

# **P760Std**

## **User Manual**



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# Introduction

The P760Std is software to make a cost-effective test system for loudspeakers. With a personal computer, a test box/chamber with measuring microphone(s) and external amplifiers it is a complete workstation for objective production testing of loudspeaker and units.

All tests are performed simultaneously, fast and reliable and can be stored locally or on a network for later analyses. The hardware concept uses a swept sinus. The input to the system is microphone response signals.

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. All main menu functions mode is protected by passwords.

**In off-line (demo) mode no hardware are needed.**

## Hardware Concept

The P760Std system hardware consists of a USB Audio System to be connected to a standard PC, and test cables for input gain calibration and for impedance measurement.

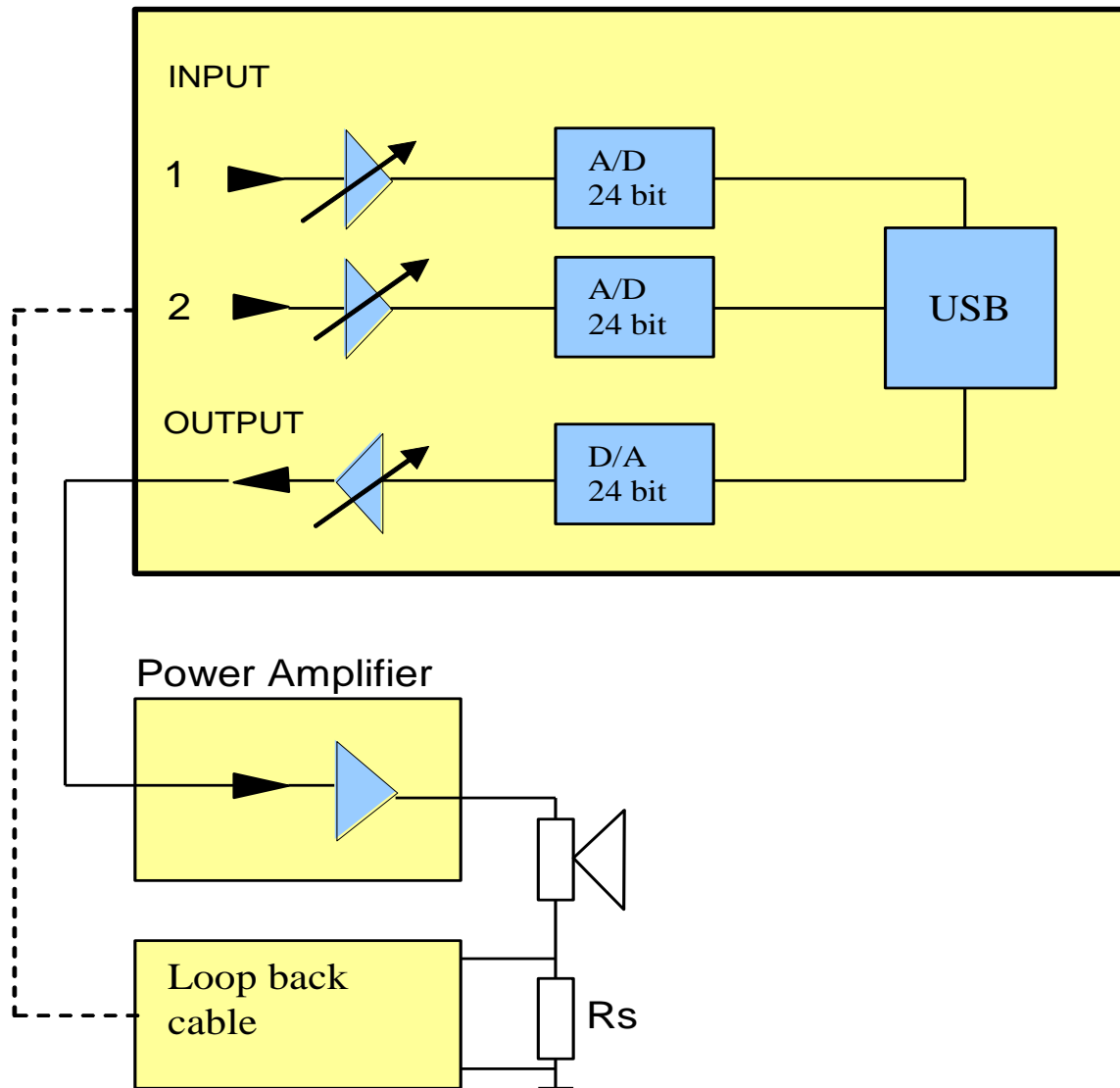
The USB Audio System has two inputs and outputs all 24 bits. The inputs are supplied with a phantom power supply of 48 volt. The sample rate can be selected to 48 KHz, 96 KHz and 192 KHz. Input and output sensitivity is controlled by potentiometers on the front of USB Audio System.

An external power amplifier must be connected to the output to drive the speakers.

An external impedance sense resistor must accomplish for impedance measurements.

# P760Std Hardware Lay Out

## USB Sound System





## Software Concept

To make the use of software both for unskilled and skilled persons the menus are split up in 4 different groups.

Run mode – for the daily production testing used by an unskilled persons.

Edit mode – to generate new or modify test setups or can be used in a lab environment.

Global mode – here general parameters can be changed for the measurement system.

Utility mode – functions as processing stored data, copying, import and export functions etc.

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 / 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 edit-mode.

The operator selects from the menu which of the existing setups to be used for running production tests. 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., are stored in a database for analysis and statistics, and also all the actual measured data are stored in database.

An on screen statistics can be displayed for each single test type and analyzed for selected data.

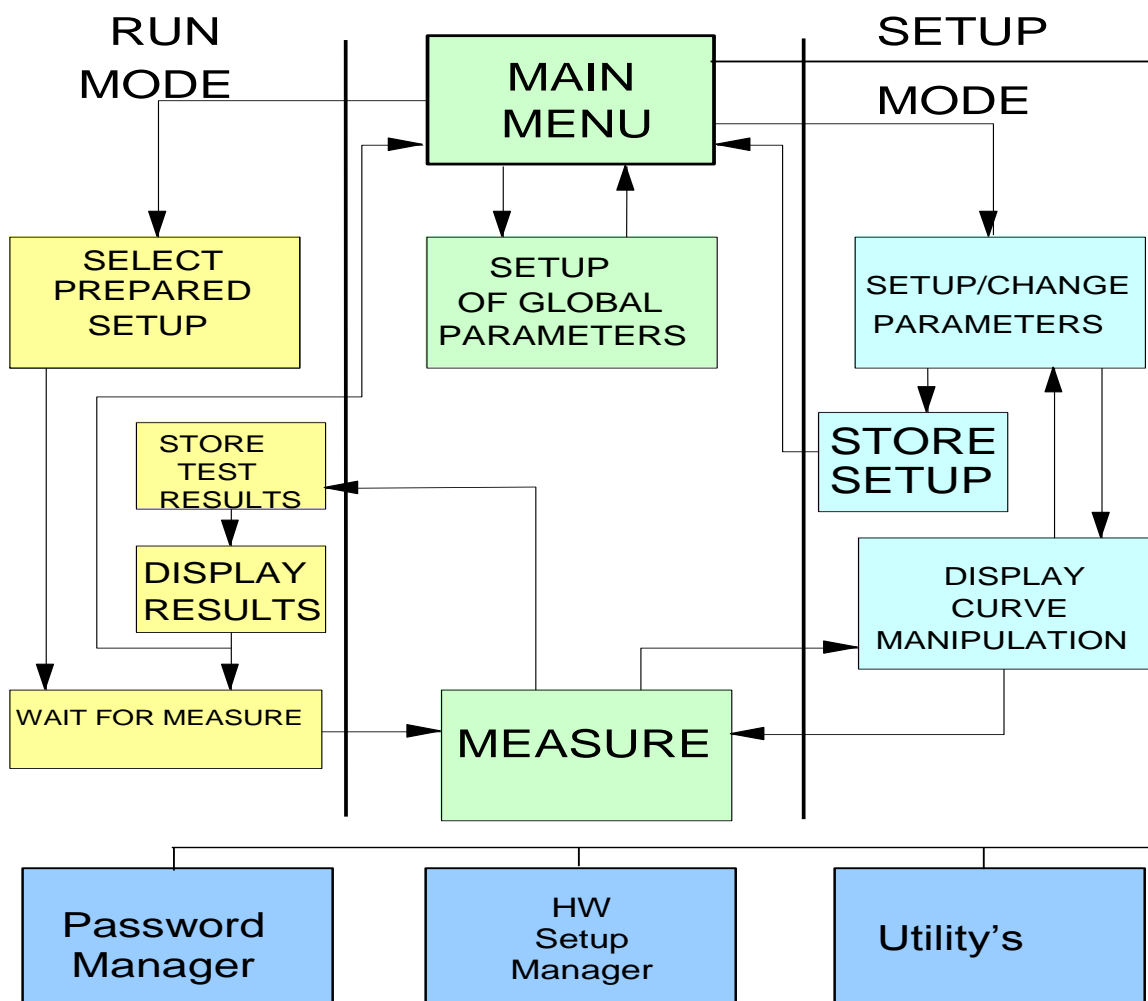
If one of the “store” measure data functions is “on” in global-setup - and - cancel record function is “on”, the operator have the possibility to “Delete” / cancel the last stored data set on disk.

## 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 setup-mode mode. After entering of a valid password, 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

## P760Std Software Lay Out



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
- Description
- Start and Stop frequencies
- Delay time
- Test points
- Sweep time
- Output level
- Polarity test ON/OFF
- Polarity pulse time and pulse polarity POS/NEG
- Polarity pulse window setup
- Inputs, LIN / LOG setup
- Main analyze channels, A, B, C & D
- Sensitivity test ON / OFF and test frequency
- Move frequency test function ON / OFF for Sensitivity test
- Storage of best fit curves
- Filter types and functions
- F resonance, Qms, Qts, and F test setup
- Auto save functions

The manipulation reference function contains:

- 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
- 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: Cancel Record - Enable / Disable  
Repeat By Reject - Enable / Disable
- Display Graph: By Approve – Enable / Disable  
By Reject – 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
- Screen: Statistics – Enable / Disable  
Include - All results / Approved  
Reload – Enable / Disable
- Path: Reference, Data, Results
- Extern Amplifier Test signal Output  
Max Output at 0 db  
Value of Rs A

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

## **Utility functions:**

To enhance 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 you can further process the data to show curves as average, +/- standard deviation (sigma). 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.

### **Copy Reference Data**

The copy reference utility contains most functions to copy single record(s) from the reference-database to other media.

You can list reference and database files.

Copy the reference setup to or from other media vice versa.

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.



# Installation

## P760Std Hardware

The P760Std system hardware consists of USB Audio System to be connected to a standard PC, and test cables for input gain calibration and for impedance measurement. See supported Sound Systems for current P760Std software.

Install ASIO drivers for supported Sound System.

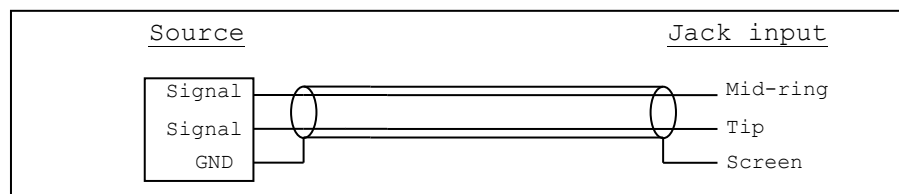
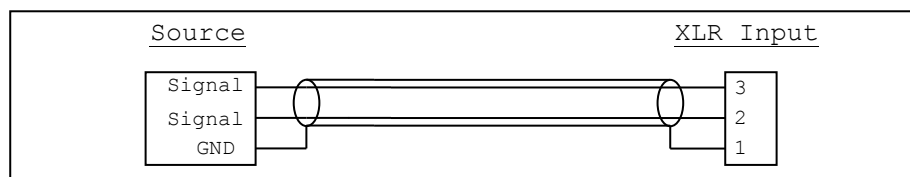
## P760Std cables

For use to calibration and impedance measurement you get two cables. See appendix B how to make the cables for impedance measurement and how to calibrate input scale.

1. A cable with attenuator for connecting input 1 or 2 to output of an external power amplifier for calibration of input scale.
2. A cable with attenuator for connecting input 2 and an external sense resistor to enable impedance measurement.

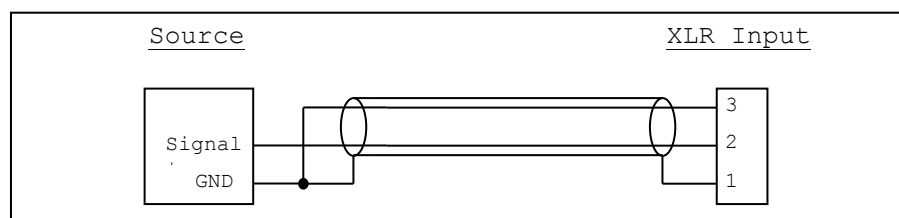
## Recommended connections

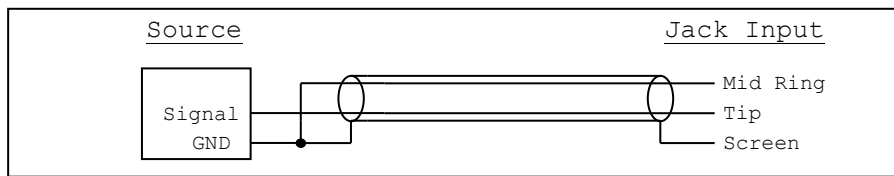
### Balanced input.



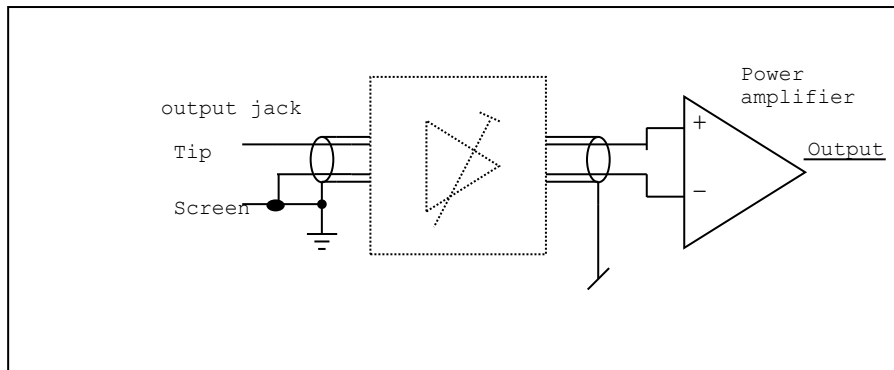
Use only balanced input if Phantom power is used

### Single-ended input.

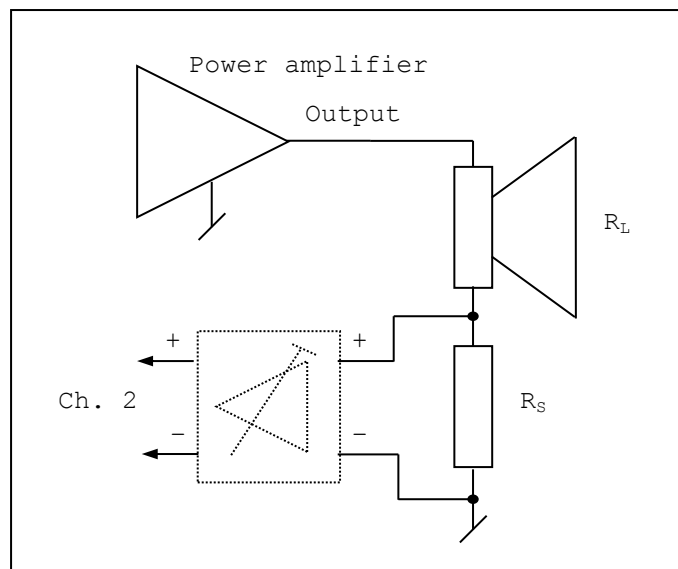




### Connection between Sound System and a power amplifier.



### Connections for impedance measurement



#### **Notes:**

- Power amplifier must be none-bridged.

- $R_S \leq \frac{R_L}{10}$

See Appendix B for more information.



## **Software installation**

### **Install USB Sound System**

Install software and drivers for selected USB Sound System.

P760Std software use ASIO drivers delivered with the USB Sound System.

Installation of USB Sound software is not needed in off-line (demo) mode.

### **Install P760Std files**

To install P760Std, run installation. Select the program media and run “setup” and follow the instructions on the screen.

When P760Std is installed the program will be in off-line mode.

This is a demo mode. All measurements are simulated data.

To activate the P760Std software for real measurements, an activation of the software is needed. See section under main menu.



# Software User Section

This section describes how the P760Std 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
  - Activation
- Run menu
- Setup menu
- Global menu
- Utility menu

## Main Menu

Main menu as showed is the entry point for the P760Std program.

From top bar you get the information of program name and serial number if activated.

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 Pass Word Manager, Hardware Manager and Graph Resolution and Activation menu.



## Pw. Mgr.

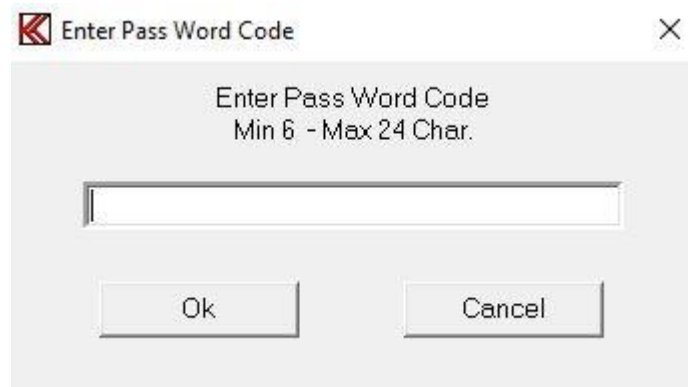
The “Pass Word Manager” control all passwords used in the Program. With this “Pass Word Manager” password can be, generated, edited, deleted and disabled. All passwords are coded and saved on disk. To manage this Pass Word Manager an administrator need to generate a unique administrator password to enter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

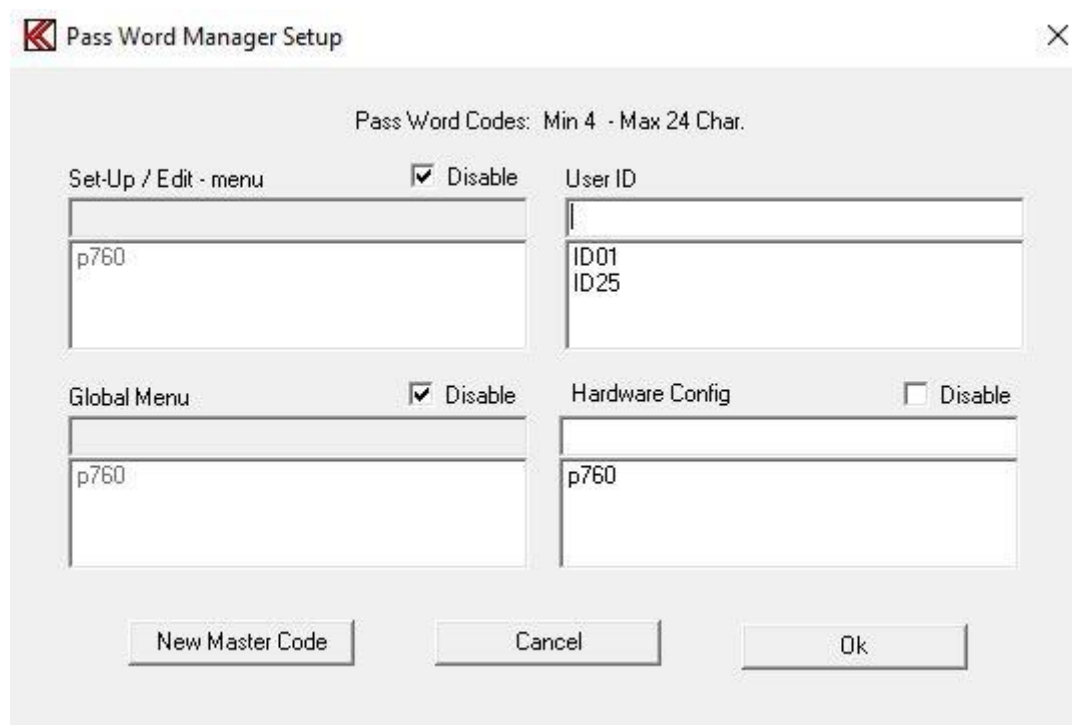
If the password is lost then reinstall the program.

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



A dialog box titled "Enter Pass Word Code" with a close button (X) in the top right corner. The text inside says "Enter Pass Word Code" and "Min 6 - Max 24 Char." Below this is a single-line text input field. At the bottom are two buttons: "Ok" and "Cancel".

When the administrator password is entered correct following menu appear:



A dialog box titled "Pass Word Manager Setup" with a close button (X) in the top right corner. The text inside says "Pass Word Codes: Min 4 - Max 24 Char." Below this are four sections, each with a list box and a checkbox labeled "Disable":

- Set-Up / Edit - menu**: List box contains "p760". Checkbox is checked.
- User ID**: List box contains "ID01" and "ID25".
- Global Menu**: List box contains "p760". Checkbox is checked.
- Hardware Config**: List box contains "p760". Checkbox is unchecked.

At the bottom are three buttons: "New Master Code", "Cancel", and "Ok".

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

Password for access creates, save and change Setup and Edit menu.

Password for access, change and save Global Menu.

To create, change and save user ID name. This ID is stored together with measured data.

Password for access creates, save and change in Hardware Config Manager.

Note the user ID is enabled from the Global menu as well as User Adjust of Compensation.

## 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

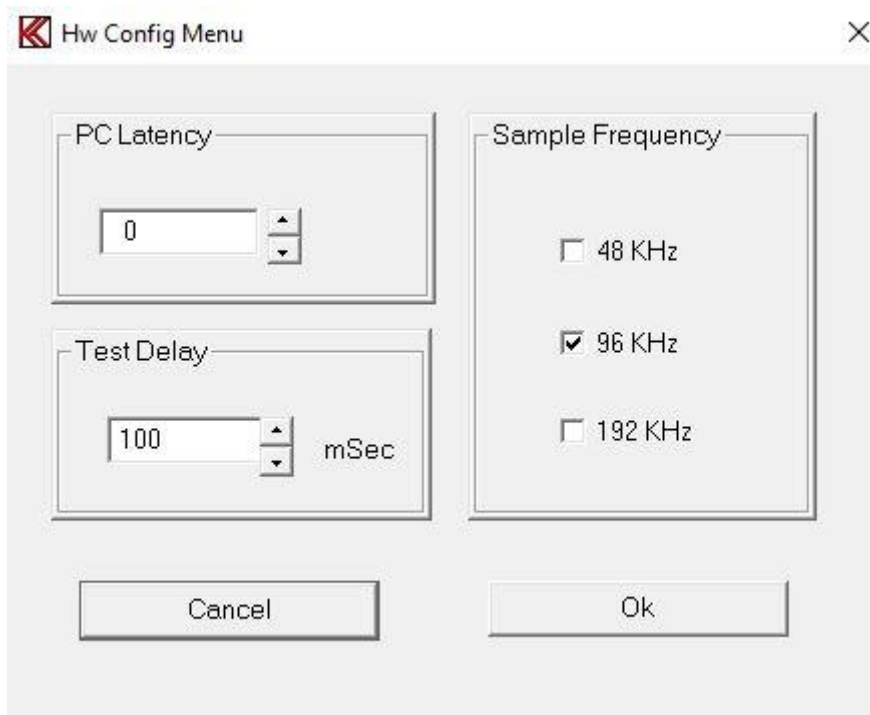
To disable a password function, mark the disable function right for the list name. When asked for a password in the program you just need to hit a key (no password).

## New Master Code

This calls the first time administrator password menu.

## Hardware Manager

On the hardware manager menu most common hardware can be controlled. The sample frequency can be set to 48 KHz, 96 KHz and 192 KHz. The default is 96 KHz. The PC Latency can be set here. The default is 0. See appendix to set or check for correct value. The test delay is a delay from a start sweep command is given and a measurement is processed.

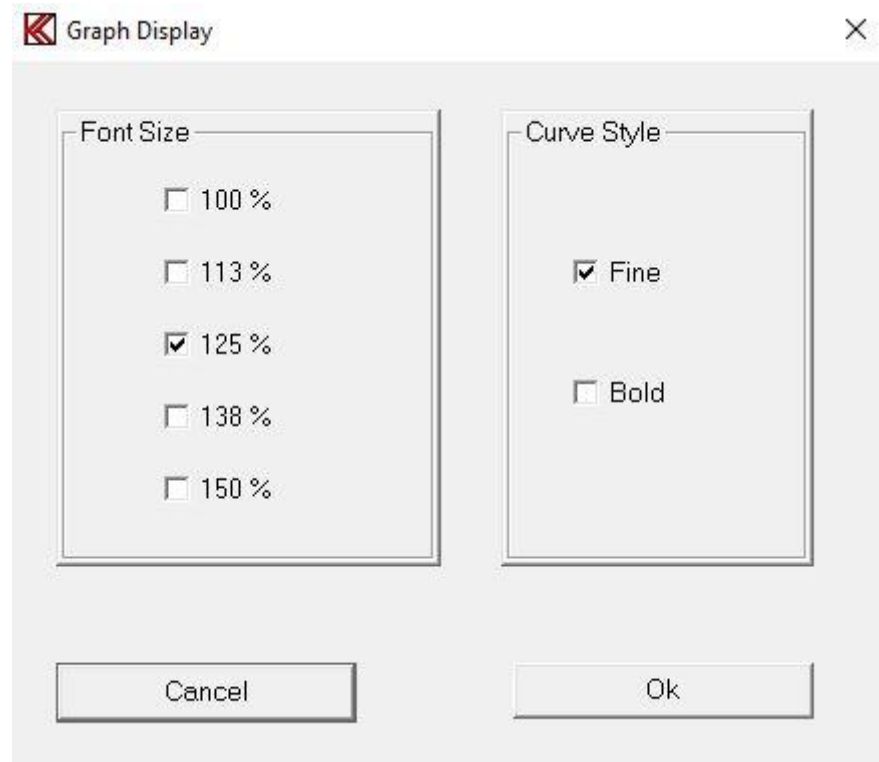


The screenshot shows a dialog box titled "Hw Config Menu" with a close button (X) in the top right corner. The dialog contains four input fields arranged in a 2x2 grid:

- PC Latency:** A text box containing the value "0" with up and down arrow buttons to its right.
- Test Delay:** A text box containing the value "100" with up and down arrow buttons to its right, followed by the unit "mSec".
- Sample Frequency:** A group box containing three radio button options:
  - ☐ 48 KHz
  - ☒ 96 KHz
  - ☐ 192 KHz

At the bottom of the dialog are two buttons: "Cancel" on the left and "Ok" on the right.

## 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 running on a screen with a high resolution.

When font sizes are changed the P760Std 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.

## Activation

The screenshot shows a window titled "Activation" with a close button (X) in the top right corner. The window contains two main sections. The first section, titled "Request Code", contains the following text: "To get a Activation Code do following:  
Generate a request Code. Copy and Paste the Code below.  
Send the code to K & K Development by e-mail.  
Find more information on [www.kk-int.dk](http://www.kk-int.dk)  
Default e-mail: [kk-dev@kk-int.dk](mailto:kk-dev@kk-int.dk)". Below this text is a large empty rectangular box for pasting the code, and a "Generate Code" button. The second section, titled "Activation", contains the text "Activate by Paste the Unclok Code in field below." followed by a text input field and an "Activate" button. At the bottom of the window is a "Quit" button.

To change the P760Std software from demo-mode, no hardware is needed in demo-mode, to live-mode, activation is needed.

To activate the system enter the Activation menu as shown above. Generate Code button to generate a unique request code that is connected to your PC. **Note this code only works for the PC where the code is generated.** It is not possible to use this unlock code for other PC's. So generated the code on the PC you want to use for the P760Std system.



Activation

×

Request Code

To get a Activation Code do following:  
Generate a request Code. Copy and Paste the Code below.  
Send the code to K & K Development by e-mail.  
Find more information on [www.kk-int.dk](http://www.kk-int.dk)  
Default e-mail: [kk-dev@kk-int.dk](mailto:kk-dev@kk-int.dk)

Request Code:-618, 186, 26, -397, -80, -797, -907, -266, 175, 175, -797, 54, 49, 49, 2786, 394, 1531, 1252, 3241, 3146, Timestamp: 02- 6-19 15:08

Generate Code

Activation

Activate by Paste the Unclok Code in field below.

Activate

Quit

In this example a request code is generated in the field above Generate Code.  
To order a unlock code this request code must be send to the dealer by copy and paste or by writing the Request Code down.

In following example the Unlock Code is “H9LIUNBLAEAGFGKBIDEKAF1JE36B5”.

The image shows a software window titled "Activation" with a close button (X) in the top right corner. The window contains two main sections. The first section, titled "Request Code", contains the following text: "To get a Activation Code do following:  
Generate a request Code. Copy and Paste the Code below.  
Send the code to K & K Development by e-mail.  
Find more information on [www.kk-int.dk](http://www.kk-int.dk)  
Default e-mail: [kk-dev@kk-int.dk](mailto:kk-dev@kk-int.dk)". Below this text is a large empty rectangular box for pasting the code, and a button labeled "Generate Code". The second section, titled "Activation", contains the text "Activate by Paste the Unclok Code in field below." followed by a text input field containing the code "H9LIUNBLAEAGFGKBIDEKAF1JE36B5". Below the input field is an "Activate" button. At the bottom of the window is a "Quit" button.

Then the Unlock Code is entered and accepted the Activate bottom will be enabled.  
Activate the system by using the “Activate” bottom.

After the system is activated the P760Std program must be restarted. After restart a serial number will be displayed at upper left corner.  
When activated the Activation menu is disabled.

# Global Menu

Global Menu

**Control**

Cancel Record  
☒ Enabled

Repeat By Rej  
☐ Enabled

**Display Graph**

☒ By Approve  
☒ By Reject

Delay  
☐ Enabled

**Store**

Data  
Approve: ON  
Reject: ON

Results  
ON

Data Format  
DBF

**User key's**

☐ User ID

**Screen**

☐ Statistics  
Include:  
☒ All results  
☐ Approved

☐ Reload

**Graphic Scale**

☒ Auto

**Ext. Amplifier**

Output  
Test signal  
1 KHz - 0 db  
On

Voltage on Outout at 0 dB  
15.0 Volt

Rs  
0.10 Ohm

OK

Cancel

**Path**

Reference: C: ->

Data: C: ->

Results: C: ->

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

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

## Control

### 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”.

### Repeat by Reject

By enable this function a second test will be executed if the first test was rejected.

## 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 P760Std reference data are located. If listed “c:” tells that the reference data are located where the P760Std main program is placed.

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.

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 facility 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.

## 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, the actual function disabled.

ON, the actual function 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.

Valid modes are:

OFF, the actual function disabled.

ON, the 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.

## **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 P750 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.

## **External Amplifier**

### **Output**

If an external amplifier is connected to the P760Std system. To adjust and calibrate the maximal output level on the power amplifier a test signal is supplied on to the output amplifier. The test signal is 1 KHz with a level at 0 dB of Maximal level.

### **Rs Out**

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



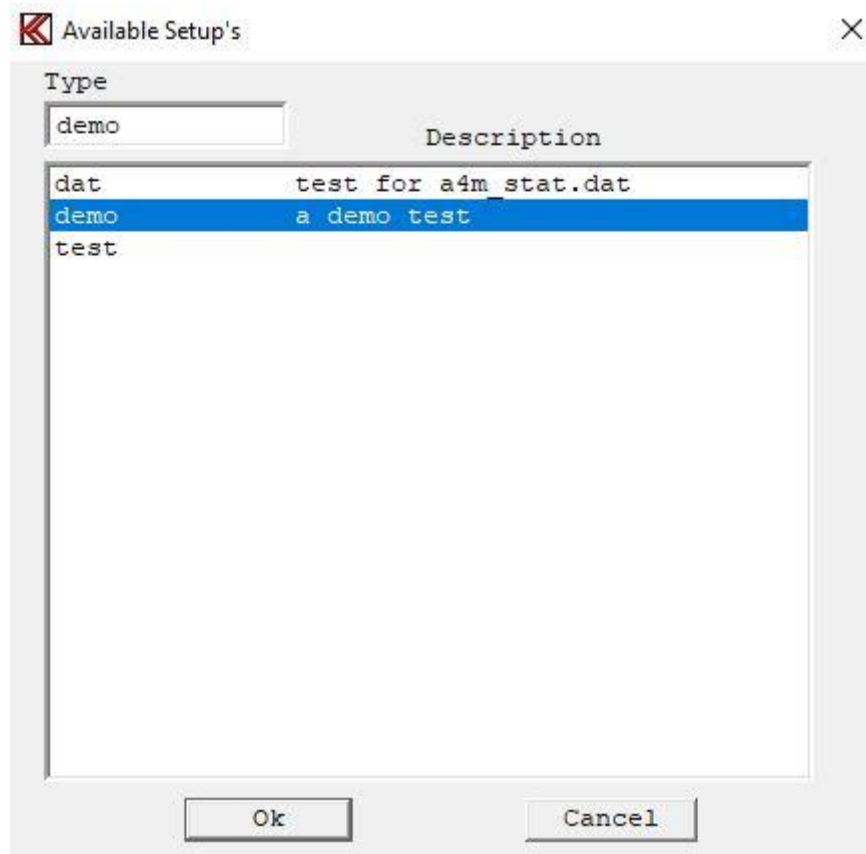
## Setup Menu

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 technology this should only be performed by a skilled technician. Therefore all parameters in this setup are protected by password.

When entering the setup menu, the type name and the content of the descriptive field for all existing setups 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. This moves 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. The Type name is case sensitive.



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.

**Setup Of Parameters**

Type

Name: demo

Description: a demo test

Sweep

Start: 20 Hz

Stop: 20000 Hz

Delay: 0 mSec

Points: 250 No

Time: 3.0 Sec.

Reference

Delete & exit

Save & exit

Exit

Sensitivity Test

☐ Move 1000 Hz

Output

5.0245 Volt

-9.50 dB

0 dB = 15.0 Volt

Polarity Test

☐ On ☐ Negative

Pulse Time: 50 mSec.

☐ Sync Burst

Auto Save

☐ Data App. ☐ Data Rej. ☐ Results

Data Path: c: ->

Result Path: c: ->

Input

Status: ☒ Ch A ☒ Ch B ☒ Ch C ☒ Ch D

Mux: 1 1 1

Detector: Log Log Log Log

Smoothing: Off Off Off Off

Rs=0.100 25.1 pt/oct

Filter

Status: ☒ Ch B ☒ Ch D

Type: TRK-HP FIX-HP

Har: 5

Freq/Bw: oo 2000

Gain: 0 db 0 db

Display: Absolute Absolute

Limit: 45 KHz 45 KHz

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

- Type
- Sensitivity Test
- Output
- Polarity Test
- Input
- Sweep
- Auto Save
- Filter



## **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.

### **Status**

Status is information for current setup as best fit curves.

## **Sensitivity Test**

The Sensitivity test a single point tested against the yellow upper and lower limits selected by the Sensitivity frequency.

### **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.

## **Output**

### **Volt**

Select the actual output level in Volt.

Minimum is 0 Volt and maximum is the voltage listed in Global setup.

Note to update entered value in the volt edit field move cursor to another field on setup.

### **dB**

Select the actual output level in dB.

Note to update entered value in the volt edit field move cursor to another field on setup.

## 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

Select the duration of the polarity pulse in milliseconds.

## Sync Burst

Generate a sync burst used to synchronize received frequency response when wireless speakers are tested. This compensates delay time from device to device. Max allowed delay time 250 mSec. Polarity is forced on with a pulse on 50 mSec in the beginning of a sweep. Sweep reverse is forced off.

## 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 number: 1 or 2

Input 2 is only enabled if channel C is disabled

You can gate (multiplex) an input module to one or two other analyze channels.

You **can not** change a channel if the host channel is already used. The host channel is the number where the gain is displayed.

Host for input 1 is channel A.

Host for input 2 is channel B.

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. Channel A, B and D linear or logarithmic.

## **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.

## **Sweep**

### **Start**

Start frequency of the sweep.

Move cursor to another field to see updated field.

### **Stop**

End frequency of the sweep.

The minimum difference between start and end frequency is one octave.

Move cursor to another field to see updated field.

### **Delay**

Delay time in milliseconds. Minimum is 0 sec and maximum is 999 sec. The typical value is 0 to 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. This is different from the delay set in Hardware Manager (the delay in Hardware Manager is a delay from start test to signal on output).

A normal test sequence is the following: First come the pulse for polarity, then the delay time and finally the sinus sweep. Move cursor to another field to see updated field.

### **Points**

Points are the number of measuring and test points. Minimum is 125 and maximum is 500. For speaker measurements use 250 or 500 points.

### **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 2.0 seconds for start frequency  $\geq 100$  Hz else 3.0 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.

## **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”.

## Filter

The programming capabilities of the filters include the following filter types:

- 1: Tracking High Pass
- 2: Fixed 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-HP and FIX-HP or OFF.  
For Rub & Buzz use TRK-HP and FIX-HP filters.

## Har. (Harmonics)

For the TRK-HP the Tracking High Pass filter the possible setting range of harmonics are from 2 to 12. To measure THD select this harmonic at 2th harmonic.

## Freq/Bw (Frequency / Bandwidth)

### TRK-HP:

The Tracking High Pass filter can change following low pass frequency:  $\infty$ , 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  $5 \times 20 = 100$  times higher than generator signal. If low pass frequency is  $\infty$  the filter limit is 45 kHz. Normal makes use of the no limit for low pass, the  $\infty$  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 filter, 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:

The Fixed High Pass filter frequency, start - end, can be selected freely between 5 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.

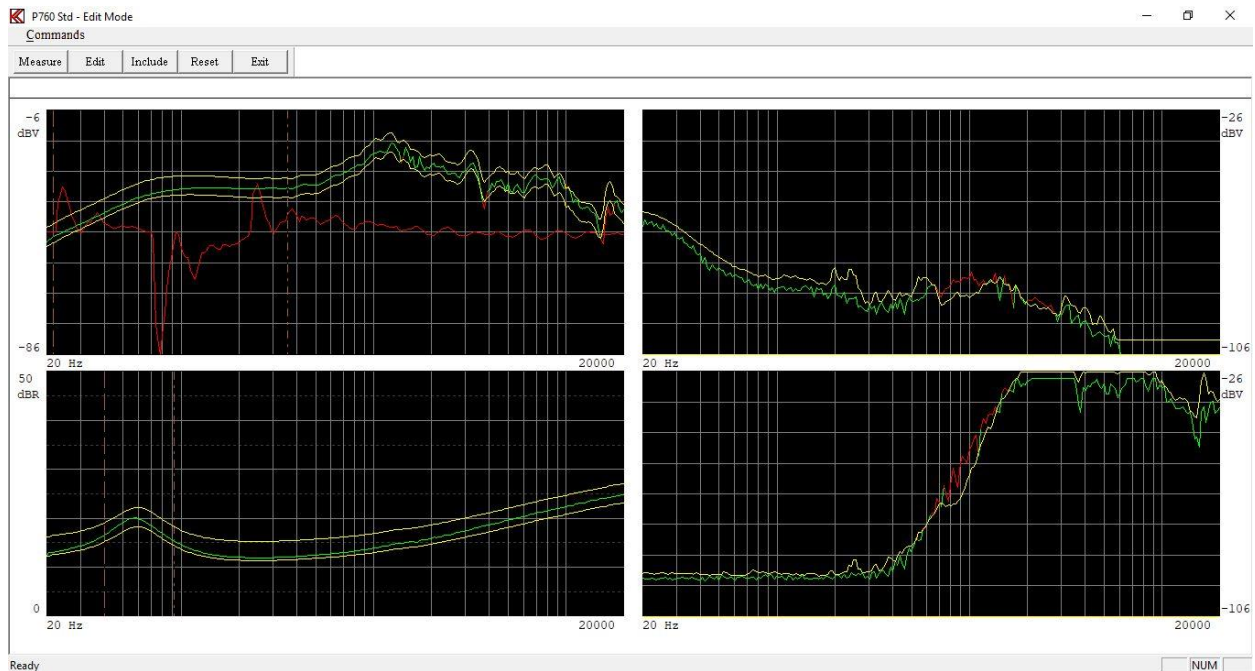
If Relative% is used the scale is displayed in %.

## **Limit**

Select the filter high-end limit between 22 kHz and 45 kHz.



# 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. By testing a number of "good" speakers you can create the basis for the tolerance envelope curves.

## Measure

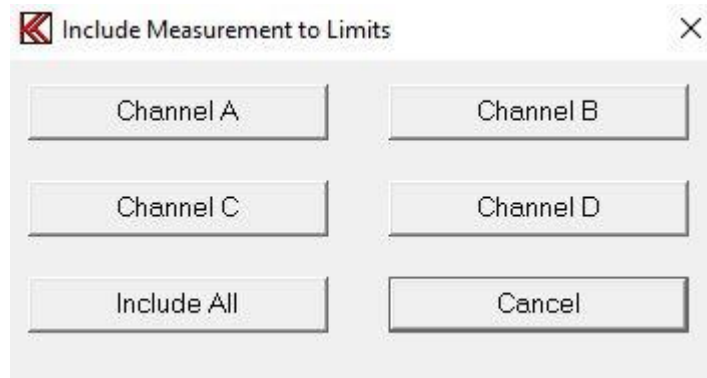
To make a measurement, activate the “Measure” command, make use of the “Measure” toolbar or use the key "M".

## 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.

## 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.



## Invert Gfx

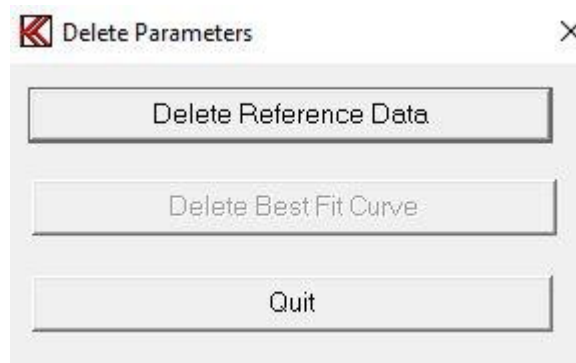
Invert Gfx function invert the graph display background is toggled from black to white and so on.

The color code of curves is the same expect white curves are converted to black and black to white. This can be useful when a print is used.



## 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

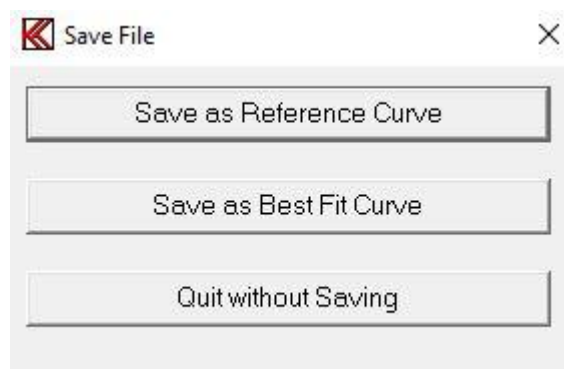
Delete all reference curve data.

### Delete 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 Best Fit Curve

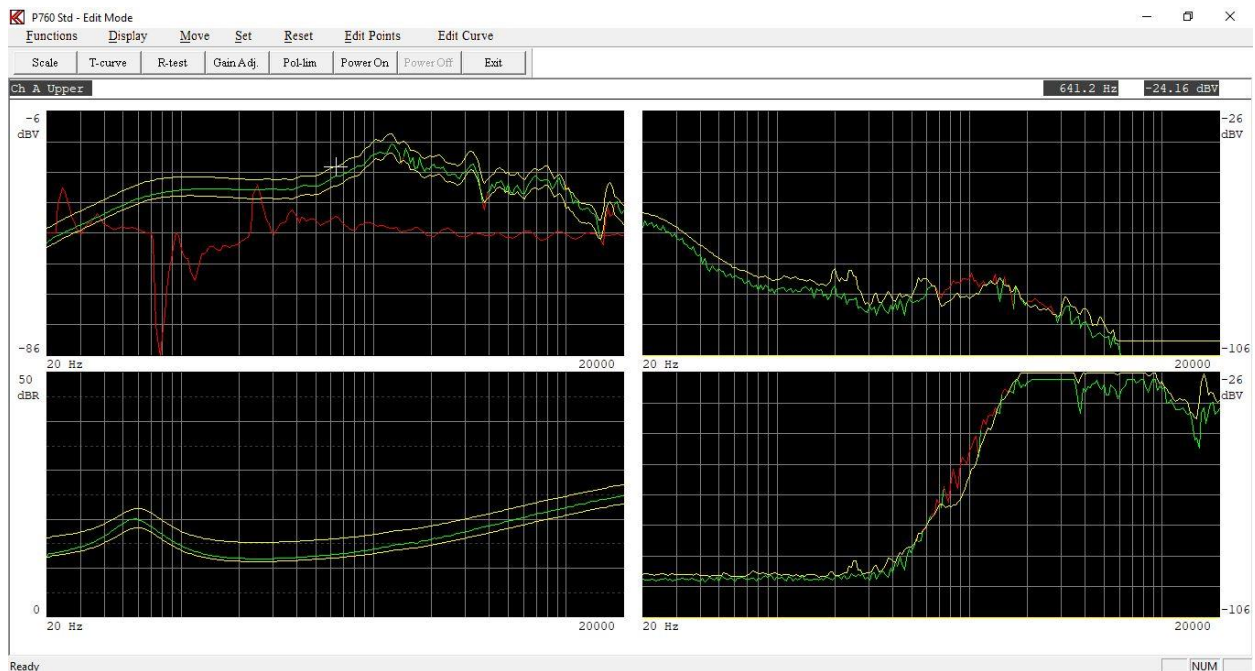
Save best-fit reference curve. Using the Find function in Utility mode uses the best-fit reference curve to match a measured curve.



## 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 times with fast cursor) up with the cursor.

Use “Edit - Point Up” or the “8 / ↑” key.

**Write point down**

Write one unit (or 10 times 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 times 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 times 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. Quick ways to a lower limit in 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”.

## **Display**

### **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.

### **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 and 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.)

Nr.	Freq. Hz	Val. db
1	20.0	-32.02
25 S	38.9	-45.00

### 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 the points are moved, 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.

**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 the 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”.

**Power On / Off**

Power “on” output the frequency selected by cursor. The output level is the setup level as measured.

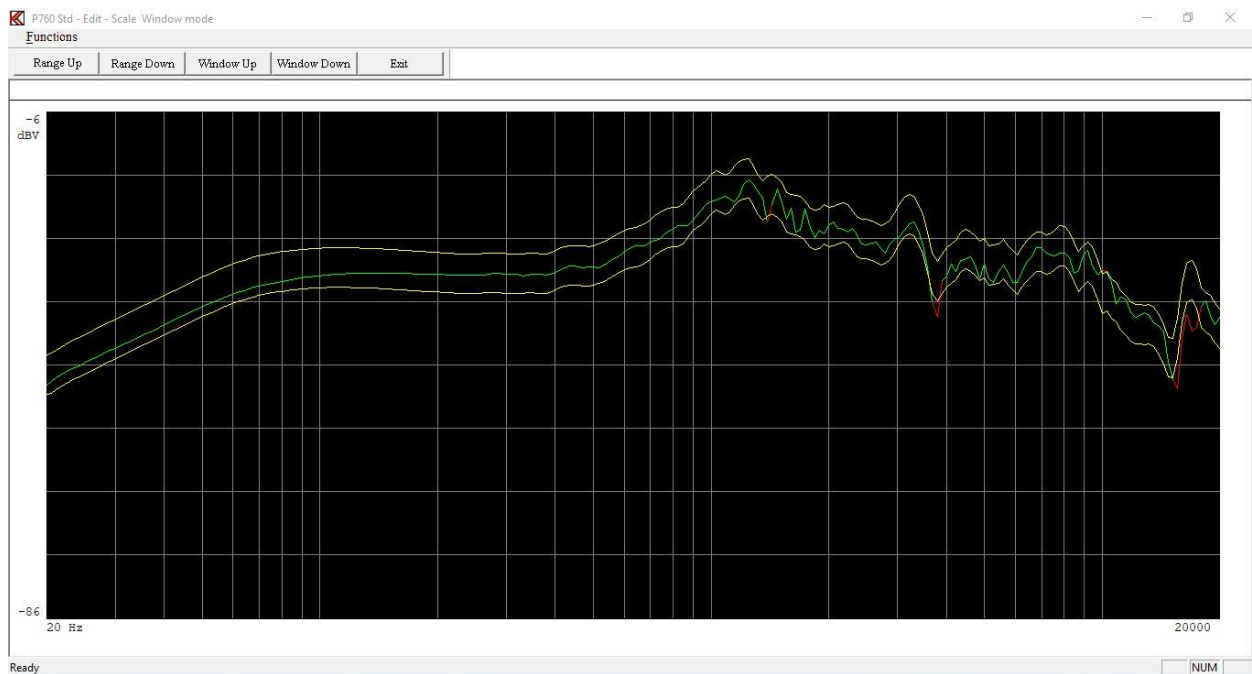
To activate power on enter “Functions – Power On” or Toolbar “Power On”.



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.

## 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.

## Tolerance curve menu

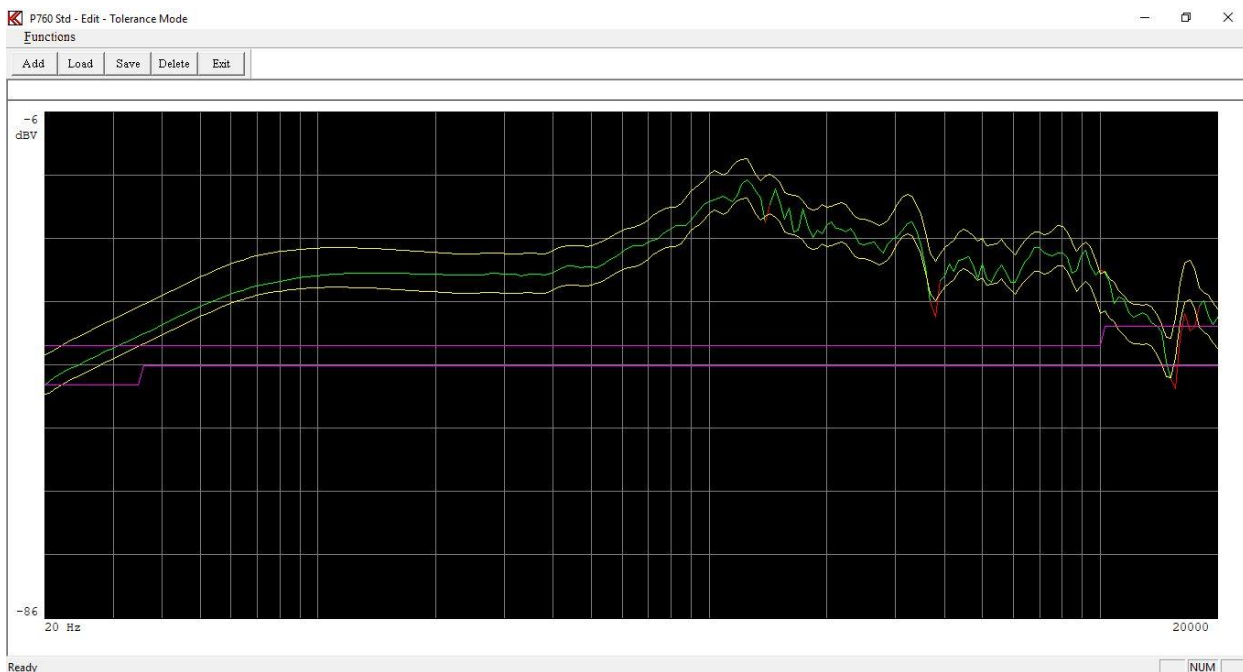
Normally you have a number of different test setups, however when you analyse the setups you have different reference curves. But the tolerance levels are almost the same for example  $\pm 2$  dB. The tolerance curve is the standard tolerance from a straight line around the middle measure range.

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 pub up menu.

### Add

Add the tolerance curve to the upper and lower limit.

### 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.

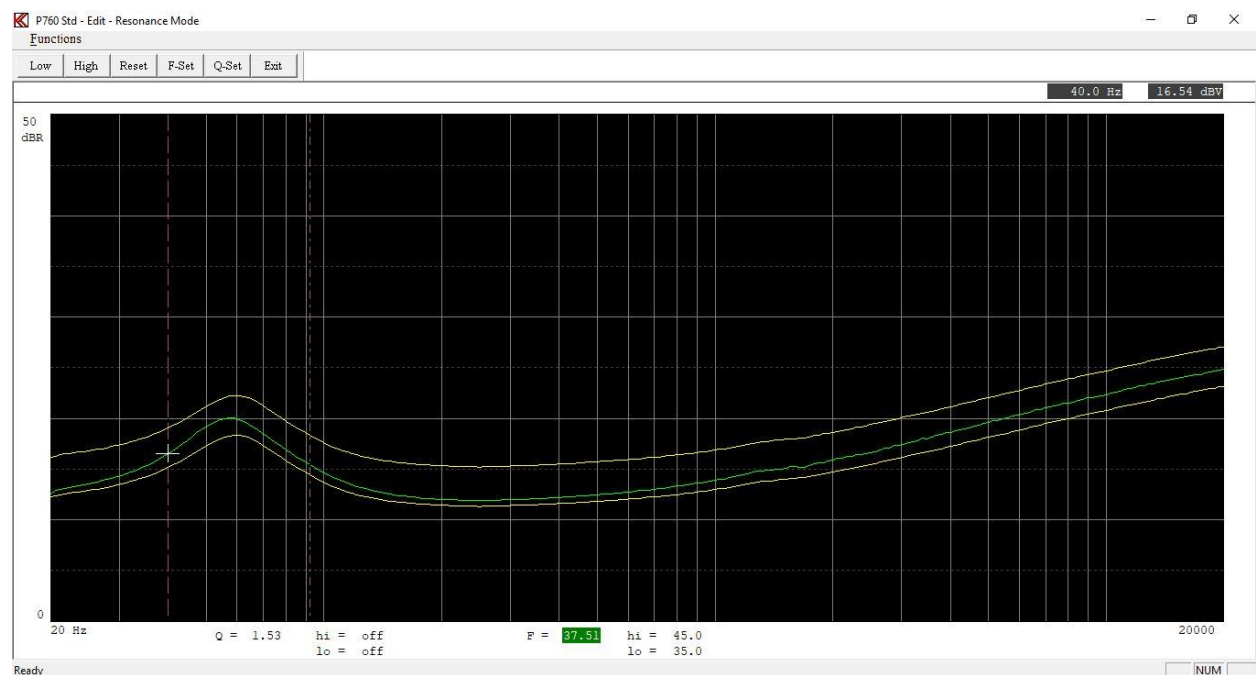
## Delete

Delete a loaded tolerance curve from disk.

## 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 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.



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". You can use the fast cursor "0".

## High Limit

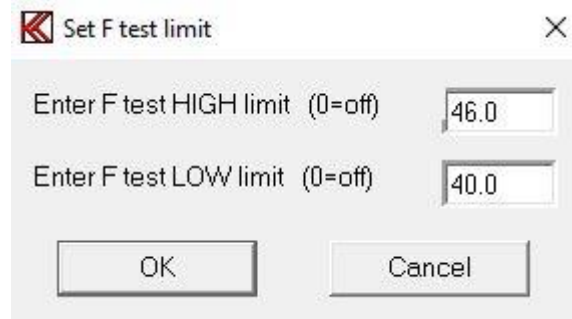
Select the end frequency for resonance test. Move the cursor to the end frequency and set frequency with "High". You can use the fast cursor "0".

## Reset Limits

Reset the resonance test frequency markers and set the test off.

## 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.



A dialog box titled "Set F test limit" with a close button (X) in the top right corner. It contains two input fields: "Enter F test HIGH limit (0=off)" with the value "46.0" and "Enter F test LOW limit (0=off)" with the value "40.0". At the bottom are "OK" and "Cancel" buttons.

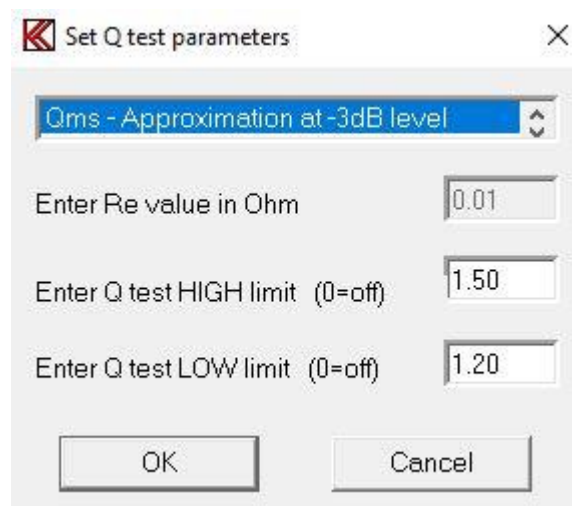
$F = (\text{resonance frequency} / Q)$

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.



A dialog box titled "Set Q test parameters" with a close button (X) in the top right corner. It features a dropdown menu at the top set to "Qms - Approximation at -3dB level". Below are three input fields: "Enter Re value in Ohm" with "0.01", "Enter Q test HIGH limit (0=off)" with "1.50", and "Enter Q test LOW limit (0=off)" with "1.20". "OK" and "Cancel" buttons are at the bottom.

The Q test can be selected as Qms or Qts.

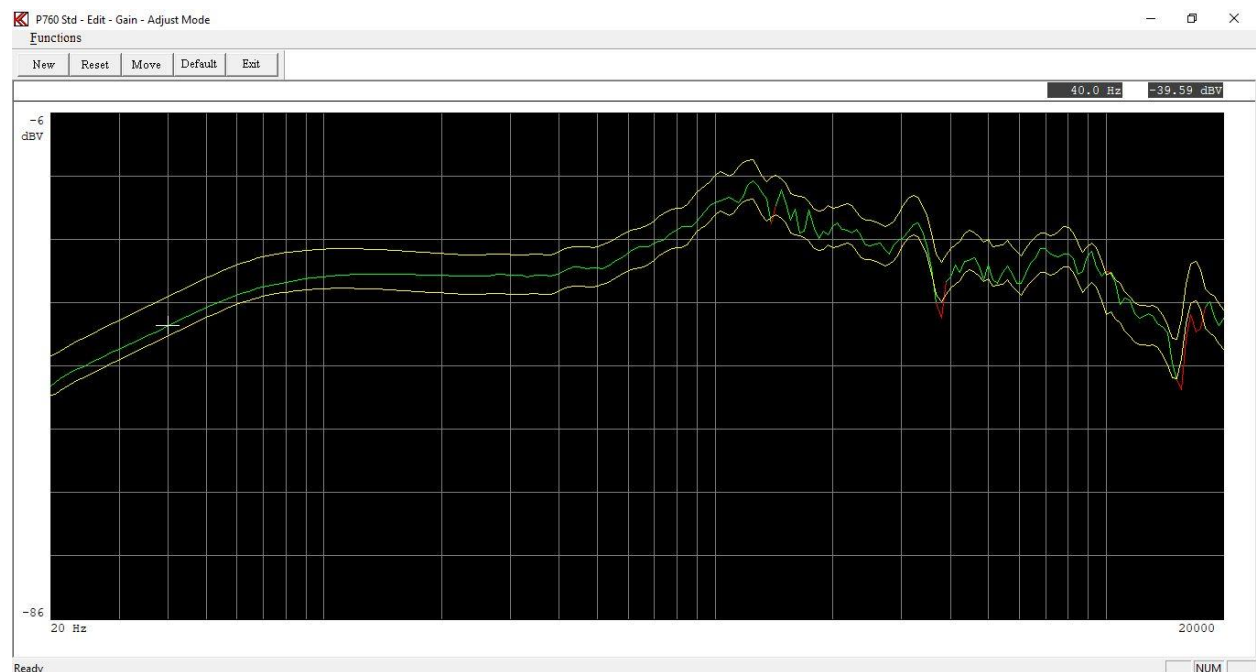
To cope with a fast automatic test, system approximations can be necessary to calculate the exact value of Q the Re, the DC resistance is needed.

To compare a speaker with others – relative measurement an approximation is preferred to be selected.

Following different Q calculations can be selected:

- $Q = Q_{ms}$ .      Approximated level as  $-3\text{dB}$  from resonance frequency.  
 $Q \leq Q_{ms}$  due to the  $R_e$  value.
- $Q = Q_{ms}$ .      Exact value.  $R_e$  must be known and entered to the separate setup.  
 $Q \neq Q_{ms}$  if the  $R_e$  not is constant for every measurement.
- $Q = Q_{ms}$ .      Approximated  $R_e$ .  $R_e = Z \text{ min}$ .  
 $Q \geq Q_{ms}$ . This value is normally  $\geq$  to  $R_e$ . (approximate  $+0$  to  $+10\%$ ).
- $Q = Q_{ts}$ .      Exact value.  $R_e$  must be known and entered to the separate setup.  
 $Q \neq Q_{ts}$  if the  $R_e$  not is constant for every measurement.
- $Q = Q_{ts}$ .      Approximated  $R_e$ .  $R_e = Z \text{ min}$ .  
 $Q \geq Q_{ts}$ . This value is normally  $\geq$  to  $R_e$ . (approximate  $+0$  to  $+10\%$ ).
- $Q = Q_{ms}$ .      Exact value.  $R_e$  is measured as a separate sequence before sweep.
- $Q = Q_{ts}$ .      Exact value.  $R_e$  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.

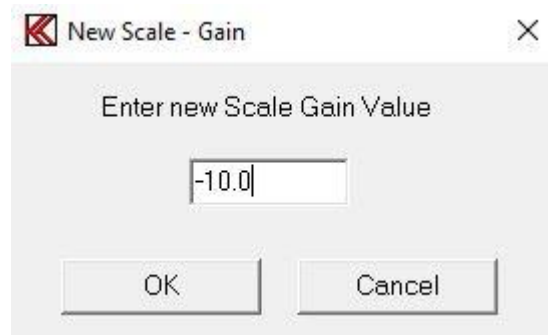
## Gain adjust menu



Functions can be activated by toolbar, by entering Functions pup 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.

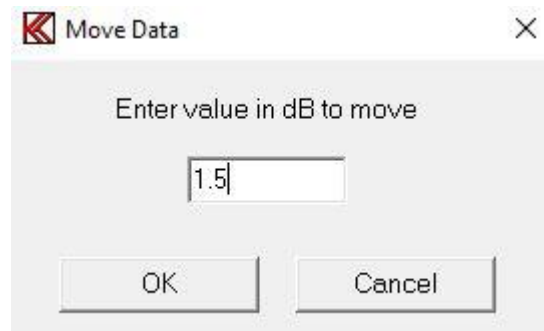


### Reset Value

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.

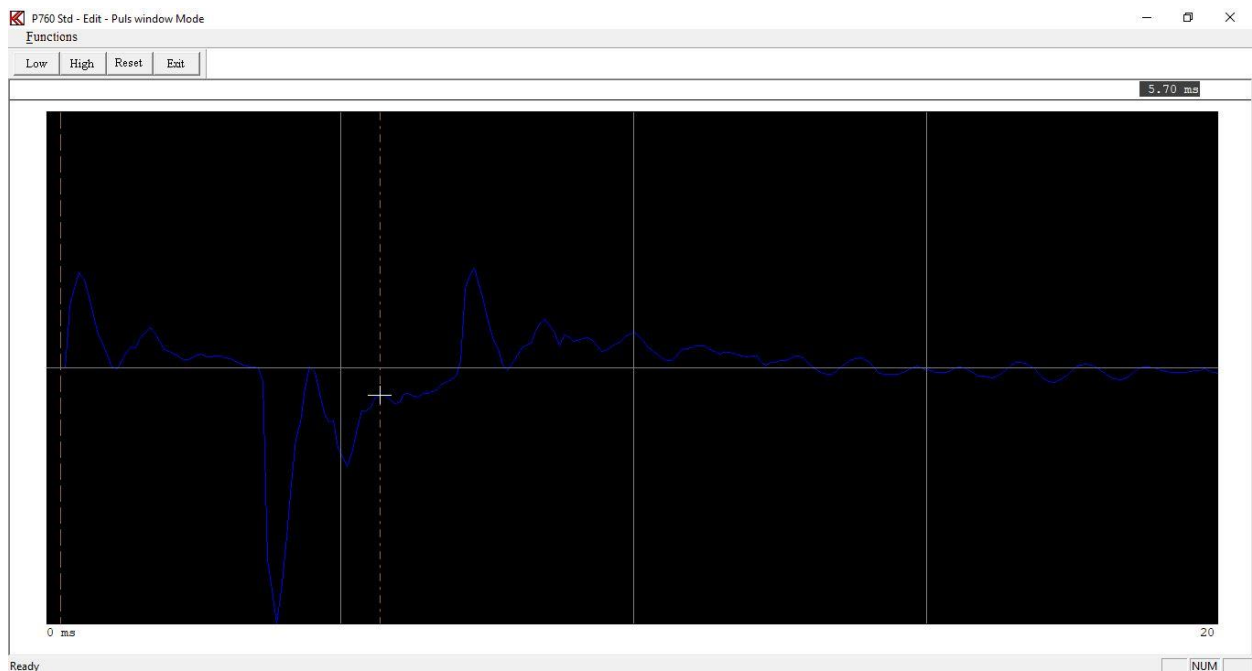
## Polarity window menu

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.



Functions can be activated by toolbar, by entering Functions pop up menu or the short key shown in pop 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 marker for the window. Move the cursor to the end time and set marker with "High". You can use the fast cursor "0".

### **Reset Markers**

Reset the markers and set time lock out window off.





## Run Menu

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.

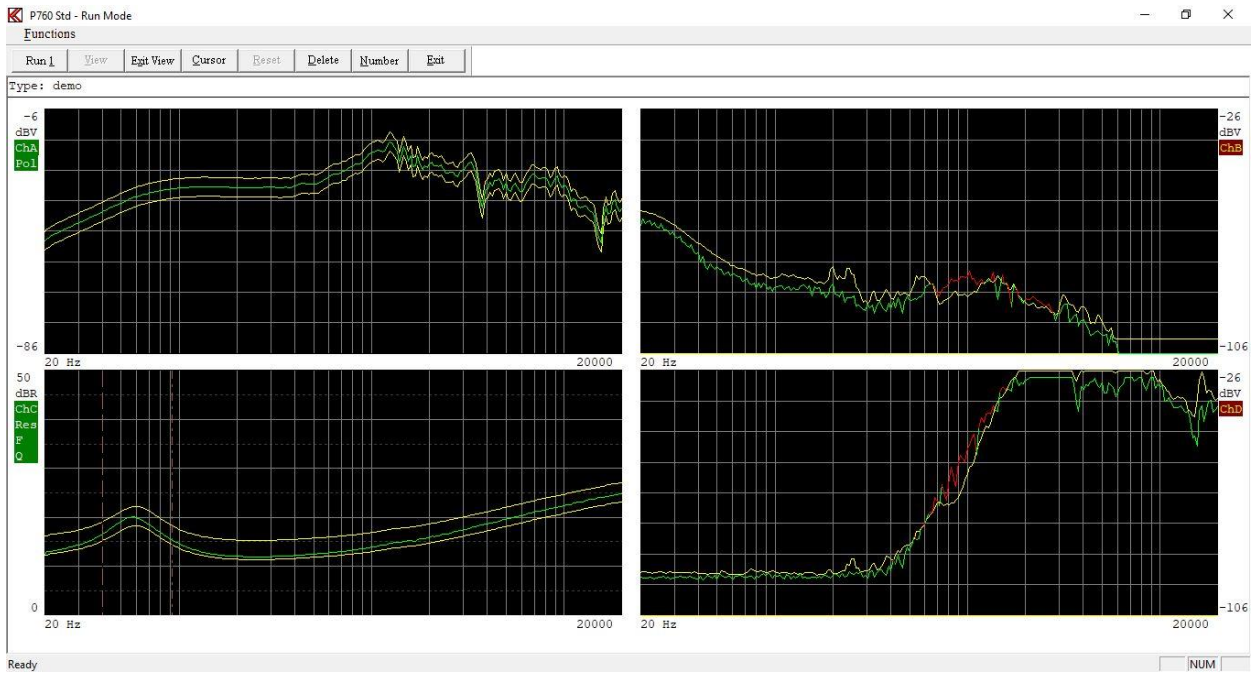


Functions can be activated by toolbar, by entering Functions pub up menu or the short key shown in pup up menu.

Note:

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

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 by click on “Run 1” or “1” on key board. This is only valid if control is external. This is selected in the global setup.

## View

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

## Exit View

Exit View and enter the text result mode.

## **Cursor**

Activate Cursor submenu.

## **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.

## **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.

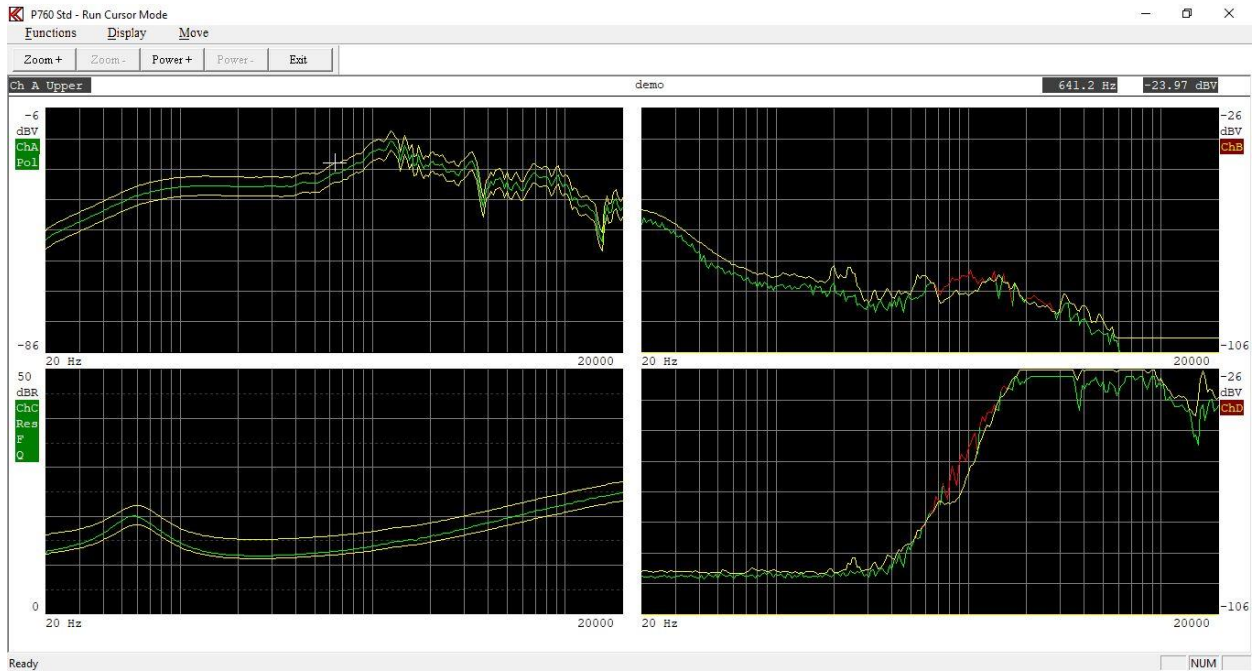
## **Invert Gfx**

Invert Gfx function invert the graph display background is toggled from black to white and so on.

The color code of curves is the same expect white curves are converted to black and black to white. This can be useful when a print is used.

## 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 pop up menu or the short key shown in pop 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 -**

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

### **Display**

As Zoom + and Zoom -.

### **Move Fast**

Select fast cursor. 10 time faster.

### **Move Normal**

Select normal cursor. Disable Fast cursor.

**Key “+”**

Select active channel by use of cursor.

**Key “←”**

Move cursor left.

**Key “→”**

Move cursor right.

**Key “↑”**

Move cursor up to next curve.

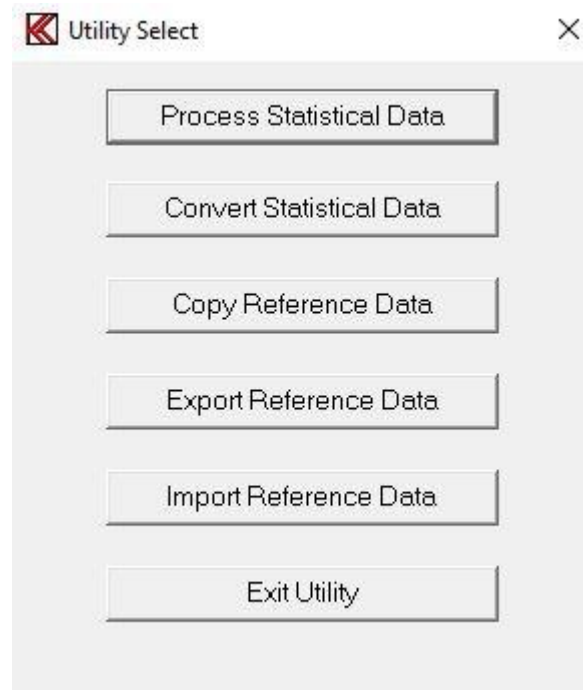
**Key “↓”**

Move cursor down to next curve.



## Utilities

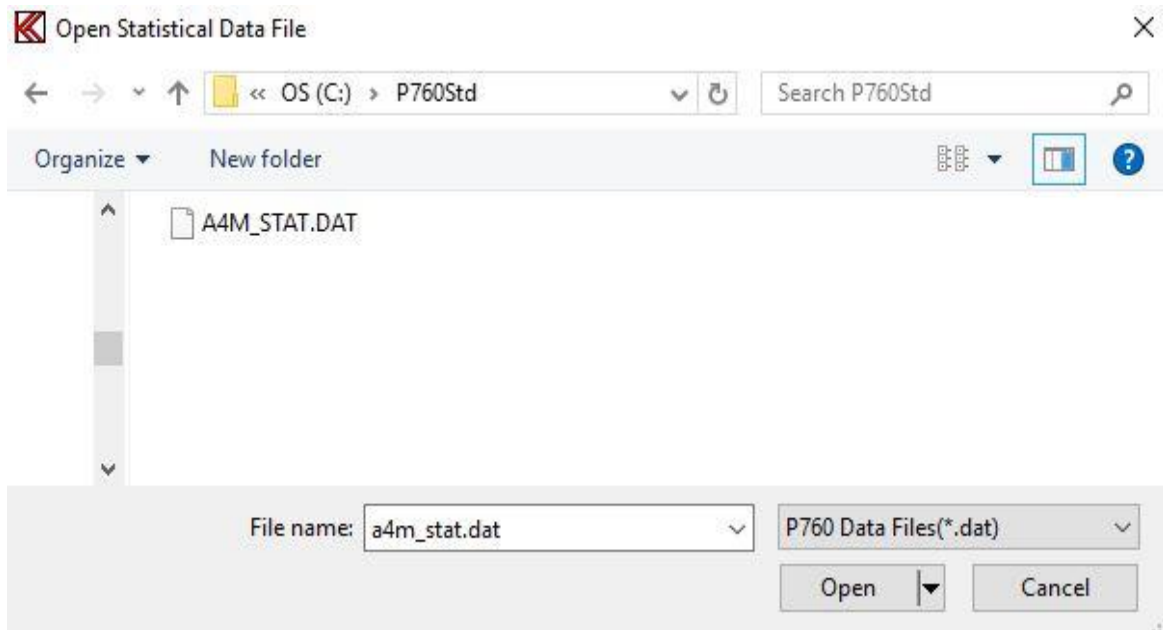
For better to manipulate with the reference and measuring data a collection of utilities are present under the utility menu.



- 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 test 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.

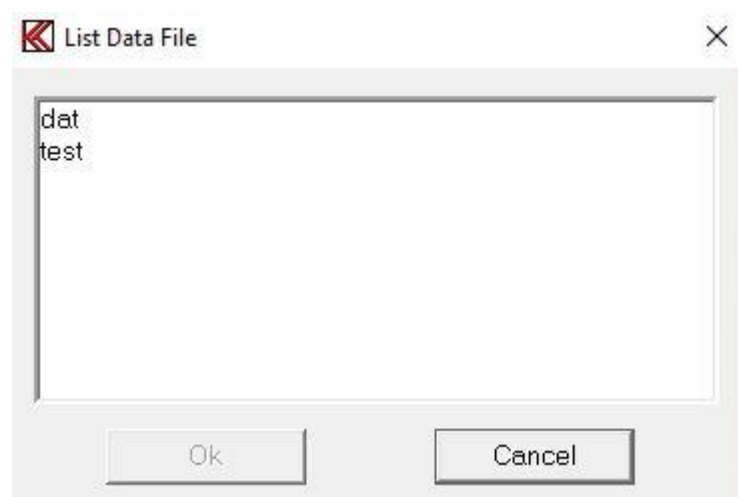
## Process Statistical Data Utility

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" is opened, a list of all different type names stored in the selected file is displayed.

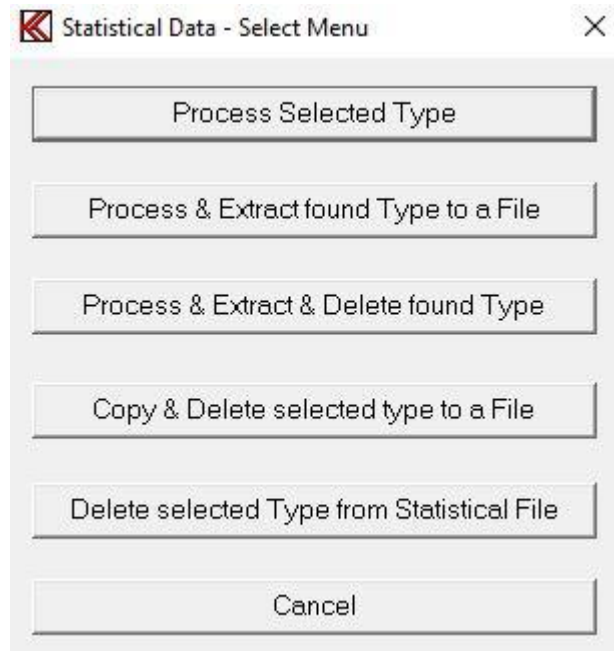
In this case only two types are in the A4M\_STAT.DAT file.



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 big for the 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.

Utility - Record Select

Number selection

Start: 0000000000000000

End: 9999999999999999

Max. count: 512000

Date selection

Start: 0000000000

End: 1999999999

Max. count: 512000

User Code selection

Start:

End:

Max. count:

Test results

☒ Approved ☒ Rejected

User test

☐ Approved ☐ Rejected

Select field

☐ Number field Only

Ok Cancel

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 64000.

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 64000.

### User Code selection (optional)

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.

## User test (Optional)

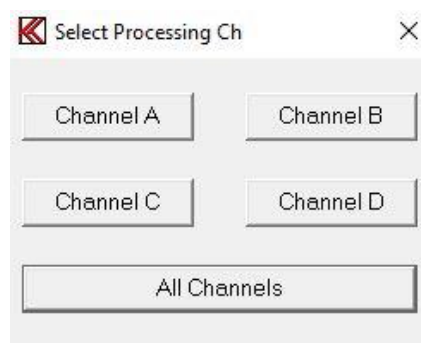
It is possible to process the data by selecting the user test results, results forced by operator. Selection can be approved, rejected or all.

Note: if the data do not contain this information, as older format, the default is all.

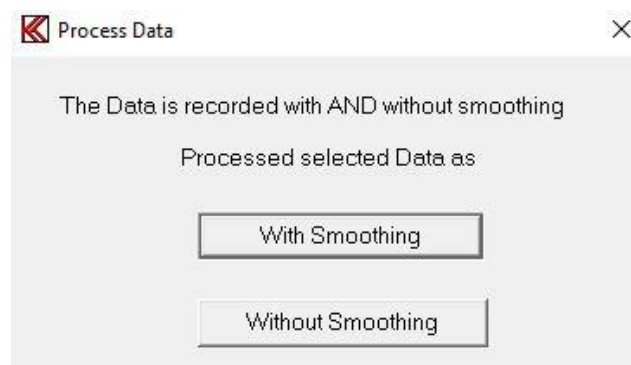
## Select field

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”.

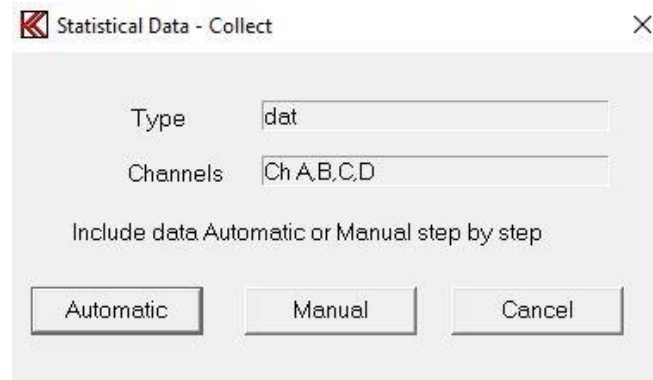


If you in the “Input channel setup” menu have chosen the data smoothing function for at least one of the active channels, you will be presented for the following screen picture, where you can select either to present the data as recorded with smoothing or as recorded non-smoothened. If no smoothing is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



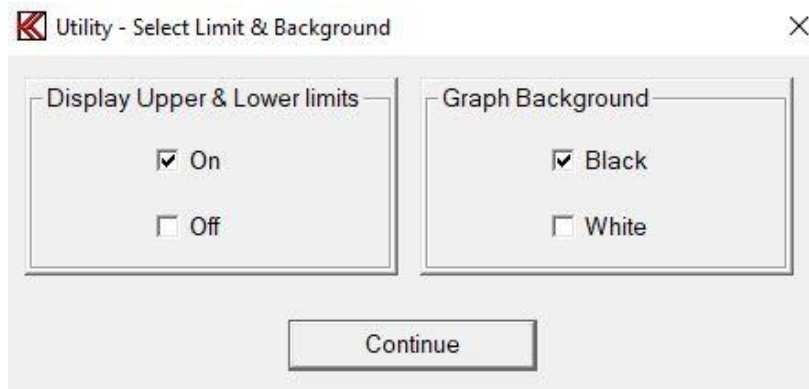
If all stored data have to be processed by the criteria selected at “Record select” the automatic function must be selected. If you want to process the “good” or only the best or maybe only the “bad” data records select instead the manual mode. In manual mode the date code and serial

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.  
Before displaying data graph background must be selected.



By entering manual mode you can select to display the upper and lower limits together with the data or make displays without any limits. Then you are asked to accept the current data or skip the record.

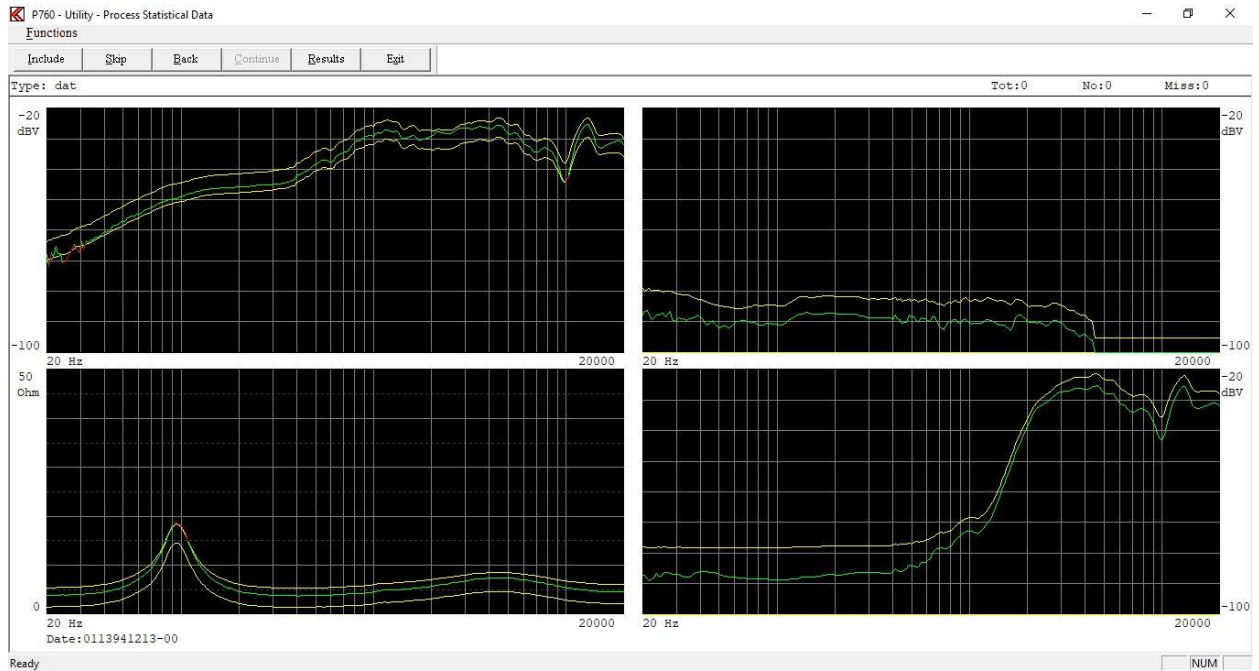
In the bottom line a date code and a serial number are displayed. The date is the actual date code for the record. If the record is stored in an old format, the two last numbers is a sequential number if more than one record have the same date code, else the two last numbers is seconds.

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 pop up menu or the short key shown in pop up menu.

### **Include**

Include current measurement to statistical data.

### **Skip**

Skip current measurement and go to next record.

### **Back**

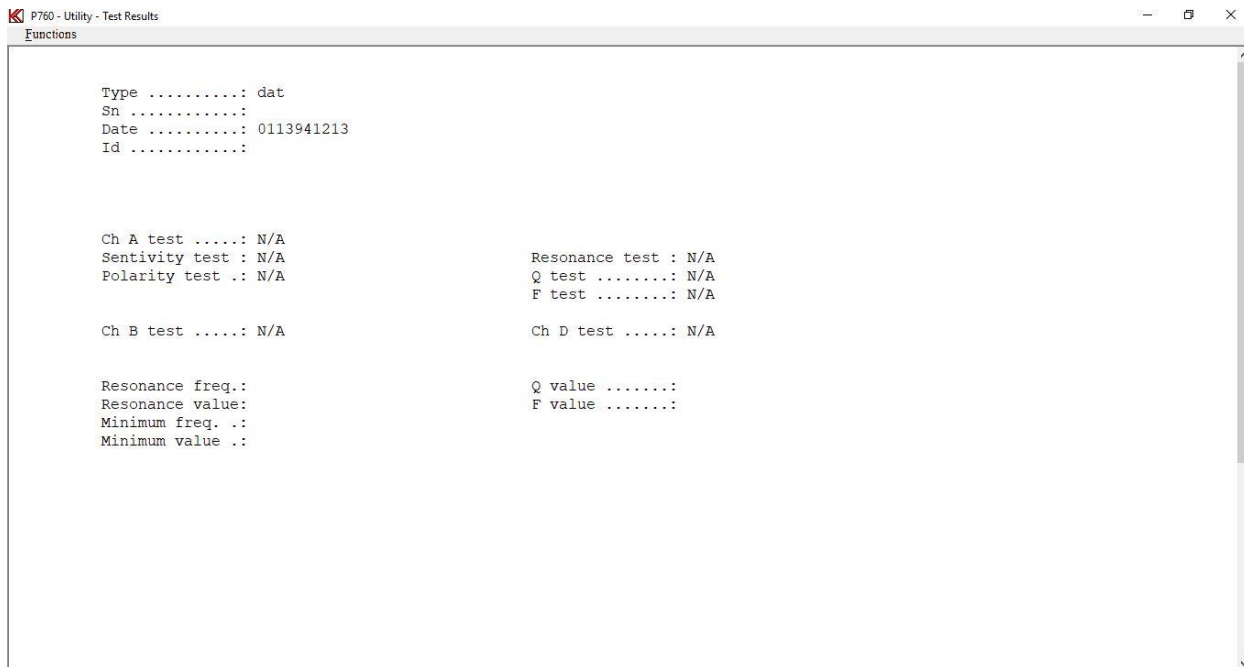
Step one record back. It is possible to step up 20 records back due to all 20 results as well as displays are stored temporally in a file.

### **Continue**

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

### **Results**

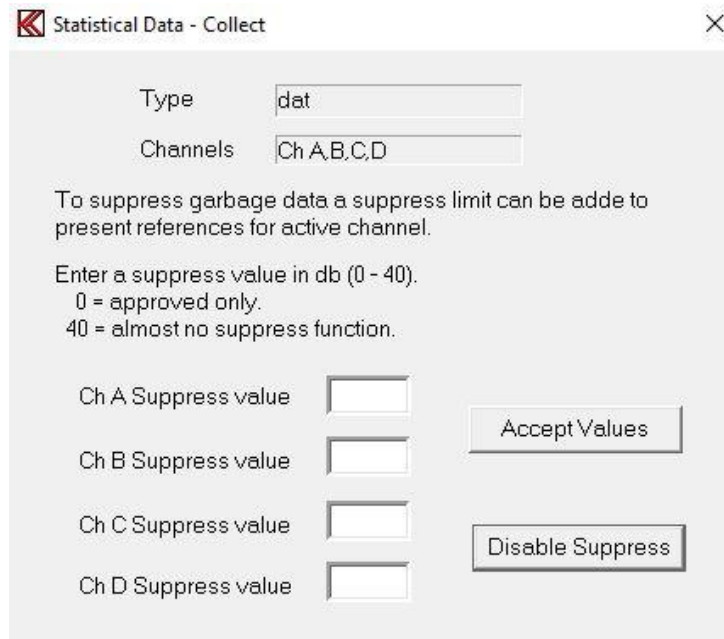
The actual test results can be displayed. This only if the data is stored in the new format.



## Automatic mode

If “auto” mode is selected and a valid set of upper and lower limits are found a suppress function appears.

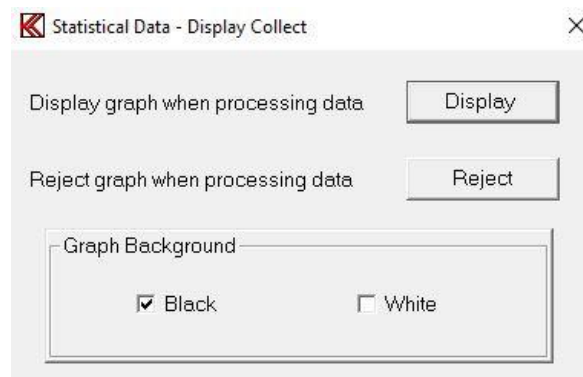
Note: if no valid limits are found this suppress function do not appear.



The dialog box titled "Statistical Data - Collect" has a close button (X) in the top right corner. It contains the following fields and controls:

- Type:** A text field containing "dat".
- Channels:** A text field containing "Ch A,B,C,D".
- Instructions:** "To suppress garbage data a suppress limit can be added to present references for active channel." and "Enter a suppress value in db (0 - 40). 0 = approved only. 40 = almost no suppress function."
- Suppress Value Fields:** Four text fields labeled "Ch A Suppress value", "Ch B Suppress value", "Ch C Suppress value", and "Ch D Suppress value", each with a small numeric keypad icon.
- Buttons:** "Accept Values" and "Disable Suppress".

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.



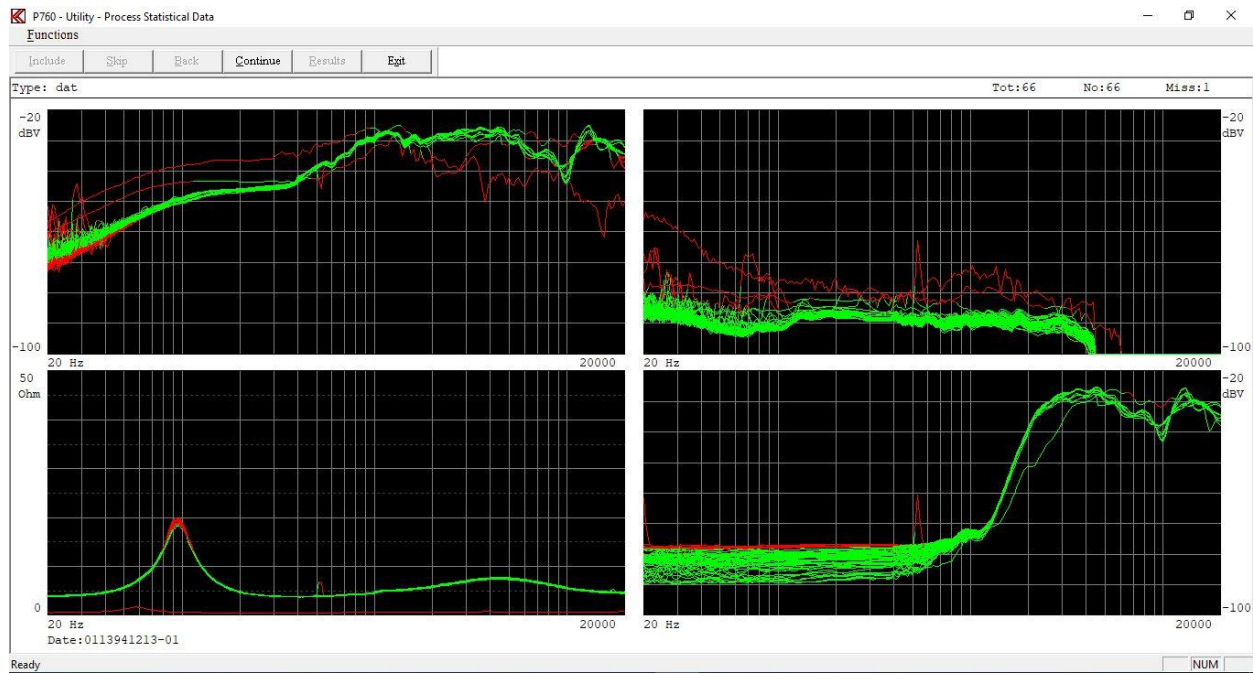
The dialog box titled "Statistical Data - Display Collect" has a close button (X) in the top right corner. It contains the following controls:

- Display graph when processing data:** A button labeled "Display".
- Reject graph when processing data:** A button labeled "Reject".
- Graph Background:** A section with two radio buttons: "Black" (selected) and "White".

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. This speeds up the process considerably if many data sets are present.

The Graph curve background can be selected as black or white.

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.



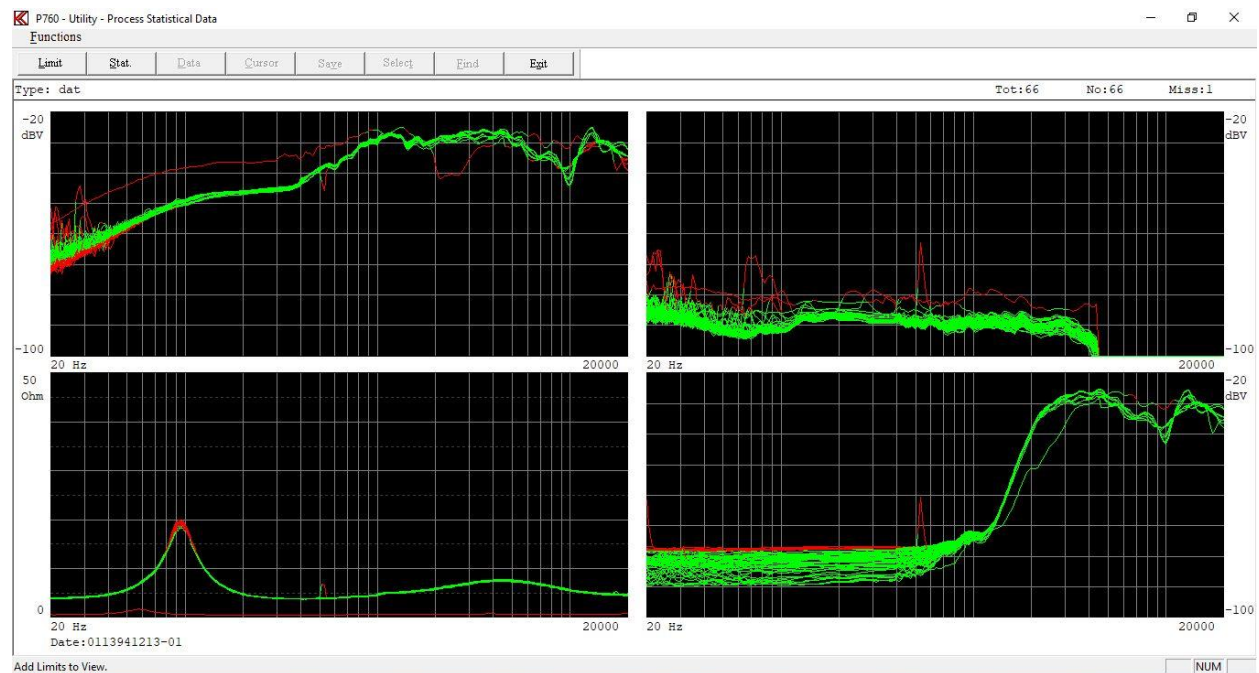
Functions can be activated by toolbar, by entering Functions pup up menu or the short key shown in pup up menu.

### Continue

Continue to process displayed data.



## Continue



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

### Limit

Add limit to display.

### Stat

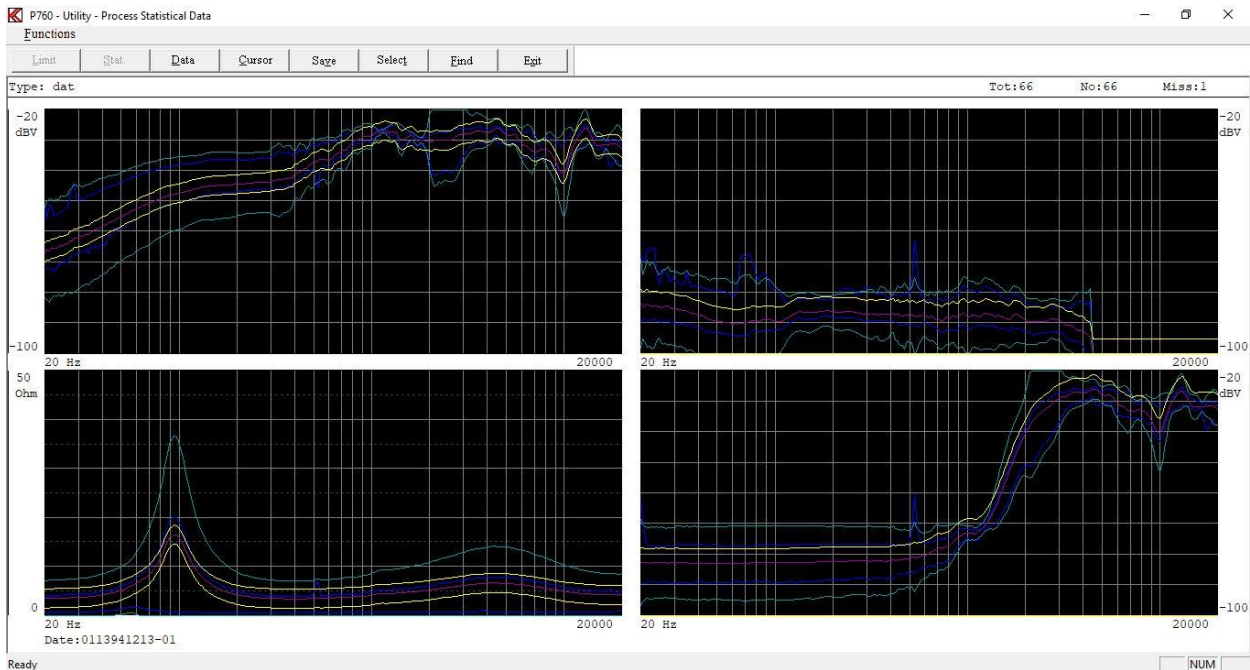
Enable Statistical menu Mode 1.

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.

## Statistical mode 1



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

### Data

Go back to previous menu.

### Cursor

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.

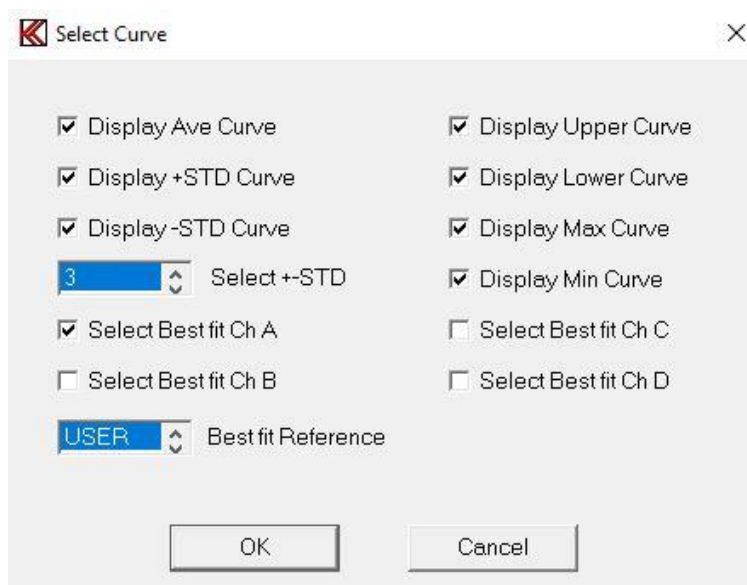
## Find

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.

## Submenus:

### 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

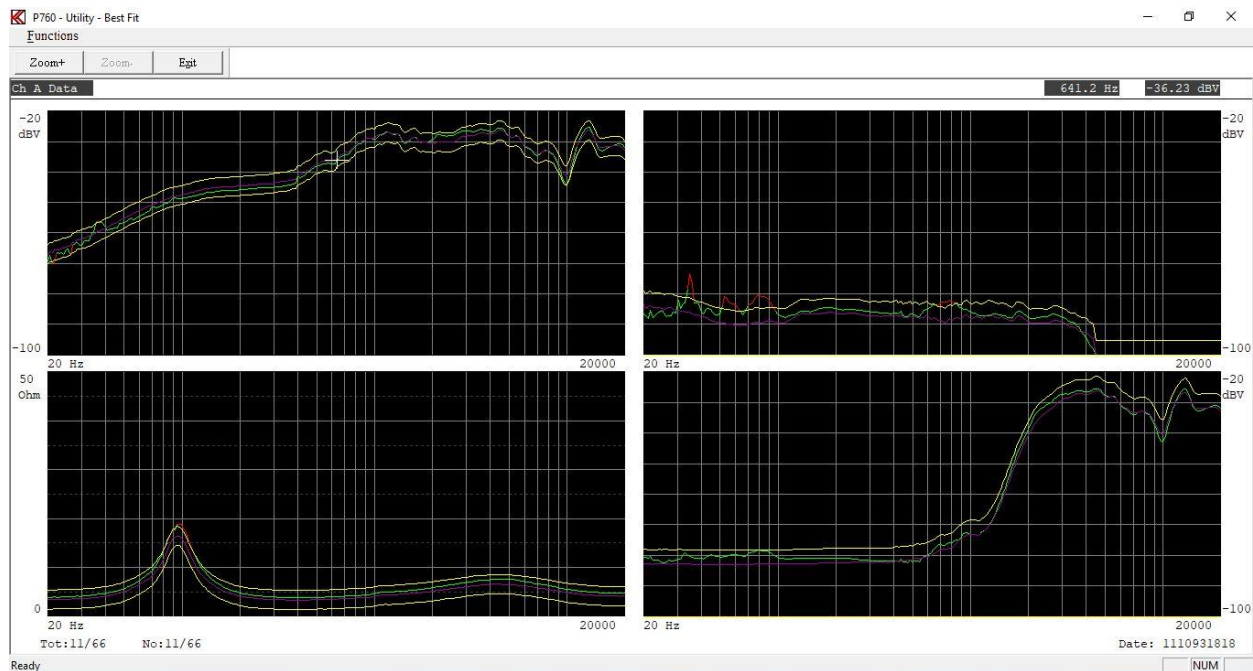
If more than 1 set of data are present on a Display Channel selection of the data set can be selected.

### Select Best Fit

One curve is 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.



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

### Fast

Fast Cursor is 10 times faster than normal.

### Normal

Disable the cursor.

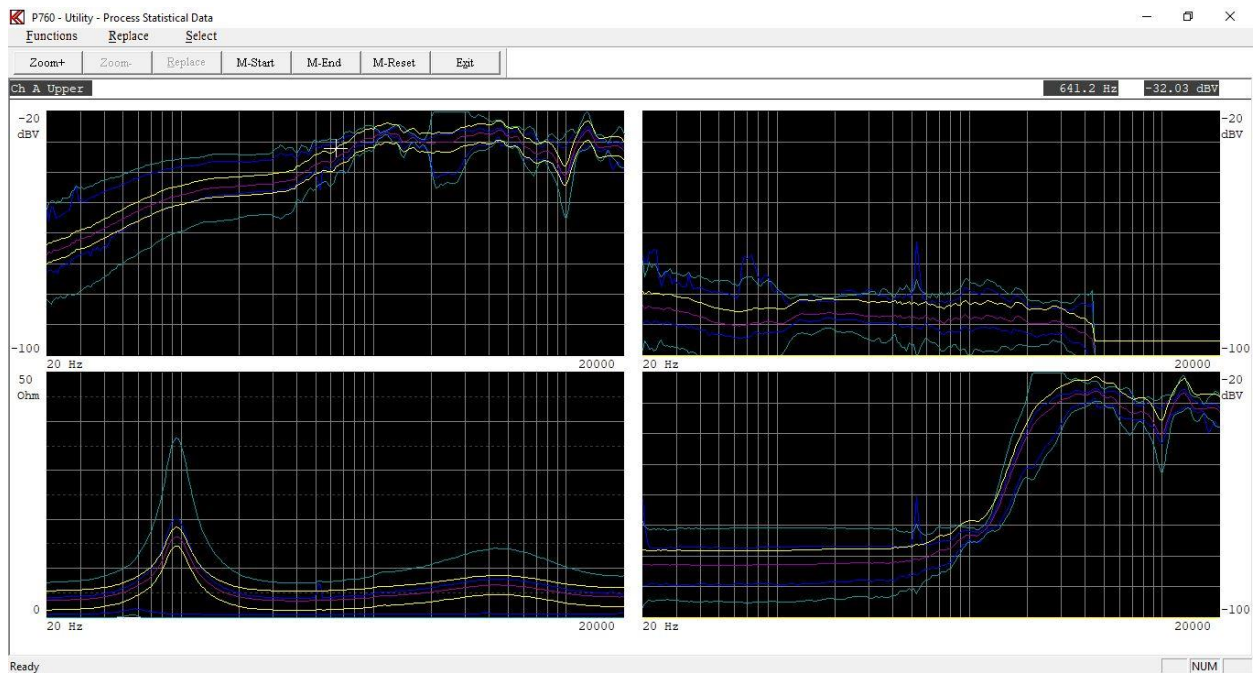
### Zoom In

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

### Zoom Out

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

## Statistical mode 2



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

### Fast

Fast Cursor is 10 times faster than normal.

### Normal

Disable the cursor.

### Zoom In

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

### Zoom Out

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

### Replace

Replace selected limit/curve with listed data.

### M-Start

Set start marker for part replacement.

### 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.

### M-Reset

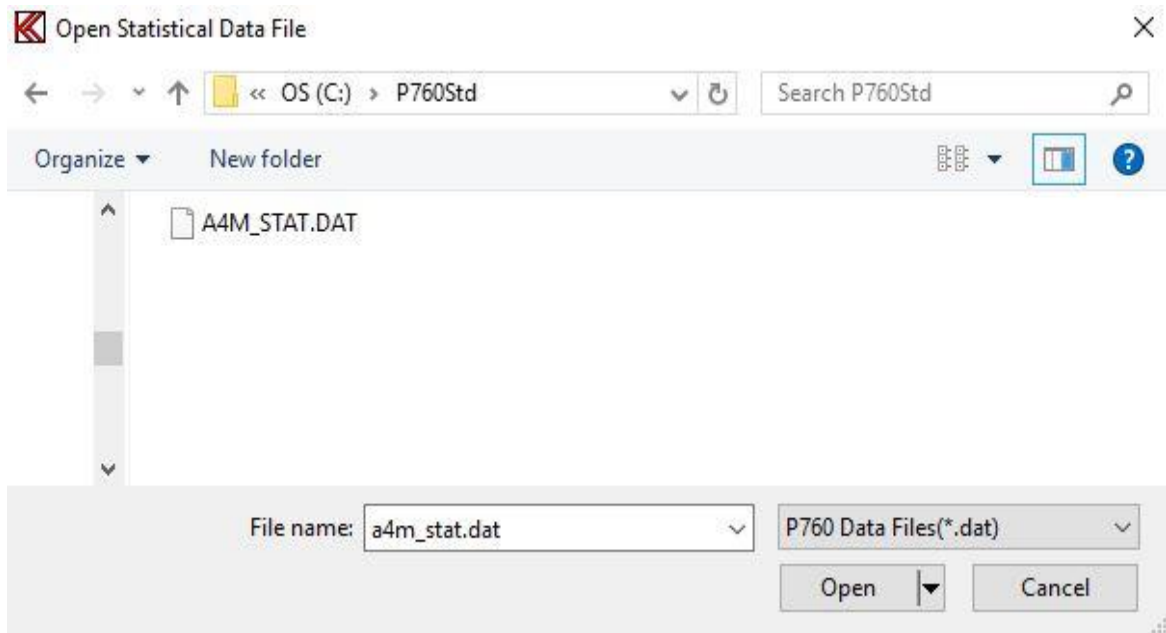
Reset markers

Note:

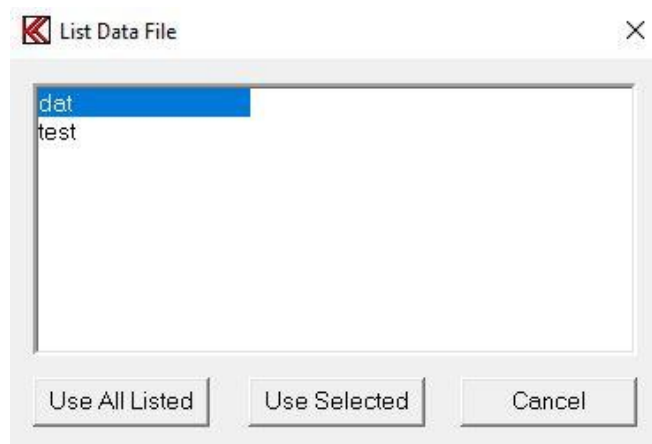
If the scale of the display is changed from the standard setup and you want to make use of a different scale setup, you have to change the display scale before you store the data in the A4M\_STAT.DAT file. It is not possible to change the scale later on. The presentation is made exactly as it was recorded.

## Convert Statistical Data

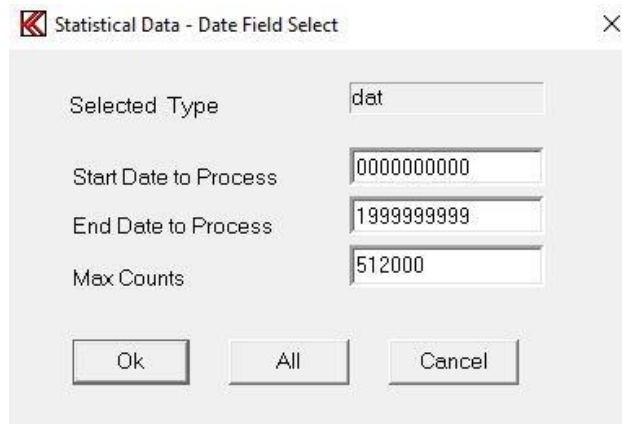
This function converts data types stored a DAT file, default file name is A4M\_STAT.DAT, to plain ASCII.



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



Statistical Data - Date Field Select

Selected Type:

Start Date to Process:

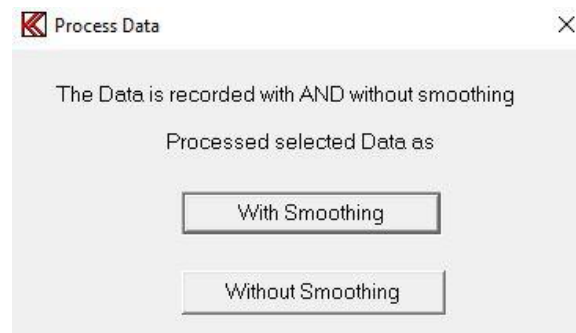
End Date to Process:

Max Counts:

Ok All Cancel

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 smoothing function).



Process Data

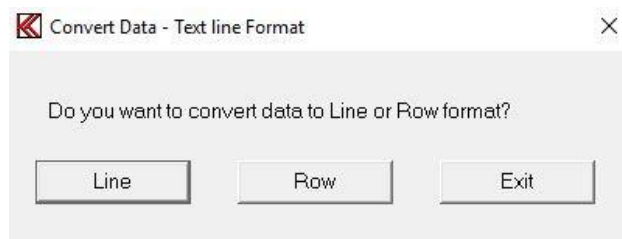
The Data is recorded with AND without smoothing

Processed selected Data as

With Smoothing

Without Smoothing

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.



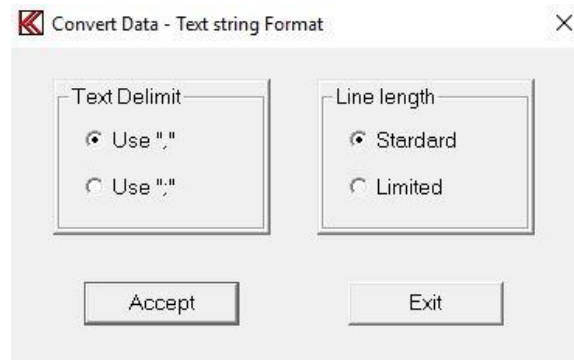
Convert Data - Text line Format

Do you want to convert data to Line or Row format?

Line Row Exit

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 characters long.

In row mode:

The number of rows is maximal 250. Numbers of lines are  $8 + \text{channels} * (\text{points} + 3)$ .

### Line Length Limited:

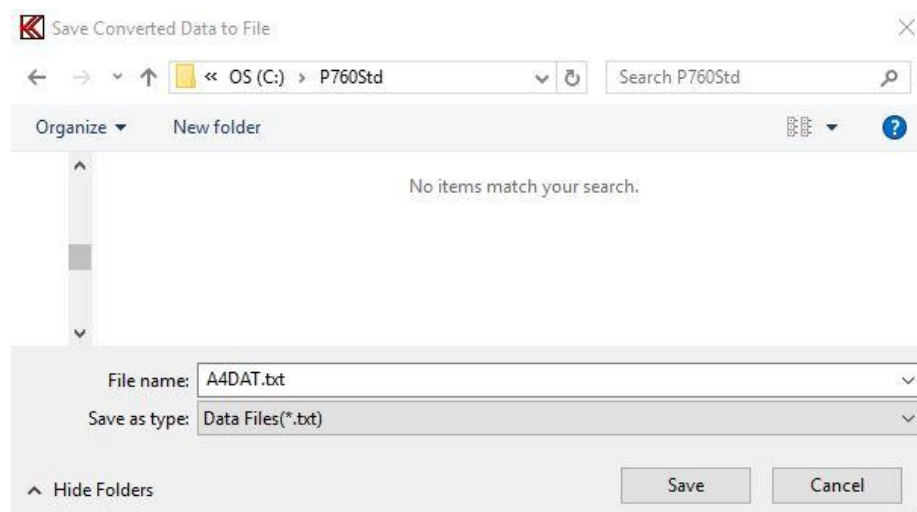
In line mode:

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

In row mode:

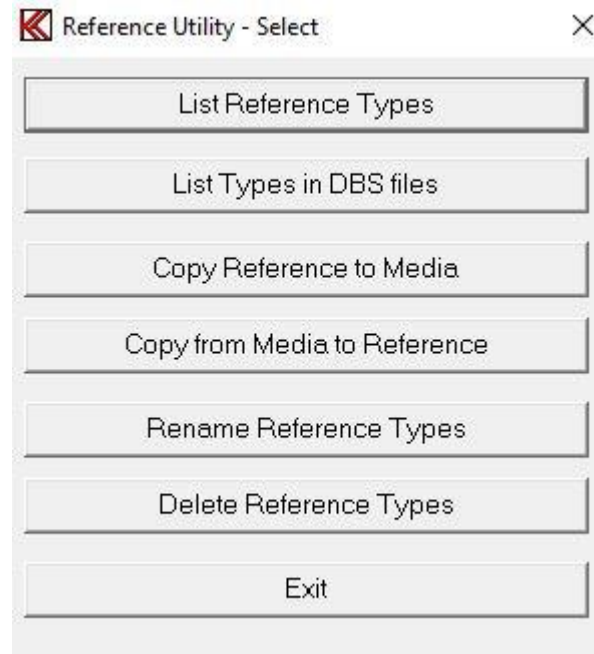
Number of row is maximal 125. Numbers of lines are  $8 + \text{channels} * (\text{points} + 3)$ .

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



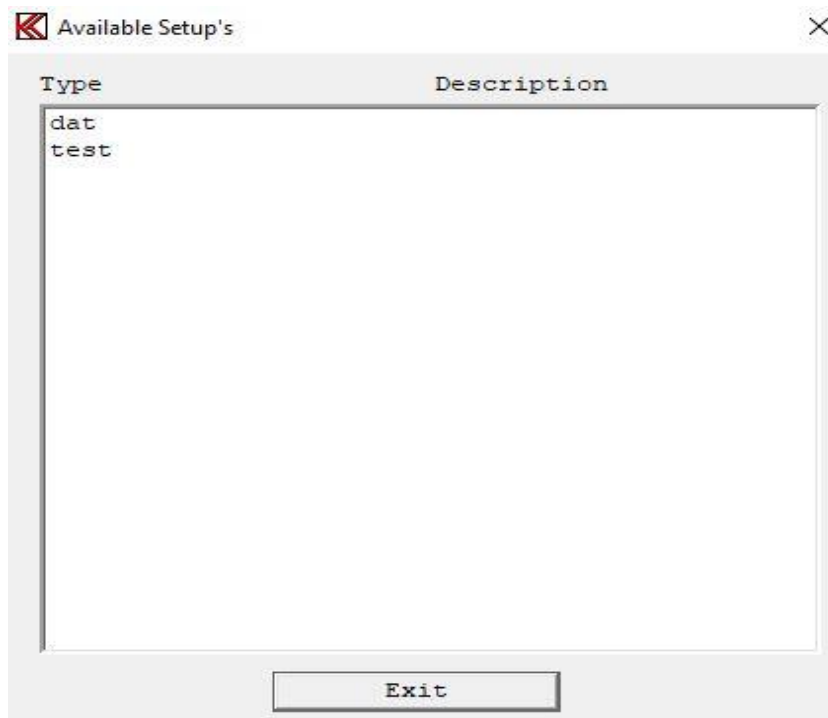
## Copy Reference Data

This group of utilities contains the most functions needed to copy single record(s) existing in the main reference database to or from another disk. The files, which you are copying, have the extension DBS for setup files and DBC for reference curve file.



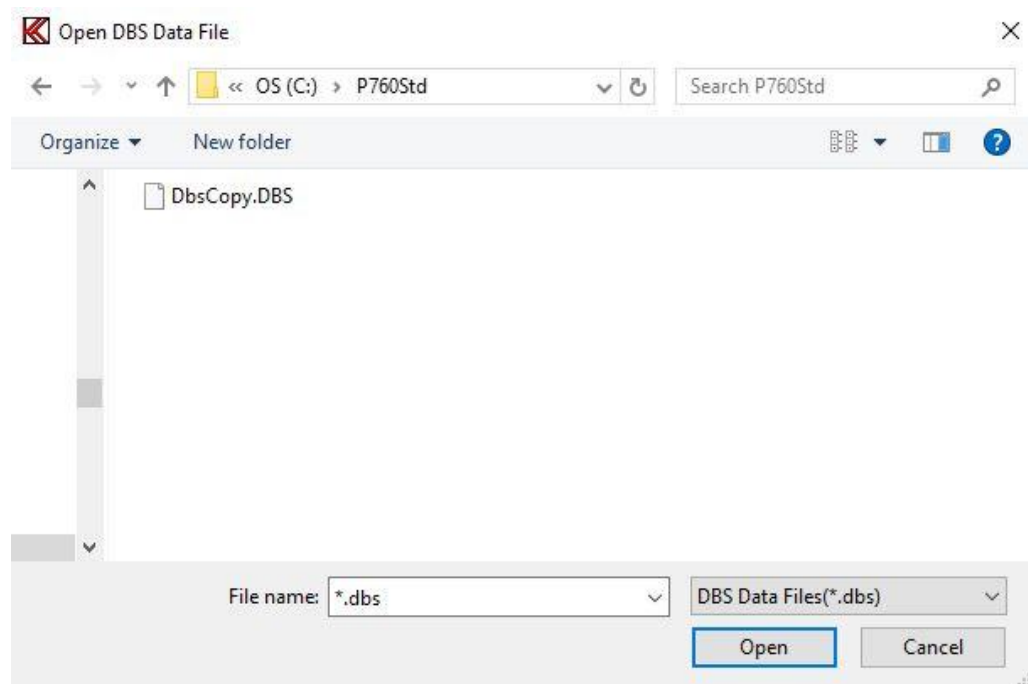
## List Reference Types

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

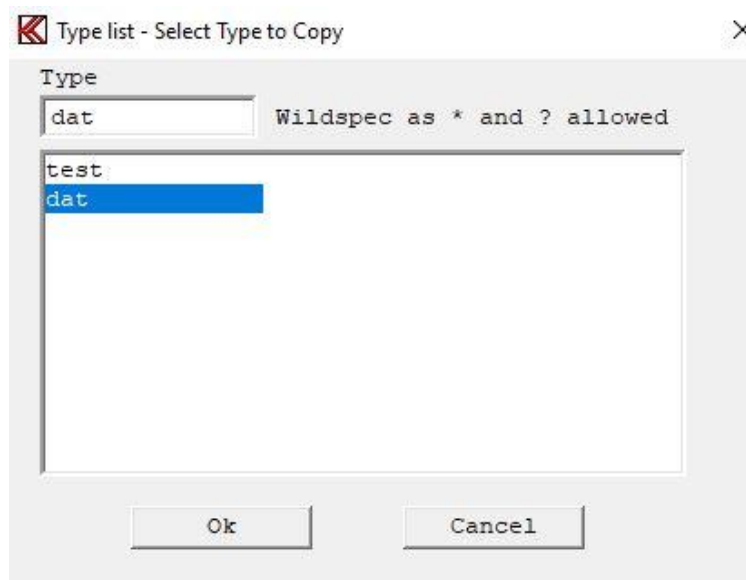
It is possible to copy a single or a group of files to the DBS file by using “wildcat” characters. To make a list of types containing a particular DBS file use this function.



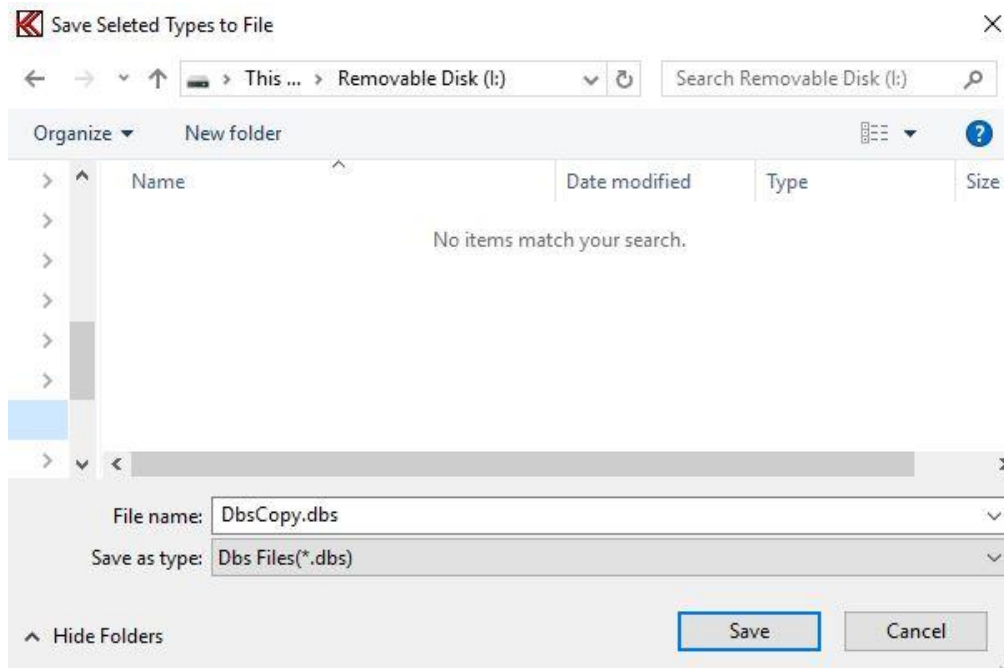
To list types in DBS file select disk, path and file name. Here a list contains of the file “DbsCopy.dbs” with only one type “test”.

## Copy Reference to Disk

To copy a reference type or types to a disk media use this function. With this function a proper reference type name must be entered. “Wildcat” characters such as “\*” and “?” are allowed. An asterisk (\*) has the same function as in DOS. 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 “dat” is selected to copy to a DBS file. DBS file name and destination must be defined.

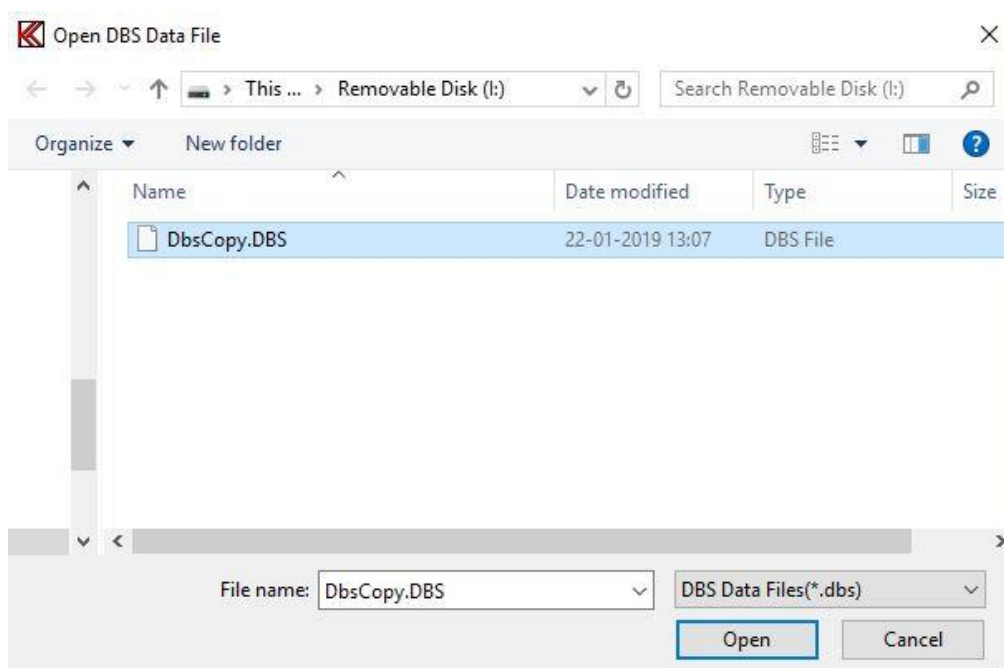


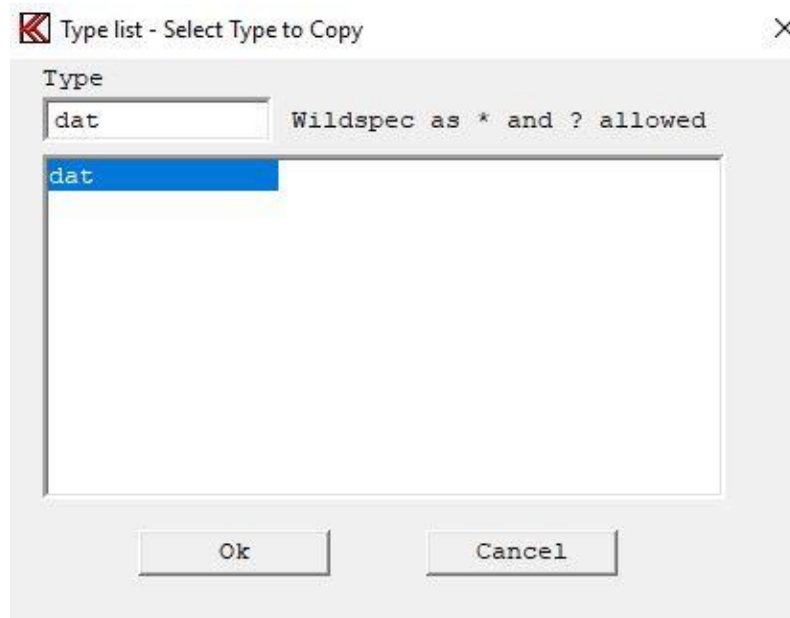
## Copy from Disk to Reference

To copy a reference type, 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 “dat”.

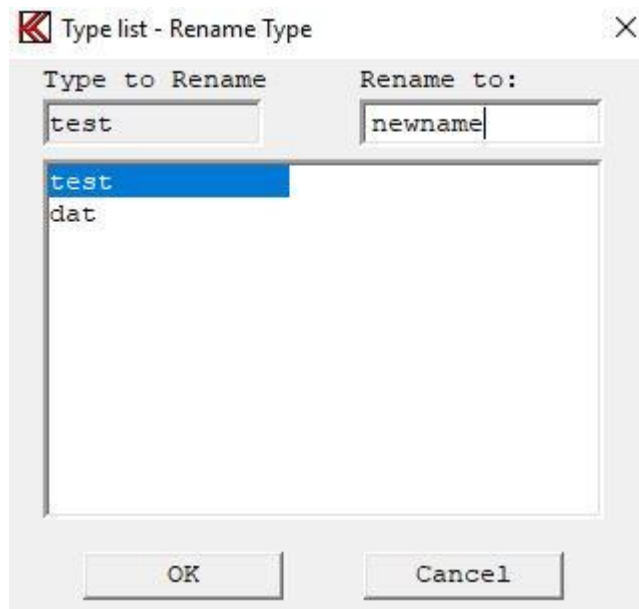


If the type name you want to copy to main reference structure already exist the system ask you to overwrite this type in the main reference or to exit the menu.

### **Rename Reference Types**

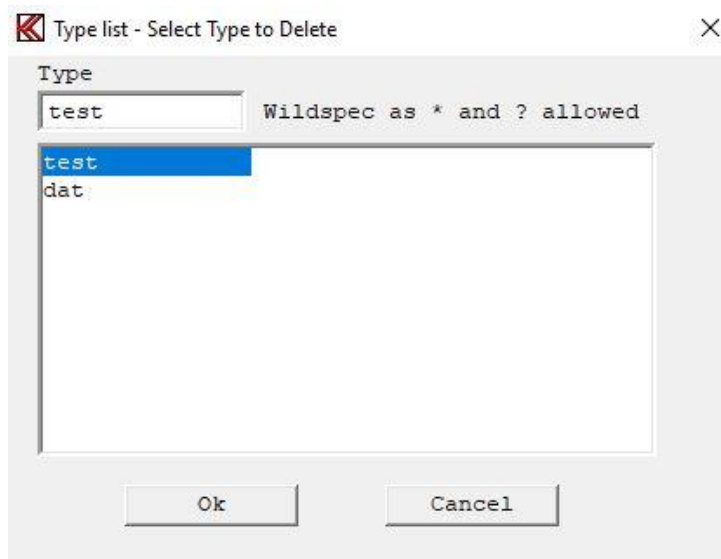
This function renames a type name in the reference database.

In this example the type “test” will be renamed to type “newname”.



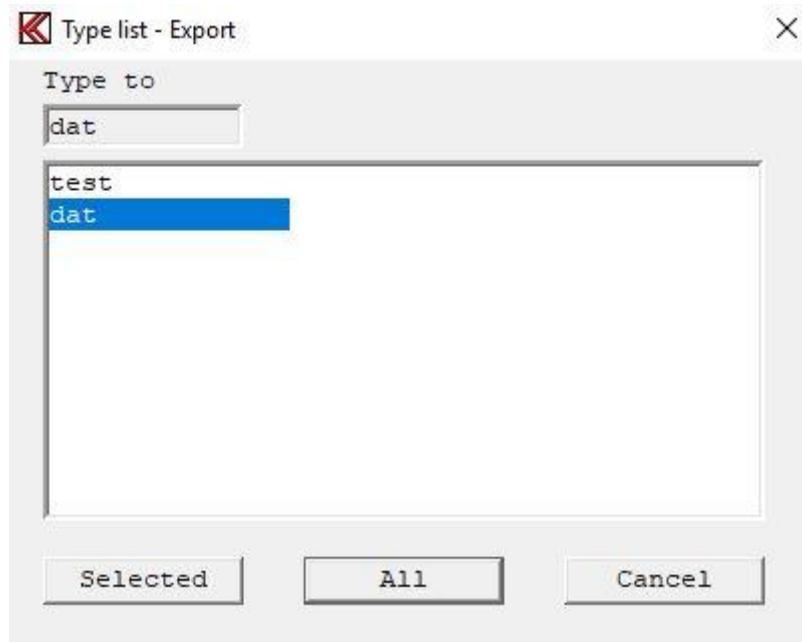
## Delete Reference Types

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: 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.



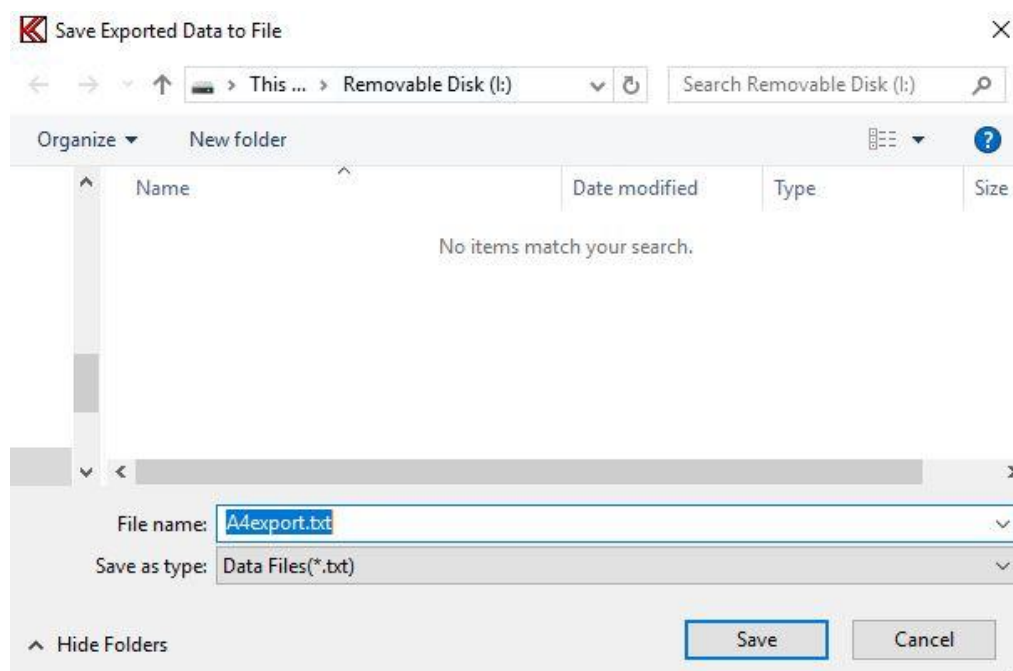
### **Selected**

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

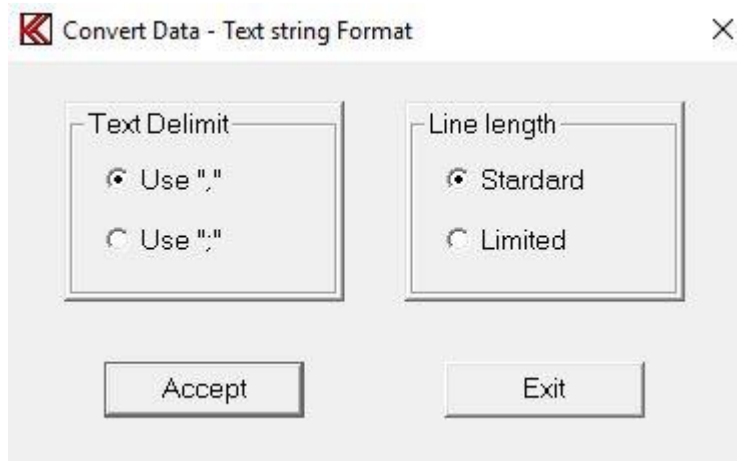
### **All**

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.

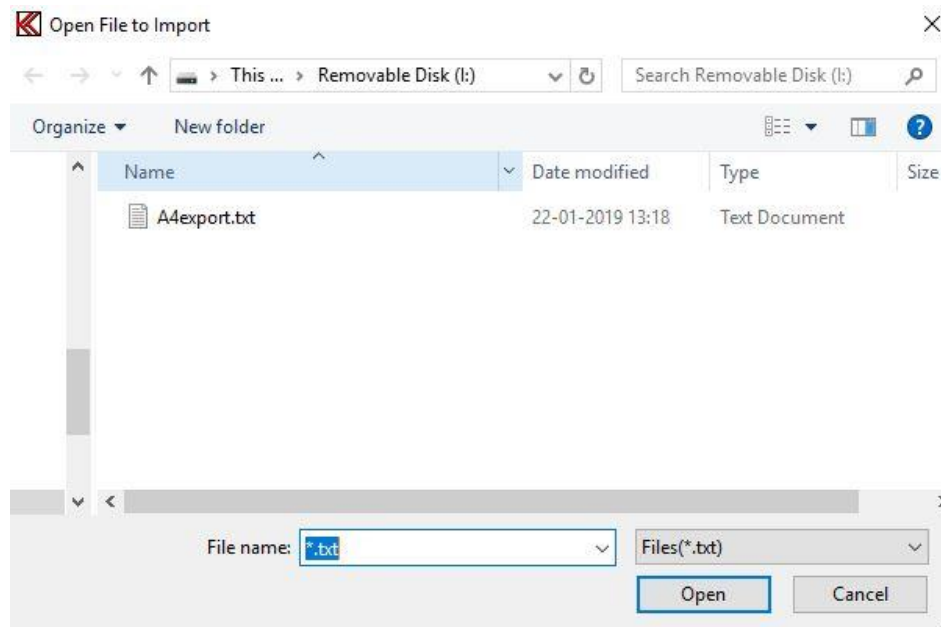
### **Line Length Limited**

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

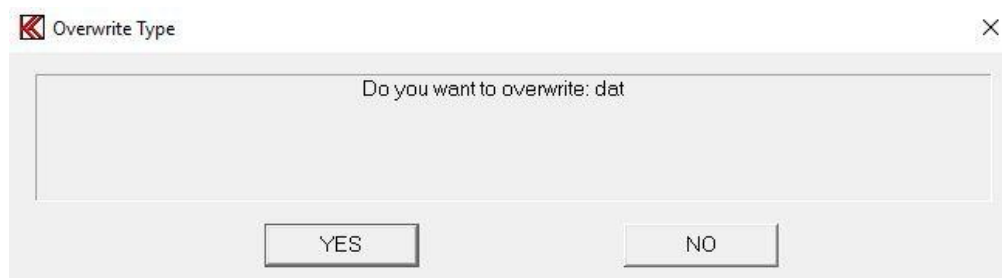


## Import Reference Data

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 change does 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.

### Note

If more than ONE setup type are present in the file that is selected for import ONLY the first setup is imported.

If the file A4EXPORT.TXT was exported with all types import function only import the first found type. To import the rest of saved types each setup must be saved in a separate text file.



## Appendix A

### Keyboard layout "Edit Mode"

Following commands are allowed in "Edit Mode":

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

C,S,T,R,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.

H,P is utility functions:

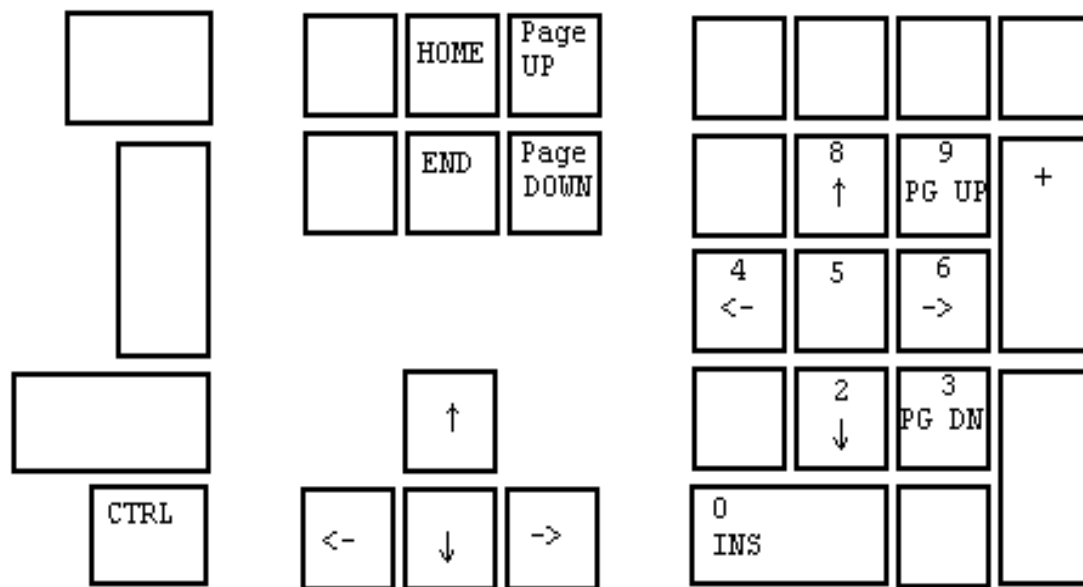
- H, Display compensations curve if present.
- P, Set power on output at cursor selected frequency.

←,→,↑,↓,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.

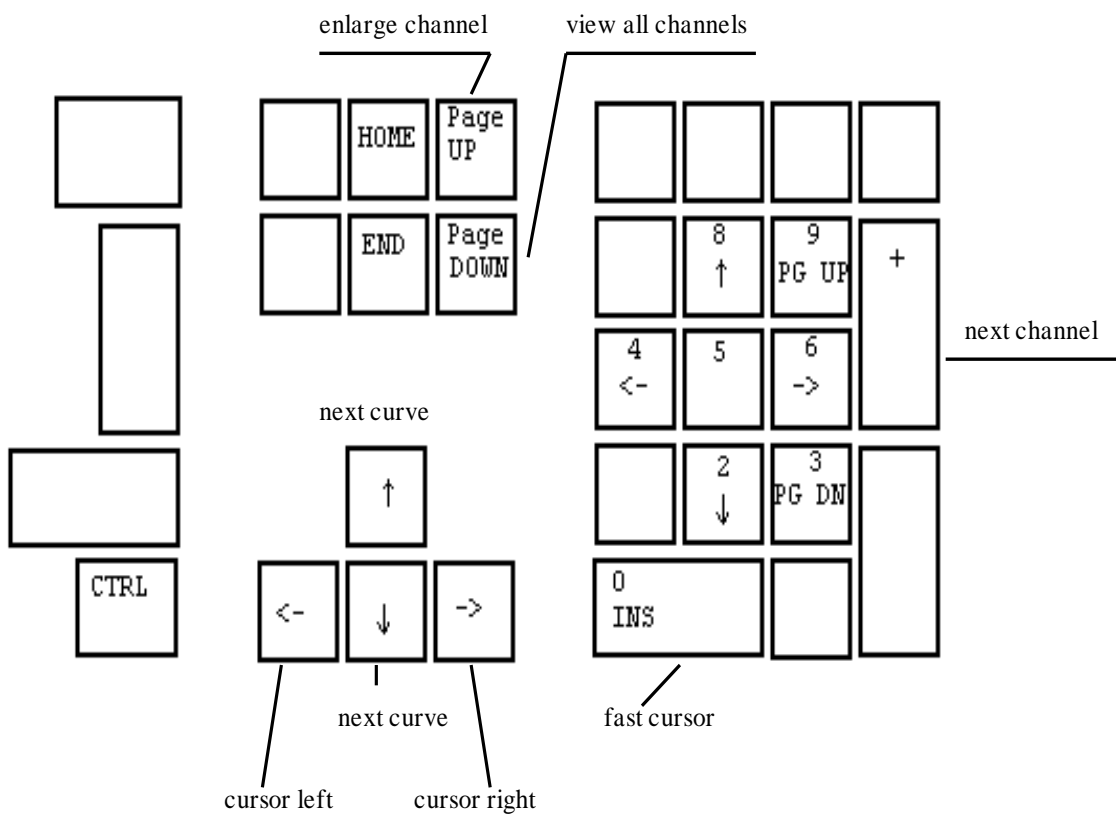
4,6,8,2,9,3,5, CTL(←,→,Page Down,End,Home) are write curve and pixel functions.

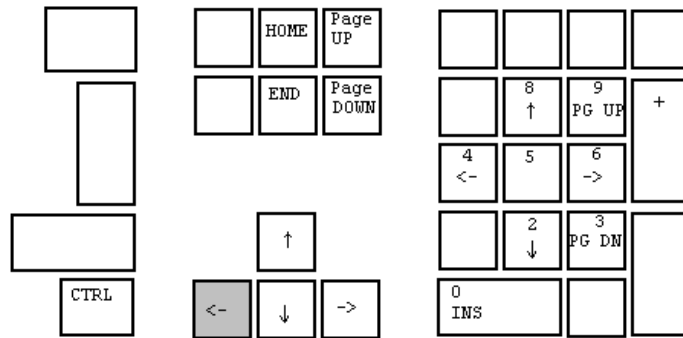
- 4, Write pixel's to left.
- 6, Write pixel's to right.
- 8, Write pixel's up.
- 2, Write pixel's down.
- 9, Move & write whole curve pixel's up.
- 3, Move & write whole curve pixel's down.
- 5, Write a straight line between two points.
- CTL ←, Write curve left, keep envelope.
- CTL →, Write curve 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. 40 dB down.



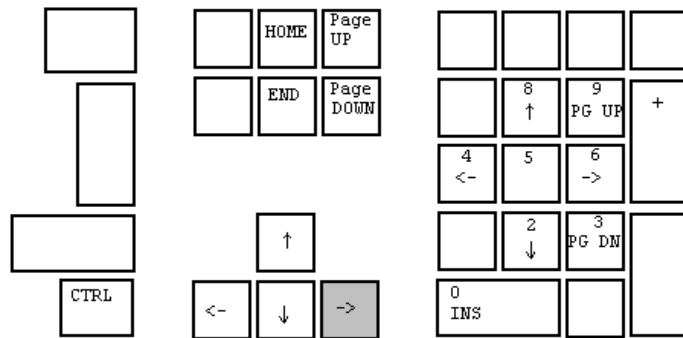
Common edit and write keyboard layout

# Cursor, Select & Display Functions

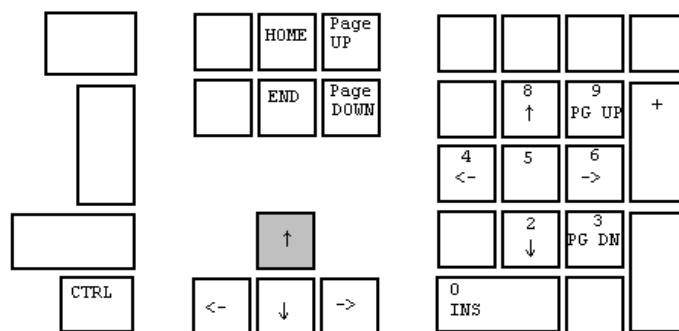




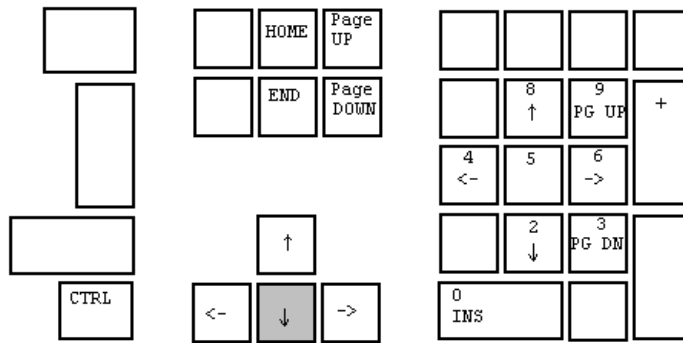
Move cursor left



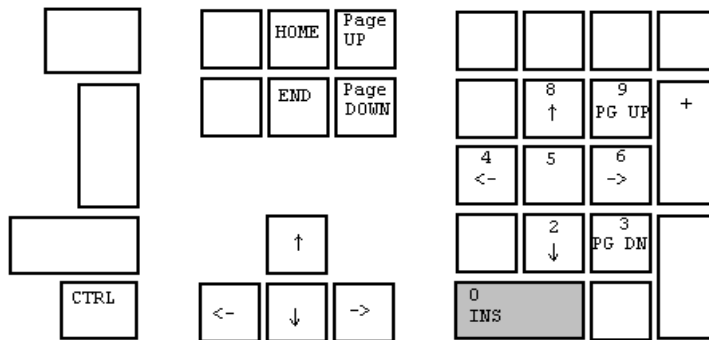
Move cursor right



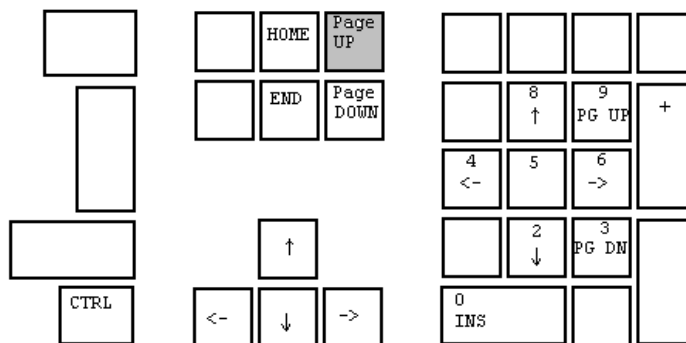
Select next curve, step up



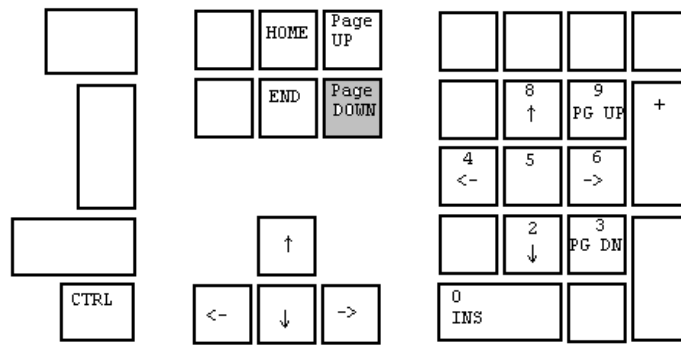
Select next curve, step down



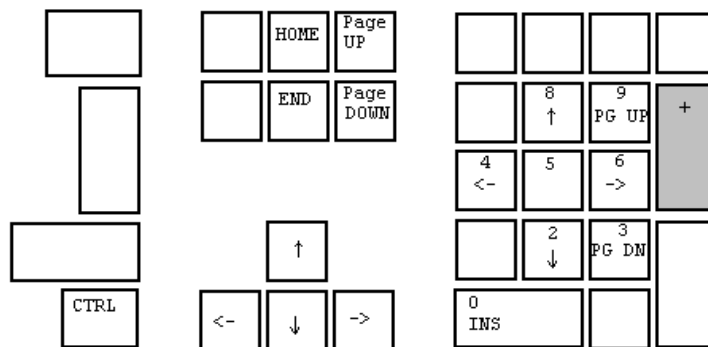
Enable / disable fast cursor



Enlarge selected channel, Page Up



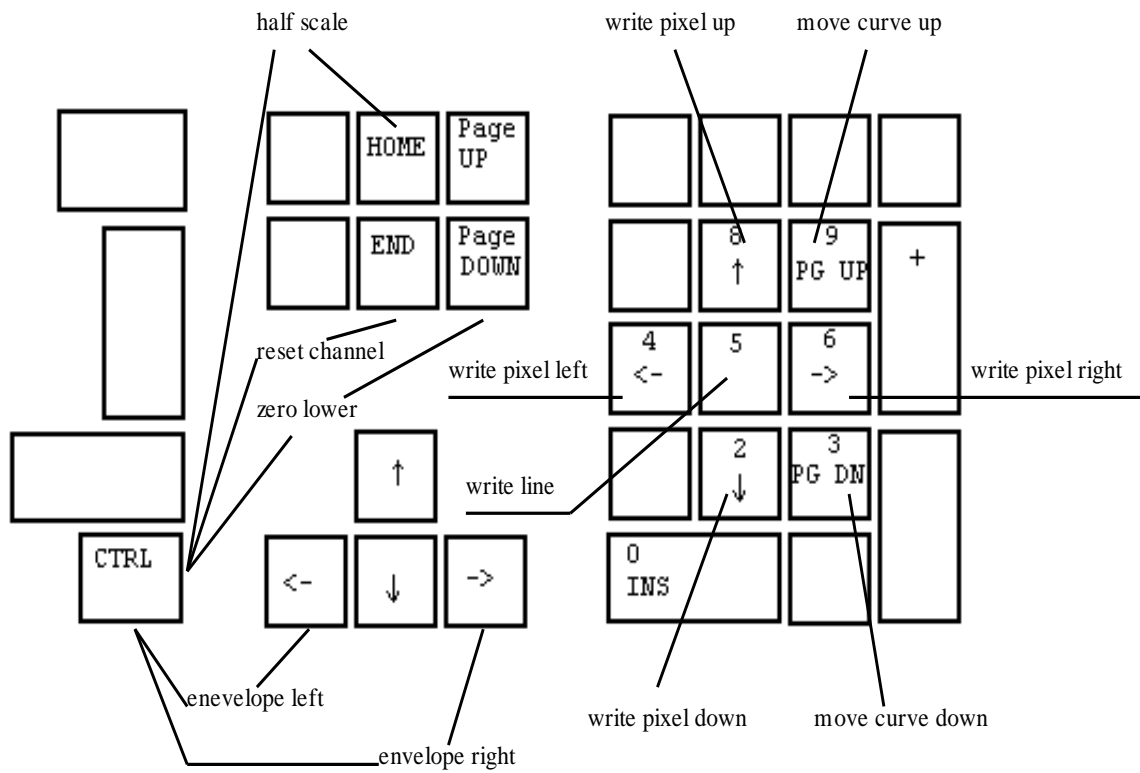
View all channels, Page Down

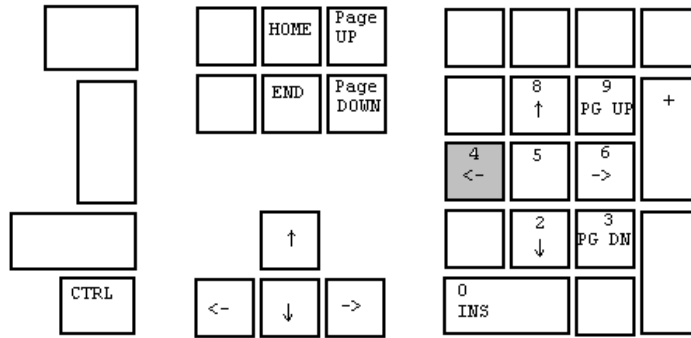


Select next channel as active channel

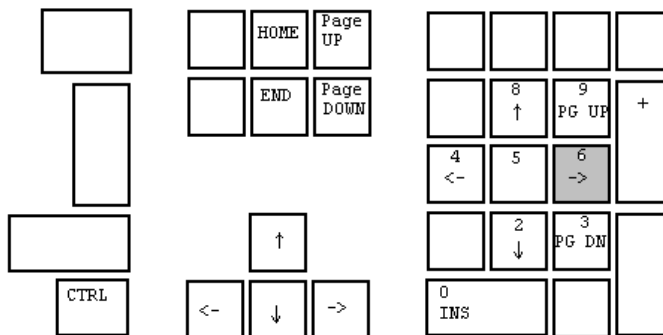


## Write curve and pixel functions

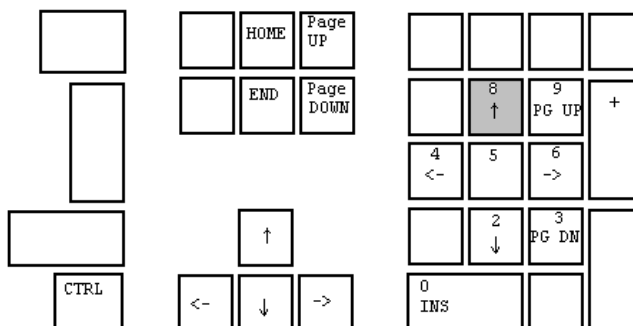




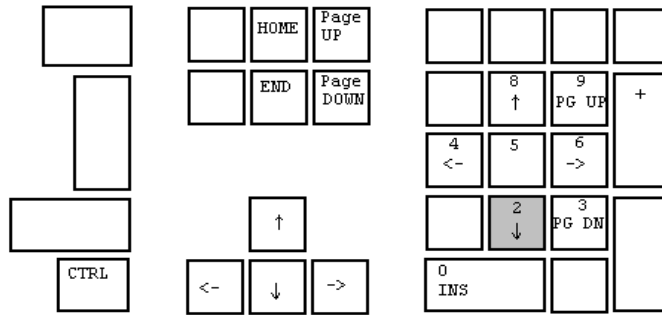
Write pixel's left



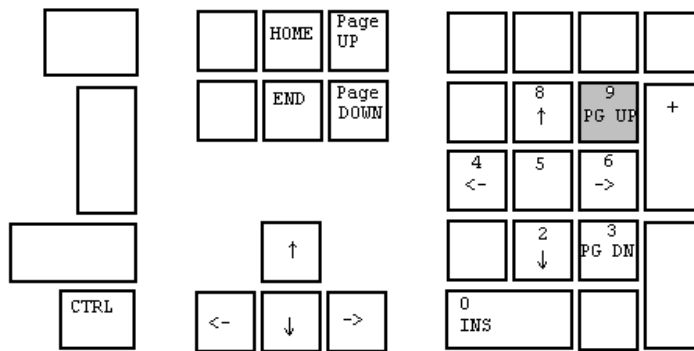
Write pixel's right



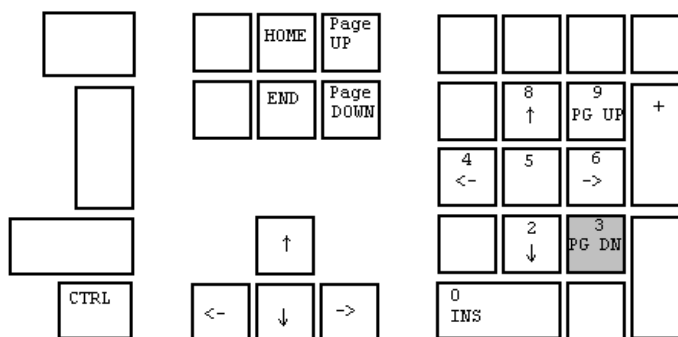
Write pixel's up



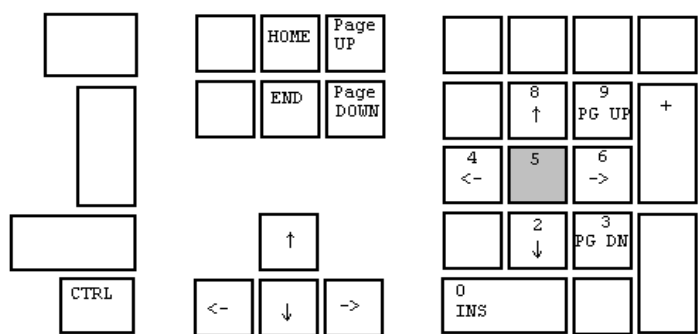
Write pixel's down



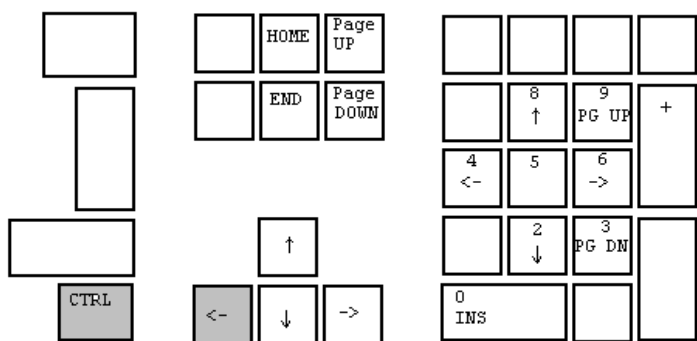
Move & write whole curve pixel's up



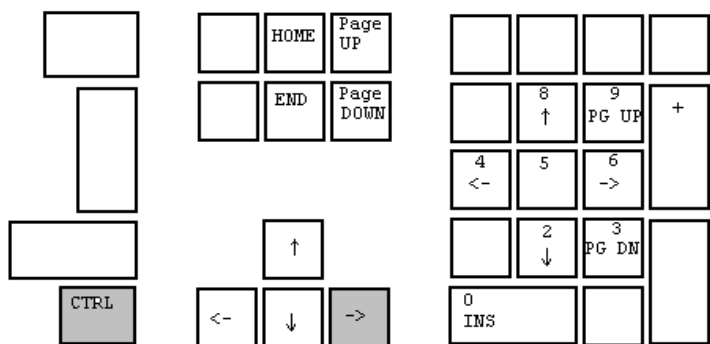
Move & write whole curve pixel's down



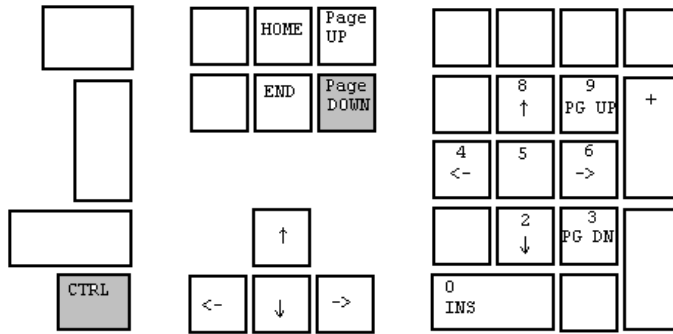
Write a straight line between two points



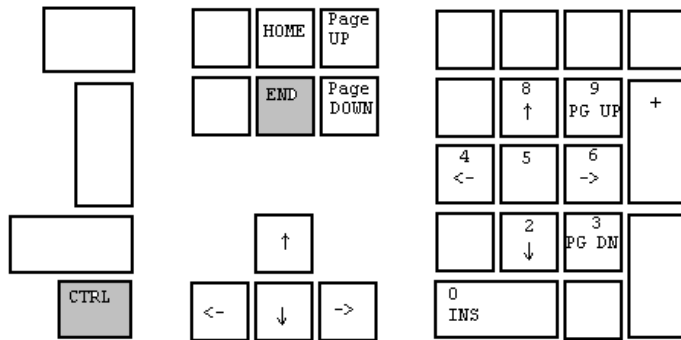
Write curve left and keep envelope



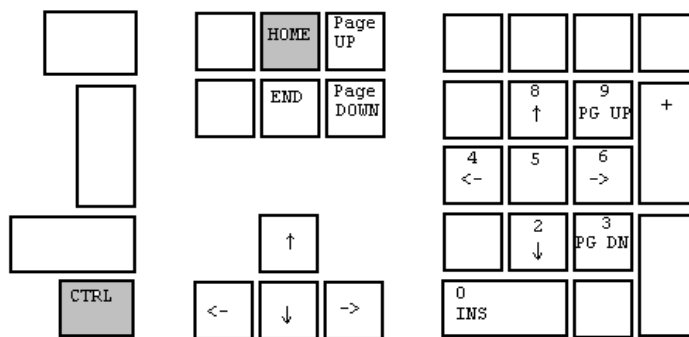
Write curve right and keep envelope



Set lower limit to zero on selected channel



Reset selected channel



Set limits to half scale, 40 dB from top

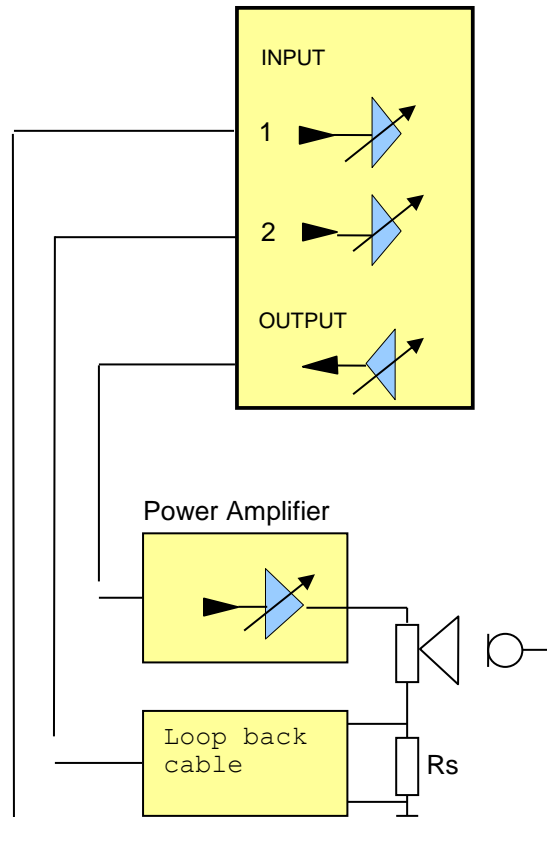




## Appendix B

### Hardware Lay Out

#### USB System



Hardware lay out for a test system. Input is here used for microphone and input 2 for impedance measurement.

Normally sequence for a setup and calibration for the system is following:

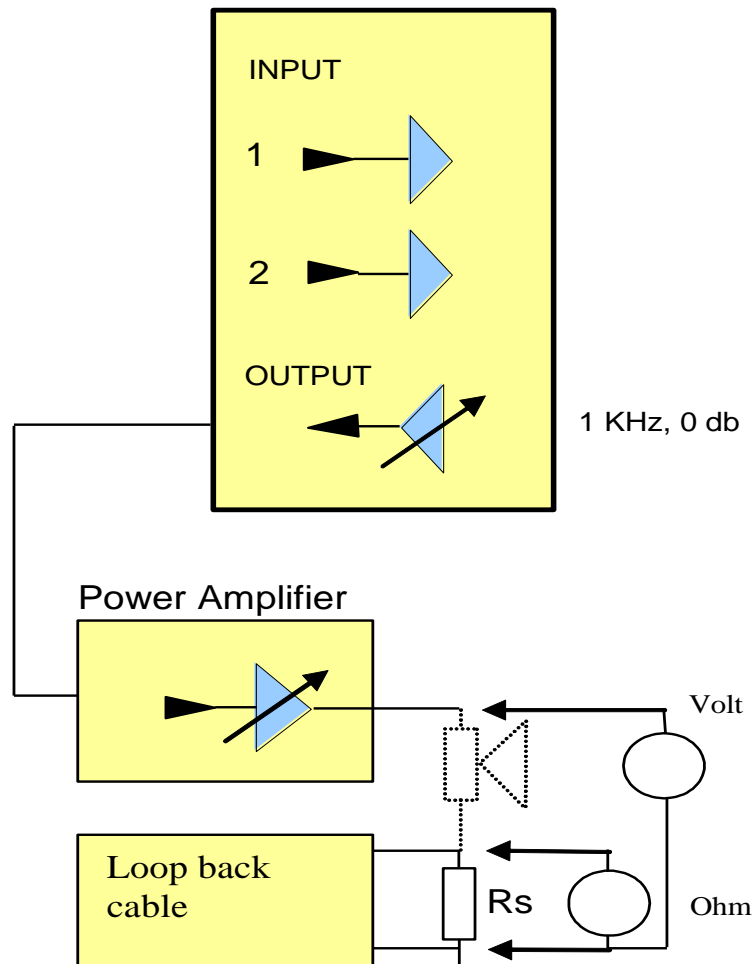
- A) For output main level setting. Adjust and enter values in Global setup.
- B) Select or create a type setup. Select wanted output level and adjust for wanted input level.
- C) Calibrate input scale and level by use of feedback calibration plug.
- D) For impedance measurement calibrate scale and level against a reference resistor.



## Global Setup

### Hardware Lay Out Global setup

#### USB System



Before the system can be used the software need to know the output level from power amplifier used with the system. Connect the output amplifier to the system. Go to Global Menu and activate the Test Signal. Measure with an rms voltmeter the output on your power amplifier. Be sure the output signal @ 1 KHz is a pure sine signal. Most likely the output level can be set in the USB sound system and the power amplifier. When done enter the read out on your voltmeter in the field "Output at 0 dB". In this example below 15.0 volt is entered.

Global Menu

✕

Control

Cancel Record

☒ Enabled

Repeat By Rej

☐ Enabled

Display Graph

☒ By Approve

☒ By Reject

Delay

☐ Enabled

Store

Data

Approve

ON

Reject

ON

Results

ON

Data Format

DBF

User key's

☐ User ID

Screen

☐ Statistics

Include

☒ All results

☐ Approved

☐ Reload

Graphic Scale

☒ Auto

Ext. Amplifier

Output

Test signal

1 KHz - 0 db

On

Voltage on Output at 0 dB

15.0 Volt

Rs

0.10 Ohm

OK

Cancel

Path

Reference

c:

->

Data

c:

->

Results

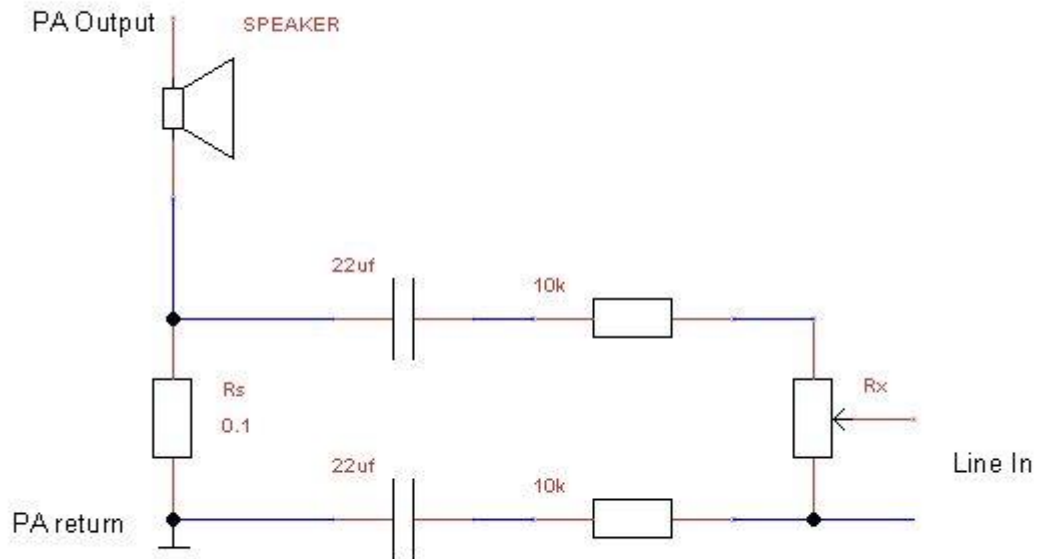
c:

->

To enable an impedance measurement for input 2 on your USB sound system a current sense resistor  $R_s$  must be added to your system.

The drawing below shows an example how to connect an  $R_s$  resistor with corresponding attenuator to input 2 on your system.

## Calibrate Channel C



An “ $R_s$ ” on 0.1 ohm is used. The attenuator consist of 2 x 22uF are bipolar type. This to avoid a ground loop or is there is a DC offset from the Power Amplifier.

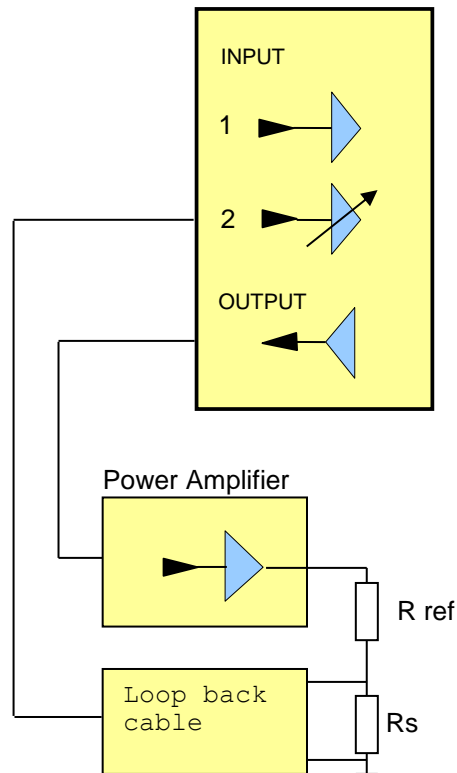
To attenuate the signal 2 x 10 K and  $R_x$  are used. The  $R_x$  depends of your amplifier and line input.

Typical a value between 500 ohm and 10 k ohm will do the job. NOTE be careful to not overload and damage the line input.

The used  $R_s$  value is entered in the  $R_s$  field. In this example 0.1 ohm is used.

Now the system is ready to be used. In the setup menu the maximal output level is referred to the level displayed in global setup.

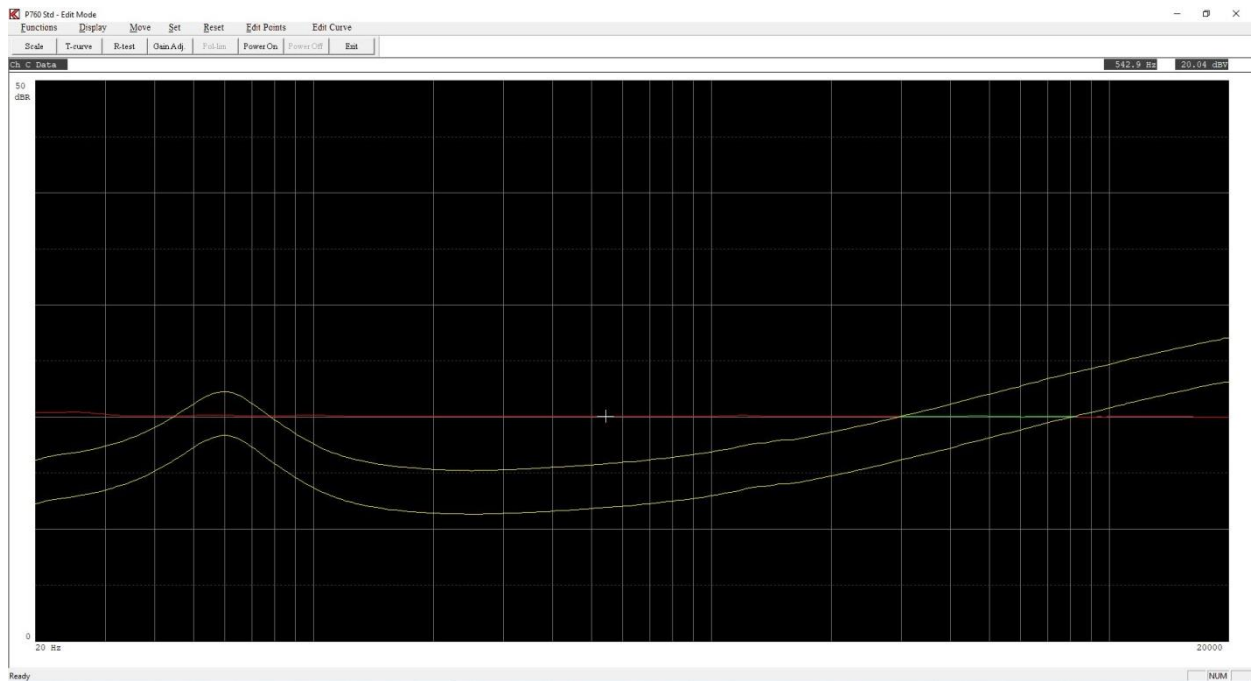
## Impedance Calibration



Replace the speaker with a resistor on 10.0 ohm ( $R_{ref}$ ).

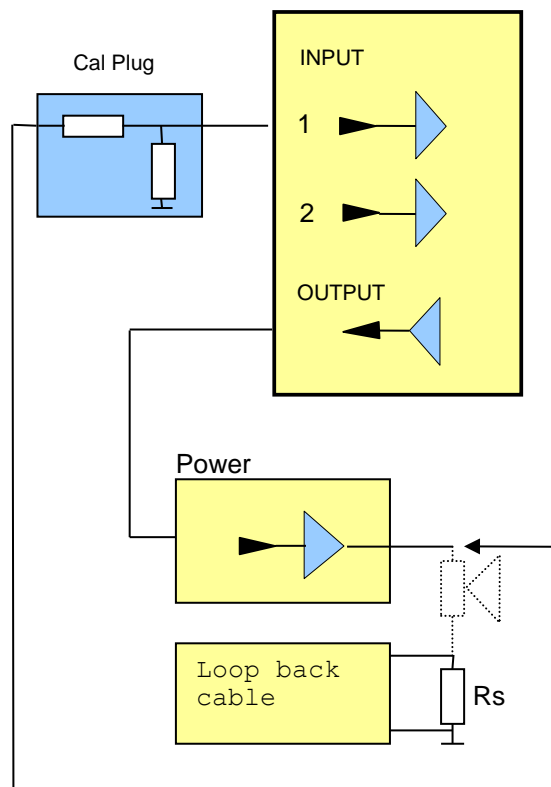
Make a measurement. Adjust the  $R_x$  in the line input attenuator together with the input sensitivity of input 2 on the USB sound system to you get 20.0 db or is Lin mode is used 10.0 ohm. The curve is a straight line (if you power amplifier is linear).

Note if input sensitivity of input 2,  $R_x$  setting or  $R_s$  is changed a new calibration is needed to get a correct readout.



## Input Scale calibration

### Input Scale Calibration

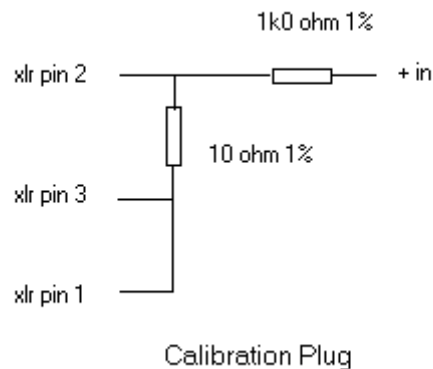


If wanted a calibration of the scale of display is possible for measurement channel A, B and D if input 1 is selected.

When the software know the maximal output level on the output it is possible to adjust the display scale by using a known attenuation of a calibration plug / cable.

### **Calibration Plug**

The calibration plug is used to calibrate the scale after the gain on the USB system has been set at desired level. The adaptor can be used for input 1 and / or 2, however only for signal inputs and NOT for impedance measurements.



#### **IMPORTANT:**

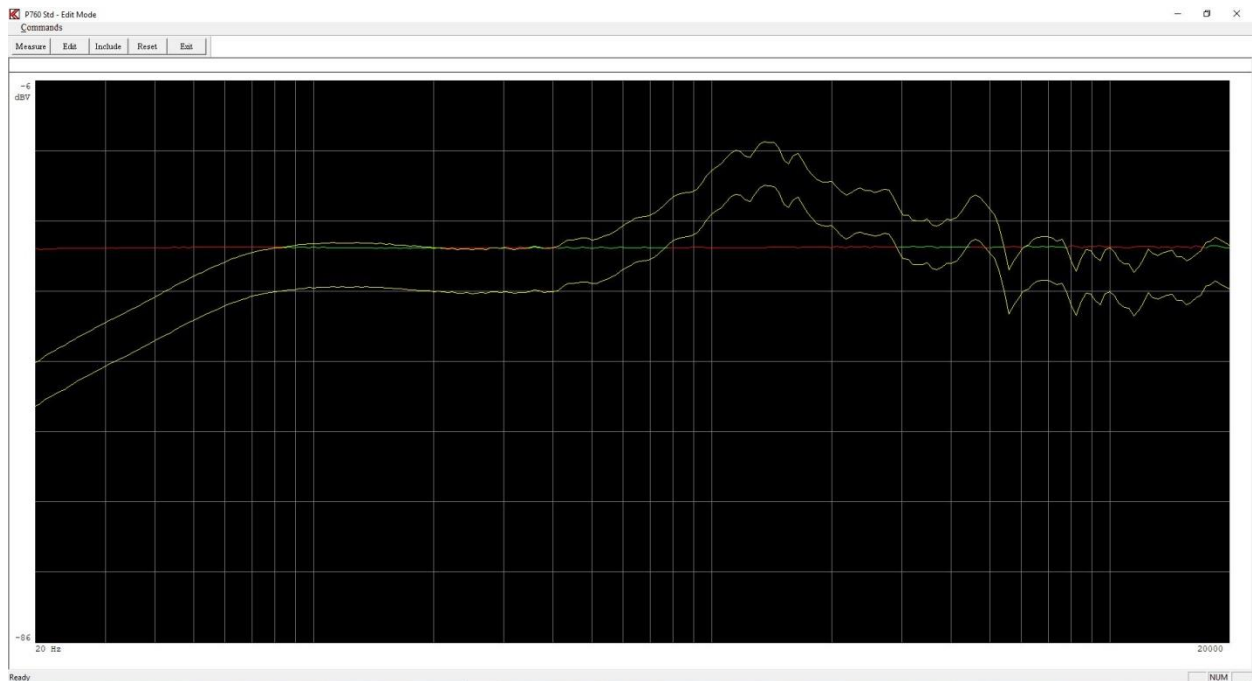
When you are using the Calibration Plug you must **DISABLE** the +48 Volt on the USB system.

When the input gain is selected an adjustment / calibration of the scale must be done. This for every time a change has been made on the input sensitivity if the out volume controls or the output of the external power amplifier has been changed. No adjustment / calibration are necessary if changes only have been made by the software.

Note adjustment only necessary for changes in the hardware settings.

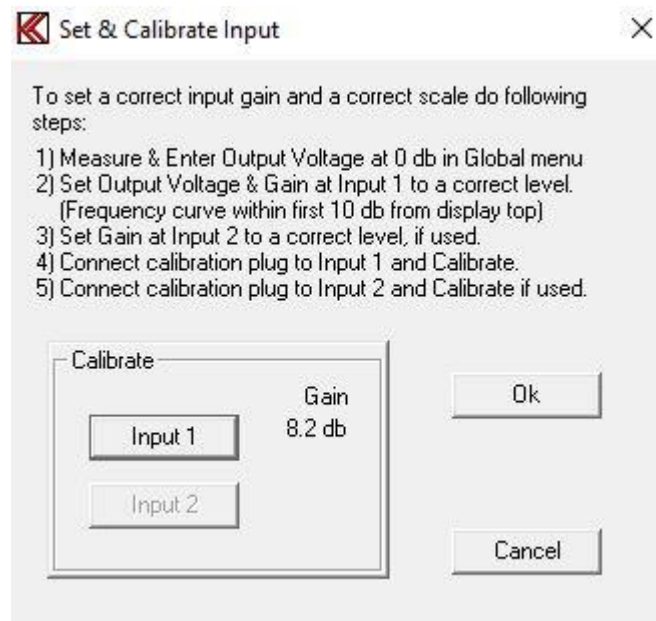
To tell the software to select a correct scale and sensitivity you have adjusted the hardware to be you do following:

Connect the feedback plug to the input you want to adjust. For a microphone normally input 1. Connect the other end of cable to your output. When you then make the adjustment in the Reference Set Input Scale (you have to do this for every setup type you generate), the program know the output level and can calculate your input sensitivity and select the correct scale. Note the program give you the gain in db so it is possible to recalibrate input sensitivity to a wanted (previous used) value.

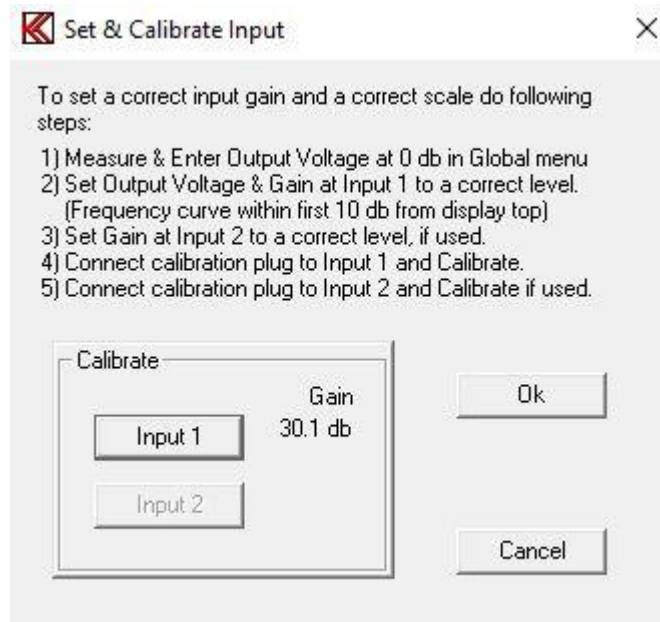


The picture above shows an example where the calibration plug is used.

To calibrate the input scale use the Set & Calibration input menu found under Commands pub up menu.



Activate the Input 1 and a calibration signal is send to output. After the calibration signal a new Gain value appears.



In this example the new gain setting is 39.1 db.  
To implement this gain press Ok.