

# Unidad II: Procesadores de Audio

## Parte 1

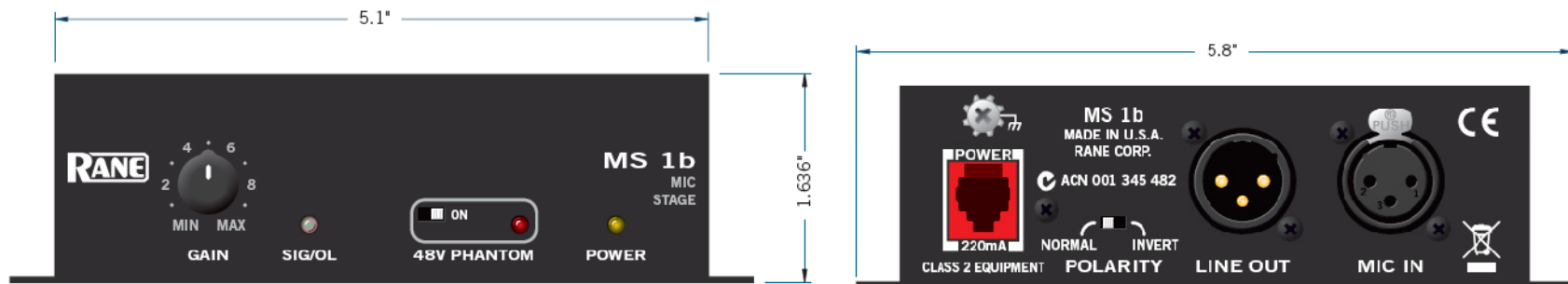
Diseño e Instalación de Sistemas de Sonido  
AUM-711

Prof. Ing. Andrés Barrera A.

# 1.- Preamplificadores

## 1.1.- Funciones

- Adaptador de impedancias.
- Adaptador de nivel (ganancia de voltaje necesaria).
- Ecualización.

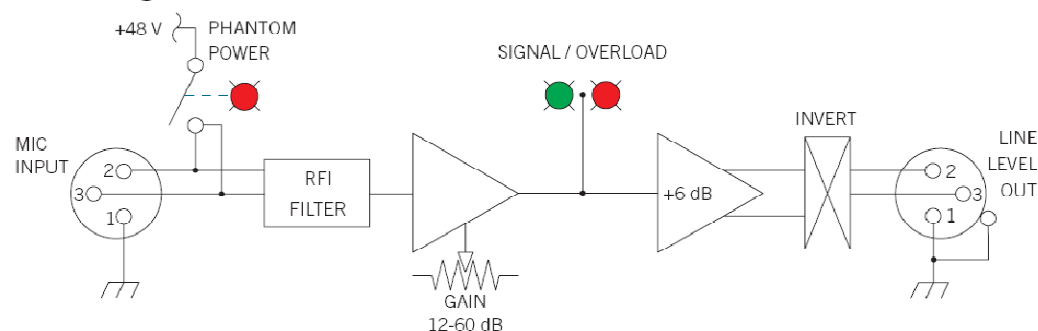


**Rane Microphone Stage  
MS1b**

## Features and Specifications

Parameter	Specification	Limit	Units	Conditions/Comments
Input Impedance	10k	1%	$\Omega$	Balanced 5k + 5k
Gain Range	18 to 66	typ.	dB	
Phantom Power	+48	4%	V	10 mA max.
.....Impedance	6.81k	1%	$\Omega$	Each leg
.....Load Regulation	0.1	typ.	%	0 to 14 mA
.....RMS CM Noise	.003	typ.	%	% of $V_{out}$ (10 Hz to 10 kHz)
Max. Input Level	+10 / -32	min.	dBu	Gain 18 / 60, balanced output
Equivalent Input Noise	-128	typ.	dBu	20 kHz BW, $R_s=150 \Omega$ , Gain = 60 dB
Signal to Noise Ratio	96	typ.	dB	20 kHz BW, $R_s=150 \Omega$ , Gain = 18 dB, re 4 dBu
Dynamic Range	120 / 95	typ.	dB	Gain 18 / 66
CMRR	80	typ.	dB	$R_s=150 \Omega$ , 120 Hz, Gain = 60 dB
Frequency Response				
.....Gain 60 dB	45 to 200k	typ.	Hz	+0, -3dB
.....Gain 18 dB	30 to 200k	typ.	Hz	+0, -3dB
THD+Noise (gain 60 dB)	.007 (Output=+20 dBu)	typ.	%	55 Hz to 20 kHz, 20 kHz BW, $R_l=10 k\Omega$
THD+Noise (gain 18 dB)	.001 (Output=+20 dBu)	typ.	%	50 Hz to 20 kHz, 20 kHz BW, $R_l=10 k\Omega$
Line Driver	Active Cross-coupled			Gain 5.2 / 6 dB typ. unbalanced / balanced
Max. Output Level	+22 / +27	min.	dBu	Unbalanced / Balanced, 2 k $\Omega$ load

### Block Diagram



## 2.- Compatibilidad de Saturación de Entrada

### Preamplificador RANE MS1b

#### Features and Specifications

Parameter	Specification	Limit	Units	Conditions/Comments
Input Impedance	10k	1%	$\Omega$	Balanced 5k + 5k
Gain Range	18 to 66	typ.	dB	
Phantom Power	-48	±%	V	10 mA max.
.....Impedance	6.81k	1%	$\Omega$	Each leg
.....Load Regulation	0.1	typ.	%	0 to 14 mA
.....RMS CM Noise	.002	typ.	%	% of Vout (10 Hz to 10 kHz)
Max. Input Level	-10 / -32	min.	dBu	Gain 18 / 60, balanced output
Equivalent Input Noise	-126	typ.	dBu	20 kHz BW, Rs=150 $\Omega$ , Gain = 60 dB
Signal to Noise Ratio	96	typ.	dB	20 kHz BW, Rs=150 $\Omega$ , Gain = 18 dB, re 4 dBu
Dynamic Range	120 / 95	typ.	dB	Gain 18 / 66
CMRR	80	typ.	dB	Rs=150 $\Omega$ , 120 Hz, Gain = 60 dB
Frequency Response				
.....Gain 60 dB	45 to 200k	typ.	Hz	+0, -3dB
.....Gain 18 dB	30 to 200k	typ.	Hz	+0, -3dB
THD+Noise (gain 60 dB)	.007 (Output=+20 dBu)	typ.	%	55 Hz to 20 kHz, 20 kHz BW, RI=10 k $\Omega$
THD+Noise (gain 18 dB)	.001 (Output=+20 dBu)	typ.	%	50 Hz to 20 kHz, 20 kHz BW, RI=10 k $\Omega$
Line Driver	Active Cross-coupled			Gain 5.2 / 6 dB typ. unbalanced / balanced
Max. Output Level	-22 / +27	min.	dBu	Unbalanced / Balanced, 2 k $\Omega$ load

### Micrófono de condensador AKG C5

Polar pattern:	cardioid
Frequency range:	65 Hz to 20 kHz
Sensitivity:	4 mV/Pa (-48 dBV re 1 V/Pa)
Max. SPL for 1% / 3% THD:	140 / 145 dB SPL
Equivalent noise level:	25 dB(A) to DIN 45412
Impedance:	≤ 200 ohms
Recommended load impedance:	≥ 2000 ohms
Connector:	3-pin XLR
Finish:	matte gray-blue
Size:	length: 185.2 mm (7.3 in.); diameter: 51 mm (2 in.)
Net weight:	345 g (12.2 oz.)
Shipping weight:	660 g (1.5 lbs.)
Patents:	electrode backing for a condenser transducer (patents nos. AT 392.182, DE 4.021.661)

This product conforms to the standards listed in the Declaration of Conformity. To order a free copy of the Declaration of Conformity, visit <http://www.akg.com> or contact [sales@akg.com](mailto:sales@akg.com).


## 2.- Compatibilidad de Saturación de Entrada

- Calculamos el nivel de salida del micrófono cuando sobre la membrana incide el máximo SPL admitido:

$$S_V = -48dBV \quad SPL_{MAX} = 140dB SPL$$

$$94 \text{ dB SPL} \leftrightarrow -48dBV$$

$$140 \text{ dB SPL} \leftrightarrow -48 + 46 = -2dBV$$


$$\begin{aligned} -2dBV &= 20 \log \left( \frac{V}{1} \right) \Rightarrow V = 0,79[V] \\ 20 \log \left( \frac{0,79}{0,775} \right) &\approx 0dBu \end{aligned}$$

**Máximo Nivel de  
Salida del  
Micrófono**

## 2.- Compatibilidad de Saturación de Entrada

- Observamos por especificaciones, el máximo nivel de entrada del preamplificador:

Max. Input Level	+10 / -32	min.	dBu	Gain 18 / 60, balanced output
------------------	-----------	------	-----	-------------------------------

*$\therefore \text{Max Input Level} = +10\text{dBu}$*

- Comparamos el valor anterior con el máximo nivel de salida del micrófono (0dBu)

*$\text{Max Input Level Preamp} = +10\text{dBu} > \text{Max Output Level Microphone} = 0\text{dBu}$*

**¡El micrófono NO  
sobrecargará al  
preamplificador!**

# 3.- Compatibilidad Respecto al Ruido Propio

## Preamplificador RANE MS1b

### Features and Specifications

Parameter	Specification	Limit	Units	Conditions/Comments
Input Impedance	10k	1%	$\Omega$	Balanced 5k + 5k
Gain Range	18 to 66	typ.	dB	
Phantom Power	-48	±%	V	10 mA max.
.....Impedance	6.81k	1%	$\Omega$	Each leg
.....Load Regulation	0.1	typ.	%	0 to 14 mA
.....RMS CM Noise	.003	typ.	%	% of $V_{out}$ (10 Hz to 10 kHz)
Max. Input Level	-10 / -32	min.	dBu	Gain 18 / 60, balanced output
Equivalent Input Noise	-128	typ.	dBu	20 kHz BW, $R_s=150 \Omega$ , Gain = 60 dB
Signal to Noise Ratio	96	typ.	dB	20 kHz BW, $R_s=150 \Omega$ , Gain = 18 dB, re 4 dBu
Dynamic Range	120 / 95	typ.	dB	Gain 18 / 66
CMRR	80	typ.	dB	$R_s=150 \Omega$ , 120 Hz, Gain = 60 dB
Frequency Response				
.....Gain 60 dB	45 to 200k	typ.	Hz	+0, -3dB
.....Gain 18 dB	30 to 200k	typ.	Hz	+0, -3dB
THD+Noise (gain 60 dB)	.007 (Output=+20 dBu)	typ.	%	55 Hz to 20 kHz, 20 kHz BW, $R_L=10 k\Omega$
THD+Noise (gain 18 dB)	.001 (Output=+20 dBu)	typ.	%	50 Hz to 20 kHz, 20 kHz BW, $R_L=10 k\Omega$
Line Driver	Active Cross-coupled			Gain 5.2 / 6 dB typ. unbalanced / balanced
Max. Output Level	-22 / +27	min.	dBu	Unbalanced / Balanced, 2 k $\Omega$ load

## Micrófono de condensador AKG C5

Polar pattern:	cardioid
Frequency range:	65 Hz to 20 kHz
Sensitivity:	4 mV/Pa (-48 dBV re 1 V/Pa)
Max. SPL for 1% / 0% THD:	140 / 145 dB SPL
Equivalent noise level:	25 dB(A) to DIN 45412
Impedance:	≤ 200 ohms
Recommended load impedance:	≥ 2000 ohms
Connector:	3-pin XLR
Finish:	matte gray-blue
Size:	length: 185.2 mm (7.3 in.); diameter: 51 mm (2 in.)
Net weight:	345 g (12.2 oz.)
Shipping weight:	660 g (1.5 lbs.)
Patents:	electrode backing for a condenser transducer (patents nos. AT 392.182, DE 4.021.661)

This product conforms to the standards listed in the Declaration of Conformity. To order a free copy of the Declaration of Conformity, visit <http://www.akg.com> or contact [sales@akg.com](mailto:sales@akg.com).

### 3.- Compatibilidad Respecto al Ruido Propio

- Calculamos el nivel de salida del micrófono cuando se genera su ruido equivalente:

$$S_V = -48dBV \quad \text{Equivalent Noise Level} = 25dB(A)SPL$$

$$94 \text{ dB SPL} \leftrightarrow -48dBV$$

$$25 \text{ dB(A) SPL} \leftrightarrow -48 - 69 = -117dBV = -115dBu \text{ A-weighted}$$

**Nivel de Ruido de  
Salida del  
Micrófono**



### 3.- Compatibilidad Respecto al Ruido Propio

- Según especificación del preamplificador, buscamos el EIN (Equivalent Input Noise) en dBu y le **restamos 5 dB para aproximar a la ponderación A.**

$$\text{Equivalent Input Noise}(EIN) = -128\text{dBu (no weighting)}$$

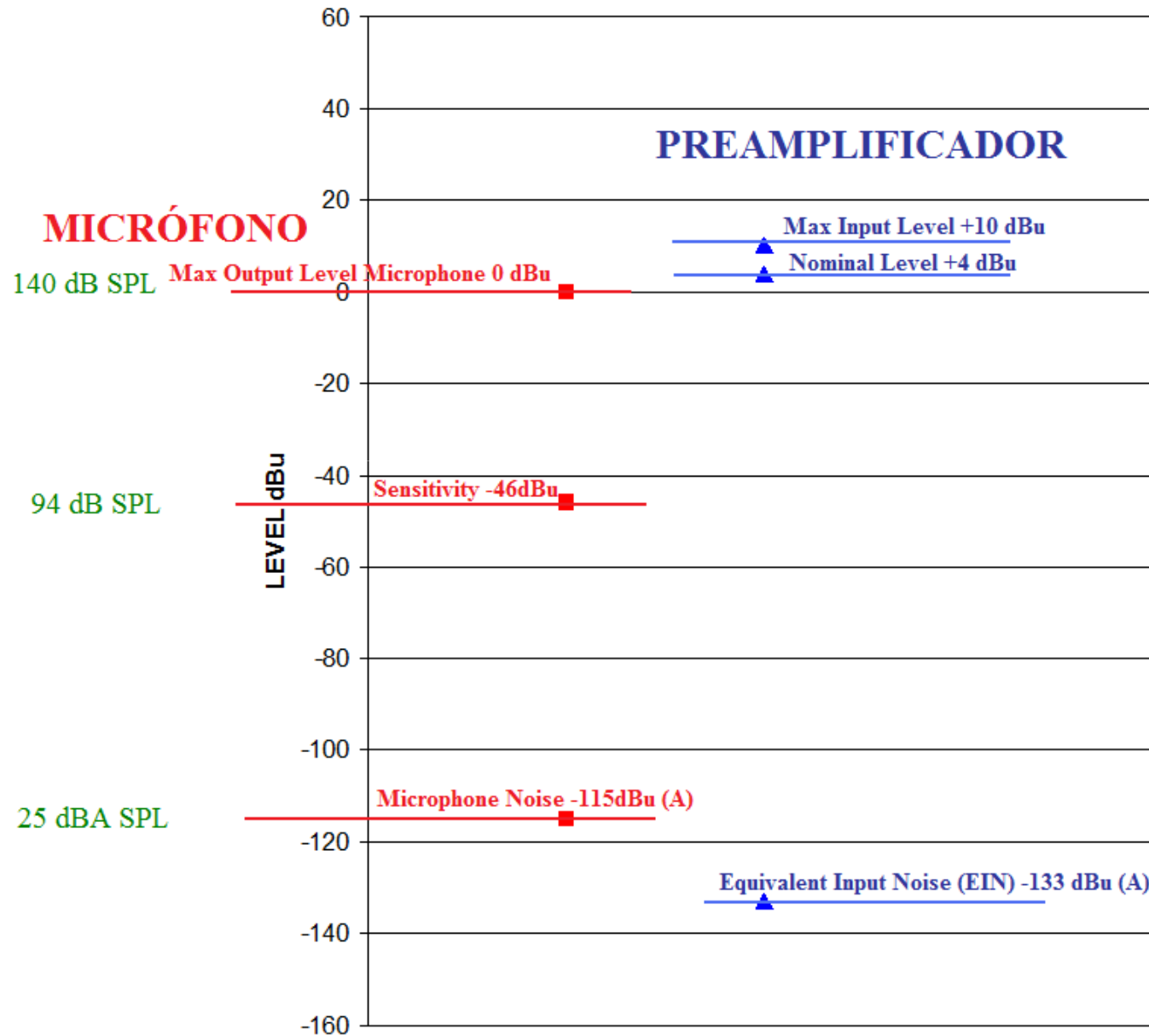
$$\text{Equivalent Input Noise}(EIN) = -128 - 5 = -133\text{dBu (A-weighting)}$$

- Comparamos el valor anterior con el nivel de ruido de salida del micrófono (-115dBu A-Weighting)

$$\text{Equivalent Input Noise}(EIN) = -133\text{dBu (A)} < \text{Output Noise Mic} = -115\text{dBu (A)}$$

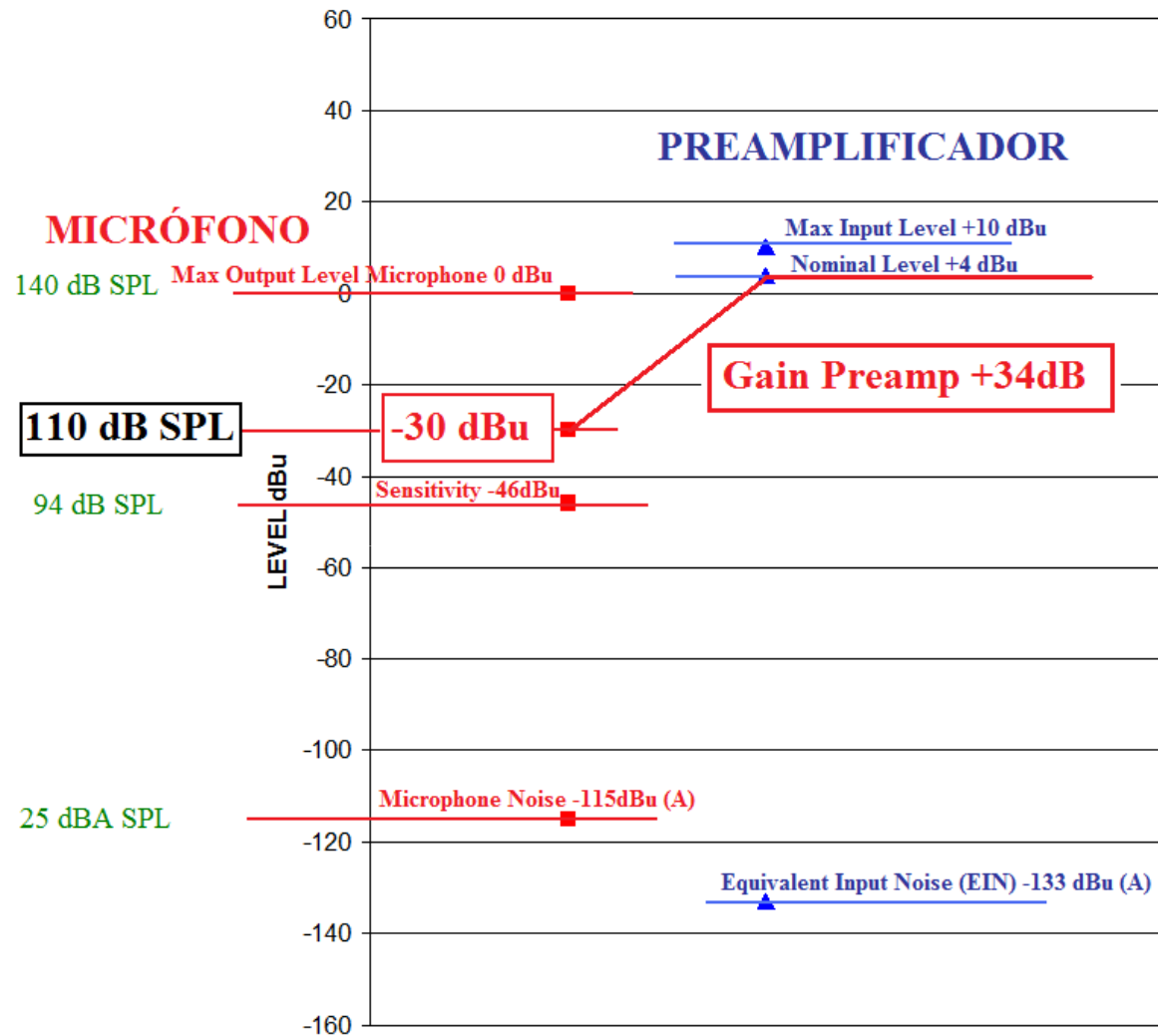
**¡El preamplificador NO degradará la performance del micrófono!**

## 4.- Diagrama de Nivel



¿Cuál será la ganancia necesaria del preamplificador para trabajar con un nivel nominal de +4 dBu, si se captura una fuente sonora a 10 [cm]? Considere que la fuente genera 90 dBSPL @ 1m

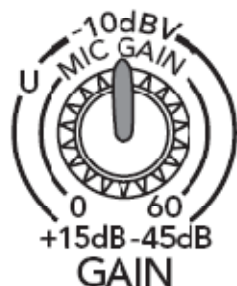
# Diagrama de Nivel



## 4. GAIN (Channels 1–4)

If you haven't already, please read the Level-Setting Procedure on page 3.

GAIN adjusts the input sensitivity of the mic and line inputs connected to channels 1 through 4. This allows signals from the outside world to be adjusted to optimal internal operating levels.



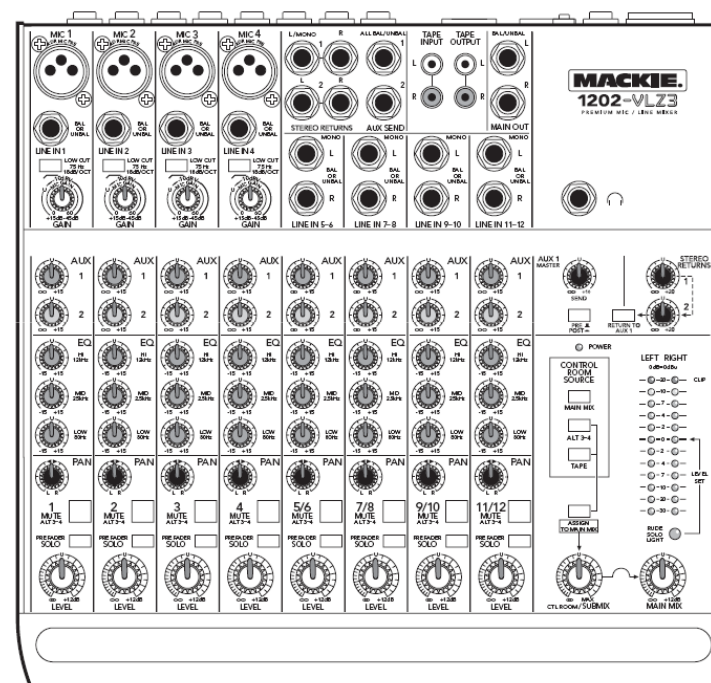
If the signal originates through the XLR jack, there will be 0 dB of gain with the knob fully down, ramping to 60 dB of gain fully up.

Through the 1/4" input, there is 15 dB of attenuation fully down and 45 dB of gain fully up, with a “U” (unity gain) mark at 10:00. This 15 dB of attenuation can be very handy when you are inserting a very hot signal, or when you want to add a lot of EQ gain, or both. Without this “virtual pad,” this scenario might lead to channel clipping.

# MACKIE®

## 1202-VLZ3

12-Channel Mic/Line Mixer



# MACKIE®

## 1202-VLZ3

12-Channel Mic/Line Mixer

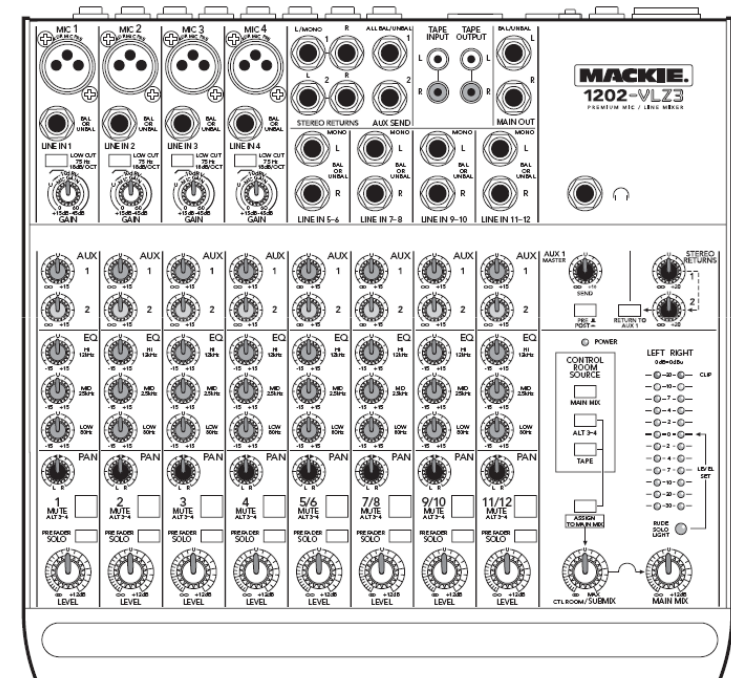
### Maximum Levels

Mic in:	+22 dBu
Tape in:	+16 dBu
All other inputs:	+22 dBu
Main Mix XLR out:	+28 dBu
All other outputs:	+22 dBu

### Equivalent Input Noise (EIN)

(Mic in to Insert Send out, max gain.)

150 ohm termination: -129.5 dBu 20 Hz-20 kHz





Polar pattern:	supercardioid
Frequency range:	70 Hz to 20 kHz
Sensitivity:	2.6 mV/Pa (-52 dBV re 1 V/Pa)
Max. SPL for 1 % / 3% THD:	147 / 156 dB SPL
Equivalent noise level:	18 dB(A) to DIN 45412
Impedance:	$\leq 600$ ohms
Recommended load impedance:	$\geq 2000$ ohms
Connector:	3-pin XLR

1.- Construir diagrama de nivel para la conexión del D5 con la Mackie 1202.

2.- Determinar la ganancia necesaria del preamplificador de entrada para trabajar con un nivel nominal de +4 dBu, si se captura un orador a 5 [cm]? Considere que el orador genera 70 dB SPL @ 1m



# Unidad II: Procesadores de Audio

## Parte 1

Diseño e Instalación de Sistemas de Sonido  
AUM-711

Prof. Ing. Andrés Barrera A.