PM1200 RADIO COMPREHENSIVE TESTER

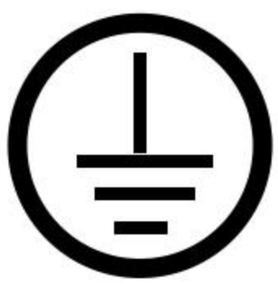
USER MANUAL

QR2.760.017SS

March, 2020

WARNING

1 When encountering prohibition signs, please refer to this manual. If you do not pay attention to the prompts in this manual during operation, personal injury may occur. In addition, the performance of this instrument may be reduced. This prohibition sign may appear in other forms, and in such cases, it may also indicate certain dangers.



2 Two instruments use a single-phase three wire power supply for AC power supply. The ground wire of the three wire power line must be well grounded, and there should be no potential difference between the ground wire and the neutral wire. If the instrument is not properly grounded, it will result in serious and fatal electrical errors.

Repair

3 Please do not repair this instrument at will. Do not attempt to open the chassis or modify the internal structure. Only forward repair personnel or personnel dispatched by your dealer with electrical repair capabilities can open the chassis. The high-voltage components inside this instrument may cause injury to untrained personnel. In addition, doing so may also cause damage to the precision parts inside this instrument.

Direction

4 The four instruments should be used in the correct direction. If the instrument is flipped over or used improperly, it will not work stably and may suffer physical mechanical damage.

PAY ATTENTION TO

Replace the fuse

Warning 

1 Before replacing the fuse, be sure to remove the power plug from the socket.
And it is necessary to use a new fuse corresponding to this instrument.
Connecting fuses and plugs may create a fatal electrical shock hazard.

Clean

Warning 

2 Please keep the signal interface section clean.
Regularly clean the signal interface section. If there is excessive accumulation of dust, the instrument will not work stably.

Lithium ion batteries

Tips and warnings 

3 The charging temperature of lithium-ion batteries is from 0 ℃ to+45 ℃. When the temperature inside the machine exceeds the given range, the instrument automatically stops charging the lithium-ion battery inside the machine, which is a normal phenomenon.

4 The storage temperature of lithium-ion batteries is -20 ℃~+60 ℃. When placing the instrument in an environment beyond t he storage temperature range of lithium-ion batteries, to avoid permanent damage to the environment, please open the battery cover and remove the battery.

5 Do not short circuit the battery or place it in a fire; Avoid placing in damp or corrosive environments.

Input check 

6 Do not input signals with a power exceeding 1mW at the antenna input port, and do not input signals with a power exceeding 30W (10s/min) at the F input/output port. Inputting signals that exceed the instrument's tolerance range will damage the instrument.

CONTENTS

1: Overview

This product model and name: PM1200 wireless comprehensive tester.

The PM1200 radio comprehensive tester is a universal measuring instrument in electronic measurement instruments, mainly used for on-site testing of wireless radio communication equipment, scattering communication equipment, and tactical control navigation systems. It provides on-site testing support for communication equipment such as shortwave and ultra short wave, and also has the ability to test the standing wave ratio and cable loss performance characteristics of antennas and cables.

The PM1200 wireless comprehensive tester, with a frequency range of 2MHz~1300MHz, can perform reception, transmission, and duplex testing on wireless communication equipment with an output power of less than 30 watts. It can test and analyze various parameters of wireless equipment such as frequency modulation, amplitude modulation, and single sideband modulation in both time and frequency domains, meeting the requirements for testing. The instrument is equipped with more than ten types of testing instrument functions, including RF synthesis source, RF spectrum analyzer, RF power meter, RF frequency difference meter, RF modulation meter, audio synthesis source, audio voltmeter, audio frequency meter, signal-to-noise meter, distortion meter, low-frequency oscilloscope, etc. It has the characteristics of wide frequency band coverage, strong comprehensiveness, and high cost-effectiveness.

The display of the PM1200 wireless comprehensive tester adopts an 800 × 600 pixel TFT high-resolution, high brightness large screen LCD display, which has a large amount of information. In terms of interface design, it adopts full Chinese display, and many test indicators are clear at a glance, making it convenient to use and improving work efficiency. Adopting a modular structure and equipped with handles, it facilitates field work and transportation.

The PM1200 wireless comprehensive tester has the ability to provide 220V AC power through an adapter and internal rechargeable battery power. External communication can be achieved through RS232, USB, and LAN interfaces.

The PM1200 radio comprehensive tester is mainly used for the detection and maintenance of various performance indicators of communication radios and airborne radios, as well as the maintenance and repair support of air to air communication and navigation equipment at various airports, and the radio parameter testing of other electronic equipment. PM1200 can also be used in fields such as radio production.

2: Performance characteristics

2.1 Performance characteristics of RF signal generators

2.1.1 Carrier frequency characteristics

2.1.1.1 Frequency range and error

Frequency: 2MHz-1300MHz

Frequency error: ≤ ± (preset value x internal reference oscillator operating error+1Hz)

2.1.1.2 Internal reference oscillator

Frequency: 80MHz

Error: ≤ ± 0.5ppm

Aging rate: ≤ 1ppm/year of soil (after preheating for 48 hours)

2.1.1.3 Frequency resolution

1Hz

2.1.2 Carrier amplitude characteristics

2.1.2.1 Output amplitude range and error

Amplitude range: RF input/output port: -50dBm~-125dBm

Antenna input and output ports: -30dBm~-90dBm

Standing wave input and output ports: -5dBm~-65dBm

Amplitude error: ± 2dB (output amplitude ≥ -100 dBm)

± 3dB (-120dBm ≤ output amplitude ≤ -100dBm)

2.1.2.2 Amplitude resolution

0.1dB

2.1.2.3 Amplitude units

dBm、μV、mV

2.1.2.4 Output impedance and voltage standing wave coefficient

Output impedance: 50Ω

Standing wave coefficient: RF input/output port: ≤ 1.4

Antenna port: ≤1.6

Standing wave port: ≤1.6

2.1.3 Carrier spectrum characteristics

2.1.3.1 Relative harmonic and non harmonic content of carrier wave

Relative harmonic content: ≤ -30dBc (2MHz ≤ carrier frequency<1300MHz)

Relative non harmonic content: ≤ -40dBc (deviation from the carrier wave by 20kHz or more, within the band)

2.1.3.2 Single sideband phase noise (typical value)

≤ -90 dBc/Hz (deviating from the carrier by more than 20kHz)

2.1.3.3 Residual frequency modulation

<30Hz (average, demodulation bandwidth: 300Hz~-3kHz)

2.1.3.4 Remaining amplitude modulation

<3% (average, demodulation bandwidth: 300Hz -3kHz) Hz)

2.1.3.5 Port reverse power protection

Antenna port:+10dBm

Standing wave port:+10dBm

2.1.4 Modulation characteristics

2.1.4.1 Amplitude modulation characteristics

2.1.4.1.1 Internal amplitude modulation - (Internal audio 1, audio 2>)

Range of amplitude adjustment: 0-100%

Resolution: 0.1%

Amplitude modulation error:

± (preset value x 5%) (modulation amplitude: 10% -90%, modulation frequency: 150Hz -5kHz)

± (preset value x 7%) (modulation amplitude ≤ 10% or modulation amplitude>90%, modulation frequency: 150Hz~-5kHz)

Amplitude modulation distortion:

≤ 1.5% (modulation frequency: 1kHz, modulation amplitude: 10%~-90%, demodulation bandwidth: 300Hz~3kHz)

Modulation frequency range: 20Hz~20kHz

2.1.4.1.2 External amplitude modulation

2.1.4.1.2.1 External audio modulation input

Switchable load: 150Ω, 600Ω, 1kΩ, high resistance

Input level: 0.05Vpp~3Vpp

Frequency range: 300Hz to 5kHz

Level sensitivity: 1%/35 mVp (high resistance state)

2.1.4.1.2.2 Microphone modulation input

Level range: 3.5mVrms~280mVrms

Frequency range: 300Hz to 3kHz

Range of amplitude adjustment: 0-80%

2.1.4.2 Single sideband amplitude modulation characteristics

2.1.4.2.1 Internal Single Sideband Modulation (Internal Audio 1, Audio 2)

Modulation frequency range: 800Hz~-3kHz

Range of amplitude adjustment: 0-100%

Resolution: 0.1%

Carrier and sideband suppression: ≥ 20dBc

2.1.4.2.2 External single sideband modulation

2.1.4.2.2.1 External audio modulation input

Switchable load: 150Ω, 600Ω, 1kΩ, high resistance

Input level: 0.05Vpp~3Vpp

Frequency range: 800Hz to 3kHz

Level sensitivity: 1%/35 mVp (High resistance state)

2.1.4.2.2.2 Microphone modulation input

Level range: 3.5mVrms~280mVrms

Frequency range: 800Hz~-3kHz

Range of amplitude adjustment: 0-80%

2.1.4.3 Frequency modulation characteristics

2.1.4.3.1 Internal frequency modulation

2.1.4.3.1.1 Internal audio modulation (internal audio 1, audio 2)

Frequency offset range: 0-100 kHz

Frequency offset error: ± (preset value x 5%) (Frequency offset: 2kHz~50kHz, modulation frequency: 150Hz~5kHz)

± (preset value x 7%) (frequency offset ≤ 2kHz or frequency offset>50kHz, modulation frequency: 150Hz~-5kHz)

Frequency modulation distortion: ≤ 1% (modulation frequency: 1kHz, frequency offset>2kHz, demodulation bandwidth: 300Hz~3kHz)

Modulation frequency range: 20Hz~-20kHz

2.1.4.3.2 External frequency modulation

2.1.4.3.2.1 External audio modulation input

Switchable load: 150Ω, 600Ω, 1kΩ, high resistance

Input level: 0.05Vpp~3Vpp

Frequency range: 20Hz to 20kHz

Level sensitivity: 1kHz%/35 mVp (high resistance state)

2.1.4.3.2.2 Microphone modulation input

Level range: 3.5mVrms~280mVrms

Frequency range: 300Hz~-5kHz

Frequency offset range: 0-80kHz

2.1.4.3.3 Analog and Digital Subtone (CTCSS, DCS) Modulation

Simulated Subtone Encoding Set

Digital compression coding set

2.2 Audio Signal Generator (Suitable for Two Internal Audio Sources>)

2.2.1 Output frequency characteristics

2.2.1.1 Output frequency range and error

Frequency range: 20Hz to 20kHz

Frequency error: ≤ ±(preset value x internal reference oscillator operating error+1Hz)

2.2.1.2 Output frequency resolution

0. 1Hz

2.2.2 Output amplitude characteristics

2.2.2.1 Output amplitude range and error

Range of amplitude: 0~1.57Vrms

Amplitude error: ≤ ±(5% of pre adjusted value+1mVrms) (voltage ≥ 10mVrms)

2.2.2.2 Amplitude resolution

10mVrms

2.2.2.3 Distortion

≤ 1% (1kHz frequency, sine wave, BPF: 300Hz~3kHz)

2.2.2.4 Output impedance

Provide 80mW drive for 16 loads

2.3 RF signal analysis

2.3.1 RF frequency difference measurement

2.3.1.1 Frequency input range and error

Frequency input range: 2M~1300MHz

Frequency error measurement range: ± 500kHz

Frequency error: ≤ ± (preset value x internal reference oscillator operating error+1Hz)

2.3.1.2 Input level range

RF input and output ports: -20dBm to+43dBm (continuous),

-20dBm ～ +44.8dBm（10s/1min）

Antenna input port: -70dBm~-10dBm

2.3.1.3 Frequency resolution

1Hz

2.3.2 RF power measurement

2.3.2.1 Measurement frequency range

Frequency range: 2M~1300MHz

2.3.2.2 Measurement range, resolution, and measurement error of signal intensity meter (narrowband power)

Measurement range: RF input/output port: -20dBm~+43dBm (continuous),

-20dBm ～ +44.8dBm（10s/1min）

Antenna port: -110dBm ～ -10dBm(（f＞10MHz）

-95dBm ～ -10dBm（2MHz≤f≤10MHz）

Measurement error: ± 2dB

Resolution: 0.01dBm

2.3.2.3 RF power meter (broadband power) measurement range, resolution, and measurement error

Measurement range: 0.1W~20W (continuous)

0.1W～30W （10s/1min）

Measurement error: ± 1dB

Resolution: 0.1dBm Or 0.01W

2.3.3 Modulation and demodulation measurement

2.3.3.2 Demodulation signal input level range

2MHz～1300MHz

2.3.3.2 Demodulation signal input level range

RF input and output ports: -20dBm to+43dBm (continuous),

-20dBm ～ +44.8dBm（10s/1min）

Antenna port: -80dBm ～-10dBm

2.3.3.3 Amplitude modulation measurement range, measurement error, resolution, and demodulation frequency range

Measurement range: 5% to 100%

Measurement error: ≤ ± 5% of the reading value (demodulation frequency is 1kHz, modulation amplitude is 30%~90%);

≤ 10% of the soil reading value (demodulation frequency range: 100Hz~10kHz)

Resolution: 1%

Display mode: positive peak, negative peak, (positive peak+negative peak)/2

Demodulation frequency range: 100Hz~10kHz

2.3.3.4 Single sideband amplitude modulation demodulation bandwidth and carrier frequency range

Carrier frequency range: 2MHz~1300MHz

Demodulation bandwidth (3dB): 100Hz~10kHz

2.3.3.5 Frequency offset measurement range, measurement error, resolution, and demodulation frequency range

Measurement range: 0.5kHz~100kHz

Measurement error: ≤ ± 5% of the reading value (frequency offset: 1kHz~10kHz, demodulation frequency: 150Hz~1kHz)

≤ ± 7% of the reading value (frequency offset: 0.5kHz~100kHz,

Demodulation frequency: 100Hz~10kHz)

Resolution: 1Hz

Display mode: positive peak, negative peak, (positive peak+negative peak)/2

Demodulation frequency range: 100Hz~10kHz

2.3.3.6 Analog Subtone (CTCSS) and Digital Subtone (DCS) Decoding

Display analog sub tone frequency

Display digital sub tone code

2.4 Standing wave and cable testing modes

2.4.1 Daily feed line parameters

Frequency range: 2MHz to 1300MHz

Sweep width range: 10MHz~1298MHz

Starting frequency range: 2MHz~1290MHz

Termination frequency range: 12MHz~1300MHz

Frequency resolution: 0.1MHz

Test cursor quantity: 3

2.4.2 Standing Wave Ratio (SWR) Test

Test range: 1.00 to 20.00

Resolution: 0.02

Test error: ≤ ± (0.2+reading value x 10%) After calibration, < 300MHz

≤ ± (0.3 reading value x 20%) After calibration, ≤ 900MHz

2.4.3 Echo loss test

Test range: 0db~-50dB

Resolution: 0.01 dB

2.4.4 Cable loss test

Test range: 0db~-50dB

Resolution: 0.01 dB

2.4.5 Fault Location (DTF) Testing

Test range: 1 meter to 100 meters

Cable type: RG series cable; SYV-50 series cables

Rated speed ratio (wave speed): 0.00~1.00, automatically selected according to cable type

2.5 Spectrum analyzer

2.5.1 Input frequency range

2MHz～1300MHz

2.5.2 Frequency readout error

≤ ± (frequency indication x internal reference oscillator operating error+0.5% bandwidth+5% RBW)

2.5.3 Band Sweeping

10kHz～1000MHz (Divided by 1, 2, and 5 sequences)

2.5.4 Resolution bandwidth

Automatically select based on scanning width (19Hz~1MHz)

2.5.5 Reference level range

RF input/output port: -10dBm~+50dBm

Antenna input port: -50dBm to+10dBm

2.5.6 In band power display range

-130dBm～+44dBm

2.5.7 In band power error

± 3 dB (RF input port: ≥ -50 dBm; antenna port: ≥ -110 dBm)

2.5.8 Display average noise level

≤ -130dB (typical value), 10kHz bandwidth

2.6 Audio Analysis

2.6.1 Audio frequency measurement

2.6.1.1 Frequency measurement signal frequency range and error

Signal frequency range:

Audio input port: 15Hz~20kHz

Frequency modulation demodulation: 15Hz~20kHz (choose appropriate intermediate frequency bandwidth)

AM demodulation: 100Hz~10kHz (select appropriate intermediate frequency bandwidth)

Frequency measurement error: ± 1Hz

2.6.1.2 Frequency measurement signal input level range

Audio input port: 0.05 Vp~3Vp

Digital voltmeter input port: 10mVrms~30Vrms

2.6.1.3 Frequency resolution

0. 1Hz

2.6.2 Audio voltage measurement

2.6.2.1 Frequency range of voltage measurement signal

Audio input port: 15Hz to 20kHz

Digital voltmeter input port: DC~20kHz

2.6.2.2 Voltage measurement range and error

Measurement range:

Audio input port: 0.05 Vp-3Vp

Digital voltmeter input port: 10mVrms~30Vrms

Measurement error: ≤ ± (3% of reading value+1mVrms))

2.6.2.3 Input impedance and coupling method

Input impedance:

Audio input port: 150Ω, 600Ω, 1KΩ, high resistance

Digital voltmeter (DVM) input port: high resistance

Coupling method:

Audio input port: AC (AC)

Digital voltmeter (DVM) input port: DC (direct current), AC (alternating current) optional

2.6.3 Distortion measurement

Signal voltage range: 50mVrms to 30Vrms

Measurement frequency: 1kHz

Measurement range: 0-100%

Measurement error:

± (5% of reading value+0.1%) (distortion: 1%~20%)
± (10% to 11% of the reading value) (Distortion<1% or Distortion>20%)

Resolution: 0.1%

2.6.4 SINAD measurement

Signal voltage range: 50mVrms~30Vrms

Measurement frequency: 1kHz

Measurement range: 0dB~40dB

Measurement error:

± 1.5dB (signal-to-noise ratio: 8dB to -40dB)
± 2.5dB (signal-to-noise ratio ≤ 8dB)

Resolution: 0.1 dB

2.7 Oscilloscope

Signal source: audio input port, digital voltmeter (DVM) input port, demodulated audio signal test
Frequency range: DC -20kHz

Test voltage range: 0-30Vrms

Voltage scale: 10mV/div~20V/div (divided into 1, 2, and 5 sequences)

Voltage measurement error: ≤ ± full scale x 10%

Time scale: 0.1 ms/div~100 ms/div (divided into 1, 2, and 5 sequences)

Time measurement accuracy: ≤ ± full scale x 3%

Trigger types: automatic, standard, single time

Edge trigger: rising edge, falling edge

2.8 Call function

The product has direct voice call function with the radio station. By adapting antennas that meet the interface requirements, using matching interface handheld devices, setting corresponding call frequencies, and within a certain distance range, voice calls can be directly made with the radio station, providing a visual experience.

2.9 Storage communication function

The product has real-time status storage performance for 1000 usage processes. Can save settings, test results, and other content during testing.

Before storage, there is an input of up to 20 characters or numbers to indicate the stored content.

The stored content can be read out through LAN port, RS232 port, and USB device (FAT32 format), and imported into the computer for editing and printing.

2.10 Power Requirements

Power adapter (AC input: 220VAC ± 10%, 50Hz ± 5%;

DC output: 24VDC ± 10%, 5A

Built in lithium-ion battery:

Working time: ≥ 4 hours (after the battery is fully charged)

Charging time: ≤ 6h

The charging temperature of lithium-ion batteries is from 0 ℃ to+45 ℃. When the temperature inside the machine exceeds the given range, the instrument automatically stops charging the lithium-ion battery inside the machine, which is a normal phenomenon.

The storage temperature of lithium-ion batteries is -20 ℃~+60 ℃. When placing the instrument in an environment beyond the storage temperature range of lithium-ion batteries, to avoid permanent damage to the environment, please open the battery cover and remove the battery.

Do not short circuit the battery or place it in a fire; Avoid placing in damp or corrosive environments.

2.11 Structure and Appearance

The surface should be smooth and free of burrs, the structure should be intact, and there should be no obvious mechanical damage or coating damage. The control components should be installed correctly, reliably, and operated flexibly. The structural form is a handheld instrument.

2.11.1 External dimensions

External dimensions: 293mm x 216mm x 71mm (length x width x height)

2.11.2 Weight

Instrument weight (including battery) ≤ 4.0kg

2.12 Preheating time

The preheating time for PM1200 is 30 minutes

Before preheating, the tested equipment shall be stabilized for 2 hours under the conditions specified in 4.2.1 of GJB 3947A-2009

2.14 Reliability

Reliability index: MTBF(θ_0) ≥5000h

2.15 Environmental adaptability

Complies with the third level environmental level specified in 3.8 of GJB3947A-2009 (with temperature requirements extended to the second level equipment).

2.16 Environmental Requirements

(a) Working temperature: -10 ℃~55 ℃

(b) Storage temperature: -50 ℃~70 ℃

(c) Humidity limit: 95% at 10 ℃~30 ℃

75% at 30 ℃~40 ℃

45% at 40 ℃~55 ℃

3. Principle Description

3.1 Overall plan and main working principles of the entire hardware system

The working principle diagram of the PM1200 wireless comprehensive tester is shown in Figure 1.

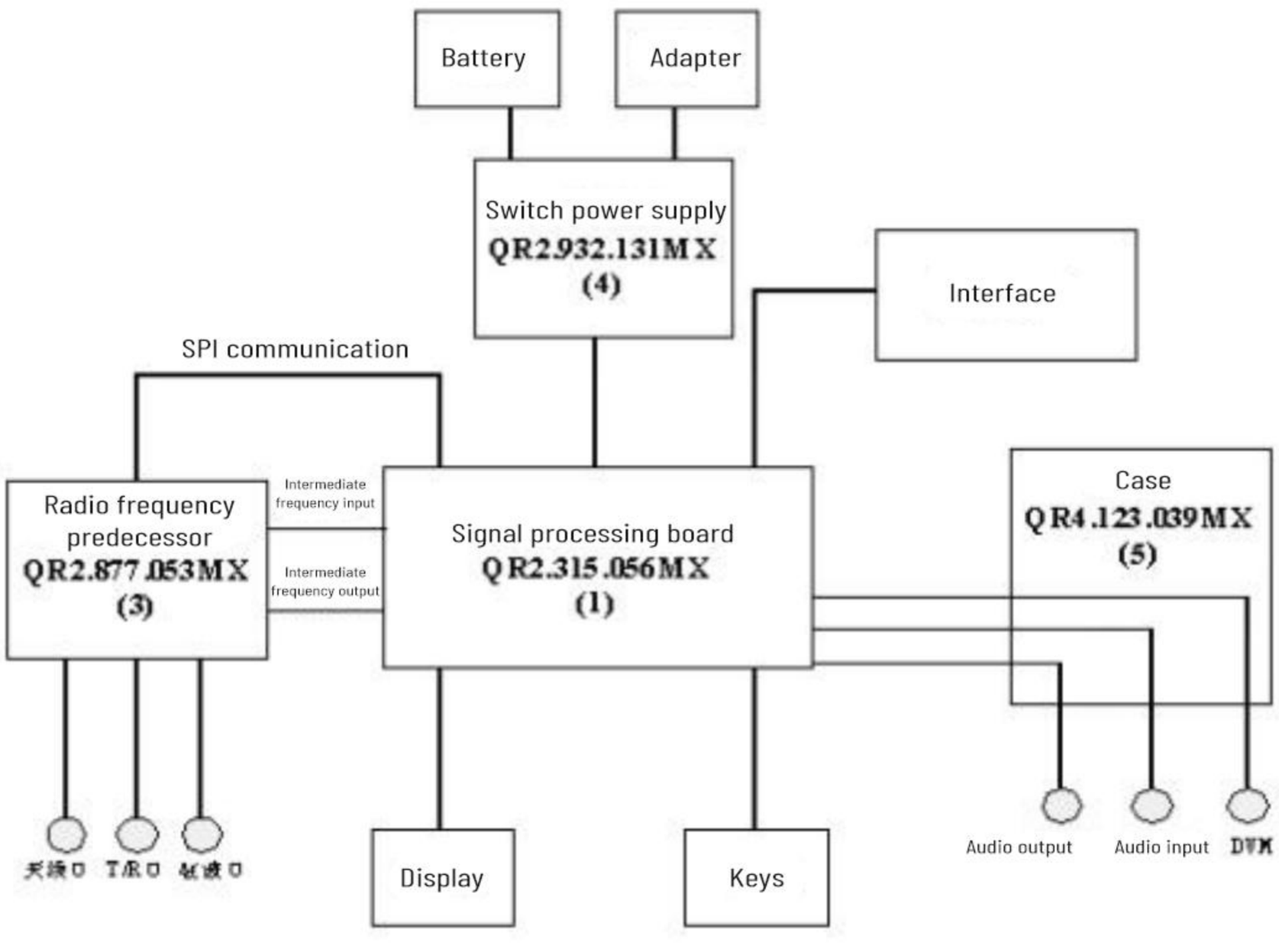


Figure 1 Hardware schematic diagram of the entire machine

The wireless comprehensive tester mainly consists of a signal processing board, an RF front-end, a switch power supply, a battery unit, an upper housing unit, a TFT display, and a power button.

When measuring the transmission performance of wireless communication equipment, the instrument operates in reception mode. At this time,

The radio comprehensive tester is equivalent to a superheterodyne RF analyzer for the tested equipment. The high-power RF signal from the measured transmitter is input into the RF input/output port and then enters the RF unit. After passing through a 20dB/30W high-power attenuator, it enters the power divider, and one output signal of the power divider enters the RF power detection circuit to obtain the power of the RF signal; The other output signal of the power divider enters the RF input amplitude conditioning circuit. If the instrument is set to "antenna port", it will directly enter the input amplitude conditioning circuit after switching through a switch. After amplitude modulation, the signal is mixed with the local oscillator signal to obtain the transmitter intermediate frequency signal. After being filtered by a bandpass filter, the signal enters the intermediate frequency conditioning circuit for intermediate frequency conditioning. Finally, it enters the digital processing unit for intermediate frequency sampling, and then enters the multifunctional unit to complete signal analysis and processing.

When measuring the reception performance of wireless communication equipment, the instrument is in transmission mode. At this point, the wireless comprehensive tester is equivalent to an RF synthesis source for the tested equipment. Firstly, in the RF digital unit, DDS technology is used to generate an intermediate frequency signal with AM/FM function. After mixing with the local oscillator signal, a frequency signal of 2MHz~1300MHz that meets the frequency range testing requirements of the receiver is obtained. After amplification, filtering, and attenuation, the signal outputs an RF carrier that meets the performance testing requirements of the receiver.

When conducting standing wave ratio and cable testing, the output signal of the internal RF synthesizer of the instrument reaches the standing wave ratio testing connector through a directional coupler. Obtain the forward voltage and reverse voltage on the connector from the directional coupler. After the signal is detected and amplified by a logarithmic detector, the software calculates the standing wave ratio of the tested device and the loss of the cable, and locates the cable fault.

The audio analysis section includes audio input filters, digital oscilloscopes, audio counters, distortion admittance meters, and other parts to complete the analysis and processing of audio signals. In the audio synthesis section, DDS is used to generate two audio signals, which are output externally through the audio distribution circuit.

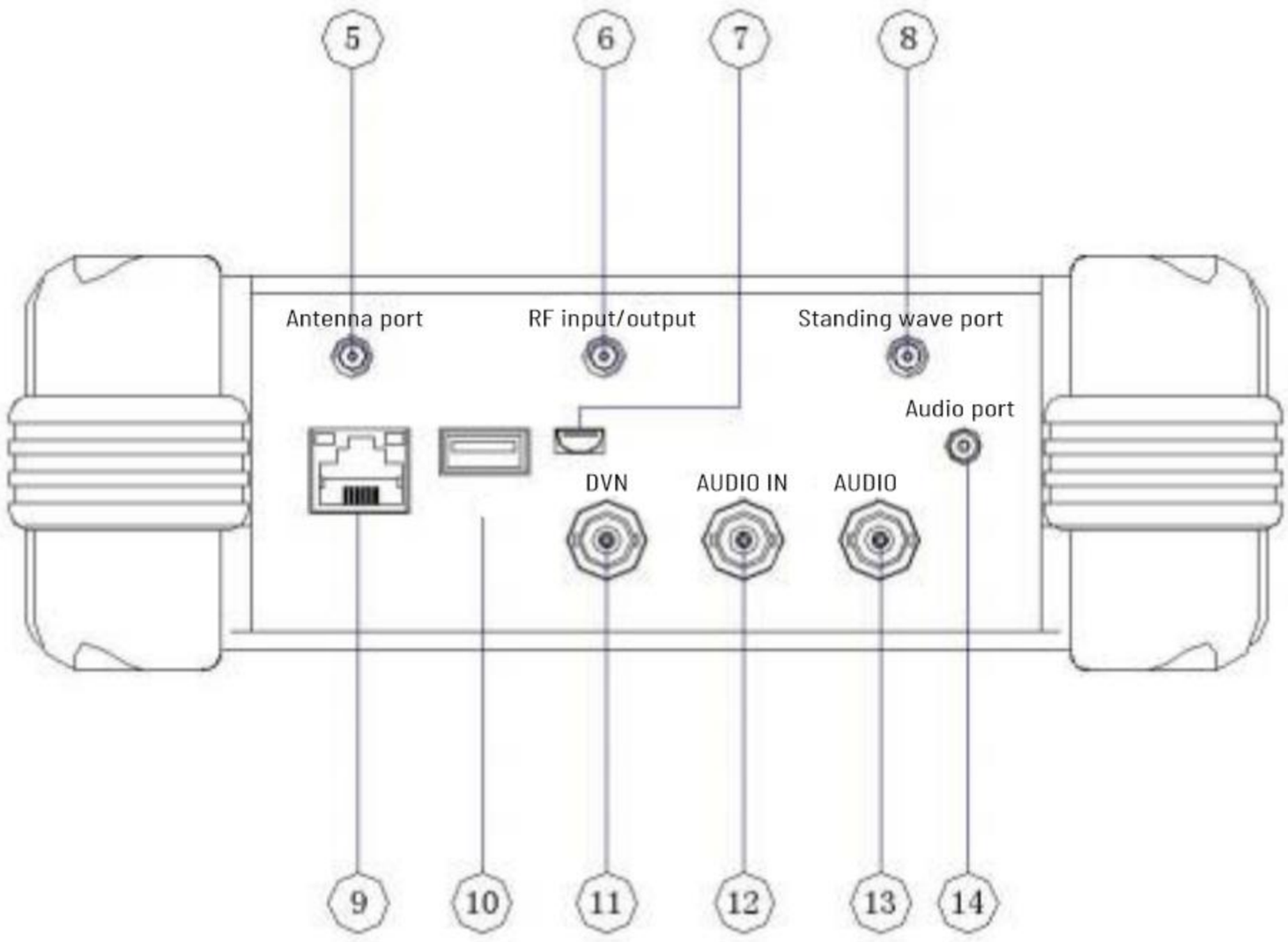
When measuring the duplex performance of wireless communication equipment, the RF synthesis source and RF analyzer inside the instrument work simultaneously to complete the receiver performance test and transmitter performance test of the tested equipment, achieving the RF duplex measurement function. Simultaneously obtain the transmission power, transmission frequency, modulation parameters of the transmitter in the communication equipment, as well as the receiver's reception sensitivity, frequency reception selection ability, audio output and other characteristics.

4 Panel Appearance Layout

This section introduces the appearance layout of PM1200, the functional operations and parameter input buttons of the front and rear panels, various input and output ports, LED indicator lights, etc. For detailed instructions on operation and usage, please refer to Section 5. The exterior layout of the front panel is shown in Figure 2. The top view layout is shown in Figure 3.

4.1 Front panel buttons, knobs, and interfaces

The front panel includes: instrument identification 1, display 2, power switch 3, and on/off status indicator light 4.


5
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Antenna port
RF input/output
Standing wave port
Audio port
DVN
AUDIO IN
AUDIO
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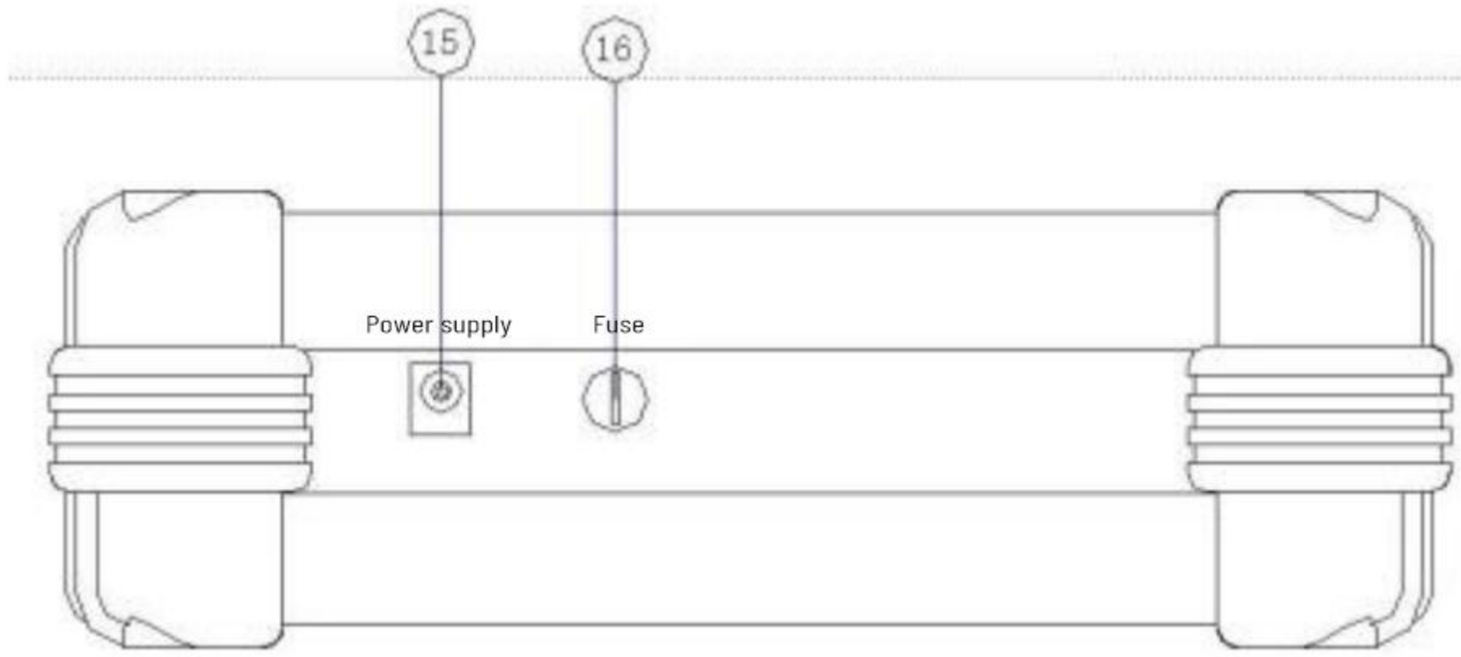


Figure 3B Top View Layout

4.1.1 Instrument Identification 1: Instrument model and name.

4.1.2 Display 2: 800 x 600 pixel TFT LCD display.

4.1.3 Power switch 3

Press the power switch to turn on the local power supply. The green LED indicator on the right side of the switch will light up, and the instrument will enter the working state; Press the power button again to disconnect the device and turn it off.

4.1.4 Instrument working status indicator light 4

The instrument's working status indicator light can display the startup status and battery status

4.2 Top view interface

The top view includes antenna port 5, RF input/output port 6, RS232 port 7, standing wave port 8, LAN type network port 9, USB port 10, DVM input port 11, audio input port 12, audio output port 13, and radio communication port 14.

4.3 Top view interface

The top view includes power interface 15 and fuse 16.

5 Operation methods

5.1 Power on

Start up in the following order:

Check the power supply voltage, which should meet the performance requirements of the input power supply, or the battery should be in normal condition and ensure good grounding.

(b) Press the "Power On/Off" button on the front panel to turn on the instrument power. The green indicator light on the right side of the power switch on the front panel will light up. After about 15 seconds of program loading time, the instrument will display the "CHIFO Forward" symbol information. At this point, the instrument is in the initialization and calibration state. After completing the above work, the instrument enters the initial menu interface, as shown in Figure 4.

Figure 4 Initial menu interface

5.2 Parameter input method

There are three types of user interface parameter input methods for PM1200 wireless comprehensive tester:

——Digital parameter input

——Switching variable input

——Option parameter input

5.2.1 Digital parameter input

There are three types of user interface parameter input methods for PM1200 wireless comprehensive tester:

Click on the number in the parameter settings box, as shown in Figure 5. After clicking, a data input interface will appear at the bottom of the screen for data input, as shown in Figure 6.

At this point, you can click the "Number" button → click the "Unit" button to complete the parameter setting, or click the "Left Right Direction" button to adjust the cursor position → click the "Up Down Direction" to increase or decrease the parameter size to complete the setting.

Above the "Direction" button are commonly used data, which can be directly clicked to complete the settings. If you need to change commonly used data, you can set it in the system.

Click the "Backspace" button to exit the data input interface.

Figure 5 Number Setting Box

Figure 6 Data Input Interface

5.2.2 Switching Variable Input

The switch variables in the PM1200 user interface use this input method:

Click on the switch icon on the interface to complete the switching of switch variables, as shown in Figures 7 and 8.

Figure 7: Switching variable off state

Figure 8: On/Off Variable Status

5.2.2 Switching Variable Input

The input port, output port, spectrum analysis sweep width and other parameters in the PM1200 user interface are used

Input method:

The parameter input of this method is similar to the setting method of switch variables. Simply click on the setting box to complete the setting.

5.3 Test mode of wireless comprehensive tester

The PM1200 wireless comprehensive tester has 7 basic testing modes, 1 application mode, and 1 system setting mode. The 9 basic measurement modes are as follows:

——— Receiving test mode;

——— Launch test mode;

——— Duplex testing mode;

——— Audio mode

——— Waveform analysis mode;

——— Spectrum analysis mode;

——— Standing wave analysis mode;

——— Call mode;

——— System settings mode.

The 9 basic testing modes are as follows:

5.3.1 Receiving Test Mode

The functions completed by the instrument in the receiving test mode include: RF synthesizer output, whose output signals can be carrier, frequency modulation, amplitude modulation, or single sideband modulation signals; The measurement of audio input signals includes measuring their frequency, voltage, distortion, and signal-to-noise ratio.

5.3.2 Launch Test Mode

The functions completed by the instrument in transmission testing mode include: RF frequency measurement, broadband power measurement, narrowband power measurement, amplitude demodulation, frequency offset demodulation, and single sideband demodulation measurement; Measurement of audio input signals; The measurement of demodulated signals and audio input signals includes frequency, voltage, distortion, and signal-to-noise ratio; Output of audio synthesizers 1 and 2.

5.3.3 Duplex testing mode

The functions completed by the instrument in duplex testing mode include: RF synthesizer output, whose output signals can be carrier, frequency modulation, amplitude modulation, or single sideband modulation signals. RF frequency measurement, broadband power measurement, narrowband power measurement, amplitude demodulation, frequency offset demodulation, and single sideband demodulation measurement; Audio input signal measurement; The measurement of demodulated signals and audio input signals includes measuring their frequency, voltage, distortion, and signal-to-noise ratio.

5.3.4 Audio Mode

The functions completed by the instrument in audio mode include: audio input signal measurement, measurement including frequency, voltage, distortion, and signal-to-noise ratio; Output of audio synthesizers 1 and 2.

5.3.5- Waveform Analysis Mode

In waveform analysis mode, the instrument measures the waveform of the digital voltmeter (DVM) input signal, audio input signal, amplitude demodulation signal, frequency offset demodulation signal, and single sideband demodulation signal.

5.3.6 Spectrum analysis mode

In spectrum analysis measurement mode, the instrument completes the measurement of RF input signals.

5.3.7 Standing wave analysis mode

In the standing wave analysis measurement mode, the instrument completes the standing wave measurement of the tested component and can perform cable fault diagnosis

5.3.8 Call Mode

The external intercom realizes radio communication functions of frequency modulation, amplitude modulation, and single sideband modulation.

5.3.9 System Setting Mode

In the system settings mode, the display brightness can be set, and the temperature and battery voltage of the instrument can be viewed. Below will provide a detailed explanation of the display interfaces and usage methods for several working modes.

5.4 Receiving Test Mode

5.4.1 Enter the receiving test mode

Press the "Receive Test" icon on the initial menu interface, and the instrument enters the receive test mode. The display interface is shown in Figure 9.

5.4.2 Introduction to the Display Interface for Receiving Test Mode

5.4.2.1 Mode: The measurement mode displayed in the top area of the interface is "Receive Test" mode. Click "Main Menu" to return to the initial menu interface.

5.4.2.2 Audio measurement: The frequency, voltage, distortion, and signal-to-noise of the measured audio input signal are displayed in the upper area of the interface.

5.4.2.3 RF synthesizer: Set the various functions and parameters of the RF synthesizer in the middle area of the interface.

5.4.2.4 Error prompt: When making an error input, an error prompt will be displayed at the bottom of the interface, and the current temperature and battery level of the instrument will be displayed in the lower right corner.

Figure 9 Receiving Test Mode

5.4.3 Instructions for receiving test mode operation

5.4.3.1 Audio measurement

The audio measurement channel is used to set the source of the current measured audio signal, including external audio, MIC, DVM, and demodulated audio.

The frequency, voltage, distortion, and signal-to-noise measurement of the audio input signal can be set to switch state.

The audio impedance can be set to: high resistance, 150Ω, 600Ω, 1kΩ. The audio impedance can only be set when measuring external audio signals, and other states default to high impedance.

Audio coupling can be set to either AC or DC. Audio coupling can only be set when measuring DVM signals, and other states default to AC.

5.4.3.2 RF synthesizer

The RF output is used to set the switch status of the RF synthesizer. When the RF output is in the open and closed state, there is no signal output from the RF port.

RF output is used to set the output ports of the RF synthesizer, including T/R (RF input/output port), Ant (antenna), and SWR (standing wave) ports.

RF frequency is used to set the carrier frequency of the RF synthesizer, with a frequency range of 2MHz to 1300MHz. The RF amplitude is used to set the signal amplitude of the RF synthesizer, and the amplitude range is determined by the output port: the T/R port is -125dBm~-50dBm, the SWR port is -65dBm~-5dBm, and the Ant port is -90dBm~-30dBm.

The modulation switch includes: external modulation, internal modulation 1, and internal modulation 2. External modulation and internal modulation 2 cannot be turned on simultaneously.

The modulation mode is divided into two types: frequency modulation and amplitude modulation.

In frequency modulation mode, modulation frequency offset, modulation frequency, and modulation type can be set. The modulation types include: modulated audio, CTCSS,+DCS, - DCS.

In amplitude modulation mode, modulation depth, modulation frequency, and modulation type can be set. The modulation types include: modulated audio, upper single sideband, and lower single sideband.

In amplitude modulation mode, modulation depth, modulation frequency, and modulation type can be set. The modulation types include: modulated audio, upper single sideband, and lower single sideband.

5.5 Launch Test Mode

5.5.1 Enter launch test mode

Press the "Emission Test" icon on the initial menu interface, and the instrument enters the emission test mode. The display interface is shown in Figure 10.

Figure 10 Launch Test Mode

5.5.2 Introduction to Launch Test Mode Display Interface

5.5.2.1 Mode: The measurement mode displayed in the top area of the interface is "Emission Test" mode. Click "Main Menu" to return to the initial menu interface.

5.5.2.2 Audio measurement: The frequency, voltage, distortion, and signal-to-noise of the measured audio input signal are displayed in the upper area of the interface.

5.5.2.3 RF measurement: Set the various functions and parameters of the RF analyzer in the middle area of the interface.

5.5.2.4 Audio Synthesizer: Set the various functions and parameters of Audio Generator 1 and Audio Generator 2 in the lower area of the interface.

5.5.2.5: Error prompt: When making an error input, an error prompt will be displayed at the bottom of the interface, and the current temperature and battery level of the instrument will be displayed in the lower right corner.

5.5.2.5: Error prompt: When making an error input, an error prompt will be displayed at the bottom of the interface, and the current temperature and battery level of the instrument will be displayed in the lower right corner.

5.5.3 Transmission Test Mode Operation Instructions 5.5.3.1 Audio Measurement

See section 5.4.3.1.

5.5.3.2 RF analyzer

The RF analyzer can choose input ports: T/R (RF input/output port) port, Ant (antenna) port.

The tuning frequency is set to the frequency that needs to be tuned during RF analysis, ranging from 2MHz to 1300MHz.

RF frequency difference measures the frequency difference between the RF input signal and the tuning frequency. The measurement range is -500kHz~500kHz.

The RF analyzer can simultaneously measure the broadband power and narrowband power of the signal.

The RF analyzer can demodulate modulated signals, including frequency modulation signals and amplitude modulation signals.

In frequency modulation demodulation mode, it can demodulate modulated audio, demodulate CTCSS, demodulate+DCS, and demodulate DCS.

In amplitude modulation and demodulation mode, it can demodulate modulated audio, demodulate upper single sideband, and demodulate lower single sideband; The intermediate frequency bandwidth option can be used to set the bandwidth of the intermediate frequency filter after tuning the input signal.

In frequency modulation demodulation mode, the intermediate frequency bandwidth can be set to 5kHz, 10kHz, 30kHz, 100kHz, 300kHz.

In amplitude modulation and demodulation mode, the intermediate frequency bandwidth can be set to 5kHz, 10kHz, or 30kHz.

The audio bandwidth option can be set to filter the bandwidth of the demodulated audio signal sent to the audio measurement, including NF, 0.3kLP, 0.3-3kBP, 0.3-5kBP, 0.3-20kBP, 3kLP, 5kLP, 15kLP, and 0.3kHP. During CTCSS and DCS demodulation, the audio bandwidth is fixed in a special filter state.

5.5.3.3 Audio Generator

In the transmission test mode, the audio synthesizer can choose two output methods: internal audio and demodulated audio.

Internal audio output can be found in section 5.7.3.2.

Demodulated audio is the audio signal after RF demodulation, which cannot be controlled by the instrument.

5.6 Duplex testing mode

5.6.1 Enter duplex testing mode

Press the "Duplex Test" icon on the initial menu interface, and the instrument enters the duplex test mode. The display interface is shown in Figure 11.

5.6.2 Introduction to Duplex Test Mode Display Interface

5.6.2.1 Mode: The measurement mode displayed in the top area of the interface is "Duplex Test" mode. Click "Main Menu" to return to the initial menu interface.

5.6.2.2 Audio measurement: The frequency, voltage, distortion, and signal-to-noise of the measured audio input signal are displayed in the upper area of the interface.

5.6.2.3 RF measurement: Set the various functions and parameters of the RF analyzer in the middle area of the interface.

5.6.2.4 RF Synthesizer: Set the various functions and parameters of the RF synthesizer in the lower area of the interface.

5.6.2.5 Error prompt: When making an error input, an error prompt will be displayed at the bottom of the interface, and the current temperature and battery level of the instrument will be displayed in the lower right corner.

Figure 11 Duplex Test Mode

5.6.3 Operation and usage instructions for duplex testing mode

5.6.3.1 Audio measurement

See section 5.4.3.1.

5.6.3.2 RF measurement

See clause 5.5.3.2.

5.6.3.3 RF synthesizer

See clause 5.4.3.2.

5.7 Audio Mode

5.7.1 Entering audio mode

Press the "Audio Mode" icon on the initial menu interface, and the instrument will enter audio mode with its display interface

As shown in Figure 12.

5.7.2 Introduction to Audio Mode Display Interface

5.7.2.1 Mode: The measurement mode displayed in the top area of the interface is "Audio Mode". Click "Main Menu" to return to the initial menu interface.

5.7.2.2 Audio measurement: The frequency, voltage, distortion, and signal-to-noise of the measured audio input signal are displayed in the upper area of the interface.

5.7.2.3 Audio Synthesizer: Set the various components of Audio Generator 1 and Audio Generator 2 in the middle area of the interface Function and parameters.

5.7.2.4 Error prompt: When making an error input, an error prompt will be displayed at the bottom of the interface, and the current temperature and battery level of the instrument will be displayed in the lower right corner.

Figure 12 Audio Mode

5.7.3 Audio mode operation instructions

5.7.3.1 Audio measurement

See section 5.4.3.1.

5.7.3.2 Audio Generator

In audio mode, the audio generator can only output internal audio. The audio path can be set to: line, speaker

The audio generator has a total of two audio outputs, with an audio frequency range of 0kHz to 120kHz and an effective audio level range of 0V to 1.57V. The maximum effective value of the total level of the two audio outputs is 1.57V.

5.8 Waveform Analysis Mode

5.8.1 Entering waveform analysis mode

Press the "waveform analysis" icon on the initial menu interface to enter waveform analysis mode, as shown in Figure 13.

5.8.2 Introduction to waveform analysis mode display interface

5.8.2.1 Mode: The measurement mode displayed in the top area of the interface is "waveform analysis" mode. Click "main menu" to return to the initial menu interface.

5.8.2.2 Waveform Display Area: The waveform diagram of the audio input signal is displayed in the upper area of the interface.

5.8.2.3 Measurement Data: The middle area of the interface displays the frequency and voltage of the audio input signal.

5.8.2.4 Parameter settings: Set the Y axis scale, X-axis scale, Y-axis offset, and trigger electrical parameters in the lower area of the interface.

5.8.2.5 Error prompt: When making an error input, an error prompt will be displayed at the bottom of the interface, and the current temperature and battery level of the instrument will be displayed in the lower right corner.

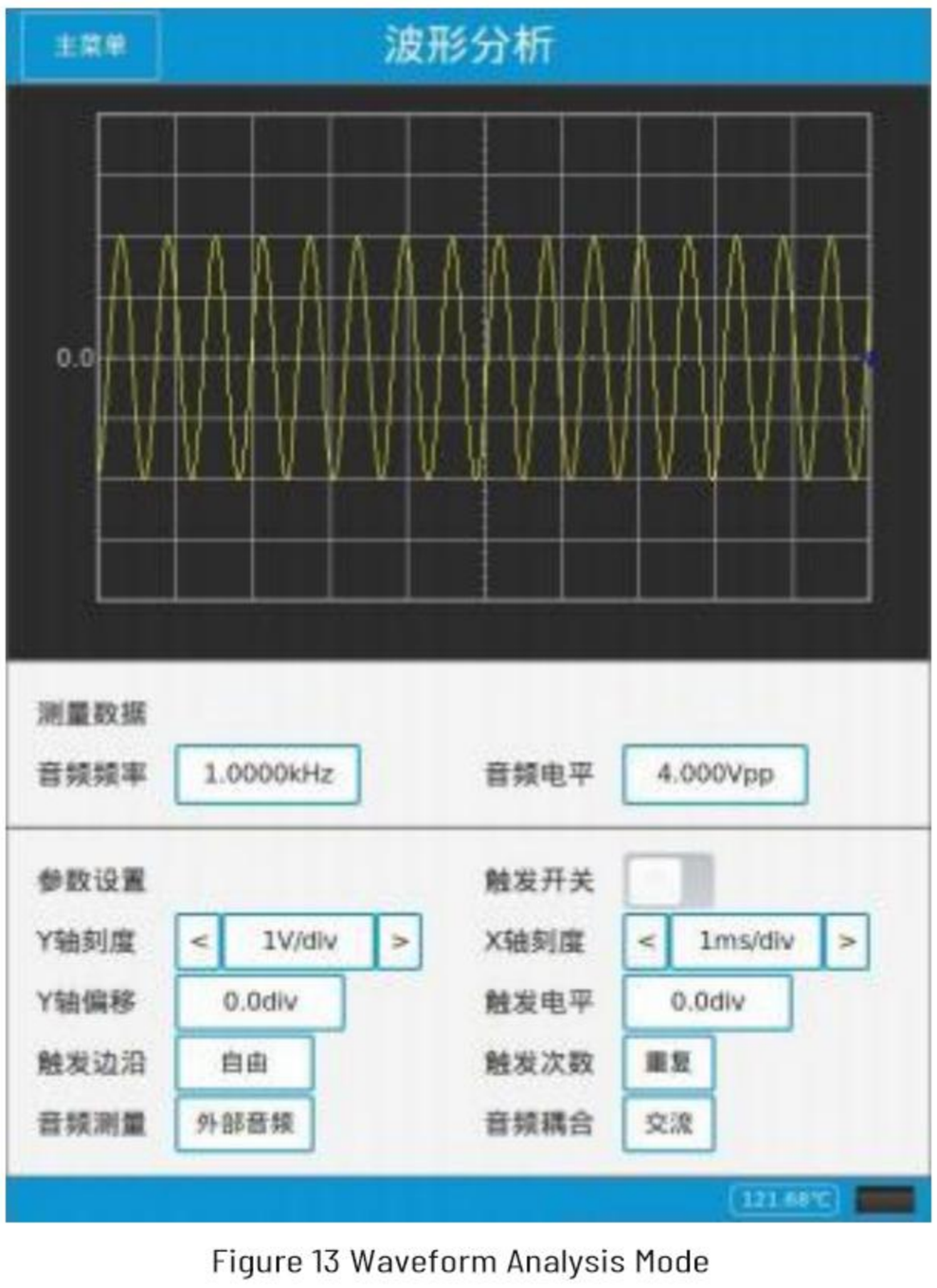


Figure 13 Waveform Analysis Mode

5.8.3 Operation instructions for waveform analysis mode

The Y-axis scale can be set to display the level of each grid on the Y-axis of the waveform, ranging from 10mV/div to 10V/div, in increments of 1, 2, and 5.

The X-axis scale can be used to set the time displayed on each grid of the waveform, ranging from 200us/div to 5ms/div, in increments of 1, 2, and 5.

Y-axis offset can perform DC offset on the input audio signal, with a range of -4div to 4div.

The audio measurement channel is used to set the source of the current measured audio signal, including external audio, MIC, DVM, and demodulated audio.

Audio coupling can be set to either AC or DC. Audio coupling can only be set when measuring DVM signals, and other states default to AC.

The waveform analysis mode can use the trigger function. The trigger level can be set to a range of -4div to 4div; The triggering edge can be set to free, rising, or falling.

When the trigger count is set to repeat, the waveform diagram in waveform analysis will be updated after each departure. When the trigger count is set to single, click the trigger switch to activate the trigger function. After triggering, the waveform schematic is updated once and the trigger switch is reset. To trigger again, click the trigger switch again.

5.9 Spectral analysis mode

5.9.1 Entering Spectrum Analysis Mode

Press the "Spectrum Analysis" icon on the initial menu interface to enter the spectrum analysis mode, as shown in Figure 14.

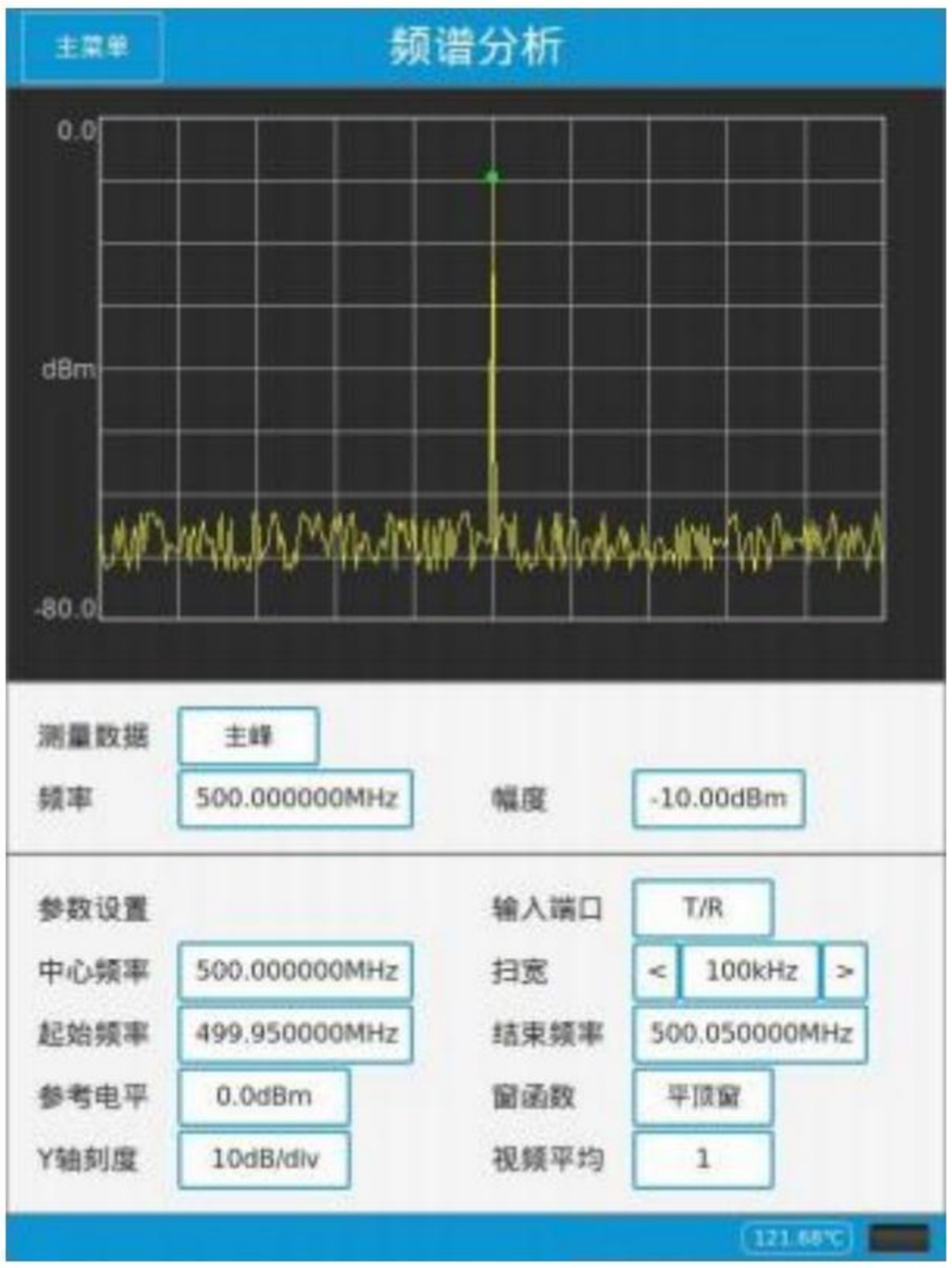


Figure 14 Spectral Analysis Mode

5.9.2 Introduction to Spectrum Analysis Mode Display Interface

5.9.2.1 Mode: The measurement mode displayed in the top area of the interface is "Spectrum Analysis" mode. Click "Main Menu" to return to the initial menu interface.

5.9.2.2 Spectrum Display Area: The schematic diagram of the RF input signal spectrum is displayed in the upper area of the interface.

5.9.2.3 Measurement data: The middle area of the interface displays the frequency and amplitude of the RF input signal.

5.9.2.4 Parameter settings: Set parameters such as center frequency, input port, and reference level in the lower area of the interface.

5.9.2.5: Error prompt: When making an error input, an error prompt will be displayed at the bottom of the interface, and the current temperature and battery level of the instrument will be displayed in the lower right corner.

5.9.3 Operating instructions for spectrum analysis mode

The tuning frequency for spectrum analysis is set at the center frequency, ranging from 2MHz to 1300MHz.

The sweep width for intermediate frequency filtering can be set to 10kHz~5MHz, with a range of 1, 2, and 5.

The starting frequency and ending frequency can be set, but they are linked to the center frequency and sweep width.

The input ports for spectrum analysis can be selected as T/R port or Ant port. In the T/R port state, the reference level range is -60dBm~50dBm; In the Ant port state, the reference level range is -100dBm~10dBm. The reference level can only be set to an integer multiple of 10dBm.

The window function can be used to set the algorithm for FFT analysis, with options such as flat top window and Hamming window.

The Y-axis scale can change the power represented by each grid in the spectrum diagram, and can be set to 1dB/div, 2dB/div, 5dB/div, or 10dB/div.

Video averaging is the process of averaging the most recent spectrograms before plotting, with a range of 1-10.

In the measurement data area, the marking method can be changed, including setting the X-axis coordinate position of the marking point for the main peak and positioning.

5.10 Standing wave analysis mode

5.10.1 Entering Standing Wave Analysis Mode

Press the "Standing Wave Analysis" icon on the initial menu interface to enter the Standing Wave Analysis mode, as shown in Figure 15.

5.10.2 Introduction to the Display Interface of Standing Wave Analysis Mode

5.10.2.1 Mode: The measurement mode displayed in the top area of the interface is "Standing Wave Analysis" mode.
Click "Main Menu" to return to the initial menu interface.

5.10.2.2 Waveform display area: The measurement standing wave schematic diagram is displayed in the upper area of the interface.

5.10.2.3 Measurement Data: The measurement of marker points displayed in the upper area of the interface.

5.10.2.5 Parameter Setting Menu: Select the parameter setting menu in the middle area of the interface.

5.10.2.5 Detailed parameter settings: Various parameter settings for standing wave analysis in the lower area of the interface.

5.10.2.6 Error prompt: When making an error input, an error prompt will be displayed at the bottom of the interface, and the current temperature and battery level of the instrument will be displayed in the lower right corner.

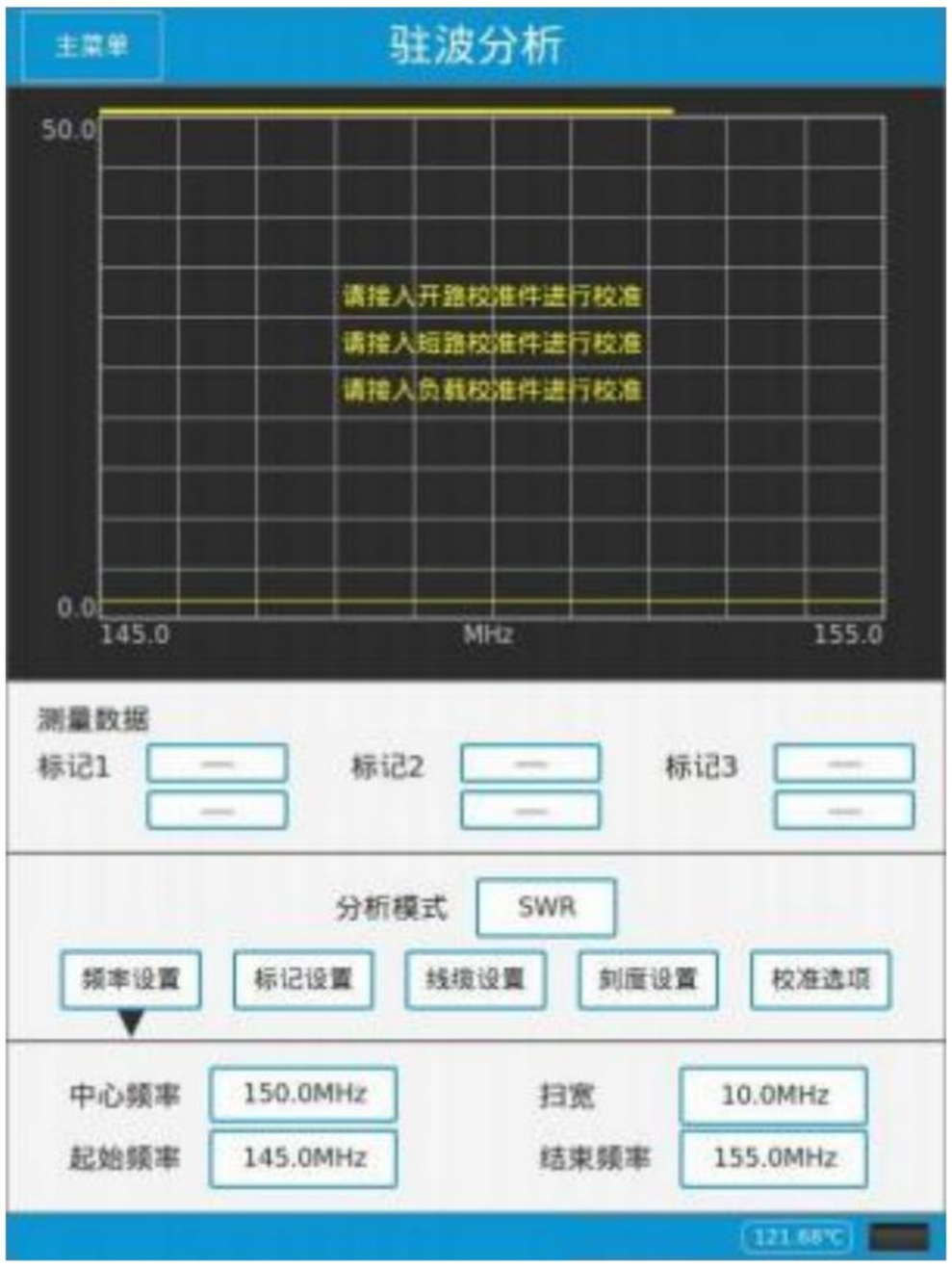


Figure 15 Standing wave analysis mode

5.10.3 Operating instructions for standing wave analysis mode

5.10.3.1 Analysis mode

Click on the analysis mode to set the standing wave analysis mode, including: SWR (standing wave measurement), DTF (cable fault location), RCO (reflection coefficient measurement), RL (return loss measurement)

Before using the standing wave analysis mode, the instrument needs to be calibrated. Please refer to section 5.10.3.6 for specific calibration steps. 5.10.3.2 Frequency related settings

After clicking on the frequency setting in the parameter setting menu, the standing wave analysis frequency can be set in the lower area of the interface, as shown in Figure 16.

Figure 16 Frequency Setting of Standing Wave Analysis Mode

The center frequency, sweep width, starting frequency, and ending frequency are interrelated, and the scanning of standing wave analysis can be set

Frequency range, 2MHz to 1000MHz.

5.10.3.3 Marking settings

After clicking on the marker settings in the parameter settings menu, the standing wave analysis marker settings can be performed in the lower area of the interface, as shown in Figure 17.

Figure 17 Setting of Standing Wave Analysis Mode Markers

The marking switch can set the switch status of the marking point, and the standing wave test waveform schematic can simultaneously open three marking points.

The marking position can be set with the X-axis coordinates of the marking, ranging from 0div to~10div.

After setting up, you can view the reading of the markers in the measurement data area below the schematic diagram. 5.10.3.4 Cable Setting

After clicking on the cable settings in the parameter settings menu, the standing wave analysis cable parameters can be set in the lower area of the interface, as shown in Figure 18.

Figure 18 Spectral Analysis Mode Cable Settings

Cable selection allows for switching between different types of cables and automatic configuration of cable parameters by the instrument. If the User option is selected, the user can configure parameters such as cable speed, cable loss, and cable length for themselves.

The cable speed range is from 0 to 100.

Set the loss range to 0~1.

Set the length range to 10m~256m.

5.10.3.5 Scale Setting

After clicking on the scale settings in the parameter settings menu, the scale settings for the standing wave analysis diagram can be performed in the lower area of the interface, as shown in Figure 19.

Figure 19 Scale Setting for Standing Wave Analysis Mode

The scale mode can be set to automatic or manual. Automatically switch the schematic to the maximum value of the scale. When manual, the user needs to set the top and bottom scales.

5.10.3.6 Calibration Options

After clicking on the calibration option in the parameter settings menu, the calibration option for standing wave analysis can be performed in the lower area of the interface, as shown in Figure 20.

Figure 20 Spectral Analysis Mode Calibration Options

Before conducting standing wave analysis on the instrument, calibration must be carried out, including calibration of open circuit calibration components, short circuit calibration components, and load calibration components. Before calibration, there will be a text prompt in the center of the screen to calibrate. Connect the corresponding standard component and click the corresponding calibration button to complete the calibration. When connecting calibration components, be sure to connect them to the SWR port. After the connection is completed, click the corresponding calibration button and wait for the progress bar above the graph to complete. After completing each calibration, the corresponding prompt text in the center of the screen will disappear. After clicking the cancel button, calibration will be interrupted.

5.11 Call Mode

5.11.1 Entering call mode

Press the "Call Mode" icon on the initial menu interface to enter call mode, as shown in Figure 21.

5.11.2 Introduction to Call Mode Display Interface

5.11.2.1 Mode: The measurement mode displayed in the top area of the interface is "Call Mode". Click "Main Menu" to return to the initial menu interface.

5.11.2.2 Parameter settings: Set various parameters for wireless communication in the middle area of the interface.

5.11.2.3 Error prompt: When making an error input, an error prompt will be displayed at the bottom of the interface, and the current temperature and battery level of the instrument will be displayed in the lower right corner.

Figure 21 Call Mode

5.11.3 Call Mode Operation Instructions

The square icon in the call mode interface is the radio communicator prompt icon. When the intercom is pressed, the icon lights up; When released, the icon fades.

In call mode, you can set the RF frequency, RF amplitude, modulation mode, modulation type, intermediate frequency band block, and audio bandwidth for wireless communication. All settings can refer to the previous instructions.

5.12 System Setting Mode

5.12.1 System Setting Mode

Press the "System Settings" icon on the initial menu interface to enter the system settings mode, as shown in Figure 22.

5.12.2 Introduction to System Setting Mode Display Interface

5.12.2.1 Mode: The measurement mode displayed in the top area of the interface is "System Settings" mode. Click "Main Menu" to return to the initial menu interface.

5.12.2.2 System Settings: Set various system parameters of the instrument in the upper area of the interface.

5.12.2.3 User Common Data Settings: Set user common data in the lower area of the interface.

5.12.2.4 Error prompt: When making an error input, an error prompt will be displayed at the bottom of the interface, and the current temperature and battery level of the instrument will be displayed in the lower right corner.

Figure 22 System Setting Mode

5.12.3 System Setting Mode Operation Instructions

After entering "1958" in the debugging code control, click "Touch Screen Calibration" to recalibrate the touch screen points. After clicking on calibration, the application will close and start the calibration program. After the calibration interface appears, click on the "+" icon on the screen in sequence. After calibration is completed, the system will restart with new touch screen calibration data. Note that the screen calibration function must be carried out by a dedicated person, and any misoperation may cause the screen to malfunction.

The display brightness can be set to the LCD screen brightness. Clicking the "+" button can increase the display brightness of the LCD screen, while clicking the "-" button can decrease the display brightness of the LCD screen.

The sleep time is the energy-saving mode of the instrument. When there is no click action within the set time, the screen brightness will be automatically reduced.

The power unit can be set to measure power in the RF analyzer, including dBm and W.

The color scheme can set the main color tone of the instrument, which can be set to black, red, yellow, blue, or green.

5.12.4 User Common Data Settings

Click on the commonly used input options, and then click on the commonly used data below to set it. Each commonly used input option can save 6 commonly used data. These data can be directly clicked on in the data input interface when inputting data

5.13 Remote control commands

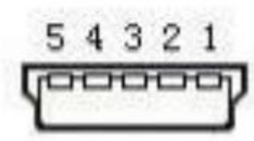
5.13.1 Overview

The instrument has remote control function and can be controlled remotely using RS-232 serial interface or standard LAN interface. When the instrument receives a remote control command, it enters the remote control state, and "Remote Control" will be displayed in the lower right corner of the screen title area. Only the "Main System" touch button in the upper right corner is available on the instrument.

5.13.2 RS-232 serial interface

The instrument is equipped with an RS-232 serial interface and uses a Mini-B USB port. The baud rate of the serial port is 115200, with no parity bit, 8 data bits, and 1 stop bit. The serial interface adopts a 3-wire system, which includes RXD, TXD, and GND. The interface pin numbers are defined in Table 1.

Table 1 Description of PM1200 Serial Interface Pins

Pin	Name	Direction	Interface diagram
1	TXD	Output	 Mini USB
2			
3	RXD	Input	
4			
5	GND	land	

5.13.3 LAN interface

The instrument is equipped with a standard LAN interface that meets the IEEE802.3 protocol. The pin numbers of LAN sockets are defined in Table 2.

When connecting to the network, use a crossover cable to directly connect to the PC host. The default IP of the instrument is 198.168.16.81, and the port number is 8888. The IP of the PC host should be in this network segment, such as 198.168.16.11.

The network of the instrument adopts TCP protocol. Please use TCP protocol for connection when programming. If using the scope class for PC programming, you can refer to the following program segments.

```
public Socket socket = new Socket(AddressFamily.InterNetwork, SocketType.Stream, ProtocolType.Tcp);
public byte[] msg;
socket.Connect("192.168.16.81", 8888);
msg = Encoding.GetEncoding("gb2312").GetBytes( “RX” );
socket.Send(msg, msg.Length, 0);
socket.Close();
```

Among them, RX is a programmable command for PM1200. This program segment is a C # environment program segment, and programming in other languages can refer to the language used.

Table 2 PM 1200 Network Interface Pin Description

Pin	Name	Describe
1	TX+	Transmit Data+
2	TX-	Transmit Data-
3	RX+	Receive Data+
4	NC	Not connected
5	NC	Not connected
6	RX-	Receive Data-
7	NC	Not connected
8	NC	Not connected

5.13.4 Programmable commands

The instrument program control command is in string format. After being sent to the instrument, the instrument changes the state parameters or returns measurement data according to the command. The detailed program control command is shown in Table 3. The command is not case sensitive and does not require a terminator. When the instrument is in remote control mode, screen operation is not available. To return to screen operation, please press the "Main Menu" icon in the upper right corner of the screen.

Table 3 PM 1200 Program Control Command Table

Command Format	Data unit	Function Description
IEEE488.2 General Command		
*IDN?		Query the instrument ID string
*RST		Reset the instrument to the preset state
Test mode		
UI		Return to main menu
RX		Enter reception testing mode
TX		Enter launch test mode
DX		Enter duplex testing mode
AF		Enter audio testing mode
OSC		Enter waveform analysis mode
SPE		Enter spectrum analysis mode
SWR		Entering Standing Wave Analysis Mode
DISMOD?		Query Test Mode
Note: The return to main menu command "UI" can be used in any mode, while other mode switching commands require returning to the main menu first and then entering the corresponding command to switch. To switch from receiving test mode to transmitting test mode, you need to first send the command "UI" and then send the command "TX". All commands in Table 3 are only valid in the corresponding test mode, as detailed in section 5.3. If a test function command that is only available in another test mode is sent in a certain test mode, the command is invalid. If the center frequency of spectrum analysis is set in the receiving test mode, the instrument will determine that the command is invalid.		

Table 3 (Continued)

RF synthesizers		
RFG:FREQ	MHz、kHz、Hz	Set carrier frequency value Example: RFG: FREQ, 10MHz
RFG:AMPL	dBm、mV、uV	Set carrier amplitude value Example: RFG: AMPL-70dBm
RFG:OFF		Turn off RF output
RFG:ON		Enable RF output
RFG:T/R		Set the RF output port to a high-power port
RFG:ANT		Set the RF output port as the antenna port
RFG:SWR		Set the RF output port as a standing wave port
RFG:FREQ?		Query carrier frequency value
RFG:AMPL?		Query carrier amplitude value
RFG:SW?		Query RF output switch status
RFG:PORT?		Query RF output port status
MOD:FM		Set the modulation mode to FM
MOD:AM		Set the modulation mode to amplitude modulation
EXTM:OFF		Turn off external modulation
EXTM:ON		Enable external modulation
MOD1:FM	kHz、Hz	Set internal modulation 1 modulation frequency offset Example: MOD1: FM 1kHz
MOD1:AM	%	Set modulation depth for internal modulation 1 :MOD1:AM 30%
MOD1:OFF		Turn off internal modulation 1
MOD1:ON		Enable internal modulation 1
MOD1:FREQ	kHz、Hz	Set internal modulation 1 modulation frequency Example: MOD1: FREQ 1kHz
MOD2:FM	kHz、Hz	Set internal modulation 2. Modulation frequency offset Example: MOD2: FM 1kHz
MOD2:AM	%	Set internal modulation 2. Modulation depth Example: MOD2: AM 30%
MOD2:OFF		Turn off internal modulation 2
MOD2:ON		Enable internal modulation 2
MOD2:FREQ	kHz、Hz	Set internal modulation 2. Modulation frequency Example: MOD2: FREQ 1kHz
MOD2:FMSEL:AF		Set the frequency modulation type to audio modulation
MOD2:FMSEL:CTCSS		Set the frequency modulation type to analog sub tone
MOD2:FMSEL:+DCS		Set the frequency modulation type to positive digital sub tone
MOD2:FMSEL:-DCS		Set the frequency modulation type to negative digital sub tone
MOD2:AMSEL:AF		Set the amplitude modulation type to audio modulation
MOD2:AMSEL:USSB		Set the amplitude modulation type to upper single sideband
MOD2:AMSEL:DSSB		Set the amplitude modulation type to bottom single sideband

Table 3 (continued)

RF Synthesizer (Continued)		
MOD:TYPE?		Query modulation mode
EXTM:SW?		Query external modulation status
MOD1:FM?		Query internal modulation 1 modulation frequency offset
MOD1:AM?		Query the modulation depth of internal modulation 1
MOD1:SW?		Query the status of internal modulation 1
MOD1:FREQ?		Query internal modulation 1 modulation frequency
MOD2:FM?		Query internal modulation 2: modulation frequency offset
MOD2:AM?		Query internal modulation 2: modulation depth
MOD2:SW?		Query the status of internal modulation 2
MOD2:FREQ?		Query internal modulation 2. Modulation frequency
RF analyzer measurement		
MEA:OFF		Close all measurements
MEA:ON		Enable all measurements
MEA:RFFREQ:OFF		Turn off RF frequency difference measurement
MEA:RFFREQ:ON		Enable RF frequency difference measurement
MEA:FMDEM:OFF		Turn off FM demodulation measurement
MEA:FMDEM:ON		Enable FM demodulation measurement
MEA:AMDEM:OFF		Turn off amplitude modulation demodulation measurement
MEA:AMDEM:ON		Enable amplitude modulation demodulation measurement
MEA:RFPOW:OFF		Turn off broadband power measurement
MEA:RFPOW:ON		Enable broadband power measurement
MEA:DMPOW:OFF		Turn off narrowband power measurement
MEA:DMPOW:ON		Enable narrowband power measurement
MEA:AVG		Set demodulation data to average value
MEA:+PEAK		Set demodulation data to positive peak value
MEA:-PEAK		Set demodulation data to negative peak value
MEA:RFFREQ?		Measure RF frequency offset
MEA:FMDEM?		Measure frequency modulation demodulation
MEA:AMDEM?		Measurement amplitude modulation demodulation
MEA:RFPOW?		Measuring broadband power
MEA:DMPOW?		Measuring narrowband power

Table 3 (continued)

RF analyzer parameter settings		
RFA:FM		Set demodulation mode to FM demodulation
RFA:AM		Set demodulation mode to amplitude modulation demodulation
RFA:FREQ	MHz、kHz、Hz	Set tuning frequency value Example: RFA: REQ 10MHz
RFA:IFBW:5KHZ		Set the intermediate frequency filter to 5kHz
RFA:IFBW:10KHZ		Set the intermediate frequency filter to 10kHz
RFA:IFBW:30KHZ		Set the intermediate frequency filter to 30kHz
RFA:IFBW:100KHZ		Set the intermediate frequency filter to 100kHz
RFA:IFBW:300KHZ		Set the intermediate frequency filter to 300kHz
RFA:AFBW:NF		Set audio filter to no filter
RFA:AFBW:0.3KLP		Set the audio filter to 0.3kLP
RFA:AFBW:0.3K-3KLP		Set the audio filter to 0.3k-3kLP
RFA:AFBW:0.3K-5KLP		Set the audio filter to 0.3k-5kLP
RFA:AFBW:0.3K-20KLP		Set the audio filter to 0.3k-20kLP
RFA:AFBW:3KLP		Set the audio filter to 3kLP
RFA:AFBW:5KLP		Set the audio filter to 5kLP
RFA:AFBW:15KLP		Set the audio filter to 15kLP
RFA:AFBW:0.3KHP		Set the audio filter to 0.3kHP
RFA:T/R		Set the RF input port to a high-power port
RFA:ANT		Set the RF input port as the antenna port
RFA:FMSEL:AF		Set FM demodulation type to audio modulation
RFA:FMSEL:CTCSS		Set FM demodulation type to analog sub tone
RFA:FMSEL:+DCS		Set the frequency modulation demodulation type to positive digital sub tone
RFA:FMSEL:-DCS		Set the frequency modulation demodulation type to negative digital sub tone
RFA:AMSEL:AF		Set the amplitude modulation and demodulation type to audio modulation
RFA:AMSEL:USSB		Set the amplitude modulation and demodulation type to upper single sideband
RFA:AMSEL:DSSB		Set the amplitude modulation and demodulation type to bottom single sideband
RFA:DMTYPE?		Query demodulation mode
RFA:FREQ?		Query tuning frequency value
RFA:IFBW?		Query the status of the intermediate frequency filter
RFA:AFBW?		Query audio filter status
RFA:PORT?		Query the status of the RF input port

Table 3 (continued)

Audio Generator 1		
AFG1:FREQ	kHz、Hz	Set audio 1 frequency value Example: AFG1: FREQ 1kHz
AFG1:LEV	V、mV	Set audio 1 level value Example: AFG1: LEV 1V
AFG1:OFF		Turn off audio 1 output
AFG1:ON		Enable audio 1 output
AFG1:FREQ?		Query audio 1 frequency value
AFG1:LEV?		Query audio 1 level value
AFG1:SW?		Query audio 1 status
Audio Generator 2		
AFG2:FREQ	kHz、Hz	Set audio 2 frequency value Example: AFG2: FREQ 1kHz
AFG2:LEV	V、mV	Set audio 2 level value Example: AFG2: LEV 1V
AFG2:OFF		Turn off audio 2 output
AFG2:ON		Enable audio 2 output
AFG2:FREQ?		Query audio 2 frequency value
AFG2:LEV?		Query audio 2 level value
AFG2:SW?		Query audio 2 status

Table 3 (continued)

Audio analyzer measurement		
MEA:AFFREQ:OFF		Turn off audio frequency measurement
MEA:AFFREQ:ON		Enable audio frequency measurement
MEA:AFLEV:OFF		Turn off audio level measurement
MEA:AFLEV:ON		Enable audio level measurement
MEA:AFDIST:OFF		Turn off audio distortion measurement
MEA:AFDIST:ON		Enable audio distortion measurement
MEA:AFSINA:OFF		Turn off audio sonar measurement
MEA:AFSINA:ON		Enable audio sonar measurement
MEA:AFLEV:VRMS		Set audio level measurement: measure as effective value
MEA:AFLEV:VPP		Set audio level measurement to peak to peak value
MEA:AFFREQ?		Measure audio frequency
MEA:AFLEV?		Measure audio level
MEA:AFDIST?		Measure audio distortion
MEA:AFSINA?		Measure audio signal
MEA:ALL?		Read all measured values
Note: The "MEA: ALL?" command is only valid for remote control via LAN port. The returned data includes the audio frequency measured by the audio analyzer, audio level, audio distortion, audio sonar, RF frequency measured by the RF analyzer, RF broadband power, RF narrowband power, FM demodulation, and AM demodulation. This command can read the above 9 measurement values at once, but the measurement data returned by the measurement function that is not available in the current mode or the measurement function that is turned off is invalid.		
Audio analyzer parameter settings		
AFA:EXT		Set the audio input port as an external audio port
AFA:MIC		Set the audio input port to MIC port
AFA:DVM		Set the audio input port to DVM port
AFA:DEMOD		Set the audio input port to demodulate audio
AFA:INRES:HIGH		Set the audio input impedance to high impedance
AFA:INRES:150OHM		Set the audio input impedance to 150 Ω
AFA:INRES:600OHM		Set the audio input impedance to 600 Ω
AFA:INRES:1KOHM		Set the audio input impedance to 1k Ω
AFA:INRES:10KOHM		Set the audio input impedance to 10k Ω
AFA:COUP:DC		Set audio input coupling to DC
AFA:COUP:AC		Set audio input coupling to AC
AFA:PORT?		Query the status of the audio input port
AFA:INRES?		Query audio input impedance status
AFA:COUP?		Query audio input coupling status

Table 3 (continued)

Waveform analysis		
OSC:YSCALE:10MV		Set the Y-axis scale to 10mV/div
OSC:YSCALE:20MV		Set the Y-axis scale to 20mV/div
OSC:YSCALE:50MV		Set the Y-axis scale to 50mV/div
OSC:YSCALE:100MV		Set the Y-axis scale to 100mV/div
OSC:YSCALE:200MV		Set the Y-axis scale to 200mV/div
OSC:YSCALE:500MV		Set the Y-axis scale to 500mV/div
OSC:YSCALE:1V		Set the Y-axis scale to 1V/div
OSC:YSCALE:2V		Set the Y-axis scale to 2V/div
OSC:YSCALE:5V		Set the Y-axis scale to 5V/div
OSC:YSCALE:10V		Set the Y-axis scale to 10V/div
OSC:XSCALE:100US		Set the X-axis scale to 100us/div
OSC:XSCALE:200US		Set the X-axis scale to 200us/div
OSC:XSCALE:500US		Set the X-axis scale to 500us/div
OSC:XSCALE:1MS		Set the X-axis scale to 1ms/div
OSC:XSCALE:2MS		Set the X-axis scale to 2ms/div
OSC:XSCALE:5MS		Set the X-axis scale to 5ms/div
OSC:XSCALE:10MS		Set the X-axis scale to 10ms/div
OSC:XSCALE:20MS		Set the X-axis scale to 20ms/div
OSC:XSCALE:50MS		Set the X-axis scale to 50ms/div
OSC:XSCALE:100MS		Set the X-axis scale to 100ms/div
OSC:YOFFSET	div	Set Y-axis offset value Example: OSC: YOFFSET 2div
OSC:TRIGGER:LEV	div	Set trigger level value Example: OSC: TRIGGER: LEV 2div
OSC:TRIGGER:RISE		Set the triggering edge to the rising edge for triggering
OSC:TRIGGER:DROP		Set the triggering edge to the falling edge triggering
OSC:TRIGGER:FREE		Set the trigger edge to free trigger
OSC:TRIGGER:SINGLE		Set the number of triggers to a single trigger
OSC:TRIGGER:PLURAL		Set the number of triggers to repeated triggers
OSC:YSCALE?		Query Y-axis scale status
OSC:XSCALE?		Query X-axis scale status
OSC:YOFFSET?		Query Y-axis offset value
OSC:TRIGGER:LEV?		Query trigger level value
OSC:TRIGGER:EDGE?		Query trigger edge status
OSC:TRIGGER:TIME?		Query trigger count

Table 3 (continued)

Audio analyzer measurement		
SPE:CENT	MHz、kHz、Hz	Set the frequency value of the spectrum analysis center Example: SPE: CENT 500MHz
SPE:START	MHz、kHz、Hz	Set the starting frequency value for spectrum analysis Example: SPE: START 499MHz
SPE:STOP	MHz、kHz、Hz	Set the end frequency value of spectrum analysis Example: SPE: STOP 501MHz
SPE:RLEV	dBm	Set reference level value Example: SPE: RLEV 0dBm
SPE:SPAN:10KHZ		Set the spectrum analysis sweep width to 10kHz
SPE:SPAN:20KHZ		Set the spectrum analysis sweep width to 20kHz
SPE:SPAN:50KHZ		Set the spectrum analysis sweep width to 50kHz
SPE:SPAN:100KHZ		Set the spectrum analysis sweep width to 100kHz
SPE:SPAN:200KHZ		Set the spectrum analysis sweep width to 200kHz
SPE:SPAN:500KHZ		Set the spectrum analysis sweep width to 500kHz
SPE:SPAN:1MHZ		Set the spectrum analysis sweep width to 1MHz
SPE:SPAN:2MHZ		Set the spectrum analysis sweep width to 2MHz
SPE:SPAN:5MHZ		Set the spectrum analysis sweep width to 5MHz
SPE:SPAN:10MHZ		Set the spectrum analysis sweep width to 10MHz
SPE:SPAN:20MHZ		Set the spectrum analysis sweep width to 20MHz
SPE:SPAN:50MHZ		Set spectrum analysis sweep width to 50MHz
SPE:SPAN:100MHZ		Set the spectrum analysis sweep width to 100MHz
SPE:SPAN:200MHZ		Set the spectrum analysis sweep width to 200MHz
SPE:SPAN:500MHZ		Set the spectrum analysis sweep width to 500MHz
SPE:SPAN:1000MHZ		Set the spectrum analysis sweep width to 1000MHz
SPE:T/R		Set the RF input port to a high-power port
SPE:ANT		Set the RF input port as the antenna port
SPE:MARK:PEAK		Set the marking mode to the main peak
SPE:MARK:NEXT		Set marking mode to secondary peak
SPE:MARK:USER		Set the marking mode to user settings
SPE:MARK:POS	div	Set marker position Example: SPE: MARK: POS 5div
SPE:YLEV:1DB		Set the Y-axis scale to 1dBm/div
SPE:YLEV:2DB		Set the Y-axis scale to 2dBm/div
SPE:YLEV:5DB		Set the Y-axis scale to 5dBm/div
SPE:YLEV:10DB		Set the Y-axis scale to 10dBm/div
SPE:HOLD:OFF		Turn off peak holding function
SPE:HOLD:ON		Enable peak holding function
SPE:WINFUNC:FLATTOP		Set the window function to a flat top window
SPE:WINFUNC:HAMMING		Set the window function to a Hamming window

Table 3 (continued)

Audio analyzer measurement		
SPE:VAVG	无	Set video average Example: SPE: VAVG 2
SPE:CENT?		Query the frequency value of the spectrum analysis center
SPE:START?		Query the starting frequency value of spectrum analysis
SPE:STOP?		Query the end frequency value of spectrum analysis
SPE:RLEV?		Query reference level value
SPE:SPAN?		Query spectrum analysis sweep width value
SPE:PORT?		Query the status of the RF input port
SPE:MARK:MODE?		Query Tag Mode
SPE:MARK:POS?		Query marker location
SPE:MARK:X?		Measure the frequency of marker points
SPE:MARK:Y?		Measure the amplitude of the marked point
SPE:HOLD?		Query peak maintenance status
SPE:VAVG?		Query video average
SPE:WINFUNC?		Query window function status
SPE:DATA?		Read spectrum analysis data
Note: Reading the spectral analysis data of the instrument is only valid for remote control via LAN port. The array length is 1285, and every 5 digits is one spectral point of the spectral data. If the first 5 digits are 15000, the first point of the spectral data is -50dBm, and the corresponding relationship is: Spectral data=Read data/100-200. When the scanning bandwidth is less than or equal to 1MHz, the spectrum data length is 257 points, and the module is in FFT analysis mode. This function can be used to directly read the spectrum data. When the scanning bandwidth is 10MHz, 20MHz, 50MHz, and 100MHz, the spectrum data length is 101 points. When the scanning bandwidth is 200MHz, the spectrum data length is 201 points. At this time, the module is in the scanning stage, and the spectrum flag can be read first. Wait for the scanning to be completed before using the function to read the spectrum data.		
SPE:ALL?		Read spectrum analysis data
Note: Reading spectrum analysis data is only valid for remote control via LAN port. The array length is 6405, and the relationship between data and spectral data is as described in the "SPE: DATA?" command above. This command When the scanning bandwidth is 2MHz, the spectrum data length is 513 points. When the scanning bandwidth is 5MHz, the spectrum data length is 1281 points. At this time, the module is in FFT analysis mode and can use this function to directly read the spectrum data. When the scanning bandwidth is 500MHz, the spectrum data length is 501 points. When the scanning bandwidth is 1000MHz, the spectrum data length is 1001 points. At this time, the module is in the scanning stage and can read the spectrum flag. Wait for the scanning to be completed before using the function to read the spectrum data.		
SPE:FLAG?		Query spectrum analysis flag
Note: Read the flag of the instrument's spectrum analysis. When the scanning bandwidth of the spectrum analysis is set to 10MHz or above, the instrument adopts a frequency scanning method for spectrum analysis. At this time, the analysis speed will decrease. Therefore, this flag can be read to determine whether the analysis is completed. When the string "OK" is received, it indicates that the secondary spectrum scanning operation is completed and the spectrum data can be read.		

Table 3 (continued)

Standing wave analysis		
SWR:MODE:SWR		Set the standing wave analysis mode to SWR testing
SWR:MODE:DTF		Set the standing wave analysis mode to DTF testing
SWR:MODE:RCO		Set the standing wave analysis mode to RCO testing
SWR:MODE:RL		Set the standing wave analysis mode to RL test
SWR:CENT	MHz、kHz、Hz	Set the frequency value of the standing wave analysis center Example: SWR: CENT 500MHz
SWR:START	MHz、kHz、Hz	Set the starting frequency value for standing wave analysis Example: SWR: START 495MHz
SWR:STOP	MHz、kHz、Hz	Set the end frequency value of standing wave analysis Example: SWR: STOP 505MHz
SWR:SPAN	MHz、kHz、Hz	Set the scanning width value for standing wave analysis Example: SWR: SPAN 10MHz
SWR:MARK1:OFF		Close marker point 1
SWR:MARK1:ON		Enable marker point 1
SWR:MARK1:DELTA	无	Set the comparison marker for marker 1 Example: SWR: MARK1: DELTA 2
SWR:MARK1:POS	div	Set the position of marker 1 Example: SWR: MARK1: POS 5div
SWR:MARK2:OFF		Close marker point 2
SWR:MARK2:ON		Enable marker point 2
SWR:MARK2:DELTA	无	Set comparison markers for marker 2 Example: SWR: MARK2: DELTA 3
SWR:MARK2:POS	div	Set the position of marker 2 Example: SWR: MARK2: POS 5div
SWR:MARK3:OFF		Close marker point 3
SWR:MARK3:ON		Enable marker point 3
SWR:MARK3:DELTA	无	Set comparison markers for marker 3 Example: SWR: MARK3: DELTA 1
SWR:MARK3:POS	div	Set the position of marker 3 Example: SWR: MARK3: POS 5div

Table 3 (continued)

Standing wave analysis (continued)		
SWR:CABLE:USER		Set cable parameter mode to user settings
SWR:CABLE:RG-8X		Select the cable parameter as RG-8X
SWR:CABLE:RG-8		Select cable parameter RG-8
SWR:CABLE:RG-8FOAM		Select the cable parameter as RG-8FOAM
SWR:CABLE:RG-8A		Select cable parameter RG-8A
SWR:CABLE:RG-55		Select the cable parameter as RG-55
SWR:CABLE:RG-55A		Select cable parameters as RG-55A
SWR:CABLE:RG-55B		Select the cable parameter as RG-55B
SWR:CABLE:RG-58		Select the cable parameter as RG-58
SWR:CABLE:RG-58FOAM		Select the cable parameter as RG-58FOAM
SWR:CABLE:RG-58A		Select cable parameter RG-58A
SWR:CABLE:RG-58B		Select the cable parameter as RG-58B
SWR:CABLE:RG-58C		Select the cable parameter as RG-58C
SWR:CABLE:RG-174		Select the cable parameter as RG-174
SWR:CABLE:RG-213		Select the cable parameter as RG-213
SWR:CABLE:RG-214		Select the cable parameter as RG-214
SWR:CABLE:RG-223		Select the cable parameter as RG-223
SWR:CABLE:RG-400		Select the cable parameter as RG-400
SWR:VELO	Not have	Set cable speed value Example: SWR: VELOO one
SWR:LOSS	Not have	Set cable loss value Example: SWR: Loss 1
SWR:LENG	m	Set cable length Example: SWR: LENG 20m
SWR:SCALE:MANUAL		Set scale mode to user settings
SWR:SCALE:AUTO		Set scale mode to automatic
SWR:TOP	dBm	Set Top Scale Value Example: SWR: TOP 20dBm
SWR:BOT	dBm	Set bottom scale value Example: SWR: BOT 0dBm

Table 3 (continued)

Standing wave analysis (continued)		
SWR:MODE?		Query standing wave analysis mode
SWR:CENT?		Query the frequency value of the standing wave analysis center
SWR:START?		Query the starting frequency value of standing wave analysis
SWR:STOP?		Query the end frequency value of standing wave analysis
SWR:SPAN?		Query standing wave analysis scan width value
SWR:MARK1:SW?		Query the status of marker point 1
SWR:MARK1:DELTA?		Comparison marker for query marker 1
SWR:MARK1:POS?		Query the location of tag 1
SWR:MARK1:X?		Measurement Mark 1 Frequency
SWR:MARK1:Y?		Measurement marker 1 standing wave
SWR:MARK2:SW?		Query the status of marker point 2
SWR:MARK2:DELTA?		Comparison markers for query marker 2
SWR:MARK2:POS?		Location of query marker 2
SWR:MARK2:X?		Measurement Mark 2 Frequency
SWR:MARK2:Y?		Measurement marker 2 standing wave
SWR:MARK3:SW?		Query the status of marker point 3
SWR:MARK3:DELTA?		Comparison markers for query marker 3
SWR:MARK3:POS?		Location of query marker 3
SWR:MARK3:X?		Measurement Mark 3 Frequency
SWR:MARK3:Y?		Measurement marker 3 standing wave
SWR:CABLE?		Query cable parameter mode
SWR:VELO?		Query cable speed value
SWR:LOSS?		Query cable loss value
SWR:LENG?		Query cable length
SWR:SCALE?		Query scale mode
SWR:TOP?		Query Top Scale Value
SWR:BOT?		Query bottom scale value

6 Maintenance and Repair

The product should be stored indoors in a dry, ventilated, non corrosive gas, non strong sunlight, and non strong electromagnetic fields. To prevent damage to the instrument, it should be turned off and both AC and DC power sources disconnected before opening the instrument case.

6.1 If the power adapter is not connected, it cannot be turned on (the power light is not on), and the battery voltage may be too low. It is necessary to connect the power adapter.

6.3 Connect the power adapter and turn on the monitor. If the instrument cannot be started, it indicates that the CPU reset is not good,

6.3 Connect the power adapter and turn on the monitor. If the instrument cannot be started, it indicates that the CPU is not resetting properly. Please restart the device.

6.4: If other difficult faults are found, please contact the manufacturer.

7 completeness

The completeness of the instrument is shown in Table 4.

Table 4 Instrument completeness

Number	Name and model	Quantity	Remarks
1	PM1200 wireless comprehensive tester	1 unit	
2	User manual	1 copy	
3	Talker	1 unit	
4	Dual SMA cable line	1 piece	
5	Double BNC cable line	1 piece	
6	SMA interface foldable rod antenna 450MHz	1 piece	
7	SMA interface foldable rod antenna 800MHz	1 piece	
8	Power adapter GS 120A24	1 unit	
9	Power cord 8411B-3X28X0 15-2m	1 piece	
10	SMA type male 50 Ω load calibration component	1 unit	
11	SMA type male short circuit calibration component	1 unit	
12	SMA type male open circuit calibration component	1 unit	
13	PM1200 certificate of conformity	1 copy	
14	Packing list	1 copy	
15	silica gel	2 bags	
16	Fuse 5A	1 piece	

8. Manufacturer's name and address

(a) Qingdao Fate Technology Co., Ltd

(b) Address: Building B, 1723, Jinhainiu Industrial Park, No. 700 Qingshan Road, Licang District, Qingdao City;

(c) Phone: +86-18765219251

(d) Email:fattsales1@163.com