



# ISONIC PA AUT

Platform for Automatic Ultrasonic Phased Array, TOFD,  
and Conventional Pulse Echo Inspection



- Up to 256 channels for connection of phased array probes
- Up to 32 channels for connection of conventional probes for pulse echo and TOFD inspection
- Parallel A/D conversion and on-the-fly digital phasing and superimposing of phased array elements signals
- Free setting of emitting and receiving aperture accumulating up to 256 elements each
- Controlled by remote computer through Ethernet
- Easy-to-follow ray tracing, calibration, and strip chart forming wizard
- Real time strip chart recording and presentation with complete capturing of raw data A-Scans
- Rugged IP 67 case mountable on scanner or tractor - no need in long bulky umbilical for probes connection
- Coordinate encoder input
- Motor powering and control port



## Sonotron NDT

Pekris st., Rabin Science Park 76702, Rehovot, Israel  
Phone: +972-(0)8-9311000 Fax: +972-(0)8-9477712  
[www.sonotronndt.com](http://www.sonotronndt.com)



## Advanced NDT Limited

Unit 4 Elgar Business Centre  
Moseley Road  
Hallow, Worcester  
WR2 6NJ, England  
Tel: 01905 371460

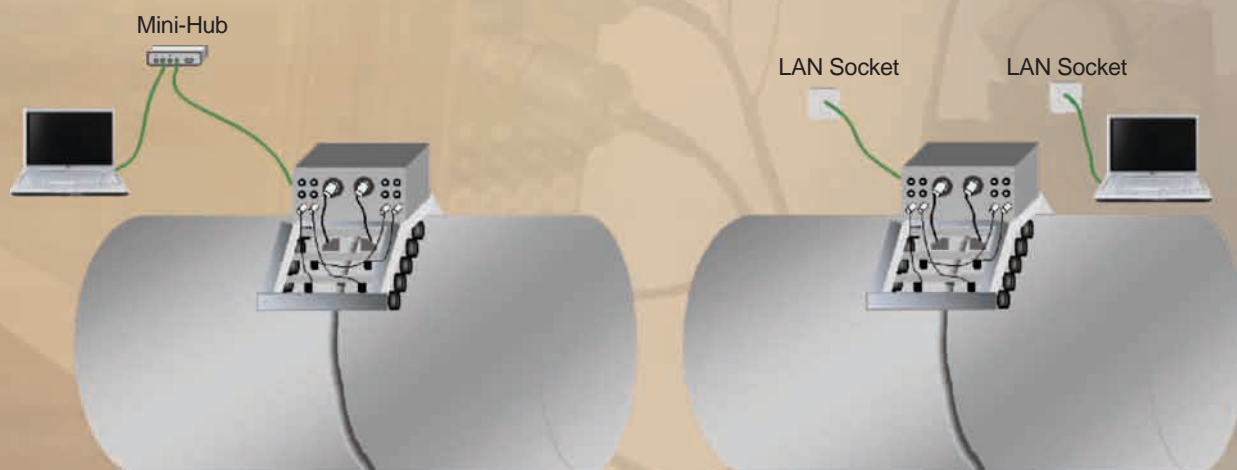
Web: [www.advanced-ndt.co.uk](http://www.advanced-ndt.co.uk)  
Email: [sales@advanced-ndt.co.uk](mailto:sales@advanced-ndt.co.uk)

## Innovative Architecture

Conventional Windows XP or Vista remote computer controls **ISONIC PA AUT Platform** through Ethernet



Connection to remote computer may be provided by means of Ethernet crossover cable, or through mini-hub or local network or Internet



Thanks to innovative architecture there is no need in bulky long umbilical for probes connection. Each probe is plugged into appropriate socket of **ISONIC PA AUT Platform** using short cable – this significantly increases signal to noise ratio and simplifies placing / removal of scanner or tractor onto / from object under test and scanning as well

**ISONIC PA AUT Platform** is available in various configurations combining **64, 128, or 256** channels for phased array probes and **0, 8, 16, or 32** channels for conventional probes, for example:

- **ISONIC PA AUT 64/0** – 64 channels for phased array probes, no channels for conventional probes
- **ISONIC PA AUT 128/8** – 128 channels for phased array probes, 8 channels for conventional probes
- **ISONIC PA AUT 256/32** – 256 channels for phased array probes, 32 channels for conventional probes
- etc

**ISONIC PA AUT Platform** is free of overheating and does not require cooling circuit



## Versatile Software

### Generic Software Package For Integrators and Users Creating Proprietary Inspection Applications:

**Generic Software Package** includes:

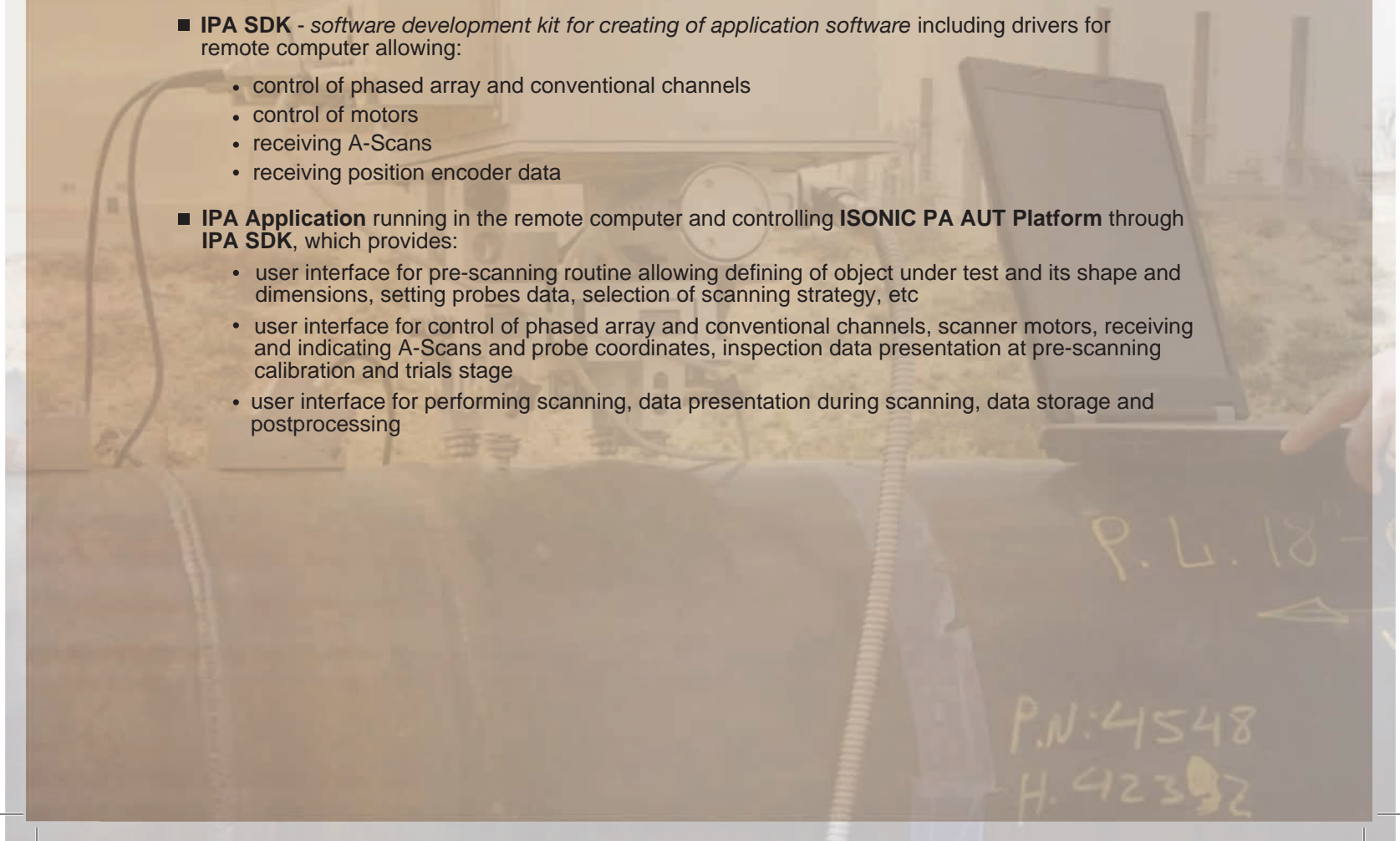
- **IPA Service** running in the *on-board satellite computer* of **ISONIC PA AUT Platform** and providing:
  - execution of commands for managing electronics and scanner motors received from remote computer
  - transmission of A-Scan and corresponding position encoder data to remote computer
- **IPA SDK** - *software development kit for creating of application software* including drivers for remote computer allowing:
  - control of phased array and conventional channels
  - control of motors
  - receiving A-Scans
  - receiving position encoder data

Examples of source code utilizing drivers of **IPA SDK** are included into delivery package

### Application Software Packages For Users Dealing With Practical Inspections

Each **Application Software Package** includes:

- **IPA Service** running in the *on-board satellite computer* of **ISONIC PA AUT Platform** and providing:
  - execution of commands for managing electronics and scanner motors received from remote computer
  - transmission of A-Scan and corresponding position encoder data to remote computer
- **IPA SDK** - *software development kit for creating of application software* including drivers for remote computer allowing:
  - control of phased array and conventional channels
  - control of motors
  - receiving A-Scans
  - receiving position encoder data
- **IPA Application** running in the remote computer and controlling **ISONIC PA AUT Platform** through **IPA SDK**, which provides:
  - user interface for pre-scanning routine allowing defining of object under test and its shape and dimensions, setting probes data, selection of scanning strategy, etc
  - user interface for control of phased array and conventional channels, scanner motors, receiving and indicating A-Scans and probe coordinates, inspection data presentation at pre-scanning calibration and trials stage
  - user interface for performing scanning, data presentation during scanning, data storage and postprocessing

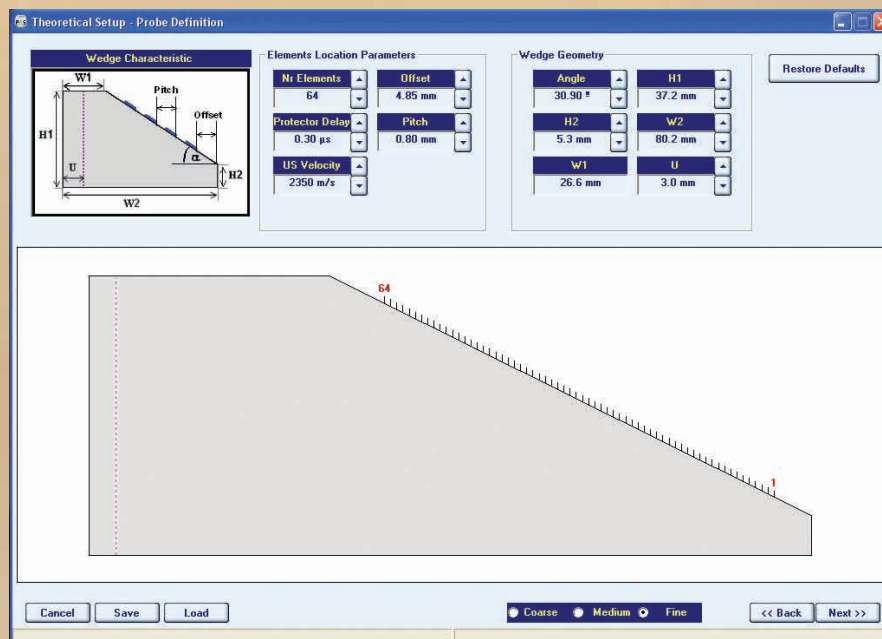


## Example of Application SW Package – ASME 2235-9 Code Case Compatible Automatic Ultrasonic Inspection of Girth Welds

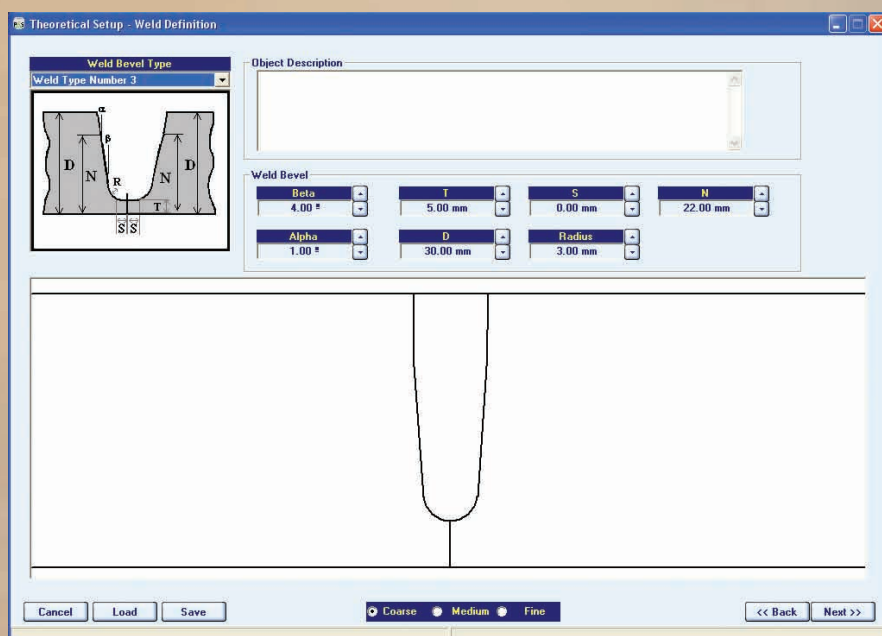
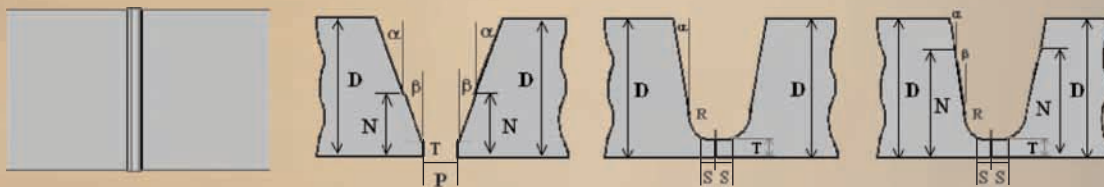
### Pre-scanning Routine – Stage 1: Theoretical Setup Wizard

**Theoretical Setup Wizard** guides through:

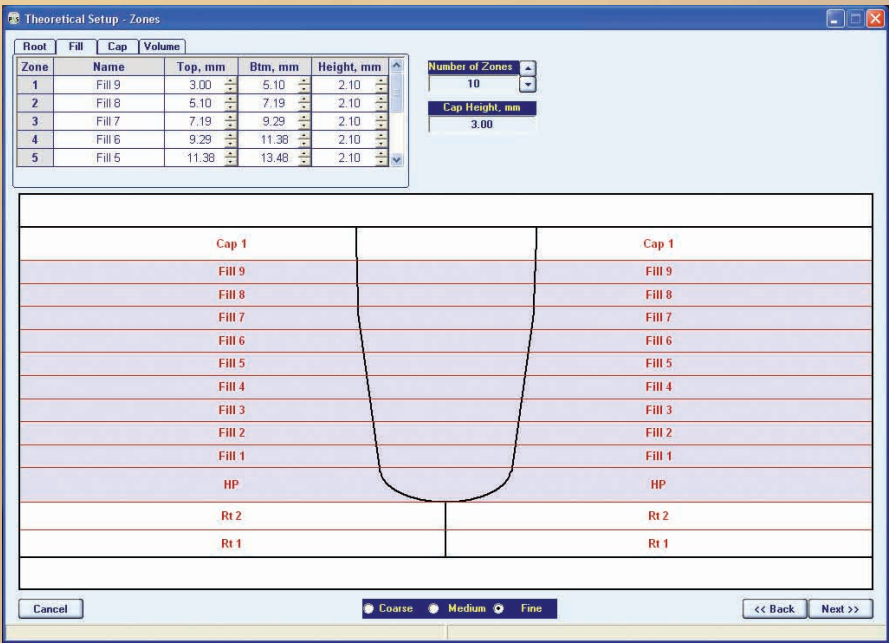
- *Phased Array Probe Definition* screen for keying in parameters of phased array probes and wedges, which are necessary for beam steering and focusing



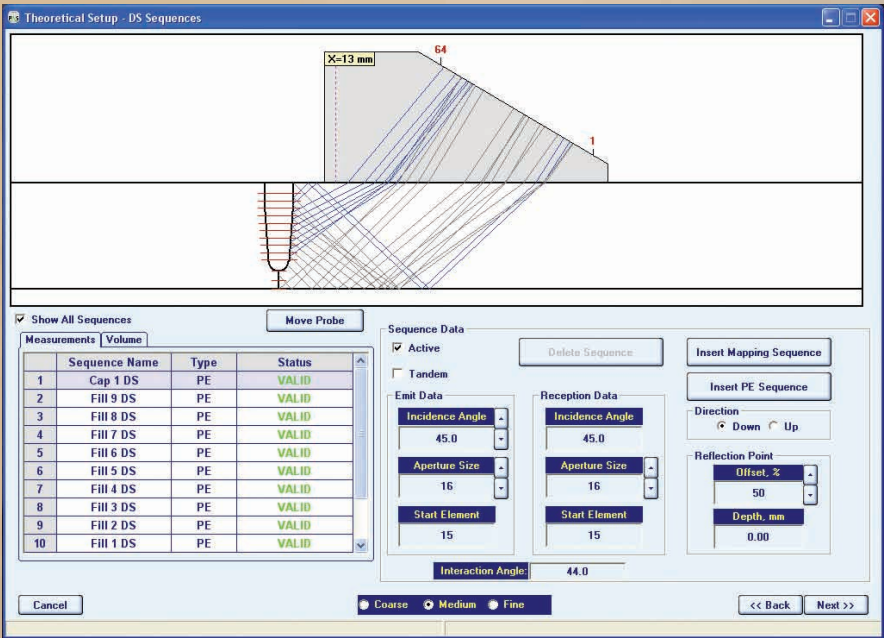
- *Weld Definition* screen for selection of appropriate weld bevel from data base and keying in related geometry and dimensions data



- *Zones Definition* screen for "slicing" of weld volume, cap, and root into zones to be insonified in each qualified position of phased array probe:



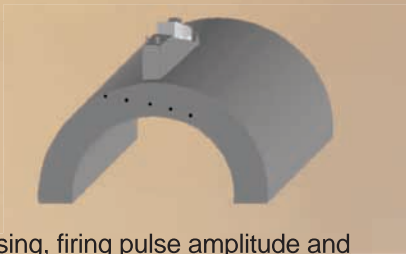
- *Ray Tracing* screen for determining of zone-by-zone insonification scheme (pulse echo or tandem; incidence angles; emitting and receiving aperture; focal distance) and appropriate positions for phased array probes from both sides of the weld



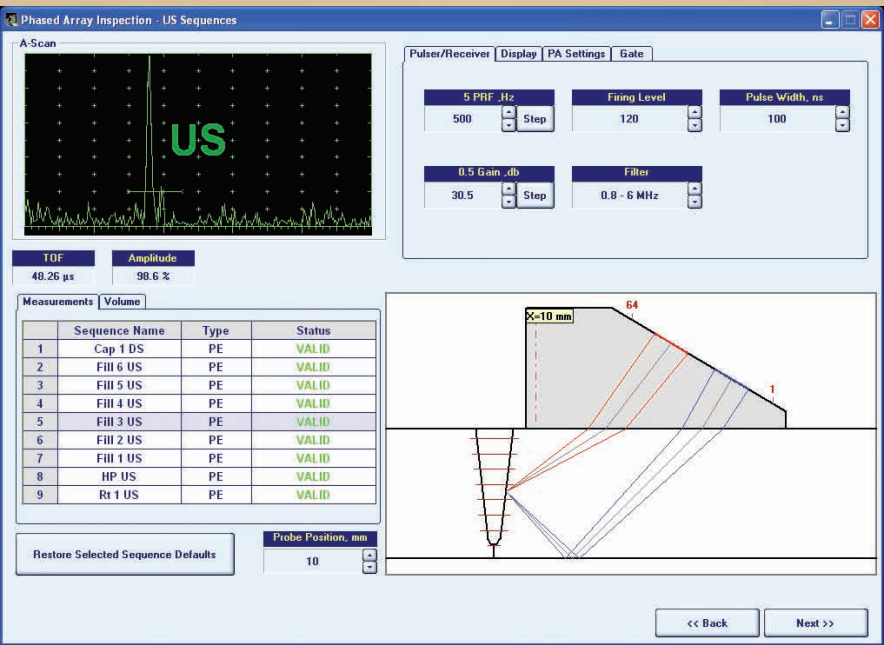
*Theoretical Setup* file is created upon completion of wizard as described and used for further setting of phased array channels

## Pre-scanning Routine – Stage 2: Ultrasonic Setup Wizard

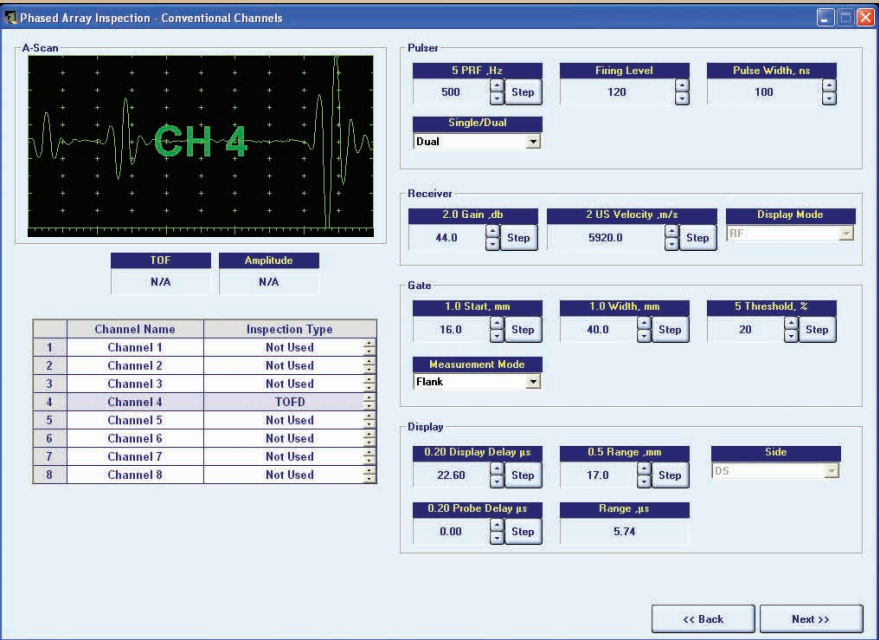
*Ultrasonic Setup Wizard* runs in the remote computer linked to **ISONIC PA AUT Platform**. At that stage phased array, conventional pulse echo, and TOFD probes connected to **ISONIC PA AUT Platform** are manipulated over appropriate test blocks in order to provide settings ensuring detection of variously located and oriented reference reflectors. *Ultrasonic Setup Wizard* guides through:



- *Phased Array Settings* screens for calibration of firing / receiving aperture and phasing, firing pulse amplitude and duration, gain, gates, etc. for each inspection zone designated for phased array probes located from both sides of the weld - downstream (DS) and upstream (US) positions



- *Conventional and TOFD Probes Channels Settings* screen for calibration of firing pulse amplitude and duration, gain, etc according to inspection schemes to be implemented

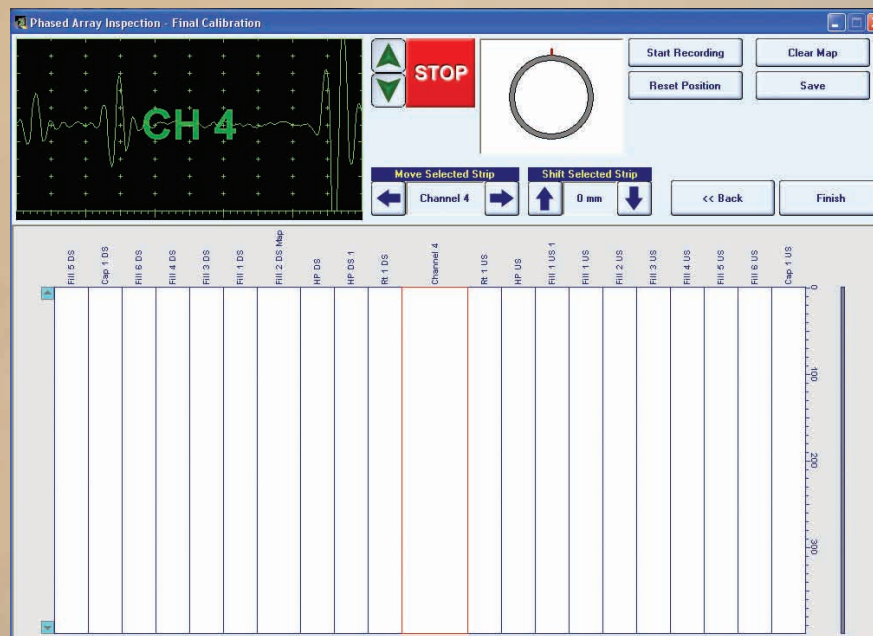




■ *Settings Coupling Monitors for Phased Array and Conventional Channels screens*



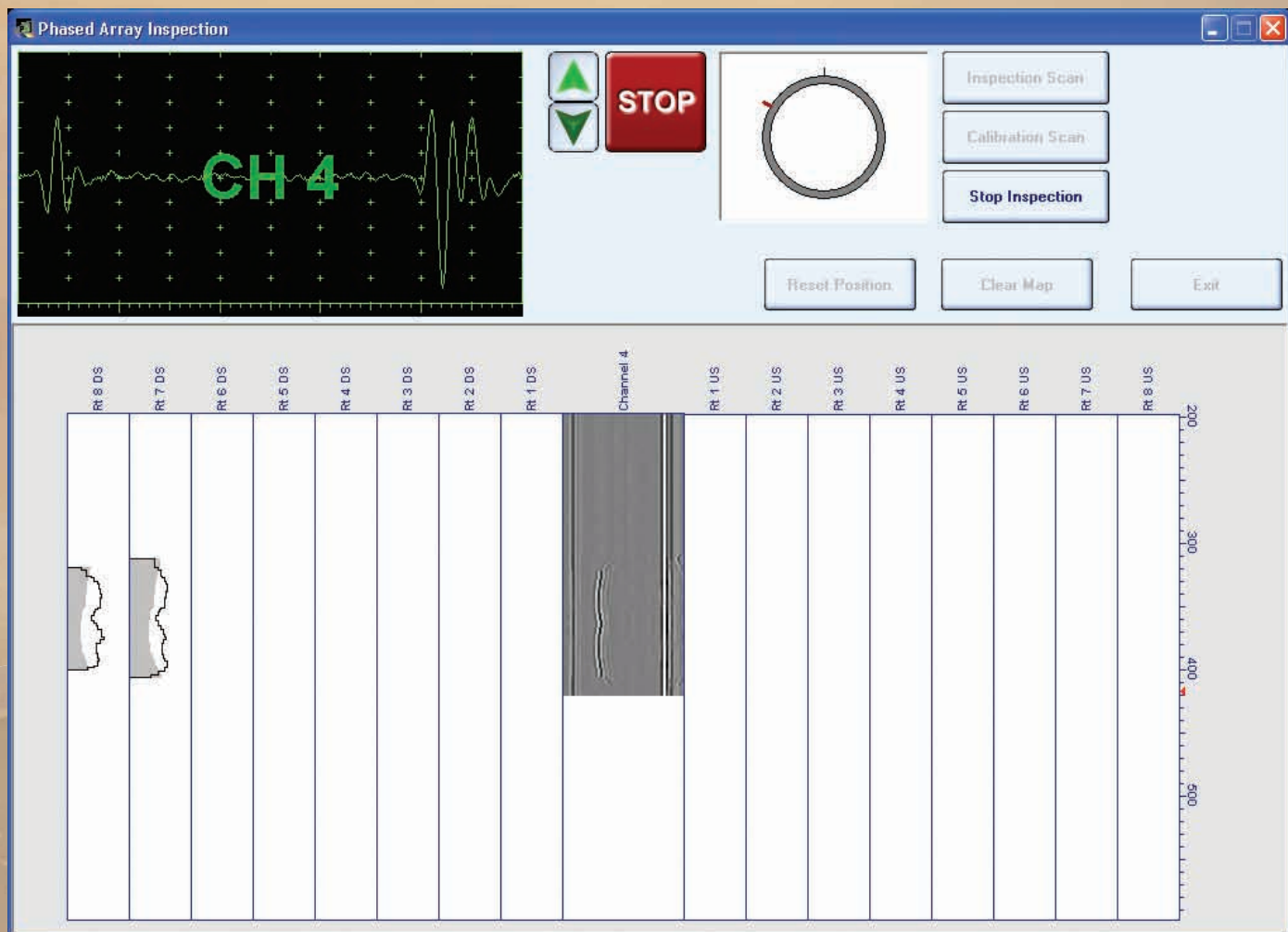
■ *Strip Chart Configuration* screen for selecting horizontal position of each strip and vertical alignment of strips according to probes positioning along the weld. It is possible to perform scanning of calibration block with generating of reference strip chart record and further analysis of captured signals



*Ultrasonic Setup Wizard* is finished with creation of complete Inspection Setup File; inspection becomes possible at any moment after said file is uploaded into scanning routine

## Scanning

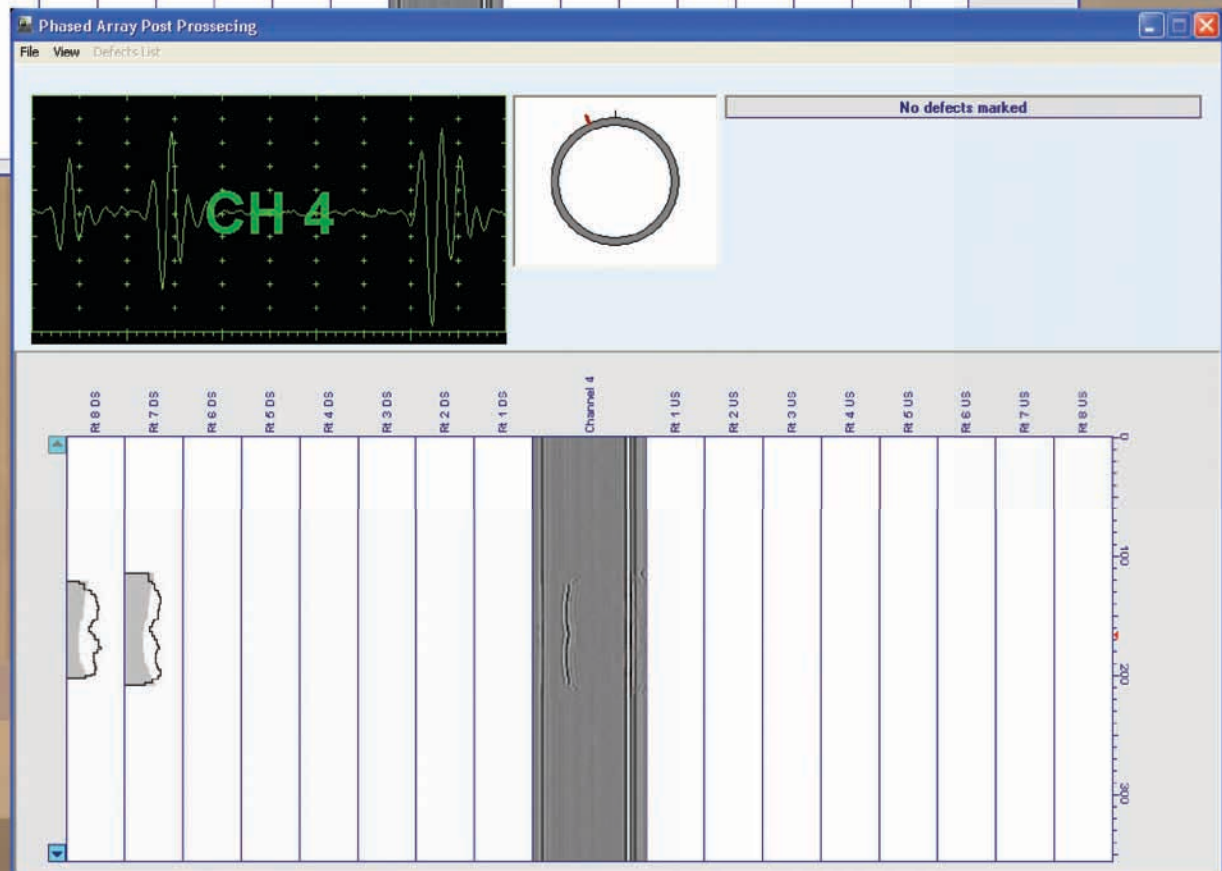
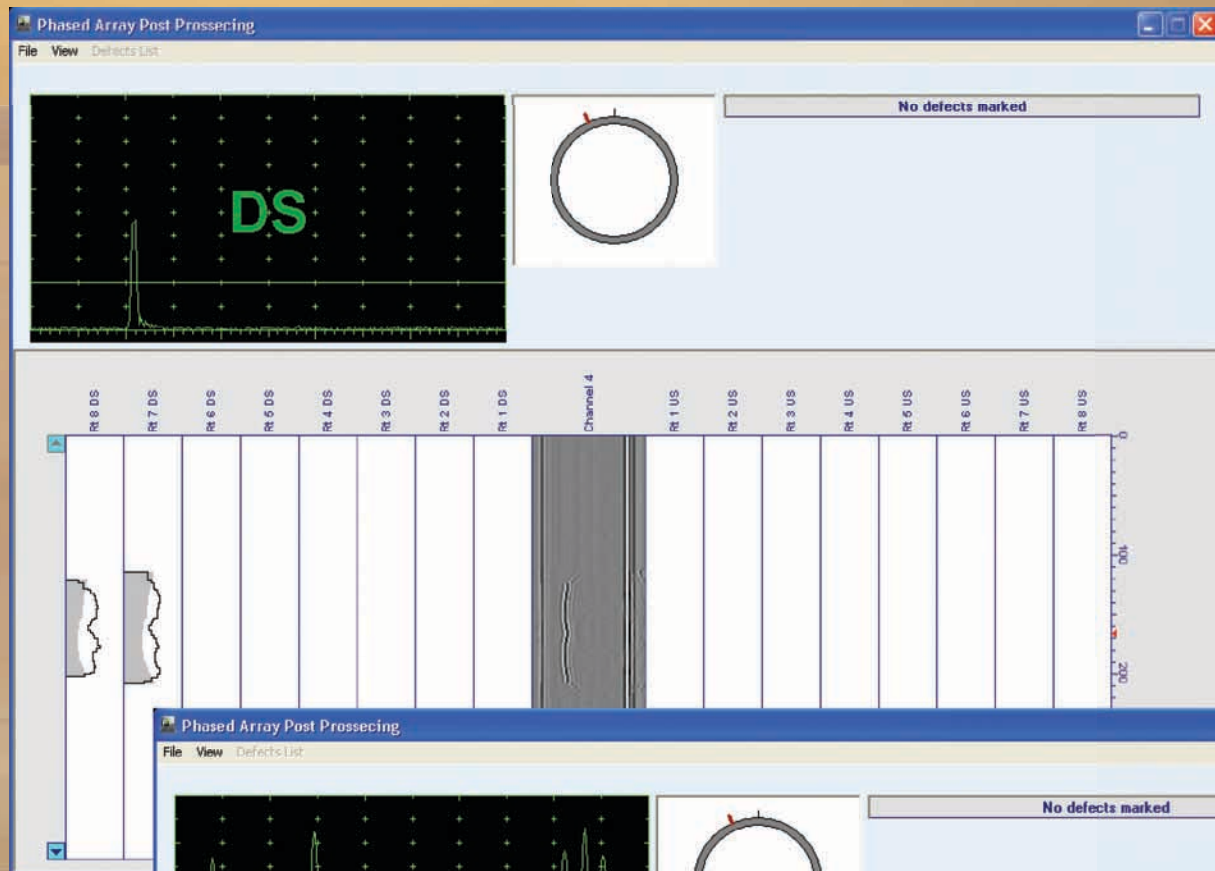
Whilst scanning the superimposed A-Scan data obtained by phased array probes for each zone and A-Scan data captured by conventional pulse echo and TOFD probes is transferred to remote computer along with corresponding coordinates. Remote computer provides on line raw data recording and strip chart imaging accompanied with presentation of position of scanner on the weld. Operator may monitor live A-Scans for any strip. Inspection results file compressing all raw data is created automatically on completion of scanning





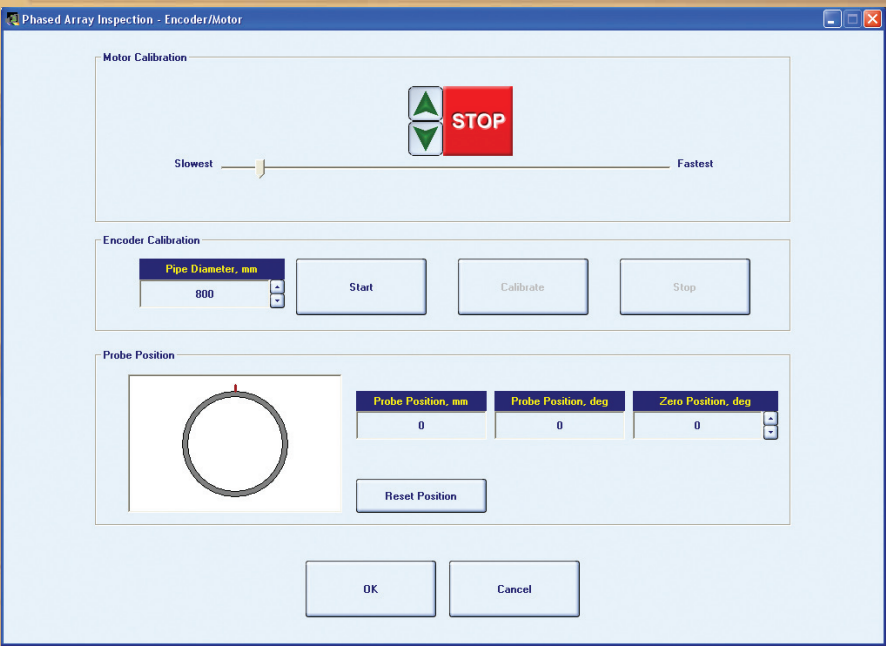
## Postprocessing

At postprocessing stage it is possible to play back all captured A-scan and to proceed with defects marking, sizing, and evaluation

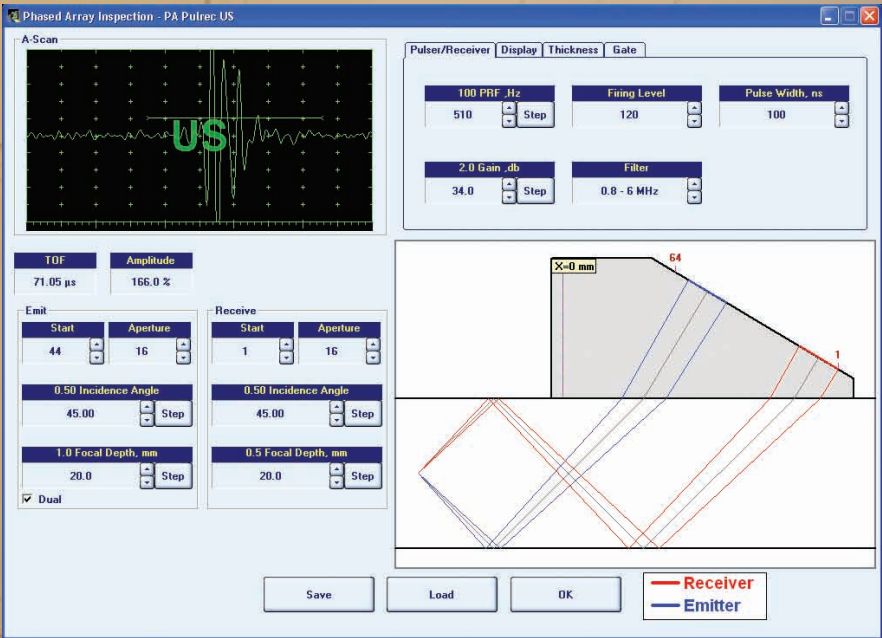


### Service Functions

- Motor setting and encoder calibration is performed in dialogue mode through simple user interface

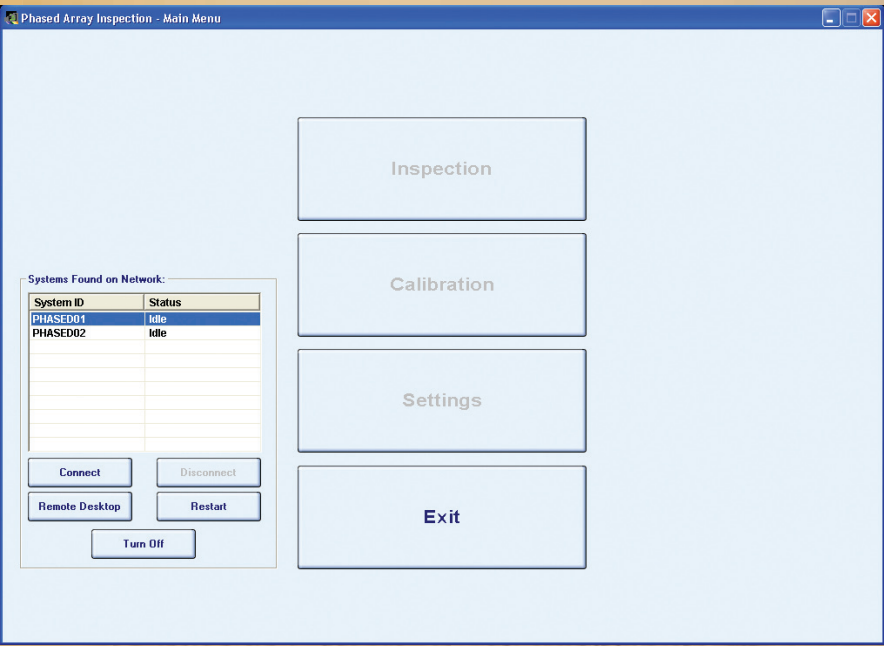


- Each probe either phased array, conventional pulse echo, or TOFD may be driven independently through appropriate pulser receiver. This feature is very useful for various purposes such as verification of wedges, studying of phased array focusing effects, etc



## Multiple Units Operation

Several **ISONIC PA AUT** platforms may be operated from one remote computer



## Typical Scope of Supply

#	Item	Note
1.	<b>ISONIC PA AUT</b> electronics configured according to scope of inspections	
2.	Power supply	
3.	Application software packages according to scope of inspections	
4.	Set of fixtures and cables	
5.	Laptop computer	Non-mandatory for purchase from Sonotron NDT; laptop computer from any vendor may be used
6.	Phased Array probes and wedges according to scope of inspections	Non-mandatory for purchase from Sonotron NDT; Phased array probes and wedges from any vendor may be used
7.	Probes for conventional pulse echo and TOFD inspection	Non-mandatory for purchase from Sonotron NDT; Probes from any vendor may be used
8.	Manual our automatic scanner or tractor equipped with position encoder	Non-mandatory for purchase from Sonotron NDT; Scanners from any vendor may be used



## Technical Data (Typical)

### Single Pulsar Receiver Channel for Phased Array and Conventional Pulse Echo and TOFD Probes

Pulse Type:	Bipolar Square Wave
Initial Transition:	$\leq 7.5$ ns (10-90% for rising edges / 90-10% for falling edges)
Pulse Amplitude:	Smoothly tunable (12 levels) 50V ... 300 V peak to peak into 50 $\Omega$
Half Wave Pulse Duration:	10...600 ns independently controllable in 10 ns step
Modes (for conventional pulse echo and TOFD probes channels only):	Single / Dual
PRF:	10...5000 Hz controllable in 1 Hz resolution
Gain:	0...110 dB controllable in 0.5 dB resolution
Advanced Low Noise Design:	85 $\mu$ V peak to peak input referred to 80 dB gain / 25 MHz bandwidth
Frequency Band:	0.2 ... 25 MHz Wide Band

### Firing of phased array probes

Phasing	0...100 $\mu$ s with 5 ns resolution
Emitting aperture	1...64 / 128 / 256 - depending on total number of channels for phased array probes

### A/D Conversion and DSP

A/D Conversion	Parallel 100 MHz 16 bit
Phasing of signals received by phased array channels	On-the-fly 0...100 $\mu$ s with 5 ns resolution
Superimposing of signals received by phased array channels	On-the-fly
Receiving Aperture	1...64 / 128 / 256 - depending on total number of channels for phased array probes
Digital Filters (for phased array and conventional pulse echo and TOFD channels)	32-Taps FIR band pass with controllable lower and upper frequency limits

### On-board satellite computer

CPU:	AMD LX 800 - 500MHz
RAM:	512 Megabytes
Internal Flash Memory - Quasi HDD:	4 Gigabytes
Interface:	Ethernet
Operating System:	Windows™XP Embedded

### Other

Housing:	IP 67 rugged aluminum case mountable on scanner or tractor
Encoder interface:	Incremental TTL encoder
Motor Control Output:	DC powering / RS 232 control - stepped motor



#### Advanced NDT Limited

Unit 4 Elgar Business Centre  
Moseley Road  
Hallow, Worcester  
WR2 6NJ, England  
Tel: 01905 371460

Web: [www.advanced-ndt.co.uk](http://www.advanced-ndt.co.uk)  
Email: [sales@advanced-ndt.co.uk](mailto:sales@advanced-ndt.co.uk)