



Microphones For Air

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Microphones

Convert sound energy to electrical energy

Type - conversion method

Four principal performance characteristics

Pickup response

Sensitivity

Frequency response

Self noise

Types



Carbon



Crystal



Ribbon



Dynamic

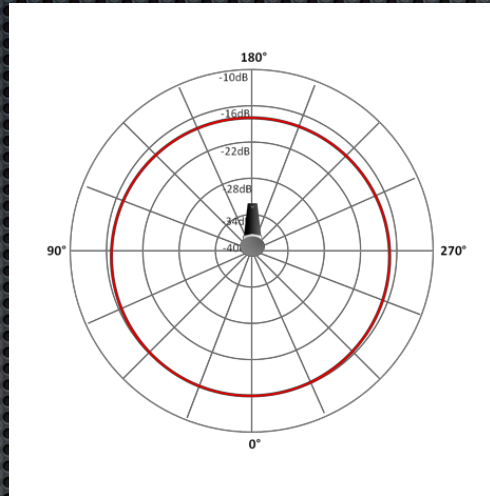
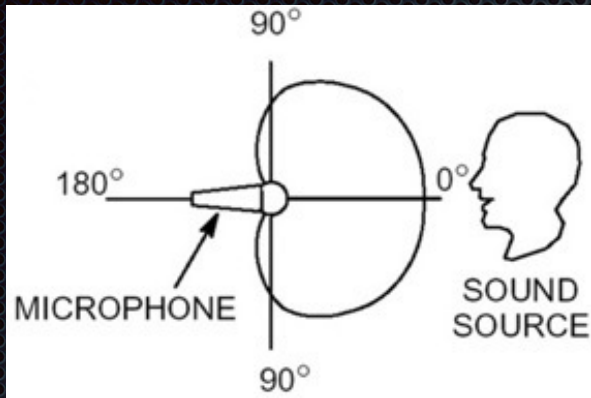


Condenser

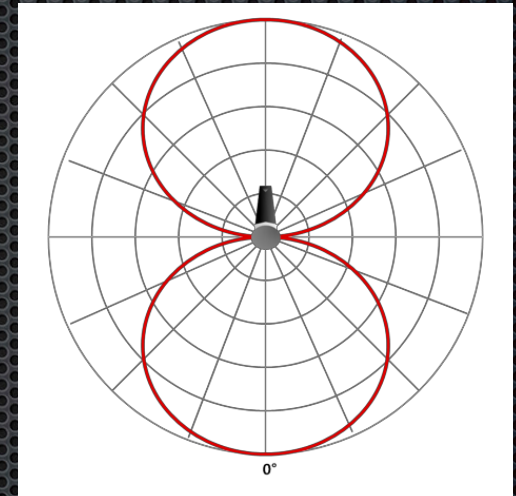


Electret

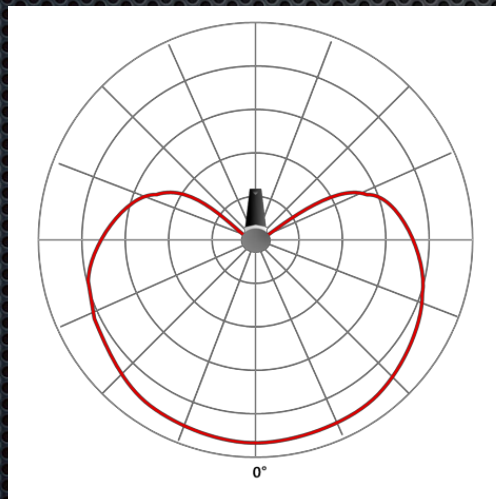
Pickup Patterns



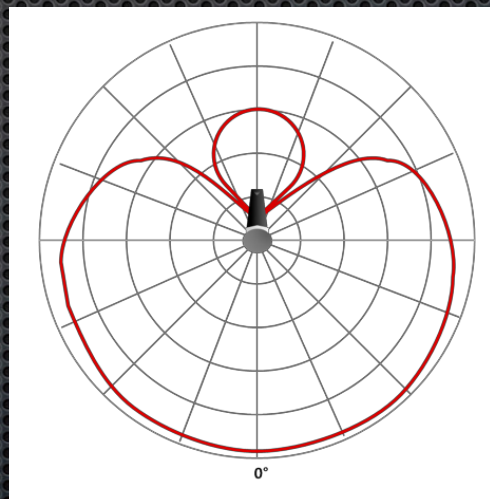
Omnidirectional



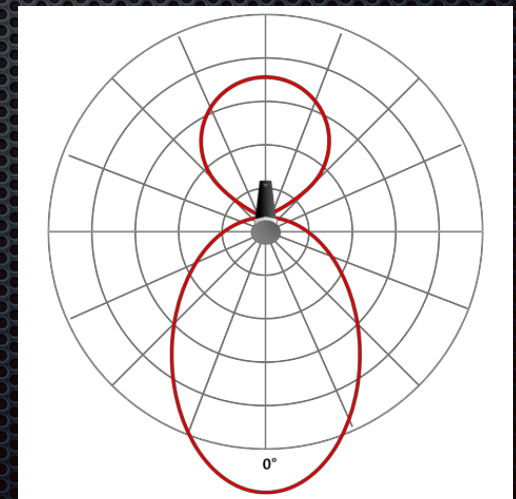
Bi-Directional



Cardioid



Super Cardioid



Hyper Cardioid

Sensitivity

Sound Pressure Difference between instantaneous pressure and static air pressure.

Measured in Pascals (Pa).

Weakest audible sound at 1 kHz is about 20 μ Pa.

Threshold of pain is about 20 Pa. Difference of 1 million.

Sensitivity

Sound Power Sound energy transferred during a period divided by a period of time.

A plane wave with a pressure of $20 \mu\text{Pa}$ through an area of 1 m^2 placed perpendicular is 1 pW (10^{-12} W).

Sound pressure of 20 Pa is 1 W .

Sensitivity

Sound intensity Power per unit of area.

For a plane wave with a pressure of $20 \mu\text{Pa}$ the power is 1 pW/m^2 .

SPL (Sound Pressure Level)

The word “Level” always refers to power and is measured in dB. Sound pressure is an amplitude measured in Pascals.

Like converting voltage to dB.

To convert to a sound pressure level (L_p), need to reference to $20 \mu\text{Pa}$.

1.0 Pa then becomes an L_p of 94 dB, the reference point for mics.

Speech

Speech Level [dB re 20 μ Pa]

Listening Distance [m]	Normal	Raised	Loud	Shout
0.25	70	76	82	88
0.5	65	71	77	83
1.0	58	64	70	76
1.5	55	61	67	73
2.0	52	58	64	70
3.0	50	56	62	68
5.0	45	51	57	63

Mic Sensitivity

Very important rating. Three possible specs.

Determines needed gain to achieve audible program.

Preamp gain (and drive level to transmitter).

Power amplifier gain.

Number of, placement, and efficiency of loudspeakers.

Mic Sensitivity (Open Circuit Voltage)

$$S_v = 20 \text{ Log } E_{\text{out}} - L_p + 74$$

$$= 20 \text{ Log } 0.001 - 94 + 74$$

$$= -80 \text{ dB/V/1 dyn/cm}^2$$

Mic outputs 0.001 V in a sound field of 94 dB referenced to 0.1 Pa (L_p).

Mic Sensitivity (Power Level Response)

$$L_{AIP} = S_v - 10 \text{ Log } Z + 44 \text{ dB}$$

L_{AIP} = Available Input Power

S_v = Open Circuit Voltage

Z = (mfg rated) impedance of mic

44 dB is a constant (next slide):

$$L_{AIP} = -80 - 10 \text{ Log } 200 + 44 = -59 \text{ dBm}$$

Mic Sensitivity (Power Level Response)

dBv reference is 1V across 1Ω is 1W

dBm rating is 0.001W

$$10 \text{ Log } 1\text{W}/0.001\text{W} = 30 \text{ dB}$$

dBV rating is taken for an $L_p = 74$

dBm rating is taken for an $L_p = 94$

$$94 - 74 = 20 \text{ dB}$$

dBV rating is open circuit,

matched circuit is -6 dB

$$30 + 20 - 6 = 44$$

Mic Sensitivity (EIA Rating)

$$G_M = S_V - 10 \text{ Log } R_{MR} - 50 \text{ dB}$$

G_M is EIA Rating

R_{MR} is center value of nominal impedance range

$$= -80 - 10 \text{ Log } 150 - 50$$

$$= -152 \text{ dBm}$$

Mic Sensitivity (Same Microphone)

Open Circuit Voltage = -80 dB

Power Level = -59 dBm

EIA Rating = -152 dBm

Frequency Response



Self Noise

$$E = \sqrt{4KRT\Delta f}$$

K = Boltzman's constant

R = mic's source resistance

T = temperature °K

Δf = bandwidth

50 Ω mic (loaded into a 50 Ω resistor) @ 300° K & 20 kHz bandwidth = 0.128 μ V or -125 dBm.

Mic has power output rating of -60 dB (re 94 dB SPL).

Noise floor is -125 - 60 = 65 dB below 94 dB SPL.

EV 676



RCA BK-6B



EV 666



The perfect mic

EV 666



Microphone courtesy of Jeff Rudisill

RCA BK-5B Restoration



RCA BK-5B



RCA 77DX



RCA 44-BX



RCA BK-44



RCA BK-1A



RCA BK-4A



EV 635A



635A Spec Sheet

635A & 635A/B Dynamic Omnidirectional Microphones



Key Features:

- Practically indestructible in normal use
- Steel housing provides magnetic shielding and strength
- Withstands humidity, salt air, and severe mechanical shocks
- Self generating, no powering required
- Uniform 80-13,000 Hz response



General Description:

The Electro-Voice 635A and 635A/B are designed for exacting professional applications such as film production, recording, broadcasting, and the more demanding PA applications. The high output level, and low sensitivity to mechanical shock, make the 635A and 635A/B excellent for interviews and for pass-around use in audiences. The 635A and 635A/B feature a diaphragm which permits very smooth response over a wide frequency range. The diaphragm withstands humidity and temperature extremes, corrosive effects of salt air, and severe mechanical shocks. It is practically indestructible with normal use. A four-stage pop and dust filter ensures a completely pop-free performance and virtually eliminates the need for an external windscreen during outdoor use. An internal shock absorber effectively reduces the pickup of cable and other noise generated by external contact.

Technical Specifications:

Generation Element:	Dynamic
Frequency Response:	80 Hz to 13,000 Hz (see chart)
Polar Pattern:	Omnidirectional
Impedance (Low):	150 Ω
Sensitivity, Open Circuit Voltage, 1 kHz:	1.4 mV/Pascal
Polarity:	Pin 2 positive, referenced to pin 3 with positive pressure on diaphragm
Case Material:	Steel
Finish:	635A Fawn Beige 635A/B Semi-Gloss Black
Accessories Included:	311 Stand Adapter
Optional Accessories:	314E Windscreen 422A Desk Stand
Dimensions:	Length = 151 mm (5.94 in) Diameter = 36 mm (1.41 in)
Net Weight:	170 grams (6 oz)
Shipping Weight:	Single Mic = 454 grams (16 oz)

Live For Sound
www.electrovoice.com



EV 642



The Electro-Voice Model 642
Cardiline Microphone Earns

THE FIRST ACADEMY AWARD FOR MICROPHONE DESIGN IN 22 YEARS!

Model 642
\$399.00 list

Today's movies, radio, TV and recordings sound better, thanks to a microphone design that has revolutionized sound pickup techniques. It is the Electro-Voice Model 642 Cardiline® ultra-directional microphone.

The E-V 642 has contributed so much to motion picture sound that on April 8, 1963 it was presented the coveted Academy Award certificate by the Academy of Motion Picture Arts and Sciences—the first such award to a microphone in 22 years!

Film sound engineers found the unique 642 Cardiline design sharply reduced effects of noise and distance. They obtained clear, crisp sound under circumstances previously thought impossible.

The 642 is another major achievement by Electro-Voice in the art and science of electro-acoustics. This engineering leadership extends equally to professional and commercial sound, home high-fidelity recording and reproduction—even to phonograph needles and cartridges.

No matter what your interest in sound, look to Electro-Voice for the consistently superior engineering that means award-winning performance for you.



The E-V Cardiline® pre-cable is also found in the famed 5-foot long E-V Model 642 (\$399.00) and the popular Model 644 for critical commercial sound installations (\$139.00). All prices list, less normal trade discounts.

© E.V. Corp., Patents Applied For

Electro-Voice®

"ACADEMY AWARD-WINNING SOUND"

ELECTRO-VOICE, INC., Dept. 631A, Buchanan, Michigan
Enter my subscription to "Microphone Facts", the FREE E-V newsletter on professional microphone applications.

Name _____
Company _____
Address _____
City _____ State _____

EV 644



RCA KU-3A



Shure SM33



Shure 333 Concert Series



AKG C-414 XLII



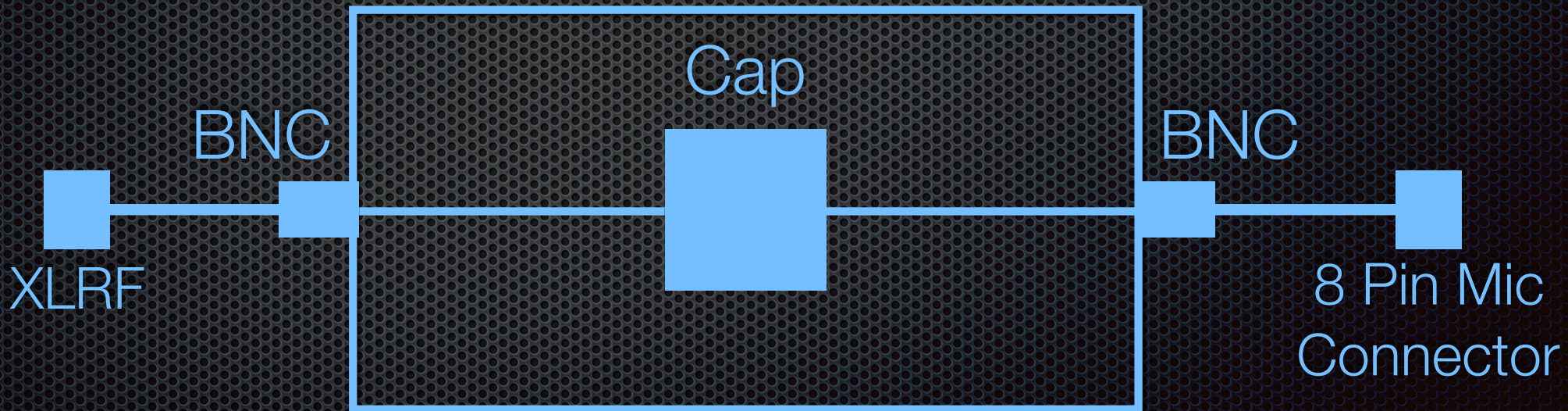
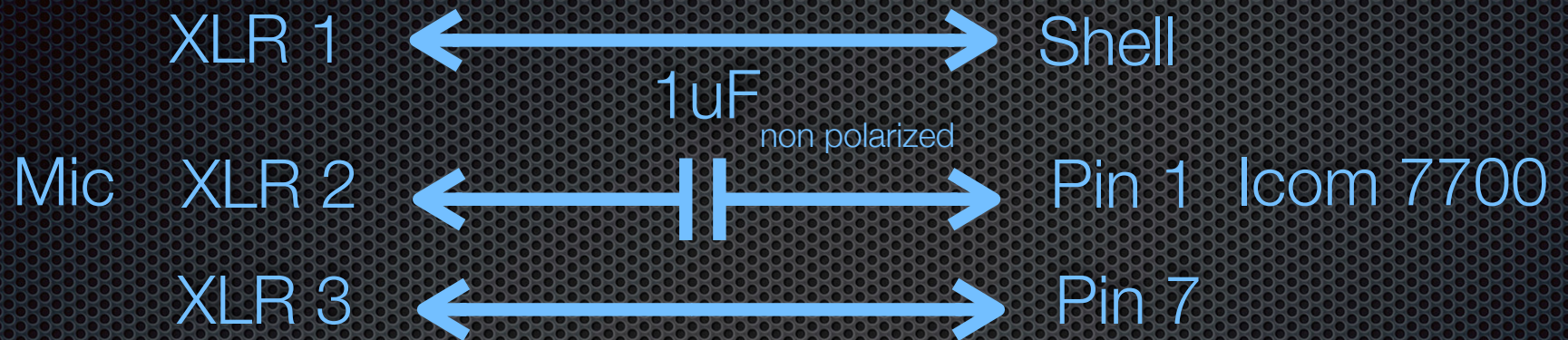
EV RE-16



EV RE-27



Rig Interfacing



Noise Cancelling



David Clark
H10-20
\$325

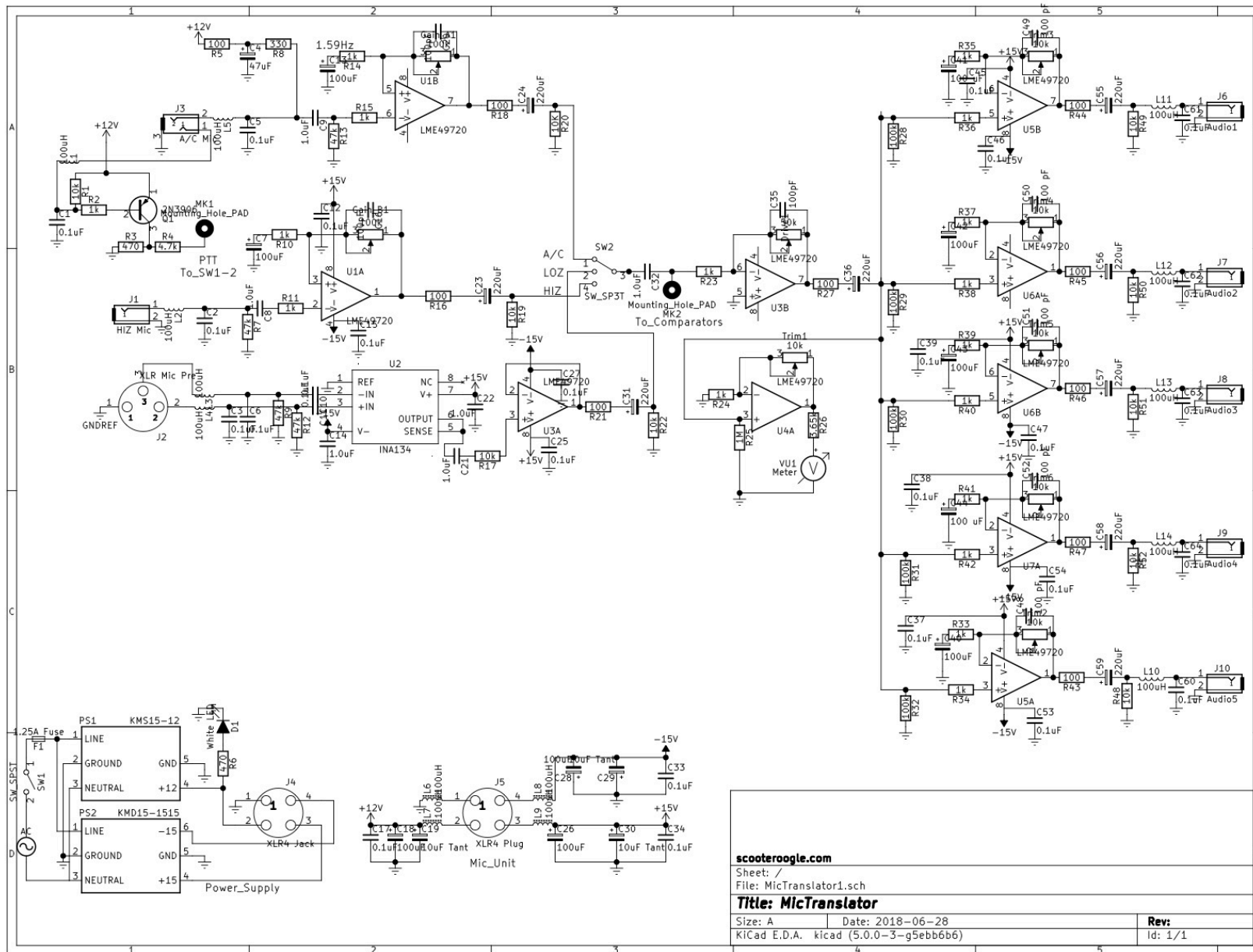
Bengoo
Gaming Headset
\$28.99



Grace Design Mic Preamp

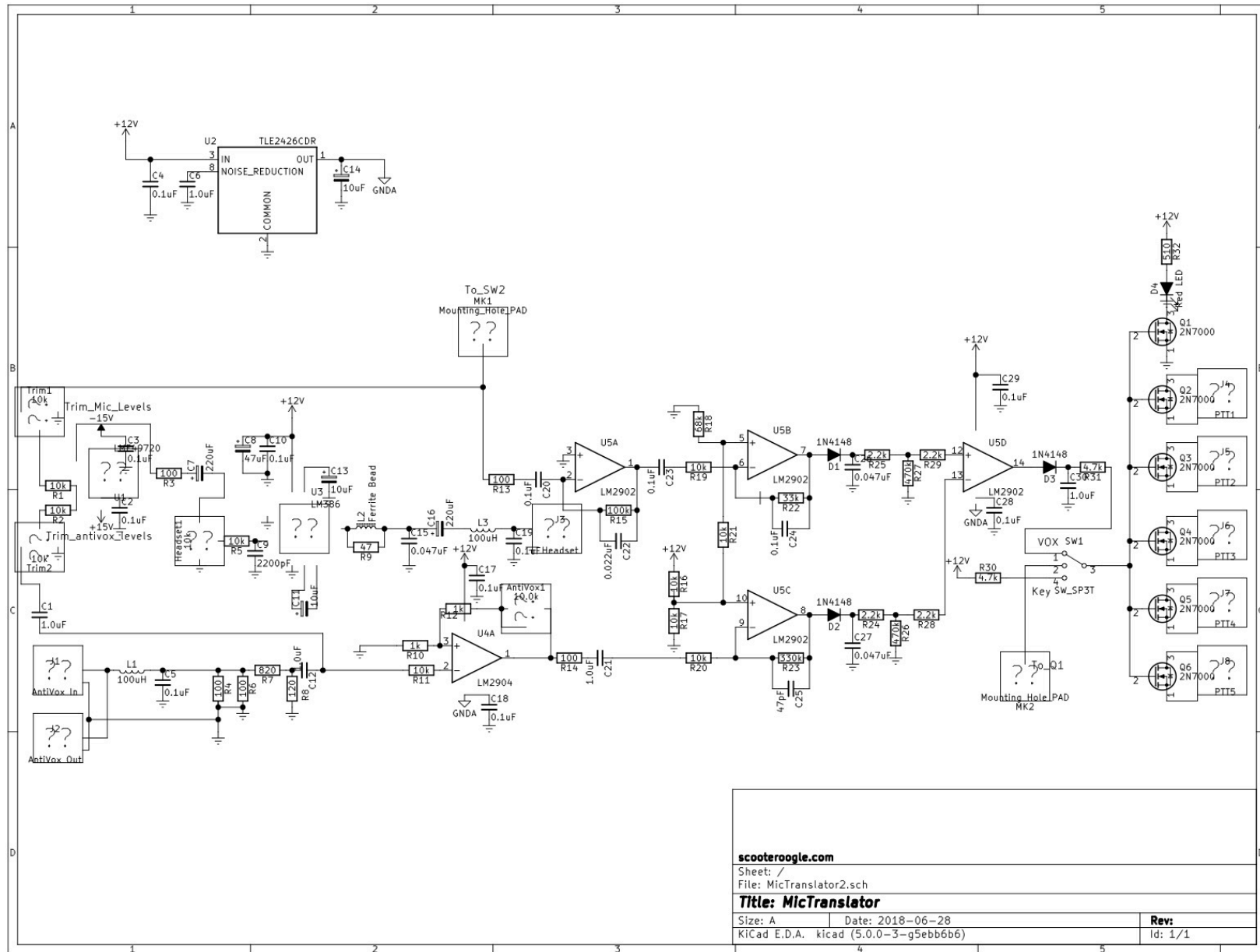


Preamp Circuit Board 1



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Preamp Circuit Board 2



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Size: A Date: 2018-06-28

Rev:

KiCad E.D.A. kicad (5.0.0-3-g5ebb6b6)

Id: 1/1

Current Project



Credits

Photographs

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Polar Plots

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