

Figure 1 — Cardioid Microphone 639A showing 3 selectivity patterns.

CARDIOID MICROPHONES 639A AND 639B

Use — The 639 Type Microphones, because of their high quality and cardioid directivity, are excellent for broadcast and public address use, not only as all-purpose microphones but also as the solution to many difficult pick-up problems.

Description — Each microphone is a combination of a dynamic moving coil type pressure element and an improved ribbon type velocity actuated element enclosed in an attractive housing which serves as a protective guard and as a wind screen. The outputs of these two elements are combined in various proportions to yield the following patterns:

When combined equally, the directional characteristic is the heart-shaped cardioid curve "C" shown in figure 1. Use of either element alone presents patterns "D" (dynamic) and "R" (ribbon). These characteristics are available with either the 639A or the 639B Microphone.

The cardioid directional performance of the 639 Microphones over the entire useful frequency range insures a practical, wide pick-up angle of at least 120° at the front of the microphone over which the quality is unchanged and the sensitivity remains practically the same.

The 639B Microphone has the above characteristics and

in addition, patterns 1, 2, and 3, which combine the outputs of the two elements in three other ratios and produces the patterns shown in figure 2.

Since the problems of pick-up in studios and remote locations are different for each condition and since they may change from time to time these multi-purpose microphones can be used by the engineer to obtain the best possible pick-up under varying and difficult conditions.

Pick-up problems, such as the following, can either be improved or overcome by the use of the 639B with its directivity patterns, which may be selected by means of a simple screwdriver operated switch:

In the Studio — when sound treatment is not fully effective and control of undesired sound pick-up is necessary.

In the Playhouse or Night Club — where there is an excess of audience noise or where it is desired to give the artist the freedom of working at a greater distance from the microphone.

In Public Address Installations — where accoustical feedback takes place before a satisfactory reinforcement level can be reached.



Figure 2 — Cardioid Microphone 639B showing 6 selectivity patterns.

Features

- High Quality.
- Three-way (639A) or six-way (639B) directivity patterns.
- Solves many difficult pick-up problems.
- Dynamic moving coil type pressure element.
- Improved type velocity activated element.
- Multi-purpose microphones.

Specifications:

Frequency Response: Essentially uniform from 40 to 10,000 cycles.

Sensitivity: Open circuit terminal voltage 64 db below 1 volt per 10 dynes per square centimeter which is equivalent to 84 db below 1 volt for one dyne per square centimeter.

Signal-to-Noise Ratio: The signal for 10 dynes per square centimeter sound pressure is 78 db above the thermal agitation noise generated within the microphone; 58 db for 1 dyne per square centimeter.

Directivity, 639A: Three patterns C, D, R, selectable through three position screwdriver operated switch. At the angle of minimum response the average discrimination with respect to 0° response is 20 db over the range from 40 to 10,000 cycles.

Directivity, 639B: Six patterns R, D, C, 1, 2 and 3 selectable through six position screwdriver operated switch. At the angle of minimum response the average discrimination with respect to the 0° response is 20 db over the range from 40 to 10,000 cycles.

Impedance: The impedance varies somewhat throughout the frequency range, but has an average value of 40 ohms. The microphone is intended for use with equipment having a rated source impedance from 25 to 50 ohms.

Power Output Level: -56 dbm for a sound pressure of 10 dynes per square centimeter, or -76 dbm for 1 dyne per square centimeter when the microphone is terminated with a resistance equal to its internal impedance. Experience indicates that approximately ten dynes per square centimeter sound pressure is produced at conversational level three feet from a microphone.

Mounting: Both floor and desk type stands of attractive design are available. These, together with a number of other accessories, are described under "Microphone Accessories."

Dimensions and Weight For 639A and 639B: Height 7½" including the plug terminal, length 4-7/16", width 3-7/16", weight 3¼ lbs.

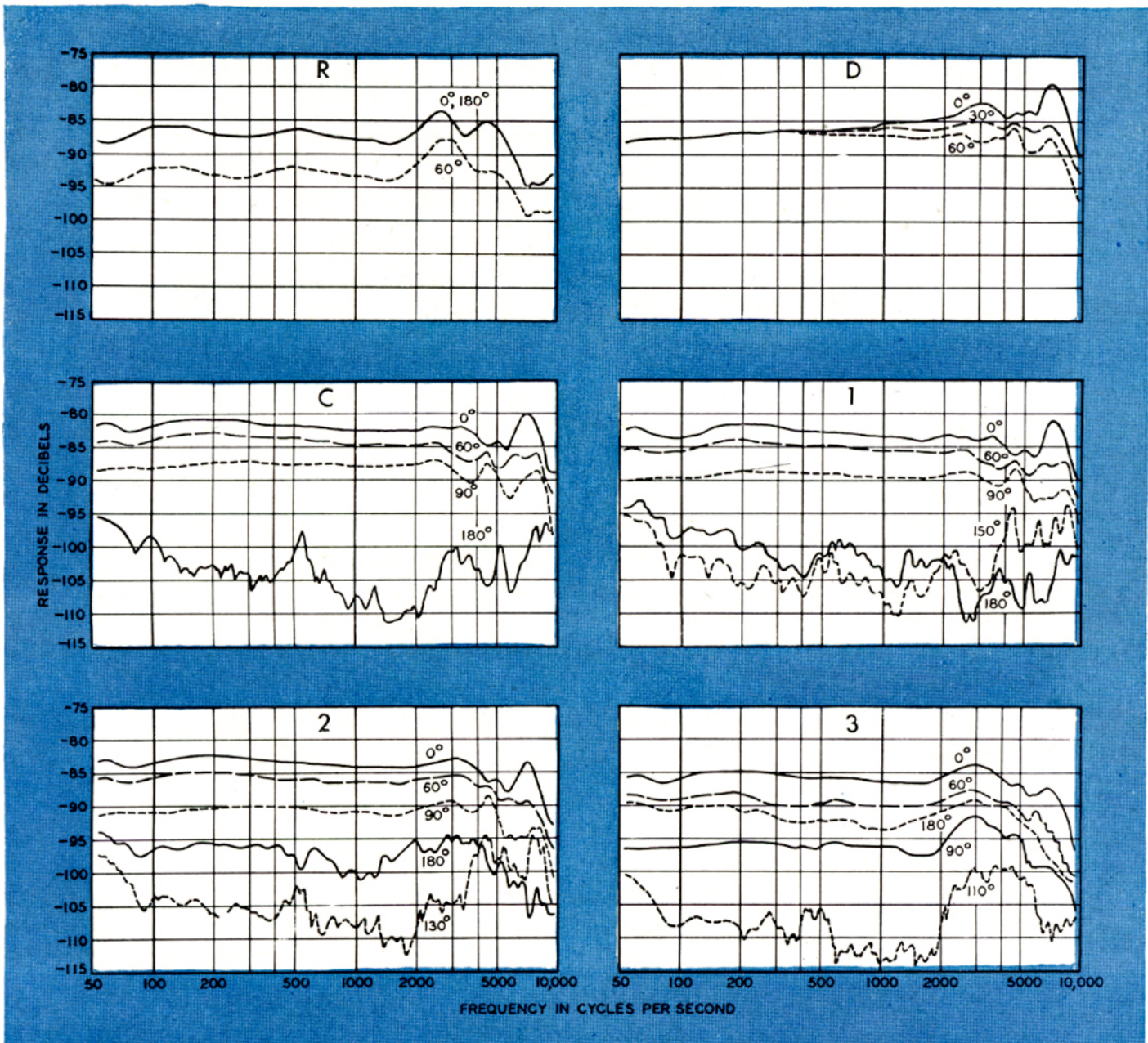


Figure 3—Field responses of a typical production model 639B Microphone for the six switch positions. Because of the unusually wide discrimination, the lower curves in each group contribute negligible amounts to the total pick-up. Minute variations in the sensitivity of the individual elements prevent absolute cancellation and account for the unevenness of these curves on a decibel scale.

Curve R shows the response of the ribbon element alone, switch on R. The response at 0° and 180° is the same and maximum. The microphone is bi-directional and has a minimum response at 90° .

Curve D shows the response of the dynamic element alone, switch on D. The microphone is now essentially semi-directional. The variations of response with angle of incidence at the higher frequencies are caused by diffraction.

Curve C shows the response of the cardioid microphone, switch on C. The ribbon and dynamic elements are combined to produce maximum response at 0° and minimum response at 180° .

Curve 1 shows the response of the microphone with the switch on 1. Again the ribbon and dynamic elements are combined, this time in such a way that minimum response is obtained at the two 150° points. This directive pattern is slightly better than either R or C for discriminating against general room noise.

Curve 2 shows the response of the microphone with the switch on 2. This combination of ribbon and dynamic elements produces minimum response at the two 130° points.

Curve 3 shows the response of the microphone with the switch on 3. The ribbon and dynamic elements are combined to produce minimum response at the two 110° points.



Figure 4 — The 633A "Salt Shaker" Microphone.

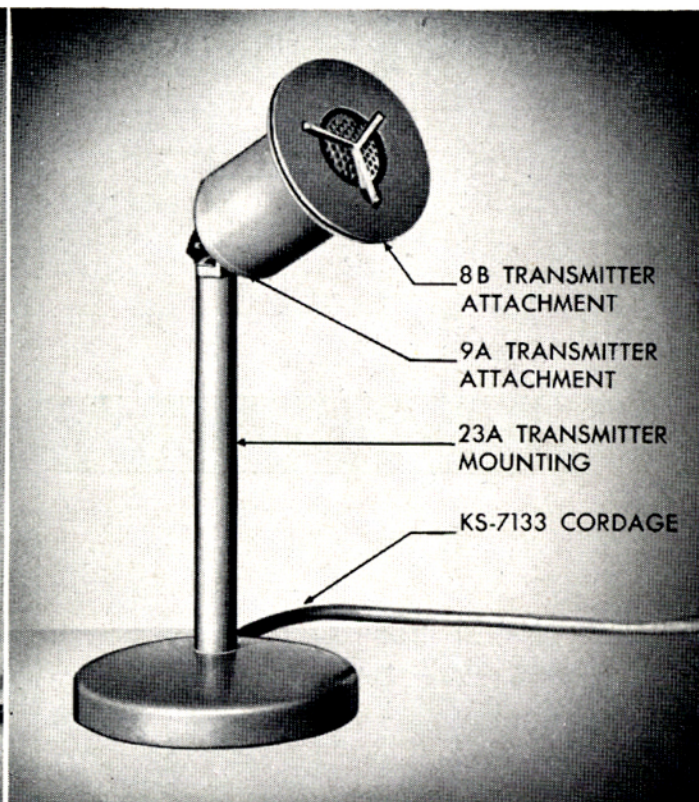


Figure 5 — The 633A Microphone with the 8B Transmitter Attachment (Baffle).

DYNAMIC MICROPHONE 633A

Use — This microphone is designed for application in radio broadcasting, high quality public address, announcing and sound distribution systems. Ruggedness, dependability, high quality and either non-directional or semi-directional performance are features which have contributed to its popularity.

Description — Having an impedance of approximately 20 ohms, the microphone is intended for use with equipment nominally rated at 25 to 50 ohms source impedance. Because of this low impedance the microphone may be used as much as 200 feet to 300 feet (or more) from associated amplifying equipment when connection is made with twisted pair, shielded microphone cordage.

For sound arriving along a line perpendicular to the plane of the diaphragm, the response is, for all practical purposes, uniform over the range of 40 to 10,000 cycles. This, however, includes a peak of up to 10 db in the neighborhood of 6,000 to 8,000 cycles.

For sound arriving along a line parallel to the plane of the diaphragm, the 633A has a uniform response over the frequency range of 50 to 10,000 cycles.

For non-directional use the microphone is mounted vertically on a stand or suspended by its cordage.

Because of the cylindrical symmetry of the microphone the

above responses hold for all angles of approach in the horizontal plane (i.e., plane of the diaphragm).

The "in-between" characteristics or directional effects may be utilized by tilting the microphone at the desired angle. The 9A Transmitter Attachment (Swivel Joint) is available for this purpose. The directional effect may be further accentuated by the use of the 8B Transmitter Attachment (Baffle) a disc $3\frac{1}{4}$ " in diameter which fits snugly over the face of the microphone and increases its sensitivity for sound arriving along a line perpendicular to the diaphragm over the range from 1,000 to 5,000 cycles.

Features

- Non-directional and semi-directional performance.
- Excellent frequency response.
- Rugged construction.
- Low impedance output.
- Stand or suspension mounting.
- Baffle for increased directivity.

Specifications

Frequency Response: 40 to 10,000 cycles.

Operates Into: 25 to 50 ohms.



Sensitivity: Open circuit terminal voltage 70 db below 1 volt per 10 dynes per square centimeter which is equivalent to 90 db below 1 volt per 1 dyne per square centimeter.

Power Output Level: -59 dbm for a sound pressure of 10 dynes per square centimeter or -79 dbm for 1 dyne per square centimeter when the microphone is terminated with a resistance equal to its internal impedance. Experience indicates that approximately ten dynes per square centimeter sound pressure is produced at conversational level three feet from a microphone.

Mounting: Both floor and desk type stands of attractive design are available. These together with a number of other accessories are described under "Microphone Accessories."

If the 633A Microphone is to be mounted in the same manner as, or interchangeably with, the 639 type microphones, on table or floor stands equipped with a 442-A Jack and 712-A Adapter, a 311-A Plug may be attached either to the 9A Swivel Joint or to the microphone and

wired to the microphone terminals.

The 22A Transmitter Mounting (Floor Stand) or 23A Transmitter Mounting (Table Stand) as well as the 8B Transmitter Attachment (Baffle), 9A Transmitter Attachment (Swivel Joint), 311-A Plug and KS-7133 Cordage should be ordered separately. Unless otherwise specified, the cordage will be furnished in 20' lengths.

Dimensions: 2" in diameter and 3½" long.

Weight: 10 ounces.

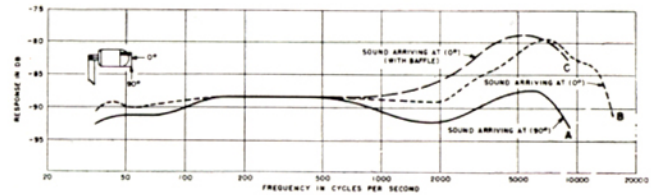


Figure 6 - Typical field response for 633A Microphone. 0 Decibels = 1 volt per dyne per square centimeter (open circuit voltage across output impedance of 20 ohms).

640AA CONDENSER MICROPHONE

Tops for FM

Use — The Western Electric 640AA Condenser Microphone offers numerous distinctive advantages both to the acoustical technician and to the broadcast studio engineer.

As a laboratory instrument this microphone incorporates the most recent technical advances in the precision measurement of sound intensity over a wide range of temperature and humidity conditions. Accurate, scientific production tests of other sound instruments such as receivers, loudspeakers and microphones may also be obtained through its use.

In the broadcasting field, when associated with its companion RA-1095 Amplifier, the 640AA Microphone provides a means for ultra-faithful program pick-up especially in auditoriums or in large studios which have proper acoustical characteristics for use of the remote single microphone pick-up

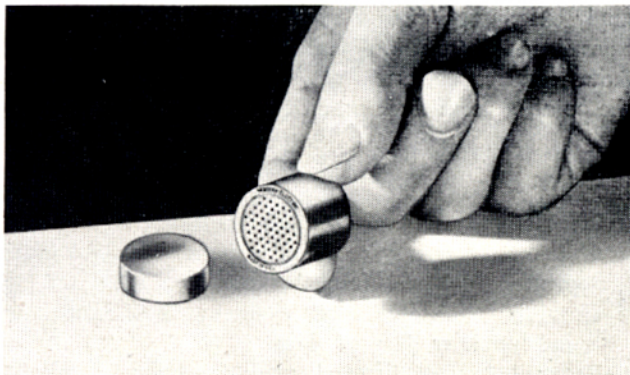


Figure 7 - 640AA Microphone.



Figure 8 - 640AA Microphone and its associated RA-1095 Amplifier.

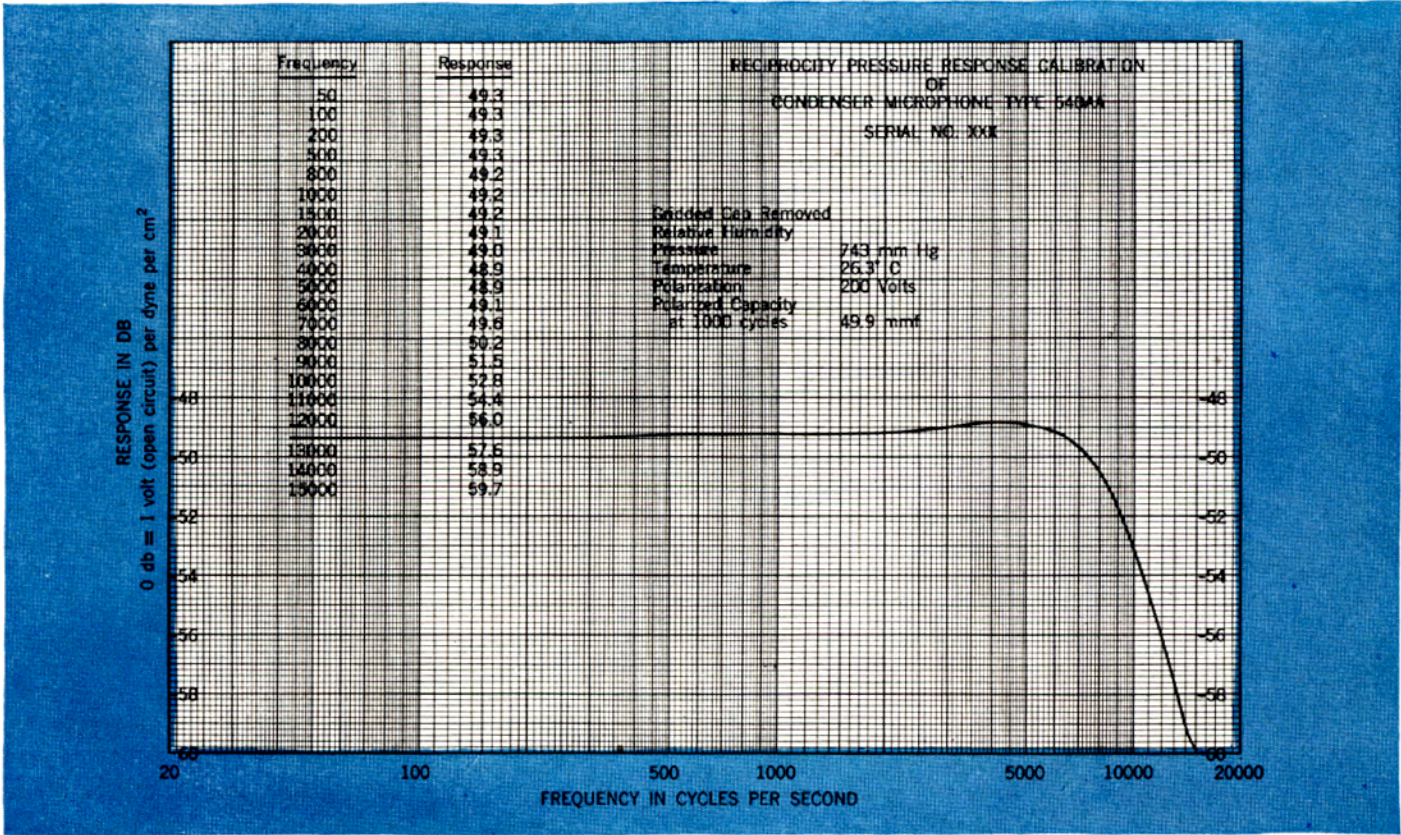


Figure 9 — Typical Pressure Calibration Chart of 640AA Condenser Microphone.

technique. This application is particularly effective where orchestras or similar large groups are involved. Another ideal application is for use as a cast microphone in broadcast stations and motion picture studios.

Description — The 640AA Condenser Microphone is furnished in a bright metal, cylindrical housing approximately 1" in diameter and 1" long. It is similar to its predecessor, the 640A Microphone, except for improved stability with respect to time, temperature and humidity.

For laboratory and test applications, the order should specify that the unit be supplied calibrated. This calibration will be in accordance with procedures established by the U.S. Bureau of Standards, Cruft Laboratories and Bell Telephone Laboratories, Inc. The stability of the 640AA Microphone is such that it will hold its calibration constant over a long period of time when treated with reasonable care. The stainless steel diaphragm and the diaphragm supporting ring have approximately the same expansion coefficients, thus assuring accurate sound measurements over an unusually wide range of ambient temperature.

This microphone is provided with a removable grid over the face of the diaphragm to afford mechanical protection under normal program pick-up conditions.

The pressure response characteristic shown in Figure 9, which is applicable only to measurements in small chambers, is approximately constant to 6,000 cycles per second and then falls off uniformly to the extent of about 8 db at 15,000 cycles per second. Being a condenser microphone it is de-

signed to work into a high impedance grid circuit of a closely associated amplifier stage. The pressure response level of the microphone unit (less amplifier), in the 50 to 6,000 cycle range with 200 volts polarizing potential, is approximately 49.5 db below 1 volt (open circuit) per dyne per square centimeter. Pressure and free-field levels are identical from 50 to 500 cycles per second.

A chart (Figure 9) is supplied with *calibrated microphones* which, in addition to the pressure response curve, shows the conditions of test, namely, the polarized capacity at 1,000 cycles, polarizing voltage, relative humidity, barometric pressure, ambient temperature and other conditions of calibration. This chart also tabulates the response values for the specific instrument in convenient steps from 50 to 15,000 cycles per second. In order for the calibration to apply exactly, the instrument should be used under conditions identical to those under which it was calibrated. Suitable correction factors can, of course, be determined at the point of use if these conditions must be altered.

Features

- Precision measurement of sound intensity.
- Ideal for measuring frequency response of sound instruments.
- Unvarying excellence under a wide range of temperature and humidity.
- Removable cover for mechanical protection.
- Small size diaphragm improves fidelity, forestalls phase



distortion, approaches "Ideal" of "point pick-up."

In combination with the RA-1095 Amplifier, it is especially adaptable for ultra-faithful pick-up in auditoriums, large studios, or cast microphone in small studios. Especially effective for single microphone pick-up technique for large orchestras and choral or similar groups. Compactness.

Specifications for the 640AA Microphone

Frequency Response: Pressure Response—See Figure 9.

Free-Field Response—See Figure 10.

Sensitivity: Approximately 49.5 db below 1 volt (open circuit) per dyne per square centimeter with 200 volts d-c polarizing potential.

Operates Into: High impedance grid circuit of closely associated vacuum tube amplifier (such as Western Electric RA-1095 Amplifier).

Output Impedance: Essentially that due to its capacitance which is approximately 50 mmf. to 60 mmf.

Polarizing Voltage: 200 volts d-c from well regulated quiet supply.

CAUTION: Polarizing voltage exceeding 200 volts should not be applied as high voltages may damage the instrument.

Mounting: Mount in structure containing first amplifier stage.

External Connection: The microphone should be connected to the grid of the vacuum tube by means of a short, well-shielded, low capacitance lead to center contact at rear of instrument. The cylindrical shell of the microphone should be connected to the ground of the vacuum tube circuit thereby serving as a shield for the inner components.

Dimensions: Cylindrical shape approximately 1" diameter and 1" long.

Weight: Approximately 1½ ounces.

Protection: Provided with a dust cap for each end of the

cylinder when instrument is not in use.

Installation — In mounting the 640AA Microphone, it is important that its associated amplifier be arranged mechanically so as to preserve as nearly as possible the freedom from distortion of the sound field which is inherent in the small physical proportions of the microphone element.

The free-field response characteristics of the 640AA Microphone mounted on the RA-1095 Amplifier are shown in Figure 10. The difference in shape between the zero degree free-field curve, and the pressure calibration shown in Figure 9, is due almost entirely to diffraction effects which result when the microphone is placed in a free sound field, and not to the amplifier which has practically no effect on the shape of the response characteristic. The range covered, it will be noted, is admirably suited to the highest quality AM or FM program transmission requirements. With the line of sound approach normal, or perpendicular to the plane of the diaphragm, (0 degrees), the response is approximately constant for sounds in the frequency range between 50 and 1,000 cycles per second. Above 1,000 cycles the response rises gradually to a maximum of about 8 db at 8,000 cycles, then drops uniformly to a level which at 15,000 cycles per second is roughly equal to that at 1,000 cycles per second.

As illustrated in Figure 10, the response of the 640AA Microphone varies somewhat in the higher frequencies depending on the direction from which the sound wave approaches the diaphragm.

For pick-ups such as are common in broadcast applications, the small, bullet shaped Western Electric RA-1095 Amplifier described on the following page serves ideally both as a mounting for the 640AA Microphone and as a means of providing the unit with first stage amplification and polarizing voltage. Where a microphone boom or other similar device is used to direct the microphone toward a given sound source, the amplifier should be shock-mounted by means of soft springs or rubber supports to isolate the elements from possible mechanical vibrations which are likely to produce noise.

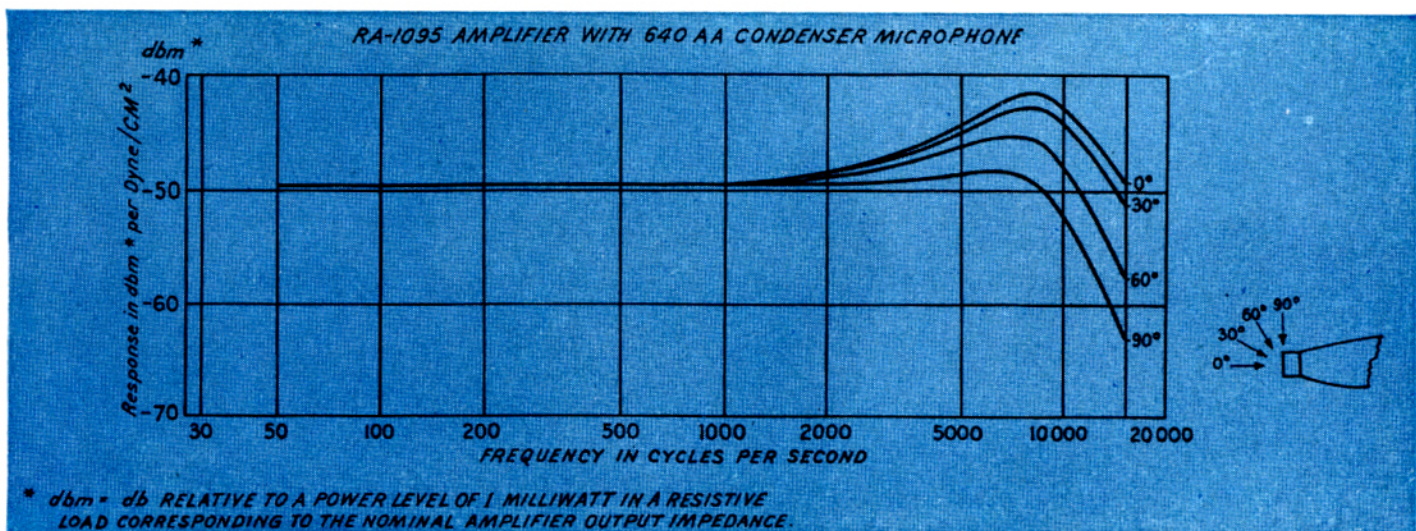


Figure 10 — Typical Free-Field Curve of 640AA Microphone mounted on the RA-1095 Amplifier.

AMPLIFIER RA-1095

Use — The RA-1095 Amplifier is a small, single stage amplifying unit developed especially for use with the 640 type Condenser Microphone.

Description — Streamlined in shape, this amplifier is approximately 7¾" long by 2½" in diameter and weighs only 1¾ lbs. All components are housed in a removable spun metal casing which is normally finished in bright chromium but can be obtained in a non-reflecting dark aluminum, wrinkle gray.

A threaded recess at the pointed end of the housing permits screwing the 640AA Microphone securely in place so that the two units present a uniform surface offering the least possible disturbance to the surrounding sound field.

The output level of this efficient combination for a given sound field is about 28 db higher than the 639 type high quality studio microphones and the signal-to-noise ratio compares favorably (see specifications). The frequency response characteristic of the amplifier is such as to assure optimum results from the use of the 640AA Microphone as an ultra-faithful pick-up device. The free-field frequency response characteristics for the combination are shown in Figure 10.

The amplifier is furnished complete with a selected 382A Vacuum Tube of the familiar "door knob" type. A row of terminals arranged alphabetically is provided on the outside of the amplifier base to permit strapping for different impedance conditions (see specifications). The amplifier case is designed to slip easily off the narrow end of the chassis frame to allow ready access to these connections.

Features

- Designed specifically for 640AA Microphone.
- Ease of attachment.
- Ease of access to strapping arrangements.
- Variety of application.
- High signal-to-noise ratio.
- High output level for low sound field.
- Single stage amplifier.

Specifications for the RA-1095 Amplifier

Frequency Response: See Curve Figure 10.

Load Impedance: 30-50 or 200-250 ohms.

Operates From: 640A or 640AA Condenser Microphone.

Power Output Level: Approximately -29.5 dbm when used with the 640AA Microphone for a sound pressure of 10 dynes per square centimeter. Experience indicates that approximately ten dynes per square centimeter sound pressure is produced at conversational level three feet from microphone.

Signal-to-Noise Ratio: 85 db below 0.5 milliwatts measured with microphone elements replaced by shielded 45 micro-micro farad condenser.

Distortion: One per cent for an output of 0.5 milliwatts with a single fundamental frequency of 400 cycles. *Normal output level less than 0.0005 milliwatts.*

Power Supply: Quiet sources required for both filament and plate power.

Filament: 6.3 volts, 150 milliamperes, d-c.

Plate: 200 volts, 3 milliamperes, d-c.

CAUTION: *Plate voltages exceeding 200 volts should not be applied when the 640 type microphone is attached, as high voltages may damage the instrument.*

External Connections: Through 6 prong socket in base of Amplifier (Use Cannon 6 hole female plug P6-11). Suitable six conductor shielded cordage is available from our nearest distributor.

Dimensions: Approximately 7¾" long, 2½" diameter.

Weight: Approximately 1¾ pounds.

Installation — Because of the variety of applications for which this microphone is suited no mounting is supplied as a part of the amplifier. A shock-type mounting however should be used to insulate the microphone from the microphone support. Suitable mounting devices are available through our nearest distributor.

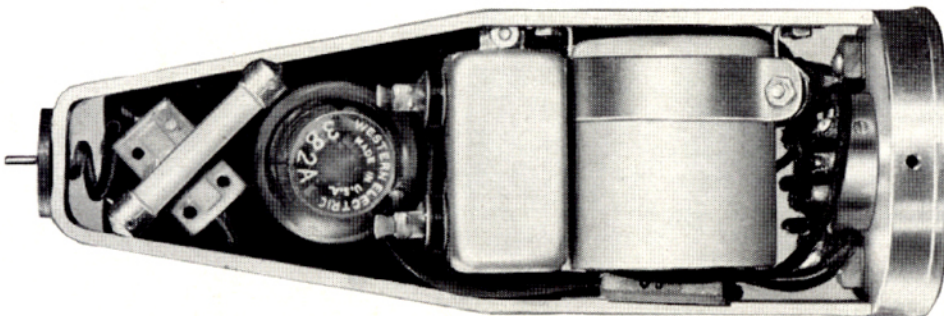


Figure 11 — RA-1095 Amplifier with Cover Removed.

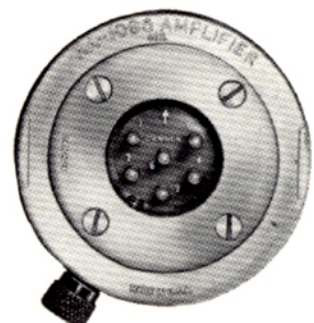


Figure 12 — Base of Amplifier Showing 6 Prong Socket.



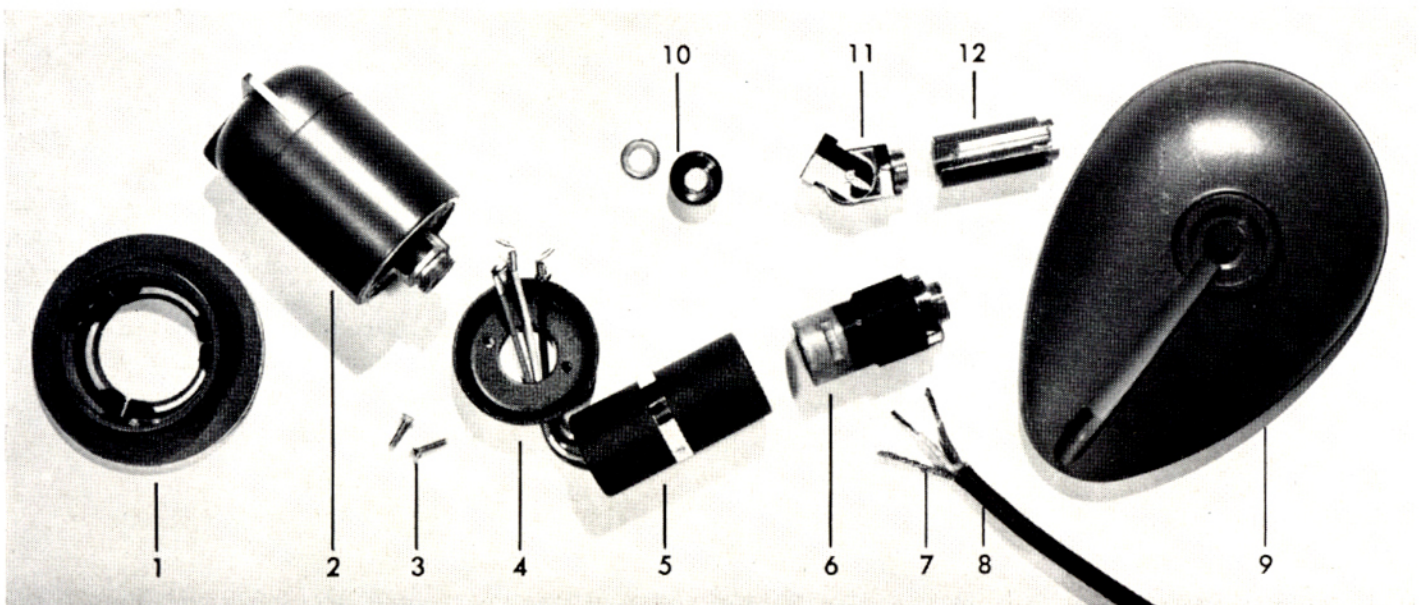
ACCESSORIES FOR 633A AND 639 TYPE MICROPHONES



Figure 13 — 633A Microphone, with 8B Transmitter Attachment (Baffle), 311A Plug, 9A Transmitter Attachment (Swivel Joint), and 713A Adapter, mounted on 24A Transmitter Mounting.

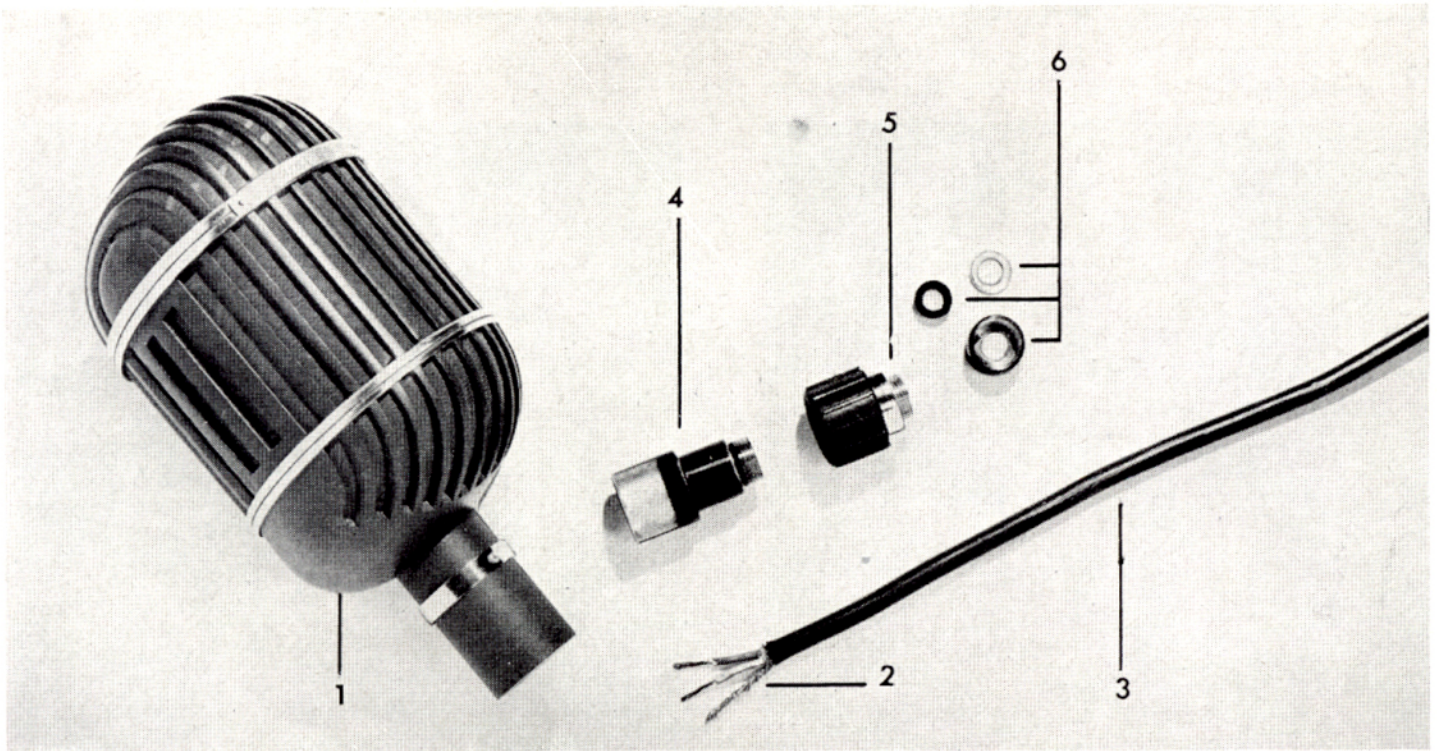


Figure 14 — Left: 639 Microphone mounted on a 22A Transmitter Mounting (Floor Stand); Right: 633A Microphone (with 8B Baffle). This shows the ease of interchangeability of microphones when the 633A is equipped with the 311A Plug.



- | | | |
|--|-------------------------------|--|
| 1. 8B Transmitter Attachment (Baffle) | 5. 311A Plug | 9. 24A Transmitter Mounting |
| 2. 633A Microphone | 6. 442A Jack and 712A Adapter | 10. Parts of 442A Jack (unused for this application) |
| 3. Screws from base of 633A Microphone | 7. Shield Braid | 11. 9A Transmitter Attachment (Swivel Joint) |
| 4. Cover for 633A Microphone | 8. KS-7133 Cordage | 12. 713A Adapter |

Figure 15 — 633A Microphone and Mounting Accessories.



1. 639 Microphone
2. Shield Braid

3. KS-7133 Cordage
4. 442A Jack

5. 712A Adapter
6. Parts of the 442A Jack

Figure 16 - 639 Microphone and Accessories.

Several accessories are available for use with the 633A and 639 Type microphones. They are designed to permit the operator to use these microphones interchangeably on desk and table stands.

CORD ASSEMBLY

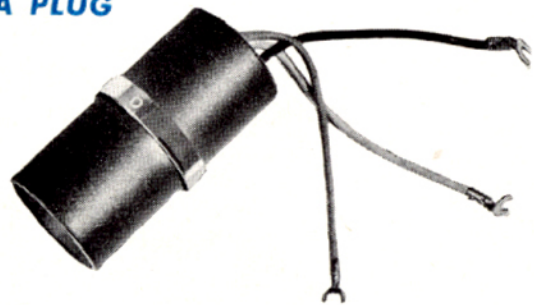
A Cord Assembly consisting of the 442A Jack, 712A Adapter, and KS-7133 Cordage is required for all applications of 639 Type Microphones. This Cord Assembly is used when the 639 Type Microphone is mounted on the 22A, 23A, or 24A Transmitter Mountings or is suspended from the 11A Transmitter Attachment.

442A JACK



The 442A Jack terminates the microphone cord at the microphone end. This jack when fitted with the 712A adapter fits the projecting cylindrical plug which is an integral part of the 639 Type Microphone and also the 311A Plug, which may be attached to the 633A Microphone.

311A PLUG



633A Microphones equipped with this plug may be used with the Cord Assembly. This makes it possible for customers who use both the 633A and the 639 Types of Microphones to use them interchangeably, as the particular application may dictate, on the 22A or 23A Stands. Equipped with 442A jacks and 712A adapters.

712A ADAPTER



Used in conjunction with the 442A Jack to give greater mounting security for 633A microphones equipped with 311A plugs and 639 Type microphones. New rubber sleeves for replacement may be ordered separately per ES-764300-2.



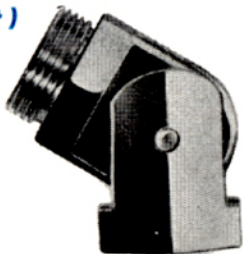
11A TRANSMITTER ATTACHMENT (Suspension Mounting)



For suspension mounting of the 639 Type Microphones, the 11A Transmitter attachment and the Cord Assembly are required.

The 11A Transmitter Attachment and the Cord Assembly are also used with the 639 Type Microphones, when mounted on either the 22A, 23A or the 24A Stand, if tilting of the microphone is desired.

9A TRANSMITTER ATTACHMENT (Swivel Joint)



This swivel joint is for use with the 633A Microphone. It makes possible tilting of the microphone to any desired angle from vertical to horizontal. This attachment may be used with any 633A Microphone whether equipped with the 311A Plug or not.

713A ADAPTER

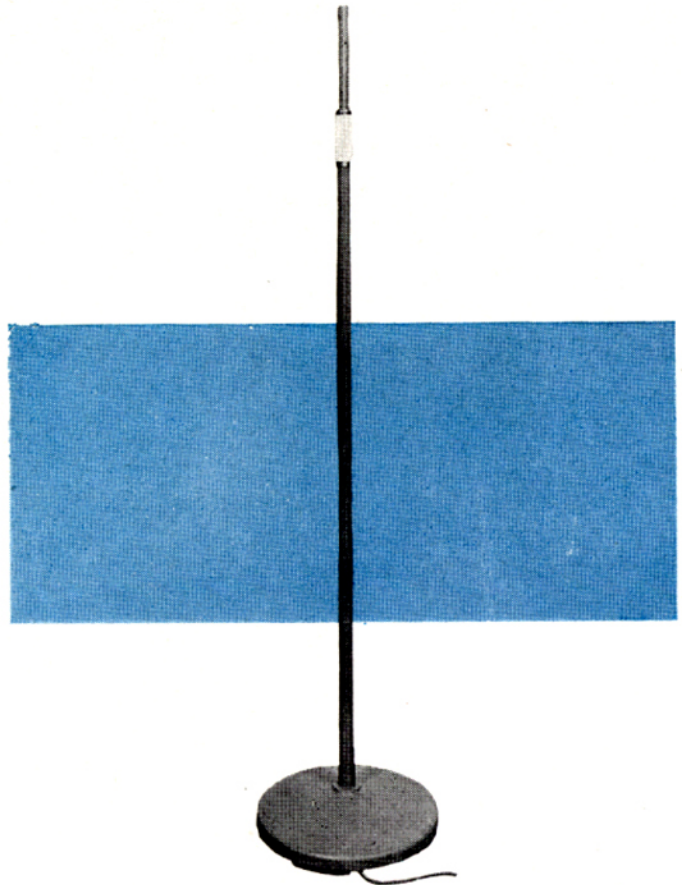


This is a slotted connector which permits the microphone cord to be run outside the stand when the microphone is mounted on the 22A Floor Stand or 23A Desk Stand. When this adapter is used it is not necessary to disconnect the Cord Assembly from the microphone when the latter is removed from or secured to the stand.

KS-7133 CORDAGE

Two or three conductor, shielded rubber covered cordage, in any length specified. Use of the three conductor cordage permits carrying the ground through the cable in addition to the shield ground. Two conductor cable will be supplied unless otherwise specified.

22A TRANSMITTER MOUNTING



Floor stand, height adjustable from 42½" to 70", requires the use of the Cord Assembly. The 713A Adapter is necessary when the cord is to be run outside the stand. The 11A Transmitter Attachment must be used with the 639 Type Microphone on this stand when tilting the microphone is desired. Tilting of the 633A Microphone can be accomplished by means of the 9A Transmitter Attachment.

FLOOR STAND WEIGHTS



For 639 Type microphones it is recommended that the weight of the 22A Floor Stand be increased by the use of a 6 lb. pair of iron weights per ES-764305-2. These weights clamp in the base of the stand and give added stability. They are not necessary for the lighter 633 Type microphone.

23A TRANSMITTER MOUNTING

The 23A Transmitter Mounting is for use with the 633A and 639 Type Microphones. The upper end of the mounting is arranged to take a 9A Swivel Joint or a 311A Plug. The base is 5" in diameter and the stand is 7½" high, exclusive of the microphone and accessories.

24A TRANSMITTER MOUNTING

A streamlined desk mounting for the 633A and 639 Type Microphones. This mounting requires the use of the Cord Assembly. The 24A Desk Stand has a cord slot which makes possible the removal or insertion of the Cord Assembly intact. The 11A Transmitter Attachment may be used for 639 Microphone or 9A Transmitter Attachment for the 633A Microphone with the 24A Transmitter Mounting when tilting of the microphones is desired.

8B TRANSMITTER ATTACHMENT (Baffle)



This 3¼" baffle mounts on the front of the 633A Microphone and is held in place by a twist locking device. It increases the directional effect of the microphone.