

# RCA Microphones

## Description

### General Information

The excellence of RCA microphones is the result of continued effort on the part of engineering and production personnel to produce a superior product. Out of this work have come the several types of broadcast microphones listed in the catalog. There is considerable overlap in the applications of the various types, but each does possess certain attributes which make it particularly well suited to some specific applications. These have been noted for each microphone in the catalog in order to assist in the selection of the microphone best suited for the intended application.

### High Quality Broadcast and Television Microphones

Broadcast-type microphones such as the Types BK-1A, BK-5B, BK-6B, BK-11A, BK-12A and 77DX, all have certain common performance criteria which make them especially suited to this application. They have smooth frequency-response characteristics over the audio range, low distortion, high output levels, well-shielded output transformers to prevent hum pickup, and where necessary, are shock mounted to reduce the pickup of low frequency building rumble. Performance features which are unique to each particular type are listed and the applications discussed in the catalog.

### Public Address Microphones for Broadcast Use

Public Address Microphones such as the SK-30, SK-31, SK-39, SK-45B, and SK-46, have been designed as economy microphones. In general, frequency range and sensitivity have been sacrificed to some extent in order to gain ruggedness and lower cost. The response limitations should be borne in mind when these microphones are used in broadcast applications.

### Unloaded Transformer Input

RCA Broadcast Microphones are designed to work into a microphone preamplifier whose input transformer is unloaded. Under this condition of operation the voltage appearing at the input of the first amplifier stage results in a gain in signal-to-noise ratio between 3 and 6 dB as compared with a matched resistance load. The exact value will depend on whether the major source of thermal noise is in the microphone amplifier or in the microphone.

### Microphone Resistance Loading

Microphones in which the moving system is highly damped will in general have their frequency response characteristics little changed by electrical loading. The BK-1A and BK-6B are examples of this.

Microphones which show output impedance variations with respect to frequency will have their response characteristics adversely affected by resistance loading. The Type BK-5B, and 77-DX (in the bi-directional and uni-directional positions) are typical examples. Resistance loading of these microphones will generally result in a loss in low frequency response.

### 150 Ohms vs. 250 Ohms

When microphones are connected to unloaded input transformers, impedance matching is not a consideration and the effects of connecting microphones with an output impedance of 250 Ohms to a microphone amplifier designed to operate from a 150 Ohm source and vice versa will usually be of small consequence. The effect on the level is shown in the tabulation below.

| Mic. Output Impedance  | Level Change dB |      |
|------------------------|-----------------|------|
| 250                    | 0               | +2.2 |
| 150                    | -2.2            | 0    |
| Amp. Input Designation | 250             | 150  |

In addition there will be some change in the overall response-frequency characteristic of the system below 100 Hz and above 5000 Hz, the magnitude depending on the connection and the design of both the microphone and the amplifier input transformer. Variations in response with the usual broadcast quality microphone amplifiers will in most cases not exceed  $\pm 2$  dB.

When microphones are connected to a resistance load the following changes in level will result when the output is referred to a matched condition.

| Mic. Output Impedance | Level Change dB |      |
|-----------------------|-----------------|------|
| 250                   | 0               | -2.5 |
| 150                   | +2.0            | 0    |
| Load Impedance        | 250             | 150  |

### Microphones Shipped Less Plug

RCA microphones are supplied less the plug for connection to the wall outlet or amplifier system. This is done to allow the user to select any desired plug. As a convenience, popular types of Cannon plugs are catalogued and they may be ordered as an accessory if desired.\*

### Microphone Mounting

RCA has standardized on the rugged 1/2-inch pipe thread for broadcast microphone mounting. This size thread makes it easy to add microphone stand extensions, booms, etc., for they may be easily made up locally from standard 1/2-inch pipe and fittings. Stands listed for use with microphones having 5/8"-27 thread will accommodate RCA Broadcast Microphones by the addition of an adapter.

\* Microphones are shipped connected for 250 Ohms since in normal usage an improved signal to noise ratio results when connected to a 150 Ohm preamplifier input.



## Effective Output Level

When a microphone is connected to an unloaded input transformer its power output cannot be expressed in dBm because no appreciable power is delivered by the microphone. The logical approach to the problem is to arrive at some level figure which, when combined with the conventionally measured amplifier gain, will give the correct output level for the combination. This figure is listed in the catalog for each microphone and is called the Effective Output Level. It differs from the EIA standard rating  $G_M$  in the value of sound pressure and source impedance. The EIA rating computation is based on a source impedance of 150 Ohms for all microphones having output impedances between 75 and 300 Ohms, and on a sound pressure of 0.0002 dynes per square centimeter.

The Effective Output Level calculation is based on the nominal microphone impedance and on a sound pressure of 10 dynes/cm<sup>2</sup>.

The EIA standard defines the system rating ( $G_M$ ) of a microphone as the ratio in decibels relative to 0.001 Watt per 0.0002 dynes per square centimeter of the maximum electric power available from the microphone to the square of the undisturbed sound field pressure in a plane progressive wave at the microphone position. Expressed mathematically:

$$G_M = (20 \log_{10} \frac{E}{P} - 10 \log_{10} R_{MR}) - 50 \text{ dB}$$

where  $E$  = the open circuit voltage of the microphone  
 $P$  = the undisturbed sound field pressure

$R_{MR}$  = the microphone rating impedance

Electrical reference level = .001 Watt  
 Sound pressure = .0002 dynes/sq. cm.

While this may look complex the application is simple. For all practical purposes the output level of the microphone is obtained by adding to  $G_M$ , the sound pressure level relative to 0.0002 dynes per square centimeter. The sound pressure level of the program material can be measured with any of the several available sound level meters.

## Hum Pickup Level

An arbitrary standard 60 Hz AC field of 10<sup>-3</sup> gauss has been established as a reference. It is fairly representative of fields measured at typical microphone locations in broadcast studios. The hum level is referred to .001 Watt and is calculated in the same fashion as the Effective Output Level, using as the output voltage the voltage produced by the standard field.

**Chart Showing Microphone Applications, Chief Characteristics and Recommended Mounts**

| Type No. | Use <sup>3</sup>      | Directional Characteristic | Effective Output Level <sup>1</sup> and $G_M$ <sup>4</sup> | Output Impedance Ohms | Frequency Response Hz | Max. Hum Pick-up Level <sup>2</sup> | Finish                    | Stand                |
|----------|-----------------------|----------------------------|--|-----------------------|-----------------------|-------------------------------------|---------------------------|----------------------|
| 77-DX    | Program Announce      | Poly-directional           | -53 dBm<br>$G_M$ -147 dB                                   | 30/150<br>250         | 30-20,000             | -128 dBm                            | Satin Chrome & TV Gray    | Boom, Desk, Floor    |
| BK-1A    | Program Announce      | Semi- and Non-directional  | -52 dBm<br>$G_M$ -146 dB                                   | 30/150<br>250         | 50-15,000             | -102 dBm                            | Satin Chrome & TV Gray    | Hand, Desk, Floor    |
| BK-5B    | Program Announce      | Uniaxial                   | -57 dBm<br>$G_M$ -151 dB                                   | 30/150<br>250         | 30-20,000             | -128 dBm                            | TV Gray                   | Boom, Desk, Floor    |
| BK-6B    | "Off-Mike" Speech     | Semi-directional           | -65 dBm<br>$G_M$ -159 dB                                   | 30/150<br>250         | 60-15,000             | -112 dBm                            | TV Gray                   | Microphone Lanyard   |
| BK-11A   | Program Announce      | Bi-directional             | -56 dBm<br>$G_M$ -150 dB                                   | 30/150<br>250         | 20-20,000             | -130 dBm                            | Stainless Steel & TV Gray | Desk, Floor          |
| BK-12A   | Program Announce      | Non-directional            | -60 dBm<br>$G_M$ -154 dB                                   | 30/250                | 60-18,000             | -120 dBm                            | Bronze epoxy & matte gold | Lavalier, Clip, Hand |
| BN-10A   | Remote Program        | Semi-directional           | +6VU   | 600                   | 80-12,000             | -112 dBm                            | TV Gray                   | Hand                 |
| KU-3A    | Program Announce      | Uni-directional            | -51 dBm<br>$G_M$ -145 dB                                   | 30/150<br>250         | 30-15,000             | -122 dBm                            | Two-Tone Umber Gray       | Boom, Desk, Floor    |
| SK-30    | Public Address Paging | Omni-directional           | -55 dBm<br>$G_M$ -149 dB                                   | 30/250                | 50-14,000             | -115 dBm                            | Midnight Blue             | Desk, Floor          |
| SK-31    | Public Address Paging | Omni-directional           | -57 dBm<br>below 1V/<br>dyne/cm <sup>2</sup>               | 30,000                | 50-14,000             | -90 dBm                             | Midnight Blue             | Desk, Floor          |
| SK-39A   | Close Up Announce     | Semi-directional           | -54 dBm<br>$G_M$ -148 dB                                   | 250                   | 70-10,000             | -105 dBm                            | Two-Tone Umber Gray       | Desk, Floor          |
| SK-45B   | Intercom & Talkback   | Semi-directional           | -56 dBm<br>$G_M$ -150 dB                                   | 200/15,000            | 70-12,000             | -106 dBm<br>-88 dB below<br>1 Volt  | TV Gray                   | Desk, Floor          |
| SK-46    | Radio & TV Announce   | Bi-directional             | -58 dBm<br>$G_M$ -150 dB                                   | 200/15,000            | 40-15,000             | -115 dBm<br>-98 dB below<br>1 Volt  | Satin Chrome & TV Gray    | Desk, Floor          |

<sup>1</sup> Reference level 0.001 Watt, sound pressure 10 dynes per square centimeter. This corresponds to a rating by the EIA system at a sound pressure level of 94 dB.

<sup>2</sup> Level referred to a hum field of 10<sup>-3</sup> gauss.

<sup>3</sup> For details refer to description of each particular type.

<sup>4</sup>  $G_M$  = (EIA rating).

<sup>5</sup> Also available in TV Gray as MI-11006-C.