PHOENIX ORGANS

The Phoenix Organ System - Overview

The Phoenix Organ System is designed to provide the best possible substitute for a pipe-organ. The initial choice to use sampling technology came aboustylet after very careful consideration and assessment of the market place and technological developments in IT and electronics. By installing the Phoenix Organ System in a fine console, and providing high-quality amplifiers and speaker systems a truly magnificent digital organ be created rivalling many fine pipe organs and surpassing the quality of the mediocre and bad pipe instruments.

Our organ system is the result of careful design carried out by individuals with

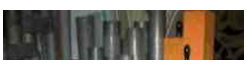
considerable experience in digital electronics, IT and most important organs. Our system designers have worked with other digital organ systems and are aware of their shortcomings and have ensured that the Phoenix System overcomes these in a cost effective manner.

The Phoenix System is modular, only the elements needed for a specific instrument need be installed. The instrument can be upgraded (*rebuilt*) at a latter stage and additional system elements added. So it is possible to initially have a smaller specification, with say five soundcards and six audio channels and add more soundcards (to add more digital ranks) and more audio channels at a future time.

The system uses pipe organ samples as its basis and we are able to offer a vast range of samples collected from instruments throughout the UK, Europe and North America. This enables us to build for you the best possible musical instrument that will meet our particular needs. Our system can provide whatever tonal palate you wish be it Baroque, Romantic, French, English, American or your own eclectic choice. Our designers can assist you in ensuring that the instrument has musical integrity and meets your musical requirements Phoenix staff have extensive experience of designing organs for both liturgical and concert use.

The Phoenix System control software has been designed to ensure that the player finds the instrument responsive even when performing the fastest passages. Particular care has been taken in our design to ensure that no notes are missed and there is no delay in producing the sound unless the system has been set up to delay the sound production from a division to more realistically simulate its placement (for example the system might delay the production of sounds from an echo or west-end a division.

The Phoenix System can also be configured to support



connections to wind blown pipes making it an excellent choice for the heart of a hybrid (pipe and digital) instrument.

The other pages in this section of the web site give some details of how the Phoenix System operates and its intrinsic functionality and capabilities.

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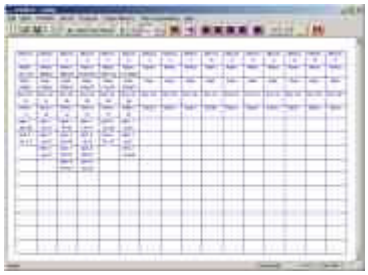
The Phoenix Organ System Capabilities

The Phoenix system capabilities are enormous - a single system will cater for up to six keyboards and pedals, 256 stops, 256 ranks and 256 pistons. Whilst six departments may seem like a lot, it enables several "floating" departments to be handled conveniently. Departments do not necessarily need key inputs. When the system is used in a cinema organ, this covers only three departments with double-touch. Should you require something larger then two systems can operate together to offer the possibilities of having a huge instrument.



Please note that the Phoenix System can also support ranks of wind blown pipes enabling the system to be used in hybrid instruments.

The functionality and capabilities of the Phoenix System are set out in subsequent sections.

System capabilities for sound generation and stop control

Dept.	Ranks	Stops	Audio	Expr	Trem	Midi (Assignable Channel for each dept.)				
Total	*256*	*256*	*64*			In	Out 1	Out 2	Expr	
Pedal	32	32	8	poss		recv	Pre	Post		
Great	48	40	20	poss	yes	recv	Pre	Post		

Swell	48	32	18	yes	yes	recv	Pre	Post	sent	recv
Choir	48	24	22	yes	yes	recv	Pre	Post	sent	recv
Solo	32	24	16	yes	yes	recv	Pre	Post	sent	recv
Fifth	32	20	16	no		recv	Pre			
Sixth	16	14	8	no		recv	Pre			

Up to ***16*** mixture stops can be put *anywhere*, with up to 10 ranks in each stop, as long as the maximum departmental stops and ranks boundaries are not exceeded.

Ranks of pipes may be controlled by the system. Contact Phoenix for details of the number of ranks that may be controlled and their interaction with the other system parameters.

**There is some duplication of audio channels, particularly where the Choir Solo Fifth and Sixth are concerned*

Couplers

	Sixth to	Fifth to	Solo to	Swell to	Choir to	Great to	Pedal to
to Sixth							
to Fifth	8						
to Solo	8	8	16 - 0 - 4				
to Swell	8	8	16*- 8 - 4*	16 - 0 - 4			
to Choir	8	8	16*- 8 - 4*	16 - 8 - 4	16 - 0 - 4		
to Great	8	8	16*- 8 - 4*	16 - 8 - 4 *Cantus Firmus*	16 - 8 - 4		AutoBass
to Pedal	8	8	8 - 4	8 - 4	8 - 4	8	

**These couplers are not available separately, but the Solo Oct & Sub always couple through.*
If Sw or Ch Oct to Gt is present, then none of the Sw or Ch Oct or Sub couplers act through.

Pistons

On the Phoenix Organ the pistons operate the stops themselves so it is clear what stops are active (it is not a blind registration system). There are two separate and autonomous parts sets of pistons.

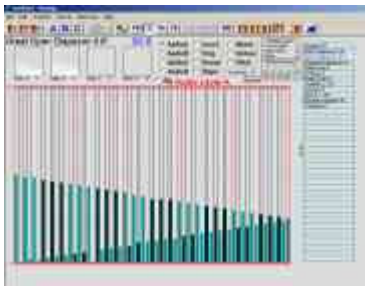
Standard Pistons - these have 8 independent memory levels

16	Adjustable Pistons to operate on stops assigned to Group 1 (normally General)
16	Adjustable Pistons to operate on stops assigned to Group 2 (normally Pedal)
16	Adjustable Pistons to operate on stops assigned to Group 3 (normally Great)
16	Adjustable Pistons to operate on stops assigned to Group 4 (normally Swell)
16	Adjustable Pistons to operate on stops assigned to Group 5 (normally Choir)
16	Adjustable Pistons to operate on stops assigned to Group 6 (normally Solo)
16	Adjustable Pistons to operate on stops assigned to Group 7 (normally Fifth)

8	Adjustable Pistons to operate on stops assigned to Group 8 (normally Sixth)
8	Adjustable Pistons to operate on stops assigned to Group 9 (any set of stops e.g. doubles)
8	Adjustable Pistons to operate on stops assigned to Group 10 (any set of stops e.g. reeds)
8	Adjustable Pistons to operate on stops assigned to Group 11 (any set of stops e.g. mixtures)
8	Adjustable Pistons to operate on stops assigned to Group 12 (any set of stops e.g. tremulants)
8	Pistons specifically for the left-hand toe pistons which can be set to either Gen 1-8 or Swell 1-8
32	Reversible Pistons each of which can be programmed to reverse any stop on the organ

Stop Sequencer Controlled Pistons with 99 independent memory level

- 16 Adjustable Pistons under Sequencer Control
- 99 pages of sequencer memory
- Up to 12 NEXT / FORWARD and 12 REVERSE / BACK standard pistons can be mapped to the sequencer
- Each time the **NEXT / FORWARD** control is operated the organ is set to the registration associated with the next sequencer piston. The organ advances through the 16 sequencer pistons on the current sequencer memory page and then moves to the first sequencer piston on the next page. **REVERSE / BACK** steps back to the previous sequencer piston registration and moves back from the first sequencer piston to the last (sixteenth) sequencer piston setting on the previous memory page.
- Sequencer ON / OFF and memory PAGE UP / DOWN controls with individual page locking.
- When the sequencer is turned on the current sequencer memory page is activated: the player then selects the sequencer piston number to activate within that page by pressing the appropriate sequencer piston. Thereafter the player may use the **NEXT / FORWARD** and **REVERSE / BACK** and the sequencer pistons to select their registration. The standard pistons (non-sequencer) continue to operate normally when the sequencer is turned on.
- When the sequencer is turned off the sequencer pistons operate as another set of general pistons, giving the flexibility of separate memory level control from the departmental and general pistons.



Standard features

- Select current piston memory level
- Lock / unlock piston settings (current set or global lock)
- Stop sequencer on /off
- Crescendo pedal on/off
- Set stops associated with each step (of the 20 steps) of the crescendo pedal
- Up to 4 different specifications with different samples for each stop if you wish
- Each specification can have either the Choir or Great as lowest keyboard for authentic French performance
- 4 Temperaments: Equal, Vallotti, Silbermann and Werckmeister
- Fine Tuning adjustment
- Transposer
- Overall volume control
- Integrated control of Lexicon Reverberation unit (via MIDI) direct from console.
- Most of the above alterable parameters can be saved as defaults for next power-on
- Discreet integrated LCD display and associated controls to allows the player to view and adjust the above settings (Volume, Pitch, Transpose etc).
- Programmable sound delays for each department to simulate some being further away than others - works in 8 feet steps from 0 - 100 feet for authentic acoustic rendition of antiphonal divisions.

- Midi channel assigned to each keyboard is programmable
- MIDI Out 1 for recording to sequencer uses pre-coupled data
- MIDI Out 2 for connecting to sound module uses post-coupled data
- Headphone output sockets
- Serial voicing port
- Expression pedals affect brightness as well as volume of sound, and both amounts are fully adjustable
- Pedal boards use Hall semiconductor switches - no moving parts for ultimate reliability.

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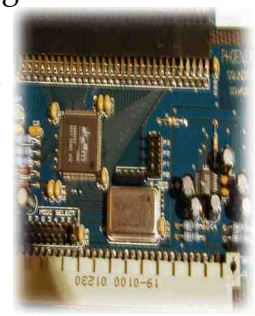
The Phoenix Organ System - How it works

Sound Generation

The sound generation process in a Phoenix Organ uses the sample replay technique. One of the key issues in the control of an electronic organ is the allocation of sound resources. In a Phoenix Organ, a separate, independent generating source is used for each note of each rank in the same manner as a traditional (non extended, non unified) pipe organ. Some technologies in the market place do not work in this manner - sound generators are shared across stops. At Phoenix, we do not do this because we believe that it is important that an electronic organ replicates a pipe organ as closely as possible.



The basic building block within the organ is the Phoenix soundcard: the number of these will depend on the size and specification of the instrument. A Phoenix soundcard has 64 generators, each of which can replay one sample at a time. Each sound card has the option of software bass and treble controls on each of its four audio channel and when this option is implemented it reduces the number of generators by two per audio channel. If eight stops (ranks) are assigned to a single sound card *without* software bass and treble controls, then this will allow up to eight notes to be played with all stops drawn simultaneously.

The sound samples to be used by a soundcard are stored in memory located on the soundcard. Some of the samples for stops can be very large: this is because we use a large number of samples to cover the range of the stop, and each sample is quite long to ensure that the sound does not become boring. We therefore tend to limit the number of ranks (stops) on a sound card to about five, balancing the memory used by the samples and the polyphony of the soundcards (and hence the polyphony of the instrument).

We use high quality sound samples in our organs. The starting point for creating the samples we use is a digital recording of a pipe organ rank. We select a number of samples from the recording that characterise the sound of the rank across its key range. Then we make use of various software tools to adjust and correct these digital samples before incorporating them into our digital rank. Some digital ranks use up to forty or fifty long samples -

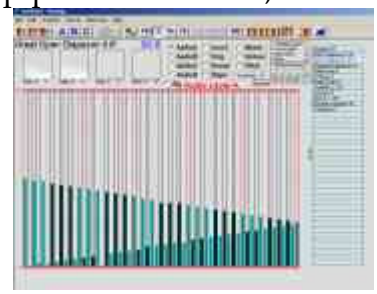
virtually one per note. This is particularly important for flutes which contain complex and uneven starting transients (chiff) and ensures that these transients are naturally re-created from the original pipe itself. The use of multiple samples also avoids the "chromatic whistling" effect which seriously flaws the sound if too few samples are used.

Stop lists can, at times, be pretty meaningless, and we have all experienced the disappointment when the sound emanating from the organ does not match one's expectations from the engraving on the stop knob. This applies as much to pipe organs as electronic organs. At Phoenix, when we are building an organ we can select, in consultation with the customer, the appropriate digital ranks (samples) that match their requirements and aspirations. We are also able to make changes to the samples after the organ has been installed should this be required or desired.

When a Phoenix Organ is installed, our skilled staff will carry out fine regulation and voicing so that the instrument meets your expectations. Voicing is carried out using our own sophisticated voicing software. This gives us the added flexibility of being able to adjust the final sound of our samples on site to suit the space in which the organ is installed.

Voicing Software

A pipe organ usually contains thousands of pipes. Each pipe can be voiced, regulated and tuned. Our system works on a similar basis. We can voice, regulate, adjust the attack and release, and tune every note of every rank independently. Our voicing software is Windows-based and easy to use - allowing the person regulating the organ to concentrate on the job-in -hand and not worry about how to use the software.



On a pipe organ, moving the expression pedal does not just vary the volume of the sound, it also changes the tone by damping higher frequencies. The Phoenix system software simulates this also, by attenuating these higher frequencies when the expression pedal is closed. The calibration curves of our expression can be set using the voicing software.

The effect of wind variation on a pipe organ can have a significant effect on the sounds we hear. Our system software simulates this effect, and using our voicing software, each stop's loading on the bellows can be set across three of the keyboard. A large Open Diapason's bottom octave will use far more wind than say the top octave of a Larigot. Each stop’s response to bellows movement is also adjustable. Wind calculations are performed hundreds of times per second in the

Phoenix control software to guarantee pipe-like response.

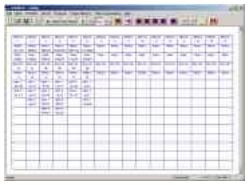
A pipe organ tremulant changes the pitch and loudness of a stop. We have incorporated this into our design, plus a feature to provide some randomness in tremulant levels which occurs in pipe reed stops. Our voicing software provides full tremulant adjustment.

Organ Control

One of the most important features in any organ is its response to key presses. The

Phoenix Organ System utilises a scaleable multiple processor architecture for its main control system. For example, each keyboard is scanned by an individual micro-processor and key presses and releases are passed to the main organ control processor. This main control processor in turn controls the operation of the sound generation pre-processors, so controlling the sound of the instrument. Similar processors handle input from stops and pistons. More control processors are provided in larger instruments to ensure that the response to all events is always consistent and prompt.

The software for Phoenix organs has been developed using the Yourdon method. This is a modern structured analysis and design technique that is widely used in both business and computer control systems. Briefly, it involves the definition of the system requirements and then expands these into process tasks. By developing the control software using this formal method, the Phoenix Organ System software is much more likely to offer a reliable service than other systems.



An important feature of the Phoenix Organ System is the ability to configure the instruments on-site. Through our configuration software system it is possible to reassign functions to different controls.

Pipe Control

The Phoenix Organ System can control wind blown ranks of organ pipes as well as digital ranks. Facilities are available within the control system for ranks of pipes to be attached to divisions of the organ and played through the console being managed by the Phoenix System. This enables the Phoenix System to be used to supplement an existing (or new) pipe organ by providing a new console system with up-to-date control

facilities and some digital voices or for a principally digital Phoenix System to be supplemented by some ranks of real pipes.