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.

Overview

The eEye ETC gantry testing system is a set of testing systems designed specifically for the standards JTG 2182-2020 and JTG/T 3520-2021. It includes hardware devices such as field strength meters, omnidirectional/ directional antennas, spectrum vector signal analyzers, vector signal generators, wireless power meters, and handheld oscilloscopes, as well as dedicated customized software. It is used to test the communication protocol consistency of ETC, that is, the communication process.

The core instruments of the system are high-precision instruments, and handheld portable instruments are selected. While ensuring high testing accuracy, it ensures high testing convenience. The system supports the following testing functions including but not limited to:

- ETC toll road test unit (RSU) communication area testing
- ETC system road test unit (RSU) working signal strength testing
- ETC system road test unit (RSU) working frequency and frequency tolerance testing
- ETC system road test unit (RSU) occupied bandwidth
- ETC system road test unit (RSU) preamble
- ETC system road test unit (RSU) communication process

Field Strength Meter

Overview

The field strength meter of the ETC eEye system is a professional handheld field strength testing device with a spectrum analysis measurement range from 9kHz to 7.5GHz. It is equipped with a multi-point color touch screen, is compact and portable, supports battery-powered operation, and has a battery life of more than 4 hours when fully charged. It not only supports spectrum observation but also a variety of advanced measurement functions, including occupied bandwidth (OBW) testing function, ACRP adjacent channel power leakage ratio testing function, frequency meter function, channel power testing function, etc. It has broad application value and ultra-high cost performance in the ETC testing field of highway transportation.

System Characteristics and Advantages

- Spectrum analysis mode, frequency range from 9KHz to 7.5GHz;
- Level measurement range: DANL to +10dBm, 100 KHz~1MHz, preamplifier off;
  DANL to +20dBm, 1MHz~7.5 GHz, preamplifier off;
- Reference level setting range: -200dBm to +30dBm, step 1dB;
- Minimum resolution bandwidth (RBW) 1Hz;
- Full amplitude accuracy ±0.7dB;
- Trace detection methods: positive peak, negative peak, sampling, standard, average (voltage/effective value/video);
- Support advanced measurement suite (SHA850-AMK);
- Maximum continuous wave RF power:+33dBm， fc≥10 MHz, 3 minutes, input attenuation>20 dB;
- Spectrum analysis trigger modes supported: free, video, and external.

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Spectrum Vector Signal Analyzer

Overview

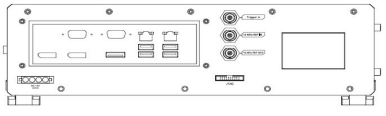
The MP7600 is a high-end RF record and playback system. When combined with custom software, it enables vector signal analysis functionality, making it an ideal tool for RF engineers conducting field signal testing and acquisition. As a standalone unit, it features real-time RF signal analysis, recording, and playback capabilities, with a maximum real-time RF signal analysis, recording, and playback bandwidth of 100MHz. It supports adjustable bandwidth from 2MHz to 100MHz, and includes spectrum analysis and power measurement functions to meet diverse application needs. The custom software supports timer settings, automatic switching, starting, and stopping of recording for different frequency bands within the operating range, real-time output during signal analysis and recording, and loop playback during signal replay.

For the highway transportation field, traditional ETC on-site signal testing is challenging due to complex road environments while ensuring traffic flow. If ETC RF signals can be directly recorded on-site and replayed for testing in the lab, it ensures test repeatability and avoids inaccurate measurement issues caused by the extremely brief signal interaction process. The MP7600 fully meets ETC signal field acquisition requirements, offering excellent low-noise performance, frequency coverage fully encompassing the ETC signal range, high recording bandwidth specifications, and supporting simultaneous uplink and downlink ETC signal acquisition and recording.

System Features and Advantages

The MP7600 is an industry-first device capable of supporting 100MHz RF real-time recording bandwidth in a single unit. It features ultra-wide frequency range (up to 6GHz) and recording bandwidth (supports 100MHz), and offers a solution for synchronously cascading up to 6 units to build an RF synchronous recording system. Beyond meeting ETC testing applications, the MP7600 can also fulfill more new application testing requirements, such as broadband satellite signal recording, WiFi signal recording, and multi-channel simultaneous signal recording.

- Recording Bandwidth: Configurable from 2M to 100MHz
- Supports Max Hold, Min Hold, and Average processing display
- Over 20 Marker functions to meet various marking test needs
- Frequency Range: 300KHz to 6.0GH
- Data Format compatible with MATLAB
- Provides IQ Data Processing Tool Software
- Spectrum Mask Trigger (Option)
- IQ Data Rate: 500MBps
- Sampling Rate: 250MS/s
- ADC Precision: 16 Bit
- 1PPS, IRIG-B Support (Option)

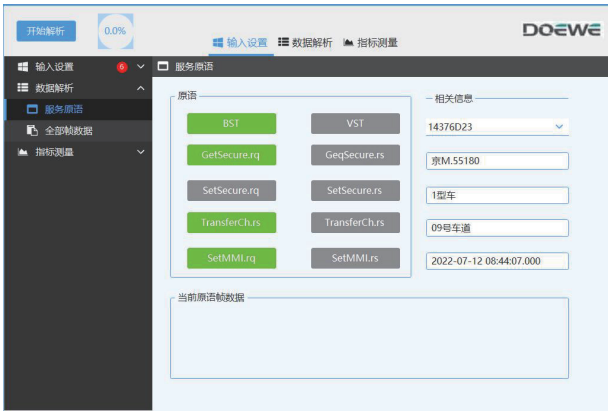


- Provides Synchox for synchronous RF signal recording with up to 6 devices (Option)
- 4×2.5-inch Internal Hard Drive Slots (Max support 4×1TB, default 2×500GB)

ETC Transaction Process Analysis Software

Overview

The ETC Transaction Process Analysis Software is a professional test software for analyzing the ETC system communication process (protocol conformance). It primarily analyzes recorded IQ files containing the ETC RF interaction process. It requires support for common IQ file formats; supports parsing RF indicators, key interaction sentences, and characteristic data at the application layer and device application layer. RF indicators include signal strength, carrier frequency, frequency tolerance, modulation index, occupied bandwidth, etc. Application layer and device application layer parsing requires the ability to automatically search for key interaction sentences, such as Preamble, BST (Beacon Service Table), VST (Vehicle Service Table), SetMMLrs, SetMMLrq, Gantry Number, and License Plate Number, to determine if the ETC system's communication process is normal. All software functions provide C# APIs for secondary development.



System Features and Advantages

- Supports IQ file reading and recognition;
- Based on the GB/T 20851-2019 series of standards, supports demodulation of RSU downlink signals and OBU uplink signals within the read IQ file;
- Supports testing various RF indicators, including: Signal Strength, Carrier Frequency, Carrier Tolerance, Modulation Index, Occupied Bandwidth;
- Based on the GB/T 20851-2019 series of standards, parses demodulated and decoded (ASK demodulation and FM0 decoding) ETC uplink/downlink data, can display decoded data, supports automatic display of Gantry Number and License Plate Number signals;
- Supports retrieval and judgment of key interaction sentences, including: Preamble, BST, VST, SetMMLrq, SetMMLrS, and concatenated statements;
- Supports display of retrieval results, prompts existence flags after corresponding key interaction sentences;
- Supports software interface screenshot output;
- Software interface design is well-structured and user-friendly.

Vector Signal Generator

Overview

The output frequency range of the vector signal generator covers 9kHz~6GHz, supports AM&FM&PM analog modulation, and can be upgraded with functions such as pulse modulation, pulse sequence generator, power meter control, etc. It has a built-in IQ baseband source and can generate common digital modulation signals, such as ASK and FSK used in ETC RF communication, as well as other common communication protocol signals. It supports common digital modulation baseband PRBS data and custom baseband data. It supports ARB custom waveform generation function. With an IQ broadband characteristic of not less than 75MHz and excellent ACPR characteristics, it can meet the application in R&D, production, and other environments.

System Characteristics and Advantages

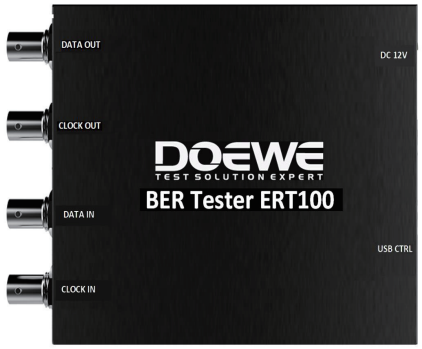
- Maximum Frequency: 6 GHz;
- Output Frequency Resolution: Up to 0.001 Hz;
- Level Setting Range: -140 dBm ~ 26 dBm;
- Phase Noise: <120 dBc/Hz @1 GHz, offset 20 KHz (Typical);
- Amplitude Accuracy: <0.7 dB (Typical);
- Supports AM/FM/PM Analog Modulation, supports internal modulation sources;
- Power Meter Control Kit enables easy power measurement using a power meter, power output control, and cable loss correction;
- Supports IQ Modulation, can output various modulation signals like 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 waveform sequence generation and playback;
- Supports real-time IQ baseband AWGN (Additive White Gaussian Noise), enabling precise control of signal and noise power, simplifying additional measurements and calculations required for receiver testing;
- Supports web remote control for convenient remote device operation;
- 5-inch capacitive touchscreen for easy user operation.

Bit Error Rate Tester (BERT)

Overview

The Bit Error Rate Tester (BERT) is a portable module designed for Bit Error Rate (BER) testing using PRBS (Pseudo-Random Binary Sequence). It supports output and input of typical PRBS pattern signals and real-time BER testing. Supports USB control and data transmission, transmitting data including real-time BER, input clock rate, received baseband data, etc. Supports setting parameters such as output pattern (common PRBS sequences), data signal amplitude, clock signal amplitude, and rate. Also supports display of input signal rate, amplitude, and real-time BER.

Appearance and 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: DC 12V Power Supply Interface

USB CTRL: USB Control Interface

Parameter Characteristics and Interface Specifications

Item	Specification
Supported Analysis Patterns	PRBS7, 9, 11, 15, 20, 23, 31
Pattern Generation Selection	PRBS7, 9, 11, 15, 20, 23, 31
Data/Clock Signal Decision Threshold	Decision threshold 0.1V~2V adjustable, step 0.1V
Output Data/Clock Signal Amplitude	0.1V~3V adjustable (peak level), step 0.1V
Output Clock Signal Rate	100Kbit/s~2Mbit/s, step 1K
Data Signal Output Interface	BNC female head, 50 ohms
Clock Signal Output Interface	BNC female head, 50 ohms
Data Signal Input Interface	BNC female head, 50 ohms
Clock Signal Input Interface	BNC female head, 50 ohms
Control & Data Transmission Interface	USB2.0
Dimensions	170mm long, 120mm wide, 35mm high

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Power Meter

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 can quickly perform the setting and measurement of the frequency range of 10MHz to 18GHz and the dynamic range of -57dBm to +20dBm. There is no need to use a power meter host. Just connect to a computer via USB and cooperate with the standard testing software to carry out the parameter setting and measurement work of the power meter. At the same time, it also fully supports customers to customize secondary development of automated integrated testing software.

System Characteristics and Advantages

Item	Specification
Frequency Range	10MHz~18GHz
Dynamic Range	2nW～100mW (-57～+20dBm)
Port VSWR	＜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

Handheld Oscilloscope

Overview

Handheld Oscilloscope, 200MHz bandwidth, maximum sampling rate 1 GSa/s, equipped with 2 analog channels, storage depth up to 12 Mpts/channel. The module utilizes SPO (Super Phosphor Oscilloscope) technology, with a waveform capture rate as high as 400,000 frames/second, featuring 256-level intensity grading and color temperature display; innovative digital trigger system with high trigger sensitivity and low trigger jitter; rich measurement and math functions; the module adopts a 5.6-inch display with a resolution of 640*480.

System Features and Advantages

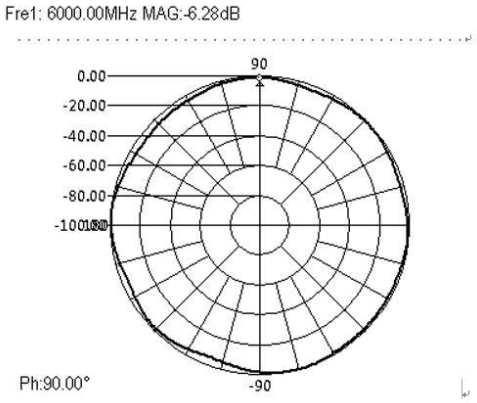
- Analog Channel Bandwidth: 200 MHz; Real-time Sampling Rate up to 1 GSa/s;
- Waveform Capture Rate up to 400,000 frames/sec (Sequence Mode), 100,000 frames/sec (Normal Mode);
- Supports 256-level waveform intensity grading and color temperature display;
- Storage Depth: 12 Mpts/channel;
- Low Background Noise, voltage range down to 2mV/div;
- History Mode, can record 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, supports 2M point FFT, Add, Subtract, Multiply, Divide, Square Root, Average, ERES (Enhanced Resolution), and custom expressions;
- 5.6-inch capacitive touch display, resolution 640*480.

Omnidirectional Antenna

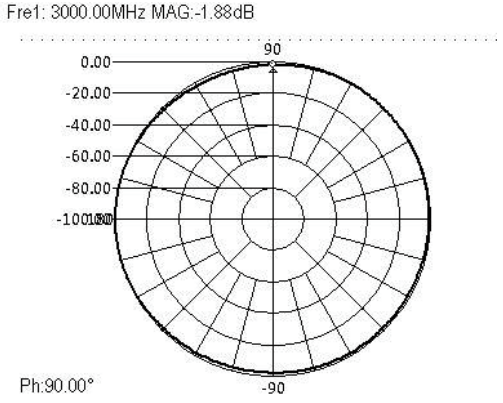
Technical Specifications

Item	Specification
Operating Frequency	1.0GHz-8.0GHz
Polarization	Vertical
VSWR	2.0(TYP)
Antenna Gain	0dBi～3.5dBi
Input Impedance	50Ω
Connector Type	N-type Female
Dimensions	Φ130×170mm
Weight	Antenna Body: ~1.3Kg, Handheld Handle: ~0.35Kg

Radiation Pattern



Vertical Polarization Omnidirectional Antenna Pattern 1



Vertical Polarization Omnidirectional Antenna Pattern 2

Usage Method

1.The antenna body bottom has a magnetic adsorption device; it can be directly adsorbed onto a car roof for testing without using the handheld handle.
2.Install the handheld handle under the antenna body for testing in a handheld antenna manner.

Directional Antenna

Product Introduction

- The direction where the signal voltage is maximum indicates the direction finding result.
- Interchangeable broadband antenna modules with different radiation patterns cover the entire frequency band from 9KHz to 8GHz. Modules can be used independently and configured separately.
- Turning on the low-noise broadband amplifier increases sensitivity (Active Mode).
- In Passive Mode, the amplifier is bypassed. The antenna can be used near strong transmitters.
- The lightweight, ultra-wideband active directional antenna set CHA200, paired with a portable receiver (e.g., FPH, FSH, FMH), is an ideal choice for locating emission sources and interference sources and measuring RF field strength.

Technical Specifications

Frequency Range	9 kHz ～ 8 GHz (ETC Industry Configuration: 500M-8GHz one module)
Antenna Modules	4 Plug-and-Play Modules for 9 kHz ～ 8 GHz: ▪ Loop antenna: 9 kHz ～ 20 MHz ▪ Loop antenna: 20 MHz ～ 200 MHz ▪ Loop antenna: 200 MHz ～ 500 MHz ▪ Log-periodic antenna: 500 MHz ～ 8 GHz
Polarization	All antenna modules are vertically polarized. Rotating the longitudinal antenna axis by 90° changes it to horizontal polarization. For the 9 kHz to 20 MHz DF loop antenna, horizontal polarization signals cannot be directionally found due to its circular horizontal pattern.
Nominal Impedance	50 Ω
VSWR	<2.5 Typical
RF Output Interface	N-type (M) Connector
Gain	See typical values in the attached charts
Amplifier Linearity	IP3 Typical 19 dBm. (Measured at Battery Voltage 6V, 25 ° C)
Typical Radiation Pattern	See typical values in the attached charts
Power Supply	4 Dry Cells (1.5V), installed within the handle

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Directional Antenna

General Specifications

Weight	
Handle (incl. batteries)	Approx. 0.5kg
10kHz~20MHz Optional RF Module	Approx. 0.4kg
20MHz~200MHz RF Module	Approx. 0.5kg
200MHz~500MHz RF Module	Approx. 0.3kg
500MHz~8.0GHz RF Module	Approx. 0.4kg
Transport Case	Approx.4kg
Total Weight	Approx. 6kg
Operating Temperature	
Operating Temperature Range	-30 °C ～ +60 °C(Active & Passive Modes)
Nominal Temperature Range	-10° C to +50° C (Active Amplifier), -30° C to +60° C (Passive Mode)
Storage Temperature Range	-30 °C ～ +60 °C
Vibration Resistance	10 Hz～300 Hz: 0.01g2/Hz，300 Hz～500 Hz: 0.003g2/Hz Acceleration approx. 1.9g every 30 min in three orthogonal axes
Shock Resistance	Max 40g, in three orthogonal axes

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