

# Principles and Key Maintenance Technologies of a 10-Watt Digital Amplitude Modulation Medium Wave Broadcasting Transmitter (Post-print)

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**Date:** 2023-10-08T00:00:00+00:00

## Abstract

China's broadcasting and television industry has experienced rapid development, primarily attributable to a well-established technical equipment system and proactive innovation. Objectively analyzed, the application of digital amplitude modulation medium-wave 10-watt transmitters constitutes an important category of broadcasting equipment that decisively impacts routine operations. Given their relatively high cost and complex internal architecture, intensifying daily maintenance is imperative to ensure superior performance during equipment utilization. This article discusses the principles and key maintenance technologies of digital amplitude modulation medium-wave 10-watt transmitters, and proposes rational recommendations.

## Full Text

### Abstract

China's radio and television industry has developed rapidly, largely due to a robust technical equipment system that continuously innovates. The 10W digital amplitude modulation (AM) medium-wave broadcast transmitter represents a critical type of broadcasting equipment that decisively impacts daily operations. Given its high cost and complex internal architecture, strengthening routine maintenance is essential to ensure optimal performance. This paper discusses the operating principles and key maintenance technologies for 10W digital AM medium-wave broadcast transmitters, offering rational recommendations.

**Keywords:** digital; amplitude modulation; broadcasting; transmitter; maintenance

**CLC Number:** TN934.1  
**Document Code:** A  
**Article ID:** 1671-0134(2018)07-053-02  
**DOI:** 10.19483/j.cnki.11-4653/n.2018.07.013  
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## 1. Principle of the 10W Digital AM Medium-Wave Broadcast Transmitter

Although broadcasting services have a broad audience, achieving high-quality performance requires in-depth equipment research. The 10W digital AM medium-wave broadcast transmitter operates by converting and processing audio waves. All broadcasts rely on amplitude modulation to clarify sound, with digital AM medium-wave processing enhancing signal quality. The system converts digital signals to analog via digital-to-analog conversion, controlling carrier frequency within the normal band to generate waveforms. The distance between troughs and peaks in these waveforms represents the transmission wavelength. Audio amplification requires proper use of frequency amplifiers to enhance transmitter power. These amplifiers process both audio and digital signals to increase wave propagation speed, with the broadcast transmitter ultimately emitting the digital AM medium-wave signal for audience selection.

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## 2. Current Maintenance Challenges

### 2.1 Insufficient Attention

While 10W digital AM medium-wave broadcast transmitters provide substantial support for broadcasting operations, contemporary broadcasting demands—particularly in harsh weather or special regions—require enhanced service capabilities and meticulous maintenance practices. However, several maintenance challenges have emerged. Foremost among these is insufficient attention to proper maintenance protocols. Maintenance activities often fail to follow established specifications or adopt well-planned schedules, generating numerous operational issues. Additionally, maintenance systems rely predominantly on traditional experience rather than advanced methodologies, causing accumulating problems that develop into significant long-term hazards.

### 2.2 Low Personnel Competence

From a subjective perspective, maintenance of 10W digital AM medium-wave broadcast transmitters constitutes essential work. Improving maintenance personnel competency is crucial for achieving better performance. Investigations

reveal that many maintenance staff lack adequate qualifications, making it difficult to address emerging issues effectively. For instance, personnel often neglect to study advanced concepts or technologies, relying instead on outdated methods. Consequently, maintenance operations fail to meet expectations, creating safety hazards during broadcasting operations and exposing organizations to public criticism.

### 2.3 Systemic Deficiencies

In the new era of social development, broadcasting has become a core activity. Continuing to rely on outdated maintenance systems not only fails to create value but also prevents subsequent work from achieving desired outcomes. First, maintenance protocols for 10W digital AM medium-wave broadcast transmitters have not evolved with changing broadcasting requirements. For example, as channel counts increase, transmitter workload rises, necessitating adjustments to component replacement and cleaning schedules. Maintaining a single rigid approach yields suboptimal results and creates hidden dangers. Second, protocol implementation fails to account for special circumstances, resulting in gaps in maintenance coverage.

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## 3. Key Maintenance Strategies

### 3.1 Personnel Training Enhancement

Objectively analyzing, maintaining 10W digital AM medium-wave broadcast transmitters is inherently difficult and influenced by numerous factors. Achieving better results requires scientific and rational personnel training programs to properly address diverse issues. First, all maintenance staff must study the latest concepts and technologies, which strengthens the maintenance system and enables effective fault resolution without creating serious hazards. Second, training programs should incorporate regular documentation of transmitter conditions, particularly parameter variations and component deterioration, to facilitate timely replacement and ensure long-term operational stability.

### 3.2 Output Power Anomaly Maintenance

Regarding the transmitter itself, digital modulation variations can cause output power anomalies that adversely affect system operation. For this fault, analyzing error coding within modules and observing its impact on output signals is recommended. Installing high-capacity mica sheets or metal foil in sampling modules can form effective capacitors that reduce signal interference and ensure normal operation. Notably, after detecting power anomalies, the transmitter's waveform must be thoroughly tested and analyzed. Any identified issues should be promptly resolved to prevent recurring faults and ensure expected performance.

### 3.3 Power Tube Breakdown Maintenance

With the rapid development of broadcasting, the load capacity of 10W digital AM medium-wave broadcast transmitters must be substantially enhanced. Under certain conditions, power tubes are prone to breakdown failures, requiring targeted solutions. When a transmitter operating normally suddenly produces irregular noise, modular power tube breakdown may occur, necessitating immediate investigation of root causes. Generally, DC current adjustment requires considerable time, and signal output pathways experience natural wear, with oxidation becoming increasingly apparent and vulnerable to breakdown. To address this, identify oxidized locations through welding inspection, test other voltage levels, and observe their characteristics. Linear voltage display indicates normal status and resolution of the breakdown issue.

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## 4. Maintenance Essentials

Current maintenance practices for 10W digital AM medium-wave broadcast transmitters generally achieve satisfactory results without major deficiencies. Moving forward, key maintenance points should be actively implemented. First, routine maintenance must include detailed inspection and analysis, with immediate reporting and resolution of any issues to prevent hazard accumulation. Second, maintenance should maximize improvement of existing shortcomings and integrate advanced components to enhance transmitter modification, extend service life, and ensure normal operation. Modern broadcasting increasingly depends on equipment reliability. While maintenance systems continue to improve, maintenance awareness must be further elevated through rational responses to multifaceted influencing factors and effective control of various aspects to create greater value in subsequent work.

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*Source: ChinaXiv — Machine translation. Verify with original.*