QingCheng AE Institute(Guangzhou) Co.,Ltd

User Manual of SCAL2 AE Calibrator

Be fitted for SCAL2 AE Calibrator

QingCheng

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Catalogue

Copyright Announcement

Before using SCAL2 AE Calibrator, customer should read this user’ s manual carefully, in order to make sure you can use the machine properly.The display screen or settings will have little changes because of future software updating, we won’ t inform the user separately.

If the company modifies the contents of this manual, the user will not be notified. We do not guarantee the quality、 accuracy and applicability of this manual. In case of any direct or indirect loss caused by the error of the contents of this manual, QingCheng company will not take any responsibility and will not provide any compensation.

Note: This manual is the general operation manual of our company's Scal2 acoustic emission calibrator. The description of some functions is only applicable to the products with this part of functions. Please refer to this manual when you purchase the products.

User’s Manual of SCAL2 AE Calibrator

Chapter 1 Instrument Brief Introduction

SCALE AE Calibrator is designed and developed according to the requirements of《JJF1505-2015 Acoustic Emission Detector Calibration Specification》for AE testing acquisition host calibration. It can also be used as a simple standard signal generator to output standard AE signal waveform; It is mainly used to calibrate acoustic emission testing instrument. Scal2 can output a variety of characteristic parameter standard signals, which can be used to calibrate the amplitude、 rise time、ring count and duration of AE parameters. It is suitable for testing the availability of AE host system、AE sensor and AE preamplifier before using the instrument, especially for quick testing the working state of AE detection system in the field environment.

1.1 Main Characteristics of SCAL2 AE Calibrator

1.1.1 System Characteristics:

(1) Protection class of outside shell is IP65;

(2) Continuous working time of battery power supply shall not be less than 10h;

(3) Output signal Connector type is BNC;

(4) Working Temperature: 0～40℃;

(5) Storage temperature: -20～60℃;

(6) Relative humidity: 30～90%;

(7) Avoid external electromagnetic interference;

(8) Anti vibration meets GB / T 242310.2008 (or other equivalent standards).

1.1.2 Hardware Technical index

(1) Colourful screen,resolution ratio 320 x 240;

(2) Keyboard control parameter setting and signal transmission;

(3) Accuracy: amplitude fluctuation range ± 0.3dB, frequency fluctuation range ± 0.5%.

1.1.3 System main functions:

(1) Settable variables: signal waveform, signal amplitude, signal frequency, transmission rate, gain, threshold;

(2) Signal waveform: AE double exponential envelope, AE triangle envelope, pulse sine wave, continuous sine wave, single pulse wave;

(3) Sine wave signal amplitude: 30dB-100dB;

(4) Acoustic emission waveform signal amplitude: 30-90dB;

(5) Continuous sine wave signal frequency: 10kHz ~ 1MHz, 0.1kHz step-by-step adjustment;

(6) Acoustic emission waveform signal frequency: 30kHz, 60kHz, 150kHz, 300kHz;

(7) It obtains AE characteristic parameters: rise time, duration, ring count;

(8) Transmission rate: 1PPS, 10pps, 100pps, 1000pps, manual control;

(9) Preamplifier gain: 0dB, 26dB, 40dB;

(10) It automatically calls up the configuration before last shutdown after start-up initialization.

In case of any defect or other special needs found in the use of this instrument, we hope you can give us valuable opinions so that we can provide you with free upgrade service in time after improvement. Due to the continuous upgrading of software, the software interface or settings may change slightly.

1.2 Instrument components of SCAL2 AE Calibrator

1.2.1 Instrument list of SCAL2 AE Calibrator

Table 1.1 Standard Configuration List of SCAL2 AE Calibrator

Model	Unit	Quantity
SCAL2 Calibrator (AE) Host	Piece	1
8.4V Power Adapter	Piece	1
BNC Cable	Piece	2
50 ohm Resistance Plug	Piece	1
BNC Three- way connector	Piece	1
QC Certificate and Warranty Card	Set	1
User’ s Manuel	Piece	1

1.2.2 System composition description

3.Interface protective Rubber Sleeve

Figure 1-1 Physical figure of scal2 acoustic emission calibrator host

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Figure 1 -2 Charging Diagram of Scal2 acoustic emission calibrator

Figure 1 -3 BNC Cable

Figure 1-4 Diagram of 50 ohm Resistance and Tee Joint

1.3 Instrument installation and use connection

1.3.1 Battery installation and charging

There are two power supply modes for scal2 acoustic emission calibrator: external power charger and instrument specially equipped with lithium-ion battery pack.

(1) **External power charger**: working voltage of power charger is AC 220V, 50Hz. Power supply mode: when the instrument is not loaded with battery, the external power charger plug is inserted into the power socket, and the indicator light of the power charger lights up, indicating that the charger works normally. Insert the DC plug of the charger into the charging socket, and the SCAL2 AE Calibrator can work normally. When the instrument is loaded with battery pack, connect the instrument and mains power, and the instrument works normally.

Note:

Please use a stable and reliable AC mains power supply of 220V and 50Hz to power the instrument, so as not to damage the power charger, lithium battery or instrument; If you need to stop the work of

the power charger, first unplug the power charger and the mains connection, and then disconnect the power charger and the instrument;

Generally, the use of ordinary 220 V power supply will bring some circuit noise, so it is recommended to use battery power supply when precise acoustic emission characteristic parameters are calibrated or small amplitude signal output.

(2) The instrument is specially equipped with lithium-ion battery pack: the top of the instrument is provided with a socket for charging the battery pack, and the battery pack is also embedded with a charging socket. The battery can be charged directly without taking out the battery or taken out for charging. When the battery power is insufficient, charge the battery in time or use the power charger to supply power, or replace the backup battery pack. Please turn off the instrument before replacing the battery.

1.3.1.1 Charging methods

Online charging:

The online charging method is as follows (charging can be carried out when the power is on or off):

1. Open the waterproof plug on the top of the instrument.

2. Insert the mains plug of the charger into the mains power socket, and then insert the charging plug into the charging socket on the top of the instrument, and the instrument will automatically start charging the battery. During charging, the indicator light of charger is red.

3. After the battery is full, the instrument will automatically stop charging. The indicator light of the charger is green.

Offline charging

Offline charging steps are as follows:

1. Turn off the instrument;

2. Take the battery module out of the battery compartment;

3. Insert the mains plug of the charger into the power socket, and then insert the charging plug into the charging socket of the battery module to start charging the battery. During charging, the indicator light of charger is red;

4. Automatically stop charging after the battery is full. The indicator light of charger changes from red to green. After removing the power socket, the indicator light of the charger is off. End of charging process.

1.3.1.2 Charging precautions:

1. Please make sure to use a special charger to charge the battery. It is not covered by the warranty if the instrument is charged by a charger not specially used for the batteries..

2. Lithium battery has self discharge problem. After the battery is fully charged, if it is not used for a short time, the power will be reduced to a certain extent; if it is not used for a long time, the battery will be over discharged and go to sleep. Power on for at least one to two hours every month, and charge the battery, so as not to affect the service life of components in the instrument due to moisture and battery power loss.

3. The battery is a consumable. Although it can be charged and discharged hundreds of times, it will

eventually fail. When you find that the working time of the battery is significantly shortened and cannot meet the performance requirements, please replace the battery with a new one.

4. The storage environment and charging place of the battery shall be kept away from high temperature and humidity, and shall be clean and free of oil, corrosive liquid, etc., especially the positive and negative pole parts of the battery shall not contact with metal objects.

5. The lithium battery is composed of multiple units. There are special protection circuits and devices inside. It is strictly forbidden to dismantle or refit the battery without permission. It is strictly forbidden to squeeze the battery and short the battery. Otherwise, there may be serious consequences.

6. During the transportation and use of the battery, care shall be taken to prevent the excessive impact of the battery, and to prevent the battery from falling, hitting, piercing, water immersion, rain, etc.

7. In the process of charging, in case of overheating and other abnormal phenomena, please immediately cut off the power supply and contact our company.

1.3.2 Connection with Acoustic Emission Host

There are two ways to connect the AE host with SCAL2: connecting the preamplifier and directly connecting the AE host equipment;

(1) Use preamplifier to connect the SCAL2 AE Calibrator

When using this method, it is basically the same as the normal use of the acoustic emission meter,

that is, the scal2 acoustic emission calibrator is directly connected with the front amplifier input by BNC cable at the front amplifier input end. It should be noted that if the built-in amplifier of the calibrator is set to 0, a 50 ohm impedance needs to be connected in parallel at the output end for impedance matching, otherwise the signal amplitude will be distorted;

(2) Connection without preamplifier

If BNC cable is used to directly connect Scal2 acoustic emission calibrator and acoustic emission acquisition host, it should be noted that the power supply of front amplifier is removed from the hardware setting of acoustic emission acquisition host; Scal2 acoustic emission calibrator is equipped with three kinds of gain amplifiers, and it should be noted that the gain setting of calibrator and acoustic emission software should be consistent with each other.

A. Use preamplifier to connect AE host

Note: *The output terminal is connected with 50 ohm resistor in parallel, the gain is set to 0 or adjusted as required, and the gain setting of AE software should be consistent with the total gain value;*

B.The calibrator is directly connected with the AE host;

Note: the actual gain value of the signal should be consistent with the gain setting of the AE software;

Figure 1-5 Diagram of connecting the calibrator to the AE host

Chapter 2 Instrument Operation Instructions

2.1 Turn on/Turn Off

Turn on: Pls press button  to open the instrument.

Turn off: Close the the instrument

◇Under the status of turning on , press button “  ” for a long while to close the machine.

◇ Automatic shutdown: when the battery voltage is too low, the power indicator on the screen will flash, and the calibrator will automatically save the data and shutdown after one hour.

The main display areas of the display interface include:

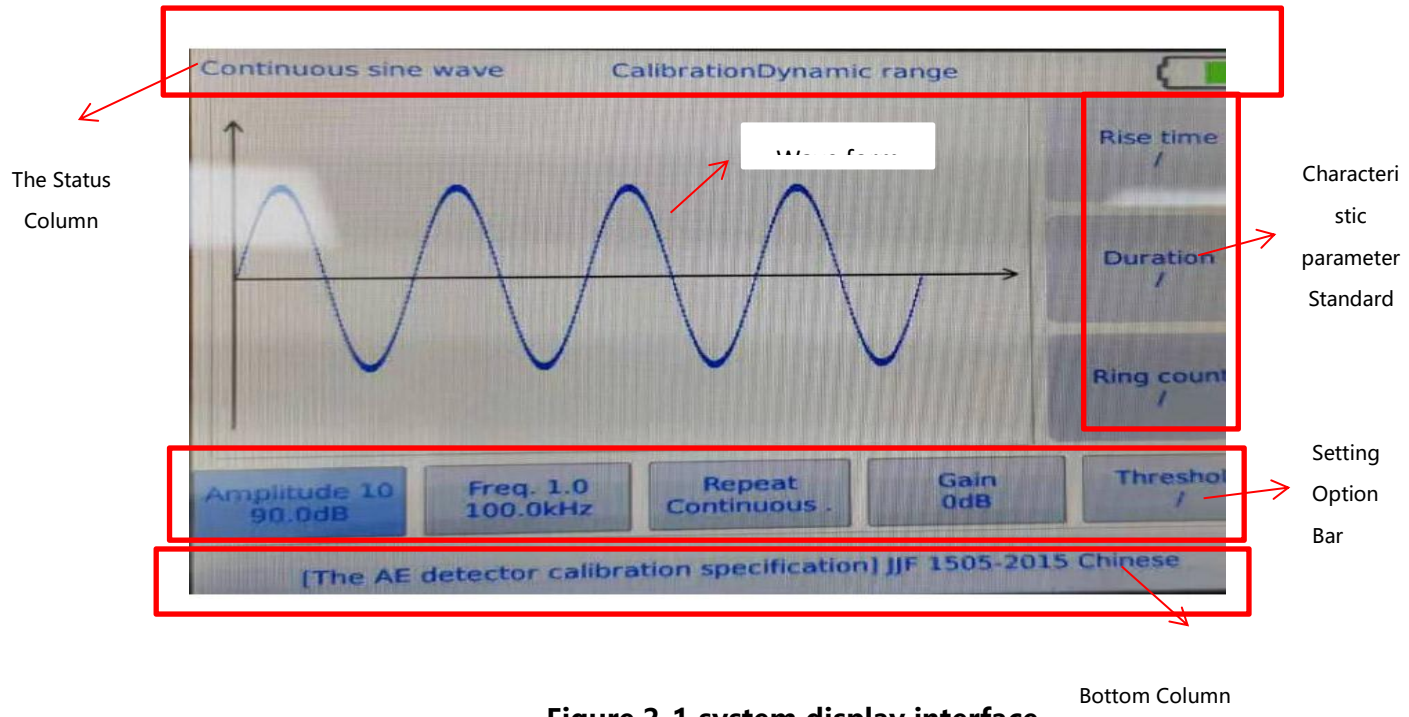


Figure 2-1 system display interface

1) The status column: it displays current waveform shape, current main functional options and battery capacity;;

2) The waveform diagram area is the shape diagram showing the currently selected waveform, which is mainly convenient for users to understand;

3) Standard value column of characteristic parameters: when the waveform parameter calibration function is selected, the standard value of acoustic emission characteristic parameters automatically calculated according to the current waveform generation settings is used to calculate the error of characteristic parameters collected by the acoustic emission host;

4) setting options bar, that is, the main menu bar, including amplitude, frequency, repetition rate, gain and threshold, which can be adjusted by pressing the key to switch between different main setting options;

5) bottom column: as a note column, when selecting different main function keys, make a brief description, so that users can understand the main purpose of the current option.

2.2 Keyboard Illustration

The operation of SCAL2 AE Calibrator is carried out by pressing the keys, which mainly includes the adjustment keys and the functional selection key lamp.

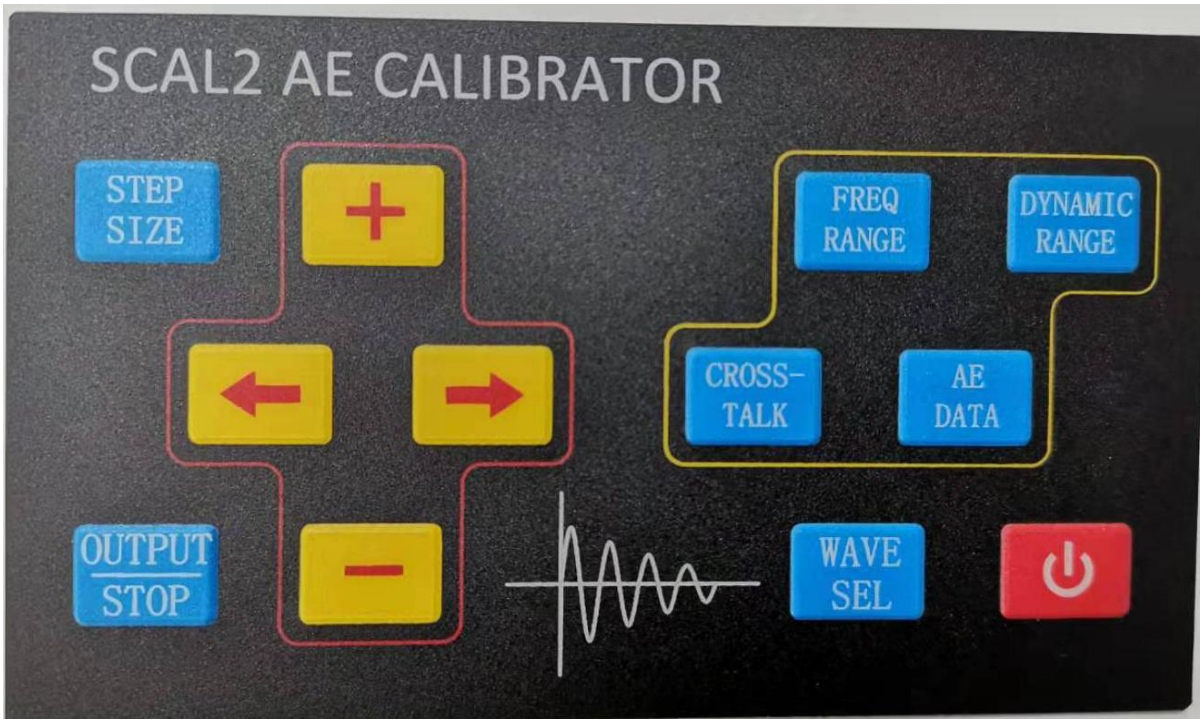


Figure 2-2 SCAL2 Button Panel

2.2.1 Basic setting keys

 :On/Off key, pls see above Instructions of the using methods ;

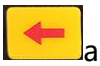
Press this key to switch the transmitted waveform, including continuous Sine wave, pulse Sine wave, Triangle wave, Double exponential wave, single pulse wave, etc;

:Output/Stop key:this key is used for signal output and stop output; when the signal is output, there will be transmission status flashing display on the right side of the status bar, as shown below;

Figure 2-3 scal2 signal output display Screen

Switch key: set the increase / decrease step of a setting item, such as frequency change. When the frequency setting option is selected, press this key to switch the increase / decrease step of frequency, such as 1.0khz, 0.1khz, and then press or key to adjust the output frequency to the target frequency;

 and  key: press those two keys to adjust the setting item. Press one time to add or subtract the setting value of the setting item according to the displayed steps;

 and  key: Switch the main setting menu from left to right, such as amplitude, frequency, repetition rate, gain, threshold, etc; press this key to select the option you want to set, and then adjust the value through and;

2.2.2 Function area buttons and testing methods

Function area buttons: all buttons in this area are shortcut keys set according to the requirements of acoustic emission host calibration in 《JJF1505-2015 Acoustic Emission Tester Calibration Specification》;

2.2.2.1 Frequency Testing Range

: Press this key to enter the frequency range test settings directly. The system will automatically transfer in the system settings required for the project test, without additional settings, and directly test the frequency range indicators according to the standards;

This project tests the frequency range of the acoustic emission host, so it does not use the preamplifier connection, and the SCAL2 Acoustic Emission Calibrator is directly connected to the acoustic emission host. See Chapter 1.3.2 for the connection method and precautions.

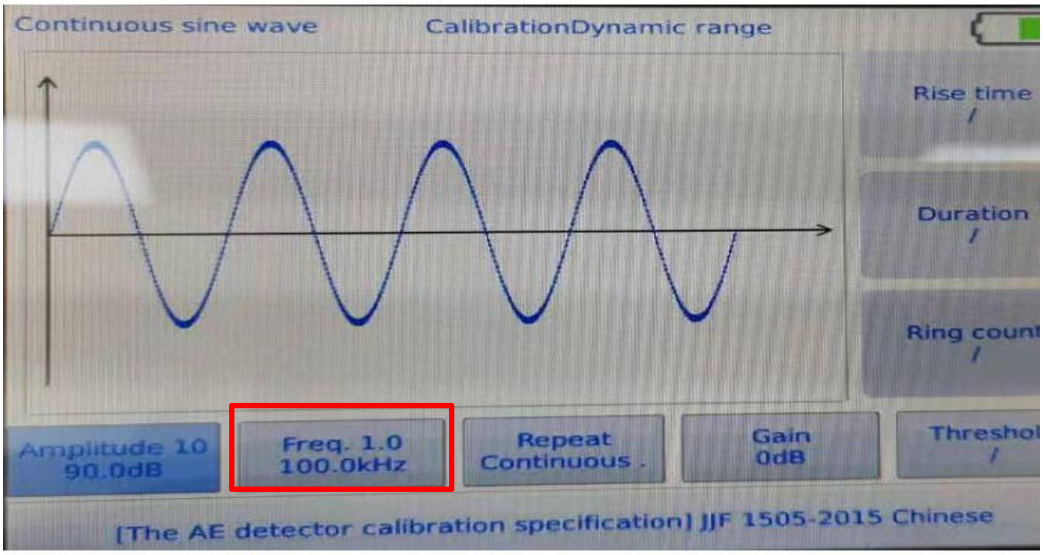


Figure 2-4 SCAL2 Frequency Range Operation Screen

Test method: Connect SCAL2 AE Calibrator to AE host, set acquisition waveform and parameters to AE host, set signal amplitude of 80dB, continuous Sine wave signal, gain of 40dB, default frequency of 150kHz according to the standard by default, press emission button, transmit waveform, record the signal amplitude acquired at the moment of AE; stop emission, change signal frequency, launch

again, find out To the maximum frequency of the signal amplitude collected by the acoustic emission host, and record the signal amplitude at this time; stop transmitting, adjust the frequency to a smaller value, and continuously adjust to reduce the amplitude ratio collected by the acoustic emission host by 3dB, and record the signal frequency at this time as the lower limit of the frequency range; similarly, increase the frequency to a larger value, and find the upper limit frequency by the same method, and get the acoustic emission Frequency range index of radio host.

2.2.2.2 Dynamic range testing

: As the same, press this key, can go directly into the dynamic range parametric testing setting of the acoustic emission host, , and can do dynamic testing according to the standard requirements.

Note:

The dynamic range test is the dynamic range of the whole acoustic emission system, so it is needed to connect to the external preamplifier and to do the test. Refer to section 1.3.2 for the connection method and precautions. According to the standard requirements, when using this function, a continuously adjustable attenuator is required. The amplitude adjustment can also be used as the attenuator adjustment, with the minimum step of 0.1dB, in line with《JJF1505-2 015 》requirements of standard content;

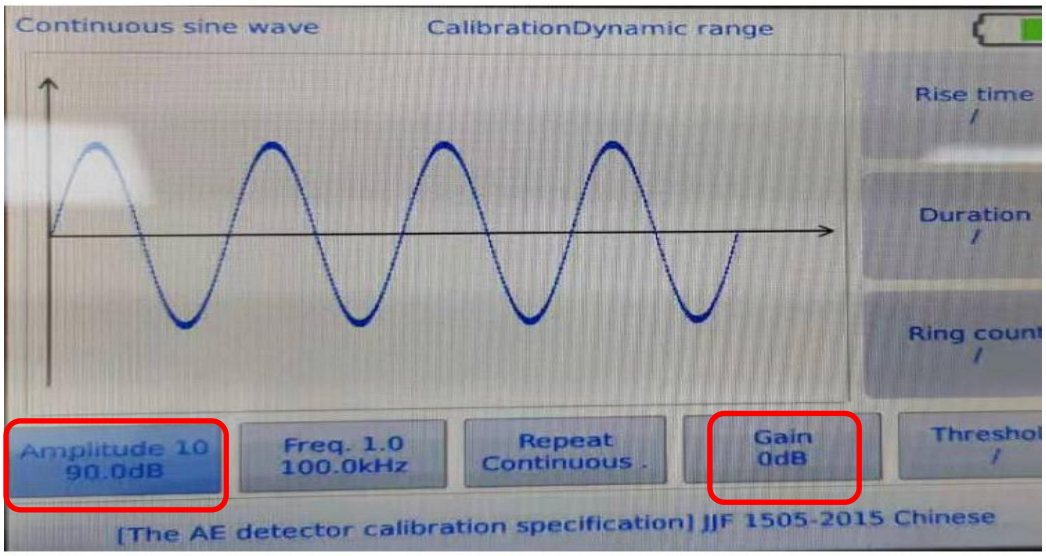


Figure 2-5 SCAL2 Dynamic Range Operation Interface

Testing method:

Connect the acoustic emission host and the standard 40dB preamplifier, connect the SCAL2 AE Calibrator, connect a random 50 ohm impedance in parallel at the output end of the calibrator, and connect the preamplifier;

Press the DYNAMIC RANGE key to enter the dynamic range test setting interface, and the default settings of SCAL2 AE Calibrator are 90dB signal amplitude, 100kHz frequency , continuous Sine wave emission, gain 0dB;

Press OUTPUT STOP, and observe the collected signal waveform of the AE host, stop output, increase the signal amplitude, press OUTPUT STOP again and observe whether the waveform shape is distorted, adjust the signal amplitude continuously and observe the waveform in real time until the waveform shape collected by the AE host has obvious distortion; record the emission amplitude value at this

time, and the difference between the value and the system noise is the dynamic range of the system.

2.2.2.3 Channel crosstalk testing

:Press this key to directly enter the channel crosstalk function test setting;

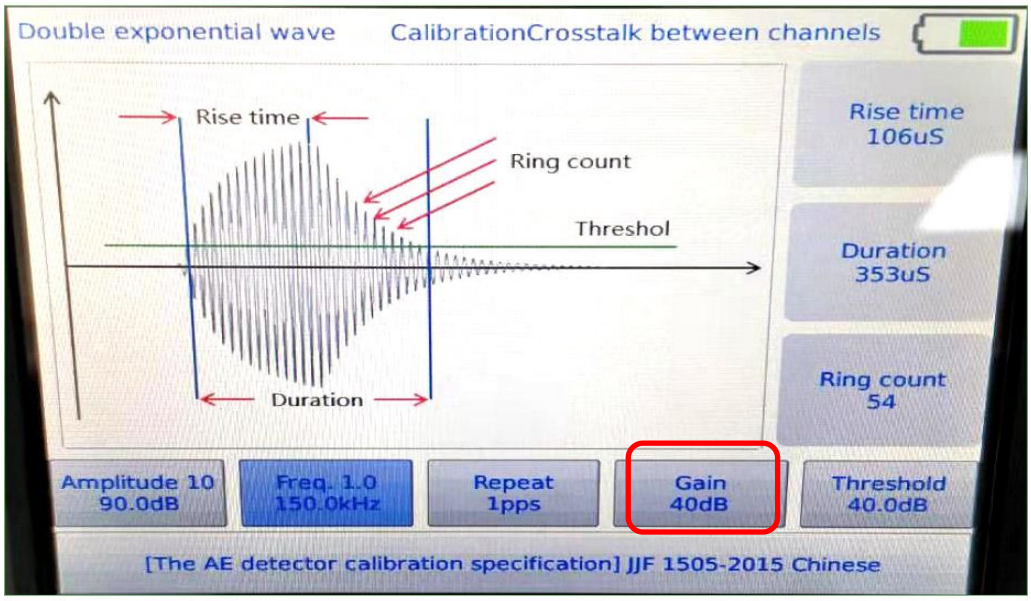


Figure 2-6 SCAL2 Channel Crosstalk Operation Screen

Testing method:

Connect SCAL2 AE Calibrator and AE host, press 

,enter interface of channel crosstalk test setting, systematic defaults are: 90dB signal amplitude, double exponential waveform, frequency 150kHz, one time per second repetition rate , 40dB gain; 20dB setting threshold;

Press 

to launch acoustic emission signal, The acoustic emission host collects the signal and observes whether there is crosstalk signal in the adjacent channel of the receiving channel. If the amplitude of the crosstalk signal is recorded, it is the channel crosstalk value.

2.2.2.4 Waveform parameter testing

:Press this key to directly enter the waveform parameter index test setting;

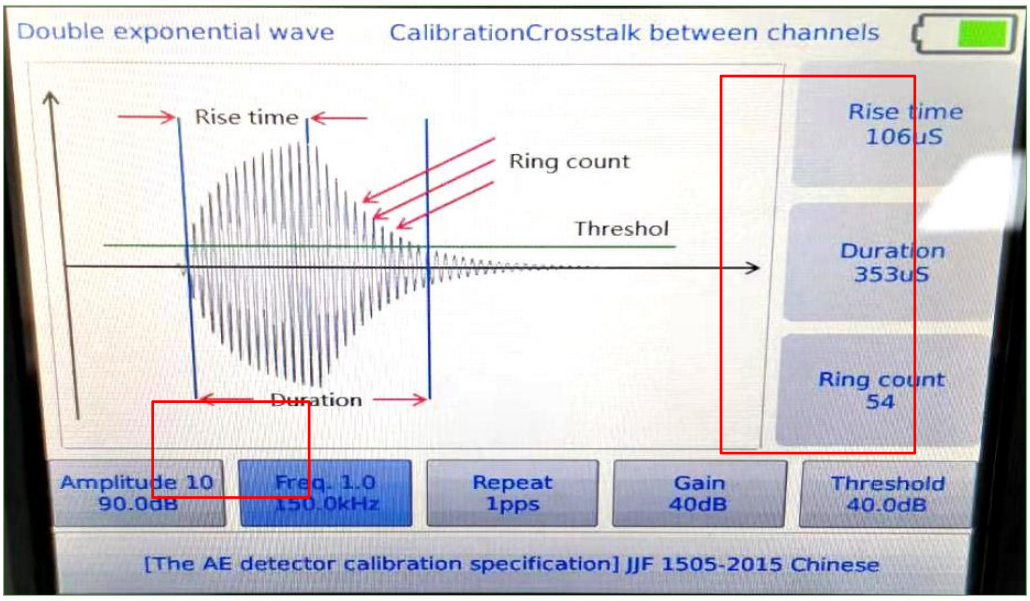


Figure 2-7 SCAL2 Waveform Parameter Operation Screen

Testing method:

Connect SCAL2 AE Calibrator and AE host, connect AE host with reference preamplifier, connect preamplifier and calibrator in parallel with a 50 ohm impedance;

Press 

to enter the setting, the system defaults are: 80dB signal amplitude , double exponential waveform , the 30kHz frequency is the adjustment item,one time per second repetition rate , 0dB gain; 60 threshold; the acoustic emission characteristic parameters of the standard double exponential wave under this condition are displayed on the right side of the screen, such as rise time, duration, ring count, etc;

Press “Output”, the AE host will collect the signal, record the acoustic emission characteristic parameter value at this time, compare it with the standard value of the acoustic emission characteristic parameter displayed on the right side of the screen, and calculate the error according to the requirements;

Press” Stop”, change the signal frequency, and test the above content at the frequency of 30kHz, 60KHZ, 150kHz and 300kHz respectively according to the standard requirements; then the waveform can be completed ;

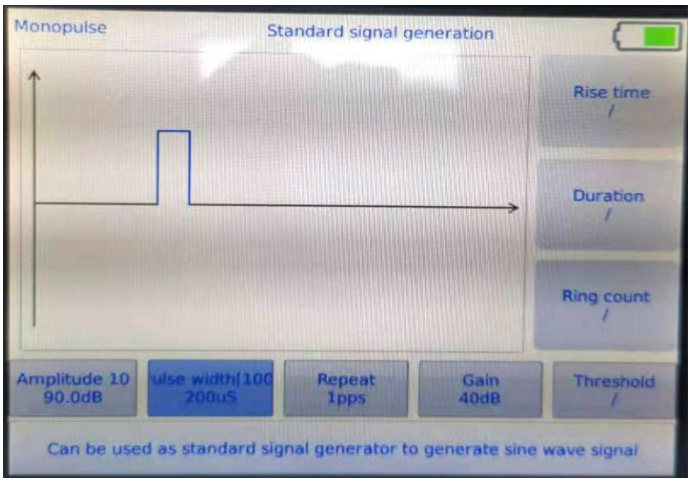
According to the test results and standard contents, the error table of AE characteristic parameters collected by AE host is obtained.

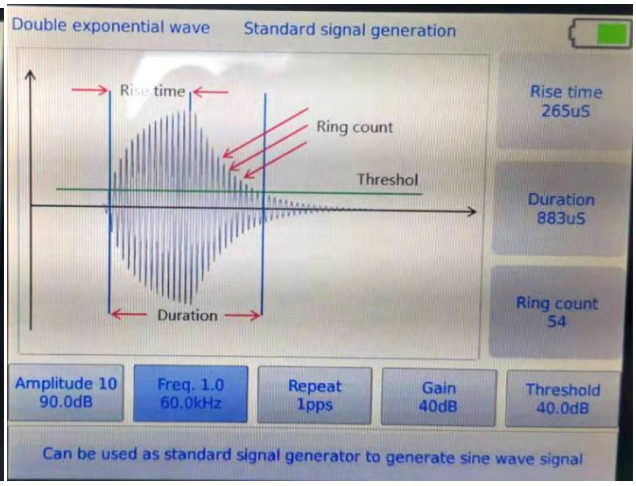
2.2.2.5 Standard Signal Output Function

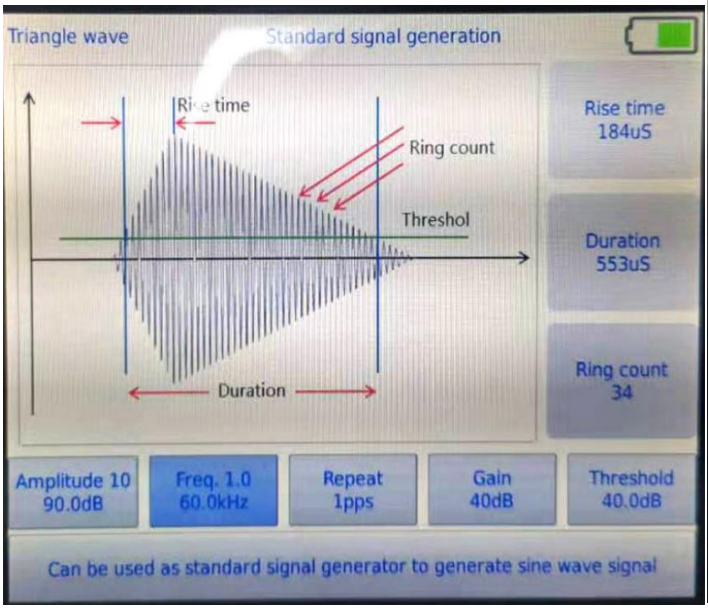
:This button is used to switch the output acoustic emission signal waveform. There are continuous sine wave, pulse sine wave, triangle wave, double exponential wave, single pulse wave and other options.

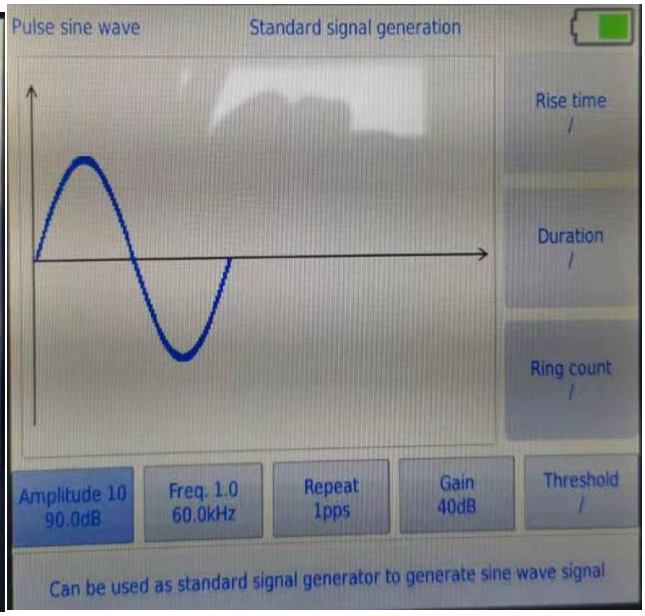
As a standard signal output, SCAL2 AE Calibrator can output five different types of wave forms, as shown in Figure 2-8. Press 

to switch five different types of wave forms, and adjust the amplitude, frequency, repetition rate, gain and other parameters of the output signal through setting options;









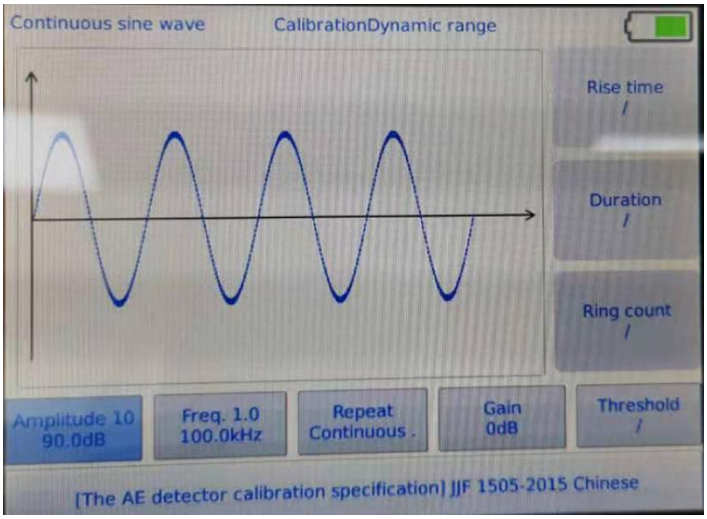


Figure 2-3 SCAL2 Five Kinds of Standard Signals

Chapter 3 Maintenance and service

3.1 Usage Precautions

- Please do not make this instrument contact with strong acid or alkali chemicals;
- Please do not use sharp objects to depict the display;
- When replacing the cable, please hold the cable connector and plug it in and out, and do not pull the cable directly;
- During daily cleaning, please avoid wiping the instrument and its accessories with wet cloth;
- Do not touch liquid at the output port and USB interface;
- The sensor surface shall not be scratched on the surface of rough objects.

3.2 Daily Maintenance

- Please clean the dirt on the surface of the instrument regularly.
- During cleaning, please wipe the surface of the instrument with a semi wet cloth.
- Please use neutral detergent to clean the instrument surface.
- In case of long-term non use, please take out the battery.

Chapter 4 Product Warranty

The scal2 acoustic emission calibrator produced by our company has a free warranty of 1 year for the main parts and processes such as the main engine from the date of delivery. If it needs to be repaired beyond the warranty period, please contact our customer service department directly.

The instrument used correctly according to the product operation manual is within the scope of this warranty. If the instrument problem is caused by improper use, unauthorized maintenance or modification, it is not within the scope of this warranty.

This warranty does not include consumables such as cables and batteries. During the warranty period, the customer pays the freight for the products to be repaired from the customer to the repair point, and our company pays the freight for the repaired products to return to the customer. After the warranty period is exceeded, the customer shall pay the round-trip transportation cost incurred in the process of product maintenance.

Our company has the right to modify all products, but is not responsible for modifying the products that have been delivered. As the environmental factors are not under the control of our company, our company will not bear any responsibility for the consequences caused by special installation or use.