



**C725 Users Guide**

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Rev B



## C725 Users Guide

Josephson C725 microphones are a new direction for Josephson Engineering, representing a hybrid of our solid-state technology with the dynamic characteristics of a vacuum tube. More than five years of development have gone into perfecting the circuit. The capsule is the current revision of our dual-diaphragm multi-chamber design made since 1989 and used in the C700 and C716 microphones, but is provided with directional pattern control that can be adjusted using a switch on the power supply. Five selectable patterns from omni through cardioid to figure-8 are provided. On the front of the power supply is also a selector labeled with the symbols for sun and moon. The "sun" or ☉ position indicates full level operation with many of the sonic attributes of classic vacuum tube microphones. In the "moon" or ☾ position the microphone output is reduced, and the overload characteristic changes to provide a more linear characteristic.

Microphones are typically used like musical instruments, as tools to create an acoustic experience. While the internal electronic parameters are designed, numerically analyzed and precisely controlled to give repeatable results, we encourage users of our microphones to use their ears rather than numbers to determine settings for using our equipment. Switching to the "moon" setting results in about a 10 dB drop in sensitivity, and 10 dB increase in the overload point of the circuit. But, the circuit is not an attenuator, the whole sonic character changes even at low levels. It's more useful to think of this change in sonic character, and we hope that the sun/moon (big and warm versus smaller and cool) will help you remember the sonic experience you had when selecting one or the other. To compare the two settings and explore their sonic character, be sure to increase the gain of your recording channel so the levels match for the comparison.

The power supply will operate from 100 to 250 volt AC power by changing the setting on the power input module. To change from 100-120 to 220-240 volt, open the door next to the power input connector and pull out the selector board. It is marked 120 on one edge, 240 on the other. Insert whichever edge corresponds to the local line voltage. Carefully slide the white plastic indicator around in the slots in the board so that when the power input module door is gently closed, the indicator pin will extend through the hole in the door corresponding to the voltage selected. Do not force the indicator or door. A normal grounded IEC power cord is used. A green LED indicator light on the front panel will illuminate when power is switched on. A 2 amp fuse is provided and is used for both voltage settings.

Allow at least two minutes for the microphone to warm up, and ten minutes before using it for critical recording. There are several internal power supply rails that must stabilize to achieve proper operating conditions. A few seconds are also required when switching from one pattern to another. The sun/moon switch may be operated at any time but creates a significant "click" in the output, so be sure the gain of your recording channel is reduced if you switch modes in use.

Output impedance is nominally 150 ohms and can be used with any transformer or transformerless input stage. Sensitivity is quite high, the signal level may exceed several volts on peaks, so it may be appropriate to use a line level input or an attenuator if loud sound is expected. The output is balanced and floating and does not require phantom power. While the circuit will not be damaged if phantom power is applied, it is recommended to keep it off.

## **Microphone circuit**

The C725 uses a new variant of the cascode circuit that's used with some variation in many of our microphones. In our other mics, the cascode is implemented using two large-geometry junction field effect transistors. In the C725 the same JFET is used for the lower or voltage-gain part of the circuit, while the upper or current-buffer part of the circuit uses a vacuum tube, in this case a selected EF806S from current production. The drain current of the FET is the cathode current of the tube. The tube contributes particular sonic characteristics, resulting in a smooth and gradual compression of the waveform as the limit of voltage swing is reached. Overloads typically do not cause clipping, only rounding-off of the peak waveform. The differences among brands of tubes were found to have little or no impact on the sound, in this circuit.

To achieve this characteristic with low distortion, two linearizing circuits are employed. One applies a preset amount of negative feedback taken from a dedicated output winding of the custom nickel core output transformer directly back to the source of the FET, setting the overall gain of the circuit. The other applies a very small amount of negative feedback to the gate of the cascode FET from the plate circuit of the tube, when the "moon" position is selected through an electromechanical reed relay, which is activated remotely from the power supply.

In operation the microphone becomes warm, due to heat from the tube and its filament regulator, which is provided so the tube receives the same voltage with any cable length up to 50 m. Operation with ambient temperatures up to 45 C is possible with automatic shutdown if temperature exceeds internal limits.

## **Power supply**

The PS725 power supply uses a custom screened dual-voltage transformer through several stages of RC filtering to a low noise MOSFET shunt regulator at 150 volts. Regulated -9 volt DC for bias and vacuum tube filament are provided using a separate supply. Another supply provides positive and negative 5 volts for the low noise MOSFET regulator circuit. A pattern control switch supplies 0 to 120 volts in 30 volt increments to set the rear diaphragm polarization voltage, which in turn determines the resulting pattern of the microphone.

Potentially lethal voltages are present in the power supply, and more than 50 Joules of energy are stored in filter capacitors. No user serviceable components are inside.

Filament and bias values are set inside the microphone by additional regulator circuits so that cable length has no effect on voltage.

## **Cable and connector**

A dedicated five-pair shielded cable is used to connect the microphone to the power supply. Traditional large-Tuchel style connectors, now made by Binder, are used. Pin 4 of the male connector is removed and the corresponding female contact mechanically blocked so that microphones of other types cannot be connected to the power supply. Extension cables up to 50 meters can be supplied.

## **Service**

If a problem is suspected in operating the microphone, please do not attempt to repair it in the field but contact the dealer where it was purchased, or Josephson Engineering directly. The tube should only be replaced if it is known to be faulty. Qualified users should contact Josephson Engineering for instructions, but the tube may be replaced if necessary with any good quality

EF86, EF806 or 6267 type. Small variations expected over the life of a tube are automatically compensated by the circuit. Silicone rubber dampers are provided around the tube and must be replaced on the new tube; they control vibration and also protect the tube if the microphone is dropped. Be particularly careful when replacing the tube to not touch the front-end FET circuit which is found on two PTFE (Teflon) standoffs near the tip of the tube envelope. This area must remain absolutely clean or additional noise may be created in the circuit. The two small resistors there have a value of 3,000 megohms and are sensitive to surface contamination.

Do not open the power supply, hazardous voltages may be present inside even after it has been switched off. There are no user-serviceable parts inside.

## Specifications

Transducer type	DC-polarized pressure/pressure gradient condenser element
Rated power supply	100-130 or 220-240 V 50/60 Hz AC, 30 watts
Impedance	150 ohms nominal, balanced floating
Minimum load impedance	1500 ohms
Sensitivity	25 mV/Pa (⊙) or 8mV/Pa (⊔)
Frequency Response	20 Hz - 20 kHz ±2 dB from reference
Directional pattern	omni/subcardioid/cardioid/hypercardioid/figure-8
Max. permissible sound pressure	165 dB SPL
Overload sound pressure	134 dB SPL (⊙) 144 dB SPL (⊔)
Equivalent SPL due to noise	<18 dB SPL (A weighted rms, ⊙)
Dimensions	63 mm diameter (100 mm wide at yoke), 261 mm long
Output connector	Modified 12-pin Binder 691 series to power supply, XLR-3 at supply
Power supply output voltage	B+ 150V, A- 9V, Vpol 0-120V
Made in USA	

## Warranty

Josephson microphones are warranted to be free of defects for five years from the date of original purchase. If purchase documents are not available, the warranty period begins when the microphone was shipped from the factory. Josephson Engineering will, at its option, repair or replace any microphone that fails, providing that it is returned to the factory prepaid and has not been abused or altered. For service information please contact Josephson at 831-420-0888. Repair shipments may be sent to: Josephson Engineering, Inc., 329A Ingalls Street, Santa Cruz CA 95060

## Certification

Josephson Engineering, Inc. certifies that the C725 microphones bearing the CE mark conform to the applicable requirements of the European Union directives as follows:

Machinery 93/68/EEC	Exempt – passive sensor
Low Voltage 93/68/EEC	Exempt – passive sensor
EMC 93/68/EEC	Exempt – passive sensor
Safety	EN 60065:2002
RoHS 2002/95/EEC	Compliant for Hg, Cd, Cr6, PB, PBDE and Pb

