

DESCRIPTION

INTRODUCTION: In a rather astonishing series of demonstrations conducted throughout the U.S., AKG recently put inventory samples of its new D-300 Series microphones through an incredible ordeal of abuse. Sample units were intentionally dropped from heights of six feet or more, repeatedly struck against hard surfaces and purposely subjected to some of the most outrageous treatment ever inflicted on microphones. Despite incurring some cosmetic damage, each unit not only "bounced back" in working order but — even more important — *each performed with the sound quality and finesse normally associated only with a more delicate studio microphone.*

While AKG does not advocate intentional abuse of *any* microphone, it nonetheless held these demonstrations to dramatize an extremely important point: That, with the development of its D-300 Series, it has succeeded in creating a radically new and vastly superior generation of musicians' and broadcast microphones — the very first instruments of their kind to successfully blend the wide-range response of a studio microphone *and* the virtually indestructible toughness of a field microphone *with* one of the most comprehensively effective systems of shock/noise rejection ever devised. Further enhancing these combined factors are the D-300s' distinctive styling, comfortable balance and easy-to-service *modular* construction.

These remarkable design goals were achieved only by breaking away from established industry concepts. After carefully evaluating the real-world needs of touring vocalists, instrumentalists *and* their sound engineers, AKG developed several unique (and patented) acoustical, electrical and mechanical configurations from the ground up to meet those needs.

As a result, the D-300 Series is a family of microphones that will surely set *the* performance standards of the pop-music and broadcast industries for years to come. Elegant, yet bulldog-tough, these units are capable of satisfying the most subtle artistic demands in the studio while shrugging off the daily abuse, rough handling and various forms of noise that are all too common in remotes, road shows, club dates and the like. Furthermore, the D-300s' simplified field-serviceability now makes it unnecessary to carry an arsenal of bulky and expensive backup microphones on tour.

PERFORMANCE: The D-330BT is the premier model in the D-300 Series, and embodies *all* of the uniquely sophisticated design principles that went into the creation of the series. A fully professional instrument whose frequency range, transient response and tonal flexibility are on a par with those of the very best studio dynamics, the D-330BT surpasses the most



challenging demands of top vocal and instrumental artists.

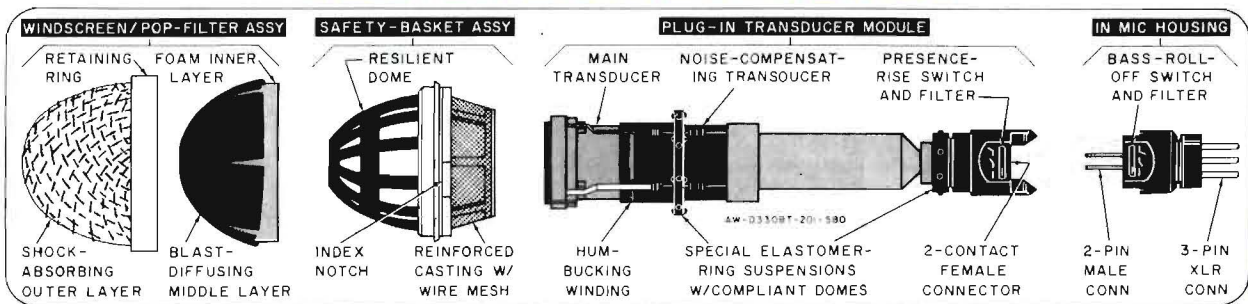
With its variable bass-versus-distance contour (marked bass emphasis or "proximity effect" when used close up; progressively diminishing bass response when used farther away) and smooth presence-rise contour (for added crispness and "punch") plus *nine* different combinations of bass-rolloff/presence-rise equalization, the D-330BT is the *ultimate* creative tool — one that offers its users unrivalled personal control over the tonal "shading" of voices or instruments to suit any conceivable locale, or any musical mood and style.

It is also noteworthy that the D-330BT — unlike competitive microphones — preserves critical signal-to-noise ratios in *all* of its equalization modes. This is due to its specially designed filter networks, which maintain *constant* midband sensitivity and assure *minimum* midband impedance variations in all possible combinations of bass and presence settings.

In addition, the D-330BT's hypercardioid directional pattern is far more discriminating than that of a standard cardioid and is also *unusually* uniform with respect to frequency. These characteristics — extremely important in broadcasting and utterly indispensable for sound reinforcement — produce negligible coloration of desired sounds at the sides of the microphone while providing exceptional (and highly predictable) suppression of unwanted acoustic feedback and background noise towards the rear of the microphone.

DESIGN/CONSTRUCTION: What sets the D-330BT apart, however, is not merely its superb performance. Rather, it is the *combination* of that performance with its unmatched ruggedness, totally unprecedented noise-rejection capabilities, fatigue-free handling, comfortable balance and extraordinary ease of field service. The key to *all* of these factors is readily apparent in the exploded view below and in the detailed "walking-tour" description that follows overleaf.

SPECIAL DESIGN AND CONSTRUCTION TECHNIQUES



DESCRIPTION (Continued)

The microphone's unique design and construction begin with an unusually sturdy *three-layer* windscreen/pop-filter assembly. This assembly consists of a shock-absorbing stainless-steel wire-mesh outer layer, a blast-diffusing fabric middle layer and reticulated polyurethane-foam inner layer (sandwiched together into a removable liner) plus a threaded retaining ring that secures the entire unit to the microphone housing. So effective is this combination in reducing the effects of wind noise, breath pop and similar acoustic interference, that an external windscreen or pop filter is seldom, if ever, required.

As tough as the windscreen/pop filter is alone, it is *further* reinforced against impact damage by a special safety-basket assembly. Note that the safety basket is contoured to support the inside of the windscreen/pop filter *and* to surround the front of the transducer system — thus also isolating all *internal* parts from head-on impact damage. As shown, the safety basket consists of a resilient dome-shaped ribbed cage joined to a reinforced open-frame casting. Fitted with a fine-wire-mesh screen that coincides with side ports in the microphone housing, the casting also has indexing notches that align the entire rugged assembly with structural members in the microphone housing.

Next in line is the totally unique transducer system. In terms of its superb performance, its extraordinarily thorough shock and noise suppression and its modular field-serviceable packaging, the system is a prime example of the care and the attention to detail that AKG engineers lavished on the D-330BT.

To start with, the transducer system "floats" uniformly in *all* directions within the microphone housing for *unprecedented* isolation from the effects of impact damage, handling noise and spurious vibrations. This is achieved by two special ring-shaped elastomer suspensions — one near the front of the system and the other at the rear of the system. To combine the advantages of both *hard and* soft suspension designs, each of these ring suspensions has a dense, relatively hard body and a series of compliant, *progressively* compressible dome-shaped projections around its periphery — in effect forming a complex, highly damped low-pass mechanical filter. Therefore, under normal handling conditions, the compliant domes effectively decouple the transducer system from mechanically *and* motionally induced vibration. Further, under extremely abusive conditions (dropping the microphone or subjecting it to lateral impact), the domes increasingly compress, in proportion to applied g-force, in a progressive *braking* action — ultimately allowing the harder body of each suspension to act as a bumper.

These extraordinary suspensions, however, are only *part* of AKG's comprehensive scheme of noise suppression. Note that the transducer system uses *two* generating elements — the main front-facing *sound-pickup* transducer (computer designed for widest possible frequency range and superb transient response) plus a special rear-facing nonacoustic (sealed) *noise-compensating* transducer. *Working together, these transducers further reduce the effects of mechanically and motionally induced handling noise by an additional 30 dB at 100 Hz.* In this unique arrangement, the two carefully matched transducers are wired in parallel and electrically in phase but — because of their opposed orientation — operate *out* of phase. Thus, any handling-noise signal generated by the main transducer is nulled by an equal but *opposite* handling-noise signal generated by the compensating transducer (which acts strictly as an electromechanical motion-sensing accelerometer). *As still another* precaution, the main transducer incorporates a hum-bucking winding to cancel the effects of electromagnetically induced noise from ever-present power and lighting cables as well as from dimmers, power switchboards and the like.

The two transducers, together with the three-position presence-switch and its associated filter network, are encapsulated in a replaceable *plug-in* module. Injection-molded of stress-resistant thermoplastic, the module is fitted with a special low-noise two-contact female audio connector precisely aligned and keyed to mate with a special two-pin male connector (and the three-position bass-rolloff switch with its filter network) within the microphone housing.

The microphone housing itself is a lightweight, yet impact-resistant zinc-alloy casting — elegantly styled, carefully balanced and finished in glare-free matte nickel. For maximum wear resistance, the finish is *electroplated* (not merely painted, as on competitive microphones). In conjunction with the windscreen/pop filter and the safety basket, this housing effectively encapsulates all internal parts against metal particles, dust and moisture spray.

Should field service ever become necessary, the windscreen/pop filter can be quickly unscrewed, the safety basket easily lifted out, and the transducer module simply unplugged and withdrawn from the microphone housing for replacement. Spare assemblies and parts are readily available.

The D-330BT is a low-impedance balanced-output unit fitted with a standard 3-pin male XLR-type connector. The microphone is supplied complete with an SA-31 stand adapter and a foam-lined vinyl protective case. Several optional accessories — listed in the Technical Data section — are available.

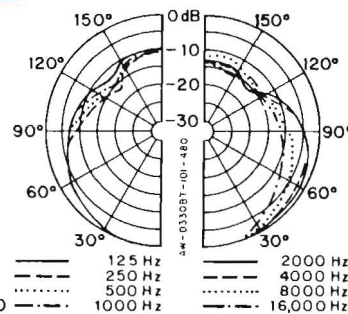
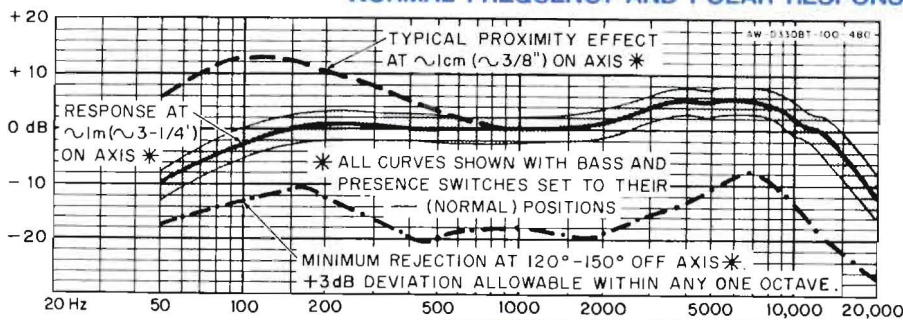
TECHNICAL DATA

Transducer Type: Dynamic
Directional Characteristic: Hypercardioid
Frequency Range (bass, presence set norm): 50-20,000 Hz
Nominal Impedance at 1 kHz (bass, pres set norm): 370 ohms
Rated-Impedance Category: 250 ohms
Recommended Load Impedance: ≥ 1000 ohms
Sensitivity at 1 kHz:
Open circuit: 1.2 mV/Pa; -58.4 dBV*
Maximum power level: -58.5 dBm (re: 1mW/10 dynes/cm²)
EIA G_m: -156 dBm
High-Z output w/MCH-20T,-20TS (optional): -48.5 dBV at 1 Pa*
Tolerance: +0, -1.5 dB
Sound Pressure Level for 1% THD:
40 Hz, 1000 Hz, 5000 Hz: 128 dB

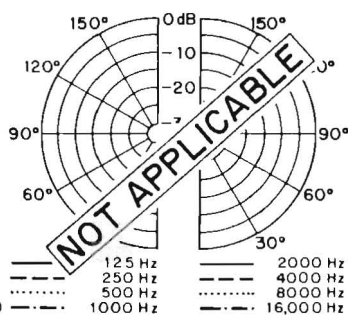
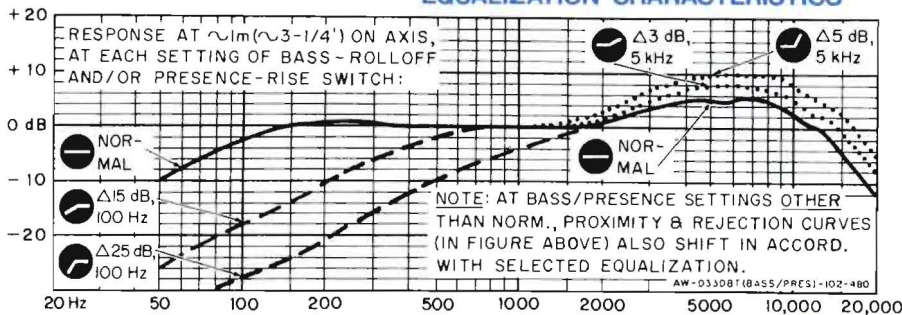
Hum Sensitivity (1 mG field; bass set norm): -143 dBm
Case Material: Nickel-plated die-cast zinc alloy
Dimensions: See Dimensions figure
Schematic: See Schematic figure
Net Weight: 340 g (≈ 12 oz)
Included Accessories:
SA-31 flex. snap-in stand adapter with 5/8-in. -27 thread
Foam-lined vinyl case
Optional Accessories:
SA-26 clothespin stand adapter with 5/8-in. -27 thread
PF-10 foam pop filter (red, blue, yellow, off-white, gray)
GN-7E, GN-20E modular flexible-gooseneck kits
KM-series floor and boom stands, stand accessories
ST-series table stands
MCH-series heavy-duty microphone cable assemblies

*1 Pa (Pascal) = 10 μ b = 10 dynes/cm² \approx 94 dB SPL

NORMAL FREQUENCY AND POLAR RESPONSE



EQUALIZATION CHARACTERISTICS



ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

OUTLINE: The microphone shall be a dynamic pressure-gradient type. As specified in subsequent detail, it shall have an intrinsically wide frequency range accompanied by a variable bass-versus-distance contour, a fixed presence-rise contour, and a highly uniform hypercardioid polar pattern with respect to frequency. As also specified in subsequent detail, it shall incorporate facilities for adjusting both its low-frequency and/or mid-high-frequency response characteristics in nine different combinations to suit user preferences and/or ambient acoustics, and shall maintain constant midband sensitivity and minimum midband impedance variations in all nine of these response combinations. As further specified in subsequent detail, it shall employ special modular design and construction techniques for exceptional resistance to impact damage and to noise (whether acoustically, mechanically, motionally, or electromagnetically induced), for protection from foreign particles, for fatigue-free handling balance and comfort under prolonged use, and for extraordinary ease of field service.

PERFORMANCE: The microphone shall have a normal, unequalized frequency range (i.e., frequency range unaltered by user adjustments of its low-frequency and/or mid-high-frequency response) of 50-20,000 Hz, accompanied by the following on-axis characteristics: (1) a 16 dB variable bass-versus-distance contour at 100 Hz that shall range from -3 dB response rolloff at a working distance of 1 m ($\approx 3\frac{1}{4}$ ft) to +13 dB typical proximity-effect boost at a working distance of 1 cm ($\approx 3/8$ in.); (2) a fixed presence-rise contour from 1500 Hz to 12,000 Hz that shall boost response +5 dB at 5000 Hz.

Under the normal, unequalized conditions previously specified, the microphone shall have a highly uniform hypercardioid directional pattern with respect to frequency as follows: (1) at a sound-incidence angle of 90 degrees, typical off-axis frequency response shall not vary more than 5-6 dB from 125-16,000 Hz; (2) at a sound-incidence angle of 120-150 degrees, minimum front-to-rear discrimination shall exceed 10 dB at 100 Hz, 18 dB at 1000 Hz, and 15 dB at 5000 Hz. An effective hypercardioid pattern shall be maintained over the entire frequency range.

Under the normal, unequalized conditions previously specified, and at 1000 Hz, the microphone shall have an open-circuit sensitivity of 1.2 mV/Pa (-58.4 dBV) and a nominal (true) impedance of 370 ohms. However, in accordance with various industry standards for calculating other sensitivity figures from this open-circuit value, the microphone's rated impedance shall be categorized as follows: (1) for a maximum-power-level output of -58.5 dBm (re: 1 mW/10 dynes/cm²), the rated impedance shall be categorized as 250 ohms; (2) for an EIA sensitivity rating (G_m) of -156 dBm, the rated impedance shall be categorized as 600 ohms. The microphone shall be capable of handling a maximum sound-pressure level of 50 Pa (128 dB SPL) at 1000 Hz with distortion not exceeding 1%.

Low-frequency response characteristics shall be adjustable by means of a three-position bass-rolloff switch accessible through a cutout in the microphone housing. The switch shall shift specified 100-Hz values of on-axis bass rolloff/proximity-effect boost, off-axis response, and front-to-rear discrimination in a fixed relationship as follows: (1) the switch position marked with the normal-response symbol shall maintain all normal values as specified; (2) the switch position marked with the medium-rolloff symbol shall adjust all normal values 15 dB downward;

(3) the switch position marked with the sharp-rolloff symbol shall adjust all normal values 25 dB downward.

Mid-high-frequency response characteristics shall be adjustable by a three-position presence-rise switch also accessible through the cutout in the microphone housing. The switch shall shift specified 5000-Hz values of on-axis presence rise, off-axis response, and front-to-rear discrimination in a fixed relationship as follows: (1) the switch position marked with the normal-response symbol shall maintain all normal values as specified; (2) the switch position marked with the medium-rise symbol shall adjust all normal values 2-3 dB upward; (3) the switch position marked with the sharp-rise symbol shall adjust all normal values 5 dB upward.

To provide nine different equalization contours, the microphone's bass-rolloff and presence-rise switches shall be separately and/or simultaneously adjustable in nine possible combinations of settings. To preserve optimum midband signal-to-noise ratios at all times, the associated equalization networks shall exhibit the following characteristics at 1000 Hz in all nine combinations of switch settings: (1) constant sensitivity; (2) minimum variations in the 370-ohm value of nominal impedance previously specified. With the bass-rolloff switch preset to one of its three positions at a time, and with the presence-rise switch stepped from normal through medium to sharp in each case, 370-ohm impedance shall vary as follows: (1) with bass rolloff preset to normal, impedance shall increase by approximately 0, +3%, and +11% respectively; (2) with bass rolloff preset to medium, impedance shall decrease by approximately -6%, -6%, and 0 respectively; (3) with bass rolloff preset to sharp, impedance shall decrease by approximately -33%, -33%, and -36% respectively.

DESIGN/CONSTRUCTION: To achieve all of the characteristics outlined or specified up to this point, the microphone shall consist of four special modular assemblies interrelated as follows: (1) a removable shock-absorbing three-layer windscreen/pop filter; (2) a removable safety basket, internally reinforcing the windscreen/pop filter and protecting the front of the transducer system; (3) a specially suspended and vibration/hum-compensated plug-in module, containing the transducer system plus the presence-rise switch with its associated network; (4) an impact-resistant main housing, mating with the first three assemblies and containing the bass-rolloff switch with its associated network plus the microphone's audio output connector. Specific details of all assemblies shall be as follows:

The three-layer windscreen/pop-filter assembly shall effectively suppress wind noise, breath pop, and similar acoustic interference, and shall also partially isolate the transducer module from the effects of head-on impact damage. The assembly shall consist of a shock-absorbing stainless-steel wire-mesh outer layer, a removable liner made up of a blast-diffusing fabric middle layer sandwiched with an open-cell reticulated polyurethane-foam inner layer, and an internally threaded retaining ring to mate the entire assembly securely with an external thread on the main housing.

The internal safety-basket assembly shall be specially contoured to fit supportively just inside the windscreen/pop filter and protectively around the front of the transducer module, thus reinforcing the wind-

continued overleaf



ARCHITECTS' AND ENGINEERS' SPECIFICATIONS (Continued)

screen/pop filter against, and additionally isolating the transducer module from, the effects of head-on impact damage. The safety basket shall consist of a resilient dome-shaped ribbed cage, joined to a reinforced truncated-conical open-frame casting fitted with fine-wire-mesh screen to coincide with side ports in the main housing and having indexing notches to align the entire assembly with structural members in the main housing.

To further isolate the transducer module from the effects of impact damage, as well as to reduce the effects of handling noise and spurious vibrations, the entire module shall float uniformly in all directions within the main housing. This degree of isolation shall be achieved by means of two special ring-shaped elastomer suspensions, one fitted around the module near its front end, and the other fitted to the module at its rear end. To combine the advantages of both hard and soft suspension designs in the form of a complex, highly damped low-pass mechanical filter, each of these ring suspensions shall have a dense, relatively hard body and a series of compliant, progressively compressible dome-shaped projections around its periphery that shall function as follows: (1) under normal handling conditions, the compliant domes shall effectively decouple the transducer module from mechanically and motionally induced handling noise; (2) under extremely abusive conditions (e.g., dropping the microphone or subjecting it to lateral impact), the domes shall increasingly compress, in proportion to applied g-force, in a progressive braking action that shall ultimately allow the harder body of each suspension to act as a bumper.

To further reduce the effects of mechanically and motionally induced handling noise by an additional 30 dB at 100 Hz, the transducer module shall employ two coaxially mounted moving-coil transducers working together in a special noise-bucking arrangement. One transducer shall serve as the main (sound-pickup) device, and the other transducer shall serve as a special electromechanical (nonacoustic) noise-compensating device acting strictly as a motion-sensing accelerometer. The main transducer shall be positioned closest to the front of the module, shall face forward, shall be computer-designed for widest possible frequency range and optimum transient response, shall employ a nonmetallic MAKROFOL™ diaphragm, and shall further incorporate a hum-bucking winding to cancel the effects of stray magnetic fields from power and lighting cables, dimmers, and power switchboards. The noise-compensating transducer shall be positioned behind the main transducer, shall face rearward, and shall employ a nonmetallic MAKROFOL™ dummy diaphragm having exactly the same mass and compliance as the main transducer's diaphragm. The two transducers shall be connected in parallel and electrically in phase (i.e., inward direction of diaphragm movement in each shall generate like polarity of output signal from each). However, because of their opposed orientation, the two transducers shall operate effectively out of phase so that any handling-noise signal generated by the main transducer shall be nulled by an equal but opposite handling-noise signal generated by the noise-compensating

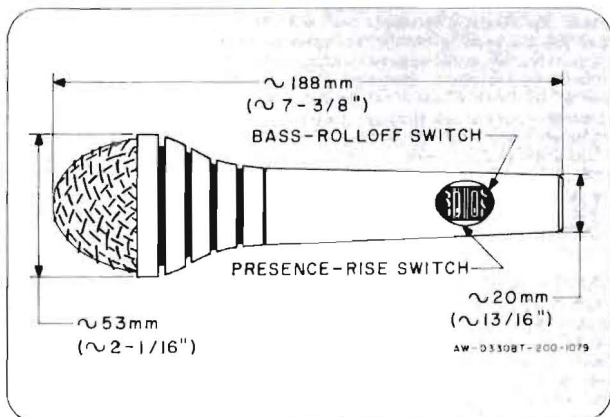
transducer. To provide the adjustable presence-rise characteristics previously specified, the transducer module shall also incorporate a low-noise SP3T switch with a tapped inductor. These shall interrelate with the transducer system as follows: (1) the normal position of the switch shall disconnect the inductor completely; (2) the medium-rise (+2-3 dB) position of the switch shall connect a tapped portion of the inductor in series with the noise-compensating transducer; (3) the sharp-rise (+5 dB) position of the switch shall connect the entire inductor in series with the noise-compensating transducer. The body of the transducer module shall be injection-molded of stress-resistant thermoplastic, and shall be fitted at its rear end with a two-contact female audio connector precisely aligned and keyed to mate the entire module securely and noiselessly with a two-pin male audio connector within the main housing.

The main housing shall incorporate the following three major elements: (1) an internal two-pin male audio connector precisely aligned to mate securely and noiselessly with the two-contact female audio connector at the rear end of the transducer module; (2) an external three-pin male audio connector designed to mate with Cannon XLR, Neutrik 3FC, Switchcraft A3F, or equivalent connectors; (3) a low-noise SP3T switch with a tapped inductor to provide the adjustable bass-rolloff characteristics previously specified. The switch and inductor shall interrelate with the system within the transducer module as follows: (1) the normal position of the switch shall disconnect the inductor completely; (2) the medium-rolloff (-15 dB) position of the switch shall connect the entire inductor in parallel with the main and noise-compensating transducers; (3) the sharp-rolloff (-25 dB) position of the switch shall connect a tapped portion of the inductor in parallel with the main and noise-compensating transducers. The main housing shall also incorporate structural members to mate with the indexing notches on the safety basket, and an external thread to mate with the internal thread on the windscreen/pop filter. In conjunction with those two assemblies, the main housing shall protect the transducer module from metal particles, dust, and moisture spray. The main housing shall be a lightweight impact-resistant zinc-alloy casting, and shall have an electroplated matte-nickel finish for maximum wear resistance and for freedom from specular light reflections.

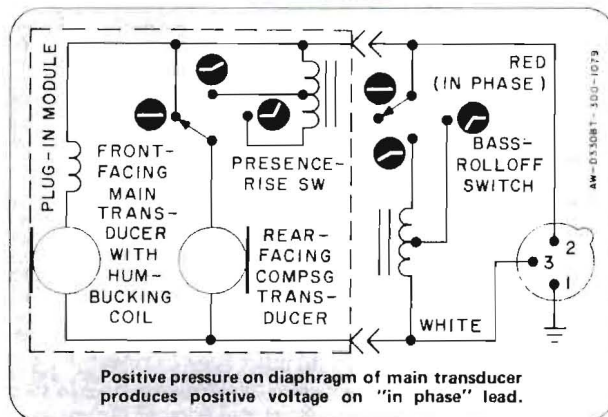
The assembled microphone shall be 188 mm ($\approx 7\text{-}3/8$ in.) long by 53 mm ($\approx 2\text{-}1/16$ in.) in maximum diameter by 20 mm ($\approx 13/16$ in.) in minimum diameter, and the net weight shall not exceed 340 g (≈ 12 oz). The microphone's weight distribution and shape shall be such that they promote fatigue-free handling balance and comfort under prolonged use. To facilitate field service, all four constituent assemblies of the microphone shall be quickly and easily separable for replacement or repair.

An AKG model SA-31 swivel stand adapter with standard 5/8-in. $\text{-}27$ thread, and a foam-lined vinyl carrying case shall be provided with the microphone. The microphone herein specified shall be the AKG D-330BT.

DIMENSIONS



SCHEMATIC



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