User Manual

Version 1.0

P C U S w a r e 32

Software for Ultrasonic Data Acquisition and
Analysis with the PCUS11 Pulser/Receiver Card

Fraunhofer Institute - Nondestructive Testing IZFP

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1. Introduction

The *PCUSware32* software is designed to aid in manual ultrasonic inspections. At least one **PCUS11** (PCI card) must be properly installed to acquire ultrasonic data.

When using PCUS11 card(s), the PCI-bios automatically detects and configures the required I/O and interrupt settings.

But the correct driver for the corresponding operating system must be installed.

The *PCUSware32* software can support up to four PCUS11 cards. Upon startup, the program scans the bus to detect the presence of PCUS11 cards. The scan process also includes a quick hardware diagnostic of the installed cards. If more then four PCUS11 cards are detected, only the first four are made available for use. Each of the installed PCUS11 cards (channels) can be programmed using different settings, such as search unit parameters, inspection modes, sweep settings, etc.

Although the *PCUSware32* software manages more than one PCUS11 card (channel), data acquisition can only be performed in single-channel mode; simultaneous operation is impossible. The remaining channels and their respective settings are recalled individually, one at the time.

The *PCUSware32* software can be used without any PCUS11 cards installed for the interpretation of acquired data, to prepare data sets for future use, to edit user-specific displays (Desktop settings) and report templates, etc. The *PCUSware32* software contains context sensitive on-line help.

2. Installation

2.1. End User License Agreement

Generally, *PCUSware32* is pre-installed and sold as part of the manual testing package with PC and PCUS11-board(s). A separate software installation is possible under the following conditions:

PCUSware32 may be used without **serial number** on any number of PCs. The program is fully operable with the exception that hardware recognition is disabled. Hence, measurements with PCUS11-boards are not possible, but analysis, generating test reports, and post-processing can be carried out.

Customers, who have already purchased PCUS11-boards and want to test *PCUSware32*, receive on request a **serial number** free of charge. This **serial number** is exclusively destined for this customer and must not be passed on. With this **serial number**, complete usage of *PCUSware32* including measurements with PCUS11-boards is possible until the expiration of the evaluation period, which is fixed in the **serial number**.

Owners of a **serial number** may purchase via license request (**License Request File**, **LRF)** an unlimited license (**License File**, **LF**) for that PC, for which **LRF** has been created. This **LF**, and so the license, is exclusive for that special PC and must not be passed on.

This license agreement prohibits any duplication *PCUSware32*, whether for selling, renting, leasing or as present, which would constitute theft.

2.2. System requirements

- Pentium PC
- at least 64 MB main memory
- hard disc and 3,5 inch disk drive
- operating system (minimally required service pack):
  - Microsoft Windows NT4 (SP6a)
  - Microsoft Windows 2000 (SP4)
  - Microsoft Windows XP (SP1)
- To carry out measurements, the PCUS11-driver incl. PCUS11-DLL for the corresponding operating system must be installed. Drivers from PCUS11-Driver-Disc version 1.1.upward are supported (excluding Windows9x/ME, cf. below).
- one free slot (long format) for PCUS11, if measurements shall be carried out
- VGA-graphics board or other Windows-compatible graphics board with minimum screen resolution of 640 x 480 (optimal 1024 x 768) and at least 16 colors (which would prevent from using desktop color options fully)

PCUSware32 is principally operable under Windows95/98/ME, too. For these operating systems, *PCUSware32* does not support access to PCUS11-boards and there is neither guarantee of error-free operation nor support in case of failures.

2.3. Installation

Generally, *PCUSware32* is pre-installed and sold as part of the manual testing package with PC and PCUS11-board(s). A separate software installation is possible.

Because *PCUSware32* can be used without **serial number** free-of charge (cf. license agreement), the software can be obtained in different forms, e .g. download from web server, per e-mail, diskette, CD etc.

Consequently, there are no special installation disks or CDs. The software is distributed as zip-archive, unpacked or also with installation program.

For versions without installation program, it is sufficient to copy the complete *PCUSware32*-directory-/filestructure to any installation directory, typically C:\Program Files\pcusw32\.

PCUSware32 is immediately operable by calling **pcusw32.exe** from installation directory. Typically, a link to **pcusw32.exe** should be placed on the desktop to ease program start.

Users of *PCUSware32* do not need write permission for the installation directory (required only for copying/installation). All relevant data are automatically included in the corresponding Windows user profile.

It is standard that the user specific directories and files are transferred from installation directory to this directory of the Windows user profile:
C:\Documents und Settings\<user>\Application Data\pcusw32

When data are found in the Windows user profile on *PCUSware32* start, which do not belong to the called *PCUSware32*-installation, a backup directory is created **(\pcusw32.01\, \pcusw32.02\,** …). In order to overwrite WITHOUT backup, *PCUSware32* can be started with the parameter „/PROFILEOVERWRITE“:
pcusw32.exe /PROFILEOVERWRITE

After installation of *PCUSware32*, the paths for data, temp and desktop files can be pre-set in the installation directory. These pre-settings will be included in the Windows user profile. For this, the following lines in the file **mesus.ini** (installation directory) have to be activated (delete comment „;“) and the corresponding paths have to be entered (WITHOUT closing „\“):
;MesusDataPath=c:\pcusw32\data
;MesusTempPath=c:\pcusw32\temp
;MesusDesktopPath=c:\pcusw32\desktop

It must be necessarily ensured that the enlisted paths exist and the user has write permissions!

Changes in the file mesus.ini (the three quoted entries only, if any) have to be performed with a text editor (e. g. NotePad). Erroneous entries can lead to malfunction of *PCUSware32*!

The three quoted pre-settings for paths can be performed on delivery of *PCUSware32* in the installation program. If the paths are not pre-set, they will be automatically assigned to the Windows user profile.

2.4. Serial number, license

PCUSware32 immediately runs without **serial number** and license. Hereby, the program is fully operable with the exception that hardware recognition is disabled and no measurements with PCUS11-boards can be performed.

A **serial number** is necessary to carry out measurements. The **serial number** is only valid in combination with company name and is entered together with it during installation or in the dialog „? | License…, Button [Edit]“. The **serial number** determines the available options and the evaluation period. *PCUSware32* is fully operable until expiration of the evaluation period.

Independently on the expiration of the evaluation period, it is possible to create a so-called **LicenseRequestFile** (**LRF**) (dialog „? | License…, Button [License Request…]“). This **LRF** has to be sent to IZFP Dresden (diskette or e-mail with subject „PCUSware32 License Request“).

On the basis of the **LRF** a **LicenseFile** (**LF**) is created at IZFP Dresden and delivered to the customer. The **LF** can be imported in *PCUSware32* via the dialog „? | License…, Button [License import…]“, whereby write permission to *PCUSware32* installation directory is required. Afterwards, *PCUSware32* is unlimited licensed for this PC and fully operable.

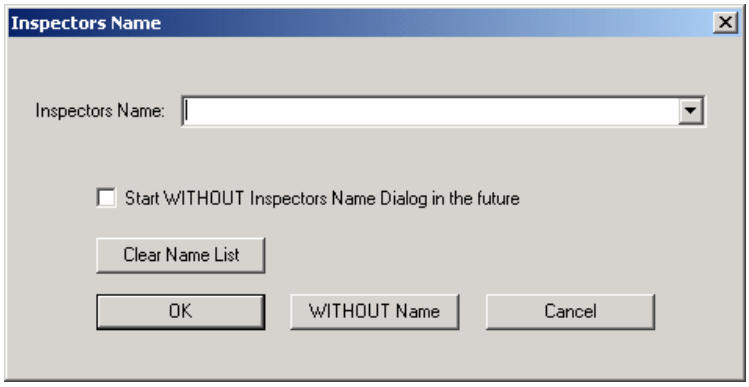
It is explicitly noted again that generally *PCUSware32* is pre-installed and sold as part of the manual testing package with PC and PCUS11-boards. The above mentioned licensing procedure is only necessary for installations by the customer.

3. User Administration

The User Administration feature of *PCUSware32* is only used for report purposes. The current user name is automatically saved with the measured scan # and will be printed in reports.

It's also possible to work without user name. Thereupon no user name is saved in measured scan # and no user name is printed in reports.

The dialog to type in or select user name can be switched off directly in this dialog box.



In menu „Setup | Inspector…" a user name can be set at any time respectively the above displayed dialog can be enabled again.

4. Using PCUSware32

4.1. Prerequisites

The *PCUSware32* software must be successfully installed (without error messages during installation) prior to the first usage. For measurement with PCUS11 cards the PCUS11 driver for the operating system including PCUS11-DLL must also be installed. In addition a valid *PCUSware32* **serial number** resp. **license** is necessary (see also License Agreement).

The PC used must meet the requirements as specified in Section 2.2 above.

For smooth, error-free operation of the software, it is recommended that all other programs be closed during *PCUSware32* data acquisition.

PCUSware32 adjusts automatically to the current screen resolution in full screen mode. If changing to other Windows applications is required, the *PCUSware32* program should first be minimized (but never during active data acquisition).

4.2. Running PCUSware32 for the First Time

After starting the program appears the user name dialog, see Section 3 "User Administration".

PCUSware32 automatically detects PCUS11 boards and reports the state of the boards.

After clicking the "OK" button in the „Hardware Detection" window the *PCUSware32* software presents the main program window using a default **Desktop**, which is automatically selected depending on the current screen resolution. Other pre-configured desktops are available and can be customized. Click **?** on the menu bar or use the **F1** key to obtain help with the desktop options.

> Note: At any time, help is provided by pressing the **F1** key or by mouse-clicking on the question mark (**?**).

The **Quick Start** option in the help menu provides step by step instructions to configure the program for basic operation and data acquisition.

PCUSware32 software can be operated using a two- or three-button mouse or by keyboard input. Detailed information on mouse functions and hot-key functions is provided in the *Technical Information* section of the online help.

What to do if *PCUSware32* does not start correctly?

- If *PCUSware32* is not correctly installed resp. licensed, a dialog box with error message will appear. In this case, the *PCUSware32* program must be uninstalled and reinstalled again. Consider the notes in Section 2!
- A hardware conflict between PCUS11 cards and the system environment or an unsuitable PCUS11 driver is present when the *PCUSware32* program is closed automatically after starting ***WITHOUT*** showing an error dialog box or when the whole windows system freezes. To detect a hardware conflict, the *PCUSware32* program can be started with the **/NOHW** option, for example:
  Run...
  `c:\Program Files\pcusw32\pcusw32.exe /NOHW`

  In this case, the *PCUSware32* program will ***NOT*** try to detect PCUS11 cards.

If the problem cannot be solved, contact IZFP by sending email (including the error messages) to pcusware@izfp-d.fraunhofer.de. We will contact you as soon as possible to help remedy the problem.

4.3. The PCUSware32 User Interface

The graphical user interface (GUI) of *PCUSware32* software consists of several elements, briefly described below.

An unlimited number of customized desktop settings, including size and position of the *Function Windows*, the *A-scan* window, *Tool Bar* and *Status Bar* settings, color settings, etc. can be saved to the desktop file (*.mdt) for later retrieval. For more information please select **Window** and/or **Desktop** from the help menu.

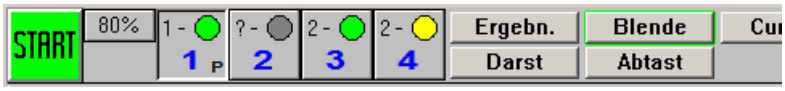
4.3.1. Pull-Down menus

Eight pull-down menus are provided by the software selectable by using the mouse or using the keyboard (ALT + underscored character) in a standard Windows application format.

4.3.2. Toolbar

The *Tool Bar* provides easy access to system settings and parameters. Display of the *Tool Bar* can be toggled on/off from the *Window* pull-down menu and it consists of the following elements:

- START/STOP-Button to activate/deactivate data acquisition
- Button to enable Automatic Gain Control (e.g. 80% screen height)
- Four buttons to display the status of the *Logical Channels* and for channel selection
- Buttons for activating *Function Windows*



The Toolbar displayed provides the following information:

- The system is using (at least) two PCUS11cards, where card #1 is configured for logical channel 1 and card #2 is configured for logical channels #3 and #4.
- The logical channel #1 is active and completely configured (including the search unit and other required parameters) indicated by the green LED and "**P**". Logical channel #1 is ready for data acquisition.

- The Logical Channel 2 is presently not configured (indicated by the gray LED and "**?**").
- Logical channels #3 and #4 are configured for the same PCUS11 card, divided into *Primary* and *Secondary* channels. The *Primary* channel is assigned to logical channel #3 and is indicated by the green LED; the *Secondary* channel is assigned to logical channel #4 and is indicated by the yellow LED.
- One of the ten available *Function Windows* is not present on the current desktop, indicated by the green outline of the corresponding button.

4.3.3. Desktop Windows

The following windows can be customized on the desktop:

- *A-scan Window* for the display of the wave form (A-Scan)
- *Scan # Log* for the selection of the active *Scan #* in the current data file and for management of stored scans, e.g. delete, packing, save as, etc.
- Any number of *Function Windows* is possible, restricted only by screen size/resolution.

4.3.4. Status Bar

The *Status Bar* provides information such as function-associated help notes and the file name of the current desktop. The display of the *Status Bar* can be toggled on/off from the *Window* pull-down menu.

5. Parameter Settings

The *PCUSware32* software controls PCUS11 pulser/receiver cards for the acquisition of ultrasonic data.

Besides controlling the hardware settings, such as filters, gain, etc., the software also controls the display mode of the waveform (RF, full-wave, etc.), gate settings, averaging functions, cursor functions, zoom etc.

Table below displays the parameters controlled by the *PCUSware32* software independent of the PCUS11 card in use.

Inspection Personnel	Auto-assignment at Login
Number of Scans	Storage of up to 100 scans per data file
Notes/Comments	Available for each scan # and for the entire data file
Search Unit Data	Name, type, serial number, manufacturer, index delay, beam angle, index point
Search Unit Position Data	X-, Y- location, and scan direction for each individual scan #
Couplant Data	Type, manufacturer, batch number
Trigger Selection	Internal or external
Sound Velocity Data	300 to 15000 m/sec
Reject Settings	0 to 80%
Cursor Settings	Two cursors, zoom-in, zoom-out
Amplitude Read Method	Peak, edge (leading)
Amplitude Read Mode	Input-signal (REM) and multiple-signal (MEM)
A-scan Mode	Full wave, pos./neg. half-wave, RF
Gate Settings	Two gates, non-overlapping (delay, range, and height in %)
Peak Hold	Allows storing of peak maximum
Parameter Memory	Allows storing of current parameters for following scans
Refresh Rate	High, medium, and low settings
Parameter Clipboard	Permits copy, paste, and display of parameter sets
Calibration Method	Manual or semi-automatic

Table below shows the most important parameters controlled by the *PCUSware32* software when used with **PCUS 11 cards**:

Filters (frequency)	Four filters, retrieved from the onboard configuration block (firmware) are available (1250, 2000, 5000, and 12500kHz standard)
Gain	0 to 110 dB
Pulse Energy	Two settings (-300V, -500V standard) are retrievable from the onboard configuration block (firmware)
Pulse Width	Six settings from 1 to 6
Impedance (IN)	Retrieved from the onboard configuration block (firmware) (50Ω, 300Ω standard)
Impedance (OUT)	Retrieved from the onboard configuration block (firmware) (50Ω, 300Ω standard)
Sweep Range	1 to 10mm in 1mm increments, 20 to 100mm in 10mm increments, 200mm to 1000mm in 100mm increments, 2000mm to 20000mm in 1000mm increments
Sweep Delay	0 to 40000mm
Index Delay	0.01 to 100µs
Signal Averaging	0, 2, 4, 8, 16, 32, 64, and 128 samples
Sampling Rate	10, 20, 40, 80, and 160MHz
Pulse Rep. Rate (PRR)	20Hz to 4kHz, and free-wheeling

6. UT Data Management

6.1. Online Data Management

The *PCUSware32* software processes a single *Scan #* at a time. Once a parameter-set file is established, all relevant data are stored in random access memory (RAM) permitting fast and instant access to a number of different data acquisition parameters from a single parameter-set file.

The software features four *Logical Channels* that can be individually programmed with completely different parameters settings (e.g., gain, sweep range, sound velocity, etc.). Depending on the configuration and assignments of the *Logical Channels* and the installed *PCUS* cards, switching between different *PCUS* cards and/or different parameter sets (using the same card) provides for convenience in ultrasonic testing.

Each data file can contain a maximum of 100 individual scan data, including the A-scan information and all related parameters. Each of the four *Logical Channels* are interchangeable with any given *Scan #*. When configuring a blank data set with four *Logical Channels*, the software assigns *Scan #1* to channel #1, *Scan #2* to channel #2, etc., by default. A certain *Scan #* can be assigned to a channel by first choosing the appropriate *Logical Channel* and then selecting the desired *Scan #*, which is easily accomplished from the *Scan # Log* menu.

When switching from one *Logical Channel* to another, the program automatically assigns a *Scan #*. In general, it is possible to manually assign the same *Scan #* to all *Logical Channels*. In such case the program, by default, prompts the user to confirm an overwrite of the previously stored *Scan #* with the new scan data. This overwrite confirmation can be deactivated from the **Setup, Options…** menu.

6.2. Data Storage

As described above, all data from the current file are temporarily stored to RAM. To prevent loosing data from sudden loss of power or accidental equipment lock-up, it is recommended to save acquired data at constant intervals to the data file on disk by using the **save** or **save as** command from the file menu. However, when exiting *PCUSware32*, the program saves the current data (temporarily stored to RAM) to the last open data file. If any changes to the open data file occurred during the recent session, the program prompts the user to save the current data upon exiting.

The *PCUSware32* data come in a proprietary (optimized and compressed) binary file format. The number of data files is limited only by hard disk capacity. A single individual data file can contain a maximum of 100 individual scan-data sets. Each individual scan-data set contains all setup data, scan parameters, and the waveform (A-scan). The number of bytes per waveform (A-scan) is adjustable from 256 to 10240 bytes (10Kb) per waveform. To estimate the size of a data file, the following values can be assumed. For a complete data file including 100 scan-data sets with 10k/A-scan each, the size of the data file exceeds 1Mbyte (1024kB); opening and saving of data files in access of 1 MB in size is relatively time consuming.

So called Data Description Files serve to print out reports in different languages without the need of installing *PCUSware32* versions in different languages.

6.3. Importing and Exporting of Data Files

As described in Section 6.2, the *PCUSware32* data files are stored in a proprietary binary format. The software is prepared for importing and exporting of *PCUSware32* data files. For data exchange from other programs, it is required to add specific import and/or export plug-in modules, optionally available.

Custom-designed import/export plug-in modules can be made available upon request.

7. Print Menu

The *PCUSware32* software permits printing of reports to the installed Windows printer.

The software provides *Description Files* used for printing of reports in different languages (currently in English and German) from the current program regardless of the installed user-interface language.

PCUSware32 supports the generation of inspection reports using the default Print Templates. These default Print Templates can be modified to any custom formats in either German or English.

When customizing a report template, the user can select from pre-defined fields that can be freely arranged on the report sheet. Some of the parameter units can be changed. For example, the unit for the sweep range can be shown in mm, inch, µs, or Samples to meet the required needs. The A-scan window can be arranged freely on the report sheet (i.e., window re-positioning and resizing are available). Special layout elements, such as separators, frames etc., are available for the custom design of the report layout.

To support printing to preprinted forms, the program also permits hiding of the parameter names so only the value will be printed.

Print templates are loaded using **File**, **Print Template**, and **Open…** from within the *PCUSware32* software.

The template editor is opened using **File**, **Print Template**, and **Edit...** from within the *PCUSware32* program.

Further help is provided from the online Help menu of *PCUSware32* describing the Print Templates editor in more detail.

8. Support

In principal, the *PCUSware32* software can be customized with additional program modules, import/export modules, etc., as required by your inspection process. We offer custom-specific *PCUSware32* program versions and/or additional *PCUSware32* modules.

If you have created your own Desktop-Files and want to share these files with other *PCUSware32* users, we are gladly accept customized Desktop Files and/or print templates for distribution. Send your Desktop Files, suggestions, critique, etc., to the following email address:

pcusware@izfp-d.fraunhofer.de

To reach us with your questions, suggestions, or any other feedback, send email to the address above or write to:

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(subject for e-mail in the case of License Request:
„PCUSware32 License Request“)