Design and Application of Audio Systems for Television Variety Show Studios: A Postprint

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Abstract

With technological advancement, audiences have increasingly higher demands for programs. To attract viewers, television stations must continuously update and design the audio systems for variety show studios to meet the requirements of high-definition program production. This paper provides a brief description of the composition and technical requirements of television station variety show studio audio systems. Simultaneously, television stations should design variety show studio audio systems based on program needs and their own capabilities. Only in this way can they design systems that meet television station program production requirements and offer high cost-effectiveness.

Full Text

Research on the Design and Application of Audio Systems for TV Variety Show Studios

Abstract: As technology continues to advance, audiences increasingly demand higher-quality programming. To attract viewers, television stations must continuously update and redesign their variety studio audio systems to meet the requirements for high-definition program production. This paper provides a brief overview of the composition and technical requirements of TV variety studio audio systems. Television stations should design their variety studio audio systems according to both program needs and their own operational capabilities. Only through this approach can they develop cost-effective audio systems that satisfy production requirements while maintaining high performance standards.

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1. Design Principles for Variety Show Studio Audio Systems

Variety show studios, which primarily produce entertainment programs, demand audio systems that meet both technical and functional requirements while accommodating the unique production characteristics of variety shows. Such systems must offer high flexibility, security, and operational simplicity. During the design process, the fundamental principles of scientific rigor and technological advancement must be satisfied, alongside careful consideration of the specific requirements of different variety programs and the station's distinctive features. Based on these factors, the following principles should guide the design of a compliant variety studio audio system.

1.1 Advanced Technology Principle The architecture of a variety studio audio system should incorporate cutting-edge technology, reflecting not only current state-of-the-art audio system capabilities but also accommodating future development trends.

1.2 Practicality Principle A television station's studio system comprises three major subsystems: lighting, video, and audio. Among these, the audio system serves as a critical benchmark for evaluating overall studio quality, as its performance directly impacts program quality. To satisfy audiences' escalating aesthetic demands and expectations for high-quality programming, stations must design audio systems that align with their operational capabilities and usage patterns. During construction, the most advanced equipment available within budgetary constraints should be selected to maximize fulfillment of practical work requirements. Simultaneously, the system should achieve operational convenience, simplified maintenance, and streamlined management.

1.3 Scalability Principle When designing a variety studio audio system, long-term considerations should be incorporated to provide greater flexibility for future system reconfiguration and upgrades.

1.4 Cost-Effectiveness Principle In designing variety studio audio systems, costs should be minimized while ensuring quality, thereby creating highly cost-effective solutions.

1.5 Design Reliability Principle Since variety studio audio systems are used for program production and recording, system safety and stability during operation are primary considerations. Designs must adhere to reliability principles to ensure continuous and stable system operation.

2. Exploration of Audio System Configuration for TV Variety Show Studios

Television studios are typically classified by program type into two categories: news studios and variety show studios. News studios, as the name implies, are used for live and recorded news programs, with news broadcasting and interviews as primary formats. In contrast, variety show studios focus on producing entertainment programs, concerts, and interactive audience shows. This paper specifically examines the design and application of audio systems for television variety show studios.

When categorizing TV variety show studios by physical space, they can be divided into large-scale and medium-to-small-scale facilities. Large-scale variety studios are built to accommodate major entertainment programs, concerts, or reality shows, requiring not only interactive video and audio systems but also comprehensive sound reinforcement covering the entire venue. Typically, two mixing consoles collaborate to handle broadcast audio and live sound reinforcement—meaning the broadcast audio system and live sound system work together for program audio capture. Medium and small variety studios, constrained by space, can only accommodate relatively smaller-scale productions. Due to their compact areas and smaller audiences, a single integrated system suffices for both broadcast and live sound reinforcement.

2.1.1 Mixing Console The mixing console serves as the core equipment of the audio system, processing, transmitting, and distributing audio signals. With rapid technological and internet development, digital technology has matured in the audio equipment field, and digital mixing consoles increasingly demonstrate significant advantages in the industry, including flexible operation, powerful processing capabilities, and excellent expandability. In both broadcast audio and live sound reinforcement systems, mixing consoles connect various audio source devices, output devices, and signal processing equipment to accomplish audio capture and live reinforcement. With modern audio processing technology advancements, most variety studios have adopted two-stage mixing configurations.

2.1.2 Audio Source Equipment Given the diverse audio effects required in variety shows, source devices with real-time playback capabilities such as CD and MD players are particularly important. As audio systems trend toward greater networking and resource sharing, convenient playlist functionality has become a primary choice for program producers. Because variety programs have different format requirements, multiple microphone types should be configured. For interactive programs, gooseneck microphones are appropriate; for ensemble pickup during concerts, compact detachable small-diaphragm condenser microphones should be used to maintain clear television images; overhead audience microphones capture live audience sound. Additionally, since hosts, singers, and

performers move flexibly around the venue, wireless microphones—including handheld and headset models—should be provided.

2.2 Live Sound Reinforcement System Configuration Digital processors, power amplifiers, and loudspeakers constitute the three essential components of a live sound reinforcement system. Based on loudspeaker types, they can be categorized as active or passive. Active loudspeakers incorporate only digital processing for received signals, while other loudspeakers combine digital processors with power amplifiers, constituting passive systems. Common signal processing equipment for live reinforcement includes graphic equalizers, compressors/limiters, delay units, and reverberation units. These peripheral devices, aided by computer-assisted design software, enable theoretical optimization of studio acoustics during live reinforcement.

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3. Connection of Studio Audio Systems

Proper audio cable selection is central to studio audio system connectivity, as signal transmission depends entirely on cable performance. Incorrect cable selection prevents optimal system performance and may even introduce noise. Analog and digital cables have different impedance standards. Analog cable impedance varies across nodes (approximately 30–90 ohms) depending on length, though analog audio quality remains unaffected by these fluctuations. Digital cables, however, must maintain impedance consistency with transmitting and receiving devices.

To minimize noise interference, two-core audio cables are typically used in analog applications. However, when lower microphone signal levels are required during cable transmission, four-core audio cables are preferable, as their nodes feature common-mode interference rejection that effectively shields most noise. When routing cables through high-current cabinets or alongside power cables, adequate spacing should be maintained, or cables should be run through metal conduits to minimize noise interference.

Upon completing system connection, comprehensive adjustment and testing should be performed. Testing comprises two aspects: evaluation of the broadcast audio and live reinforcement systems, and assessment of the live sound reinforcement system alone. Both employ physical measurement techniques to inspect the audio system, with core analysis focusing on sound from the acoustic field. By comparing monitoring quality inside and outside the studio, program audio quality can be verified and system adjustments made promptly.

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4. Conclusion

Each television station operates studios of different scales and purposes. TV variety studio audio systems should be designed according to individual station needs and economic capabilities, integrating multiple factors to create systems that match studio video and lighting systems while enabling high-quality recording and broadcasting of diverse variety programs.

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Note: Figure translations are in progress. See original paper for figures.