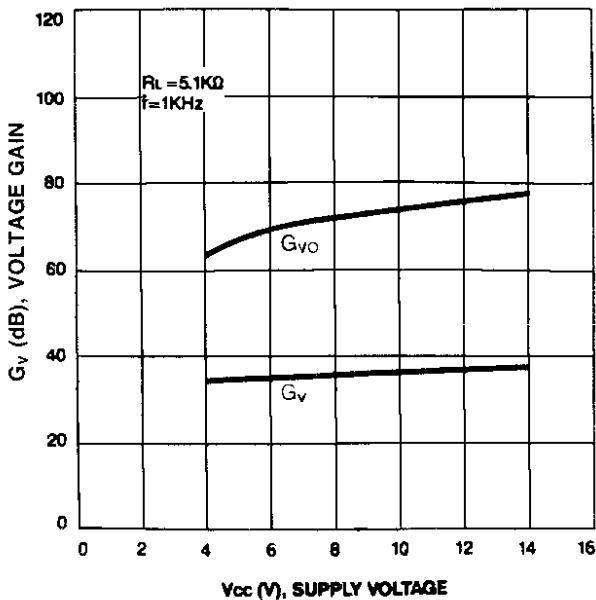
**OUTPUT VOLTAGE-INPUT VOLTAGE**



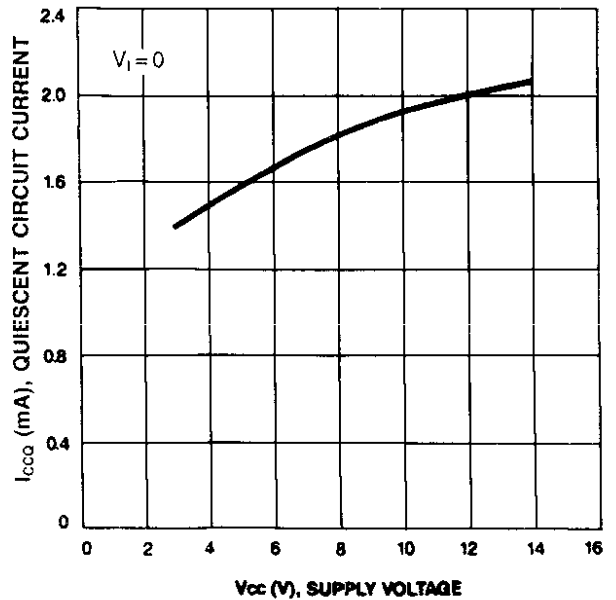
**OUTPUT VOLTAGE-SUPPLY VOLTAGE**

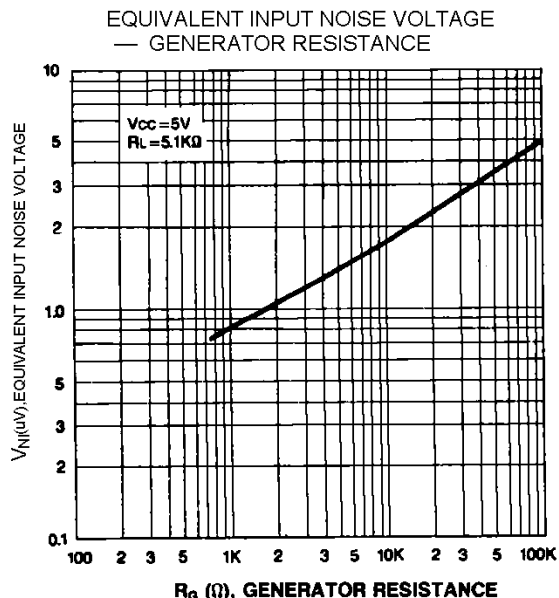


**VOLTAGE GAIN-SUPPLY VOLTAGE**



**QUIESCENT CIRCUIT CURRENT-SUPPLY VOLTAGE**





## APPLICATION INFORMATION

### ACL Grade Binning Table

Symbol	$A_v$ (dB)		ALC Grade (dB)	
	Min	Max	Min	Max
KA2220 J	34	36	- 16.0	- 27.0
KA2220 M			- 25.0	- 34.0

### External Components (Refer to test circuits)

**C<sub>1</sub>:** Input coupling capacitor

The recommended value is 10 $\mu$ F. If made too small the low frequency characteristics will change for the worse, and too large a capacitance value will increase the rising time when power is applied.

**C<sub>2</sub>:** Bypass capacitor

Short emitter resistor on the AC and prevents an AC signal from feedback to input.

**C<sub>3</sub>, R<sub>1</sub>, R<sub>2</sub>:** Equalizer network

The closed loop voltage gain is determined by these components in relation to the internal resistance at Pin 3.

**C<sub>4</sub>:** Output coupling capacitor

C<sub>2</sub> is determined as follows:

$$C_4 = \frac{1}{2\pi \cdot f_L \cdot R_L}$$

f<sub>L</sub>: low cut-off frequency

R<sub>L</sub>: load resistance

**C<sub>5</sub>:** Phase compensation capacitor.

Prevents high frequency oscillation by phase error when feedback is heavy.

**C<sub>6</sub>:** Ripple filter for power supply

A large value is required to get an excellent ripple characteristic under the line operation, but must be made smaller to shorten the starting time.

**R<sub>3</sub>:** Filter resistance.

**R<sub>4</sub>:** Collector resistor of first stage transistor of the IC

Low voltage characteristic can be improved by adjusting this resistance.

## ALC GRADE BINNING TEST CIRCUIT

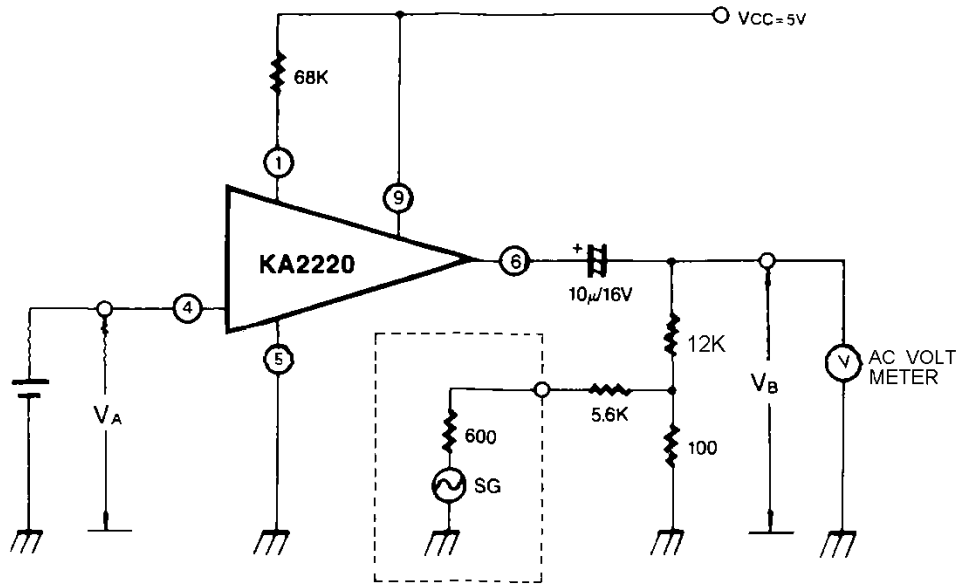


Fig. 3

Test condition: S.G output level should be adjusted to be 13.8mV of the AC voltmeter reading ( $V_B$ ) when the D.U.T is not connected from the test circuit ( $V_{CC} = 5V$ ,  $V_A = 1.16V$ ,  $T_a = 25^\circ C$ )

ALC RANK is defined as  $ALC-G.R = 20 \log V_{B2}/V_{B1}$

where

$V_{B1}$ : AC voltmeter reading when the D.U.T is not connected

$V_{B2}$ : AC voltmeter reading when the D.U.T is connected

## APPLICATION CIRCUIT

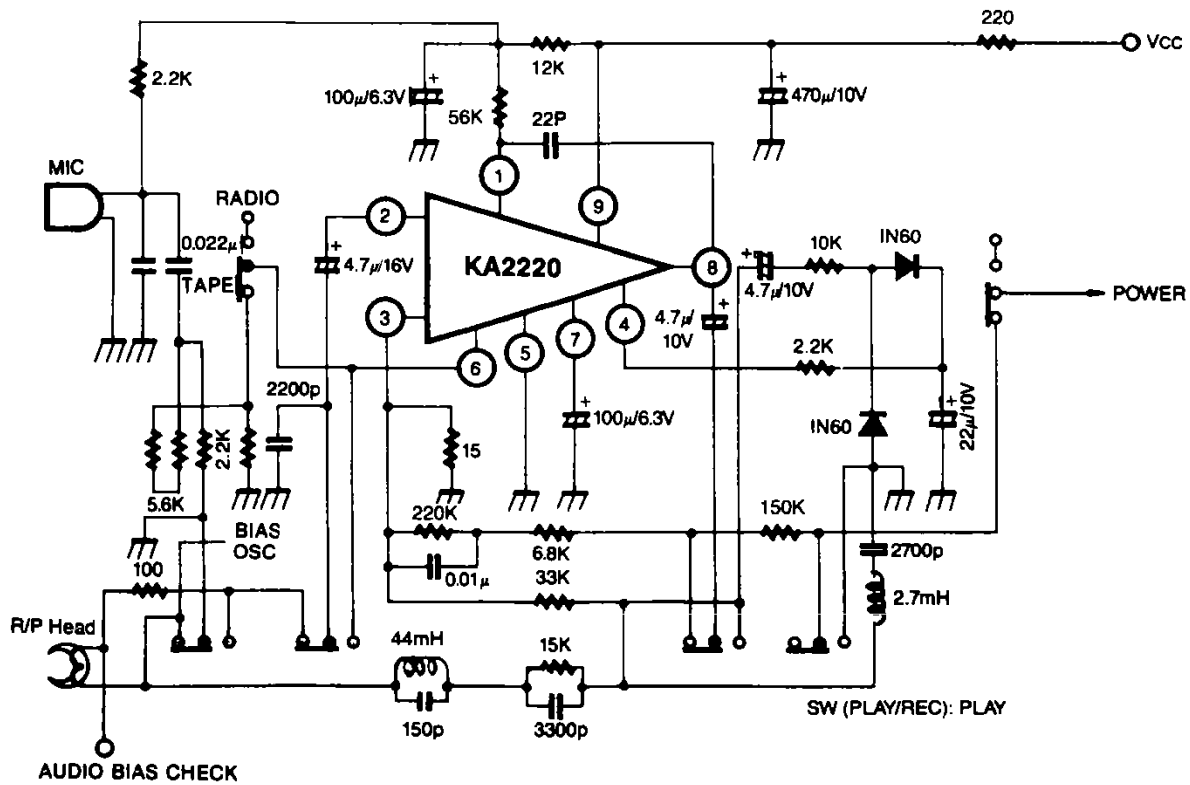


Fig. 4



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