

DATE: May 1937

SUBJECT: Model 66A Piezoelectric  
Stethophone

## MODEL 66A PIEZOELECTRIC STETHOPHONE

GENERAL : Model 66A Stethophone is primarily designed for pickup of heartbeats and chest sounds. A piezoelectric crystal converts the vibrations transmitted through the flesh into corresponding electrical impulses for amplified reproduction or recording. The instrument responds with uniform efficiency to the entire frequency range covered by heart sounds, murmurs, rales, etc. Model 66A replaces the earlier Model 65A Stethophone.

The new Stethophone is highly sensitive to the vibrations produced by body sounds but is extremely insensitive to air-borne or acoustic sounds. It is therefore possible to use the instrument in close proximity to loud speakers without acoustic feed back, and to successfully amplify extremely faint body sounds in the presence of external noises. This has not been possible heretofore with electrical Stethoscope devices which acoustically pickup body sounds from an air chamber.

In operation the Stethophone is simply applied to the body with moderate pressure in much the same way the conventional Stethoscope would be used. A suitable high gain amplifier and reproducing or recording equipment must be supplied by the purchaser.

APPLICATIONS : The usefulness of the Stethophone in conjunction with the proper amplifying and reproducing equipment has extended to fields which are far beyond the possibilities of the ordinary Stethoscope. Heart and chest sounds can be observed with much greater clearness than with a Stethoscope. Extremely faint noises can be heard clearly with the Stethophone which would be difficult or impossible to detect with the ordinary Stethoscope.

### Auscultation

A 66A Stethophone, in conjunction with a suitable amplifier with one or more sets of headphones, constitutes the simplest complete equipment for auscultation. The sounds can be heard by several persons simultaneously by simply providing a sufficient number of headphones. This feature is particularly useful in teaching auscultation to medical students,

### Clinical Demonstrations

By feeding the output of the amplifier to one or more suitable loud speakers, body sounds can be demonstrated to a large group without the necessity for individual headphones. If desired, the demonstration can be made at a point remote from the patient.

### Surgery

The Stethophone can be strapped to the chest of a surgical patient during an operation and the condition of the patient's heart can be observed continuously throughout the course of the operation. The observation may be made at a distance from the patient by suitably extending the connecting cord thus causing a minimum of interference with those actually engaged in the surgery.



Visual Observation

By means of a cathode ray oscillograph or other suitable device, the electrical wave forms which correspond to the body sounds may be observed visually. In this way it may be possible to observe abnormalities which might not be apparent from auscultation.

### Graphic Records

By means of a suitable recorder, recording galvanometer, or oscillograph, permanent records of heart sounds can be made which are analogous to the well known electrocardiograph records.

### Sound Recording

With the aid of the Stethophone, recordings can be made of heart and body sounds by any of the well-known sound recording methods. "Instantaneous" phonograph discs are especially convenient for this purpose. Such sound records offer convenient means for demonstrating abnormal heart sounds to students.

Many other applications of the Stethophone will undoubtedly occur to those in the medical profession.

CONNECTIONS: Suggested block diagrams of the 66A Stethophone, associated amplifier and various reproducing, indicating and recording devices are shown in Fig. A. Many other arrangements are of course possible.

The Stethophone should be connected to the grid circuit of the first tube across a resistance of 5 megohms, as shown in Fig. B.

The output level of the Stethophone depends upon individual conditions but good results should be obtained with high-gain amplifiers designed for crystal microphone operation.

A 7-foot cable is supplied attached to the Model 66A. If necessary, added cable may be attached for extension purposes to a maximum of 25 feet total length. High quality, low-capacity cable should be used. It is essential that the leakage resistance of the cable be high so that it will not appreciably reduce the effective shunt resistance across the Stethophone. Heart-beat sounds are of relatively low frequency and leakage resistance will reduce the low frequency response.

When splicing in extra lengths of cable, the respective coded conductors should be sol-

dered together and carefully insulated with a good grade of rubber tape. A wrap of fine wire or a piece of metal braid sleeving soldered to the shield of the cables should be used to cover the joint of the cable to complete the shielding. Connector fittings are suitable for jointing cables if they provide complete metallic shielding of the conductor.

**OPERATION:** Although the crystal unit of the Stethophone is not extremely delicate, it should not be allowed to come in contact with hard, sharp objects. It should not be operated at temperatures exceeding

125° F. or permanent damage to the crystal may result.

**FREQUENCY RESPONSE :** Heart and chest sounds are made up of frequencies below approximately 1,500 cycles and the 66A Stethophone has been designed to reproduce these sounds faithfully and accurately. The response to frequencies above 1,500 cycles is low, thus lessening pickup of undesirable high-frequency sounds. The response is down 10 db at 2000 cycles and down 25 db at 8000 cycles. By suitable design of the amplifier, the transmitted frequency range may be adjusted to accentuate either normal heart sounds, or murmurs, in any desired manner.

**SPECIFICATIONS**

**Voltage Sensitivity:** The output level depends upon individual conditions. The output voltage for an average heartbeat is of the order of 5 to 10 millivolts r.m.s.

**Recommended Load Impedance:** 5 megohms

MODEL 66A (See Fig. C)	
Diameter . . . . .	1-5/16"
Thickness . . . . .	15/16"
Finish . . . . .	Chrome Plated
Net Weight (less cord). . . . .	3 oz.
Shipping Weight . . . . .	3/4 lbs.
Code Word . . . . .	RUTAL
List Price . . . . .	\$35.00

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

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

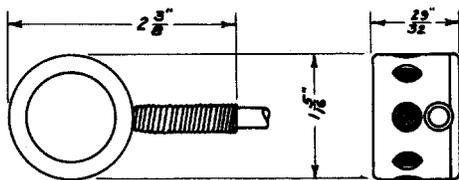
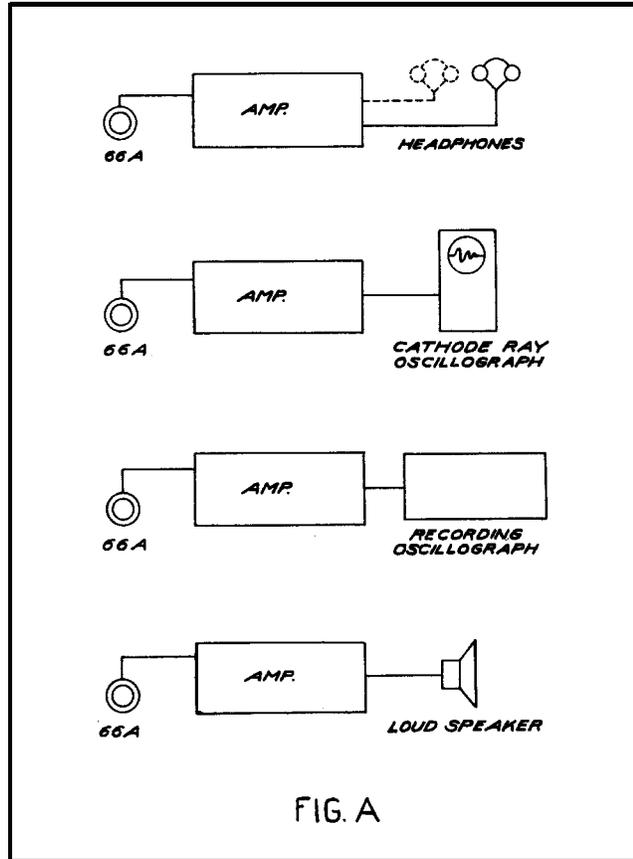


FIG. C

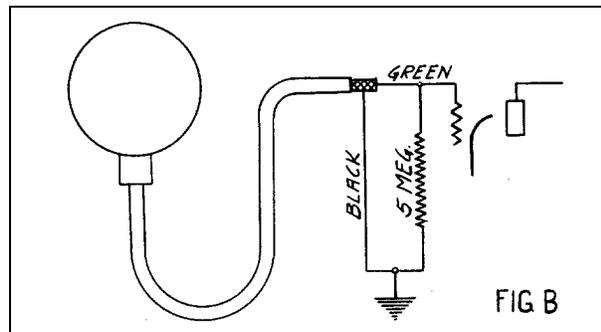


FIG B