Palace of Arts Budapest
Pipe Organ Samples

Medium Edition

for Hauptwerk™ 4.2

and Hauptwerk™ V

User's Manual

Printed in Hungary.

Version 2020|A

Table of Contents

1. Welcome

Welcome to one of the largest virtual pipe organs in the world and congratulations for your purchase!

Palace of Arts Budapest (PAB) Pipe Organ Samples is a fully playable, freely configurable, intuitively manageable and MIDI-controllable virtual pipe organ, delivering the authentic sound of the 92-stop Pécsi-Mühleisen pipe organ of the Béla Bartók National Concert Hall of the Palace of Arts – Budapest, Hungary.

Designed for operation within Hauptwerk™ software, on both PC and Macintosh computers, Palace of Arts Budapest Pipe Organ Samples sets a new standard in virtual pipe organs used by leading organists, professional musicians, professors and tutors, educational, worship and culture institutions, recording professionals and enthusiasts.

Despite its immense size and capabilities, it is a pipe organ you can play and take with you wherever you go, offering unprecedented flexibility and sound quality never heard before in a virtual instrument.

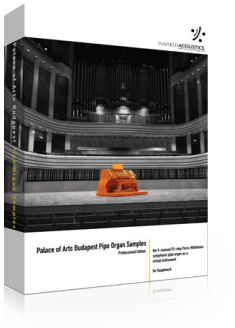
1.1. Highlights

The organ has many unique features, including:

- Fully functional Combination Action exactly duplicating the real organ, independent of Hauptwerk™'s combination action, controllable directly from the screen or by means of MIDI. (see Chapter 3.8)
- 61-stage crescendo with multiple programs (see Chapter 3.7)
- Multiple pages optimized for single or dual touch-screens. (see Chapter 3.1)
- and more

1.2. What is contained inside the package

1.2.1. Contents of the box



If your version of PAB Pipe Organ Samples was delivered to you in a physical form rather than a download, please make sure you have the following contents in the box to ensure you have received a complete product:

- Three USB thumb drives (also known as USB sticks) containing the installation data
- Your personal serial number / Activation Code on a printed registration card
- PAB User's Manual.

Medium Edition
(45 stops, 3 + P)

Pedal (C-g')	I. Manual, Grande orgue (C-c'''')	II. Manual, Positif expressif (C-c'''')	III. Manual, Récit expressif (C-c'''')
Principalbass 16'	Montre 16'	Principal 8'	Gedeckt 16'
Contrebasse 16'	Principal 8'	Cor de nuit 8'	Geigenprincipal 8'
Soubasse 16'	Flûte harmonique 8'	Salicional 8'	Bourdon à cheminée 8'
Octavbass 8'	Gamba 8'	Flûte traversière 8'	Gamba 8'
Gedackt 8'	Bourdon 8'	Praestant 4'	Voix céleste 8'
Octave 4'	Praestant 4'	Flûte conique 4'	Flûte octaviante 4'
Mixtur 4x 2 2/3'	Rohrflöte 4'	Quinte 22/3'	Octavin 2'
Basson 16'	Quinte 22/3'	Doublette 2'	Basson-Hautbois 8'
Bombarde 16'	Superoctave 2'	Terz 13/5'	Tremulant III.
Trompete 8'	Cornet 2-5x 8'	Larigot 11/3'	
	Mixtur 5-7x 22/3'	Mixtur 4-6x 2'	
	Cimbel 4-5x 11/3'	Trompette 8'	
	Trompete 8'	Cromorne 8'	
	Trompete 4'	Tremulant II.	

1.3. Hardware and software requirements

Palace of Arts Budapest Pipe Organ Samples is hosted within Hauptwerk™ virtual pipe organ software, available for both PC and Mac computers from Milan Digital Audio, found at http://www.hauptwerk.com on the Internet. Hauptwerk™ functions with both currently available 32-bit and 64-bit operating systems. Hauptwerk™ Advanced Edition is recommended. A high-performance computer is required to experience full, flawless and convenient operation of this library.

1.3.1. RAM and number of loadable stops

Since Hauptwerk™ loads the sample data into the computer's random access memory (RAM) – and does not stream data from the hard disk – the amount of RAM determines the number of stops you can load for playing at a given time. The theoretical RAM limitation, per program instance is 4 GB in 32-bit operating systems; loading all stops of the organ requires a 64-bit operating system, capable of handling more than 4 GB of RAM. Regardless of operating system, please make sure you are using more than 4 GB of RAM.

Hauptwerk™ allows you to load the library with independent options for each available stop, allowing you to trade off the number of loadable stops with varying degrees of realism (you can, for example, choose to load less than the full complement of release samples). Loading all of the stops in their most complete multi-looped versions and with full release samples will consume much more RAM than loading them with, say, single looped data and/or truncated release tails.

Please refer to the Hauptwerk™ User's Manual for a complete description of how to maximize performance with these features.

Hauptwerk™ offers lossless compression for sample loading. We recommend turning this option ON when loading the samples, since it does not affect the quality of sound, but increases the number of stops one can load at a time.

The following table summarizes the loading requirements for the instrument.

RAM requirements for PAB Medium Edition

Loading setup	Bits	Multiple Loops	Multiple Releases	Subjective Quality	Required RAM
Medium Edition, all 45 stops	24	all	all	maximum	23.7 GB
Medium Edition, all 45 stops	16	all	all	almost maximum	14.3 GB
Medium Wet Edition, all 45 stops	24	all	all	maximum	30.2 GB
Medium Wet Edition, all 45 stops	16	all	all	almost maximum	18.1 GB

1.3.2. CPU and Polyphony

It is essential that your computer has a high-performance CPU in order to experience full polyphony. A high polyphony capability is required when many stops are drawn and many notes played together.

> **Note:** Polyphony is defined as the number of stops being selected, times the number of notes held per stop, including the duration release tails to sound, at any given time.

A series of fast staccato chords in Tutti will stress your computer the most, because the initial release tails will continue to sound as additional staccato chords are being played. For the most flawless operation, we recommend the use of a 4-core or 8-core CPU or better, equipped with the most RAM that you can afford. As your CPU power increases, you can achieve more polyphony.

Please refer to the Hauptwerk™ User's Manual for a complete description of how to achieve maximum polyphony with your computer.

2. Installation

Installing the PAB Pipe Organ Samples requires that you own a registered, installed copy of Hauptwerk™ virtual pipe organ software, together with a registered, working dongle. See Chapter 2.2 for more detail about acquiring a Hauptwerk™ license and authorizing the dongle. Please do not attempt to install the PAB library unless you have a registered copy of Hauptwerk™ installed in your computer.

This installation procedure is for Hauptwerk™ version 4.2. If using a later version of Hauptwerk™, the required steps may be slightly different in detail; please refer to your version's copy of the Hauptwerk™ User Guide.

1. Plug in the first USB stick or External Hard Disk Drive into an unused USB slot of your computer. Wait until the computer recognizes the USB drive and, either a drive letter is dispatched to it (PC - Windows), or it is mounted on the desktop (Mac - OS X). Once your computer has accessed the USB stick / External Hard Disk Drive, proceed to the next step.
2. Launch Hauptwerk™ virtual organ software in the "standalone" mode.
3. From within Hauptwerk™, go to the file menu and select Install organ, sample set, temperament or impulse response
    a. The program will prompt you to select the program to install.
    b. Navigate to the USB stick / External Hard Disk Drive to select the first file set to install. All of the available file sets should be installed in order to make the library work.
    c. Click Open and then click OK on the next screen.
    d. Wait until Hauptwerk™ finishes installing the file you have selected.
4. Repeat Step 3 until all files are installed from the first USB stick / External Hard Disk Drive.
    a. Remove the current USB stick from the computer, and plug in the next USB stick.
5. Repeat Steps from 3 to 4 until you have finished installing all of the files from all of the USB sticks.

2.1. Upgrading and updating PAB Pipe Organ Samples

There are two cases for which you may need to apply an upgrade:

1. You wish to apply a new update to your current Edition
2. You own a smaller Edition that you wish to upgrade to a larger Edition

The procedure for installing upgrades and updates is the same as the normal installation process, except that, instead of inserting USB drives, you may receive the update or upgrade files by downloading them from the Inspired Acoustics website,

http://www.inspiredacoustics.com.

2.2. USB license key authorization for Hauptwerk™ version 4

The sample set comes in a Hauptwerk-specific encrypted format requiring a Hauptwerk USB key, compatible with Hauptwerk 4.0, 4.1, 4.2 and later. In order to use PAB Pipe Organ Samples in Hauptwerk version 4, you do not need a license update to your current USB dongle.

2.3. License authorization for Hauptwerk™ version V

Hauptwerk™ version V uses PACE's iLok system for copy protection and the management of licenses of both Hauptwerk™ V and compatible sample sets. In order to use PAB Pipe Organ Samples, you must authorize the library in your iLok account within the previously installed iLok License Manager by redeeming and activating the license for the sample set with the given Activation Code.

Hauptwerk™ version V has to identify new sample set licenses, so before installing PAB Pipe Organ Samples in Hauptwerk™ V, please download and install the latest "licensing package" containing this information from Milan Digital Audio through their website:

https://www.hauptwerk.com/licensingpackages.

If you have any problems, please contact us through our Website at

http://www.inspiredacoustics.com.

3. Controls of the virtual pipe organ

The organ at the Palace of Arts – Budapest contains two working consoles: the upper console, integrated into the main body and pipe case of the organ; the lower (or "stage") console is a movable console, capable of placement at center stage as a solo instrument, or located to either side of the stage during orchestral productions.

Inspired Acoustics has taken extraordinary measures to reproduce every possible sonic nuance of the original pipe organ, and provide every control feature of its stage console in the virtual instrument format. Some features – previously not available in Hauptwerk™ software – were developed by Inspired Acoustics in order to maximize the convenience of your playing experience.

3.1. Pages

The organ controls are organized into so-called "Pages" in the Hauptwerk™ program, to allow convenient operation. Each page of this virtual instrument plays a different role, and allows you to control and monitor the organ's numerous features in a convenient way. The following table summarizes the contents of each page.

Page name	Description	What is it for?
Console	Overview of the stage console.	Check, control, observe and demonstrate everything on one screen, including keyboard, pedal, swell box and crescendo wheel movements.
Stops - Center	Simplified view of all stops and default couplers in one single page, modified for convenient control	For systems with a single touch display screen, this page allows you to control all stops and default couplers
Stops - Left	Simplified view of stops and default couplers of the left side, modified for convenient control	For systems with two individual touch screens, you can place this screen to the left of the keyboard, to control the left bank of stops and default couplers.
Stops - Right	Simplified view of stops and default couplers of the right side, modified for convenient control	For systems with two individual touch screens, you can place this screen to the right of the keyboard, to control the right bank of stops and default couplers.
Center	Stage console: all control elements except keys on one single page, modified for convenient control.	For systems with a single touch display screen, this page allows you to control all stops, combination action and miscellaneous functions

Left	Stage console: stops of the left side, close-up, modified for convenient control.	For systems with two individual touch screens, you can place this screen to the left of the keyboard, to control the left bank of stops, just as on the real instrument.
Right	Stage console: stops of the right side, close-up, modified for convenient control.	For systems with two individual touch screens, you can place this second screen to the right of the keyboard, to control the right bank of stops, just as on the real instrument.
Crescendo 1	Programmable crescendo, page 1	These pages allow you to program the pipe organ's 61-stage crescendo wheel to any desired custom configuration.
Crescendo 2	Programmable crescendo, page 2	
Voicing*	Voicing tool for all divisions and stops, and combination action	These pages allow you to set and save the voicing configurations of all individual stops or divisions.
Performance	Performance related controls and performance sequencer	Virtual controls for the Keyboard Mass™ functionality allowing you to change the response and inertia of the keyboards.

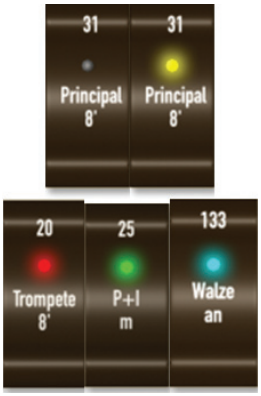
**displayed on multiple pages in Hauptwerk™ version V.*

3.2. Keys and keyboards

The virtual instrument boasts the Palace of Arts Budapest's full five 61-note manuals and a 32-note set of pedals. All keys and keyboards are shown in a photo-realistic perspective view, fully responsive to mouse control. The notes, pedal keyboard, swellbox pedals and crescendo wheel all faithfully mirror your performance. The Medium Edition has 3 working manuals and a pedal.

3.3. Stops

The stage console of the organ features pushback key stops with colored lights indicating their functional states. Indicator lights come on when individual stops or controls are drawn. There are various "pages" in the Hauptwerk™ displays containing close-up images of the stops. If you manipulate the stops or controls in one page, their on/off status will be synchronized with the other pages as well.



Color	Meaning
yellow	flue pipes and electrical couplers
red	reed pipes
green	mechanical couplers
cyan (blue)	controls related to the crescendo wheel (called the "walze" in the stoplist)

3.4. Buttons

The stage console has several button controls for use during live performance. Some of these buttons control additional sounds, such as the engine Motor or Tuba; other buttons control or trigger functions, such as the Combination Action or the temporary removal/restoration of reed stops.

3.4.1. Optional Engine Sounds (Motor, Tuba)

The Motor and the Tuba button are buttons that will optionally turn on the organ motors. The real organ has a separate electric motor for the stop Tuba Mirabilis 8' on the 4th (Solo) manual. The virtual instrument however allows you to play all stops without any motor noise at all, allowing the creation of super-high-quality totally noise-free recording, something that is (naturally) not even achievable on the real instrument. For those seeking ultimate realism, just turn on the motors!

3.4.2. All reeds off button (–Z)

This button, available as both a foot piston on the Console Page and as a separate button with the label –Z, will temporarily disable the reeds from any active configuration of stops.

Interesting fact: Letter Z denotes Zungen, the German name of Reeds.

3.4.3. Plenum and Tutti buttons (PL and TT)

PAB Pipe Organ Samples Professional Edition ships with pre-programmed Plenum and Tutti combinations (PL and TT, respectively) for your convenience. If you have not had time (or are disinclined) to prepare preset combinations, just press either of these buttons, and you will get moderate-level or full-level sound, as desired.

This feature is available both as foot pistons marked as PL and TT and as square-shaped wooden buttons on the Center, Left and Right pages.

3.4.4. Cancel and Zero buttons

Due to the large number of stops in this organ, it is not easy to turn off all stops manually. To make this easier, there are Cancel and Zero buttons. Cancel buttons turn off each manual's stops independently, while the Zero button turns all stops and couplers off with a single click, and will also deactivate the PL and TT pistons. The Cancel buttons are located near the stop switches and are labeled with the name of their respective manual.

The Zero or general cancel button turns all stops and couplers off. In Palace of Arts Budapest Pipe Organ Samples it is marked with a zero sign Ø and is located on the right side beneath the first manual on the Console Page.

3.5. Swellboxes

Left pedal: manual II. (Positiv expr.)

Right pedal: manual III. (Récit expr.)

Swellbox Condition: 'heels up' means swellbox shutters are opened.

Swellboxes are enclosures with vertical venetian blind-type shutters controlled by the swell pedals (or 'swell shoes'). As a given shutter closes, the pipes contained in that swellbox will sound quieter and darker. The Palace of Arts organ's swellbox characteristics, through careful measurement and accurate modeling, are brought to life with breathtaking realism.

3.6. Light Emitting Diode (LED) Numeric Indicators

The original organ is equipped with various numeric indicators on the stage console, to assist the organist in determining the status of combination, divisional and crescendo settings.

The Combination label represents the status of PAB's proprietary combination action, ranging from 000 to 059 in the Medium Edition, each number representing a user-programmable combination bank or frame.

The Walze label has two sets of matrix LEDs that represent the operating status of the crescendo wheel: the left Walze display identifies the currently selected crescendo program. The right Walze display shows the actual state of wheel position, from 00 (start of wheel program) to 60 (end of wheel program).

The Positiv and the Récit indicators portray the current positions of the swellbox shutters: from 00 (fully closed) to 20 (fully open).

3.7. Crescendo wheel (Walze)

The crescendo wheel is an axially rotating drum operated by foot control, and is used in place of a conventional crescendo pedal. The Walze is positioned to the left of the foot-operated swellbox pedals. Sliding (rolling) it forward from position 00 to a higher position triggers stops in a preset user-defined manner, according to the sequence contained in the respective Crescendo Program. Cyan lighted stops control the crescendo wheel located in the bank of Manual IV. (Solo) stops.

Note: To enable the crescendo program, turn on the stop 133 *Walze An.*

Stop switch	Effect
133 Walze an (Walze On)	Crescendo wheel enabler
134 Koppeln aus Walze (Couplers off Walze)	Disables couplers from the current crescendo wheel position
135 Mixturen aus Walze (Mixtures off Walze)	Disables mixture stops from the current crescendo wheel position
136 Zungen aus Walze (Reeds off Walze)	Disables reed stops from the current crescendo wheel position

Note: You must turn on Stop #133 Walze An to enable the crescendo wheel. If you enable the wheel on a non-zero position of the crescendo wheel, such as 26 for example, the corresponding combination will load.

The virtual instrument supports multiple crescendo programs. While two programs are preloaded in the instrument, you can freely modify any of them. The crescendo has 61 stages, from 00 to 60, inclusive.

To toggle the crescendo program between #1 and #2, and back again, push the button labeled **W** ▷ .

You will find this button near the Crescendo Indicator. If the current program is the last and you push this button, you will be brought back to the first program.

3.8. Independent Combination Action

The Combination Action of the PAB Pipe Organ Samples is totally unique amongst Hauptwerk™ organ libraries. For the first time, you can control different sets of stops (combinations) stored in the organ's internal memory by a single click or touch, right from the graphical interface.

This amazing feature is completely independent of Hauptwerk's™ own combination action system, allowing more convenient use and the possibility to register the virtual organ's stop list in exactly the same way as the real organ.

The key element of PAB's Combination action is the "Increment" and "Decrement" button array, clearly marked with left- and right-facing triangles.

Combination action is used to access presets of different stop configurations with a single click, an essential feature when performing organ pieces in real time.

3.8.1. Features

Each Edition of PAB Pipe Organ Samples is capable of storing different numbers of combinations within its internal memory; the Medium Edition can store up to 60 programs ranging from 000 to 059. You can save and load these programs into a single file by using Hauptwerk™'s built-in Save and Load functionality in the Combinations menu (as of Hauptwerk™ Version 4.2).

The Combination Action, or "Setzer" in its German name, is accessed and controlled by a

group of dedicated buttons. Ten numerical buttons (numbered 0 - 9) can directly access the first ten memory positions, and are also used in conjunction with the four buttons marked with arrow-like triangles, permitting rapid navigation within the combination memory. The up-down arrow buttons advance/decrement the selection by 'tens', while the left-right buttons advance/decrement by 'ones' (see below). The S key is used to Set combinations in memory.

3.8.2. Programming and resetting from Graphical User Interface (GUI) or Musical Instrument Digital Interface (MIDI)

Once you define a stop configuration on the console that you wish to save as a combination preset (also called a "frame"), press the S button once, and then press either a number or a navigation key to select which combination frame you want to program. If you select the same number that was previously active, the previous combination will be overwritten with the new one.

Hint: The easiest way to program a particular stop combination into the next frame is to press the S set button and then press the increment button. This will program the currently set configuration to the next frame and increment the current frame by one to that frame – with a single click.

You can also assign MIDI messages to these buttons so that, if you have a MIDI-capable console, all these functionalities can be directly available to you in physical form as well.

3.8.3. Navigation and use during organ play

Navigating between different combination frames is very easy. You can increment and decrement the current frame by one using the buttons below:

Button	Effect
	Decrement the current combination frame by one number (previous)
	Increment the current combination frame by one number (next)

There are also"Up" and "Down" buttons, to make navigation even easier. The up and down buttons increment and decrement the combination frames by "tens". It is a simple matter to use these buttons together with the numerical buttons to quickly navigate to the desired combination frame.

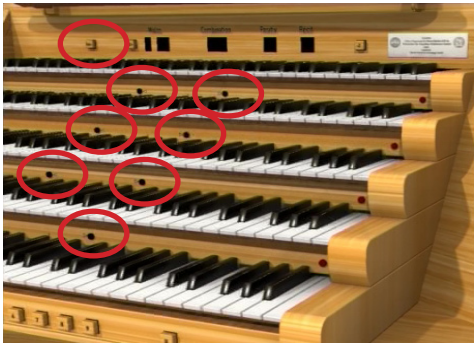
For Example: If you wish to change from combination frame 004 to 025, this is possible by just three clicks. Push the button UP twice (to go from "00_" to "02_", and then press button 5 to get you to "025". The newly chosen combination will only be changed when you push the third numerical digit you wish you reach, e.g. number 5. In this way, you can navigate easily, conveniently, and safely.

Button	Effect
	Navigate the system to the next tens of combination without changing the current combination. Then, push one of the number buttons to access the desired combination frame directly.
	Navigate the system to the previous tens of combination without changing the current combination. Then, push one of the number buttons to access the combination frame directly.

3.8.4. Loading and saving Combinations to files

Saving entire banks of combinations is just as easy as saving Hauptwerk's™ own combinations, and can be configured using the same commands.

3.8.5. Combination frame advancement buttons beneath the keyboards and Seq+



Below each manual on the Console page you will find two small black buttons. These buttons increase and decrease the current frame of the combination action, e.g. from 000 to 001 or vice versa if they are enabled only with the Seq+ button. You will find Seq+ on the top left of the console on the Console Page.

These features were made available should you construct a real organ console with such features and wish to equip it with suitable MIDI control. You will find it very convenient to play and develop stop/combination registration with the help of these buttons.

3.9. Couplers

3.9.1. Mechanical couplers: couplers between manuals

Mechanical couplers on the original organ's upper console couples manuals which you can visually verify by the joint movement of the coupled keys. In PAB Professional, it is implemented similarly but using the lower console. The labeling of the mechanical couplers follows the labeling rule 'Destination + Source m', for example, 'I+II m' couplers the second manual to the first, mechanically so when you play the first manual (destination) the keys of the second will also move. Alternatively this rule can be interpreted as 'X has additionally Y playing'.

3.9.2. Electronic couplers: couplers between divisions

In the original organ, electronic couplers are labeled the same way as the mechanic ones, only the letter 'm' is changed to 'e' and the keys are not moving together but the coupling is realized 'hidden' with no visual feedback on the key movement.

3.10. Dynamic KeyboardMass™ simulation and control

Keyboards and tracker actions of pipe organ have mass, inertia, which describe their response while you play. The Dynamic KeyboardMass™ is a special feature in the PAB Medium Edition that allows you simulate and control each of the organ's keyboards' and pedal board's heaviness independently with the attached slider, even if your keyboard controller does not support any dynamics at all. This revolutionary feature adds a new layer of realism to play the virtual pipe organ. The Dynamic KeyboardMass™ model sets the response of both the speaking and the release part of the pipe sound simultaneously and dynamically. Practically, this makes the virtual organ a more living instrument and ensures that it remains very responsive even if you set it to have very heavy keyboards.

The controllers for the Dynamic KeyboardMass™ simulation can be found on the Performance Page. By moving the slider toward the setting 'heavy' the keyboard may feel more and more heavy. To completely turn off this feature, for compatibility, you can engage the K.mass off switch which will temporarily disable the functionality for the given division (regardless of the current keyboard assignment).

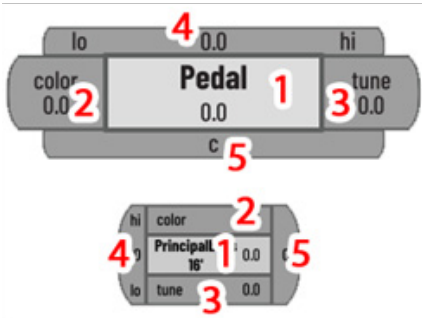
3.11. Performance Sequencer

PAB Medium's unique Performance Sequencer™ is a secondary combination action that helps you storing and recalling configuration-related parameters, such as the keyboard mass settings.

The PerformanceSequencer™ has 8 frames each accessible by a dedicated button labeled Conf. 1 to Conf. 8. The current configuration can be stored by using the Combination Action's S (set) button. To store, for example, the current state in Conf. 3: press S and then Conf. 3.

3.12. Voicing Page*

PAB Pipe Organ Samples has a unique feature that allows you to control the tuning, overall gain, overall brightness, increase volume of bass/treble notes and save presets in the combination action dedicated to the voicing configurations.



Button	Effect
1	Control overall volume of the entire division or stop (dB)
2	Control overall brightness of the entire division or stop (dB)
3	Control the tuning of the entire division or stop (cent)
4	Increase volume of bass ("lo") or treble ("hi") notes in the entire division or stop (dB)
5	Cancel changes in the entire division or stop

**displayed on multiple pages in Hauptwerk version V due to compatibility issues.*

4. Answers to frequently asked questions

4.12.1. Why do we recommend convolution reverb instead of release samples?

Multiple layers of release samples are meant to provide a more accurate model than a single release sample, and indeed a much accurate result is obtained, since it is obvious that a long sustained note will have a different release 'footprint' than a short staccato note whose sustained part has not fully developed. However, as the number of release sample layers increase, the loading and computing (mixing) demand also increases. Multiple release sample layers - even if supplied in great number - will always be quantized in time, i.e. their lengths will exactly correspond to only a few particular note durations.

Convolution reverberation, adopting rigorously prepared and measured state-of-the-art impulse responses, provides the appropriate quantization for any length of note since the release samples will not be pre-calculated but calculated as you play, in real time. It is also possible to use release samples and convolution reverb at the same time when the release samples are used only for reproducing the valve-closing sound in the case of smaller instruments or ranks producing audible valve-related sounds, or when the sample set is relatively dry.

On the other hand, convolution is not just capable of reverberation, but of filtering as well, so the swellboxes can be also replaced with more accurate, organ-specific models, if measured adequately during the recording.

4.12.2. What is MUPA?

MUPA is the abbreviation of Művészetek Palotája, the Hungarian name of the Palace of Arts – Budapest, where the organ is located. In the professional music world, MUPA has become an icon of quality, professionalism and excellence where the world's leading artists perform on a daily basis.

You can visit the website of the complex at **http://www.mupa.hu.**

5. The Béla Bartók National Concert Hall

5.1. The Palace of Arts, Budapest

After a surprisingly short 28-month construction period, the long-awaited new cultural institution of Budapest and Hungary – the Palace of Arts – was opened on March 14, 2005. The PPP (Public-Private Partnership) construction project was financed by the Ministry of National Cultural Heritage and Trigránit Development Corporation.

The creators of the institute were inspired by the concept of creating a new European cultural citadel as part of the new Millennium City Centre of Budapest. From the very beginning, the jewel in the crown for the Palace of Arts was to be its superb new concert hall– not only because for almost a hundred years no concert halls were built in Budapest, but also because the investors and architects wanted to achieve a level of quality that would guarantee a renowned status on an international scale, to take its place among the very best in the world. Therefore, besides the architects, a company with necessary experience was needed to oversee the critical acoustic design of the hall. The international tender was won by Artec Consulting Inc., and the company lived up to its reputation. The acoustic components – the 40-ton canopy above the stage, the stage's mechanical devices below, the 48 pieces of reverberation chamber doors (each weighing 10 tons in average), the special wall and floor coatings, etc. – were all custom-developed.

The Palace of Arts, in its wide-ranging calendar of events, presents not only the finest representatives of Hungarian art life, but also welcomes artists and ensembles from all around the world.

5.1.1. Venues and halls

The Palace of Arts building complex is home to the following venues and halls:

Béla Bartók National Concert Hall

The National Concert Hall is located at the heart of the new Palace of Arts, and has the dimensions of a Gothic cathedral. Below we describe the Concert Hall in detail.

Festival Theatre

The 452-seat Festival Theatre, in the eastern third of the Palace of Arts building, utilizes the most modern technologies. Thanks to its acoustic design, it can also be used for classical music concerts, chamber operas, jazz concerts, world music and light music events. It has a nearly 750 square meter (8000 square foot) world-class stage with a side stage, a back stage adaptable for projection, and an upper engineering structure of nearly 24 meters (80 feet) that facilitates set movement. The latest electronic technologies in this hall offer the possibility of professional sound and video recording.

Ludwig Múzeum – Museum of Contemporary Arts

The Museum occupies that wing of the building closest to the Danube River. The first floor is used for temporary exhibitions, while the second and third floors house exhibitions drawn from the Museum's vast contemporary art collections. The intentionally neutral, but technically well equipped, halls are suitable for accommodating the demands of the most diverse exhibitions. The special foil used for the general lighting offers high quality scattered light, supplemented by individual lighting units suitable for creating new and unusual lighting effects. The second floor hosts the museum's specialist library and a place to organize educational programs for children.

Glass Hall

The representational hall of the Palace of Arts has chandeliers of unique design that shine in varied colors, with a beautiful view to the Danube River. The hall serves diverse purposes: primarily, the space hosts various receptions and banquets, but the majority of press conferences are also held here. Thanks to its fine acoustic characteristics, it is a suitable venue for chamber concerts also; at the same time it is a popular "playground" of the youngest guests of the Palace of Delights.

Auditorium

The 130-seat hall, with fixed-row seating, hosts professional lectures, conferences and film/video screenings. Its modern technical devices fulfill the requirements of any presentation, while a built-in language interpreter's box and translation equipment aid in bridging the language barrier at international conferences.

Blue Hall

The Blue Hall, which owes its name to its deep blue-colored carpeting, complements the functions of the Auditorium and the Glass Hall, serving catering purposes primarily. As an independent event location, it hosts youth programs and professional meetings with more intimate surroundings for smaller numbers of participants.

5.1.2. Awards

The Palace of Arts was awarded the "FIABCI Prix d'Excellence 2006" in the "specialized" category, which is the equivalent of an Oscar Award for construction and real estate development. It is bestowed on buildings – educational and cultural institutions, libraries, airports etc. – which offer products and services to the general public. FIABCI (the International Real Estate Federation), formed in 1951 and represented in 56 countries, every year organizes the International Prix d'Excellence for International Real Estate development, aiming to select and reward the most successful projects. The principal criteria for judging are: to what extent does a given development serve the interests of society, how much does it improve the living conditions of the local people, and how well does it meet the requirements of its users.

There are very few cultural institutions in Europe that can boast ISO 9000 series Quality Certification. In 2005, the year of its inauguration, the Palace of Arts initiated the detailed assessment process and, after continuous inspection, in 2006 was awarded the latest version of the certification, the ISO 9001:2000, ahead of the Pompidou Centre of Paris.

5.2. The Béla Bartók National Concert Hall

The National Concert Hall, located at the heart of the new Palace of Arts, has the dimensions of a Gothic cathedral. The world-class acoustics are the work of Artec Consulting Inc. (New York), led by Russell Johnson. Their work in creating concert halls and opera houses in countries all over the globe has been widely praised and acknowledged by performers and audiences alike.

The auditorium of the Béla Bartók National Concert Hall accommodates a maximum of nearly 1700 audience members; 130 additional on-stage seats can be added for chamber concerts. For students, there are 136 standing places in the side galleries located on the second and third floors.

The orchestra podium is located in the open auditorium, with mobile units facilitating the creation of three different stage sizes and an orchestra pit, if required. The 40-ton acoustic canopies over the concert podium serve to create the appropriate stage acoustics required for a given performance, as do the reverberation chambers which surround the inner space, if their doors are opened.

The state-of-the-art audio-visual system is capable of producing unique lighting effects, sound recordings and film projections. Professional-quality CD and DVD recordings can be produced in the recording studio adjoining the hall.

In the spring of 2006, the "King" of instruments, a new symphonic organ, took its place in the Béla Bartók National Concert Hall. This magnificent instrument, with its 92 stops and 5 manuals, was under construction for thirteen months, involving the work of some sixty expert craftsmen. The largest pipes were put into place during the hall's initial construction phase, itself a world first. Made from the finest materials and meeting the most stringent requirements, its tonal quality is unsurpassed--the result of an exhaustive ten-month voicing and tuning period as well as its specially constructed dedicated air-conditioning system.

6. The Organ of the Béla Bartók National Concert Hall

On May 22, 2006, after one and a half years of work, one of the most prestigious symphonic organs of Europe was inaugurated in the Palace of Arts amid spectacular celebrations. Here are just a few numbers that characterize the new organ of the Béla Bartók National Concert Hall: 92 stops, 5 manuals, 6804 pipes, and a 10-month voicing and tuning period.

6.1. Construction of the organ[1]

In Spring 2003, Arcadom Construction Company Ltd., the general contractor of the Palace of Arts building project announced a closed invitation for a tender to build the organ of the Concert Hall. Five of the thirteen organ builder companies invited – Orgelbau Klais Bonn; Jehmlich Orgelbau; Gerhard Grenzing; Rieger Orgelbau; Mander Organs and the consortium of Pécsi Organ-Building Manufacture Ltd. and Mühleisen GmbH – submitted valid bids.

The bids were evaluated with the help of five renowned concert organists: István Baróti, László Fassang, István Lantos, Christophe Mantoux and János Pálúr. The committee included Judit Angster representing the Hungarian Music Council, László Homolya commissioner of the Cultural Ministry, and István Sokorai director of Duna Sétány Székház Ltd, representing the investor. The committee was extended with Arcadom CEO Péter Bálint, acoustic expert Russell Johnson and lead architect Gábor Zoboki. After thorough consideration, the Committee selected and Arcadom signed a contract with the Pécsi–Mühleisen consortium in February 2004.

The specification of the organ changed several times, from the very first phase of discussions until the signing of the preliminary contract. The current disposition (stoplist) was finalized on July 6, 2004, and the frontal aspect of the organ was finalized in August 2004. The preliminary technical plans (part of the submitted bids) needed to be modified, and the detailed construction plans had to be re-aligned continuously as the construction progressed. The largest modifications were of the final disposition, redesigning the organ case, and installing an inner air-conditioning unit. Despite all these midstream modifications, the plans for implementing the organ case were still ready by August 2004.

The two companies started producing the necessary parts in the summer of 2004, and their untiring work lasted until September of 2005. The on-site construction of the inner structure, the wind chests, the pipes of the pedal division, the organ case, and the front pipes started on October 4, 2004. The only way to meet the 2006 deadline was to build and install the organ in parallel with the construction of the concert hall.

[1] Source: www.mupa.hu

The 92 tin display pipes are in an impressive harmony with the surrounding Béla Bartók National Concert Hall. The largest tin pipe is 9.5 meter (32 feet) long and weighs over 480 kilograms (1000 pounds). Except for the Spanish trumpets (Chamades), the front of the organ presented its façade for the first test concerts in January 2005, and it served as a permanent working surface as acoustic engineers voiced the tonal characteristics of the concert hall.

Starting from February 28, 2005, all remaining inner components of the organ were being installed during the late evening and early morning hours. The work had to be done in such a way that the front view of the organ would appear to be finished all the time. To accomplish this feat, the organ's wind chests, bellows, wind trunks, swellboxes and all the other inner components had to be lifted up and built in from within the inside. For certain tasks, this required partial disassembly.

By May 23, 2005, the structure was in a condition ready to start tuning and voicing the ranks of pipes. After collecting audio data and comparing results of live listening tests, the two companies were engaged in continuously voicing the pre-intoned pipes on-site from July 25th until the end of the year.

The technical delivery took place on December 30, 2005 followed by field tests. The organ was inaugurated on May 22, 2006.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6.2. The organ builders

The German Orgelbau Mühleisen and the Pécsi Organ-Building Manufacture Ltd have collaborated for more than ten years on such joint projects as the organs in Stiftskirche in Stuttgart, and the churches in Hamburg, Keitum, Braunschweig and Nienstedten.

6.2.1. Pécsi Organ–Building Manufacture Ltd

The Pécsi Organ-Building Manufacture Ltd, starting as a small enterprise in 1992, has grown to become the largest organ building company in Hungary, whose equipment, technical expertise, and craftsmanship set the standard of quality for all of the Western European workshops. Their craftsmen learned their profession in Hungary, Austria and in Germany. Specializing in building new organs, they conduct restorations, repairs and maintenance routines of historic organs as well.

The company is regularly called upon to meet special requirements as they design their instruments individually, and install each of them in a unique space, taking into account the site's distinctive architectural and acoustic characteristics. They cooperate with and offer their expertise to acoustic experts, restorers and concert organists as well.

Their guiding principle is to completely fill a given space with glorious organ sound, and to create the best possible structure for each organ. They build reliable, excellent instruments both in their appearance and their structure, all based on thousands of working hours – demanding artisan work commensurate with European traditions.

The company has been manufacturing organ parts for Western-European workshops for many years. They are experts in crafting wooden and metal pipes and generally receive original equipment manufacturing orders from Mühleisen, and other market-leading organ companies, such as the German Glatter-Götz, Italian Andrea Zeni, or the Dutch Stinkens.

6.2.2. Werkstätte für Orgelbau Mühleisen

The Werksätte für Orgelbau Mühleisen GmbH was established in 1989 in Leonberg. The company's leader, Konrad Mühleisen, is one of the most prestigious organ builders in Germany.

The Orgelbau-Mühleisen specializes in building new mechanical action (tracker) organs, and in restoring organs from the 19th and 20th century. They wish to build organs that can be "played on". Articulation is an important factor too, achieved by careful planning, good material selection and precise hand work and voicing. Their sound realization does not belong to one particular scheme. However, their sound is often classified as representing the Southern German and Alsace tradition. The 'Mühleisen sound' is created by the intensive interaction between the space and the instrument. Their organs are made to meet the highest expectations of purpose, long life span and aesthetics.

In manufacturing their organs, Orgelbau-Mühleisen tends to combine the best attributes of both old and new crafting and design techniques. Their ideal organ design -- in making the wind chest and the mechanical action – lies in the masterpieces of the baroque master builders; they contend that the space application, the built-in console, the mechanical action, and the classical arrangement of the slide chest is still the best and simplest system, making it possible for artists to play and articulate music sensibly and authentically.

An indispensable condition to this design philosophy is to plan the wind supply and wind movement exactly, and to optimize the leverage of the mechanically moving parts while minimizing friction points. Eloquent testimony to Orgelbau-Mühleisen's design philosophy is to be found in their more than 80 instruments, ranging from the one-manual portatives to the symphonic-style three-manual organs.

In recent years, Konrad Mühleiesen participated in the design of new software which makes it possible to determine with greater accuracy the optimum size of organ for a given venue. With the aid of this powerful tool, they design and build a unique wind supply to each new organ, whatever its size or class. This use of software modeling helps pinpoint ahead of time – and solve – all of the potential areas for mistakes in wind routing, in the acoustic planning stage, and even at the design phase.

6.2.3. Division of labor

The Pécsi Organ-Building Manufacture Ltd was responsible for the following:

- preparing the inner scaffolding, frames, stairs and walking planks
- preparing the slider chests
- preparing the constituents for the wind supply
- preparing the swell boxes
- manufacturing the wooden pipes
- manufacturing a group of inner metal flue pipes
- assembly in the workshop
- installing the high voltage electrical wiring
- making the choir organ

The Werkstatte für Orgelbau Mühleisen GmbH was responsible for

- determining the final measurements
- preparing the whole technical documentation
- making of two consoles
- making of the mechanical action

- supplying certain parts of the reed pipes, front pipes and inner metal pipes
- making of the electrical side wind chests
- providing the electronics

Joint tasks:

- setting up the organ on-site
- installing and regulating the structures
- installing the electrical and electronic devices on-site
- voicing and intonation

6.3. Features of the organ in detail

6.3.1. Disposition

The disposition of the organ defines a 5-manual symphonic organ of 92 stops. The first four manuals, the pedal and their couplers are of mechanical, the fifth manual, the octave couplers and the register trackers are of electrical action.

The organ has 5498 flue pipes (consisting of 5028 tin and 470 wood pipes, made of spruce and maple) and 1214 reed pipes. It has two consoles, one mechanical, the other of electrical action. Manuals II. and III. have swellboxes and there is also a crescendo wheel in each console.

The memory of the organ can store thousands of preset combinations which can also be saved to (and loaded from) an external USB module. The built-in MIDI sequencer can record the performance of the organist, so the artist can listen to his or her own performance. There is also a "sostenuto" function built in, similar to the middle pedal of a piano: the played chord keeps playing even after releasing the keys on the manual.

6.3.2. Dimensions

The dimensions for the arrangement of the new organ were fixed by the dimensions in the hall. A 12.5 meter (41 feet) wide, 13 meter (43 feet) high and 5 meter (16.4 feet) deep niche determined the architectural placement. The front of the organ consists of a wall-to-wall case on the front balcony, and independent display pipes.

6.3.3. Physical Location of Organ Divisions

Mechanical components of the organ are placed in relation to the built-in mechanical console, also known as the upper console:

Located directly above the upper console are the wind chests for the Manual V horizontal Chamade pipes. Above the Chamades are the Grand Orgue and the Récit expressif; above the Grand Orgue pipes are the Solo pipes in the front and the Positif expressif behind.

The pedal pipes flank the two sides of the organ, with the wind chests of the Grand Pedal posi-

tioned closest to the stage. In addition, there are two more levels of wind chests for the pedals, positioned to the side of the Grand Orgue and Solo divisions.

The pipes of the organ are manufactured from materials according to the required sounds of the stops. The wooden pipes are made of spruce and maple of excellent quality. The metal pipes are made of cast and machined tin-lead alloys of varying tin content, according to the intended sound. The front pipes are made of 80% tin alloy, with elevated and sealed lips, and a glossy surface finish.

The walls of the pedal pipes are tapered in the 32' ranks and partly in the 16' sections; the largest pipes' bases and bodies are strengthened with zinc plates. The largest front pipes of the organ are actually hung from the ceiling. All reed pipes were manufactured in Göttingen, at Carl Giesecke und Sohn GmbH.

6.3.4. Organ Case Construction

The case of the organ is made mostly of solid cherry, and partially of curved elements with cherry overlay. The pipes in the front consist of the 32' and 16' principal pedal stops and the 16' Principal stop of the Grand Orgue; above the main row of front stops, the next higher row of pipes consist of the 8' Principal stop of the Pedal and the Solo divisions. The chamades are secured in an iron frame, the front of which is hanging from the ceiling on steel wires.

6.3.5. Consoles

The organ can be played from two consoles. Regarding the size of the manuals and the placement of the switches, the two consoles are functionally identical. The bodies of both consoles are made from cherry and cherry-overlaid plates, just like the organ casing. Both consoles have a music stand and a bench also made of cherry.

Gallery Console

The console on the organ gallery, built into the organ case is of mechanical action. The manuals consist of keys made of spruce, with double-armed levers. The natural keys are covered with ivory, the overlay of the black keys is of ebony. The keys are guided by nickel-plated and polished inserts and their bottom is protected by a layer of felt.

The frame of the curved, radial pedalboard is made of cherry. The base of the pedal keys is made of cherry, the overlays are of hornbeam on the natural keys, with ebony on the blacks. The middle D# key of the pedals is positioned directly below the middle D#4 key of the manuals.

On each front side of the gallery console are the two panels of electrical stop switches. The stop switches connect to lathed ebony stop heads, with china inlays. The buttons to configure the electronic registration memory, to store and change the configured combinations are all located on the rail under Manual I..

The preset combinations can be transferred to the gallery console using an USB storage device. In the middle of the vertical board connecting to the foot res is the crescendo wheel; on its right are the two foot-operated swell pedals. There are one preset and three custom (user)-

defined programs for the crescendo wheel.

The brass foot-operated pistons are arranged ergonomically in two horizontal rows. The currently selected general combination, crescendo program, and the setting (condition) of the crescendo wheel and the swell pedals' positions are all shown on dedicated LED digital displays.

Lower Console / Stage Console

The free-standing, movable console on the orchestral stage is fully electronic. The manuals have a key pressure simulator, customizable key-by-key. The arrangement (numbering) of the toggle stop switches is the same as on the mechanical console's draw-stops; they are arranged by division in horizontal rows. The console is supported on a cherry stand, reinforced with a welded iron frame with self-adjusting casters. The remote console electrically connects to the "mother organ" through its "umbilical cord" connector on the orchestral podium.

The connection between the stop switches of the organ and the wind chest sliders is fully electric – sliders open and close by means of 24V electromagnets. The drawing power and speed can be set continuously for each magnet using a peripheral electronic device.

6.3.6. Slider Chests

There are twenty-two slider chests in the organ, diatonically organized by organ division; the manual divisions are further divided into bass and descant parts. The valves in the slider chests utilize a double opening system: mechanical (for the gallery console) and electrical (for the stage console). The body of the slider chests is made of oak and plywood, with the valve chests additionally incorporating oak-overlaid plywood. The valves are made of spruce, while their closing surface is covered with special felt and very soft leather. The bases of the manual divisions feature assisting nozzles. The valve chests include compensating blowers with ventils. The sliders are made of the highest quality oak – their sliding contact surfaces covered with graphite for smoother motion. The sliders and the pipe bases are sealed with Schmid rings. The middle layer of the three-layered pipe bases is made of pine, the covers of oak. All flue and reed pipes larger than 4' are arranged on oak hangers. Those of the tin pipes are covered with felt. The largest pipes of the organ and the large frontal pipes stand on auxiliary electrical chests.

6.3.7. Wind System

The wind system of the organ consists of four motors and eight blowers. Two large, slow blower motors work to produce wind for the largest pipes of the I., III. and V. manual divisions as well as the pedal division. The uppermost physical level of the organ houses two more blower motors: one produces wind for two of the upper (II. and IV.) manual works, the other is solely dedicated to the Tuba Mirabilis 8' (380 water mm pressure) stop. The remaining parts of the wind system include the gate valves and wind tunnels. The blowers and wind tunnels, sized according to the wind requirements of the stops, are made of medium density fiberboard (MDF) boards covered with oak.

Actual wind pressure is controlled by blocks at the blowers, and by plate springs at the compensating blowers of the wind chests. By subdividing the five manual divisions into bass and

descant parts, it is possible to send different wind pressures required by the different ranks of pipes. Final values were determined after a subjective assessment of the hall acoustics, when setting up the sample pipes.

6.3.8. Internal Organ Case Construction

The main inner bracing of the organ was built of doweled and glued spruce beams. The whole bracing stands on a layer of resin. There are built-in stairs to allow human access to the various levels of the organ, and walking boards and ladders to provide better access to the wind chests, pipes and mechanics.

The swellbox of the II. manual (Positif expressif) is 40 mm thick; that of the III. manual (Récit expressif) 50 mm. They are made of multiple-layered, sandwich-structured leaves and side plates. The leaves are double-horned. Both swellboxes are operated electronically, opening or suppressing the respective divisions' output.

6.4. Statistics of the Organ

Builders	Pécsi Organ-Building Manufacture Ltd. Werkstätte für Orgelbau Mühleisen GmbH
Date of inauguration	May 22, 2006
Voicing Duration	10 months
Total construction hours	28,000
Number of consoles	2
Upper console (organ gallery console)	mechanical action
Lower console (mobile stage console)	electrical action
Number of manuals	5 + Pedal on both consoles
Number of stops	92
Tuning	Equal Temperament
frequency (A4)	442 Hz (continental European concert pitch)
Number of swellboxes	2, (manuals II. and III.)
Crescendo programs	4
Discrete crescendo program frames	61
Dimensions of the organ (meters)	918.3 m3 (32430 cubic feet)
Total frontal sound emission surface of the organ	155.2 m2 (1671 square feet)
Height of the organ from the gallery (façade)	12.03 m (40 feet)
Height of the connecting room downwards	3.65 m (12 feet)
Total height	15.68 m (51.4 feet)
Total width	12.90 m (42.3 feet)

Total depth	4.54 m (14.9 feet)
Total weight	38,000 kg (38 tons)
Total number of pipes	6804
wooden pipes	470
tin pipes in the front of the organ façade	92 (equal to the number of stops)
inner tin pipes	5028
reed pipes	1214
Frequency range of the pipes	16 Hz – 25000 Hz
Length of the largest wooden pipe	9.85 m (32 feet speaking length)
Length of the largest front pipe on the façade	9.58 m (32 feet speaking length)
Length of the smallest pipe (without base)	7 mm (0.28 inch speaking length)
Weight of the largest front pipe	485 kg (1067 pounds)
Number of motors (engines)	4
Number of blowers	8
Number of slider chests	22
Number of auxiliary wind chests	22
Wind pressure	85–130 water mm (mbar)
Total length of tracker wires	2307 m (7570 feet)

6.5. Disposition and explanation of the stops

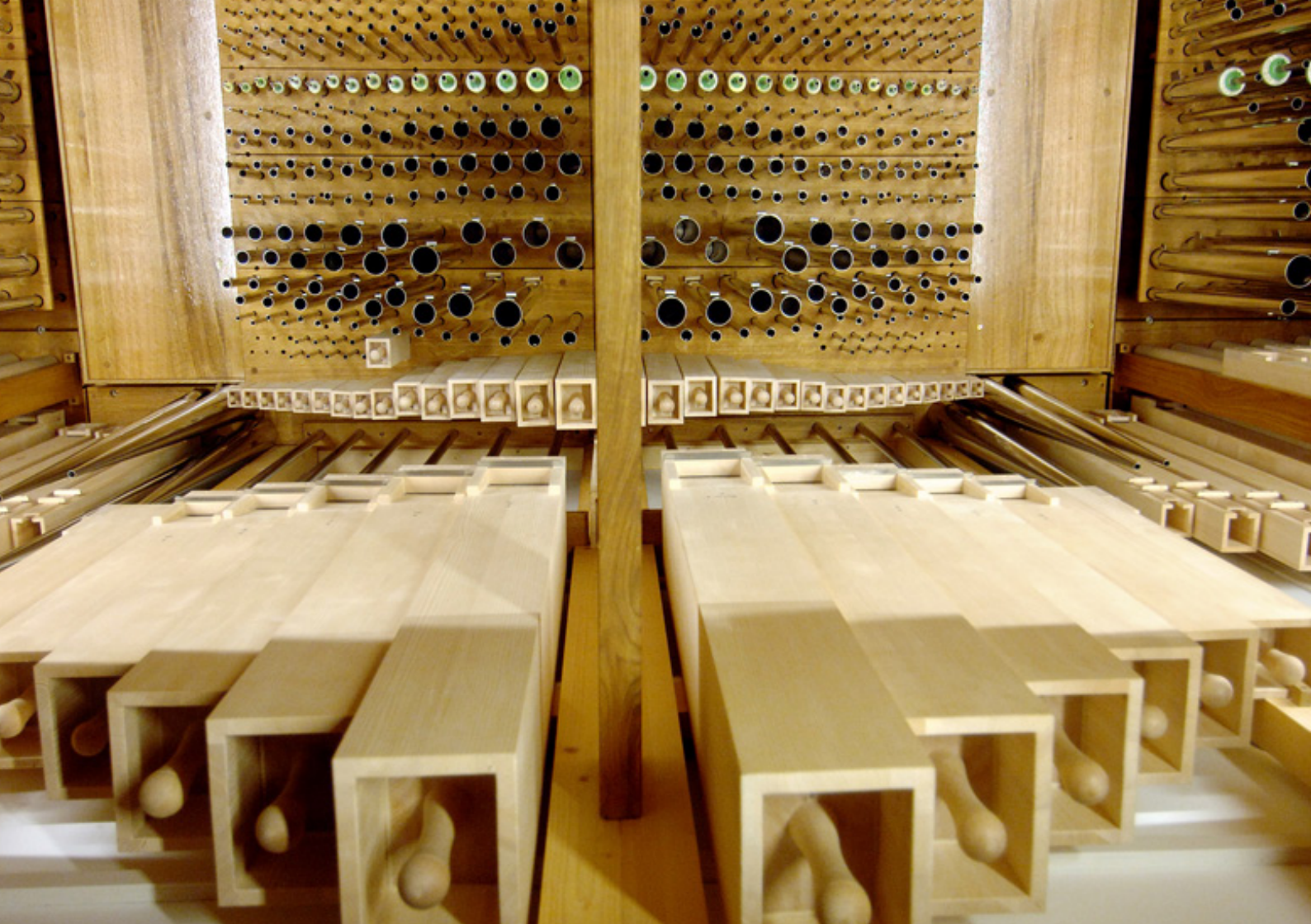
	Name of the stop	Description
Pedal (C-g')		
1	Majorbass 32'	This register is a low-pitched "Contra" Principal.
2	Soubasse 32'	Soubasse is a Bourdon pitched an octave lower.
3	Principalbass 16'	A Principal stop of 16' pitch in the pedal.
4	Contrebasse 16'	An imitative string stop of 16' pitch.
5	Violon 16' (transmission from III. Manual)	A mild string stop of the pedal. Named after the orchestral instrument of the same name, the largest member of the viola da gamba family
6	Soubasse 16'	Soubasse is a Bourdon pitched an octave lower.
7	Grossquinte 10 2/3'	A stopped rank of pipes made of pine, used to simulate a 32' "resultant" sound when played simultaneously with a 16' stop.
8	Octavbass 8'	An open rank of pipes made of 80% tin. Partly featured in the front of the case. These are the widest scaled pipes of the organ.
9	Gedäckt 8'	A covered flute of 8' pitch, similar to Bourdon and Stopped Diapason. It is perhaps the most common covered flute stop. ("Gedäckt" means "covered.)
10	Cello 8'	A string stop imitative of the orchestral instrument of the same name.
11	Octave 4'	An Open Diapason of 4' pitch.
12	Tibia 4'	A stop of conical metal pipes (40% tin). In order to sound well together with Zinck 3x: 5 1/3', the conicity and the mouth of the pipes are exactly the same and have almost the same proportions (Mensur).
13	Tercsept 2x: 6 2/5'	A two-rank compound stop with the following content: 6 2/5' + 4 4/7'

	Name of the stop	Description
14	Zinck 3x: 5 1/3′	This stop imitates a certain type of Renaissance musical instrument, constructed and fingered like a woodwind but blown like a trumpet. A compound stop with the following content: 5 1/3′ + 3 1/5′ + 2 2/7′
15	Compensum 7x 2 2/3′	A 7- line harmonic stop with the following contents: 2 2/3′ + 2′ + 1 3/5′ + 1 1/3′ + 1′ + 2/3′ + 1/2′
16	Mixtur 4x 2 2/3″	Mixtur is a generic name for compound stops containing mutations, usually with breaks. Here it is a 4-line harmonic stop with the following content: Excerpt from Compensum (15): 2 2/3′ + 2′ + 1 1/3′ + 1
17	Bombarde 32′	A powerful chorus reed at 32′ pitch, made of pine. Its resonators are inverted pyramidal wood. Its longest pipe is 9 m. Here it is a combined register with Bombarde 16′ in the pedal (18)
18	Bombarde 16′	A powerful chorus reed at 16′ pitch.
19	Basson 16 transmission from II. manual (75)′	An imitative reed stop with medium intonation. Its volume is rather set for the positive work (which can be swelled). However, it is loud enough and the placement of the pipes allows using it as a reed in low-volume pedal music.
20	Trompete 8′	A reed stop at 8′ pitch, perhaps should more properly be called Orchestral Trumpet.
21	Clairon 4′	A chorus reed of 4′ pitch, essentially an octave Trumpet.
22	P+IV m.	A mechanical coupler (the "m" stands for "mechanical") between the Pedal and the fourth (Solo): it operates the mechanics but the keys are not depressed.
23	P+III m.	mechanical coupler between the pedal and third manual
24	P+II m.	mechanical coupler between the pedal and second manual
25	P+I m.	mechanical coupler between the pedal and first manual
I. Manual, Grande orgue (C-c″″)		
30	Montre 16′	Another name of Diapason, Principal, Prestant, etc., the quintessential tone of the pipe organ.
31	Principal 8′	'Main play', the major element of the organ sound. Typical metallic, organ-like sound.
32	Flûte harmonique 8′	Harmonic flutes are constructed from open pipes twice the normal speaking length. The pipes are then overblown to speak their first harmonic (the octave). A hole is pierced in each pipe to prevent the formation of an acoustical node at the middle of the pipe's speaking length.
33	Gamba 8′	A non-imitative string stop of 8′ pitch. A common and generally useful string stop.
34	Bourdon 8′	A stopped wooden flute, the name of which is derived from the French word bourdonner, "to buzz". Its sound is similar to Gedäckt and Stopped Diapason.
35	Praestant 4′	An Open Diapason of 4′ pitch.
36	Rohrflöte 4′	Pipe flute – medium-wide closed pipes with an extension that yields a brighter sound than the fully closed flute.
37	Quinte 2 2/3′	A harmonic register at the fifth (e.g. when a C is pressed, a G sounds).
38	Superoctave 2′	An alternative name of a Principal at 2′ pitch. The pipes are of open metal construction.
39	Cornet 2-5x 8′	The Cornet is a wide-scaled compound stop without breaks, originally also attempting to imitate the Renaissance cornet or zink (see Zinck above), not the modern orchestral cornet.
40	Mixtur 5-7x 2 2/3′	Mixtur is a generic name for compound stops containing mutations, usually with breaks. Here it is an 5-7-line harmonic stop, starting with 2 2/3′ + 2′ + 1 1/3′ + 1′ + 2/3′.
41	Cimbel 4-5x 1 1/3′	Highest-pitched, tight, multi-row pipe set. Lots of repetitions, at various harmonics. The brightest-sounding crown of the organ sound.
42	Trompete 16′	These three registers are the "Germanic" trumpets of the organ (as opposed to the "Spanish" Chamades and the remaining "French" Trompettes, Cornet, etc.).

	Name of the stop	Description
43	Trompete 8′	
44	Trompete 4′	
45	I+IV m.	mechanical coupler between the first and fourth manual
46	I+IV e.	electrical coupler between the first and fourth manual
47	I+III m.	mechanical coupler between the first and third manual
48	I+III e.	electrical coupler between the first and third manual
49	I+II m.	mechanical coupler between the first and second manual
50	I+II e.	electrical coupler between the first and second manual
II. Manual, Positif expressif (C-c″″′)		
60	Quintatön 16′	'Quinter', narrow, closed base pipes sounding the fifth strongly. Quite nasal, somewhat bitter sound.
61	Principal 8′	'Main play', the major element of the organ sound. Typical metallic, organ-like sound.
62	Cor de nuit 8′	A stopped flue rank, the low octave pipes made of pine, the rest of the pipes (from C0) made of tin.
63	Unda maris 8′	'Wave of the sea' – a soft, flute-like pipe rank deliberately tuned slightly sharp. Together with other stops this causes the sound to 'float' in an undulation reminiscent of massed orchestral strings.
64	Salicional 8′	"Willow" pipe – a tight, cylindrical, somewhat string-like register.
65	Flûte traversière 8′	'Transversal flute', wide blow-through pipes twice the size of normal open pipes. A clear, somewhat veiled flute sound, imitating the orchestral flute.
66	Praestant 4′	An Open Diapason of 4′ pitch.
67	Flûte conique 4′	'Conic' flute: the pipes are wider at the top than at the mouth.
68	Quinte 2 2/3′	A harmonic register at the fifth (e.g. when a C is pressed, a G sounds).
69	Doublette 2′	2′ principal stop on French organs, a synonym for Super Octave.
70	Terz 1 3/5′	A mutation stop of 1-3/5′, supporting the 8′ harmonic series. It supports the fifth harmonic, sounding approximately an E when played from a C key, seventeen scale steps higher. It is therefore known as a "third-sounding" rank.
71	Larigot 11/3′	A mutation stop of 1-1/3′ pitch, basically a Nineteenth (but a flute, not a principal). The name comes from l'arigot, a French word denoting a small flute or flageolet.
72	Piccolo 1′	An open flute stop of 1′ pitch, closely, but not perfectly imitating the orchestral instrument of the same name.
73	Mixtur 4-6x 2′	A 4-6-line harmonic stop.
74	Septnon 2x 8/9′ + 1 1/7′	A 2-line harmonic stop of sevenths.
75	Basson 16′	An imitative reed stop of medium timbre. Its volume is rather set for the positive work (which can be swelled). However, it's inherent output and the placement of the pipes allows using it as a reed in low-volume pedal music.
76	Dulzian 16′	A soft-toned 16′ reed stop, built from soft, cylinder-shaped flue pipes.
77	Trompette 8′	Strong reed pipes that resemble the trumpet in sound, usually with a cornet-shaped resonator.
78	Cromorne 8′	One of the oldest organ stops: 'bent horn', reed pipes with natural-length cornets. While it takes its name from the instrument of the same name (a capped reed with a curved body and a muffled, buzzing tone), the organ stop in its most familiar form has a tone resembling that of the Clarinet.
79	Clarinette 8′	Clarinet – medium-pitched pipes that resemble the actual instrument.
80	Tremulant II.	
81	II+III m.	mechanical coupler between the second and third manuals

	Name of the stop	Description
82	II+III e.	electrical coupler between the second and third manuals
83	II+IV m.	mechanical coupler between the second and fourth manuals
84	II+IV e.	electrical coupler between the second and fourth manuals
III. Manual, Récit expressif (C-c””)		
90	Violon 16′	A mild string stop. Named after the orchestral instrument of the same name, the largest member of the viola da gamba family.
91	Gedeckt 16′	A covered flute of 16′ pitch, similar to Bourdon and Stopped Diapason. It is perhaps the most common covered flute stop. ("Gedäckt" means "covered.)
92	Geigenprincipal 8′	The Geigen (named after the German geige, meaning "violin") is a common diapason/string hybrid. It blends well, and is often used as the 8′ foundation in Swell divisions.
93	Flûte harmonique 8′	Harmonic flutes are constructed from open pipes twice the normal speaking length. The pipes are then overblown to speak their first harmonic (the octave). A hole is pierced in each pipe to prevent the formation of an acoustical node at the middle of the pipe's speaking length.
94	Gamba 8′	A non-imitative string stop of 8′ pitch. A common and generally useful string stop.
95	Voix céleste 8′	The ubiquitous Voix Céleste is typically a single rank of pipes yielding a mild string tone, found in Swell divisions and intended for use with a Salicional or Viola da Gamba. The Voix Celeste is tuned slightly sharp, producing that undulating chorus tone reminiscent of massed orchestral strings.
96	Aeoline 8′	The Aeoline is a string stop of very soft tone; the softest string tone in the organ. It is constructed of small scale cylindrical metal pipes.
97	Bourdon à cheminée 8′	'Chimney' bourdon. 'á cheminée' (Rohr in the German) indicates the small extension piece at the end of a closed pipe.
98	Violine 4′	A stop imitating bowed stringed instruments.
99	Flûte octaviante 4′	An open flute of 4′ pitch, similar to Flûte harmonique: in its perfect form it is said first to touch the ground tone and then leap into the octave.
100	Nasard 2 2/3′	A mutation stop of 2-2/3′. It represents the lowest non-unison pitch that reinforces a harmonic of the fundamental pitch (8′ on the manuals, 16′ on the pedals). As such, it is the most important mutation pitch.
101	Octavin 2′	Wide, soft blow-through pipes in French organs.
102	Tierce 1 3/5′	A mutation stop of 1-3/5′, supporting the 8′ harmonic series. It supports the fifth harmonic, sounding approximately an E when played from a C key, seventeen scale steps higher. It is therefore known as a "third-sounding" rank.
103	Progressio 2-4x 2′	A Mixture stop in which the ranks increase in number as the notes progress from bass to treble. Invented by Musikdirektor F. Wilke of Neu-Ruppin, Germany as a means of reinforcing the treble.
104	Cymbale 4x 1′	Highest-pitched, tight, multi-row pipe set. Lots of repetitions, at various harmonics. The brightest-sounding crown of the organ sound.
104	Cymbale 4x 1′	Highest-pitched, tight, multi-row pipe set. Lots of repetitions, at various harmonics. The brightest-sounding crown of the organ sound.
105	Bombarde 16′	A powerful chorus reed at 16′ pitch. Its resonators are inverted conical metal or inverted pyramidal wood, and may be of harmonic (double) length in the treble.
106	Basson-Hautbois 8′	Some schools of organ-building, in particular 18th & 19th century French, consider the Bassoon to be the proper bass of the Oboe. Therefore some organs feature a single rank of reed pipes, split so that the treble and bass are controlled by two separate stops, labeled Oboe and Basson, respectively. When an entire such rank is controlled by a single stop, it is sometimes labeled as here.
107	Trompette harmonique 8′	Double-sized, blow-through trumpet stops with harmonic (double) length resonators, invented by Aristide Cavaillé-Coll. The use of harmonic resonators does not, by itself, result in louder tone. On the contrary, harmonic resonators tend to subdue the tone (, all other things being equal). They also make the tone purer and less dissonant. The double-length resonators are typically used in the treble part of the compass.

	Name of the stop	Description
108	Voix humaine 8′	The Vox Humana is one of the oldest organ stops, a reed stop of the Regal class. While it does not really approach the sound suggested by its name (human voice), its beauty depends not so much on the details of its construction, but rather on its acoustical environment. A large, reverberant room, distance from the listener, and enclosure in a swell box all contribute greatly to its effect. A tremulant is also essential, which must be carefully adjusted. The Voix Humaine was a standard voice in the Grand Orgue division of the French Classic organ, where it was always used with the 8′ Bourdon and the tremblant doux, and often with the 4′ Flute as well.
109	Clairon harmonique 4′	This lingual stop, also invented by Aristide Cavaillé-Coll, is the true Octave of the Harmonic Trumpet, 8′, and is, accordingly, of 4′ pitch. The pipes are formed in all respects similar to those of the unison stop, being of about double the normal speaking lengths, voiced on high-pressure wind so as to speak the octave pitch.
110	Tremulant III.	
111	III+IV m.	mechanical coupler between the third and fourth manual
112	III+IV e.	electronic coupler between the third and fourth manual
IV. Manual, Solo (C-c‴′)		
120	Rohrbourdon 16′	A large, 16′ Rohrflöte.
121	Principale 8′	The quintessential tone of the pipe organ.
122	Konzertflöte 8′	The widest one of the four blow-through stops on the manuals. Actually, below the small octave this stop shares its pipes with Principale 8′ on the Solo work.
123	Voce humana 8′	In Italian organs, the Voce Umana is usually a Diapason Celeste. The term celeste refers to a rank of pipes detuned slightly so as to produce a floating effect when combined with a normally tuned rank. It is also used to refer to a compound stop of two or more ranks in which at the ranks are detuned relative to each other
124	Nasard 5 1/3′	A mutation stop of 5-1/3′. It represents the lowest non-unison pitch that reinforces a harmonic of the fundamental pitch (8′ on the manuals, 16′ on the pedals). As such, it is the most important mutation pitch.
125	Octave 4′	An Open Diapason of 4′ pitch.
126	Tierce 1 3/5′	A mutation stop of 1-3/5′, supporting the 8′ harmonic series. It supports the fifth harmonic, sounding approximately an E when played from a C key, seventeen scale steps higher. It is therefore known as a "third-sounding" rank.
127	Septième 2 2/7′	A mutation stop of 1-1/7′ or 2-2/7′ pitch. The name Septième was introduced by Cavaillé-Coll and it was he who first brought it to prominence in France in the 1860's.
128	Flûte 2′	An open flute stop with no particular distinguishing characteristic.
129	Sesquialtera 2 2/3′ + 1 3/5′	A compound flue stop of two unbroken diapason ranks, speaking the 12th and 17th of the 8′ harmonic series (thus the ranks at 2-2/3′ and 1-3/5′ pitch).
130	Plein jeu 3-5x 2 2/3′	The term Plein Jeu ("full chorus") originally designated not a stop but a registration consisting of Principals, Flutes, Fournitures, and Cymbales, rarely containing any 3rd-sounding ranks. Since the end of the French classical period the mixture called Plein Jeu consists of two or more octave and fifth sounding ranks (and never thirds).
131	Cor anglais 8′	The orchestral English Horn is neither English nor a horn; it is essentially a tenor oboe which dates back at least as far as the 18th century. The name "English Horn" is a translation of the French cor anglais which is probably a corruption of cor anglé, meaning "angled horn", referring to an early form of the instrument which was bent in the middle at an angle. The tone of this stop is intended to imitate this woodwind instrument, which has been described as rich, round, plaintive, and somber.
132	Tuba mirabilis 8′	A Tuba of extraordinary power, among the most powerful of all stops.
133	Walze	enables the crescendo wheel
134	Koppeln aus Walze	couplers disabled when using the crescendo wheel



	Name of the stop	Description
135	Mixturen aus Walze	mixtures disabled when using the crescendo wheel
136	Zungen aus Walze	reeds disabled when using the crescendo wheel
137	P+IV e.	electrical coupler between the pedals and the fourth manual
138	P+III e.	electrical coupler between the pedals and the third manual
139	P+II e.	electrical coupler between the pedals and the second manual
140	P+I e.	electronic coupler between the pedals and the first manual
V. Manual, Chamaden (C-c''')		
150	Chamade 16′	During the 20th century, the phrase en chamade (meaning "to sound a parley") came to mean a stop (invariably a loud chorus reed) whose pipes were mounted horizontally outside the organ case. When used by itself as a stop name, Chamade indicates some sort of chorus reed mounted en chamade. The name here is also used for an entire division. There are a number of reasons for mounting a reed horizontally, or for "hooding" it by mitering its resonators by 90 degrees. The most important reason, arguably, is tonal: by speaking directly into the church or hall, a noticeable number of high harmonics are transferred to the ears of the listener that would otherwise be lost to reflection or absorption. Another important reason is the great visual impact of such externally-, mounted ranks. Other reasons include tuning stability and protection from gravity-borne dust and debris. It should be noted that all of these advantages (except visual impact) can be had by placing the reeds inside the case rather than outside — at considerable savings in cost. Externally mounted reeds are very expensive, because of the required supporting structure, and because the resonators usually employ more expensive materials, and brought to a higher state of finish.
151	Chamade 8′	
152	Chamade 4′	
153	IV+V	electrical coupler between the fourth and fifth manuals
154	III+V	electrical coupler between the third and fourth manuals
155	II+V	electrical coupler between the second and fifth manuals
156	I+V	electrical coupler between the first and fifth manuals
157	P+V	electrical coupler between the pedal and fifth manuals
158	IV+IV 4′	couples a one-octave higher transposed version of the fourth manual to itself
159	IV+IV 16′	couples a one-octave lower transposed version of the fourth manual to itself
160	III+III 4′	couples a one-octave higher transposed version of the third manual to itself
161	III+III 16′	couples a one-octave lower transposed version of the third manual to itself
162	II+III 4′	couples a one-octave higher transposed version of the third manual to the second manual
163	II+III 16′	couples a one-octave lower transposed version of the third manual to the second manual
164	I+IV 4′	couples a one-octave higher transposed version of the fourth manual to the first manual
165	I+IV 16′	couples a one-octave lower transposed version of the fourth manual to the first manual
166	I+III 4′	couples a one-octave higher transposed version of the third manual to the first manual
167	I+III 16′	couples a one-octave lower transposed version of the third manual to the first manual
168	I+II 4′	couples a one-octave higher transposed version of the second manual to the first manual
169	I+II 16′	couples a one-octave lower transposed version of the second manual to the first manual
170	P+IV 4′	couples a one-octave higher transposed version of the fourth manual to the pedal
171	P+III 4′	couples a one-octave higher transposed version of the third manual to the pedal

7. About the recording process and the library

by Csaba Huszty

7.1. Recording

Preparations for this recording included initiation and implementation of a broader cooperation between Entel/Inspired Acoustics and the Palace of Arts – Budapest. Nearly 2 years of preparation, organization and planning took place before the actual recording could start. We were introduced to the instrument from the late phases of its building and voicing. The recording effort itself started in September 2007, more than a year after the official opening of the Palace. The Béla Bartók National Concert Hall has a very busy schedule so we pre-programmed everything before we entered the concert hall to minimize the recording and measurement session time requirements. Even the regular cleaning maintenance of the hall had to be rescheduled to allow us the privilege of continuous recording. Preparations included a custom acoustic setup of the hall, involving repositioning the 40-ton stage canopy and the 10-ton reverberation chamber doors along with all curtains to a location we specifically desired. The first session took about 47 hours, continuously, allowing us to capture a completely consistent spatial image of the organ. All together we recorded a net amount of 66 hours.

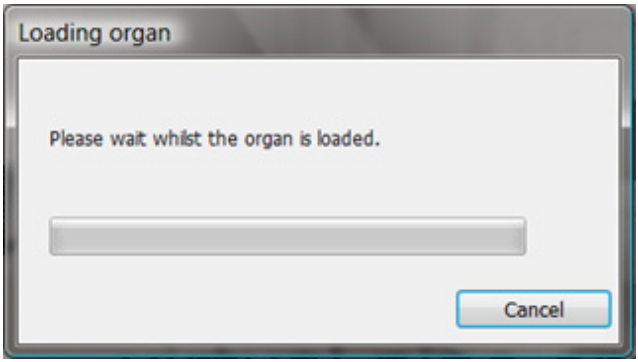
7.2. The recording in numbers

Time of recording	September 2007
Microphone used for this edition	DPA 4035 (a pair)
Microphone setup	AB, hung from the canopy, with a base moderately spaced
Net recording hours (organ only)	66
Sampling frequency	192 kHz/32 bits for all samples
Amount of data recorded	over 640 GB
Room acoustics	optimized for the recording
Total development hours	12,000 hours
Noise filtering performed in	Hungary
Number of continents participating in the post-processing works	4
Number of sound samples in this release	10 930 (Medium Edition)

8. Known issues

8.1. Hauptwerk™ loads this organ more slowly than other organs

This is a result of the tremendous number of switch linkages and logic in the organ definition file that describes the PAB Organ. Depending on the speed of your computer, you may need to wait from a few seconds to a few minutes before the Rank Page is displayed in Hauptwerk™ . This is normal, so there is no workaround for this; please wait while Hauptwerk™ finishes processing the organ definition file.



It may take about 30 minutes to load the organ for the first time after the Rank Page was displayed. This is because first Hauptwerk™ generates a cache file to allow faster subsequent loadings. Using the cache, Hauptwerk™ will load the organ in about 3 minutes.

8.2. Limitations in assigning MIDI messages at this time of writing

Although it may be possible in future releases of Hauptwerk™, the current Version 4.2.1 and earlier, unfortunately, do not support assigning MIDI program change increment and decrement messages to the custom combination frame buttons < and > that increment and decrement PAB's custom combination frames, available on the graphical user interface. You can attach fixed program change messages or other MIDI messages, however.

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