

DATE: November, 1941

SUBJECT: Models 97A and 97AN "Hi-Lo" Lightweight Crystal Phonograph Pickups

Models 97A and 97AN "Hi-Lo" Lightweight Crystal Phonograph Pickups

GENERAL: Model 97A "Hi-Lo" Crystal Phonograph Pickup is intended for use with permanent and semi-permanent type needles for reproduction of 10" and 12" lateral-cut records and is designed to give high-quality frequency response with medium output and unusually low record wear. The crystal element is a Grafoil Bimorph torsion unit with special-process moisture-proofing, completely shielded in a pressed metal cartridge. The base of the 97A is designed for single hole mounting, and is cushioned to increase isolation from the motor-board.

The 97AN is similar to the 97A in all respects, except that it is supplied with a permanent sapphire point needle designed especially to produce optimum results with this reproducer.

Low record wear is assured by the offset head, (which maintains the horizontal projection of the needle closely tangent to the groove at all times), by low needle-point impedance, and the low needle pressure of 1 to 1-1/8 oz.

Models 97A and 97AN Lightweight Pickups are provided with 14" leads. An arm rest is included for mounting on the motor-board.

APPLICATIONS: Models 97A and 97AN Crystal Phonograph Pickups will give high-quality wide range reproduction with lateral-cut recordings at either 33-1/3 or 78 r.p.m. speeds.

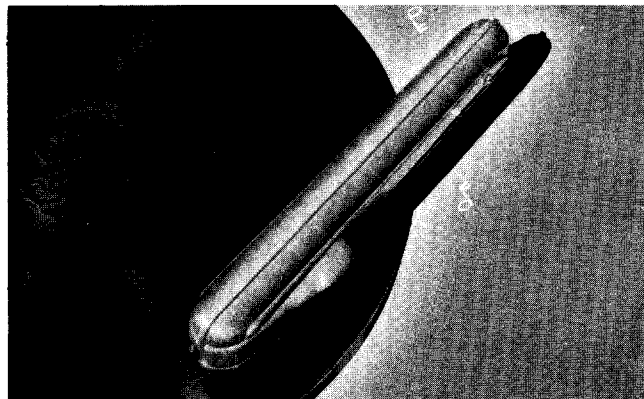
The output voltage is approximately 1.4 volts for an overall groove amplitude of 0.84 mil at 1,000 cycles which is sufficient to produce full output from the audio stages of modern radio receivers and from moderate-gain audio amplifiers.

INSTALLATION: The Pickup should be mounted on the motor-board so that the arc of travel of the needle passes 1/4" from the center of the record on the far side of the tone-arm pivot. A drilling template is furnished with each pickup to facilitate motor-board layout. The motor-board should be heavy and well isolated from vibrations of the motor and the loudspeaker.

If necessary, the length of the cable can be increased considerably without excessive output loss. Low-capacity shielded single conductor cable is suitable for this purpose. Make certain that joints are well shielded to avoid hum pickup.

Nothing should interfere with the free motion of the Pickup. Leads (or cable) should be allowed to extend freely at least two inches before making connections, so that the pickup may rotate freely about its vertical axis.

Sufficient cabinet ventilation should be provided to keep the ambient temperature about the pickup at the lowest possible value. In any event the ambient temperature should not be allowed to exceed 125° Fahrenheit. (51.7° C.).



CONNECTIONS: The Pickup should be connected to the grid circuit of a vacuum tube across a load resistance of 1/2 megohm or more. The coded conductor should be connected to the "high" side of the amplifier in-put; the black conductor should be connected to ground or chassis.

OPERATION: The Model 97A offers the advantages of a lightweight pick-up regardless of the needle used. Any of the conventional needles may be employed, but best results are obtained with those tipped with sapphire or precious metal. The high-frequency response of the unit will depend to some extent on the needle chosen, and typical response characteristics are shown in Fig. A.

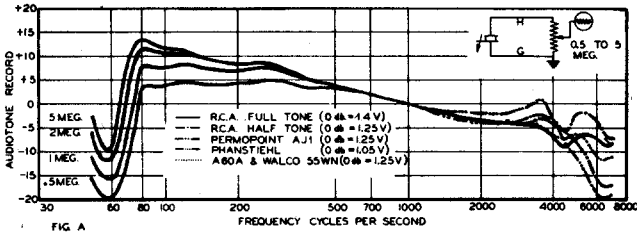
The 97A is regularly supplied with a set-screw to be used for holding permanent point needles. A thumb-screw is included, however, and may be substituted for the set-screw if ordinary needles requiring frequent changing are to be used. The "high-lift" arm construction is employed, and greatly facilitates needle changing.

Crystal Phonograph Pickups should not be kept or used in places where the temperature exceeds 125° Fahrenheit. (51.7° C.).

RECORD WEAR: Low needle pressure (only 1 to 1-1/8 oz.) and low needle point impedance (resistance to side-to-side motion of the needle) are achieved through a unique system of mounting and coupling the crystal unit. These features permit the needle to ride through the record-groove with a minimum of thrust and wear on the side walls. Record wear is still further reduced by the off-set head of the pickup, which keeps the normal axis of rotation of the needle closely tangential to the record grooves throughout the playing time of the record. This results in low tracking error, and in maximum fidelity of reproduction at all frequencies. The pickup should be carefully located as specified under "Installation" to derive full benefit from this feature.

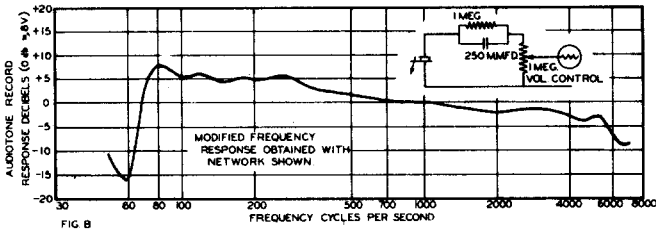
Because of the factors described above, records and needles will give several times the length of service with a 97A that they would with an ordinary reproducer.

FREQUENCY RESPONSE: Frequency response curves of the 97A Pickup obtained on standard test records are shown in Fig. A. This type of response is very satisfactory for high-quality reproduction of records without the use of compensating circuits. The curve shown using the A60A needle applies to the 97AN.



The low frequency response below approximately 500 cycles depends upon the terminal resistance as shown in Figure A. The user can thus adjust the low-frequency response over wide limits by proper choice of resistance of the input potentiometer or grid resistor. A value of 1 megohm will be satisfactory in most cases. The high frequency response is not affected by the value of the terminal resistance.

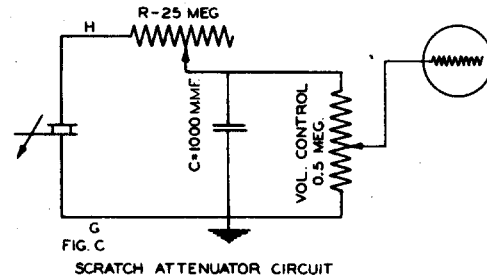
For more uniform overall response, the low frequency equalizer circuit shown in Fig. B, below, may be used, although it is not necessary for most applications.



SURFACE NOISE: Surface noise or "needle scratch" is produced by the passage of the needle over the minute irregularities in the surface of the record groove. In the 97A Pickup, with low needle pressure, low needle-point impedance, and low tracking error, there is a minimum of surface noise from the record. However, due to the wide range frequency response (necessary for life-like reproduction) some

residual surface noise may be noticed, depending on the condition of the record. Some needles are designed to decrease record noise by providing an attenuation of the high frequency response. Figure A. shows the variation of the 97A response with various standard needles.

Where maximum fidelity is not important, it is possible to decrease the audible needle-scratch level by using the circuit shown in Fig. C below. This will give a tone control effect similar to that found in most radio receivers and amplifiers. If the amplifier or receiver used with the pickup has a tone control for attenuation of higher frequencies, this circuit is unnecessary.



SPECIFICATIONS

Voltage Sensitivity: The output level depends upon individual recording, etc. With a standard recording the Model 97A has an output of approximately 1.4 volts for 0.84 mil double displacement at 1,000 cycles.

Internal Impedance: Equivalent to 1,500 mmf condenser.

Recommended Load Impedance: 1/2 megohm or more depending upon the response curve desired. See Fig. A.

Model No.	97A	97AN
Finish	Plastic Mahogany	Plastic Mahogany
Code Word:	RUZEP	RUZER
Cable Length:	14"	14"
Arm Rest:	Included	Included
Net Weight:	3-1/2 ozs.	3-1/2 ozs.
Needle	None	Included
Shipping Weight:	9 ozs.	9 ozs.

GUARANTEE: Every Shure Pickup is guaranteed to be free from electrical and mechanical defects for one year from date of shipment from the factory, provided all instructions are complied with fully.

License Notice: Shure Crystal Record Reproducers are licensed under patents of the Brush Development Company. Shure patents pending.

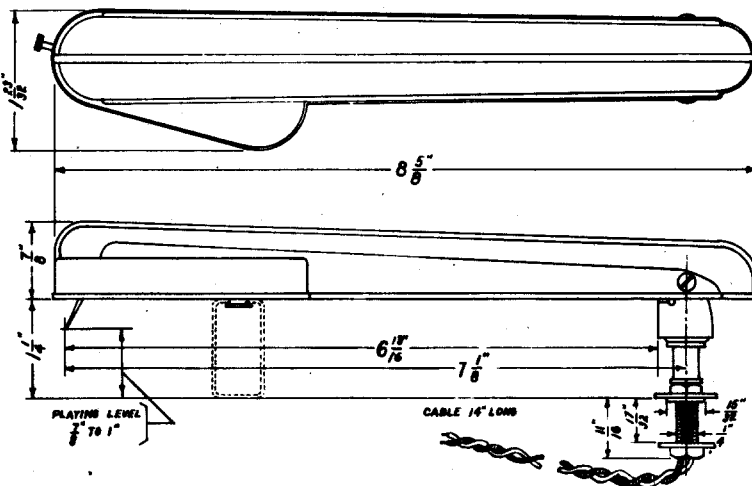


FIG. D. PHYSICAL DIMENSIONS OF MODEL 97A.