

Skeleton measurement sheet

Location: Paris, Musee de la Musique

Inv. N°: **E.365**

Measured: Adrian Brown

Date: 22-Jun-26

Pitch @ a=440hz: g

Total length: 829.8

Speaking length: 777

Windway length: 52.8

Material: maple

mark: Single trefoil

FINGERHOLES					
	length		diameter		direction
	(from top)	(from bl)	east/w	north/s	↑⇌↓⇌
X	310.3	257.5	7.4	7.8	
1	342.3	289.5	8.7	8.9	sl up
2	385.5	332.7	8.7	8.8	
3	425.8	373	8.7	9.6	sl down
4	501	448.2	9.0	9.5	sl up
5	545.8	493	8.6	8.8	
6	585.8	533	8.5	8.4	sl down
7 (under key)	682.3	629.5	10.8	11.0	

Step: damage

Window width: 19.1

Edge thickness: damage

Cutup (+/-5.5?)

only a trace of original

Windway exit chamfers:

up: Large, 45 deg

Ramp width north 19.6

down: smaller, but present

south 20.1

W/W entrance: width 21.2

Ramp length: west 24.9

height 1.7

east 25.3

middle 29.7

NOTES:

Clean basset not attributed to Rauch, presumably because of the single trefoil. This mark is under the window and a tiny trace of it is left on the bell too. Additionally, there is an as yet unidentified mark between the 3rd and 4th tone holes. The edge and parts of the window north wall are damaged and there seems to be a part of the ceiling loose in the windway. Like E.303, the window was originally nicely cut and neatly symmetrical.

The key parts except for posts are new and these are inset into finely scalloped recesses (see photos)

Cap And Fontanelle

Cap		External diameters		
Overall length	75.5	(east - west)		
internal Ø	37.5	distance		
depth	52.0	extra deep drill mark in centre	from top	Ø
largest external Ø	56.5		0	40.8
blow hole	13x5.0		39.5	42/49.2
		blockline	52.7	48.3
ring width	19.7		163	44.1
Ø	49.8/51.3		138	42.3
			hole X	41.4
Fontanelle			1	41.1
Overall length	87.9		2	40.6
			3	39.9
internal Ø south	56.5		4	39.3
internal Ø north	52.5		5	38.9
			6	38.5
largest external Ø	64.7	above fontanelle	619/620.5	38.5/52
			7	49.1/37.8
north ring width	19.2	lower fontanelle mount	709.5	56.3
Ø	58.6/60.7	bead	712	46.9
		below bead	714	38.8
south ring width	17.9		796	45.5
Ø	63.2/65.0	bell		77.5
				replacement
rose Ø	26.5			
holes	2.5			
line from top	48	no visible line...		

NOTE:

The rings, cap and fontanelle all look original. No real line scored to align the roses. The blow hole meets the corner of the bore and is flared towards the inside (see photos)

Tuning

I = Tuner set to				Temp. Humidity			
g 440				Equal tempered			
Note	Cents deflection from 0	Pressure mm H ₂ O	Fingering, where different	Note	Cents deflection from 0	Pressure mm H ₂ O	Fingering, where different
I				VIII	35	25	
II	35	19		IX	50	28	
III	30	19		X	30	28	
IV	35	20		XI			
V	35	22		XII	35	35	
VI	40	24		XIII			
VII	20	26		XIV			
				XV			

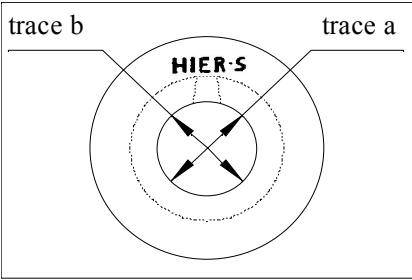
Tested with an organ blower. The pitch is sharp of g, more than flat of g# and considering the now huge window, this was probably always the case. It's surprising so many notes worked considering the condition of the labium. The octaves also seem to be quite well in tune. The replacement key is not sealing properly, so I and XIII were not possible

Paris E 365 basset Rauch revisited.xls, Bore from top

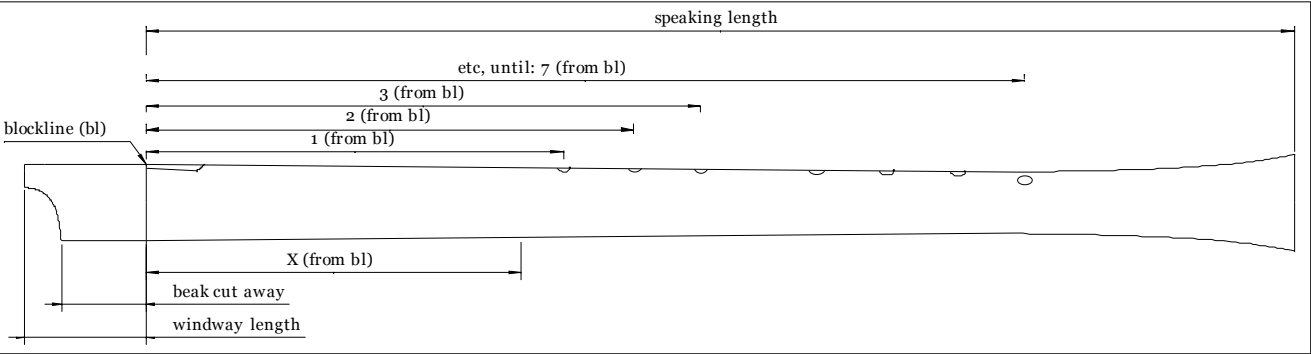
Length	Ø⇐⇒	Ø⇑⇓		Length	Ø⇐⇒	Ø⇑⇓		Length	Ø⇐⇒	Ø⇑⇓		Length	Ø⇐⇒	Ø⇑⇓		Length	Ø⇐⇒	Ø⇑⇓
55.3	30.41	33.33		240.3	30.01	29.99		425.3	27.58	31.55		610.3	25.31	25.35		795.3	25.93	25.95
60.3	30.12	33.07		245.3	29.93	29.88		430.3	27.58	30.66		615.3	25.23	25.32		800.3	26.04	26.06
65.3	30.19	29.47		250.3	30.08	29.88		435.3	27.58	27.69		620.3	25.12	25.21		805.3	26.15	26.21
70.3	30.04	29.54		255.3	29.90	29.80		440.3	27.51	27.69		625.3	25.01	25.13		810.3	26.22	26.28
75.3	29.82	29.58		260.3	29.97	29.84		445.3	27.44	27.58		630.3	24.94	25.06		815.3	26.22	26.28
80.3	29.71	29.58		265.3	29.86	29.80		450.3	27.36	27.47		635.3	24.87	25.02		820.3	26.22	26.32
85.3	29.71	29.58		270.3	29.82	29.77		455.3	27.33	27.47		640.3	24.83	24.91		825.3	26.22	26.32
90.3	29.68	29.54		275.3	29.64	29.62		460.3	27.25	27.36		645.3	24.83	24.91				
95.3	29.60	29.54		280.3	29.57	29.58		465.3	27.11	27.21		650.3	24.72	24.87				
100.3	29.64	29.51		285.3	29.46	29.47		470.3	27.03	27.21		655.3	24.61	24.72				
105.3	29.68	29.51		290.3	29.31	29.43		475.3	26.92	27.25		660.3	24.42	24.72				
110.3	29.68	29.58		295.3	29.24	29.40		480.3	26.81	27.10		665.3	24.42	24.65				
115.3	29.71	29.54		300.3	29.09	29.32		485.3	26.81	27.50		670.3	24.28	24.50				
120.3	29.68	29.54		305.3	29.05	29.28		490.3	26.78	30.73		675.3	24.24	26.17				
125.3	29.71	29.51		310.3	28.98	37.74		495.3	26.89	31.29		680.3	24.13	27.73				
130.3	29.68	29.51		315.3	28.91	30.69		500.3	26.92	30.88		685.3	24.17	23.95				
135.3	29.68	29.51		320.3	28.83	28.91		505.3	26.81	27.28		690.3	24.20	23.57				
140.3	29.64	29.58		325.3	28.80	28.91		510.3	26.67	27.28		695.3	24.35	24.09				
145.3	29.68	29.65		330.3	28.76	28.95		515.3	26.52	27.25		700.3	24.42	24.39				
150.3	29.68	29.65		335.3	28.76	30.29		520.3	26.48	27.06		705.3	24.61	24.50				
155.3	29.82	29.77		340.3	28.83	33.03		525.3	26.41	26.91		710.3	24.72	24.65				
160.3	29.86	29.84		345.3	28.80	32.73		530.3	26.30	26.65		715.3	24.79	24.84				
165.3	29.82	29.77		350.3	28.69	26.36		535.3	26.19	26.36		720.3	24.90	24.91				
170.3	29.86	29.77		355.3	28.61	28.21		540.3	26.08	29.62		725.3	25.09	25.02				
175.3	29.79	29.69		360.3	28.46	28.73		545.3	25.97	29.88		730.3	25.20	25.24				
180.3	29.86	29.84		365.3	28.50	28.88		550.3	25.89	27.28		735.3	25.23	25.28				
185.3	29.86	29.84		370.3	28.43	28.84		555.3	25.78	26.06		740.3	25.31	25.39				
190.3	29.82	29.91		375.3	28.24	30.54		560.3	25.71	25.95		745.3	25.38	25.43				
195.3	29.86	29.91		380.3	28.06	32.62		565.3	25.71	25.80		750.3	25.45	25.43				
200.3	29.86	29.91		385.3	27.99	32.21		570.3	25.60	25.73		755.3	25.45	25.54				
205.3	29.82	29.84		390.3	27.88	30.69		575.3	25.56	25.65		760.3	25.56	25.54				
210.3	29.82	29.80		395.3	27.80	28.32		580.3	25.49	26.54		765.3	25.60	25.65				
215.3	29.90	29.84		400.3	27.66	28.17		585.3	25.49	29.10		770.3	25.67	25.69				
220.3	29.86	29.95		405.3	27.66	28.25		590.3	25.42	26.54		775.3	25.71	25.76				
225.3	29.90	30.03		410.3	27.58	28.25		595.3	25.34	25.50		780.3	25.82	25.80				
230.3	29.86	29.88		415.3	27.62	28.02		600.3	25.42	25.43		785.3	25.82	25.84				
235.3	29.97	29.99		420.3	27.55	30.77		605.3	25.31	25.35		790.3	25.82	25.87				

KEY AND NOTES TO MEASUREMENT SHEETS

All attempts at measuring are necessarily subjective and the current survey was undertaken with some finite objectives: To undertake an inclusive study of surviving recorders, using a skeleton format of the most important measurements and minimal intervention. The bores are measured from the bottom, using a strain gauge based digital internal caliper. This has the advantage that bores can be measured with the blocks in situ, thus preventing damage to this sensitive part. Normally, at least two traces are made, at approximately 90° from each other, avoiding the tone holes where possible. Calculations are then made to give internal diameters from the top of the instruments, and to allow bore traces to be plotted.



FIELD	TYPICAL VALUE	EXPLANATION
Location:		Town, collection or both, where the instrument is currently located
Inv. N°:		Inventory number of the instrument
Measured:		Name of measurer
Date:		Date of measurements, where known
Pitch @ a=440hz:		Pitch in terms of lowest note, all holes covered, relative to modern pitch (a=440hz). + or - indicates a quarter tone step, relative to modern pitch
Material:		Material from which the instrument is made
mark:		Mark or stamp visible on the instrument, branded or embossed by maker or owner

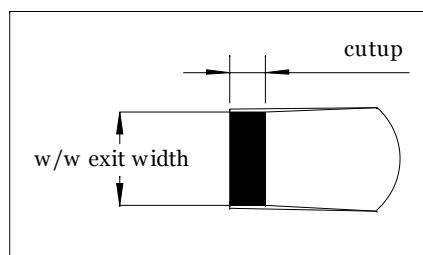
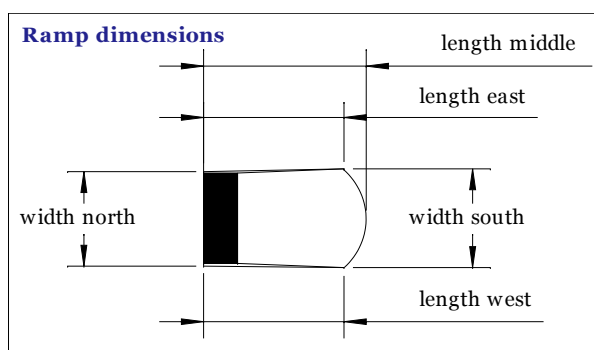


FINGERHOLES	Tone, or fingerholes of the instrument
length	(See drawing above)
(from bl)	Sum of length from blockline and windway length
(from top)	
diameter	
east/w	Tone hole minimum diameter in an east to west direction
north/s	Tone hole minimum diameter in a north to south direction
direction	
↗ ↘ ↙ ↖	Indicates if a fingerhole is bored obliquely, or undercut with an unusual bias, and in which direction
Step:	Difference between lower surface of edge (labium) and upper surface of windway ceiling. Typically, this measurement is a visual estimate, given that the blocks would not normally be removed
Edge thickness:	Thickness of edge (labium). Measured by impression made in fine gum and compared using feeler gauges

Windway exit chamfers: up	small, c. 0.6	Chamfer on upper surface of windway exit (on ceiling)
	flat	An estimate of its angle
down	2.0	Chamfer on lower surface of windway exit (on block)
	45°	An estimate of its angle
(These measurements have either been obtained by the same method as the edge thickness, or are a visual estimate)		

W/W entrance: width	Width of windway entrance,
height	Height of windway entrance, distance between windway ceiling and block surface

External diameters	Diameter of the instrument's exterior
(east - west)	Measured at 90 degrees to the longitudinal plane of the tone holes
distance from top	Distance from the north end of the instrument, at which measurement was taken. Note: On basses with fontanelles, the approximate measurements of beads and fontanelle supports were also included.



Cap		Measurements relative to cap
Overall length	99	Total length of the cap
internal Ø	57.6	Approximate internal diameter of cap recess
depth	73	Maximum depth of cap recess
largest external Ø	74.7	Maximum diameter of caps external turning
hole Ø	11.8	Diameter of crook hole, where appropriate
blow hole		Width and height of blowing hole, where appropriate
ring width	21.6	Width of brass strengthening ring
Ø	64	Diameter of brass strengthening ring

Fontanelle		Measurements relative to fontanelle
Overall length	151	Total length of fontanelle
internal Ø south	69.5	Approximate internal diameter of lower end
internal Ø north	64.3	Approximate internal diameter of upper end
largest external Ø	81.2	Maximum exterior diameter, typically scored with a line though the middle of the roses
north ring width	22.5	Width of upper brass strengthening ring
Ø	71.7	Diameter of upper brass strengthening ring
south ring width	22.9	Width of lower brass strengthening ring
Ø	78.5	Diameter of lower brass strengthening ring
rose Ø	28	Diameter of the largest ring of hole arrangement. Typically holes are arranged in three rings, with an extra hole in the centre.
holes	3	Diameter of the rose holes

For the exterior of the instruments, measurements are taken at strategic points, relative to the functionality of the instruments. Some decorative details, particularly with regard to bass instruments, were also recorded to allow a faithful reproduction to be made.

Concerning the voicing of the instruments, only the most basic details such as those concerning the window and ramp, windway width can be recorded with any surety. Many of the blocks are badly damaged, missing or replacements and it is felt that little can be gained by miniscule examination of these areas. With instruments with an undamaged labium or chamfers, estimates are made to give instrument makers an idea of the sort of degree of voicing these recorders might have originally had.

The recorders are mouth blown and measurements taken with a Korg tuner calibrated in equal temperament at $a=440\text{hz}$, Readings are taken as cents deflection from this pitch standard. In some cases, pressure measurements are taken in millimetres of water column, using an Appleby and Ireland pressure gauge with the range 0 to 100 mm/H₂O.

Each instrument is blown to find the centre of the sound and the pressure and pitch recorded. Where fingerings other than the standard fingerings given below are used, these too are recorded, as are any variants. Whilst finding the 'centre of the sound' is always a subjective process, using a mechanical method to test pitch and sound does have the advantage of consistency and is generally more objective than having several players try the instruments. It is also considerably less destructive to the recorders and gives a good idea of the relationship between different instruments.

The following standard fingerings are tested.

Note	Fingering
I	1234567
II	0123456-
III	012345--
IV	01234-5-
V	0123----
VI	012-----
VII	01-----
VIII	0-2-----
IX	-----
X	0/12345--
XI	Not recorded
XII	0/123----
XIII	0/12-----
XIV	Various
XV	Various