P900 Pro

User Manual



Version Pro 1.0m

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SAFETY PRECAUTIONS

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warning elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. K&K International assumes no liability for the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT
To minimise shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a tree-conductor ac power cable. The power cable must either be plugged into an approved tree-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electro-technical Commission (IEC) safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE
Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS
Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personal only. Do not replace components with power cable connected. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE
Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT
Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorised modification to the instrument. Contact a K&K International Sales and Service Office for service and repair to ensure that safety features are maintained.

WARNING
TO HELP MINIMISE THE POSSIBLE OF ELECTRICAL FIRE OR SHOCK HAZARDS, DO NOT EXPOSE THIS INSTRUMENT TO RAIN OR EXCESSIVE MOISTURE

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CONTENTS

Volume1

Introduction 9
- Hardware Concept 9
- Software Concept 11
  - Run mode: 11
  - Setup mode: 11
  - Global setup: 13
  - Utility functions: 14

Installation 17
- P900 Hardware 17
  - P900 Cabinet 17
  - Connections 17
- External key box (Optional) 19
- Software installation 21
  - Install files 21

Software User Section 23

Main Menu 23
- Pw. Mgr. 24
  - New password 25
  - Edit password 26
  - Delete password 26
  - Disable password 26
  - New Master Code 26
- ASIO 27
  - Buffer Settings 27
- Hardware Manager 29
  - Hardware Calibration 31
- Graph Resolution Menu 33
- Spl Menu 35

Global Menu 37
- Control 37
  - Start Control 37
  - Cancel Record 37
  - Multiplex 38
  - Multiplex System 3 38
  - Repeat by Reject 38
- Chain 38
- Path 38
- Display Graph 39
- User key's 39
- Store 39
  - Data 39
  - Results 39
- Screen 40
- Graphics Scale 40
- Gain Adjustment 41

External Amplifier 41
Output 41
Rs 41
Setup 43
Type 45
Name 45
Description 45
Chain 45
Help File 45
3-Limit 45
Status 45
I/O 45
Auto Save 46
Data App. 46
Data Rej. 46
Results 46
Sweep 46
Start 46
Stop 46
Reverse 46
Slow 46
Delay 46
Points 47
Time 47
Warning 47
Output 47
Output 47
Volt 47
dB 47
Mute Out 47
Mute Monitor 47
Polarity Test 48
On 48
Negative 48
Pulse Time 48
After 48
Sync delay 48
Sensitivity Test 48
Move 48
Hz 48
Compress 49
Range 49
Reference Channel 49
Input 49
Status 49
Mux 49
Detector 49
Gain 49
Smoothing 49
Filter 50
Type 50

Har. (Harmonics) 50
Freq/Bw (Frequency / Bandwidth) 50
Gain 51
Display 51
Limit 51
Process Delay 51
Reference 53
Measure 53
Include 53
Reset 54
Edit 55
Compensate 55
Master Comp 55
Make M-Comp 55
Out Compress 55
Phase Test Menu 57
THD Test Menu 59
Hi-2Test Menu 61
N-Check 63
Thiele & Small 65
BL 71
R-23 73
Monitor 75
AI-Mode 77
Delete & exit 79
Delete Reference Data 79
Delete Compensation Curve 79
Delete Compress Output Curve 79
Delete Master Curve 79
Delete Master Compensation Curve 79
Delete Best Fit Curve 80
Save & exit 81
Save as Reference Curve 81
Save as Compensation Curve 81
Save as Master Curve 81
Save as Best Fit Curve 81
Reference submenu 83
Edit mode 83
Keyboard Functions 83
Mouse Functions 85
Display 87
Move 87
Set 88
Reset 88
Edit Points 88
Edit Curve - Curve Editor 91
Curve Convert Menu 93
Scale Window Menu 93
Tolerance Curve Menu 93
Resonance test menu 93
Gain adjust menu 93

Polarity Window menu 93
Frequency average menu 93
Sensitivity average menu 93
Power On / Off 93
Spectrum 93
Print 94
Print Setup 94
Curve convert menu 95
Upper -> Data 95
Lower -> Data 95
Data -> Upper 95
Data -> Lower 95
Data – Upper -> Data 95
Data – Lower -> Data 95
Print 95
Print Setup 96
Scale window menu 97
Range Up 97
Range Down 97
Window Up 97
Window Down 97
Print 98
Print Setup 98
Tolerance curve menu 99
Add 99
Add2 100
Add3 100
Load 100
Save 100
Delete 100
Print 100
Print Setup 100
Resonance test menu 101
Low Limit 101
High Limit 101
Reset Limits 102
QR-Set 102
F-Set 102
Q-Set 103
EBP 104
Low-2 104
High-2 104
Reset-2 104
R-Set 105
Invert Gfx 105
Print 105
Print Setup 105
Mouse Functions 106
Gain adjust menu 107
New Value 107
Reset Value 108

Move Data 108
Reset Move (Default) 108
Print 108
Print Setup 108
Mouse Functions 108
Polarity window menu 111
Low Mark 111
High Mark 112
Reset Makers 112
Print 112
Print Setup 112
Mouse Functions 112
Frequency average menu 113
Low Mark 113
High Mark 113
Reset Makers 114
Include 114
Group 114
Limit 114
Print 115
Print Setup 115
Mouse Functions 115
Sensitivity average menu 117
5-Sensitivity Test 117
Sensitivity Average Test 118
Slope test menu 119
Frequency Span 119
Measured Slope 119
Slope Limits 120
Spectrum 121
Power On 121
Power Off 121
Key “P” or key “p” 121
Print 122
Exit 122
Mouse Functions 122
Monitor 123
Run Speaker Tests 125
F8 125
Run 1 126
Run 2 126
Run 3 126
View 126
Exit View 126
Cursor 127
First 127
Second 127
Third 127
Last 127
Reset 127
Delete 127

Stat A 127
Stat B 127
Number 127
U-code 128
Cursor Submenu 129
Mouse Functions 130
Statistics 133
Stat A -Varians & Collation 133
Stat B - Results & Distribution 135
Utilities 137
Process Statistical Data Utility 139
Process Selected Type 140
Process & Extract found Type to a File 140
Process & Extract & Delete found Type 140
Copy & Delete selected type to a File 140
Delete selected Type from Statistical File 140
Number selection 141
Date selection 141
Code selection 141
Test results 142
Select field. 142
Manual mode 143
Automatic mode 145
Continue 149
Statistical mode 1 150
Submenus: 151
Cursor - Statistical mode 2 155
Convert Statistical Data 157
Copy Reference Data 161
List Reference Types 162
List Types in DBS files 163
Copy Reference to Media 164
Copy from a media to Reference 165
Rename Reference Types 166
Delete Reference Types 166
Export Reference Data 169
Selected 169
All 169
Line length Standard 170
Line Length Limited 170
Import Reference Data 171
Log Manager 173
Restore 175
Clean Up 175
Appendix A 177
Cursor, Select & Display Functions 181
Write curve and pixel functions 185
Appendix B 191
PC 191
Test Delay 191
Chain on I/O 192

Sample frequency 192
Swap Input 192
Monitor 192
Crest Factor 192
Run Init 192
Polarity of Output Pulse 192
Output (only ++ version) 192
Result Flags 192
Noise Text 193
Ave Result File 193
Digital Output Formats 193
Appendix C 195
Hardware Soft Calibration & Test Menu 195
Output Level Adjustment 195
Impedance Fine Adjustment 195
Re Adjustment 195
Check of Digital I/O 195
Appendix D 197
Re-index database & simulated data for P900 197
Re-index 197
Save Data 197
Appendix E 199
How to make tolerance limits. 199
Make References with a known golden unit. 200
Make references with some known good units. 201
Make references with many units and select manual statistical data to make limits 202
Make references with many units and auto select statistical data to make limits. 204
Ai-mode to auto learns and modifies references on the fly in run-mode. 206
Appendix F 209
Test sequence 209
Start test 209
Test Delay 209
Re Measurement 209
Polarity test - before 210
Sweep Delay 210
Sweep 210
Polarity test – after. 210
Store & display results 210
Next test in chain 210
Store & display results from chain 210
Sweep parameters 211
Sweep Delay 211
Sweep format 211
Points 211
Sweep frequency range 211
Sweep time 212
Sweep reverse 212
Sweep slow 212
Sweep overview 212
Sweep to fast 213

Display drift 215
Appendix G 217
P900 back panel. 217
Appendix H 219
P900 Block diagram 219

Introduction

The P900 Pro is a test system designed to work in a production environment.
With a computer and a test box/chamber a measuring microphone(s) it is a complete workstation for objective production testing of loudspeaker units and systems. It is also the right solution for test of other transducers like microphones, headphones and telephone handsets.

The system consists of P900 hardware and the P900 software. In the rest of the manual P900 Pro is named as P900. All tests are performed simultaneously, fast and reliable and all measured data can be stored locally or on a network for later analyze. The system makes use of a swept sinus. For the analysis of noise, distortion, THD, and Rub & Buzz the system utilizes filters, which ensures very fast response time. The input to the system is microphone response signals and current for impedance analyzes. For microphone measurements, P900 have a built-in compressor function. All analysis and graphical presentation is done by software to both assure fast processing, fast graphic presentation and flexibility. The software consists of a run mode for relatively unskilled day-to-day production testing, and a setup mode for set-up of test parameters, and a group of utilities for analyze, copy, export and import purpose. Among one of the utility functions a log change of a setup enable a fold back if mistakes are done. All main menu functions mode is protected by passwords.

Hardware Concept

The system hardware consists of a standard industrial 19". The system has 8 inputs. Two inputs are allocated for impedance measurement while the rest 6 inputs are allocated for microphone or other signal inputs. Maximal 4 inputs including the impedance channel can be used at same measurement while the other inputs can be used in the same test sequence by be multiplexed. XLR inputs can have an software selected phantom power supply and Lemo inputs for microphones can have a polarization voltage of 200 volt or / and an BNC input for repolarized microphones for Constant Current Power, typical 4-10 mA.
Depending of ordered configuration P900 can have maximal 6 inputs with a BNC plug with maximal 3 inputs with CCP, or P900 can have maximal 6 inputs with a Lemo plug with maximal 3 inputs with polarization voltage of 200 volt. P900 can have maximal 6 inputs with a XLR plug with maximal 3 inputs with phantom power supply off 48 volt. Combinations of those inputs are possible.

There are as standard two individual outputs, connected to an internal power amplifier, which can be selected freely by the software. Impedance measurements are performed using an internal series resistor. An external power amplifier can replace the internal power amplifier. For impedance measurements when an external power amplifier is used, external series resistor is used to replace output Channel B.

More uniquely the system also embodied a built-in system multiplexer, which makes it possible freely to interchange input and output modules, and to run a **two-line production** line with only one workstation. By enabling the system multiplexer it is possible to test two production lines side by side:

While one loudspeaker unit / system or microphone is mounted line 1, a second unit / system on production line 2 can be tested automatically and vice versa. The two different production line set-ups do not necessarily need to be identical.
Even with fully automated production line facilities, the needed handling time will be significantly longer than the required test time. The built-in system multiplexer thus ensures a very high productivity with a complete test cycle down to less than 1-2 seconds or faster is possible.

The system has 8 digital outputs and 4 digital inputs, there is used for external control and processing. The levels are a TTL level. For inputs a 3.3 volt level are accepted.

The external control possibilities support start / end of test and sending the results to an output device.

Connection to a PC is done by a USB connection. As minimum a USB 2.0 high-speed connection is required.

Software Concept

Additionally to the very modular and flexible hardware lay out, all hardware parameters are under direct software control, consequently highly improving the versatility and possible applications of the entire workstation.
The accompanying software has been designed in such a way that it is:

- Easy to use in a production environment
- Fast and secure to setup the test parameters
- Simple graphical control of rejected / approved test
- Incorporates extensive automated database storage possibilities

All tests are performed in **parallel** and all results are shown simultaneously on the screen in appropriate coding of color (green approved (yellow for attention) / red rejected).

Run mode:

Relatively unskilled operators can be used for production testing since test setups and decisions about test parameters are made in the protected technician setup-mode.

The operator selects from the menu which of the existing setups to be used for running the production tests. In a two-line production assembly, the system multiplexer too must be selected from the menu. The setups for each production line can be selected freely and independently.

The operator can select to view complex detailed graphical results, or alternatively short, simple and clear result flags in the form of descriptive text, appropriate color code.
The main results from each test: rejected / approved, error type, speaker type, channels, date etc., can be stored in a database for analysis and statistics.
An on screen statistics can be displayed for each single test type and analyzed for selected data.

The operator can make small on-line calibrations / adjustment in reference setup by entering a user-password and making use of a previously stored master curve if used.

If one of the “store” measure data functions is “on” in global-setup - and - cancel record function is “on”, the operator have the possibility to “Delete” / cancel the last stored data.

If Ai functions are active the Ai auto learns movement of reference curves. These functions do only work for approved test.

Setup mode:

Appropriate setup of test parameters requires a certain level of expertise and in-depth knowledge of loudspeaker / microphone technology. To ensure that only skilled personnel are allowed to make or change of test parameter setups, a secure manager protects the technician mode.

After entering of a valid password if activated, the type descriptions and content of the memo field for all previous setups are shown on the screen and a new setup can be implemented in various ways:

- Previously stored parameter setup can be used as the basis for manual changes
- The software contains a built-in standard “default” setup which can be used as basis
- A number of "good" speakers / microphones can be tested and used to create envelopes for frequency and filter setups
- Limits can be established / modified using the cursor in the graphical edit functions
- A fixed level can be added to / subtracted from existing envelopes

Furthermore, any combination of the above mentioned procedures could be used. This gives a very flexible and powerful technique of setting up parameter characteristics.

Available parameters for setup include:

- Type name
- Chain name
- Description
- Selection of help file
- 3-Limit function
- Start and Stop frequencies
- Delay time
- Test points
- Sweep time
- Sweep Reverse
- Sweep Slow
- Output level and channel
- I/O code (optional)
- Polarity test ON/OFF
- Polarity pulse time and pulse polarity POS/NEG
- Polarity pulse window setup
- Polarity before / after sweep
- Sync burst and delay
- Inputs, gain, LIN / LOG / SPL setup
- Main analyze channels, A, B, C & D
- Secondary analyze channels A2, B2, C2, D2
- Secondary analyze functions: Phase, THD, Current, Bl, Ambient Noise
- Sensitivity test ON / OFF and test frequency
- Move frequency test function ON / OFF for Sensitivity test
- Separate Sensitivity test 1 to 5 with separate limits and without move
- Loudness functions
- Compensation curve function
- Master and calibrations curve functions
- Storage of best fit curves
- Compressor function
- Filter types and functions
- Impedance resonance, Qms, Qts, Re, Qr and F test setup
- Average group selection setup
- Auto save functions

- Multi Frequency Average test function
- Single point Average test 1 and 2 function with separate limits
- Thiele and Small parameters
- Slope
- Hi-2 or blat
- 2. Resonance for maximum or minimum part of impedance
- Auto learning (Ai) functions to modify limits in run-mode
- R-23 (a distortion ratio of harmonic)
- Process delay
- Output mute

The manipulation reference functions contain:

- Measure loudspeaker unit / system
- Include / reject results
- Smoothen results
- Reset curves

And a comprehensive number of edit functions:

- Writing points of curve
- Moving whole or part of curve
- Tolerance curves to manipulate reference curves
- Reset lower envelope
- Reset selected envelope
- Jitter envelope
- Curve manipulation
- Ai Curve manipulation
- Input level scale function
- Gain adjust functions
- Manual power on output at cursor value

With the zoom function it is possible to interchange between the channels A-D on the screen when editing. The edit functions can be operated by the cursor and / or by the numeric keypad. The type number of speaker setup can be up to 12 characters for storage of data, and the corresponding memo field can be up to 25 characters long.
The number of different setup stored on hard disk is virtually unlimited (depending on hard disk size only).

Global setup:

In the opening menu of the program the current global parameter setup as well as the setup / change of parameters are found.

The global parameters comprise of the following:

- Control: Start Control – Keyboard / External
  Cancel Record - Enable / Disable
  Multiplexer – Enable / Disable
  Repeat By Reject - Enable / Disable

Repeat By Reject, C2 Stop - Enable / Disable
Repeat counts

- Chain: Chain – On / Off
  Delay – Off / 1 / 2 / 3 / 4 / 5 sec.
  Break – On / Off
- Display Graph: By Approve – Enable / Disable
  By Reject – Enable / Disable
  Delay – Enable / Disable
- Store: Data Approve – On / Off / Aut
  Data Reject - On / Off / Aut
  Results – On / Off / Aut
  Data Format – Dbf / Txt
- Graphic Scale: Auto – Enable / Disable
- User Key's: User ID – Enable / Disable
  Password – Enable / Disable
  Lock - Enable / Disable
- Screen: Statistics – Enable / Disable
  Include - All results / Approved
  Reload – Enable / Disable
- Gain Adjustment: Input 1, 2, 3, 4, 5, and Ch C
- Path: Reference, Data, Results
- Extern Amplifier Test signal Output
  Value of external Rs

Any changes to the current global parameters can be stored on disk / network for further reference.

Utility functions:

To enchanted the exploitation of collected reference and measurement data a variety of utilities are included.

Process Statistical Data
Processing all stored data processed in the "run" mode for each setup type.
For each type you can select start and ending date, start and end number, test result and select active channels to process.
You can select either automatic, where all records from a user-defined selector are included, or manual, where you decide for each record to include or exclude to process.

In manual mode the actual test results can be displayed if stored together with data.
After processing the results are shown graphically on the screen for valid records. Here a further process the data to show curves as average, +/- standard deviation (sigma) data as curves. With a powerful “Find” function the best match to the average or a “best fit” reference can be found or a match to a stored user curve.
Basic data for Ai learning functions.

Copy Reference Data
The copy reference utility contains most functions to copy single record(s) from the reference-database to media or disk.
You can list reference, database files and copy reference to or from other media.
You can rename or delete reference types in the database.

Convert, Export and Import Data
The export, import, convert utility can be used to export data to spreadsheets for further manipulation or presentation.
Reference files, including all parameters and reference curve data can be converted to ASCII files with a delimiter as comma or semicolon. Likewise also measured data can be converted.
Finally this utility can also import text files generated from the export utility as reference.

Log Manager
The log manager list all saved changes made in the setup of types and global parameters as well.
The changes are listed in group of global and type of setups sorted on date of change.
The Log Manager has functions as restore of changes (backups) and a “Clean up” have saved Log files as list of changes and backup database.

Installation

P900 Hardware

P900 consist of components of hardware placed in the P900 rack.
Changes of hardware related can changed by make use of the Hardware Configuration Manager.

P900 Cabinet

Check that the delivered P900 is supplied with the right mains voltage. You will find a voltage switch marked 115 V or 220 V on the P900 near the main inlet. Please be sure you have selected the correct voltage. The change has only effect for the power amplifier.

Connections

Front panel

Output A + B

Type Speak on 4 poles	PIN +1, +OUT
	PIN -1, -OUT
	PIN +2, not used
	PIN -2, not used

Inputs

Type XLR	PIN 1, Signal GND
	PIN 2, +INPUT phantom +48volt by software
	PIN 3, -INPUT phantom +48volt by software
Type Lemo	PIN 1, Signal GND
If installed	PIN 2, +INPUT
	PIN 3, Pol. Voltage +200 Volt trough 1 MOhm
	PIN 4, -INPUT
	PIN 5, + power supply
	PIN 6, + power supply
	PIN 7, Signal GND
Type BNC	Center Pin, CCP typical 4 mA.
If installed	

Back panel

Analog Output

Generator output:

Jack socket 6.3 mm	Center pin, Generator Signal Middle pin, Generator Signal Ground pin, Signal GND

Monitor output (optional):

Mini jack 3.5 mm	Center pin, Monitor or Generator Signal Middle pin, Monitor or Generator Signal Ground pin, Signal GND

Analog Input 2

Input for impedance ChB;

Jack socket 6.3 mm	Center pin, +INPUT Middle pin, -INPUT Ground pin, Signal GND

Note the software detect if a jack plug is mounted for activation of input.

Digital IO

25 pole female	Pin 1	+OUT 0, testing
	Pin 2	+OUT 2, test result bit 3
	Pin 3	+OUT 4, test result bit 5
	Pin 4	+OUT 6, User IO bit 0
	Pin 5	+IN 0, START Test System 1
	Pin 6	+IN 2, DELETE statistics record
	Pin 7	not used
	Pin 8	not used
	Pin 9	+5 volt
	Pin 10	not used
	Pin 11	not used
	Pin 12	not used
	Pin 13	GND
	Pin 14	+OUT 1, archive system
	Pin 15	+OUT 3, test result bit 4
	Pin 16	+OUT 5, test result bit 6
	Pin 17	+OUT 7, User IO bit 1
	Pin 18	+IN1, START Test System 2
	Pin 19	+IN3, START Test System 3 only P900+ & P900++

Pin 20	not used
Pin 21	not used
Pin 22	not used
Pin 23	not used
Pin 24	not used
Pin 25	not used

Inputs and outputs are TTL level. Level for input 3.3v is accepted.

USB

Type B	USB 2.0 High-speed (480 MHz) or USB 3

External key box (Optional)

As optional a key box can be delivered with the P900 system. This key box has two buttons. Connect the 25 pole plug to P900 "I/O".

Software installation

Install files

P900 software make use different drivers.
The P900 make use of a Multichannel streamer and a USB 1-wire key.

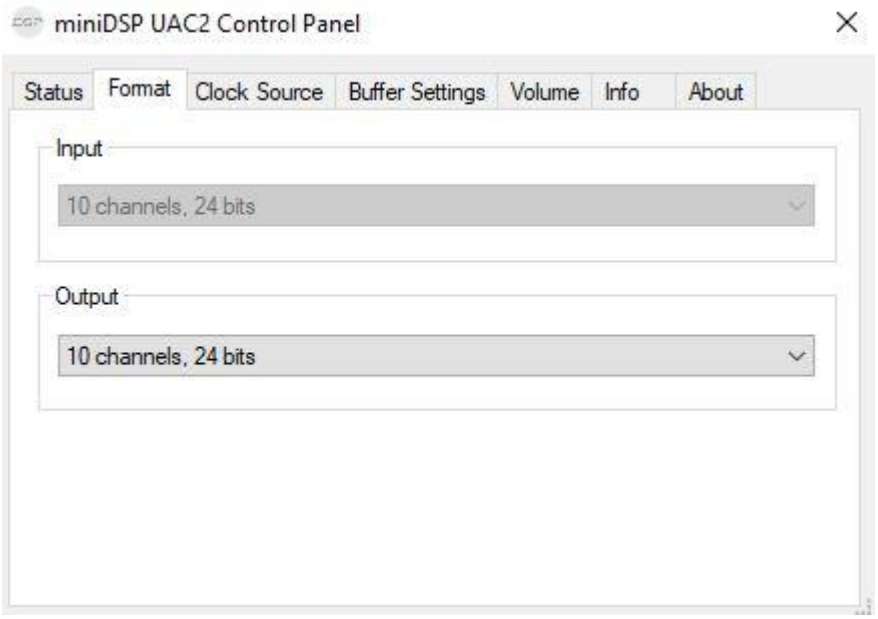
The drivers for the Multichannel streamer – miniDSP and the 1-wire are located on the P900 media. Please read the readme files before installation of the drivers.

After proper installation of these drivers continue to install the P900 program.
To install P900 run the installation. Select the program media and run “setup” and follow the instructions on the screen.

1. Install the P900 program from delivered media.
2. Connect the P900 to the USB port on your PC.
3. Turn power P900.
4. Install Multichannel streamer driver from delivered media.
5. Inset USB dongle.
6. Install 1-wire driver for dongle. Select driver for your system.

Use the miniDSP control panel to setup the Multichannel streamer.
To open the control panel clicks on the DSP icon on the toolbar at right side.

Set parameters as shown on picture below:



Now your system should be ready use.
First time P900 program is entered go to ASIO setup and change the Buffer Settings.
See the ASIO setup described later in this manual.

Software User Section

This section describes how the P900 software is used to properly setup and carries out speaker tests.
It consists of an overall setup of global parameters, mostly to be used by a fairly unskilled operator during production. A more detailed setup of test parameters and characteristics only to be used by a skilled technician and production runs to be performed by an operator and a set of utility functions to be used off-line.

The manual consists of the following chapters:

- Main menu
  - Pw. Mgr.
  - Hw. Mgr.
  - Graph Resolution
  - Spl menu
- Global menu
- Setup menu
- Run menu
- Utility menu

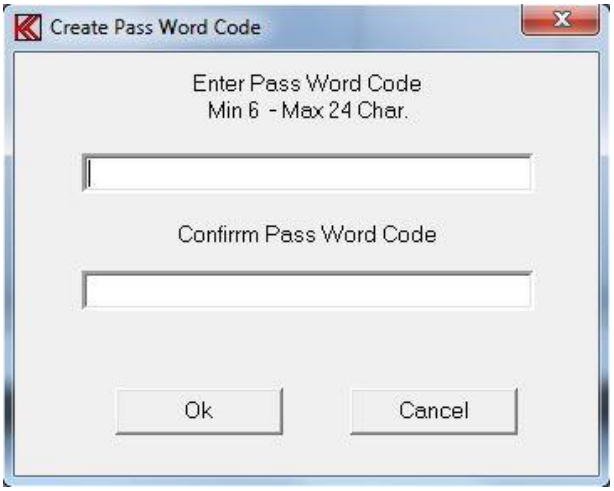
Main Menu

Main menu as showed is the entry point for the P900 program.
From top bar you get the information of program name and serial number.
The Menu bar contains the Main and Version menus.
From Version menu you get information about program name, version and serial number.
The Main menu has same functions as Toolbar below it except for the Microphone & Spl setup, Pass Word Manager, Hardware Manager and Graph Resolution menu.



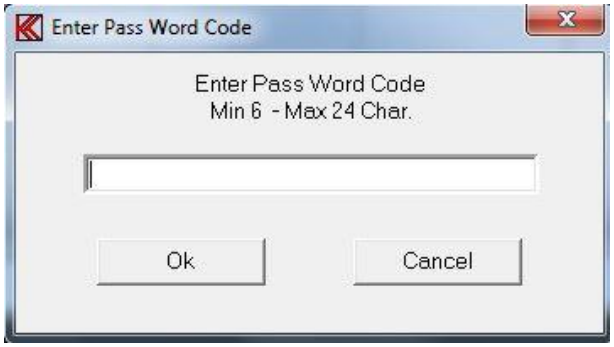
Pw. Mgr.

The “Pass Word Manager” control all passwords used in the Program. With this “Pass Word Manager” password can be, generated, edited, deleted and disabled. All passwords are coded and saved on disk. To manage this Pass Word Manager an administrator need to generate a unique administrator password to enter the Pass Word Manager. First time the Pass Word Manager is entered following picture is shown.

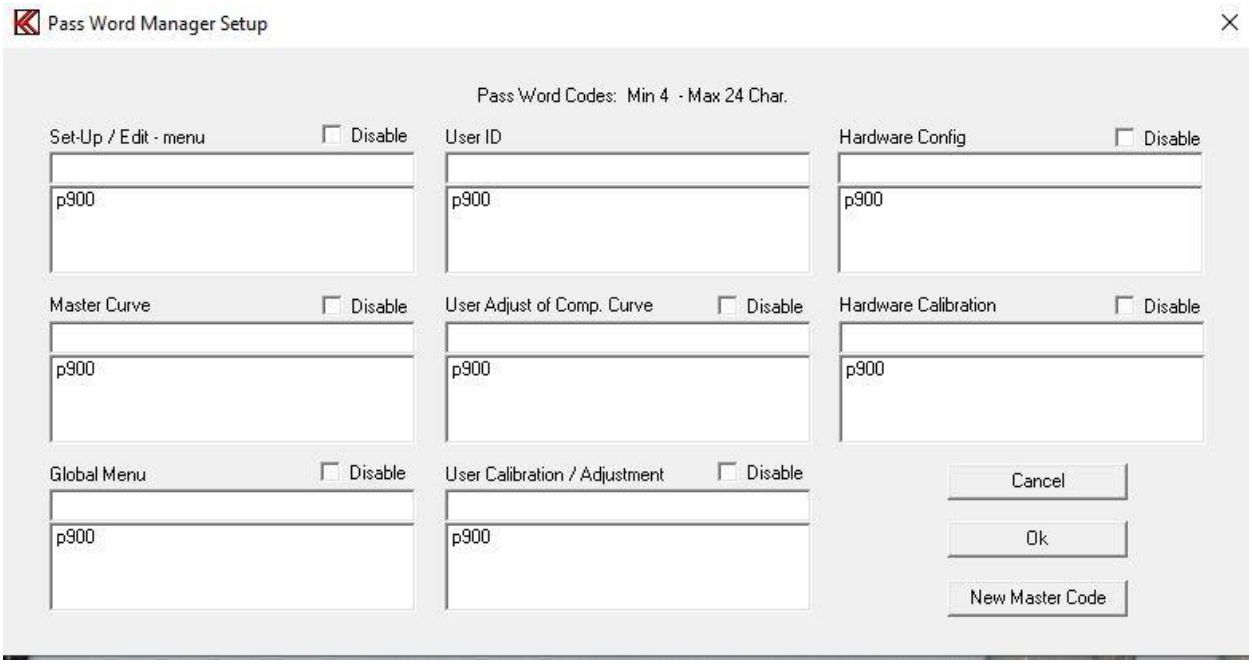


A password for the administrator must be entered. Minimum **6 characters and maximum 24** characters are allowed. Only following characters are allowed: Space, @, 0 - 9, A - Z and a - z. Then password is entered it must be confirmed. ”Ok” saves the password.
IMPORTANT after the password is saved it is NOT possible to read the word. Remember the word or write it down and save it on a safe location.
If the password is lost then reinstall the program.

Next time the Pass Word Manager is entered the administrator password must be used.



When the administrator password is entered correct following menu appear:



In the Pass Word manager Setup following password can be managed:

- Password for set-up / Edit - menu.
- The setup password.
- The Master curve password.
- The Global Menu password.
- The user ID.
- The Hardware Config password.
- The Hardware Calibration password.

Note the user ID is enabled from the Global menu.

Changes allowed by user.
Scale Calibration / Adjustment password and the Compensation curve adjustment password.
Note the user Compensation is enabled from the Global menu.

New password

Enter the new password in the edit field (top on the list). Password length must be between **4 and 24** characters. Add the new password to the list by CR (the enter key). There are almost no limits for numbers of passwords.

Edit password

Highlight a password on the list by clicking by left mouse button. Move the cursor to the edit field so the word in the edit field no longer is highlighted. Edit the name and save the name on the list by CR. Note the manager check for a name duplet. If so the name cannot be saved twice.

Delete password

Highlight a password on the list by clicking by left mouse button. Use the Delete or Backspace button to delete the password from the list.

Disable password

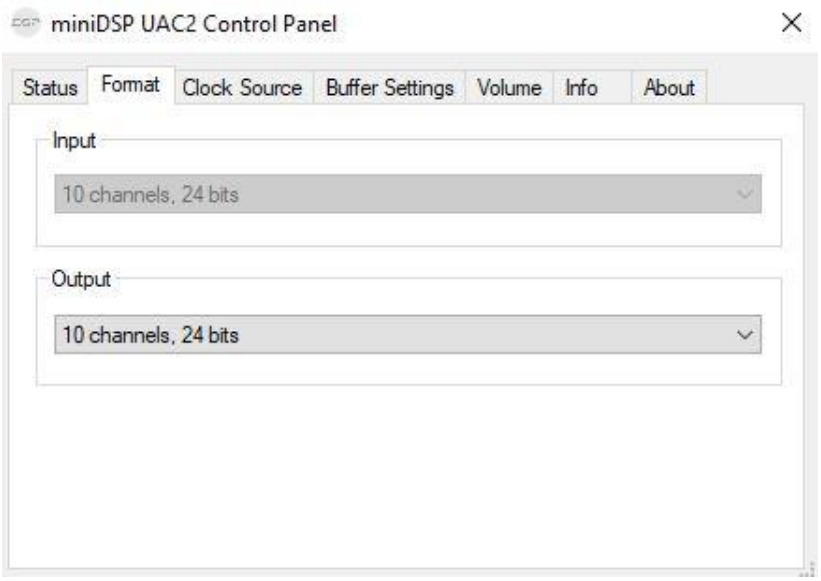
To disable a password function, mark the disable function right for the list name. When asked for a password in the program you just need to hit a key (no password).

New Master Code

This calls the first time administrator password menu.

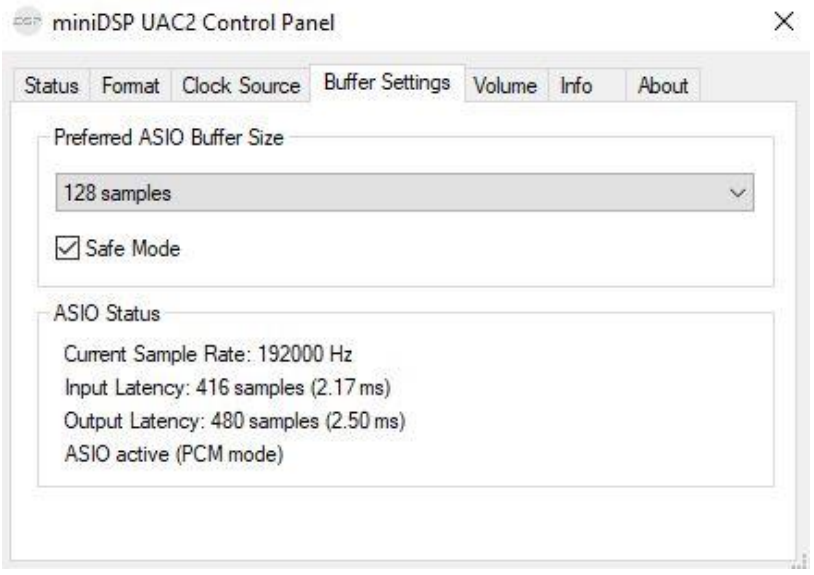
ASIO

The miniDSP Control Panel are called.
The menu is the same described under software installation.



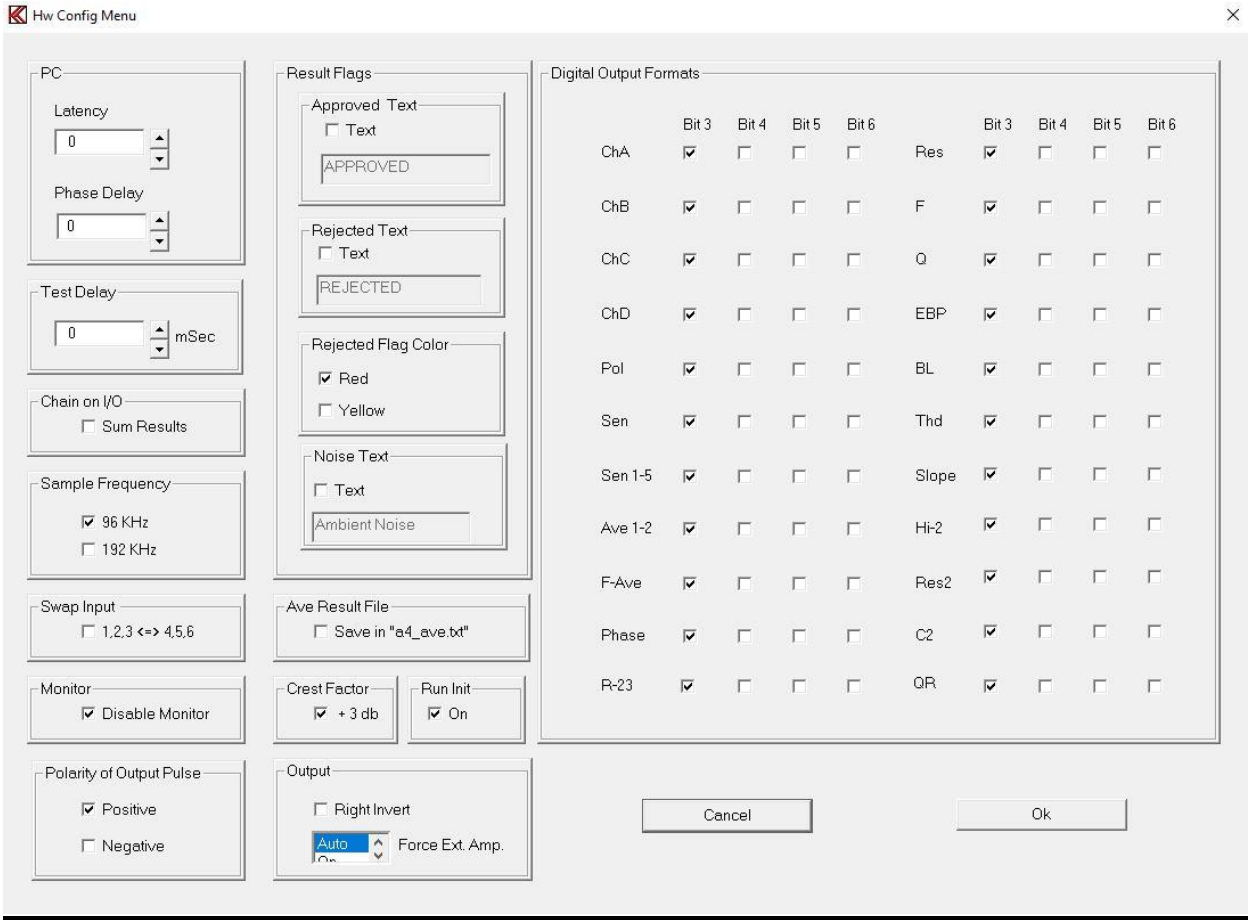
Buffer Settings

Be Shure the buffer settings is 128 samples and the safe mode have the flag on.



Hardware Manager

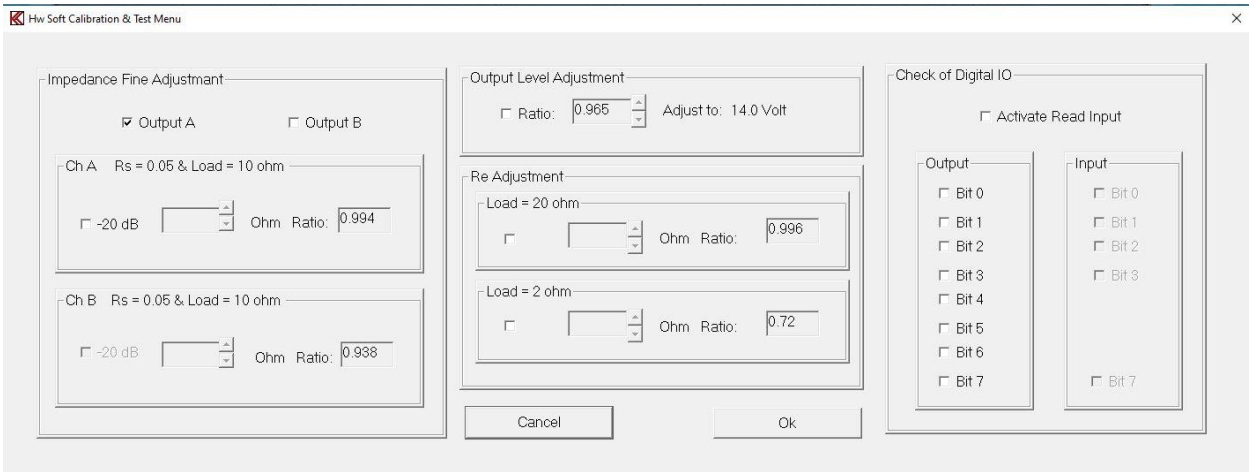
On the hardware manager menu most common hardware can be controlled. The Digital Output layouts are done from this manager.



For more details see Appendix B.

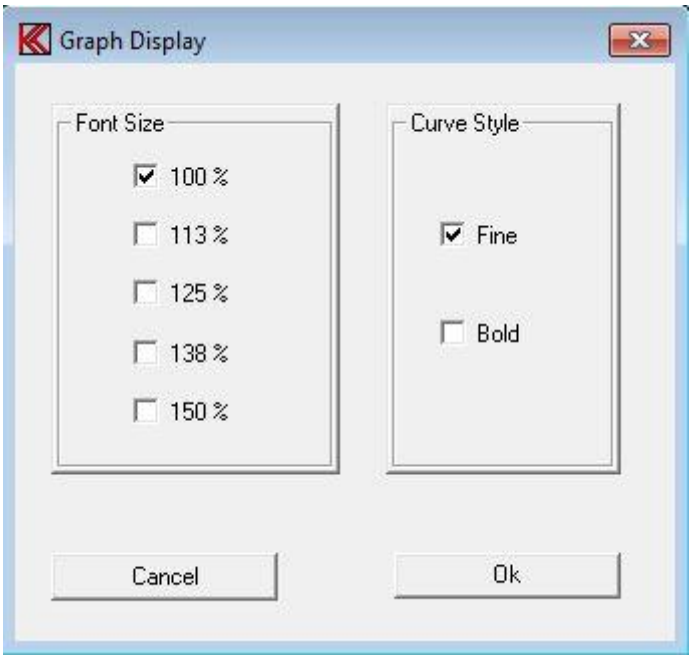
Hardware Calibration

Some of the common hardware calibration can be done in this hardware soft calibration menu.



For more details see Appendix C.

Graph Resolution Menu



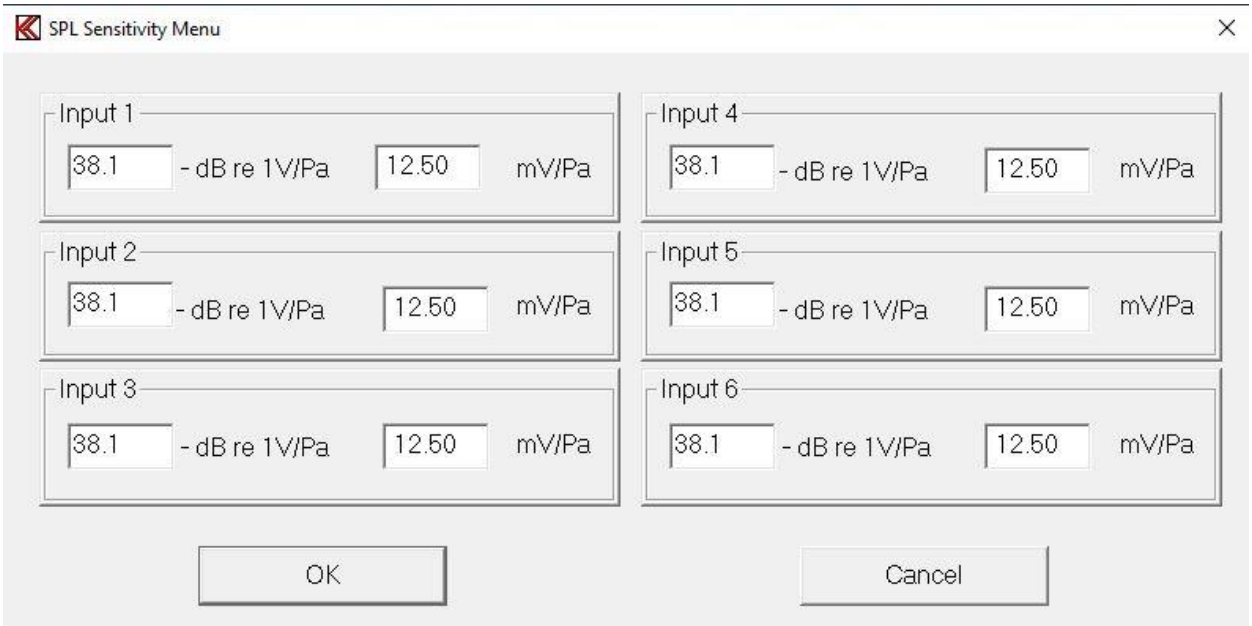
From this menu display presentation can be changed.

Font size for toolbars and menus and dialog menus can be changed from 100 % size and up to 150 %. This can be useful when the programs are cunning on a screen with a high resolution.

When font sizes are changed the P900 program must be restarted before the changes can be implemented.

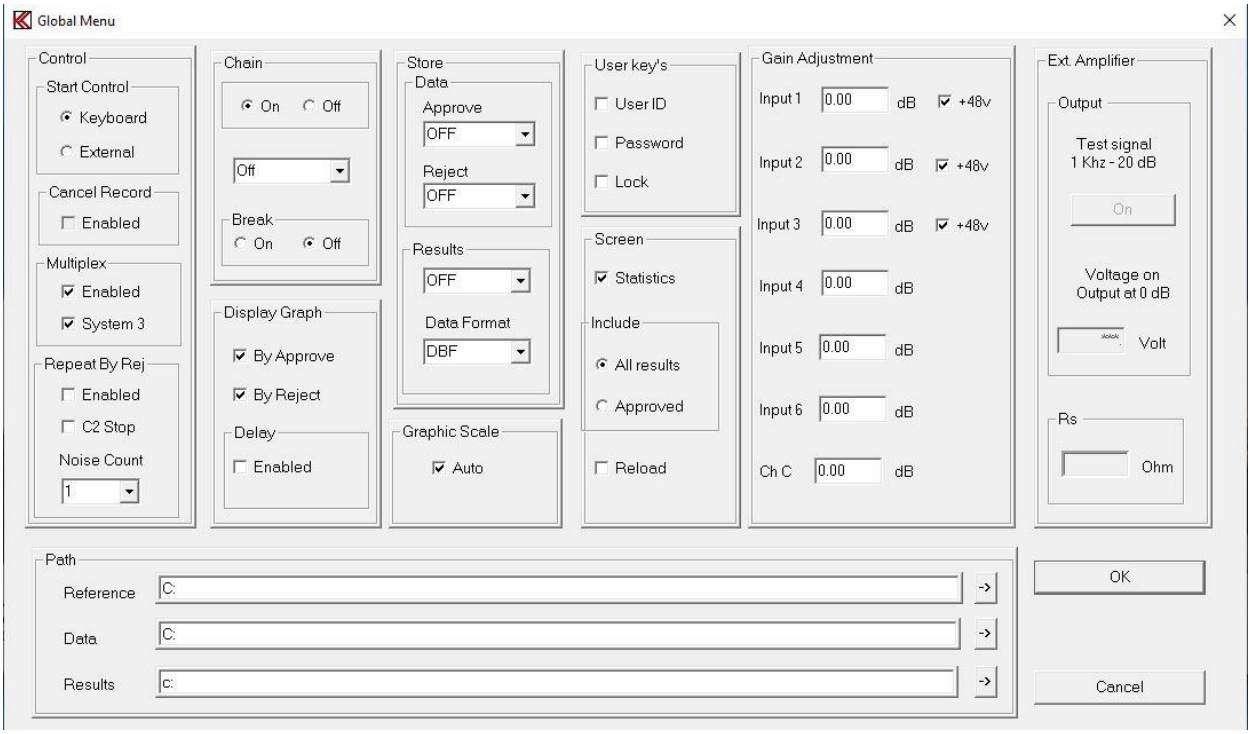
Then graph curves are displayed on a screen with high resolution it can be difficult to see the curves. When the bold flag is on curves are displayed as bold. This takes effect without a restart of the program.

Spl Menu



The SPL Sensitivity Menu are only used is the scale in log mode is selected as “SPL”.
To get the correct Spl level on P900 scale the program must know your sensitivity of the selected microphone. To do this you enter the sensitivity of your microphone connected to a P900 input module. You can ether enter the sensitivity in db with reference to 1V/Pa, without the minus sign, or in mV/Pa.

Global Menu



The Global Menu can be grouped into various functions of similar nature:

- Control
- Chain
- Path
- Display Graph
- User Key's
- Store
- Screen
- Graphic Scale
- Gain Adjustment
- External Amplifier

Control

Start Control

With this function (only works in run mode) you will be able to control the measurements in the production line process either by use of the Keyboard or by External I/O unit (I/O plug on P900 rear).

Cancel Record

If one of the Store Data or Store Results is on, the Cancel Record function can be enabled. This "cancel" function enables the "Delete" key in run mode. The delete key cancel the last stored measured data by marking the actual record with "deleted".

Multiplex
The system contains a built-in multiplier. This allows you to operate two different production lines of speakers in run mode side by side with only one P900 and one PC.

Multiplex System 3
A third test system can be added to be used in Run-Mode (P900+ and P900++).
Multiplex disabled –> system 1.
Multiplex enabled -> system 1 and system 2.
Multiplex enabled and system 3 enabled -> system 1, system 2 and system 3.

Repeat by Reject
By enable this function a second test will be executed if the first test was rejected.
If “C2 Stop” is enabled and channel C filter is on (the I-curve - C2) the repeat will automatic be disabled if a reject appear in C2. If acoustic environment noise force a reject in the channels connected to the microphone the repeat will make a second test. If a reject is present and a reject in channel C2 is present it do not come from the environment due the C2 do not use signal from the microphone. Noise count is the number of repeat (P900+ and P900++). The repeat count is normally 1 however can be set up to 4.

Chain

This function allows you to activate an indefinite number of other test setups in a "chain". First the setup test is carried out and then the chain setup test is carried out (which in turn can invoke another chain operation etc.). Care should be exercised NOT to chain the same type twice in the process as this would result in an infinite loop! In the setup you can select the delay between tests in the chain from 0 to 5 seconds, and you can select whether or not you want to break the chain of tests at the first "reject" in one of the test the results.
Note: To activate a “chain” in run mode both this global chain must be “on” and a valid chain name (name of a test) must be in the called setup of test and must be present in the database, else the chain function will be forced “off”.

Path

To facilitate the processing of the results and the statistics you can freely select where the input files are to be found and where the output files shall be stored.
Define the appropriate paths for this here.
The Reference refers to where the P900 reference data are located. If listed “c:” tells that the reference data are located where the P900 main program is located.
The Data refer to the location of all measured data.
The Results refer to the location of all test results.
Make sure that the paths referred to already exists, if not, the program will not work properly and you will get error messages when you try running the software.
To use a network you have to map the network with a drive letter, example “j:\my-network”.

Display Graph

When you are in the run mode you have the option of having the result presented graphically on the screen, whichever they are approved, rejected or rejected and approved or not at all.
Without graphics you will see if the individual tests are either rejected, color coded RED, or approved, color coded GREEN, or if 3-limit used and approved however out site one of the 3-limits color coded YELLOW.
Display Graph can be activated by Approve only, by Reject only or both at same time.
A Delay function can be enabled.
In the Run Mode this function maintains the results from the preceding test on the screen until the result from the next test is ready (“delays” the updating of the screen).

User key’s

The ID function allows you to enable/disable a request for your identification code during running speaker tests. The ID is like a production password. Several ID codes are possible. The ID code is stored in the A4STAT database.

The User Password, a Key, is only used when the user makes a calibration in run mode. The calibration function will only appear if you have created a compensation curve in setup/changes parameters.

Lock function. As described above it is possible to make small changes in a compensation curve in run-mode. If the changes are more than 3 db you get a warning. If the changes are more than 6 db the system tells that you must do the changes from edit mode. To suppress the 3 db warning however not the 6-db warning flag enable the Lock field.

Store

Data

You will be able to store the measure data (only in run mode) of the test for approved, rejected or for all tests (in file A4M_STAT.DAT).
Valid modes for both approved and rejected are:

- OFF, Function is disabled.
- ON, Function is activated.
- AUT, Store data as saved in actual type setup. See Auto Save functions in setup.

Results

You will be able to store all test results (only in run mode).
This is for further post-processing analysis and you will be able to store in either TXT format or in DBF format. The file: A4STAT.DBF or A4STAT.TXT is self-creating. The formats are described in the README.DOC file.

Valid modes are:

OFF, Actual function disabled.
ON, Actual function activated.
AUT, Store test results as saved in actual type setup. See Auto Save functions in setup.

NOTE: Data to files in store data and store statistics are appended. To avoid a disk full message remove files A4M_STAT.DAT, A4STAT.TXT and A4STAT.DBF by copying and deleting files frequently or if not used, simply by deleting the files. The text format of the A4STAT.TXT is in a decoded format.

Screen

By selecting Statistics you will be able to see the statistics on-screen. The numbers of cumulated approved and rejected tests are shown on the screen.
You can add test results as all or approved only.
By selecting Reload you can reload previous statistics from last time the P900 program was running.

Graphics Scale

With Auto scaling enabled you will maximise the screen representation depending on the number of active channels. With the function OFF, the screen will be split into four default segments, even when you only are performing a single test, in such case only using a quarter of the available screen.

Gain Adjustment

By Gain Adjustment each input amplifier can be fine adjusted within +/- 10.0 db. By entering the correcting gain value in db the value will be added to data with sign. On this way it is possible to change gain as input gain setting in the setup mode.
This Gain Adjust function will be disabled if the SPL function is used.

External Amplifier

This menu is only activated if a jack plug is mounted in the 6.3 mm female plug.

Output

An output can be connected to external amplifiers. To adjust and calibrate the maximal output level on each power amplifier a test signal is supplied on external output. When the test signal is supplied the gain on the external amplifier can be changed and when the test signal is stopped the system measure Output level in Volt rms and displayed. The test signal is 1 KHz with a level at –20 dB of Maximal level. Care must be taken to not allow an out signal higher than the power amplifier allow for an undistorted signal.

Rs

The value of the external sense resistor is entered in the fields Rs.

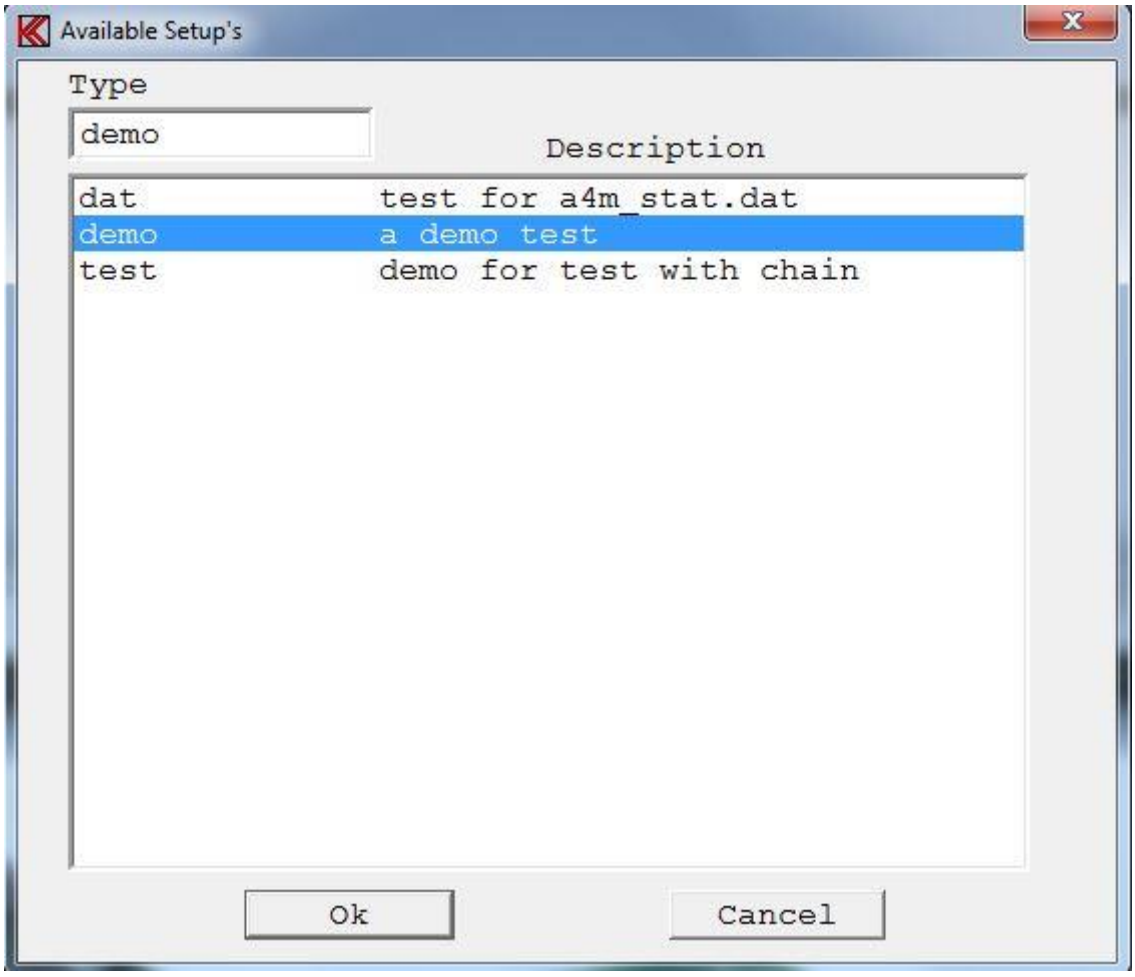
NOTE Monitor (optional) can be used as a line output to external device if “Monitor Disable” Flag is set in Hardware Config menu. See Appendix B,

Setup

Before you can run a speaker test you have to configure your testing parameters. As a proper setup is very important and requires a certain level of expertise and in-depth knowledge of loudspeaker / microphone technology this should only be performed by a skilled technician. Therefore all parameters in this setup are protected by password.

When entering setup, lists of stored setups with description are shown on the screen.

To create / change a setup you can either use an existing setup as model or start from scratch with default parameters. To use an existing as model, enter the “Type” name of the existing setup or double click on a Type to move the name to Type field and click Ok.
To start from scratch with default parameters, enter a new unique name with max. 12 characters in the Type field and click Ok.



If you entered a new type name you will be prompted to respond on the question if you really want to create a new type or you just made a typing mistake.
The next screen picture is the setup of parameters. If it is a new type it contains only standard setup values. If it was an existing it contains the characteristics of this type. To make it into a new type you must change the name of the type.



The setup of parameters screen consists of the following main items:

- Type
- I/O
- Auto Save
- Sweep
- Output
- Sensitivity Test
- Polarity Test
- Compress
- Input
- Filter
- Process Delay

Type

Name
Select the new Name of the setup to change and copy into a new type. If no new type is entered any changes will be done on the existing type name. Note the name is upper and lower character sensitive.

Description
Enter a test description of the selected setup.

Chain
Input an existing type as chain. The chain test type is carried out after this test setup in the run mode. Care must be taken NOT to chain a previous type used in the chain. This will result in an infinite loop.

To use the chain function the following must be completed:

1: Chain in global parameters must be ON.
2: The chain type must be an existing valid type.

Help File
When entering a test setup in the menu the user will be presented with a request for (user defined) “Help” text description relating to the Type. The file containing the description shall be in HTML format (files ending with *.htm) created/edited by the user previously. The user can then in this Help File field select the file name.

3-Limit
This function does only work for channel A. Normally the frequency response is tested against an upper and a lower limit.
With the 3-limit function on you can test the frequency response against 2^{nd} and 3^{rd} upper and lower test limits. Each set of limits is a separate test.
The color-coding of the frequency response is only referred to the first upper and lower limit.
If you only want the red color coding of the frequency response by a total reject of all 3 test limits you start with 3^{rd} limit and end with the 1^{st} limit as the widest set of tolerance. The color-coding between rejects and approved are then yellow.

Status
Status is information for current setup as compensation, master and master compensation and output curves.

I/O
As a special software module, the I/O output address is then selected entering a decimal value from 0 to 3.
Each individually defined type can have a different I/O setting.

Auto Save

Data App.
This function has same function as approve in “Store Data Approve” in “setup of global menu”.
To activate this function the “Store Data Approve” in “setup of global menu” must be set to “AUT”.

Data Rej.
This function has same function as reject in “Store Data Reject” in “setup of global menu”.
To activate this function the “Store Data Reject” in “setup of global menu” must be set to “AUT”.

Results
This function has same function as “Store Results” in “setup of global menu”.
To activate this function the “Store Results” in “setup of global menu” must be set to “AUT”.

Sweep

Start
Start frequency of the sweep (min. 5 Hz.).
Move cursor to another field to see updated field.

Stop
End frequency of the sweep is 50000 Hz with sample frequency 192000 KHz else 30000 Hz.
The minimum difference between start and end frequency is one octave.
Move cursor to another field to see updated field.

Reverse
The sweep begins with the end frequency and end with the start frequency. Note this method may make the sweep slower.

Slow
The step rate on a sweep depends of no of test points, the sweep time and start frequency.
Due to a sweep is semi logarithmic the step rate can be short at end frequency of sweep. As result the measured curve drifting to right. To minimize this use the Slow function.
See appendix F.

Delay
Delay time in milliseconds. Minimum is 0 sec and maximum is 999 sec. The typical value is 0 to 350 mSec for a woofer and 0 to 150 mSec for a tweeter. The delay time is the time from the signal is present on output to input signals are processed.
A normal test sequence is the following: First signal is the pulse for polarity, then the delay time and finally the sinus sweep. If the “After” in polarity test is enabled the polarity test comes after the sweep.
Move cursor to another field to see updated field.

Points
Number of test and measure points. Valid points 10 - 500. For speaker measurements use 250 or 500 points. Note select 250 points to avoid interference on a short sweep time.

Time
Sweep time. A sweep starting with a lower frequency requires a longer sweep time than a sweep starting with a higher one. Sweep time must be adjusted for best and more reliable Rub & Buzz results. Minimum 0.1 seconds for start frequency >= 100 Hz else 0.5 seconds, maximum 32 seconds.

An advantageous hint: Start with a relative slow sweep. Then reduce the sweep time until the curve starts to change. This shows the point where the sweep time is too short for the selected frequency range. Make the sweep time a little bit longer.
Note, the system do not compensate from the sound delay from speaker to microphone.

Warning
Be carefully to select start frequency – stop frequency number of points and sweep time.
If number of points at low frequency start and stop frequency is to close (as 20-200 Hz) and sweep time is low as 2 sec. the sweep frequency can make interference to the measurement.

Output

Output
As standard the system have two output connectors, output A & B. Note the text field must be highlighted to be selected and activated. Note if external output is activated Output B is grayed.

Volt
Select the actual output level in Volt.
Minimum is 0 Volt and maximum is 14 Volt as standard. Move cursor to another field to see updated field.

dB
Select the actual output level in dB.
Maximal output is 0 dB = 14 volt Rms. as standard. Move cursor to another field to see updated field.

Mute Out
If this flag is set output on internal power amplifier output A, B and jack output is muted.

Mute Monitor
If this flag is set output on mini jack output is muted.
Note if Monitor is disabled in hardware setup the same signal are gated to jack and mini jack socket. By using mute out and mute monitor in a combination signal can be gate to two different external devices and be gated to both or only one of the outputs.

Polarity Test

On
A mark at the on enable the polarity tests during at the start of a sweep. Initial for using this test the time gate window has to be set up. See Polarity Time Gate Submenu (Pol-lim) in Edit Mode.

Negative
Select polarity approved by a positive or negative signal. The output pulse is always positive but you can select the polarity test to be approved as positive or negative.

Pulse Time
Input the duration of polarity pulse in milliseconds. Range from 50 to less than <3 mSec.

After
Polarity test is done before the delay and sweep. With the “After” enabled the polarity test is done after the delay and sweep.

Sync delay
Sync delay adds a trigger signal before a polarity. The purpose for this trigger signal is to automatic remove a delay from output to received input signal. Normally when activated the delay is 0.0 mSec. An extra delay is needed to add to get a prober adjustment. The extra delay can be set in the range 0 to 15 mSec. Use this function if the delay from output to input is variable.

Sensitivity Test

The Sensitivity test a single point tested against the yellow upper and lower limits selected by the Sensitivity frequency.
Similar 5 sensitivity tests without the move can be selected against a list of upper and lower limits different from the yellow curve limits. To select those test enter the Reference, then the edit mode and select the S-Ave menu.

Move
Selecting this feature you can move the entire frequency band. This is only for channel A and in LOG mode and only during run mode. If the frequency response follows the tolerance band but is outside the upper or lower limit, the move function moves the measured data into limits. If by doing so the frequency test then is approved the actual value of the moved curve is displayed. If the “move” frequency curve is on, the sensitivity frequency test is performed before the movement of the curve.

Hz
Enter Sensitivity frequency in Hz. The sensitivity frequency must be within the start and end frequency. The sensitivity test is a separate test in run mode.

Compress

Range
This is only valid when an output curve is generated in reference mode.
If the output compression is used (for testing microphones), select a reference channel to compensate the Ch A. The compress range is then displayed.
Normal test procedure: With the use of a reference microphone an almost constant sound level is generated with the output curve. The remaining variations in sound level are then subtracted from channel A, the measuring channel, with a reference microphone channel

Reference Channel
Reference channel against Ch A can be Channel B or D if enabled as input.

Input

Channel C is reserved for impedance measurements.
Channel B and D are designed to measure Rub & Buzz and THD measurements however can be used for measurements of frequency response as well.

Status
Select active channels. Note that at least one channel must be active.

Mux
Select input module address: 1, 2, 3, 4, 5 or 6 (depending on your hardware configuration).
Address:

1 & 4 is Ch A
2 & 5 is Ch B
3 & 6 is Ch D

You can gate (multiplex) an input module to one or two other analyze channels.
You **cannot** change a channel if the host channel is already used. The host channel is the number where the gain is displayed.
If a selected channel not can go off, check that the module address is used in the other channels even if the other channels are off.

Detector
Select detector and presentations mode:
Channel C linear or logarithmic. For filter data in channel C is only used in logarithmic mode.
Channel A, B and D linear, logarithmic or SPL.
SPL is logarithmic with reference to 20 micro Paschal as 0 dB.

Gain
Select gain for each channel (A, B or D).

Smoothing
Here you can select data smoothing on or off to appear on the screen as well as in the data processing. You can select smoothness over octave selections of 1/48, 1/24, 1/12, 1/6, 1/3, 2/3

and 3/3. If external power amplifier is selected a second smoothing appear for smoothing the second filter data curve. This second is only valid if filter C is on in log mode. Below Ch D smoothing the actual number of test points for an octave is displayed.

Filter

The programming of the filters includes the following filter types:

1: Tracking Band Pass
2: Tracking High Pass
3: Fixed High Pass
4: Modified High Pass

Advanced high order, filter technology ensures that both Rub & Buzz and THD can be controlled efficiently.

Type

The filters can be selected as TRK-BP, TRK-HP, and FIX-HP or OFF.
For Rub & Buzz use TRK-HP, FIX-HP and / or MOD-HP filters.

The MOD-HP filter is a FIX-HP filter where the filter setting automatic turn over to a tracked filter 5 times less the corner HP filter frequency.
This give a better detection just before the FIX-HP filter begin to meet the FIX frequency corner.
The MOD-HP is terminating the data at the frequency corner.

Har. (Harmonics)

For the TRK-BP the tracking Band Pass filter and TRK-HP the Tracking High Pass filter the possible setting range of harmonics are from 2 to 12.

Freq/Bw (Frequency / Bandwidth)

TRK-BP:
The Tracking Band Pass filter can change the filter bandwidth. It is possible to select 0.25, 0.5, 1.0 and 2.0 harmonic around the center frequency as filter bandwidth.
This filter can be used to suppress noise if selected for 1st. harmonic.

TRK-HP:
The Tracking High Pass filter can change following low pass frequency: ∞, 20, 10, 8, 6 and 4.
To calculate the low pass frequency, use following formula: selected high pass harmonic * selected low pass harmonic. Example, harmonic = 5 & BW - Har. = 20. The low pass end is 5*20 = 100 times higher than generator signal. If low pass frequency is ∞ the filter limit is 45 kHz.
Normal makes use of the no limit for low pass, the ∞ sign. The high end can be limited using the "Limit" function. This filter, and the Fixed High Pass, emits more noise than the Band Pass filters, but have a higher dynamic range. The 5th harmonics is often used to measure Rub & Buzz, while the 2nd harmonic is commonly used to measure the THD.

FIX-HP and MOD-HP:

The Fixed High Pass filter frequency, start - end, can be selected freely between 20 Hz. and 20000 Hz. This is especially useful for the testing of full tone speakers and woofers.
Make use the filter frequency approximate 10 to 20 times the resonance frequency for Rub & Buzz give the best results.

Gain

The filter gain can be selected as 0 or 20 dB. This can be useful if the signal level trough the filter is less than –70 dB.

Display

When Ch A and Ch B or Ch D are using the same input amplifier (same address) and using the log mode, you can display the result of Ch B or Ch D as relative. This function is made to display the difference between frequency curve and rub & buzz. The differences are displayed, as a distortion in dB and the 100% in top of the screen as 0 dB.
If Relative% is used the scale is displayed in % this useful in THD measurements.
As secondary a THD measurement can be selected in Reference mode for Ch B or Ch D. This enables two curves and limits in those channels. A rub & buzz can be done at same time on Ch B or Ch D. Note If Relative or Relative% can only be selected if Ch A and the selected channel have same mux type.

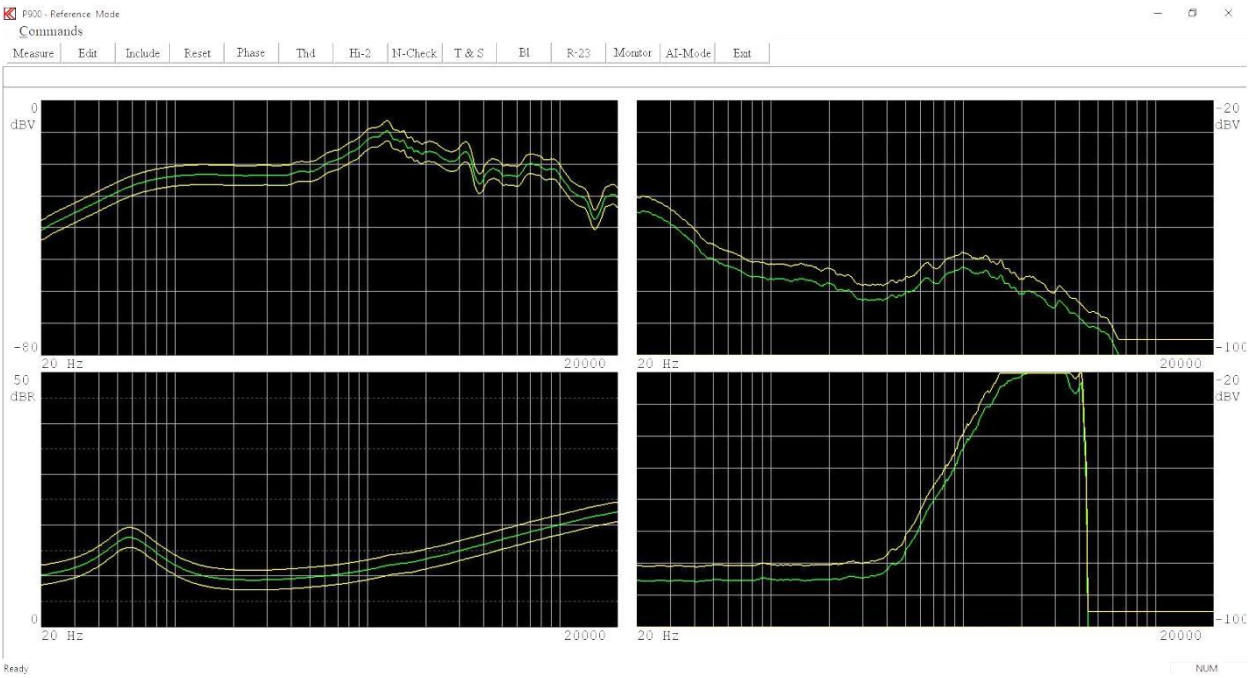
Limit

Select the filter high-end limit between 22 kHz, 34 kHz, 45 kHz and 52 kHz with sample frequency 192000 KHz else 22 kHz and 45 kHz.

Process Delay

The process delay adds a delay between output signal to received signal for input channel A, B and D. This allows adding a layer of external processing between output signal and received data. This delay can be different from saved test types. The value can be in the range off 0 to 500 mSec. If the delay is needed for input C the Out flag must be active.

Reference



Activating “Reference” leads you into the setting up of reference envelopes for approved and rejected conditions for the different test channels.

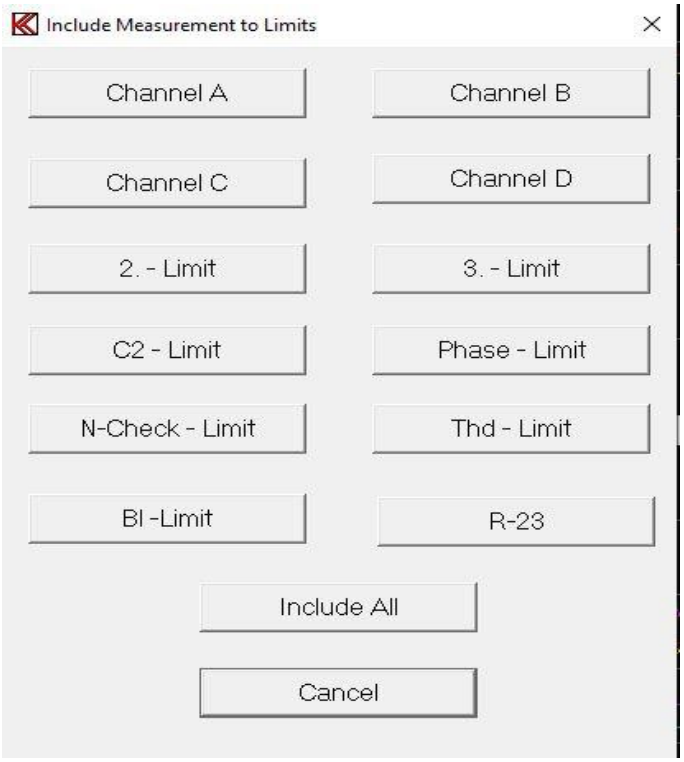
Often you use already approved reference speakers to set up a future standard. Often it is called a "good" speaker. By testing a number of "good" speakers you can create the basis for the tolerance envelope curves.

Measure

To make a measurement, activate the “Measure” command, make use of the “Measure” toolbar or use the key "M".

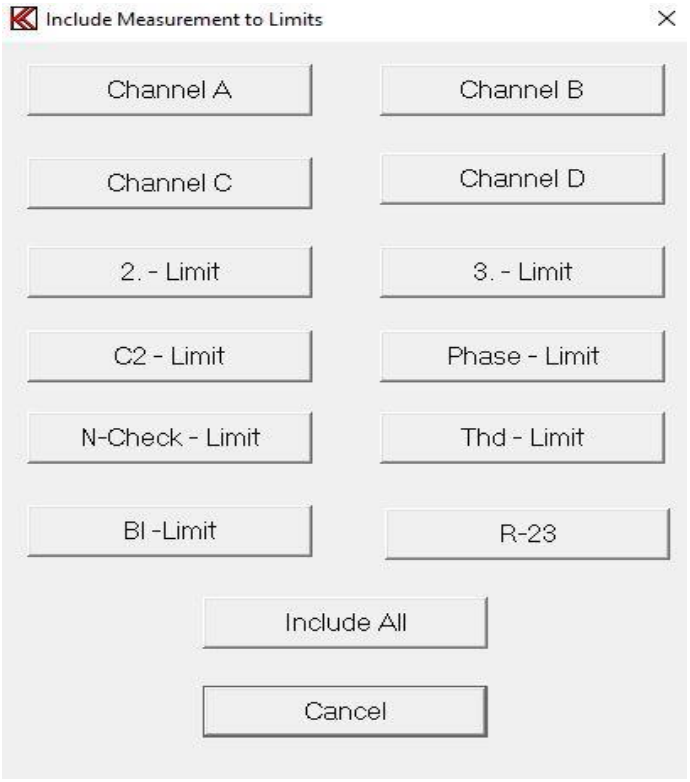
Include

If you accept the test results of a tested speaker you include the test by selecting all or a single channel the transgressions of the upper or lower limit with respect to the present envelopes will be included to the future reference envelopes.



Reset

The upper limit is thus positioned to minimal value and lower limit is positioned to maximal value by selecting all or a single channel.



Edit
Testing of "good" speakers will only provide the basis for a set of envelope curves. To complete the envelopes you have to go to the "Edit" function. See Edit Reference Mode.

Compensate
Note: You must make a least one measurement to get the menu - and a compensation curve must be present.
Compensate the actual measurement in channel A with "stored compensation curve".
The user in run mode within +- 3 dB can modify the compensation curve and if Lock flag is in Global setup +- 6 dB.

Master Comp
Mater compensates current measurements.
This will compensate all channels that use channel A as input.
Note: You must make a least one measurement to get the menu - and - a master curve and a master compensation curve must also be present.

Make M-Comp
Make a master compensation curve.
Note: You must make a least one measurement to get the menu - and - a master curve must also be present.
Generate a master calibrate curve. This curve acts like a compensations curve but if channel B or channel D use same input as channel A the actual channels will be compensated as channel A.
What is the use of a calibration curve? To calibrate your total test system you use a reference speaker.
First make a master curve with the reference speaker. As time goes your test parameters will change due to changes in microphone, microphone position, temperature, mechanical changes in your test environment, change in calibrations of the P900, etc. etc.
To calibrate the system you make a new measurement with your reference speaker. If you have differences then you must re-calibrate. Then you get the master calibrate curve. After this is done all measurements will be corrected to your first measurement stored as master curve.

Out Compress
Note: You must make at least one measurement to get to this the menu.
Generate an output compress curve. To compress output the frequency response in channel A is inverted and moved to the top of the Channel A display. The compress curve is actually the voltage output. Maximal output is output level minus 0 dB. Min output is output level minus maximal curve deviation. This value in dB is displayed in the setup of parameters. Channel A must be “on” and in the Log mode and a least one measurement must have been produced.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Phase
Phase enable a Phase Test Menu. Phase test compare phase of frequency response and display phase curve selected in channel enabled in this menu.

THD
The THD enables a separate THD test. The purpose of this test is to make secondary test in Ch B or Ch D without take up a analyze channel used for Rub & Buzz measurement.

Hi-2
Hi-2 or blat menu enable to test the Hi-2 or blat distortion.

N-Check
Ambient Noise Check is a function used in Run-mode to check for ambient noise by using a separate microphone.

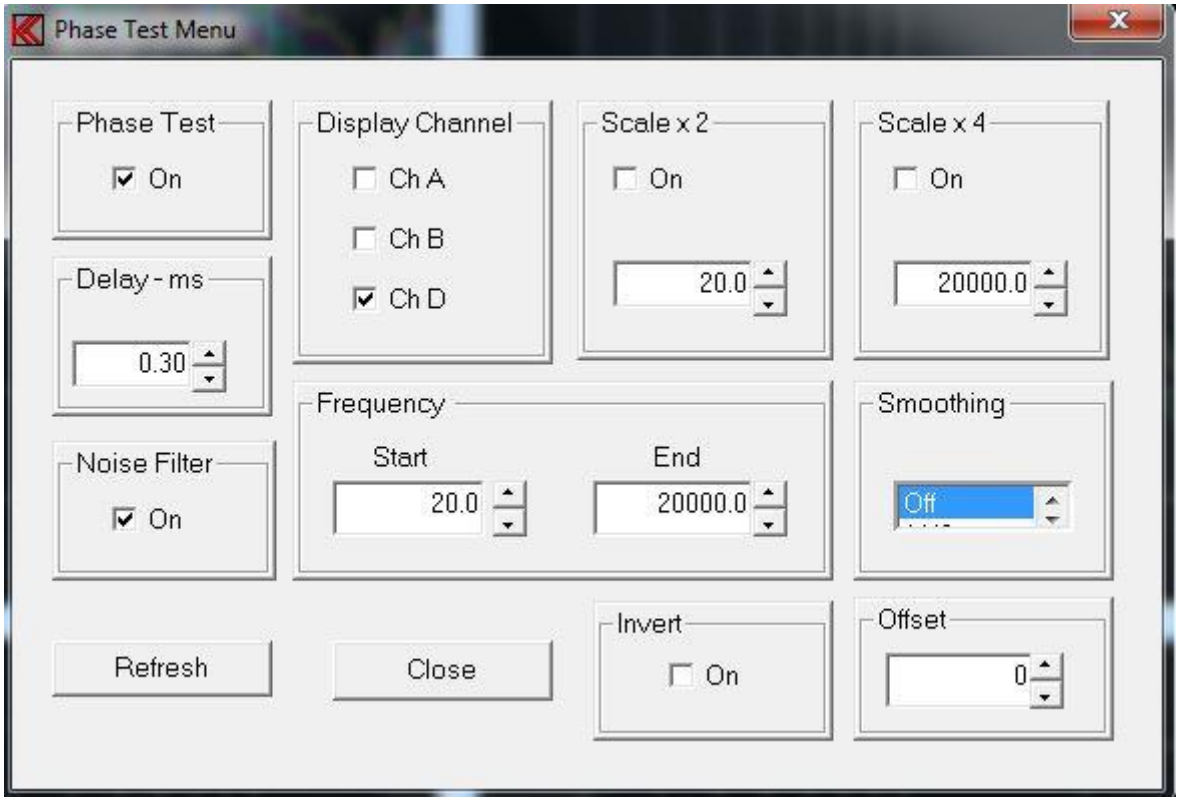
Thiele & Small
Measure and calculate Thiele & Small parameters.

Bl
With the Bl function it is possible to test the speaker coil is in the middle of the magnetic field.

R-23
R-23 is a distortion test using different harmonic component in a ratio.

Monitor
With the monitor function it is possible to output measured data to Monitor Output.

Phase Test Menu



Phase Test

Phase test enable disable the Phase test.

Delay

From sound source to source microphone is a distance. This distance course in a sound delay and as a result a phase error will be added over the entire frequency range increasing with increasing frequency.

To out compensate this delay the “delay” must enter here in msec. Hint enter the value where you get the most straight phase curve. When a measurement is done the delay can be changes and by a “Refresh” a new calculation and presentation is done.

Noise Filter

Noise filter is a filter to improve tracking of phase especially at lover frequency where the signal level can low and signal noise ratio is poor.

Display Channel

While input is the input Ch A the display channel can be Ch A, Ch B or Ch D.

Frequency

The frequency span the phase test can be between the start and end of sweep. Anyway it is possible to make a smaller frequency range for the phase test. This is to avoid noise at the beginning of start frequency and instability at high frequency.

Scale x 2
With scale x 2 on the phase scale will be displayed 2 x normally. The frequency selects the frequency where the 2-x scale will be enabled and upward.

Scale x 4
With scale x 4 on the phase scale will be displayed 4 x normally. The frequency selects the frequency where the 4-x scale will be enabled and upward.

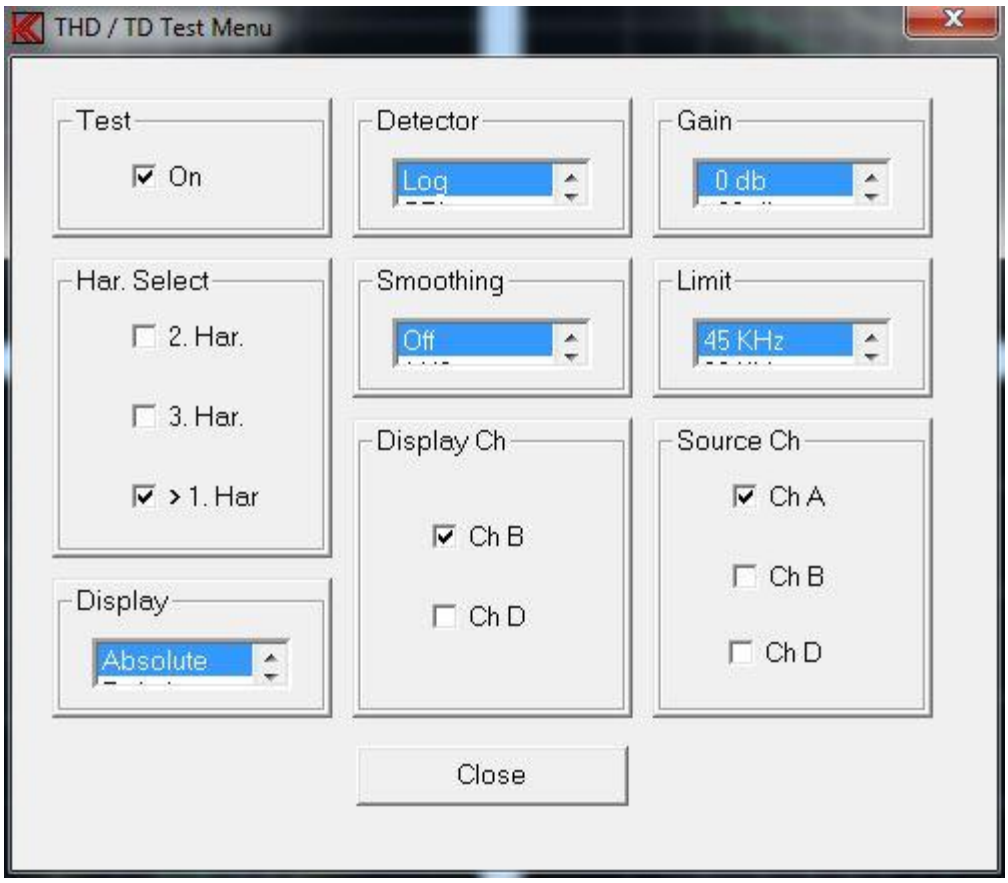
Smoothing
Phase curve smoothing.

Invert
This invert (180 deg.) input signal before phase processing.

Offset
With offset a display offset is added to phase before presentation between +- 180 deg.

THD Test Menu

The THD Test Menu enables a separate THD test.



Test
This enables or disables the secondary THD / TD (total distortion) test.

Har. Select
Harmonic selection:
2^{nd} harmonic only, 3^{rd} harmonic only, 2^{nd} & 3^{rd} harmonic only and > 1^{st} harmonic.

Detector
Detector Selection: LOG or SPL.

Smoothing
Selection of data smoothing:
Off, 1/48, 1/24, 1/12, 1/6, 1/3, 2/3, 3/3 of octave.

Gain
Gain of selected input channel 0 or +20 db.

Limit
Upper frequency limits 45 or 22 KHz.

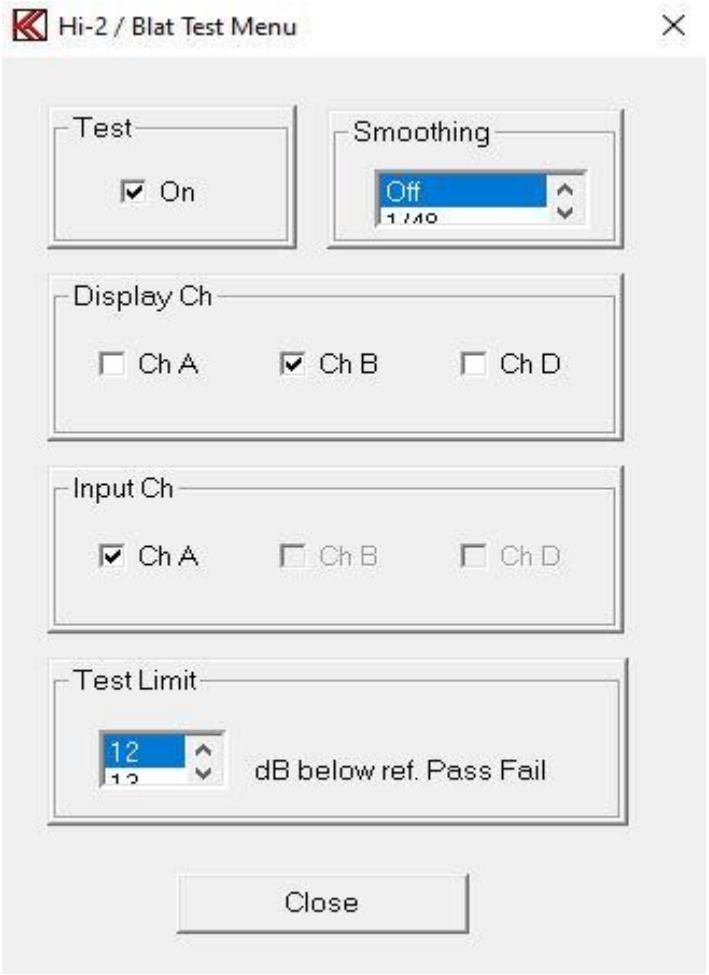
Source Ch
Selection of input channel for a secondary analyzes. Possible channels are Ch A, Ch B or Ch D.

Display
Data presentation: Absolute, Relative and Relative %.

Display Ch
Selection of the secondary presentation channel: Ch B or Ch D.

Hi-2Test Menu

The Hi-2 / Blat test menu enables a separate distortion test with reference to David Clark paper 950189.



Test
This enables or disables the secondary Hi-2 / Blat distortion test.

Smoothing
Selection of data smoothing:
Off, 1/48, 1/24, 1/12, 1/6, 1/3, 2/3, 3/3 of octave.

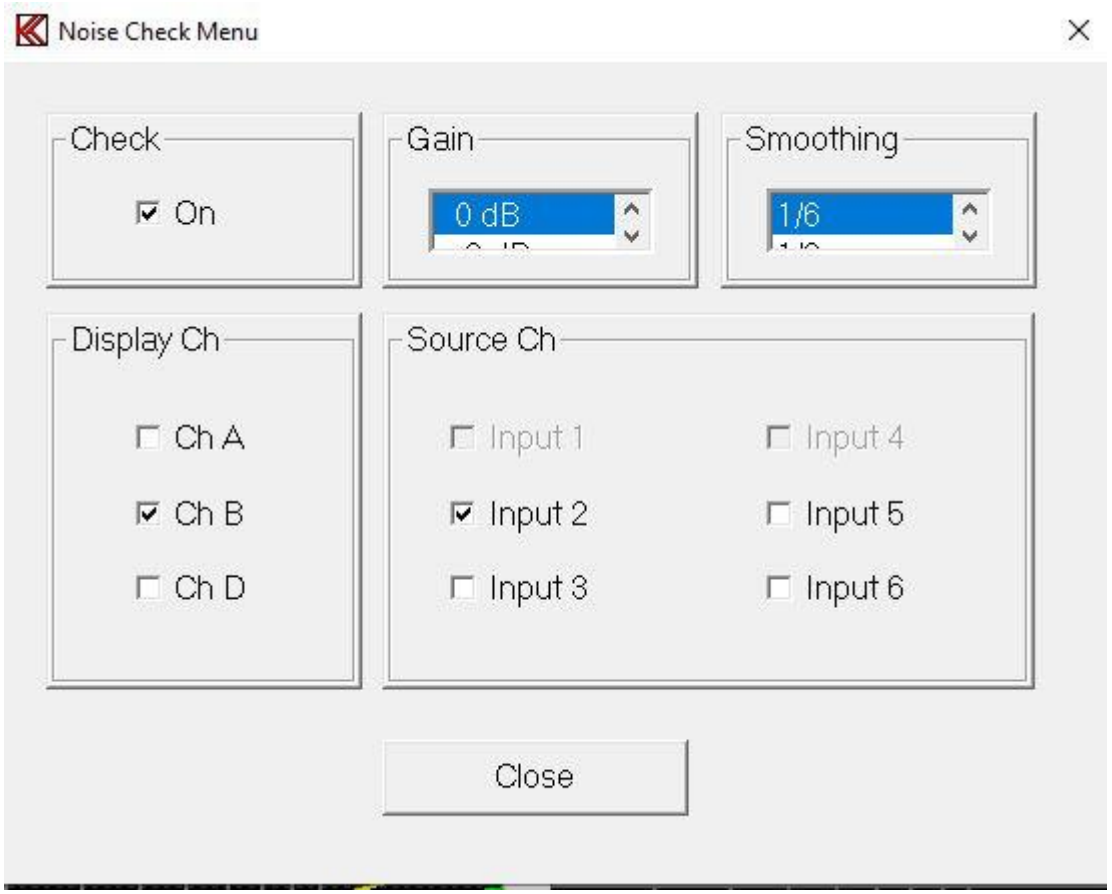
Display Ch
Selection of the secondary presentation channel: Ch A, Ch B or Ch D.

Input Ch
Input channel selection. Following channels can be selected as enabled in setup: Ch A (mux 1 or 4), Ch B (mux 2 or 5) or Ch D (mux 3 or 6).

Test Limit
Set the test limits for the test relative to the reference Pass Fail curve. The Pass Fail curve is the upper Hi-2 curve. The Standard Target curve is 12 db below Pass Fail curve, the lower Hi-2 curve. The test curve limit can be set from 0 to 18 db below Pass Fail curve. The default is 12 db to get the Target Curve for the test.

N-Check

Ambient Noise Check is a function used in Run-mode to check for ambient noise there could interfere / disturb the test results. A microphone outside the test fixture collects this noise signal and when an upper limit exceeds, activate the check. If activated, a warning will be displayed. If the main test is a reject AND the noise exceeds the noise limit AND the where there is correlation between the two rejects second test be executed.



Check
This enable disable the Noise Check in Run - mode.

Display Ch
Selection of the secondary channel where the Noise Check curve will be displayed: Ch A, Ch B or Ch D.

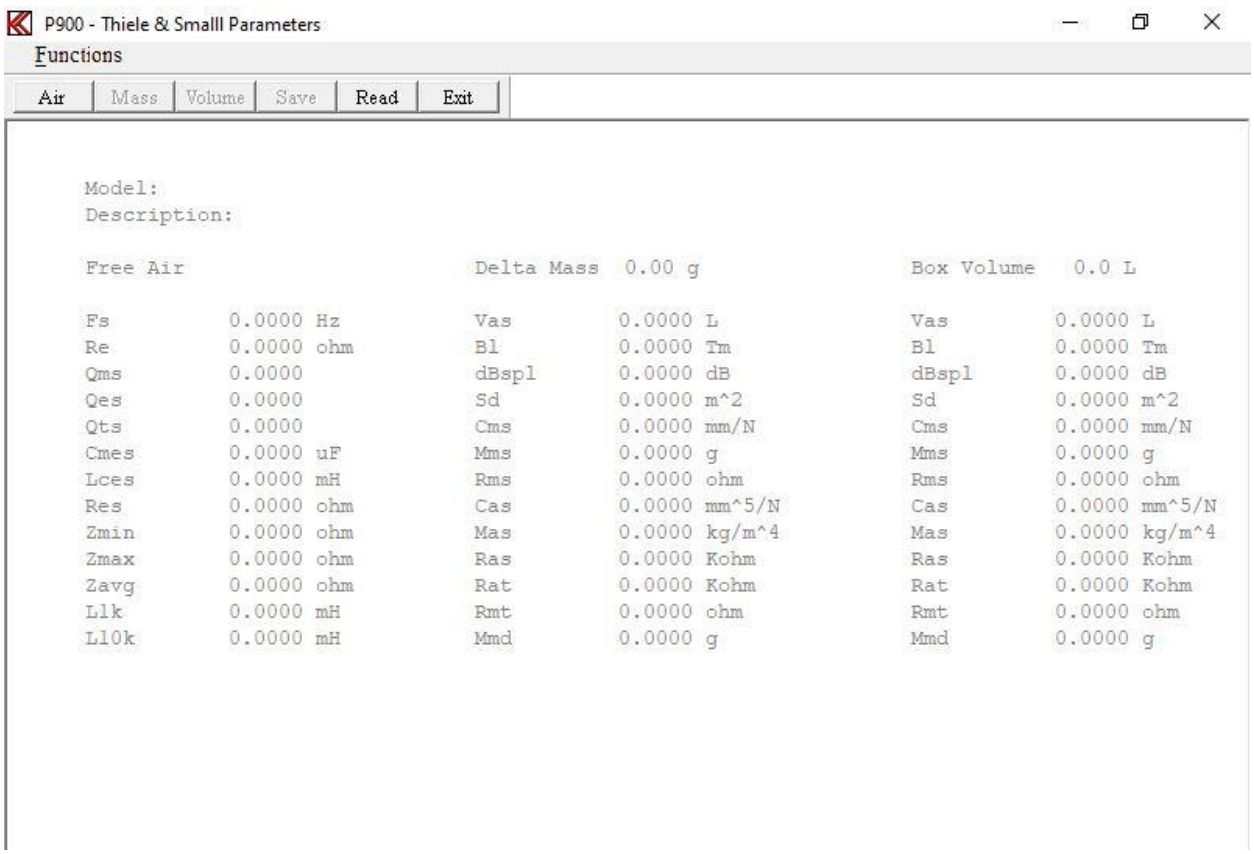
Source Ch
Selection of the input module used for the noise check microphone.
Possible input modules: 1, 2, 3, 4, 5 and 6. Only modules installed will be highlighted.

Gain
Gain of selected input module.

Smoothing
Selection of data smoothing:
Off, 1/48, 1/24, 1/12, 1/6, 1/3, 2/3, 3/3 of octave.

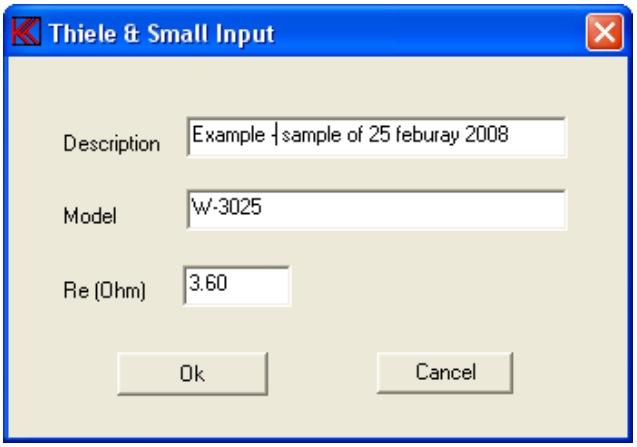
Thiele & Small

Thiele and Small parameters can be measured and calculated from this menu when channel C is activated for impedance measurements.
Three options are available for measured impedance data.
Step one and always needed an impedance measurement in free air.
Next step can be a new impedance measurement with the speaker mounted in a box with a known volume the delta compliance method or / and a measurement with a known mass added to the mowing part of the speaker in a free air the delta mass method.

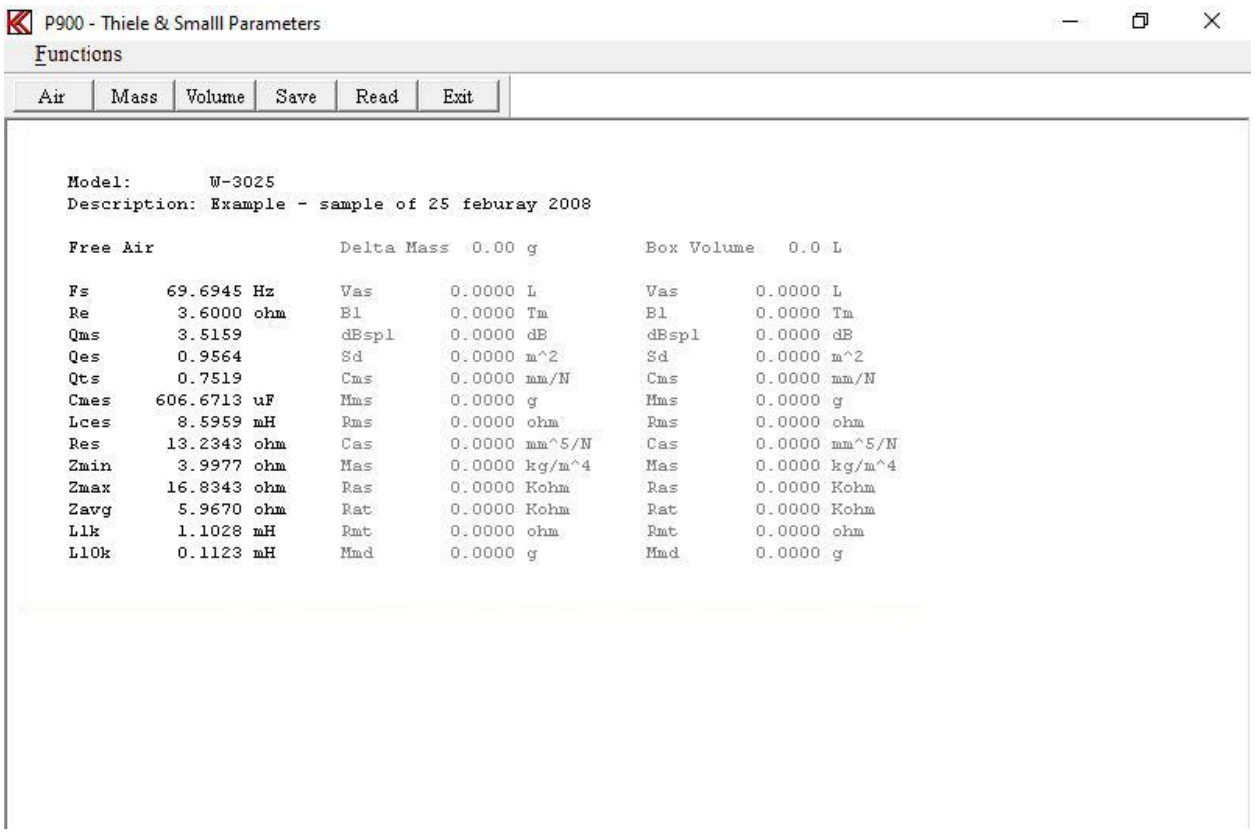


Free Air

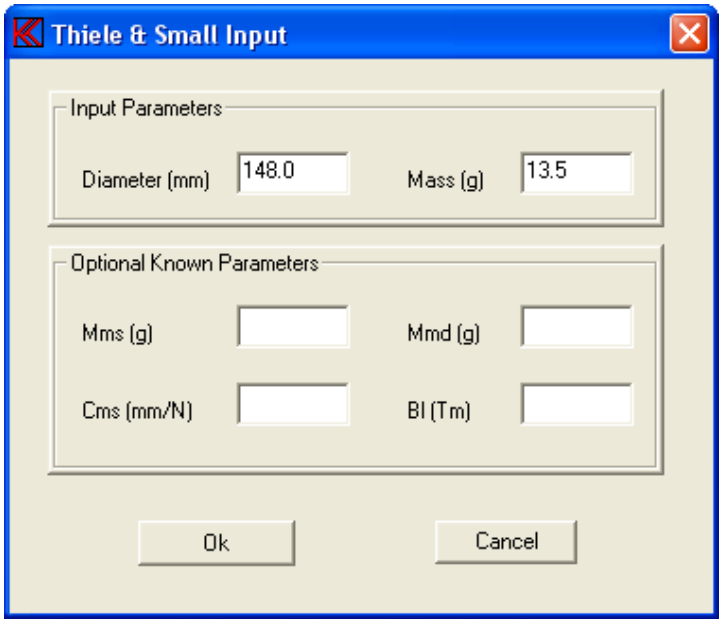
To calculate the Free Air parameters an impedance measurement must be done in free air. Then calculate the free air parameters by the “Air” function.
Then this calculation must be done before a delta mass or Volume calculation can be enabled.



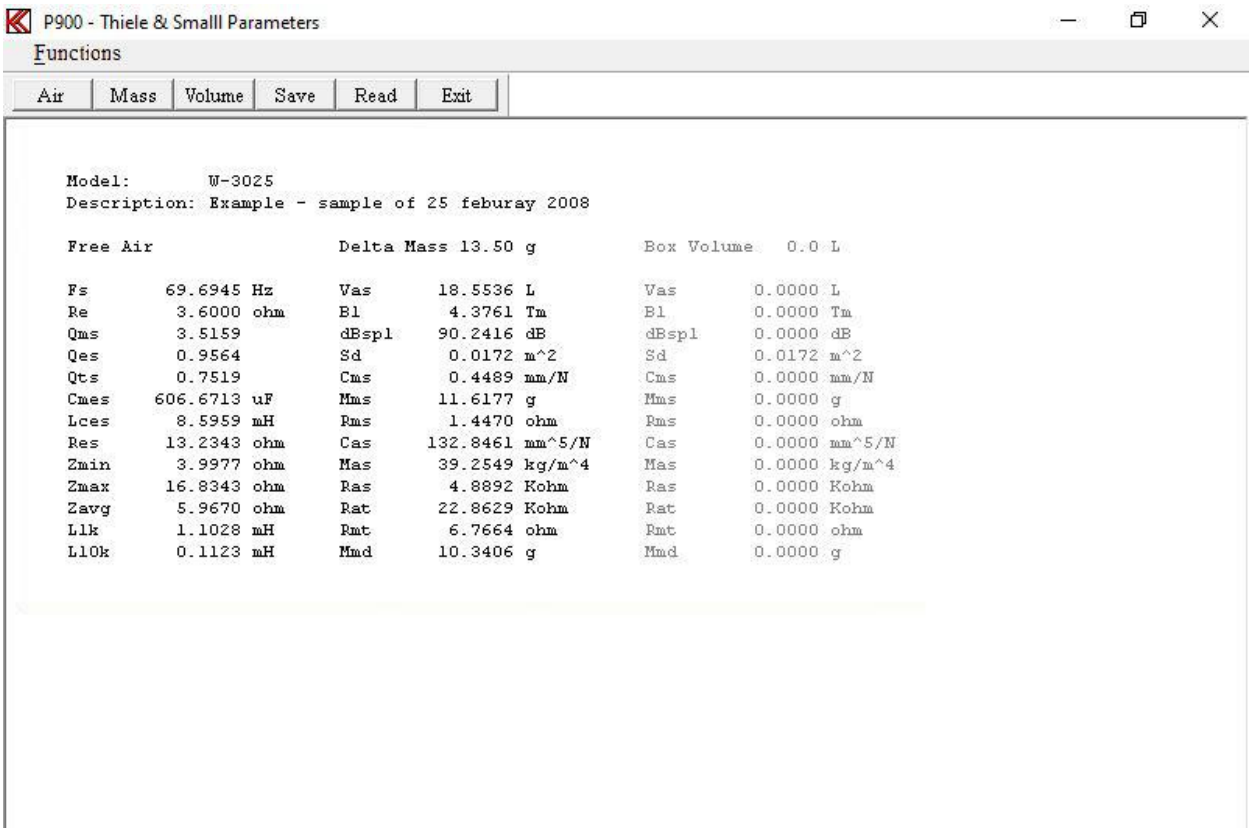
A dialog box appears. A description and model name can be entered for information.
To continue the Re of the speaker must be entered if field is empty.



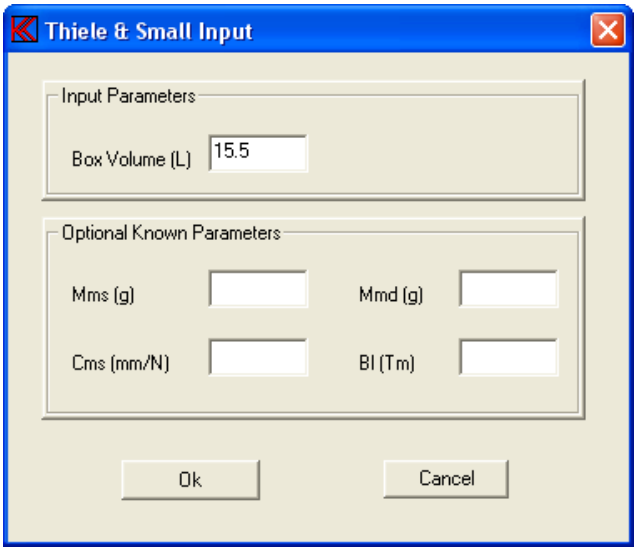
Mass
To calculate the rest of parameters by the delta mass the calculation of free air must be fulfilled or the parameters must be read from a measurement processed by the air command and already saved.



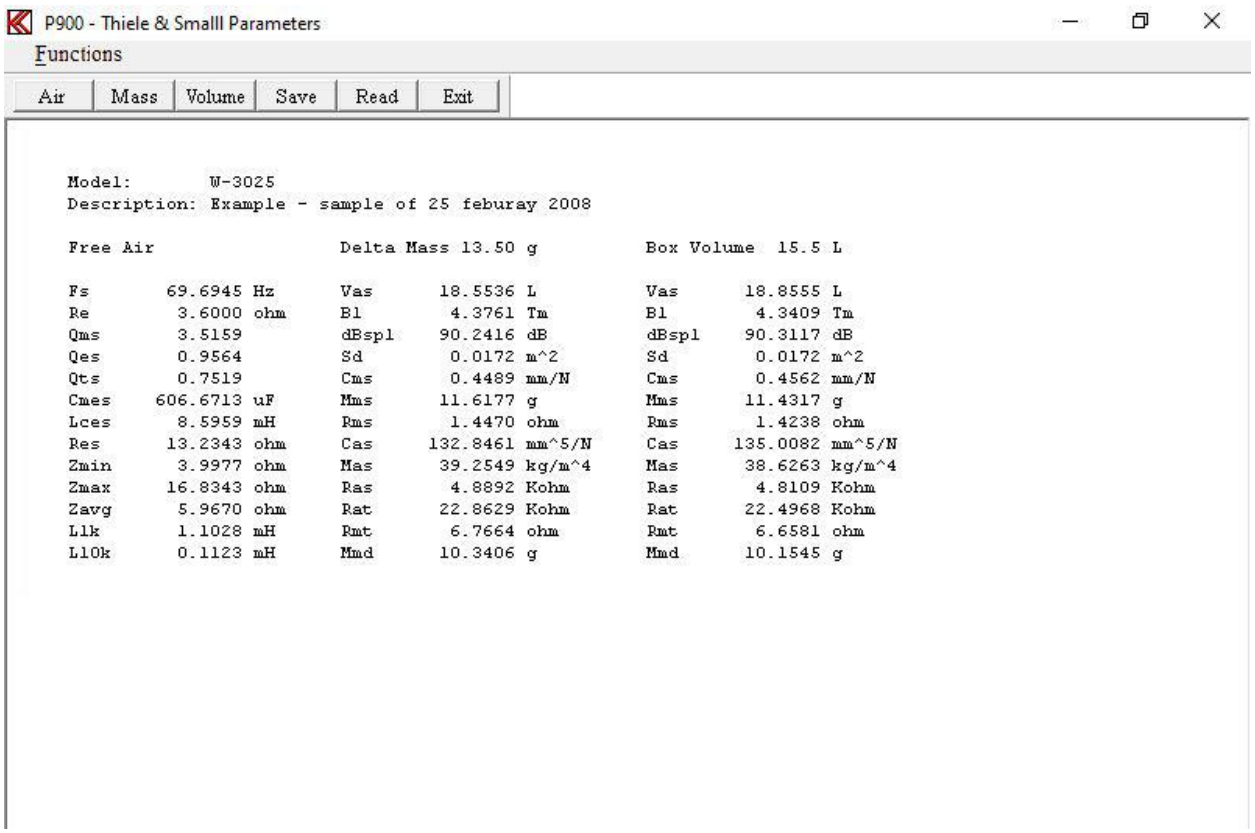
A new dialog box appears. The diameter of the speaker must be entered in millimeters together with the delta mass.
As optional known parameters can be entered. The optional parameters are: “Mms” in gram, “Mmd” in gram, “Cms” in millimeters / Newton and the “Bl” in Tesla / meter.



Volume
To calculate the rest of parameters by the known box volume the calculation of free air must be fulfilled or the parameters must be read from a measurement processed by the air command and already saved.



A new dialog box appears. The box volume must be entered liter.
As optional known parameters can be entered. The optional parameters are: “Mms” in gram, “Mmd” in gram, “Cms” in millimeters / Newton and the “Bl” in Tesla / meter.



Save
Processed data can be saved for later use.

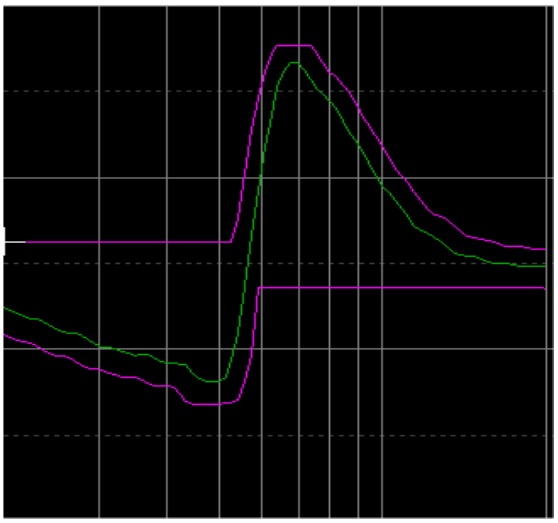
Read
Saved and processed data can read for further processing or presentation.

Used symbols

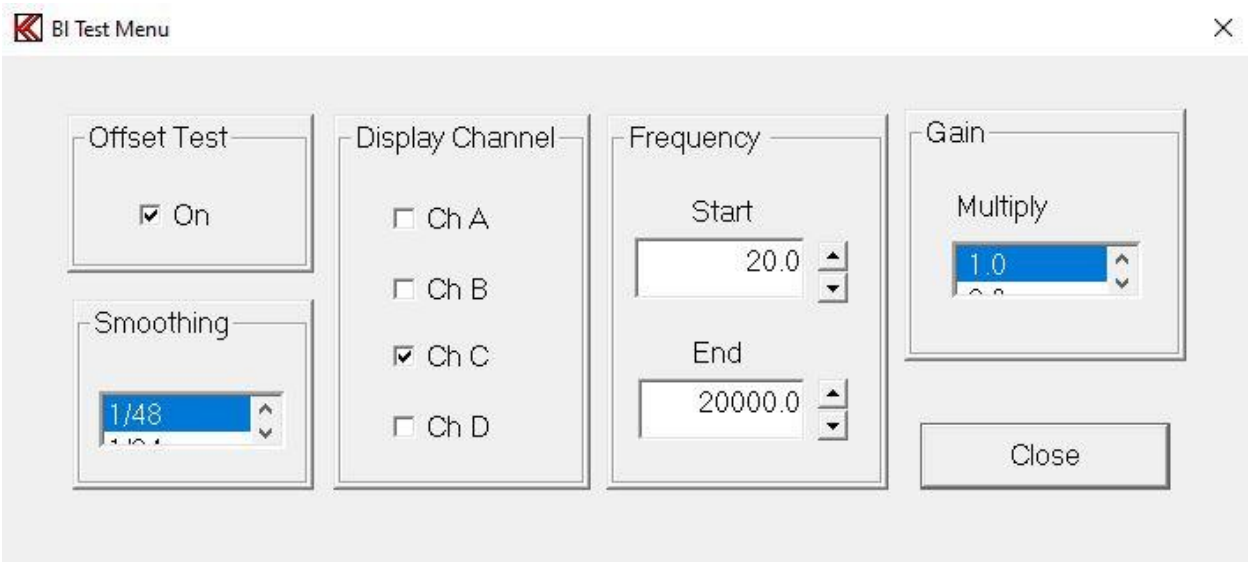
Fs	Resonant frequency of driver including air load
Re	Dc electrical resistance of voice coil
Qms	Q of driver at Fs considering mechanical losses only
Qes	Q of driver at Fs considering electrical losses only
Qts	Q of driver at Fs considering all driver losses
Cmes	Electrical capacitance representing the driver total moving mass
Lces	Electrical inductance representing the driver mechanical compliance
Res	Electrical resistance representing the driver mechanical losses
Zmin	Minimum impedance in the frequency range above Fs
Zmax	Impedance at Fs
Zavg	Average impedance over the measured frequency range
L1k	Inductance at 1 kHz
L10k	Inductance at 10 kHz
Vas	Volume of air having the same acoustic compliance as driver suspension
Bl	Motor strength, the product of B * l
dBspl	Acoustic pressure produced by driver a 1 meter when driven by 1 watt
Sd	Effective surface of the driver cone
Cms	Mechanical compliance of driver suspension
Mms	Mechanical mass of driver cone assembly including load
Rms	Mechanical resistance of driver suspension
Cas	Acoustic compliance of driver suspension
Mas	Acoustic mass of driver cone assembly including reactive air load
Ras	Acoustic resistance of driver suspension losses
Rat	Total acoustic resistance of driver
Rmt	Total mechanical resistance of driver (suspension losses & electrical reflected)
Mmd	Mechanical mass of driver cone assembly excluding air load

BL

The BL test is a part of the impedance measurement. With the BL function it is possible to test the speaker coil is in the middle of the BL field. At the speaker resonance the movement of the coil is biggest. To testing the un-linearity of the impedance and compare the asymmetry of this it tells the position of the coil in the BL field. In fact the asymmetry is a sum of the BL and the suspension.



This picture shows a small difference between positive against the negative part. The middle position of the coil is in the middle of the picture. Note if speaker the speaker connection is reversed the signal will be a reverse polarity. This makes it possible to test the polarity with the BL test function.



Offset Test.

This enables or disables the secondary BL test.

Display Channel

Selection of the secondary presentation channel: Ch A, Ch B, Ch C or Ch D.

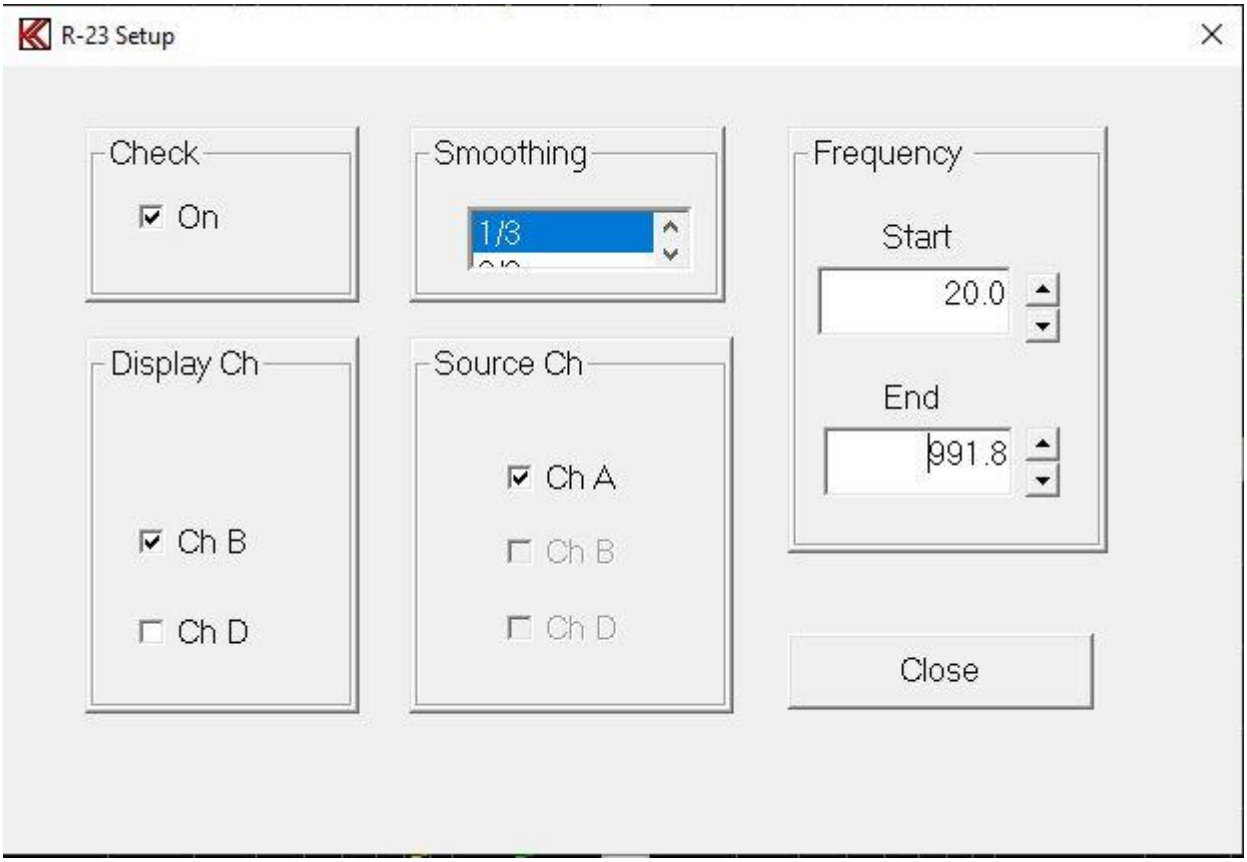
Smoothing
Selection of data smoothing:
Off, 1/48, 1/24, 1/12, 1/6, 1/3, 2/3, 3/3 of octave.

Frequency
The frequency span the BL test can be between the start and end of sweep. Anyway it is possible to make a smaller frequency range for the BL test.

Gain
The gain multiply the BL result before display with the selected multiply factor. The multiply can be selected between 0.2 and 20. The calculated data is 24 bit while the display is 12 bit.

R-23

This test is a distortion ratio test. It compares some harmonic component in a ratio and as result generates a curve with a reference at -40 db from display top as reference. The range for this test is +/- 40db.
The test can only be done in LOG mode.



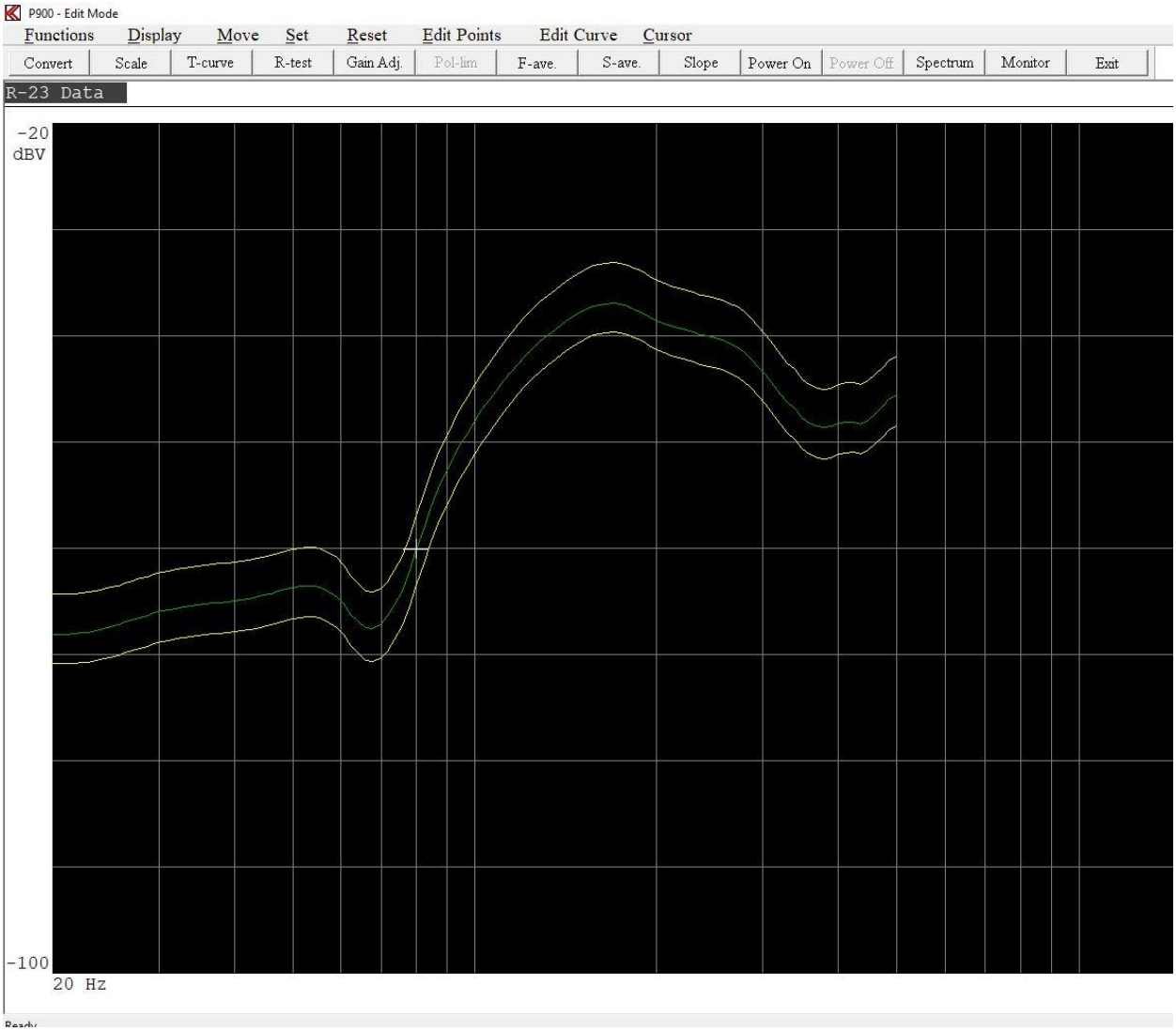
Check
This enables or disables the secondary R-23 test curve.

Display Channel
Selection of the secondary presentation channel: Ch B or Ch D.

Source Ch
Selection of source input. Possible input channels: Ch A, Ch B or Ch D.

Smoothing
Selection of data smoothing:
Off, 1/48, 1/24, 1/12, 1/6, 1/3, 2/3, 3/3 of octave.

Frequency
The frequency span the R-23 curve can be between the start and end of sweep. Anyway it is possible to make a smaller frequency range for the R-23 curve.

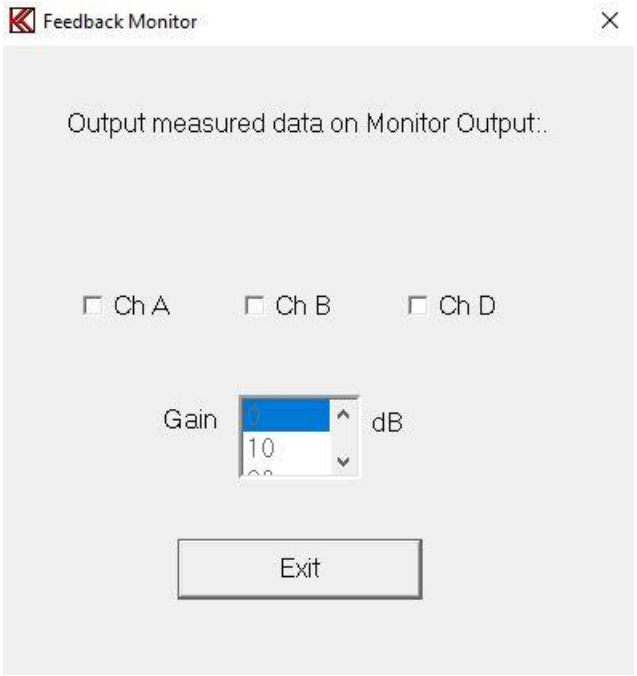


This example shows a B-23 curve. Note the cursor is placed at 0 db level for the B-23 curve. The curve is in this case displayed on Ch B. Ch B was used for rub & buzz measurement with a display scale of -20 to -100 db.

Monitor

To enable Monitor (optional) function the “Disable Monitor” flag must be disabled in Hardware Config menu.

With the feedback monitor function it is possible to output measured data to Monitor Output. The output is a balanced signal.

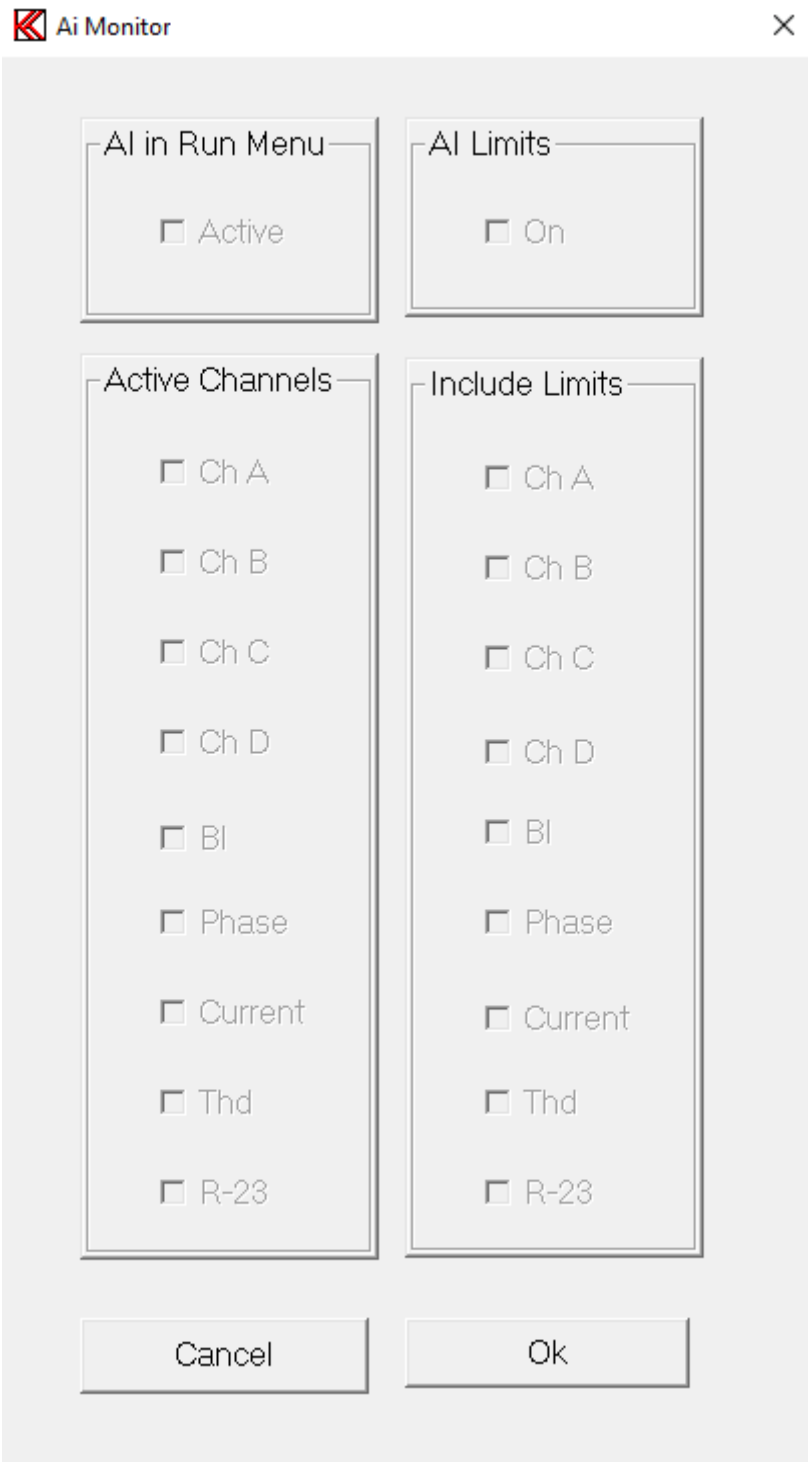


To enable a feedback select Ch A, Ch B or Ch D. It is possible to select an internal gain between 0-50 db. This is usefully if filter is used on the selected channel.

The monitor function is useful if you want to hear what is picked up by microphone id a speaker under test is mounted in an acoustical closed test camber.

AI-Mode

The Ai-mode (artificial intelligence) dos only work in run-mode. To activate this mode a process for the actual type must be processed in the utility process stat data (see under Utility). This to give the Ai-mode needed learning data. When this process is done the Ai function must be enabled here in edit-mode to be activated in run-mode.
The Ai-mode learns where the middle of upper and lower limits has to be placed (floating limits). It moves the upper and lower limits up and down for each reference point. It does not modify the distance between upper and lower limits. If only upper limit is used as in rub & buzz and in THD references, lower limit is not affected.



Active Channels
Here are displayed processed channels under the utility process Ai-function.
Only processed channels marked with a flag can be selected.

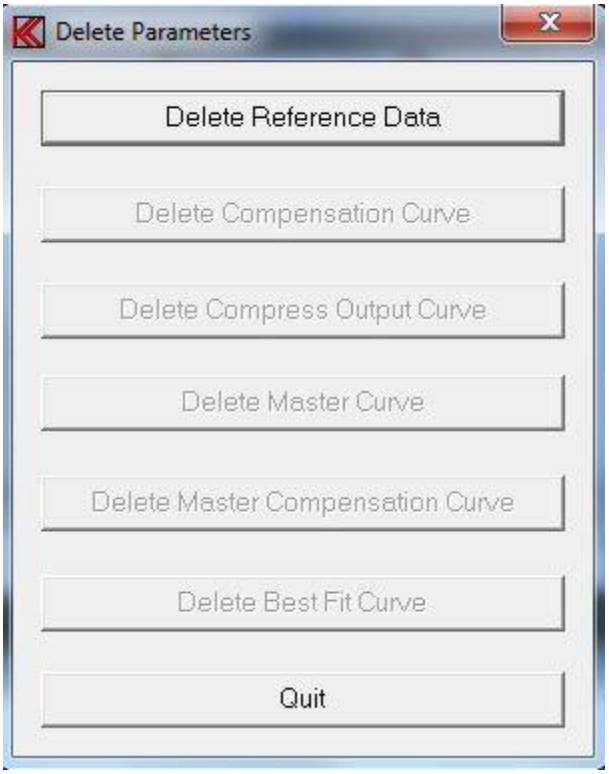
AI in Run Menu
To enable the Ai-mode in run-mode this flag must be on and one or more channels must be selected in Active Channels. Note the setup must be saved as reference data before the system can read the Ai-setup in run-mode. If chain mode is used in run-mode ONLY the first test can be an active Ai test.

AI Limits
If a number of measurements has been done it is possible to see the reference curves before the Ai-process and after. The limit without AI Limit flag is before and with the flag are current limits with the Ai-processed data. This is a way to see what the Ai-process is doing.

Include Limits
The Ai-processed limits can be included (replace the old limits) id AI Limits flag is on and the Include Limits channel is selected.
Node the setup must be saved as reference data.

Delete & exit

Normally you only delete the reference data. If so you just have to confirm to delete. If compensation or a compress output curves are present, you have to select:



Delete Reference Data
Delete all reference curve data.

Delete Compensation Curve
This is only active if a compensation curve is present.
Delete only compensation curve data

Delete Compress Output Curve
This is only active if an output compress curve is present.
Delete only compress output curve data

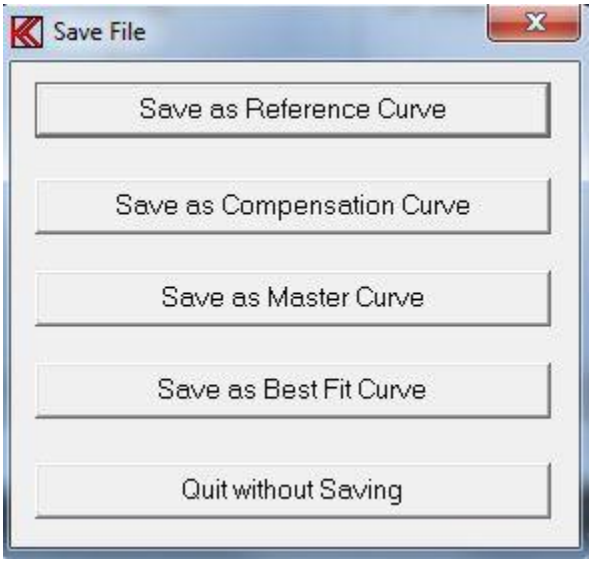
Delete Master Curve
This is only active if a master curve is present.
Delete only master curve data. To delete a master curve you have to enter your master password as stored with Password Manager.

Delete Master Compensation Curve
Only active if a master and a master calibration (compensation) curve if present.
Delete only master calibration curve.

Delete Best Fit Curve

This is only active if a best-bit reference curve is present.
Delete only best bit reference curve. The best-fit reference curve is used together with the find function, a utility function.

Save & exit



Save as Reference Curve
Save all reference data and limits as a reference curve.

Save as Compensation Curve
Save upper limit in Channel A as a compensation curve. If reference data are not present a set of reference limit and setup will be stored as a compensation curve.
Upper and lower limits must be of the same level. Else you receive a “warning” from the system.

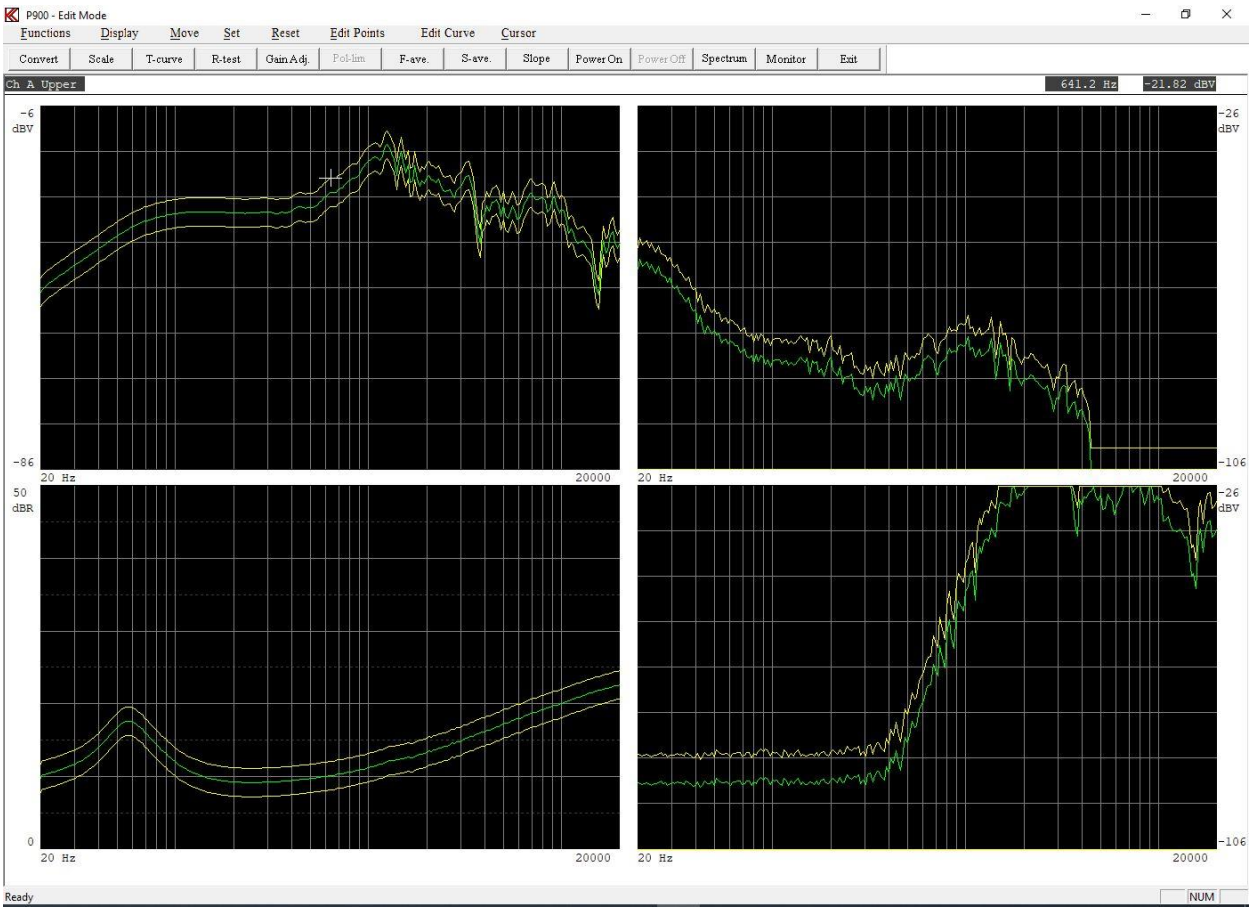
Save as Master Curve
Save upper limit in Channel A as a master curve. If reference data are not present a set of reference limits and setup will be stored as a master curve.
Upper and lower limit must be of the same level. If not, you will receive a “warning” from the system.

Save as Best Fit Curve
Save best-fit reference curve. Using the Find function in Utility mode uses the best-fit reference curve to match a measured curve.

Reference submenu

Edit mode

Here you can edit the tolerance band for the different channels. The cursor will start in the upper left window: "Ch A Upper". In the upper right corner the present cursor values are shown.



Keyboard Functions

Left Arrow
Move the cursor to the left.

Right Arrow
Move the cursor to the right.

Up Arrow
Move cursor up to next curve on the selected channel.

Down Arrow
Move cursor down to next curve on the selected channel.

Fast Cursor
You can activate and toggle the fast cursor (10 times faster) by pressing the “0” key or in ”Move” menu use the Fast / Normal function.

Page Up
“Page up” key or the “Display - Zoom In” will blow the selected channel up to full screen. If this function already is active, the screen will be refreshed.

Page Down
“Page down“ key or the “Display - Zoom out” forces the system to display all channels. If all channels already are displayed, the screen will be refreshed.

Change Channel
Use the key “+” to change the active channel.

Write point left
Write one point (or 10 with fast cursor) to the left with the cursor.
Use “Edit - Point Left” or use the NUM Lock on keyboard and the numeric keypad on the right part of the keyboard and use the “4 / ←” key.

Write point right
Write one point (or 10 with fast cursor) to the right with the cursor.
Use “Edit - Point Right” or the “6 / →” key.

Write point up
Write one unit (or 10 with fast cursor) up with the cursor.
Use “Edit - Point Up” or the “8 /↑” key.

Write point down
Write one unit (or 10 with fast cursor) down with the cursor.
Use “Edit - Point Down” or the “2 /↓” key.

Move curve up
Write and move the entire curve one unit (or 10 with fast cursor) up. The moved value is displayed in the top of the display.
Use “Move - Move Up” function or the key “9 / Page Up”.

Move curve down
Write and move the entire curve one unit (or 10 with fast cursor) down. The moved value is displayed in the top of the display.
Use “Move – Move Down” function or the key “3 / Page Down”.

Point to Point straight line
With this function you can write a straight line between two points. Move or write cursor to the starting point.
Activate the function by “Set – Line Start” or pressing "5". Move or write cursor to the end point. Note that the line change color. Activate again the function by “Set – Line End” or pressing "5". A straight line between the two points is made.

Move part left
“Ctrl ←” key or use “move – Move part Left”.

By writing part of a curve up or down you can keep the curve envelope shape and move part of the curve to the left.

Move part right
"Ctrl →" key or use "move – Move part Right".
By writing part of a curve up or down you can keep the curve envelope shape and move part of the curve to the right.

Reset limit
This resets upper and lower limits only on the selected channel.
Use toolbar "Reset – Channel Limit" or use shortcut key "Ctrl End".

Reset lower limit
"Ctrl Page Down", "Set Limit off" or shortcut key "Ctrl Page Down".
This forces the lower limit to zero on the selected channel. This is a quick way to have a lower limit for rub & buzz test.

Center reference limits
This sets the upper and lower limit to half range value 40 dB from screen top. This is to make tolerance curves. See the tolerance sub menu.
Use "Set – Center Limits" or shortcut key "Ctrl Home".

Mouse Functions

Double click middle mouse button
Toggle the fast cursor on /off.
This has the same function as the keyboard "0".

Scroll mouse wheel forward
This function has the same function as the keyboard arrow up.

Scroll mouse wheel backward
This function has the same function as the keyboard arrow down.

Left mouse click
Left click with mouse move the cross cursor to selected measurement point.
The mouse must be within the graph area.
If the mouse is placed on another measured channel the cross cursor is moved to the new channel. This function has the same function as the combination as mode the keyboard left and right arrows and the keyboard "+" key.

Double click left mouse
The cross cursor get dotted to enable move curve functions.

Move entire curve up or down when cross is dotted
This enable selected curve to move up or down.
To move the entire selected curve up use the mouse wheel forward.
To move the entire selected curve down use the mouse wheel backward.
This function is the same the keyboard "9" and "3".

Right click mouse
This enables / disable move part of curve.

Move part of a curve up or down
Between the dotted cross cursor and the point where the right mouse was clicked can be move up or down. Note the curve outside that point is dotted.
To move the selected part of curve up use the mouse wheel forward.
To move the selected part of curve down use the mouse wheel backward.

Double click left mouse when the cross is dotted
The cross cursor get red to enable edit curve functions.

Scroll mouse wheel forward when cross is red
Move selected point of curve up.
This function has the same function as the keyboard arrow up.

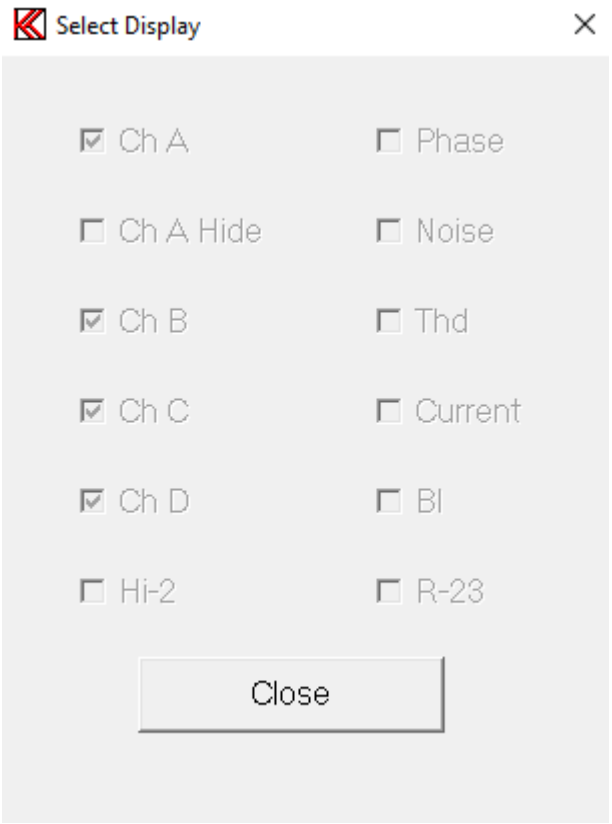
Scroll mouse wheel backward when cross is red
Move selected point of curve down.
This function has the same function as the keyboard arrow down.

Move mouse when left mouse is down and cross is red
This write a straight live from the left mouse was down to the point the left mouse is released.

To leave the Red Cross function
Right click mouse or double click the left mouse.

Display

Select Display
In this menu curves can be set temporary off if more than 1 curve are displayed in a display channel. This enables a better overview if curves are mixing together.



For Ch A Hide must be unchecked to display more curves in Channel A as compensation-, master-, master compensation- or a best-fit curves.

Zoom In
See Keyboard Functions – Page Up.

Zoom Out
See Keyboard Functions – Page Down.

Move

9 Move Up
See Keyboard Functions – Move curve up.

3 Move Down
See Keyboard Functions – Move curve down.

Freq. Jitter
Frequency Jitter expands upper and lower limits 1 test point down and up on the frequency scale to allow jitter in test data. Note every time this function is activated it moves the limits +/- 1 frequency point.

Move part left
See Keyboard Functions – Move part left.

Move part right
See Keyboard Functions – Move part right.

0 Fast
See Keyboard Functions – Fast Cursor.

0 Normal
See Keyboard Functions – Fast Cursor.

Set

Low Limit Off
See Keyboard Functions – Rest lower limit.

Center Limits
See Keyboard Functions – Center reference limits.

5 Line Start
See Keyboard Functions – Point to Point straight line.

5 Line End
See Keyboard Functions – Point to Point straight line.

Reset

Channel Limit
See Keyboard Functions – Reset limit.

Edit Points

4 Left
See Keyboard Functions – Write point left.

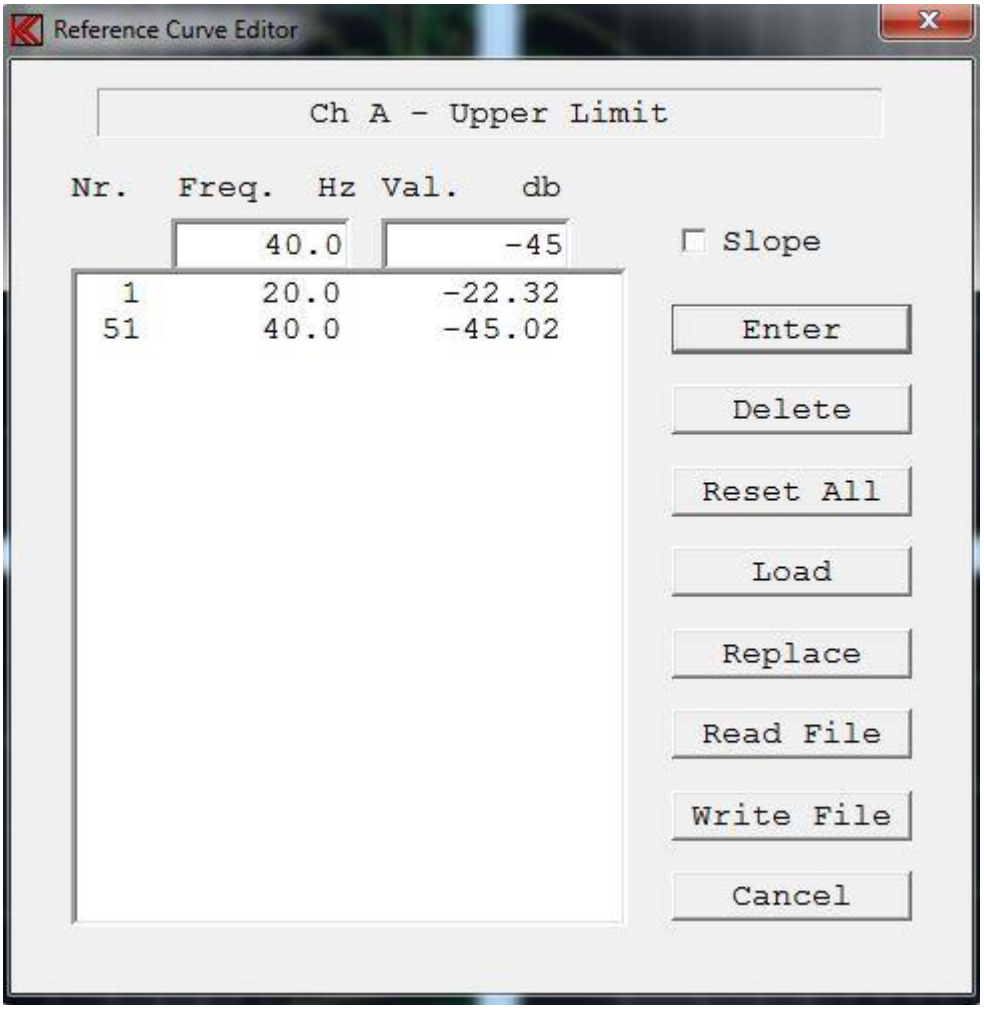
6 Right
See Keyboard Functions – Write point right.

8 Up
See Keyboard Functions – Write point up.

2 Down
See Keyboard Functions – Write point down.

Edit Curve - Curve Editor

Curves are normally generated and edited graphically. With the Curve editor it is possible to generate or manipulate the curves by a curve table.
First select the curve with cursor and enter the Curve Editor to edit the curve. The selected curve will then be displayed on the top of the Curve Editor. A reference curve needs a number of test points. The number of test is set in the setup. 250 test points are normally used. When curve is loaded all points are loaded in the editor. If a new curve is generated it can be imported by read file or by manual enter all test points. If not all test points are entered the editor automatic add the missing test points between to selected point with the lowest entered points value. A curve between a point to another point can be made by marking the slope flag.
The display is arranged as following:
Nr. Freq. Val.
Frequency hertz (Freq.) equal to corresponding test point (Nr.) and actual limit value (Val.)



Enter
Write the wanted frequency in the Freq. edit field in hertz. Then write the wanted value of the limit in the "Val." edit field. When done, move the data to table by the Enter function. Hint - use the tab key to select the functions. When moved to the table, the program finds the nearest test point and allocates the test point number.
To make a point to point line the Slope flag must be set at the start point of the point where slope have to start.

Delete
Highlight a line in the table and delete to remove the line.

Reset All
Reset and empty the complete table.

Load
Load selected curve into table.

Replace
Replace selected curve with contains of table.

Read File
Import a table from a text file.

Write File
Export a table to a text file.

Curve Convert Menu
To go to Curve Convert Menu activate “Functions – Curve Convert”, use toolbar “Convert” or use shortcut key “C”.

Scale Window Menu
To activate Scale Window Menu enter “Functions – Scale Window”, use toolbar “Scale” or shortcut key “S”.

Tolerance Curve Menu
To enter tolerance curve menu activate “Function s– Tolerance Curve”, use toolbar “T-curve” or use the shortcut key “T”.

Resonance test menu
To enter resonance test sub menu enter “Functions – Resonance Test”, use toolbar “R-test” or shortcut key “R”.

Gain adjust menu
Use “Functions - Display gain adjust” or toolbar “Gain Adj.” to enter Gain adjust menu.

Polarity Window menu
Polarity Window activates the “Pulse-polarity time window” sub menu.
To activate menu enter “Functions – Polarity Window” or use shortcut key “W”.

Frequency average menu
Average frequency response quality test menu is activated by enter “Functions – Freq. Average” or with toolbar “F-ave.”.

Sensitivity average menu
Sensitivity average test menu is activated by enter “Functions – Sen. Ave. Test” or with toolbar “S-ave.”.

Slope menu
Slope test menu is activated by enter “Functions - Slope” or with toolbar “Slope”.

Power On / Off
Set power “on” at cursor frequency. The output level is the setup level as measured.
To activate power on enter “Functions – Power On” or Toolbar “Power On”.
To set power “off “ use the “Functions – Power Off” function or use Toolbar “Power Off”.
Use the shortcut key “P” to toggle the power on/off.

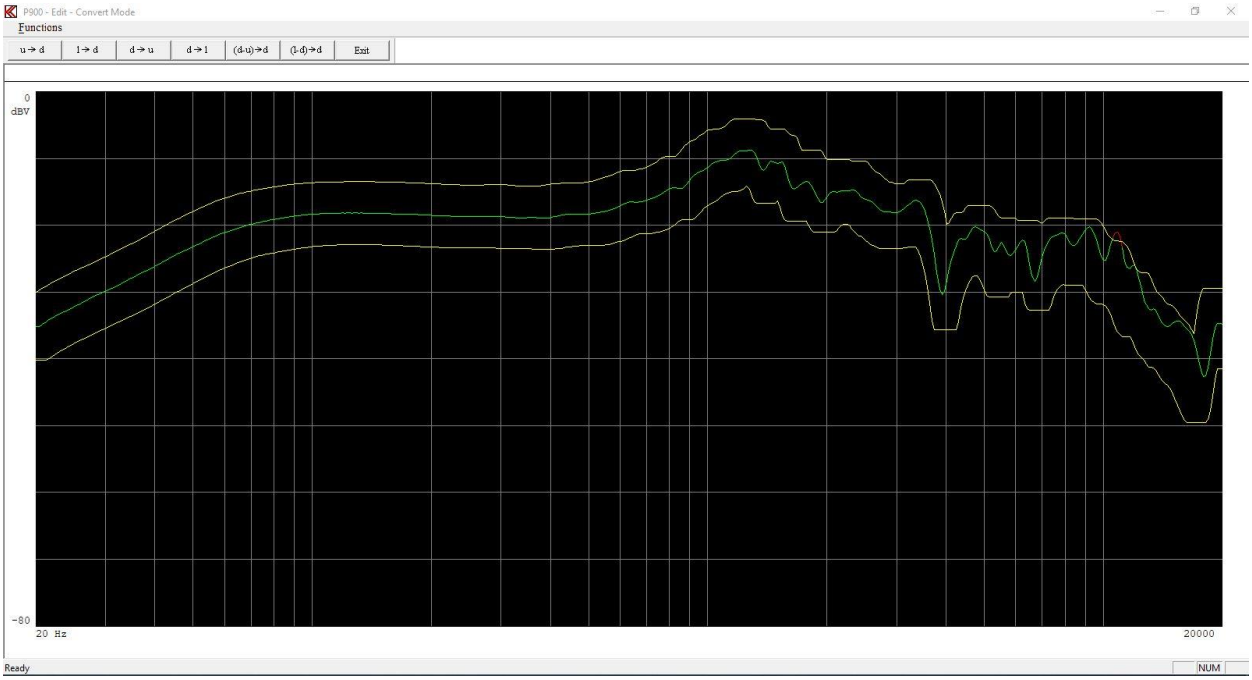
Spectrum
Spectrum activates a Power Spectrum display. The Power Spectrum shows the actual spectrum with the first harmonic as selected frequency by sine generator.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Curve convert menu



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Upper -> Data
Convert upper reference curve to data curve on selected channel.

Lower -> Data
Convert lower reference curve to data curve on selected channel.

Data -> Upper
Convert data curve to upper reference curve on selected channel.

Data -> Lower
Convert data curve to lower reference curve on selected channel.

Data – Upper -> Data
Data minus upper reference curves added a half scale stored in data curve.

Data – Lower -> Data
Data minus lower reference curves added a half scale stored in data curve.

Invert Gfx
Invert curve toggle background from black to white and white to black.

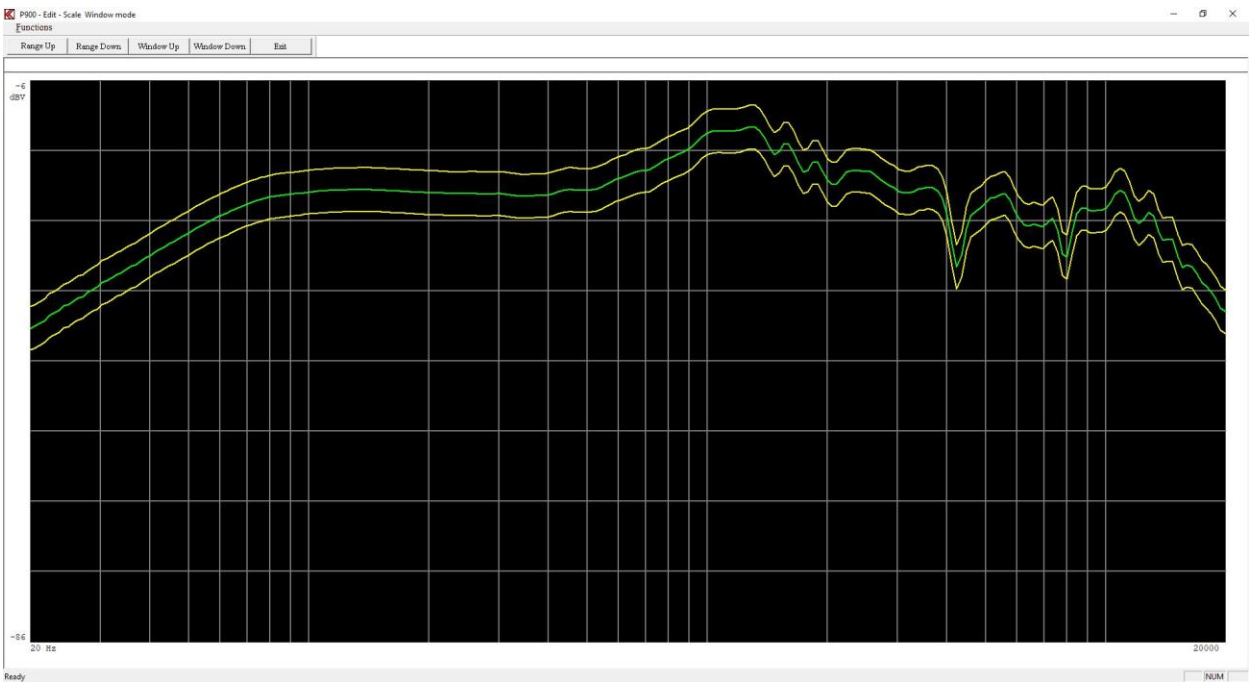
Print
Print curves on selected printer.

Print Setup

Select printer and settings.

Scale window menu

The display has a range in Log mode of 80 dB. By changing the display scale you can display up to 10 dB for full scale. 80 dB / 10 dB give max. 8 windows you can select.
For channel C you have a range of 50 dB and can select maximal 5 windows.



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Range Up
Decrease the display by 10 dB. Display range up.

Range Down
Increase the display by 10 dB. Display range down.

Window Up
Move selected window up.

Window Down
Move selected window down.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Tolerance curve menu

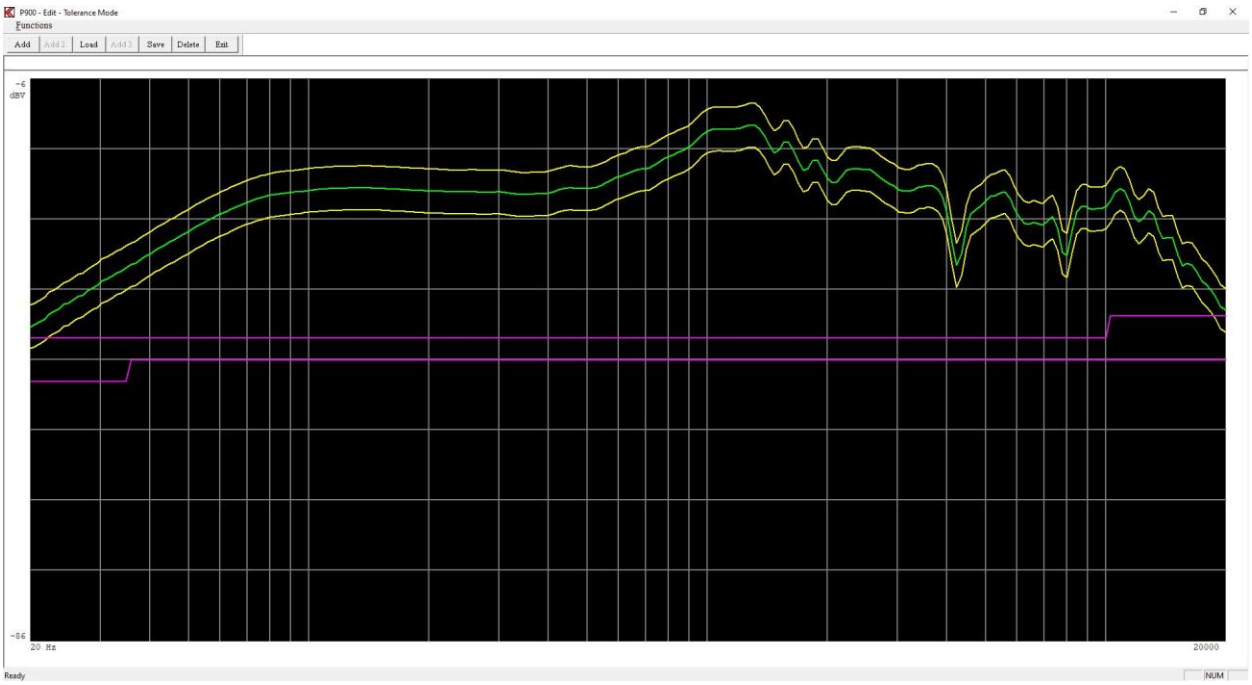
Normally you have a number of different test setups, however when you analyse the setups you have different reference curves. But the tolerance levels are almost the same for example +/- 2 dB. The tolerance curve is the standard tolerance from a straight line around the middle measure range.

How to use of tolerance curve:

a) - Make a measurement
- Include data
- Go to tolerance curve
- Load a tolerance curve
- Add the tolerance curve
- Edit reference curve if necessary

How to make a tolerance curve:

b) - Reset channel A to middle position (Ctrl Home)
- Make the tolerance curve
- Store the tolerance curve



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Add

Add the tolerance curve to the upper and lower limit.

Add2
Add the tolerance curve to the 2nd upper and 2nd lower limit.
This only for channel A and 3-limit is enabled.

Add3
Add the tolerance curve to the 3rd upper and 3rd lower limit.
This only for channel A and 3-limit is enabled.

Load
Load a tolerance curve from disk to memory.

Save
Store a tolerance curve, upper and lower limit to disk.
NOTE: To save a tolerance curve the curve must be generated in channel A.

Delete
Delete a loaded tolerance curve from disk.

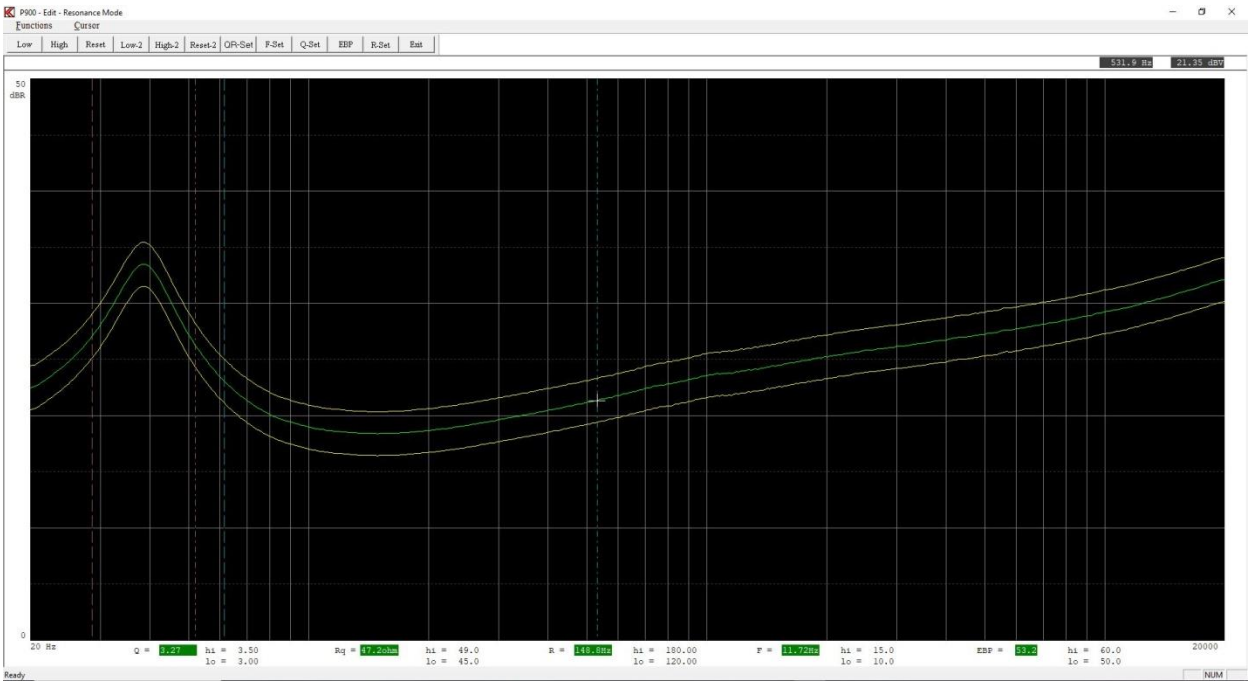
Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Resonance test menu

In the Run menu you can perform a resonance test as a separate test if Ch. C is enabled. When a resonance test is performed all result as resonance frequency and value, test result, min. impedance and frequency, Q at resonance (if enabled) the F result, the EBP result and values are stored in the A4STAT file.
To activate this test you have to tell the system the actual start and end test frequency of resonance.
The F is (resonance frequency / Q) hertz. In this way you can test the resonance frequency, the maximal Q and the min Q by using the F.
R-Set is a second resonance test. This test can test for a maximum or for a minimum. This test is made to better test a speaker system with a passive resonance port.



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Low Limit

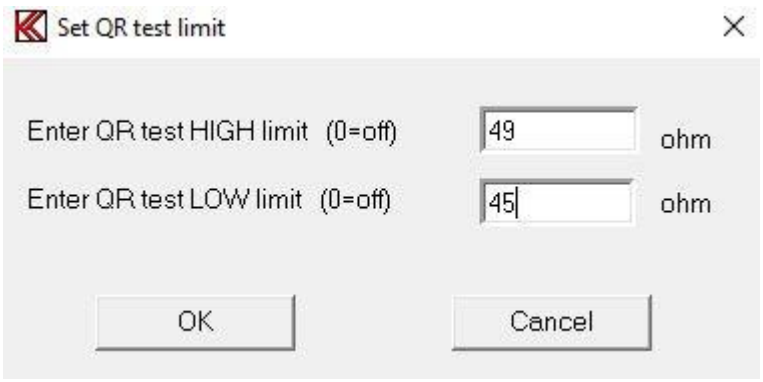
Select the start frequency for resonance test. Move the cursor to the start frequency and set frequency with “Low" or the key “1”. You can use the fast cursor "0".

High Limit

Select the end frequency for resonance test. Move the cursor to the end frequency and set frequency with "High" or the key “2”. You can use the fast cursor "0".

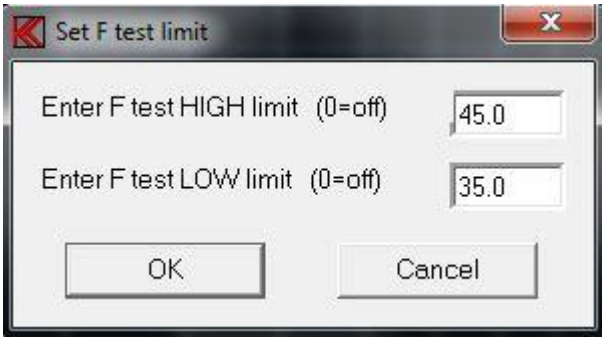
Reset Limits
Reset the resonance test frequency markers and set the test off. The key “4” do the same.

QR-Set
If the resonance test is selected you can enable a QR test by entering an upper and lower tolerance (only ++ version). Note 0 = off. This QR test is separate test in run mode. The QR is as the Q test however the readout and test for the resonance is measured in ohm.



QR upper and QR lower limits must be added to activate the QR test.
To disable the QR test enter 0 to upper limit.

F-Set
If the resonance test is selected you can enable F test by entering an upper and lower tolerance. Note 0 = off. This F test is separate test in run mode. The F is the frequency span around the resonance frequency.

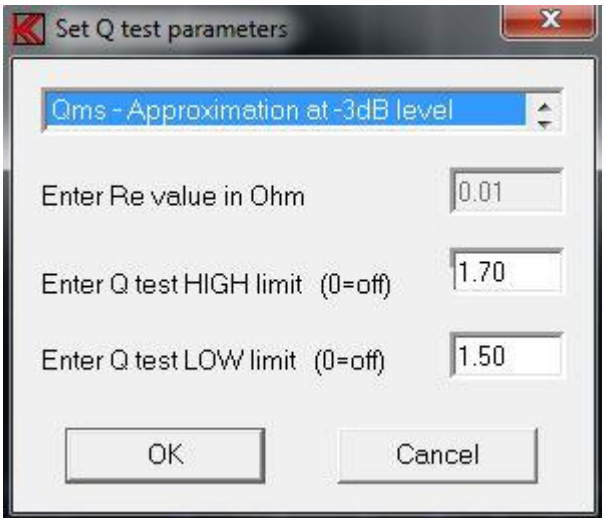


F = (resonance frequency / Q)
The F is the span in hertz measured between the lower and higher frequency point the Q is calculated at.

F upper and F lower limits must be added to activate the F test.
To disable the F test enter 0 to upper limit.

Q-Set

If the resonance test is selected you can enable the Q test by entering an upper and lower tolerance. Note 0 = off. This Q test is separate test in run mode.



The Q test can be selected as Qms or Qts.
To cope with fast automatic test approximations can be necessary.
To calculate the exact value of Q the Re, the DC resistance is needed.
To compare a speaker with others – relative measurement a approximation is preferred to be selected.

Following different Q calculations can be selected:

Q = Qms. Approximated level at –3dB from resonance frequency.
Q <= Qms due to the Re value.

Q = Qms. Exact value. Re must be known and entered to the separate setup.
Q ≠ Qms if the Re not is constant for every measurement.

Q = Qms. Approximated Re. Re = Z min.
Q >= Qms. This value is normally >= to Re. (approximate +0 to +10%).

Q = Qts. Exact value. Re must be known and entered to the separate setup.
Q ≠ Qts if the Re not is constant for every measurement.

Q = Qts. Approximated Re. Re = Z min.
Q >= Qts. This value is normally >= to Re. (approximate +0 to +10%).

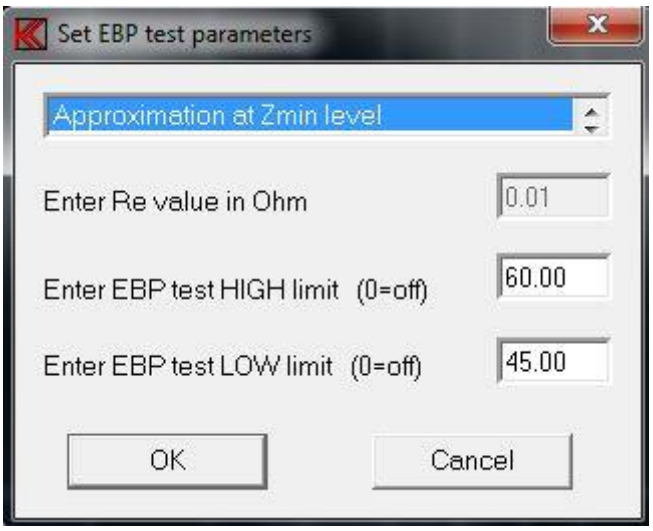
Q = Qms. Exact value. Re is measured as a separate sequence before sweep.

Q = Qts. Exact value. Re is measured as a separate sequence before sweep.

Q - Upper and Q - Lower limits must be added to activate the Q test.
To disable the Q test enter 0 to upper limit.

EBP

If the resonance test is selected you can enable the EBP (Efficiency Bandwidth Product) test by entering an upper and lower tolerance. Note 0 = off. This EBP test is separate test in run mode.



Following different EBP calculations can be selected:

Re must be known and entered to the separate setup.

Approximated Re. Re = Z min.

Re is measured as a separate sequence before sweep.

Low-2

Select the start marker frequency for R-resonance test. Move the cursor to the start frequency and set frequency with “Low-2" or the key “6”. You can use the fast cursor "0".

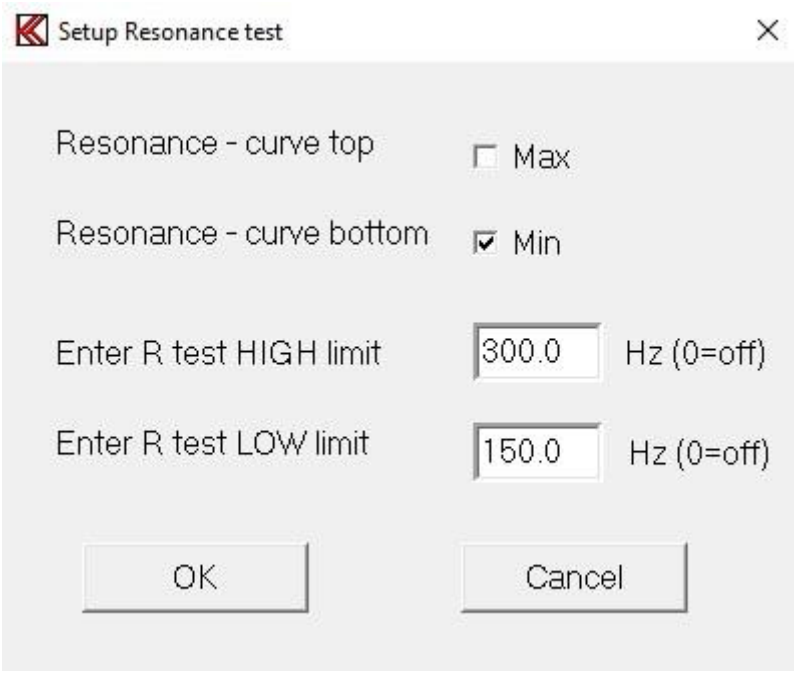
High-2

Select the end marker frequency for R-resonance test. Move the cursor to the end frequency and set frequency with "High-2" or the key “7”. You can use the fast cursor "0".

Reset-2

Reset the R-resonance test frequency markers and set the test off. The key “9” do the same.

R-Set
On this menu a setup of the 2th resonance test can be done.



Max-Min
The resonance try to find a maximum or a minimum of the impedance curve between the start and end markers. Select Max for maximum. Select Min for a minimum.

R-test limits
To activate the R-Test start and end markers must be selected to fins a max or a min resonance.
The upper and lower limit must be set within the marker frequency range.
If the R-test frequency is within the upper and lower test frequency the test is approved, else there is a reject.
To reset the R-Test select a “0” on upper or lower limit.
The R-Test is disabled if the start and end markers are reset (Reset-2).

Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

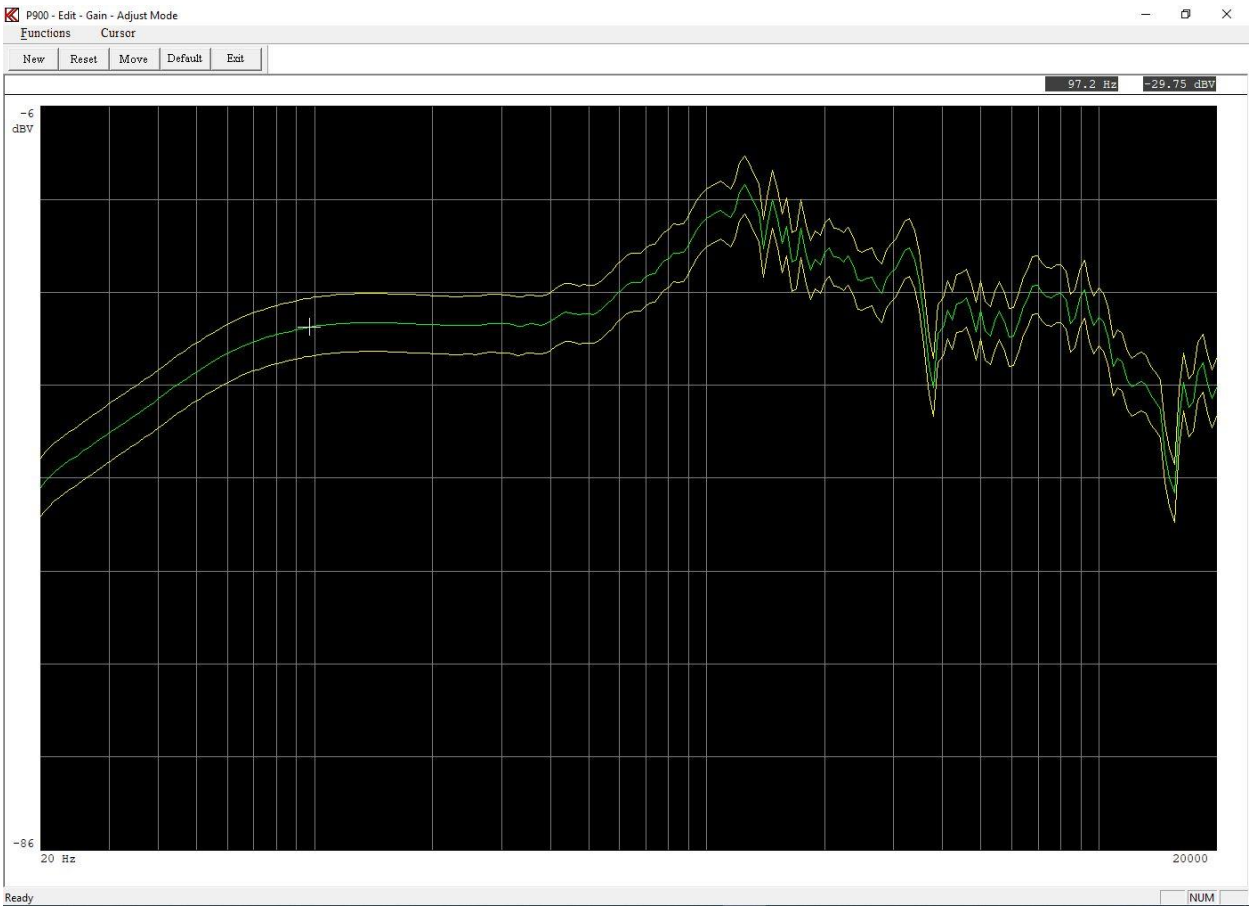
Mouse Functions

Double click middle mouse button
Toggle the fast cursor on /off.
This has the same function as the keyboard “0”.

Left mouse click
Left click with mouse move the cross cursor to selected measurement point.
The mouse must be within the graph area.

Gain adjust menu

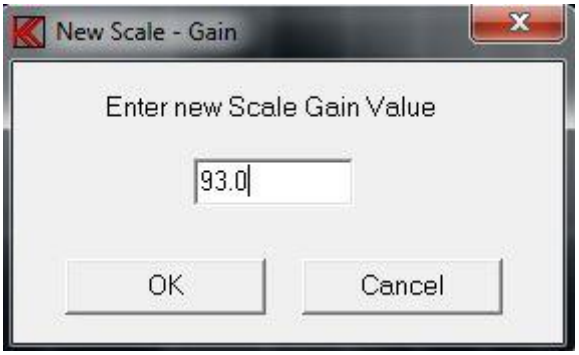
If you are using the loudness functions you must first select the output level. Then select the best gain in the input amplifier. Normally you adjust the microphone sensitivity by using a Sound Level Calibrator.
Set the Calibrator to microphone. Set the best gain in input stage. Enter the gain adjust sub menu.
Select proper frequency by using cursor. Set new value on display.



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

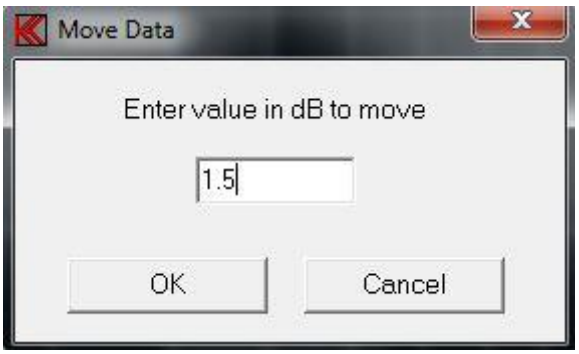
New Value

Enter the new display value. The value is included in all calculations. This function only works in channel A.



Reset Value
Resets adjust value. Get the previous screen value.

Move Data
Move data moves the measured data with entered value, as an offset, before any processing and is displayed as moved. This function has same effect as changes in the input gain.



Reset Move (Default)
Reset the data move function and value.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

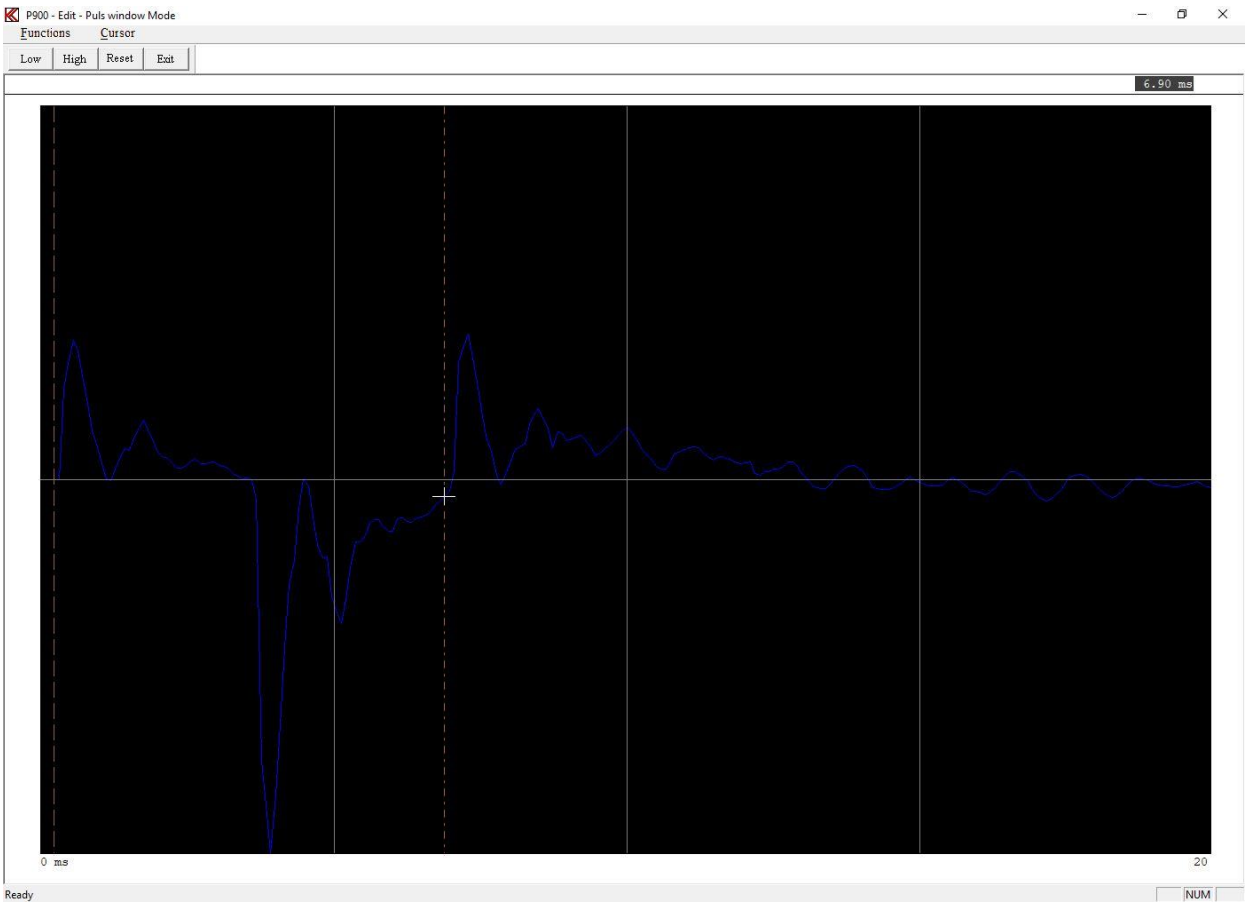
Mouse Functions

Double click middle mouse button
Toggle the fast cursor on /off.
This has the same function as the keyboard “0”.

Left mouse click
Left click with mouse move the cross cursor to selected measurement point.
The mouse must be within the graph area.

Polarity window menu

The polarity test is by the program performed in the following manner:
The program finds the largest positive signal and stores this. Then the program finds the largest negative signal and stores this. The result of the polarity test is approved if the largest positive signal arrives before the largest negative signal and “APROVED” has been set to “POSITIVE” in the setup menu and vice versa.
If the magnet is poor or if amplifiers have been built-into the speaker (as in PC speaker systems), the polarity may look like a damped sine oscillation. Also if the environment is noisy, a faulty polarity test result may occur. To prevent this time window can be defined to eliminate any signal that can interfere with the polarity test.



In this example show the beginning of the signal, where the first maker is placed, and a value of 0.24 mSec. This is the signal delay from speaker to microphone, and therefore the distance in mSec.

Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Low Mark

Select the start marker for the window. Move the cursor to the start time and set marker with “Low". You can use the fast cursor "0".

High Mark
Select the end maker for the window. Move the cursor to the end time and set maker with "High". You can use the fast cursor "0".

Reset Makers
Reset the makers and set time lock out window off.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Mouse Functions

Double click middle mouse button
Toggle the fast cursor on /off.
This has the same function as the keyboard “0”.

Left mouse click
Left click with mouse move the cross cursor to selected measurement point.
The mouse must be within the graph area.

Frequency average menu

It is possible to select measurements of frequency response and put the results into different quality groups. This is done by calculating the average for a given frequency response and compare this value against a reference value. To select the quality groups a user defined quality criteria can be set up in the “Group” menu. The frequency average test is the measured data between the markers against the sensitivity limits.
Note – this test is different from the Sensitivity average test found in the “S-ave.”.



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pop up menu.

The two markers define the frequency range used to calculate the average value.
The reference level is generated using the include function. Include converts the actual calculated average value to the reference value.

Low Mark

Select the low mark for start of average frequency range. Move the cursor to the start frequency and set start with “Start Mark". You can use the fast cursor "0".

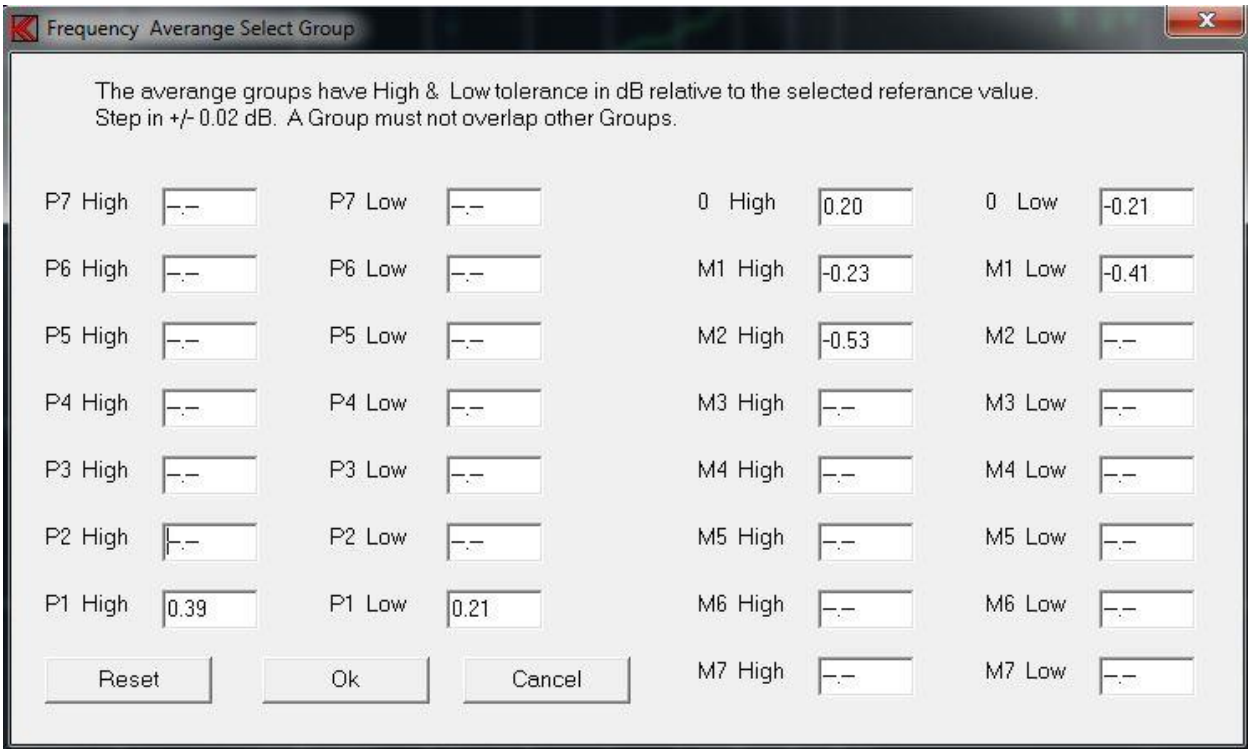
High Mark

Select the high mark for end of average frequency range. Move the cursor to the end frequency and set end with “End Mark". You can use the fast cursor "0".

Reset Makers
Reset the makers and disable average function and test.

Include
Include average value calculated between markers as reference average value.

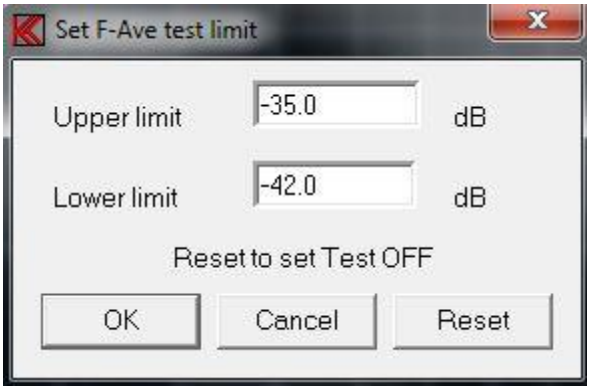
Group
15 individual quality groups can be defined.
Seven groups are defined as P1 to P7, as positive groups.
One group is defined as “0” the zero group around the reference.
Seven groups are defined as M1 to M7, as negative groups.



The input for each group is the upper + or – tolerance in dB and the lower + or – tolerance in dB from the reference value.

The tolerances of each group can be defined freely (+ to +, + to –, – to – or – to +), but two different groups must not overlap.
This facility is for example useful to group the data into purely individual quality groups.

Limit
By define an upper and lower absolute limit an average test will be enabled in run-mode.
The test result in edit-mode will display the “Ave” value as green if approved and red if rejected.
The average is the absolute value between the low and high markers. The markers must be defined together with the upper and lower limits to activate this test



Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

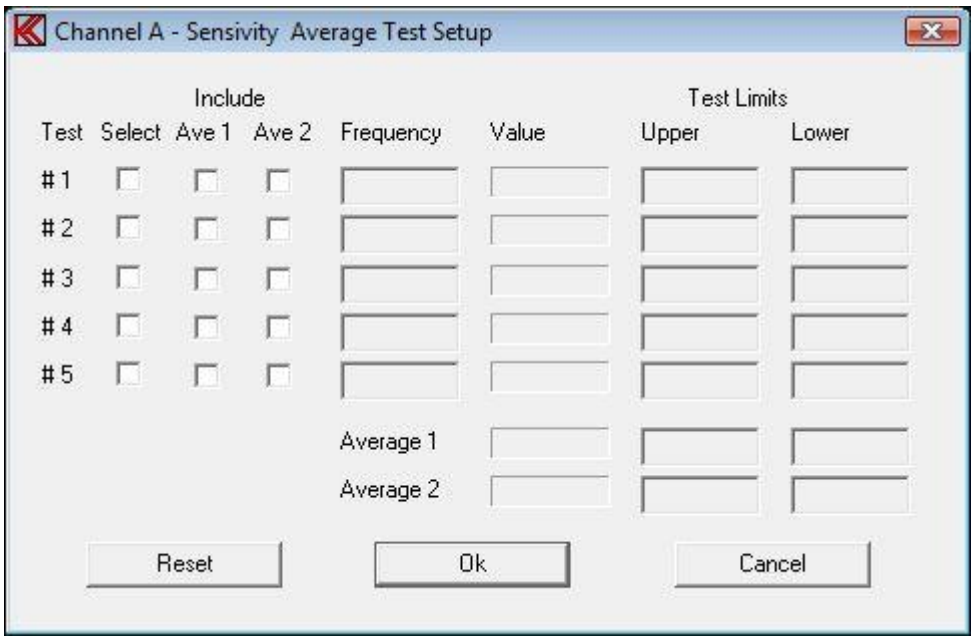
Mouse Functions

Double click middle mouse button
Toggle the fast cursor on /off.
This has the same function as the keyboard “0”.

Left mouse click
Left click with mouse move the cross cursor to selected measurement point.
The mouse must be within the graph area.

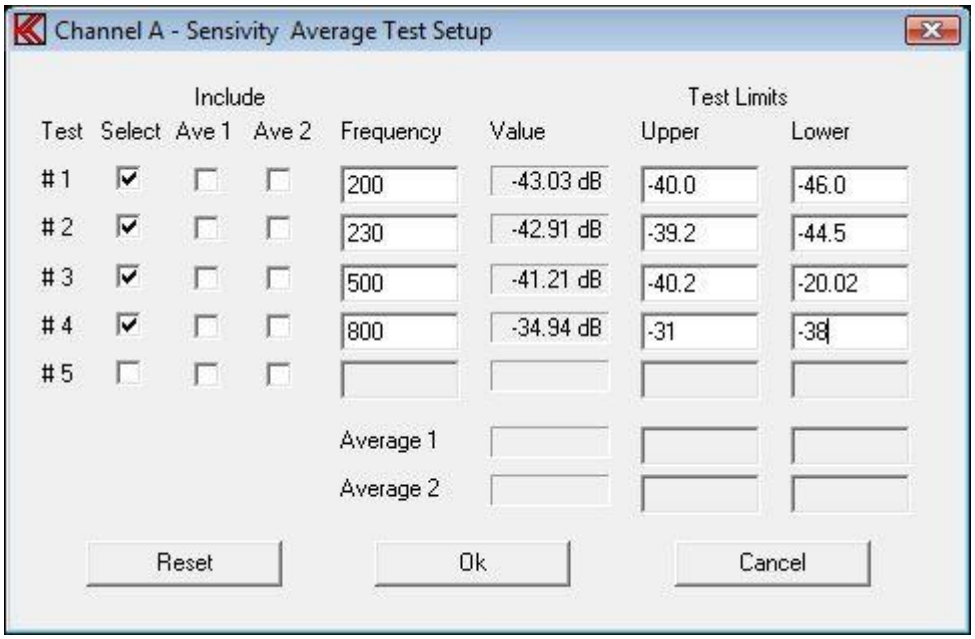
Sensitivity average menu

The sensitivity average menu consists of up to 5 separate sensitivity test there can be merged together into two different average test. The test use data from frequency response the Channel A.



5-Sensitivity Test

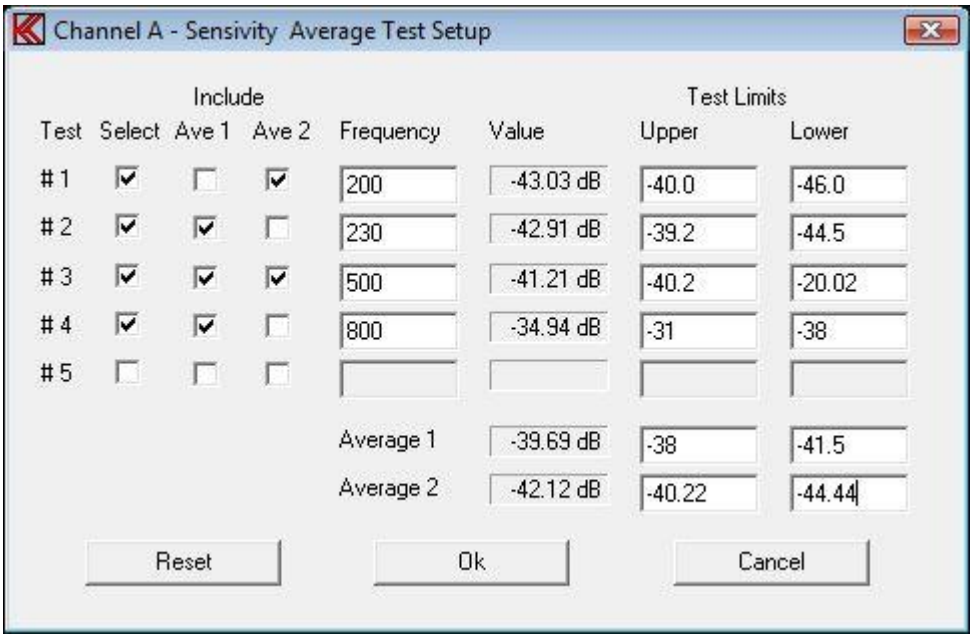
To enable a separate sensitivity test flag the Select field. Then a test is selected a test frequency must be entered. Frequency must be within the sweep frequency range. When the test frequency is selected the actual measured value is displayed.
To update this value select another “white” field or set the select field off then on.
To complete the sensitivity test setup a limit must be entered.



The picture above the sensitivity test 1 to 4 is activated.

Sensitivity Average Test

Average test 1 and test 2 are average of test results selected of the separate 5-sensitivity tests.
To activate the average test “Ave 1” or “Ave 2” a least 2 and up to 5 sensitivity tests must be included and test 1 or 2 field must flagged on.
The actual measured values are displayed in the field “Value”.
To complete an average test the limits must be entered.



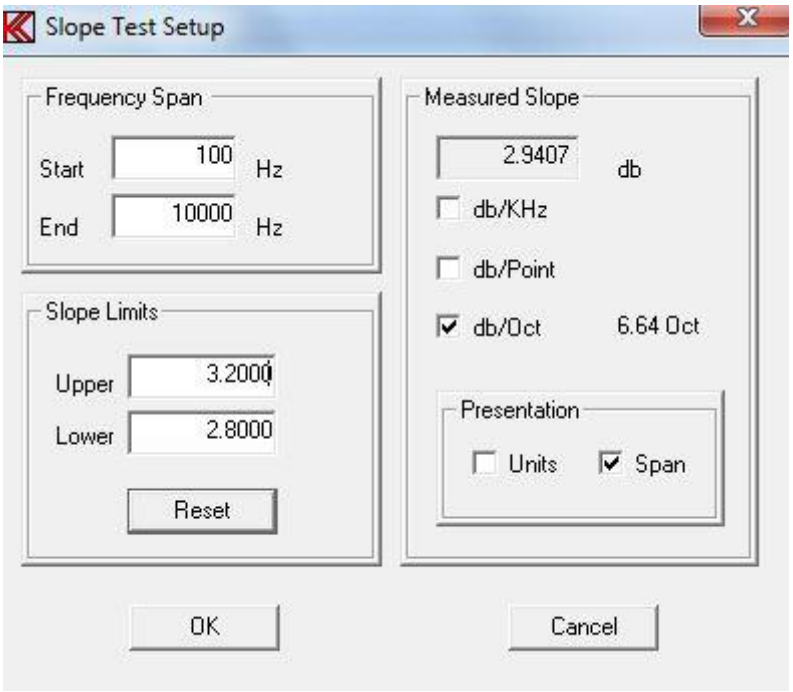
To accept table setup and quit menu selects Ok.

To cancel and quit menu select Cancel.

To reset all table setups select Reset.

Slope test menu

The purpose with the “Slope test” is to measure a slope in a defined part of the frequency response – a span. The slope test use Channel A as source. The measured slope is tested against a upper and lower limit.



Frequency Span

The frequency span must be within the start and end frequency of measured frequency response.

Measured Slope

The calculated slope is presented in db. The readout depends on selected units and on presentation.

Presentation
The measured readout is in selected units or in the complete span range.
The span range is span end frequency – start frequency.

db/KHz
Measured unit is in db / KHz for presentation in units or db / KHz for the selected span.
The span in KHz is displayed right side.

db/Point
Measured unit is in db / Point for presentation in units or db / Point for the selected span.
The frequency curve has 250 points between start and end frequency. Every time the cursor are moved to left or right it step 1 point. The span in points is displayed right side.

db/Oct
Measured unit is in db / Octave for presentation in units or db / Octave for the selected span. The span in octaves is displayed right side.

Slope Limits

The enable the Span Test an upper and lower limit must be present. To disable the test use the reset.

Spectrum

The spectrum is a Power Spectrum generated out from measured data with first harmonic as selected generator frequency.



In this example the generator frequency is 641.2 Hz.
The start frequency of the display is the same as start frequency of the sweep and the end frequency of the display depends of the sample rate.

The display range is 100 dB with the upper display with same sensitivity as selected values as in sweep menu and with each division 10 dB.

Power On

This start the Power Spectrum analyzes furthermore the power is set on.

Power Off

This stop the Power Spectrum analyzes furthermore the power is set off.

Key “P” or key “p”

This start / stop the Power Spectrum analyzes furthermore the power is set on / off.

0 Fast

See Keyboard Functions – Fast Cursor.

0 Normal
See Keyboard Functions – Fast Cursor.

Key "0"
You can activate and toggle the fast cursor (10 times faster) by pressing the "0".

Key "←"
Move cursor left. Move the generator frequency "Down".

Key "→"
Move cursor right. Move the generator frequency "Up".

Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print the graph to a printer.

Exit
Exit Power spectrum menu.

Mouse Functions

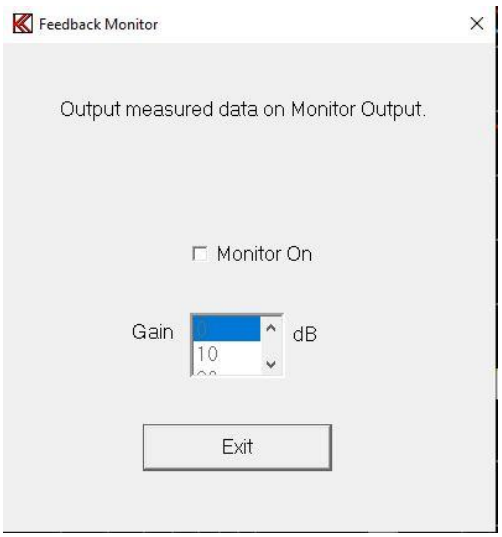
Double click middle mouse button
Toggle the fast cursor on /off.
This has the same function as the keyboard "0".

Left mouse click
Left click with mouse move the cross cursor to selected measurement point.
The mouse must be within the graph area.

Monitor

To enable Monitor function the “Disable Monitor” flag must be disabled in Hardware Config menu.

As in reference mode it is possible with the feedback monitor function to output measured data to Monitor Output.



With Monitor On the channel selected by the cursor is gated to output 3.
Channel A, B and D can be selected.

Internal gain from 0 to 50 db can be selected.

The feedback is activated when Power On is activated & Monitor On is active.

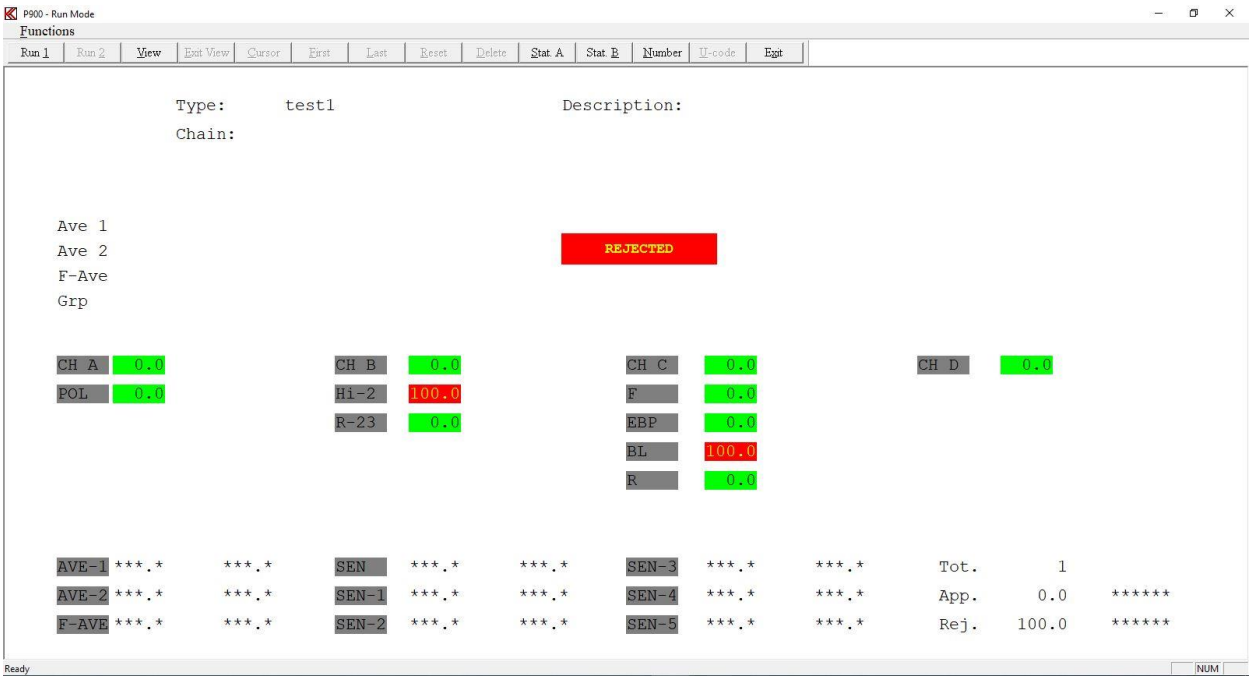
Frequency is selected by cursor.

Run Speaker Tests

Entering "Run" from the main menu will show you the available selection of speaker setups.

The screen will be almost the same as if you were editing type setups, described in setup of testing characteristics.

Select a valid type by entering an existing type name. If the system multiplexer is “on” you have to select two setups. The system requests the type for system 1 and then the type for system 2. P900Pro + and P900 Pro++ the system multiplexer have tree setups. System 1, 2 and 3.



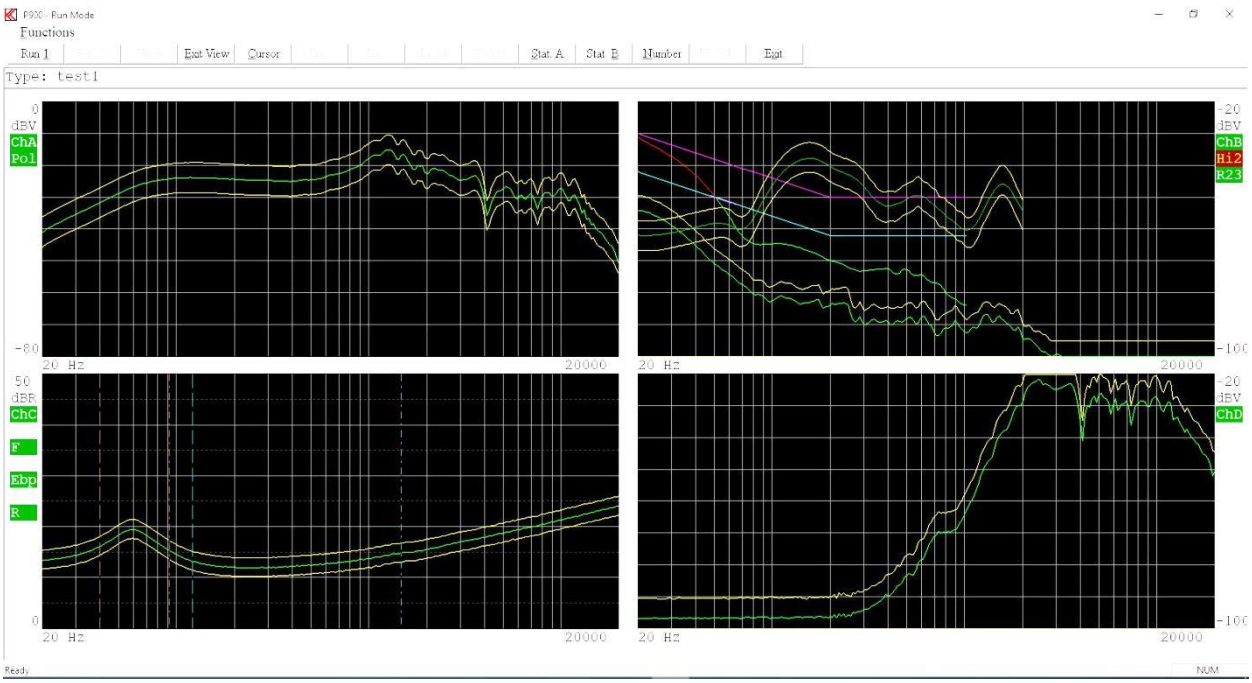
Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Note:
The green approved label is for the last test (all test together except the first). Channel b shows a reject for the first test and approved for the rest test only if the chain function is activated.

F8

Use the key “F8” to display resonance test values as f-res, f-value, f-min, min value, R-res and R-values if activated. This data are displayed as well under Stat A menu.

Following picture show same test as before, however the first one of the chain and as graph “View” enabled.



With both pictures have the following options:

Run 1

Make a measurement. This is only valid if control is KEYboard and system multiplexer is “off”. This is selected in the global setup. For system multiplexer is on make a measurement channel 1. The control is KEYboard.

Run 2

Make a measurement. This is for system multiplexer channel 2. The control is KEYboard.

Run 3

Only on P900 Pro+ and P900 Pro++. Make a measurement. This is for system multiplexer channel 3. The control is KEYboard.

View

View the test result graphical. It is only necessary if “Display Graph” is disabled in global setup. Else this function is automatically entered.

Exit View

Exit View and enter the text result mode.

Cursor
Enter Cursor submenu.

First
Display first measurement only if chain is enabled and activated.

Second
Only on P900 Pro+ and P900 Pro++. Display second measurement only if chain is enabled and activated.

Third
Only on P900 Pro++. Display third measurement only if chain is enabled and activated.

Last
Display last measurement only if chain is enabled and activated.

Reset
Reset screen statistics. Note: Only possible before making the first measurement and only if the option is enabled in "Setup of Global Parameters".

Delete
Delete last statistics record if statistics or store data is "enabled" in the global setup. The record is not removed but renamed to USERDELETED.
Note. If a chain is used it is only the last displayed record that is marked for deletion.

Stat A
Enter on screen Statistics A if "enabled" in the global setup.

Stat B
Enter on screen Statistics B, result statistics, if "enabled" in the global setup.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Number
The actual measurement displayed can be indicated by a serial number of 16 digits. If activated the serial number is stored together with the measured data. Store measured data must be ON in global setup.
If the chain function is activated you must enter the "View" and select the first or rest to enter a properly serial number for each test data. If the chains have more than two tests in the chain you can only add a serial number to the first and last sat of data.
If increase by one is on the number will be automatic increased by 1.

U-code

This allows the user to give the actual set of data a user code 0 – 999. This a useful function to add a user reject code to the actual test.

If you start a measurement all the tests (according to the setup and tolerances in the type setup) will be carried out.

Depending on the setup in the global parameters you will see the results color-coded in text mode (approved / rejected) or color coded in graphics mode.

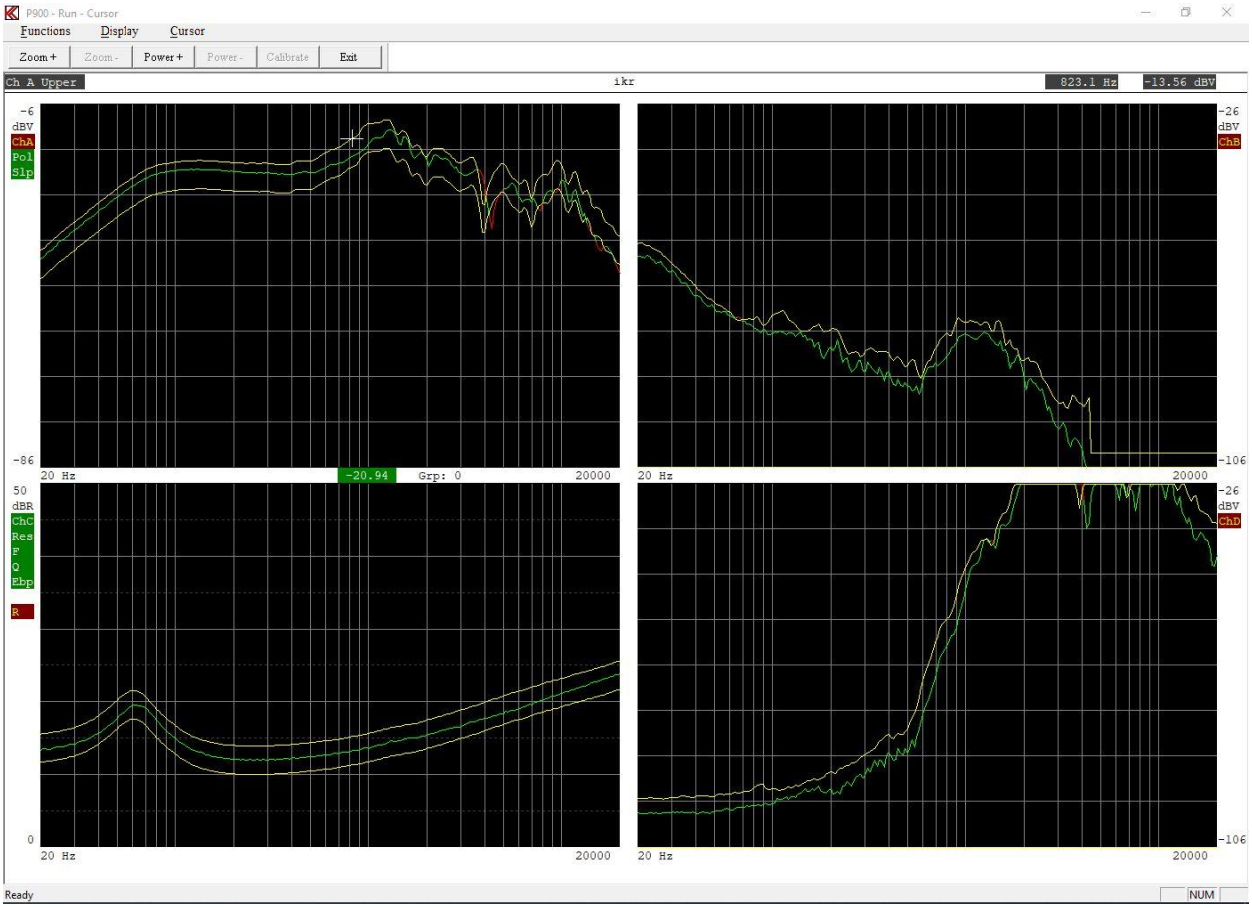
If you use the "chain mode" (chain must be selected in global setup and use of a valid chain name in your selected type) two rows of results appear. The first row and numbers are the results for the first test in the chain. The second row and numbers are for the entire rest test in the chain lumped together. However, if you only have two tests in the chain, the second row is the results for the second test only.

The text will show you for each individual channel, if it has been approved (Green) or rejected (Red), yellow for 3-limit if data outside 2^{nd} or 3^{rd} limit however still within reject limit.

Appropriate beeps will accompany the tests (as setup in the global parameters).

Cursor Submenu

Navigation is performed equivalent to the Edit mode in the setup of reference parameters described in setup of testing characteristics. In run mode you cannot change parameters as in Edit mode.



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Zoom +
Enlarge display at selected channel. Key “Page Up” has same function.

Zoom –
View all channels. Key “Page Down” has same function

Power +
Set power on output. Move cursor to select frequency. Key “P” as toggle has same function.

Power On
Set power on output. Move cursor to select frequency. Key “P” as toggle has same function.

Power -
Disable power on output. Key “P” as toggle has same function.

Power Off
Disable power on output. Key “P” as toggle has same function.

Calibrate
Update master calibrate curve. Act like a compensation curve.

Display Select
Display compensation-, masters-, master compensation curve and second level displays as phase, noise, THD and BL curves on / off if present.

Move Fast
Select fast cursor. 10 time faster.

Move Normal
Select normal cursor. Disable Fast cursor.

Key "0"
Toggle fast cursor Select fast cursor on / off.

Key "+"
Select active channel by use of cursor.

Key "←"
Move cursor left.

Key "→"
Move cursor right.

Key "↑"
Move cursor up to next curve.

Key "↓"
Move cursor down to next curve.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Mouse Functions

Double click middle mouse button
Toggle the fast cursor on /off.
This has the same function as the keyboard "0".

Scroll mouse wheel forward
This function has the same function as the keyboard arrow up.

Scroll mouse wheel backward
This function has the same function as the keyboard arrow down.

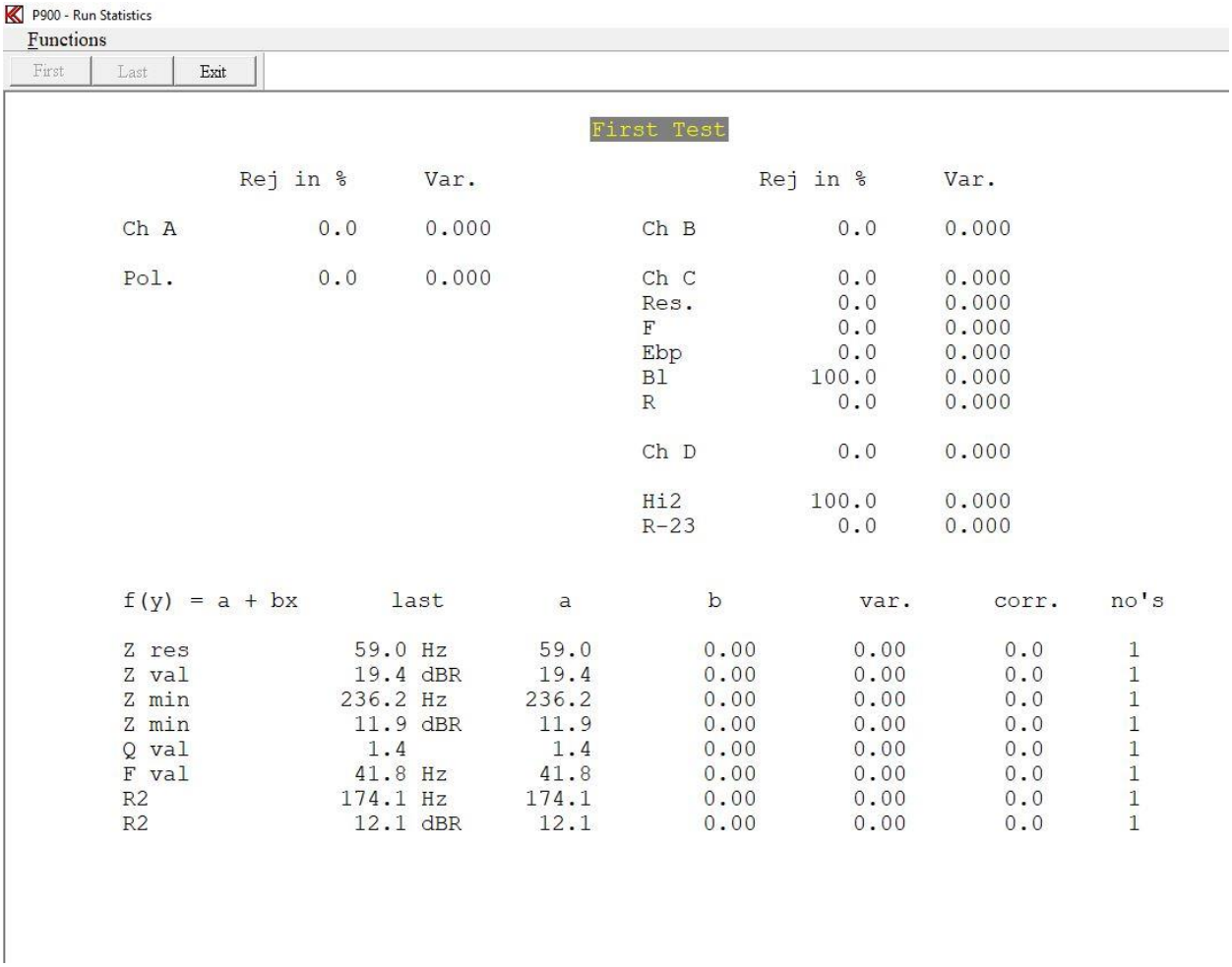
Left mouse click
Left click with mouse move the cross cursor to selected measurement point.
The mouse must be within the graph area.
If the mouse is placed on another measured channel the cross cursor is moved to the new channel. This function has the same function as the combination as mode the keyboard left and right arrows and the keyboard “+” key.

Statistics

Stat A -Varians & Collation

If on screen statistics is “enabled” in the global setup you can have display information as:

- Rejected test in percent and the variance for each sub test.
- If resonance test or loudness test is enabled you have information in the form:
  - f(y) = a + bx , "a" is the average , "b" is the slope
  - Last measured value
  - Variance of "a"
  - Correlation of result. Note: If "b" is “0” the correlation coefficient will be “0”
  - Numbers of tests in analyze



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

If you use the "chain mode" (chain must be selected in global setup and use of a valid chain name in your selected Type) two pages of results are presented. The first page is the statistics for the first test in the chain and the second page is for the remainder of the tests lumped together.

First
Select first type data.

Second
Select second type data. P900 Pro+ and P900 Pro++ only.

Third
Select third type data. P900 Pro++ only.

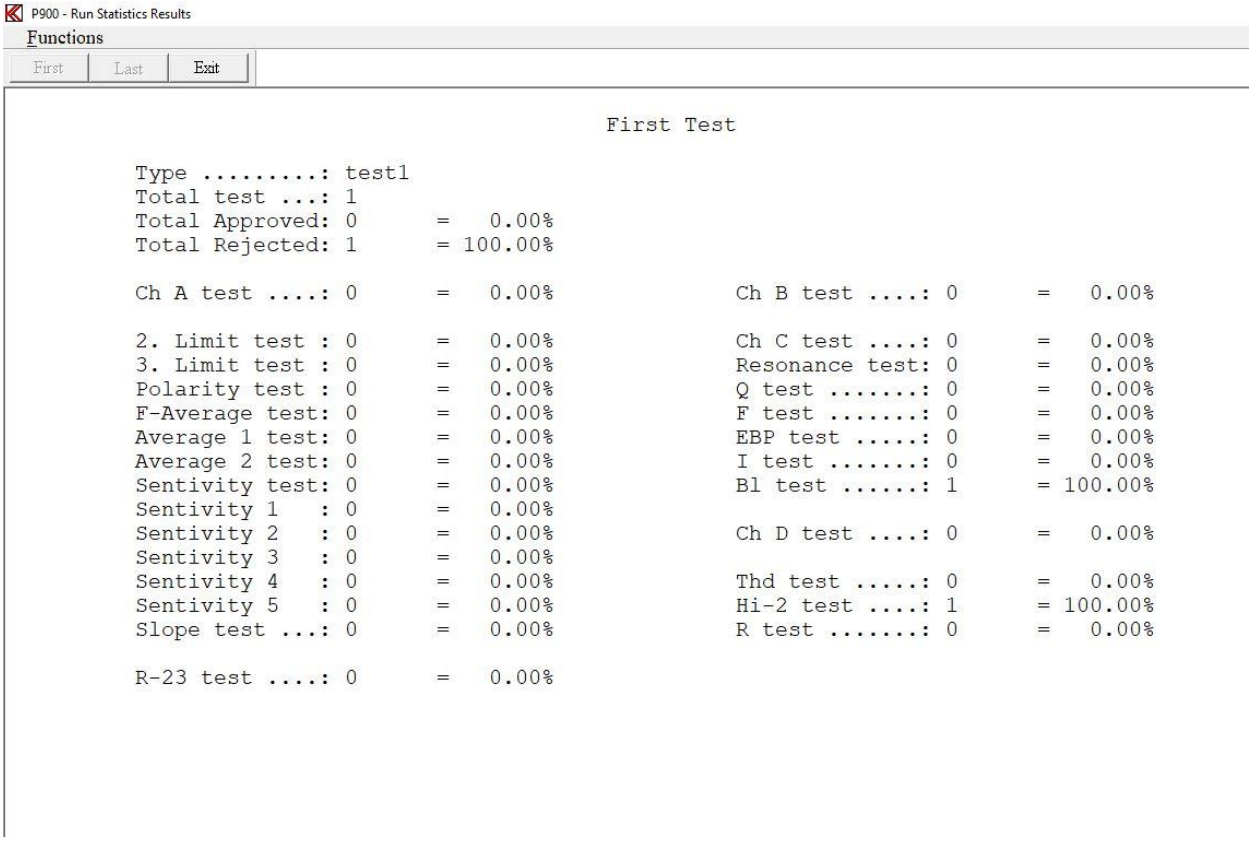
Last
Select last type data. If more than 2 (3 for pro+ or 4 for pro++) tests in chain impendence channel is only from the last else approved and rejected data from all types lumped together except the first.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Stat B - Results & Distribution

This menu shows the statistics and test results for the actual test type. If the user code is activated the statistics for the first 40 different user codes is displayed (optional).



First
Select first type data.

Second
Select second type data. P900 Pro+ and P900 Pro++ only.

Third
Select third type data. P900 Pro++ only.

Last
Select last type data. If more than 2 (3 for pro+ or 4 for pro++) tests in chain impendence channel is only from the last else approved and rejected data from all types lumped together except the first.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Utilities

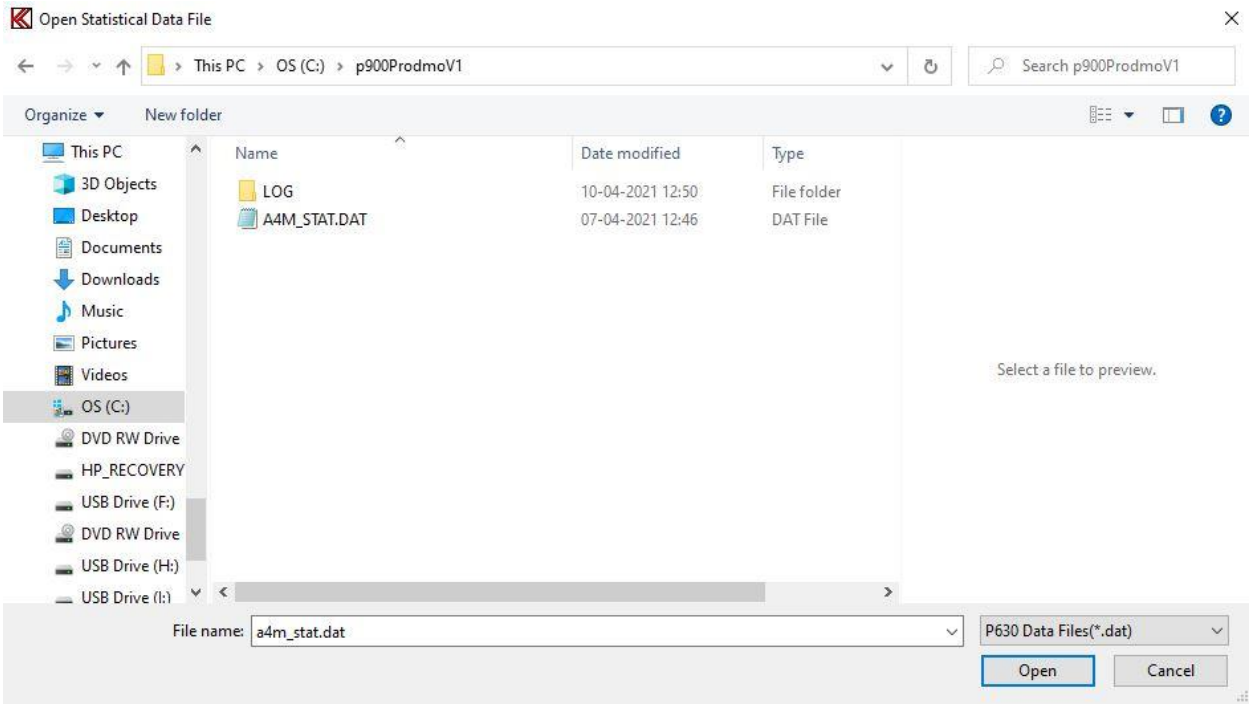
For better to manipulate with the reference and measuring data a collection of utilities functions can be selected under the utility menu.



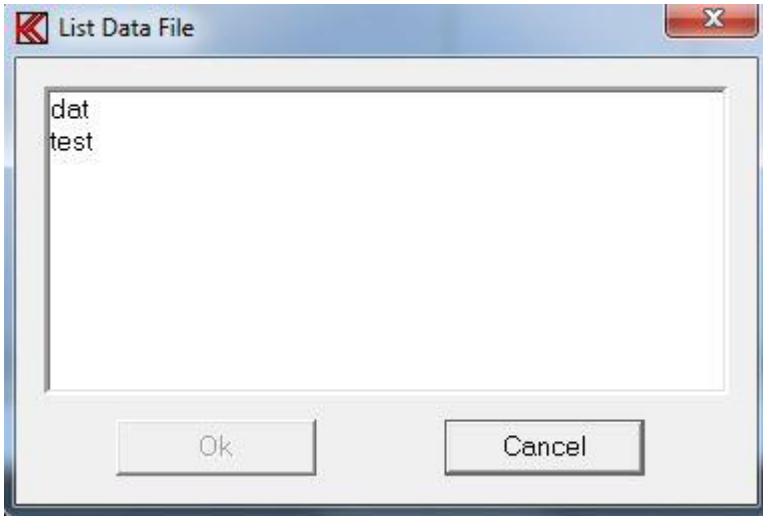
- A utility to process the stored data in the Statistical Data file, default A4M_STAT.DAT. The file containing all measuring data, stored in run mode if "enabled" in the global setup.
- A utility to convert data stored a DAT file to plain ASCII as input for spreadsheets.
- A group of utilities to transfer setup and reference data to and from your P900 systems.
- A group of utilities to export setups and reference data.
- A group of utilities to import setups and reference data.
- A utility a Log Manager to restore setups and make a clean-up of Log Database.
- A utility to match two set measurement of frequency responses together.

Process Statistical Data Utility

When entering the Statistical Data Utility, the program asks you to select a Statistical Data file. Default A4M_STAT.DAT.



When a Data File of the type “DAT” if opened, a list of all different type names stored in the selected file is displayed.
In this case only 2 types are in the a4m_stat.dat file.



Note: The program reads only the first 128 different setup types. It is a good idea to copy and then delete the DAT file from your production line PC to avoid a message "disk full" or to be sure that the file does not become too large to make a process.

After a proper selection of a valid Type you get the choices.



It is possible to manipulate with the stored data. The following options are possible:

Process Selected Type
Process the data without manipulating any of your source data in the Statistical Data file.

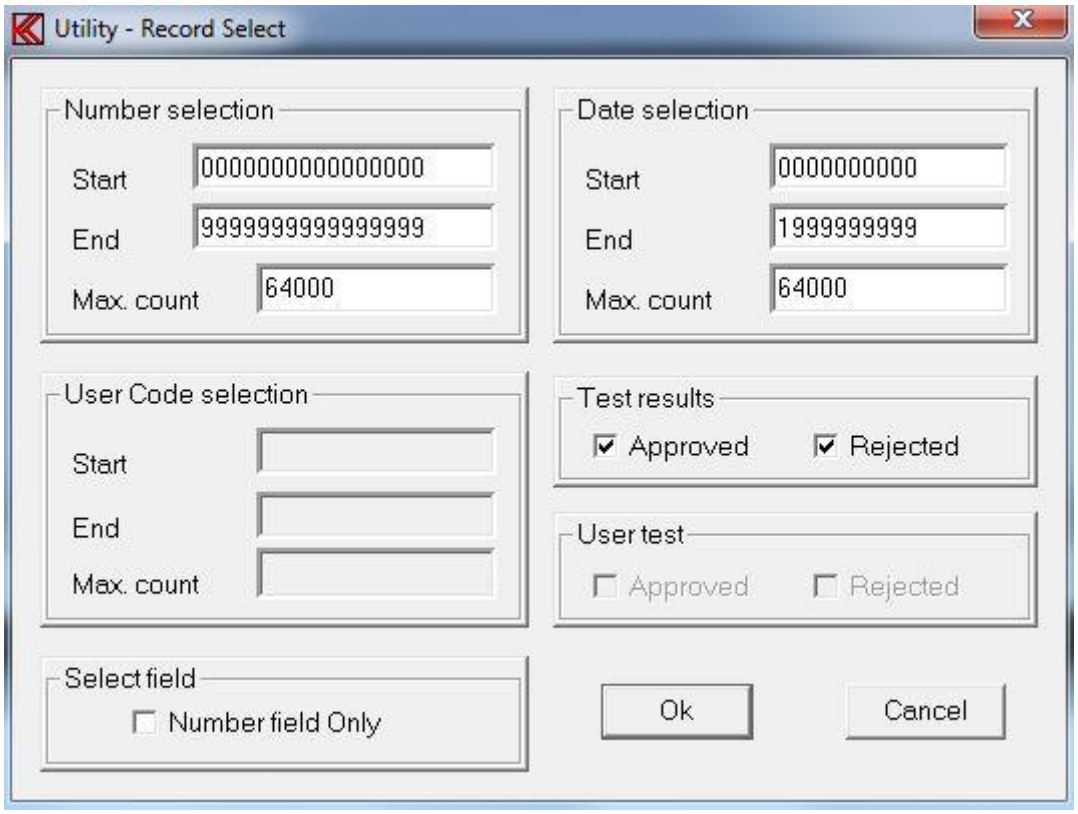
Process & Extract found Type to a File
Process and extract the found and accepted data to a file (A4M_XTR.DAT is default).

Process & Extract & Delete found Type
Process and extract the data to a file and delete only the transferred data in the source file. Found but not accepted (missed) data will be left in the source file allowing later separate processing of missed data. Missed data is caused by mismatch in parameters as: number of channels, gain/scale, start / end frequency and number of test points.

Copy & Delete selected type to a File
Copy and Delete selected type to a file. Copies all data of the selected type to a separate file and deletes it from the source file.

Delete selected Type from Statistical File
Delete the selected type from the selected Statistical Data file.

To process the data a selection of criteria's can be selected.



To select only a fraction of all stored data it is possible to select Number, Date, User Code (optional), Test results, User test (optional) and Select the field.

Number selection

If the serial numbers are present in the data file, a selection of numbers to process can be selected. A start number and an end number can be selected. The maximum number of counts, hits is 16 numbers. (9999999999999999)
Note: if the data do not contain this information, as older format, the default is all, 64000.

Date selection

Start and end date can be selected within data can be processed and maximum of counts / hits. Date format is: MM, DD, YY, hh, mm.
Where MM is month, DD is date, YY is year, hh is hour and mm is minutes.
The maximum number of counts, hits is 512000. For older versions of software the maximum number is 64000.

Code selection

A user start and end code can be selected for the processed data. The maximum number of counts, hits is 64000.
Note: if the data do not contain this information, as older format, the default is all, 64000.

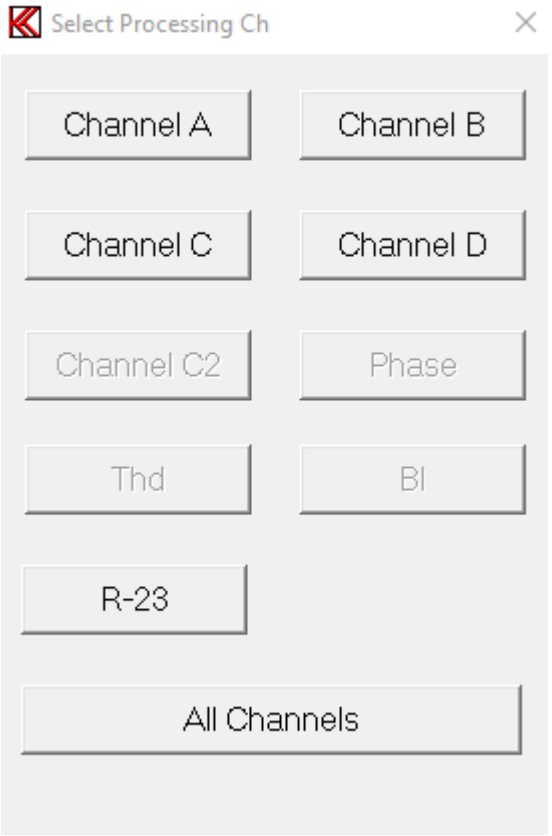
Test results.

It is possible to process the data by selecting the test results. Selection can be approved, rejected or all.
Note: if the data do not contain this information, as older format, the default is all.

Select field.

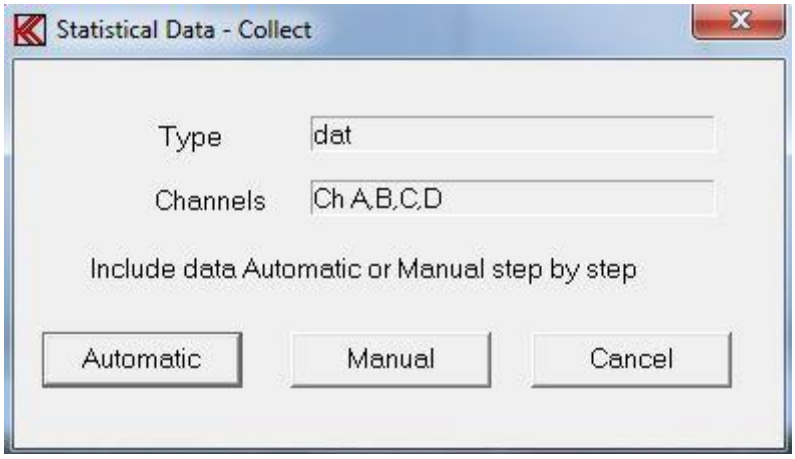
By default all data is processed this to process old format of the data files. However it is possible only to select new data format records containing the number selection field.

It is possible to select only a single channel if more than one channel is present. If all present channels have to be processed just select “All Channels”.



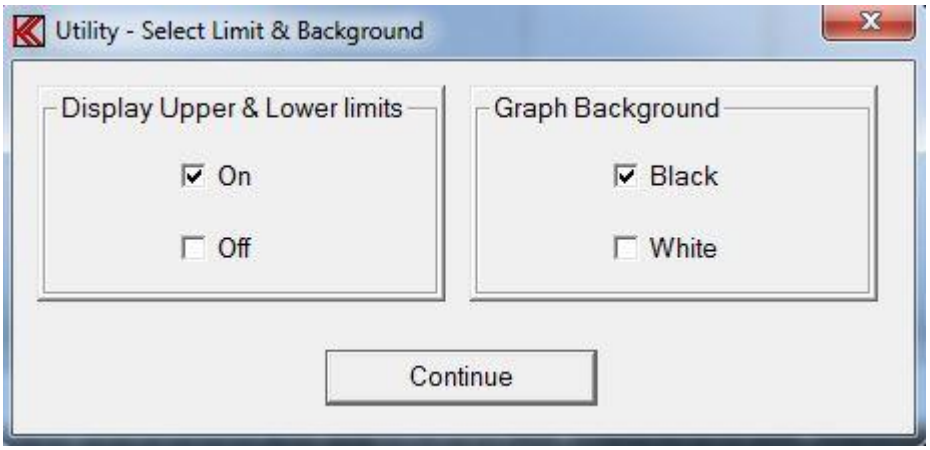
If you in the “Input channel setup” menu have chosen the data smoothing function for at least one of the active channels, you will be presented for the following screen picture, where you can select either to present the data as recorded with smoothing or as recorded non-smoothened. If no smoothing is selected the display will not appear.

If all stored data have to be processed by the criteria selected at “Record select” the automatic function must be selected. If you want to process the “good” or only the best or maybe only the “bad” data records select instead the manual mode. In manual mode the date code and serial number are displayed. If the data is stored in new format the actual test results for each measurement can be displayed in manual mode.



Manual mode

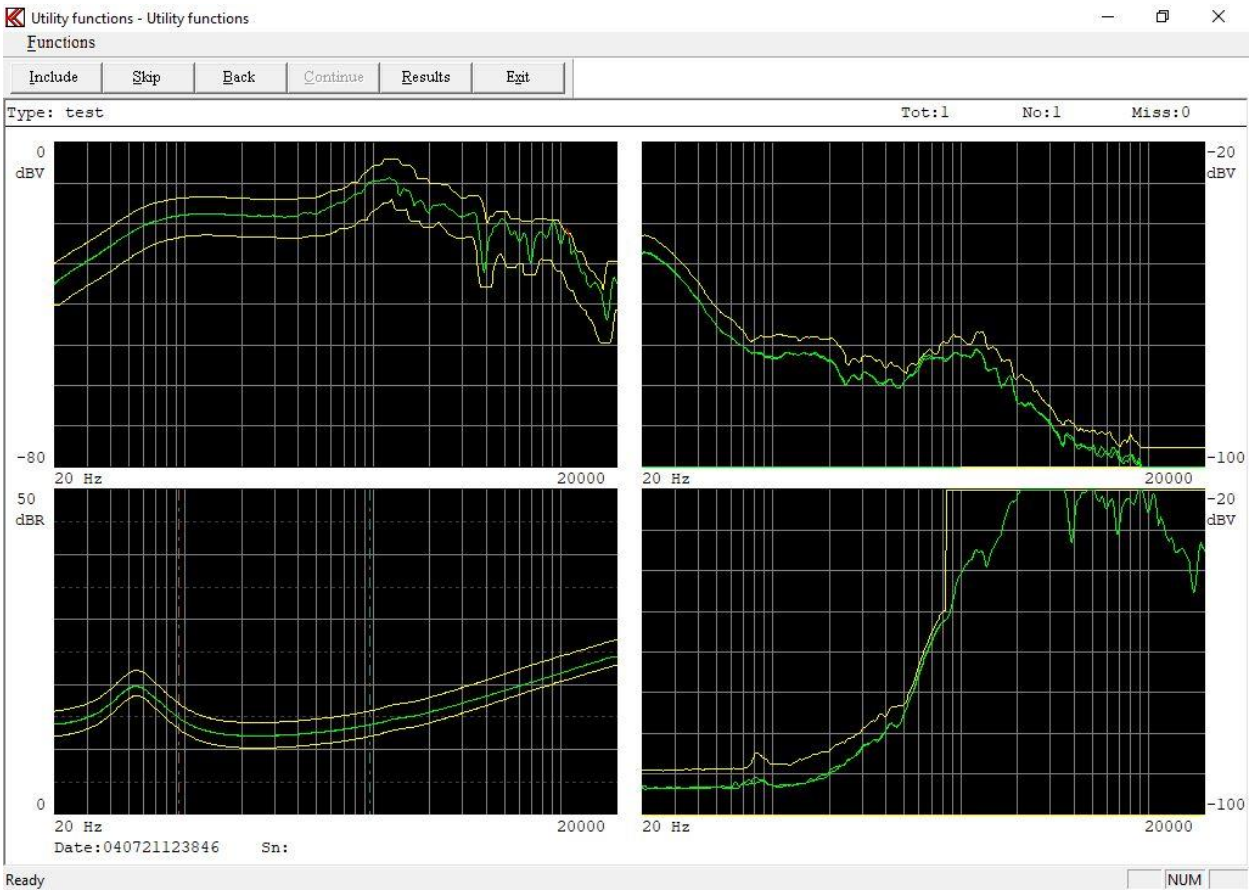
In the manual mode the actual record is displayed. By entering manual mode you can select to display the upper and lower limits together with the data or make displays without any limits. Graph background can be selected as black or white.



Then you are asked to accept the current data or skip the record.
In the bottom line a date code and a serial number are displayed. The date is the actual date code for the record. If the record is stored in an old format, the two last numbers is a sequential number if more than one record have the same date code, else the two last numbers is seconds. In this way no two records have the identical date code, this only for the old format.
The format is: month, date, year, hour, minute and seconds.

If the selected type number is present in the reference curve setup, the displayed data is color-coded “green” for approved and “red” for rejected. If the program cannot find the selected reference type all curves becomes “red”.

If the selected data type you want to process is stored in your reference base with a valid upper and lower limit the following menu appears:



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

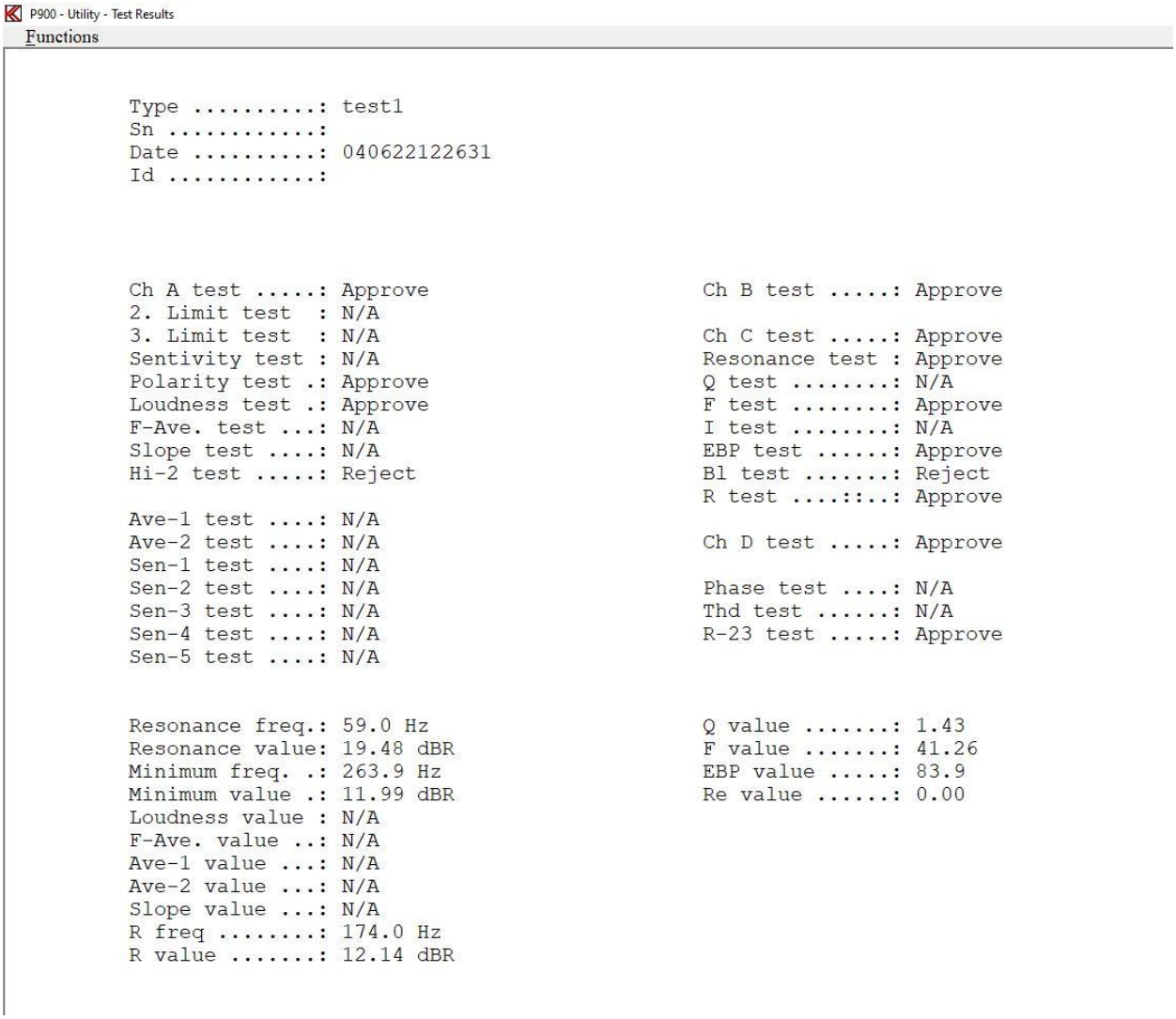
Include
Include current measurement to statistical data.

Skip
Skip current measurement and go to next record.

Back
Step one record back. It is possible to step up 20 records back due to all 20 results as well as displays are stored temporally in a file.

Continue
This command is only active when last record is found with selected type.
Continue to process accepted data.

Results
The actual test results can be displayed. This only if the data is stored in the new format.

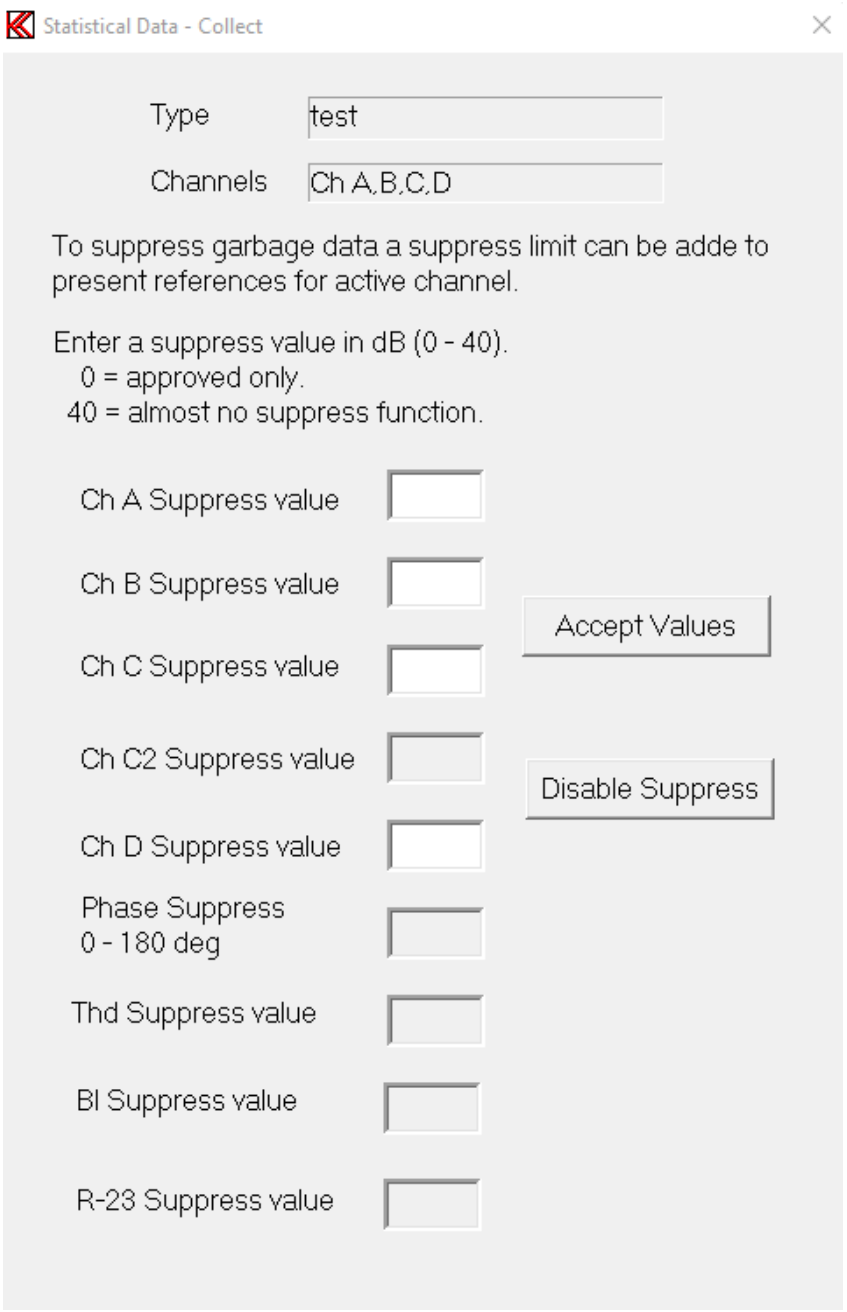


Print
Print curves on selected printer.

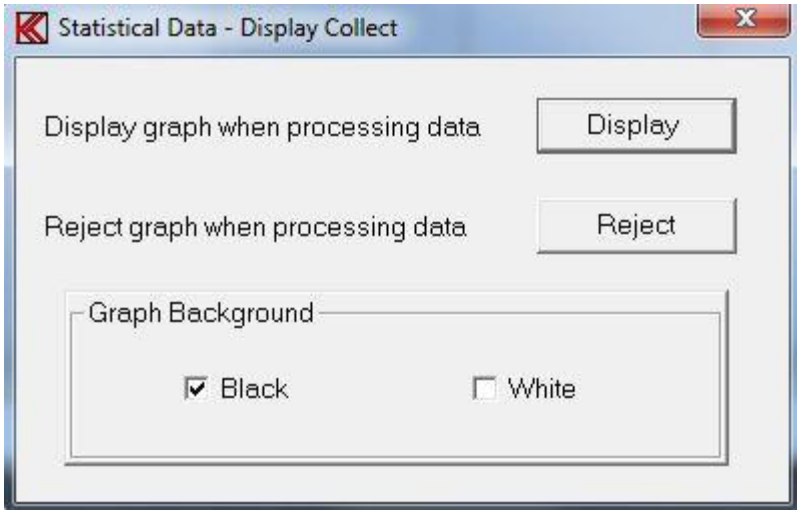
Print Setup
Select printer and settings.

Automatic mode

If “auto” mode is selected and a valid set of upper and lower limits are found a suppress function appears.
Note: if no valid limits are found this suppress function do not appear.

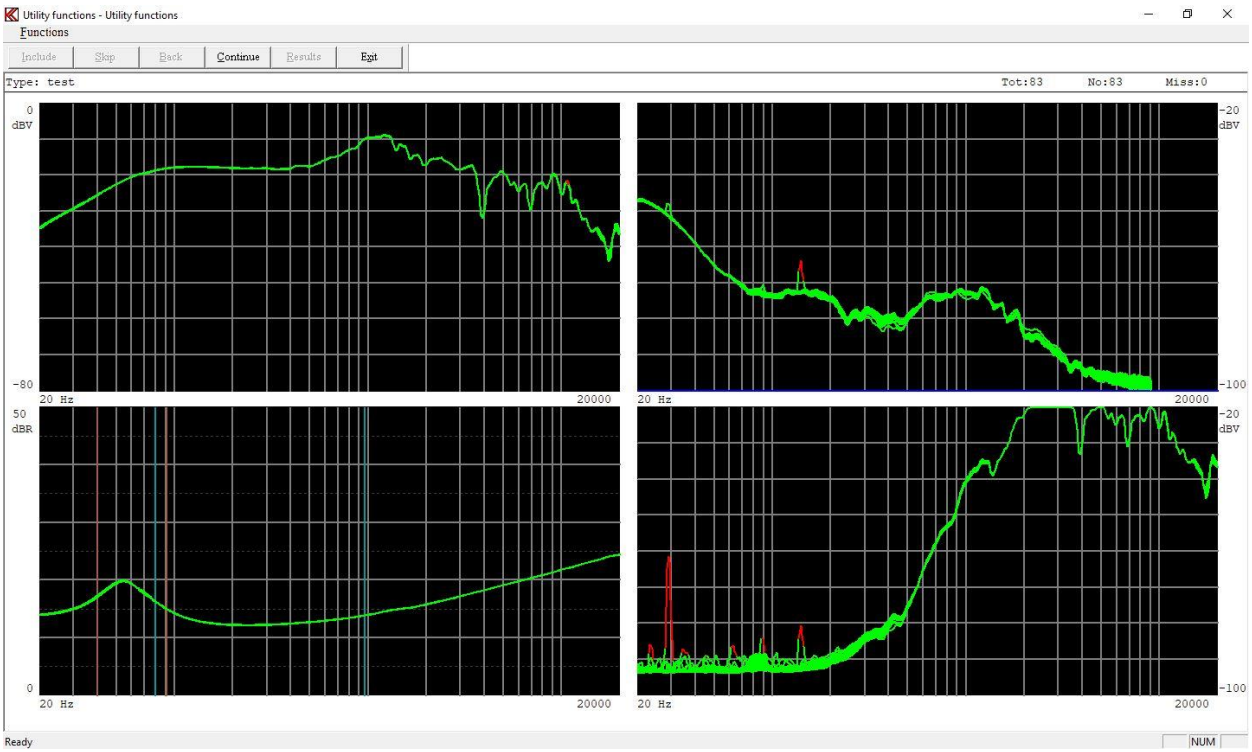


It is possible to suppress unwanted stored records. This works in the following way. The value you add as suppress value is added to your upper and lower limits to widen your present limits. This is a way to suppress wrong measurements from your data. If for example the speaker was disconnected during the test you collect totally erroneous data. To add for example 10 dB or more to your present limits, you can suppress this kind of errors but still include normal rejects to your processing of data.



It is possible to choose to by-pass the screen presentation for each data set and jump directly to the presentation of limits in the “STATISTICS” submenu. This is done in the “Display” or “Reject” submenu. These speeds up the process considerable if many data sets are present.

When all data records have been processed all accepted records are displayed at the same time. If a valid reference setup is found a proper color-coding is selected.
At the top of the display information about the total number of collected record is displayed. If for any reasons the structure of the first selected record is different from the rest a "miss" is counted. The cause could be a change of frequency range, gain or active channel number. None of the "miss" records are processed.



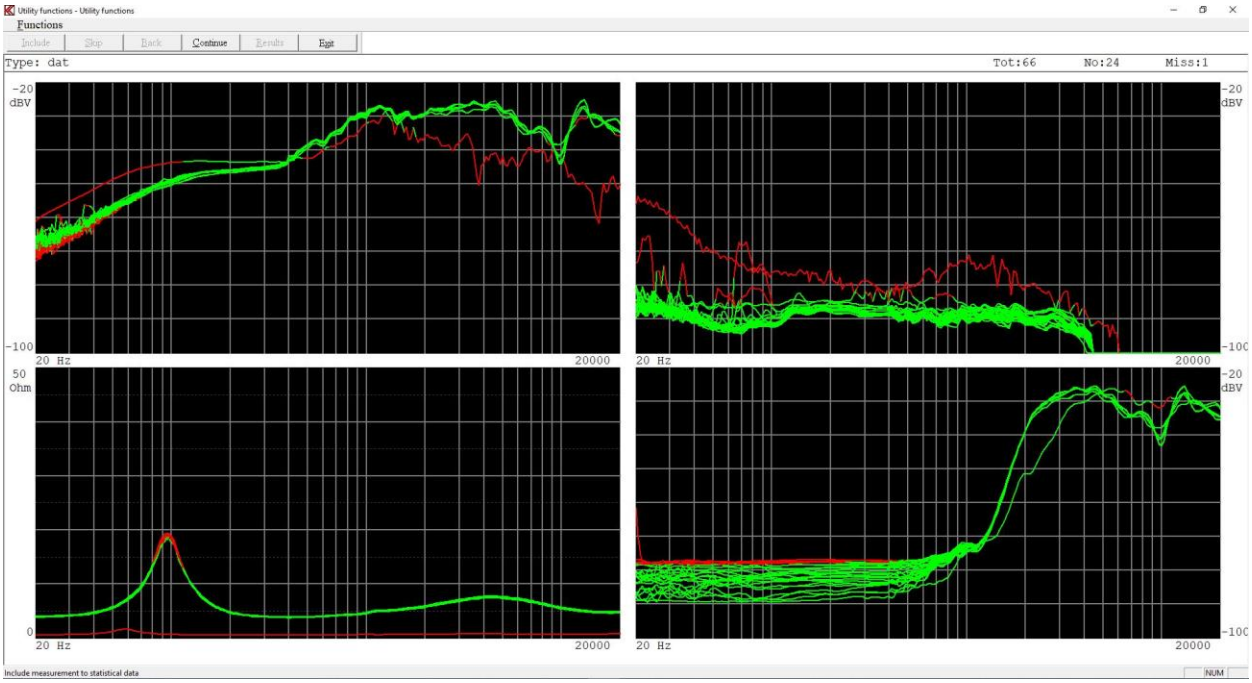
Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Continue
Continue to process displayed data.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Continue



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Limit
Add limit to display.

Stat
Enable Statistical menu Mode 1.
If the "Reject display" function has been selected the screen picture is bypassed and goes directly to the Statistical menu Mode 1.
The statistics function processes the already collected data called “Mode 1” and the presentation of the following curves:

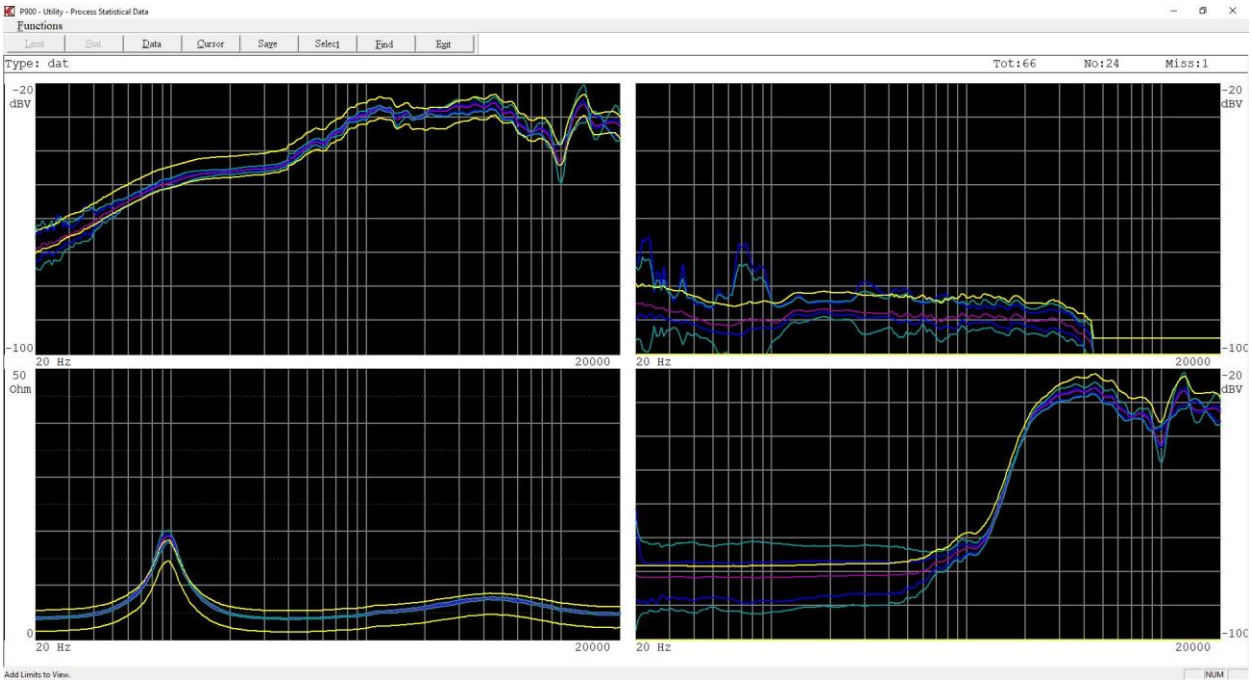
- Yellow upper and lower reference curves if selected.
- Pink average of collected data.
- Blue maximum and minimum of collected data.
- Light blue + and - 3 times standard deviation of collected data.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Statistical mode 1



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Data
Go back to previous menu.

Cursor
A cursor function activates the cursor and enters the “mode 2” from which replacement between the different data and reference curves can be done.

Save
The function is a sub menu. The save function allows to store the processed data to selected reference curves or as a totally new type.

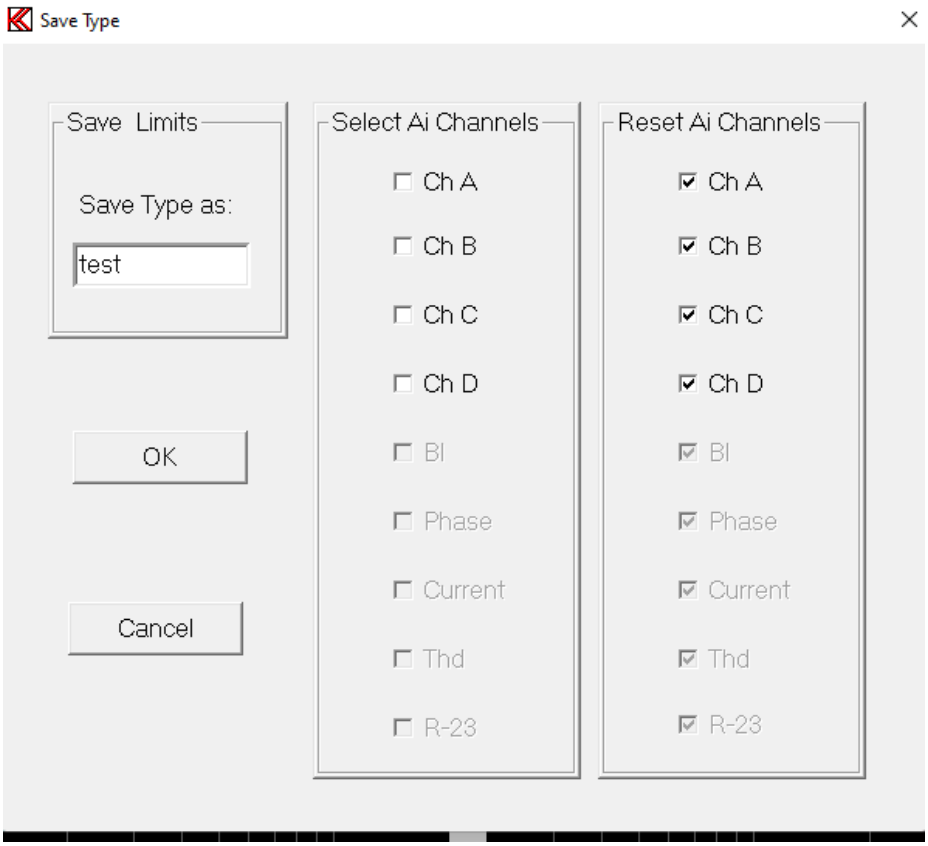
Select
The select is a sub menu. It is possible to select the curves to display on screen as listed in this sub menu.

Find
With this function the user can “find” the best match of a data set to the “average” of the included data set or a “Best fit reference”. A “Best fit reference” must be saved in the “EDIT” menu before processing the data with the statistics utility function. This is done like the saving of a “Reference”, “Compensation” or “Master” curve in the “SAVE” submenu. A status will accordingly be shown in the “SET UP OF PARAMETER” screen picture for the Type.
The “average” or “best fit” selection criteria are set up in the “MODE 1” submenu “SELECT”. The user can select the average for channel A, B, C or D or any combination of these, or for the best-fit reference.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Submenus:

Save
The save function allows to store the processed data to selected reference curves or as a totally new type.

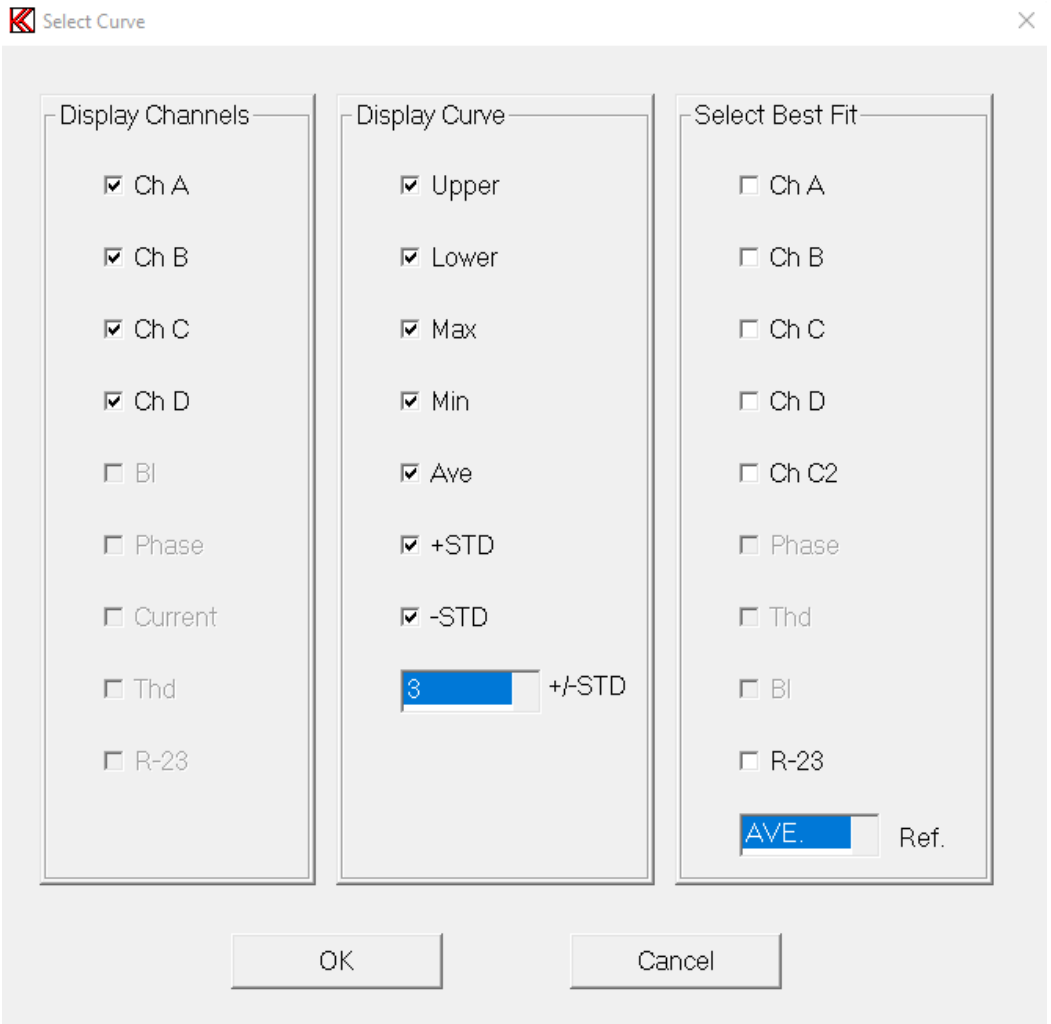


Select Ai Channels
Here the processed channels can be selected. Only channels processed can be selected. In this example Ch A to Ch D are processed. If example Ch A is selected and then the OK is pressed the Ai-Ch A is stored. This channel must be enabled in

edit-mode before the Ai-process can be activated in Run-mode.

Reset Ai Channels
Here the processed Ai-channels can be reset. The reset have impact in edit-mode and run-mode.

Select
In this sub menu it is possible to select the curves to display in "Mode 1" and "Mode 2". This function is made for better to make a screen dump to a printer or disk for documentation purposes.



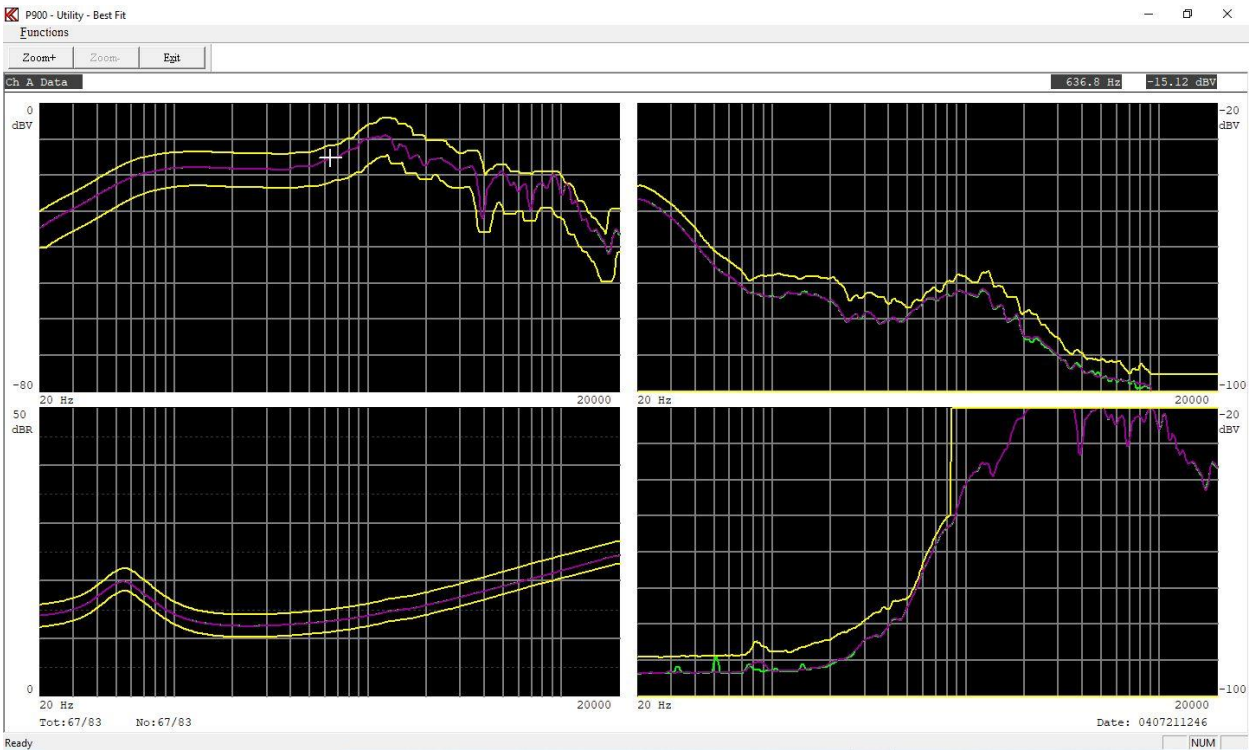
Display Curve
Select the Curves to be displayed. Selection The STD (the sigma) is done here.

Display Channels
If more than 1 set of data are present on a Display Channel selection of the data set can selected.

Select Best Fit
One curve ar a combination of curves can be selected as criteria for a best fit. Best fit is selected against the Average (AVE.) curve or a Best Fit curve, the User (USER) curve

Find

The find function select the records that match best to the average or the best file reference curve selected in “select curve” menu. Note a least one best-fit channel must be selected as above channel A.
In this example record 67 out of total 68 or record out of 83 processed records was found. The date code of the unit is 0407211246



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Fast
Fast Cursor is 10 times faster than normal.

Normal
Disable the cursor.

Key “0”
Toggle fast cursor on / off.

Zoom In
Enlarge display at selected channel. Key “Page Up” has same function.

Zoom Out
View all channels. Key “Page Down” has same function.

Zoom+
Enlarge display at selected channel. Key “Page Up” has same function.

Zoom-
View all channels. Key “Page Down” has same function.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Mouse Functions

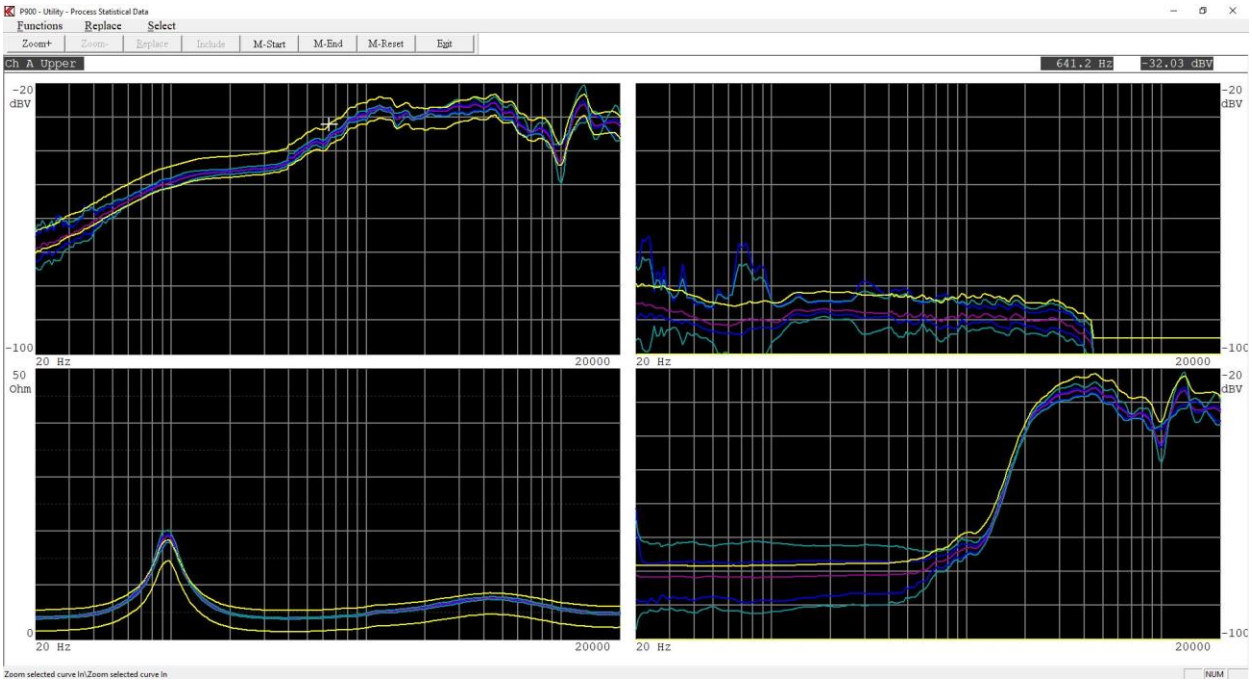
Double click middle mouse button
Toggle the fast cursor on /off.
This has the same function as the keyboard “0”.

Scroll mouse wheel forward
This function has the same function as the keyboard arrow up.

Scroll mouse wheel backward
This function has the same function as the keyboard arrow down.

Left mouse click
Left click with mouse move the cross cursor to selected measurement point.
The mouse must be within the graph area.
If the mouse is placed on another measured channel the cross cursor is moved to the new channel. This function has the same function as the combination as mode the keyboard left and right arrows and the keyboard “+” key.

Cursor - Statistical mode 2



Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.
Note that the displayed curves have to be selected in previous menu under Select.

Fast
Fast Cursor is 10 times faster than normal.

Normal
Disable the fast cursor.

Key "0"
Toggle fast cursor on / off.

Zoom In
Enlarge display at selected channel. Key "Page Up" has same function.

Zoom Out
View all channels. Key "Page Down" has same function.

Zoom+
Enlarge display at selected channel. Key "Page Up" has same function.

Zoom-
View all channels. Key "Page Down" has same function.

Invert Gfx
Invert curve toggle background from black to white and white to black.

Replace
Replace selected limit/curve with listed data.

M-Start
Set start marker for part replacement.

Key "1"
Same function as M-Start.

M-End
Set end maker for part replacement.
If start and end maker are present and you make use of the "Replacement" the replacement is only performed between the markers.

Key "2"
Same function as M-End.

M-Reset
Reset markers

Key "4"
Same function as M-Reset.

Print
Print curves on selected printer.

Print Setup
Select printer and settings.

Mouse Functions

Double click middle mouse button
Toggle the fast cursor on /off.
This has the same function as the keyboard "0".

Scroll mouse wheel forward
This function has the same function as the keyboard arrow up.

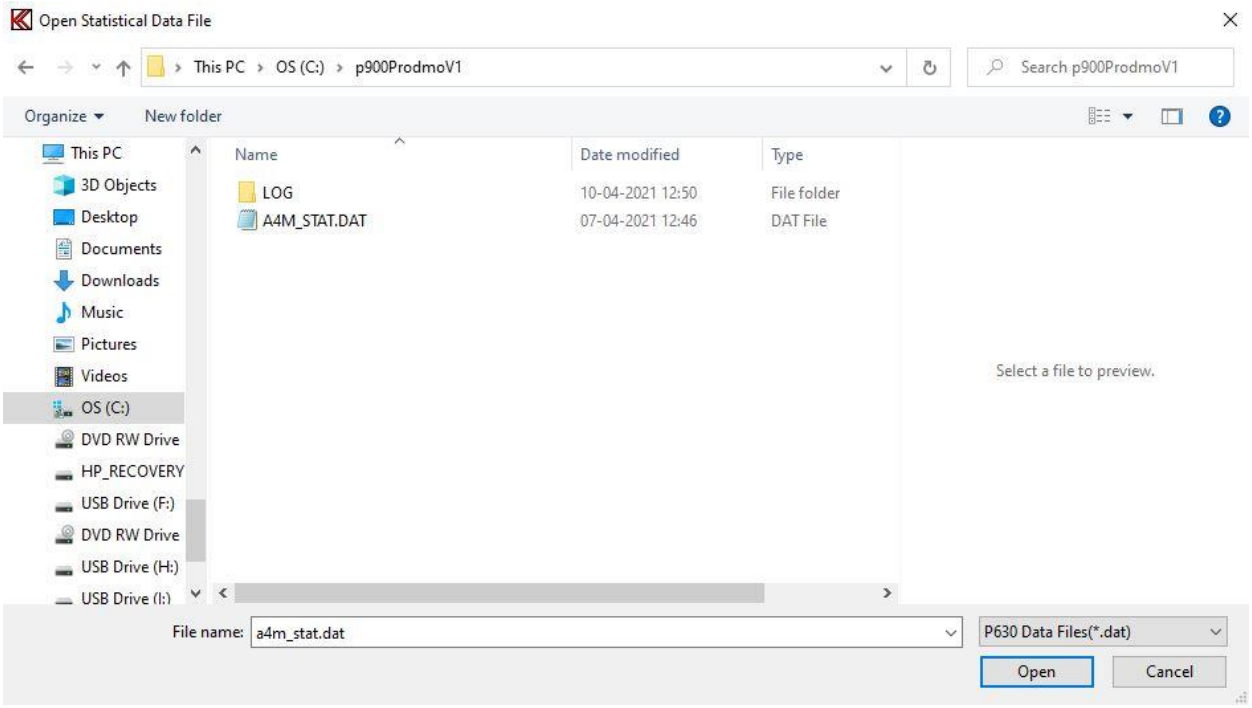
Scroll mouse wheel backward
This function has the same function as the keyboard arrow down.

Left mouse click
Left click with mouse move the cross cursor to selected measurement point.
The mouse must be within the graph area.
If the mouse is placed on another measured channel the cross cursor is moved to the new channel. This function has the same function as the combination as mode the keyboard left and right arrows and the keyboard "+" key.

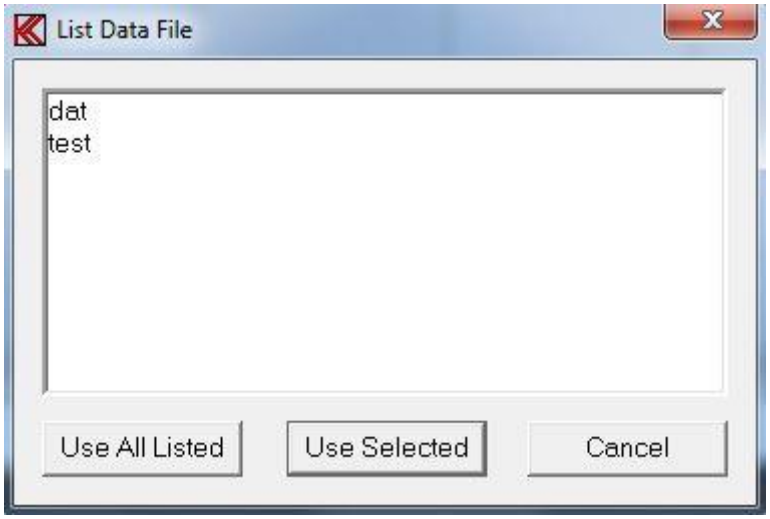
Note:
If the scale of the display is changed from the standard setup and you want to make use of a different scale setup, you have to change the display scale before you store the data in the A4M_STAT.DAT file. It is not possible to change the scale later on. The presentation is made exactly as it was recorded.

Convert Statistical Data

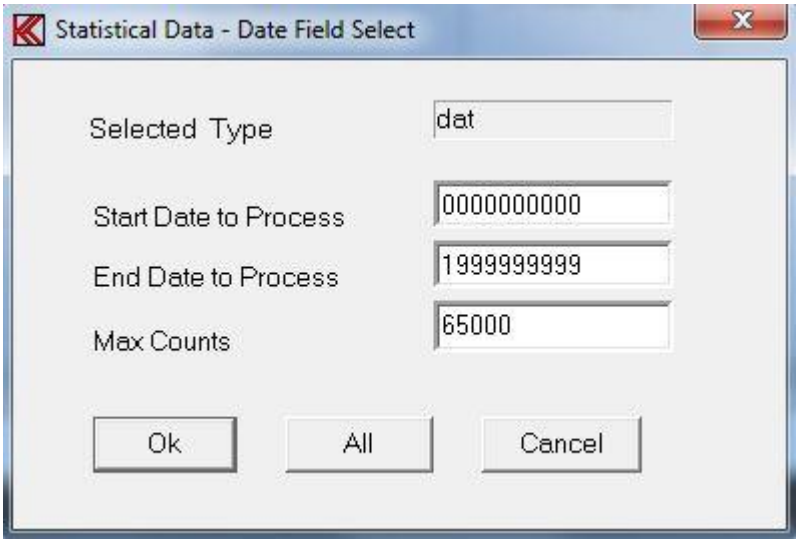
This function converts data types stored a DAT file, default file name is A4M_STAT.DAT, to plain ASCII.



When selected file is opened a list of stored “Types” appears. A selection of a single data “Type” can be selected or all listed data types listed on the screen by the “Use All Listed” function.

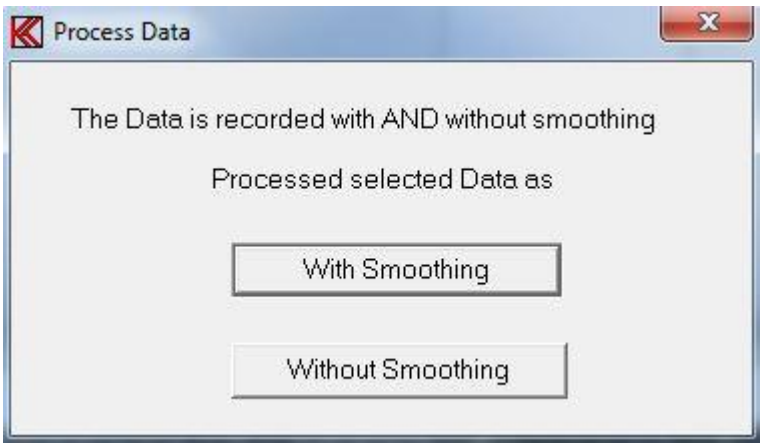


After selected types to convert a Data Field Select menu appears. Here it is possible to select a part of selected type by entering start and end date. Maximal Count is 512000.

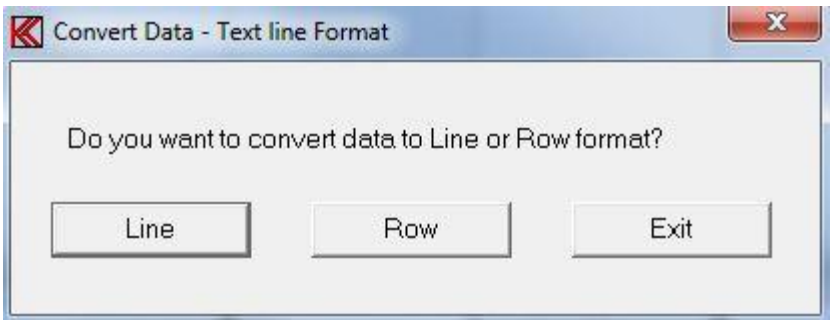


If a type, which has been recorded with smoothing, is selected, you are prompted to select the data to be converted as recorded with smoothing or as the raw non-smoothened data.

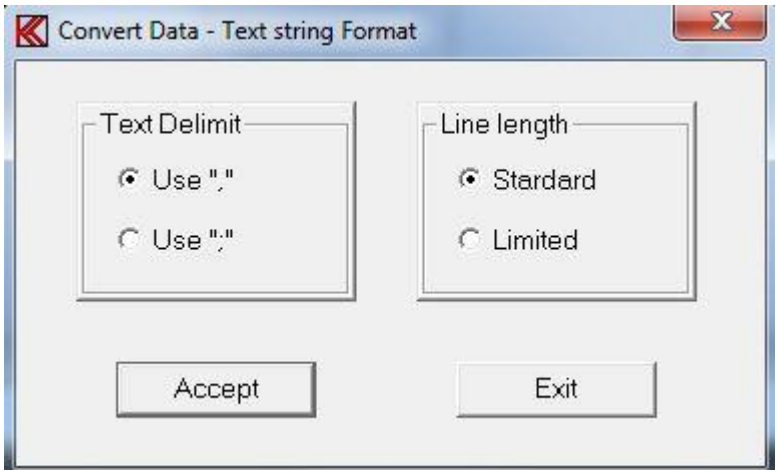
If, however, you select all types to be converted, and there among these exist types with smoothened data, all types will be converted just as recorded (with or without the smoothening function).



Furthermore it is possible to select “line” or “row” format. The line format is standard. All records are converted as lines in a text file. If the row format is selected all records are stored as rows. However, using row format the date and time codes are lost in the transfer.



In text files, used for third party programs, (as spreadsheet) a delimiter has to be used as “,” or “;”. Finally a problem of too long strings can cause problems in some programs. To solve such problems a selection of the maximum string length can be made.



Line Length Standard:

In line mode:

None of the strings are broken down into minor parts. A single string length for a reference curve can be up to 1775 charters long.

In row mode:

The number of rows is maximal 250. Numbers of lines are 8 + channels* (points + 3).

Line Length Limited:

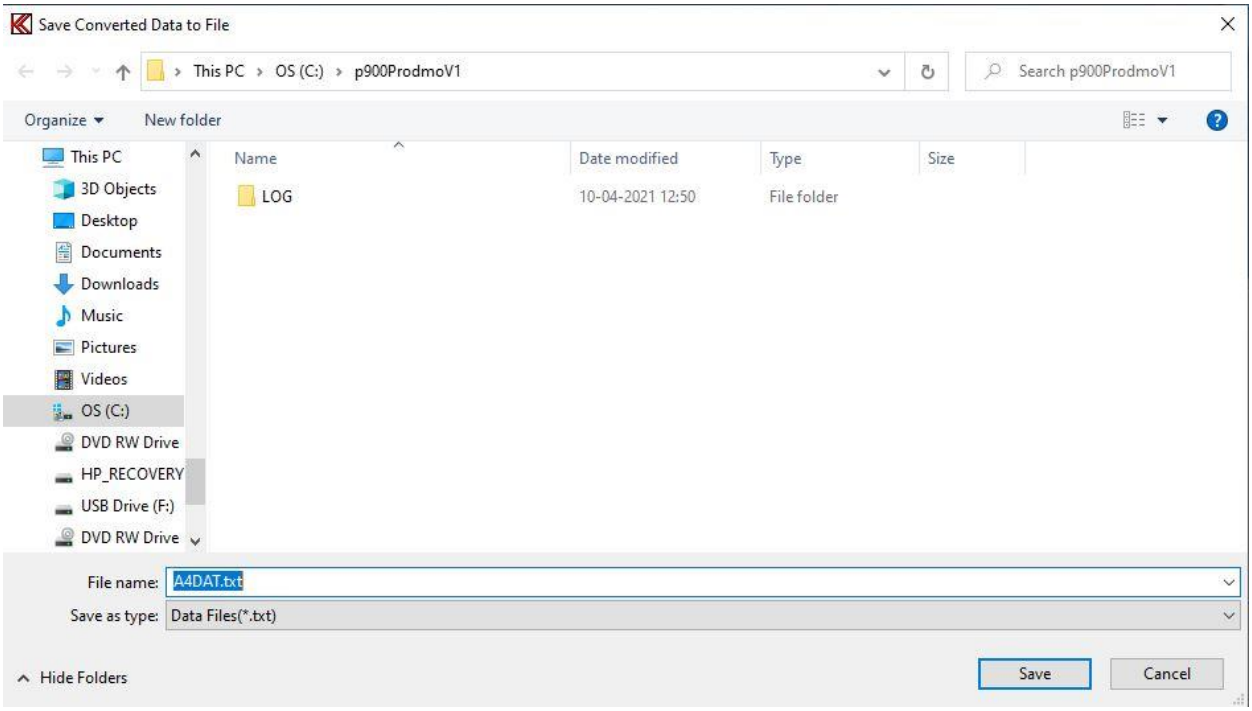
In line mode:

The maximum string length is 1/2 of length used as in the standard mode.

In row mode:

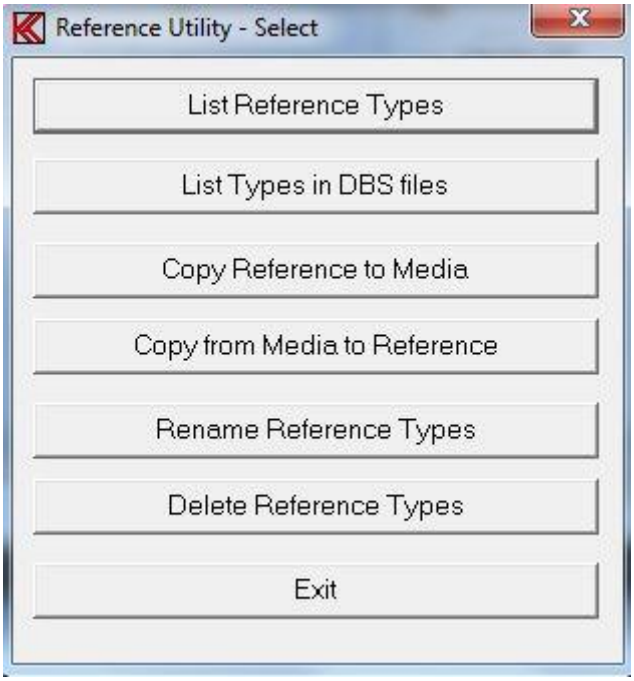
Number of row is maximal 125. Numbers of lines are 8 + channels*(points + 3).

After all these selections have been made the conversion takes place you have to save the converted file.


Save Converted Data to File
This PC › OS (C:) › p900ProdmoV1
Search p900ProdmoV1
Organize
New folder
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
OS (C:)
DVD RW Drive
HP_RECOVERY
USB Drive (F:)
DVD RW Drive
Name
Date modified
Type
Size
LOG
10-04-2021 12:50
File folder
File name:
A4DAT.txt
Save as type:
Data Files(*.txt)
Hide Folders
Save
Cancel

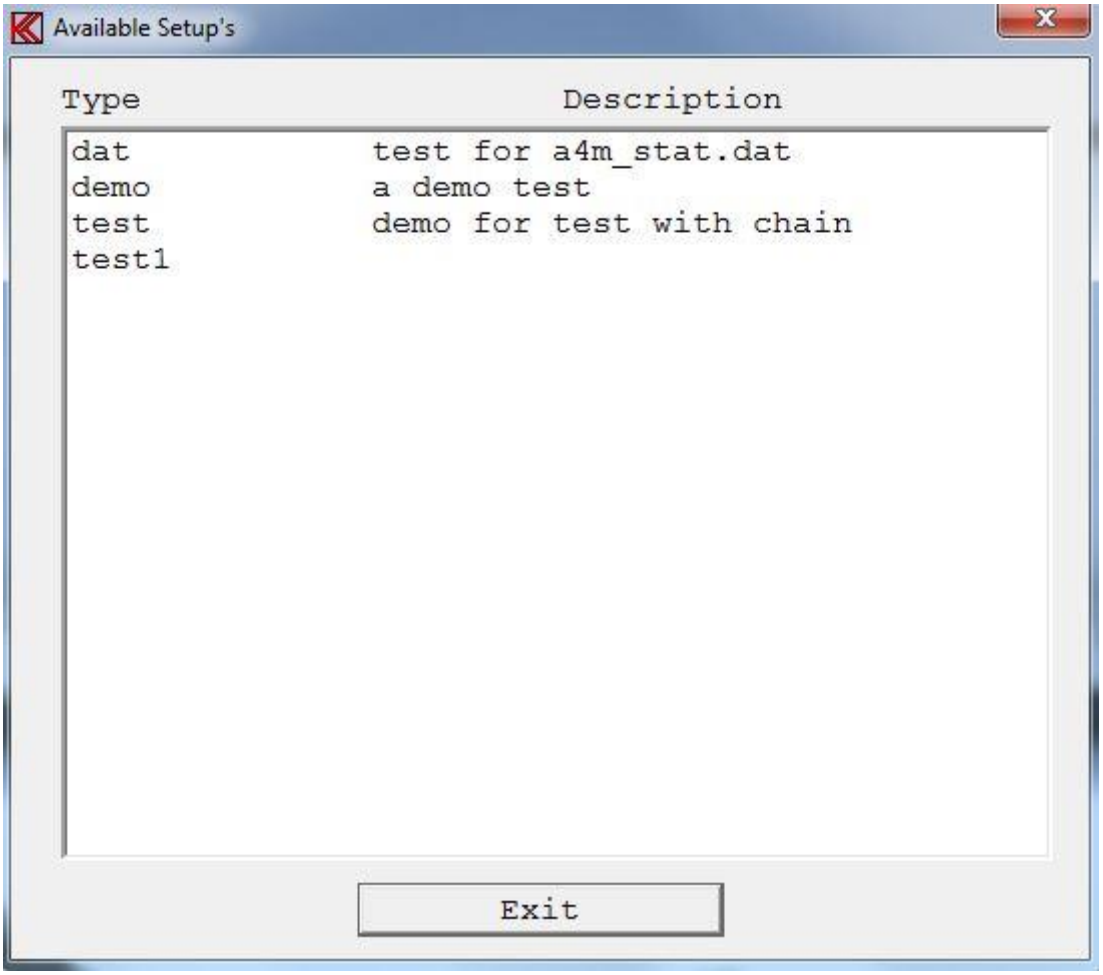
Copy Reference Data

This group of utilities contains the most functions needed to copy single record(s) existing in the P900 main reference database to or from a media. The files, which you are copying, have the extension DBS for setup files, DBC for reference curve file, DBA for Frequency average setup and DBN for sensitivity average setup, DPS for phase, Bl, Hi2 and Monitor, DPC for phase, Bl and Hi2 curves, DIS for Ai setup and DIC for Ai curves.



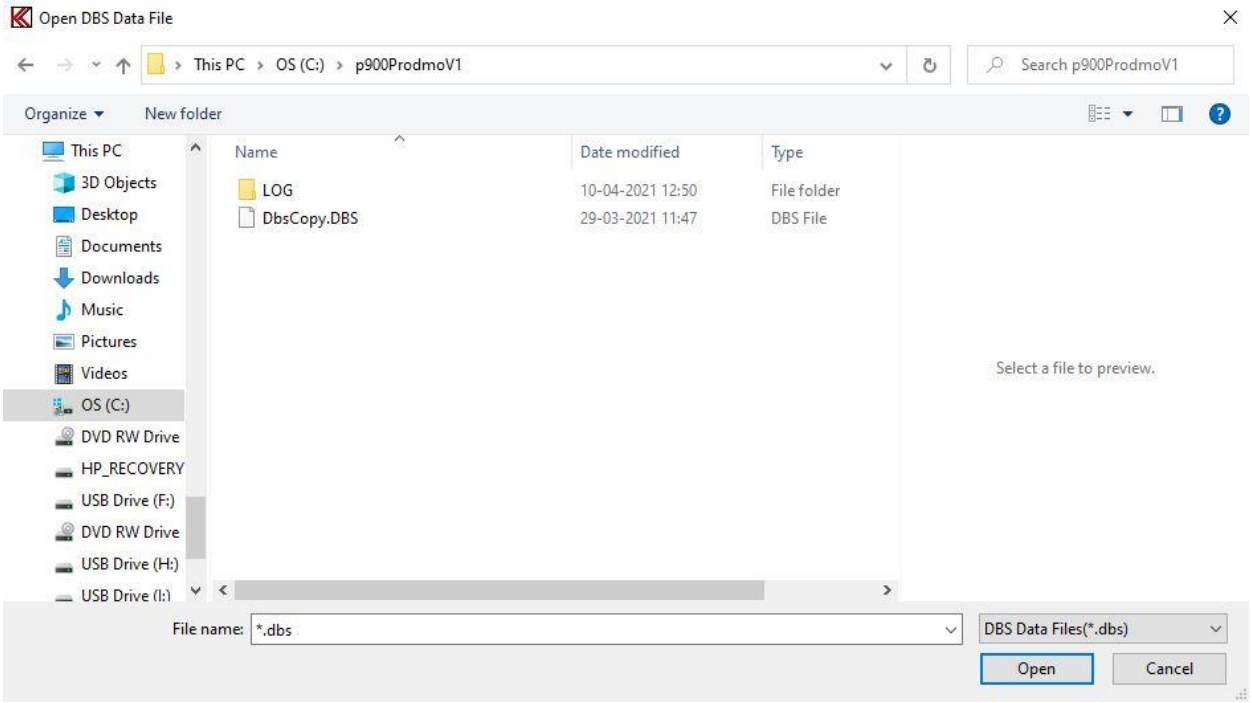
List Reference Types

This function lists all types existing in the reference setup database. This is the same list you are presented with when entering the run or change setup mode.

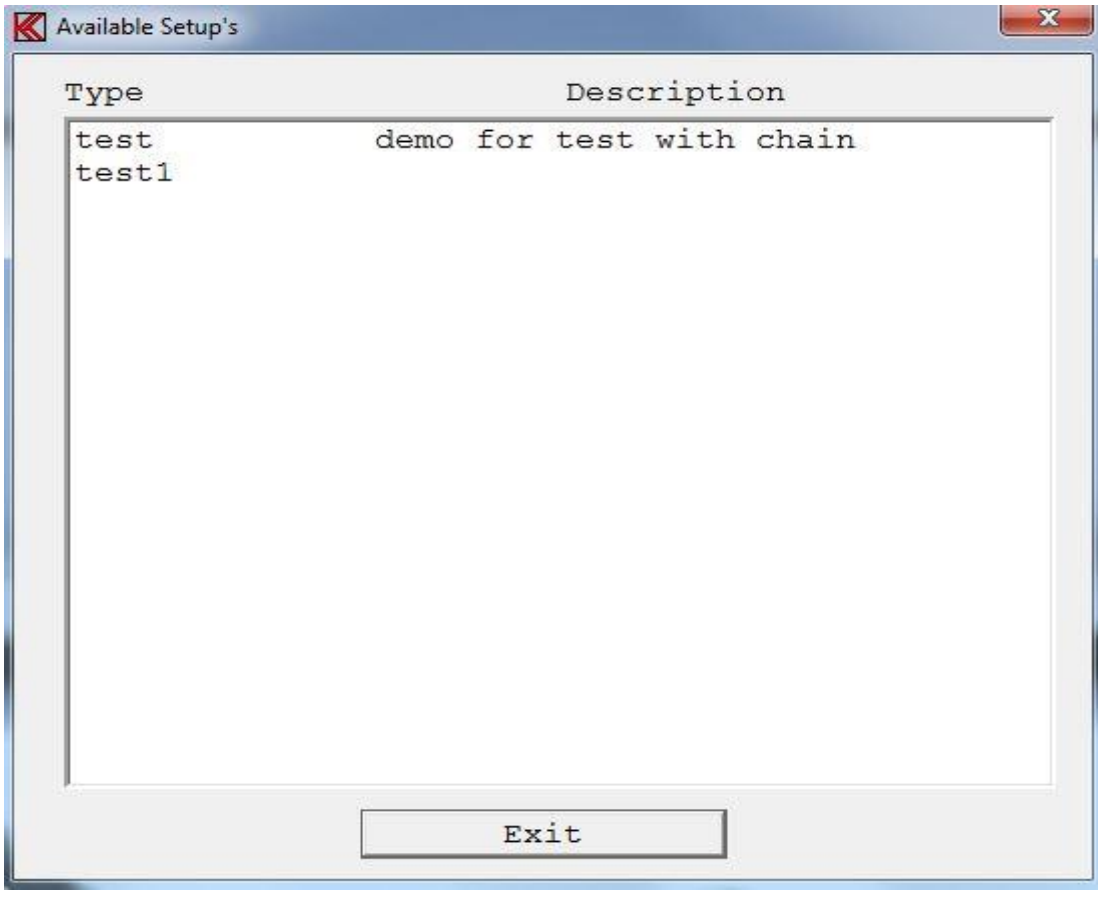


List Types in DBS files

It is possible to copy a single or a group of files to the DBS file by using “wildcat” characters. To make a list of types containing a particular DBS file use this function.

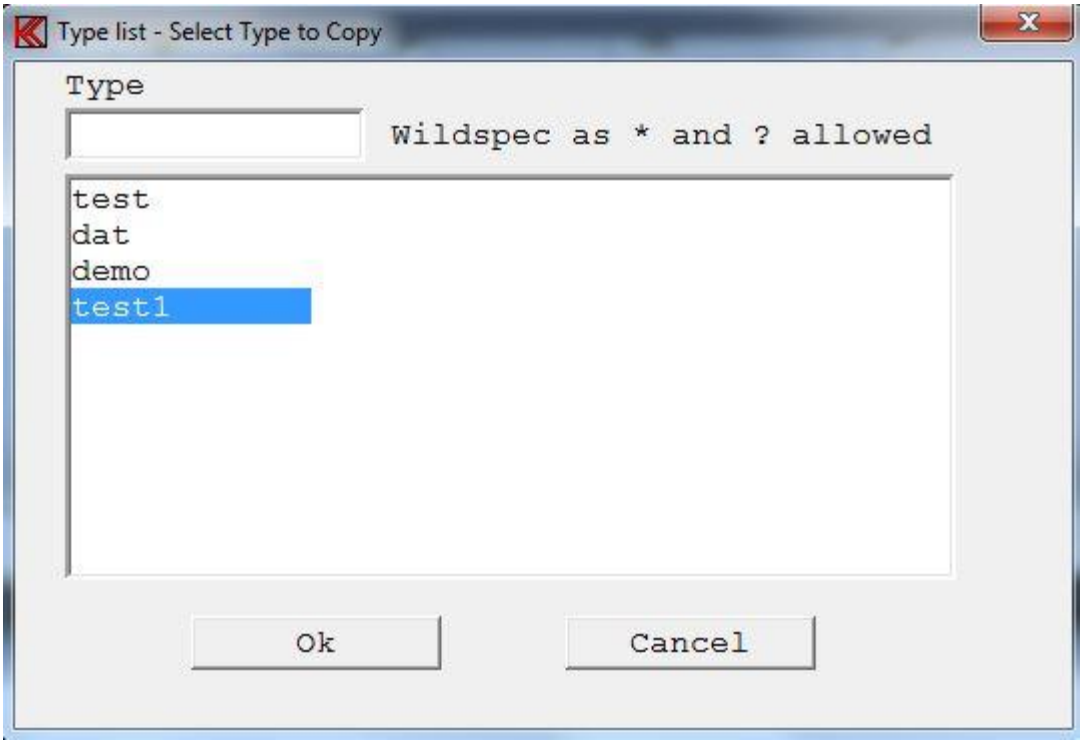


To list types in DBS file select disk, path and file name. Here a list contains of the file “Dbscopy.dbs” with only one type “test”.

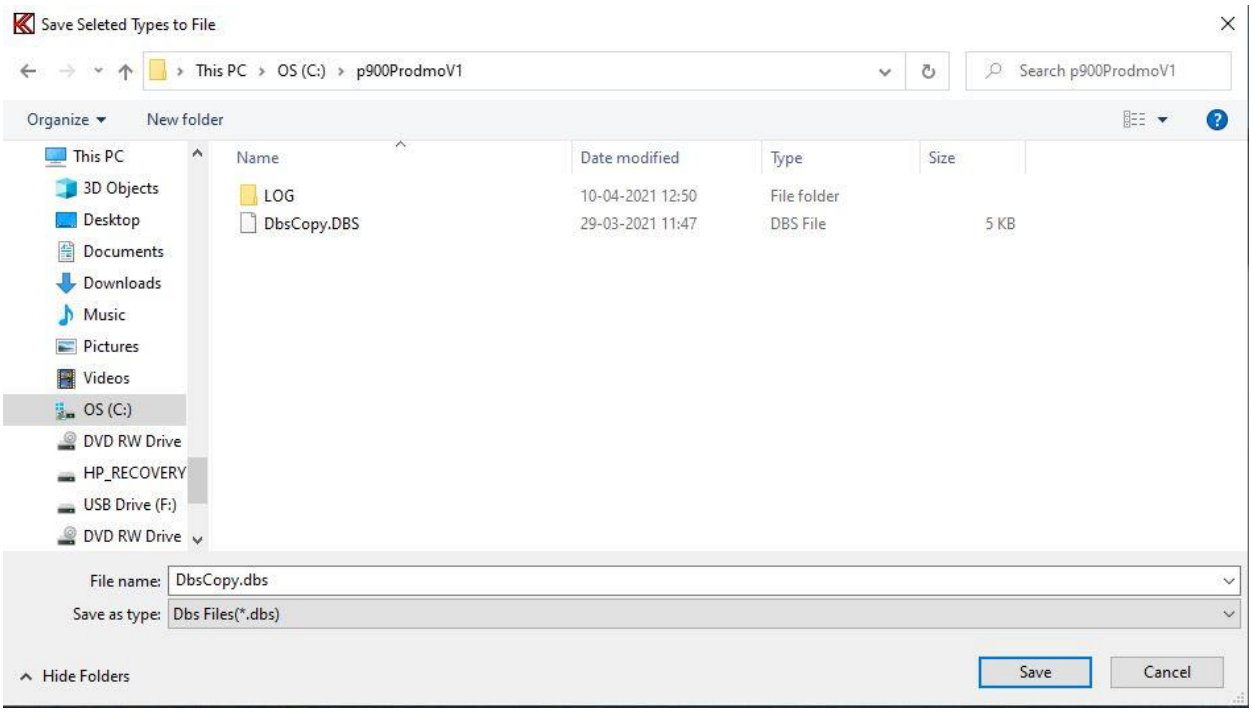


Copy Reference to Media

Copy a reference setup to a media. With this function a proper reference type name must be entered. “Wildcat” characters such as “*” and “?” are allowed. An asterisk (*). An asterisk means all characters, if places in the beginning or at the end of a string. The question mark(s) means character(s) in a particular place in a string.

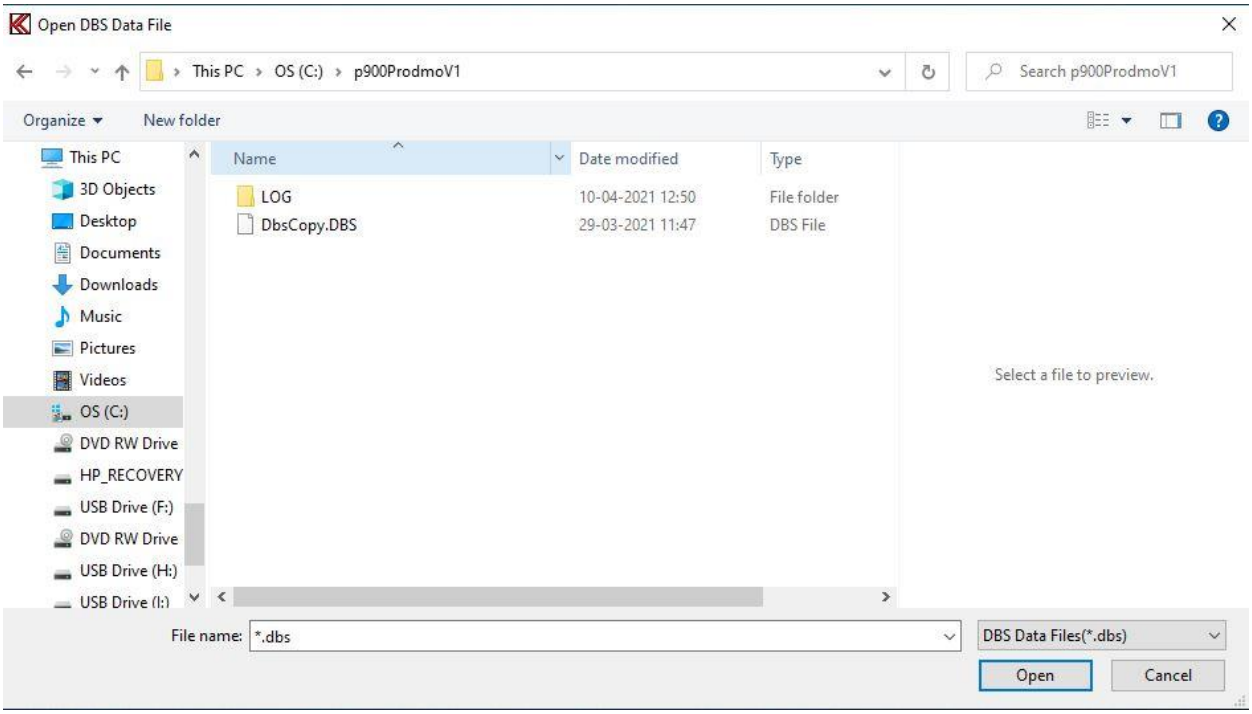


Here the type “test1” is selected to copy to a DBS file. DBS file name and destination must be defined.

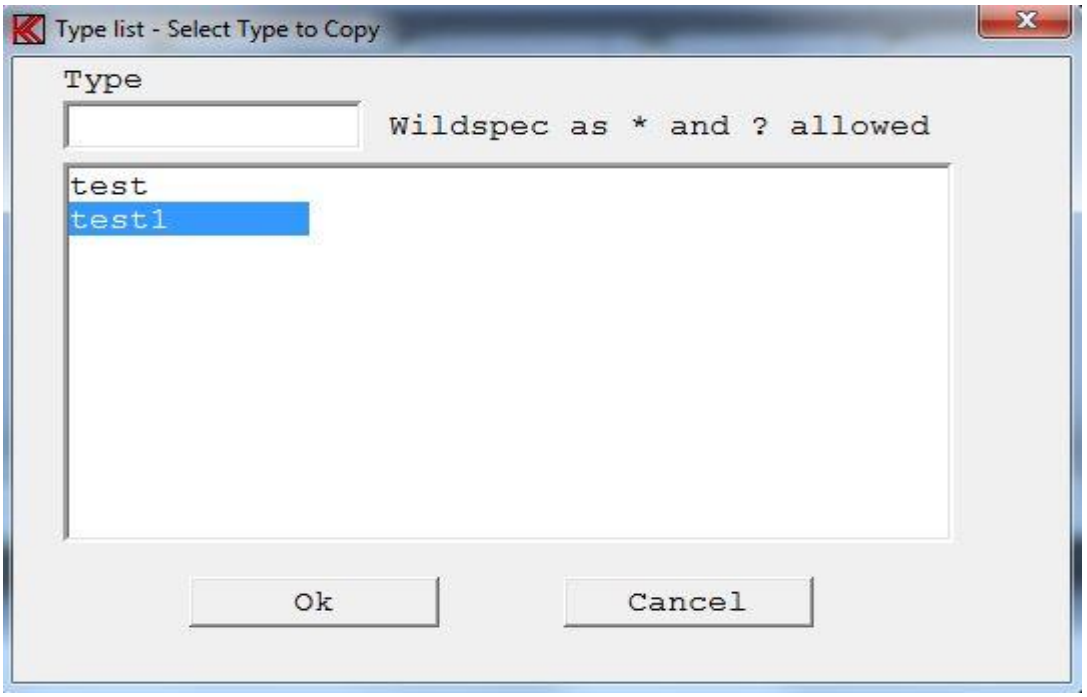


Copy from a media to Reference

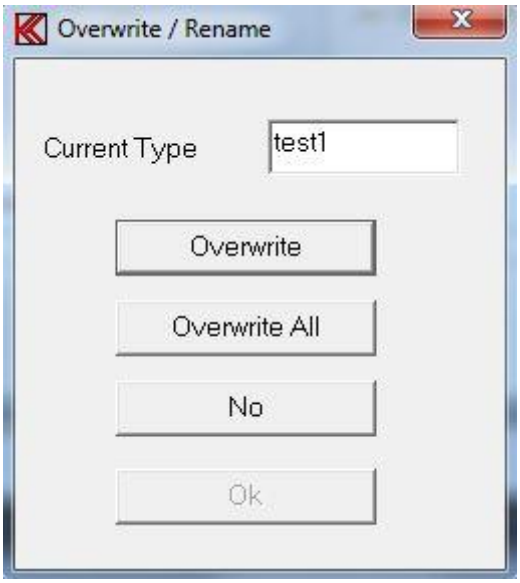
Copy a reference setup, stored in a DBS format, to the main reference structure, use this function. The actual type name or names in the particular DBS file have to be specified. “Wildcat” characters as “*” and “?” are allowed. An asterisk (*) means all characters if places in the beginning or at the end of a string. The question mark means a character in a particular place in the string.
After valid password is entered you have to select the DBS filename from you have to copy reference data from.



Here the file “Dbscopy.dbs” is selected to copy from.



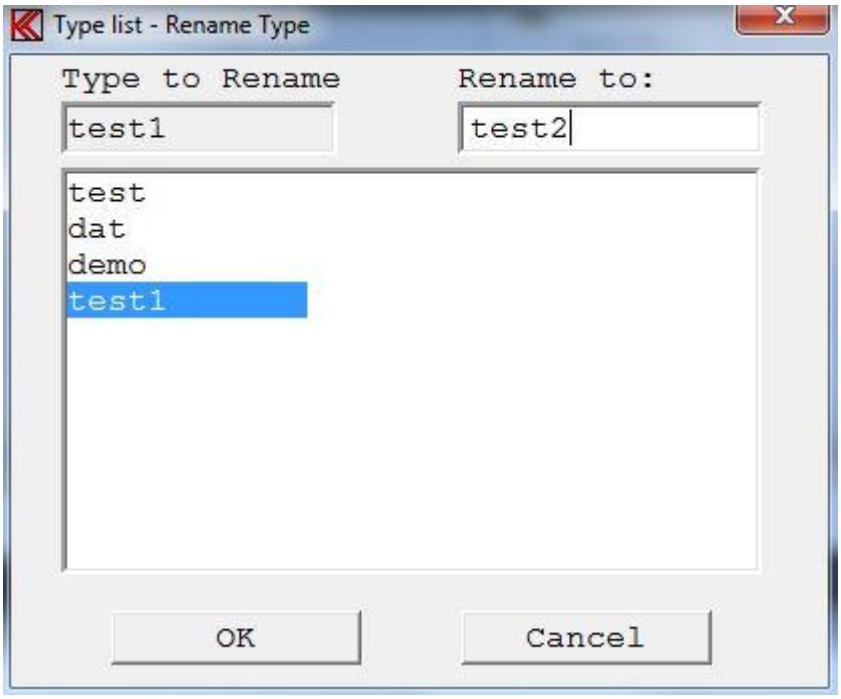
The file contains only one type with name “test1”.



If the type name you want to copy to main reference structure already exist the system ask you to overwrite this type in the main reference or to exit the menu.

Rename Reference Types

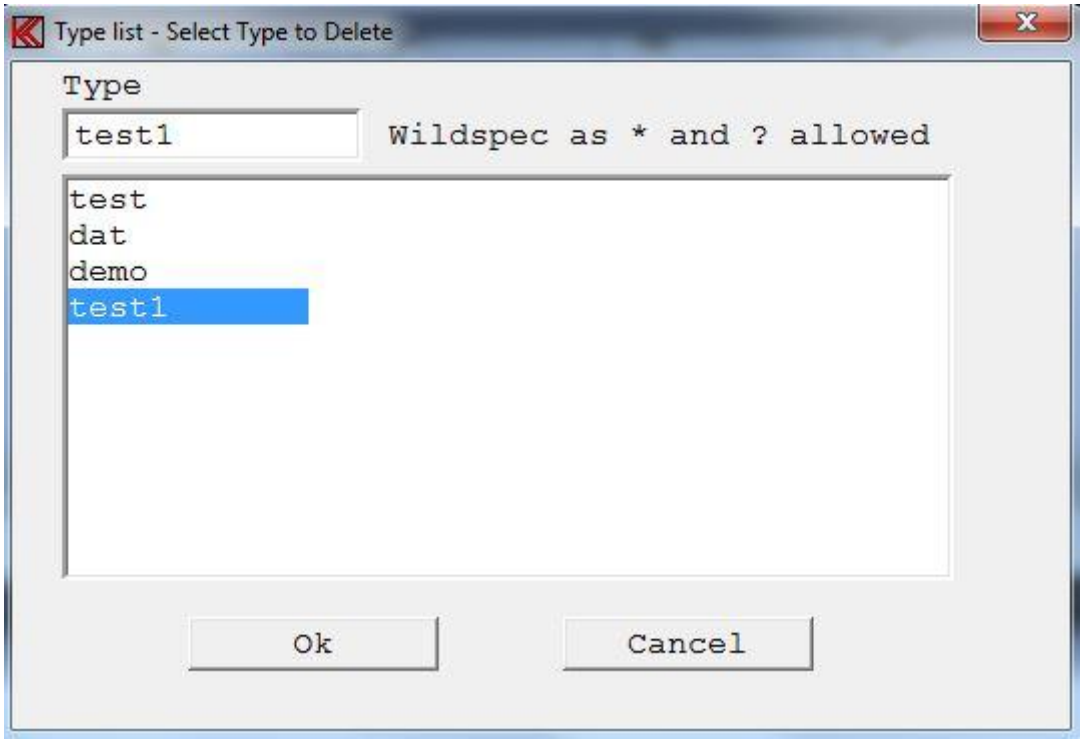
This function renames a type name in the reference database.
In this example the type “test1” will be renamed to type “test2”.



Delete Reference Types

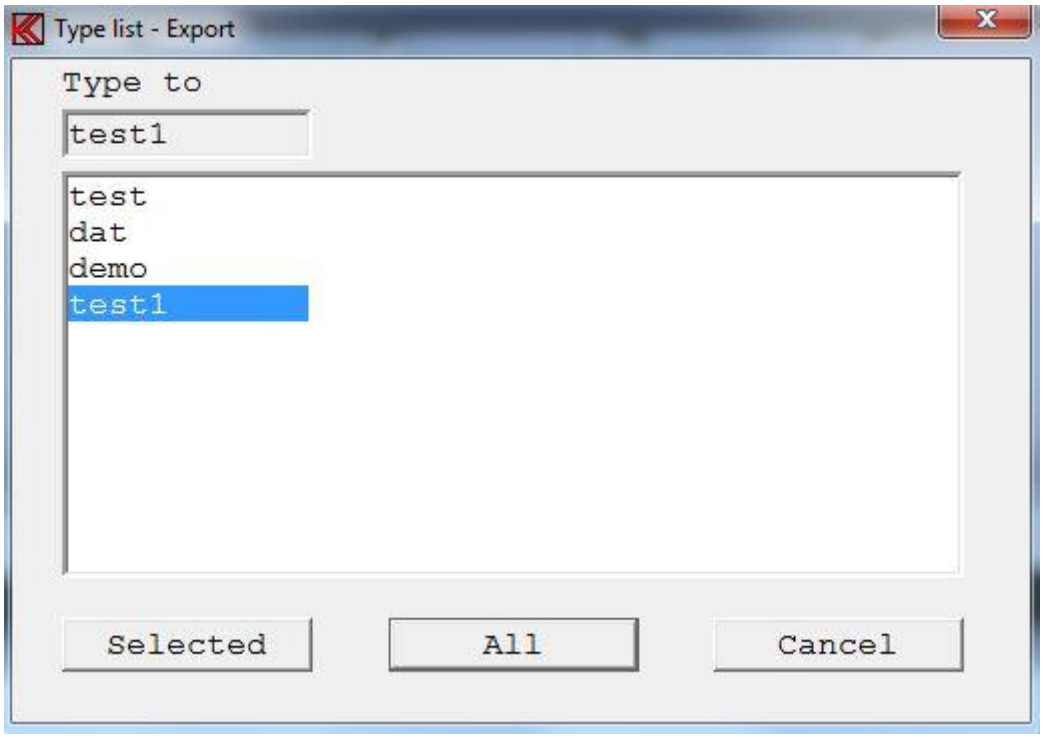
To delete a single reference type or several types use this function. Enter the name of type you want to delete. “Wildcat” characters as “*” and “?” are allowed. An asterisk has the function that all characters are marked if places in the beginning or at the end of a string. The question mark

indicates a character in a particular place in string. Final you have to confirm the operation or quit.



Export Reference Data

This function takes the reference setup and converts both the setup parameters and the reference curve data to a TXT file. First a list of available type name appears on the screen.



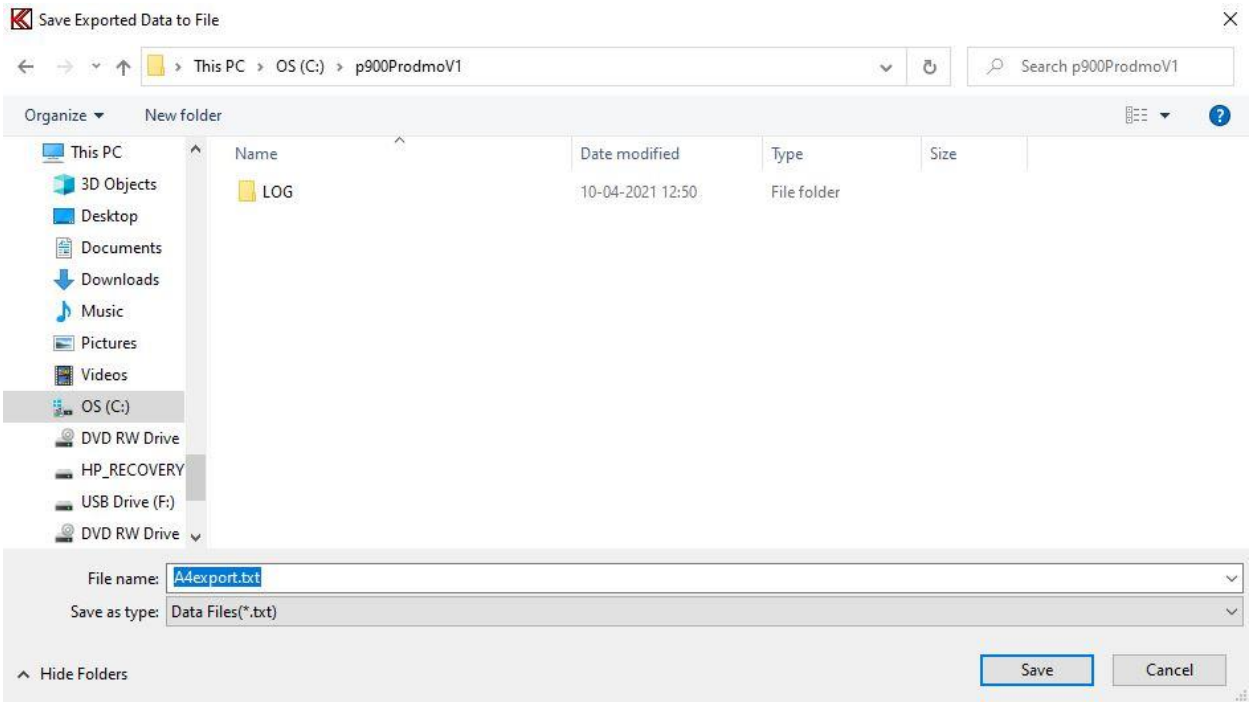
Selected

Select only one reference Type to be converted. Type must be in gray field “Type to Export”. Click twice on name to select.

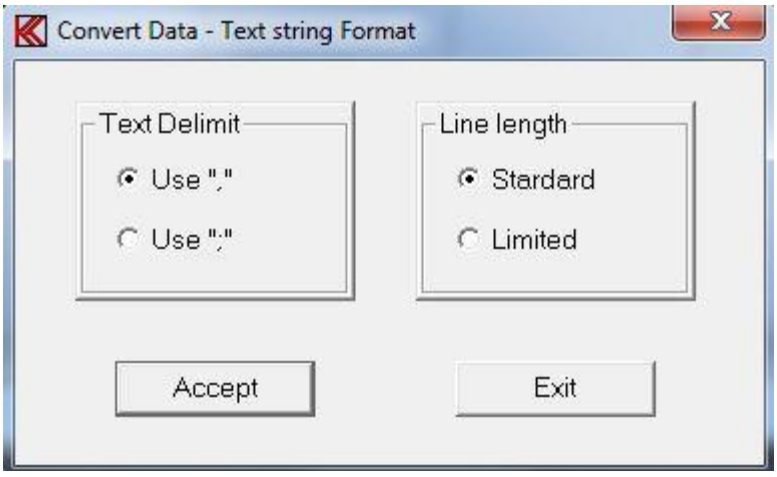
All

Select all reference types listed on the display to be converted.

When the desired action has been chosen a proper path for the output text file have to be selected.



In text files used for third party programs (as spreadsheet) a delimiter has to separate the data. Too long strings can cause problems in some programs. To solve such problems a selection of the maximum string length can be made.



Line length Standard

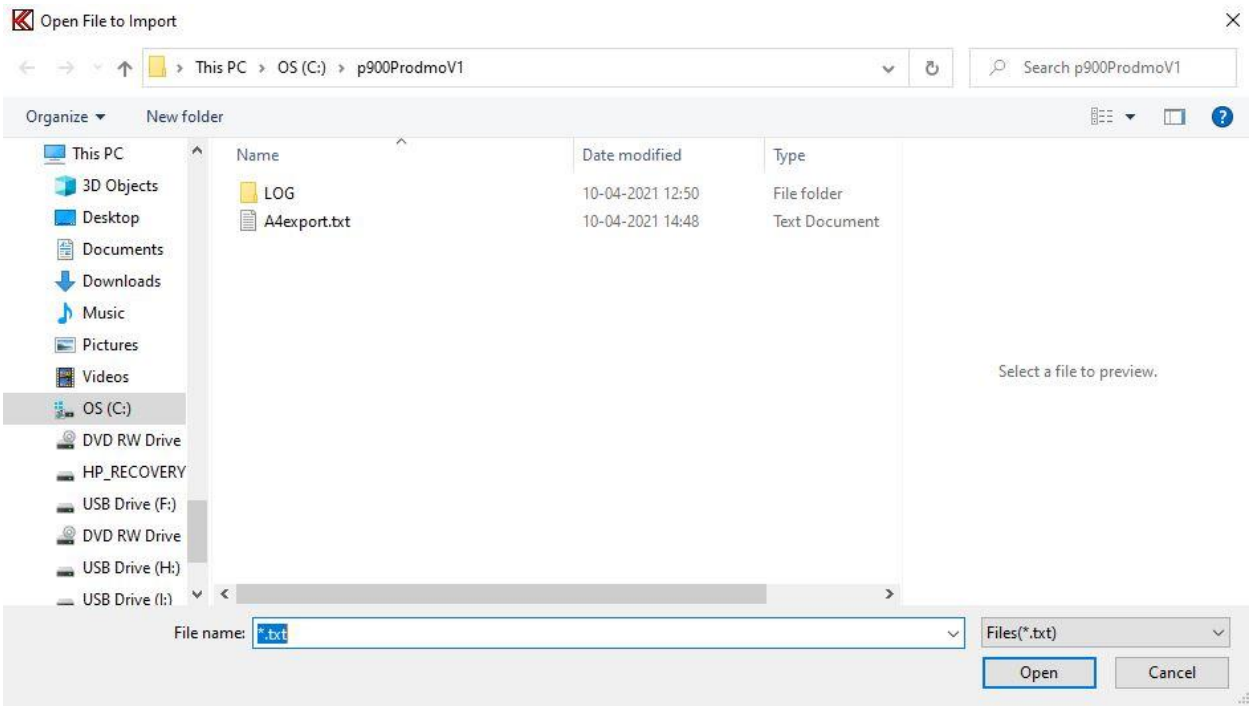
None of the strings are broken down into minor parts. A single string length for a reference curve can be up to 1775 characters long.

Line Length Limited

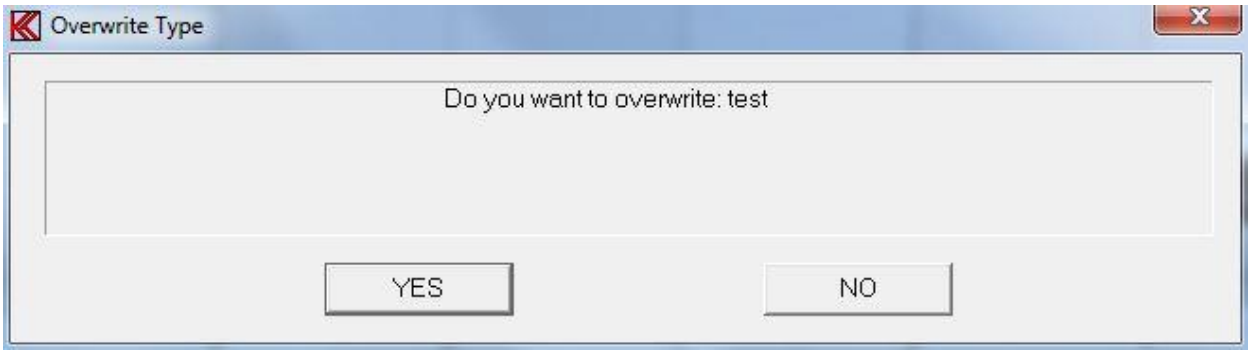
The maximum string length is 1/2 of the length used in the standard mode.

Import Reference Data

This function imports a setup from a text file format as generated by “export reference data” to TXT format. If changes in the file have to be made or lines have been added it is the user's responsibility to check that the changes do not cause the system to hang or terminate. However, if changes are done properly, with valid numbers and line format, it should work fine.
First the input file name has to be specified. Normally the input file name is the output file as exported - A4EXPORT.TXT.



If the imported file contains an already present type name for reference setup, the system asks to overwrite or not.



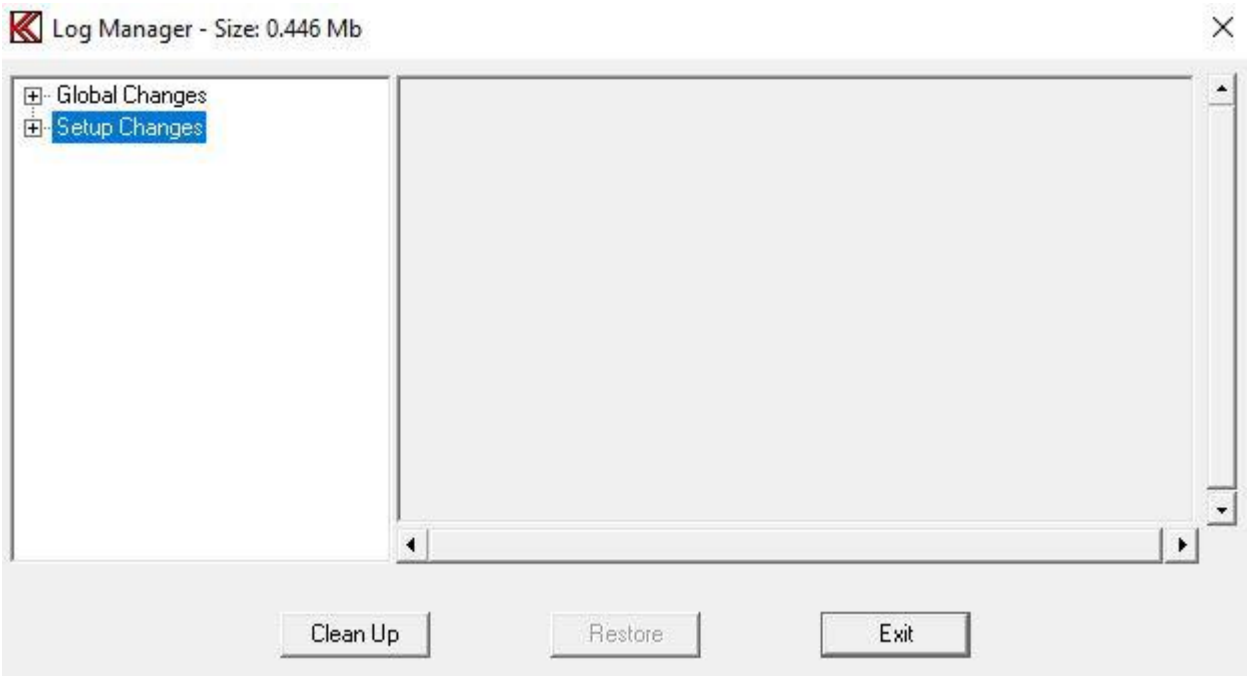
In case of a new type name, but not all parameters are specified, a question of filling in the remainder of the parameters by default values or not is asked by the system.

Log Manager

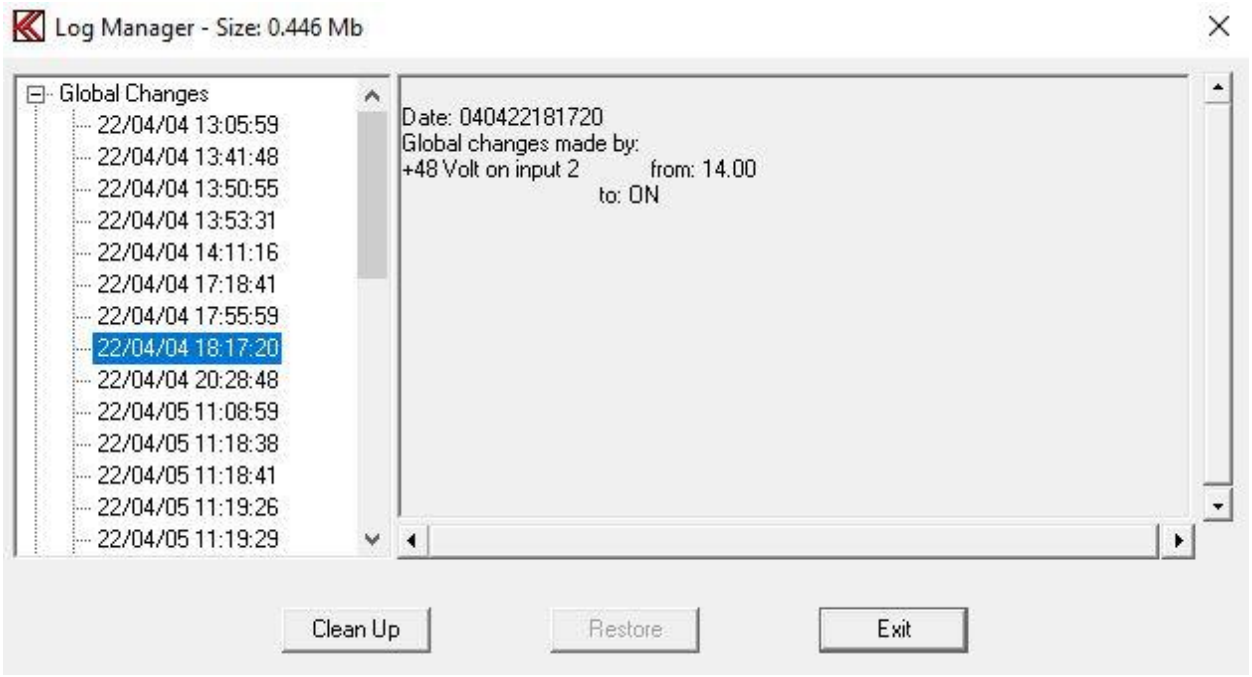
The Log Manager is a tool to list changes made in the Global Setup and Setup of Types.
Every time s Global Setup is save the program find out the changes made between the new and old setup. Only the changes are saved as plain text in a log file.

See more about this in the section “Log Utility”.

On the same way the changes between a setup of a “Type” are saved in the log file as plain text. If changes are made in your reference curves a backup of the old setup with curves are stored in a log database. The “Type name” of this backup is a time stamp at present time the backups are made. This to ensure not two backups have same type name.

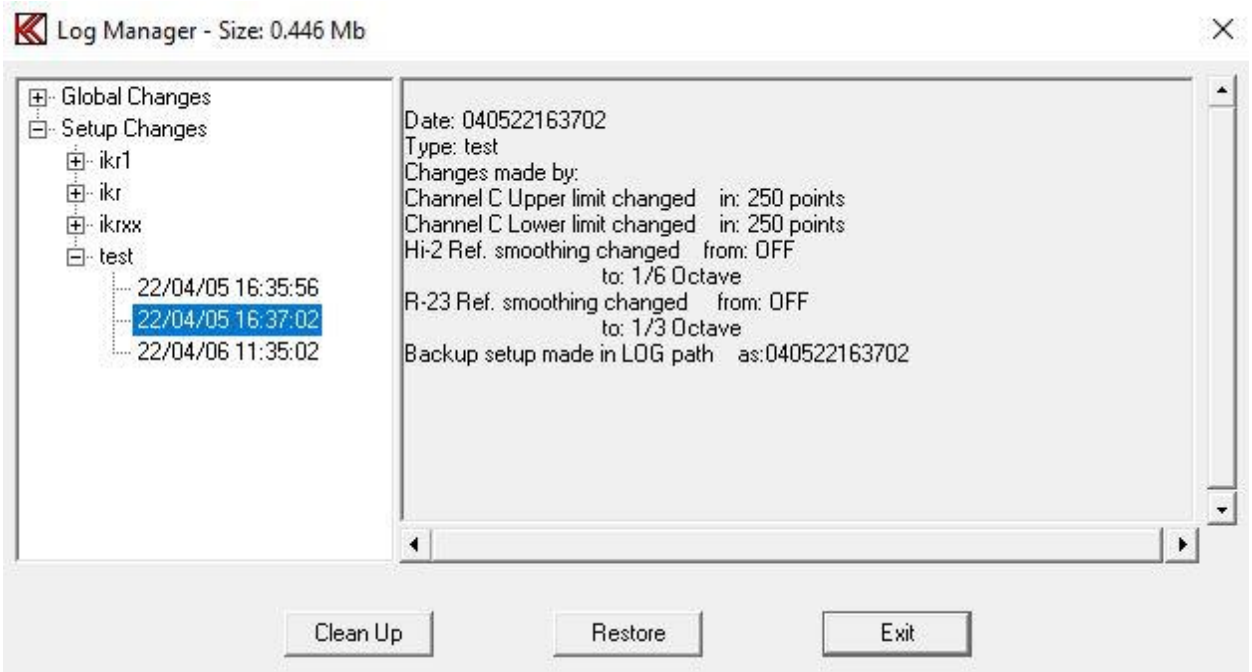


The left side of the Log Manager is a selection tree to enable a list of a change in “Global Changes” or the “Setup Changes”.



The lists of “Global Changes” are sorted on the saved time stamp as year, month, date, hour, minute and second.

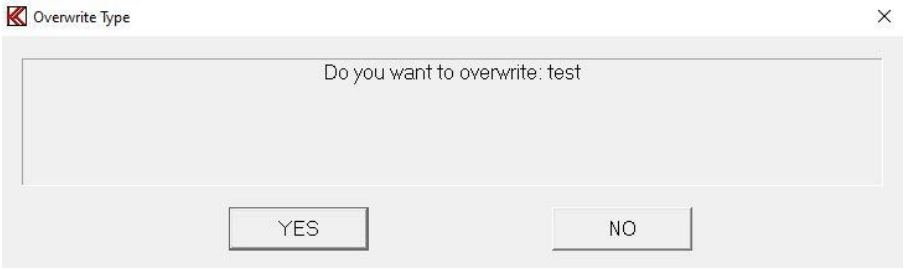
The lists of “Setup Changes” are sorted in types and then on date.



When as picture above a backup was made for Ch C. The restore function will be active.
As this example the Type “test” have been changed 4 April 2021 at time 11:43 and saved as “040721143127”.

Restore

To restore a setup simply use the restore function when enabled. If the Type is present in your current setup you have to confirm to overwrite type if desired.



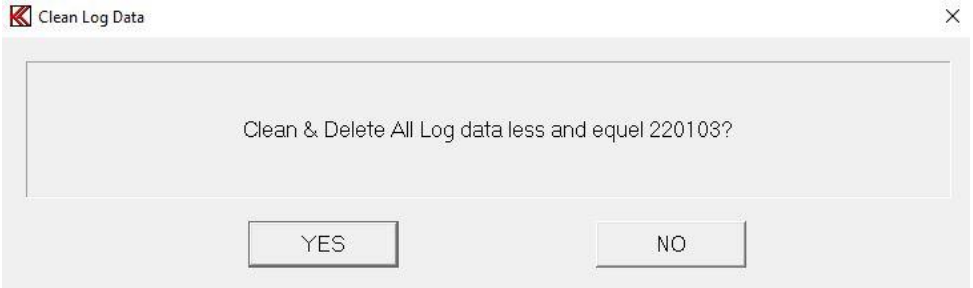
Current setup will then be saved in the log backup database to ensure it is possible to restore last action.

Clean Up

With this Clean Up function, all saved data in the Log database will be removed up to and including the selected date code.



In this case all saved data including and before the date of 10 November 2004 will be removed from the log database.



Finally to remove the saved data it must be confirmed with a yes.

Appendix A

Keyboard layout

"Edit Mode"

Following commands are allowed in "Edit Mode":

←, →, ↑, ↓, 0, Page Up, Page Down, +, 4, 6, 8, 9, 3, 5, C, S, T, P, R, G, W, CTL:←, → , Page Down, End, Home

C, S, T, R, and G are submenus:

C	Curve Convert menu.
S	Scale Window menu.
T	Tolerance Curve menu.
R	Resonance Test menu.
G	Display Gain menu.
W	Polarity Window menu.

P is utility functions:

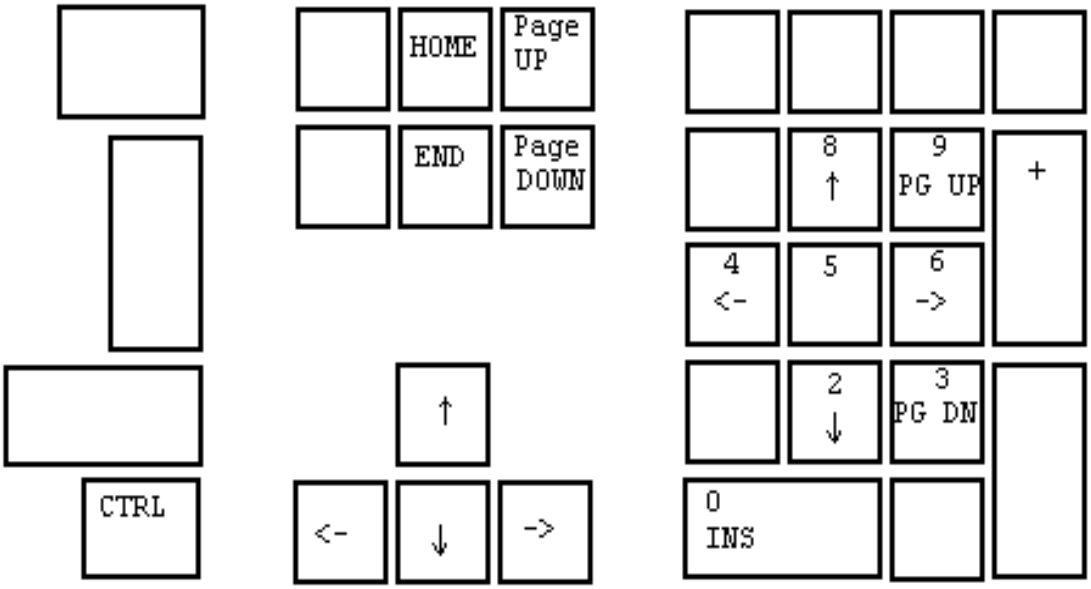
P	Set power on output at cursor selected frequency.

←, → , ↑ , ↓ , 0, PgU, PgD, + are cursor, select and display functions:

←	Move cursor left.
→	Move cursor right.
↑	Select next curve, up.
↓	Select next curve, down.
0	Enable/disable fast cursor.
Page Up	Enlarge selected channel, Page Up.
Page Down	View all channels, Page Down.
+	Select next channel as active channel.

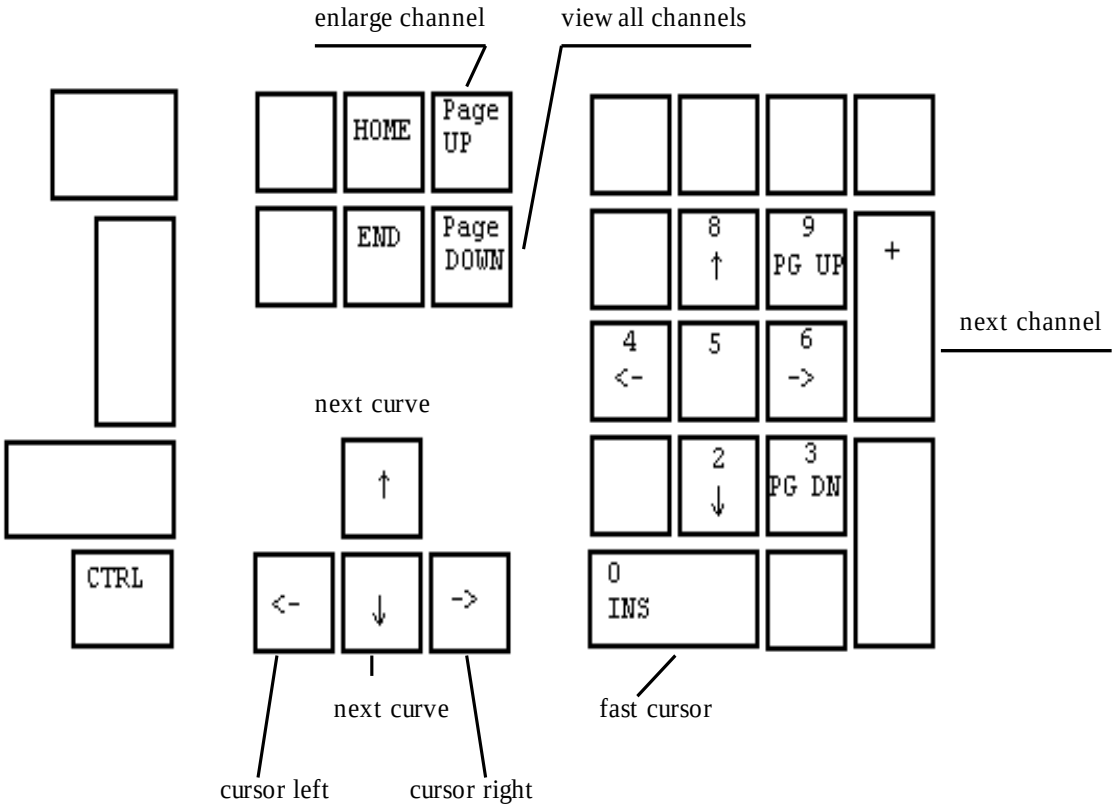
4, 6, 8, 2, 9, 3, 5, Ctl ←, Ctl → , Ctl Page Down , Ctl End, Ctl Home are write curve and pixel functions.

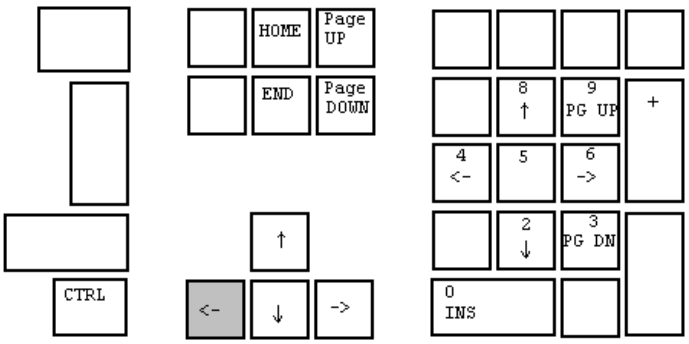
4	Write pixel’s to left.
6	Write pixel’s to right.
8	Write pixel’s up.
2	Write pixel’s down.
9	Move & write whole curve pixel’s up.
3	Move & write whole curve pixel’s down.
5	Write a straight line between two points.
Ctl ←	Write curve left, keep envelope.
Ctl →	Write curve right, keep envelope.
Ctl Page Down	Set lower limit to zero on selected channel.
Ctl End	Reset selected channel.
Ctl Home	Set limits to half scale at 40 dB down top of screen.



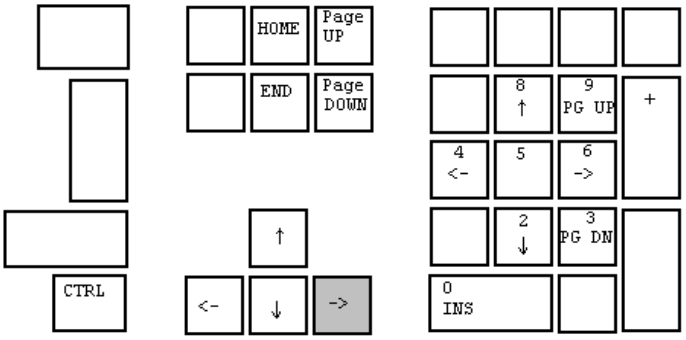
Common edit and write keyboard layout

Cursor, Select & Display Functions

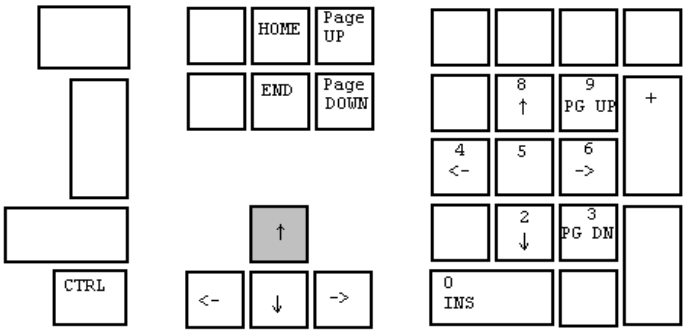




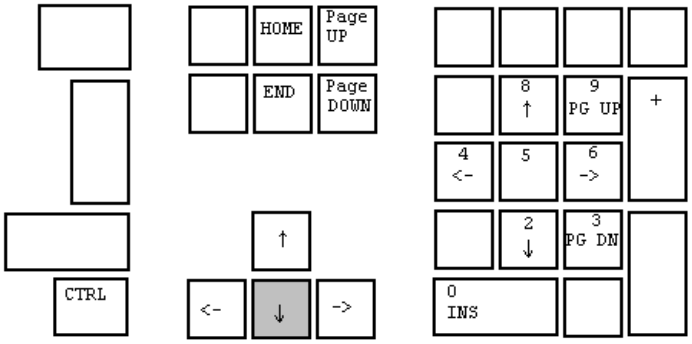
Move cursor left



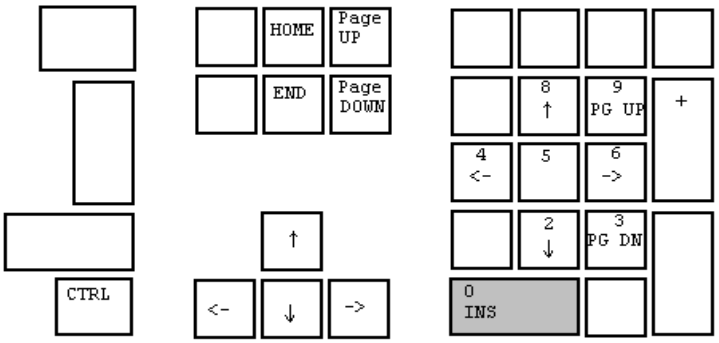
Move cursor right



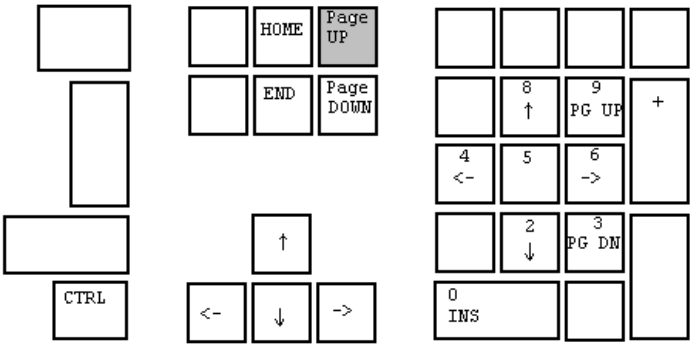
Select next curve, step up



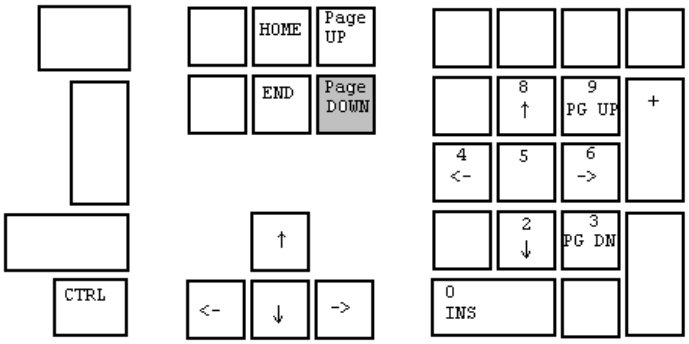
Select next curve, step down



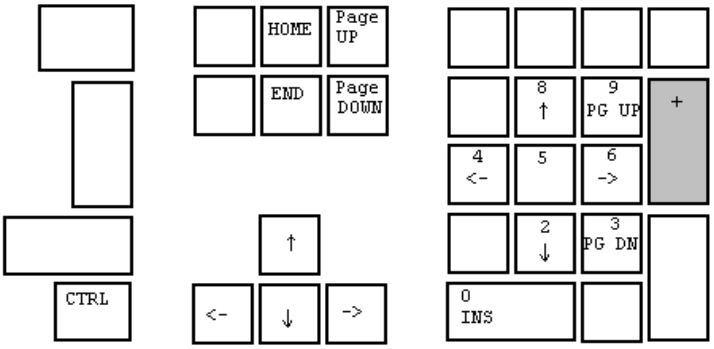
Enable / disable fast cursor



Enlarge selected channel, Page Up

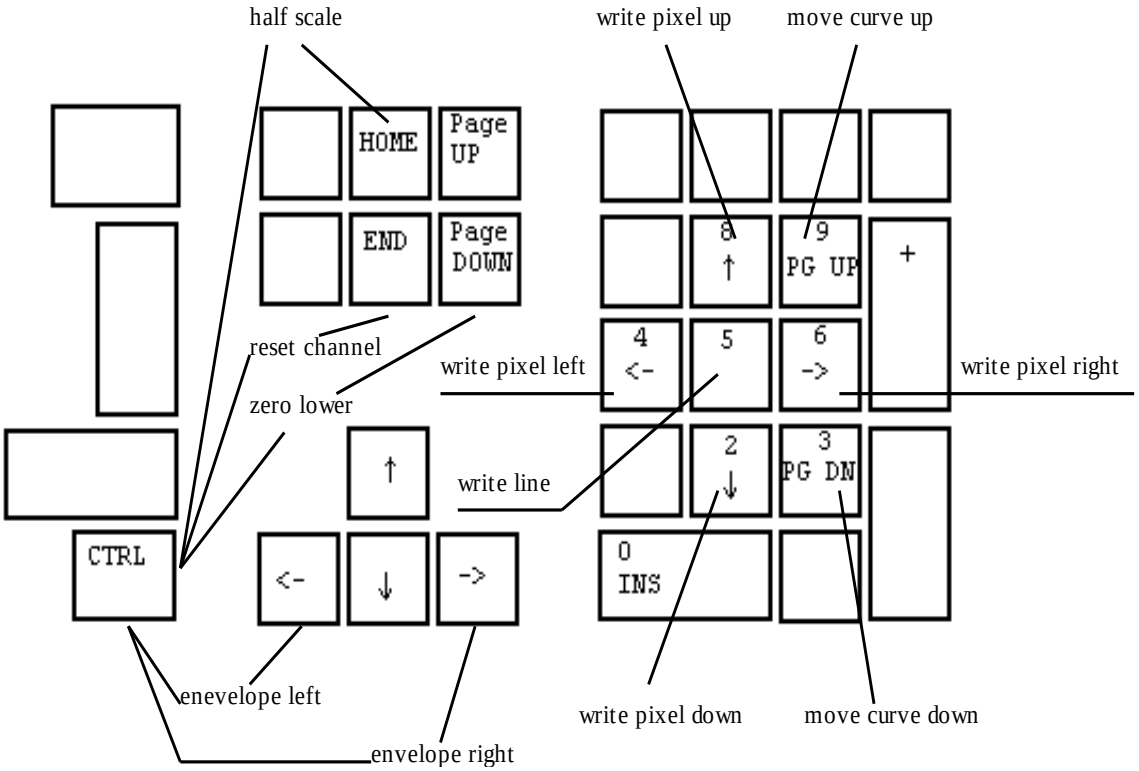


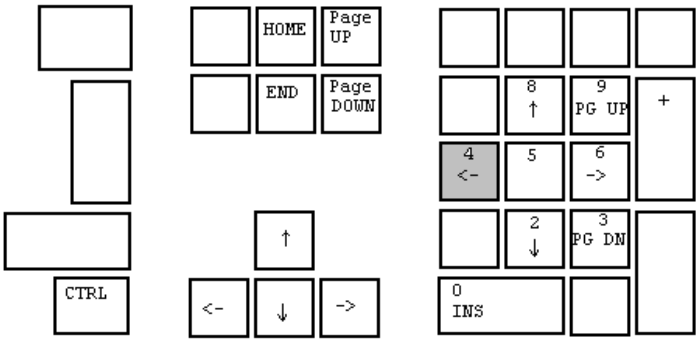
View all channels, Page Down



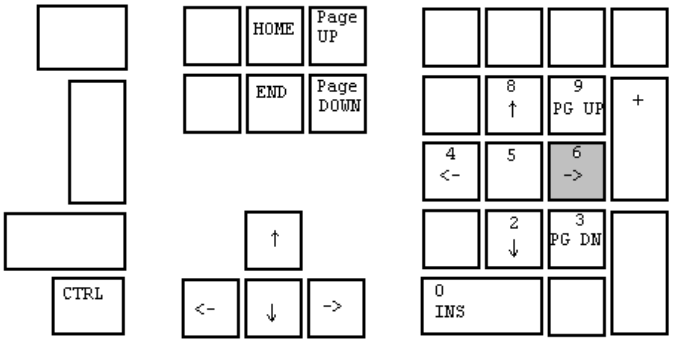
Select next channel as active channel

Write curve and pixel functions

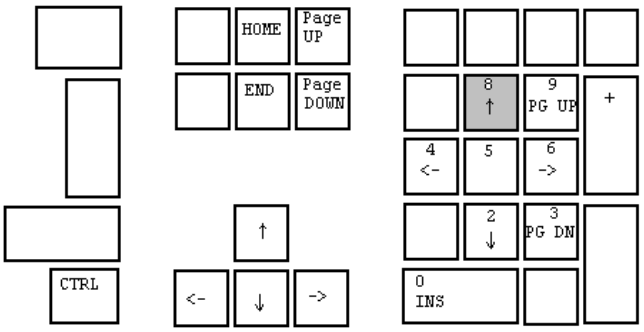




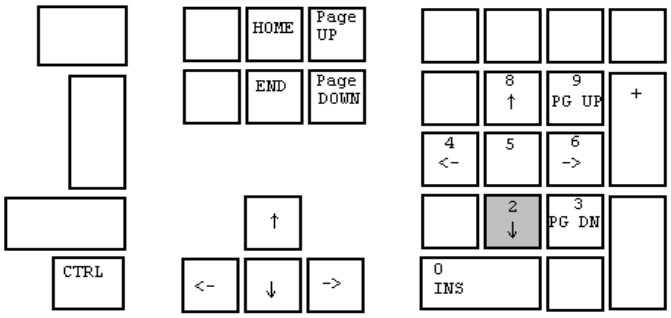
Write pixel’s left



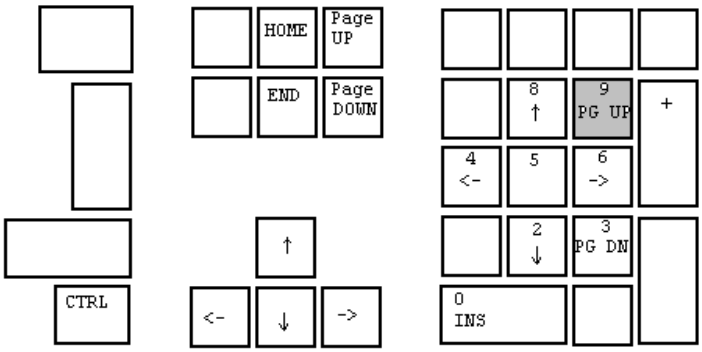
Write pixel’s right



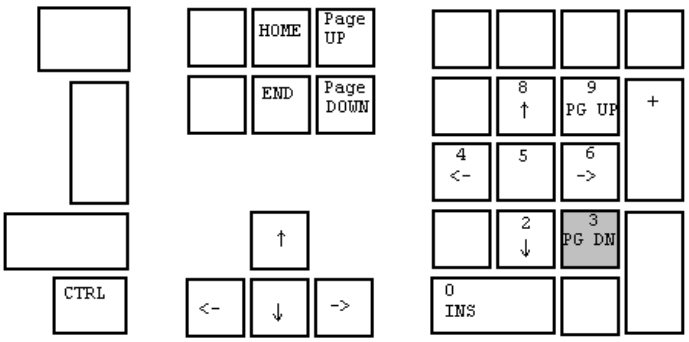
Write pixel’s up



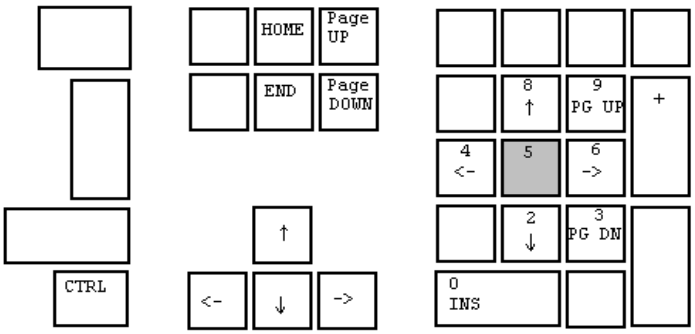
Write pixel’s down



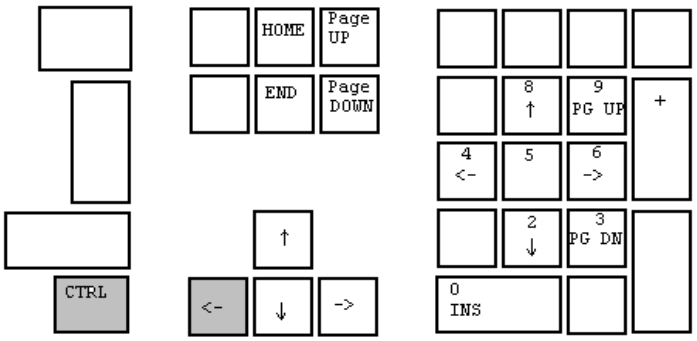
Move & write whole curve pixel’s up



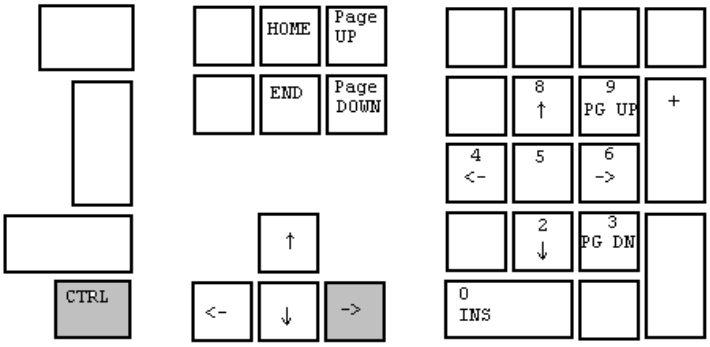
Move & write whole curve pixel’s down



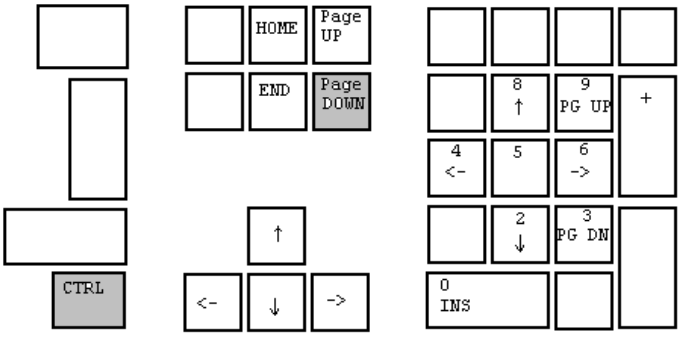
Write a straight line between two points



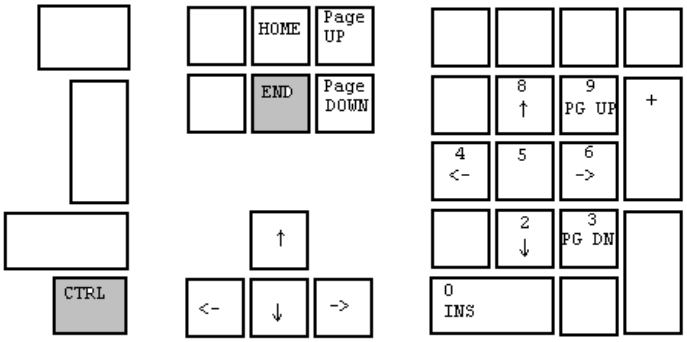
Write curve left and keep envelope



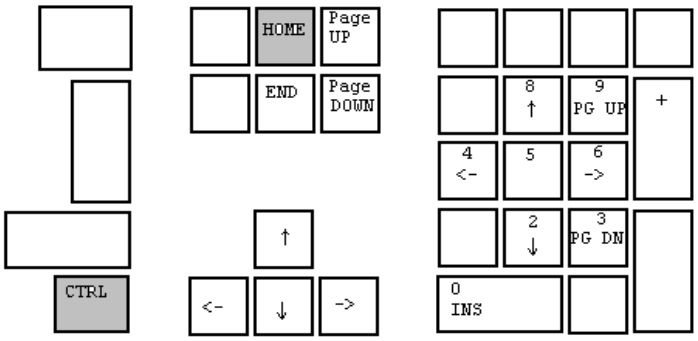
Write curve right and keep envelope



Set lower limit to zero on selected channel

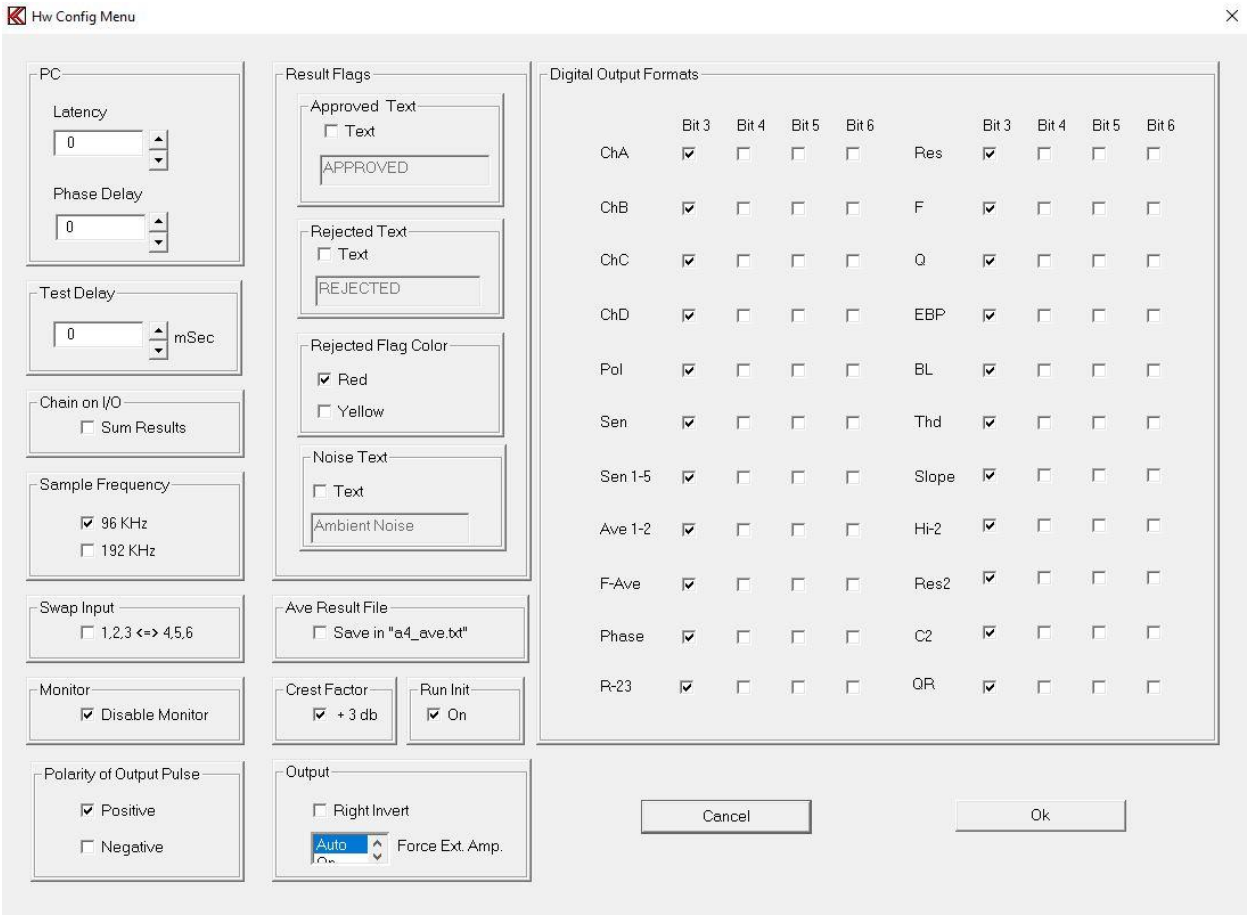


Reset selected channel



Set limits to half scale, 40 dB from top

Appendix B



PC

Some timing within the pc programs and hardware can here be adjusted.

Latency

The latency is the signal delay between the streamer output and input. There is a small delay between output and to the signal is collected. This delay is as default compensated in the program. However depending of PC it is possible to change this latency delay. The delay is in samples with reference to selected sample frequency.

Phase Delay

In the phase test a delay is needed to compensate between sound source and microphone. This is done in the setup of phase test. To correlate this distance to a delay in mSec a default delay is necessary. This delay is set here.

Test Delay

When the program is ordered to execute a test the program will do this as fast as possible. In some case a delay between the start signal and test sequence are executed necessary. The delay is entered here in mSec. Do not confuse this with delay in the setup. The setup delay is the delay from the sweep start with a signal on output to sweep makes the sweep.

Chain on I/O
If a test sequence makes use of a chain the result and test begin and end signal on the I/O port are activated for each sweep. To avoid this and force the test end signal on I/O port after the complete sequence is completed mark the Sum Results.

Sample frequency
The sample frequency is selected here. Possible frequencies are 96000 and 192000 Hz.

Swap Input
Swap input swap input 1 -> 4 & 2 -> 5 & 3 -> 6.
This is usefully and more easily if data from Test systems as P500, P600 and P750 are imported or exported without to have to reallocate the input number.

Monitor
If “Disable Monitor” flag is set the monitor function in setup menus are disabled. Instead for a monitor signal on monitor output jack a line signal from generator is gated to this output.

Crest Factor
If +3 db is enabled the gain for the preamplifiers are reduced by 3 db to give higher crest factor. This give only a benefit if the measured data is close to top of screen (max level before converted in the ad converter). If the crest factor is to low the measured signal can generate an internal distortion. This only seen if measured signal are higher than -3 db from top of screen.
If +3 db is disabled give higher dynamic range at +3 db (a lower noise floor).

Run Init
Normally when entered the run menu first time all setup parameters of the internal electronics are preloaded. If Run Init flag is set on this setup are done every time before a run test are done.

Polarity of Output Pulse
It is possible to invert the output pulse used for polarity test. As standard the polarity is positive. To enable the Negative flag have the same result as swap the output cables.

Output (only ++ version)

Right Invert
It is possible to invert the output pulse used for polarity test. As standard the polarity is positive. To enable the Negative flag have the same result as swap the output cables.

Force Ext. Amp.
If extern amplifier is used the output channel B is used for External amplifier setup.
P900 detect if a jack plug is mounted on the rear input. This enables the extern setup and enables jack input on the rear of P900 for impedance measurement.
Force extern amplifier in:
Auto mode - P900 program detect the Input jack plug.
On mode – Act as Input jack plug is mounted.
Off mode – Act as no input jack plug is mounted.

Result Flags
In Run-mode the main test result are displayed as APPROVED or REJECTED.

It is possible to change the standard text to a user defined one. This is useful to add a text in another langue.
As standard an approved text background is green and a rejected text background is red.
With the Reject Flag Color the rejected background color can be changed to yellow.

Noise Text

As similar way as the Flag Flags the text for Ambient Noise Check flag text can be changed to a user defined text.

Ave Result File

If frequency average test is activated it is possible to save the average result and group in a text file with a default name “A4_ave.txt”. The results are appended to the end of file. The users are responsible to check the file not growth to big and slow the system as result.

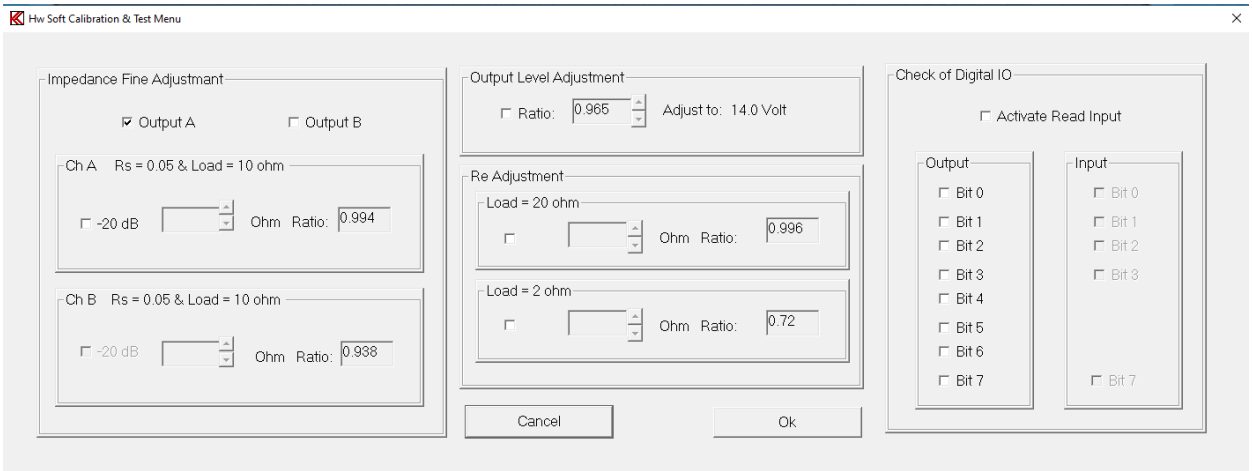
Digital Output Formats

The test results are gated to I/O port bit 3 to 6.
It is possible to allocate test result to each of those ports in this table.

Appendix C

Hardware Soft Calibration & Test Menu

P900 hardware is calibrated from factory when you receive the equipment.
To keep the equipment within spec it is necessary to check and re calibrate over time.



Output Level Adjustment

The output level on selected power amplifier in hardware configuration menu is adjusted here. Output A or Output B can be used. When selected a 1 KHz sine is set on the output at max level. Measure the output with a calibrated voltmeter and if necessary file adjust the level with the slider.

Impedance Fine Adjustment

When output is adjusted continue with this adjustment.
This is the adjustment there change most over time. Both adjustments for output A and output B must be fulfilled.

a) Start to add a calibrated 10.0-ohm resistor on output A.
b) Calibrate value to 10.0 ohm with the slider at -20 dB level.

Repeat the same adjustment for output B.

Re Adjustment

After adjustment of impedance fine adjustment you can continue with Re adjustment.

Add a load of 20 ohm on output and adjust with slider to value closest to 20 ohm.
Do the same with a load of 2.0 ohm. This adjusts offset errors.

Check of Digital I/O

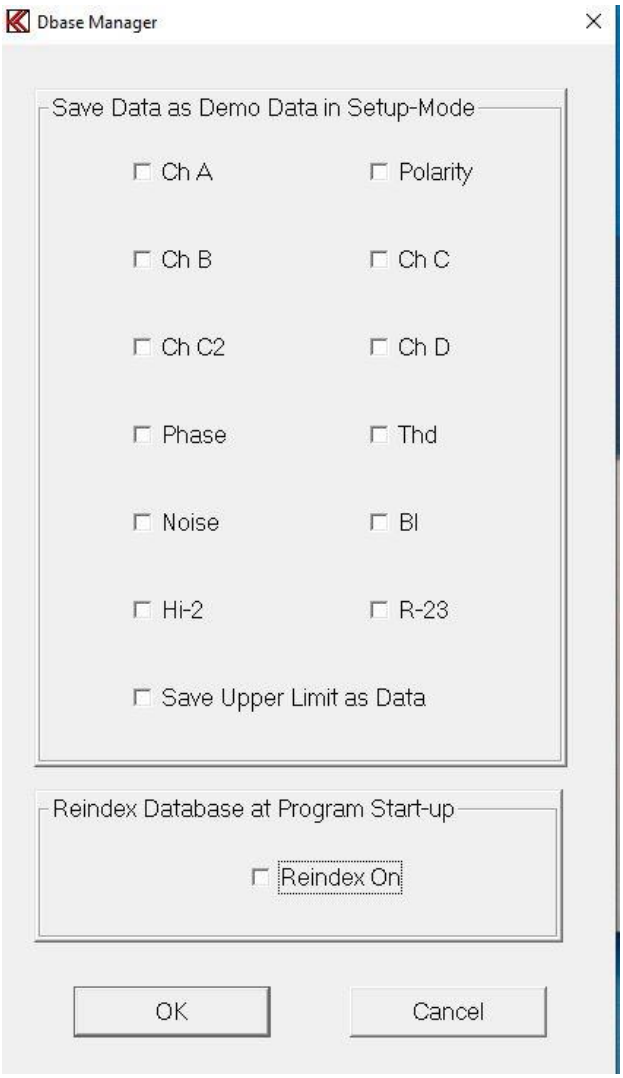
Output

In this menu it is possible to force the digital output bit 0 to 7 on / off.

Input
In this menu it is possible to read 0 to 3.
To activate the read function Activate read Input must be checked.
Input bit 7 check that there is mounted a jack plug to use for external sense resistor for Ch B.

Appendix D

Re-index database & simulated data for P900



Re-index

Following menu can be activated only from the main menu. ”Ctl D” activates this menu.
To enable re-indexing of the selected P900 database mark the Reindex On. Then first time Run, or Setup menu are activated the P630 database are re-indexed. Only the database files selected in Global setup in Reference Path are re-indexed. The re-index flag are always off when the P900 program is entered.

Save Data

When working in “Setup-mode” it is possible to save the last measurement to the curve database. To do this flag the actual channel or test data there can be saved. This saved data will then replace the simulated data in the offline version of P900.
The procedure to save and replace the simulated data is as following:

1. Open Global Setup and set the Reference Path to the location of the off-line data base setup.
2. In the main start page select the menu by “Ctl D”.
3. Enter the Setup-menu with the wanted Type of setup.
4. If an Upper limit is needed to save as data flag the Save Upper Limit as Data.
   Polarity and Hi-2 can only save as data and not upper limit as data.
5. Make a measurement.
6. Quit by saving as reference.

Appendix E

How to make tolerance limits.

When testing loudspeakers you need to know what you are testing against.
Normally you test against some reference parameters.
The concept used for all models produced by K & K International the references tested against is upper (maximal) and lower (minimal) limits or upper limits only.
On the following descriptions are explained how to make those limits.

a) Make references with a known golden unit.
b) Make references with some known good units.
c) Make references with many units and select manual statistical data to make limits.
d) Make references with many units and auto select statistical data to make limits.
e) Ai-mode to auto learns and modifies references on the fly in run-mode.

The following examples show the differences between the different ways to make limits and not how to setup the different tests. It is recommending look in the user manual for actual test system.

Make References with a known golden unit.

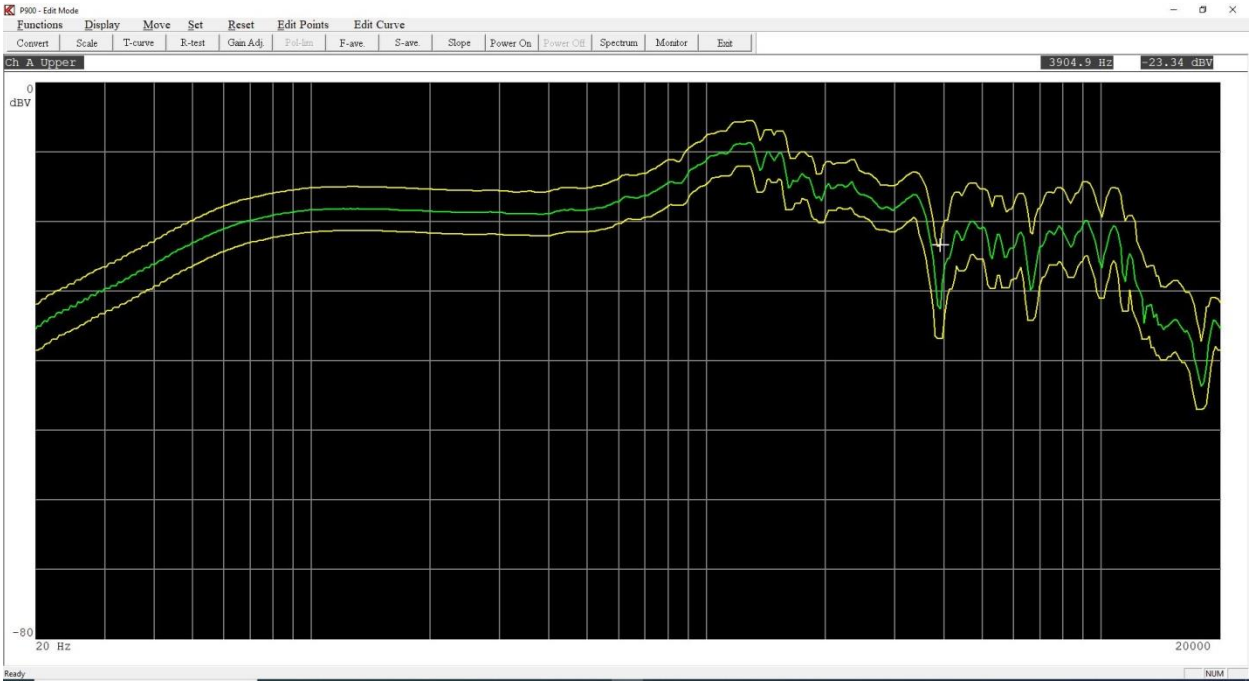
To make test limits with a well-known good speaker, a golden unit it is very easy and simple. After the desired test parameters are selected as start and end frequency, output voltage, test time, input channels and gain and setup of filters if need a measurement is done.
Include all data and then edit the limits.



In the following example only frequency curve limits are used. The limits are moved +/-3.1db. Normally higher tolerances are given at the lower and higher frequency due to wider deviations.
Benefit: Very simple to make.
Disadvantage: No guarantee that the golden unit is representative for a wider number of units.
Test for units: Few number of units.
References: One.

Make references with some known good units.

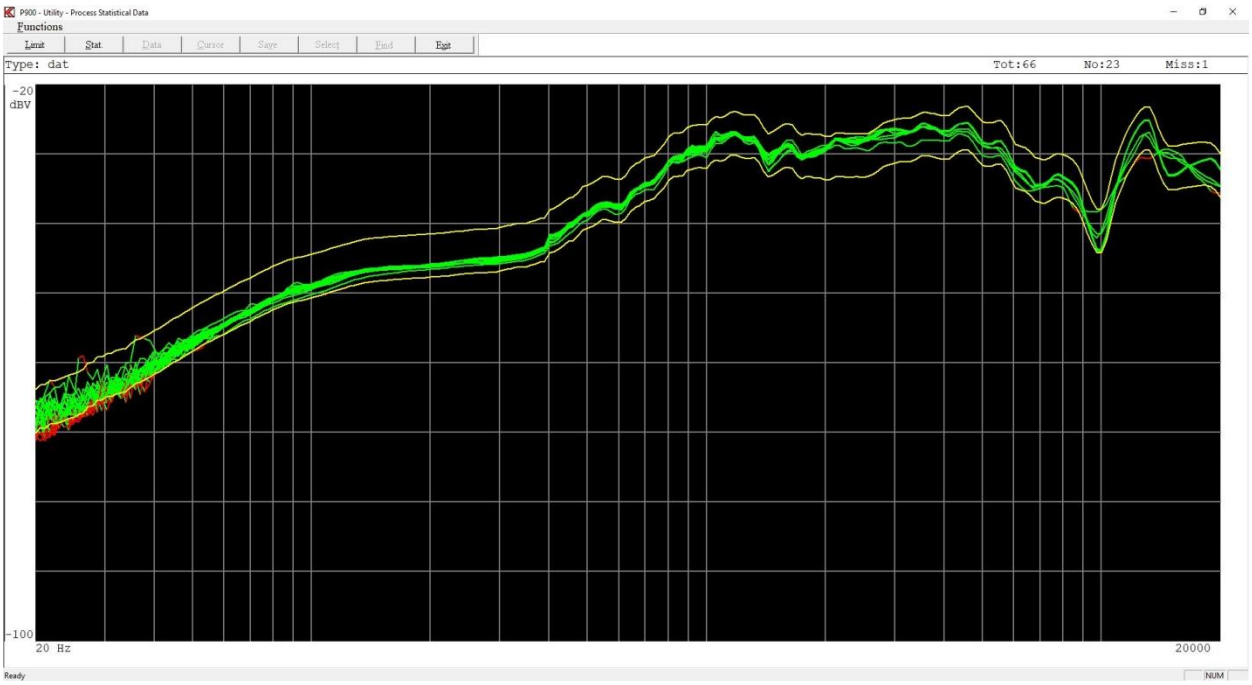
To make test limits with some well-known good speakers.
After the desired test parameters are selected as start and end frequency, output voltage, test time, input channels and gain and setup of filters if need a measurement is done.
Include all data and then edit the limits. Repeat this with a number of good units.
Every time an “include” is done the upper and lower limits are grown if the measured data are outside the present limits before an “include”. On this way the limits give a better tolerance for a wider population of number of tested units.



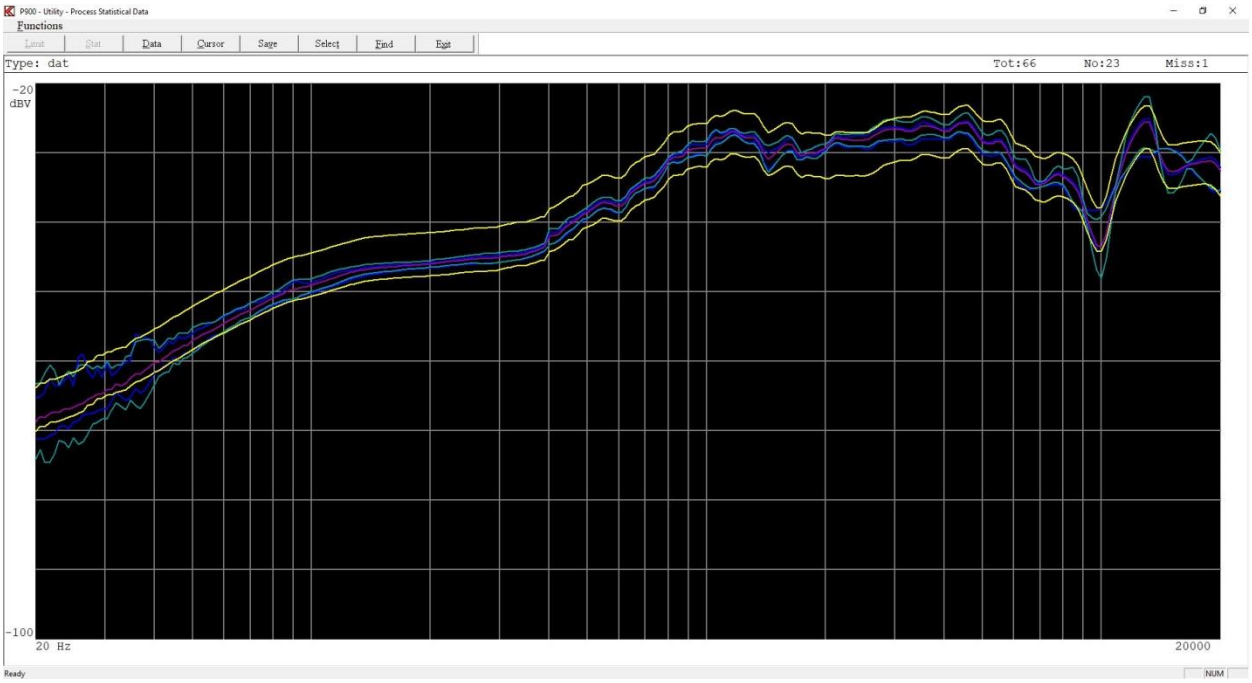
In the following example only frequency curve limits are used. The limits are moved +/-2 db.
Here are used 10 good units. The difference from only use 1 unit and now using 10 units see in this case at frequency higher than 4000 Hz.
Benefit: Very simple to make. Give a better representation for a number of units.
Disadvantage: No guarantee that the good units give representation for a large number of units.
Test for units: A wider number of units.
References: Few units as 5 to 25 good units.

Make references with many units and select manual statistical data to make limits.

A better way to make test limits is to collect a number of stored measured data for analyze.
To this make a complete setup for a wanted speaker. When a setup is complete and all test parameters are done you are ready to run test in run-mode. You have made test limits as described above.
Now collect all measured data both approved and rejected to a4mstat.dat file (default name). To do this enables the function in global-setup. When serval measurements are done and data is collected and stored use the utility function “Process Statistical Data”.



In this example above show only the frequency curve data processed in manual mode. Number of collected measurement is in this case 23 out of 66 measurements. This show that the current limits could be fitted better to the measured data.



The same data is now processed. Displayed are the upper and lower limits, the average of collected and selected data and in this case +/- 3 Standard diversions (sigma). With benefit the upper and lower limits could be modified. I would use +/- 3 sigma and add a limit example +/- 1 db to this.

Benefit: Give a good representation for a many number of units.

Disadvantage: No guarantee that this gives representation a large number of units in different batch.

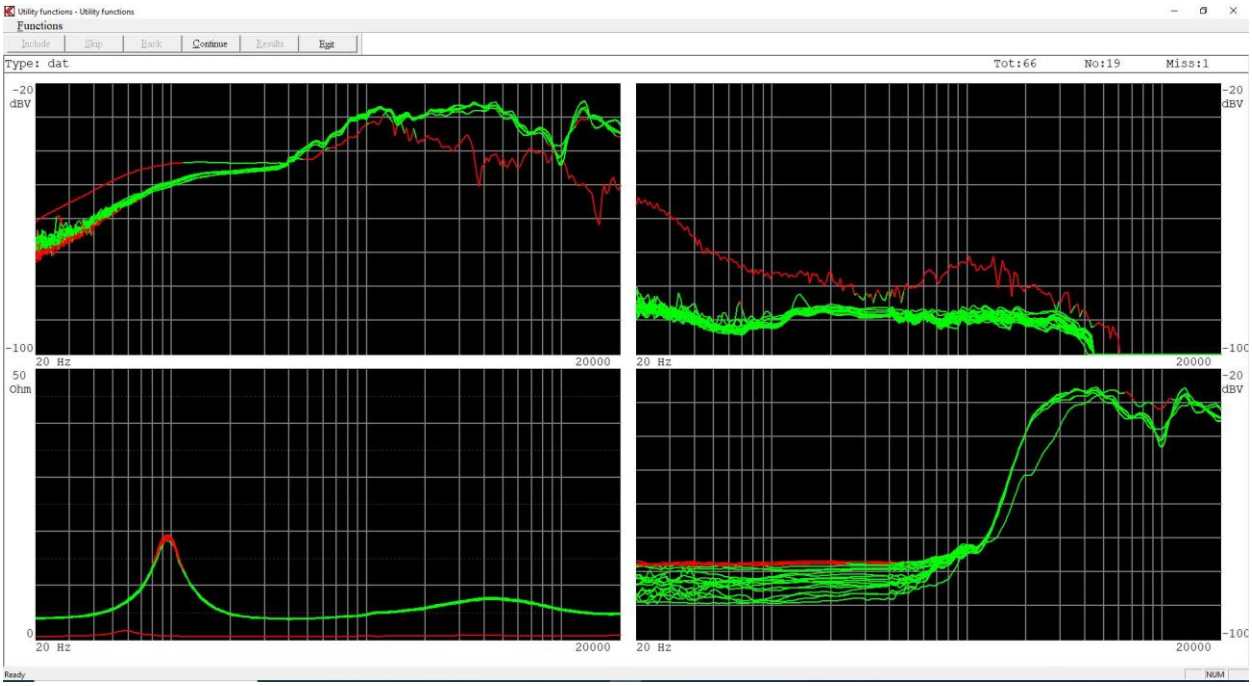
It takes time to manual process the collected data.

Test for units: A wide number of units.

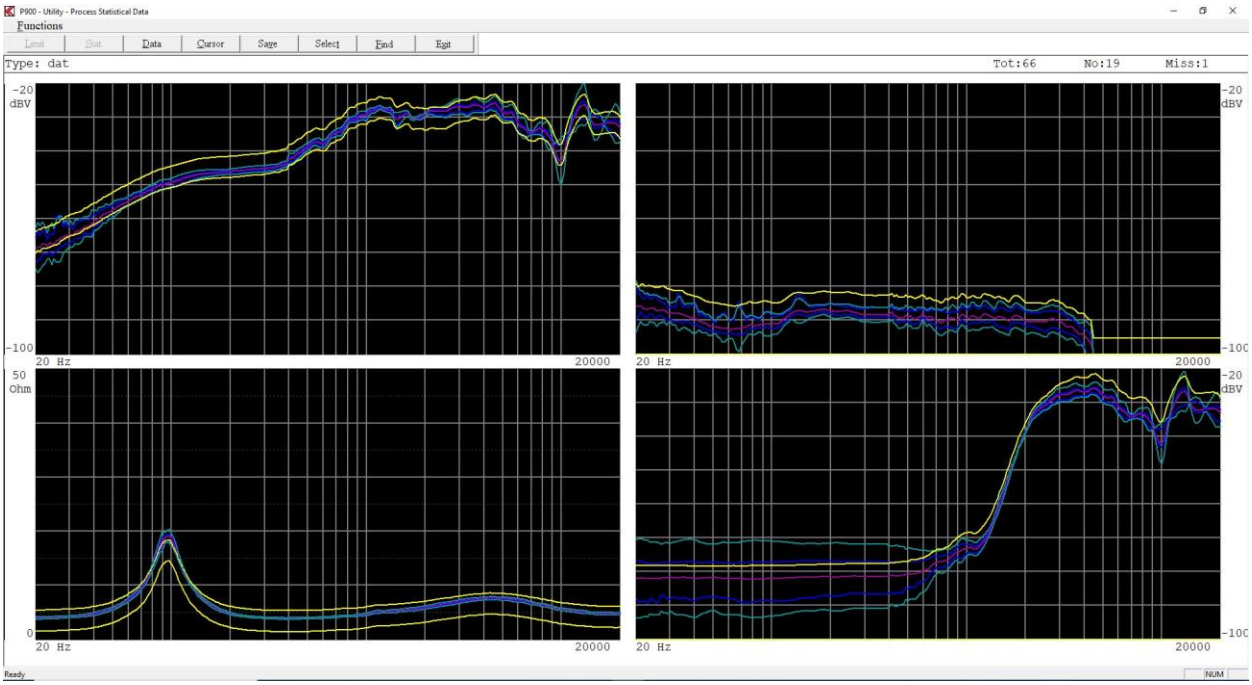
References: Units as 25 to 100 of accepted good units.

Make references with many units and auto select statistical data to make limits.

As to “Process Statistical Data” in manual mode the data can be processed on auto mode. The auto mode is a “pseudo learning mode” where a large number of data can be processed. This mode a suppress function is very powerfully. To get a more correct population of data as both rejected and approved data however not direct very bad measurements this suppress function are used. Simply it take the current limits and add a new limit (the suppress values) to data before the processing are excluded in the collecting of data.



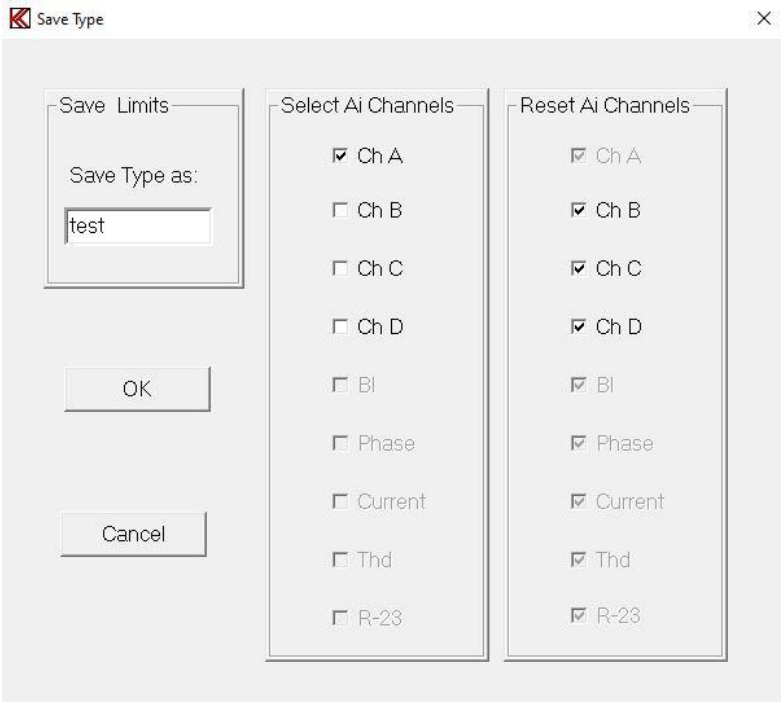
In this example a suppress function is used for all 4 channels. There are collected 19 measurements of 66 stored measurements.



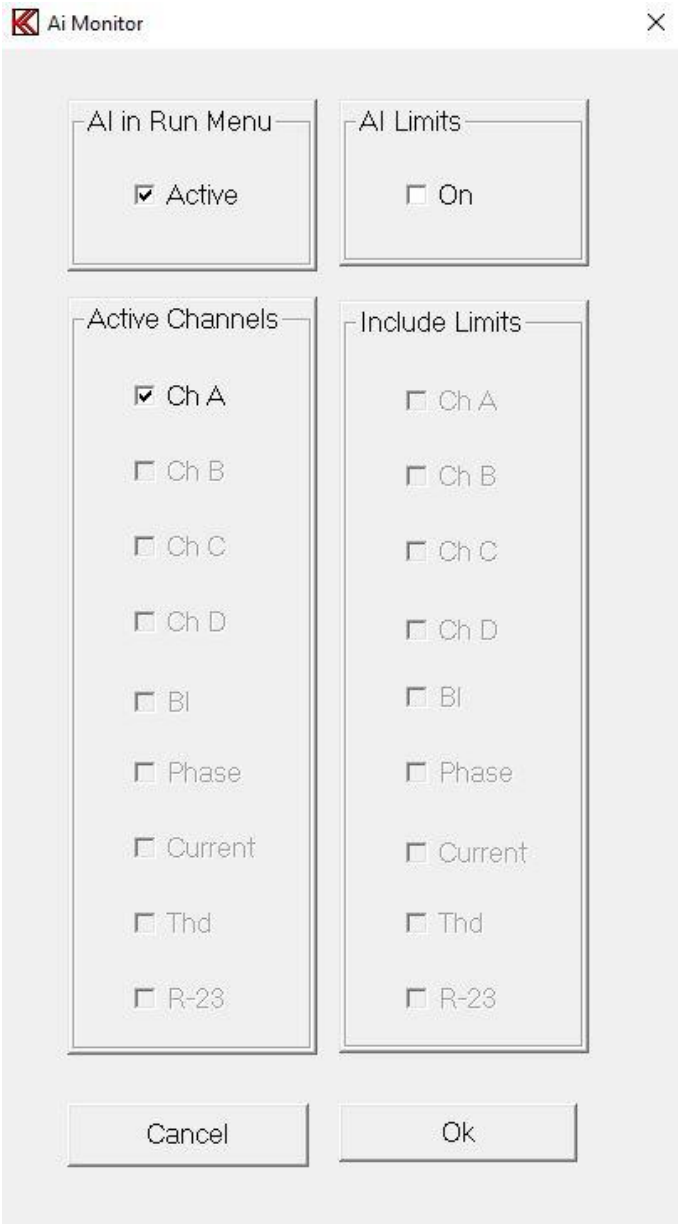
The data is now processed for all channels. Improvements of limits are recommended for all channels.
The stored data used are the same used in manual and auto mode.
Benefit: Fast to use. Give a good representation for a large number of units.
Disadvantage: No guarantee that this gives representation a large number of units in different batch unless data are collected from different batch.
Test for units: A large number of units.
References: Units as 25 and > 10000 of accepted units.

Ai-mode to auto learns and modifies references on the fly in run-mode.

A step further can the system auto learn the entire population of measured data on the fly. First accepted measurement higher than 50 units must be processed by the utility “Process Statistical Data”. Typical this is done in the auto-mode. In Ai-mode the system learns for every measurement in run-mode where the averages of the population have to be placed. The upper and lower limits are them auto moved under the auto learning, however not the gap between upper and lower limits. Then saving the processed limits you got following.



In this case all tests were processed, due to highlighted under Reset Ai Channels. We do only want to select Channel A. The selected Ai channels are prepared to use / select for later auto learning.
Before the auto learning can be activated the references for the selected channels must be selected as above. When this is done the channels must be selected in edit-mode the Ai-mode activated. It is allowed to select all channels as picture above and later only select one of them in edit-mode. If the channels are not selected when save data in utility the reference in Ai-mode are missing.



Now next time a measurement is made in run-mode the auto learning is done. If auto learning is not wanted click the Ai in Run mode off. It is possible to see the difference of the references in auto learning and the reference mode before learning in the edit-mode.
The save measured data set in global setup can be OFF or ON this do not interfere the learning mode.
Benefit: Fast to use. Give a good representation for very large number of units.
Disadvantage: The auto-learn function do move limits by machine learning. It is needed to check that the machine take over test result by mistake (run away case).
Test for units: A very large number of units.
References: Minimum units as 50 and up.

Appendix F

Test sequence

The standard test sequence is showed in figure 1.

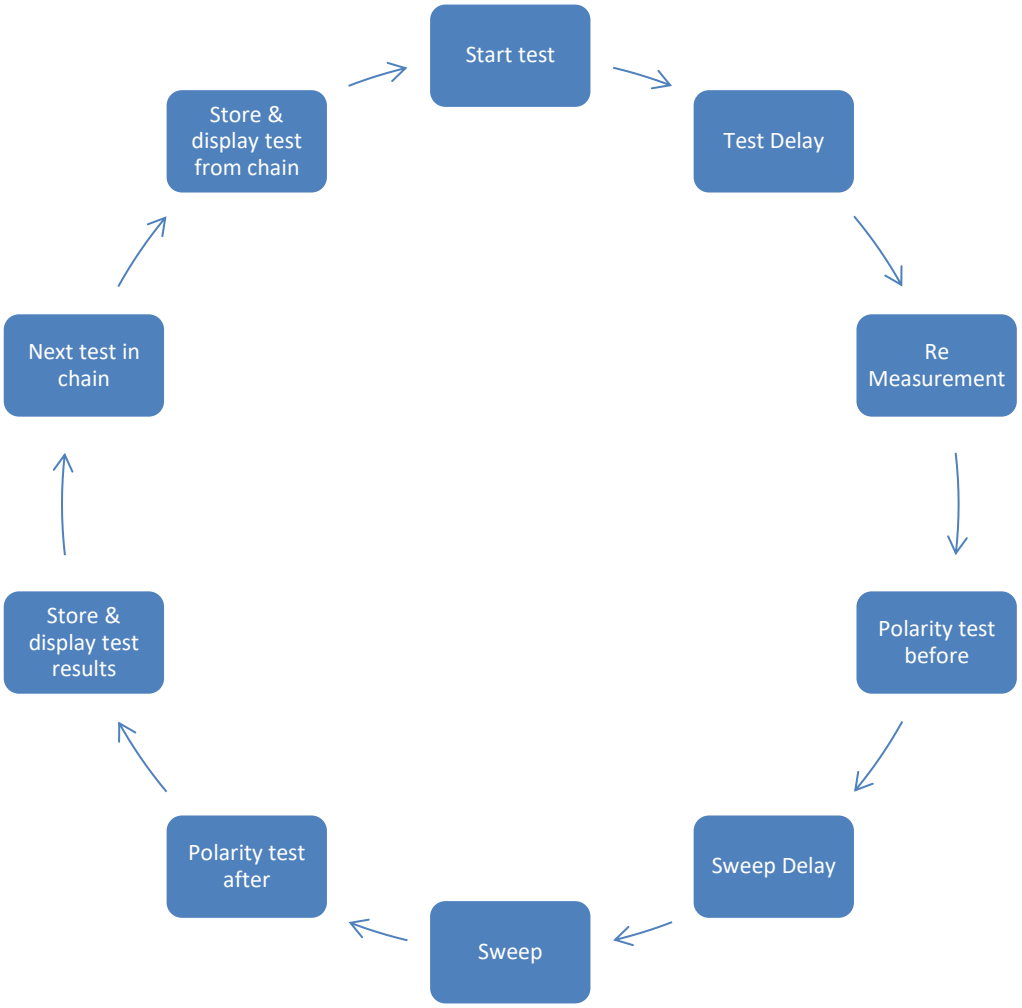


Figure 1: Test sequence

Start test

When a start signal is received from keyboard or external a control system via an i/o signal the test sequence is started.

Test Delay

With a test delay it is possible to delay the complete test sequence when a start test signal is received. This enables external devices to be setup before the test begins.
The test delay is set in the Hardware Config menu. Valid values are 0 to 3000 mSec.

Re Measurement

If activated the Re is measured.
The measurement is activated in setup under R-Test in the sub-menu Q-Set.

Polarity test - before

If activated the polarity test is processed.
The polarity test is set on in setup menu and the after flag must be off. The times for a polarity test are between 3 to 50 mSec.

Sweep Delay

The sweep delay makes a delay when the sweep begins. Under the delay signal is present on output with the frequency at the start frequency of the sweep. The delay is set in setup under sweep.
The delay can be between 0 – 9999 mSec.

Sweep

The sweep is done as setup under sweep. Parameters to set are:
Start frequency
Stop frequency
Number of test / measuring points
Sweep time
Sweep forward / reverse
Normal sweep / slow

Polarity test – after.

If activated the polarity test is processed.
The polarity test is set on in setup menu and the after flag must be on. The times for a polarity test are between 3 to 50 mSec.

Store & display results

The test data and results are stored if activated and the test results are displayed.
If enabled the result is and test is gated to i/o ports.

Next test in chain

If a chain test is activated test in the chain is activated.

Store & display results from chain

The test data and results are stored if activated and the test results are displayed.
If enabled the overall result is and test is gated to i/o ports.

Sweep parameters

To make a sweep following parameters must be setup.

- Start and stop frequency of the sweep
- Sweep delay
- Sweep time
- Points. No of test & measuring points
- Sweep forward / reverse
- Sweep normal / slow

Setup of the sweep parameters and the impact of the sweep quality:

Sweep Delay

The sweep delay makes a delay when the sweep begins. Under the delay signal is present on output with the frequency at the start frequency of the sweep. This enable device to be stabile if the device has a settling time. Typical value of this sweep delay is 0 mSec. Some devices need a delay on 150 mSec.
For our old P522 test system it was typical 350 mSec due to long settling time of this old test system.

Sweep format

The make a measurement on one sine on 10 Hz it takes 100 mSec. If the next test point is with 20 Hz it takes 50 mSec for one sine. For a measurement with one sine on 1000 Hz it takes 1 mSec.
Measurement at lower frequencies takes much longer time than at higher frequency. For that reason the sweep sequence takes longer time at lower frequency and shorter at higher frequencies. The optimum for a sweep is a logarithmic sequence. However a pure logarithmic sequence gives an acoustic delay problem at the high end of a sweep. A 20000 Hz sine takes 0.05 mSec. The sweep is made as a semi-logarithmic. When step rate get to fast the sweep turn over to a linear sweep.

Points

The number if test points can be set for a sweep. If the test points / stepping points are few the resolution of measurement is bad however the test speed can be fast. To get a prober resolution for example a sweep from 20 to 20000 Hz a least 200 test points is needed. As standard do not go below 250 test points. To obtain a prober resolution on test with woofers 500 test points can be a solution.
More test points take longer time to get a prober measurement.

Sweep frequency range

Start frequency of the sweep have to be set so low that all parameters of wants system can be measured.
However the start frequency must be high as possible to not lose test parameters to save test time.
Lower start frequency need longer test time.
Stop frequency of sweep must be set so all parameters for a test is fulfilled.

Sweep time

The sweep time must be so long that all parameters can be tested properly. To save time on a complete test sequence the test time can be optimized. To fast test time the rub & buzz element can be lost in measurement due to energy / time element.
Note due to sound delay between speaker and microphone, the sound speed is 340-343 mSec, the higher frequencies, is shifted to right of displayed measurement. If the test is a relative measurement it is allowed however if the measurement have to be compared with other test brand the sweep test time must be increased.

Sweep reverse

The sweep reverse enable a sweep from stop frequency to start frequency. Note that not all test parameters is allowed on a reverse sweep.

Sweep slow

This function changes the sweep format so the semi-logarithmic are converted to a linear sweep at an early time than normal. As standard the linear part is started if the step rate is faster than 0.4 mSec.
The slow option changes the linear rate faster than 2 mSec. This eliminates some of the frequency shift to right on display.

Sweep overview

The qualities of a sweep are a product of the no of test points, the sweep speed, the frequency range and the sweep format.

Sweep to fast

Depending start frequency of the sweep and number of test points and again due to sweep time a sequence can done too fast. First of all detection of rub and buzz will be depressed and false information is added to test. The number of samples in each test point will be too few and a risk for the sweep frequency itself will be modulated with the test signal.

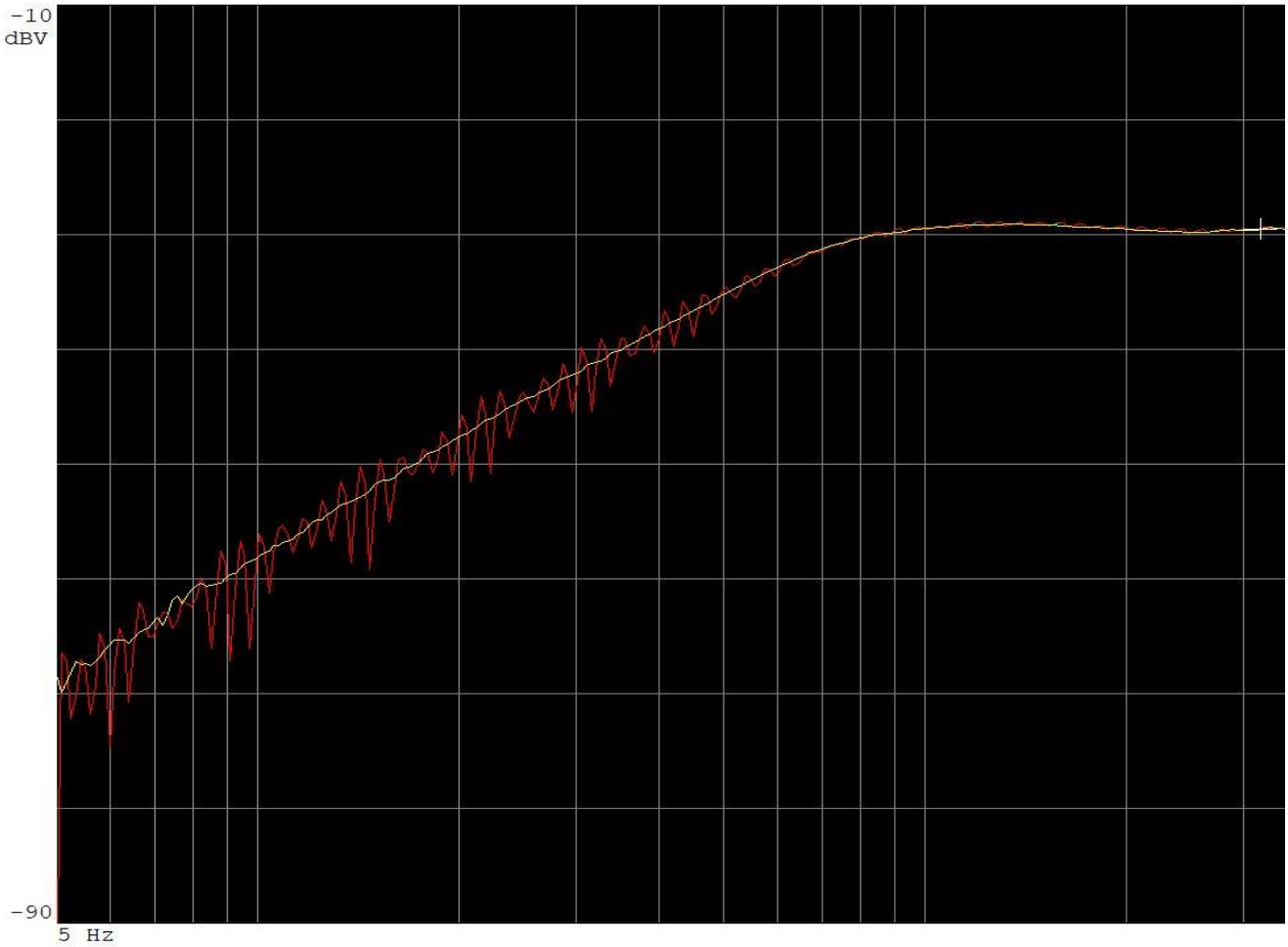


Figure 2: Sweep to fast. Sweep from 5 – 20000 Hz. Frequency response displayed. The red curve is too fast. The yellow is ok.

Figure 2 shows a measurement there have too few sample point to give a stabile measurement. The reason the product of start frequency – test time – sample points is to less. Solution, increase the start frequency and / or rise the test time.

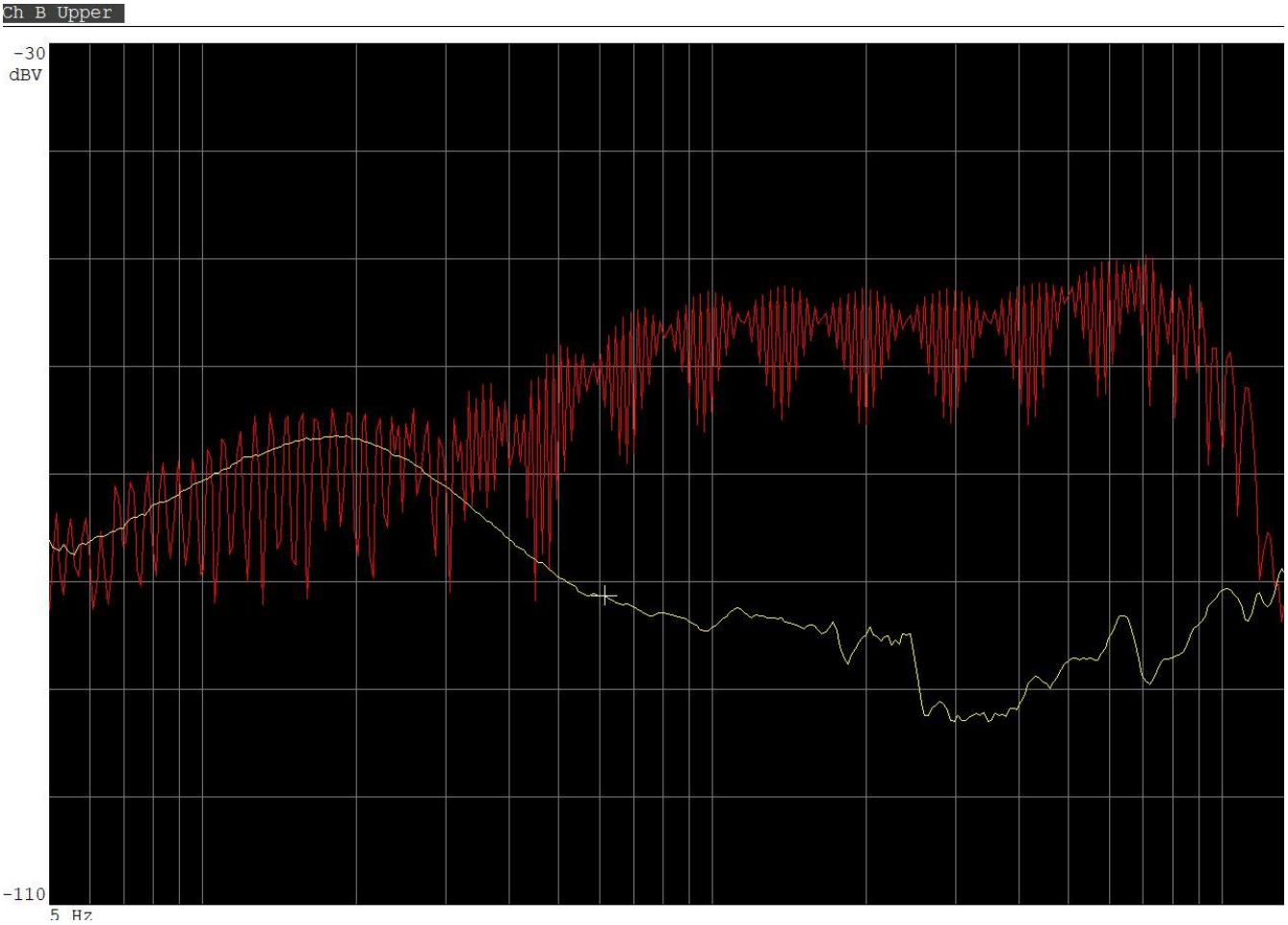


Figure 3: Sweep to fast. Sweep from 5 – 20000 Hz. Rub & buzz displayed.
The red curve is too fast. The yellow is ok.

Figure 3 shows a measurement there have too few sample point to give a stabile measurement and the sweep frequency is modulated with signal. The reason the product of start frequency – test time – sample points is to less. Solution, increase the start frequency and / or rise the test time.

Display drift

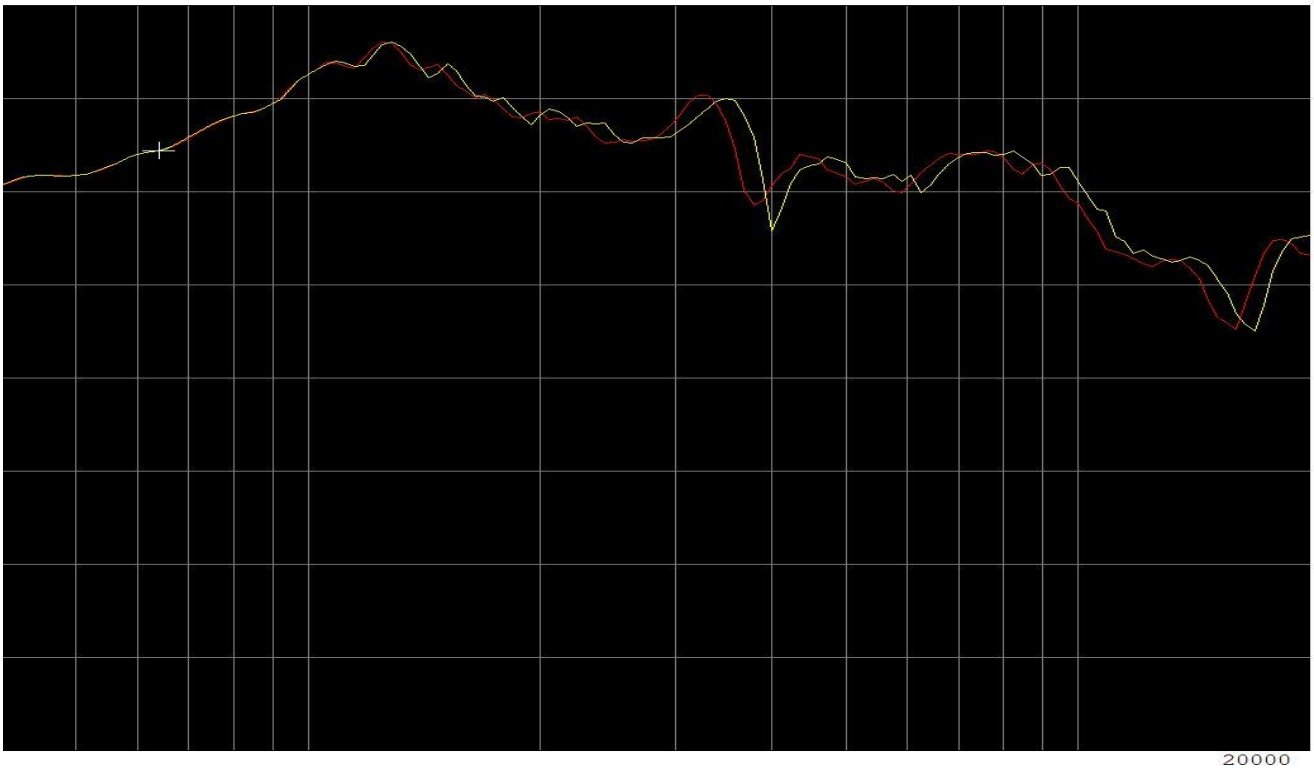


Figure 4: The end of a frequency sweep.
The yellow show the sig drifted to right due to delay. The red is ok.

Figure 4 show a drift of frequency signal to right. The drift to right comes from the delay from speaker to microphone due to the speed of sound. The delay depends of the distance from speaker and microphone.
For a near field measurement the sweep format can help by enable the slow format. Figure 4 show the difference the sweep format as normal and slow. Another solution is to make the sweep time longer.

Appendix G

P900 back panel.



See Installation P900 Cabinet Back panel:

From left at top **USB** connection with a led indication for USB connected.

Monitor an option. A 3.5 mm jack output to monitor processed input signal.
Plug below the USB connector. This DC plug is not used for P900.

I/O is a 25 pole female plug is digital input and output for external control.

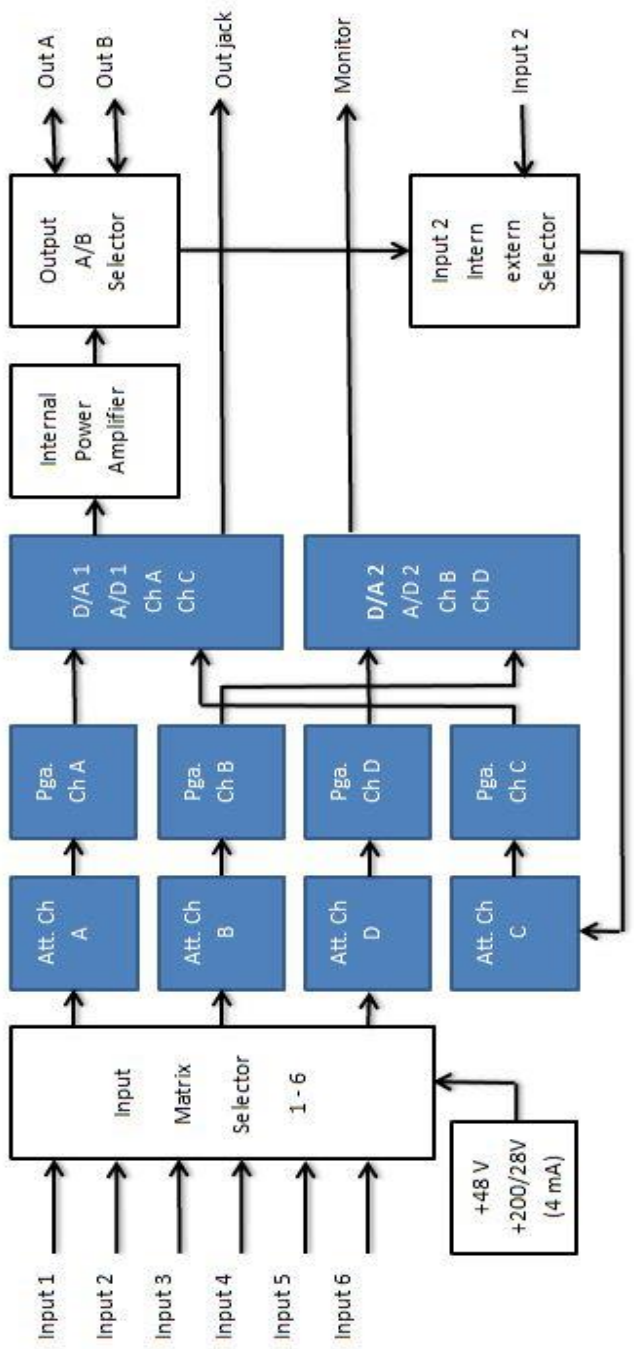
Input 2 can be selected by software. This can only be used if an external power amplifier is used. This is used to measure impedance with an external sense resistor.

Out is a line output for an external power amplifier.

At right the main voltage selection 230V or 115 Volt.
Mains inlet with power switch including main fuse.

Appendix H

P900 Block diagram



P900-1 block diagram

Blue blocks are modules

Input 1 or 4 valid for Ch. A. Input 1 and 4 on at same time not valid.
Input 2 or 5 valid for Ch. B. Input 2 and 5 on at same time not valid.
Input 3 or 6 valid for Ch. D. Input 3 and 6 on at same time not valid.
Ch. A input 1,2,3,5,6 or 2,3,4,5,6 mix valid.
Ch. B input 1,2,3,4,6 or 1,3,4,5,6 mix valid.
Ch. D input 1,2,3,4,5 or 1,2,4,5,6 mix valid.