



UFD-F720

DIGITAL ULTRASONIC FLAW DETECTOR

OPERATION MANUAL

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— UFD-F720 Digital Ultrasonic Flaw Detector Introduction

1.1 Features

- Fashionable appearance, solid, light weight, with strong anti-interference ability.
- Infinitely adjustable support, freely removable hand rests.
- Button light touch without shock, dark environment backlight display, does not affect the operation of the instrument.
- Preset 200 groups of independent flaw detection channels, flaw detection technology and standards are automatically generated, can be freely set up in various industries flaw detection technology standards, on-site flaw detection without carrying a test block.
- TFT true-color display with clear brightness and with immunity to environmental disturbances and 3 levels of brightness adjustability.
- High-quality circuit system for stable and reliable performance.
- Ultra-high-speed sampling for more fidelity in echo display and more accurate positioning.
- High-precision dosing and positioning, solving long-distance positioning errors.
- Dedicated parameter setting interface for quick user settings.
- Dual input of navigation keys and numeric keys, at the user's free choice, convenient and efficient.
- With straight probe, oblique probe, bicrystalline straight probe, bicrystalline oblique probe and penetration probe five kinds of probing work mode.
- Simple, powerful operating functions, Chinese prompts, dialog operation, practical and easy to learn.
- With independent dual detection gates, can be set up separately into the wave alarm, lost wave alarm and dual gate alarm, and can display the echo - echo distance, suitable for completing different kinds of detection tasks.
- Real-time display of defective echo parameters (distance, vertical, horizontal, amplitude, dB or equivalent aperture value).
- Amplitude curves are automatically plotted according to standards and can be moved up and down freely.
- Automatic probe zero calibration and oblique probe K-value (refractive angle) test.
- Clutter suppression adjustment function without affecting gain and linearity.
- Automatic gain function to improve detection speed.
- Automatic peak memory function to improve detection accuracy.
- Echo envelope function to assist in analyzing the nature of defects.
- Screen freeze function, better help to record and analyze each waveform.
- Standard USB interface, realize ultrasonic flaw detector and computer management.
- Built-in SD card can store massive data of echo and curve of flaw detection. No need to install the relevant driver after connecting the host computer with the computer, just through the U disk can quickly export the data in the instrument.
- Ultra-low power consumption design, one charge can be used continuously for more

than 10 hours.

- Factory settings can be restored.

1.2 Main technical parameters

Operating Frequency: 0.4 ~ 20MHz

Total gain: 0 ~ 110dB (0.1dB/1dB /2dB /6 dB /12 dB continuous adjustment)

Detection range: 0 ~ 15000mm longitudinal wave in steel

Sound velocity range: 0 ~ 10000m/s

Dynamic range: ≥ 36 dB

Vertical linearity error: $\leq 3\%$

Horizontal linear error: $\leq 0.1\%$

Resolution: ≥ 36 dB

Sensitivity margin: ≥ 62 dB (depth 200mm $\varnothing 2$ flat bottom hole)

Digital rejection: (0 ~ 90)%, does not affect linearity and gain

Display: 5.7" TFT color LCD with , resolution 640 x 480

Data storage: The instrument can store 50 groups of probe adjustment parameters and the corresponding probe DAC curve can be mass storage site defect echo and results data

Power supply: DC power supply, battery can work continuously for about 10 hours

Ambient temperature: (-20 ~ 50) $^{\circ}$ C

Relative humidity: 20% - 95% (RH)

External dimensions: 228 x 140 x 45mm (L x W x H)

Weight: 1.0kg (including battery)

1.3 Name of the main parts of the instrument

The names of the main parts of this instrument are shown in Figure 1-1.

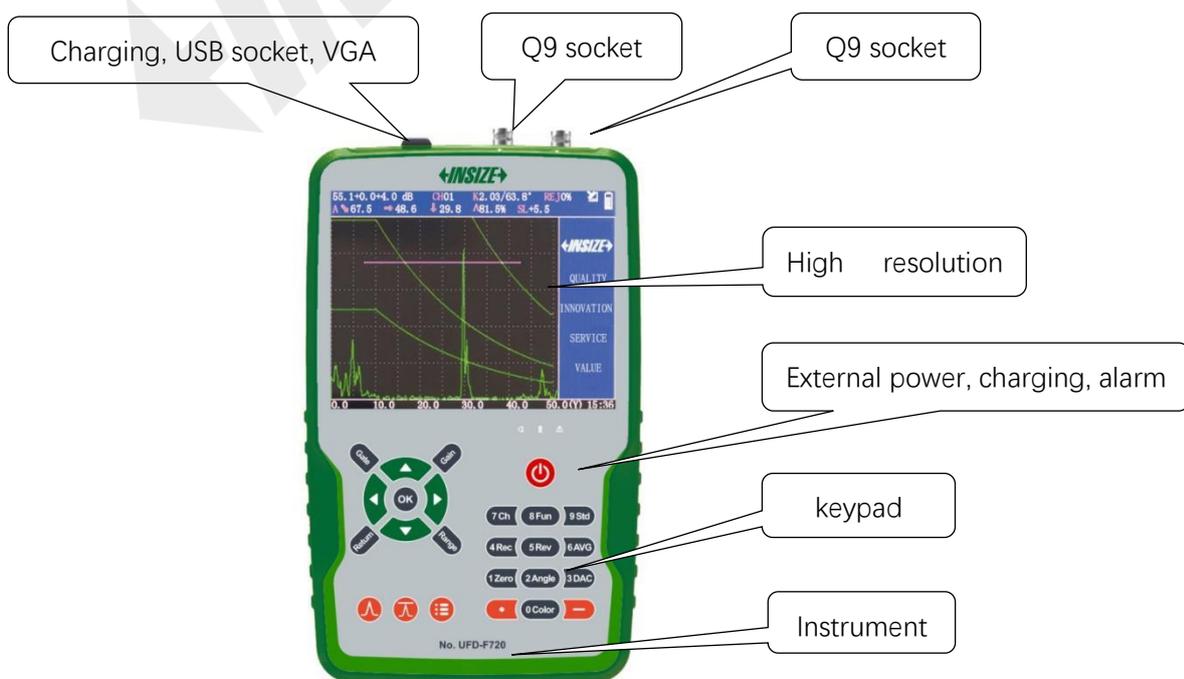


Figure 1-1

1.4 Introduction to the Keyboard

The keyboard is the medium to accomplish the man-machine dialog. The keyboard is equipped with 25 control keys, the key positions are shown in Figure 1-2. All the control commands issued by the user to the flaw detector are transmitted to the flaw detector through the keyboard operation. During the operation of the keyboard, the flaw detector automatically recognizes the different meanings of each key according to different states and executes the instructions of the operator. The specific use of each key will be gradually introduced in batches in the following chapters. The following is a brief description of the main functions of each key.

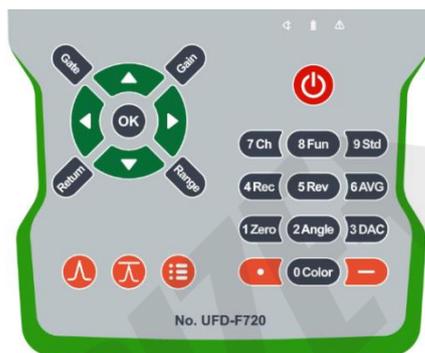


Figure 1-2

-  Power on/off key
-  The symbol “.” key, multiplication sign key and screen freeze
-  Symbol “-” key (negative sign)
-  Numeric “0” key and screen color selection
-  Digit “1” and probe zero test key
-  Number “2” and K value (refractive angle) test key
-  The number “3” and the DAC curve making key
-  Digit “4” and Record Function Key
-  Digit “5” and Inquiry Function Key
-  The number “6” and the key for making AVG curves
-  The number “7” and the key to select the probe channel

-  Number “8” and function selection key
-  Numeric “9” and Standard Selection Key
-  Gate function selection key
-  Gain Function Selection Key
-  Sound range function selection key
-  Detection parameter setting key
-  Auto Gain Shortcut
-  Peak Memory Shortcut
-  Input data recognition or setup validation key
-  Abandon modification/return to previous screen or main screen/exit function

selection

-  Numeric Increment or Page Key
-  Numeric Decrease or Page Turn Key
-  Upward Direction Selection Key
-  Downward Direction Selection Key

1.5 Environmental requirements

1.5.1 Environment of use

Ambient temperature: -20°C~50°C

Relative Humidity: 20%~95%RH

Atmospheric pressure: 70.0kPa ~ 106.0kPa

1.5.2 Transportation and storage

Ambient Temperature: -40°C~+70°C

Relative Humidity: 10%~100% RH

Atmospheric pressure: 50.0kPa~106.0kPa

Transportation conditions: After packing, it can be adapted to the transportation by air, railroad, ship and third-class highway.

二 Basic operation of UFD-P720 digital ultrasonic flaw detector

2.1 Power on

UFD-P720 digital ultrasonic flaw detector adopts DC power supply mode, and the instrument is equipped with rechargeable battery. Press the key for one second and release the hand with a “drop” sound. The screen of the instrument will show the English icon and the model number of the instrument, meanwhile, the instrument will carry out self-check and display the following screen:



Ver: EXX.XX.XX.X

No: UXXXXX

After the instrument self-test is completed, enter the main interface of flaw detection, see Figure 2-1

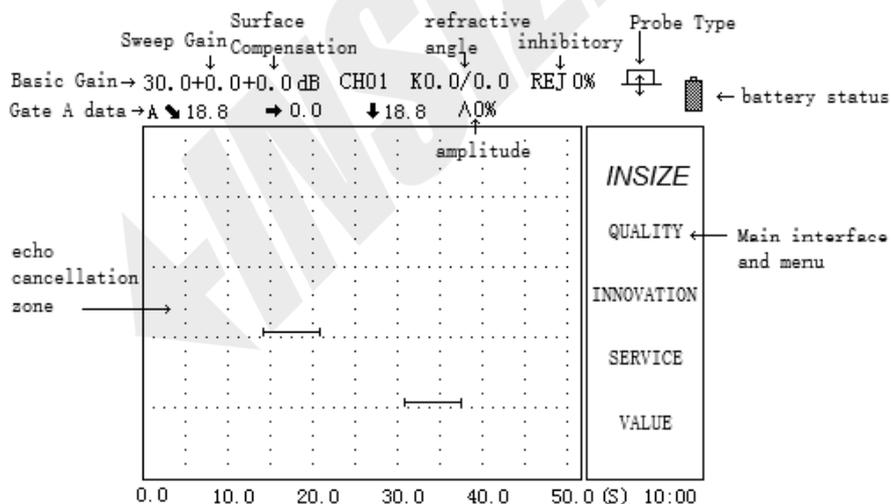


Figure2-1

Explanation: The screen echo display area is divided into ten frames in horizontal and horizontal coordinates, indicating the acoustic range, which can be defined as acoustic range (S), acoustic range (X) and acoustic range (Y). The value when adjusting the sound range is the sound range of the tenth frame.

The screen echo display area is divided into five vertical vertical coordinates, indicating the wave amplitude.

The A-gate parameter is displayed under normal conditions:

Indicates the sound range (S), which refers to the straight-line distance of the sound wave from the point of incidence to the defect.

Indicates the acoustic range (X), which refers to the horizontal distance of the sound wave from the point of incidence to the defect.

Indicates the acoustic range (Y), which refers to the vertical distance of the sound wave from the point of incidence to the defect.

Indicates what percent of the amplitude of the echo in the door.

2.2 Adjustment of common function states

2.2.1 Channel Selection

The instrument is preset with 50 sets of parameters, i.e. 50 channels. The inspector can select the corresponding channel according to the need, and at the same time can set and modify the parameters of each channel. press . A selection is made for the channel, at which point the display appears inverted at the channel in the right menu area on the display. press or , or after directly inputting the channel value. press perform channel selection. As shown in Figure 2-2.

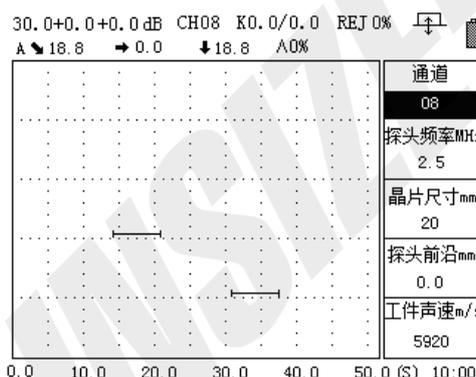


Figure2-2

2.2.2 Adjustment of gates

The most outstanding feature of the digital flaw detector is the ability to display all the information about the reflected waves on the screen in digital quantification. When reading, the instrument processes and calculates the echo inside the gate and displays all the data of the highest echo (including sound range, horizontal distance, vertical distance and wave amplitude). Therefore, it is necessary to use the gate to cover the defective echoes during the flaw detection process, so that the instrument can display the data required for flaw detection.

Gate position: refers to the starting position of the gate. The user can adjust the gate position of the current gate according to the need. Move the gate parallel to the desired position to lock the echo you are interested in.

Gate Width: This is the width of the gate. The user can adjust the gate width of the currently used gate as needed. Adjust the gate width to the appropriate size to lock the echo you are interested in.

Gate Height: This is the percentage of the gate's full width relative to the echo display area. Gate height has no effect on readings and gate height has an effect on alarms.

When reading, the wave should be within the visual range of the screen, otherwise it will

bring reading error.

This instrument is a double gate working mode, divided into A gate and B gate. There are two types of gate reading methods, i.e. single gate reading method and double gate reading method. Users can choose any gate as the current use of the gate, the following will introduce the gate position, gate width, gate height adjustment are for the current use of the gate.

2.2.2.1 Single gate display operation

Press , Entering the gate state, the instrument defaults to “A gate reading mode”.

As shown in Figure 2-3

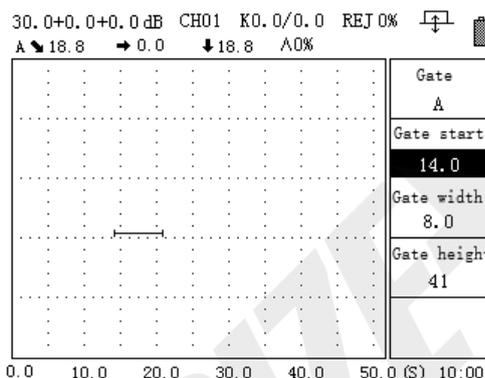


Figure2-3

The default display of the instrument is in the gate state, i.e., the gate value is inverted at the,press  或 , The door position can be adjusted. To make adjustments to the door width,press , Invert the door width value,press  or , The door width can be adjusted. Similarly, to make adjustments to the door height,press , Reflecting the high value of a door, press  or , Adjustments can be made to the door height. note: When long-pressing the  or , Quickly adjustable values. successive presses  or , Then cycle through the choices between gate, gate position, gate width and gate height.

2.2.2.2 Dual gate display mode operation

Press  to enter the gate state, the default instrument is “A gate reading mode”,

and then press , gate A inverse display, press  or  to switch A to B. As shown in Figure 2-4

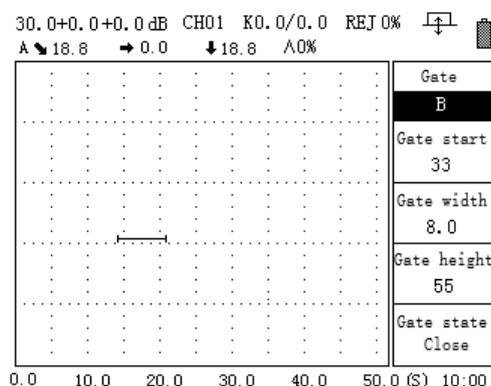


Figure2-4

Then press to invert the status off, and press or to switch off to on, and then door B appears on the screen. To adjust the door height, press to highlight the door height value, and then press or to adjust the door height. Similarly, to adjust the door width, press to invert the door width value, and then press or to adjust the door width. To adjust the gate position, press to invert the value of the gate position and then press or to adjust the position. Pressing or continuously cycles through gate, gate position, gate width and height, and status.

2.2.2.3 The B gate reading method is shown in Figure 2-5.

Note: B-A: 0.0 indicates the difference in sound range between the highest echo in gate B and the highest echo in gate A.

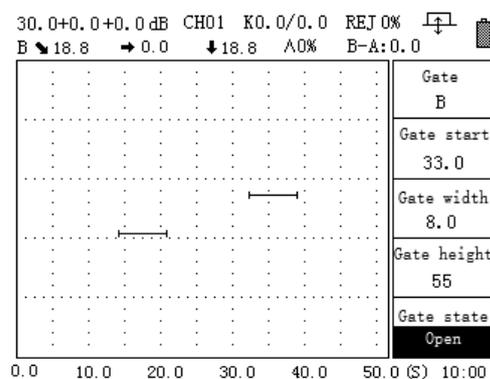


Figure2-5

When gate B is in the open state and the gate is switched to gate A, then A-B: 0.0 is displayed, which indicates the difference in sound range between the highest echo in gate A and the highest echo in gate B. As shown in Figure 2-6.

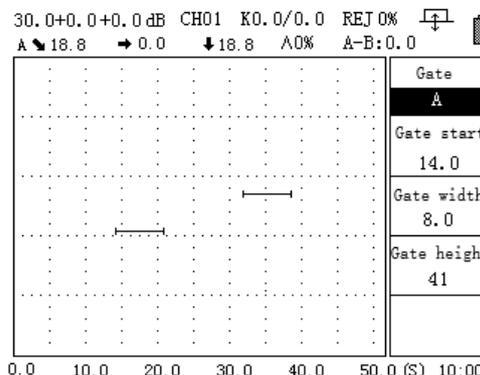


Figure2-6

When adjusting the gate position, width and height of the gate, you can input the value

directly and then press **OK**, in addition to pressing **▶** or **◀** to adjust.

2.2.3 Gain adjustment

In flaw detection work, the use of attenuators can control the sensitivity of the instrument, measuring the relative height of the signal to determine the size of the defect, or measure the attenuation of the material. The attenuator in addition to the above for sensitivity control, its main purpose is to measure the relative size of the reflected wave amplitude, expressed in decibels.

The system sensitivity of this instrument consists of three parts: basic gain, sweep gain and surface compensation. The total gain is 110 dB.

2.2.3.1 Operation of manual adjustment of basic gain

Press **Gain** to enter the gain adjustment, the instrument default display in the basic gain state, that is, the gain value at the inverse display, by pressing **▶** or **◀** can be adjusted to the size of the gain. As shown in Figure 2-7

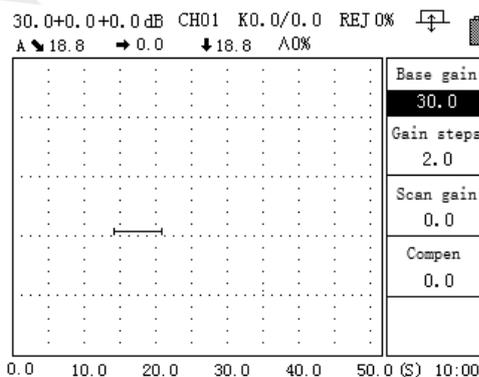


Figure2-7

2.2.3.2 Adjustment operation of gain stepping

Press **Gain** to enter the gain adjustment, the instrument default display in

the basic gain state, that is, the gain value at the inverse display. Press , the gain step value will be inverted, and then you can select the gain step by pressing  or

, there are five kinds of step can be selected: 0.1dB, 1.0dB, 2.0dB, 6.0dB, 12dB.

0.1dB means that the base gain dB value is currently adjusted in 0.1dB steps, 1.0dB means that the base gain dB value is currently adjusted in 1.0dB steps, similarly, 2.0dB means that the base gain dB value is currently adjusted in 2.0dB steps, 6.0dB means that the base gain dB value is currently adjusted in 6.0dB steps, 12.0dB means that the base gain dB value is currently adjusted in 12.0dB steps. dB step value to adjust the basic gain dB value. As shown in Figure 2-8

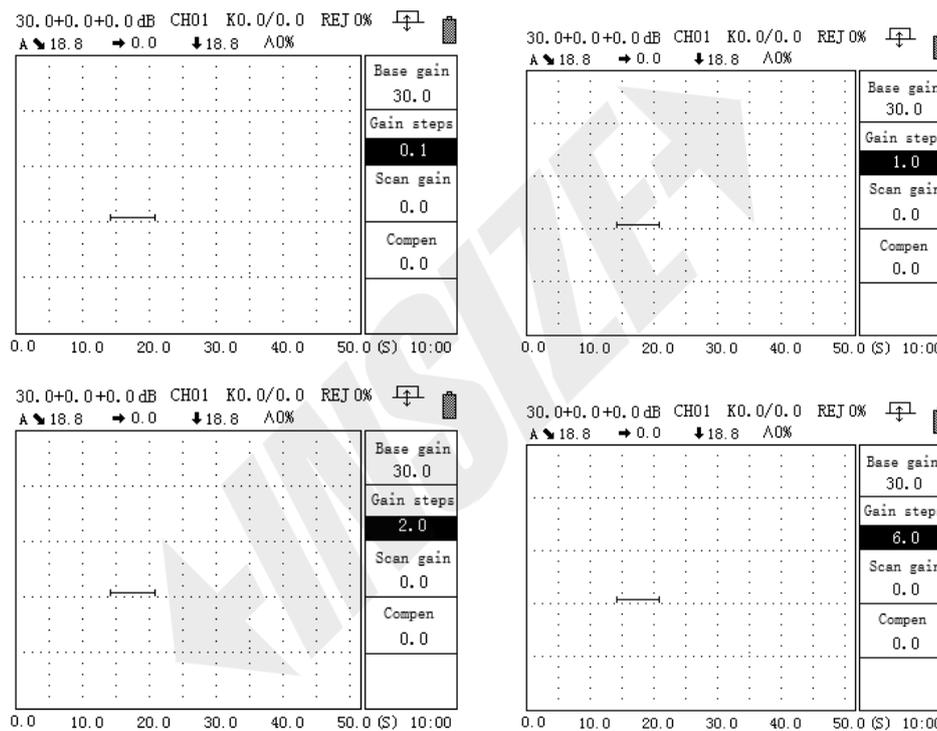


Figure2-8

2.2.3.3 Manual Adjustment of Sweep Gain Operation

Press  to enter the gain adjustment, the instrument default display in the basic

gain state, that is, the gain value at the anti-display, by pressing  or  will sweep the

gain value anti-display, and then by pressing  or  can be adjusted to the size of the sweep gain. As shown in Figure 2-9

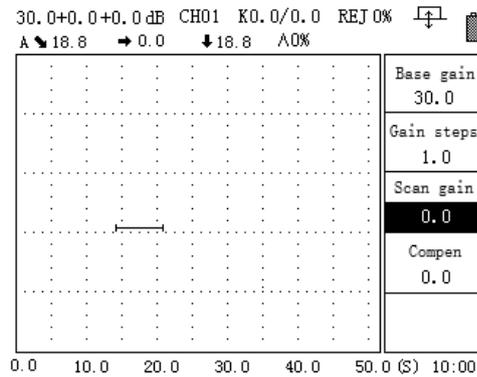


Figure2-9

The step size of the sweep gain adjustment is the same as the step of the base gain adjustment at this point, and the gain step can also be changed, as described in 2.2.3.2.

2.2.3.4 Manual Adjustment of Surface Compensation Gain

Press to enter the gain adjustment, the instrument default display in the

basic gain state, that is, the gain value at the inverse display, by pressing or

to the surface compensation value inverse display, and then by pressing or

can be adjusted to the size of the surface compensation gain. As shown in Figure 2-10

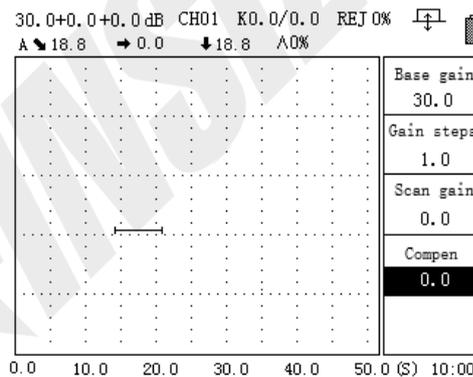


Figure2-10

The step size for the surface compensation adjustment is the same as the step for adjusting the base gain at this point, and the gain step can also be changed, as described in 2.2.3.2.

Note: When adjusting the basic gain, sweep gain, and surface compensation, press

and hold or to quickly adjust the value. In addition, you can directly input the

value and then press .

In addition, when the base gain or surface compensation value is inverted, the gain

step can be quickly switched by pressing and then adjusted by pressing or .

When the sweep gain value is inverted, press  to quickly return the sweep gain to zero.

In the absence of a DAC/AVG curve, the basic gain and the surface compensated gain are adjusted in the same way and do not affect the results. When there is DAC/AVG curve, there is a significant difference between the three:

(1) Adjusting the basic gain, the DAC/AVG curve and echo amplitude change synchronously. When probing, in order to find a certain echo, you need to adjust the gain, but can not change the relative equivalent value of the echo and the DAC/AVG curve (does not change the set probing standards), at this time should be in the basic gain state, adjust the gain.

(2) Adjusting the sweep gain can make the gate echo higher or lower, the DAC/AVG curve is unchanged, and its equivalent value is also unchanged.

(3) During flaw detection, surface compensation is required due to the difference between the on-site workpiece condition and the test block test. By adjusting the surface compensation, the DAC/AVG curve remains unchanged, while the echo amplitude changes, and the relative equivalent value also changes accordingly.

2.2.4 Adjustment of sound range

2.2.4.1 Adjustment operation of the sound range

The inspector adjusts the appropriate acoustic range (i.e., detection range) according to the thickness of the inspected workpiece, and the acoustic range adjustment will not change the relative position and amplitude between the echoes, and the range of adjustment of this instrument is (0~15000) mm (longitudinal wave in steel).

The specific operation is as follows: Press  to enter the sound range adjustment, the instrument default display in the sound range value state, that is, the sound range value at the anti-display, by pressing  or  can be adjusted to the size of the gain. As shown in Figure 2-11

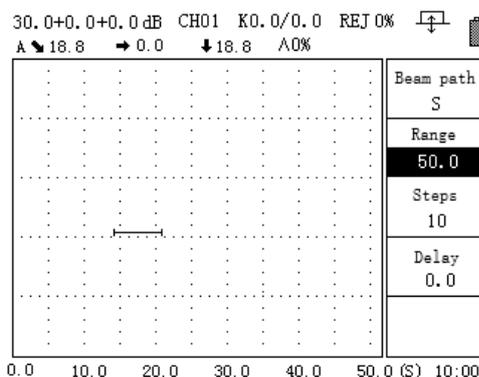


Figure2-11

2.2.4.2 Adjustment operation of the acoustic range step

Press  to enter the sound range adjustment, the instrument default display in the

sound range value state, that is, the sound range value at the inverse display. Press , the acoustic range step value is inverted, and then you can select the gain step by pressing  or , there are four kinds of steps to choose from: 0.1, 1, 10, 100.

0.1 means that the current range value is adjusted in 0.1mm steps, 1 means that the current range value is adjusted in 1mm steps, 10 means that the current range value is adjusted in 10mm steps, and similarly, 100 means that the current range value is adjusted in 100mm steps. As shown in Figure 2-12

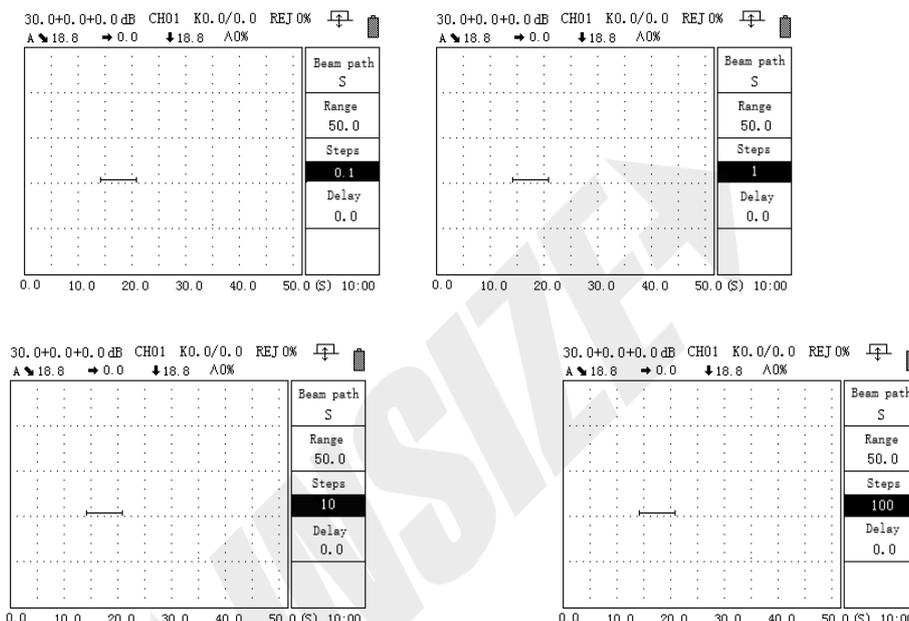


Figure2-12

2.2.4.3 Horizontal delay adjustment operation

Adjustment of the horizontal delay, i.e. adjusting the pulse shift of the instrument, does not change the relative position and amplitude of the echo. The maximum adjustable displacement distance is not greater than 14990mm (longitudinal wave in steel, and also determined by the size of the range of the acoustic range).

The specific operation is as follows: Press  to enter the sound range adjustment, the instrument default display in the sound range value state, that is, the sound range value at the anti-display. Press , the acoustic range step value anti-display, and then press , the delay value anti-display, and then press  to increase the delay value, or press  to reduce the delay value, you can see that the horizontal baseline at the beginning of the adjusted value, at this time, the acoustic range value remains unchanged. As shown in Figure 2-13

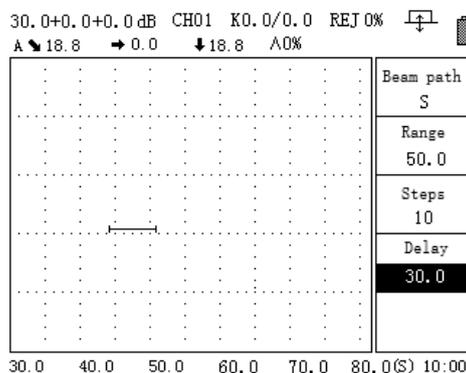


Figure2-13

The step size of the delay adjustment is the same as the step of the sound range adjustment at this time, and the step can also be changed, as described in 2.2.4.2.

Note: When adjusting the sound range and delay time above, long press or to adjust the value quickly. In addition, you can directly input the value and then press .

In addition, when the sound range or delay value is inverted, you can quickly switch the step by pressing , and then press or to make adjustments.

2.2.5 Automatic Gain Adjustment

The automatic gain function enables the gate echo to be quickly raised or lowered to a predetermined standard wave height (generally 80%), but the total gain amount will not exceed 110dB during the automatic adjustment process; its gain value is used on top of the basic gain.

The specific operation steps are as follows:

1. Move the gate to lock the echo.

2. Pressing , the instrument automatically performs gain adjustment so that the maximum echo amplitude in the gate is adjusted to a height of about 80% of the vertical coordinate.

2.2.6 Operation of Peak Memory

Peak memory is the instrument automatically records with the highest dynamic echo in the gate and retains it on the screen. In practical flaw detection, this helps in the capture of maximum defective echoes.

The steps are as follows:

- A、 Lock the echo to be searched with the gate.
- B、 BPress the key to enter the wave search state. When you move the probe, if a new wave higher than the previous displayed echo appears, the instrument immediately captures this high wave as the current highest displayed wave.

C、 Press the key again to exit the search state.

2.2.7 parameterization

Press , the instrument defaults to the first page, and the default channel value is inverted, as shown in Figure 2-14.

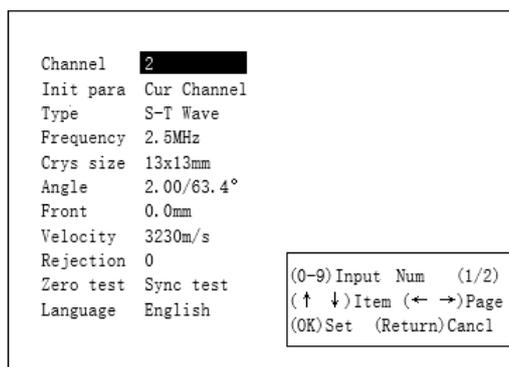


Figure2-14

2.2.7.1 Channel Setting: Input the channel value directly, and then press  to select channel, the machine sets 1-50 channels.

2.2.7.2 Initialization Selection: Press  and the current channel will be inverted, as shown in Figure 2-15.

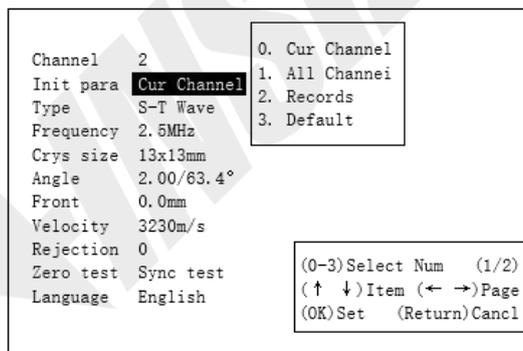


Figure2-15

Press the corresponding number to select the content to be initialized from 0-3 options, and then press the number 0 to confirm or press the number 1 to cancel. After confirming the initialization, it will prompt "Initialization is finished!" The instrument restores the default state. As shown in Figure 2-16

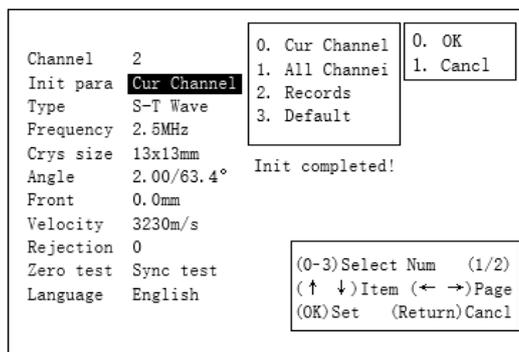


Figure2-16

2.2.7.3 Probe Type Selection: Press to invert the slant probe, as shown in Figure 2-17.

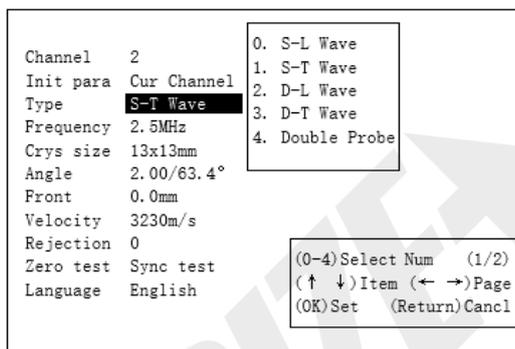


Figure2-17

Press the corresponding numbers from 0-4 options to select the probe type needed for flaw detection, after the selection of the anti-display part of the display just selected probe type, and probe frequency, wafer size, refraction angle and the workpiece speed of sound and other parameters are modified accordingly (the instrument's default values).

2.2.7.4 Probe Frequency Setting: Press , the value of the probe frequency will be displayed, according to the frequency of the selected probe, input the value directly, and then press to confirm.

2.2.7.5 Wafer size setting: Press , the wafer size value will be reflected, according to the wafer size of the selected probe, input the value directly, and then press to confirm.

The multiplication sign is replaced by , and the maximum input value is 99.

2.2.7.6 Refractive Angle Setting: Press , the refractive angle value will be displayed, according to the refractive angle of the selected probe, input the value directly, and then press to confirm. If the input value is below 5 (including 5), the machine defaults to the K value, and if the input value is above 5, the machine defaults to the refractive angle value. In addition, after the refractive angle (or K value) test is completed, the refractive angle value

here will be modified simultaneously.

2.2.7.7 Probe Front Setting: Press , the value of probe front will be displayed, according

to the probe front of the selected probe, input the value directly, and then press  to confirm. The maximum input value is 100; in addition, after the probe frontage test is completed, the value of the probe frontage here will be modified synchronously.

2.2.7.8 Workpiece sound speed setting: Press , the workpiece sound speed value will be displayed, according to the sound speed of the selected material, input the value directly, and

then press  to confirm. The maximum input value is 20,000; in addition, after the zero-point sound speed test is completed, the workpiece sound speed value here will be modified synchronously.

2.2.7.9 Inhibit setting: Press , the inhibit value is displayed, enter the value directly and then press the key to confirm. The maximum input value is 90.

This function is mainly used to suppress the low amplitude or considered unnecessary noise on the screen, i.e. noise, in order to improve the signal-to-noise ratio, thus making the waveform display on the screen clear. Normally, 00% of the suppression data display area indicates that the instrument is in a non-suppression state. With the increase in the amount of inhibition display, "inhibit" role has been added, then the display of the percentage of values within the noise is filtered out, not to display, and greater than the percentage of values of the echo is not changed. Therefore, the signal-to-noise ratio in the actual flaw detection is greatly improved. The suppression range of this instrument is 0 ~ 90%, which does not affect the vertical linearity. To view the suppression value, note the "REJ XX%" in the upper right corner of the screen.

Note: With the increase of the "suppression" effect, the dynamic range of the instrument will become smaller, so after using the suppression function, it is necessary to restore the non-suppression state of the instrument in time (i.e., the percentage of suppression is zero).

2.2.7.10 Zero Test Selection: Press , to synchronize the test inverse display, as shown in Figure 2-18.

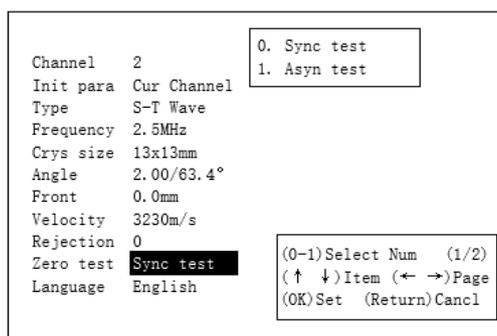


Figure2-18

Press the corresponding number from 0-1 options to select the zero test method, after the selection of the anti-display part of the display just selected zero test method, the instrument zero test method is divided into two kinds of synchronous test and asynchronous test.

Synchronized test, that is, in the process of zero test, set to look for the two reflective waves appear in the screen at the same time, the instrument two gates at the same time to record the parameters of the two reflective waves, and then calculate the zero point and the speed of sound.

Asynchronous testing, that is, in the zero test process, set to look for the two reflected waves appear in the screen successively, the instrument was recorded in the two reflected wave parameters, and then calculate the zero point and the speed of sound. Generally, it is suitable for the probe to search for two reflected waves in two positions to test the zero point and the speed of sound.

2.2.7.11 Language Selection: Press to display Chinese, as shown in Figure 2-19.

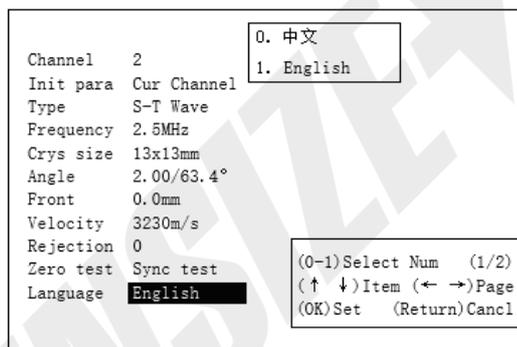


Figure2-19

Press the corresponding number to select the language type from 0-1 options, after the selection of the reflective part of the display just selected language type, the operating interface synchronization into the corresponding language.

2.2.7.12 Workpiece Thickness Selection: Press to turn to the next page, i.e. page 2, the instrument defaults to the workpiece thickness option, and the workpiece thickness value will be displayed in reverse, so according to the thickness of the workpiece to be flawed, input the value directly, and then press to confirm.

Note: Once the workpiece thickness is input, any reflected wave with depth greater than this value will be regarded as secondary or multiple reflected waves, and then the corresponding calculation will be made, and the depth shown on the screen will be the actual depth down from the probing surface.

2.2.7.13 Rejection line setting: Press , the Rejection line value will be displayed, according to the corresponding flaw detection standard, positive value directly input the value, and then press to confirm, negative value first press , and then input the value and press

 to confirm. The maximum input value is 40, the minimum input value is -40, when the probe type is straight probe, it is changed to hole 1, the input value of diameter is required, the range is 0~40.

2.2.7.14 Standard line setting: Press , the Standard line value will be displayed, according to the corresponding flaw detection standard, positive value directly input the value, and then

press  to confirm, negative value first press , and then input the value and press

 to confirm. The maximum input value is 40, the minimum input value is -40. When the probe type is straight probe, change it to hole 2, and input the diameter value, the range is 0~40.

2.2.7.15 Evaluation Line Setting: Press , the evaluation line value will be displayed, according to the corresponding flaw detection standard, input the value directly for positive

value, then press  to confirm, for negative value, press  first, then input the value

and press  to confirm. The maximum input value is 40, the minimum input value is -40. When the probe type is straight probe, change it to hole 3, and input the diameter value, the range is 0~40.

2.2.7.16 Surface Compensation Setting: Press , the surface compensation value will be displayed, enter the value directly according to the corresponding flaw detection standard,

and then press  to confirm. The maximum input value is 50.

2.2.7.17 Equivalent standard selection: Press , the instrument default SL inverse display, as shown in Figure 2-20

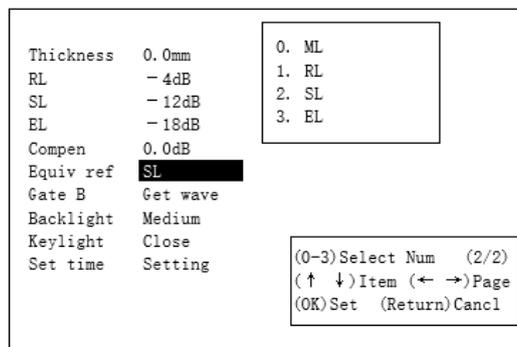


Figure2-20

Press the corresponding number from 0-3 options to select the equivalent standard, after the selection of the anti-display part of the display just select the equivalent standard. Generally, the instrument defaults to the Standard line.

This option means that the equivalent value of the defective echo in the wave gate is calculated based on which line, commonly used as “mother line” or “Standard line”, the default value of the instrument is “Standard line”; This parameter is valid only after the DAC curve is made successfully.

2.2.7.18 Door B use selection: Press , the waveform inverse display, as shown in Figure 2-21.

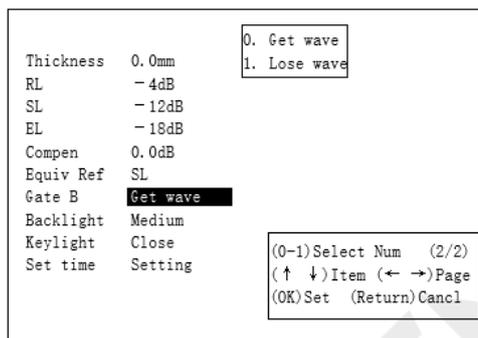


Figure2-21

Press the corresponding number from the 0 or 1 option to select the waveform or loss of waveform, after the selection of the anti-display part of the site is displayed just selected B-gate purpose. Generally, the instrument defaults to wave-in.

2.2.7.19 Screen Brightness Selection: Press , the brightness is reflected in the brightness, as shown in Figure 2-22.

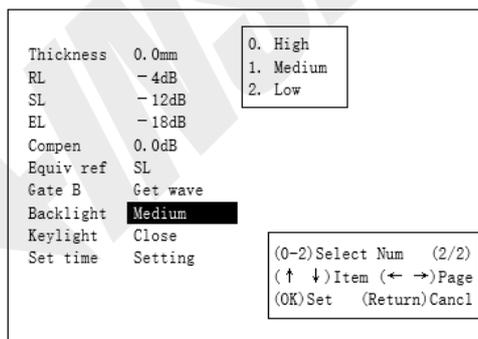


Figure2-22

Press the corresponding number from 0-2 options to select the screen brightness, after the selection of the anti-display part of the display just selected screen brightness. Generally, the instrument defaults to the brightness of the center.

2.2.7.20 Keyboard Brightness Selection: Press , and the brightness off is reflected, as shown in Figure 2-23.

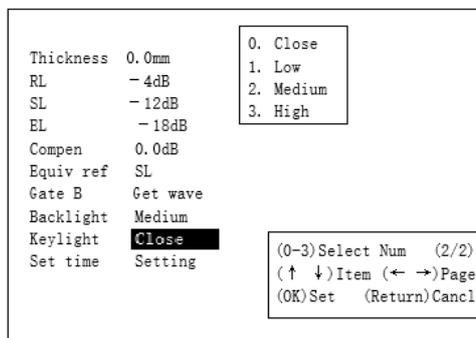


Figure2-23

Press the corresponding number to select the keyboard brightness from the 0-1 option, after the selection of the anti-display part of the place is displayed just selected keyboard brightness. Generally, the instrument defaults to Brightness Off.

2.2.7.21 Time Setting Selection: Press to set the inverse display, as shown in Figure 2-24.

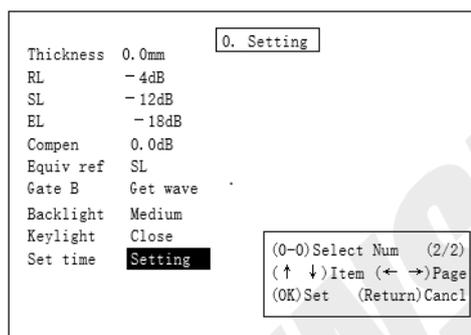


Figure2-24

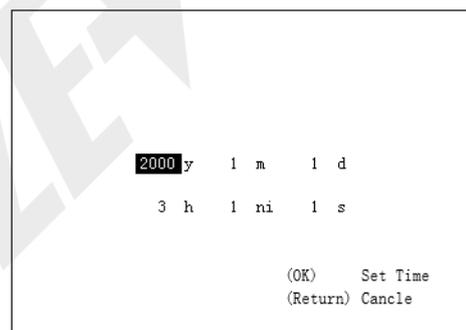


Figure2-25

Press the number 0 to select the setting, as shown in Figure 2-25, the instrument defaults in the year, the value of the year is inverted, press or to modify the value, press or to move to the next, respectively, month, day, hour, minute and second, and then press or to modify the value. Finally, press the to confirm and exit to the previous menu level.

Press again to turn to the first page, a total of 3 pages, cycle display. You can also press to reverse the direction of the display for setting and modification. During the above operation, press to confirm and exit the menu after all the selections and settings have been made, and then press to return to the previous menu until you exit the parameter menu and abandon the selections and settings you have made.

≡ Calibration of instruments

Ultrasonic flaw detector must be closely matched with the probe to achieve accurate flaw detection purposes. Some technical indicators of the flaw detector, such as: sensitivity margin, vertical line shape, resolving power, etc., strictly speaking, should be the comprehensive indicators of the instrument and the probe. Therefore, before detecting injuries, it is necessary to calibrate the system of the instrument and the probe to ensure that the results of the injury detection is true and reliable. The above details some of the basic functions of the instrument and the use of methods, now combined with examples of flaw detection to introduce the instrument tuning operation, in order to further strengthen the understanding of the function of the instrument operation.

3.1 Slant probe DAC method:

Assume that the conditions and requirements for flaw detection are as follows:

1. Workpiece: 20mm thick steel plate butt weld, according to NB/T47013.3-2015 standard flaw detection
2. Probe: 5P13×13K2 oblique probe and Q9-Q9 probe wire
3. Test block: CSK-IA, CSK-IIA-1
4. DAC curve method, DAC points: 3 (10, 30, 50)
Rejection line: -4 dB
Standard line: -12 dB
Evaluation line: -18 dB

3.1.1 Power On

Press the power switch of the instrument, after 2 seconds, the instrument automatically enters the main interface of flaw detection, use the probe wire to

connect the probe with the instrument, so that the instrument is in normal working condition.

3.1.2 parameterization

Press , input the channel value, press , then initialize the current channel, then set the probe type as slant probe, probe frequency as 5MHz, wafer size as 13x13mm, refractive angle as 2, and the workpiece sound velocity as 3230m/s. If the default value of the instrument is the same as the actual value, then there is no need to change it; if not, then change it accordingly, and the other parameters can be set in the process of the test or after the end of the test. Finally, press  to confirm and return to the main interface.

3.1.3 Zero-point speed of sound tuning

Zero adjustment refers to the adjustment of the zero point of the probe. In order to accurately localize defects on the workpiece, we must adjust the zero point of the probe, which is commonly referred to as the distance from the piezoelectric wafer of the probe to the surface of the workpiece (including the thickness of the protective film of the probe and the thickness of the coupling agent). In this instrument, the distance from the zero point of the probe is expressed in time (μ s microseconds).

The material speed of sound is a very important parameter in the localization of flaw detection defects. The speed of sound plays an extremely important role in the localization accuracy of ultrasonic flaw detection, so it is an important preparatory step before flaw detection to determine the speed of sound of the workpiece for which the speed of sound of the material is unknown.

Specific operations are as follows (the following for synchronized testing):

Press  to enter the zero-point sound speed adjustment program, and “Action ” is displayed, as shown in Figure 3-1.

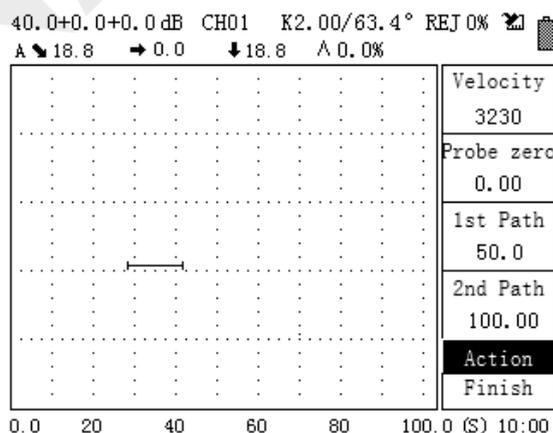


Figure3-1

Note: If the speed of sound, primary sound range and secondary sound range are not

the default values of the instrument, press  to display the required modification part,

then directly input the actual value and press , after the modification is completed, press



to display the "Action".

Press  to start the test, as shown in Figure 3-2.

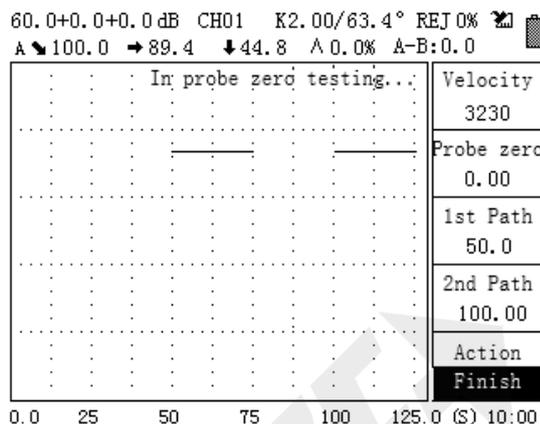
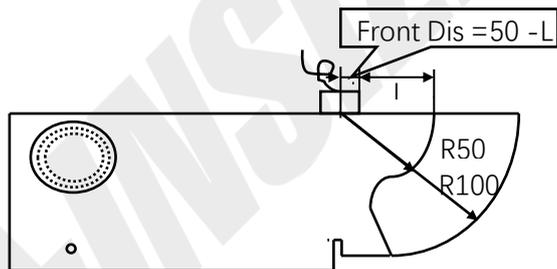


Figure3-2

Move the inclined probe over the CSK-IA test block, ensuring that one side of the probe is leveled with the side of the R50 arc, as shown in Figure 3-3



CSK-IA Schematic diagram of zero point and leading

Figure3-3

edge of sound velocity measurement by test block
 Move the probe left and right parallel, so that the highest echo of R100 appears in the wave gate (such as not in the moveable gate position, generally do not need to move the gate position), if the wave height is more than 100%, stabilize the probe does not move, the instrument is automatically adjusted, so that the echo is reduced to 80%, and then left and right parallel to the move the probe, in the process, the instrument automatically enable the peak memory function and the echo envelope function, to assist in identifying the highest wave of R100, as shown in Fig. 3-4

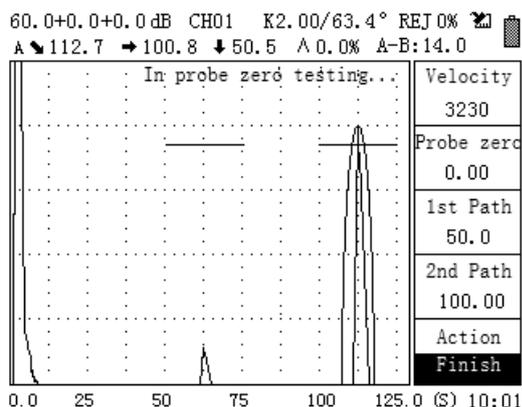


Figure3-4

At this time, stabilize the probe does not move, press  to end the test, the instrument will be the speed of sound and the probe zero point test is completed, as shown in Figure 3-5

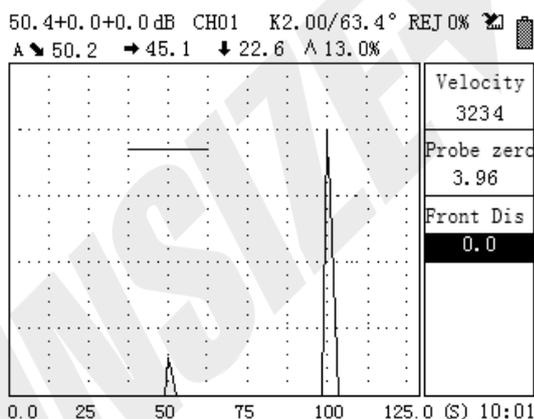


Figure3-5

In this interface, you can directly read out the sound speed value and the zero point value of the probe, and at the same time, the value of the probe front is displayed in reverse, then use a ruler to measure the distance L from the front end of the probe to the arc of R50 (or R100) to get the front of the probe = 50-L (or 100-L), then input this value into the instrument

directly, then press  to confirm and return to the main interface.

3.1.4 Refraction angle (K value) adjustment

Angle of refraction (K-value) measurements are suitable for oblique probes, surface wave probes and small angles. For example, the probe labeled 5P13×13K2 is a slant probe with a K value of 2, a 13×13mm square wafer, and a frequency of 5 MHz. the nominal values of the probe, especially the K value, have a certain degree of error from the actual value. In order to accurately locate the distance of defects during inspection, the K-value must be measured after the zero-point sound velocity calibration.

The K-value measurement of this model fully utilizes the data processing capability of the digital instrument, adopts the direct input method of the aperture, and the instrument automatically calculates the compensation amount according to the input value of the

aperture, which completely eliminates the depth and sound range errors brought about by the aperture, and makes the measured K-value accurate and reliable. The instrument is simple and convenient to measure the K value, using the known aperture diameter and the depth of the center of the aperture H (away from the probe placed on the side) of the hole for measurement.

The specific operation is as follows:

Press **2Angle** to enter the refraction angle (K value) adjustment program, "Action" is displayed, as shown in Figure 3-6.

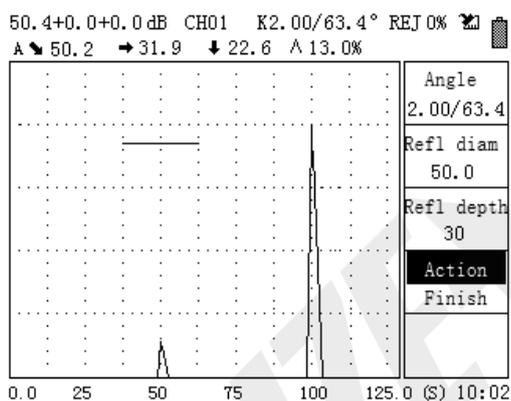


Figure3-6

Note: If the probe angle, hole diameter and hole depth are not the default values, press **▲** to highlight the required modification parts, then directly enter the actual values

and press **OK**, after the modification is completed, press **▼** to highlight "Action".

Press **OK** to start the test, as shown in Figure 3-7.

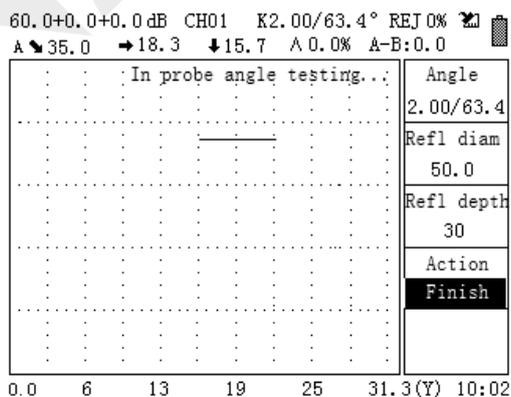


Figure3-7

Move the inclined probe on the CSK-IA test block to ensure that one side of the probe is leveled with the side of the $\Phi 50$ hole, as shown in Figure 3-8

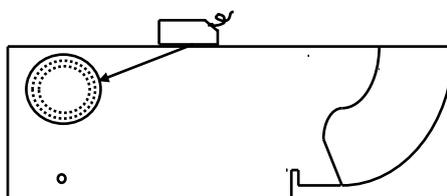


Figure3-8

CSK-IA Schematic diagram of K value measured by test block

Left and right parallel to move to the probe, so that $\Phi 50$ holes in the highest echo appeared in the door into the wave (such as not in the door can be moved to the door position, generally do not need to move the door position), if the wave height exceeds 100%, hold the probe immobile, the instrument is automatically adjusted, so that the echo is reduced to 80%, and then parallel to the left and right to move the probe, in the process, the instrument automatically enable the peak value of the memory function and the return envelope function, to assist in identifying $\Phi 50$ holes in the highest wave, such as Fig. 3- 9 shown

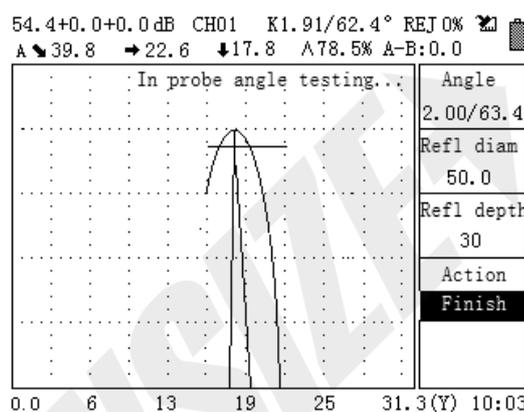


Figure3-9

At this time, hold the probe still, press to end the test, the instrument will be refractive angle (K value) test is completed, and return to the main interface, from the parameter display area can be read out directly just measured refractive angle (K value).

3.1.5 Production of DAC curves

The DAC curve (i.e. Distance-Amplitude Curve) is a curve that describes the correlation between the distance from the reflection point to the wave source, the height of the echo and the equivalent size. Defects of the same size have different echo heights due to different distances. Therefore, the distance-wave amplitude curve is very useful for the quantification of defects. This instrument can automatically produce the distance-amplitude curve (DAC curve).

The specific operation is as follows:

Press to enter the DAC curve creation program, and the "Action" is displayed, as shown in Figure 3-10.

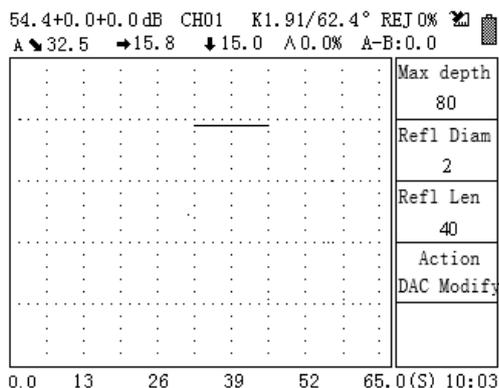


Figure3-10

Note: If the curve depth, known hole diameter and known hole length are not the default values of the instrument, press  to display the required modification part, then directly input the actual value and press , after the modification is completed, press  to display the “Action”.

Press  to start taking points, the instrument automatically adjusts the gate at the 10mm deep picking point position, if you want to collect the reflected wave of other depth holes, press  or  to move the gate to the corresponding position. As shown in Figure 3-11

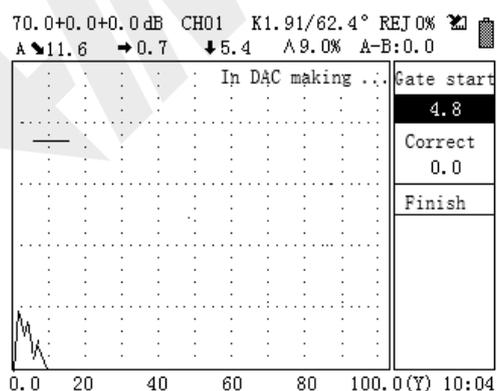


Figure3-11

(1)、Place the probe on the CSK-IIA-1 test block and look for the reflected wave from the 10mm deep $\Phi 2$ hole first, as shown in Fig. 3-12

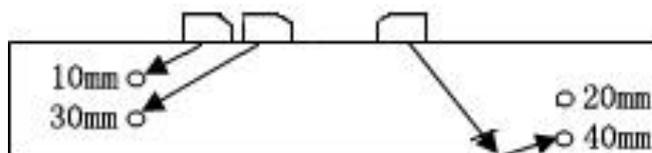


Figure3-12

Left and right parallel to move the probe, and accompanied by a small angle of swing, so that $\Phi 2$ hole of the highest echo appeared in the wave gate, if the wave height exceeds 100%, hold the probe still, the instrument is automatically adjusted, so that the echo down to 80%, and then left and right to move and swing the probe in a small range, in the process, the instrument automatically enable the peak value of the memory function and the echo envelope function, to assist in finding out $\Phi 2$ holes in the highest echo, and in addition to

press , you can quickly adjust the echo to 80% of the screen. As shown in Figure 3-13

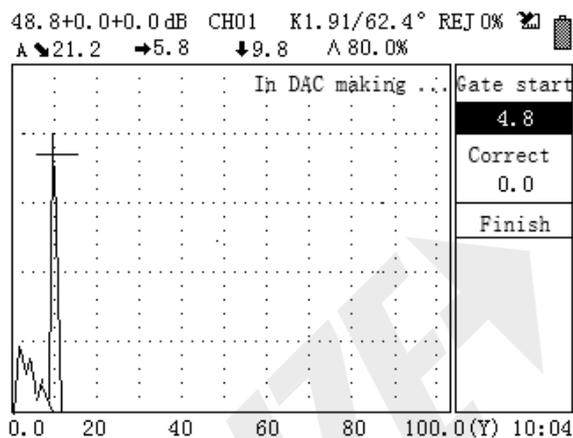


Figure3-13

At this time, press  to confirm the echo, the instrument automatically adjusts the basic gain so that the screen shows a straight line at 80% of the height, and at the same time, the gate position is automatically adjusted to 20mm deep to collect the point, so that the first point acquisition is completed. Press  again to adjust the gate position to 30mm deep to facilitate the second point acquisition.

(2)、Put the probe on the CSK-IIA-1 test block, and then look for the reflected wave of 30mm deep $\Phi 2$ hole, move the probe left and right parallel, and accompanied by a small angle of swing, so that the highest echo of $\Phi 2$ hole appeared in the inlet gate, in the process, the instrument automatically enable the peak memory function and the echo envelope function, to assist in finding the highest wave of $\Phi 2$ hole. If the echo is relatively low, it is not

easy to find the highest wave, you can press  to adjust the echo to 80% of the screen, so as to quickly find the highest echo. As shown in Figure 3-14

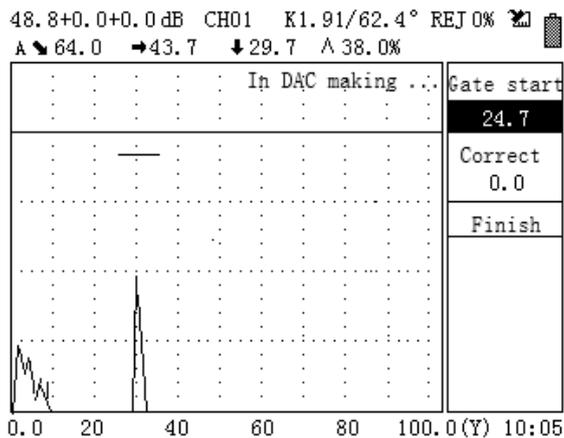


Figure3-14

At this time, press  to confirm the echo, a curve connecting the first point and the second point will be displayed on the screen, and at the same time, the gate position will be automatically adjusted to 40mm deep to collect the point, so that the second point acquisition is completed. Press  again to adjust the gate position to 50mm deep to facilitate the acquisition of the third point.

(3)、Put the probe on the CSK-IIA-1 test block, and finally look for the reflected wave of 50mm deep $\Phi 2$ hole, move the probe left and right parallel to each other, accompanied by a small angle of swing, so that the highest echo of $\Phi 2$ hole appears in the inlet gate, in the process, the instrument automatically enables the peak memory function and echo envelope function, to assist in finding the highest wave of $\Phi 2$ hole. If the echo is relatively low, it is not

easy to find the highest wave, you can press  to adjust the echo to 80% of the screen, so as to quickly find the highest echo. As shown in Figure 3-15

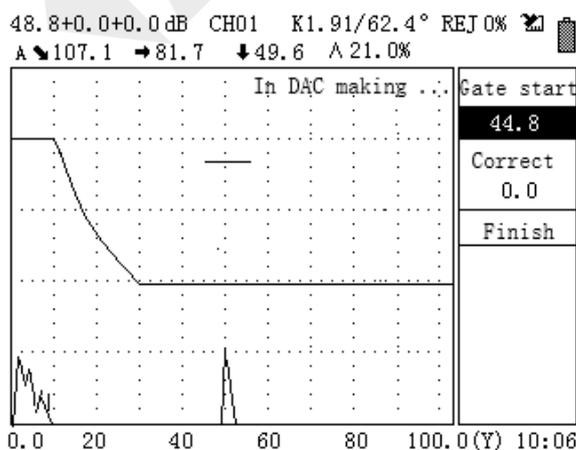


Figure3-15

At this time, press  to confirm the echo, the screen will display a curve connecting the first point with the second point and the third point, and at the same time, the door

position will be automatically adjusted to the 60mm depth of the collection point, so that the third point of the collection is completed. As shown in Figure 3-16

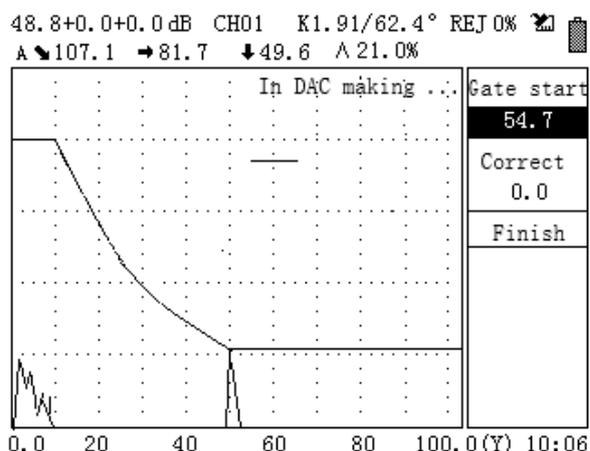


Figure3-16

If a certain point or points are not accurate enough during the curve making process, you can adjust the curve, the specific operation is as follows:

When the value of the gate position is reversed, press or , move the gate to the depth of the required adjustment, at this time, the screen will automatically appear “X” icon, prompting the location of the previously picked points. As shown in Figure 3-17

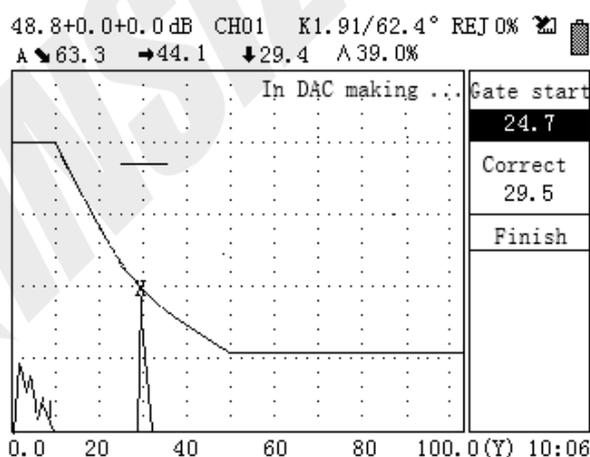


Figure3-17

A、 Move the probe to find the exact point again, and then press , when the depth error is less than 2mm, the instrument automatically adjusts the original picking point. When the depth error is more than 2mm, the instrument will regenerate a new point.

B、 Move the probe to find the exact point at this position again, then press to invert the curve adjustment value, and press or to adjust the height of this point on the curve according to the height of the actual echo.

C、 If a previous point was taken in error, you can press  to delete it and take a new point.

After all the points are tested, confirm that the DAC bus is completed, press  to display the “Finish”, press  to enter the next level of the menu, and the instrument defaults to display the “Compen”, as shown in Figure 3-18.

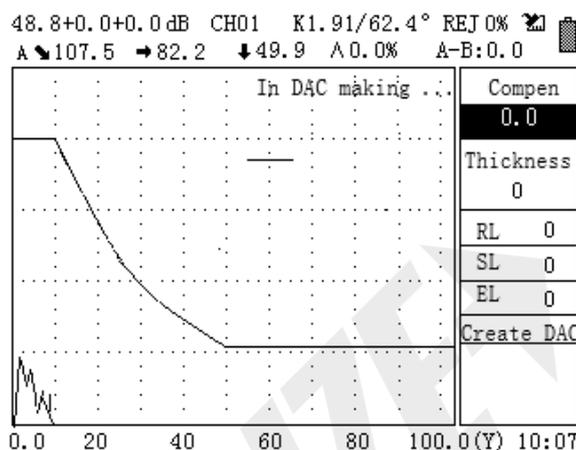


Figure3-18

A、 If necessary, input the appropriate surface compensation value and press , then press , input the thickness of the workpiece according to the need, and input the decibel value of the judgment line, the quantitative line and the evaluation line according to the standard. Finally, press  again to highlight “Create DAC”, press , the DAC curve production is completed and return to the main interface, the screen displays three curves, the instrument automatically sets the acoustic range scale to depth, and adjusts the eighth horizontal grid to twice the thickness of the plate. The sensitivity of the instrument automatically sets the evaluation line at twice the plate thickness to 20%.

B、 If not, press , the “Create DAC” will be displayed, press , the DAC curve production is completed and return to the main interface, the screen displays a curve, the instrument will automatically set the acoustic range scale to the depth, the instrument sensitivity will be automatically set to 20% of the deepest point of the curve.

After confirming that the adjustment and parameter setting are correct, the instrument can be shut down and brought to the site for flaw detection. After the instrument is turned off, the parameters adjusted and set will not be lost.

3.2 Straight probe AVG method:

Assume that the conditions and requirements for flaw detection are as follows:

1. Workpiece: 200mm thick steel forgings
2. Probe: 2.5PΦ20 straight probe and Q9-Q9 probe wire
3. Test piece: CSK-IA, CS-1-5
4. AVG method (only take a point)

3.2.1 Power On

Press the power switch of the instrument, after 2 seconds, the instrument automatically enters the main interface of flaw detection, use the probe wire to connect the probe with the instrument, so that the instrument is in normal working condition.

3.2.2 parameterization

Press , input the channel value, press , then initialize the current channel, then set the probe type as straight probe, probe frequency as 2.5MHz, wafer size as 20mm, and the workpiece sound speed as 5900m/s. If the default value of the instrument is the same as the actual value, then there is no need to modify it, if not, then modify it accordingly, and the other parameters can be set in the process of the test or after the end of the test. Finally, press  to confirm and return to the main interface.

3.2.3 Zero sound speed tuning, as follows (the following is for synchronization tests):

Press  to enter the zero-point sound speed adjustment program, and "Action" is displayed, as shown in Figure 3-19.

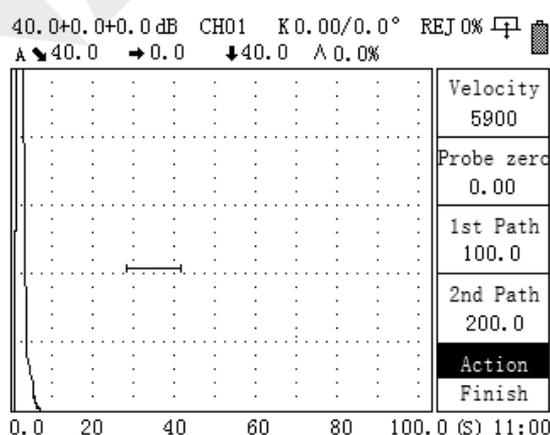


Figure3-19

Note: If the speed of sound, primary sound range and secondary sound range are not the default values of the instrument, press  to display the required modification part,

then directly enter the actual value and press , after the modification is completed, press  to display the "Action".

Press  to start the test, "Finish" is displayed, as shown in Figure 3-20.

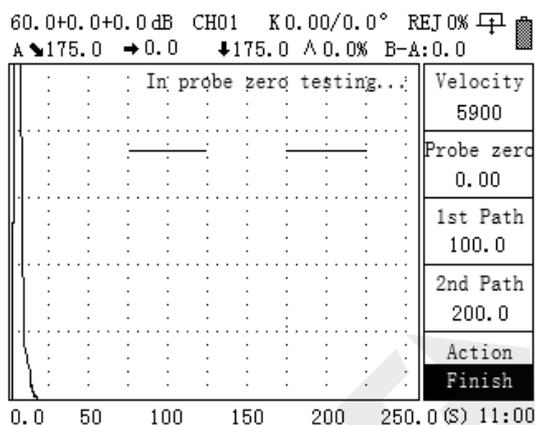


Figure3-20

Place the straight probe at the position of 100mm thickness on the CSK- I A test block, as shown in Figure 3-21:

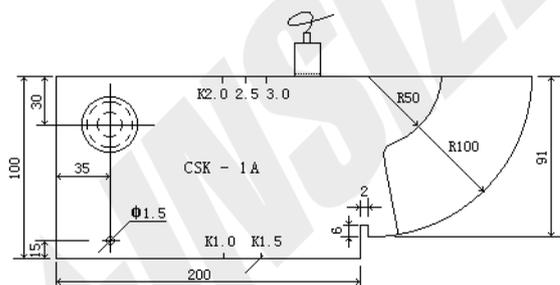


Figure3-21

Gently move the probe, so that the highest echo of 100mm appeared in the wave gate (such as not in the removable door position, generally do not need to move the door position), if the wave height exceeds 100%, stabilize the probe does not move, the instrument is automatically adjusted, so that the echo is reduced to 80%, in the process, the instrument automatically enable the peak memory function and the echo envelope function, to assist in identifying the highest wave of 100mm, as shown in Figure 3-22

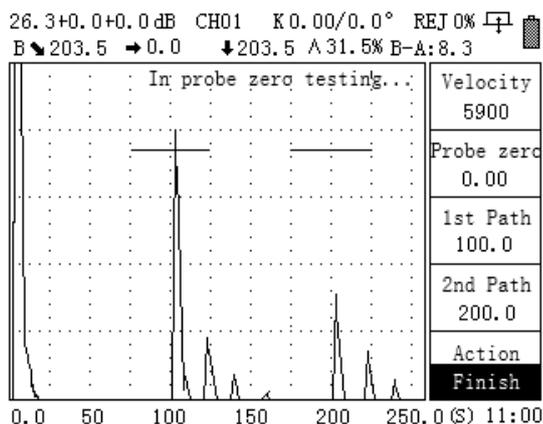


Figure3-22

At this time, stabilize the probe does not move, press  to end the test, the instrument will be the speed of sound and the probe zero test is completed, the probe zero value anti-display, as shown in Figure 3-23

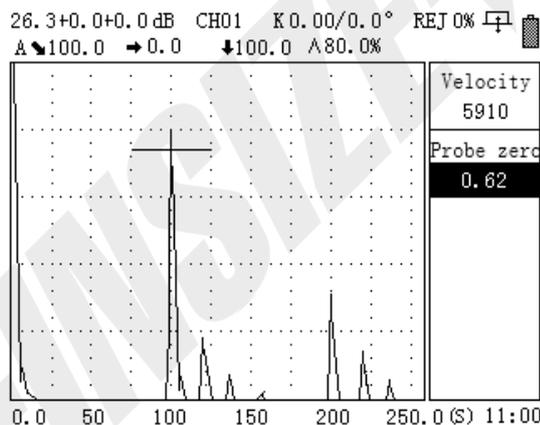


Figure3-23

Press  again to confirm the test result and return to the main screen.

3.2.4 Production of AVG curves

Press  to enter the AVG curve creation program, and the “Action” is displayed, as shown in Figure 3-24.

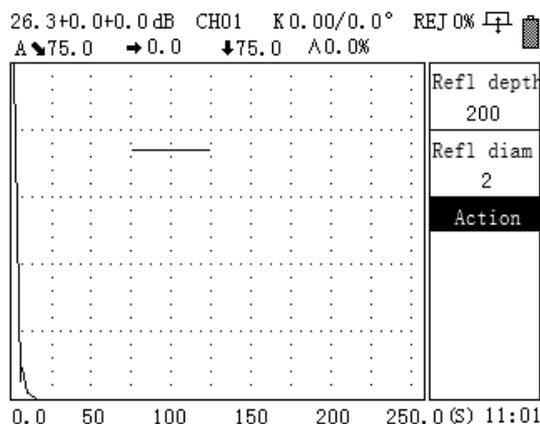


Figure3-24

Note: If the actual values of maximum depth and reflective aperture are not the default values of the instrument, press to highlight the required modification, and then directly enter the actual values and then press (if the workpiece is used to pick a point with a large flat bottom, the maximum depth is entered into the thickness of the workpiece, and the reflective aperture is entered into the 0), and after the modification is completed, press to highlight the “Action”.

Press to start the test, put the straight probe on the CS-1-5 test block, as shown in Figure 3-25.

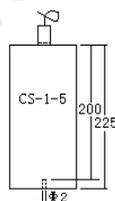


Figure3-25

Move the probe so that the highest echo of $\Phi 2$ hole appeared in the wave (such as not in the door can be shifted, generally do not need to move the door position), if the wave height of more than 100%, stabilize the probe does not move, the instrument is automatically adjusted, so that the echo is reduced to 80%, and then move the probe, in the process, the instrument automatically enable the peak value of the memory function and the echo envelope function, to assist in identifying the highest $\Phi 2$ holes in the wave, such as Figure 3 -26 shows

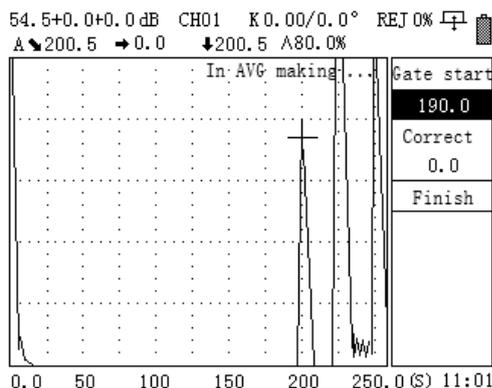


Figure3-26

Press to confirm the highest wave, and the instrument will form a curve automatically. If the picking point is not accurate enough during the curve making process, the curve can be adjusted as follows:

A. Move the probe to find the accurate point at this position again, and then press

, the instrument will automatically adjust the original picking point.

B. Move the probe to find the accurate point at this position again, and then press

, the curve adjustment value will be displayed, according to the actual echo height, press

or to adjust the height of this point on the curve.

C. If there is an error in the previous point, press to delete it and then pick up the point again.

If the echo is confirmed, press to invert the "Finish".

Press again to end the point taking. Enter the next interface, the instrument default "Compen" inverse display, as shown in Figure 3-27

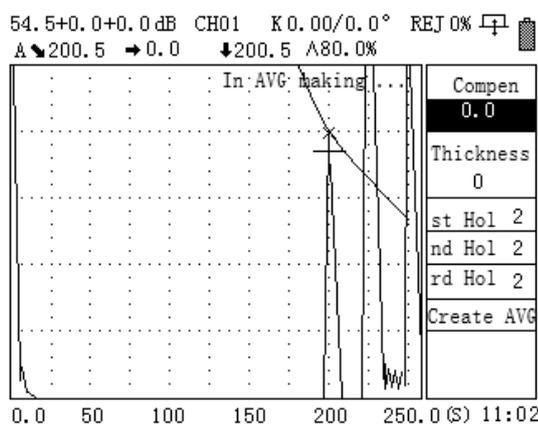


Figure3-27

A, if necessary, enter the appropriate surface compensation value and press , the same, and then press , according to the need to enter the thickness of the workpiece, according to the standard input hole 1, hole 2, hole 3 diameter value.

Finally, press , the "Create AVG" will be displayed, press , the AVG curve production is completed and return to the main interface, the screen displays three curves, the instrument will automatically set the acoustic range scale for the acoustic range, the level of the eighth frame adjusted to the workpiece thickness value. Instrument sensitivity automatically set the minimum aperture value of the AVG curve at the workpiece thickness of 20%. Such as Figure 3-28

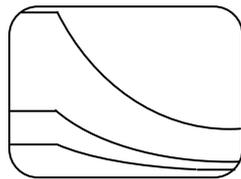


Figure3-28

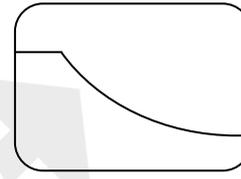


Figure3-29

B. If you don't need it, press  directly, the AVG curve production is completed and return to the main interface, the screen displays a curve. Such as Figure 3-29

Note: 1. When making AVG curves, pay attention to whether the frequency and wafer size of the probe used are appropriate, and whether the values in the setup menu are correct, because these values affect the distance of the near-field area. Before doubling the near-field area is only shown as a straight line, it is recommended to probe at a distance after tripling the near-field area. If the depth of the test block used is small, it is necessary to use multiple waves so that the required echo is after the triple near-field zone.

2, in the production of any large flat bottom (set to 0) AVG curve, the instrument will automatically be converted to 2 curve; also can be set in the parameter menu AVG hole one, hole two, hole three curves corresponding to the aperture value; the instrument read out the equivalent value of defects for the defects and the equivalent difference between the curve under the AVG.

So far the tuning work is completed, after confirming that the tuning and parameter settings are correct, the machine can be turned off and brought to the scene for flaw detection. After the instrument is turned off, the parameters adjusted and set will not be lost.

3.3 Bicrystal probe tuning:

The selected probes and test blocks are as follows:

1. Bicrystalline probe: 5P20FG10 bicrystalline straight probe and Q9-C5 bicrystalline

probe wire

2. Test block: ladder test block

3.3.1 Power On

Press the power switch of the instrument, after 2 seconds, the instrument automatically enters the main interface of flaw detection, use the probe wire to connect the probe with the instrument, so that the instrument is in normal working condition.

3.3.2 参数设置

Press , input the channel value, press , then initialize the current channel, then set the probe type as bicrystal probe, probe frequency as 5MHz, wafer size as 20mm, and workpiece sound speed as 5900m/s. If the default value is consistent with the actual value, then no modification is needed, if not, then modify accordingly, and the other parameters

can be set in the test process or after the test is finished. Finally, press  to confirm and return to the main interface.

3.3.3 zero point adjustment

Note: There is a focal depth of the bicrystal probe, so when measuring the zero point speed of sound, note that the test piece close to the focal depth is chosen as the primary sound range, otherwise the error of the measured zero point speed of sound may be larger. Otherwise, the error of zero point sound velocity may be larger. In addition, the zero point sound velocity is generally measured by one time sound range, but not sound velocity.

Press  to enter the zero-point speed of sound tuning program, “Action” anti-display, as shown in Figure 3-30

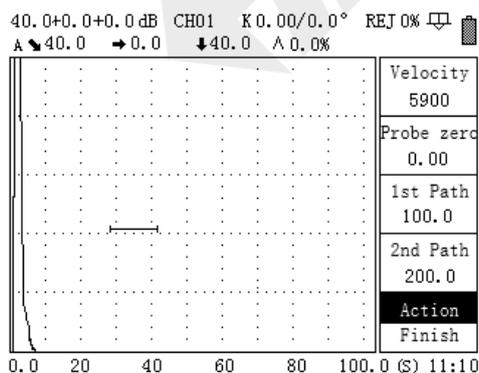


Figure3-30

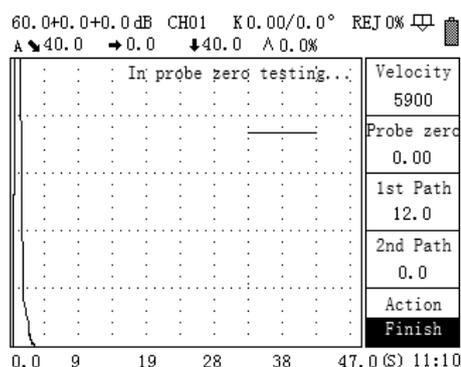


Figure3-31

Press , the primary acoustic range value will be reversed, directly enter 12mm, press

, the instrument will automatically modify the secondary acoustic range to 24mm, and

then press , the secondary acoustic range value will be reversed, directly enter 0, press , and finally press  to “Action” reversed, press  to start testing. As shown in Figure 3-31

Place the probe at a depth of 12mm on the step test block. As the zero point of the double crystal probe is longer, the target echo may not be in the gate, or even not in the screen display range, at this time, you can adjust the gate position or acoustic range, so that

the echo is in the gate, and then press  to return to the zero point test state. When the

highest wave of one echo at 12mm appears in the wave gate, press  to confirm, the instrument will be the probe zero point test is completed, the probe zero point value is displayed, as shown in Figure 3-32

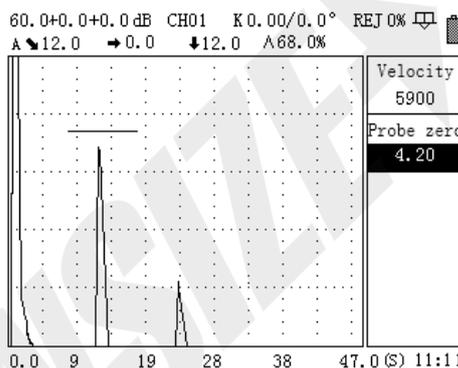


Figure3-32

Press  again to confirm the test result and return to the main screen.

3.3.4 DAC curve tuning for bicrystal probes

If a DAC curve is required, press  after the zero-point sound velocity has been measured, and produce the curve according to the appropriate reference block. Generally, the DAC curves are made from thin to thick, see 3.1.5 Oblique Probe DAC Method.

Note: Because the echo is highest near the focal point, the shape of the DAC curve made from thin to thick may be different from that of the conventional slant probe DAC curve, and may be in the shape of a mountain peak.

3.4 On-site inspection

The tuned and set-up instrument is brought to the site. The probing process is carried out as usual by adjusting the gain, acoustic range, and gate so that the waveform and positional parameters of the defective waveform are displayed in their entirety. As shown in Figure 3-33

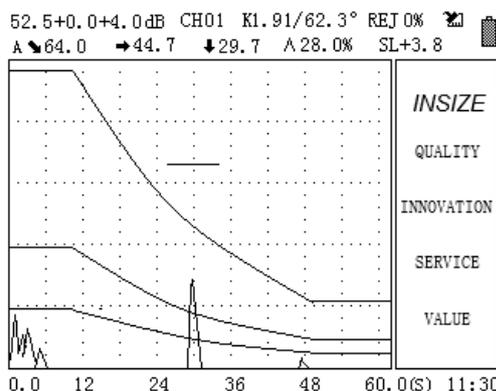


Figure3-33

In the above figure, SL indicates that the quantization line is used as the reference, and “+3.8” indicates that the equivalent difference between the defective wave and the quantization line is +3.8dB.

The equivalent standard can be changed in the parameter menu, for example, if you select the equivalent standard as “ML”, the equivalent difference between the defective wave and the busbar will be displayed on the screen.

If you need to record the defect waveform, press  to record the defect waveform and its parameters, and store the results in the instrument memory. Repeat the above flaw detection process until the flaw detection is completed, then the instrument can be turned off. After the instrument is turned off, the data stored in the instrument will not be lost.

The use of some auxiliary functions during on-site flaw detection will help to improve the efficiency and reduce the difficulty of work, see Chapter 4 for the use of auxiliary functions. (The setting of some special functions is usually carried out after all the debugging is finished.)

四 Probing applications

This machine has added many auxiliary functions for flaw detection according to the various needs of users in flaw detection, and the application of these functions will greatly simplify the artificial calculation and cumbersome operation in the previous flaw detection, and create a good platform for improving the efficiency of flaw detection. This chapter will focus on the introduction of these functions, the user can choose the appropriate functions according to their own requirements for flaw detection to simplify the process of flaw detection.

4.1 Functionality

Press , the instrument will set six functions, which are Gate Alarm, In-gate Spread, DAC Gate, Echo Envelope, Solid Waveform and Performance Test, etc. Press the up and down keys to move the cursor to the desired function. Press the up and down keys, move the cursor to the desired function, "Off" will be displayed, and "0.On 1.Off" selection menu will appear at the same time, press  to turn on the relevant function. The functions are described below.

4.1.1 Gate Alarm

The role of the "Alarm" is that once the return wave in the incoming wave gate is higher than the gate line or the return wave in the outgoing wave gate is lower than the gate line, the instrument will sound an alarm and the alarm lamp will flash at the same time, and the wave height and the gate height will have a direct influence on the alarm status, as shown in Figure 4-1.

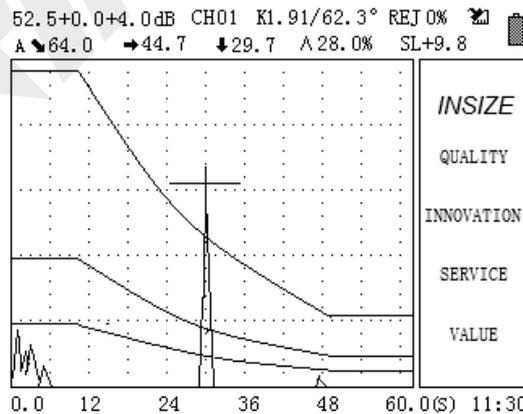


Figure4-1

4.1.2 In-gate spread

When this function is enabled, the instrument amplifies the display of the intragate echo and only displays the intragate echo parameters. Canceling this function restores the previous state. As shown in Figure 4-2.

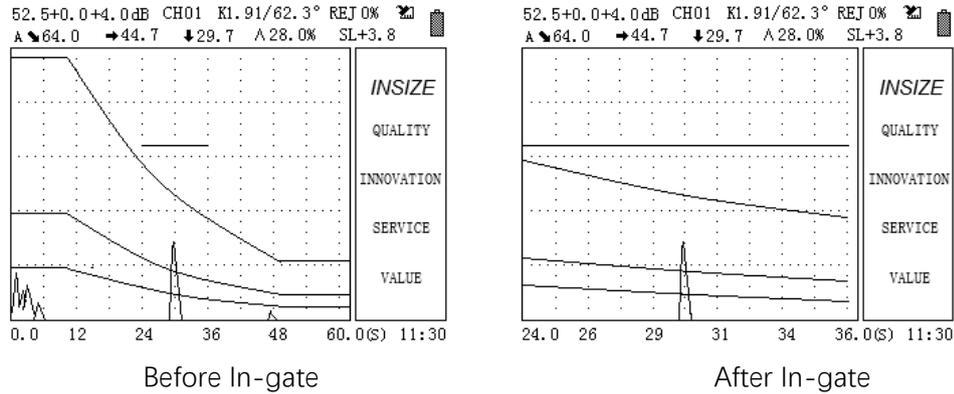


Figure4-2

4. 1. 3 DAC Gate

The function of “DAC Gate” is to align the gate height line of gate A with the shape of the DAC curve made, so that the alarm can be made according to the equivalent value of the defect instead of simply the wave height. This is shown in Figure 4-3.

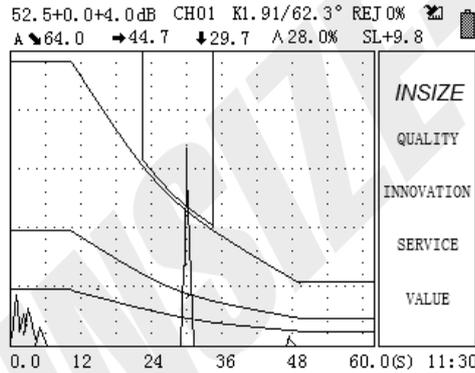


Figure4-3

Note: This function only works after making DAC/AVG curves;

4. 1. 4 Echo Envelope

The function of “Envelope” is that when the probe moves on the test block or workpiece, the peak points of a number of consecutive echoes in the wave gate are memorized, which are connected into an envelope and displayed on the screen. Envelope function is mainly for oblique probe, according to the shape of the envelope, can easily find the highest wave of the defect, and can provide a basis for judging the nature of the defect, as shown in Figure 4-4

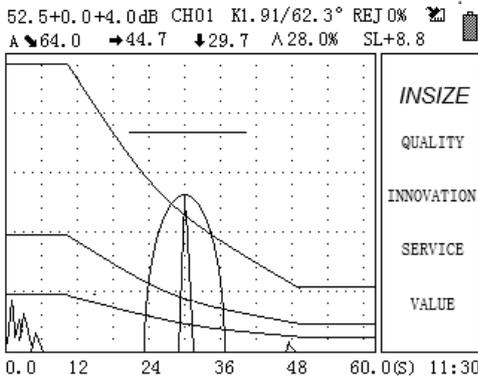


Figure4-4

4.1.5 Solid Wave

Under the default state of the instrument, the screen displays hollow waveforms, and this function can be enabled to make the screen display waveforms as solid, which is convenient to distinguish and recognize the waveforms.

4.1.6 Performance Testing

Before the test, connect the 2.5MHz Φ 20 straight probe with the instrument, set "Probe Type" as straight probe in the parameter menu, and set the probe frequency as 2.5M.

When the performance test function is enabled, as shown in Figure 4-5

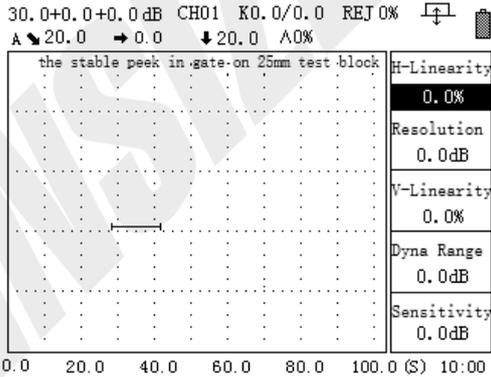


Figure4-5

In the on-screen menu function area from top to bottom there are five performance tests: horizontal linearity, resolving power, vertical linearity, dynamic paradigm and sensitivity margin.

4.1.6.1 First, test the horizontal linearity, the waveform display area above the prompt "Press OK when get the stable peek in gate on 25mm test block".

As shown in Figure 4-6, place the straight probe on the CSK-IA test block, hold the probe still, press "OK", the instrument automatically adjusts the acoustic range, move the gate test probe zero point, sound velocity zero point measurement, the acoustic range is automatically changed to 125mm, so that the 25mm thick test block of the one to five echoes appear in sequence in the second, fourth, sixth, eighth and tenth frames, to keep the probe motionless, the instrument will automatically adjust the gain, gate position, so that the level of linearity value is calculated. The instrument will automatically adjust the gain and the gate position so that the return wave in the gate is 50% high, and finally calculate the horizontal linearity value.

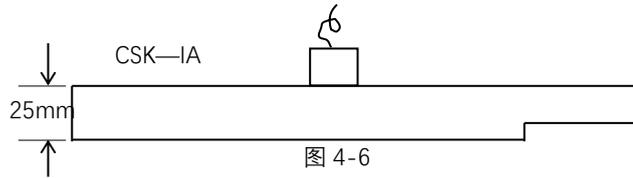


图 4-6

4. 1. 6. 2 Test the resolving power, the top of the waveform display area prompts “Press OK when get the stable peak of 85mm and 91mm reflect”.

As shown in Figure 4-7, in the CSK-IA test block to move the straight probe, when 85mm and 91mm two places of the echo is high and 50%, press “OK”, hold the probe and wait for a few moments, the instrument automatically increase the gain so that the two wave troughs rise to 50%, the instrument recorded gain difference, that is, for the straight probe resolving power.

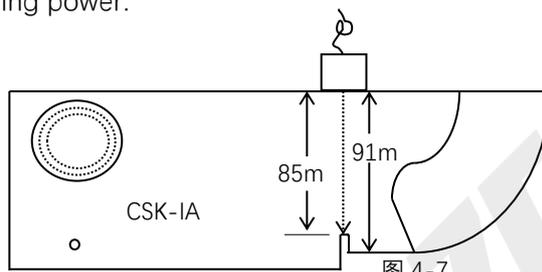


图 4-7

4. 1. 6. 3 Test vertical linearity and dynamic range, the top of the waveform display area prompts “Press OK when get the stable peak of 200mm Φ 2 in CS-1-5”.

As shown in Figure 4-8, move the straight probe on the CS-1-5 test block, press “OK” when the echo at the 200mm deep Φ 2 flat-bottomed hole is the highest and 100%, hold the probe still, and the instrument automatically adjusts the gain, and the gain decreases in 2dB steps, at which time the instrument automatically notes down the value of the wave height each time, and then finally calculates the vertical linearity and dynamic range.

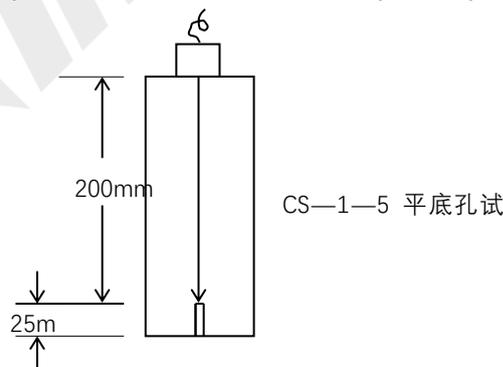


图 4-8

4.1.6.4 Test the sensitivity margin, when the vertical linearity and dynamic range test is completed, the instrument automatically adjusts the gain, so that the echo of the hole reaches 50%, and at the same time the top of the waveform display area prompts “remove the probe and press OK”.

When you need to remove the probe, press “OK, the instrument will automatically increase the gain, so that the noise reaches 10%, and note down the difference in gain as the

sensitivity margin.

After the above five performance tests are completed, the instrument will automatically calculate the results and display them in the menu bar on the right side of the screen. At the same time, it prompts “Test end , OK save test results ,Return cancel” at the top of the waveform display area. Press “OK”to save the test result and return to the main interface.

Note: The probe used for standard instrument performance should be a 2.5MHz 20 straight probe;

Since the test performance is a combination of the performance of the test instrument and the probe, it is strongly recommended that you use a good quality probe.

4.2 Color settings

The color settings are preset with 8 color schemes to choose from. They are Color 1 (Classic Blue), Color 2 (Classic White), Color 3 (Classic Black), Color 4 (Vanilla Green), Color 5 (Athenian Gray), Color 6 (Purple Ink Green), Color 7 (Champagne Pink), and Color 8 (Terracotta Red). Simply complete the setting by pressing  and then press  or



Users are free to choose colors according to their personal preferences.

4.3 Screen freeze

In the interface of conventional flaw detection, press , the waveform display area is frozen, press  again to unfreeze, when the waveform is frozen, the red “X” symbol is displayed on the screen and falls on a certain wave peak (wave height is greater than 10%), and at the same time, the parameters of the waveform (position, wave height and equivalent) are synchronously displayed in the parameter display area. Pressing the left and right arrow keys, the “X” symbol will fall on the wave crests higher than 10% in the screen, and the parameters of the wave will be displayed in the parameter display area synchronously.

Screen freeze function can better help the flaw detectorists to record and analyze each waveform.

4.4 Standard

Press , the instrument displays the Standard menu and defaults in the Preset Standard option, as shown in Figure 4-9.

Standard	Custom	0. Custom
Line num	3	1. JB/T4730-2005
Block	Custom	2. NB/T47013-2015
Thickness	0.0mm	3. GB/T11345-89
1st Curve	+0dB	4. GB/T11345-2013
2nd Curve	+0dB	5. DL/T820-2002
3rd Curve	+0dB	6. JIS/Z3060-2002
		7. JG/T203-2007
		8. JB/T10559-2006
		9. CB/T3559-2011
		-. AWS D1.1 2006

Figure4-9

按相应的数字从 0-9 及“-”号选项中选择探伤需要的标准，选好后反显部位处则显示刚选择的标准。一般选择标准后，仪器会根据所选标准自动设定曲线根数及试块类型，同时再依据工件厚度自动设定判废线、定量线及评定线的偏移量。

在标准选项中仪器已预置了 JB/T4710-2005、NB/T47013-2015、GB/T11345-89、GB/T11345-2013、DL/T820-2002、JIS/Z3060-2002、JG/T203-2007、JB/T10559-2006、CB/T3559-2011、AWS D1.1 2006 等标准，及一个自定义选项“Custom”。选择不同的标准，其相应参数“曲线根数、试块类型”也会有相应变化。比如选择 NB/T47013-2015 标准时，其相对应的试块就有 CSK-IIA、CSK-IIIA、CSK-IVA、GS-X 及 AL 等项可选。当工件厚度不同时，其三线偏移量也依据标准相应改变。探伤时可根据实际情况选择。

Press the corresponding numbers from 0-9 and “-” option to select the standards needed for flaw detection, after the selection of the anti-display part of the display of the standard just selected. Generally speaking, after selecting the standard, the instrument will automatically set the number of curves and the type of test pieces according to the selected standard, and at the same time, it will automatically set the offset of the judgment line, quantitative line and evaluation line according to the thickness of the workpiece.

The instrument is preset in the standard options, JB/T4710-2005、NB/T47013-2015、GB/T11345-89、GB/T11345-2013、DL/T820-2002、JIS/Z3060-2002、JG/T203-2007、JB/T10559-2006、CB/T3559-2011, AWS D1.1 2006, and a custom option “Custom”. Selecting different standards, the corresponding parameters “number of curve roots, test block type” will also have corresponding changes. For example, when NB/T47013-2015 is selected, the corresponding test blocks are CSK-IIA, CSK-IIIA, CSK-IVA, GS-X and AL. When the thickness of the workpiece is different, the offset of the three lines also changes according to the standard. It can be selected according to the actual situation when detecting the flaw.

Note: The criteria listed there are currently valid only for oblique probe DAC curves.

4.5 Data processing

If information such as defective waves are found during the flaw detection process, the data needs to be processed. This can be accomplished by recording and querying functions.

4.5.1 Record

The instrument is capable of storing 99999 waveforms, numbered from 1 to 999999. the

storage area number can be given by the instrument automatically incrementally, or arbitrarily selected by the user. The specific operation is as follows:

4.5.1.1 Single-image record

Press , the instrument displays the Record menu and “Action” is displayed, as shown in Figure 4-10.

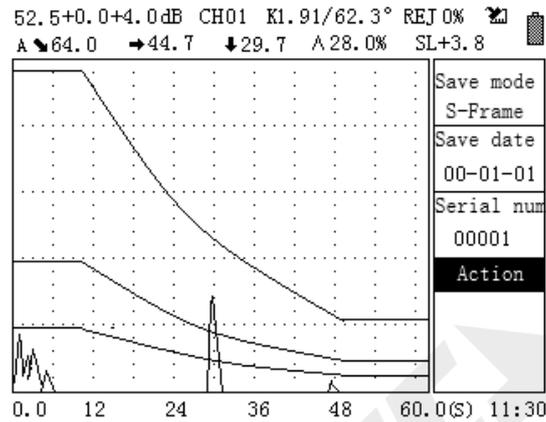


Figure4-10

Press , the instrument saves the single waveform and parameters of the current number, and the record number is automatically incremented to the next one. Press  to exit the recording function.

If the saved file number already exists, press  to start recording, then the instrument screen waveform display area above the prompt “The file is existed, (OK) replace, (Return) cancel”, at this time and then press  to save the new waveform and parameters, the old waveform and parameters will be overwritten, press  to go back to Figure 4-10, press  to record the number of the reverse display Press  to display the new waveform and parameters, and then press  to display the record number, and finally press the key to record and save the new waveform and parameters.

4.5.1.2 Multi-Frame data recording

Press , the instrument displays the record menu, “Action” is displayed, as shown in Figure 4-10, press  to display the record mode, press  or  to change the single amplitude to continuous, then press  to display the record number, select the

appropriate record number, and then press  to display the start of the record, and then press  to record continuously to save new waveforms and parameters, and the instrument prompts the following. The instrument indicates that it is in continuous recording, and at the same time, the instrument will end the recording inverse display, as shown in Figure 4-11.

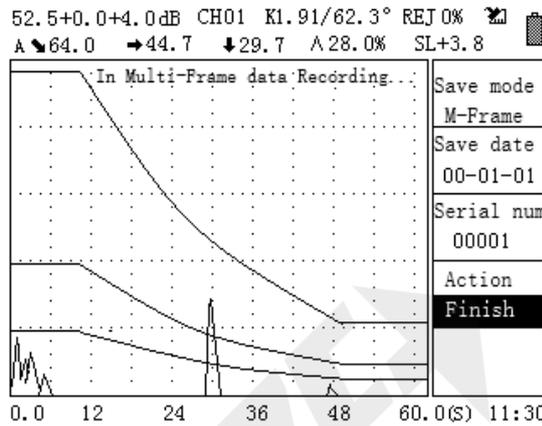


Figure4-11

Press  to end continuous recording and the instrument will automatically increment the record number to the next one. Press  to exit the logging function.

If the file number where the consecutive record is saved already exists, the instrument will automatically add the new consecutive record to the record number by default (i.e., the old record is saved backward in the order of the old record, and the record number is still the same as the original number).

4. 5. 2 Consult

Press , the instrument displays the query menu and the name search is reversed, as shown in Figure 4-12.

File Name	Status	Num seek
000101-00001.dat		00001
000101-00002.dat		Date seek
000101-00003.dat		00-01-01
		Copy one
		Delete one
		Set Param

Figure4-12

Display the file name and status in the waveform display area, the file name consists of date

and number, and display the data of all records. The specific operations are as follows:

A. All recorded files can be searched by name or date, and data can be copied, deleted and

recalled by pressing  or .

B. Press  or  to move the cursor to the file name, then press  or  to select the

corresponding file, and press  to view it (the right menu bar num seek or date seek is in the inverted state), as shown in Figure 4-13, or to copy data (the right menu bar copy one is in the inverted state), or delete the data (the right menu bar delete one is in inverted state), or call the data to the current channel and overwrite the original parameters of the current channel (the right menu bar set param is in inverted state).

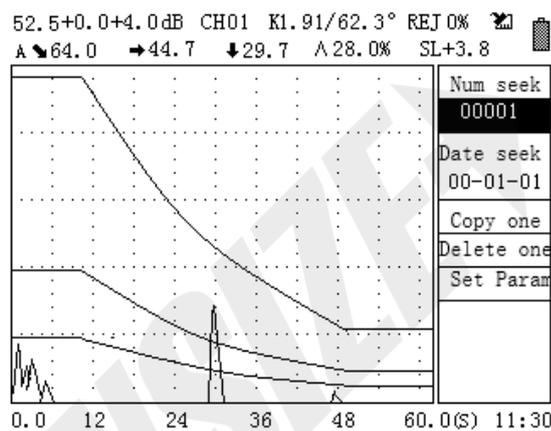


Figure4-13

C. As shown in Figure 4-13, when the file is in the viewing state, the screen displays the waveform and detailed parameters of the viewed file. At the same time, the right menu bar

num seek is displayed, and you can switch the related functions by pressing  or .

When num seek or date seek is inverted, press  or  to view the saved files sequentially;

When copy one is displayed, press , and the file with the number is displayed in the copy number search column;

When delete one is inverted, press  to delete the file whose number is displayed in the name retrieval column;

When set param inversion, press  to call the current curve and related parameters to the current channel and overwrite the original parameters of the current channel.

Press  to return to the previous screen, as shown in Figure 4-12, and then press  to return to the main screen.

Important: When copying files, you must turn off the power and then plug the USB disk into the instrument before turning on the power, and then carry out the relevant operations.



五 Instructions for using the charger

5 . 1 Charger for the UFD-F720:

Easy to use, convenient, any occasion, connect 100V-240V AC power can be used.

5 . 2 Three indicator lights on the upper right of the instrument keyboard:

(left green center yellow right red)

Green: Lights up to indicate power is on.

Yellow: Lights up to indicate charging.

Red: Lights up to indicate an alarm indication

5 . 3 Charging time is about five to six hours.

5 . 4 Steps to use:

5.4.1 Turn off the power to the UFD-F720 main unit.

5.4.2 Connect the charger to the UFD-F720 mainframe charging plug.

5.4.3 Connect the AC power. The power indicator and charger indicator will light up.

5 . 5 Fill it up:

When charging, the power indicator and charging indicator light up at the same time, and the charging indicator light goes out when the battery is full.

Cautions:

(a): The maximum charging time is not more than 18 hours. So as not to affect the battery life!

(b): You must turn off the UFD-F720 mainframe before turning on the charger! Otherwise it will affect the performance of the main unit!

六 Safe use, care and maintenance of instruments

6 . 1 Precautions for use

- 6.1.1 When removing the battery, the power must be turned off first to avoid damaging the instrument.
- 6.1.2 After the power is turned off, it must be stopped for more than 5 seconds before the power can be turned on again. Never switch the power on and off repeatedly.
- 6.1.3 When connecting external USB devices, they must be operated in the state of power off.
- 6.1.4 Avoid strong vibration, shock and strong electromagnetic field interference.
- 6.1.5 Do not place it in high temperature, humidity and corrosive gas for a long time.
- 6.1.6 When operating the keys, do not use too much force, and do not operate the keyboard of the instrument with hands stained with oil and mud, so as not to affect the service life of the keyboard.
- 6.1.7 When the instrument fails, please contact us immediately and do not open the case for repair.

6 . 2 Care and Maintenance

- 6.2.1 After the use of the flaw detector, the appearance of the instrument should be cleaned, and then placed in a dry and ventilated place indoors.
- 6.2.2 Probe cable, charger cable and so on should not be twisted and pressurized; when pulling and inserting cable, the root of plug should be grasped, and the cable should not be grasped and pulled, inserted or dragged.
- 6.2.3 When the flaw detector is not used for a long time, the battery should be fully charged first, and then turn off the power switch.
- 6.2.4 In order to protect the flaw detector and the battery, at least one to two hours every month to power on and charge the battery, so as to avoid the moisture of the components inside the instrument, and at the same time prolong the service life of the battery.
- 6.2.5 The flaw detector should avoid dropping, strong vibration, impact and rain or snow splash during transportation, so as not to affect the service life of the instrument.

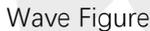
6 . 3 General Troubleshooting

Failure phenomenon	Cause of Failure	Methods of elimination
When the battery is installed and the power is turned on, the display screen disappears in a short period of time.	Insufficient battery power	Charging the battery
During use, the screen is	Memory confusion due	Use "Default" in the list of

suddenly disorganized or redundant abnormal displays appear.	to some kind of	probing parameters to restore the instrument to its initial state and work again.
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Annex: Generic Detection Report

Inspection Report			
Inspection Company:			Report NO: <input style="width: 50px;" type="text"/>
Client Company:			Test Date: <input style="width: 50px;" type="text"/>
Workpiece	Part Name:	<input style="width: 100%;" type="text"/>	Part Number: <input style="width: 100%;" type="text"/>
	Material:	<input style="width: 100%;" type="text"/>	Groove Type: <input style="width: 100%;" type="text"/>
	Heat Treatment:	<input style="width: 100%;" type="text"/>	Surface Roughness: <input style="width: 100%;" type="text"/>
Scanner	Model:	<input style="width: 100%;" type="text"/>	Gain: <input style="width: 100%;" type="text"/>
	Sound Path:	<input style="width: 100%;" type="text"/>	Rejection: <input style="width: 100%;" type="text"/>
	Delay:	<input style="width: 100%;" type="text"/>	Velocity: <input style="width: 100%;" type="text"/>
Probe	Probe Model:	<input style="width: 100%;" type="text"/>	Probe Type: <input style="width: 100%;" type="text"/>
	Crystal Size:	<input style="width: 100%;" type="text"/>	Frequency: <input style="width: 100%;" type="text"/>
	Front Edge:	<input style="width: 100%;" type="text"/>	Probe Zero: <input style="width: 100%;" type="text"/>
	K-Value:	<input style="width: 100%;" type="text"/>	Probe Angl: <input style="width: 100%;" type="text"/>
Defect	Distance:	<input style="width: 100%;" type="text"/>	Hor Distance: <input style="width: 100%;" type="text"/>
	Ver Distance:	<input style="width: 100%;" type="text"/>	Wave Height: <input style="width: 100%;" type="text"/>
	Equivalent:	<input style="width: 100%;" type="text"/>	Indication Length: <input style="width: 100%;" type="text"/>
			
Defect Evaluation:			
Inspector:	<input style="width: 100%;" type="text"/>	Date:	<input style="width: 100%;" type="text"/>
Reviewer:	<input style="width: 100%;" type="text"/>	Date:	<input style="width: 100%;" type="text"/>
Approver:	<input style="width: 100%;" type="text"/>	Date:	<input style="width: 100%;" type="text"/>



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