

UD2N-PM

Ultrasonic Flow Detector

Operating Manual

Important Notice

Please read the following information prior to use of any ultrasonic Kropus instrument.

General Warning

The correct and effective use of ultrasonic test equipment requires the interaction of three essential factors:

- The test equipment itself
- The specific test applications
- The operator

The principal purpose of this operating manual will be to give instructions in the basic set-up and functional operation of the test equipment. Other variable factors are the responsibility of the customer/user. Details regarding these factors are beyond the scope of the operating manual.

Ultrasonic Theory

Basic conceptions of soundwave propagation theory, including the effects of sound velocity, attenuation, reflection, refraction and the limitation of the sound beam must be understood by the operator.

Training

The customer must provide for adequate training of the operators to assure competence in the operation of the equipment and in the associated factors. The operator must be trained both in general ultrasonic testing procedure and in the set-up and performance of a particular test or application.

Test Application Requirements

Customer engineers should supply specific test application requirements to the operator. These requirements include a definition of the test problem, selection of suitable techniques, adequate probes, evaluation of discovered conditions in the test material, and the selection of acceptance or rejection limits.

Coverage and Location of Test

Selection of test locations and degree of coverage of the part, is based on customer knowledge of expected defective areas, material being tested, environment and similar factors.

Flaw Size Evaluation

There are, basically, two methods of assessing flaws.

- **Flaw Boundary Method:** If the diameter of the sound beam is smaller than the spread of the flaw, then the beam can be used to search the flaw boundaries to determine its area. The smaller the diameter of the sound beam, the more accurately the boundaries can be determined. If, however, the sound beam is relatively broad, the flaw area determination can differ from the actual.
- **Echo Comparison Method:** If the diameter of the sound beam is greater than the spread of the flaw, the maximum echo response from the flaw must be compared with the maximum echo response from an artificial flaw provided for comparison purposes. The echo from a small natural flaw is usually smaller than the echo from an artificial comparison flaw of the same size. This fact due to indirect orientation or irregular shape of the flaw surface, and should be considered when evaluating flaw size to avoid underestimating size.

Specifications and Procedures

The customer must understand and provide for interpretation and compliance with the specifications covering its work, generated by such groups as in-house Quality Assurance, Technical Societies, Industry Groups, or Government Agencies.

Ultrasonic Thickness Measurements

Ultrasonic thickness measurements are the result of the mathematical product of the velocity of sound in a material and the transit time of the soundwaves through the material. The transit time is the data obtained by the ultrasonic equipment.

Velocity of Sound

The accuracy of ultrasonic thickness measurements and of flaw location depends to a major degree on the velocity of sound through the material. This velocity value is dependent mainly from physical characteristics of test material and its temperature. Any non-uniformity of sound velocity in the test material may result in erroneous thickness measurements.

Temperature Dependence

Velocity of sound is affected to varying degrees by the temperature of the material. When temperature variables are expected, frequent checks must be made to maintain instrument calibration for the changing test conditions.

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1. Understanding the Keypad, Menu System, and Displays

The UD2N-PM is an ultrasonic flaw detection and thickness measurement instrument. It's capable of storing A-Scans, operating parameters, and a variety of measurement data. This chapter of manual will help you understand the menu structure and know about functions of instrument.

In this chapter, you'll learn how to

- Install Batteries in the instrument
- Power up the instrument
- Understand the function of each key on the keypad
- Access each UD2N-PM function using the built-in menu system
- Interpret the symbols that most often appear on the display
- List the features of the UD2N-PM

1.1 Battery Installation

The UD2N-PM operates on four D-size or four C-size (optional) batteries, located in the rear of the housing, or by using 9-12V AC power adapter (figure 1-1). To remove/install the battery compartment cover, use the two thumb-screws. It's recommended that you install 9.0 Ahr rechargeable NiMh (Nickel Metal Hydride) batteries but the instrument will accept alkaline and rechargeable NiCad batteries. Whichever type of batteries you install, be sure to properly align the batteries' poles as marked in the battery compartment.

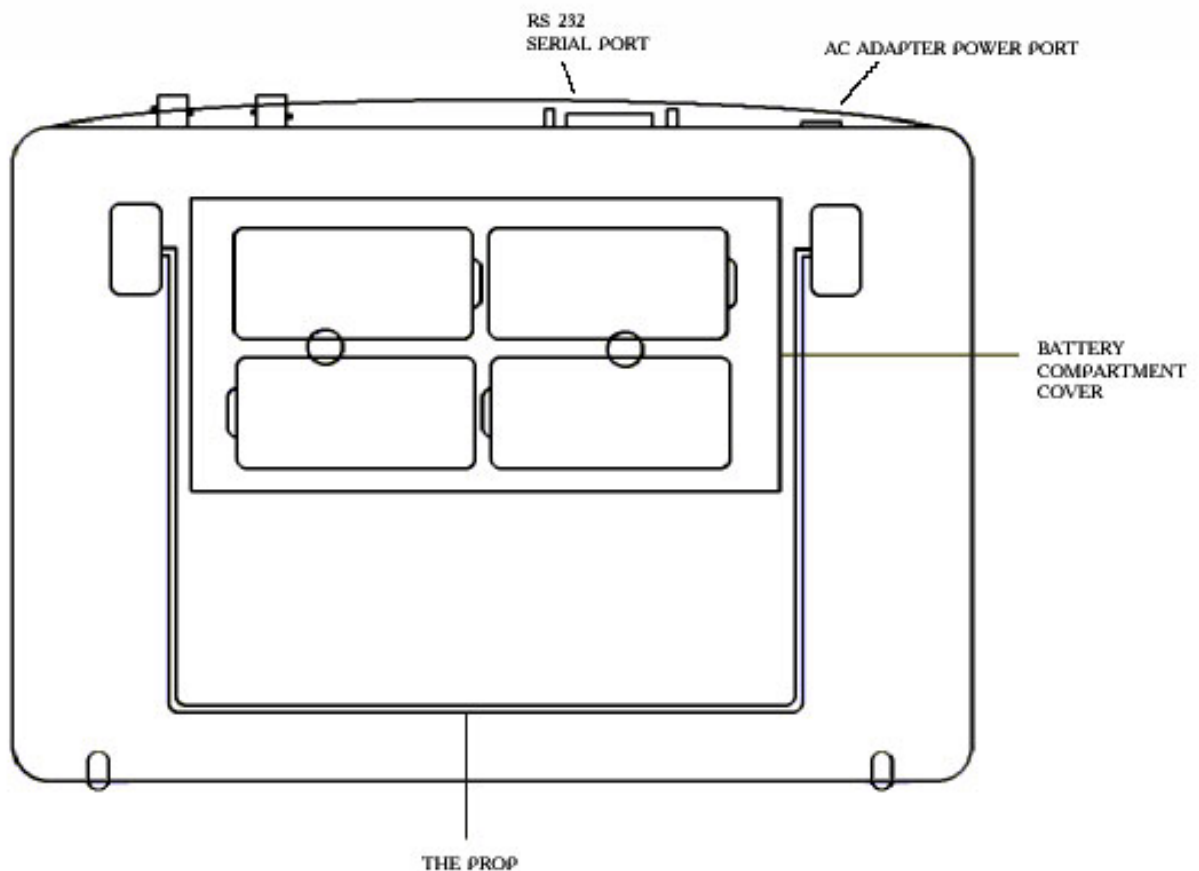



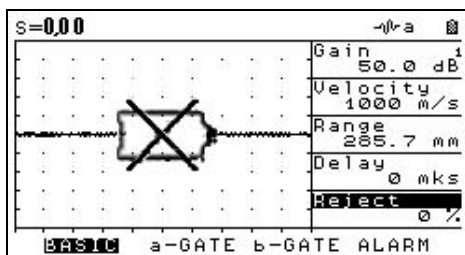
Figure 1-1 Rear view of instrument

NOTE: Your instrument was supplied with four rechargeable batteries.

To charge the batteries you need to remove the batteries from compartment cover and install into universal battery charger (optional). Refer to Charger's Operation Manual for a complete explanation of how to charge the batteries.

The approximate level of remaining battery life is visually displayed by the  icon. When fresh batteries are installed, the icon will appear as "full". As the battery life is consumed, the icon will begin to "empty."


NOTE: When batteries are too weak for reliable operation, the special symbol appears on display. If it occur, replace the batteries as soon as possible.



The UD2N-PM automatically shuts off through two minutes. Settings are saved and restored when the instrument is turned on again.

NOTE: The UD2N-PM can be operated on AC power with the AC/DC power adapter. This adapter is connected to the instrument though the Power Adapter Port shown in Figure 1-1.











1.2 Powering On and Off the Instrument

Press and hold  for three seconds to power the instrument on and off.







1.3 Keypad Features

The UD2N-PM is designed to give the user quick access to all of the instrument's functions.

To access any function:

- Press one of keys   to select a menu. The submenus across the right of the display will be immediately replaced with the submenus contained in the selected menu.
- Press a   to move through submenu
- Press  to select desired function.
- Press   to change the function value
- Press  to exit from value changing mode or press one of keys   to select another menu.

You'll also find these keys and knobs on the instrument (figure 1-2):

-  - Freeze Key freezes the A-Scan display / or enables Peak Trace mode (if Peak Trace function was activated in additional menu)
-  - Zoom-in the signal in a-gate into full size of A-Scan display / or enables Full Screen mode (if pressed together with )
-  - Copy Key, performs a data-storage
-  - Enter to additional menu (if no one function is selected) or service button.
-  - Power key turns instrument on and off

1.4 UD2N-PM Menus and Functions

The UD2N-PM menu system allows the operator to select adjust various features and instrument settings. It includes:

Main Menu - Several menus used to configure and calibrate the instrument prior to test. Also used to select pulser and receiver characteristics, position gates, set alarms, specify operating mode and screen appearance, adjust the A-Scan display, and control other significant measurement features.

Additional Menu - Allows the operator to make special adjustments like a pulser repetition frequency, change preselected speed and range values, etc.

Note: Figures 1-3 show the instrument's main menu structure. The information provided in the following manual section explains what each function does and shows how to access the function through the menu system.

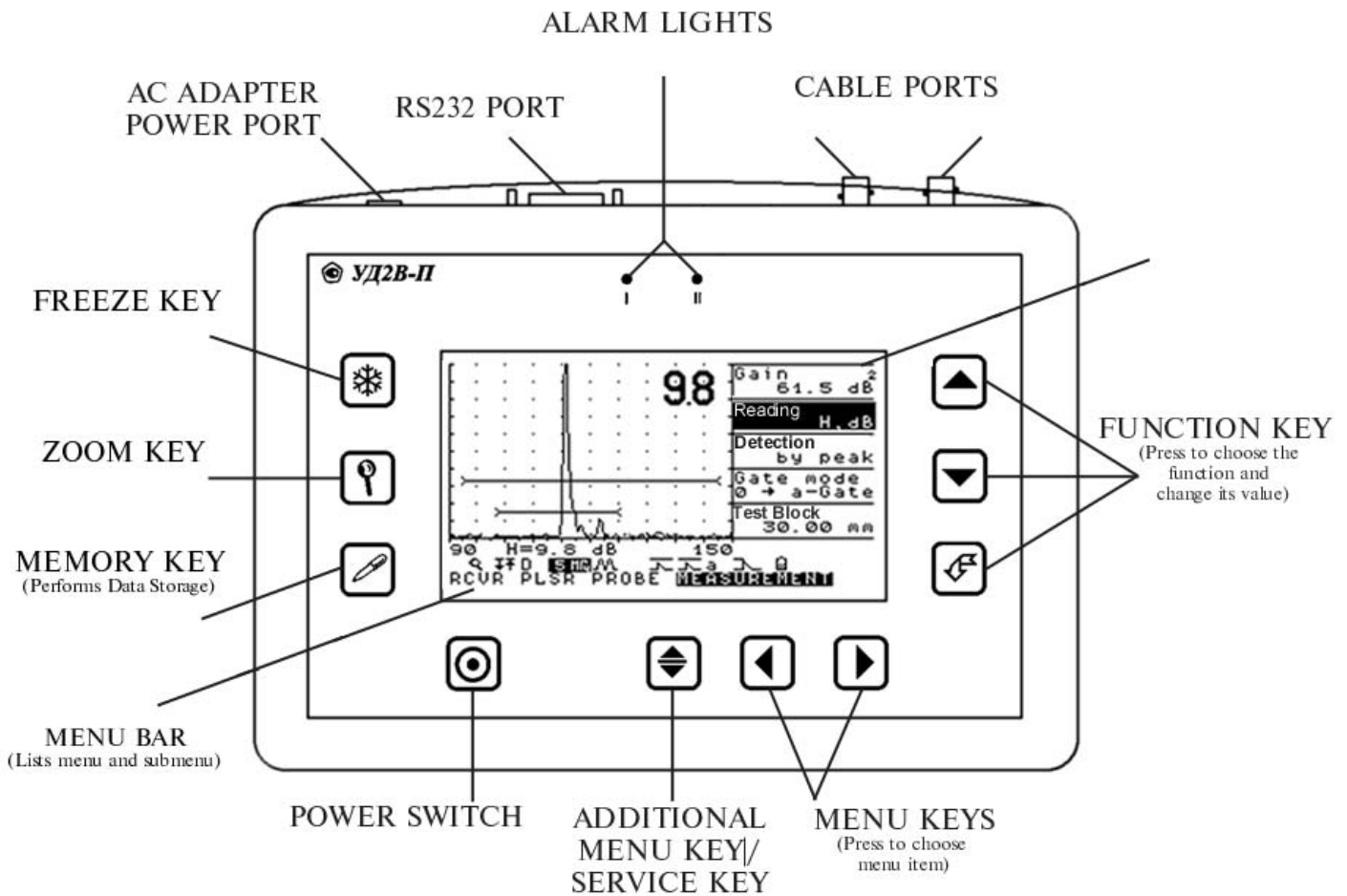


FIGURE 1-2—Some of the keypad functions are shown here.

1.4.1 Main Menu System

The UD2N-PM Main Menu System consists of several submenus, and functions.

Then no one function is selected:

- To move through menu items use ◀ ▶ buttons
- To move through submenu items (functions) use ▲ ▼ buttons
- To select function press ⬡
- To enter in additional menu press ⬢

Then function is selected:

- To change function value use ▲ ▼ buttons
- To access additional function values press ⬢ (not for all functions, see 1.4.2)
- To deselect function press ⬡
- To move to another menu items use ◀ ▶

Note: GAIN function is present i all submenus. To change a GAN step press ⬢ then function is active. Steps may set : 0,5 dB; 1 dB; 2 dB; 6 dB.



Main Menu	Functions			
BASIC	Velocity	Range	Delay	Reject
a-GATE	a- Thresh	a- Start	a- Width	a- Logic
b-GATE	b-Thresh	b- Start	b- Width	b- Logic
ALARMS	Mode	Horn	Led	
RCVR	Rectify	Digit Flt	Analog Flt	
PLSR	Frequency	Periods		
MEASUREMENT	Reading	Detection	Gate Mode	Delay
VELOCITY	Distance	Min vel.	Max vel.	
DISPLAY	Contrast*	Brightness	a-Magnify	
RESULTS	File	Save Result	Preview File	Clear File
SETTINGS	Load Setting	Save Setting	Load Work Setting	

* Function is available only in instrument with LCD display.

Figure 1-3 These functions are accessed through the Main Menu

MAIN MENU:

BASIC submenu:

- **VELOCITY** – allows the user to input a velocity of the sound. Pressing  button then the function is active let to choose one of the four preselected values.
- **RANGE** - Adjusts the range of the display screen (from 16mks to 2000mks for 1250 freq range, or from 80mks to 10 000mks for 250kHz freq range). Pressing  button then the function is active choose one of the four preselected values.
- **DELAY** - —Shifts the A-Scan viewing window to the left or right.
- **REJECT** - Determines what percentage of the A-Scan height is displayed at 0% full screen height.

A-GATE submenu:

- **A-THRESH** - Sets the height of the a- gate
- **A-START** - Sets the beginning position of the a- gate on the A-scan
- **A-WIDTH** - Sets the width of the a-gate on the A-Scan
- **A-LOGIC** - Determines whether the gate alarm is triggered when a signal crosses the gate or does not cross the gate

B-GATE submenu:

- **B-THRESHOLD** - Sets the height of the b- gate
- **B-START** - Sets the beginning position of the b- gate on the A-scan
- **B-WIDTH** - Sets the width of the b-gate on the A-Scan
- **B-LOGIC** - Determines whether the gate alarm is triggered when a signal crosses the gate or does not cross the gate

RECEIVER submenu:

- **FREQ** – Selects the bandwidth of the instrument.
- **ANALOG FLT** – On and Off analog filter
- **DIGIT FLT** – Change digital filter
- **RECTIFY** – Selects the rectification mode which effects how the A-Scan appears on the display

MEASURE submenu:

- **READING** - Selects the measurement displayed in Reading Box
- **DETECTION** – Selects whether an A-Scan echo's flank, or peak is evaluated by the gate
- **GATE MODE** – Selects time calculation mode: from IP to a-gate, or between a- and b-gates.
- **DELAY**- Sets the probe delay

DISPLAY submenu:

- **CONTRAST** - Allows to change the display's contrast from 0 to 100% (only for LCD display)
- **BRIGHTNESS** – Allows to change the display's brightness from 0 to 100%
- **A-GATE MAGNIFY** – Allows user to magnify a-gate to full screen size

SETTINGS submenu:

- **LOAD SETTING** - Loads the settings
- **SAVE SETTING** – Saves the settings
- **LOAD WORK SETTING**– Load working setting (setting which loading then instrument turning on)

ALARMS submenu:

- **MODE** - Determines whether the alarm is triggered when a signal is only in a-gate, only in b-gate, both in a- and b-gate, though in one of the a- or b –gate or by DAC.
- **HORN** - Enables the audible warning alarm (horn)
- **LED** - Enables the visible warning alarm

PULSER submenu:

- **DAMPING** – On and off pulser damping (50 Ohm)
- **IP WIDTH** – Changes the initial pulse width to match the installed probe
- **INDUCTANCE** – Couple inductance in the pulser circuit to match the installed probe
- **PRF VALUE** – Displays actual Pulse Repetition Frequency

VELOCITY submenu:


- **DISTANCE** - Sets the distance for velocity calculation
- **MIN VEL** – Min gate value of velocity for alarm is triggered
- **MAX VEL**– Max gate value of velocity for alarm is triggered

RESULTS submenu:



- **FILE** - Selects one of 10 data files
- **SAVE RESULT** – Saves the measurement value in selected file
- **PREVIEW FILE**– Allows user to review selected file
- **CLEAN FILE**- Deletes the selected file


1.4.2 Additional Menu System

Additional Menu consist of those functions, which frequent use are not necessary.

To enter in additional menu press  then no one function in submenus is selected.

To use the additional menu:

Press   - to navigate through menu and to change function value, then function is selected.

Press  - to select/deselect function

Press  - to exit from additional menu













FUNCTIONS	FUNCTION DESCRIPTION
Date	Day . Month . Year Sets the current date
Time	Hours : Minutes : Seconds Sets the current time
Freq range	to 250 kHz / to 1250 kHz Select the maximum frequency range to set maximum display range 10 000 mks (for 250 kHz) or 1 000 mks (for 1250kHz)
Test Mode	ECHO / TX-RX Select the control technique – echo method or using two probes on opposite sides of test piece
Filling	ON / OFF Turns on and off A-signal filling (except RF rectification)
Grid	ON / OFF Turns Coordinate Grid on and off
Reference A, dBc	Input reference amplitude value – for "A, dBc" measurement mode.
Velocity 1	Input 1-st preselected velocity value
Velocity 2	Input 2-nd preselected velocity value
Velocity 3	Input 3-d preselected velocity value
Velocity 4	Input 4-th preselected velocity value
Range 1	Input 1-st preselected range value.
Range 2	Input 2-nd preselected range value
Range 3	Input 3-d preselected range value
Range 4	Input 4-th preselected range value
Test Frequency	Special function for metrological checkup. Send impulses to pulser cable port with 20 KHz frequency

1.5 Display Screen Features

The UD2N-PM displays are designed to be easy to interpret. Display includes active A-scan, main menu system, numerical measurement results and special graphical icons.

Definition of Display Icons

There are several graphical features (icons) which appear in the display screen's icon bar for various reasons.

	- Freeze mode has been activated: by  pressing button or loading A-scan from settings;
	- full rectification mode
	- negative halfwave rectification mode
	- positive halfwave rectification mode
	- radio signal (without rectification)
	- alarm mode: a-gate
	- alarm mode: b-gate
	- alarm mode: a-gate AND b-gate
	- alarm mode: a-gate OR b-gate
	- alarm mode: V – mode
	-A-gate magnify mode has been turned on

1.6 Features of the UD2N-PM

- LCD or ELD (optional) Display 240 x 128 pixels with “Analog Look” echo dynamics
- Weighs only 2,5 kg including standard D-size batteries for convenient use anywhere
- Two independent flaw gates to handle a wide range of applications
- 20KHz to 1,25 MHz capability with selectable frequency to match probe for optimum performance
- 25 Hz PRF (pulse repetition frequency)
- Eight hours of use on standard D-size 7 Ahr NiMH batteries for the instrument with LCD and full display backlight (AC adapter for bench-top use)
- RF rectification for phase inversion and thin measurement application
- dB step function with four gain steps
- Storage of 750 test reports with A-scan, measurement data, name, date and time of saving
- Memory for 100 settings with A-scan
- Special alarm mode (V-mode) with MIN and MAX selectable speed values
- 10 000mks display range

2. Set Up and Calibration of the UD2N-PM




This chapter explains how to prepare your instrument for use. In this chapter, you'll learn how to :

- Set up the instrument's display and basic operating features
- Install a probe and configure the Pulser/Receiver to match the probe type
- Adjusting the A-Scan display screen's appearance
- Calibrate the instrument

Most sections in this chapter describe steps that will be followed by every user of a new instrument. For this reason, we suggest that you proceed through each section in this chapter while configuring your instrument for the first time.

2.1 Initial Instrument Setup

This part of the manual describes how to configure the UD2N-PM instrument's display and operating features. Follow these procedures to turn on the UD2N-PM and make initial adjustments to the instrument control settings. Because the instrument saves the control settings when it's turned off and restores them when it's turned on, you won't have to repeat these adjustments unless a change is required.





Turn on the UD2N-PM by pressing  for at least three seconds. The Main Menu system will appear on the screen. Navigate through menu by pressing   buttons.


2.1.1 Display Appearance



Use the procedures in this section to adjust display appearance. The adjustments will require access to the DISPLAY submenu, which is accessed from the Main Menu and also GRID and FILLING function, which are accessed from the Additional Menu.


Setting the Display Contrast (DISPLAY-CONTRAST)

**Only for LCD displays*

Step 1. Find the DISPLAY submenu by pressing   buttons and CONTRAST function in this submenu by pressing   buttons.


Step 2. Activate the CONTRAST function by pressing  on it. The function appearance will be inverse.



Step 3. Change contrast value by pressing   buttons. Settings range from 0 to 100 %.


Step 4. To De-activate function press  button

Step 5. The display contrast will remain at the level last displayed

Setting the Display Brightness (DISPLAY-BRIGHTNESS)


Step 1. Activate the Brightness function by pressing 



Step 2. Change brightness value by pressing   buttons. Settings range from 0 to 100 %.


Step 3. To De-activate function press  button

Step 4. The display brightness will remain at the level last displayed

Setting the Display Grid (Additional Menu –GRID)

Step 1. Then no one function is active, press 

Step 2. Navigate through menu by pressing   buttons







Step 3. Activate GRID function by pressing  button

Step 4. Change function value. Available values are YES or NO.

Step 5. De-activate GRID function by pressing  button

Step 6. Exit from Additional Menu by pressing  button

Setting the A-scan Style (Additional Menu – FILLING)

- Step 1. Then no one function is active, press  button
- Step 2. Navigate through menu be pressing pressing   buttons
- Step 3. Activate FILLING function be pressing  button
- Step 4. Change function value. Available values are YES or NO.
- Step 5. De-activate FILLING function by pressing  button
- Step 6. Exit from Additional Menu be pressing  button

2.2 Installing a probe

2.2.1 Connecting a probe




Very important that the instrument is properly configured to work with the installed probe. The UD2N-PM operate with one or two single-element probes or with a dual-element probe.

To install a single-element probe, connect the probe with special cable with both two ports on the top of the instrument. When two probes, or a dual-element probe is connected to the instrument, the “RECEIVE” probe connector should be installed in the left port and the “TRANSMIT” probe connector in the right port.





2.2.2 Configuring the Instrument to Match the Probe Type

Some instrument settings are directly dependent on the type of probe installed. These settings must be adjusted any time a probe of a different type is installed.







Specifying the Probe Frequency (PLSR-PULSE FREQ)

- Step 1. Activate the PULSE FREQ function by pressing  button
- Step 2. Select the central frequency (from 20-1250 kHz) to match probe by pressing   buttons.

Selecting Periods Quantity (PLSR-PERIODS)

- Step 1. Activate the PERIODS function by pressing  button
- Step 2. Select the number of periods (from 1 to 32) to match probe (for maximum signal amplitude) by pressing   buttons.
- Step 3. De-Activate the function by pressing  button

Specifying the Control Mode (Additional Menu-TEST MODE)



- Step 1. Enter to Additional Menu by pressing  button, then no one function is active.
- Step 2. Navigate through menu be pressing pressing   buttons
- Step 3. Activate CONTROL MODE function be pressing  button
- Step 4. Change function value. Available values are ECHO or TX-RX. If connected one single element probe or dual element probe set function value to ECHO. If installed two single element probes (one for transmit and one for receive to opposite testing piece sides) set function value to TX-RX.
- Note:** This function value causes influence only into time measurement results. In ECHO mode time measurement value will be divided on 2.
- Step 5. De-activate TEST MODE function by pressing  button
- Step 6. Exit from Additional Menu be pressing  button

Modifying Signal to Noise Ration by application of filters.

UD2N-PM has two types of filters : analogical filters for 50, 100, 200 and 400 kHz frequency and digital filters (200 KHz)



Turning on the analogical filter (RCVR-ANALOG FLT)

Step 1. Activate **ANALOG FLT** function in RCVR submenu by pressing  button

Step 2. Selects analogical filter by pressing   buttons.


Turning on digital filters (RCVR-DIGIT FLT)




Step 1. Activate **DIGIT FLT** function in RCVR submenu by pressing  button

Step 2. ON/OFF digital filter by pressing   buttons.

2.3 Adjusting the A-scan

2.3.1 Setting the A-Scan Range (BASIC-RANGE)

Step 1. Activate RANGE function by pressing  button

Step 2. Select one of four preselected range value by pressing  button or adjust range manually by pressing   buttons. Overall range can changes from 8 to 10000 μ sec

Step 3. The display's horizontal range will remain as set.



Note: The overall range value depends from FREQ RANGE value (in ADDITIONAL MENU).

Frequency	to 1250 kHz	to 250 kHz
Minimum range	8 μ s	40 μ s
Maximum range	2000 μ s	10 000 μ s

2.3.2 Setting the Display Delay (BASIC-DELAY)

The display delay function shifts the displayed A-Scan to the left or right. This function is used to set the UD2N-PM viewing window. To set the display delay:

Step 1. Activate DELAY function by pressing  button

Step 2. Adjust delay value pressing   buttons. Overall range can changes from 0 to 1992 μ sec (for 1250 kHz mode) or from 0 to 9992 μ sec (for 250 kHz mode).

2.3.3 Selecting a Rectification Mode (RCVR-RECTIFY)

Rectification effects the orientation of the A-scan on the display screen. The A-scan represents the sound pulse (echo) that's returned from the material being tested to the instrument. The series of echoes looks like the Radio Frequency (RF) signal. Note that the RF signal has a negative component below the axis, and a positive component above the axis. In RF mode, the A-gate and B-gate can be positioned either above or below the axis, to be triggered by a positive-heading echo or a negative-heading echo.

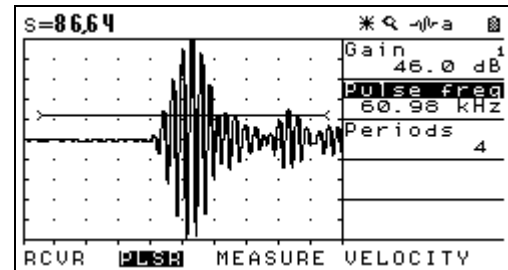


Fig. Radio Frequency signal

Positive Half Rectification means that only the upper (positive) half of the RF signal is displayed

Negative Half Rectification means that only the bottom (negative) half of the RF signal is displayed.

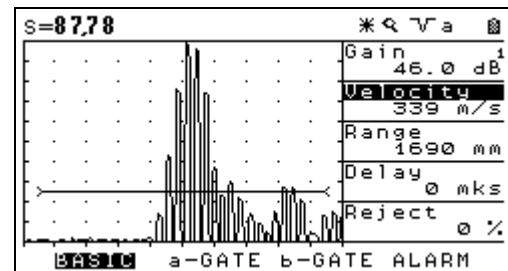


Fig. Negative 1/2 wave rectification

Note: even though it's the negative half of the RF signal, it's displayed in the same orientation as a positive component. This is only to simplify viewing. The signal displayed in the view identified as Negative Reactance is the negative component of the RF signal.

Full-Wave Rectification combines the positive and negative rectified signals together, and displays both of them in a positive orientation.

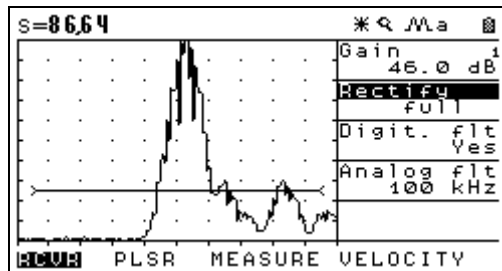




Fig. Full wave rectification

Use the following procedure to select a rectification mode

Step 1. Activate RECTIFY function in RCVR

submenu by pressing  button


Step 2. Change rectification mode by pressing



  buttons.

- **NEG**—Shows the negative component of the RF signal but displays it in a positive orientation
- **POS**—Shows the positive component of the RF
- **FULL**—Shows the positive and negative halves of the RF wave, but both are oriented in the positive direction
- **RF**—Shows the echo with no rectification

2.3.4 Setting the A-Scan REJECT Level (BASIC-REJECT)

A portion of the A-Scan can be omitted from the display screen. To omit a portion of the A-Scan, you must define the percentage of full-screen height you wish to omit. To set a reject percentage

Step 1. Activate the REJECT function (located in the BASIC submenu) by pressing  button

Step 2. To change the amount of A-Scan you wish to omit from the display screen (as a percentage of screen height) press   buttons. You may omit A-Scans up to 80% of the screen height.

3. Configuring Your Instrument for Measurement

This chapter explains how to configure your instrument's flaw detection and thickness measurement capabilities.

In this chapter, you'll learn how

- Adjust the A and B-Gates and alarms
- Choose a GATE-DETECTION MODE (peak or flank)
- Specify the action taken by the A-GATE MAGNIFY MODE
- Setting the Amplitude measurement units

3.1 Configuring the A and B-Gates


Setting the position and characteristics of the A and B-Gates is the first step to configuring the UD2N-PM for flaw detecting or material-thickness measurement.


3.1.1 Positioning Gates


Use the following procedures to set the vertical and horizontal position of the A and B-Gates. Remember that gate position has the following effects on instrument performance:



- A-Scan echoes on the right side of the display screen represent features that occur at a greater depth from the test-material surface than those on the left of the display screen. Therefore, moving a gate to the right means that the gate is evaluating a deeper portion of the test material
- A wider gate will simply span the equivalent of more test-material depth
- Increasing the vertical height (called threshold) of a gate means that only reflected signals of sufficiently large amplitude will cross the gate

Setting a Gate's Starting Point (A-GATE - A-START) or (B-GATE - B-START)


Step1. Activate A-START (B-START) function by pressing  button


Step 2. Change gate start position by pressing  buttons.


You'll note that A-START (B-START) function has both coarse and fine adjustment modes. Coarse and fine modes are selected by pressing  button then function is active.



- When "a-start" or "b-start" appears in all small letters, pressing  buttons will change the value by smaller amounts.
- When "a-START" or "b-START" appears in capital letters, pressing  buttons will produce large changes in gate start value.

Adjusting a Gate's Width (A-GATE – A-WIDTH) or (B-GATE – B-WIDTH)

Step1. Activate A-WIDTH (B-WIDTH) function by pressing  button

Step 2. Change gate width by pressing  buttons.


You'll note that A-WIDTH (B-WIDTH) function has both coarse and fine adjustment modes. Coarse and fine modes are selected by pressing  button then function is active.



- When "a-width" or "b-width" appears in all small letters, pressing  buttons will change the value by smaller amounts.
- When "a-WIDTH" or "b-WIDTH" appears in all capital letters, pressing  buttons will produce large changes in gate width value.

Note: The gate start and gate width changing accuracy depends of selected frequency

Frequency	to 250kHz	to 1250kHz
Min. step of gates position and width changing	0,5 mm	0,1 mm

Setting a Gate's Threshold (Vertical Position) (A-GATE – A-THRES) or (B-GATE – B-THRES)

Step1. Activate A-THRESH (B-THRESH) function by pressing  button



Step 2. Change gate threshold by pressing   buttons. Available values are from 0 to 95% in Full Wave, Positive and Negative wave modes and from –95% to 95% in RF mode.

3.1.2 Selecting the Gate Detection Method

A-Scan signals crossing the A or B-Gate are evaluated for the purposes of flaw detection and material-thickness evaluation. When the signal crosses the A or B-Gate, either the gate-crossing point (flank) of the signal, or the maximum point (peak) of the signal (in a- gate) is used for evaluation purposes. The DETECTION function allows the user to specify which A-Scan feature (FLANK or PEAK) is used to evaluate the signal in a-gate.

Setting the A-Scan Signal-Detection Method (MEASURE-DETECTION)

Step1. Activate DETECTION function in MEASURE submenu by pressing  button


Step 2. Change detection mode position by pressing   buttons. Available values are PEAK or FLANK



3.1.3 Setting Gate Alarms

An alarm can be set for each of the two gates. When a gate alarm is activated, one or more of the following will occur:

- An alarm indication light on the front of the instrument will illuminate
- An audible alarm (HORN) will sound
- A TTL alarm signal will be output


Turning On/Off the indicators illumination (ALARM-LED)



Step1. Activate LED function in ALARM submenu by pressing  button

Step 2.Set led function value by pressing   buttons. Available values are YES or NO

Turning On/Off the audible signal (ALARM-HORN)


When any gate's alarm is triggered, an audible horn will sound. Use the following procedure to turn this horn off or on:



Step1. Activate HORN function in ALARM submenu by pressing  button

Step 2.Set horn function value by pressing   buttons. Available value are YES or NO



Defining Gate-Alarm Logic

Each gate's alarm can be triggered under one of two circumstances. Gate alarms can be set to trigger when an A-Scan echo crosses the gate or when **no** echo crosses the gate. Use the following procedure to specify GATE LOGIC settings:

Step 1. Activate A- LOGIC (B-LOGIC) function by pressing  button


Step 2. Change gate logic by pressing   buttons.



Available values are

-  - alarms, then the echo cross the gate
-  - alarms, then the echo not cross the gate
- OFF – gate alarms turned off

3.1.4 Setting the Alarm mode (ALARM-MODE)

This feature sets then the audible signal will triggered

Step1. Activate MODE function in ALARM submenu by pressing  button

Step 2.Set function value by pressing   buttons. Available value are

- **A-GATE** – then alarms only in a-gate
- **B-GATE** - then alarms only in b-gate
- **A & B-GATE** – then alarms in both a and b-gates
- **A or B – GATE** – then alarms though in one of the gates
- **V-mode**– by sound velocity value



3.1.5 Sound velocity testing

This feature allows to trigger alarm when sound velocity in material goes beyond MIN and MAX set values.

Setting the distance between probes (VELOCITY-DISTANCE)

This function allows to set the distance (base) between probes surface for velocity calculation.



Step1. Activate DISTANCE function in VELOCITY submenu by pressing  button

Step 2. Set function value by pressing   buttons. Available values range from 0 to 2000mm with 0.1mm step

Setting the minimum velocity value (VELOCITY-MIN VEL)

This function allows to set the low bound value for velocity control.



Step1. Activate MIN VEL function in VELOCITY submenu by pressing  button

Step 2. Set function value by pressing   buttons. Available values range from 0 to 2000mm with 0.1mm step

Setting the maximum velocity value (VELOCITY-MAX VEL)

This function allows to set the high bound value for velocity control.


Step1. Activate MAX VEL function in VELOCITY submenu by pressing  button



Step 2. Set function value by pressing   buttons. Available values range from 0 to 2000mm with 0.1mm step

3.1.6 Settings the Displaying Measure (MEASURE-READING)

The instrument can calculate five type of measures, but, not all of them can be displayed at same time.

To set measure will be displayed in reading box

Step 1. Activate READING function by pressing  button

Step 2. Change measure type by pressing   buttons.

Available measures are

- S, mm – sound path.

Note: If PROBE-ANGLE function value more than zero instrument also calculates and displays X and Y measures for angle beam probe control.

- V, m/s – velocity of sound.



Note: For calculation velocity of sound the reference block thickness must be set by MEASURE-BLOCK function.

- H, % -amplitude in % of screen height
- H, dB –displays amplitude readings as a dB difference between the echo’s peak and the a-gate threshold
- \bar{H} , dB –displays middle amplitude in a-gate in % of screen height
- A, dbc - displays readings as a dB difference between the echo in the a-gate and the reference echo.

3.1.7 Settings the Measurement Mode (MEASURE-GATE MODE)

This feature define how the time will be measured: from IP to A-gate, or between a-gate and b-gate


Step1. Activate GATE MODE function in MEASURE submenu by pressing  button

Step 2. Change the mode by pressing   buttons. Available modes are “0 → A-GATE” and “A → B-GATE”



3.3 Saving the Instrument Configuration In Data Set

Instrument settings can be stored as Data Sets. When a stored data set is later recalled, all active functional settings are replaced with those settings contained in the data set, and the stored A-Scan is displayed and frozen on the display screen. Once a data set is recalled, the newly active functional settings may be modified. However, once a data set is stored, functional settings within that data set may not be permanently modified. Anytime that data set is recalled, the functional settings will be returned to their initially stored values.



Saving settings in Data Set (SETTINGS-SAVE SETTING)

Step1. Activate SAVE SETTING function in SETTINGS submenu by pressing  button.


Note: Then the SAVE SETTING function is active the list consist of 100 data set names appears.



The previously saved data set has symbol , the empty data set has symbol .

Step 2. Use   buttons to select data set.



Step 3. Use  button to save settings in data set or use  button to enter RENAME DATA SET MODE (see **Renaming Data Set**).

Recalling settings from Data Set (SETTINGS-LOAD SETTING)

Step1. Activate LOAD SETTING function in SETTINGS submenu by pressing  button.

Note: Then the LOAD SETTING function is active the list consist of 64 data set names. The previously saved data set has symbol , the empty data set has symbol .


Step 2. Use   buttons to select data set.



Step 3. Use  button to load settings from data set or use  button to enter RENAME DATA SET MODE (see **Renaming Data Set**).

Renaming Data Set

Then LOAD SETTING or SAVE SETTING function is active you can change Data Set name from keypad.

Step 1. Use   buttons to select data set.


Step 2. Use  button to enter RENAME DATA SET MODE. **The cursor on first symbol of Data Set name will blink.**



Step 3. Use   buttons to change symbol in Data Set name.

Note: Only English alphabetic capital characters, digits and some special symbols are available in this mode. By PC Soft Package employment any ASCII characters are available.

Step 4. Use   buttons select next symbol in Data Set name

Note: Overall Data Set name length is 28 symbols max.

Step 5. Use  button to exit from RENAME DATA SET MODE. **The cursor on first symbol of Data Set name will stop blink**



Step 6. Use  button to load/save settings (depends on function) or  to exit in Main Menu.

4. Using the Instrument during test operations


4.1 Setting the Gain



Instrument gain, which increases and decreases the height of a displayed A-Scan, is adjusted with the Gain Function. The instrument's gain can be adjusted while in any Main Menu location.

4.1.1 Changing the Gain-Adjustment Increment (dB STEP)

When adjusting the A-Scan gain, each pressing of the   buttons, then the gain function is active, increases or decreases the gain level by a dB increment equal to the dB STEP. Several values can be specified for dB STEP. To select one of the existing dB STEP values:

Step 1. Activate Gain Function by pressing  button.

Step 2. Press  button to select one of four existing dB steps. They are **0,5dB**; **1dB**; **2dB** and **6dB**.


Step 3. Once a dB STEP value has been selected, each pressing of the   buttons, will increase or decrease the instrument's gain by the dB STEP increment.



4.2 Using the dB Reference Feature


When **A, dBc** is activated, the amplitude of the echo in A-Gate will compare with the reference echo recorded in Additional Menu **A, dBc function**. This value means the gain at which the reference signal is 100% screen height.

Note: For properly compare echo in A-Gate will must be in 30-100 % of screen height.


To record reference echo


Step 1. Enter to Additional Menu by pressing  button, then no one function is active.

Step 2. Navigate through menu be pressing pressing   buttons


Step 3. Activate **REFERENCE A, dBc** function be pressing  button




Step 4. Change function value.






Step 5. De-activate **REFERENCE A, dBc** function by pressing  button

Step 6. Exit from Additional Menu be pressing  button

4.3 Saving the measurement results

Measurement results may be stored in data logger files. Totally may be stored 750 results (15 data logger files with 50 results in each file). To save displayed result press  button or select from RESULTS submenu SAVE RESULT function. The instrument suggest you to save result with same name what have the current setting (loaded from settings list or setting, with which instrument started).



You can press  or  to save result with default name, press  to cancel the saving or change the default name completely or fractionally.

To change the name of result use   buttons to select the character in the results name, then press   buttons to change character. After changing all desired characters press  to save result with that name.

Note: Overall Results Name length is 28 symbols max.

To select one of 10 data logger files:


Step1. Activate FILE function in RESULTS submenu.

Step2. Change file by pressing   buttons

To review contents of data logger file: activate REVIEW function in RESULTS submenu.

To clear content of data logger file: activate CLEAR FILE function in RESULTS submenu

4.4 Magnifying the Contents of the A-Gate

Whenever an A-Scan is active press  button or activate A-MAGNIFY function in DISPLAY menu. MAGNIFY feature enlarges the displayed portion of the A-Scan contained in a a-gate. The width of the magnified gate determines the level of magnification. This is because the display is magnified until the gate width equals 100% full-screen width.

