



ISONIC 2005 / 2020 / STAR

Portable Digital Ultrasonic Flaw Detector and Recorder
Operating Manual
Revision 2.38



Sonotron NDT



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Covered by the United States patents **5524627**, **5952577**, **6545681**; other US & foreign patents pending



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EC Declaration of Conformity

**Council Directive 89/336/EEC on Electromagnetic Compatibility, as amended by Council Directive 92/31/EEC & Council Directive 93/68/EEC
Council Directive 73/23/EEC (Low Voltage Directive), as amended by Council Directive 93/68/EEC**

We, **Sonotron NDT Ltd.**, 4 Pekeris Street, Rehovot, 76702 Israel, certify that the product described is in conformity with the Directives 73/23/EEC and 89/336/EEC as amended

ISONIC 2005 / 2020 / STAR

Portable Digital Ultrasonic Flaw Detector and Recorder

The product identified above complies with the requirements of above EU directives by meeting the following standards:

Safety

EN 61010-1:1993

EMC

EN 61326:1997

EN 61000-3-2:1995 /A1:1998 /A2:1998 /A14:2000

EN 61000-3-3:1995





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Declaration of Compliance

We, **Sonotron NDT Ltd.**, 4 Pekeris Street, Rehovot, 76702 Israel certify that the product described is in conformity with National and International Codes as amended

ISONIC 2005 / 2020 / STAR

Portable Digital Ultrasonic Flaw Detector and Recorder

The product identified above complies with the requirements of following National and International Codes:

- ASME Section I – Rules for Construction of Power Boilers
- ASME Section VIII, Division 1 – Rules for Construction of Pressure Vessels
- ASME Section VIII, Division 2 – Rules for Construction of Pressure Vessels. Alternative Rules
- ASME Section VIII Article KE-3 – Examination of Welds and Acceptance Criteria
- ASME Code Case 2235 Rev 9 – Use of Ultrasonic Examination in Lieu of Radiography
- Non-Destructive Examination of Welded Joints – Ultrasonic Examination of Welded Joints. – British and European Standard BS EN 1714:1998
- Non-Destructive Examination of Welds – Ultrasonic Examination – Characterization of Indications in Welds. – British and European Standard BS EN 1713:1998
- Calibration and Setting-Up of the Ultrasonic Time of Flight Diffraction (TOFD) Technique for the Detection, Location and Sizing of Flaws. – British Standard BS 7706:1993
- WI 00121377, Welding – Use Of Time-Of-Flight Diffraction Technique (TOFD) For Testing Of Welds. – European Committee for Standardization – Document # CEN/TC 121/SC 5/WG 2 N 146, issued Feb, 12, 2003
- ASTM E 2373 – 04 – Standard Practice for Use of the Ultrasonic Time of Flight Diffraction (TOFD) Technique
- Non-Destructive Testing – Ultrasonic Examination – Part 5: Characterization and Sizing of Discontinuities. – British and European Standard BS EN 583-5:2001
- Non-Destructive Testing – Ultrasonic Examination – Part 2: Sensitivity and Range Setting. – British and European Standard BS EN 583-2:2001
- Manufacture and Testing of Pressure Vessels. Non-Destructive Testing of Welded Joints. Minimum Requirement for Non-Destructive Testing Methods – Appendix 1 to AD-Merkblatt HP5/3 (Germany).– Edition July 1989



FCC Rules

This **ISONIC 2005 / 2020 / STAR** ultrasonic flaw detector and data recorder (hereinafter called **ISONIC 2005 / 2020 / STAR**) has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Safety Regulations



Please read this section carefully and observe the regulations in order to ensure your safety and operate the system as intended

Please observe the warnings and notes printed in this manual and on the unit

The **ISONIC 2005 / 2020 / STAR** has been built and tested according to the regulations specified in EN60950/VDE0805. It was in perfect working condition on leaving the manufacturer's premises

In order to retain this standard and to avoid any risk in operating the equipment, the user must make sure to comply with any hints and warnings included in this manual

Depending on the power supply the **ISONIC 2005 / 2020 / STAR** complies with protection class I /protective grounding/, protection class II, or protection class III

Exemption from statutory liability for accidents

The manufacturer shall be exempt from statutory liability for accidents in the case of non-observance of the safety regulations by any operating person

Limitation of Liability

The manufacturer shall assume no warranty during the warranty period if the equipment is operated without observing the safety regulations. In any such case, manufacturer shall be exempt from statutory liability for accidents resulting from any operation

Exemption from warranty

The manufacturer shall be exempt from any warranty obligations in case of the non-observance of the safety regulations

The manufacturer will only warrant safety, reliability, and performance of the **ISONIC 2005 / 2020 / STAR** if the following safety regulations are closely observed:

- Setting up, expansions, re-adjustments, alterations, and repairs must only be carried out by persons who have been authorized by manufacturer
- The electric installations of the room where the equipment is to be set up must be in accordance with IEC requirements
- The equipment must be operated in accordance with the instructions
- Any expansions to the equipment must comply with the legal requirements, as well as with the specifications for the unit concerned
- Confirm the rated voltage of your **ISONIC 2005 / 2020 / STAR** matches the voltage of your power outlet
- The mains socket must be located close to the system and must be easily accessible
- Use only the power cord furnished with your **ISONIC 2005 / 2020 / STAR** and a properly grounded outlet /only protection class I/
- Do not connect the **ISONIC 2005 / 2020 / STAR** to power bar supplying already other devices. Do not use an extension power cord
- Any interruption to the PE conductor, either internally or externally, or removing the earthed conductor will make the system unsafe to use /only protection class I/
- Any required cable connectors must be screwed to or hooked into the casing
- The equipment must be disconnected from mains before opening
- To interrupt power supply, simply disconnect from the mains
- Any balancing, maintenance, or repair may only be carried out by manufacturer authorized specialists who are familiar with the inherent dangers
- Both the version and the rated current of any replacement fuse must comply with specifications laid down
- Using any repaired fuses, or short-circuiting the safety holder is illegal
- If the equipment has suffered visible damage or if it has stopped working, it must be assumed that it can no longer be operated without any danger. In these cases, the system must be switched off and be safeguarded against accidental use
- Only use the cables supplied by manufacturer or shielded data cable with shielded connectors at either end
- Do not drop small objects, such as paper clips, into the **ISONIC 2005 / 2020 / STAR**
- Do not put the **ISONIC 2005 / 2020 / STAR** in direct sunlight, near a heater, or near water. Leave space around the **ISONIC 2005 / 2020 / STAR**
- Disconnect the power cord whenever a thunderstorm is nearby. Leaving the power cord connected may damage the **ISONIC 2005 / 2020 / STAR** or your property

- When positioning the equipment, external monitor, external keyboard, and external mouse take into account any local or national regulations relating to ergonomic requirements. For example, you should ensure that little or no ambient light is reflected off the external monitor screen as glare, and that the external keyboard is placed in a comfortable position for typing
- Do not allow any cables, particularly power cords, to trail across the floor, where they can be snagged by people walking past
- The voltage of the External DC Power Supply below 11 V is not allowed for the **ISONIC 2005 / 2020 / STAR** unit
- The voltage of the External DC Power Supply above 16 V is not allowed for the **ISONIC 2005 / 2020 / STAR** unit
- Charge of the battery for the **ISONIC 2005 / 2020 / STAR** unit is allowed only with use of the AC/DC converters / chargers supplied along with it or authorized by Sonotron NDT

Remember this before:

- balancing
- carrying out maintenance work
- repairing
- exchanging any parts

Please make sure batteries, rechargeable batteries, or a power supply with SELV output supplies power

Software

ISONIC 2005 / 2020 / STAR is a software controlled inspection device. Based on present state of the art, software can never be completely free of faults. **ISONIC 2005 / 2020 / STAR** should therefore be checked before and after use in order to ensure that the necessary functions operate perfectly in the envisaged combination. If you have any questions about solving problems related to use the **ISONIC 2005 / 2020 / STAR**, please contact your local Sonotron NDT representative

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1. Introduction

ISONIC 2005 / 2020 / STAR uniquely combines functionality and mobility of high performance portable digital ultrasonic flaw detector with recording, imaging, and data processing capabilities of smart computerized inspection system

ISONIC 2005 / 2020 / STAR resolves a *variability of ultrasonic inspection tasks*:

- **A-Scan-based inspection** using conventional pulse echo, back echo attenuation, and through transmission techniques
 - **Straight Line Scanning Record - based inspection**:
 - **Thickness Profile B-Scan** imaging and recording, which is performed through continuous measuring of thickness value along straight line type probe trace
 - **B-Scan cross-sectional imaging and recording of defects** for longitudinal and shear wave inspection, which is performed through continuous measuring of echo amplitudes and reflectors coordinates along straight line type probe trace
 - **CB-Scan horizontal plane-view imaging and recording** of defects for shear, surface, and guided wave inspection, which is performed through continuous measuring of echo amplitudes and reflectors coordinates along straight line type probe trace
 - **TOFD Inspection – RF B-Scan and D-Scan Imaging** along straight line type probe trace
- For *Straight Line Scanning* records it may be used:
- *Time-based mode* – **ISONIC 2005 / 2020 / STAR** is equipped with built-in real time clock
 - *True-to-location mode* – **ISONIC 2005 / 2020 / STAR** is equipped with built-in incremental encoder interface

- **XY-Scanning Record - based inspection**:
 - **Thickness Map** imaging and recording, which is performed through continuous measuring of thickness value along probe trace
 - **Flaw Detection – Pulse Echo 3D imaging (C-Scan, B-Scan, D-Scan) and recording of defects** for straight beam inspection, which is performed through continuous measuring of echo amplitudes and reflectors coordinates along probe trace
 - **Flaw Detection – Through Transmission / Back Echo Attenuation 2D imaging and recording (C-Scan)** which is performed through continuous measuring of signal amplitudes along probe trace
- For *XY-Scanning* records it is necessary to use optional items such as scanning mechanism driven either manually or automatically, 2 incremental encoders built-in into a scanning mechanism, dual axis encoder USB Interface, and **MULTISCAN COMBO S ME** inspection software package

For all types of *Straight Line Scanning* and *XY-Scanning* records A-Scans are captured for each probe position along probe trace and may be played back and evaluated off-line at postprocessing stage. This unique feature makes it possible **off-line defect characterization through echo-dynamic pattern analysis**

Thickness Profile B-Scan Data recorded during *Straight Line Scanning* and **Thickness Map** data recorded during *XY-Scanning* is presented in the format compatible with various *Risk Based Inspection and Maintenance* procedures. Off-line measurements and statistical analysis functions also meet the requirements of said procedures

ISONIC 2005 / 2020 / STAR has practically unlimited capacity for storing of

- Single **A-Scans** accompanied with corresponding instrument settings
- Ultrasonic signal spectrum graphs (FFT Graphs) accompanied with corresponding RF **A-Scans** and instrument settings
- Various **A-Scans** sequences along with corresponding Thickness Profiles, or **B-Scans**, or **CB-Scans**, or **TOFD** Maps depending on mode of operation selected accompanied with corresponding instrument settings

ISONIC 2005 / 2020 / STAR complies with the requirements of National and International Codes:

- ❑ ASME Section I – Rules for Construction of Power Boilers
- ❑ ASME Section VIII, Division 1 – Rules for Construction of Pressure Vessels
- ❑ ASME Section VIII, Division 2 – Rules for Construction of Pressure Vessels. Alternative Rules
- ❑ ASME Section VIII Article KE-3 – Examination of Welds and Acceptance Criteria
- ❑ ASME Code Case 2235 Rev 9 – Use of Ultrasonic Examination in Lieu of Radiography
- ❑ Non-Destructive Examination of Welded Joints – Ultrasonic Examination of Welded Joints. – British and European Standard BS EN 1714:1998
- ❑ Non-Destructive Examination of Welds – Ultrasonic Examination – Characterization of Indications in Welds. – British and European Standard BS EN 1713:1998
- ❑ Calibration and Setting-Up of the Ultrasonic Time of Flight Diffraction (TOFD) Technique for the Detection, Location and Sizing of Flaws. – British Standard BS 7706:1993
- ❑ WI 00121377, Welding – Use Of Time-Of-Flight Diffraction Technique (TOFD) For Testing Of Welds. – European Committee for Standardization – Document # CEN/TC 121/SC 5/WG 2 N 146, issued Feb, 12, 2003
- ❑ ASTM E 2373 – 04 – Standard Practice for Use of the Ultrasonic Time of Flight Diffraction (TOFD) Technique
- ❑ Non-Destructive Testing – Ultrasonic Examination – Part 5: Characterization and Sizing of Discontinuities. – British and European Standard BS EN 583-5:2001
- ❑ Non-Destructive Testing – Ultrasonic Examination – Part 2: Sensitivity and Range Setting. – British and European Standard BS EN 583-2:2001
- ❑ Manufacture and Testing of Pressure Vessels. Non-Destructive Testing of Welded Joints. Minimum Requirement for Non-Destructive Testing Methods – Appendix 1 to AD-Merkblatt HP5/3 (Germany).– Edition July 1989

2. Technical Data

2.1. Instruments manufactured on or before Dec 1, 2007

Pulse Type:	Positive Spike Pulse / Positive Square Wave Pulse
Initial Transition:	≤5 ns (10-90%)
Pulse Amplitude:	Spike pulse - smoothly tunable (18 levels) 50V ... 400 V into 50 Ω at 4 levels of excitation Energy Square wave pulse - smoothly tunable (18 levels) 50V ... 400 V into 50 Ω
Pulse Duration:	Spike pulse - 10...70 ns for 50 Ω load depending on Energy and Damping setup Square wave pulse - 65...600 ns independently controllable in 5 ns step
Energy (Spike Pulse):	4 discrete energy values / 40 μJ (min) to 250 μJ (max) – at 400V amplitude
Modes:	Single / Dual
Damping:	17 discrete resistances values / 25 Ω min to 1000 Ω max
Internal Matching Coil –	16 discrete inductivity values / 2 μH min to 78 μH max
Probe Impedance Matching:	
PRF:	0 – optionally; 15...5000 Hz controllable in 1 Hz resolution
Optional Sync Output /	Max +5V, τ ≤ 5 ns, t ≥100 ns, Load Impedance ≥ 50 Ω
Input:	
Gain:	0...120 dB controllable in 0.5 dB resolution
Advanced Low Noise	93 μV peak to peak input referred to 80 dB gain / 35 MHz bandwidth
Design:	
Frequency Band:	0.35 ... 35 MHz Wide Band / 34 Sub Bands
Ultrasound Velocity:	300...20000 m/s (11.81...787.4 "/ms) controllable in 1 m/s (0.1 "/ms) resolution
Range:	0.5...7000 μs controllable in 0.01 μs resolution
Display Delay:	0...3200 μs controllable in 0.01 μs resolution
Probe Angle:	0...90° controllable in 1° resolution
Probe Delay:	0 to 70 μs controllable in 0.01μs resolution - expandable
Display Modes:	RF, Rectified (Full Wave / Negative or Positive Half Wave), Signal's Spectrum (FFT Graph)
Reject:	0...99 % of screen height controllable in 1% resolution
DAC / TCG:	Theoretical – through keying in dB/mm (dB/") factor Experimental – through sequential recording echo amplitudes from variously distanced equal reflectors 46 dB Dynamic Range, Slope ≤ 20 dB/μs, Capacity ≤ 40 points Available for Rectified and RF Display
DGS:	Standard Library for 18 probes / unlimitedly expandable
Gates:	2 Independent Gates / unlimitedly expandable
Gate Start and Width:	Controllable over whole variety of A-Scan Display Delay and A-Scan Range in 0.1 mm /// 0.001" resolution
Gate Threshold:	5...95 % of A-Scan height controllable in 1 % resolution
Measuring Functions –	27 automatic functions / expandable; Dual Ultrasound Velocity Measurement Mode
Digital	for Multi-Layer Structures; Curved Surface / Thickness / Skip correction for angle
Display Readout:	beam probes; Ultrasound velocity and Probe Delay Auto-Calibration for all types of probes
Freeze (A-Scans and	Freeze All – A-Scans and Spectrum Graphs / Freeze Peak – A-Scans / All
Spectrum Graphs)	measurements functions, manipulating Gates, and ±6dB Gain varying are available for frozen signals
Encoder Interface:	Built-in interface for incremental mechanical encoder
Imaging Modes:	Thickness Profile B-Scan, Cross-sectional B-Scan, Plane View CB-Scan, TOFD
Encoding:	Time-based (built-in real time clock – 0.02 sec resolution) True-to-location (incremental encoder – 0.5 mm resolution)
Length of one record:	50...20000 mm (2" ...800"), automatic scrolling
Method of Record:	Complete raw data recording
Region of Interest:	Controllable over entire Display Delay, Probe Delay, Range, Ultrasound Velocity and other appropriate instrument settings
Off-Line Image Analysis:	A-Scan sequences recovery, Defects sizing, outlining, pattern recognition
Data Reporting:	Direct printout of Calibration Dumps, A-Scans, Spectrum Graphs, thickness profile B-Scans, cross-sectional B-Scans, plane view CB-Scans, TOFD maps

Data Storage Capacity:	At least 100000 sets including calibration dumps accompanied with A-Scans and/or Spectrum Graphs; At least 10000 sets including calibration dumps accompanied with thickness profile B-Scans or cross-sectional B-Scans or plane view CB-Scans or TOFD maps
Data Logger:	Optional – organizes and manages database files capable to store up to 254745 records whereas each record includes complete <Instrument Setup ⊕ A-Scan ⊕ Wall Thickness (Distance) Reading> data
On-Board Computer:	Pentium M 300MHz
RAM:	128 Megabytes
Internal Flash Memory - Quasi HDD:	2 Gigabytes
Outputs:	LAN, USB X 2, PS 2, SVGA
Screen:	6.5" High Color Resolution (32 bit) SVGA 640×480 pixels 133×98 mm (5.24" × 3.86") Sun-readable LCD; Maximal A-Scan Size (working area) – 130×92 mm (5.12" × 3.62")
Controls:	Front Panel Sealed Keyboard, Front Panel Sealed Mouse, Touch Screen
Compatibility with the external devices:	PS 2 Keyboard and Mouse, USB Keyboard and Mouse, USB Flash Memory card, Printer through USB or LAN, PC through USB or LAN, SVGA External Monitor
Operating System:	Windows™98SE – instrument operation Fully compatible for networking and / or USB connection and off-line data analysis and reporting in external PC running under Windows™98SE, Windows™2000, Windows™XP
Power:	Mains - 100...240 VAC, 40...70 Hz, auto-switch; Battery 12V 8AH up to 6 hours continuous operation
Housing:	IP 53 rugged aluminum case with carrying handle
Dimensions:	265×156×101 mm (10.43"×6.14"×3.98") - without battery 265×156×139 mm (10.43"×6.14"×5.47") - with battery
Weight:	2.650 kg (5.83 lbs) - without battery 3.580 kg (7.88 lbs) - with battery

2.2. Instruments manufactured after Dec 1, 2007

Pulse Type:	Positive Spike Pulse / Positive Square Wave Pulse
Initial Transition:	≤5 ns (10-90%)
Pulse Amplitude:	Spike pulse - smoothly tunable (18 levels) 50V ... 400 V into 50 Ω at 4 levels of excitation Energy Square wave pulse - smoothly tunable (18 levels) 50V ... 400 V into 50 Ω
Pulse Duration:	Spike pulse - 10...70 ns for 50 Ω load depending on Energy and Damping setup Square wave pulse - 65...600 ns independently controllable in 5 ns step
Energy (Spike Pulse):	4 discrete energy values / 40 μJ (min) to 250 μJ (max) – at 400V amplitude
Modes:	Single / Dual
Damping:	17 discrete resistances values / 25 Ω min to 1000 Ω max
Internal Matching Coil –	16 discrete inductivity values / 2 μH min to 78 μH max
Probe Impedance Matching:	
PRF:	0 – optionally; 15...5000 Hz controllable in 1 Hz resolution
Optional Sync Output /	Max +5V, τ ≤ 5 ns, t ≥100 ns, Load Impedance ≥ 50 Ω
Input:	
Gain:	0...120 dB controllable in 0.5 dB resolution
Advanced Low Noise	93 μV peak to peak input referred to 80 dB gain / 35 MHz bandwidth
Design:	
Frequency Band:	0.35 ... 35 MHz Wide Band / 34 Sub Bands
Ultrasound Velocity:	300...20000 m/s (11.81...787.4 "/ms) controllable in 1 m/s (0.1 "/ms) resolution
Range:	0.5...7000 μs controllable in 0.01 μs resolution
Display Delay:	0...3200 μs controllable in 0.01 μs resolution
Probe Angle:	0...90° controllable in 1° resolution
Probe Delay:	0 to 70 μs controllable in 0.01μs resolution - expandable
Display Modes:	RF, Rectified (Full Wave / Negative or Positive Half Wave), Signal's Spectrum (FFT Graph)
Reject:	0...99 % of screen height controllable in 1% resolution
DAC / TCG:	Theoretical – through keying in dB/mm (dB/") factor Experimental – through sequential recording echo amplitudes from variously distanced equal reflectors 46 dB Dynamic Range, Slope ≤ 20 dB/μs, Capacity ≤ 40 points Available for Rectified and RF Display
DGS:	Standard Library for 18 probes / unlimitedly expandable
Multiple DAC/DGS Curves*:	Main DAC/DGS Curve plus up to 3 (three) curves with individually controllable levels in ±14 dB range
Gates:	2 Independent Gates / unlimitedly expandable
Gate Start and Width:	Controllable over whole variety of A-Scan Display Delay and A-Scan Range in 0.1 mm /// 0.001" resolution
Gate Threshold:	5...95 % of A-Scan height controllable in 1 % resolution
Measuring Functions –	27 automatic functions / expandable; Dual Ultrasound Velocity Measurement Mode
Digital	for Multi-Layer Structures; Curved Surface / Thickness / Skip correction for angle
Display Readout:	beam probes; Ultrasound velocity and Probe Delay Auto-Calibration for all types of probes
Freeze (A-Scans and	Freeze All – A-Scans and Spectrum Graphs / Freeze Peak – A-Scans / All
Spectrum Graphs)	measurements functions, manipulating Gates, and ±6dB Gain varying are available for frozen signals
Encoder Interface:	Built-in interface for incremental mechanical encoder
Imaging Modes:	Thickness Profile B-Scan, Cross-sectional B-Scan, Plane View CB-Scan, TOFD
Encoding:	Time-based (built-in real time clock – 0.02 sec resolution) True-to-location (incremental encoder – 0.5 mm resolution)
Length of one record:	50...20000 mm (2" ...800"), automatic scrolling
Method of Record:	Complete raw data recording
Region of Interest:	Controllable over entire Display Delay, Probe Delay, Range, Ultrasound Velocity and other appropriate instrument settings
Off-Line Image Analysis:	A-Scan sequences recovery, Defects sizing, outlining, pattern recognition
Data Reporting:	Direct printout of Calibration Dumps, A-Scans, Spectrum Graphs, thickness profile B-Scans, cross-sectional B-Scans, plane view CB-Scans, TOFD maps

Data Storage Capacity:	At least 100000 sets including calibration dumps accompanied with A-Scans and/or Spectrum Graphs; At least 10000 sets including calibration dumps accompanied with thickness profile B-Scans or cross-sectional B-Scans or plane view CB-Scans or TOFD maps
Data Logger:	Optional – organizes and manages database files capable to store up to 254745 records whereas each record includes complete <Instrument Setup ⊕ A-Scan ⊕ Wall Thickness (Distance) Reading> data
On-Board Computer:	AMD LX 800 - 500MHz
RAM:	1 Gigabyte
Internal Flash Memory - Quasi HDD:	4 Gigabytes
Outputs:	LAN, USB X 2, PS 2, SVGA
Screen:	6.5" High Color Resolution (32 bit) SVGA 640×480 pixels 133×98 mm (5.24" × 3.86") Sun-readable LCD; Maximal A-Scan Size (working area) – 130×92 mm (5.12" × 3.62")
Controls:	Front Panel Sealed Keyboard, Front Panel Sealed Mouse, Touch Screen
Compatibility with the external devices:	PS 2 Keyboard and Mouse, USB Keyboard and Mouse, USB Flash Memory card, Printer through USB or LAN, PC through USB or LAN, SVGA External Monitor
Operating System:	Windows™XP Embedded
Power:	Mains - 100...240 VAC, 40...70 Hz, auto-switch; Battery 12V 8AH up to 6 hours continuous operation
Housing:	IP 53 rugged aluminum case with carrying handle
Dimensions:	265×156×101 mm (10.43"×6.14"×3.98") - without battery 265×156×139 mm (10.43"×6.14"×5.47") - with battery
Weight:	2.650 kg (5.83 lbs) - without battery 3.580 kg (7.88 lbs) - with battery

3. ISONIC 2005 / 2020 / STAR – Scope of Supply

#	Item	Order Code (Part #)	Note
1	<p>ISONIC 2005 / 2020 / STAR – Portable Digital Ultrasonic Flaw Detector and Recorder</p> <ul style="list-style-type: none"> • ISONIC 2005 / 2020 / STAR Electronic unit – including: <ul style="list-style-type: none"> > Internal PC (P-MMX-S - 300 MHz, RAM-1G, Quazi-HDD Flash Memory Card 4G, active TFT sVGA LCD High Color Sun-Readable Touch Screen, Built-In Interfaces: 2XUSB; Ethernet; PS/2; Front Panel Sealed Keyboard and Mouse; sVGA output) > 100 ... 250 VAC AC/DC converter > SE 248000 - UDS 3-5 Pulsar Receiver Card: <ul style="list-style-type: none"> □ Combined “Spike wave – Selectable Energy” / “Square Wave – Tunable Width” Tunable Firing Level Pulsar; Single / Dual Modes of Operation; Damping: 17 discrete resistances values / 25Ω min to 1000Ω max; Internal Matching Coil – Probe Impedance Matching: 16 discrete inductivity values / 2 μH min to 78 μH max; Special Probe Protection Circuit to Prevent Probe Damage for Not Properly Adjusted Pulse Width □ Gain: 0...120 dB controllable in 0.5 dB resolution; Advanced Low Noise Design: 93μV peak to peak input referred to 80 dB gain / 35 MHz bandwidth; Ffrequency Band: 0.35 ... 35 MHz Wide Band / 34 Sub Bands □ Built-In Incremental Encoder Interface • Software <ul style="list-style-type: none"> □ ISONIC 2005 / 2020 / STAR Multi-Functional Package (SWA 99C05200) <ul style="list-style-type: none"> ◆ A-Scan <ul style="list-style-type: none"> ⇒ A-Scan (Full Wave / Neg Wave / Pos Wave rectification; RF) ⇒ DAC, DGS, TCG ⇒ FFT (Frequency Domain Signal Presentation) - additional feature for the defects evaluation and / or pattern recognition / probes characterization <ul style="list-style-type: none"> ⇒ Enhanced Signal Evaluation for the Live and Frozen A-Scans including Gain Adjustments while in the Freeze Mode ⇒ Dual Ultrasound Velocity Multi-echo Measurements Mode ⇒ Thickness / Skip Distance / Curved Surface Correction Measurements Mode for Angle Beam Probes ⇒ Probe Delay / Ultrasound Velocity Auto Calibration Mode for Straight Beam and Angle Beam Probes ⇒ Flank, Top, Flank-First, Top-First Mode of Measurements for Gated Signals Sequences ⇒ Comprehensive Setup and A-Scan / FFT graph report, Direct Connection To any Type of USB Windows Printer; Printing through the LAN ◆ Thickness Profile Imaging and Recording (Typical Application: Corrosion characterization) <ul style="list-style-type: none"> ⇒ Continuous measuring of the thickness value along the probe trace ⇒ Time-based (real time clock) and true-to-location (built-in incremental encoder interface) modes of data recording ⇒ Recording of the complete sequence of A-Scans along with the thickness profile ⇒ Off-line evaluation of the thickness profile images featured with: <ul style="list-style-type: none"> ▶ Sizing of the thickness damages at any location along the stored image: remaining thickness, thickness loss, and the length of the damage ▶ Play-back and evaluation of the A-Scans obtained during the thickness profile recording ▶ Echo Dynamic Pattern Analysis ▶ Off-line reconstruction of the thickness profile image for the various Gain / Gate setup ⇒ Comprehensive Setup and Scanning Reporting, Direct Connection To any Type of USB Windows Printer; Printing through the LAN ◆ B-Scan cross-sectional imaging and recording of the defects for longitudinal and shear wave inspection (Typical Application: Pulse echo inspection of welds, composites, metals, plastics, and the like) <ul style="list-style-type: none"> ⇒ Continuous measuring of the echo amplitudes and reflectors coordinates along the probe trace ⇒ Time-based (real time clock) and true-to-location (built-in incremental encoder interface) modes of data recording ⇒ Recording of the complete sequence of A-Scans along with the B-Scan defects images ⇒ Off-line evaluation of the B-Scan record images featured with: <ul style="list-style-type: none"> ▶ Sizing of the defects at any location along the stored image – coordinates and projection size 	SA 80450	Standard Configuration

#	Item	Order Code (Part #)	Note
	<ul style="list-style-type: none"> ▶ Play-back and evaluation of the A-Scans obtained during the B-Scan imaging and recording ▶ Echo Dynamic Pattern Analysis ▶ Defects outlining and pattern recognition based on the A-Scan sequence analysis ▶ Off-line reconstruction of the B-Scan defects images for the various Gain / Rejection level setup ▶ DAC / DGS B-Scan normalization ⇒ Comprehensive Setup and Scanning Reporting, Direct Connection To any Type of USB Windows Printer; Printing through the LAN ◆ CB-Scan horizontal plane-view imaging and recording of the defects for the shear, surface, and guided wave inspection (Typical Application: Long range pulse echo and CHIME inspection of the annular plates and piping, stress corrosion, etc; weld inspection, surface wave inspection) <ul style="list-style-type: none"> ⇒ Continuous measuring of the echo amplitudes and reflectors coordinates along the probe trace ⇒ Time-based (real time clock) and true-to-location (built-in incremental encoder interface) modes of data recording ⇒ Recording of the complete sequence of A-Scans along with the CB-Scan defects images ⇒ Off-line evaluation of the CB-Scan record images featured with: <ul style="list-style-type: none"> ▶ Sizing of the defects at any location along the stored image – coordinates and projection size ▶ Play-back and evaluation of the A-Scans obtained during the CB-Scan imaging and recording ▶ Echo Dynamic Pattern Analysis ▶ Defects outlining and pattern recognition based on the A-Scan sequence analysis ▶ Off-line reconstruction of the CB-Scan defects images for the various Gain / Rejection level setup ▶ DAC / DGS CB-Scan normalization ⇒ Comprehensive Setup and Scanning Reporting, Direct Connection To any Type of USB Windows Printer; Printing through the LAN ◆ TOFD Inspection – RF B-Scan and D-Scan Imaging (Typical Application: weld inspection; CHIME inspection) <ul style="list-style-type: none"> ⇒ Time-based (real time clock) and true-to-location (built-in incremental encoder interface) modes of data recording ⇒ Averaging A-Scans whilst recording as per operator's selection ⇒ Recording of the complete sequence of A-Scans along with the TOFD map ⇒ Off-line evaluation of the TOFD Map featured with: <ul style="list-style-type: none"> ▶ Improvement of the near to surface resolution through the removal of the lateral wave and back echo records from the TOFD Map ▶ Linearization and straightening of the TOFD Map ▶ Increasing the contrast of the TOFD images through the varying Gain and rectification ▶ A-Scan sequence analysis ▶ Defects pattern recognition and sizing ⇒ Comprehensive Setup and Scanning Reporting, Direct Connection To any Type of USB Windows Printer; Printing through the LAN <ul style="list-style-type: none"> • <u>USB Flash Drive for External Data Storage</u> • <u>12 months warranty</u> • <u>Lifetime free software update</u> 		
2	Backup Pen-Drive	SFD 2005098	Operating Manual on the Backup Pen-Drive
3	Silicon Rubber Jacket	SK 2005111	Optional item
4	Rechargeable Battery Ni MH 9 AH / 12V	SK 2005102	Optional item
5	Battery Charger	SK 2005103	Optional item Required for battery charge
6	Travel Hard Case	SK 2005104	Optional item Allows safe cargo transportation
7	External USB Keyboard	SK 2005105	Optional Item Extremely Useful at Postprocessing Stage
8	External USB Optical Mouse	SK 2005106	Optional Item Extremely Useful at Postprocessing Stage

#	Item	Order Code (Part #)	Note
9	Postprocessing SW Package for Office PC: IOFFICE 2005 - ISONIC 2005 / 2020 / STAR Office /// comprehensive postprocessing of inspection results files captured by ISONIC 2005 / 2020 / STAR /// automatic creating of ISONIC 2005 / 2020 / STAR inspection reports in MS Word® format	SWA99C0204	Optional Item
10	Postprocessing SW Package for Office PC: D-LINE - ISONIC D-Spreadsheet Creator /// automatic MS Excel® thickness spreadsheet creating through conversion of thickness B-Scan files captured by ISONIC 2005 / 2020 / STAR and ISONIC 2006 using line scanning mode; compliant with various <i>Risk Based Inspection and Maintenance</i> procedures	SWA99C0212	Optional Item
11	Optional SW Package: ISONIC Data Logger – comprehensive data recording, on-site and off-site editing, importing, exporting, and reporting for routine point-by-point wall thickness gauging. Thanks to automatic MS Excel® thickness spreadsheet creating ISONIC Data Logger is compliant with various <i>Risk Based Inspection and Maintenance</i> procedures	SWA 99C05280	Optional Item
12	<p>Inspection SW Package: MULTISCAN-COMBO - S ME Immersion Mode / Contact Mode Inspection with Straight Beam Single Element or Dual Ultrasonic Probes for Internal Defects with Tomographical and 3D Data Presentation and User Defined Mapping Scheme, Complete Raw Data Capturing</p> <ul style="list-style-type: none"> ⇒ Support of all A-Scan types (Full Wave / Neg Wave / Pos Wave rectification; RF) while scanning, recording and imaging defects ⇒ Support of Linear or DAC-, DGS-, TCG- normalized recording and imaging defects ⇒ FFT (Frequency Domain Signal Presentation) - additional feature for defects evaluation and / or pattern recognition ⇒ Testing Integrity / Coverage Imaging (Top View of Probe Manipulation Area) Showing of Actually Implemented Probe Trace ⇒ Pulse Echo Amplitude / Distance C-Scan (Top View of Scanning Area either Global or Sliced - switcheable) ⇒ Pulse Echo B-Scan (Side View of the Scanning Area either Global or Sliced - switcheable) ⇒ Pulse Echo D-Scan (End View of the Scanning Area either Global or Sliced - switcheable) ⇒ B-Scan (Side View - Thickness / Corrosion Profile either Global or Sliced - switcheable) ⇒ D-Scan (End View - Thickness / Corrosion Profile either Global or Sliced - switcheable) ⇒ Through Transmission / Back Echo Attenuation Amplitude C-Scan (Top View of Scanning Area) ⇒ Versatile Color Palette for Defects Imaging ⇒ Postprocessing: Off-line Recovery and Play-Back of A-Scans; Echo Dynamic Pattern Recognition; Sizing of defects; Gate Manipulation - Rebuild C-, B-, and D-Scan views for various Gate Settings; Statistical Analysis; Slicing and Filtering Images ⇒ Comprehensive Setup and Scanning Reporting, Direct Connection To any Type of USB or LAN Windows Printer 	SWA 999806	Optional Item
13	Dual Axis Encoder USB Interface	S 808440	Optional Item
14	<p>Dual Channel TOFD preamplifier package including:</p> <ul style="list-style-type: none"> ⇒ Dual Channel TOFD preamplifier ⇒ Set of 2 low noise coaxial cables (10 meters length each) for connection to the signal input of ISONIC instrument 	SA 80442	Optional Item Improves long cable connection to ultrasonic probes. Typical applications are TOFD, Corrosion Detection, etc performed with probes fitted into scanner / crawler frame – refer to chapter 10 of this Operating Manual

#	Item	Order Code (Part #)	Note
15	ISONIC Alarmer - standard firmware configuration and hardware platform including: ⇒ Internal Speaker functioning according to alarm logic settings of UDS 3-5 Pulser Receiver in the ISONIC 2005 / 2020 / STAR, 2006, 2007 instruments / UDS 3-6 Pulser Receiver of ISONIC 2008 Instrument ⇒ Speaker Volume Control Wheel ⇒ Headphone Connector ⇒ 25-pin programmable Input / Output interface (blank) ⇒ USB port and cable for connecting to ISONIC 2005 / 2020 / STAR, 2006, 2007, 2008 instrument	SE 554780987	Optional Item Refer to paragraph 8.8.5 of this Operating Manual
16	Ultrasonic probes, fixtures, scanners, cables and other accessories depending on the inspection tasks to be resolved		Optional Items Ultrasonic probes, fixtures, scanners, cables and other accessories from any manufacturer may be used

4. Operating ISONIC 2005 / 2020 / STAR

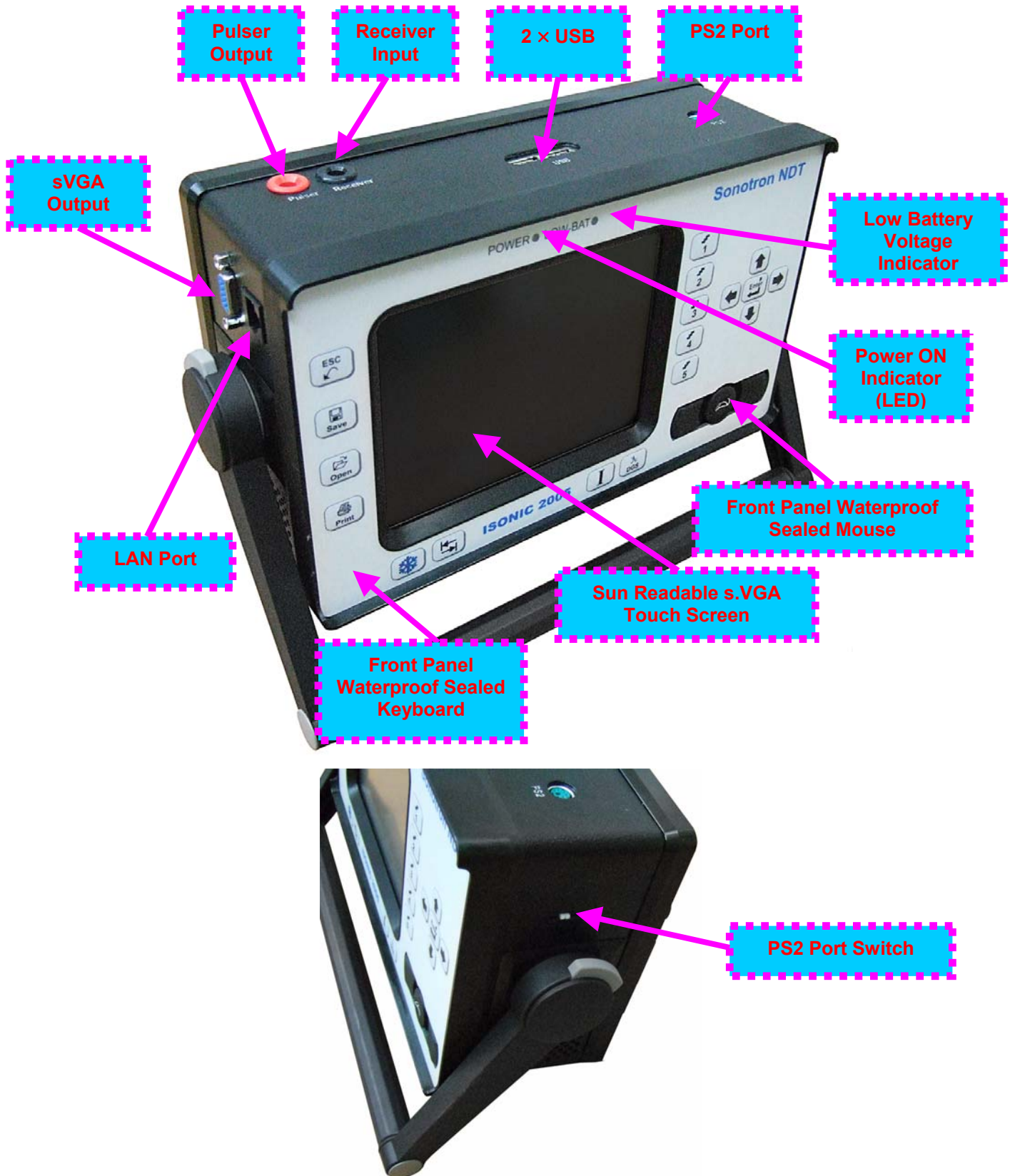
Please read the following information before you use **ISONIC 2005 / 2020 / STAR**. It is essential to read and understand the following information so that no errors occur during operation, which could lead damaging of the unit or misinterpretation of inspection results

4.1. Preconditions for ultrasonic testing with ISONIC 2005 / 2020 / STAR

Operator of **ISONIC 2005 / 2020 / STAR** must be certified as at least *Level 2 Ultrasonic Examiner* additionally having the adequate knowledge of

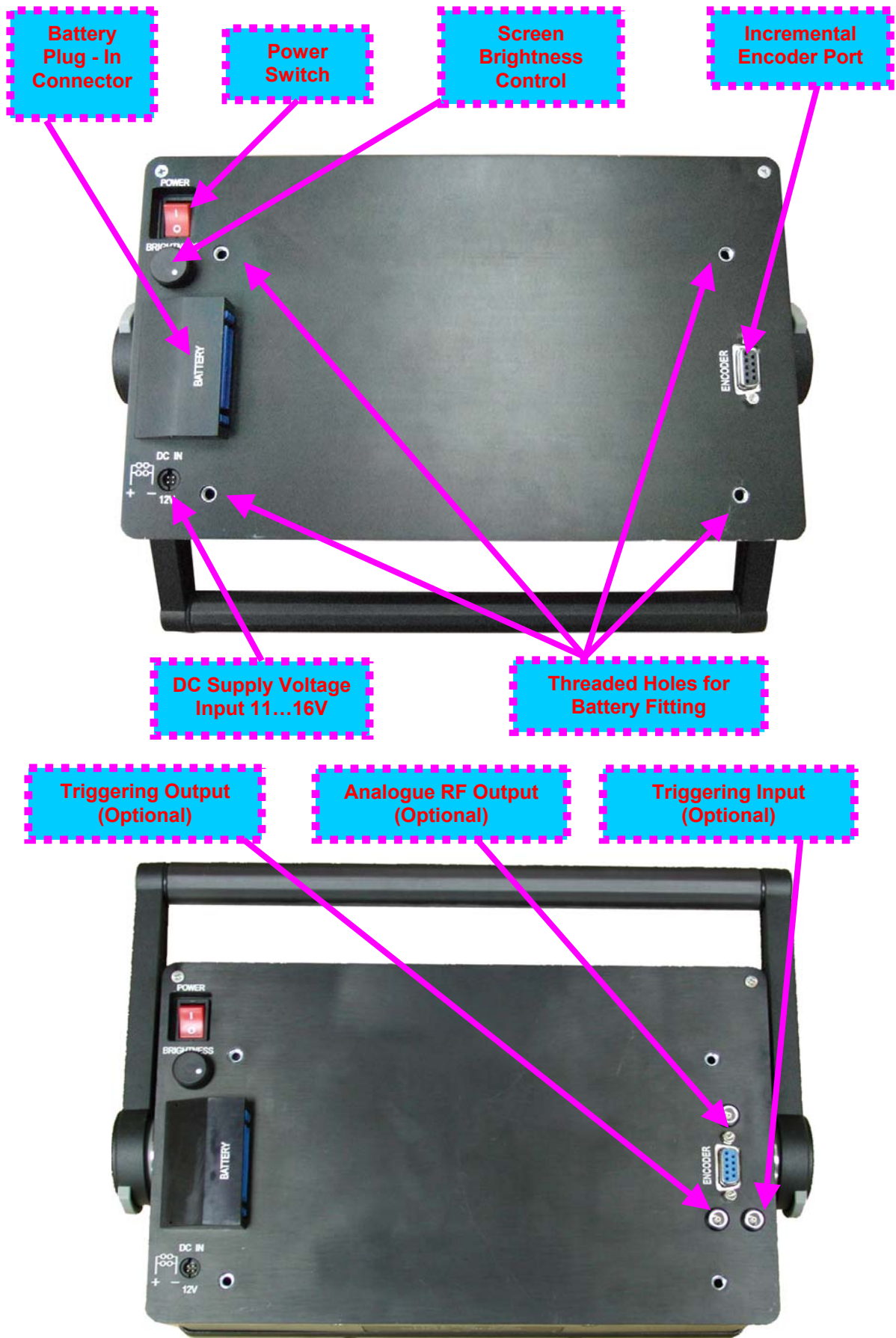
- operating digital ultrasonic flaw detector
- basics of computer operating in the **Windows™** environment including turning computer on/off, keyboard, touch screen and mouse, starting programs, saving and opening files

4.2. ISONIC 2005 / 2020 / STAR Controls and Terminals



PS 2 Port Switch has 2 positions:

- Front – Front Panel Keyboard and Mouse active; PS2 Port inactive
- Rear – Front Panel Keyboard and Mouse inactive; PS2 Port active



4.3. Turning On / Off

ISONIC 2005 / 2020 / STAR may be powered from:

- 100...250 VAC through external AC/DC converter
- External 11...16V DC source (12V – typical)
- Rechargeable battery (optionally)

AC Power Supply

- Ensure that power switch is in **O** position before connecting power cords
- Connect one end of AC power cord to AC/DC converter and plug another end into AC mains
- Connect DC power cord with suppression filter outgoing from AC/DC converter to DC Supply Voltage Input of **ISONIC 2005 / 2020 / STAR**

External DC Power Supply

- Ensure DC mains do supply voltage between 11 V and 16 V
- Ensure that power switch is in **O** position before connecting power cord
- Connect one end of DC power cord with suppression filter to DC Supply Voltage Input of **ISONIC 2005 / 2020 / STAR** and plug another end into DC mains

Battery

- Ensure that power switch is in **O** position
- Plug in battery and fix it using 4 screws



Power-Up and Turn Off



To Power-Up **ISONIC 2005 / 2020 / STAR** set power switch into **I** position. An automatic system test program will then be executed; during this test various texts and information appear followed by the screen as below while booting up



Instruments manufactured on or before Dec 1, 2007	Instruments manufactured after Dec 1, 2007
	



Wait until **ISONIC 2005 / 2020 / STAR start screen** becomes active automatically upon boot up is completed





Click on  or press  on front panel keyboard or press **F1** on external keyboard to operate **ISONIC 2005 / 2020 / STAR** – refer to Chapters 5 and 6 of this Operating Manual

Click on  or press  on front panel keyboard or press **F2** on external keyboard to proceed with general settings of **ISONIC 2005 / 2020 / STAR** – refer to Chapters 7 and 8 of this Operating Manual

Click on  or press  on front panel keyboard or press **F3** on external keyboard if it is necessary to fulfill some general purpose Windows procedures such as setting up drivers for external devices (printers, USB memory card, and the like), connecting to LAN, quasi-disk management, etc – refer to Chapter 8 of this Operating Manual

To turn **ISONIC 2005 / 2020 / STAR** off click on  or press on  on front panel keyboard or press **F4** on external keyboard then wait until the screen as below appears:

Instruments manufactured on or before Dec 1, 2007	Instruments manufactured after Dec 1, 2007
	



Set power switch into **O** position upon

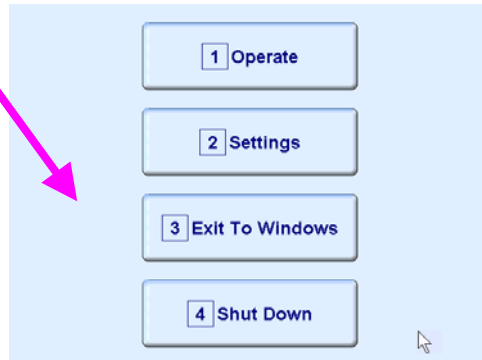


After turning **ISONIC 2005 / 2020 / STAR OFF** wait at least 10...30 seconds before switching it **ON** again

5. UDS 3-5 Pulsar Receiver

5.1. Start Up UDS 3-5 Pulser Receiver

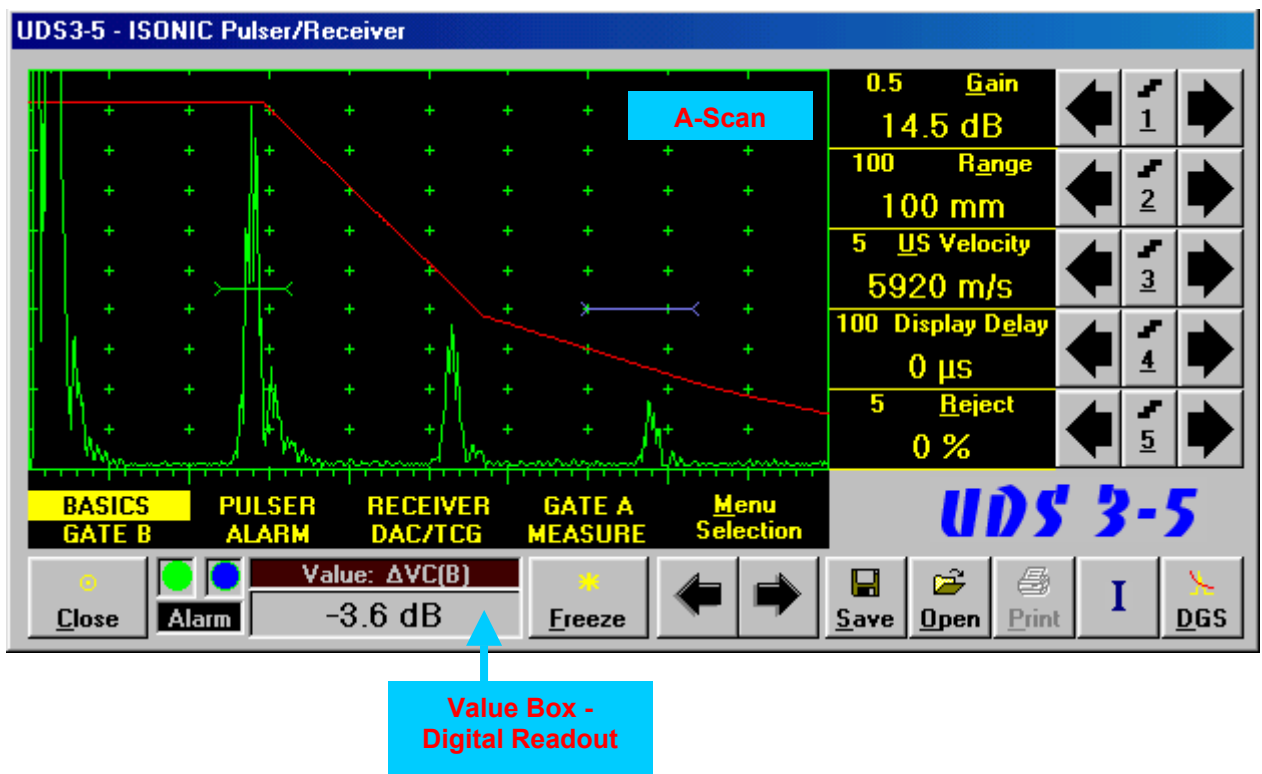
While **ISONIC 2005 / 2020 / STAR start screen** is active click on  or press  on the front panel



keyboard or press **F1** on external keyboard

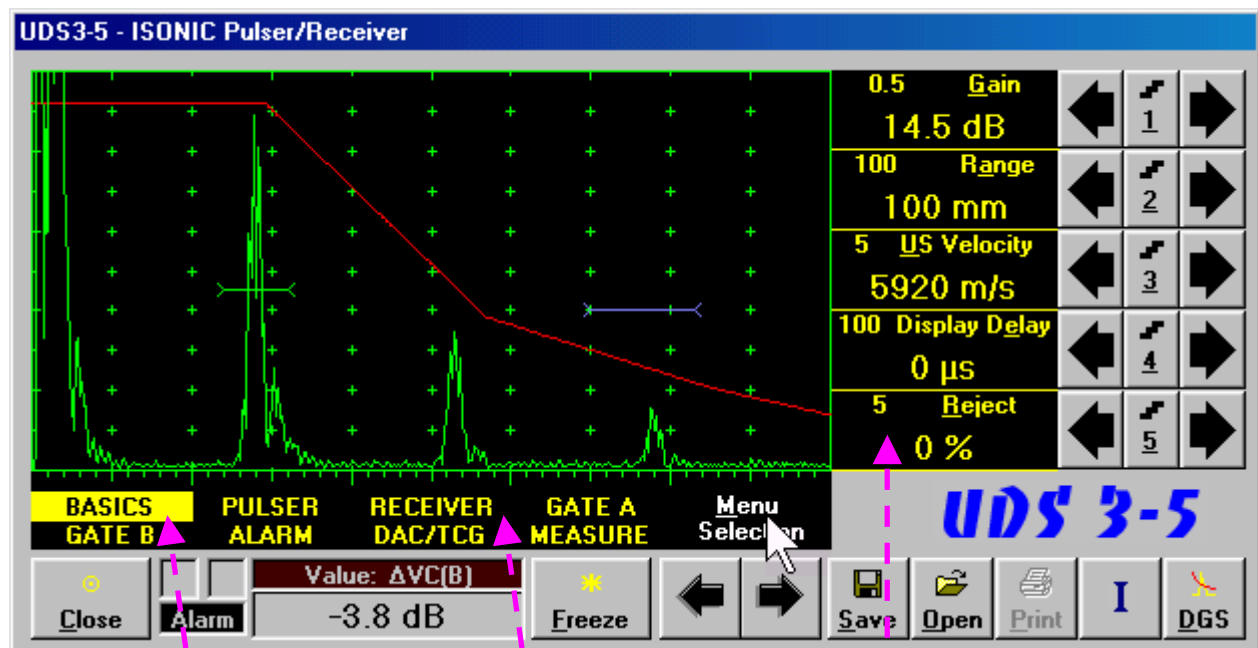
5.2. Main Operating Surface

UDS 3-5 is fully controllable through the main operating surface:



5.2.1. Main Menu

Main Menu consists of eight topics; each topic is associated with corresponding **submenu** appearing as vertical bar showing names for five parameters or modes of operation, their current settings and current value of increment/decrement for a parameter. The active topic is highlighted








Active Topic

Main Menu

Vertical bar – Submenu corresponding to highlighted active topic

To activate a topic the following manipulations are applicable:

- **Keyboard**









- Press  on front panel keyboard or **F7** on external keyboard until highlighting required topic
OR
- Press **<Alt>+<M>** on external keyboard ⇒ **Menu Selection** fore color changes to white - then use , , , 

- **Mouse / Touch Screen**

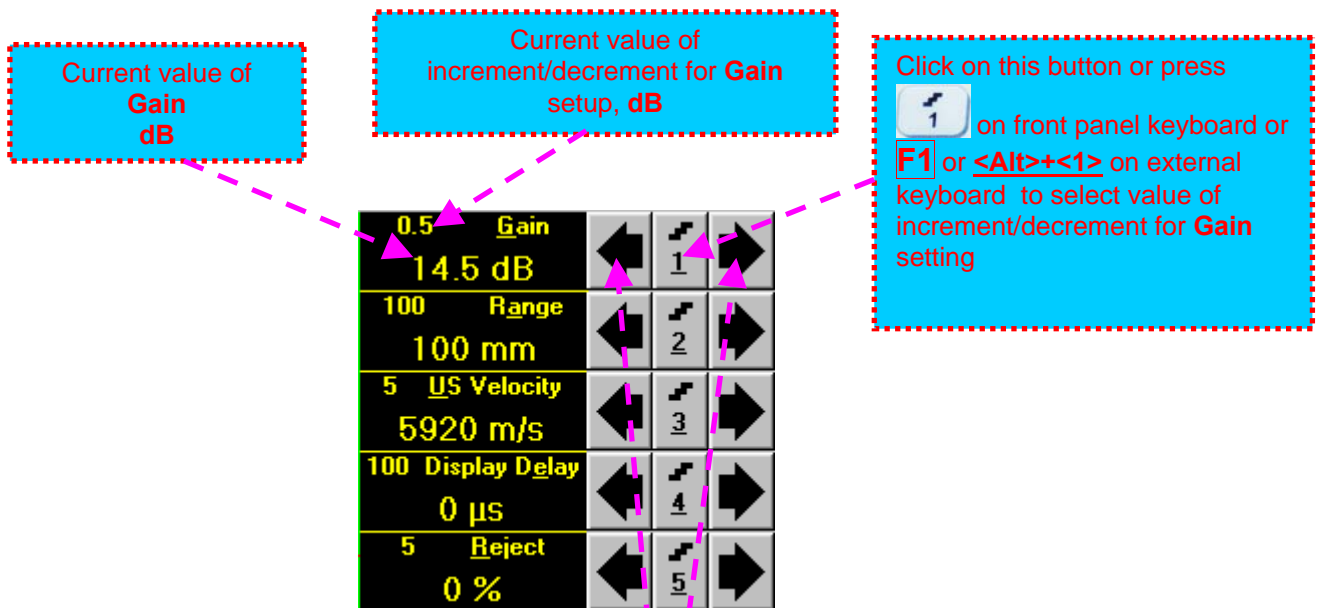
- Click on topic's name
OR

- Click on 

- **Combined**

- Click on **Menu Selection** ⇒ **Menu Selection** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

5.2.2. Sub Menu BASICS












To control **Gain** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

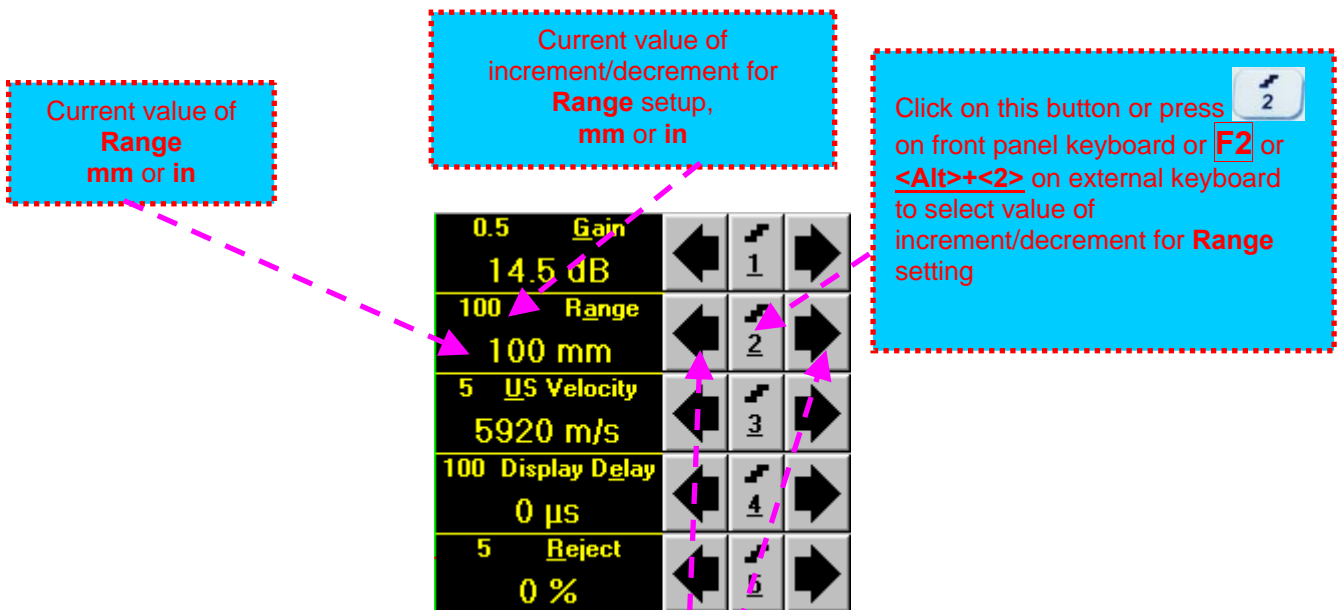
- Press  on front panel keyboard or **F1** or **<Alt>+<G>** on external keyboard ⇒ **Gain** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Gain** ⇒ **Gain** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



Gain setup is also possible through a number of other submenus following the same rules as above












To control **Range** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate **button**

- **Keyboard**

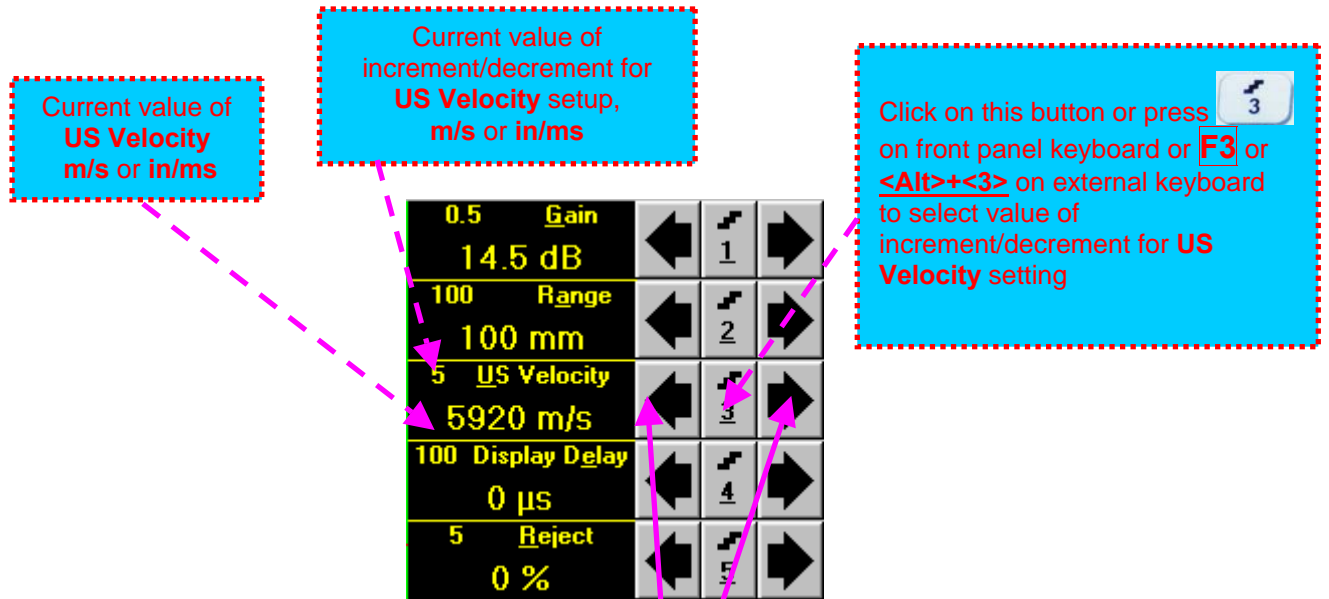
- Press  on front panel keyboard or **F2** or **<Alt>+<A>** on external keyboard ⇒ **Range** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Range** ⇒ **Range** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



Range setup is also possible through a number of other submenus following the same rules as above












To control **US Velocity** the following manipulations are applicable:









- **Mouse / Touch Screen**

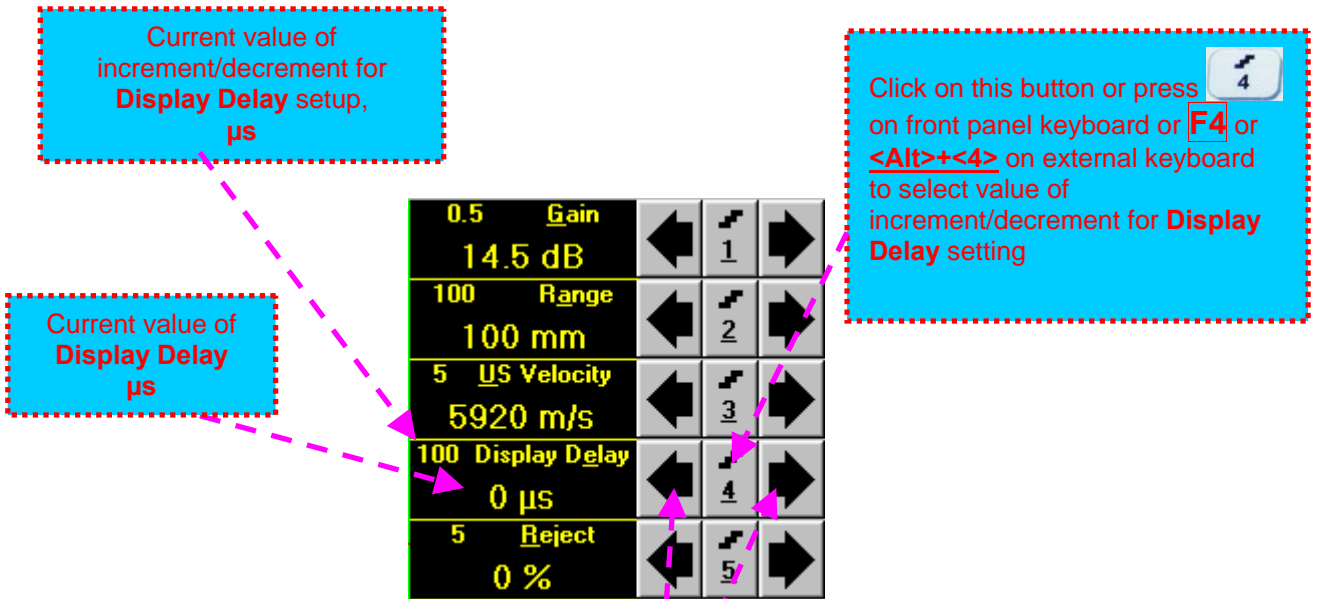
- Click or press and hold on the appropriate **button**

- **Keyboard**

- Press  on front panel keyboard or **F3** or **<Alt>+<U>** on external keyboard ⇒ **US Velocity** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **US Velocity** ⇒ **US Velocity** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard












To control **Display Delay** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**


- Press  on front panel keyboard or **F4** or **<Alt>+<E>** on external keyboard ⇒ **Display Delay** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard






- **Combined**

- Click on **Display Delay** ⇒ **Display Delay** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

Current value of increment/decrement for **Reject** setup, %

Current value of **Reject** %

Click on this button or press  on front panel keyboard or **F5** or **<Alt>+<5>** on external keyboard to select value of increment/decrement for **Reject** setting










0.5	Gain	←		→
14.5	dB	←	1	→
100	Range	←		→
100	mm	←	2	→
5	US Velocity	←		→
5920	m/s	←	3	→
100	Display Delay	←		→
0	μs	←	4	→
5	Reject	←		→
0	%	←	5	→

To control **Reject** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

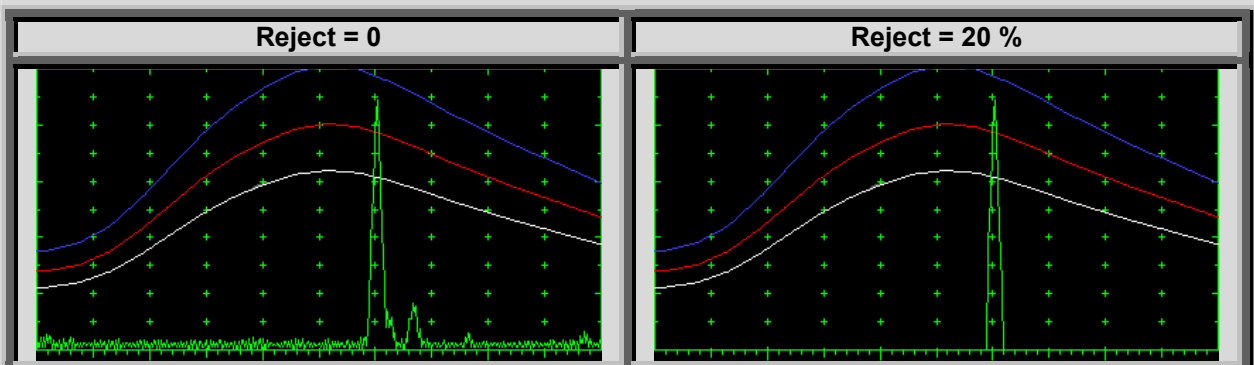
- Press  on front panel keyboard or **F5** or **<Alt>+<E>** on external keyboard ⇒ **Reject** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Reject** ⇒ **Reject** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard




- ◆ Signals below **Reject** level (small signals) are suppressed
- ◆ Signals exceeding **Reject** level (large signals) are presented on the A-Scan without affecting their original height
- ◆ Part of large signal wave form below **Reject** level is suppressed

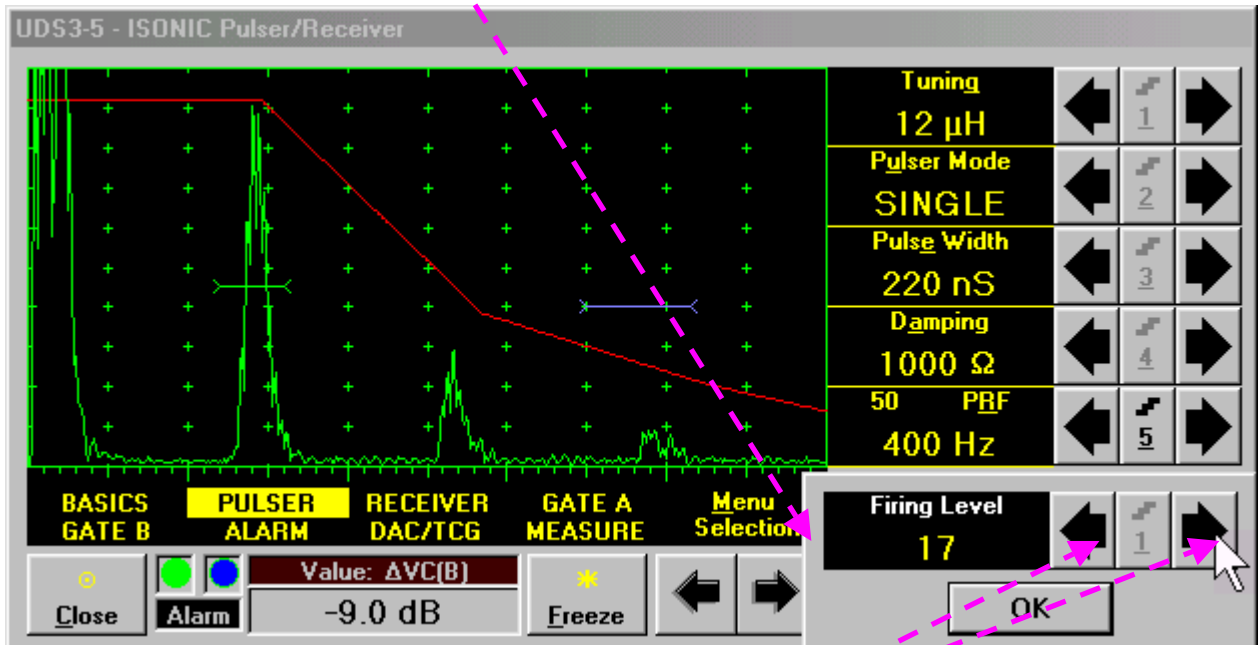


- ◆ **Reject** level may be applied to rectified signals only (Display Modes **Full**, **NegHalf** and **PosHalf** - refer to paragraph 5.2.4 of this Operating Manual)
- ◆ **Reject** setup is also possible through a number of other submenus following the same rules as above

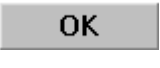
5.2.3. Sub Menu PULSER











Amplitude of initial pulse (Firing Level) is controllable through button  appearing on the main operating surface upon activating submenu **PULSER**

To activate **Firing Level Control** subwindow click on 



To control **Firing Level** the following manipulations are applicable:

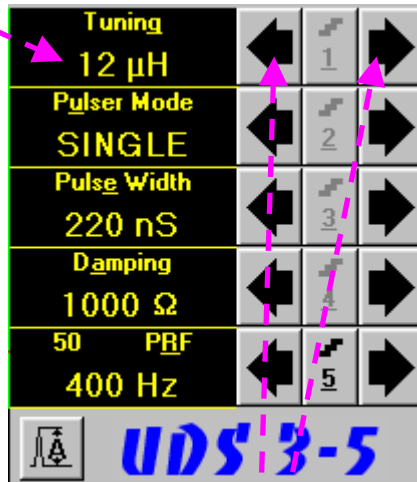
- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate **button** Click on  or on any control outside **Firing Level Control** popup window upon completing
- **Combined**

Click on **Firing Level** ⇒ **Firing Level** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard. Press  or  on front panel keyboard or **Esc** or **Enter** on an external keyboard upon completing



There are 18 grades (1 through 18) for setting **Firing Level** – amplitude of initial pulse is controlled from 50 V (**Firing Level** = 1) to 400 V (**Firing Level** = 18)

Current value of
Tuning
 μH



To control **Tuning** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

- Press 1 on front panel keyboard or **F1** or **<Alt>+<G>** on external keyboard \Rightarrow **Tuning** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard

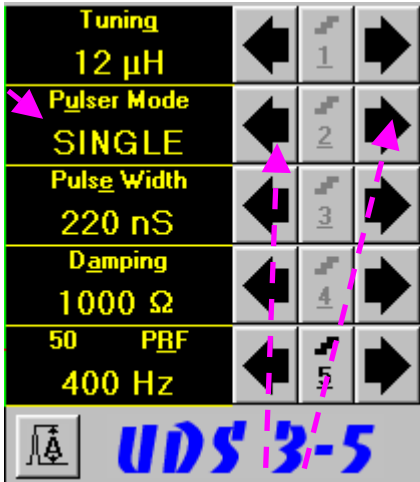
- **Combined**

- Click on **Tuning** \Rightarrow **Tuning** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard



- ◆ There are 16 (sixteen) matching coils, which may be connected at parallel to ultrasonic probe in order to obtain best available probe impedance matching / signal to noise ratio. Possible values for the matching coil inductance are: 2 μH , 7 μH , 12 μH , 17 μH , 24 μH , 29 μH , 34 μH , 39 μH , 41 μH , 46 μH , 51 μH , 56 μH , 63 μH , 68 μH , 73 μH , and 78 μH
- ◆ Setting the **Tuning** to "NO" disconnects matching coil

Current **Pulser Mode**



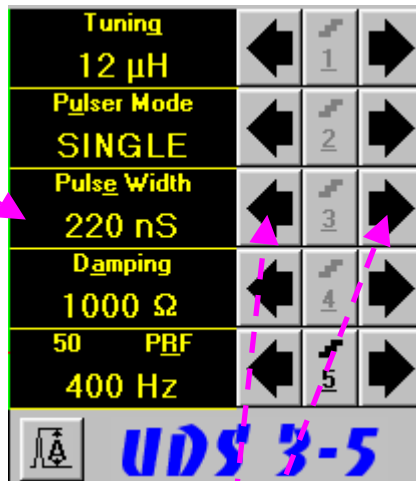
To control **Pulser Mode** the following manipulations are applicable:

- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate button
- **Keyboard**
 - Press 2 on front panel keyboard or **F2** or **<Alt>+<U>** on external keyboard ⇒ **Pulser Mode** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard
- **Combined**
 - Click on **Pulser Mode** ⇒ **Pulser Mode** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard




















There are two Pulser Modes available: **Single** and **Dual**

Current value of **Pulse Width**
(Duration of Square Wave
Initial Pulse)
ns

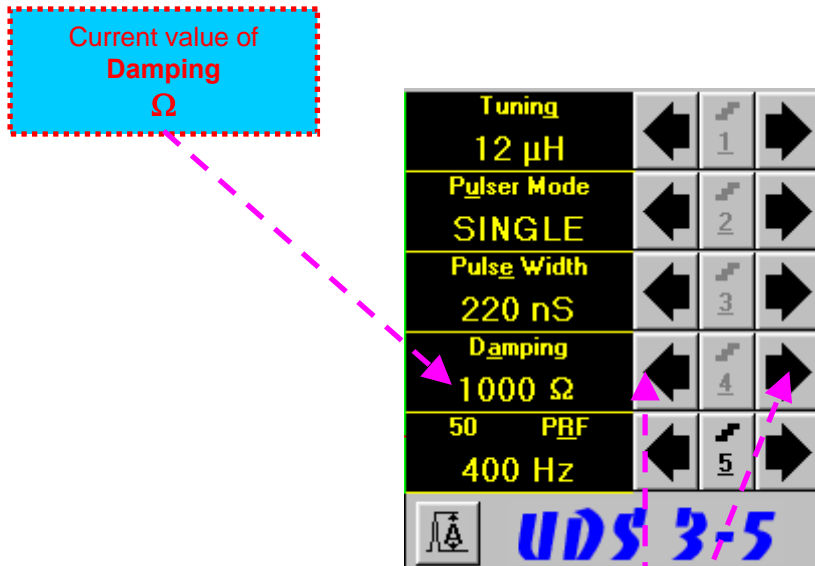


To control **Pulse Width** the following manipulations are applicable:

- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate **button**
- **Keyboard**
 - Press  on front panel keyboard or **F3** or **<Alt>+<E>** on external keyboard ⇒ **Pulse Width** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard
- **Combined**
 - Click on **Pulse Width** ⇒ **Pulse Width** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



- ◆ **Pulse Width** (Duration of Square Wave Initial Pulse) is tunable between 65 ns to 600 ns in 5 ns steps
- ◆ Attempt to decrease **Pulse Width** below 65 ns switches to *excitation of Spike Pulse instead of Square Wave Pulse*. There are 4 (four) energy levels available for the **Spike Pulse** excitation; said levels are indicated in the **Pulse Width** field:
 - **Spike (250μJ)** – spike pulse with the 250 μJ energy of excitation
 - **Spike (160μJ)** – spike pulse with the 160 μJ energy of excitation
 - **Spike (90μJ)** – spike pulse with the 90 μJ energy of excitation
 - **Spike (40μJ)** – spike pulse with the 40 μJ energy of excitation
- ◆ The energy of **Spike Pulse** excitation is controllable through the same controls as **Pulse Width**
- ◆ Attempt to increase energy of **Spike Pulse** excitation above 250 μJ switches to *excitation of Square Wave Pulse instead of Spike Pulse*
- ◆ Energy levels of **Spike Pulse** excitation are calibrated at **Firing Level = 18**












To control **Damping** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

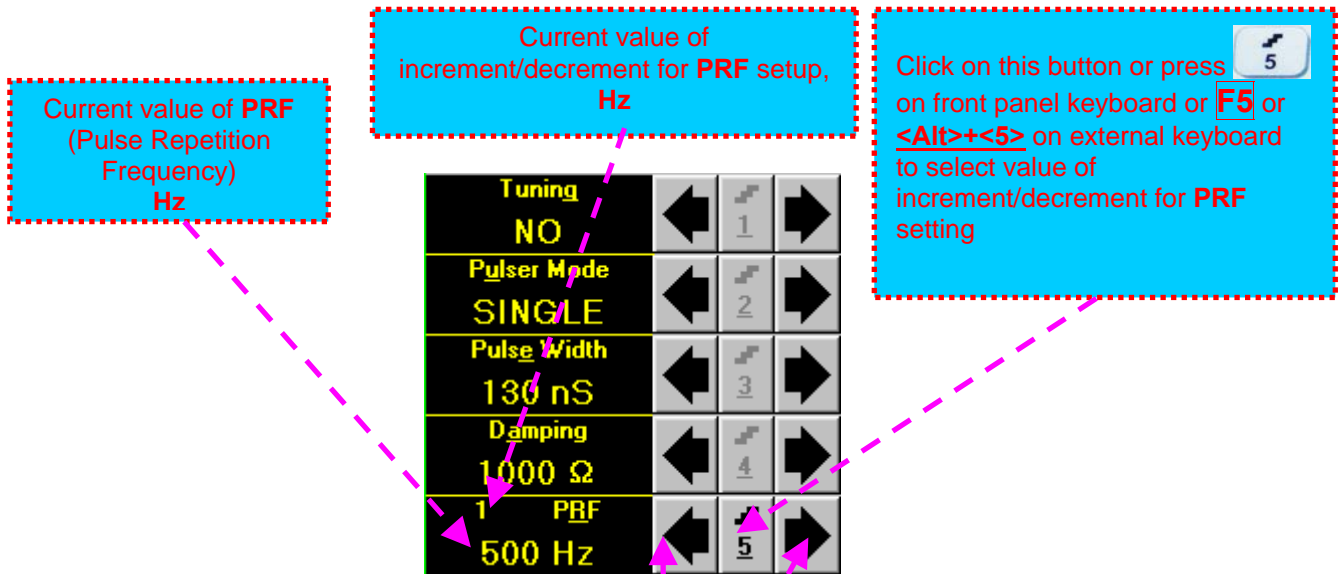
- Press  on front panel keyboard or **F4** or **<Alt>+<A>** on external keyboard ⇒ **Damping** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Damping** ⇒ **Damping** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



There are 17 (seventeen) discrete damping resistors, which may be connected at parallel to ultrasonic probe, their resistance values are 25Ω, 30Ω, 35Ω, 40Ω, 45Ω, 56Ω, 65Ω, 76Ω, 90Ω, 115Ω, 130Ω, 150Ω, 180Ω, 240Ω, 320Ω, 500Ω, and 1000 Ω



To control **PRF** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click or press and hold on the appropriate **button**

- **Keyboard**

- Press **5** on front panel keyboard or **F5** or **<Alt>+<R>** on external keyboard ⇒ **PRF** fore color changes to white - then use **↑**, **→**, **←**, **↓** on front panel keyboard or **↑**, **→**, **←**, **↓** on external keyboard

- **Combined**

- Click on **PRF** ⇒ **PRF** fore color changes to white - then use **↑**, **→**, **←**, **↓** on front panel keyboard or **↑**, **→**, **←**, **↓** on external keyboard



UDS 3-5 is equipped with a protection circuit preventing probe damage, which may be caused by not proper setting of **Tuning**, or **Damping**, or **Pulse Width**, or **Firing Level**, or combination of them. Protection circuit limits total energy delivered to firing output through *automatic reducing of PRF until reaching safe mode of operation*

5.2.4. Sub Menu RECEIVER

Current setting of **Filter** representing central frequency of the narrow band (resonant) Filter
MHz










0.5	Gain	←	1	→
11	dB	←	2	→
Filter	BB	←	3	→
Frequency	0.35-35	←	4	→
Display	Full	←	5	→
5	Reject	←		→
0	%	←		→

To control **Filter** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate **button**

- **Keyboard**

- Press  on front panel keyboard or **F2** or **<Alt>+<L>** on external keyboard ⇒ **Filter** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

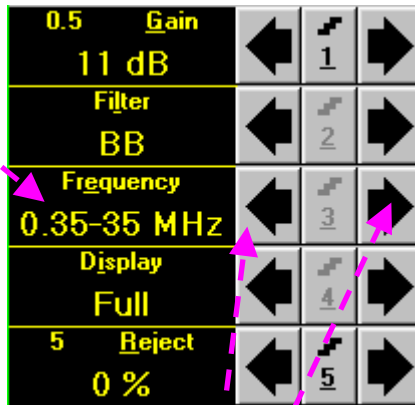
- **Combined**

- Click on **Filter** ⇒ **Filter** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



- ◆ The are 6 (six) narrow bands (resonant) filters with central frequencies as below:
 - **0.5 ± 0.15 MHz** – recommended for 0.3 ... 0.8 MHz probes
 - **1 ± 0.3 MHz** – recommended for 0.8 ... 1.5 MHz probes
 - **2 ± 0.6 MHz** – recommended for 1.5 ... 3.2 MHz probes
 - **4 ± 1.2 MHz** – recommended for 3.2 ... 7.5 MHz probes
 - **10 ± 3 MHz** – recommended for 7.5 ... 12.4 MHz probes
 - **15 ± 4.5 MHz** – recommended for 12.4 ... 17 MHz probes
- ◆ The narrow band (resonant) filtering is negated upon setting **Filter** to **BB** (Broad Band)

Current **Frequency** band of the receiver
MHz
From – To












To control receiver's **Frequency** band the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate **button**

- **Keyboard**

- Press  on front panel keyboard or **F3** or **<Alt>+<E>** on external keyboard ⇒ **Frequency** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Frequency** ⇒ **Frequency** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



There are 28 (twenty eight) receiver's **Frequency** bands:

0.35 – 35 MHz	0.35 – 19.5 MHz	0.35 – 13 MHz	0.35 – 5.2 MHz	0.35 – 2.6 MHz	0.35 – 1.3 MHz	0.35 – 0.65 MHz
0.7 – 35 MHz	0.7 – 19.5 MHz	0.7 – 13 MHz	0.7 – 5.2 MHz	0.7 – 2.6 MHz	0.7 – 1.3 MHz	
1.4 – 35 MHz	1.4 – 19.5 MHz	1.4 – 13 MHz	1.4 – 5.2 MHz	1.4 – 2.6 MHz		
2.8 – 35 MHz	2.8 – 19.5 MHz	2.8 – 13 MHz	2.8 – 5.2 MHz			
7 – 35 MHz	7 – 19.5 MHz	7 – 13 MHz				
10.5 – 35 MHz	10.5 – 19.5 MHz	10.5 – 13 MHz				

Current mode of signal presentation (**Display**)










0.5 Gain 11 dB	←	1	→
Filter BB	←	2	→
Frequency 0.35-35 MHz	←	3	→
Display Full	←	4	→
5 Reject 0 %	←	5	→

To select mode of signal presentation (**Display**) the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

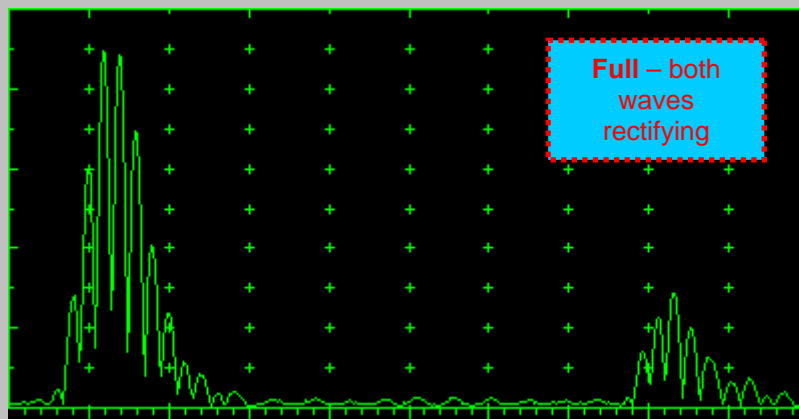
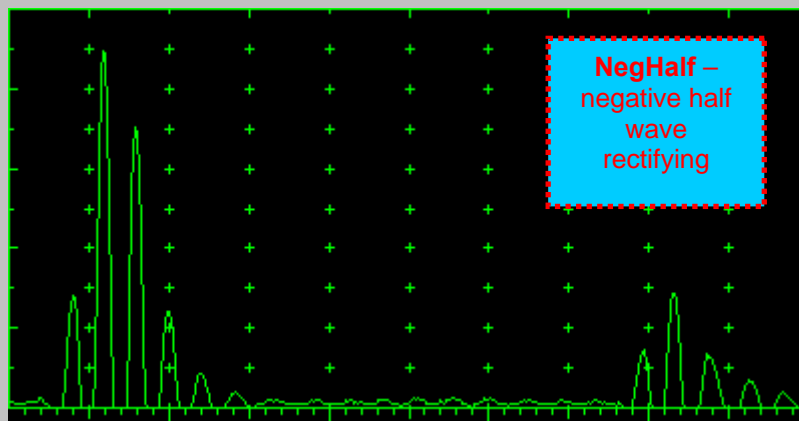
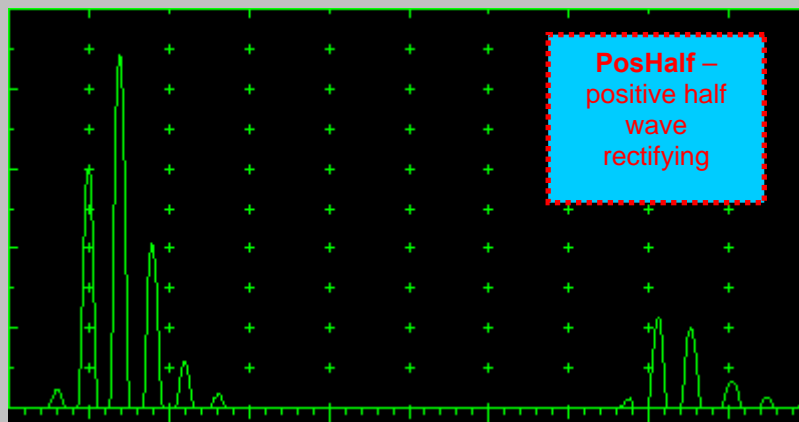
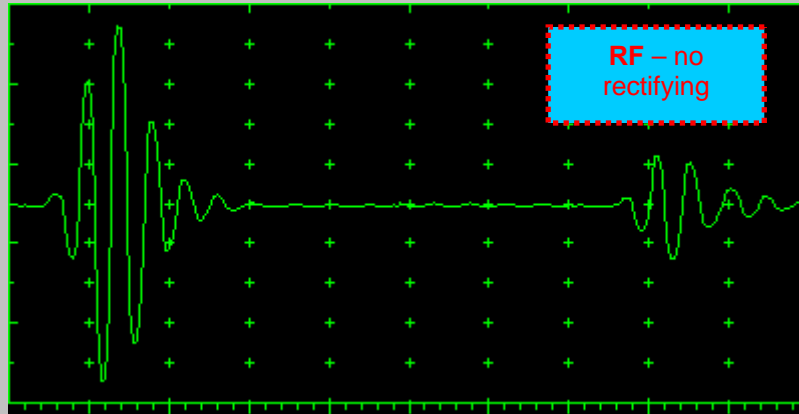
- Press  on front panel keyboard or **F4** or **<Alt>+<I>** on external keyboard ⇒ **Display** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

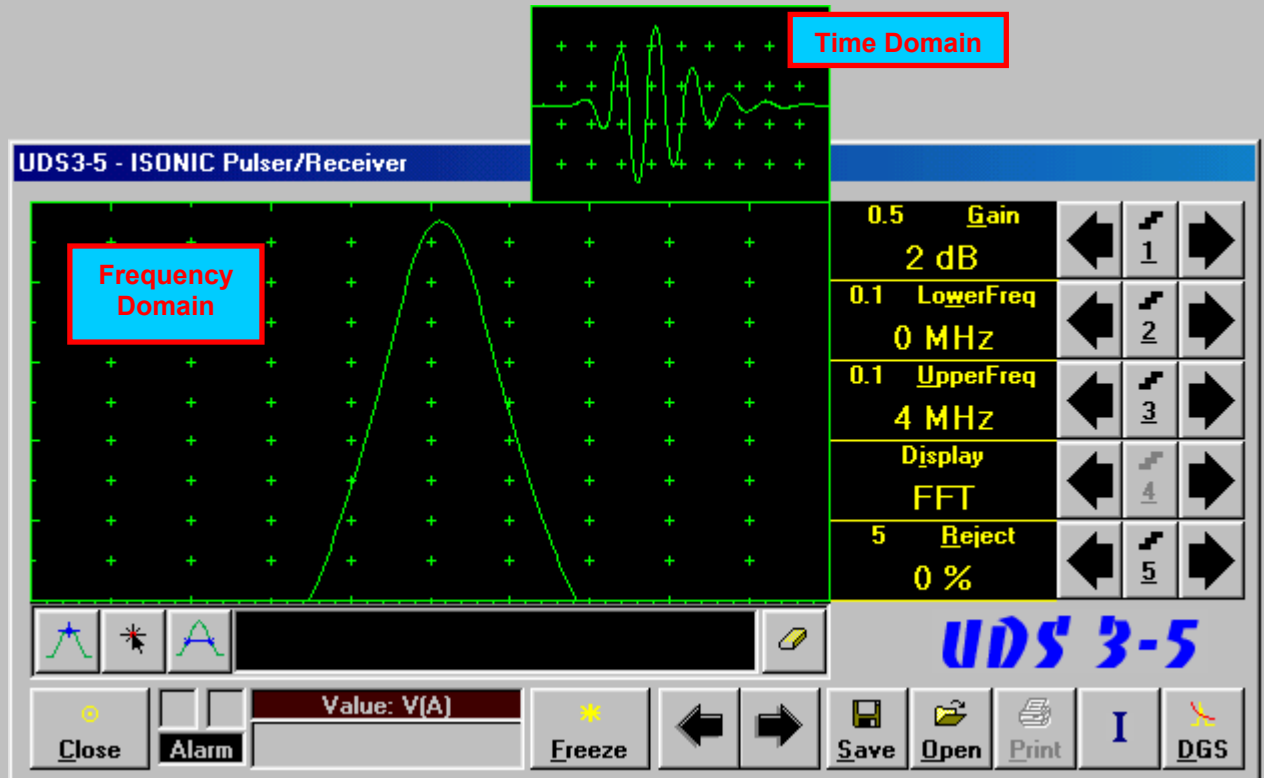
- Click on **Display** ⇒ **Display** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



- ◆ There are four **Display modes** for *time domain signal presentation*:



- ◆ Frequency domain signal presentation is available through **FFT Display mode**. Refer to paragraph 5.2.14 of this Operating Manual for instructions related to frequency domain signal presentation



- Frequency Domain Signal presentation is not possible if:
- DAC is active (refer to paragraph 5.2.9 of this Operating Manual)
 - TCG is active (refer to paragraph 5.2.9 of this Operating Manual)

5.2.5. Sub Menu GATE A

Current status of Gate A

0.5	Gain	←	1	→
3 dB				
aSwitch		←	2	→
ON				
2	aStart	←	3	→
26 mm				
2	aWidth	←	4	→
8 mm				
10	aThreshold	←	5	→
45 %				

To switch Gate A ON / OFF the following manipulations are applicable:

- **Mouse / Touch Screen**

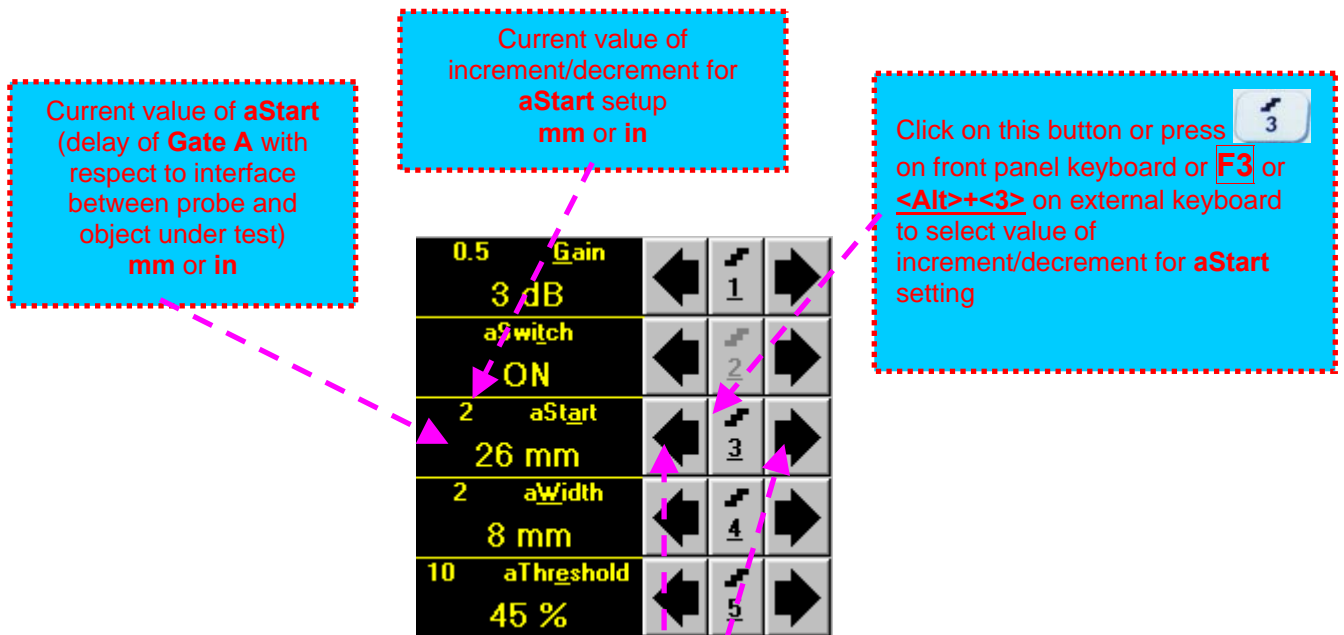
- Click or press and hold on the appropriate button

- **Keyboard**

- Press 2 on front panel keyboard or **F2** or **<Alt>+<T>** on external keyboard ⇒ **aSwitch** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard

- **Combined**

- Click on **aSwitch** ⇒ **aSwitch** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard

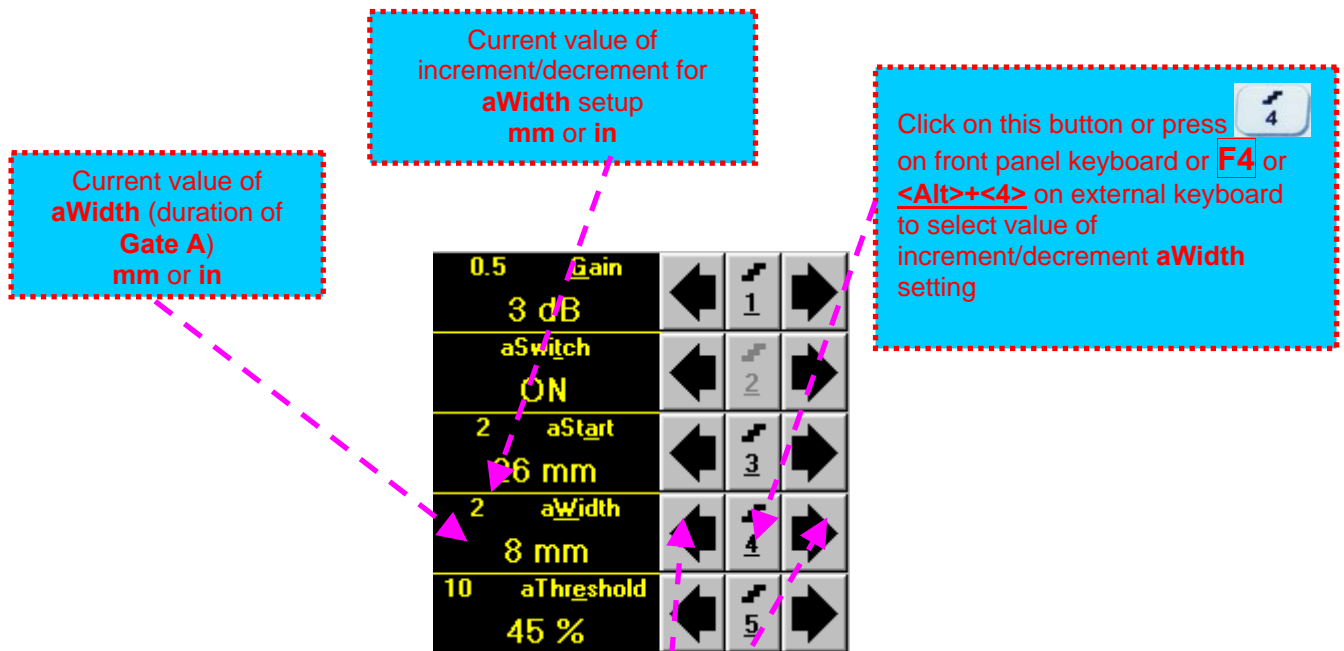


To control delay of **Gate A (aStart)** the following manipulations are applicable:

- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate button
- **Keyboard**
 - Press on front panel keyboard or **F3** or **<Alt>+<A>** on external keyboard ⇒ **aStart** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard
- **Combined**
 - Click on **aStart** ⇒ **aStart** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard
- **Drag and Drop (refer to paragraph 5.2.7 of this Operating Manual)**



- ◆ **aStart** setup is also possible through a number of other submenus following the same rules as above
- ◆ Counting of **aStart** value starts after finishing of **Probe Delay** count (refer to paragraphs 5.2.12 and 5.2.13 of this Operating Manual)



To control duration of **Gate A (aWidth)** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

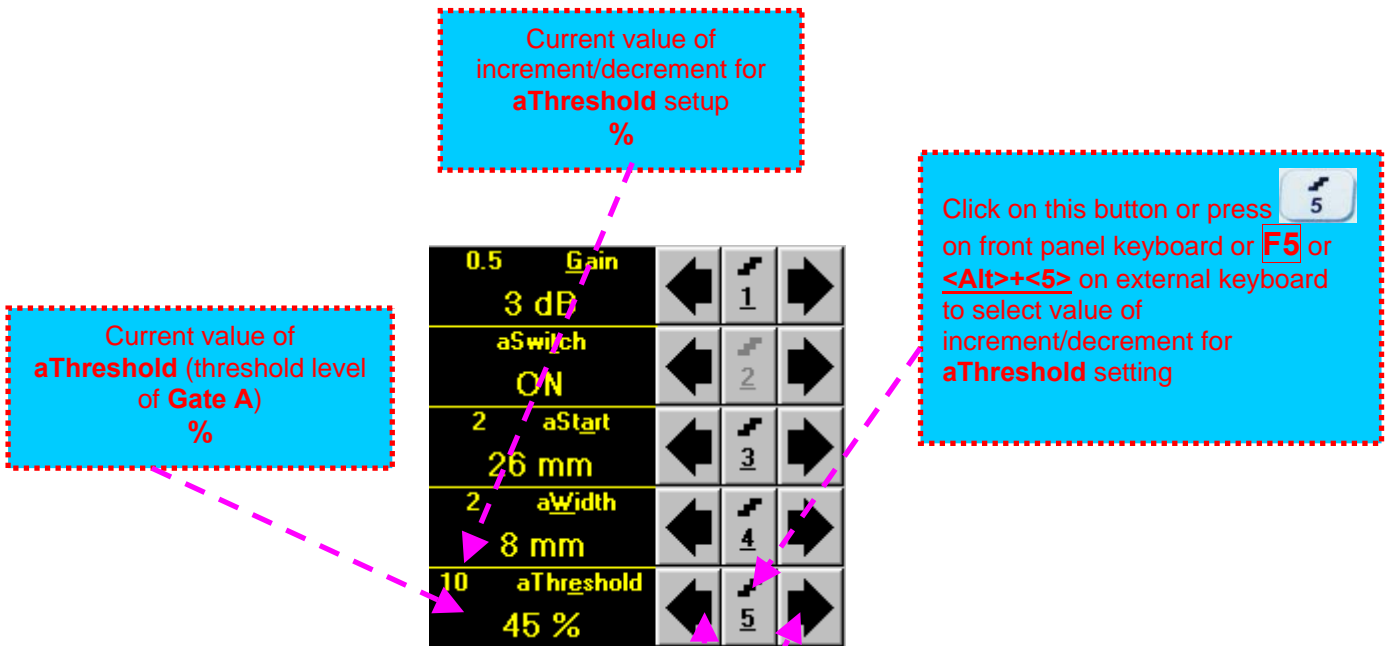
- **Keyboard**

- Press on front panel keyboard or **F4** or **<Alt>+<W>** on external keyboard ⇒ **aWidth** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Combined**

- Click on **aWidth** ⇒ **aWidth** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Drag and Drop (refer to paragraph 5.2.7 of this Operating Manual)**



To control threshold level of **Gate A** (**aThreshold**) the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click or press and hold on the appropriate **button**

- **Keyboard**

- Press on front panel keyboard or **F5** or **<Alt>+<E>** on external keyboard ⇒ **aThreshold** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Combined**

- Click on **aThreshold** ⇒ **aThreshold** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Drag and Drop (refer to paragraph 5.2.7 of this Operating Manual)**

5.2.6. Sub Menu GATE B

5.2.6.1. All ISONIC 2005 Instruments Running Under Win98SE and ISONIC 2005, 2020, STAR 2005 Instruments Running Under WinXP Embedded

Current status of Gate B










0.5	<u>G</u> ain	←	1	→
3	dB			
	<u>b</u> Switch	↑	2	↓
ON				
2	<u>b</u> Start	←	3	→
47.9	mm			
2	<u>b</u> Width	←	4	→
13.2	mm			
10	<u>b</u> Threshold	←	5	→
40	%			

To switch **Gate B ON / OFF** the following manipulations are applicable:









- **Mouse / Touch Screen**

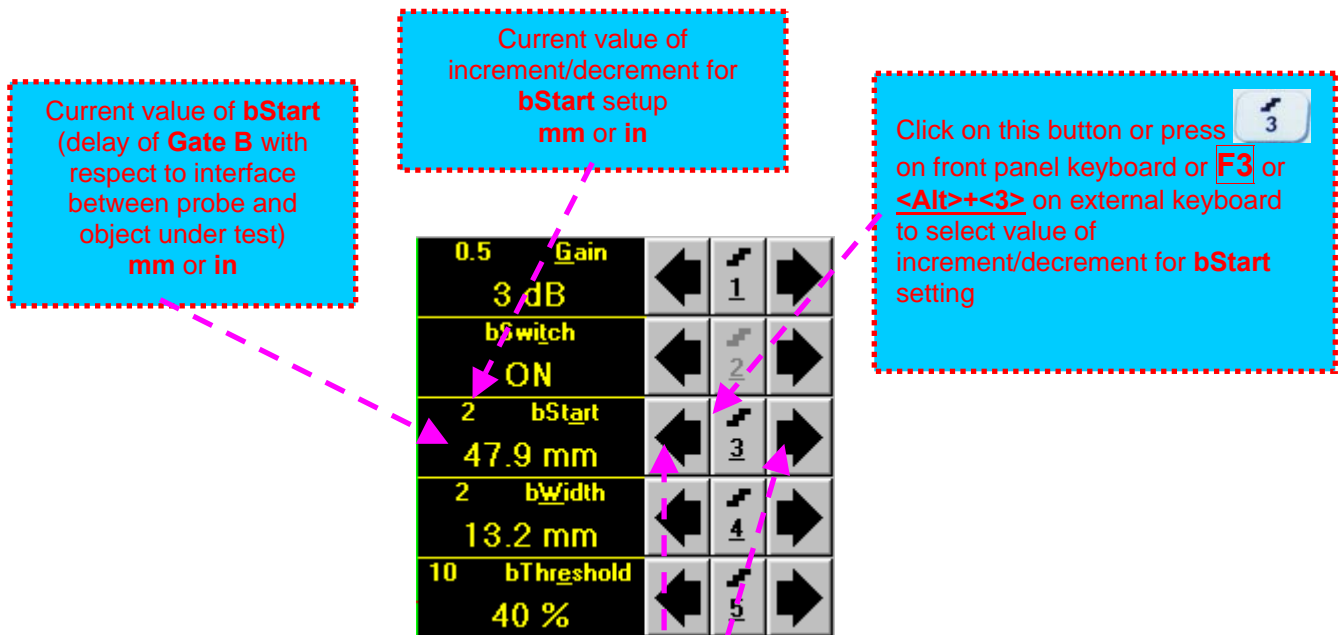
- Click or press and hold on the appropriate **button**

- **Keyboard**


















- Press  on front panel keyboard or **F2** or **<Alt>+<T>** on external keyboard ⇒ **bSwitch** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **bSwitch** ⇒ **bSwitch** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

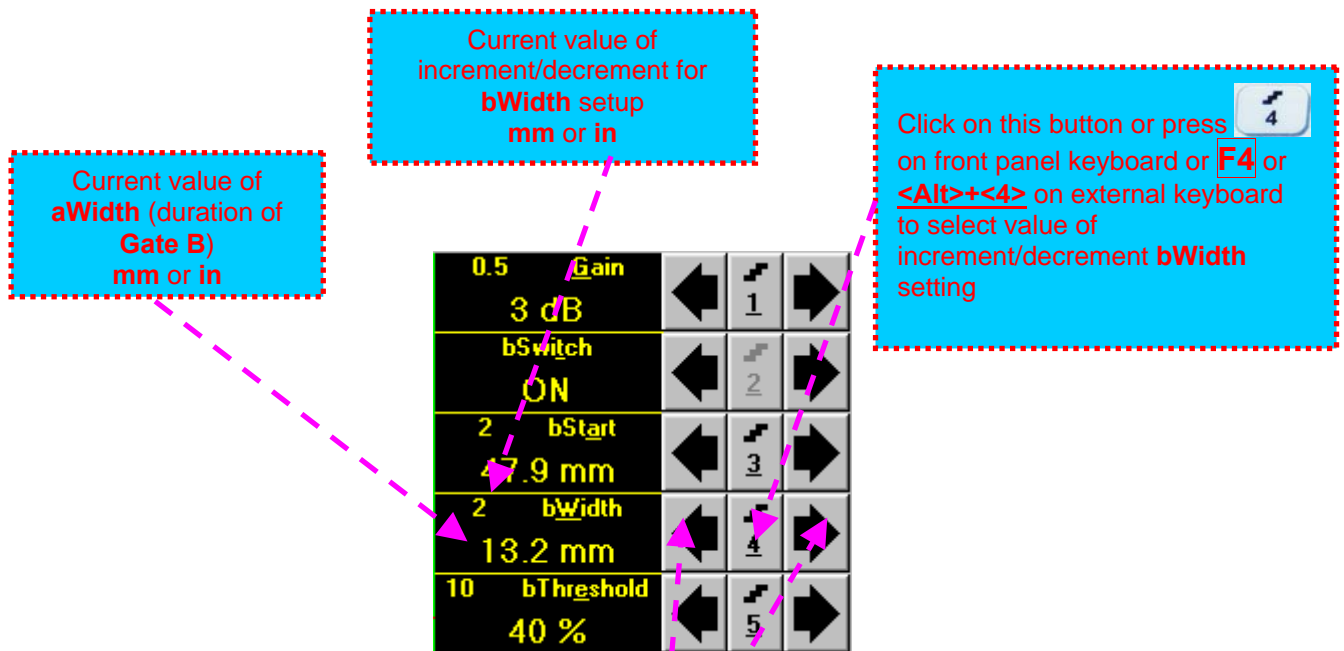


To control delay of **Gate B (bStart)** the following manipulations are applicable:

- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate button
- **Keyboard**
 - Press  on front panel keyboard or **F3** or **<Alt>+<A>** on external keyboard ⇒ **bStart** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard
- **Combined**
 - Click on **bStart** ⇒ **bStart** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard
- **Drag and Drop (refer to paragraph 5.2.7 of this Operating Manual)**



Counting of **bStart** value starts after finishing of **Probe Delay** count (refer to paragraph 5.2.12 and 5.2.13 of this Operating Manual)



To control duration of **Gate B (bWidth)** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

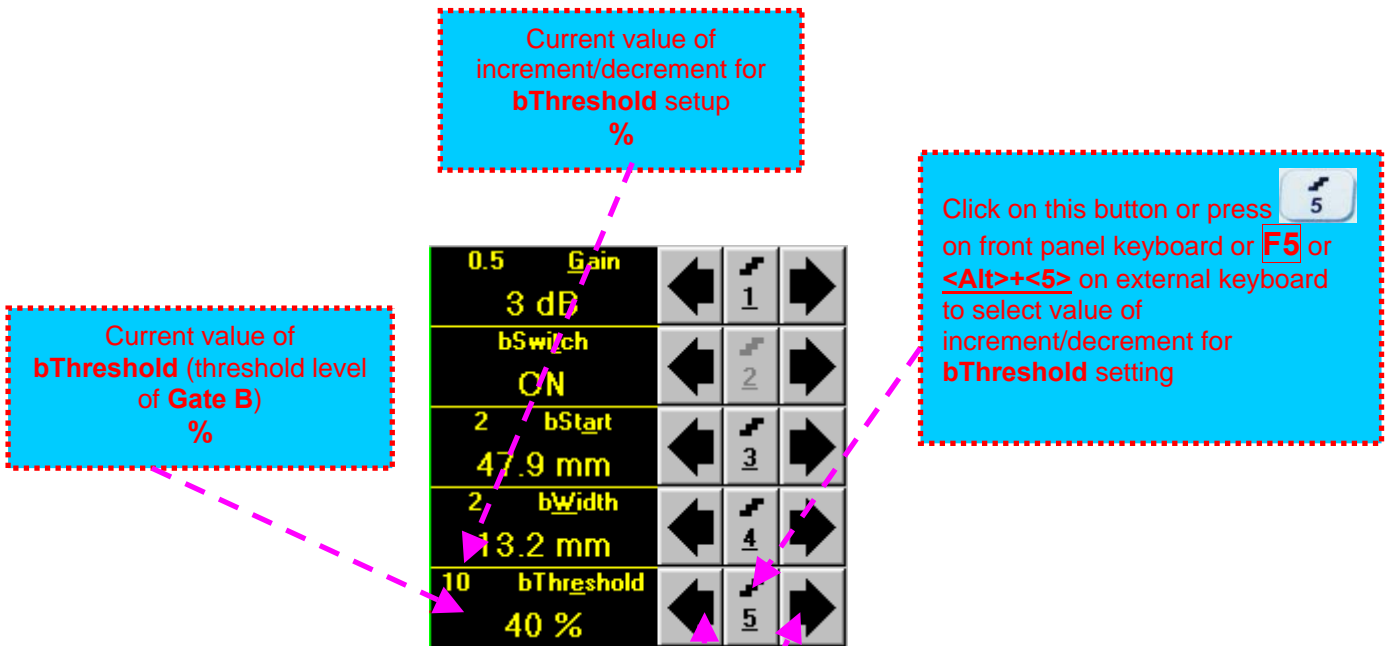
- **Keyboard**

- Press on front panel keyboard or **F4** or **<Alt>+<W>** on external keyboard ⇒ **bWidth** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Combined**

- Click on **bWidth** ⇒ **bWidth** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Drag and Drop (refer to paragraph 5.2.7 of this Operating Manual)**



To control threshold level of **Gate B** (**bThreshold**) the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click or press and hold on the appropriate **button**

- **Keyboard**

- Press on front panel keyboard or **F5** or **<Alt>+<E>** on external keyboard ⇒ **bThreshold** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard



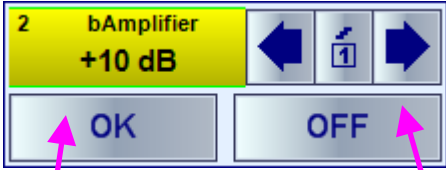






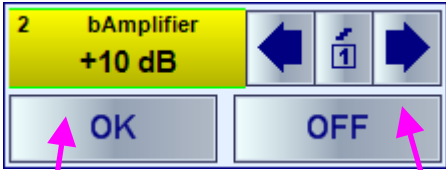




- **Combined**

- Click on **bThreshold** ⇒ **bThreshold** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Drag and Drop (refer to paragraph 5.2.7 of this Operating Manual)**

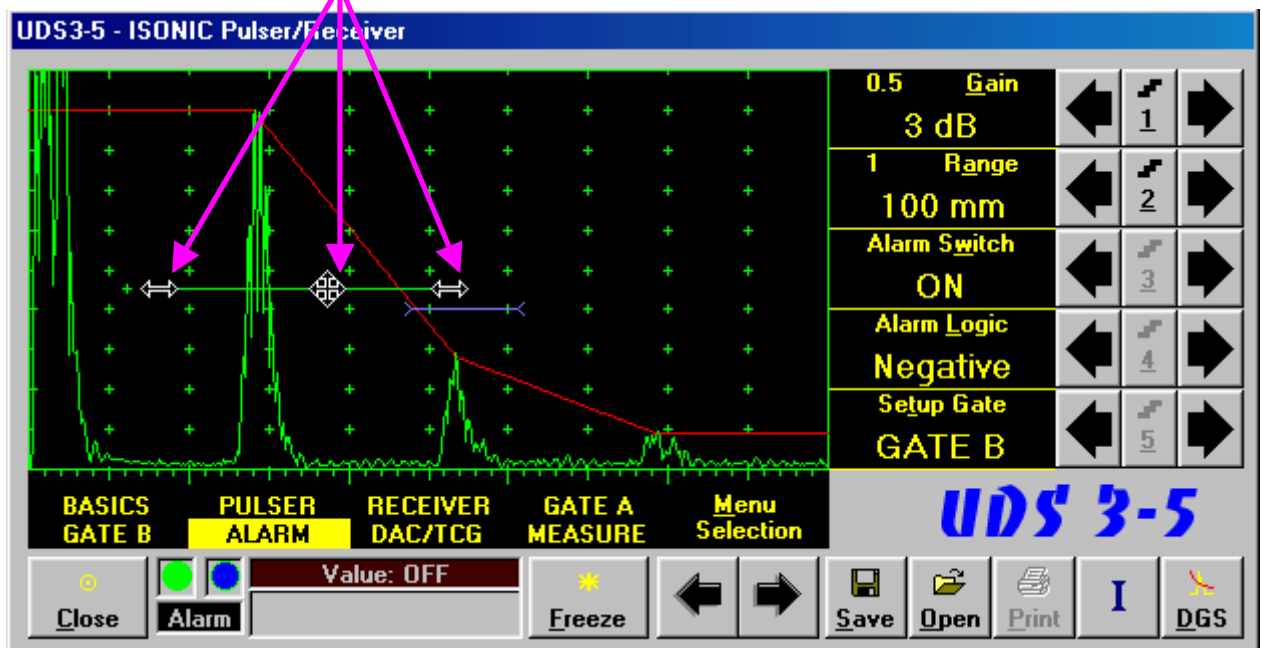
5.2.6.2. ISONIC 2005, 2020, STAR 2005 Instruments Running Under WinXP Embedded with Software Release Dated June 13, 2011 or Later – Gain per Gate B adjustment

It is possible to adjust **Gain** in the **- 6dB ... + 12 dB** range for the signals matching with **Gate B**:

Gain per Gate B adjustment	Mode
	<p>The adjustment is ON</p> <p>Clicking on  turns to the bAmplifier Gain adjustment:</p>  <p>On completion click on or press  or </p> <p>To negate click on or setup bAmplifier to 0 dB then press  or </p>
	<p>The adjustment is ON</p> <p>Clicking on  turns to the bAmplifier Gain adjustment:</p>  <p>On completion click on or press  or </p> <p>To negate click on or setup bAmplifier to 0 dB then press  or </p>

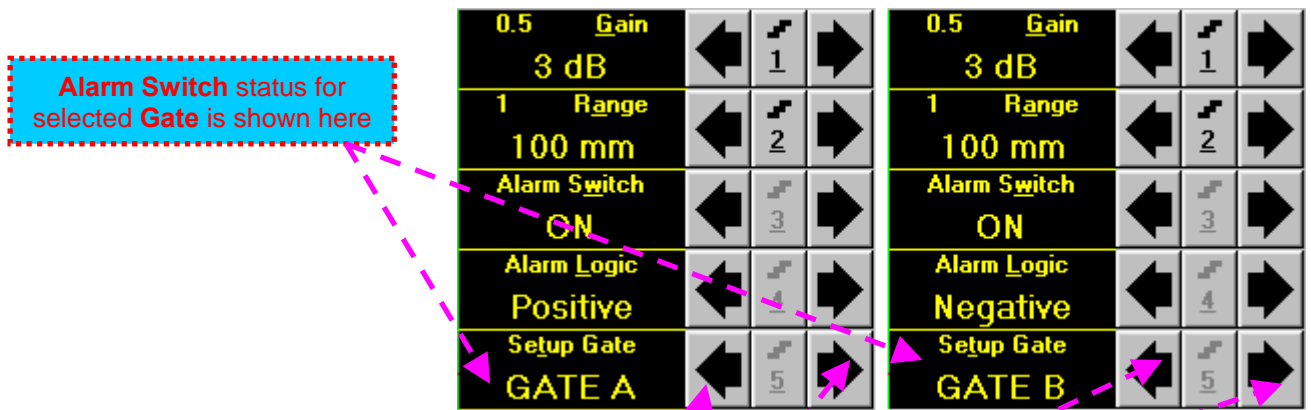
5.2.7. Drag and Drop: Gate A and Gate B

Gate A and Gate B may be manipulated through Drag and Drop provided that they are visible in the A-Scan area. Mouse pointer changes shape while placing it above appropriate section of a gate



To manage a gate just press and hold left mouse button or touch screen stylus and drag, then drop through releasing of left mouse button or touch screen stylus

5.2.8. Sub Menu ALARM



To select a **Gate** for **Alarm Setup** the following manipulations are applicable:

- **Mouse / Touch Screen**

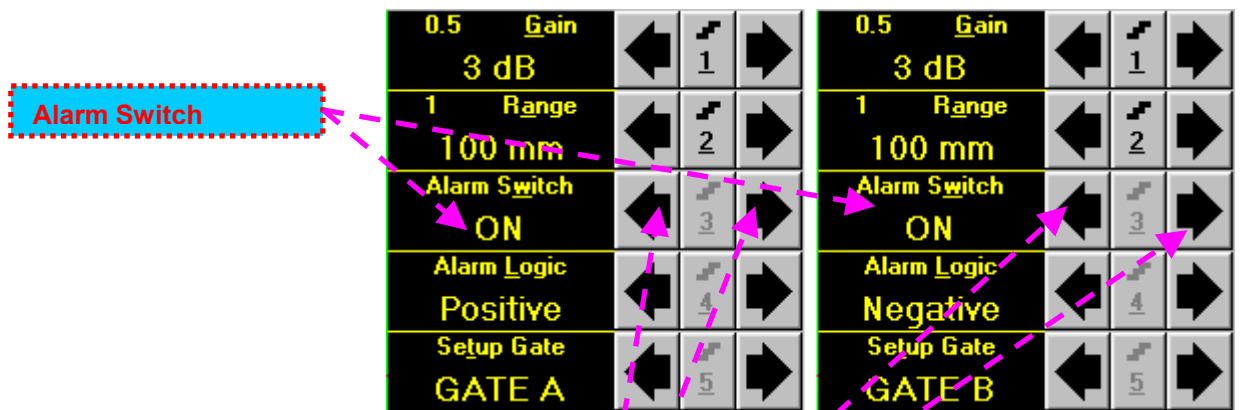
- Click or press and hold on the appropriate button

- **Keyboard**

- Press 5 on front panel keyboard or **F5** or **<Alt>+<T>** on external keyboard ⇒ **Setup Gate** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard

- **Combined**

- Click on **Setup Gate** ⇒ **Setup Gate** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard



To control **Alarm Switch** the following manipulations are applicable:

- **Mouse / Touch Screen**

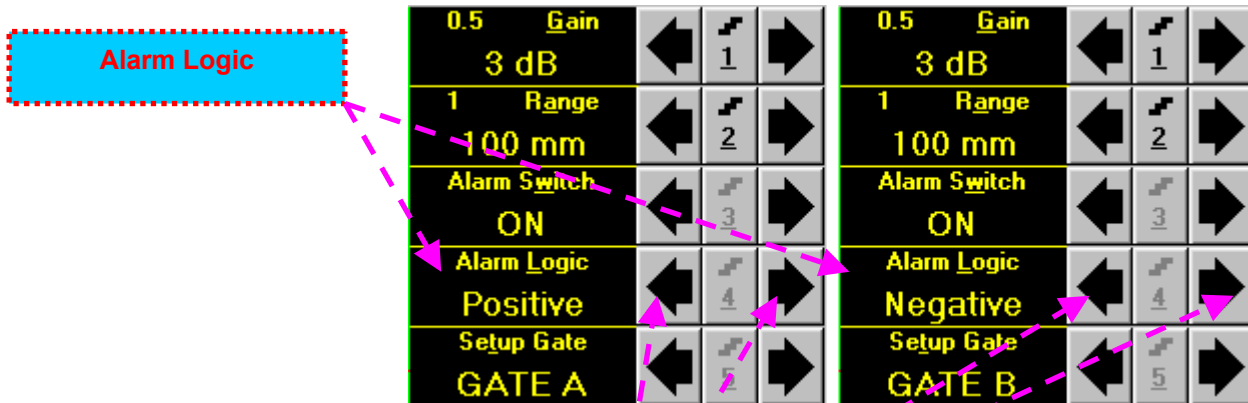
- Click or press and hold on the appropriate button

- **Keyboard**

- Press 3 on front panel keyboard or **F3** or **<Alt>+<W>** on external keyboard ⇒ **Alarm Switch** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard

- **Combined**

- Click on **Alarm Switch** ⇒ **Alarm Switch** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard












To select **Alarm Logic** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

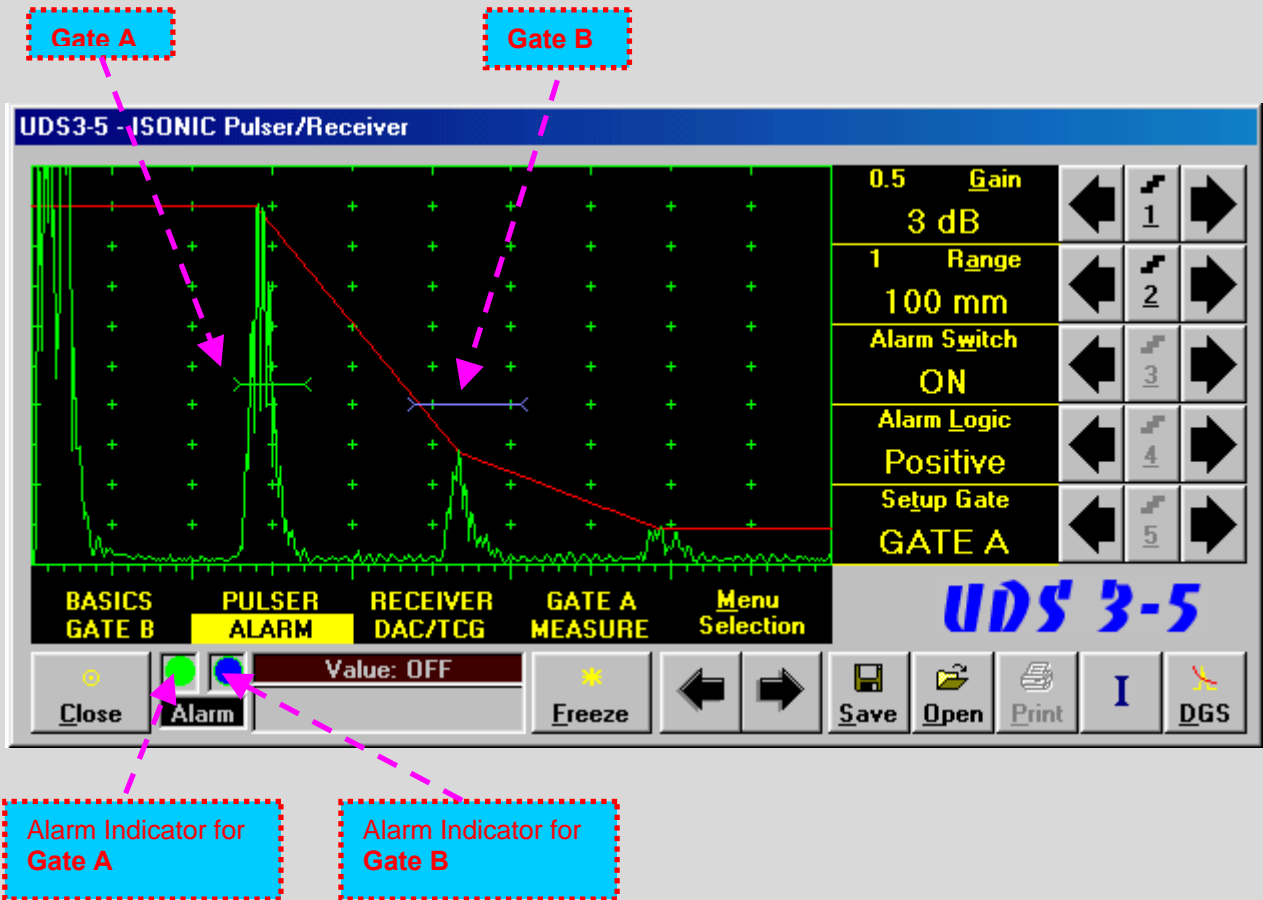
- Press  on front panel keyboard or **F4** or **<Alt>+<L>** on external keyboard ⇒ **Alarm Logic** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Alarm Logic** ⇒ **Alarm Logic** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



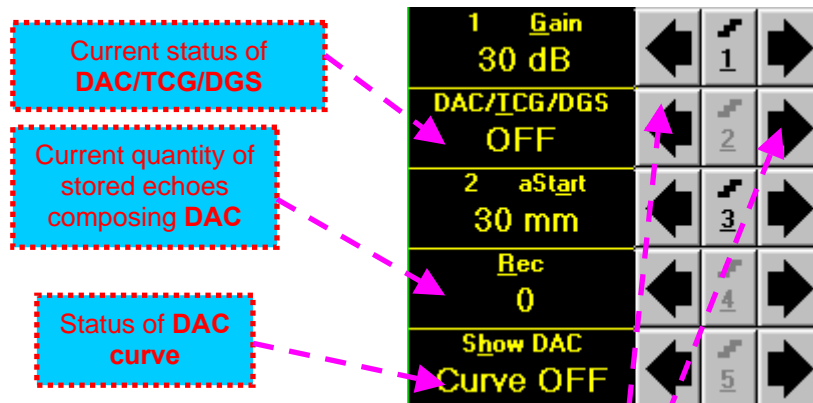
Alarm Example



- ◆ There is a pulse matching with **Gate A** and exceeding its threshold; the **Alarm Logic** setting for **Gate A** is **Positive** ⇒ **Alarm Indicator** for **Gate A** is active
- ◆ There is a pulse matching with **Gate B** and not exceeding its threshold; the **Alarm Logic** setting for **Gate B** is **Negative** ⇒ **Alarm Indicator** for the **Gate B** is active

5.2.9. Sub Menu DAC/TCG

5.2.9.1. ISONIC 2005 Instruments Running Under Win98SE and ISONIC 2005, 2020, STAR 2005 Instruments Running Under WinXP Embedded with Software Release Dated July, 2010 or Earlier












To select required mode for **DAC/TCG/DGS** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

- Press  on front panel keyboard or **F2** or **<Alt>+<T>** on external keyboard ⇒ **DAC/TCG/DGS** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

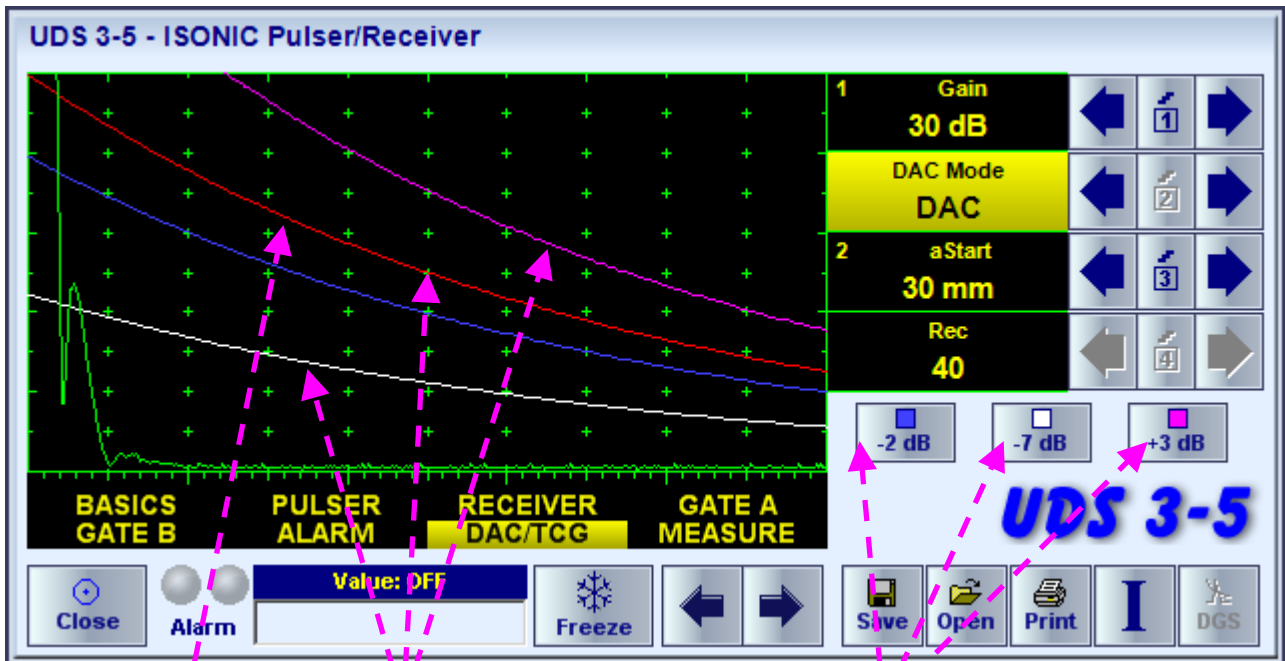
- Click on **DAC/TCG/DGS** ⇒ **DAC/TCG/DGS** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



- ◆ There are four possible modes for **DAC/TCG**:
 - There are four possible modes for **DAC/TCG**:
 - **OFF** - **DAC Curve** switches automatically to **OFF** while in **OFF**
 - **DAC** - available if quantity of stored echoes is 2 (two) or more. **DAC Curve** switches automatically to **ON** while in **DAC** mode. Both experimental and theoretical methods for creating **DAC** are available
 - **TCG** - available if quantity of stored echoes is 2 (two) or more. **DAC Curve** switches automatically to **OFF** while in **TCG** mode
 - **Update** - allows to create/update new/existing **DAC**. **Update** of existing **DAC** performed through erasing of a number of sequentially recorded echoes, starting from the latest one, and/or recording of new echoes. The maximal number of echoes recorded into the one **DAC** is 40 (forty). **DAC Curve** switches automatically to **ON** if the number of recorded echoes is 2 (two) or more and switches automatically to **OFF** if number of recorded echoes is less than 2 (two) while in **Update** mode
- ◆ It is possible to Create / Modify / Activate **DAC** and **TCG** for all **Display** modes (**RF**, **Full**, **Negative**, and **Positive**)
- ◆ To create / modify **DAC/TCG** or **DGS** refer to paragraphs 5.2.10, 5.2.11 of this Operating Manual

5.2.9.2. ISONIC 2005, 2020, STAR 2005 Instruments Running Under WinXP Embedded with Software Release Dated Aug, 2010 or Later

Control of ISONIC 2005, 2020, STAR Instruments running under WinXP Embedded with software release dated Aug, 2010 or later for DAC / TCG / DGS functions is identical to earlier SW releases except the new ability of managing up to 3 independently controllable DAC curves in addition to the main one:



Main DAC Curve (red)

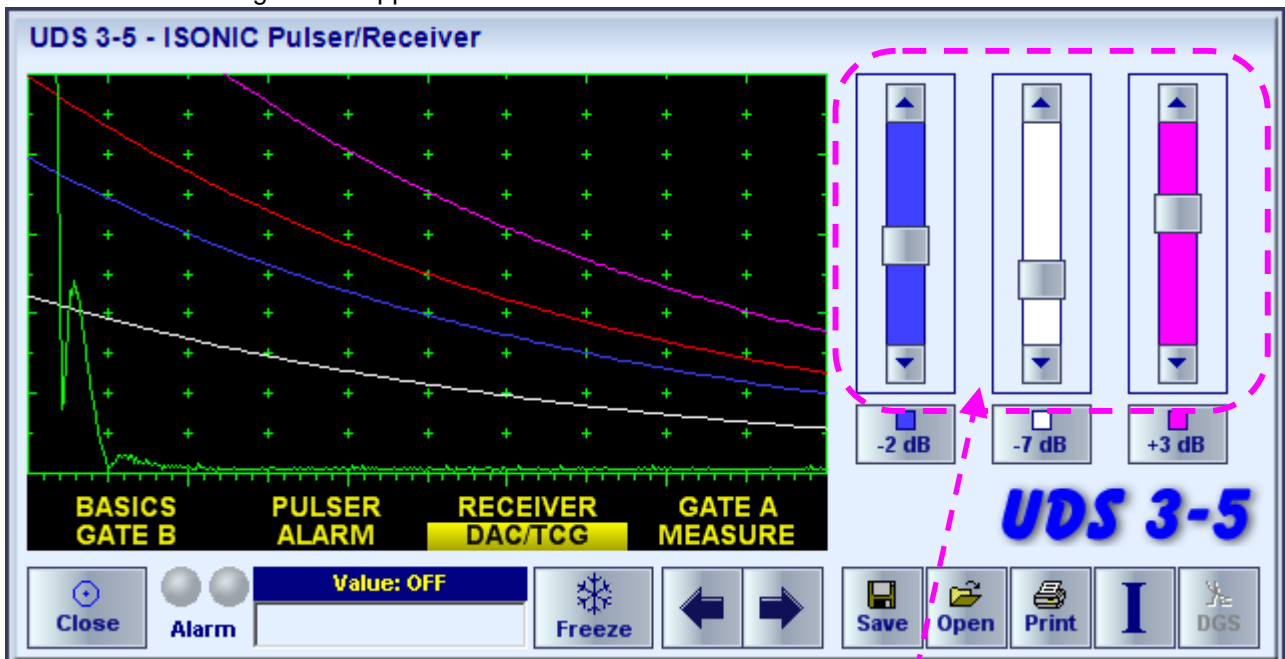
Additional curves (Blue, White, and Violet)

Level indicators for the of additional curves (Blue, White, and Violet), the levels are indicated in dB relatively main DAC Curve

To control levels of the additional DAC curves click on one of three indicators as above, for example on



The following screen appears:



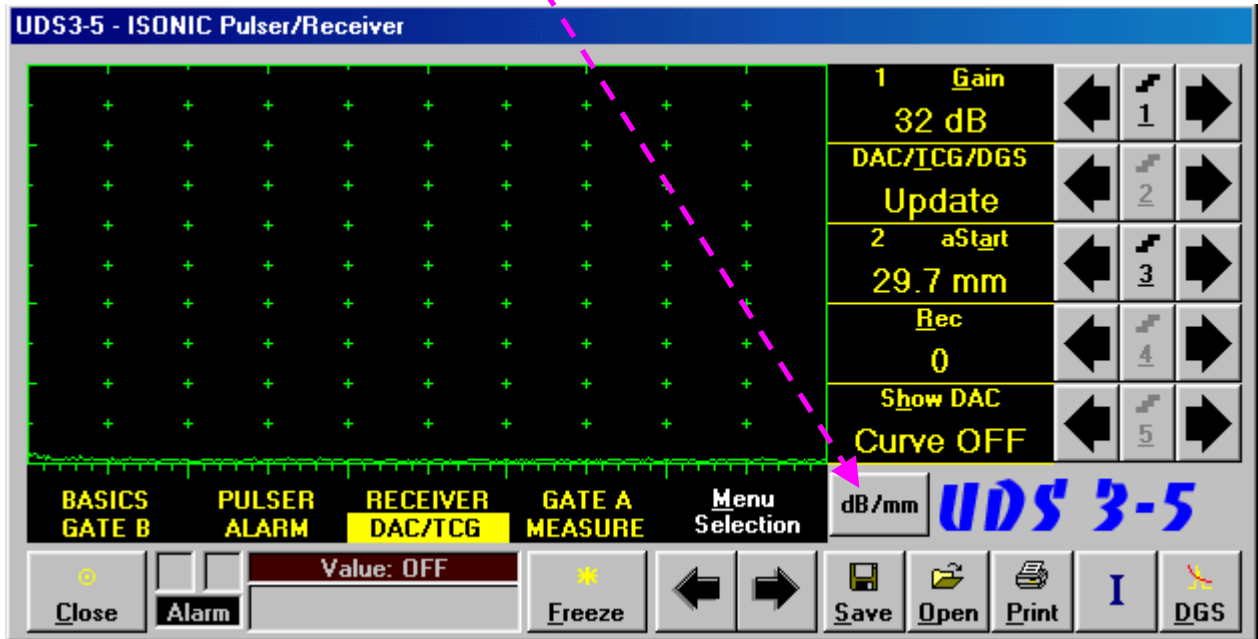
The level of each additional DAC curve is controlled through clicking on **arrow buttons** in the corresponding sliding bar. On completion click on a level indicator

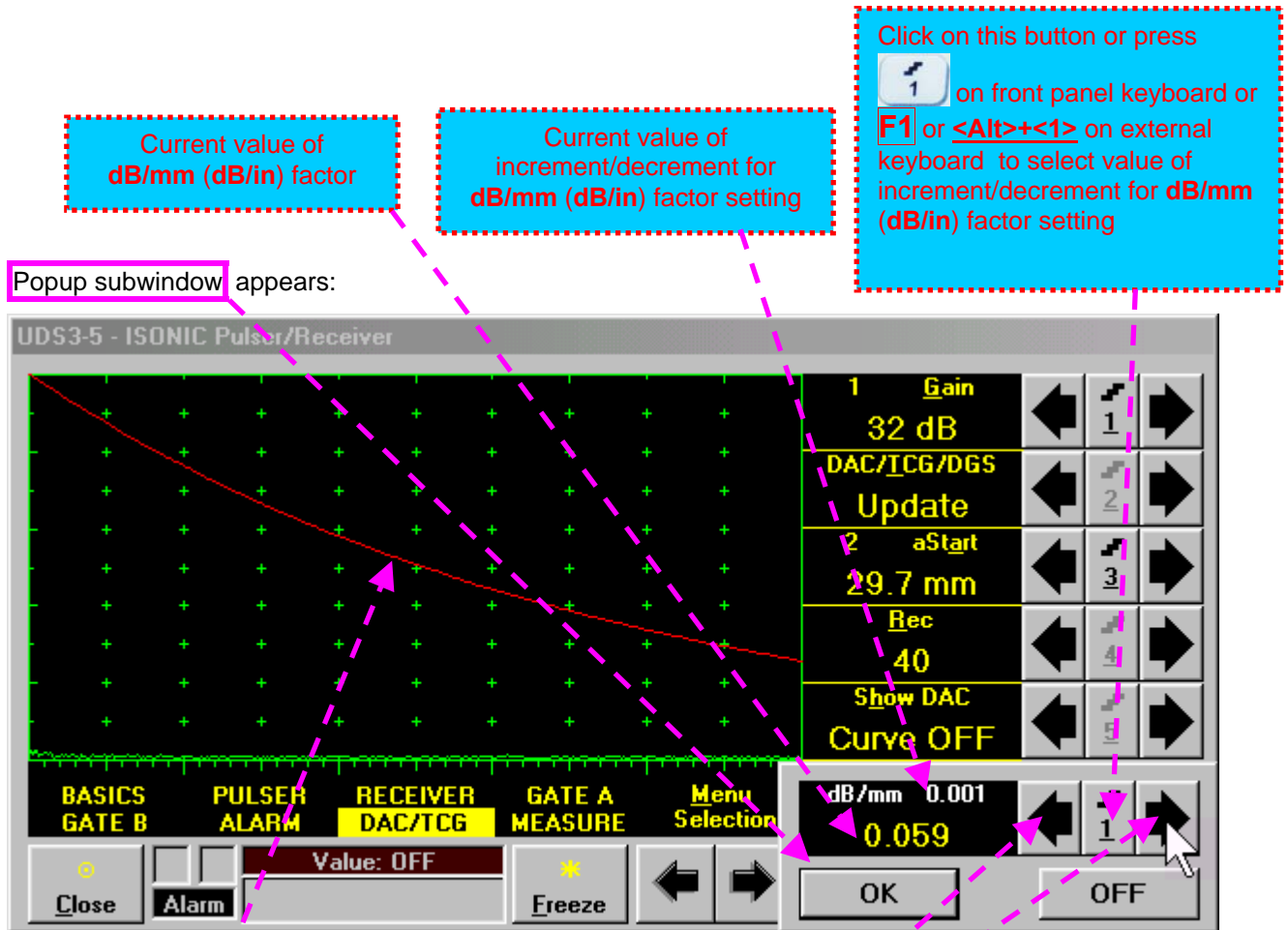
5.2.10. Create / Modify DAC

5.2.10.1 Theoretical DAC: dB/mm (dB/in)

Theoretical **DAC** represents pure exponential law for distance amplitude curve; said law is determined by **dB/mm (dB/in)** factor and value of **Probe Delay** - refer to paragraphs 5.2.12, 5.2.13 of this Operating Manual: at zero material travel distance theoretical **DAC** has start point at 100% of A-Scan height

Set **DAC/TCG/DGS** to **Update** then click **on**





Theoretical DAC according to entered **dB/mm (dB/in)** factor

To control **dB/mm (dB/in)** factor the following manipulations are applicable:

- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate **button**
- **Keyboard**
 - Press , , , on front panel keyboard or , , , on external keyboard

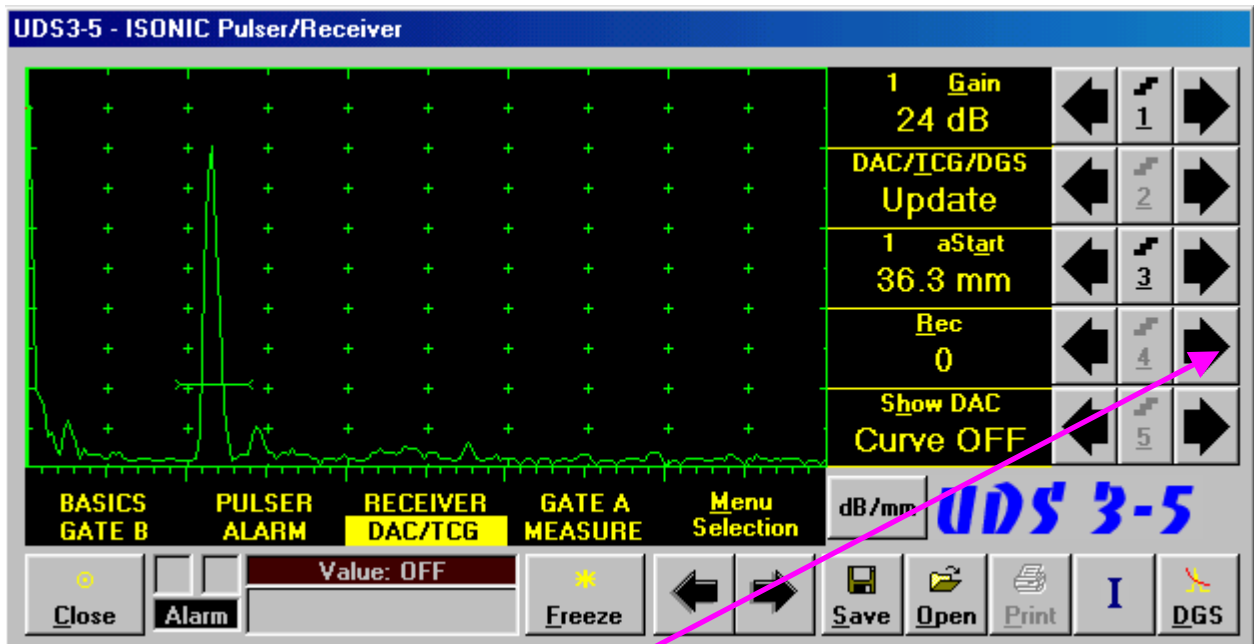
On completing **dB/mm (dB/in)** factor setting click on **OK** or press on front panel keyboard **Enter** on external keyboard. This will return to main operating surface of UDS 3-5 Pulsar Receiver and

activate theoretical **DAC**. Button **dB/mm** becomes green while theoretical **DAC** is setup; set **DAC/TCG/DGS** to **DAC** to activate theoretical **DAC** or to **TCG** if it is necessary to perform time correction of gain in accordance with theoretical **DAC** law.

To modify or switch theoretical **DAC** off set **DAC/TCG/DGS** to **Update** then click on **dB/mm**. In the appeared popup subwindow modify value **dB/mm (dB/in)** factor as it is described above or click on **OFF** then on **OK**

5.2.10.2 Experimental DAC: recording signals from variously located reflectors

If theoretical **DAC** is active then it must be switched off according to paragraph 5.2.10.1 of this Operating Manual prior to building of experimental **DAC**. Switch on **Gate A** then set **DAC/TCG/DGS** to **Update**. Place probe onto **DAC** calibration block and maximize echo from the reflector closest to the probe (first echo) then place **Gate A** over received signal and capture first *DAC echo*












To capture *DAC echo* the following manipulations are applicable:





- **Mouse / Touch Screen**

- Click **on**

- **Keyboard**

- Press  on front panel keyboard or **F4** or **<Alt>+<R>** on external keyboard ⇒ **Rec** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

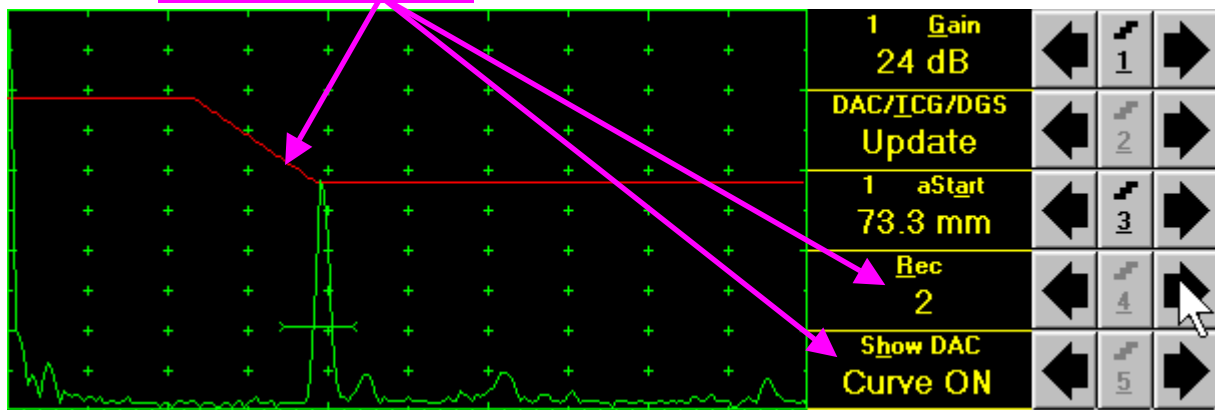
- **Combined**

- Click on **Rec** ⇒ **Rec** fore color changes to white - then use ,  on front panel keyboard or ,  on external keyboard

As a result the *first DAC echo* will be stored and corresponding **indication** will appear

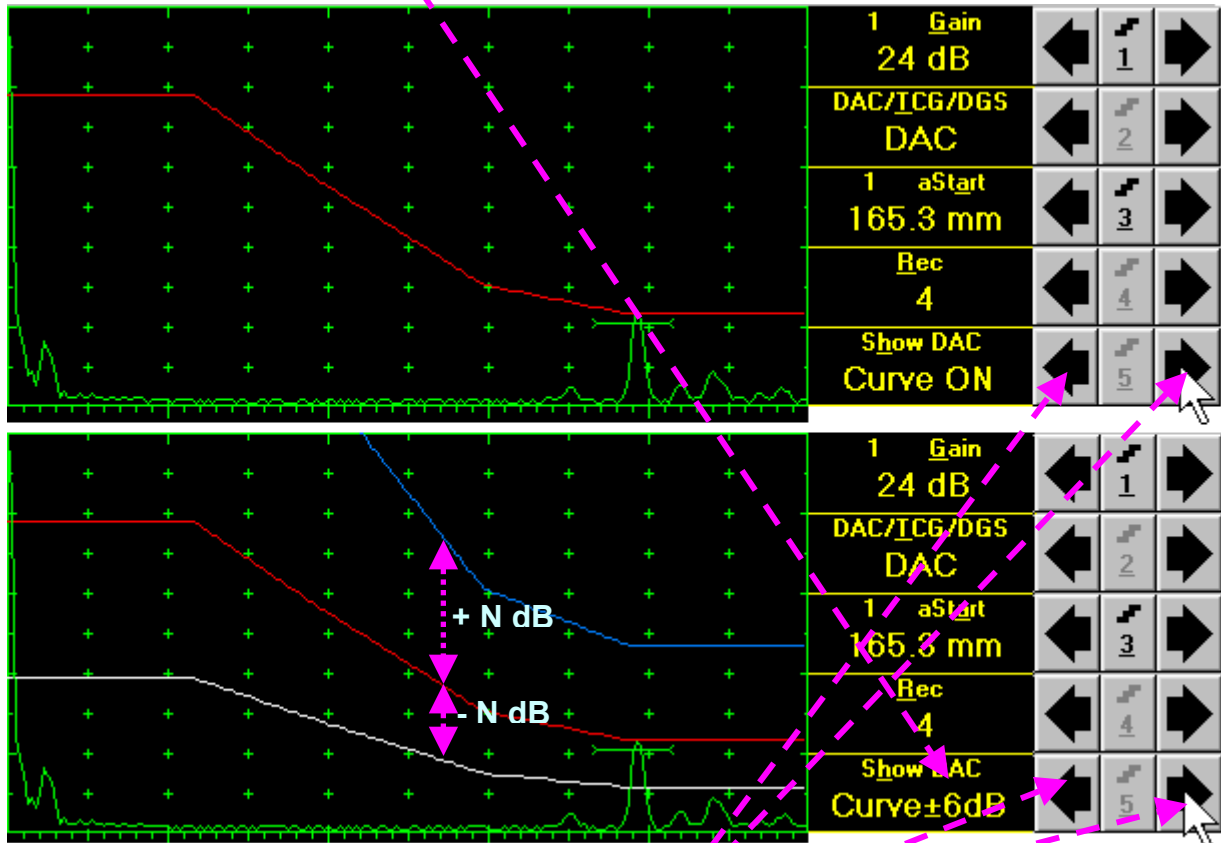


Place probe onto DAC calibration block and maximize echo from next reflector then place **Gate A** over received signal and capture *next DAC echo*. As result *next DAC echo* will be stored causing appropriate modifying of corresponding indications



- ◆ The highest echo in the **Gate A** will be stored said echo may either exceed **Gate A** threshold level or not
- ◆ Stored echo must be below 100% of **A-Scan** height
- ◆ A total number of 40 echoes may be stored one by one by the same way as described above

After creating a DAC (2 or more echoes stored) the DAC and / or TCG may be activated. There are two styles of DAC indication in the DAC mode: **Main Curve Only** and **Main Curve \pm N dB**, where **N may be setup either as 2, 4, 6, 8, 10, 12, or 14 dB**. To proceed follow the rules below:



- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

- Press 5 on front panel keyboard or **F5** or **<Alt>+<H>** on external keyboard \Rightarrow **Show DAC** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard

- **Combined**

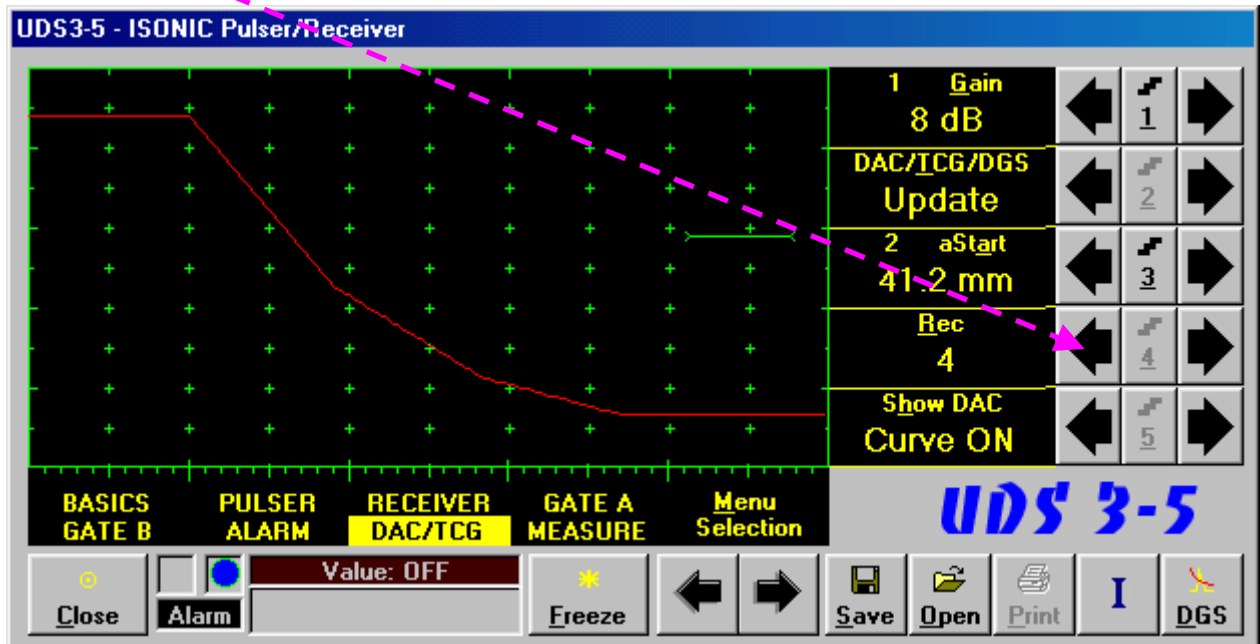
- Click on **Show DAC** \Rightarrow **Show DAC** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard

It's possible to erase the last stored echo from the **DAC**. To proceed set the **DAC/TCG/DGS** to **Update**:

To erase the last stored echo from the **DAC** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on



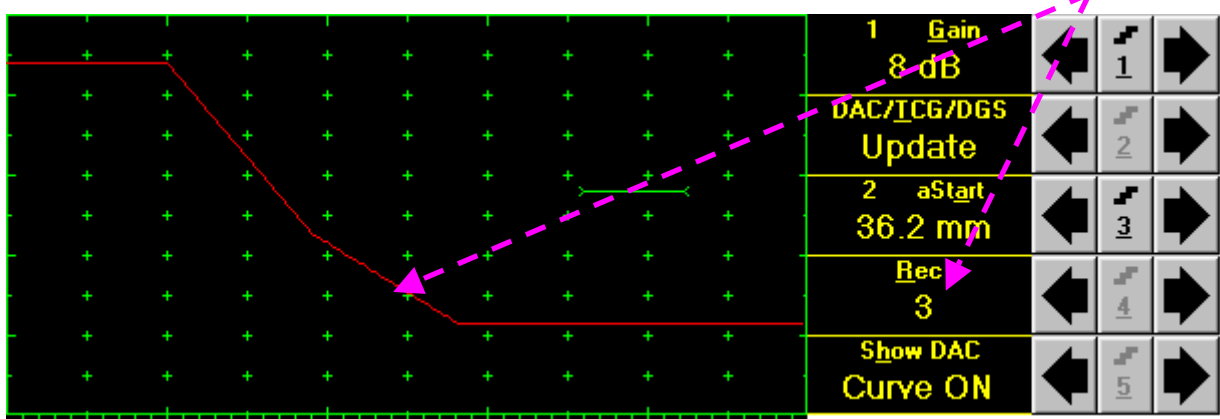
- **Keyboard**

- Press 4 on front panel keyboard or **F4** or **<Alt>+<R>** on external keyboard ⇒ **Rec** fore color changes to white - then use ←, ↓ on front panel keyboard or ←, ↓ on external keyboard



- **Combined**

- Click on **Rec** ⇒ **Rec** fore color changes to white - then use ←, ↓ on front panel keyboard or ←, ↓ on external keyboard

As a result the last stored echo will be erased causing appropriate modifying of corresponding indications



5.2.11. DGS

To setup **DGS** set **Display** to **Full** then click on  or press  on front panel keyboard or **F9** or **<Alt>+<D>** on external keyboard. The following screen appears:

Back echo amplitude as function of metal travel distance in the *reference block* for the selected probe

Disk shaped reflector (flat bottom hole - **FBH**) echo amplitude as function of metal travel distance in the *material under test* for the selected probe and **FBH** diameter

UDS3-5 - ISONIC Pulser/Receiver

0.5 Gain 3 dB

1 Range 200 mm

5 US Velocity 3250 m/s

100 Display Delay 9.82 μs

5 Reject 0 %

RASICS PULSER RECEIVER GATE A Menu

DGS Setup: SWB-60-5 / 7.7 mm

Probe	Gain	
SWB-60-5	3 dB	
Equivalent Dia	Transfer Loss	
7.7 mm	0 dB	
Modify	Material Attenuation	
Apply	0 dB/m	
Close	Reference Attenuation	
	0 dB/m	

K1 $\Delta V_{K1}(1,5) = -16.5$ dB

Backwall Echo

Setup Step

6 dB (dB/m) 2 dB (dB/m) 1 dB (dB/m)

Equivalent Diameter (FBH) selection box

Probe selection box

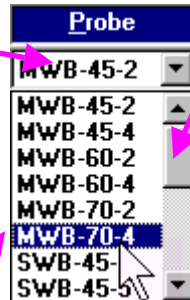
To activate **DGS** follow the steps below:

Step 1: Probe Selection

The following manipulations are applicable for the **Probe** selection:









- **Mouse / Touch Screen**

- Click on **on**
- Scroll probes list to see the selected one











- Click on **selected probe**

- **Keyboard**

- Press **<Alt>+<P>** on external keyboard ⇒ **Probe** fore color changes to white – then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

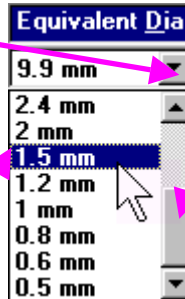
- Click on **Probe** ⇒ **Probe** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

Step 2: Equivalent Diameter of disk shaped reflector (flat bottom hole – FBH)

The following manipulations are applicable for the selection of the **Equivalent Diameter** of disk shaped reflector:









- **Mouse / Touch Screen**

- Click on **on**
- Scroll diameters list to see the selected one











- Click on **selected equivalent diameter**

- **Keyboard**


- Press **<Alt>+<D>** on external keyboard ⇒ **Equivalent Dia** fore color changes to white – then use , , ,  on front panel keyboard or , , ,  on external keyboard

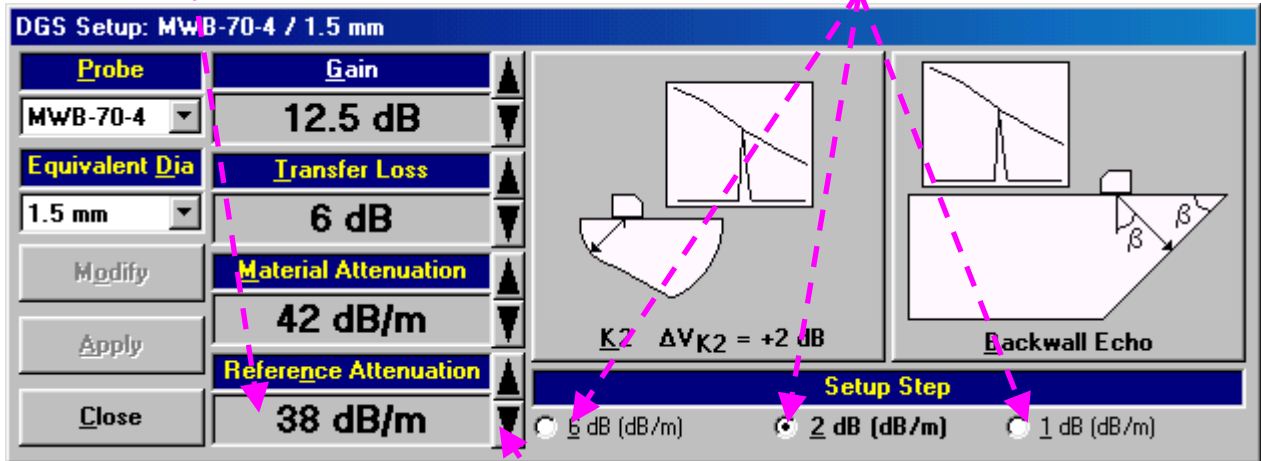
- **Combined**

- Click on **Equivalent Dia** ⇒ **Equivalent Dia** fore color changes to white – then use , , ,  on front panel keyboard or , , ,  on external keyboard

















Step 3: Attenuation in the reference block

Current setting of **Reference Attenuation** (attenuation in the reference block) **dB/m**

Click on **Setup Step** option or press **<Alt>+<1>** or **<Alt>+<2>** or **<Alt>+<6>** on external keyboard to select required value for increment / decrement for setting **Reference Attenuation**. The last selected value of increment / decrement is checked: 



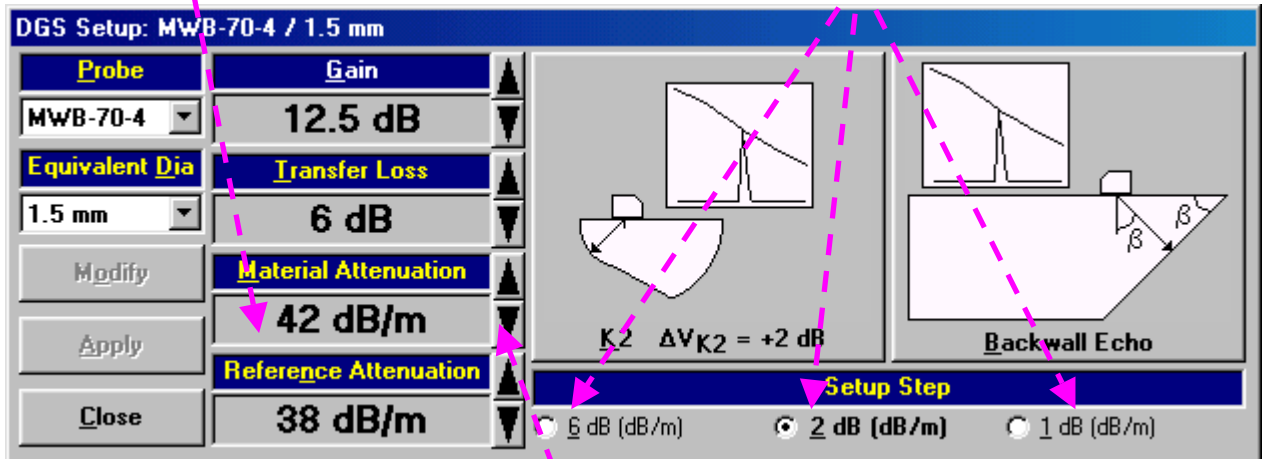
The following manipulations are applicable:

- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate button
- **Keyboard**
 - Press **<Alt>+<N>** on external keyboard ⇒ **Reference Attenuation** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard
- **Combined**
 - Click on **Reference Attenuation** ⇒ **Reference Attenuation** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

















Step 4: Attenuation in the object under test

Current setting of **Material Attenuation** (attenuation in the object under test) **dB/m**

Click on **Setup Step** option or press **<Alt>+<1>** or **<Alt>+<2>** or **<Alt>+<6>** on external keyboard to select required value for increment / decrement for setting **Material Attenuation**. The last selected value of increment / decrement is checked:



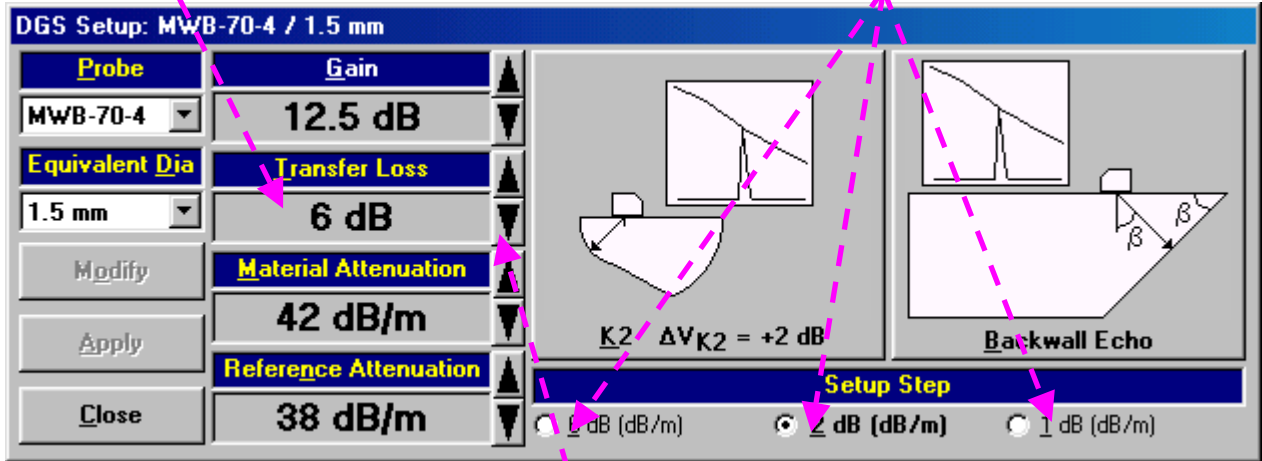
The following manipulations are applicable:

- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate **button**
- **Keyboard**
 - Press **<Alt>+<M>** on external keyboard ⇒ **Material Attenuation** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard
- **Combined**
 - Click on **Material Attenuation** ⇒ **Material Attenuation** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

















Step 5: Transfer loss

Current setting of **Transfer Loss** **dB**

Click on **Setup Step** option or press **<Alt>+<1>** or **<Alt>+<2>** or **<Alt>+<6>** on external keyboard to select required value for increment / decrement for setting **Transfer Loss**. The last selected value of increment / decrement is checked:



The following manipulations are applicable:

- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate button
- **Keyboard**
 - Press **<Alt>+<T>** on external keyboard ⇒ **T**ransfer **L**oss fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard
- **Combined**
 - Click on **T**ransfer **L**oss ⇒ **T**ransfer **L**oss fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

Step 6: Gain

Apply probe to the reference block to get the appropriate echo. There are two methods available:

- K1 or K2 reference block (reference block and reflector are defined in the probe data sheet and reproduced automatically from the **DGS** data base upon probe selection)
- Inclined reference block (reference reflector – back surface)

The screenshot shows the UDS3-5 ISONIC Pulsar/Receiver software interface. At the top, there is a control panel with the following settings:

0.5	Gain	←	1	→
12.5	dB			
1	Range	←	2	→
100	mm			
5	US Velocity	←	3	→
3250	m/s			
100	Display Delay	←	4	→
6.23	μs			
5	Reject	←	5	→
0	%			

Below this is a menu bar with options: **BASICS**, **PULSER**, **RECEIVER**, **GATE A**, **Menu**. The main display area shows a DGS Setup for MWB-70-4 / 1.5 mm. On the left, a table lists parameters:

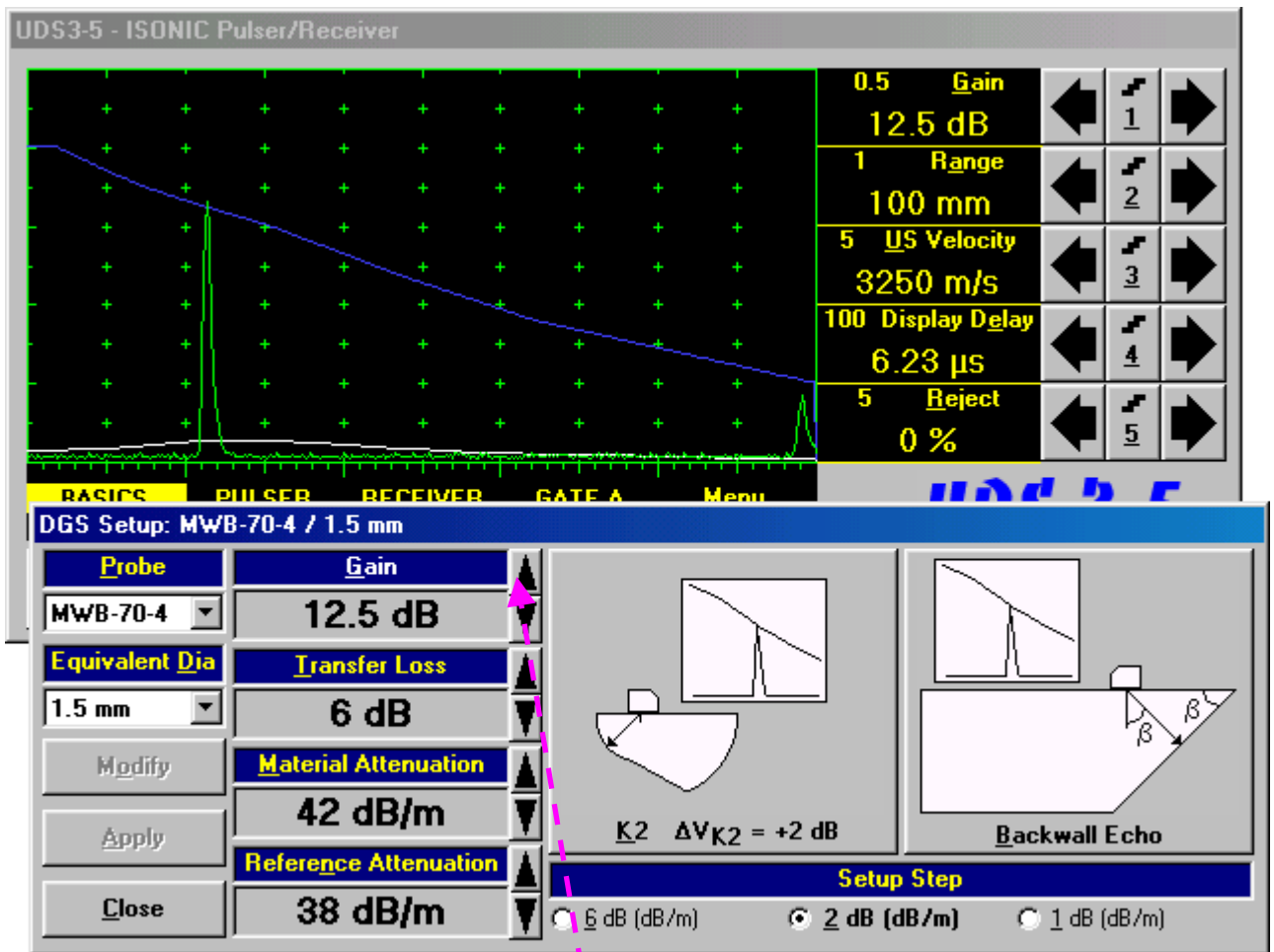
Probe	Gain
MWB-70-4	12.5 dB
Equivalent Dia	Transfer Loss
1.5 mm	6 dB
Modify	Material Attenuation
Apply	42 dB/m
Close	Reference Attenuation
	38 dB/m

To the right of the table are two diagrams: 'K2' showing a curved reference block with $\Delta V_{K2} = +2$ dB, and 'Backwall Echo' showing an inclined reference block with angle β . Below these is a 'Setup Step' section with three radio button options: 6 dB (dB/m), 2 dB (dB/m), and 1 dB (dB/m). A blue dashed line with arrows points from the 'Current Gain dB' callout to the '12.5 dB' value in the Gain field, and from the 'The goal of Gain setup...' callout to the '2 dB (dB/m)' radio button.

Current Gain
dB

Click on **Setup Step** option or press <Alt>+<1> or <Alt>+<2> or <Alt>+<6> on external keyboard to select required value for increment / decrement for increment / decrement for setting **Gain**. The last selected value of increment / decrement is checked:

The goal of Gain setup is obtaining tip of maximized reference echo reaching back echo level (blue curve)











The following manipulations are applicable for **Gain** setup:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

- Press **<Alt>+<G>** on external keyboard ⇒ **G**ain fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

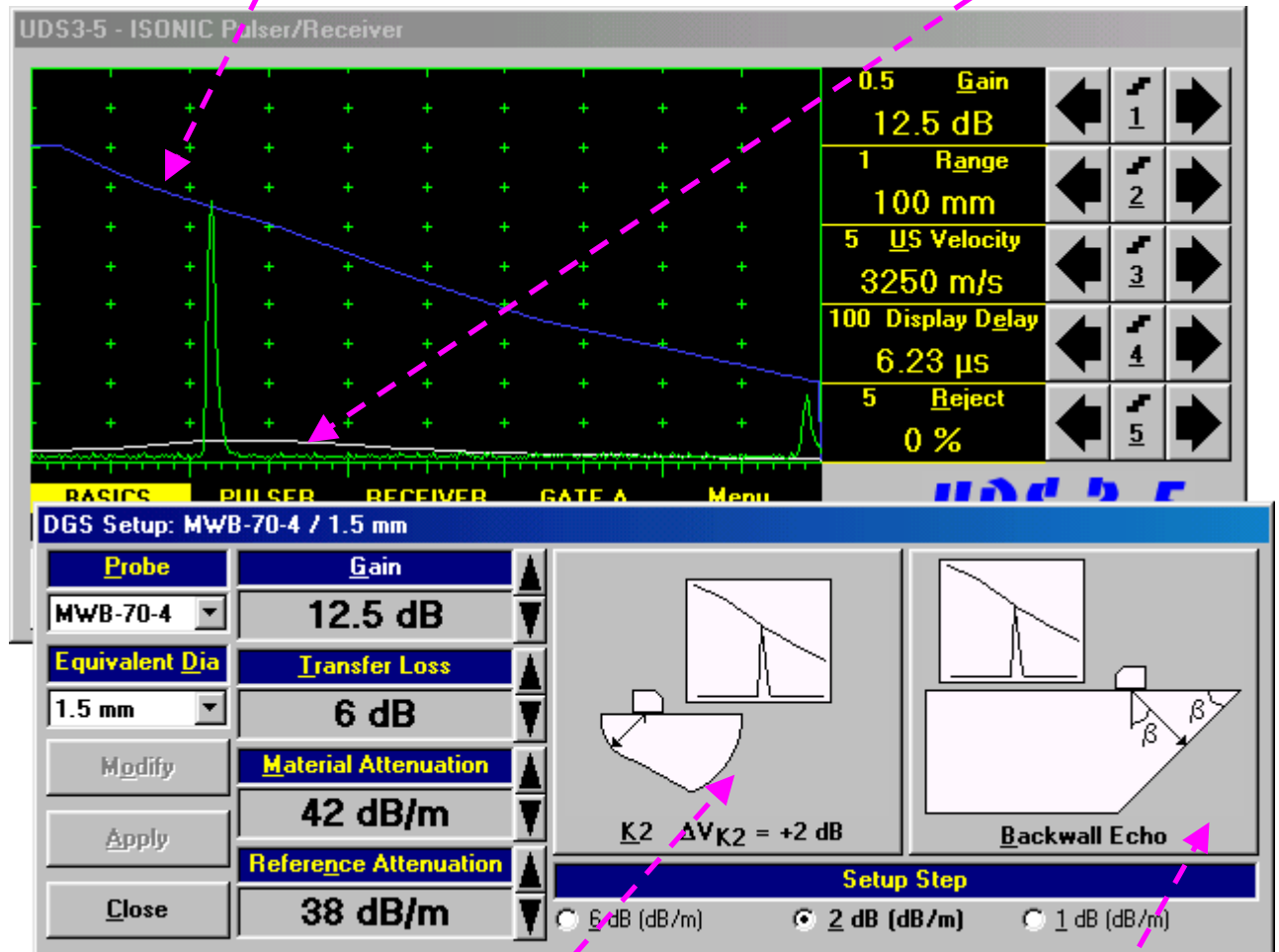
- Click on **G**ain ⇒ **G**ain fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

Step 7: Finalizing DGS curve and return to the main UDS 3-3 / UDS 3-4 window

Before finalizing the **DGS** curve:

Finalized back echo curve (blue) – depends on **Probe** and **Reference Attenuation**

Finalized FBH echo curve (white) – depends on **Probe, Equivalent Dia, and Material Attenuation**



To finalize the **DGS** curve the following manipulations are applicable:

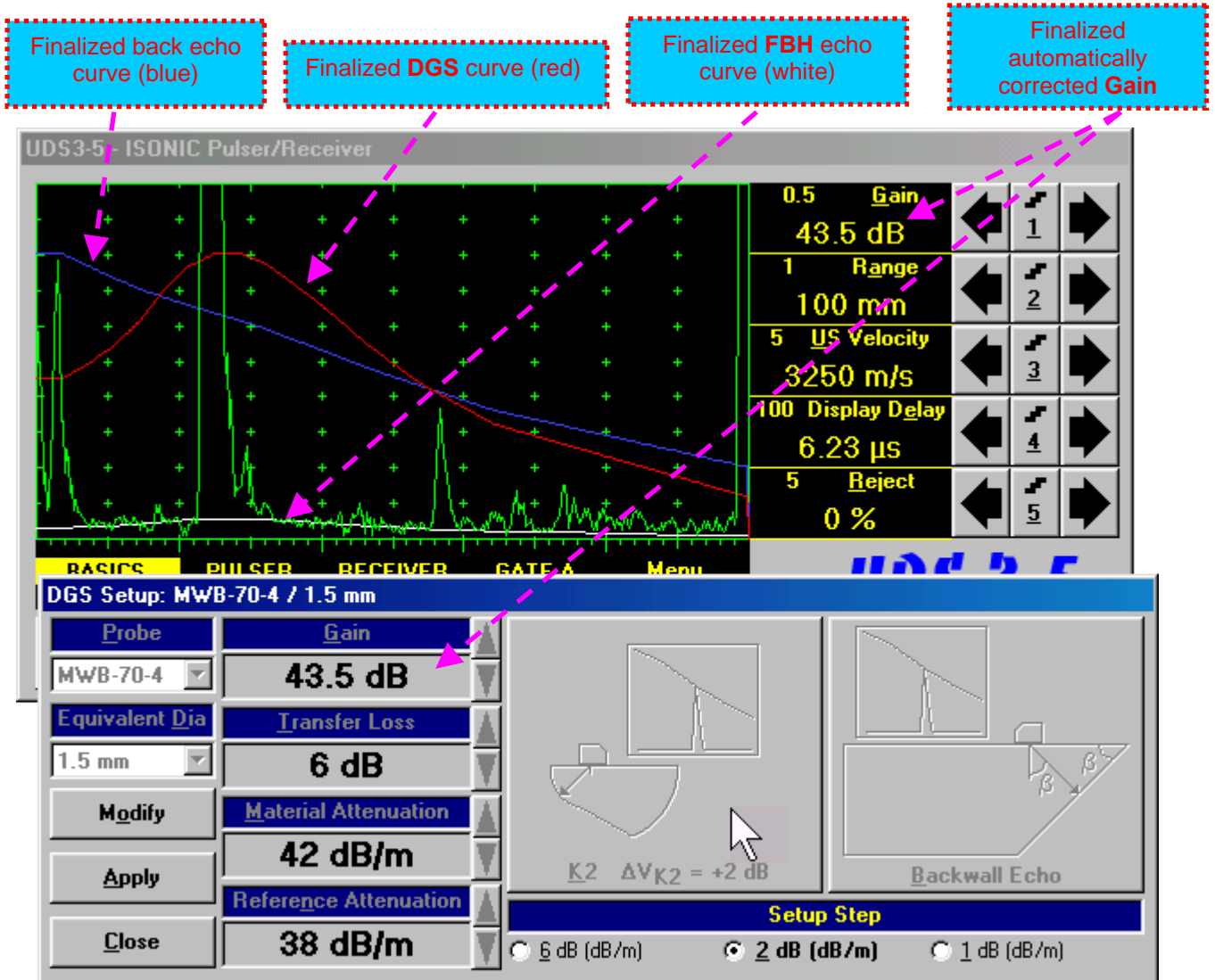
Case 1 (K1 or K2 reference block)

- **Mouse / Touch Screen**
 - Click **on**
- **Keyboard**
 - Pressing **<Alt>+<K>** on external keyboard

Case 2 (Inclined reference block)

- **Mouse / Touch Screen**
 - Click **on**
- **Keyboard**
 - Pressing **<Alt>+** on external keyboard

The finalized **DGS** curve appears upon accompanied with *Automatic Gain Correction*:



To accept finalized **DGS** curve and return to the main operating surface the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on 

then

- Click on 

- **Keyboard**

- Press <Alt>+<A> on external keyboard, then  or <Alt>+<C> or  on front panel keyboard

To negate the finalized **DGS** curve and return to main **UDS3-5** window the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on 

then

- Click on 

- **Keyboard**

- Press **<Alt>+<O>** on external keyboard, then **Esc** or **<Alt>+<C>** or  on front panel keyboard

To create new **DGS** curve the following manipulations are applicable:

- **Mouse / Touch Screen**

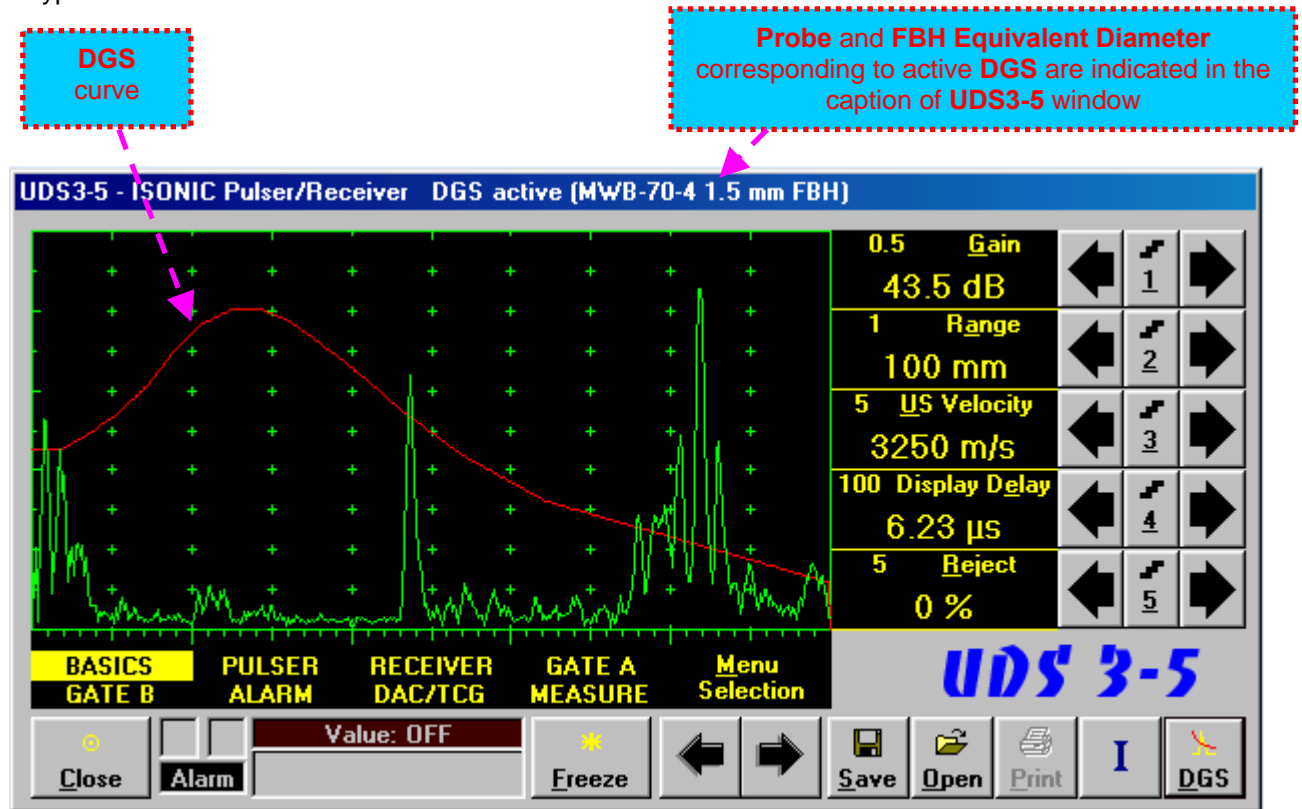
- Click on 

- **Keyboard**

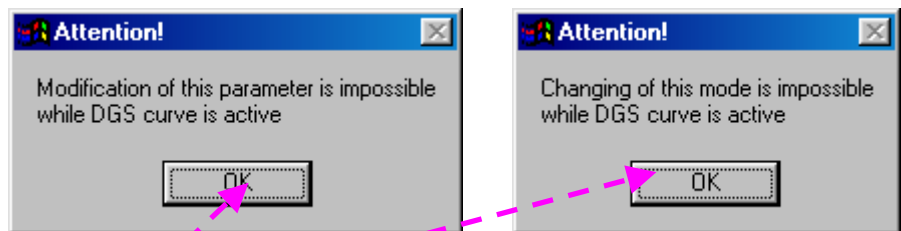
- Press **<Alt>+<O>** on external keyboard



Step 8: Work whilst DGS is active

A typical screenshot with active **DGS** is shown below



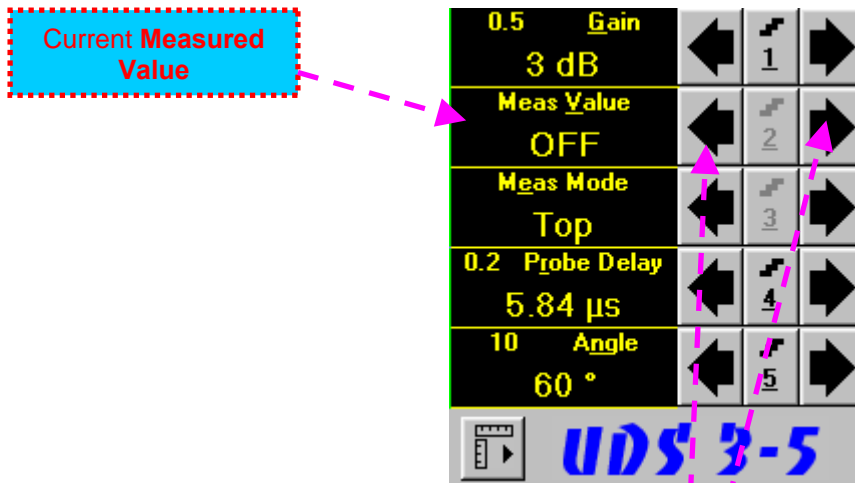
Some parameters and modes may not be modified whilst **DGS** is active - corresponding messages appear if attempting to modify:



To continue operation click on the **button** after message appears or press  or  on front panel keyboard or **Esc** or **Enter** on external keyboard

To negate the active **DGS** or create a new one click on  or press  on front panel keyboard or **F9** or **<Alt>+<D>** on external keyboard

5.2.12. Sub Menu MEASURE












To select **Measured Value** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate **button**

- **Keyboard**

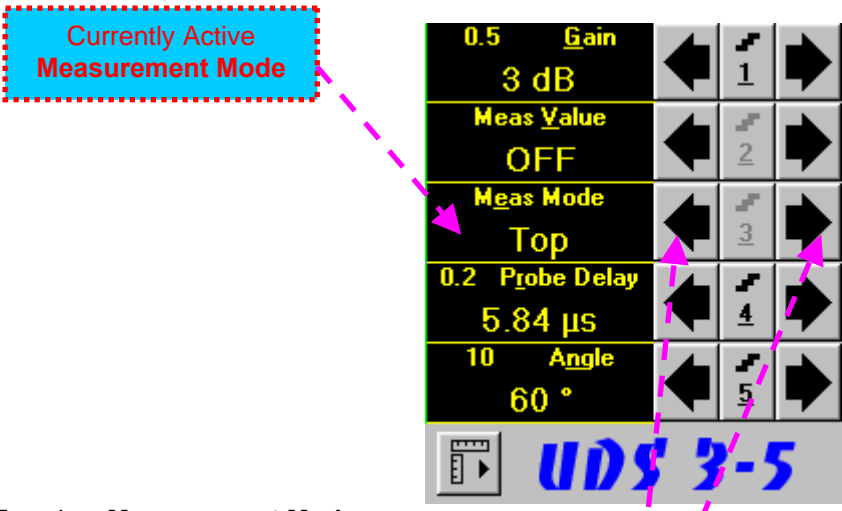
- Press  on front panel keyboard or **F2** or **<Alt>+<V>** on external keyboard ⇒ **Meas Value** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Meas Value** ⇒ **Meas Value** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



Refer to paragraph 5.2.13 of this Operating Manual for information about values available for automatic measurement and indication in the **Value Box (Digital Readout)**



To select **Measurement Mode** the following manipulations are applicable:

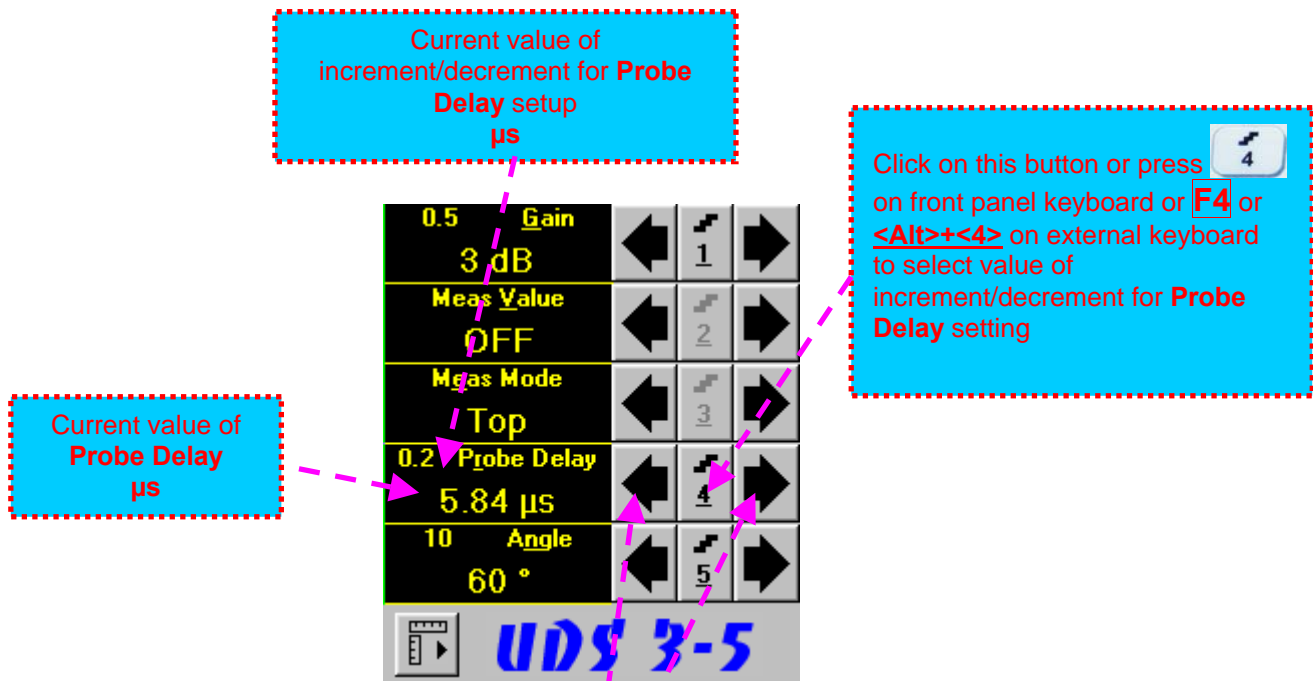
- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate button
- **Keyboard**
 - Press 3 on front panel keyboard or **F3** or **<Alt>+<E>** on external keyboard ⇒ **Meas Mode** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard
- **Combined**
 - Click on **Meas Mode** ⇒ **Meas Mode** fore color changes to white - then use ↑, →, ←, ↓ on front panel keyboard or ↑, →, ←, ↓ on external keyboard

i

There are four Measurement Modes possible:

- ◆ Flank
- ◆ Top
- ◆ Flank-First
- ◆ Top-First

Refer to paragraph 5.2.13 of this Operating Manual for further information












To control **Probe Delay** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate **button**

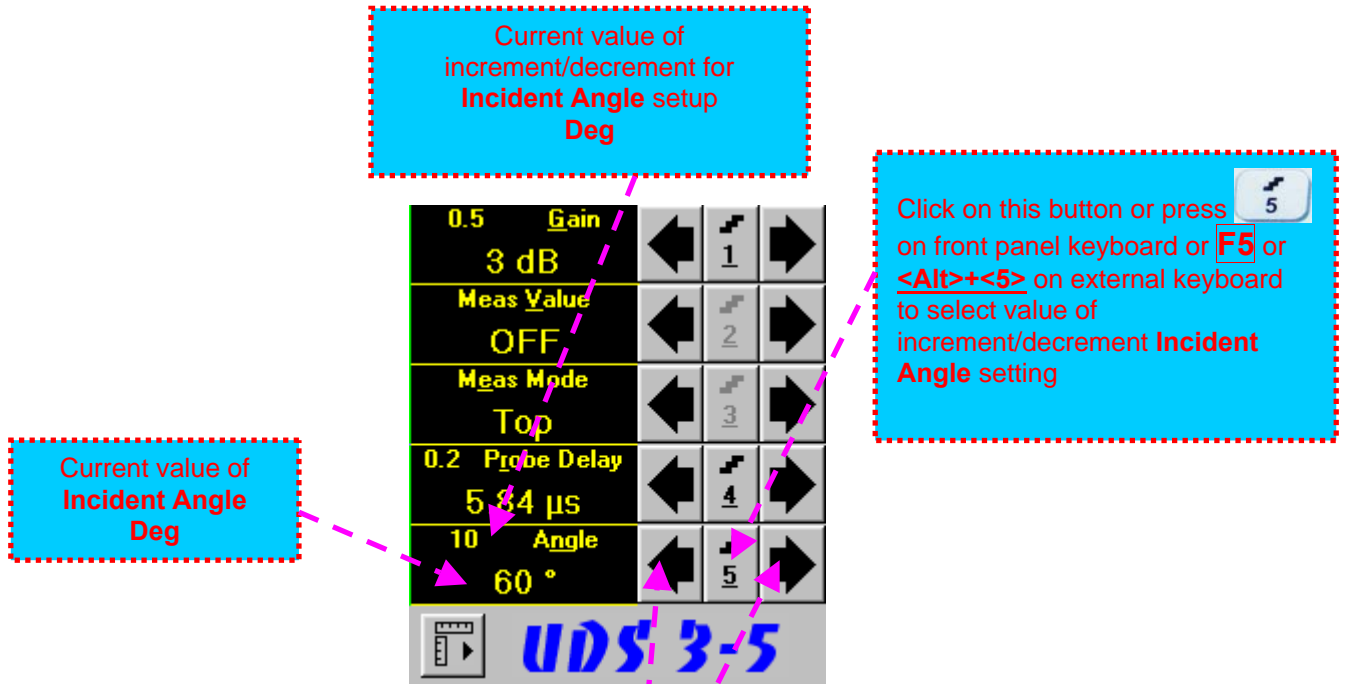
- **Keyboard**

- Press  on front panel keyboard or **F4** or **<Alt>+<R>** on external keyboard \Rightarrow **Probe Delay** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Probe Delay** \Rightarrow **Probe Delay** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

 Refer to paragraph 5.2.13 of this Operating Manual for some hints on determining **Probe Delay**












To control **Incident Angle** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

- Press  on front panel keyboard or **F5** or **<Alt>+<N>** on external keyboard ⇒ **Angle** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard


- **Combined**

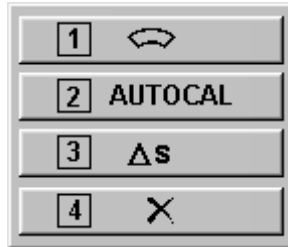
- Click on **Angle** ⇒ **Angle** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard







Refer to paragraph 5.2.13 of this Operating Manual for some hints on determining and / or checking **Probe Angle**



Advanced Measurements Settings Menu




Advanced measurement settings are available through button  appearing on the **UDS 3-5** main operating surface upon activating submenu **MEASURE**. Clicking on that button activates Advanced Measurements Settings Menu:



Press  on front panel keyboard or **F1** on external keyboard or click on  to activate **Advanced Scheme for Reflectors Depth Measurement Whilst Using Angle Beam Probe – Thickness / Skip / Curved Scanning Surface Correction**

Press  on front panel keyboard or **F2** on external keyboard or click on  to activate **Automatic Calibration Procedure**

Press  on front panel keyboard or **F3** on external keyboard or click on  to activate **Dual Ultrasound Velocity Measurement Mode**

Press  or  on front panel keyboard or **F3** on external keyboard or click on  to return to main operating surface

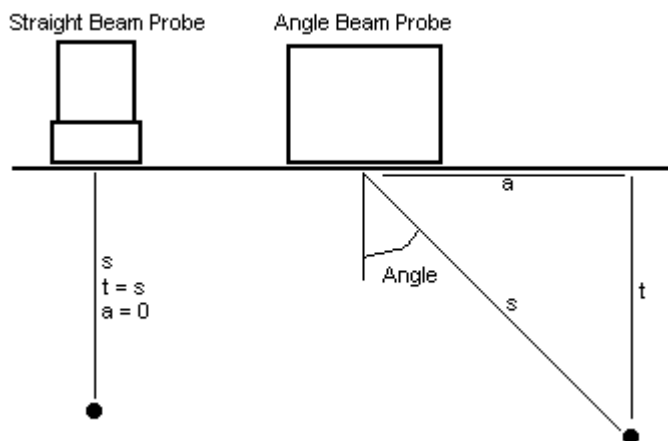
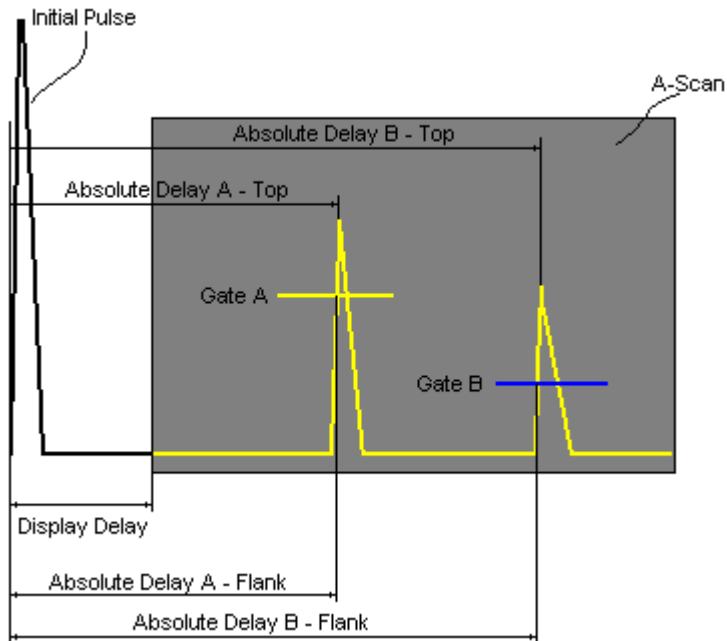


Refer to paragraph 5.2.13.3 of this Operating Manual to get instructed on:

- ◆ **Advanced Scheme for Reflectors Depth Measurement Whilst Using Angle Beam Probe – Thickness / Skip / Curved Scanning Surface Correction**
- ◆ **Automatic Calibration Procedure**
- ◆ **Dual Ultrasound Velocity Measurement Mode**

5.2.13. Time Domain Signal Evaluation - Measurements Guide

5.2.13.1. Values available for Automatic Measurements and Digital Readout



Value 1: T(A)

Time of Flight - μs of an echo matching with **Gate A** measured with respect to **Probe Delay**:

$$T(A) = \text{Absolute Delay A} - \text{Probe Delay}$$

Value 2: T(B)

Time of Flight - μs of an echo matching with **Gate B** measured with respect to **Probe Delay**:

$$T(B) = \text{Absolute Delay B} - \text{Probe Delay}$$

Value 3: s(A)

Material Travel Distance - mm or in of an echo matching with **Gate A**:

$$s(A) = \frac{1}{2} \cdot T(A) \cdot \text{US Velocity}$$

Value 4: s(B)

Material Travel Distance - mm or in of an echo matching with **Gate B**:

$$s(B) = \frac{1}{2} \cdot T(B) \cdot \text{US Velocity}$$

Value 5: a(A)

Projection Distance - mm or in of reflector returning an echo matching with **Gate A**, measured with respect to *Beam Incident Point*:

$$a(A) = s(A) \cdot \sin(\text{Angle})$$

Value 6: a(B)

Projection Distance - mm or in of reflector returning an echo matching with **Gate B**, measured with respect to *Beam Incident Point*:

$$a(B) = s(B) \cdot \sin(\text{Angle})$$

Value 7: t(A)

Depth - mm or in of reflector returning an echo matching with **Gate A**:

$$t(A) = s(A) \cdot \cos(\text{Angle})$$

Value 8: t(B)

Depth - mm or in of reflector returning an echo matching with **Gate B**:

$$t(B) = s(B) \cdot \cos(\text{Angle})$$

Value 9: ΔT - μs :

$$\Delta T = T(B) - T(A)$$

Value 10: Δs - mm or in:

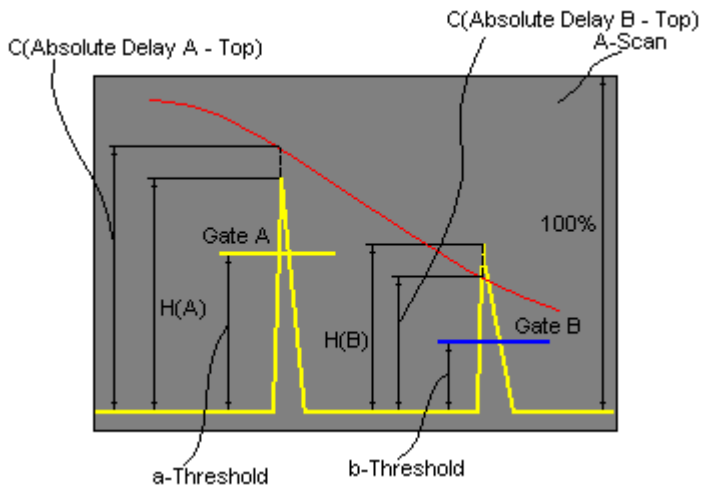
$$\Delta s = s(B) - s(A)$$

Value 11: Δa - mm or in:

$$\Delta a = a(B) - a(A)$$

Value 12: Δt - mm or in:

$$\Delta t = t(B) - t(A)$$



Value 13: H(A)

Amplitude - % of A-Scan height of an echo matching with **Gate A**

Value 14: H(B)

Amplitude - % of A-Scan height of an echo matching with **Gate B**

Value 15: V(A)

Amplitude - dB of an echo matching with **Gate A** with respect to **aThreshold**:

$$V(A) = 20 \cdot \log_{10} (H(A) / aThreshold)$$

Value 16: V(B)

Amplitude - dB of an echo matching with **Gate B** with respect to **bThreshold**:

$$V(B) = 20 \cdot \log_{10} (H(B) / bThreshold)$$

Value 17: ΔV - dB:

$$\Delta V = V(B) - V(A)$$

Value 18: ΔVC(A) (dB to DAC) – dB:

$$\Delta VC(A) = 20 \cdot \log_{10} (H(A) / C (Absolute Delay A_Top))$$

Value 19: ΔVC(B) (dB to DAC) – dB:

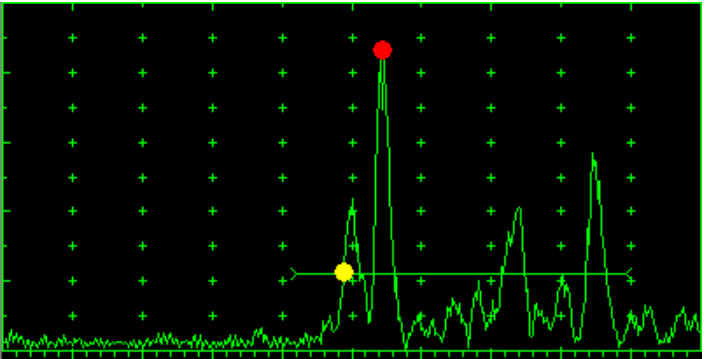
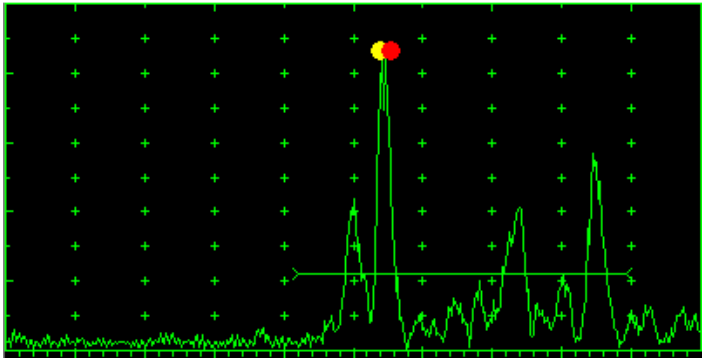
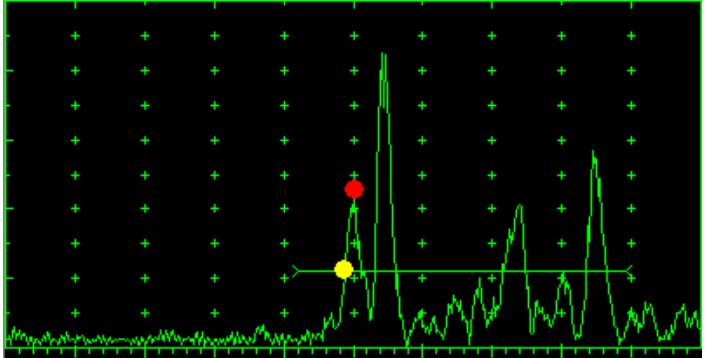
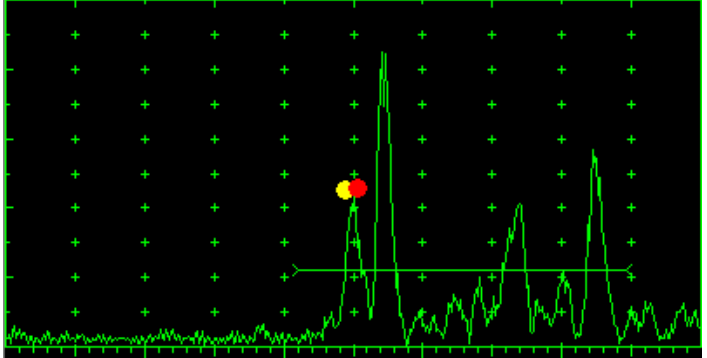
$$\Delta VC(B) = 20 \cdot \log_{10} (H(B) / C (Absolute Delay B_Top))$$



- ◆ To proceed corresponding **Gate** or both **Gates** to be active
- ◆ **ΔVC(A) (dB to DAC)** measurements require active **DAC/DGS**
- ◆ Amplitude measurements of echoes may be performed provided their heights don't exceed 200% of **A-Scan** height
- ◆ For 2 and more echoes matching with a **Gate** - refer to paragraph 5.2.13.2 of this Operating Manual

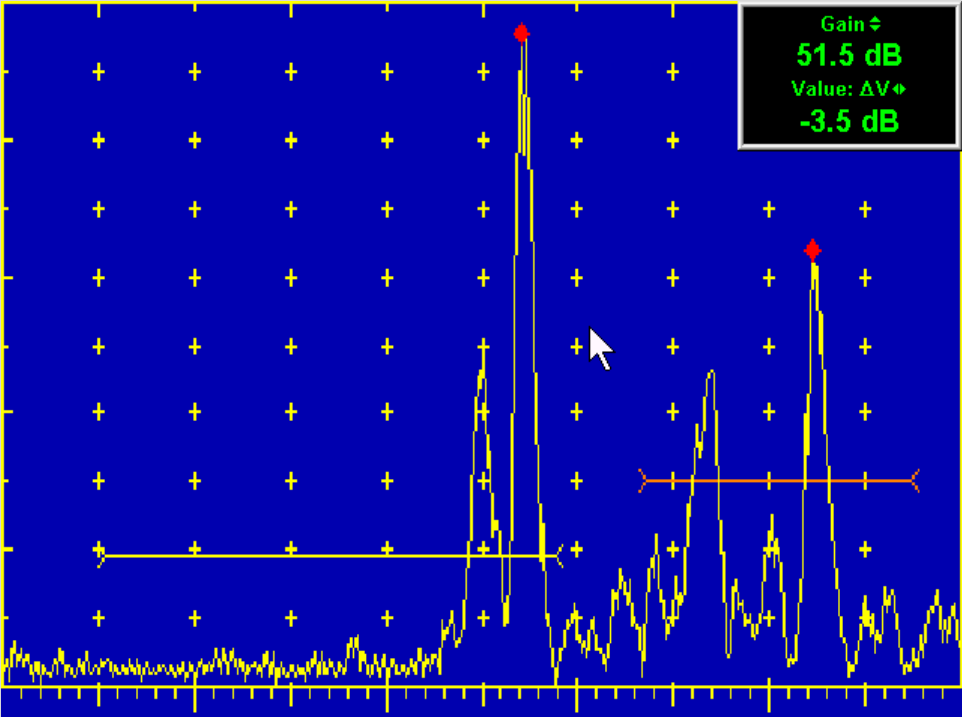
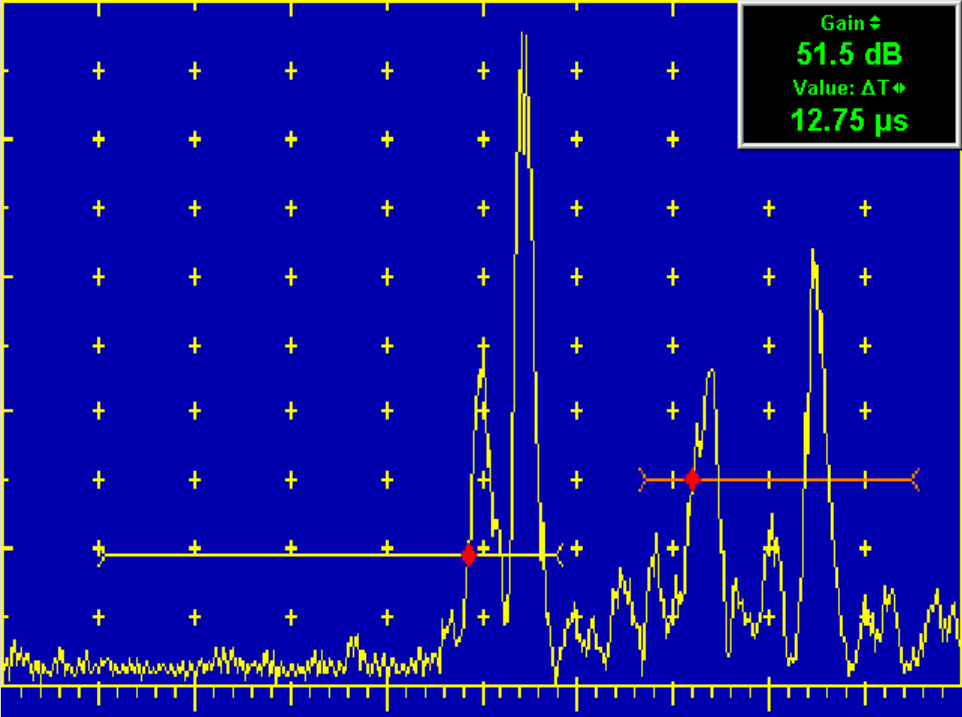
5.2.13.2. Flank, Top, Flank-First, and Top-First Modes of Measurement

The table below represents distinguishing points on an **A-Scan**, which will be taken for automatic measurements depending on **Meas Mode** setting





Meas Mode setting	A-Scan
<p style="text-align: center;">Meas Mode Flank</p> <p>● - T(A), T(B), s(A), s(B), t(A), t(B), a(A), a(B), ΔT, Δs, Δt, Δa ● - V(A), V(B), H(A), H(B), ΔV, ΔVC(A), ΔVC(B)</p>	
<p style="text-align: center;">Meas Mode Top</p> <p>● - T(A), T(B), s(A), s(B), t(A), t(B), a(A), a(B), ΔT, Δs, Δt, Δa ● - V(A), V(B), H(A), H(B), ΔV, ΔVC(A), ΔVC(B)</p>	
<p style="text-align: center;">Meas Mode Flank-First</p> <p>● - T(A), T(B), s(A), s(B), t(A), t(B), a(A), a(B), ΔT, Δs, Δt, Δa ● - V(A), V(B), H(A), H(B), ΔV, ΔVC(A), ΔVC(B)</p>	
<p style="text-align: center;">Meas Mode Top-First</p> <p>● - T(A), T(B), s(A), s(B), t(A), t(B), a(A), a(B), ΔT, Δs, Δt, Δa ● - V(A), V(B), H(A), H(B), ΔV, ΔVC(A), ΔVC(B)</p>	



Distinguishing points of signals are automatically marked on A-Scan whilst measuring:



5.2.13.3. Advanced Scheme for Reflectors Depth Measurement Whilst Using Angle Beam Probe – Thickness / Skip / Curved Scanning Surface Correction

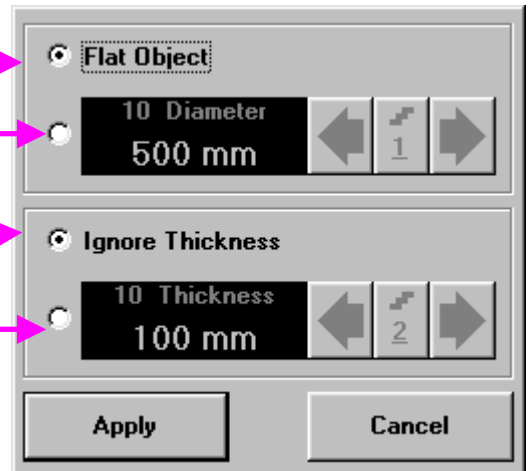
Button  becomes available upon clicking on  if **Angle** setting differs from 0° in submenu **MEASURE**. The window as below appears after clicking on  or pressing  on front panel keyboard or **F1** on external keyboard

Object under test may be designated as either

- **Flat** – click here 
- Or
- **Curved** – click here 

While scanning above plates, tube wall, and the like the finite thickness of object under test may be either

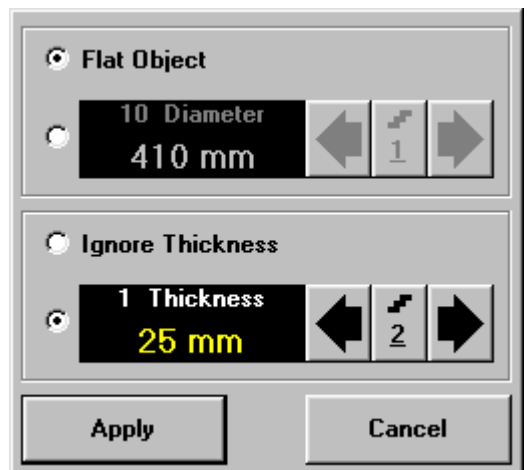
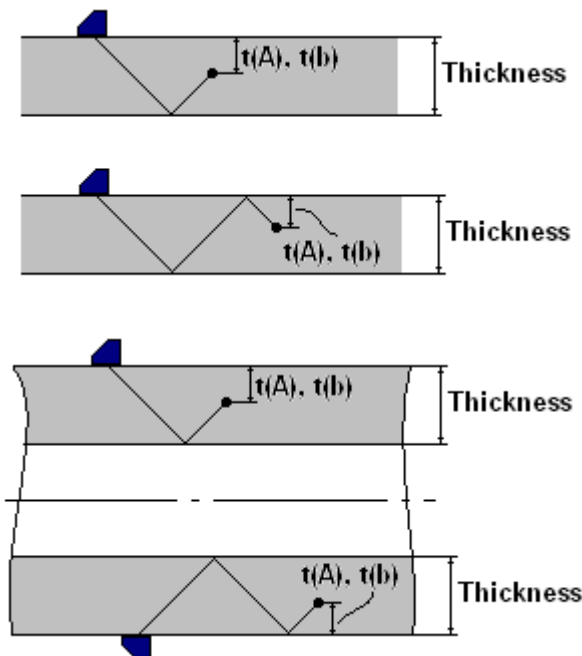
- **Ignored** – click here 
- Or
- **Entered** – click here 



Case 1

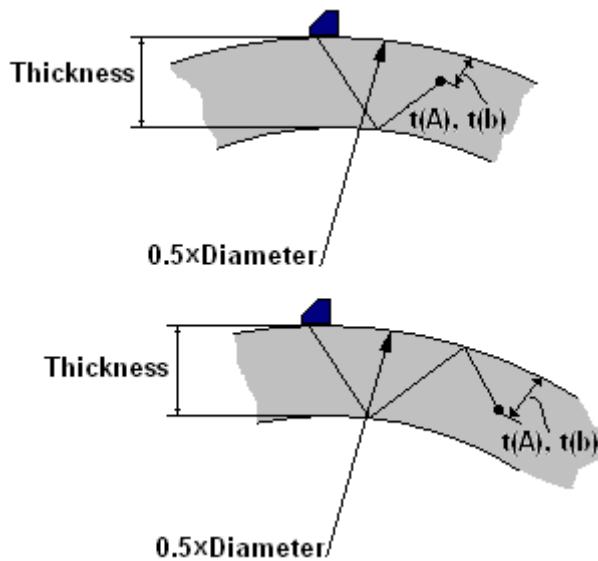
Case 1 represents simplest scheme supposing that scanning is performed above hemi-space whereas coordinates **t(A)**, **t(B)** are determined in accordance with appropriate sketches, equations, and **A-Scans** shown in paragraphs 5.2.13.1 and 5.2.13.2 of this Operating Manual

Case 2 represents scanning above plate, or scanning above tubular object longitudinally. Reflectors depth for half skip, full skip, and multi skip insonification will be determined with respect to actual **Thickness** value – **t(A)**, **t(B)** readings will be in accordance with sketches below:



Case 2

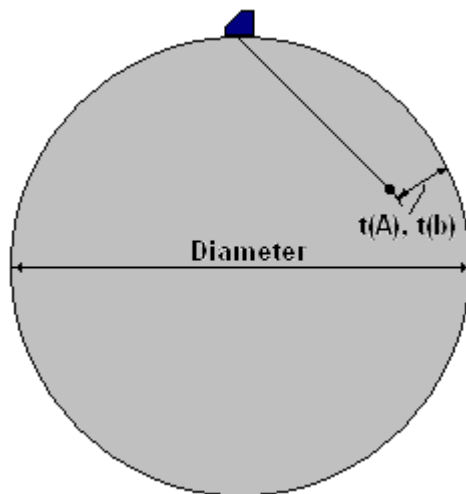
Case 3 represents scanning above curved wall surface circumferentially. Reflectors depth for half skip, full skip, and multi skip insonification will be determined with respect to actual **Thickness** and **Diameter** values – **t(A)**, **t(B)** readings will be in accordance with sketch below:



<input type="radio"/> Flat Object	<input checked="" type="radio"/> 10 Diameter 400 mm	←	↗ 1	→
<input type="radio"/> Ignore Thickness	<input checked="" type="radio"/> 1 Thickness 9 mm	←	↗ 2	→
Apply		Cancel		

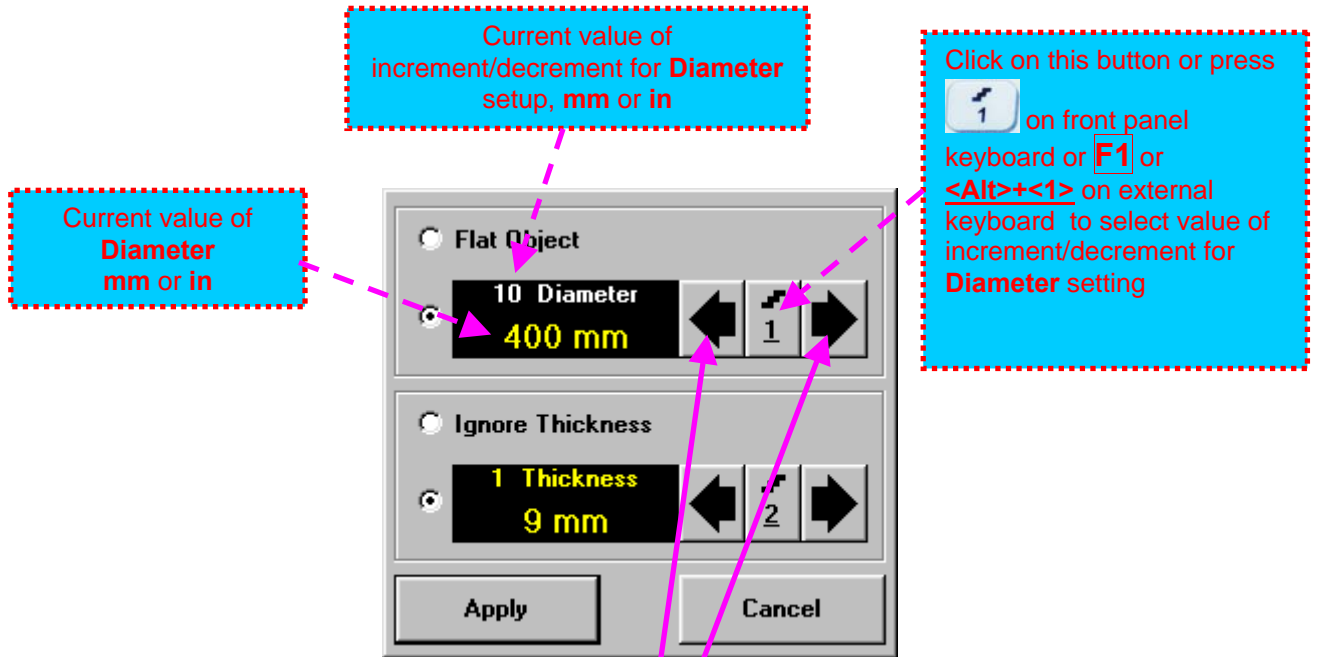
Case 3

Case 4 represents scanning above solid cylindrical object circumferentially or above spherical object. If this is a case **Thickness** setting to be: **Thickness = 0.5 x Diameter** and reflectors depth will be determined with respect to actual **Diameter** value – **t(A)**, **t(B)** readings will be in accordance with sketch below:



<input type="radio"/> Flat Object	<input checked="" type="radio"/> 2 Diameter 254 mm	←	↗ 1	→
<input type="radio"/> Ignore Thickness	<input checked="" type="radio"/> 50 Thickness 127 mm	←	↗ 2	→
Apply		Cancel		

Case 4












To control **Diameter** the following manipulations are applicable:









- **Mouse / Touch Screen**

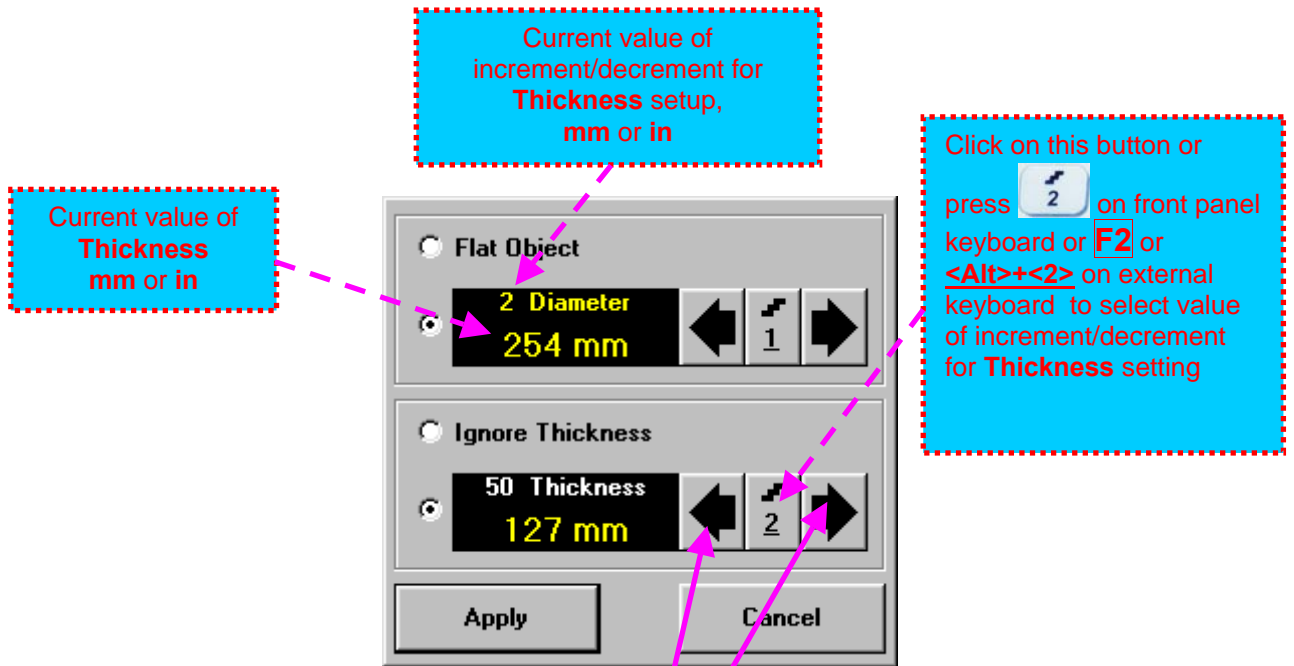
- Click or press and hold on the appropriate button

- **Keyboard**

- Press  on front panel keyboard or **F1** on external keyboard ⇒ **Diameter** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

Click on **Diameter** ⇒ **Diameter** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard












To control **Thickness** the following manipulations are applicable:








- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button

- **Keyboard**

- Press  on front panel keyboard or **F2** on external keyboard ⇒ **Thickness** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Thickness** ⇒ **Thickness** fore color changes to white - then use , , ,  on front panel keyboard or , , , on external keyboard

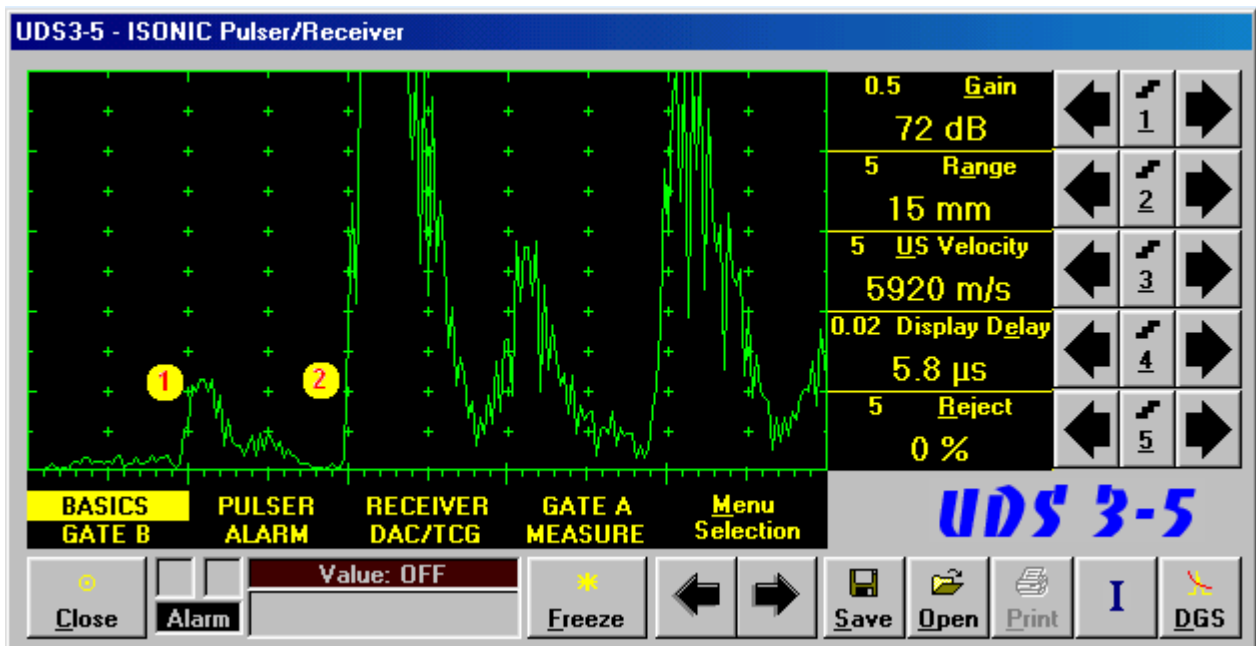
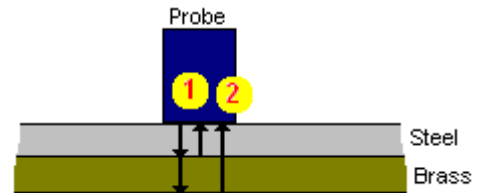


- ◆ Click on Apply or press  on front panel keyboard or **Enter** on external keyboard to activate new settings
- ◆ Click on Cancel or press  on front panel keyboard or **Esc** on external keyboard to negate new settings

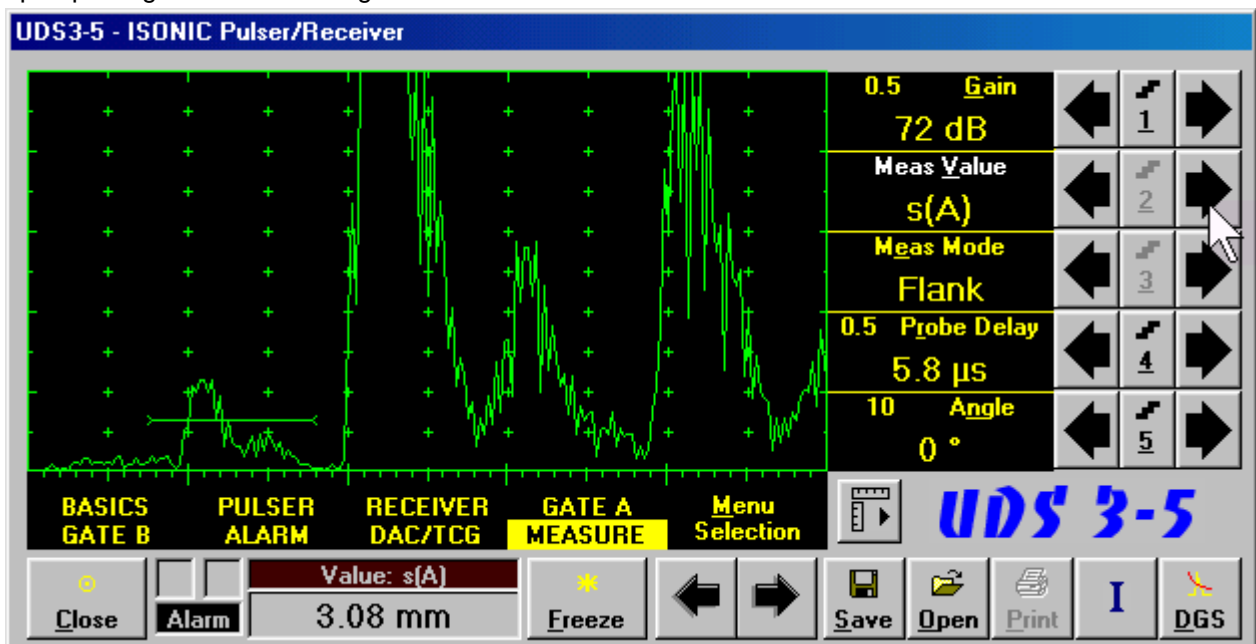
5.2.13.4. Dual Ultrasound Velocity Measurement Mode – Typical Example

For some practical applications it is necessary to measure sound path distances in dissimilar materials, multi-layer structures, and the like. Also it may occur a need in measuring sound path distances for signals representing various kinds of ultrasonic waves in the same object. Such cases are characterized by variety of **US Velocity** values to be used while measuring intervals between signals on the same **A-Scan**. To simplify measurement procedure and avoid operator's computations it may be activated **Dual Ultrasound Velocity Measurements Mode**, which's use is illustrated by the example below

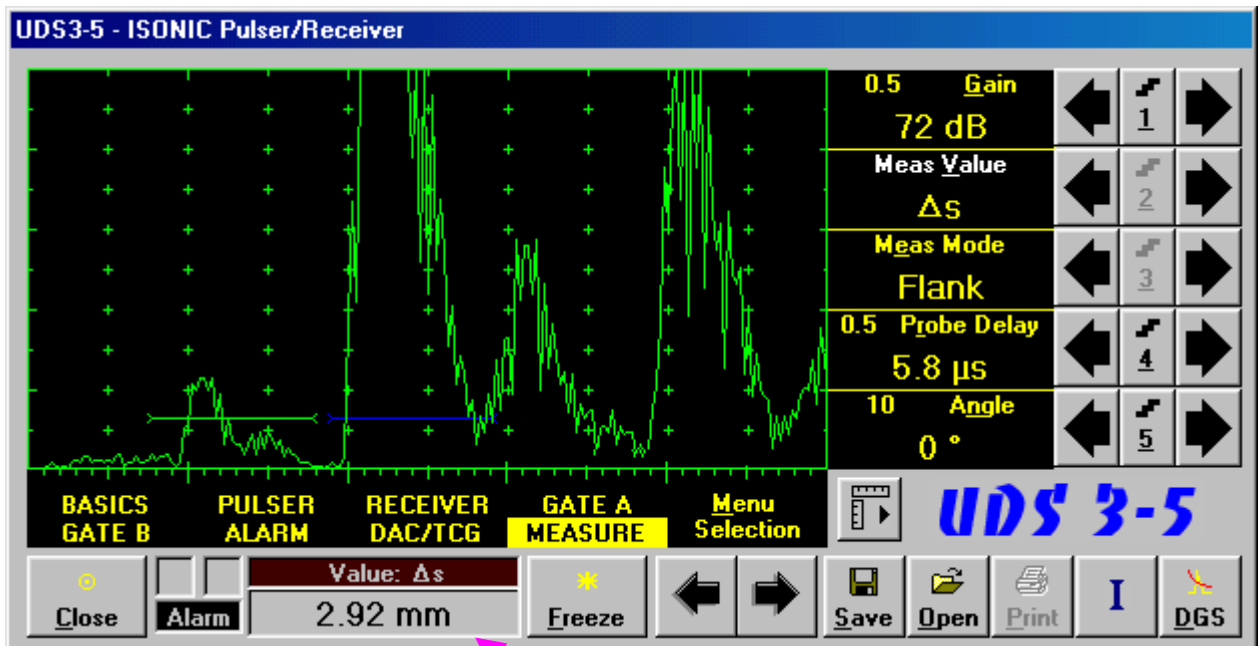
Supposing it's necessary to measure thickness of each layer of bi-metallic part made through by means of explosion welding between regular carbon steel (**US Velocity = 5920 m/s**) and brass alloy (**US Velocity = 4720 m/s**) plates while probe to be placed on low carbon steel plate. While placed on the steel side 10 MHz dual element probe with **Probe Delay = 5.8 μs** receives two clear echoes **1** and **2** from the *steel-to-brass boundary* and from the *back surface of the brass layer* correspondingly:



US Velocity setting is suitable for steel and thickness of steel layer may be found through direct reading upon placing **Gate A** above signal 1:




If placing now **Gate B** above signal **2** and selecting Δs as **Meas Value** then interval between signals **1** and **2** will be measured. To obtain proper Δs readout value of **US Velocity** valid for brass alloy layer (second material) must be keyed in

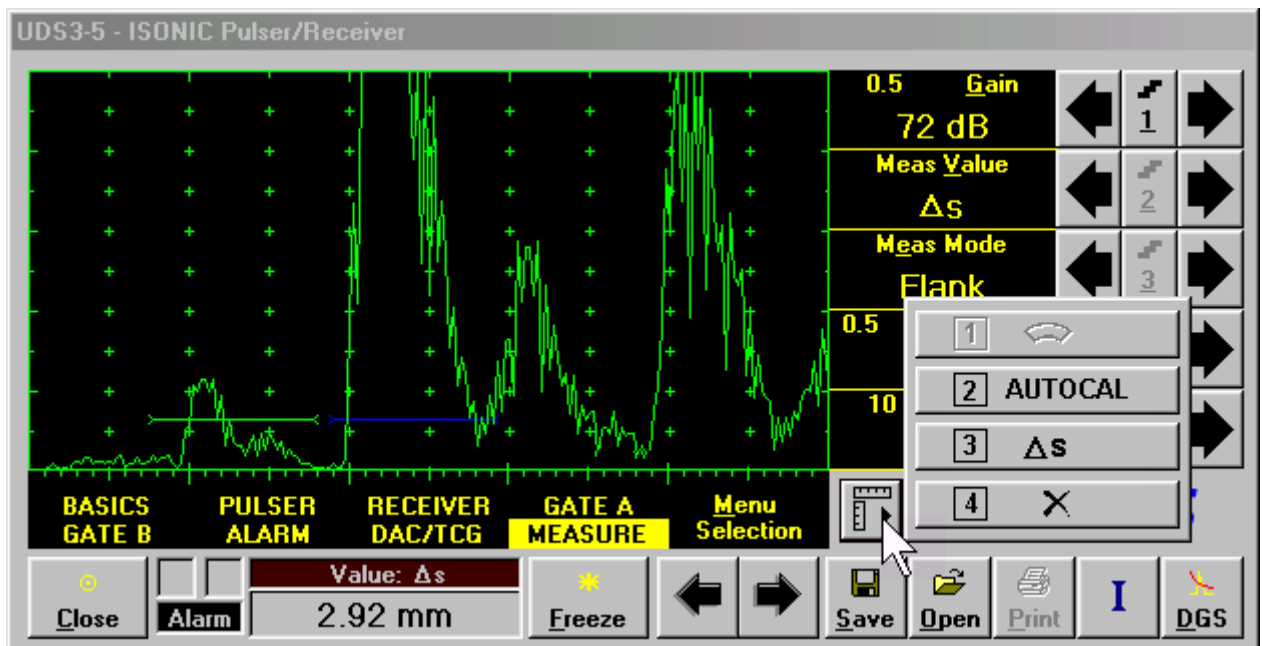




This digital readout was obtained through use of steel **US Velocity** setting (first material) and may not be recognized as a thickness of brass alloy layer (second material)

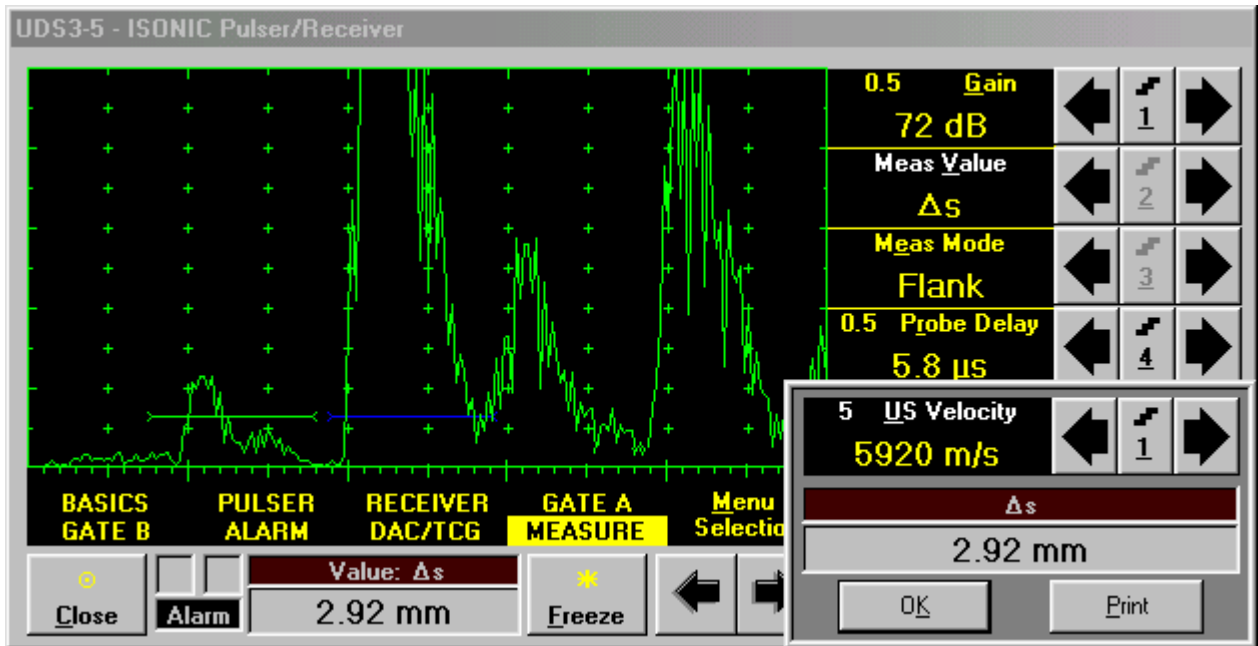
To obtain proper reading for the thickness of brass layer activate **Dual Ultrasound Velocity Measurements**

Mode - Button **3** Δs becomes available upon clicking on  if:

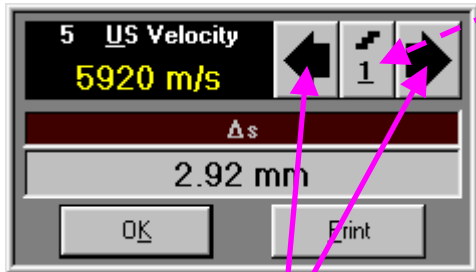
- ◆ Both **Gate A** and **Gate B** are active (refer to paragraphs 5.2.5 and 5.2.6 of this Operating Manual)
- ◆ **Meas Value** setting is Δs (refer to paragraph 5.2.12 of this Operating Manual)



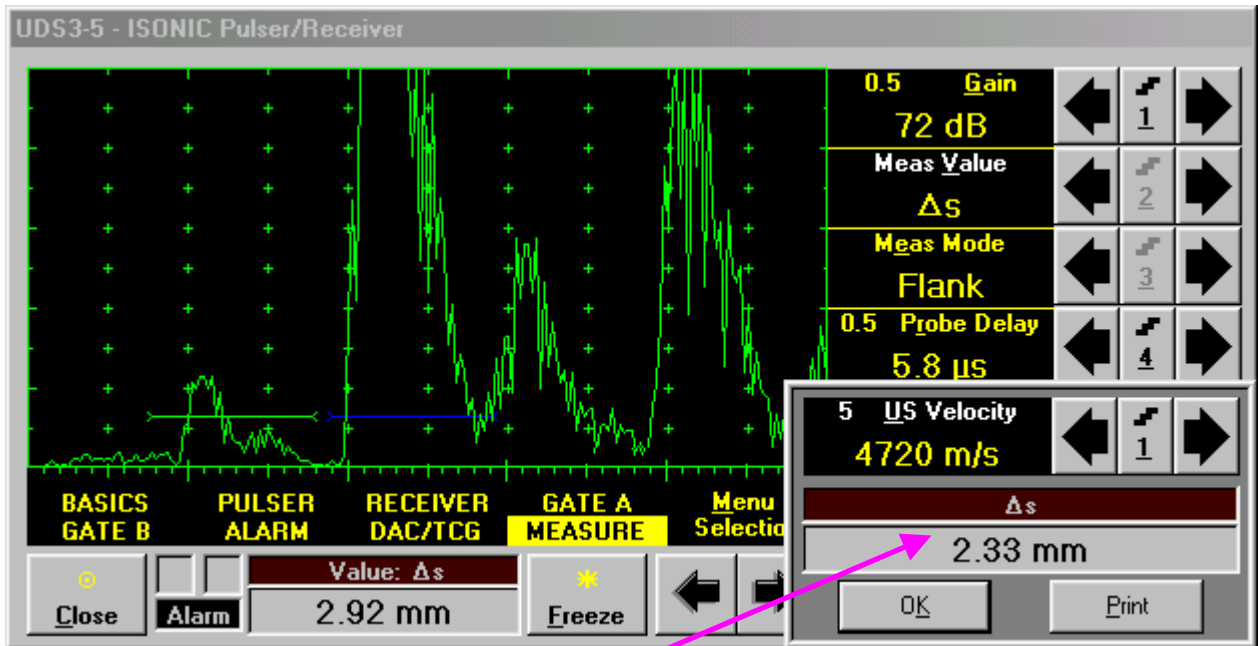
The screen as below appears after clicking on  or pressing  on front panel keyboard or **F3** on external keyboard:



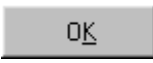


Click on this button or press  on front panel keyboard or **F1** or **<Alt>+<1>** on external keyboard to select value of increment/decrement for second **US Velocity** setting




Click on appropriate  or press , , ,  on front panel keyboard or **↑**, **→**, **←**, **↓** on external keyboard to setup value of second **US Velocity** valid for brass alloy layer (second material)

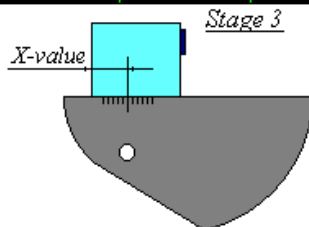
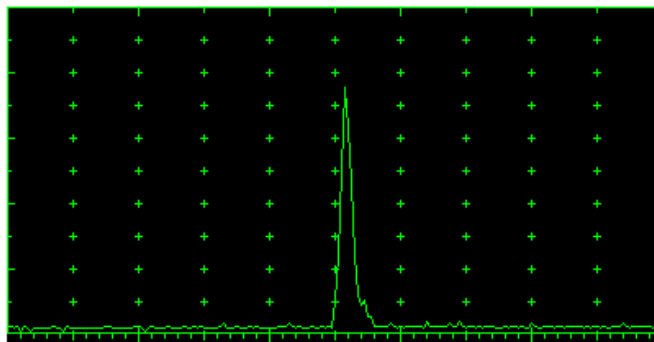
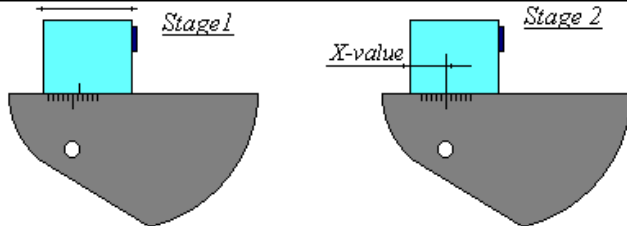
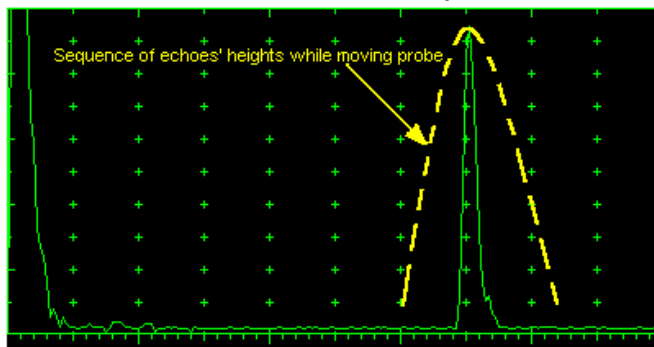


Digital readout for actual thickness of the brass alloy layer (second material) is obtained upon completing setting for second **US Velocity**

To return to the main **ISONIC Pulser Receiver** window click on  or press  or  on front panel keyboard or **<Alt>+<K>** or **Enter** or **Esc** on external keyboard

To printout **A-Scan** accompanied with setup list, measured value of **Δs**, and second **US Velocity** value click on  or press **<Alt>+<P>** on external keyboard (printer to be accessible through either USB or LAN port and defined as default in the **ISONIC 2005 / 2020 / STAR**)

5.2.13.5. Determining Probe Delay - Miniature Angle Beam Probes (contact face width 12.5 mm / 0.5 in or less) - Shear or Longitudinal Waves – Typical Example



Activate submenu **PULSER** then set:

- Pulser Mode** to **Single** or **Dual** depending on probe
- Pulse Width** to **Spike (240 μJ)** for probe having resonant frequency of 8 MHz and higher or to **PW ns**, were $PW = 0.5 / F$ (F is the probe resonant frequency) for probes having resonant frequency below 8 MHz
- Firing Level** to **18**
- Damping** to **1000 Ω**
- Tuning** to **NO**

Activate submenu **RECEIVER** then set:

- Display** to **Full** or **RF**
- Filter** to **BB**
- Frequency** to completely cover probe's effective bandwidth

Activate submenu **BASICS** topic then set:

- US Velocity** to **5920 m/s (233.1 in/ms)** for longitudinal wave probes or **3255 m/s (128.1 in/ms)** for shear wave probes
- Range** to **50.0 mm (2 in)**
- Display Delay** to **0 μs**
- Reject** to **0%**

Stage 1: Manipulate probe over main working surface of V-2 reference standard and maximize echo from 25 mm (1 in) radius concave reflector

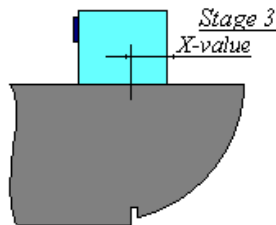
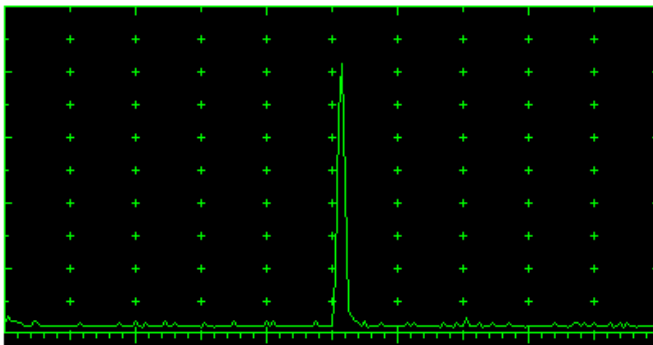
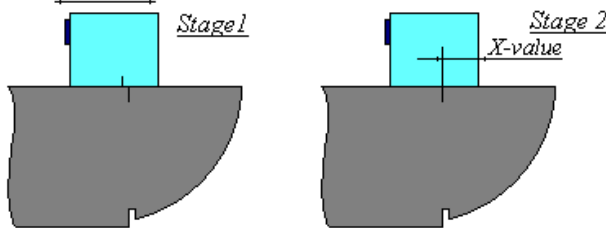
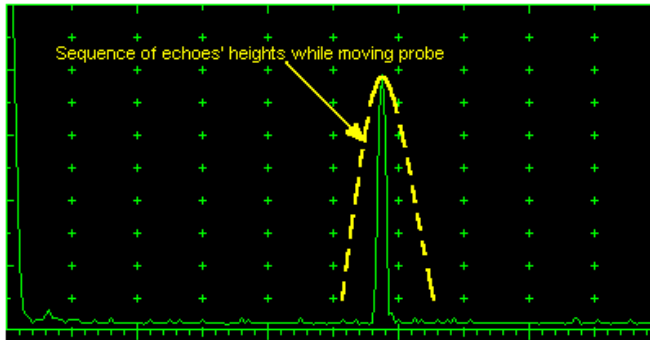
Stage 2: Fix probe in found position - the center of 25 mm (1 in) radius concave reflector will indicate **incident point** while the distance between probe's frontal edge and **incident point** is equal to **X-Value**

Stage 3: Tune **Display Delay** while probe is still fixed in found position until rising edge of maximized echo will match with 50%-grid of the **A-Scan** width. Upon completing the *obtained value of Display Delay* will be equal to **actual Probe Delay**



- ◆ It's necessary to setup **Gain** bringing height of maximized echo to **75-80%** of **A-Scan** height
- ◆ It is recommended to optimize **Tuning** in **PULSER** submenu upon obtaining maximized echo. The goal of such optimization is increasing of ultrasonic excitation energy through better matching between firing output and probe. Level of ultrasonic excitation energy is clearly represented by echo amplitude. Upon completing **Tuning** optimization **Gain** to be adjusted to bring echo to **75-80%** of **A-Scan** height

5.2.13.6. Determining Probe Delay - Large and Medium Size Angle Beam Probes (contact face width more than 12.5 mm / 0.5 in) - Shear or Longitudinal Waves – Typical Example



Activate submenu **PULSER** then set:

- Pulser Mode** to **Single** or **Dual** depending on probe
- Pulse Width** to **Spike (240 μJ)** for probe having resonant frequency of 8 MHz and higher or to **PW ns**, where $PW = 0.5 / F$ (F is the probe resonant frequency below 8 MHz)
- Firing Level** to **18**
- Damping** to **1000 Ω**
- Tuning** to **NO**

Activate submenu **RECEIVER** then set:

- Display** to **Full** or **RF**
- Filter** to **BB**
- Frequency** to completely cover probe's effective bandwidth

Activate submenu **BASICS** topic then set:

- US Velocity** to **5920 m/s (233.1 in/ms)** for longitudinal wave probes or **3255 m/s (128.1 in/ms)** for shear wave probes
- Range** to **200.0 mm (8 in)**
- Display Delay** to **0 μs**
- Reject** to **0%**

Stage 1: Manipulate probe over main working surface of V-1 reference standard and maximize echo from 100 mm (4 in) radius concave reflector

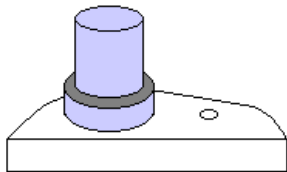
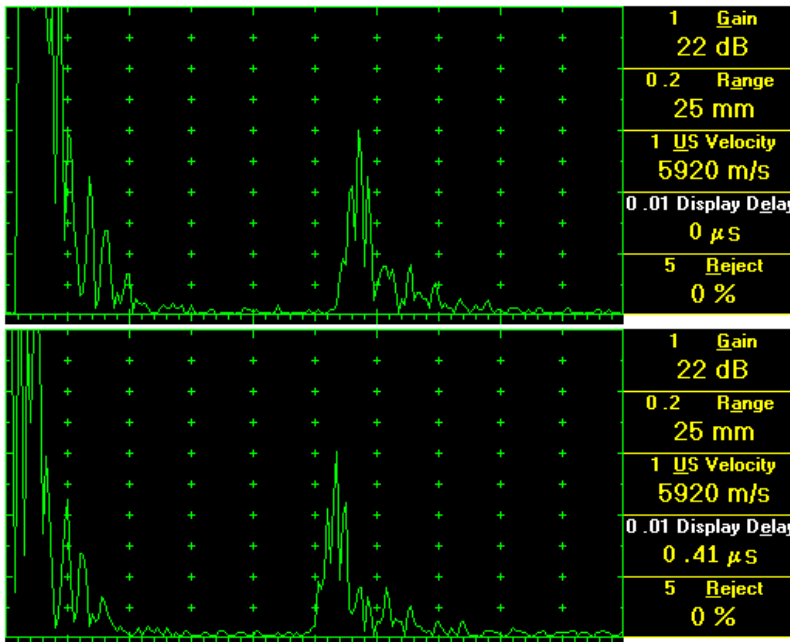
Stage 2: Fix probe in found position - the center of 100 mm (4 in) radius concave reflector will indicate **incident point** while the distance between probe's frontal edge and **incident point** is equal to **X-Value**

Stage 3: Tune **Display Delay** while probe is still fixed in found position until rising edge of maximized echo will match with 50%-grid of the **A-Scan** width. Upon completing the *obtained value of Display Delay* will be equal to *actual Probe Delay*



- ◆ It's necessary to setup **Gain** bringing height of maximized echo to **75-80%** of **A-Scan** height
- ◆ It is recommended to optimize **Tuning** in **PULSER** submenu upon obtaining maximized echo. The goal of such optimization is increasing of ultrasonic excitation energy through better matching between firing output and probe. Level of ultrasonic excitation energy is clearly represented by echo amplitude. Upon completing **Tuning** optimization **Gain** to be adjusted to bring echo to **75-80%** of **A-Scan** height

5.2.13.7. Determining Probe Delay - Straight Beam (Normal) Single Element and Dual (TR) Probes – Typical Example



Activate submenu **PULSER** then set:

- Pulser Mode** to **Single** or **Dual** depending on probe
- Pulse Width** to **Spike (240 μJ)** for probe having resonant frequency of 8 MHz and higher or to **PW ns**, where **PW = 0.5 / F** (F is the probe resonant frequency) for probes having resonant frequency below 8 MHz
- Firing Level** to **18**
- Damping** to **1000 Ω**
- Tuning** to **NO**

Activate submenu **RECEIVER** then set:

- Display** to **Full** or **RF**
- Filter** to **BB**
- Frequency** to completely cover probe's effective bandwidth

Activate submenu **BASICS** topic then set:

- US Velocity** to **5920 m/s (233.1 in/ms)** for longitudinal wave probes or **3255 m/s (128.1 in/ms)** for shear wave probes
- Range** to **25.0 mm (1 in)**
- Display Delay** to **0 μs**
- Reject** to **0%**

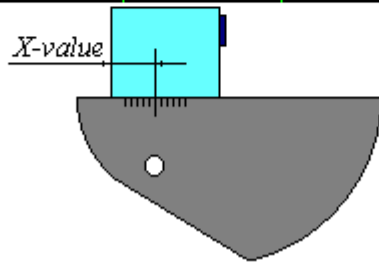
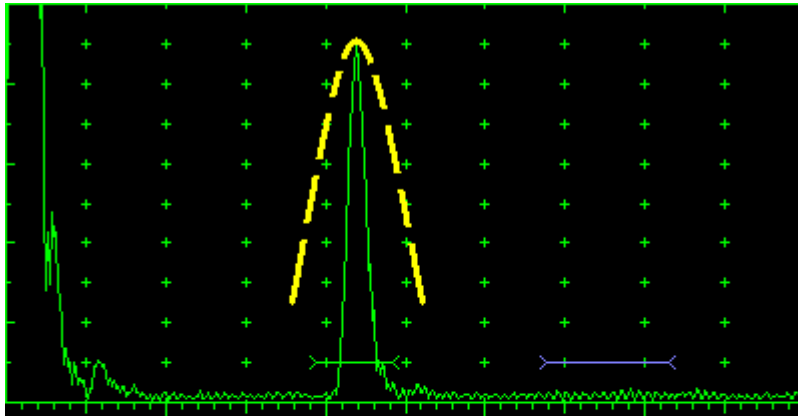
Stage 1: Apply probe to a side surface of V-2 reference standard to receive back echo

Stage 2: Tune **Display Delay** until rising edge of the *back echo* will match with the 50%-grid of the **A-Scan** width: in such case the obtained value of the **Display Delay** is equal to the actual **Probe Delay**

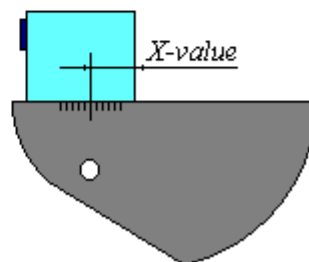
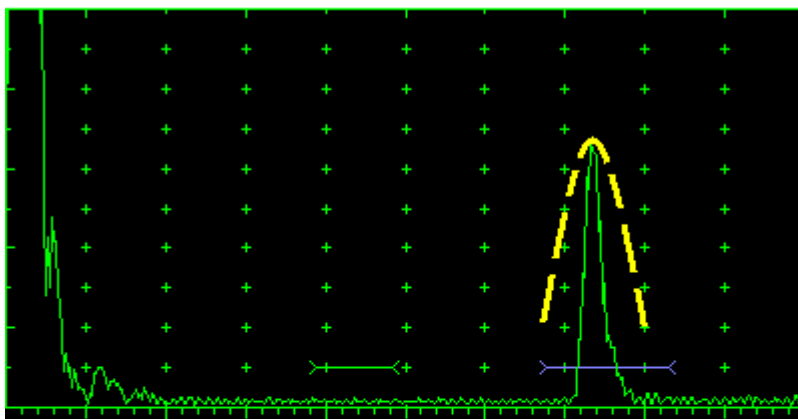


- ◆ It's necessary to setup **Gain** bringing height of back echo to **75-80%** of **A-Scan** height
- ◆ It is recommended to optimize **Tuning** in **PULSER** submenu upon obtaining back echo. The goal of such optimization is increasing of ultrasonic excitation energy through better matching between firing output and probe. Level of ultrasonic excitation energy is clearly represented by back echo amplitude. Upon completing **Tuning** optimization **Gain** to be adjusted to bring echo to **75-80%** of **A-Scan** height


5.2.13.8. Automatic Calibration (AUTOCAL) of Probe Delay and US Velocity - Angle Beam Probes - Shear or Longitudinal Waves – Typical Example

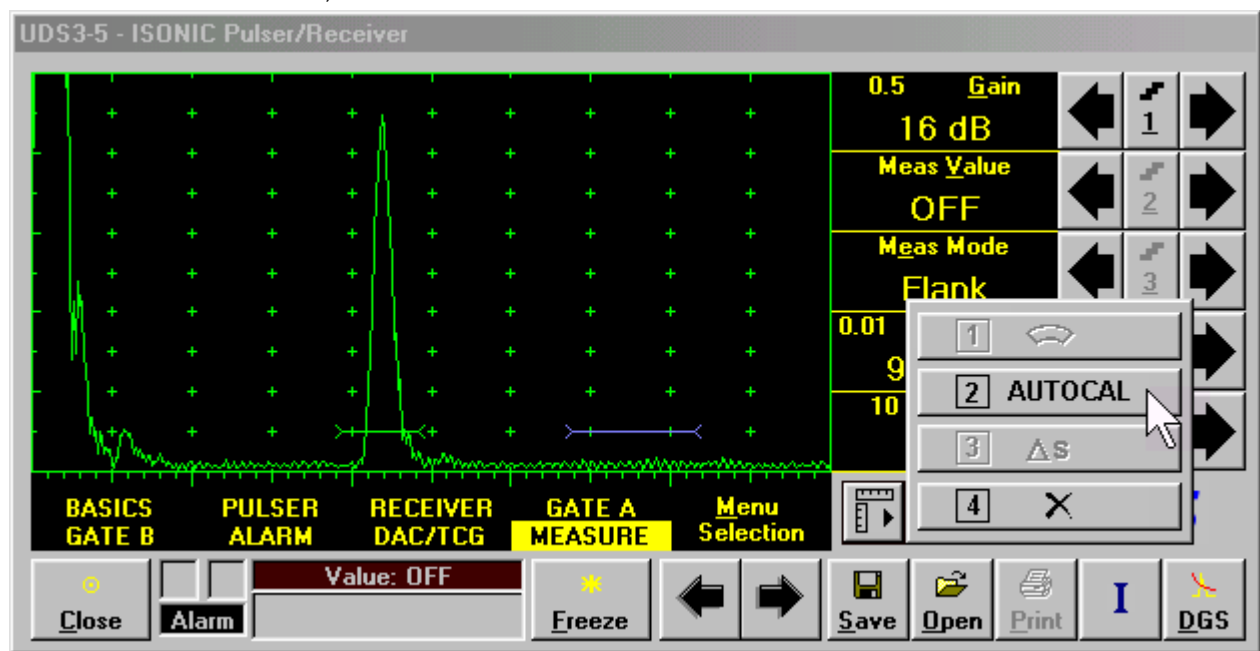




There are 2 maximized reference echoes from 2 concave reflectors with different radius 25 mm (1 in) and 50 mm (2 in) in use for performing automatic calibration of **Probe Delay** and **US Velocity**. **A-Scan** settings (**Range**, **Display Delay**, **US Velocity** – refer to paragraph 5.2.2 of this Operating Manual) must allow observing of both signals. **Gate A** to match with first reference echo received from concave reflector with smaller radius (shorter material travel distance) – refer to paragraph 5.2.5 of this Operating Manual. **Gate B** to match with second reference echo received from concave reflector with larger radius (longer material travel distance) – refer to paragraph 5.2.6 of this Operating Manual

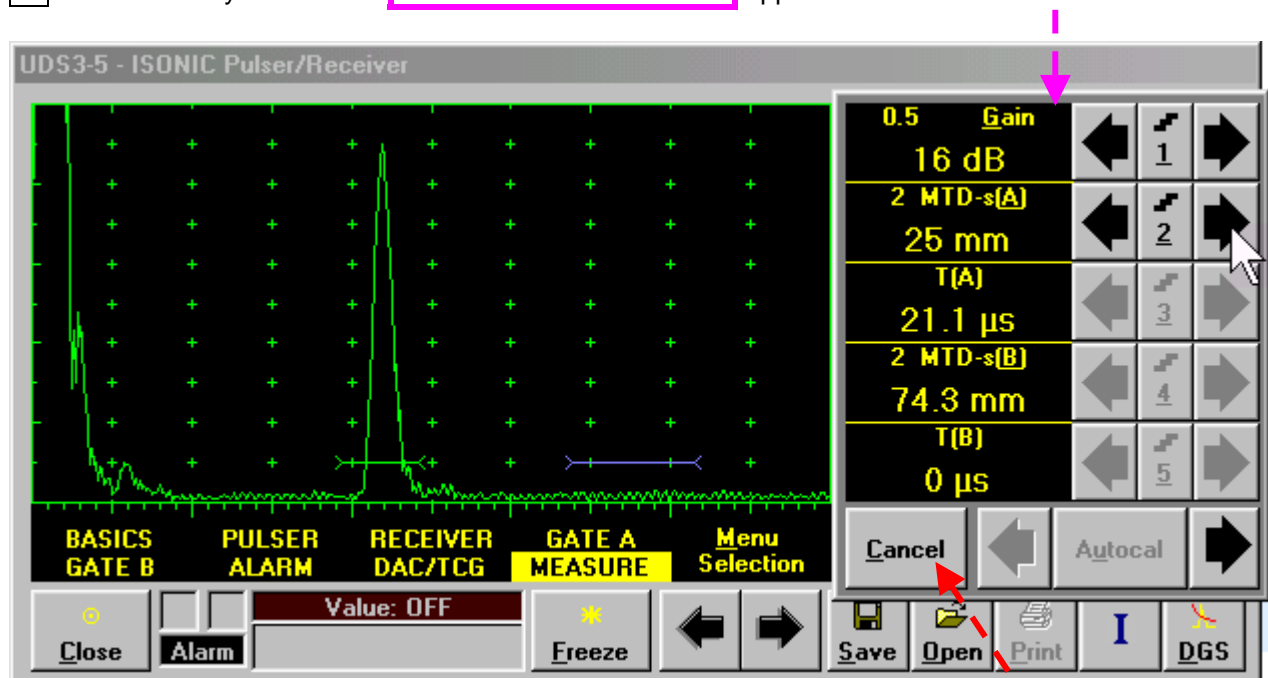



- ◆ It's necessary to setup **Gain** bringing height of back echo to **75-80%** of **A-Scan** height
- ◆ It is recommended to optimize **Tuning** in **PULSER** submenu upon obtaining back echo. The goal of such optimization is increasing of ultrasonic excitation energy through better matching between firing output and probe. Level of ultrasonic excitation energy is clearly represented by back echo amplitude. Upon completing **Tuning** optimization **Gain** to be adjusted to bring echo to **75-80%** of **A-Scan** height

Obtain first reference echo, activate submenu MEASURE then click on 

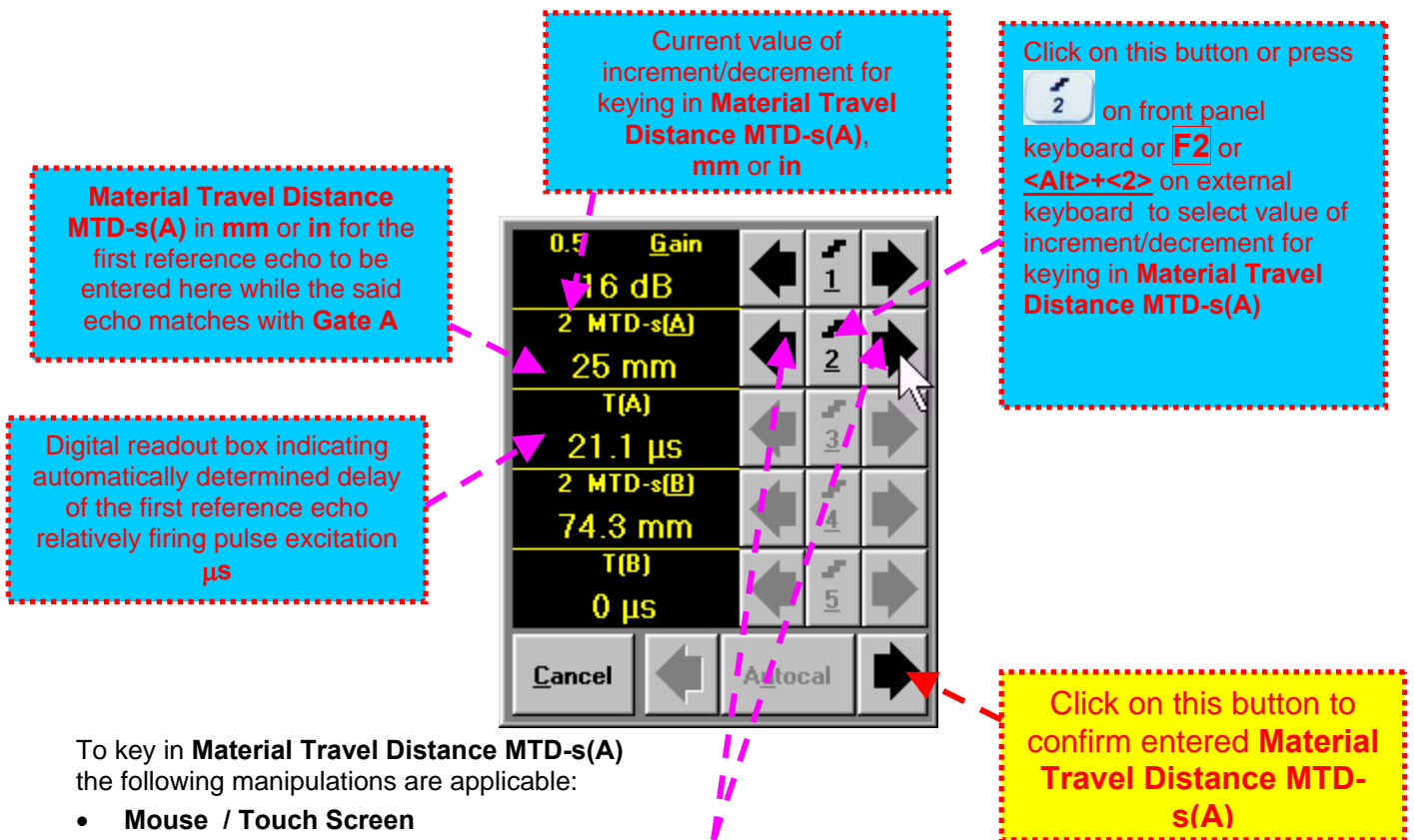


To activate AUTOCAL procedure click on  or press  on front panel keyboard or **F2** on external keyboard – the **AUTOCAL Control Surface** appears



Click on this button or press  on front panel keyboard or **Esc** or **<Alt>+<C>** on external keyboard to interrupt **AUTOCAL** Procedure and return to main UDS 3-5 control surface

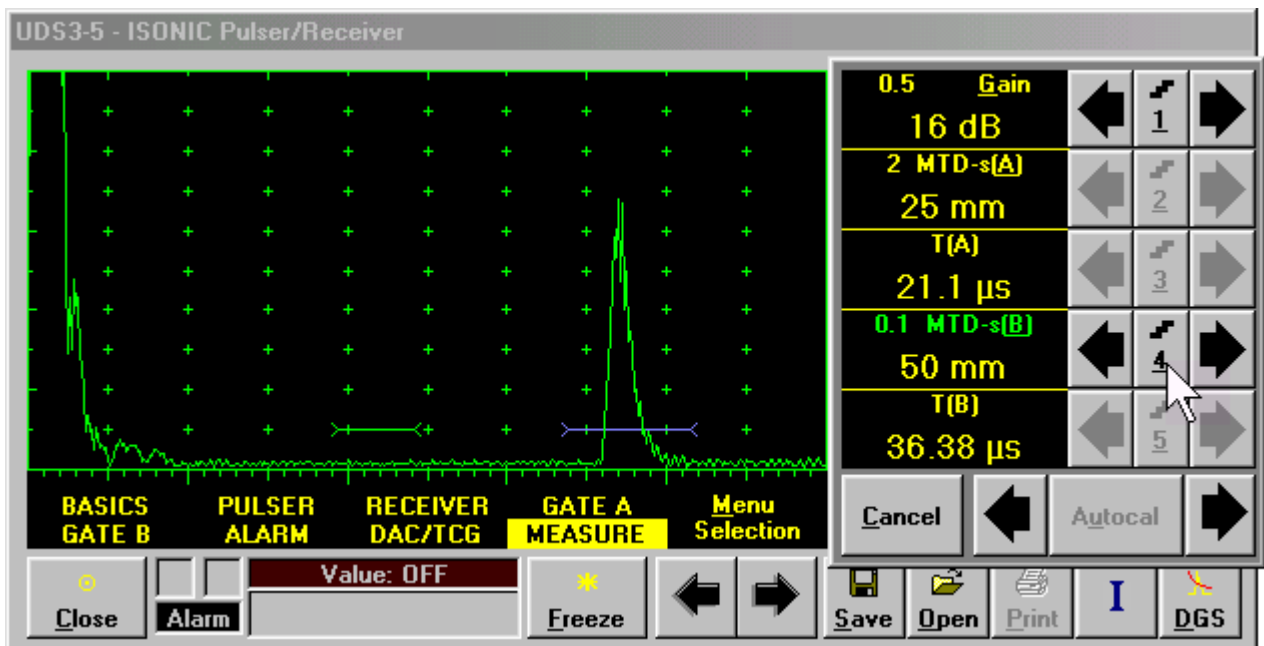
If necessary **Gain** may be re-adjusted in the **AUTOCAL Control Surface** by the same way as it is explained in paragraph 5.2.2 of this Operating Manual

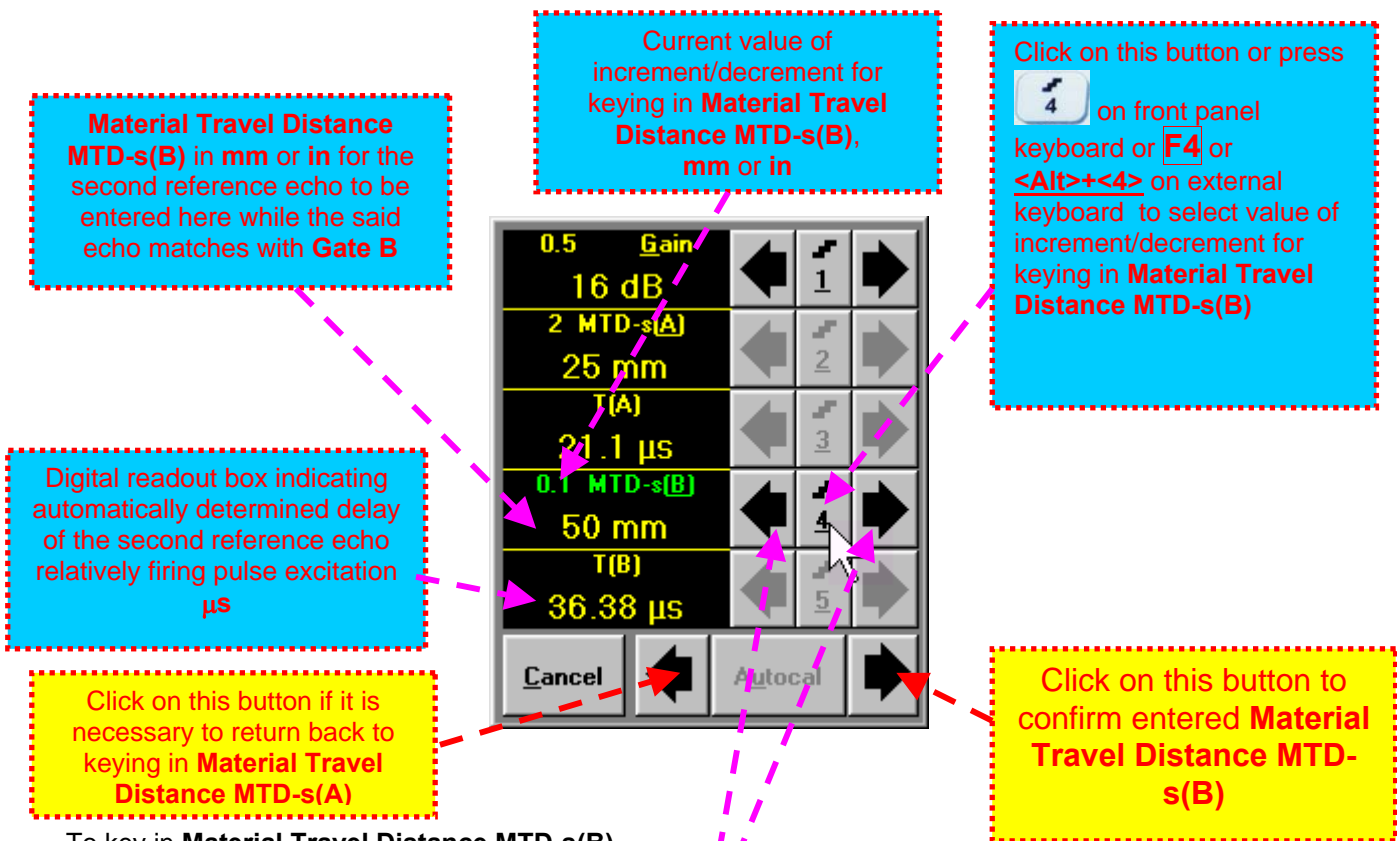


To key in **Material Travel Distance MTD-s(A)** the following manipulations are applicable:

















- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate button
- **Keyboard**
 - Press on front panel keyboard or **F2** or **<Alt>+<A>** on external keyboard \Rightarrow **MTD-s(A)** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard
- **Combined**
 - Click on **MTD-s(A)** \Rightarrow **MTD-s(A)** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

Upon confirming keying in **Material Travel Distance MTD-s(A)** obtain second reference echo

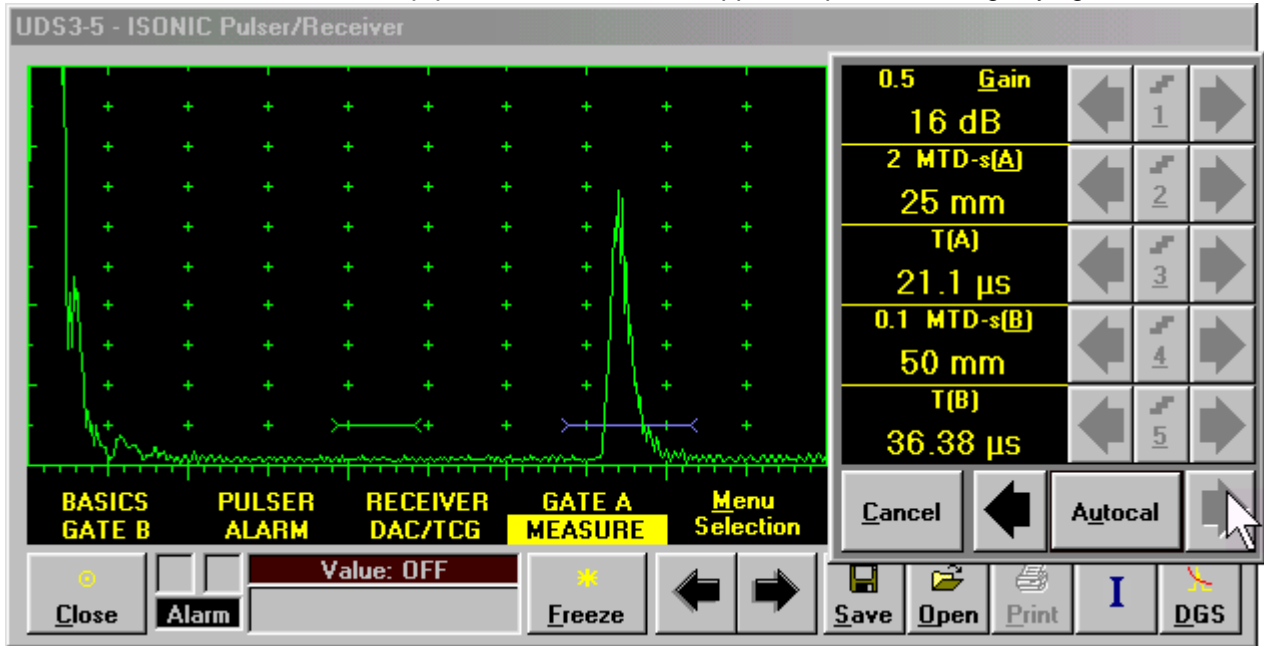







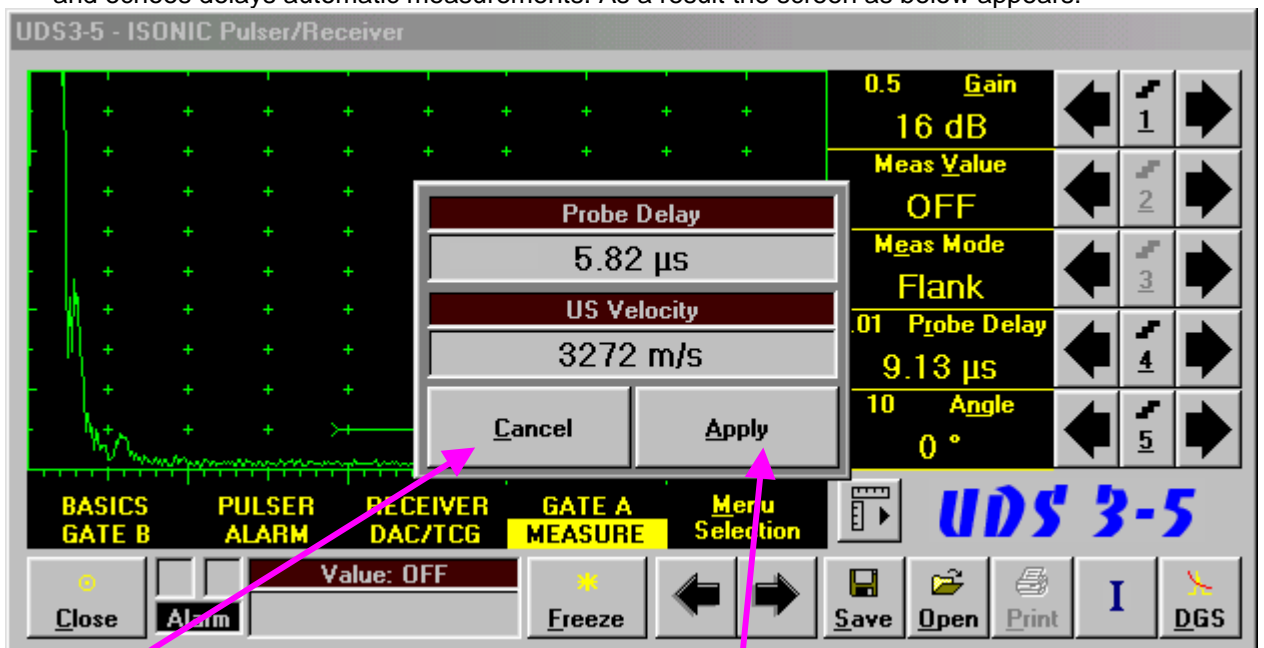
To key in **Material Travel Distance MTD-s(B)** the following manipulations are applicable:



- **Mouse / Touch Screen**
 - Click or press and hold on the appropriate button
- **Keyboard**
 - Press  on front panel keyboard or **F4** or **<Alt>+** on external keyboard ⇒ **MTD-s(B)** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard
- **Combined**
 - Click on **MTD-s(B)** ⇒ **MTD-s(B)** fore color changes to white - then use , , ,  on front panel keyboard or , , , on external keyboard

Material Travel Distance MTD-s(B) The screen as below appears upon confirming keying in

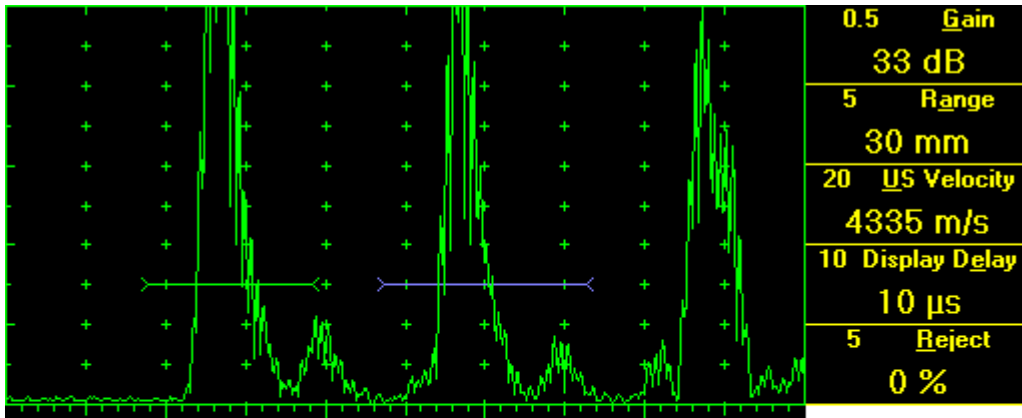


- ◆ Click on  if it is necessary to return back to keying in **Material Travel Distance MTD-s(A)**
- ◆ Click on  or press  on front panel keyboard or Enter or <Alt>+<U> on external keyboard to initialize automatic determining of **US Velocity** and **Probe Delay** based on above described keying and echoes delays automatic measurements. As a result the screen as below appears:

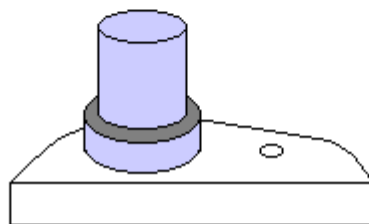


- ◆ Click on  or press **Esc** or <Alt>+<C> on external keyboard to negate **AUTOCAL** results and return to main operating surface without modifying **Probe Delay** and **US Velocity** settings
- ◆ Click on  or press **Enter** or <Alt>+<A> on external keyboard to accept **AUTOCAL** results and return to main operating surface with appropriate modifying **Probe Delay** and **US Velocity** settings

5.2.13.9. Automatic Calibration of Probe Delay and US Velocity - Straight Beam (Normal) Single Element and Dual (TR) Probes – Typical Example



There are 2 sequentially received back echoes required for performing automatic calibration of **Probe Delay** and **US Velocity**. **A-Scan** settings (**Range**, **Display Delay**, **US Velocity** – refer to paragraph 5.2.2 of this Operating Manual) must allow observing of both signals.



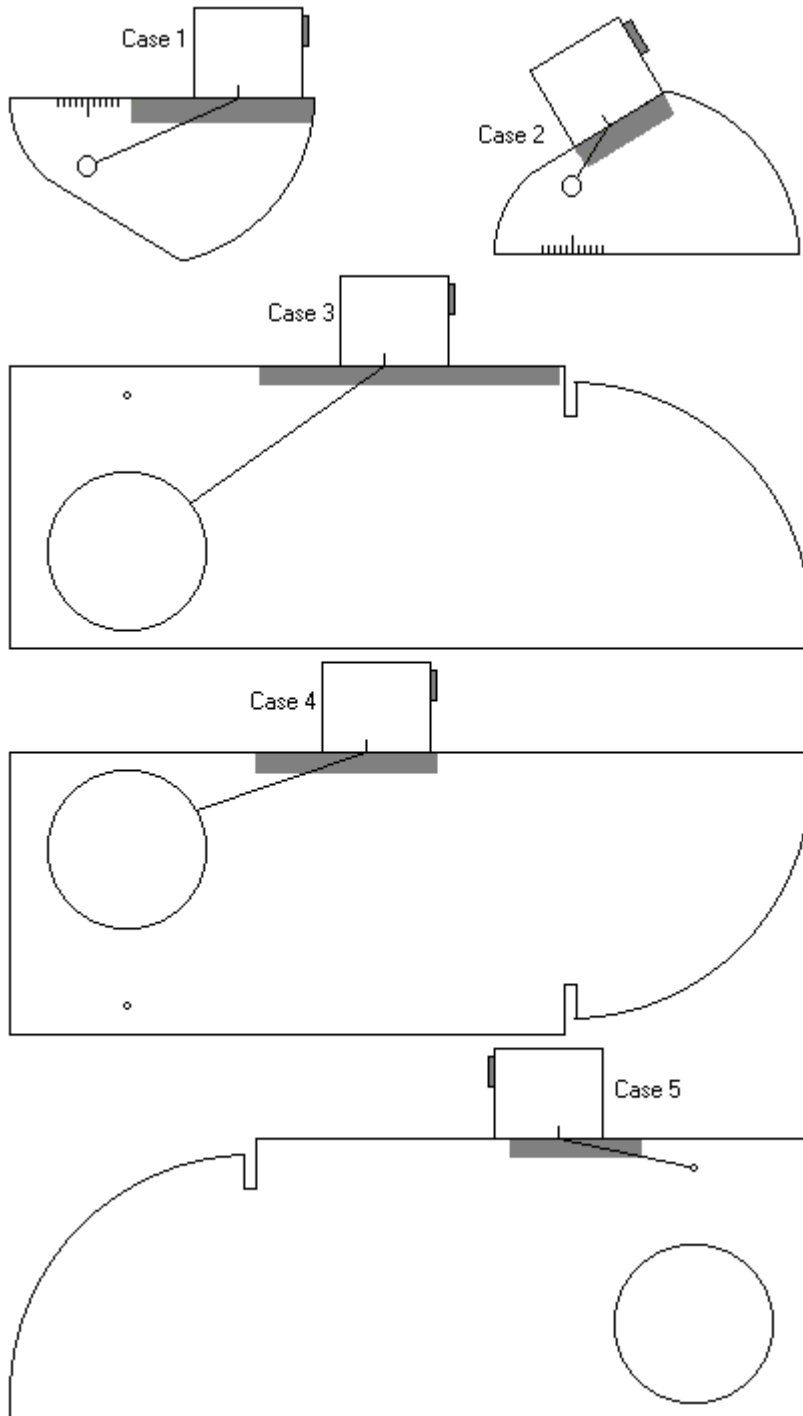
Gate A to match with first back echo (shorter material travel distance) – refer to paragraph 5.2.5 of this Operating Manual. **Gate B** to match with second back echo (longer material travel distance) – refer to paragraph 5.2.6 of this Operating Manual



- ◆ It's necessary to setup **Gain** bringing height of back echo to **75-80%** of **A-Scan** height
- ◆ It is recommended to optimize **Tuning** in **PULSER** submenu upon obtaining back echo. The goal of such optimization is increasing of ultrasonic excitation energy through better matching between firing output and probe. Level of ultrasonic excitation energy is clearly represented by back echo amplitude. Upon completing **Tuning** optimization **Gain** to be adjusted to bring echo to **75-80%** of **A-Scan** height

All further operations to be performed identically to described in paragraph 5.2.13.8 of this Operating Manual

5.2.13.10. Determining Incidence Angle (Probe Angle)



Determining of incidence angle is based on maximizing echo from side-drilled hole in reference block and reading the value of angle from corresponding scale. Depending on probe dimensions and angles there are various reference blocks and scales applicable:

Case 1: Miniature angle beam probe, incidence angle 35° to 65° , V-2 reference block

Case 2: Miniature angle beam probe, incidence angle 65° to 75° , V-2 reference block

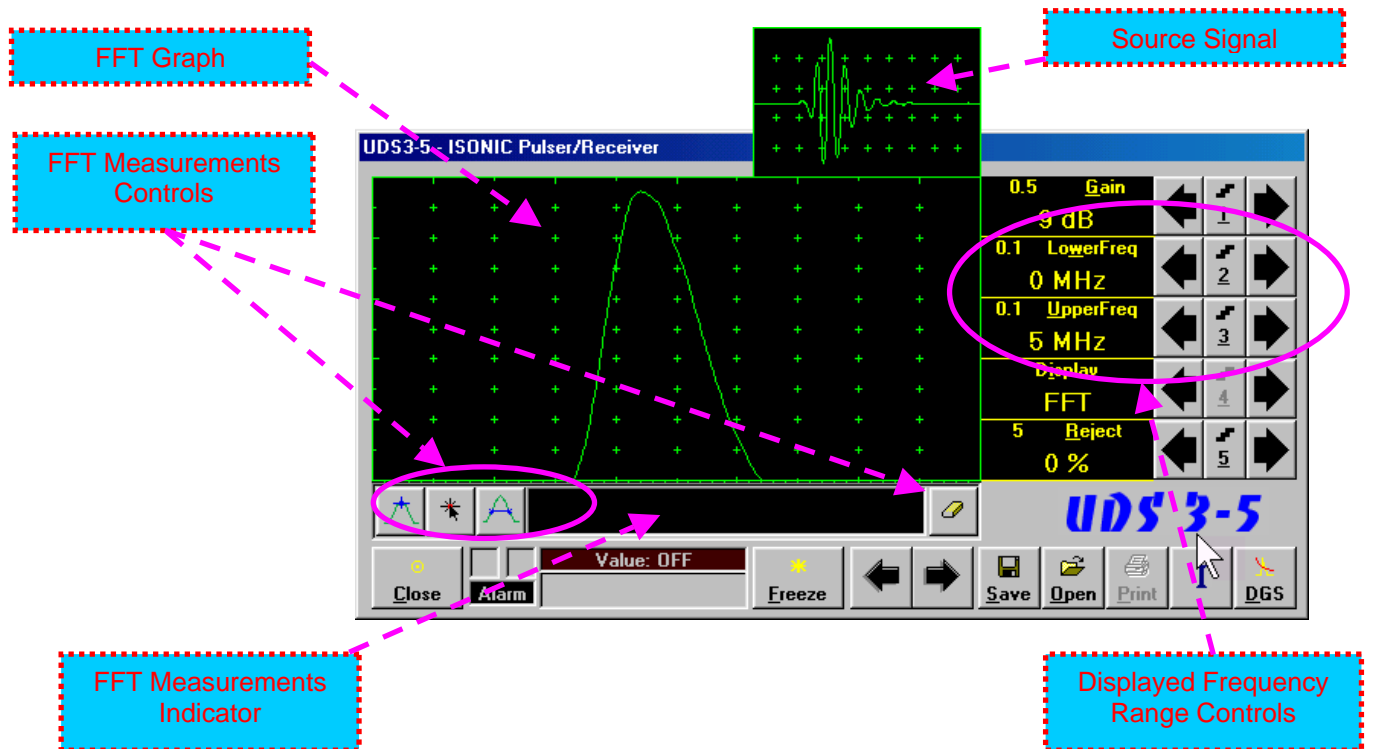
Case 3: Medium or large size angle beam probe, incidence angle 40° to 66° , V-1 reference block

Case 4: Medium or large size angle beam probe, incidence angle 60° to 76° , V-1 reference block

Case 5: Medium or large size angle beam probe, incidence angle 74° to 80° , V-1 reference block

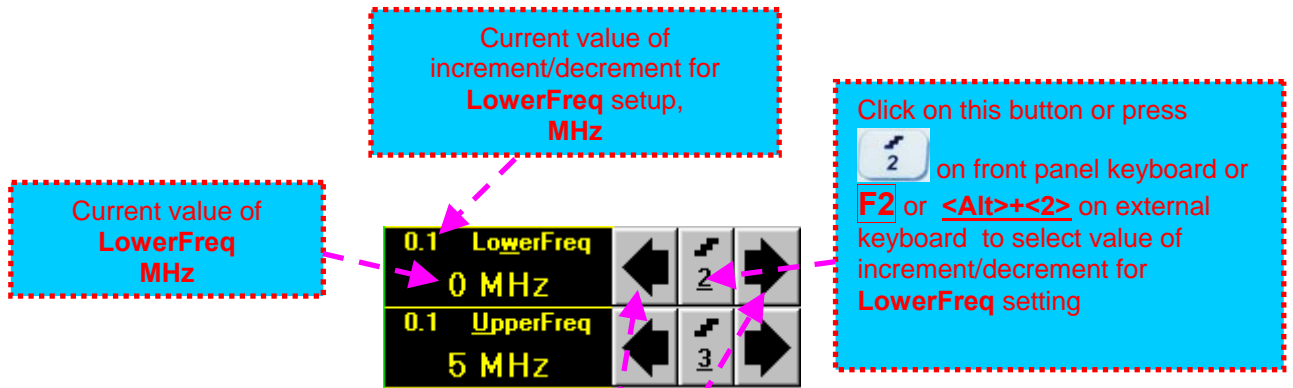
5.2.14. Frequency Domain Signal Presentation and Evaluation

Using **Range** and **Delay** parameters select a portion of **A-Scan** for frequency domain (FFT) presentation then do activate submenu **RECEIVER** and switch **Display** to **FFT** (refer to paragraph 5.2.4 of this Operating Manual). The screen as below appears:



i Display may not be switched into the FFT if the **Range** value is too long or **DAC/TCG/DGS** is active

Lower frequency bound (LowerFreq)











To control **LowerFreq** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click or press and hold on appropriate button

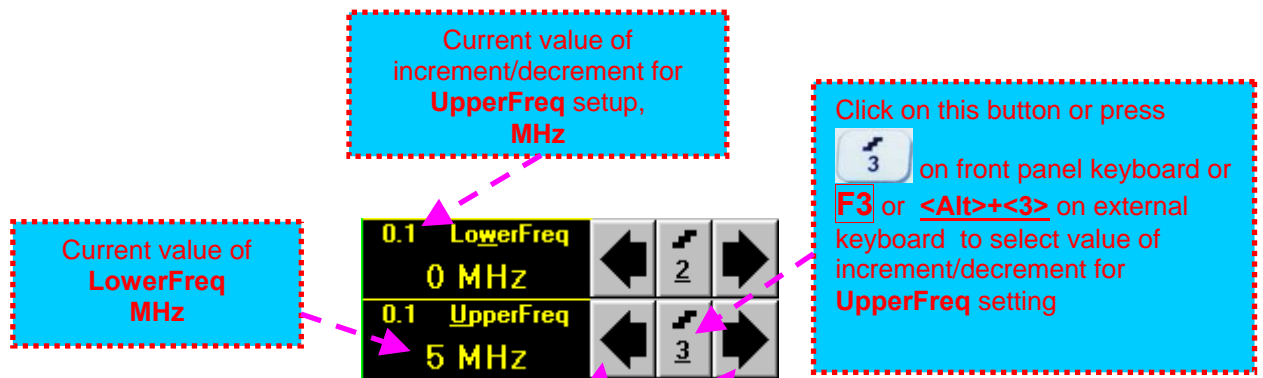
- **Keyboard**

- Press  on front panel keyboard or **F2** or **<Alt>+<W>** on external keyboard ⇒ **LowerFreq** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **LowerFreq** ⇒ **LowerFreq** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

Upper frequency bound (UpperFreq)



To control **UpperFreq** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click or press and hold on the appropriate button


- **Keyboard**

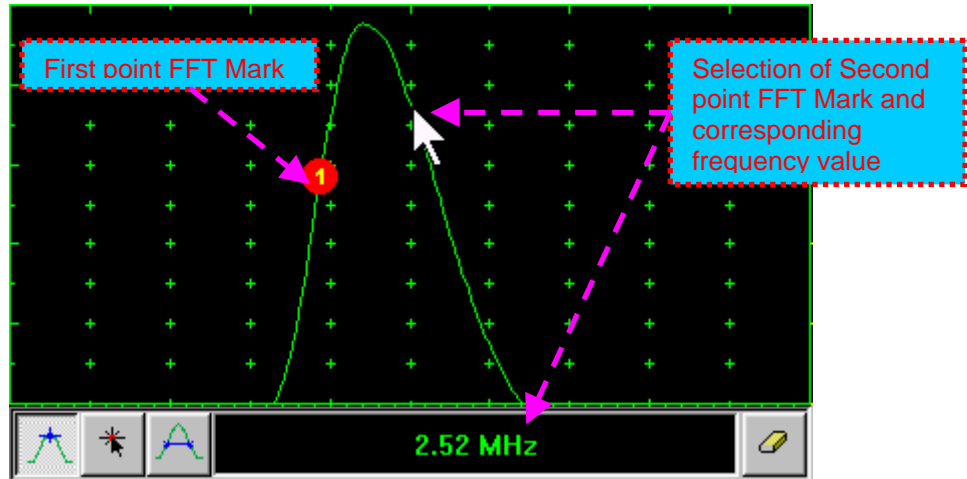
- Press on front panel keyboard or **F3** or **<Alt>+<U>** on external keyboard ⇒ **UpperFreq** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard


- **Combined**

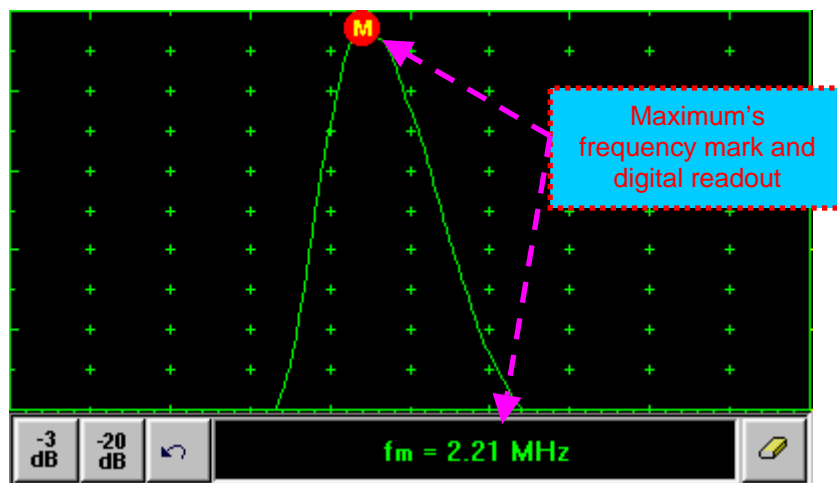
- Click on **UpperFreq** ⇒ **UpperFreq** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

Find maximum



Click on  – mouse pointer may be guided then just over FFT graph. **FFT Readout Box** displays frequency corresponding to pointer position whilst guiding the cursor. Select first point of interest by mouse click or through release of touch screen stylus. The appropriate mark **1** appears. Select the second point of interest by the same way

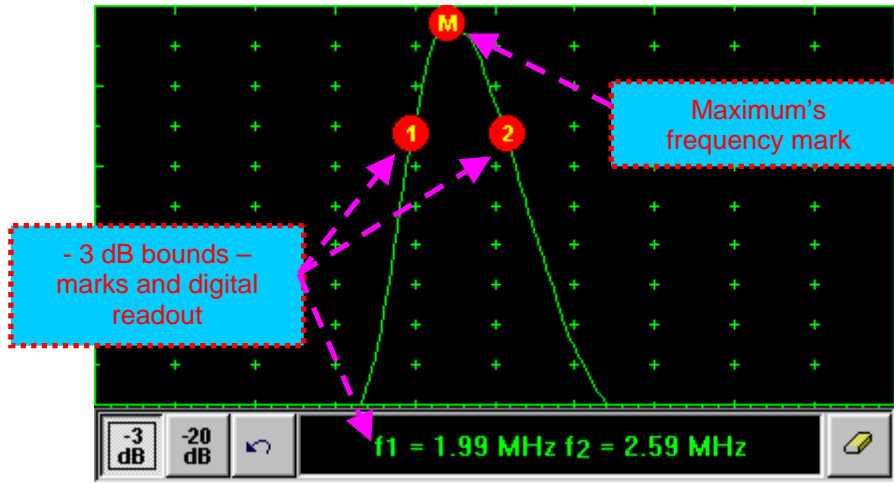


Maximum's frequency mark  appears and **FFT Readout Box** displays the found value automatically upon mouse click or releasing of touch screen stylus:



Find the -3db / -20db level bounds:


Upon finding the maximum's frequency click on  or . Two points found corresponding to selected level appear on the FFT graph and **FFT Readout Box** shows their corresponding frequency values:

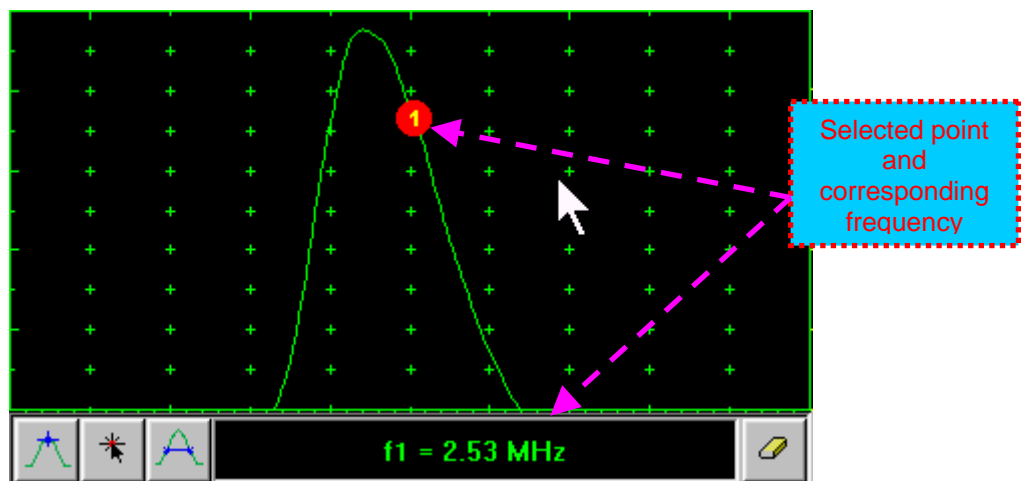


Return to FFT Measurements toolbar:


Click on 

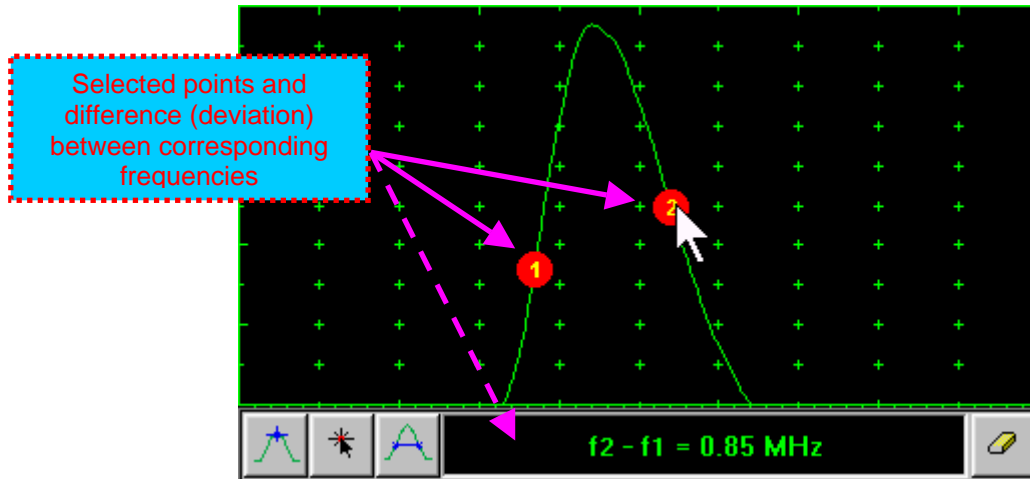
Find frequency corresponding to selected single point on FFT graph:

Click on  – mouse pointer may be guided then just over FFT graph. **FFT Readout Box** displays frequency corresponding to pointer position whilst guiding the cursor. Select first point of interest by mouse click or through release of touch screen stylus. The appropriate mark **1** appears and **FFT Readout Box** displays corresponding frequency:



Frequency difference (deviation) between two points:

Click on  – mouse pointer may be guided then just over FFT graph. **FFT Readout Box** displays frequency corresponding to pointer position whilst guiding the cursor. Select first point of interest by mouse click or through release of touch screen stylus. The appropriate mark **1** appears. Select second point of interest by the same way - the appropriate mark **2** appears and the **FFT Readout Box** displays difference (deviation) between corresponding frequencies:



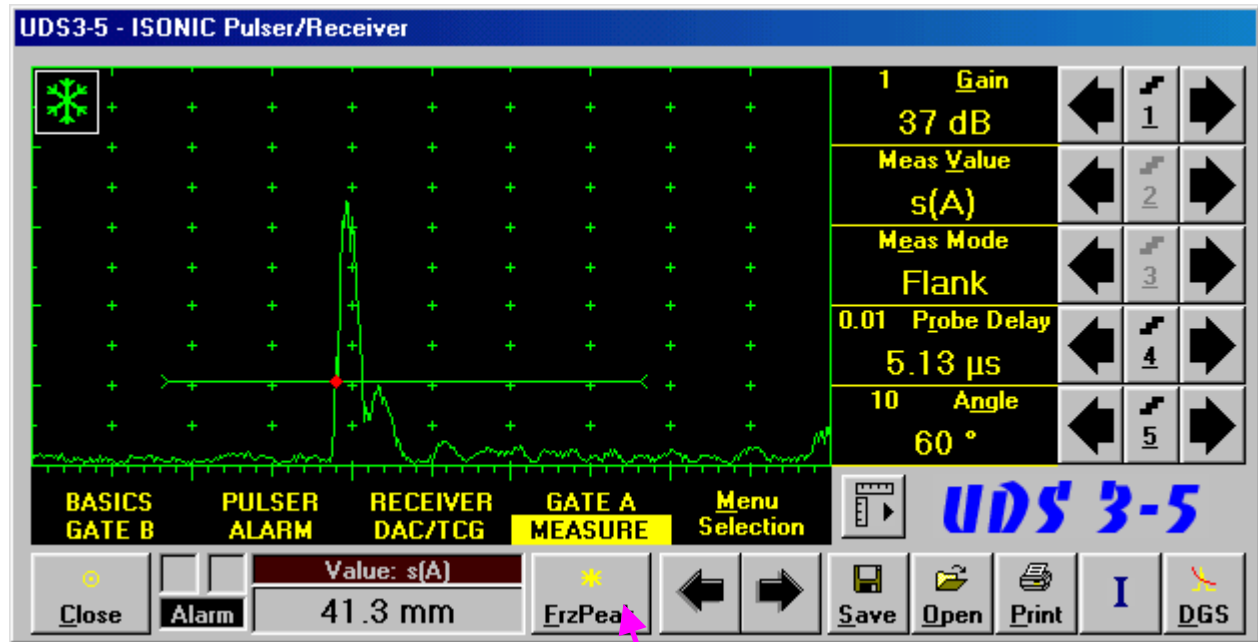
Clear FFT Marks:



Click on 

Exit FFT Mode:

Change **Display** mode

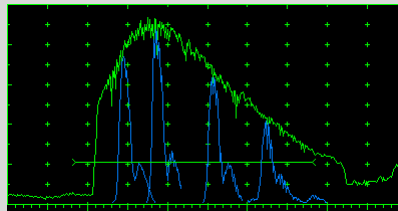
5.2.15. Freeze A-Scan / FFT Graph





To freeze / freeze peak / unfreeze the **A-Scan** click  or press  on front panel keyboard or **F6** or **<Alt>+<F>** on external keyboard



- ◆ **Freeze Peak** mode allows representing of Hilbert envelop for sequence of echoes obtained while manipulating probe over some reflector. This function may be useful for localization of echo maximum when working in A-Scan mode:







- ◆ **Freeze Peak** mode may not be activated for RF and FFT signal presentation
- ◆ Appearing of  at the upper left corner of **A-Scan** indicates that it is frozen (**Freeze**)
- ◆ Appearing of  at the upper left corner of **A-Scan** indicates that **Freeze Peak** mode is active
- ◆ The following operations are available when time domain **A-Scan** is frozen:
 - ± 6 dB **Gain** varying according to paragraph 5.2.2 of this Operating Manual
 - Manipulating **Gates A** and **B** according to paragraphs 5.2.5, 5.2.6, 5.2.7 of this Operating Manual
 - Varying **Alarm** mode according to paragraph 5.2.8 of this Operating Manual
 - Selecting parameter (**Meas Value**) for automatic measurements and varying settings **Probe Delay** and **Angle** as per paragraph 5.2.12 of this Operating Manual and obtaining corresponding measurements results in the digital readout box (**Value**)
- ◆ The following operations are available while frequency domain **FFT Graph** is frozen:
 - ± 6 dB **Gain** varying according to paragraph 5.2.2 of this Operating Manual
 - All **FFT evaluation / measurements** as per paragraph 5.2.14 of this Operating Manual
- ◆ Caption of appropriate button changes in the **UDS 3-5 Pulser/Receiver** window when freeze / freeze peak / unfreeze **A-Scan / FFT Graph**



5.2.16. Zoom A-Scan / FFT Graph

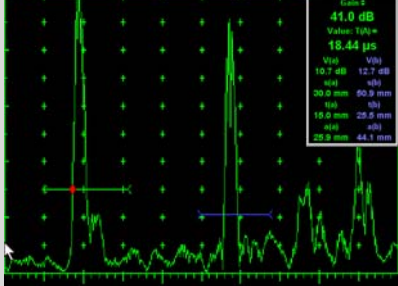
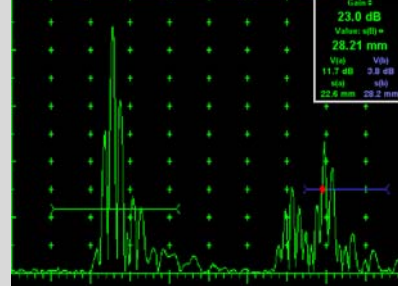
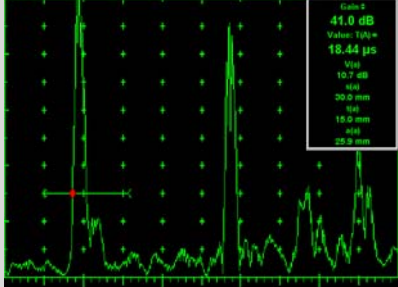
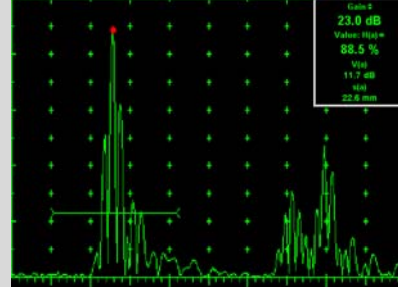
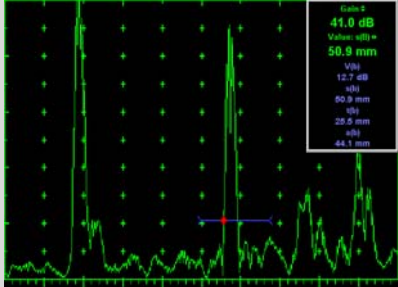
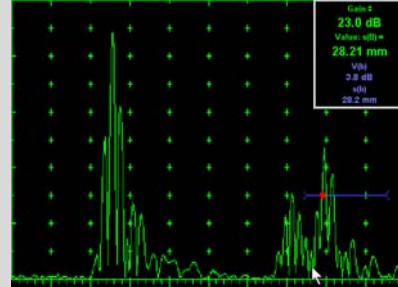
Double click on **A-Scan / FFT Graph** to get it enlarged. Enlarged **A-Scan / FFT Graph** occupies screen completely





In upright corner of **A-Scan** there is a digital readout box indicating current **Gain** value and digital readout of automatic measurements provided that corresponding **Gate** is active

To control **Gain** while **A-Scan** is enlarged use  and  on front panel keyboard or ,  on external keyboard



To freeze / freeze peak / unfreeze enlarged **A-Scan** press  on front panel keyboard or **F6** on external keyboard

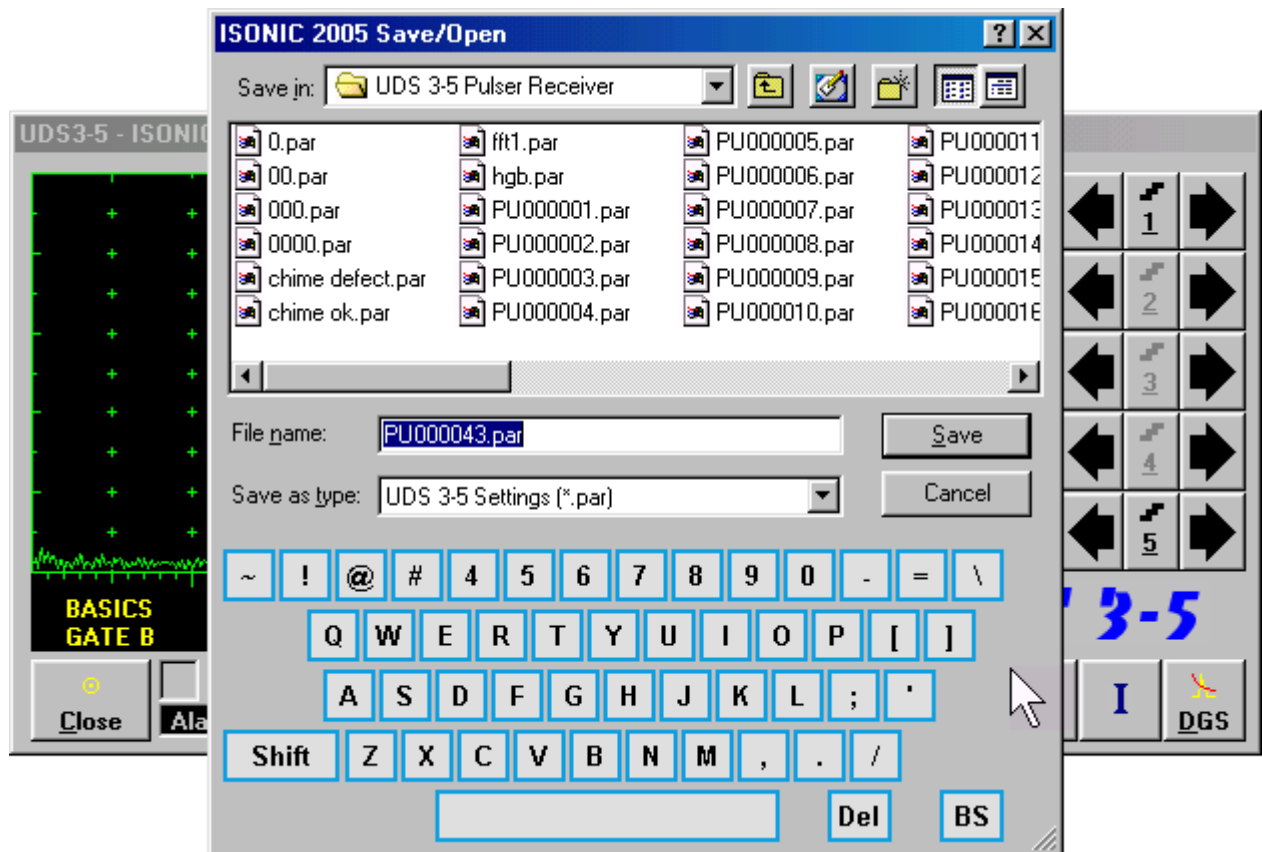
If **Gate A** and / or **Gate B** is active then:

Active Gate	Angle Beam Probe Angle > 0° in the submenu MEASURE	Straight Beam Probe Angle = 0° in the submenu MEASURE
A and B	 <p>Parameters V(A), s(A), t(A), a(A), V(B), s(B), t(B), and a(B) are measured and indicated automatically – refer to paragraph 5.2.13.1 of this Operating Manual</p>	 <p>Parameters V(A), s(A), V(B), and s(B) are measured and indicated automatically – refer to paragraph 5.2.13.1 of this Operating Manual</p>
A	 <p>Parameters V(A), s(A), t(A), and a(A) are measured and indicated automatically – refer to paragraph 5.2.13.1 of this Operating Manual</p>	 <p>Parameters V(A), and s(A) are measured and indicated automatically – refer to paragraph 5.2.13.1 of this Operating Manual</p>
B	 <p>Parameters V(B), s(B), t(B), and a(B) are measured and indicated automatically – refer to paragraph 5.2.13.1 of this Operating Manual</p>	 <p>Parameters V(B), and s(B) are measured and indicated automatically – refer to paragraph 5.2.13.1 of this Operating Manual</p>

To select an additional parameter for automatic measurement and large character indication while **A-Scan** is enlarged (**Meas Value** - refer to paragraphs 5.2.12 and 5.2.13 of this Operating Manual) use  and  on front panel keyboard or ,  on external keyboard. **Gate A** and **Gate B** if active may be drag and drop manipulated on the enlarged **A-Scan** according to paragraph 5.2.7 of this Operating Manual. To return to main operating surface window double click on enlarged **A-Scan / FFT Graph**




5.2.17. Save an A-Scan and its Calibration Dump into a file

To save the **A-Scan / FFT Graph** and **Calibration Dump** into a file click on  or press  on front panel keyboard or **F12** or **<Alt>+<S>** on external keyboard – **ISONIC 2005 / 2020 / STAR Save/Open** window becomes active providing automatically created name for a new file in **File name:** box:

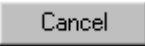



To save a file:

- select disk drive and directory for placing a file using mouse or touch screen
- approve automatically created new file name
 - OR
 - mark a file to be replaced from the list appearing in the destination directory
 - OR
 - type a new file name using either virtual keyboard generated in **ISONIC 2005 / 2020 / STAR Save/Open** window or external keyboard – standard Windows rules for file naming are applicable, long names (up to 64 characters) are supported

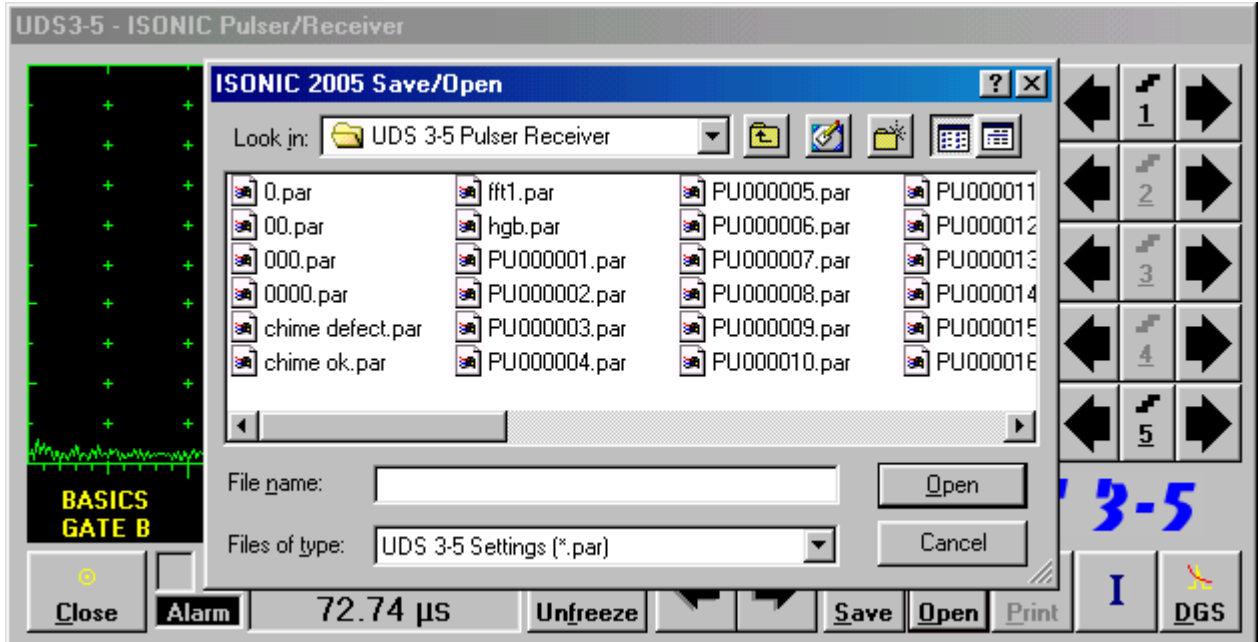
- double click on file to be replaced or click on  or press  or  on front panel keyboard or press **F12** or **Enter** or **<Alt>+<S>** on external keyboard

ISONIC 2005 / 2020 / STAR Save/Open window disappears automatically upon completing saving a file




To exit from **ISONIC 2005 / 2020 / STAR Save/Open** window without saving a file click on  or press  on front panel keyboard or **Esc** on external keyboard

5.2.18. Load an A-Scan and its Calibration Dump from a file

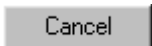

To load **A-Scan/FFT Graph** and **Calibration Dump** from a file click on  or press  on front panel keyboard or **F11** or **<Alt>+<O>** on external keyboard – **<Alt>+<O>** on the keyboard – **ISONIC 2005 / 2020 / STAR Save/Open** window becomes active



To open a file:



- select disk drive and directory containing a file required
- select then file then double click on its name or click on  or press  or  on front panel keyboard or **F11** or **Enter** or **<Alt>+<O>** on external keyboard

ISONIC 2005 / 2020 / STAR Save/Open window disappears automatically upon completing loading a file



To exit from **ISONIC Save/Open** window without opening a file click on  or press  on front panel keyboard or **Esc** on external keyboard

5.2.19. Print A-Scan/FFT Graph and Settings List

Ensure the printer connection is in order (printer to be accessible through either USB or LAN port and

defined as default in the **ISONIC 2005 / 2020 / STAR**) then click on  or press  on front panel keyboard or **F10** or <Alt>+<P> on external keyboard

5.2.20. Activate Main Recording Menu

Click on  or press  on front panel keyboard or **F8** on external keyboard. Refer to Chapter 6 of this Operating Manual for further instructions

5.2.21. Switch OFF UDS 3-5

To switch OFF UDS 3-5 click on  or press  on front panel keyboard or **Esc** or <Alt>+<C> on external keyboard

6. Recording and Imaging

6.1. Main Recording Menu

Main Recording Menu is shown below:



There are 2 recording submenus available:

- ◆ **Time Based Recording** submenu relates to line scanning procedures where probe is manipulated over object under test with constant speed and defects images are formed from sequence of **A-Scans** captured at equal time intervals (real time clock). To open **Time Based**

Recording submenu click on  or press  on front panel keyboard or **F1** on external keyboard

- ◆ **True to Location Recording** submenu relates to line scanning procedures where coordinate of probe manipulated over object under test is transferred to **ISONIC 2005 / 2020 / STAR** instrument by means of position encoder while defects images are formed from sequence of **A-Scans** captured at equal distance intervals. To open **True to Location Recording** submenu


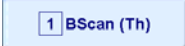










click on  or press  on front panel keyboard or **F2** on external keyboard




To return to main operating surface click on  or press  or  on front panel keyboard or **Esc** or **F3** on external keyboard

6.2. Time Based and True to Location Recording Submenus

Both **Time Based Recording** and **True to Location Recording** submenus allow activating 4 protocols of data recording:





- ◆ **Thickness Profile imaging and recording** – t-BScan(Th) or BScan(Th) – click on  or  or press  on front panel keyboard or **F1** on external keyboard – illustrative video is available at <http://www.sonotronndt.com/video.asp?Videoid=1>
- ◆ **B-Scan cross-sectional imaging and recording of defects for longitudinal and shear wave inspection** – t-ABIScan or ABIScan – click on  or  or press  on front panel keyboard or **F2** on external keyboard – illustrative video is available at <http://www.sonotronndt.com/video.asp?Videoid=2>
- ◆ **TOFD Inspection – RF B-Scan and D-Scan Imaging** – t-TOFD or TOFD – click on  or  or press  on front panel keyboard or **F3** on external keyboard – illustrative video is available at <http://www.sonotronndt.com/video.asp?Videoid=4>
- ◆ **CB-Scan horizontal plane-view imaging and recording of defects for shear, surface, and guided wave inspection** – t-FLOORMAP L or FLOORMAP L click on  or  press  on front panel keyboard or **F4** on external keyboard – illustrative video is available at <http://www.sonotronndt.com/video.asp?Videoid=3>

To return to **Main Recording Menu** click on  or press  or  on front panel keyboard or **Esc** or **F5** on external keyboard

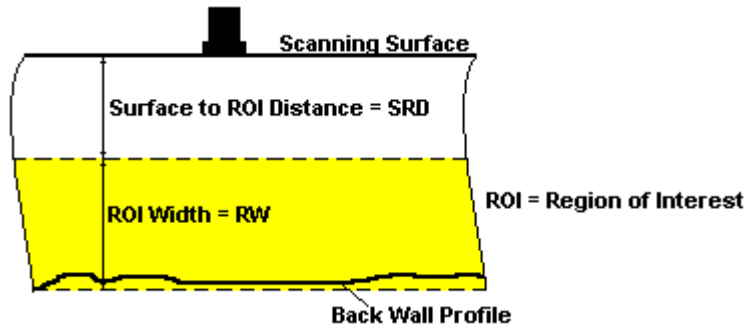
6.3. Thickness Profile Imaging and Recording – t-BScan(Th) and BScan(Th)

6.3.1. Setup Pulser Receiver for Thickness Profile Imaging and Recording

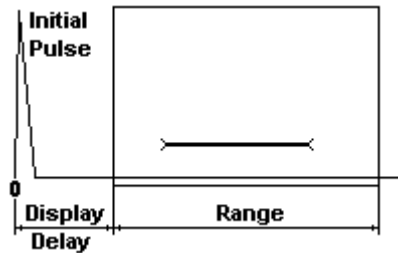
UDS 3-5 Pulser Receiver window – main operating surface – appears on ISONIC 2005 / 2020 / STAR screen upon clicking on  or . The following settings to be provided:

#	Parameter or Mode	Submenu	Required Settings	Note
1	aSwitch	GATE A	ON	
2	Gain aThreshold	BASICS GATE A	Gain and aThreshold settings to provide receiving an echo from the minimal area of thickness degradation to be detected; height of the said echo to exceed aThreshold; signals from other reflectors less then defined one not to exceed aThreshold	
3	DAC/TCG	DAC/TCG	DAC/TCG settings to meet requirements of the Inspection Procedure	
4	Pulser Mode	PULSER	Dual for dual element probes Single for single element probes	
5	Tuning, Pulse Width, Firing Level, Damping	PULSER	Tuning, Pulse Width, Firing Level, and Damping settings to provide optimal signal to noise ratio	To synchronize with Gain and aThreshold setting procedure
6	Filter, Frequency	RECEIVER	Filter and Frequency settings to match with probe's frequency	To synchronize with Gain and aThreshold setting procedure
7	Display	RECEIVER	Display mode may be either Full, RF, PosHalf, or NegHalf	The same Display mode to be used for both Probe Delay determining and Thickness Profile Imaging
8	USVelocity	BASIC	USVelocity setting to be equal to actual value of ultrasound velocity in the object under test	
9	Probe Delay	MEASURE	Probe Delay setting to be equal to actual probe delay	Probe delay may be determined according to paragraph 5.2.13.7 or 5.2.13.9 of this Operating Manual or similarly
10	Angle	MEASURE	Angle = 0°	
11	Meas Mode	MEASURE	Flank	
12	Range, Display Delay, AStart, aWidth	BASIC GATE A	Range, Display Delay, AStart, and aWidth settings to be performed with reference to the Region of Interest for t-BScan(Th) and BScan(Th) table below	
13	Settings for other parameters and modes have no significance			

Upon completing click on  or press  on front panel keyboard or **F8** on external keyboard



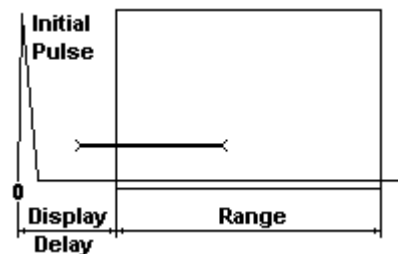
Case 1



$$SRD = aStart$$

$$RW = aWidth$$

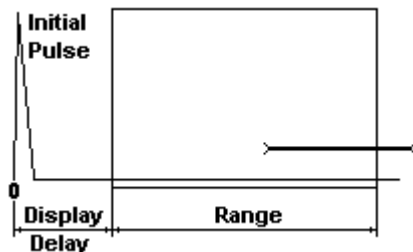
Case 2



$$SRD = \frac{DisplayDelay}{2} \times USVelocity$$

$$RW = aStart + aWidth - SRD$$

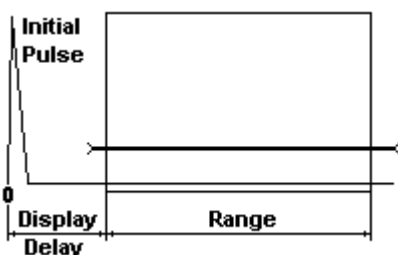
Case 3



$$SRD = aStart$$

$$RW = \frac{DisplayDelay}{2} \times USVelocity + Range - aStart$$

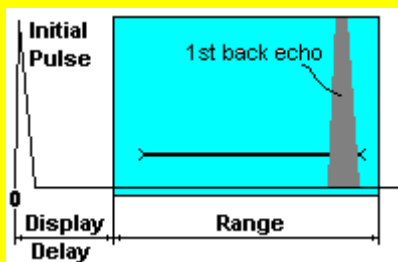
Case 4



$$SRD = \frac{DisplayDelay}{2} \times USVelocity$$

$$RW = Range$$

Preferred embodiment

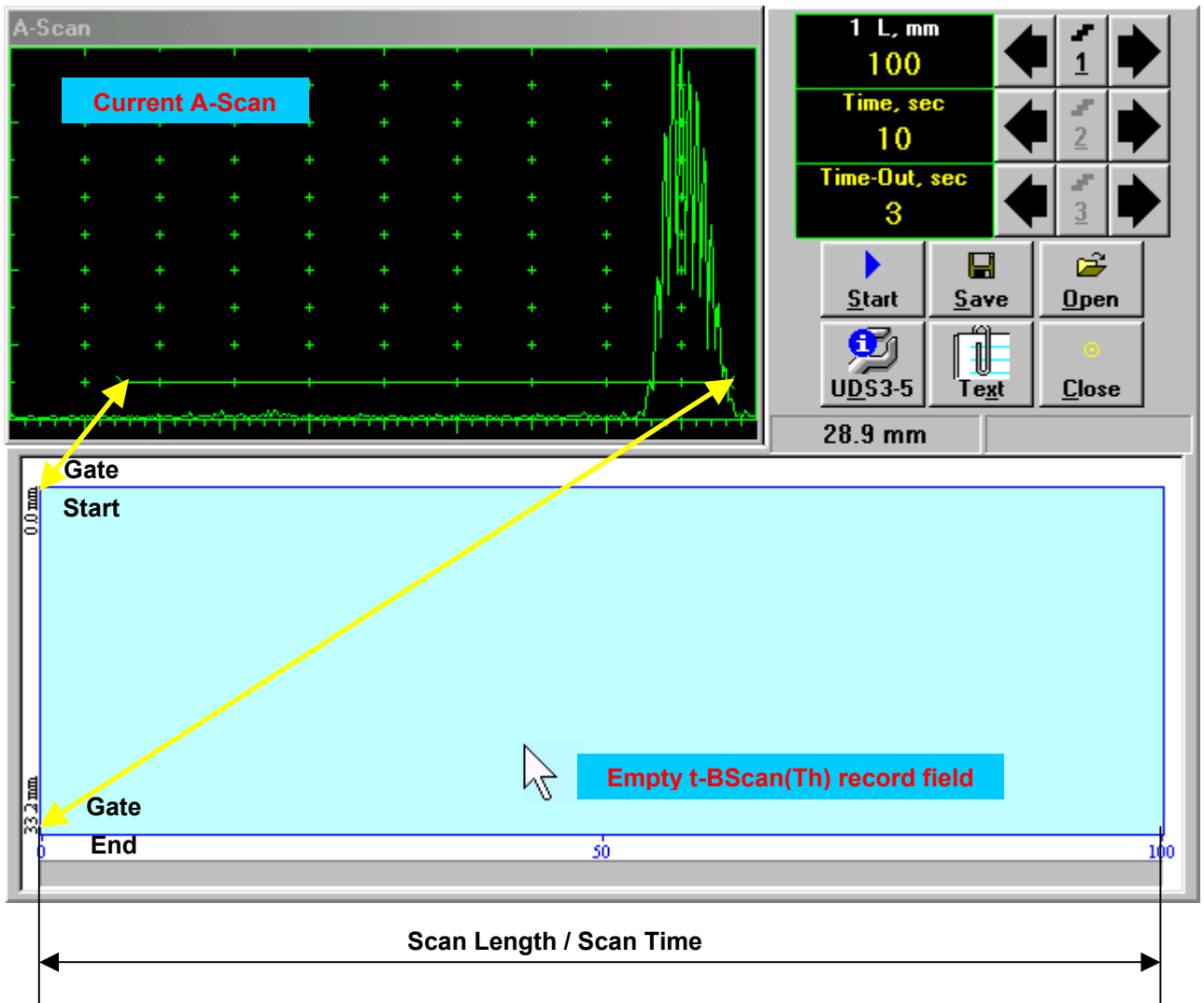


- ◆ aStart and aWidth setting to provide appearance of whole Gate A on the A-Scan
- ◆ aWidth = (0.75...0.95) × Range
- ◆ First Back Echo at the thickest area of object under test to be fully matching with Gate A
- ◆ First Back Echo at the thickest area of object under test to "occupy" 5-10% of the Gate A width on the A-Scan

6.3.2. Thickness Profile Imaging – Implementation

6.3.2.1. t-BScan(Th) – Prior to Scanning

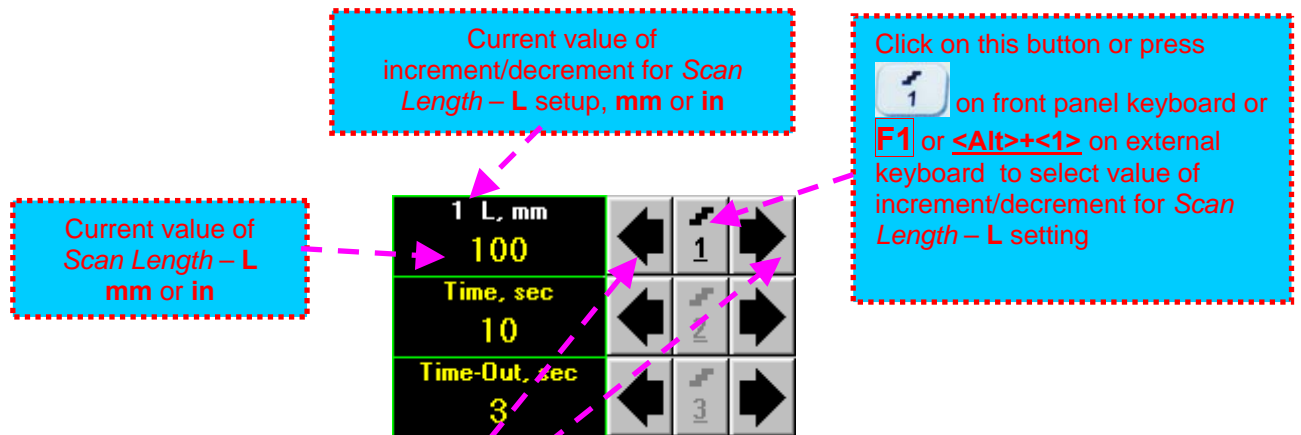
t-BScan(Th) control panel is shown below



Display Delay and **Range** settings for current **A-Scan** to be used for the recording are equivalent to the same setting of **UDS 3-5 Pulsar Receiver** precessing entering into **t-BScan(Th)** mode

Scan Length and Scan Time

Scan Length – **L** represents length of section of test object to be displayed, over which probe will be scanning during recording period. **Time** (Scan Time) is the duration of recording period



To control *Scan Length* – **L** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

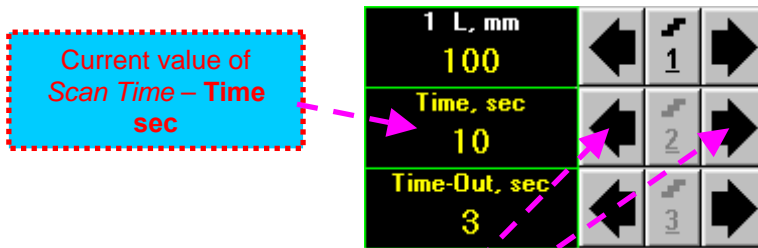
- Press **F1** on front panel keyboard or **F1** on external keyboard ⇒ **L** fore color changes to white - then use **↑**, **→**, **←**, **↓** on front panel keyboard or **↑**, **→**, **←**, **↓** on external keyboard

- **Combined**

- Click on **L** ⇒ **L** fore color changes to white - then use **↑**, **→**, **←**, **↓** on front panel keyboard or **↑**, **→**, **←**, **↓** on external keyboard



The value of *Scan Length* – **L** is adjustable between 50 and 1000 mm or 2 and 40 in












To control *Scan Time – Time* the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F2** on external keyboard ⇒ **Time** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

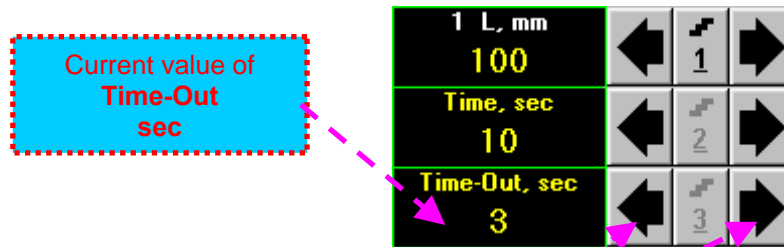
- Click on **Time** ⇒ **Time** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of *Scan Time – Time* is adjustable between 5 and 60 **sec** in 1 **sec** increment/decrement

Time-out

Time-Out is waiting time for intermissions precessing **t-BScan(Th)** recording, which starts unconditionally upon **Time-Out** period is over



To control **Time-out** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F3** on external keyboard ⇒ **Time-out** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Time-Out** ⇒ **Time-Out** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard




The value of **Time-Out** is adjustable between 0 and 15 **sec** in 1 **sec** increment/decrements

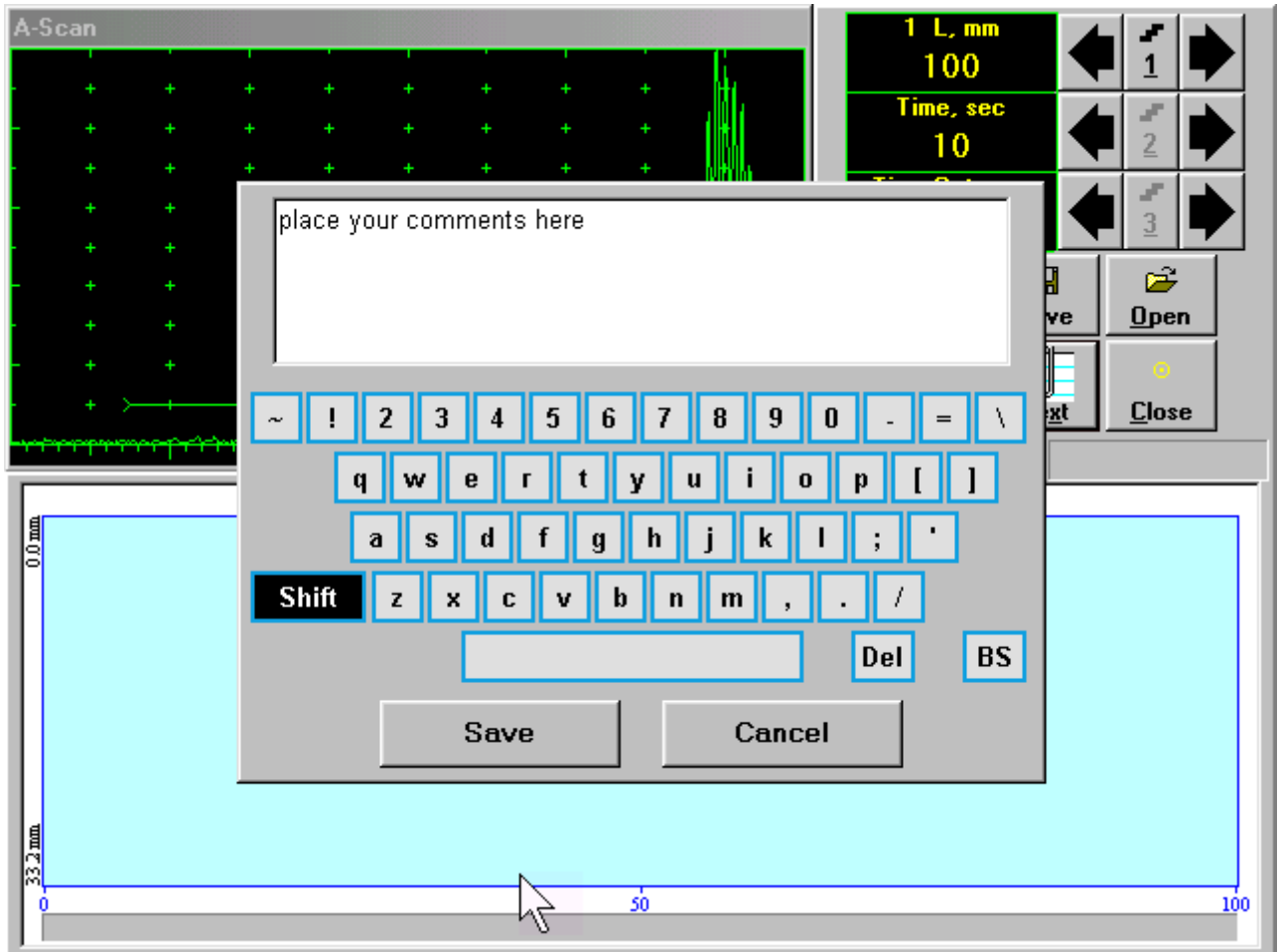
Insert Text Note




Inserting of text notes is available in the old SW versions only for **ISONIC 2005** instruments running under W'98SE

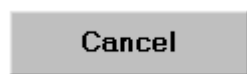



A text note may be entered to accompany **t-BScan(Th)** record. To proceed click on  or press **<Alt>+<X>** on external keyboard



Type notes and comments to accompany scanning files: use either virtual keyboard appeared (touch screen or mouse) or external keyboard

Click on  to store typed note and to return to **t-BScan(Th)** control panel

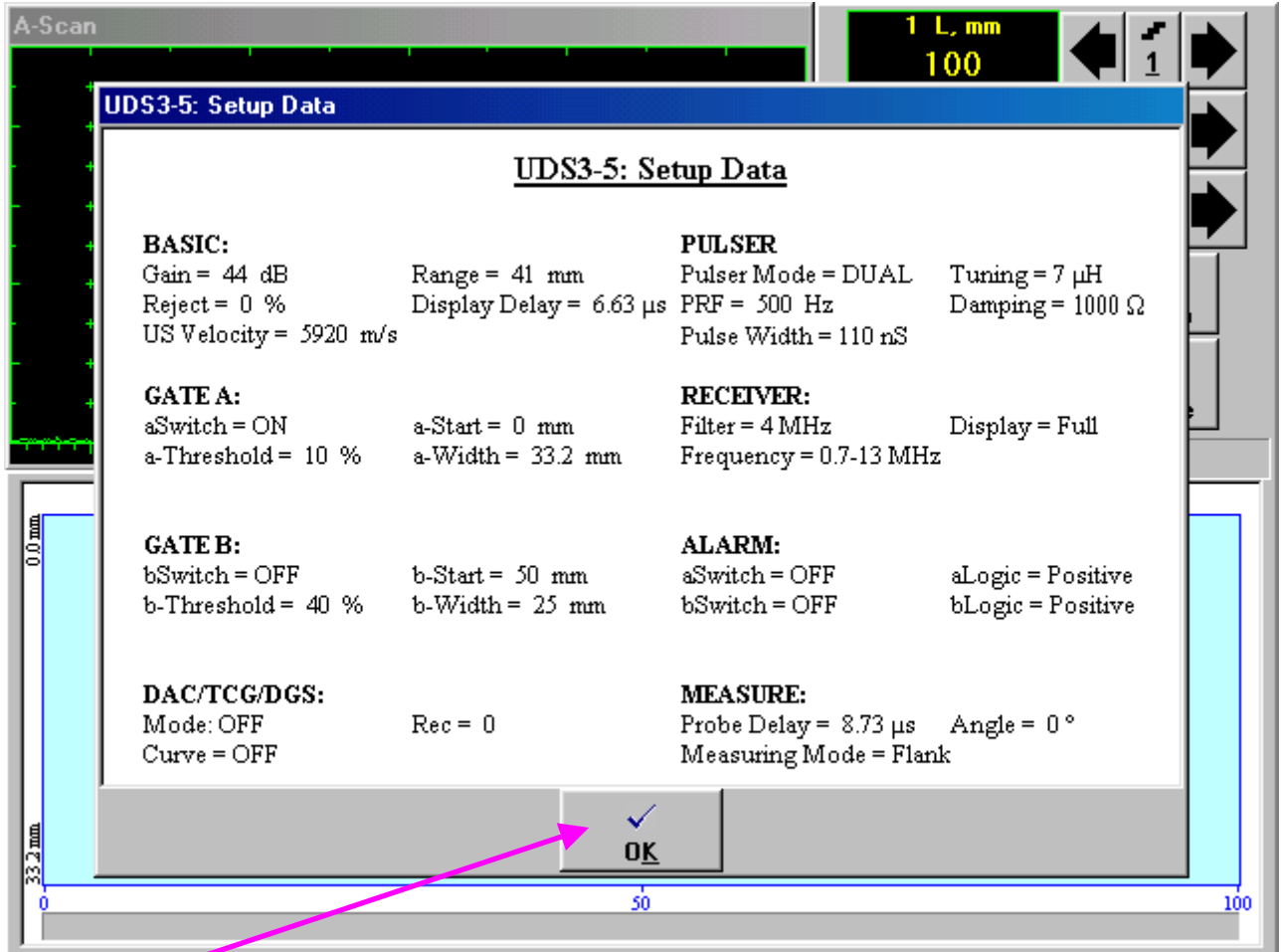
Click on  or press  on front panel keyboard or **Esc** on external keyboard to negate typed note and to return to **t-BScan(Th)** control panel

Preview UDS 3-5 Settings

UDS 3-5 Pulser Receiver settings for the **t-BScan(Th)** record may be previewed through clicking on









or pressing **<Alt>+<D>** on external keyboard . The corresponding window appears:





Click on or press **<Alt>+<K>** or **Esc** on external keyboard to return to return to **t-BScan(Th)** control panel



Start/Stop t-BScan(Th) recording

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to start **t-BScan(Th)** recording



 button becomes invisible since **t-BScan(Th)** recording starts.  button occupies its position. Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to terminate **t-BScan(Th)** recording prior to automatic completion

 button becomes invisible after completion / termination of **t-BScan(Th)** record.  button returns to its position



Save record into a file

Click on  or press  on front panel keyboard or **F12** or **<Alt>+<A>** on external keyboard to save captured **t-BScan(Th)** record accompanied with instrument calibration dump and text notes / comments into a file. Refer to paragraph 5.2.17 of this Operating Manual to proceed with file saving

Open record from a file and starting postprocessing session

Click on  or press  on front panel keyboard or **F11** or **<Alt>+<O>** on external keyboard **t-B-Scan(Th)** record accompanied with instrument calibration dump and text notes / comments from a file. Refer to paragraph 5.2.18 of this Operating Manual to proceed with file opening. Refer to paragraph 6.3.2.5 of this Operating Manual to proceed with postprocessing

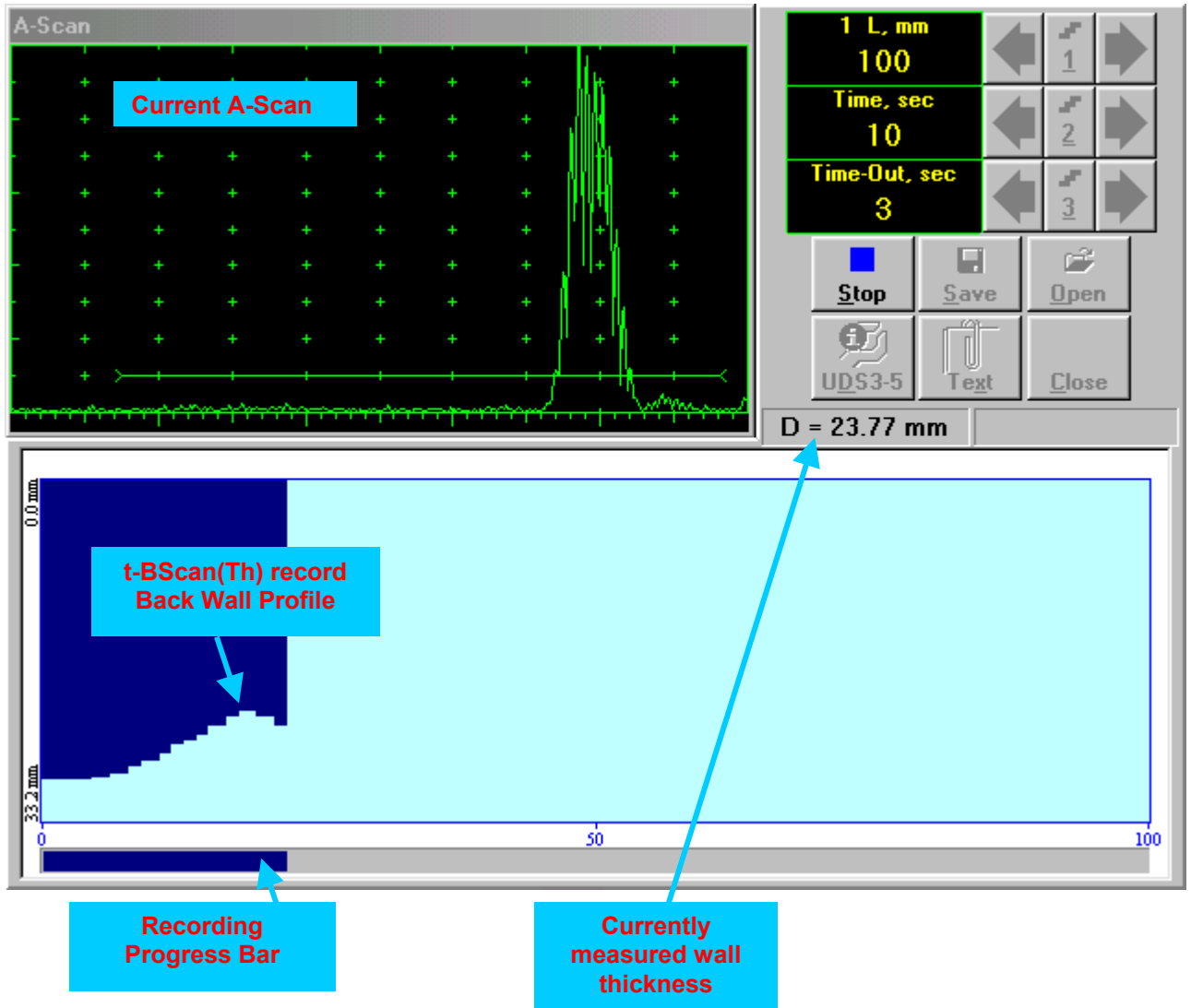
Return to UDS 3-5 main operating surface

Click on  or press  on front panel keyboard or **<Alt>+<C>** or **Esc** on external keyboard

6.3.2.2. t-BScan(Th) – Scanning

- Apply probe to test object in the start point of selected scanning line

- Click on **Start** or press **I** on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard
- Guide probe over the scanning line synchronously with *Recording Progress Bar* – typical scanning progress display during is shown and explained below



6.3.2.3. BScan(Th) – Prior to Scanning

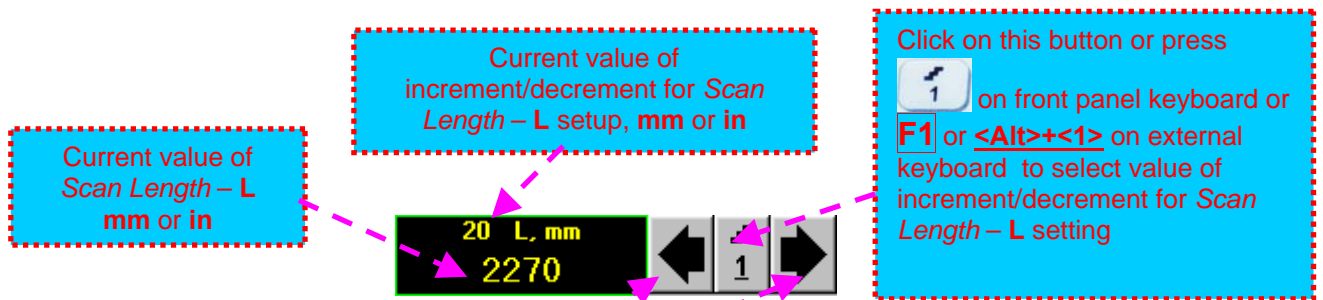
BScan(Th) control panel is shown below

The image displays the BScan(Th) control panel interface, which is divided into several sections:

- A-Scan Section:** Located at the top left, it shows a grid of green crosses on a black background. A green waveform is visible on the right side of the grid. Two yellow arrows point from the A-Scan section to the BScan(Th) record fields below.
- Control Panel (Top Right):** This panel includes a display showing "5 L, mm" and "100". It features navigation buttons (left, center, right) and a "1" button. Below this is an "Encoder:" dropdown menu set to "Default". A row of buttons includes "Start", "Open", "Save", and "Close". Another row contains "Text" and "UDS3-5" buttons. At the bottom of this panel, a display shows "27.8 mm".
- Empty BScan(Th) record field (Middle):** A large light blue rectangular area representing an empty record field. The vertical axis is labeled "0.0 mm" at the top and "33.2 mm" at the bottom. The horizontal axis has a "50" mark. A red text box in the center reads "Empty BScan(Th) record field". A double-headed arrow below this field indicates a "Total Scan Length for L ≤ 1000 mm / 40 in".
- BScan(Th) scrolling controls (Bottom):** This section shows a smaller version of the control panel from the top right, with a display showing "20 L, mm" and "2270". It includes navigation buttons and a "1" button. A red text box above it reads "BScan(Th) scrolling controls". Below this is another "Empty BScan(Th) record field" with a horizontal axis labeled from 600 to 1500. A red text box in the center reads "Empty BScan(Th) record field". A double-headed arrow below this field indicates a "1000 mm / 40 in Segment of Scrolled Total Scan Length exceeding 1000 mm / 40 in".
- Information Panel (Bottom):** A grey box containing an information icon (i) and the text: "Display Delay and Range settings for current A-Scan to be used for the recording are equivalent to the same setting of UDS 3-5 Pulsar Receiver predecesing entering into BScan(Th) mode".

Scan Length

Scan Length – L represents length of section of test object to be displayed, over which probe will be scanning during recording period



To control *Scan Length – L* the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press on front panel keyboard or **F1** on external keyboard ⇒ **L** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Combined**

- Click on **L** ⇒ **L** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard



The value of *Scan Length – L* is adjustable between 50 and 20000 **mm** or 2 and 800 **in**

Encoder

Select encoder to be used through appropriate box



Clamp probe into encoder – refer to Chapter 7 of this Operating Manual

Connect encoder to its input on the rear panel of **ISONIC 2005 / 2020 / STAR** instrument



Insert Text Note



Refer to paragraph 6.3.2.1 of this Operating Manual



Preview UDS 3-5 Settings

Refer to paragraph 6.3.2.1 of this Operating Manual

Start/Stop BScan(Th) recording



Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to start **BScan(Th)** recording

 button becomes invisible since **BScan(Th)** recording starts.  button occupies its position.



Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to terminate **BScan(Th)** recording

 button becomes invisible after termination of **BScan(Th)** record.  button returns to its position



Save record into a file

Click on  or press  on front panel keyboard or **F12** or **<Alt>+<A>** on external keyboard to save captured **BScan(Th)** record accompanied with instrument calibration dump and text notes / comments into a file. Refer to paragraph 5.2.17 of this Operating Manual to proceed with file saving

Open record from a file and starting postprocessing session

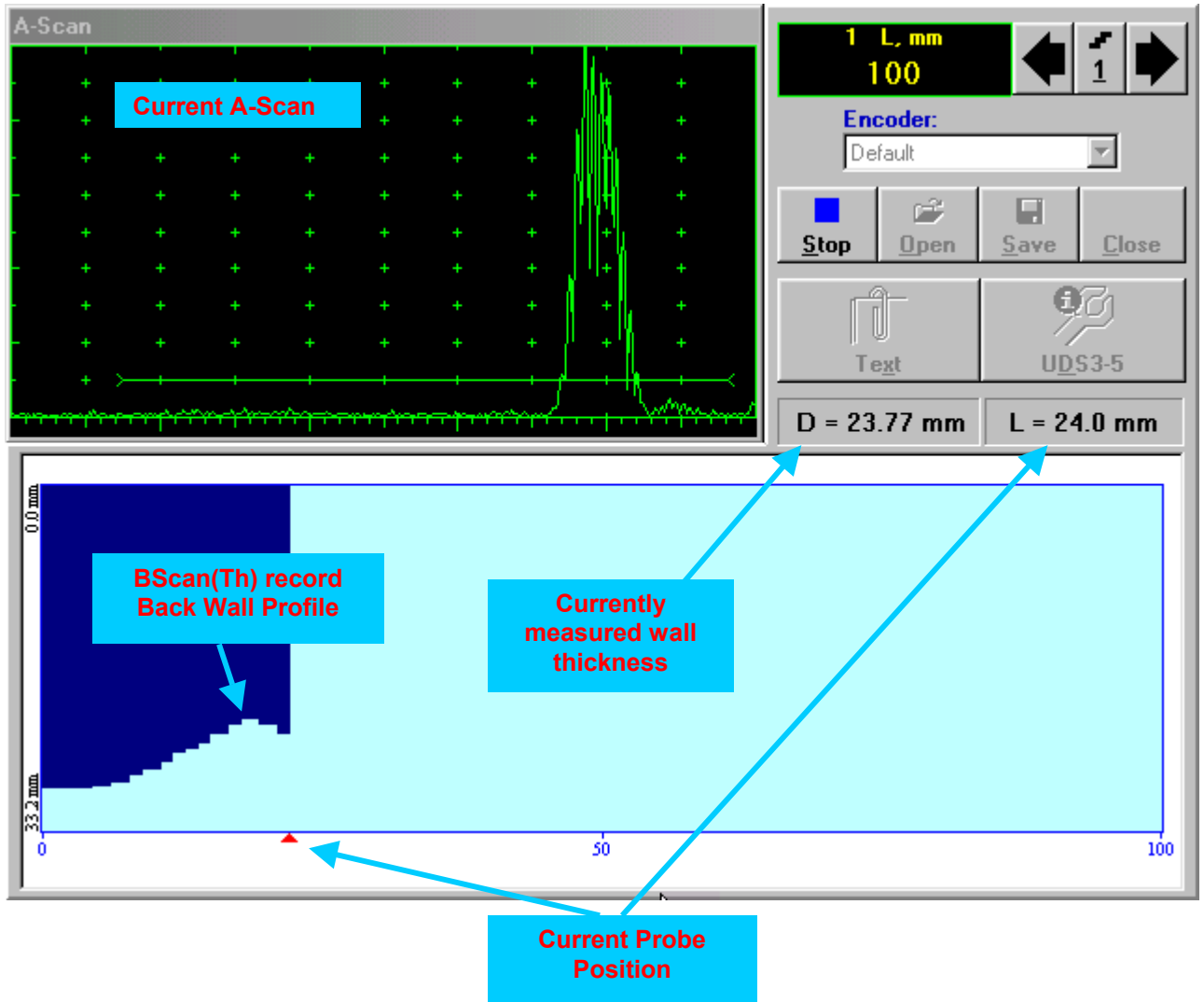
Click on  or press  on front panel keyboard or **F11** or **<Alt>+<O>** on external keyboard **B-Scan(Th)** record accompanied with instrument calibration dump and text notes / comments from a file. Refer to paragraph 5.2.18 of this Operating Manual to proceed with file opening. Refer to paragraph 6.3.2.5 of this Operating Manual to proceed with postprocessing

Return to UDS 3-5 main operating surface

Click on  or press  on front panel keyboard or **<Alt>+<C>** or **Esc** on external keyboard

6.3.2.4. BScan(Th) – Scanning

- Apply probe equipped with an encoder to test object in the start point of selected scanning line
- Click on **Start** or press **I** on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard
- Guide probe over the scanning line – typical scanning progress display is shown and explained below

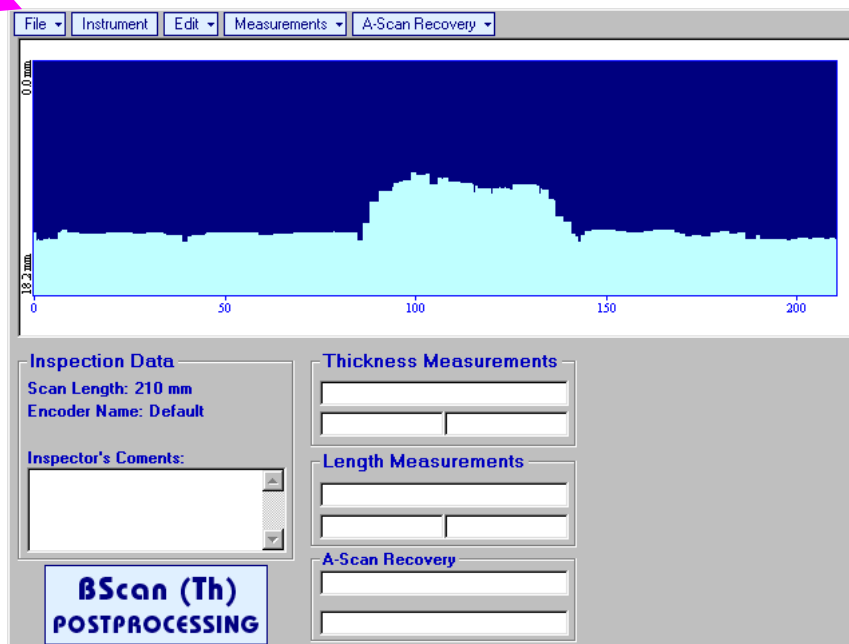


6.3.2.5. t-BScan(Th) / BScan(Th) – Postprocessing

Postprocessing of **t-BScan(Th) / BScan(Th)** records is featured with:





- ❑ Sizing thickness damages at any location along stored images (remaining thickness, thickness loss, and length of damage)
- ❑ Play-back and evaluation of **A-Scans** obtained and captured during thickness profile recording
- ❑ Reconstruction of thickness profile image for various **Gain** and / or **Gate A** settings

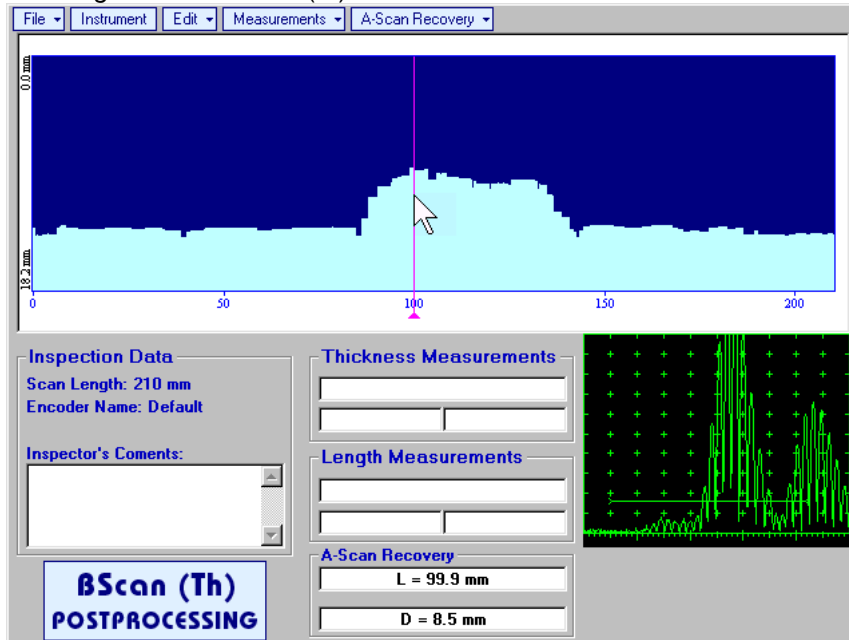
The screen as below appears upon opening file. All postprocessing procedures are performed through **menu bar** – touch screen stylus or front panel or external mouse to be used




Menu Bar Functions


- **File→Open** – opens new **t-BScan(Th) / BScan(Th)** file
- **File→Snapshots→Add Snapshot** – stores current postprocessing screen snapshot accompanied with appropriate settings and measurements into *postprocessing session memory stack*
- **File→Snapshots→Restore Snapshot** – recalls earlier stored postprocessing screen snapshot accompanied with appropriate settings and measurements from *postprocessing session memory stack*
- **File→Snapshots→Delete Snapshot** – deletes earlier stored postprocessing screen snapshot accompanied with appropriate settings and measurements from *postprocessing session memory stack*
- **File→Print** – prints out postprocessing screen snapshot(s) accompanied with appropriate settings and measurements
- **File→Exit** – returns to **t-BScan(Th) / BScan(Th)** control panel
- **Instrument** – indicates setup of **UDS 3-5** Pulser Receiver used for scanning when file was created

- A-Scan Recovery**→ON – generates *cursor representing sound path* of probe's central beam in the object under test that may be guided over **t-BScan(Th)** / **BScan(Th)** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *sound path cursor* position. In the **A-Scan Recovery** field there are indicated coordinate (**L**) of *sound path cursor* along **t-BScan(Th)** / **BScan(Th)** record and corresponding *remaining thickness* value (**D**)













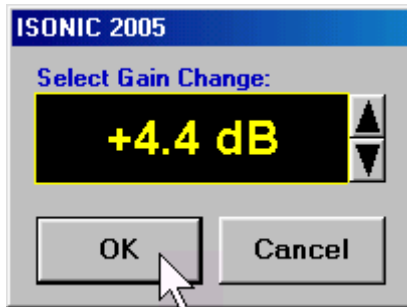
To fix position of *sound path cursor* with corresponding recovered **A-Scan** and *remaining thickness*

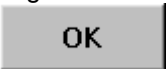

value left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard

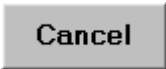

To interrupt recovery of **A-Scans** and empty **A-Scan Recovery** field right mouse click or press  on front panel keyboard or **ESC** on external keyboard

- A-Scan Recovery**→OFF – erases *sound path cursor*, switches off recovered **A-Scan**, and empties **A-Scan Recovery** field












- **Edit→Change Gain→ON** – generates *cursor representing sound path* of probe's central beam in the object under test that may be guided over **t-BScan(Th) / BScan(Th)** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to cursor position. To select reference **A-Scan** release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard – this generates subwindow allowing off-line re-adjusting of **Gain** for all **A-Scans** captured during **t-BScan(Th) / BScan(Th)** recording in $\pm 6\text{dB}$ range with $\pm 0.1\text{ dB}$ increments through clicking or pressing and holding on  or pressing  ,  on front panel keyboard or  ,  on external keyboard

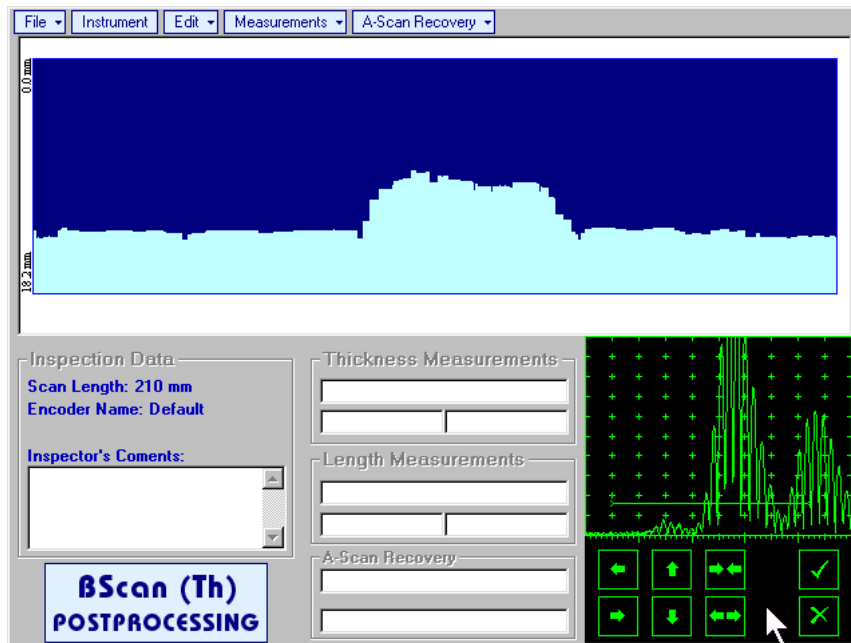



During **Gain** re-adjusting reference **A-Scan** is modified accordingly. Upon completing re-adjusting **Gain** click on  or press  on front panel keyboard or **Enter** on external keyboard – this applies new **Gain** value to all captured **A-Scans** and redraws **t-BScan(Th) / BScan(Th)** image accordingly


To interrupt re-adjusting of **Gain** click on  or press  on front panel keyboard or **Esc** on external keyboard

- **Edit→Change Gain→OFF** – negates **Gain** re-adjustment and returns to originally recorded **t-BScan(Th) / BScan(Th)** image and original **Gain** setting

- Edit→ROI→ON** – generates *cursor representing sound path* of probe's central beam in the object under test that may be guided over **t-BScan(Th) / BScan(Th)** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to cursor position. To select reference **A-Scan** release touch screen stylus or mouse click or press  on front panel keyboard or **Enter** on external keyboard – this generates off-line **Gate A** controls  ,  ,  ,  ,  ,  allowing to redefine **Region Of Interest** for **t-BScan(Th) / BScan(Th)** imaging



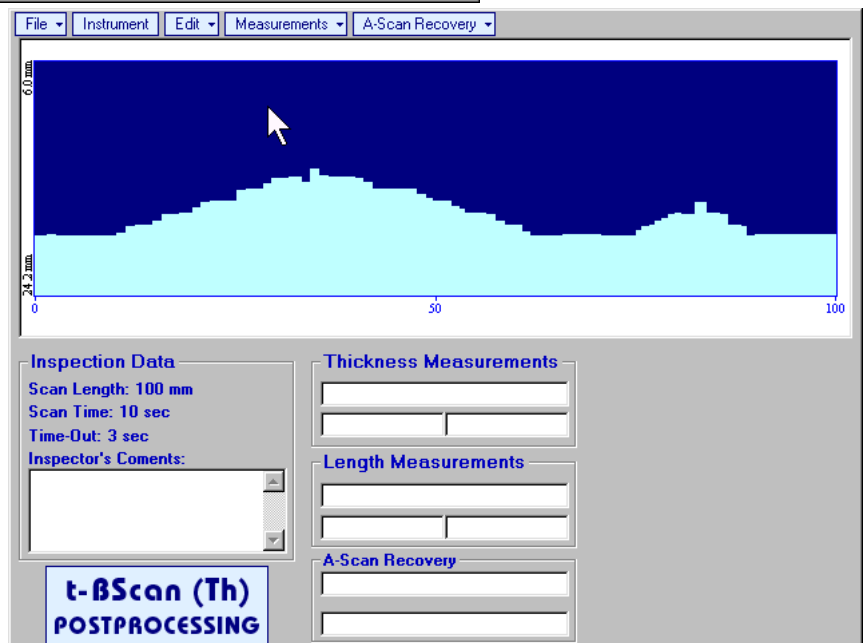
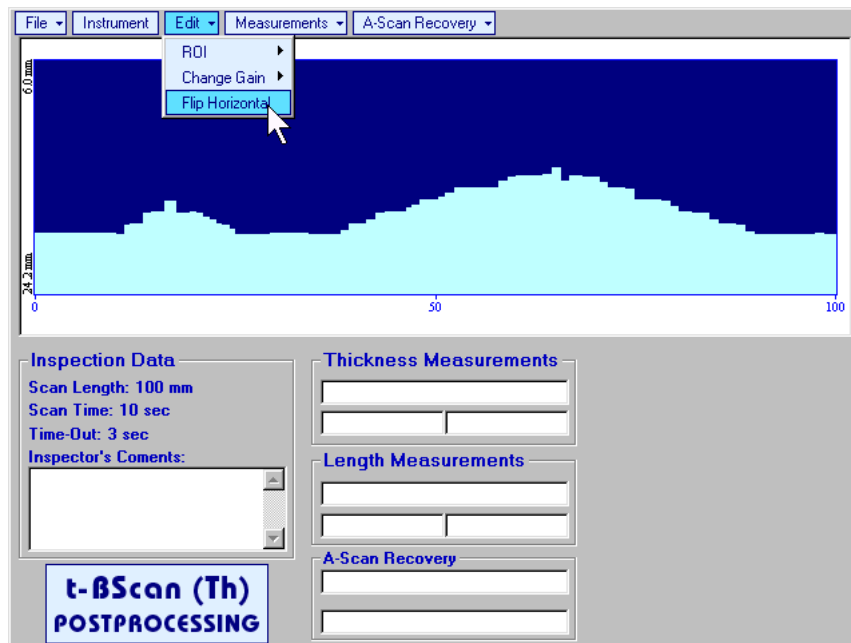
Upon completing redefining of **Region Of Interest** click on  – this applies new **Gate A** to all captured **A-Scans** and updates **t-BScan(Th) / BScan(Th)** image accordingly

To interrupt selection of reference of **A-Scan** right mouse click or press  on front panel keyboard or **Esc** on external keyboard







To interrupt re-adjustment of **Region Of Interest** after selection of reference of **A-Scan** click on 







- Edit→ROI→OFF** – negates **Gate A** re-adjustment and returns to originally recorded **t-BScan(Th) / BScan(Th)** image and original **Gate A** setting

- **Edit→Flip Horizontal** – reorders **A-Scans** captured during **t-BScan(Th)** / **BScan(Th)** recording in reverse succession and redraws **t-BScan(Th)** / **BScan(Th)** image accordingly. This service function may be useful for merging scans of neighboring sections of an object, which were scanned in opposite direction due to access conditions, etc

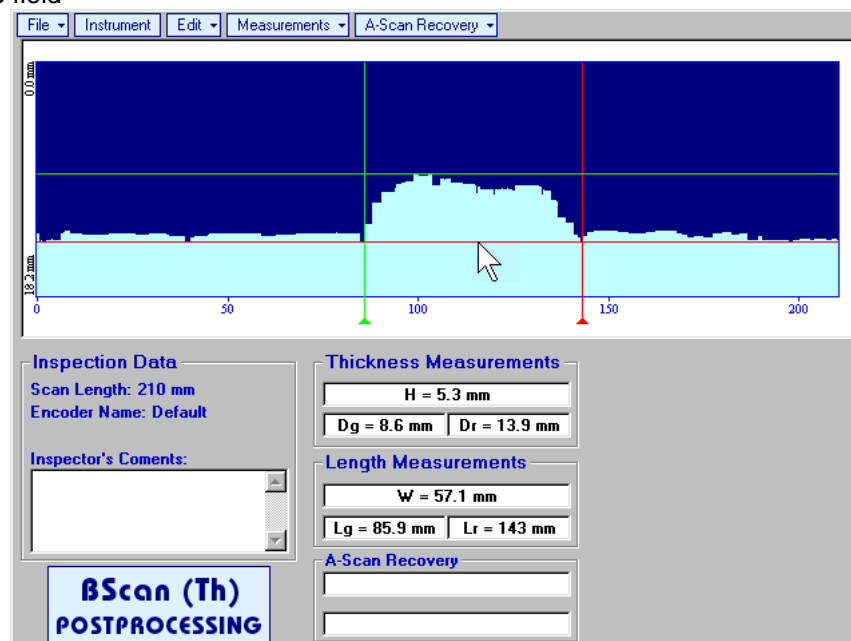


Applying of **Flip Horizontal** function empties *postprocessing session memory stack*

- Measurements→Length→ON** – generates first vertical cursor that may be guided over **t-BScan(Th)** / **BScan(Th)** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard . Coordinate of the first vertical cursor along **t-BScan(Th)** / **BScan(Th)** image (**Lg**) is indicated in the **Length Measurements** field. To fix position of the first vertical cursor left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard . To interrupt vertical cursor manipulations and empty **Length Measurements** field right mouse click or press  on front panel keyboard or **Esc** on external keyboard



Second vertical cursor appears upon fixing first one, it may be manipulated by the same way. Coordinate of the second vertical cursor along **t-BScan(Th)** / **BScan(Th)** image (**Lr**) is indicated in the **Length Measurements** field along with parameter **W = Lr – Lg**. Parameter **W** represents length of defect provided that vertical cursors are placed appropriately
- Measurements→Length→OFF** – erases vertical cursors and empties **Length Measurements** field
- Measurements→Thickness→ON** – generates first horizontal cursor that may be guided over **t-BScan(Th)** / **BScan(Th)** image using either touch screen or mouse or ,  on front panel keyboard or ,  on external keyboard . Coordinate of the first horizontal cursor along **t-BScan(Th)** / **BScan(Th)** image (**Dg**) is indicated in the **Thickness Measurements** field. To fix position of the first horizontal cursor left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard . To interrupt horizontal cursor manipulations and empty **Thickness Measurements** field right mouse click or press  on front panel keyboard or **Esc** on external keyboard

Second horizontal cursor appears upon fixing first one, it may be manipulated by the same way. Coordinate of the second horizontal cursor along **t-BScan(Th)** / **BScan(Th)** image (**Dr**) is indicated in the **Thickness Measurements** field along with parameter **H = Dr – Dg**. Parameter **H** represents thickness loss provided that horizontal cursors are placed appropriately
- Measurements→Thickness→OFF** – erases horizontal cursors and empties **Thickness Measurements** field





6.4. B-Scan cross-sectional imaging and recording of defects for longitudinal and shear wave inspection – t-ABIScan or ABIScan

6.4.1. Setup Pulser Receiver for t-ABIScan or ABIScan Imaging and Recording

UDS 3-5 Pulser Receiver window – main operating surface – appears on ISONIC 2005 / 2020 / STAR screen upon clicking on  or . The settings as below to be provided

6.4.1.1. Straight Beam Probes

#	Parameter or Mode	Submenu	Required Settings	Note
1	Gain	BASICS	Gain setting to be performed according to inspection procedure providing required echo heights from defects to be detected	
2	DAC/TCG	DAC/TCG	DAC/TCG settings to meet requirements of inspection procedure	
3	Pulser Mode	PULSER	Dual for dual element probes Single for single element probes	
4	Tuning, Pulse Width, Firing Level, Damping	PULSER	Tuning, Pulse Width, Firing Level, and Damping settings to provide optimal signal to noise ratio	To synchronize with Gain setting procedure
5	Filter, Frequency	RECEIVER	Filter and Frequency settings to match with probe's frequency	To synchronize with Gain setting procedure
6	Display	RECEIVER	Display setting may be either Full, RF, PosHalf, or NegHalf	The same Display mode to be used for both Probe Delay determining and t-ABIScan / ABIScan Recording
7	USVelocity	BASIC	USVelocity setting to be equal to actual value of ultrasound velocity in the object under test	
8	Probe Delay	MEASURE	Probe Delay setting to be equal to actual probe delay	Probe delay may be determined according to paragraph 5.2.13.7 or 5.2.13.9 of this Operating Manual or similarly
9	Angle	MEASURE	Angle = 0°	
10	Settings for other parameters and modes have no significance			

Click on  or press  on front panel keyboard or **F8** on external keyboard upon completing

6.4.1.2. Angle Beam Probes

#	Parameter or Mode	Submenu	Required Settings	Note
1	Gain	BASICS	Gain setting to be performed according to inspection procedure providing required echo heights from defects to be detected	
2	DAC/TCG	DAC/TCG	DAC/TCG settings to meet requirements of inspection procedure	
3	Pulser Mode	PULSER	Dual for dual element probes Single for single element probes	
4	Tuning, Pulse Width, Firing Level, Damping	PULSER	Tuning, Pulse Width, Firing Level, and Damping settings to provide optimal signal to noise ratio	To synchronize with Gain setting procedure
5	Filter, Frequency	RECEIVER	Filter and Frequency settings to match with probe's frequency	To synchronize with Gain setting procedure
6	Display	RECEIVER	Display setting may be either Full, RF, PosHalf, or NegHalf	The same Display mode to be used for both Probe Delay determining and t-ABIScan / ABIScan Recording
7	USVelocity	BASIC	USVelocity setting to be equal to actual value of ultrasound velocity in the object under test	
8	Probe Delay	MEASURE	Probe Delay setting to be equal to actual probe delay	Probe delay may be determined according to paragraph 5.2.13.5 or 5.2.13.6 or 5.2.13.9 of this Operating Manual or similarly
9	Angle	MEASURE	Angle setting to be equal to actual probe angle	
10	Settings for other parameters and modes have no significance			

Click on  or press  on front panel keyboard or **F8** on external keyboard upon completing

6.4.2. B-Scan Cross Sectional Imaging – Implementation

6.4.2.1. t-ABIScan – Prior to Scanning (Straight Beam Probes)

t-ABIScan control panel for straight beam probe is shown below

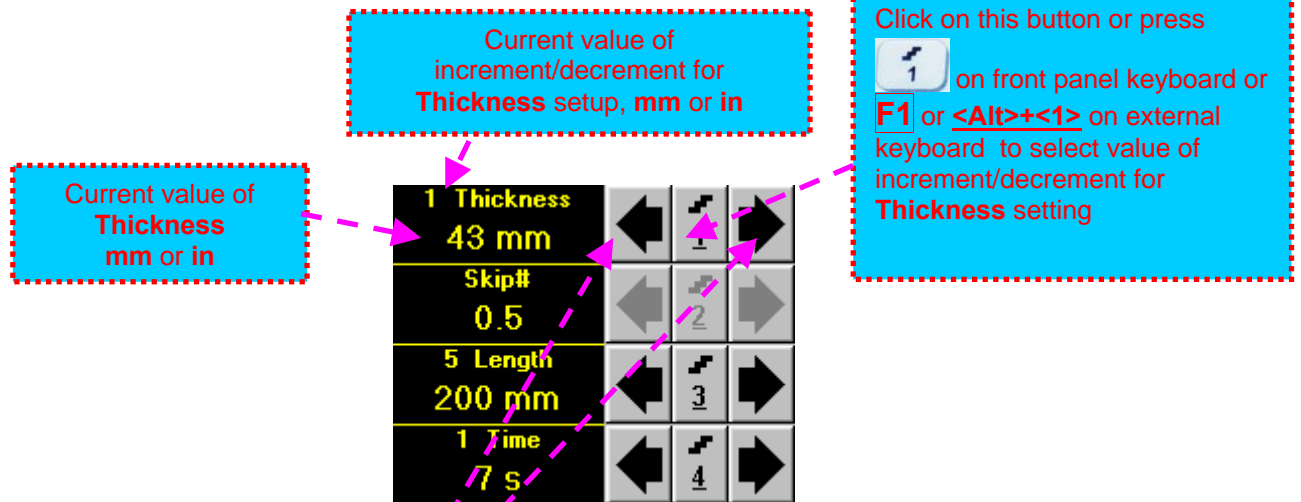
The screenshot displays the t-ABIScan control panel. On the left, an 'A-Scan' window shows a graph with a red line and a blue line on a grid. Below it is a 'Current A-Scan' label. The central panel contains four rows of settings: '1 Thickness 43 mm', 'Skip# 0.5', '5 Length 200 mm', and '1 Time 7 s'. Each row has navigation arrows and a numeric keypad. To the right, a 'Coloring' section offers 'Pseudo', 'Pseudo2', 'Grayscale', and 'Thermal' options, along with 'Start', 'Open', 'Save', and 'Close' buttons. Further right are icons for 'Text', 'UDS3-5', and a power button. The bottom of the panel shows 't-ABIScan' and the date '26-Jan-2006'.

Below the control panel, two diagrams illustrate scanning constraints. The first diagram shows a horizontal axis from 0 to -200 with a blue box labeled 'Empty t-ABIScan record field'. A double-headed arrow below indicates 'Scan Length not exceeding 600 mm or 24 in / Scan Time'. The second diagram shows a horizontal axis from 0 to -600. A blue box labeled 'Empty t-ABIScan record field' is positioned between -400 and -600. A blue box labeled 't-ABIScan scrolling controls' is positioned between -300 and -400. A double-headed arrow below indicates 'Segment of Scrolled Total Scan Length exceeding 600 mm or 24 in / Scan Time'.

i Display Delay for current A-Scan to be used for the recording is equal to Probe Delay setting in submenu MEASURE of UDS 3-5 Pulser Receiver precessing entering into t-ABIScan mode

Thickness

Thickness setting defines the region of interest starting from the scanning surface and automatic **Range** setting for current **A-Scan** to be used for the recording: **Range = Thickness**. For objects whereas back echo is feasible it may be useful to key in **Thickness** value slightly exceeding actual thickness of the object under test – this will allow to record simultaneously defects signals and back echo itself. For the screenshot as above the actual thickness of the test piece is 40 mm while the **Thickness** setting is 43 mm thanks to such setting back echo is clearly resolved at the end of **A-Scan**



To control **Thickness** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press on front panel keyboard or **F1** on external keyboard ⇒ **Thickness** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Combined**

- Click on **Thickness** ⇒ **Thickness** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard



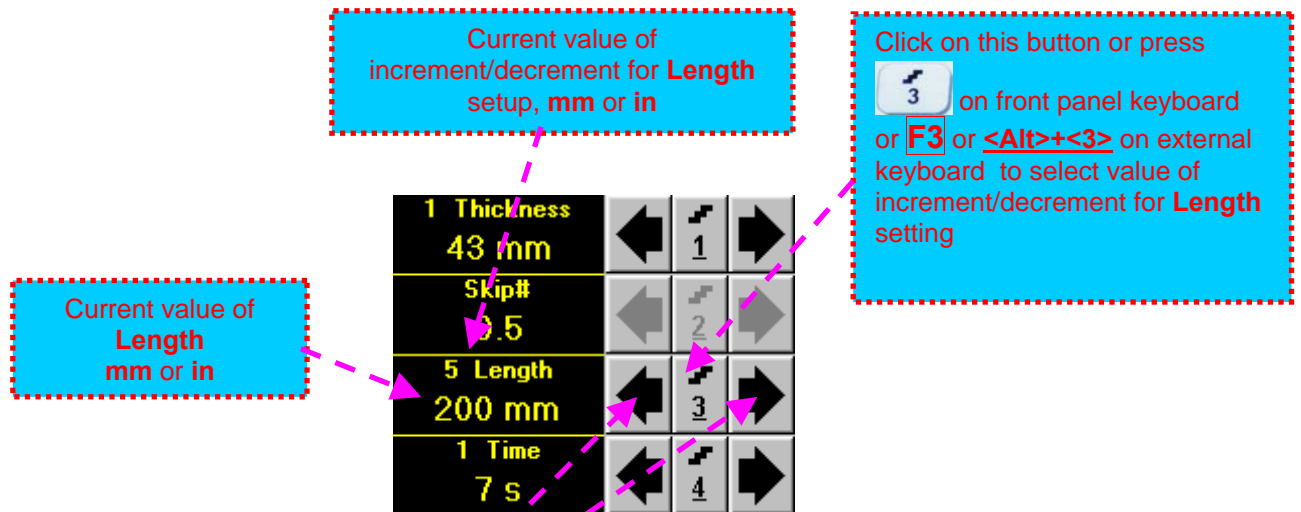
The value of **Thickness** is adjustable between 5 and 300 **mm** or 0.2 and 12 **in** (expandable on special inquire)

Skip

This setting is ignored while using straight beam probes

Scan Length and Scan Time

Length represents length of section of test object to be displayed, over which probe will be scanning during recording period. **Time** (Scan Time) is the duration of recording period

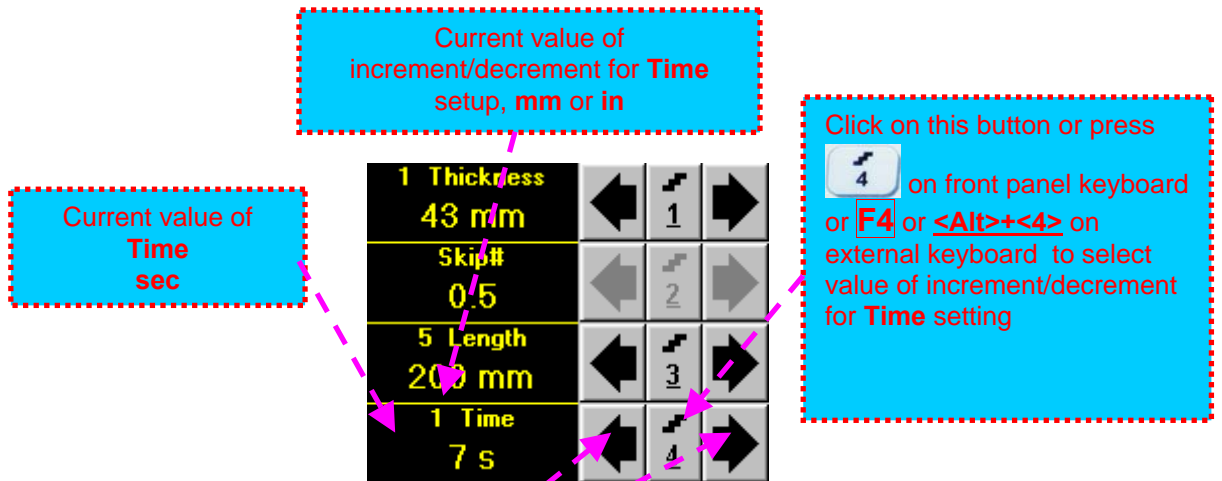


To control **Length** the following manipulations are applicable:

- **Mouse / Touch Screen**
 - Click on corresponding **button**
- **Keyboard**
 - Press on front panel keyboard or **F3** on external keyboard ⇒ **Length** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard
- **Combined**
 - Click on **Length** ⇒ **Length** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard



The value of **Length** is adjustable between 50 and 1000 **mm** or 2 and 40 **in**












To control **Time** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F4** on external keyboard ⇒ **Time** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Time** ⇒ **Time** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of **Time** is adjustable between 5 and 60 **sec**

Time-out

Time-Out is waiting time for intermissions preceeding **ABIScan** recording, which starts unconditionally upon **Time-Out** period is over. **Time-Out** has fixed duration of 3 sec for **t-ABIScan**

Insert Text Note

Refer to paragraph 6.3.2.1 of this Operating Manual

Preview UDS 3-5 Settings



Refer to paragraph 6.3.2.1 of this Operating Manual


t-ABIScan Record Palette



There are four palettes available through click on appropriate button:





Start/Stop t-ABIScan recording

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to start **t-ABIScan** recording

 button becomes invisible since **t-ABIScan** recording starts.  button occupies its position.

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to terminate **t-ABIScan** recording prior to automatic completion

 button becomes invisible after completion / termination of **t-ABIScan** record.  button returns to its position

Save record into a file

Refer to paragraph 6.3.2.1 of this Operating Manual

Open record from a file and starting postprocessing session

Refer to paragraph 6.3.2.1 of this Operating Manual

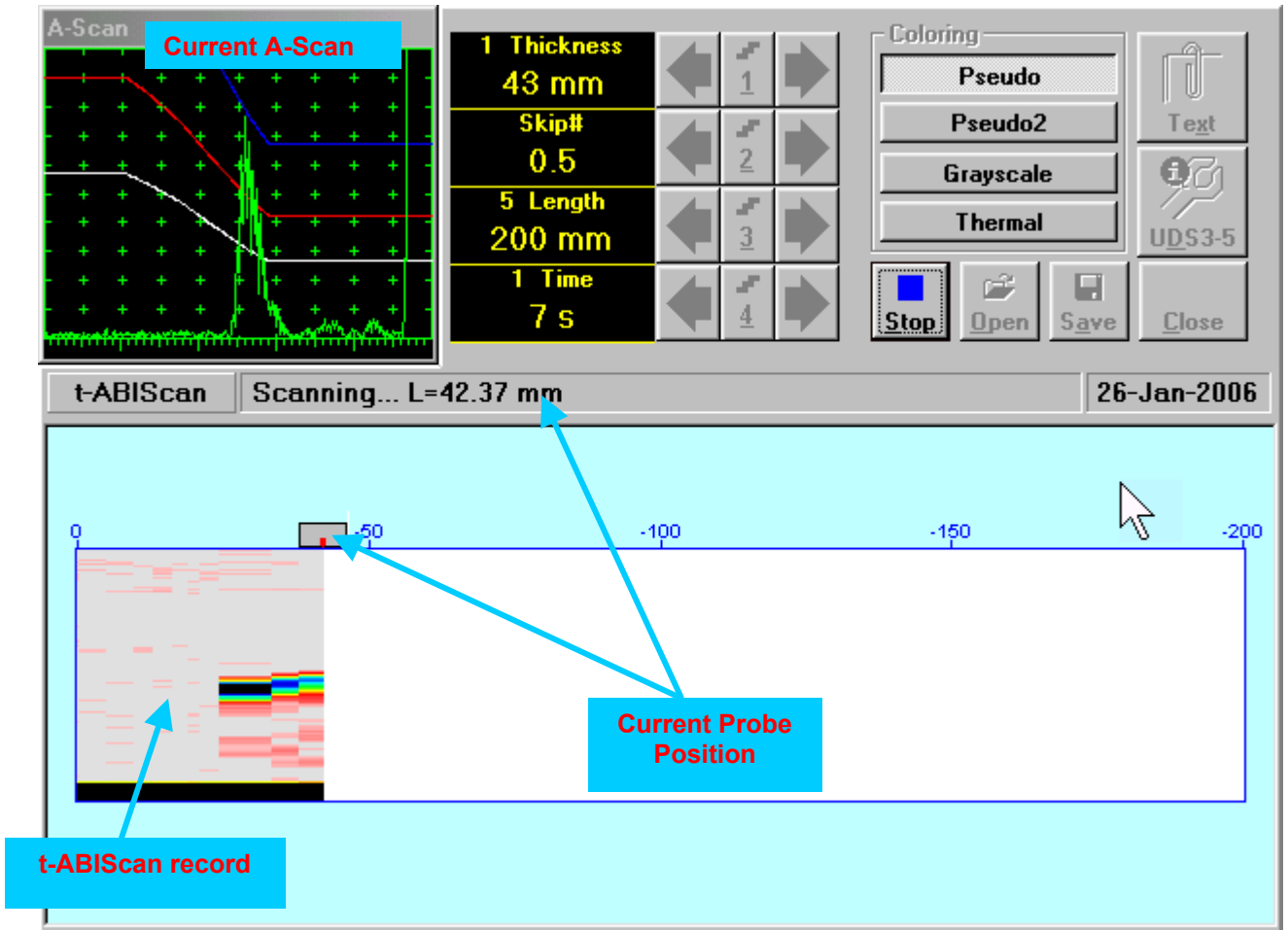
Return to UDS 3-5 main operating surface

Refer to paragraph 6.3.2.1 of this Operating Manual

6.4.2.2. t-ABIScan – Scanning (Straight Beam Probes)

- Apply probe to test object in the start point of selected scanning line

- Click on **Start** or press **I** on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard
- Guide probe over the scanning line synchronously with *Probe Icon* moving with constant speed above t-ABIScan record field – typical scanning progress display during is shown and explained below



6.4.2.3. ABIScan – Prior to Scanning (Straight Beam Probes)

ABIScan control panel for straight beam probe is shown below

The screenshot shows the ABIScan control panel. On the left, an 'A-Scan' window displays a graph with a red line and a blue line on a grid of green crosses. A blue box labeled 'Current A-Scan' points to the red line. To the right of the graph are control buttons for 'Thickness' (43 mm), 'Skip#' (0.5), and 'Length' (200 mm). Below these is an 'Encoder' dropdown menu set to 'Default'. Further right is a 'Coloring' section with buttons for 'Pseudo', 'Pseudo2', 'Grayscale', and 'Thermal'. On the far right are buttons for 'Text', 'UDS3-5', 'Start', 'Open', 'Save', and 'Close'. At the bottom of the panel, the text 'ABIScan' is on the left and '26-Jan-2006' is on the right. Below the panel is a large light blue area representing the 'Empty ABIScan record field'. A horizontal axis at the top of this area is marked from 0 to -200 in increments of 50. A double-headed arrow below the axis indicates a 'Scan Length not exceeding 600 mm or 12 in'.

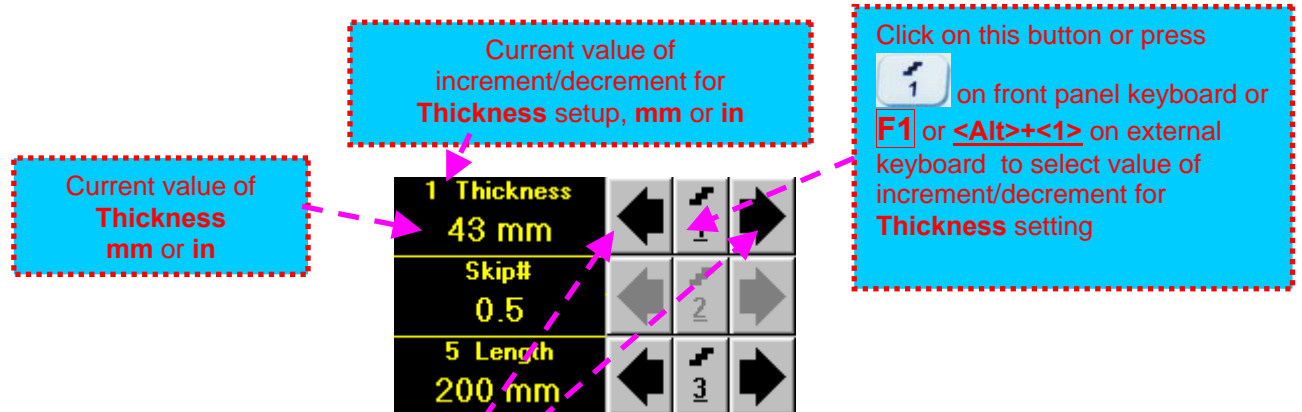
This screenshot shows the ABIScan control panel with a scrolled view of the A-Scan data. The 'Length' is now set to 2600 mm. The 'Empty ABIScan record field' is shown as a long horizontal axis with a scale from 0 to -1000 in increments of 200. A blue box labeled 'ABIScan scrolling controls field' is positioned below the axis, with arrows pointing left and right. A double-headed arrow below the axis indicates a 'Segment of Scrolled Total Scan Length exceeding 600 mm or 12 in'.



Display Delay for current A-Scan to be used for the recording is equal to Probe Delay setting in submenu MEASURE of UDS 3-5 Pulsar Receiver precessing entering into ABIScan mode

Thickness

Thickness setting defines the region of interest starting from the scanning surface and automatic **Range** setting for current **A-Scan** to be used for the recording: **Range = Thickness**. For objects whereas back echo is feasible it may be useful to key in **Thickness** value slightly exceeding actual thickness of the object under test – this will allow to record simultaneously defects signals and back echo itself. For the screenshot as above the actual thickness of the test piece is 40 mm while the **Thickness** setting is 43 mm thanks to such setting back echo is clearly resolved at the end of **A-Scan**










To control **Thickness** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding button

- **Keyboard**

- Press  on front panel keyboard or **F1** on external keyboard ⇒ **Thickness** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Thickness** ⇒ **Thickness** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



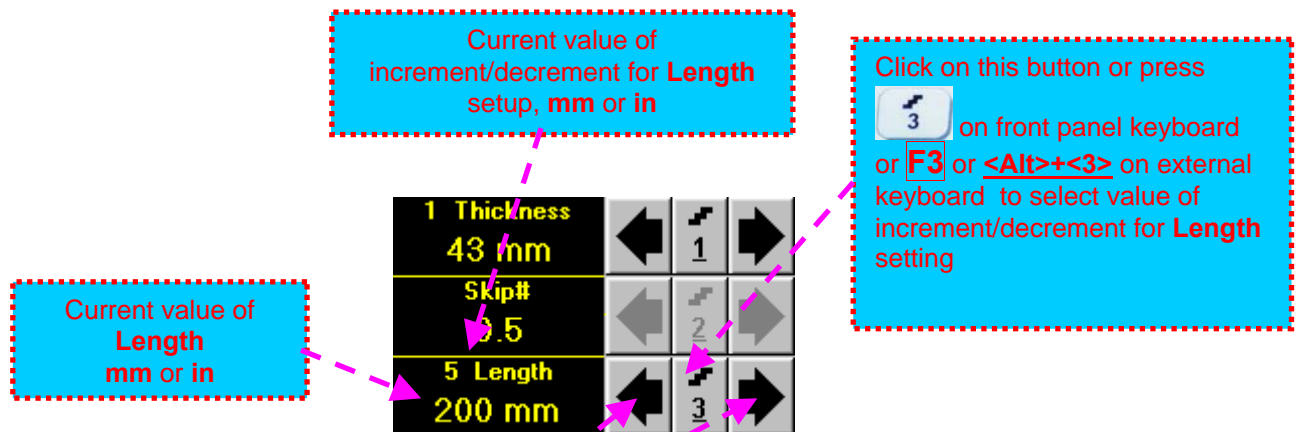
The value of **Thickness** is adjustable between 5 and 300 **mm** or 0.2 and 12 **in** (expandable on special inquire)

Skip

This setting is ignored while using straight beam probes

Scan Length

Length represents length of section of test object to be displayed, over which probe will be scanning during recording period









To control **Length** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F3** on external keyboard ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Length** ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of **Length** is adjustable between 50 and 20000 **mm** or 2 and 800 **in**

Encoder

Select encoder to be used through appropriate box



Clamp probe into encoder – refer to Chapter 7 of this Operating Manual

Connect encoder to its input on the rear panel of **ISONIC 2005 / 2020 / STAR** instrument

Insert Text Note

Refer to paragraph 6.3.2.1 of this Operating Manual

Preview UDS 3-5 Settings



Refer to paragraph 6.3.2.1 of this Operating Manual

ABIScan Record Palette


There are four palettes available through click on appropriate button:





Start/Stop ABIScan recording

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to start **ABIScan** recording




button becomes invisible since **ABIScan** recording starts.  button occupies its position.



Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to terminate **ABIScan** recording



button becomes invisible after termination of **ABIScan** record.  button returns to its position



Save record into a file

Refer to paragraph 6.3.2.1 of this Operating Manual

Open record from a file and starting postprocessing session

Refer to paragraph 6.3.2.1 of this Operating Manual

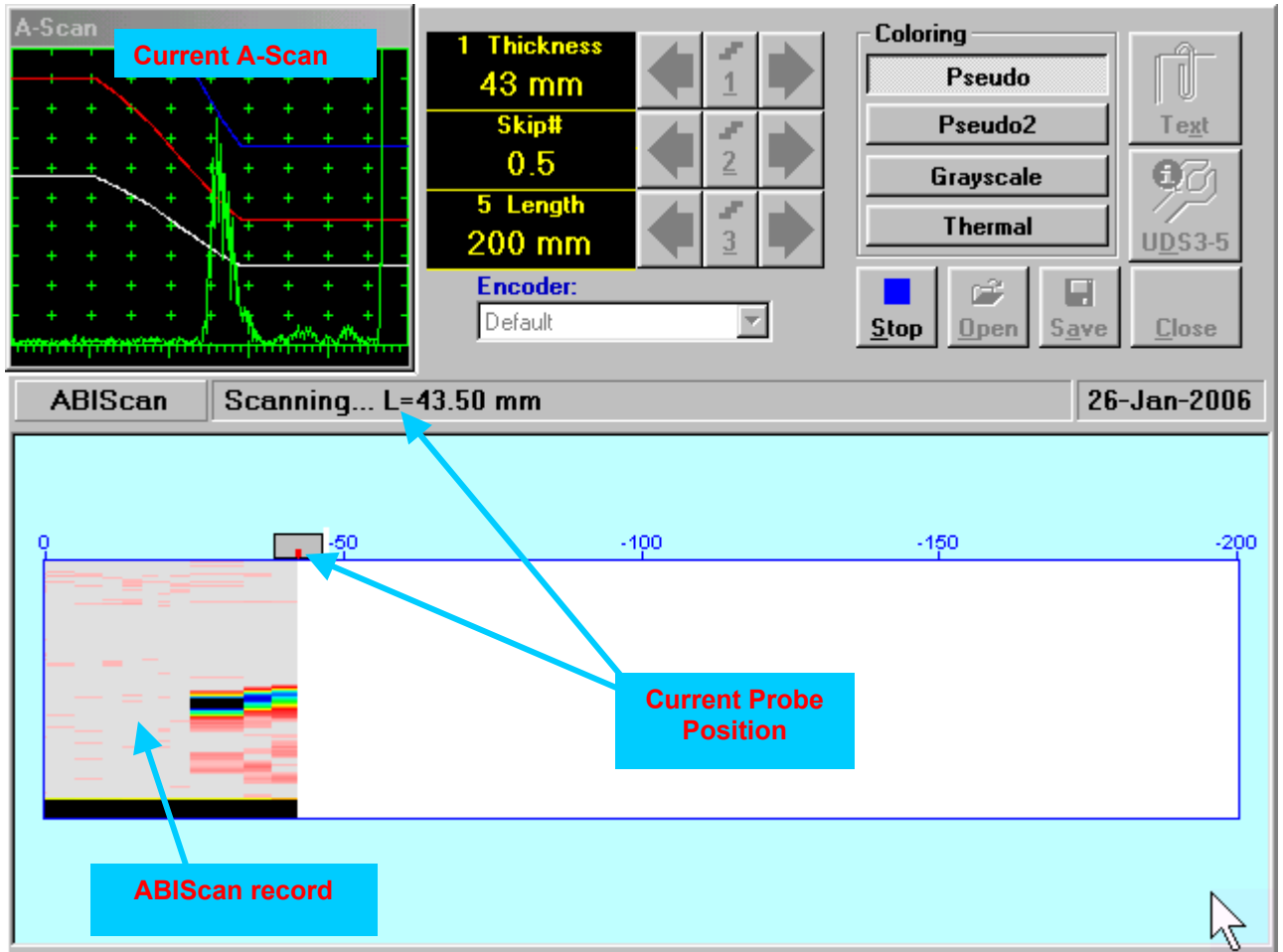
Return to UDS 3-5 main operating surface

Refer to paragraph 6.3.2.1 of this Operating Manual

6.4.2.4. ABIScan – Scanning (Straight Beam Probes)

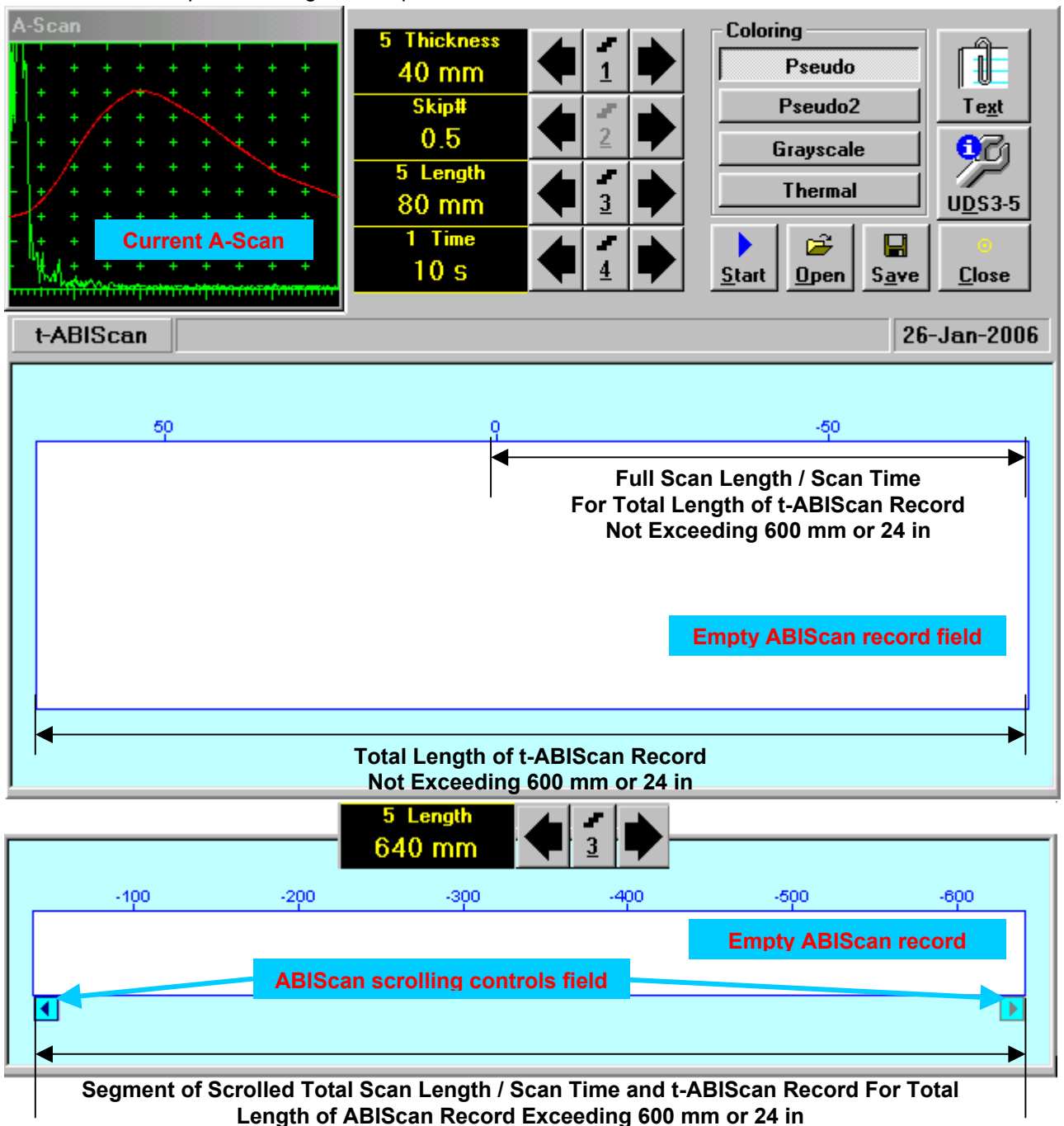
- Apply probe equipped with an encoder to test object in the start point of selected scanning line

- Click on **Start** or press **I** on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard
- Guide probe over the scanning line – typical scanning progress display during is shown and explained below



6.4.2.5. t-ABIScan – Prior to Scanning (Angle Beam Probes)

t-ABIScan control panel for angle beam probe is shown below



- ❑ **Display Delay** for current **A-Scan** to be used for the recording is equal to **Probe Delay** setting in submenu **MEASURE** of **UDS 3-5 Pulsar Receiver** preceeding entering into **t-ABIScan** mode
- ❑ **Total Length of t-ABIScan Record** is determined automatically according to:
 - Total Length of t-ABIScan Record = Total Scan Length + 2 * Skip # * Thickness * Tan (Angle)** whereas
 - ◆ **Thickness, Skip #, and Total Scan Length = Length** are the settings of **t-ABIScan** control panel
 - ◆ **Angle** is setting in submenu **MEASURE** of **UDS 3-5 Pulsar Receiver** preceeding entering into **t-ABIScan** mode

Thickness and Skip

Thickness and **Skip #** settings define the region of interest starting from the scanning surface and automatic **Range** setting for current **A-Scan** to be used for the recording:

$$\text{Range} = 2 \times \text{Skip \#} \times \text{Thickness} \times \text{Cos (Angle)}$$

whereas

- ◆ **Thickness** and **Skip #** are the settings of **t-ABIScan** control panel
- ◆ **Angle** is setting in submenu **MEASURE** of **UDS 3-5 Pulsar Receiver** precessing entering into **t-ABIScan** mode

For objects with parallel surfaces the actual **Thickness** value to be entered for full skip inspection (**Skip # = 1**)

The diagram shows a control panel with the following settings:

5 Thickness	←	↕	→
40 mm	←	1	→
Skip#	←	↕	→
0.5	←	2	→
5 Length	←	↕	→
80 mm	←	3	→
1 Time	←	↕	→
10 s	←	4	→

Callouts from the diagram:




- Current value of Thickness mm or in**: Points to the '40 mm' value.
- Current value of increment/decrement for Thickness setup, mm or in**: Points to the '1' button.
- Click on this button or press 1 on front panel keyboard or F1 or <Alt>+<1> on external keyboard to select value of increment/decrement for Thickness setting**: Points to the '1' button.

To control **Thickness** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F1** on external keyboard ⇒ **Thickness** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

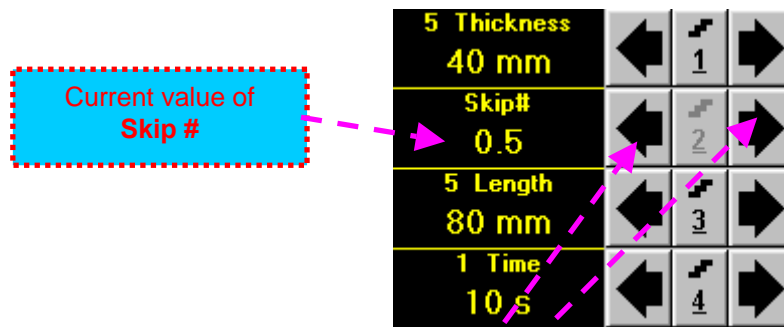
- **Combined**

- Click on **Thickness** ⇒ **Thickness** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of **Thickness** is adjustable between 5 and 300 **mm** or 0.2 and 12 **in** (expandable on special inquire)

Skip



To control **Skip #** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F2** on external keyboard ⇒ **Skip #** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

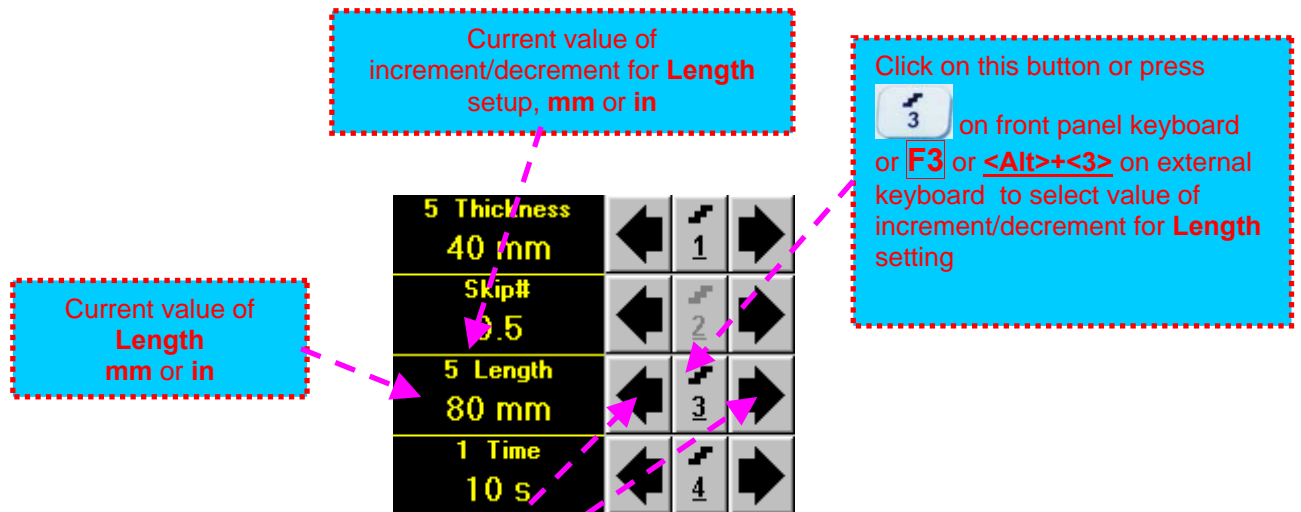
- Click on **Skip #** ⇒ **Skip #** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard




















The **Skip #** setting may be **0.5** – half skip insonification or **1** – full skip insonification

Scan Length and Scan Time

Length represents length of section of test object to be displayed, over which probe will be scanning during recording period. **Time** (Scan Time) is the duration of recording period

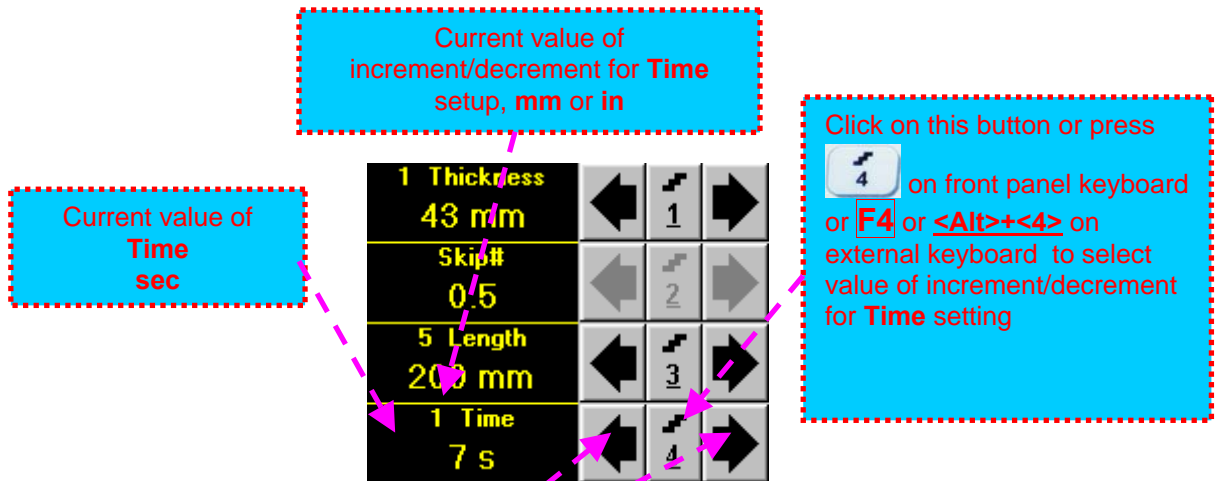


To control **Length** the following manipulations are applicable:

- **Mouse / Touch Screen**
 - Click on corresponding **button**
- **Keyboard**
 - Press  on front panel keyboard or **F3** on external keyboard ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard
- **Combined**
 - Click on **Length** ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of **Length** is adjustable between 50 and 1000 **mm** or 2 and 40 **in**



To control **Time** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press on front panel keyboard or **F4** on external keyboard ⇒ **Time** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Combined**

- Click on **Time** ⇒ **Time** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard



The value of **Time** is adjustable between 5 and 60 **sec**

Time-out

Time-Out is waiting time for intermissions preceeding **ABIScan** recording, which starts unconditionally upon **Time-Out** period is over. **Time-Out** has fixed duration of 3 sec for **t-ABIScan**

Insert Text Note

Refer to paragraph 6.3.2.1 of this Operating Manual

Preview UDS 3-5 Settings



Refer to paragraph 6.3.2.1 of this Operating Manual


t-ABIScan Record Palette



There are four palettes available through click on appropriate button:





Start/Stop t-ABIScan recording

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to start **t-ABIScan** recording

 button becomes invisible since **t-ABIScan** recording starts.  button occupies its position.

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to terminate **t-ABIScan** recording prior to automatic completion

 button becomes invisible after completion / termination of **t-ABIScan** record.  button returns to its position

Save record into a file

Refer to paragraph 6.3.2.1 of this Operating Manual

Open record from a file and starting postprocessing session

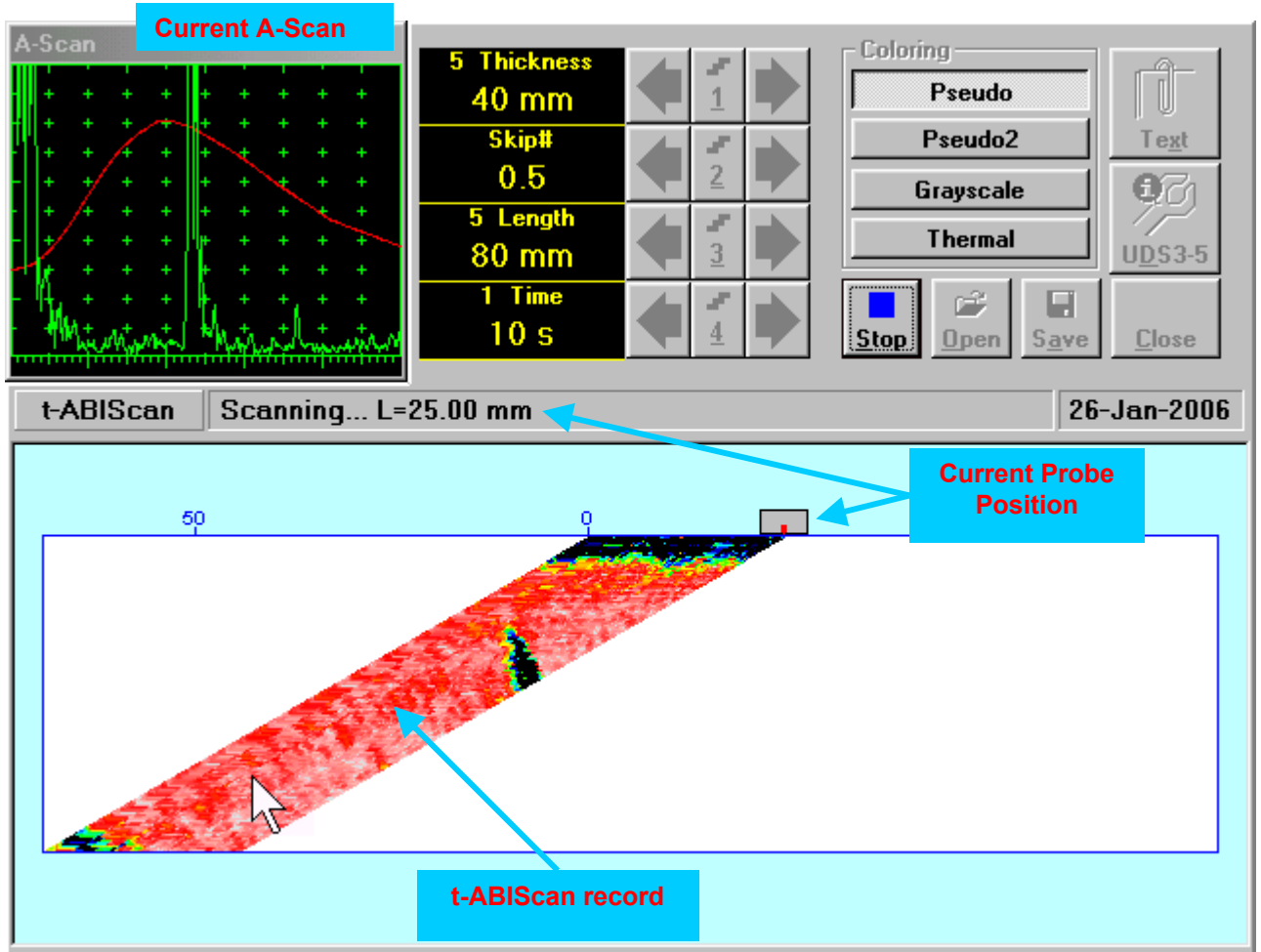
Refer to paragraph 6.3.2.1 of this Operating Manual

Return to UDS 3-5 main operating surface

Refer to paragraph 6.3.2.1 of this Operating Manual

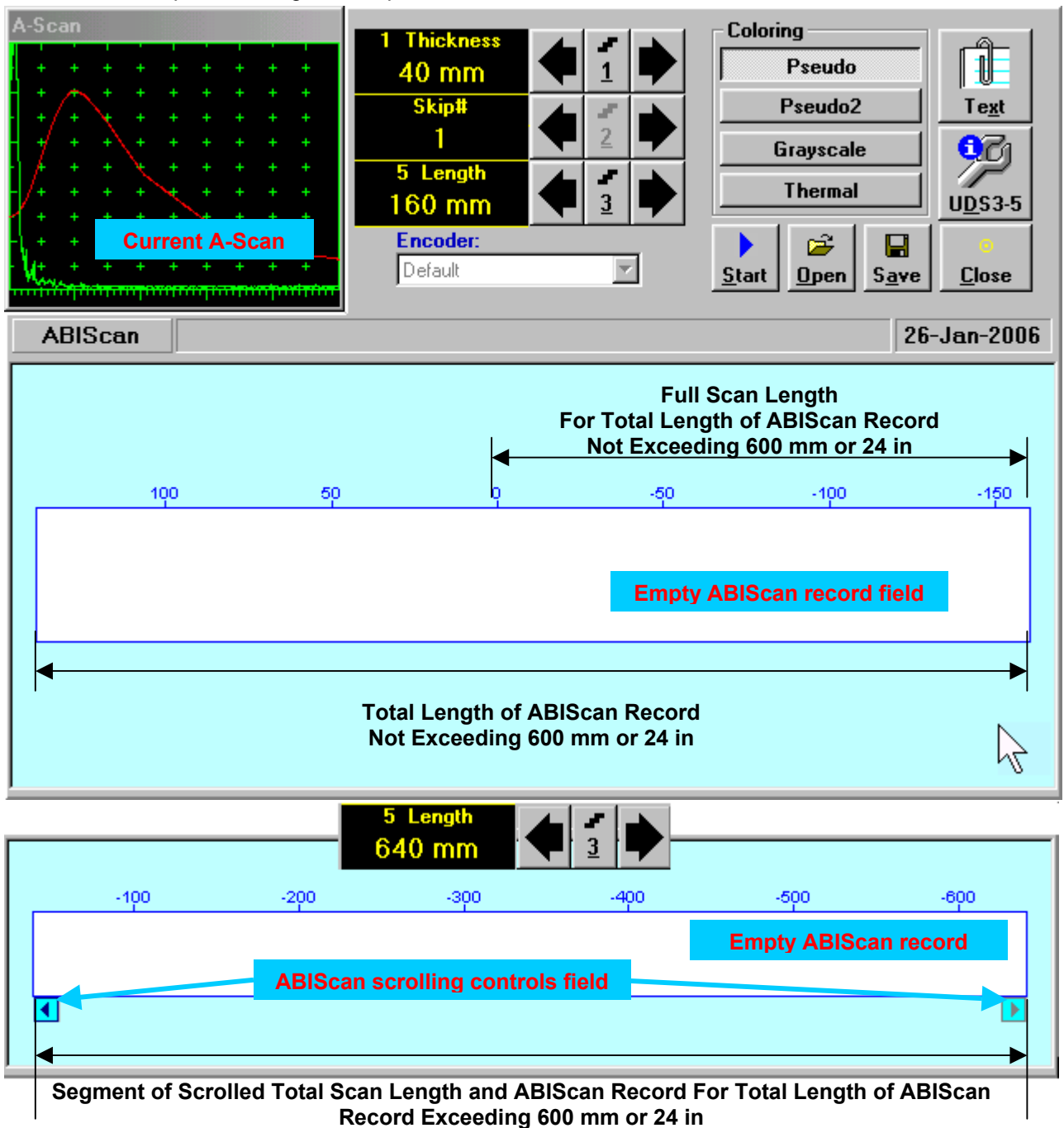
6.4.2.6. t-ABIScan – Scanning (Angle Beam Probes)

- Apply probe to test object in the start point of selected scanning line
- Click on **Start** or press **I** on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard
- Guide probe over the scanning line synchronously with *Probe Icon* moving with constant speed above **t-ABIScan** record field – typical scanning progress display during is shown and explained below



6.4.2.7. ABIScan – Prior to Scanning (Angle Beam Probes)

ABIScan control panel for angle beam probe is shown below



- **Display Delay** for current **A-Scan** to be used for the recording is equal to **Probe Delay** setting in submenu **MEASURE** of **UDS 3-5 Pulser Receiver** preceeding entering into **ABIScan** mode
- **Total Length of ABIScan Record** is determined automatically according to:
 - Total Length of ABIScan Record = Total Scan Length + 2 * Skip # * Thickness * Tan (Angle)**
 - where
 - ◆ **Thickness**, **Skip #**, and **Total Scan Length = Length** are the settings of **ABIScan** control panel
 - ◆ **Angle** is setting in submenu **MEASURE** of **UDS 3-5 Pulser Receiver** preceeding entering into **ABIScan** mode

Thickness and Skip

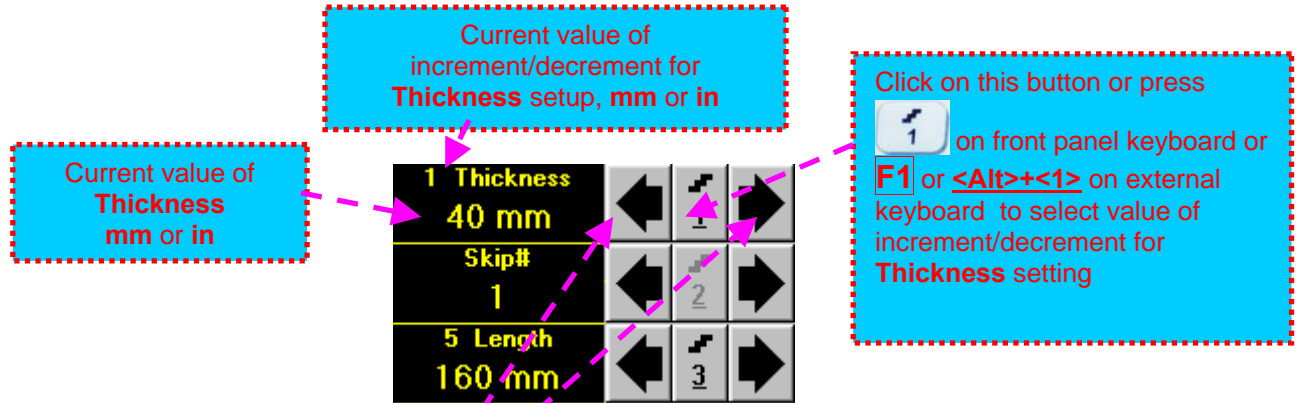
Thickness and **Skip #** settings define the region of interest starting from the scanning surface and automatic **Range** setting for current **A-Scan** to be used for the recording:

$$\text{Range} = 2 \times \text{Skip \#} \times \text{Thickness} \times \text{Cos (Angle)}$$

whereas

- ◆ **Thickness** and **Skip #** are the settings of **ABIScan** control panel
- ◆ **Angle** is setting in submenu **MEASURE** of **UDS 3-5 Pulsar Receiver** precessing entering into **ABIScan** mode

For objects with parallel surfaces the actual **Thickness** value to be entered for full skip inspection (**Skip # = 1**)



To control **Thickness** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press on front panel keyboard or **F1** on external keyboard ⇒ **Thickness** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

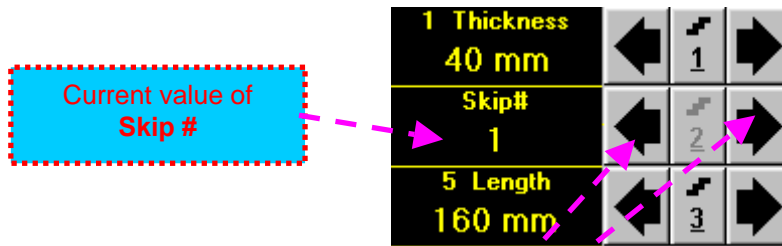
- **Combined**

- Click on **Thickness** ⇒ **Thickness** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard



The value of **Thickness** is adjustable between 5 and 300 **mm** or 0.2 and 12 **in** (expandable on special inquire)

Skip












To control **Skip #** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F2** on external keyboard ⇒ **Skip #** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

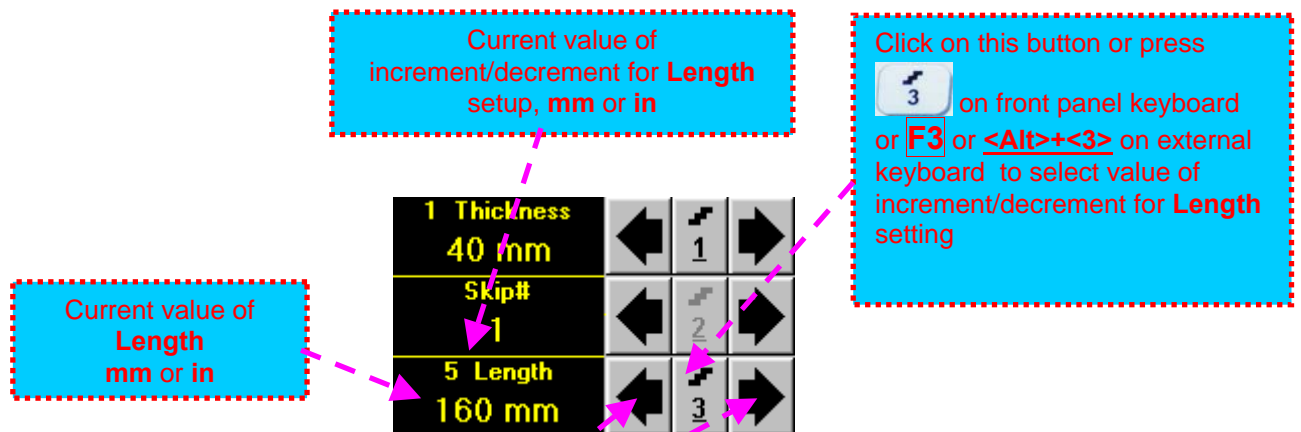
- Click on **Skip #** ⇒ **Skip #** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The **Skip #** setting may be **0.5** – half skip insonification or **1** – full skip insonification

Scan Length

Length represents length of section of test object to be displayed, over which probe will be scanning during recording period





To control **Length** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F3** on external keyboard ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Length** ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of **Length** is adjustable between 50 and 1000 **mm** or 2 and 40 **in**

Encoder

Select encoder to be used through appropriate box



Clamp probe into encoder – refer to Chapter 7 of this Operating Manual

Connect encoder to its input on the rear panel of **ISONIC 2005 / 2020 / STAR** instrument

Insert Text Note

Refer to paragraph 6.3.2.1 of this Operating Manual

Preview UDS 3-5 Settings



Refer to paragraph 6.3.2.1 of this Operating Manual



ABIScan Record Palette



There are four palettes available through click on appropriate button:





Start/Stop t-ABIScan recording

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to start **ABIScan** recording

 button becomes invisible since **ABIScan** recording starts.  button occupies its position.

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to terminate **ABIScan** recording prior to automatic completion

 button becomes invisible after termination of **ABIScan** record.  button returns to its position

Save record into a file

Refer to paragraph 6.3.2.1 of this Operating Manual

Open record from a file and starting postprocessing session

Refer to paragraph 6.3.2.1 of this Operating Manual

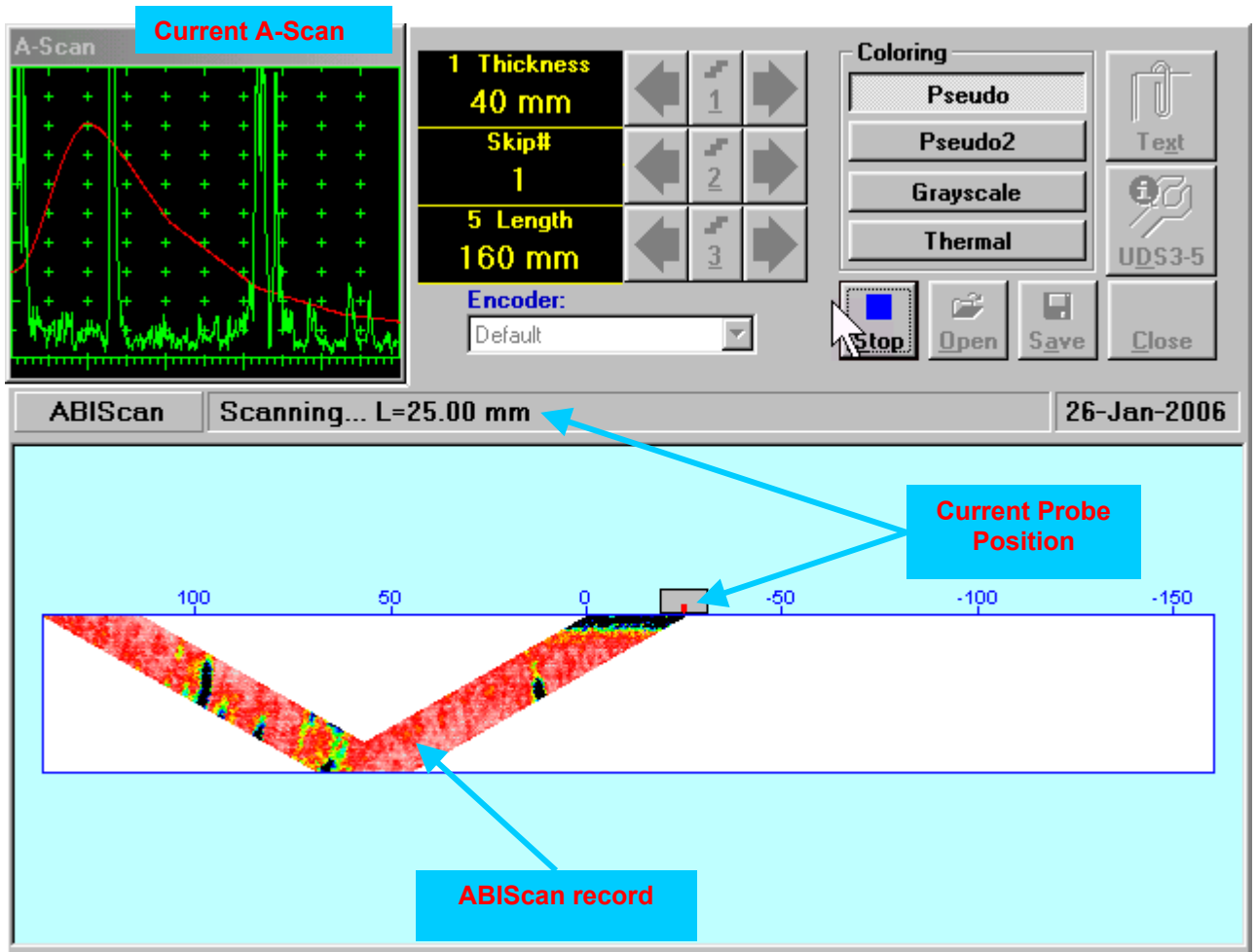
Return to UDS 3-5 main operating surface

Refer to paragraph 6.3.2.1 of this Operating Manual

6.4.2.8. ABIScan – Scanning (Angle Beam Probes)

- Apply probe equipped with an encoder to test object in the start point of selected scanning line

- Click on **Start** or press **I** on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard
- Guide probe over the scanning line – typical scanning progress display during is shown and explained below



6.4.2.9. t-ABIScan / ABIScan – Postprocessing

Versatile postprocessing of **t-ABIScan / ABIScan** records is featured with:

- ❑ Sizing defects at any location along stored images (coordinates, projection size, amplitude-based evaluation)
- ❑ Play-back and evaluation of **A-Scans** obtained and captured during **t-ABIScan / ABIScan** defects imaging and recording
- ❑ Defects outlining and pattern recognition based on **A-Scan** sequence analysis – **Echo Dynamic Pattern Analysis**
- ❑ Reconstruction of **B-Scan** defects images for various **Gain, Reject,** and **off-line Gate** level settings
- ❑ **DAC / DGS t-ABIScan / ABIScan** normalization





The screen as below appears upon opening file. All postprocessing procedures are performed through **menu bar** – touch screen stylus or front panel or external mouse to be used

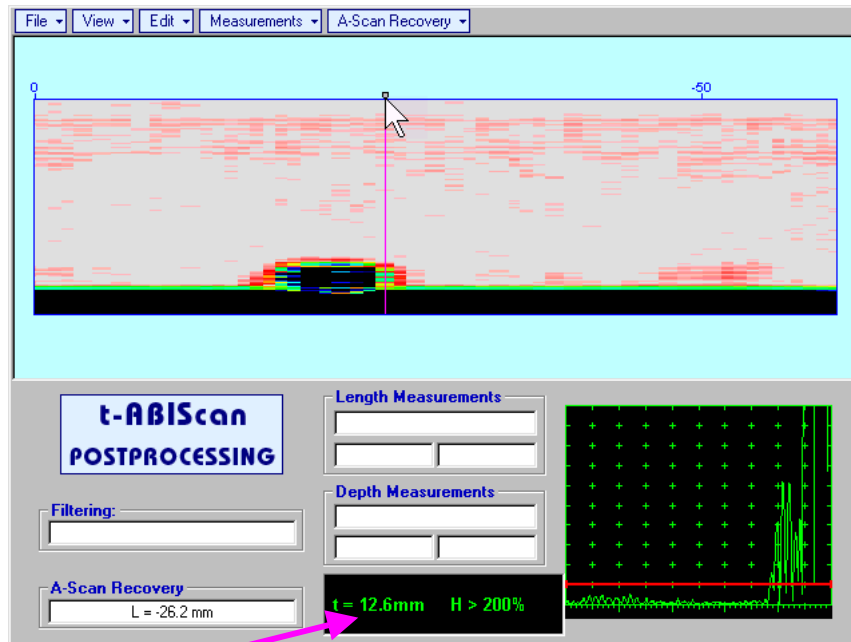


Menu Bar Functions

- **File→Open** – opens new **t-ABIScan / ABIScan** file
- **File→Snapshots→Add Snapshot** – stores current postprocessing screen snapshot accompanied with appropriate settings and measurements into *postprocessing session memory stack*
- **File→Snapshots→Restore Snapshot** – recalls earlier stored postprocessing screen snapshot accompanied with appropriate settings and measurements from *postprocessing session memory stack*
- **File→Snapshots→Delete Snapshot** – deletes earlier stored postprocessing screen snapshot accompanied with appropriate settings and measurements from *postprocessing session memory stack*
- **File→Print** – prints out postprocessing screen snapshot(s) accompanied with appropriate settings and measurements
- **File→Exit** – returns to **t-ABIScan / ABIScan** control panel
- **View→Instrument** – indicates setup of **UDS 3-5** Pulsar Receiver used for scanning when file was created
- **View→Inspection Data** – indicates operator's comments entered prior to scanning
- **View→Coloring** – selects palette for **t-ABIScan / ABIScan** image

- **A-Scan Recovery →ON** (*straight beam inspection record*) – generates *cursor representing sound path* of straight beam probe's central beam in the object under test that may be guided over **t-ABIScan** /


ABIScan image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *sound path cursor* position. Starting position of cursor (**L**) corresponding to probe's center is indicated in the **A-Scan Recovery** field. On the recovered **A-Scan** there is red **Off-line Gate** presented. Initially **Off-line Gate** covers whole **A-Scan** range




Automatic Measurements Display accompanies recovered **A-Scan** and indicates (refer to paragraphs 5.1.12, 5.2.13.1 and 5.2.13.2 of this Operating Manual):





- depth **t** of reflector (measurement mode - **Flank**)
- amplitude **H** of the maximal signal in the **Off-line Gate** expressed in % of full **A-Scan** height
- **ΔVC** (dB to DAC) of the maximal signal in the **Off-line Gate** provided that DAC was active whilst recording **t-ABIScan** / **ABIScan** data

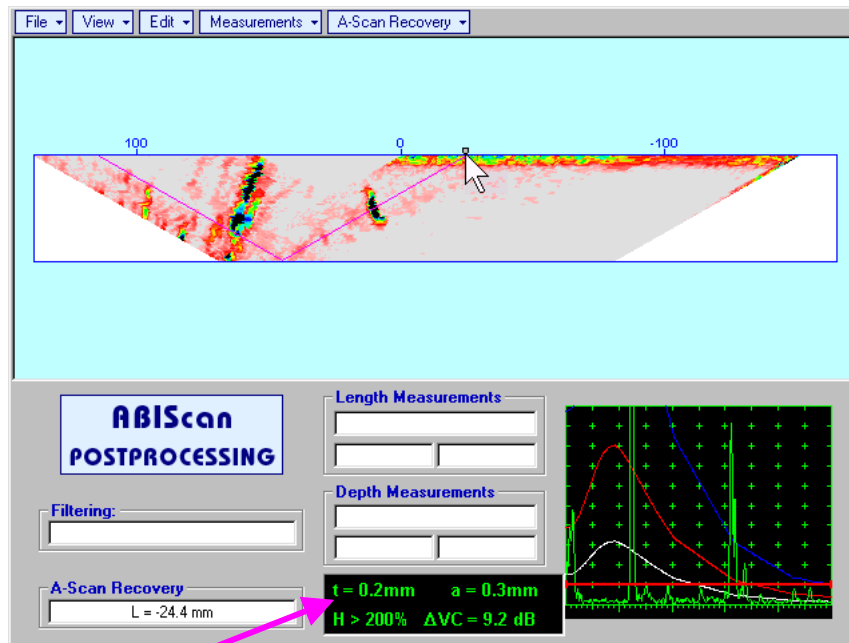
To fix position of *sound path cursor* with corresponding recovered **A-Scan** and **Automatic**

Measurements Display data left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard

To interrupt recovery of **A-Scans** and empty **A-Scan Recovery** field right mouse click or press  on front panel keyboard or **Esc** on external keyboard

- **A-Scan Recovery →OFF** (*straight beam inspection record*) – erases *sound path cursor* with recovered **A-Scan** and **Automatic Measurements Display** and empties **A-Scan Recovery** field


- **A-Scan Recovery →ON** (*angle beam inspection record*) – generates *cursor representing sound path* of angle beam probe's central beam in the object under test that may be guided over **t-ABIScan / ABIScan** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *sound path cursor* position. Starting position of cursor (**L**) corresponding to probe's incidence point is indicated in the **A-Scan Recovery** field. On the recovered **A-Scan** there is red **Off-line Gate** presented. Initially **Off-line Gate** covers whole **A-Scan** range




Automatic Measurements Display accompanies recovered **A-Scan** and indicates (refer to paragraphs 5.1.12, 5.2.13.1 and 5.2.13.2 of this Operating Manual):











- depth **t** of reflector (measurement mode - **Flank**)
- distance **a** between probe incidence point and reflector taken along scanning surface (measurement mode - **Flank**)
- amplitude **H** of the maximal signal in the **Off-line Gate** expressed in % of full **A-Scan** height
- **ΔVC (dB to DAC)** of the maximal signal in the **Off-line Gate** provided that DAC was active whilst recording **t-ABIScan / ABIScan** data

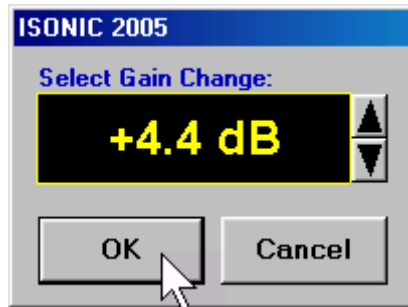
To fix position of *sound path cursor* with corresponding recovered **A-Scan** and **Automatic**

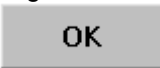

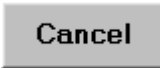

Measurements Display data left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard

To interrupt recovery of **A-Scans** and empty **A-Scan Recovery** field right mouse click or press  on front panel keyboard or **Esc** on external keyboard

- **A-Scan Recovery →OFF** (*angle beam inspection record*) – erases *sound path cursor* with recovered **A-Scan** and **Automatic Measurements Display** and empties **A-Scan Recovery** field





- Edit→Change Gain→ON** – (*straight beam and angle beam inspection records*) generates *cursor representing sound path* of probe's central beam in the object under test that may be guided over **t-ABIScan** / **ABIScan** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *sound path cursor* position. To select reference **A-Scan** release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard – this generates subwindow allowing off-line re-adjusting of **Gain** for all **A-Scans** captured during **t-ABIScan** / **ABIScan** recording in **±6dB** range with **±0.1 dB** increments through clicking or pressing and holding on  or pressing  ,  on front panel keyboard or  ,  on external keyboard










- During **Gain** re-adjusting reference **A-Scan** is modified accordingly. Upon completing re-adjusting **Gain** click on  or press  on front panel keyboard or **Enter** on external keyboard – this applies new **Gain** value to all captured **A-Scans** and redraws **t-ABIScan** / **ABIScan** image accordingly
- To interrupt re-adjusting of **Gain** click on  or press  on front panel keyboard or **Esc** on external keyboard

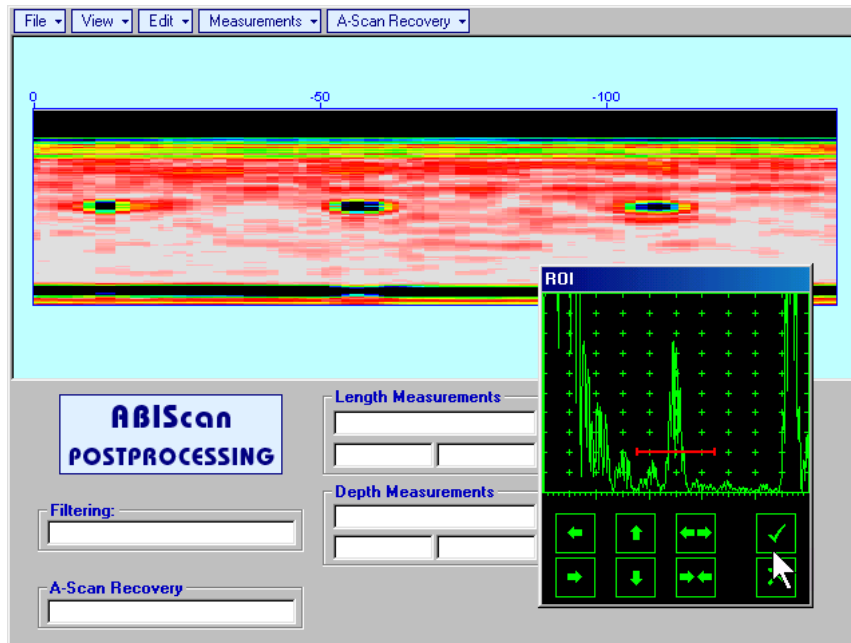
- Edit→Change Gain→OFF** – negates **Gain** re-adjustment and returns to originally recorded **t-ABIScan** / **ABIScan** image and original **Gain** setting


- **Edit→ROI→ON** (*straight beam inspection record*) – generates *cursor* representing *sound path* of straight beam probe's central beam in the object under test that may be guided over **t-ABIScan** /

ABIScan image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *sound path cursor* position. To select reference **A-Scan** release touch screen stylus or left mouse click or press


 on front panel keyboard or **Enter** on external keyboard – this generates **Off-line Gate** controls

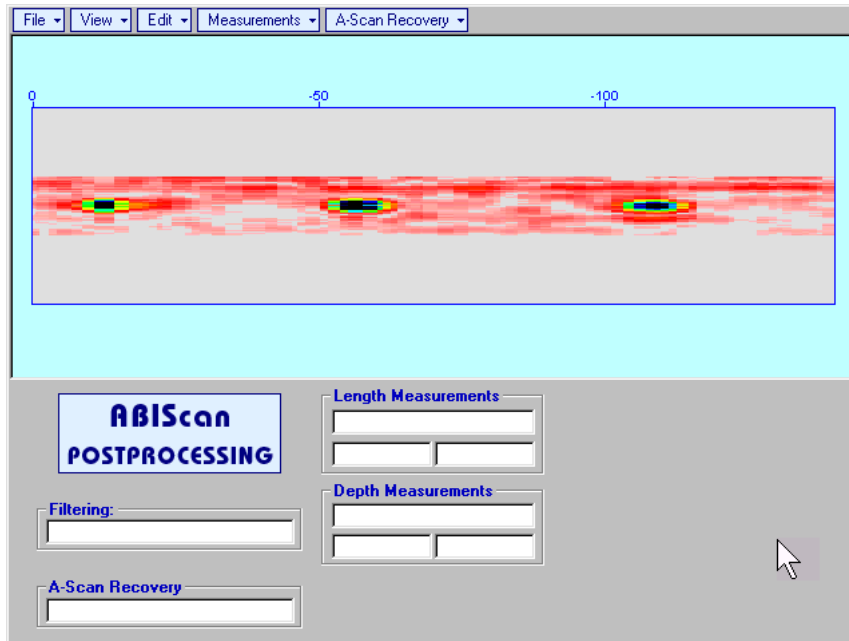
 ,  ,  ,  ,  ,  allowing to redefine **Region Of Interest** for **t-ABIScan** / **ABIScan** imaging



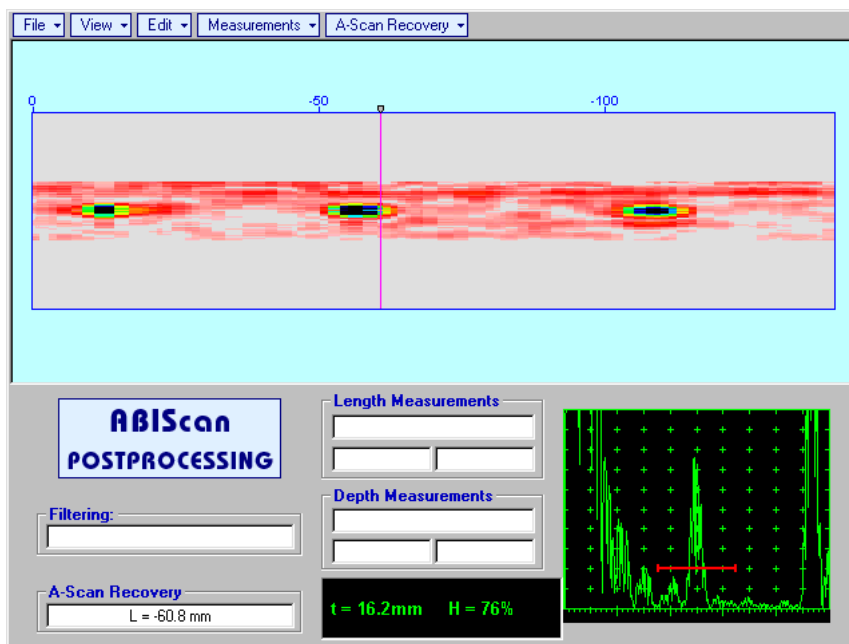
To interrupt selection of reference of **A-Scan** right mouse click or press  on front panel keyboard or **Esc** on external keyboard

To interrupt re-adjustment of **Region Of Interest** after selection of reference of **A-Scan** click on 












Upon completing redefining of **Region Of Interest** click on  – this applies new **Off-line Gate** to all captured **A-Scans** and updates **t-ABIScan / ABIScan** image accordingly – only segment of **t-ABIScan / ABIScan** image covered by newly adjusted **Off-line Gate** remains visible

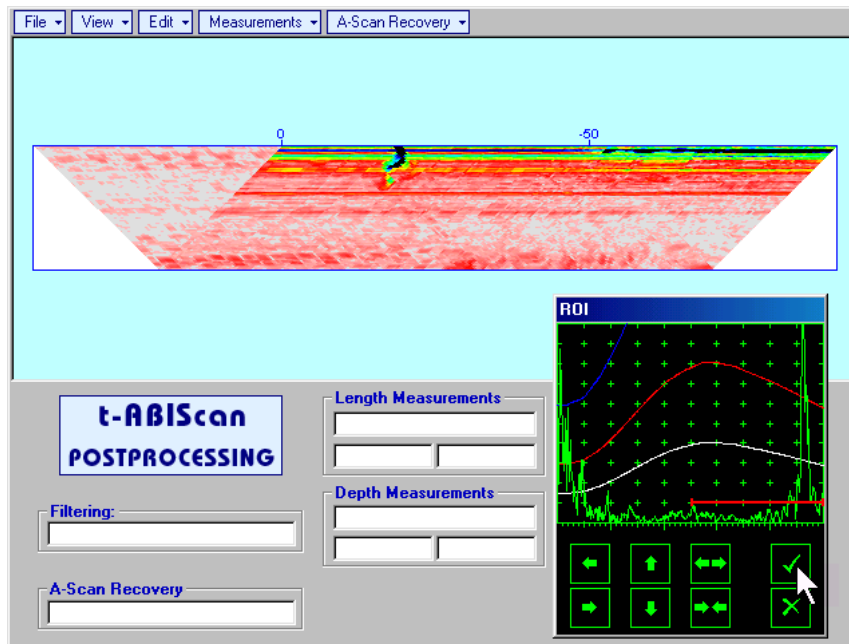



It is possible then to perform **A-Scan** signals evaluation using newly adjusted **Off-Line Gate** through **A-Scan Recovery** → **ON**




- **Edit→ROI→OFF** (*straight beam inspection record*) – negates **Off-line Gate** re-adjustment and returns to originally recorded **t-ABIScan / ABIScan** image and initial **Off-line Gate** setting

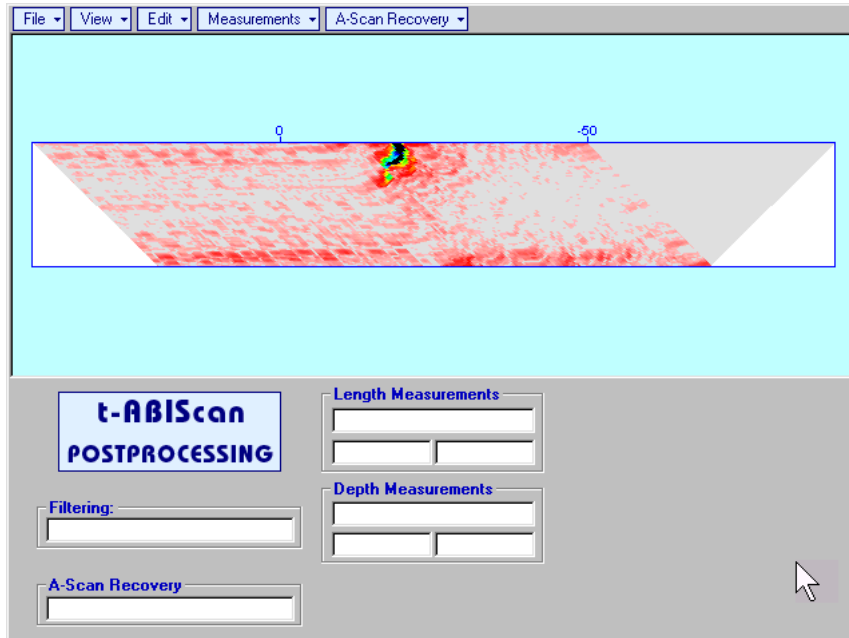
- Edit→ROI→ON** (*angle beam inspection record*) – generates *cursor representing sound path* of angle beam probe's central beam in the object under test that may be guided over **t-ABIScan / ABIScan** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *sound path cursor* position. To select reference **A-Scan** release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard – this generates **Off-line Gate** controls , , , , ,  allowing to redefine **Region Of Interest** for **t-ABIScan / ABIScan** imaging



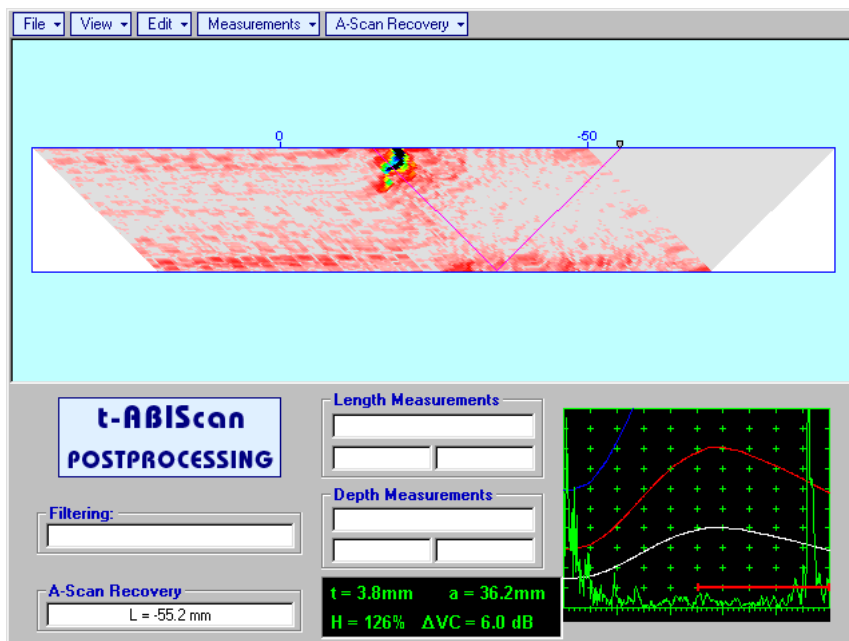
To interrupt selection of reference of **A-Scan** right mouse click or press  on front panel keyboard or **Esc** on external keyboard

To interrupt re-adjustment of **Region Of Interest** after selection of reference of **A-Scan** click on 





Upon completing redefining of **Region Of Interest** click on  – this applies new **Off-line Gate** to all **A-Scans** captured during **t-ABIScan / ABIScan** recording and updates **t-ABIScan / ABIScan** image accordingly – only segment of **t-ABIScan / ABIScan** image covered by newly adjusted **Off-line Gate** remains visible: in the present example there was under surface crack detected using full skip insonification and **Off-line Gate** was readjusted by such a way that only full skip segment of **t-ABIScan / ABIScan** image remained visible – this allowed to eliminate disturbing presence of initial pulse reverberations on the **t-ABIScan / ABIScan** image

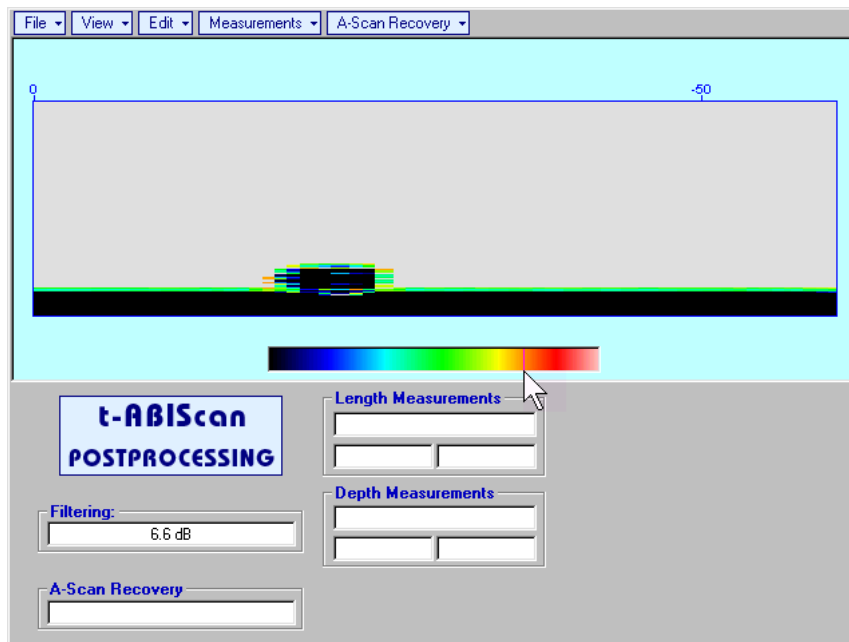


It is possible then to perform **A-Scan** signals evaluation using newly adjusted **Off-Line Gate** through **A-Scan Recovery** → **ON**



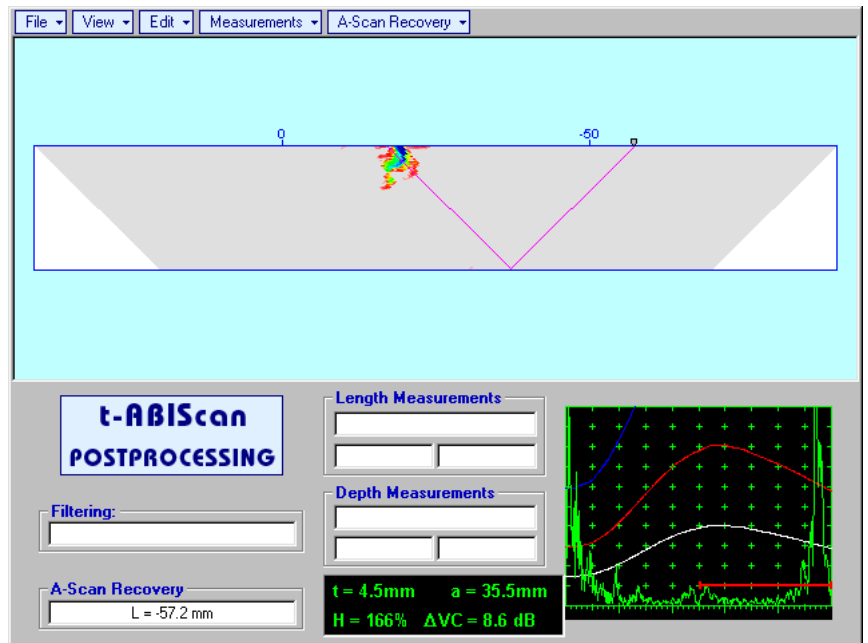
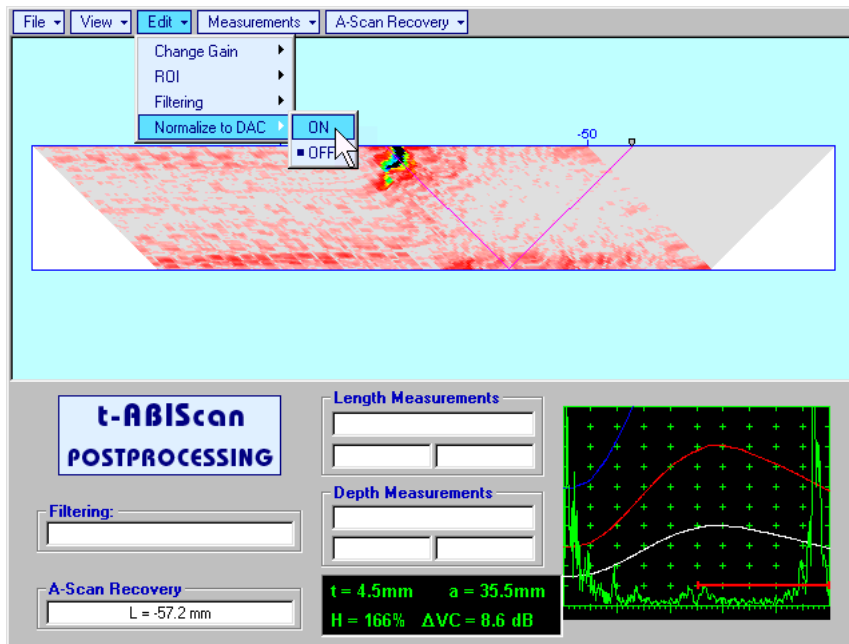
- **Edit**→**ROI**→**OFF** (*angle beam inspection record*) – negates **Off-line Gate** re-adjustment and returns to originally recorded **t-ABIScan / ABIScan** image and initial **Off-line Gate** setting

- **Edit→Filtering→ON** – (*straight beam and angle beam inspection records*) generates *amplitude palette bar* with *sliding cursor*, which may be controlled using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard . Position of the *sliding cursor* on the *amplitude palette bar* determines filtering level, which is indicated in the **Filtering** field. All elements of **t-ABIScan / ABIScan** image representing signal amplitude below filtering level are suppressed:



- **Edit→Filtering→OFF** (*straight beam and angle beam inspection records*) – returns to originally recorded **t-ABIScan / ABIScan** image and empties **Filtering** field













- **Edit→Normalize to DAC→ON** (*straight beam and angle beam inspection records*) – applies **DAC/DGS** normalized color palette to **t-ABIScan / ABIScan** image, which was recorded with active **DAC/DGS** and redraws **t-ABIScan / ABIScan** image correspondingly (**dB to DAC/DGS** normalization)

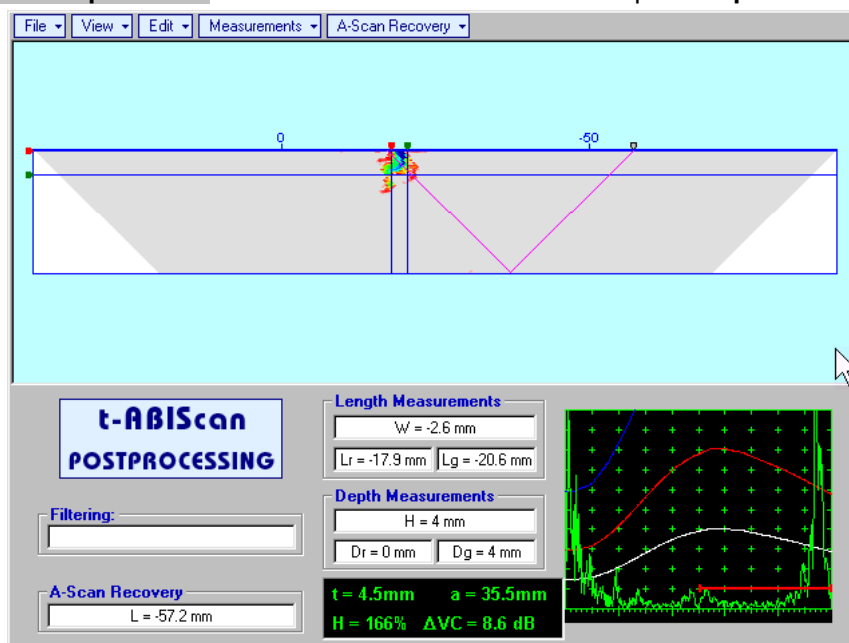


- **Edit→Normalize to DAC→OFF** (*straight beam and angle beam inspection records*) – negates **dB to DAC/DGS** normalization and returns to originally recorded **t-ABIScan / ABIScan** image



Applying of **Edit→Normalize to DAC→ON** or **Edit→Normalize to DAC→OFF** negates **Filtering** (**Edit→Filtering→OFF**)

- Measurements→Length→ON** – generates first vertical cursor that may be guided over **t-ABIScan / ABIScan** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard . Coordinate of the first vertical cursor along **t-ABIScan / ABIScan** image (**Lr**) is indicated in the **Length Measurements** field. To fix position of the first vertical cursor left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard . To interrupt vertical cursor manipulations and empty **Length Measurements** field right mouse click or press  on front panel keyboard or **Esc** on external keyboard
 Second vertical cursor appears upon fixing first one, it may be manipulated by the same way. Coordinate of the second vertical cursor along **t-ABIScan / ABIScan** image (**Lg**) is indicated in the **Length Measurements** field along with parameter **W = Lg – Lr**. Parameter **W** represents projection length of defect provided that vertical cursors are placed appropriately
- Measurements→Length→OFF** – erases vertical cursors and empties **Length Measurements** field
- Measurements→Depth→ON** – generates first horizontal cursor that may be guided over **t-ABIScan / ABIScan** image using either touch screen or mouse or ,  on front panel keyboard or ,  on external keyboard . Coordinate of the first horizontal cursor along **t-ABIScan / ABIScan** image (**Dr**) is indicated in the **Depth Measurements** field. To fix position of the first horizontal cursor left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard . To interrupt horizontal cursor manipulations and empty **Depth Measurements** field right mouse click or press  on front panel keyboard or **Esc** on external keyboard
 Second horizontal cursor appears upon fixing first one, it may be manipulated by the same way. Coordinate of the second horizontal cursor along **t-ABIScan / ABIScan** image (**Dg**) is indicated in the **Depth Measurements** field along with parameter **H = Dg – Dr**. Parameter **H** represents thickness loss provided that horizontal cursors are placed appropriately
- Measurements→Depth→OFF** – erases horizontal cursors and empties **Depth Measurements** field



6.5. TOFD Inspection – RF B-Scan and D-Scan Imaging and Recording – t-TOFD or TOFD

6.5.1. Setup Pulser Receiver for t-TOFD and TOFD

UDS 3-5 Pulser Receiver window – main operating surface – appears on ISONIC 2005 / 2020 / STAR

screen upon clicking on  or . The following settings to be provided:

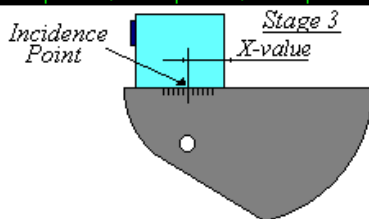
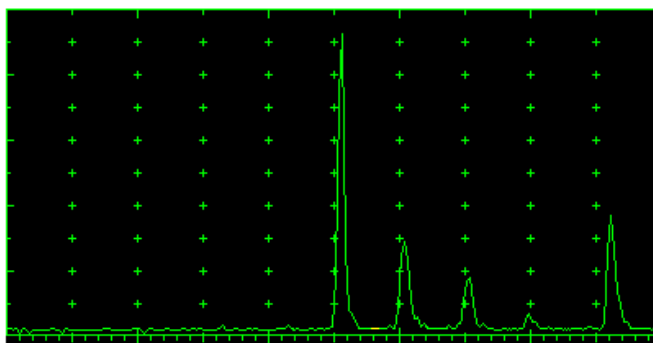
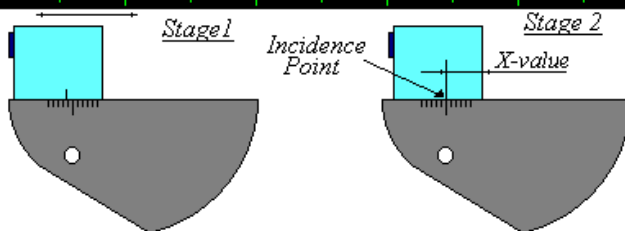
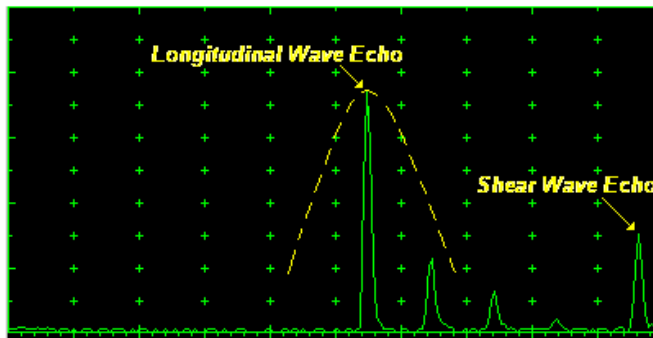
#	Parameter or Mode	Submenu	Required Settings	Note
1	Pulser Mode	PULSER	Dual	
2	Tuning, Pulse Width, Firing Level, Damping	PULSER	Tuning, Pulse Width, Firing Level, and Damping settings to provide optimal signal to noise ratio	To synchronize with Gain setting procedure
3	Filter, Frequency	RECEIVER	Filter and Frequency settings to match with probe's frequency	To synchronize with Gain setting procedure
4	Display	RECEIVER	RF	
5	USVelocity	BASIC	USVelocity setting to be equal to actual value of ultrasound velocity in the object under test	
6	Probe Delay	MEASURE	Probe Delay setting to be equal to actual Accumulated Probe Pair Delay	Accumulated Probe Pair Delay may be determined according to paragraph 6.5.1.1 of this Operating Manual
7	Display Delay Range	BASICS	Display Delay and Range to provide clear A-Scan representing: <ul style="list-style-type: none"> o Lateral Wave and Longitudinal Wave Back Echo Signals at the beginning and at the end of A-Scan correspondingly <li style="text-align: center;">OR o Lateral Wave, Longitudinal Wave Back Echo, and Mode Conversion Back Echo at the beginning, middle, and at the end of A-Scan correspondingly <li style="text-align: center;">OR o Other combination of signals required by Inspection procedure 	Display Delay and Range will be determined according to paragraph 6.5.1.2 of this Operating Manual
8	Gain	BASICS	Gain setting to be performed according to inspection procedure providing required amplitude of signals from defects to be detected	Refer to paragraph 6.5.1.3 of this Operating Manual
9	Settings for other parameters and modes have no significance			

Click on  or press  on front panel keyboard or **F8** on external keyboard upon completing

6.5.1.1. Accumulated Probe Pair Delay

Two probes to be used in order to capture the *TOFD Map*. The **Probe Delay** to be precisely measured for each of them.

Measuring Probe Delay - Miniature Probes (contact face width 12.5 mm / 0.5 in or less) – Pulse Echo Technique



Activate submenu **PULSER** then set:

- Pulser Mode to Single**
- Pulse Width to Spike (240 μJ)** for probe having resonant frequency of 8 MHz and higher or to **PW ns**, were **PW = 0.5 / F** (F is the probe resonant frequency) for probes having resonant frequency below 8 MHz
- Firing Level to 18**
- Damping to 1000 Ω**
- Tuning to NO**

Activate submenu **RECEIVER** then set:

- Display to Full or RF**
- Filter to BB**
- Frequency to completely cover probe's effective bandwidth**

Activate submenu **BASICS** topic then set:

- US Velocity to 5920 m/s (233.1 in/ms)**
- Range to 50.0 mm (2 in)**
- Display Delay to 0 μs**
- Reject to 0%**

Stage 1: Manipulate probe over main working surface of V-2 reference standard and maximize echo from 25 mm (1 in) radius concave reflector

Stage 2: Fix probe in found position - the center of 25 mm (1 in) radius concave reflector will indicate **incident point** while the distance between probe's frontal edge and **incident point** is equal to **X-Value**

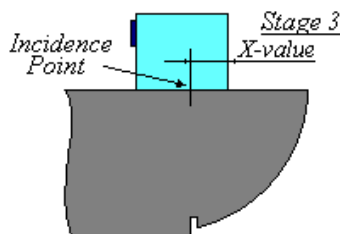
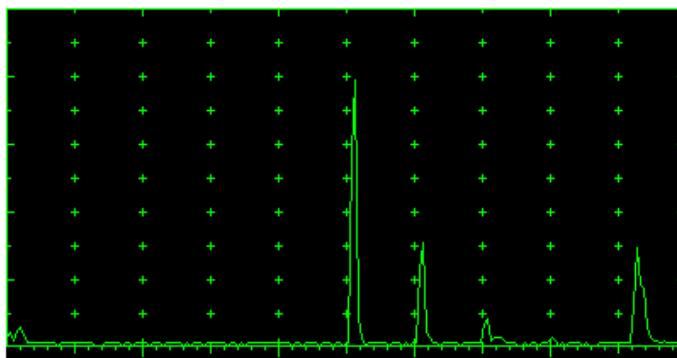
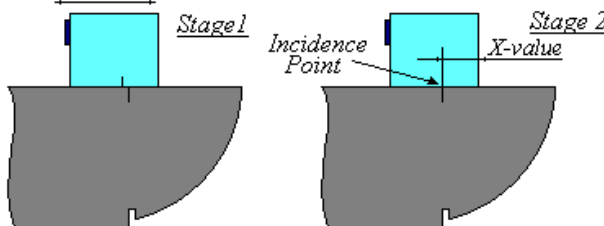
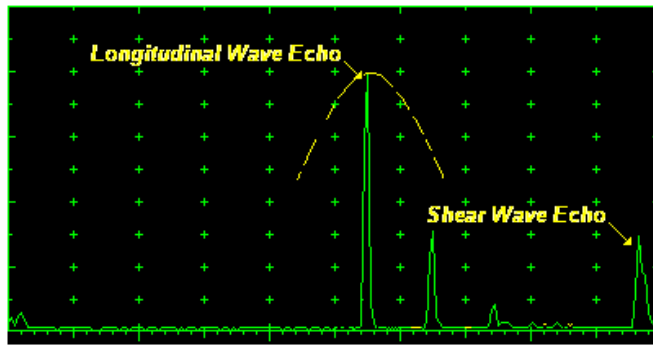
Stage 3: Tune **Display Delay** while probe is still fixed in found position until rising edge of maximized echo will match with 50%-grid of the **A-Scan** width. Upon completing the *obtained value of Display Delay will be equal to actual Probe Delay*



- ◆ It's necessary to setup **Gain** bringing height of maximized echo to **75-80%** of **A-Scan** height
- ◆ It is recommended to optimize **Tuning** in **PULSER** submenu upon obtaining maximized echo. The goal of such optimization is increasing of ultrasonic excitation energy through better matching between firing output and probe. Level of ultrasonic excitation energy is clearly represented by echo amplitude. Upon completing **Tuning** optimization **Gain** to be adjusted to bring echo to **75-80%** of **A-Scan** height

Supposing that **Probe Delay** values found for probes of the pair are **PD₁** and **PD₂**
Accumulated Probe Pair Delay = 0.5•(PD₁ + PD₂)

Measuring Probe Delay - Large and Medium Size Probes (contact face width more than 12.5 mm / 0.5 in) – Pulse Echo Technique



Activate submenu **PULSER** then set:

- Pulser Mode**
- Pulse Width** to **Spike (240 μJ)** for probe having resonant frequency of 8 MHz and higher or to **PW ns**, where $PW = 0.5 / F$ (F is the probe resonant frequency) for probes having resonant frequency below 8 MHz
- Firing Level** to **18**
- Damping** to **1000 Ω**
- Tuning** to **NO**

Activate submenu **RECEIVER** then set:

- Display** to **Full** or **RF**
- Filter** to **BB**
- Frequency** to completely cover probe's effective bandwidth

Activate submenu **BASICS** topic then set:

- US Velocity** to **5920 m/s (233.1 in/ms)**
- Range** to **200.0 mm (8 in)**
- Display Delay** to **0 μs**
- Reject** to **0%**

Stage 1: Manipulate probe over main working surface of V-1 reference standard and maximize echo from 100 mm (4 in) radius concave reflector

Stage 2: Fix probe in found position - the center of 100 mm (4 in) radius concave reflector will indicate **incident point** while the distance between probe's frontal edge and **incident point** is equal to **X-Value**

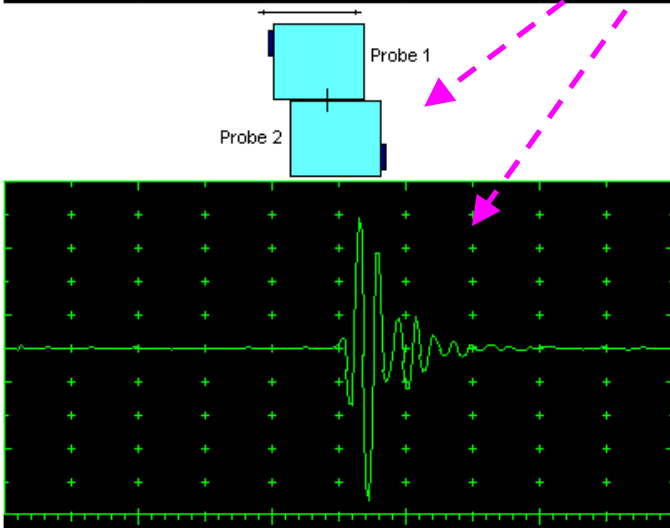
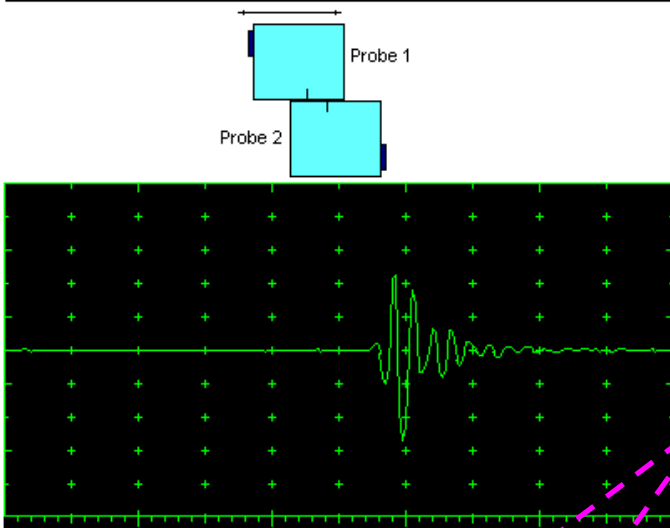
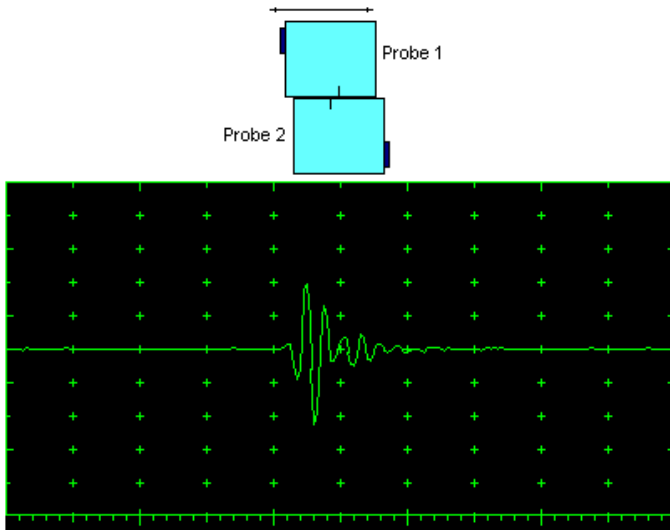
Stage 3: Tune **Display Delay** while probe is still fixed in found position until rising edge of maximized echo will match with 50%-grid of the **A-Scan** width. Upon completing the *obtained value of Display Delay will be equal to actual Probe Delay*



- ◆ It's necessary to setup **Gain** bringing height of maximized echo to **75-80%** of **A-Scan** height
- ◆ It is recommended to optimize **Tuning** in **PULSER** submenu upon obtaining maximized echo. The goal of such optimization is increasing of ultrasonic excitation energy through better matching between firing output and probe. Level of ultrasonic excitation energy is clearly represented by echo amplitude. Upon completing **Tuning** optimization **Gain** to be adjusted to bring echo to **75-80%** of **A-Scan** height

Supposing that **Probe Delay** values found for probes of the pair are PD_1 and PD_2
Accumulated Probe Pair Delay = $0.5 \cdot (PD_1 + PD_2)$

Direct Measurement of Accumulated Probe Pair Delay - All Sizes of Probes – Through Transmission Technique



Activate submenu **PULSER** then set:

- Pulser Mode** to **Dual**
- Pulse Width** to **Spike (240 μJ)** for probe having resonant frequency of 8 MHz and higher or to **PW ns**, were $PW = 0.5 / F$ (F is the probe resonant frequency) for probes having resonant frequency below 8 MHz
- Firing Level** to **18**
- Damping** to **1000 Ω**
- Tuning** to **NO**

Activate submenu **RECEIVER** then set:

- Display** to **RF**
- Filter** to **BB**
- Frequency** to completely cover probe's effective bandwidth

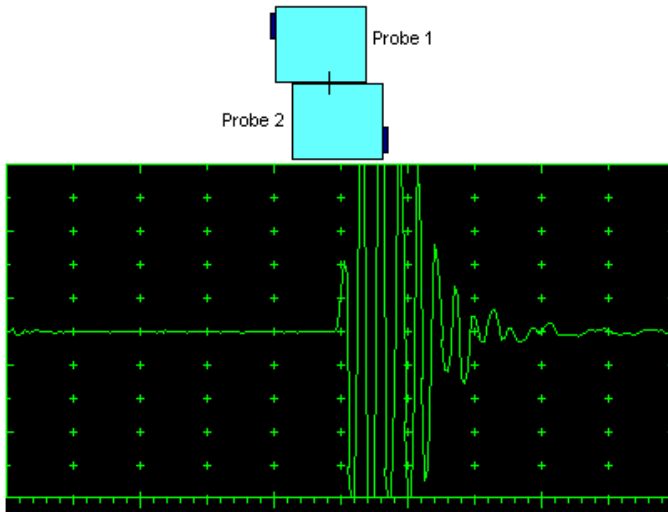
Activate submenu **BASICS** topic then set:

- Display Delay** to **0 μs**

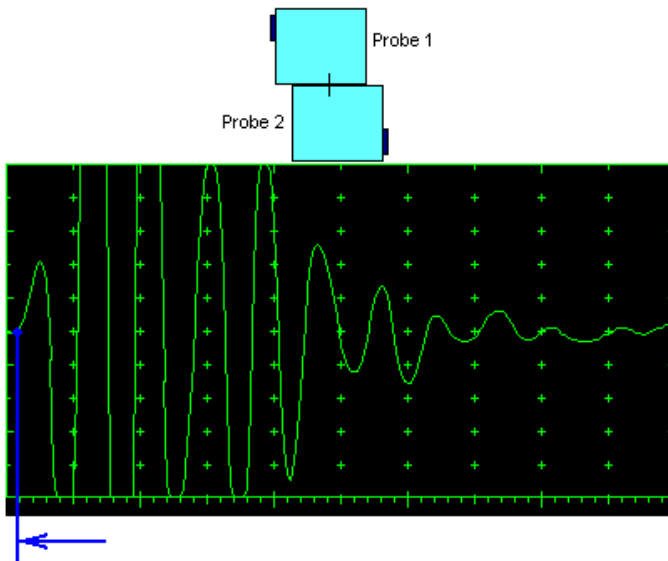
Stage 1: Manipulate probes over each other and setup of **Gain**, **Range**, and **USVelocity** providing firm indication of the signal propagating in the probes wedges from emitting to receiving crystal then maximize said signal

Stage 2: Fix the probe in the found position corresponding to highest signal amplitude

- i**
 - ◆ It's necessary to setup **Gain** bringing height of maximized echo to **75-80%** of **A-Scan** height
 - ◆ It is recommended to optimize **Tuning** in **PULSER** submenu upon obtaining maximized echo. The goal of such optimization is increasing of ultrasonic excitation energy through better matching between firing output and probe. Level of ultrasonic excitation energy is clearly represented by echo amplitude. Upon completing **Tuning** optimization **Gain** to be adjusted to bring echo to **75-80%** of **A-Scan** height



Stage 3: Increase Gain to provide height of first half wave of received signal reaching 20 % of total A-Scan height



Stage 4: Decrease Range to provide ~ 50% of the A-Scan width occupied by the signal

Stage 5: Start increasing of Display Delay aiming displacement of signal's start point to beginning of A-Scan horizontal base

Stage 6: Stop Display Delay manipulation upon reaching the target – at this moment value of Display Delay will represent *Accumulated Delay of the Probes Pair*

Accumulated Probe Pair Delay = Display Delay

UDS3-5 - ISONIC Pulser/Receiver

1	Gain	32 dB	←	1	→
1	Range	15.3 mm	←	2	→
100	US Velocity	5920 m/s	←	3	→
0.01	Display Delay	7.85 μs	←	4	→
5	Reject	0 %	←	5	→

BASICS | PULSER | RECEIVER | GATE A | Menu
 GATE B | ALARM | DAC/TCG | MEASURE | Selection

Close | Alarm | Value: OFF | Freeze | Save | Open | Print | I | DGS

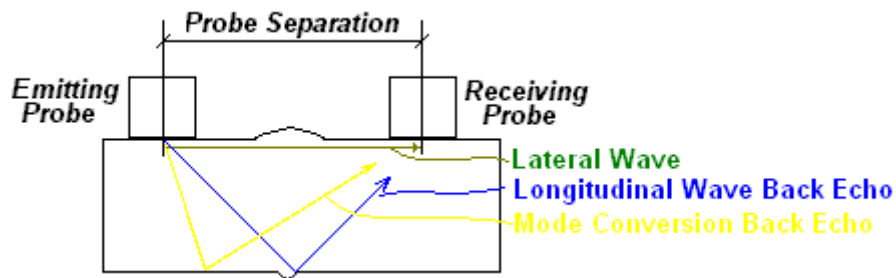
6.5.1.2. Display Delay and Range

Display Delay depends on **Accumulated Probe Pair Delay**, **Probe Separation**, and **USVelocity**:

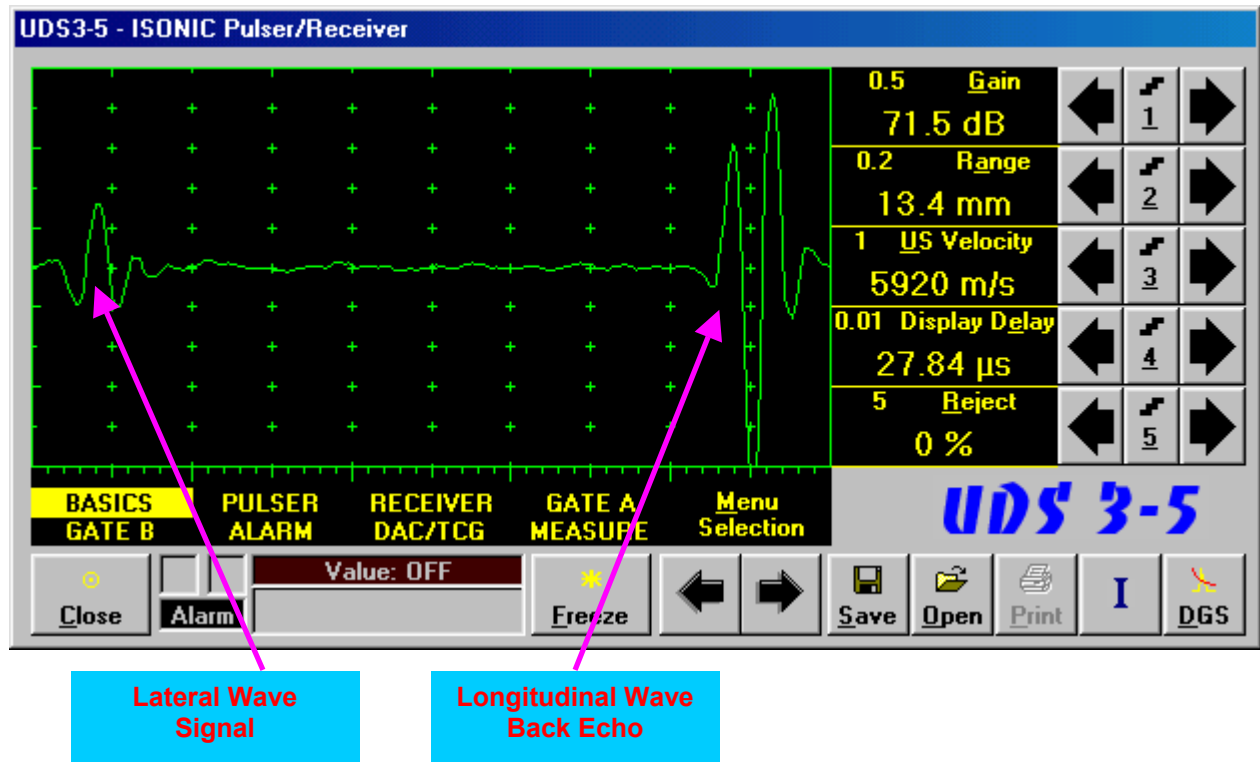
$$\text{Display Delay} = \text{Probe Delay} + \text{Probe Separation} / \text{USVelocity}$$

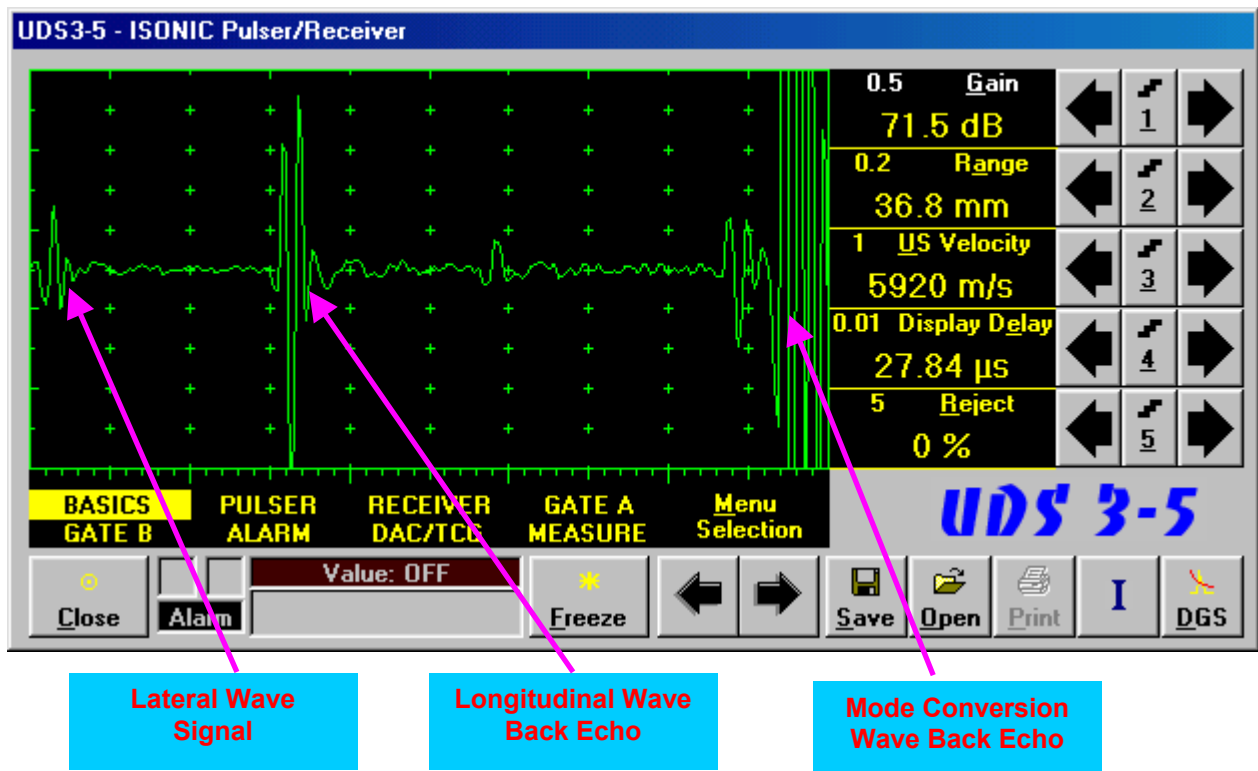
whereas:

- **USVelocity** is the *actual value of longitudinal wave velocity in the material*, of which the object under test is made
- **Probe Separation** is the distance between incidence points of the emitting and receiving TOFD probes measured **along the lateral wave trace**:



Probe Separation should be optimized according to Inspection procedure and probes positions in the **TOFD** fixture to be fixed upon. **Display Delay** and **Range** to be adjusted then to provide representing of signals according to Inspection procedure – the typical examples are given below for 40 mm thickness welded plates.





6.5.1.3. Gain

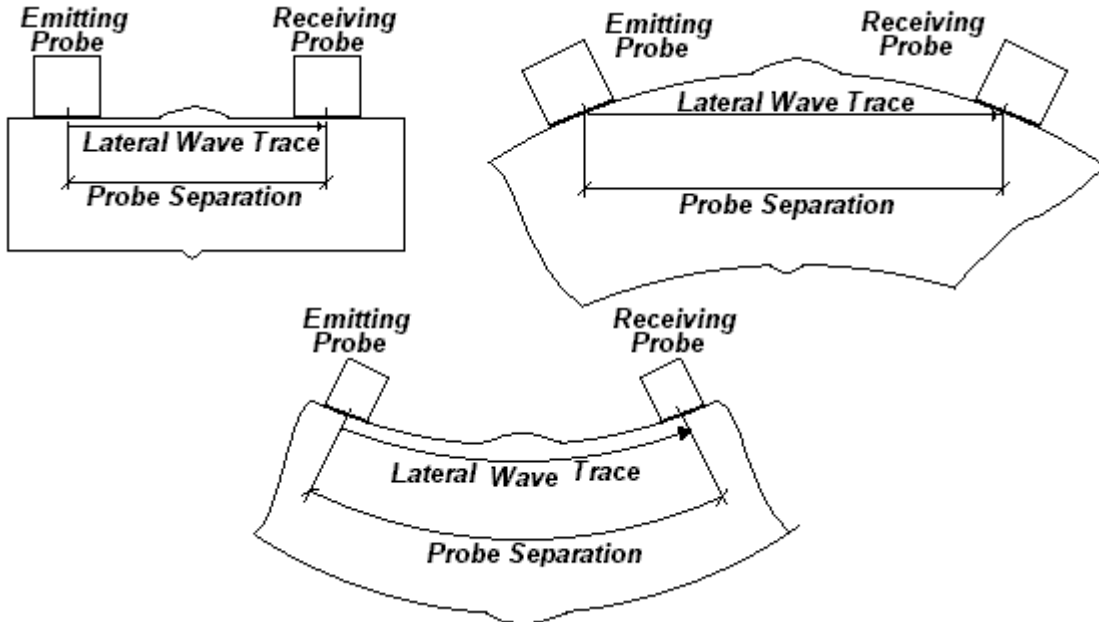
Depending on Inspection procedure (Inspection specs) **Gain** may be setup with the reference to:

- Representative flaw sample
- Artificial diffractors in the form of EDM notches or V-shaped notches
- Side drilled holes
- Grain noise
- Lateral wave signal amplitude

For both examples above the typical procedure of **Gain** setting was provided through bringing height of lateral wave signal to 30% of **A-Scan** height

6.5.1.4. Probe Separation

Probe Separation must be properly defined and entered to have the ability of precise defects sizing at postprocessing stage. Most widely used way of **Probe Separation** determining is mechanical measuring of distance between **TOFD** probes excitation points by using a scaled ruler. However mechanical measurements are not accurate and their implementation becomes quite complicate for objects with curved surfaces:



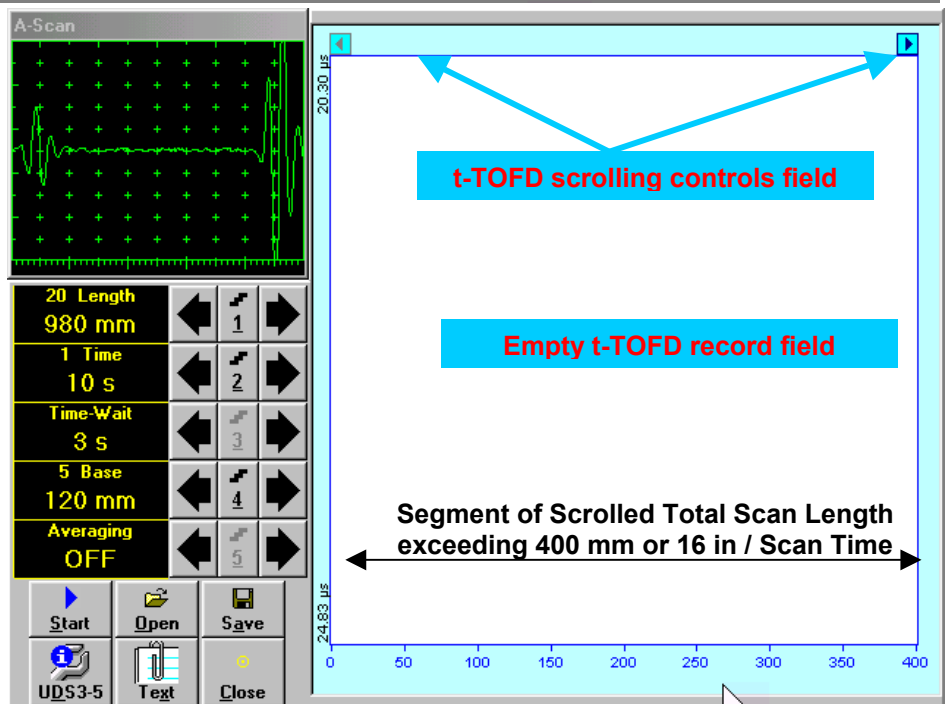
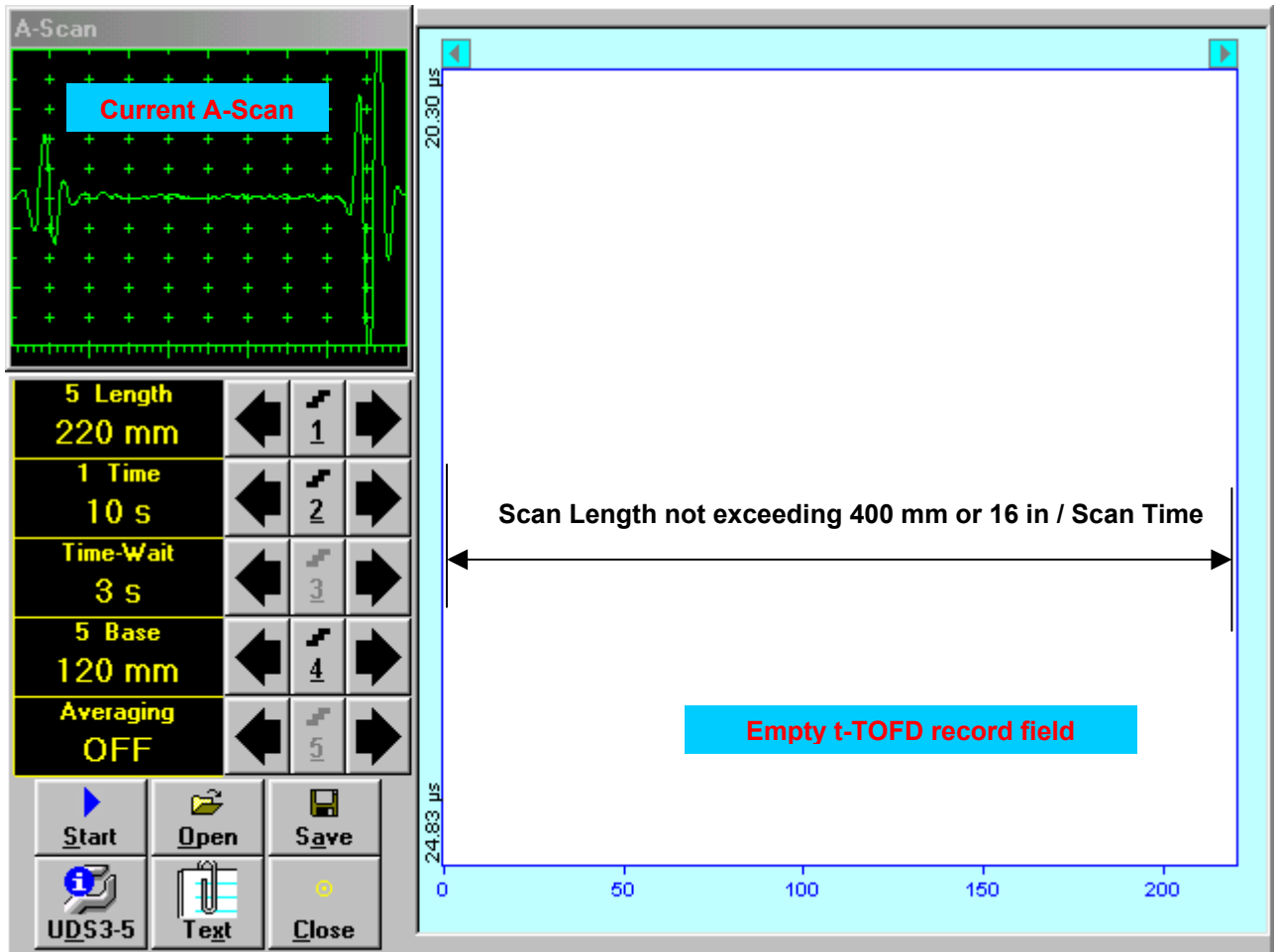
Probe Separation may be defined more precisely through the way as below:

- ❑ Increase **Gain** to provide height of first half wave of lateral wave signal reaching 10-20 % of total **A-Scan** height
- ❑ Activate **Gate A**, setup **aThreshold** to 5%(submenu **GATE A**)
- ❑ Select **s(A)** as **Meas Value** and set **Meas Mode** as **Flank** (submenu **MEASURE**)
- ❑ Provide rising edge of first half wave of lateral wave will cross **Gate A**
- ❑ Define **Probe Separation** as **Probe Separation = 2 × s(A)** whereas **s(A)** is the digital readout taken from **Value** box

6.5.2. t-TOFD and TOFD – Implementation

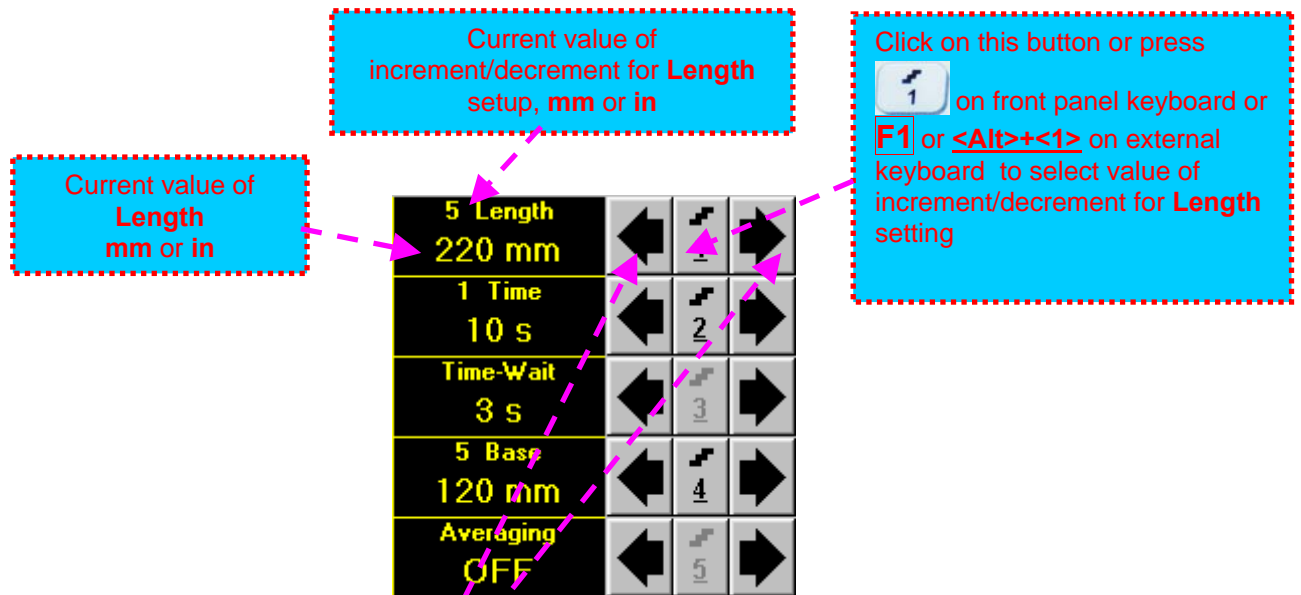
6.5.2.1. t-TOFD – Prior to Scanning

t-TOFD control panel is shown below



Scan Length and Scan Time

Length represents length of section of test object to be displayed, over which probe will be scanning during recording period. **Time** (Scan Time) is the duration of recording period



To control **Length** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on corresponding button

- **Keyboard**

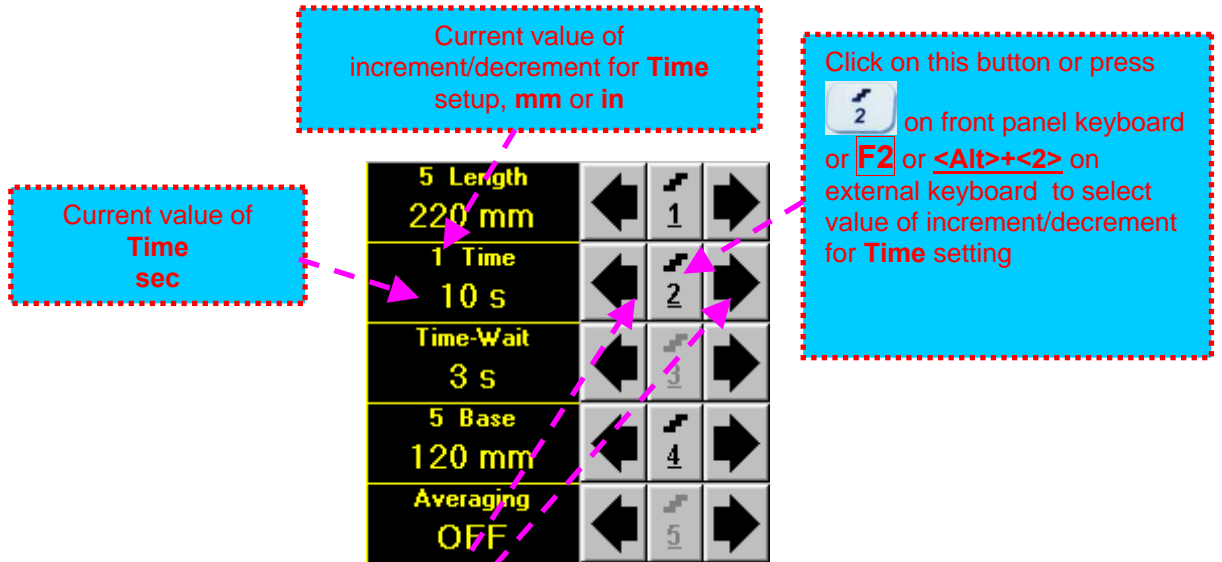
- Press **1** on front panel keyboard or **F1** on external keyboard ⇒ **Length** fore color changes to white - then use **↑**, **→**, **←**, **↓** on front panel keyboard or **↑**, **→**, **←**, **↓** on external keyboard

- **Combined**

- Click on **Length** ⇒ **Length** fore color changes to white - then use **↑**, **→**, **←**, **↓** on front panel keyboard or **↑**, **→**, **←**, **↓** on external keyboard



The value of **Length** is adjustable between 50 and 1000 **mm** or 2 and 40 **in**



To control **Time** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press on front panel keyboard or **F2** on external keyboard ⇒ **Time** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Combined**

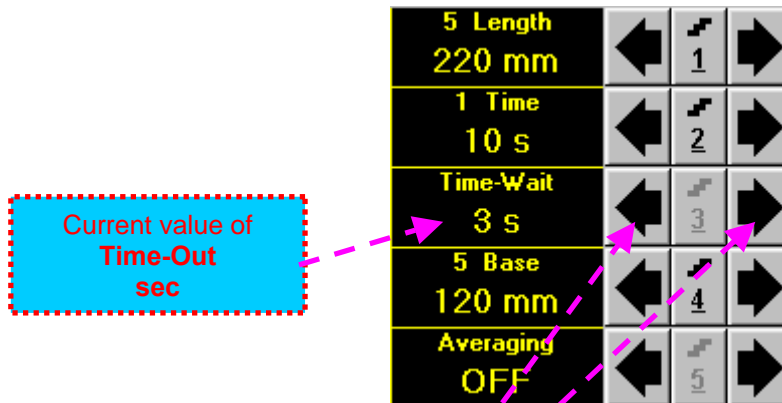
- Click on **Time** ⇒ **Time** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard



The value of **Time** is adjustable between 5 and 60 **sec**

Time-Wait

Time-Wait is waiting time for intermissions preceeding **t-TOFD** recording, which starts unconditionally upon **Time-Wait** period is over












To control **Time-Wait** the following manipulations are applicable:








- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F3** on external keyboard ⇒ **Time-Wait** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

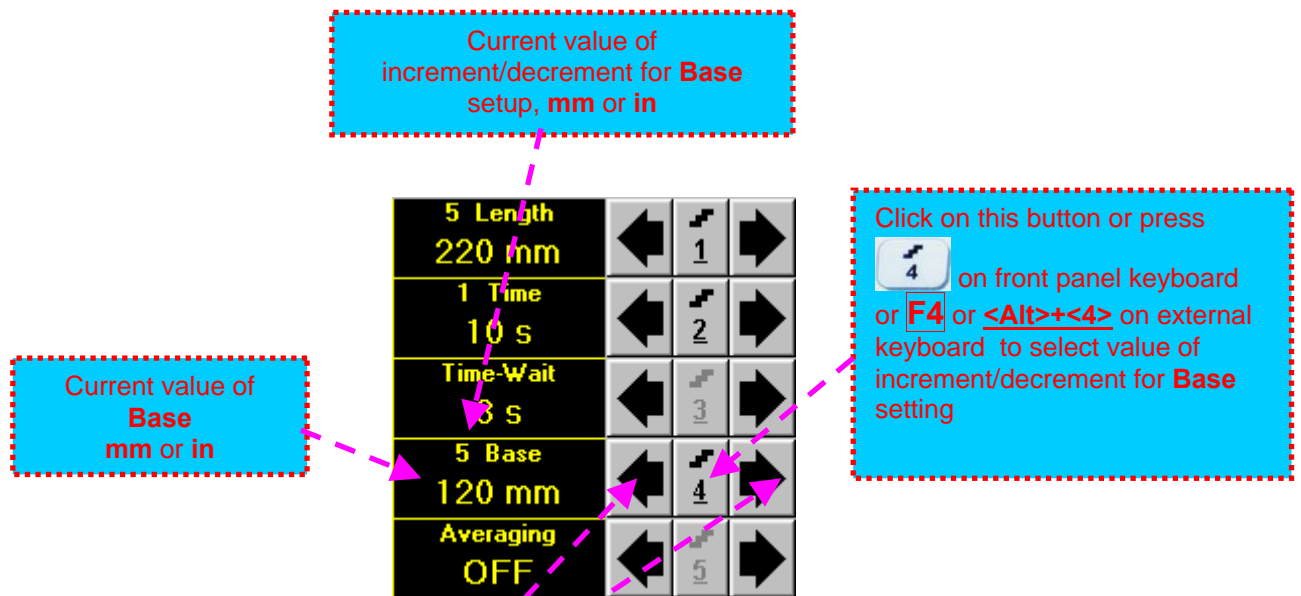
- Click on **Time-Wait** ⇒ **Time-Wait** fore color changes to white - then use , , ,  on front panel keyboard or , , , on external keyboard



The value of **Time-Wait** is adjustable between 0 and 15 **sec**

Base

Base represents **Probe Separation**



To control **Base** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F1** on external keyboard ⇒ **Base** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

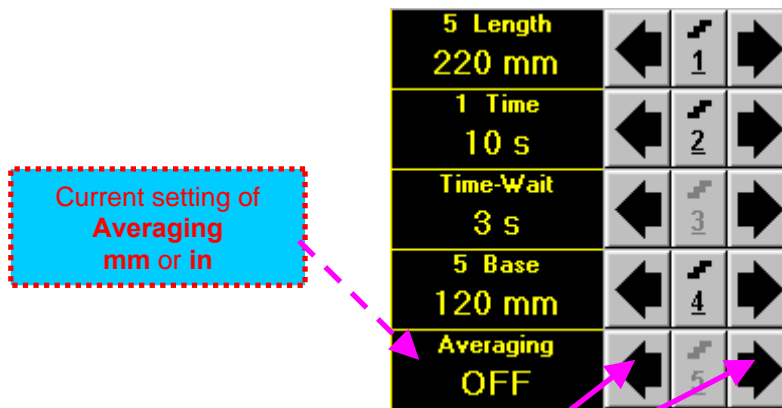
- Click on **Base** ⇒ **Base** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of **Base** is adjustable between 25 and 500 **mm** or 1 and 20 **in**

Averaging

Averaging of sequential **A-Scans** is required sometimes to improve signal to noise ratio of the **t-TOFD** record











To control **Averaging** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F5** on external keyboard ⇒ **Averaging** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Averaging** ⇒ **Averaging** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



Averaging may be either inactive (**OFF**) or setup for factor **2** or **4** or **8**



Insert Text Note



Refer to paragraph 6.3.2.1 of this Operating Manual



Preview UDS 3-5 Settings



Refer to paragraph 6.3.2.1 of this Operating Manual

Start/Stop t-TOFD recording

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to start **t-TOFD** recording

 button becomes invisible since **t-TOFD** recording starts.  button occupies its position.

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to terminate **t-TOFD** recording prior to automatic completion

 button becomes invisible after completion / termination of **t-TOFD** record.  button returns to its position

Save record into a file

Refer to paragraph 6.3.2.1 of this Operating Manual

Open record from a file and starting postprocessing session

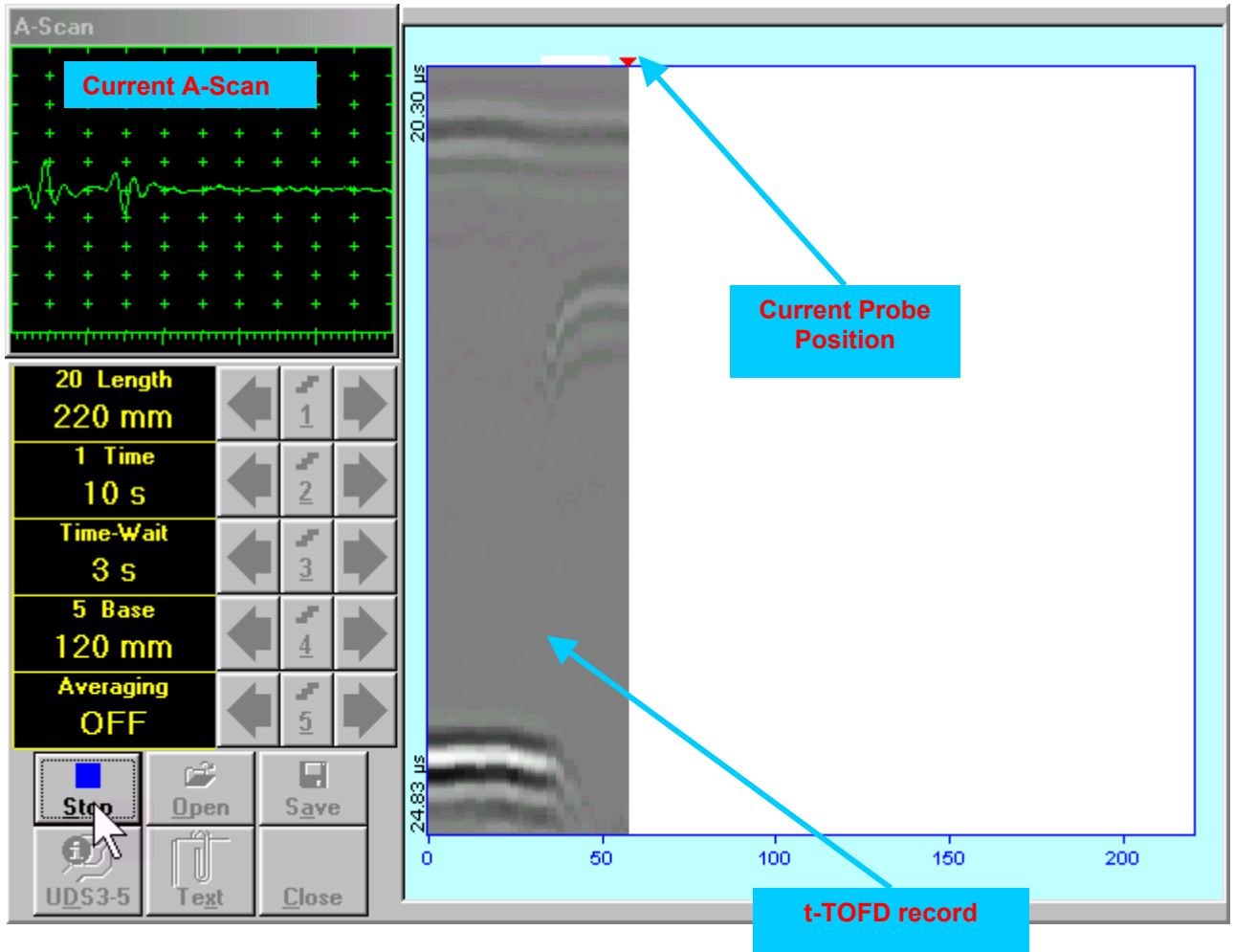
Refer to paragraph 6.3.2.1 of this Operating Manual

Return to UDS 3-5 main operating surface

Refer to paragraph 6.3.2.1 of this Operating Manual

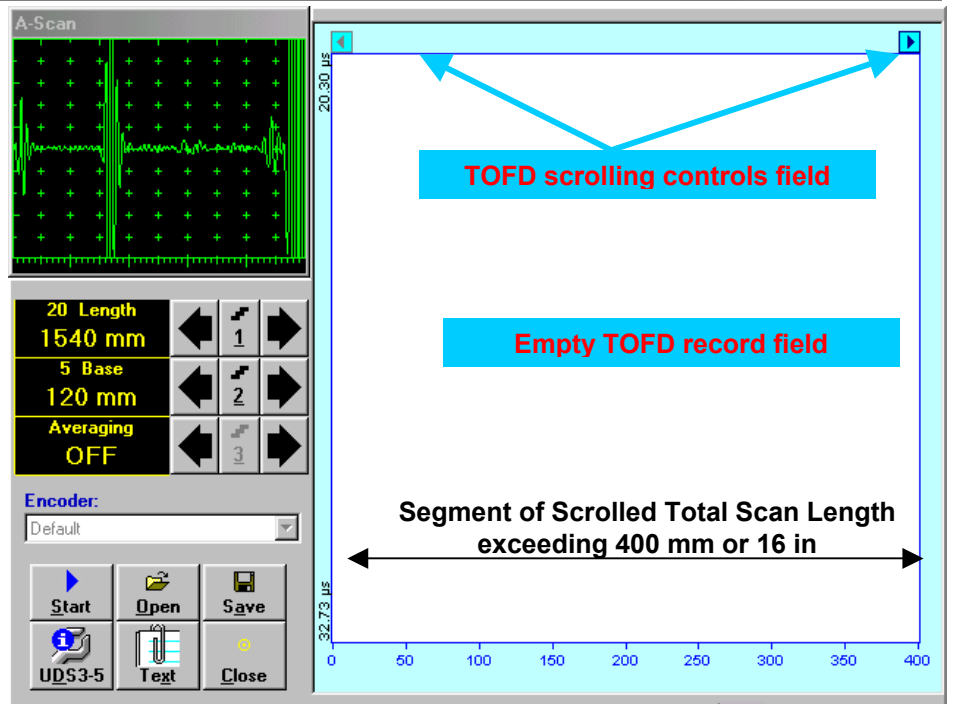
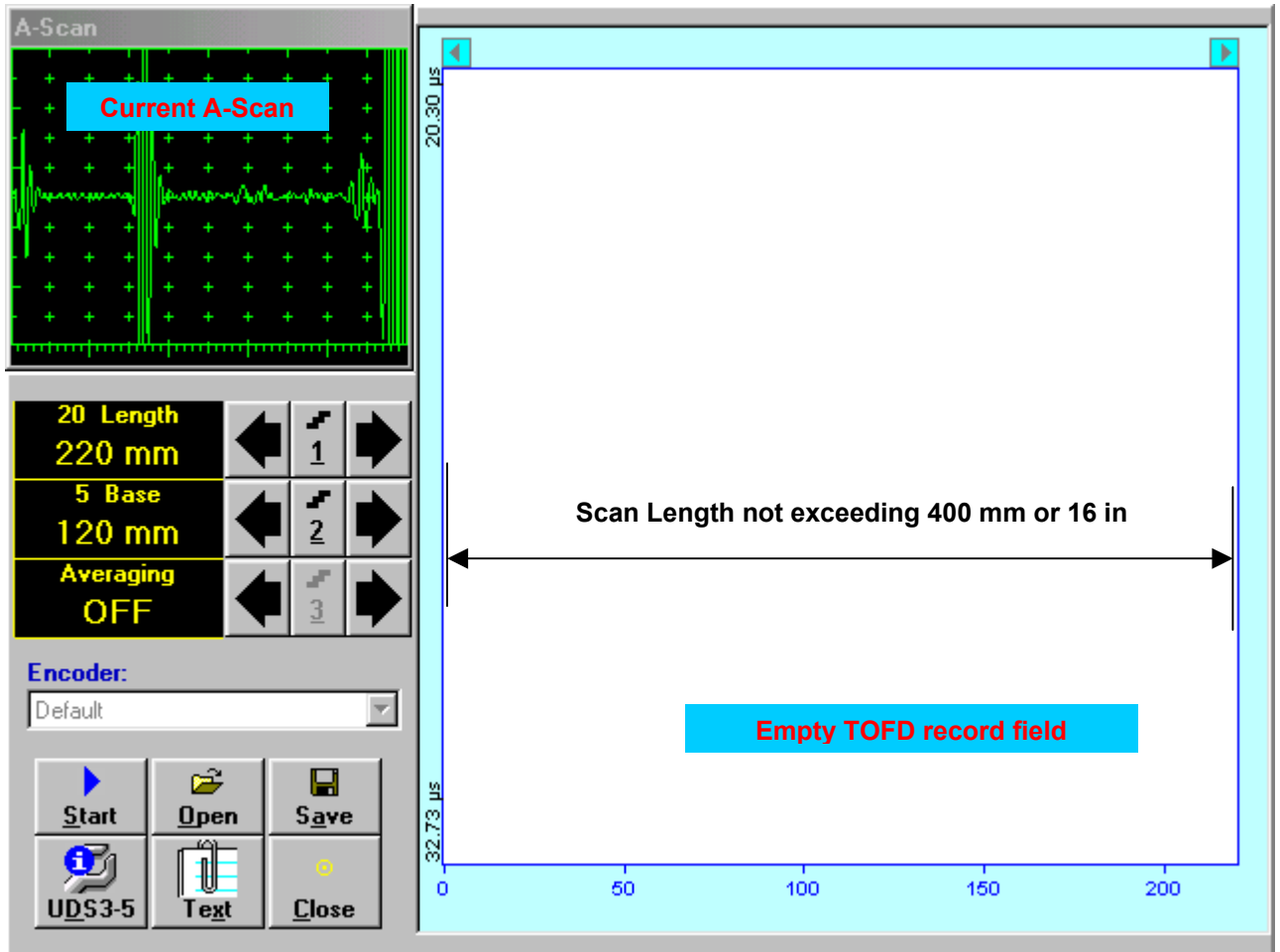
6.5.2.2. t-TOFD – Scanning

- Apply probes pair to test object in the start point of selected scanning line
- Click on **Start** or press **I** on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard
- Guide probe pair over the scanning line synchronously with *Position Icon* moving with constant speed above t-TOFD record field – typical scanning progress display during is shown and explained below



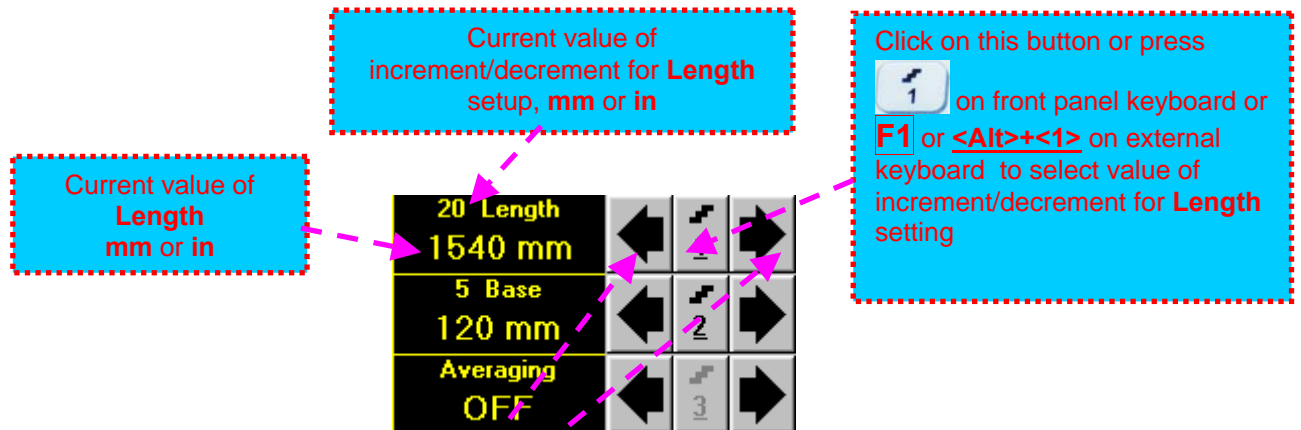
6.5.2.3. TOFD – Prior to Scanning

TOFD control panel is shown below




















Scan Length

Length represents length of section of test object to be displayed, over which probe will be scanning during recording period



To control **Length** the following manipulations are applicable:

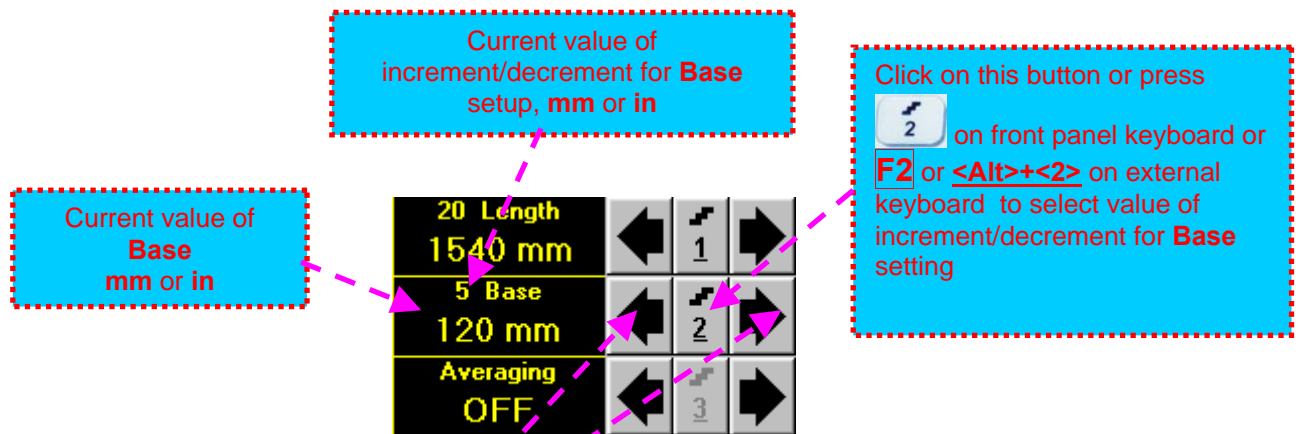
- **Mouse / Touch Screen**
 - Click on corresponding button
- **Keyboard**
 - Press  on front panel keyboard or **F1** on external keyboard ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard
- **Combined**
 - Click on **Length** ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of **Length** is adjustable between 50 and 20000 **mm** or 2 and 800 **in**

Base

Base represents **Probe Separation**



To control **Base** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F2** on external keyboard ⇒ **Base** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

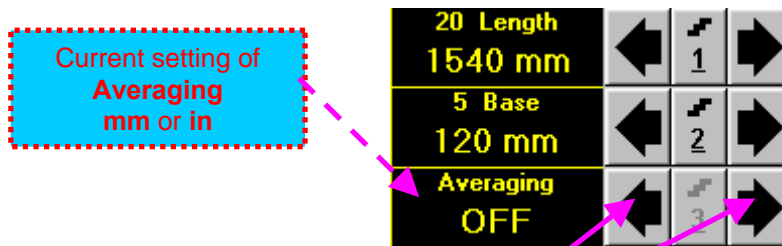
- Click on **Base** ⇒ **Base** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of **Base** is adjustable between 25 and 500 **mm** or 1 and 20 **in**

Averaging

Averaging of sequential **A-Scans** is required sometimes to improve signal to noise ratio of the **TOFD** record












To control **Averaging** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F3** on external keyboard ⇒ **Averaging** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Averaging** ⇒ **Averaging** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



Averaging may be either inactive (**OFF**) or setup for factor **2** or **4** or **8**

Encoder

Select encoder to be used through appropriate box



Clamp fixture holding **TOFD** probe pair into encoder – refer to Chapter 7 of this Operating Manual

Connect encoder to its input on the rear panel of **ISONIC 2005 / 2020 / STAR** instrument



Insert Text Note





Refer to paragraph 6.3.2.1 of this Operating Manual

Preview UDS 3-5 Settings

Refer to paragraph 6.3.2.1 of this Operating Manual

Start/Stop TOFD recording

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to start **TOFD** recording

 button becomes invisible since **TOFD** recording starts.  button occupies its position. Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to terminate **TOFD** recording

 button becomes invisible after termination of **TOFD** record.  button returns to its position

Save record into a file

Refer to paragraph 6.3.2.1 of this Operating Manual

Open record from a file and starting postprocessing session

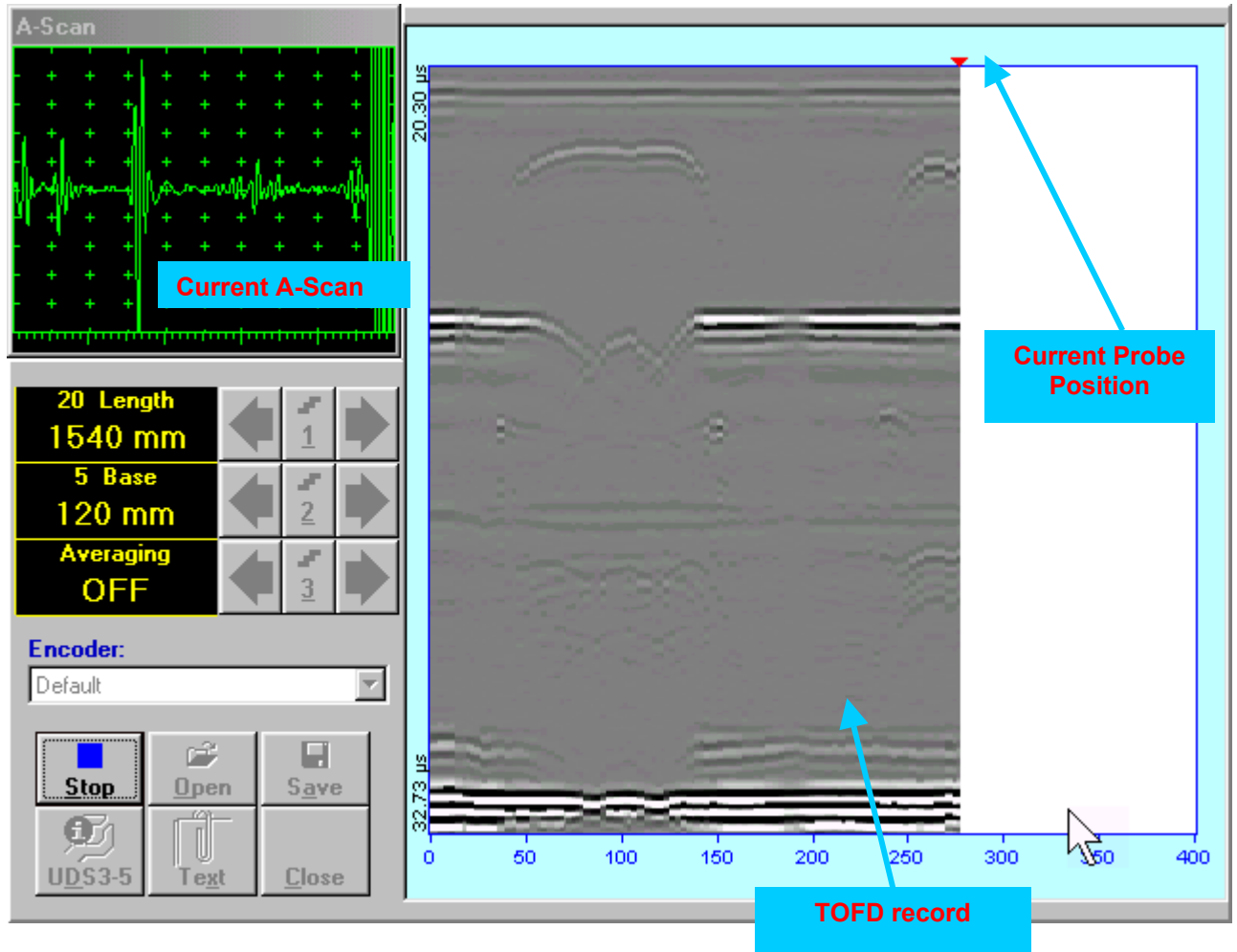
Refer to paragraph 6.3.2.1 of this Operating Manual

Return to UDS 3-5 main operating surface

Refer to paragraph 6.3.2.1 of this Operating Manual

6.5.2.4. TOFD – Scanning

- Apply probes pair to test object in the start point of selected scanning line
- Click on **Start** or press **I** on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard
- Guide probe pair over the scanning line – typical scanning progress display during is shown and explained below

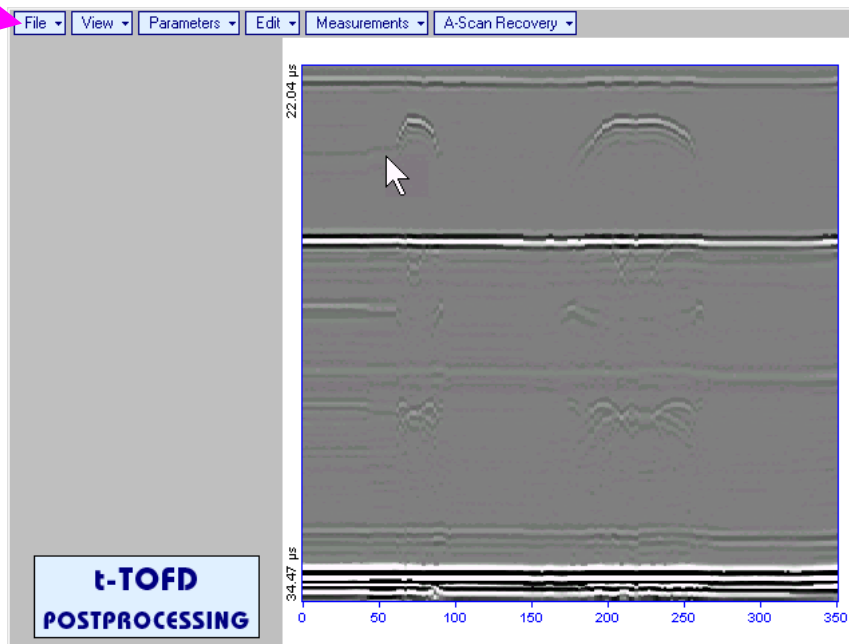


6.5.2.5. t-TOFD / TOFD – Postprocessing

Versatile postprocessing of **t-TOFD / TOFD** records is featured with:





- ❑ Improvement of near to surface resolution through removal of lateral wave and back echo records from **t-TOFD / TOFD Map**, zooming **t-TOFD / TOFD Map** accompanied with appropriate **A-Scan** expanding
- ❑ Linearization and straightening of **t-TOFD / TOFD Map**
- ❑ Increasing contrast of **t-TOFD / TOFD** images through varying **Gain** and rectification
- ❑ Defects pattern recognition and sizing

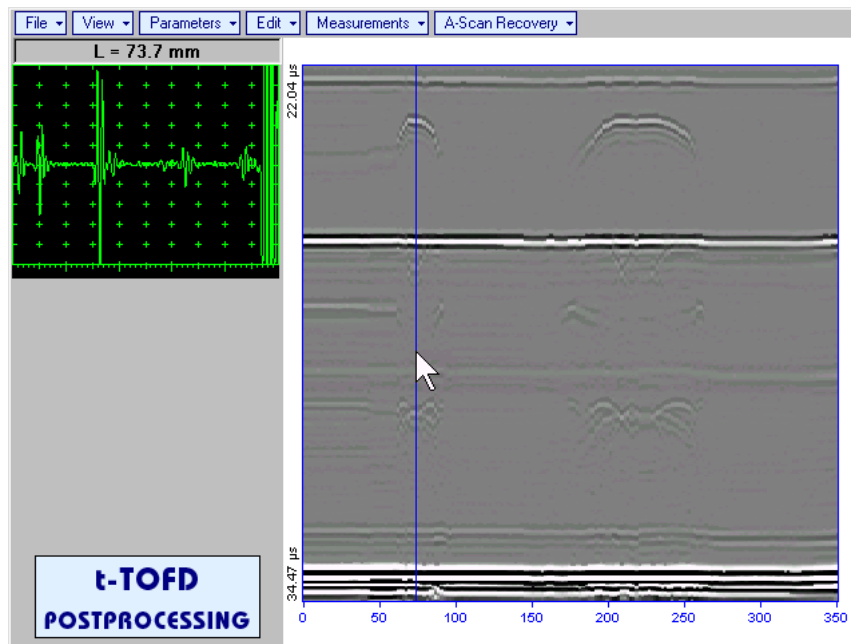
The screen as below appears upon opening file. All postprocessing procedures are performed through **menu bar** – touch screen stylus or front panel or external mouse to be used





Menu Bar Functions

- **File→Open** – opens new **t-TOFD / TOFD** file
- **File→Snapshots→Add Snapshot** – stores current postprocessing screen snapshot accompanied with appropriate settings and measurements into *postprocessing session memory stack*
- **File→Snapshots→Restore Snapshot** – recalls earlier stored postprocessing screen snapshot accompanied with appropriate settings and measurements from *postprocessing session memory stack*
- **File→Snapshots→Delete Snapshot** – deletes earlier stored postprocessing screen snapshot accompanied with appropriate settings and measurements from *postprocessing session memory stack*
- **File→Print** – prints out postprocessing screen snapshot(s) accompanied with appropriate settings and measurements
- **File→Exit** – returns to **t-TOFD / TOFD** control panel
- **View→Instrument** – indicates setup of **UDS 3-5** Pulser Receiver used for scanning when file was created
- **View→Inspection Data** – indicates operator's comments entered prior to scanning
- **View→Coloring→Grayscale / View→Coloring→Thermal** – selects base color for **t-TOFD / TOFD** image
- **View→TOFD→Logic→Negative / View→TOFD→Logic→Positive** – selects black / white tones for representation of positive/negative half waves components of **RF A-Scan** on the **TOFD Map** – refer also to paragraph 8.2.2 of this Operating Manual
- **View→TOFD→Contrast→Natural / View→TOFD→Contrast→Soft / View→TOFD→Contrast→Sharp** – selects contrast of the **TOFD Map** – refer also to paragraph 8.2.2 of this Operating Manual

- **A-Scan Recovery→ON** – generates *cursor corresponding to A-Scan base line* that may be guided over **t-TOFD / TOFD** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *A-Scan base line cursor* position. Indication of starting position of cursor (**L**) corresponding to the position of **TOFD** probes pair accompanies recovered **A-Scan**

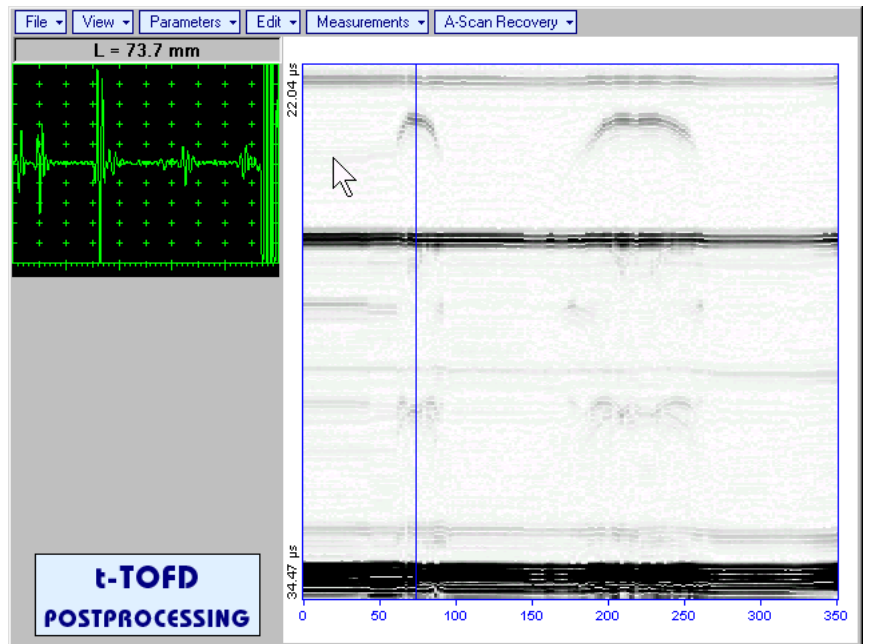
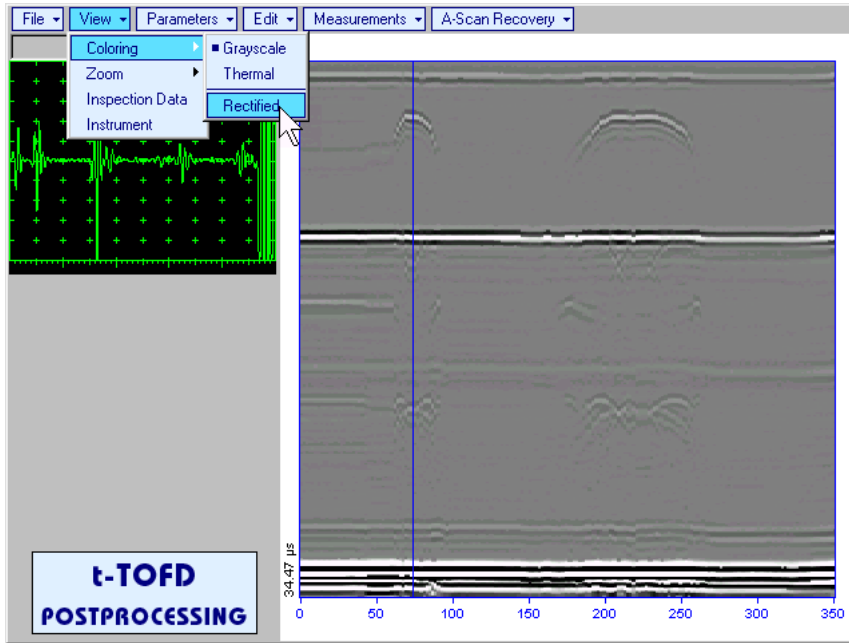


To fix position of *A-Scan base line cursor* with corresponding recovered **A-Scan** left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard

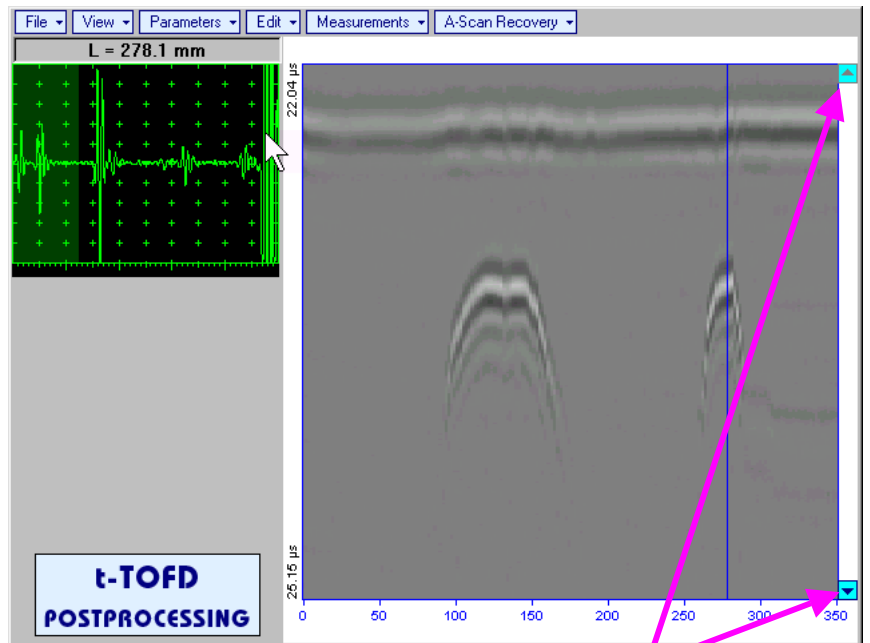
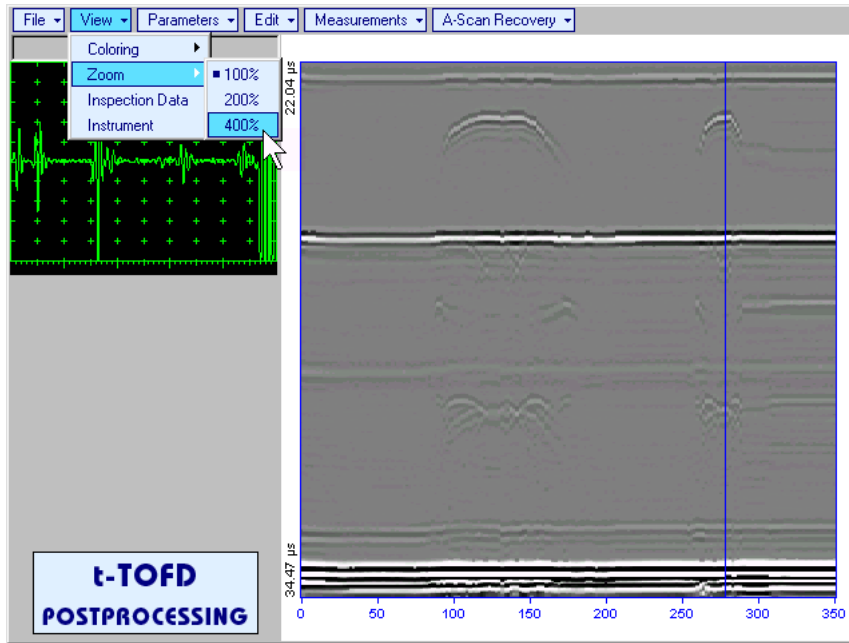
To interrupt recovery of **A-Scans** right mouse click or press  on front panel keyboard or **Esc** on external keyboard

- **A-Scan Recovery→OFF** – erases *A-Scan base line cursor*, indicator of its position, and recovered **A-Scan**

- **View→Coloring→Rectified** – switches between rectified and RF presentation of t-TOFD / TOFD image

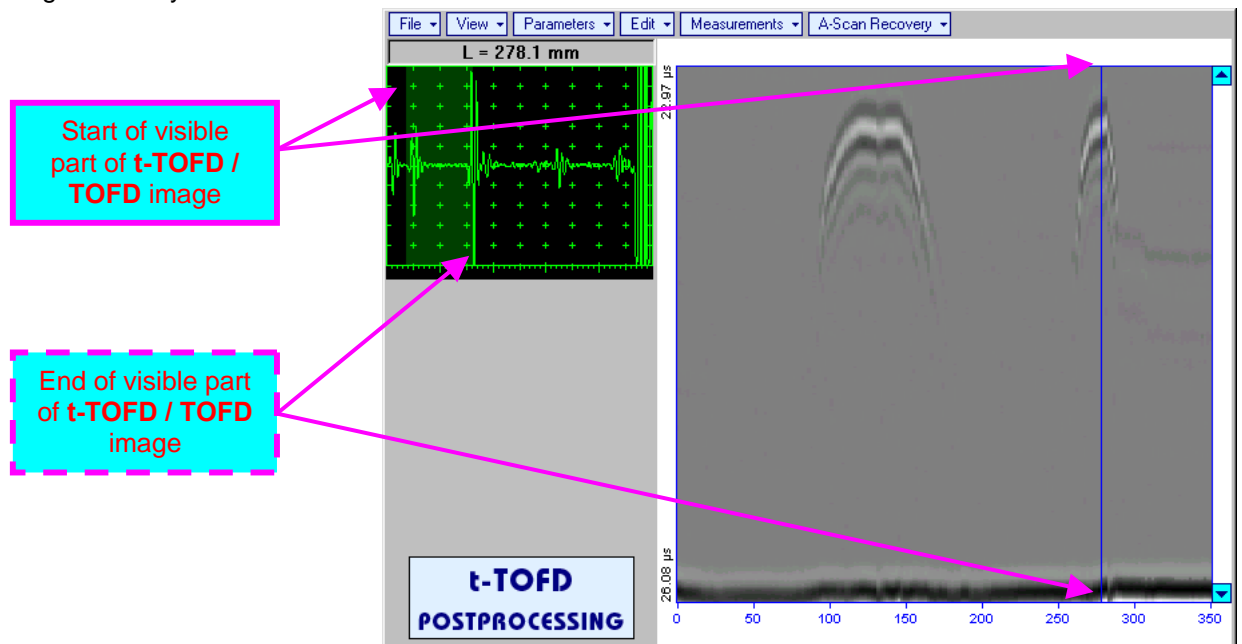


- **View→Zoom→Zoom Factor%** – expands **t-TOFD / TOFD** image along time line (vertically)

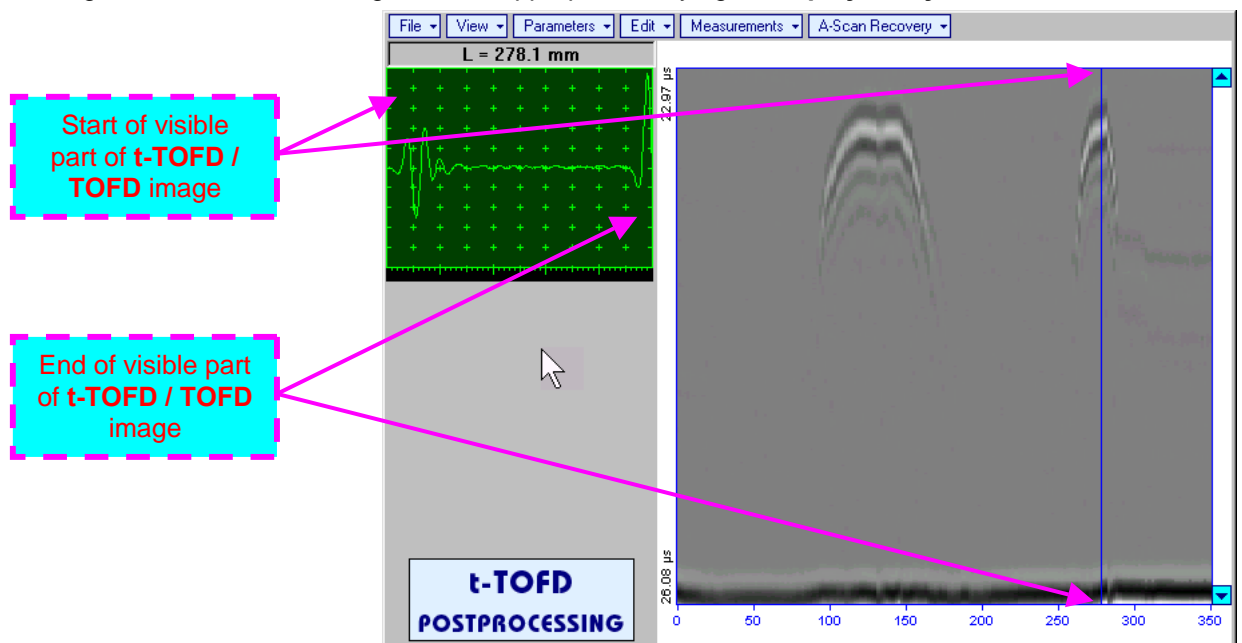


Expanded **t-TOFD / TOFD** image may be scrolled it vertically using appropriate **buttons**

Green background highlights segment of recovered **A-Scan** corresponding to visible part of **t-TOFD / TOFD** image. Said segment moves over recovered **A-Scan** background while scrolling **t-TOFD / TOFD** image vertically



Segment of recovered **A-Scan** corresponding to visible part of **t-TOFD / TOFD** image may be expanded through double click on it – whole **A-Scan** background is green for the expanded segment. Vertical scrolling of **t-TOFD / TOFD** image causes appropriate varying of **Display Delay** for recovered **A-Scan**

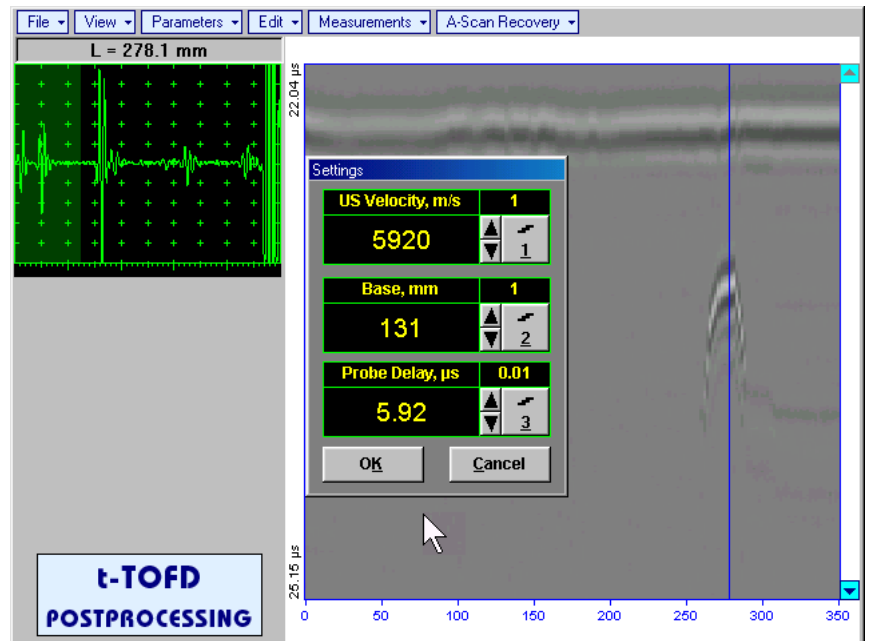
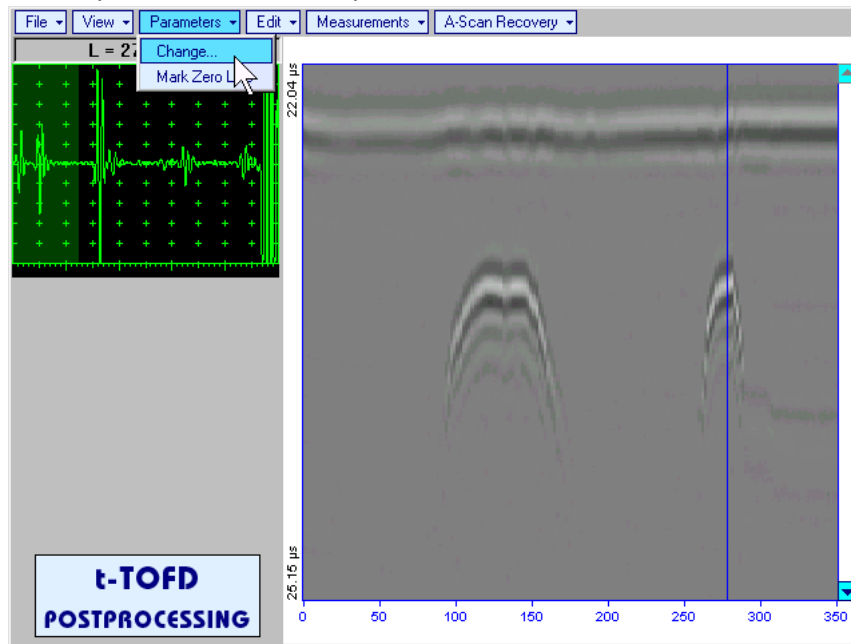


To return to complete recovered **A-Scan** visibility double click on **A-Scan** area







- ◆ Zoom function is available for t-TOFD / TOFD image composed of A-Scans longer than 5 μ s
- ◆ Possible zoom factors are defined by ISONIC 2005 / 2020 / STAR software automatically
- ◆ Maximal possible Zoom factor is 400%

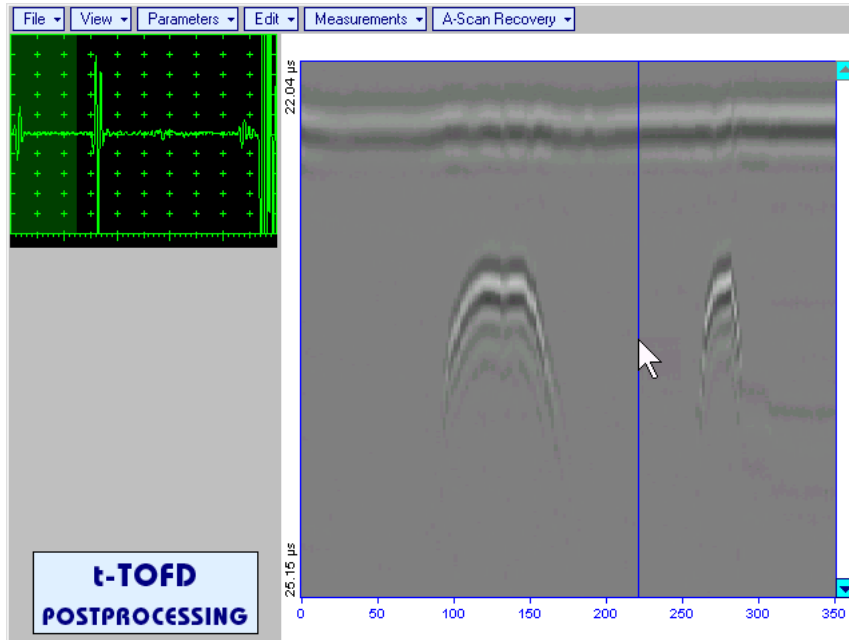
- **Parameters→Change...** – allows re-adjusting of basic parameters (**USVelocity**, **Base**, **Probe Delay**) for computation of defects depth and linearization of **t-TOFD / TOFD** image



On completing click **OK** or press **Enter** on front panel keyboard or **Enter** on external keyboard

To negate re-adjustments click on **Cancel** or press **ESC** on front panel keyboard or **Esc** on external keyboard





- Parameters → Mark Zero Line** – allows re-adjusting of **Probe Delay** for computation of defects depth and linearization of **t-TOFD / TOFD** image through mark of start point of lateral wave signal on the recorded **t-TOFD / TOFD** image with reference to recovered **A-Scan**. Initially this function generates *cursor corresponding to A-Scan base line* that may be guided over **t-TOFD / TOFD** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *A-Scan base line cursor* position



Upon selecting reference **A-Scan** with clear lateral wave left mouse click or press



on front panel keyboard or **Enter** on external keyboard – this generates horizontal cursor, which may be guided over **t-TOFD / TOFD** image using either touch screen stylus or

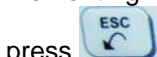
mouse or ,  on front panel keyboard or ,  on external keyboard

To mark the beginning of lateral wave signal corresponding to zero depth left mouse click or press

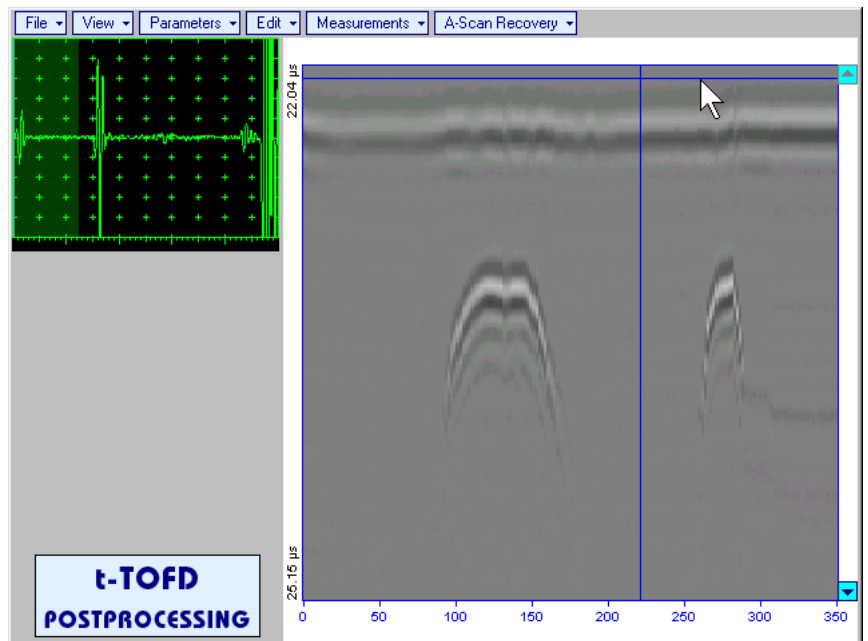


on front panel keyboard or **Enter** on external keyboard

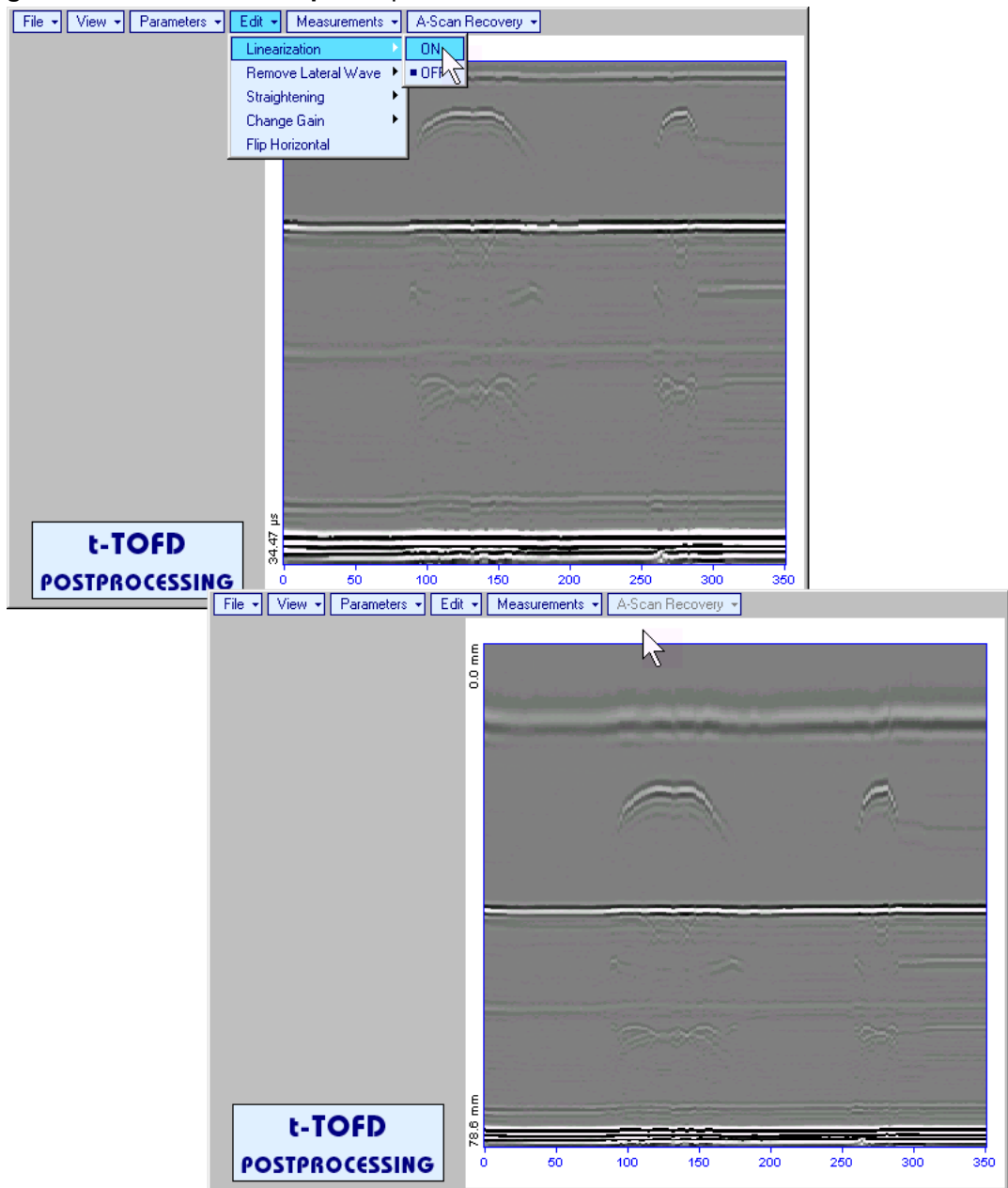
To interrupt function at any moment right mouse click or



press on front panel keyboard or **Esc** on external keyboard








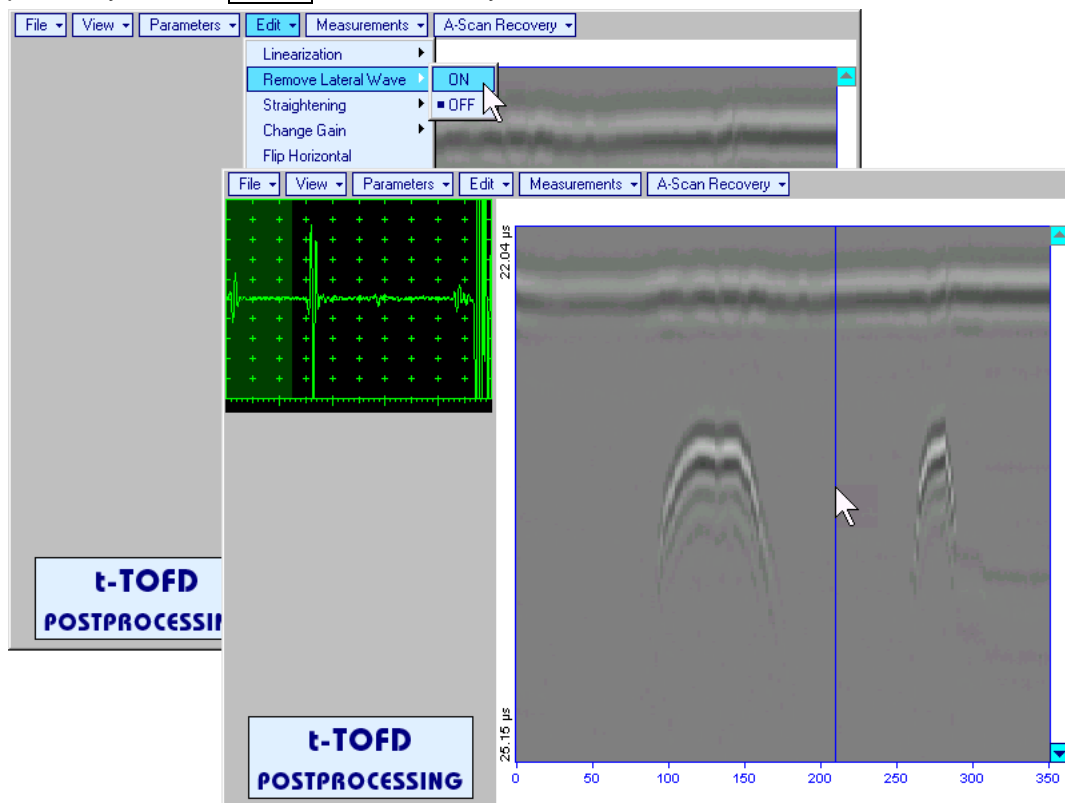
- **Edit→Linearization→ON** – recalculates depth for each point of **t-TOFD / TOFD** image and redraws it as **Longitudinal Coordinate – Depth** map








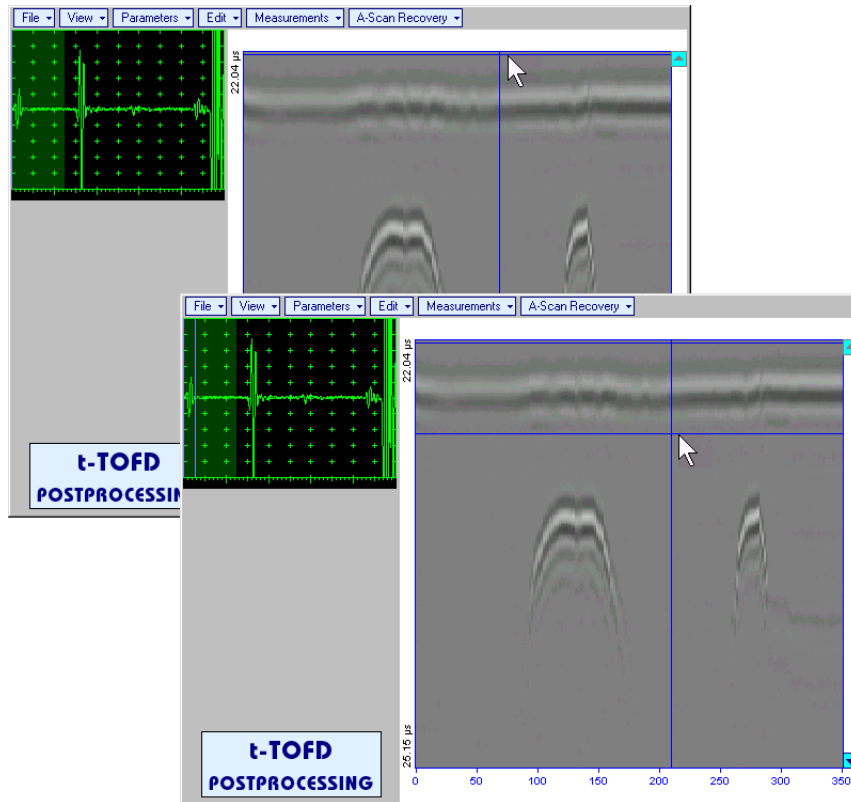
- **Edit→Linearization→OFF** – returns to original **t-TOFD / TOFD** image - **Longitudinal Coordinate – Time** map

- **Edit→Remove Lateral Wave→ON** – removes *rectangle segment* designated by an operator from **t-TOFD / TOFD** image. Most frequently this function is applied to lateral wave record, which is recorded continuously during line scanning and allows to better resolve defects located closely to scanning surface. Also this function may be applied to other signals continuously recorded during line scanning for example, backwall echo, mode conversion backwall echo, etc. - this allows to better resolve defects located closely to bottom surface. In addition to modifying of *rectangle segment* selected by an operator this function automatically straightens **t-TOFD / TOFD** image in order to compensate deviations caused by various factors during recording, for example, coupling instability, unevenness of scanning or bottom surface, etc. The described function is based on selecting *reference signal* and defining a *rectangle segment* on the **t-TOFD / TOFD** image. All signals corresponding to selected *rectangle segment* of **t-TOFD / TOFD** image are equalized by straightening function and then removed; appropriate changes do occur on **t-TOFD / TOFD** image above and under selected rectangle segment after its removal. Initially *cursor corresponding to A-Scan base line* is generated; it may be guided over **t-TOFD / TOFD** image

using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *A-Scan base line cursor* position. To select reference **A-Scan** left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard







First horizontal cursor appears on the **t-TOFD / TOFD** image upon selecting reference **A-Scan**. It may be guided over **t-TOFD / TOFD** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard . To fix position of the first horizontal cursor and **designate start of reference signal** left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard . Second horizontal cursor appears upon fixing first one; it may be manipulated by the same way and allows **designating end of reference signal**

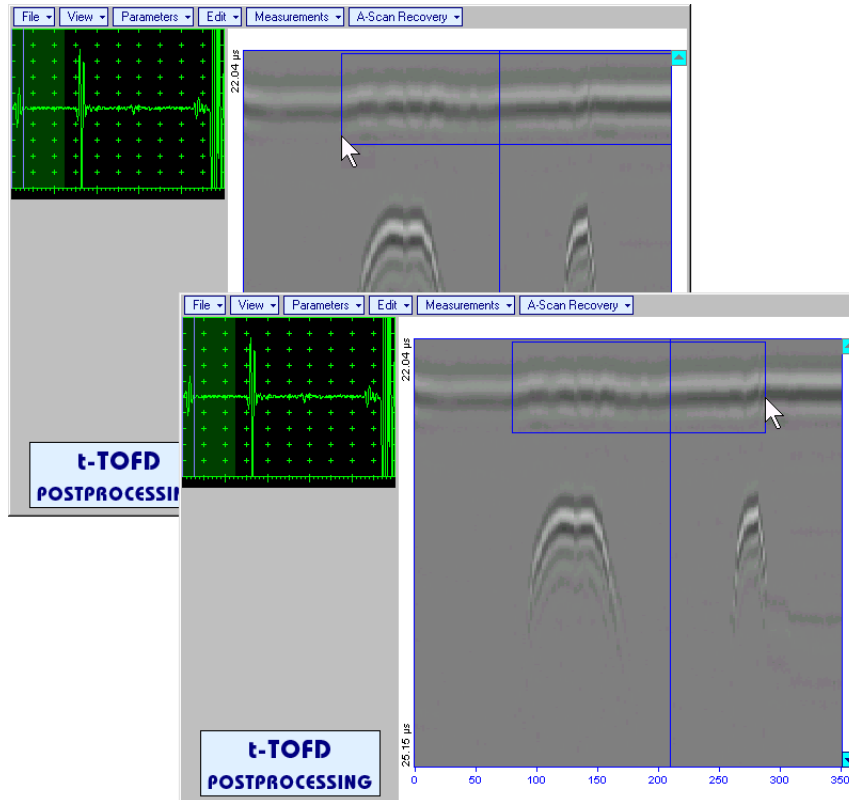


Horizontal cursors are accompanied with appropriate time cursors moving over reference A-Scan

First vertical cursor appears upon designating end of *reference signal*. Its length corresponds to duration of *reference signal* and it is located between first and second horizontal cursors. First vertical cursor may

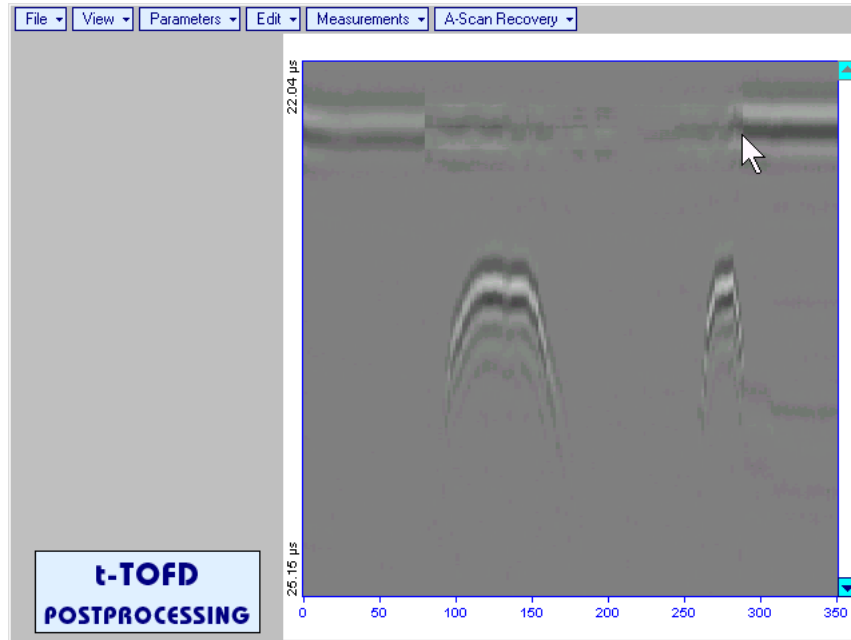
be manipulated over **t-TOFD / TOFD** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard . To **designate first border of rectangle segment**


left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard . Second vertical cursor completing defining a rectangle appears upon fixing first one; it may be manipulated by the same way and allows to **designate second border of rectangle segment**








As a result:

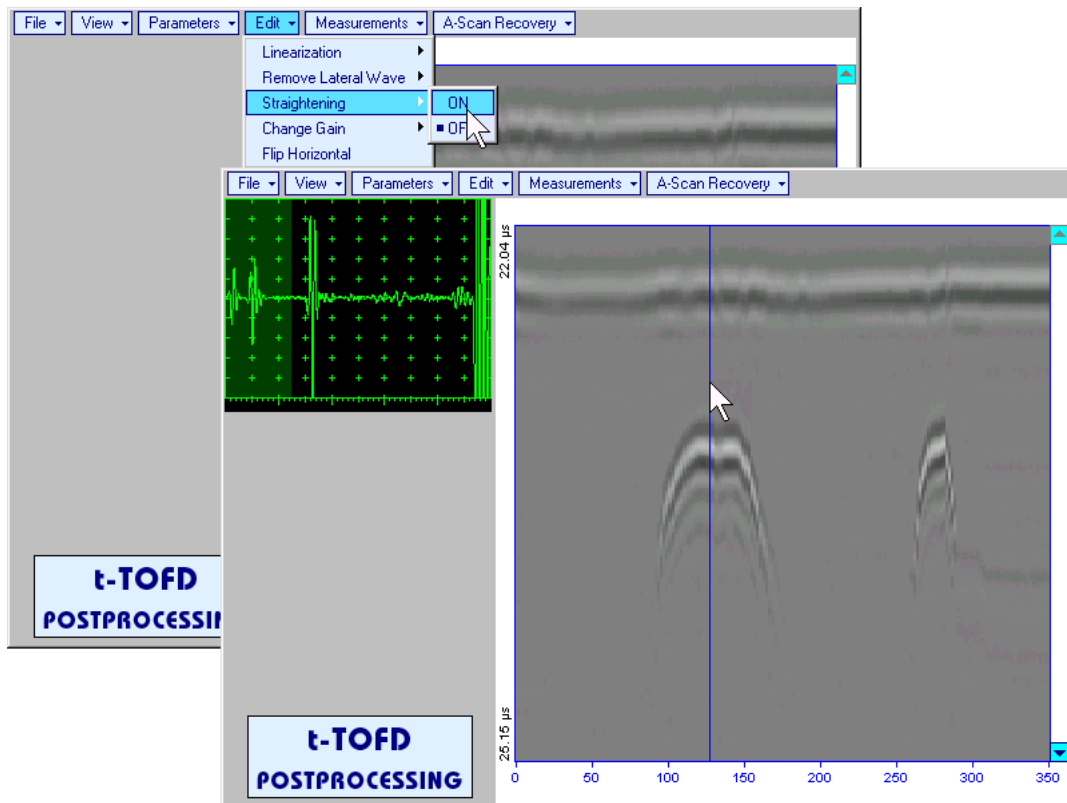
- Signs of *reference signal* and corresponding signals in the selected *rectangle segment* are removed from **t-TOFD / TOFD** image
- **t-TOFD / TOFD** image is straightened above and under selected and modified *rectangle segment* to compensate deviations caused by various factors during recording, for example, coupling instability, unevenness of scanning or bottom surfaces, etc








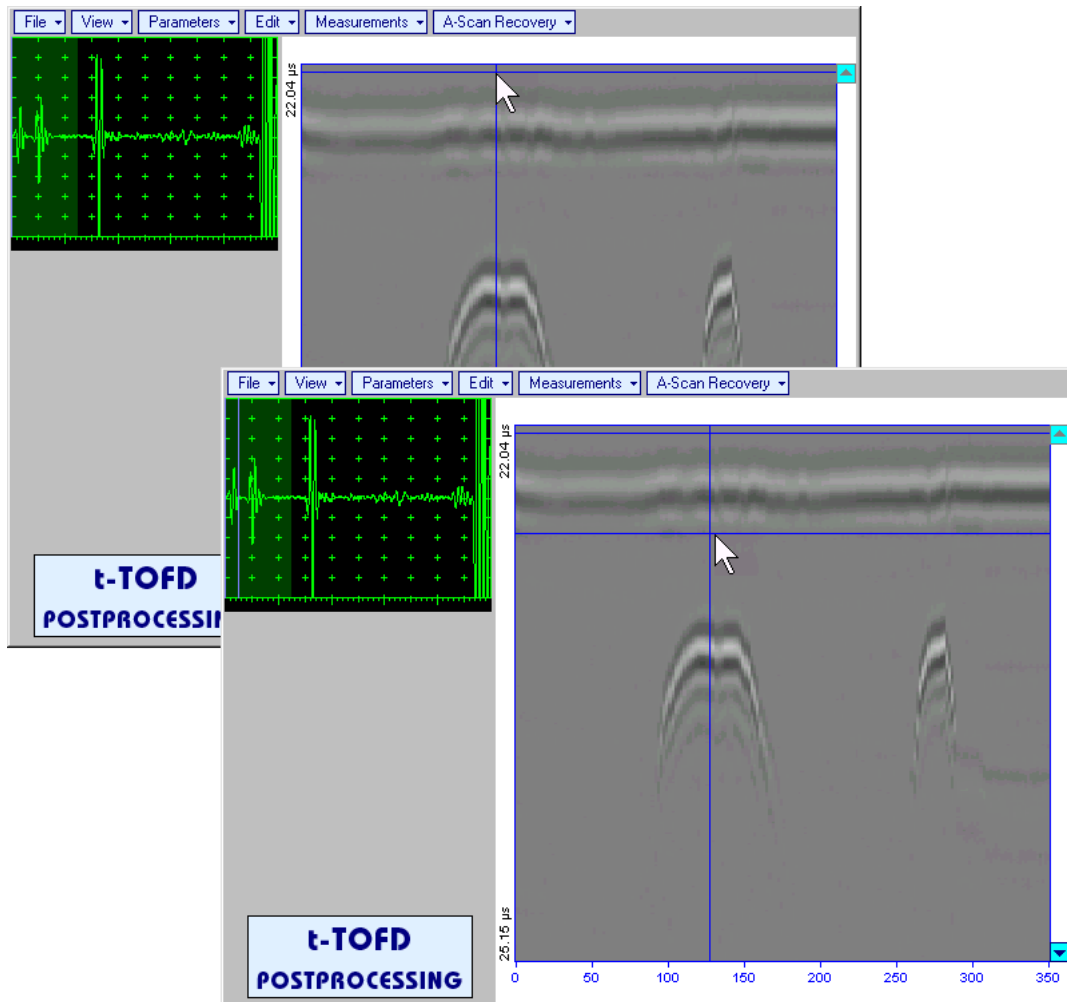
To interrupt function at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard

- **Edit→Remove Lateral Wave→OFF** – negates modification of selected *rectangle segment* of **t-TOFD / TOFD** image





- Edit→Straightening→ON** – straightens **t-TOFD / TOFD** image in order to compensate deviations caused by various factors during recording, for example, coupling instability, unevenness of scanning or bottom surfaces, etc. It is based on selecting *reference signal* (either lateral wave, or backwall echo, or mode conversion backwall echo, etc) and defining a *rectangle segment* on the **t-TOFD / TOFD** image. All signals corresponding to selected *rectangle segment* of **t-TOFD / TOFD** image are equalized by straightening function and appropriate changes do occur on **t-TOFD / TOFD** image above and under modified *rectangle segment*. Initially *cursor corresponding to A-Scan base line* is generated; it may be guided over **t-TOFD / TOFD** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *A-Scan base line cursor* position. To select reference **A-Scan** left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard



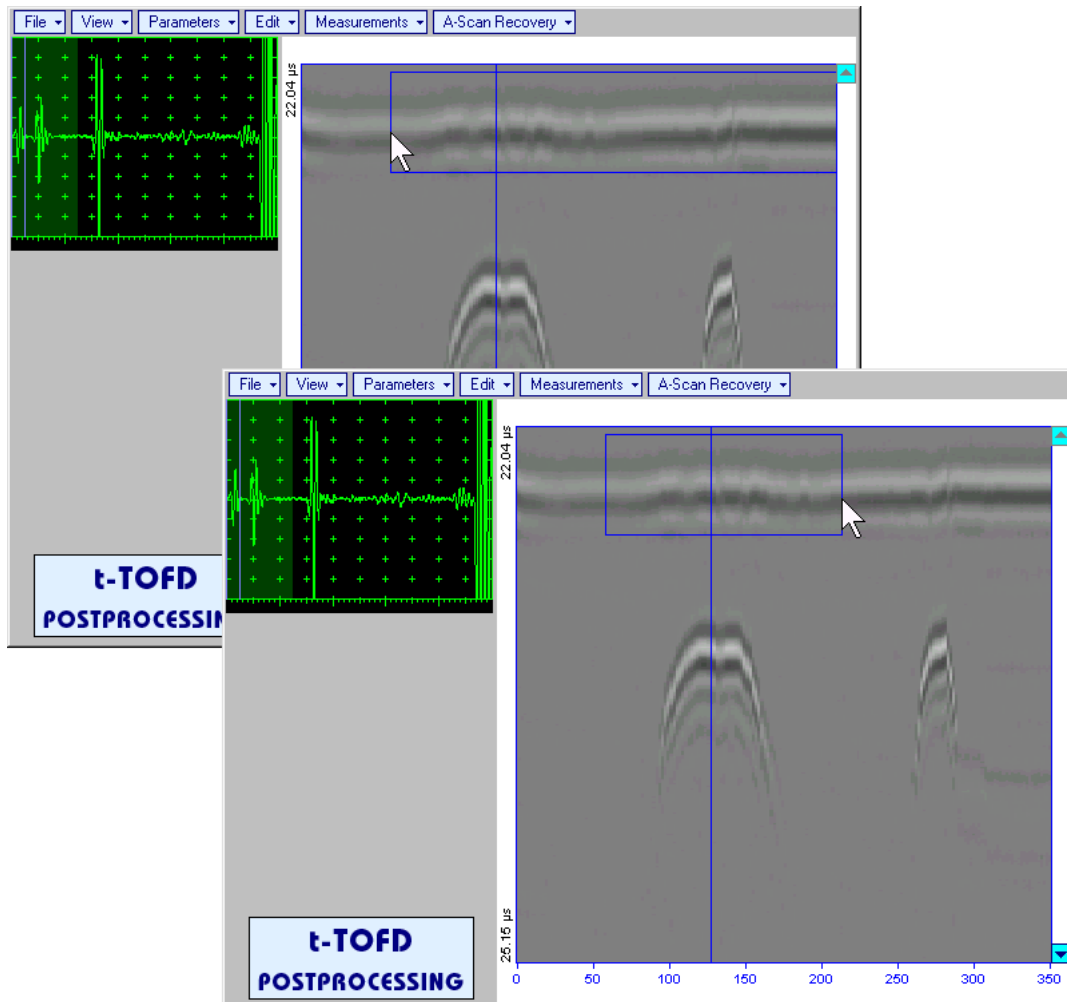
First horizontal cursor appears on the **t-TOFD / TOFD** image upon selecting reference **A-Scan**. It may be guided over **t-TOFD / TOFD** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard . To fix position of the first horizontal cursor and **designate start of reference signal** left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard . Second horizontal cursor appears upon fixing first one; it may be manipulated by the same way and allows to **designate end of reference signal**



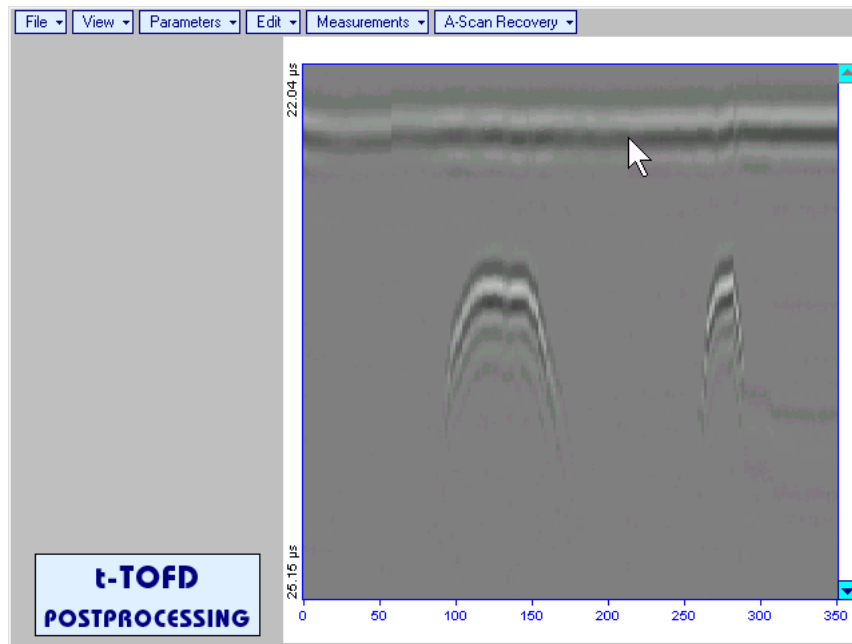
First vertical cursor appears upon designating end of *reference signal*. Its length corresponds to duration of *reference signal* and it is located between first and second horizontal cursors. First vertical cursor may


be manipulated over **t-TOFD / TOFD** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard . To **designate first border of rectangle segment**

left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard . Second vertical cursor completing defining a rectangle appears upon fixing first one; it may be manipulated by the same way and allows to **designate second border of rectangle segment**













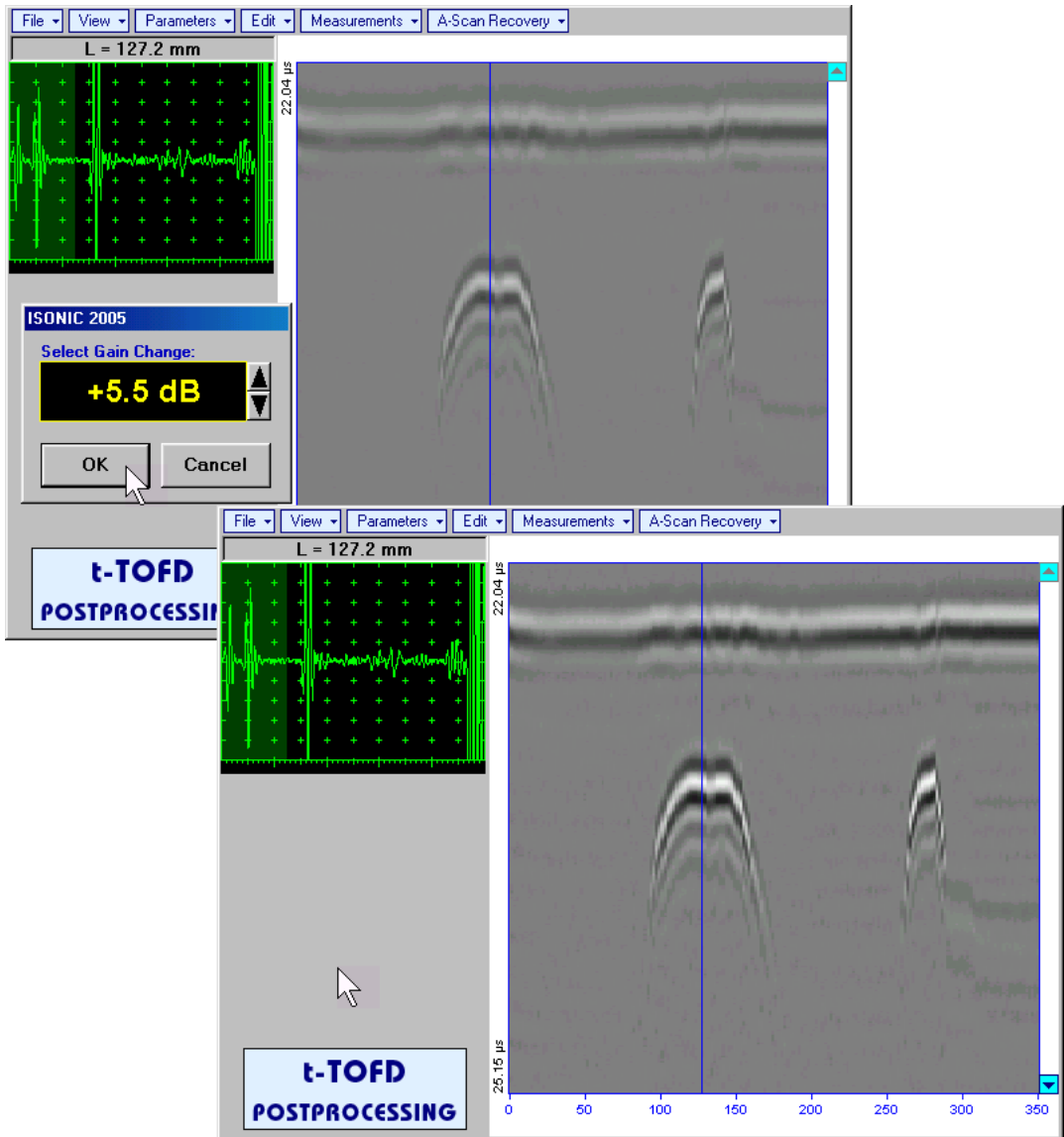
As a result **t-TOFD / TOFD** image is straightened in, above, and under selected *rectangle segment* to compensate deviations caused by various factors during recording, for example, coupling instability, unevenness of scanning or bottom surfaces, etc





To interrupt function at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard

- **Edit→Straightening→OFF** – negates modification of selected *rectangle segment* of **t-TOFD / TOFD** image

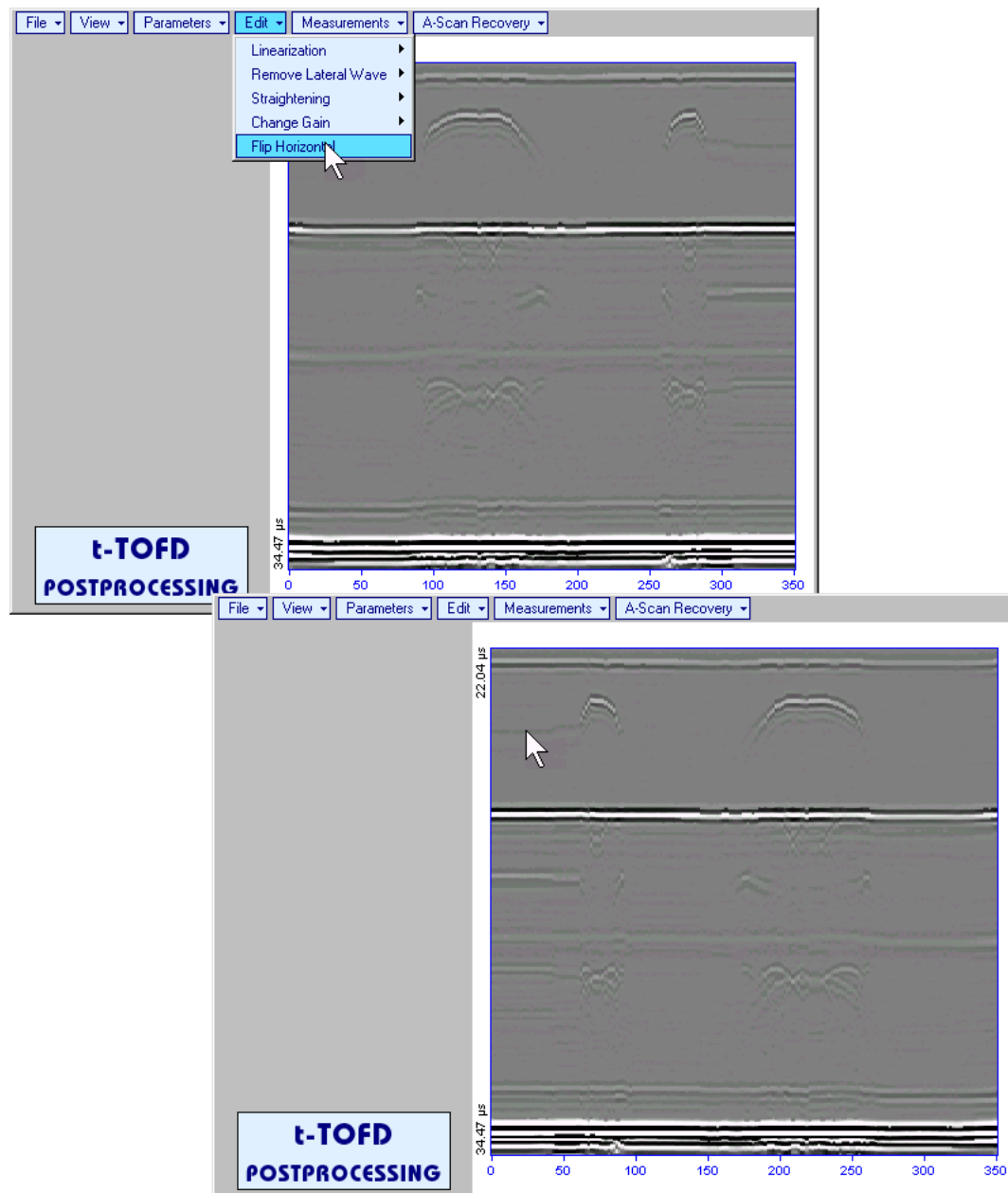
- Edit→Change Gain→ON** – generates *cursor corresponding to A-Scan base line* that may be guided over **t-TOFD / TOFD** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *A-Scan base line cursor position*. To select reference **A-Scan** release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard – this generates subwindow allowing off-line re-adjusting of **Gain** for all **A-Scans** captured during **t-TOFD / TOFD** recording in $\pm 6\text{dB}$ range with $\pm 0.1\text{ dB}$ increments through clicking or pressing and holding on  or pressing ,  on front panel keyboard or ,  on external keyboard








During **Gain** re-adjusting reference **A-Scan** is modified accordingly. Upon completing re-adjusting **Gain** click on **OK** or press  on front panel keyboard or **Enter** on external keyboard – this applies new **Gain** value to all captured **A-Scans** and redraws **t-TOFD / TOFD** image accordingly

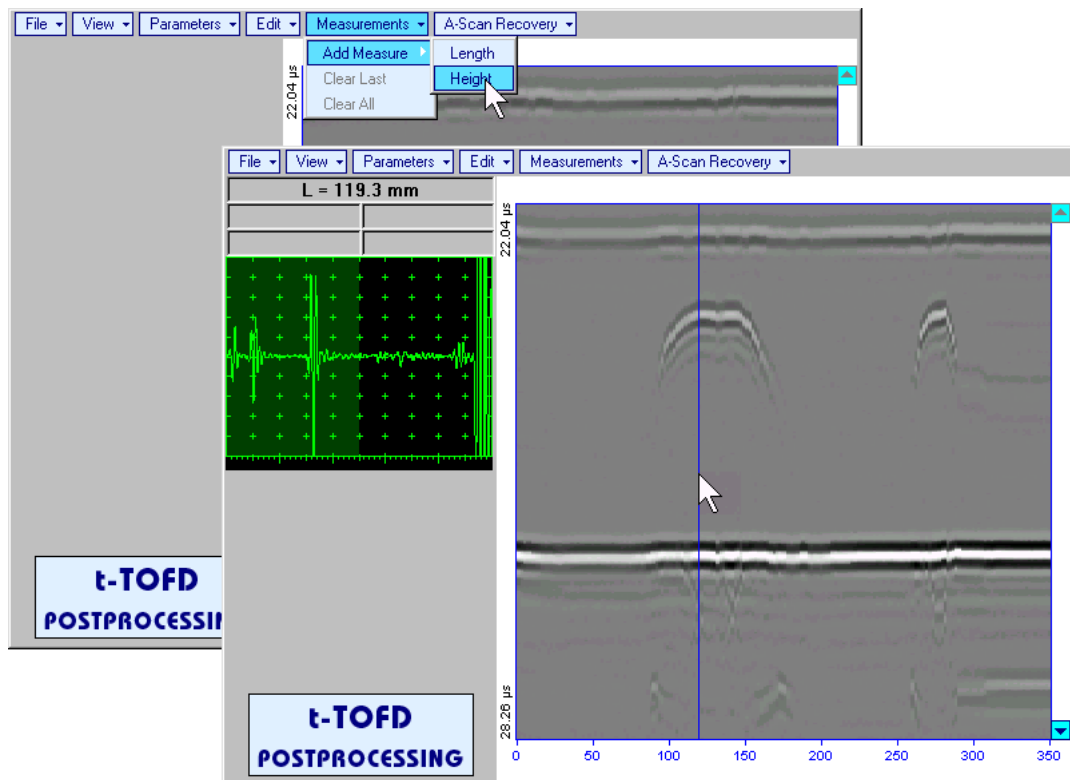
To interrupt re-adjusting of **Gain** click on **Cancel** or press  on front panel keyboard or **Esc** on external keyboard

- **Edit→Change Gain→OFF** – negates **Gain** re-adjustment and returns to originally recorded **t-TOFD / TOFD** image and original **Gain** setting
- **Edit→Flip Horizontal** – reorders **A-Scans** captured during **t-TOFD / TOFD** recording in reverse succession and redraws **t-TOFD / TOFD** image accordingly. This service function may be useful for merging scans of neighboring sections of an object, which were scanned in opposite direction due to access conditions, etc








Applying of **Flip Horizontal** function empties *postprocessing session memory stack*

- Measurements→Add Measure→Height** – generates *cursor corresponding to A-Scan base line* that may be guided over **t-TOFD / TOFD** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *A-Scan base line cursor* position. Indication of starting position of cursor (**L**) corresponding to the position of **TOFD** probes pair accompanies recovered **A-Scan**. *A-Scan base line cursor* to be positioned over defect image to minimize displacement of defect's signal with regard to starting point of **A-Scan**. To fix position of *A-Scan base line cursor* release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard . Indication of starting position of cursor (**L**) corresponding to probe's center accompanies recovered **A-Scan**



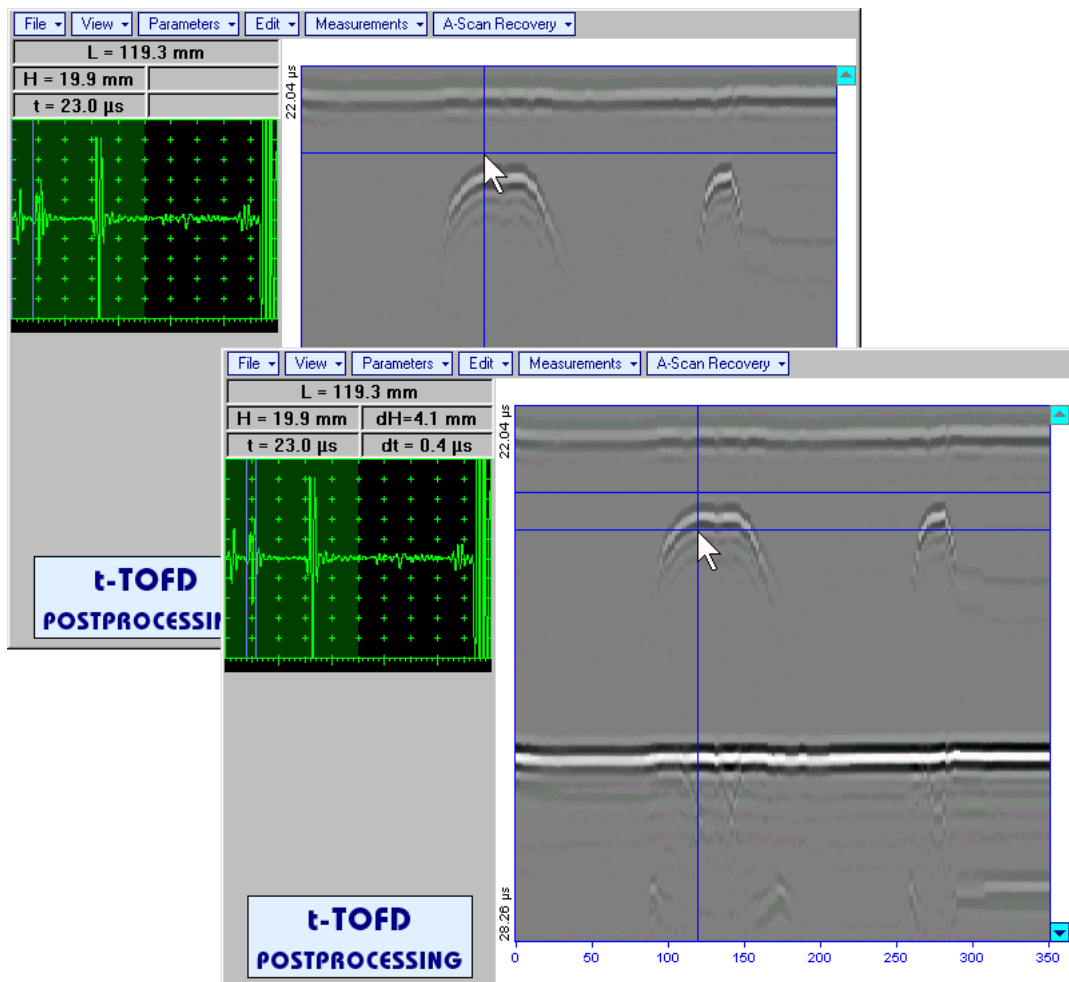
First horizontal cursor appears upon fixing *A-Scan base line cursor*, it may be guided over **t-TOFD** /


TOFD image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard . First horizontal cursor is accompanied with first *time cursor* synchronously moving over reference **A-Scan**. Coordinate of the first horizontal cursor - *depth* (**H**) and corresponding time of flight (**t**) are indicated synchronously. To fix position of the first horizontal cursor left mouse click or

release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard .

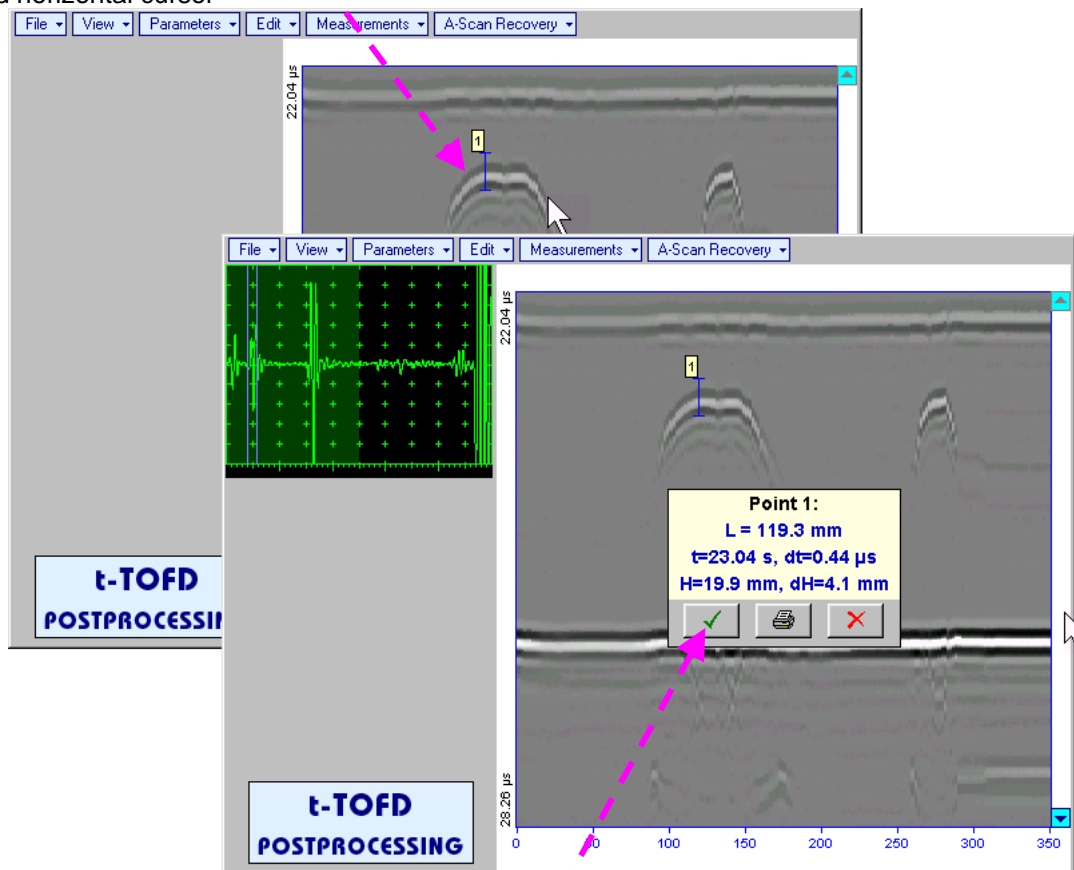
Second horizontal cursor appears upon fixing first one, it may be manipulated by the same way. Second horizontal cursor is accompanied with second *time cursor* synchronously moving over reference **A-Scan**. Coordinate of the second horizontal cursor measured relatively to position of first horizontal cursor (**dH**) and corresponding delay of second *time cursor* relatively to first *time cursor* (**dt**) are indicated synchronously. Provided the horizontal cursors are placed properly:

- **H** represents defect depth
- **t** represents time of flight for first diffracted signal
- **dH** represents defect's height
- **dt** represents delay of second diffracted signal relatively first diffracted signal



To interrupt width measurement procedure at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard


Vertical **depth/height measurement mark** appears on the **t-TOFD / TOFD** image upon fixing position of second horizontal cursor




Depth measurement results may be recalled into **subwindow** accompanied with corresponding **A-Scan** through double click on the *depth measurement mark*










In the subwindow appearing:

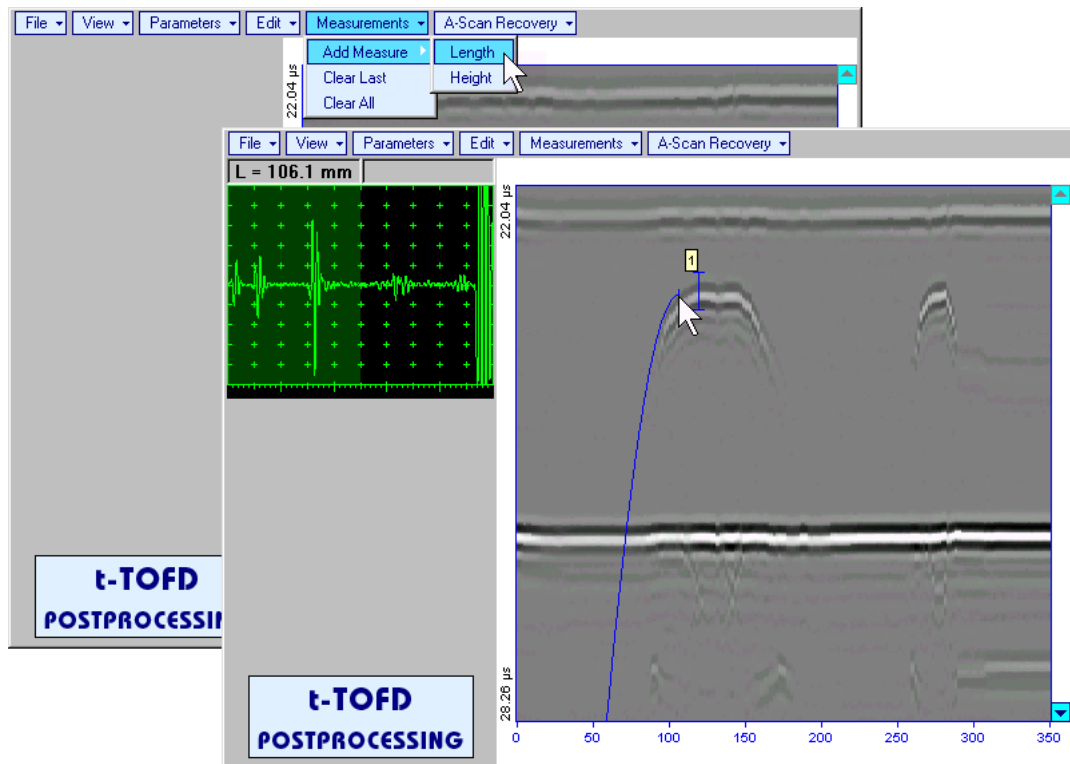
- **L** is coordinate of *depth measurement mark* along scanning line
- **H** represents defect depth
- **t** represents time of flight for first diffracted signal
- **dH** represents defect's height
- **dt** represents delay of second diffracted signal relatively first diffracted signal

Clicking on  will print current screen snapshot accompanied with *depth measurement mark* data

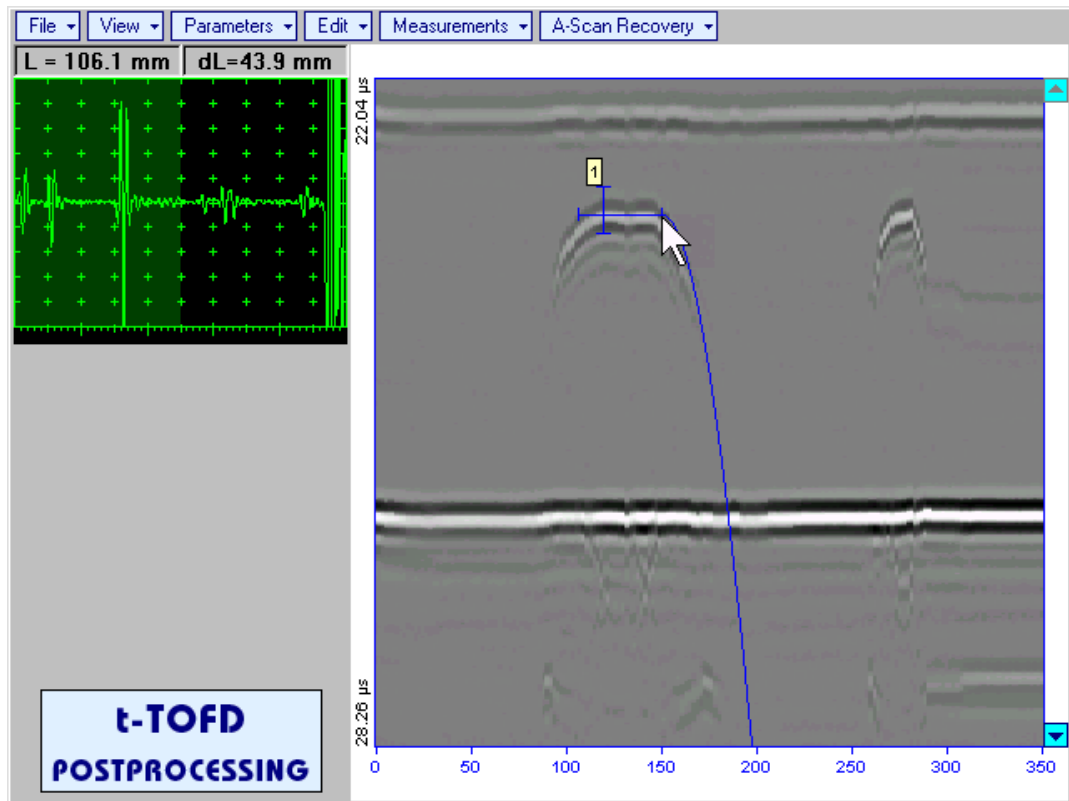
Clicking on  will hide subwindow with *depth measurement mark* data


Clicking on  will hide subwindow with *depth measurement mark* data and erase corresponding *depth measurement mark*

- Measurements→Add Measure→Length** – generates *left parabolic cursor* that may be guided over **t-TOFD / TOFD** image using either touch screen stylus or mouse or , , ,  on front panel keyboard or , , ,  on external keyboard . **A-Scan**, corresponding to coordinate (**L**) of tip of *left parabolic cursor* along scanning line is recovered synchronously. *Left parabolic cursor* to be placed over left defect's end providing shape matching. To fix position of *left parabolic cursor* left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard

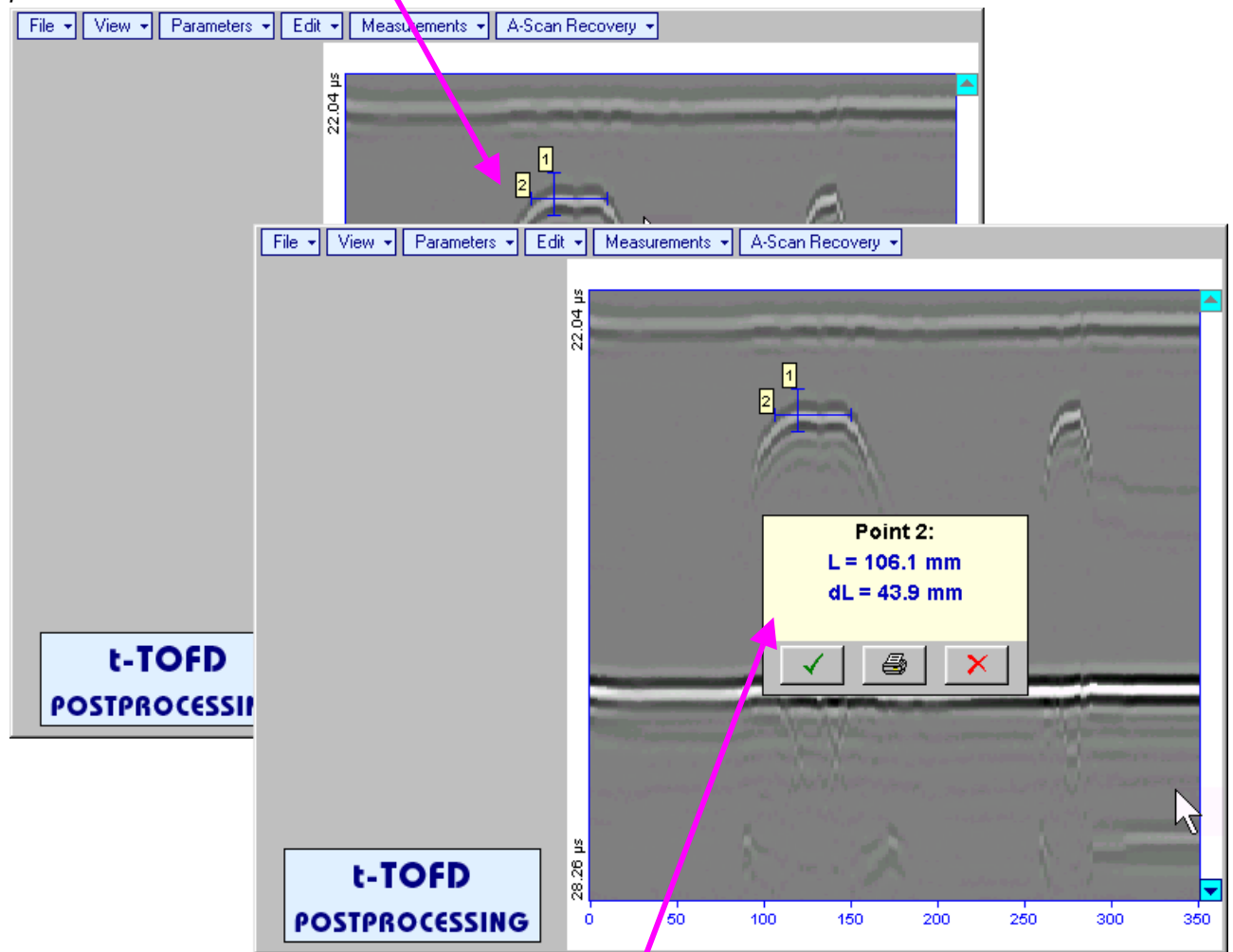


Right parabolic cursor appears upon fixing *left parabolic cursor*. It may be manipulated by the same way and must be placed over right defect's end providing shape matching. Coordinate of *right parabolic cursor* along **t-TOFD / TOFD** image measured relatively to position of *left parabolic cursor* (**dL**) is indicated synchronously, it represents length of defect area provided that both parabolic cursors are placed properly



To interrupt length measurement procedure at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard


Horizontal **length measurement mark** appears on **t-TOFD / TOFD** image upon fixing position of *right parabolic cursor*





Length measurement results may be recalled into **subwindow** through double click on the *length measurement mark*

In the subwindow appearing:

- **L** is coordinate of left end of the *length measurement mark*
- **dL** is length of defect area covered by *length measurement mark*
- **H** is distance between scanning line and *length measurement mark*

Clicking on  will print current screen snapshot accompanied with *length measurement mark* data



Clicking on  will hide subwindow with *length measurement mark* data

Clicking on  will hide subwindow with *length measurement mark* data and erase corresponding *length measurement mark*

- **Measurements→Clear Last** – erases last *length* or *depth/height measurement mark* placed on the **t-t-TOFD / TOFD** image
- **Measurements→Clear All** – erases all *length* and *depth/height measurement marks* placed on the **t-t-TOFD / TOFD** image

6.6. CB-Scan horizontal plane-view imaging and recording of defects for shear, surface, and guided wave inspection – t-FLOORMAP L or FLOORMAP L

6.6.1. Setup Pulser Receiver for t-FLOORMAP L and FLOORMAP L

UDS 3-5 Pulser Receiver window – main operating surface – appears on ISONIC 2005 / 2020 / STAR screen upon clicking on  or . The settings as below to be provided

6.6.1.1. Angle Beam Inspection – Shear and Longitudinal Waves

#	Parameter or Mode	Submenu	Required Settings	Note
1	Gain	BASICS	Gain setting to be performed according to inspection procedure providing required echo heights from defects to be detected	
2	DAC/TCG	DAC/TCG	DAC/TCG settings to meet requirements of inspection procedure	
3	Pulser Mode	PULSER	Dual for dual element probes Single for single element probes	
4	Tuning, Pulse Width, Firing Level, Damping	PULSER	Tuning, Pulse Width, Firing Level, and Damping settings to provide optimal signal to noise ratio	To synchronize with Gain setting procedure
5	Filter, Frequency	RECEIVER	Filter and Frequency settings to match with probe's frequency	To synchronize with Gain setting procedure
6	Display	RECEIVER	Display setting may be either Full, RF, PosHalf, or NegHalf	The same Display mode to be used for both Probe Delay determining and t-FLOORMAP L / FLOORMAP L Recording
7	USVelocity	BASICS	USVelocity setting to be equal to actual value of ultrasound velocity in the object under test	
8	Probe Delay	MEASURE	Probe Delay setting to be equal to actual probe delay	For shear wave / longitudinal wave angle beam inspection probe delay may be determined according to paragraph 5.2.13.5, 5.2.13.6 or 5.2.13.8 of this Operating Manual or similarly
9	Display Delay	BASICS	Display Delay setting to be equal to actual probe delay	Recommend Display Delay = Probe Delay
10	Angle	MEASURE	Angle setting to be equal to actual probe angle	
11	Settings for other parameters and modes have no significance			

Click on  or press  on front panel keyboard or **F8** on external keyboard upon completing

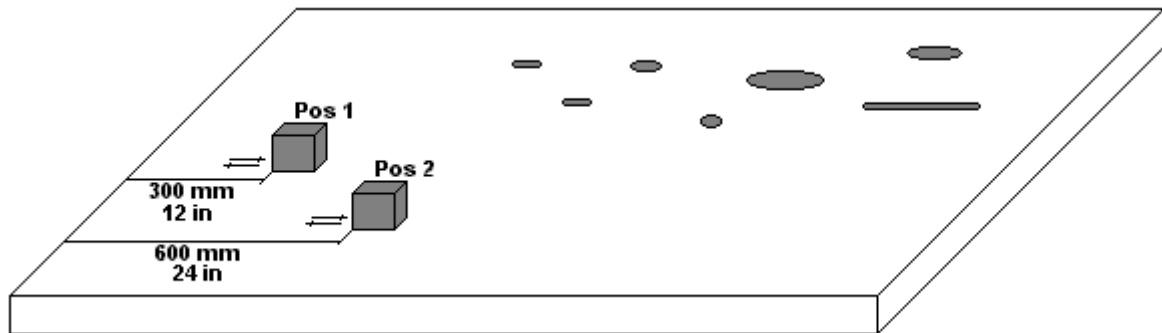
6.6.1.2. Guided, Surface, Creeping, and Head Wave Inspection

#	Parameter or Mode	Submenu	Required Settings	Note
1	Gain	BASICS	Gain setting to be performed according to inspection procedure providing required echo heights from defects to be detected	For guided / surface / creeping / head wave inspection Gain setting may be implemented according to paragraph 6.6.1.4 of this Operating Manual or similarly
2	DAC/TCG	DAC/TCG	DAC/TCG settings to meet requirements of inspection procedure	For guided / surface / creeping / head wave inspection DAC may be created according to paragraph 6.6.1.4 of this Operating Manual or similarly
3	Pulser Mode	PULSER	Dual for dual element probes Single for single element probes	
4	Tuning, Pulse Width, Firing Level, Damping	PULSER	Tuning, Pulse Width, Firing Level, and Damping settings to provide optimal signal to noise ratio	To synchronize with Gain setting procedure
5	Filter, Frequency	RECEIVER	Filter and Frequency settings to match with probe's frequency	To synchronize with Gain setting procedure
6	Display	RECEIVER	Display setting may be either Full, RF, PosHalf, or NegHalf	The same Display mode to be used for both Probe Delay determining and t-FLOORMAP L / FLOORMAP L Recording
7	USVelocity	BASICS	USVelocity setting to be equal to actual value of ultrasound velocity in the object under test	For guided / surface / creeping / head wave inspection ultrasound velocity may be determined according to paragraph 6.6.1.3 of this Operating Manual or similarly
8	Probe Delay	MEASURE	Probe Delay setting to be equal to actual probe delay	For guided / surface / creeping / head wave inspection probe delay may be determined according to paragraph 6.6.1.3 of this Operating Manual or similarly
9	Display Delay	BASICS	Display Delay setting to be equal to actual probe delay	Recommend Display Delay = Probe Delay
10	Angle	MEASURE	90°	
11	Settings for other parameters and modes have no significance			

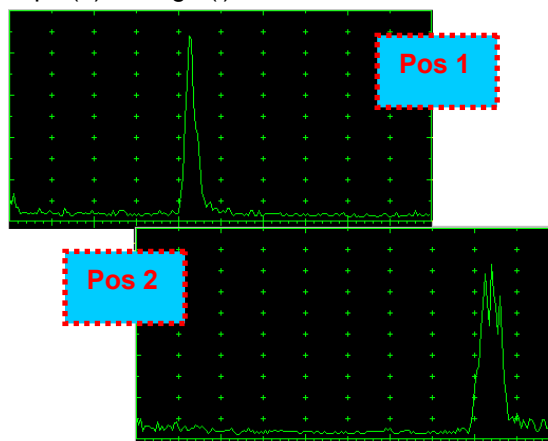
Click on  or press  on front panel keyboard or **F8** on external keyboard upon completing

6.6.1.3. Determining Probe Delay and Ultrasound Velocity for Guided / Surface / Creeping / Head Wave Inspection

The following procedure is recommended for finding **Probe Delay** and **US Velocity** settings necessary to perform guided wave inspection:



- In the **UDS 3-5 Pulser Receiver** window – submenu **BASICS** setup **Range = 750 mm** (or **30 in**)
- In the **UDS 3-5 Pulser Receiver** window – submenu **BASICS** setup **US Velocity = 3000 m/s** (or **120 in/ms**)
- Place guided wave probe into position **Pos 1** on a reference plate providing **300 mm** (or **12 in**) distance between probe's frontal surface and plate end
- Tune **Gain** to provide plate end echo reaching **80-90%** of **A-Scan** screen height
- Tune **Display Delay** (submenu **BASICS**) to provide rising edge of plate end echo matching with **40%** grid on horizontal **A-Scan** screen scale
- Place guided wave probe into position **Pos 2** on a reference plate providing **600 mm** (or **24 in**) distance between probe's frontal surface and plate end
- Tune the **US Velocity** (submenu **BASICS**) to provide rising edge of plate end echo matching with **80%** grid on horizontal **A-Scan** screen scale
- Place again guided wave probe into position **Pos 1** on a reference plate providing **300 mm** (or **12 in**) distance between probe's frontal surface and plate end
- Repeat steps (e) through (h) as above until further tuning will not be necessary, i.e. placement of guided wave probe into positions **Pos 1** and **Pos 2** causes rising edge of plate end echo appearing at **40%** and **80%** on horizontal **A-Scan** screen scale correspondingly. Since that **Display Delay** and **US Velocity** settings are proper
- In the submenu **MEASURE** provide **Probe Delay = Display Delay** whereas **Display Delay** value to be found according to above steps (a) through (i)



- Probe Delay** and **US Velocity** for surface / creeping / head wave inspection may be found similarly
- Automatic Calibration (AUTOCAL) procedure according to paragraph 5.2.13.8 of this Operating Manual is also applicable

6.6.1.4. Setting Gain and DAC for Guided / Surface / Creeping / Head Wave Inspection

For setting up **Gain** and **DAC** a reference plate containing artificial defects is required; said reference plate must have acoustical properties (longitudinal and shear wave propagation velocity, attenuation) thickness and curvature differing from the same properties of the plate to be inspected in not more than $\pm 10\%$.

Gain setting to be performed through providing sure detection of artificial defect from selected distances according to required inspection range

Optional **DAC** setting for guided wave inspection to be performed as below:

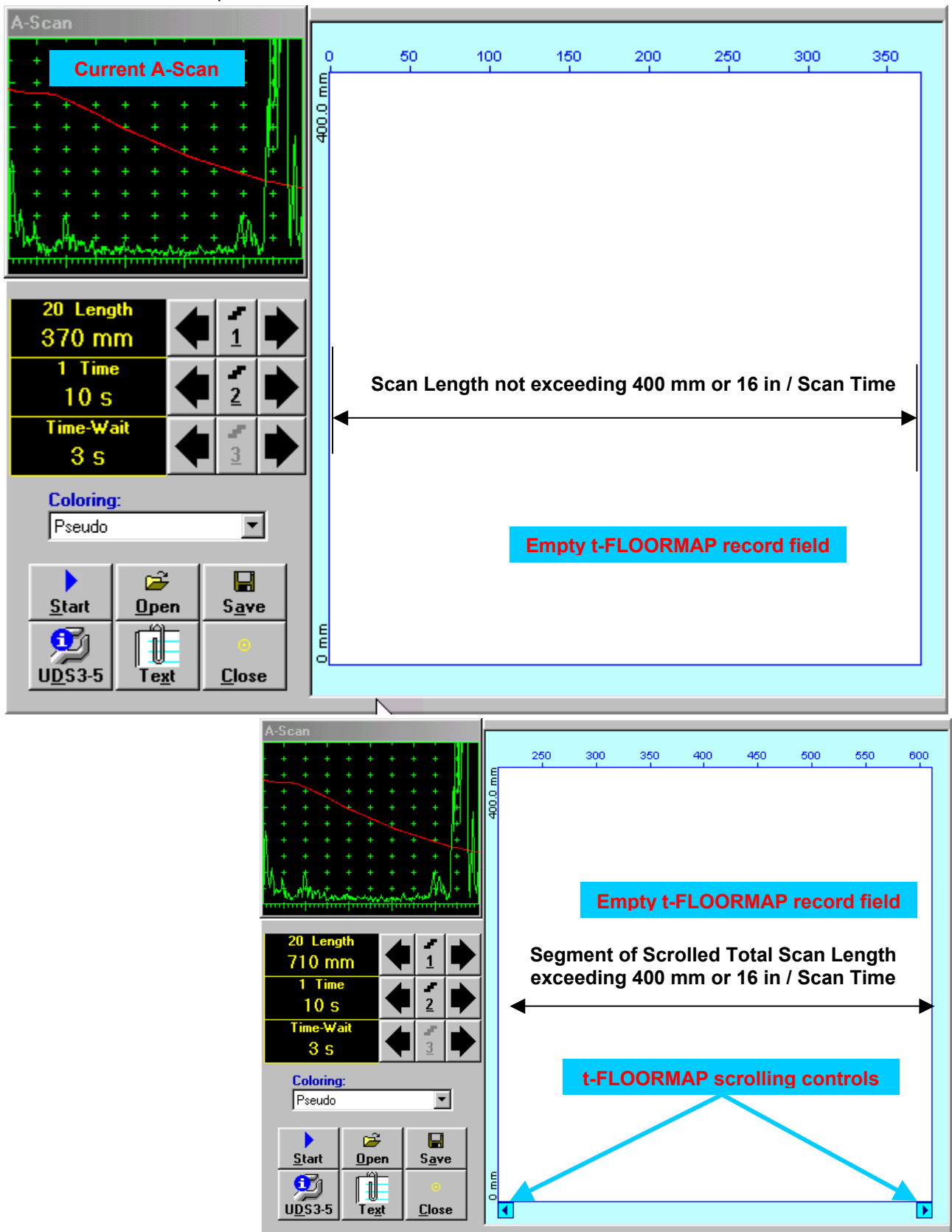
Place guided wave probe into position on reference plate providing receiving of an echo from a reflector

- (a) Place guided wave probe into position on reference plate providing receiving of an echo from a reflector passing minimal travel distance
- (b) Follow instructions of paragraph 5.2.10 of this Operating Manual to record first DAC echo
- (c) Move the probe away from the reflector keeping it's echo maximized for each new DAC echo recording paragraph 5.2.10 of this Operating Manual

6.6.2. t-FLOORMAP L and FLOORMAP L – Implementation

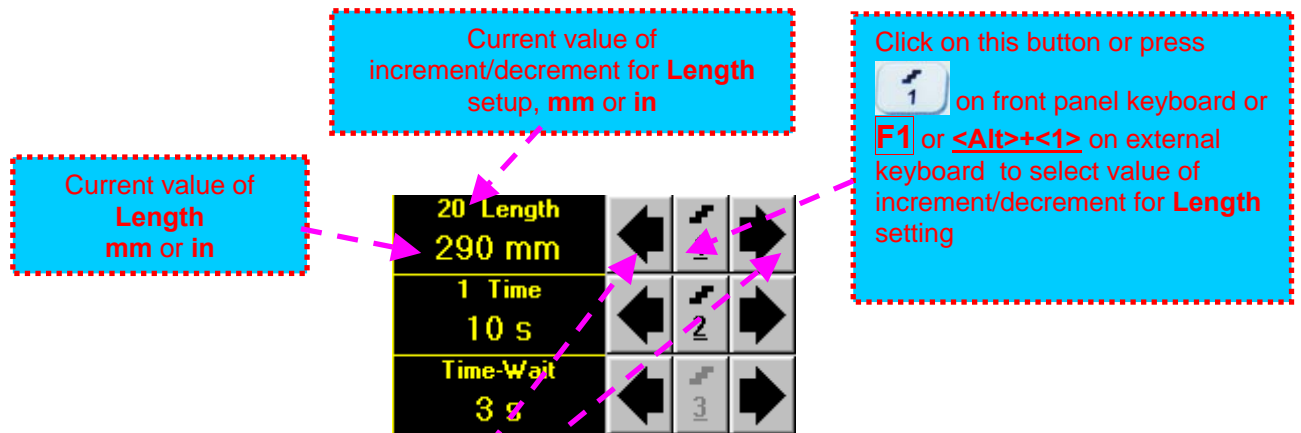
6.6.2.1. t-FLOORMAP L – Prior to Scanning

t-FLOORMAP L control panel is shown below



Scan Length and Scan Time

Length represents length of section of test object to be displayed, over which probe will be scanning during recording period. **Time** (Scan Time) is the duration of recording period












To control **Length** the following manipulations are applicable:








- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

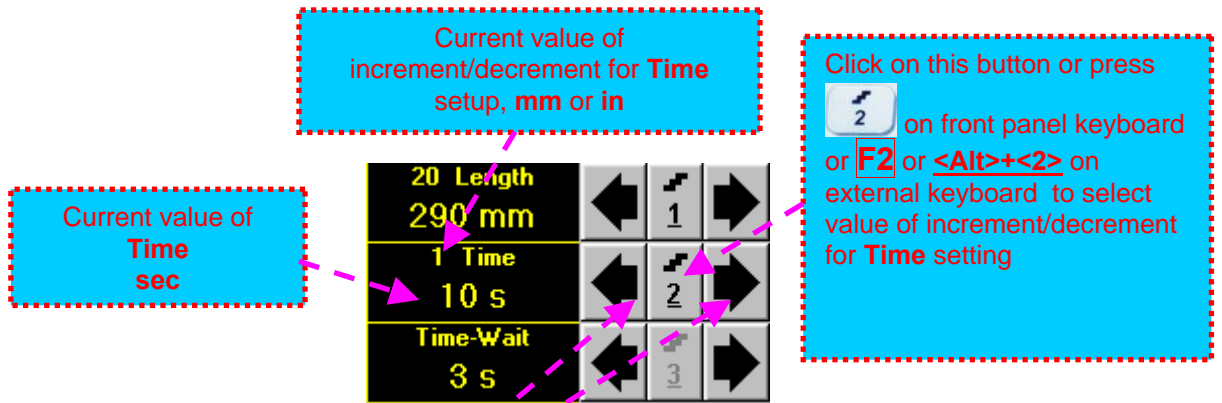
- Press  on front panel keyboard or **F1** on external keyboard ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Length** ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , , on external keyboard



The value of **Length** is adjustable between 50 and 1000 **mm** or 2 and 40 **in**



To control **Time** the following manipulations are applicable:

- **Mouse / Touch Screen**

- Click on corresponding button

- **Keyboard**

- Press on front panel keyboard or **F2** on external keyboard ⇒ **Time** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard

- **Combined**

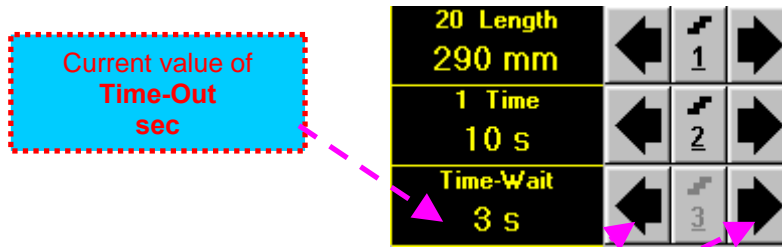
- Click on **Time** ⇒ **Time** fore color changes to white - then use , , , on front panel keyboard or , , , on external keyboard



The value of **Time** is adjustable between 5 and 60 **sec**

Time-Wait

Time-Wait is waiting time for intermissions precessing **t-TOFD** recording, which starts unconditionally upon **Time-Wait** period is over












To control **Time-Wait** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F3** on external keyboard ⇒ **Time-Wait** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Time-Wait** ⇒ **Time-Wait** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of **Time-Wait** is adjustable between 0 and 15 sec

t-FLOORMAP L Record Palette

There are four palettes available through – select **through**





Insert Text Note





Refer to paragraph 6.3.2.1 of this Operating Manual



Preview UDS 3-5 Settings

Refer to paragraph 6.3.2.1 of this Operating Manual

Start/Stop t-FLOORMAP L recording

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to start **t-FLOORMAP L** recording

 button becomes invisible since **t-FLOORMAP L** recording starts.  button occupies its position. Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to terminate **t-FLOORMAP L** recording prior to automatic completion

 button becomes invisible after completion / termination of **t-FLOORMAP L** record.  button returns to its position

Save record into a file

Refer to paragraph 6.3.2.1 of this Operating Manual

Open record from a file and starting postprocessing session

Refer to paragraph 6.3.2.1 of this Operating Manual

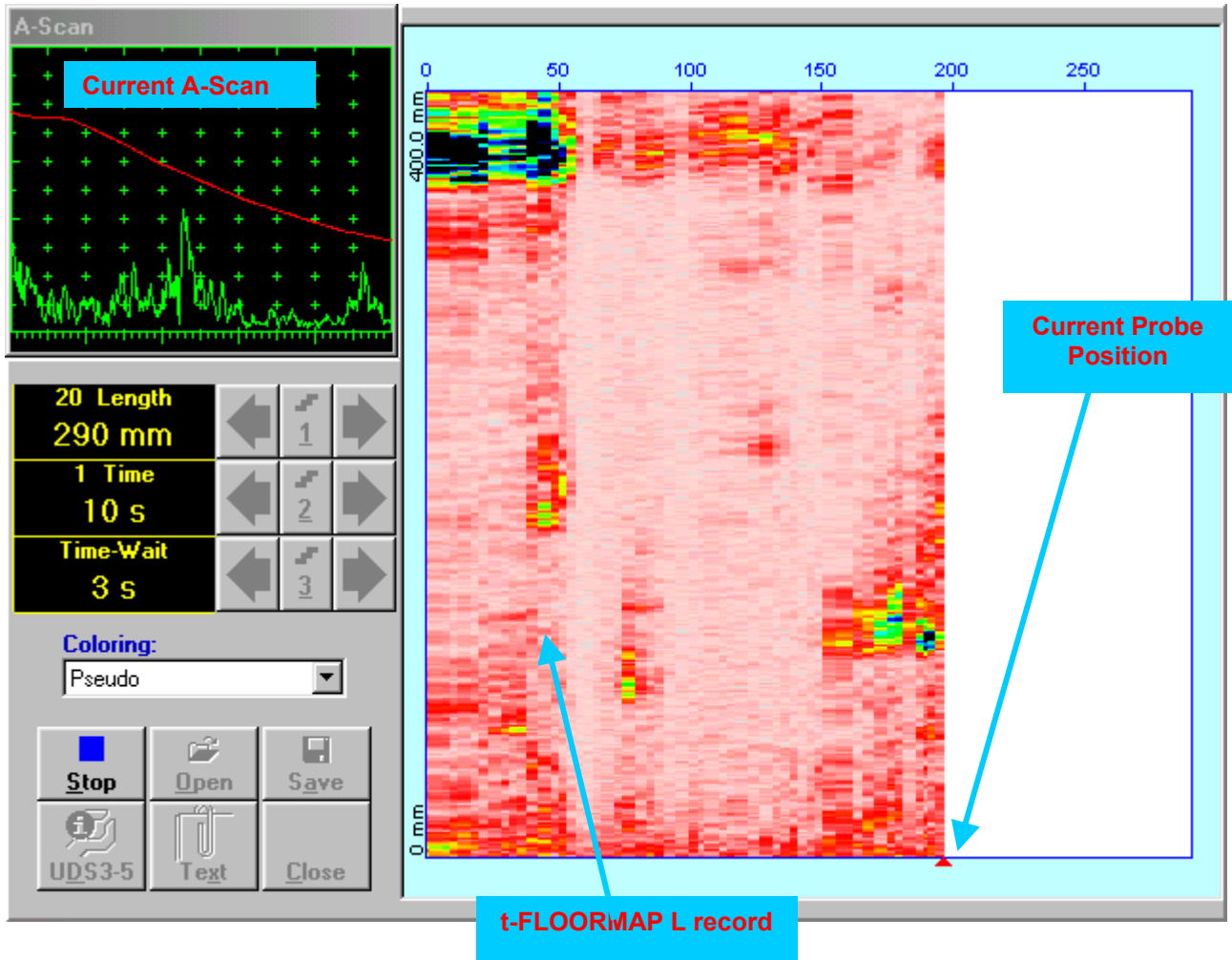
Return to UDS 3-5 main operating surface

Refer to paragraph 6.3.2.1 of this Operating Manual

6.6.2.2. t-FLOORMAP L – Scanning

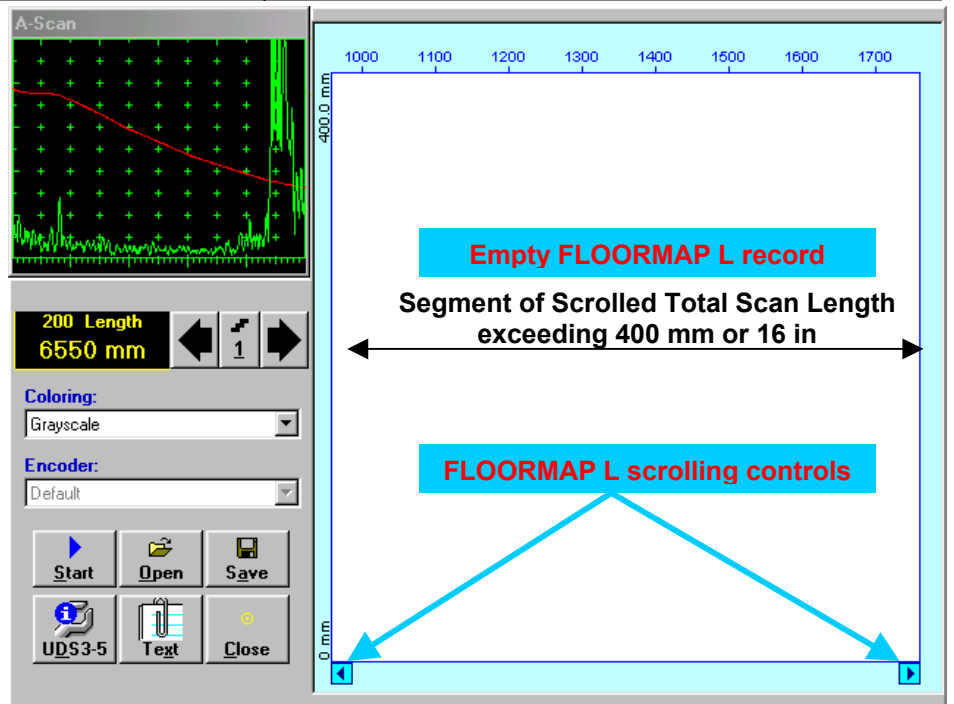
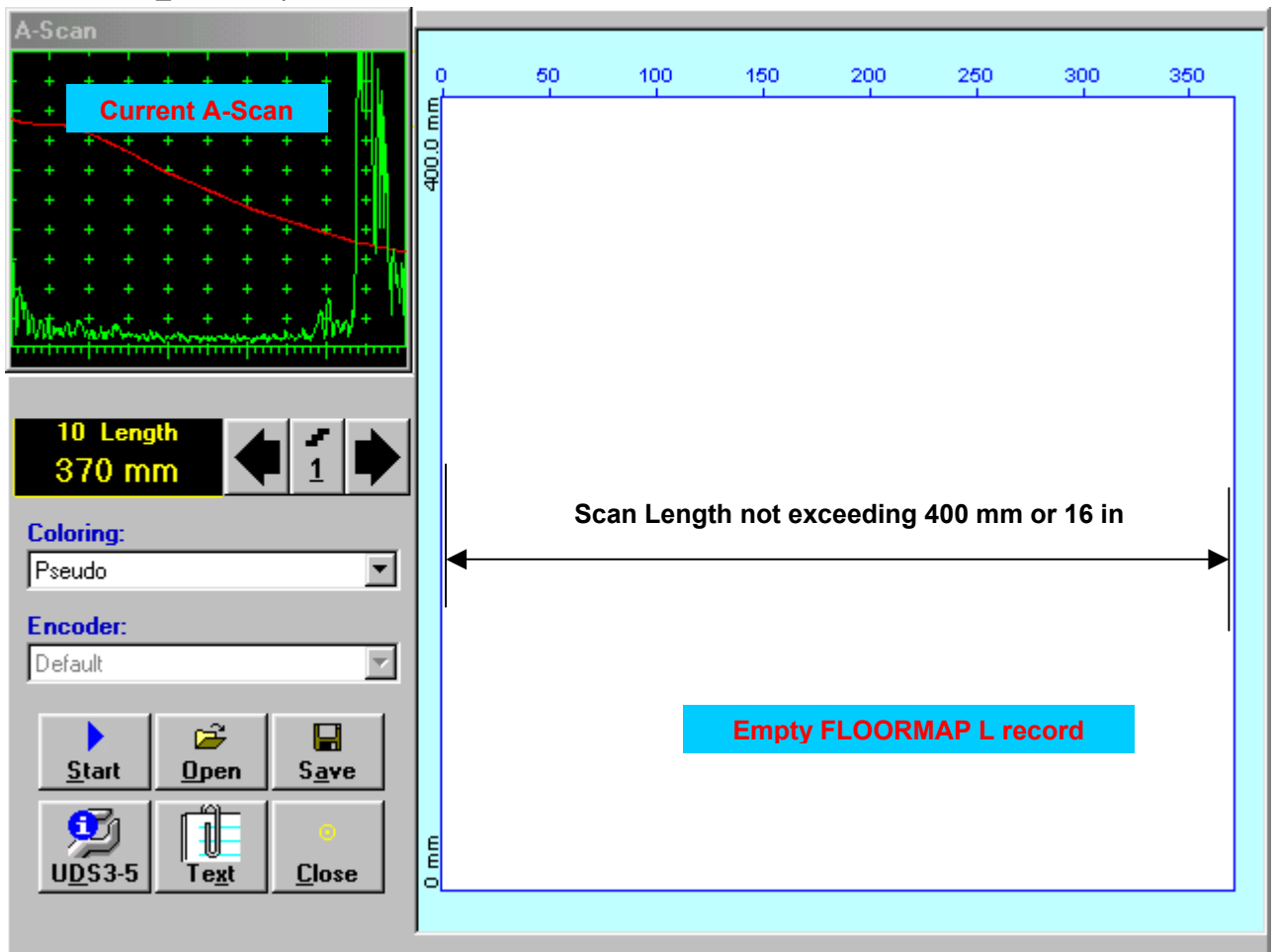
- Apply probes pair to test object in the start point of selected scanning line

- Click on **Start** or press **I** on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard
- Guide probe over the scanning line synchronously with *Position Icon* moving with constant speed above **t-FLOORMAP L** record field – typical scanning progress display during is shown and explained below



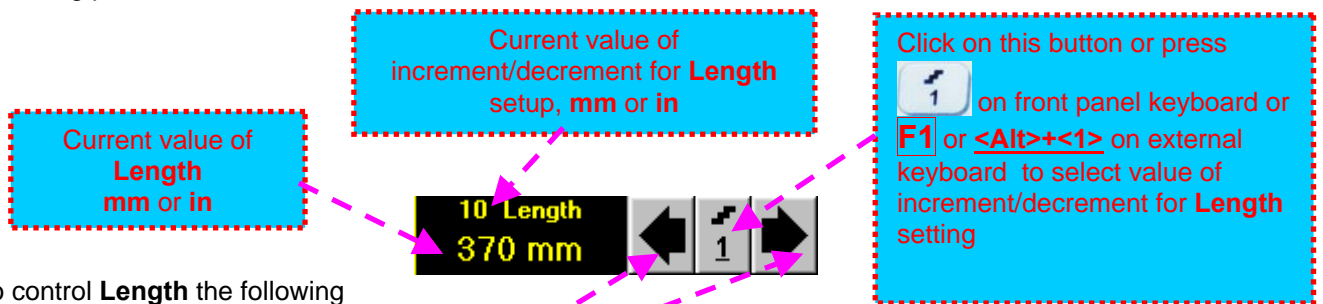
6.6.2.3. FLOORMAP L – Prior to Scanning

FLOORMAP_L control panel is shown below



Scan Length

Length represents length of section of test object to be displayed, over which probe will be scanning during recording period












To control **Length** the following manipulations are applicable:









- **Mouse / Touch Screen**

- Click on corresponding **button**

- **Keyboard**

- Press  on front panel keyboard or **F1** on external keyboard ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard

- **Combined**

- Click on **Length** ⇒ **Length** fore color changes to white - then use , , ,  on front panel keyboard or , , ,  on external keyboard



The value of **Length** is adjustable between 50 and 20000 **mm** or 2 and 800 **in**

FLOORMAP L Record Palette

There are four palettes available through – select **through**



Encoder

Select encoder to be used through appropriate box



Clamp probe into encoder – refer to Chapter 7 of this Operating Manual

Connect encoder to appropriate input on the rear panel of **ISONIC 2005 / 2020 / STAR** instrument



Insert Text Note





Refer to paragraph 6.3.2.1 of this Operating Manual

Preview UDS 3-5 Settings

Refer to paragraph 6.3.2.1 of this Operating Manual

Start/Stop FLOORMAP L recording

Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to start **FLOORMAP L** recording

 button becomes invisible since **FLOORMAP L** recording starts.  button occupies its position. Click on  or press  on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard to terminate **FLOORMAP L** recording

 button becomes invisible after termination of **FLOORMAP L** record.  button returns to its position

Save record into a file

Refer to paragraph 6.3.2.1 of this Operating Manual

Open record from a file and starting postprocessing session

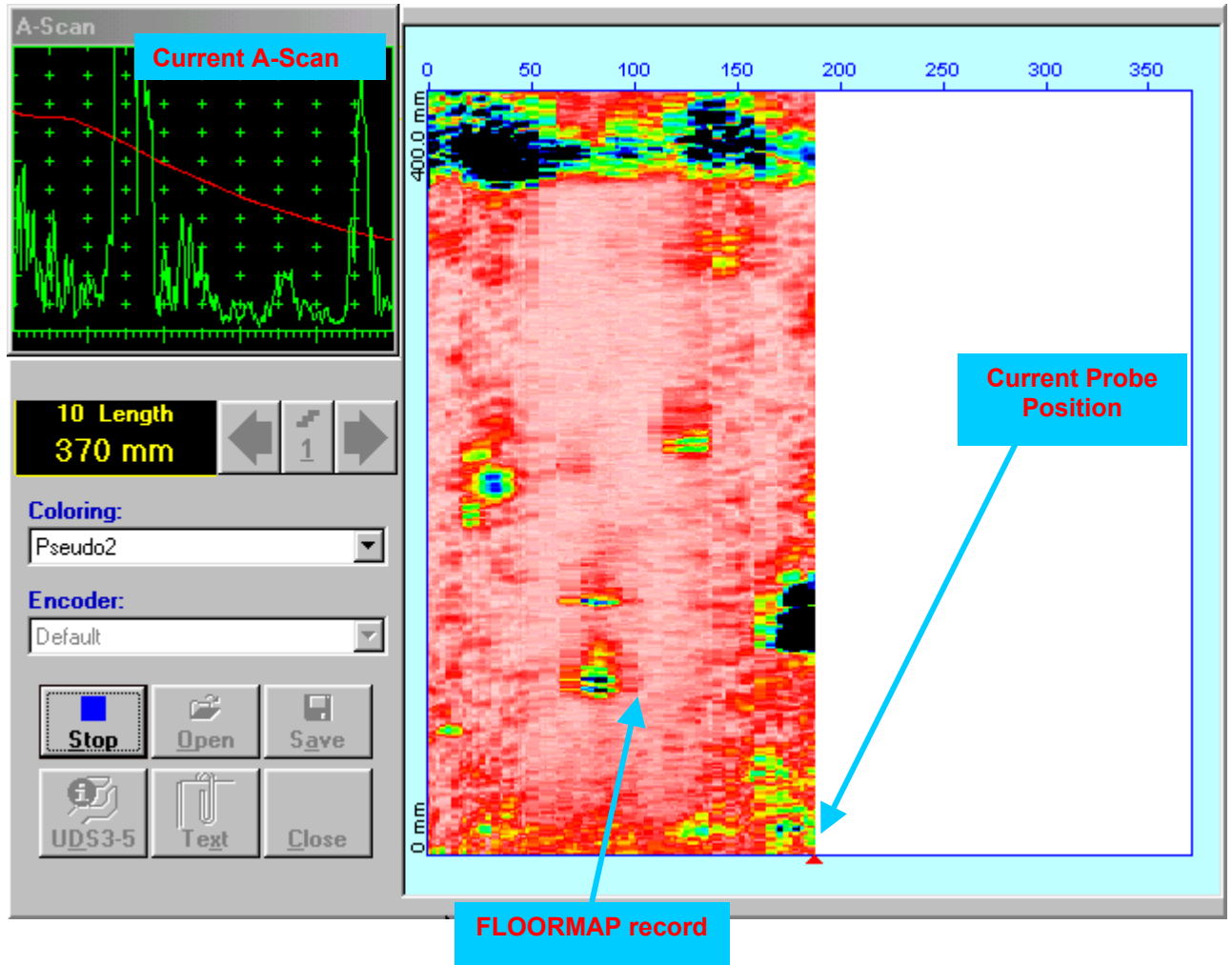
Refer to paragraph 6.3.2.1 of this Operating Manual

Return to UDS 3-5 main operating surface

Refer to paragraph 6.3.2.1 of this Operating Manual

6.6.2.4. FLOORMAP L – Scanning

- Apply probes pair to test object in the start point of selected scanning line
- Click on **Start** or press **I** on front panel keyboard or **F8** or **<Alt>+<S>** on external keyboard
- Guide probe over the scanning line – typical scanning progress display during is shown and explained below

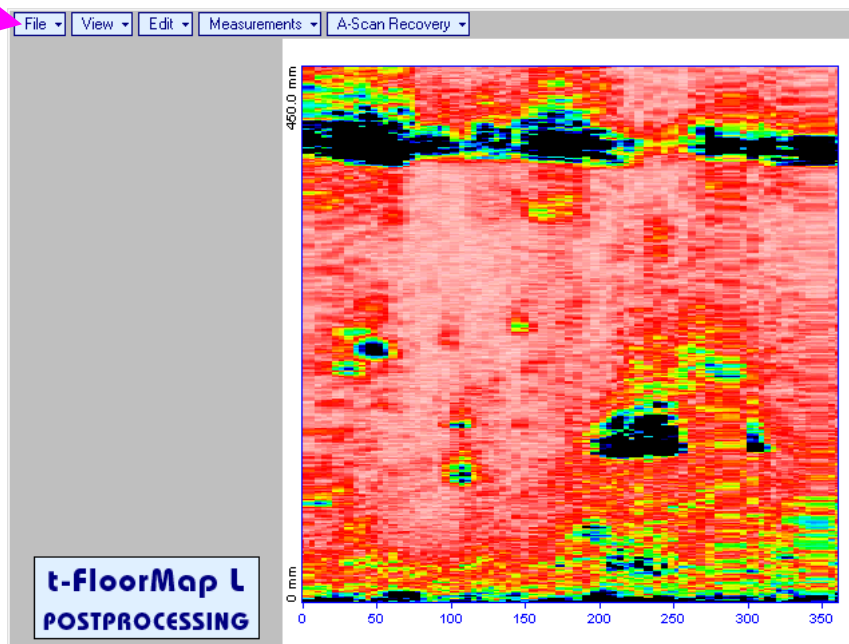


6.6.2.5. t-FLOORMAP L / FLOORMAP L – Postprocessing

Versatile postprocessing of t-FLOORMAP L/FLOORMAP L (CB-Scan) records is featured with:





- ❑ Sizing of the defects at any location along stored images (coordinates, projection size, amplitude-based evaluation)
- ❑ Play-back and evaluation of **A-Scans** obtained and captured during t-FLOORMAP L / FLOORMAP L (CB-Scan) defects imaging and recording
- ❑ Defects outlining and pattern recognition based on **A-Scan** sequence analysis – **Echo Dynamic Pattern Analysis**
- ❑ Reconstruction of t-FLOORMAP L / FLOORMAP L (CB-Scan) defects images for various **Gain, Reject, and off-line Gate** level settings
- ❑ **DAC/DGS t-FLOORMAP L / FLOORMAP L (CB-Scan)** normalization

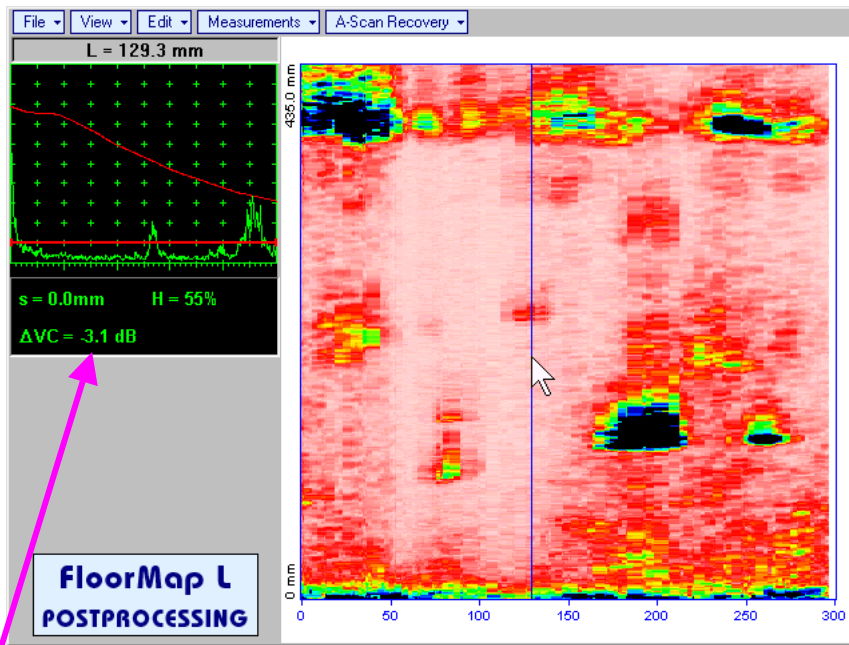
The screen as below appears upon opening file. All postprocessing procedures are performed through **menu bar** – touch screen stylus or front panel or external mouse to be used



Menu Bar Functions

- **File→Open** – opens new t-FLOORMAP L / FLOORMAP L (CB-Scan) file
- **File→Snapshots→Add Snapshot** – stores current postprocessing screen snapshot accompanied with appropriate settings and measurements into *postprocessing session memory stack*
- **File→Snapshots→Restore Snapshot** – recalls earlier stored postprocessing screen snapshot accompanied with appropriate settings and measurements from *postprocessing session memory stack*
- **File→Snapshots→Delete Snapshot** – deletes earlier stored postprocessing screen snapshot accompanied with appropriate settings and measurements from *postprocessing session memory stack*
- **File→Print** – prints out postprocessing screen snapshot(s) accompanied with appropriate settings and measurements
- **File→Exit** – returns to t-FLOORMAP L / FLOORMAP L (CB-Scan) control panel
- **View→Instrument** – indicates setup of **UDS 3-5** Pulsar Receiver used for scanning when file was created
- **View→Inspection Data** – indicates operator's comments entered prior to scanning
- **View→Coloring** – selects palette for t-FLOORMAP L / FLOORMAP L (CB-Scan) image


- **A-Scan Recovery →ON** – generates *cursor representing sound path* of probe's central beam in the object under test that may be guided over **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *sound path cursor* position. Indication of starting position of cursor (**L**) corresponding to probe's center accompanies recovered **A-Scan**. On the recovered **A-Scan** there is red **Off-line Gate** presented. Initially **Off-line Gate** covers whole **A-Scan** range




Automatic Measurements Display accompanies recovered **A-Scan** and indicates (refer to paragraphs 5.1.12, 5.2.13.1 and 5.2.13.2 of this Operating Manual):

- sound path **s** between reflector and probe's center (measurement mode - **Flank**)
- amplitude **H** of the maximal signal in the **Off-line Gate** expressed in % of full **A-Scan** height
- **ΔVC (dB to DAC)** of the maximal signal in the **Off-line Gate** provided that DAC was active whilst recording **t-FLOORMAP L / FLOORMAP L (CB-Scan)** data


To fix position of *sound path cursor* with corresponding recovered **A-Scan** and **Automatic**






Measurements Display data left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard

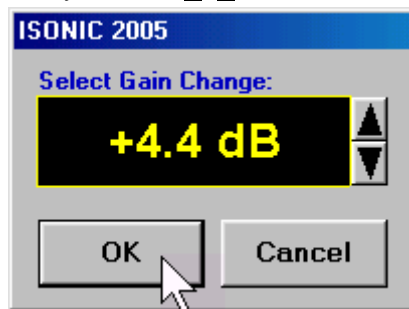
To interrupt recovery of **A-Scans** and empty **A-Scan Recovery** field right mouse click or press  on front panel keyboard or **Esc** on external keyboard

- **A-Scan Recovery →OFF** – erases *sound path cursor* with recovered **A-Scan**, indicator of *sound path cursor* position, and **Automatic Measurements Display**



- **Edit→Change Gain→ON** – generates *cursor representing sound path* of probe's central beam in the object under test that may be guided over **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *sound path cursor* position.

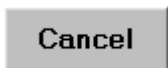

To select reference **A-Scan** release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard – this generates subwindow allowing off-line re-adjusting of **Gain** for all **A-Scans** captured during **t-FLOORMAP L / FLOORMAP L (CB-Scan)**

recording in **±6dB** range with **±0.1 dB** increments through clicking or pressing and holding on  or pressing  ,  on front panel keyboard or  ,  on external keyboard














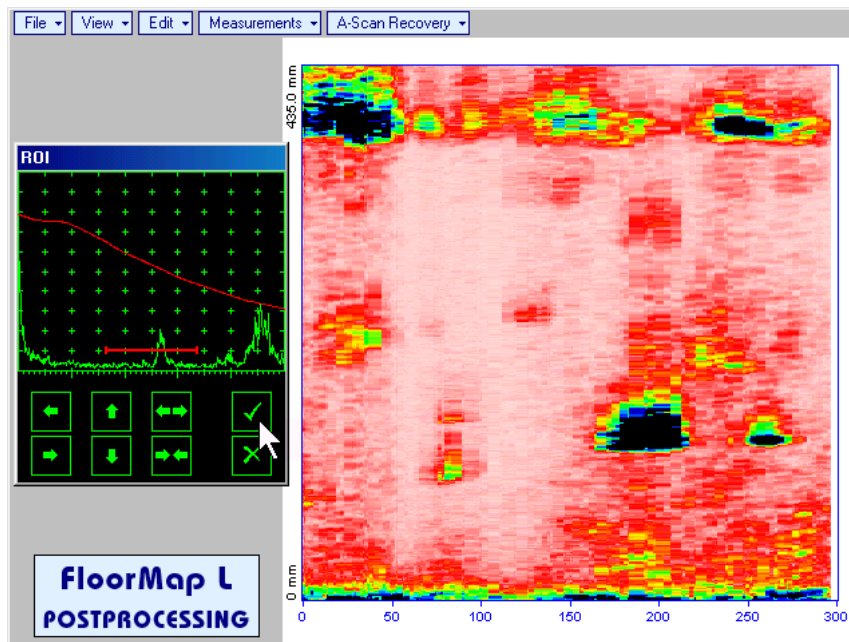
During **Gain** re-adjusting reference **A-Scan** is modified accordingly. Upon completing re-adjusting **Gain**


click on  or press  on front panel keyboard or **Enter** on external keyboard – this applies new **Gain** value to all captured **A-Scans** and redraws **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image accordingly

To interrupt re-adjusting of **Gain** click on  or press  on front panel keyboard or **Esc** on external keyboard


- **Edit→Change Gain→OFF** – negates **Gain** re-adjustment and returns to originally recorded **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image and original **Gain** setting

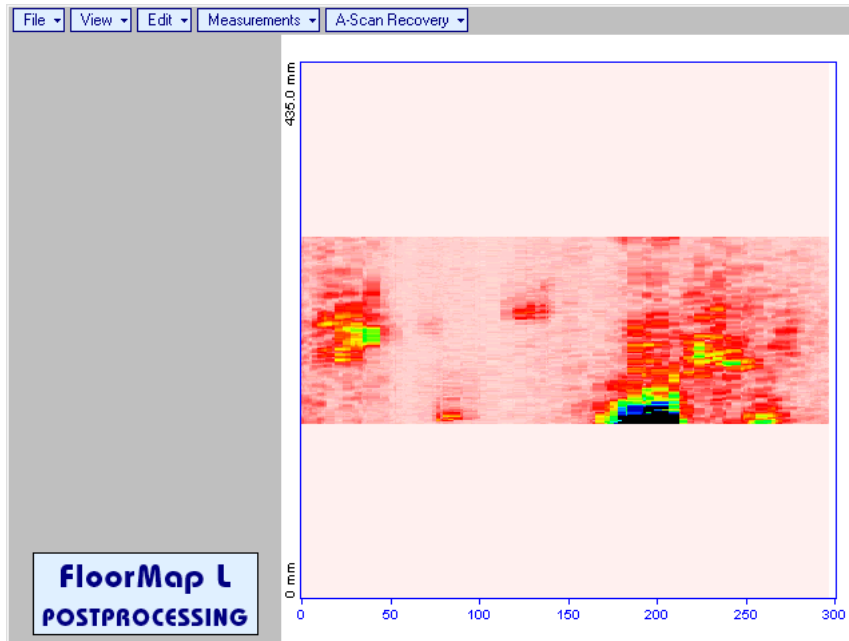
- Edit→ROI→ON** – generates *cursor representing sound path* of probe's central beam in the object under test that may be guided over **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *sound path cursor* position. To select reference **A-Scan** release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard – this generates **Off-line Gate** controls  ,  ,  ,  ,  ,  allowing to redefine **Region Of Interest** for **t-FLOORMAP L / FLOORMAP L (CB-Scan)** imaging



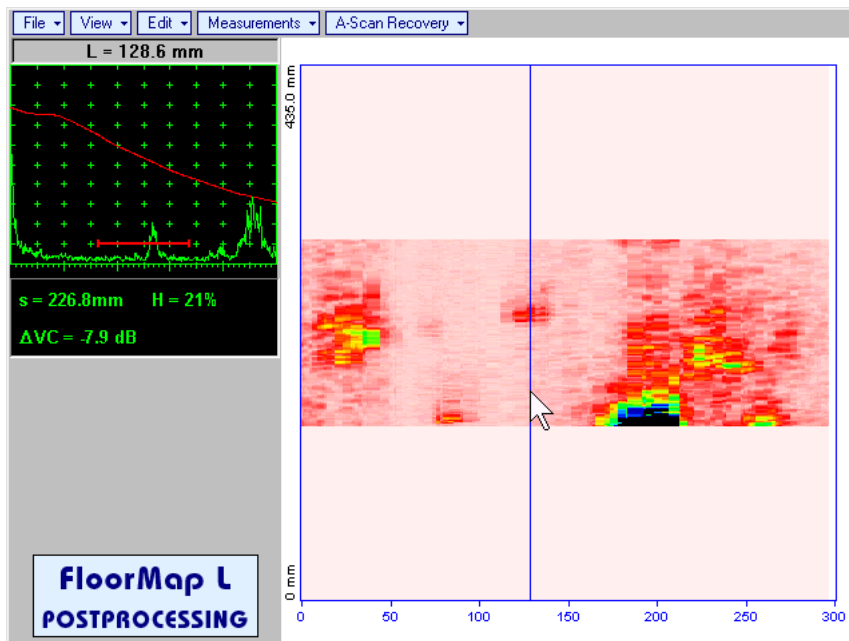
To interrupt selection of reference of **A-Scan** right mouse click or press  on front panel keyboard or **Esc** on external keyboard

To interrupt re-adjustment of **Region Of Interest** after selection of reference of **A-Scan** click on 





Upon completing redefining of **Region Of Interest** click on  – this applies new **Off-line Gate** to all captured **A-Scans** and updates **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image accordingly – only segment of **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image covered by newly adjusted **Off-line Gate** remains visible

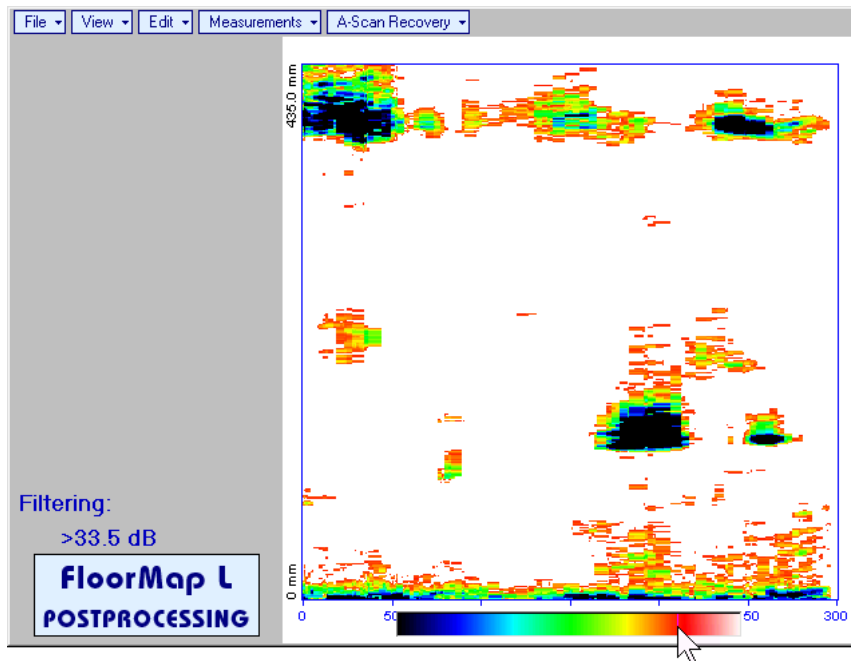


It is possible then to perform **A-Scan** signal evaluation using newly adjusted **Off-Line Gate** through **A-Scan Recovery** → **ON**



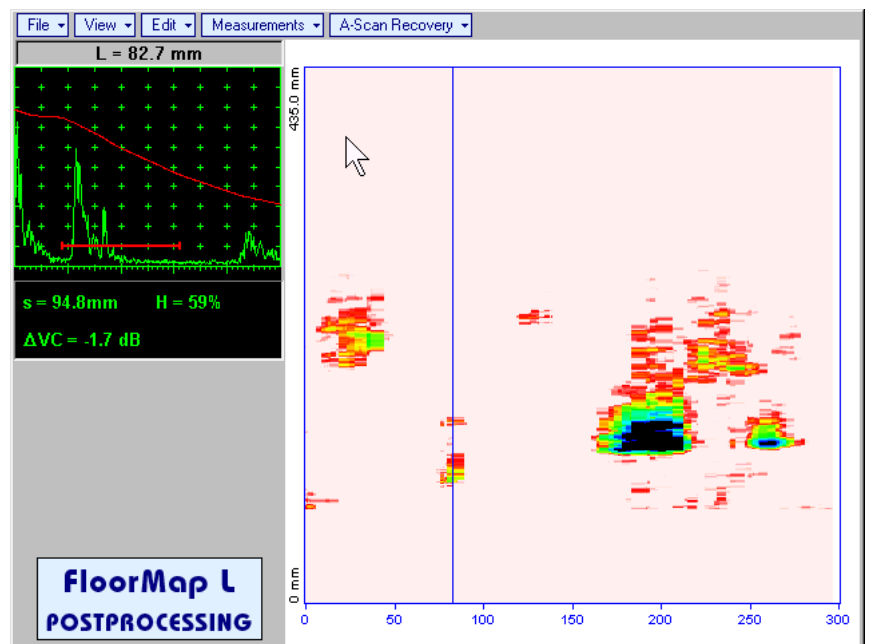
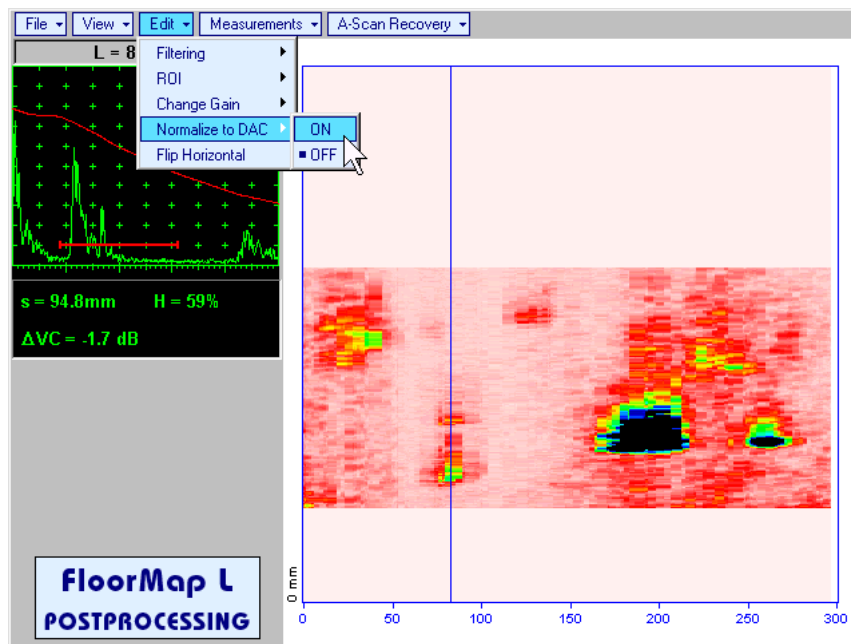
- **Edit**→**ROI**→**OFF** – negates **Off-line Gate** re-adjustment and returns to originally recorded **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image and initial **Off-line Gate** setting

- **Edit→Filtering→ON** – generates *amplitude palette bar* with *sliding cursor*, which may be controlled using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard . Position of the *sliding cursor* on the *amplitude palette bar* determines filtering level, which is indicated as **Filtering**. All elements of **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image representing signal amplitude below filtering level are suppressed:



- **Edit→Filtering→OFF** – returns to originally recorded **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image and removes **Filtering** indication

- **Edit→Normalize to DAC→ON** – applies **DAC/DGS** normalized color palette to **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image, which was recorded with active **DAC/DGS** and redraws **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image correspondingly (**dB to DAC/DGS** normalization)

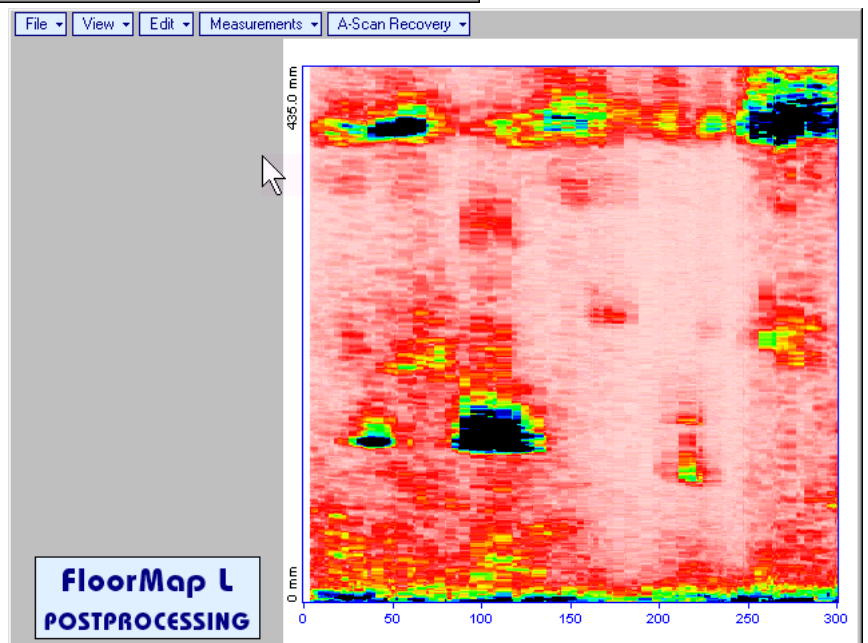
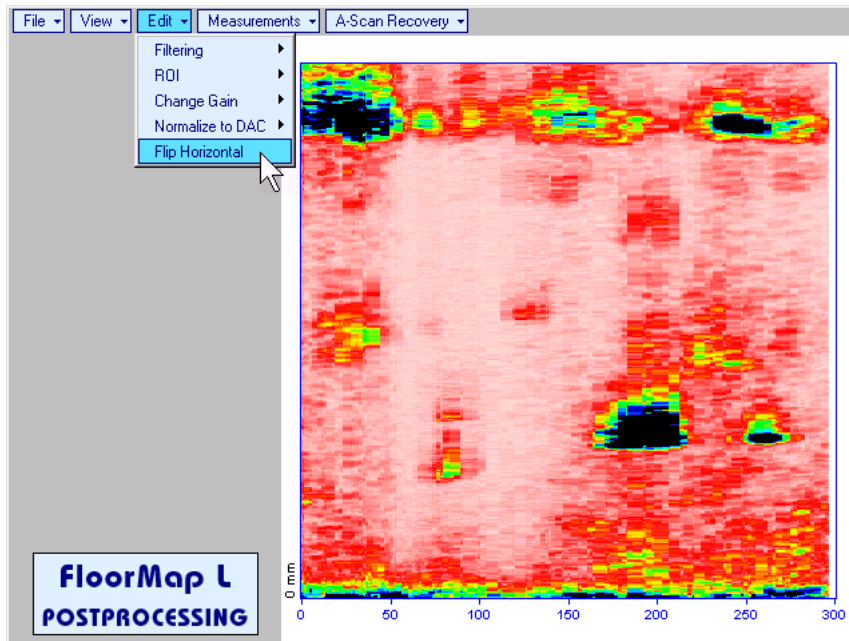


- **Edit→Normalize to DAC→OFF** – negates **dB to DAC/DGS** normalization and returns to originally recorded **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image








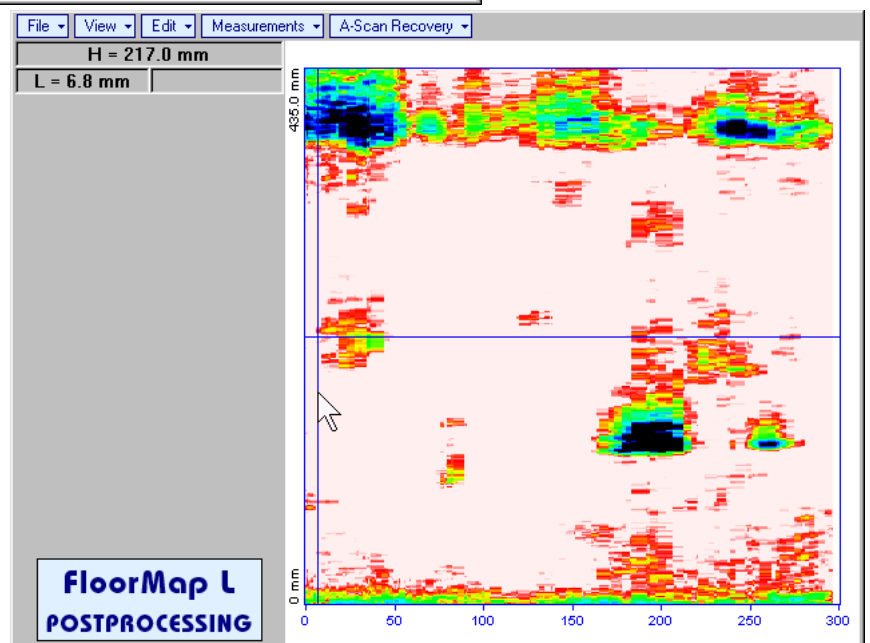
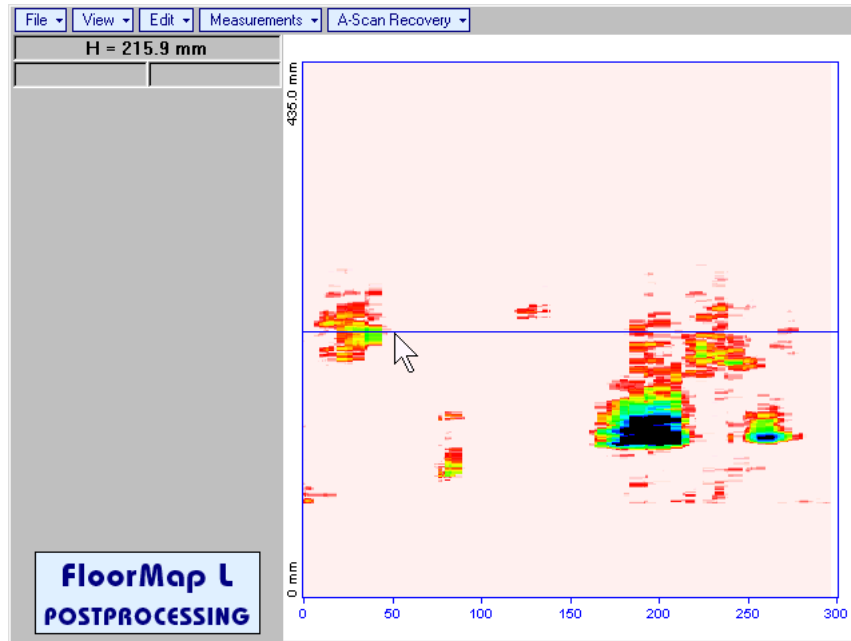
Applying of **Edit→Normalize to DAC→ON** or **Edit→Normalize to DAC→OFF** negates **Filtering (Edit→Filtering→OFF)**






- **Edit→Flip Horizontal** – reorders **A-Scans** captured during **t-FLOORMAP L / FLOORMAP L (CB-Scan)** recording in reverse succession and redraws **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image accordingly. This service function may be useful for merging scans of neighboring sections of an object, which were scanned in opposite direction due to access conditions, etc




Applying of **Flip Horizontal** function empties *postprocessing session memory stack*

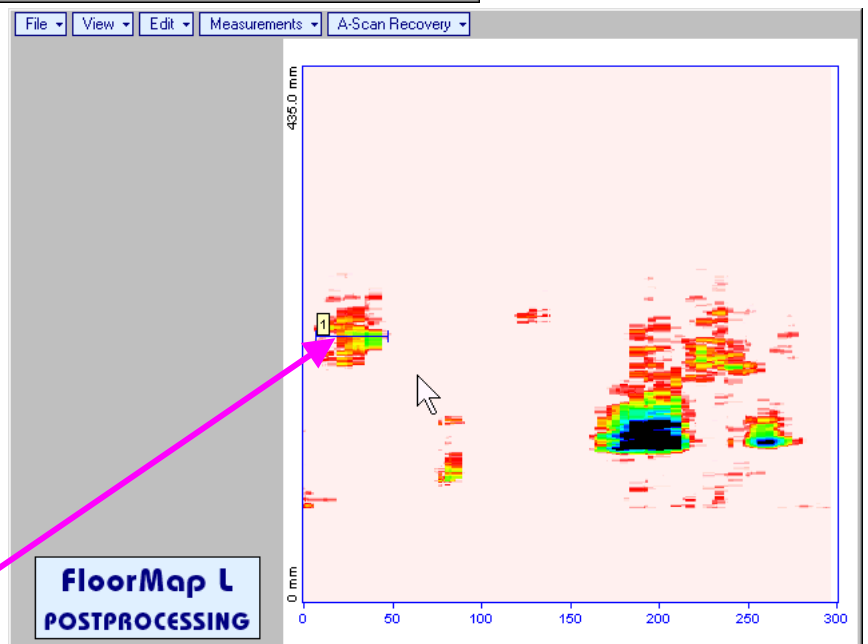
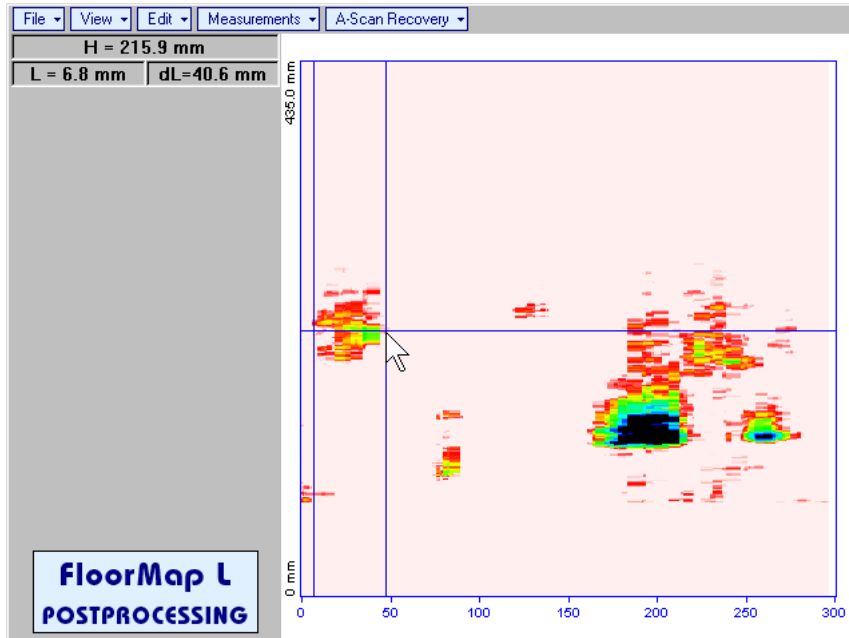
- Measurements** → **Add Measure** → **Length** – generates horizontal cursor that may be guided over **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard . Horizontal cursor to be positioned over defect area, which's length along the scanning line to be evaluated. Position of horizontal cursor characterizes its coordinate (**H**) relatively scanning line. To fix position of horizontal cursor left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard



First vertical cursor appears upon fixing horizontal cursor, it may be guided over **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard . Coordinate of the first vertical cursor along **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image (**L**) is indicated synchronously. To fix position of the first vertical cursor left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard

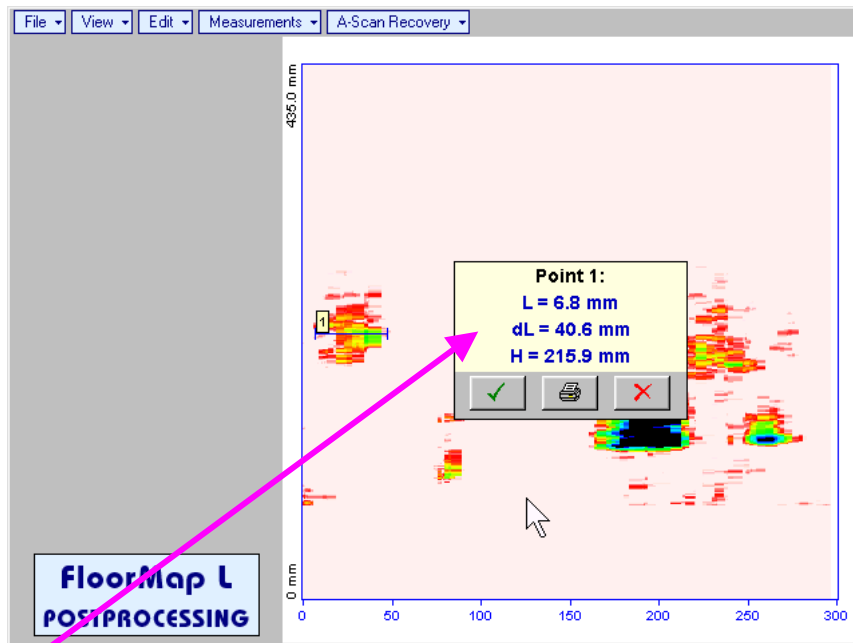
Second vertical cursor appears upon fixing first one, it may be manipulated by the same way. Coordinate of the second vertical cursor along **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image measured with relatively first vertical cursor (**dL**) is indicated synchronously, it represents projection length of defect area provided that vertical cursors are placed properly

To interrupt length measurement procedure at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard




Horizontal **length measurement mark** appears on the **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image upon fixing position of second vertical cursor


Length measurement results may be recalled through double click on the *length measurement mark*




In the **subwindow** appearing:





- **L** is coordinate of left end of the *length measurement mark*
- **dL** is length of defect area covered by *length measurement mark*
- **H** is distance between scanning line and *length measurement mark*

Clicking on  will print current screen snapshot accompanied with *length measurement mark* data

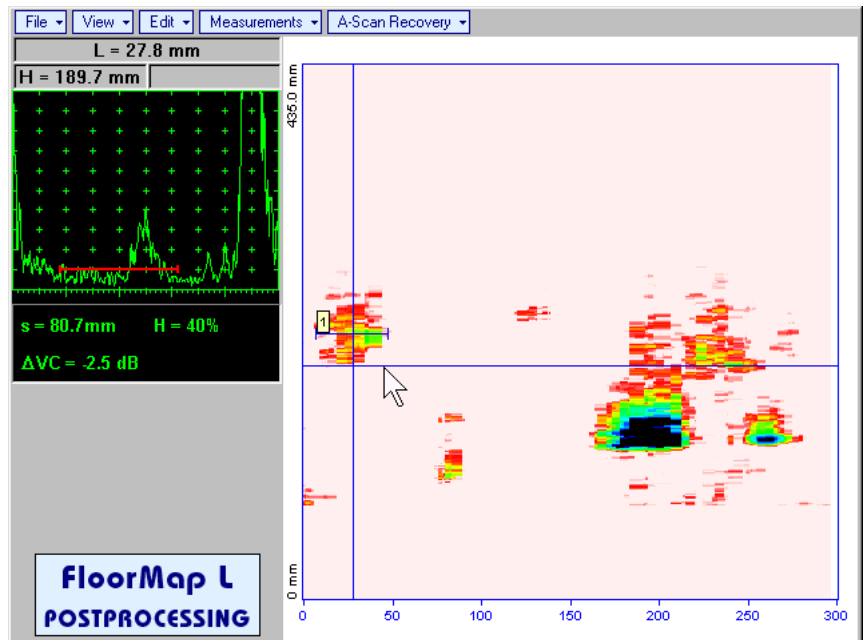
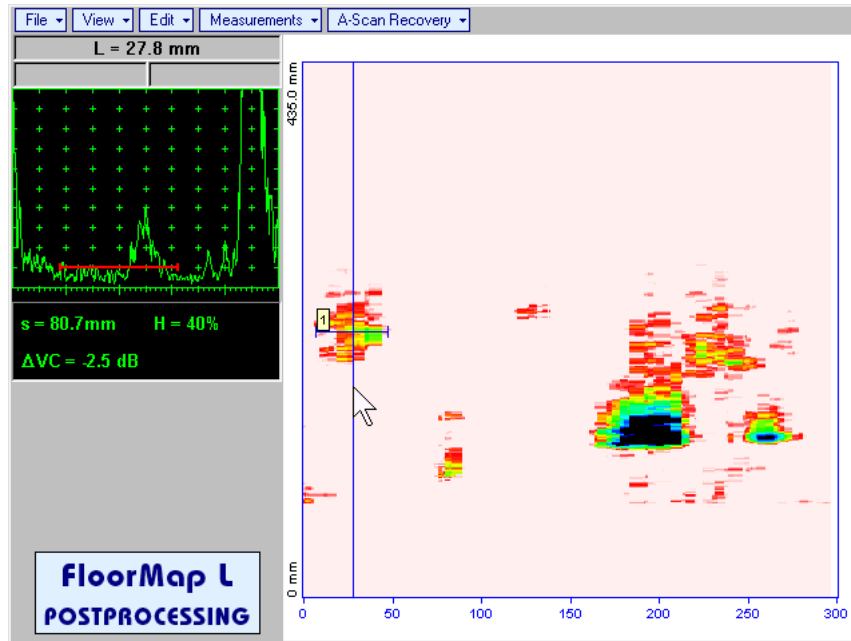
Clicking on  will hide subwindow with *length measurement mark* data

Clicking on  will hide subwindow with *length measurement mark* data and erase corresponding *length measurement mark*





- **Measurements**→**Add Measure**→**Width** – generates *cursor representing sound path* of probe's central beam in the object under test that may be guided over **t-FLOORMAP L / FLOORMAP L (CB-Scan)**


image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard – corresponding **A-Scan** is recovered synchronously according to *sound path cursor* position. Indication of starting position of cursor (**L**) corresponding to probe's center accompanies recovered **A-Scan**. *Sound path cursor* to be positioned over defect area, which's width along the sound path line to be evaluated. To fix position of *sound path cursor* left mouse click or release touch screen


stylus or press  on front panel keyboard or **Enter** on external keyboard

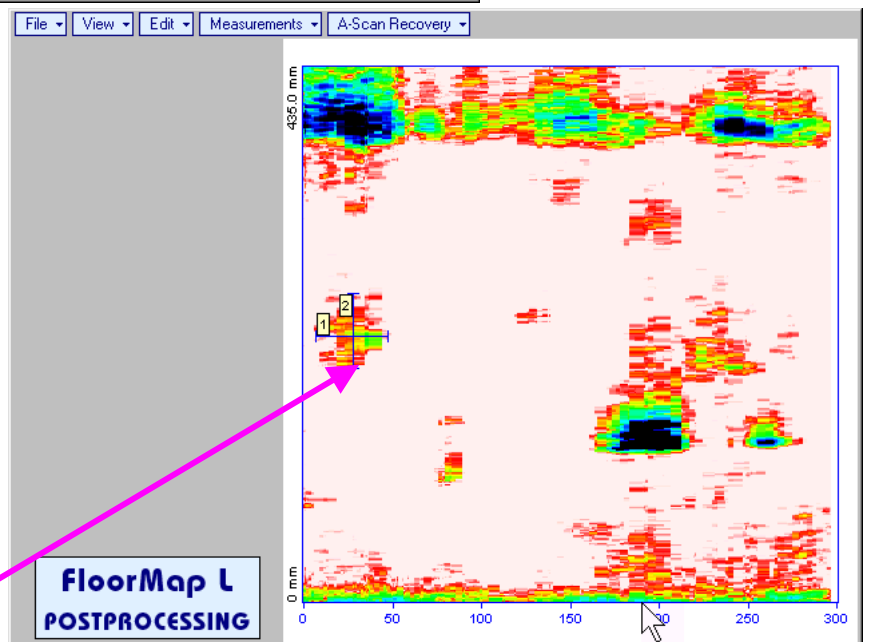
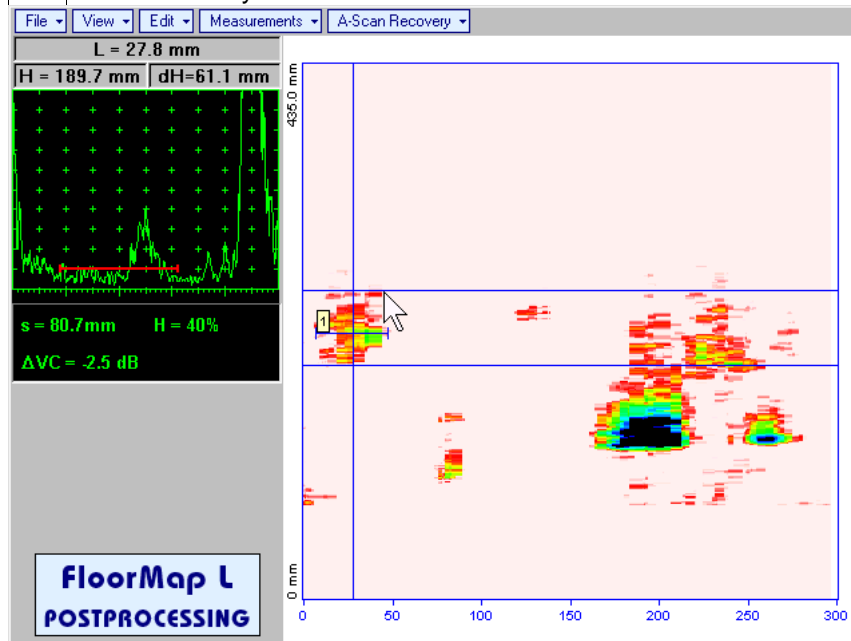


First horizontal cursor appears upon fixing *sound path cursor*, it may be guided over **t-FLOORMAP L /**

FLOORMAP L (CB-Scan) image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard . Coordinate of the first horizontal cursor along sound path (**H**) is indicated synchronously

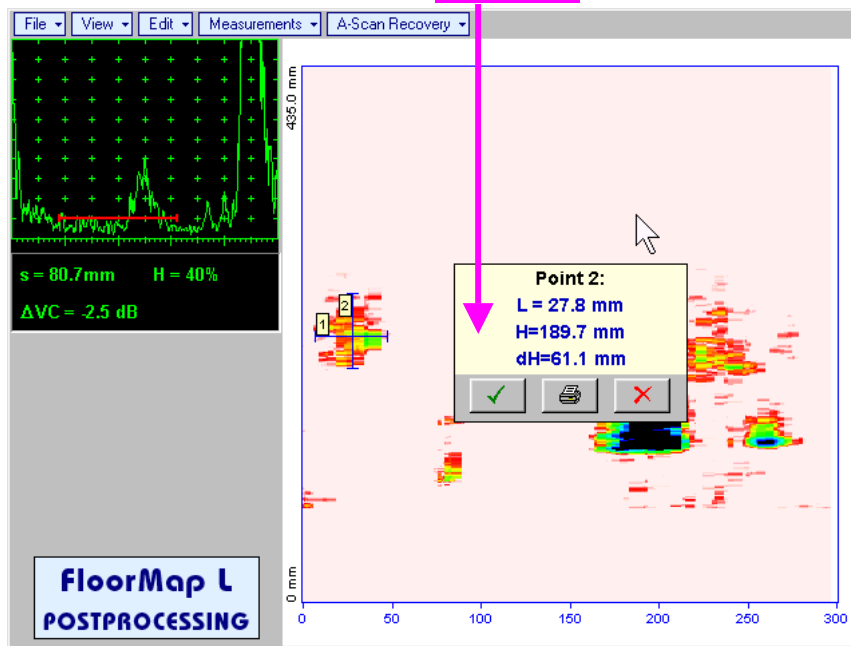
To fix position of the first horizontal cursor left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard . Second horizontal cursor appears upon fixing first one, it may be manipulated by the same way. Coordinate of the second horizontal cursor along sound path measured with relatively first horizontal cursor (**dH**) is indicated synchronously, it represents projection with of defect area provided that horizontal cursors are placed properly. To interrupt width

measurement procedure at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard




Vertical **width measurement mark** appears on the **t-FLOORMAP L / FLOORMAP L (CB-Scan)** image upon fixing position of second horizontal cursor

Width measurement results may be recalled through double click on the *width measurement mark*. This causes appearance of corresponding A-Scan and subwindow.




In the subwindow appearing:

- **L** is coordinate of the *width measurement mark* along scanning line
- **H** is distance between scanning line and *width measurement mark*
- **dH** is width of defect area covered by *width measurement mark*

Clicking on  will print current screen snapshot accompanied with *width measurement mark* data

Clicking on  will hide subwindow with *width measurement mark* data

Clicking on  will hide subwindow with *width measurement mark* data and erase corresponding *width measurement mark*

- **Measurements** → **Clear Last** – erases last *length* or *width measurement mark* placed on the t-FLOORMAP L / FLOORMAP L (CB-Scan) image
- **Measurements** → **Clear All** – erases all *length* and *width measurement marks* placed on the t-FLOORMAP L / FLOORMAP L (CB-Scan) image

7. Incremental Encoders

7.1. Standard Encoder SK 2001108 ABI

Encoder **SK 2001108 ABI** is originally designed for **BScan(Th)** and **ABISCan** recording with **ISONIC 2001**, **ISONIC 2005 / 2020 / STAR**, and **ISONIC 2006** instruments. It does not require calibration for using with these instruments (recognized as default encoder)

To start with encoder follow simple guidance as below

Step 1

Fit probe into appropriate probe holder and connect signal cable(s) to probe



Step 2

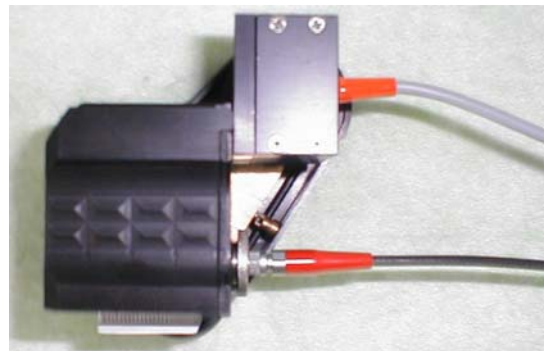
Fit probe holder with probe into encoder



Step 3

Connect probe signal cable(s) to appropriate coaxial socket on **ISONIC 2005 / 2020 / STAR** instrument – refer to paragraph 4.2 of this Operating Manual

Connect encoder data cable to the appropriate D-Type connector on rear panel of **ISONIC 2005 / 2020 / STAR** instrument – refer to paragraph 4.2 of this Operating Manual



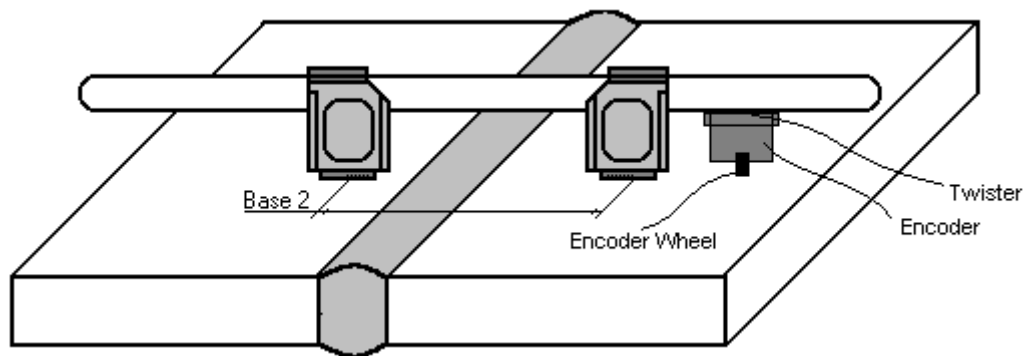
7.2. Standard Encoder SK 2001108 FM

Encoder **SK 2001108 FM** is originally designed for **TOFD** and **FLOORMAP L** recording with **ISONIC 2001**, **ISONIC 2005 / 2020 / STAR**, and **ISONIC 2006** instruments. It does not require calibration if using with these instruments (recognized as default encoder). To start with encoder follow simple guidance as below

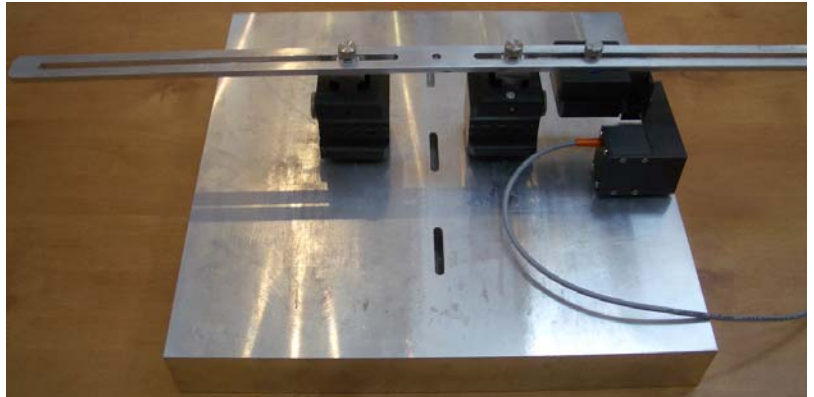
7.2.1. TOFD

Insert ultrasonic probes into their probe holders then:

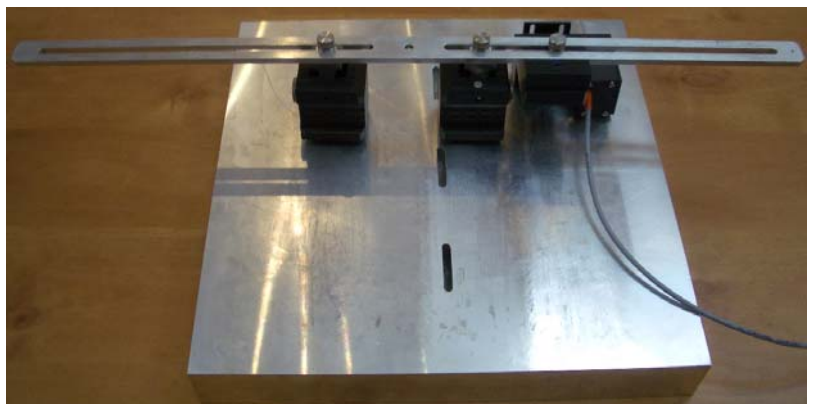
- ❑ Fit probe holders with probes on **TOFD** bar and fix them at at necessary separation distance
- ❑ Fix twister **S 904050** on the **TOFD** bar
- ❑ Fit encoder **SK 2001108 FM** into twister **S 904050** and provide necessary orientation of encoder's wheel – it must be oriented at parallel to the desired probes' trace either along or across the weld – refer to the sketch and photos below



TOFD Fixture and encoder positioning for scanning along the weld



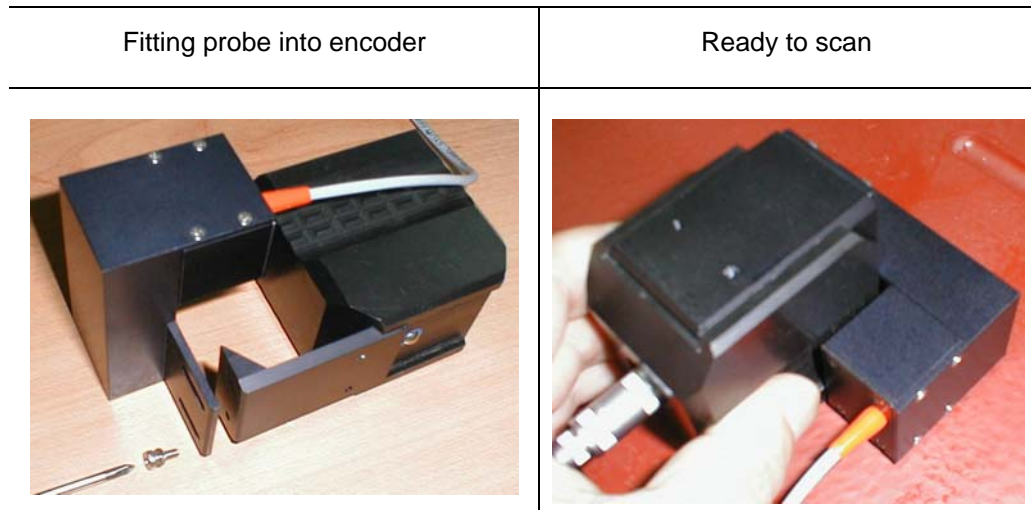
TOFD Fixture and encoder positioning for scanning across the weld



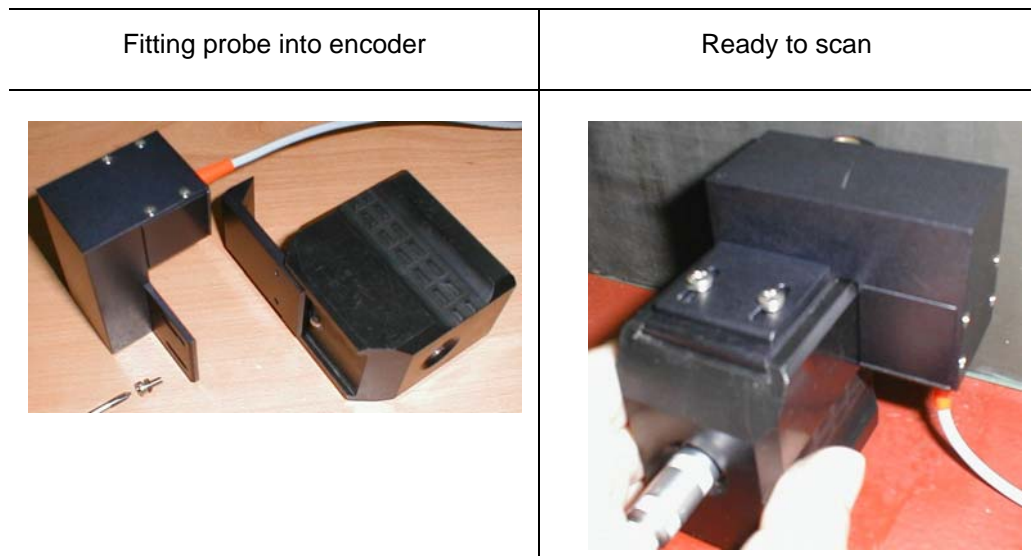
7.2.2. FLOORMAP L

Encoder **SK 2001108 FM** allows 2 ways of direct fitting of S 544 series guided wave probes or other probes fitted into appropriate probe holders:

- Both encoder's wheel and probe contact face are situated on scanning surface:



- Encoder's wheel is situated on surface, which is rectangular to scanning surface:



7.3. Customized Encoders for Proprietary Inspection Tasks

Various custom made encoders for proprietary inspection tasks may be used with **ISONIC 2005 / 2020 / STAR**. For appropriate encoder data cable and connector pinout contact

- ❑ Nearest Sonotron NDT representative

OR

- ❑ Directly to Sonotron NDT – mail to support@sonotronndt.com with subject **ISONIC 2005 / 2020 / STAR encoder connection**




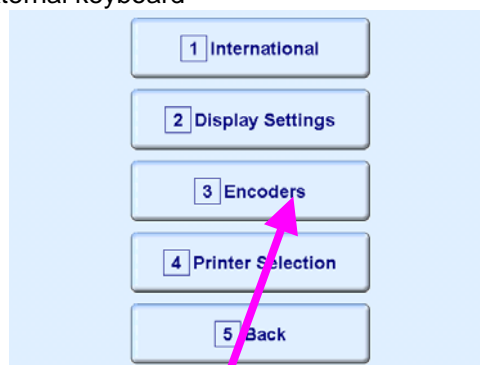
Improper cable out-coming from custom made encoder for proprietary inspection tasks may lead to warranty exempted damaging ISONIC 2005 / 2020 / STAR instrument


7.4. Encoder Calibration

Every encoder to be calibrated prior to use with **ISONIC 2005 / 2020 / STAR**

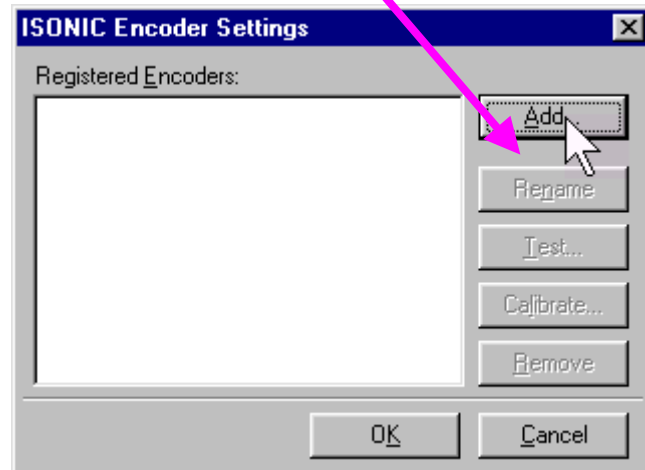


To proceed with the calibration in the **ISONIC 2005 / 2020 / STAR start screen** **click on** or press  on front panel keyboard or **F2** on external keyboard

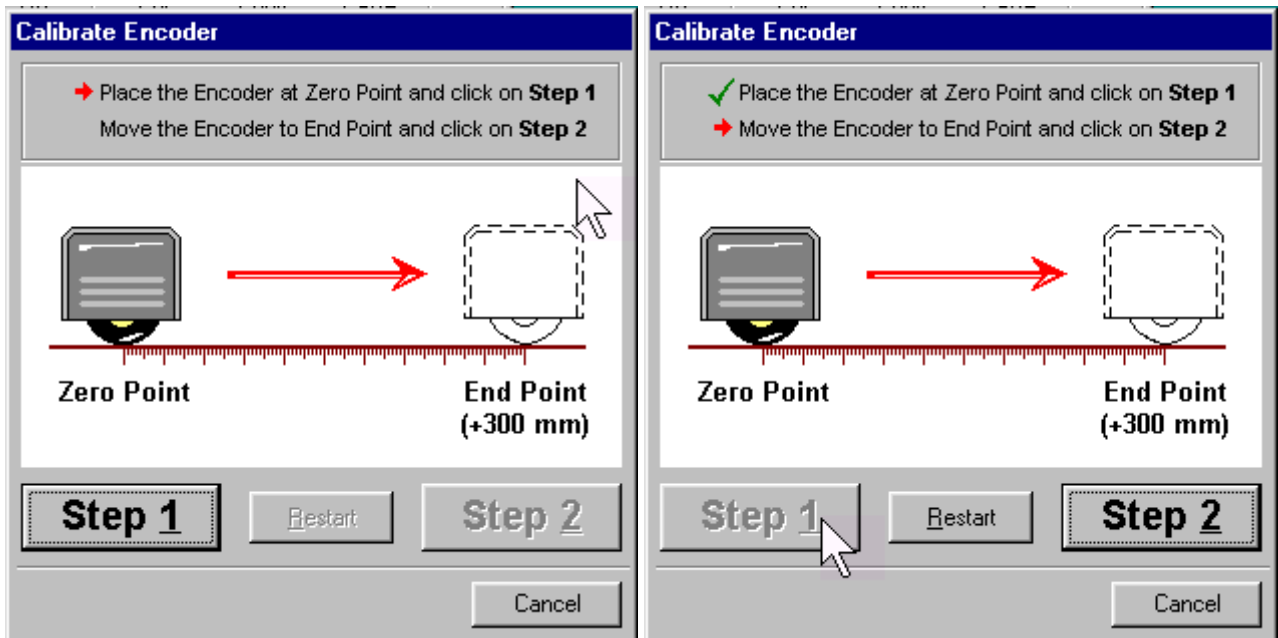


In the appeared **ISONIC 2005 / 2020 / STAR Settings Menu** **click on** or press  on front panel keyboard or **F3** on external keyboard

In the appeared **ISONIC Encoder Settings** window **click on** or press **<Alt>+<A>** on external keyboard



The **Calibrate Encoder** window appears; it contains simple instructions to follow:





Encoder's wheel while calibrating must pass linearly the distance of **300 mm (12 in)** between **Zero Point** designated through clicking on **Step 1** or pressing **<Alt>+<1>** on external keyboard and **End Point** along scale bar attached to flat surface

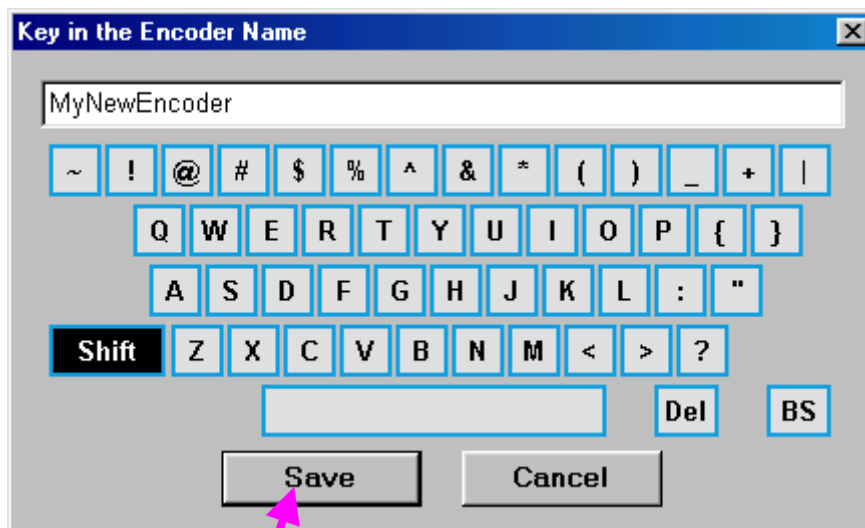
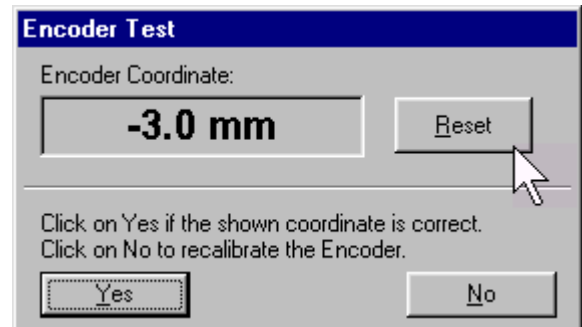
Upon reaching **End Point** and clicking on **Step 2** or pressing **<Alt>+<2>** on external keyboard new **Encoder Test** window appears



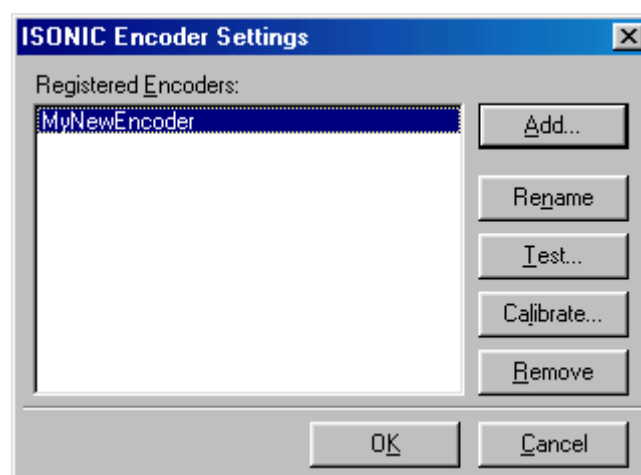
If it's necessary to re-designate **Zero Point** click on **Restart** or press **<Alt>+<R>** on external keyboard

In the **Encoder Test** window:

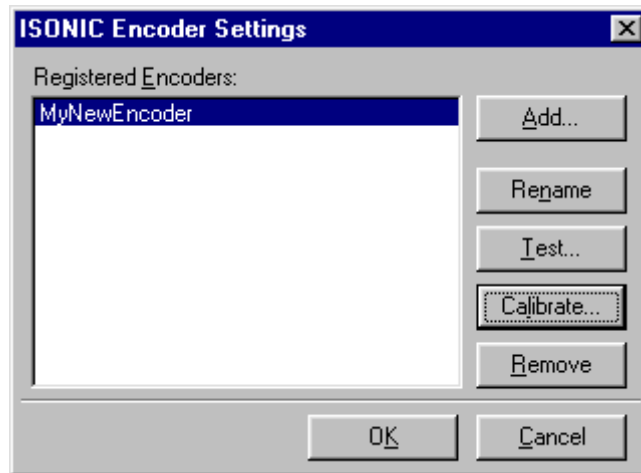
- ❑ Click on **Reset** or press **<Alt>+<R>** on external keyboard to designate **local zero point** for continuing test
- ❑ Click on **Yes** or press  on front panel keyboard or **Enter** or **<Alt>+<Y>** on external keyboard to name the selected encoder – **Key in the Encoder Name window** appears
- ❑ Click on **No** or press  on front panel keyboard or press **Esc** or **<Alt>+<N>** on external keyboard to recalibrate the encoder – return to **Calibrate Encoder window**





Upon keying in new Encoder name **click on**, **ISONIC Encoder Settings** window returns upon



To update the registry of **ISONIC 2005 / 2020 / STAR** with new encoder data click on the **OK** or press on front panel keyboard or **Enter** or **<Alt>+<Y>** on external keyboard – this will automatically return to **ISONIC 2005 / 2020 / STAR Settings Menu**

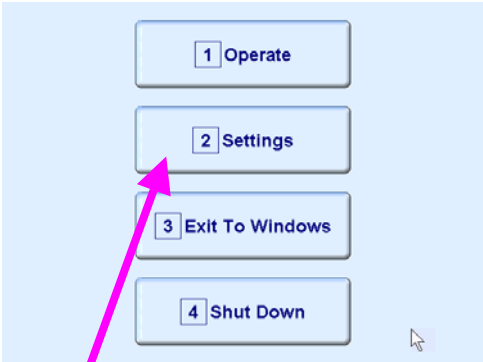



While running encoder calibration next time:

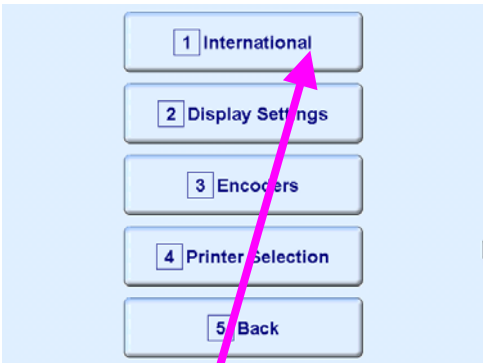
- ❑ Click on **Add...** or press **<Alt>+<A>** on external keyboard to proceed with next new encoder by the same way as described above
- ❑ Click on **Rename** or press **<Alt>+<N>** on external keyboard to rename the selected encoder
- ❑ Click on **Test** or press **<Alt>+<T>** on external keyboard to check the accuracy of selected encoder calibration
- ❑ Click on **Calibrate** or press **<Alt>+<L>** on external keyboard to recalibrate selected encoder
- ❑ Click on **Remove** or press **<Alt>+<R>** on external keyboard to remove selected encoder from the registry of **ISONIC 2005 / 2020 / STAR**
- ❑ Click on the **Cancel** or press  on front panel keyboard or press **Esc** or **<Alt>+<C>** on external keyboard to negate all changes and return to **ISONIC 2005 / 2020 / STAR Settings Menu**
- ❑ Click on the **OK** or press  on front panel keyboard or **Enter** or **<Alt>+<K>** on external keyboard to update the registry of **ISONIC 2005 / 2020 / STAR** and return to **ISONIC 2005 / 2020 / STAR Settings Menu**


8. Miscellaneous

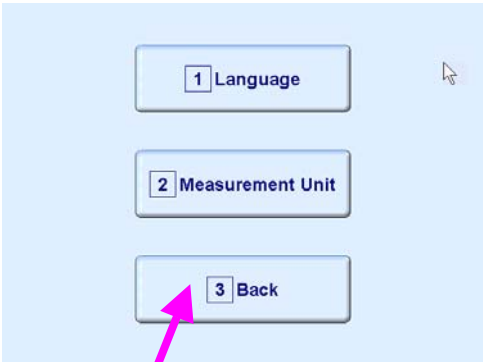
8.1. International Settings



In the **ISONIC 2005 / 2020 / STAR start screen** **click on** or press  on front panel keyboard or **F2** on external keyboard

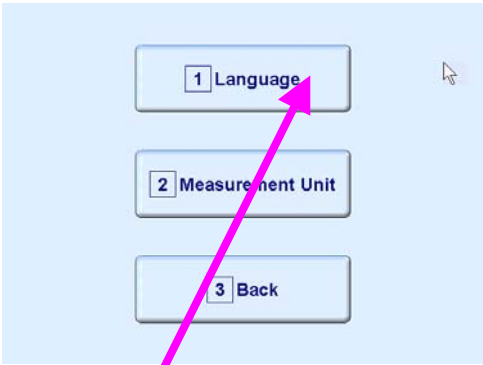



In the appeared **ISONIC 2005 / 2020 / STAR Settings Menu** **click on** or press  on front panel keyboard or **F1** on external keyboard, the **International Settings** screen appears:

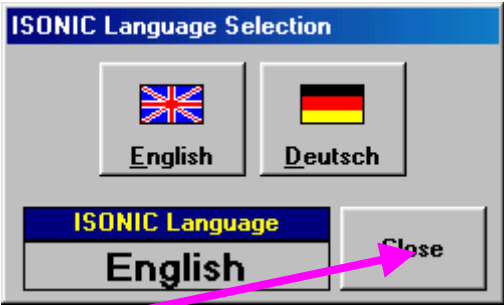


To return to **ISONIC 2005 / 2020 / STAR Settings Menu** **click on** or press  or  on front panel keyboard or **F3** or **Esc** on external keyboard


8.1.1. Language



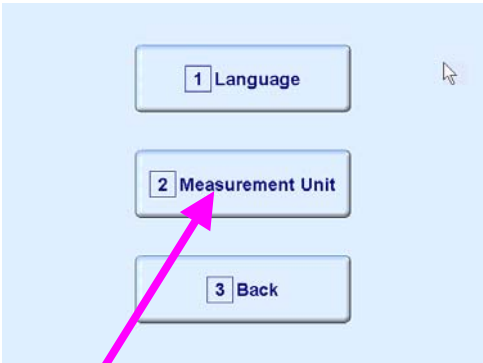
In the **International Settings** screen **clicks on** or press  on front panel keyboard or **F1** on external keyboard




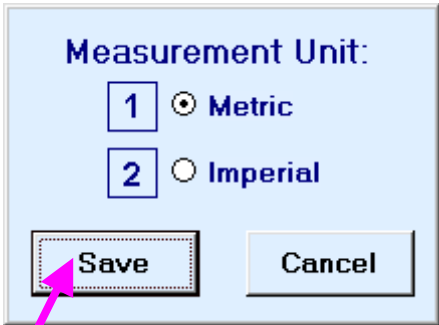
Select language then **click on**

 Standard languages of **ISONIC 2005 / 2020 / STAR** are English and German. Other languages are available on request

8.1.2. Metric and Imperial Units




In the **International Settings** screen **click on** or press  on front panel keyboard or **F2** on external keyboard



Select measurement units then **click on**

8.2. Display Settings



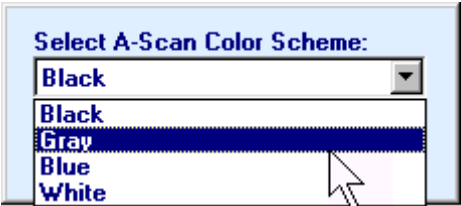
In the **ISONIC 2005 / 2020 / STAR Settings Menu** **click on** or press  on front panel keyboard or **F2** on external keyboard

8.2.1. A-Scan Color Scheme

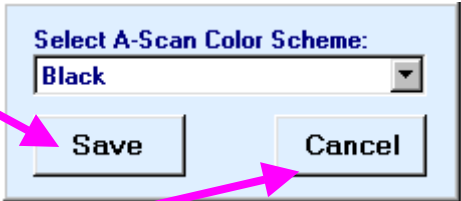


In the **Display Settings Menu** **click on** or press  on front panel keyboard or **F1** on external keyboard

then mark the selected color scheme



then **click on**

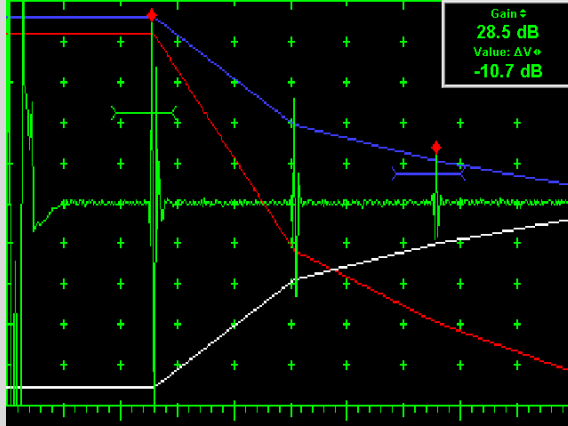


To negate new selection **click on**

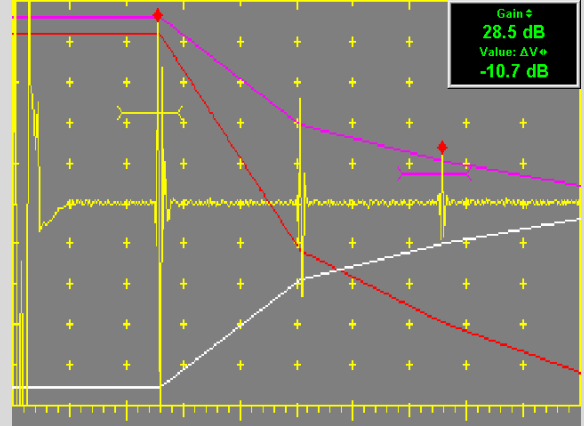


There are 4 A-Scan Color Schemes available:

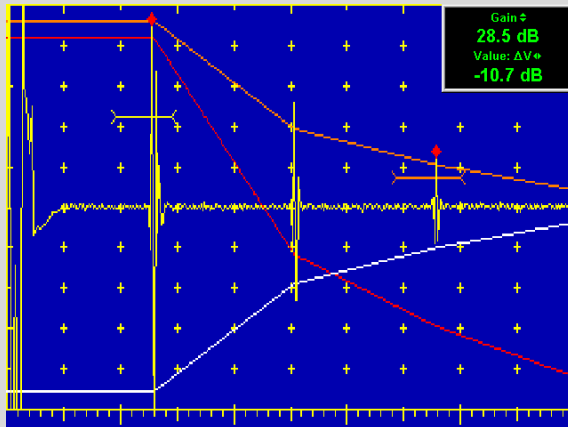
Black



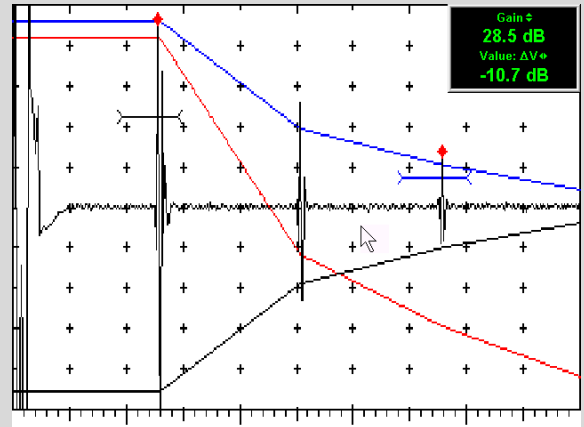
Gray



Blue




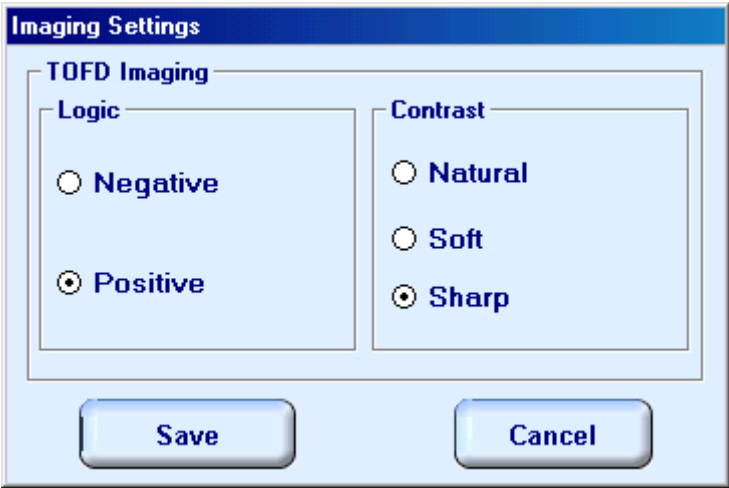
White



8.2.2. TOFD Display Settings



In the **Display Settings Menu** **click on** or press  on front panel keyboard or **F2** on external keyboard then check the selected options:





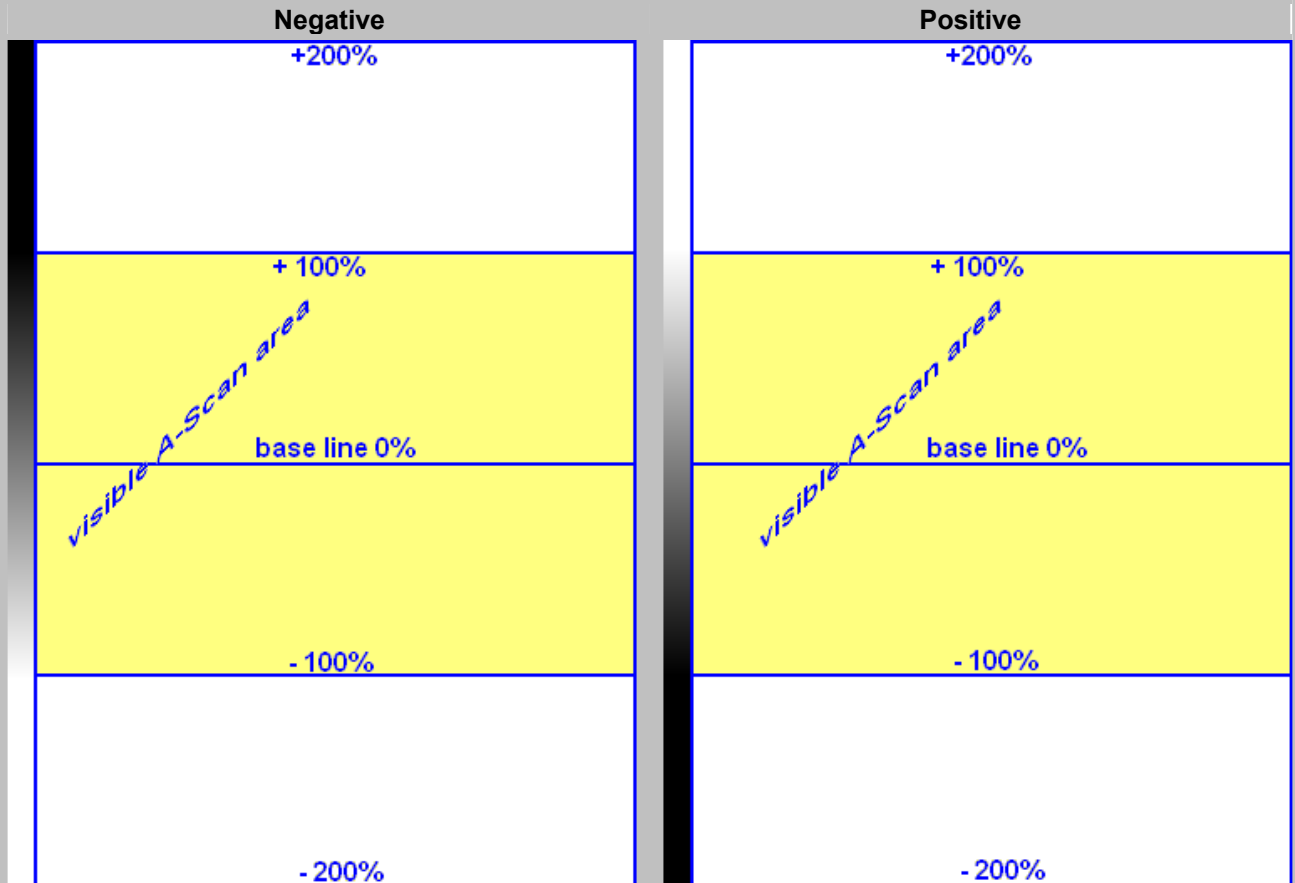
Natural Contrast TOFD Display

Negative

256 brightness levels of **TOFD Map** from absolutely white to absolutely black are distributed for RF signals, which's half waves do vary from minus 100% to plus 100% of A-Scan display height. Positive half wave signals equal or exceeding plus 100% of A-Scan display height are represented by absolutely black color. Negative half wave signals equal or exceeding minus 100% of A-Scan display height are represented by absolutely white color

Positive

256 brightness levels of **TOFD Map** from absolutely black to absolutely white are distributed for RF signals, which's half waves do vary from minus 100% to plus 100% of A-Scan display height. Positive half wave signals equal or exceeding plus 100% of A-Scan display height are represented by absolutely white color. Negative half wave signals equal or exceeding minus 100% of A-Scan display height are represented by absolutely black color





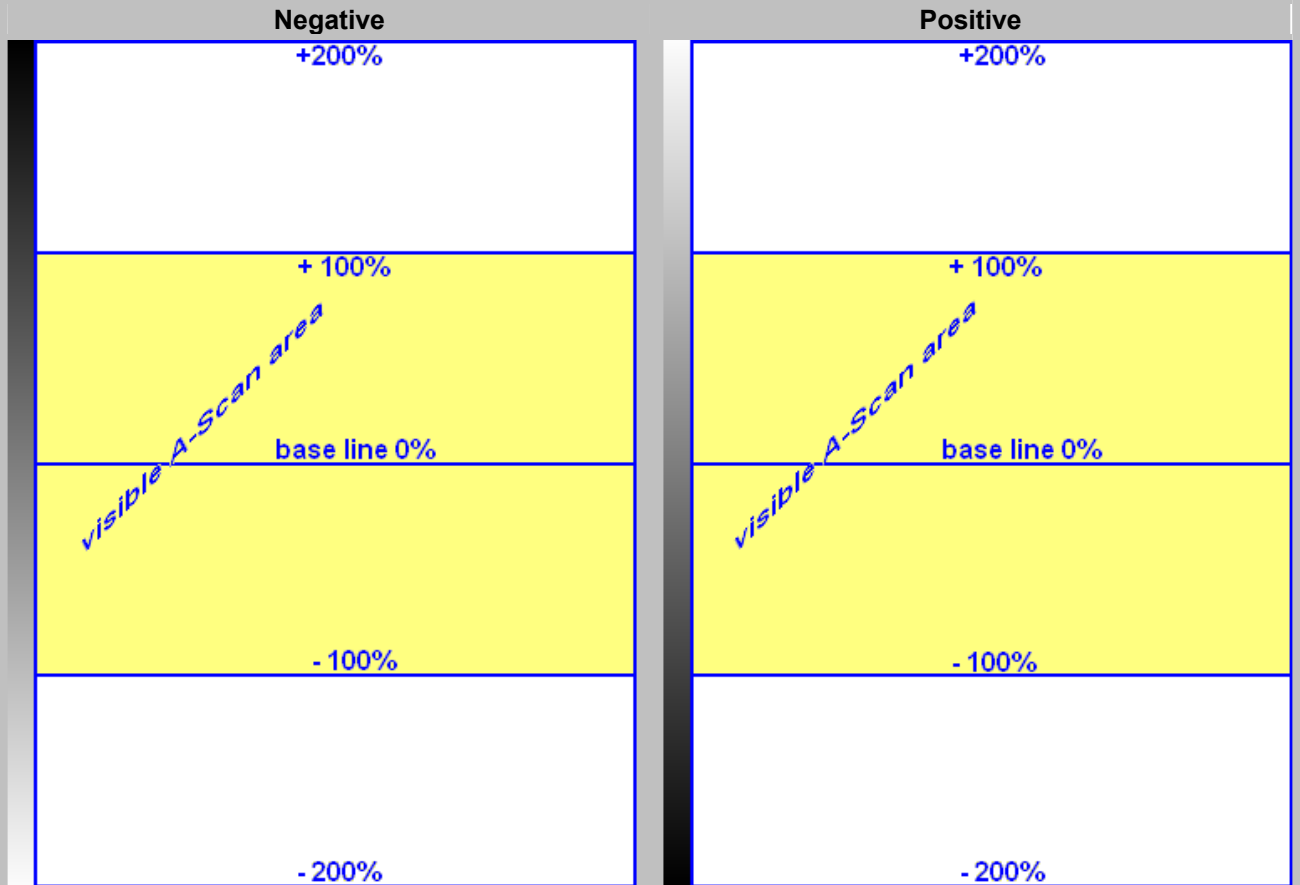
Soft Contrast TOFD Display

Negative

256 brightness levels of **TOFD Map** from absolutely white to absolutely black are distributed for RF signals, which's half waves do vary from minus 200% to plus 200% of A-Scan display height. Positive half wave signals equal or exceeding plus 200% of A-Scan display height are represented by absolutely black color. Negative half wave signals equal or exceeding minus 200% of A-Scan display height are represented by absolutely white color

Positive

256 brightness levels of **TOFD Map** from absolutely black to absolutely white are distributed for RF signals, which's half waves do vary from minus 200% to plus 200% of A-Scan display height. Positive half wave signals equal or exceeding plus 200% of A-Scan display height are represented by absolutely white color. Negative half wave signals equal or exceeding minus 200% of A-Scan display height are represented by absolutely black color





Sharp Contrast TOFD Display

Negative

256 brightness levels of **TOFD Map** from absolutely white to absolutely black are distributed for RF signals, which's half waves do vary from minus 50% to plus 50% of A-Scan display height. Positive half wave signals equal or exceeding plus 50% of A-Scan display height are represented by absolutely black color. Negative half wave signals equal or exceeding minus 50% of A-Scan display height are represented by absolutely white color

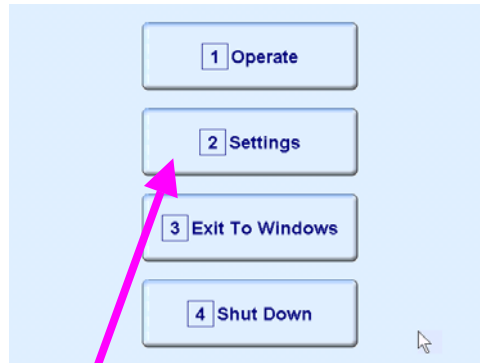
Positive


256 brightness levels of **TOFD Map** from absolutely black to absolutely white are distributed for RF signals, which's half waves do vary from minus 50% to plus 50% of A-Scan display height. Positive half wave signals equal or exceeding plus 50% of A-Scan display height are represented by absolutely white color. Negative half wave signals equal or exceeding minus 50% of A-Scan display height are represented by absolutely black color

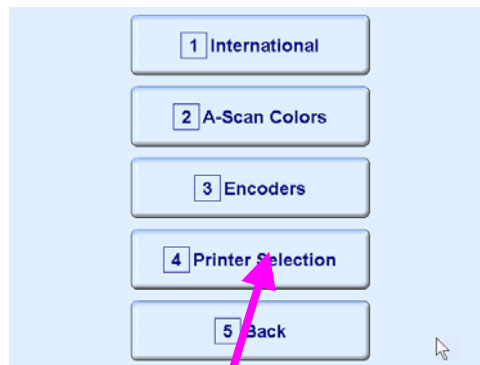


8.3. Printer Selection

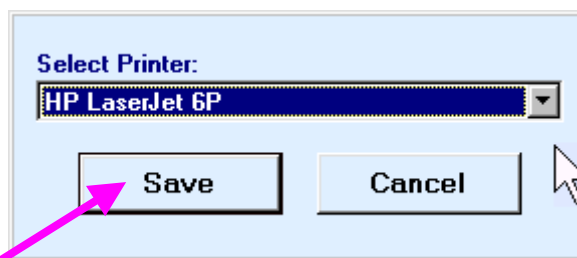
This option is available if there are more than 1 printer drivers installed in **ISONIC 2005 / 2020 / STAR**



In the **ISONIC 2005 / 2020 / STAR start screen** click on **2** or press  on front panel keyboard or **F2** on external keyboard



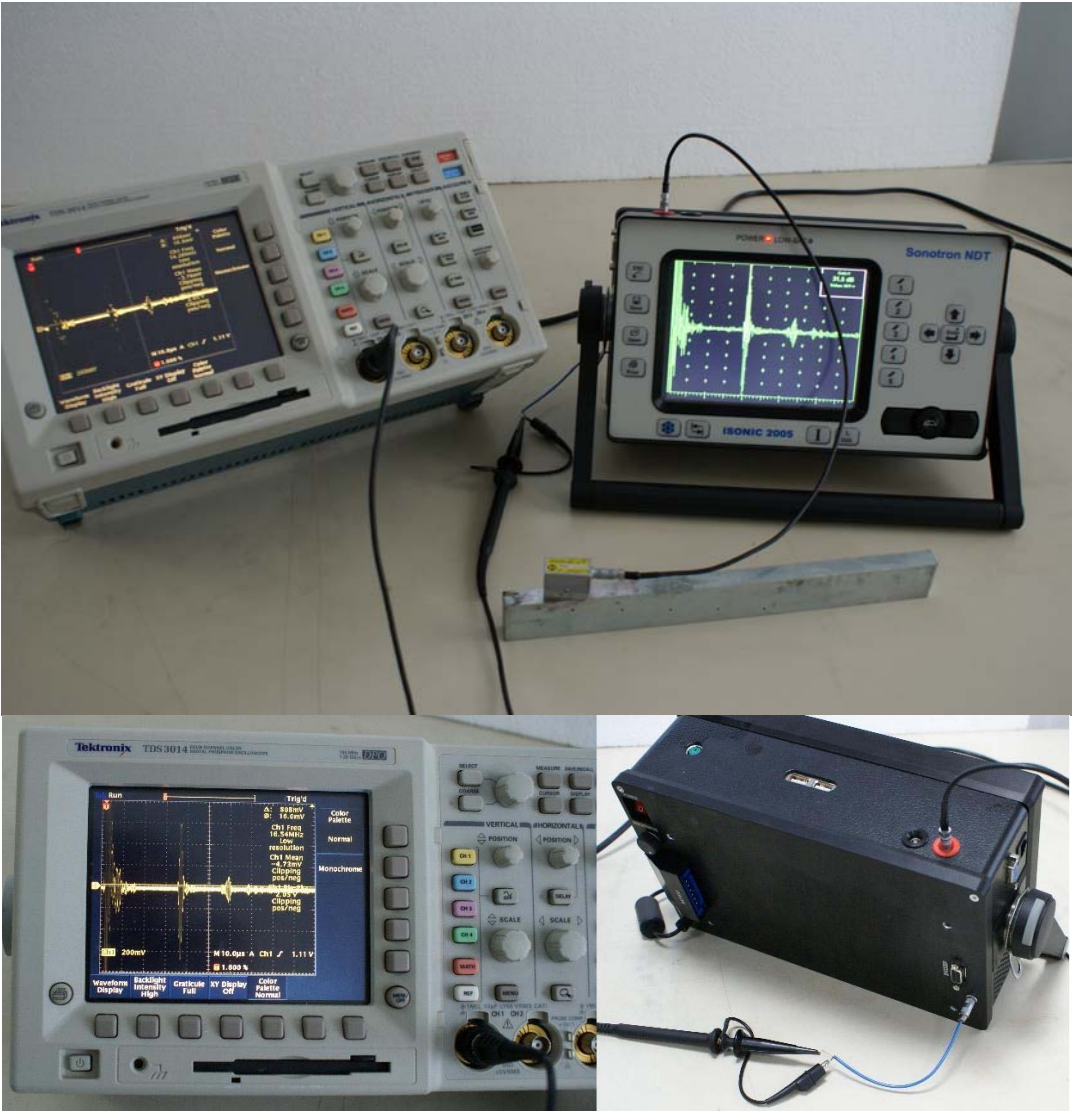
In the appeared **ISONIC 2005 / 2020 / STAR Settings Menu** click on **4** or press  on front panel keyboard or **F4** on external keyboard



Select printer then click on **Save**

8.4. Time of Sale Option – Analogue RF Output Terminal

Optional analogue RF Output Terminal is available in the new **ISONIC 2005 / 2020 / STAR** instrument at time of sale – refer to paragraph 4.2 of present Operating Manual



Signal on RF output is available all the time while A-Scan is present at the instrument screen in all modes of operation

RF output is terminated with LEMO 00 socket. The load parameters of RF output are:

Input impedance	$\geq 1 \text{ M}\Omega$
Input Capacity	$\leq 30 \text{ pF}$

8.5. Time of Sale Option – Triggering In / Out

Optional analogue **Triggering In / Out** Terminals are available in the new **ISONIC 2005 / 2020 / STAR** instrument at time of sale – refer to paragraph 4.2 of present Operating Manual

Triggering-Out Terminal

The default mode of **ISONIC 2005 / 2020 / STAR** is internal synchronization. Synchronization pulse appears on the **Triggering-Out** Terminal (LEMO 00 Socket) all the time while A-Scan is present at the instrument screen in all modes of operation. Parameters of synchronization pulse are:

Polarity	Positive
Amplitude	5 V
Duration	600 ns

The load parameters of **Triggering-Out** Terminal are:

Triggering-In Terminal

The default mode of **ISONIC 2005 / 2020 / STAR** is internal synchronization. **Triggering-In** Terminal (Lemo 00 Socket) to be used as an input for external triggering pulse. Required parameters of the external triggering pulse delivered to **Triggering-In** Terminal of **ISONIC 2005 / 2020 / STAR** are:





Polarity	Positive
Amplitude	Not lower than 2 V Not higher than 5.5 Volt
Pause DC Level	Not lower than Minus 0.5 Volt Not higher than 0.4 Volt
Duration	Not shorter than 100 ns Not longer than 2 μs

The input parameters of **Triggering-In** Terminal are:

Input impedance	$\geq 10 \text{ M}\Omega$
Input Capacity	$\leq 15 \text{ pF}$


If there is a need to synchronize firing receiver mode of **ISONIC 2005 / 2020 / STAR** from an external source:


- Connect external source to **Triggering-In** Terminal of **ISONIC 2005 / 2020 / STAR** instrument
- Start **UDS 3-5 Pulser Receiver** (refer to paragraph 5.1 of present Operating Manual)
- Enter submenu **PULSER** (refer to paragraph 5.2.3 of present Operating Manual)
- Refer to the table below:

Triggering Mode Control Button Appearance	Mode
	External Triggering Clicking on  turns to External Triggering; if triggering pulse will not appear on the Triggering-In Terminal during an interval of approximately 20 seconds then instrument will return to internal synchronization mode of operation
	Internal Synchronization Clicking on  turns to Internal Synchronization mode

8.6. Exit to Windows



In the **ISONIC 2005 / 2020 / STAR start screen** click on **3** or press  on front panel keyboard or **F3** on external keyboard

To return to **ISONIC 2005 / 2020 / STAR** Operation double click on icon  located in the Windows Desktop



Exit to Windows is required for:

- Connection to network
 - Printing inspection results to network printer
 - Transferring data to / from remote PC
- Installing printer driver(s)
- Installing USB memory stick (disk on key) driver (for **ISONIC 2005 / 2020 / STAR** instruments running under Windows 98 SE Operating System)
- Quasi-disk management

In order to prevent overloading of **ISONIC 2005 / 2020 / STAR** quasi-disk and memory with data and non **ISONIC 2005 / 2020 / STAR** software that may affect instrument performance it's not allowed to install non **ISONIC 2005 / 2020 / STAR** software except drivers noted above. Affecting of instrument performance through installing on non **ISONIC 2005 / 2020 / STAR** software except drivers noted above is the warranty exemption damage

8.7. Connection to Network

To connect **ISONIC 2005 / 2020 / STAR** to local area network using Ethernet connector (refer to paragraph 4.2 of this Operating Manual) and standard Windows rules

8.8. External USB Devices

8.8.1. Mouse

Use one of 2 USB Connectors (refer to paragraph 4.2 of this Operating Manual). **ISONIC 2005 / 2020 / STAR** finds and registers external USB mouse automatically through standard Windows routine. Microsoft optical mouse is recommended

8.8.2. Keyboard

Use one of 2 USB Connectors (refer to paragraph 4.2 of this Operating Manual). **ISONIC 2005 / 2020 / STAR** finds and registers USB keyboard automatically through standard Windows routine. Microsoft keyboard is recommended

8.8.3. Memory Stick (Disk on Key)

Use one of 2 USB Connectors (refer to paragraph 4.2 of this Operating Manual)

ISONIC 2005 / 2020 / STAR running under Windows XP Embedded finds and registers USB memory stick (disk on key) automatically through standard Windows routine.

For **ISONIC 2005 / 2020 / STAR** instruments running under Windows 98 SE preliminary driver setup is required. To install driver use network connection (refer to paragraph 8.5 of this Operating Manual)

8.8.4. Printer

Use one of 2 USB Connectors (refer to paragraph 4.2 of this Operating Manual). Preliminary driver setup is required. To install driver use network connection (refer to paragraph 8.5 of this Operating Manual) or USB memory stick (disk on key) if it's already registered in **ISONIC 2005 / 2020 / STAR**

8.8.5. ISONIC Alarmer

For a variety of manual and automatic inspection applications it may be necessary:

- generating sound alarm on defect detection
- controlling some external devices, such as sorters, multi-element go/no go display panels, etc
- starting inspection and recording process upon receiving triggering signal from an external device
- etc

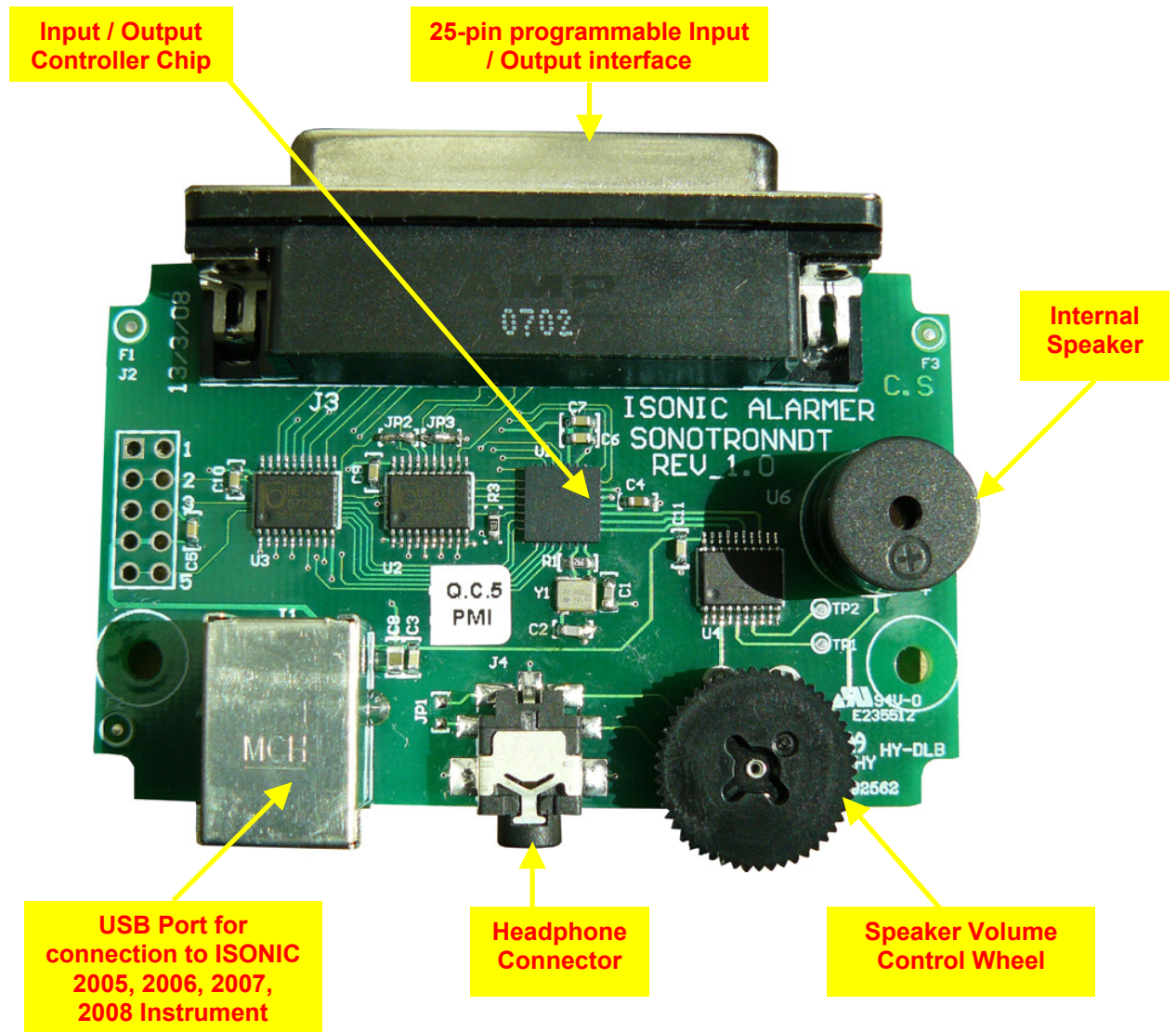
A variety of above tasks is resolved by simple **ISONIC Alarmer** (part # SE 554780987), which is interfaced to ISONIC 2005 / 2020 / STAR, 2006, 2007, 2008 instrument through USB port



- **ISONIC Alarmer** may be connected to the instrument at any moment since **ISONIC 2005 / 2020 / STAR Start Screen** became active (refer to paragraph 4.3 of this Operating Manual)
- **ISONIC Alarmer** may be disconnected from the instrument at any moment prior to shut down (refer to paragraph 4.3 of this Operating Manual)

ISONIC Alarmer includes:

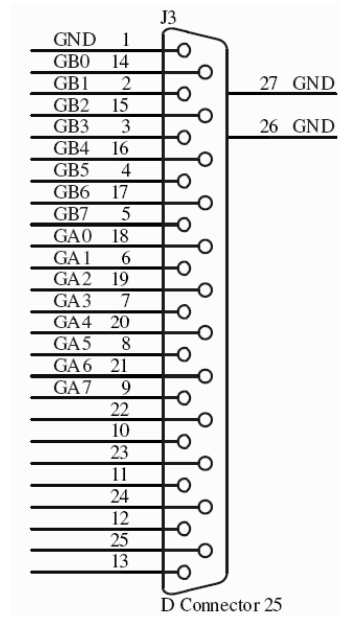
- Internal Speaker, which is switched ON / OF according to alarm logic settings of UDS 3-5 Pulser Receiver in the ISONIC 2005 / 2020 / STAR, 2006, 2007 instruments / UDS 3-6 Pulser Receiver of ISONIC 2008 Instrument
- Speaker Volume Control Wheel
- Headphone Connector
- Input / Output Control chip
- 25-pin programmable Input / Output interface



Initially **ISONIC Alarmer** is configured to deliver sound through speaker and headphone connector (standard configuration)

25-pin input / output interface is configured according to the duty book, which is agreed with the customer (optional configuration)

Standard configuration pin-out of 25-pin input / output interface D-Type connector is shown below:



Pin Number	Function
1	Ground
2	Alarm Gate B – Channel 1 (Only Channel for ISONIC 2005 / 2020 / STAR, 2006)
3	Alarm Gate B – Channel 3
4	Alarm Gate B – Channel 5
5	Alarm Gate B – Channel 7
6	Alarm Gate A – Channel 1 (Only Channel for ISONIC 2005 / 2020 / STAR, 2006)
7	Alarm Gate A – Channel 3
8	Alarm Gate A – Channel 5
9	Alarm Gate A – Channel 7
10	NC
11	NC
12	NC
13	NC
14	Alarm Gate B – Channel 0
15	Alarm Gate B – Channel 2
16	Alarm Gate B – Channel 4
17	Alarm Gate B – Channel 6
18	Alarm Gate A – Channel 0
19	Alarm Gate A – Channel 2
20	Alarm Gate A – Channel 4
21	Alarm Gate A – Channel 6
22	NC
23	NC
24	NC
25	NC

8.9. External VGA screen / VGA projector

Connect to appropriate connector (refer to paragraph 4.2 of this Operating Manual) while at least one of 2 devices either **ISONIC 2005 / 2020 / STAR** or external screen / projector is switched OFF then switch on one or both devices

8.10. Software Upgrade

Refer to <http://www.sonotronndt.com/support.htm> in the Internet

8.11. ISONIC Office and ISONIC Office 2005 Software packages for office PC

ISONIC Office and **ISONIC Office 2005** software packages allow performing of all-function postprocessing for all types of inspection files captured using **ISONIC 2005 / 2020 / STAR** in an office PC. All postprocessing procedures are identical to the postprocessing procedures and menus inside the unity itself. If Microsoft Word is installed in an office PC then at any moment postprocessing snapshots including all graphics and accompanying setup and / or measurement data may be converted into the MS Word® *.doc file


8.12. ISONIC Par2Txt Converter Software package

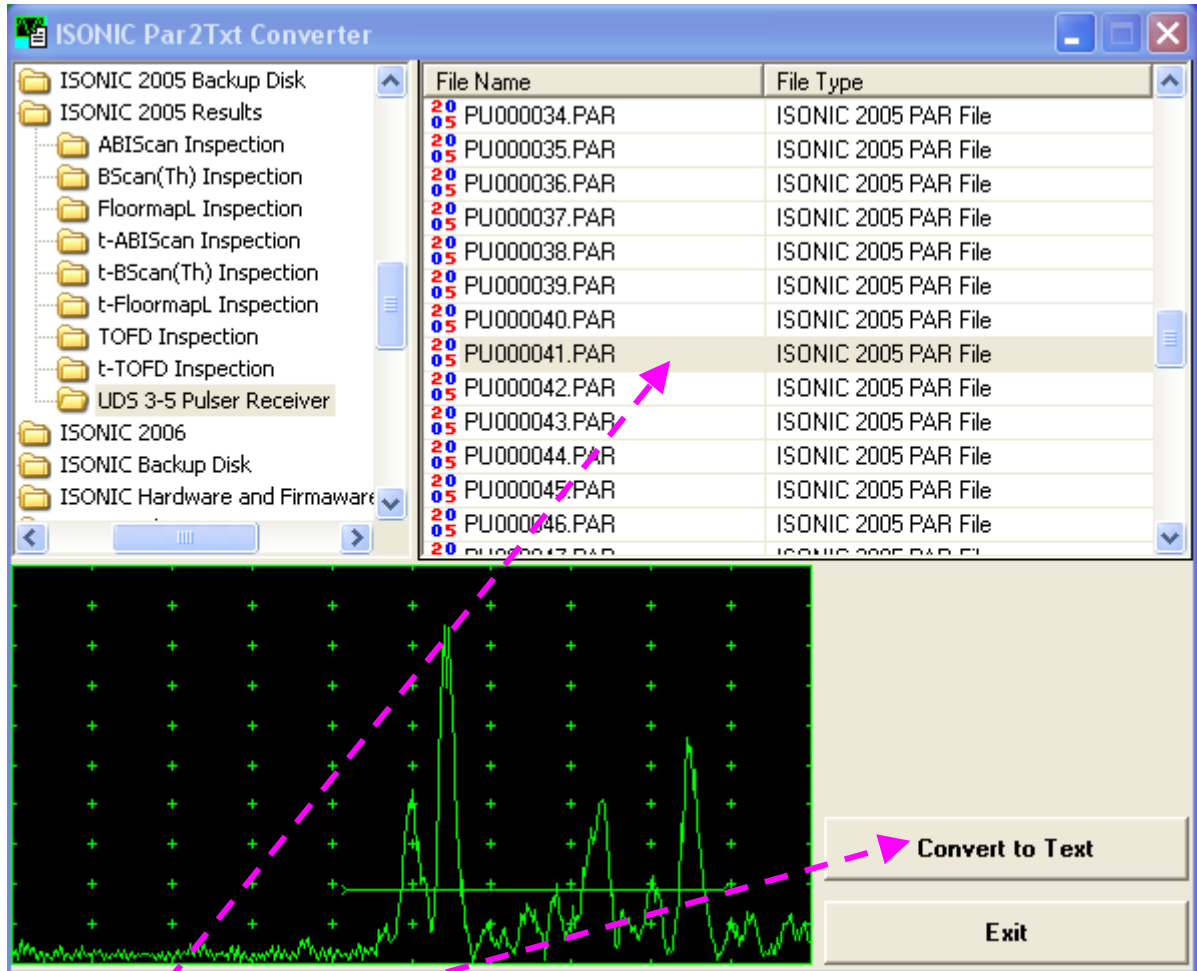


Contents of this chapter is valid for the **ISONIC Par2Txt Converter** SW Package version 2.0.0.1 or higher

ISONIC Par2Txt Converter converts variously configured *.PAR files created by **ISONIC 2001** and **ISONIC 2005 / 2020 / STAR** instruments into *.txt files. Both pure **A-Scans** and **A-Scans** accompanied with frequency domain (**FFT**) graphs are presented in ASCII format in *.txt files. This allows further off-line signal analysis using popular software packages Mathlab®, Labview®, and the like

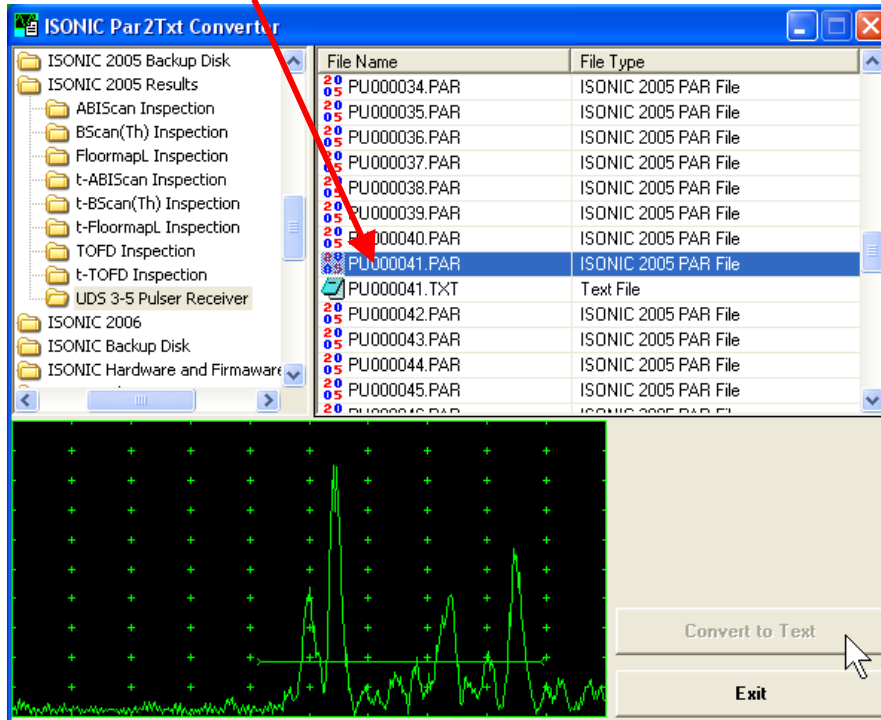


Click on *Start* then select *Programs* ⇒ *ISONIC* ⇒ *ISONIC Par2Txt Converter* or click on  icon located in the desktop to run **ISONIC Par2Txt Converter** - window as below appears:

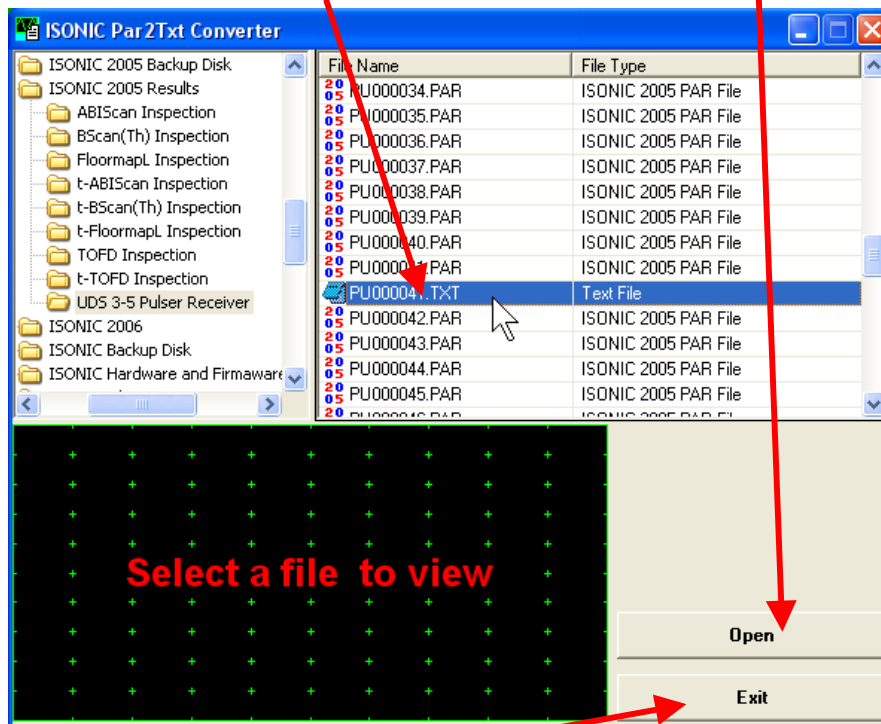


Select the **file of interest** then **click on**

As a result the corresponding ***.txt file** appears



To preview the contents of *.txt file **double click on its name** or mark it and **click on**




To end ISONIC Par2Txt Converter session **click on**

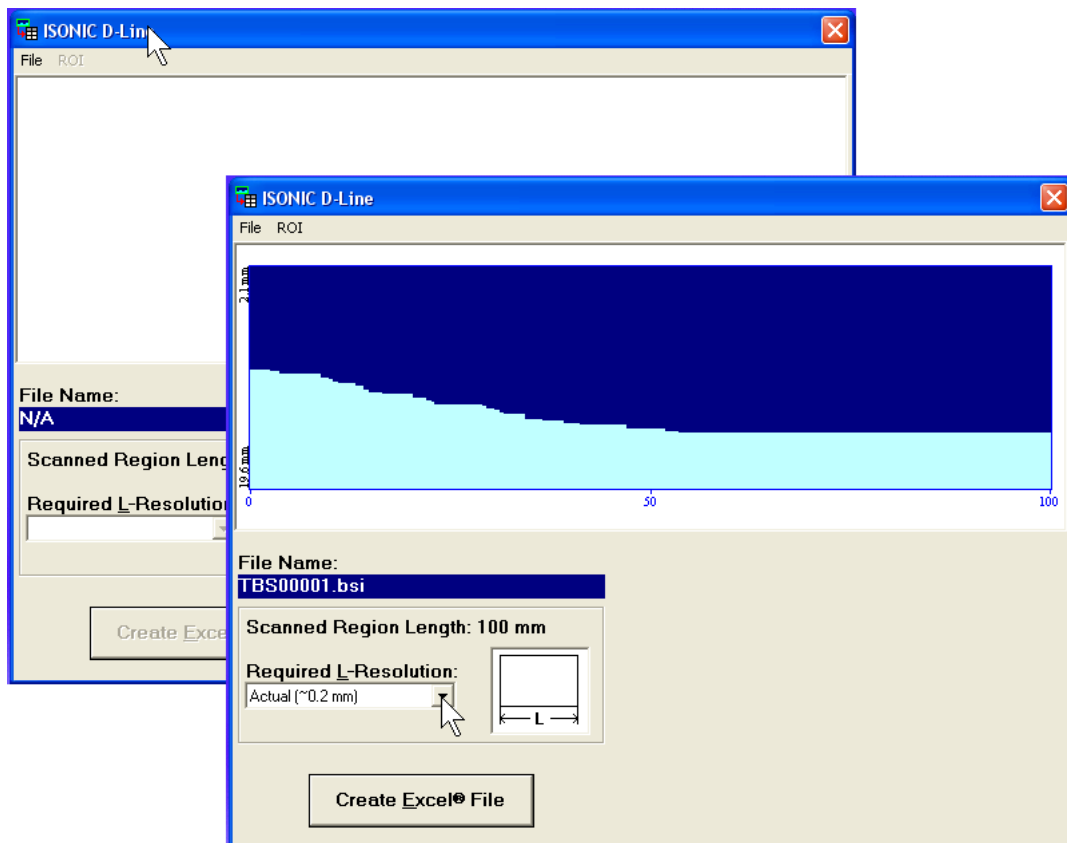
8.13. ISONIC D-Line and ISONIC D-Spreadsheet Creator Software packages

ISONIC D-Line and ISONIC D-Spreadsheet Creator software packages for office computer equipped with Microsoft® Office allow converting of t-BScan(Th)/BScan(Th) files (special format *.bsi) into Microsoft® Excel (.xls) spreadsheet file



ISONIC D-Line







Click on *Start* then select *Programs* ⇒ *ISONIC* ⇒ *ISONIC D-Line* or click on  icon located in the desktop to run **ISONIC D-Line**

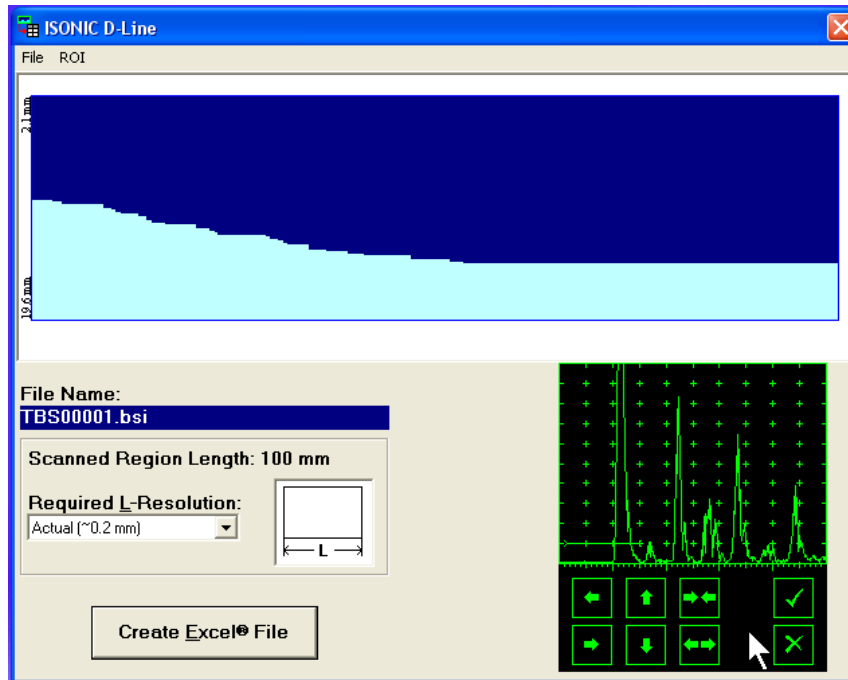
- **File → Open** allows selection and loading of *.bsi format t-BScan(Th)/BScan(Th) data file



On completing download:

- **ROI → ON** – generates *cursor representing sound path* of probe's central beam in the object under test that may be guided over **t-BScan(Th) / BScan(Th)** image using either mouse or ,  buttons on keyboard – corresponding **A-Scan** is recovered synchronously according to cursor position. To select reference **A-Scan** left mouse click or press **Enter** on external keyboard – this generates off-line **Gate**

A controls , , , , ,  allowing to redefine **Region Of Interest** for **t-BScan(Th)** / **BScan(Th)** imaging

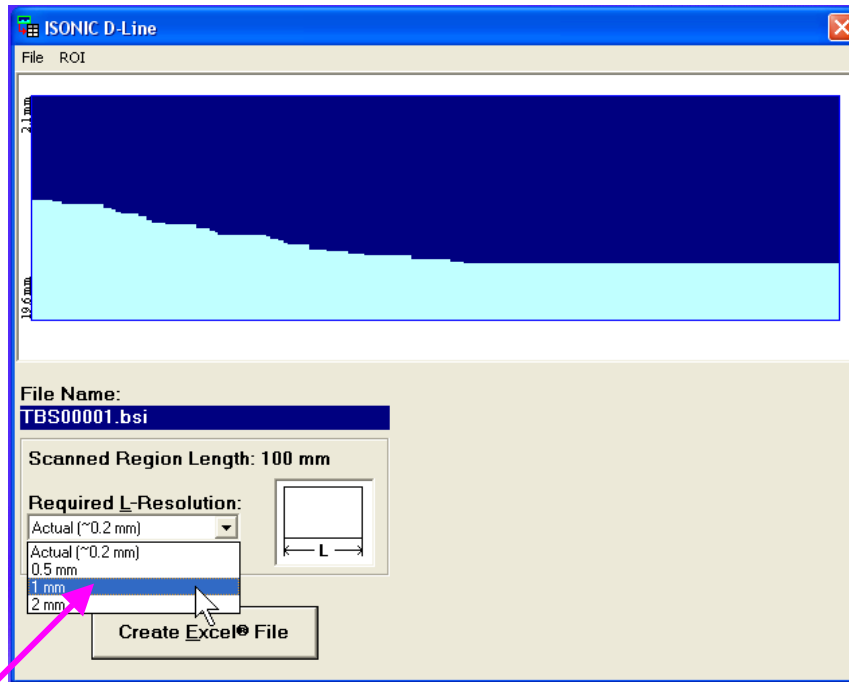


Upon completing redefining of **Region Of Interest** click on  – this applies new **Gate A** to all captured **A-Scans** and updates **t-BScan(Th) / BScan(Th)** image accordingly

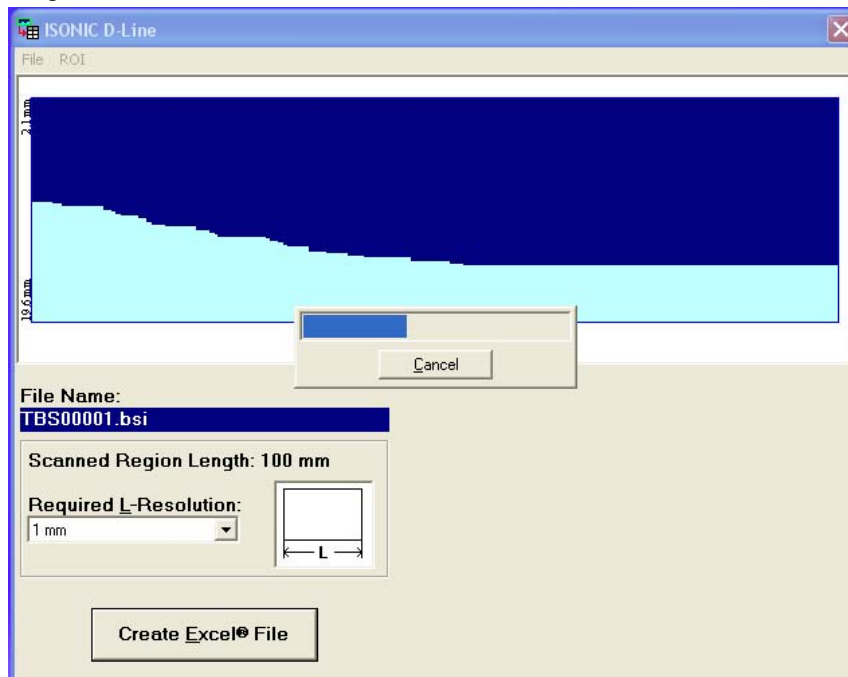
To interrupt selection of reference of **A-Scan** right mouse click or press **ESC** on keyboard

To interrupt re-adjustment of **Region Of Interest** after selection of reference of **A-Scan** click on 

- **ROI→OFF** – negates **Gate A** re-adjustment and returns to originally recorded **t-BScan(Th) / BScan(Th)** image and original **Gate A** setting



- Required L-Resolution** – this control allows selecting of necessary longitudinal scanning coordinate increments for depth spreadsheet to be created. Best possible resolution (actual) corresponding to minimal possible increment is default – it corresponds to single depth reading per each coordinate. On selecting coordinate increment larger than actual **ISONIC D-Line** software will analyze all depth readings with actual resolution for each interval covered by selected increment and place minimal values into corresponding cells



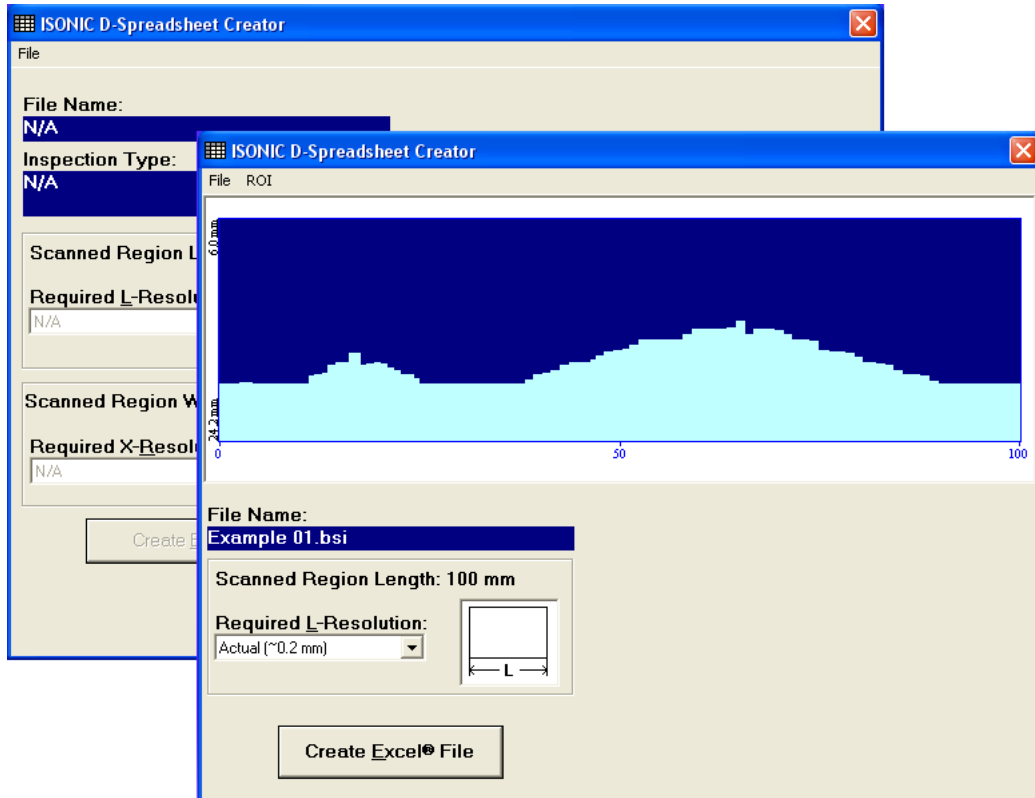
- Create Excel® File** – clicking on this button will initiate automatic creation of spreadsheet followed by starting Microsoft® Excel software
- File→Exit** – quits **ISONIC D-Line** software

ISONIC D-Spreadsheet Creator



Click on *Start* then select *Programs* ⇒ *ISONIC* ⇒ *ISONIC D-Spreadsheet Creator* or click on  icon located in the desktop to run **ISONIC D-Spreadsheet Creator**

File → Open allows selection and loading of *.bsi format t-BScan(Th)/BScan(Th) data file



- **File → Open** allows selection and loading of *.bsi format t-BScan(Th)/BScan(Th) data file

All further operations are identical to above described for **ISONIC D-Line**

8.14. Charging Battery

Battery of **ISONIC 2005 / 2020 / STAR** may be charged while disconnected from the unit. The special charger is required (refer to Chapter 3 of this Operating Manual). Connect charger to the battery as it is shown below



There is **Charge** LED on the charger. While charging the battery this LED emits solid light. **Charge** LED starts flashing upon charge is completed



If a battery is new and almost completely discharged then "boiling" effect in the electrolyte may start earlier than battery is fully charged. In order to prevent battery charger stops on detecting boiling "boiling" effect:

- ❑ If temperature inside battery does not exceed 60°C deg limit then **Charge** LED starts flashing – for such case it is necessary to disconnect charger from mains for few minutes and to connect it to mains again. The normal charging will continue
- ❑ If temperature inside battery exceeds 60°C deg limit then **Temp** LED starts flashing – for such case it is necessary to disconnect charger from mains for at least 2 hours and to connect it to mains again. The normal charging will continue

After few charge / discharge cycles battery becomes "trained" and probability of "boiling" effect decreases to almost zero

8.15. Silicone Rubber Jacket

1. Establishing Image:



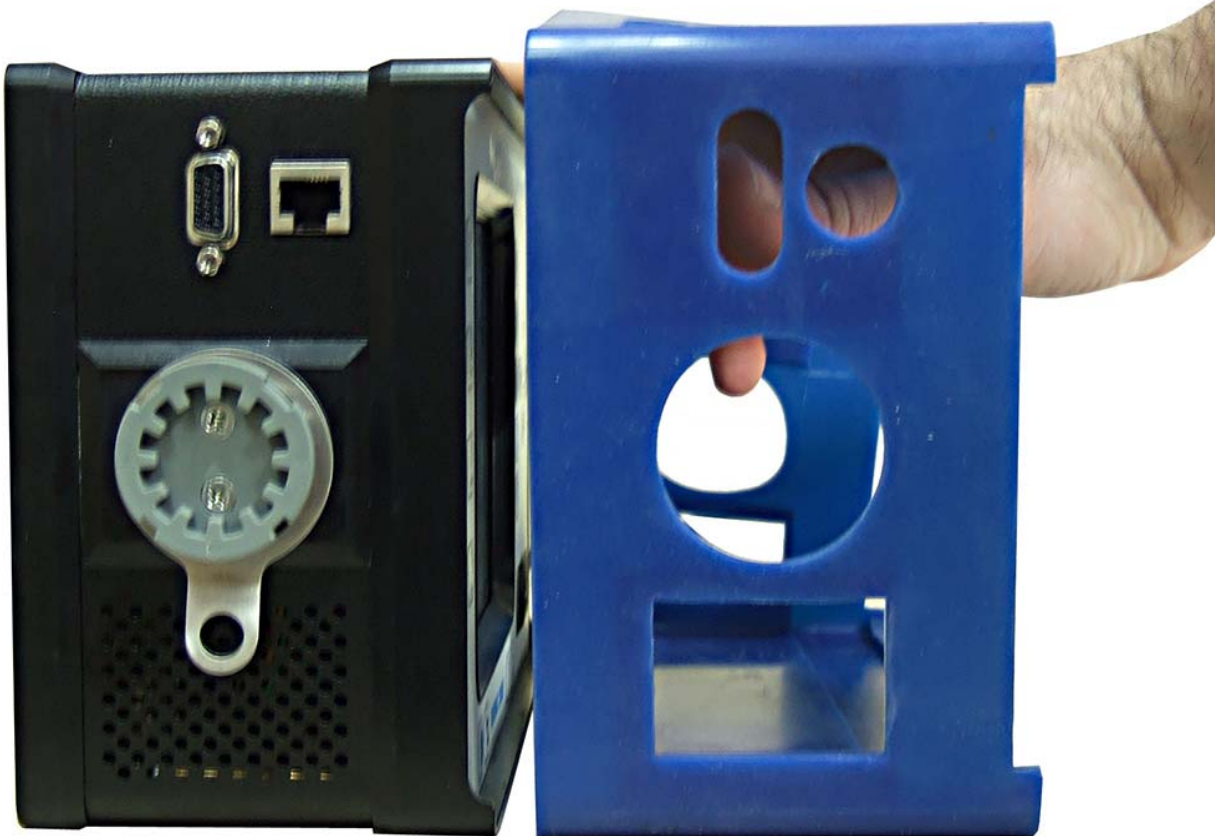
2. Push the gray buttons of the handle on both sides, and rotate the handle until it is released:



3. Lift-up and remove the handle:



4. Place the Silicone Rubber Jacket so that the holes match the ports of the ISONIC machine:



5. Slip the Silicone Rubber Jacket around the machine until it fits properly and covers all edges:



6. A view from the back:



7. Put the handle back in position and twist it until it locks in place:



8. DONE!



9. Optional Software Package: ISONIC Data Logger

9.1. About ISONIC Data Logger

ISONIC Data Logger is optional software package providing comprehensive data recording, on-site and off-site editing, importing, exporting, and reporting for routine point-by-point wall thickness gauging. Thanks to automatic MS Excel® thickness spreadsheet creating **ISONIC Data Logger** is compliant with various *Risk Based Inspection and Maintenance* procedures

ISONIC Data Logger software package includes two utilities:

- **ISONIC Data Logger – Instrument** for running in **ISONIC 2005 / 2020 / STAR** and **ISONIC 2006** instruments
- **ISONIC Data Logger – Office** for running in office PCs

ISONIC Data Logger – Instrument utility provides comprehensive data recording for routine point-by-point wall thickness gauging. At each point operator ads *record* into selected location in currently open database file (job) or edits or overwrites record already existing at selected location in the said file. Each *record* includes:

- Complete **ISONIC 2005 / 2020 / STAR** or **ISONIC 2006** Instrument setup
- Complete **A-Scan** obtained in point of gauging
- Corresponding wall thickness (distance) reading either **s(A)** or **Δs** (refer to paragraphs 5.2.12 and 5.2.13 of this Operating Manual)

Each record is equivalent to single ***.PAR** file (refer to paragraphs 5.2.17 and 5.2.18 of this Operating Manual) additionally accompanied with corresponding wall thickness (distance) reading

Special ***.DLI** format is used for database files managed by **ISONIC Data Logger**. Each ***.DLI** database file (job) is organized as two-dimensional matrix whereas each record has unique address. Address is defined by:

- Row number (may vary from 1 to 999)
- Column number (may vary from 1 to 255 whereas 255 is typical limitation of MS Excel®)

Each ***.DLI** database file (job) may contain up to $999 \times 255 = 254\,745$ records

For early created ***.DLI** database file located in **ISONIC 2005 / 2020 / STAR** or **ISONIC 2006** instrument each record may be recalled, previewed, compared with newly obtained **A-Scan** and wall thickness (distance) reading, and either replaced with a new one or untouched – this allows uploading of earlier obtained results into instrument just before next inspection of the same object and performing point-by-point comparative testing permanently keeping wall thickness and **A-Scan** database up to date





ISONIC Data Logger – Office utility processes ***.DLI** database files imported into office PC. **ISONIC Data Logger – Office** utility allows:

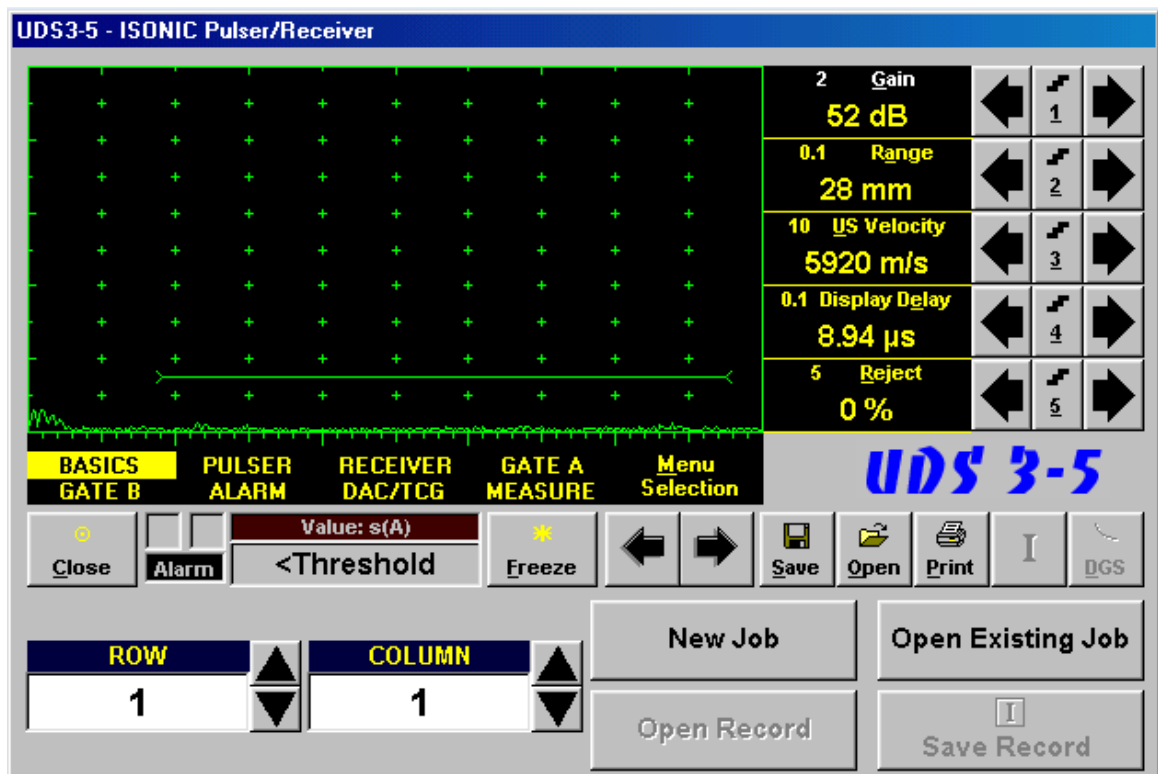
- Previewing of captured **A-Scans** and corresponding wall thickness (distance) readings and instrument setup
- Editing records in ***.DLI** database files through off-line **Gates** and/or **Gain** readjustment and taking new wall thickness (distance) reading
- Automatic creating of MS Excel® wall thickness spreadsheet file as it is required by various *Risk Based Inspection and Maintenance* procedures (office PC must be equipped with MS Excel®)
- Other functions (refer to paragraph 9.4 of this Operating Manual)

9.2. Start ISONIC Data Logger - Instrument

1. Switch on ISONIC 2006
2. **ISONIC 2006 start screen** becomes active automatically upon boot up is completed



3. Click on **3 Exit To Windows** or press  on front panel keyboard or press **F3** on external keyboard
4. Double click on  icon at Windows desktop
5. **ISONIC 2006 start screen** becomes active again - Click on  or press  on front panel keyboard or press **F1** on external keyboard . The screen as below appears:

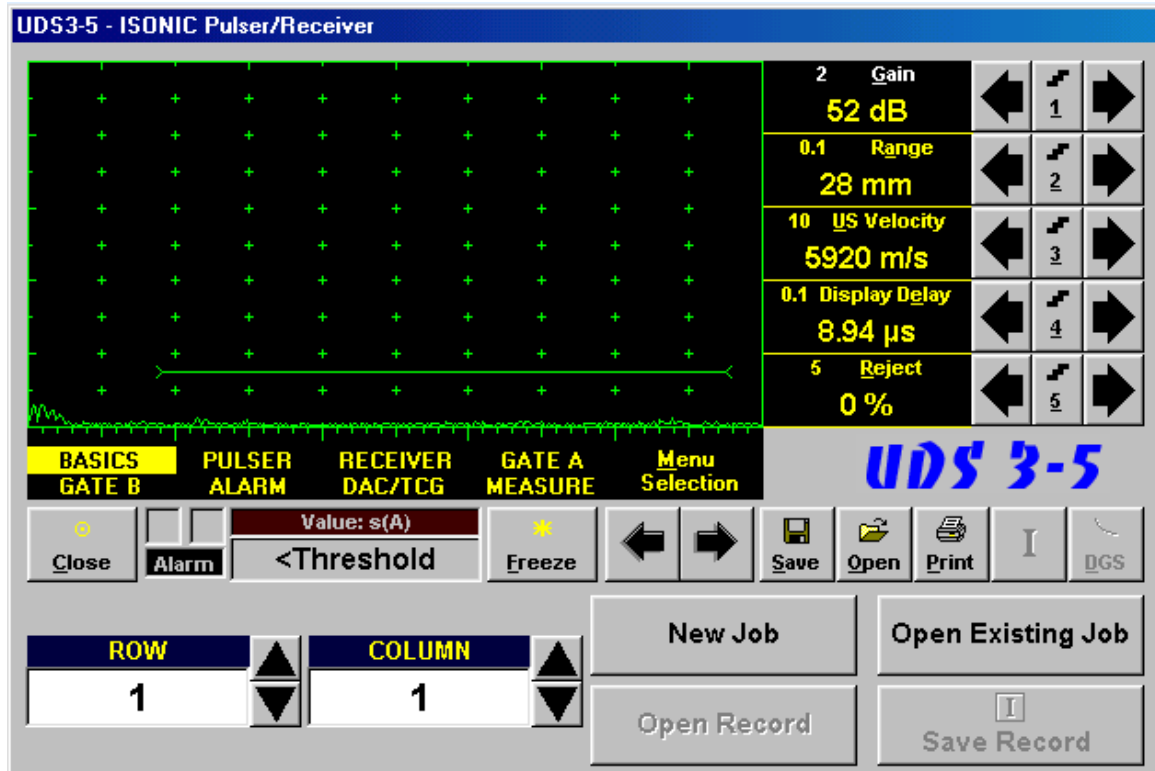


9.3. Operating ISONIC Data Logger - Instrument

9.3.1. General

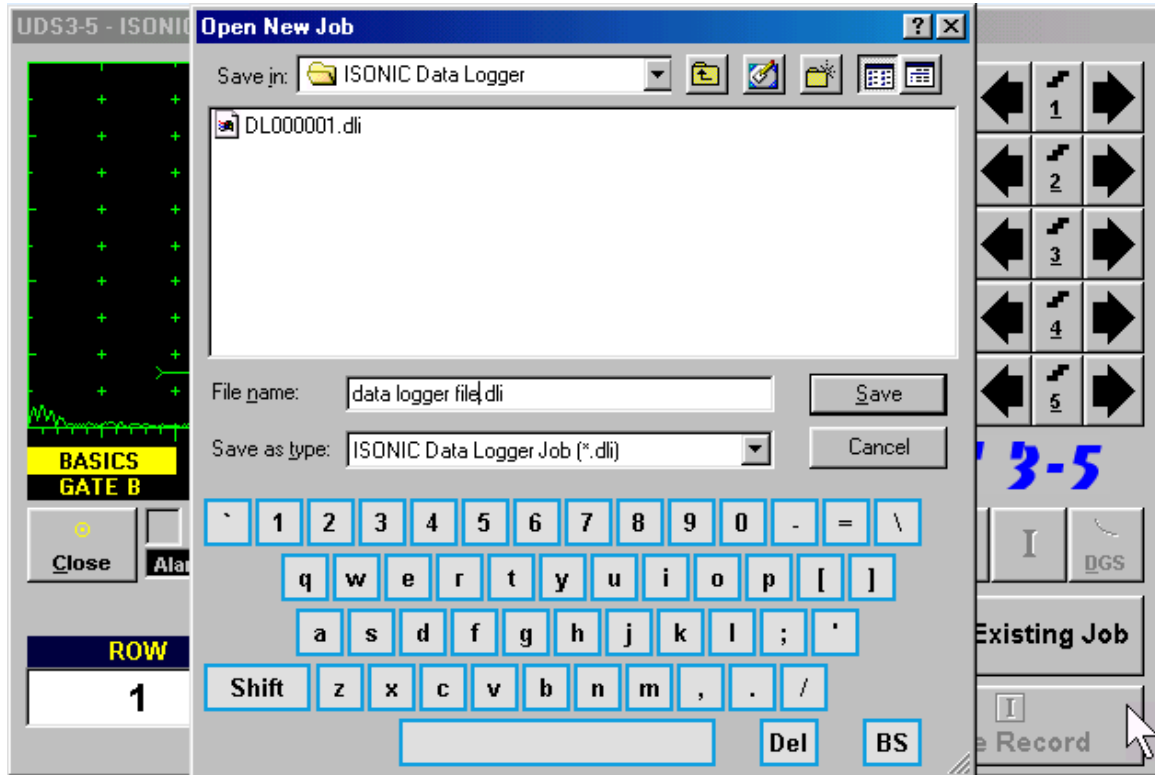
Operating surface of **ISONIC Data Logger** includes main operating surface of **UDS 3-5**, which may be controlled in full compliance with chapter 5 of this Operating Manual and 6 (six) additional controls; said additional controls allow:

- Creating new *.DLI database file (job)
- Opening existing *.DLI database file (job)
- Placing new record into currently open *.DLI database file (job)
- Uploading and previewing record from currently open *.DLI database file (job)
- Replacing existing record in currently open *.DLI database file (job) with a new one



9.3.2. Creating new *.DLI database file (job)

Click on **New Job** then type name of *.DLI database file (job) to be created and click on **Save** or press or press **Save** on front panel keyboard or **F12** or **<Alt>+<S>** on external keyboard



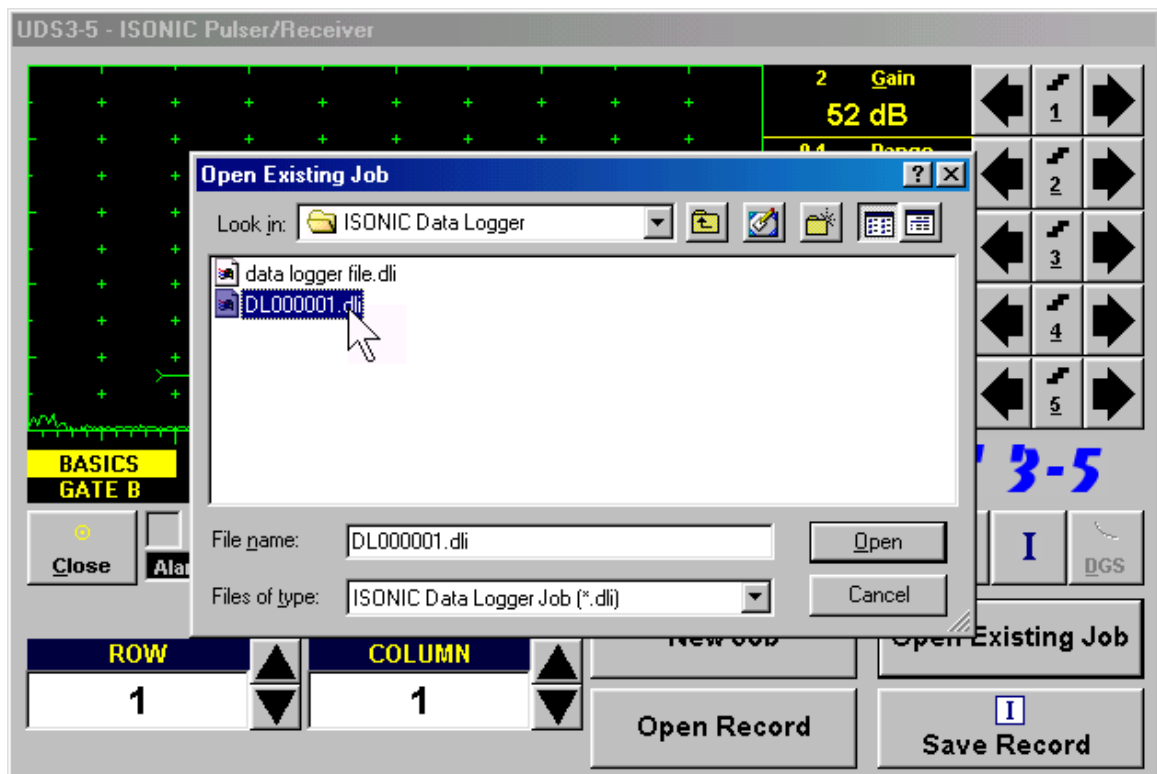
To quit above window without creating new *.DLI database file (job) click on **Cancel** or press **ESC** on front panel keyboard or **Esc** on external keyboard



New *.DLI database file (job) appears physically after adding of first record into

9.3.3. Opening existing *.DLI database file (job)

Click on **Open Existing Job** then select file name and double click on it or click on **Open** or press **Open** or **Enter** on front panel keyboard or **F11** or **Enter** or **<Alt>+<O>** on external keyboard




To quit above window without opening data base file click on **Cancel** or press **ESC** on front panel keyboard or **Esc** on external keyboard

9.3.4. Managing records in currently open *.DLI database file (job)

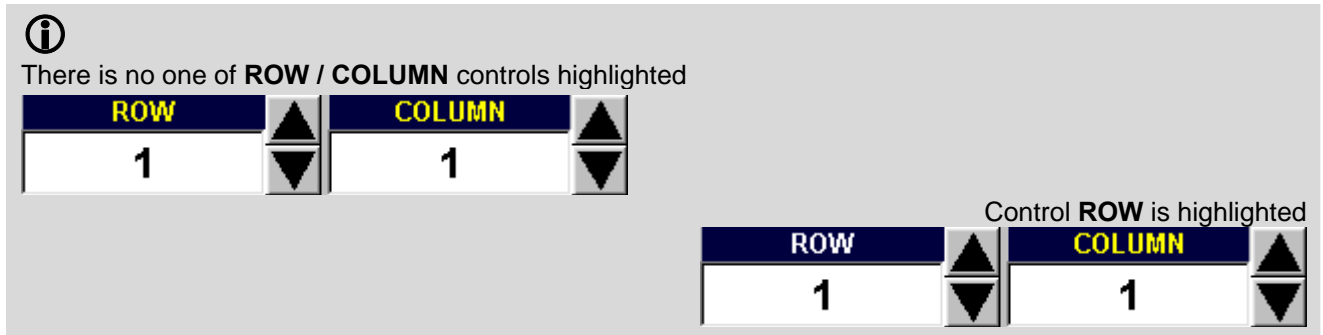
Address of record is defined through settings of row number and column number, said numbers may be







incremented / decremented through clicking on appropriate button





Alternatively it is possible to select number for increment / decrement through pressing  on front panel keyboard or **F7** on external keyboard - this highlights sequentially **UDS 3-5 Main Menu** topics and **ROW / COLUMN** controls as well

If one of **ROW / COLUMN** controls is highlighted then its name is indicated using white characters:



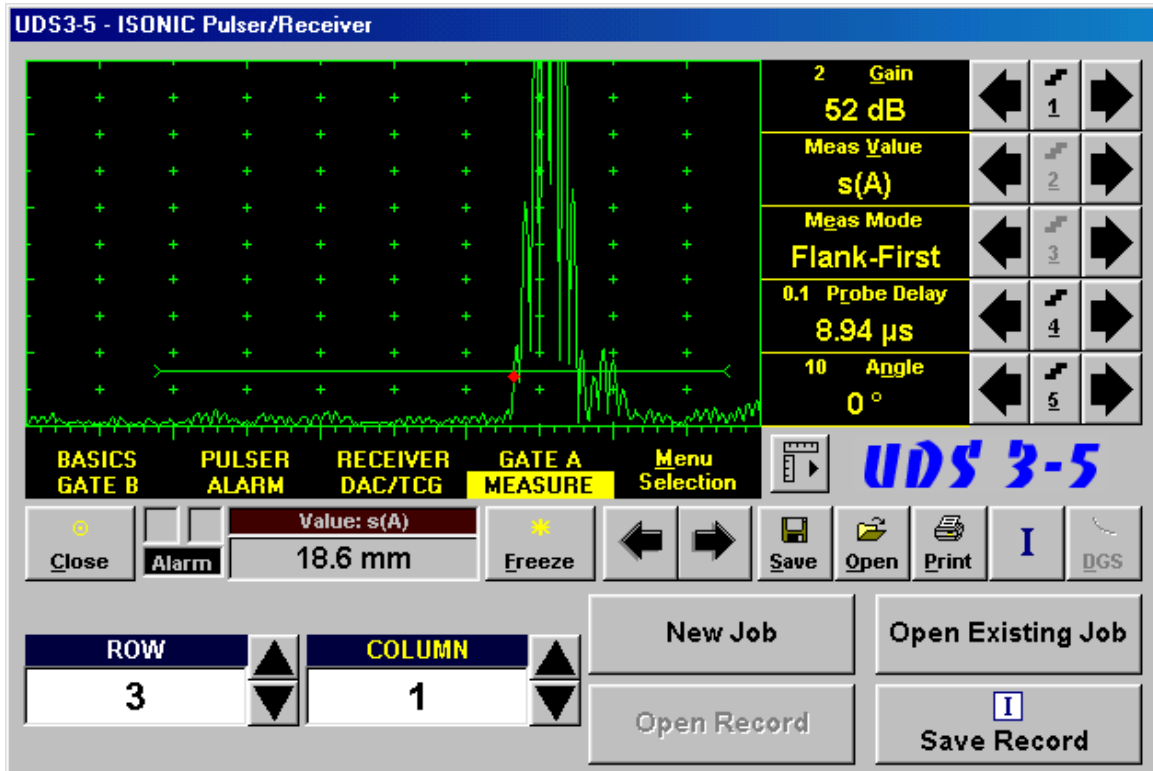
It is possible to increment / decrement number for highlighted control through pressing  /  on front panel keyboard or  /  on external keyboard




If one of **ROW / COLUMN** controls is highlighted then it is possible to select another one of them through


pressing on  /  on front panel keyboard or  /  on external keyboard

It is also possible to click on either **ROW** or **COLUMN** control name or value to highlight one and then to operate as it is described above

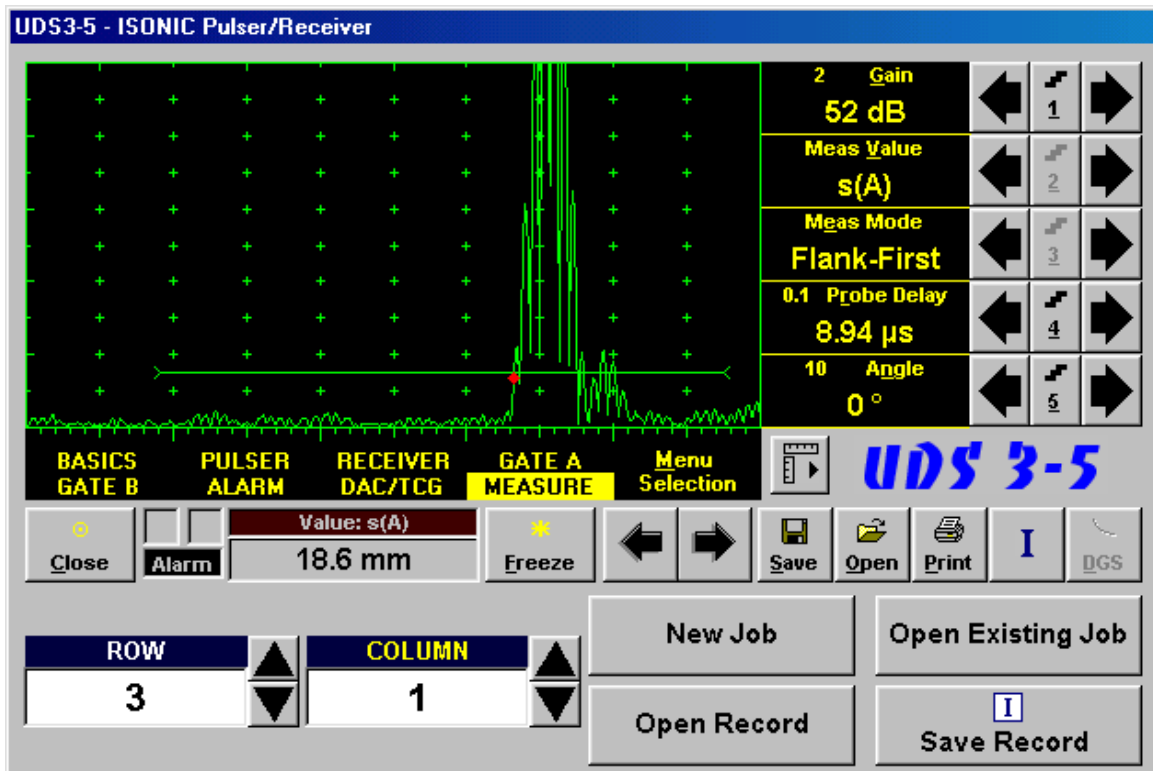
Since address of record is selected:







If  is **disabled** then there is no record identified by selected address – record cell is empty. To fill cell identified by selected address with a record click on  or press  on front panel keyboard or **F8** on external keyboard

 Saving of a record is possible if:

- There is either **s(A)** or Δs reading selected (refer to paragraph 5.2.12 of this Operating Manual)
- First back wall echo signal exceeds **Gate A** level provided that **s(A)** reading is selected
- First back wall echo signal exceeds **Gate A** level and second back wall echo signal exceeds **Gate B** level if Δs reading is selected




If  is **enabled** then cell identified by selected address is filled with a record. Clicking on  will upload instrument setup and **A-Scan**; **Freeze** mode of operation becomes active allowing to preview / process uploaded record completely according to paragraph 5.2.15 of this Operating Manual

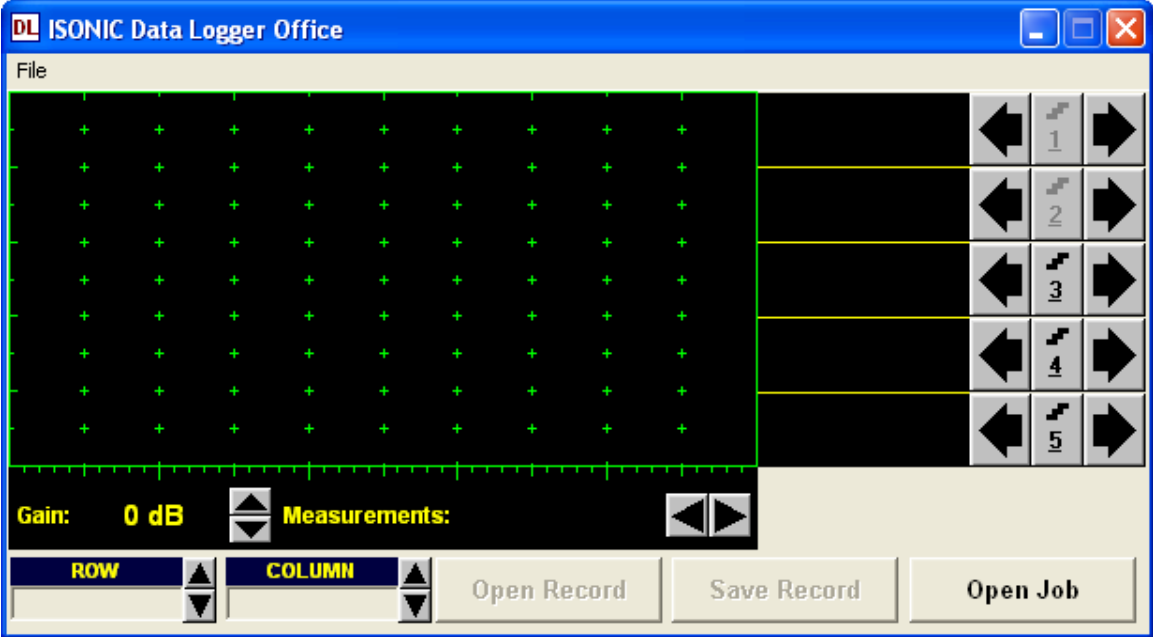
To replace existing record in the cell identified by selected address with a new one click on  or press  on front panel keyboard or **F8** on external keyboard


9.3.5. Export of *.DLI database file (job)

*.DLI database file (job) may be exported at any moment either through copying onto USB memory stick Alternatively it may be copied directly onto disk of remote computer provided that both **ISONIC 2005 / 2020 / STAR** or **ISONIC 2006** instrument and remote computer are connected to LAN and the appropriate sharing is possible

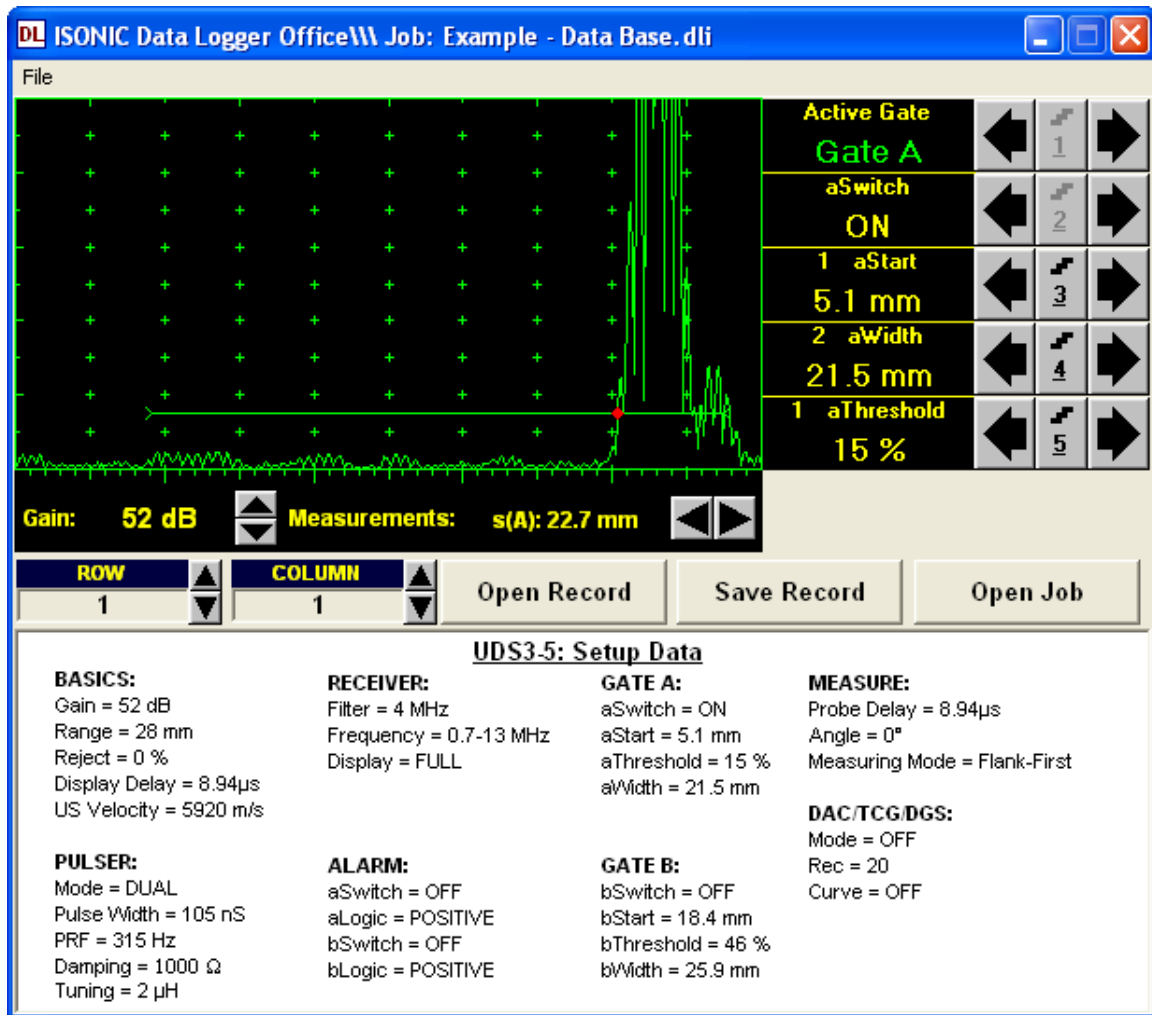
9.4. Operating ISONIC Data Logger – Office PC

To start **ISONIC Data Logger Office** double click on  icon at Windows desktop or go through **Start → Programs → ISONIC → ISONIC Data Logger Office**

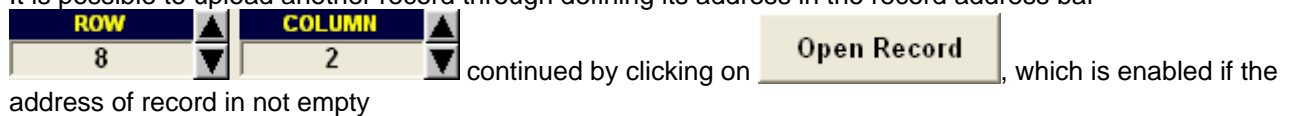


In the appeared window click on  or go through **File → Open** – this allows to specify location of *.DLI database file (job) through standard Windows™ procedures and to open *.DLI database file (job) then

Upon opening *.DLI database file (job) file first available valid record is uploaded



It is possible to upload another record through defining its address in the record address bar



Its is possible to readjust **Gates** and/or **Gain** in ± 6 dB range for uploaded record as well as to perform **A-Scan** signals evaluation in accordance with Chapters 5.2.5, 5.2.6, 5.2.7, 5.2.12, and 5.2.13 of this Operating Manual

To correct reading record **s(A)** or **ΔS** in open *.DLI database file (job) off-line readjustment of **Gate A** or both **Gates A** and **B**, or changing **Gain** if necessary. Such need may occur if wrong reading was detected off-line as it is illustrated by screenshot below – while in the field there was a disturbance signal appearing in the **Gate A** before back wall echo and wrong thickness reading of **5.9 mm** was taken into data base cell defined by row # 8 and column # 2. To replace wrong reading in the database cell it is sufficient to readjust position and width of **Gate A** to avoid its matching with disturbance signal. As a result correct reading of **18.6 mm** is obtained

The top screenshot shows the ISONIC Data Logger interface with the following parameters:

- Active Gate: Gate A
- aSwitch: ON
- 1 aStart: 5.1 mm
- 2 aWidth: 21.5 mm
- 1 aThreshold: 15 %
- Gain: 52 dB
- Measurements: s(A): 5.9 mm
- ROW: 8, COLUMN: 2

The bottom screenshot shows the same interface after adjustment, with the following parameters:

- Active Gate: Gate A
- aSwitch: ON
- 1 aStart: 12.4 mm
- 2 aWidth: 14.3 mm
- 1 aThreshold: 15 %
- Gain: 52 dB
- Measurements: s(A): 18.6 mm
- ROW: 8, COLUMN: 2

The 'UDS3-5: Setup Data' panel in the bottom screenshot contains the following information:

BASICS:	RECEIVER:	GATE A:	MEASURE:
Gain = 52 dB	Filter = 4 MHz	aSwitch = ON	Probe Delay = 8.94μs
Range = 28 mm	Frequency = 0.7-13 MHz	aStart = 5.1 mm	Angle = 0°
Reject = 0 %	Display = FULL	aThreshold = 15 %	Measuring Mode = Flank-First
Display Delay = 8.94μs		aWidth = 21.5 mm	
US Velocity = 5920 m/s			
PULSER:	ALARM:	GATE B:	DAC/TCG/DGS:
Mode = DUAL	aSwitch = OFF	bSwitch = OFF	Mode = OFF
Pulse Width = 105 nS	aLogic = POSITIVE	bStart = 18.4 mm	Rec = 20
PRF = 315 Hz	bSwitch = OFF	bThreshold = 46 %	Curve = OFF
Damping = 1000 Ω	bLogic = POSITIVE	bWidth = 25.9 mm	
Tuning = 2 μH			

Clicking on **Save Record** will modify record in the database cell with a new one containing proper reading

Further manipulations are possible through clicking on **File** – this opens **vertical menu bar**:

File

- Open
- Records List
- Convert to Par File
- Convert A-Scan to Txt File
- Export Database
- Print To
- Print
- Exit

Active Gate

Gate A

aSwitch
ON

1 aStart
12.4 mm

2 aWidth
14.3 mm

1 aThreshold
15 %

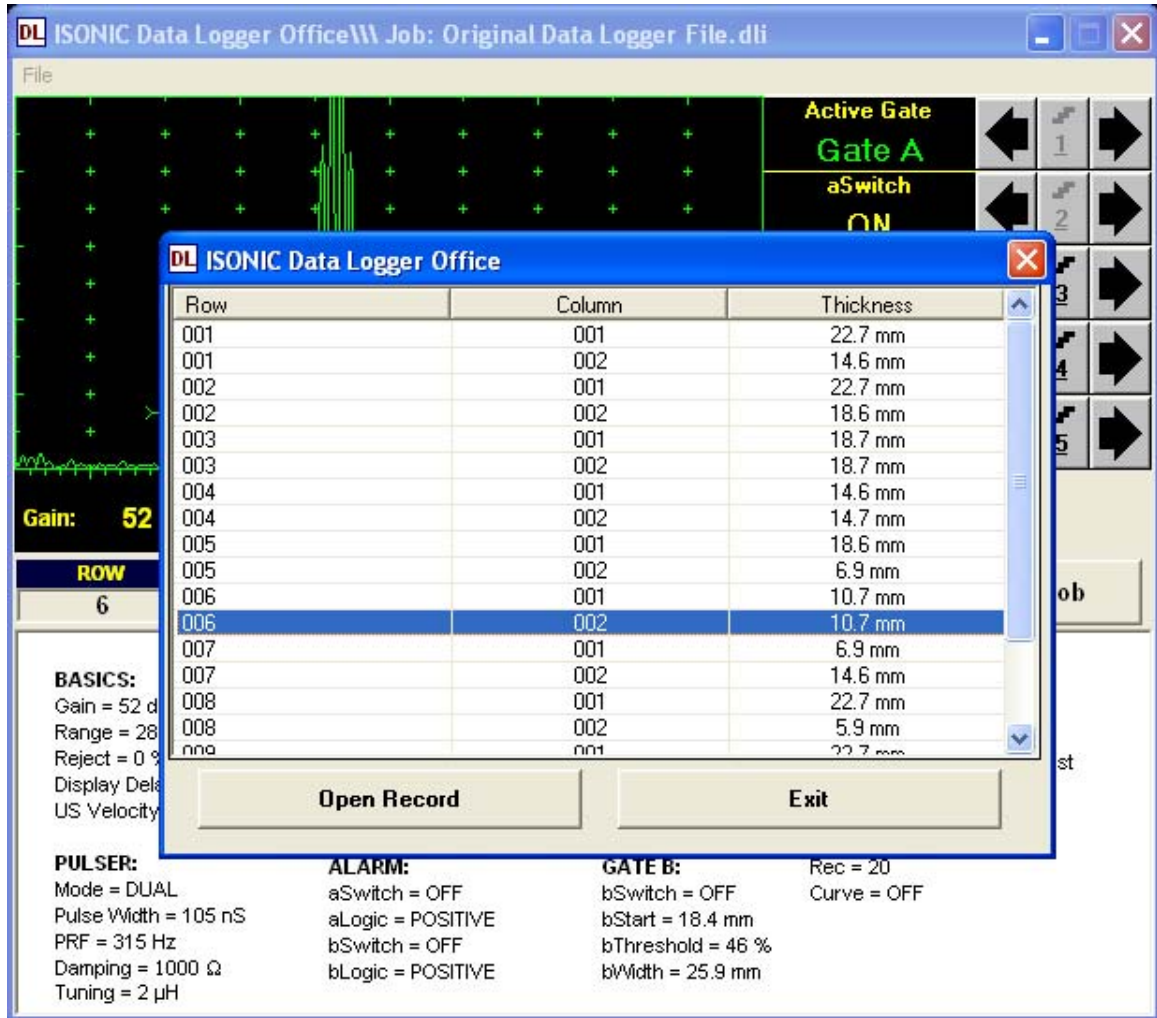
Gain: 52 dB **Measurements:** s(A): 18.6 mm

ROW 8 **COLUMN** 2 **Open Record** **Save Record** **Open Job**

UDS3-5: Setup Data

BASICS: Gain = 52 dB Range = 28 mm Reject = 0 % Display Delay = 8.94µs US Velocity = 5920 m/s	RECEIVER: Filter = 4 MHz Frequency = 0.7-13 MHz Display = FULL	GATE A: aSwitch = ON aStart = 12.4 mm aThreshold = 15 % aWidth = 14.3 mm	MEASURE: Probe Delay = 8.94µs Angle = 0° Measuring Mode = Flank-First
PULSER: Mode = DUAL Pulse Width = 105 nS PRF = 315 Hz Damping = 1000 Ω Tuning = 2 µH	ALARM: aSwitch = OFF aLogic = POSITIVE bSwitch = OFF bLogic = POSITIVE	GATE B: bSwitch = OFF bStart = 18.4 mm bThreshold = 46 % bWidth = 25.9 mm	DAC/TCG/DGS: Mode = OFF Rec = 20 Curve = OFF

File → Records List opens complete list of valid records in the database:



To upload record double click on it in the popup records list or click on

Open Record

To return to main **ISONIC Data Logger Office** operating surface without uploading record click on  or on

Exit

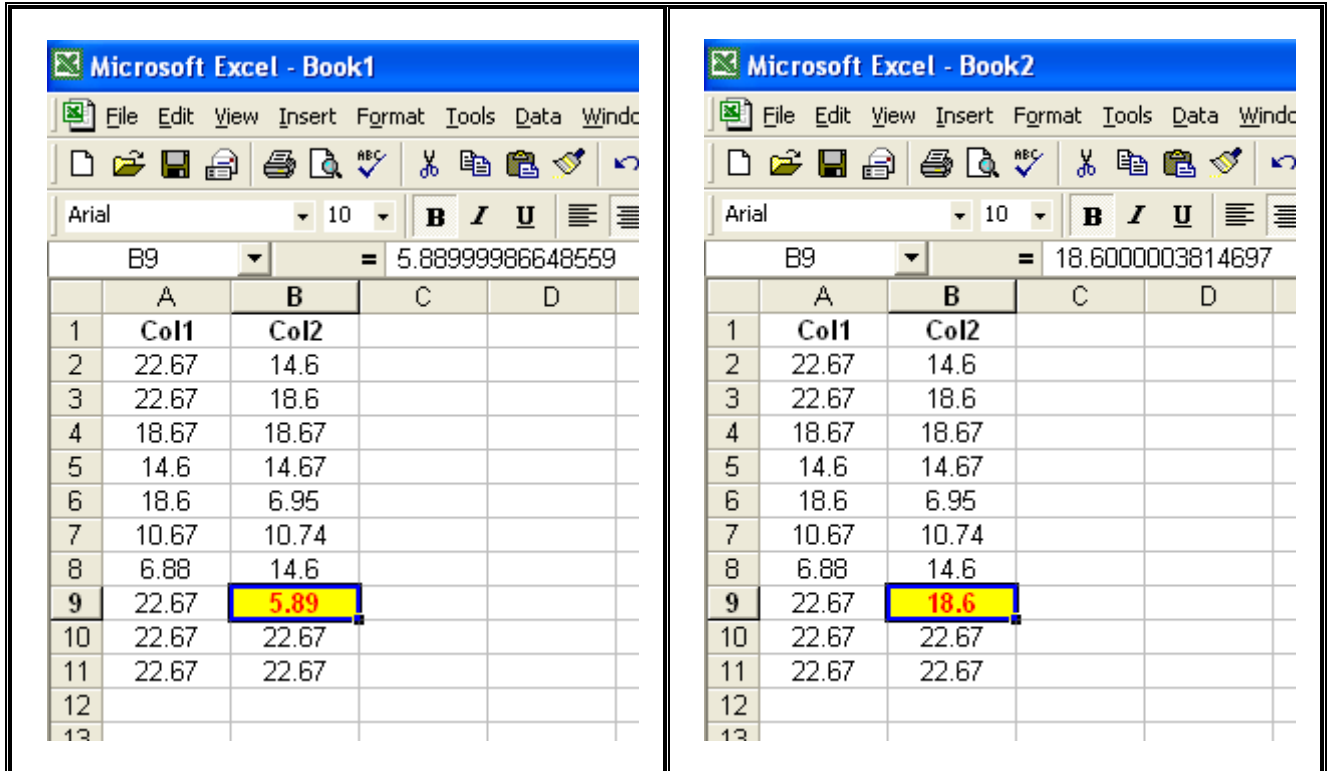
or press **Esc**

File → Convert to PAR File converts uploaded record into single *.PAR file for **ISONIC 2005 / 2020 / STAR** or **ISONIC 2006**

File → A-Scan to Txt File converts A-Scan from uploaded record into ASCII code *.TXT file for further processing by various software, for example Matlab®, Labview®, etc or some proprietary software package – this function is equivalent to **Par2Txt Converter** software package performance (refer to paragraph 8.10 of this Operating Manual)

File → Export Data Base takes all **s(A)** and **Δs** wall thickness (distance) readings existing in the records of *.DLI database file (job) and converts them into MS Excel® spreadsheet provided that MS Excel® is installed in the office PC

For example there are two MS Excel® spreadsheets shown:



First spreadsheet (Book 1) was created directly from *.DLI database file (job) without measurement correction for cell corresponding to row # 8 and column # 2 as in the example above. Second spreadsheet (Book 2) was created from database file where record corresponding to row # 8 and column # 2 was corrected as in the example above

File → Print To defines default printer among plurality of available printers. MS Word® may be designated as default printer provided it installed in the PC. If MS Word® is defined as default printer then *.doc file is created instead of plotting on a paper sheet

File → Print prints out **A-Scan** accompanied with instrument setup and automatic measurements data corresponding to uploaded record

File → Exit or clicking on  quits **ISONIC Data Logger – Office**

10. Optional Software Package: MULTISCAN COMBO S ME

10.1. Introduction into ISONIC MULTISCAN COMBO S ME

ISONIC MULTISCAN COMBO S ME is optional software package featuring ISONIC 2005 / 2020 / STAR instrument with the ability of mechanically encoded manual XY-scanning using straight beam single element or dual probes with 100% raw data recording and real time **C-, B-, D-Scan** imaging. Refer to paragraph 3 of this Operating Manual for brief characteristics of **MULTISCAN COMBO S ME** is optional software package



- ❑ To perform mechanically encoded scanning probe to be mounted into *scanning mechanism* driven either manually or automatically
- ❑ Scanning mechanism to be equipped with 2 incremental encoders
- ❑ Interface between scanning mechanism and ISONIC 2005 / 2020 / STAR instrument is provided by *Dual Axis Encoder USB Interface – order code S 808440*

10.2. Setup of ISONIC MULTISCAN COMBO S ME Optional SW Package and Activation of SW Driver for Dual Axis Encoder USB Interface

If **MULTISCAN COMBO S ME** optional software package was ordered at the time of sale of new instrument then **ISONIC 2005 / 2020 / STAR** Instrument comes pre-installed

To setup **MULTISCAN COMBO S ME** optional software package into **ISONIC 2005 / 2020 / STAR** instrument or to upgrade existing version with a new one

10.2.1. From CD Through Network

- Exit to Windows (refer to paragraph 8.4 of this Operating Manual)
- Connect the **ISONIC 2005 / 2020 / STAR** to your local network
- Switch on the local computer, which is also connected to the local network and equipped with the CD drive
- Provide sharing for the CD drive, i.e. the CD drive must become accessible from the **ISONIC 2005 / 2020 / STAR** via the local network
- Insert the CD into the drive
- On the **ISONIC 2005 / 2020 / STAR** double click **Network Neighborhood** icon and then find the shared CD drive in the network and double click on its icon
- Double click the icon of **Software Package Setup** folder
- For each application to be upgraded perform the following sequence of operations:
 - Double click the icon of the corresponding folder
 - Run **setup.exe** program placed in this folder
 - The prompt to delete previous installation of application will appear. Click on **Yes** and follow the instructions appearing on the screen, confirming all requests by clicking on **Yes, OK** or other corresponding buttons
 - Upon uninstall procedure completed run **setup.exe** program again
 - Follow the instructions appearing on the screen, confirming all requests by clicking on **Yes, OK** or other corresponding buttons

10.2.2. From USB Memory Stick (Disk on Key)

If memory stick (disk on key) is already registered in **ISONIC 2005 / 2020 / STAR** – copy contents of **ISONIC 2005 / 2020 / STAR** backup CD to memory stick (disk on key) then

- Exit to Windows (refer to paragraph 8.4 of this Operating Manual)
- Connect USB memory stick (disk on key) to one of 2 USB Connectors (refer to paragraph 4.2 of this Operating Manual)
- Double Click on **My Computer** icon
- Find icon related to connected memory stick (disk on key) and explore it
- Double click the icon of **Software Package Setup** folder
- For each application to be upgraded perform the following sequence of operations:
 - Double click the icon of the corresponding folder
 - Run **setup.exe** program placed in this folder
 - The prompt to delete previous installation of application will appear. Click on **Yes** and follow the instructions appearing on the screen, confirming all requests by clicking on **Yes, OK** or other corresponding
 - Upon uninstall procedure completed run **setup.exe** program again
 - Follow the instructions appearing on the screen, confirming all requests by clicking on **Yes, OK** or other corresponding buttons

10.2.3. Activation of SW Driver for Dual Axis Encoder USB Interface



Activation of SW Driver for Dual Axis Encoder USB Interface is necessary after first installation of **MULTISCAN COMBO S ME** optional software package only

Dual Axis Encoder USB Interface has 3 terminals:

Terminal 1



Terminals 2 and 3



Terminal 1 to be connected to USB socket of **ISONIC 2005 / 2020 / STAR** instrument via standard USB cable, included into scope of delivery

Terminals 2 and 3 to be connected to encoders incorporated into scanning mechanism, both are 9-pin D-Type female connectors. For pin-out of **terminals 2 and 3** and recommendation for connecting to encoders send your inquire to support@sonotronndt.com

- Switch **ISONIC 2005 / 2020 / STAR** Instrument on and wait until **ISONIC 2005 / 2020 / STAR start screen** becomes active automatically upon boot up is completed
- Exit to Windows (refer to paragraph 8.4 of this Operating Manual)
- Connect Dual Axis Encoder USB Interface to USB socket of **ISONIC 2005 / 2020 / STAR** instrument



- New hardware wizard starts automatically - click on **Next**



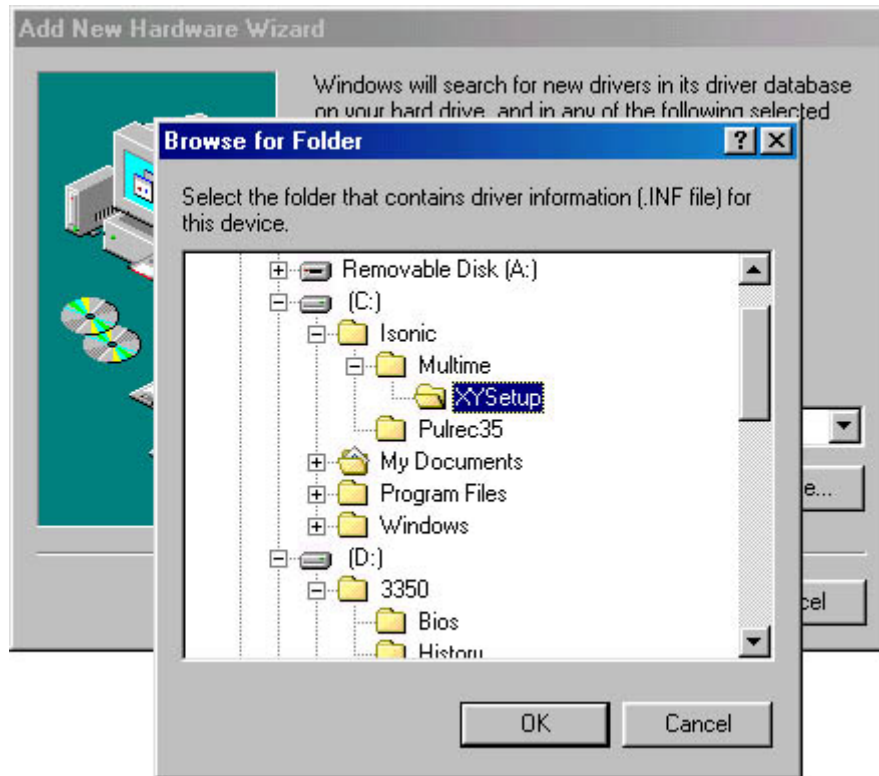
- Select **Search for the best driver...** then click on **Next>**



- Select **Specify a location** then click on **Browse...**



- Select **C:\Isonic\Multime\XYSetup** then click on **OK**



- Click on **Next>**



- Click on **Next>**



- Click on **Finish**




- New hardware wizard may appear few times in sequence – if so then just repeat it as it is just described
- After completing activation of driver connect Dual Axis Encoder USB Interface to another USB socket of **ISONIC 2005 / 2020 / STAR** instrument. If New hardware wizard will appear then just repeat it again

10.3. Running MULTISCAN COMBO S ME

10.3.1. Preparations

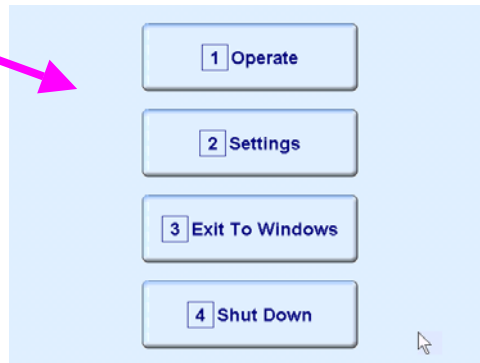
- Switch **ISONIC 2005 / 2020 / STAR** Instrument on and wait until **ISONIC 2005 / 2020 / STAR start screen** becomes active automatically upon boot up is completed
- Exit to Windows (refer to paragraph 8.4 of this Operating Manual)
- Connect Dual Axis Encoder USB Interface to USB socket of **ISONIC 2005 / 2020 / STAR** instrument and to encoders of XY scanning mechanism






- Connect probe(s) to appropriate sockets on the top cover of **ISONIC 2005 / 2020 / STAR** instrument
- Double click on  icon at Windows desktop



10.3.2. MULTISCAN COMBO S ME Start Screen

MULTISCAN COMBO S ME start screen is identical to



Click on  or press  on front panel keyboard or press **F1** on external keyboard to run **MULTISCAN COMBO S ME** inspections

Click on  or press  on front panel keyboard or press **F2** on external keyboard to proceed with general settings of **ISONIC 2005 / 2020 / STAR** – refer to Chapters 7 and 8 of this Operating Manual and with calibration of encoders incorporated into scanning mechanism – refer to paragraph 10.3.3 of this of this Operating Manual

Click on  or press  on front panel keyboard or press **F3** on external keyboard if it is necessary to fulfill some general purpose Windows procedures such as setting up drivers for external devices (printers, USB memory card, and the like), connecting to LAN, quasi-disk management, etc – refer to Chapter 8 of this Operating Manual

To turn **ISONIC 2005 / 2020 / STAR** off click on  or press on  on front panel keyboard or press **F4** on external keyboard – the screen as below appears



followed by the shut down completion screen:



Set power switch into **O** position upon




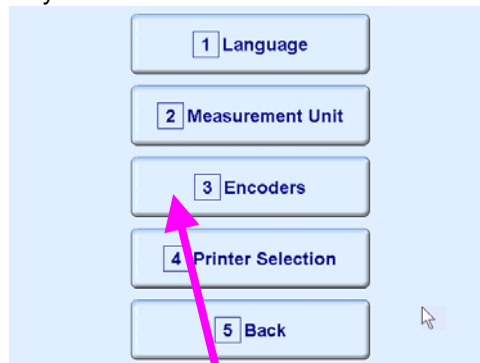
After turning **ISONIC 2005 / 2020 / STAR OFF** wait at least 10...30 seconds before switching it **ON** again


10.3.3. Calibration of Encoders Incorporated into Scanning Mechanism

It is necessary to calibrate encoders encoder incorporated into scanning mechanism for each new scanning mechanism prior to running of **MULTISCAN COMBO S ME** inspections

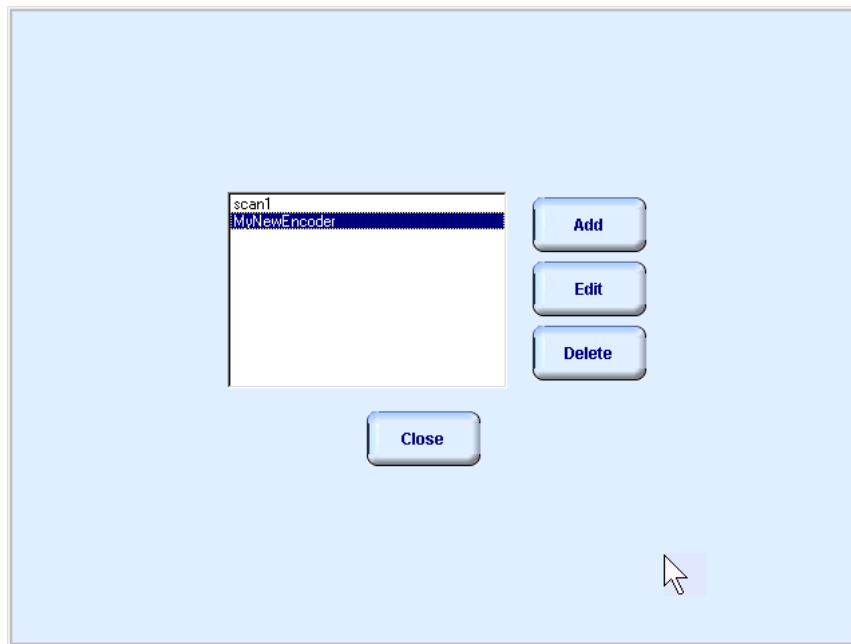







To proceed with calibration **click on** in the **MULTISCAN COMBO S ME** start screen or press  on front panel keyboard or **F2** on external keyboard



In the appeared **ISONIC 2005 / 2020 / STAR Settings Menu** **click on** or press  on front panel keyboard or **F3** on external keyboard

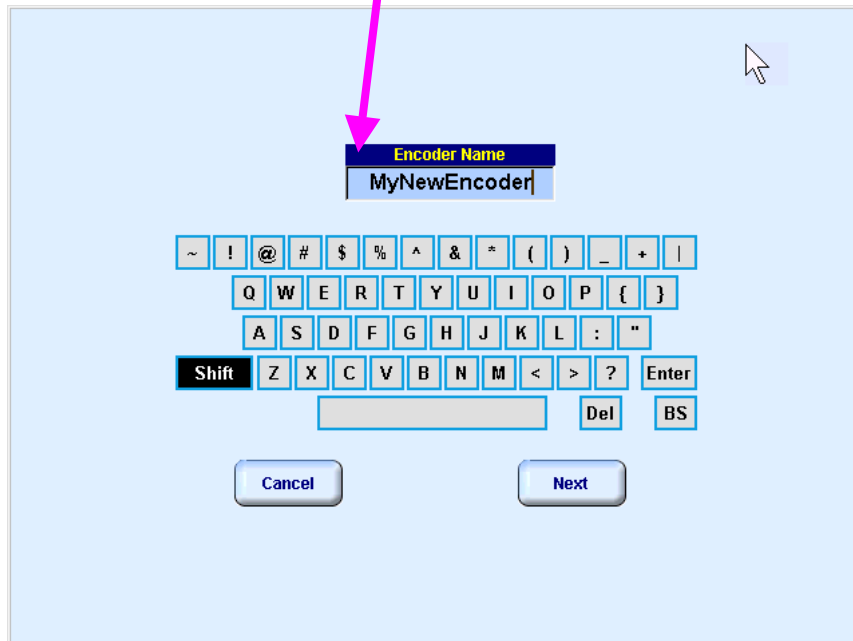
10.3.1.1. List of Scanning Mechanisms





- ❑ Click on  to start new calibration of encoders of new scanning mechanism
- ❑ Select name identifying scanning mechanism already existing in the memory of **ISONIC 2005 / 2020 / STAR** instrument and click on  to edit selected name and to recalibrate / recheck if necessary
- ❑ Select name identifying scanning mechanism already existing in the memory of **ISONIC 2005 / 2020 / STAR** instrument and click on  to erase data about said scanning mechanism from the memory of **ISONIC 2005 / 2020 / STAR** instrument
- ❑ Click on  or press  on front panel keyboard or **Esc** on external keyboard to return to **ISONIC 2005 / 2020 / STAR Settings Menu**

10.3.1.2. Name of Scanning Mechanism

Type / edit name identifying scanning mechanism



then click on  or press or press  on front panel keyboard or **F8** on external keyboard to proceed with calibration / recalibration / recheck of encoders incorporated into scanning mechanism

To return to previous screen click on  or press  on front panel keyboard or **Esc** on external keyboard

10.3.1.3. Encoders Calibration Data - Manual Key-In


Check **Manual** option, select **mm / inch** units then key-in value of **Ticks (per Unit)** generated by **X-Axis / Y-Axis** encoders:


The screenshot displays the calibration interface for the X and Y axes. It is divided into three main sections: X-Axis, Y-Axis, and Test.


X - Axis: The 'Manual' option is selected. The 'Ticks' field is set to 2.000, and the 'Unit' is set to mm. The 'Auto' option is unselected, with 'Distance' set to 100. A 'Calibrate' button is present below the settings.


Y - Axis: The 'Manual' option is selected. The 'Ticks' field is set to 2.000, and the 'Unit' is set to mm. The 'Auto' option is unselected, with 'Distance' set to 100. A 'Calibrate' button is present below the settings.



Test: A 'Test' button is located to the left of two boxes labeled 'X' and 'Y'. Both boxes currently display '0.0 mm'. Below the 'Test' button are four buttons: '< Back[Esc]', 'Restore Defaults', 'Finish', and 'Cancel'.

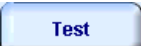

Clicking on  pressing  on front panel keyboard or **Esc** on external keyboard will return to previous screen

Clicking on  will reset calibration data to defaults

Clicking on  will store new calibration data and return to list of names identifying scanning mechanisms in the memory of ISONIC 2005 / 2020 / STAR instrument

Clicking on  will return to list of names identifying scanning mechanisms in the memory of ISONIC 2005 / 2020 / STAR instrument without storing new calibration data

Clicking on  allows to perform motion of probe fitted into scanning mechanism for checking functionality and precision of incorporated encoders (X and Y axis).  button occupies place of

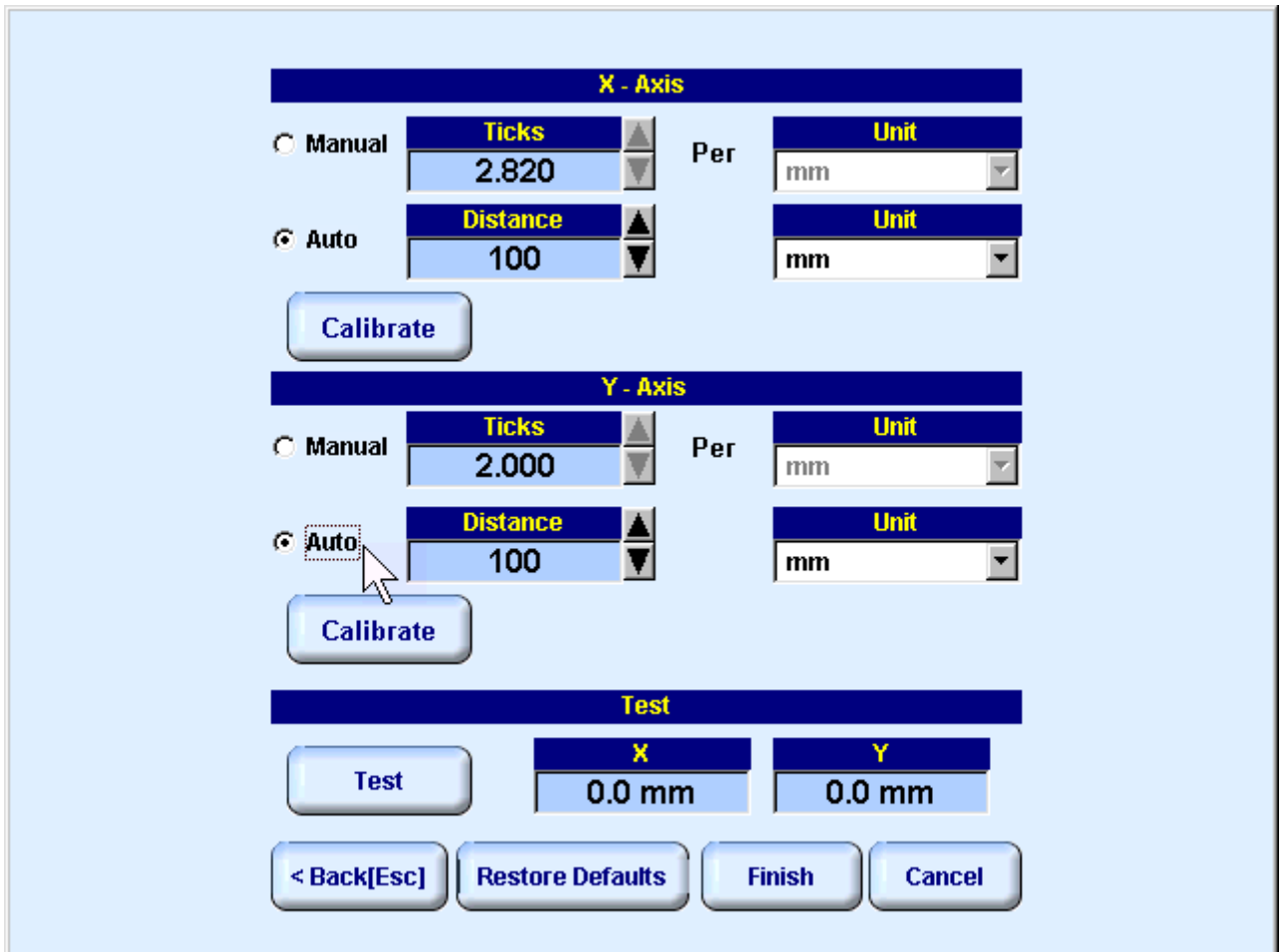
 upon pressing on it and probe coordinates are indicated in the X and Y boxes. Click on  to complete checking and reset X,Y readings to 0

10.3.1.4. Encoders Calibration Data - Automatic Acquisition

Check **Auto** option, select **mm / inch** units then key-in value of **(Reference) Distance** to be passed by probe for automatic calibration of **X-Axis / Y-Axis** encoder.


For each axis:

- Click on 




The screenshot displays a software interface for encoder calibration, organized into three main sections: X-Axis, Y-Axis, and Test.

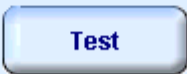
X - Axis





- Manual: Ticks = 2.820, Per = mm
- Auto: Distance = 100, Unit = mm
- 


Y - Axis

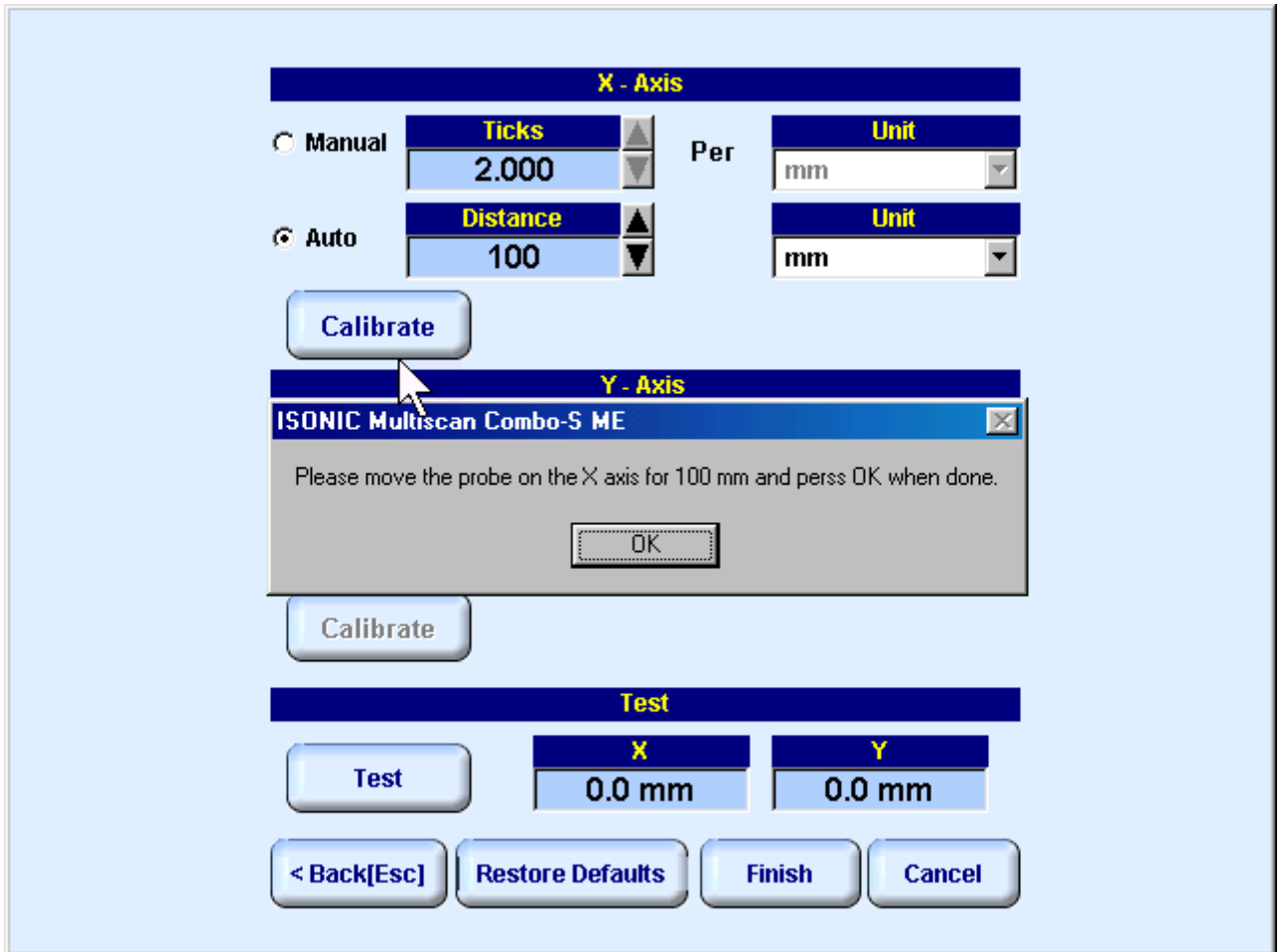
- Manual: Ticks = 2.000, Per = mm
- Auto: Distance = 100, Unit = mm
- 



Test


- 
- X: 0.0 mm
- Y: 0.0 mm


Navigation buttons at the bottom:    


- Perform motion of probe fitted into scanning mechanism for each axis providing that probe will pass keyed-in **(Reference) Distance** then click on **OK** or press  on front panel keyboard or **Enter** on an external keyboard upon completing







Clicking on  pressing  on front panel keyboard or **Esc** on external keyboard will return to previous screen

Clicking on  will reset calibration data to defaults

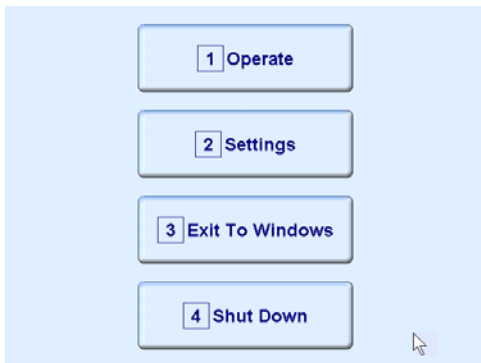
Clicking on  will store new calibration data and return to list of names identifying scanning mechanisms in the memory of ISONIC 2005 / 2020 / STAR instrument

Clicking on  will return to list of names identifying scanning mechanisms in the memory of ISONIC 2005 / 2020 / STAR instrument without storing new calibration data

Clicking on  allows to perform motion of probe fitted into scanning mechanism and to check functionality and precision of incorporated encoders (X and Y axis).  button occupies place of

 upon pressing on it and probe coordinates are indicated in the X and Y boxes. Click on  to complete checking and reset X,Y readings to 0

10.3.4. Start MULTISCAN COMBO S ME Inspections

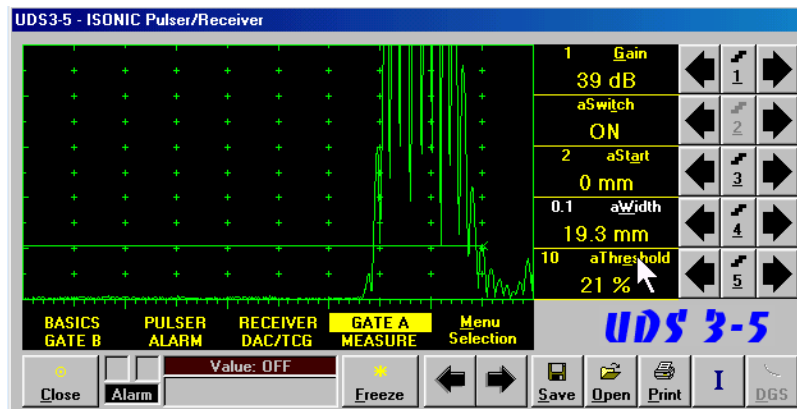


With reference to paragraph 10.3.2 of this Operating Manual in the **MULTISCAN COMBO S ME Start** screen click on

1 Operate or press **1** on front panel keyboard or press **F1** on external keyboard to run **MULTISCAN COMBO S ME** inspections – this will enter next stage related to calibration of **UDS 3-5** pulser receiver

10.3.4. Pulser Receiver Settings

Calibration of **UDS 3-5 Pulser Receiver** to be provided with reference to Chapter 5 and paragraphs 10.3.4.1, 10.3.4.2, and 10.3.4.1 of this Operating Manual

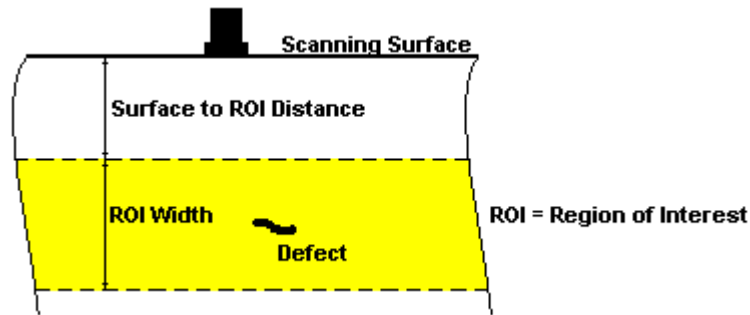


To return to previous screen click on **Close** or press **ESC** on front panel keyboard or **Esc** or **<Alt>+<C>** on external keyboard

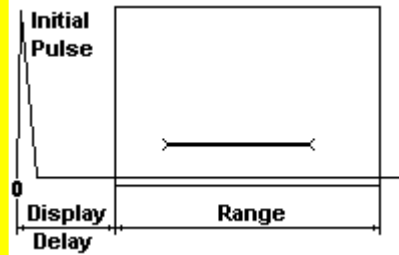
On completing calibration click on **I** or press **I** on front panel keyboard or **F8** on external keyboard

10.3.4.1. Pulse Echo – Flaw Detection

#	Parameter or Mode	Submenu	Required Settings	Note
1	aSwitch	GATE A	ON	
2	Gain	BASICS	Gain setting to be performed according to inspection procedure providing required echo heights from defects to be detected	
3	aThreshold	GATE A	aThreshold settings to provide echo heights from defects to be detected exceeding aThreshold; signals from other reflectors – not exceeding aThreshold	
4	DAC/TCG	DAC/TCG	DAC/TCG settings to meet requirements of inspection procedure	
5	Pulser Mode	PULSER	Dual for dual element probes Single for single element probes	
6	Tuning, Pulse Width, Firing Level, Damping	PULSER	Tuning, Pulse Width, Firing Level, and Damping settings to provide optimal signal to noise ratio	To synchronize with Gain and aThreshold setting procedures
7	Filter, Frequency	RECEIVER	Filter and Frequency settings to match with probe's frequency	To synchronize with Gain and aThreshold setting procedures
8	Display	RECEIVER	Display setting may be either Full, RF, PosHalf, or NegHalf	The same Display mode to be used for both Probe Delay determining and MULTISCAN COMBO S Recording
9	USVelocity	BASIC	USVelocity setting to be equal to actual value of ultrasound velocity in the object under test	
10	Probe Delay	MEASURE	Probe Delay setting to be equal to actual probe delay	Probe delay may be determined according to paragraph 5.2.13.7 or 5.2.13.9 of this Operating Manual or similarly
11	Angle	MEASURE	Angle = 0°	
12	Meas Mode	MEASURE	Flank	
13	Range, Display Delay, AStart, aWidth	BASIC GATE A	Range, Display Delay, aStart, and aWidth settings to be performed with reference to below table Region of Interest for MULTISCAN COMBO S	
14	Settings for other parameters and modes have no significance			



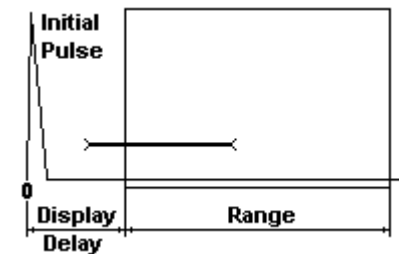
Case 1 – preferred embodiment



$$SRD = aStart$$

$$RW = aWidth$$

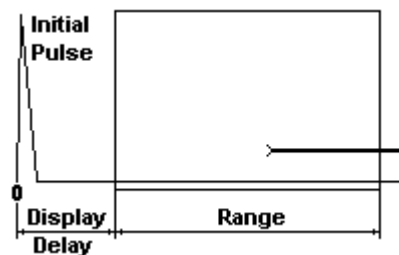
Case 2



$$SRD = \frac{DisplayDelay}{2} \times USVelocity$$

$$RW = aStart + aWidth - SRD$$

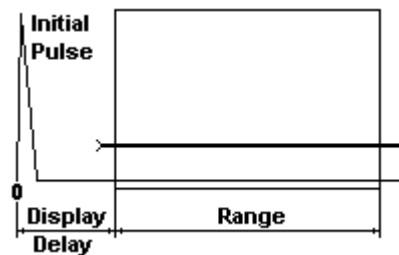
Case 3



$$SRD = aStart$$

$$RW = \frac{DisplayDelay}{2} \times USVelocity + Range - aStart$$

Case 4



$$SRD = \frac{DisplayDelay}{2} \times USVelocity$$

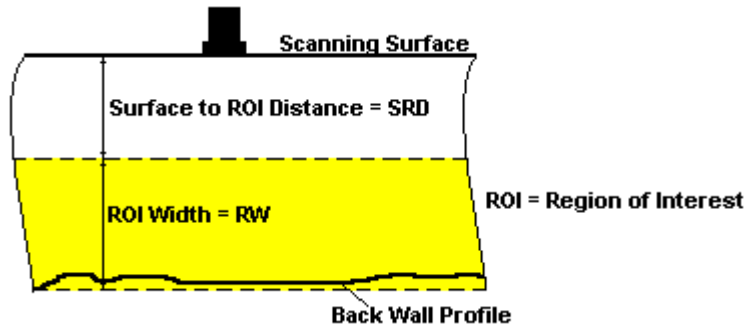
$$RW = Range$$

10.3.4.2. Back Wall Echo Attenuation and Through-Transmission

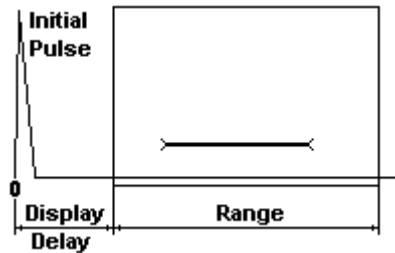
#	Parameter or Mode	Submenu	Required Settings	Note
1	Gain	BASICS	Gain setting to be performed according to inspection procedure providing required amplitude of back wall echo or through-transmitted signal	
2	aSwitch	GATE A	ON	
3	Range, Display Delay, aStart, aWidth	BASIC GATE A	Range, Display Delay, aStart, and aWidth settings to be performed to provide presence of back wall echo or through-transmitted signal on the A-Scan and time coincidence of evaluated signal with Gate A	
4	DAC/TCG	DAC/TCG	DAC/TCG settings to meet requirements of inspection procedure	
5	Pulser Mode	PULSER	Dual for dual element probes and for through-transmission inspection with use of two probes Single for single element probes	
6	Tuning, Pulse Width, Firing Level, Damping	PULSER	Tuning, Pulse Width, Firing Level, and Damping settings to provide optimal signal to noise ratio	To synchronize with Gain setting procedures
7	Filter, Frequency	RECEIVER	Filter and Frequency settings to match with probe's frequency	To synchronize with Gain setting procedures
8	Display	RECEIVER	Display setting may be either Full, RF, PosHalf, or NegHalf	
9	Settings for other parameters and modes have no significance			

10.3.4.3. Pulse Echo – Thickness Profiling

#	Parameter or Mode	Submenu	Required Settings	Note
1	aSwitch	GATE A	ON	
2	Gain aThreshold	BASICS GATE A	Gain and aThreshold settings to provide receiving an echo from the minimal area of thickness degradation to be detected; height of the said echo to exceed aThreshold; signals from other reflectors less then defined one not to exceed aThreshold	
3	DAC/TCG	DAC/TCG	DAC/TCG settings to meet requirements of the Inspection Procedure	
4	Pulser Mode	PULSER	Dual for dual element probes Single for single element probes	
5	Tuning, Pulse Width, Firing Level, Damping	PULSER	Tuning, Pulse Width, Firing Level, and Damping settings to provide optimal signal to noise ratio	To synchronize with Gain and aThreshold setting procedure
6	Filter, Frequency	RECEIVER	Filter and Frequency settings to match with probe's frequency	To synchronize with Gain and aThreshold setting procedure
7	Display	RECEIVER	Display mode may be either Full, RF, PosHalf, or NegHalf	The same Display mode to be used for both Probe Delay determining and Thickness Profile Imaging
8	USVelocity	BASIC	USVelocity setting to be equal to actual value of ultrasound velocity in the object under test	
9	Probe Delay	MEASURE	Probe Delay setting to be equal to actual probe delay	Probe delay may be determined according to paragraph 5.2.13.7 or 5.2.13.9 of this Operating Manual or similarly
10	Angle	MEASURE	Angle = 0°	
11	Meas Mode	MEASURE	Flank	
12	Range, Display Delay, AStart, aWidth	BASIC GATE A	Range, Display Delay, AStart, and aWidth settings to be performed with reference to the Region of Interest for CORROMAP table below	
13	Settings for other parameters and modes have no significance			



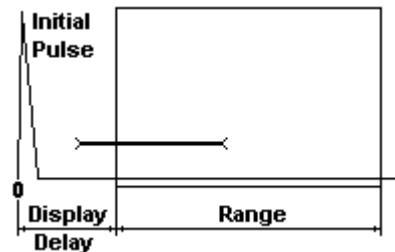
Case 1



$$SRD = aStart$$

$$RW = aWidth$$

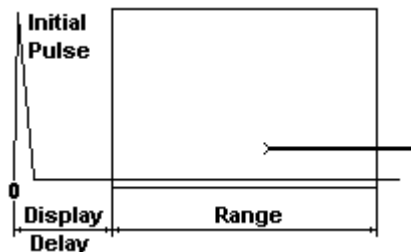
Case 2



$$SRD = \frac{DisplayDelay}{2} \times USVelocity$$

$$RW = aStart + aWidth - SRD$$

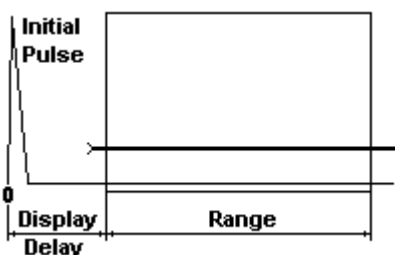
Case 3



$$SRD = aStart$$

$$RW = \frac{DisplayDelay}{2} \times USVelocity + Range - aStart$$

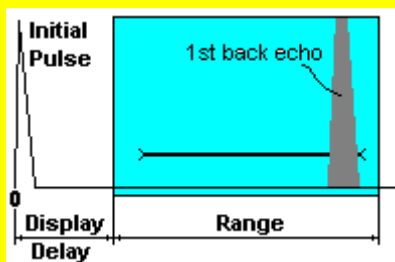
Case 4



$$SRD = \frac{DisplayDelay}{2} \times USVelocity$$

$$RW = Range$$

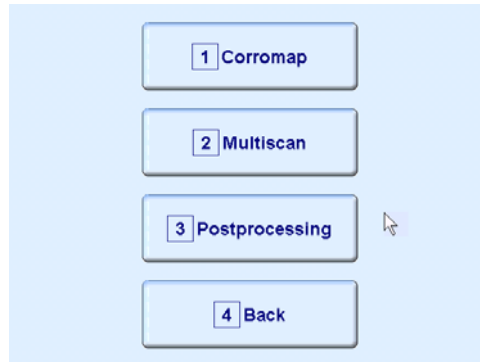
Preferred embodiment







- ◆ aStart and aWidth setting to provide appearance of whole Gate A on the A-Scan
- ◆ aWidth = (0.75...0.95) × Range
- ◆ First Back Echo at the thickest area of object under test to be fully matching with Gate A
- ◆ First Back Echo at the thickest area of object under test to "occupy" 5-10% of the Gate A width on the A-Scan



10.3.5. Operating Modes

Operating mode to be selected on completing calibration of **UDS 3-5 Pulsar Receiver**



Click on  or press  on front panel keyboard or press **F1** on external keyboard to run thickness profiling mode

Click on  or press  on front panel keyboard or press **F2** on external keyboard to run flaw detection mode

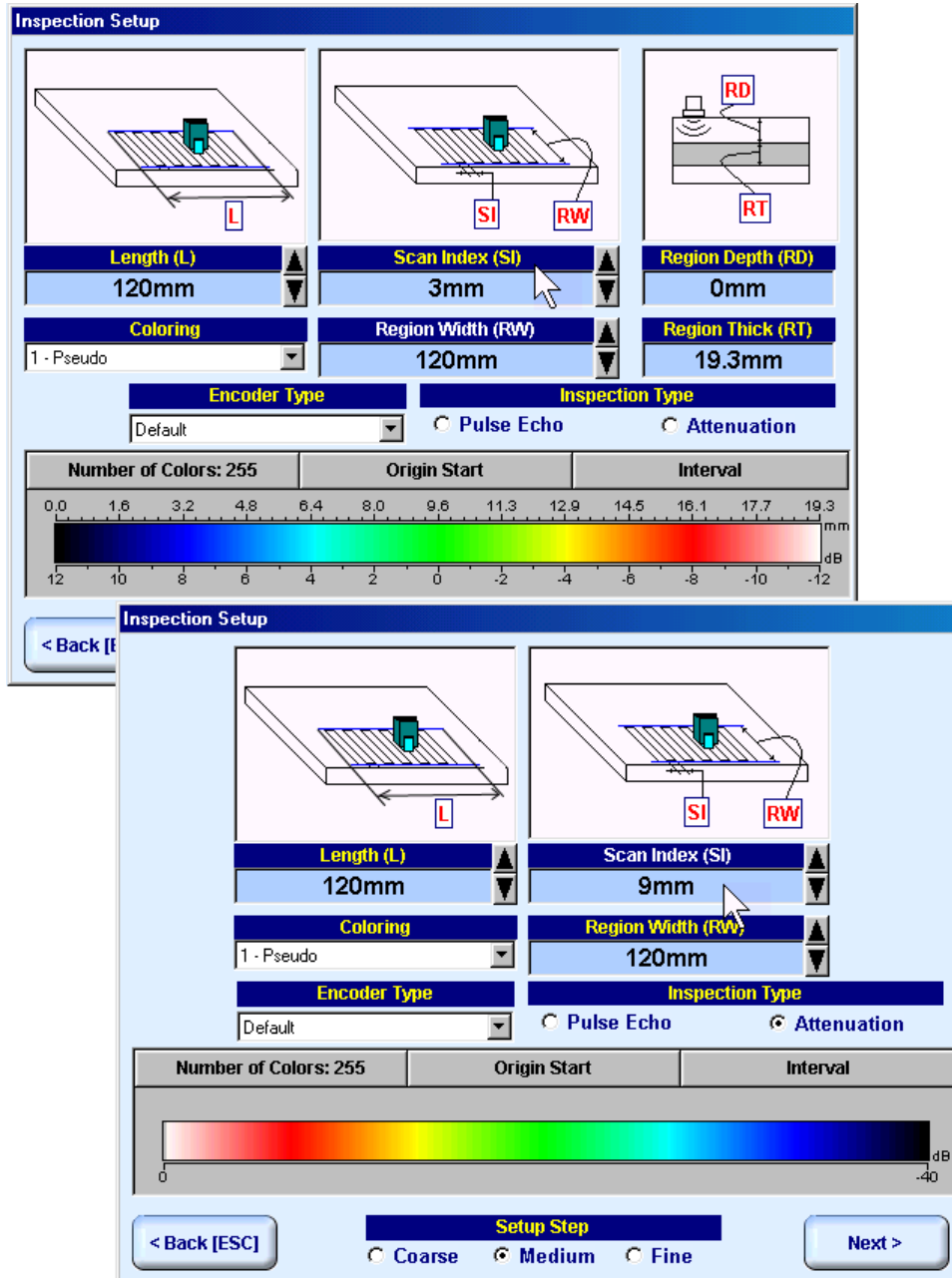
Click on  or press  on front panel keyboard or press **F3** on external keyboard to start postprocessing of **MULTISCAN COMBO S ME** inspection results

Click on  or press on  on front panel keyboard or press **F4** to return to previous screen

10.3.6. Flaw Detection – Pulse Echo / Back Wall Echo Attenuation or Through Transmission


10.3.6.1. Inspection Setup


Layout of **Inspection Setup** screen depends on option selected – it is necessary to check **Pulse Echo** or **Attenuation** in the **Inspection Method** field (click on). **Attenuation** mode is suitable for both back wall echo attenuation and through-transmission inspection











In the **Inspection Setup** screen it is necessary to key in:

- Length** of rectangular scanning area
- Region Width** which defines width of rectangular scanning area
- Scan Index** – value of **Scan Index** defining coverage of scanning area to be selected and entered according to inspection procedure

Setting of said parameters to be performed through clicking / pressing corresponding spin button  with **Fine, Medium, or Coarse** increments according to checked option (click on) in the **Setup Step** field

Alternatively parameter for setting to be selected through pressing  on front panel keyboard or **F7** on external keyboard or through clicking on its label. Label indicating name of selected parameter changes it's

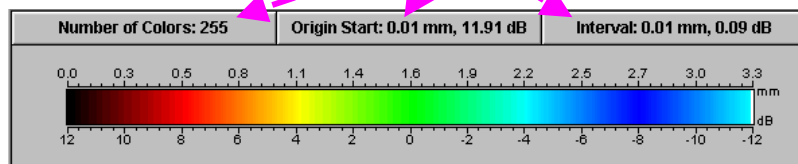
fore color from yellow to white – since that moment parameter may be modified using , , ,  on front panel keyboard or , , ,  on external keyboard

Values of **Region Depth (RT)** and **Region Thick (RT)** for pulse echo mode indicated in the **Inspection Setup** screen are defined by **Gate A** settings of **UDS 3-5 Pulser Receiver**:

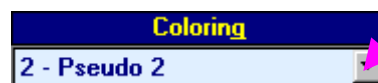
Region Depth (RD) = aStart

Region Thick (RT) = aWidth

Color scale (palette) representing signal amplitudes and defects coordinates may consist of up to 255 grades. Customizing is possible through corresponding **controls** (click on)







Style of palette (**Pseudo, Thermal, or Gray**) is selectable through clicking **on**:



Encoders calibration data corresponding to scanning mechanism in use is selectable through clicking **on**

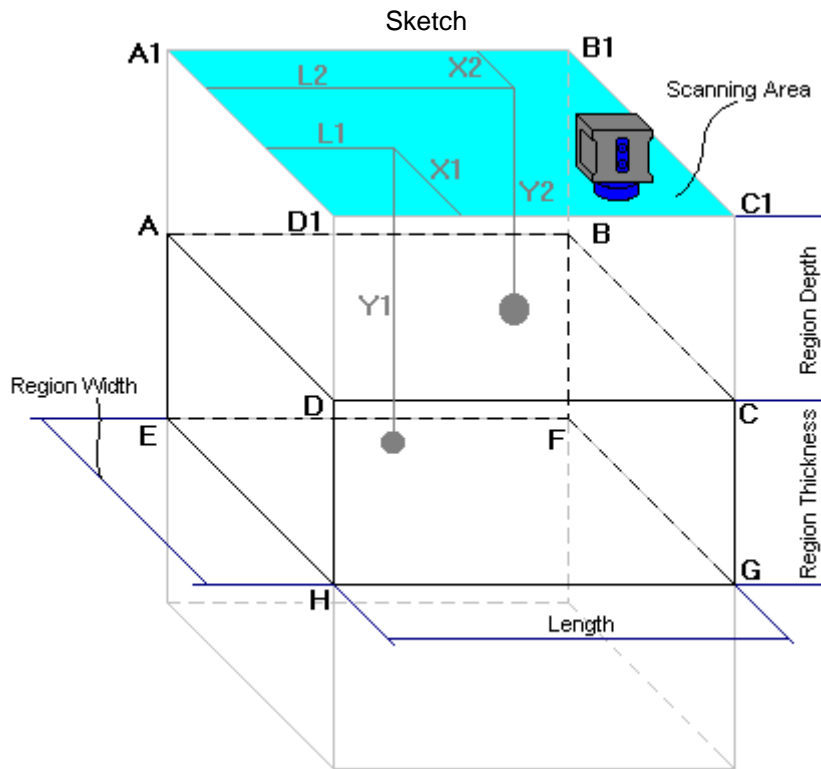


To return to previous screen click on  or press  on front panel keyboard or **Esc** on external keyboard

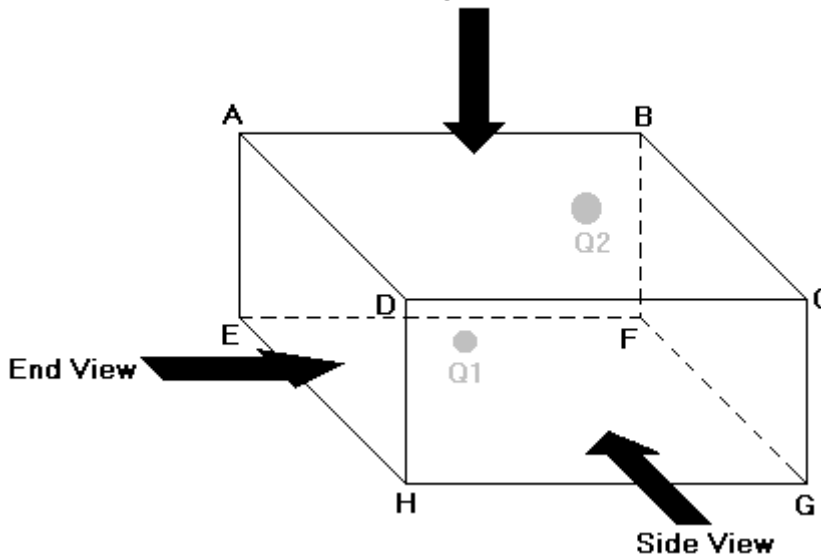
To continue click on  or press  on front panel keyboard or **F8** on external keyboard

10.3.6.2. Imaging Principles: Pulse Echo

1



Top View



- Q1 (L1, X1, Y1) – Internal Reflector 1
- Q2 (L2, X2, Y2) – Internal Reflector 2

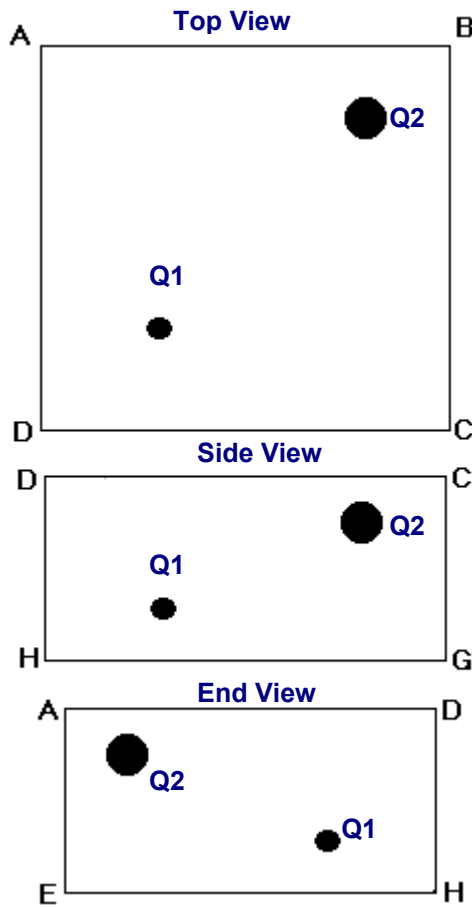
Note

General

- (a) Volume Under Test (**Region of Interest**) is located between two parallel rectangles namely ABCD and EFGH
- (b) Scanning is provided above surface of rectangle A1B1C1D1
- (c) With reference to **Inspection Setup** screen – Pulse Echo Mode (paragraph 10.3.6.1 of this Operating Manual):
 - A1A = Region Depth
 - AB = Length
 - AD = Region Width
 - DH = Region Thickness
- (d) In the present example it is supposed that there are two reflectors Q1 and Q2 in **Region of Interest**, said reflectors have different dimensions and coordinates

2

Sketch



Note

Global Top, Side, and End View

Supposing that scanning is well completed reflectors Q1 and Q2 will be detected and represented in global **Top, Side, and End View** according to sketch # 2

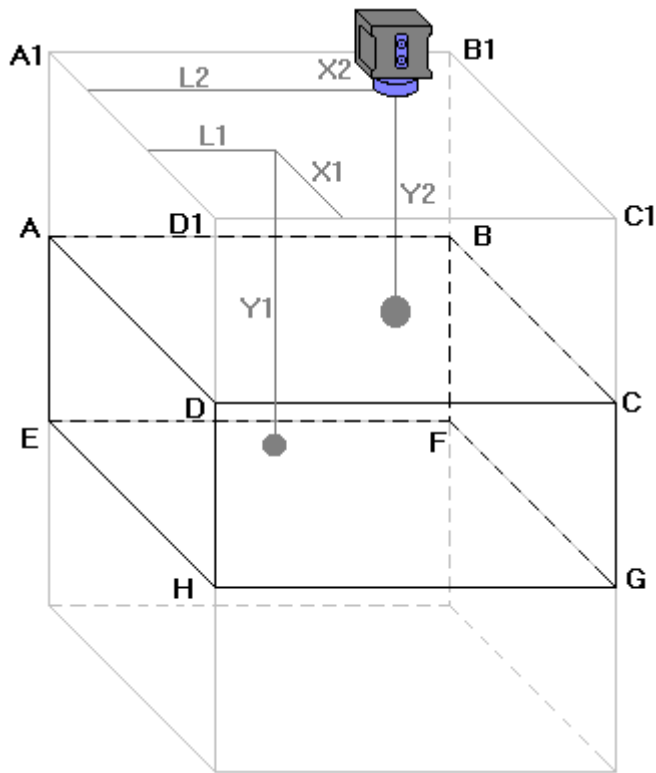
Global **Top View** is obtained through superimposing of parallel planes between rectangles ABCD and EFGH. Global **Top View** may be presented in two modes: *Depth Map* and *Amplitude Map*. *Amplitude Map* represents distribution of echo amplitude above scanning surface. *Depth Map* represents distribution of minimum reflector depth above scanning surface. Thanks to complete raw data storing technology implemented in **ISONIC 2005 / 2020 / STAR** it is possible to switch between Depth Map and Amplitude Map while scanning

Global **Side View** and **End View** are orthogonal images composed through superimposing of corresponding cross sectional views along and across of whole **Region of Interest**. **Side View** and **End View** images represent distribution of highest echo amplitudes, depth of reflectors and their cross-sectional locations

Acquired data is converted into 3D-matrix allowing sectional presentation of **Top View, Side View** and **End View** during scanning – refer to below sketches ## 3 through 8

3

Sketch



Note

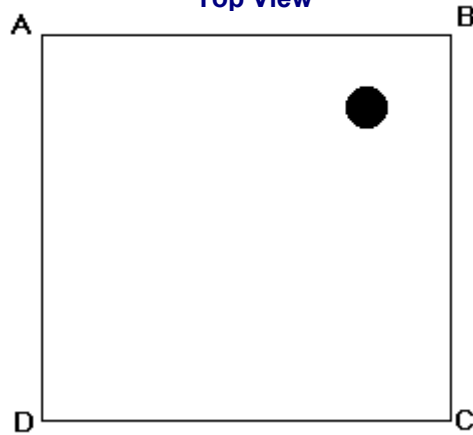
Sectional Top View
(Horizontal Slice)

Sketches ## 3 and 4 illustrate composing of sectional **Top View**

Top View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to:

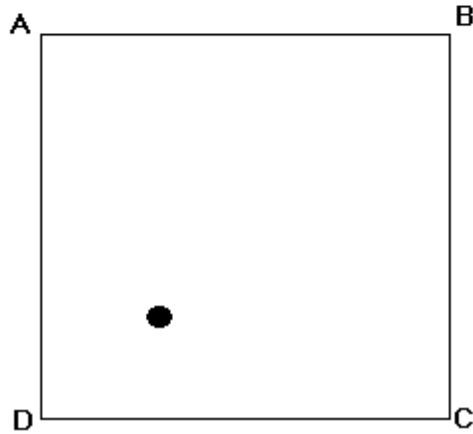
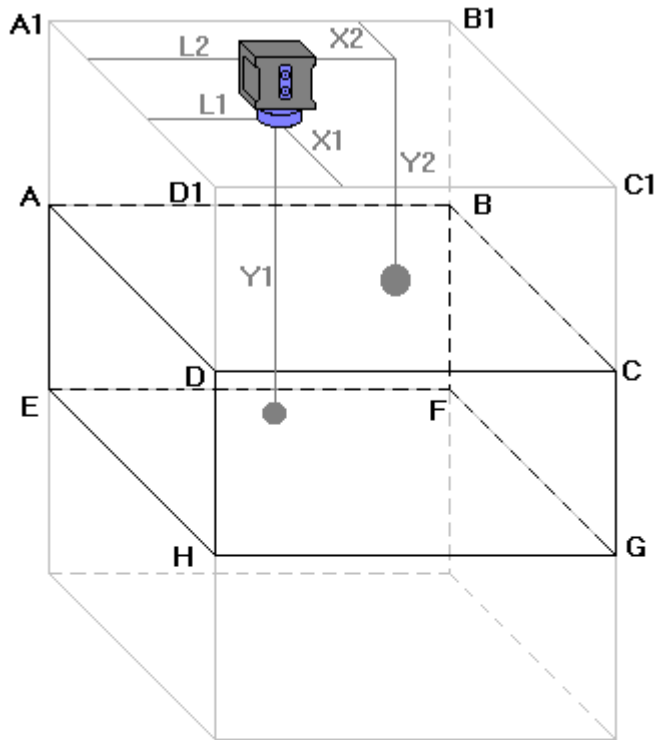
- ❑ current probe coordinates on scanning surface
- ❑ depth of reflector closest to probe on A-Scan obtained for current probe coordinates on scanning surface – **Top View** section represents horizontal slice at depth corresponding to reflector closest to probe

Top View



4

Sketch



Note

Sectional Top View
(Horizontal Slice)

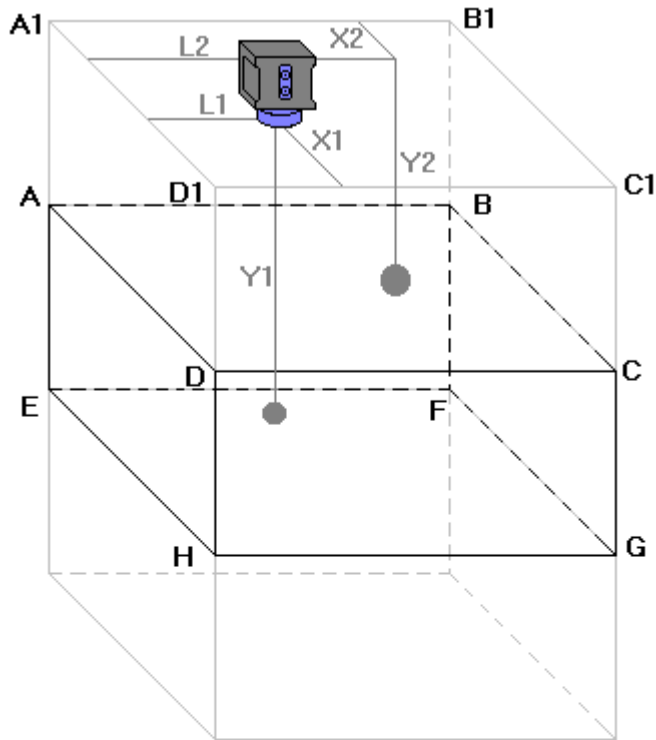
Sketches ## 3 and 4 illustrate composing of sectional **Top View**

Top View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to:

- ❑ current probe coordinates on scanning surface
- ❑ depth of reflector closest to probe on A-Scan obtained for current probe coordinates on scanning surface – **Top View** section represents horizontal slice at depth corresponding to reflector closest to probe

5

Sketch



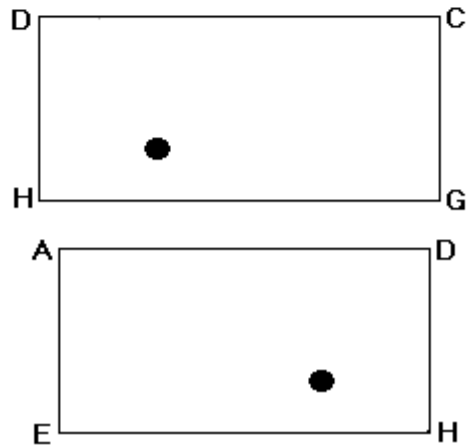
Note

Sectional Side and End View (Vertical Cut Slices)

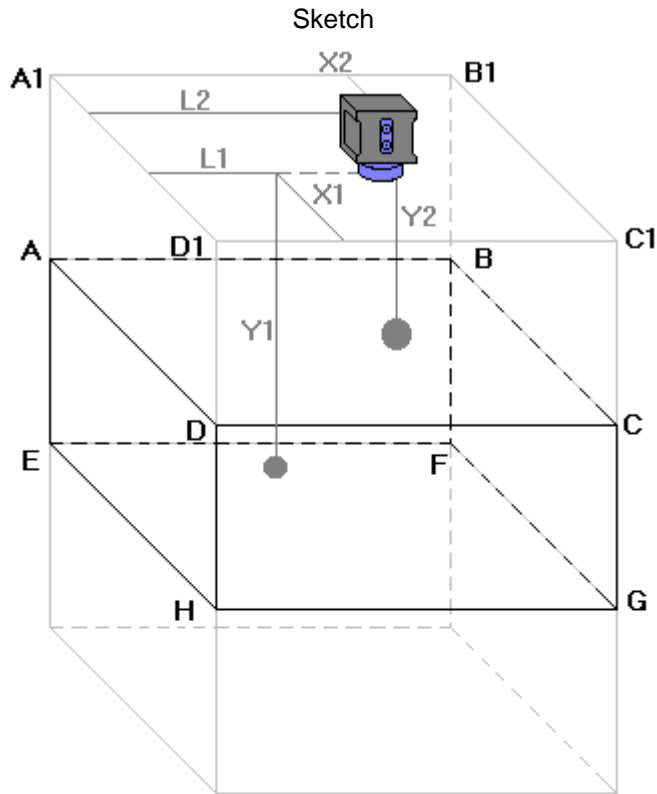
Sketches ## 5, 6, 7, and 8 illustrate composing of sectional **Side View** and **End View**

Side View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **X**-coordinate of probe

End View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **L**-coordinate of probe



6



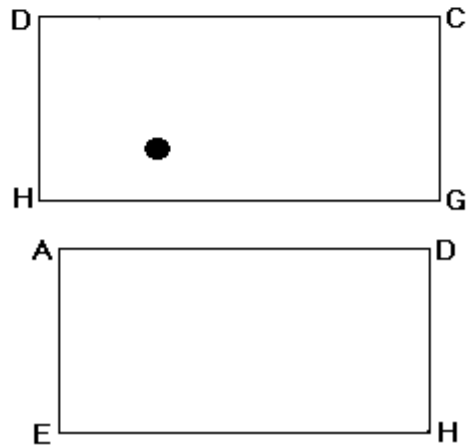
Note

Sectional Side and End View (Vertical Cut Slices)

Sketches ## 5, 6, 7, and 8 illustrate composing of sectional **Side View** and **End View**

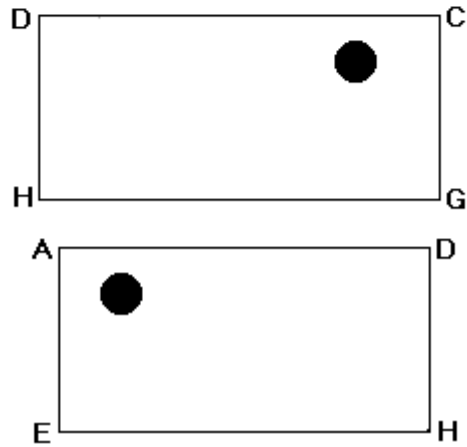
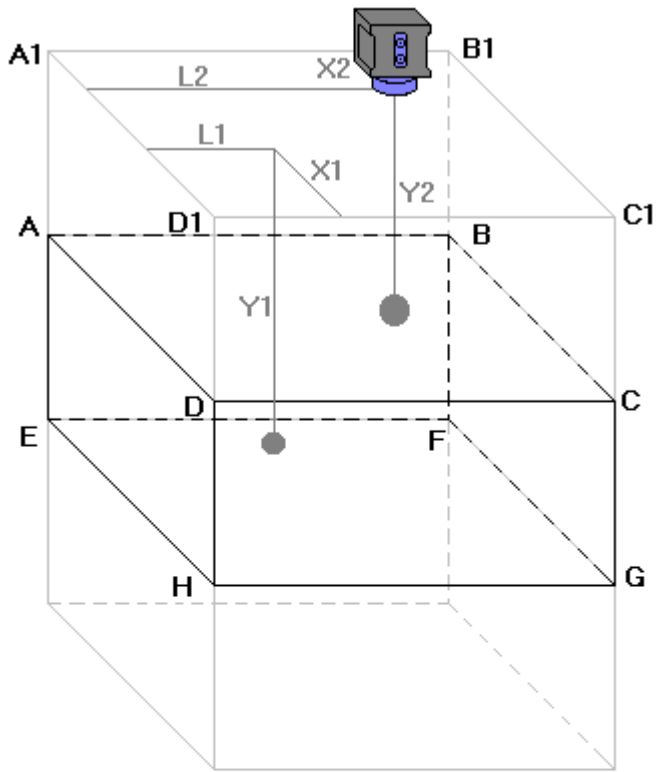
Side View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **X**-coordinate of probe

End View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **L**-coordinate of probe



7

Sketch



Note

Sectional Side and End View (Vertical Cut Slices)

Sketches ## 5, 6, 7, and 8 illustrate composing of sectional **Side View** and **End View**

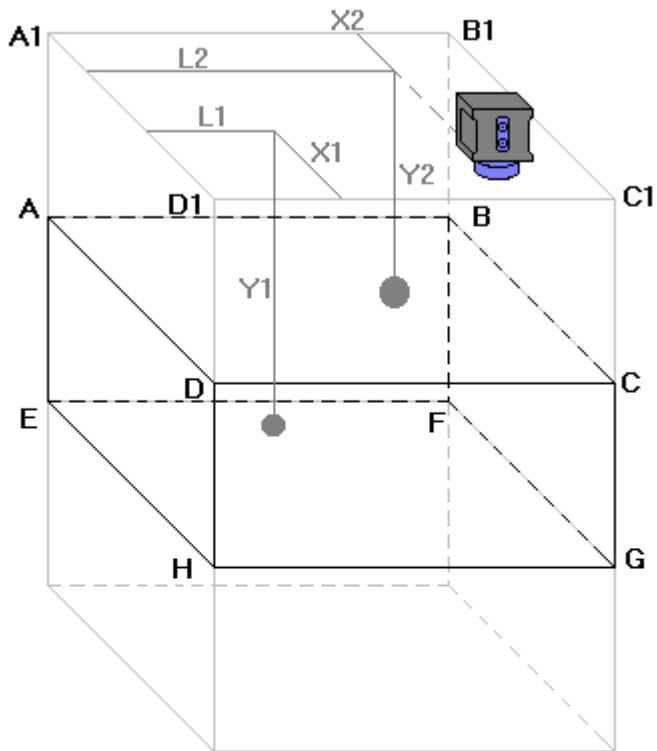
Side View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **X**-coordinate of probe

End View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **L**-coordinate of probe

8

Sketch

Note

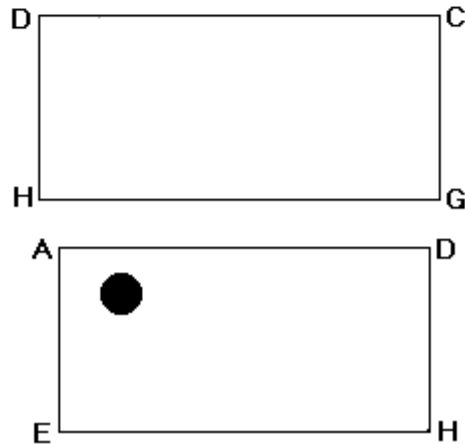


Sectional Side and End View (Vertical Cut Slices)

Sketches ## 5, 6, 7, and 8 illustrate composing of sectional **Side View** and **End View**

Side View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **X**-coordinate of probe

End View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **L**-coordinate of probe

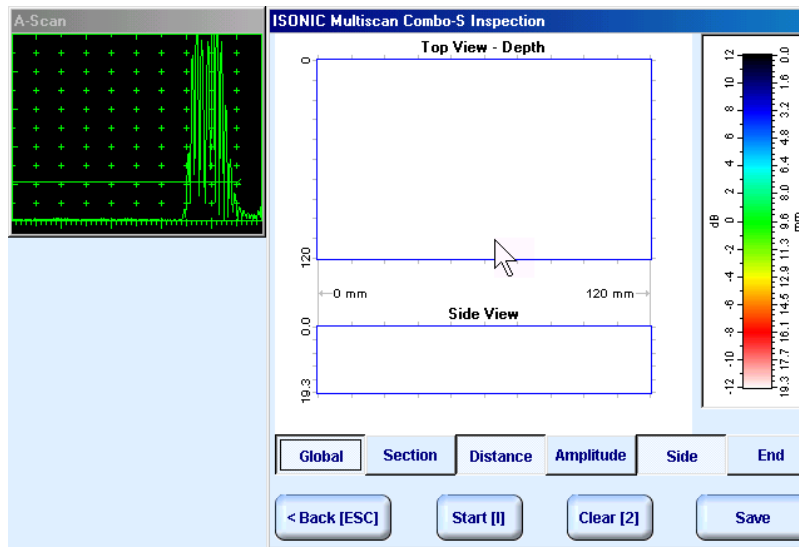


10.3.6.3. Imaging Principles: Attenuation

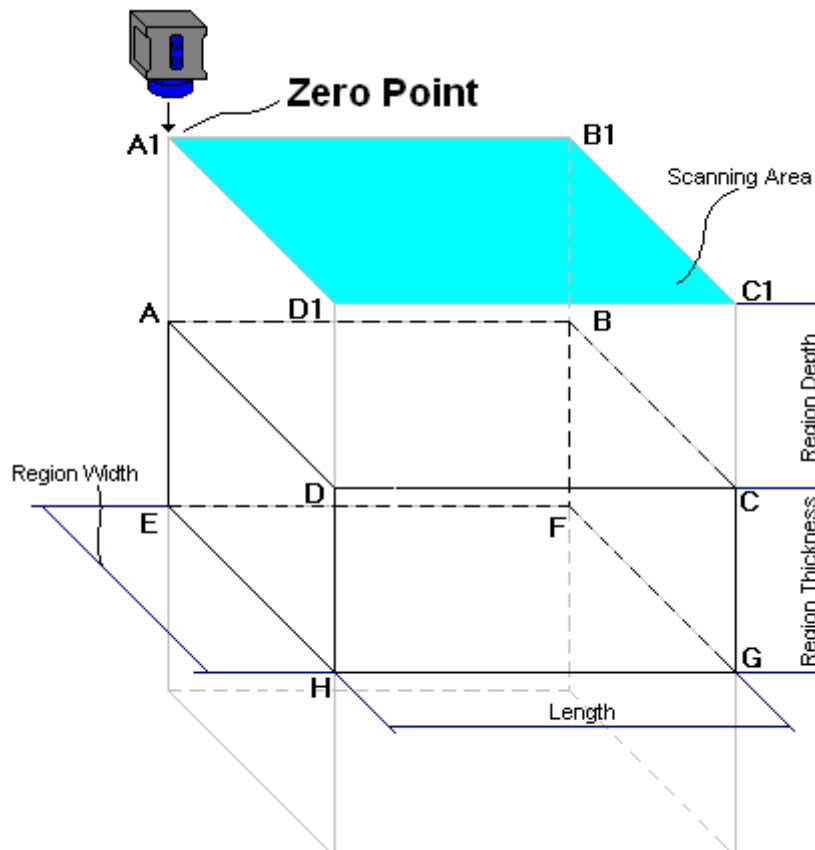
In attenuation mode it is generated *Amplitude Map* representing distribution of back wall echo amplitude or through transmission signal amplitude above scanning surface

10.3.6.4. Scanning: Pulse Echo

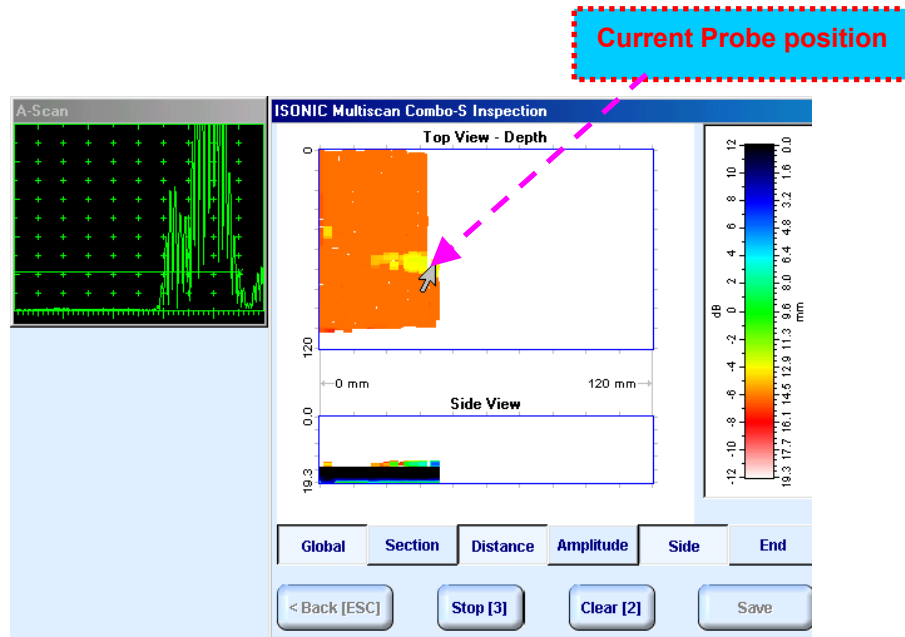
ISONIC Multiscan Combo-S Inspection screen follows after **Inspection Setup** screen:




On opening **ISONIC Multiscan Combo-S Inspection** screen place probe onto zero point of scanning area then click on **Start [I]** or press **I** on front panel keyboard or **F8** on external keyboard




During scanning **ISONIC Multiscan Combo-S Inspection** screen is accompanied with **A-Scan**



ISONIC Multiscan Combo-S Inspection screen represents:



- ❑ Current Probe Position
 - ❑ **Top View:**
 - for **Amplitude** pressed down – *Global Amplitude Map*
 - for **Distance** pressed down – *Global Depth Map*
 - for **Top Section** pressed down – *Horizontally Sliced Amplitude Map* according to sketches ## 3 and 4 – paragraph 10.3.6.2 of this Operating Manual
 - ❑ **Side View** for **Side** pressed down or **End View** for **End** pressed down or press  on front panel keyboard or **F7** on external keyboard to switch between **Side** and **End View**
- Depending on which button is pressed – **Global** or **Section** – **Side View** and **End View** are presented either in global mode according to sketch # 2 – paragraph 10.3.6.2 of this Operating Manual or in sectional mode according to sketches ## 5, 6, and 7 – paragraph 10.3.6.2 of this Operating Manual



- ❑ All **A-Scans** are captured during scanning unconditionally however projection images **Top View**, **Side View**, and **End View** are updated only with signals exceeding threshold of **Gate A** presented on **A-Scan** however
- ❑ Highest amplitude and minimal sound path are dominant while recording data into **Top View – Amplitude** and **Top View – Distance** correspondingly
- ❑ **Map Repair Function** is active while keeping pressed  on front panel keyboard or **F8** on external keyboard – new readings will overwrite already recorded data unconditionally; this allows record correction after finding some non-relevant data recorded with dominance

To cleanup **Top View**, **Side View**, and **End View** fields click on  or press  on front panel keyboard or **F2** on external keyboard

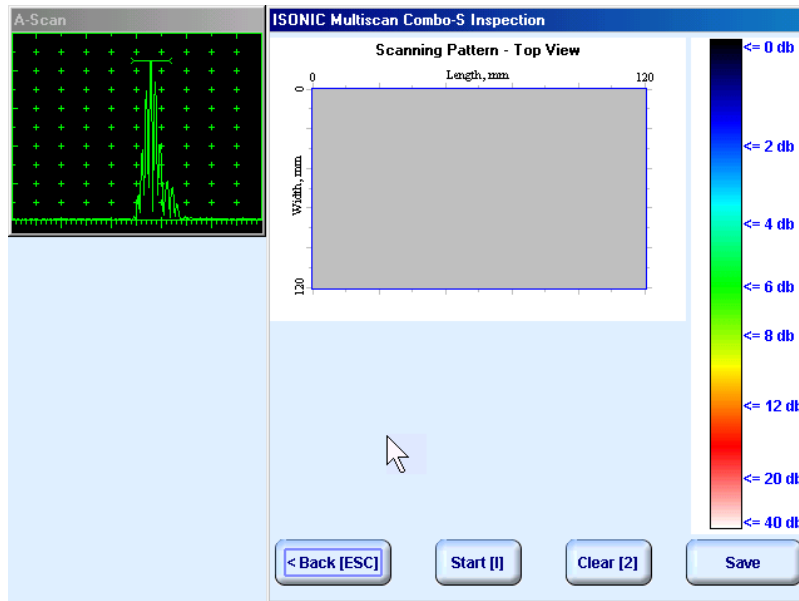
To stop scanning click on  or press  on front panel keyboard or **F3** on external keyboard

To save **MULTISCAN** record into a file click on  or press  on front panel keyboard or **F12** on external keyboard. Refer to paragraph 5.2.17 of this Operating Manual to proceed with file saving

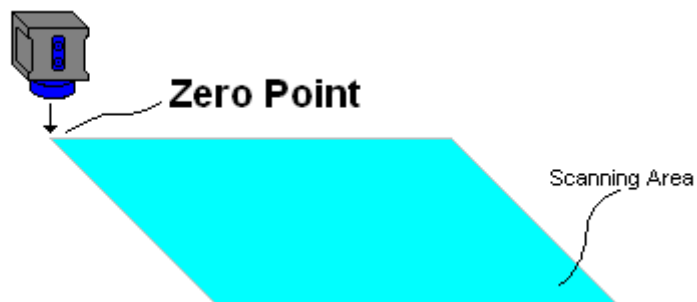
To return to **Inspection Setup** screen click on  or press  on front panel keyboard or **Esc** on external keyboard

10.3.6.5. Scanning: Attenuation

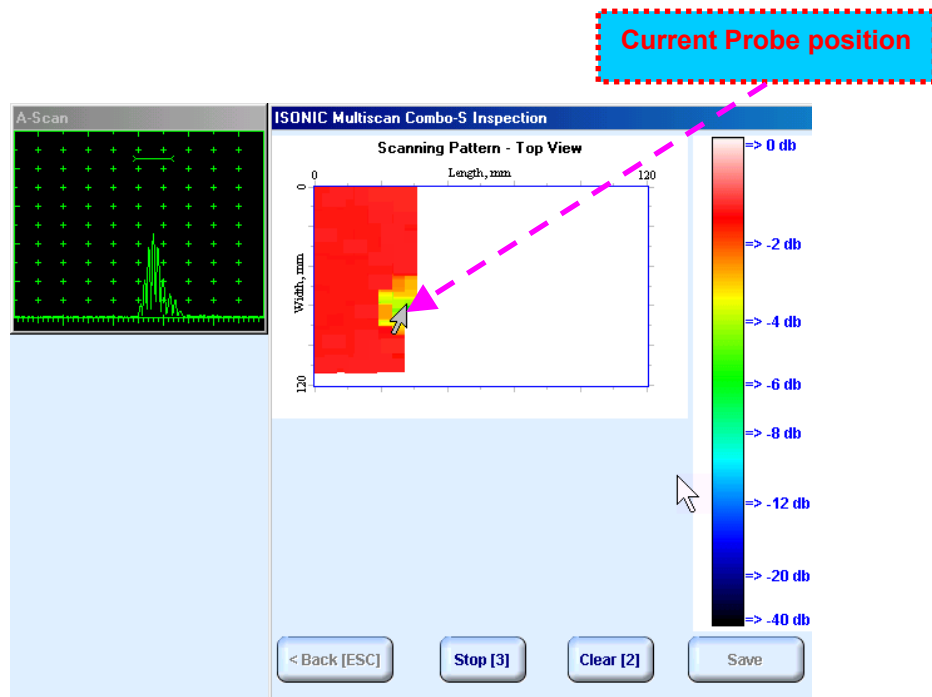
ISONIC Multiscan Combo-S Inspection screen follows after **Inspection Setup** screen:



On opening **ISONIC Multiscan Combo-S Inspection** screen place probe onto zero point of scanning area then click on **Start [I]** or press **I** on front panel keyboard or **F8** on external keyboard



During scanning **ISONIC On-Line Imaging** screen is accompanied with **A-Scan** and **Digital Display** box






ISONIC Multiscan Combo-S Inspection screen represents:

- ❑ Current Probe Position
- ❑ **Top View** as *Amplitude Map* representing distribution of back wall echo amplitude or through transmission signal amplitude above scanning surface

To cleanup **Top View** field click on  or press  on front panel keyboard or **F2** on external keyboard

To stop scanning click on  or press  on front panel keyboard or **F3** on external keyboard

To save **MULTISCAN COMBO S ME** record into a file click on  or press  on front panel keyboard or **F12** on external keyboard. Refer to paragraph 5.2.17 of this Operating Manual to proceed with file saving

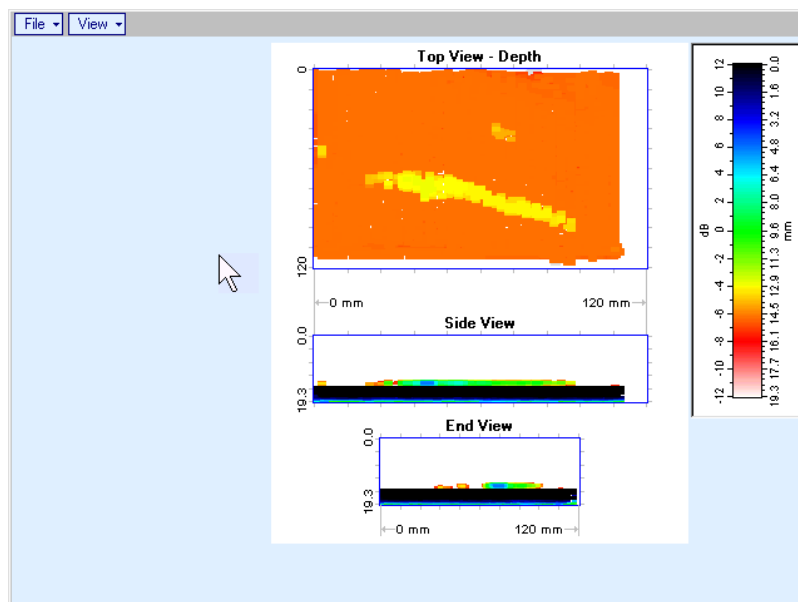
To return to **Inspection Setup** screen click on  or press  on front panel keyboard or **Esc** on external keyboard

10.3.6.6. Postprocessing

Postprocessing of **MULTISCAN ME** records may be performed directly in the instrument or in external computer using **IOFFICE 2005** or **IOFFICE** or **MULTIPP** SW package. User interface and operations are practically identical except two features listed below:

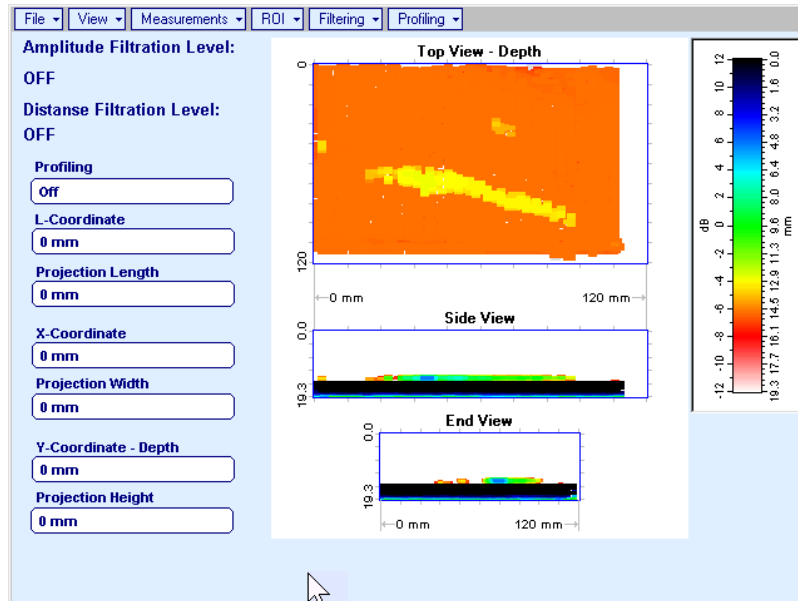
	Off-line analysis directly in ISONIC 2005 / 2020 / STAR instrument	Off-line analysis in external computer using MULTIPP SW Package	Off-line analysis in external computer using IOFFICE 2005 or IOFFICE SW Package
Off-line re-adjustment of Gain for MULTISCAN COMBO S ME record	NO	YES	YES
Automatic creation of Inspection report in MS Word® format	NO	NO	YES

Menu Bar Functions on Opening File









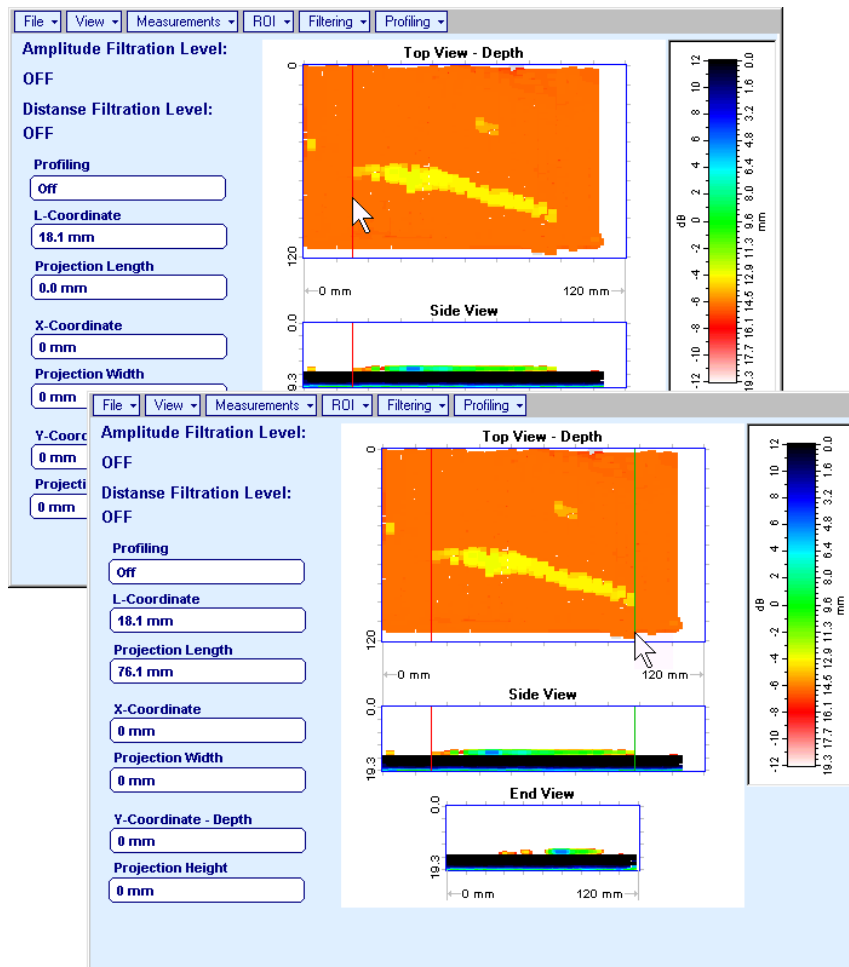
- **File → Print To**
 - selection of printer among available for printing out inspection report
 - selection of **MS Word®** as printer to create inspection report as doc file (**IOFFICE** and **IOFFICE 2005** SW Packages only)
 - selection of paper sheet size either A4 or Letter
- **File → Print → Whole Report** – prints out complete inspection report including **UDS 3-5 Pulser Receiver** settings, inspection setup and scanning parameters, and recorded maps
- **File → Print → Graphics Only** – prints out scanning recorded maps
- **File → Exit** – ends postprocessing session
- **View → Primary Information** – previews **UDS 3-5 Pulser Receiver** settings, inspection setup and scanning parameters
- **View → ISONIC Image Processing** – activates menu for detailed off-line analysis of the record







ISONIC Image Processing Menu Bar Functions

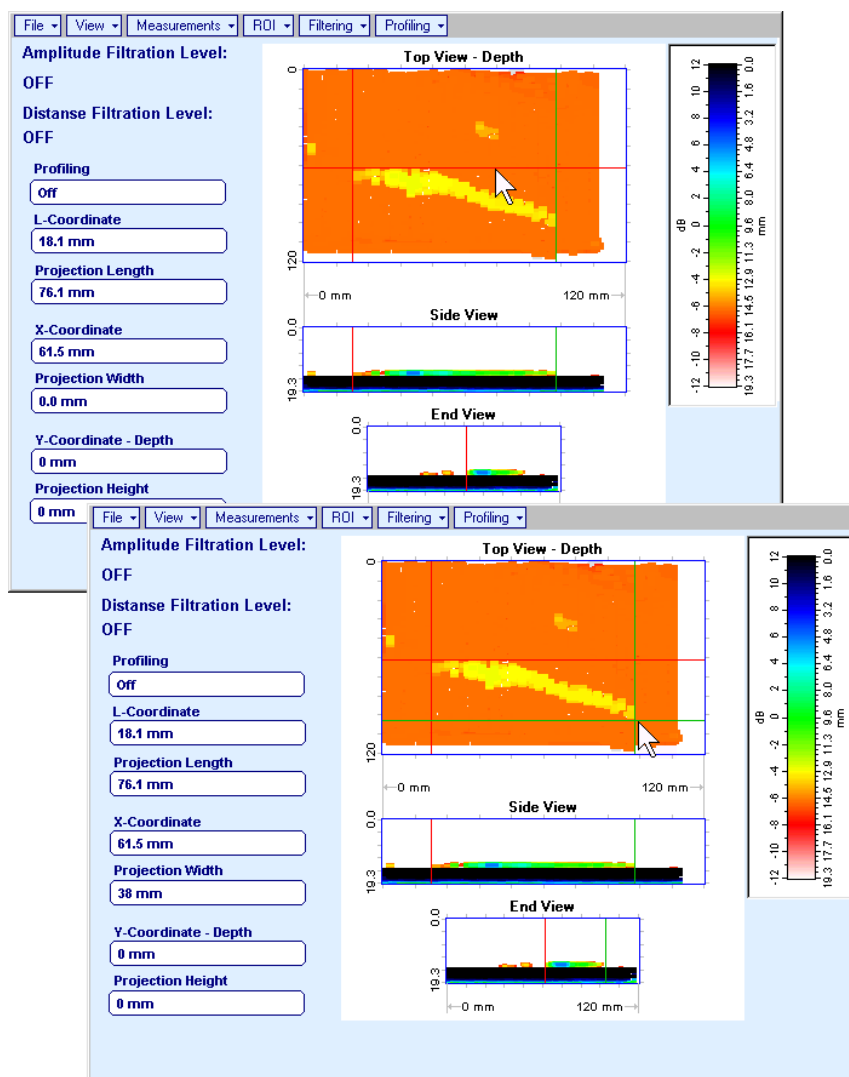








- **File → Print To**
 - ❑ selection of printer among available for printing out inspection report
 - ❑ selection of **MS Word®** as printer to create inspection report as doc file (**IOFFICE** and **IOFFICE 2005** SW Packages only)
 - ❑ selection of paper sheet size either A4 or Letter
- **File → Print** – prints current postprocessing page
- **File → Exit** – ends postprocessing session
- **View → ISONIC Image Processing** – returns to initial postprocessing screen appearing on opening file
- **View → Top View Mode** – represents **Top View C-Scan** image as either **Amplitude** or **Distance Map**
- **View → Zoom** – zooms either **Top**, or **Side**, or **End View** image as per operator's selection
- **View → Coloring** – allows to **edit color scale (palette)** applied to **Top**, **Side**, and **End View** images

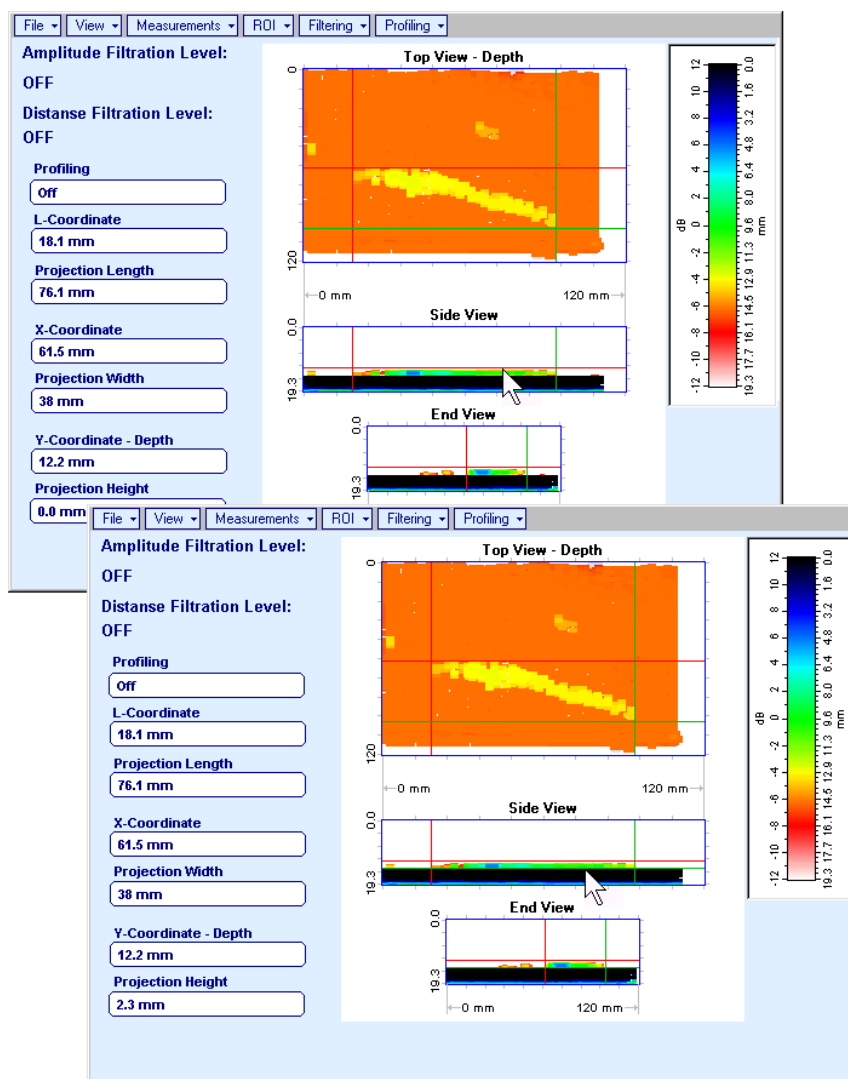
- Measurements → L-Coordinate, Projection Length** – generates *first vertical cursor* that may be guided over **Top** and **Side View** images using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard; coordinate of the *first vertical cursor* along **Top** and **Side View** images is indicated in the **L-Coordinate** field. To fix position of the *first vertical cursor* left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard. *Second vertical cursor* appears upon fixing the first one; it may be manipulated by the same way. Coordinate of the *second vertical cursor* along **Top** and **Side View** images measured relatively first vertical cursor is indicated in the **Projection Length** field. Provided that *vertical cursors* are placed properly:
 - **L-Coordinate** represents distance between left border of scanning area and left defect's end
 - **Projection Length** represents appropriate size of defect
 To interrupt **L-Coordinate** and **Projection Length** measurement procedure at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard













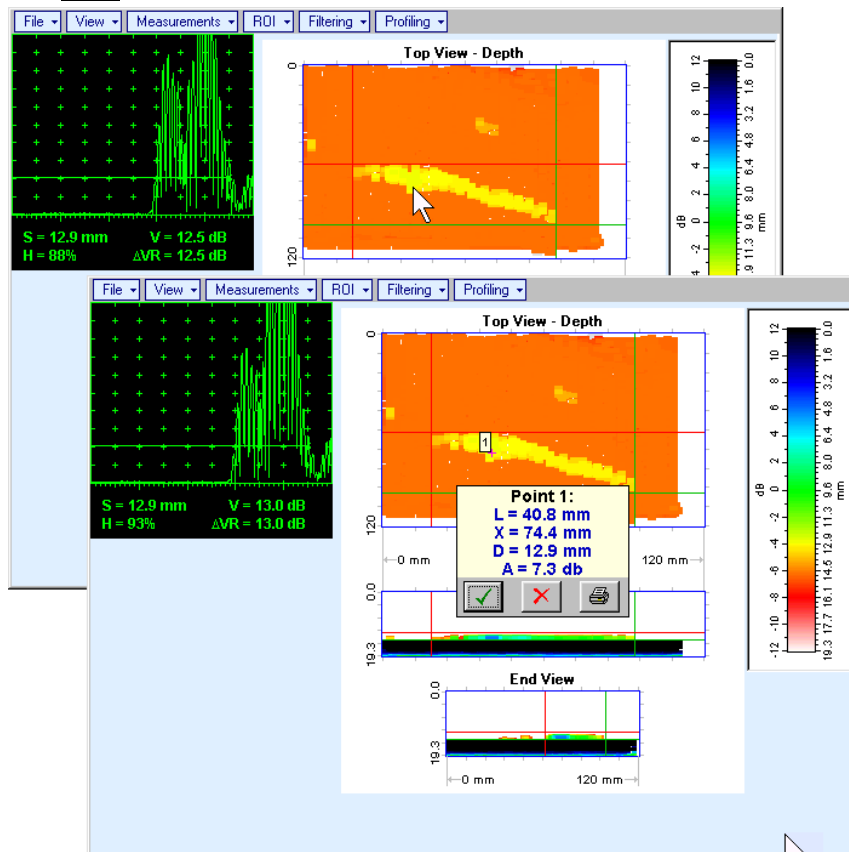
- Measurements → X-Coordinate, Projection Width** – generates *first horizontal cursor* that may be guided over **Top View** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard; coordinate of the *first horizontal cursor* along **Top View** image is indicated in the **X-Coordinate** field. To fix position of the *first horizontal cursor* left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard. *Second horizontal cursor* appears upon fixing first one; it may be manipulated by the same way. Coordinate of the *second horizontal cursor* along **Top View** image measured relatively *first horizontal cursor* is indicated in the **Projection Width** field. Provided that *horizontal cursors* are placed properly:
 - **X-Coordinate** represents distance between zero line of scanning area and closest defect end
 - **Projection Width** represents appropriate size of defect
 Horizontal cursors generated and manipulated over **Top View** image are accompanied with synchronous vertical cursors over **End View** image
 To interrupt **X-Coordinate** and **Projection Width** measurement procedure at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard






- Measurements → Y-Coordinate - Depth, Projection Height** – generates *first horizontal cursor* that may be guided over **Side** and **End View** images using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard; coordinate of the *first horizontal cursor* along **Side** and **End View** images is indicated in the **Y-Coordinate-Depth** field. To fix position of the first *horizontal cursor* left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard. *Second horizontal cursor* appears upon fixing first one, it may be manipulated by the same way. Coordinate of the *second horizontal cursor* along **Side** and **End View** images measured relatively *first horizontal cursor* is indicated in the **Projection Height** field. Provided that *horizontal cursors* are placed properly:
 - **Y-Coordinate - Depth** represents depth of defect
 - **Projection Height** represents appropriate size of defect
 To interrupt **Y-Coordinate - Depth** and **Projection Height** measurement procedure at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard





- **Measurements → Point TOF & Echo Amplitude → Set Points** – generates *pointing cursor* that may be guided over **Top View** image using either touch screen stylus or mouse or , , ,  on front panel keyboard or , , ,  on external keyboard; by means of said *pointing cursor* representing probe's central point virtual off-line scanning is performed with recovering of recorded **A-Scans**, which are accompanied with appropriate **Gate A** measurements – refer to paragraph 5.2.13 of this Operating Manual for measurements legend. To memorize **A-Scan** related to current cursor *pointing cursor* for further printing out release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard. To interrupt virtual off-line scanning press  on front panel keyboard or **Esc** on external keyboard

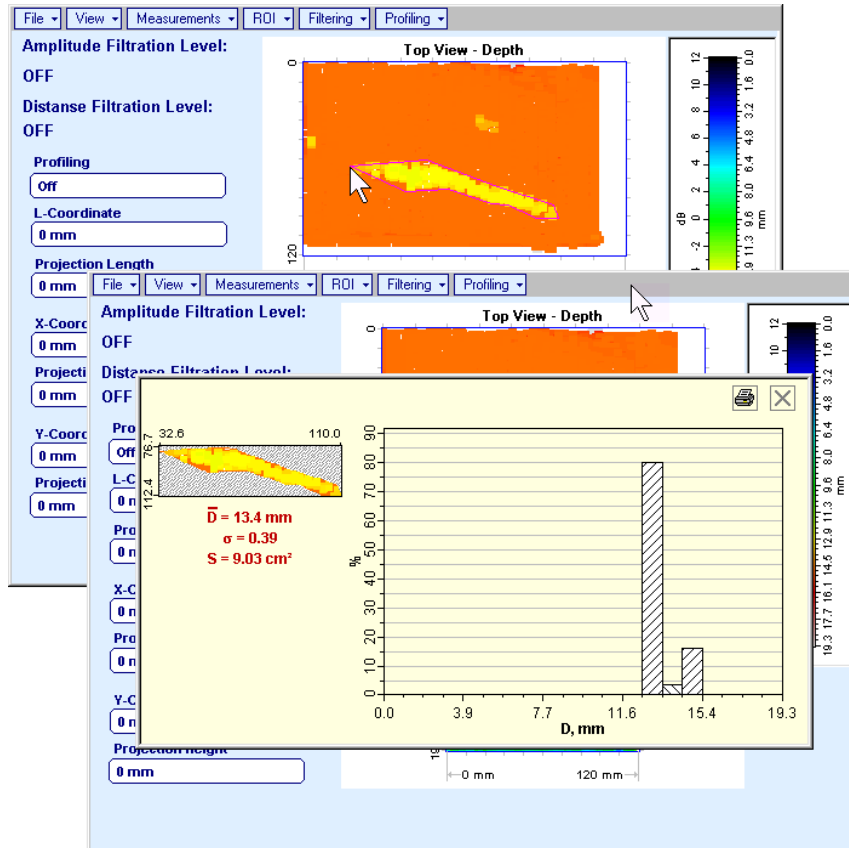


Points with memorized **A-Scans** and measuring results are highlighted by appropriate numbered marks on **Top View** image; to preview a point double click on it – this will generate popup box as below:

- To erase highlighted mark click on 
- To print out individual point report click on 
- To return to main menu operation click on 



- **Measurements → Point TOF & Echo Amplitude → Remove Last Point** – erases last pointed mark from **Top View** image
- **Measurements → Point TOF & Echo Amplitude → Remove All Points** – erases all marks from **Top View** image

















- **Measurements → Polygon** – activates procedure of enveloping of area of interest on **Top View** image by polygon, each apex of polygon is appointed through touch screen stylus or left mouse click; last apex of polygon is appointed through double touch screen stylus or left mouse click or pressing  on front panel keyboard or **Enter** on external keyboard. To interrupt creating of polygon right mouse click or press  on front panel keyboard or **Esc** on external keyboard



Provided that polygon is placed properly:

- \bar{D} represents the average value of informative parameter (amplitude or distance) represented by colors in the area of polygon
- σ represents dispersion of informative parameter (amplitude or distance) represented by colors in the area of polygon; statistical distribution is presented by appropriate graph
- S represents area occupied by defect


To printout polygon analysis click on ; to close polygon analysis window click on 

- ROI → ON** (ISONIC 2005 / 2020 / STAR instrument) or **EDIT → ROI → ON** (IOFFICE, IOFFICE 2005, and MULTIPP SW Packages for external computer) – generates *pointing cursor* that may be guided over **Top View** image using either touch screen stylus or mouse or , , ,  on front panel keyboard or , , ,  on external keyboard; by means said *pointing cursor* representing probe's central point virtual off-line scanning is performed with recovering of recorded **A-Scans**, which are accompanied with appropriate **Gate A** measurements – refer to paragraph 5.2.13 of this Operating Manual for measurements legend. To select reference **A-Scan** release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard – – this generates off-line **Gate A** controls , , , , ,  allowing to redefine **Region Of Interest** for **MULTISCAN COMBO S** imaging. Upon completing redefining of **Region Of Interest** click on  – this applies new **Gate A** to all captured **A-Scans** and updates **Top**, **Side**, and **End View** images accordingly





The image displays a software interface for radar data analysis, organized into three stacked panels. Each panel features a 'Top View - Depth' heatmap, a 'Side View' plot, and an 'End View' plot. The top panel includes a control panel with the following measurements: S = 12.9 mm, V = 13.0 dB, H = 93%, and ΔVR = 13.0 dB. The middle and bottom panels show multiple profiles. A control panel on the left allows for filtering and projection settings.





Control Panel Settings:

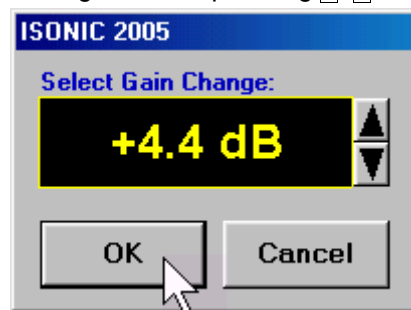
- Amplitude Filtration Level: OFF
- Distance Filtration Level: OFF
- Profiling: Off
- L-Coordinate: 0 mm
- Projection Length: 0 mm
- X-Coordinate: 0 mm
- Projection Width: 0 mm
- Y-Coordinate - Depth: 0 mm
- Projection Height: 0 mm


To interrupt selection of reference of **A-Scan** right mouse click or press  on front panel keyboard or **Esc** on external keyboard

To interrupt re-adjustment of **Region Of Interest** after selection of reference of **A-Scan** click on 

- **ROI → OFF** (ISONIC 2005 / 2020 / STAR instrument) or **EDIT → ROI → OFF** (IOFFICE, IOFFICE 2005, and MULTIPP SW Packages for external computer) – negates **Gate A** re-adjustment and returns to originally recorded **Top, Side, and End View** images and original **Gate A** setting
- **Edit→Change Gain→ON** – (IOFFICE, IOFFICE 2005, and MULTIPP SW Packages for external computer) – generates *pointing cursor* that may be guided over **Top View** image either mouse or , , ,  on external keyboard; by means said *pointing cursor* representing probe's central point virtual off-line scanning is performed with recovering of recorded **A-Scans**. To select reference **A-Scan** left mouse click or press **Enter** – this generates popup window allowing off-line re-adjusting of **Gain** for all **A-Scans** captured during **MULTISCAN COMBO S** Scanning in $\pm 6\text{dB}$ range with $\pm 0.1\text{ dB}$ increments

through clicking or pressing and holding on ,  or pressing ,  on keyboard








During **Gain** re-adjusting reference **A-Scan** is modified accordingly. Upon completing re-adjusting **Gain** click on  or press **Enter** on keyboard – this applies new **Gain** value to all captured **A-Scans** and updates **Top, Side, and End View** images accordingly

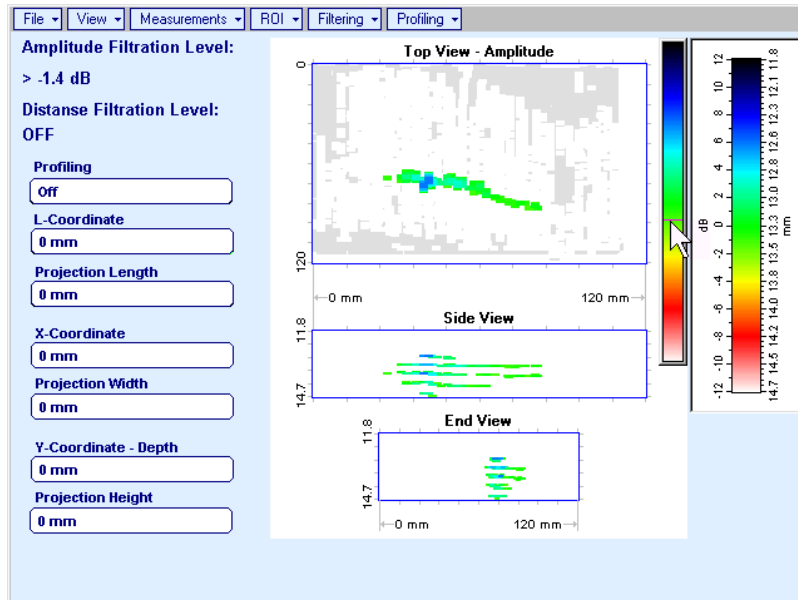
To interrupt selection of reference of **A-Scan** right mouse click or press **Esc** on keyboard

To interrupt re-adjusting of **Gain** click on  or press **Esc** on keyboard





- **Edit→Change Gain→OFF** (IOFFICE, IOFFICE 2005, and MULTIPP SW Packages for external computer)– negates **Gain** re-adjustment and returns to originally recorded **Top, Side, and End View** images and original **Gain** setting


- Filtering → Amplitude → Filtering ON** – generates *amplitude palette bar* with *sliding cursor*, which may be controlled using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard. Position of *sliding cursor* on the *amplitude palette bar* determines **Amplitude Filtration Level**, which is appropriately indicated. All elements of **Top**, **Side**, and **End View** images representing signal amplitude below filtering level are suppressed

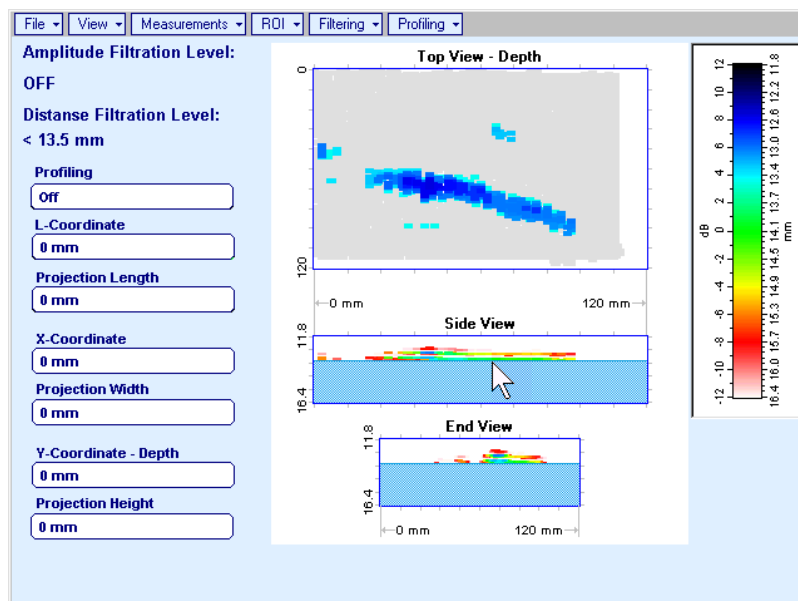
To interrupt filtering procedure right mouse click or press  on front panel keyboard or **Esc** on external keyboard












- Filtering → Amplitude → Filtering OFF** – returns to originally recorded **Top**, **Side**, and **End View** images
- Filtering → Distance → Filtering ON** – generates *sliding horizontal cursor* above **Side** and **End View**

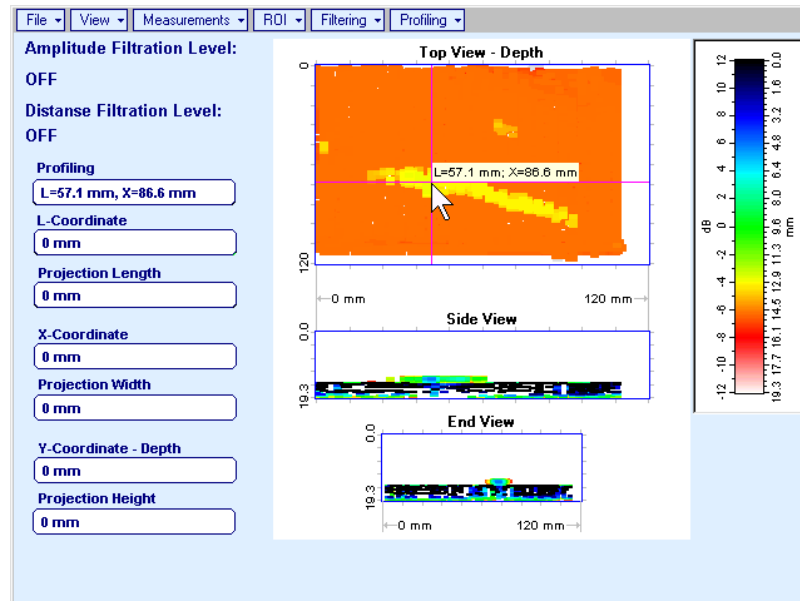
images, which may be controlled using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard. Position of the *sliding horizontal cursor* determines **Distance Filtration Level**, which is appropriately indicated. All elements of **Top**, **Side**, and **End View** images related to distances exceeding **Distance Filtration Level** are suppressed






To interrupt filtering procedure right mouse click or press  on front panel keyboard or **Esc** on external keyboard

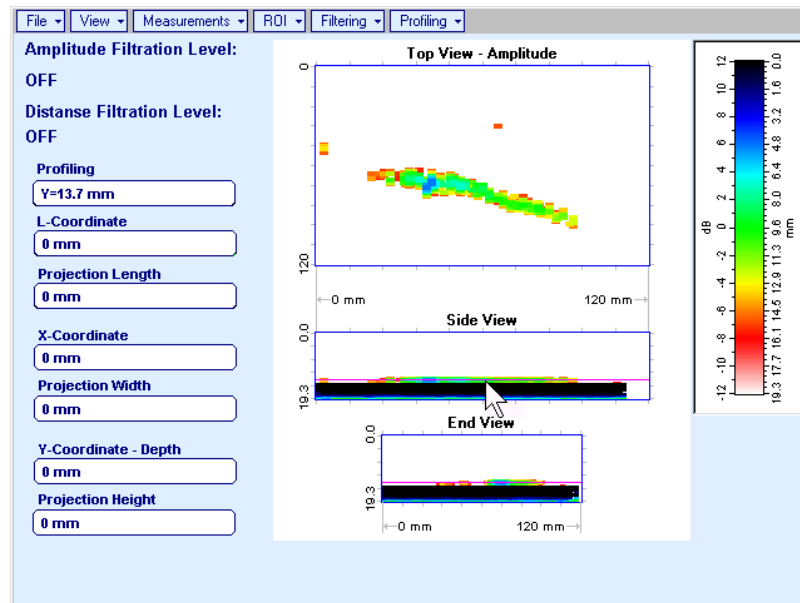


- **Filtering → Distance → Filtering OFF** – returns to originally recorded **Top**, **Side**, and **End View** images
- **Profiling → L,X Profiling** – generates *sliding horizontal and vertical cursors* above **Top View**, which may be controlled using either touch screen stylus or mouse or  ,  ,  ,  on front panel keyboard or  ,  ,  ,  on external keyboard . Positions of both *sliding cursors* are appropriately indicated in the **Profiling** box. Horizontal cursor determines sectional cut (vertical slice) represented as **Side View** image; vertical cursor determines sectional cut (vertical slice) represented as **End View** image

To interrupt profiling procedure right mouse click or press  on front panel keyboard or **Esc** on external keyboard



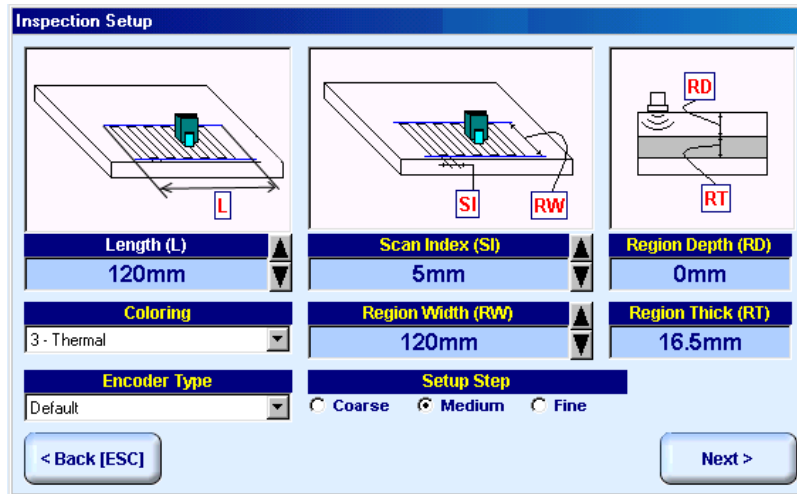
- Profiling → Y Profiling** – generates *sliding horizontal cursor* above **Side** and **End View** images, which may be controlled using either touch screen stylus or mouse or  ,  on front panel keyboard or  ,  on external keyboard. Position of *sliding horizontal cursor* is appropriately indicated in the **Profiling** box. Horizontal cursor determines sectional cut (horizontal slice) represented as **Top View** image
 To interrupt profiling procedure right mouse click or press  on front panel keyboard or **Esc** on external keyboard



- Profiling → Profiling Off** – returns to global **Top**, **Side**, and **End View** images


10.3.7. Thickness Profiling


10.3.7.1. Inspection Setup



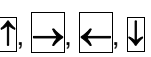


In the **Inspection Setup** screen it is necessary to key in:

- ❑ **Length** of rectangular scanning area
- ❑ **Region Width** which defines width of rectangular scanning area
- ❑ **Scan Index** – value of **Scan Index** defining coverage of scanning area to be selected and entered according to inspection procedure

Setting of said parameters to be performed through clicking / pressing corresponding spin button  with **Fine, Medium, or Coarse** increments according to checked option (click on) in the **Setup Step** field

Alternatively parameter for setting to be selected through pressing  on front panel keyboard or **F7** on external keyboard or through clicking on its label. Label indicating name of selected parameter changes its

fore color from yellow to white – since that moment parameter may be modified using ,  on front panel keyboard or  on external keyboard


Values of **Region Depth (RT)** and **Region Thick (RT)** for pulse echo mode indicated in the **Inspection Setup** screen are defined by **Gate A** settings of **UDS 3-5 Pulser Receiver**:

$$\text{Region Depth (RD)} = a\text{Start}$$



$$\text{Region Thick (RT)} = a\text{Width}$$



Style of palette (**Pseudo, Thermal, or Gray**) is selectable through clicking  on:



Encoders calibration data corresponding to scanning mechanism in use is selectable through clicking  on:



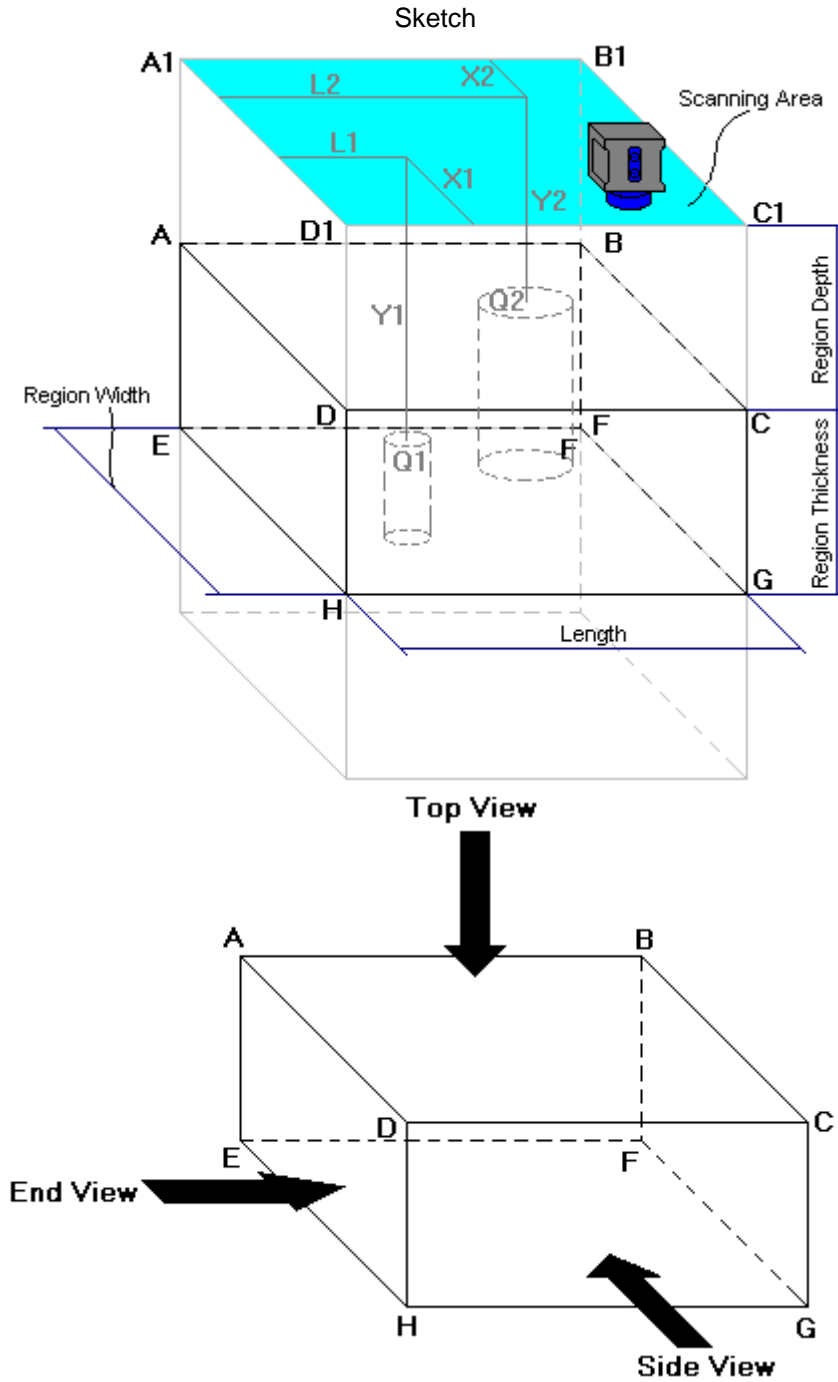
To return to previous screen click on  or press  on front panel keyboard or **Esc** on external keyboard

To continue click on  or press  on front panel keyboard or **F8** on external keyboard

10.3.7.2. Imaging Principles

##

1



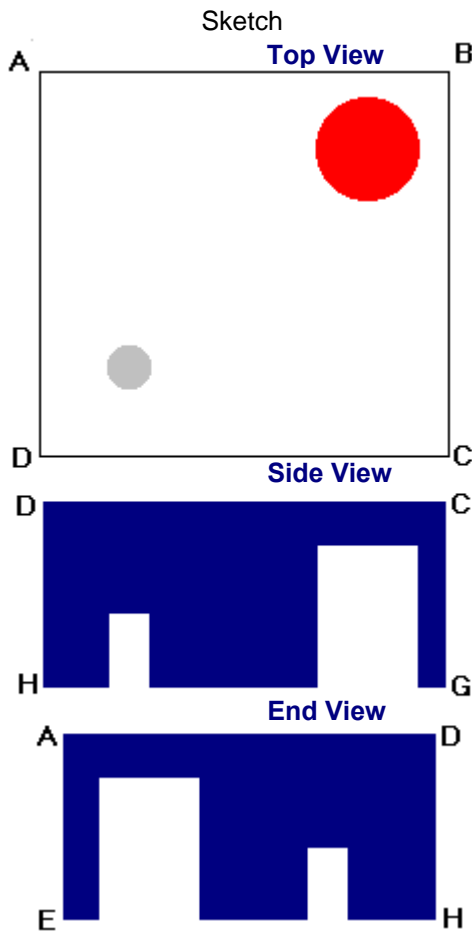
Note

General

- (a) Volume Under Test (**Region of Interest**) is located between the two parallel rectangles namely ABCD and EFGH
- (b) Scanning is provided above surface of rectangle A1B1C1D1
- (c) With reference to **Inspection Setup** screen – paragraph 10.3.7.1 of this Operating Manual:
 - **A1A = Region Depth**
 - **AB = Region Length**
 - **AD = Region Width**
 - **DH = Region Thickness**
 - **A1E = Normal Material Thickness**
- (d) In the example it is supposed that there are two flat bottom drills in the object under test, said drills have different diameters, coordinates and depths of penetration into **Region of Interest**

- **Q1 (L1, X1, Y1) – Center of the Drill # 1's Bottom Surface**
- **Q2 (L2, X2, Y2) – Center of the Drill # 2's Bottom Surface**

2



Note

Top View, Global Side and End View

Supposing that scanning is well completed drills bottoms Q1 and Q2 will be detected and represented in **Top View**, and global **Side View** and **End View**

Top View is obtained through superimposing of parallel planes between rectangles ABCD and EFGH and represents distribution of minimum thickness above scanning surface

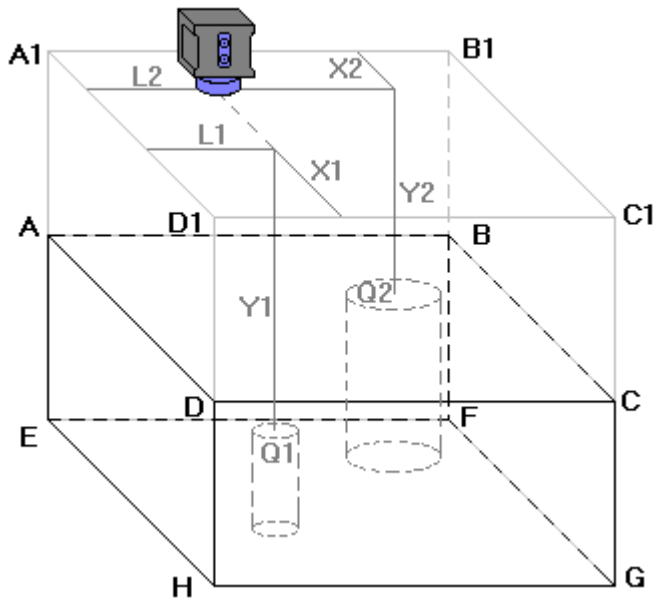
Global **Side View** and **End View** are orthogonal images composed through superimposing of the corresponding cross sectional profiles along and across the whole **Region of Interest**, said superimposing is performed by overwriting of high value of remaining material thickness with lower value and provides representation of least remaining thickness values

Acquired data is converted into 3D-matrix allowing sectional presentation of **Side** and **End View** during scanning – refer to below sketches ## 3, 4, and 5

3

Sketch

Note

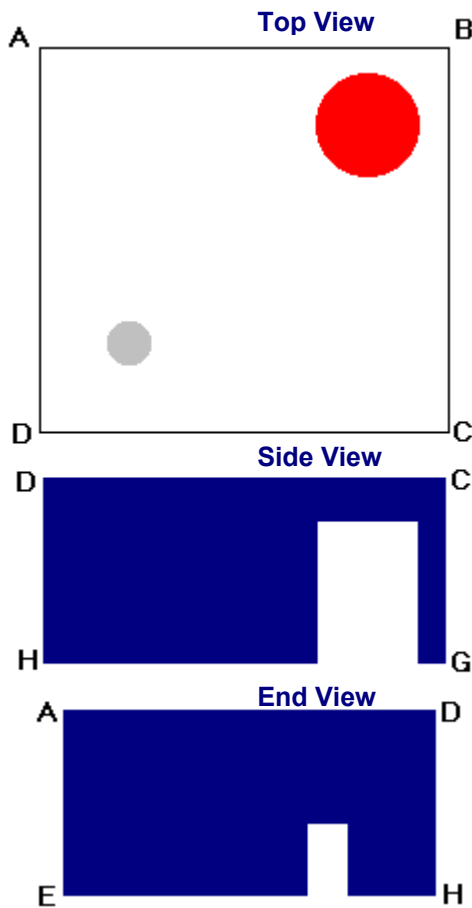


Sectional Side and End View (Vertical Cut Slice)

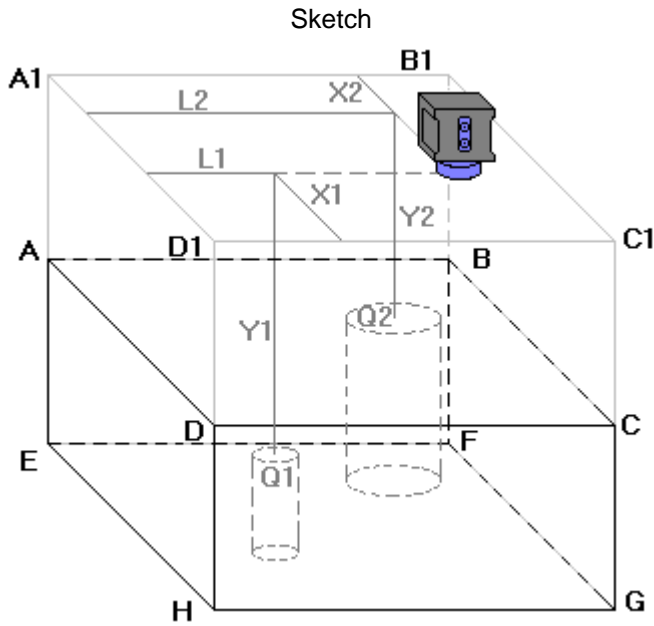
Sketches ## 3, 4, and 5 illustrate composing of sectional **Side View** and **End View**

Side View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **X**-coordinate of probe

End View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **L**-coordinate of probe



4



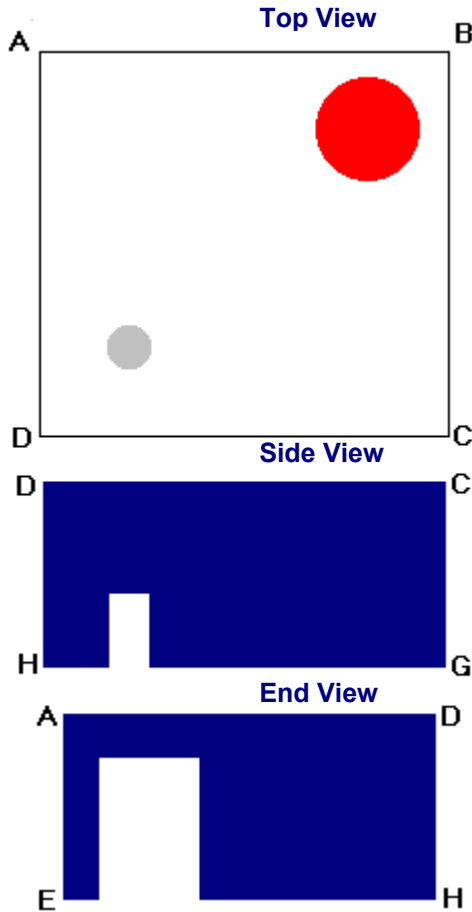
Note

Sectional Side and End View (Vertical Cut Slice)

Sketches ## 3, 4, and 5 illustrate composing of sectional **Side View** and **End View**

Side View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **X**-coordinate of probe

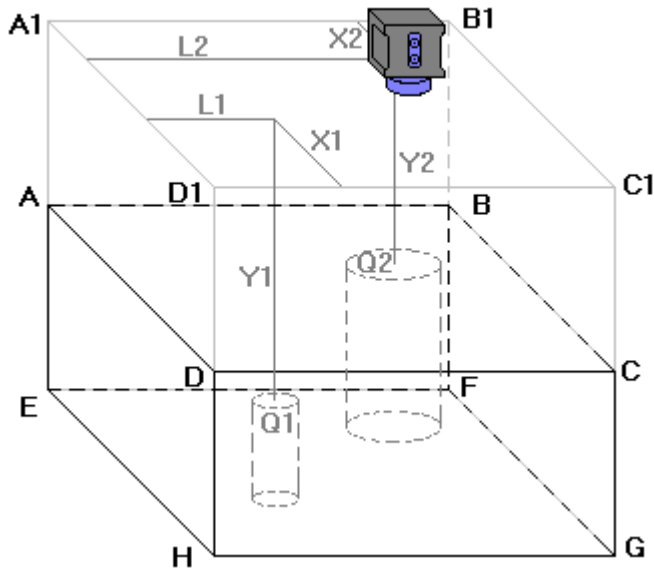
End View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **L**-coordinate of probe



5

Sketch

Note

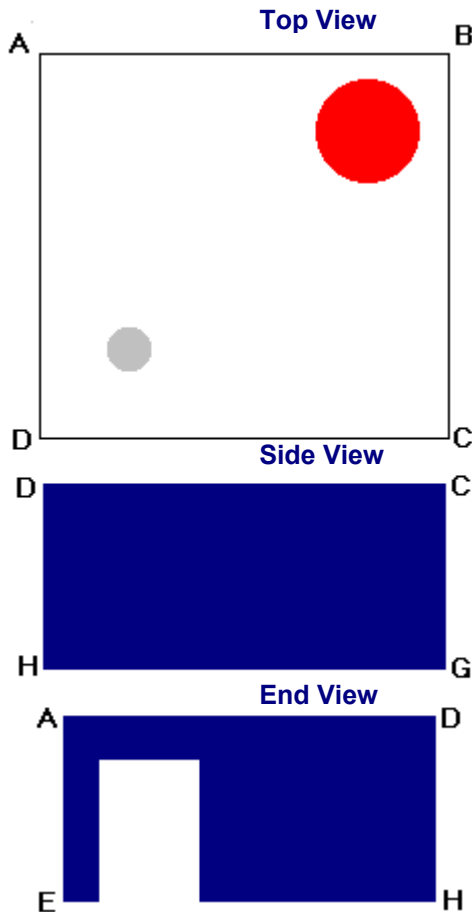


Sectional Side and End View (Vertical Cut Slice)

Sketches ## 3, 4, and 5 illustrate composing of sectional **Side View** and **End View**

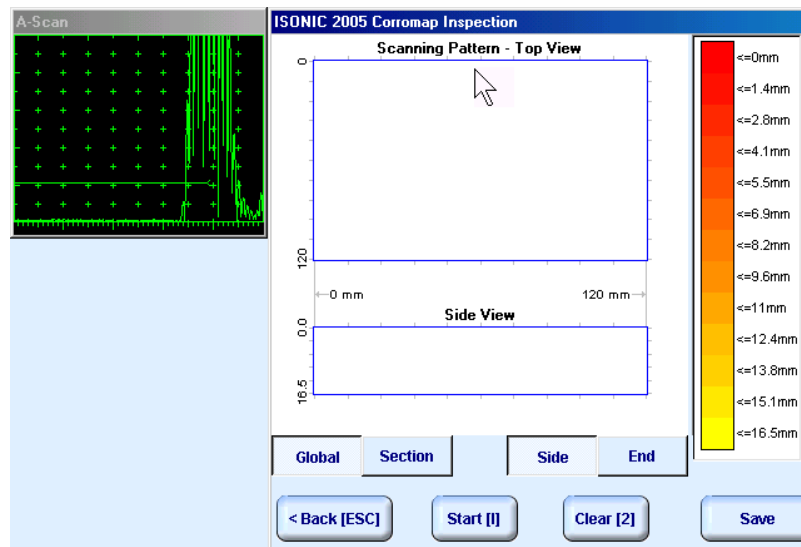
Side View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **X**-coordinate of probe

End View section currently represented on **ISONIC 2005 / 2020 / STAR** screen corresponds to current **L**-coordinate of probe

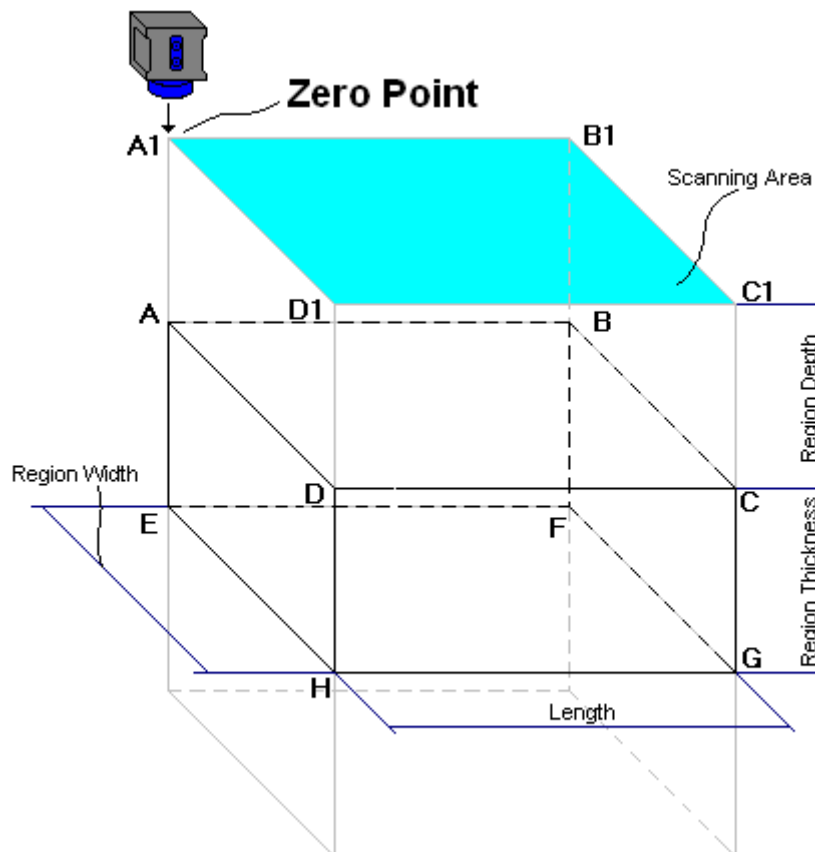


10.3.7.3. Scanning

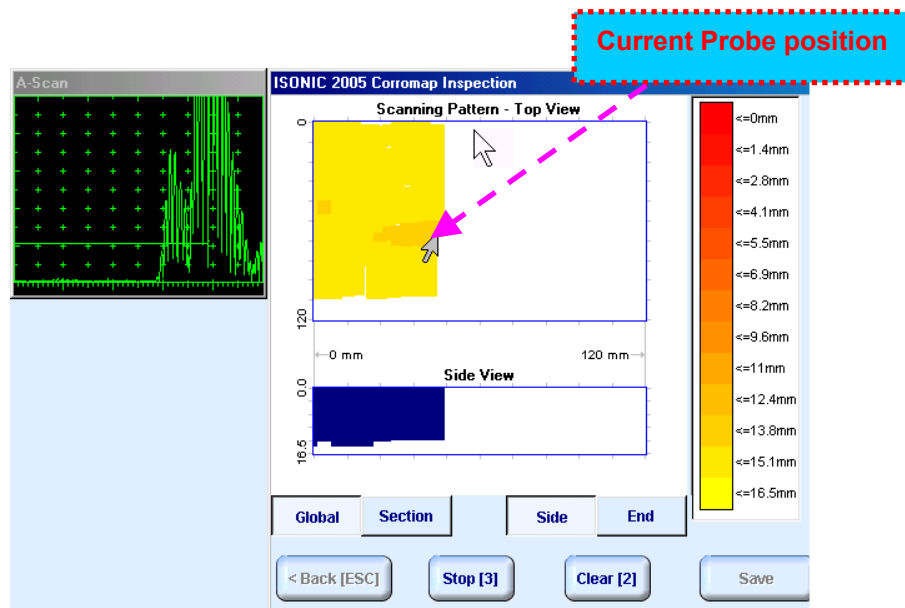
ISONIC 2005 / 2020 / STAR Corromap Inspection screen follows after **Inspection Setup** screen:




On opening **ISONIC 2005 / 2020 / STAR Corromap Inspection** screen place probe onto zero point of scanning area then click on **Start [I]** or press **I** on front panel keyboard or **F8** on external keyboard



During scanning **ISONIC 2005 / 2020 / STAR Corromap Inspection** screen is accompanied with **A-Scan**





ISONIC 2005 / 2020 / STAR Corromap Inspection screen represents:

- Current Probe Position
- Top View**
- Side View** for **Side** pressed down or **End View** for **End** pressed down or press  on front panel keyboard or **F7** on external keyboard to switch between **Side** and **End View**


Depending on which button is pressed – **Global** or **Section** – **Side View** and **End View** are presented either in global mode according to sketch # 2 – paragraph 10.3.7.2 of this Operating Manual or in sectional mode according to sketches ## 3, 4, and 5 – paragraph 10.3.7.2 of this Operating Manual



- All **A-Scans** are captured during scanning unconditionally however projection images **Top View**, **Side View**, and **End View** are updated only with signals exceeding threshold of **Gate A** presented on **A-Scan** however
- Minimal thickness is dominant while recording data into **Top View**
- Map Repair Function** is active while keeping pressed  on front panel keyboard or **F8** on external keyboard – new readings will overwrite already recorded data unconditionally; this allows record correction after finding some non-relevant data recorded with dominance

To cleanup **Top View**, **Side View**, and **End View** fields click on **Clear [2]** or press  on front panel keyboard or **F2** on external keyboard

To stop scanning click on **Stop [3]** or press  on front panel keyboard or **F3** on external keyboard

To save **CORROMAP ME** record into a file click on **Save** or press  on front panel keyboard or **F12** on external keyboard. Refer to paragraph 5.2.17 of this Operating Manual to proceed with file saving

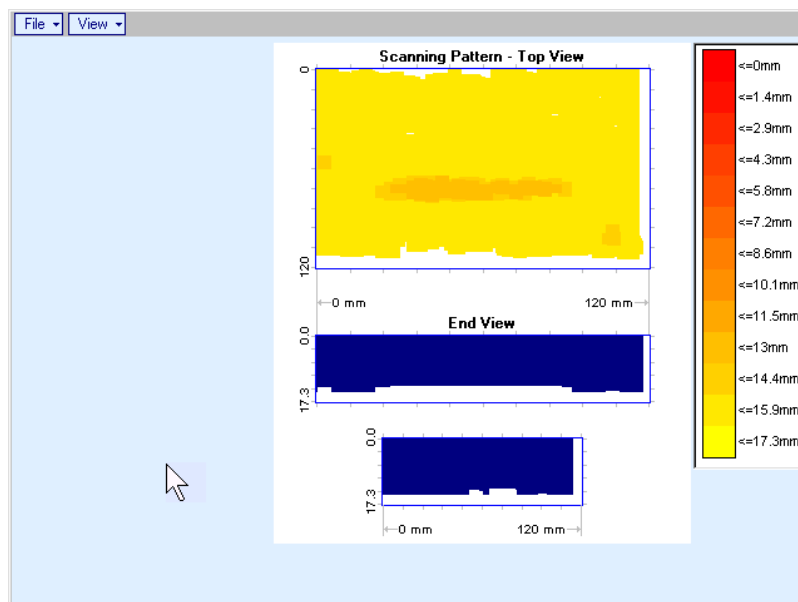
To return to **Inspection Setup** screen click on **< Back [ESC]** or press  on front panel keyboard or **Esc** on external keyboard

10.3.7.4. Postprocessing

Postprocessing of **CORROMAP ME** records may be performed directly in the instrument or in external computer using **IOFFICE 2005** or **IOFFICE** or **MULTIPP** SW package. User interface and operations are practically identical except two features listed below:

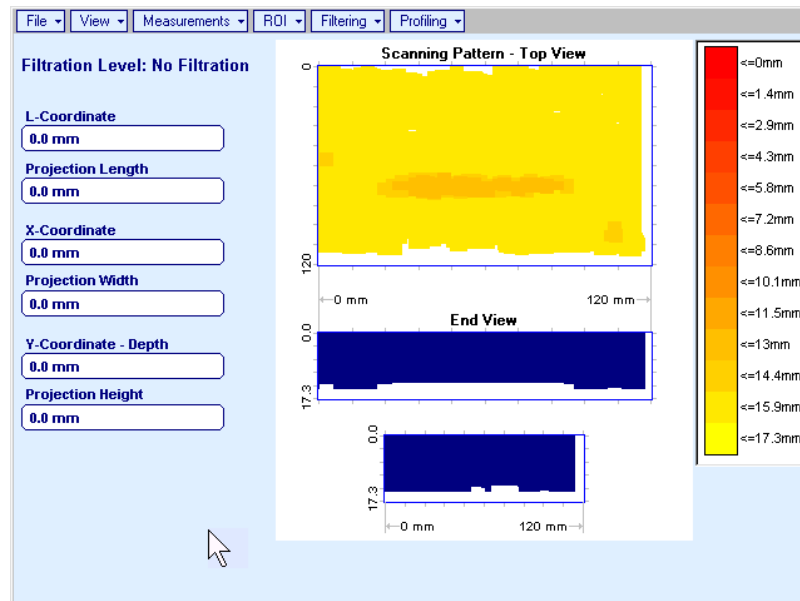
	Off-line analysis directly in ISONIC 2005 / 2020 / STAR instrument	Off-line analysis in external computer using MULTIPP SW Package	Off-line analysis in external computer using IOFFICE 2005 or IOFFICE SW Package
Off-line re-adjustment of Gain for CORROMAP ME record	NO	YES	YES
Automatic creation of Inspection report in MS Word® format	NO	NO	YES

Menu Bar Functions on Opening File









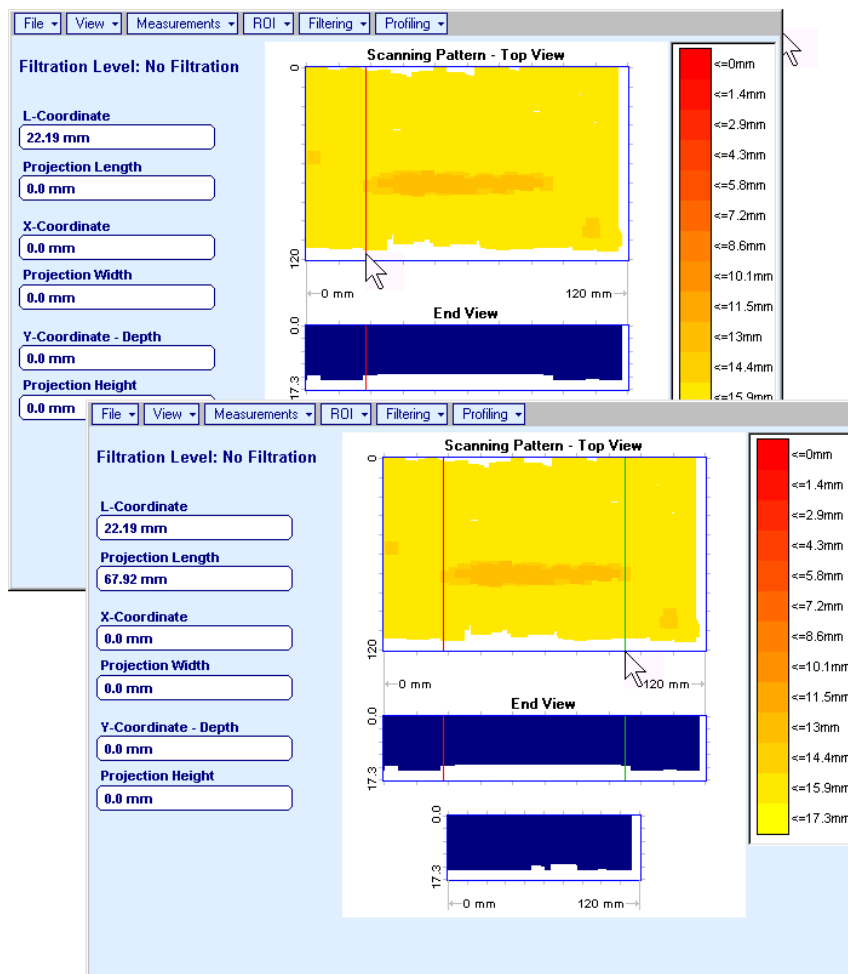
- **File → Print To**
 - selection of printer among available for printing out inspection report
 - selection of **MS Word®** as printer to create inspection report as doc file (**IOFFICE** and **IOFFICE 2005** SW Packages only)
 - selection of paper sheet size either A4 or Letter
- **File → Print → Whole Report** – prints out complete inspection report including **UDS 3-5 Pulsar Receiver** settings, inspection setup and scanning parameters, and recorded maps
- **File → Print → Graphics Only** – prints out scanning recorded maps
- **File → Exit** – ends postprocessing session
- **View → Primary Information** – previews **UDS 3-5 Pulsar Receiver** settings, inspection setup and scanning parameters
- **View → ISONIC Image Processing** – activates menu for detailed off-line analysis of the record







ISONIC Image Processing Menu Bar Functions

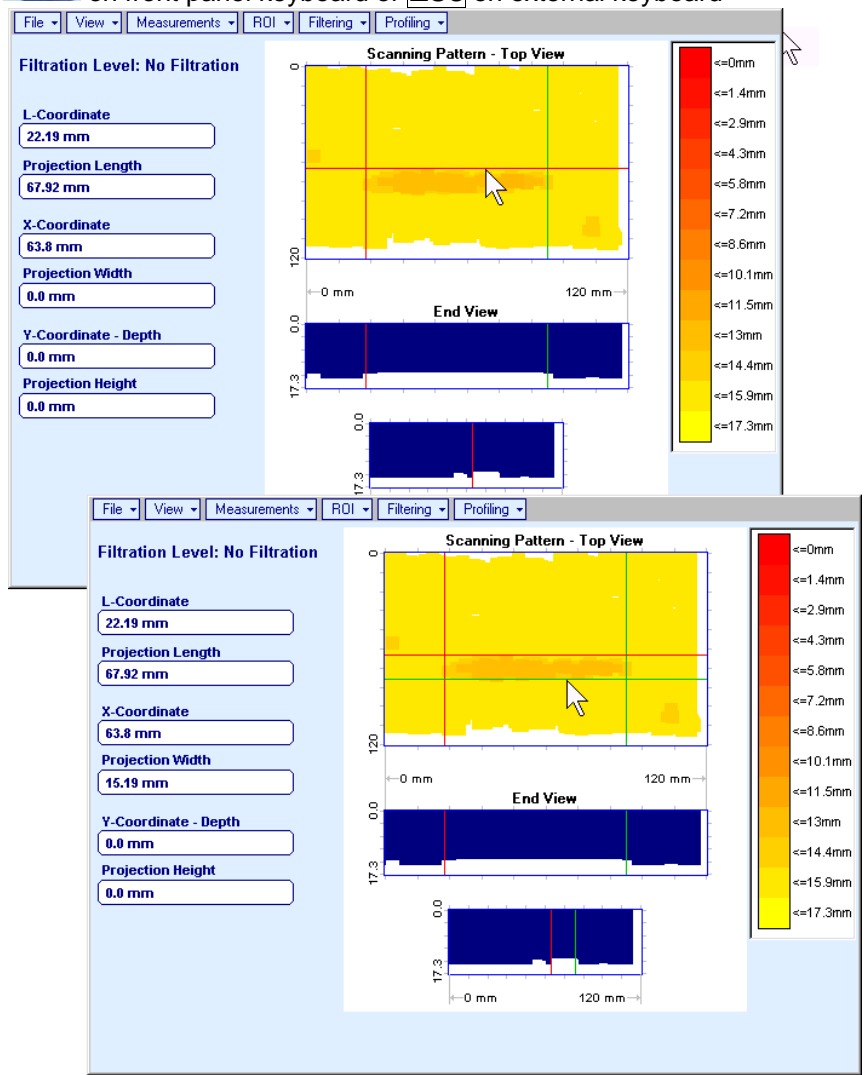








- **File → Print To**
 - selection of printer among available for printing out inspection report
 - selection of **MS Word**[®] as printer to create inspection report as doc file (**IOFFICE** and **IOFFICE 2005** SW Packages only)
 - selection of paper sheet size either A4 or Letter
- **File → Print** – prints current postprocessing page
- **File → Exit** – ends postprocessing session
- **View → ISONIC Image Processing** – returns to initial postprocessing screen appearing on opening file
- **View → Top View Mode** – represents **Top View C-Scan** image as either **Amplitude** or **Distance Map**
- **View → Zoom** – zooms either **Top**, or **Side**, or **End View** image as per operator's selection
- **View → Coloring** – allows to **edit color scale (palette)** applied to **Top**, **Side**, and **End View** images

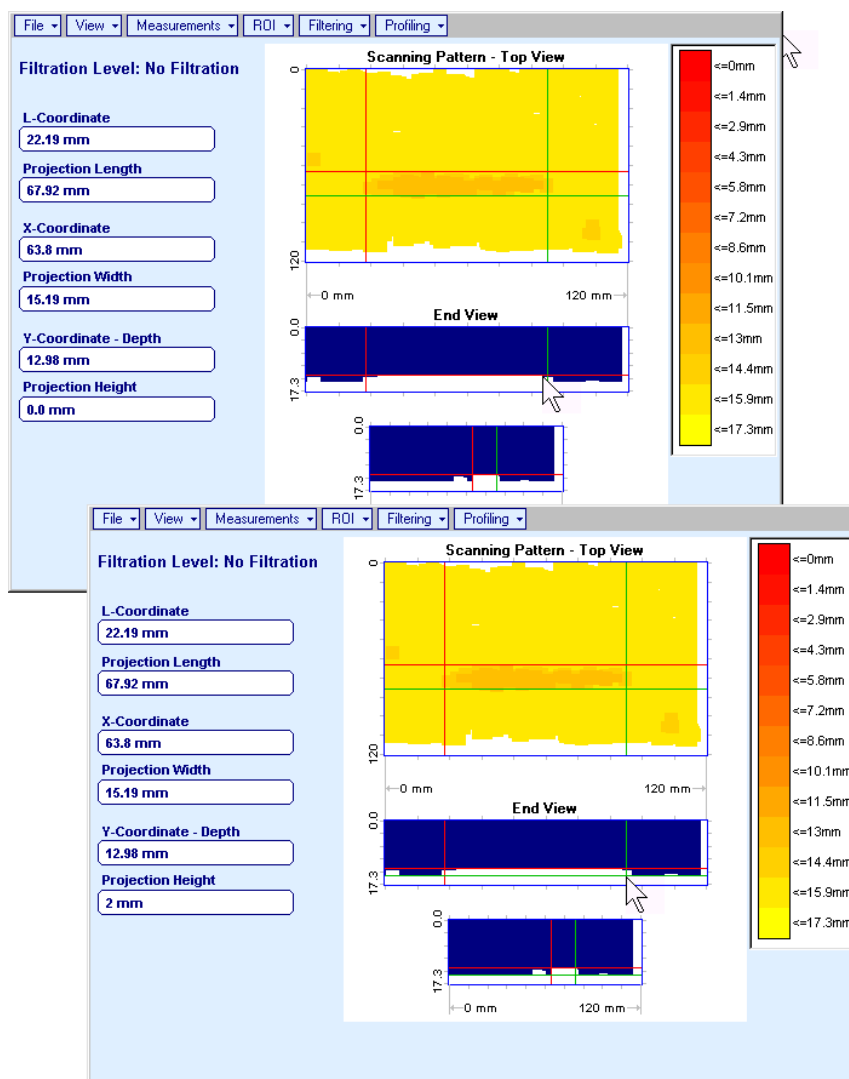
- Measurements → L-Coordinate, Projection Length** – generates *first vertical cursor* that may be guided over **Top** and **Side View** images using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard; coordinate of the *first vertical cursor* along **Top** and **Side View** images is indicated in the **L-Coordinate** field. To fix position of the *first vertical cursor* left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard. *Second vertical cursor* appears upon fixing the first one; it may be manipulated by the same way. Coordinate of the *second vertical cursor* along **Top** and **Side View** images measured relatively first vertical cursor is indicated in the **Projection Length** field. Provided that *vertical cursors* are placed properly:
 - L-Coordinate** represents distance between left border of scanning area and left end of corrosion damage
 - Projection Length** represents appropriate size of corrosion damage
 To interrupt **L-Coordinate** and **Projection Length** measurement procedure at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard













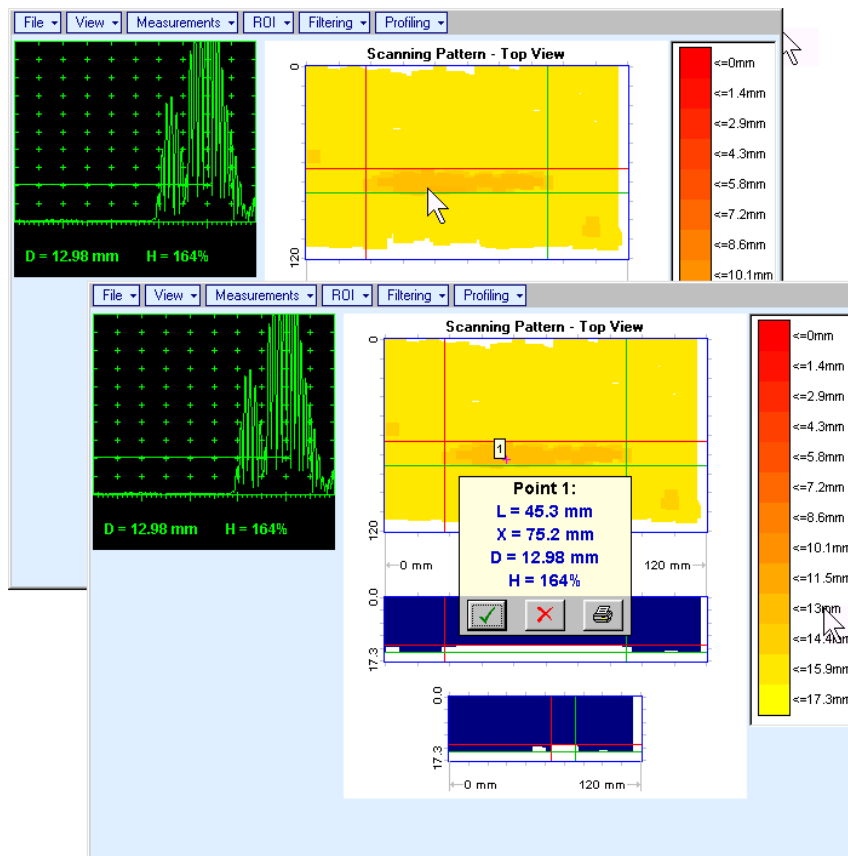
- Measurements → X-Coordinate, Projection Width** – generates *first horizontal cursor* that may be guided over **Top View** image using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard; coordinate of the *first horizontal cursor* along **Top View** image is indicated in the **X-Coordinate** field. To fix position of the *first horizontal cursor* left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard. *Second horizontal cursor* appears upon fixing first one; it may be manipulated by the same way. Coordinate of the *second horizontal cursor* along **Top View** image measured relatively *first horizontal cursor* is indicated in the **Projection Width** field. Provided that *horizontal cursors* are placed properly:
 - **X-Coordinate** represents distance between zero line of scanning area and closest end of corrosion damage
 - **Projection Width** represents appropriate size of corrosion damage
 Horizontal cursors generated and manipulated over **Top View** image are accompanied with synchronous vertical cursors over **End View** image
 To interrupt **X-Coordinate** and **Projection Width** measurement procedure at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard






- Measurements → Y-Coordinate - Depth, Projection Height** – generates *first horizontal cursor* that may be guided over **Side** and **End View** images using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard; coordinate of the *first horizontal cursor* along **Side** and **End View** images is indicated in the **Y-Coordinate-Depth** field. To fix position of the first *horizontal cursor* left mouse click or release touch screen stylus or press  on front panel keyboard or **Enter** on external keyboard. *Second horizontal cursor* appears upon fixing first one, it may be manipulated by the same way. Coordinate of the *second horizontal cursor* along **Side** and **End View** images measured relatively *first horizontal cursor* is indicated in the **Projection Height** field. Provided that *horizontal cursors* are placed properly:
 - **Y-Coordinate - Depth** represents remaining thickness
 - **Projection Height** represents appropriate depth of corrosion damage
 To interrupt **Y-Coordinate - Depth** and **Projection Height** measurement procedure at any moment right mouse click or press  on front panel keyboard or **Esc** on external keyboard





- Measurements → Point** – generates *pointing cursor* that may be guided over **Top View** image using either touch screen stylus or mouse or , , ,  on front panel keyboard or , , ,  on external keyboard; by means of said *pointing cursor* representing probe's central point virtual off-line scanning is performed with recovering of recorded **A-Scans**, which are accompanied with appropriate **Gate A** measurements – refer to paragraph 5.2.13 of this Operating Manual for measurements legend. To memorize **A-Scan** related to current cursor *pointing cursor* for further printing out release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard. To interrupt virtual off-line scanning press  on front panel keyboard or **Esc** on external keyboard.

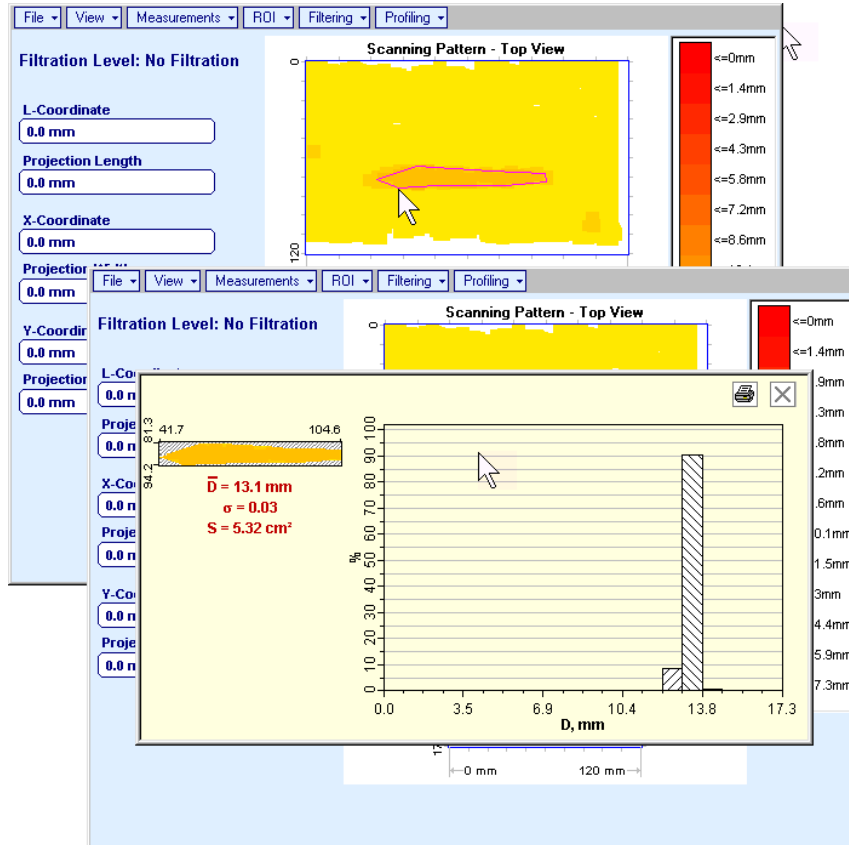


Points with memorized **A-Scans** and measuring results are highlighted by appropriate numbered marks on **Top View** image; to preview a point double click on it – this will generate popup box as below:

- To erase highlighted mark click on 
- To print out individual point report click on 
- To return to main menu operation click on 



- Measurements → Point → Clear Last** – erases last pointed mark from **Top View** image
- Measurements → Point → Clear All** – erases all marks from **Top View** image

















- **Measurements → Polygon** – activates procedure of enveloping of area of interest on **Top View** image by polygon, each apex of polygon is appointed through touch screen stylus or left mouse click; last apex of polygon is appointed through double touch screen stylus or left mouse click or pressing  on front panel keyboard or **Enter** on external keyboard. To interrupt creating of polygon right mouse click or press  on front panel keyboard or **ESC** on external keyboard

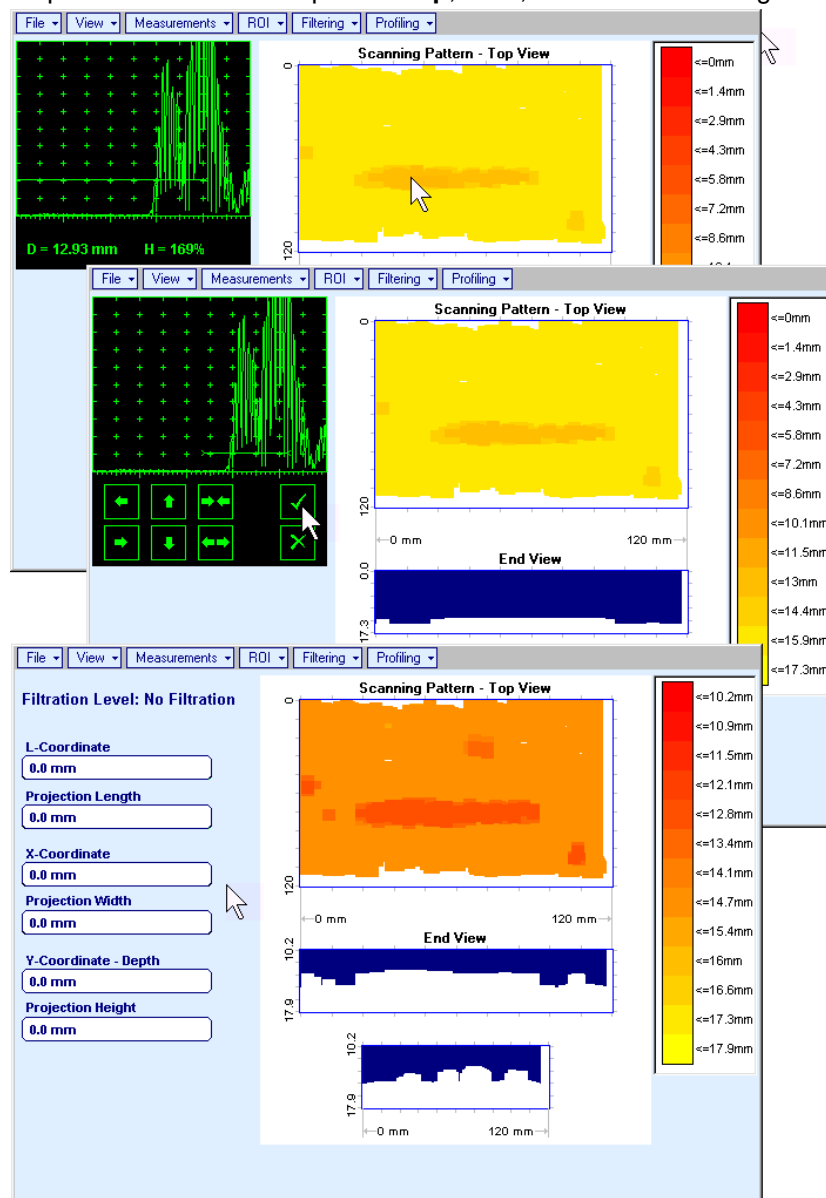



Provided that polygon is placed properly:

- \bar{D} represents average remaining thickness represented by colors in the area of polygon
- σ represents dispersion of remaining thickness represented by colors in the area of polygon; statistical distribution is presented by appropriate graph
- S represents area occupied by corrosion damage





To printout polygon analysis click on ; to close polygon analysis window click on 

- ROI → ON (ISONIC 2005 / 2020 / STAR instrument) or EDIT → ROI → ON (IOFFICE, IOFFICE 2005, and MULTIPP SW Packages for external computer)** – generates *pointing cursor* that may be guided over **Top View** image using either touch screen stylus or mouse or , , ,  on front panel keyboard or , , ,  on external keyboard; by means said *pointing cursor* representing probe's central point virtual off-line scanning is performed with recovering of recorded **A-Scans**, which are accompanied with appropriate **Gate A** measurements – refer to paragraph 5.2.13 of this Operating Manual for measurements legend. To select reference **A-Scan** release touch screen stylus or left mouse click or press  on front panel keyboard or **Enter** on external keyboard – – this generates off-line **Gate A** controls , , , , ,  allowing to redefine **Region Of Interest** for **CORROMAP** imaging. Upon completing redefining of **Region Of Interest** click on  – this applies new **Gate A** to all captured **A-Scans** and updates **Top**, **Side**, and **End View** images accordingly

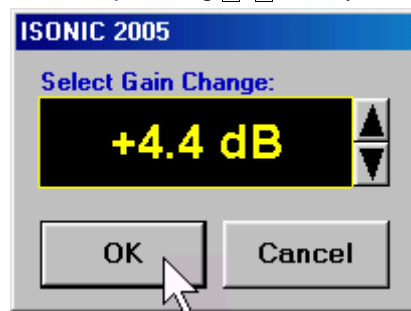


To interrupt selection of reference of **A-Scan** right mouse click or press  on front panel keyboard or **Esc** on external keyboard

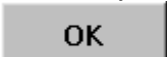
To interrupt re-adjustment of **Region Of Interest** after selection of reference of **A-Scan** click on 

- **ROI → OFF** (ISONIC 2005 / 2020 / STAR instrument) or **EDIT → ROI → OFF** (IOFFICE, IOFFICE 2005, and MULTIPP SW Packages for external computer) – negates **Gate A** re-adjustment and returns to originally recorded **Top, Side, and End View** images and original **Gate A** setting
- **Edit→Change Gain→ON** – (IOFFICE, IOFFICE 2005, and MULTIPP SW Packages for external computer) – generates *pointing cursor* that may be guided over **Top View** image either mouse or , , ,  on external keyboard; by means said *pointing cursor* representing probe's central point virtual off-line scanning is performed with recovering of recorded **A-Scans**. To select reference **A-Scan** left mouse click or press **Enter** – this generates popup window allowing off-line re-adjusting of **Gain** for all **A-Scans** captured during **CORROMAP ME** Scanning in $\pm 6\text{dB}$ range with $\pm 0.1\text{ dB}$ increments through

clicking or pressing and holding on  or pressing ,  on keyboard







During **Gain** re-adjusting reference **A-Scan** is modified accordingly. Upon completing re-adjusting **Gain**


click on  or press **Enter** on keyboard – this applies new **Gain** value to all captured **A-Scans** and updates **Top, Side, and End View** images accordingly

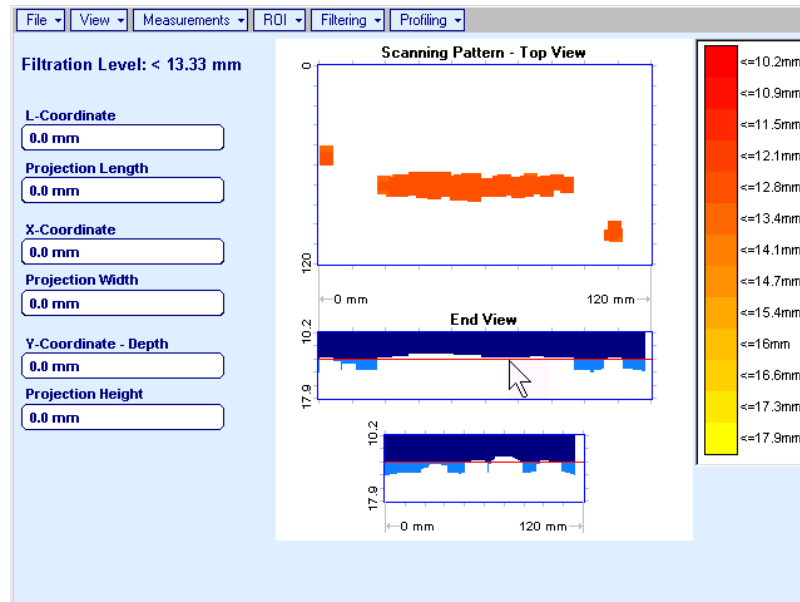
To interrupt selection of reference of **A-Scan** right mouse click or press **Esc** on keyboard

To interrupt re-adjusting of **Gain** click on  or press **Esc** on keyboard










- **Edit→Change Gain→OFF** (IOFFICE, IOFFICE 2005, and MULTIPP SW Packages for external computer)– negates **Gain** re-adjustment and returns to originally recorded **Top, Side, and End View** images and original **Gain** setting

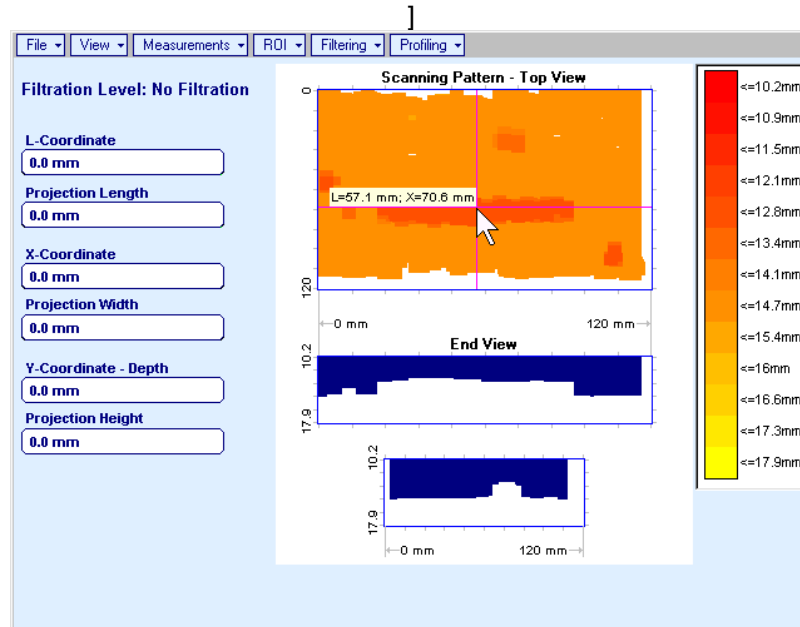
- Filtering → ON** – generates *sliding horizontal cursor* above **Side** and **End View** images, which may be controlled using either touch screen stylus or mouse or ,  on front panel keyboard or ,  on external keyboard. Position of the *sliding horizontal cursor* determines **Distance Filtration Level**, which is appropriately indicated. All elements of **Top**, **Side**, and **End View** images related to distances exceeding **Distance Filtration Level** are suppressed

To interrupt filtering procedure right mouse click or press  on front panel keyboard or **Esc** on external keyboard



- Filtering → OFF** – returns to originally recorded **Top**, **Side**, and **End View** images

- Profiling → ON** – generates *sliding horizontal and vertical cursors* above **Top View**, which may be controlled using either touch screen stylus or mouse or , , ,  on front panel keyboard or , , ,  on external keyboard. Positions of both *sliding cursors* are appropriately indicated in the **Profiling** box. Horizontal cursor determines sectional cut (vertical slice) represented as **Side View** image; vertical cursor determines sectional cut (vertical slice) represented as **End View** image
- To interrupt profiling procedure right mouse click or press  on front panel keyboard or **Esc** on external keyboard



- Profiling → OFF** – returns to global **Top**, **Side**, and **End View** images

11. Dual Channel TOFD preamplifier

SA 80442 Fixed Gain Dual Channel Preamplifier Package from Sonotron NDT improves long cable connection to ultrasonic probes, which may be required in NDT practice very often. Typical applications are TOFD, Corrosion Detection, and the like implemented through use of probes fitted into the scanner / crawler frame



Technical Data:

Independent Channels	2
Frequency Band	0.2...25 MHz at -3 dB
Advanced Low Noise Design	34 nV peak to peak input referred to 20 dB gain / 25 MHz bandwidth
Gain	20 dB
Output Impedance	50 Ω
Output Driving Capacity – Cable Length	≤ 30 m
Terminals	Input 2 X LEMO 00 Output 2 X LEMO 01
Power	4 X Dry Alkaline Batteries AA Size
Flashing LED Indicators	Channel 1 Switch ON Channel 2 Switch ON Low Battery
Housing	Sealed IP 67 Rugged Aluminum Case
Dimensions	62 X 30 X 112 mm (2.44 X 1.18 X 4.4 “)
Weight	320 g (0.7 lbs)

