

SHURE®

THE SOUND OF THE PROFESSIONALS®

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AREA CODE 312/866-2200 • CABLE: SHUREMICRO

PROFESSIONAL PRODUCTS



The Model SM82-LC is a hand-held, self-contained, unidirectional, condenser microphone containing its own line level amplifier, peak limiter, and battery. It is designed to provide a line level output for use in a variety of broadcasting situations where a line level microphone with a built-in limiter is required.

Microphone Features:

- Wide range frequency response for exceptionally clean and natural sound reproduction
- Cardioid polar pattern, uniform with frequency and symmetrical about axis, to provide maximum rejection and minimum coloration of off-axis sound
- Balanced line level output can directly drive telephone lines or other line level inputs
- Built-in peak limiter controls output level to prevent microphone line amplifier or external equipment overloading
- Internal 9.8V battery operation
- Phantom powering over a 15V to 50V range
- Automatic switchover from phantom to battery power
- Solid-state line level amplifier output
- Built-in "pop" and wind filter protects against wind and explosive breath sounds
- Unidirectional condenser transducer
- Output connector/switch turns microphone on when cable connector is inserted

- Rugged construction for outstanding reliability
- Can be used over wide range of operating temperatures and humidity conditions
- Very low mechanical handling noise

The Model SM82 was designed to fill the need for a rugged, reliable line level microphone for broadcast applications. Intensive laboratory development and testing in major broadcast studios and remote pickup sites complemented the field-derived specifications and features, resulting in an optimum design to meet a variety of broadcast needs.

The exceptional performance and unique features of the SM82 make it an outstanding choice for such applications as:

- Single-Channel Remotes-without separate remote amplifier.
- "Dialed-Up" Telephone Reports - internal resistance holds "dialed-up" line.
- Long-Run Microphone Lines for Parades, Political Events, Golf Tournaments or Other Live Remotes - using unshielded cable.
- Sports Announcing-limiter prevents overloading of remote broadcast amplifier.

The SM82 is supplied with an accessory foam wind-screen, swivel adapter, and mercury battery.

SPECIFICATIONS

Type

Cardioid condenser with line level amplifier and limiter

Frequency Response

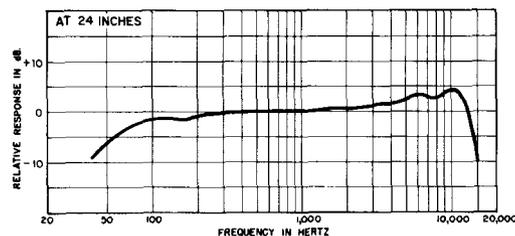
40 to 15,000 Hz (see Figure 1)

Polar Pattern

Cardioid (unidirectional) response-uniform with frequency, symmetrical about axis (see Figure 2)

Output Impedance

250 ohms actual (designed for use with 600-ohm or greater loads)



TYPICAL FREQUENCY RESPONSE

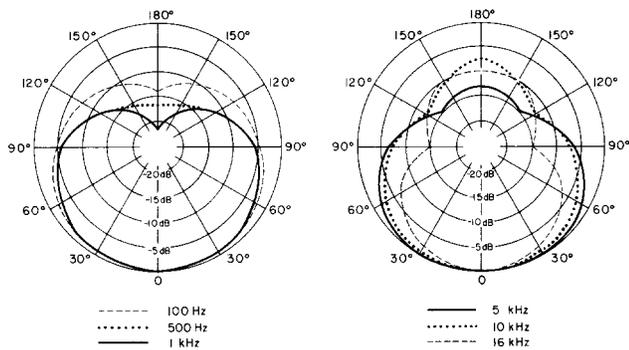
FIGURE 1

SHURE®

MODEL SM82

• LINE LEVEL UNIDIRECTIONAL MICROPHONE

TECHNICAL DATA



POLAR PATTERNS
FIGURE 2

Output Level (1000 Hz response)

Open circuit voltage: -23 dBV (0.11V) for 74 dB SPL (0 dBV = 1 volt)

Power output: -4 dBm into 600 ohms for 94 dB SPL

(0 dBm = 1 mW in 600 ohms)

Limiter

Threshold: +6 dBm (approx. 104 dB SPL) (Figure 3)

Attack time: Typically 5 msec for 10 dB input change

Release time: Typically 330 msec for 10 dB input change

Range: 20 dB

Output clipping level: +10 dBm

Total Harmonic Distortion (1000 Hz response at +4 dBm output level)

1% or less (below limiting)

Hum Sensitivity

Less than -125 dBm in 1 millioersted field (ref: Power Output specification)

Output Noise

Equivalent to 37.5 dB SPL with weighting per DIN 45405

Phasing

Positive pressure produces positive voltage on pin 2 with respect to pin 3

Power

Battery:

Type: 9.8V Mercury (Duracell TR177 or equivalent)

Average Life: 90 hours

Minimum Voltage: 8.5 Vdc

Current Drain (typical): 2.5 mA (idle); 8 mA max. (full signal)

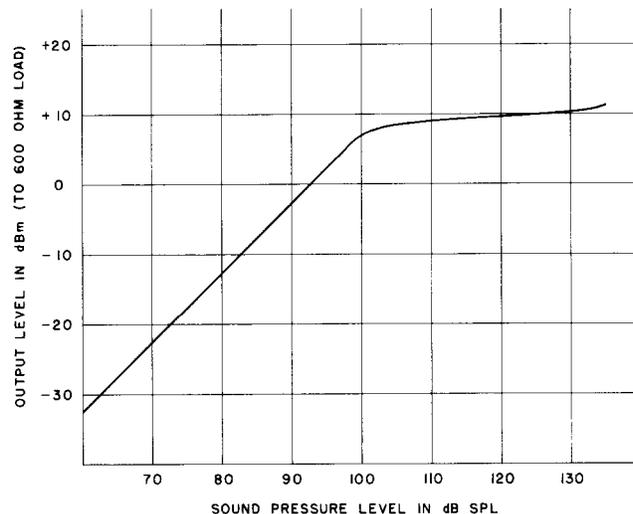
Phantom Voltage: See Figure 5

Current Drain (typical): 16 mA

Operating Conditions

Temperature: -12° to 57°C (10° to 135°F) (battery operation); -23° to 57°C (-10° to 135°F) (external supply operation)

Relative humidity: 5 to 98% over temperature ranges specified above



LIMITER THRESHOLD
FIGURE 3

Storage Temperature: Up to 74°C (165° F) without appreciable change in performance

Microphone Overload and Shorting Protection

Shorting: Shorting output (even for prolonged periods) will produce no damage, but may shorten battery life

Maximum external voltage applied to pins 2 and 3 with respect to pin 1: 22V

Maximum external voltage applied between pins 2 and 3: 44V

Connector

Professional three-pin audio connector* with built-in on-off switch (depressing pin 1 turns microphone on)

Case

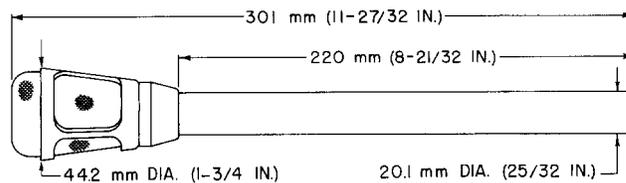
Stainless steel housing, brass and brazed steel grille

Case Finish

Bronze vinyl enamel with dull chrome grille screen

Dimensions

See Figure 4



OVERALL DIMENSIONS
FIGURE 4

Net Weight

406 grams (14.4 oz) with battery

Shipping Weight

834 grams (29.4 oz)

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

FURNISHED ACCESSORIES

A57D Swivel Adapter: The swivel adapter provided with the SM82 is a standard "snap-in" adapter to securely hold the microphone. The swivel adapter has a 5/8"-27 thread and fits conventional floor and desk stands.

A82WS Windscreen: The microphone windscreen provided with the SM82 is designed to minimize outdoor wind noise and help reduce "pop" (explosive breath sounds). To install the windscreen, position it at the top of the SM82 grille and gently pull it downward, one section at a time, around the circumference, until the windscreen is drawn down and covers the entire grille.

OPTIONAL ACCESSORIES

PS1A Power Supply: This power supply provides phantom (simplex) power for one or two Shure SM82 or other condenser microphones. It contains a power switch, power-on indicator, and two input and two output three-pin professional audio connectors.

50AC Telephone Acoustic Coupler: Primarily designed to acoustically couple tape-recorded information from a tape recorder to a telephone transmitter, the 50AC is useful when the SM82 cannot be hard-wired into a telephone line. Replacing the 50AC's mini-plug with a three-socket connector permits the SM82's output to be acoustically coupled to the telephone transmitter.

OPERATION

Output Connections: The SM82 is supplied with a three-pin, professional audio connector.* Any standard two-conductor microphone cable (shielded or unshielded) may be used, with the output cable connector chosen for the particular microphone applications: three-pin plug, phone plug, clip leads, etc. For maximum rejection of noise and crosstalk, use shielded cable.

Note that pin 1 of the SM82 output connector, in addition to providing a ground connection, is an on-off switch. Connecting the microphone to a cable automatically turns the microphone on. BE SURE TO DISCONNECT THE CABLE FOR STORAGE OR WHEN OPERATION IS NOT DESIRED.

Battery: The SM82 uses one 9.8-volt mercury battery (Duracell TR177 or equivalent) as a prime power source, or as an auxiliary power source in case of failure of an external ac or dc power supply. This battery will power the SM82 for approximately 90 hours.

To replace the battery, first remove the outer sleeve by turning it counterclockwise (from bottom) and sliding it away from the grille. Remove the old battery from the battery compartment in the inner sleeve. Insert the new battery, taking care to observe battery polarity (although accidental reversal will not cause damage). Replace the outer sleeve.

Although the SM82 battery compartment is designed to contain any possible battery leakage, it is a good practice to remove the battery during storage for extended periods. If a battery should leak, the battery contacts may be cleaned with a pencil eraser or a cotton swab moistened with water or alcohol.

Applications:

A. **Single Channel Remotes:** The SM82 can be used directly connected to a telephone line without the need for a remote amplifier. Check to see whether the telephone company requires an interface coupler between the SM82 and the telephone line. If a coupler is required, make certain the coupler selected and the wiring arrangement are in compliance with local telephone company regulations.

When using the SM82 connected directly to a telephone line subject to lightning-induced voltage surges, the following part (commercially available) can be installed across pins 2 and 3 to provide additional protection for output circuit components: Metal Oxide Varistor, General Electric Co., Type No. V22ZA1.

B. **"Dialed-Up" Telephone Lines:** The SM82 can be connected to a "dialed-up" telephone as described above. The SM82 presents an 1120-ohm dc resistance to the telephone line and will, in most cases, hold a "dialed-up" line. Note that the SM82 output circuit is protected and will not be damaged by normal telephone line voltages.

Again, a voice coupler is recommended between the SM82 and the telephone line.

When it is not possible to hard-wire the SM82 into a telephone line, the SM82 can be used with a Shure Model 50AC Telephone Acoustic Coupler. The 50AC, which is acoustically connected to the telephone transmitter, must be rewired as follows: remove the miniplug connector and connect the "hot" lead to pin 3 and the shield to pin 2 of a three-pin professional three-socket audio connector (no connection to pin 1).

C. **Microphone Mixers:** To connect the SM82 to mixers such as the Shure M67 or M267 Microphone Mixer, or SE30 Gated Compressor/Mixer, set the mixer MIC/LINE Switch to the LINE position. Either shielded or unshielded connecting cable may be used. To use the SM82 with a mixer having only low-impedance microphone inputs, use a Shure A15LA Line Input Adapter at the mixer to convert the input to a line level input. Do not use the A15LA between the microphone and power supply when the microphone is phantom-powered.

D. **Long-Run Microphone Lines:** Because the SM82 is a line level output device, up to 1.6 kilometers (1 mile) of unshielded cable may be used between the SM82 and the broadcast equipment. For greater distances, some form of equalization may be desirable. This may be an equalized telephone line, which provides high-frequency pre-emphasis that generally improves intelligibility and signal-to-noise ratio.

Power Supplies: As an alternate to internal battery power or the PS1A power supply, the SM82 may be phantom-powered from virtually any mixer using one of the wiring configurations shown in Figure 5. Any voltage value obtainable in the mixer from 20 to 50 volts may be used. The graph shows recommended values for resistor R when the SM82 is used with a regulated power supply. Note that the phantom power supply (configuration [1]) and mixer input present a paralleled load to the SM82. If the combined paralleled load is below 600 ohms the transformer configuration (configuration [2]) should be used. These circuits will yield an operating voltage of 16V as measured at the microphone connector, with a nominal current drain of 16 mA. Voltages as low as 13V minimum as measured at the microphone connector are acceptable. The nominal current drain at 13V is 9 mA. This is the minimum acceptable current a power supply must deliver for proper operation.

If the power supply is unregulated, the power supply voltage may drop when the SM82 is connected to it, due to the added load. To minimize this drop, the value of R

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

must be determined as follows. Connect a variable resistance (or resistor substitution box) in series with a 1.8 kilohm, 10% resistor. Connect the free end of the 1.8k resistor to ground, and the free end of the variable resistor to B + of the power supply. Adjust the variable resistor until 13V is measured across the 1.8k resistor (9 mA load). The value of the variable resistor is the proper resistance for use in configuration [2]. If configuration [1] is to be used, double the resistor value.

For example, the Shure M67 and SE30 Mixers have unregulated power supplies. With the added 9 mA load, the value of 2R for configuration [1] should be 3.3k. Two 3.3k resistors can be mounted externally with the B+ 30V terminal. The resistors can also be mounted internally (the following modifications should only be performed by qualified service personnel). In the M67, connect the resistors from pins 2 and 3 of line input connector 4 to pin R (B+) on the printed circuit board. In the SE30, obtain the B+ from pins C, K or L of printed circuit board 5. Place the MIC/LINE switch for the channel in use to LINE. Note that in the SE30, the added drain cancels the automatic battery switchover feature. To avoid battery drain while the unit is ac-powered, remove the batteries or slide the battery compartment out approximately one inch to disconnect the batteries. Note too that with either the M67 or SE30, only one SM82 can be used with each unit.

Note too that the SM82 output stage consists of two class B stages in a bridged configuration to provide a balanced output without a transformer. As a result, the maximum output level is obtained between pins 2 and 3. Should pins 2 or 3 be tied to pin 1 (unbalanced connection), the output level will drop by 6 dB with no damage to the SM82.

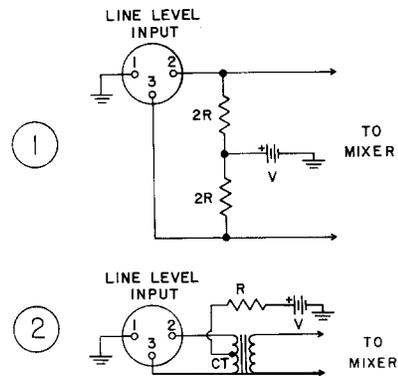
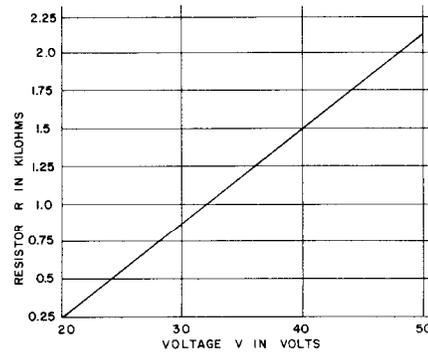
CIRCUIT DESCRIPTION

A block diagram of the SM82 is shown in Figure 6. The condenser cartridge is followed by a field-effect transistor (FET) impedance conversion stage. The output enters the printed circuit board to a limiter attenuator circuit, which uses an optically coupled isolator, both as part of the limiter attenuator and part of a feedback circuit. The line amplifier output stage uses two class B stages in a bridged configuration to provide a balanced output, without a transformer, that can operate from a 9-volt supply. The internal battery is diode-isolated, providing an automatic switchover from phantom power to internal battery power. A zener diode limits and regulates the phantom voltage entering the unit to a nominal value.

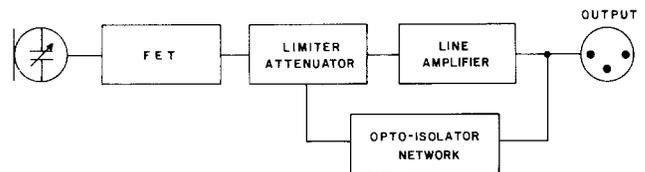
REPLACEMENT PARTS

The following replacement parts may be ordered through your Authorized Shure Professional Microphone Distributor or from Shure Brothers Incorporated (see Figure 8).

DESCRIPTION	PART NO.	FIG. 8
Grille and Screen	90BU2600	A
Cartridge	99A671	B
Cartridge Assembly (with FET)	90A2059	B, C
Coupling Ring (less Nameplate) . . .	31A1174B	D
Handle Inner Sleeve Assembly (with PC Assembly, Connector/Switch)	90A3128	E
Three-Pin Audio Connector/Switch .	90A2045	F
Battery	90HC1371	G
Handle Outer Sleeve	31A1184B	H



POWER SUPPLY REQUIREMENTS
FIGURE 5



BLOCK DIAGRAM
FIGURE 6

MICROPHONE SERVICING

(Refer to Figures 7 and 8)

Part No. 90BU2600

Grille (A)

To remove the grille, grasp the microphone by the coupling ring (D), and unscrew it counterclockwise (from top). Attach the new grille by screwing it on in a clockwise (from top) direction.

Part No. 99A671

Cartridge (B)

To replace the microphone cartridge, remove the grille (A) and perform these steps:

- Using small needle-nose pliers, carefully pull white wire to remove it from terminal connector on rear of cartridge.
- Grasp cartridge assembly support pedestal beneath cartridge, and unscrew and remove present cartridge by turning it counterclockwise (from top). CAUTION: Handle cartridge by outer edge only to avoid deterioration of high-impedance characteristics through contamination.

3. Screw new cartridge securely in place and replace white wire.
4. Replace grille. If old cartridge is to be stored, wrap in 2-inch square of aluminum foil to preserve electrostatic charge.

Part No. 31A1184B

Handle Outer Sleeve (H)

To remove the outer sleeve, grasp the microphone by the coupling ring (D), unscrew it counterclockwise (from bottom) and slide it away from grille (A). Attach the new outer sleeve by screwing it on in a clockwise (from bottom) direction.

Part No. 90A2045

Connector/Switch (F)

To replace the connector/switch assembly, remove the outer sleeve (H) and battery (G) and perform these steps:

1. Using small screwdriver, turn connector/switch locking screw (I) at base of inner sleeve (E) counterclockwise (inward).
2. Grasp connector pin 2 or 3 (not pin 1) with small needle-nose pliers and gently withdraw connector/switch assembly from inner sleeve.

Note: If connector/switch assembly does not withdraw sufficiently from inner sleeve to permit unsoldering, remove grille (A), coupling ring (D) and cartridge pedestal assembly (C). Remove two screws in handle inner sleeve assembly, push gently on circuit board carrier and slide circuit board carrier partly out rear of handle inner sleeve.

3. Carefully remove leads from connector/switch assembly. Yellow (pin 3) and green (pin 2) leads have push-on terminals; grey (pin 1) and black (ground) leads are soldered (see Circuit Diagram).
4. Solder jumper wire between case ground lug of new connector/switch terminal nearest pin 3, black lead to the case ground lug, and grey lead to switch terminal nearest pin 2.
5. Attach yellow and green leads to pins 3 and 2, respectively.
6. Reassemble circuit board carrier, screws, cartridge pedestal assembly, coupling ring and grille to inner sleeve if necessary.
7. Carefully replace connector/switch assembly in inner sleeve, aligning locking screw with hole in inner sleeve.
8. Turn locking screw clockwise (outward) to lock it in place. Replace battery and outer sleeve.

Part No. 90A2051

Handle Inner Sleeve Assembly (E)

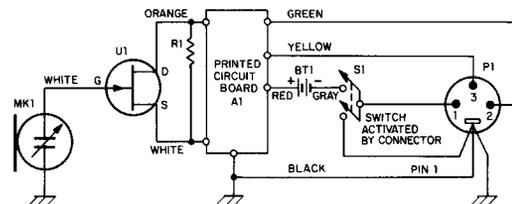
1. Remove grille (A), handle outer sleeve(H), and battery (G) as described above.
2. Loosen screw in coupling ring (D) with 0.035 in. Allen wrench and unscrew coupling ring.
3. Unplug cartridge assembly (C) from handle inner assembly.

4. Plug cartridge assembly into new handle inner assembly, and replace and tighten coupling ring. Tighten setscrew with Allen wrench. CAUTION: These two assemblies are keyed. Make sure keyway on inner sleeve assembly is aligned with key in cartridge assembly.
5. Replace grille, handle outer sleeve and battery. Note battery polarity.

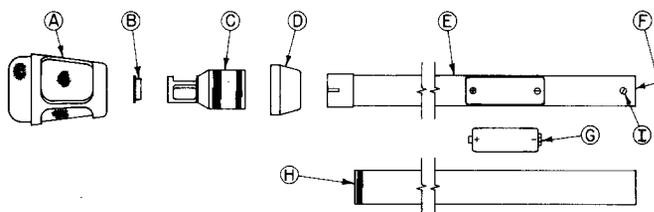
TROUBLESHOOTING

Due to the high packing density and circuit complexity of the SM82, other than basic servicing is not recommended. The following basic troubleshooting steps should be followed if problems arise.

1. Check battery polarity and voltage. Minimum voltage under load (measured across battery terminals with connector/switch pin 1 depressed) should be 8.5 Vdc. Replace battery if necessary, noting proper polarity. To check the phantom power supply, disconnect the microphone and connect a 2.2-kilohm resistor between pins 1 and 3, and another 2.2-kilohm resistor between pins 1 and 2. The voltage measured across each resistor should be between 15V and 20V (pin 1 negative).
2. Check switch (pin 1 of connector/switch assembly) for proper operation. Make sure connector/switch assembly is securely fastened (setscrew tightened). Replace assembly if defective.
3. If more than one SM82 is available, interchange cartridge assemblies to determine whether the cartridge or amplifier is at fault. Return defective microphone to Authorized Shure Professional Microphone Distributor or Shure Brothers Incorporated.



CIRCUIT DIAGRAM
FIGURE 7



EXPLODED VIEW
FIGURE 8

GUARANTEE

This Shure product is guaranteed in normal use to be free from electrical and mechanical defects for a period of one year from date of purchase. Please retain proof of purchase date. This guarantee includes all parts and labor. This guarantee is in lieu of any and all other guarantees or warranties, express or implied, and there shall be no recovery for any consequential or incidental damages.

SHIPPING INSTRUCTIONS

Carefully repack the unit, have it insured, and return it prepaid to: Shure Brothers Incorporated

Attention: Service Department

222 Hartrey Avenue

Evanston, Illinois 60202-3696

If outside the United States, return the unit to your dealer or Authorized Shure Service Center for repair. The unit will be returned to you prepaid.