

SONY®
ELECTRET CONDENSER
MICROPHONE
ECM-21
OPERATING INSTRUCTIONS

SONY CORPORATION

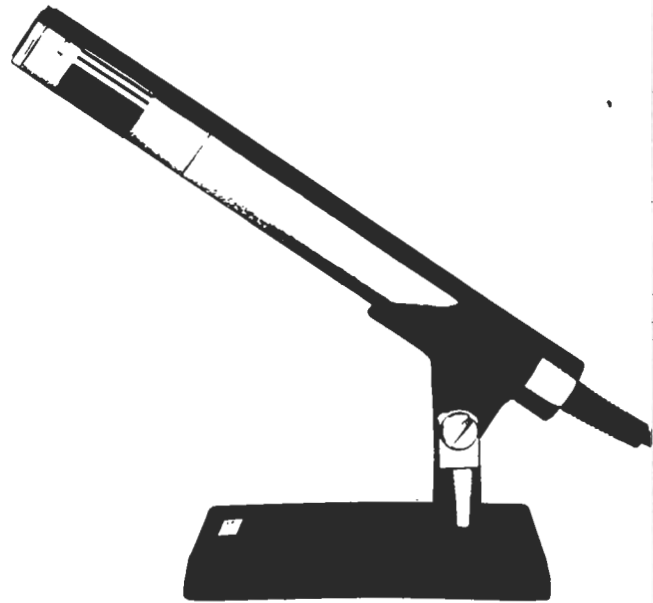
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SONY Corporation, in their constant search for state-of-the-art developments and new techniques of construction, has successfully completed the development of condenser microphones utilizing the electret-foil principle of permanent polarization.

The SONY electret condenser microphone type ECM-21 incorporates all of the advanced features of the electret microphone in conjunction with a highly sophisticated FET impedance translator (pre-amplifier).



FEATURES

The "electret" condenser capsule provides superb frequency response and excellent directivity for rejecting unwanted back ground noise.

Extremely small power consumption is achieved by the use of a highly dependable FET in the amplifier.

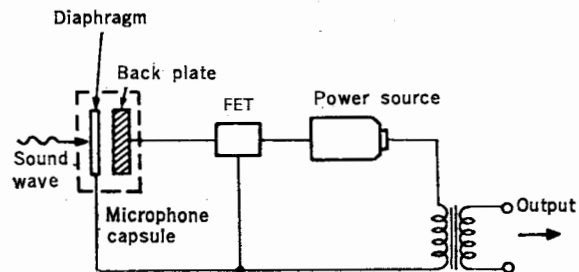
Convenient accessories (supplied) such as a microphone stand and wind screen permit many applications for the ECM-21.

Construction and Principle of the Electret Condenser Microphone

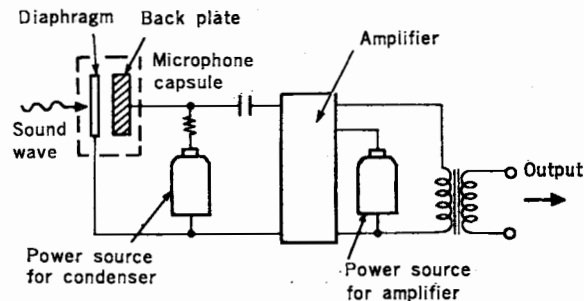
The electret condenser microphone is one type of condenser microphone. Condenser microphones use the principle of converting the difference of static capacitance between the diaphragm and the backplate, which is an air space, into the difference of an electrical signal. Condenser microphones consist of the following:

1. A condenser capsule that converts sound pressure to an electric voltage.
2. An impedance translator (amplifier or pre-amplifier) that converts the signal from the condenser capsule to a usable output impedance.
3. A DC power source to supply the polarization voltage to the condenser capsule and a second DC power source to supply voltage to the impedance translator (FET amplifier).

The electret condenser microphone does not require a power source to maintain a polarization charge at the capsule, as the diaphragm has been permanently charged and can be looked at as a condenser capsule with a built-in voltage. Because only a single power source to power the FET impedance translator is required, the current requirements of the entire microphone package are minimal (on the order of 100 to 200 micro-Amps). Even with a very small battery such as a size AA, long periods of continuous operation can be expected. Because the power source for the condenser capsule is eliminated, extreme miniaturization is now possible.



Electret Condenser Microphone



Ordinary Condenser Microphone

What is the Electret Phenomenon

When a piece of iron is put on a magnet, the iron is magnetized and remains so after the iron has been removed from the magnet. By the same analogy, when a material is charged by a strong electric field, an electrostatic charge, of either plus or minus, remains in the material after the electric field is removed. This phenomenon is called electret and was discovered in Japan by Mr. Gentaro Eguchi in the early 1900's. However, it is quite a problem to maintain that induced electret charge for a period of time. Consequently, until this time, the electret phenomenon has had little practical application.

SONY research laboratory and the microphone development group began to study the electret principle for a practical application. They have succeeded in the

SPECIFICATIONS

development of a processing method to imprint on a special high-polymer plastic film an exceptionally large electrostatic charge with excellent retentive properties over a long period of time. With the use of the electret high-polymer plastic film comprising the diaphragm of a condenser capsule, the new electret condenser microphone has evolved without the need for any form of external polarization voltage.

This electret condenser capsule has all of the same high performance characteristics of a condenser capsule with the added advantage of lower noise due to the lack of external power sources such as batteries or DC-to-DC converters. This, in turn, greatly increases the usable dynamic range of the electret condenser microphone over the present condenser capsule design.

Miniaturization of Electronics

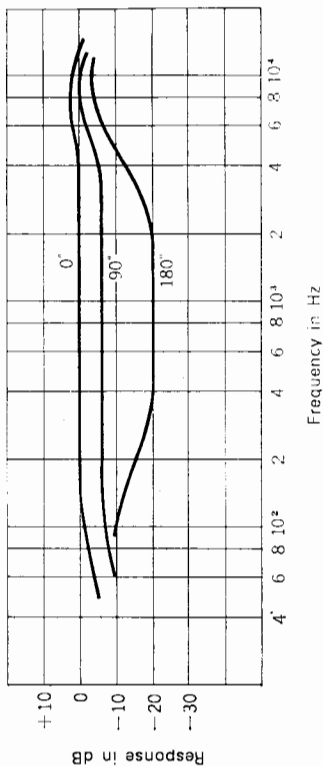
Since it is possible and practical to make electret condenser capsules exceptionally small — on the order of less than $\frac{1}{4}$ " (6.3mm) — and with the elimination of a battery or DC-to-DC converter to polarize the condenser diaphragm, it is now practical to utilize such state-of-the-art miniaturized components such as an FET amplifier. The use of this advanced FET having high input resistance, exceedingly low noise characteristics and minimal power requirements for ample gain culminates in a "free gate" circuit which makes possible improved noise levels of approx. 6 dB and assures highly sensitive, stable performance with extended dynamic range.

The electret condenser microphone is the final evolution in condenser microphone design. It enables a condenser microphone to be competitive in function, size, and adaptability with other types of microphones.

Type :	Electret Condenser Microphone ECM-21			
Capsule :	electret capsule			
Impedance				
Transformer :	FET			
Battery :	SONY Super UM-3 battery EVEREADY 1015 Manganese battery EVEREADY E-91 Alkaline battery EVEREADY E-502, E-9 Mercury battery			
Microphone Cable :	0.165" ϕ (4.1 mm ϕ) 2 conductor cadmium bronze cable, 19 ft. 8 in. (6 m)			
Frequency Response :	30 - 20,000 Hz (see page 6)			
Directivity :	Uni-directional (see page 7)			
Output Level :				
	Output impedance	Effective output level (dBm)*1	Open circuit voltage (dB)*2	EIA rating GM (dB)*3
	600 ohms	-53.8	-50.0	-147.8
	250 ohms	-53.6	-53.8	-145.6
	50 ohms	-53.8	-60.8	-146.6
Note :	*1 0dB=1mW/10 μ bar ☆ Deviation \pm 3 dB *2 0dB=1V/10 μ bar *3 EIA standard			
Output Impedance :	50 ohms, 250 ohms, 600 ohms \pm 20 % at 1,000 Hz			
Power Supply :	Normal operating voltage 1.5V Minimum operating voltage 1.1V Current drain approx. 130 μ A Battery life ; More than 10,000 hours with SONY Super UM-3 or EVERE- ADY 1015 More than 7,700 hours with EVEREADY E-91 More than 15,000 hours with EVEREADY E-502 or E-9			
Noise Level :	S/N ratio; better than 46 dB (1,000 Hz, 1 μ bar) Inherent noise ; less than 28 dB Wind noise*1 ; 50 dB \pm 5dB SPL Induction noise of external mag- netic field*2; 5 dB/m gauss			

- *1 Wind noise is the value measured by applying a wind velocity of 6.6 ft/second from all directions to the microphones. The mean value is taken and converted to the equivalent input sound level.
(0 dB = 2×10^{-4} μ bar)
- *2 The external magnetic field induction noise is measured with the microphone placed in the alternating magnetic field of 50 Hz, 1 milligauss. The maximum noise value is taken and then converted to the equivalent input sound level.
(0 dB = 2×10^{-4} μ bar)

Frequency Characteristics



Maximum Sound Pressure Input Level: More than 126 dB SPL

Dimensions: 0.75" ϕ \times 6.7"
(19mm ϕ \times 170.5mm)

Weight: 7.7 oz (210 g)

Supplied Accessories:

(For use in USA)

SONY battery Super UM-3

Wind screen AD-39

Microphone holder SAD-17NB ($\frac{1}{4}$ ")

Microphone stand A-7N ($\frac{1}{4}$ ")

(For use in European countries)

SONY battery Super UM-3

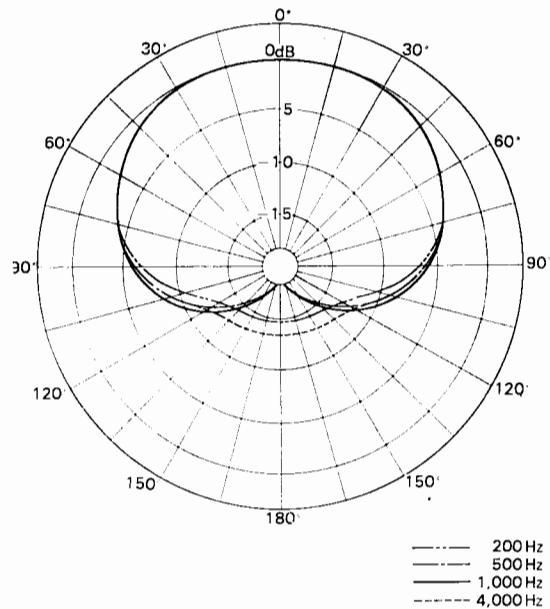
Wind screen AD-39

Microphone holder SAD-17B ($\frac{3}{16}$ ")

Microphone stand A-7B ($\frac{3}{16}$ ")

Stand Adaptor SAD-18 ($\frac{3}{16}$ " to $\frac{3}{8}$ ")

Directivity Characteristics

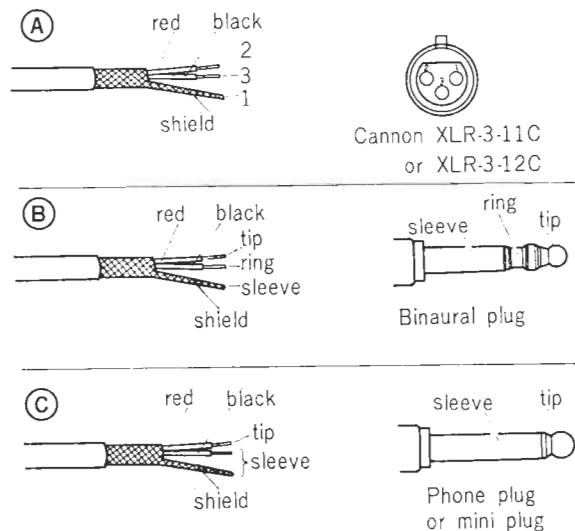


Keep the microphone away from extreme temperatures (above 140°F, 60°C).

CONNECTION

Connect the end of the microphone cable to a connector corresponding to the input requirements of the equipment as shown below.

There are two basic types of connections; balanced to ground and unbalanced to ground, depending on the equipment. Figures (A) and (B) show balanced connection and Figure (C) shows unbalanced. Usually, for consumer type tape recorder, use unbalanced inputs.



BATTERY INSTALLATION

1. Attach the rubber caps to the supplied battery; red cap to positive (+) side and black cap to negative (-) side of the battery.



RED

BLACK

2. Turn the microphone head counterclockwise and remove it.



3. Insert the battery into the unit as illustrated and replace the microphone head by turning clockwise.



Notes :

1. The supplied battery will last for about one year of continuous operation.
When the microphone is not used for a long period of time, remove the battery to prevent any possibility of corrosion.
2. In case of battery leakage, wipe off any deposits left on the inside of the microphone case and the rubber caps and replace with a new battery.
Manganese battery, Alkaline battery or Mercury battery can also be used.

OUTPUT IMPEDANCE

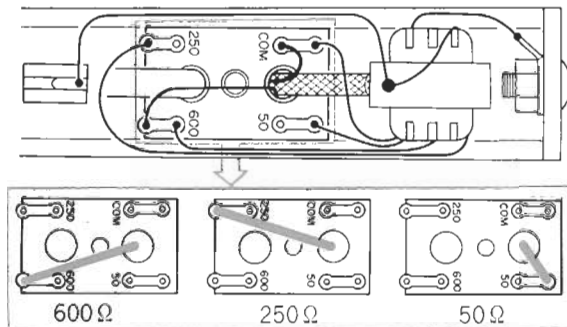
The output impedance of this microphone is factory preset to 250 ohms.

If necessary, the impedance may be changed to either 50 ohms or 600 ohms as follows.

1. Insert the spanner wrench into the two holes on the cable end of the microphone case.
2. Turn the spanner wrench counterclockwise several times while holding the microphone body stationary with hand.
The microphone and the transformer will then separate.



3. Unsolder the red lead wire from the 250 ohm terminal and solder it to the required terminal.



WIND SCREEN

For use in outdoor applications, on rainy or windy days, the supplied wind screen will protect the microphone and reduce wind noise. The characteristics of the microphone will not be affected by use of this wind screen.

Cover the microphone head completely with the wind screen.



Architect's and Engineering Specifications

The microphone shall be a SONY Model ECM-21 Condenser Microphone or equivalent. The microphone shall have unidirectional characteristics with a flat frequency response ranging from 30 Hz to 20,000 Hz. The condenser capsule, shall utilize the electret principle of polarization having high-polymer plastic film for its diaphragm. The front to back rejection at 1,000 Hz shall be better than 18 dB. The microphone shall have available three output impedances: 50, 250, and 600 ohms $\pm 20\%$ at 1,000 Hz balanced. It shall be possible to select a desired impedance by changing one soldered connection on the transformer which shall be encased within the microphone body. Lines shall be balanced to ground and phased. The self-generating noise with 600 ohm output impedance shall be less than 28 dB SPL (reference level: 0 dB equals 2×10^{-4} μ bar, audibility threshold level). Hum pick-up level shall be equivalent to, or less than, 5 dB SPL in the alternating magnetic field of 50 Hz, 1 milligauss (0 dB equals 2×10^{-4} μ bar). Maximum sound pressure input level shall be more than 126 dB SPL. The FET shall be powered by a penlight battery, size AA or equivalent. The battery shall be a 1.5 volt EVEREADY 1015 or equivalent, and shall be able to operate for more than 10,000 hours continuously without replacement. Overall dimensions shall be .75 inches (19 mm) in diameter, and 6.7 inches (170.5 mm) in length. A 19 foot 8 inches (6m) three-conductor, shielded, vinyl-jacketed cable shall be provided, and attached to the microphone and exclusion of any type of cable connector. The microphone cable shall be approximately .165 inches (4.1mm) in diameter. Net weight of the microphone shall be 7.7 ounces (210 g). Supplied accessories shall include a battery, SONY type UM-3; a wind screen, type AD-39; microphone holder, type SAD-17NB ($\frac{5}{16}$ " , USA) or SAD-17B ($\frac{5}{16}$ " , European countries); microphone stand, type A-7N ($\frac{3}{8}$ " , USA) or A-7B ($\frac{5}{16}$ " , European countries); and for European countries, a stand adaptor SAD-18 ($\frac{5}{16}$ " to $\frac{3}{8}$ ").