

BIAS 7 Software Manual

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FOR EXPERIENCED USER ONLY !

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QUICK START

Measuring Saving Printing

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QUICK START

MEASURING



Whenever you do several measurements in this way, you should always type the instrument and fingering immediately after measuring in the white comment field on top of the measuring window! You will need this information if you need to save the measurement, as each curve must be assigned to an instrument folder and setup folder. Experience shows that when there are many curves displayed on the monitor, after a little while it is difficult to remember which curve was measured under which conditions.

QUICK START 19

SAVING

Click on the disk icon on the measuring window. 17 h. -1- 🖊) 🛠 🕀 🔎 💥 💻 N S S N Alternative A: You would like to assign the measurement to an already existing instrument. Choose the instrument and the setup in the database (see adjacent picture, example "Optimiser Mensur", no valve pressed). X <u>C</u>ancel Instrument group. Choose the type of instrument with this drop down menu. • Pitch. Choose the pitch of the instrument (e.g.: • in C, in Bb, in F, etc.). Instrumen • 🗈 Optimiser Mensur Setup Instrument. Choose either an already existing Standard_Setup - 🗈 measured instrument with the drop down menu, to which you can assign the measurement, or Reassign Valvecode V0 click on the icon to create a new instrument. Setup. Leave this as it is!!!

To save a measurement that has not been classified:

Valve. Mark the check box and choose which valves were pressed when you measured (if none, choose V0).

Setup Select	×
<u>O</u> K <u>C</u> ancel	
Group	_
Trumpet	•
Кеу	
Bb	•
Instrument	
Optimiser Mensur	🖸 🖬 🧹
Setup	
Standard_Setup	- 6
V0 Reassign Valvecode	

Alternative B: You would like to assign the measurement to a new instrument that has not been saved yet.

Choose the **Instrument group** and the **pitch** as described above.

Click on this icon to create a new instrument.

A new window will open, where in an intermediate step you can create the name of the new instrument (see next page).

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QUICK START

SAVING



• Type a name for the new instrument in the yellow field. Ignore all other fields for the time being

and

• Click on the "OK" button. BIAS will create the structure of the new instrument in the database, and the previous saving window will appear again.

onfiguration auswählen	2	ĸ
<u>O</u> K	Abbrechen	
Instrumentengrupj		
Trompete	•	
Stimmung		
с	•	
Instrument		
×***		
Konfiguration		
Standard_Konfiguration	· D	
Valve		
V0 •		
Anmerkuna zur Messuna		
	<u>_</u>	
	V	
🗖 Übernehmen für alle noch nicht zugeord	dneten Messungen	

In the saving window, the new instrument with the name you typed, will appear in the field "Instrument" (in the adjacent picture the name is "XXXX").

Now you only need to choose the fingering (=setup), and click on the "OK" button and your measurement will be properly saved in a newly created instrument folder.

(Please do not change anything in the filed "Setup"!!!)

QUICK START 21

PRINTING



Click on the printer icon



Print Plot Print Comments Print Certificate	
Fontfor Legends: Arial	P ^f T
I⊄ Print Legend	
Header trompete	E ₁ E
biasd60	F ^f T

• In this window you can perform further adjustments like type face, Certificate print out, etc. Leave these settings as they are for the time being. If needed, delete the text written in both fields and click on the printer icon.



The program then shows how the print out will look like, for checking purposes

• Click on the printer icon on the top left corner of this window. The usual Windows Print Window will appear, and after choosing a particular printer, you will be able to start printing following the habitual procedure.

BIAS

```
QUICK START
```

CLIPBORD



With the command "Copy to Clipbord"

you can transfer the curve from the current window into a text or layout program. BIAS assigns a legend automatically.



Clicking on the circled symbol, the contents of the current window will be copied, and can be pasted into an open text file using the command "Paste" or typing "Ctrl.+V"

Example in Windows Word:

) 📽 🖬	@ u @ d v X % @	1		¶ 100% • (?) . Aial	• 11	• I≣ • 3
	Endgulige Version enthalt Markups	▲nzeigen* • 3 · 1 · 4 · 1 · 5 · 1 · 6	••••••••••••••••••••••••••••••••••••••	M \ \ \ U O M +	× .	-
	Fate Sector		100.57 30			

This feature has been valuable for producing documentation for customers in an easy and fast way!

WORKING WITH

THE ADMINISTRATOR

USER SETUP

PRELIMINARY REMARK

BIAS can be used in a "multi-user" environment, which means that it can be started within a network by different people at different places.

Different rights can be assigned to different people, e.g. a user might have only the right to access to instruments and analysis (read permission), or the right to make and delete measurements (write permission), or all rights (Admin).

If you are going to be the only person using BIAS, you can ignore this feature, and simply click "OK" on the Password enquiry.

After the first BIAS installation, a "Standard User" is determined with a "Standard Password". Additionally, the box "Save entry" is checked, so that BIAS remembers the password, and in the future you will only need to click on the "OK" button.

Standard user: iwk Standard password: bias

If you do not set up your own user's account, the standard user name "IWK" will appear and not your name as the certificate's origin whenever a certificate is printed, .

If you are planning to work seriously with BIAS, and make print outs for your customers, you should definetely create your own user account!

GETTING STARTED

ť	7	The Ad	lminis	trator Program		
	2		6	BIAS62	• 🕅	Bias6 Admin
		Programme	<u> </u>	×	5	BIAS51
(A.666)		Dokumente				BIAS62
_					<u>ø</u>	BiasSpelunker
na	4	Einstellungen	→			Mucalc32
sio		Cusher				Optimise
fes		Suchen	· ·		0	Optimise Help
Prot	?	Hilfe und Support			2	VIAS
¥		Ausführen				

Start the administrator program by clicking: "START" -> "All Programs"
 -> "BIAS" -> "BIAS Admin". The following access window will appear, where you will be asked to type your password.

Access	After the first installation, the
Administrator Name	following values are set by de- fault:
AdministratorPassword	Administrator Name: admin
<u>O</u> K	Administrator Password: 0000

Type in the name field "admin" and in the password field "0000" (4 times the zero). The administrator window will appear. As soon as you have created a new administrator, you will be able to delete the standard administrator.



WARNING: all actions performed in the administrator's window are saved immediately, therefore take also immediate effect!

ADMINISTRATOR WINDOW

THE ADMINISTRATOR WINDOW

exit the program	
create a new user	
change the rights	of an existing user
Bits User Administration Exit New Edit Delete User Admin Demo Read iwk Admin User	delete an existing user
	Please do not click on these two but- tons for the time being! They are used to create a new instrument
	The instructions for doing this are described
Instruments Playlists	11 paye 170 - 192.

BIAS

ADMINISTRATOR 27

CREATE NEW USER

TO CREATE A NEW USER:



Read: The user can access instruments, display, analyse and measure, but cannot save the measurements. The same situation applies for the simulation: the user can simulate, but cannot save the result of the simulation. The user cannot delete any existing measurements, simulations or instruments.

Write: The user can use all features from BIAS, but cannot start the Administrator program.

Admin: This user has all user rights from BIAS and from the Administrator program.

• When you have finished, click on the "OK" button. Clicking the "Cancel" button will abort the action. Nothing will be saved.

PASSWORD MANAGEMENT

PASSWORD SECURITY - PASSWORD PROTECTION

- After a new user account has been created, the administrator notifies the password to the new user.
- The new user has the possibility to change his password after accessing BIAS for the first time, so that nobody apart from himself knows it.

TO CHANGE A PASSWORD (FOR NEW USERS):



Click on the command: Data base -> Maintenance

AS -Wartung	×
	9
Check + Repair / Backup + Com	pact
C\Programme\BIAS60\Database\Back.md	b 🗘
Change Password	
New Password Retype Pa	ssword
BASG	Î)
Type the new passwo	rd twice
Click on the green arr	OW
DONE!	

This procedure guarantees that nobody knows other people's passwords.

The administrator can nevertheless withdraw a user the right to work with BIAS, by simply deleting his user's account. BIAS

ADMINISTRATOR 29

EDITING A USER

TO EDIT AN EXISTING USER'S ACCOUNT:

👯 Bias User Administration	×	Mark the user to be edited	
E <u>x</u> it <u>N</u> ew <u>E</u> dit	<u>D</u> elete		
User	Access		
admin	Admin		
Deno	Read	Click on the "Edit" button. The "edit user" window will appear	ar.
iwk	Admin		
User	Write		

Edit User		The
<u>0</u> K	<u>C</u> ancel	Ine
Userna	ne Demo	 canr
Passwo	rd <mark>************************</mark>	
Retype Passwo	rd [*****	- The
	Access Mode	 thet
	Read	
	O Write	The
	⊂ Admin	click

he "User name" remains blocked and cannot be changed.

The password can be modified. Type it in the two marked fields.

The access rights can be changed by clicking on the appropriate radio button.

• After performing the relevant changes, click on the "OK" button.

ADMINISTRATOR

DELETING A USER

TO DELETE AN EXISTING USER'S ACCOUNT:



Effect on the BIAS program:

• without a valid user account, BIAS cannot be started!



- whenever the "save entry" box was checked, the window for typing in the password appears with the data from the user who used the program last, and it is only necessary to click "OK" or to press the Enter key.
- This feature is convenient, if BIAS is used only by one person. For a multi user environment, this feature is not suitable, as in this mode, BIAS can be started by anybody!

If more than one person is working with BIAS, then the "save entry" box should never be checked!

Whenever a measurement is done, the user which is logged in at that time will appear as the "Creation User", as BIAS will automatically save the date, time and user that performed the measurement.

This has the advantage that e.g. measurements can be searched by the day they were made, or by the user which made it.

 Whenever you wish to print out a measurement certificate, the right user should be logged in, otherwise the standard user "IWK" will appear on it.

WORKING WITH BIAS 31



WORKING WITH

THE DATABASE

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THE DATABASE

INTRODUCTION

Unlike the previous version BIAS 5, all measurements are integrated in the "Database file"

BIAS 6 installs a sample database, which contains some example measurements. It can be found in the directory

C:\documents and settings\all users\shared documents\BIAS6\database under the name "Sample.mdb".

This sample database will be invoked and used automatically when the program is first started.

As soon as you start using BIAS more seriously, you should generate and use your own database. The creation of a new database is very easy and finished in 5 seconds (see page 54).

To facilitate the work, the database is presented in a "Windows Explorer Look", i.e., a "**tree structure**" with subdirectories will be employed (hence the name "TreeView").

Basically, there is a directory for each **Instrument type** (e.g.: trumpet).

The directory **"Trumpet**" contains in turn subdirectories with Bb Trumpets, C trumpets, Eb trumpets, etc.

The directory **"Bb**" contains all Bb trumpets that have been measured, each within its own directory (e.g. "Stradivarius 72").

The directory "**Stradivarius 72**" contains subdirectories for each possible fingering (="setup") that can be measured (e.g. V0 = open, V2 = 2nd valve pressed, V12 = 1st and 2nd valves pressed). These directories can be empty, or contain one or several instruments.

As it will be shown later (page 35-40), the database does not have to be ordered by the instrument type, but also by user, instrument maker, setups, etc.

THE TREE VIEW



TREE VIEW

Different ways of displaying and sorting files:

• by instrument type (default)

🝽 BIAS - Integrated Tools -Sample-ed	it
<u>File Windows ⊻iews A</u> ddressbo	ok <u>T</u> ools <u>H</u> elp
Instrument Types	
Image: Treeview Keys Image: Trumpet Valve Codes - Instrum Image: Trumpet Valve Codes - Keys Image: Trumpet Valve Codes - Keys Image: Trumpet Valve Codes - Keys Image: Trumpet Valve Codes - Instrum Image: Trumpet Valve Codes - Keys Image: Trumpet Builder - Instrument T Image: Trumpet Operator - Instrument Image: Trumpet Image: Trumpet Imag	ment Types Types t Types
 Flute Flute_parts Saxophone Saxophone_parts Clarinet_parts Clarinet Fluegelhorn Fluegelhorn Baritone Euphonium Cornet 	
 Pocket Trumpet Bass Trumpet Alto Trombone Trombone (Valve) Bass Trombone Natural Trumpet Hand Horn 	Creation User Kausel Creation Date 2008.02.05 17:05 History Converted from BIAS 5.1

TREE VIEW

by the "key": e.g., in the directory "C" you will find all instruments that are tuned in C.

🝽 BIAS - Integrat	ed Tools -Sample-ed	lit	
<u>F</u> ile <u>W</u> indows	<u> V</u> iews <u>A</u> ddressbo	ok <u>T</u> ools <u>H</u> elp	
	Instrument Types		
🝽 Treeview 👘	 Keys 		
E C C Trump Tuba Tuba	Valve Codes - Instru Valve Codes - Keys Builder - Instrument 1 Owner - Instrument T Operator - Instrumen	ment Types Types Ivpes It Types	8
	Filter		
E	Ulear Filter		
	o i rumpet +		
	t Trumpet		
Bass ⁻	Trumpet		
	oone (Valve)		
🕒 🛄 🔂 Natura	al Trumpet		
⊡ C -alto	·		
🗄 🛅 C-bass			
∎ 🗄 🗠 🕒 🕒			
🗄 🖻 D			
🗄 🖻 D-alto			
⊡ D-bass		Creation User	
Db		Kausel	
⊞ Db-bass		Creation Date	
		2007 12 01 14:17	
Eb-alto		History	
Eb-alto		Converted from BIAS	5.1 I

TREE VIEW

by "fingering (valve code = setup) and type of instrument": e.g. in the directory "V13" you will find all instruments where the V13 fingering is commonly used. Only the fingering "13" will be displayed under the shown instruments.

🛸 BIAS -Sample	
Datenbank Fenster	Baumansichten Adressbuch
🕶 Baumansicht	nach Stimmung
International distance of the second s	Ventilstellung - Instrument
	Ventilstellung - Stimmung
	Hersteller - Instrument
⊡	Besitzer - Instrument
	Ersteller - Instrumente
	Filter
⊨œ <mark>, ∨13</mark>	Filter aufheben
📄 🗁 Trompete	
⊟ 2⇒ B	
∎ ⊡ ⊡ Strad	ivarius 72
📔 📄 🗁 Ione	lla
	JLX-2
Badł	Horn
E A Dadi	aha Wiener Horn
	13
⊡ ⊡ f-alto	
i <u>i</u>	
⊡⊡⊡ ∨24	
∎ ⊕ 🔁 🗸 ∨14	
□ 124	
□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	
□ □ \/134	
i ⊕ ⊡ ∨1234	
S-Bogen	
123bb4567	

TREE VIEW

by the "fingering/setup and key": e.g. in the directory "V0" you will find all instruments where the setup "V0" is commonly used, but ordered by the key:

V0 contains instruments in "F" (horns and tubas), in "f-alto" (horns), in "Bb" (trumpets and trombones), The instrument directories themself contain the measured instruments (see e.g. directory V13).

🛸 BIAS - Integra	ted Tools -Sample-edit	
<u>F</u> ile <u>W</u> indows	Views <u>A</u> ddressbook <u>T</u> ools Instrument Types	Help
🤜 Treeview	Keys	
D D D D D D D D D D D D D D D D D D D	Valve Codes - Instrument Types Valve Codes - Keys Builder - Instrument Types Owner - Instrument Types Operator - Instrument Types Filter Clear Filter	Codes
⊕ - ⊡ ∨1 ⊕ - ⊡ ∨12		-
E 😕 Trum ⊡ 🔁 C	pet -	
È	Stradivarius 72 Test-trumpet Tonella ❷ V13 □□□1096.01.25	
📕 🗉 🖻 Ek	o-alto	
i ⊕ 🙃 Horn	V5	
E - Corne	∨5 ∨6 .t	
∎⊡⊡ ∨4 ≣⊡ ⊡ ∨24		
□ - <u>-</u> ∨14		
V234 □□□ V234		

TREE VIEW

by "manufacturer and instrument": e.g. in the directory "Bach" you will find all instruments from the "Bach" manufacturer (in the picture there is only one such instrument). All fingerings (=setups) are displayed.



by "owner and instrument": e.g. in the directory "Gregor Widholm" you will find all instruments whose ownership was assigned to "Widholm" in the database.



TREE VIEW

by "operator and instrument", i.e., the data are sorted according to the person who performed the measurement. The picture shows only one "oerator".

With this feature it is easy to determine who measured what instrument.



FILTER

THE FILTER IS A VERY POWERFUL SEARCH TOOL

With the filter, you can:

- specify what you see or not in the tree view
- do a systematic search for anything that is located in the database
- You can invoke the filter command in three different ways:

ed Tools -Sample-edit	• with the	e menu bar command "Tree view" ->
⊻iews <u>A</u> ddressbook <u>T</u> ools <u>F</u>	Filter (see	e picture on the left)
 Instrument Types Keys Valve Codes - Instrument Types Valve Codes - Keys 	or	
Builder - Instrument Types Owner - Instrument Types Operator - Instrument Types Filter	Fitter	• by clicking on the filter icon located beside the tree view,
Liear Filter		01

• by clicking on the filter icon located on the top right corner of the main window (see picture below)

🝽 BIAS -Sample		
Datenbank <u>F</u> enster <u>B</u> aumansichte	n <u>A</u> dressbuch <u>W</u> erkzeuge <u>H</u> ilfe	
BIAS Sample Detenbark Fenster Beumensicht Destenbark Fenster Beumensichte Destenbark Fenster Beumensichter BeumensichterBeumensichter Beumensichter Beumensichter Beumensichter Beumensich	n Adressbuch Werkzeuge Hile	Mohm Image Image <thi< th=""></thi<>
٤ ٥		Cent -4 -5 -3 -10 10 10 13 4 8 9 5 2 -13 -23 -21 10 50

BIAS

FILTER

With the **filter** you can show very specific data, or target your search to measurements or instruments, of which you only remember particular details.

Besides the common criteria in the top field, the filter can be set to display only measurements and/or simulations, or only such which are connected to a bore list, or manufacturers, serial numbers and much more.

If you unintentionally choose the wrong settings, or if you lose the overview and do not know any more if all measurements are really being shown, click on the "Undo" button. The filter is then set back to showing all measurements that are available in the database.

Data Filta			
<u>0</u> K	<u>R</u> eset	Cancel	
Group	All Groups	_	Shows only instruments selected by the group
Кеу	All Keys		class) kov or fingorings (= sotups)
ValveCode	All ValveCodes		ciass), key of inigenings (– setups).
Operator		× 🗢	
🖂 Measurements	🖂 Borelists 🛛 🖾 Simulations	🗹 Calculation	 shows measurements only
Instrument			• shows "bore lists" only (shows all instruments
Instrument			that have a here list available for simulation). Can
Description			that have a bore list available for simulation). Can
Fabrication Year			be used to search for bore lists.
Series Nr.			 shows simulations only
Owner		× 🗢	 shows instruments with statistic data only
Builder		X	
History			
Creation Date			
			search for instruments with help of their properties
Setup			
Name			search for specific setups (=fingerings) with the
Description			boln of their properties
History			help of their properties
Measurement			
Session			
Temperature			
BIAS Series Number			search for specific measurements with help of
Description			their properties
History			
Creation Date			

The filter has 4 areas/regions:

With the menu bar command "Clear Filter" or with a click on the "Reset" button, the original settings will be restored, and the standard view will appear.

FILTER

- The chosen filter criteria are combined using the "AND"-Principle. That applies for all fields! For example: If you choose "Trumpet" on the drop down menu located at the top, the rest are left in their default setting, and in the last region ("Measurement") you specify 24 in the "Temperature" field, in the tree view only trumpets are shown which were measured or simulated at 24°C.
- You must type the search criteria in the empty fields (words or numbers). However, you do **not** have to type **full** description, only part of it is required. For example: In the second area (=Instrument) in the field "History" you type "mport". In the tree view, all instruments and measurements that were "imported" from BIAS 51 will be shown, as in BIAS 6 whenever something is imported, the following comment in the field "History" is written: "Imported from BIAS 5.1".

• With the three top drop-down menus, you can choose the instrument group, the keys and the setup (fingerings/valve code).

• You can also choose "all groups", "all keys" and "all valve codes", in which case these three drop-down menus do not contain any search criteria. This makes sense, if you would like to search by e.g. simulations, bore list or statistically processed measurements.

● If there are several users, and the user should **not** be a search criterion, then you should delete it in the field "Creator", by clicking on the **red cross** X that is located beside the field operator.

• On the contrary, with this field you can search for all instruments measured by a particular user.

In this case, click on the **blue arrow** beside the field, and in a new database window you can choose a particular user. By double clicking on the corresponding entry, this will be overtaken by the filter.

Data Filter				×
<u>0</u> K	<u>R</u> eset		<u>C</u> ance	1
Group	All Groups		•	
Кеу	All Keys		-	
ValveCode	All ValveCodes		•	
Operator			X <	⊨
Measurements	🗹 Borelists	🗹 Simulations	🔽 Calculatio	ins
Instrument				
Instrument				
Description				
Fabrication Year				
Series Nr.				
Owner			×	(
Builder			×	\$
History				
Creation Date				
Setup				
Name				
Description				
History				
Measurement				
Session				
Temperature				
BIAS Series Number				
Description				
History				
Creation Date				

44	BIAS					THE DAT	TABASE
							FILTER
			🔽 Measurem	nents 🗹 E	Borelists	☑ Simulations	Calculations
		•	With these for ment, bore list calculations (=	ur check box (see page 14 statistic curv	es, you can 13), simulatic es, page 155	target your sea on (page 140 and 5-162).	rch by measure- d 149) or statistic
			The status of e by clicking on	ach box has them.	three differer	nt meanings, tha	t can be changed
			grey (default s into account	etting) mean	s: "don't care	e", i.e., this crite	erion is not taken
			the box is che	cked: this crit	erion will be	searched and s	hown
			the box is uncl cluded and v	necked: every vill not be s	ything that co hown!	prresponds to th	is box will be ex-
			Example 1:	Measurement:	s 🔽 Borelis	ts 🔽 Simulat	ions 🔽 Calculations
			All instruments urements or si	s that contain mulations are	bore lists wil e existing or	l be shown, irres not ("search for	spective of meas- bore lists").
			Example 2:	Measurements	s 🔽 Borelis	ts 🔽 Simulati	ons 🔽 Calculations
			All instruments instruments wl	that contain l hich include a	oore lists and Ilso measure	statistical data ments will not	will be shown, but be shown!
			Example 3:	🗹 Measurement	s 🔽 Borelis	sts 🔽 Simulat	ions 🔽 Calculations
			All instruments	that have stat	istical data wi	ll be shown ("sea	arch for statistics")
			Example 4:	Measurements	s 🔽 Borelis	ts 🔽 Simulat	ions 🔽 Calculations
			All instruments Whether they	s that were b also include b	ooth, measur	ed and simulate r statistical data	ed will be shown. is irrelevant.
Data Filter

Group

ValveCode

Operator

Instrument

Instrument

Description

Series Nr.

Owner

Fabrication Year

Key

ОK

🗹 Measurements

45 THE DATABASE

FIL	TEF	2
-----	-----	---

Instrument: In the instrument area. you can search for a specific instrument that was previously measured. Just type in the "Instrument" field the name (or parts of it) of the instrument you measured. You do not need to type the full name, only some letters are sufficient.

×

Cancel

•

Ŧ

•

🗹 Simulations 🛛 🗹 Calculations

🗙 🗢

🗙 🦛

Description: If you included comments in the "Comments" field, you can also choose this as search criterion. Typing **one word** that is contained in the "Comments" field is sufficient, to find and show the instrument.

Year of manufacture: By typing a year in this field, only the instruments that were produced in that year will be shown. If in addition to that, you choose "Trumpet" in the drop down menu, then only trumpets that were produced in that year will be shown.

By typing e.g. "198", all instruments that were produced between 1980 and 1989 will be shown.

Serial number: The same as for the "Year of manufacture" field applies here.

Owner, manufacturer: by clicking on the blue arrow, you can select the name of an owner or manufacturer of the instruments from the "Address Database". By clicking on the red crosse, the entry will be deleted from the field (but not from the database!).

History: This information is generated and recorded in BIAS automatically, whenever an instrument is imported from another (possibly older) database.

Creation date: BIAS writes this information when a measurement is created or imported. e.g., typing "2006.03" shows all instruments that were measured or imported in March 2006.

Keep in mind, that the criteria specified in the other areas (Instrument group etc., setup and measurement), are also effective!

Builder	🗢 🗶
History	
Creation Date	
Setup	
Nemo	
Name	
Description	
History	
Measurement	
Session	
Temperature	
BIAS Series Number	
Description	
History	
Creation Date	

<u>R</u>eset

All Groups

All Keys

🖾 Borelists

Stradi

All ValveCodes

THE DATABASE

FILTER

Data Filter			2
<u>0</u> K	<u>R</u> eset		<u>C</u> ancel
Group	All Groups	_	-
Key	All Keys		•
ValveCode	All ValveCodes		•
Operator			× 🗢
🗹 Measurements	🗹 Borelists	🖂 Simulations	🔽 Calculations
Instrument			
Instrument	Stradi		
Description			
Fabrication Year			
Series Nr.			
Owner			× 🗢
Builder			× 🗢
History			
Creation Date			
Setup			
Name			
Description			
History			
Measurement			
Session			
Temperature			
BIAS Series Number			
Description			
History			
Creation Date			

Setups (=fingerings or valve codes) do not have to be called V0, V1, V12 or V23. If for instance, you create a new setup for an already measured instrument or rename an existing setup (see page 52 and 69), this setup can also be called: V0 simulation, V12 simulation, etc.

Name: Type the name in this field, and only the instruments that have this setup name will be shown.

If you type for instance only "V", all instruments that have the letter "V" in their setup's name will be shown.

Description: By typing words or parts of words in this field, instruments will be shown, which include these words in the description of their setup.

History: This information is generated and recorded in BIAS automatically, whenever an instrument is imported from another (possibly older) database.

Keep in mind that the criteria specified in the other areas (Instrument group, instrument, measurement or check boxes) are also effective!

THE DATABASE

FILTER

47

Data Filter			×
<u>0</u> K	<u>R</u> eset		<u>C</u> ancel
Group	All Groups		•
Key	All Keys		•
ValveCode	All ValveCodes		•
Operator			× 🗢
🗹 Measurements	🖾 Borelists	🖂 Simulations	🔽 Calculations
Instrument			
Instrument	Stradi		
Description			
Fabrication Year			
Series Nr.			
Owner			🖛 🗶
Builder			× 🗢
History			
Creation Date			
Setup			
Name			
Description			
History			
Measurement			
Session			
Temperature			
BIAS Series Number			
Description			
History			
Creation Date			

The search criteria from this area apply exclusively to measurements.

Session: if you work with the "session" concept, you can search for measurements that were performed in a particular session, by typing the name or part of the name of the session.

Temperature: Only instruments that were measured at the specified temperature will be shown.

BIAS Serial Number:

Description: By typing words or parts of words, instruments will be shown that include these words in the description of its measurement.

History: This information is generated and recorded in BIAS automatically, whenever an instrument is imported from another (possibly older) database.

Keep in mind that the criteria specified in the other areas (Instrument group, instrument, measurement or check boxes) are also effective!

Example (with the sample database): If you click the "Measurement" box in the top area empty, and in the bottom area you type the word "imported" in the field "History", there will be no measurements shown in the tree view, although there are many imported measurements! Having the "Measurement" box clicked empty prevents these measurements from being shown!



Before you measure an instrument, you should create a directory in the database, where the measurement will be automatically saved.

at BIAS -Sample Datenbank Eenster Boumansicht	en Adressbuch Werkzeu	ge Hite	
Image: Second	Vanaha Wiener Herstellungsper Herstellungsper Besitter Herstelle Beschenbung wich hord inside fre bol Buider Vanaha Dunger WENER Ersteller Kossel		Image: Section of the section of t
B 1996.01.09 C 0 V1 C 0 V1 C 0 V2 C 0 V2 C 0 V23 C 0 V12 C 0 V23 C 0 V23 C 0 V12 C 0 V23 C	Erstellungsdetum 2006.0329.20.06 Verlauf Imported from BIAS 5.1		

This procedure is carried out by clicking on the shown icon, and only takes a few seconds to do. The icon is located on the top right beside the tree view, and also on the menu file, on the top right corner of the BIAS main window.



Click on the "New instrument" icon. The following window

- will appear.	
strument	
QK Cancel I Add Default Setup	
F	Photo 🗶 🛍 🛍 🗢
Hom in F	
Name	
Fabrication Year Series Number	
Description	
Owner	
Builder	
🗾 🗶 📼 🗌	

If you marked only "Horn" before (step 1a), then choose "Horn in F" in the drop down menu.

If you marked already "in F" before (step 1b), then the "in F" will already be chosen in the drop down menu.

• Type an arbitrary name in the field "Name" for the instrument to be measured - this name will later appear in the tree view as "Directory name", and the measurements will be saved there.

Click on the "OK" button, and you are done!

The database additionally offers other features that you should also be using. See the following pages!

HINT: You do not necessarily have to follow this procedure to create a new instrument. It is also possible to measure first, and when saving, to create the corresponding instrument directory, as it is described in the Short Introduction (page 16). However, experience shows that creating the instrument before measuring is somehow safer, as it is less likely to save the measurement in the wrong directory.

• Enter specific information about the instrument:

IMPORTANT! This check box has to stay checked, to ensure that BIAS will create a complete structure for the new instrument (all valve codes, the right standard fingerings, for transposing instruments the right representation as written or concert pitch, etc.)



• To insert a picture of the instrument:



There are 4 symbols over the space reserved for the picture. You can perform the following actions with them:



Clicking on the blue arrow will open a Windows Search Window, where you can load a picture in an arbitrary format, and then insert it into the database. The picture will be automatically adjusted to the size of the window.



Clicking on the red cross will delete the picture that has already been loaded.



Clicking on this icon will copy the existing picture in the Windows clipboard, making it available for other purposes.



Clicking on the paste icon will paste the contents of the Windows clipboard in the space provided for the picture.



Example for an inserted picture

THE DATABASE

GENERATING A NEW SETUP



1 INSTRUMENT = 8 INSTRUMENTS

If there are no valves pressed (setup/fingering V0), the instrument has a specific length (e.g. a Bflat trumpet is 1.46 m long, an F Horn, 3.8 m), and a particular set of natural notes can be played.

If the first valve is pressed (setup V1), the instrument length will increase to play two semitones lower (approximately 6% of the original length). The same set of natural notes can be played, but two semitones below the original pitch.

If the first and second value are pressed (setup V12), the tones that can be played are 1 tone + 1 semitone lower, etc.

As there are 8 valve combinations possible, an instrument that has 3 valves will be represented in BIAS by 8 different setups (impedance curves). An instrument with 4 valves will have 15 setups (e.g. Tuba). The notes of a scale are played by combining different setups.

A setup is always represented in the database as a directory, in which the corresponding measurements are stored.

Usually, an instrument has a group of setups that will be automatically generated by BIAS, and is always named V0, V1, etc., depending on the combination of the pressed valves.

Why to generate a new extra setup?

Generating a new setup makes sense, if the instrument is to be measured many times, e.g. with different mouthpieces, bells, etc. Then it is possible, after having performed an "Automatic measurement" (see page 133), to save all measurements correctly and compare them only with a mouse click.

An example is shown in the picture on the left:

Apart from the standard setup, whose name corresponds to the fingering (V0, V1, V2, etc.), there are also other setups with the following names: "With Tilz mouthpiece" and "Simulation 1", where simulations instead of measurements can be found.

More information on setups can be found in page 143 and 186-190.



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GENERATING A NEW SETUP

Image: Treeview Image: C Image: C Image: Bb Image: C Image: Bb Image: C Image: Bb <tr

To generate a new setup:

• Click (and mark) on the instrument for which you wish to generate a new setup (on the picture, the instrument "Stradivarius 72" has been marked).



• Click on the "Generate setup" icon.

Setup New				
Name	<u>O</u> K	<u>C</u> oncel	ValveCodes ♥ V0 ♥ V2 ♥ V1 ♥ V12 ♥ V3 ♥ V2 ♥ V3 ♥ V3	
Description				

This window will appear

• Type in the yellow field the name for the new setup group. This name appears in addition to V0, V1, V2, etc.

• You can type in the field "Description" a commentary with details about this setup. These comments will be shown on the right hand side of the database window beside the tree view.

• Click on the "OK" button, and BIAS will generate the new setup group.

ValveCo	des	
✓ ∨0		
✓ V2		
✓ \/1		
🗹 V12		
🗹 V3		
✓ V23		
□ V123		

🤝 Baumansicht
🖃 😂 Trompete
📄 🖻 C
🖹 🖻 🗁 B
🗄 🗂 Standard Mensur
🖻 🗁 Stradivarius 72
i ⊕ C ∨0
V0 Test
V2 Test
E ⊡ 1
V1 Test
E E V12
V12 lest
V3 lest

When generating a new setup or setup group, you can choose which valve codes the instrument should have, by checking the corresponding boxes, as shown in the picture.

For example, in the picture the V13 and V123 will not be generated.

It is however strongly recommended, to generate a new setup group with all fingerings, which means: leave the default setting as it is!

The picture shows the newly generated setup with the name "Test".

DATABASE MANAGEMENT

Working with the BIAS 6 database is very easy:

All commands are found under the menu item "Files", because the database is a "file".





With "**New**" a new empty database is created, with the same structure as the sample database.

Choose the name of the file and the directory where the new database should be saved, and click on the "Save" button.

Speichern ur	iter		?×
Speichern	🔁 Database 📃 🚽	🕂 🖻 (* 💷 🔸
) Bias.mdb Biasdata.r Biassys.m Sample.m Widholm 1	ndb 3b 3b .mdb		
Dateiname:	Test-Datenbank		Speichern
Dateityp:	Datenbanken (*.mdb)	•	Abbrechen

DATABASE MAINTENANCE



Database maintenance and repair

Databases are sometimes very complicated structures. The BIAS database is particularly complex, since it has to be able to deal with not only measuring data and instrument characteristics, but also with new user defined instrument structures and different formats (VIAS files, Optimiser files, etc).

Errors in the data or structures can arise unintentionally, and result inevitably in unmanageable chaos.

With the command "Maintenance", the consistency of the currently opened database will be checked, and if desired, automatically repaired. The actions that were preformed automatically will be shown at the end of the repair process. At this point, you can still decide if you would like to accept the repair, or leave the database as it was before the repair actions took place.



The two fields below the title "Change Password" serve to change the password of the currently logged in user, and have nothing to do with the database management (more at page 28). By clicking on the disk icon, a security copy of the current database will be automatically created in the shown directory with the name "Back.mdb". You can choose a different name and directory for this file by clicking on the blue arrow.

2 The consistency check and corresponding repair procedure starts after you click on the repair icon. Inconsistent entries will be deleted.

After this process is finished, all changes that were made will be shown in detail, and can if needed be transferred to a text program. After you have looked at them, you can decide if you would like to actually save those changes or not.

IMPORT OLD MEASUREMENTS FROM BIAS 5



To import all measurements from BIAS 5.1:

Click on the command "BIAS50 Import". The shown window will appear, where you can load the desired data.

Öffnen				? ×
Suchen in:	🗀 Measurements	•	🗢 🗈 💣 🎟	-
🖬 1960.bia	國 1966.bia	國 2095.bia	國 2149.bia	a :
🖬 1961.bia	🚾 1967.bia	🚾 2096.bia	國 2150.bia	🖬 : 🛛
🗖 1962.bia	🚾 2091.bia	🚾 2097.bia	📼 2151.bia	🖬 : 🛛
🗖 1963.bia	🚾 2092.bia	🚾 2098.bia	國 2152.bia	a :
🗖 1964.bia	🚾 2093.bia	🚾 2147.bia	國 2153.bia	1
🗖 1965.bia	🚾 2094.bia	🚾 2148.bia	國 2154.bia	1
•				Þ
Dateiname:	1960.bia		Öfi	fnen
Dateityp:	BIAS50 Daten Dateie	en (*.BIA)	Abbr	echen

• Find the directory where your measurements are stored. In case you have not changed them, all measurements should be found in the following directory:

C:\Program Files\BIAS51\Measurements\

- Mark with a mouse click the first file (see picture).
- Shift the bar up until the last file, hold the "Shift" key, and mark (with a mouse click) the last file. Now you have chosen all files in that directory.
- Click on the "Open" button, and the import process will begin. Depending on the amount of data, this process can take a few minutes. You can also import data stored in a CD or DVD in this manner.

HINT: In the import window usually only BIAS files can be selected. In case you have mistakenly selected files that are not BIAS files (by changing the "File types" to "all files" in the drop down menu), the import action will be aborted. Make sure that only BIAS files are selected repectively marked.

IMPORT OLD MEASUREMENTS FROM BIAS 5

ERROR MESSAGES

BIAS 6 creates the corresponding directory for each imported measurement, and also imports all the commentaries and remarks.

At the same time, a consistency check of the data will be conducted. Data sets with serious errors will not be imported. Defective data sets will be immediately reported during the import procedure.

Informati	on X
į)	Context information of C:\Programme\BIAS60\Measurements\2158.bia missing or incomplete.
	<u>(0K</u>

Editor
*** Bias Context Information ***
- Instrument description: Identifier: 1065 Type code: 27 Class code: 33 Key code: 31 Valve code: 26 Name: TUBA Builder: Rudolf MEINL Owner: Mario SMETANA Fab year: 1995 Series #: Comment: 2, messung mit 5 V Trigger 2. Zug: H, A klingend Trigger 5. Zug: B klingend Trigger: 65535
- Measurement info: Comment: TimeStamp: 08.01.1996 10:51:46 Random key: 38598114,78545809 FlgInst: 0
HeadCal: -99

Click on the OK button, and the data will be shown in another window.

If needed, you can copy this information and save it with a text program.

• Click on the "X" symbol on the top right corner of the window to close it. The import procedure will continue.

CHANGES IN THE DATABASE STRUCTURE

Create a new instrument class:

If you would like to measure an instrument that does not exist in the database, e.g. a historical instrument, or some special type of signal instrument, you can create the structure for such an instrument in the database.

The procedure to do this is described in page 178-192. The creation of a new instrument class is a radical change in the database structure, hence, it should only be performed by experienced users.



In the "Database edition mode", changes will be written directly into the database: Errors cannot be corrected any more!

Rename an instrument class:

This is a less dangerous case, and can increase the convenience in the everyday work.

Example:

You often measure instruments that are strictly speaking Bb-Trumpets, but that are commonly known as "Bugle" in your country. In this case, you can rename the instrument class from "Trumpet" to "Bugle" (see page 179 and 182), or if you would like to measure both, you can clone the instrument class "Trumpet" (create a new class with the same properties like the Trumpet Class) and name the clone "Bugle", so that both "Trumpet" and "Bugle" are available (page 180).

Change the display sequence:

Example: You mostly measure Renaissance instruments, which are shown at the end of the list of displayed instruments in the tree view. You must therefore scroll again and again down to the end of the list: That can be bothersome!

You can insert a numerical entry in the database editor (page 182), whereby you arbitrarily change the sequence in which instruments are displayed. This change in the database structure is not critical.



THE WORKING WINDOWS

The database window The impedance window The impulse response window The intonation window The acqusition window

Database in Windows Explorer Look



Impedance window

Pulse response window



The size of all windows, including the tree view window, can be changed to an arbitrary size with the mouse, and they can also be positioned anywhere inside the main screen.

THE MAIN SCREEN 61

THE WINDOWS

BIAS has 5 windows:

1 Data acquisition window (yellow border) with specific features to measure, simulate and to make statitstical analyses, and

5 windows to display the data

the databese window "tree view" the impedance window the intonation window and the pulse response window the bore list window



Each window has on the top a band with different buttons (icons), that are used to display, process, print, manipulate or export and import the data in different ways.

A click on the two icons in the right top corner of the windows opens the remaining data windows. The data displayed in the current open window are automatically taken over by the new windows.

Example: you have the impedance window open displaying 3 curves. If you click on the icon with the tuning fork the intonation window appears and shows the intonation for these 3 curves.

🝽 Treeview	<u>-0×</u>
⊡ Trumpet	
🚊 😂 Trumpet	123 🖉 👗 🙈 🛤 💵 🖤
	hu J 🥢
⊨ 😕 Bb	Mbb -4- 🧭 🔛
🖻 🗁 Stradivarius 72	
i ⊕- 🛅 ∨2	Setup
i i i i i i i i i i i i i i i i i i i	V0
⊡	
⊕ - © ∨3	Grouping
in the the test is the test i	O By Valve
⊕ 🖻 ∨13	• By Name

(as it is commonly done in Windows) the separating line between them.

The database window is split in two parts: You can move with the mouse

The **left** part contains the "**tree** view"

The **right** part contains additional information, and the action buttons.

Which and how many of the buttons you can see and use, depends on whether you have marked in the **tree view** an instrument class, an instrument, a fingering (=setup) or a measurement.

🝽 Treeview	
	Instrument Trumpet



_ 🗆 🗵 Treeview Trumpet ٠ 1-2-3 1 X Filter 🥻 🗽 📘 🗄 🗁 Bb Illow 1 نه 🗄 🗂 Standard Mensur 🗄 🗁 Stradivarius 72 lb. -10 🗄 🗁 🔽 - 🖹 1995.11.30 Setup - 🖹 2008.07.18 23: V0<u>⊕</u> ⊡ ∨2 Grouping 🗄 🕒 V1 🗄 🔂 V12 C By Valve By Name 🗄 🗖 V3 . ⊨−**∩** ∨23

If you have marked an **Instrument group** you can:

- create a new instrument
- use the filter
- search for an instrument by name

If you have marked a measured **Instrument** you can:

- create a new instrument
- insert a commentary
- change the setup
- delete the marked instrument
- use the filter
- search for an instrument by name
- print a certificate

If you have marked a **setup (fingering)** you can:

- change the setup
- add a commentary
- delete the marked setup
- use the filter
- search for an instrument by name
- measure with this setup
- edit the bore profile (if it exists)
- display the impedance curve of this setup
- display the pulse response(s) of this setup
- display the intonation of the measurement
- display all impedance curves of the instrument

THE DATABASE WINDOW





If you have marked a measurement you can:

- add a commentary to the measurement
- delete the marked measurement
- search for an instrument by name
- measure with this setup
- display the measurement as impedance curve
- display the pulse response of this measurement
- display the intonation of this measurement

Grouping of the setups

If you have created several setups for an instrument besides the standard setup, e.g. one with extra "aaa" and another one with extra "zz" in the name (see picture), you can choose how these directories should be grouped.



(1) arranged by name (default)

first the setup with the default names is shown, and then in alphabetical order the folders of the setup "aaa" and lastly the setup with the name "zz"

0.0		٦.
Be St	adivarius 72	L
	VU	L
🖸	VUaaa	L
	VU ZZ	L
H - C	V2	L
	V2 aaa	L
🗅	V2 zz	L
÷.	V1	L
	V1 aaa	1
- 6	∨1 zz	1
۵ 🚯	V12	1
- 0	V12 aaa	1
	V12 zz	L
😐 🕒	V3	L
	V3 aaa	L
	V3 zz	L
🗄 - 🖨	V23	L
	V23 aaa	1
- 6	V23 zz	1
ė 🗅	V13	L
- 6	V13 aaa	1
	V13 zz	1
ė-6	V123	1
0	V123 aaa	1
	V123 zz	1
_	-	

(2) arranged by valve code

first the fingering V0 for all setups is shown, then the fingering V2 for all setups, then the fingering V1 for all the setups, etc.



The most important commands are available on the top right corner of the main window, no matter what you have marked in the database.

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THE DATABASE WINDOW

THE COMMANDS

Which commands are available in your database window depends on what you have marked (a measurement, a setup, an instrument or an instrument group).

As the commands are mostly linked to measurements or analyses, they will be explained in detail later on, when they become necessary. What follows is just an overview as introductory information.



Generate a new instrument. Generates a new directory folder for an instrument where you fill in the measurements. It is recommended to do it befor you measure an instrument (see page 48)



Editor. The editor has two functions: 1. Change the name of an instrument folder and the names of the setup folders and measurements. 2. Add or change the description (commentaries) of instruments, setups and measurements (see page 67-70).



Generate a new setup. Creates one or more new setup folders (directories for V0, V1, etc.) in an already existing instrument. This is useful if you will be measuring an instrument several times (e.g. with different mouthpieces) (see page 52).



Delete. Deletes the currently marked element from the database (see page 66).



Filter. Starts the filter, so that only specific data are shown in the tree view (see page 41-47).



Search. Starts the database search function.



Measure. Opens the measuring window (see page 130).



Bore profile editor. Opens the bore list and allows changes in the bore list. This is only active for simulations and optimisation tasks. It is also useful in conjunction with the optimiser (see page 144).



Print out certificate. Prints out an already existing certificate.

THE DATABASE WINDOW 65

THE COMMANDS

opens the Impedance Window and plots there the actual marked element opens the Impulse Response Window and plots there the actual marked element opens the Intonation Window and shows the Intonation of the actual marked element









È- 🕒 Yamaha Wiener Horn È- Ĉi V0 È- Ĉi <mark>V2</mark> If you have marked for instance the folder "**Horn**" an you click on the symbol for "Impedance" **all curves of all Instruments** (Horns) are showen in the Impedance Window.

If you have marked for instance "**Horn F**" an you click on the symbol for "Impedance" **the curves of all Horns in Fa** are showen in the Impedance Window.

If you have marked a **particular instrument** (see left), then all curves of that instrument are displayed in the Impedance Window.

If you have marked for instance the **setup** "**V0**" only the curves of this setup are shown. Normally each setup contains **only one** measurement.



🗄 🗁 Те	st-trumpet
÷	V0
🛅	V0 aaa
÷	V2
🛅	V2 aaa
÷	V1
🛅	V1 aaa
÷	V12
🛅	V12 aaa
÷	V3
6	V3 aaa
÷	V23

If you have **measured an instrument twice or more times** (for instance with different leadpipes or mouthpieces), then you surely have generated two or more "setups". In the picture left you see the standard setup (V0, V1, etc.) and a second one named "test" (V0 test, V1 test, etc.).

If you have marked for instance the setup "test" and you click one of the 3 symbols shown above, **only the curves belonging to the setup** "test" are displayed.

These commands help to **differentiate between various setups** of one instrument. If you want to display only the data of a specific setup you need not click on all measurements, separately. **Only mark one folder and click on one of the symbols above.**

THE DATABASE WINDOW

THE CONTEXT MENU



New

Edit

Filter

Delete

Filter

Search

Measure

Plot Impedance

Plot Intonation

Filter: opens the filter

(see page 41-47)

Plot Pulseresponse

A click with the **right mouse button** anywhere within the **tree view area** opens the "context menu" which offers you all necessary commands you need at your fingertips.

New: generates the folder for a new instrument (page 48)

Edit: add or change the description, name, comments, etc. of the actual marked element (page 67).

IMPORTANT: the command is always related to the actual marked element, for instance if an instrument is marked you can change the name of the instrument etc. If a measurement is marked you can edit only this measurement.

The commands always apply only to the actual marked elements!

delete: deletes the actual marked element. To avoid an unwanted deletion a "security" window (see below) opens:



only a click on "**yes**" deletes the element (measurement, setup or the whole instrument).

ATTENTION: deleted elements are irrecoverable!

If you have **marked a setup**, after the security window shown above one more window appears and asks you if you want to delete only the actual marked element of the setup or the whole setup:



NO means: only the actual part of a setup (e.g. V12) is deleted.

YES: the entire setup is deleted

CANCEL: aborts the action

Search: opens the search window

Measure: opens the acqusition window for measuring (page 130)

The other commands are self-explanatory!

THE DATABASE WIDNOW 67

THE EDITOR



The editor has two functions:

1. Edit the Name of an instrument, setup or measurement

2. Enter or edit the **description** of an instrument, a setup or a measurement.

To modify anything, you first have to mark an element (an instrument, setup or measurement) by clicking on it. After that, the editor can be started.

There are **three ways** of invoking the editor:



THE DATABASE WINDOW

THE EDITOR

Instrument Photo X R C C	
Name	
Strad Test	
Fabrication Year Series Number	
no comment E Owner:	
Owner	
×⇔ ∑	
Builder	

INSTRUMENT: RENAME

- mark the instrument in the tree view and start the editor
- type the new name of the instrument in the field marked yellow (e.g. "Stradivarius 72" in "Strad Test").

• click on the OK button, and the new name of the instrument will be adopted.

before	after
Bradivarius 72	E-⊛ <mark>Strad Test</mark>

Instrument
QK <u>C</u> ancel
Instrument
Trumpet in Bb
Name
Strad Test
Fabrication Year Series Number
1982 🗢 214802
Description
The instrument was measured wirh a Bach 1c mouthpiece
Owner
× ×
Builder

INSTRUMENT: MODIFY THE DESCRIPTION

• If you would like to modify the description, simply click on the "Description" field, where you can type, modify or delete the text.

HINT: It is recommended to note in the description of the instrument, with which mouthpiece the instrument was measured. Similarly, any particularities should be noted there.

HINT: You also have the opportunity to type or modify the production year, the serial number, the owner and the manufacturer, and to add a photograph of the instrument.

THE DATABASE WINDOW

THE EDITOR



SETUP: RENAME

- mark a setup on the tree view
- type the new name in the marked field

• click on the OK button, and the typed name will be **added** to the standard name V0, V1, etc. To undo the renaming, invoke the editor one more time, and delete the name that is written in the yellow field. This will restore the standard naming V0, V1, etc.

before	after
	⊕ C V0 Editor testing ⊕ C V2 Editor testing

If this box is checked, the new name will be assigned to **all parts of the setup that have the same name** (default setting). Clicking on the box will uncheck it, and the renaming will only apply to the **currently marked** part of the setup.

figuration bearbeil	ten		
	<u>0</u> K	Abbrechen	
Name			
Gruppe aktual	isieren (alle Konfi	gurationen gleichen Nam	ens)
Beschreibunge	an		
C Beschreibu	ngen unveränder	rt belassen	
 Beschreibu 	ng hinten anhäng	jen	
C Beschreibu	ngen ersetzen		
Beschreibung			
Kommentar zu e	einer Kontiguratio	n	~
			7

🗄 -- 🛅 🛛 🗸 🗠

SETUP: CHANGE THE DESCRIPTION

There are three options to change the description, as it is shown in the figure:

• Leave description unchanged: This is the default setting, and is used when you only wish to change the setup name.

• **Append to existing description:** In this case, the text you type will be appended to a description that might already exist.



• **Replace description:** The text that you type will replace the existing description.

THE DATABASE WINDOW

THE EDITOR

Update Group (All setups with same name)

As it was the case with renaming a setup (see previous page), you can also decide by checking/unchecking the box, if the

change in the description will apply **for all parts of the setup with the same name**, or just for the element of the setup that is currently marked.

Edit Measurement			×
	<u>0</u> K	<u>C</u> ancel	
Session			
1995.12.14			
Description measurement w	ith no valve engage	ed	×
Temperature	21.0 🜲		

MEASUREMENT: RENAME

BIAS automatically names every measurement with the current date and time.

2007.12.31 14:04:28
C O Test
E Renamed

Mark a measurement

• Invoke the editor. The original name appears in the name field. Type the new name in this field (see picture).

• You can also add something to the original name (date and time). Leave the original name, and just add something to it.





MEASUREMENT: CHANGE THE DESCRIPTION

• You can type a commentary about the measurement by clicking the "Description" field.

Renaming and changing the description of a measurement only applys to the currently marked measurement!

MEASUREMENT: CHANGE OR DOCUMENT THE AMBIENT TEMPERATURE

With the arrows you can change the documentation of the air temperature. If you forgot to document it before or after a measurement it's an easy way to add the correct temperature. A correct documented ambient temperature is important if you want to print out a certificate (see page 14, 92, 94), if simulations will be done (see page 153) or if you want to use the optimiser. If no value is entered a default of 21°C is set by BIAS.

THE IMPEDANCE



THE IMPEDANCE WINDOW

HOW AN INSTRUMENT WORKS

When you play e.g. a c^1 with 523 Hz, the lips open and close like a valve 523 times per second.

Through an over pressure in the mouth cavity, air will be pressed into the mouthpiece 523 times in a second, and through that, an over pressure will be generated at a rate of 523 times in a second.

At the end of the bell, 94-96% of the sound energy will be reflected, and **only 4%-6%** will be radiated outside the instrument and into the room!

The radiated sound is the "tone" of the instrument, that we perceive. The "acoustic" impedance is the quotient of sound pressure over sound volume flow, or in other words, the resistance that a system (the instrument) poses to another system (the lips of the musician).

Strictly speaking, it is called the "**input impedance**", but for simplicity will be called "Impedance" in this manual.

How does a wind instrument work?

The lips of the musician open and close periodically like a valve, and generate an "over pressure impulse" in the mouthpiece. This over pressure impulse travels (at the speed of sound) from the mouthpiece to the end of the bell.

• That is: The musician generates a sound wave in the instrument.

At the end of the bell, the sound wave will be almost completely reflected (!), and comes back inside the instrument towards the mouthpiece. Hence, a **standing wave** is produced. But not always:

A "standing wave" is built only when the time that takes for the lips to open and close (=period) is the same as the time that the sound wave takes to travel to the bell of the instrument and back.

or:

when the "period" of the lip valve is half of the round trip of the sound wave, that is, the lips open and close double as fast as in the first case.

or:

the lips open and close three times as fast as in the first case, or four times as fast, etc.

• That is: When the bore of the instrument is excited with a particular frequency (resonance frequency), a standing wave is generated, and a tone can be played. This tone is called the fundamental or the first natural tone.

At the same time, a tone (standing wave) of double the frequency can be generated: the second natural tone, and the same for three times the frequency: third natural tone, etc.

WHAT THE IMPEDANCE CURVE SHOWS

What happens in between?

When a frequency is excited, that does not correspond to the "round trip" of the sound wave in the instrument, the reflected waves that come back from the bell of the instrument arrive at the wrong time to the mouthpiece: a backward travelling under pressure impulse meets e.g. an over pressure impulse at the lip valve.

Under pressure + over pressure = normal air pressure = no standing wave, therefore no tone is possible!

When the exciting frequency is only slightly different from this "round trip", then a standing wave is built, but only in a very weak form, depending on how close the excited frequency is to the resonance frequency.

This means, that a tone can be "pulled", that is, one can play slightly flatter or sharper. However, a lot of energy is lost, the standing wave is only weakly excited, and one has to inject more energy into the system.

• What does BIAS do?

BIAS excites the instrument with **all frequencies** and at the same time measures how strong the standing wave is at each frequency.

Hence, the impedance curve displays the strength of the standing wave at each frequency. A peak in the curve means that, when the instrument is excited at that frequency, a standing wave is built, and at that frequency a tone can be played.

If a peak is higher than another one, it means that at this frequency, a stronger standing wave is generated, in comparison with other peaks of the impedance curve. With the same excitation level, this tone will be louder and will be easier to play than the other one.



The peaks in the impedance curve show where the natural tones exist in the instrument, i.e., what the instrument offers the musician. The musician can only make minor changes to it.



The first two peaks are always too flat, and do not correspond to what the musician plays. The reason for this will be explained in the chapter "Intonation" and "Weighing" (page 120) and depends on both the instrument and the player.

THE IMPEDANCE WINDOW

1 INSTRUMENT = 8 INSTRUMENTS

When no valves are pressed (setup V0), the instrument has a certain length (e.g., 1.46 m for a B^{\downarrow} trumpet, or 3.8 m for an F horn), and with this setup a particular set of natural tones can be played.

When the first valve is pressed (setup V1), a piece of tubing is inserted into the cylindrical part of the instrument, which makes the instrument sounding two semitones lower. The same natural tones can be played, but they are this time one tone lower.

When the first and second valves are pressed (setup V12), the natural tones sound 1 1/2 tones lower, etc.

As with three valves, 8 different valve combinations are possible, one instrument consists of 8 curves (setups).

The pictures shows schematically the parts of the instrument for the 8 different setups.



THE SETUP

75

Depending on which valves are pressed, the instrument with three valves will have 8 different lengths. An instrument with 4 valves will have 16 different lengths, and an instrument with 5 valves would theoretically have 32 lengths, etc.

However, not all combinations are used with instruments that have 4, 5, or 6 valves, as the extra valves are often used simply to correct the intonation of certain notes.



Which parts of the instrument contribute to the actual length depends on which valves are pressed. This is called **SETUP**.

8 Setups = 8 measurements = 8 curves

Not all peaks of a setup (curve) are used to play a note:

- The first peak (the pedal note) is only very seldomly used, if at all only for "special effect".
- the 7th, 11th, 13th, 14th and 15th peaks lie between two musical notes, and therefore are not used.

Used peaks in trumpets: 2, 3, 4, 5, 6, 8, 9, and 10 Used peaks in F horns: 2, 3, 4 5, 6, 8, 9, 10, 12, and 16 Used peaks in $B^{\frac{1}{9}}$ horns: (1), 2, 3, 4, 5, 6, 8, 9, 10 and 12 Used peaks in trombones: (1), 2, 3, 4, 5, 6, 8, 9, 10 and 12 Used peaks in tubas: not standard, depends on the intonation and the number of valves.

BIAS provides three setups for trombones:

- 1st position (slide not used, corresponds to setup "V0" of a valve instrument)
- **3rd position** (the right hand is placed exactly at the height of the end of the bell, and corresponds to the V1 setup)
- Q4 + 1st position: In case the trombone has a quarter valve, this valve is pressed without using the slide.

This constraint is necessary, as the position of the slide is individual and not comparable. The only setups that are comparable are the "1st position" and "3rd position" setups. Make sure that the "slide hand" is placed exactly at the height of the bell when you use the "3rd position".

WINDOW ELEMENTS

Basically, each BIAS window contains **all commands** that are needed for display and processing of the displayed data in the **top area**.

The "**Status bar**" is located on the bottom of the window, and it provides extra information (depending on the cursor status).

Additionally, the **"context menu"** is opened by pressing the right mouse button, offering more commands.



DISPLAY MEASUREMENT



To display a measurement in the impedance window:

Mark a measurement in the tree view of the database window, or a setup (e.g. the directory that corresponds to the valve code marked V23), or an instrument (e.g. tonella) or an instrument group (e.g. horn), and click on the impedance icon (either in the database window or on the top right corner of the BIAS main window).

The impedance window will open:

• when you had marked a measurement, it is displayed as a curve

• when you had marked a setup (e.g. the directory "V1"), and that directory had several measurements in it, all these measurements are displayed

• when you had marked an instrument, all measurements corresponding to this instrument are displayed

• when you had marked a whole instrument group (e.g. horn), all measurements of all horns are displayed.

After BIAS has "filled in" 50 measurements in the window, a security check asks if you would like to proceed or abort the action.

 DRAG&DROP: when the window is already open and you would like to add a measurement (or a whole instrument), simply drag and drop it from the database tree view (pressing the left mouse button) into the impedance window.



If you click on the impedance icon, and at the same time press the Shift key, the marked element will be displayed in a new additional impedance window.

You can generate many such windows with the Shift key.

THE ZOOM





Zoom in:

To increase the size of the picture, simply click on the left mouse button and drag a rectangle

The area inside the rectangle will be expanded in the whole window.

You can use the zoom feature as often as you like.

You can slide over the whole curve with the scrolling bars that are located on the left and bottom edge of the window.

You can slide over the whole window step by step by clicking the arrow buttons at the extreme ends of the scrolling bars, or by clicking the keyboard arrow keys

Zoom out:



Clicking on this icon will gradually reduce the magnification.



Clicking on this icon restores the original setting.

You get the same effect if you "**Double click**" anywhere inside the plot area of the window.

DISPLAY AREA - Whole area

BIAS measures basically from 0 to 4000 Hz (and also above), and all the measured data are stored. But normally not the entire frequency range is displayed, but **only those areas** where natural tones of the instrument are located.

Additionally, the range between 0 and 20 Hz is removed, as in this range measurement errors can occur.



Beside you can see the whole range for a bass tuba, and below for a trumpet.

A particular optimised frequency range for each instrument is saved in the BIAS database, so that you do not have to use the zoom feature.

BIAS shows automatically an optimal window range for each instrument:

Trumpet:	0 - 1800 Hz
Trombone:	0 - 1200 Hz
Horn:	0 - 1500 Hz
Tuba:	0 - 1000 Hz

Whole area:



• If you nevertheless wish to see the whole area, right click anywhere inside the display area, to invoke the "context menu". Select "**Recorded Range**", and you will see the data up to 4000 Hz and above (e.g. 6000 Hz).

If you wish to restore the display, right click again and select "Recorded range".

THE IMPEDANCE WINDOW

THE CURSOR

On the left hand side, directly beside the vertical Y axis, there is a **red line, the "cursor"**. Move the mouse towards the Y axis until the pointer turns into a double arrow (see picture).

Drag the cursor to the right. You can drag the cursor over the whole curve. All values of the curve that lie at the cursor position are shown in the **status bar** on the bottom of the window.



THE STATUS BAR

indicates the name of the note that corresponds to the frequency at the cursor position, including its deviation (in cents) from an equally tempered scale. The picture shows that the marked peak lies on the note C_{5}^{\sharp} , and that it is 10 cents too sharp.




THE "ACTIVE" CURVE

(or all) curves you have to use the Plot Manager (see page 84) Whenever many curves (=measurements) are displayed inside a window, the program must know to which curve it has to apply the current action.

Actions can normally be applied only to **one** curve: the **"active curve"**. The default active curve is the one that was last invoked or loaded. The colour of the active curve is shown in the circled field.



The information shown in the status bar also applies for the "active" curve.

To change the active curve:

In the above picture, the active curve is the blue curve. If you wish to make the yellow curve active, simply click with the mouse on the yellow curve. The colour in the circled field will then change to yellow, and all following actions, as well as the cursor values and the information on the status bar, will correspond to the yellow curve.

The note names in BIAS always follow the American notation:

C5 (American) = C2 (European) (page 169)

Subtract "3" to convert into European notation.

THE "ACTIVE" CURVE - CHANGING COLOUR



• To change the colour of the "active" curve:

Click on the colour field and choose a colour from the colour palette, or define a new colour.



THE COMMANDS

All the commands you need are located on the top edge of the impedance window.





Clicking on this icon saves the current position and size of the window, so that whenever BIAS is started again, it will be arranged like that.



Clicking on this icon reverts the shown area (e.g. after having zoomed in) to the standard value.



Clicking on this icon zooms out one step.

THE PLOT MANAGER



The plot manager is an important tool to organise and administer curves. Whenever you wish to perform an action that should apply not only to the active curve, but to some or all curves, click on this icon, and the plot window will appear.

The picture below shows the invoked plot manager, showing a complete instrument (8 curves) that has been loaded into the impedance window.

- Clicking on the green arrow will perform all possible changes that you have made.

Clicking on the red arrow aborts the actions, and leaves everything unchanged ("Cancel").

BIAS	Grupp e bearbeiten								
							2		
			6.7.1.1	-	N 1 1		8		
	Active	Lolor	Weight	Freq	Delete	Session	Lomment		
		-	U	440.0		In B: WERILX-2 VU 1995.12.14	measurement with no valve engaged		
		-	U	440.0		in B: WERILX-2 V2 1995.12.14	measurement with second valve pressed		
			U	440.0		in B: WERILX-2 V1 1995.12.14	measurement with first valve pressed		
			U	440.0		in B: WERILX-2 V12 1995.12.14	measurement with first and second valve pre		
			U	440.0		in B: WERILX-2 V3 1995.12.14	measurement with third valve pressed		
			U	440.0		in B: WERILX-2 V23 1995.12.14	measurement with second and third valve pr		
			U	440.0		in B: WERILX-2 V13 1995.12.14	measurement with first and third valve presse		
	×		U	440.0		in B: WERILX-2 V123 1995.12.14	measurement with first, second and third val-		
						A			
	This field shows the instrument in- tonation, the name, the setup and the date of the measurement This field shows the						nt in- o and This field shows the		
	field you can specify the co- lours of all curves setup of each rement (curve) By checking this box you designate a new "active" curve								

THE PLOT MANAGER

Choose and display the weightings

(go to page 119-126 to learn more about the meaning and sense of weighting)

The column "Weight" shows the display mode of each curve. All impedance curves are displayed by default "unweighted" ("U"), i.e. exactly how they were measured. Clicking on one of the fields in the "Weight" column (see picture) will open a drop-down menu, where you can choose the weighing of each curve.

Active	Color	Weight	Freq	Delete	Session
		U	440.0		in B: WERILX-2 V0 1995.12.14
		U	440.0		in B: WERILX-2 V2 1995.12.14
		Unweig	hted		🗙 👩 [:] RILX-2 V1 1995.12.14
		U	440.0		in B: WERILX-2 V12 1995.12.14
		U	440.0		in B: WERILX-2 V3 1995.12.14
		U	440.0		in B: WERILX-2 V23 1995.12.14

Choose e.g. "Mezzo Forte" If you click on the blue check mark, the selection only applies to this particular measured curve If you click on the red cross, the action will be aborted and nothing will be changed 440.0 U B: WERILX-2 V If you click on the "world" icon, the Unweighted Ŧ M RILX-2 × selection will apply to all curves Unweighted in B: WERILX-2 V Standard in B: WERILX-2 V Piano in B: WERILX-2 V MezzoForte in B: WERILX-2 V Forte 口 U 440.0 in B: WERILX-2 V

Unweighted impedance curve of a trumpet



Weighted (forte) impedance curve of a trumpet

THE PLOT MANAGER

Choose the reference frequency

You can choose a different reference frequency for each curve (=setup =valve setting) separately

What is the reference frequency for?

It serves only as a "reference" for the note that is shown in the status bar when the cursor is scrolled across the window, and has no influence on the calculation of the intonation displayed in the intonation window.

It is by default set to a4 = 440 Hz, i.e. the note shown in the status bar (on the current cursor position) and its deviation from an equally tempered scale (in cents) is based on 440 Hz.

On the "Freq" column click on the frequency of the chosen curve, and a drop-down menu will appear, where you can change the frequency by clicking on the arrows.

Gruppe bearbeiten								
× (
Active	Color	Weight	Freq	Delete	Session	Comment		
		U	440.0		In D. Chedivarius 72 V0 1995.11.30			
		U 🌔	447.	0 🔷 🗸	🖌 🗙 👩 <mark>ivarius 72 /2 1995.11.30</mark>	com6[[]]]]		
		U	440.0		in B: Stradivarius 12 V1 1995.11.30	com2IIIIIII		
		U	440.0		in B: Stradivarius 72 V1 1995.11.30	com2IIIIII		
		U	440.0		in B: Stradivarius 72 V12 1995.11.30	com3IIIIII		
		U	440.0		in B: Stradivarius 72 V3 1995.11.30	com8IIIIII		
		U	440.0		in B: Stradivarius 72 V23 1995.11.30	com7 111111		
		U	440.0		in B: Stradivarius 72 V13 1995.11.30	com5IIIIIII		



• clicking on the blue check mark will make the changes effective

- clicking on the red cross will abort the actions
- by clicking on the world icon, the modified frequency will apply to all curves
- Clicking on the **green check mark** will close the plot manager, and all the changes made will apply to the impedance window.
- By clicking on the red cross, the plot manager will close, and the changes will be cancelled.

THE PLOT MANAGER

Remove several curves from the plot

You can remove either the "active" curve or all curves from the window with the shown icons in the menu bar.

Use the plot manager if you wish to remove only a particular set of curves.

Gruppe bearbeiten									
~	×								
	Active	Color	Weight	Freq	Delete	Session			
			U	440.0		in B: Stradivarius 72 V0 1995.11.30			
			U	440.0		in B: Stradivarius 72 V2 1995.11.30			
			U	440.0	×	in B: Stradivarius 72 V1 1995.11.30			
			U	440.0	×	in B: Stradivarius 72 V1 1995.11.30			
			U	440.0		in B: Stradivarius 72 V12 1995.11.30			
			U	440.0		in B: Stradivarius 72 V3 1995.11.30			
			U	440.0		in B: Stradivarius 72 V23 1995.11.30			
			U	440.0		in B: Stradivarius 72 V13 1995.11.30			
•[

In the column "Delete" you can mark (by clicking with the mouse) several curves.

Clicking on the **green check mark** will delete the marked curves from the window.

Add or edit a commentary to a measurement

 You can add or edit a comment to a measurement by clicking on the field "Comment".

BIAS	Gruppe bearbeiten									
✓ ×										
	Active	Color	Weight	Freq	Delete	Session	1	Comment		
	×		U	440.0		Tonella V0 1996.01.25		Dies ist ein Kommentar nur 🛛 🛃		
			U	440.0		Tonella V2 1996.01.25		tix diese eine Messung.		
			U	440.0		Tonella V1 1996.01.25				
			U	440.0		Tonella V12 1996.01.25				

This comment is only associated to this measurement, and is different from e.g. the description, which is assigned to the whole instrument or setup.

HINT: It is more convenient to edit a commentary (=description) in the Editor (see page 67).

COPY TO CLIPBORD



"Copy to Clipbord"

This command is especially convenient: You can copy the curves from the current window directly into a text or layout program. BIAS adds a legend automatically.

Clicking on the icon copies the whole content of the window into the clipbord, to be pasted into e.g. Word or any other text program, by invoking the command "Paste" or by typing "Ctrl+V" inside the opened text document.

Example in Windows Word:

This feature has proved to be very useful when creating documentation for customers!



PRINTING



You can print from **all windows** the respective diagram (intonation) or curve (impedance/impulse) by clicking on this icon. You have the following options:

- print curves or diagrams
- print only the description and commentary
- print a certificate

After clicking on the printing icon, the following will happen:

- a window will open, where you can choose the layout
- the print preview will be shown
- the printout will be sent to the printer

The layout window

print the contents of the window

	print preview	
	print only the description	
	print a certificate	XI
	Print Plot Print Comments Print Certificate	
	Font for Legends: Arial	F ^f T
	Fint Legend	
	Header. trompete	F ^f T
	biasd60	₽ ^f T
adds the	elegend	
		here you can choose the type and size of the
	here you can type the name of your com- pany or other information	font
		add the date and time

PRINTING

The layout window

Printer Setup	×
<u></u>	
Print Plot Print Comments Print Certificate	
Font for Legends: Arial	F ¹ F
Print Locand	
ie i incegena	02
Header Fantasy Brass Ltd.	F ^f F
Comment	₽ ⁴ ₽



Clicking on this icon will open the Windows Font Window, where you can choose the font type and size. You can choose different fonts for different fields (legend and company name).

Schriftart			? ×	
Schriftat:	Schriftschnitt: Standard Standard Kursiv Fett Fett Kursiv	Schriftgrad: 9 10 11 12 14 16 18	OK Abbrechen	here you can choose: • the font type • the font style
Effekte Durchgestrichen Unterstrichen Farbe:	Beispiel AaBbYyZz Skript Westlich	· · · · · · · · · · · · · · · · · · ·		 the font size the font colour



Clicking on this icon will insert the current date and time

Hint: you have to mark (with a mouse click) the corresponding field (see picture) first! If the field is not empty, the date will be added.

Printer Setup	×
3	
Print Plot Print Comments Print Certificate	
Font for Legends: Arial	efr
I Print Legend	02
Header. Fantasy Brass Ltd.	F ^f T
Comment 19.07 2008 13:29:06	e ⁴ t



Clicking on the print icon will open the print preview window.

PRINTING



Clicking on the X button located on the top right corner of the window (circled in red) will cancel the whole action.

Clicking on the printer icon located on the top left corner of the window (circled in green) will open the Windows print window, where you can choose the printer and send the printout.

Drucken		<u>? ×</u>
Drucker		
Name:	LaserJet 1010	Eigenschaften
Status:	Bereit	
Тур:	hp LaserJet 1010	
Standort:	DOT4_001	
Kommentar		
Druckbereic	h	Exemplare
Alles		Anzahl Exemplare: 1
C Seiten	von: 1 bis: 1	
C Markier		1 2 3 3
		OK Abbrechen

The Windows print window.

BIAS will select "Portrait" or "Landscape" automatically depending on the printout.

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THE IMPEDANCE WINDOW

PRINT A CERTIFICATE

Print a certificate

With BIAS you can print a "certificate" for a measured instrument, which will include in a standard A4 page:

- the pulse response
- the intonation diagram (referenced to V0)
- some text which contains the following:
 - Name of the instrument
 - Serial number
 - Date when the certificate was printed
 - Date of the measurement
 - The operator or creator responsible for the measurement
 - The reference intonation for a1 calculated by BIAS
 - an extrapolated "normalised" intonation
 - the pulse response factor as a measure of playability

The pulse resonse was chosen for the Certificate print out (instead of the impedance) because it clearly shows manufacture errors.

The Intonation is displayed with "standard weighting" and referenced to the pitch of the setup V0 (no valve engaged).

In order to get a Certificate print out, certain preconditions must be fullfilled:

1. a serial number must have been entered in the corresponding field. If this is not the case you can enter the serial number now: click on the Instrument name in the tree view to mark the name and then click on the editor icon to edit the serial number.



- 2. In the window from which you start the certificate print out are allowed only data of one single instrument.
- 3. If an instrument has more than one setup (e.g. the default setup "V0, V1,..." and one additional e.g. "V0 Simulation, V1 Simulation,...), the currently open window may contain the data of only one setup and no mixture.
- 4. A Certificate print out is only possible for already **saved** data.

BIAS

THE IMPEDANCE WINDOW 93

PRINT A CERTIFICATE

HINT: As the name of the person who was logged in in BIAS during the measurement (that is, who performed the measurement) appears in the certificate as the "Operator", you should have created a "user" (see page 27). Otherwise BIAS sets the Operator name automatically to "IWK".

To create a certificate:

 Load all measurements corresponding to a particular setup of an instrument in any window (impedance, intonation or pulse response window)



3. In the layout window, click on "Print a certificate"

• You can then choose where the text will be printed (top left or top right)

• You can also type a commentary in the field "Description". Keep in mind that this whatever is written in this field will not be printed, as it is intended to serve as information for you.



• Clicking on the printer icon will open the print preview window, showing the pulse response as checkup.

4. Clicking on "INTONATION" (red circle in the picture on the left) will show the intonation diagram for check up.

 Contractor Pols
 Contractor

 0K
 Contractor

 0
 Contracto

• By clicking on the corresponding icon (red circle in the picture on the left) you can decide if only the standard fingering will be shown (see page 116), or all fingerings.

• You can also show the deviation of the intonation of the notes (default A_4) with any frequency, by clicking on the arrows corresponding to the field located on the right.

PRINT A CERTIFICATE

5. Click on the "OK" button, and then on the printer icon of the print preview window, and the certificate will be printed.





As you can print a certificate many times, BIAS numbers them automatically. The number beside the word "Certificate" (red circle in the picture on the left) indicates how many times the current certificate has been issued.

HINT: You can issue a new certificate, or print a copy of an already existing certificate.

PRINT A CERTIFICATE

• To print a copy:

Click on this icon on the database window. A selection screen will appear (see picture below), where all certificates that have been issued so far will be listed. You can simply choose one, and print a copy of it by clicking on the printer icon.

rtifikal	te drucken		
U	Description	Examiner	Date
1		Wilfried Kausel	31.12.2007
2		Wilfried Kausel	31.12.2007
3		Wilfried Kausel	31.12.2007

• By clicking on the **red cross** you can delete the currently marked certificate from the list of existing certificates!



Documentation of the pitch for A₄

Beside the common specifications, the following will be also specified in the certificate:

- "Actual Tuning" and
- "Normalised Tuning"

This is because:

• It is well known that the room temperature influences the pitch of a wind instrument. This is the reason why the basic pitch of instruments measured at different temperatures is not comparable!

• In our experience, customers and instrument makers attach great importance to the basic pitch! To be able to establish comparability, BIAS takes the measured basic pitch ("Actual Tuning"), and calculates from it a fictitious basic pitch at a temperature of 21°C ("Normalized Tuning").

WARNING:

Temperatur: 22.8 🛟

That only works, if you entered the current ambient temperature in the corresponding field in the measuring window **already before you start the measurement!** (see page 134).



HINT: The intonation given in the certificate is "concert pitch"

You do not have to have loaded all curves from a setup. If you have only loaded one curve, only one will be displayed.



EXPORTING DATA

- Procedure:
- 1. Choose the data you wish to export
 - 2. Choose the curves you wish to export
 - 3. Click on the "Export" button
 - 4. Choose the name of the file and the directory where it should be exported
 - 5. Close the export window

Speichern unter		<u>?×</u>
Speichern 🗨 DATEN (D:)	• •	🌶 📂 🖽 -
D_VR	🚞 Budapest 2005	🛅 FOTOS 1 (bis '
AAA 🧰	🚞 CURIOSA	🔁 FOTOS 2 (ab 👘
aes 🔁	🛅 DIA Sigescannt	🛅 FOTOS 3 RETI
ausseninstitut	🚞 DATENBANKEN	🚞 FOTOS 4 (200
🛅 BEARBEITEN	🛅 DISK1 vorletzte version	🚞 FOTOS 5 (200
📄 BILDMATERIAL	🚞 FILM Fun	🚞 FOTOS 6 (200
•		F
Dateiname: .csv		Speichern
Dateityp: Export Dateien	(*.CSV)	Abbrechen

The picture on the left shows such a "csv" file (only one curve and only the impedance were exported) when opened with Microsoft Excel. On the first column it contains the frequency, and on the second column the impedance (for a frequency range from 0 to 4000 Hz, with a point every 0.5 Hz). The plot below can be generated with the Excel automatic plotting function:



If you delete everything from row 2500 till the end, you get a zoomed image.



BIAS

E) H	andbuchtest.	SV						
	A	В	С					
1		Stradivarius 72 VD 1995.11.						
2	Freq	Impedancedata						
3	0	0,04558586						
4	0,5	0,05143591						
5	1	0,05702421						
6	1,5	0,06220201						
7	2	U,06685527						
8	2,5	U,07091144						
9	3	0,07434087						
10	3,5	0,07715324						
11	4	0,07939026						
12	4,5	0,08111615						
13	6	0,08240769						
14	5,5	0,08334513						
15	6	0,0840051						
16	6,5	0,08445577						
17	7	0,08475427						
18	7,5	0,08494602						
19	8	0,08506552						
20	8,5	0,08513778						
21	9	0,08518019						
22	9,5	0,08520449						
23	10	0,08521834						
24	10,5	0,08522684						
25	11	0,08523388						
h	115	111852435						

BIAS

EXPORTING DATA

B 1	Handbuchtest.csv													
	A	A B		D	E	F	G	Н						
1		in Bb: Stradi	variu											
2	Freq	Impedanceda	ta											
3	0	0,04558586	0,04558586	3,09947753	0,04558586	0,04558586	0,04558586	4,96388531	0,04558586					
4	0,5	0,05143591	0,05143591	2,70419717	0,05143591	0,05143591	0,05143591	4,60380411	0,05143591					
5	1	0,05702421	0,05702421	0,05702421	0,05702421	0,05702421	0,05702421	0,05702421	0,05702421					
6	1,5	0,06220201	0,06220201	0,06220201	0,06220201	0,06220201	0,06220201	0,06220201	0,06220201					
7	2	0,06685527	0,06685527	0,06685527	0,06685527	0,06685527	0,06685527	0,06685527	0,06685527					
8	2,5	0,07091144	0,07091144	0,07091144	0,07091144	0,07091144	0,07091144	0,07091144	0,07091144					
9	3	0,07434087	0,07434087	0,07434087	0,07434087	0,07434087	0,07434087	0,07434087	0,07434087					
10	3,5	0,07715324	0,07715324	0,07715324	0,07715324	0,07715324	0,07715324	0,07715324	0,07715324					
11	4	0,07939026	0,07939026	0,07939026	0,07939026	0,07939026	0,07939026	0,07939026	0,07939026					
12	4,5	0,08111615	0,08111615	0,08111615	0,08111615	0.08111615	0,08111615	0,08111615	0,08111615					
13	5	0,08240769	0,08240769	0,08240769	0,08240769	0,08240769	0,08240769	0,08240769	0,08240769					
14	5,5	0,08334513	0,08334513	0,08334513	0,08334513	0,08334513	0,08334513	0,08334513	0,08334513					
15	6	0,0840051	0,0840051	0,0840051	0,0840051	0,0840051	0,0840051	0,0840051	0,0840051					

As an example, the picture shows an Excel file where the impedance values of all 8 curves were exported.

The picture below shows the corresponding plot. The data from row 3500 onwards were deleted.





Whenever you export several types of data, e.g. impedance and pulse response, or pulse response and phase, one type of data will be followed by the other.

That is: First the 8000 impedance values are written in the first column, then after a row with the label e.g. "phase", follow the 8000 phase values (also in the first column).

The picture on the left shows the data arrangement in a csv file if you export impedance, phase and puls response data of two setups.

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EXPORTING DATA

Whenever you need to export the data in "BIAS" format, check the box (with a mouse click) marked "BIAS 50 compatible mode"

Choose which curves should be exported (in the picture below all curves will be exported) and click on the "Export" button.

Using the BIAS 5 format for each curve (=setup) a separate .bia-file is created.

Export Data		×								
<u>C</u> lose <u>E</u> xport	C CSV Format	 Include Headers Include Impedance Data Include Pulse Response Data Include Phase Data 								
✓ X										
 in Bb: Stradivarius 72 ∨0 1995.11.30 in Bb: Stradivarius 72 ∨2 1995.11.30 in Bb: Stradivarius 72 ∨1 1995.11.30 in Bb: Stradivarius 72 ∨12 1995.11.30 in Bb: Stradivarius 72 ∨3 1995.11.30 in Bb: Stradivarius 72 ∨23 1995.11.30 in Bb: Stradivarius 72 ∨13 1995.11.30 										

Choose the file name and the directory where the files with the exported data should be saved.

• Whenever you export all 8 setups of an instrument, you **only** need to type **one name**. BIAS will automatically add the numbers 1 to 8 to each of the created file names.



• Warning: As the file name in BIAS51 can only have 8 characters, you only have 5 characters available for naming the file, as the other 3 characters are needed by BIAS for the automatic numbering of the files.

One file will be created for each curve. For example: XXXXX_1.bia, XXXXX_2.bia, XXXXX_3.bia, etc.

These files can be imported into the BIAS 5.1 program or into BIAS 6 databases.

REMOVE CURVES FROM SCREEN



Clicking on this icon will remove the "**active**" curve from the impedance window.



Clicking on this icon will remove **all curves** from the impedance window.

The data will not be deleted, the curves are simply not be displayed at the screen.

MANUALLY NATURAL TONE DETECTION



If you move the cursor along the impedance curve, the status bar (on the bottom of the impedance window) will show for

each position of the cursor the corresponding note and its deviation from an equally tempered scale. In the above picture where the menu bar is shown, the cursor is placed at a position that corresponds to the note $\mathsf{B}_{4,}^{\flat}$ which is also 5 cents sharp. This is only valid if the orchestra is tuned at A=440 Hz!



If A=443 Hz, then this note would be 7 cents flat. To be able to check that the instrument is tuned according to the desired intonation, it is possible to change the reference frequency in steps of 0.1 Hz. This is done by clicking on the arrows beside the frequency display located in the menu bar.

The shown reference frequency applies only to the "**active**" curve. You can change the reference frequency for several or all curves in the "**Plot-Manager**".



HINT: The note names in BIAS are always written using the American notation: \mathbf{B}_{4}^{\flat} (American) = b1 (European) You only need to subtract 3 from the American notation to convert to European notation. \mathbf{B}_{4} = b, \mathbf{B} = h.

THE WEIGHTING



With this drop-down menu you can choose if the curve is unweighted (original data) or "weighted" displayed.

The "Weighting" is at first sight a somehow complicated matter, however it is very important for the correct interpretation of the impedance curve and its significance on the playing of the instrument!

To learn what the "weighting" is good for, read the chapter "Intonation - Weighting" on page 119-126.



SWITCHING BETWEEN WINDOWS

Shift to another window



Clicking on this icon will open the intonation window, and all data from the impedance window are copied to the intonation window.





Clicking on this icon will open the pulse response window, and all data from the impedance window are copied to the pulse response window.



Each BIAS window has these two icons on the top right corner. With them you can open other windows, and the data of the currently opened window will be automatically transferred to the new window.

If you click on the icon and at the same time press the Shift-Key, the marked element will be shown in a new window. In this way you can open e.g. several Intonation windows, Impedance windows or Pulse Response windows.

THE CONTEXT MENU

Magnitude
 Phase
 Recorded Range
 Magnitude
 Phase
 Recorded Range
 As
 Magnitude
 Phase
 Recorded Range
 As
 Magnitude
 If y
 Recorded Range

Right clicking anywhere inside the display area will open the context menu. With it you can shift between the displays:

- of the impedance **magnitude** (default)
- of the impedance phase

To learn more about the meaning and interpretation of the phase, please read the chapter "At which frequency is the note played in fact?" on page 126-127.

As was mentioned in the chapter "Display area" page 79, the complete measured frequency range will be by default never shown: Only the range that is relevant and interesting to each instrument is shown.

If you however wish to see the complete range, click on the command "recorded range", and the whole frequency range up to 4000 Hz will be shown.







Phase default range



Magnitude "Recorded Range"



Phase "Recorded Range"

The Pulse Response Window

WINDOW ELEMENTS



The pulse response of the instrument is generated when an infinitely short impulse is injected into the instrument. This effect is achieved in BIAS by a mathematical transformation that converts the impedance data from the frequency domain into the time domain.

The pulse response window can be used to find and analyse **imperfec**tions, to determine the exact "acoustic length" of the instrument, or to estimate the response of the instrument.

The commands in the menu bar, the cursor and the Zoom features are like the ones in the impedance window (see pages 83-99)







Distance between the cursor position and the edge of the mouthpiece rim in cm

THE ACOUSTIC LENGTH

When a very short and strong impulse is sent into a tube (instrument), the impulse will be reflected at points where there is a sudden change in surroundings (e.g. change of the cross section or the end of the bell)

BIAS calculates this effect by a mathematical transformation which transforms the impedance data from the frequency domain into the time domain.

With help of the pulse response, the acoustical length of an instrument can be easily determined. Simply move the cursor to the small negative peak before the main peak of the instrument, and read the value shown in the first field of the status bar.



Measuring the length of a slide:

- for example drag and drop the measurements corresponding to the setups V0 and V3 into the pulse response window
- with the aid of the cursor, read the length of the instrument with the V0 setup
- with the aid of the cursor, read the length of the instrument with the V3 setup
- the difference of these two values is the length of the third slide (e.g. 28.5 cm)



THE ACOUSTIC LENGTH

What is the difference between the "length" and the "acoustical length" (it's also called "effective length") of an instrument?

The acoustical length depends on the temperature. When the temperature is high, the speed of sound is also higher and the tube will be seen by the standing wave shorter, although its physical length always remains the same.

You can determine the influence of air temperature in the acoustical length of the instrument, by simply simulating an instrument at 20°C and at 30°C, and comparing both curves in the pulse response window.

When you load several or all measured valve combination of an instrument, you can determine the length of each slide by calculating (with the aid of the cursor) the length difference between each bell peak.

Keep in mind that you don't measure the physical length, but the acoustical "effective" length, that means, if the slide is somewhat pulled out (as it is the case in practical playing condition), this length is included in your measurement!

If you wish to measure the physical length of the slide, make sure that the slide is completely inserted!





Both pictures show a trumpet measured at a temperature of 21°C (a_4 =443.6Hz, blue curve) and at a temperature of 30°C (a_4 =450 Hz, red curve).

IMPERFECTION ANALYSIS

With the aid of the impulse response, you can determine imperfections inside the instrument. Small variation of the order of a 10th of a mm generate "peaks" or noticeable "unevenness" in the curve.

Keep in mind the following "rules"

• A **positive** peak indicates a position where a sudden constriction inside the instrument occurs. • A **negative** peak indicates a position where a sudden expansion inside the instrument occurs and stands as well for leakiness (e.g. waterkey). • Each peak features before and afterwards one or more small peaks with opposite direction. • Nevertheless, the bell of the instrument always appears as a strong positive peak! To get the length of the instrument you have to measure at the inflection point at the minimum of the small negative peak before! • Discontinuities in the cross section with a distance less than 3-4 cm from each other cannot be discriminated. • The first 20-30 cm of the pulse response plot are superimposed by mouthpiece resonances and therefore are not usfully for detecting imperfections.

• All instruments show more or less small insignificant peaks that are caused by reflections in the valve area.

• In all trombones, there are generally coarse imperfections as a result of the slide.

An example of how to interpret the pulse response curve of an F horn (setup V0, no valves pressed) is shown in the next page.

IMPERFECTION ANALYSIS



Although the impedance curve is all right, and the instrument is of good quality, the pulse response shows a significant imperfection at 214.5 cm from the top of the instrument: a constriction in the valve stock.

The picture beside shows the pulse response of a Vienna horn in Fa with a leaky and not air tight valve. There is a distinct negative peak at 170 cm distance from the mouthpiece rim, as well as the strongly attenuated peak from the bell of the instrument and an additional imperfection at 120 cm where the F-crook connects to the main tube. The PRF is in this case only 17.4 %, instead of approx. 27% to 29% for a good quality horn.



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THE PULSE REFLECTION FACTOR

The pulse reflection factor (**PRF**) is shown in the third field of the status bar and is a measure for the **response** of the instrument.

If you have loaded more than one curve, the PRF for the currently **"active**" curve is displayed.



It is given as a percentage, and it expresses the relationship between the reflected pulse at the end of the bell and the input pulse. For example, 37% means: the reflected pulse from the bell is 37% of the input pulse.

Experience has shown that the pulse reflection factor is in **good agreement** with what musicians judge as **response**. A higher PRF means that the instrument responds better.

The PRF is strongly influenced by the shape and volume of the mouthpiece cup! A flatter and hence smaller cup causes a significantly higher PRF. This effect is well known in practice: It is easier to play an instrument with a flatter cup, but the resulting timbre is generally also affected.

There are three possible reasons for having a bell peak or PRF that are smaller than usual:

- 1. There are imperfections inside the instrument (forgotten cleaning flannels have been discovered with help of the pulse response): look for positive peaks along the instrument axis.
- 2. The instrument is not air tight: look for negative peaks.
- **3.** The inner surface of the instrument is extremely rough and causes high friction losses. This cannot be identified along the curve, but only through the height of the bell peak.

If the pulse response curve looks generally fine, but the bell peak or PRF are still smaller than normal, the problem is usually the inner surface of the instrument.

THE INTONATION



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CALCULATION OF THE INONATION

• First of all the frequencies of the peaks of the impedance curve are identified. For the calculation of the main pitch only the peaks 3, 4, 5, 6, 8, 9 and 10 are used (the frequencies of the peaks 1 and 2 are musically always incorrect and the peak 7 is not used).

• After this the "grid" of the equally tempered scale is shifted along the frequency axis till the mean value of the deviation of all used peak frequencies becomes a minimum. The frequency for the **a**⁴ detected with this method is then declared as the "reference pitch" of this impedance curve (=setup).

• The deviation of all playable notes of this setup (=combination of pressed valves) are referred to this a⁴.

• This method is applied to all setups independently which means:

each setup has - independent to other setups - an individual "reference pitch" a⁴=xxx Hz. You can varify this by dragging all measurements of an instrument into the Intonation Window and by clicking on one of the colored bars (all playable notes of a setup have the same color). You will see that for each setup/ color a different frequency for a⁴ is displayed in the "reference intonation box" on the top edge of the Intonation Window.



If a musician tests a brass instrument, he usually plays the natural tones of the setup "V0" which means no valve pressed, and then locates the frequency of the a⁴.

• The same result you will get with BIAS if you click on one of the dark-blue bars (setup=V0=no valve engaged) of the Intonation Window. With this action you define the setup "V0" as the "active curve". The "reference intonation box" displays always the detected frequency of the "active" setup (curve).

With a click on the symbol "referenced intonation", the deviation of all playable notes of the instrument to the equally tempered scale (intonation error) is showen in "cent" referred to the a⁴ of the actual "active" setup.

ELEMENTS OF THE INTONATION WINDOW



The Intonation Window shows the deviation to the equally tempered scale of all or several tones of an instrument.

The deviation of each note is displayed as a "bar" above the graphic symbol of the note. The scale unit is "cent" (1 cent = 1/100 semitone).

Some of the commands are identical to the commands of the Impedance Window (page 83-100), some are especially made for the purpose of the Intonation evaluation.



DATA EXPORT



Saves the actual window Size and position (same command like Impedance Window, see page 83)



Administration of the measurements and setups (same command like Impedance Window, see page 84-87)



Transfers the content of the Window to the Clipbord for the use with word processing programs like Microsoft Word (same command like Impedance Window, see page 88).



Prints out the Content of the Window (same command like Impedance Window, see page 89-95).



The data export feature works like the feature of the Impedance Window (see page 96-99). Exception: In the case of exporting intonation data only the options "include Header" and "include Intonation data" are allowed.

If you open such an exported csv-file with e.g. Microsoft Excel, you will see that the file contains data of all playable notes of the marked setup:

9	A 3.csv															
	A	В	C	D	E	F	G	н	1	J	K	L	M	N	0	Р
1		in	F: Yamaha V	445,539093	[Hz]	Standard										
2	Intonation:															
3	Instr	Valve	Desc	Ref	Weights	Tone	Note	Key	Offset	Envelope	Curvature	Low3dbLimit	High3dbLimit	Phase	Groupdelay	ZeroPhase
4				[Hz]					[Cent]	[MOhm]	[kOhm/Hz²]	[Cent]	[Cent]	[deg]	[ms]	[Cent]
5		in	F: Yamaha V	445,539093	Standard	17	F1	Std	-3,09106827	200,939713	36,3672676	15,4868202	17,8120823	-20,6374226	-22,9992695	-347,247131
6		in	F: Yamaha V	445,539093	Standard	24	C2	Std	-0,39941791	163,217316	0,17322955	23,1437073	24,8000679	-26,4924583	-15,6142588	-437,384796
7		in	F: Yamaha V	445,539093	Standard	29	F2	Std	2,03817368	145,974411	0,30022967	28,4342365	29,7647152	-27,7628174	-11,8159647	-454,440125
8		in	F: Yamaha V	445,539093	Standard	33	A2	Std	-14,2896843	125,954521	0,46498761	32,2768745	33,6562881	-27,8369713	-9,51191139	-468,812561
9		in	F: Yamaha V	445,539093	Standard	36	C3	Std	1,80910122	113,69593	0,84587336	35,4196053	36,7684479	-27,9772835	-7,29538155	-503,468903
10	1	in	F: Yamaha V	445,539093	Standard	41	F3	Std	6,29213285	91,1107025	1,53118527	40,279892	41,7647171	-31,639864	-5,21329737	-606,767639
11		in	F: Yamaha V	445,539093	Standard	43	G3	Std	11,4148903	85,80056	2,22028613	42,4391556	43,7774429	-30,8342133	-5,00891399	-531,145508
12	1	in	F: Yamaha V	445,539093	Standard	45	A3	Std	-10,4456139	75,5404434	2,65198779	44,2563477	45,6183624	-31,444088	-4,7490344	-533,190552
13	1	in	F: Yamaha V	445,539093	Standard	48	C4	Std	4,2978096	64,8156128	5,03481913	47,5389442	48,8158569	-33,8429451	-2,97197127	-807,924683
14		in	F: Yamaha V	445,539093	Standard	53	F4	Std	2,3736763	46,9328079	9,38331032	52,4853821	53,9534073	-40,3110504	-1,96768224	-1215,65173

Column D: the calculated refrence pitch of the setup Column F: the internal BIAS tone number (of no interest for the user) Column G: the name of the musical tone (sounding) Column I: the deviation of the tone to the equally tempered scale in cent

Column J-P: special correlation data developed only for research purposes and not for the common user. These data can be interpreted only in the state "unweighted"

- Column J: Envelope (height of the peaks)
- Column K: Curvature
- Column L: lower 3 dB Limit
- Column M: upper 3 dB Limit Column O: Group delay
- Column N: Phase
- Column P: Distance of the Phase-Cero-Point in cent

DATA EXPORT

For further data processing the columns "G" and "I" are primarily of interest. If you mark both columns (as shown in the figure at the previous page) you can create diagrams as shown below by using the diagram wizard of Microsoft Excel.



SOUNDING - WRITTEN



SOUNDING (default)

With a click on this symbol, the displayed graphic illustration of the note corresponds to the "sounding" note in reality.



WRITTEN

With a click on this symbol, the displayed graphic illustration of the note corresponds to the note as written in the score. In the case of "transposing" instruments (for instance French Horn in F) the "written" c^4 of the score is a f^3 in reality which means: a written "c" sounds with the frequency of a "f" below.

This feature was implemented for the convenience of players and instrument makers to provide them with the view they are accustomed to.

STANDARD FINGERING - ALL FINGERINGS



STANDARD FINGERING (default)

Using a setup (=combination of pressed valves) one can play several natural tones, but normally not all playable tones of a setup are used. With a click on this symbol, only those notes are shown which are commonly used (standard fingering). For the setup "V0" of a Horn in Fa it is for example the 2nd, 3rd, 4th, 5th, 6th, 8th, (9th), 10th, 12th und 16th natural tone, but for the B-flat Horn only the 2nd, 3rd, 4th, 5th, 6th, 8th und 10th natural tone (see also page 189 and 192).

Please note that standard fingerings differ between countries. So is for example the pressed 3rd valve (=setup V3) for Bb trumpets not used as a "standard fingering" in Austria and therefore hidden at the intonation plot. In such cases you can switch to the "all fingerings" mode.



ALL FINGERINGS

With a click on this symbol all playable notes of the actual loaded setups (=measurements=impedance curves) are shown. This feature can be used to find alternative fingerings with a better intonation.



Attention: an alternative fingering can have a better intonation but a bad response or poor sound quality!
THE INTONATION WINDOW 117

INTONATION separated - referenced to...



SEPARATED (default)

The frequency for a⁴ is calculated for each setup (= valve combination = measurement) **separately** and the deviation of all playable notes of this setup to the equally tempered scale is refrenced to this frequency.

This mode proofs how good the natural tones correspond in frequency spacing to each other **within the setup**.



REFERENCED TO A (GIVEN) CERTAIN FREQUENCY

The deviation of **all** playable notes of the instrument is refrenced to the a^4 of the actual **"active" setup**! This means that the calculation of the deviation of the notes is not referenced to the a^4 of the setup they belong, but to the a^4 of an other setup, the actually selected "active" setup.

To match the practical experience as perfect as possible you should select as "active" the setup "V0" in the case of instruments in Fa and the setup "V2" in the case of instruments in B-flat, because these setups are used to play the a^4 with the instrument.

This mode shows the quality of intonation for the **entire instrument**.



1 INSTRUMENT = 8 INSTRUMENTS !

If no valve is pressed (setup "V0"), the instrument has a certain length (for example 1.46 m for the Bb-Trumpet and 3.8 m for a French Horn in Fa) and you can produce a certain number of natural notes.

If the first valve is pressed (setup "V1"), the length of the instrument is raised about 12% so that all natural notes sound two semitones lower.

If the valves 1 and 2 are pressed simultaneously (setup "V12"), all natural notes sound 3 semitones lower, and so on...

Therefore an instrument consists of 8 setups (impedance curves), because 3 valves allow 8 different combinations. Playing a musical scale, you have to use different setups.

Please note: if you select the mode "Referenced to..." it is normal that the intonation values are generally worse than in the mode of "independent".

THE INTONATION WINDOW

THE REFERENCE FREQUENCY



This box shows the actual reference frequency (for the a⁴) to which the deviation of the various notes is referenced.

Normally this is the frequency for the a⁴ of the "active" setup. But you can alter it manually in 0.1 Hz steps by a cklick on the up or down buttons. Doing so, the length of the intonation bars change automatically.



If you have preselected "**independent**" the manually alteration of the reference frequency is effective only for notes played with the "**active**" **setup**.



If you have preselected "**refrenced to...**" the manually alteration of the reference frequency becomes effective for **all notes** of the instrument.



If you have altered the reference frequency manually and you want to get back to the original calculated refrence frequencies by BIAS for each setup, simply:

- click on the symbol "independent"
- click on any colored bar (e.g. dark blue)
- click again on "referenced"

THE WEIGHTING - objective Intonation

• For the calculation of the intonation the frequencies corresponding to the peaks of the impedance curve are identified. Only the peaks 3, 4, 5, 6, 8, 9 and 10 are used (the frequencies of the peaks 1 and 2 are always musically incorrect and the peak 7 is not used).

• After this the "grid" of the equally tempered scale is shifted along the frequency axis till the mean value of the deviation of all used peak frequencies becomes a minimum. The frequency for the **a**⁴ detected with this method is then declared as the "pitch or refrence frequency" of this impedance curve (=setup).

• The deviation (=intonation error) of all playable notes with this setup (=valve combination) is referred to this a¹.

• This calculation is done separately for each setup.



The intonation calculated by this method represents the **"objective In**tonation" of the instrument. It is the intonation offered by the instrument.



The practical experience shows, that the intonation played by the musician with that very instrument **can match** the **"objective**" intonation, but normally **does not match**!

The reason for this effect is, that being measured the instrument gets excited by a **sinusoidal signal** (is near to the excitation signal of a player if playing "*pianissimo*").

But normally the musician excites the instrument with a broad stimulus containing **many sinusoidal frequencies simultaneously** (the human stimulus contains at least 15 to 20 partials with different amplitudes, in the case of "*fortissimo*-notes" up to 60 partials!).

Therefore the entire energy of the human excitation signal **is the sum** of the energy (amplitude) **of all partials** included in the stimulus.

This means, that the playability of a note is **not only given by** the impedance peak at the **fundamental frequency** of the note (e.g. 440 Hz for the a⁴), but also by the peaks of its **partials** (e.g. 880, 1320, 1760, 2200, etc. Hz). The peak at the fundamental frequency is only a part of the whole!

The "objective" intonation is correct, but does not match the practical experience!

This is because the measured "objective" intonation represents only the intonation offered by the instrument.

The played intonation in fact is a compromise influenced by the physical properties of the instrument and the individual properties of the player.

THE WEIGHTING - the out of tune fundamental

If you play for example the first or second natural note, then all frequencies of the partials of your excitation stimulus correspond more or less with the peaks of the impedance curve of that setup, with one exception: the peak of the fundamental frequency is much too low! (up to 3 semitones, see the figure below). But it does not matter because the sum of the impedance values at all partial frequencies of your excitation stimulus is sufficient. **You play the first natural tone although there is no peak at this frequency!**

This is possible because playing notes in the lowest register of the instrument, the part of the fundamental compared with the entire stimulus (all partials) is very small.

If all peaks of the curve correspond well with the frequencies of the partials of the stimulus (except the first one), the musician plays a "virtual" note at a frequency where no peak is located!

Example:

All partials of the human excitation stimulus correspond with the frequencies of the impedance peaks, only for the first one it is not the case.

In the figure below one can see that all peaks correspond to the integer multiple of 39 Hz (78, 117, 156, 195, 234, 273 Hz, etc), only the first peak is located at 28,9 Hz.





The musician plays the note at that frequency **where the sum** of the impedance values **for all partials** of the stimulus is a **maximum**.

He therefore plays a note with a fundamental frequency of 39 Hz and not with 28,9 Hz (factual frequency of the first peak)

THE INTONATION WINDOW 121

THE WEIGHTING - sum function

To use this finding for the calculation of the intonation error only the sum of the impedance values at all integer multiple frequencies for any fundamental frequency (this means mathematically: a "convolution") has to be taken. Plotting these new values for each frequency point creates a new impedance curve ("sum function") which corresponds very well with the intonation played by musicians.



The figure above shows the same impedance curve as before, but as "sum function" - like the musician "feels" the instrument. And suddenly the first peak is at the right frequency - at 39 Hz!



But this procedure still does not express perfectly the practical playing experience, because it does not take into account that the **amplitude** of the various partials of the stimulus is quite **different**. That is: the contribution of each partial to the entire energy input is defined by the relation of its amplitude to the amplitude of the strongest partial.

This means, the impedance value to be added at that frequency where a partial of the stimulus is located, has to be multiplied with a "**Weight**" according to it's amplitude relationship within the sound spectrum of the stimulus.

Therefore BIAS takes the relation of the actual amplitude of a partial to the strongest partial. The impedance value at the frequency where the **strongest partial** is located is **multiplied with "1"**, the values of all other partials are multiplied with a number between 0 and 1, corresponding to their amplitude.

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THE INTONATION WINDOW

THE WEIGHTING - sum function

This method allows to simulate the change of played intonation depending on the played dynamic:

Playing e.g. *fortissimo*, the stimulus contaions more partials and additionally the amplitude of the partials with a high ordinal number is larger. This means more influence (=contribution) of the higher partials. For this reason the frequency of a *fortissimo note* can differ to the frequency offered by the instrument or to the frequency of the same note played "*pianissimo*".



The **effective intonation** depends on the individual stimulus of the musician and on the played dynamic!

Practical experience shows, that the difference in intonation depending on the played dynamic is negligible for instruments which offer a "good" intonation.

But big differencies can be found at instruments where the offered intonation is poor.

IMPLEMENTED WEIGHTS IN BIAS

BIAS uses actually 5 different weights:

unweighted (original measured data, without weights) piano standard mezzoforte forte



The default for the **impedance plot** is always "**unweighted**",

The default for the **intonation plot** is always "standard weighting"!

THE INTONATION WINDOW 123

THE WEIGHTS

The figure below shows some weighting curves.

Horizontal axis: ordinal number of the partials of the default stimulus. Vertical axis: amplitude for each partial expressed by the relation to the amplitude of the strongest partial.These weighting curves can be seen also as the "envelope" of the excitation spectrum.

The weight "fortissimo" turned out to be not necessary.



The weights are defined as:

1 unweighted (=without weights or multiplied with 1)



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PLAYED DYNAMIC - INTONATION

To verify if an instrument reacts on different played dynamic by a **poor intonation** you only have to **"drag" one and the same measurement twice** into the intonation window. For the figure below we took the setup "V0" of a horn in Fa. You can find it in the sample database as: Yamaha Wiener Horn.

This setup (=measurement) is **displayed now twice** (blue and red). The "red" setup is the "**active**" setup because it was dragged into the window at last. Both are displayed "standard weighted" because of the default setting.



- for the "active" setup select "unweighted"
- now click on any blue bar to select the blue setup as "active"
- select "forte" for the blue setup

The difference of the intonation depending on the played dynamic can be clearly seen! (figure next page)

PLAYED DYNAMIC - INTONATION

One and the same measurement with different weights:

red: unweighted blue: weighted with "forte"



Starting BIAS the default is:

Impedance plot always: **unweighted (original data)** Intonation plot always: **standard weighted** At which frequency is the note played in fact?

Considerations on a correct determination of the played intonation.

In principle it must be differentiated between the "objective intonation" and the "subjective or played intonation".

- The **"objective**" intonation is the intonation offered by the instrument and matches the measured impedance curve 100%.
- The "**subjective**" intonation is the actual played intonation by the musician with the instrument. This intonation is the result of:
 - **1.** the individual properties of the players lips (volume displacement inside the mouthpiece, page 6),
 - **2.** the typical individual sound of the player (number and amplitude of the partials of the excitation spectrum) and
 - **3.** the actual played dynamic.

On the one hand it should be sufficent for an instrument maker to determin the "objective" intonation of his instrument. On the other hand he is confronted with the judgments by his customers who do not evaluate the objective intonation but the individual intonation as the product of the player and the instrument!

For the player only the "subjective" intonation is of interest. Therefore a software which is written to evaluate the quality of brass instruments has also take into consideration the influence of the individual human player on the intonation. This is done by BIAS using different rubber plates (reducing the cup volume of the mouthpiece like the players lips) and different weightings for the calculation of the intonation.

At which frequency is the note played?

Simplified the note is played at that frequency where the impedance curve shows a peak.

This is not exactly true because the "impedance" is a complex value, which consists of a "**real-part**", an "**imaginary-part**" and a "**phase**". But the impedance window shows only the real part as default.

At which frequency is the note played in fact?

Most of the acousticians think that the musician does not play the note at the frequency of the peak, but at that frequency where the "**phase**" crosses the "**cero line**".



An example on the basis of a horn in Fa (Yamaha Wiener Horn)

The peak of the 8^{th} natural note (f⁵) is located at 354,5 Hz and matches perfectly an a^4 with 446,6 Hz (figure 1).

If you switch to the display mode "**phase**" with the help of the "context menu" you will see that the phase does not cross the cero line at 345,5 Hz where the impedance peak is located, but at 356,9 Hz (figure 2).

This would be +12 cent too sharp for an a^4 at 354,5 Hz, but corresponds to an a^4 = 449,6 Hz.

If you switch back to the "**real part**" mode and select the weight "**forte**", you will see that the peak of the (now weighted) impedance curve is located at 356,5 Hz (2 cent below the crossing point of the phase with the cero line), see figure 3.

This proofs, that the use of various weights in combination with the "sum function" method can simulate the effect of the individual player on the actual played intonation.

If you select "standard weighting" the calculated frequency for the peak is 356 Hz, 4 cent below the frequency of the "cero crossing" of the phase.

BIAS measures the "objective" intonation offered by the instrument and simulates the "subjective" intonation by the use of the sum function method with various weights.

The complexity of this matter showed an experiment: one note played by 9 professional trumpet players differed significant in it's frequency depending on the musical context.

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Albor

ACQUISITION WINDOW

OVERVIEW

The **Data Acquisition Window** offers different functionalities. It allows you to:





to calibrate the measurement head (only recommended after consultation of the IWK development team!)

Switch between Measurement and Simulation mode

Commands related to Measurement or Simulation mode	
Automatic measurement: select time space between measurements	
🛤 Aquisit on Trumpet in Bb: Stradivarius 72	
Session: Comm nt.	
Measurement Simulation	
Temperature: 22.8 🗧 🛄 Valve V0 💌 Time 1 🗧	
M0hm 100 30 30 70 Ceneral commands Statistical analysis - only visible 10 10 10 10 10 10 10 10 10 10	

SINGLE / AUTOMATIC MEASUREMENT

You can choose between a



• Single measurement: you measure the instrument with a certain setup (fingering), for example V0, or



• Automatic Measurement: you measure all 8 setups of the instrument. The sequence is determined displayed by BIAS, it guides you through the procedure.

START SINGLE MEASUREMENT:



• select the slot (valve combination) of the active setup which you want to measure.



• Click on the "Measure" icon. The measurement will start and the resulting impedance curve will be shown.



Take care not to talk or create loud noise in front of or near the bell and not to move the instrument while you hear that the measurement is running.

AUTOMATIC MEASUREMENTS (of whole instrument):



This command starts a complete series of measurements for all available slots (valve combinations) of the active setup. The program will prompt you to press certain valves before each measurement is started.

• You can change the time interval (in seconds) between the measurements using the up/down arrows of the control labelled with "**Time**".



• Click on the icon "Measure All" to start a complete series of measurements, beginning with slot V0 (open instrument, no valve engaged).



Blinking indicator of valve combination to measure next.

Measurement progress. Clicking on the red diagonal cross aborts the running measurement cycle.

MEASURE NEW INSTRUMENT

The subsequent described procedures can be applyed with Single Measurements and Automatic Measurements.

There are several possibilities:

Measure new instrument 1 (recommended):

• Select an instrument group (e.g. Trumpet in Bb) in the tree view.





• Create a new instrument by clicking on the icon "New Instrument" on the right panel of the tree view.

• Enter at least a name in the yellow edit box for the new instrument. Enter more complete information if you want to (which is even better - see chapter "Database" on page 49-51).





• Press "OK" to close the dialog then click on the acquisition window icon near the right top corner of the main application window. The data acquisition window will be displayed and a measurement can be started by clicking on the measurement icon. Measurements will be assigned correctly when you save them.

Measure new instrument 2 (less recommendable):

• Select an instrument group (e.g. Trumpet in Bb) in the tree view and immediately start a measurement. When you save the measurements you will have to enter all the missing information like instrument name and setup ex post. Eventually you even will have to specify the correct valve combination. Out of experience it can be said that this approach is error-prone specifically if more than one measurement has to be assigned while saving.

Measure new instrument 3 (not recommended):

• You dont care at all about the tree view and start to measure. When such "context-free" measurements are saved, they have to be assigned to the right instrument group, key, setup and valve combination manually. You might even have to override defaults related to an eventually wrong tree view position during the measurements.

ADD MEASUREMENT

Add measurement to existing instrument

Baumansicht

 Gröpete

 C

 B

 D

 Stradivarius 72

 Tonella

 Various mutes (Tone

 WERILX-2

• Select the instrument which is to receive a new measurement by navigating in the tree view and clicking on its graphical representation or on its name string (e.g., the trumpet "Tonella"). Open it and select a setup by clicking on one of its slots.



• open the ACQUISITION WINDOW by clicking on the measurement icon.



in case you want to measure **a specific valve combination only**, select the corresponding slot in the list box and start the measurement (see "Single Measurement" page 131)



• clicking on the floppy disk icon will save this measurement in the database assigning it to the right instrument, setup and valve combination.



in case you want to measure or re-measure the **whole instrument** you don't need to select a valve combination. Just click on the icon "**Automatic Measurement**" to start a complete series of measurements (see next page)



• clicking on the icon "**Save all**" will store all unsaved measurements in the database assigning them automatically to the correct individual slots of the selected instrument and setup according to their valve combination.

Each slot (valve combination) of a setup can keep an arbitrary number of measurements, simulations and calculations.

If you prefer to store the additional measurements of the instrument in a different setup, you have to create a new setup for this instrument befor you start the measurement (page 52).

With a click on the save symbol, all measurements are assigned then correctly to the new setup.

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ACQUISITION WINDOW

AIR TEMPERATURE

The temperature of the air column inside an instrument plays an important role for the intonation (see pages 14 and 107).

It makes a big difference whether you measure an instrument at 23 $^\circ\text{C}$ or at 16 $^\circ\text{C}!$ BIAS will determine quite a different tuning pitch in both cases.

Although the relative intonation of different overtones of the same harmonic series will stay unaffected (a C# which is too sharp when compared to all other notes will stay too sharp, regardless whether you measure at -10 °C or at +30 °C), but the overall tuning pitch of the instrument strongly depends on the ambient temperature during the measurement.

In order to make this tuning pitch comparable to some extent - especially when you intend to **print certificates** later - there is the possibility to enter the correct ambient temperature using the scrollbox before you start to measure.

Measurement	Simulation	
τε	emperature:	22.8 🛟

Use the arrow buttons to adjust the value of the temperature field **before you start** a measurement.

The entered ambient temperature will be saved along with your measurement. It will be used to estimate a normalised tuning pitch according to a standard temperature of 21 °C when certificates are printed.



The temperature value you enter **does not at all effect** the intonation chart of the measurement nor the absolute tuning pitch of a single valve combination or of the whole instrument which is calculated and displayed in intonation windows.



But when you simulate an instrument the selected temperature is fully taken into accout. Simulations at different ambient temperatures will produce different impedance curves! Be sure to enter the temperature you want the instrument to be simulated at!

DELETING MEASUREMENTS

ATTENTION:

As long as you did not save your measurements different icons will be used for deleting curves from the plot! Instead of



"Remove single / all screen representation(s) of database curve(s)"

the icons:



"Delete", "Delete All" will be shown. If you click on one of these icons, the (unsaved) active measurement, resp. all (unsaved) measurements will unrecoverably be lost.



If you have a mixture of unsaved new measurements and previously saved impedance curves in the acquisition window (can be dragged there from the tree view), the "Delete All" icon will warn you of the danger loosing data while the "Delete" icon might occasionally be replaced by the "Remove from Screen" icon depending on what curve has currently been selected by the user.

SAVING MEASUREMENTS



Saves the active measurement curve to the database. This icon is inactive (grayed out) when the currently selected curve belongs to an already saved measurement.



Saves all unsaved measurements to database. Does not operate on already saved measurements. Modifications of some attributes of already saved measurements (comment textbox) do not need to be explicitely saved again, they are updated implicitly



GENERALITIES:

BIAS requires the following information to properly save a measurement to the database :

Instrument group (Trumpet, Horn, etc.) Key (in C, in Bb, in F, etc.) Instrument name Setup name and slot (valve combination V0, V2, V13, etc)

SAVING MEASUREMENTS



General recommendation:

Select what you are going to measure **before you do the measurement** by selecting the corresponding object in the database tree view using the mouse!

Measuring a new instrument completely

Create this new instrument in the database first (see page 48).



• Select instrument group and key e.g. Horn in F by clicking on the corresponding element in the database tree view.



Click on "New Instrument"



- Name the new instrument using the yellow text field
- if you are in a hurry: **click on OK** (Owner, builder and other identifying information could be entered later, yet we strongly recommend not to skip this step in the first place as it does not take much more time than a few seconds and it will let you enjoy a clean and tidy database!)



• Click on "Automatic Measurement" to start with the measurement sequence.



• Click on "Save All" to store everything and assign all measurements to the new instrument.

Single measurements (e.g. slot V2 of standard setup) of a new instrument

• follow instructions above, but before starting a single measurement



• select slot e.g. V2 of active setup using the list box. Go on with the measurement and click on the floppy disk icon to save.



IMPORTING MEASUREMENTS



By clicking on this icon you can import external measurement data into the open BIAS database. The external measurement has to be provided in the older BIAS51 data format (filename.bia).

Importing data is available in the acquisition window only! The impedance curve of the imported measurement is shown in the acquisition window and can be treated there like other unsaved measurements. If you want to keep it permanently you have to assign it to a database instrument and save it to database!

• How to import measurement data:

• Click on the icon "Import"

BIAS 6 Session identifier spoified. Continue?

• When prompted for a Session identifier click on "Yes". More information related to "Data exchange between BIAS, Optimizer and VIAS" you will find in the appendix (page XXX).

mport BIAS50 Compatibility Data 🛛 🗶				
<u>C</u> lose	🛛 🗹 Include Instrument and Measurement information as comment			
<u>I</u> mport				
	Scale Factor 1.0			

• Check the box "Add instrument data as a comment", to save original instrument identification information with the measurement.

• Click on the button "Import".

• Using the next file selector dialog select the BIAS file containing the measurement you want to import. Click on the "Open" button to actually import the data.



The box "**Scaling factor**" allows to scale the MOhm values during the import procedure. The picture left shows an imported curve with factor 1 (blue), factor 2 (red) and factor 0.5 (green)



EXPORTING MEASUREMENTS

There are several ways to export measurement data for postprocessing by other applications. It is not required to save such measurements to the database in order to export them.

Exporting measurements has already been described in the chapter on the "Impedance Window" on page 96-99.

EDITING MEASUREMENT COMMENTS



Clicking on this icon you will be able to add some kind of comment or remark to a measurement.

This comment or descriptive text will be assigned to the currently "active" curve/measurement. All measurement comments can be reviewed and edited in the "comment" column of the "Plot Manager" window (see page 84).



Once a measurement has been saved to database its comment can be seen in the "Description" field of the tree view if you select the measurement in the tree. To modify this database field click on the "Editor" icon (see page 67-70).

🤜 Beschreibung bea	arbeiten		×
	<u>0</u> K	<u>A</u> bbrechen	
Name: 377C Baujahr: 2004 Seriennummer: AF Hersteller: XY Mundstück: Ankerl (46315 C C2		A
geänderter 2. Zug			
٩			

Text editor window for comments and descriptions.

SIMULATION

SIMULATION

(Physical Modeling)

Introduction and basic knowledge Borelist generation Applications

SIMULATION - BASICS

It is **not required** to understand how computers can simulate the acoustics of brasswind instruments in order to benefit from many possible applications of "virtual instruments" in BIAS.

- Therefore you can safely skip this section if you do not want to deal with the theoretical background!
- As a user you only have to know that you have to provide a text file containing a complete sequence of bore (inner) diameters together with their position along the acoustical axis of the instrument, both measured as accurately as possible.
- BIAS will calculate the impedance of this "virtual instrument" numerically. The simulation result can be analysed and plotted in exactly the same way as measurements.

This feature is especially useful for simulating modifications of single parts of an instrument (e.g. lead pipes). Modifying certain dimensions in the borelist allows to study the effect of these modifications on intonation and response without actually having to build such parts.

The computer model is based on the so-called transmission line analogy, which is widely used in physics to simulate one dimensional wave propagation. The voltage drop along a transmission line segment represents the sound pressure difference before and after any cylindrical or conical slice the virtual instrument is composed of. The complete sequence of all slices should well approximate the bore of the instrument. The dynamic air flow of the sound wave inside the bore (not the static air flow supplied by the lung!) is represented by the electrical current. Thermo-viscous losses are modelled by distributed resistances being part of the transmission line.

The series of all transmission line segments is terminated by a termination impedance (Z_t), causing partial reflection of the wave as observed in real instruments.

SIMULATION - BASICS



Example for cylindrical segment

Example for conical segment

The Impedance of such a segment is:

$$A_{i}(f) = \begin{bmatrix} a_{i11}(f) & a_{i12}(f) \\ a_{i21}(f) & a_{i22}(f) \end{bmatrix}$$

Pressure (p) and Flow (u) before and after the ith element are linked by

 $\begin{bmatrix} p_i(f) \\ u_i(f) \end{bmatrix} = A_i(f) \begin{bmatrix} p_{i+1}(f) \\ u_{i+1}(f) \end{bmatrix}$

The Impedanz (Z_i) at position i results from

$$Z_i(f) = \frac{p_i(f)}{u_i(f)}$$

The overall transmission matrix of the whole instrument is obtained as the product of all single matrices $A(f) = \prod A_i(f)$

$$\mathcal{Q}_{11} = \frac{X_1}{X_0} \left[\cosh(\Gamma L) - \left(\frac{1}{\Gamma L}\right) \sinh(\Gamma L) \right]$$

$$\mathcal{Q}_{12} = \frac{X_0}{X_1} Z_e \sinh(\Gamma L)$$

$$\mathcal{Q}_{11} = \left[\left(\frac{X_1}{X_0} - \left(\frac{1}{\Gamma X_0}\right)^2\right) \sinh(\Gamma L) + \left(\frac{\Gamma L}{\left(\Gamma X_0\right)^2}\right) \cosh(\Gamma L) \right]$$

$$\mathcal{Q}_{22} = \frac{X_0}{X_1} \left[\cosh(\Gamma L) - \left(\frac{1}{\Gamma X_0}\right) \sinh(\Gamma L) \right]$$

Matrix element $(A_i(f))$ of single slice

Termination impedance (Z_t)

$$Z_{L} = \frac{\mu}{\pi R_{a}^{2}} \left(\frac{(k R_{a})^{2}}{4} + i0.6133(k R_{a}) \right)$$

SIMULATION - BORE LIST

Bore list creation:

Each line of the bore list contains at least two space or <TAB> separated floating point numbers: An x-value (distance from reference cross-section, e.g. mouthpiece rim) and a y-value (bore diameter). Specify both dimensions in [mm].

Example:



The bore list of the above geometry could look like::

Nr.	X-Value in mm	Y-Value in mm
1	0	20
2	10	20
3	18	14
4	21	10,78
5	29	10,78
6	49,3	13,6
7	78	13,6
8	88	12,1
9	91	20,6
10	111	20,6

HINTS:

Bore values have to be inside diameters. Of course, it is much easier to determine outside diameters of real instruments. Knowing the wall thickness (plate thickness) you can determine the bore by subtracting double that amount from a measured outer diameter (Example: Outer diameter = 15 mm, plate thickness = 0,35 mm. Therefore the inner diameter (bore) results to 15 - 2 x 0,35 = 14,3 mm).

If you do not know the wall thickness you can try to measure it at some convenient place using a caliper.

- It is enough to specify one coordinate pair at the beginning and one coordinate pair at the end of a segment if the duct shape inbetween is sufficiently close to a cone or cylinder. (Example: in the trumpet bore list on the next page at Millimeter 190,67 (X-column) up to Millimeter 627,67 the bore stays constant for 43,7 cm).
- In the mouthpiece and bell regions diameters are changing quickly, so bore values have to be determined at shorter intervalls (mouthpiece about 3-5 mm, bell about 1 -2 cm).

SIMULATION - BORE LIST



Bore lists are always connected to a setup! (e.g. V0, V23, etc.)



Bore lists can only be created in connection with an existing setup!



Each setup can contain **one and only one** bore list! If you want to simulate e.g. the open instrument V0 more than once using different bore lists, then simply create that setup V0 more than once using the Setup editor (page 53). Recommendation: choose different names for varying setups!

When you select a setup which already contains a bore list then BIAS will indicate this fact by displaying an additional icon on the right side of the database window!





You can open the geometry editor to create or edit a bore list by clicking on this icon



Clicking this button will open a plot window showing the setup's bore list graphically.



0

16.66



Example of the bore list of the V0 setup of a complete trumpet in B_{\downarrow} including mouthpiece (no valve pressed). Values in Millimeter.

In this list you will find values like e.g. 8,666 mm which might have been created by the computer Three decimal places are not required! One decimal place will be completely sufficient.

SIMULATION - BORE LIST

There are two ways to create a bore list:

- 1. entering data directly in the geometry editor in BIAS, or
- using any text editor (e.g. Windows Notepad) or spreadsheet program (e.g. Microsoft Excel) first to enter the data and copy it to the BIAS geometry editor later.

• Creating a bore list directly in BIAS:

• Use the treeview to navigate to a specific instrument. Open it and select one of its setups by clicking on its icon or name.



• click on the icon of the geometry editor

📲 Bor	e Editor		_	П×
[^]X 1 1000 	[^]Y 12 12	Loss 1 1	°C 21 21	1
Exa a c len	ample o ylindrica gth of 1	of a bore al tube v meter.	e list of vith the	

- enter the first X-value
- press the <TAB> key
- enter the Y-value
- press <Enter> or <Return> key
- enter the next X-value
- press the <TAB> key
- enter the next Y-value
- <Enter>, ...

• after you have finished the bore list close the geometry editor window using the close box (the button with the cross on the very top right of the window)



• this icon indicates that there exists a bore list defining the geometry of the active setup.

SIMULATION - GEOMETRY EDITOR

The BIAS geometry editor uses 4 columns:

1. The column [^]X contains the X-values, representing the **axial distances (in mm)** between the **entry position** (e.g. the mouthpiece rim) and the bore position where you have specified the diameter.

2. The column [[^]]Y contains the Y-values, representing **inner diame-ters (in mm)** at the positions specified by the corresponding X-value.

3. The third column "Loss" is optional. You can use it to specify a **loss** factor different from and relative to the thermo viscous loss factor used by the standard simulation model. If you leave this column empty, BIAS will assume a value of 1. (page XXX)

4. The fourth column "°C" can be used to specify local temperatures (page XXX). If this column is empty then the simulation temperature defaults to 21 °C.

• When you enter e.g. "24" in column "°C" of all lines of the bore list, then you will simulate the room temperature of 24°C being in all parts of the instrument.

• When you start e.g. with 36°C at the mouthpiece and decrease the temperature linearly along the axis of the instrument reaching e.g. 20°C somewhere inside the bell, then your simulation will approximate the real playing situation at an ambient temperature of about 20°C.

Of course, the exact characteristics of the temperature drop between mouthpiece and bell will depend on wall thickness, material (alloy), bore shape and some more parameters.

If you omit these values then BIAS will automatically assume a temperature of 21°C.



I	Mensur Editor			
	Men [^]X 0 1.33 3 5.33 6.33 8 9.67	sur Edit [^]Y 16.66 15.34 14 10.66 8.67 6 4.66	or Loss 1 1 1 1 1 1 1 1 1	°C 21 21 21 21 21 21 21 21 21
	12.33 13.67 18 24.67 31.33 48 85.67 90.67	4 4.66 5.66 6.34 7.34 8.66 10	1 1 1 1 1 1 1	21 21 21 21 21 21 21 21 21 21
	95.67 105.67 110.67 120.67 130.67 140.67 150.67	9.95 9.95 10 10.1 10.2 10.35 10.6	1 1 1 1 1	21 21 21 21 21 21 21 21

SIMULATION - GEOMETRY EDITOR

Relative Values

Up to now only "absolute" values have been used in the examples, which means specifications like: At position X (e.g. 200 mm away from the mouthpiece rim) we have an inner diameter of Y (e.g. 13 mm).

Sometimes it is more convenient to specify relative changes in both dimensions instead of absolute values. This is especially true when the influence of a constriction caused by a sleeve inserted somewhere in a slide is to be studied using the simulator.

If that sleeve is specified using "**relative values**" then it is quite easy to modify parameters like sleeve position, sleeve length and wall thickness in the bore list.

"**Relative values**" are always referenced to their predecessor. They specify the local differences to the previous value. BIAS will recognize numbers as relative values if they are preceeded by the "^" character.

Examples for the [^]Y-column:

^-1 = Diameter is smaller than previous diameter by 1 mm^5 = Diameter is 5 mm bigger than previous diameter

The next example demonstrates how you can easily add a constriction or expansion at an arbitrary axial position (e.g. 20 cm away from the moutpiece plane) by means of relative values.

Example "	constriction"	Example "	'expansion"
[^]X	[^]Y	[^]X	[^]Y
200	13 ^_1	200	13 ^1
^10	^0	^10	^0
^0	^1	^0	^-1





SIMULATION - BORE LIST

......

Clicking on this icon will open a plot window showing the bore list graphically. This optical cross-check will help you to immediately recognize numerical mistakes in the entered bore list. The figure below shows such a wrong specification at position 830 mm.



Creating a bore list using Windows NotePad

- start NotePad
- Enter values
- select all (Ctrl+A)
- copy selection (Ctrl+C)
- if BIAS is already open swich to BIAS (Alt+Tab) otherwise start BIAS
- use the tree view to navigate to a certain setup of a certain instrument and click to select it
- open the geometry editor
- paste clipboard with bore list (Ctrl+V)



SIMULATION - BORE LIST

Creating a bore list using Microsoft Excel

A spreadsheet program like Excel is much more comfortable for bore list entry than the simple geometry editor of BIAS or Windows NotePad.

If you do not own Microsoft Office you can alternatively download the "Open Office" suite from the Internet. It is "Open Source" and offers the same functionality as Microsoft Office and very good compatibility. The program "Calc" which is part of "Open Office" corresponds exactly to Microsoft Excel and you can get it for free.

English: <u>http://www.openoffice.org</u> French: <u>http://fr.openoffice.org</u> German: <u>http://de.openoffice.org</u>

Excel or Calc is especially convenient if you want to specify temperature gradients and different loss factors in the simulation. Refer to page XXX!

- enter your values for the X and Y-column
- select both columns
- copy selection (Ctrl+C)
- switch to BIAS (Alt+Tab)
- paste clipboard contents into the geometry editor window(Ctrl+V)

2) M	lappe1	
	A	В
1	0	16,66
2	1,33	15,34
3	3	14
4	5,33	10,66
5	6,33	8,666
6	8	6
7	9,67	4,66
8	12,33	4
9	13,67	4
10	18	4,66
11	24,67	5,66
12	31,33	6,34
13	48	7,34
14	85,67	8,66
15	90,67	10
16	95,67	9,95
17	105,67	9,95
18	110,67	10
19	120,67	10,1
20	130,67	10,2
21	140,67	10,35
22	150,67	10,6
23	160,67	10,8
24	190,67	11
25	627,67	11
26	677,67	11,2
27	727,67	11,3

START SIMULATION



- By clicking on the measurement icon the aquisition window will be opened
- Click on the tab to select "Simulation"

🝽 Aquisition 🗌	rumpet in Bb: Stradivariu	s 72 - VO
Session:		Comment:
Measurement	Simulation	
Ten	nperature: 25.0 🛟	
168	1	
		_

Click on this icon to start a simulation

itzung:	<u> </u>	Anmerkungen	
essung	Simulation		
	Temperatur: 25.0 🛟	Venti V0	
10			-1- 🥖
In score			
MOH	hm		
100			
90-			
80-			
70-		Simulation Bermatru	
60-			
50-		Z3% Abbrechen	
40.			
20.			
- 20			
20.			
10			
01	0 100 200 300 400 5	00 600 700 800 900 1000 1100 1200 1300 1400 1500 1	600 1700 1800 1900 2000
	· · · ·	, ,	

During the simulation a progress bar will indicate the remaining time till completion. Clicking on the red cross will abort the simulation.



The result

150 BIAS

ACQUISITION WINDOW

SIMULATION - DAMPING

DAMPING

In all brass wind instruments energy is lost by several reasons. The causes the standing wave being damped are:

Frinction losses at the wall. Soundwaves propagate spherically. Inside a tube this is not possible as there is only one main propagation dimension (parallel to the tube axis). Air molecules hitting the walls are being reflected and will collide with other oscillating gas particles. This will decrease the sound velocity near the wall and dissipate energy.

By observation it is known that the viscous boundary layer where friction takes place has a thickness of about 0,2 Millimeter adjacent to the wall.

In case of significant wall roughness energy losses will be considerably higher than in the perfectly smooth case.

Energy losses caused by thin walls. In those regions where standing waves exhibit antinodes the oscillating air pressure will stimulate the instrument walls to co-vibrate. The vibration amplitude will depend on the wall thickness. The thinner the brass the bigger the amplitude will be.

To make the walls of the instrument vibrate energy is transferred from the standing wave. Part of this energy will be dissipated or radiated and is therefore lost for the standing wave.

Energy losses by leaky valves. Are there leaky valves in regions where the standing waves have there antinodes then energy is lost again. If those leaks happen to be close to nodes of the standing waves then no effect will be observable.

SIMULATION - DAMPING

The sumtotal of all energy losses will cause a damping of the standing wave inside the instrument. In the impedance curve the effect of damping can be identified by lower and wider peaks.



The blue curve corresponds to a trumpet which has been simulated in BIAS using the normal damping model (loss=1). The red curve shows the same instrument simulated with higher damping (loss=2). The figure below shows a magnification of the 7^{th} peak.



Instruments with much damping have easier and faster response but they radiate less sound at the same stimulus level provided by the musician.

SIMULATION - DAMPING

• How to create complete loss specifications with little effort:

- start Excel or Calc
- enter the loss factor into the third column of the first line

• drag the right bottom corner of the cell selection rectangle and move the mouse right down to the last line of your bore list. When you drop the loss factor (1,8) will be copied to all cells of this column.

	A	В	C
1	0,00	16,66	(,80 <u>)</u>
2	1,33	15,34	
3	3,00	14,00	
4	5,33	10,66	
5	6,33	8,67	
6	8,00	6,00	
7	9,67	4,66	
8	12,33	4,00	
9	13,67	4,00	
10	18,00	4,66	
11	24,67	5,66	
12	31,33	6,34	
13	48,00	7,34	
14	85,67	8,66	



Now you can modify that loss factor in certain places (e.g. assuming leaky valves or wall roughness). Increasing the loss factor locally will increase damping in the corresponding sections of the air column compared to the standard model when you simulate the instrument.

The figure below shows the impedance differences for the 5^{th} overtone of a trumpet, when at the position of the valve section (62 - 65 cm distance from mouthpiece rim) the loss facture is increased by 40% (1,4 instead of 1) over an axial distance of as little as 5 cm.



The additional damping in the valve region causes a decrease in impedance amplitude of about 2 MOhm!
ACQUISITION WINDOW 153

SIMULATION - TEMPERATURE

The ambient temperature has significant influence on the absolute pitch of an instrument but does not change the relative intonation of its overtones. If a certain overtone is sharp or flat compared to other overtones then this will not change at higher or lower temperatures.

This is not true for temperature gradients inside the instrument (e.g. starting with 36°C in the mouthpiece and ending with e.g. 20°C at the bell). Therefore the geometry editor allows to specify local temperatures inside the instrument (4th column, °C).

When you leave the 4th column empty then BIAS will assume a default temperature of 21 $^\circ\text{C}.$

You can enter all the local temperature values using the geometry editor or you can do it just the way proposed for the loss factor.

• How to create temperature specifications with little effort:

- start Excel or Calc
- enter the temperature into the fourth column of the first line

• drag the right bottom corner of the cell selection rectangle and move the mouse right down to the last line of your bore list. When you drop the temperature (26°C) will be copied to all cells of this column.

Mappe1				
	A	В	С	D
1	0,00	16,66	1,00	26,00
2	1,33	15,34	1,00	
3	3,00	14,00	1,00	
4	5,33	10,66	1,00	
5	6,33	8,67	1,00	
6	8,00	6,00	1,00	
7	9,67	4,66	1,00	
8	12,33	4,00	1,00	
9	13,67	4,00	1,00	
10	18,00	4,66	1,00	
11	24,67	5,66	1,00	
12	31,33	6,34	1,00	
13	48,00	7,34	1,00	
14	85.67	<u> 33 8</u>	1.00	

In the above picture is the damping factor 1,00 instead of 1 and the temperature 26,00 instead of 26. This makes no difference for the simulation and depends on the individual default settings of the program.

• Copy the data into the bore list editor as described on page 147 and 148 and start the simulation..



ACQUISITION WINDOW

SIMULATION - TEMPERATURE



The figure at the left shows the pitch difference of the 8^{th} natural tone (Bb⁵) between a simulation temperature of 21°C (blue curve) and 26°C (red curve). The difference in intonation is 14 cent.

At 21 °C the instrument matches the tuning of a^4 = 443,6 Hz and at 26°C of a^4 = 447,1 Hz.



BIAS helps to make such comparisons with very little effort: Having both curves in the acquisition window just press the tuning fork icon at the top right in order to analyse both curves in an intonation window.

When you activate the blue curve by clicking on one of the blue bars in the bar graph then the reference frequency (a^4) of the blue curve is indicated. Click on one of the red bars and the tuning frequency will be calculated for the red curve.



The figure at the left shows the simulation result when a continuous temperature drop is specified, starting at 36°C in the mouthpiece and decreasing linearly down to 21°C at the open end of the bell.

In this case the difference compared with the standard case (21°C) is as much as 19 cent which is even bigger than before. The corresponding tuning note a^4 has a frequency of 448,5 Hz in this case.

The true temperature distribution between the app. 36°C of the breath and the ambient temperature at the bell depends on several factors:

- ambient temperature
- wall thickness
- thermal conductivity of the brass
- playing duration (until thermal equilibrium has been reached)

On this no conclusive scientific investigations have been published yet, as far as we know. We are planning to deal with this question in the future.

ACQUISITION WINDOW 155

STATISTICS

STATISTICAL EVALUATIONS

BIAS

ACQUISITION WINDOW

STATISTICS

Currently three statistical operations are available in BIAS.

- calculate statistical mean (average of several impedance curves)
- calculate upper confidence limit
- calculate lower confidence limit

Other functions are already prepared and will be implemented as required.



Statistical analysis is available in the acquisition window only.

The analysis icon (note the red circle in the figure above) is only visible when there is **more than one curve** in the acquisition window. Curves representing the result of a statistical analysis (mean value, confidence interval) are immediately plotted **using new colours and wide line types.** These curves can be saved just like measurements or simulations but they themselves are ignored by other subsequent statistical analysis operations.

USING STATISTICAL ANALYSIS YOU CAN:

• show typical properties (characteristics) of a group of instruments either made by you or made by your competitors or sharing certain other distinguishing marks.

• calculate confidence intervals which you can use for quality control in your own manufactury or to reveal parameter variations of instruments from external production.

MEAN VALUE

Drag e.g. all measurements connected to all V0-setups of several instruments of a specific instrument type made by a certain manufacturer and drop them in the acquisition window. Calculate the statistical mean to get typical characteristics of such instruments of this manufacturer.

ACQUISITION WINDOW 157

STATISTICS - MEAN

How to calculate statistical mean:



open an acquisition window by clicking on the associated icon.
drag and drop e.g. all V0 setups of all Yamaha B_b-trumpets from the tree view into the acquisition window.



click on the statistics icon to open the calculation dialog.

Calculations	
Average	
Shift average by	Deviations
ОК	Cancel

Make sure the scroll box for shifting the result up or down contains the number "**0**" then click "OK".

This calculates the average which is immediately plotted as a new curve (in the figure below it was plotted in black).



The new impedance curve is the arithmetic mean of all previously visible curves. You can save this curve for later reference and to compare other curves with.

It is advisable to save such derived curves in a new instrument!

How to save the average curve:

- create a new instrument by clicking 1 in the tree view (refer to page 48-50). Give it a name, e.g. "Average Yamaha B -Trumpet"
- by clicking in the acquisition window the curve will automatically be stored correctly and can be retrieved at any later time for comparison purposes.

ACQUISITION WINDOW

STATISTICS - MEAN

How to use average curves:

• As a reference curve for other instruments

• To compare it with average curves obtained from instruments of other manufacturers.

• From an average impedance curve you can also plot the **intonation** to see an "average" intonation of e.g. all Yamaha trumpets.

• From an average impedance curve you can also plot the **pulse response**. This allows you to:

1. determine the average length of e.g. Yamaha trumpets

2. determine average response characteristics (response quality) of e.g. Yamaha trumpets by checking the "pulse response factor" which is indicated in the pulse response window.

3. calculate the average length of e.g. the first slide. To do this you need average curves of V0 and V1.

STATISTICS - STANDARD DEVIATION

THE STANDARD DEVIATION

The standard deviation is required to determine confidence intervals in normal distributions. Such intervals are used as tolerance bands for production tests and as an indicator for constant production quality. If the number of instruments failing this test is small and constant (does not increase over time) then constant production quality can be assumed.

This method can be used for sample based quality control as well as for continuous monitoring of a running production.

What is the standard deviation?

Mathematically the standard deviation $\pmb{\delta}$ "Sigma" of a variable X is defined by th formula:

$$\sigma_X := \sqrt{E\left((X - E\left(X\right))^2\right)}$$

The confidence intervals commonly used in production testing are centered around the mean value and have a width of $2 \ \mathbf{0}$, $4 \ \mathbf{0}$ or $6 \ \mathbf{0}$. Depending on that width a certain percentage of all produced instruments can statistically be expected to pass the test (have their measured curves completely inside that interval) provided that the production quality is kept constant.

- Mean \pm 1 **6**: statistically 68,3% of all produced instruments can be expected to have their curves between the confidence limits
- Mean ± 2 **6**: statistically 95,4% of all produced instruments can be expected to have their curves between the confidence limits
- Mean \pm 3 **6**: statistically 99,7% of all produced instruments can be expected to have their curves between the confidence limits

Mean \pm 10^{\circ} corresponds to the **narrowest** tolerance band. More than 30% of all instruments will fail that test.

Mean \pm 30 corresponds to the **widest** tolerance band. If the production conditions are kept constant then only 3 out of 1000 instruments can be expected to fail!

The upper and lower confidence limits are calculated separately. Therefore you can specify different parameters for both calculations.

The upper and lower limit of the **"confidence interval**" are normal impedance curves which can be saved just the conventional way.

 This way you can easily document the good quality of your production and you can sort out instruments which significantly deviate from your usual standards.

STATISTICS - CONFIDENCE INTERVAL

How to create tolerance limits:

- drag and drop selected curves into the acquisition window
- click on the statistics item and select a tolerance band width of 1, 2 oder 3 (times δ) using the little arrows of the corresponding scrollbox.



• click "OK" to create the curve for the "**upper confidence limit**" (see figure below).



 open the statistics dialog once more and use the scroll box to select a negative value this time (-1 = for a narrow band, etc.). Click "OK" to create the "lower confidence limit". Both curves together enclose the "tolerance band" or "confidence interval".





STATISTICS - CONFIDENCE INTERVAL

• How to store confidence limits (3 possibilities)



- click on the icon "save all curves"
- select:

- instrument group (e.g. trumpet)
 - instrument key (e.g. in B_b)
 - the specific instrument (e.g. Sreadivarius 72)
 - the setup (e.g. V1)
- check the checkbox "apply to all...." then click "OK"

Both curves defining the confidence interval (tolerance band) are associated with the selected setup. You can replot them at any time for reference purposes.



• use the icon "save active curve" for both curves separately if you intend to associate both curves with different setups or different instruments.

B associate curves with new instrument

There are good reasons to associate both curves of a tolerance band with a separate instrument. You will be able to locate them more easily in future and you can add them to any plot window in a single step. If you name the new instrument e.g. "tolerance band" you only have to drag it into the open acquisition window for using it for comparison.

- ?
- click on the icon "new instrument"

	QK.		Gencel		
naturne	nt.				Photo
Trumpel	in Bb			<u>v</u>	
Varne					
Strad Te	est.				
abricat	on Year		Series Numbe		
1982	_	4	214602		
Descript	ion				
	ner/.			2	
Owner:					
				-	
Dunir					
				🗉 🗙 🖉	•
Builder					
				× × •	-

- give it a name e.g. "tolerance band"
- don't change any defaults and click "OK"
- click on the "save" icon in the acquisition window. This will save the curves in the new instrument (e.g. in V0).

Unused setups (V1 to V123) can be deleted (if you want to) in the tree view by selecting them with the right mouse button and deleting them with the corresponding command of the context menu or by using the delete button of the tree view.

STATISTICS - CONFIDENCE INTERVAL



associate curves with a new setup of an existing instrument

This option also has some adventages: The tolerance limits can easily be added to any plot window by a drag and drop operation. When the whole instrument is plotted, they will appear automatically.

- E-Can Bad Hom E-Can Bad Hom Comparison ✓ Amaha Wiener Hom
- select the desired instrument



• click on "new setup" to create a new setup in this instrument.



• give this new setup a name e.g. "tolerance band" and click "OK".

• now you can save both curves from the acquisition window in the new setup which you just created.

HINT: if you do not need separate tolerance bands for all valve combinations then you can, instead of deleting unnecessary setups later, simply not create them in the first place. This is the case if you create a single pair of tolerance limits for all setups of one or many equal instruments. So you need as a container only **a single setup** with the name "tolerance band" (e.g. "V0 tolerance band").

In this case you can uncheck all unneeded valve combinations on the right side of the dialog "new setup" (see figure below). Only the checked valve combinations will be created.

There will be only one new setup with the name "tolerance band". This **single folder** can be used to save the tolerance curves in, just like measurements (see figures below).

🖕 🤒 F	E F
🖻 😂 Bad Horn	Bad Horn
🕀 🗇 🔽 Toleranzband	🗇 🗁 😕 🗸 🖓 🖓 🖓
⊡	🖺 2007.12.31 22:08
⊕ ◘ ∨12	
⊕ 🔁 ∨3	

THE MUSICAL CALCULATOR

Musical Calculator	×
(c) 2001	7
Transpose to	
Tone Sounding	
Octave 4th - octave	
Reference Pitch and Deviation Fix a4= 440,0 Hz Fix 0	Cent
Frequency and Wavelenght	1,2 cm
Temperature 20,0 *C O Fix I	Freqency Lenght

The Musical Calculator is a very useful tool to convert between musical notes and their intonation in Cent and physical parameters like frequency in Hz and wave length in m. It also takes temperature into account and it can be used for transposing.

The standard version is shown below on the left side, the extended version with transposing functionality on the right. You can get the extended version by checking the box "Transpose" (red circle).

B Musical Calculator	×	Musical Calculator	X
(c) 2001		Tone C Octave 4th - octave	▼ ▼
anspose to		X Transposition in	C (identical)
Tone Sounding C Image: Constraint of the sound of		Tone Sounding C Octave 4th - octave	× #
Reference Pitch and Deviation Fix a4= 440.0 Hz 0 II	Cent	Reference Pitch and Deviation ● Fix a4= ↓440,0 Hz	C Fix
Frequency and Wavelenght	;m	Frequency and Wavelenght	▲ 131.2 cm
C G Fix Freqency C Fix Lenght		20.0 °C	Fix Freqency Fix Lenght

The Musical Calculator takes care of the principle that all indicated values have to be consistent at any time. Once the user changes the contents of any one field all other fields will be recalculated immediately.

All fields - with the exception of the two fields containing the graphical representations of musical notes - are **input as well as output fields.** This means, you can select notes or modify values (like in an input field), but the same field will be updated and possibly modified by the program (like an output field) as soon as you change some value in another field.

The fields in the upper and center region are "input fields". Click on the down arrow of these list boxes to select notes and registers.

The fields in the lower region can be used to enter numbers numerically or by scrolling with the mouse using the up and down arrow buttons.

When you edit a numerical value directly you have to press the key <Enter> to complete your input and make it effective.



1 **Input Field:** Select one of the 12 notes of the chromatic scale using the down-arrow of the listbox and select a register using field 2.

ATTENTION: Field 1 is connected to field 5. If field 5 is set to C (identical), like in the figure above, then field pair 1, 2 and field pair 6, 7 are equivalent. You can select notes in either one of both fields. If you have specified an interval for transposition then field 1 represents the written note while field 6 represents the sounding note. If you enter a note of your scores in fields 1 and 2 the program will show you the sounding note in fields 6 and 7.

EXAMPLE:

Input: Field 1: "C", Field 2: "4-th octave", Field 5: "F basso" **Output:** "sounding" F (field 6) in the 3-rd octave (field 7)

Output: On the other side, if you select a sounding note in fields 6 and 7 having specified a transposition interval other than unity in field 5, then field 1 and 2 will become outputs showing you the notes as they are written.

(2)

Select the octave of your note (zero to nineth). The common tuning pitch of about 440Hz is an A in the 4-th octave.

3 Graphical representation of the musical note selected in fields 1 and 2. It should serve musicians as an input aid and as a means to crosscheck.



4 Check or uncheck this box to turn transposition functionality on and off.

- 5 Use this listbox to specify key and direction for transposition. Choose "basso" to make the sounding note lower than the written note, choose "alto" to make the sounding note higher than the written one.
- 6 **Input field:** select a note as it sounds. Field 1, 2 & 3 will then show how this note is written in the scores.

As an output: having selected a written note in field 1 & 2 according to the key (as specified in field 5) then field 6, 7 & 8 will represent the note as it sounds.

- 7) Oktave number of the sounding note shown in field 6.
- 8) Graphical representation of sounding musical note of field 6 & 7.

For all selected notes frequency and wave length at an ambient temperature as specified in field 15 are calculated and constantly kept up to date in fields 13 & 14.



- 9 **Switch "Fix Reference Pitch":** This button is initially active (black point) when you start the calculator. In this mode changes in other fields (e.g.: temperature [15], wave length [14], etc.) will be reflected as a deviation in Cent from the fixed reference pitch (e.g. a1= 440 Hz as specified in field 11) which will be output in field 12.
- (10) **Switch "Fix Deviation":** For logical reasons either reference pitch [9] or deviation [10] must be fixed. If deviation is fixed (by clicking on the white circle) then the reference frequency of the a4 (field 11) becomes an output while the Cent deviation of field 12 can be forced to any desired value (usually zero) when parameters like temperature or wave length (usually connected to the length of the instrument) are varied.
- 11 **Input field:** Used to enter the fundamental tuning pitch. The default value is 440Hz (for the a4 tuning note). Whenever the user modifies this value (either using the up/down arrow buttons or by numerical input) all other fields will be recalculated.

As an output: If switch 9 is off by turning switch 10 on (fix Cent deviation) then this field shows the corresponding change of the reference frequency whenever other fields (e.g. note frequency in field 13) are modified by the user.

BIAS



12 **Input field:** When you modify the Cent deviation of the selected note in field 12 then you will observe how field 11 (if switch 10 is on) or field 13 (if switch 9 is on) will change accordingly. It is possible to either type in new values for the deviation in Cent or use the mouse to click on the up/down arrow buttons.

After having typed the new value on the keyboard press the <Enter>-key to validate your input and to force a recalculation of the other fields.

As an output: In case Cent deviation is not fixed (switch 10 on) then this field will respond to changes of other fields indicating the deviation of selected notes from the equally tempered scale (1 Cent = 1/100 semitone). The actual main tuning frequency (field 11) is taken into account.

(13)

Input field: If you alter the frequency in this field (either with the arrow keys in 1-Hertz-steps or entering the value directly, followed by pressing the "enter" key of your keybord), the fields 1, 2, 3 and 6, 7, 8, show the corresponding name of the note. Field 12 shows the deviation to the equally tempered scale for the new (altered) note related to the actual pitch of field 11 and the actual temperature of field 15.

Frequency range: 16 Hz up to 14.000 Hz. If you enter a frequency value out of this range, it will be automatically transposed by an octave.

As an output: shows the frequency of a note in Hz., depending on the values of other fields (e.g. field 1, 2, 11, 12, etc.)



14 **Input field:** alter the wave length with the arrow keys in 1 cm steps or enter a value directly followed by pressing the enter key of th keybord.

As an output: the wave length of the actual sound wave in cm (depends on the temperature of field 15).

15 **Input field:** alter the air temperature with the arrow keys in 1 °C steps or enter a value directly followed by pressing the enter key of th keybord (the temperature influences the intonation). Range: -273 °C to +1000 °C.

As an output: Temperature in °Celsius.

- **Switch "Fix Frequency":** Apply to the frequency of field 13. If this switch is turned on (black dot inside) and the temperature is altered, field 14 shows the corresponding wave length.
- **Switch "Fix Wave Length":** if this switch is turned on, the wave length is fixed. If e.g. the temperature is altered, field 13 shows the corresponding frequency and field 12 the deviation to the equally tempered scale (also depending on the reference pitch of field 11 and the switches 9 and 10).

MUSICAL CALCULATOR

EXAMPLES

EXAMPLE 1: You want to know the frequency of a specific note:

- select this not with field 6 or field 1.
- select the octave name with field 7 or field 2.

The result (the nfrequency for this note) is shown in field 13.

EXAMPLE 2: You want to know which note is sounding, if you play a g#⁵ with a Horn in Fa ("transposing"):

- Click into the box 4 to turn on the "transposition mode".
- select with field 5 the key "f basso".
- select "g#" with field 1.
- select with field 2 "5th octave".

Field 6, 7 and 8 show the note "sounding" and field 11 shows the frequency of the note.

EXAMPLE 3: You want to know how much the frequency of the "written" c⁶ played with a Bb-Trompete arises, if the temperature is 28 °C instead of 20 °C.

• Open the musical calculator and turn on the transposing mode by a click on the box 4.

- Select with field 5 "*B basso*" because the key of the trumpet is Bb.
- \bullet Click into the box 17 "Fixed Length" then raise the temperature in the field 15 to 28 $^{\rm o}C.$
- Field 12 shows the alteration (23 cent) compared to the frequency at 20 °C, additionally field 13 shows thze new frequency value.

MUSICAL CALCULATOR 171

EXAMPLES

EXAMPLE 3a: if you want to know the difference between 23 °C and 28 °C use the following steps:

- Item 1 and 2 like example 3.
- Enter 23 °C into field 15.
- Schalten Sie den Schalter 17 ein (fixe Länge).
- Raise the temperatuer with field 15 to 23 °C.
- Change the value of field 12 (+9 cent) to "0".
- raise the temperature in field 15 up to 28 °C

Field 12 shows the alteration in cent an (+14 cent). Field 13 shows the new frequency of the note at 28 $^\circ C$ (559 Hz).

ATTENTION:

BIAS uses the American notation the Musical calculator partially the European notation!

	european	american
Sub Kontra	sub kontra A	a
Kontra	kontra A	a¹
Groß	А	a ²
klein	а	a ³
eingestrichen	a ¹	a ⁴
zweigestrichen	a ²	a ⁵
dreigestrichen	a³	a
viergestrichen	a ⁴	a ⁷
fünfgestrichen	a⁵	a ⁸
sechsgestrichen	a ⁶	aº
	h	В
	b	B,
	cis	C _‡



The features which are documented in the sections below are intended to be only used by expert users after having thoroughly studied the manual!

In case you modify your system settings or your data base structure by mistake in a way you cannot handle yourself, we have to charge you actual rates if you need us to help you troubleshooting your system or recovering your data!

BIAS

COPY MEASUREMENTS

It may happen that measurements have been saved in a wrong place. The correct solution would be to delete that measurement, to measure again and assign that measurement to the right instrument and setup now.

This is not always an option, especially if the mistake is noticed at a later moment when the instrument is no longer available for a measurement.

In order to correct such mistakes without having to re-measure instruments, there is the command "Copy Data" in the submenu "Help" of the main window menu bar.



How to copy a curve to a different tree view location

- Select the curve you want to copy in the tree view of the database window
- Issue the menu command "Copy Data"
- Select source (measurement). Crosscheck whether your source instrument has been correctly preselected in the "Instrument" panel of the BIAS Database Import dialog (figure left below).
- If you have to change that selection you can do so using the "Select" button (red circle). A dialog will be shown (figure right below) where you can select the right instrument and key. Any new selection will also be reflected in the tree view.

BIAS Database Imp	ort 🛛 🗶
BIAS Database	
Login	C\Dokumente und Einstellungen\All Users\Dokumente\Bias6\Database
Instrument	
	Trumpet in Bb
Select	Tonella
	Standard_Setup
Measurement	
Valve	Measurement
	1996.01.25
Session	1996.01.25
Description	<u>×</u>
Temperature	
	<u>O</u> K

Setup Select	×
<u>0</u> K	<u>C</u> ancel
Group	
Trumpet	•
Кеу	
Bb	v
Instrument	
Tonella	
Setup	
Standard_Setup	_ B

COPY MEASUREMENTS

BIAS Database Imp	ort	×
BIAS Database	C\Dokumente und Einstellungen\All Users\Dokumente\Bias6\Database	
Instrument		
	Trumpet in Bb	
<u>S</u> elect	Tonella	
	Standard_Setup	
Measurement		
	1996.01.25	
Session	1996.01.25	
Description	A.	
Temperature		
	Y	
	QK	

- now select the right setup with the right valve combination containing the curve you want to copy (red circle).
- if there is more than one measurement in this container then select the one you want to copy using the listbox.
- click "OK" to finish your selection.

• Select target position. Having finished the source selection dialog the target selection dialog will be shown. It looks very similar to the first dialog. Now you have to specify and optionally to create a database location where the selected data are to be copied to.

IAS Database Ex	port
BIAS Database	
Login	C\Dokumente und Einstellungen\All Users\Dokumente\Bias6\Database
Instrument	
	Trumpet in Bb
<u>S</u> elect	Tonella
	Standard_Setup
Measurement	
	Session Valve
	V23 V
	Description
	×
Temperature	
21.8	
21.0 -	Y
•	
	<u></u>
-	

• select a target instrument by clicking on the "Select" button. The dialog which becomes visible now also contains two small buttons for creating new instruments and new setups!

• now select a target setup which is to contain the copied data (red circle in the figure left) and click "OK".

If you are using this command to move wrongly assigned measurements then you should delete the copy source afterwards!

(In the database treeview right-click the measurement which was saved in the wrong container and use the context menü command "Delete".)

Here you can change the ambient temperature if wanted.

BIAS

SETTINGS



Clicking on this icon in the acquisition window opens a dialog for changing the basic settings of BIAS. Under normal circumstances there is no reason to change most of these settings!



Use this command - with exception of the sound device selection as described below - never without having contacted the BIAS development team first!

In certain exceptional cases it can happen, that Windows enforces the use of a specific audio interface by all application programs. The BIAS stimulus signal will then be routed not to the USB measurement head but e.g. to the internal sound card of your notebook. In this case you might have to select the correct USB-device manually.

How to select the USB measurement head as active BIAS audio device:

Sound Output Douise	1
Creative USB Sneaker	
Aufnahmeneräte	
Creative USB Speaker	
Audio-Mixer	
Creative USB Speaker	
Sound Input Mixer	
Creative USB Speaker	
Stimulus Description	Pro Tro Eulo
01S206 Chirp 12000Hz USBII	
Filename	
C:\Programme\BIAS62\01S206_chirp_12000.wav	
Samplingrate Period Prolog Epilog	
12000 🔽 24000 3000 0	
Section Offset Low Limit High Limit	
All 🔽 0 20.00 4096.00	
	I BIAS51 Compatibility
	Simulation Model
Response Filename	Mapes Riordan 💌
C:\Dokumente und Einstellungen\gregor\Eigene Datei	
Pulse Length Threshold Smooth	Measuring
0.125 2 FIR auto 1 💌	C Calibrating
🗖 Hilbert 🔽 Deglitch 🗖 KaiserWnd	OK

• select the "Creative USB Speaker" device in all four list boxes as the active sound input and output device and as sound mixer and input mixer device to be used.

• Click "OK". BIAS will remember these selections in future.

SETTINGS

Select different stimulus signal



ONLY AFTER HAVING CONTACTED THE BIAS DEVELOPMENT TEAM!

With the BIAS installation program you get a stimulus signal which has been customised and calibrated to match your specific measurement head. In some cases the installation includes more than one such customised stimulus files. They might be different in terms of measurement time, frequency band width or sampling frequency.

By choosing a different "Stimulus Description" (red circle in figure below) many related parameters describing the contents of the selected stimulus wave file will switch accordingly. It is absolutely critical that those parameters accurately match the contents of the wavefile, so do not tamper with these settings without having got our advice!

BIAS Soundcard Interface	_ 🗆 🗙
Sound Jutopt Device	
Aufwaharaaniika	
Creative USB Sneaker	
Sound Input Mixer	
Creative USB Sneaker	
Clinadas Deseriation	
Of COC Chies 10000 La LICOU	Pro Tra Exh
C:\Programme\BIAS62\UIS206_chirp_12000.wav	
Samplingrate Period Prolog Epilog	/
12000 24000 3000 0	
Section Offset Low Limit High Limit	
All 🔽 0 20.00 4096.00	RIASE1 Compatibility
	Simulation Model
Response Filename	Mapes Riordan
C:\Dokumente und Einstellungen\gregor\Eigene Datei	
Pulse Length Threshold Smooth	Measuring
0.125 2 FIR auto 1 💌	C Calibrating
THilbert To Deglitch TKaiserWnd	
	UK

CREATING A NEW INSTRUMENT CLASS

This feature was implemented to satisfy the need of customers from instrument collections and museums. There are historical instruments which cannot be classified the conventional way. The BIAS database contains many modern instrument types but not all historical types do match one of these existing classes.

In order to solve that problem expert users can create their own instrument classes having any number of setups or valve combinations and which can be tuned in any possible key.



ATTENTION: This is an intrusion into the conventional structure of the BIAS database! You are creating new instrument classes which will automatically be disseminated into all databases which are opened or created by you at some later time.

Before you start make a backup copy of all your BIAS databases on an external USB hard disk, memory stick or on CD or DVD!

ATTENTION! DON'T MISTAKE!

Create new instrument - Generate new instrument class

Create new instrument: an everyday procedure. You "reference" an existing structure of the database (e.g. trumpet in C) and give it a unique name in order to save your measurements in that container. You do not



have to know about available valves and playable overtones as this information is already present in the database. You simply link your measurements to a specific instance of an already existing instrument class. This gives BIAS the necessary information on

how to interpret your measurements musically and allows you to assign personal remarks and information identifying the measured instrument in order to remind yourself in future.

Generate new instrumenten class: a task for expert users. You create a completely new structure in one of your BIAS databases. You have to know and to enter the key, the number of valve combinations with all their playable notes, plot ranges, whether it transposes and even more advanced information. For consistency reasons such classes will automatically be copied to all databases which you will open or generate in future.

For this reason generation of new instrument classes has not been implemented in BIAS. Instead a separate program, the database administrator, has intentionally been provided for this purpose.

FOR EXPERIENCED USERS ONLY 179

GENERATE NEW INSTRUMENT CLASS

Res User Administration X Exit New Edit Delete			
User Access admin Admin Demo Read	How to generate a new instrument class:		
iwe Anman User Write	 Start the BIAS6 Admin program. Next follow two steps: 		
	First, generate the instrument class and specify its properties		
Instruments Playlots	Playlists Second, specify all setups with their playable overtones ("Playlist")		

GENERATE INSTRUMENT CLASS



The commands "Edit" and "New" will both show the same dialog. Therefore it is documented only once in the "New" context.

The only difference between "Edit" and "New" is that when you "Edit" existing instrument classes you cannot create new subclasses like e.g. "in C", "in B_{\flat} " or "in B-alto".

FOR EXPERIENCED USERS ONLY

GENERATE NEW INSTRUMENT CLASS





🖷 Available Instruments		X
Instrument Administration		
	Group Phantasie-Horn	
Del New Edit	Key D-basso	

Now we will create a completely new instrument class!

The instrument class is named "Fantasy-Horn" and the key is to be D-basso. Use the listboxes and edit fields to select the key and to enter the name then click on "Create".

A Windows Dialog-Box will confirm the successful generation of a new instrument class.

In the next step the properties have to be specified. In the "Instrument Administration" dialog the new instrument class should already be available. Select it and click on "Edit". The dialog shown on the next page will be opened.

FOR EXPERIENCED USERS ONLY 181

GENERATE NEW INSTRUMENTEN CLASS

📬 Instrument Editor				×
Instrument Details	Deutsch Phantasie-Hom English Phantasie-Hom	D-basso D-basso	View Order Grp 65546 View Order Key 200	Lowest Note C C3 + Highest Note C1 C4 +
ID Group 62 ID Key 62	Lang3 Phantasie-Horn Lang4 Phantasie-Horn	D-basso D-basso	Frequency Limit 1700 Time Limit 200	Key c1 Color
	Lang5 Phantasie-Horn	D-basso Hist	Written (Semitor	nes) Creator 1 Date
	Jinstrument defined by adm	ringcopied from Trumpet in C		13.01.2008 13.

In this dialog you specify:

English Phantasie-Horn	D-t	Jasso	the name and the designator for the key of the new instru- ment class in all languages known by BIAS (must not be left empty!!!)
	View Order Grp 65546	a number spe classes with	ecifying the sort order of all instrument classes. Instrument low numbers will appear at the top of the tree view.
	View Order Key 200	a number sp classes.	ecifying the sort order of all instrument keys within their
	Frequency Limit 1700	the upper lim	it of the frequency range (in Hz) which is usually visible in e plot windows.
	Time Limit 200	the useful ins response wir	strument length (in cm) which is usually visible in all pulse idows.
	Written (Semitone <mark>0</mark>	the distance the "sounding	in semitones of the "written" representation as compared to g" representation (transposing instruments only).
	Lowest Note	the lowest no	te to be visible in all intonation windows.
	Highest Note	this field is cu	urrently not used!
	C1 C4	the fundament the base for a	ntal note (first peak of the impedance curve). This is used as automatical generation of the "Playlist".
		this field is cu	urrently not used!
	s) Creator 1 -	Creator of the	e instrument class, filled in automatically !
		With the arrow modify (atte	<i>w</i> -keys you can scroll through the database to inspect and/or ntion, no undo!) properties of other instrument classes.

FOR EXPERIENCED USERS ONLY

GENERATE NEW INSTRUMENT CLASS

Deutsch	
Trompete	В
English	
Trumpet	ВЬ
Lang3	
Trompette	si bémol
Lang4	
La Trompeta	bemol
Lang5	

• enter the name of an instrument class in all languages

BIAS has been designed to be multilingual. At run-time it can be switched between German, English, French (work in progress) und Spanish (planned). All commands, buttons, hints and database contents will reflect the selected language. Therefore it is mandatory that the language fields for instrument class names and keys must not left empty.

The 1st line contains the name and key of the instrument class in German, the 2nd line in english and the 3rd line in french. The 4th line is reserved for Spanish and the 5th line may be used for user provided translations into any other language (see figure left).

Simply click into a field and type the name.

The same applies to the second column which contains the designator for the key of the instrument, again according to the correspondig language.

Help			
💡 Bias Help			-
Language	١	Deutsch	
🤣 IWK Homepage		🖌 English	
📑 mailto ľWK	1		-
About			
Copy Data			
	_		

• Switching the language in BIAS at run time can be performed using the screen menu of the main window. Open the submenu "Help" then "Language" to select between "Deutsch" and "English". Later "Français", "Español" and "Custom" will be added.

Vie	w Orde	er Grp
65	546	

• Define the sorting order for the treeview. Instrument classes will be sorted in the treeview according to this number, low numbers above, higher numbers below.



If you mainly measure renaissance instruments which are currently sorted towards the end of the list then you have to scroll down in the tree everytime you want to access your instruments. This can be annoying. Although there is a tree view filter which might provide a solution to this problem, there is a better way. Changing the "View Order Grp" field of your instruments to **lower values** will move them up in the treeview.

All values between 1 and more than 300000000 are available. The trumpet which is by default the top most instrument class in the treeview has got the value of 65546. Any lower number will sort your instruments above.

• We enter a value of e.g. 30000 into the view order field of our instrument class "Fantasy-Horn" to have it on top of all other instrument classes.

These values are not critical and can be modified at any time. If you assign the same view order value to more than one instrument class then you loose control over the sort order of these classes.

FOR EXPERIENCED USERS ONLY ¹⁸³

GENERATE NEW INSTRUMENT CLASS







How to detemine the length of our D-bass Fantasy-Horn?

Plot the pulse response of any F-Horn and read off the distance of the main bell reflection. The "D" is 3 semitones flater than the "F". This corresponds to the setup V12 of an F-horn.

Drag and drop this V12 setup into a pulse response window and use the cursor to read out the position of the bell reflection. • determines the sort order of the key designators in some list boxes. Enter a suitable value for your new instrument. As our new instrument class has a key of "D-basso" we choose the value "**320**" (according to the table at the left).

• this field determines the visible frequency range in impedance plot windows. The value 1700 means that measured impedance curves are normally only plotted in the range between 0 Hz and 1700 Hz.

The default frequency band for measurements in BIAS ranges from 20 Hz to 4096 Hz. Yet the frequency band of interest (of course depending on instrument class) usually doesn't exceed 1800 Hz. To avoid having to zoom in all the time, enter the frequency where you want BIAS to truncate impedance plots of such instruments normally. In special cases you can instruct BIAS to display the whole available frequency range ignoring the upper limit entered here (see page 79).

 we define the upper frequency limit for impedance plots for our new instrument as 1000 Hz here.

• this field defines the plot range for pulse response plots. This definition is quite important for the analysis of bore imperfections!

The pulse response which is used for the analysis of bore imperfections represents the sound pressure response in the mouthpiece when an infinitesimal short air pulse is injected through the lip orifice. The pressure building up in the mouthpiece plane will exhibit the initial pulse together with the complete reverberation caused by wave reflections from all bore disconituities and especially from the open end of the bell. Pressure pulses will go around many times while being attenuated by damping. This makes the pulse response a **periodic function** in time. In order to identify reflections for diagnostic purposes the x-axis has been converted from propagation time to reflection distance by multiplying with the speed of sound and dividing by 2 (see figure at left).

For analysis purpose **only the first period** (the time until the main reflection at the open end of the bell arrives at the mouthpiece plane) is of interest. Therefore only that part of the curve should be visible in the plot.

• To enter the right value estimate the length of the instrument in cm and **add about 40% of this value** (this will show the whole instrument including all possible slides).

• The key of our Fantasy-Horn is D-basso, so the length of the open instrument will be about 460 cm. Adding 40% results in a length of **644**

GENERATE NEW INSTRUMENT CLASS



Transposing instruments: Enter the number of semitones between the sounding and the written note.

Example B_b-**trumpet:** When you play a "C" on a B_b-Trumpet then in reality a "B_b" will sound. The note which is written in the scores as "C" is a whole step (= 2 semitones) sharper than the note "B_b" which will actually sound.

Therefore in the field "Written" you will find the value (+)**2**, indicating that the written note is two semitones higher than the sounding note. For C-trumpets there is no difference between the written and the sounding notes, so the corresponding value is "0".

Example F-horn: when you play a " C_5 " on this instrument then an " F_4 " will sound, which is 7 semitones lower. Therefore the field contains the value (+)**7**, because all written notes are 7 semitones higher than the actually sounding notes.

Example trumpet in D: when you play a "C" on this instrument then a "D" will sound. This is a whole step higher than the note "C" written in the scores. The written note is 2 semitones lower than the sounding note, therefore the corresponding value is -2 this time!

• Our "Fantasy-Horn" is in D-basso. Playing a " C_4 " will sound as " D_3 " which is a seventh (10 semitones) lower than the written " C_4 ". In the field "Written" we enter therefore the value (+)**10**.

Values in the field "Written" effect how intonation is displayed graphically when the "written" representation of notes is selected. These values have **no effect** on the intonation display **when the "sounding"** representation of notes is selected nor on any other calculation or selection. They have nothing to do with the list of playable notes (playlist) which is specified somewhere else.



If you have entered a wrong value in that field then the graphical note representations in the "written" intonation chart will be messed up!

You can correct that mistake any time later!

GENERATE NEW INSTRUMENT CLASS



The lowest note which is to be visible in the intonation window.

The left field contains the note written according to the European conventions, the right field contains the American notation.

• Each click on the small up/down arrows will change the indicated note by a semitone. Typing the text is possible - but unfortunately ignored by the program - at least in the current version!

Specifying the lowest note of the instrument instructs the program to choose an appropriete playing range in the intonation chart. This is necessary as instruments do have significantly different playing ranges: e.g. a trumpet from C3 bis zum Bb5, an F-tuba from C1 bis zum Bb4.

This makes up about 5 octaves in total which is too much for one chart. Specifying the lowest note defines the subrange which is most suitable for a specific instrument.

This input **effects intonation plots only**. It doesn't effect the list of playable notes (playlist).

• For our Fantasy-Horn in D-bass we select the note **D2**. The fundamental note is in fact the D1, but we don't want BIAS to display it because it is not used regularily (see page 120 and 189).



Here you select the real fundamental note (first peak of the impedance curve) of the instrument using the little arrows. This input is used as a base for the automatic generation of the "Playlist". For our Fantasy-horn we select **D1 now**, as this is the **first resonance**. The left field is again used to display the European style, the right field will show the American notation.



If you are not sure about the true sounding notes of your instrument you can cross-check with the "Musical Calculator".



This field is not used currentyl!



This field is filled in by Bias automatically. The number corresponds to the creator of the instrument class. "1" means the first record in the address table of the database.



When you have finished your edits close the "Instrument Edit" dialog by **clicking on the closebox (X)** at the top right of the window. The selection dialog "Avaible Instruments" and the Bias6 Admin program itself can be closed just in the same way.

GENERATE NEW INSTRUMENT SETUP

• The next step is to define setups (possible valve combinations) and their corresponding play lists (playable notes).

Open the "Playlist Adminis at the bottom of the Bias6 A	tration" dialog by clicking on the right button dmin window.
lists all availab	le instrument classes
lists all instrum	available keys for the selected ent class
lis	sts all available setups for the se- ected instrument class and key
	lists all playable notes for the se- lected setup
C:\Dokumente und Einstellungen\ \II Use Playlist Administration Create Script File C Create Standard Sequence Note Del New Edit C allows to add a new note to the playlist of the cur- rently selected setup.The operation can be aborted by clicking on the "Close" button of the dialog shown next.	Allows to edit the "Standard fingering" broperty of the currently selected note.
deletes the current note from the cur- rently selected setup of the currently selected instrument and key. Clicking on this button opens a confirmation dia- log where you can cancel the operation	Create Script File export Playlist of currently selected setup as text file. Read Script File import Playlist from pre- viously exported text file.
	Create Standard Sequence] generate playlist for the currently selected setup automatically using some standard assumptions.

FOR EXPERIENCED USERS ONLY 187

GENERATE NEW INSTRUMENT SETUP

Create Standard Sequence (recommended)

🖷 C:\Dokumente und Einstellungen\All Users\Dokumente\Bias6\D 💌			
Playlist	Group Phantasie-Hom		
Administration	Key		
Create Script File	D-basso 💌		
Read Script File	Valve Combination		
Create Standard Sequence	Note		
Del New Edit	▼ V Std		

The Playlist Administration dialog should, when opened, already display the "Fantasy Horn" in "D-basso" as we created it before. The initial selection is always the first instrument according to ViewOrder Group (we assigned the relatively low value 30000 to bring it in front - see page 182). If your instrument is not selected for any reason, just select

it using the listboxes "Group" and "Key".

The lower listboxes are still empty as no setups and no playable notes have been defined for that instrument yet.

Our new instrument is to have 2 valves only. This creates 4 setups:

- **V0** (open instrument),
- V1 (first valve engaged)
- V2 (second valve engaged) and
- V12 (both valves engaged)

To complicate things we define:

1st valve lowers by a whole step (= 2 semitones) (D becomes C) 2nd valve lowers by 2 (!) whole steps (= 4 semitones) (D becomes B_{\flat}) so V12 lowers by 3 (!) whole steps (= 6 semitones) (D becomes A_{\flat})

• Now we create those 4 setups. Click on the button "New".

🗃 C:\Dokumente und Ei	nstellungen\All Users'	\Dokumente\Bias6\D 🗙
Playlist	Group Phantasie-Horn2	•
Administration	, Key	_
Create Script File	D-basso	•
Read Script File	Valve Combination	T
Create Standard Sequence	Note	
Del New Edit		💌 🔽 Std
- New Plau List Entries-		
	DK 🔽	✓ Standard Fingering
Close		Create Note

(1) select "V0" in the left listbox.

(2) select the lowest playable note of this setup in the right listbox. This is a D1 in our example. The European notation is D K (D in the "Kontra" octave).

(3) uncheck the "Standard fingering" flag to make it a nonstandard fingering as this note will normally not be used and shouldn't be displayed by BIAS.

(4) Click on "Create Note". The yellow panel will close.

(5) Check the "Standard fingering" box and click on the button "**Create Standard Sequence**" to let BIAS generate a playlist containing a standard overtone sequence with "Standard fingering" flag set.

 Click on the button "New" once more and select "V1" in the left listbox and "C K" in the right listbox. Uncheck "Standard fingering" and click on "Create Note". Then generate the playlist for V1 just as described in (5).

As we (unreasonably) defined V2 of our Fantasy-Horn to lower by 2 whole steps (instead of 1 semitone as usual), we have to generate the playlist of setup V2 and setup V12 manually!

NATURAL TONE SEQUENCE

THE SEQUENCE OF NATURAL TONES

Relation between impedance peaks and natural tones

For manual generation of playlists some basic considerations are useful. It is essential to know about the sequence of natural tones and about which natural tones are typically useful and commonly played in order to be able to **generate a playlist manually.**

In the figure below impedance peaks (resonances) are shown in musical notation. Unfortunately do not all resonance frequencies match musical notes exactly. The note values below shall indicate how well natural tones match corresponding notes of the equal tempered scale.





 The frequency distance between adjacent natural tones is always constant and corresponds exactly to the fundamental frequency (e.g. 1st peak at 100 Hz, therefore 2nd peak at 200 Hz, 3rd peak at 300 Hz, etc.),

but:

as our ear perceives pitch "logarithmically", the subjective distance (the musical intervall) gets smaller with rising frequency! The distance between 1st and 2nd overtone is perceived by our ears as an octave, the distance between 2 and 3 as a quint, between 3 and 4 as a fourth, between 4 and 5 as a third, etc.
PLAYING RANGE AND PLAYLIST

The fundamental note (1st resonance) determines the key of the instrument but is typically used in exceptional cases only. Therefore it will not be visible in BAIS intonation charts.

The typical playing range:

Trumpet:	2 nd 10 th resonance
Horn in F:	2^{nd} 16^{th} resonance
Horn in B ;:	$1^{st}\\ 12^{th}\ resonance$
Trombone in B _b :	2 nd 12 th resonance
Tuba:	$1^{st}\\ 12^{th}\ resonance$

Generally not used are:

the 7^{th} resonance, the 11^{th} resonance and the $13^{th},\;14^{th},$ and 15^{th} resonance.

• The standard playlist for an instrument e.g. in C is therefore:

	V0:	(c2), c3, g3, c4, e4, g4, c5, d5, e5, g5, c6
r than V0)	V1:	(B 1), B 2, f3, B 3, d4, f4, B 4, c5, d5, f5, b5
r than V0)	V2:	(b1), b2, g 3, B 3, e 4, g 4, b4, d 5, e 5, g 5, b5
r than V0)	V12:	(a1), a2, e3, a3, d þ 4, e4, a4, b4, c5, e5, a5
r than V0)	V3:	(a1), a2, e3, a3, d þ 4, e4, a4, b4, c5, e5, a5
r than V0)	V13:	(g1), g2, d3, g3, b3, d4, g4, a4, b4, d5, g5
r than V0)	V23:	(a b 1), a b 2, e b 3, a b 3, c4, e b 4, a b 4, B b 4, b4, e b 5, a b 5
r than V0)	V123	(g 1), g 2, d 3, g 3, b3, d 4, g 4, a 4, a4, d 5, g 5

Notation:	European	American		
Sub Kontra C (16,4 Hz) Kontra C (32,8 Hz) Großes C (65,4 Hz) kleines C (130,8 Hz) c1 (261,6 Hz) etc.	C SK C K C c c1	c0 c1 c2 c3 c4		

If your new instrument has a key of e.g. A-basso then you have to transpose the playlists given above by 3 semitones **downwards**.

Yet if the instrument is in e.g. D-alto then you have to transpose all playable notes by 2 semitones upwards!

(2 semitones lower (1 semitones lower (3 semitones lower (3 semitones lower (5 semitones lower (4 semitones lowe (6 semitones lowe

CREATING PLAYLIST MANUALLY

Summary:

- the fundamental note (1st resonance) determines the key of the instrument class. It is the central reference point for the playlist of setup "V0". Usually it is completely out of tune (see page 120) and because of the poor response used in exceptional cases only. It will not be displayed in intonation charts.
- When playlists of other setups (V1, V2 and V3) are generated automatically they will be lower than V0 by 2, 1 and 3 semitones!
- Therefore automatic generation of playlists for new instrument classes requires that:

V1 lowers by 2 semitones (compared to V0) V2 lowers by 1 semitone V3 lowers by 3 semitones



If you are uncertain about the definition of the fundamental note, inspect the definition of an existing similar instrument of similar length and compare with your instrument.



In such cases the "Musical Calculator" is often useful. It shows you the correct notation of notes and the related frequencies.

Examples:

Trumpet in B_{\flat} : Trumpet in C: Horn in Fa: Horn in B_{\flat} : Trombone in B_{\flat} : Tuba in C: Tuba in B_{\flat} : Tuba in Fa: Fundamental 116,5HzatA4=440Hz (B > 2) Fundamental 130,8 Hz at A4=440 Hz (c3) Fundamental 43,7 Hz at A4=440 Hz (f1) Fundamental 58,3 Hz at A4=440 Hz (B > 1) Fundamental 58,3 Hz at A4=440 Hz (B > 1) Fundamental 32,7 Hz at A4=440 Hz (c1) Fundamental 29,1 Hz at A4=440 Hz (B > 0) Fundamental 43,7 Hz at A4=440 Hz (f1)



Problem: If you measure the fundamental frequency (1st resonance) of an unknown instrument in BIAS please bear in mind that the 1st resonance can be out of tune by up to a third!

Solution: When you follow this basically reasonable approach please make sure to use "**forte**" weighting in the impedance chart! This way you will get relatively accurate the correct played frequency for your (virtual) pedal tone even in case its physical resonance is far off.

BIAS

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Playlist

Administration

Create Script File

Read Script File

Create Standard Sequence Note
Del New Edit CK

V1 💌

FOR EXPERIENCED USERS ONLY 191

CREATING PLAYLIST MANUALLY

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Valve Combination

D-basso

СК

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Standard Fingering

Update

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(1) To generate the playlists for V2 and V12 click again on "New" and select "V2" in the left listbox of the yellow panel.

(2) in the right listbox choose the fundamental note, in our case a "B SK" (subkontra B_{\flat}), 4 semitones lower than V0.

(3) uncheck the "standard fingering" box because this note is not used.

(4) click on "Create Note" to generate that playlist entry.

(5) now repeat steps (1)..(4) creating the next note, the 2nd natural tone, "B K" (**Attention**: now you should activate the "standard fingering" check box). Then the third note of the Playlist "F", etc.

• After having created all notes of the playlist for setup V2 you repeat the procedure for the setup V12. The notes of the corresponding playlist will be shifted downwards by 6 semitones compared with V0 (fundamental note "As SK" which corresponds to Ab₀).

In this way you have defined the complete structure of the new instrument class. Finally you should decide which natural tones to be visible in the standard intonation chart.



Standard fingerings - all fingerings

Looking into the sequence of natural tones you will recognise that starting with the 8th resonance the musical interval assigned to adjacent natural tones is a whole step or a semitone. Neither of them will be accurate in most cases. Starting with the 15th resonance the distances will even decrease to something like a quartertone or less.

This means that in the register starting with the 8th overtone notes can be played not with one specific setup only but with several different setups.

Generally musicians prefer to play notes using the setup corresponding to the shortest total tube length. But if in the case of intonation or response it turns out to be poor for a certain note, musicians will try to find a different setup with longer tube length offering more desirable properties.

To get a well arranged intonation chart only "standard fingerings" are visible by default (see table on next page). As there are different regional preferences as well as different preferences related to certain instruments of certain manufacturers, any table of standard fingerings naturally will not be valid in general. That is why the display option "all fingerings" in intonation charts will be very useful in certain cases.

FOR EXPERIENCED USERS ONLY

PLAYLIST - STANDARD FINGERINGS

PLAYLIST						Commont						
Setup	1. peak	2. peak	peak	4. peak	5. peak	6. peak	8. peak	9. peak	10. peak	12. peak	16. peak	Comment
V0	c2	c3	g3	c4	e4	g4	c5	d5**	e5***	g5	c6*	
V1	Bb1	Bb2	f3	Bb3	d4	f4	Bb4	c5	d5	f5	Bb5	2 semitones lower than V0
V2	b1	b2	gb3	b3	eb4	gb5	b4	db5	eb5	gb5	b5	1 semitone lower than V0
V3	a1	a2	e3	a3	db4	e4	a4	b4	c5	e5	a5	3 semitones lower than V0
V12	a1	a2	e3	a3	db4	e4	a4	b4	c5	e5	a5	3 semitones lower than V0
V13	g1	g2	d3	g3	b3	d4	g4	a4	Bb4	d5	g5	5 semitones lower than V0
V23	ab1	ab2	eb2	ab3	c4	eb4	ab4	Bb4	b4	eb5	ab5	4 semitones lower than V0
V123	gb1	gb2	db3	gb3	Bb3	db4	gb4	ab4	a4	db5	gb5	6 semitones lower than V0
Standard Fingering												
Defined in BIAS as standard fingering, but with some instrument types other setups (another fingering) are used to produce this note												
Not defined as standard fingering in BIAS, but is sometimes -depending on the instrument- used as standard fingering												

Fingering chart for Horn in Fa (as written)

* is sometimes played with V2 (17th peak) or V23 (20th peak)

** is often played with V1 (10th peak)

*** is sometimes played with V12 (12th peak)

The notes on coloured background are assumed in BIAS to be standard fingerings of an F-horn. The table shows that several notes e.g. Db4, E4 and others, can be played using 3 different setups (=valve combinations), C5 even using 4 different setups.

In the high register the number of alternatives increases even more: on F-horns e.g. the note Eb5 can be played with 6 different valve combinations!

Example: Yamaha Vienna Horn, A4=445,5 Hz, Weighting: standard. The note sounding Eb5 (written Bb5) can be played with setups V0, V1, V2, V3, V12, V23 and V123. Of course, this note will not be equally well in tune with each setup (see intonation chart), even the response will vary considerably (magnitude of peaks at 630 Hz in impedance plot).



With the **option "all fingerings"** almost **all resonances** will be calculated and displayed, even many of those which are not commonly used, e.g. the 7th, 11th, 13th, 14th, 15th, 17th, 18th, 19th, 20th peak, etc.

Therefore this option is well suited to identify alternative fingerings for certain notes. These alternative fingerings are often useful for that specific instrument only.

CALIBRATION-WINDOW



This operation is not destined for customers! It serves the purpose of adjusting the BIAS Software to the specific measurement head. It is documented here just for the sake of completeness.



Never use this command!

If you need our help to recover your calibration data after having damaged them using this command, we have to charge you our standard rates for troubleshooting!

Specification of calibration volumes



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