DOEWE
TEST SOLUTION EXPERT

COMPANY PROFILE

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.

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Overview

ETC Runsys is a professional ETC automated testing system deployed on management workstations, where all core devices can be remotely and automatically controlled. The core devices mainly use domestic instruments, offering high cost-performance, supporting Chinese operation interfaces, and facilitating functional debugging and application testing. The ETC testing process and data analysis results are visualized for easy viewing, and the system's testing framework is clear with a rational process, simplifying test flow logic judgment. This system complies with the national standard GB/T 20851.5-2019, achieves efficient RSU/OBU testing, is suitable for ETC testing in different scenarios, and is an excellent choice for transportation field testing.

RSU Testing Items

- Carrier frequency, frequency tolerance, occupied bandwidth
- E.I.R.P (Equivalent Isotropic Radiated Power), spurious emission
- Adjacent channel power leakage ratio
- Modulation mode, modulation coefficient, bit rate
- Receiving sensitivity
- Receiving bandwidth
- Maximum input signal power
- Co-channel interference rejection ratio
- Adjacent channel interference rejection ratio
- Blocking interference rejection ratio
- BER (Bit Error Rate)
- Preamble
- Postamble

OBU Testing Items

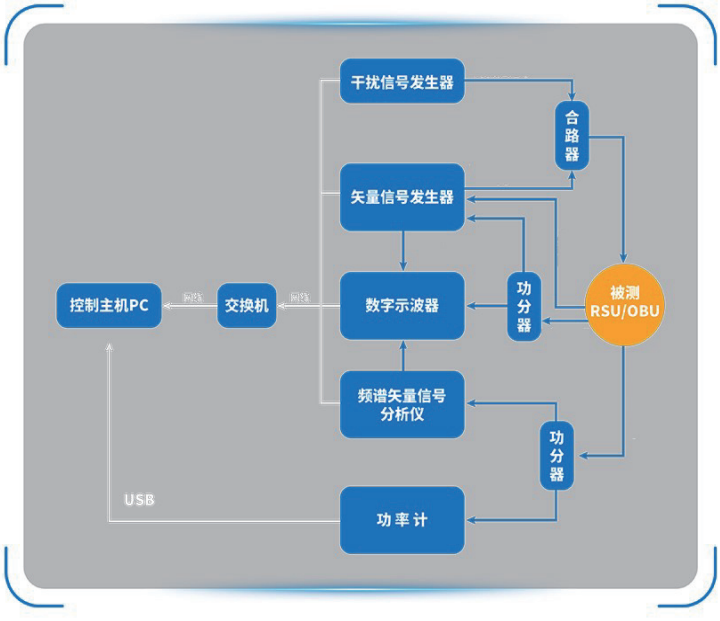
- Carrier frequency, frequency tolerance, occupied bandwidth
- E.I.R.P, spurious emission
- Adjacent channel power leakage ratio
- Modulation mode, modulation coefficient, bit rate
- Wake-up sensitivity
- Wake-up time
- Receiving sensitivity
- Receiving bandwidth
- Maximum input signal power
- Co-channel interference rejection ratio
- Adjacent channel interference rejection ratio
- Blocking interference rejection ratio
- BER
- Preamble
- Postamble

System Introduction

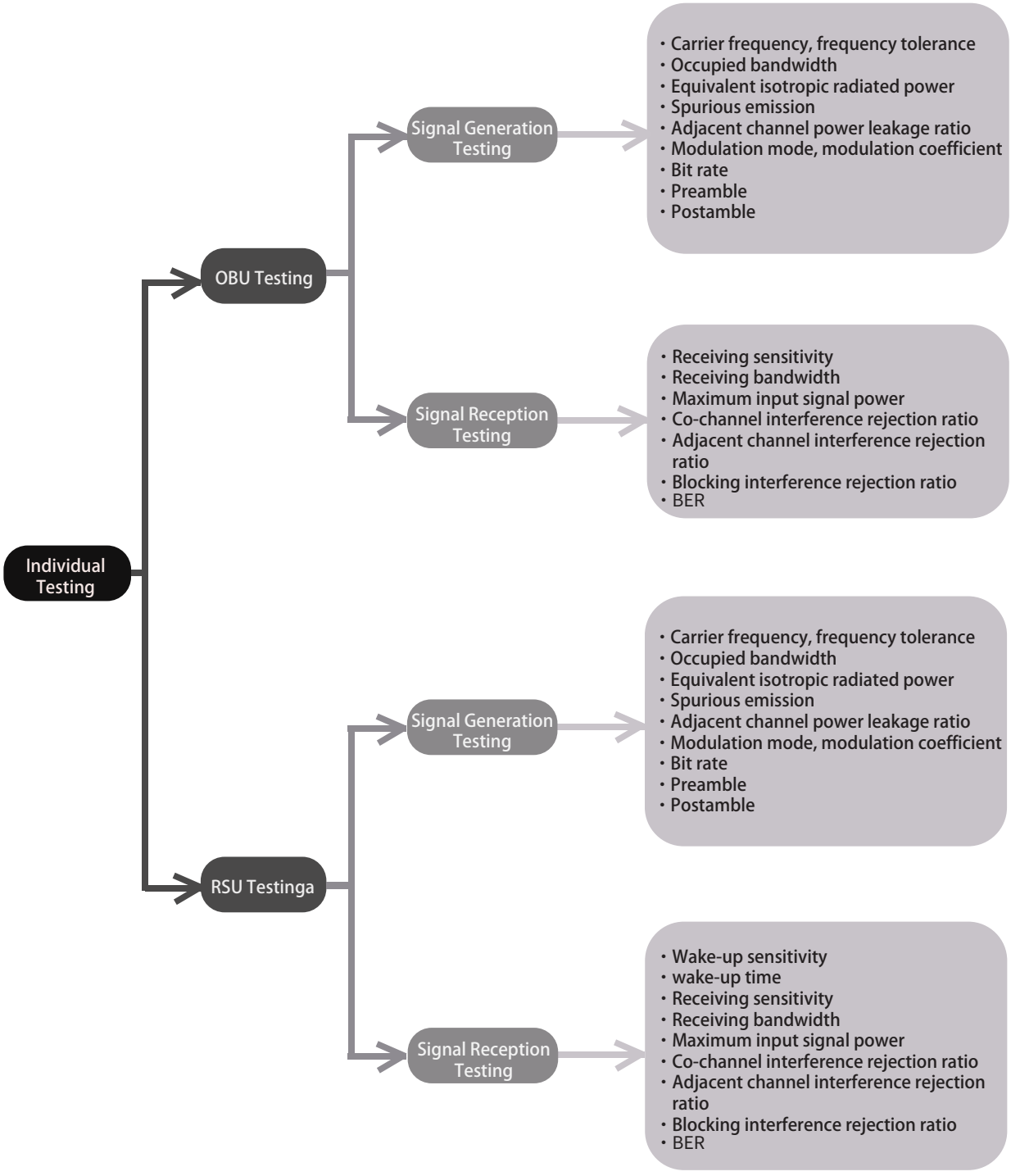
System Features and Advantages

- Fully compliant with GB/T 20851.5-2019
- Supports independent testing for RSU and OBU, as well as gantry testing (including transaction process analysis)
- Designed based on individual test items, supporting custom selection of test items
- Automatically displays testable items after selecting typical testing equipment, simplifying test logic judgment
- Strives to simplify the testing process, with full automation except for necessary manual cooperation scenarios
- Follows a modular design concept to ensure convenient and efficient maintenance
- Has high expandability to meet future testing application extensions
- Can directly call predefined test item settings for efficient repeated testing
- Enables real-time viewing of test records, saving labor and time costs
- Visualizes testing processes and data analysis results, facilitating demonstration and learning
- Core devices and software support Chinese for easy testing operations
- The system testing framework is clear and the process is rational, making testing management easy

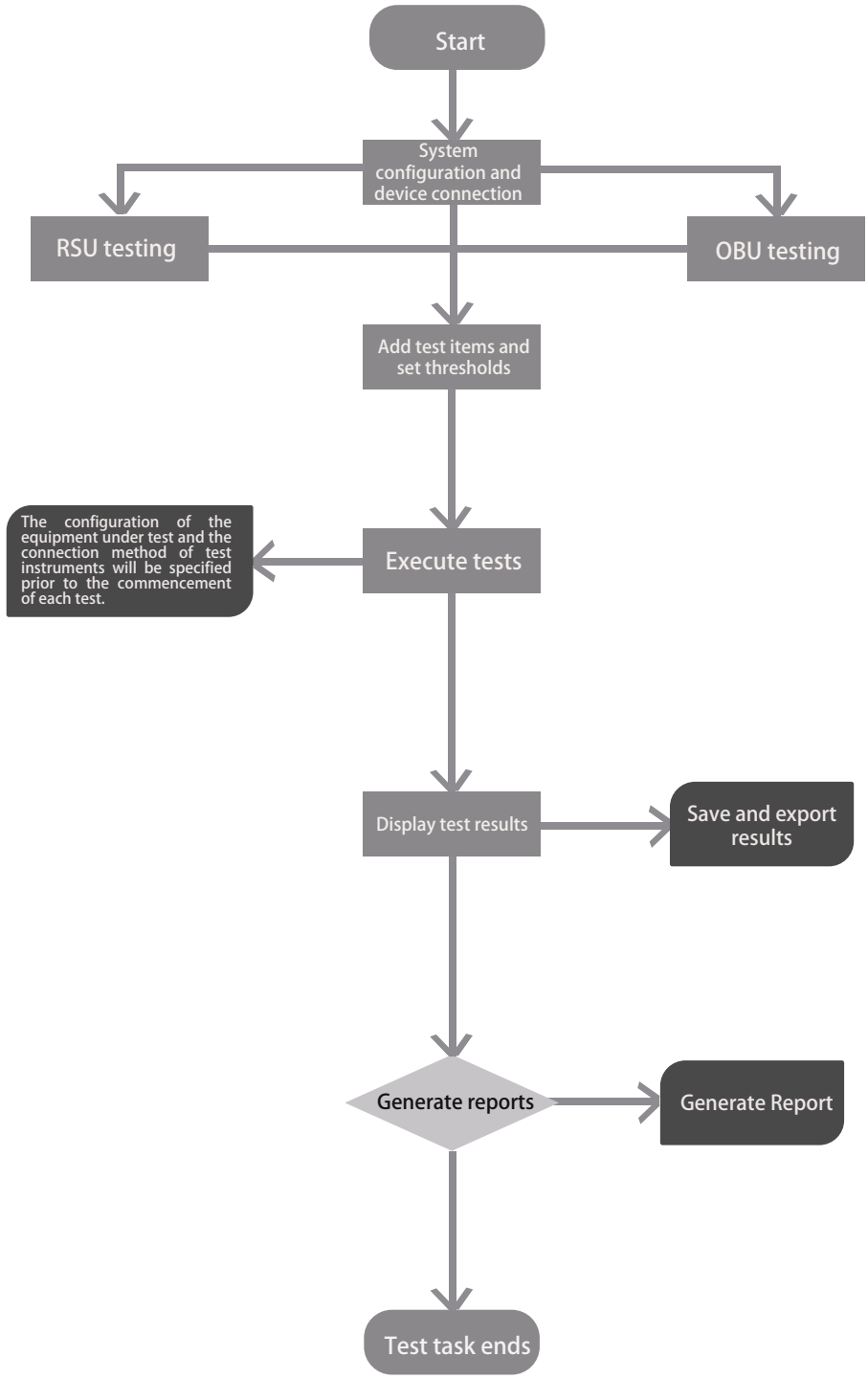
System Composition and Framework



System Testing Framework

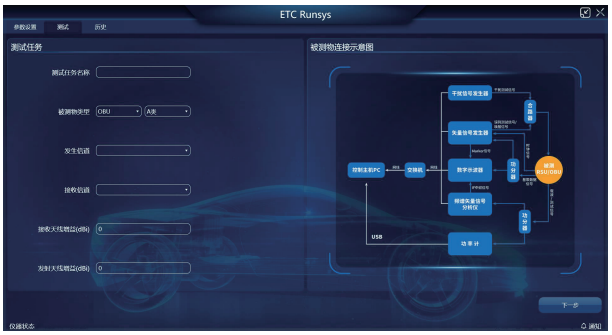


System Workflow

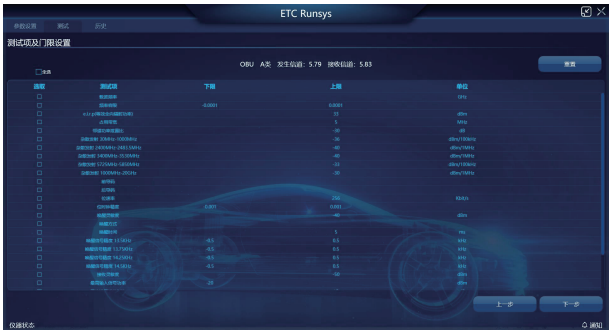


System Interface Schematic

Interface 1 - System Configuration



Interface 2 - Create New Test Task



Interface 3 - Select Test Items

Interface 4 - Perform Test

Interface 5 - Historical Task Query

Interface 6 - Historical Data View

Spectrum & Signal Analysis Module Introduction

Overview

The Spectrum & Signal Analysis module of the ETC Runsys system is an RF measurement module combining RF analysis and demodulation analysis capabilities. The SSA5083A features an intuitive touchscreen, is simple and easy to use, offers reliable RF performance, and has an easy-to-operate design. The spectrum analysis measurement range spans from 9 kHz to 13.6/26.5 GHz. The instrument not only supports spectrum measurements but also high-precision power measurements using power sensors and analysis of analog and digitally modulated signals. Excellent phase noise and Displayed Average Noise Level (DANL) make it fully meet the requirements for electromechanical testing and product testing in traffic engineering.

System Features & Advantages

- Spectrum Analysis Mode, Frequency Range: 9 kHz to 13.6/26.5 GHz;
- Displayed Average Noise Level (DANL) below -165 dBm/Hz;
- SSB Phase Noise: -105 dBc (1 Hz) 1 GHz Carrier, 10 kHz offset;
- Minimum Resolution Bandwidth (RBW): 1 Hz;
- Real-time Spectrum Analysis Bandwidth: 25MHz/40MHz;
- Supports measurement function suites including Channel Power, Adjacent Channel Power Ratio (ACPR), Occupied Bandwidth, Harmonic Analysis, Intermodulation Analysis, etc.;
- Supports analog signal and vector signal modulation analysis;
- Supports remote monitoring and file operations via network browser on computers or handheld terminals;
- 12.1-inch multi-touch screen, supports mouse and keyboard control.

Vector Signal Generator Module Introduction

Overview

The Vector Signal Generator module of the ETC Runsys system has an output frequency range covering 9 kHz~6 GHz. It supports AM, FM & PM analog modulation and can be upgraded for pulse modulation, pulse sequence generation, power meter control, and other functions. Equipped with an internal IQ baseband source, it can generate common digital modulation signals, such as ASK and FSK used in ETC RF communication, as well as signals for other common communication protocols. Supports common digital modulation baseband PRBS data and also supports custom baseband data. Supports ARB (Arbitrary Waveform Generation) functionality. With an IQ bandwidth of not less than 75MHz and excellent ACPR (Adjacent Channel Power Ratio) characteristics, it can meet applications in various environments such as R&D and production.

System Features & Advantages

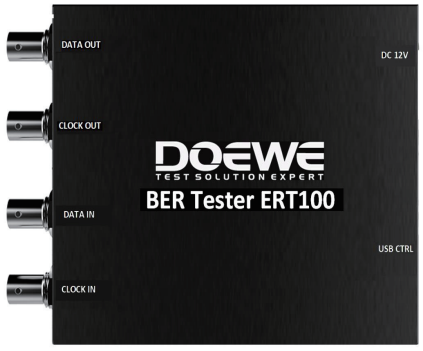
- Maximum Frequency: 6 GHz;
- Output Frequency Resolution: up to 0.001 Hz;
- Level Setting Range: -140 dBm ~ 26 dBm;
- Phase Noise: < -120 dBc/Hz @1 GHz, offset 20 KHz (typical value);
- Amplitude Accuracy: < 0.7 dB (typical value);
- Supports AM/FM/PM analog modulation, supports internal/external modulation sources;
- Power Meter Control Suite, enabling easy power measurement using a power meter, control of power output, and cable loss correction;
- Supports IQ modulation, can output various modulation signals such as QAM, FSK, ASK, PSK, multi-tone; supports playback of data sources generated by Matlab;
- Supports protocol file playback; includes built-in common protocol files;
- Supports generation and playback of waveform sequences;
- Supports real-time IQ baseband AWGN (Additive White Gaussian Noise), accurately controlling signal and noise power, simplifying additional measurements and calculations required for receiver testing;
- Supports web remote control, enabling users to control the device remotely;
- 5-inch capacitive touchscreen for convenient user operation.

Bit Error Rate Test Module Introduction

Overview

The Bit Error Rate Test module of the ETC Runsys system is a portable module for BER (Bit Error Rate) testing of PRBS (Pseudo-Random Binary Sequence) signals. It supports output and input of typical PRBS pattern signals and real-time BER testing. Supports USB control and data transmission; transmitted data includes real-time BER, input clock rate, received baseband data, etc. Supports setting output pattern (common pseudo-random sequences), data signal amplitude, clock signal amplitude and rate, and other parameters. Also supports display of input signal rate, amplitude, and real-time BER.

Appearance & Interface Description



DATA OUT: Output Pattern Data Signal Interface

CLOCK OUT: Output Pattern Clock Signal Interface

DATA IN: Input Pattern Data Signal Interface

CLOCK IN: Input Pattern Clock Signal Interface

DC 12V: 12V DC Power Supply Interface

USB CTRL: USB Control Interface

Parameter Characteristics & Interface Specifications

Parameter	Specification
Supported Analysis Patterns	PRBS7, 9, 11, 15, 20, 23, 31
Pattern Generation Selection	PRBS7, 9, 11, 15, 20, 23, 31
Data/Clock Signal Threshold	Threshold adjustable from 0.1V~2V, step 0.1V
Output Data/Clock Amplitude	Adjustable from 0.1V~3V (Peak Level), step 0.1V
Output Clock Signal Rate	100Kbit/s~2Mbit/s, step 1K
Data Signal Output Interface	BNC Female, 50 Ohm
Clock Signal Output Interface	BNC Female, 50 Ohm
Data Signal Input Interface	BNC Female, 50 Ohm
Clock Signal Input Interface	BNC Female, 50 Ohm
Control & Data Interface	USB2.0
Dimensions	Length 170mm, Width 120mm, Height 35mm

Time Domain Signal Analysis Module Introduction

Overview

The Time Domain Signal Analysis module of the ETC Runsys system offers a bandwidth of 500 MHz, a maximum sampling rate of 2 GSa/s, and features 4 analog channels with memory depth up to 200 Mpts/channel. Utilizing SPO (Super Phosphor Oscilloscope) technology, the module achieves a high waveform capture rate of 500,000 frames/second, with 256-level intensity grading and color temperature display. It features an innovative digital trigger system with high trigger sensitivity and low trigger jitter. It provides rich measurement and math functions. The 12-bit mode enables higher precision data acquisition and processing. The module incorporates a 10.1-inch capacitive touchscreen supporting multi-touch gestures for common waveform operations.

System Features & Advantages

- Analog Channel Bandwidth: 500 MHz; Real-time Sampling Rate: up to 2 GSa/s;
- Waveform Capture Rate: up to 500,000 frames/sec (Sequence mode), 100,000 frames/sec (Normal mode);
- Supports 256-level waveform intensity grading and color temperature display;
- Memory Depth: 200 Mpts/Channel;
- Low noise floor, voltage range down to 500 μV/div;
- 12-Bit mode provides higher precision data acquisition and processing;
- History Mode, capable of recording up to 80,000 frames of waveforms;
- Dozens of automatic measurement functions; supports measurement statistics, Gating measurement, Math measurement, History measurement, Ref measurement. Supports histogram and trend chart statistics for measurement parameters;
- 2 independent waveform math channels, supporting 2M point FFT, addition, subtraction, multiplication, division, square root, averaging, ERES (Enhanced Resolution), and custom expressions;
- 10.1-inch capacitive touch display, resolution 1024*600.

Power Measurement Module Introduction

Overview

The Power Measurement module of the ETC Runsys system is a pocket-sized CW signal average power meter with a built-in USB interface. It enables quick setup and measurement over a frequency range of 10MHz to 18GHz and a dynamic range of -57dBm to +20dBm. It does not require a separate power meter mainframe; simply connect it to a computer via USB, and use the included test software for parameter setup and measurement. It also fully supports custom secondary development for automated integrated test software.

System Features & Advantages

Parameter	Specification
Frequency Range	10MHz~18GHz
Dynamic Range	2nW～100mW (-57～+20dBm)
VSWR (Port)	＜1.35
Power Measurement Uncertainty	Max：±0.3, TYP：±0.15
Input Connector Type	N (J)
Dimensions	165×39×30mm (excluding 1.5m USB cable)
Weight	Approx.280g

Interference Signal Generator Module Introduction

Overview

The Vector Signal Generator module of the ETC Runsys system has an output frequency range covering 9 kHz~6 GHz. It supports AM, FM & PM analog modulation and can be upgraded for pulse modulation, pulse sequence generation, power meter control, and other functions. Equipped with an internal IQ baseband source, it can generate common digital modulation signals, such as ASK and FSK used in ETC RF communication, as well as signals for other common communication protocols. Supports common digital modulation baseband PRBS data and also supports custom baseband data. Supports ARB (Arbitrary Waveform Generation) functionality. With an IQ bandwidth of not less than 75MHz and excellent ACPR (Adjacent Channel Power Ratio) characteristics, it can meet applications in various environments such as R&D and production.

System Features & Advantages

- Maximum Frequency: 6 GHz;
- Output Frequency Resolution: up to 0.001Hz;
- Level Setting Range: -140dBm ~ 26dBm;
- Phase Noise < -120dBc/Hz@1GHz, offset 20KHz (Typ.);
- Amplitude Accuracy < 0.7dB (Typ.);
- Supports AM/FM/PM analog modulation, supports internal/external modulation sources;
- Power Meter Control Suite, enabling easy power measurement using a power meter, control of power output, and cable loss correction;
- Supports IQ modulation, can output various modulation signals such as QAM, FSK, ASK, PSK, multi-tone;supports playback of data sources generated by Matlab;Supports protocol file playback; includes built-in common protocol files;
- Supports generation and playback of waveform sequences;
- Supports real-time IQ baseband AWGN, accurately controlling signal and noise power, simplifying additional measurements and calculations required for receiver testing;
- Supports web remote control, enabling users to control the device remotely;
- 5-inch capacitive touchscreen for convenient user operation.

Microwave Signal Generator Module Introduction

Overview

The Microwave Signal Generator module of the ETC Runsys system has an output frequency range covering 9 kHz~20 GHz, fully meeting ETC blocking test requirements. The level setting range supports -130dBm~20dBm. It also supports AM, FM & PM analog modulation, pulse modulation, pulse sequence generation, power meter control, and other functions. Configured with an OCXO (Oven-Controlled Crystal Oscillator) reference, it provides high stability and high output accuracy. It delivers excellent and stable signal output, suitable for various application scenarios in the transportation field, including R&D and production.

System Features & Advantages

- Maximum Frequency 40GHz ;
- Output Frequency Resolution: up to 0.01Hz;
- Level Setting Range: -130dBm ~ 24dBm;
- Phase Noise < -135dBc/Hz@1GHz, offset 20KHz (Typ.);
- Amplitude Accuracy < 0.7 dB (Typ.);
- Supports AM/FM/PM analog modulation, supports internal/external modulation sources;
- Power Meter Control Suite, enabling easy power measurement using a power meter, control of power output, and cable loss correction;
- Supports web remote control, enabling users to control the device remotely;
- 5-inch capacitive touchscreen for convenient user operation;
- Rich communication interfaces: USB-HOST, USB DEVICE (USB-TMC), LAN (VXI-11, Socket, Telnet).

Option List

Option Name	Model
Professional ETC Test Solution - Automated Test Software	ETC Runsys
Spectrum & Signal Analysis Module (w/ Modulation Analysis & Advanced Measurement)	SSA5085A
Time Domain Analysis Module	SDS2504X HD
Power Measurement Module (w/ dedicated data cable)	NRP18S
Vector Signal Generator Module	SSG5060X-V
Bit Error Rate Test Module	ERT100
Interference Signal Generator Module	SSG5060X-V
Microwave Signal Generator Module	SSG6085A

DOEWE
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Beijing Doewe Technologies Co., Ltd

Beijing Headquarters

Address: Room 1821, Building 2, Soubao Business Center, No. 16 South Third Ring Road West, Fengtai District, Beijing.

Technology Center

Address: Room 1812, Building 2, Soubao Business Center, No. 16 South Third Ring Road West, Fengtai District, Beijing.

Doewe Technologies (Shanghai) Co., Ltd.

Address: Room 212, Kaidi Commercial Building, No. 688 Huajiang Road, Jiangqiao Town, Jiading District, Shanghai.

Phone：010-64327909

Website：https://www.doewe.com

Email：info@doewe.com

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