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PROFESSIONAL PRODUCTS

The Shure Model SM84 is a professional-quality, miniature, lavalier condenser microphone designed for the most demanding applications in broadcasting and sound reinforcement. It is especially suitable for applications requiring wide frequency response, low distortion and RF susceptibility, and reliable operation over a wide range of temperature and humidity extremes.

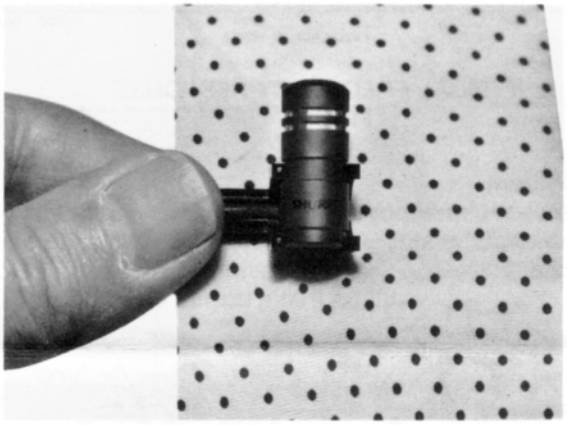
The SM84 features a supercardioid (unidirectional) pickup pattern that rejects unwanted sound "bleed" and permits greater gain-before-feedback than omnidirectional microphones. In addition, the microphone has a specially tailored frequency response designed to provide more natural "stand mike" sound when the microphone is chest-worn. This response is achieved by an electronically created dip at 730 Hz to compensate for the "chest resonance" phenomenon, and by an acoustically generated high-frequency boost for a flatter response in the lavalier position. In addition, a 12 dB/octave rolloff below 100 Hz helps reduce room noise and other undesirable low-frequency signals.

The SM84 consists of the following: microphone with attached amplifier cable; amplifier assembly with attached cable and three-pin professional audio connector; two mounting blocks for lanyard, safety pin, or sewn mounting; single mounting block with tie bar; dual mounting block with tie bar; and acoustic windscreen to minimize wind noise in outdoor applications such as live remotes and political rallies. A heavy-duty, compartmented, zippered carrying/storage bag is also provided.

The SM84 is designed for powering from a readily available 9-volt battery (not supplied) installed in the amplifier assembly, or phantom powering from broadcast, sound reinforcement or recording equipment or an external supply. An automatic power switchover feature provides for automatic switching between phantom and battery powering. The SM84 operates over an extremely wide voltage range of 5 to 52 Vdc, covering both DIN Standard 45 596 phantom voltages of 12 and 48 volts, and the proposed 24-volt standard. A dual-channel power supply (Model PS1A) is available for providing phantom power to the SM84.

In addition to its small size, the SM84 is finished in non-reflective black for minimum on-camera distraction. The microphone cable emerges from the side, rather than the bottom, of the microphone housing; when used with the supplied mounting accessories, this arrangement makes the thin, strong microphone cable even more unobtrusive.

The SM84's amplifier assembly also incorporates a number of unusual design features. The small high-impact plastic case makes a handy, "pocketable"



package, and a belt clip permits the amplifier to be clipped to the belt or waistband. The amplifier is fully shielded from RFI and other noise sources, and there are no switches to fail. The amplifier is activated upon insertion of the battery—it only fits one way—in the hinged door. Even if the battery is forgotten, the efficient circuit design provides two months' continuous operation with a fresh alkaline battery.

Features

- Supercardioid pickup pattern for minimal "bleed" from unwanted sources and greater gain-before-feedback
- Wide-range frequency response specially tailored for chest-worn microphone operation
- Controlled low-frequency rolloff reduces low-frequency clothing and room noise
- Low distortion and wide dynamic range characteristics under various load impedances
- Very low susceptibility to RFI and electrostatic and magnetic hum
- Wide-range phantom powering accepts all commonly used voltages
- Tiny size, light weight and non-reflective finish for inconspicuous on-camera use
- Usable over wide range of temperature and humidity conditions
- Rugged construction for outstanding reliability
- Versatile mounting accessories permit fast and simple user installation
- Amplifier assembly can be pocketed, strapped to body, or clipped to belt or waistband

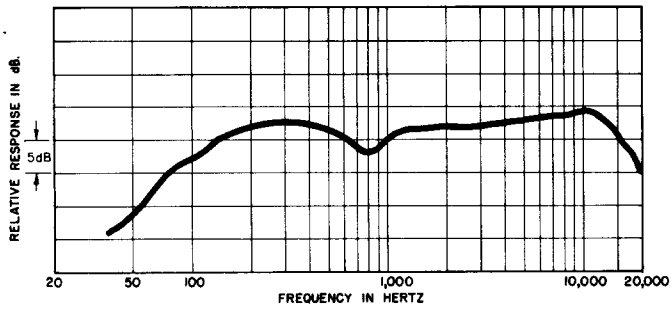
SPECIFICATIONS

Type
Condenser (electret bias)

Frequency Response
80 to 20,000 Hz (see Figure 1)

27A2342 (KL)

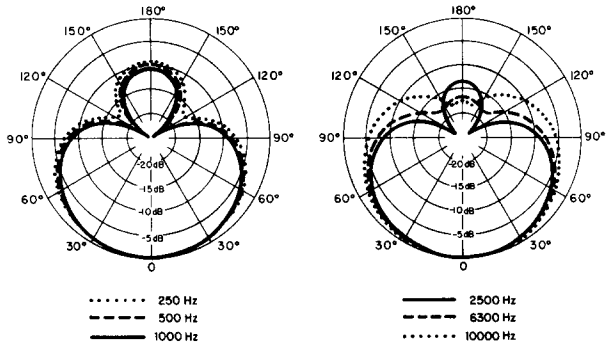
Printed in U.S.A.
U.S. Patent 4,577,070



TYPICAL FREQUENCY RESPONSE
FIGURE 1

Polar Pattern

Supercardioid response—narrower than cardioid for higher directionality, superior rejection of undesirable sounds



TYPICAL POLAR PATTERNS
FIGURE 2

Output Impedance

Rated at 150 ohms (90 ohms actual)

Recommended minimum load impedance: 800 ohms (May be used with loads as low as 150 ohms with reduced clipping level)

Output Level (at 2,000 Hz)

Open Circuit Voltage ..... —73 dB (0.22 mV)
(0 dB = 1 volt per microbar)

Clipping Level (at 2,000 Hz)

800-ohm Load ..... —17 dBV (0.14V)
150-ohm Load ..... —28 dBV (0.04V)

Total Harmonic Distortion

Less than 1% (126 dB SPL at 2,000 Hz into 800-ohm load)

Maximum SPL

131 dB with 800-ohm load
123 dB with 150-ohm load

Hum Pickup

—3 dB equivalent SPL in a 1 millioersted field (60 Hz)

Output Noise (equivalent sound pressure levels; measured with true rms voltmeter)

30 dB typical, A-weighted
34 dB typical, weighted per DIN 45 405

Dynamic Range

101 dB (maximum SPL to A-weighted noise level)

Signal-to-Noise Ratio

64 dB (IEC 651) at 94 dB SPL

Phasing

Positive pressure on diaphragm produces positive voltage on pin 2 relative to pin 3

Power

Battery: 9 Vdc (type 1604A, alkaline recommended); 0.33 mA current drain; approximately 1600 hours continuous use with fresh alkaline battery

Phantom Voltage: 5 to 52 Vdc; 0.33 mA current drain

Protected against reverse voltage application

Environmental Conditions

Operating Temperature . . —18° to 60°C (0° to 140°F)
Storage Temperature. —29° to 66°C (—20° to 150°F)

Cables

Microphone: 3m (10 ft) attached, two-conductor, shielded with miniature 3-pin connector*

Amplifier: 3m (10 ft) attached, two-conductor, shielded, TRIPLE-FLEX® with 3-pin professional audio connector**

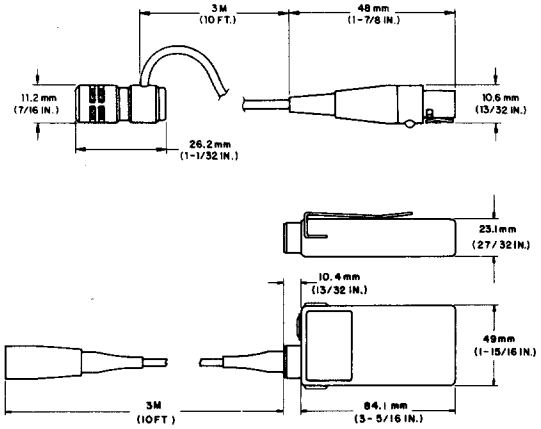
Case

Microphone: Brass construction with flat black finish and black steel-mesh grille

Amplifier: Black molded high-impact plastic with detachable belt clip

Dimensions

See Figure 3



OVERALL DIMENSIONS
FIGURE 3

Net Weight

Microphone: 45 grams (1.58 ounces)
Amplifier: 270 grams (9.45 ounces) including battery

*Designed to mate with Switchcraft TA3 series or equivalent.

**Designed to mate with Cannon XL series, Switchcraft A3 (Q.G.) series or equivalent connectors.

BATTERIES

The SM84 is normally powered by a 9-volt battery (alkaline types are recommended). Under normal operating conditions, a fresh alkaline battery should provide approximately 1600 hours of operation. Recommended battery types are:

Duracell MN1604	NEDA 1604A
Eveready 522	IEC 6LR22
Bright Star 7590	Japanese 6AM6
Ray-O-Vac A1604	Varta 4022
Radio Shack 23-553	U.S. Military BA3090

Note that the SM84 is designed without an on-off switch; the amplifier is on whenever a "good" battery is inserted or phantom power is applied. The highly efficient circuit can operate for two months continuously with a fresh alkaline battery.

To insert the battery, depress the ridged area of the case and swing the hinged door outward. Insert the battery in the compartment, battery terminals toward the hinge and positive terminal inward (the negative contact is marked inside the compartment). Depress the battery slightly and hook it under the "ledge" in the compartment. The ledge and spring contacts will retain the battery even if the door or hinges are damaged. Close and lock the door. Note that the door will not lock if the battery is incorrectly inserted; the positive and negative contact areas accept only the corresponding battery terminals.

Note too that no current is drawn from the battery when a phantom voltage higher than the battery voltage is applied. Phantom power can be used whether or not a battery is in place.

To prevent battery drain when the unit is not in use, the battery should be removed or stored in the battery compartment upside down (contacts upward) and positive contact inward. If the unit is not used for a prolonged period, the battery should be removed to prevent possibility of damage from leakage.

PHANTOM POWERING

The SM84 is designed for phantom powering by virtually any microphone power supply providing 5 to 52 Vdc phantom voltage. The Shure Model PS1A Power Supply will provide phantom power to one or two SM84 microphones. Phantom powering uses the balanced audio cable pair to carry the supply current to the microphone, and the cable shield as a ground return.

Use only high-quality cables, as intermittent shorts between broken shield wires and balanced conductors will cause objectionable noise transients in the system. A reliable ground path is essential for the same reason.

MICROPHONE LOADING

A minimum load impedance of 800 ohms or greater should be used for maximum signal handling and minimum distortion. The load can be as low as 150 ohms, but a reduction in output clipping level will result. It should be noted that the power supply itself may add loading (3300 ohms in the Shure PS1A) to the microphone.

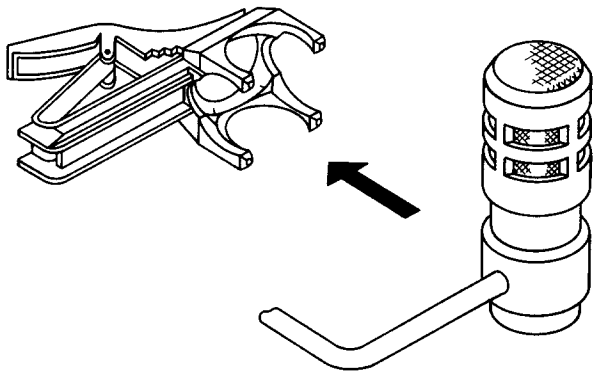
WIND NOISE

A lavalier microphone generally needs no windscreen for proper operation. However, when used outdoors under windy conditions, the SM84's acoustic foam windscreen helps eliminate the unpleasant "rushing" noise associated with outdoor miking.

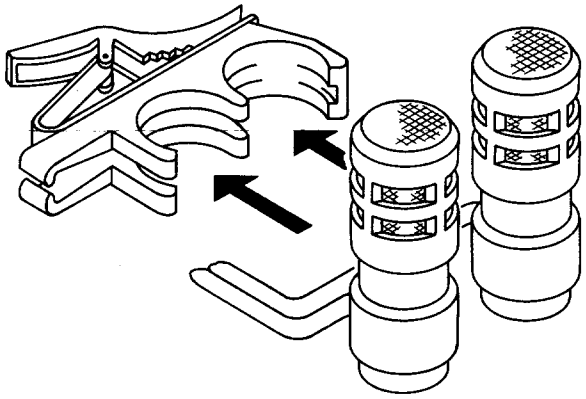
MICROPHONE MOUNTING

Both the single-mount and dual-mount tie bars attach to a blouse, shirt, coat or tie using the spring-loaded tie clasp. After the microphone is snapped into the mounting block, the cable is tucked into the channel behind the microphone (see Figure 4). Note that the dual-mount tie bar requires that the microphone furthest from the tie clasp be inserted first (Figure 5).

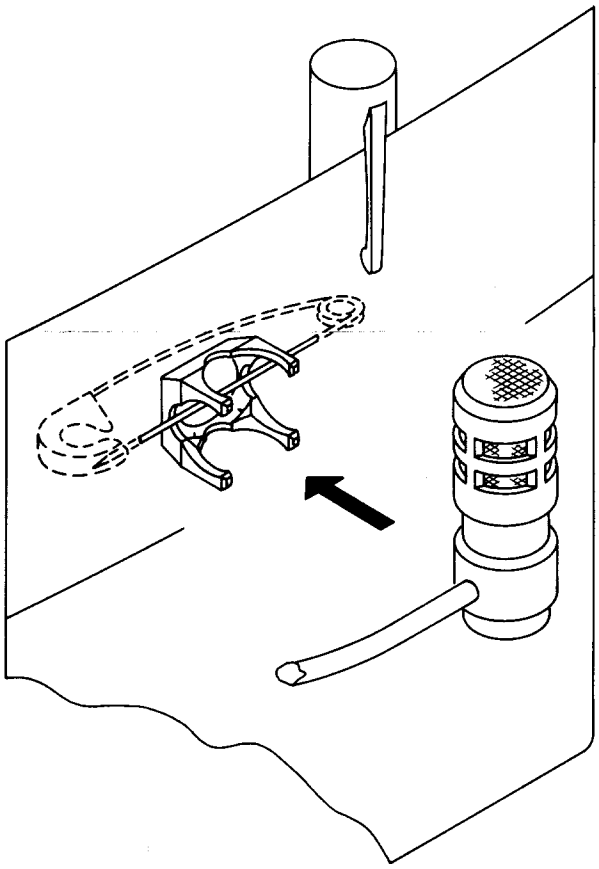
The mounting blocks provided with the SM84 are highly versatile mounting aids. Some of the many methods of mounting include the following (see Figure 6):



SINGLE-MOUNT TIE BAR
FIGURE 4

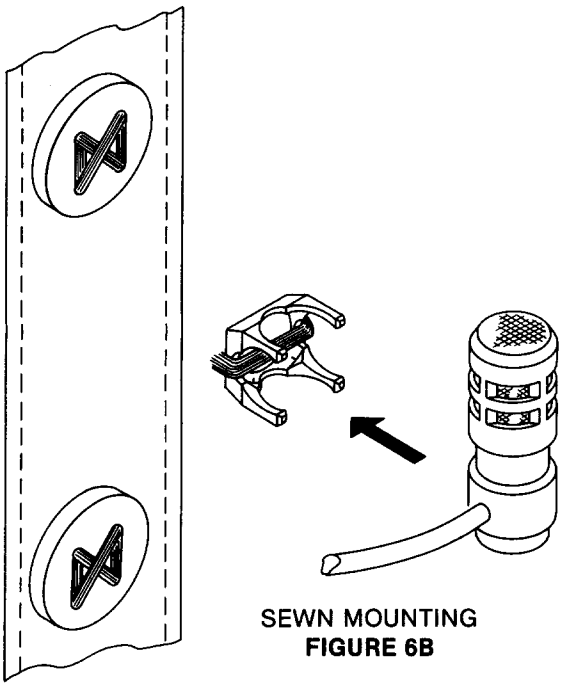


DUAL-MOUNT TIE BAR
FIGURE 5



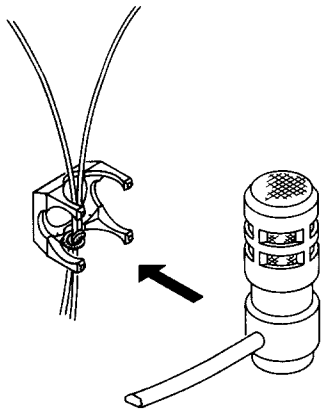
SAFETY PIN MOUNTING
FIGURE 6A

1. **Safety Pin.** With the safety pin inside the clothing and the mounting block outside the clothing, secure the block with the pin running either vertically or horizontally through one of the narrow channels in the block (see Figure 6A).
2. **Sewing.** The mounting block can be sewn like a button using the narrow channels in the block as guides for the thread (see Figure 6B). Dark thread is recommended.



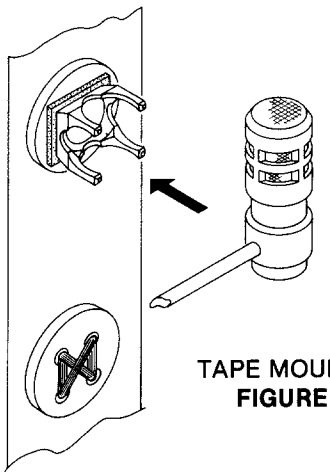
SEWN MOUNTING
FIGURE 6B

3. **Lanyard.** The narrow channels of the mounting block will accept a lavalier-type lanyard for mounting in the conventional lavalier manner (see Figure 6C). Note that the microphone, mounting block and cable are not held against the body in this mode; body movements can result in objectionable thumping noise unless the cable is secured.



LANYARD MOUNTING
FIGURE 6C

4. **Tape.** With a heavy-duty, double-coated foam tape such as 3M's No. 4032, the mounting block can be fastened to almost any non-porous, fairly flat surface. Buttons are especially useful for this type of mounting. A surface area at least 13 mm (½ inch) across should be used. (See Figure 6D).



TAPE MOUNTING
FIGURE 6D

Note that in all uses of the mounting block, the side-exit cable design minimizes distracting cable loops and provides a direct cable path inside the clothing.

Other mounting methods, such as the use of VELCRO, can be devised and obtained in fabric or hardware stores.

AMPLIFIER MOUNTING

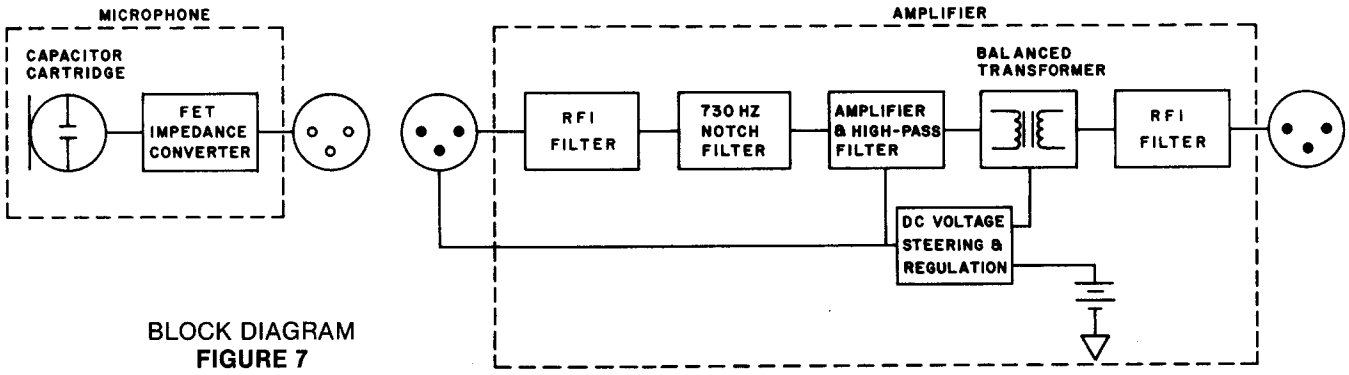
Most SM84 applications require that the amplifier be worn on the body. The spring-loaded belt clip holds the amplifier to a belt, skirt or trouser waistband, or inside pocket.

The belt clip can be removed from the case and the amplifier placed on a nearby horizontal surface or worn in an inside pocket without any retention method. Clip removal requires disassembly of the case (two Phillips screws in the case and two slotted screws in the connector collar).

Note that the "W-shaped" belt clip permits the power supply to be worn with the cable end either upward or downward, depending on the speaker's comfort and the particular application.

CIRCUIT DESCRIPTION

A block diagram of the SM84 is shown in Figure 7. The capacitor cartridge is followed by a field-effect transistor impedance conversion stage. The FET output is coupled through a two-conductor, shielded cable and miniature three-pin connectors to the amplifier assembly. The first stage in the amplifier is a 730 Hz "chest resonance" notch filter. The filter output enters a compound transistor, Class A, emitter-follower amplifier and 12 dB/octave active high-pass filter. The circuit output is transformer-coupled, providing a balanced output. Both the input and the output of the preamp have RFI protection filters. A constant-current power supply circuit regulates the powering voltage, allowing maximum battery life and operation over the widest range of phantom voltages. Reverse voltage protection diodes automatically select phantom powering when the applied phantom voltage exceeds the battery voltage, and guard against miswired cables and equipment. The circuit provides low noise, low distortion, wide frequency response and dynamic range, low output impedance, and reliable operation over a wide range of working environments.



BLOCK DIAGRAM
FIGURE 7

SERVICING

TROUBLESHOOTING

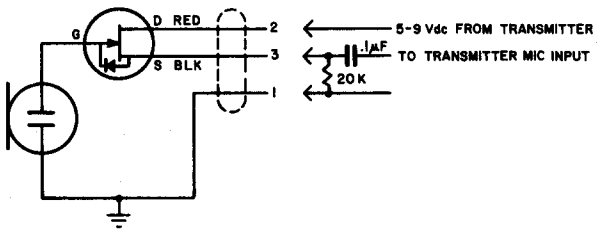
The following steps should be taken if problems arise.

1. Check to see that battery voltage (or external voltage on pins 2 and 3 of cable output connector) is adequate.
2. If a second SM84 is available, interchange microphones and amplifiers to localize the problem.
3. Remove the amplifier case cover* and check the voltages against those given in the circuit diagram.
4. Check the microphone and amplifier cables for continuity.

*Remove four screws: two Phillips in the case and two slotted in the connector collar.

ALTERNATE APPLICATIONS

The SM84 can be used without its supplied amplifier for alternate applications such as wireless microphones. No additional circuitry is required for Shure wireless microphone systems and some other brands. Check the manufacturer's wiring diagrams before attempting to use the SM84 in such applications. Note that operation without the Shure amplifier removes the 730 Hz dip that eliminates the "chest resonance" phenomenon for optimized "natural" sound. A typical wireless microphone transmitter input (preferably 10 kilohms or more input impedance) is depicted in Figure 8. With a well-filtered 5 to 9 Vdc transmitter voltage available for application to pin 2, approximately 2V appears at pin 3, which will be wired to the transmitter microphone input. A 0.1 μF dc blocking capacitor should be wired into the microphone input (if not already present). A 20-kilohm resistor should be wired across pins 1 and 3.



WIRELESS MICROPHONE INPUT
FIGURE 8

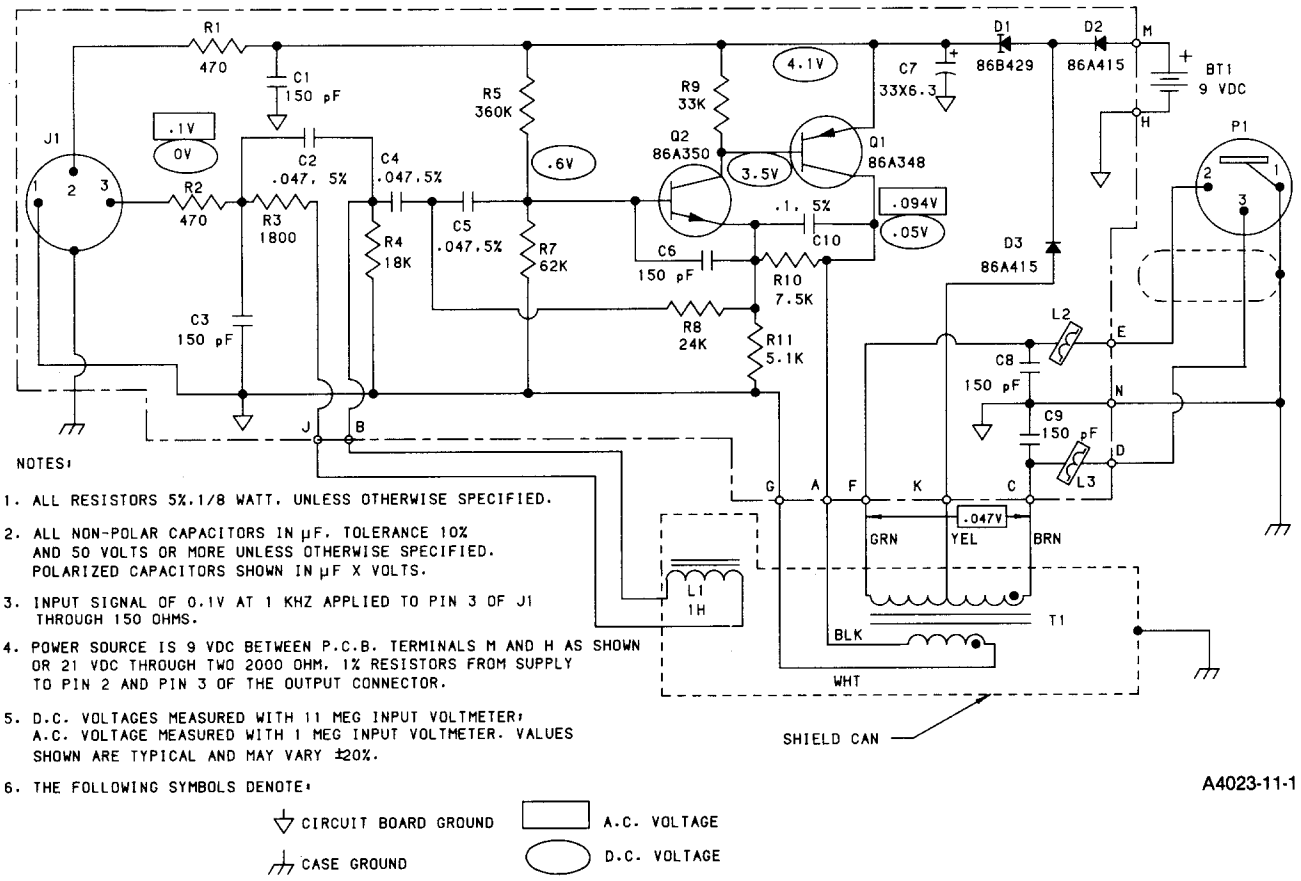
REPLACEMENT PARTS

Microphone Cartridge-Housing	R146
Microphone-Amplifier Cable	C109
Battery Compartment Door	65A1536
Belt Clip	44A279
Carrying/Storage Bag	26A08

FURNISHED ACCESSORIES*

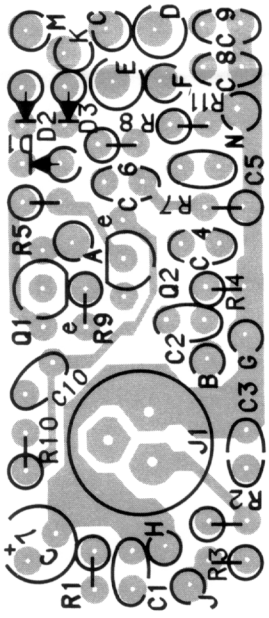
Mounting Block	RK239MB
Single-Mount Tie Bar	RK240SB
Dual-Mount Tie Bar	RK241DB
Windscreen	RK261WS

*EACH KIT CONTAINS FOUR (4) UNITS.



AMPLIFIER CIRCUIT DIAGRAM

AMPLIFIER PRINTED CIRCUIT BOARD



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AMPLIFIER REPLACEMENT PARTS LIST

Reference Designation	Part Number	Description	Commercial Alternate
A1	90A8288	Printed Circuit Board Assembly	None
C7	86B651	Capacitor, Tantalum, 33 µF, 6.3 Vdc	Sprague 196D336X9010KA1
D1	86B429	Diode, Current Regulator, 100 V, 0.33 mA	Motorola 1N5287
D2, D3	86A415	Diode, Computer, 75V, 0.4A	TI/GE 1N4148
J1	95A8077	Connector, Receptacle, Miniature 3-pin	Switchcraft TB3M
L1	95A976	Inductor, 1H	None
L2, L3	80A253	Ferrite Bead Ring	Stackpole 57-0180
P1	90BT2600	Connector, Receptacle, 3-pin	None
Q1	86A348	Transistor, PNP	Motorola 2N5087
Q2	86A350	Transistor, NPN	Motorola 2N5210
T1	51B286	Transformer, Audio	None
W1	90A3792	Cable and Connector Assembly (incl. P1)	None