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UFD-B450

DIGITAL ULTRASONIC FLAW DETECTOR (ADVANCED TYPE)

OPERATATION MANUAL

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1 Introduction

This instrument is a portable industrial digital ultrasonic flaw detector that can detect, locate, evaluate and diagnose various defects (cracks, inclusions, pores, etc.) in the workpiece quickly, conveniently, without damage, and accurately. It can be used both in the laboratory and on the engineering site. This instrument can be widely used in manufacturing, iron and steel metallurgy, metal processing, chemical industry and other fields that require defect detection and quality control. It is also widely used in online safety inspection and Life assessment in the fields of aerospace, railway transportation, boilers and pressure vessels, etc. The instrument can be widely used in locating and sizing hidden cracks, voids, disbands, and similar discontinuities in welds, forgings, billets, axles, shafts, tanks and pressure vessels, turbines, and structural components.

1.1 Features of the Instrument

The core hardware is designed with ARM+FPGA, and the software uses a highly reliable multitasking operating system, which greatly improves the function, portability, durability and reliability of the instrument.
This instrument uses a master-slave menu, and is designed with shortcut keys and a digital rotary knob.The instrument is light and portable, and can be held with one hand.

External Structure:
Display Interface:

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Display

Master-slave menu, wizard-style operation, with shortcut keys and a digital dial for convenient operation.
Utilizes IPS (In-Plane Switching) full digital LCD display, significantly enhancing color and response speed.
Wide viewing angle; minimal color and detail changes even when viewed from the side.
60 Hz fast display update. Able to display subtle waveform changes.
Resolution of 640X480, providing more delicate and user-friendly interface and waveform display.
High-brightness display usable in strong light conditions.
4 operating interface styles can be selected according to the environment.
The LCD brightness can be set freely.

Shape

Ergonomic design, waterproof and oil-proof.
Equipped with two types of stands, rotating damping and keyboard, suitable for indoor and outdoor use.
The rubber protective cover provides a delicate touch and convenient use.
High-transparency glass panel, extremely hard, wear-resistant and scratch-resistant.

Screenshot and PDF flaw detection report

Real-time screenshots of all pages and flaw detection reports, and save them as BMP pictures to U disk, which can be set as color or grayscale pictures.
Export the flaw detection report as a PDF file and save it to a U disk for easy archiving and printing.
All contents of the PDF file can be customized according to user needs.
BMP pictures and PDF files can be viewed on a computer or mobile phone.

Range

Up to 9999 mm in steel; range selectable in fixed steps or continuously variable.
Suitable for use on large work pieces and in high-resolution measurements.

Pulser

Pulse Energy selectable among 100V,200V, 250V,300V,350V, 400V and 500V.
Pulse Width tunable from 0.1μs to 0.5 μs to match the probes with different frequency.
Pulse Repetition Frequency adjustable from 20 Hz to 2 KHz.
Damping selectable among 50Ω、150Ω、300Ω and 400Ω for optimum probe performance
Probe selection: single crystal probe, dual crystal probe, special angle probe, penetrating probe, climbing probe.

Receiver

Sampling：16 digit AD Converter at the sampling speed of 320 MHz
Rectification：Positive Halfwave, Negative Halfwave, Fullwave and RF
Analog Bandwidth: 0.2MHz to 20MHz capability with selectable frequency ranges (automatically set by the instrument) to match probe for optimum performance.
Gain：0 dB to 110 dB adjustable in selectable steps 0.1 dB, 2 dB, 6 dB.

Gates

Two fully independent gates offer a range of measurement options for signal height or distance using peak triggering.
The echo-to-echo mode allows accurate gate positioning for signals which are extremely close together.
Gate Start: Variable over entire displayed range
Gate Width: Variable from Gate Start to end of displayed range
Gate Height: Variable from 0 to 99% Full Screen Height
Alarms: Threshold positive/negative with LED Flash.

Memory

The instrument has a built-in large-capacity memory, and data and files will not be lost due to power failure of the instrument.
Memory of 500 channel files to store calibration setups and probe parameter.
Memory of 1000 wave report files to store A-Scan wave and settings.
All the files can be stored, recalled and cleared.
The channel settings and report files can be exported via U disk, and the information can also be stored in unlimited amounts via USB memory.

Video Recorder

Video Recorder is useful in many situations, it is very convenient for those who want to analyze the probing activities later.

The instrument can record the test process and save it as a video file, which can be played back through the instrument or special software. It supports up to 10 video files, and each video file can be up to 5 minutes long.

If you choose to save the video file to the U disk, the number and duration of the video file will not be limited.

Recording and replaying the testing process provides great convenience for future study and analysis of flaw detection.

Video playback supports pause, fast forward, fast rewind, and stop functions.

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Functions

- Flaw detection standard: Built-in common flaw detection standards, direct call, convenient and fast.
- Auto calibration: Automated calibration of probe zero offset, probe angle (K value) and material velocity.
- Flaw Locating：Live display Sound-path, Projection (surface distance), Depth, Amplitude,
- Flaw sizing: Automatic flaw sizing using AVG or DAC, speeds reporting of defect acceptance or rejection.
- Digital Readout and Trig. Function: Thickness/Depth can be displayed in digital readout when using a normal probe and Surface Distance and Depth are directly displayed when angle probe is in use.
- DAC/AVG：The curve is automatically generated, and the sampling points can be compensated and corrected. The curve automatically floats with the gain, automatically expands with the detection distance, and automatically moves with the delay time. It can display the AVG curve of any aperture.
- AWS D1.1. Choosing this standard can reduce manual calculations and improve detection efficiency.
- Curved Surface Correction feature.
- Crack Height Measure function.
- Gate Magnify ：spreading of the gate range over the entire screen width.
- Video Recording and playback.
- Auto-gain function
- Envelope: Simultaneous display of live A-scan at 60 Hz update rate and envelope of A-scan display
- Peak Hold: Compare frozen peak waveforms to live A-Scans to easily interpret test results.
- Peak mark: capture and mark the peak in real time
- Echo coding: display 1~9 echo display area in different colors, used to analyze the defect position.
- A Scan Freeze：Display freeze holds waveform and test distance data.
- B Scan display feature. Intuitively display the defect shape of the workpiece and the detection result is more intuitive.

Real Time Clock

The instrument clock keeps running tracking the time.

Communication

Two High speed USB2.0 port. Two USB modes can be selected: U-DISK and U-BRIDGE. In U-DISK mode, channel Configuration files, flaw report files, screenshot pictures and recorded movies can be saved to U-DISK. In U-BRIDGE mode, the instrument exchanges data with DataPro Software.

Battery

Built-in large-capacity and high-performance lithium-ion battery.
The continuous working time more than 12 hours.
4-6 hours typical recharge time.

Knob

Operating adjustments are easily and quickly made using the rotary knob.

software upgrade

The software can be easily upgraded through U-DISK. The upgrade will not cause damage to the machine.

1.2 Specifications

- Measuring Range: 0 to 15000 mm, at steel velocity
- Material Velocity: 100 to 20000m/s
- Gain: 110 dB max in selectable resolution 0.1, 1.0, 2.0, 6.0 dB.
- System Linearity: Horizontal: +/-0.1% FSW,
  Vertical: 1.5% FSH, Amplifier Accuracy +/-1 dB.
- Sensitivity Leavings: more 54dB(Deep 200mmΦ2 flat-bottomed hole)
- Dynamic range: ≥26dB
- Bandwidth (amplifier bandpass): 1.0 to 20 MHz
- Resolving Power: more 32dB
- Noise: less than10%
- Display Delay: -20 to 3400 µs
- Probe Delay/Zero Offset : 0 to 99.99µs
- Test Modes: Pulse echo, dual element and thru-transmission
- Pulser: Tunable Wave Pulser
- Pulse Repetition Frequency ranges from 20 Hz to 2000 Hz
- Pulse Energy: 100V, 200V, 250V, 300V, 500V selectable
- Gate Monitors: Two independent gates controllable over entire sweep range
- Rectification: Positive half wave, negative half wave, full wave, RF
- Reject (suppression): 0 to 80% full screen height
- Units: Inch or millimeter
- Transducer Connections: BNC or LEMO
- Power Requirements: AC Mains 100-240 VAC, 50-60 Hz
- Operating Temperature: -10℃ to 50℃
- Storage Temperature: -30℃ to 50℃

1.3 Base Instrument Package

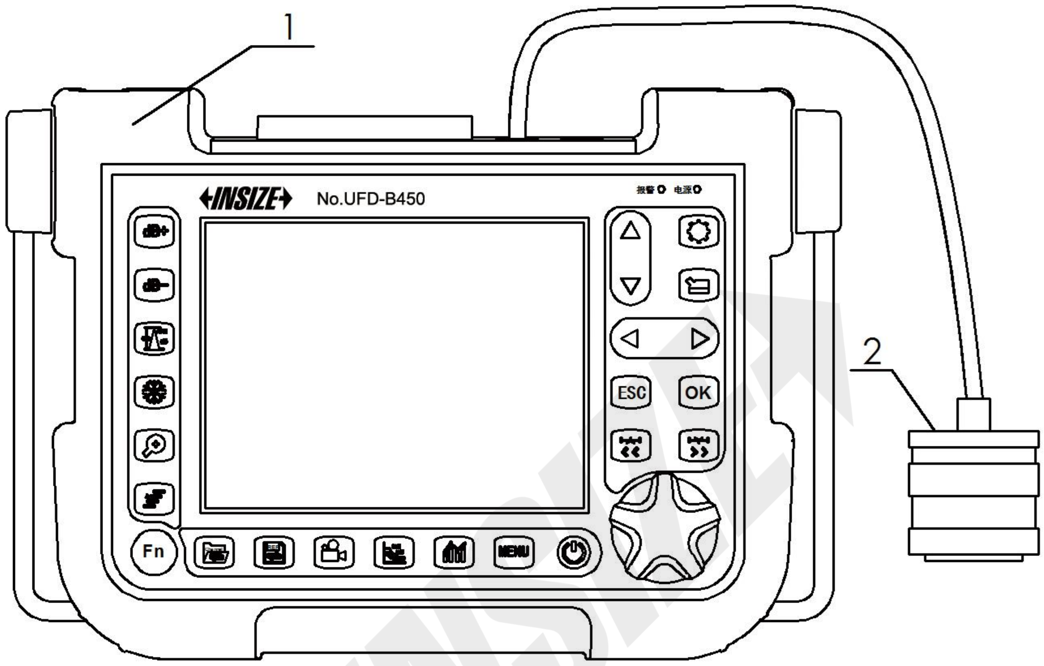
Portable Ultrasonic Flaw Detector with multi-color TFT LCD Display
Straight Beam Transducer (2 MHz or 4 MHz, Φ10)
Angle Beam Transducer (2 MHz or 4 MHz, 8 mm×9 mm, 60°)
Interconnect Cable for the transducer (BNC-BNC，or optional BNC- C5)
Power supply/charger unit
Operating Manual in English

2 Understanding the Keypad, Menu System and Display

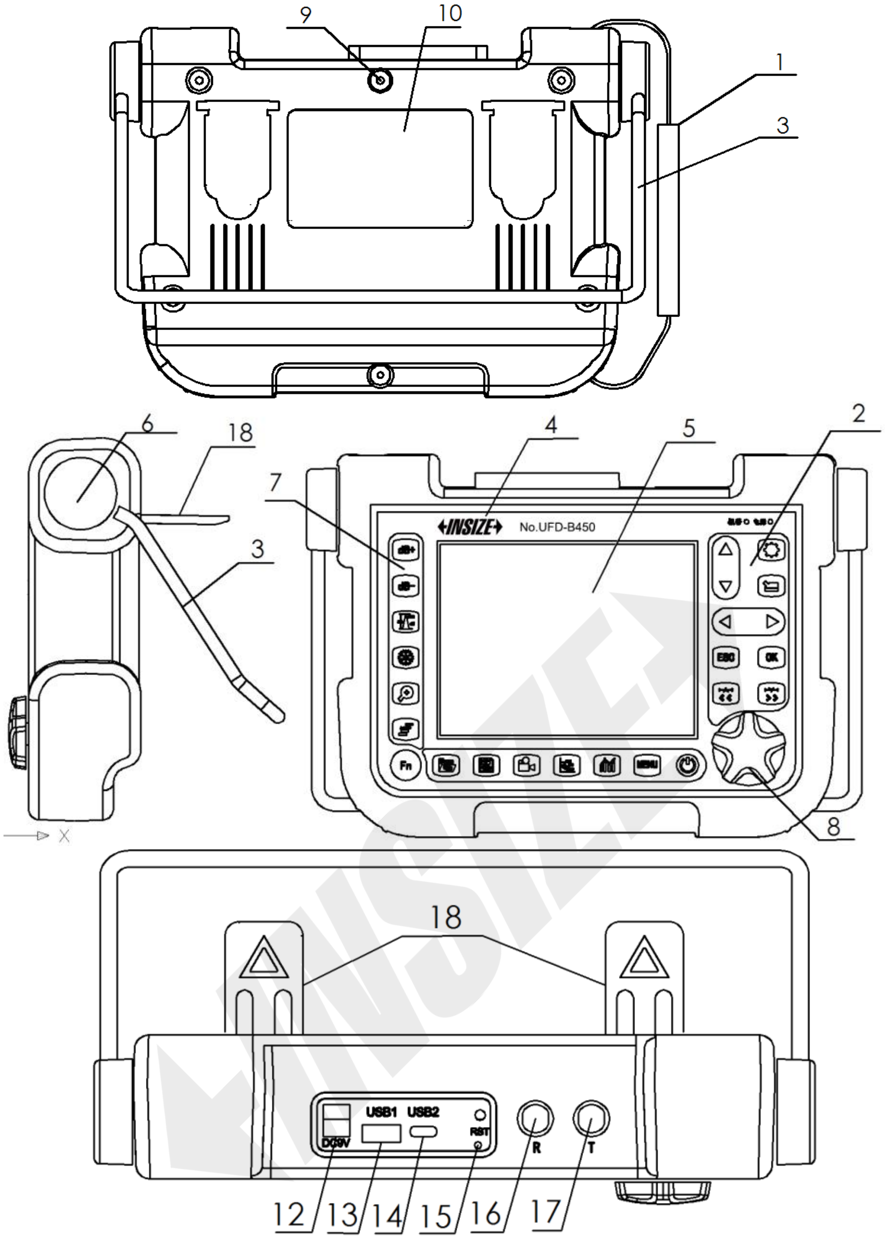
2.1 Structure Feature

The figure gives an overview of the instrument system.

1. The Main Unit
2. Probe(Transducer)



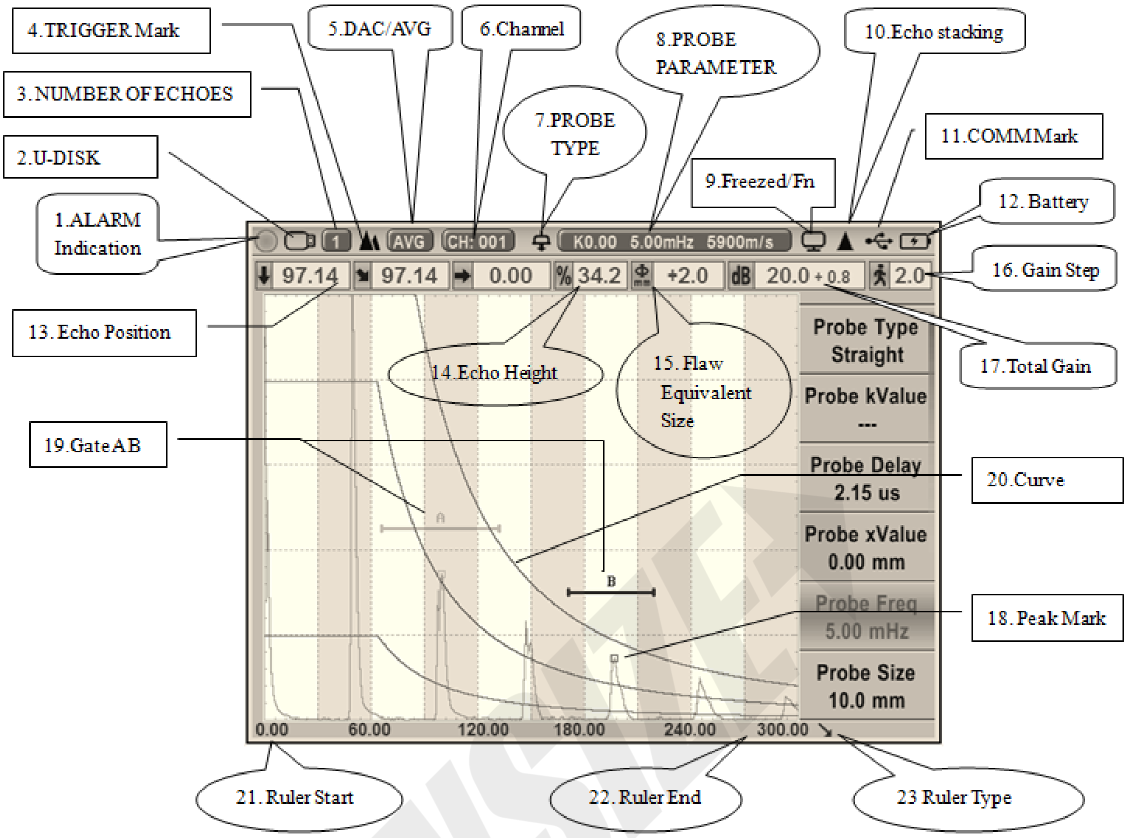
The Main Unit



1, Belt 2, Keypad 3, Rotating bracket 4, LOGO pad
5, LCD Display 6, Damping turntable 7, Shortcut Keys 8, Rotary Knob
9, Support block 10, Product Label 11, Thumb screw12, Power adapter port
13, USB Socket of U-DISK 14, USB Socket of Comm 15, Reset Key
16, Probe Cable Port(Receive) 17, Probe Cable Port (Transmit)
18, Lifting lug 19, Alarm LED 20, Power LED

2.2 Screen Display

The instrument displays are designed to be easy to interpret.



1. ALARM indication: Alarm state: ● red, Normal state: ● green
2. U-DISK indication: Display when inserting U disk
3. NUMBER OF ECHOES: Display the number of echoes when using an angle probe
4. TRIGGER Mark: Peak trigger ▲▲, Edge trigger ⎍
5. DAC/AVG: Curve type
6. CHANNEL: Display the current channel number
7. PROBE TYPE: single-element straight transducer,
   dual-element (TR) straight probes,
   single-element angle transducer,
   dual-element (TR) angle probes,
   Through-transmission mode for the use with two single-element probes; the receiver is connected with right, the pulser is connected with left.
8. PROBE PARAMETERS: Display probe angle (or K value), probe frequency and sound velocity
9. Freeze: Show icons when the screen is frozen
10. Echo stacking: ✸ Envelope function On,

▲ Peak hold function On

11. USB indication： Show icon when communicating
12. Battery Capacity： （▭, ◧, ◧, ■, ⚡）
13. Echo Position： ⬇ Depth， ⬊ Sound path , ➡ Projection
14. Echo Height： 18.0%. It means that the peak echo height inside the current selected gate is 18.0% FSH (Full Screen Height of the wave area).
15. Flaw equivalent Size Value：

    When AVG curve is on, ERS (Equivalent Reflector Size) of the reflector signal inside the current selected gate.

    Φ dB Hole dB,

    Φ mm Φ IN Hole diameter

    When DAC curve is on, this value will be displayed as the dB offset of the peak echo inside the current selected gate to the reference DAC curve (DAC→OFFSET→SIZE REF).

    RL dB **Rubbish Line** EL dB **Evaluation Line**

    SL dB **Scalar Line** GL dB general Line

16. Gain Step： Display the minimum distance of gain change
17. Total Gain： 28+0.5 :Basic gain + compensation gain
18. Peak Mark： Capture and display the highest point of echo in the current selected gate.
19. Gate： A gate or B gate.
20. Curve： DAC or AVG
21. Ruler Start Scale：Unit: mm
22. Ruler End Scale: Unit :mm
23. Ruler Type： ↓Depth，↘Sound path，→Projection

2.3 Menu Display

Press the menu key to enter the menu page, and use the arrow keys or digital rotary knob to select different function groups.

In the menu interface, press the menu key to return to the main interface.

2.4 Keys and Rotary Knob Features

The keyboard of this instrument has two modes of operation: "shortcut keys" and " Rotary Knob ". Some keys have two functions. You can select the second function by "double-clicking" or pressing the "Fn" key. The key positions are shown in the figure below.
This design allows direct access to important instrument set-up parameters and provides easy and fast operating in difficult inspection environments.

"Fn" key is invalid	←→	Adjust the width of the gate A
	Rotary knob	Adjust the position of the gate A
	Rise Gate	Adjust the height of the gate A
	Down Gate	
"Fn" key is valid	←→	Adjust the width of the gate B
	Rotary knob	Adjust the position of the gate B
	Rise Gate	Adjust the height of the gate B
	Down Gate	

Under the main page, if there is a single gate, the “left and right direction keys” adjust the width of the gate, the “Rotary knob” adjusts the position of the gate, and the “gate raise” and “gate lower” adjust the height of the gate. If it is a double gate, press the above button to adjust gate A.

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Functions of the keys:

⏻	Press and hold for 2 seconds to turning the instrument On/Off.
MENU	Enter the menu page. Returns to the main screen.
DB+ DB−	Increase/decrease gain.
ESC	Cancel key. Home page status switch full screen.
OK	Confirm key.
⚙	Base function selecting
⌸	Probe function selecting
🎥	Clicking the button under any page is the "screenshot" function. Double-click or "Fn+this button" to enter the "Record" function group.
DAC AVG	Click to switch between "DAC function group" and "AVG function group".
«	Single gate, "Fn" is invalid: the gate is raised Single gate, "Fn" is valid: the image moves to the left Double gate, "Fn" is invalid: gate A is raised Double gate, "Fn" is valid: gate B is raised
»	Single gate, "Fn" is invalid: the gate is lowered Single gate, "Fn" is valid: the image moves to the right Double gate, "Fn" is invalid: gate A is lowered Double gate, "Fn" is valid: gate B is lowered
Channel	"Fn" is invalid: Save the channel "Fn" valid: Load the channel
REP	"Fn" is invalid: Save the report "Fn" valid: Load the report
🔍	Magnify the waveform in the current gate to the full screen.

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📈	"Fn" is invalid: Switch Envelope function ON / OFF. "Fn" is valid: Switch Peak-Hold function ON / OFF.
Fn	The second function key can achieve more functions in conjunction with other keys.
80% AUTO dB	Auto-Gain key starts or stops the Auto-Gain function
Δ	Switch the dB step.
❄	Switch freezes function ON / OFF
Rotary knob	Turn clockwise: increase the selected parameter, or change the selection.
	Turn counter-clockwise: decrease the selected parameter, or change the item selection.
	Single press: Equivalent to the OK key.

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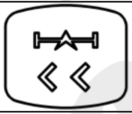
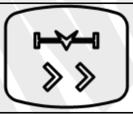
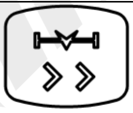
Shortcut list

UI	Fn Status	KEY	Function	Notes
Main display	random	DAC AVG	Loop open DAC or AVG	
			Loop open Envelope or Peak-Hold	✸ Envelope ▲ Peak-Hold
Main display	invalid		Screenshot and save to U disk	
	valid		Open the video menu	
	invalid	Channel	Save channel data	
	valid		Open the select channel menu	
	invalid	REP	Save current report	
	valid		Open the report menu	
	invalid		Gate A is raised	Single gate
	valid		Image left	
	invalid		Gate A is raised	Double gate
	valid		Gate B is raised	
	invalid		Gate A down	Single gate
	valid		Image right	
	invalid		Gate A down	Double gate,
	valid		Gate B down	
DAC AVG Curve making dialog	random	△	Save calibration points	
		▽	Delete calibration points	
Text input dialog	random	DB+	Case switch	
		DB−	backspace	
Record and playback	random	OK	Pause/continue	
Main display	random	ESC	Full screen	

2.5 Alarm Lights

Two alarm lights appear at the below the the instrument’s keypad. One alarm light is marked as ALARM, which is assigned to the gate alarm. When a gate alarm is triggered, this light will illuminate. The other light is marked as CHARGE indicating battery status.

STATUS	ALARM LED	CHARGE
Gate alarm	Red on	×
Battery charging	×	Yellow on
Battery charge completed	×	Blue on
No external power	×	×

2.6 Rotating bracket

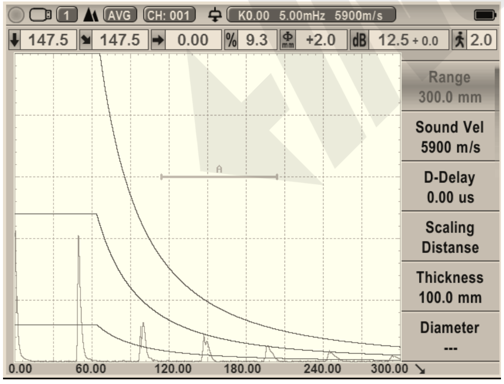
During flaw detection, you can adjust the rotation angle of the rotating bracket to obtain a proper viewing angle, so as to control the instrument more conveniently and comfortably.

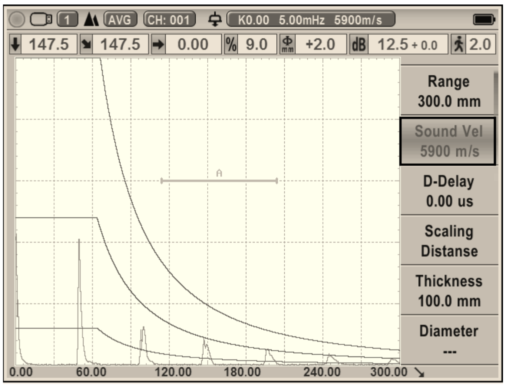
Two set screws are used to fix the bracket and generate a certain rotational torque. If the torque of the rotating bracket needs to be adjusted, it can be achieved by tightening or loosening these two set screws.

2.7 Parameter Item Selection

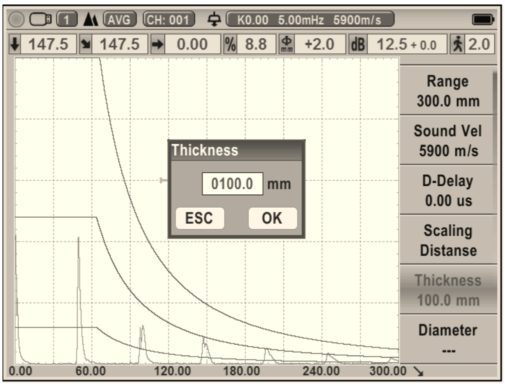
Any parameter item can be selected using shortcut key, function group selection key and function item selection key.

Press the △▽ key on the main interface to select parameter items.





Press the "OK" key or press the rotary knob key, the instrument will pop up the parameter dialog box, as shown in the figure below



0100.0 mm

Range 300.0 mm

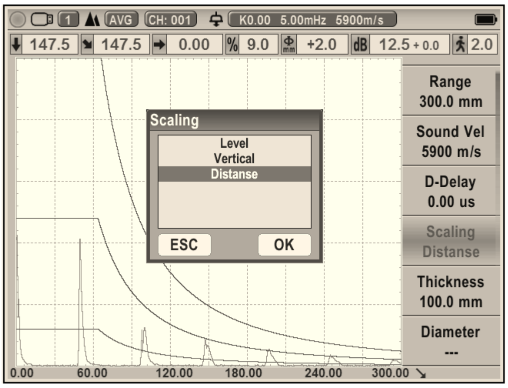
Sound Vel 5900 m/s

D-Delay 0.00 us

Scaling Distanse

Thickness 100.0 mm

Diameter ---



Range 300.0 mm

Sound Vel 5900 m/s

D-Delay 0.00 us

Scaling Distanse

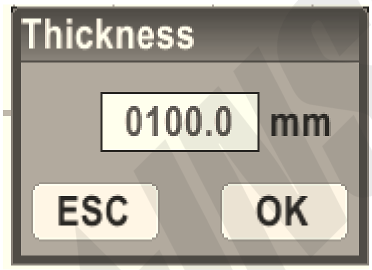
Thickness 100.0 mm

Diameter ---

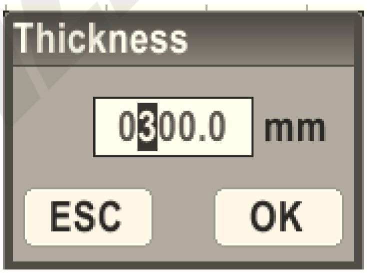
2.8 Parameter setting

Parameter values can be changed by turning Rotary knob after the parameter item is selected. The values will take effect immediately. Parameters of the device are interrelated, if there is incorrect parameter, device will correct it immediately, or pop up error message.

For dialogs with numerical values, move the cursor with the "left or right " key, change the numerical value with the wheel key, OK" key to change the parameter, and "ESC" to cancel the change.

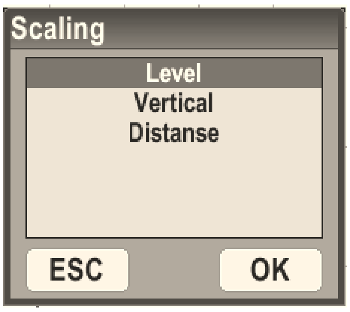


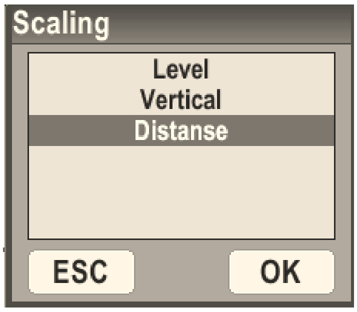
0100.0 mm



0300.0 mm

For dialog boxes with options, move the options through the "up or down" key or "turn the wheel", "OK" key to change the parameter, and "ESC" to cancel the change.

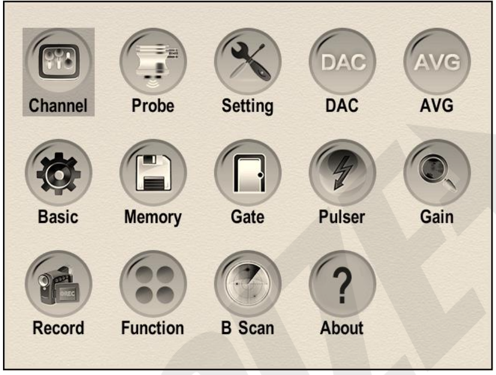




For dialog boxes with switch options, move the options through the "left or right " key or " rotation knob", "OK" key to change the parameter, and "ESC" to cancel the change.

3 Use of function groups

The menu page displays the icons of all function groups. Select the corresponding function group icon to enter the function group. The following is a detailed description of how to use each functional group.



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3.1 Channel Function Group

Implement：“MENU” Key--->>Select the "Channel" icon

Hot key：

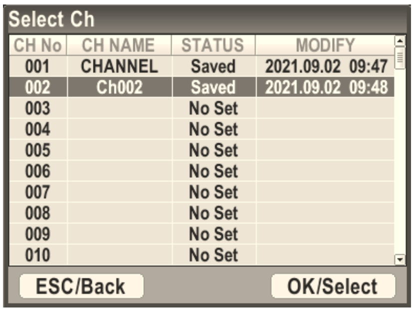
When Fn is invalid, the parameters saved to the current channel,
When Fn is valid, load all channel lists

Explanation: Because it is often necessary to detect multiple workpieces and replace multiple probes during on-site flaw detection, it is necessary to test and store multiple sets of flaw detection settings according to different situations when the instrument is adjusted. One channel can store a set of flaw detection process data, and multiple channels can pre-test and store multiple sets of different flaw detection settings, which can be directly recalled on site without the need to debug the instrument. The channel number is displayed with the CHxxx icon at the top of the screen.

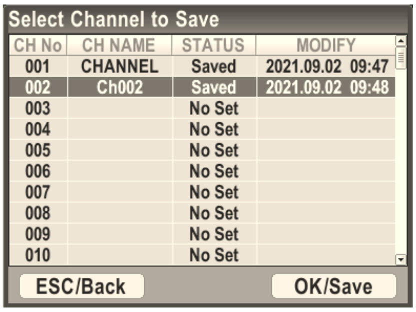
ItemsList: Select Ch Save Ch Rename Ch Delete Ch Delete All Export Ch Import Ch Export All Import All

3.1.1 Select Ch

CH No: Number of channels 1-500
CH NAME: Channel name, can be modified
STATUS:
No Set-- This channel has no user parameters, only the factory configured default parameters
Saved--This channel already has channel parameters saved by the user
MODIFY: Date and time when the user saved the channel



CH No	CH NAME	STATUS	MODIFY
001	CHANNEL	Saved	2021.09.02 09:47
002	Ch002	Saved	2021.09.02 09:48
003		No Set	
004		No Set	
005		No Set	
006		No Set	
007		No Set	
008		No Set	
009		No Set	
010		No Set	



CH No	CH NAME	STATUS	MODIFY
001	CHANNEL	Saved	2021.09.02 09:47
002	Ch002	Saved	2021.09.02 09:48
003		No Set	
004		No Set	
005		No Set	
006		No Set	
007		No Set	
008		No Set	
009		No Set	
010		No Set	

3.1.2 Save Ch

Save the current detection parameters to any one of the 500 channels, press the "OK" key to save, and the "ESC" key to close the channel list.

3.1.3 Rename Ch

Select a channel in the list, press the "OK" key to rename it, and the "ESC" key to close the channel list.

"DB+"key to switch between upper and lower case,
"DB-" key to delete
<u>Channels that have not been set up cannot be renamed</u>

3.1.4 Delete Ch

Select a channel in the list, press the "OK" key to delete it, and the "ESC" key to close the channel list.。

3.1.5 Export Ch

Select a channel in the channel list, press the "OK" key to export the channel parameters to the U disk, and the "ESC" key to close the channel list.

This function is used to transfer the parameters of one instrument to the second instrument via a USB flash drive, without the need to debug the second instrument.

3.1.6 Import Ch

Select a channel in the list, press the "OK" key to import the parameters from the U disk to this channel, and the "ESC" key to close the channel list.

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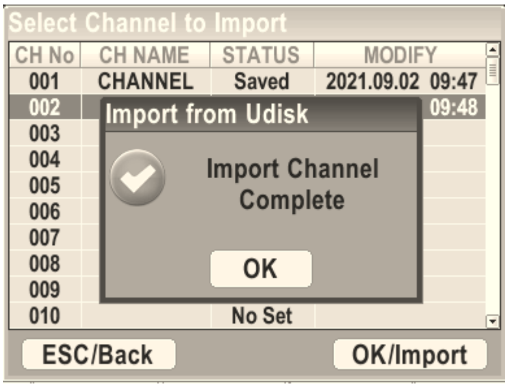
CH No	CH NAME	STATUS	MODIFY
001	CHANNEL	Saved	2021.09.02 09:47
002			09:48
003			
004			
005			
006			
007			
008			
009			
010		No Set	

Export Channel Complete



CH No	CH NAME	STATUS	MODIFY
001	CHANNEL	Saved	2021.09.02 09:47
002			09:48
003			
004			
005			
006			
007			
008			
009			
010		No Set	

Import Channel Complete

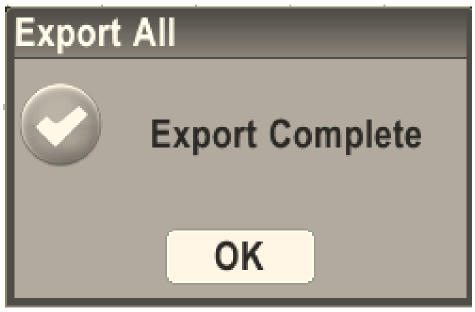
3.1.7 Export All

Export all channel parameters to U disk and press "OK" to confirm the export.

This function is used to backup instrument parameters, or to transfer parameters between two instruments.

Export All

Export to Udisk



Export All

Export Complete

3.1.8 Import All

Import all the channel parameters from the U disk to the instrument, and press the "OK" key to confirm the import.

3.2 Probe Function Group

Implement：“MENU” Key--->>Select the "Probe" icon

Hot key：

Explanation: Set all options about the probe.
ItemsList: Probe Type Probe kValue Probe Delay Probe xValue Probe Freq Probe Size Probe Damp Calibrate Probe Name

3.2.1. Probe Type

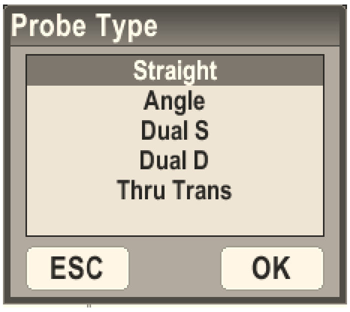
Straight : single-element straight transducer，

Angle: single-element angle transducer，

Dual S: dual-element (TR) straight probes，

Dual D: dual-element (TR) angle probes，

Thru Trans: Through-transmission mode for the use with two single-element probes; the receiver is connected with right, the pulser is connected with left。

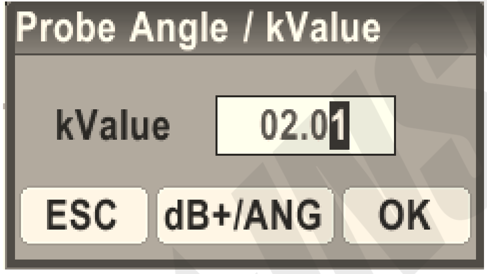


Probe Type

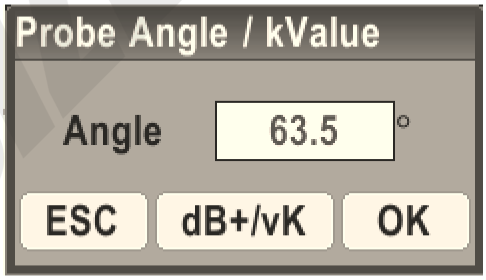
3.2.2. Probe kValue

There are three nominal methods for angle probes:
1. Nominal by the incident angle α_L;
2. Nominal by the shear wave refraction angle β_s;
3. Nominal by the K value （$K = tg\beta_s$）.

This instrument uses the latter two.
The K value of the probe and the refraction angle are related to each other. Different angle probes have different refraction angles, and their K values are also different. For example, K2 indicates that the K value of the angle probe is equal to 2, and its refraction angle is 63.4°; the refraction angle corresponding to K1 is 45°; the refraction angle corresponding to K1.5 is 56.3°. The refraction angle of the straight probe is 0°, the K value is also 0, so the straight probe does not need K value calibration.
Each probe has a set of data symbols to illustrate its "identity".
2.5P13×13K2 is an angle probe, K represents the slope, and its value is 2. The piezoelectric chip used is a square chip with a size of 13×13mm and the frequency is 2.5MHz. The corresponding parameters can be input into the instrument according to the "identity" value of the probe.
The "identity" value of the probe, especially the K value, has a certain error with the actual value. In order to accurately locate the position of the defect during flaw detection, the probe can be accurately calibrated.



kValue 02.01



Angle 63.5 °

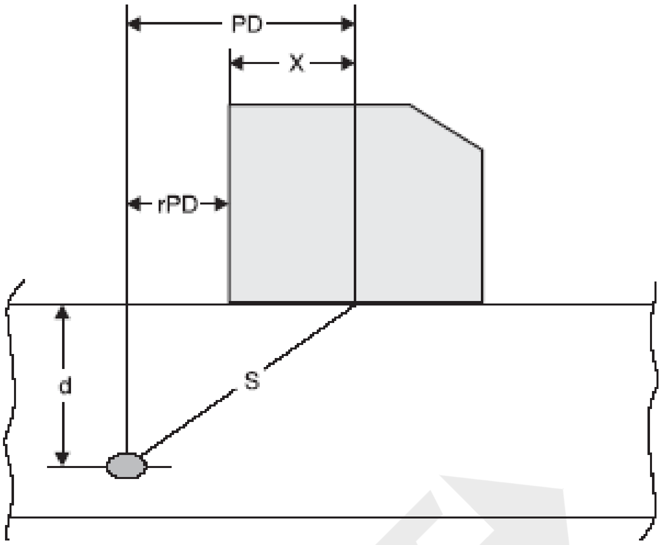
3.2.3. Probe Delay(Zero Point)

"Probe delay" is the distance between the transducer element and the coupling face (including the thickness of the probe protective film and the thickness of the couplant). The unit is microseconds.
In order to accurately locate the defect of the workpiece, the probe should be calibrated before testing, and the actual "probe delay" should be measured.

Notice:
After replacing the probe, the zero point must be adjusted;
After the probe is calibrated, do not change it at will, otherwise it will affect the measurement accuracy.
Setting range: 0us ~ 99.99us

3.2.4. Probe xValue

xValue: The distance X from the incident point of the angle probe to the foremost end of the probe. As shown below.



The xValue can be entered when calibrating the probe or in the function menu.
Note: If the xVvalue has been entered, the horizontal distance value (rPD) in the display area will be the value minus the xValue.
If the xValue parameter input is inaccurate, it will affect the horizontal position value of the defect.
Setting range: 0~99.99 mm

3.2.5. Probe Freq

Probe frequency: The natural (resonant) frequency of the piezoelectric chip in the probe.
The higher the probe frequency, the higher the frequency and the smaller the wavelength of the generated ultrasonic signal, which can detect smaller defects;
However, the higher the frequency of the probe, the greater the sound attenuation of the ultrasonic signal it generates when propagating in the material, and the weaker the echo signal.
The instrument must input the correct probe frequency to match the filter frequency band of the system.
The correct frequency value will obtain the best signal-to-noise ratio and resolution.

Incorrect frequency values will produce unpredictable detection errors!

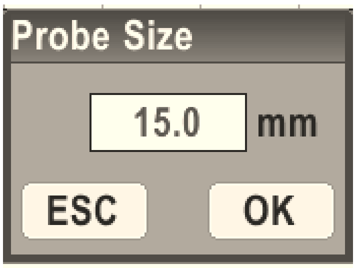
Setting range: 0.2MHz ~20MHz

INSIZE

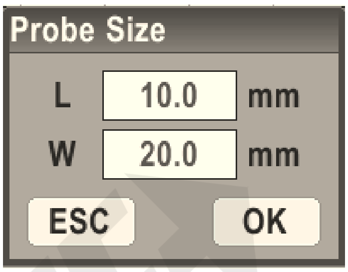
3.2.6. Probe Size

The probe size refers to the size of the crystal in the probe.
Straight probe is expressed by diameter. For example, Φ20 means that the crystal diameter of the straight probe is 20mm.
Angle probe is expressed by length×width, such as "12×9K2" means that the length of the crystal is 12mm, the width is 9mm, and the K value is 2.

The probe frequency and probe size determine the length of the near-field zone, which are important parameters for making the AVG curve, and must be entered correctly. These two parameters also need to be entered in the wizard for making AVG curves.


Probe Size

15.0 mm


Probe Size

L 10.0 mm

W 20.0 mm

3.2.7. Probe Damp

The probe damping is used to match the ultrasonic probe, and the damping is adjusted to adapt to the sound impedance of the measured material, thereby improving the amplitude, width and resolution of the echo signal display.
Setting range:：50Ω、150Ω、300Ω、400Ω。

3.2.8. Probe Name

Used to display the name of the probe in the flaw detection report。

3.2.9. Probe Calibrate

The probe needs to be calibrated when it is used for the first time. This instrument uses the wizard mode for calibration, and the instrument automatically selects the calibration method according to the probe type.

Note: The dual crystal probe has a focal depth. When measuring the zero point and sound velocity, pay attention to selecting a test block close to the focal depth for measurement, otherwise the measured zero point and sound velocity may have a large error.

For the detailed steps of probe calibration, please refer to the subsequent introduction.

3.3 Setting function group

Implement： “MENU” Key--->>Select the "Setting" icon
Explanation: Related options for the parameters of this instrument

3.3.1 Language

Language selection: Chinese or English

3.3.2 Test Unit

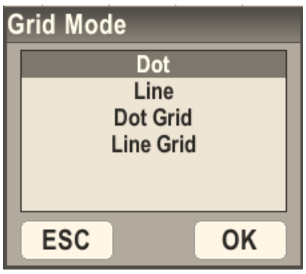
Metric or Inch

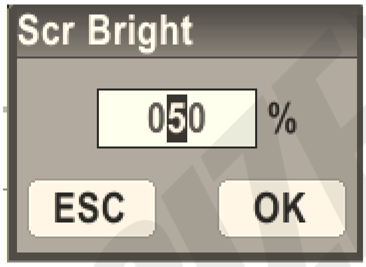
3.3.3 Grid Mode

Set the coordinate and grid display mode。

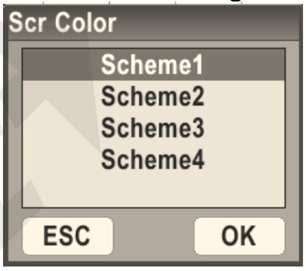
3.3.4 Scr Bright

It can be adjusted continuously from 20% to 100%. The difference in screen brightness will affect the battery's standby time and continuous working time.





050 %



3.3.5 Scr Color

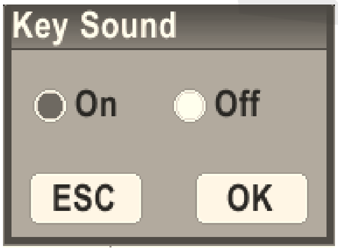
There are 4 display styles to choose from.

3.3.6 Key Sound

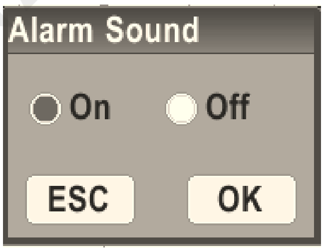
On or Off

3.3.7 Alarm Sound

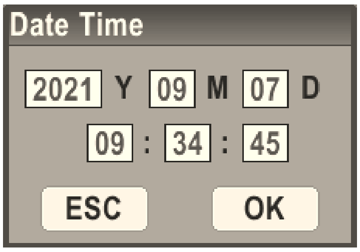
On or Off



● On ○ Off



● On ○ Off



2021 Y 09 M 07 D
09 : 34 : 45

INSIZE

3.3.8 Date Time

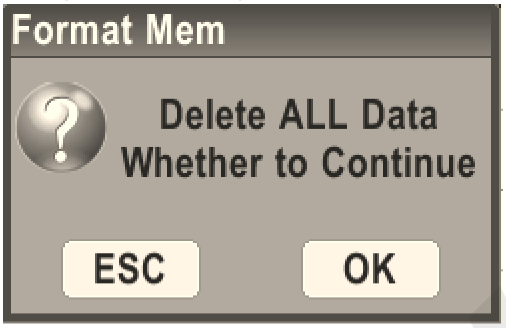
Press the "Left" or "Right" key to switch options, and turn the wheel to change the value.

3.3.9 Comm Port

Please set it to off, it will not affect normal communication.

3.3.10 Format Mem

The internal memory of the instrument contains channel data, report data, video data, etc. When storage errors occur, the memory needs to be formatted. Formatting the memory will clear all data.。



Delete ALL Data
Whether to Continue

Format Complete
MemSize: 119208 KB

3.3.11 ScrShor Mode

The screenshot picture can be set as a grayscale picture or a color picture.

Press the "Screenshot/Video" shortcut key to convert the screen image into a picture file in BMP format and save it to the U disk.

INSIZE

3.4 DAC function Group

Implement：“MENU”Key--->>Select the "DAC" icon

Hot key：

Explanation: Distance Amplitude Curve (DAC) function

DAC is a curve that describes the relationship between the distance from the reflection point to the wave source, the echo height, and the equivalent size. Defects of the same size have different echo heights due to different distances. Therefore, the DAC curve is very useful for the determination of flaw detection.

A DAC curve is programmed using a series of same-reflector echoes at various depths covering the range of depths to be inspected in the test material. Because near field and beam spread vary according to transducer size and frequency, and materials vary in attenuation and velocity, DAC must be programmed differently for different applications. A DAC curve can be based on up to 16 data points (material depths).These points are recorded from the DAC menu as described below.

ItemsList: DAC set Standard DAC Build DAC Edit Size Ref Curve RL Curve Sl Curve EL Curve No4 Curve No5 Curve No6

3.4.1 DAC Set

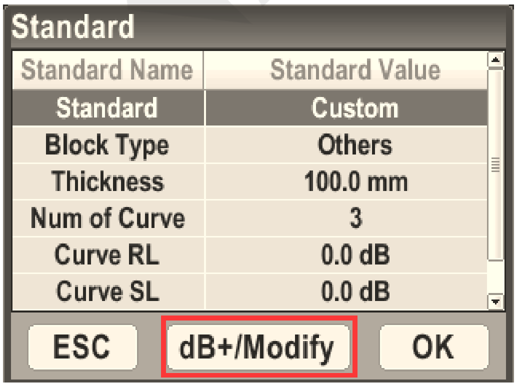
On or Off

The DAC curve can be build and edit only when the DAC is on. After the DAC is on, an DAC icon will be displayed at the top of the screen. DAC curve build may use shortcut keys to adjust gain, gate position/width/height, peak memory, etc.

3.4.2 Standard

"Up and down" keys move options, and "dB+" keys change options.

Other options can only be changed when "Custom" is selected as the standard.

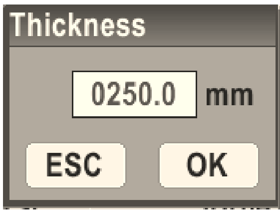


Standard

Standard Name	Standard Value
Standard	Custom
Block Type	Others
Thickness	100.0 mm
Num of Curve	3
Curve RL	0.0 dB
Curve SL	0.0 dB

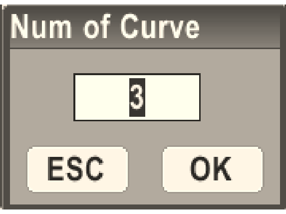
Standard

Custom
GB/T11345-2013
NB/T47013.3-2015
JG/T3034-2005
SY/T4109-2013
CB/T3559-94



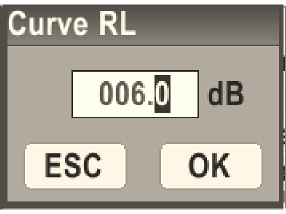
Thickness

0250.0 mm



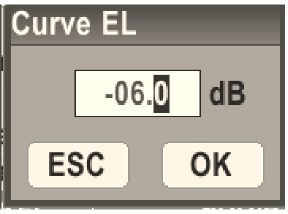
Num of Curve

3



Curve RL

006.0 dB

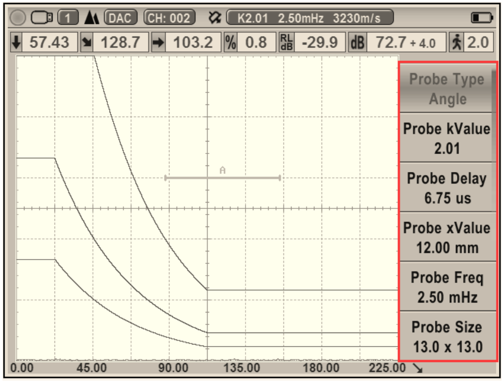


Curve EL

-06.0 dB

3.4.3 DAC Build

First input the probe frequency correctly, then calibrate the probe zero point, sound velocity and angle, and then enter the DAC curve build wizard.



Probe Type
Angle

Probe kValue
2.01

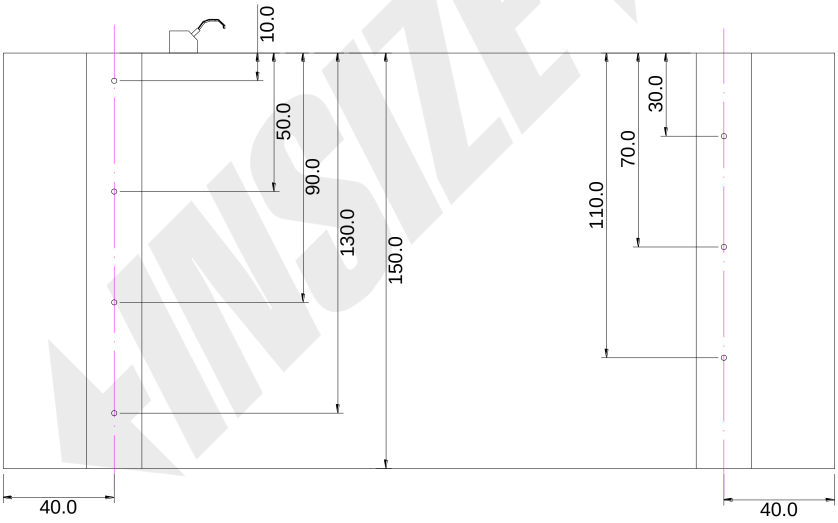
Probe Delay
6.75 us

Probe xValue
12.00 mm

Probe Freq
2.50 mHz

Probe Size
13.0 x 13.0

DAC Curve points are typically taken from a standard with equally sized reflectors (holes) located at various material depths. The primary echo from each of these points (for up to a total of 16 echoes) are recorded. When DAC is active, the instrument displays a curve that represents echo peaks for constant reflectors at varying material depth.



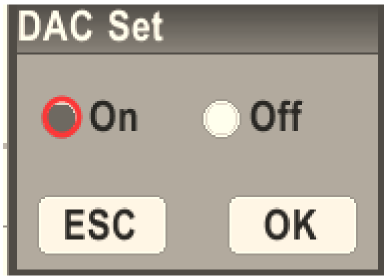
XINSIZE

CSK-ⅢA test block

Take 2.5M angle probe and CSK-ⅢA test block as an example to make DAC curve.

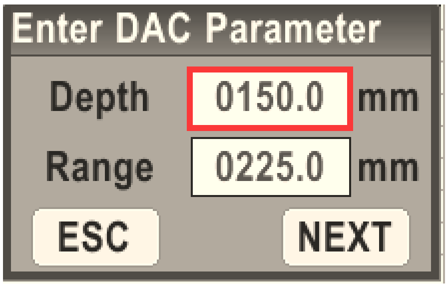
Step 1:DAC Set　On

Step 2: Perform DAC build



DAC Set

● On　○ Off



Enter DAC Parameter

Depth 0150.0 mm

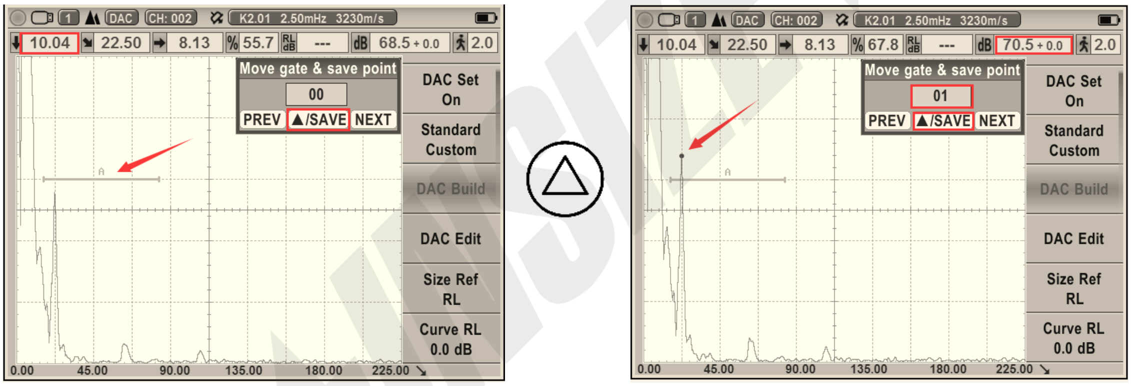
Range 0225.0 mm

Enter the maximum depth of the test block as prompted by the display screen. The height of the test block for CSK-3A is 150mm. After entering 150mm, press the "OK" key to enter the next step.

Step 3:

The screen prompts that the reference point is 0.

Place the angle probe on the CSK-3A test block so that it faces the short horizontal hole 10mm deep and place it on a suitable horizontal position. Move the probe repeatedly to find the highest echo of the hole.



Move gate & save point 00

Move gate & save point 01

Use the rotary wheel to adjust the gate width so that it covers the highest echo.

Press Auto gain the echo height to 80%. According to the screen prompts, press the key to save the reference point. The screen prompts that the reference point is 1. Indicates that one reference point has been successfully entered.

Useful skills:

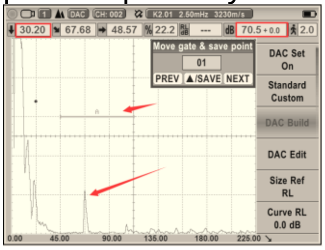
Press the key to turn on the “Peak Hold” function to help you quickly find the highest echo of the hole.

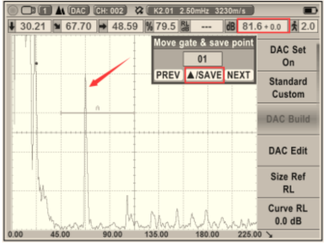
Press the key to delete this reference point.

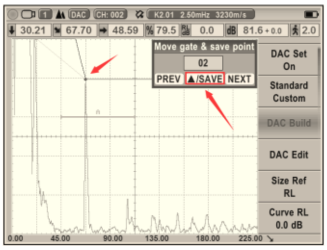
Step 4:

The screen prompts that the reference point is 1.

Reverse the direction of the probe so that it faces the short horizontal hole at a depth of 30mm, and and place it on a suitable horizontal position. Move the probe repeatedly to find the highest echo of the hole.

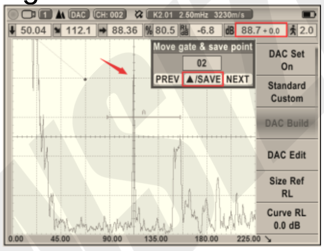


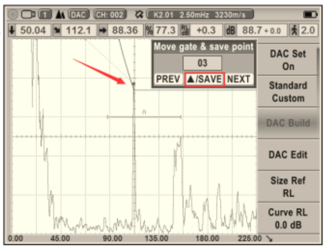




Use the rotary wheel to adjust the gate width so that it covers the highest echo. Press 80% AUTO dB Auto gain the echo height to 80%. According to the screen prompts, press the △ key to save the reference point. The screen prompts that the reference point is 2. Indicates that two reference point has been successfully entered.

Step 5:
The screen prompts that the reference point is 2.
Reverse the direction of the probe so that it faces the short horizontal hole at a depth of 50mm, and and place it on a suitable horizontal position. Move the probe repeatedly to find the highest echo of the hole.

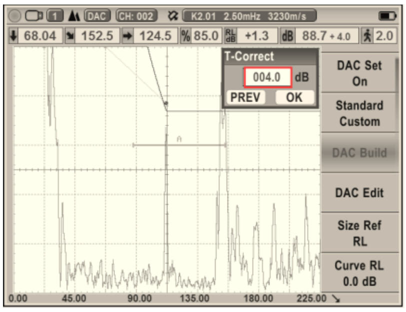


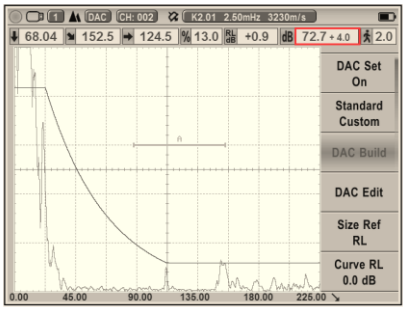


Use the rotary wheel to adjust the gate width so that it covers the highest echo. Press 80% AUTO dB Auto gain the echo height to 80%. According to the screen prompts, press the △ key to save the reference point. The screen prompts that the reference point is 3. Indicates that three reference point has been successfully entered.
There are 16 reference points for the DAC curve at most. According to the actual situation, 3~5 points are enough.

press the OK key to enter the next step.

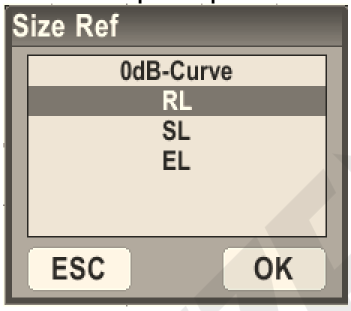
Step 6: After the 3 reference point collection is completed, you can continue to collect more reference points, or you can press the "OK" button to complete the collection and enter the next step, enter the ***surface compensation gain*** value”T-Correct”, generally 4db. Press the "OK" button to complete the DAC reference point data collection. The curve displayed at this time is the original DAC curve (0dB-Curve) of Φ1×6mm.





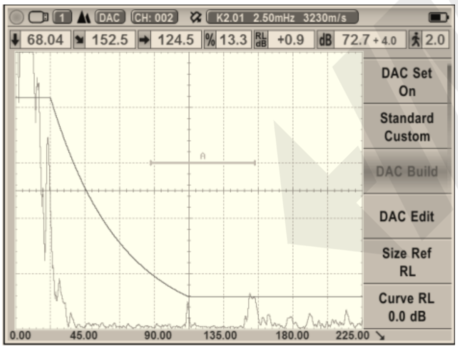
If you need to modify the reference point of the DAC curve, you can follow the DAC edit prompts.

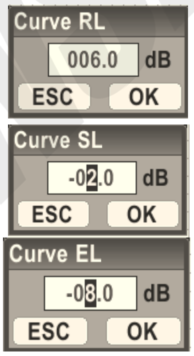
Step 7: Select "Size Ref", the screen prompts



Step 8: Set RL SL EL

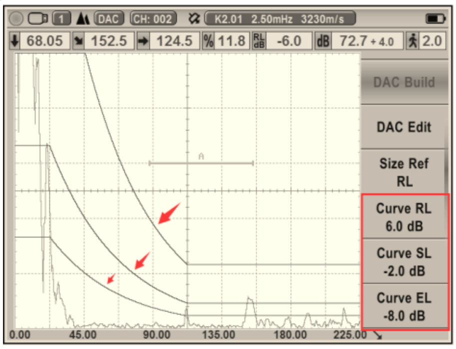
When operating with DAC turned on, three DAC curves including RL, SL and EL are typically displayed. The three curves can be offset from the original DAC curve (ML) by a user-inputted amount.




Curve RL 006.0 dB

Curve SL -02.0 dB

Curve EL -08.0 dB



Step 9: Press the key to save the curves parameters to the current channel.

Echo Evaluation with DAC

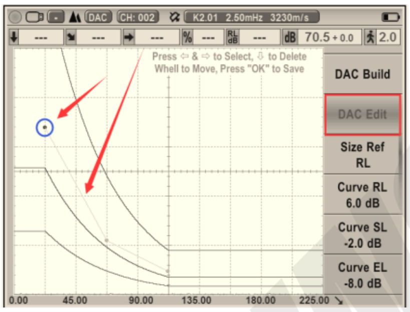
In order to be able to evaluate a flaw indication by means of the DAC, certain conditions must be met.

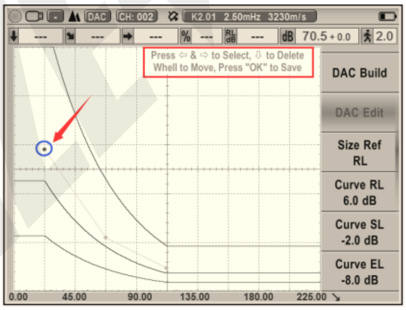
- The DAC curve must already be recorded.
- It only applies to the same probe that was used when recording the curve. Not even another probe of the same type must be used.
- The DAC only apply to the material corresponding to the material of the reference block.

All functions affecting the echo amplitude must be set the same way as they were when the curve was recorded.

3.4.4 DAC Edit

If the deviation between the DAC curve and the actual echo is large, the edit function can be used to make partial adjustments. Please follow the instructions displayed on the wizard.


Press ⇦ & ⇨ to Select, ⇩ to Delete
Whell to Move, Press "OK" to Save


Press ⇦ & ⇨ to Select, ⇩ to Delete
Whell to Move, Press "OK" to Save

INSIZE

3.5 AVG Function Group

Implement：“MENU” Key--->>Select the "AVG" icon

Hot key：DAC AVG

Explanation:

Using the AVG (the same as DGS) function, you can compare the reflecting power of a natural flaw in the test object with that of a theoretical flaw (circular disk-shaped equivalent reflector) at the same depth.

Note: You are comparing the reflecting power of a natural flaw with that of a theoretical flaw. No definite conclusions may be drawn on the natural flaw (roughness, inclined position, etc.).

The so-called AVG diagram forms the basis for this comparison of the reflecting power. This diagram consists of a set of curves showing the correlation of three influencing variables:

- Distance between the probe and circular disk-shaped equivalent reflector
- Difference in gain between various large circular disk-shaped equivalent reflectors and an infinitely large backwall
- Size of the circular disk-shaped equivalent reflector. The influencing variable always remains constant for one curve of the set of curves.

The advantage of the AVG method lies in the fact that you can carry out reproducible evaluations of small discontinuities. The reproducibility is most of all important, for example, whenever you aim to carry out an acceptance test.

Apart from the influencing variables already mentioned, there are other factors determining the curve shape: sound attenuation, transfer losses, amplitude correction value, probe and etc.

The following probe parameters affect the curve shape:

- Element or crystal diameter
- Frequency
- Delay length
- Delay velocity

You can adjust these parameters on the instrument in such a way that you can use the AVG method with many different probes and on different materials.

Note: Before setting the AVG function, the instrument must first be calibrated because all functions affecting the AVG evaluation mode (VEL, P-DELAY, DAMPING, ENERGY, P-WIDTH, FREQ, DIAMETER, RECTIFY) can no longer be changed after the reference echo has been recorded.

3.5.1 AVG Set

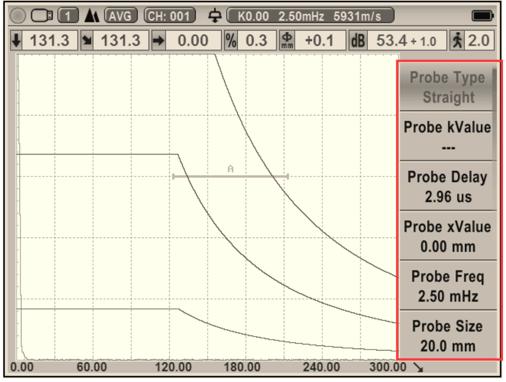
On or Off

The AVG curve can be build and edit only when the AVG is on. After the AVG is on, an AVG icon will be displayed at the top of the screen. AVG curve build may use shortcut keys to adjust gain, gate position/width/height, peak memory, etc.

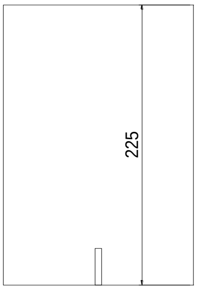
INSIZE

3.5.2 AVG Build

First input the probe frequency correctly, then calibrate the probe zero point, sound velocity and angle, and then enter the AVG curve build wizard.



Probe Type Straight
Probe kValue ---
Probe Delay 2.96 us
Probe xValue 0.00 mm
Probe Freq 2.50 mHz
Probe Size 20.0 mm



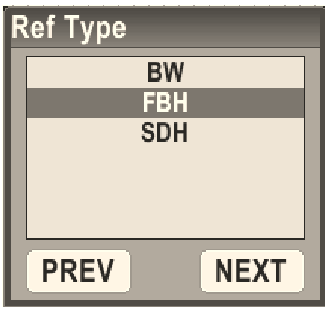
Take 2.5M Straight probe and CSK-1-5 test block as an example to make AVG curve.

Step 1:AVG Set On

Step 2: Perform AVG build

Avg Set
● On ○ Off

AVG SET
ProbFreq 02.50 mHz
ProbSize 20.0 mm
SoundVel 05931 m/s
MaxDeep 00250.0 mm
Ref Dia 002.0 mm
Near3 Field 126.45 mm



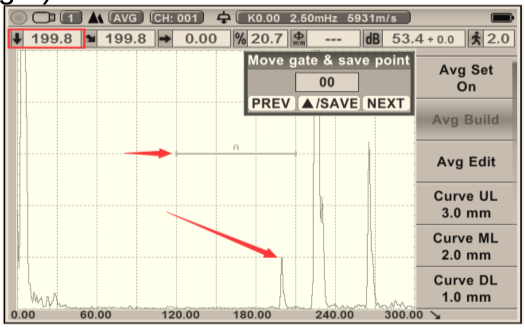
Ref Type
BW
FBH
SDH

Before using the AVG feature to evaluate reflectors in test pieces, the characteristics of the attached probe must be specified, certain characteristics of the reference standard must be input, and a reference echo must be stored. You must input the characteristics for the probe you've connected including:

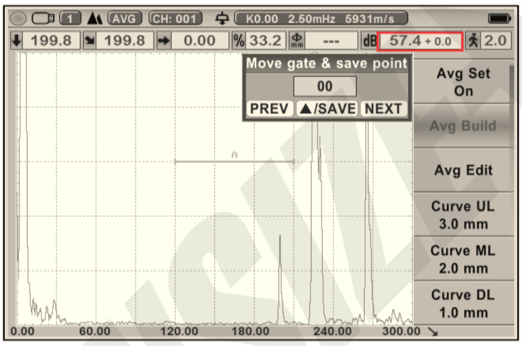
ProbeFreq- The probe's frequency rating
ProbeSize – The probe element's effective diameter rating.
Ref Dia– The probe
MaxDeep–Must be greater than the thickness of the CSK-1-5 test block
Ref Type
    BW – Backwall echo with reference defect size defined as infinity
    FBH – Flat Bottom Hole with a reference defect size equal to the hole's facial diameter.
    SDH – Side Drilled Hole with a reference defect size defined as the hole's diameter.

Step 3: Couple the probe to the CSK-1-5 standard test block , capture the reference flaw so that its reflected echo is displayed on the instrument's A-Scan, and adjust selected Gate's starting point to ensure that the resulting echo triggers the gate.

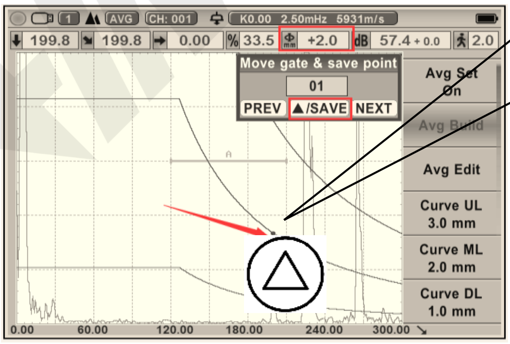
Step 4: Adjust the gain until the reference flaw's A-Scan peak measures 60% of FSH (Full Screen Height).



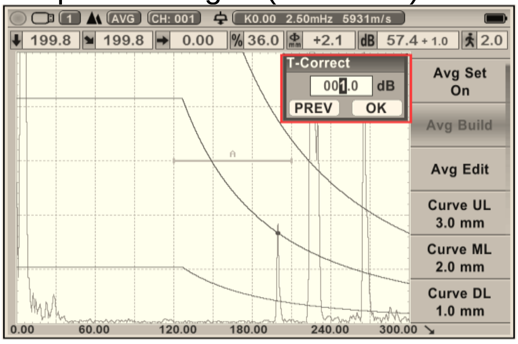
DB+



Measurement points less than the near3-field cannot be saved!

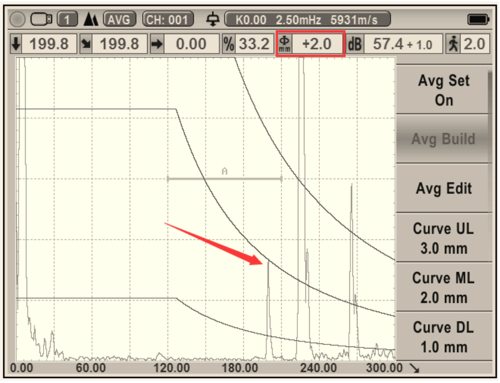


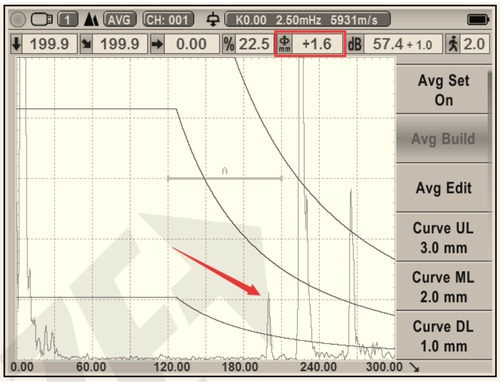
Step 5: Input surface compensation gain(T-Cerrect)



Step 6: Press OK to complete the AVG curve build.Press the Channel key to save the curves parameters to the current channel.

Once the AVG curve is recorded and displayed, the instrument automatically calculates the straight value and position of the defect, and displays it on the status bar in real time.
Echoes are automatically compared to the AVG curve and evaluated based on the recorded reference. The result is shown as ERS (Equivalent Reflector Size), which evaluates the reflected echo and calculates the equivalent reflector size.

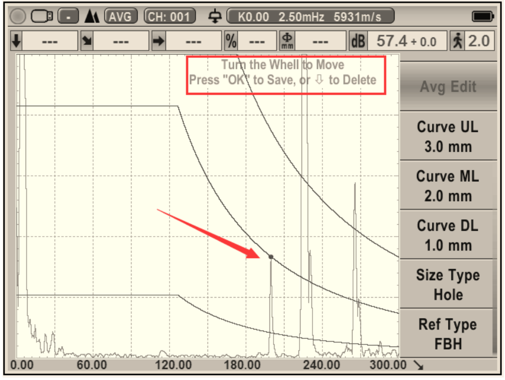


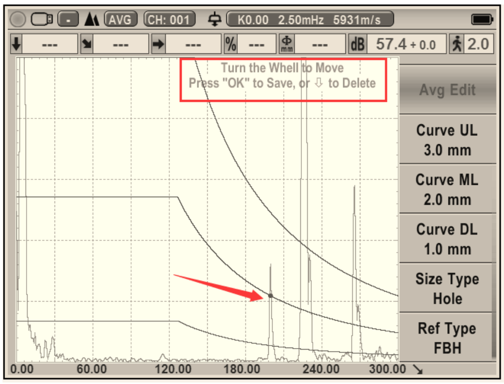


When building the AVG curve, you must pay attention to whether the frequency of the straight probe and the size of the chip are correct.
This instrument only calculates the value after the near-field area, and only displays the value before the near-field area as a straight line. If the thickness of the test block used is small, it is necessary to use multiple echoes to select the test point so that the desired echo is behind the near-field area.

3.5.3 AVG Edit

If the deviation between the AVG curve and the actual echo is large, the edit function can be used to make partial adjustments. Please follow the instructions displayed on the wizard.


Turn the Whell to Move
Press "OK" to Save, or ⇩ to Delete


Turn the Whell to Move
Press "OK" to Save, or ⇩ to Delete

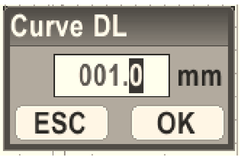
3.5.4 AVG UL、AVG ML、AVG DL


Curve UL

003.0 mm

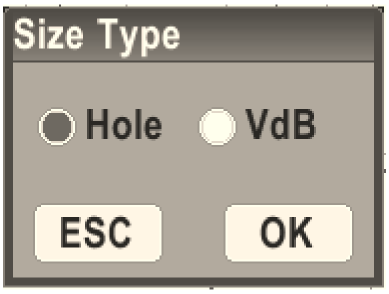

Curve ML

002.0 mm


Curve DL

001.0 mm

3.5.5 Size Type


Size Type

● Hole ○ VdB

3.6 Basic Function Group

Implement：“MENU” Key--->>Select the "Basic" icon

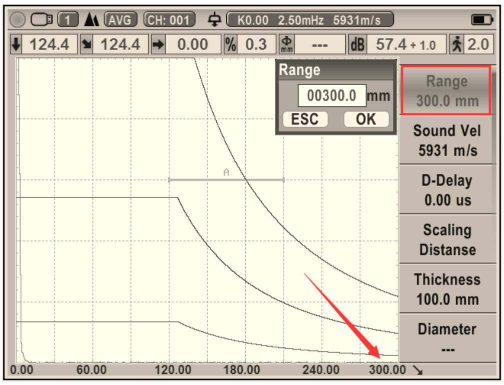
Hot key：

Explanation: Basic settings before testing

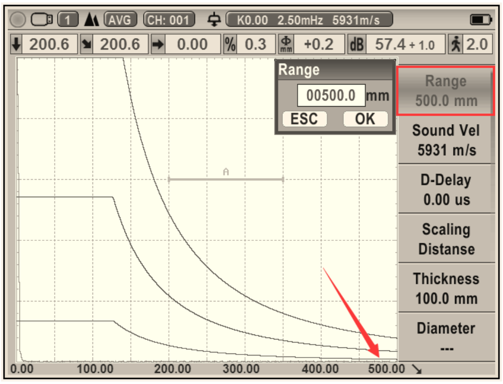
WINSIZE

3.6.1 Range

The detection range should be adjusted according to the thickness of the workpiece. After the detection range changes, the echo position displayed on the screen will change accordingly. If the DAC/AVG curve is turned on, the DAC/AVG curve will also change accordingly.
Setting limit: 2.5mm~15000mm (speed of sound 5900m/s)


Range

00300.0 mm


Range

00500.0 mm

3.6.2 Sound Vel

Sound velocity of test object is an important parameter in flaw detection. Always ensure that the Sound velocity is correctly set. The instrument calculates all range and distance indications on the basis of the value adjusted here.

The material sound velocity is divided into longitudinal wave sound velocity and transverse wave sound velocity. Straight probe uses longitudinal wave flaw detection, and angle probe uses transverse wave flaw detection.
When the speed of velocity changes, the maximum detection range also changes.

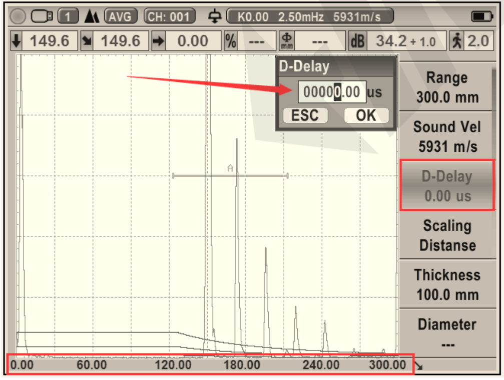
The following is the sound velocity of commonly used materials

2260m/s	0.089 in /µs	Transverse sound velocity in Copper
2730m/s	0.107 in /µs	Longitudinal sound velocity in plexiglass
3080m/s	0.121 in /µs	Transverse sound velocity in Aluminum
3230m/s	0.127 in /µs	Transverse sound velocity in steel
4700m/s	0.185 in /µs	Longitudinal sound velocity in copper
5920m/s	0.233 in /µs	Longitudinal sound velocity in steel
6300m/s	0.248 in /µs	Longitudinal sound velocity in aluminum

Sound Velocity limit：100m/s～20000m/s (measurement range:200mm)

3.6.3 Image movement(D-Delay)

The image movement operation can move the display position of the echoes left and right without changing the relative position and amplitude between the echoes. The echoes that are not of interest can be adjusted to the outside of the screen to focus and display the echo area of interest.
Here you can choose whether to display the adjusted range (for example 300 mm) starting from the surface of the test object, or in a section of the test object starting at a later point. This allows you to shift the complete screen display and consequently also the display zero. If the display should for example start from the surface of the test object, the value in D-DELAY must be set to 0.



D-Delay 00000.00 us

Range 300.0 mm

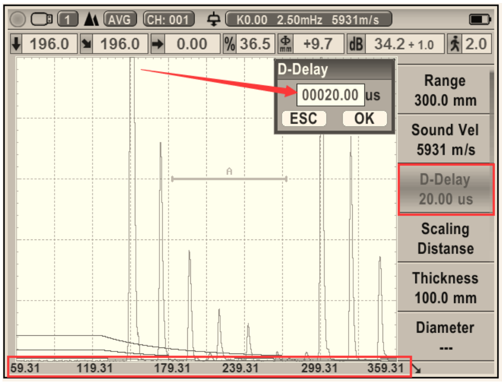
Sound Vel 5931 m/s

D-Delay 0.00 us

Scaling Distanse

Thickness 100.0 mm

Diameter ---



D-Delay 00020.00 us

Range 300.0 mm

Sound Vel 5931 m/s

D-Delay 20.00 us

Scaling Distanse

Thickness 100.0 mm

Diameter ---

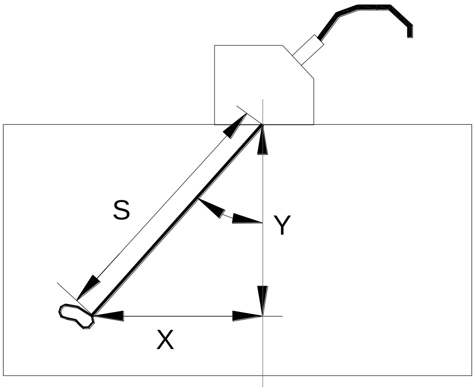
D-Delay limit：-20uS ~ 10000uS

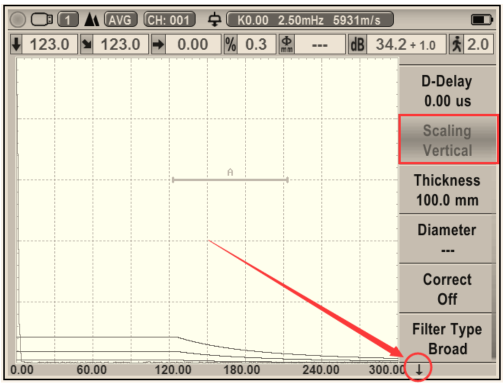
3.6.4 Scaling

The sound path indicates the transmission distance of the ultrasonic wave in the detected object.
According to geometric relationship,the sound path is divided into three types:

Distance sound path (S),
Vertical sound path (Y)
Horizontal sound path (X)

As shown in the figure below.




D-Delay 0.00 us

Scaling Vertical

Thickness 100.0 mm

Diameter ---

Correct Off

Filter Type Broad

3.6.5 Thickness

The thickness of the detected object is an important input parameter for the calculation of the number of echoes.

thickness Limit：1mm ~ 1000mm

3.6.6 Diameter

Diameter of the detected object can be set only when the Curved correction to an inner surface or an outer surface.

for example when testing longitudinally welded tubes. In order to make the instrument carry out the corresponding correction of (reduced) projection distance and depth, you should enter the outside diameter of your test object in this function.

Diameter Limit：0mm ~ 5000mm

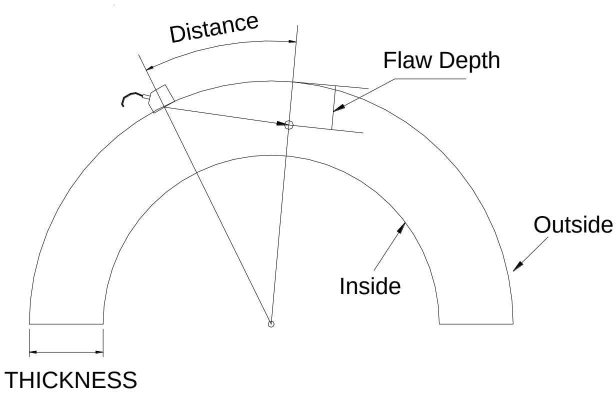
3.6.7 curved surface Correct

When using angle probe on a curved surface the instrument will calculate the surface distance and depth of defect, taking into account the internal or external radius.

Cured Correction function :Inner or Outer

Thickness: the material’s wall thickness. This value is required for the automatic calculation of the real depth.

Diameter: the material’s Diameter



INSIZE

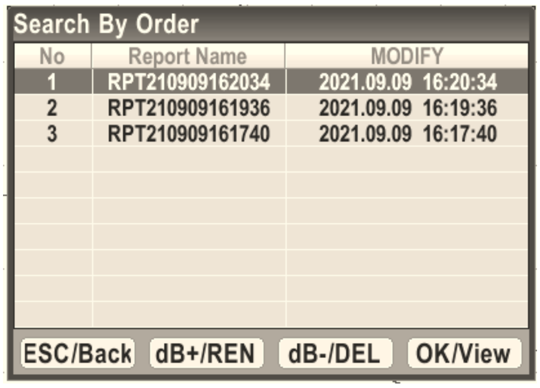
3.7 Memory Function Group

Implement：“MENU”Key--->>Select the "Memory" icon

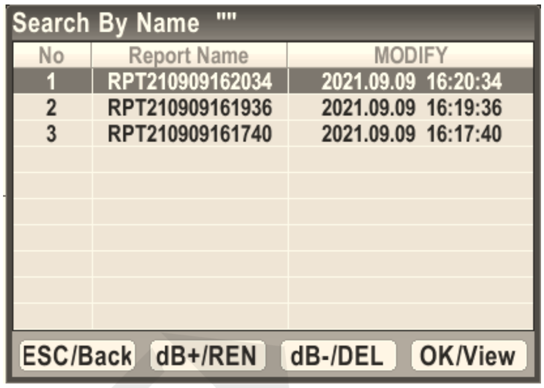
Hot key：

Explanation: Flaw detection report related functions

3.7.1 Search By Order


Search By Order

No	Report Name	MODIFY
1	RPT210909162034	2021.09.09 16:20:34
2	RPT210909161936	2021.09.09 16:19:36
3	RPT210909161740	2021.09.09 16:17:40


Search By Name ""

No	Report Name	MODIFY
1	RPT210909162034	2021.09.09 16:20:34
2	RPT210909161936	2021.09.09 16:19:36
3	RPT210909161740	2021.09.09 16:17:40

3.7.2 Search by Name

3.7.3 Search by Date

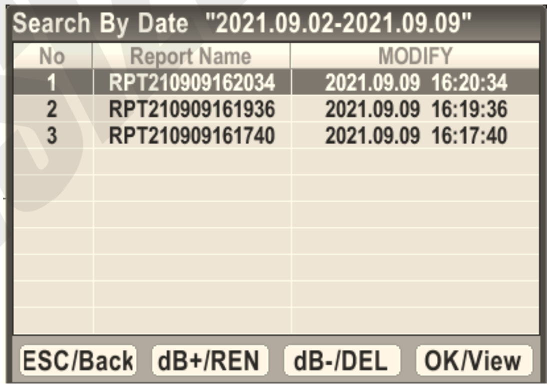

Input Date

Start Date

2021 Y 09 M 02 D

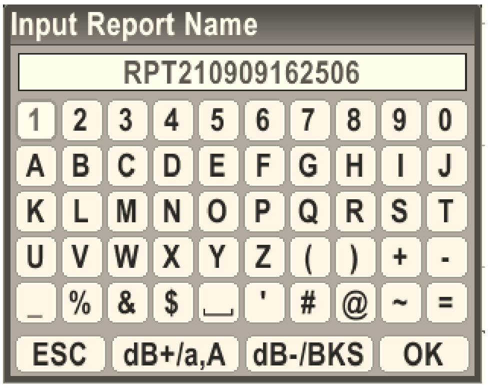
End Date

2021 Y 09 M 09 D

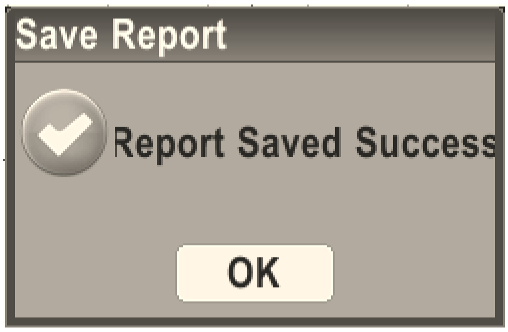

Search By Date "2021.09.02-2021.09.09"

No	Report Name	MODIFY
1	RPT210909162034	2021.09.09 16:20:34
2	RPT210909161936	2021.09.09 16:19:36
3	RPT210909161740	2021.09.09 16:17:40

3.7.4 保存报告


Input Report Name

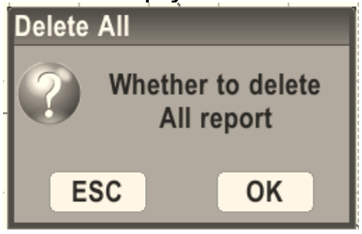
RPT210909162506


Save Report

Report Saved Success

3.7.5 Delete All

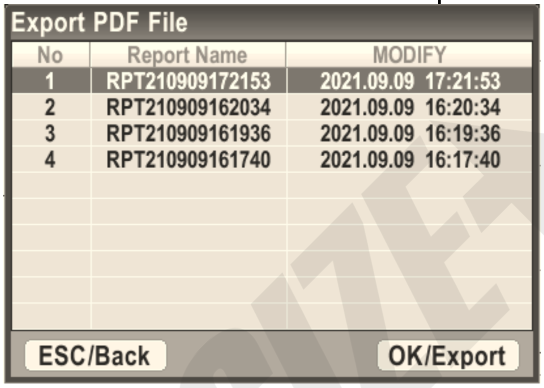
Delete all reports, the report list is empty. ...



Whether to delete
All report

3.7.6 Export PDF

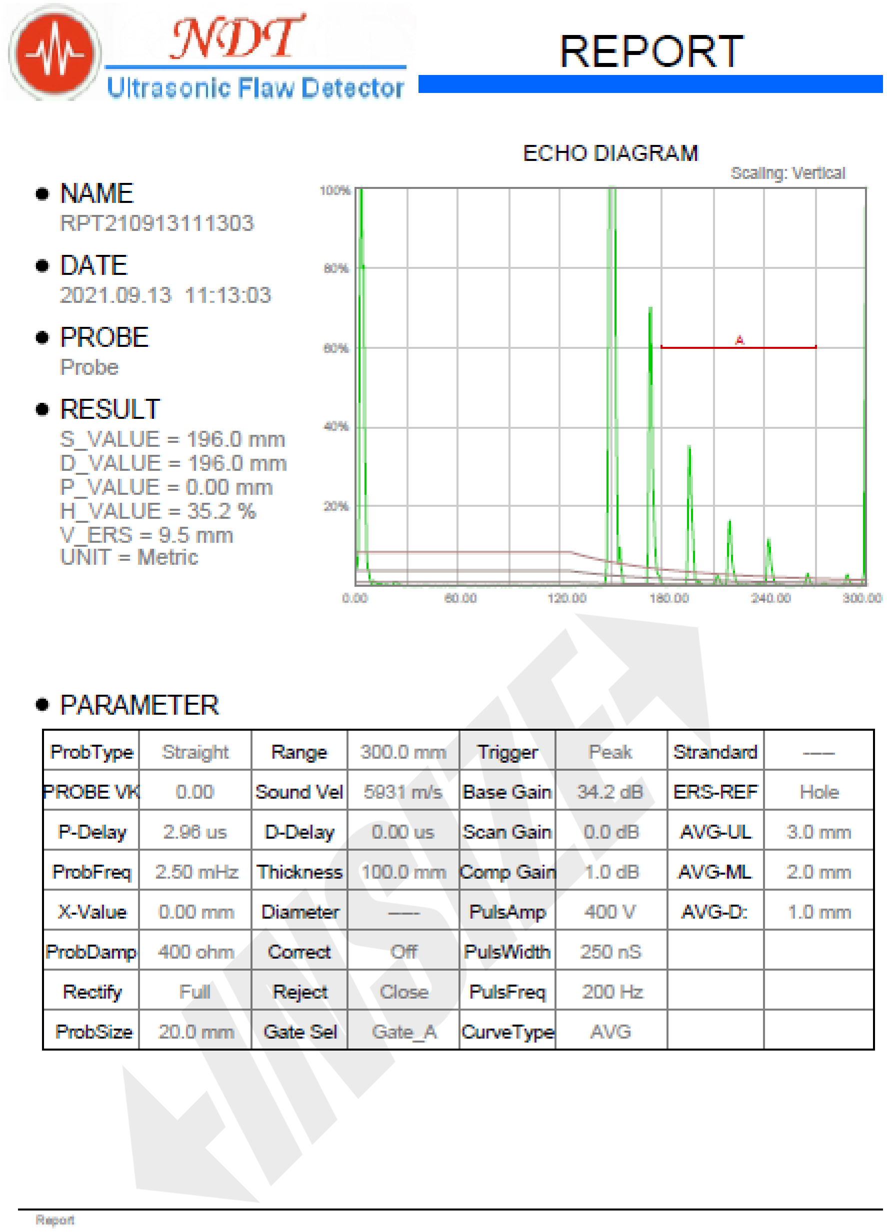
First select a report, and then press the "OK" button to convert the report into a PDF file and store it in the U disk (SysUS_PDF directory). The name of the exported PDF file is the same as the name of the report.



No	Report Name	MODIFY
1	RPT210909172153	2021.09.09 17:21:53
2	RPT210909162034	2021.09.09 16:20:34
3	RPT210909161936	2021.09.09 16:19:36
4	RPT210909161740	2021.09.09 16:17:40

Not Found Udisk

Complete, Save to
"U:\SysUS_PDF"



NDT
Ultrasonic Flaw Detector

REPORT

ECHO DIAGRAM

- NAME
  RPT210913111303
- DATE
  2021.09.13 11:13:03
- PROBE
  Probe
- RESULT
  S_VALUE = 196.0 mm
  D_VALUE = 196.0 mm
  P_VALUE = 0.00 mm
  H_VALUE = 35.2 %
  V_ERS = 9.5 mm
  UNIT = Metric

- PARAMETER

ProbType	Straight	Range	300.0 mm	Trigger	Peak	Strandard	----
PROBE VK	0.00	Sound Vel	5931 m/s	Base Gain	34.2 dB	ERS-REF	Hole
P-Delay	2.96 us	D-Delay	0.00 us	Scan Gain	0.0 dB	AVG-UL	3.0 mm
ProbFreq	2.50 mHz	Thickness	100.0 mm	Comp Gain	1.0 dB	AVG-ML	2.0 mm
X-Value	0.00 mm	Diameter	----	PulsAmp	400 V	AVG-D:	1.0 mm
ProbDamp	400 ohm	Correct	Off	PulsWidth	250 nS		
Rectify	Full	Reject	Close	PulsFreq	200 Hz		
ProbSize	20.0 mm	Gate Sel	Gate_A	CurveType	AVG		

INSIZE

Report

3.7.7 Export All

Export all reports to a USB flash drive.
This function is used to export the report on one instrument to another instrument for viewing.
You can also view the report from the data management software.
The save directory and file name of the report: U:\SysUS_System\report.bin


Export All

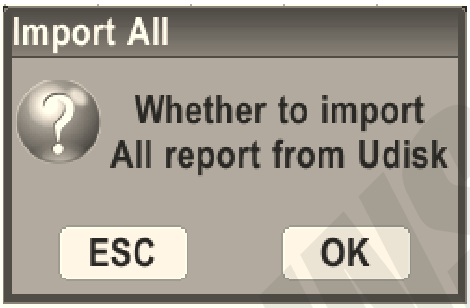
Whether to export
All report to Udisk


Export All

Exporting Complete

3.7.8 Import All

Import all reports from the USB flash drive.


Import All

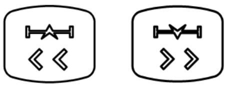
Whether to import
All report from Udisk


Import All

Importing Complete

3.8 Gate Function Group

Implement：“MENU” Key--->>Select the "Gate" icon

Hot key：

Explanation:

Use the "gate " to lock the echo to be measured, and display all the parameters of the highest echo in real time (the sound path distance, the horizontal distance and the vertical distance, and the echo height, etc.).

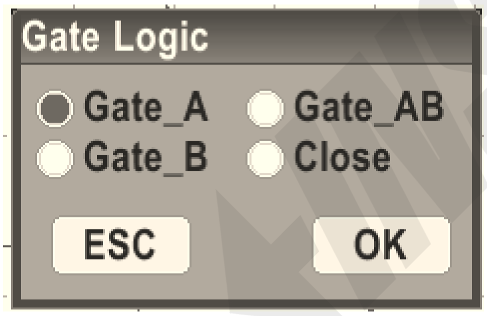
This instrument has two gates: gate A and gate B. Use "Gate Logic" to choose single use or double gate use.

When using any one of the gates, the functions of gate B and gate A are the same (the operation mode is the same, the measurement calculation is the same), and the reading method is a single gate.

When double gates are used, the reading method and calculation are double gates.

The start of the gate, the width of the gate, and the height of the gate are generally convenient to adjust with shortcut keys.

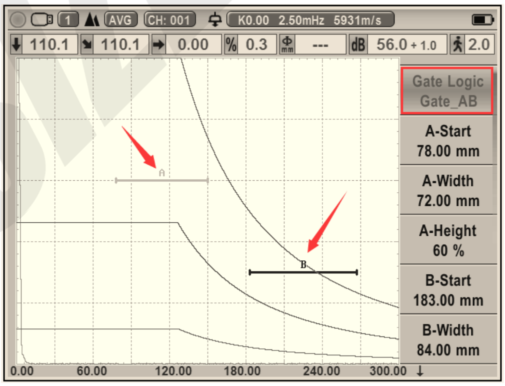
3.8.1 Gate Logic


Gate Logic

● Gate_A ○ Gate_AB

○ Gate_B ○ Close

ESC OK


Gate Logic Gate_AB

A-Start 78.00 mm

A-Width 72.00 mm

A-Height 60 %

B-Start 183.00 mm

B-Width 84.00 mm

3.8.2 Gate Start

Adjust the starting position of the gate currently in use, and move the gate to the desired position as needed to lock the echo to be measured.

Turn the wheel to move in units of each pixel, and the "left and right" arrow keys take every 10 pixels as the unit.


A-Start 20.00 mm

Gate Logic Gate_AB

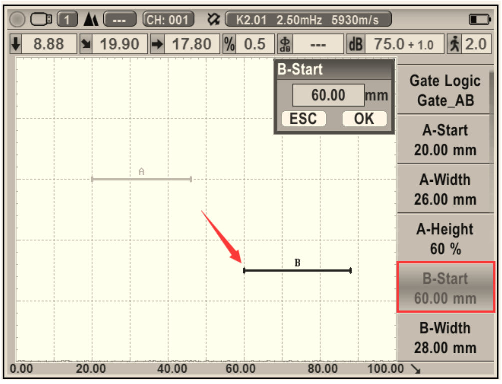
A-Start 20.00 mm

A-Width 26.00 mm

A-Height 60 %

B-Start 61.00 mm

B-Width 28.00 mm


B-Start 60.00 mm

Gate Logic Gate_AB

A-Start 20.00 mm

A-Width 26.00 mm

A-Height 60 %

B-Start 60.00 mm

B-Width 28.00 mm

3.8.3 Gate Width

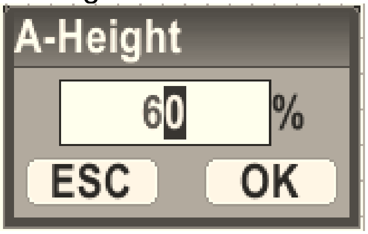
Turn the wheel to move in units of each pixel, and the "left and right" arrow keys take every 10 pixels as the unit.


A-Width
25.00 mm


B-Width
30.00 mm

3.8.4 Gate Height

The gate height refers to the percentage of the gate relative to the full width of the echo display area.
The adjustment range is 5 to 90%.

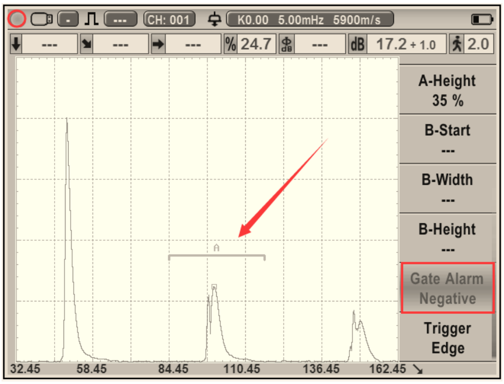

A-Height
60 %


B-Height
30 %

3.8.5 Gate Alarm

Positive Alarm: When the echo value in the gate is higher than the gate height, the alarm will start.
Negative Alarm: When the echo value in the gate is lower than the gate height, the alarm will start.
Alarm prompt: ALARM LED and audible alarm

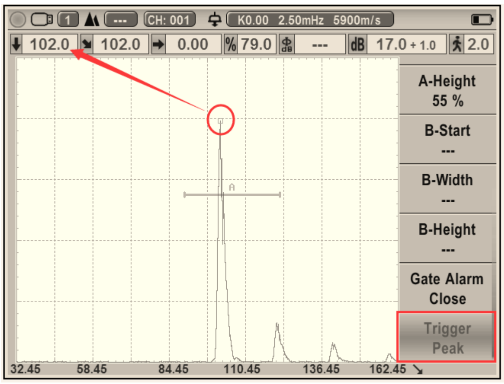

A-Height 35 %
B-Start ---
B-Width ---
B-Height ---
Gate Alarm Positive
Trigger Edge

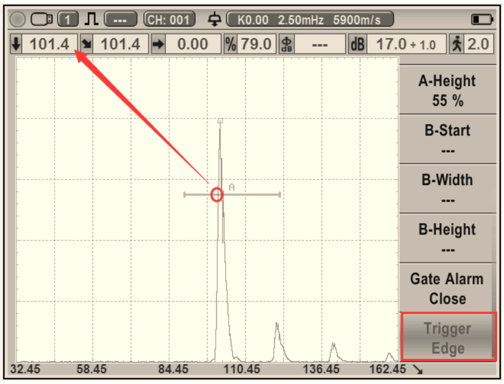

A-Height 35 %
B-Start ---
B-Width ---
B-Height ---
Gate Alarm Negative
Trigger Edge

3.8.6 Trigger

Peak Trigger: The echo position and echo height are the echo data with the highest amplitude in the gate.
Edge Trigger: The echo position and echo height are the data at the intersection of the front edge of the echo in the gate and the gate.

<u>When the trigger mode is edge, it does not affect the echo envelope, peak memory, and echo height.</u>





3.9 Pulser Function Group

Implement: “MENU” Key--->>Select the "Pulser" icon
Explanation: Transmit pulse signal related options.
Inside the instrument, the ultrasonic transmitter circuit generates a large electric voltage pulse and sends it to the ultrasonic probe, which stimulates the probe to emit ultrasonic pulses and enter the material to be inspected. The size of the transmitted pulse amplitude (pulse voltage) and duration (pulse width) determine the size of the emission intensity (also known as emission power, emission energy).

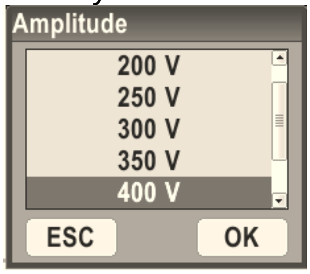
UNSIZE

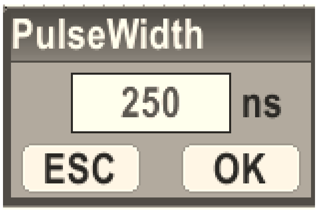
3.9.1 Amplitude of Pulse Signal

The voltage value of the pulse signal.
Options::100V、200V、250V、300V、350V、400V、450V、500V。
Generally set to 400V

3.9.2 Pulse Width

By adjusting the value of the pulse width, you can match probes of different frequencies.
Increasing the pulse width increases the emission energy and the penetration distance, but the resolution will decrease.
In the case where high resolution is required, especially near-surface resolution, too large pulse width and pulse amplitude should not be used.
The resolution requirements and the specific conditions of the inspected materials (such as the size of the sound wave attenuation) must be considered for comprehensive consideration.
Range: 30nS ~ 510nS
Generally set to 250nS





3.9.3 Pulse Freq

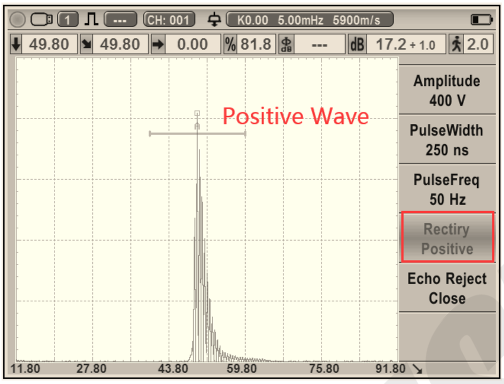
PRF:The number of pulses that excite the probe element per second is called the pulse repetition frequency.

When the scanning speed is faster, a higher repetition frequency should be selected to prevent the defect from being missed; when the scanning speed is slow, setting a lower emission repetition frequency can reduce the power consumption of the instrument.

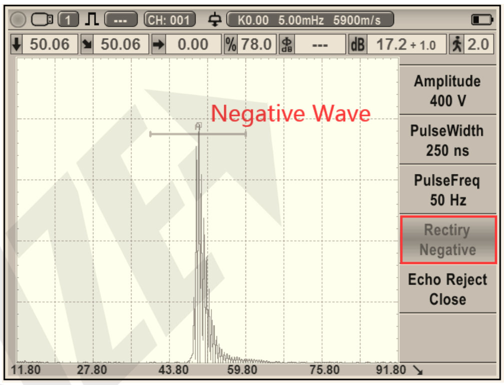
Range: 20Hz ~ 2000Hz, general setting (30~200) Hz.

3.9.4 Rectiry

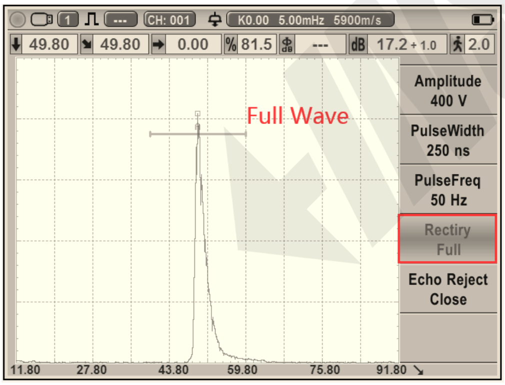
For flaw detection tasks, the most commonly used is full wave detection. However, in some special applications, it may be more advantageous to choose positive half-wave or negative half-wave detection due to different purposes.
When the DAC\AVG curve is set to on, the radio frequency detection mode is invalid.



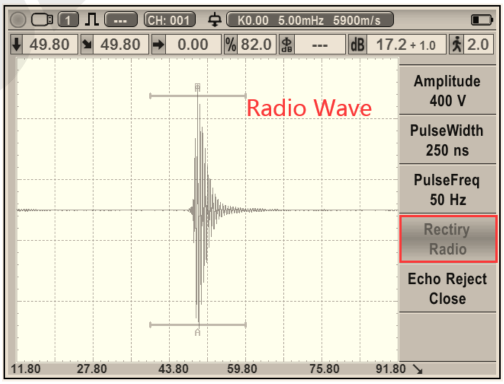
Amplitude 400 V
PulseWidth 250 ns
PulseFreq 50 Hz
Rectiry Positive
Echo Reject Close



Amplitude 400 V
PulseWidth 250 ns
PulseFreq 50 Hz
Rectiry Negative
Echo Reject Close



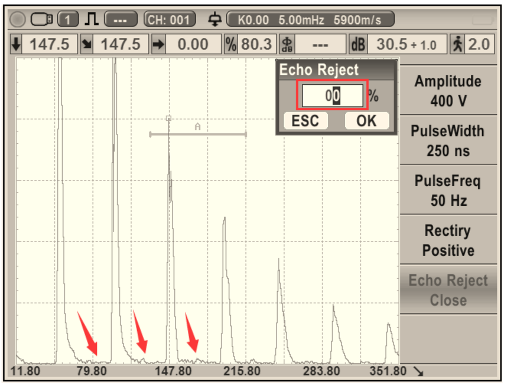
Amplitude 400 V
PulseWidth 250 ns
PulseFreq 50 Hz
Rectiry Full
Echo Reject Close

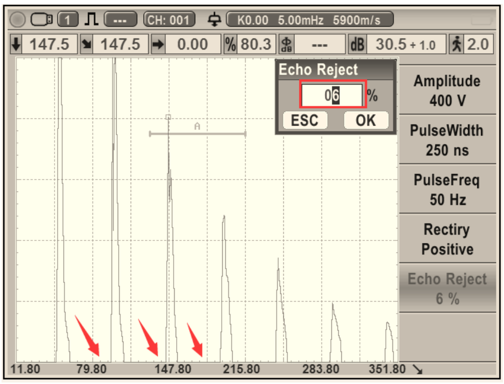


Amplitude 400 V
PulseWidth 250 ns
PulseFreq 50 Hz
Rectiry Radio
Echo Reject Close

3.9.5 Echo Reject

This function is used to limit the display of clutter (noise) to improve the signal-to-noise ratio. This makes the effective echo displayed on the screen clearer.
The instrument directly digitally displays the restricted percentage value.
Function introduction: With the increase of the limit value, the " Reject " effect has been added. At this time, the clutter smaller than the set value is filtered out and not displayed, and the echo larger than the set value is not changed, so the signal-to-noise ratio is reduced. Greatly improve.


CH: 001
K0.00 5.00mHz 5900m/s
147.5 147.5 0.00 % 80.3 --- dB 30.5 + 1.0 2.0
Echo Reject 00 %
Amplitude 400 V
PulseWidth 250 ns
PulseFreq 50 Hz
Rectiry Positive
Echo Reject Close


CH: 001
K0.00 5.00mHz 5900m/s
147.5 147.5 0.00 % 80.3 --- dB 30.5 + 1.0 2.0
Echo Reject 06 %
Amplitude 400 V
PulseWidth 250 ns
PulseFreq 50 Hz
Rectiry Positive
Echo Reject 6 %

Note: As the reject effect increases, the dynamic range of the instrument will become smaller, so please turn off this function in time after using this function.

3.10 Gain Function Group

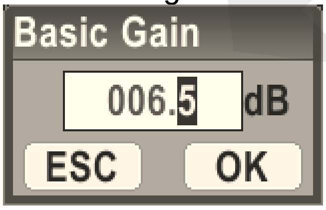
Implement: “MENU” Key--->>Select the "Gain" icon

Hot key: DB+ DB–

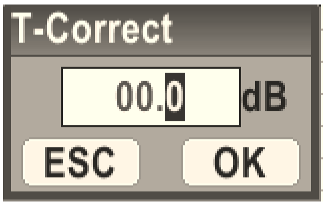
Explanation:
The gain is used to adjust the echo amplitude.
As the gain increases, the echo amplitude increases.
The gain decreases and the echo amplitude decreases.
In flaw detection, gain adjustment can be used to control the sensitivity of the instrument, measure the relative height of the signal, determine the size of the defect or measure the attenuation performance of the material, etc.
Unit: dB.

3.10.1 Basic Gain

When the basic gain changes, the DAC/AVG curve and the echo amplitude change simultaneously.
Adjustment range :0~110dB


Basic Gain 006.5 dB


DB Offset 00.0 dB


T-Correct 00.0 dB

3.10.2 Gain Step

The minimum gain step for each press of the "dB+" or "dB-" shortcut key.

Adjustment range: 0.1dB ~ 6dB

INSIZE

3.10.3 DB Offset

Surface compensation gain (DB Offset) refers to the compensation for flaw detection sensitivity due to the influence of the surface roughness of the workpiece.

Adjustment range: -30dB ~ 50dB

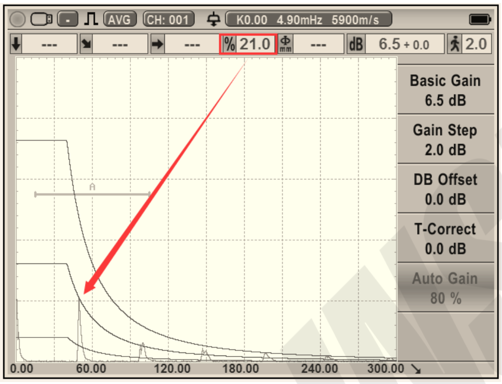
3.10.4 T-Correct

T-Correct scan gain can increase or decrease the echo in the gate.

Adjustment range: -30dB ~ 50dB

3.10.5 Auto Gain

Pre-set the waveform height value, press the auto gain control shortcut key, the echo in the gate quickly reaches the preset height.



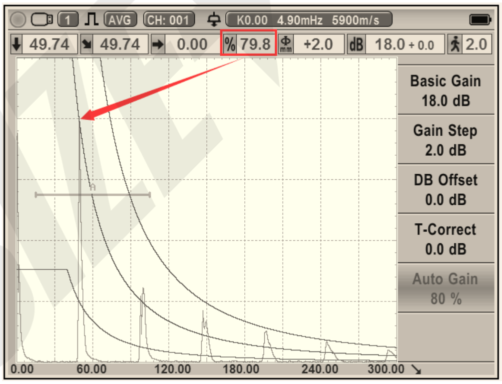
Basic Gain 6.5 dB

Gain Step 2.0 dB

DB Offset 0.0 dB

T-Correct 0.0 dB

Auto Gain 80 %



Basic Gain 18.0 dB

Gain Step 2.0 dB

DB Offset 0.0 dB

T-Correct 0.0 dB

Auto Gain 80 %

3.11 Record Function Group

Implement：“MENU” Key--->>Select the "Record" icon

Hot key： 🎥

	Fn	Function
🎥	Invalid	Screenshot and save to U disk
	Valid	Open the recording menu

Explanation:

This instrument can take a screenshot of the defect echo in real time on the spot to facilitate detailed identification and analysis of the size and location of the defect in the future.

It can also record defect echo continuously, and the record file can be stored in the instrument memory or U disk.

The record file can be played with the instrument or through the software.

3.11.1 Recording

The instrument has whether to open the recording dialog box and whether to stop the recording dialog box.

The video has a time progress prompt.

During the recording process, the shortcut keys can be operated normally.

The detection range can be adjusted in this menu.

USIZE


Recording

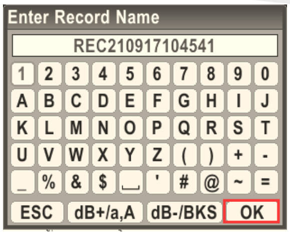
Whether to Start Recording


Recording
00 : 00 : 02

Range
300.0 mm


Recording

Whether to Stop Recording


Enter Record Name

REC210917104541


Recording

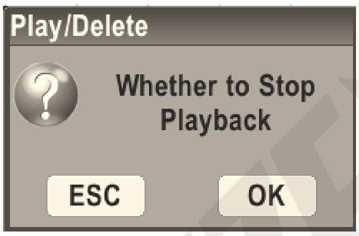
Save to "U:\SysUS_Record"


Recording

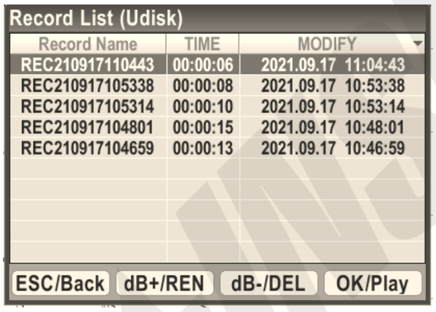
Record File Saved

3.11.2 Play/Delete

Function	Method of operation
Play	Open the video list, use the arrow keys to select the video file and then press the "OK" key to start playback. There is a time progress prompt for playback.
Stop	Select the "Playback" column and press the "OK" button, a dialog box pops up whether to stop the playback.
Pause	Press the "Menu" button to pause playback, and press the "Menu" button again to resume playback.
Fast forward	Turn the wheel clockwise.
Backward	Turn the wheel counterclockwise.
Rename file	DB+
Delte	DB-

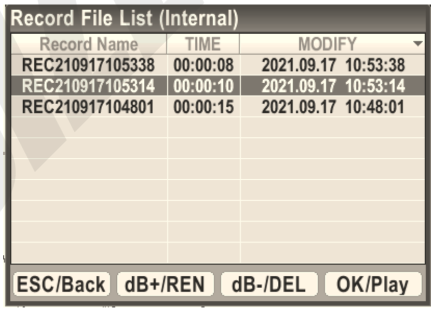


Whether to Stop Playback



Record List (Udisk)

Record Name	TIME	MODIFY
REC210917110443	00:00:06	2021.09.17 11:04:43
REC210917105338	00:00:08	2021.09.17 10:53:38
REC210917105314	00:00:10	2021.09.17 10:53:14
REC210917104801	00:00:15	2021.09.17 10:48:01
REC210917104659	00:00:13	2021.09.17 10:46:59



Record File List (Internal)

Record Name	TIME	MODIFY
REC210917105338	00:00:08	2021.09.17 10:53:38
REC210917105314	00:00:10	2021.09.17 10:53:14
REC210917104801	00:00:15	2021.09.17 10:48:01

3.11.3 Storage location

You can choose instrument memory or external U disk.

If the instrument memory is selected, a maximum of 10 video files can be saved, and each video recording time is no more than 5 minutes.

If you choose to store in an external U disk, there is no limit on the number of recordings and time.

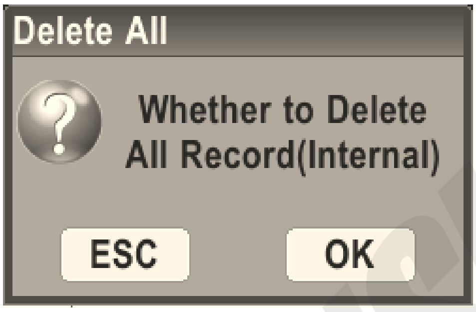
3.11.4 Export Rec

This function is used to export the video recorded on one instrument to a USB flash drive, and play it on another instrument or in the software.

3.11.5 Export All

Whether to Export All Record to Udisk

3.11.6 Delete All



Whether to Delete All Record(Internal)

Whether to Delete All Record(Udisk)

INSIZE

3.12 Auxiliary function Group

Implement: “MENU” Key--->>Select the "Auxiliary" icon

Explanation:

The purpose of flaw detection is to determine the location and size of the defect in the inspected workpiece, and then analyze the nature of the defect.

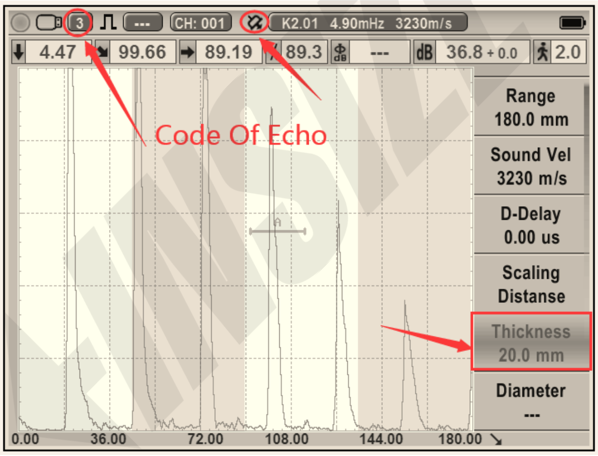
In order to improve the accuracy of detection, this instrument is designed with related digital processing and management functions for the detection data, which will greatly reduce the intensity of flaw detection work, which is conducive to the correct judgment of the location, quantification and nature of defects.

3.12.1 Echo Code

The echo code function is used to identify how many times the echo signal is the first echo. In addition to displaying the echo code in a histogram, there is also a digital display at the top of the screen.

This function should meet the following 3 conditions:

1. Echo code is set to "On".
2. The probe is set as an angle probe.
3. The thickness of the workpiece is set correctly.



Range 180.0 mm

Sound Vel 3230 m/s

D-Delay 0.00 us

Scaling Distanse

Thickness 20.0 mm

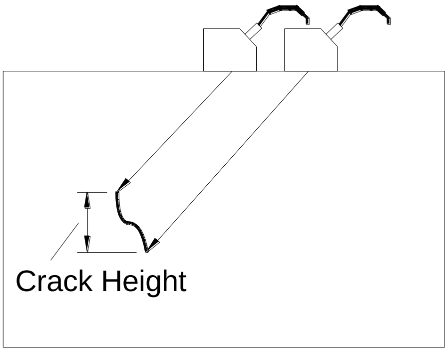
Diameter ---

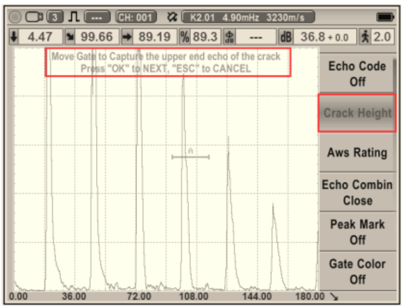
3.12.2 Crack Height Measuring Feature

This feature allows measuring the height of a crack found inside the workpiece. Before starting to use the Crack Height Measure function, the instrument and the probe must be correctly calibrated.

Determine the position of end point A (the upper end of the crack): move the probe, lock the defect echo with the current gate, find the peak value of the defect echo, and then press the "OK" key. The instrument automatically locks and records the echo peak position P1.

Determine the position of end point B (the lower end of the crack): continue to move the probe, find the defect echo at the lower end of the crack, and lock the peak of the echo, press the "OK" key, the instrument will automatically lock and record the peak position of the echo P2 , And calculate the result.





Move Gate to Capture the upper end echo of the crack
Press "OK" to NEXT, "ESC" to CANCEL

Height = 12.1 mm

3.12.3 AWS D1.1 weld Rating

This feature allows analysis of welds according to AWS specification D1.1 and provides a D1.1 rating. The AWS D1.1 feature utilizes four AWS-specified variables including:

1. INDICAT – Gain (in dB) required to position an A-Scan echo’s peak (from the measured reflector) at 50% of full screen height (FSH).
2. REFRNCE – Gain (in dB) required to position an A-Scan echo’s peak (from the reference reflector) at 50% of FSH.
3. ATTEN – Determined by subtracting 1 inch from the sound path distance to the discontinuity, using the equation: ATTEN=(SA-1)×2. This compensates for sound loss from material attenuation along the sound path to the discontinuity.
4. RATING – Calculated based on the AWS formula: .RATING=INDICAT-REFRNCE-ATTEN.

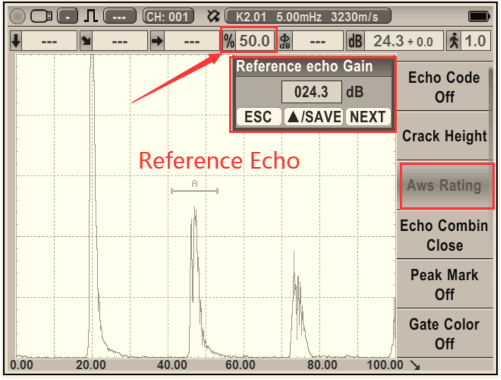
Before activating the AWS D1.1 weld rating feature, make sure that the angle probe has been calibrated.
The steps are as follows:
Step 1: Press "OK" to open the “reference echo gain” dialog box.
Step 2: Couple the probe to a suitable reference test standard.
Step 3: Ensure that the A-Gate is positioned over the desired echo. Then adjust the gain until the peak of the desired reference echo reaches 50% of full screen height (FSH). Note that if the echo’s peak amplitude does not fall between 47.5% and 52.5%, the inputted point will not be accepted.

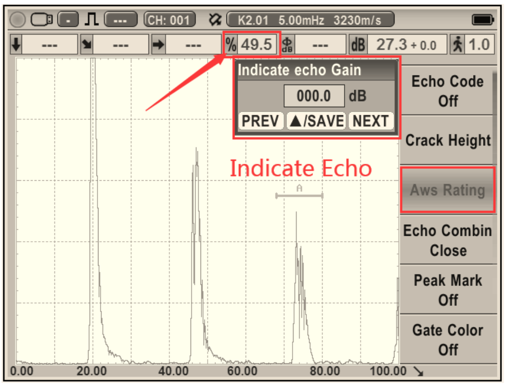
Step 4:Press △ Save data of reference echo gain.
Step 5: Press "OK" key to open the “Indicate echo gain: dialog box.
Step 6: Couple the probe to the workpiece to be tested.
Step 7: Adjust the gain until the peak of the workpiece echo reaches 50% of full screen height (FSH). Note that if the echo’s peak amplitude does not fall

between 47.5% and 52.5%, the inputted point will not be accepted.

Step 8: Press △ Save data of indicate echo gain and calculate the result.

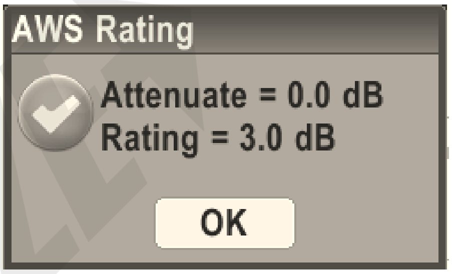
To evaluate additional reflectors against the recorded reference, simply repeat Steps 5 to 8.





Height Exceeds Limit

Adjust to (47.5 ~ 52.5)



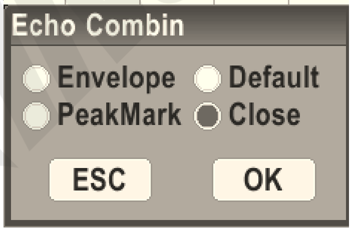
AWS Rating

Attenuate = 0.0 dB

Rating = 3.0 dB

3.12.4 Echo Combin

Note: Echo envelope and peak hold cannot be effective at the same time.
The instrument has "Envelope/Peak" shortcut keys for easy setting.



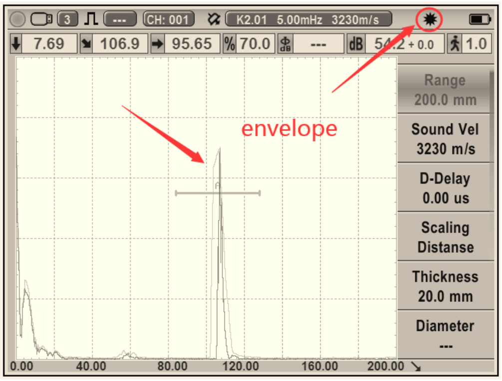
Echo Combin

○ Envelope ○ Default

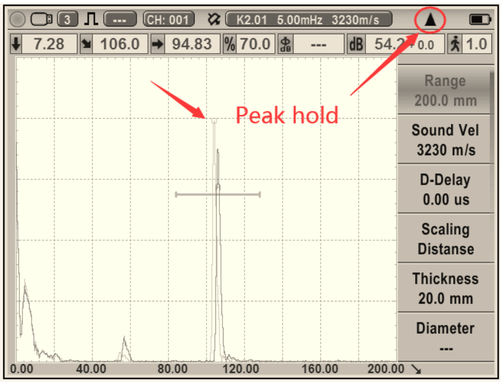
○ PeakMark ● Close

The echo envelope function is mainly for angle probes. Its function is to memorize the peak display points of multiple consecutive echoes in the current gate when the probe moves on the workpiece, and connect them into an envelope line to display on the screen.
According to the envelope shape, the highest echo of the defect can be easily found, and it can provide a basis for judging the nature of the defect.

The peak hold is to capture the highest peak echo (wave height and position) of the dynamic echo in the gate and display it on the screen. After the probe is removed, the gate capture information is still maintained. In actual flaw detection, this helps to search for the largest flaw echo.



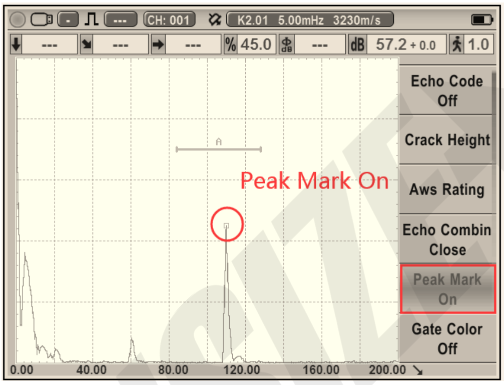
Range
200.0 mm
Sound Vel
3230 m/s
D-Delay
0.00 us
Scaling
Distanse
Thickness
20.0 mm
Diameter



Range
200.0 mm
Sound Vel
3230 m/s
D-Delay
0.00 us
Scaling
Distanse
Thickness
20.0 mm
Diameter

3.12.5 Peak Mark

In actual flaw detection, marking the peak point helps to find the highest echo. You can choose to On or Off.



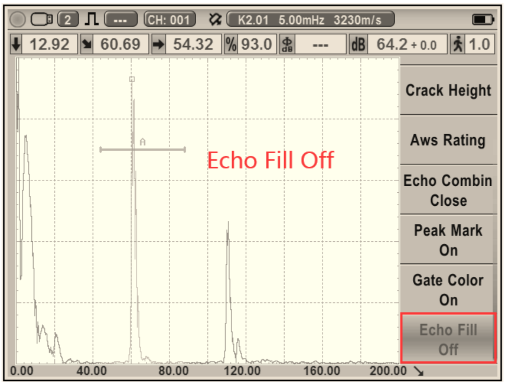
Echo Code
Off
Crack Height
Aws Rating
Echo Combin
Close
Peak Mark
On
Gate Color
Off

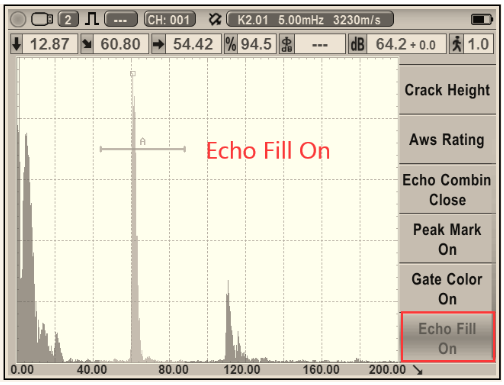
3.12.6 Gate Color

When the function is on, the echo colors inside and outside the gate will be displayed in different colors. In the actual flaw detection, it is helpful to distinguish the echo inside the gate.

Echo Code
Off
Crack Height
Aws Rating
Echo Combin
Close
Peak Mark
On
Gate Color
On

3.12.7 Echo Fill

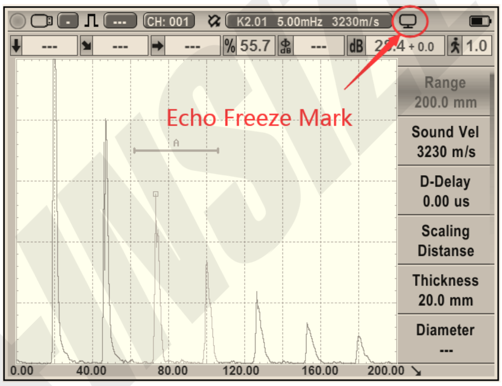




3.12.8 Echo Freeze

Press the shortcut key to freeze the echo and data displayed on the screen, and press this key again to release the freeze.

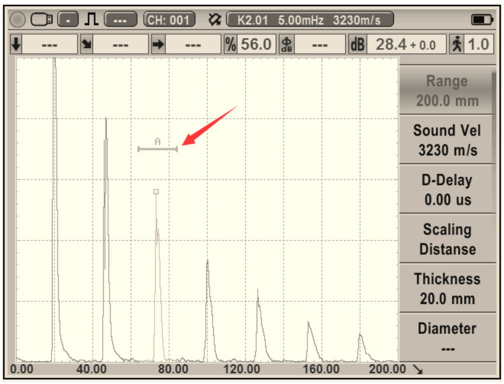
After the echo freeze is valid, icon flashes on the screen, and the shortcut key function is invalid at this time.



3.12.9 Magnify Gate Details

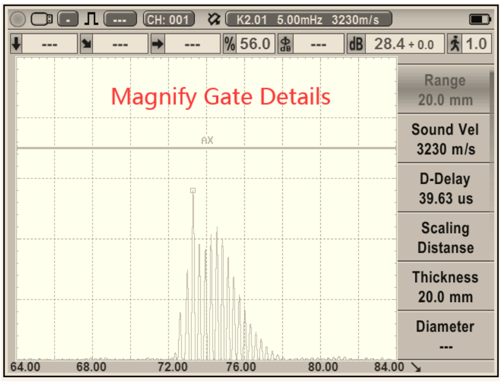
Press the shortcut key to enlarge the echo within the current gate range to the entire waveform display area, and press this key again to restore the display state.

After the gate is magnify, gate A is marked AX and gate B is marked BX.



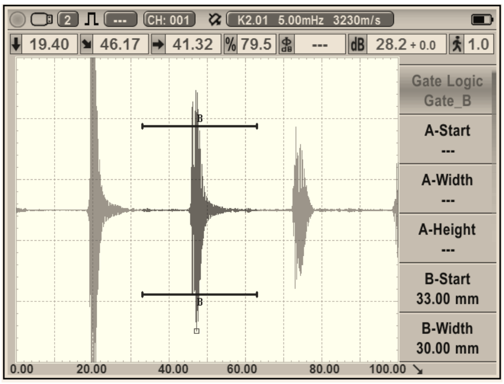
--- --- --- % 56.0 --- dB 28.4 + 0.0 1.0

Range 200.0 mm
Sound Vel 3230 m/s
D-Delay 0.00 us
Scaling Distanse
Thickness 20.0 mm
Diameter ---



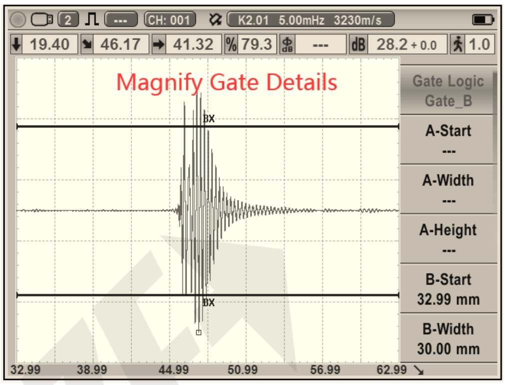
--- --- --- % 56.0 --- dB 28.4 + 0.0 1.0

Range 20.0 mm
Sound Vel 3230 m/s
D-Delay 39.63 us
Scaling Distanse
Thickness 20.0 mm
Diameter ---



19.40 46.17 41.32 % 79.5 --- dB 28.2 + 0.0 1.0

Gate Logic Gate_B
A-Start ---
A-Width ---
A-Height ---
B-Start 33.00 mm
B-Width 30.00 mm



19.40 46.17 41.32 % 79.3 --- dB 28.2 + 0.0 1.0

Gate Logic Gate_B
A-Start ---
A-Width ---
A-Height ---
B-Start 32.99 mm
B-Width 30.00 mm

UNISIZE

3. 12. 10 Screenshot

Press the 📷 shortcut key to save the image displayed on the screen as a BMP format picture and store it on the U disk. The storage directory is the U disk folder "SysUS_ScrShot".

The picture color can be set to grayscale or color. The grayscale image file is relatively small, which is convenient for document editing and printing.

Before taking the screenshot, a dialog box for entering the BMP file name will pop up. If you do not change the file name, just press the "OK" button.

If you want to take a screenshot quickly, press the 📷 button continuously.

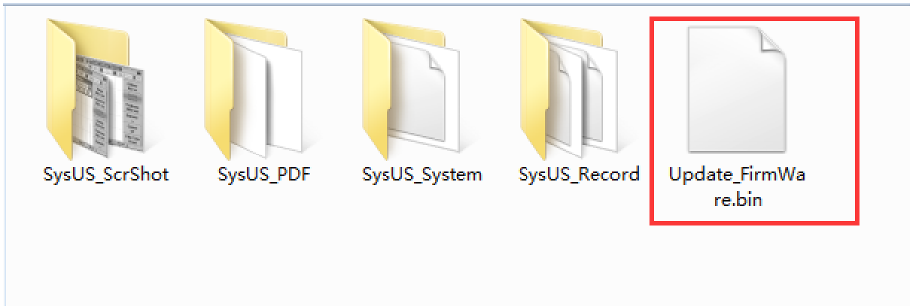
3. 13. 1 Program Firmware Upgrade

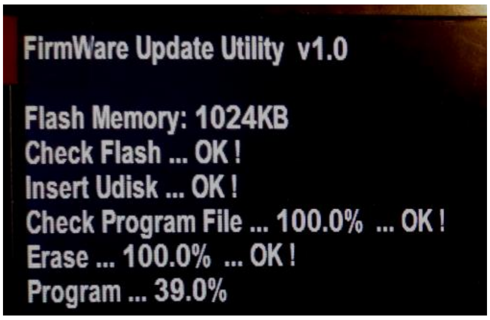
The instrument can upgrade the program through a U disk, and the user can upgrade the program to the latest version by himself. It is convenient to increase the function of the instrument.

Program upgrade steps:

1. Copy the upgrade file "Update_Firmware.bin" to the root directory of the U disk.
2. Insert the USB flash drive.
3. Turn on the instrument while holding down the Fn key, the instrument will automatically complete the upgrade and there will be progress prompts.

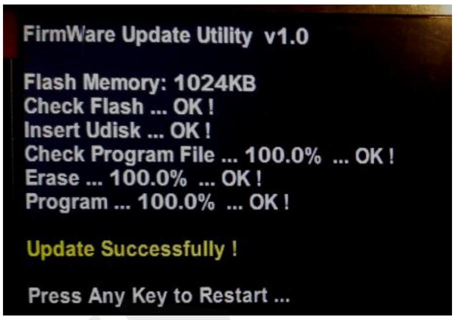
The upgrade process is relatively fast, usually within ten seconds to complete the upgrade. During the upgrade process, try to ensure sufficient power, and do not plug or unplug the U disk. If there is a power failure or U disk error, repeat the above steps.





```
FirmWare Update Utility  v1.0

Flash Memory: 1024KB
Check Flash ... OK !
Insert Udisk ... OK !
Check Program File ... 100.0%  ... OK !
Erase ... 100.0%  ... OK !
Program ... 39.0%
```



```
FirmWare Update Utility  v1.0

Flash Memory: 1024KB
Check Flash ... OK !
Insert Udisk ... OK !
Check Program File ... 100.0%  ... OK !
Erase ... 100.0%  ... OK !
Program ... 100.0%  ... OK !

Update Successfully !

Press Any Key to Restart ...
```

3.13 B Scan Function

Implement：“MENU” Key--->>Select the "B Scan" icon

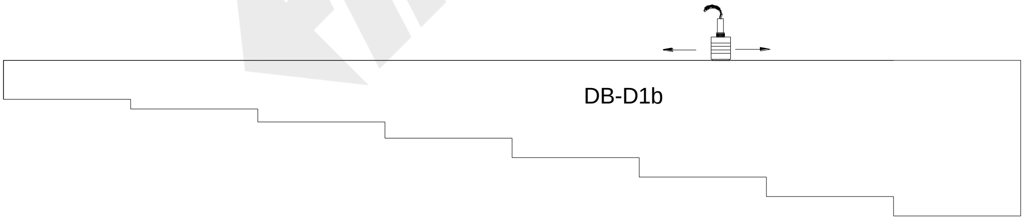
Explanation:

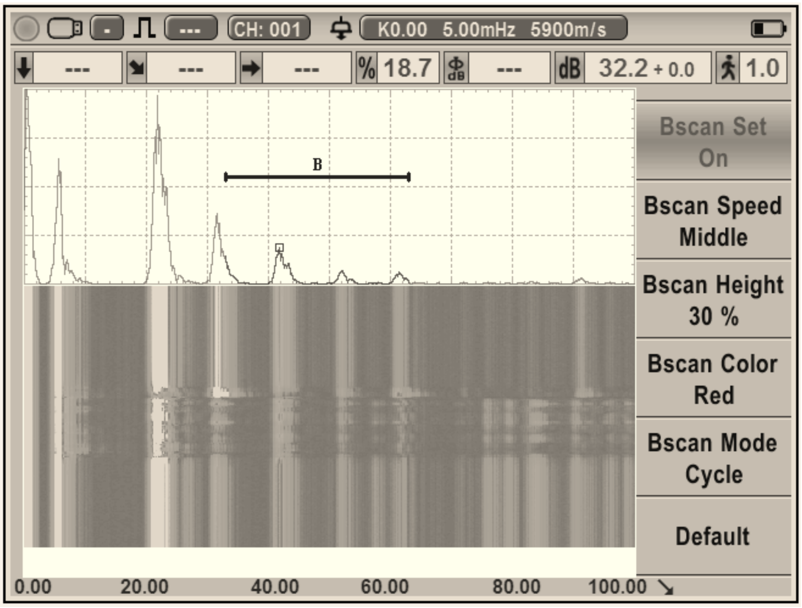
In B-SCAN mode, the instrument displays a graphical cross-section of the workpiece.

This instrument supports color-coded B-scan, using the depth of color to express the intensity of the echo, making the scanned image more intuitive.

Take the DB-D1b ladder test block as an example, first change the gain so that the echo can be clearly displayed in the B-scan area.

Place the probe on the test block and move the probe left and right to scan the echo intensity graph of the test block, as shown in the figure below:





Bscan Set
On

Bscan Speed
Middle

Bscan Height
30 %

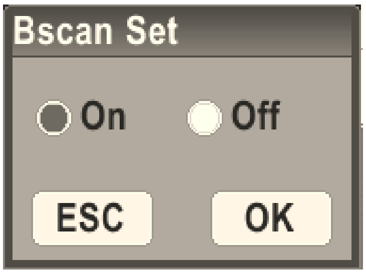
Bscan Color
Red

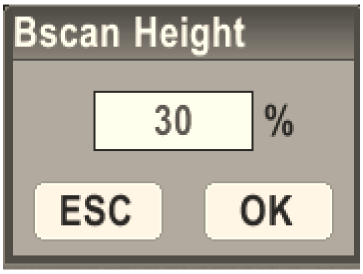
Bscan Mode
Cycle

Default

INSIZE

3. 13. 2 B Scan Set



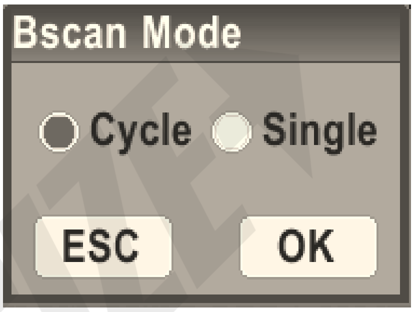


3.13.3 B Scan Speed

3.13.4 B Scan Height

Range: 10% ~ 80%, the higher the value, the darker the B-scan color.

3.13.5 B Scan Color



3.13.6 B Scan Mode

If it is set to single, only scan one screen, and then stop scanning again, which helps to fix the image for easy analysis and evaluation.

3.13.7 Default

If the scan parameters are unknown, you can restore the default settings.

3. 13. 8 Connecting to a Computer

The instrument is equipped with a communication port . The PC can be connected with the communication port. A-Scan display, instrument settings, and videos stored in the memory of the instrument can be transferred to the computer through the communication port. Detailed information of the communication software and its usage refer to the DataPro software manual.

4 Faults and solutions

4.1 The instrument cannot be turned on.

(1) Check whether the battery power is sufficient, whether the installation is reliable, or directly connect to the power adapter and turn on the machine;
(2) Press the power button many times, but the interval should not be less than half a minute;
(3) Connect the power adapter and repeatedly turn on the power switch of the instrument.
(4) If the above method does not work, connect the power adapter to charge the battery for half an hour and then turn it on.

4.2 The instrument shuts down automatically

The instrument has the ability to detect battery power. When the battery power is too low, the instrument will automatically shut down. You can charge the battery for a period of time, or connect it directly to the power adapter, and then turn it on.

4.3 No Echo

(1) Whether the probe is connected correctly;
(2) Whether the probe method is appropriate, if the probe is set to dual crystal or penetrating probe, and the single probe is connected, there will be no echo;
(3) Whether the probe wire is normal, whether the probe and the probe wire are in normal contact, a tweezers (metal) can be used to touch the inner core of the probe base. If there is noise, the instrument is in good condition, and the probe wire should be damaged.
(4) Whether the parameters such as gain, display shift, probe zero, signal suppression, etc. are set correctly.
(5) Simple processing method when there is no echo: load a default channel, then connect a straight probe with a new probe cable, and probe on a well-coupled thin test block. If there is an echo, the original parameters may be set incorrectly or The probe wire is in poor contact.

4.4 Keyboard failure

(1) The keyboard is locked (that is, this key should not be operated at this time);
(2) The touch point in the keyboard is not pressed;
(3) Operate the keyboard without following the on-screen prompts;
Set "Key Sound" to "On", press the instrument keyboard to see if there is a key buzzer. If there is a key buzzer, the key is normal.

4.5 Clutter interference is large or the echo moves left and right or suddenly disappears

(1) The probe is in poor contact with the probe cable. Remove the probe

cable at this time and the phenomenon should disappear.

(2) The power cord or power adapter has interference. Remove the charger and use the battery directly. The phenomenon should disappear.

(3) The probe or the probe wire is too close to the screen, causing radiation.

4.6 Unable to build DAC curve

(1) The detection mode of the instrument is in the radio frequency state, so you should switch to other detection modes first.

(2) The displayed echo amplitude is too low and does not reach above the gate height (when the echo amplitude is lower than the gate height, the automatic search echo signal function cannot be realized).

4.7 Crash

There is a reset hole at the top of the instrument, and lightly touch the reset hole with a needle such as a toothpick.

5 Frequently Asked Questions

Before working with the instrument, you have to calibrate the instrument: you

Question : Why are the results different under the same conditions and operating procedures?

Answer: The human and external factors of ultrasonic flaw detection have a great influence on the flaw detection results. Although on the surface, the flaw detection conditions and operations are the same (for example, the same test block or workpiece, the same operation function), but the results are different. This is normal. . Because there are some conditions that cannot be controlled and repeated, such as coupling, feel, direction and position of the probe, and so on. As long as the difference is within the allowable range.

Question : Why do some parameter values in the parameter area on the screen keep changing slightly?

Answer: Whether it is with or without echo display, the amplitude display value on the screen may have slight changes (usually in decimal places), which is normal. The reason is due to the slight fluctuation of the echo in the gate. If the probe is not connected, it may be the cause of instrument noise.

Question : Why is the echo height at a short distance lower when making the DAC curve?

Answer: The coupling between the probe and the test block is poor, and the highest wave is not found; the influence of the near-field area of the probe (for example: the echo of a hole with a depth of 10mm with a K1 probe is lower than that of a hole with a depth of 20mm.)

6 Maintenance and Care

6.1 Care of the Instrument

Clean the instrument and its accessories using a moist cloth. Only use the following recommended instrument cleaners: water, a mild household cleaner or alcohol (no methyl alcohol).

Attention:

Do not use any methyl alcohol, solvents, or dye penetrant cleaners!

The plastic parts can be damaged or embrittled by this.

6.2 Care of the Batteries

Capacity and life of batteries mainly depend on the correct handling. Please therefore observe the tips below.

You should charge the batteries in the following cases:

- Before the initial startup
- After a storage time of 3 months or longer
- After frequent partial discharge

6.3 Maintenance

The instrument requires basically no maintenance.

Attention:

Repair work may only be carried out by authorized Service staff of us.

6.4 Warranty

When used in accordance with the manufacturer’s written instructions and under normal operating conditions, the instrument is conditionally guaranteed to be free from defects in material and workmanship for a period of two years from date of shipment.

This warranty shall not apply to equipment subjected to misuse or abuse, improper installation, alteration, neglect, or accident. Excluded from this warranty are expendable items such as transducers, interconnecting cables, and batteries.

This warranty is limited to the original purchaser and is not transferable. No other warranty, expressed or implied, is made.

6.5 Tips on Safety

The design of the instrument meets safety standard. During the operation, it shall meet the specified external ambient condition, and the operator shall be furnished with concerned technology background, so as to guarantee safe operation.

Note:

1. This instrument is a non-destructive inspection instrument for inspecting material, it is not allowed to use as a medical instrument.

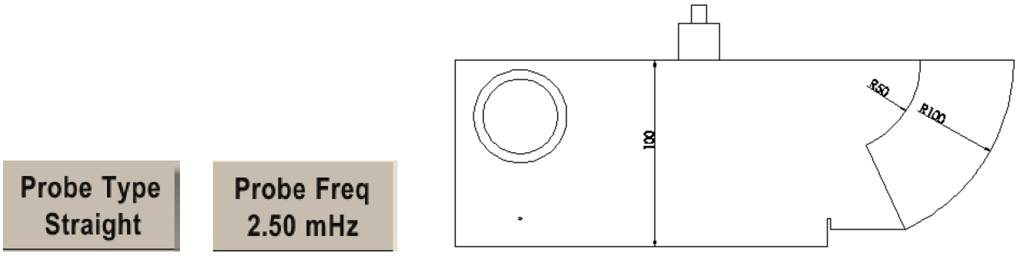
2. The instrument is limited to be used in lab and industrial environment.

INSIZE

Example A:2.5M straight probe calibration method:

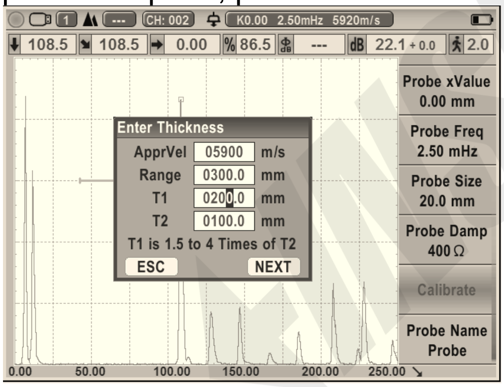
Element :CS-1A test block and 2.5M straight probe
Method: echo-echo method, the operation is as follows:

Step 1: The probe type is selected as a straight probe, and the probe frequency 2.5M must be input correctly.
Place the probe on the CS-1A test block as shown in the figure below and select "Calibrate".

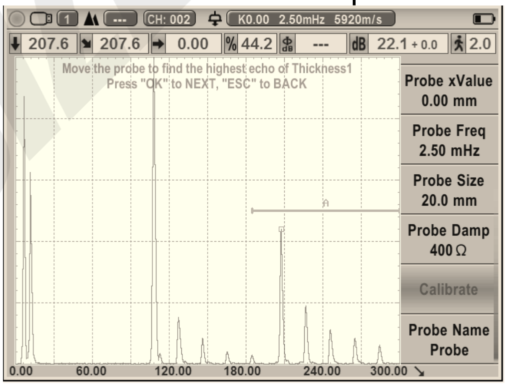


（Step 1）

Step 2: Select "Calibration" and enter, as shown in the figure below. T1 is the thickness value of the second echo, input 200mm, T2 is the thickness value of the first echo, input 100mm, the Appvel (approximate Velocity) defaults to 5900, the Range changes with the set value of T1, or you can enter it manually. After the input is complete, press the "OK" button to enter the “NEXT” step.

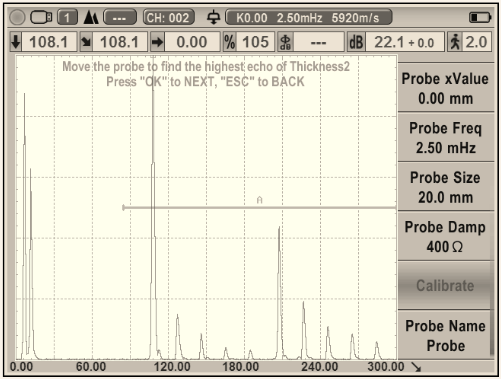

Enter Thickness
ApprVel 05900 m/s
Range 0300.0 mm
T1 0200.0 mm
T2 0100.0 mm
T1 is 1.5 to 4 Times of T2

（Step 2）

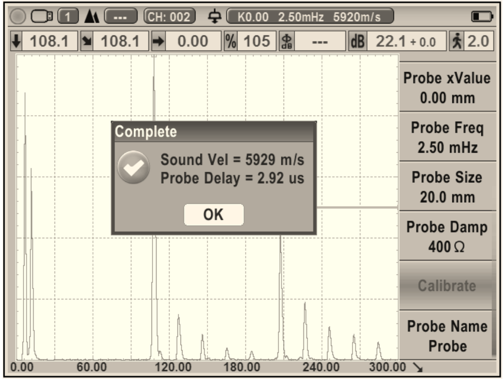

Move the probe to find the highest echo of Thickness1
Press "OK" to NEXT, "ESC" to BACK

（Step 3）

Step 3: Adjust the gain so that both the first echo and the second echo appear on the screen. Follow the instructions on the screen, move the gate and cover the "T1 (200mm)" echo, and press the "OK" key to enter the next step.


Move the probe to find the highest echo of Thickness2
Press "OK" to NEXT, "ESC" to BACK

（Step 4）


Complete
Sound Vel = 5929 m/s
Probe Delay = 2.92 us

（complete）

Step 4: Follow the instructions on the screen, move the gate and cover the "T2

(100mm)" echo, and press the OK key to complete the calibration.

Step 5: Press the Channel key to save the calibrated probe parameters to the current channel.

Example B:5.0M straight probe calibration method:

Element :CS-1-5 test block and 5.0M straight probe
Method: echo-echo method, the operation is as follows:

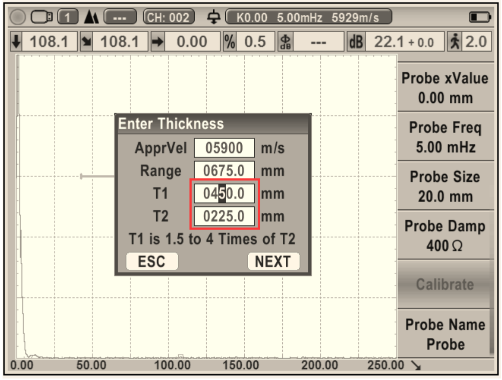
Step 1: The probe type is selected as a straight probe, and the probe frequency 2.5M must be input correctly.
Place the probe on the CS-1-5 test block as shown in the figure below and select "Calibrate".

WINSIZE

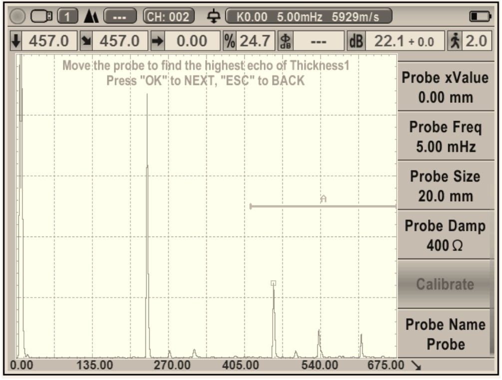

Probe Type Straight
Probe Freq 5.00 mHz

(Step 1)

Step 2: Select "Calibration" and enter, as shown in the figure below. T1 is the thickness value of the second echo, input 450mm, T2 is the thickness value of the first echo, input 225mm, the Appvel (approximate Velocity) defaults to 5900, the Range changes with the set value of T1, or you can enter it manually. After the input is complete, press the "OK" button to enter the “NEXT” step.

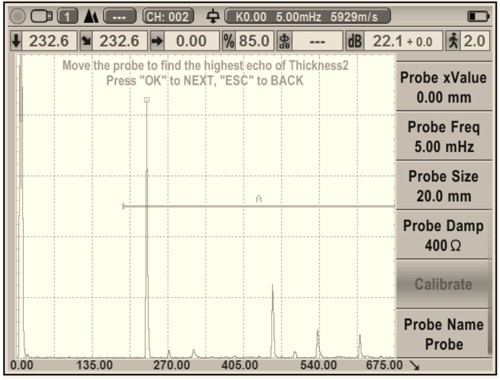

Enter Thickness
ApprVel 05900 m/s
Range 0675.0 mm
T1 0450.0 mm
T2 0225.0 mm
T1 is 1.5 to 4 Times of T2
Probe xValue 0.00 mm
Probe Freq 5.00 mHz
Probe Size 20.0 mm
Probe Damp 400Ω
Probe Name Probe

（Step 2）


Move the probe to find the highest echo of Thickness1
Press "OK" to NEXT, "ESC" to BACK
Probe xValue 0.00 mm
Probe Freq 5.00 mHz
Probe Size 20.0 mm
Probe Damp 400Ω
Probe Name Probe

（Step 3）

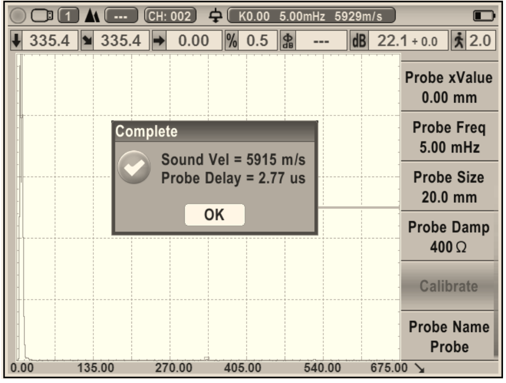
Step 3: Adjust the gain so that both the first echo and the second echo appear on the screen. Follow the instructions on the screen, move the gate and cover the "T1 (450mm)" echo, and press the "OK" key to enter the next step.



Move the probe to find the highest echo of Thickness2
Press "OK" to NEXT, "ESC" to BACK

Probe xValue 0.00 mm
Probe Freq 5.00 mHz
Probe Size 20.0 mm
Probe Damp 400 Ω
Calibrate
Probe Name Probe

(Step 4)



Complete
Sound Vel = 5915 m/s
Probe Delay = 2.77 us
OK

Probe xValue 0.00 mm
Probe Freq 5.00 mHz
Probe Size 20.0 mm
Probe Damp 400 Ω
Calibrate
Probe Name Probe

（complete）

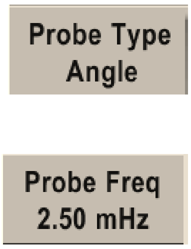
Step 4: Follow the instructions on the screen, move the gate and cover the "T2 (2250mm)" echo, and press the "OK" key to complete the calibration.

Step 5: Press the Channel key to save the calibrated probe parameters to the current channel.

Example C: 2.5M angle probe calibration method:

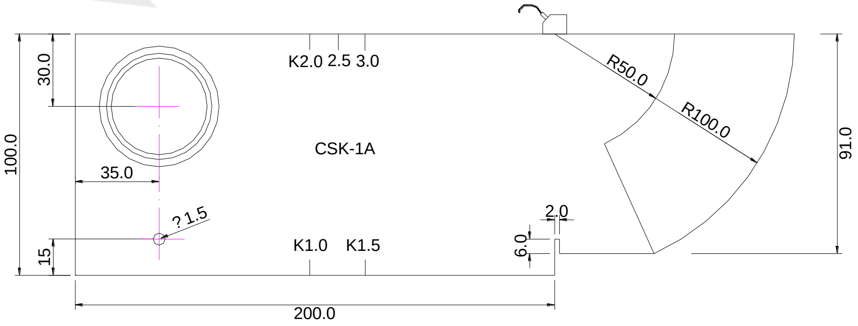
Element :CS-1A test block and 2.5M angle probe and ruler
Method: CS-1A Step arc method, the operation is as follows:

When the angle probe is calibrated, the zero point and sound velocity must be calibrated first, and then the angle can be calibrated. The operation is as follows:
Step 1: Select the angle probe as the probe type, and input the probe frequency correctly. Place the probe on the test block, as shown in the figure below, select "Calibrate" and enter.



Probe Type Angle

Probe Freq 2.50 mHz



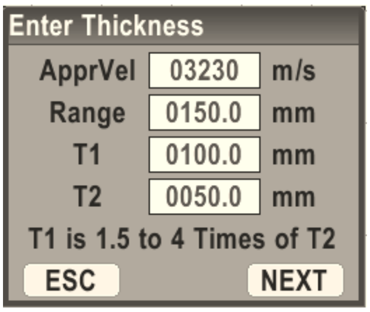
Step 2: First select "Calibrate zero point and sound velocity", input "T1" as 100mm and "T2" as 50mm (T1=R100mm, T2=R50mm). If it is a steel material, the ApprVel (approximate Velocity) is 3230, no need to adjust.

INSIZE


Calibrate

librate Zero & Sound V

Calibrate Angle


Enter Thickness

ApprVel 03230 m/s

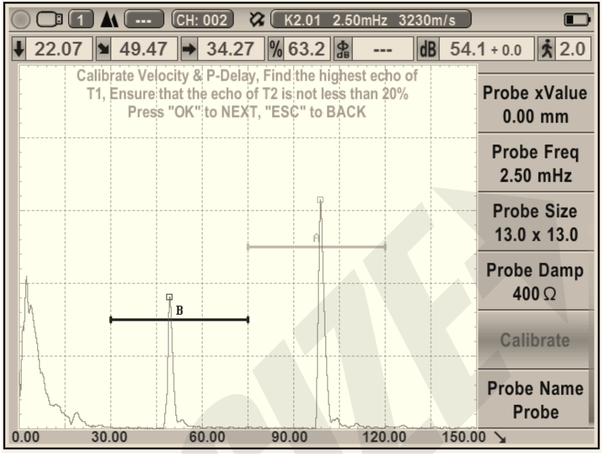
Range 0150.0 mm

T1 0100.0 mm

T2 0050.0 mm

T1 is 1.5 to 4 Times of T2

Step 3: Adjust the gain so that both the R50 echo and R100 echo appear on the screen. Follow the instructions prompt information on the screen, move the gate A and cover the "T1 (100mm)" echo, move the gate B and cover the "T2 (50mm)" echo, and press the "OK" key to enter the next step.


1 --- CH: 002 K2.01 2.50mHz 3230m/s

22.07 49.47 34.27 % 63.2 --- dB 54.1 + 0.0 2.0

Calibrate Velocity & P-Delay, Find the highest echo of T1, Ensure that the echo of T2 is not less than 20% Press "OK" to NEXT, "ESC" to BACK

Probe xValue 0.00 mm

Probe Freq 2.50 mHz

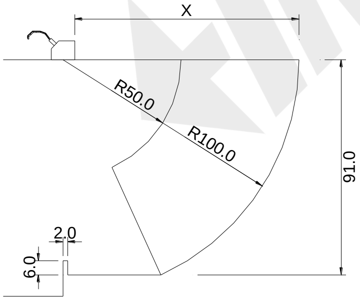
Probe Size 13.0 x 13.0

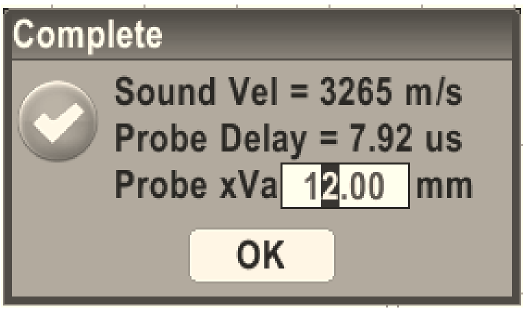
Probe Damp 400 Ω

Calibrate

Probe Name Probe

Step 4: Keep the probe still, use a ruler to measure the distance X from the tip of the probe to the top of the R100 arc of the CSK-1A test block, then use 100-X to calculate the xValue of the probe, and enter the value in the dialog box, and press OK to finish calibration.




Complete

Sound Vel = 3265 m/s

Probe Delay = 7.92 us

Probe xVa 12.00 mm

Step 5: Select "Calibration Angle", and input "Range", "Hole Depth" and "Aperture". The diameter of the CSK-1A standard test block is Φ50, and the vertical distance between the center of the hole and the detection surface is 30mm, press "OK" to enter the next step.


Calibrate

librate Zero & Sound V

Calibrate Angle

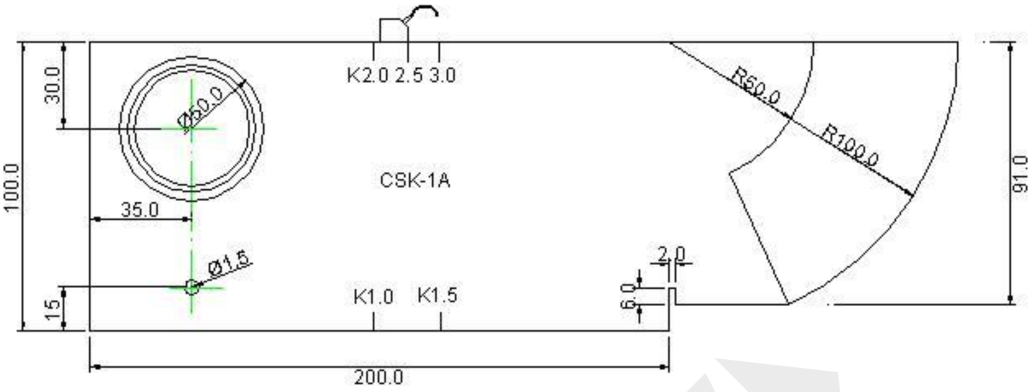

Enter Thickness

Range 0150.0 mm

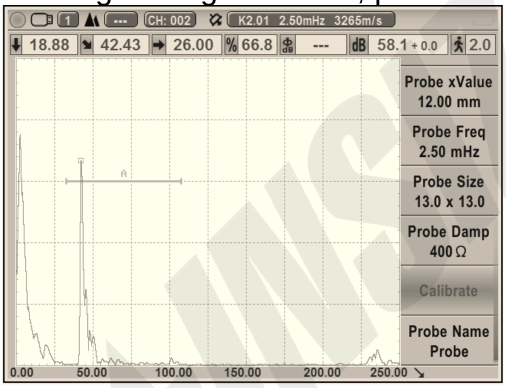
Hole Depth 0030.0 mm

Aperture 0050.0 mm

Step 6: Place the probe on the test block, as shown in the figure below. Because the nominal K value of the probe is 2, we place the probe near the K2 marking line of the CSK-1A test block, aim the probe on the 50mm diameter circular hole, and slowly move the probe to find the highest echo of the 50mm diameter circular hole. You can press the shortcut key and use the "Peak Memory" function to search for the highest echo.



Step 7: After finding the highest echo, press "OK" to complete the calibration.



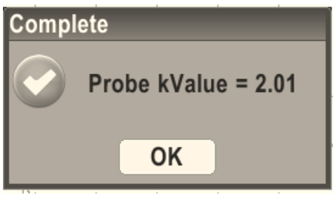
Probe xValue 12.00 mm

Probe Freq 2.50 mHz

Probe Size 13.0 x 13.0

Probe Damp 400 Ω

Probe Name Probe



Complete

Probe kValue = 2.01

Step 8: Press the key to save the calibrated probe parameters to the current channel.

HINSIZE

Appendix A: Charging the Batteries

The approximate level of remaining battery life is visually displayed by the battery indicator. When fresh batteries with full capacity are installed, the icon will appear as 🔋. As the battery life is consumed, the icon will begin to “empty”. When the battery indicator is almost empty as indicated by the symbol ▭ , charge the batteries as soon as possible. You may take a second battery pack or replacement battery pack with you if you cannot connect the instrument to mains.

The instrument automatically shuts off when batteries are too weak for reliable operation. Settings are saved and restored when the instrument is turned on again.

You can charge the lithium-ion battery pack either directly in the instrument or by means of an external battery charger provided with the instrument.

Attention:

You should only use the batteries provided by us and the corresponding battery charger. An improper handing of the batteries and of the battery charger may cause explosion hazard.

If a battery pack is located in the instrument, the charging process is started automatically when you connect the plug-in power supply unit. You can carry out ultrasonic inspections and charge a battery at the same time.

The charging time is about 8 hours with a simultaneous ultrasonic inspection. If the instrument is not being used for ultrasonic inspections, the charging time is about 4 hours. This charging time applies to ambient temperatures from 25 to 30℃. Please take into consideration that the batteries are not charged to their full capacity at higher temperatures.

The CHARGE LED display at the bottom of the keypad indicates the status of the charging process. The yellow light is on when charging, and the blue light is on when the battery is full..

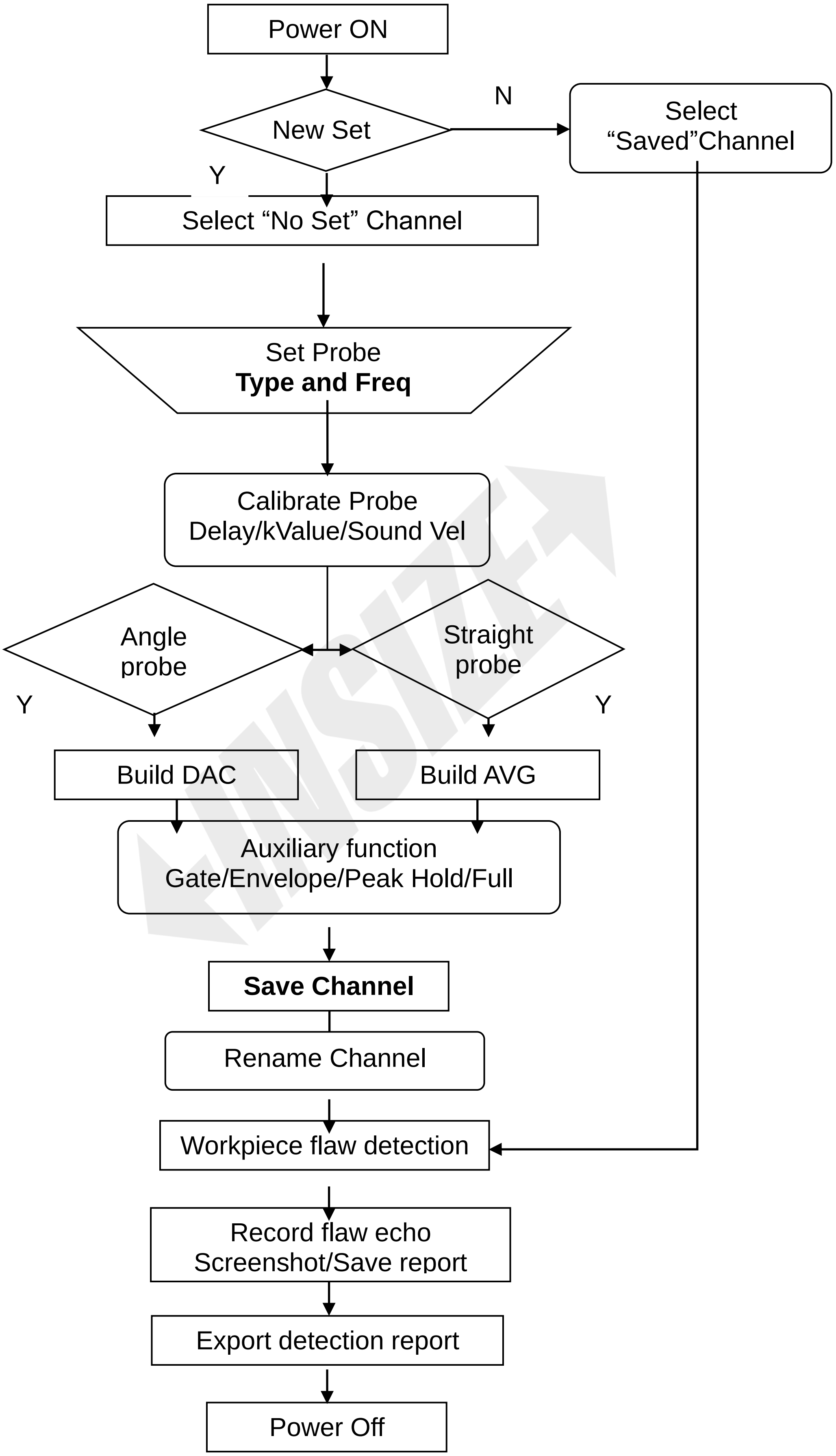
Note:

- The battery pack should be charged over a period of time, even not used.
- The instrument can only work with the specially designed battery pack and power adapter (charger) supplied by us. Working with others may result in damage of the instrument, battery leakage, fire or even explosion.

Appendix B: Menu Structure

Channel	**Probe**	Setting	**DAC**	**AVG**	Basic	Memory
Select Ch	Probe Type	Language	DAC Set	AVG Set	Range	Order View
Save Ch	Probe kValue	Test Unit	Standard	AVG Build	Sound Vel	Name View
Reame Ch	Probe Delay	Grid Mode	DACBuild	AVG Edit	D-Delay	Date View
Delete Ch	Probe xValue	Scr Bright	DAC Edit	AVG UL	Scaling	Save Report
Delete All	Rorbe Freq	Scr Color	Size Ref	AVG ML	Thickness	Delete All
Export Ch	Probe Size	Key Sound	Curve RL	AVG DL	Diameter	Export PDF
Import Ch	Probe Damp	Alarm Sound	Curve SL	Size Type	Correct	Export All
Export All	Calibrate	DateTime	Curve EL	Ref Type	Filter Type	Import All
Import All		Comm Port	Curve No4			
		Format Mem				
		ScrShot Mode				
Gate	Pulser	Gain	Record	Auxiliary	**B Scan**	About
Gate Logic	Amplitude	Basic Gain	Recording	Echo Coded	B Scan Set	
A-Start	Pluse Width	Gain Setp	Play/Delete	Crack Height	B Scan Speed	
A-Width	Pulse Freq	DB Offset	Storage	AWS Rating	B Scan Height	
A-Height	Rectiry	T-correct	Export Rec	Echo Combin	B Scan Color	
B-Start	Echo Reject	Auto Gain	Export All	Peak Mark	B Scan Mode	
B-Width			Delete All	Gate Color	B Scan Mode	
B-Height				Echo Fill	Default	
Gate Alarm						
Trigger						

Appendix C: Instrument operation flow chart



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