U-47/U-48

NEUMANN

U-47/U-48 studio standard condenser microphone system

There are over 1500 U-47 microphones in use in the United States, making it truly the Studio Standard for all recording, TV, film, and broadcasting applications.

It is the clear, distortion-free reproduction, and its ability to present a transparent sound picture, which have made it the number 1 microphone in the world today. Unlike other condenser microphones which are restricted to only one directional characteristic, NEUMANN microphones are electronically switchable (U. S. Pat. No. 2,678,967).

The U-47 provides an omni-directional or a cardioid pattern at the flick of a switch, while the U-48, its new partner, selects either a cardioid or bi-directional (figure 8) characteristic.

Further outstanding features are a high output level and an extremely low inherent noise level, a problem plaguing many other makes of condenser microphones. The double-condenser capsule with its gold sputtered polyvinyl diaphragms is carefully shock-mounted and the entire capsule shielded by a triple wire mesh cover. The entire capsule head unplugs from the amplifier section for easy access.

The complete impedance matching amplifier including the output transformer and all components is located in the microphone itself, permitting virtually unlimited distance between microphone and power supply. The mike cable contains only power and low impedance balanced leads and is therefore not susceptible to noise or RF interference.

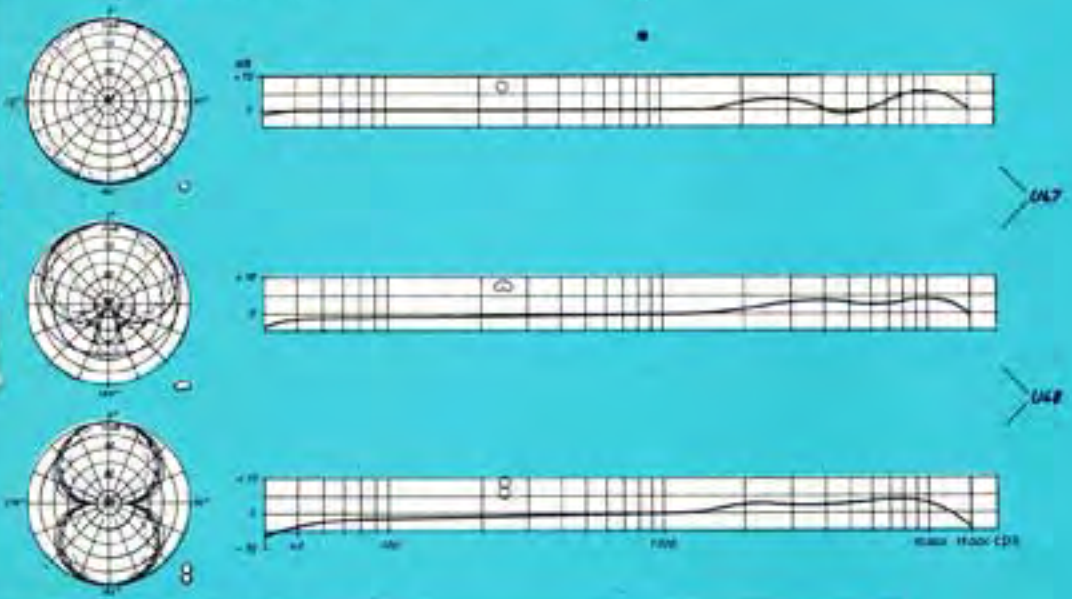
Gotham Audio sales co. inc.

2 West 46th Street • New York 36, N.Y. Cable: Telaudio Newyork

SPECIFICATIONS

Frequency Response: 30 to 15,000 cps.
Directional Characteristic: U-47 — omni-directional & cardioid
U-48 — bi-directional & cardioid
Sensitivity: 2.5 mV/dyne/cm²
RMS Harmonic Distortion: less than 1% over entire range up to an intensity level of 110 db.
Output Impedance: 50 or 250 ohms (switchable)
Front to Back Rejection: greater than 25 db.
Dimensions: U-47/U-48 — 2½" dia. x 8" long
NG — 8" x 4" x 4"
Weight: U-47 — 1½ lbs.
NG Power Supply — 4 lbs.
Finish: Matte Satin Chrome

The U-47/U-48 Condenser Microphone System consists of the following components:
U-47/U-48 Microphone
NG Power Supply (U. S. std. fuse, pilot, XL output, AC plug)
UC-3 Microphone Interconnect Cable
Z-37 Full-elastic Suspension
5 foot AC Power Cord: Mating **XLR-3-11** Output Connector



ACCESSORIES

NG-2 Double Power Supply: supplies two U-47 or U-48 microphones from an 8" x 4" x 4" single supply weighing 4.75 lbs. Separate filtering.

U-47S or U-48S Stereo System: consists of either two U-47 or two U-48 microphones, a NG-2 double power supply, two UC-4 cables, power cord, connectors, and two Z-37's, etc.

Z-37 Full-elastic Suspension: for full shock mounting of either U-47 or U-48 microphones from booms or on program stands. Eliminates shock interference from building or floor.

Printed in U.S.A.

New 3/8/61

THE CONNECTION OF NEUMANN CONDENSER MICROPHONES TO THE INPUTS OF AMERICAN TYPE PREAMPLIFIERS

1.) THE IMPEDANCE SITUATION:

The preamplifiers found in NEUMANN condenser microphones are designed to operate solely as voltage amplifiers with unterminated ouput. When set for a source impedance of 50 or 200 ohms they should look into a load of a magnitude at least five times this value, or a minimum of 250 ohms or 1000 ohms. Non-linear distortion will increase rapidly for high sound pressure levels if this is not strictly observed. This same problem concerns ALL condenser microphones no matter whose manufacture, but many firms ignore it in order to make the condenser microphone more acceptable to the general market. We at GOTHAM AUDIO feel that imperfections of even a few dB in the microphone's response as a result of improper application is of the greatest concern when applied to a product which is engineered to fractions of a decibel.

American preamplifiers generally use at their input an unterminated input transformer whose input impedance is highly frequency dependent (Fig. 1). Should one now select, as is usually the case in the United States, the nominal input impedance equal to the source impedance of the microphone, an inadmissible loading of the microphone will occur in any case at the high frequency end, and usually also at the very low frequencies.

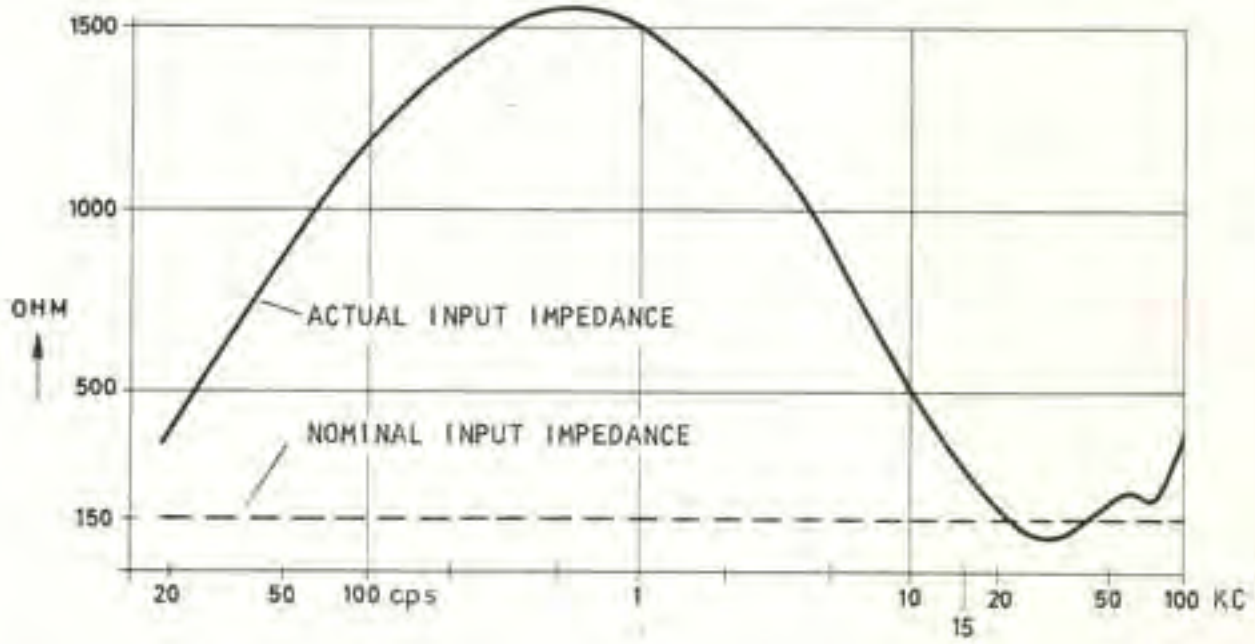


FIG. 1 Apparent input impedance of an American preamplifier (Langevin 5116) plotted against frequency.

Should one, to avoid this problem, choose a nominal input impedance which is higher than the source impedance of the microphone, then a rising characteristic at the high frequencies of several decibels will result. This is due to the fact that the unterminated input transformer requires that the impedance of the source feeding it, R_q, be equal to the nominal input impedance. A source impedance of the preceding device which is too low results (due to stray resonances in the transformer) in a rise at high frequencies, while a source impedance too large will produce a droop at the high end (Fig. 2).

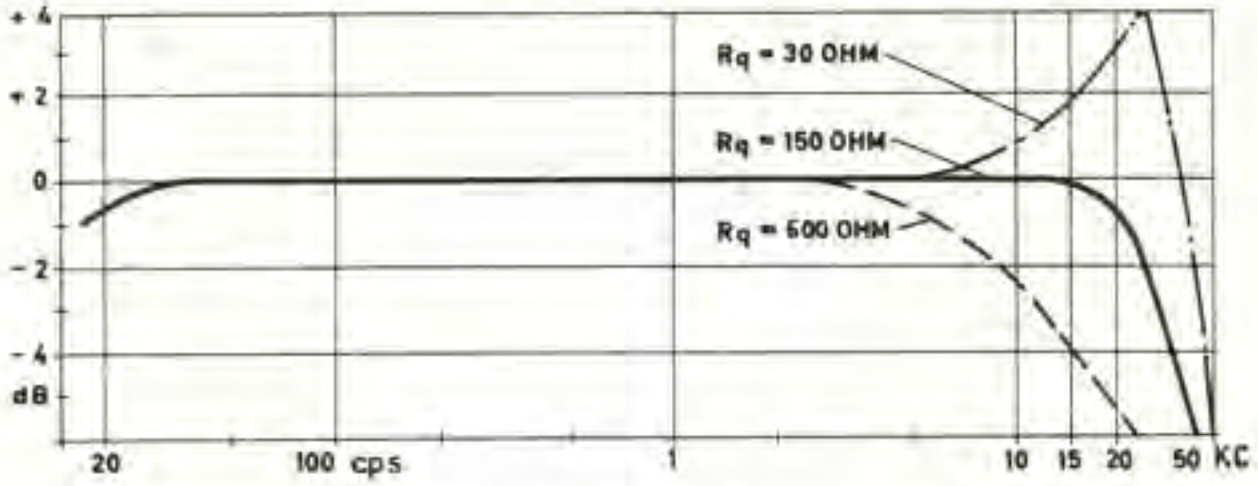


FIG. 2 Effect of three different source impedances (R_q) on the frequency response of a Langevin Model 5116 preamplifier connected for 150 ohms nominal input impedance.

It is therefore recommended that the source impedance be chosen lower than the nominal input impedance, and be brought artificially to the nominal value by the use of series resistors.

) MICROPHONE OUTPUT LEVEL REQUIREMENTS:

The output level from NEUMANN condenser microphones varies with the type but is in every case higher than the level usually obtained from dynamic type microphones. A level increase of up to 10 dB is highly desirable in studio operation, for it increases the signal-to-noise ratio obtained from the input stages of the console or tape machine. If this level increases beyond 10 dB, however, it may already overload the input transformer or even the first stage of the preamplifier. In such a case a special resistive pad must be used, which can then serve at the same time to correct the impedance matching situation.

.) CONNECTING NEUMANN MICROPHONES U-47(a), U-48(a), and U-67:

These microphones must be connected to U.S. type preamplifiers via a loss pad arrangement. For ALL of the above microphones delivered after September 1, 1960, this pad is built into the power supply for the microphone. For units bought prior to that date, into which such a pad has not been subsequently installed by the user or by GOTHAM AUDIO, it may be ordered separately under designation number Z-47. Whenever such a pad is used -- and it should be used at all times -- the microphone itself must be set for a source impedance of 50 ohms. If your microphone is either a U-47a or U-48a, then this has been done at the factory. If you own a U-47 or U-48 (without the "a" designation after it), you must check inside the microphone to make sure it is set for 50 ohms. The switching of impedance to either 30/50 ohms or 150/250 ohms is then solely done on this loss pad in the power supply. The microphone remains ALWAYS at 50 ohms.

Microphones which are equipped with such pads may be connected to all normal microphone inputs to which dynamic or other professional microphones are normally connected.

For a sound pressure of 10 dyne/cm^2 the mean value of the effective output level, as generally used for such data today, will be:

MICROPHONE	CHARACTERISTIC	at 30/50 ohm output	at 150/250 ohm output
U-47(a)	Cardioid	- 54 dBm	- 47 dBm
U-47(a)	Non-directional	- 59 dBm	- 52 dBm
U-48(a)	Cardioid	- 56 dBm	- 49 dBm
U-48(a)	Figure-8	- 59 dBm	- 52 dBm
U-67	Non-directional	- 59 dBm	- 53 dBm
U-67	Cardioid	- 55 dBm	- 48 dBm
U-67	Figure-8	- 59 dBm	- 53 dBm
As a comparison:			
RCA 77-DX	Cardioid	- 62 dBm	- 53 dBm

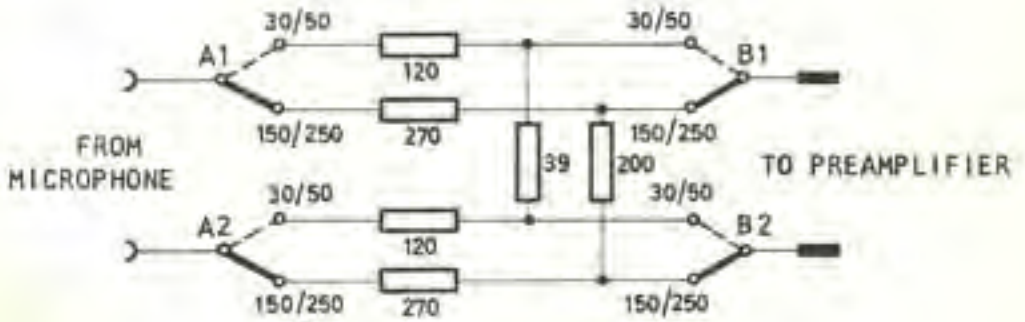


FIG. 3 Schematic of loss pad Z-47 as used with U-47, U-48, and U-67.

4.) CONNECTING NEUMANN MICROPHONES M-49b, M-50b, KM-53a, KM-54a, KM-56, SM-2:

These microphones have a lower output level and do not need any loss pads. To insure that they will operate unterminated they will be delivered at all times set for 50 ohms. To determine whether your microphone is set for a source impedance of 50 ohms, look at the neck of the connector at the base of any of the KM Series or the SM-2 for a red dot. On the M-49b and M-50b microphones this red dot would be on the serial number tag at the base of the microphone. This red dot signifies a 50 ohm source impedance. On the M-49b and M-50b you may check this easily by glancing at the settings inside the microphone. Restrapping of the KM Series or the SM-2 is a difficult job and should be left to our own labs.

We will restrap any such unit bought from us or one of our authorized distributors or dealers FREE of charge if the shipping charges are paid both ways. For microphones NOT obtained through us or our authorized distributors or dealers, a $ 5.00 service charge is made. Microphones are returned on the day of their receipt.

Once it has been ascertained that the microphone is set for 50 ohms, and you wish to connect to a microphone input rated 150/250 ohms, then the termination requirements of your input transformer requires that two 56 OHM 5% 1/2 watt resistors be installed in the power supply such that each of the two output lines appearing at the power supply's audio output connector are interrupted by one of the 56 ohm resistors. Nothing should be placed across the output.

To connect any of these microphones to a 30/50 ohm nominal input impedance of a preamplifier, three resistors as shown in Fig. 4 must be installed. It is highly recommended that wherever possible these microphones be operated into a 150/250 ohm input.

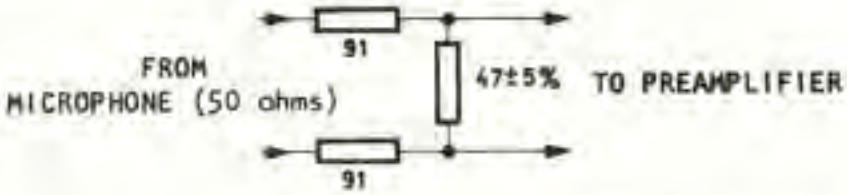


FIG. 4 Schematic of impedance matching network (Minimum LOSS) for use when M-49b, M-50b, KM Series, and SM-2 microphones are connected to a 30/50 ohm nominal input impedance.

For a sound pressure of 10 dyne/cm^2 the mean value of the effective output level, as generally used for such data today, will be:

MICROPHONE	CHARACTERISTIC	at 30/50 ohm output	at 150/250 ohm output
M-49b	ALL	- 61 dBm	- 46 dBm
M-50b	Non-directional	- 58 dBm	- 43 dBm
KM-53a	Non-directional	- 56 dBm	- 42 dBm
KM-54a	Cardioid	- 58 dBm	- 43 dBm
KM-56	All three	- 60 dBm	- 45 dBm
SM-2	All	- 58 dBm	- 43 dBm

5.) HOW TO CALCULATE THE EFFECTIVE OUTPUT LEVEL:

To obtain effective output level from catalogue data for the "microphone field transmission factor" (formerly called "sensitivity"), use the following formula:

$$\text{EFFECTIVE OUTPUT LEVEL} = -20 \cdot \log \left(\frac{77.5}{0.5 \cdot B_F} \right) + 0.6 \quad \text{(dBm)}$$

B_F = Field transmission factor or sensitivity as found in catalogue in mV/microbar for 200 ohm source impedance and 1000 ohm termination.

Factor 0.5 takes into consideration that the microphone must be operated at 50 ohms source, therefore only delivering 1/2 the stated voltage.

Addition +0.6 dB is due to the fact that unterminated input transformers as used in the United States offer a smaller termination than 1000 ohms.

Reference level of 77.5 mV was used instead of the usual 775 mV (± 0dB) due to the fact that data in the USA usually refers to sound pressure of 10 dyne/cm^2 rather than the 1 dyne/cm^2 or 1 microbar quoted in the catalogue.

THE PROPER PHASING OF NEUMANN MICROPHONES

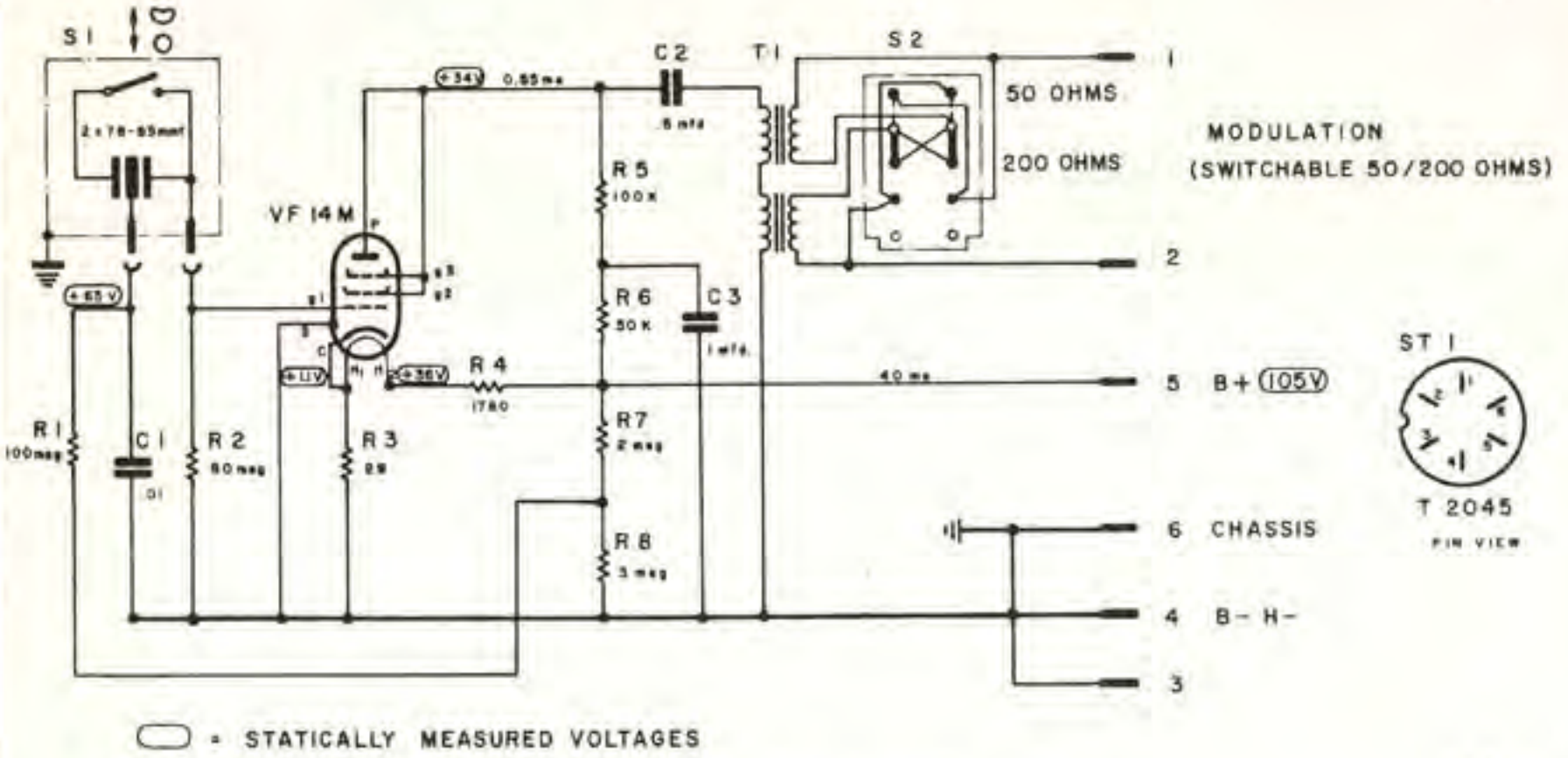
The proper phasing of microphones is of utmost importance, especially for stereo, but also for monophonic applications where two microphones are operated with approximately equal output level in close proximity to each other. If this phasing is not observed then the electrical addition in the case of monophonic and the acoustical addition in the case of stereophonic recording will cause interferences and nulls, with resultant loss of low frequencies and drop-out of certain frequencies in the entire range.

All NEUMANN microphones of the same type are phased identically. The various different types, however, do not agree as to their phasing.

The following polarities will be found at the output connections of the microphone (or power supply) for a sound pressure increase on the capsule diaphragm which is normally directed towards the sound source.

Microphone type	Pins of output plug on power supply						Pins of microphone plug*					An identical voltage surge will result for a directionality switch
	Tuchel				Cannon							
	1	2	4	5	2	3	1	2	5	6	7	from.....to
U-47(a)	+	-			+	-	+	-				Cardioid Non-directional
U-48(a)	+	-			+	-	+	-				Cardioid Figure-8
M-49b	-	+			-	+	-	+				Non-direct. Figure-8
M-50b	-	+			-	+	-	+				- - - - -
KM-53a	+	-			+	-	+	-				- - - - -
KM-54a	+	-			+	-	+	-				- - - - -
KM-56	+	-			+	-	+	-				- - - - -
SM-2												
Upper	+	-								+	-	Non-direct. Figure-8
Lower			-	+			-	+				Non-direct. Figure-8
U-67	+	-			+	-	+	-				Figure-8 Non-directional
MM-3	-	+			-	+	-	+				- - - - -
MM-5	-	+			-	+	-	+				- - - - -

* This data is necessary for use with plug-in power supplies.



VF 14M

BOTTOM VIEW

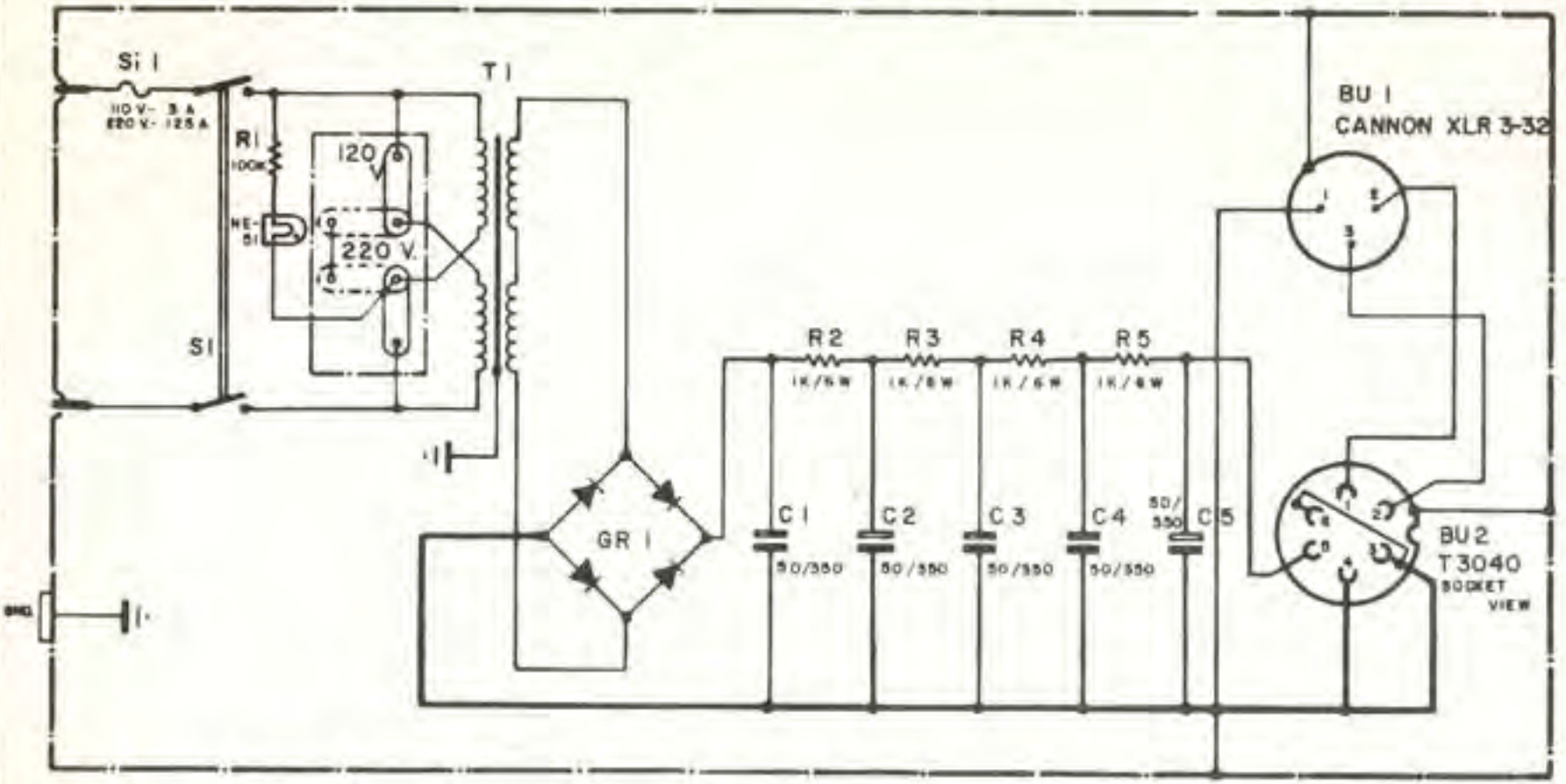
FOR REPLACEMENTS ALWAYS GIVE SERIAL & PART NUMBER.

CONDENSER MICROPHONE

U 47 A

GOTHAM AUDIO CORPORATION
NEW YORK 36, N.Y.

U47-00-00-01-S



POWER SUPPLY
—NG—

GOTHAM AUDIO CORPORATION
NEW YORK 36, N.Y.

NG/1-S

GOTHAM AUDIO CORPORATION
2 West 46th Street, New York 36, NY
COlumbus 5-4111

U 47a "Studio"

P A C K I N G L I S T

NEUMANN U 47a "Studio" microphone system, consisting of one each of the following:

UNITS	TYPE	DESCRIPTION
1	U 47a	NEUMANN microphone, serial # 4977
1	NG [illegible]	NEUMANN power supply, serial # [illegible] with built-in Z-47 impedance matching pad
1	UC-3	Interconnect cable, 25 feet
1	Z-37	NEUMANN full elastic suspension
1	01399-1	AC power cord
1	XLR 3-11c	Cannon connector
1	6032	Instructions
1		Operating instructions
1		Guarantee card
1		Blue specification sheet
1		U 47a schematic
1		NG schematic
		This packing list

OPERATING INSTRUCTIONS FOR NEUMANN CONDENSER MICROPHONES U 47/U 48 AND ACCESSORIES

October 1959

A. TECHNICAL DATA

Microphones:		
Useable Range of Frequencies		35 to 15,000 cps
Directional Characteristics	U 47	non-directional and cardioid
	U 48	bi-directional and cardioid
Source Impedance		200 or 50 ohms
Sensitivity	U 47	approx. 2.5 mv/dyne/cm² (cardioid)
	U 48	approx. 2.0 mv/dyne/cm² (cardioid)
Total Harmonic Distortion		less than 0.8% (at 1000 cps) up to a sound pressure level of 110 db
Tube Complement		1 VF-14 M (selected)
Power Supply NG:		
Power Requirement		110/220 volts 50-60 cps
Operating Voltage		105 volts D.C. (40 ma) (the heater voltage is taken from the 105 volt supply)
Fuse		0.3/0.125 amp
Pilot Lamp		110 volts (neon)
Interconnecting Cable UC 4:		
Standard Length		33 ft. (other lengths on request)
Stand Mount		½" right-hand thread (⅜-27 thread on request)

B. GENERAL

The U 47 and U 48 microphones are identical with the exception of their directional characteristics (U 47: non-directional and cardioid; U 48: bi-directional and cardioid) which can easily be selected by means of a slide-switch located at the base of the wire-mesh part of the microphones.

The newer type U 48 is designed in such a way that the plug-in head of the U 47 may be inserted in place of the U 48 head, thus making possible all three patterns with the same basic unit, whereas it is impossible to use the U 48 head on the U 47 amplifier part.

C. PLACING IN OPERATION

1. The U 47 and U 48 microphones are equipped with special 6-pin plugs in their base, the No. 5 pin carrying the D.C. supply voltage to the microphone being purposely shortened to make provision that the ground pin connects before the plate voltage. As a further pre-caution, always make sure that the power supply is switched off when plugging the microphone into the mating receptacle on the UC 3 extension cable or the UC 4 interconnecting cable, with microphone stand mount, to avoid possible shock to the operator.
2. The UC 4 stand mount, incorporating a swivel joint, comes normally equipped with a ½" right-hand thread (in the case of U.S.A. use, with ⅜—27 thread) for the purpose of mounting the microphones on stands and booms.
3. The four-conductor shielded cable comes normally 33 ft. long, but lengths up to 300 feet are admissible between microphone and power supply, and can be supplied on order.
4. The NG power supply delivers the required single voltage of 105 volts D.C. at 40 ma to the microphone. The required heater voltage is taken from this single voltage.
5. The power supply is equipped with a two-pole plug to which the power cord has to be connected. A mating A.C. connector for this plug is supplied with the power supply on special request.
6. First, make certain that the power supply is properly strapped for the A.C. line voltage (110 or 220 volts) required. The correct setting of this strap is visible through a small window at one side of the power supply cover. The strapping board is accessible after removal of the cover.
7. Make also sure that the proper value fuse for the voltage used has been inserted in the fuse holder. 300 ma for 110 volts; 125 ma for 220 volts.
8. The output signal from the microphone is fed to a three-prong chassis-mounted plug on th power supply unit. The mating cable connector for this plug is supplied with each uni Connection to the microphone input of the console or recorder is accomplished by means of a two-conductor shielded cable of any desired length.
9. The U 47 and U 48 microphones are designed to work into a load impedance (input impedance of console preamplifier) of 250 respectively 1000 ohms, or even higher. To provide a sufficiently low source impedance from the microphones, they have been designed for a source impedance

one-fifth the load impedance. For a 250 ohm load impedance, the source impedance of the microphones is set for 50 ohms, and for a 1000 ohm load impedance, it is set for 200 ohms. This prevents overloading of the preamplifier in the microphone itself.

The microphones are usually supplied strapped for a 1000 ohm load impedance, but on request will be delivered for 250 ohms. The 250 ohm-adjusted microphones may be identified by a red dot located on the type number tag of the microphone.

10. After interconnection of the microphone, power supply, and A.C. line, the main switch may be switched on. Operating condition will be indicated by a neon lamp. It is not harmful to the power supply if it is operated even for longer periods of time without connection of a microphone.
11. The warm-up time of the U 47 and U 48 microphones is somewhat over one minute.

D. TESTING AND MAINTENANCE

NEUMANN microphones are made with extreme care and accuracy, and careful handling is required if consistently excellent results are expected.

Warning

The plug-in head as well as the amplifier part of the microphones are sealed at the factory, and we recommend that these seals not be broken, otherwise the guarantee will be void.

Should the microphones need servicing, it is recommended that they be repaired at our factory or at our authorized service centers.

The following instructions are given on the explicit understanding that all such operations performed on NEUMANN microphones are undertaken at your own risk.

1. Work performed on the microphones should be approached with extreme care and dry hands. Such repair should only be attempted by a skilled technician.
2. Under no circumstances should one blow into the microphone capsule itself, and the diaphragm should remain untouched.
3. The microphone head can be removed after unscrewing the three fastening screws, and the protecting cover of the amplifier can be taken off after removal of the screw at the microphone base.
4. The amplifier tube VF-14M (which, incidentally, is especially selected for low noise at our factory and should only be obtained through us or our representatives) is of the plug-in type and can therefore be quickly replaced.
5. The amplifier characteristics can be measured by means of the test capsule Z 9. Instructions for test procedure are furnished with the Z 9 test capsule.

   A voltage of 100 mv at the test capsule Z 9 is equivalent to a sound pressure of 70 µbar (110 phon) at the microphone capsule.

   For microphones adjusted to a source impedance of 200 ohms, the gain of the amplifier amounts to approximately 3 db.
6. Without connection of microphone, the voltage at the power supply unit is approximately 300 volts.
7. Should the diaphragm have become dusty after a long period of service, it may be cleaned by means of an extremely soft camel hair brush. For that purpose, the capsule itself is accessible after removal of the three outer fastening screws located at the bottom of its mounting plate.
8. Caution! Never remove the four fastening screws located in the middle of the capsule mounting plate.
9. Re-strapping from one impedance to the other can be simply performed after removal of the microphone housing, by following the diagram and pictorial presentation of the terminal board attached.
10. When ordering spare parts, it is recommended that you include the serial number, so that the proper parts for your particular model can be supplied.

E. RECOMMENDATIONS

1. U 47 and U 48 microphones can be suspended from film and television booms by means of special full-elastic suspensions (type Z 37) which help reduce mechanical shock interference carried through the floor, and which permit rapid turning at the end of the boom.
2. Where U 47 or U 48 microphones are permanently installed in studios or other locations, we recommend the installation of microphone outlets (T 3040) into which the microphone interconnecting cable can be plugged. Concealed lines should lead from these wall sockets to the equipment rack or console where type NGK plug-in power supply may be installed in a suitable plug-in frame.
3. Where two or more type U 47 or U 48 microphones are used in the same location, we recommend the use of double power supply NG 2. Two U 47 or U 48 microphones (or one of each) can be operated from this unit whose dimensions are identical to those of the single type NG power supply.

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