

# COMPANY PROFILE

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Doewe Technologies, headquartered in Beijing, has been operating for a decade and currently has branches including the Beijing R&D Center, Chengdu R&D Center, Doewe Shanghai, Doewe Shenzhen, and Doewe Hong Kong. The company is fully committed to building its independent brand "Doewe," with its business covering two main categories: Advanced Sensing Measurement and Control (ASMC) and Professional Test and Measurement Solutions (PTMS).

The ASMC product line provides innovative high-precision sensing acquisition and data analytics solutions. PTMS focuses on industry-specific test and measurement solutions for audio, video, and RF applications. It has established the 5XC product system, serving sectors such as transportation, broadcasting, automotive electronics, consumer electronics, and university research institutes.

Through relentless effort, several of the company's products have become benchmark test instruments in their respective industries. Doewe Technologies also holds multiple core patents and software copyrights, participates in relevant industry standards working groups, and contributes to the formulation of national and industry standards. Building on past achievements, Doewe continues to increase its R&D investment. We have never forgotten our original aspiration, firmly believing that only profound technological accumulation creates value. We persistently pursue innovation in test and measurement technology, dedicated to technology development, application software services, and research in test and measurement solutions.

Leveraging its Beijing headquarters, related technical centers, and subsidiaries, Doewe Technologies has gradually established a nationwide pre-sales and after-sales service network, providing customers with professional technical consultation. Guided by the principles of "Rigorous, Efficient, Professional, Innovative," Doewe Technologies will continue steadfastly on this path, living up to the trust of every customer.

The journey ahead is long and challenging. We will accompany you on this path of growth to create a new future of technology together.

## Solution Overview

AM (Amplitude Modulation) and FM (Frequency Modulation) broadcasting, as traditional wireless broadcasting technologies, despite facing challenges from emerging technologies like streaming in the digital age, still play an irreplaceable role in various fields due to their unique technical characteristics and coverage advantages. They are widely used in areas such as long-distance coverage, emergency communications, news, talk shows, campus broadcasting, etc., with particular prevalence in automotive broadcasting applications. Therefore, testing the AM/FM broadcasting performance and functionality of in-vehicle terminals is particularly important.

In response to these needs, we have developed an AM/FM testing system for in-vehicle terminals. This system is a professional testing solution for the AM/FM radio reception performance and functionality of in-vehicle terminal products. The in-vehicle AM/FM testing solution mainly follows the GB/T 26775-2011 "General Technical Conditions for In-Vehicle Audio and Video Systems" standard for AM/FM parameter testing. The system mainly consists of an AM/FM signal generator (dual-purpose device), interference signal generator, audio analyzer A8, AM/FM standard simulation antenna, DC power supply, standard load, and other core components. The tests should be conducted in a professional shielded room, with the performance of the shielded room complying with GB/T12190-90 standards.



Figure 1: Cabinet Diagram



# Testing System Description

## Testing System Principles

The in-vehicle AM/FM testing solution provides a complete testing solution for vehicle broadcast performance, including core equipment. It has full testing capabilities for AM and FM simulation broadcast formats. The testing system consists of two parts: standard excitation and response testing. The standard excitation consists of two RWC2010C broadcasting testing systems—one supports AM/FM standard test signal output, and the other mainly generates interference signals to test the device's immunity. Additionally, it is equipped with AM/FM standard simulation antennas. The standard excitation part provides corresponding excitation (i.e., corresponding AM or FM RF signals) to the tested vehicle broadcast terminal (referred to as the "test system"). A DC stabilized power supply powers the test system, and the test system outputs corresponding response signals (and demodulated audio signals) to the response testing part. The response testing part consists of 8 standard loads and an 8-channel audio analyzer A8. The response signal is passed through the standard load to the audio analyzer for professional audio parameter measurement. The overall structure diagram of the testing system is as follows:

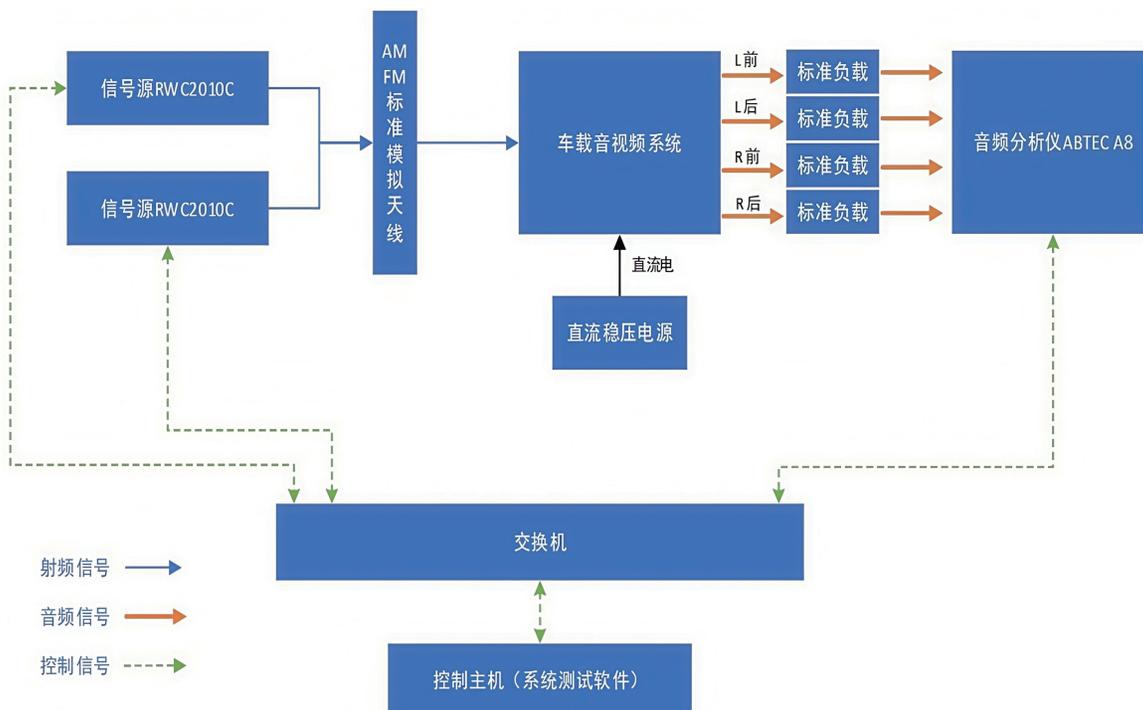


Figure 2: Overall Structure of the Testing



# Testing Standards and Parameters

The in-vehicle AM/FM testing solution performs AM/FM parameter testing in accordance with the GB/T 26775-2011 "General Technical Conditions for In-Vehicle Audio and Video Systems" standard. The AM/FM parameters in GB/T 26775-2011 are as follows (see sections 4.5.2.1 and 4.5.2.2 in the standard):

## AM Performance Testing Parameters

Item	Test Point	Unit	Technical Requirement	
Frequency Range	/	KHz	531~1629	
Intermediate Frequency	603KHz	KHz	450±5	
Noise Limit Sensitivity (S/N=20dB)	603KHz	dBuV	≤37	
	999KHz			
	1404KHz			
Lock Sensitivity	603KHz	dBuV	36±10	
	999KHz			
	1404KHz			
Signal-to-Noise Ratio	999KHz	dB	≥43	
Intermediate Frequency Suppression	603KHz	dB	≥50	
Mirror Image Suppression	1404KHz	dB	≥50	
selectivity	+9KHz	999KHz	dB	≥45
	-9KHz		dB	≥45
Automatic Gain Control	999KHz	dB	≥45	
Distortion RF=74dBuV Fdev=30%	999KHz	%	≤2	
Overload Distortion RF=100dBuV Fdev=80%	999KHz	%	≤3	

## FM Performance Testing Parameters

Item	Test Point	Unit	Technical Requirement	
Frequency Range	/	MHz	87.5~108.0	
Intermediate Frequency	90.1MHz	MHz	10.7±0.3	
Noise Limit Sensitivity (S/N=30dB)	90.1MHz	dBuV	≤12	
	98.1MHz			
	106.1MHz			
Lock Sensitivity	90.1MHz	dBuV	23±8	
	98.1MHz			
	106.1MHz			
Capture Ratio	98.1MHz	dB	≤6	
Signal-to-Noise Ratio	98.1MHz	dB	≥48	
Selectivity	+400KHz	98.1MHz	dB	≥70
	-400KHz			
Intermediate Frequency Suppression	90.1MHz	dB	≥50	
Mirror Image Suppression	106.1MHz	dB	≥50	
Amplitude Modulation Suppression	98.1MHz	dB	≥40	
Distortion RF=60dBuV Fdev=22.5KHz	98.1MHz	%	≤2	
Overload Distortion RF=100dBuV Fdev=75KHz	98.1MHz	%	≤3	
Frequency Response	100Hz	98.1MHz	dB	0±4
	1KHz			0
	10KHz			0±4
stereo Degree of resolution	100Hz	98.1MHz	dB	≥18
	1KHz			≥23
	10KHz			≥18
ST lighting sensitivity	98.1MHz	dBuV	≤12	
Stereo signal-to-noise ratio	98.1MHz	dB	≥45	
Stereo distortion	98.1MHz	W	≤3	
10%Distortion and noise Output power	98.1MHz	%	/	

**Note: Intermediate frequency and mirror image-related parameters are only tested with analog receivers; digital receivers generally do not require testing.**



# Key Parameters of the Testing System

AM/FM Signal generator RWC2010C Key Parameters	
Modulation Modes	OFDM,D-QPSK,16QAM, 64QAM,FM/AM
Frequency Range	Low/Medium/High Frequency Range:149KHz~30 MHz I/II/III Bands:47~68MHz, 76~108 MHz, 174~250MHz
Resolution	1KHz
Accuracy	±1.5 ppm/year in the working environment
Output Level	-10~+110 dBm(OFDM: -20~-120 dBm),Low/Medium/High Frequency Range, I/II/III Bands:0~-110 dBm(OFDM:10~-120 dBm)
Precision	±1dB
Standing Wave Ratio	Better than 1.5
Internal Reference and Stability	10 MHz, ±1.5 ppm/year (working environment)
External Reference Input	10MHz,0~+20dBm(MAX)
Audio Signal Input Frequency Range	0.1~20KHz
Audio Signal Input Range	Unbalanced 2.25Vrms
Audio Signal Analysis Bandwidth	20KHz
Audio Signal Common Mode Rejection Ratio (CMRR)	56dB

ABTEC A8 Audio Analyzer Key Parameters			
Maximum Input Voltage	160Vpk	Signal Source Frequency Range	5Hz~80.1kHz
Maximum Bandwidth	90kHz	IMD Test Standards	SMPTE, MOD, DFD
Maximum Frequency Bandwidth (1 kHz)	±0.05dB	Maximum Output Amplitude (Balanced)	14.4Vrms
Frequency Response (20Hz~20kHz)	0±0.05dB	Maximum Output Sampling Rate	216kHz
Noise (20kHz BW)	≤ 1μV	Sampling Frequency	3ppm
Maximum FFT Length	1M	ADC Bit Depth	8-24bit
Total Harmonic Distortion+Noise (THD+N, 20kHz BW)	≤-103dB	Analog-to-digital conversion mode	Balanced and single-ended



# Solution Advantages and Features

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- Complies with the testing requirements for in-vehicle AM/FM performance indicators as specified in the standard "GB/T 26775-2011 General Technical Conditions for In-Vehicle Audio and Video Systems";
- Supports multiple analog and digital broadcast formats, including AM, FM, RDS, etc.;
- Supports AM/FM broadcast output, and supports various audio signals (MONO/STEREO/SWEEP/WAVE File);
- Supports professional audio parameter testing functions, and supports multiple professional audio testing functions, including signal-to-noise ratio, distortion, frequency response, cross-talk, and other core audio indicators;
- Provides a complete API or remote control command set, and also offers automated testing system development services, supporting one-click testing and automatic report generation.
- Features digital radio multiplexing functionality, supporting up to 64 services, with DAB/DMB mode supporting 64 services, and DRM mode supporting up to 4 streams. Users can quickly edit protocol parameters and apply them in real-time.
- The RWC2010C supports seamless connection between devices and SFN (Single Frequency Network) synchronization transmission, ensuring efficient and stable testing when multiple devices work together, improving the reliability and scalability of the testing system.
- With the high-precision functionality of the ABTEC A8 audio analyzer, the system can monitor and test audio signal quality changes in real-time, covering key audio indicators such as high-precision frequency response, signal-to-noise ratio, harmonic distortion, etc., making it particularly suitable for the precise performance evaluation of complex audio devices.
- The system's audio analysis module supports various digital interface expansions, including USB, HDMI, PDM/A-DIO, etc., enabling it to meet the broad requirements of home theaters, consumer audio, and professional audio systems, ensuring equipment compatibility and flexibility.
- The system supports real-time testing of SINAD, THD, SNR, and other audio indicators, and displays spectrum and waveform graphs, helping users deeply analyze audio signal quality and ensuring the clarity and stability of broadcast signals.



# Core Product Introduction-RWC2010C

## Overview

The RWC2010C Broadcast Testing System is an integrated multi-protocol broadcast signal testing platform, designed for broadcasters, communication operators, and equipment manufacturers. It supports DAB, DMB, DRM, AM, FM, and RDS broadcast formats, and can simulate and analyze various broadcast signals to meet different testing needs. The system comes with a built-in multiplexer, allowing users to easily edit protocol parameters through the GUI and adjust broadcast configurations in real-time. It features audio quality analysis functions, including SINAD, THD, and SNR measurements, and supports spectrum and waveform displays to help assess signal quality. The unique ETI/MDI file playback function makes signal simulation more realistic, and it supports seamless connection between multiple devices and SFN synchronization transmission, ensuring efficient and stable testing. The RWC2010C is widely used in broadcast signal research, verification, and laboratory testing.

## Key product features are as follows

- **Digital Radio Multiplexing Function:** RWC2010C supports up to 64 services, with DAB/DMB mode supporting 64 services and DRM mode supporting up to 4 streams. Users can quickly edit protocol parameters and apply them in real-time.
- **ETI/MDI Playback Function:** Supports ETI and MDI file playback, simulating DAB and DRM broadcast signals, providing a real signal testing experience.
- **Simulated Broadcast Transmitter Function:** Supports DAB/DRM, AM, FM, and RDS broadcasts, meeting both digital and analog broadcast testing needs.
- **Advanced Function Testing Capability:** Supports real-time changes to multiplex configurations, broadcast notifications, frequency switching, etc., enhancing testing flexibility.
- **Service Connection Testing Function:** Through the “Service Seamless Connection Testing Tool,” the system enables multi-device collaboration, improving testing coverage.
- **Audio Analysis Function:** Supports SINAD, THD, SNR, and other audio quality measurements, displaying frequency, waveform, and spectrum in real-time to deeply analyze signal quality.



Figure 3: RWC2010C



## Key Parameters of the RWC2010C

Item	Specific Item	Parameters
Modulation Mode	Modulation Mode	OFDM, D-QPSK, 16QAM, 64QAM, FM/AM
Frequency Range	Low/Medium/High Frequency Band	Low/Medium/High Frequency:149kHz ~ 30 MHz
	I/II/III Type Bands	47~68 MHz, 76~108 MHz, 174~250 MHz
	Frequency Step	1 kHz
	Frequency Deviation	±1.5 ppm/year(working environment)
Output Power	Output Power Range	-10 to -110 dBm(OFDM:-20 to -120 dBm) I/II/III Type:0 to -110 dBm(OFDM:-10 to -120 dBm)
	Output Power Accuracy	±1 dB
	Output Power Step	0.1 dB
	Harmonic Ratio	1.5
RWC9500B Output Power(Optional)	Output Power Accuracy	±1 dB
	Output Power Step	0.1 dB
	Output Power Range	+15 to +55 dBm(CW/OFDM)
Frequency Parameters	Internal Frequency Reference	10 MHz,±1.5 ppm/year (working environment)
	External Reference Frequency	10 MHz:0~+20 dB(max)



# Core Product Introduction-A8

## Overview

The A8 is a true multi-channel audio analyzer, supporting the simultaneous input and output of 8 analog channels, and offers various digital interface expansions, including BT, I<sup>2</sup>S, HDMI, PDM/A-DIO, AMC, A2B, etc. The A8's high-precision testing functions cover key audio indicators such as frequency response, harmonic distortion, and signal-to-noise ratio, allowing real-time monitoring of audio signal quality. It is suitable not only for testing home theater receivers and consumer audio equipment but also for the precise analysis of professional audio systems. With its powerful multi-channel audio testing capabilities, the A8 can handle multiple audio signals simultaneously, especially suited for the performance evaluation of complex audio devices.

## Key product features are as follows

- Fully comparable to APx585 audio analyzer from AP Company
- Standard support for SPDIF/TOSLINK/AES/EBU digital interfaces
- Supports BT/HDMI/I<sup>2</sup>S/PDM/ADIO/AMC/A2B and other digital interface expansions
- Code-free automation and nationwide API interface
- Complete and powerful electroacoustic testing functions
- General software platform
- Supports simultaneous multi-channel audio testing, including testing one-to-many or many-to-one channel separation or position differences, testing maximum power over time for all channels, and with the channel switching function, up to 192 test channels can be achieved.

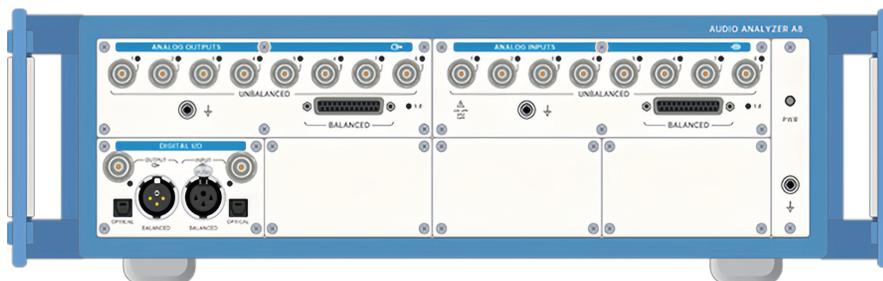


Figure 4: A8 Audio Analyzer Product



## Key Parameters of the A8

Item	Parameters
Sine Wave Test Frequency Range	5Hz ~ 80.1kHz
Spectrum Density	3ppm
IMD Test Signals	SMPTE, MOD, DFD
Maximum Output Amplitude (Balanced)	14.4Vrms
Bandwidth (1 kHz)	±0.05dB
Bandwidth Flatness (20Hz ~ 20kHz)	±0.08dB
ADC Mode	Balanced and Unbalanced
Maximum Output Sampling Rate	216kHz
Sampling Frequency	3ppm
Bit Depth	8-24bit
Dolby/dts Signal Support	Supports encoded files
Maximum Input Voltage	160Vpk
Maximum Bandwidth	90kHz
Frequency Response (20 Hz ~ 20 kHz)	0±0.05dB
Residual Noise (20 kHz BW)	≤1μV
Independent Harmonic Analysis	d2-d10
Maximum FFT Length	1M
DC Voltage Measurement	DC Bias Measurement





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