

Running head: SHURE SLX2/SM58 MIC

SHURE SLX2/SM58 Vocal Microphone

submitted to

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Abstract

Shure Microphones has met the demands for high-energy performances, proven from time and time again through decades of rigorous use by performers and engineers from all experience levels around the world. The well-known sound and construction of the Shure Microphone line became a template for other companies, setting standards by the way it handles feedback. In live performances and recording applications, the SM Microphone family is reliable, legendary gear for professional musicians.

At any given moment, people from around the world rely on Shure products to communicate, entertain, and educate. The brand is known and trusted worldwide by audio professionals and enthusiasts alike. A particular member of the Shure Microphone family that has stood out is the SHURE SLX2/SM58 Handheld Transmitter. The SM58, descendant of the 565, is the studio sound solution that eliminated the toughest problems in live sound.

History

A history of innovation has begun as early as 1925 for the Shure company. Shure has turned a passion for making great microphones and audio electronics into an obsession. Shure continues to set the worldwide industry standard for superior, reliable products. The founder, Sidney N. Shure, established the company and began operation on April 25th, 1925 in downtown Chicago. Mr. Shure's values and philosophy continues to guide the company associates today and is clearly reflected in their products and services.

Shure offers audio products ranging from wired microphones and wireless microphone systems to DJ mixers and listening products. Throughout their years of innovation, one microphone series has outperformed the others – the Unidyne Series. Sleek in its design, the Unidyne series quickly came to symbolize the word “microphone.”

In the 1950s, the Shure SM58 Microphone was invented by Shure Engineer Ernie Seeler and his team that wanted to create the ideal vocal microphone. Studio microphones are notoriously fragile, therefore the challenge to solve studio mic durability and design problems was no easy feat for Seeler and his creative team. The SM58's ball-shaped and lined grille reduces wind, breathe noise, and plosive popping, making the microphone better suited for vocal applications. Following its debut, it quickly became a mainstay in the world of professional audio. Celebrities, entertainers, and politicians including Elvis Presley, Billie Holiday, and Patsy Cline, all relied on this series to help amplify their talent to millions of people throughout their career.

The SM58's destiny as an iconic live vocal microphone was not unprecedented, despite the mic's original designation as a studio tool. Prior to the development of the handheld transmitter, singers stood behind a microphone mounted on a stand. The SM58 gave singers freedom to roam the stage, but this created new issues of feedback and handling noise. The SM58's consistent cardioid polar pattern, high gain-before-feedback, and groundbreaking integrated pneumatic shock mount greatly eliminated these problems, allowing vocalists to focus on connections with their fans without worrying about their mics. Plus, the tailored frequency response and lightweight build made the SM58 sound and feel like an extension of the singer's voice rather than a tool separate from themselves.

As great as all this may might sound, changes are still frequently being made to all Shure products, not just microphones. Dramatic innovations in materials and manufacturing processes have been integrated into the SM58. Furthermore, Shure subjects the SM58 microphone to military standard tests – the materials, the parts, and the fully assembled microphone.

Description of Innovation

The Shure SM58 is a unidirectional (cardioid) dynamic vocal microphone for professional vocal use in sound reinforcement and studio recording. To explain, unidirectional means the microphone can only pick up sound with high gain from a specific side or direction. Cardioid means the microphone picks up sound with high gain from the front and sides but poorly from the rear, making this microphone style ideal for performers.

A highly effective, built-in, spherical filter minimizes wind and breath noises. A cardioid pickup pattern isolates the main sound source while minimizing unwanted background noise. The SM58 has a tailored vocal response for a sound which is a world standard. Rugged construction, a proven shock-mount system, and a steel-mesh grille ensure that even with rough handling, the SM58 will perform consistently. Outdoors or indoors, singing or speech, the SM58 is the preferred choice for professionals worldwide.

Below, describes the technical characteristics of the Shure SLX2/SM58. This information was published by the manufacturer, SHURE, to help consumers understand what exactly the item is.

Specifications

| | |
|---------------------------|--|
| Type | Dynamic (moving coil) |
| Frequency Response | 50 to 15,000 Hz |
| Polar Pattern | Cardioid |
| Output Impedance | 300 Ω |
| Sensitivity | 1 kHz, open circuit voltage |
| Polarity | Positive pressure on diaphragm produces positive voltage on pin 2 with respect to pin 3 |
| Net Weight | 0.33 kg (0.72 lb.) |
| Connector | Three-pin professional audio (XLR), male |
| Housing | Dark grey, enamel-painted, die cast metal; matte-finished, silver colored, spherical steel mesh grille |

Mechanical Composition

SLX2 Handheld Transmitter

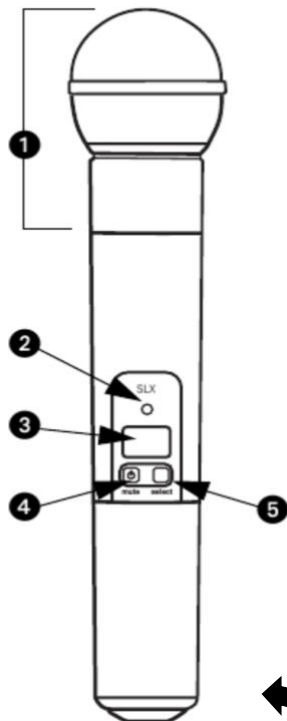
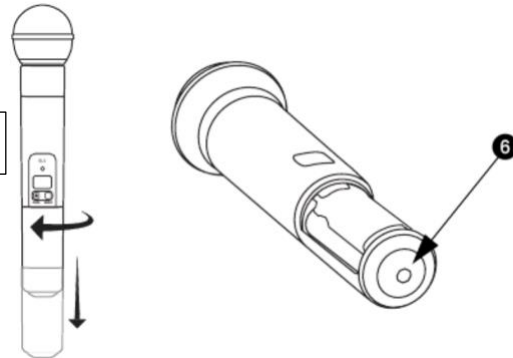


Figure 1A

Figure 1B



On the left, Figure 1A, #1 is the **Interchangeable microphone head**. There are many accessories sold separately that can be used for the SM58 microphone. #2 is the **Power/Infrared/Mute Indicator**. This light signals the status of the microphone. Green indicates the mic is ready for use. Amber indicates the mic is on mute. Glowing Red indicates the battery power is low. Pulsing Red indicates the battery is dead. #3 is the **LED Screen**. This displays the written status of the microphone. For example, the battery life, signal strength to amplifier, etc. #4 is the **On-Off/ Mute Switch**. Press and hold to turn the microphone on or off. Press and release to mute or unmute the microphone. *To avoid accidentally muting the microphone during a performance, lock the front panel while the microphone.* #5 is the **Select Switch**. This is used to step down the output signal if you have an extremely loud source. Lastly, on Figure 1B above, #6 is the **IR Port**. This receives infrared beams to synchronize frequencies. *When using multiple system, only one transmitter IR port should be exposed at a time.*

On the right, Figure 2, #1 is the **Interchangeable microphone head**. To access the gain adjustment switch, unscrew the head of the microphone. #2 is the **Gain Adjustment Switch**. Two gain settings are available on the SLX2. Choose a setting appropriate for vocal volume and for the performing environment. **0dB** is for quiet to normal vocal performances and **10dB** is used for loud vocal performances.

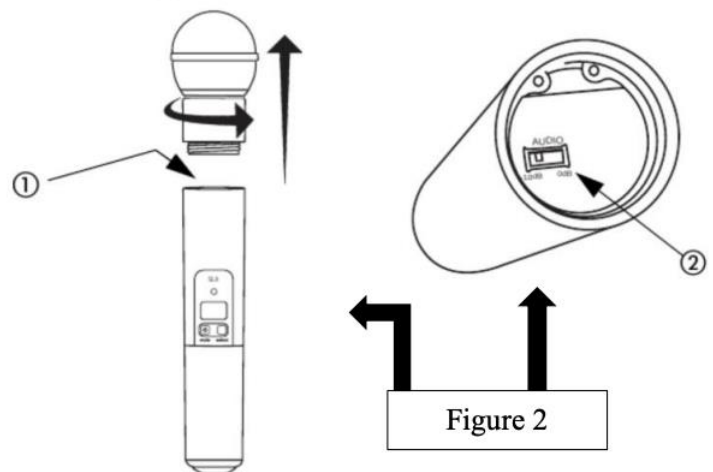


Figure 2

Operation

The following chart provides a guideline for suggested microphone placements and tone quality for the Shure SM58 Handheld Transmitter.

| Application | Suggested Microphone Placement | Tone Quality |
|-------------|--|--|
| Vocals | Lips less than 15 cm (6 in.) away or touching the windscreen, on axis to microphone. | Robust sound, emphasized bass, maximum isolation from other sources. |
| | 15 to 60 cm (6 in. to 2 ft.) away from mouth, just above nose height. | Natural sound, reduced bass. |
| | 20 to 60 cm (8 in. to 2 ft.) away from mouth, slightly off to one side. | Natural sound, reduced bass and minimal “s” sounds. |
| | 90 to 1.8 m (3 to 6 ft.) away. | Thinner, distant sound; noticeable levels of ambient noise. |

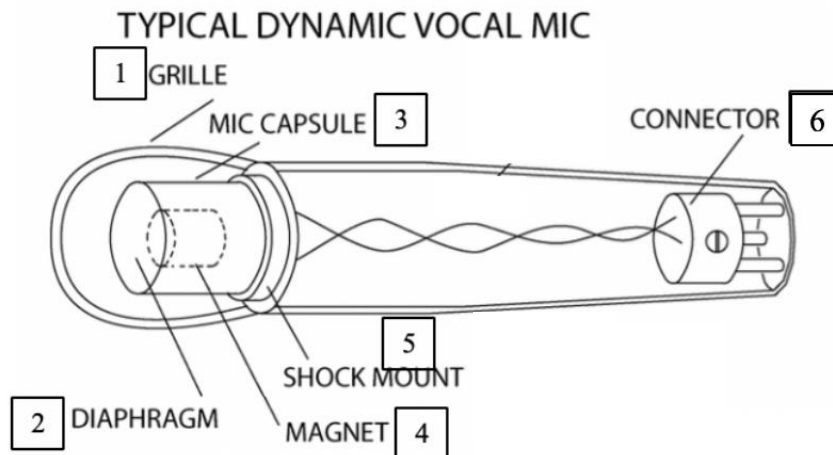


Figure 4

Above, Figure #4, is a schematic drawing of a Typical Dynamic Vocal Microphone. #1 is the grille of the microphone. The grille is the solid metal mesh we find around the capsule, it's designed to protect the microphone's sensitive capsule from physical harm. Additionally, grilles

often have an interior acoustic foam layer that will help to absorb moisture so that the capsule doesn't get wet. Think of the grille as a car bumper and the capsule as a driver. #2 is the diaphragm. A microphone diaphragm is the thin, movable part of the mic capsule that moves sympathetically with the sound waves around the mic. Diaphragm movement is caused by sound pressure differences between the front and back of the diaphragm and begins the transduction, in most microphone designs. In dynamic microphones, moving-coil diaphragms are typically made of BoPET (biaxially-oriented polyethylene terephthalate). BoPET material is preferably used for its high tensile strength, stability, and flexibility. These diaphragms have conductive coils attached to their backsides, typically made of very small diameter insulated copper wire that is wound many times around. #3 is the microphone capsule. A microphone capsule is a mechanism that acts as an electroacoustic transducer, changing sound waves (mechanical wave energy) into microphone signals (electrical energy). Capsules are often labeled by transducer type and polar pattern. In this particular model, it's a cardioid condenser capsule. A condenser capsule is a transducer with a parallel-plate capacitor capsule that requires a steady electrical charge to produce a mic signal. The diaphragm moves according to sound waves, causing a variation in capacitance and, therefore voltage (mic signal).

#4 is the microphone magnet. Magnets are crucial components in dynamic microphones since mics convert sound waves to mic signals via electromagnetic induction, a voltage across an electric conductor in a changing magnetic field. It is the working principle of dynamic mics, where the conductor (coil) moves within a permanent magnetic field and, therefore, induces voltage (the mic signal). #5 is the shock mount. A shock mount is designed to hold and isolate a microphone, protecting it from shock. A shock mount is a mechanical fastener that elastically connects a microphone to a threaded mic stand. The elastic connection is critical, providing

secure mounting for the microphone and, at the same time, the freedom for the microphone to move independently of the mic stand. This reduces the amount of mechanically transmitted noise (shock) the microphone will be susceptible to. Shock mounts elastically isolate microphones from their solid environment. The isolation drastically decreases the severity of mechanically transmitted noise and external vibrations present in the microphone. Which, in turn, lessens the noise in the microphone signal. Lastly, #6 is the connector. For the Shure SLX2/SM58, it has a 3-pin XLR Connector. XLR connectors were originally patented by Cannon as part of their X series cables/connectors. XLR proved to be the best of the series. Cannon no longer has the patent, but professional mics nearly all have XLR outputs and XLR cables carry their balanced audio signals from mic output to preamp, an electronic amplifier designed to amplify mic level signals to line level signals. Preampers are essential if the user wants to use the microphone with any mixing console or digital audio workstation.

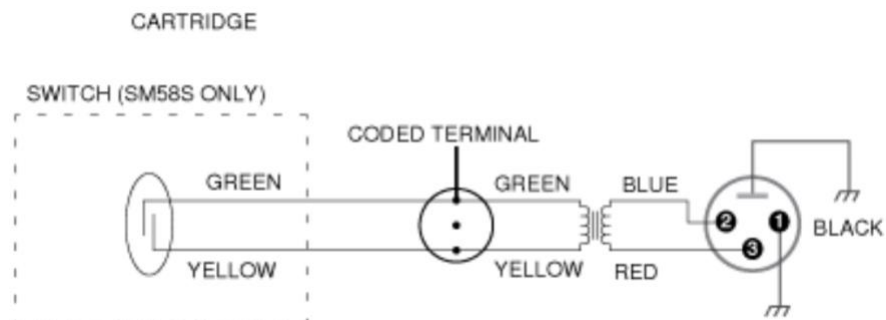


Figure 5

Above, Figure 5, is the wiring of the microphone. When the permanent magnet produces a magnetic field that cuts through the coil, an electrical current is starting to flow through the green and blue wires as shown above. The electric current flows out from the microphone to an amplifier or sound recording device through the 3-pin connector that connects back to the moving-coil diaphragms previously discussed. The original sound is turned into electricity. By using this current to drive sound recording equipment, you could amplify the current and then feed it into a loudspeaker, turning the electricity back into a much louder sound. That's how PA (personal address) systems, and concert amplifiers work.

Conclusion

The Shure SLX2/SM58 Handheld Transmitter is the ideal microphone to ever be designed by the Shure company. The success of this product was unpredictable. It was just another, ordinary product to be sketched and built. Its popularity attracted other audio companies who envied to build a replica of the Shure SLX2/SM58 but in their own unique ways for consumers. It began its journey in the 1950s and hasn't stopped developments since.

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