

SHURE®

MODEL SM15 UNIDIRECTIONAL HEAD-WORN CONDENSER MICROPHONE



The Shure Model SM15 is a unidirectional headworn electret condenser microphone primarily designed for high-quality sound reinforcement applications. Its high output and excellent acoustic properties also make it a good choice for use in broadcasting, talk-back, paging, communications, and data entry. The SM15 is one of the few headworn microphones available today that closely approximates the best in hand-held/stand-mount vocal microphones.

The SM15's smooth, natural voice frequency response makes it ideal for drummers, keyboard artists and other musicians requiring a vocal microphone with all the qualities of a hand-held unit—the SM15 can be used under noisy conditions without loss or masking of voice signals.

A small, lightweight, rugged and reliable unit, the SM15 has provisions for mounting to a supplied headband with cushioned arms. The dual steel headband holds securely without causing discomfort for active microphone users. A pivot housing permits the microphone boom to be moved 20° in any direction, and the distance between the microphone and pivot can be changed by up to 89 mm (3-1/2 in.).

The SM15's amplifier is constructed of high-impact ARMO-DUR®, making it compact, lightweight, and extremely rugged. It can easily be clipped to a belt or waistband, or slipped into a pocket. It is powered by a readily available 9-volt battery or by phantom power from an external source providing 5-52 Vdc (such as a Shure PS1A power supply or M267 or M268 microphone mixer). The amplifier incorporates extensive RF and hum shielding to reduce the effects of electromagnetic and electrostatic interference. Connections between the microphone and amplifier are made through a miniature 3-pin connector.

The SM15 is supplied with a windscreens to protect against wind noise and explosive breath sounds, and a foam-lined carrying/storage case.

Features

- Close-talk operation and unidirectional polar pattern for effective noise reduction
- High sound pressure level capacity
- Smooth, natural frequency response, tailored for voice
- Low distortion and wide dynamic range characteristics under various load impedances
- Wide-range phantom powering accepts all commonly used voltages; can also be battery-powered
- Acoustically isolated for maximum feedback freedom
- Locking adjustment knob permits 20° boom pivot in any direction. Boom mounts on either side of headband
- Boom length adjustment through 89 mm (3-1/2 in.)
- Dual headband design plus serrated arms minimize accidental movement
- Lightweight design prevents user fatigue
- No interference with eyeglasses
- Ruggedly constructed of stainless steel, aluminum and high-impact thermoplastic
- Usable over wide range of temperature and humidity conditions
- Amplifier assembly can be pocketed, strapped to body, or clipped to belt or waistband

ASSEMBLY

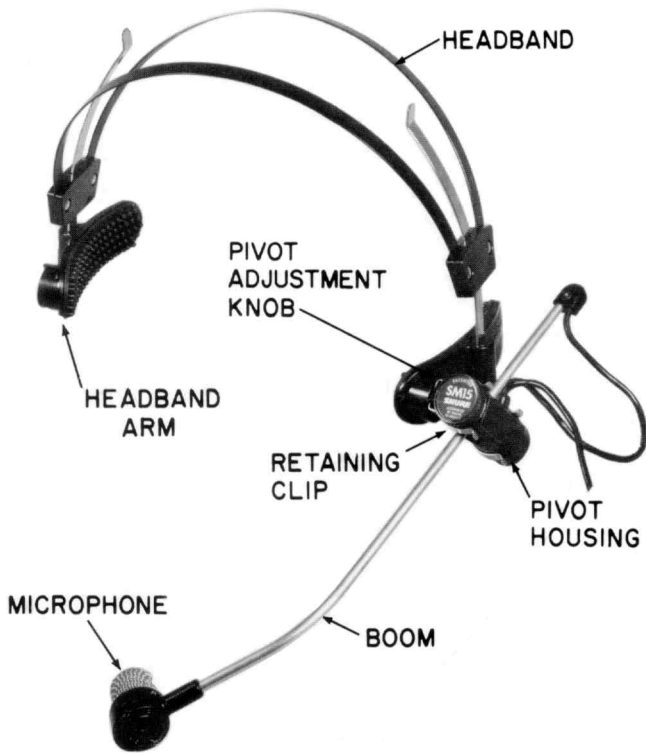
Assemble the SM15 for use as follows:

1. Twist the lower headband arms 90° so they are perpendicular to the headband. As supplied, the retaining clip is positioned for left side operation as shown in Figure 1. For right side usage (see photo), remove the retaining clip and attach it to the other (unused) hole in the headband arm so the screw is at the top.
2. Snap the microphone pivot housing into the retaining clip with the pivot adjustment knob upward and the microphone toward the front. Loosen the pivot adjustment knob, position the boom so that the microphone is near where the side of the mouth will be, and tighten the pivot adjustment knob.
3. Place the assembled microphone on the user's head and pull the headband arms downward until they rest against the head just over the ears.
4. Loosen the pivot adjustment knob and position the microphone as close as possible to the corner of the mouth. **IMPORTANT:** For optimum close-talking operation, the microphone should be less than 25mm (1 in.) from the corner of the mouth. Be sure to position the microphone at the corner (not the center) of the mouth to eliminate explosive breath sounds ("pop"). Tighten the adjustment knob.

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SHURE
MODEL SM15

5. Connect the SM15 microphone cable to the amplifier assembly.
6. Insert a fresh 9-volt battery in the amplifier battery compartment (see Batteries section) and connect the amplifier 3-pin XLR connector to the mixer input connector, or phantom-power the SM15 by connecting the amplifier (without battery) to a microphone powersupply providing 5 to 52 Vdc phantom voltage. This can be a separate phantom power supply, or a mixer or amplifier with provisions for phantom powering (see Phantom Powering section).
7. Place the amplifier assembly in the desired position (see Amplifier Mounting section).



SM15 POSITIONED FOR LEFT SIDE OPERATION
FIGURE 1

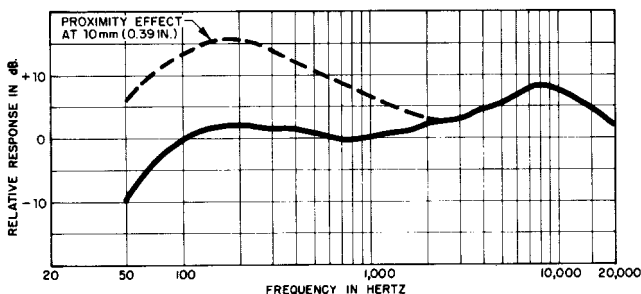
SPECIFICATIONS

Type

Condenser (electret bias)

Frequency Response (at 76 mm–3 in.)

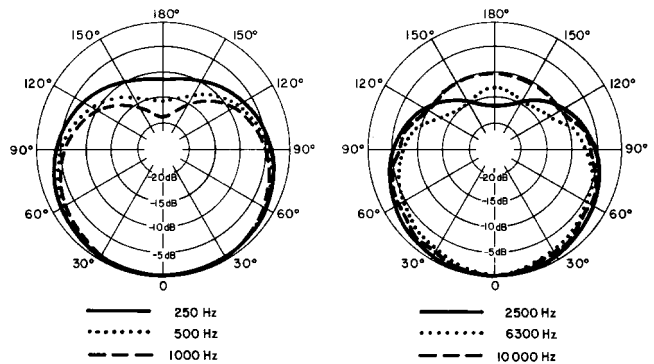
50 to 15,000 Hz (see Figure 2)



TYPICAL FREQUENCY RESPONSE
FIGURE 2

Polar Pattern

Cardioid (unidirectional) response—uniform with frequency, symmetrical about axis (see Figure 3)



TYPICAL POLAR PATTERNS
FIGURE 3

Output Impedance

Rated at 150 ohms (95 ohms actual)
Recommended minimum load impedance: 800 ohms
(may be used with loads as low as 150 ohms with reduced clipping level)

Output Level (close-talked at 1,000 Hz)

Open Circuit Voltage
–40.5 dB (0.9 mV) at 610 mm (24 in.)
–39 dB (1.1 mV) at 10 mm (0.39 in.)
(0 dB = 1 volt per 100 microbars)

Clipping Level (at 1,000 Hz)

800-ohm Load –13 dB (0.22V)
150-ohm Load –27 dB (0.045V)

Total Harmonic Distortion

Less than 1% (138 dB SPL at 1,000 Hz into 800-ohm load)

Maximum SPL

141 dB with 800-ohm load
130 dB with 150-ohm load

Hum Pickup

Less than or equal to 0 dB equivalent SPL in a 1 millioersted field (60 Hz)

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

32 dB typical, A-weighted
38 dB typical, weighted per DIN 45 405

Dynamic Range

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

Signal-to-Noise Ratio

62 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 battery

Phantom Voltage: 5 to 52 Vdc; 0.33 mA current drain
Protected against reverse voltage application

Environmental Conditions

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

Cables

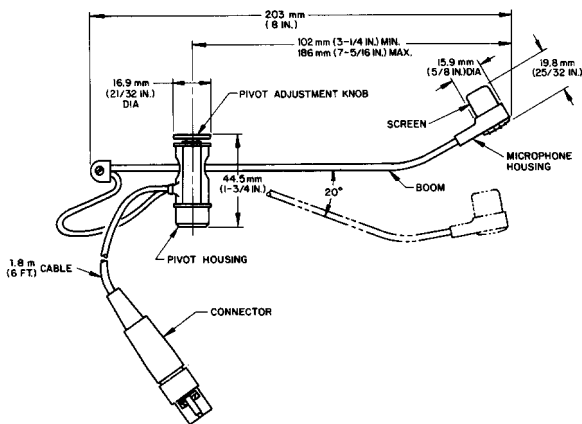
Microphone: 1.2m (4 ft) attached, two-conductor, shielded with miniature 3-pin connector designed to mate with Switchcraft TA3 series or equivalent.
Amplifier: 3m (10 ft) attached, two-conductor, shielded with 3-pin XLR audio connector designed to mate with Cannon XL series, Switchcraft A3 (Q-G) series or equivalent connectors

Case

Microphone: Black thermoplastic microphone and pivot housing, anodized aluminum end caps, stainless steel grille and boom
Amplifier: Black molded high-impact ARMO-DUR® with detachable belt clip

Dimensions

See Figure 4



OVERALL DIMENSIONS
Figure 4

Net Weight

Microphone: 78 grams (2.8 ounces)
Amplifier: 270 grams (9.45 ounces)

BATTERIES

The SM15 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 SM15 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.

To prevent battery drain when the unit is not in use, the battery should be removed or stored in the battery compartment upside down (battery terminals facing in the opposite direction from the amplifier contacts) and positive battery terminal inward. If the unit is not to be used for a prolonged period, the battery should be removed to prevent possible damage from leakage.

Note 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 the amplifier.

PHANTOM POWERING

The SM15 is designed for phantom powering by virtually any microphone power supply providing 5 to 52 Vdc phantom voltage. The Shure PS1A power supply will provide phantom power to one or two SM15 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 extension 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 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.

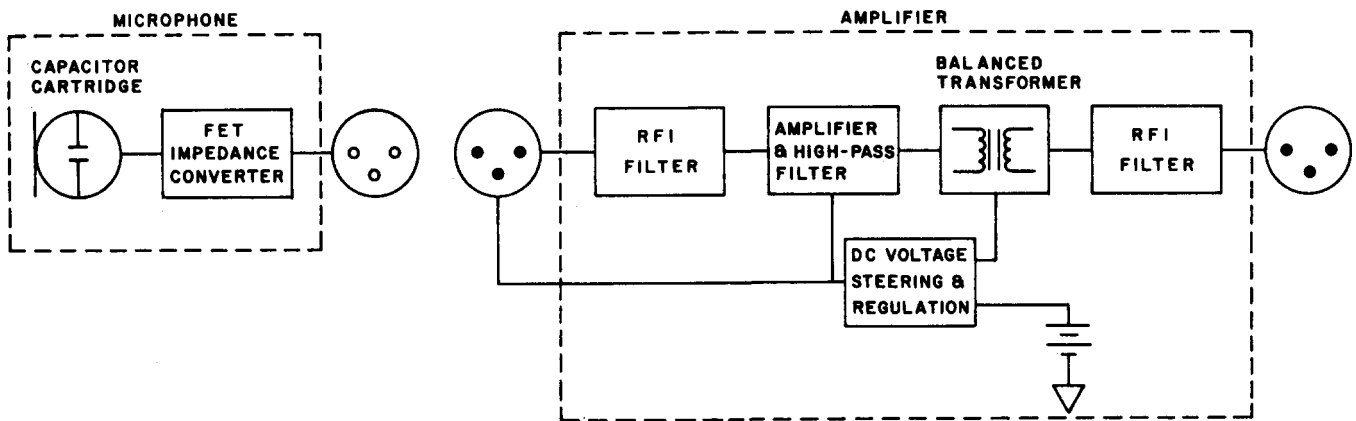
WIND NOISE

A head-worn microphone generally needs a wind-screen for proper operation. When used outdoors under windy conditions, the SM15’s acoustic foam windscreen helps eliminate the unpleasant “rushing” noise associated with outdoor miking.

AMPLIFIER MOUNTING

Most SM15 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 head screws in the case and two slotted head screws in the connector collar).



BLOCK DIAGRAM
Figure 5

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 SM15 is shown in Figure 5. 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 an RFI filter, whose 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. The preamp output is also RFI-filtered.

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.

TROUBLESHOOTING

The following steps should be taken if problems arise.

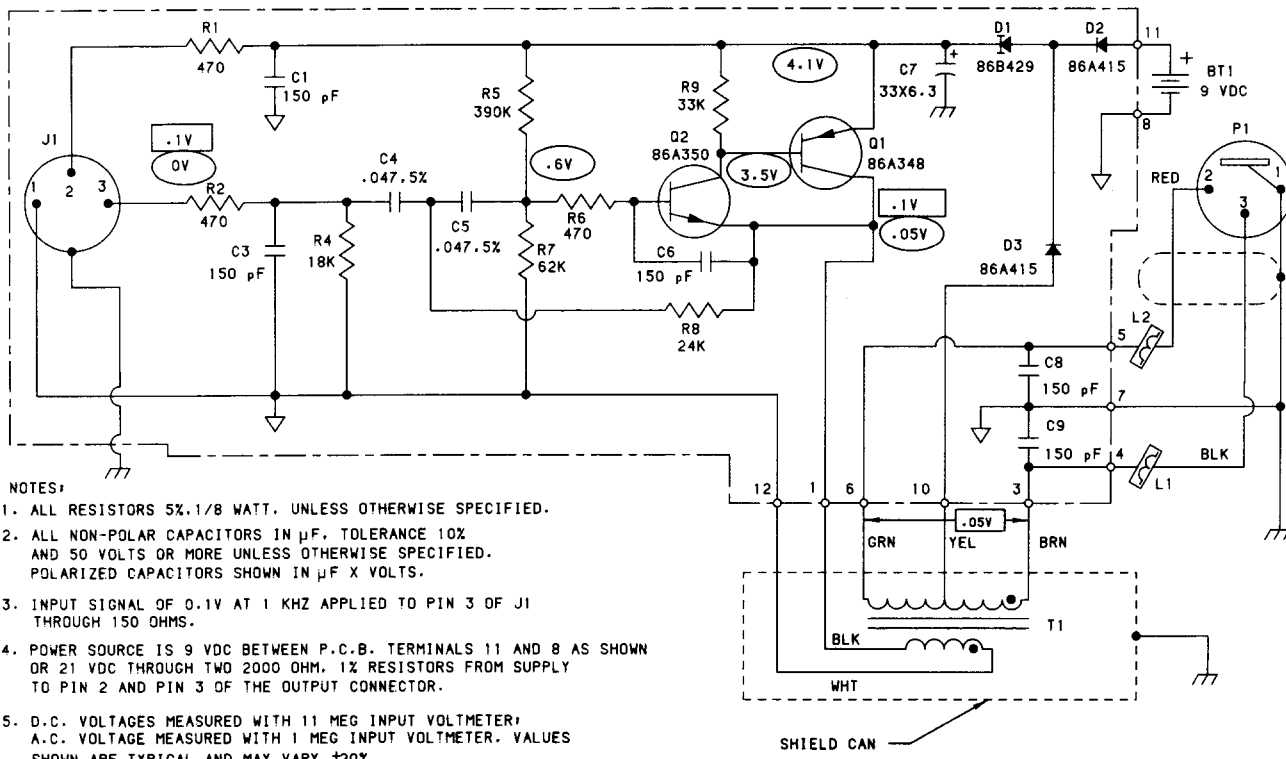
1. Check to see that battery voltage (or external voltage on pins 2 and 3 of cable output connector) is adequate.
2. If a second SM15 is available, interchange microphones and amplifiers to localize the problem.
3. Remove the amplifier case cover (four screws: two Phillips head in the case and two slotted head in the connector collar) and check the voltages against those given in the circuit diagram.
4. Check the microphone and amplifier cables for continuity.

FURNISHED ACCESSORIES

Windscreen.....	49A74A
Carrying Case.....	65A1578

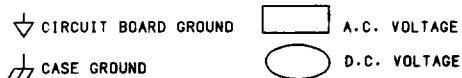
REPLACEMENT PARTS

Microphone Cartridge	R145
Headband Assembly	90A3997
Headband Retaining Clip	53A1801C
Battery Compartment Door.....	65A1536
Belt Clip	44A279



NOTES:

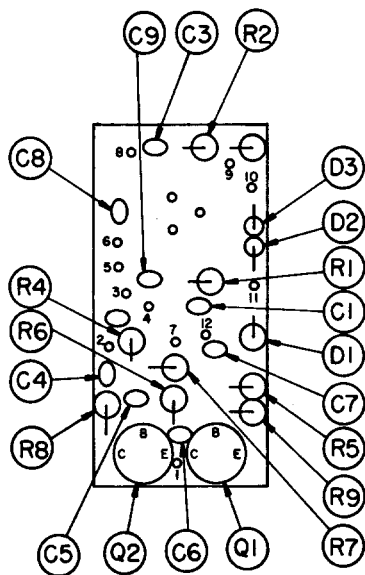
1. ALL RESISTORS 5X.1/8 WATT, UNLESS OTHERWISE SPECIFIED.
2. ALL NON-POLAR CAPACITORS IN μF , TOLERANCE 10% AND 50 VOLTS OR MORE UNLESS OTHERWISE SPECIFIED. POLARIZED CAPACITORS SHOWN IN μF X VOLTS.
3. INPUT SIGNAL OF 0.1V AT 1 KHZ APPLIED TO PIN 3 OF J1 THROUGH 150 OHMS.
4. POWER SOURCE IS 9 VDC BETWEEN P.C.B. TERMINALS 11 AND 8 AS SHOWN OR 21 VDC THROUGH TWO 2000 OHM, 1% RESISTORS FROM SUPPLY TO PIN 2 AND PIN 3 OF THE OUTPUT CONNECTOR.
5. D.C. VOLTAGES MEASURED WITH 11 MEG INPUT VOLTMETER; A.C. VOLTAGE MEASURED WITH 1 MEG INPUT VOLTMETER. VALUES SHOWN ARE TYPICAL AND MAY VARY $\pm 20\%$.
6. THE FOLLOWING SYMBOLS DENOTE:



A4004-11-2

AMPLIFIER CIRCUIT DIAGRAM

**AMPLIFIER PRINTED
CIRCUIT BOARD**



A4005-1-1

AMPLIFIER REPLACEMENT PARTS LIST

Reference Designation	Part Number	Description	Commercial Alternate
A1	90A4005	Printed Circuit Board Assembly	None
C7	86B651	Capacitor, Tantalum, 33 μF , 6.3V	Motorola 1N5287
D1	86B429	Diode, Current Regulator, 100V, 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, L2	80A253	Ferrite Bead Ring	Stackpole 57-0180
P1	90BT2600	Connector, Receptacle, 3-pin XLR	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